# Operating instructions

## Control module delta®

## Supplementary operating instructions for delta® Solenoid metering pump


Three sets of operating instructions are required for the safe, correct and proper operation of the metering pumps: The product specific operating instructions, the "General operating instructions for ProMinent® solenoid metering pumps" and the operating instructions "Solenoid metering pump delta® with controlled solenoid drive optoDrive®". These operating instructions are only valid when read together.

**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.**

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# Table of contents

# 1 Introduction

These operating instructions provide information on the technical data and functions of the control module delta®.

## 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.<br>Electricians should be specifically trained for the working environment in which the are employed and know the relevant standards and regulations.<br>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

**WARNING!**

**Live parts!**

Possible consequence: Fatal or very serious injuries

- Measure: Disconnect the mains power supply prior to opening the housing
- De-energise damaged, defective or manipulated units by disconnecting the mains plug

**WARNING!**

**Unauthorised access!**

Possible consequence: Fatal or very serious injuries

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

**WARNING!**

**Operating errors!**

Possible consequence: Fatal or very serious injuries

- The unit 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, measuring water pumps ...
- The operator is responsible for ensuring that personnel are qualified

**CAUTION!**

**Electronic malfunctions**

Possible consequence: Material damage to destruction of the unit

- The mains connection cable and data cable should not be laid together with cables that are prone to interference
- Measure: 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 unit may only be used in accordance with the technical details 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 dosing is only possible if the sensor is working perfectly
- It is imperative that the run-in times of the sensors are adhered to
- The run-in times should be allowed for when planning initial operation
- It may take a whole working day to run-in the sensor
- Please read the operating instructions for the sensor

NOTICE!

**Correct sensor operation**

Damage to the product or its surroundings

- Correct measuring and dosing is only possible if the sensor is working perfectly
- Check and calibrate the sensor regularly

NOTICE!

**Compensation of control deviations**

Damage to the product or its surroundings

- This controller cannot be used in control circuits which require rapid compensation (< 30 s)

## 2.2 Specific safety instructions for the control module delta®

WARNING!

**Emergency stop switch**

Possible consequence: Fatal or very serious injuries

An emergency stop switch on the complete system. This should enable the complete system to be switched off in event of an emergency in such a way that the complete system is stopped in a safe condition.

WARNING!

- Hazardous substances
- Danger resulting from contact, breathing in or other contaminations with / from substances or media
- Observe the safety data sheet of the substances / media used
- The system operator must ensure that these safety data sheets are available and that they are kept up to date

**WARNING!**

- Unexpected starting after a failure, malfunction of the controller / power supply or as an action wanted due to a control process
- Danger due to unexpected actions of the system
- In event of a failure / malfunction of the controller or power supply, the measuring / control station must be disconnected from the power supply. For further information, read the operating instructions of the devices and sensors used

**NOTICE!**

- Secure the measuring / control station against unauthorised access
- Please also observe the operating instructions for controllers and fittings and any other component groups, such as sensors, sample water pumps ...
- Observe the resistance of the wetted materials for all modules (see also, e.g. also the ProMinent resistance list in the product equipment catalogue or at www.prominent.com)
- Protect the measuring / control station against direct sunlight and other UV sources
- Observe the basic rules for ergonomic principles

## 2.3 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 Functional description

**Brief functional description**

The control module delta® enhances the delta® range of pumps to become measurement variable-dependent metering pumps. The control module delta® has an active 4-20 mA input for use in combination with pHV1, RHV1 measuring transducers or chlorine sensors CLE-mA. The control module delta® uses PID control behaviour to adapt the delta® solenoid metering pump precisely to the requirements of the process. If a two-sided control is required, a second pump can be controlled via the optional pacing relay.

**Table of measured variables: Assignment of the measured variable to the measuring input of the control module delta®**

| Measured variable | mA input | Part no.: |
|---|---|---|
| Chlorine | X | |
| pH | X* | 809126 |
| Redox | X* | 809127 |
| | * with measuring transducer | |

## 3.1 Application examples for the control module delta®

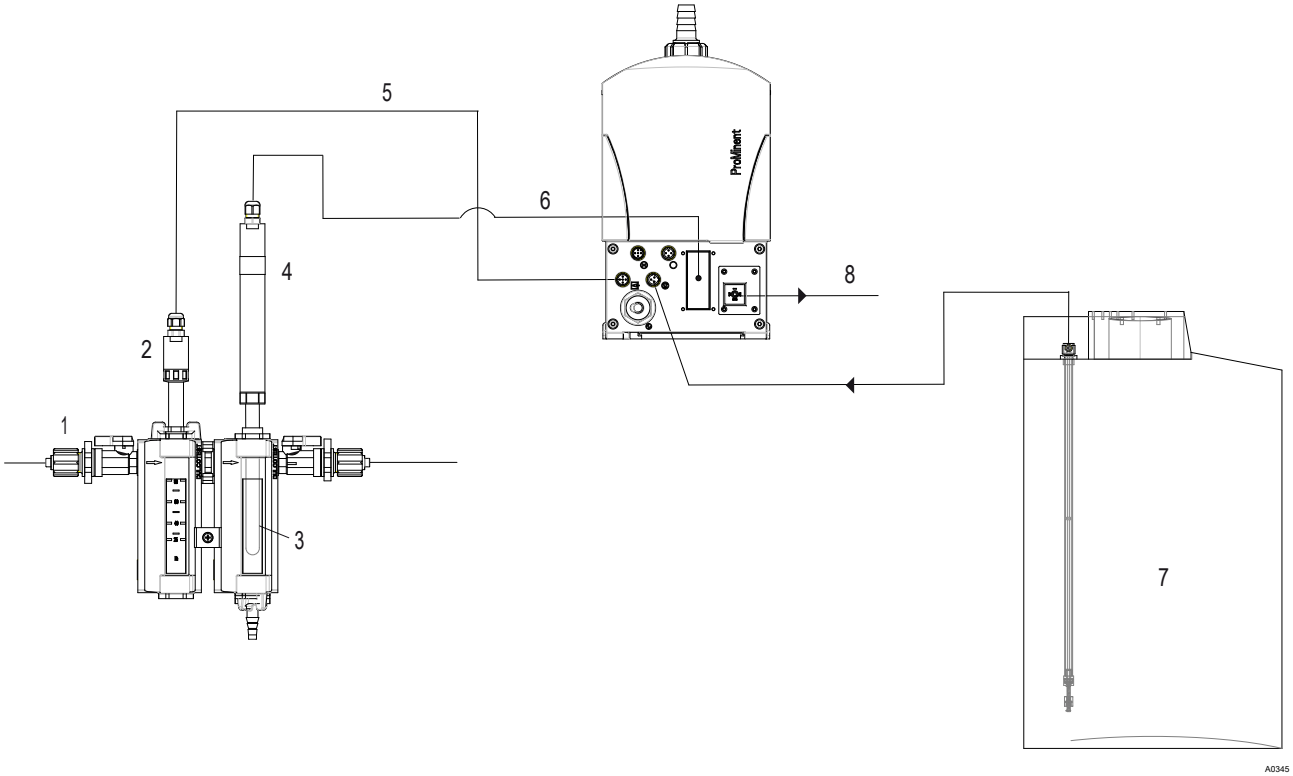



*Fig. 1: Application examples for pH or Redox for one-way control*

1. Measurement water inflow (30 - 60 l/h)
2. Flow gauge (Part of the DGMA)
3. pH sensor (PHEP 112SE) or Redox sensor (e.g. RHEP-Pt-SE)
4. pH measuring transducer (pHV1 / 809126) or Redox measuring transducer (RHV1 / 809127)
5. Universal control wire (e.g. 1001300)
6. External wire (2-pin / e.g. 707702)
7. Metering tank with two-stage lance
8. Relay cable (part of the delta® solenoid metering pump)

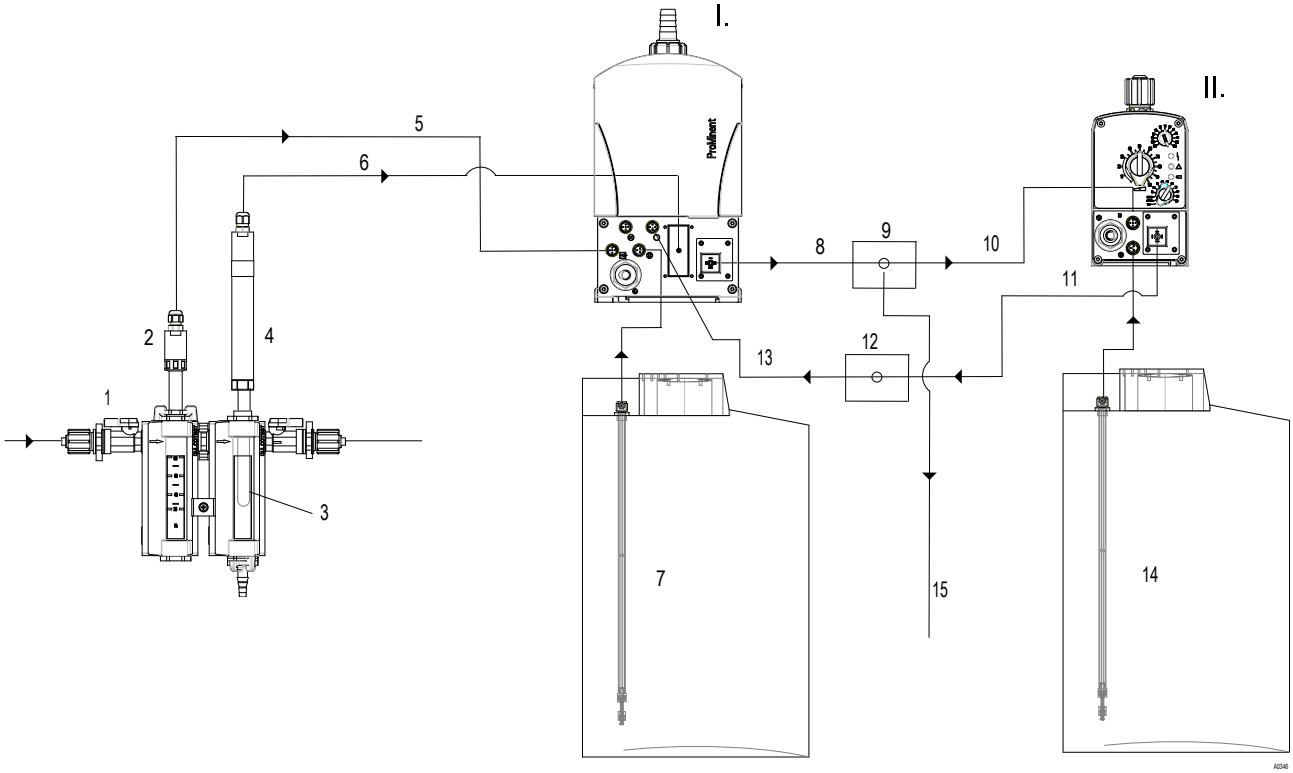



*Fig. 2: Application examples for pH or Redox for two-way control*

I. First pump delta® with control module delta®
II. Second pump, e.g. Beta®
1. Measurement water inflow (30 - 60 l/h)
2. Flow gauge (Part of the DGMA)
3. pH sensor (e.g. PHEP 112SE) or Redox sensor (e.g. RHEP-Pt-SE)
4. pH measuring transducer (pHV1 / 809126) or Redox measuring transducer (RHV1 / 809127)
5. Universal control wire (e.g. 1001300)
6. External wire (2-pin / e.g. 707702)
7. Metering tank with two-stage lance
8. Relay cable (part of the delta® solenoid metering pump)
9. Connecting box 1
10. External wire (2-pin / e.g. 707702)
11. Relay cable (3-pin, part of the external pump)
12. Connecting box 2
13. Diaphragm rupture cable
14. Suction lance
15. Collective alarm

## 3.2 Electrical interfaces

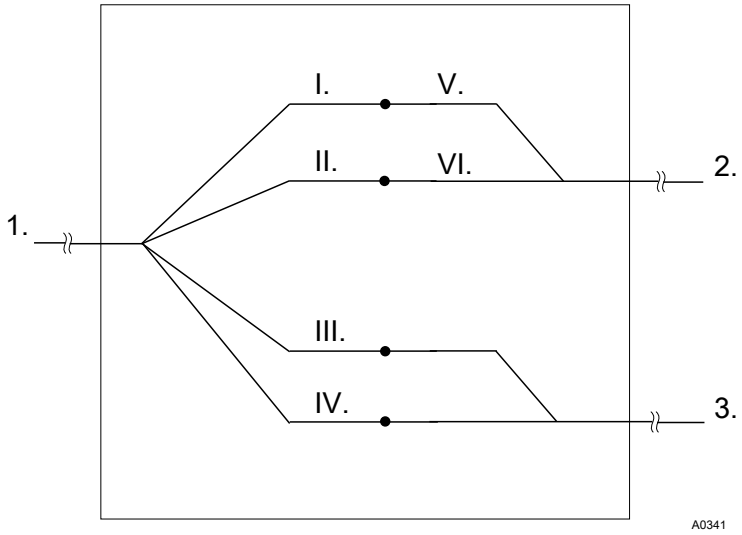



*Fig. 3: Connection box 1 (IP 65)*

1. Relay cable 4-pin
2. External cable for the second pump
3. Fault indicating relay = External overall alarm (max. load 24 V / 100 mA)

I. White (pacing pulse relay)
II Brown (pacing pulse relay)
III. Yellow (fault indicating relay)
IV. Green (fault indicating relay)
V. White
VI. Brown

Connection of the external pump via a 4-pin relay cable.

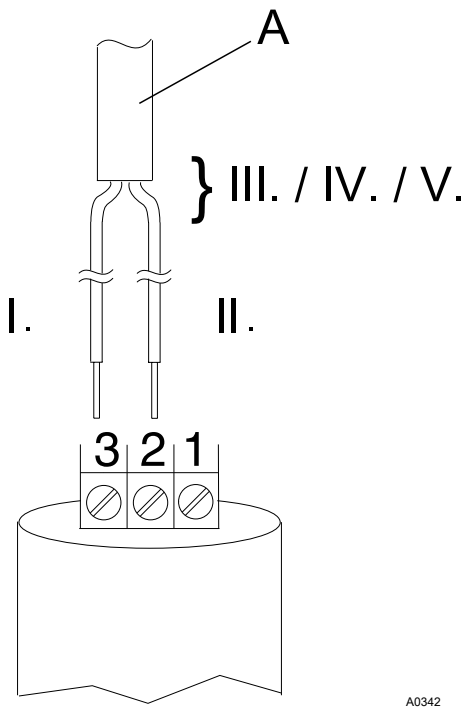



*Fig. 4: Connection of the flow gauge*

A. 5-pin universal cable
I. Black
II. Brown
III. Blue (not used)
IV. Grey (not used)
V. White (not used)

Functional description: As soon as the flow falls below the set threshold, the contact is opened and the delta® solenoid metering pump switches to *„PAUSE“*.

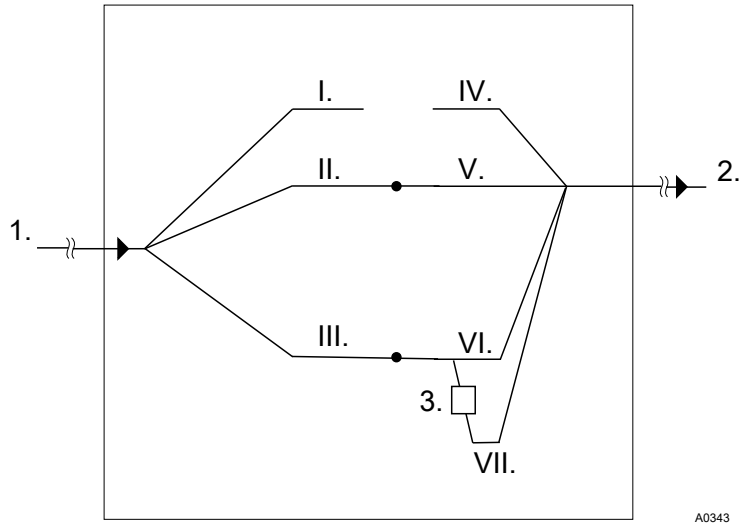



*Fig. 5: Connection box 2 (IP 65)*

1. Relay cable 3-pin Beta
2. Delta diaphragm rupture cable
3. Resistance 300 Ω

I. White (open)
II. Green (NC)
III. Brown (C)
IV. White (open)
V. Blue (signal)
VI. Black (ground)
VII. Brown (5 V)

Connecting the alarm relay of the external pump to the input of the diaphragm rupture alarm of the delta® solenoid metering pump. As soon as the external pump reports an error, this error is passed on to the delta® via the input of the diaphragm rupture alarm. The delta® solenoid metering pump stops and outputs a collective alarm.

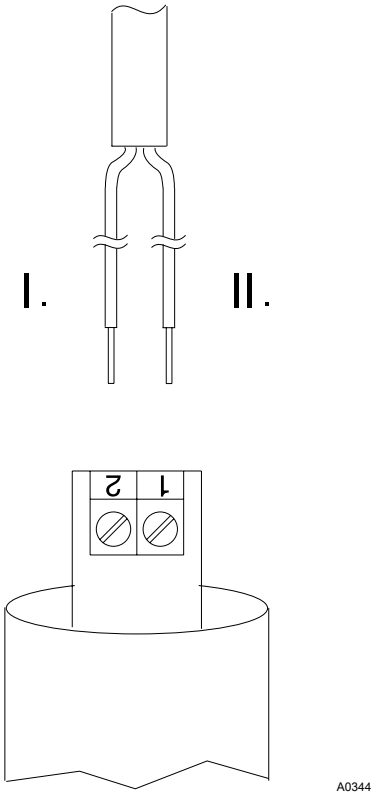



*Fig. 6: Connecting the sensor or measuring transducer*

I. White
II. Brown

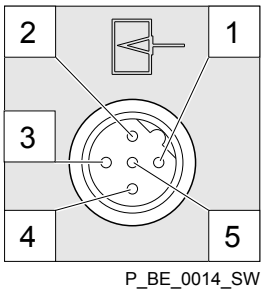



*Fig. 7: Assignment on the control module*

1 Free
2 Supply voltage approx. 25.5 Volt
3 Ground
4 Voltage input
5 Free

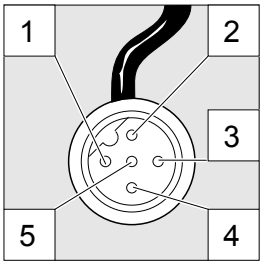



*Fig. 8: Assignment on the cable / 2-wire external cable*

1 Voltage input
2 Brown / supply voltage approx. 25.5 Volt
3 Free
4 White / voltage input
5 Free

# 4 Assembly

**NOTICE!**

**Installation position and conditions**

- Ensure that there is unimpeded access for operation
- Secure, low-vibration fixing
- Avoid direct sunlight
- Permissible ambient temperature at fixing position: -10 ... + 45 °C at max. 95% relative air humidity (non-condensing)

**NOTICE!**

**Operating instruction for all components used**

Possibility of material damage due to incorrect assembly.

When assembling the system, observe the operating instructions for all components used.

*Reading and operating position*

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

The control module delta® is fully integrated in the delta® solenoid metering pump and must not be installed separately.

## 4.1 Installation (hydraulic)

**CAUTION!**

- Observe the maximum permissible operating parameter for the entire installation of the measuring / control station (e.g. pressure, temperature, flow)
- In the process, observe the lowest maximum permissible operating parameter of the parts of the measuring / control and the sensors installed (see their operating instructions)
- Please also observe the operating instructions for controllers and fittings and any other component groups, such as sensors, sample water pumps ...
- Observe the flow direction of the measured water.
- One pressure reducer must be installed.
- Danger resulting from media under pressure.
- Before working with hydraulic parts of the measuring / control station, this must be depressurised in a controlled manner via the sampling cock.
- Wear protective goggles

**Fittings**

The bypass fitting (flow gauge) used depends particularly on the measured water, in some cases also from the measured variable or or the combination of the measured variables. The type DGMA with flow controller is always used for all clear water types and the type DLG III for contaminated water is also used for upstream flow controlling.

**Hydraulic connection, pipework**

With the DGMa, the hydraulic connection of the measured water is carried out using an 8 x 5 mm hose connection. A shut-off ball valve is installed before and after the bypass fitting. The optionally available measuring water filter is installed before the bypass fitting. Each of the bypass fittings have a mounted sampling cock.

## 4.2 Hydraulic test run after installation

A hydraulic test run of the measuring / control station is necessary after successful installation.

- The sampling cock must be closed! Otherwise measured water will escape
- Check all screw connections before the initial commissioning
- Open the shut-off ball valve on the inlet and outlet ends.
- The system must now be hydraulically tight. No fluid must leak out.

If fluid should leak out, the reason for this must be determined and eliminated.

### 4.2.1 Set the flow meter switching point

1. For testing, reduce the flow - the delta® Solenoid metering pump must indicate *„Pause“*
2. Check the screw connection for leaks.

The flow gauge DGMa:

Goal: Reduction in flow should switch - *„Pause“* on the delta® solenoid metering pump when the inlet is closed

1. Set the flow using the ball valve.
2. Set value: 40 l/h
3. Test value: 30 to 60 l/h (read-off from the top edge of the float)
4. Loosen the flow gauge.
5. Push the flow gauge upwards in the rail until the delta® Solenoid metering pump switches to *„Pause“*.
6. Push the flow gauge down far enough until *„Pause“* on the delta® solenoid metering pump has just cancelled.
7. Fasten the flow gauge.
8. For testing, reduce the flow

   ⇨ - the delta® Solenoid metering pump must switch to *„Pause“*.

## 4.3 Commissioning sensors

**WARNING!**

- Hazardous substances
- Danger resulting from contact, breathing in or other contaminations with / from substances or media
- Observe the safety data sheet of the substances / media used
- The system operator must ensure that these safety data sheets are available and that they are kept up to date

**CAUTION!**

- The sampling cock must be closed! Otherwise measured water will escape
- The measured water must be free of air bubbles to guarantee a reliable measurement and control! If air has to be carried along in the measuring water due to the process, the air must be discharged using a suitable technical method.
- Please also observe the operating instructions for controllers and fittings and any other component groups, such as sensors, sample water pumps ...

**Preparation**

1. Retighten all screw connections and check for leaks.
2. Check the position of all shut-off valves. The position of the shut-off valves must guarantee that the measuring / control station is tight and the flow of the measured water is given.
3. Commission the measuring / control station

### 4.3.1 Run-in time

A run-in time must be observed for the chlorine sensor. Depending on the sensor, this may vary between 1 hour and 24 hours. For this purpose, the respective sensor must be located in the measured water to be measured and connected electrically. This measured water must already contain the measured variables in a quality and quantity sufficient for the process.

The running-in of the sensors is described in the operating instructions of the sensor.

# 5 Commissioning

**WARNING!**
**Run-in time of sensors**
This can result is hazardous incorrect metering

Take into consideration run-in times when commissioning

- Correct measuring and metering is only possible if the sensor is working perfectly
- It is imperative that the run-in times of the sensors are adhered to
- The run-in times should be allowed for when planning initial operation
- It may take a whole working day to run-in the sensor
- Please read the operating manual for the sensor

## 5.1 Initial Commissioning

The control module delta® has the same language settings as the control module delta® connected to the delta® solenoid metering pump.

### 5.1.1 Selecting the operating language

Setting the operating language is carried out via the setting menu of the connected delta® solenoid metering pump.

### 5.1.2 Selection of the Measured Variable and Measuring Range

**WARNING!**
**Incorrect metering due to incorrect metering range**
Possible consequence: Fatal or serious injuries

- **The measuring range of the sensor is essential for the measuring range!**
- 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 must be recalibrated

# 6 Operating Schematics / Display Symbols

***Operating the delta® solenoid metering pump with controlled solenoid drive optoDrive®***

*For the fundamental operation of the delta® solenoid metering pump, the operating instructions of the delta® solenoid metering pump with controlled solenoid drive optoDrive® is available. The operating instructions of the control module delta® describes the enhanced operating possibilities of the control module delta® in conjunction with the delta® solenoid metering pump.*

***Access to the settings of the control module delta®***

*For accessing the settings of the control module delta® , you have to stop the delta® solenoid metering pump using the STOP-key. The display indicates the following symbols and Stop. You will only then be able to access the settings of the control module delta®.*

## 6.1 Overview of device / operating elements

***Contents of the LCD display***
*The content of the LCD display can vary depending on the Identcode of the delta® solenoid metering pump.*

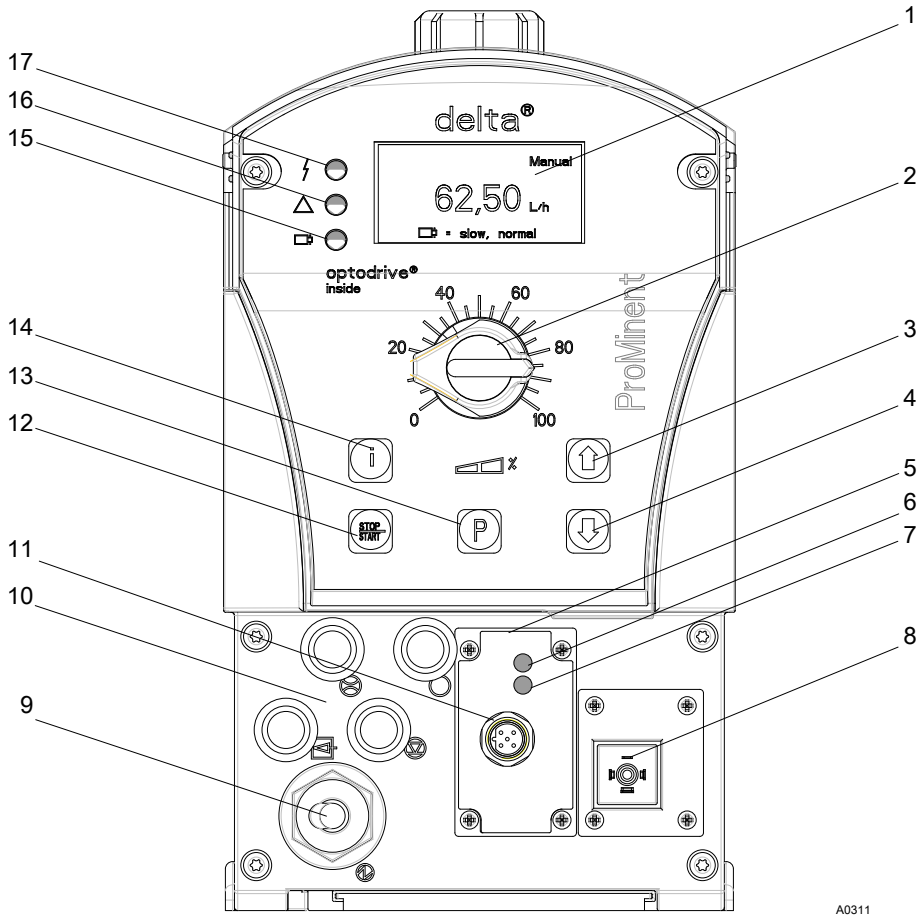
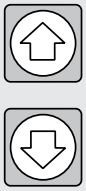



*Fig. 9: Operating elements of the delta® solenoid metering pump*

1 LCD display
2 Stroke length adjustment knob
3 UP key
4 DOWN key
5 Control module delta®
6 Device LED-LED
7 Connecting LED
8 Relay insert (optional)
9 Mains power
10 Terminal for the additional functions
11 Sensor connection
12 STOP / START key
13 P key
14 i key
15 Operating indicator (green)
16 Warning indicator (yellow)
17 Fault indicator (red)

### 6.1.1 Key functions

| Key | Operation | In continuous displays (Operation) | In setting mode (Settings) |
|---|---|---|---|
| STOP / START key  | briefly pressed (0.2 - 1 s) | stop pump<br>start pump | stop pump<br>start pump |
| P key  | briefly pressed (0.2 - 1 s) | start batch (only in operating mode "Batch") | Confirm entry - Jump to next menu option or in the continuous display |
| | 2 s pressed | go to setting mode | ---- |
| | 3 s pressed | ---- | Return *[ESCAPE]* to the continuous display |
| i key  | briefly pressed (0.2 - 1 s) | toggle between the continuous displays | ---- |
| | long pressed (> 1 s) | go to the second level of the continuous display | ---- |
| Arrow keys UP or DOWN  | individually pressed (until double arrows appear) | change directly adjustable variables | select another setting.<br>change individual figure or number.<br>at the upper end of a selection, effect similar to the ESC key |
| | simultaneously pressed | suction (in continuous display "stroke frequency") | ---- |

## 6.2 Continuous display extended control module delta®

In the main display, in addition to the display of the delta® solenoid metering pump, the display for the control module delta® can also be added.

The control module delta® display has all the values for the setpoint and actual values of the control module delta® .

- I. Setpoint (of the control module delta® ) in a very large figure (12 x 24 points), in the selected unit (ppm, pH or mV)
- II. Actual value *[i]* (input value of the control module delta® ) in a very large figure (12 x 24 points), in the selected unit (ppm, pH or mV)
- III. Existing continuous display on the delta® solenoid metering pump

Format for the main display (S = Setpoint):

- Chlorine: (S) XXX.YY ppm
- pH: (S) XX.YY pH
- Redox:(S) XXX mV

Display: Only measured value = actual value

Display: Measured value with an *„S“* in front of it = Setpoint

## 6.3 Secondary display extended control module delta®

In the secondary display, the specified nominal value as well as the current actual value of the control module delta® can be displayed.

- I. Setpoint (of the control module delta®) in a very large figure (8 x 8 points), in the selected unit (ppm, pH or mV)
- II. Actual value *[i]* (input value of the control module delta®) in a very large figure (8 x 8 points), in the selected unit (ppm, pH or mV)
- III. Current value (input value of the control module delta®) in xx,xx mA
- IV. Existing continuous display on the delta® solenoid metering pump

Format for the secondary display (S = Setpoint):

- Chlorine: (S) XXX.YY ppm
- pH: (S) XX.YY pH
- Redox: (S) XXX mV

Display: Only measured value = actual value

Display: Measured value with an *„S“* in front of it = Setpoint

## 6.4 Activating / deactivating the control module delta®

This menu is available for putting the delta® solenoid metering pump in the operating mode for the control module delta®.

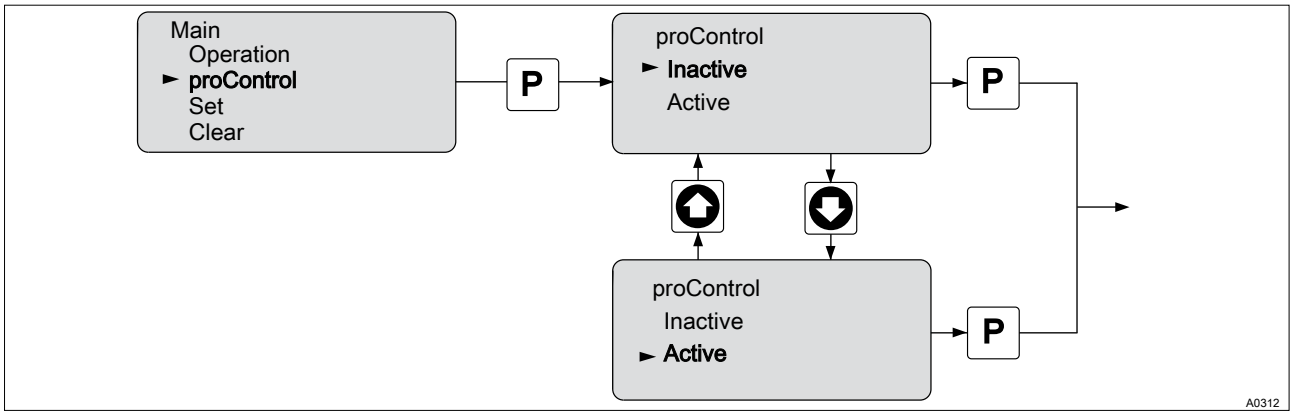



*Fig. 10: Activating / deactivating the control module delta®*

If the control module delta® is set to *„active“*, then operation or controlling of the delta® solenoid metering pump takes place in the control module delta®. Independent as to which operating mode the delta® solenoid metering pump was previously located. If the control module delta® is set to *„inactive“*, then the delta® solenoid metering pump returns back to its original operating mode.

In the inactive state, no error messages or warning messages are transferred to the delta® solenoid metering pump.

If the control module delta® is set to *„active“* then the symbol appears in the operating indicator of the delta® solenoid metering pump to indicate that the control module delta® is working actively. At the same time, the light diode *„Connecting LED“* switches to green with regular operation.

## 6.5 Selection of the Measured Variable and Measuring Range

The control module delta® has a 4 - 20 mA input. A sensor can be connected to this input. The control parameter, the menu navigation and the continuous display are sensor specific.

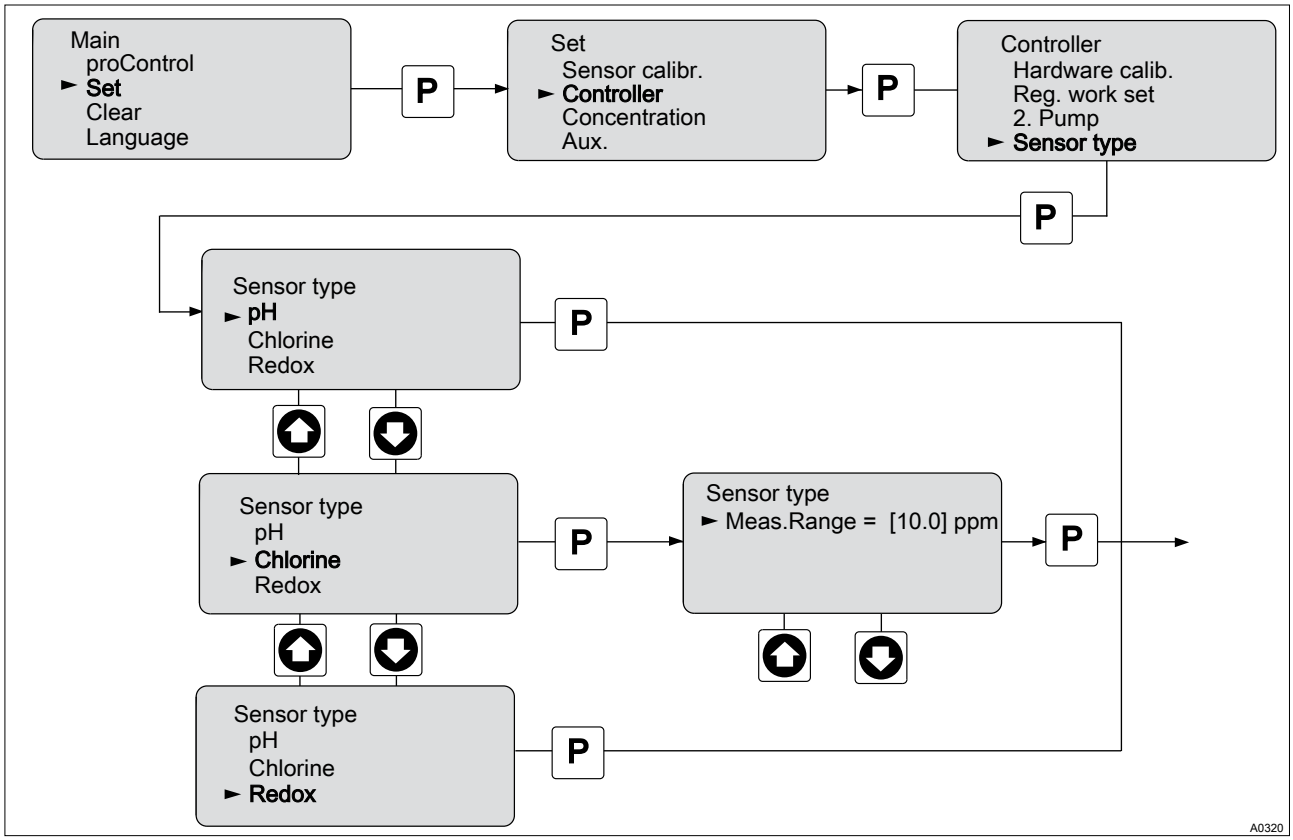



*Fig. 11: Selection of the Measured Variable and Measuring Range*

Using the menu item *„Sensor Type“* , you are able to select the respective sensor. The different versions or measurement ranges of the sensors can also be selected in this menu item.

| Sensors | Types |
|---|---|
| Redox | Only one sensor version is operated with the measuring transducer "RhV1".<br>■ 1,000 mV ➡ 20 mA<br>■ 0 mV ➡ 4 mA |
| Chlorine | ■ Measuring range from 0 ... 20 ppm |
| pH | Only one sensor version is operated with the measuring transducer "pHV1".<br>■ -500 mV ~ pH 0 ➡ 20 mA<br>■ 500 mV ~ pH 14 ➡ 4 mA |

## 6.6 Setting the limit values

***Hysteresis***

*An hysteresis is installed here so that when in the range of the limit value of the control module delta®, switching is not constantly carried out between the control and base load metering.*

*The hysteresis is approx. 2% of the measuring range:*

– *(„Limit value up“ minus „Limit value down“) * 2 %*

You have the possibility of setting the permissible value for the controlling for each sensor type. When a measurement value lies outside this limit value, the control will be discontinued. Basic load control is only active in this case.

If the measurement value lies outside the limit value than a warning is reported and the symbol is displayed in the status display of the delta® solenoid metering pump.

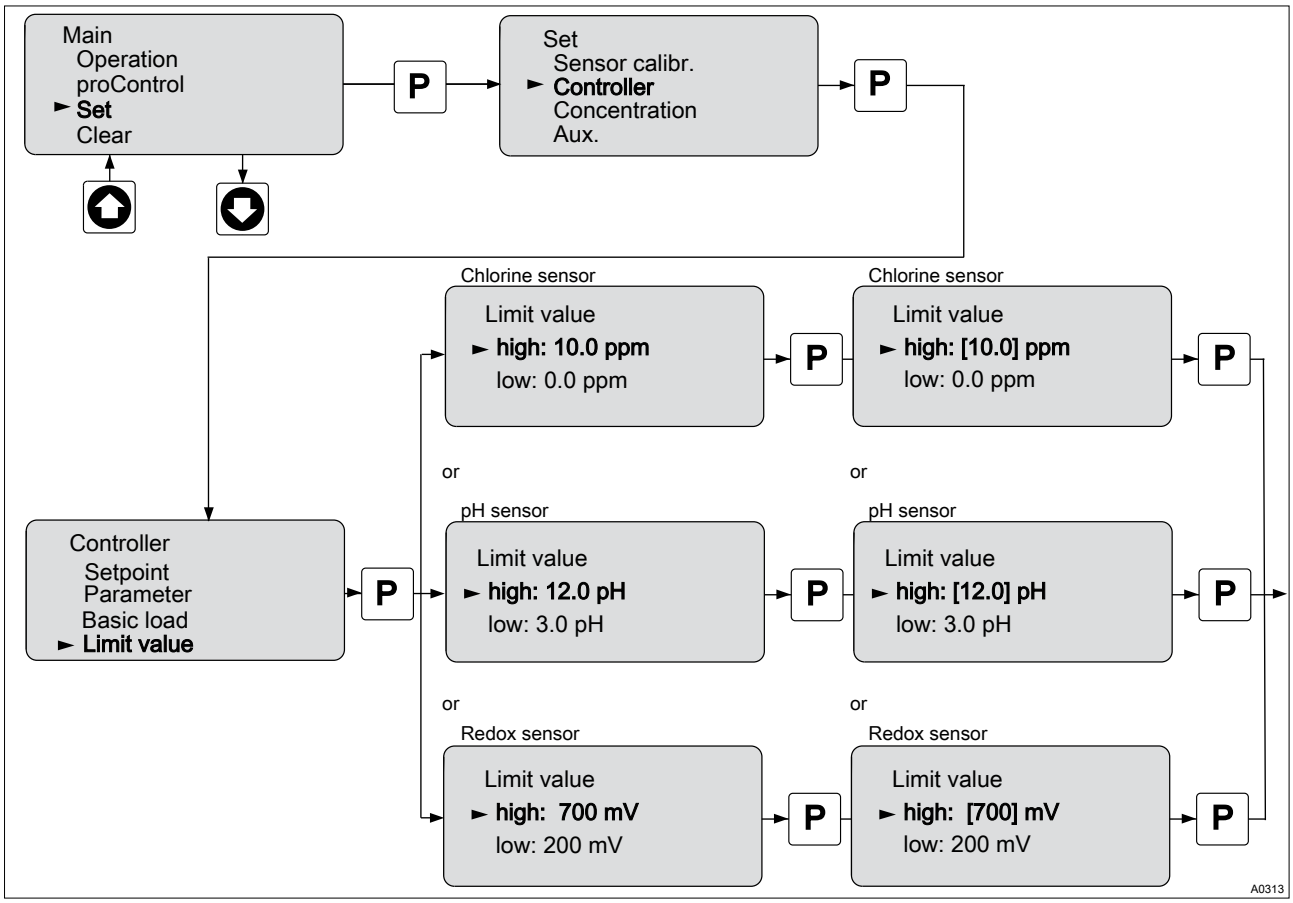



*Fig. 12: Setting the limit values*

| Sensor | Factory setting | | Settings |
|---|---|---|---|
| | top | bottom | |
| Chlorine | 0 ppm | 20 ppm | 0 ppm up to the maximum value of the sensor. In increments of 0.1 ppm |
| pH | 0 pH | 14 pH | 0 pH to 14 pH. In increments of 0.1 pH |
| Redox | 0 mV | 1,000 mV | 0 mV to 1,000 mV. In increments of 1 mV |

## 6.7 Setting the basic load

*Basic load*

*It may be necessary to meter the feed chemical with a basic load.*

You can switch the basic load control on or off using this menu. You switch the basic load on by entering a percentage proportion of the maximum set value.

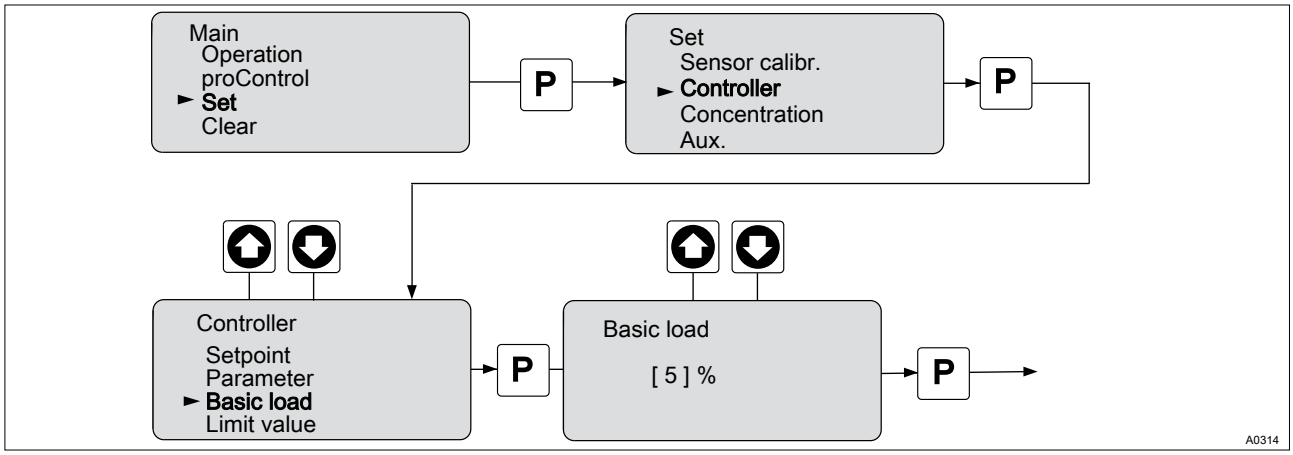



*Fig. 13: Setting the basic load*

| Basic load | Settings |
|---|---|
| Setting values | 0 % to 100 % in increments of 1 %. Start value of 0 %. 0 % = Basic load off. |

## 6.8 Setting the set value

You can set the set value via this menu. An *„S“* is put in front in the display value for the set value is displayed in the continuous display.

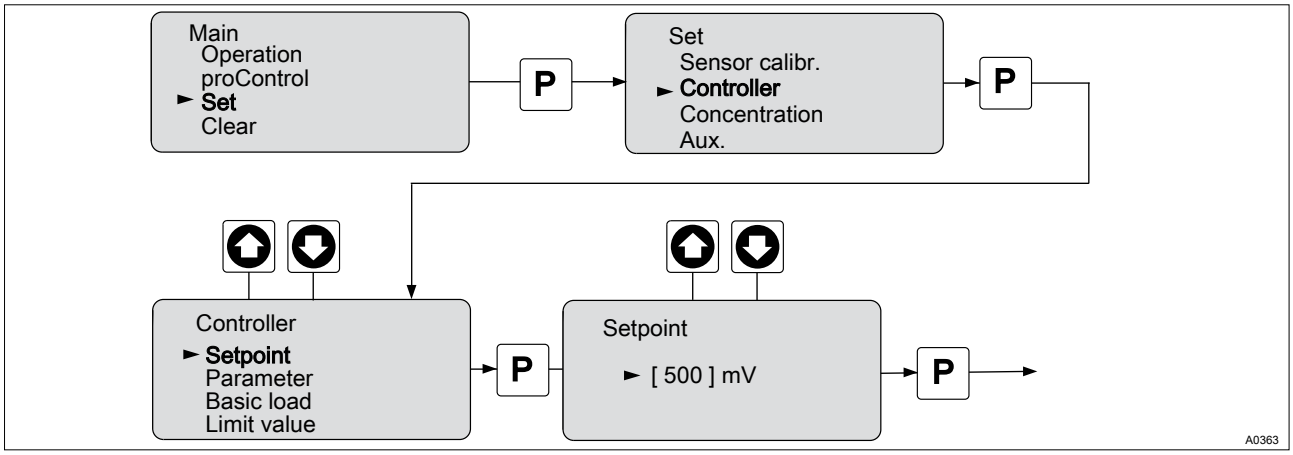



*Fig. 14: Setting the set value*

| Setting | | Possible values | | | |
|---|---|---|---|---|---|
| **Display** | **Starting value** | **Increment** | **Lower value** | **Upper value** | **Remarks** |
| mV | 500 mV | 1 mV | 0 mV | 999 mV | Redox |
| pH | 7.00 pH | 0.01 pH | 0.00 pH | 14.00 pH | |
| Chlorine | 5.00 ppm | 0.01 ppm | 0 ppm | 20 ppm | |
| The upper and lower value can only be adjusted in the scope of the adjusted limit values, see ↳ *Chapter 6.6 „Setting the limit values“ on page 27*. The values in the table shows the maximum possible range. | | | | | |

## 6.9 Setting the checkout time

***Monitoring of the controlled system***

*The checkout time monitors the controlled system. Possible defective sensors may be detected via the mechanism of the checkout time.*

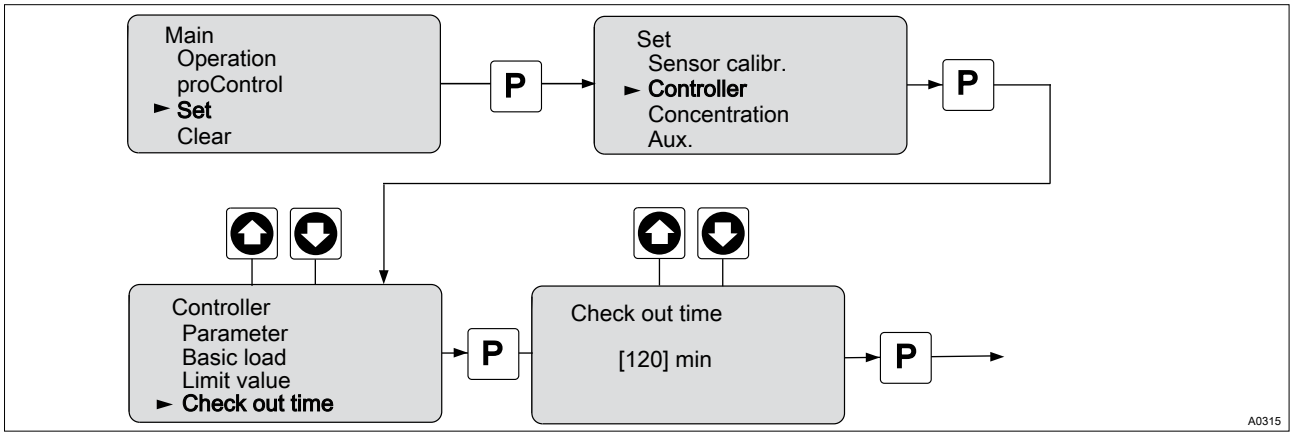



*Fig. 15: Setting the checkout time*

*Determine the dead time and adjusting the checkout time*

Each controlled system has a dead time. The dead time is the time that the controlled system requires to determine a change caused by the addition of the metered chemicals by measurement.

You have to select the checkout time greater than the dead time. You can determine the dead time by allowing the the metering pump to operate in manual mode and, e.g. metering acid.

**NOTICE!**

**Dead time determination**

You should only determine the dead time when the actual process cannot be influenced in a negative way by the manual metering.

You have to determine the time that the controlled system (therefore, the entirety of the controller, sensor, measured water, flow gauge, etc.) requires to detect the first change to the measured value, from beginning the metering. This time is the *„Dead Time“*. A safety margin must be added to this determined dead time, e.g. 25%. This safety margin must be determined individually for your process. If the set value is not reached after the checkout time has elapsed, see *Chapter 6.8 „Setting the set value“ on page 29*, the metering pump switches to base load metering.

If the control module delta® should not have reached a certain threshold after the checkout time, the control module delta® switches to base load operation. A warning is released to the superior system, the delta® solenoid metering pump in this case and the symbol is displayed in the status display of the delta® solenoid metering pump.

| Settings | Comment |
|---|---|
| Settings | 1 min to 999 min in increments of 1 minute |
| Starting value | off (= 0 min) |

**Reset after activating the checkout time**

If the control module delta® is in operating mode *„Checkout time, “*then the base load metering is active. If, however, one wants to return to the normal control mode then the checkout time must be restarted. Press the -key to restart the checkout time.

## 6.10 Setting the control module delta®

The controlled system can be adjusted via this menu. The feed chemical that will be metered must be selected, e.g. "raise" or "lower".

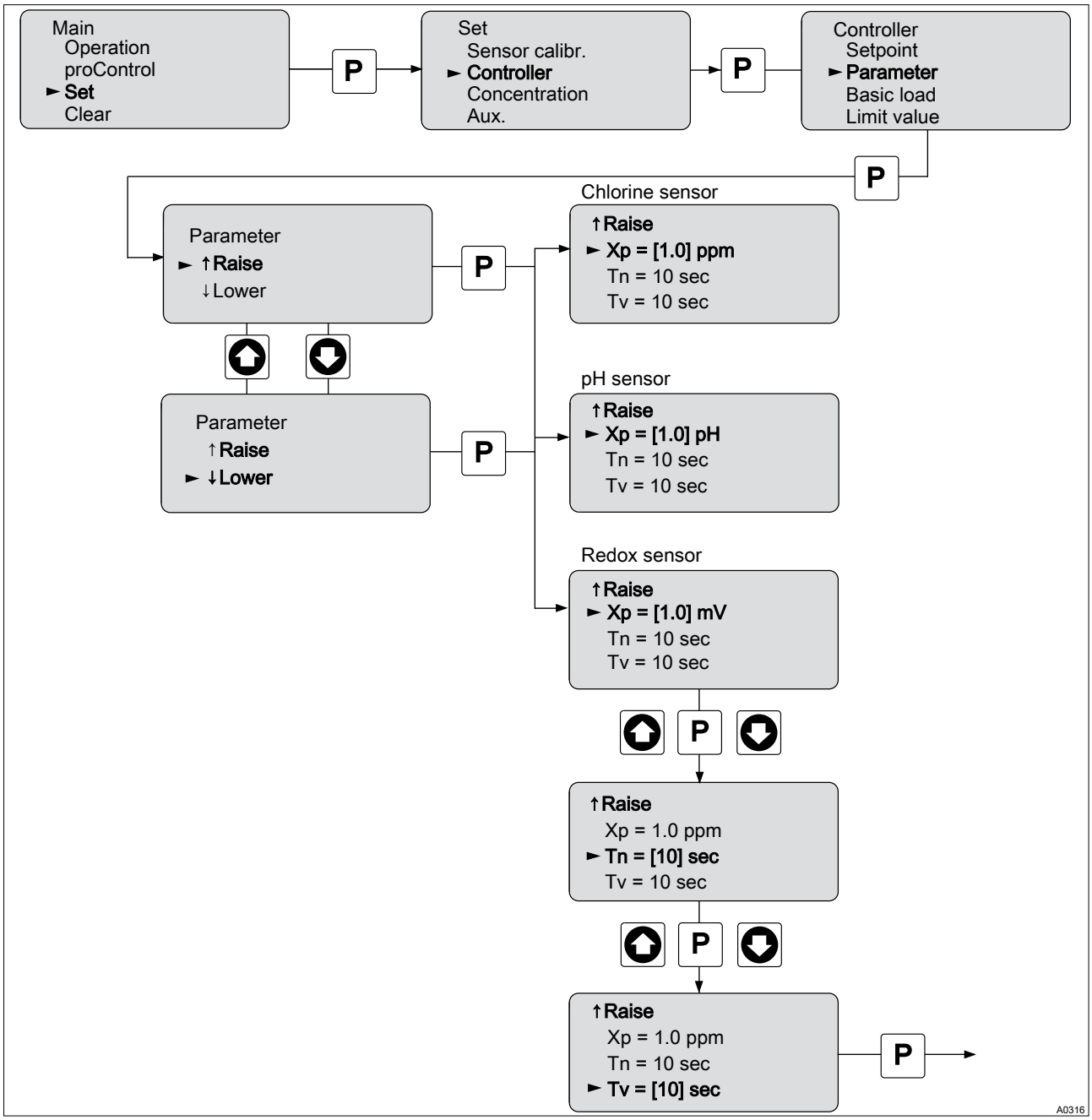



*Fig. 16: Setting the control module delta®*

Then the parameter for the controlled system can be adjusted. These are:

- $X_p$ ➡ KP (reciprocal proportional coefficient)
- $T_N$ ➡ I-controller reset time in seconds
- $T_V$ ➡ Derivative time of D-control in seconds

| $T_N$ | $T_V$ | Controllers |
|---|---|---|
| 0 | 0 | P controller |
| >0 | 0 | PI controller |
| 0 | >0 | PD controller |
| >0 | >0 | PID controller |

| Sensor | Parameter | Comment |
|---|---|---|
| Chlorine | Set point | 0.01 ppm to the upper limit of the measuring range. In increments of 0.01 ppm. Start value: 50 % of the measuring range |
| | $X_p$ | 0 to measuring range in increments of 0.01 ppm. Start value: 10 % of the measuring range |
| | $T_N$ | 0 s to 9999 s in increments of 1s. Start value 0 s. |
| | $T_V$ | 0 s to 9999 s in increments of 1s. Start value 0 s. |
| pH | Set point | pH 0,01 pH to 14 pH in increments of 0.01 pH. Start value 50 % of measuring range |
| | $X_p$ | 0 pH to measuring range in increments of 0.01 pH. Start value: 10 % of the measuring range |
| | $T_N$ | 0 s to 9999 s in increments of 1s. Start value 0 s. |
| | $T_V$ | 0 s to 9999 s in increments of 1s. Start value 0 s. |
| Redox | Set point | 0 mV to 1,000 mV in increments of 1 mV. Start value: 50 % of the measuring range |
| | $X_p$ | 0 mV to 1,000 mV in increments of 1 mV. Start value: 10 % of the measuring range |
| | $T_N$ | 0 s to 9999 s in increments of 1s. Start value 0 s. |
| | $T_V$ | 0 s to 9999 s in increments of 1s. Start value 0 s. |

## 6.11 Factory settings of the control module delta®

The factory settings that are loaded always refer to the current sensor used (pH, Redox or chlorine).

If the request is acknowledged with *„yes“*, then the default values for the characteristic curve data, measurement range, set value and control parameters can be loaded.

*Default values for the characteristic curve data*

*As the parameters for the characteristic curve are default values, the sensors must be calibrated.*

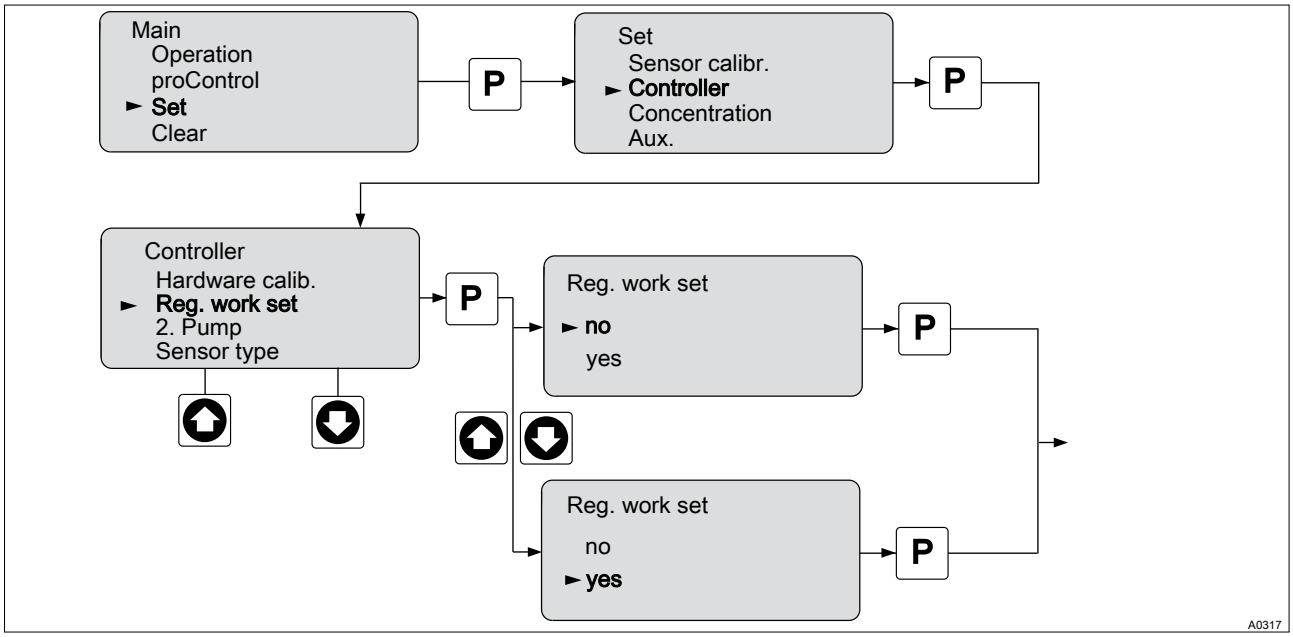



*Fig. 17: Factory settings of the control module delta®*

| Parameter | Value | | | Comment |
|---|---|---|---|---|
| | Chlorine | pH | Redox | |
| Measuring range bottom | 0 ppm | 0 pH | 0 mV | |
| Measuring range top | 10 ppm | 14 pH | 100 mV | |
| Set point | 50 % of the measuring range | | | |
| Set point | 50 % of the measuring range | | | |
| Parameter $X_p$ | 10 % of the measuring range | | | |
| Parameter $T_N$ | 0 sec. | | | |
| Parameter $T_V$ | 0 sec. | | | |
| Characteristic curve | Default | | | Default parameter for the characteristic curve |

## 6.12 Setting the "Two-pump mode"

The control module delta® can also be operated in two-pump mode. Different parameters have to be entered for both pumps for this purpose.

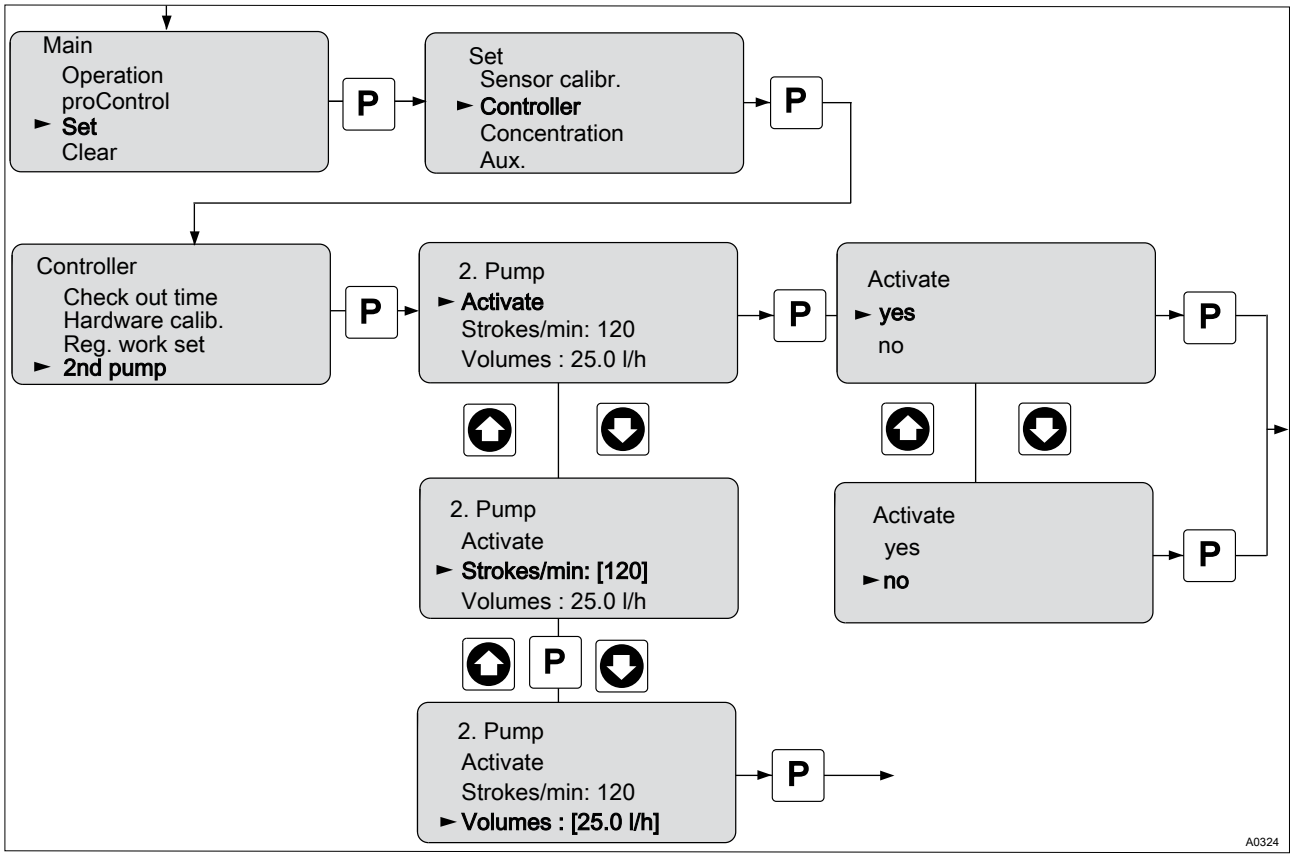



*Fig. 18: Setting the "Two-pump mode"*

The control module delta® now controls the second pump indirectly via the relay output of the delta® solenoid metering pump.

| Settings | Comment |
|---|---|
| Activating | The controller is only active when the control relay in the delta® solenoid metering pump has been activated. |
| Strokes / min. | Stroke rate of the pump in strokes / minute. maximum 180 / min. |
| Volume | Volumes in litre / hour |

### 6.12.1 Setting the controller pulse of the second pump

**NOTICE!**

**Calibrating the delta® solenoid metering pump**

To enable the second pump to be controlled by the delta® solenoid metering pump, the delta® solenoid metering pump must have been calibrated. Notes for this purpose: Operating instructions "Solenoid metering pump delta® with controlled solenoid drive optoDrive®", chapter *„Settings for the function “Calibration” (CALIBRATION menu)“*

Depending on the pump type that should be connected to the control relay of the delta® solenoid metering pump, it is necessary to set the controller pulse accordingly. The controller pulse can be a growing or a falling pulse of the controller relay. Take note that this menu can only be called up when a control relay has been installed in the delta® solenoid metering pump.

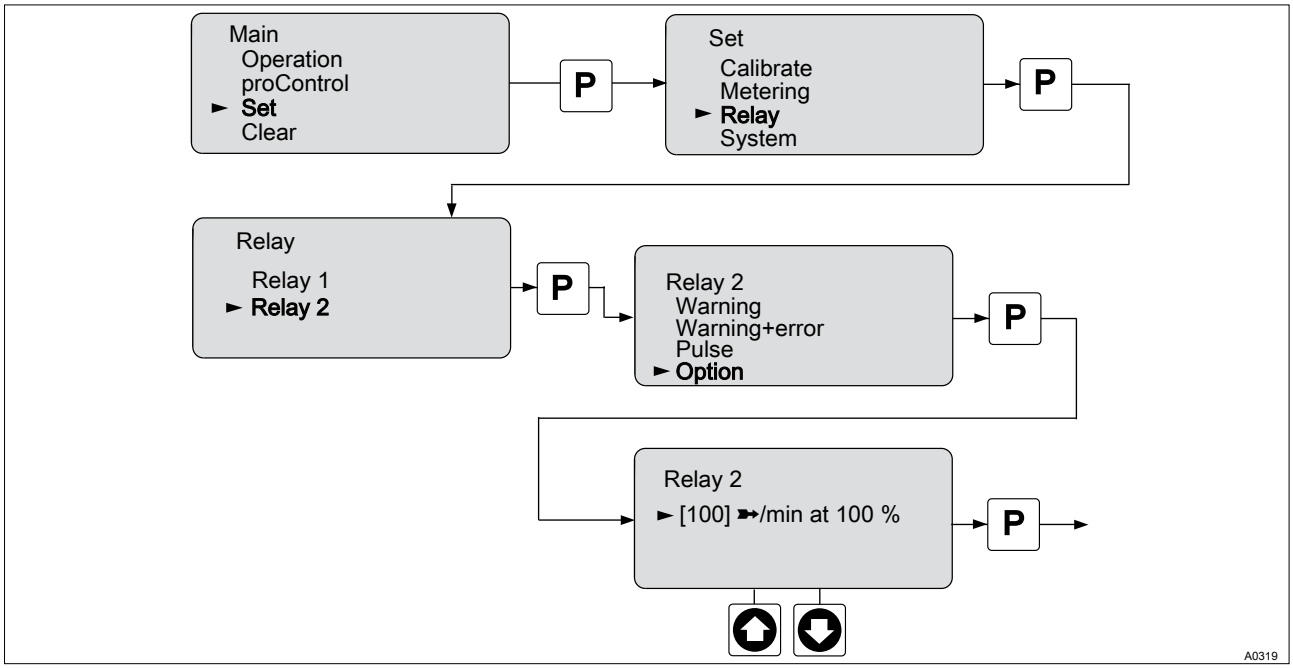



*Fig. 19: Menu for adjusting the controller pulse of the second pump*

# 7 Measured variables for the control module delta®

**WARNING!**

**Danger of incorrect metering**

This can result in hazardous incorrect metering

During initial commissioning, the measured variable and the measuring range of the sensor must be set prior to calibration.

When working on or with sensors, also observe the respective technical documentation of the sensors.

***Measurement range of the sensors***

*You must adapt the measuring range of the controller to the measuring range of the chlorine sensor used.*

| Measured variable | Preset measuring range (default) |
|---|---|
| Chlorine | 10 ppm |
| **The measuring range can be selected infinitely from 0.5 ... 20 ppm.** | |

| pH Measured variable | Typical measuring range |
|---|---|
| Measuring range | 0 ... 20 mA |
| Display range | At least pH -1.45 … 15,45 |
| Reference temperature | + 25 °C |
| Resolution | 0.01 pH |

| Redox measured variable | Typical measuring range |
|---|---|
| Measuring range | - 1,000 mV ... + 1,000 mV |
| Resolution | 1 mV |

## 7.1 Calibrating the sensor for chlorine

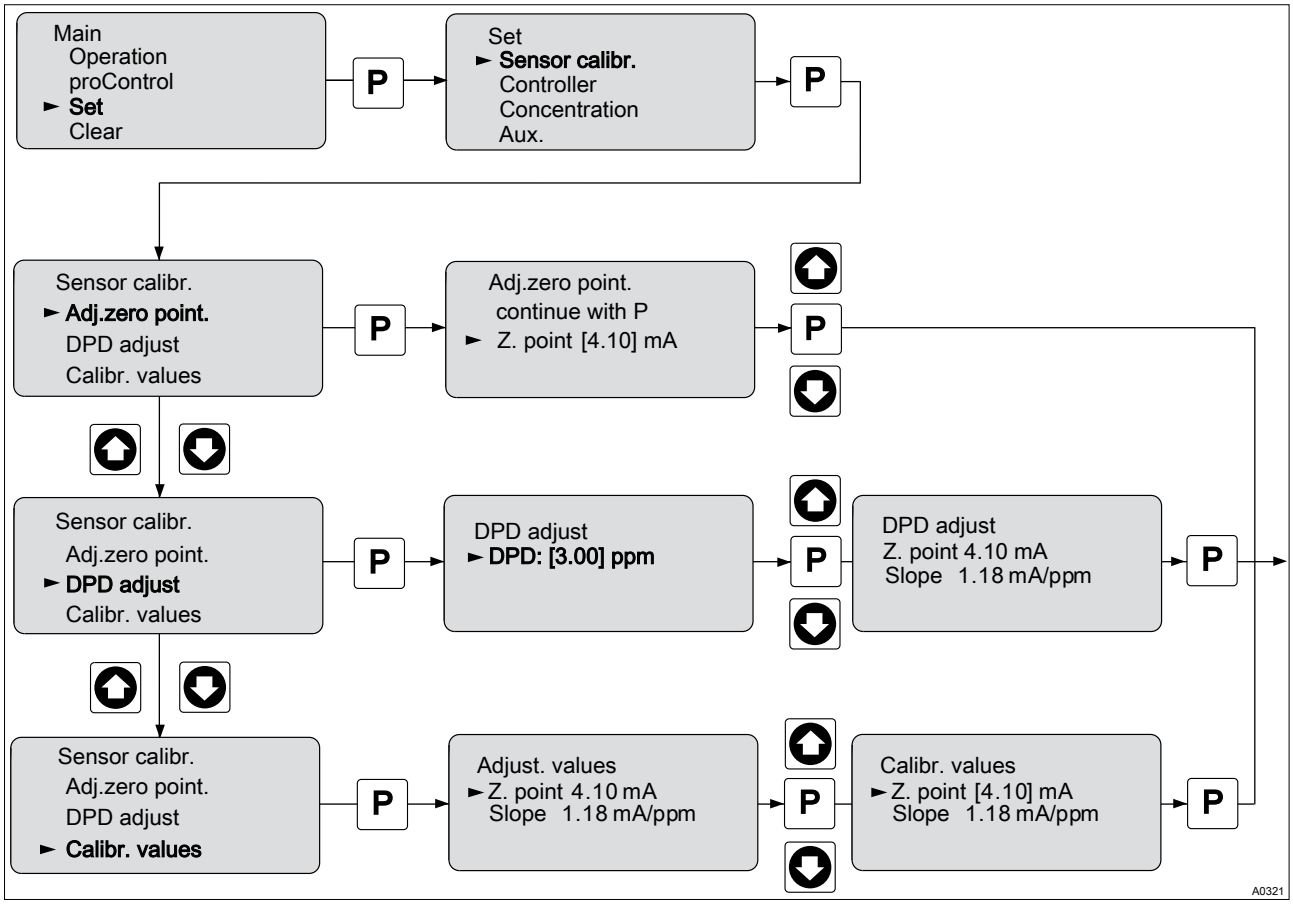



*Fig. 20: Calibrating the sensor for chlorine*

### 7.1.1 Preparing the calibration of the sensor for chlorine

**CAUTION!**

**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
- Please read the operating manual for the sensor
- Please also read the operating manuals for the fittings and other components used
- It is imperative that the run-in times of the sensors are adhered to
- The run-in times should be allowed for when planning initial operation
- It may take a whole working day to run-in the sensor

***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.*

During the calibration, the control module delta® sets the actuating outputs to *„0“*. The mA standard signal outputs are frozen. The reading frozen at the start of calibration is suggested as a DPD value. The DPD value can be set using the arrow keys.

### 7.1.2 Calibration of Zero Point and Gradient

**NOTICE!**

**Prerequisites for correct calibration of the sensor gradient**

- The DPD method required by the metering medium employed will be used
- The run-in time for the sensor has been adhered to
- There is permitted and constant flow at the flow gauge
- There is temperature equalisation between the sensor and the sample water
- There is a constant pH value in the permitted range

**Calibrating the chlorine sensor: slope**

The sensor is fitted, flushed with sample water and connected electrically to the control module delta® and run-in.

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

Remove sample water directly at the measuring point and using an appropriate reference method (e.g. DPD, titration etc.), determine the content of metering medium in the sample water in *„ppm“*. Enter this value in the control module delta® as follows:

1. Select the calibration menu *[Sensor Calibration]*. The press the button P
2. Take a sample of water and perform a reference measurement immediately.
3. Select the unit *„DPD adjust“* to be calibrated using the buttons ▽ or △
4. The press the button P
   ⇨ The current reading will now be frozen.
5. When necessary, adapt the ppm value determined using keys ▽ and △
   ⇨ The ppm value of the sensor shown in this display now corresponds to the reading in *„ppm“*.
6. The press the button P
   ⇨ The display now shows the value determined for the zero point and gradient. Refer to the Error Message table should an error be displayed

***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.*

### Calibrating the chlorine sensor: Zero point

A container with water, which is free of additives that could falsify the measured result, is needed for calibration. Immerse the sensor removed that is still connected to the control module delta® electrically into this water. Stir the sensor around the water for approx. 5 minutes until the reading on the on the control module delta® is displayed steady and close to *„0“*.

1. Select the calibration menu *[Sensor Calibration]*. The press the button P
2. Select the unit *„Adj. zero point“* to be calibrated using the buttons ⇩ or ⇧
3. Continue with P
   ⇨ A prompt is shown in the display
4. Adapt the *„ Zero point“* value displayed during the calibration using the buttons ⇩ or ⇧ and when necessary, accept the value using the button P
   ⇨ Refer to the Error Message table should an error be displayed

**NOTICE!**
Then definitively calibrate the gradient with a suitable reference method (e.g. DPD. titration etc.).

## 7.2 Calibrating the sensor for pH

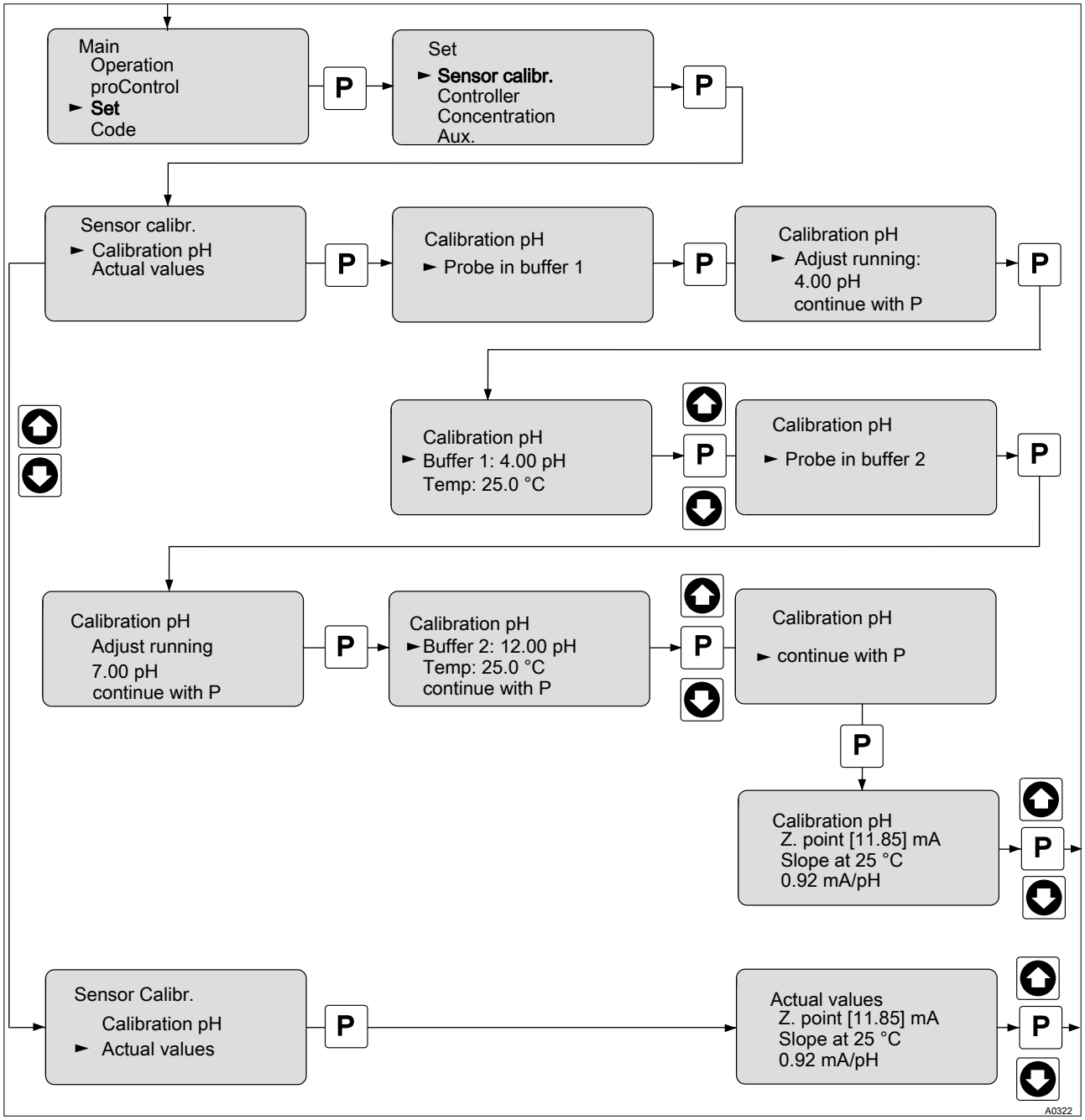



*Fig. 21: Calibrating the sensor for pH*

## 7.3 Calibrating the sensor for Redox

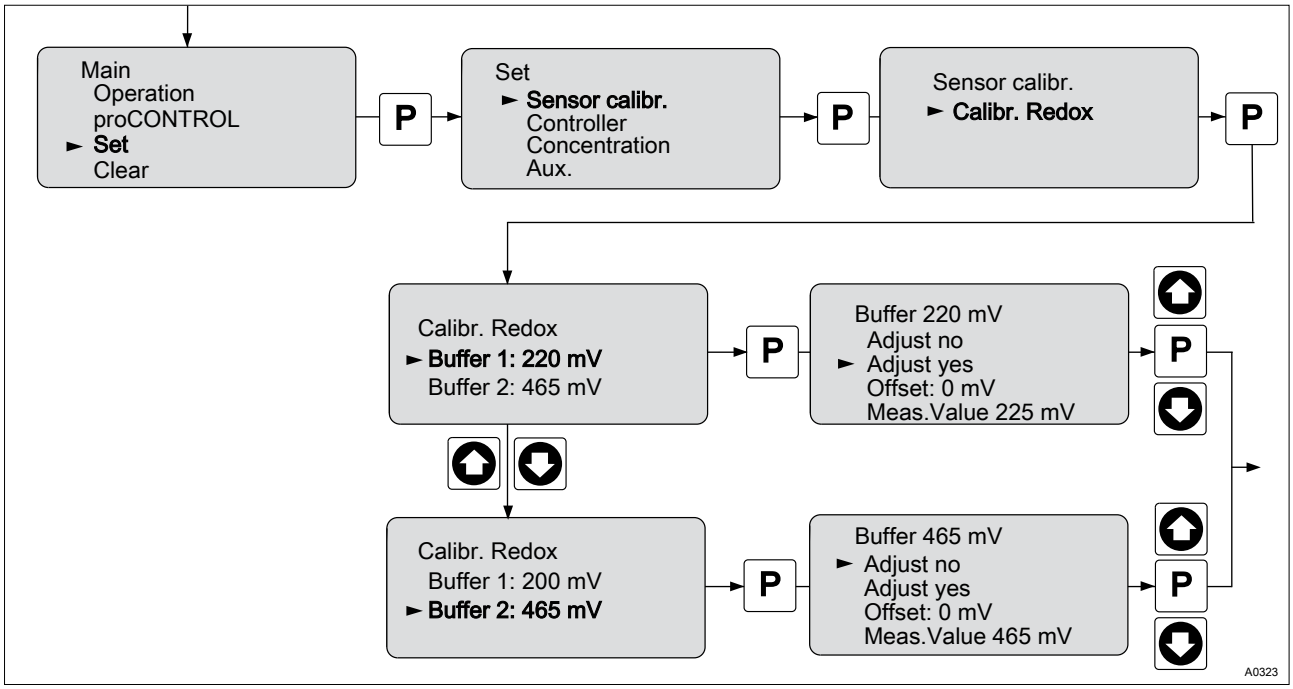



*Fig. 22: Calibrating the sensor for Redox*

# 8 Troubleshooting

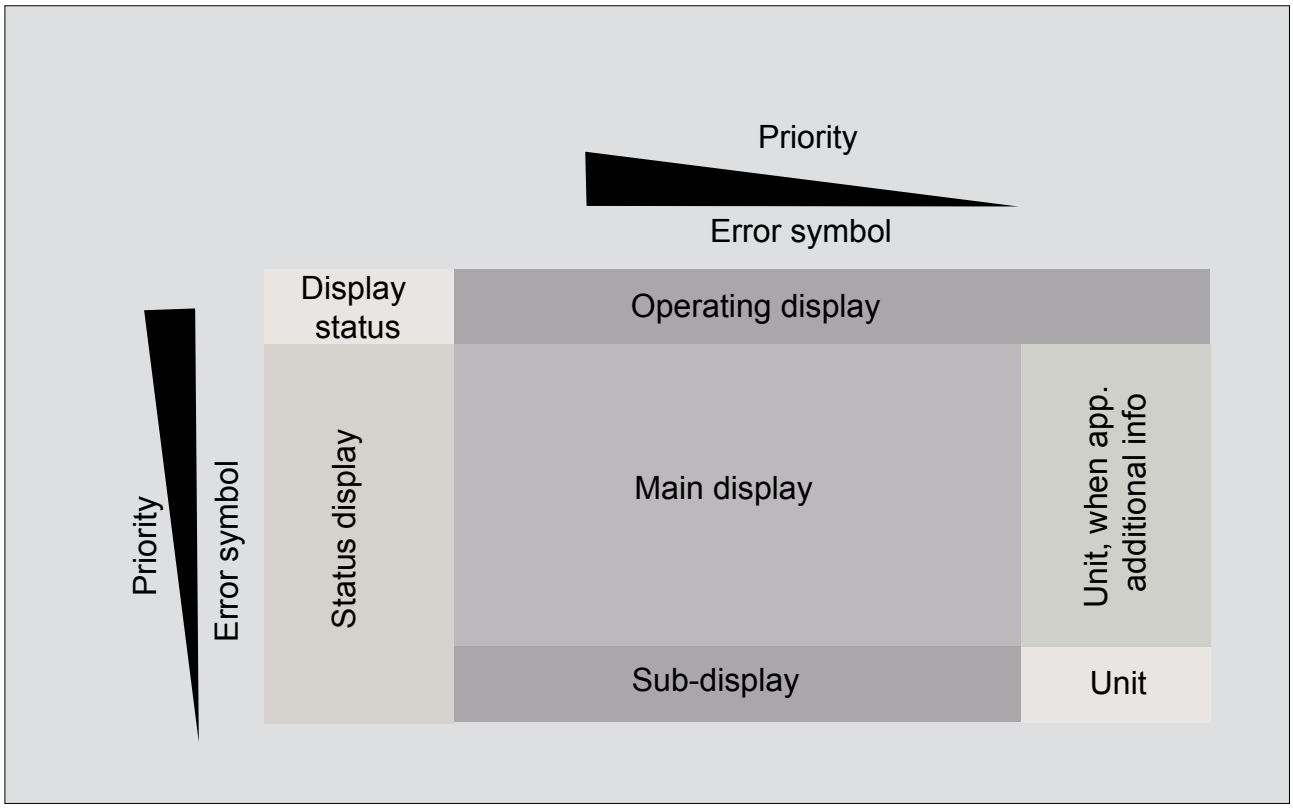



*Fig. 23: Overview of the operating indicator of the delta® solenoid metering pump*

| | | |
|---|---|---|
|  | Control module operating indicator | Standard display with regular operation. If the control module delta® is not activated then the symbol will not be displayed. |

## 8.1 "Fault" status display

In the inactive state of the control module delta® , no error messages or warning messages are transferred to the delta delta® solenoid metering pump.

The symbol will be displayed in the status display. Then the respective error symbol flashes in the main display. If several errors occur simultaneously, these will be displayed one after another.

| Photo | Error | Description |
|---|---|---|
|  | Control module | In the control module delta® , an error has been detected<br>■ EEProm error<br>■ Data error<br>■ When in the field *„Status display“* the symbol is displayed additionally then an error has been detected when calibrating the Redox sensor (deviating from the buffer value >+/- 40 mV) |
| i < 4 mA | Control module | A value less than 4. mA has been measured at the voltage input |
| i > 20 mA | Control module | A value greater than 20. mA has been measured at the voltage input |
| 20 mA! | Control module | The 20 mA interface has been put in an error state.<br>■ Short circuit<br>■ Overcurrent (> approx. 50 mA)<br>■ Counter voltage (< 0 V) |
|  | Control module missing | Option module is missing or communication with the option module cannot be established<br>If the option module "Control module" has been switched into the active state, then the delta® solenoid metering pump expects the login of the control module delta® . If no login takes place then this symbol will be displayed |

## 8.2 Error control module delta®

| Error | Description |
|---|---|
| Hardware error | A hardware error has been detected<br>■ Access error to EEProm<br>■ Overcurrent / undercurrent sensor<br>■ Communication error |
| Software / data | Configuration values cannot be used, e.g. the control parameters ($X_P$, $T_V$, $T_N$) are all set to zero. |

## 8.3 Status display Warning

The display flashes. An explanation of the warning is displayed on the bottom line. In this state, the control module delta® is still functional.

| Photo | Warning | Description |
|---|---|---|
|  | Control module | A warning from the control module delta® has been detected<br>■ Error with the feedforward control (control module delta® still operates)<br>■ Overflow of the control module output value (control module delta® still operates)<br>■ The control module is located in basic load control |
|  | checkout time, | A warning from the control module delta® has been detected<br>■ Checkout time has elapsed (control module delta® still with basic load) |
|  | Limit | The limit value has been exceeded / undershot<br>■ The control module delta® is located in basic load control |
|  | Calibration | A calibration error has been detected<br>When an error has been detected then the calibration data will not be accepted. Operation is continued with the old data. This affects the calibration for the current interface and the sensors. If a warning is displayed during a sensor calibration, this could indicate a sensor error. |

## 8.4 Warnings control module delta®

| Warning | Description |
|---|---|
| Communication | A continuous communication error has been determined |
| Software / data | ■ Configuration values are inconsistent<br>■ Communication error (unknown reply, wrong checksum) |
| Controllers | ■ Limit value undershot / exceeded<br>■ Checkout time elapsed |

## 8.5 LED status control of the control module delta®

The LED status control signalises the current operating status of the control module delta® . There are different LED status displays: The device LED and the connection LED. The LED status displays do not have a flash mode.

### Device LED

| LED | Status |
|---|---|
| Green | Operating indicator |
| Red | Fault display<br>■ Internal hardware error<br>■ Sensor error |
| Orange | Warning display<br>■ Configuration error |

### Connecting LED

| LED | Status |
|---|---|
| - | Passive controller operation, otherwise okay |
| Green | Active controller operation |
| Red | No connection establishment to the pump |

# 9 Technical data, maintenance, disposal

## Electrical data

### Voltage input

| | Value |
|---|---|
| Measuring range | 0/4 mA - 25 mA (at 50 Ohm measurement resistor) |
| Accuracy | After calibrating ± 0.5% of the measuring range transmitting value at calibration temperature |
| Resolution | 10-12 Bit |
| Input voltage protected against incorrect polarity and return of electric energy to ± 30 V. | |

### Switchable voltage output

| | Value |
|---|---|
| Output voltage | 22.5V-26V load dependent, < 50 Ohm; maximum 50mA |
| Output voltage protected against incorrect polarity and return of electric energy to ± 30 V. | |

Galvanic Isolation to the delta® front panel. Load current limiting to approx. 55mA (51 mA - 58 mA).

Deactivation with short circuit (approx. 70 mA) due to foldback and by software. Reactivation using software.

## Maintenance

The control module delta ® is maintenance free.

## Disposal of Used Parts

**NOTICE!**

**Regulations governing disposal of used parts**

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

ProMinent Dosiertechnik, Heidelberg / Germany is prepared to take back the decontaminated and cleaned used parts.

The current valid Declaration of Decontamination can be obtained as download at *www.prominent.com*.

# 10 Index