SMARTMAC 200 W Handbook

Operating and display unit
for SMARTPAT PH/ORP/COND sensors

Electronic Revision: ER 2.0.X_

The documentation is only complete when used in combination with the relevant documentation for the sensor.

KROHNE

IMPRINT

1.1 Software history

INFORMATION!
In the table below, "x" is a placeholder for possible multi-digit alphanumeric combinations, depending on the available version.

Changes and effect on compatibility

1	Downwards compatible changes and fault repair with no effect on operation (e.g. spelling mistakes on display)	
2-_	Downwards compatible hardware and/or software change of interfaces:	
	H	HART®
	P	PROFIBUS
	F	Foundation Fieldbus
	M	Modbus
	X	all interfaces
3-_	Downwards compatible hardware and/or software change of inputs and outputs:	
	I	Current output
	F, P	Frequency / pulse output
	S	Status output
	C	Control input
	CI	Current input
	X	all inputs and outputs
4	Downwards compatible changes with new functions	
5	Incompatible changes, i.e. electronic equipment must be changed.	

Release date	Electronic revision	Changes and compatibility	Documentation
2015-10-01	ER 1.0.X_	-	MA SMARTMAC 200 W R01
2016-05-25	ER 1.1.X	4	MA SMARTMAC 200 W R02
2017-09-04	ER 2.0.X_	5	MA SMARTMAC 200 W R03

1.2 Intended use

DANGER!
For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

CAUTION!
Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

WARNING!
If the device is not used according to the operating conditions (refer to chapter "Technical data"), the intended protection could be affected.

INFORMATION!
This device is a Group 1, Class A device as specified within CISPR11:2009. It is intended for use in industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.

INFORMATION!
The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

SMARTMAC 200 W is a loop-powered operating unit with display. The intended use of the SMARTMAC 200 W is to configure and calibrate the SMARTPAT PH, ORP or COND sensors in field.

1.3 Certifications

CE marking

The device meets the essential requirements of the EU directives. The CE marking indicates the conformity of the product with the union legislation applying to the product and providing for CE marking.

For full information of the EU directives and standards and the approved certifications, please refer to the EU declaration on the KROHNE website

Other approvals and standard

- NAMUR recommendation NE 21

1.4 Safety instructions from the manufacturer

1.4.1 Copyright and data protection

The contents of this document have been created with great care. Nevertheless, we provide no guarantee that the contents are correct, complete or up-to-date.

The contents and works in this document are subject to copyright. Contributions from third parties are identified as such. Reproduction, processing, dissemination and any type of use beyond what is permitted under copyright requires written authorisation from the respective author and/or the manufacturer.

The manufacturer tries always to observe the copyrights of others, and to draw on works created in-house or works in the public domain.

The collection of personal data (such as names, street addresses or e-mail addresses) in the manufacturer's documents is always on a voluntary basis whenever possible. Whenever feasible, it is always possible to make use of the offerings and services without providing any personal data.

We draw your attention to the fact that data transmission over the Internet (e.g. when communicating by e-mail) may involve gaps in security. It is not possible to protect such data completely against access by third parties.

We hereby expressly prohibit the use of the contact data published as part of our duty to publish an imprint for the purpose of sending us any advertising or informational materials that we have not expressly requested.

1.4.2 Disclaimer

The manufacturer will not be liable for any damage of any kind by using its product, including, but not limited to direct, indirect or incidental and consequential damages.

This disclaimer does not apply in case the manufacturer has acted on purpose or with gross negligence. In the event any applicable law does not allow such limitations on implied warranties or the exclusion of limitation of certain damages, you may, if such law applies to you, not be subject to some or all of the above disclaimer, exclusions or limitations.

Any product purchased from the manufacturer is warranted in accordance with the relevant product documentation and our Terms and Conditions of Sale.

The manufacturer reserves the right to alter the content of its documents, including this disclaimer in any way, at any time, for any reason, without prior notification, and will not be liable in any way for possible consequences of such changes.

1.4.3 Product liability and warranty

The operator shall bear responsibility for the suitability of the device for the specific purpose. The manufacturer accepts no liability for the consequences of misuse by the operator. Improper installation or operation of the devices (systems) will cause the warranty to be void. The respective "Standard Terms and Conditions" which form the basis for the sales contract shall also apply.

1.4.4 Information concerning the documentation

To prevent any injury to the user or damage to the device it is essential that you read the information in this document and observe applicable national standards, safety requirements and accident prevention regulations.

If this document is not in your native language and if you have any problems understanding the text, we advise you to contact your local office for assistance. The manufacturer can not accept responsibility for any damage or injury caused by misunderstanding of the information in this document.

This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device. Special considerations and precautions are also described in the document, which appear in the form of icons as shown below.

1.4.5 Warnings and symbols used

Safety warnings are indicated by the following symbols.

DANGER!
This warning refers to the immediate danger when working with electricity.

DANGER!
This warning refers to the immediate danger of burns caused by heat or hot surfaces.

DANGER!
This warning refers to the immediate danger when using this device in a hazardous atmosphere.

DANGER!
These warnings must be observed without fail. Even partial disregard of this warning can lead to serious health problems and even death. There is also the risk of seriously damaging the device or parts of the operator's plant.

WARNING!
Disregarding this safety warning, even if only in part, poses the risk of serious health problems. There is also the risk of damaging the device or parts of the operator's plant.

CAUTION!
Disregarding these instructions can result in damage to the device or to parts of the operator's plant.

INFORMATION!
These instructions contain important information for the handling of the device.

LEGAL NOTICE!
This note contains information on statutory directives and standards.

- HANDLING
  This symbol designates all instructions for actions to be carried out by the operator in the specified sequence.

➲ RESULT
This symbol refers to all important consequences of the previous actions.

1.5 Safety instructions for the operator

WARNING!
In general, devices from the manufacturer may only be installed, commissioned, operated and maintained by properly trained and authorized personnel.
This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device.

2.1 Scope of delivery

INFORMATION!
Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

INFORMATION!
Do a check of the packing list to make sure that you have all the elements given in the order.

INFORMATION!
Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

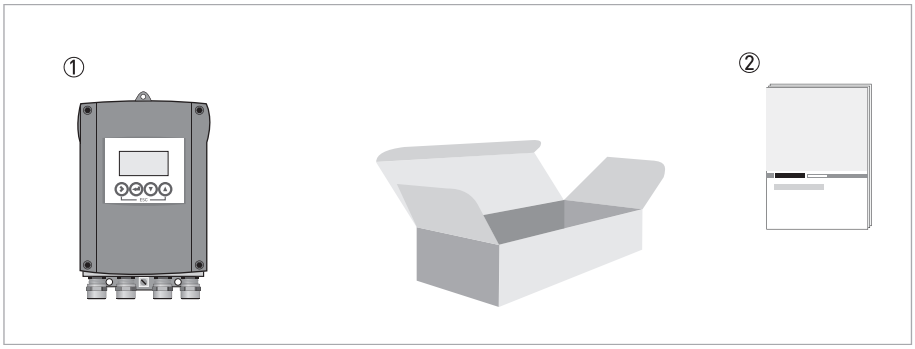

Figure 2-1: Standard scope of delivery

① Ordered device
② Documentation

2.2 Device description

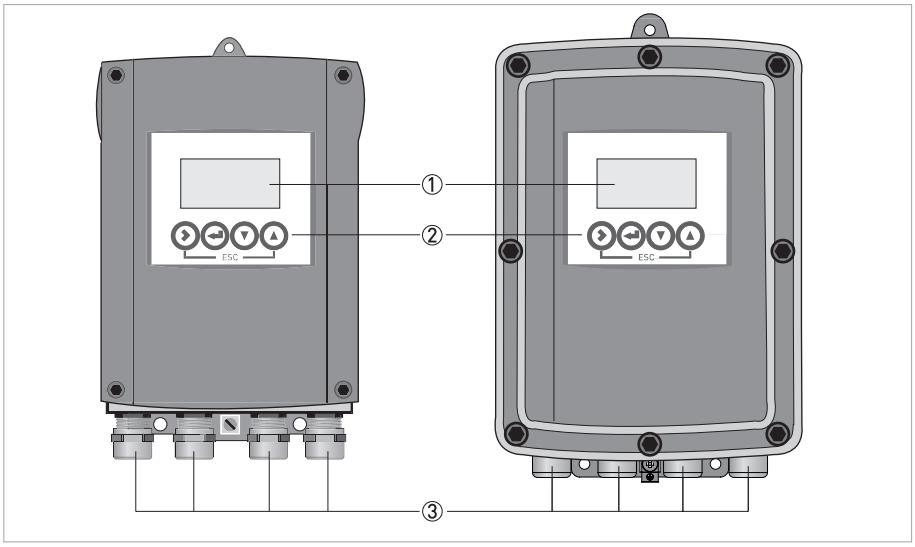

Figure 2-2: Device description (left - die-cast aluminium / right - stainless steel)

① Display
② Operation keys
③ Cable glands

2.3 Nameplate

INFORMATION!
Look at the device nameplate to ensure that the device is delivered according to your order.
Check for the correct supply voltage printed on the nameplate.

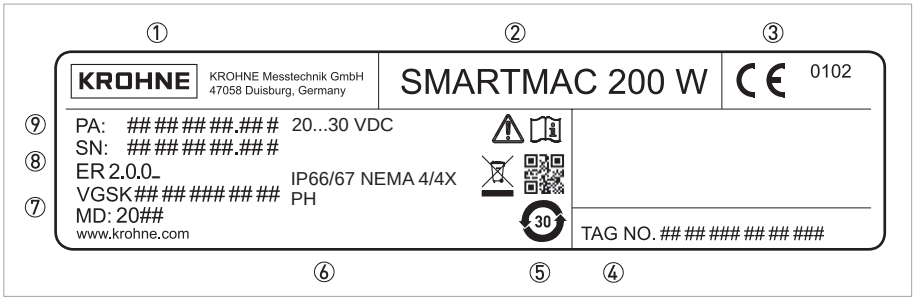

Figure 2-3: Example of a nameplate

① Manufacturer
② Device name
③ CE marking
④ TAG number
⑤ China RoHS,
Data matrix code (serial number),
Electronic / Electric device waste marking,
Observe the operation and installation instruction
⑥ Power supply data,
Ingress protection
Parameter of measuring unit
⑦ Order code,
Manufacturing date,
Internet address of manufacturer
⑧ Electronic revision,
Serial number
⑨ Production order

3.1 General notes on installation

DANGER!
All work on the electrical connections may only be carried out with the power disconnected.

DANGER!
Observe the national regulations for electrical installations!

WARNING!
During installation of the device make sure that you use ESD (electrostatic discharge) protection equipment.

WARNING!
Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

INFORMATION!
Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

INFORMATION!
Do a check of the packing list to make sure that you have all the elements given in the order.

INFORMATION!
Look at the device nameplate to ensure that the device is delivered according to your order.

INFORMATION!
The manufacturer delivers the device preconfigured and ready for operation with the sensor specified in the customer's order. Though due to the physics of the measurement, the operator has to perform an onsite calibration or an adjustment to the relevant sensor and to the environmental conditions at the initial start-up. For more details refer to the manual of the relevant sensor!

3.2 Storage and transport

CAUTION!
Do not make any mechanical modifications to the device. This can result in the loss of proper functionality, as well as the rights under the device warranty.

- *Store and transport the device in a dry, dust-free environment.*
- *Store and transport the device in an environment with a temperature between -40...+70° C / -40...+158° F.*
- *The original packing is designed to protect the equipment. It has to be used if the device is transported or sent back to the manufacturer to prevent damage of the device.*

3.3 Point-to-Point connection - analogue / digital mode

Point-to-Point connection between the sensor and the HART® Master.

The current output of the sensor is passive.

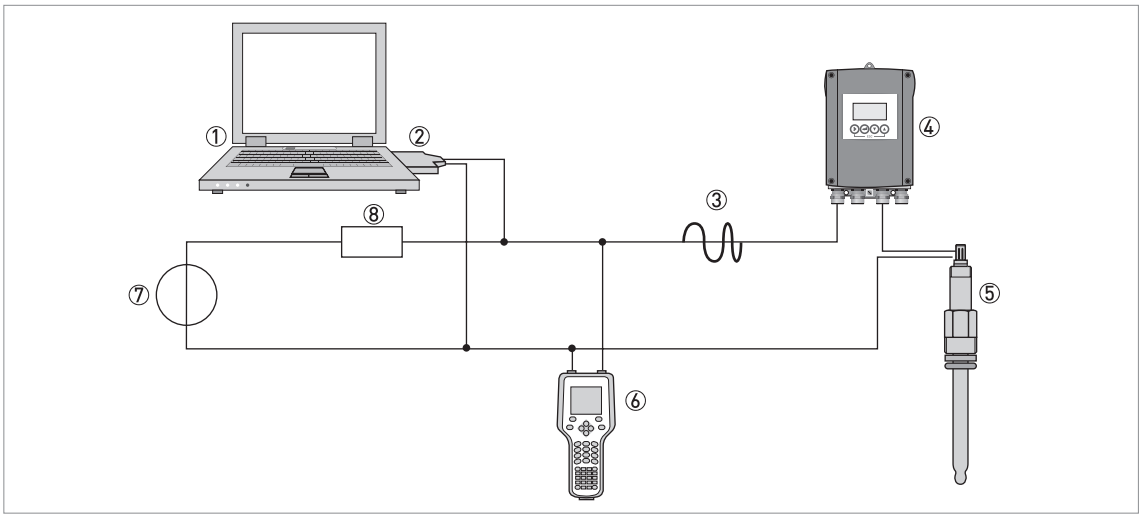

Figure 3-1: Point- to-Point connection (only one primary and one secondary master can communicate with the slave simultaniously)

① Primary master with e.g. PACTware™ FDT/DTM
② FSK modem
③ HART® signal
④ SMARTMAC 200 W
⑤ SMARTPAT Sensor
⑥ Secondary master with HART® DD
⑦ Power supply for devices (slaves) with passive current output
⑧ Load ≥ 250 Ω (Ohm)

3.4 Pre-installation requirements

CAUTION!
Always note the following items to ensure a proper and safe installation:

- *Make sure that there is adequate space to the sides.*
- *Protect the device from direct sunlight.*
- *The device installed in control cabinets require adequate cooling, e.g. by fan or heat exchanger.*
- *Do not expose the device to intense vibration.*
- *Use assembly materials and tools in compliance with the applicable occupational health and safety directives (assembly materials and tools are not part of the scope of delivery).*
- *Do not make any mechanical modifications to the device. This can result in the loss of proper functionality, as well as the rights under the device warranty.*
- *The device must not be heated by radiated heat (e.g. exposure to the sun) to a electronics housing surface temperature above the maximum permissible ambient temperature. If it is necessary to prevent damage from heat sources, a heat protection (e.g. sun shade) has to be installed.*

CAUTION!
The device must be suitable for the temperature specified (including chemical resistance).

INFORMATION!
Assembly materials and tools are not part of the delivery. Use the assembly materials and tools in compliance with the applicable occupational health and safety directives.

For further information refer to *Mounting plate die-cast aluminium* on page 69.

INFORMATION!
Only sensors with software (SW) version > 1.0.3 can be operated with the SMARTMAC 200 W. Please check the SW version of the sensor.

3.5 Wall mounting

DANGER!
Never install or operate the device in potentially explosive areas, it might cause an explosion that can result in fatal injuries.

CAUTION!
Always note the following items to ensure a proper and safe installation:

- *Make sure that there is adequate space to the sides.*
- *The device must not be heated by radiated heat (e.g. exposure to the sun) to a electronics housing surface temperature above the maximum permissible ambient temperature. If it is necessary to prevent damage from heat sources, a heat protection (e.g. sun shade) has to be installed.*
- *Signal converters installed in control cabinets require adequate cooling, e.g. by fan or heat exchanger.*
- *Do not expose the signal converter to intense vibration.*
- *Use assembly materials and tools in compliance with the applicable occupational health and safety directives (assembly materials and tools are not part of the scope of delivery).*

CAUTION!
Installation, assembly, start-up and maintenance may only be performed by appropriately trained personnel. The regional occupational health and safety directives must always be observed.

The mounting plate is fixed at the back side of the device in the delivery condition. The following drawings illustrate the proper mounting:

INFORMATION!
A mounting system with a minimum load force of 0.1 kN (for example FISCHER type UX10) suitable for the background has to be applied.

Wall mounting with plugs

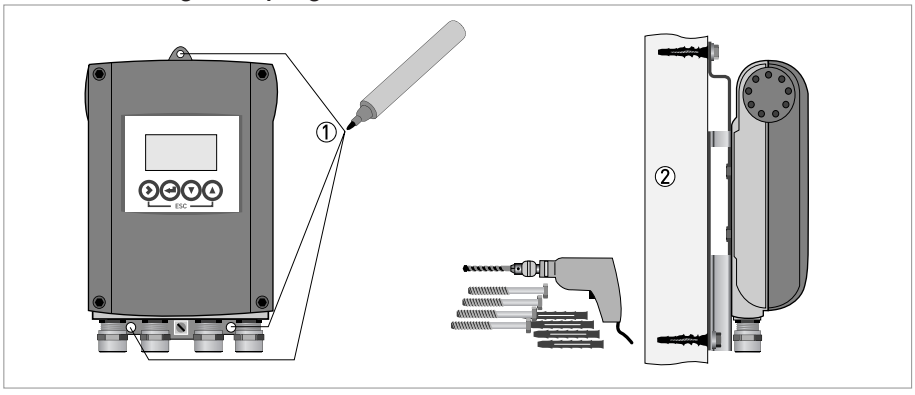

Figure 3-2: Mounting procedure to walls

- Note the drawing above and mark all drill holes with the help of a pen, e.g. a felt pen ①.
- Fasten the device securely to the wall with the help of drilling machine, plugs, screws and the mounting plate ②.

Wall mounting of multiple devices (Die-cast aluminium)

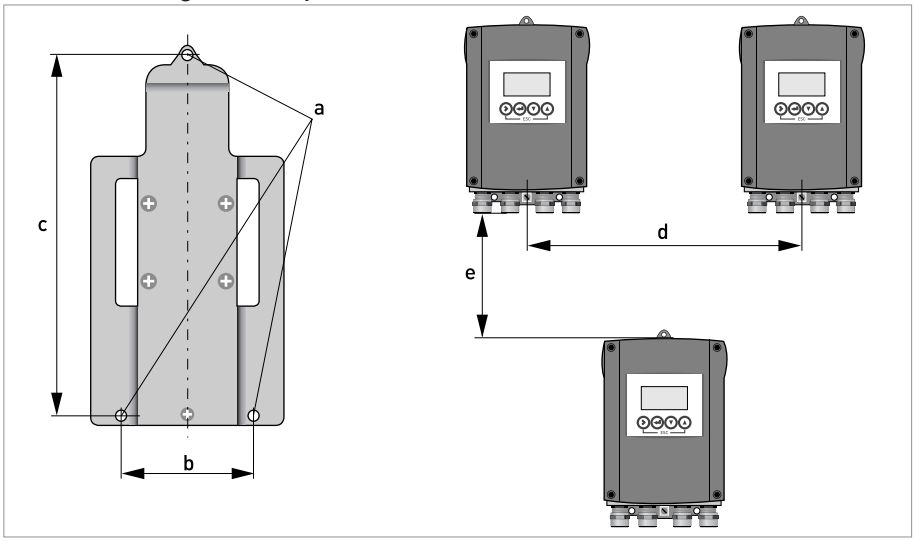

Figure 3-3: Dimensions and distances

	[mm]	["]
a	Ø6.5	Ø0.26
b	87.2	3.4
c	241	9.5
d	310	12.2
e	257	10.1

Wall mounting of multiple devices (Stainless steel)

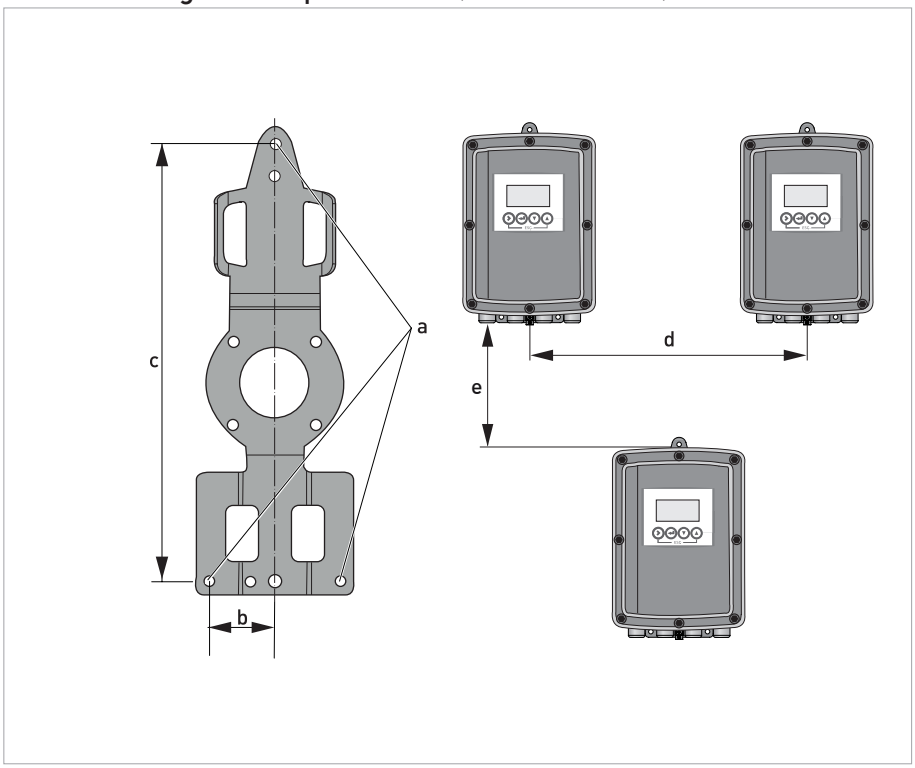

Figure 3-4: Dimensions and distances

	[mm]	[inch]
a	Ø6.5	Ø0.26
b	40	1.6
c	268	10.5
d	336	13.2
e	257	10.1

4.1 Safety instructions

DANGER!
All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

DANGER!
Observe the national regulations for electrical installations!

WARNING!
Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

INFORMATION!
Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

4.2 Important device-specific notes on electrical connection

DANGER!
For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

DANGER!
The housing must be grounded with low impedance. Please use the ground connection on the housing between the cable glands for low impedance grounding. Please consider the information mentioned in this documentation as well as the supplementary instruction of the SMARTPAT sensor.

INFORMATION!
The SMARTMAC 200 W is a loop powered device and has no function if no sensor is connected.

INFORMATION!
Use only shielded cables for connection with the control system (e.g. PLC).

4.3 Opening and closing the converter housing

INFORMATION!
Clean and grease all threads each time you open the housing. Use only resin-free and acid-free grease. Before closing the cover, ensure that the housing gasket is properly fitted, clean and undamaged.

4.3.1 Die-cast aluminium housing

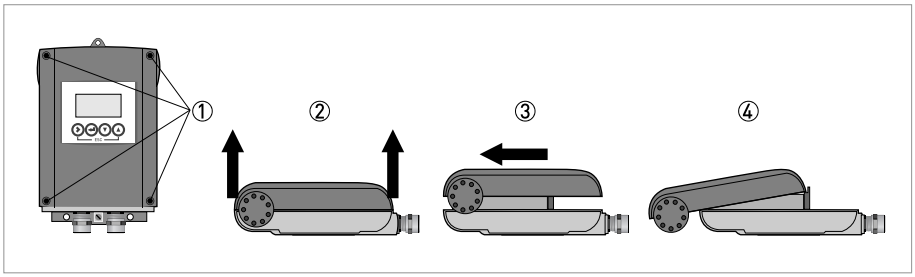

Figure 4-1: Opening the converter housing

- Loose the 4 screws ① with a crosstip screwdriver.
- Lift the housing at the top and bottom at the same time ②.
- Slide the housing cover backward ③.

➲ The housing cover is guided and held by the inside hinge; you have access to the terminal compartment now ④.

After completion of work close the converter housing.

4.3.2 Stainless steel converter housing

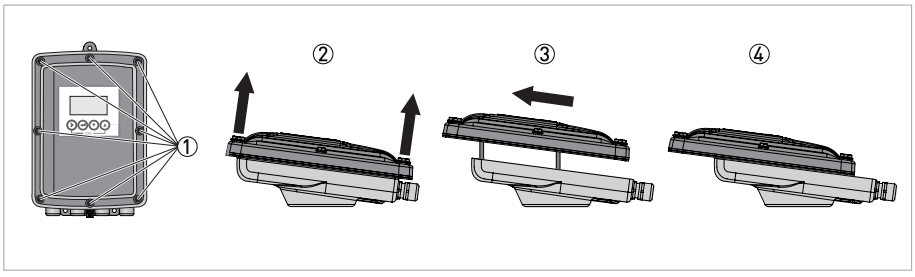

Figure 4-2: Opening the converter housing

- Loose the 8 hexagon screws ① with a 10 mm spanner socket.
- Lift the housing at the top and bottom at the same time ②.
- Slide the housing cover backward ③.

➲ The housing cover is guided and held by the inside hinge; you have access to the terminal compartment now ④.

After completion of work close the converter housing. To achieve a proper sealing of the device please tighten the screws in the following order with a torque of 5 Nm.

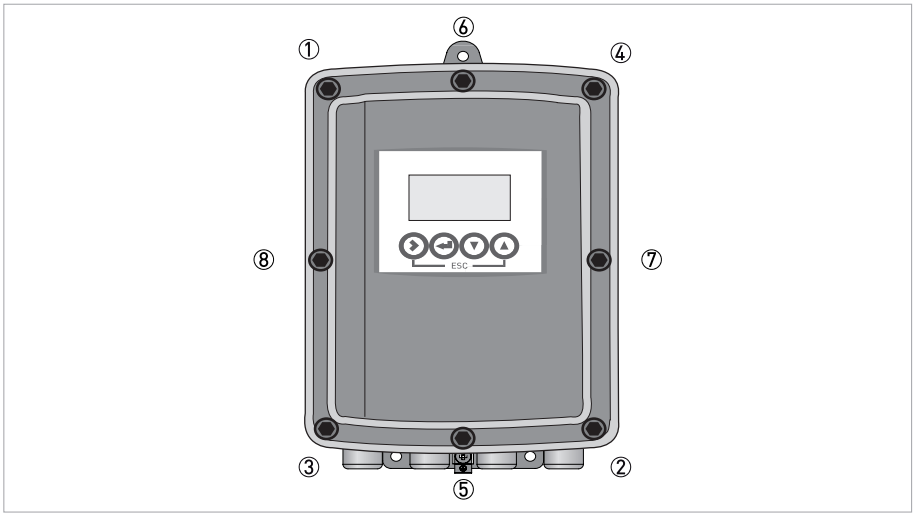

Figure 4-3: Tighten the screws

4.4 Connection assignment

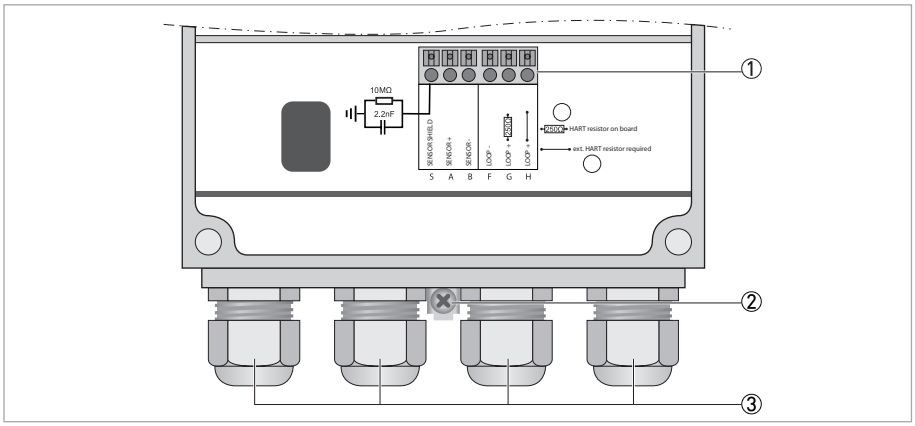

Figure 4-4: Connection assignment

① Connection terminal
② Functional earth
③ Cable glands

4.5 Connecting the sensor cable

DANGER!
All work on the electrical connections may only be carried out with the power disconnected.

INFORMATION!
The cable glands installed by the manufacturer are designed for a cable diameter of 8 mm...13 mm / 0.31"...0.51". If you are using cables with a larger diameter, you must replace the manufacturer's cable glands with suitable ones. The operator is responsible for the correct sealing of cable glands.

Cable VP2-S

Transparent-black (inner coax shield)	Ub+
White	Ub-
Shield	S

4.6 Connection diagram overview

Connection with sensor and control system

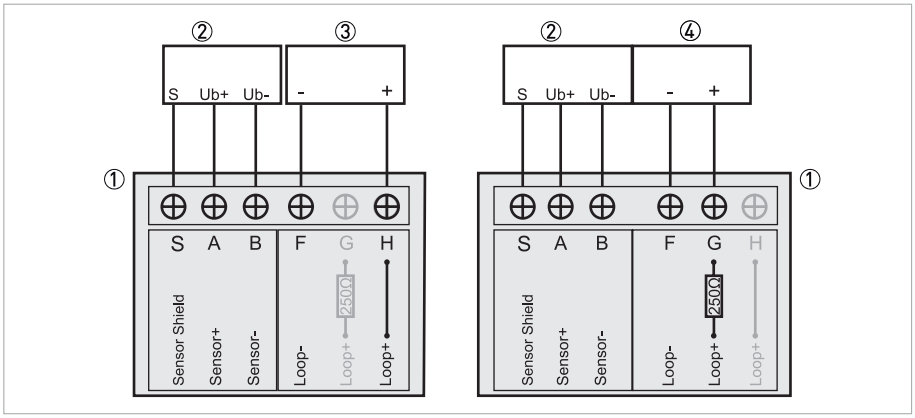

Figure 4-5: SMARTMAC 200 W connection to a control system with internal 250 Ω resistor (left side). SMARTMAC 200 W connection to a control system without internal 250 Ω resistor (right side).

① SMARTMAC 200 W
② Sensor with VP2-S cable
③ Control system with internal 250 Ω resistor
④ Control system without internal 250 Ω resistor

SMARTMAC 200 W without internal resistor R		SMARTMAC 200 W with internal resistor R	
S	Shield	S	Shield
A	Sensor +	A	Sensor +
B	Sensor -	B	Sensor -
F	Loop -	F	Loop -
H	Loop +	G	Loop + [250Ω]

Connection of SMARTMAC 200 W with a loop powered device via the optional SJB 200 W-Ex junction box to a SMARTPAT sensor

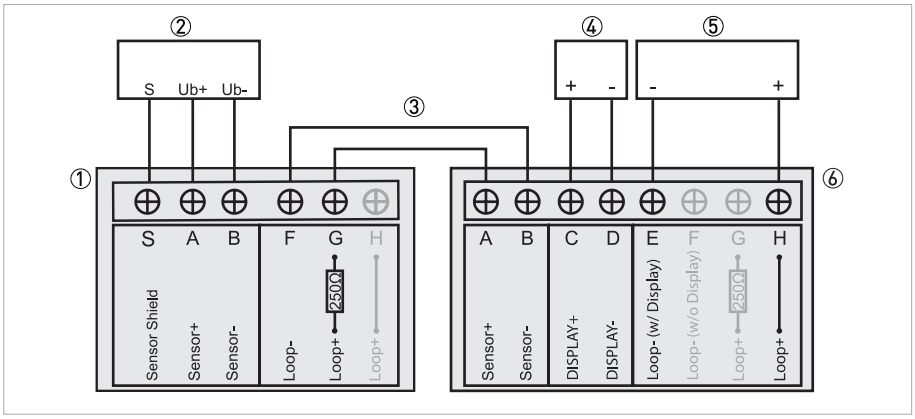

Figure 4-6: Example of connecting the SMARTMAC 200 W to a control system without internal 250 Ω resistor and one additional loop powered device

① SMARTMAC 200 W
② Sensor with VP2-S cable
③ Cable connection between SJB 200 W-Ex and SMARTMAC 200 W
④ Display or other 4...20 mA loop powered device (e.g. data logger)
⑤ Control system without internal 250 Ω resistor
⑥ SJB 200 W-Ex junction box

SMARTMAC 200 W without internal resistor R		SJB 200 W-Ex junction box with internal resistor R	
S	Shield	S	Shield
A	Sensor +	A	Sensor +
B	Sensor -	B	Sensor -
		C	Display +
		D	Display-
F	Loop -	E	Loop w/ Display
G	Loop + [250Ω]	H	Loop +

INFORMATION!
The SJB 200 W-Ex offers the opportunity to access the sensor via HART® hand held. Please consider the information mentioned in the documentation of the SJB 200 W-Ex.

4.7 Power supply

DANGER!
To avoid fatal injuries as well as destruction or damage of the device assure a correct installation before switching on the power. This includes:

- *The device is mechanically safe, mounting and power connection comply with the regulations.*
- *The electrical terminal compartments must be secured, i.e. the housing has to be closed and the screws have to be tightened.*
- *The electrical operating data of the power supply comply with the requirements of the device.*

CAUTION!
When connecting the power supply, always note the safety regulations of the current state of the art. To avoid fatal injuries, destruction or damage of the device or measuring errors, also note the following items:

- *Cables may only be connected when the power is switched off.*
- *Always keep the housing of the device well closed if you do not perform any installation works. The function of the housing is to protect the electronic equipment from dust and moisture.*
- *Check the nameplate and assure that the power supply meets the voltage of the device. The device is loop powered and operates in the range of 20...30 VDC with a voltage drop < 4 VA. If the power supply is below 20 VDC the device and sensor will not work. If the power supply is above 30 VDC the device and sensor may be damaged/destroyed.*

CAUTION!
Do not use the integrate 250 Ohm HART® resistor of the SMARTMAC 200 W, when using an Ex isolation amplifiers of third-party with integrated 250 Ohm HART® resistor.

WARNING!
Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

The device and the sensor requires a minimum operating voltage of 20 VDC. The power supply is provided via the 2-wire interface (4...20 mA).

- Switch on the power

➲ The device performs a self test; afterwards it begins to measure immediately if a sensor is connected and the display shows the current value(s).

During initialisation of the device and the sensor the manufacturer logo appears. The logo disappears after a few seconds once the initialisation is completed. Afterwards, the measured value appears.

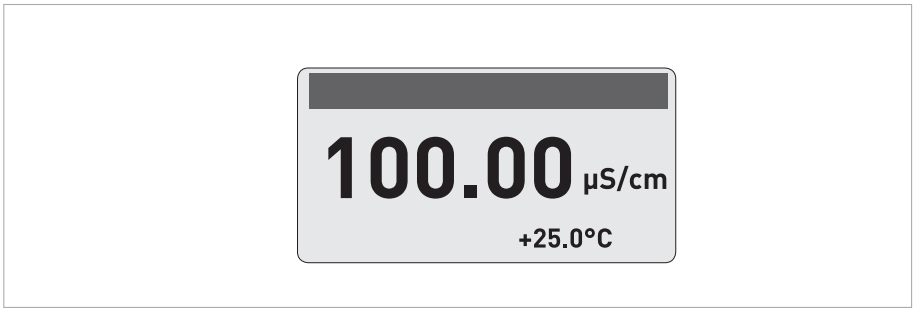

Figure 4-7: Measuring mode for conductive conductivity (for example)

The previous drawing shows the measured value of sensor in the upper line and the temperature reading in the lower line.

5.1 Operating elements

The operation elements consist of the four operation keys:

Operating key	Symbol in text
	>
	↵
	↑
	↓

The function of a key depends on the mode of the device and on the menu level:

Key	Measuring mode	Menu mode		
		Menu mode	Sub-menu or function mode	Parameter and data level
>	Switch from measuring mode to menu mode; press key for 1.5 seconds (menu "Sensor" is displayed)	Access to main menu	Access to sub-menu	For numerical values: move cursor one position to the right
↵	Reset of the display	Return to measuring mode (prompt appears whether the data should be saved)	Press 1 to 3 times, return to menu mode, data saved	Return to sub-menu or function, data saved
↑ or ↓	-	Select menu	Select sub-menu or function	Use highlighted cursor to change number, unit, property
Esc: > + ↑	-	-	Return to main menu, data not saved	Return to next sub-menu or function, data not saved

INFORMATION!
Always push the keys at right angles to the front. Touching them from the side can cause incorrect operation!

5.2 Measuring mode

The measuring mode is mentioned on the first measuring pages. The second measuring page lists the sensor errors. Use ↑ or ↓ to scroll. For further information refer to *Error page pH* on page 27 or refer to *Error page ORP* on page 28 or refer to *Error page conductive conductivity* on page 29

After switching on the power, the display always shows the measuring page.

The NE 107 signs of the sensor "Maintenance required", "Out of specification" and "Check function" appears on the display on the top left in case of errors.

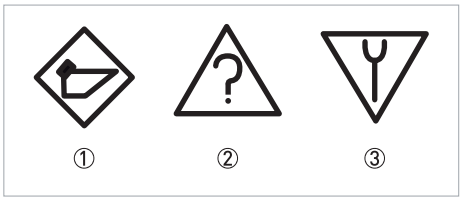

Figure 5-1: NE 107 signs

① Maintenance required
② Out of specification
③ Check function

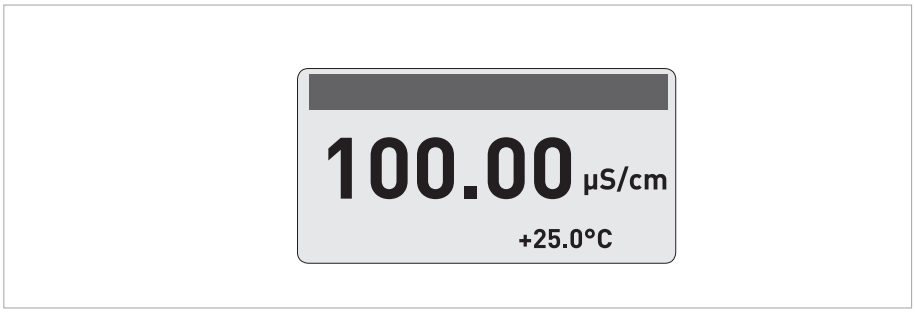

Figure 5-2: Measuring mode conductivity sensor

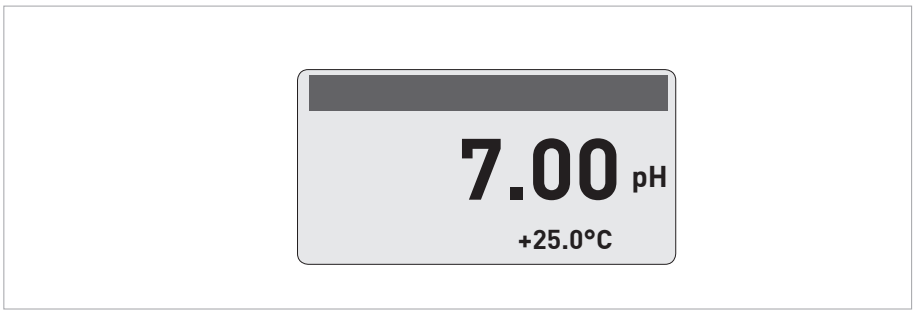

Figure 5-3: Measuring mode pH sensor

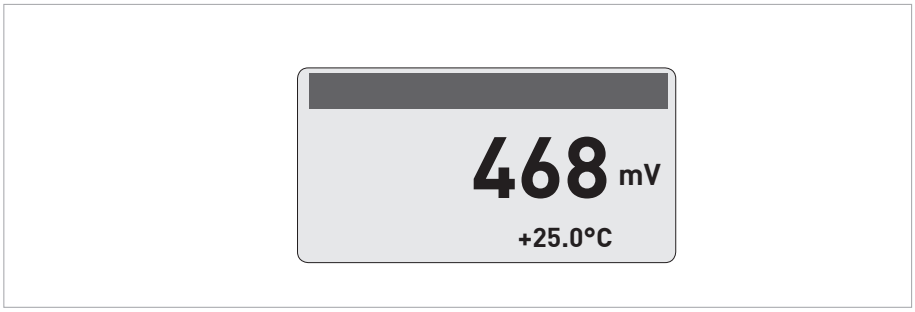

Figure 5-4: Measuring mode ORP sensor

5.2.1 Error page pH

The second measuring page lists the currently existing sensor errors. Use ↑ or ↓ to scroll.

Measurements out of specification

Message	Description	Action
S01	pH value > pH max pH value out of range	Check if the sensor tip is in contact with the medium. Measurements in air lead to not plausible results. Consider the measuring range limits, otherwise select a suitable sensor for the process conditions of the application.
S02	pH value < pH min pH value out of range	
S03	Temp. value > Temp max Temperature value out of range	
S04	Temp. value < Temp min Temperature value out of range	

Maintenance

Message	Description	Action
M01	Slope < -65 mV/pH	Recalibrate the sensor.
M02	Slope > -50 mV/pH	
M03	Offset < -99 mV	
M04	Offset > +99 mV	
M05	Maintenance interval expired	

5.2.2 Error page ORP

The second measuring page lists the currently existing sensor errors. Use ↑ or ↓ to scroll.

Measurements out of specification

Message	Description	Action
S01	ORP value > ORP max ORP value out of range	Check if the sensor tip is in contact with the medium. Measurements in air lead to not plausible results. Consider the measuring range limits, otherwise select a suitable sensor for the process conditions of the application.
S02	ORP value < ORP min ORP value out of range	
S03	Temp. value > Temp max Temperature value out of range	
S04	Temp. value < Temp min Temperature value out of range	

Maintenance

Message	Description	Action
M01	Offset < -99 mV	Recalibrate the sensor.
M02	Offset > +99 mV	
M03	Maintenance interval expired	

5.2.3 Error page conductive conductivity

The second measuring page lists the currently existing sensor errors. Use ↑ or ↓ to scroll.

Measurements out of specification

Message	Description	Action
S01	Cond. > Max. cond. Conductive value out of range	Check if the sensor tip is in contact with the medium. Measurements in air lead to not plausible results. Consider the measuring range limits, otherwise select a suitable sensor for the process conditions of the application.
S02	Cond. < Min. cond. Conductive value out of range	
S03	Res. > Max. res. Resistivity value out of range	
S04	Res. < Min. res. Resistivity value out of range	
S05	T > Temp. Max. Temperature value out of range	
S06	T < Temp. Min. Temperature value out of range	

Maintenance

Message	Description	Action
M01	Data out of range Failure in calibration; cell constant deviation	Recalibrate the sensor.
M02	Maint. interval Maintenance interval expired	

5.3 Menu mode

The menu mode consists of main menus with different sub-levels:

- Main menu level
- First and second sub-menu level
- Parameter level

5.4 Menu mode structure pH

INFORMATION!
The following table just presents an overview. When programming the device, always consult the function tables additionally as they contain further information!

Main menu		Submenu		Parameter	
> 1.5 s ↵	S Sensor	> ↵	S1 Quick setup	> ↵	S1.1 TAG S1.2 Manual Hold? S1.3 I/O S1.4 pH calibration S1.5 Autoclaving counter
			S2 Logbooks		S2.1 Calibration logbook S2.2 Error logbook
			S3 Setup		S3.1 Process input S3.2 I/O S3.3 I/O HART S3.4 Information S3.5 Commissioning
			S4 Service		S4.1 Calibration S4.2 Parameter S4.3 Sensor Lock
	↓↑		↓↑		↓↑
> 1.5 s ↵	R Replace sensor	> ↵	R1 Load from sensor	> ↵	
			R2 Write from sensor		
	↓↑		↓↑		
> 1.5 s ↵	D Device	> ↵	D1 Setup	> ↵	D1.1 Language D1.2 HART master D1.3 Set clock D1.4 Contrast D1.5 Information
			D2 Service		D2.1 Password D2.2 Reset display
	↓↑		↓↑		

5.4.1 Function table pH measurement

CAUTION!
All data change in SMARTMAC 200 W will be directly saved in SMARTPAT 200 W sensor. If the sensor has to be changed please use the menu "R replace sensor" to copy sensor data.

S Sensor	Press > to access the sub-menu and ↑ or ↓ to scroll. Press ↵ to leave the sub menu.
S1 Quick setup	Press > to access the function table and ↑ or ↓ to scroll. Press ↵ to leave the function table.
S1.1 TAG	TAG Press > to access the function and ↑ or ↓ to enter the TAG. Press > to move the cursor one position to the right. Press ↵ to confirm and proceed.
S1.2 Manual Hold?	Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes". Select "Yes" to activate the function "Manual hold?" to avoid an alarm. Press ↵ to confirm and to proceed. Select "No" to deactivate the function "Manual hold?" Press ↵ to confirm and to proceed.
S1.3 I/O	S1.3.1 Meas. Range Press > to access the function ↑ or ↓ to enter the pH measuring range. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	S.1.3.2 Time constant Press > to access the function and ↑ or ↓ to set and display time constant for 4...20 mA; update rate 1…60 seconds. Default setting: 1 second Press ↵ to confirm and to proceed.
S1.4 pH calibration	For more information refer to *pH calibration* on page 37.
S1.5 Autoclaving counter	Raise autoclav. Counter Press > to access the function and ↑ or ↓ to select between "No" and "Yes". Press ↵ to confirm and to proceed.
S2 Logbooks	Press > to access the function and ↑ or ↓ to scroll. Press ↵ to leave the function table.
S2.1 Calibration logbook	Display sensor calibration data Press > to access the function and ↑ or ↓ to scroll (read only). Press ↵ to leave.
S2.2 Error logbook	Display of sensor error Press > to access the function and ↑ or ↓ to scroll. For more information refer to *Error page pH* on page 27. Press ↵ to leave.

S3 Setup	Press > to access the function and ↑ or ↓ to scroll. Press ↵ to leave the function table.
S3.1 Process input	S3.1.1 Temperature Press > to access the function and ↑ or ↓ to scroll. Press ↵ to leave the function table.
	S3.1.1.1 Units Press > to access the function and ↑ or ↓ to select between "°C" or "°F". Default Setting: °C Press ↵ to confirm and to proceed.
	S3.1.1.2 Correction Press > to access the function and ↑ or ↓ to adjust the temperature value. Press > to move the cursor one position to the right. Press ↵ and on the screen the following message appears: "YYYY-MM-DD" "Set clock" "2000-01-01 00:00" (for example) Press > to access the function "Set clock" and ↑ or ↓ to enter the data. Press > to move the cursor one position to the right. "YYYY-MM-DD HH:MM" Press ↵ to confirm and to proceed or press ESC to abroad.
	S3.1.1.3 Temperature comp. Press > to access the function and ↑ or ↓ to select between "Automatic" and "Manual". Default setting: Automatic Press ↵ to confirm and to proceed. If you select "Manual" enter the temperature value ("Temp. value") of the medium. Press > to access the function "Temp. value" and ↑ or ↓ to adjust the value. Press > to move the cursor one position to the right. Default setting: 25°C / 77°F Press ↵ to confirm and to proceed or press ESC to abroad.
	S3.1.2 pH calibration For more information refer to *pH calibration* on page 37.
	S3.1.3 Maint. interval Press > to access the function and ↑ or ↓ to set and display maintenance interval in days (0...999). Press > to move the cursor one position to the right. Default setting: 0 Press ↵ to confirm and to proceed.
	S3.1.4 Reset maintenance Press > to access the function and ↑ or ↓ to select between "No" and "Yes". Default setting: No Press ↵ to confirm and to proceed.
S3.2 I/O	S3.2.1 Meas. Range Press > to access the function and ↑ or ↓ to enter the pH measuring range. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	S3.2.2 Time constant Press > to access the function and ↑ or ↓ to set and display time constant for 4...20 mA; update range: 1...60 seconds. Press > to move the cursor one position to the right. Default setting: 1 second Press ↵ to confirm and to proceed.

S3.3 I/O HART	S3.3.1 HART function Press > to access the function and ↑ or ↓ to select between "HART on" to activate the HART function and "HART off" to deactivate the HART function. Default setting: HART on Press ↵ to confirm and to proceed.
	S3.3.2 TAG Press > to access the function and ↑ or ↓ to enter the TAG. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	S3.3.3 Long TAG Press > to access the function and ↑ or ↓ to set and display the Long TAG. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	S3.3.4 Previous Long TAG (read only) Press ↵ to leave.
	S3.3.5 Polling address Press > to access the function and ↑ or ↓ to set and display the polling address. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	S3.3.6 Device variables (read only) PV: pH value SV: mV value TV: Temperature value (°C / °F) Press ↵ to leave.

S3.4 Information (read only)	S3.4.1 Sensor info Press > to access the function and ↑ or ↓ to scroll. Press ↵ to leave.
	S3.4.1.1 Order code
	S3.4.1.2 Device name
	S3.4.1.3 Device serial no.
	S3.4.1.4 HART ID
	S3.4.1.5 Polling address
	S3.4.1.6 Manufacturer ID
	S3.4.1.7 Date of manufacturing
	S3.4.1.8 SW version
	S3.4.1.9 HW version
	S3.4.2 Calibration Press > to access the function and ↑ or ↓ to scroll. Press ↵ to leave.
	S3.4.2.1 Slope
	S3.4.2.2 Offset
	S3.4.2.3 SIP counter
	S3.4.2.4 CIP counter
	S3.4.2.5 Autoclaving counter
	S3.4.3 Operating parameter Press > to access the function and ↑ or ↓ to scroll. Press ↵ to leave.
	S3.4.3.1 Commissioning
	S3.4.3.2 Operating hours
	S3.4.3.3 Time > +80°C/176°F (hh:mm)
	S3.4.3.4 Time > +110°C/230°F (hh:mm)
	S3.4.3.5 Time < -300 mV (hh:mm)
	S3.4.3.6 Time > +300 mV (hh:mm)
	S3.4.3.7 Max. temperature (°C / °F)
S3.5 Commissioning	Press > to access the function and ↑ or ↓ to enter the date of commissioning. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
S4 Service	Press > to access the function table and ↑ or ↓ to scroll. Press ↵ to leave the function table.
S4.1 Calibration	S4.1.1 4 mA trimming Press > to access the function and ↑ or ↓ to select between "Decrease" and "Increase" for trimming. Press ↵ to confirm and to proceed.
	S4.1.2 20 mA trimming Press > to access the function and ↑ or ↓ to select between "Decrease" and "Increase" for trimming. Press ↵ to confirm and to proceed.

S4.2 Parameter	S4.2.1 Reset sensor Press > to access the function and ↑ or ↓ to select between "No" and "Yes". If you select and confirm "Yes", the sensor will be rebooted. Default setting: No Press ↵ to confirm and to proceed.
	S4.2.2 Factory setting Press > to access the function and ↑ or ↓ to select between "No" and "Yes". Factory settings will be loaded If you select and confirm "Yes" the factory settings will be loaded. The following settings will be reset to default: temperature unit, measurend (PV), I/O, calibration interval, 4...20 mA trimming, TAG and Long TAG. Polling address will be set to 0 and the loop current will be enabled. Press ↵ to confirm and to proceed.
S4.3 Sensor Lock	Press > to access the function and ↑ or ↓ to select between "No" and "Yes". Select "No" and press ↵ to leave the function. **Warning!** If you select and confirm "Yes", the sensor is locked and the HART communication is not possible anymore. The setting is not reversible anymore! Press ↵ to confirm and to proceed.
R Replace sensor	Press > to access the function table and ↑ or ↓ to scroll. Press ↵ to leave the function table.
R1 Load from sensor	Press > to start loading the sensor settings form the sensor to the device.
R2 Write to sensor	Press > to start writing the sensor settings form the device to the new sensor.

D Device	Press > to access the function table and ↑ or ↓ to scroll. Press ↵ to leave the function table.
D1 Setup	D1.1 Language Press > to access the function and ↑ or ↓ to select the language. Press ↑ or ↓ to select between "English", "German", "French", "Italian" and "Spanish". Press ↵ to confirm and to proceed.
	D1.2 HART master Press > to access the function and ↑ or ↓ to select between "Primary Master" and "Secondary Master". Press ↵ to confirm and to proceed.
	D1.3 Set clock Press > to access the function and ↑ or ↓ to set the date and clock of the device. Press ↵ to confirm and to proceed.
	D1.4 Contrast Press > to access the function and ↑ or ↓ to select the contrast of the display. Press ↵ to confirm and to proceed.
	D1.5 Information (read only). Press > to access the function and ↑ or ↓ to scroll. Press ↵ to confirm and to proceed.
	D1.5.1 Serial number of the device (read only).
	D1.5.2 SW revision of the device Press > to access (read only). Press ↵ to leave.
	D1.5.3 HW revision of the device Press > to access (read only). Press ↵ to leave.
D2 Service	D2.1 Password Press > to access the function and ↑ or ↓ to select between "off" and "on". Default setting: off Press ↵ to confirm and to proceed. If you select on, on the display the following appears.
	D2.1.1 Password? on Press ↑ or ↓ to select between "on" and "off"
	D2.1.2 Operator PW Press > to access the function and ↑ or ↓ to enter the password Press ↵ to confirm and to proceed.
	D2.1.3 Administrator PW Press > to access the function and ↑ or ↓ to enter the password. Press ↵ to confirm and to proceed.
	D2.2 Reset Display Press > to access the function and ↑ or ↓ to select between "No" and "Yes". Default setting: No Press ↵ to confirm and to proceed.

5.4.2 pH calibration

INFORMATION!
For sensor handling during calibration please consider the standard documentation of the sensor!

Step 1: Start configuration for calibration

- Start the function "pH calibration" in menu mode "S1 Quick Setup" (submenu S1.4) or "S3 Setup" (submenu S3.1.2).
- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "Yes" to activate the function "Manual hold?" to avoid an alarm.
- Press ↵ to confirm and to proceed.
- On the screen the following message appears:
  "Temperature comp. Automatic"
- Select the temperature compensation for the calibration.
- Press > to access the function temperature comp. and ↑ or ↓ to select between "Automatic" and "Manual".
- Press ↵ to confirm and to proceed.
- If you select "Manual" press ↵ twice to proceed.
- Press > to access the function and ↑ or ↓ to enter the temperature for calib. solution.
  Press > to move the cursor one position to the right.
- Press ↵ twice to confirm and to proceed.

Step 2: Start calibration

- On the screen the following message appears:
  "Buffer solution 1"
  7.00 pH (for example)
- Wait until the value is stabile and press ↵ to proceed.
- "Please wait" appears on the screen.
- On the screen the following message appears:
  "Set buffer 1"
  +7.00 pH (for example)
- Press > to access the function and ↑ or ↓ to adjust the value.
  Press > to move the cursor one position to the right.
- Press ↵ twice to confirm and to proceed.
- An indication Error appears below the buffer solution value if an incorrect value was entered.
- Enter the correct value and press ↵ to proceed.
- On the screen the following message appears:
  "Buffer solution 2"
  4.00 pH (for example)
- Wait until the value is stable and press ↵ to proceed.
- "Please wait" appears on the screen.
- On the screen the following message appears:
  "Set buffer 2"
  +4.00 pH (for example)
- Press > to access the function and ↑ or ↓ to adjust the value.
  Press > to move the cursor one position to the right.
- Press ↵ twice to confirm and to proceed.

- An indication Error appears below the buffer solution value if an incorrect value was entered.
- Enter the correct value and press ↵ to proceed.
- On the screen the following message appears:
  "Calibr. values" (read only)
  Slope: -59.00 mV/pH (for example)
  Offset: 01.00 mV (for example).
- Press ↵ to confirm and to proceed.
- If the calibration was not successful the following message appears:
  Slope: inf mV/pH
  Offset: -nan mV
  Slope out of range
  Saving not possible

Step 3: Save values

- On the screen the following message appears:
  "Store cal. values?"
  No
- Press > to access the function "Store cal. values?" and ↑ or ↓ to select between "No" and "Yes".
- Select "Yes" to save the value.
- Press ↵ twice to confirm and to proceed.
- Select "No" to abort the calibration.
- Press ↵ to confirm and proceed.
- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "No" to deactivate the function "Manual Hold?"
- Press ↵ twice to confirm and to proceed.
- The message "pH calibration aborted" appears on the screen.
- Press ↵ to leave the calibration menu.
- On the screen the following message appears:
  "YYYY-MM-DD"
  "Set clock"
  "2000-01-01 00:00" (for example)
- Press > to access the function "Set clock" and ↑ or ↓ to enter the data for calibration: "YYYY-MM-DD HH:MM".
  Press > to move the cursor one position to the right.
- Press ↵ to confirm and to proceed.

Step 4: Leave calibration

- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "No" to deactivate the function "Manual Hold?"
- Press ↵ twice to confirm and to proceed.
- On the screen the following message appears:
  "pH calibration"
  "successful"
- Press ↵ several times to leave the calibration.

5.5 Menu mode structure ORP

INFORMATION!
The following table just presents an overview. When programming the device, always consult the function tables additionally as they contain further information!

Main menu		Submenu		Parameter	
> 1.5 s ↵	S Sensor	> ↵	S1 Quick setup	> ↵	S1.1 TAG S1.2 Manual Hold? S1.3 I/O S1.4 ORP Calibration
			S2 Logbooks		S2.1 Calibration logbook S2.2 Error logbook
			S3 Setup		S3.1 Process input S3.2 I/O S3.3 I/O HART S3.4 Information S3.5 Commissioning
			S4 Service		S4.1 Calibration S4.2 Parameter S4.3 Sensor Lock
	↓↑		↓↑		↓↑
> 1.5 s ↵	R Replace sensor	> ↵	R1 Load from sensor	> ↵	
			R2 Write from sensor		
	↓↑		↓↑		
> 1.5 s ↵	D Device	> ↵	D1 Setup	> ↵	D1.1 Language D1.2 HART master D1.3 Set clock D1.4 Contrast D1.5 Information
			D Service		D2.1 Password D2.2 Reset display
	↓↑		↓↑		

5.5.1 Function table ORP measurement

CAUTION!
All data change in SMARTMAC 200 W will be directly saved in SMARTPAT 200 W sensor. If the sensor has to be changed please use the menu "R replace sensor" to copy sensor data.

S Sensor	Press > to access the sub-menu and ↑ or ↓ to scroll. Press ↵ to leave the sub menu.
S1 Quick setup	Press > to access the function table and ↑ or ↓ to scroll. Press ↵ to leave the function table.
S1.1 TAG	TAG Press > to access the function and > and ↑ or ↓ to enter the TAG. Press ↵ to confirm and proceed.
S1.2 Manual Hold?	Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes". Select "Yes" to activate the function "Manual hold?" to avoid an alarm. Press ↵ to confirm and to proceed. Select "No" to deactivate the function "Manual hold?" Press ↵ to confirm and to proceed.
S1.3 I/O	S1.3.1Meas. Range Press > to access the function and ↑ or ↓ to enter the ORP measuring range. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	S.1.3.2 Time constant Press > to access the function and ↑ or ↓ to set and display time constant for 4...20 mA; update rate 1…60 seconds. Default setting: 1 second Press ↵ to confirm and to proceed.
S1.4 ORP Calibration	For more information refer to *ORP calibration* on page 46.
S2 Logbooks	Press > to access the function table and ↑ or ↓ to scroll. Press ↵ to leave the function table.
S2.1 Calibration logbook	Display sensor calibration data Press > to access the function and ↑ or ↓ to scroll (read only). Press ↵ to leave.
S2.2 Error logbook	Display of sensor errors Press > to access the function and ↑ or ↓ to scroll. For more information refer to *Error page ORP* on page 28. Press ↵ to leave.

S3 Setup	Press > to access the function and ↑ or ↓ to scroll. Press ↵ to leave.
S3.1 Process input	S3.1.1 Temperature Press > to access the function and ↑ or ↓ to scroll. Press ↵ to leave the function table.
	S3.1.1.1 Units Press > to access the function and ↑ or ↓ to select between "°C" or "°F". Default setting: °C Press ↵ to confirm and to proceed.
	S3.1.1.2 Correction Press > to access the function and ↑ or ↓ to adjust the temperature value. Press > to move the cursor one position to the right. Press ↵ and on the screen the following message appears: "YYYY-MM-DD" "Set clock" "2000-01-01 00:00" (for example) Press > to access the function "Set clock" and ↑ or ↓ to enter the data. "YYYY-MM-DD HH:MM" Press ↵ to confirm and to proceed or press ESC to abroad.
	S3.1.2 ORP calibration For more information refer to *ORP calibration* on page 46.
	S3.1.3 Maint. interval Press > to access the function and ↑ or ↓ to set and display maintenance interval in days (0...999). Press > to move the cursor one position to the right. Default setting: 0 Press ↵ twice to confirm and to proceed.
	S3.1.4 Reset maintenance Press > to access the function and ↑ or ↓ to select between "No" and "Yes". Default setting: No Press ↵ twice to confirm and to proceed.
S3.2 I/O	S3.2.1 Meas. Range Press > to access the function and ↑ or ↓ to enter the ORP measuring range. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	S3.2.2 Time constant Press > to access the function and ↑ or ↓ to set and display time constant for 4...20 mA; update range: 1...60 seconds. Press > to move the cursor one position to the right. Default setting: 1 second Press ↵ to confirm and to proceed.

S3.3 I/O HART	S3.3.1 HART function Press > to access the function and ↑ or ↓ to select between "HART on" to activate the HART function and "HART off" to deactivate the HART function. Default setting: HART on Press ↵ to confirm and to proceed.
	S3.3.2 TAG Press > to access the function and ↑ or ↓ to enter the TAG. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	S3.3.3 Long TAG Press > to access the function and ↑ or ↓ to set and display the Long TAG. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	S3.3.4 Previous Long TAG (read only) Press ↵ to leave.
	S3.3.5 Polling address Press > to access the function and ↑ or ↓ to set and display the polling address. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	S3.3.6 Device variables (read only) PV: mV value SV: mV value TV: Temperature value (°C / °F) Press ↵ to leave.

S3.4 Information (read only)	S3.4.1 Sensor info Press > to access the function and ↑ or ↓ to scroll. Press ↵ to leave.
	S3.4.1.1 Order code
	S3.4.1.2 Device name
	S3.4.1.3 Device serial no.
	S3.4.1.4 HART ID
	S3.4.1.5 Polling address
	S3.4.1.6 Manufacturer ID
	S3.4.1.7 Date of manufacturing
	S3.4.1.8 SW revision
	S3.4.1.9 HW revision
	S3.4.2 Calibration Press > to access the function and ↑ or ↓ to scroll. Press ↵ to leave.
	S3.4.2.1 Offset (mV)
	S3.4.2.2 ORP (mV)
	S3.4.2.3 SIP counter
	S3.4.2.4 CIP counter
	S3.4.3 Operating parameter Press > to access the function and ↑ or ↓ to scroll. Press ↵ to leave.
	S3.4.3.1 Commissioning
	S3.4.3.2 Operating hours
	S3.4.3.3 Time > +80°C/176°F (hh:mm)
	S3.4.3.4 Time > +110°C/230°F (hh:mm)
	S3.4.3.5 Time < -300 mV (hh:mm)
	S3.4.3.6 Time > +300 mV (hh:mm)
	S3.4.3.7 Max. temperature (°C / °F) Press ↵ to leave.
S3.5 Commissioning	Press > to access the function and ↑ or ↓ to enter the date of commissioning. Press > to move the cursor one position to the right. Press ↵ twice to confirm and to proceed.

S4 Service	Press > to access the function table and ↑ or ↓ to scroll. Press ↵ to leave the function table.
S4.1 Calibration	S4.1.1 4 mA trimming Press > to access the function and ↑ or ↓ to select between "Decrease" and "Increase" for trimming. Press ↵ to confirm and to proceed.
	S4.1.2 20 mA trimming Press > to access the function and ↑ or ↓ to select between "Decrease" and "Increase" for trimming. Press ↵ to confirm and to proceed.
S4.2 Parameter	S4.2.1 Reset sensor Press > to access the function and ↑ or ↓ to select between "No" and "Yes". If you select and confirm "Yes", the sensor will be rebooted. Default setting: No Press ↵ to confirm and to proceed.
	S4.2.2 Factory settings Press > to access the function and ↑ or ↓ to select between "No" and "Yes". Factory settings will be loaded If you select and confirm "Yes" the factory setting will be loaded. The following settings will be reset to default: temperature unit, measurend (PV), I/O, calibration interval, 4...20 mA trimming, TAG and Long TAG. Polling address will be set to 0 and the loop current will be enabled. Press ↵ to confirm and to proceed.
S4.3 Sensor Lock	Press > to access the function and ↑ or ↓ to select between "No" and "Yes". Select "No" and press ↵ to leave the function. **Warning!** If you select and confirm "Yes", the sensor is locked and the HART communication is not possible anymore. The setting is not reversible anymore! Press ↵ to confirm and to proceed.
R Replace sensor	Press > to access the function table and ↑ or ↓ to scroll. Press ↵ to leave the function table.
R1 Load from sensor	Press > to start loading the sensor settings form the sensor to the device.
R2 Write to sensor	Press > to start writing the sensor settings form the device to the new sensor.

D Device	Press > to access the function table and ↑ or ↓ to scroll. Press ↵ to leave the function table.
D1 Setup	D1.1 Language Press > to access the function and ↑ or ↓ to select the language. Press ↑ or ↓ to select between "English", "German", "French", "Italian" and "Spanish". Press ↵ to confirm and to proceed.
	D1.2 HART master Press > to access the function and ↑ or ↓ to select between "Primary Master" and "Secondary Master". Press ↵ to confirm and to proceed.
	D1.3 Set clock Press > to access the function and ↑ or ↓ to set the date and clock of the device. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	D1.4 Contrast Press > to access the function and ↑ or ↓ to select the contrast of the display. Press ↵ to confirm and to proceed.
	D1.5 Information (read only). Press > to access the function and ↑ or ↓ to scroll. Press ↵ to confirm and to proceed.
	D1.5.1 Serial number of the device (read only).
	D1.5.2 SW revision of the device Press > to access (read only). Press ↵ to leave.
	D1.5.3 HW revision of the device Press > to access (read only). Press ↵ to leave.
D2 Service	D2.1 Password Press > to access the function and ↑ or ↓ to select between "off" and "on". Default setting: off Press ↵ to confirm and to proceed. If you select on, on the display the following appears
	D2.1.1 Password? on Press ↑ or ↓ to select between "on" and "off".
	D2.1.2 Operator PW Press > to access the function and ↑ or ↓ enter the password. Press ↵ to confirm and to proceed.
	D2.1.3 Administrator PW Press > to access the function and ↑ or ↓ to enter the password. Press ↵ to confirm and to proceed.
	D2.2 Reset Display Press > to access the function and ↑ or ↓ to select between "No" and "Yes". Default setting: No Press ↵ to confirm and to proceed.

5.5.2 ORP calibration

INFORMATION!
For sensor handling during calibration please consider the standard documentation of the sensor!

Step 1: Start configuration for calibration

- Start the function ORP calibration in menu mode "S1 Quick Setup" (submenu S1.4) or "S3 Setup" (submenu S3.1.2).
- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "Yes" to activate the function "Manual hold?" to avoid an alarm.
- Press ↵ twice to confirm and to proceed.

Step 2: Start calibration

- On the screen the following message appears:
  "Set ORP solution"
  "220 mV" (for example)
- Press > to access the function and ↑ or ↓ to enter the temperature for calibration solution.
  Press > to move the cursor one position to the right.
- Wait until the value is stable and press ↵ to proceed.
- "Please wait" appears on the screen.
- On the screen the following message appears:
  "Calibr. values" (read only)
  "Offset: -20 mV" (for example)
  "ORP: 220 mV" (for example)
- Press ↵ to confirm and to proceed.

Step 3: Save values

- On the screen the following message appears:
  "Store cal. values?"
  "No"
- Press > to access the function "Store cal. values?" and ↑ or ↓ to select between "No" and "Yes".
- Select "Yes" to save the value.
- Press ↵ twice to confirm and to proceed.
- Select "No" to abort the calibration.
- Press ↵ to confirm and proceed.
- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "No" to deactivate the function "Manual Hold?"
- Press ↵ twice to confirm and to proceed.
- The message "ORP calibration aborted" appears on the screen.
- Press ↵ to leave the calibration menu.
- On the screen the following message appears:
  "YYYY-MM-DD"
  "Set clock"
  "2000-01-01 00:00" (for example)

- Press > to access the function "Set clock" and ↑ or ↓ to enter the data for calibration: "YYYY-MM-DD HH:MM".
  Press > to move the cursor one position to the right.
- Press ↵ to confirm and to proceed.

Step 4: Leave calibration

- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "No" to deactivate the function "Manual Hold?".
- Press ↵ twice to confirm and to proceed.
- On the screen the following message appears:
  "ORP calibration"
  "successful"
- Press ↵ several times to leave the calibration.

5.6 Menu mode structure conductivity

INFORMATION!
The following table just presents an overview. When programming the device, always consult the function tables additionally as they contain further information!

Main menu		Submenu		Parameter	
> 1.5 s ↵	**S** Sensor	> ↵	**S1** Quick setup	> ↵	S1.1 TAG S1.2 Manual Hold? S1.3 I/O S1.4 Calibration
			S2 Logbooks		S2.1 Calibration logbook S2.2 Error logbook
			S3 Setup		S3.1 Process input S3.2 I/O S3.3 I/O HART S3.4 Information S3.5 Commissioning
			S4 Service		S4.1 Calibration S4.2 Parameter S4.3 Sensor lock
	↓↑		↓↑		↓↑
> 1.5 s ↵	R Replace sensor	> ↵	R1 Load from sensor	> ↵	
			R2 Write from sensor		
	↓↑		↓↑		
> 1.5 s ↵	D Device	> ↵	D1 Setup	> ↵	D1.1 Language D1.2 HART master D1.3 Set clock D1.4 Contrast D1.5 Information
			D2 Service		D2.1 Password D2.2 Reset display
	↓↑		↓↑		

5.6.1 Function table conductivity measurement

CAUTION!
All data change in SMARTMAC 200 W will be directly saved in SMARTPAT 200 W sensor. If the sensor has to be changed please use the menu "R replace sensor" to copy sensor data.

S Sensor	Press > to access the sub-menu and ↑ or ↓ to scroll. Press ↵ to leave the sub menu.
S1 Quick setup	Press > to access the function table and ↑ or ↓ to scroll. Press ↵ to leave the function table.
S1.1 TAG	TAG Press > to access the function and ↑ or ↓ to enter the TAG. Press > to move the cursor one position to the right. Press ↵ to confirm and proceed.
S1.2 Manual Hold?	Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes". Select "Yes" to activate the function "Manual hold?" to avoid an alarm. Press ↵ to confirm and to proceed. Select "No" to deactivate the function "Manual hold?" Press ↵ to confirm and to proceed.
S1.3 I/O	S1.3.1 Measurand Press > to access the function and ↑ or ↓ to select "Conductivity" and "Resistivity". Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	S1.3.1 Meas. Range Press > to access the function and ↑ or ↓ to enter the measuring range for "Conductivity" or "Resistivity". Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	S.1.3.2 Time constant Press > to access the function and ↑ or ↓ to set and display time constant for 4...20 mA; update rate 1...60 seconds. Default setting: 1 second Press ↵ to confirm and to proceed.
S1.4 Calibration	S.1.4.1 Calibration method Press > to access the function and ↑ or ↓ to select between S.1.4.1.1 Product calibration S.1.4.1.2 Calib. solution S.1.4.1.3 Input cell constant For further information refer to *Conductivity calibration* on page 54 Press ESC to leave the calibration menu. The message "Calibration aborted" appears on the screen.
S2 Logbooks	Press > to access the function table and ↑ or ↓ to scroll. Press ↵ to leave the function table.
S2.1 Calibration logbook	Display sensor calibration data Press > to access the function and ↑ or ↓ to scroll (read only). Press ↵ to leave.
S2.2 Error logbook	Display of sensor error Press > to access the function and ↑ or ↓ to scroll. For further information refer to *Error page conductive conductivity* on page 29. Press ↵ to leave.

S3 Setup	Press > to access the function table and ↑ or ↓ to scroll. Press ↵ to leave the function table.
S3.1 Process input	S3.1.1 Temperature Press > to access the function and ↑ or ↓ to scroll. Press ↵ to leave.
	S3.1.1.1 Units Press > to access the function and ↑ or ↓ to select between "°C" or "°F". Default setting: °C Press ↵ to confirm and to proceed.
	S3.1.1.2 Correction Press > to access the function and ↑ or ↓ to adjust the temperature value. Press > to move the cursor one position to the right. Press ↵ and on the screen the following message appears: "YYYY-MM-DD" "Set clock" "2000-01-01 00:00" (for example) Press > to access the function "Set clock" and ↑ or ↓ to enter the data. Press > to move the cursor one position to the right. "YYYY-MM-DD HH:MM" Press ↵ to confirm and to proceed or press ESC to abroad.
	S3.1.1.3 Temperature comp. Press > to access the function and ↑ or ↓ to select between "Linear", "Natural water", "Off". Default setting: Linear If you select "Linear", enter the "Temp. coefficient" of the medium (default setting: 2%/K) and the Reference temp. (default setting: 25°C / 77°F). Press > to access the function and ↑ or ↓ to enter the value. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed or press ESC to abroad.
	S3.1.1.4 Temp. coefficient Only displayed if temp. compensation is set to linear. Default setting: 2%/K (read only). Press ↵ to leave.
	S3.1.1.5 Reference temp. Only displayed if temp. compensation is set to linear. Default setting: 25°C (read only). Press ↵ to leave.
	S3.1.2 Calibration Press > to access.
	S3.1.2.1 Calibration method Press > to access the function and ↑ or ↓ to select between "Product calibration", "Calib. solution", "Input cell constant" For more information refer to *Conductivity calibration* on page 54. Press ESC to leave the calibration menu. The message "Calibration aborted" appears on the screen.
	S3.1.3 Maint. interval Press > to access the function and ↑ or ↓ to set and display maintenance interval in days (0...999 days). Press > to move the cursor one position to the right. Default setting: 000 days Press ↵ to confirm and to proceed.
	S3.1.4 Reset maintenance Press > to access the function and ↑ or ↓ to select between "No" and "Yes" Default setting: No Press ↵ to confirm and to proceed.

S3.2 I/O	S3.2.1 Measurand Press > to access the function and ↑ or ↓ to select between "Conductivity" and "Resistivity" Press ↵ to confirm and to proceed.
	S3.2.2 Meas. Range Press > to access the function and ↑ or ↓ to change the measuring range for "Conductivity" or "Resistivity". Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	S3.2.3 Time constant Press > to access the function and ↑ or ↓ to set and display time constant for 4...20 mA; update range: 1...60 seconds. Press > to move the cursor one position to the right. Default setting: 1 second Press ↵ to confirm and to proceed.
S3.3 I/O HART	S3.3.1 HART function Press > to access the function and ↑ or ↓ to select between "HART on" to activate the HART function and "HART off" to deactivate the HART function. Default setting: HART on Press ↵ to confirm and to proceed.
	S3.3.2 TAG Press > to access the function and ↑ or ↓ to enter the TAG. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	S3.3.3 Long TAG Press > to access the function and ↑ or ↓ to set and display the Long TAG. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	S3.3.4 Previous Long TAG (read only) Press ↵ to leave.
	S3.3.5 Polling address Press > to access the function and ↑ or ↓ to set and display the polling address. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	S3.3.6 Device variables (read only) PV: Conductivity (Resistivity) SV: Resistivity (Conductivity) TV: Temperature value (°C / °F) Press ↵ to leave.

S3.4 Information (read only)	S3.4.1 Sensor info Press > to access the function and ↑ or ↓ to scroll. Press ↵ to leave.
	S3.4.1.1 Order code
	S3.4.1.2 Device name
	S3.4.1.3 Device serial no.
	S3.4.1.4 HART ID
	S3.4.1.5 Polling address
	S3.4.1.6 Manufacturer ID
	S3.4.1.7 Date of manufacturing
	S3.4.1.8 SW revision
	S3.4.1.9 HW revision
	S3.4.2 Calibration Press > to access the function and ↑ or ↓ to scroll. Press ↵ to leave.
	S3.4.2.1 Measurand
	S3.4.2.2 Cell constant
	S3.4.2.3 Calib. solution
	S3.4.2.4 No. of calibrations
	S3.4.2.5 SIP counter
	S3.4.2.6 CIP counter
	S3.4.3 Operating parameter Press > to access the function and ↑ or ↓ to scroll. Press ↵ to leave.
	S3.4.3.1 Commissioning
	S3.4.3.2 Operating hours (OP)
	S3.4.3.3 OP time > Max. OP t.
	S3.4.3.4 Max. OP temperature
	S3.4.3.5 Max. temperature (maximum reached temperature in °C / °F)
	S3.4.3.6 Temperature comp.
	S3.4.3.7 Temp. coefficient (displayed only if linear temperature compensation is selected).
	S3.4.3.8 Reference. coefficient (displayed only if linear temperature compensation is selected). Press ↵ to leave
S3.5 Commissioning	Press > to access the function and ↑ or ↓ to enter the date of commissioning. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.

S4 Service	Press > to access the function table and ↑ or ↓ to scroll. Press ↵ to leave the function table.
S4.1 Calibration	S4.1.1 4 mA trimming Press > to access the function and ↑ or ↓ to select between "Decrease" and "Increase" for trimming. Press ↵ to confirm and to proceed.
	S4.1.2 20 mA trimming Press > to access the function and ↑ or ↓ to select between "Decrease" and "Increase" for trimming. Press ↵ to confirm and to proceed.
S4.2 Parameter	S4.2.1 Reset sensor Press > to access the function and ↑ or ↓ to select between "No" and "Yes". If you select and confirm "Yes", the sensor will be rebooted. Default setting: No Press ↵ to confirm and to proceed.
	S4.2.2 Factory setting Press > to access the function and ↑ or ↓ to select between "No" and "Yes". Factory settings will be loaded If you select and confirm "Yes" the factory settings will be loaded. The following settings will be reset to default: temperature unit, measurend (PV), I/O, calibration interval, 4...20 mA trimming, TAG and Long TAG. Polling address will be set to 0 and the loop current will be enabled. Press ↵ to confirm and to proceed.
S4.3 Sensor lock	Press > to access the function and ↑ or ↓ to select between "No" and "Yes". Select "No" and press ↵ to leave the function. **Warning!** If you select and confirm "Yes", the sensor is locked and the HART communication is not possible anymore. The setting is not reversible anymore! Press ↵ to confirm and to proceed.
R Replace sensor	Press > to access the function table and ↑ or ↓ to scroll. Press ↵ to leave the function table.
R1 Load from sensor	Press > to start loading the sensor settings form the sensor to the device.
R2 Write to sensor	Press > to start writing the sensor settings form the device to the new sensor.

D Device	Press > to access the function table and ↑ or ↓ to scroll. Press ↵ to leave the function table.
D1 Setup	D1.1 Language Press > to access the function and ↑ or ↓ to select the language. Press ▲ or ▼ to select between "English", "German", "French", "Italian" and "Spanish". Press ↵ to confirm and to proceed.
	D1.2 HART master Press > to access the function and ↑ or ↓ to select between "Primary Master" and "Secondary Master". Press ↵ to confirm and to proceed.
	D1.3 Set clock Press > to access the function and ↑ or ↓ to set the date and clock of the device. Press > to move the cursor one position to the right. Press ↵ to confirm and to proceed.
	D1.4 Contrast Press > to access the function and ↑ or ↓ to select the contrast of the display. Press ↵ to confirm and to proceed.
	D1.5 Information (read only). Press > to access the function and ↑ or ↓ to scroll. Press ↵ to confirm and to proceed.
	D1.5.1 Serial number of the device (read only).
	D1.5.2 SW revision of the device Press > to access (read only). Press ↵ to leave.
	D1.5.3 HW revision of the device Press > to access (read only). Press ↵ to leave.
D2 Service	D2.1 Password Press > to access the function and ↑ or ↓ to select between "off" and "on. Default setting: off Press ↵ to confirm and to proceed. If you select on, on the display the following appears
	D2.1.1 Password? on Press > to access the function and ↑ or ↓ to select between "No" and "Yes".
	D2.1.2 Operator PW Press > to access the function and ↑ or ↓ to enter the password. Press ↵ to confirm and to proceed.
	D2.1.3 Administrator PW Press > to access the function and ↑ or ↓ to enter the password. Press ↵ to confirm and to proceed.
	D2.2 Reset Display Press > to access the function and ↑ or ↓ to select between "No" and "Yes". Default setting: No Press ↵ to confirm and to proceed.

5.6.2 Conductivity calibration

INFORMATION!
For sensor handling during calibration please consider the standard documentation of the sensor!

Select the calibration method

- Start the function "Calibration" in menu mode "S1 Quick Setup" (submenu S1.4) or "S3 Setup" (submenu S3.1.2).
- Calibration methods:
  "Product calibration" to calibrate the sensor with the help of a reference sensor
  "Calib. solution" to calibrate the sensor with the help of a reference solution
  "Input cell constant" to enter the calibrated cell constant of a sensor

Step 1: Start "Product calibration"

- Product calibration
- Press > to access the "Calibration method" and ↑ or ↓ to select "Product calibration".
- Press ↵ twice to confirm and to proceed.
- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "Yes" to activate the function "Manual hold?" to avoid an alarm.
- Press ↵ twice to confirm and to proceed.

Step 2: Start configuration for product calibration

- The calibration starts and on the screen the following message appears:
- Wait for a stable value
  147.00 µS/cm (for example)
- Wait until the value is stable, press ↵ to proceed.
- "Please wait" appears on the screen
- Information!
  If the Measurand (S1.3.1) is "Conductivity" the unit "µS/cm" or "mS/cm" appears, depending on the sensor type connected.
  If the Measurand (S1.3.1) is "Resistivity" the unit "kΩ*cm" or "MΩ*cm" appears, depending on the sensor type connected.
- On the screen the following message appears:
  "Value: 147.00 µS/cm" (for example)
  "Save value?"
  "No"
- Press > to access the function "Save value?" and ↑ or ↓ to select between "No" and "Yes".
- Select "Yes" to save the value
- Press ↵ twice to confirm and to proceed.
- Select "No" to abort the calibration.
- Press ↵ to confirm and to proceed.
- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "No" to deactivate the function "Manual hold?"
- Press ↵ twice to confirm and to proceed.
- The message "Calibration aborted" appears on the screen.
- Press ↵ to leave the calibration method.

- On the screen the following message appears:
  "Ref. value unit"
  "µS/cm" (for example)
- Press > to access the function "Ref. value unit." and ↑ or ↓ to select between "µS/cm" and "mS/cm".
  Press > to move the cursor one position to the right.
- Information!
  If the Measurand (S1.3.1) is "Conductivity" the unit "µS/cm" or "mS/cm" appears, depending on the sensor type connected.
  If the Measurand (S1.3.1) is "Resistivity" the unit "kΩ*cm" or "MΩ*cm" appears, depending on the sensor type connected.
- Press twice ↵ to confirm and to proceed.
- On the screen the following message appears:
  "Set reference value"
  "0000.00 µS/cm" (for example)
- Press > to access the function "Set reference value" and ↑ or ↓ to enter the reference value.
  Press > to move the cursor one position to the right.
- Information!
  If the Measurand (S1.3.1) is "Conductivity" the unit "µS/cm" or "mS/cm" appears, depending on the sensor type connected.
  If the Measurand (S1.3.1) is "Resistivity" the unit "kΩ*cm" or "MΩ*cm" appears, depending on the sensor type connected.
- Press twice ↵ to confirm and to proceed.
- On the screen the following message appears:
  "Calibr. values"
  "Old cell const.: 0.1000" (for example)
  "New cell const.: 0.0999" (for example)
- Press ↵ to confirm and to proceed.

Step 3: Save product calibration values

- On the screen the following message appears:
  "Store cal. values?"
  "No"
- Press > to access the function "Store cal. values?" and ↑ or ↓ to select between "No" and "Yes".
- Select "Yes" to save the value.
- Press ↵ twice to confirm and to proceed.
- Select "No" to abort the calibration.
- Press ↵ to confirm and to proceed.
- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "No" to deactivate the function "Manual Hold?"
- Press ↵ twice to confirm and to proceed.
- The message "Calibration aborted" appears on the screen.
- Press ↵ to leave the calibration menu.
- On the screen the following message appears:
  "YYYY-MM-DD"
  "Set clock"
  "2000-01-01 00:00" (for example)

- Press > to access the function "Set clock" and ↑ or ↓ to enter the date for calibration: "YYYY-MM-DD HH:MM".
  Press > to move the cursor one position to the right.
- Press ↵ to confirm and to proceed.

Step 4: Leave product calibration

- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "No" to deactivate the function "Manual Hold?"
- Press ↵ twice to confirm and to proceed.
- On the screen the following message appears:
  "Calibration"
  "successful"
- Press ↵ several times to leave the calibration.
- If the cell deviates, please check the new cell constant and repeat the calibration procedure again.

Step 1: Start "Calib. Solution"

- Calib. Solution
- Press > to access the function "Calibration method" and ↑ or ↓ to select "Calib. solution".
- Press ↵ twice to confirm and to proceed.
- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "Yes" to activate the function "Manual hold?" to avoid an alarm.
- Press ↵ twice to confirm and to proceed.

Step 2: Start configuration for Calib. solution

- On the screen the following message appears:
  "Calib. solution unit"
  "µS/cm" or "mS/cm"
- Press > to access the function "Calib. solution" and ↑ or ↓ to select the "Ref. value" unit between "µS/cm" or "mS/cm".
- Information!
  If the Measurand (S1.3.1) is "Conductivity" the unit "µS/cm" or "mS/cm" appears, depending on the sensor type connected.
  If the Measurand (S1.3.1) is "Resistivity" the unit "kΩ*cm" or "MΩ*cm" appears, depending on the sensor type connected.
- Press ↵ twice to confirm and to proceed.
- On the screen the following message appears:
  "Set reference value"
  "0000.00 µS/cm" (for example)
- Press > to access the function Set reference value and ↑ or ↓ to enter the reference value.
  Press > to move the cursor one position to the right.
- Information!
  If the Measurand (S1.3.1) is "Conductivity" the unit "µS/cm" or "mS/cm" appears, depending on the sensor type connected.
  If the Measurand (S1.3.1) is "Resistivity" the unit "kΩ*cm" or "MΩ*cm" appears, depending on the sensor type connected.
- Press ↵ twice to confirm and to proceed.
- "Please wait" appears on the screen
- On the screen the following message appears:
  "Calibr. values"
  "Old cell: 0.1000" (for example)
  "New cell: 0.0999" (for example)
- Press ↵ to confirm and to proceed.

Step 3: Save Calib. Solution values

- On the screen the following message appears:
  "Store cal. values?"
  "No"
- Press > to access the function "Store cal. values?" and ↑ or ↓ to select between "No" and "Yes".
- Select "Yes" to save the value.
- Press ↵ twice to confirm and to proceed.
- Select "No" to abort the calibration.
- Press ↵ to confirm and to proceed.

- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "No" to deactivate the function "Manual Hold?"
- Press ↵ twice to confirm and to proceed.
- The message "Calibration aborted" appears on the screen.
- Press ↵ to leave the calibration method.
- On the screen the following message appears:
  "YYYY-MM-DD"
  "Set clock"
  "2000-01-01 00:00" (for example)
- Press > to access the function "Set clock" and ↑ or ↓ to enter the date for calibration: "YYYY-MM-DD HH:MM". Press > to move the cursor one position to the right.
- Press ↵ to confirm and to proceed.

Step 4: Leave Calib. Solution

- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "No" to deactivate the function "Manual Hold?"
- Press ↵ twice to confirm and to proceed.
- On the screen the following message appears:
  "Calibration"
  "successful"
- Press ↵ several times to leave the calibration.
- If the cell deviates, please check the new cell constant and repeat the calibration procedure again.

Step 1: Start "Input cell constant"

- Input cell constant
- Press > to access the "Calibration method" and ↑ or ↓ to select "Input cell constant".
- Press ↵ twice to confirm and to proceed.
- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "Yes" to activate the function "Manual hold?" to avoid an alarm.
- Press ↵ twice to confirm and to proceed.

Step 2: Start configuration Input cell constant

- On the screen the following message appears:
  "Old cell const."
  "0.1000" (for example)
- Press ↵ to confirm and to proceed.
- On the screen the following message appears:
  "Input new cell const.?"
  "No"
- Press > to access the function "Input new cell const.".
- Select "Yes"
- Press ↵ twice to confirm and to proceed.
- Select "No" to abort the calibration.
- Press ↵ to confirm and to proceed.
- The message "Calibration aborted" appears on the screen.
- Press ↵ to leave the calibration menu.
- Press > to access the "S1 Quick setup" and ↑ or ↓ to select the function "Manual hold?"
- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "No" to deactivate the function "Manual Hold?"
- Press ↵ twice to confirm and to proceed.
- On the screen the following message appears:
  "new cell constant."
  "0.1000" (for example)
- Press > to access the function "new cell constant." and ↑ or ↓ to enter the "new cell const".
  Press > to move the cursor one position to the right.
- Press ↵ twice to confirm and to proceed.

Step 3: Save Input cell solution values

- On the screen the following message appears:
  "Store cal. values?"
  "No"
- Press > to access the function "Store cal. values?" and ↑ or ↓ to select between "No" and "Yes".
- Select "Yes" to save the value.
- Press ↵ twice to confirm and to proceed.
- Select "No" to abort the calibration.
- Press ↵ to confirm and to proceed.
- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "No" to deactivate the function "Manual Hold?"
- Press ↵ twice to confirm and to proceed.

- The message "Calibration aborted" appears on the screen.
- Press ↵ to leave the calibration menu.
- On the screen the following message appears:
  "YYYY-MM-DD"
  "Set clock"
  "2000-01-01 00:00" (for example)
- Press > to access the function "Set clock" and > and ↑ or ↓ to enter the data for calibration:
  "YYYY-MM-DD HH:MM".
- Press ↵ to confirm and to proceed.

Step 4: Leave Input cell solution

- Press > to access the function "Manual hold?" and ↑ or ↓ to select between "No" and "Yes".
- Select "No" to deactivate the function "Manual Hold?"
- Press ↵ twice to confirm and to proceed.
- On the screen the following message appears:
  "Calibration"
  "successful"
- Press ↵ several times to leave the calibration.
- If the cell deviates, please check the new cell constant and repeat the calibration procedure again.

6.1 Maintenance and repair

The device is maintenance free. Also note the following admonition concerning malfunctions:

DANGER!
In case of a malfunction only the technical service is allowed to repair the device. Never try to repair the device on your own, otherwise it may come to fatal injuries, destruction or damage of the device or measuring errors.

6.2 Availability of services

The manufacturer offers a range of services to support the customer after expiration of the warranty. These include repair, maintenance, technical support and training.

INFORMATION!
For more precise information, please contact your local sales office.

6.3 Returning the device to the manufacturer

6.3.1 General information

This device has been carefully manufactured and tested. If installed and operated in accordance with these operating instructions, it will rarely present any problems.

WARNING!
Should you nevertheless need to return a device for inspection or repair, please pay strict attention to the following points:

- *Due to statutory regulations on environmental protection and safeguarding the health and safety of the personnel, the manufacturer may only handle, test and repair returned devices that have been in contact with products without risk to personnel and environment.*
- *This means that the manufacturer can only service this device if it is accompanied by the following certificate (see next section) confirming that the device is safe to handle.*

WARNING!
If the device has been operated with toxic, caustic, radioactive, flammable or water-endangering products, you are kindly requested:

- *to check and ensure, if necessary by rinsing or neutralising, that all cavities are free from such dangerous substances,*
- *to enclose a certificate with the device confirming that it is safe to handle and stating the product used.*

6.3.2 Form (for copying) to accompany a returned device

CAUTION!
To avoid any risk for our service personnel, this form has to be accessible from outside of the packaging with the returned device.

Company:		Address:
Department:		Name:
Tel. no.:		Fax no. and/or Email address:
Manufacturer's order no. or serial no.:		
The device has been operated with the following medium:		
This medium is:		radioactive
		water-hazardous
		toxic
		caustic
		flammable
		We checked that all cavities in the device are free from such substances.
		We have flushed out and neutralized all cavities in the device.
We hereby confirm that there is no risk to persons or the environment through any residual media contained in the device when it is returned.		
Date:		Signature:
Stamp:		

6.4 Disposal

LEGAL NOTICE!
Disposal must be carried out in accordance with legislation applicable in your country.

Separate collection of WEEE (Waste Electrical and Electronic Equipment) in the European Union:

According to the directive 2012/19/EU, the monitoring and control instruments marked with the WEEE symbol and reaching their end-of-life **must not be disposed of with other waste**.
The user must dispose of the WEEE to a designated collection point for the recycling of WEEE or send them back to our local organisation or authorised representative.

7.1 Technical data

INFORMATION!

- *The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Downloadcenter).*

Measuring system

Measuring principle	The measuring principle depends on the used sensor(s), for further information refer to the sensor manual(s).
Measuring range	The measuring range depends on the used sensor(s), for further information refer to the sensor manual(s).

Design

Construction	A typical measuring system consists of: • SMARTMAC 200 W operating unit • SMARTPAT PH/ORP/COND sensors • VP2-S sensor cable • Mounting assembly
Communication protocol	HART® 7 - FSK 1200 physical layer definition on top of the current loop.
Display and user interface	
Graphic display	LC display
	128 x 64 pixels
Operating elements	4 push buttons for operator control of the signal converter without opening the housing.
Operating menu	The operation menu consists of: Measuring mode: 2 pages (measuring page and error page) Menu mode: main and submenu for SMARTPAT PH/ORP/COND sensors
Operating and display languages	English, German, French, Italian, Spanish
Units	pH, mV, µS/cm, mS/cm, kOhm *cm, MOhm *cm, °C, °F, sec, days

Operating conditions

Temperature	
Ambient	-15...+55°C / +5...+131°F
	Note: the manufacturer strongly recommends to protect the signal converter from external heat sources such as direct sunlight as higher temperatures reduce the life cycle of all electronic components!
Storage	-40...+70°C / -40...+158°F

Other conditions

Humidity	5...95% rH, not condensing
Ingress protection acc. to IEC 60529:	IP66/ IP67 IP69K (stainless steel only) NEMA 4/4X

Installation conditions

Weight	Approx. 1.9 kg / 4.2 lb for die-cast aluminium Approx. 3.5 kg / 7.2 lb for stainless steel
Installation	Wall mounting; assure a vertical mounting orientation

Materials

Housing	Die-cast aluminium Stainless steel
Cable glands	M20x1.5: Plastic (polyamide 6) M20 1/2-NPT (female): Brass M20x1.5: Stainless steel (IP69K)
Mounting plate	Steel

Electrical connections

Power supply	20...30 VDC, loop powered from 4...20 mA signal input. Voltage drop max. 4V DC at 4 mA.
System requirements	250 Ω loop resistance for HART® communication. Note: In most Ex isolation amplifiers the 250 Ohm resistor is already integrated.

Approvals and certifications

CE	
The device meets the essential requirements of the EU directives. The CE marking indicates the conformity of the product with the union legislation applying to the product and providing for CE marking.	
For full information of the EU directives and standards and the approved certifications, please refer to the EU declaration on the website of the manufacturer.	
Other approvals and standards	
NAMUR recommendation	NE 21
Shock resistance	IEC 60068-2-31

7.2 Dimensions

Housing stainless steel

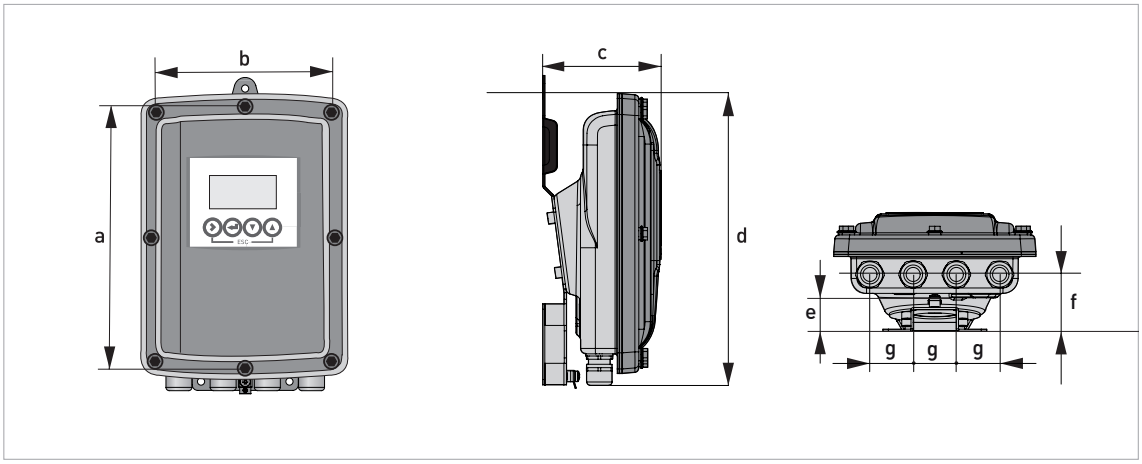

Figure 7-1: Dimensions stainless steel housing

Dimensions and weights in mm and kg

	Dimensions [mm]	Dimensions [inch]
a	268	10.55
b	187	7.36
c	110	4.33
d	276	10.87
e	29	1.14
f	53	2.09
g	40	1.57
Weight	Approx. 3.5 kg	Approx. 7.2 lb

Housing die-cast aluminium

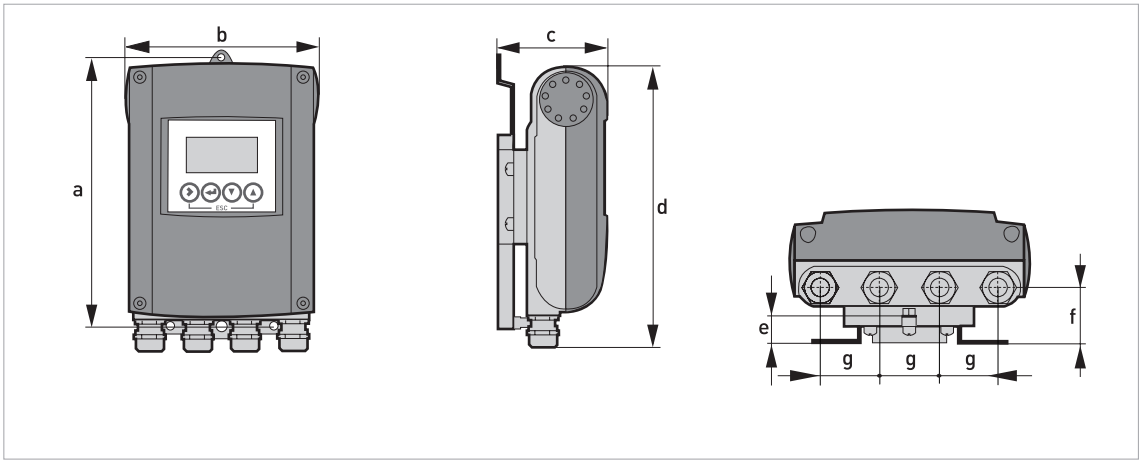

Figure 7-2: Dimensions die-cast aluminium housing

Dimensions and weights in mm and kg

	Dimensions [mm]	Dimensions [inch]
a	241	9.50
b	161	6.34
c	95.2	3.75
d	257	10.12
e	19.3	0.76
f	39.7	1.56
g	40	1.57
Weight	Approx. 1.9 kg	Approx. 4.2 lb

7.2.1 Housing die-cast aluminium

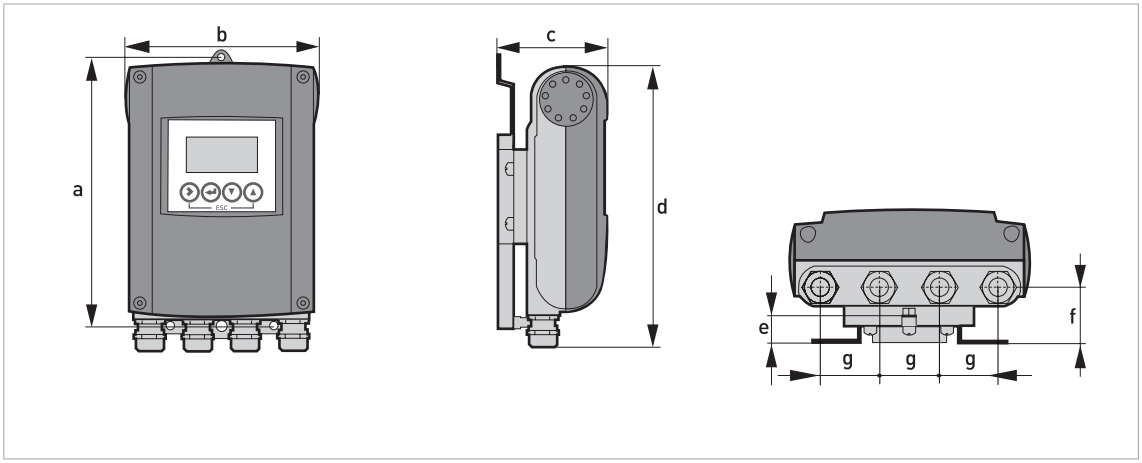

Figure 7-3: Dimensions die-cast aluminium housing

Dimensions and weights in mm and kg

	Dimensions [mm]							Weight [kg]
	a	b	c	d	e	f	g	
Wall-mounted version	241	161	95.2	257	19.3	39.7	40	1.9

Dimensions and weights in inch and lb

	Dimensions [inch]							Weight [lb]
	a	b	c	d	e	f	g	
Wall-mounted version	9.50	6.34	3.75	10.12	0.76	1.56	1.57	4.2

7.2.2 Housing stainless steel

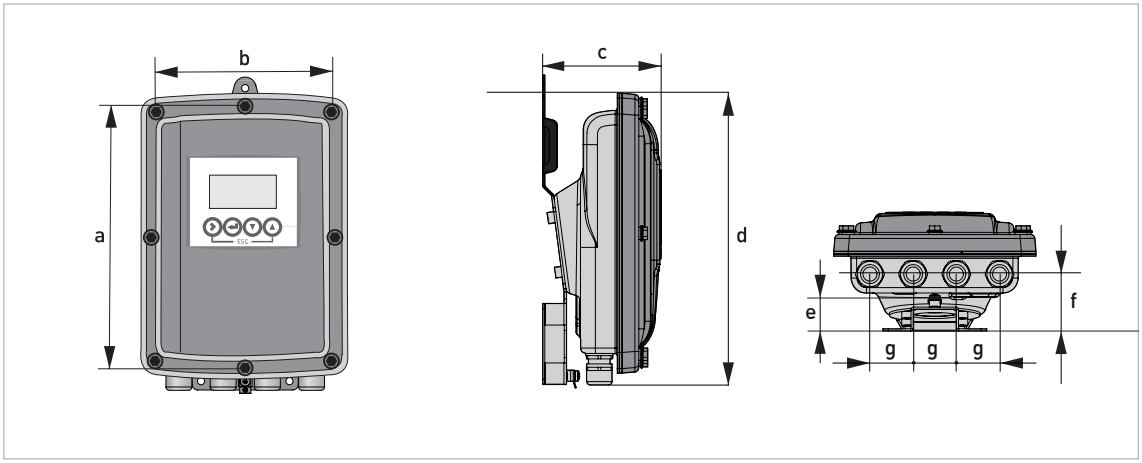

Figure 7-4: Dimensions stainless steel housing

Dimensions and weights in mm and kg

	Dimensions [mm]							Weight [kg]
	a	b	c	d	e	f	g	
Wall-mounted version	268	187	110	276	29	53	40	Approx. 3.5

Dimensions and weights in inch and lb

	Dimensions [inch]							Weight [lb]
	a	b	c	d	e	f	g	
Wall-mounted version	10.55	7.36	4.33	10.87	1.14	2.09	1.57	Approx. 7.2

7.2.3 Mounting plate die-cast aluminium

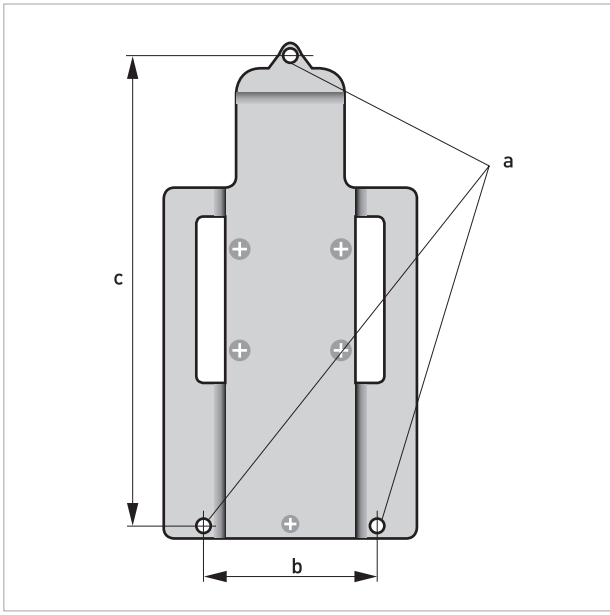

Figure 7-5: Dimensions mounting plate

Dimensions mounting plate

	[mm]	[inch]
a	Ø6.5	Ø0.26
b	87.2	3.4
c	241	9.5

7.2.4 Mounting plate stainless steel

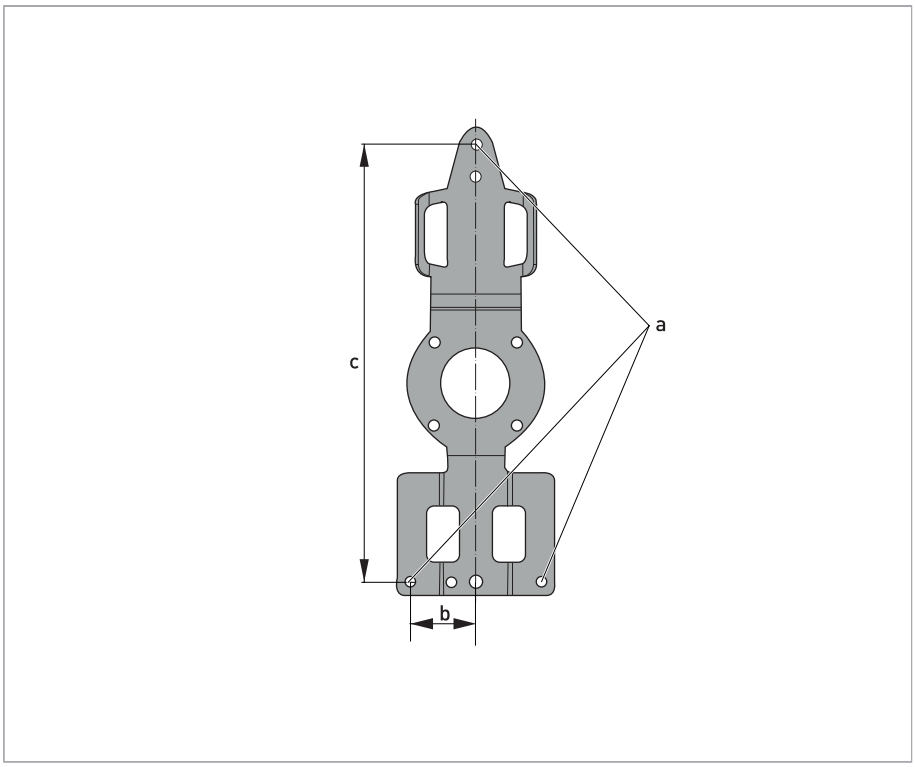

Figure 7-6: Dimensions mounting plate

Dimensions mounting plate

	[mm]	[inch]
a	Ø6.5	Ø0.26
b	40	1.6
c	268	10.5

KROHNE – Process instrumentation and measurement solutions

- Flow
- Level
- Temperature
- Pressure
- Process Analysis
- Services

Head Office KROHNE Messtechnik GmbH
Ludwig-Krohne-Str. 5
47058 Duisburg (Germany)
Tel.: +49 203 301 0
Fax: +49 203 301 10389
info@krohne.com

The current list of all KROHNE contacts and addresses can be found at:
www.krohne.com

KROHNE