Supratec

S200

Operating Instructions for Users

Exclusive distribution by AQUALABO

CE

Designed, developed and Made in Germany

Notes:

AQUALABO CONTROLE
115 Rue Michel MARION
56850 CAUDAN - France
Tel: +33 (0)1 72 87 97 90
Fax: +33 (0)1 85 09 03 52
Hotline : +33 (0)1 72 87 97 93

E-mail: info@aqualabo.fr
Internet: /www.aqualabo-group.com/

Subject to technical changes. Errors and omissions excepted.
Author: M. Scheffold

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Valid for software versions starting 09/16

Contents

1 General information

1.1 General

This technical information contains instructions for installation, commissioning, maintenance and repair of the S200 measuring and control device.

The safety instructions and notes in bold type are to be observed at all times!

1.2 Notes in bold

In this technical information, the bold headings Caution, Warning, and Note have the following meaning:

Caution:
This heading is used if failure to observe the operating or working instructions, or prescribed procedures, or incorrect observation of such instructions and the like can lead to accident or personal injury.

Warning:
This heading is used if failure to observe the operating or working instructions or prescribed procedures, or incorrect observation of such instructions and the like can lead to damage to the equipment.

Note:
This heading is used to draw special attention to important points.

1.3 Warranty

The manufacturer guarantees the operational safety and reliability of the system only if the following conditions are observed:

- Installation, connection, adjustment, maintenance and repairs are carried out only by authorized and qualified specialist personnel.

- Only original replacement parts are used for repairs.

- The measuring and control device is used in accordance with the information and instructions given in this manual.

Warning:
If the device is not used as intended, this will void the warranty.

Note:
Wearing parts are not subject to warranty (see table in chapter 9).

1.4 Electrical connection

Warning:
The S200 measuring and control device may only be operated with the supply voltage specified on the nameplate!
By default, the device is delivered for a supply voltage of 230V/50Hz.

1.5 Safety instructions

The S200 measuring and control devices are manufactured and tested in accordance with DIN EN 61010-1/VDE 0411-1. The device left the factory in a safe condition. In order to maintain this condition and to ensure a continued safe operation, the user must observe the information and warning in this manual. If it must be assumed that a safe operation is no longer possible, the device must be turned off and taken out of service, and made safe against accidental operation.
This is the case:
- if the system shows visible signs of damage,
- if the system is apparently no longer operational,
- after prolonged storage under unfavourable conditions.

1.6 Transport damage

The S200 measuring and control devices are carefully packed by us for the purpose of transport. Please check that the delivery is complete and undamaged. Any transport damage **must be notified immediately** (carrier).

The device must never be exposed to temperatures outside the range of -20 to +70°C (transport and interim storage).
Subject to technical changes. Changes in assembly of components reserved.

2 Technical data

2.1 General

Item	Adjustment ranges
Power supply	230 V/AC ± 10 % (50/60Hz) 117 V/AC ± 10 % (50/60Hz)
Power consumption	16 VA
Protection class	IP 65
Fuse (device)	80 mAT (230V) 160 mAT (117V)
Electrical properties of relay contact Max. continuous current/max. start-up current Nominal voltage/max. switching voltage Max. switching capacity AC Max. switching current DC	 6A/16A 250VAC, 24VDC 6A 6A
Working temperature	-20° - 50° C
Permissible storage temperature	-20° - +65° C
Permissible humidity	max. 90 % at +40 °C (non-condensing)
Dimensions device	166 x 161 x 73.5 mm (w x h x d)
Weight	approx. 1.1 kg

Warning:
Pre-fuse of unit max. 16 A.

2.2 Measured variables

Measured variable	Measurement and control range	Resolution
pH	-2.00 pH ... 16.00 pH	0.01 mV/input resistance >5x1011 Ω
Redox	-1500 mV ...+1500 mV	1 mV/input resistance >1x106 Ω
Ion-selective	0...9999 ppb/ ppm/ mg/l	0.1 mV/input resistance >5x1011 Ω
Temperature	-30 °C...+140 °C	0.1 °C / PT100/ Pt1000 switchable
Current input:	0/4 mA...20 mA	0.01 mA / 50 Ω load
Oxygen	0.00 mg/l...20.00 mg/l 0 %...200 %	+/-0.1 mg/l / ModBus digital sensor +/- 1 %
Turbidity	0.00 NTU... 50.00 NTU 0.0 NTU... 200.0 NTU 0 NTU...1000 NTU 0 NTU...4000 NTU	0.01 NTU / ModBus digital sensor 0.1 NTU 1 NTU 1 NTU
Chlorine (active)	0.00 mg/l... 5.00 mg/l.	0.01 mg/l.
Chlorine (total)	0.00 mg/l... 5.00 mg/l.	0.01 mg/l.
Chlorine dioxide	0.00 mg/l... 5.00 mg/l.	0.01 mg/l.
Ozone	0.000 mg/l... 1.000 mg/l.	0.001 mg/l.
Oxygen	0.00 mg/l... 20.00 mg/l.	0.01 mg/l.
Conductivity (conductive)	0.000 µS/cm... 2.000 µS/cm 0.00 µS/cm... 20.00 µS/cm 0.0 µS/cm... 200.0 µS/cm 0 µS/cm... 2000 µS/cm 0.00 mS/cm...20.00mS/cm	0.001 µS/cm 0.01 µS/cm 0.1 µS/cm 1 µS/cm 0.01 mS/cm
Conductivity (inductive)	100 µS/cm... 250 mS/cm	1 µS/cm

3 Description

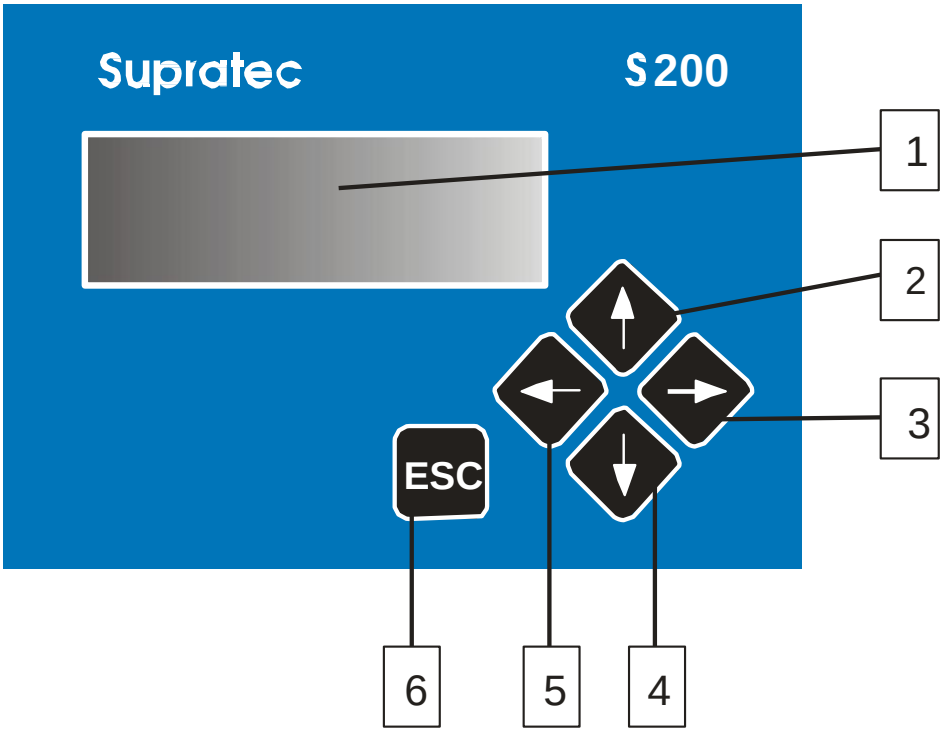
The S200 measuring and control device is easy to use.
Equipment:

- Large backlit display
- Cursor-controlled operation with just 5 keys
- Menu navigation in plain text
- Up to 6 different parameters simultaneously (depending on the type code)
- Password-protected access
- Easy integration into process technology via existing ModBus RTU
- Connection for digital sensors, including power supply
- 2 digital outputs for control of frequency-driven metering pumps
- 3 relay outputs
- 2 digital inputs, switch input or frequency input
- Option for connection of 3-wire sensors at digital inputs
- 2 electrically isolated ModBus RTU interfaces
- 2 0/4 - 20mA outputs, electrically isolated
- Up to 4 individually adjustable PI controllers (depending on the type code)
- Feed forward control via an additional analog input 0/4-20 mA
- Real time clock, battery-backed
- Slot for additional sensors

4 Assembly Instructions

The S200 measuring and control device is supplied as complete unit.

5 Operation



5.1 Control elements

(1) Display Backlit LCD display 4 lines with 20 characters each

(2) Key Cursor control key / Increase numerical value

(3) Key Confirm selection / Change function

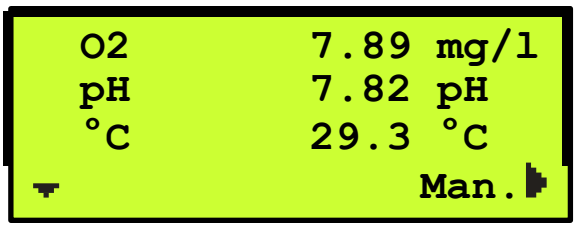
(4) Key Cursor control key / Reduce numerical value / Select operating menu

(5) Key Save value / Go back 1 menu level

(6) Key ESC Cancel entry without saving / Back to start screen

5.2 Display

5.2.1 Graphic symbol

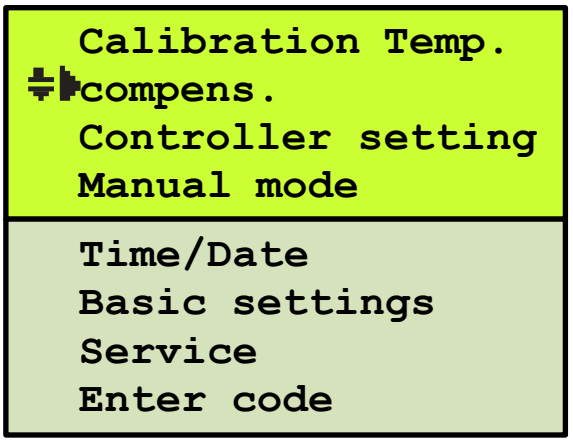


Note:
The display shown in the example will be different, depending on the configuration of the device.

The graphic symbols on the display indicate which keys are available for operation of the device.

Indicates that you can switch to the operating level by using the corresponding key.

Indicates that the control function is switched from manual to automatic by pressing the key.



Note:
The display shown in the example will be different, depending on the configuration of the device.

Indicates that the cursor can be moved up and down with the cursor control keys.

The additional arrow to the right indicates that a sub-menu or input of numeric values can be selected.

Note:
In the operating instructions the following line is displayed above the menu window, for example:

/Service/LCD display/

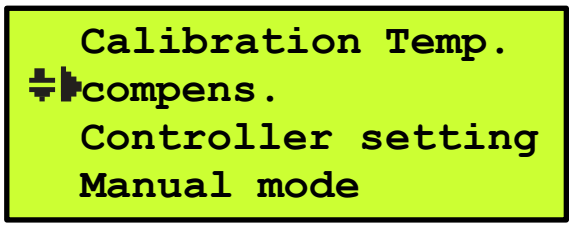
This line helps users to easily find this menu item in the device again.
Explanation:

Indicates the selection of the first main menu.

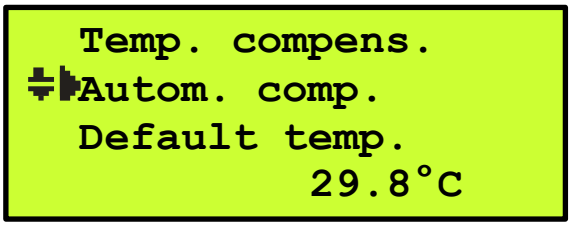
/Service/LCD display/: Means selection of the sub-menu “Service”.

/Service/**LCD display**/: Means selection of an additional sub-menu.

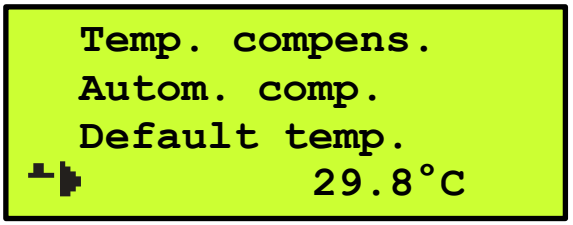
5.2.2 **Menu selection “Temperature compensation”**



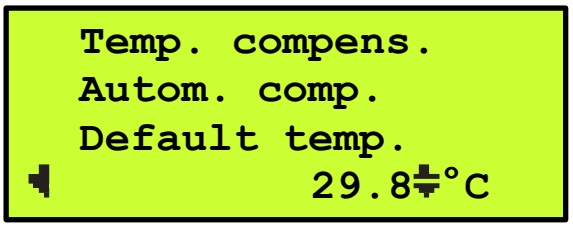
Use the key to select the sub-menu “ Temperature compensation”.



Use the key to switch the temperature compensation from automatic to manual.
In case of an automatic temperature compensation, the Pt100 / Pt1000 is used for temperature compensation.



Use the key to select the entry of parameters.



A blinking arrow indicates that you are in the input mode. Use the arrow keys - up arrow and down arrow - to change the numerical value.

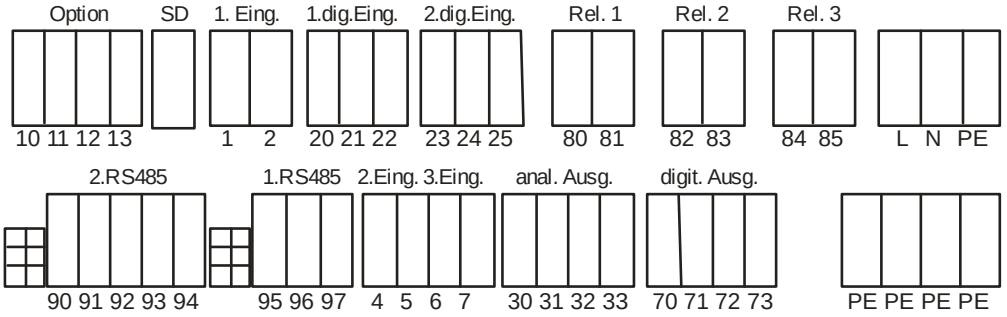
Indicates that the cursor key - left arrow - is used to complete the entry and that the value is saved.

Note:

The entry may be cancelled at any time by pressing the ESC key. The old value is retained.

6 Installation

6.1 Terminal assignment



Eing. = Input *Ausg. = Output*

6.1.1 **Pin assignment**

Connection	**Terminals**	**Description**
Voltage supply	L/N/PE	230 V/AC +/- 10 % (50/60 Hz)
Distributor block PE	PE, PE, PE, PE	Distributor PE
pH/ORP/ ion-specific probe	1+2	1 = Reference probe (shielding) 2 = Measuring probe = inner wire
0/4-20 mA analog input	4+5	-4/+5 load internal 50 Ω
Analog input +/- 1500mV	4+5	-4/+5
Temperature sensor Pt 100/1000	6+7	Pt 100/ Pt1000 selectable via software
Additional function (option)	10+11+12+13	Expandability
Digital input 1	20+21+22	21/ 22 digital input (potential-free contact) Electronic contact, voltage supply 12V 20/-22 Pulse 21
Digital input 2	23+24+25	24/ 25 digital input (potential-free contact) Electronic contact, voltage supply 12V +23/-25 Pulse 24
Analog output 1 0/4-20 mA load max. 500Ω	30+31	-30/+31
Analog output 2 0/4-20 mA load max. 500Ω	32+33	-32/+33
Digital output 1 Max. load 200 mA/30V	70+71	Digital output for an electronic control of metering pumps
Digital output 2 Max. load 200 mA/30V	72+73	Digital output for an electronic control of metering pumps
Switching output relay 1	80+81	Potential-free contact
Switching output relay 2	82+83	Potential-free contact
Switching output relay 3	84+85	Potential-free contact

Connection	Terminals	Description
Modbus RS485 interface for connection of digital probes Voltage supply 12 V DC max. 200 mA	90+91+92+93+94	90 = 0 V, 91 = +12 V, 92 = B 93 = A 94 = shielding
ModBus RS485 interface for communication with management systems	95+96+97	95 = B 96 = A 97 = shielding

6.2 Menu operation

All settings are accessible via a menu.
Change of a set value (example)

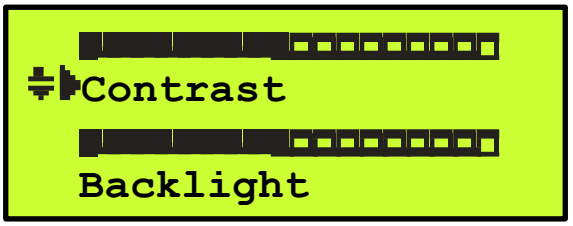
7 Explanation of menu structure

Note:
This manual includes all available menu items. Remember that, depending on the selected code, not all menu items will be displayed, and/or not all menu items can be selected.

7.1 LCD display settings

7.1.1 Contrast setting

/Service/LCD display/



The contrast setting can be used to change the contrast level of the LCD display.

Note:
If a contrast adjustment is not possible, because the setting is too high or too low, it is possible to adjust the contrast as follows:

ESC - Press the key, hold it and press ▲ in addition, if the contrast is to be increased.

If the contrast is to be reduced, hold the ESC key down and press ▼ in addition.
This may be necessary after a factory reset.

7.1.2 Setting the backlight

The intensity of the backlight can be varied via the menu item “Backlight”.

Note:
The intensity of the backlight should only be as bright as necessary. A setting that is too bright will shorten the service life of the display.

7.1.3 Code

There are 3 access levels that are accessible by means of codes.
This is to protect the device from unauthorized operation.

A) Code A - 00: all entries - except for code B, C and D - are locked
B) Code B - 15: user code
C) Code C - 55: code for service
D) Code D - NN: code for factory service

7.2 Calibration pH

Terminal assignment		
Wire	**Function**	**Connection**
Shielding	Reference electrode	Terminal 1
Inner conductor	pH- electrode	Terminal 2

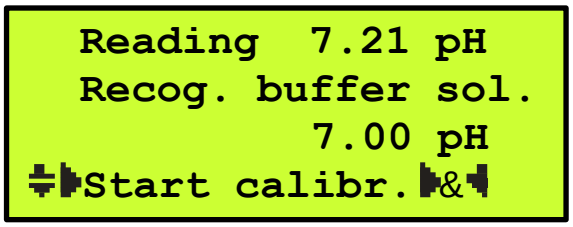
Reference of pH electrode : 202101SU

/Calibration/Calibration pH/

```
  Reading  7.21 pH
  Recog. buffer sol.
           7.00 pH
Start calibr.
```

Note:
The pH probe must be checked periodically. A buffer solution is used for this. If there are deviations exceeding 0.2 pH, a calibration of the pH probe should be carried out. Two different buffer solutions with a difference of at least 2 pH are required for the calibration. pH 7 and pH 4 have become a standard for this, for example.

/Calibration/Calibration pH/



Note:
The pH probe must be checked periodically. A buffer solution is used for this. If there are deviations exceeding 0.2 pH, a calibration of the pH probe should be carried out. Two different buffer solutions with a difference of at least 2 pH are required for the calibration. pH 7 and pH 4.62 have become a standard for this, for example.

7.2.1 Calibration process with buffer solution for pH probe

Buffer solutions, such as pH 4. and pH 7, must be ready for the calibration.

1. If the pH probe is used for control, the S200 control must be switched off before removing the pH probe.
2. Temperature compensation - adjust according to the temperature of the buffer solution.
3. Remove the pH probe.

Note:
To remove the probe, the plug-in connection of the pH probe must be disconnected. It is important to ensure that no moisture can penetrate into the plug-in connection.

4. Dry the pH probe with a soft paper towel before calibrating it.
5. Select the menu “Calibrate pH” as shown above.
6. Immerse the probe in the first buffer solution, for example pH 7.

   Note:
   The probe must be immersed deep enough so that the diaphragm (small round dot on the glass shaft) is also immersed in the buffer solution.
7. The buffer solution recognized by the S200 is indicated in the display. Observe the display of the pH value until the value has stabilized.
8.  - Press and hold the key. Press  in addition to activate the calibration of the pH probe.
9. Rinse the probe with water and dry it with a soft paper towel.

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10. Immerse the probe in the second buffer solution pH 4.

    Note:
    The probe must be immersed deep enough so that the diaphragm (small round dot on the glass shaft) is also immersed in the buffer solution.

11. The buffer solution recognized by the S200 is indicated in the display.
    Observe the display of the pH value until the value has stabilized.
12.  - Press and hold the key. Press  in addition
    to activate the calibration of the pH probe.
13. Rinse the probe with water and dry it with a soft paper towel.
14. Install the pH-probe.
    Adjust the temperature compensation back to the original value.
    If the control was turned off, turn it on again.

Note:
The S200 recalculates the probe of the slope and the zero point deviation after each calibration.

7.2.1.1 Interrogating the slope/zero point of the pH probe

The current slope and zero point deviation of the pH probe are displayed in the calibration menu.

7.2.1.2 Explanation slope of pH probe

A pH probe delivers a defined voltage per pH at 25°C. A new probe releases a maximum of 59.2 mV/pH at 25°C.
During operation, the slope of the probe is reduced over time. The displayed slope of the probe is only recalculated after the calibration. As soon the slope falls below 50mV/pH, the probe must not be used any longer. In case of a slope error, this error is displayed in the status display in the start menu.
Note:
It is important for the calibration process that you ensure that the temperature compensation is set to the correct buffer solution temperature.

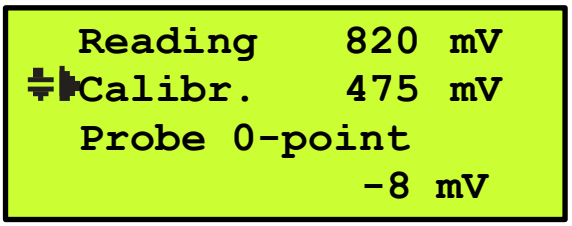
7.2.1.3 Explanation zero point pH probe

Physically, the zero point of a new pH probe is 0 mV.
This value can vary by +/- 25mV. During operation, the zero point changes in a positive or negative direction. The zero point is recalculated during the next calibration. If the deviation of the zero point exceeds +/- 58mV, the probe must not be used any longer. In case of a zero point error, this error is displayed in the status display in the start menu.

7.3 Calibration Redox (Redox)

Terminal assignment		
Wire	**Function**	**Connection**
Shielding	Reference electrode	Terminal 4
Inner conductor	ORP electrode	Terminal 5

/Calibration/Calibration ORP/



Note:
The Redox (ORP) probe must be checked periodically. A buffer solution is used for this, e.g. 475 mV. If there are deviations exceeding +/- 10mV, a calibration of the Redox probe should be carried out.
This calibration is a one point calibration. To do this you need a Redox buffer solution. As standard, 475 mV has proven, for example.

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7.3.1 **Calibration process with buffer solution for Redox probe**

The buffer solution, such as 475 mV, must be ready for the calibration.

1. If the Redox probe is used for control, the S200 control must be switched off before removing the Redox probe.
2. Remove the Redox probe.

   Note:
   To remove the probe, the plug-in connection of the redox probe must be disconnected. It is important to ensure that no moisture can penetrate into the plug-in connection.
3. Dry the Redox electrode with a soft paper towel before calibrating it.
4. Select the menu “Calibrate ORP” as shown above.
5. Immerse the probe in the buffer solution.

   Note:
   The probe must be immersed deep enough so that the diaphragm (small round dot on the glass shaft) is also immersed in the buffer solution.
6. Observe the display of the Redox (mV) value until the value has stabilized.
7.  - Press the key and select the entry function. If necessary, adjust the value of the buffer solution. Activate the calibration by pressing the  key and in addition  .
8. Rinse the probe with water and dry it with a soft paper towel.
9. Reinstall the Redox probe.
   If the control was turned off, turn it on again.

   Note:
   The S200 recalculates the zero point deviation after each calibration.

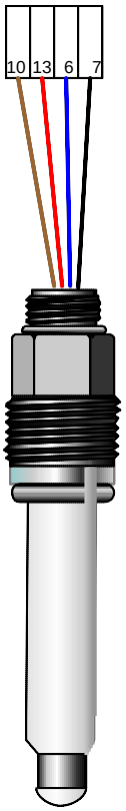
7.3.1.1 Checking the slope/zero point of the Redox probe

The current zero point deviation of the Redox probe is displayed in the calibration menu.

7.3.1.2 Explanation zero point Redox probe

Physically, the zero point of a new Redox probe is 0 mV.
This value can vary by +/- 25mV. During operation, the zero point changes in a positive or negative direction. The zero point is recalculated during the next calibration. If the deviation of the zero point exceeds +/- 58mV, the probe must not be used any longer. In case of a zero point error, this error is displayed in the status display in the start menu.

7.4 Calibration chlorine/chlorine dioxide/ozone (valve...)

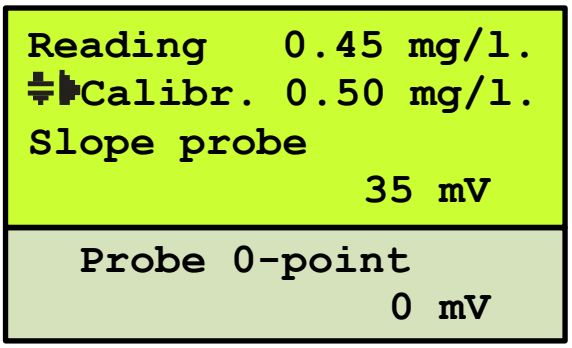


Connection terminals Chlorine sensor		
Cable	**Function**	**Connection**
Brown	Measuring electrode	Terminal 10
Red	Counter electrode	Terminal 13
Blue	Pt 1000	Terminal 6
Black	Pt 1000	Terminal 7

Note: for pH sensor connection
Terminals 11 (white cable for pH sensor) + 12 (transparent cable pH sensor) are connected with the respective reference electrode (pH or redox). A red junction cable link terminal 12 and terminal 1.

Reference of Special Metal electrode : 204103SU

/Calibration/Calibrate chlorine/ (example: chlorine)



Note:
The chlorine/chlorine dioxide/ozone probe must be checked periodically. To check the probe, use a comparative measurement, e.g. according to the DPD method. If there are deviations exceeding +/- 0.10 mg/l, a calibration of the probe is required.
A deviation of the measuring value is possible after an automatic probe cleaning process, since the probe has been newly polarized, which can result in a temporarily higher measuring value.
If a calibration of pH or redox value is required, this calibration should be carried out first.

After pH or Redox have been calibrated, wait for at least 15 minutes before calibrating the chlorine/chlorine dioxide/ozone probe. During this time, the sample water must flow through the valve again.
This calibration is a one point calibration.

7.4.1 Calibration process when using comparison measurement

1. After flushing with about 250 ml of water, open the sampling tap on the valve and take a water sample.
2. Carry out a comparative measurement.
   If the deviation is less than 0.10 mg/l, no calibration is required.

   Note:
   Do not carry out a calibration if the concentration is lower than 0.10 mg/l.

3. Press the key  and select the input function. If necessary, adjust the value for the comparative measurement.
4. Activate the calibration process by pressing the  key and in addition  .

Note:
The S200 recalculates the slope and the zero point deviation after each calibration.

7.4.1.1 Checking the slope/zero point of the chlorine/chlorine dioxide/ozone probe

The current slope/zero point deviation of the probe is displayed in the calibration menu.

7.4.1.2 Explanation 'Slope of probe'

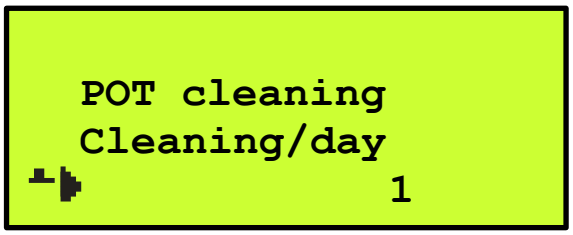
The slope of the probe is a theoretical value, and is within a range of 5 mV and 100 mV. The stored value is 35 mV. If the slope of the probe is outside the range, the probe should be cleaned manually.
If necessary, the surface of the gold ring is to be cleaned.

7.4.1.3 Explanation 'Zero point of probe'

The zero point of the chlorine/chlorine dioxide/ozone probe is at 0 mV.

7.4.2 **Automatic cleaning of the chlorine/chlorine dioxide/ozone probe**

☚/Basic setting/POT cleaning



Note:
When set to 0, the cleaning feature is deactivated.
A maximum 4 cleaning processes can be carried out per day.
The start of the cleaning is controlled by the internal clock.
The first cleaning/day will be carried out at 0:00.

Note:
After a cleaning was carried out, the measuring value is slightly higher due to the new polarization of the probe.

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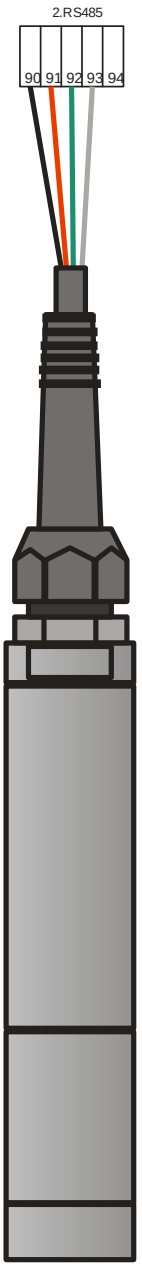
7.5 Calibration of the digital oxygen sensor

MODBUS RTU

Terminal assignment		
Wire colors	**Function**	**Connection**
Black	GND	Terminal 90
Red	DC 12V +	Terminal 91
Green	RS485 - (B)	Terminal 92
White	RS485 + (A)	Terminal 93

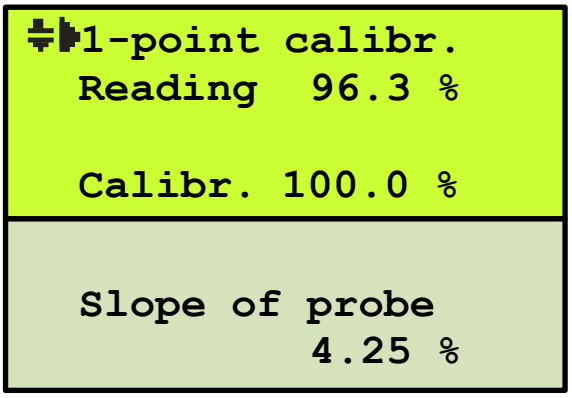


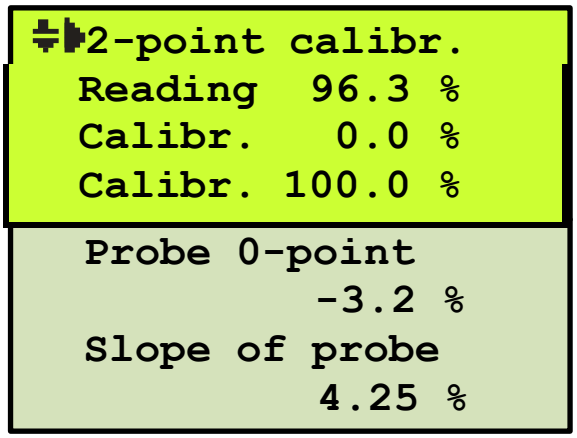
7.5.1 Calibration methods

The S200 offers two calibration methods to calibrate the oxygen sensor:

- Final value calibration (one point calibration)
  With this method, the slope of the sensor is calibrated. It is the standard method.
- Two point calibration
  With this method, zero point and slope of the sensor are calibrated. This is the more accurate, but also more complex method, because a “Zero point solution” is required in addition.

The different calibration methods are selected via the menu.
/Calibration/Calibration O2/



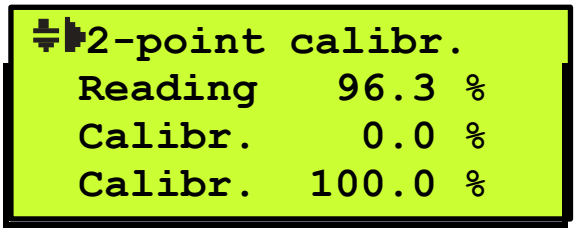


7.5.2 Selection of calibration methods

Use the  key to select the respective calibration method.

7.5.3 Two point calibration

/Calibration/Calibration O2/



A sodium sulphite solution (concentration < 2 %) is used as zero point calibration solution for the two point calibration.

Note:
The oxygen probe must be checked periodically (depending on how dirty it is). It is important to rinse the probe and diaphragm each time before checking them. Organic deposits on the diaphragm, such as mud or biofilm can cause measurement errors. These deposits can be removed carefully using warm soap water and a soft sponge. Never use an abrasive cleaner.

7.5.4 **Zero point calibration - process**

The sodium sulfite solution must be ready for the calibration.

1. If the oxygen probe is used for control, the S200 control must be switched off before removing the probe.
2. Remove the probe, rinse it, check for any contamination/dirt, clean as described, if necessary.
3. Immerse the probe in a vessel filled with sodium sulfite solution.
4. Wait until the reading is stable.
5. Use the arrow key  or  to select the menu item “Calibr. 0.0%”.
6.  - Press the key and select the input function. Activate the calibration by pressing the  key and in addition  .
7. A blinking square behind the displayed reading indicates that the automatic calibration process is coming to an end. This display will turn off when the zero point calibration process is complete.
8. Following this, wash the probe off with clear water and blot the diaphragm with a soft pad.

Note:

The zero point calibration is complete. At this point, it is imperative to carry out a one point calibration!

7.5.5 **End point calibration - process**

The end point calibration is carried out with an oxygen saturation of 100%. This is done by placing the probe above a water surface with a distance of 2cm.

1. Use the arrow key  or  to select the menu item “Calibr. 100.0%”.
2.  - Press the key and select the input function. Activate the calibration by pressing the  key and in addition  .
3. A blinking square behind the displayed reading indicates that the automatic calibration process is coming to an end. This display will turn off when the end point calibration process is complete.
4. After the calibration process is complete, check the zero point and the slope of the probe. In case of a calibration error, this error is displayed in the status display in the start menu.

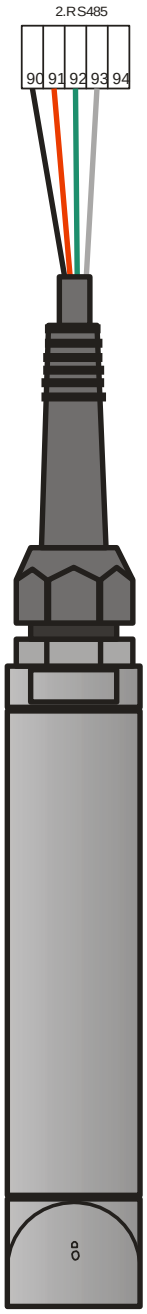
7.5.6 **One point calibration**

The process of a one point calibration is the same as described for the end point calibration.

7.6 Calibration of the digital turbidity sensor

Terminal assignment		
Wire colors	**Function**	**Connection**
Black	GND	Terminal 90
Red	DC 12V +	Terminal 91
Green	RS485 - (B)	Terminal 92
White	RS485 + (A)	Terminal 93

MODBUS RTU



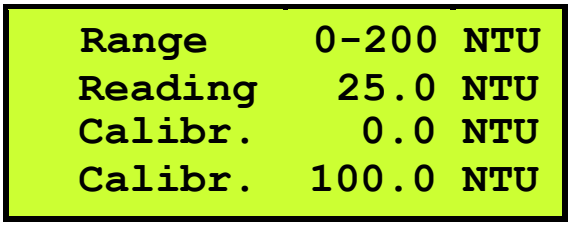
7.6.1 General information about turbidity sensors

Turbidity sensors are optical sensors. The measuring principle of the sensor is based on the 90° scattered-light method. The measurement is made in the infrared range. This sensor is subject to aging during operation and thus to a sensor drift. These influences are compensated for by a calibration.
The sensor is calibrated at the factory, so there is no calibration required during the initial commissioning. During operation the sensor must be cleaned at regular intervals, depending on the contamination level of the measuring medium.

7.6.2 Calibration

The calibration must be carried out for the selected measuring range. It is always a two point calibration that is to be carried out.

Calibration/Calibr. turbidity/



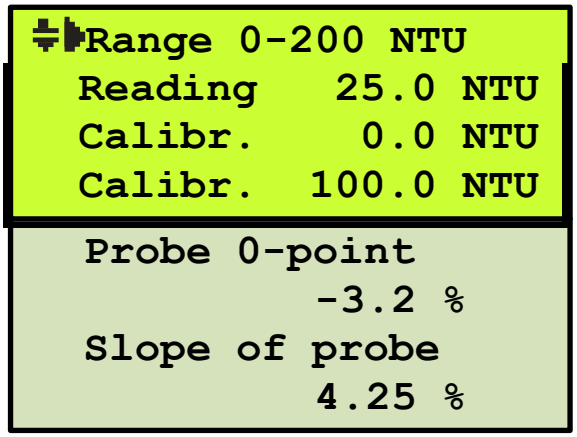
The measuring range for the turbidity measurement is set in the menu “Calibration NTU”.

Note:
After a change of the measuring range, a calibration for this measuring range must be carried out.

To calibrate the turbidity sensor, a reference solution in the middle area of the measuring range is required, e.g. 200 NTU reference solution 100 NTU.

7.6.2.1 Calibration process

Calibration/Calibr. turbidity/



Distilled water is used as zero point calibration solution for the calibration.

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Note:
The turbidity probe must be checked periodically (depending on how dirty it is). It is important to rinse the probe each time before checking it. Organic deposits on the probe, such as mud or biofilm, will result in measurement errors. These deposits can be removed carefully using warm soap water and a soft sponge. Never use an abrasive cleaner. Lime deposits can be removed with a diluted hydrochloric acid (max 5 %).

7.6.2.2 Zero point calibration - process

Have distilled water ready for the calibration.

1. If the turbidity probe is used for control, the S200 control must be switched off before removing the probe.
2. Remove the probe, rinse it, check for any contamination/dirt, clean as described, if necessary.
3. Immerse the probe in a vessel filled with distilled water.
4. Wait until the reading is stable.
5. Use the arrow key  or  to select the menu item “Calibr. 0.0 NTU”.
6.  - Press the key and select the input function. Activate the calibration by pressing the  key and in addition  .
7. A blinking square behind the displayed reading indicates that the automatic calibration process is coming to an end. This display will turn off when the zero point calibration process is complete.

Note:
The zero point calibration is complete. At this point, it is imperative to carry out a one point calibration!

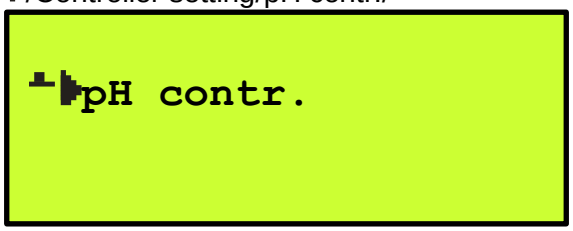
7.6.2.3 Concentration calibration - process

The calibration is carried out at 50 % of the selected measuring range.
A reference solution is prepared for this purpose, e.g. 100 NTU at a measuring range of 200 NTU. The reference solution is prepared from a ‘Formazin’ stock solution.

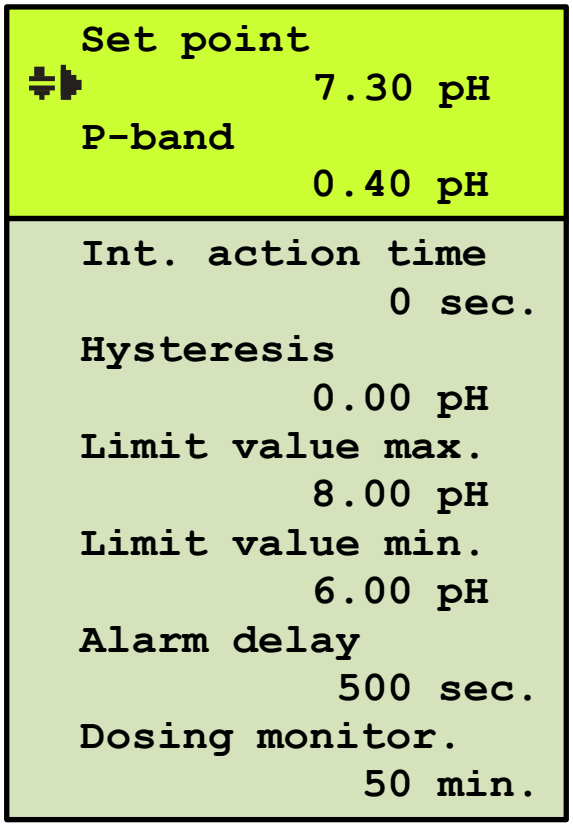
1. Immerse the probe in a vessel filled with the reference solution.
2. Wait until the reading is stable.
3. Use the arrow key  or  to select the menu item “Calibr.”. Select 100.0 NTU.
   If the value 100.0 has not been stored before, it can be set using the  or  key after the input function has been selected.
4.  - Press the key and select the input function. Activate the calibration by pressing the  key and in addition  .
5. A blinking square behind the displayed reading indicates that the automatic calibration process is coming to an end. This display will turn off when the calibration process is complete.
6. After the calibration process is complete, check the zero point and the slope of the probe. In case of a calibration error, this error is displayed in the status display in the start menu.

7.7 Controller settings

/Controller setting/pH contr./



Note:
This display is only an example. Depending on the number of the used controllers, this menu will be different.



7.7.1 Set point settings

You can set the desired set point for the selected measurement in this menu.
Set the desired value, e.g. 7.30 pH.

7.7.2 **Proportional band (P-share)**

Note:
If a proportional band of 0.00 pH is set, the controller works as On-Off controller/controller without proportional action.

The setting for the proportional band determines the control range of the proportional controller. If the difference between the set point reaches the size of the proportional band, the control works with an controlled variable of 100 %.

7.7.3 **Integral action time (Integral gain)**

Note:
If an integral action time of 0 sec. is set, the control works as a proportional controller, provided a P-band has been set.

With the setting for the integral action time, the control rate of the PI control is set.

7.7.4 **Hysteresis**

If the controller is operated as On-Off controller, it is possible to use the hysteresis setting to set a default dead band around the set point.

Example:
Set point = 7.00 pH
Hysteresis = 0.50 pH

The hysteresis range of 0.50 pH is distributed evenly around the set point. The controller turns on at 6.75 pH and off at 7.25 pH.
So the difference corresponds to 0.50 pH = hysteresis.

7.7.5 **Limit value max./min.**

With the threshold setting it is possible to monitor the maximum deviation of the actual value. When reaching the set limits, the alarm relay is activated and a corresponding message is displayed in the status display.
The alarm message and the display can be delayed for an adjustable time.

7.7.6 **Alarm delay time**

When reaching the set limit values, the alarm message is delayed for the set time. If you set the numerical value 0 sec., the alarm message is displayed immediately (no delay).

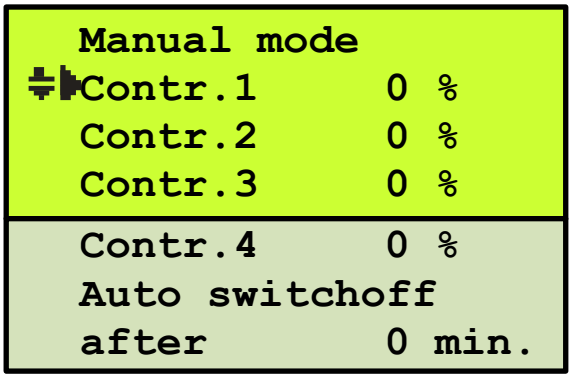
7.7.7 **Dosing monitoring**

If the metering is carried out with a capacity of 100% for a longer time than the set dosing time monitoring, the metering is interrupted and an alarm message is displayed. The alarm relay is activated and a corresponding message is displayed in the status display. This alarm message must be confirmed by switching from **Automatic** to **Manual operation**. If you set the numerical value
0 min., the alarm message is displayed immediately (no delay).

7.8 Manual operation mode

7.8.1 Manual controller mode

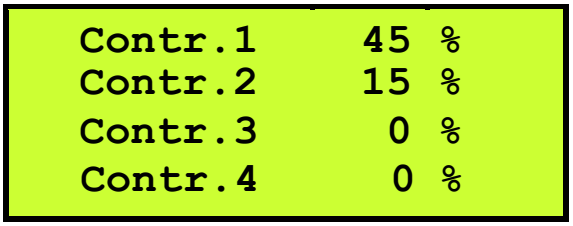
/Manual mode/



The controlled variables of the controller can be set in the manual controller settings. This setting can be made for each controller separately. The output signal provided for the controller is controlled directly, e.g. relay, analog output, etc.
The control type preset for the controller is used for control, e.g. pulse frequency or pulse interval.
The adjustable time “Auto switch off” means there will be a forced switch off after the set time has elapsed. The set controlled variable is then set to 0 %.

7.8.2 Automatic controller mode

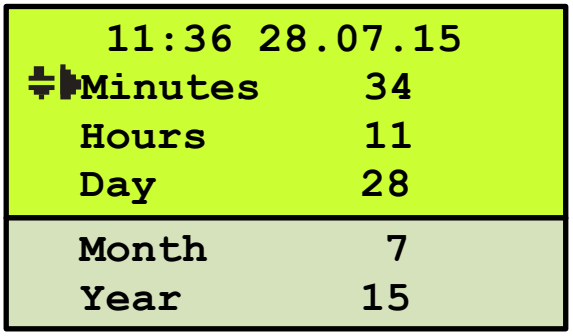
/Manual mode/



When the controller is in the automatic mode, the current controlled variable for each controller can be read.

7.9 Time and date

/Time/Date/



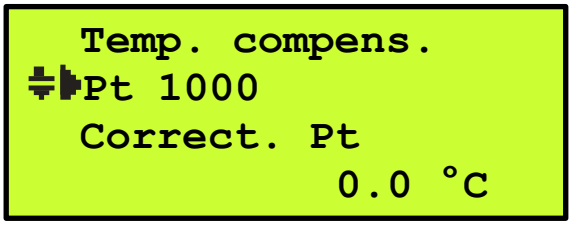
Note:
In this menu, the integrated real-time clock can be set.

7.10 Temperature compensation

In case of different measurements, the measuring signal is dependent on the temperature. The S200 measurement and control device compensates the measured values to a reference temperature of 25°C. The temperature compensation takes place automatically if a temperature sensor is used and the automatic mode for the temperature compensation is enabled.

7.10.1 **Correction temperature sensor**

/Basic settings/Correct. Pt/



It is possible to connect different temperature sensors to the S200. You can choose between the Pt 100 and the Pt 1000.
The zero point error of the Pt 100/Pt 1000 temperature sensor can be corrected by +/- 5°C.

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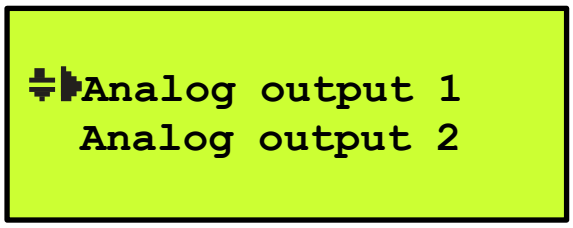
7.11 Analog outputs

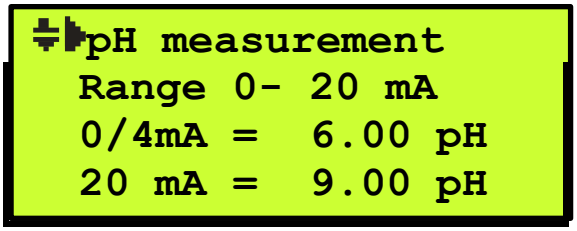
The S200 measurement and control device allows an output of all measuring values as standard current signals 0/4-20mA to DIN IEC 60381-1. You can adjust the type of output here.

/Basic settings/Analog outputs/



7.11.1 Assigning measured values

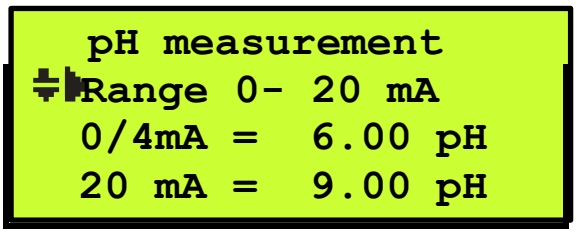
/Basic settings/Analog outputs/Analog output 1



It is possible to assign different parameters to the analog outputs, such as pH measurement or redox measurement, etc.
If the analog output is used as a controller, the setting "No measurement" is to be selected here.

7.11.2 Current range 0/4mA

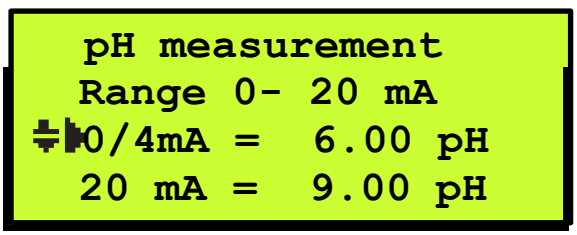
/Basic settings/Analog outputs/Analog output 1



A current range 0-20 mA or 4-20 mA is to be set.

7.11.3 Setting the range

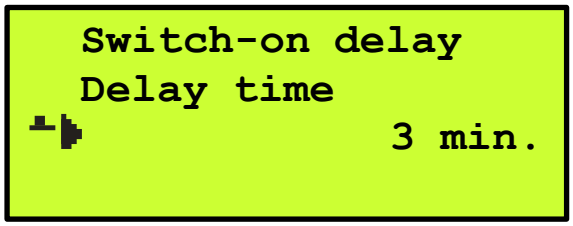
/Basic settings/Analog outputs/Analog output 1



Set the beginning (0/4 mA) and end (20mA) of the analog output range.

7.12 Switch-on delay

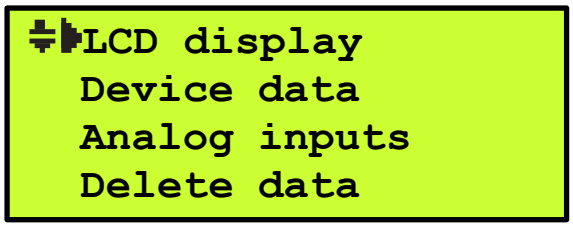
/Basic settings/Switch-on delay



In case of a power failure, the control is delayed for the adjustable time. Setting the delay to 0 minutes means that the delay time is deactivated.

7.13 Service

/Service/



This menu provides all important data about your device.
For the setting of the LCD display, see (7.1.)

7.13.1 **Device data**

You can retrieve specific data in the menu “Device data”, for example the serial number, the software version and the date of manufacture.

7.13.2 **Analog inputs**

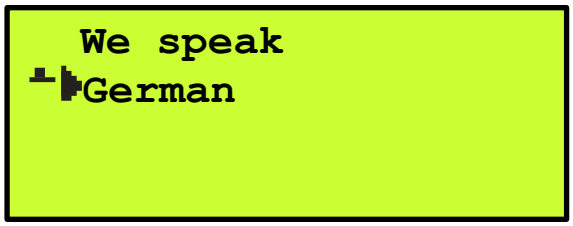
The function of the analog inputs can be checked here.

7.13.3 **Delete data / Factory settings**

In this menu item, you can restore the factory settings (reset).

7.14 Languages

/Basic settings/Language



At present (August 2015) the following languages are available:
- German
- English

Other languages are in preparation.

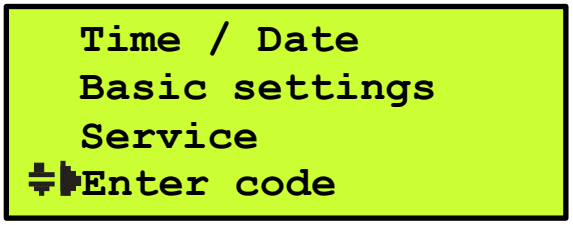
8 Initial commissioning

8.1 Checking the hardware installation

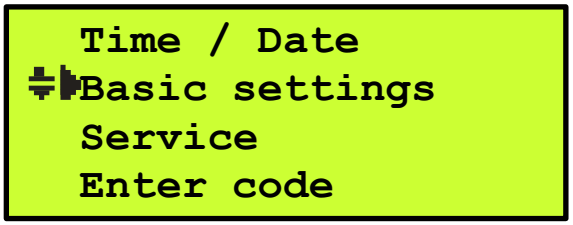
Warning:
Before connecting the supply voltage to the device, check the supply voltage against the data on the rating plate and compare these.
Check the wiring of the device against the wiring diagram.

8.2 Basic device settings

After switching on, select the function “Enter code”. Code “Level 3” is required for the basic settings of the device.

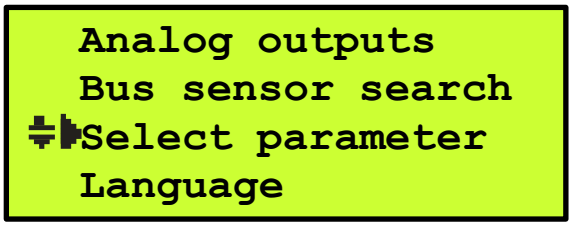


After entry of the code, select the function “Basic settings”.



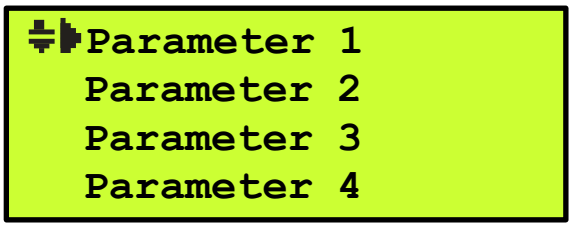
8.2.1 **Parameters / Reading assignment**

Select the function “Select parameters”.
/Basic settings/



Depending on the device version (order size), up to six parameters can be selected.

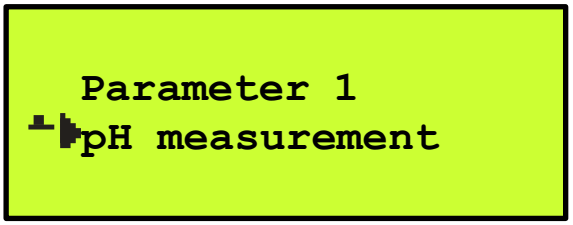
/Basic settings/Select parameter



Assign the required reading to parameter 1, e.g. pH measurement or temperature.

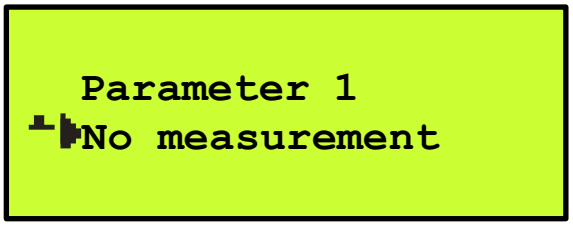
Use the key to select the desired reading assignment.

/Basic settings/Select parameter/Parameter 1/

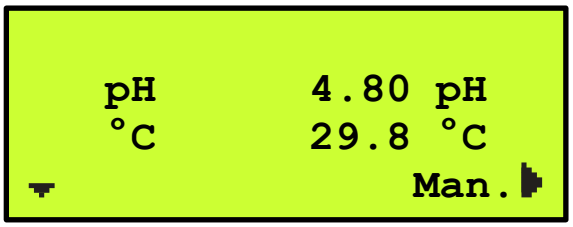


If a parameter is not to be used, select “No measurement”.

/Basic settings/Select parameter/Parameter 1/



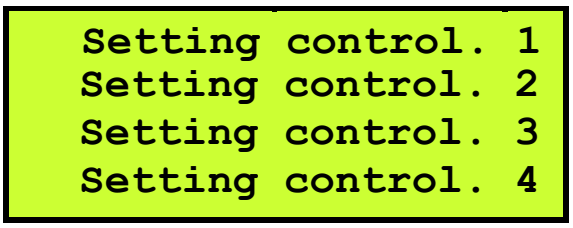
According to the number of selected parameters, what is indicated in the display will be different, for example two parameters (pH and temperature).



8.2.2 Controller reading assignment

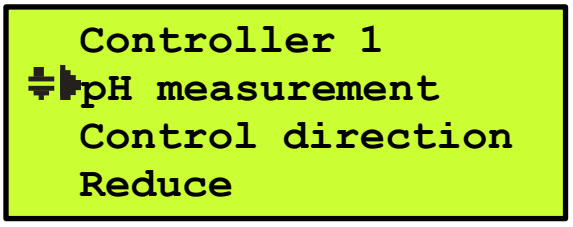
Depending on the degree of expansion, up to four separate controllers can be assigned to the different readings.

/Basic settings/Control param./



E.g. select “Setting contr. 1”

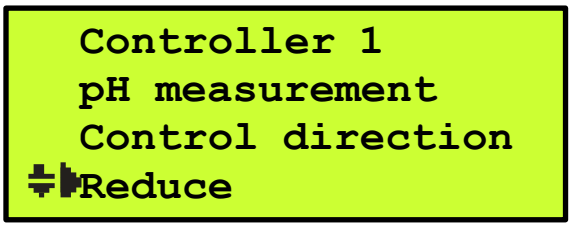
/Basic settings/Control param./Setting control.1/



Use the key to select the desired measuring value allocation.
If a parameter is not used, select the reading assignment “No measurement”..
For additional control settings, see chapter “Controller settings".

8.2.3 Direction of control action

/Basic settings/Control param./Setting control.1/

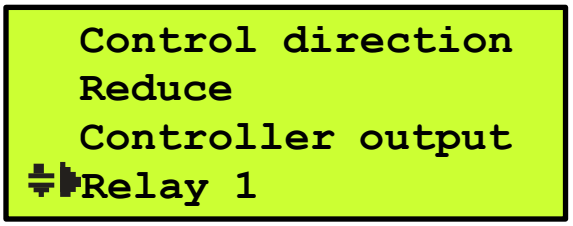


The direction of the controller action is be determined with the setting “Control direction”.
For example, “Reduce” means that the controller is running when the reading exceeds the adjusted set point. As a result, the reading is goes down (lower value).

8.2.4 **Assignment of the control output**

The output signal of the controller can be assigned to various actuators (relays, etc.).

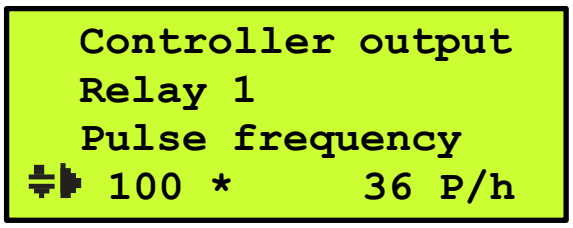
/Basic settings/Control param./Setting control.1/



The output signal of the controller is assigned with the  key, e.g. relay 1, relay 2, digital output 1, digital output 2, analog output 1 or analog output 2.

8.2.5 **Pulse frequency**

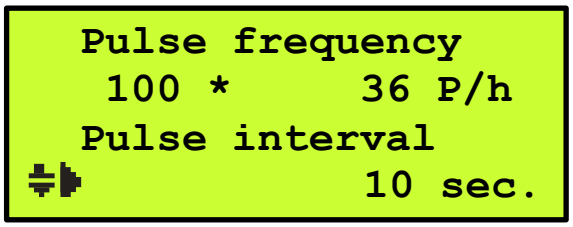
/Basic settings/Control param./Setting control.1/



The controller output is switched to pulse frequency via the pulse frequency setting. A setting of 0 p/h switches the controller to pulse interval controller. The numerical value, e.g. 36 p/h, means that 3600 pulses/hour are released at 100% dosing capacity.

8.2.6 **Pulse interval control**

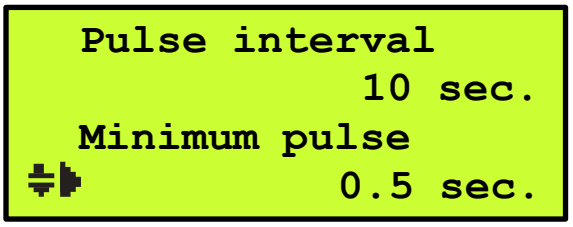
/Basic settings/Control param./Setting control.1/



With the setting of the pulse interval time, the total pulse interval time is determined. Given a controlled variable of 50%, this means pulse and interval time are of equal length if the value is set to 10 sec. In this case, it would be 5 seconds.
A controlled variable of 0% means that there is no pulse.
A controlled variable of 100% means that there is no interval.

8.2.7 **Minimum pulse**

/Basic settings/Control param./Setting control.1/

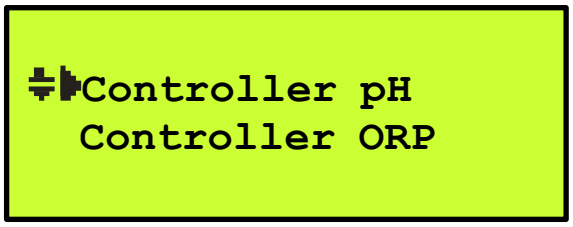


The setting “Minimum pulse” determines the smallest pulse width for a pulse interval controller. This is in particular important for larger actuators, as short pulses cannot be processed.
Note:
The minimum pulse time must not exceed 25% of the pulse interval time.

8.2.8 **Setting of control parameters**

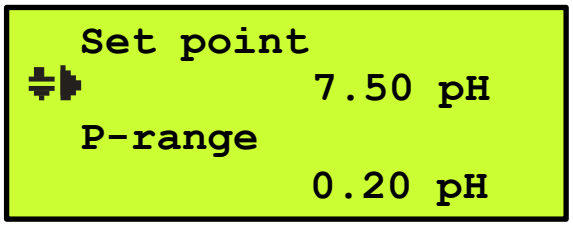
Select the function “Controller setting” in the main menu.

/Controller setting/



Use the  key to select the desired controller setting.

/Controller setting/Setting control.1/



The complete setting of the controller is described in the chapter “Controller settings".

8.2.9 **Calibration of probes**

Finally, the connected probes are to be calibrated according to the calibration instructions.

Please continue reading under section (7.2).

9 Maintenance and servicing

The housing may only be wiped with a damp cloth; the use of sharp, caustic or abrasive cleaning agents (acid cleaners, lyes, etc.) is not permitted!
The S200 measuring and control device is easy to maintain, but should be checked and serviced by a trained technician at regular intervals.
Please contact us if you have any further questions regarding our measuring, control and dosing system.

9.1 Cleaning and calibrating the probes

Depending on the water quality, the probes must be cleaned at intervals of 1 to 6 months (or earlier, if required). A recalibration is required depending on the type of probe.

Warning:
Deactivate the dosing function before removing the probes.

10 Alarm messages

10.1 List of error messages

Alarm message	Cause	Activity	Remedy
Slope of pH probe	pH measurement Slope of probe < 50mV	Controller function remains active, faulty calibration value is accepted	Recalibrate or replace the probe
Error zero point pH	pH measurement Zero point deviation > ±58mV	Controller function remains active, faulty calibration value is accepted	Recalibrate or replace the probe
Zero point error ORP	Redox measurement: Zero point deviation > ±58mV	Controller function remains active, faulty calibration value is accepted	Recalibrate or replace the probe
Limit value controller 1	Upper or lower limit value of controller 1 has been exceeded/fallen short of	Alarm relay switches	Check the measurement and control
Limit value controller 2	Upper or lower limit value of controller 2 has been exceeded/fallen short of	Alarm relay switches	Check the measurement and control
Limit value controller 3	Upper or lower limit value of controller 3 has been exceeded/fallen short of	Alarm relay switches	Check the measurement and control
Limit value controller 4	Upper or lower limit value of controller 4 has been exceeded/fallen short of	Alarm relay switches	Check the measurement and control
Dosing monitoring controller 1	Controller 1 has worked with 100% control value for a time exceeding the set dosing monitoring time.	Controller 1 is turned off, and the alarm relay switches	Check measurement and control; confirm the error message by briefly switching to the manual mode.
Dosing monitoring controller 2	Controller 2 has worked with 100% control value for a time exceeding the set dosing monitoring time.	Controller 2 is turned off, and the alarm relay switches	"
Dosing monitoring controller 3	Controller 3 has worked with 100% control value for a time exceeding the set dosing monitoring time..	Controller 3 is turned off, and the alarm relay switches	"
Dosing monitoring controller 4	Controller 4 has worked with 100% control value for a time exceeding the set dosing monitoring time.	Controller 4 is turned off, and the alarm relay switches	"
Switch-on delay	Switching the power supply of the S200 on	Switching on of the controller will be delayed by the adjustable delay time	
External controller stop	Digital input 1 terminal 21/22 is switched	The controller is stopped	If digital input 1 is not switched, the controller will work again
Error calibr. O2	An error occurred during the calibration of the digital oxygen sensor	Controller function remains active, faulty calibration value is accepted	Recalibrate or replace the probe
Error calibr. NTU	An error occurred during the calibration of the digital turbidity sensor	Controller function remains active, faulty calibration value is accepted	Recalibrate or replace the probe

11 MODBUS RTU

The S200 measuring and control device is equipped with a Modbus RTU interface.
The hardware is a RS 485 interface.
Shielding = terminal 97
A = + Terminal 96
B = - Terminal 95

11.1 Shielding

The use of shielded cables offers a high protection against electromagnetic interference, especially against high frequencies. However, the effectiveness of the shielding is dependent on a careful installation of the cable.
The shielding is placed near the ModBus master.

11.2 Communication parameters

Baud rate:	9600 bps
Data bits:	8
Start bits:	1
Stop bits:	1
Parity:	no

11.3 Used MODBUS functions

The following MODBUS functions are used:
• 04 (0x04) Read Input Registers – reading of max. 40 register
• 06 (0x06) Write Single Register – writing 1 register

11.4 List of MODBUS register S200

Register	Description	Unit	Value range	Position decimal point	R/W
0	Measuring value pH	pH	-200…1600	xx.xx	R
1	Measuring value ORP	mV	-1500...+1500	xxxx	R
2	Measuring POT - measurement	Mg/L	0... 500	xxx.x	R
3	Measuring value temperature	°C	-3000…14000	xxx.xx	R
4					
5	Measuring conductivity	µS mS	0... 2000	measuring range	R
6	Measuring value temperature conductivity sensor	°C	-3000... 14000	xxx.xx	R
7					
8					
9	Measuring flow measuring water	L/h	0 - 120	xxx	R
10	Measuring active chlorine	mg/L	0... 500	x.xx	R
11					
12					
...					
...					
37	Measuring temperature turbidity digital sensor	°C	-3000... 14000	xxx.xx	R
38	Measuring turbidity	NTU	0... 4000	measuring range	R
...					
41	Measuring temperature O2 digital sensor	°C	-3000... 14000	xxx.xx	R
...					
43	Measuring O2 digital sensor	%	0... 2000	xxx.xx	R

Note:
To read register 0 (measured value pH), the MODBUS register 30001 must be selected.
The MODBUS address is shifted by +1 at a time.

12 Sensor - Actuator Bus (MODBUS RTU)

The S200 measuring and control device is equipped with a sensor - actuator bus.
The MODBUS RTU protocol is used.
The hardware is a RS 485 interface.
Shielding = terminal 94
A = + terminal 93
B = - terminal 92
+12V = terminal 91
0V = terminal 90
A max. load of 200mA is allowed for the 12V power supply.

12.1 Shielding

The use of shielded cables offers a high protection against electromagnetic interference, especially against high frequencies. However, the effectiveness of the shielding is dependent on a careful installation of the cable.
The shielding is placed near the ModBus master.

12.2 Communication parameters

Baud rate:	9600 bps
Data bits:	8
Start bits:	1
Stop bits:	1
Parity:	no

13 Annex

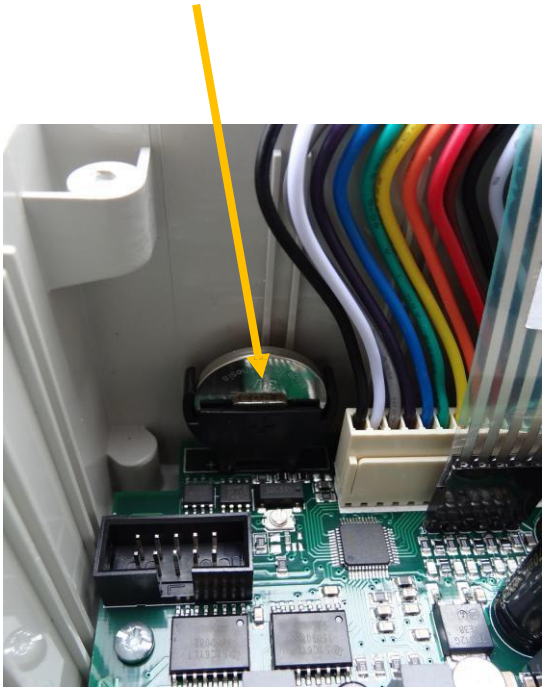
13.1 What to do in case of a power failure

In case of a power failure, the unit maintains the last operating state. Once the power is restored, the device continues to work with all previous settings.

13.2 Battery

The **S200** measuring and control device has a battery so that the internal clock keeps running if no voltage is connected. The battery must be replaced if, for example, the time or date changes suddenly (lithium CR 2032).

Fig. 13.2-1: View on board, housing cover open



13.3 Trouble shooting

Defects	Cause	Solution

14 Spare parts and wearing parts

14.1 Wearing parts

Item	Item number
Battery type CR 2032	

15 Electrical connection

15.1 Terminal marking

No.	Terminal	Function
L	L	Power input (see nameplate) *Warning*: The voltage specified on the nameplate must be observed.
N	N	
PE	PE	
PE	PE	Terminal block PE
PE	PE	
PE	PE	
PE	PE	
1	⊥	Measuring input 1, e.g. measurement pH
2	+	
4	⊥	Measuring input 2, e.g. measurement redox or 0/4-20 mA with internal jumper
5	+	
6	⊥	Connection temperature sensor Pt 100 or Pt 1000
7	+	
10		Connection extension module Please refer to the module description for details about the assignment.
11		
12		
13		
20	+ 12V	Digital input 1 - pulse input or switch input Contact closed = controller stop 21 22
21	⊓	
22	⊥	
23	+ 12V	Digital input 2 - pulse input or switch input 24 25
24	⊓	
25	⊥	
30	⊥	Analog output 1 0/4....20 mA (load 500Ω)
31	+	
32	⊥	Analog output 2 0/4....20 mA (load 500Ω)
33	+	
70		Digital output 1 max. 200mA / 30V e.g. for control of a diaphragm metering pump
71		
72		Digital output 2 max. 200mA / 30V e.g. for control of a diaphragm metering pump
73		

No.	Terminal	Function
80		Relay 1
81		
82		Relay 2
83		
84		Relay 3
85		
90	0V	Power supply for bus devices 12V DC 200mA Sensor - Actuator - Bus 2. RS 485 interface (ModBus RTU)
91	+ 12 V	
92	B	
93	A	
94		
95	B	1. RS 485 interface (ModBus RTU)
96	A	
97		