The Art of Measuring. **Knick** ❯

Stratos Evo A402

Stratos® *Evo*

Knick ❯

☺ **7.65** PH
14:32   123.4 °C

meas

meas   menu   info

Latest Product Information: www.knick.de

Table of Contents

Warranty

Defects occurring within 3 years from delivery date shall be remedied free of charge at our plant (carriage and insurance paid by sender).

Sensors, fittings, and accessories: 1 year.

Subject to change

Return of products under warranty

Please contact our Service Team before returning a defective device.

Ship the cleaned device to the address you have been given.

If the device has been in contact with process fluids, it must be decontaminated/ disinfected before shipment. In that case, please attach a corresponding certificate, for the health and safety of our service personnel.

Disposal

Please observe the applicable local or national regulations concerning the disposal of "waste electrical and electronic equipment".

About This Manual:

This manual is intended as a reference guide to your device –

You don't have to read the book from front to back.

Take a look at the *Table of Contents* or the *Index* to find the function you are interested in. Each topic is explained on a double-page spread with step-by-step instructions on how to configure the desired function. Clearly legible page numbers and headlines help you to quickly find the information:

Left page:
How do I get to the function

Parameter concerned

Right page:
Which settings are provided for this function

Specific Test Report Certificates

CD-ROM

Complete documentation:

- User manuals in different languages
- Safety instructions
- Certificates
- Quickstart guides
- Overview of measuring modules and typical wirings

Safety Instructions

In official EU languages and others.

- EU Declarations of Conformity

Measuring Modules

Installation of measuring modules
Wiring examples

Quickstart Guides

Installation and first steps:

- Operation
- Menu structure
- Calibration
- Error messages and recommended actions

Various languages on CD-ROM and on our website:
www.knick.de

Stratos Evo is a 4-wire analyzer for process analysis applications.
The analyzer comes as basic device for measurement with digital sensors
(Memosens, optical oxygen measurement, inductive conductivity measurement).
All measuring functions are stored in an internal memory. You select a measuring
function to configure the analyzer for a specific measuring task. Additional measur-
ing modules can be connected to allow measurement with analog sensors.
The Model A402B allows applications in hazardous-area Zone 2.
Current is provided through a universal power supply 80 ... 230 V AC, 45 ... 65 Hz /
24 ... 60 V DC. The analyzer provides two 0 (4) .... 20 mA current outputs for transmis-
sion of measured value and temperature, for example. Four floating relay contacts
are available for free configuration. A PID controller and a time-controlled cleaning
function can be configured. Two parameter sets are provided. You can externally
switch between them via the Control input, for example. The HOLD input allows
setting the HOLD mode from the outside. The analyzer also provides power supply
and allows signal processing for additional 2-wire transmitters, e.g. for pressure and
temperature.

You can select one of the following measuring functions:
- pH
- ORP
- Dissolved oxygen (also supply and operation of optical DO sensors, e.g. SE 740)
- Contacting conductivity measurement
- Electrodeless (inductive) conductivity measurement
- Dual measurement of pH/pH and pH/Oxy using two Memosens sensors

Enclosure and mounting possibilities
- The sturdy molded enclosure is rated IP 67/NEMA 4X outdoor.
  Material of front unit: PBT, rear unit: PC.
  Dimensions: H 148 mm, W 148 mm, D 117 mm.
  It is provided with knockouts for:
- panel mounting (138 mm x 138 mm cutout to DIN 43700)
- wall mounting (with sealing plugs to seal the enclosure)
- post/pipe mounting (dia. 40 … 60 mm, ☐ 30 … 45 mm)

Connection of sensors, cable glands
For connecting the cables, the enclosure provides
- 3 knockouts for cable glands M20x1.5
- 2 knockouts for NPT 1/2" or rigid metallic conduit

Display
Plain-text messages in a large, backlit LC display allow intuitive operation.
You can specify which values are to be displayed in standard measuring mode
("Main Display").

Color-coded user interface
The colored display backlighting signals different operating states (e.g. alarm: red,
HOLD mode: orange).

Diagnostics functions
Diagnostics functions are provided by the "Sensocheck" automatic monitoring of
glass and reference electrode and the "Sensoface" function for clear indication of the
sensor condition.

Data Logger
The internal logbook (additional function, TAN SW-A002) can handle up to
100 entries – up to 200 with AuditTrail (additional function, TAN SW-A003).

2 parameter sets A/B
The device provides two parameter sets which can be switched manually or via a
control input for different process adaptations or different process conditions.
For an overview of parameter sets (original for copy), refer to the CD or
www.knick.de.

Password protection
Password protection (passcode) for granting access rights during operation can be
configured.

Automatic calibration with Calimatic
You can choose from the most commonly used buffer solutions.
In addition, you can enter an individual buffer set.

Introduction ## Control inputs

Input +   **6** Current

Input -   **7** input
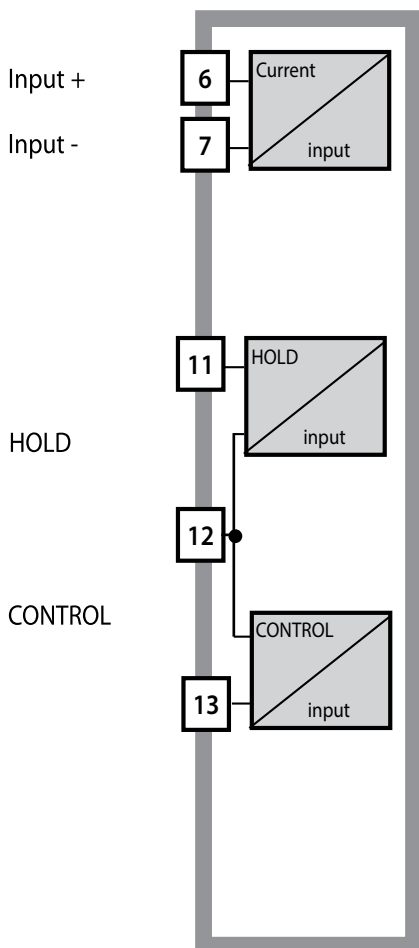
I input
The analog (0) 4 ... 20 mA current input can be used for external pressure or temperature compensation (TAN required).

11 HOLD input

HOLD

12

CONTROL CONTROL input

13 input

HOLD
(floating digital control input)
The HOLD input can be used for external activation of the HOLD mode.

CONTROL
(floating digital control input)
The CONTROL input can be used either for parameter set selection (A/B) or for flow monitoring.
The "Wash" contact can be used for indicating the active parameter set.

Power supply
Current is provided through a universal power supply 80 ... 230 V AC, 45 ... 65 Hz/ 24 ... 60 V DC.
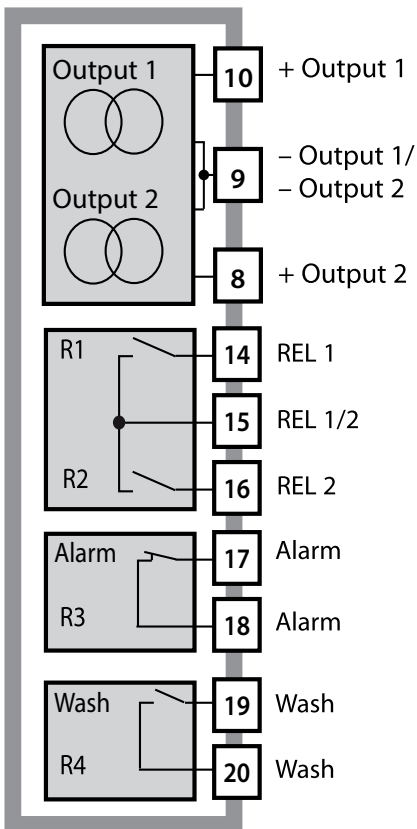
Options
Additional functions can be activated by entering a TAN.

Signal outputs

The analyzer provides two 0 (4) .... 20 mA current outputs for transmission of measured value and temperature, for example.

Relay contacts

Four floating relay contacts are available.

Output 1	10	+ Output 1
Output 2	9	– Output 1/ – Output 2
	8	+ Output 2
R1	14	REL 1
	15	REL 1/2
R2	16	REL 2
Alarm	17	Alarm
R3	18	Alarm
Wash	19	Wash
R4	20	Wash

Current outputs
The floating current outputs (0) 4 ... 20 mA are used for transmitting measured values. An output filter can be programmed, the fault current value can be specified.

Relay contacts
2 relay contacts for limit values. Adjustable for the selected process variable: hysteresis, switching behavior (MIN/MAX limit), contact type (N/O, N/C) and delay.

Alarm
An alarm can be generated by Sensocheck, flow monitoring or current failure.
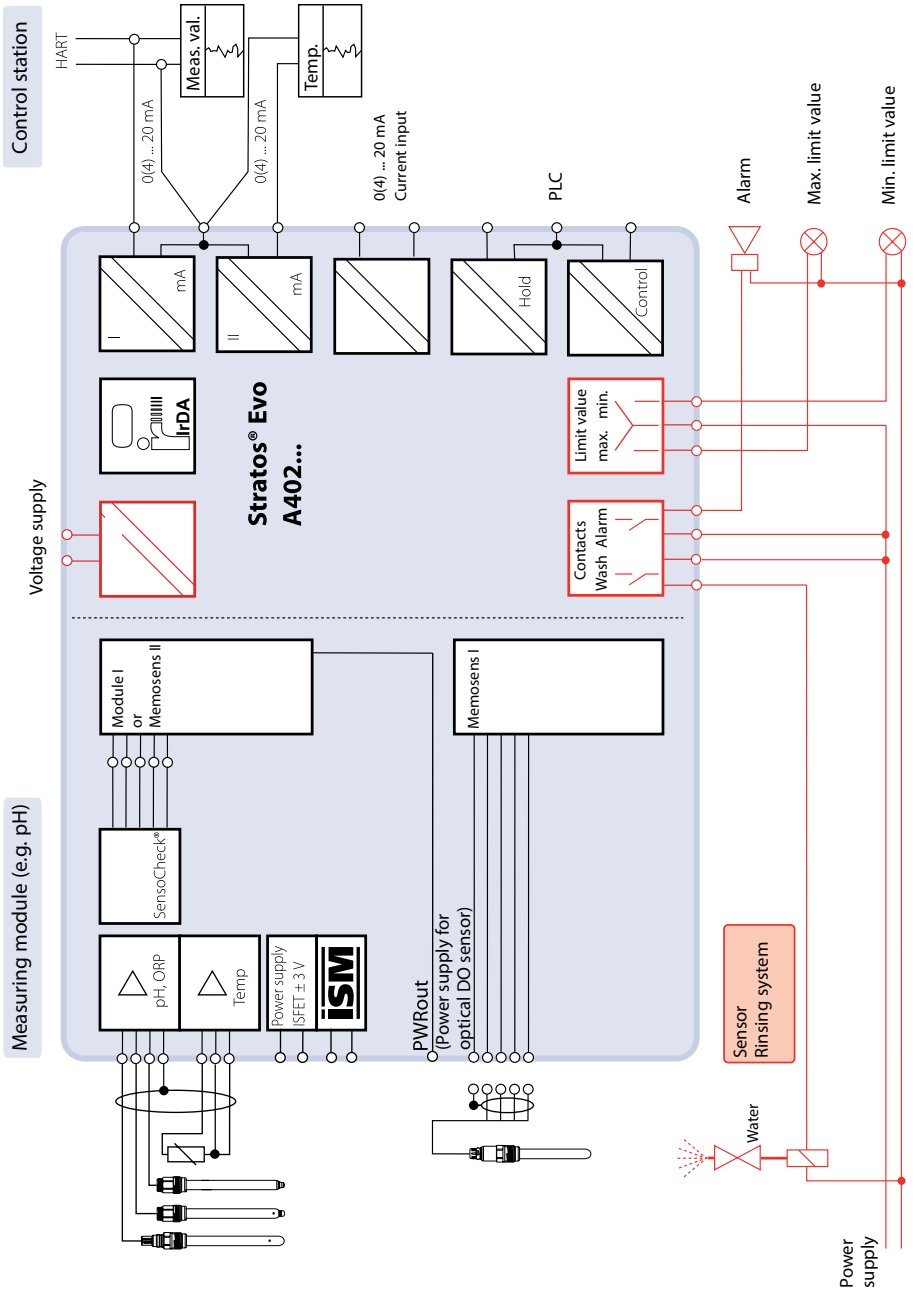
Wash (cleaning function)
This contact can be used for controlling a rinsing probe or for indicating the active parameter set.

PID controller

Configurable as pulse length or pulse frequency controller.

Package Contents

Check the shipment for transport damage and completeness.

The package should contain:

Front unit, rear unit, bag containing small parts

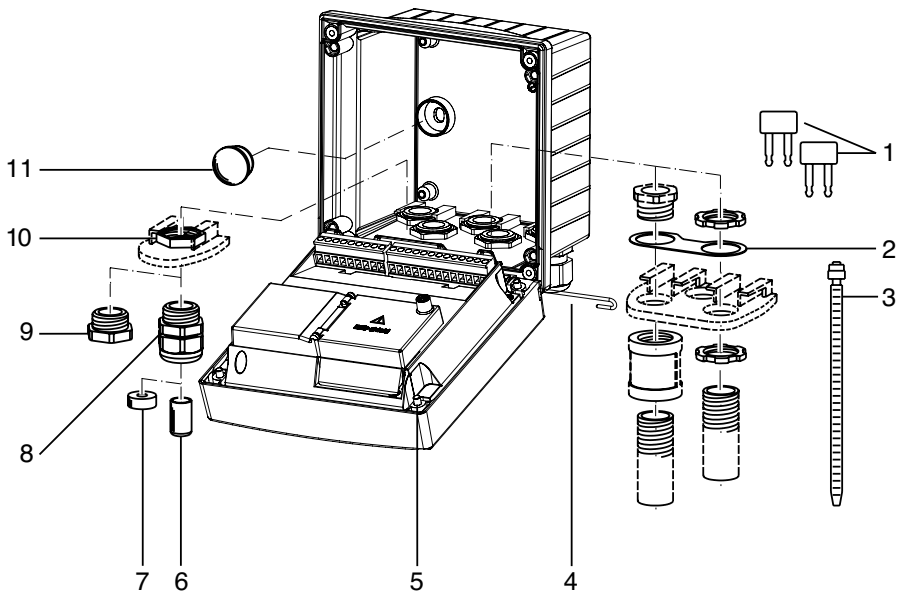Specific test report

Documentation

CD-ROM

Fig.: Assembling the enclosure

1) Jumper (3 x)
2) Washer (1 x), for conduit mounting: Place washer between enclosure and nut
3) Cable tie (3 x)
4) Hinge pin (1 x), insertable from either side
5) Enclosure screw (4 x)

6) Sealing insert (1 x)
7) Rubber reducer (1 x)
8) Cable gland (3 x)
9) Filler plug (3 x)
10) Hexagon nut (5 x)
11) Sealing plug (2 x), for sealing in case of wall mounting

Mounting Plan, Dimensions
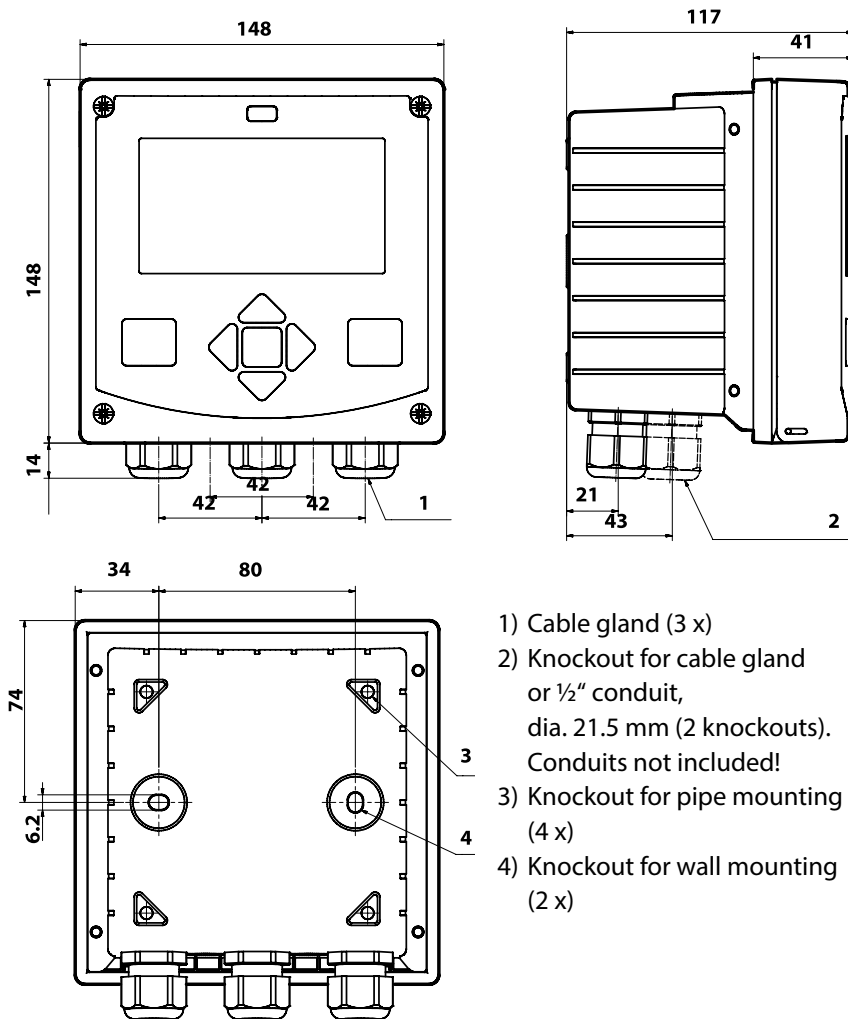
1) Cable gland (3 x)
2) Knockout for cable gland
   or ½" conduit,
   dia. 21.5 mm (2 knockouts).
   Conduits not included!
3) Knockout for pipe mounting
   (4 x)
4) Knockout for wall mounting
   (2 x)

All dimensions in mm

Mounting Accessories
Pipe-mount kit, accessory ZU 0274
Protective hood for wall and pipe mounting, accessory ZU 0737
Panel-mount kit, accessory ZU 0738

For connection of analog sensors:
Insert interchangeable module
(measuring module)

Slot for measuring module

Output 1

10   + Output 1

9   – Output 1/ – Output 2

Output 2

8   + Output 2

R1   **14**   REL 1

15   REL 1/2

R2   **16**   REL 2

Alarm   **17**   Alarm

18   Alarm

Memosens

+3 V   **1**   RS 485

Wash   **19**   Wash

20   Wash

RS 485 A   **2**

RS 485 B   **3**

GND/Shield   **4**

PWR out   **5**

Input +   **6**

Input –   **7**

HOLD   **11**   HOLD input

HOLD / CONTROL   **12**

Power   **21**   Power

CONTROL   **13**   Control input
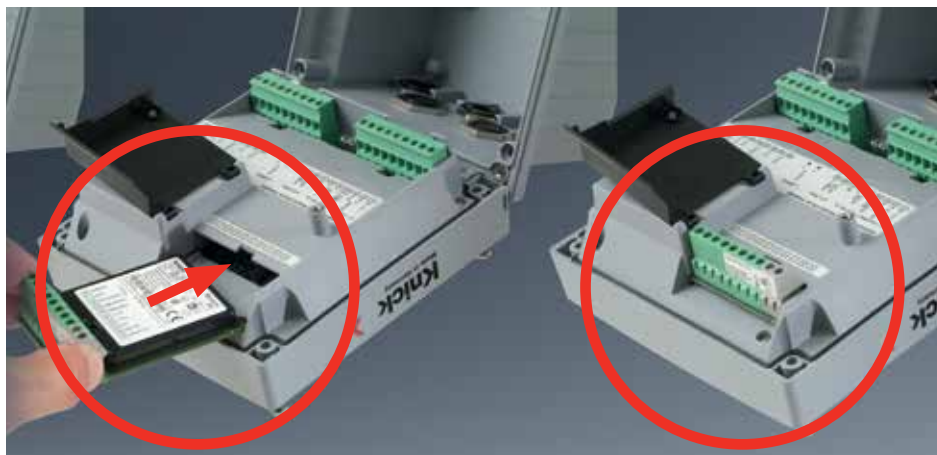
22   Power
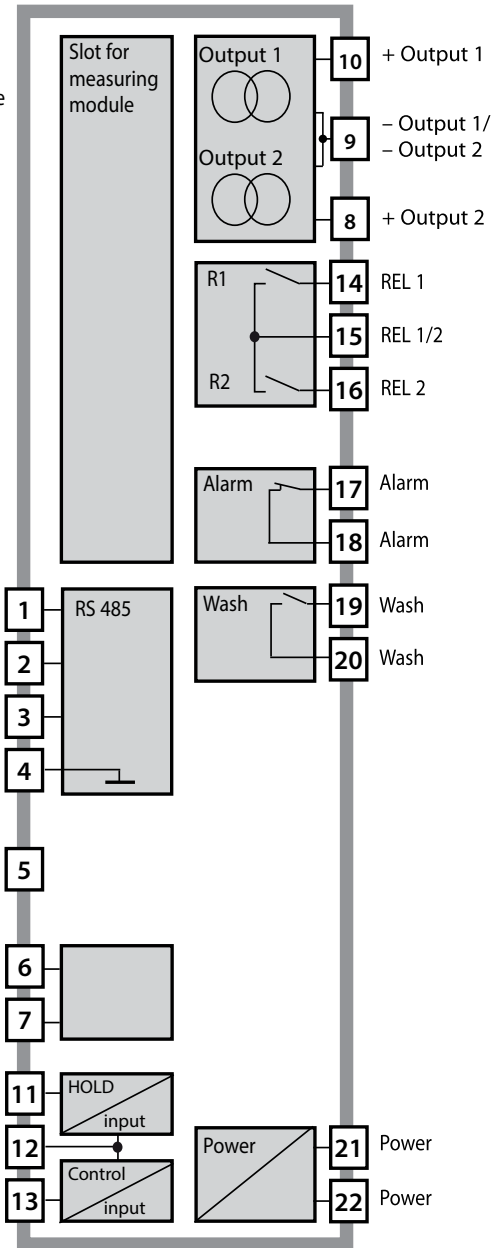
Measuring modules for connection of analog sensors:
pH, dissolved oxygen, conductivity

Measuring modules for the connection of analog sensors are simply inserted into the module slot. Upon initial start-up, the analyzer automatically recognizes the module and adjusts the software correspondingly. When you replace the measuring module, you must select the corresponding measuring function in the "Service" menu.

Multi-channel module for connection of analog sensors:
Dual conductivity
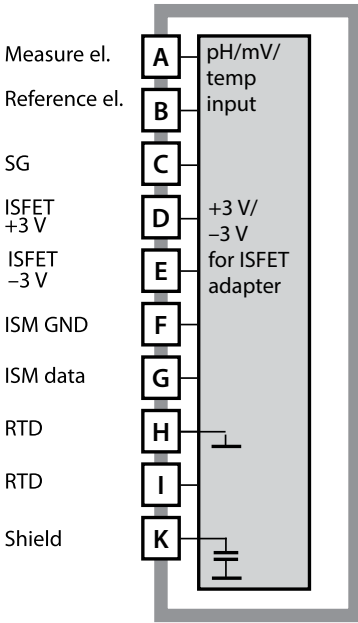For this module, you must select the operating mode ("device type") in the configuration menu.

Measuring module for 2nd Memosens channel
If you want to measure two process variables using Memosens sensors, you must insert a Memosens module for the second channel. The operating mode for multi-channel measurement ("device type") must be selected in the configuration menu.
The following combinations are possible:
Memosens pH + Memosens pH
Memosens pH + Memosens Oxy

Measure el.	**A**	pH/mV/ temp input
Reference el.	**B**	
SG	**C**	
ISFET +3 V	**D**	+3 V/ −3 V
ISFET −3 V	**E**	for ISFET adapter
ISM GND	**F**	
ISM data	**G**	
RTD	**H**	
RTD	**I**	
Shield	**K**	

Cathode	**A**	Oxy input
Reference	**B**	
Anode	**C**	
Guard	**D**	
ISM GND	**E**	
ISM data	**F**	
RTD	**G**	
RTD	**H**	
Shield	**I**	

Module for pH measurement
Order code MK-PH015
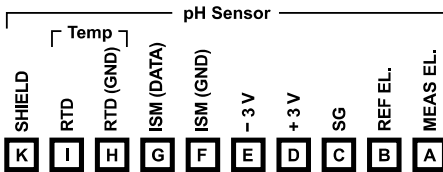For wiring examples, see documentation CD or www.knick.de.
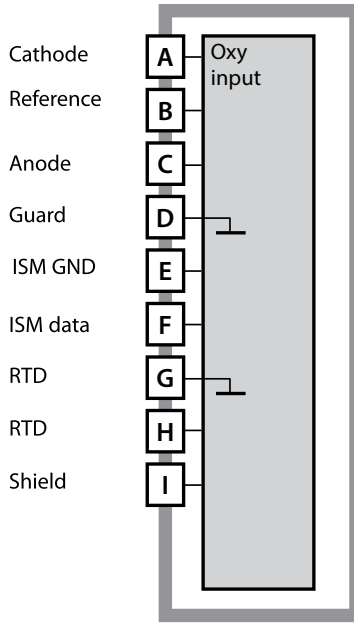
Module for dissolved-oxygen measurement
Order code MK-OXY045
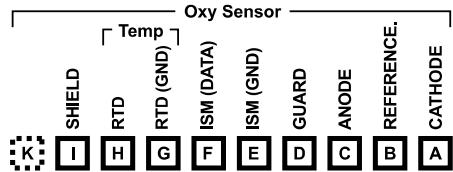For wiring examples, see documentation CD or www.knick.de.

pH Sensor

Temp

SHIELD	RTD	RTD (GND)	ISM (DATA)	ISM (GND)	− 3 V	+ 3 V	SG	REF EL.	MEAS EL.
K	I	H	G	F	E	D	C	B	A

Oxy Sensor

Temp

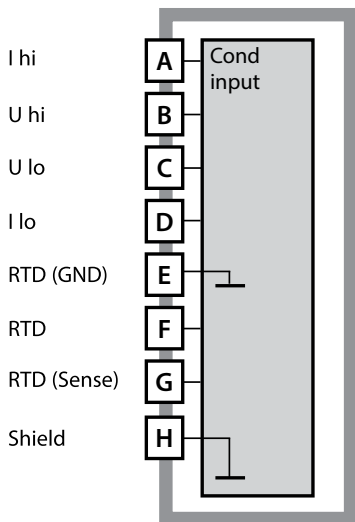| SHIELD	RTD	RTD (GND)	ISM (DATA)	ISM (GND)	GUARD	ANODE	REFERENCE.	CATHODE
K	I	H	G	F	E	D	C	B	A

Terminal plate of pH module
The terminals are suitable for single or stranded wires up to 2.5 mm^2 (AWG 14).
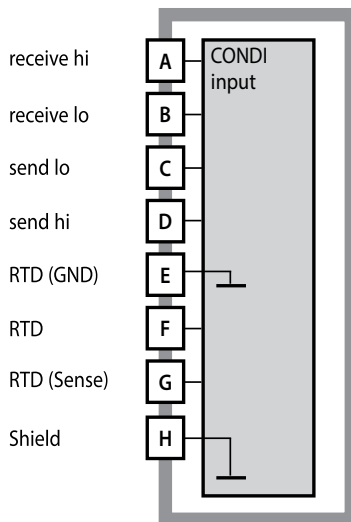
Terminal plate of DO module
The terminals are suitable for single or stranded wires up to 2.5 mm^2 (AWG 14).

I hi — A — Cond input

U hi — B

U lo — C

I lo — D

RTD (GND) — E

RTD — F

RTD (Sense) — G

Shield — H

Module for contacting conductivity measurement (COND)
Order code MK-COND025
For wiring examples, see documentation CD or www.knick.de.

receive hi — A — CONDI input

receive lo — B

send lo — C

send hi — D

RTD (GND) — E

RTD — F

RTD (Sense) — G

Shield — H

Module for inductive conductivity measurement (CONDI)
Order code MK-CONDI035
For wiring examples, see documentation CD or www.knick.de.

COND Sensor — Temp

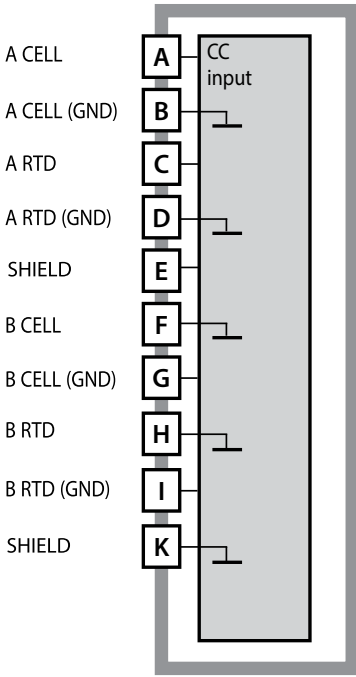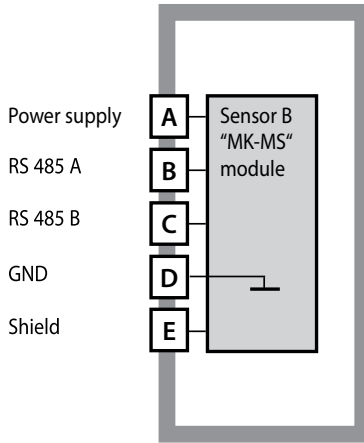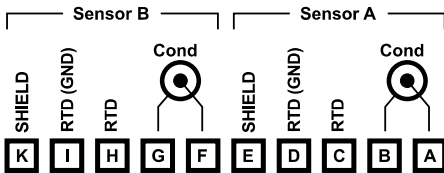SHIELD | RTD (SENSE) | RTD | RTD (GND)

K | | | H | G | F | E | D | C | B | A
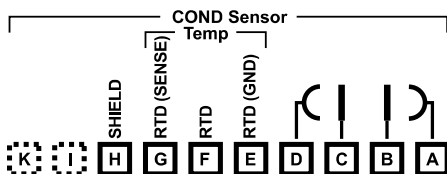
Terminal plate of COND module
The terminals are suitable for single or stranded wires up to 2.5 mm^2 (AWG 14).
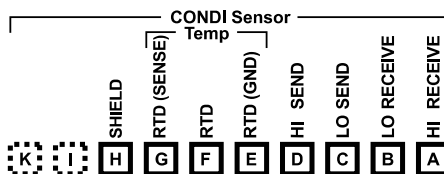
CONDI Sensor — Temp

SHIELD | RTD (SENSE) | RTD | RTD (GND) | HI SEND | LO SEND | LO RECEIVE | HI RECEIVE

K | | | H | G | F | E | D | C | B | A

Terminal plate of CONDI module
The terminals are suitable for single or stranded wires up to 2.5 mm^2 (AWG 14).

A CELL — A — CC input

A CELL (GND) — B

A RTD — C

A RTD (GND) — D

SHIELD — E

B CELL — F

B CELL (GND) — G

B RTD — H

B RTD (GND) — I

SHIELD — K

Power supply — A — Sensor B "MK-MS" module

RS 485 A — B

RS 485 B — C

GND — D

Shield — E

Module for 2 x conductivity measurement
Order code MK-CC065
For wiring examples, see documentation CD
or www.knick.de.

Module for 2nd Memosens channel
Order code MK-MS
For wiring examples, see documentation CD
or www.knick.de.

Sensor B | Sensor A

SHIELD (K) | RTD (GND) (I) | RTD (H) | Cond (G) | (F) | SHIELD (E) | RTD (GND) (D) | RTD (C) | Cond (B) | (A)

Memosens — RS 485

CL SHIELD (K) | GND (I) | (H) | (G) | (F) | CL SHIELD (E) | WH GND (D) | YE B (C) | GN A (B) | BN 3V (A)

**Terminal plate
for 2 x conductivity measurement**
The terminals are suitable for single or stranded
wires up to 2.5 mm^2 (AWG 14).
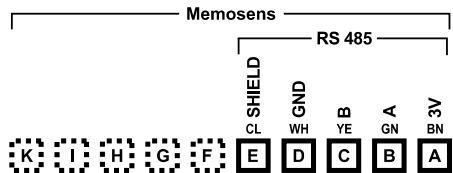
**Terminal plate of module
for 2nd Memosens channel**
The terminals are suitable for single or
stranded wires up to 2.5 mm^2 (AWG 14).

Start-Up
When an MS sensor is connected, you will be prompted to select the desired measuring function (a connected sensor will not be identified automatically).

Changing the Measuring Function
In the "Service" menu you can select another measuring function at any time.
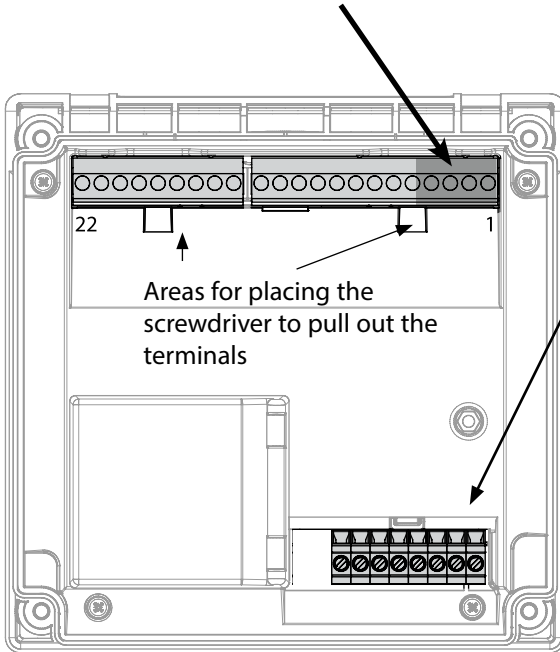
Calibration and Maintenance in the Lab
The "MemoSuite" software allows calibrating Memosens sensors under reproducible conditions at a PC in the lab. The sensor parameters are registered in a database. Documenting and archiving meet the demands of FDA CFR 21 Part 11.
Detailed reports can be output as csv export for Excel. MemoSuite is available as accessory and comes in the versions "Basic" and "Advanced": www.knick.de.

Settings and specifications

Currently connected sensor:
Sensor type, manufacturer,
order code and serial number

Function selection
(The selected function is highlighted.)

Parameters of currently connected sensor

Last calibration (adjustment)

Display size of measured values
When the cursor moves over a measured value, it changes to a magnifying glass, allowing to magnify the measured-value display at a mouse click.

Standard connection (sensor A)		
1	Brown	supply
2	Green	RS 485 A
3	Yellow	RS 485 B
4	White/Transp.	GND/shield

22   1

Areas for placing the
screwdriver to pull out the
terminals

For dual devices (2 measuring channels): (MK-MS095 module) Connection of sensor B		
A	Brown	supply
B	Green	RS 485 A
C	Yellow	RS 485 B
D	White	GND
E	Transp.	SHIELD

Memosens Cable

Brown — Power supply +

Green — RS485 (A)

Yellow — RS485 (B)

White — Power supply – (GND)

Transparent — Shield

Connecting cable for contactless inductive digital transmission of measured signals (Memosens).

The connecting cable consists of an inductive connector for digital Memosens sensors (bayonet lock). It allows connecting the ferrule-terminated wires from the sensor loop of the transmitter. Contactless inductive digital transmission of signals and energy eliminates the influence of humidity, electromagnetic fields and corrosion.

Specifications

Material	TPE
Cable diameter	6.3 mm
Cable	2x2, twisted wire pairs
Length	up to 100 m
Process temperature	−20 °C ... 135° C
Ingress protection	IP 68

Order Codes

Cable type	Cable length	Order code
Memosens cable	3 m	CA/MS-003NAA
	5 m	CA/MS-005NAA
	10 m	CA/MS-010NAA
	20 m	CA/MS-020NAA
Memosens cable, Ex*	3 m	CA/MS-003XAA
	5 m	CA/MS-005XAA
	10 m	CA/MS-010XAA
	20 m	CA/MS-020XAA
	Other lengths available on request.	

*) Ex-certified, ATEX II IG Ex ia IIC T3/T4/T6
    The Type-Examination Certificate is enclosed with each Ex sensor.

Terminal Assignments

The terminals are suitable for single or stranded wires up to 2.5 mm^2 (AWG 14).

22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
24 to 230 V AC/DC		REL 3/ WASH		ALARM		REL 2		REL 1	CONTROL	CONTROL/ HOLD	HOLD	+ 0(4) to 20 mA	—	— 0(4) to 20 mA	+	+ 0(4) to 20 mA	—	PWR out	WH/CL GND/ SHIELD	YE B	GN A	BN 3 V
└ Power ┘		└——— Contacts ———┘							└ Digital-In ┘			└ HART Out 1 ┘		└ Out 2 ┘		└ I-In ┘	⚠	└——— RS 485 ———┘			

WARNING:
DO NOT SEPARATE WHEN ENERGIZED!   DO NOT REMOVE OR REPLACE FUSE WHEN ENERGIZED!
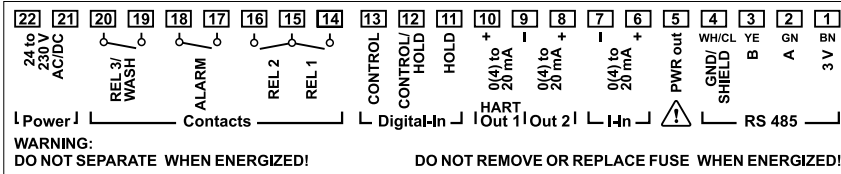
A402N Rating Plate

Knick ❯

A4*2N

No. 84192 / 0000000 / 1233

-20 ≤ T$_a$ ≤ +55°C
Enclosure Type 4X

D-14163 Berlin   Made in Germany

Power
80 (-15%) to 230 (+10%) V AC,
45 to 65 Hz, < 15 VA

24 (-15%) to 60 (+10%) V DC,
--- 10 W

⚠ ▣ C€

A402B Rating Plate

Knick ❯ ⟨Ex⟩

A4*2B

No. 81193 /0000000 / 1233

-20 ≤ T$_a$ ≤ +55°C
Enclosure Type 4X

Knick SC91214A   see Control drawing 212.002-100
☐ II 3 G Ex nA [ic] IIC T4 Gc   ☐ II 3 D Ex tc [ic] IIIB T85°C Dc IP5x

***IECEx* KEM 08.0020**   see Control drawing 212.002-100
☐ Ex nA [ic] IIC T4 Gc   ☐ Ex tc [ic] IIIB T85°C Dc IP5x

PWR: 80 (-15%) to 230 (+10%)V AC, 45 to 65 Hz, < 15 VA
24 (-15%) to 60 (+10%) V DC, --- 10 W   ⚠ ▣ C€

D-14163 Berlin   Made in Germany

Power Supply

Connect the power supply for Stratos Evo to terminals 21 and 22
(24 ... 230 V AC, 45 ... 65 Hz / 24 ... 80 V DC)

Areas for placing the
screwdriver to pull out
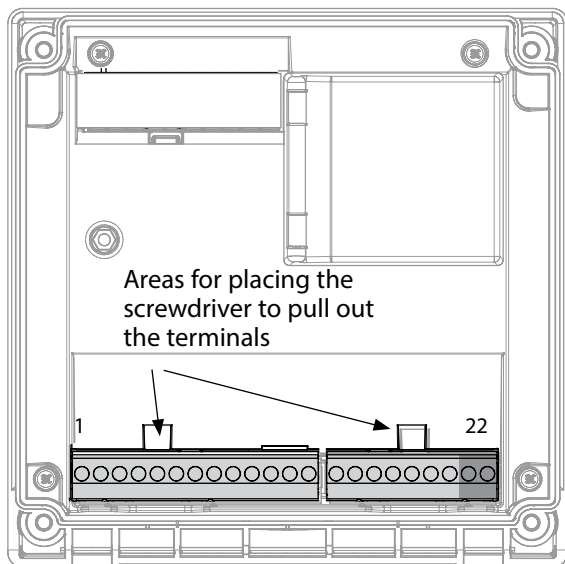the terminals

1   22

Figure:
Terminals, device opened,
back of front unit

Connecting the Memosens Sensor

Connect the Memosens sensor to the RS-485
interface of the device.
Then select the measuring function. (When you
change to another sensor type, you can change
the measuring function in the "Service" menu.)
When you select the sensor in the Configuration
menu, the calibration data are read from the
sensor. They can later be modified by calibration.

Terminal assignments		
Memosens connection		
1 (BN)	+3 V	Brown
2 (GN)	RS 485 A	Green
3 (YE)	RS 485 B	Yellow
4 (WH)	GND/shield	White / Shield
5	Power Out	
6	+ input	
7	– input	
Current outputs OUT1, OUT2		
8	+ Out 2	
9	– Out 2 / – Out 1 / HART	
10	+ Out 1 / HART	
11	HOLD	
12	HOLD / Control	
13	Control	
Relay contacts REL1, REL2		
14	REL 1	
15	REL 1/2	
16	REL 2	
17	alarm	
18	alarm	
19	wash	
20	wash	
Power supply		
21	power	
22	power	

Start-Up

Upon initial start-up, the analyzer automatically recognizes a connected module and adjusts the software correspondingly. When you replace the measuring module, you must select the corresponding measuring function in the "Service" menu.

This does not apply to the multi-channel module for dual conductivity measurement and to the connection of Memosens sensors. Here, you will be prompted to select the desired measuring function upon first start-up.

Changing the Measuring Function

In the "Service" menu you can select another measuring function at any time.

Measuring Mode

Prerequisite: A Memosens sensor is connected or a measuring module is installed with a corresponding conventional sensor connected.

After the operating voltage has been connected, the analyzer automatically goes to "Measuring" mode. To call the measuring mode from another operating mode (e.g. Diagnostics, Service): Hold **meas** key depressed (> 2 s).

Sensoface indicator (sensor status)

Time

Mode indicator (measuring)

Hold **meas** key depressed for calling the measuring mode (pressing once more switches the display)
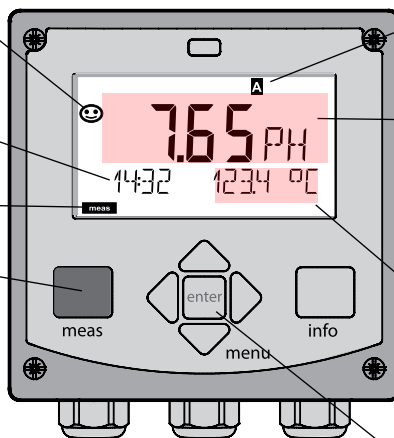
Active parameter set (configuration)

Display indicates OUT1: e.g. measured value

Display indicates OUT2: e.g. temperature

enter key

Depending on the configuration, one of the following displays can be set as standard display for the measuring mode:

- Measured value, time and temperature (default setting)
- Measured value and tag number ("TAG")
- Time and Date
- Output currents

Note: By pressing the **meas** key in measuring mode you can view the displays for approx. 60 sec.

⚠ **Caution:**
You must configure the analyzer for the respective measurement task.

Up / Down arrows
- Menu: Increase/decrease a numeral
- Menu: Selection

IrDA Interface

Left / Right arrows
- Menu: Previous/next menu group
- Number entry: Move between digits

A

HOLD

00:00

CLK: TIME hh/mm

conf

enter
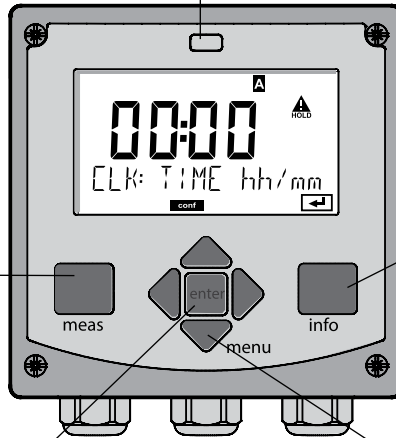
meas

info

menu

meas
- Return to last menu level
- Directly to measuring mode (press > 2 s)
- Measuring mode: other display

info
- Retrieve information
- Show error messages

enter
- Configuration: Confirm entries, next configuration step
- Calibration: Continue program flow

menu
- Measuring mode: Call menu
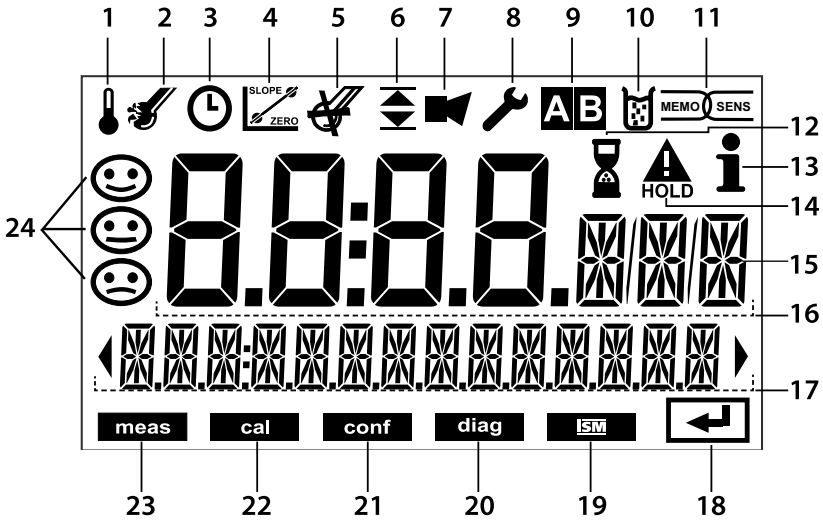
1 Temperature
2 Sensocheck
3 Interval/response time
4 Sensor data
5 Sensocheck
6 Limit message:
   Limit 1 ▼ or Limit 2 ▲
7 Alarm
8 Service
9 Parameter set
10 Calibration
11 Digital sensor
12 Waiting time running

13 Info available
14 HOLD mode active
15 Unit symbols
16 Main display
17 Secondary display
18 Proceed using enter
19 ISM sensor
20 Diagnostics
21 Configuration mode
22 Calibration mode
23 Measuring mode
24 Sensoface

Signal Colors (Display Backlighting)

Red	Alarm (in case of fault: display values blink)
Red blinking	Input error: illegal value or wrong passcode
Orange	HOLD mode (Calibration, Configuration, Service)
Turquoise	Diagnostics
Green	Info
Purple	Sensoface message

The MAIN DISPLAY is the display which is shown in measuring mode. To call the measuring mode from any other mode, hold the **meas** key depressed for at least 2 sec.

meas key

enter key

meas

By pressing **meas** briefly you can step through further displays such as tag number (TAG) or flow (L/h).
These displays are turquoise. After 60 sec they switch back to the main display.
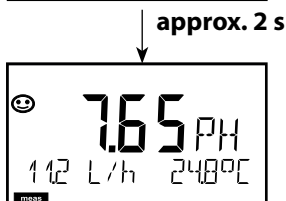
meas

Press **enter** to select a display as MAIN DISPLAY.

enter

The secondary display shows "MAIN DISPLAY – NO".
Use the **UP** / **DOWN** arrows to select "MAIN DISPLAY – YES" and confirm by pressing **enter**.
The display color changes to white.
This display is now shown in measuring mode.

approx. 2 s

The color-coded user interface guarantees increased operating safety.
Operating modes are clearly signaled.

The normal measuring mode is white. Information text appears on a green screen and the diagnostic menu appears on turquoise. The orange HOLD mode (e.g. during calibration) is quickly visible as is the magenta screen which indicates asset management messages for predictive diagnostics – such as maintenance request, pre-alarm and sensor wear.
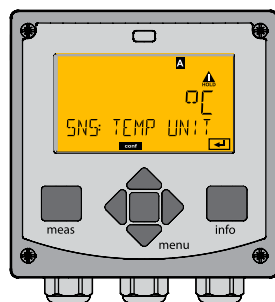
The alarm status has a particularly noticeable red display color and is also signaled by flashing display values. Invalid inputs or false passcodes cause the entire display to blink red so that operating errors are noticeably reduced.
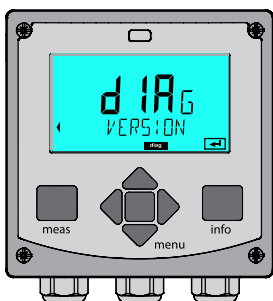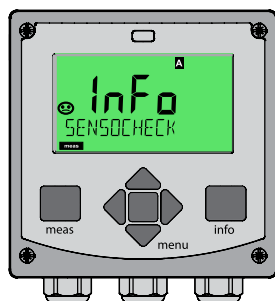
White:
Measuring mode

Red blinking:
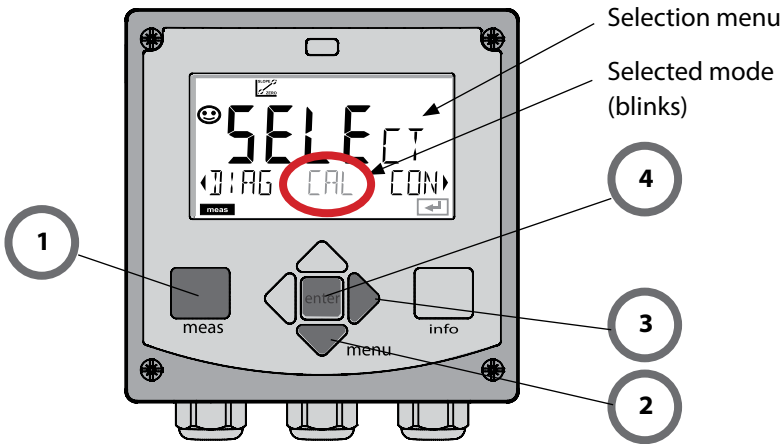Alarm, errors

Orange:
HOLD mode

Magenta:
Maintenance request

Turquoise:
Diagnostics

Green:
Information texts

To select the operating mode:
1) Hold **meas** key depressed (> 2 s) (measuring mode)
2) Press **menu** key: the selection menu appears
3) Select operating mode using left / right arrow key
4) Press **enter** to confirm the selected mode

Selection menu

Selected mode (blinks)

To enter a value:
5) Select numeral: left / right arrow
6) Change numeral: up / down arrow
7) Confirm entry by pressing **enter**
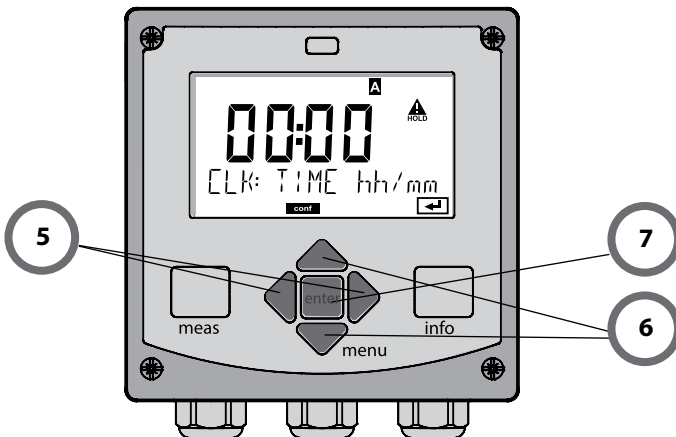
Diagnostics
Display of calibration data, display of sensor data, sensor monitor, performing a device self-test, viewing the logbook entries, display of hardware/software versions of the individual components. The logbook can store 100 events (00...99). They can be displayed directly on the device. The logbook can be extended to 200 entries using a TAN (Option).

HOLD
Manual activation of HOLD mode, e.g. for replacing a sensor. The signal outputs adopt a defined state.

Calibration
Every sensor has typical characteristic values, which change in the course of the operating time. Calibration is required to supply a correct measured value. The device checks which value the sensor delivers when measuring in a known solution. When there is a deviation, the device can be "adjusted". In that case, the device displays the "actual" value and internally corrects the measurement error of the sensor. Calibration must be repeated at regular intervals. The time between the calibration cycles depends on the load on the sensor. During calibration the device is in HOLD mode.
During calibration the device remains in the HOLD mode until it is stopped by the operator.

Configuration
You must configure the analyzer for the respective measurement task. In the "Configuration" mode you select the measurement method, the connected sensor, the measuring range to be transmitted, and the conditions for warning and alarm messages. During configuration the device is in HOLD mode.
Configuration mode is automatically exited 20 minutes after the last keystroke. The device returns to measuring mode.

Service
Maintenance functions (current source, relay test, controller test), IrDA operation, passcode assignment, device type selection, reset to factory settings, enabling of options (TAN).

The HOLD mode is a safety state during configuration and calibration.
Output current is frozen (LAST) or set to a fixed value (FIX).
Alarm and limit contacts are disabled.
The display backlighting turns orange, display icon:

Output signal response
- **LAST:** The output current is frozen at its last value. Recommended for short configuration procedures. The process should not change decisively during configuration. Changes are not noticed with this setting!
- **FIX:** The output current is set to a value that is noticeably different from the process value to signal the control system that the device is being worked at.

Output signal during HOLD:
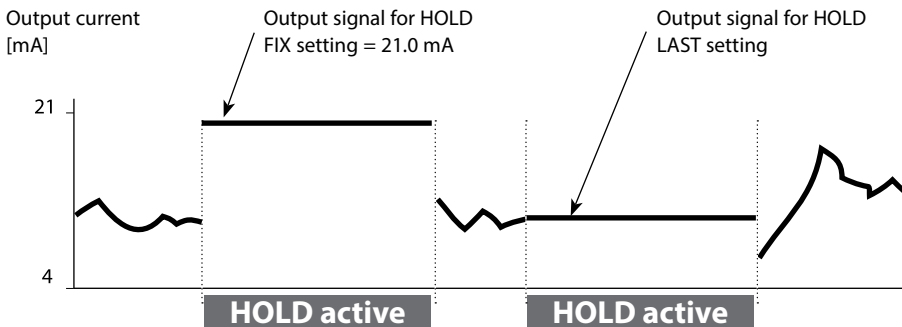
Terminating the HOLD mode
The HOLD mode is exited by switching to measuring mode (hold **meas** key depressed). The display reads "Good Bye". After that, the HOLD mode is exited. When the calibration mode is exited, a confirmation prompt ensures that the installation is ready for operation (e.g.: sensor reinstalled, located in process).

External activation of HOLD
The HOLD mode can be activated from outside by sending a signal to the HOLD input (e.g. from the process control system).

HOLD inactive	0...2 V AC/DC
HOLD active	10...30 V AC/DC

Alarm

When an error has occurred, **Err xx** is displayed immediately.

Only after expiry of a user-defined delay time will the alarm be registered and entered in the logbook.

During an alarm the display blinks, the display backlighting turns **red**.

Error messages can also be signaled by a 22 mA output current (when configured correspondingly).

The alarm contact is activated by alarm or power failure. 2 sec after the failure event is corrected, the alarm status will be deleted.

The 22-mA signal can also be triggered by Sensoface messages (configurable).

Generating a message via the CONTROL input

(min. flow / max. flow)

The CONTROL input can be used for parameter set selection or for flow measurement (pulse principle), depending on its assignment in the "Configuration" menu.

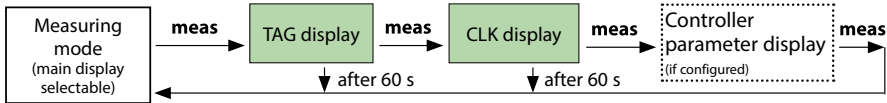When preset to flow measurement

CONF/CNTR_IN/CONTROL = FLOW

an alarm can be generated when the measured flow exceeds a specified range:

CONF/ALA/FLOW CNTR = ON

CONF/ALA/FLOW min (specify value, default: 5 liters/h)

CONF/ALA/FLOW max (specify value, default: 25 liters/h)

| Measuring mode (main display selectable) | **meas** → | TAG display | **meas** → | CLK display | **meas** → | Controller parameter display (if configured) | **meas** → |

↓ after 60 s   ↓ after 60 s
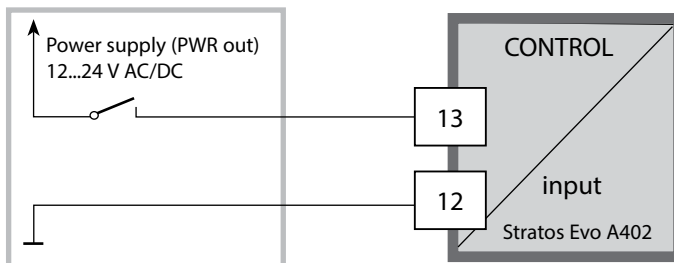
Pressing the **menu** key (down arrow) opens the selection menu.
Select the menu group using the left/right arrow keys.
Pressing **enter** opens a menu item. Press **meas** to return.

DIAG

CALDATA	Display of calibration data
SENSOR	Display of sensor data
SELFTEST	Self test: RAM, ROM, EEPROM, module
LOGBOOK	100 events with date and time
MONITOR	Display of direct sensor values
VERSION	Display of software version, model designation, serial number

HOLD

Manual activation of HOLD mode, e.g. for sensor replacement.
The signal outputs behave as configured (e.g. last measured value, 21 mA)

CAL

pH	pH adjustment / ORP adjustment / product calibration
Oxy	Adjustment (WTR/AIR) / zero adjustment / prod. cal.
COND(I)	Adjustment with solution / cell factor input / prod. cal.
CAL_RTD	Adjustment of temperature probe

CONF

| PARSET A | For configuring parameter set A / B |
| PARSET B | see "Overview of Configuration" on next page. |

SERVICE

(Access via code, factory setting: 5555)

MONITOR	Display of measured values for validation (simulators)
SENSOR	Sensor (resetting diagnostics messages)
POWER OUT	Selecting the output voltage (3.1 V / 12 V / 15 V / 24 V)
OUT1	Current source, output 1
OUT2	Current source, output 2
RELAIS	Relay test
CONTROL	Controller: manual specification of controller output
IRDA	IrDA activation
CODES	Specifying access codes for operating modes
DEVICE TYPE	Selecting the device type
DEFAULT	Reset to factory setting
OPTION	Enabling an option via TAN

The configuration steps are assigned to different menu groups. Using the left/right arrow keys, you can jump between the individual menu groups. Each menu group contains menu items for setting the parameters. Pressing **enter** opens a menu item. Use the arrow keys to edit a value. Press **enter** to confirm/save the settings.
Return to measurement: Hold **meas** key depressed (> 2 s).

Select menu group	Menu group	Code	Display	Select menu item
	Sensor selection (multi-channel device: select sensor A / sensor B)	SNS: (S_A / S_B)	ConF SENSOR	**enter**
			Menu item 1	**enter**
			⋮	**enter**
			Menu item ...	**enter**
▶	Current output 1	OT1:	ConF OUT 1	**enter**
▶	Current output 2	OT2:	ConF OUT2	
▶	Compensation	COR:	ConF CORRECTION	
▶	Control input (parameter set or flow measurement)	IN:	00.00 %/K COR TC LIQUID	
▶	Alarm mode	ALA:	ConF ALARM	
▶	Relay outputs	REL:	ConF REL 1/REL2	
▶	Cleaning	WSH:	ConF WASH	◀
▶	Setting the clock	CLK:	ConF CLOCK	◀
	Tag number	TAG:	ConF TAG	

Parameter Set A/B: Configurable Menu Groups

The device provides 2 parameter sets "A" and "B". By switching between the parameter sets you can adapt the device to different measurement situations, for example. Parameter set "B" only permits setting of process-related parameters.

Menu group	Parameter set A	Parameter set B
SENSOR	Sensor selection	---
OUT1	Current output 1	Current output 1
OUT2	Current output 2	Current output 2
CORRECTION	Compensation	Compensation
CNTR_IN	Control input	---
ALARM	Alarm mode	Alarm mode
REL 1/REL 2	Relay outputs	Relay outputs
WASH	Cleaning	---
PARSET	Parameter set selection	---
CLOCK	Setting the clock	---
TAG	Tag number	---

External switchover of parameter sets A/B

You can switch between parameter sets A and B by applying a signal to the CONTROL input (setting: CNTR-IN – PARSET).

e.g. process control system
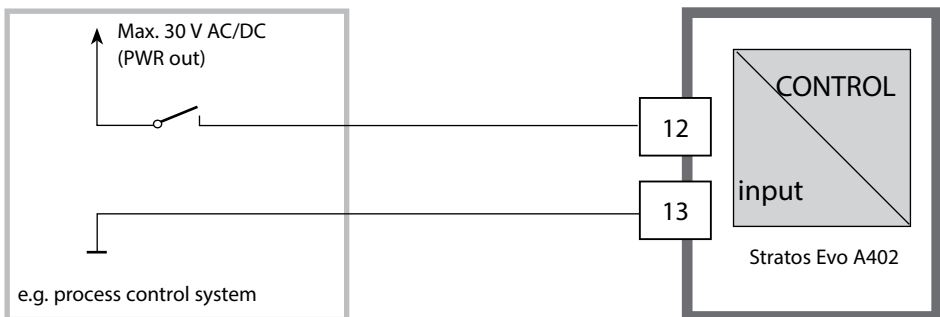
Parameter set A active	0...2 V AC/DC
Parameter set B active	10...30 V AC/DC

Parameter Set A/B: Manual Switchover

Display	Action	Remark
	To switch between parameter sets: Press **meas**	Manual selection of parameter sets must have been preset in CONFIG mode. Default setting is a fixed parameter set A. Wrong settings change the measurement properties!
☺ **7.23** PH PARSET~B	PARSET blinks in the lower line. Select parameter set using ◀ and ▶ keys.	
☺ **7.23** PH PARSET A	Select PARSET A / PARSET B	The currently active parameter set is read on the display: ☺ **7.2** i
	Press **enter** to confirm. Cancel by pressing **meas**	

Parameter Set A/B: Signaling via WASH Contact

Wash	**19** Wash
	20 Wash
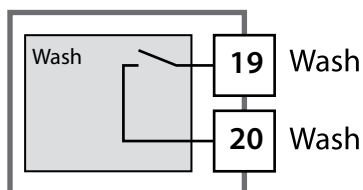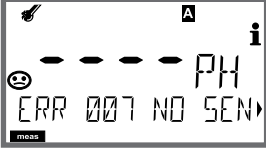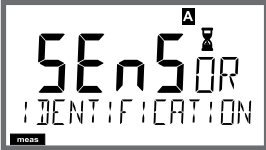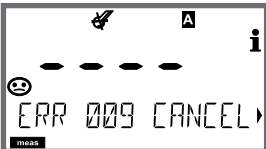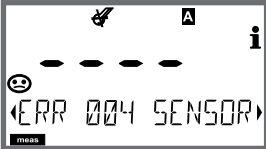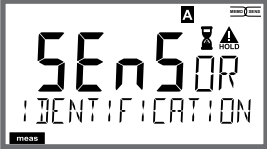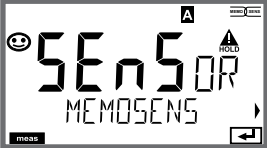
The active parameter set can be signaled using the WASH contact:

If configured correspondingly, the WASH contact signals:
Parameter set A: Contact open
Parameter set B: Contact closed

Step	Action/Display	Remark
Connect sensor	```␣␣␣␣ A␣␣␣i␣␣- - - - PH ERR 007 NO SEN▸```	Before a Memosens sensor is connected, the error message "NO SENSOR" is displayed.
Wait until the sensor data are displayed.	```5En5oR IDENTIFICATION```	The hourglass in the display blinks.
Check sensor data	```5En5oR MEMOSENS``` View sensor information using ◄ ► keys, confirm using **enter**.	Sensoface is friendly when the sensor data are okay.
Go to measuring mode	Press **meas**, **info** or **enter**	After 60 sec the device automatically returns to measuring mode (timeout).
Possible error message		
Sensor worn out. Replace sensor	```- - - - ERR 009 CANCEL▸```	When this error message appears, the sensor cannot be used any more. Sensoface is sad.
Sensor defective. Replace sensor	```- - - - ◄ERR 004 SENSOR▸```	When this error message appears, the sensor cannot be used. Sensoface is sad.

Step	Action/Display	Remark
Select HOLD mode A sensor should only be replaced during HOLD mode to prevent un-intended reactions of the outputs or contacts.	Press **menu** key to call the selection menu, select HOLD using the ◀ ▶ keys, press **enter** to confirm.	Now the device is in HOLD mode. The HOLD mode can also be activated externally via the HOLD input. During HOLD the output current is frozen at its last value or set to a fixed value.
Disconnect and remove old sensor		
Install and connect new sensor.		Temporary messages which are activated during the replace-ment are indicated but not out-put to the alarm contact and not entered in the logbook.
Wait until the sensor data are displayed.	SEnSoR IDENTIFICATION meas	
Check sensor data	SEnSoR MEMOSENS meas View sensor information using ◀ ▶ keys, confirm using **enter**.	You can view the sensor manu-facturer and type, serial number and last calibration date.
Check measured values		
Exit HOLD	Hit **meas** key: Return to the selection menu. Hold **meas** key depressed: Device switches to measuring mode.	

pH

Overview of pH Sensor Configuration

pH sensor			Choices	Default
SNS:			STANDARD, ISFET INDUCON, ISM MEMOSENS	STANDARD
	RTD TYPE (omitted for ISM)		100 PT, 1000 PT, 30 NTC, 8.55 NTC, Balco 3kOhm	100 PT
	TEMP UNIT		°C / °F	°C
	TEMP MEAS [*]		AUTO, MAN, EXT (EXT only with I-input enabled via TAN)	AUTO
		MAN	−20...200 °C (−4...392 °F)	025.0 °C (077.0 °F)
	TEMP CAL		AUTO, MAN, EXT (EXT only with I-input enabled via TAN)	AUTO
		MAN	−20...200 °C (−4...392 °F)	025.0 °C (077.0 °F)
	NOM ZERO [**]		0.00 ... 14.00 PH	07.00 PH
	NOM SLOPE [**]		30.0 ... 60.0 mV	059.2 mV
	PH_ISO [**]		0.00 ... 14.00 PH	07.00 PH
	CAL MODE		AUTO, MAN, DAT	AUTO
		AUTO BUFFER SET	-01-...-10-, -U1- **Please note:** Pressing **info** displays nominal buffer values + manufacturer	-02-
		U1 (For specifiable buffer set, see Appendix: "Buffer Tables")	EDIT BUFFER 1 (NO, YES) Enter values for buffer 1	NO
			EDIT BUFFER 2 (NO, YES) Enter values for buffer 2	NO
	CAL TIMER (omitted for ISM)		OFF, FIX, ADAPT	OFF
	ON	CAL-CYCLE	0...9999 h	0168 h

[*]   The setting: TEMP MEAS: AUTO/MAN/EXT applies to all outputs: OUT1/OUT2/limit values/controller/display; Sensors with deviating zero/slope require the "Pfaudler" option (TAN). Settings with "Sensor: STANDARD" selected (not required for Memosens Pfaudler sensor).

[**]   only with STANDARD and Pfaudler option (TAN), not with Memosens Pfaudler.

pH

Device Type: pH

Connected modules are automatically recognized. When no module is installed, but a Memosens sensor is connected at initial start-up, it is recognized and the corresponding process variable is automatically selected. In the SERVICE menu you can change the device type. Afterwards, you must select the corresponding calibration mode in the CONF menu.
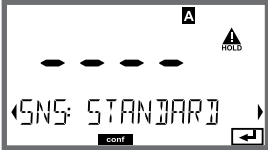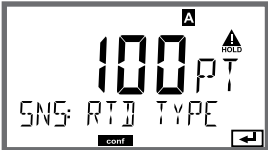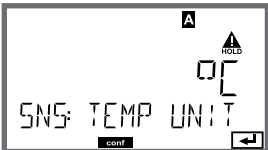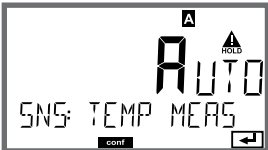
1   Press **menu** key.
2   Select **CONF** using ◀ ▶ keys,
    press **enter**.
3   Select parameter set using ◀ ▶ keys,
    press **enter**.
4   Select **SENSOR** menu using ◀ ▶ keys,
    press **enter**.
5   All items of this menu group are indicated by the "SNS:" code.
    Press **enter** to select menu,
    edit using arrow keys (see next page).
    Confirm (and proceed) by pressing **enter**.
6   Exit: Press **meas** key until the [meas] mode indicator is displayed.

Select sensor type	**enter**
Select type of temp probe
Temperature unit
Temp detection during measurement
(Manual temperature)
Temp detection during calibration
(Manual temperature)
Calibration mode
(AUTO: Buffer set)
Calibration timer
Calibration cycle
Cleaning cycles
Cleaning cycle counter
Sterilization cycles
Sterilization cycle counter

5

Menu item	Action	Choices
Select sensor type `‹SNS: STANDARD ›`	Select sensor type using ▲ ▼ keys. Press **enter** to confirm.	**STANDARD** ISFET Digital sensors: INDUCON ISM MEMOSENS

Select type of temp probe
 	
`100 PT`
`SNS: RTD TYPE`
	(not for digital sensors)
	Select type of temperature probe using ▲ ▼ keys.
	
	Press **enter** to confirm.
		100 PT
		1000 PT
		30 NTC
		8.55 NTC
		Balco 3 kOhm

Temperature unit
 	
`°C`
`SNS: TEMP UNIT`
	Select °C or °F using ▲ ▼ keys.
	
	Press **enter** to confirm.
		°C / °F

Temperature detection during measurement
 	
`Auto`
`SNS: TEMP MEAS`
	Select mode using ▲ ▼ keys:
	AUTO: Measured by sensor
	MAN: Direct input of temperature, no measurement (see next step)
	EXT: Temperature specified via current input (only if enabled via TAN)
	Press **enter** to confirm.
		AUTO
		MAN
		EXT

(Manual temperature)
 	
`025.0 °C`
`SNS: TEMP MEAS`
	Modify digit using ▲ ▼ keys, select next digit using ◀ ▶ keys.
	Press **enter** to confirm.
		−20...200 °C
		(−4...+392 °F)

pH

Support of Pfaudler Sensors
or pH sensors with a zero point other than pH 7 and/or deviating slope,
e.g. pH sensors with a zero point at pH 4.6

This requires an additional function (TAN). The option is enabled in the
SERVICE / OPT: PFAUDLER menu.
For Pfaudler standard pH sensors, you can specify a nominal zero point and a
nominal slope.
In addition, you can enter a pHiso value.
The additional entries appear in the CONFIGURATION / SENSOR menu:

SNS: NOM ZERO (default: 07.00 pH)
SNS: NOM SLOPE (default: 59.2 mV)
SNS: PH_ISO (default: 07.00 pH)

Prior to measurement, you must enter the values for nominal zero and slope and the
isothermal intersection point pHiso as provided by the manufacturer and perform a
calibration using suitable buffer solutions.
When you use a Memosens Pfaudler sensor, the data will be read from the sensor or
will be set to standard values. Here, you do not have to make entries. The respective
menu items will be suppressed.
The nominal ZERO/SLOPE values are required for the proper functioning of the sen-
sor monitoring and calibration functions (Sensoface, Calimatic), they do not replace
an adjustment (calibration)!

Typical values

Probe	Pfaudler enamel probes (Pfaudler specifications)	Probes with absolute pH measurement and Ag/AgCl reference system	Probes with absolute pH measurement and Ag/A (silver acetate) reference system	Differential pH probe
Nom. slope	55 mV/pH	55 mV/pH	55 mV/pH	55 mV/pH
Nom. zero	pH 8.65	pH 8.65	pH 1.35	pH 7 ... 12
pHiso	pH 1.35	pH 1.35	pH 1.35	pH 3.00

Note:
Please refer to the operating instructions of the respective sensor for more information on functioning, installation, calibration and configuration.

pH
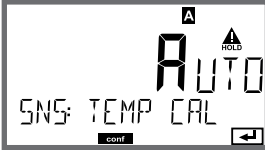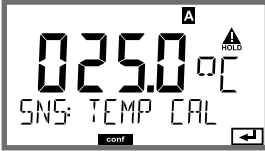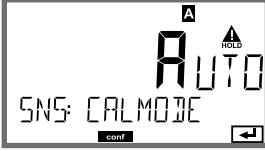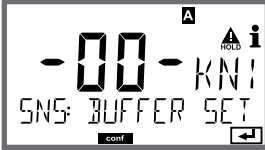
Sensor, Temp Detection during Calibration, Calibration Mode

1

menu

2

SELECT
CONF

meas

enter

3

ConF
PARSET A P

conf

enter

4

ConF
SENSOR

conf

enter

5

- - - -
SNS STANDARD

conf

meas

6

7.23 PH
14:18 27.4 °C

meas

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using keys,
   press **enter**.
4 Select **SENSOR** menu using ◀ ▶ keys,
   press **enter**.
5 All items of this menu group are indicated by the "SNS:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

5

	enter
Select sensor type	
Select type of temp probe	
Temperature unit	
Temp detection during measurement	
(Manual temperature)	
Temp detection during calibration	
(Manual temperature)	
Calibration mode	
(AUTO: Buffer set)	
Calibration timer	
Calibration cycle	
Cleaning cycles	
Cleaning cycle counter	
Sterilization cycles	
Sterilization cycle counter	

pH

5

Menu item	Action	Choices
Temp detection during calibration	Select mode using ▲ ▼ keys: AUTO: Measured by sensor MAN: Direct input of temperature, no measurement (see next step) EXT: Temperature specified via current input (only if enabled via TAN) Press **enter** to confirm.	**AUTO** MAN EXT
(Manual temperature)	Modify digit using ▲ ▼ keys, select next digit using ◄ ► keys. Press **enter** to confirm.	–20...200 °C (–4...+392 °F)
Calibration mode	Select CALMODE using ▲ ▼ keys: AUTO: Calibration with Calimatic buffer set recognition MAN: Manual entry of buffer solutions DAT: Input of adjustment data of premeasured sensors Press **enter** to confirm.	**AUTO** MAN DAT
(AUTO: Buffer set)	Select buffer set using ▲ ▼ keys (see buffer tables for nominal values) Press **enter** to confirm.	-00-...-10-, (-U1-, see Appendix) Pressing the **info** key displays the manufacturer and nominal values in the lower line.

pH
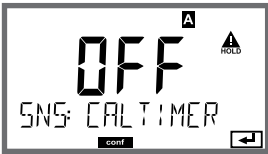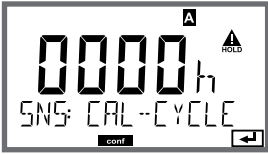
Sensor, Calibration Timer, Calibration Cycle

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶ keys,
   press **enter**.
4 Select **SENSOR** menu using ◀ ▶ keys,
   press **enter**.
5 All items of this menu group are indicated by the "SNS:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

Select sensor type	**enter**
Select type of temp probe	
Temperature unit	
Temp detection during measurement	
(Manual temperature)	
Temp detection during calibration	
(Manual temperature)	
Calibration mode	
(AUTO: Buffer set)	
Calibration timer	
Calibration cycle	
Cleaning cycles	
Cleaning cycle counter	
Sterilization cycles	
Sterilization cycle counter	

pH

5

Menu item	Action	Choices

Calibration timer
 	
`OFF`
`SNS: CALTIMER`
A / HOLD / conf
	Adjust CALTIMER using ▲ ▼:
	OFF: No timer
	ADAPT: Maximum cal cycle (adjust in the next step)
	FIX: Fixed cal cycle (adjust in the next step)
	Press **enter** to confirm.
		OFF/ADAPT/FIX
		
		With ADAPT, the calibration cycle is automatically reduced depending on the sensor load (high temperatures and pH values) and for digital sensors also depending on the sensor wear

Calibration cycle
 	
`0000 h`
`SNS: CAL-CYCLE`
A / HOLD / conf
	Only with FIX/ADAPT:
	Modify digit using ▲ ▼ keys, select next digit using ◄ ► keys.
	Press **enter** to confirm.
		0...9999 h

Note for the calibration timer:
When Sensocheck has been activated in the Configuration / Alarm menu,
the expiration of the calibration interval is indicated by Sensoface:

Display	Status
🧪 + 😐	Over 80 % of the calibration interval has already passed.
🧪 + 🙁	The calibration interval has been exceeded.

The calibration timer settings apply to both parameter sets A and B.

The time remaining until the next due calibration can be seen in the diagnostics menu (see Diagnostics chapter).

pH

ISM Sensor, Adaptive Cal Timer (ACT)

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶ keys,
   press **enter**.
4 Select **SENSOR** menu using ◀ ▶ keys,
   press **enter**.
5 All items of this menu group are indicated by the "SNS:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
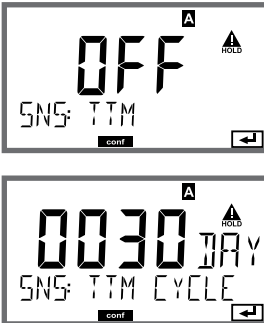6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

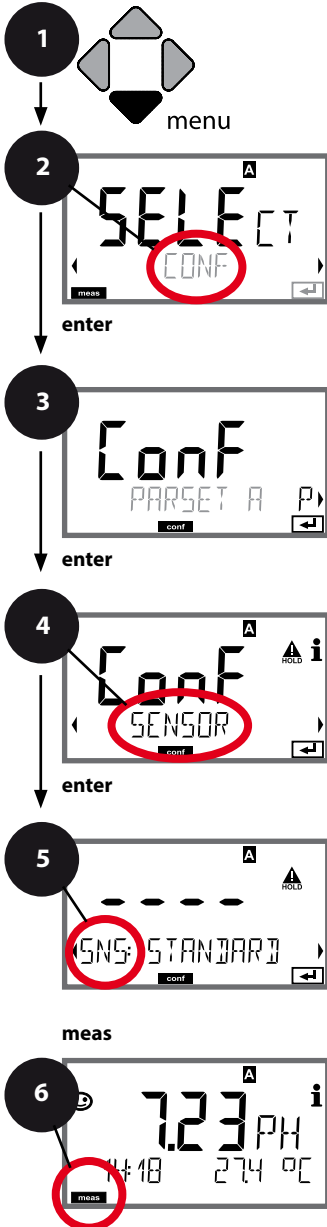|	
Select sensor type	**enter**
Temperature unit	
Temp detection during measurement	
(Manual temperature)	
Temp detection during calibration	
(Manual temperature)	
Calibration mode	
(AUTO: Buffer set)	
ACT - Adaptive calibration timer	
TTM - Adaptive maintenance timer	
CIP/SIP cycles	
Autoclaving counter	

5

Adaptive Cal Timer (ACT)

By issuing a Sensoface message, the adaptive calibration timer reminds you to calibrate the sensor. After expiration of the interval, Sensoface is getting "sad". Pressing the info key shows the text "OUT OF CAL TIME CALIBRATE SENSOR" which reminds you that a calibration is due. The ACT interval is either read automatically from the sensor settings or can be specified manually (max. 9999 days). Stressing influences (temperature, measurement in extreme ranges) shorten the timer interval.

The adaptive cal timer is reset after each calibration.

You can configure the current outputs so that a Sensoface message generates a 22-mA error signal, see page 125.

Menu item	Action	Choices
Adaptive cal timer (ACT) OFF SNS: ACT A HOLD conf 0007 DAY SNS: ACT CYCLE A HOLD conf	Select using ▲ ▼ keys: AUTO: The interval stored in the ISM sensor is used (default) MAN: The interval is specified manually (0 ... 9999 days) Confirm by pressing**enter**	**OFF**/AUTO/MAN

pH

ISM Sensor, Adaptive Maintenance Timer (TTM)

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶ keys,
   press **enter**.
4 Select **SENSOR** menu using ◀ ▶ keys,
   press **enter**.
5 All items of this menu group are indicated by the "SNS:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

Select sensor type	enter
Temperature unit	
Temp detection during measurement	
(Manual temperature)	
Temp detection during calibration	
(Manual temperature)	
Calibration mode	
(AUTO: Buffer set)	
ACT - Adaptive calibration timer	
TTM - Adaptive maintenance timer	
CIP/SIP cycles	
Autoclaving counter	

pH

5

Adaptive Maintenance Timer (TTM, Time to Maintenance)

By issuing a Sensoface message, the adaptive maintenance timer reminds you to service the sensor. After expiration of the interval, Sensoface is getting "sad". Pressing the info key shows the text "OUT OF MAINTENANCE CLEAN SENSOR" which reminds you that a sensor maintenance is due. The TTM interval is either read automatically from the sensor settings or can be specified manually (max. 9999 days).

Stressing influences (temperature, measurement in extreme ranges) shorten the timer interval.

You can configure the current outputs so that a Sensoface message generates a 22-mA error signal, see page 125.

Menu item	Action	Choices

Adaptive maintenance timer (TTM)
 	
`OFF`
`SNS: TTM`
 	
`0030 DAY`
`SNS: TTM CYCLE`
	Select using ▲ ▼ keys:
	AUTO:
	The interval stored in the ISM sensor is used (default)
	MAN:
	The interval is specified manually (0 ... 9999 days)
	
	Confirm by pressing **enter**
		OFF/AUTO/MAN

The adaptive maintenance timer can be reset in the SERVICE / SENSOR / TTM menu. Here, the interval is reset to its initial value.		
`YES` `TTM RESET`	To do so, select **"TTM RESET = YES"** and confirm by pressing **enter**.	**NO** / YES

pH

Standard and ISFET Sensor, CIP/SIP Cycles

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶ keys,
   press **enter**.
4 Select **SENSOR** menu using ◀ ▶ keys,
   press **enter**.
5 All items of this menu group are indicated by the "SNS:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
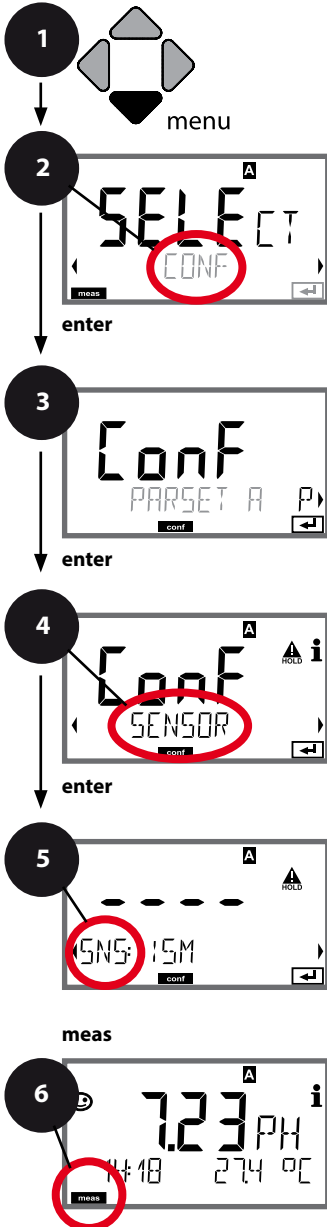6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

Select sensor type	enter
Select type of temp probe	
Temperature unit	
Temp detection during measurement	
(Manual temperature)	
Temp detection during calibration	
(Manual temperature)	
Calibration mode	
(AUTO: Buffer set)	
Calibration timer	
Calibration cycle	
CIP cleaning cycles	
SIP sterilization cycles	

5

Menu item	Action	Choices
CIP / SIP		
The following adjustments are possible for standard and ISFET sensors:		
Cleaning cycles OFF SNS: CIP COUNT conf	Select On or OFF using ▲ ▼ keys. When switched on, the cycles will be entered in the extended logbook but not counted. Press **enter** to confirm.	ON/**OFF**
Sterilization cycles On SNS: SIP COUNT conf	Select On or OFF using ▲ ▼ keys. When switched on, the cycles will be entered in the extended logbook but not counted. Press **enter** to confirm.	ON/**OFF**

Logging the cleaning and sterilization cycles with connected sensor helps measuring the load on the sensor.
Suitable for biochemical applications (process temperature approx. 0 ... 50 °C, CIP temperature > 55 °C, SIP temperature > 115 °C).

pH
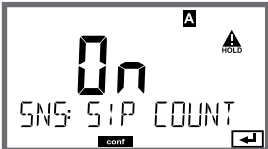
ISM Sensor, InduCon, CIP Cleaning Cycles, SIP Sterilization Cycles
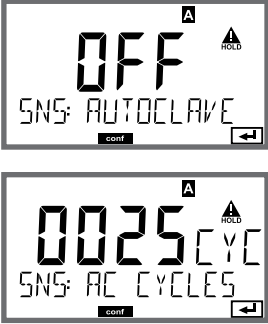
1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
  press **enter**.
3 Select parameter set using ◀ ▶ keys,
  press **enter**.
4 Select **SENSOR** menu using ◀ ▶ keys,
  press **enter**.
5 All items of this menu group are indicated by the "SNS:" code.
  Press **enter** to select menu,
  edit using arrow keys (see next page).
  Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is displayed.

| Select sensor type |
| Temperature unit |
| Temp detection during measurement |
| (Manual temperature) |
| Temp detection during calibration |
| (Manual temperature) |
| Calibration mode |
| (AUTO: Buffer set) |
| ACT - Adaptive calibration timer |
| TTM - Adaptive maintenance timer |
| Cleaning cycle counter |
| Cleaning cycles |
| Sterilization cycle counter |
| Sterilization cycles |
| Autoclaving counter |

5

Menu item	Action	Choices
CIP / SIP		
The following adjustments are possible for ISM and InduCon sensors:		
Cleaning cycle counter **OFF** Ⓐ ⚠ HOLD SNS: CIP COUNT conf ↵	Select ON or OFF using ▲ ▼ keys. Press **enter** to confirm.	ON/**OFF**
Cleaning cycles **0025** CYC Ⓐ ⚠ HOLD SNS: CIP CYCLES conf ↵	Only with CIP COUNT ON: Enter value using ▲ ▼ ◀ ▶ keys Press **enter** to confirm.	0...9999 CYC (**0000 CYC**)
Sterilization cycle counter (also Memosens) **On** Ⓐ ⚠ HOLD SNS: SIP COUNT conf ↵	Select ON or OFF using ▲ ▼ keys. Press **enter** to confirm.	ON/**OFF**
Sterilization cycles **0025** CYC Ⓐ ⚠ HOLD SNS: SIP CYCLES conf ↵	Only with CIP COUNT ON: Enter value using ▲ ▼ ◀ ▶ keys Press **enter** to confirm.	0...9999 CYC (**0000 CYC**)

The cleaning and sterilization cycles are counted to measure the load on the sensor. Suitable for biochemical applications (process temperature approx. 0 ... 50 °C, CIP temperature > 55 °C, SIP temperature > 115 °C).

pH

ISM Sensor, InduCon, Autoclaving Counter

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶ keys,
   press **enter**.
4 Select **SENSOR** menu using ◀ ▶ keys,
   press **enter**.
5 All items of this menu group are indicated by the "SNS:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

Select sensor type	**enter**
Temperature unit	
Temp detection during measurement	
(Manual temperature)	
Temp detection during calibration	
(Manual temperature)	
Calibration mode	
(AUTO: Buffer set)	
ACT - Adaptive calibration timer	
TTM - Adaptive maintenance timer	
CIP/SIP cycles	
Autoclaving counter	

5

Autoclaving Counter

After reaching a specified limit value the autoclaving counter generates a Senso-face message. As soon as the counter has reached the specified value, Sensoface is getting "sad". Pressing the info key shows the text "AUTOCLAVE CYCLES OVERRUN" which reminds you that the maximum number of autoclaving cycles has been reached. After each autoclaving process, you must manually increment the auto-claving counter in the SENSOR service menu. The transmitter displays "INCREMENT AUTOCLAVE CYCLE" as confirmation. You can configure the current outputs so that a Sensoface message generates a 22-mA error signal, see page 125.

Menu item	Action	Choices

Autoclaving counter
 	
`OFF`
`SNS: AUTOCLAVE` `conf`
 	
`0025 CYC`
`SNS: AC CYCLES` `conf`
	Select using ▲ ▼ keys:
	ON:
	Enter the number of cycles
	(0 ... 9999).
	
	Press **enter** to confirm.
		OFF/ON

With the autoclaving counter switched on, you must increment the count after each autoclaving process in the SERVICE/SENSOR/AUTOCLAVE ... menu:		

Incrementing the autoclaving counter
(SERVICE menu)
 	
`24 YES`
`AUTOCLAVE +1`
	After having completed an autoclaving process, open the SERVICE menu SENSOR / AUTOCLAVE to increment the autoclaving count.
	To do so, select "**YES**" and confirm by pressing **enter**.
		NO / YES

Overview of Cond Sensor Configuration

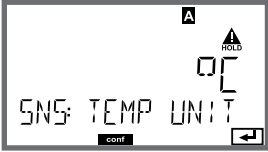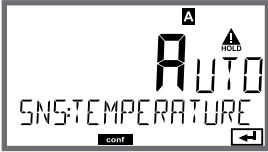| Cond sensor			Choices	Default
SNS:			2-ELECTRODE 4-ELECTRODE MEMOSENS	2-ELECTRODE
	2-EL / 4-EL	CELLFACTOR [1]	00.0000- 19.9999 c	01.0000 c
	MEAS MODE		Cond Conc % Sal ‰ USP µS/cm	Cond
	Cond	MEAS RANGE [2]	x.xxx µS/cm xx.xx µS/cm xxx.x µS/cm xxxx µS/cm x.xxx mS/cm xx.xx mS/cm xxx.x mS/cm x.xxx S/m xx.xx S/m xx.xx MΩ	xxx.x mS/cm
	Conc	Solution	-01- (NaCl) -02- (HCl) -03- (NaOH) -04- (H2SO4) -05- (HNO3) -06- (H2SO4) -07- (HCl) -08- (HNO3) -09- (H2SO4) -10- (NaOH)	-01- (NaCl)
	TEMP UNIT		°C / °F	°C
	TEMPERATURE (EXT. only with I-input enabled via TAN)		AUTO MAN EXT (only if enabled via TAN)	AUTO
	AUTO	RTD TYPE	100 PT 1000 PT 8.55 NTC 30 NTC Ni100	100 PT
	MAN	TEMPERATURE	−50 ... 250 °C (−58 ... 482 °F)	025.0 °C (077.0 °F)

Cond Configuration

Cond

Device Type: Cond

Connected modules are automatically recognized. When no module is installed, but a Memosens sensor is connected at initial start-up, it is recognized and the corresponding process variable is automatically selected. In the SERVICE menu you can change the device type. Afterwards, you must select the corresponding calibration mode in the CONF menu.

1   Press **menu** key.
2   Select **CONF** using ◀ ▶ keys,
    press **enter**.
3   Select parameter set using ◀ ▶ keys,
    press **enter**.
4   Select **SENSOR** menu using ◀ ▶ keys,
    press **enter**.
5   All items of this menu group are indicated by the "SNS:" code.
    Press **enter** to select menu,
    edit using arrow keys (see next page).
    Confirm (and proceed) by pressing **enter**.
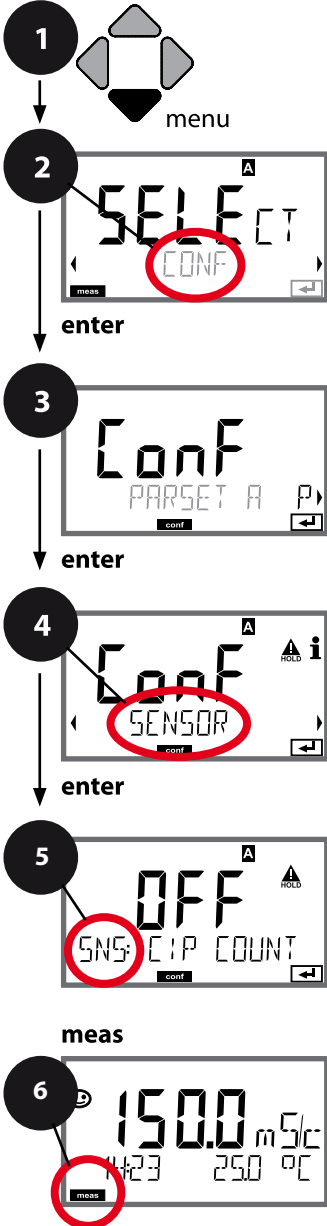6   Exit: Press **meas** key until the [meas] mode indicator is displayed.

Select sensor type	**enter**
Enter cell factor	
Select measuring mode	
Select measuring range	
Concentration determination	
Temperature unit	
Temperature detection	
Select type of temp probe	
Cleaning cycles	
Sterilization cycles	

5

Menu item	Action	Choices
Select sensor type	Select sensor type using ▲ ▼ keys. Press **enter** to confirm.	**2-ELECTRODE** 4-ELECTRODE MEMOSENS
Enter cell factor	Modify digit using ▲ ▼ keys, select next digit using ◀ ▶ keys. Press **enter** to confirm.	00.0000...19.9999 c **(01.0000 c)**
Select measuring mode	Select desired mode using ▲ ▼ keys. Press **enter** to confirm.	**Cond** Conc % Sal ‰ USP µS/cm
Select measuring range	**For cond measurement only** Select desired measuring range using ▲ ▼ keys. Press **enter** to confirm.	x.xxx µS/cm, xx.xx µS/cm xxx.x µS/cm, xxxx µS/cm x.xxx mS/cm, xx.xx mS/cm **xxx.x mS/cm**, x.xxx S/m xx.xx S/m, xx.xx MΩ
Concentration determination	**For conc measurement only** Select desired concentration solution using ▲ ▼ keys. Press **enter** to confirm.	**-01- (NaCl)** -02- (HCl) -03- (NaOH) -04- (H_2SO_4) -05- (HNO_3) -06- (H_2SO_4) -07- (HCl) -08- (HNO_3) -09- (H_2SO_4) -10- (NaOH)

Cond
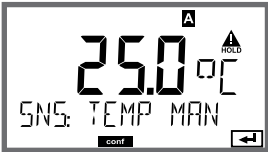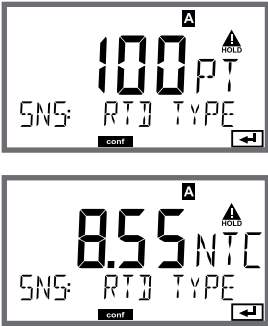
Sensor, Temperature Unit, Temp Detection, Temperature Probe

1

menu

2

```
SELECT
   CONF
```
meas

enter

3

```
ConF
PARSET A  P▸
```
conf

enter

4

```
ConF        HOLD i
  SENSOR
```
conf

enter

5

```
- - - - -  TYP
SNS:-ELECTRODE
```
conf

meas

6

```
150.0 mS/c
4:23   25.0 °C
```
meas

1   Press **menu** key.
2   Select **CONF** using ◀ ▶ keys,
    press **enter**.
3   Select parameter set using ◀ ▶ keys,
    press **enter**.
4   Select **SENSOR** menu using ◀ ▶ keys,
    press **enter**.
5   All items of this menu group are indicated by the "SNS:"
    code.
    Press **enter** to select menu,
    edit using arrow keys (see next page).
    Confirm (and proceed) by pressing **enter**.
6   Exit: Press **meas** key until the [meas] mode indicator is
    displayed.

5

	enter
Select sensor type	
Enter cell factor	
Select measuring mode	
Select measuring range	
Concentration determination	
Temperature unit	
Temperature detection	
Select type of temp probe	
Cleaning cycles	
Sterilization cycles	

5

Menu item	Action	Choices
Temperature unit °C SNS: TEMP UNIT	Select °C or °F using ▲ ▼ keys. Press **enter** to confirm.	**°C** / °F
Temperature detection AUTO SNS:TEMPERATURE	Select mode using ▲ ▼ keys: AUTO: Measured by sensor MAN: Direct input of temperature, no measurement (see next step) EXT: Temperature specified via current input (only if enabled via TAN) Press **enter** to confirm.	**AUTO** MAN EXT
(Manual temperature) 25.0 °C SNS: TEMP MAN	Modify digit using ▲ ▼ keys, select next digit using ◀ ▶ keys. Press **enter** to confirm.	–50...250 °C (–58...482 °F)
Select type of temp probe 100 PT SNS: RTD TYPE 8.55 NTC SNS: RTD TYPE	(not for Memosens) Select type of temperature probe using ▲ ▼ keys. Press **enter** to confirm.	**100 PT** 1000 PT 30 NTC 8.55 NTC Ni100

Cond

Sensor, Cleaning Cycles, Sterilization Cycles

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
  press **enter**.
3 Select parameter set using ◀ ▶ keys,
  press **enter**.
4 Select **SENSOR** menu using ◀ ▶ keys,
  press **enter**.
5 All items of this menu group are indicated by the "SNS:"
  code.
  Press **enter** to select menu,
  edit using arrow keys (see next page).
  Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
  displayed.

Select sensor type	**enter**
Enter cell factor	
Select measuring mode	
Select measuring range	
Concentration determination	
Temperature unit	
Temperature detection	
Select type of temp probe	
Cleaning cycles	
Sterilization cycles	

5

Menu item	Action	Choices
CIP / SIP		

Cleaning cycles on/off
 	
`OFF`
`SNS: CIP COUNT`
	Select ON or OFF using ▲ ▼ keys.
	Activates/deactivates logging in extended logbook
	Press **enter** to confirm.
		ON/**OFF**

Sterilization cycles on/off
 	
`On`
`SNS: SIP COUNT`
	Select ON or OFF using ▲ ▼ keys.
	Activates/deactivates logging in extended logbook
	Press **enter** to confirm.
		ON/**OFF**

The cleaning and sterilization cycles are logged to measure the load on the sensor.
Suitable for biochemical applications (process temperature approx. 0 ... 50 °C,
CIP temperature > 55 °C, SIP temperature > 115 °C).

Note:
A CIP or SIP cycle is only entered into the logbook 2 hours after the start to ensure
that the cycle is complete.

Overview of CondI Sensor Configuration

CondI Sensor			Choices	Default
SNS:			SE 655 SE 656 SE 660 SE 670 SE 680 OTHER	SE 655
	OTHER	RTD TYPE	100PT / 1000PT / 30 NTC	1000PT
		CELL FACTOR	XX.XXx	01.980
		TRANS RATIO	XXX.Xx	120.0
	MEAS MODE		Cond Conc % Sal ‰	Cond
	Cond	MEAS RANGE	x.xxx mS/cm xx.xx mS/cm xxx.x mS/cm x.xxx S/m xx.xx S/m	x.xxx mS/cm
	Conc	Solution	-01- (NaCl) -02- (HCl) -03- (NaOH) -04- (H2SO4) -05- (HNO3) -06- (H2SO4) -07- (HCl) -08- (HNO3) -09- (H2SO4) -10- (NaOH)	-01- (NaCl)
	TEMP UNIT		°C / °F	°C

CondI Configuration

CondI
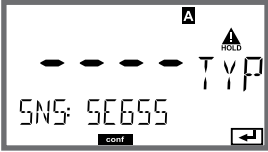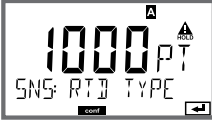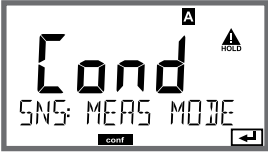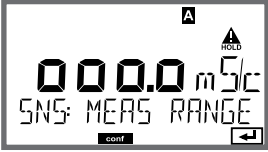
Device Type: CondI

Connected modules are automatically recognized.
In the SERVICE menu you can change the device type.
Afterwards, you must select the corresponding calibration
mode in the CONF menu.

1

menu

2

SELECT
CONF

enter

3

ConF
PARSET A P

enter

4

ConF
SENSOR

enter

5

- - - - - TYP
SNS: SE655

meas

6

150.0 mS/c
4:23   25.0 °C

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶ keys,
   press **enter**.
4 Select **SENSOR** menu using ◀ ▶ keys,
   press **enter**.
5 All items of this menu group are indicated by the "SNS:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.
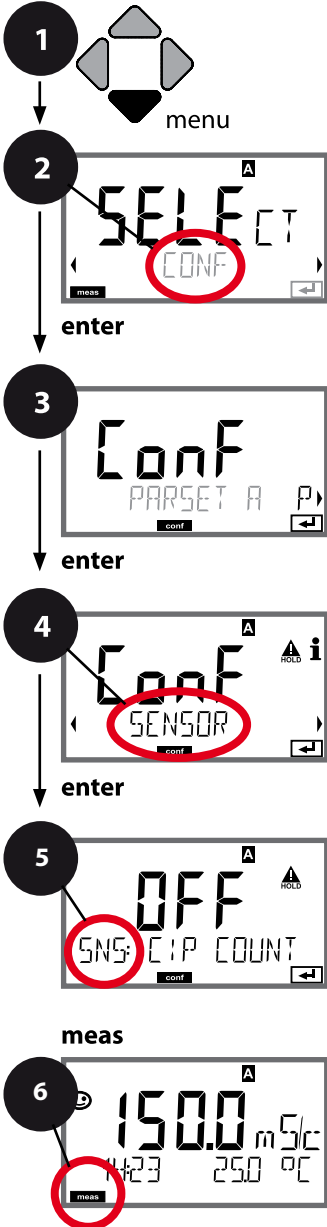
5 **enter**

| Sensor type |
| Temperature probe |
| Cell factor |
| Transfer ratio |
| Measuring mode |
| Measuring range |
| Concentration determination |
| Temperature unit |
| Cleaning cycles |
| Sterilization cycles |

5

Menu item	Action	Choices
Sensor type	Select sensor type using ▲ ▼ keys.	**SE 655**
		SE 656
		SE 660
	Press **enter** to confirm.	SE 670
		SE 680
		OTHER
Temperature probe	**Only with OTHER:** Select type of temperature probe using ▲ ▼ keys. Press **enter** to confirm.	**1000PT**
		100PT
		30 NTC
Cell factor	Enter cell factor using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	**01.980**
		XX.XXx
Transfer ratio	Enter transfer ratio using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	**120.00**
		XXX.Xx
Measuring mode	Select desired mode using ▲ ▼ keys.	**Cond**
		Conc %
		Sal ‰
	Press **enter** to confirm.	
Measuring range	**For cond measurement only**	**x.xxx mS/cm**, xx.xx mS/cm
		xxx.x mS/cm, x.xxx S/m
	Select desired measuring range using ▲ ▼ keys.	xx.xx S/m
	Press **enter** to confirm.	

CondI

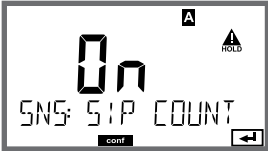## **Sensor,** Concentration Determination, Temperature Unit
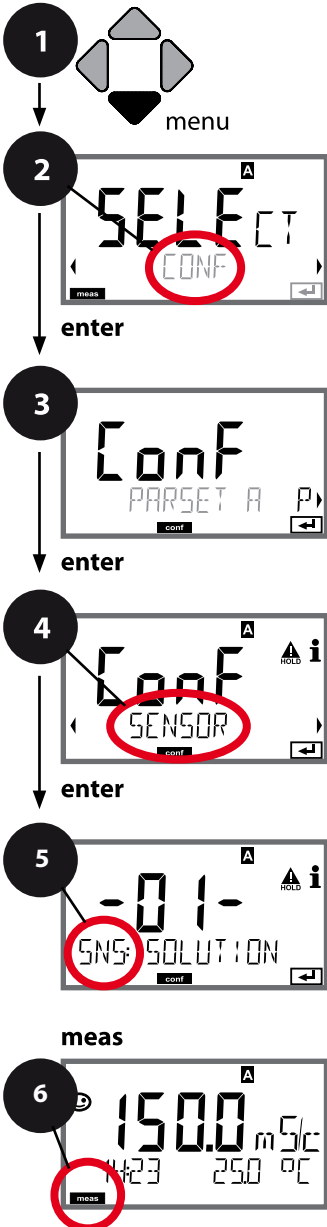
1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶ keys,
   press **enter**.
4 Select **SENSOR** menu using ◀ ▶ keys,
   press **enter**.
5 All items of this menu group are indicated by the "SNS:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

Sensor type	
Temperature probe	
Cell factor	
Transfer ratio	
Measuring mode	
Measuring range	
Concentration determination	
Temperature unit	
Cleaning cycles	
Sterilization cycles	

CondI

5

Menu item	Action	Choices
Concentration determination -01- SNS: SOLUTION	**For conc measurement only** Select desired concentration solution using ▲ ▼ keys (see appendix for ranges). Press **enter** to confirm.	**-01- (NaCl)** -02- (HCl) -03- (NaOH) -04- (H_2SO_4) -05- (HNO_3) -06- (H_2SO_4) -07- (HCl) -08- (HNO_3) -09- (H_2SO_4) -10- (NaOH)
Temperature unit °C SNS: TEMP UNIT	Select °C or °F using ▲ ▼ keys.	**°C** / °F
°F SNS: TEMP UNIT	Press **enter** to confirm.	

CondI

Sensor, Cleaning Cycles, Sterilization Cycles

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
  press **enter**.
3 Select parameter set using ◀ ▶ keys,
  press **enter**.
4 Select **SENSOR** menu using ◀ ▶ keys,
  press **enter**.
5 All items of this menu group are indicated by the "SNS:" code.
  Press **enter** to select menu,
  edit using arrow keys (see next page).
  Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is displayed.

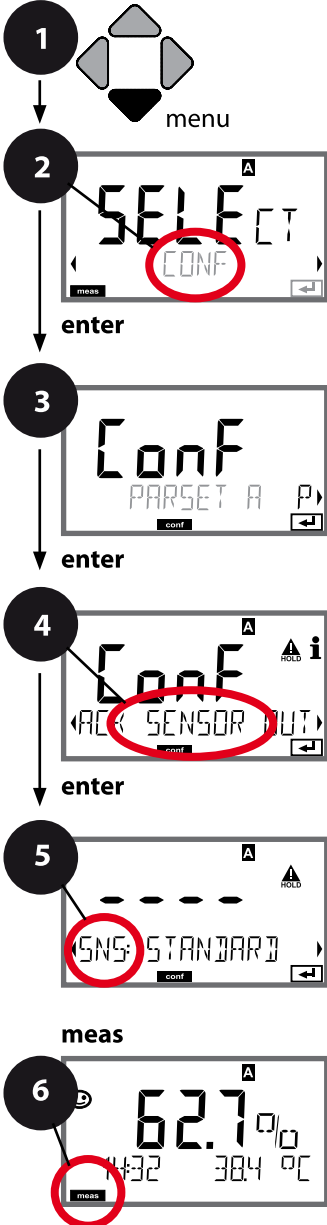| Select sensor type |
| --- |
| Select temp probe |
| Select cell factor |
| Select transfer ratio |
| Select measuring mode |
| Select measuring range |
| Concentration determination |
| Temperature unit |
| Cleaning cycles |
| Sterilization cycles |

5

Menu item	Action	Choices
CIP / SIP		
Cleaning cycles on/off **OFF** HOLD SNS: CIP COUNT conf	Select ON or OFF using ▲ ▼ keys. Activates/deactivates logging in extended logbook Press **enter** to confirm.	ON/**OFF**
Sterilization cycles on/off **On** HOLD SNS: SIP COUNT conf	Select ON or OFF using ▲ ▼ keys. Activates/deactivates logging in extended logbook Press **enter** to confirm.	ON/**OFF**

The cleaning and sterilization cycles are logged to measure the load on the sensor. Suitable for biochemical applications (process temperature approx. 0 ... 50 °C, CIP temperature > 55 °C, SIP temperature > 115 °C).

Note:
A CIP or SIP cycle is only entered into the logbook 2 hours after the start to ensure that the cycle is complete.

Configuration			Choices	Default
Sensor (SENSOR)				
SNS:	(Select text line)		STANDARD 10 Typ TRACES 01 Typ SUBTRACES 001 T. (requires "Traces" Option) ISM-DIGITAL MEMOSENS	STANDARD 10 Typ
	MEAS MODE		dO %, dO mg/l dO ppm, GAS %	dO %
	U-POL		-400...–1000 mV (0000...–1000 mV for traces)	-675 mV
	U-POL CAL			
	MEMBR. COMP.		00.50...03.00	01.00
	RTD TYPE		22 NTC 30 NTC	22 NTC
	TEMP UNIT		°C / °F	°C
	CAL MODE		CAL AIR CAL WTR	CAL AIR
	CAL TIMER		ON/OFF	OFF
	ON	CAL-CYCLE	0...9999 h	0168 h
	For ISM sensors in addition	ACT (Adaptive Calibration Timer)	OFF / AUTO / MAN	OFF
		MAN	ACT CYCLE	0...9999 DAY	0007 DAY
		TTM (Time to Maintenance)	OFF / AUTO / MAN	OFF
		MAN	TTM CYCLE	0...9999 DAY	0030 DAY
		CIP COUNT	ON/OFF	OFF
		ON	CIP CYCLES	0...9999 CYC	0025 CYC
		SIP COUNT	ON/OFF	OFF
		ON	SIP CYCLES	0...9999 CYC	0025 CYC
		AUTOCLAVE	ON/OFF	OFF
		ON	AC CYCLES	0...9999 CYC	0000 CYC

Oxy

Device Type: Oxy
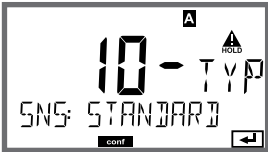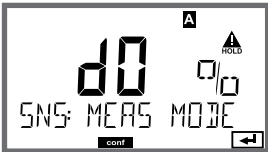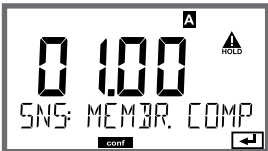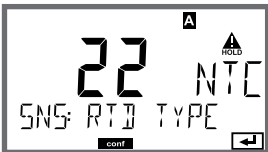
Connected modules are automatically recognized. When a Memosens sensor is connected at initial start-up, the corresponding process variable is loaded and Memosens is configured. In the SERVICE menu you can change the device type. Afterwards, you must select the corresponding calibration mode in the CONF menu.

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶ keys,
   press **enter**.
4 Select **SENSOR** menu using ◀ ▶ keys,
   press **enter**.
5 All items of this menu group are indicated by the "SNS:" code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is displayed.

Select sensor type
Select measuring mode
Polarization voltage
Membrane compensation
Type of temp probe
Temperature unit
Calibration medium water/air
Calibration timer
ACT - Adaptive calibration timer
TTM - Adaptive maintenance timer
CIP/SIP counter
Autoclaving counter

5

Menu item	Action	Choices
Select sensor type analog/digital **10 - Typ** SNS: STANDARD conf	Select sensor type using ▲ ▼ keys. Press **enter** to confirm.	**STANDARD 10 Typ** TRACES 01 Typ SUBTRACES 001 Typ ISM MEMOSENS LDO (SE 740 optical sensor)
Select measuring mode **dO** % SNS: MEAS MODE conf	Select measuring mode using ▲ ▼ keys. DO: Measurement in liquids GAS: Measurement in gases Press **enter** to confirm.	**dO %,** dO mg/l dO ppm GAS %
Polarization voltage **-675** mV SNS: U-POL conf	To be entered separately for measurement/calibration. When measuring low oxygen concentrations (traces) U-POL MEAS = −500 mV Enter V_{pol} using arrow keys. Press **enter** to confirm.	**-675 mV** -400...−1000 mV (0000...−1000 mV for trace measurement) ***Not for Memosens*** ***Not for optical sensor***
Membrane compensation **01.00** SNS: MEMBR. COMP conf	Enter membrane compensation using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	**01.00** 00.50...05.00 ***Not for Memosens*** ***Not for optical sensor*** ***Not for ISM sensor***
Type of temp probe **22** NTC SNS: RTD TYPE conf	Select type of temperature probe using ▲ ▼ keys. Press **enter** to confirm.	**22 NTC** 30 NTC ***Not for Memosens*** ***Not for optical sensor*** ***Not for ISM sensor***

Oxy
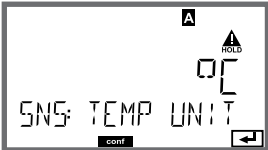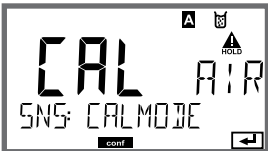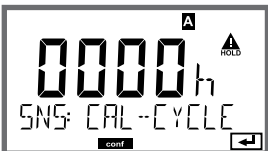
Sensor, **Temperature Unit, Medium: Water/Air, Calibration Timer**

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
  press **enter**.
3 Select parameter set using ◀ ▶ keys,
  press **enter**.
4 Select **SENSOR** menu using ◀ ▶ keys,
  press **enter**.
5 All items of this menu group are indicated by the "SNS:"
  code.
  Press **enter** to select menu,
  edit using arrow keys (see next page).
  Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
  displayed.

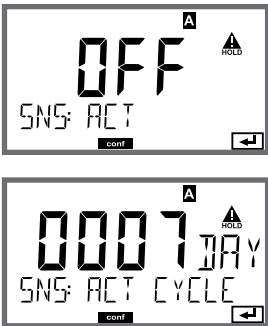| Select sensor type |
| --- |
| Select measuring mode |
| Polarization voltage |
| Membrane compensation |
| Type of temp probe |
| Temperature unit |
| Calibration medium water/air |
| Calibration timer |
| ACT - Adaptive calibration timer |
| TTM - Adaptive maintenance timer |
| CIP/SIP counter |
| Autoclaving counter |

5

Menu item	Action	Choices
Temperature unit °C SNS: TEMP UNIT conf	Select temperature unit using ▲ ▼ keys. Press **enter** to confirm.	**°C** °F
Medium: air/water CAL AIR SNS: CALMODE conf	Select calibration medium using ▲ ▼ keys. AIR: Air as cal medium WTR: Air-saturated water as cal medium Press **enter** to confirm.	**CAL_AIR** CAL_WTR
Calibration timer OFF SNS: CALTIMER conf	Select/deselect calibration timer using ▲ ▼ keys Press **enter** to confirm.	**OFF** ON
(ON: Calibration cycle) 0000h SNS: CAL-CYCLE conf	Enter calibration cycle in hours using ▲ ▼ ◀ ▶ keys Press **enter** to confirm.	0...9999 h **0168 h**

Note for the calibration timer:
When Sensocheck has been activated in the Configuration / Alarm menu, the expiration of the calibration interval is indicated by Sensoface (beaker icon and smiley).
The calibration timer settings apply to both parameter sets A and B. The time remaining until the next due calibration can be seen in the diagnostics menu (see "Diagnostics").

Oxy

ISM Sensor, Adaptive Cal Timer (ACT)
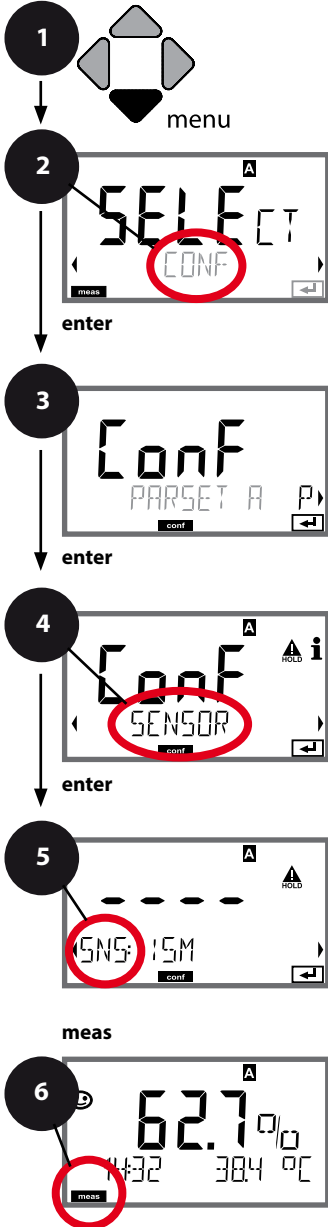
1

menu

2

SELE ct

CONF

meas

enter

3

ConF

PARSET A P

conf

enter

4

ConF

SENSOR

conf

enter

5

SNS: ISM

conf

meas

6

62.7 %

14:32   38.4 °C

meas
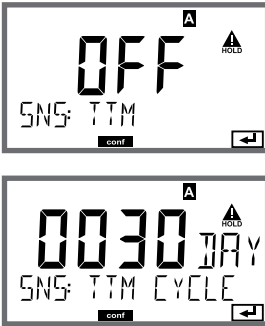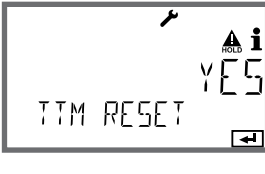
1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶ keys,
   press **enter**.
4 Select **SENSOR** menu using ◀ ▶ keys,
   press **enter**.
5 All items of this menu group are indicated by the "SNS:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

5

	enter
Select measuring mode	
Select sensor type	
Polarization voltage	
Temperature unit	
Calibration medium water/air	
Calibration timer	
ACT - Adaptive calibration timer	
TTM - Adaptive maintenance timer	
CIP/SIP counter	
Autoclaving counter	

5

Adaptive Cal Timer (ACT)

By issuing a Sensoface message, the adaptive calibration timer reminds you to calibrate the sensor. After expiration of the interval, Sensoface is getting "sad". Pressing the info key shows the text "OUT OF CAL TIME CALIBRATE SENSOR" which reminds you that a calibration is due. The ACT interval is either read automatically from the sensor settings (7 days) or can be specified manually (max. 9999 days). Stressing influences (temperature, measurement in extreme ranges) shorten the timer interval.

The adaptive cal timer is reset after each calibration.

You can configure the current outputs so that a Sensoface message generates a 22-mA error signal, see page 125.

Menu item	Action	Choices
Adaptive cal timer (ACT) OFF SNS: ACT 0007 DAY SNS: ACT CYCLE	Select using arrow keys: AUTO: The interval stored in the ISM sensor is used (default 7 days) MAN: The interval is specified manually (0 ... 9999 days) Press **enter** to confirm.	**OFF**/AUTO/MAN

Oxy

ISM Sensor, Adaptive Maintenance Timer (TTM)

1 menu

1. Press **menu** key.
2. Select **CONF** using ◀ ▶ keys,
   press **enter**.
3. Select parameter set using ◀ ▶ keys,
   press **enter**.
4. Select **SENSOR** menu using ◀ ▶ keys,
   press **enter**.
5. All items of this menu group are indicated by the "SNS:" code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6. Exit: Press **meas** key until the [meas] mode indicator is displayed.

Select measuring mode	enter
Select sensor type	
Polarization voltage	
Temperature unit	
Calibration medium water/air	
Calibration timer	
ACT - Adaptive calibration timer	
TTM - Adaptive maintenance timer	
CIP/SIP counter	
Autoclaving counter	

5

Adaptive Maintenance Timer (TTM, Time to Maintenance)

By issuing a Sensoface message, the adaptive maintenance timer reminds you
to service the sensor. After expiration of the interval, Sensoface is getting "sad".
Pressing the info key shows the text "OUT OF MAINTENANCE CHECK ELECTROLYTE
AND MEMBRANE" which reminds you that a sensor maintenance is due. The TTM
interval is either read automatically from the sensor settings (30 days) or can be
specified manually (max. 9999 days). Stressing influences (temperature, measure-
ment in extreme ranges) shorten the timer interval.
You can configure the current outputs so that a Sensoface message generates a
22-mA error signal, see page 125.

Menu item	Action	Choices

Adaptive maintenance timer (TTM)
 	
`OFF`
`SNS: TTM`
 	
`0030 DAY`
`SNS: TTM CYCLE`
	Select using arrow keys:
	AUTO: The interval stored in the ISM sensor is used (default 30 days)
	MAN: The interval is specified manually (0 ... 9999 days)
	
	Press **enter** to confirm.
		OFF/AUTO/MAN

The adaptive maintenance timer can be reset in the SERVICE / SENSOR / TTM menu. Here, the interval is reset to its initial value.		
`YES` `TTM RESET`	To do so, select **"TTM RESET = YES"** and confirm by pressing **enter**.	**NO** / YES

Oxy
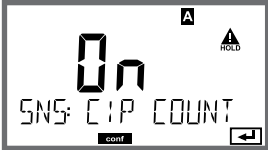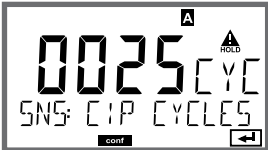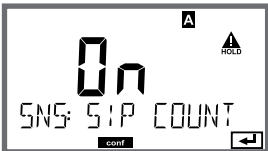
Sensor, CIP Cleaning Cycles, SIP Sterilization Cycles
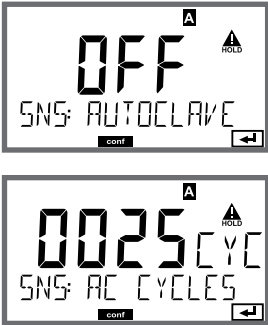

1   Press **menu** key.
2   Select **CONF** using ◀ ▶ keys,
    press **enter**.
3   Select parameter set using ◀ ▶ keys,
    press **enter**.
4   Select **SENSOR** menu using ◀ ▶ keys,
    press **enter**.
5   All items of this menu group are indicated by the "SNS:" code.
    Press **enter** to select menu,
    edit using arrow keys (see next page).
    Confirm (and proceed) by pressing **enter**.
6   Exit: Press **meas** key until the [meas] mode indicator is displayed.

Select measuring mode	enter
Select sensor type	
Polarization voltage	
Temperature unit	
Medium: water/air	
Calibration timer	
ACT - Adaptive calibration timer	
TTM - Adaptive maintenance timer	
CIP counter, cleaning cycles	
CIP cleaning cycles	
SIP counter, sterilization cycles	
SIP sterilization cycles	
Autoclaving counter	

5

Menu item	Action	Choices

CIP counter
 	
`On`
A HOLD
`SNS: CIP COUNT`
conf
	Use arrow keys ▲ ▼
	Set CIP counter:
	OFF: No counter
	ON: Fixed cleaning cycle (adjust in the next step)
	Press **enter** to confirm.
		OFF/ON

CIP cycles
 	
`0025 CYC`
A HOLD
`SNS: CIP CYCLES`
conf
	Only with CIP COUNT ON:
	Enter max. number of cleaning cycles using ▲ ▼ ◄ ► keys
	
	Press **enter** to confirm.
		0...9999 CYC
		(**0000 CYC**)

SIP counter
 	
`On`
A HOLD
`SNS: SIP COUNT`
conf
	Use arrow keys ▲ ▼
	Adjust SIP counter:
	OFF: No counter
	ON: Max. sterilization cycles (adjust as for CIP counter)
	Press **enter** to confirm.
		OFF/ON

The cleaning and sterilization cycles are counted to measure the load on the sensor.
Suitable for biochemical applications (process temp approx. 0...50 °C,
CIP temperature > 55 °C, SIP temperature > 115 °C).

Oxy

ISM Sensor, Autoclaving Counter

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶ keys,
   press **enter**.
4 Select **SENSOR** menu using ◀ ▶ keys,
   press **enter**.
5 All items of this menu group are indicated by the "SNS:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

Select measuring mode	**enter**
Select sensor type	
Polarization voltage	
Temperature unit	
Medium: water/air	
Calibration timer	
ACT - Adaptive calibration timer	
TTM - Adaptive maintenance timer	
CIP/SIP counter	
Autoclaving counter	

5

Autoclaving Counter

After reaching a specified limit value the autoclaving counter generates a Senso-face message. As soon as the counter has reached the specified value, Sensoface is getting "sad". Pressing the info key shows the text "AUTOCLAVE CYCLES OVERRUN" which reminds you that the maximum number of autoclaving cycles has been reached. After each autoclaving process, you must manually increment the auto-claving counter in the SENSOR service menu. The transmitter displays "INCREMENT AUTOCLAVE CYCLE" as confirmation. You can configure the current outputs so that a Sensoface message generates a 22-mA error signal, see page 125.

Menu item	Action	Choices

Autoclaving counter
 	
`OFF`
`SNS: AUTOCLAVE`
	Select using arrow keys:
	ON:
	Enter the number of cycles
	(0 ... 9999).
	
	Press **enter** to confirm.
		OFF/ON

`0025 CYC` `SNS: AC CYCLES`		
With the autoclaving counter switched on, you must increment the count after each autoclaving process:		

Incrementing the autoclaving counter
(SERVICE menu)
 	
`24 YES`
`AUTOCLAVE +1`
	After having completed an autoclaving process, open the SERVICE menu SENSOR / AUTOCLAVE to increment the autoclaving count.
	To do so, select "**YES**" and confirm by pressing **enter**.
		NO / YES

Cond	Cond

Sensors A and B – Arrangement

Device type CC

Inlet::
COND A sensor
with fitting

Connection length
max. 3 m

Outlet:
COND B sensor
with fitting

Channel selection and display assignment

TC

TC

COND A
COND B
TEMP A
TEMP B
CALC

OUT 1

CALC
C1 Difference
C2 Ratio
C3 Passage
C4 Rejection
C5 Deviation
C6 pH (VBG)
C7 pH (var.)
C8 USER SPEC

Display
OUT 1

DISPLAY:

Display
OUT 2

COND A
COND B
TEMP A
TEMP B
CALC

OUT 2
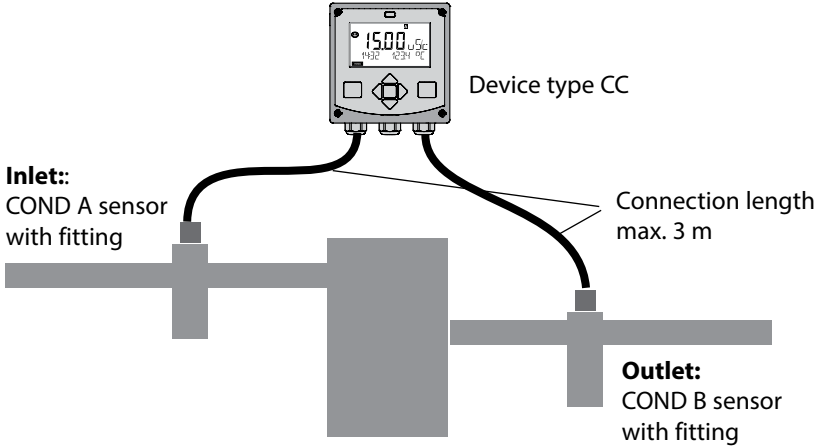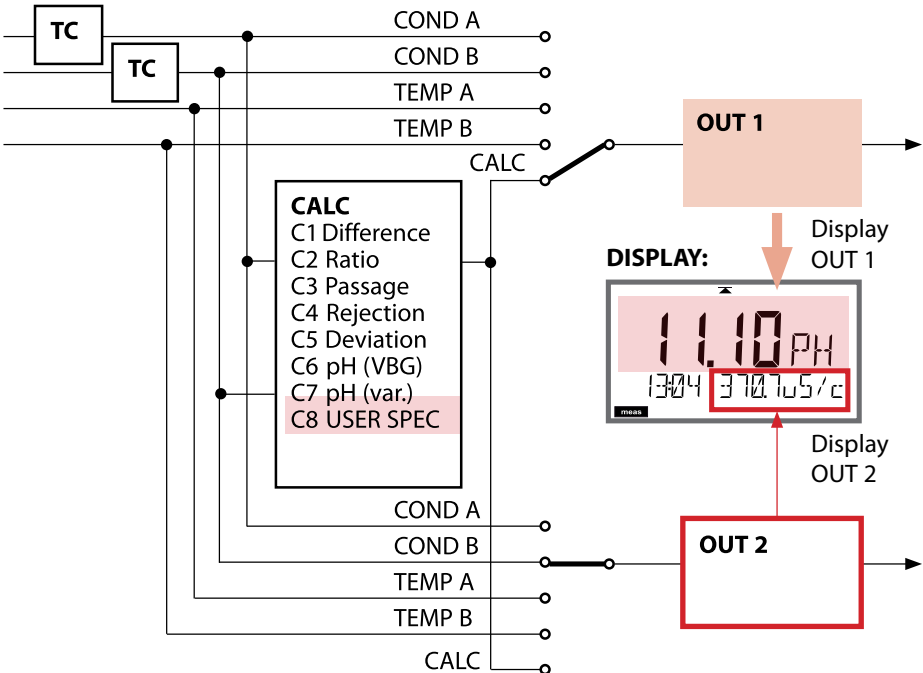
Cond | Cond

Calculations (CALC)

CONF	Calculation	Formula
-C1-	Difference	COND A – COND B
-C2-	Ratio	COND A / COND B
-C3-	Passage	COND B / COND A * 100
-C4-	Rejection	(COND A – COND B) / COND A * 100
-C5-	Deviation	(COND B – COND A) / COND A * 100
-C6-	pH value acc. to VBG 450	11+log((COND A – COND B /3)/243)
-C7-	Variable pH value, factors specifiable	11+log((COND A – COND B /F1)/F2) F1, F2 specifiable
-C8-	USER SPEC	PARAMETER W xxxx E-3 1000 E-3
		PARAMETER A xxx.x E-3 000.0 E-3
		PARAMETER B xxx.x E-4 000.0 E-4

| Cond | Cond |

pH Value Calculation by Means of Dual Conductivity Measurement

When monitoring boiler feed water in power plants, the pH value can be calculated by means of a dual conductivity measurement. For that purpose, the boiler feed water conductance is measured before and after the cation exchanger. This commonly used method of indirect pH value measurement does not require much maintenance and has the following advantage:

Normal pH measurement in ultrapure water is very critical. Boiler feed water does not contain many ions. This requires the use of a special electrode, which must be calibrated constantly and the service life of which is generally rather short.

Function

Two sensors are used to measure the conductivity before and after the cation exchanger. The pH value is inferred from these two conductivity values according to the calculation formulas shown below:
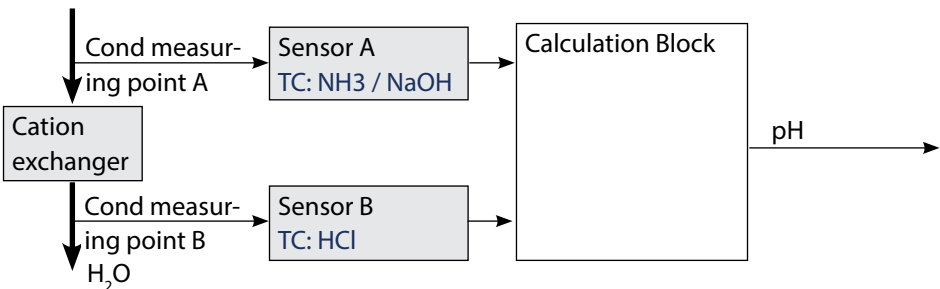
Calculating the concentration of sodium hydroxide solution / pH value:

$$c(NaOH) = \frac{COND\ A - 1/3\ COND\ B}{243} \qquad pH = 11 + \log[c(NaOH)]$$

Recommended pH ranges:

10 ± 0.2   for < 136 bars operating overpressure or
9.5 ± 0.2   for > 136 bars operating overpressure
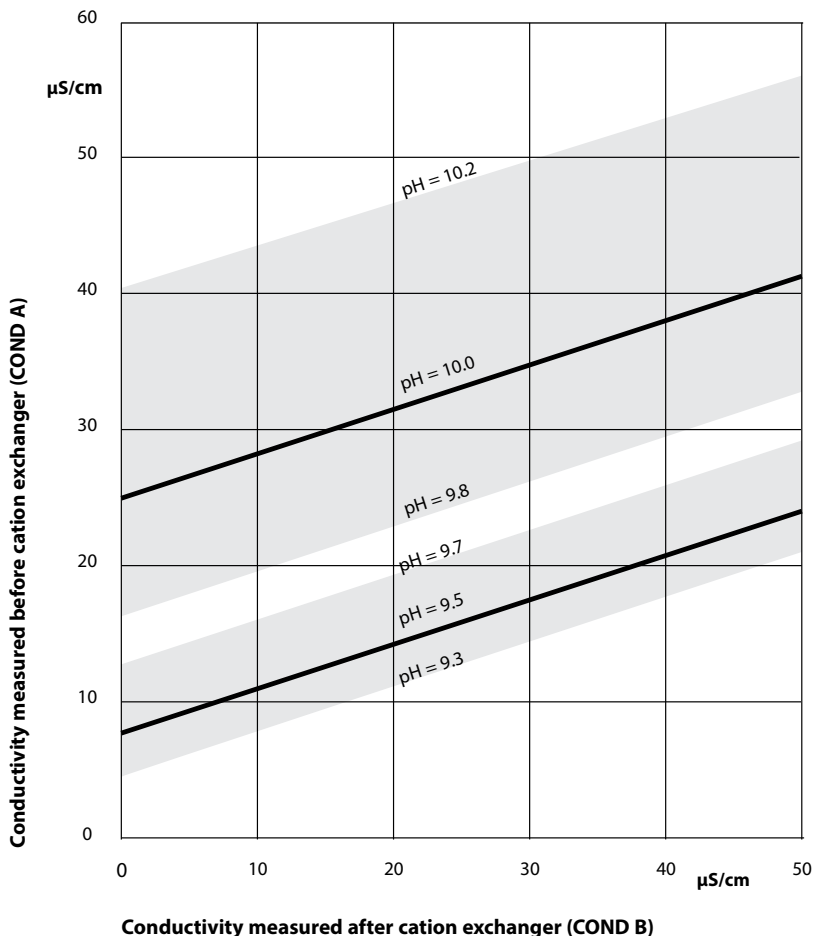
Figure:

Conditioning the feed water of natural circulation boilers with sodium hydroxide. Relationship between the pH value and the conductivity measured before and after the cation exchanger.

Source: Appendix to VGB guideline for boiler feed water, boiler water and steam of steam generators above 68 bars permissible operating overpressure (VGB-R 450 L)

Cond Cond

Configuration		Choices	Default
SENSOR A			
S_A	CELLFACTOR A [1]	0.0050 ... 1.9999	0.0290
	TC SELECT	OFF LIN, NLF, NaCl HCl, NH3, NaOH	OFF
	LIN TC LIQUID	00.00 ... +19.99 %/K	00.00 %/K
SENSOR B			
S_B	CELLFACTOR B [1]	0.0050 ... 1.9999	0.0290
	TC SELECT	OFF LIN, NLF, NaCl HCl, NH3, NaOH	OFF
	LIN TC LIQUID	00.00 ... +19.99 %/K	00.00 %/K
MEAS MODE			
MEAS	MEAS RANGE [2] (this setting applies to both channels, A and B)	o.ooo µS/cm oo.oo µS/cm o.ooo µS/cm oooo µS/cm oo.oo MOhm	oo.oo µS/cm
	TEMP UNIT	°C/°F	°C
	CALCULATION	ON/OFF	OFF
	ON (Selected in text line)	-C1- DIFFERENCE -C2- RATIO -C3- PASSAGE -C4- REJECTION -C5- DEVIATION -C6- PH-VGB -C7- PH-VARIABLE -C8- USER SPEC	-C1- DIFFERENCE
	-C7- FACTOR 1	01.00 ... 10.00	03.00
	FACTOR 2	0100 ... 0500	0243
	-C8- PARAMETER W	xxxx E-3	1000 E-3
	PARAMETER A	xxx.x E-3	000.0 E-3
	PARAMETER B	xxx.x E-4	000.0 E-4

1) The cell factor can be modified by an entry in the configuration menu or by calibration (one storage position). This means, a cell factor determined by calibration is taken over by pressing **enter** during configuration. It remains unchanged until a new value is entered.

2) For conductivity (µS/cm), the range selection determines the max. resolution.
   If the selected range is exceeded, the device automatically switches to the next higher range until the max. measurement limit is reached (9999 µS/cm).
   This applies to display values and current outputs. The current outputs are adjusted using a floating-point editor which allows settings over several decades.
   The initial range of the editor is the selected range:

Selected resolution	Displayed range (or floating-point editor)			
	x.xxx µS/cm	xx.xx µS/cm	x.xxx µS/cm	xxxx µS/cm
x.xxx µS/cm				
xx.xx µS/cm				
xxx.x µS/cm				
xxxx µS/cm				

| MSPH | MSPH | MSPH | MSOXY |

Connection of sensor A

1	Brown	supply
2	Green	RS 485 A
3	Yellow	RS 485 B
4	White/Transp.	GND/shield

22   1

Areas for placing the screwdriver to pull out the terminals
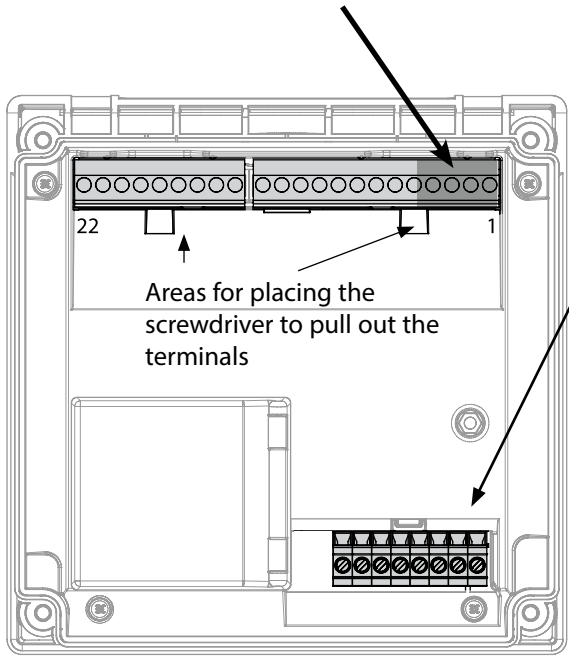
Connection of sensor B (2nd channel): (MK-MS095 module)

A	Brown	supply
B	Green	RS 485 A
C	Yellow	RS 485 B
D	White	GND
E	Transp.	SHIELD

Memosens Cable

Brown — Power supply +

Green — RS485 (A)

Yellow — RS485 (B)

White — Power supply – (GND)

Transparent — Shield
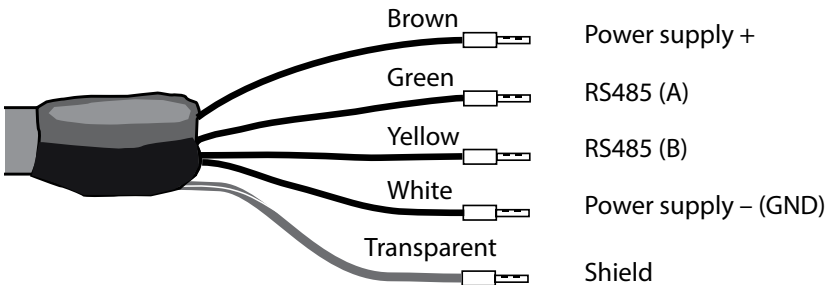
Sensors A and B – Typical Arrangement

(Connection of Memosens sensors: channel A via terminals on the device, channel B via MK-MS095 module)
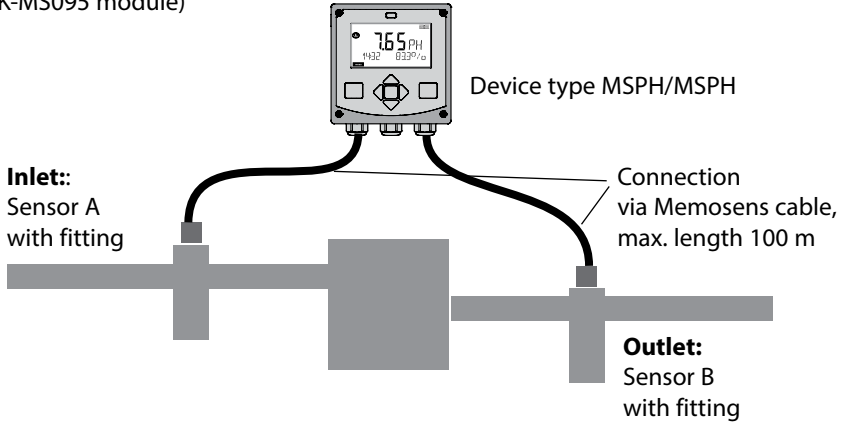
Device type MSPH/MSPH

Inlet::
Sensor A
with fitting

Connection
via Memosens cable,
max. length 100 m

Outlet:
Sensor B
with fitting

Channel selection and display assignment

pH A
pH B
mV A
mV B
TEMP A
TEMP B
CALC

OUT 1

CALC
DIFF pH (A–B)
DIFF mV (A–B)
DIFF TMP (A–B)

DISPLAY:

Display
OUT 1

pH A
pH B
mV A
mV B
TEMP A
TEMP B
CALC

Display
OUT 2

OUT 2
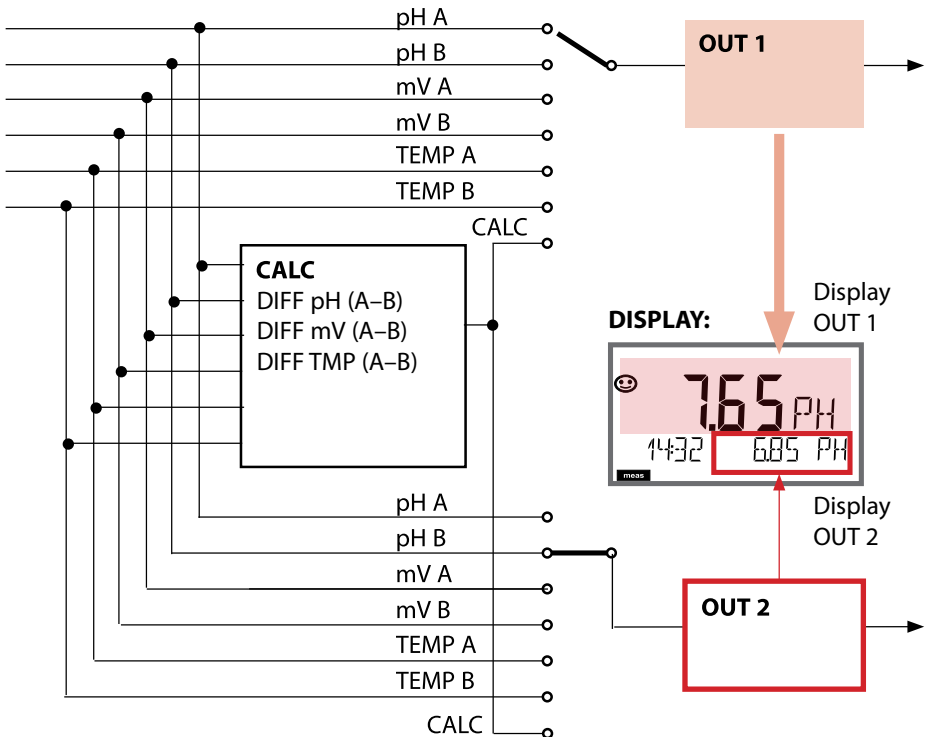
MSPH MSPH

Configuration		Choices	Default
Sensor A			
S_A:	SENSOR	ON / OFF	ON
	CALMODE	AUTO MAN DAT	AUTO
	AUTO	BUFFER SET	-00- ... -09-, -U1-	-00-
		Note: Pressing **info** displays nominal values and type of buffer set		
		U1 (For specifiable buffer set, see Appendix: "Buffer Tables")	EDIT BUFFER 1 (NO, YES) Enter values for buffer 1	NO
			EDIT BUFFER 2 (NO, YES) Enter values for buffer 2	NO
	CAL TIMER		OFF, FIX, ADAPT	OFF
	ON	CAL-CYCLE	0...9999 h	0168 h
	CIP COUNT		ON/OFF	OFF
	SIP COUNT		ON/OFF	OFF
Sensor B			
S_B:	SENSOR	ON / OFF	OFF
	CALMODE	AUTO MAN DAT	AUTO
	AUTO	BUFFER SET	-00- ... -09-, -U1-	-00-
		Note: Pressing **info** displays nominal values and type of buffer set		
		U1 (For specifiable buffer set, see Appendix: "Buffer Tables")	EDIT BUFFER 1 (NO, YES) Enter values for buffer 1	NO
			EDIT BUFFER 2 (NO, YES) Enter values for buffer 2	NO
	CAL TIMER		OFF, FIX, ADAPT	OFF
	ON	CAL-CYCLE	0...9999 h	0168 h
	CIP COUNT		ON/OFF	OFF
	SIP COUNT		ON/OFF	OFF

MSPH MSPH

Configuration			Choices	Default
MEAS_MODE				
MES:	TEMP UNIT		°C / °F	°C
	CALCULATION		ON/OFF	OFF
	ON	(Selected in text line)	-C1- Difference PH -C2- Difference mV -C3- Difference TMP	-C1- Difference PH

Calculations (CALC)

CONF	Calculation	Formula	Display
-C1-	pH difference	pH A – pH B	dPH
-C2-	mV difference	mV A – mV B	dmV
-C3-	Temp difference	TMP A – TMP B	d°C (d°F)

Device Type: MSPH-MSOXY

MSPH   MSOXY

pH and Oxy measuring point (example)
(Connection of Memosens sensors: channel A (PH) via terminals on the device,
channel B (OXY) via MK-MS module)

Device type MSPH/MSOXY

Connection
via Memosens cable
Length max. 100 m

pH measurement:
PH sensor
with fitting

Oxy measurement:
OXY sensor
with fitting

Channel selection and display assignment

OUT 1

pH
mV
TEMP A
OXY
TEMP B

Display
OUT 1

DISPLAY:

Display
OUT 2

pH
mV
TEMP A
OXY
TEMP B

OUT 2
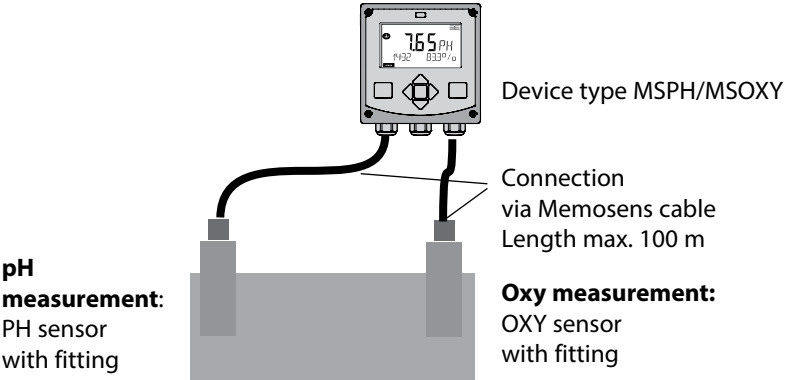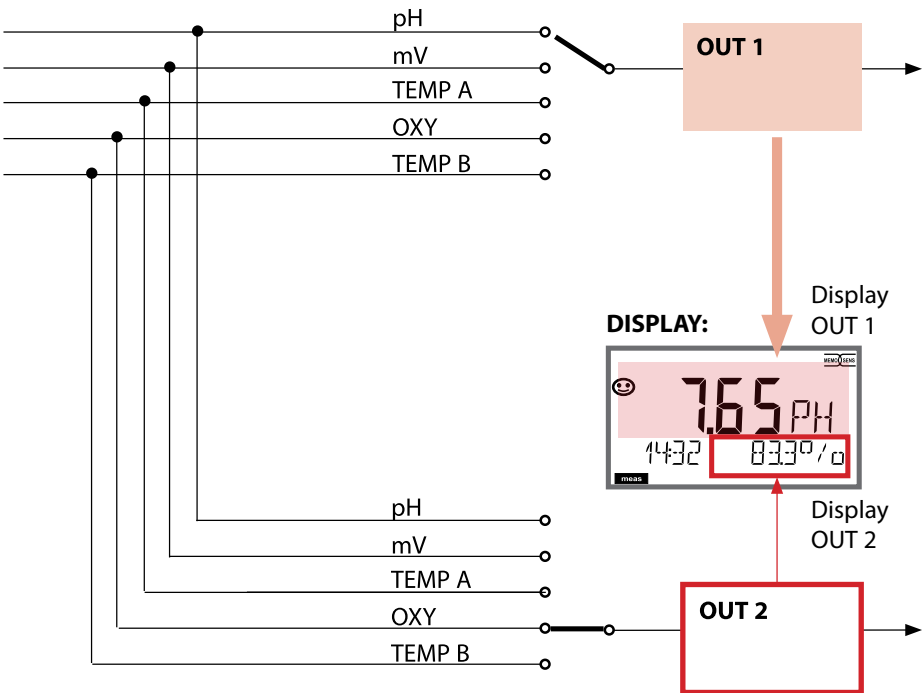
Configuration		Choices	Default
PH sensor			
PH:	MEAS MODE [1]	ON / OFF	ON
	CALMODE	AUTO MAN DAT	AUTO
	AUTO	BUFFER SET	-00- ... -09-, -U1-	-00-
		Note: Pressing **info** displays nominal values and type of buffer set		
		U1 (For specifiable buffer set, see Appendix: "Buffer Tables")	EDIT BUFFER 1 (NO, YES) Enter values for buffer 1	NO
			EDIT BUFFER 2 (NO, YES) Enter values for buffer 2	NO
	CAL TIMER		OFF, FIX, ADAPT	OFF
	ON	CAL-CYCLE	0...9999 h	0168 h
	TC-LIQUID		-19.99 ... +19.99 %/K	00.00 %/K
	CIP COUNT		ON/OFF	OFF
	SIP COUNT		ON/OFF	OFF

[1] When the channel is disabled, MEAS_MODE = OFF, the sensor values will be set in such a way that no error message is generated.

Oxy

Configuration			Choices	Default
OXY sensor				
OXY:	MEAS MODE [1]		OFF dO % dO mg/l dO ppm GAS %	dO %
	CALMODE		CAL_AIR CAL_WTR	CAL_AIR
	CAL TIMER		OFF, FIX, ADAPT	OFF
	ON	CAL CYCLE	0 ... 9999 h	0168
	SALINITY		00.00 ... 45.00 ppt	00.00 ppt
	PRESSURE UNIT		BAR / KPA / PSI	BAR
	PRESSURE		MAN / EXT [2]	
	MAN	BAR	PRESSURE	0.000 ... 9.999 BAR	1.013 BAR
		KPA	PRESSURE	000.0 ... 999.9 KPA	100 KPA
		PSI	PRESSURE	000.0 ... 145.0 PSI	14.5 PSI
	EXT [2]	I-INPUT	0–20 mA, 4–20 mA	4–20 mA
		BAR	BEGIN 0/4 mA	0.000 ... 9.999 BAR	0.000 BAR
			END 20 mA	0.000 ... 9.999 BAR	9.999 BAR
		KPA	BEGIN 0/4 mA	000.0 ... 999.9 KPA	000.0 KPA
			END 20 mA	000.0 ... 999.9 KPA	999.9 KPA
		PSI	BEGIN 0/4 mA	000.0 ... 145.0 PSI	000.0 PSI
			END 20 mA	000.0 ... 145.0 PSI	145.0 PSI
	CIP COUNT		ON/OFF	OFF
	SIP COUNT		ON/OFF	OFF

[1] When the channel is disabled, MEAS_MODE = OFF, the sensor values will be set in such a way that no error message is generated.

[2] EXT can be configured when the external current option has been activated.

Device Type: pH

pH sensor		Choices	Default
SNS:		STANDARD, ISFET INDUCON, ISM MEMOSENS	STANDARD
	RTD TYPE (omitted for ISM)	100 PT, 1000 PT, 30 NTC, 8.55 NTC, Balco 3kOhm	100 PT
	TEMP UNIT	°C / °F	°C
	TEMP MEAS *)	AUTO, MAN, EXT (EXT only with I-input enabled via TAN)	AUTO
	MAN	−20...200 °C (−4...392 °F)	025.0 °C (077.0 °F)
	TEMP CAL	AUTO, MAN, EXT (EXT only with I-input enabled via TAN)	AUTO
	MAN	−20...200 °C (−4...392 °F)	025.0 °C (077.0 °F)
	NOM ZERO **)	0.00 ... 14.00 PH	07.00 PH
	NOM SLOPE **)	30.0 ... 60.0 mV	059.2 mV
	PH_ISO **)	0.00 ... 14.00 PH	07.00 PH
	CAL MODE	AUTO, MAN, DAT	AUTO
	AUTO BUFFER SET	-01-...-10-, -U1- **Note:** Pressing **info** displays nominal buffer values + manufacturer	-02-
	U1 (For specifiable buffer set, see Appendix: "Buffer Tables")	EDIT BUFFER 1 (NO, YES) Enter values for buffer 1	NO
		EDIT BUFFER 2 (NO, YES) Enter values for buffer 2	NO
	CAL TIMER (omitted for ISM)	OFF, FIX, ADAPT	OFF
	ON CAL-CYCLE	0...9999 h	0168 h

*) The setting: TEMP MEAS: AUTO/MAN/EXT applies to all outputs: OUT1/OUT2/limit values/controller/display; Sensors with deviating zero/slope require the "Pfaudler" option (TAN). Settings with "Sensor: STANDARD" selected (not required for Memosens Pfaudler sensor).

**) only with STANDARD and Pfaudler option (TAN), not with Memosens Pfaudler.

Device Type: Cond

Cond sensor			Choices	Default
SNS:			2-ELECTRODE 4-ELECTRODE MEMOSENS	2-ELECTRODE
	2-EL / 4-EL	CELLFACTOR [1]	00.0000- 19.9999 c	01.0000 c
	MEAS MODE		Cond Conc % Sal ‰ USP µS/cm	Cond
	Cond	MEAS RANGE [2]	x.xxx µS/cm xx.xx µS/cm xxx.x µS/cm xxxx µS/cm x.xxx mS/cm xx.xx mS/cm xxx.x mS/cm x.xxx S/m xx.xx S/m xx.xx MΩ	xxx.x mS/cm
	Conc	Solution	-01- (NaCl) -02- (HCl) -03- (NaOH) -04- (H2SO4) -05- (HNO3) -06- (H2SO4) -07- (HCl) -08- (HNO3) -09- (H2SO4) -10- (NaOH)	-01- (NaCl)
	TEMP UNIT		°C / °F	°C
	TEMPERATURE (EXT. only with I-input enabled via TAN)		AUTO MAN EXT (only if enabled via TAN)	AUTO
	AUTO	RTD TYPE	100 PT 1000 PT 8.55 NTC 30 NTC Ni100	100 PT
	MAN	TEMPERATURE	−50 ... 250 °C (−58 ... 482 °F)	025.0 °C (077.0 °F)

Device Type: Cond

CondI sensor			Choices	Default
SNS:			SE 655 SE 656 SE 660 SE 670 SE 680 OTHER	SE 655
	OTHER	RTD TYPE	100PT / 1000PT / 30 NTC	1000PT
		CELL FACTOR	XX.XXx	01,980
		TRANS RATIO	XXX.Xx	120.0
	MEAS MODE		Cond Conc % Sal ‰	Cond
	Cond	MEAS RANGE	x.xxx mS/cm xx.xx mS/cm xxx.x mS/cm x.xxx S/m xx.xx S/m	x.xxx mS/cm
	Conc	Solution	-01- (NaCl) -02- (HCl) -03- (NaOH) -04- (H2SO4) -05- (HNO3) -06- (H2SO4) -07- (HCl) -08- (HNO3) -09- (H2SO4) -10- (NaOH)	-01- (NaCl)
	TEMP UNIT		°C / °F	°C

Device Type: Oxy

Oxy sensor			Choices	Default
SNS:	(Select text line)		STANDARD 10 Typ TRACES 01 Typ SUBTRACES 001 T. (requires "Traces" Option) ISM-DIGITAL MEMOSENS	STANDARD 10 Typ
	MEAS MODE		dO %, dO mg/l dO ppm, GAS %	dO %
	U-POL		-400...−1000 mV (0000...−1000 mV for traces)	-675 mV
	U-POL CAL			
	MEMBR. COMP.		00.50...03.00	01.00
	RTD TYPE		22 NTC 30 NTC	22 NTC
	TEMP UNIT		°C / °F	°C
	CAL MODE		CAL AIR CAL WTR	CAL AIR
	CAL TIMER		ON/OFF	OFF
	ON	CAL-CYCLE	0...9999 h	0168 h
	For ISM sensors in addition	ACT (Adaptive Calibration Timer)	OFF / AUTO / MAN	OFF
		MAN	ACT CYCLE	0...9999 DAY	0007 DAY
		TTM (Time to Maintenance)	OFF / AUTO / MAN	OFF
		MAN	TTM CYCLE	0...9999 DAY	0030 DAY
		CIP COUNT	ON/OFF	OFF
		ON	CIP CYCLES	0...9999 CYC	0025 CYC
		SIP COUNT	ON/OFF	OFF
		ON	SIP CYCLES	0...9999 CYC	0025 CYC
		AUTOCLAVE	ON/OFF	OFF
		ON	AC CYCLES	0...9999 CYC	0000 CYC

pH	Oxy	Cond

Configuration (default in bold print)

Sensor			pH	Oxy	Cond
SNS	CALMODE		**AUTO** MAN DAT		
	AUTO	BUFFER SET	-01- MT **-02- KNC** ... -U1- USR ("info" shows nominal buffer values)		
	MEAS MODE			**dO %** dO mg/l dO ppm GAS %	
	U-POL MEAS			-xxxx mV	
	U-POL CAL			-xxxx mV	
	MEMBRANE COMP.			xx.xx	
	MEAS MODE				**Cond** Conc % SAL ‰
	Cond	MEAS RANGE			x.xxx µS/cm * xx.xx µS/cm * xxx.x µS/cm * xxxx µS/cm * x.xxx mS/cm xxxx mS/cm ** xx.xx mS/cm **xxx.x mS/cm** x.xxx S/m xx.xx S/m xx.xx MΩ *
	Conc	SOLUTION			**-01- (NaCl)** -02- (HCl) -03- (NaOH) -04- (H$_2$SO$_4$) -05- (HNO$_3$) -06- (H$_2$SO$_4$) -07- (HCl) -08- (HNO$_3$) -09- (H$_2$SO$_4$) -10- (NaOH)
	TEMP UNIT		**°C** / °F		

| pH | Oxy | Cond |

Configuration (default in bold print)			
Sensor		**pH**	**Oxy**	**Cond**
SNS	CALTIMER		**OFF** / ON		
	ON	CAL-CYCLE	0 ... 9999 h (**168 h**)	
	ACT		**OFF** / AUTO / MAN	
	MAN	ACT CYCLE	0 ... 2000 DAY (**0030 DAY**)	
	TTM		**OFF** / AUTO / MAN	
	MAN	TTM CYCLE	0 ... 2000 DAY (**0365 DAY**)	
	CIP COUNT		**OFF** / ON	
	ON	CIP CYCLES	**0** ... 9999	
	SIP COUNT		**OFF** / ON	
	ON	SIP CYCLES	**0** ... 9999	
	AUTOCLAVE		**OFF** / ON	
	ON	AC CYCLES	**0** ... 9999	

*) not for toroidal (inductive) conductivity sensors **) only for inductive conductivity measurement

Configuration (default in bold print)			
Current output 1		**pH**	
OT1	RANGE		**4 … 20 mA** 0 … 20 mA
	CHANNEL		**PH** ORP TEMP
	PH	BEGIN 4 mA (0 mA)	– 2.00 … 16.00 pH **00.00 pH**
		END 20 mA	– 2.00 … 16.00 pH **14.00 pH**
	ORP (Memosens ORP sensor)	BEGIN 4 mA (0 mA)	– 1999 … 1999 mV **– 1000 mV**
		END 20 mA	– 1999 … 1999 mV **1000 mV**
	TMP °C	BEGIN 4 mA (0 mA)	– 20 … 300 °C **000.0 °C**
		END 20 mA	– 20 … 300 °C **100.0 °C**
	TMP °F	BEGIN 4 mA (0 mA)	– 4 … 572 °C **032.0 °F**
		END 20 mA	– 4 … 572 °C **212.0 °F**

Current output 2	**Default setting CHANNEL: TMP** **(other settings like OT1)**

Correction			**pH**
COR	TC SELECT		**OFF** LIN PURE WTR
	LIN	TC LIQUID	– 19.99 … 19.99 %/K **00.00 %/K**

Oxy

Configuration (default in bold print)		
Current output 1	**Oxy**	
OT1	RANGE	**4 ... 20 mA** 0 ... 20 mA
	CHANNEL	**OXY** TMP
	OXY dO %	BEGIN 4 mA (0 mA)	**000.0** ... 600.0 **%**
		END 20 mA	000.0 ... **600.0 %**
	OXY dO mg/l	BEGIN 4 mA (0 mA)	0000 µg/l ... 99.99 mg/l
		END 20 mA	0000 µg/l ... 99.99 mg/l
	OXY dO ppm	BEGIN 4 mA (0 mA)	0000 ppb ... 99.99 ppm
		END 20 mA	0000 ppb ... 99.99 ppm
	OXY GAS %	BEGIN 4 mA (0 mA)	0000 ppm ... 99.99 %
		END 20 mA	0000 ppm ... 99.99 %
	TMP °C	BEGIN 4 mA (0 mA)	– 20 ... 150 °C **000.0 °C**
		END 20 mA	– 20 ... 150 °C **100.0 °C**
	TMP °F	BEGIN 4 mA (0 mA)	– 4 ... 302 °C **032.0 °F**
		END 20 mA	– 4 ... 302 °C **212.0 °F**

Current output 2	**Default setting CHANNEL: TMP** **(other settings like OT1)**

Correction	Oxy	
COR	SALINITY	00.00 ... 45.00 ppt (**00.00 ppt**)
	PRESSURE UNIT	**BAR** / KPA / PSI
	PRESSURE	MAN / EXT. (with SW-A005 "External current input" option only)
	BAR	PRESSURE	0.000 ... 9.999 BAR (**1.013 BAR**)
	KPA	PRESSURE	000.0 ... 999.9 KPA (**100 KPA**)
	PSI	PRESSURE	000.0 ... 145.0 PSI (**14.5 PSI**)

Configuration (default in bold print)	
Current output 1	**Cond**

OT1	RANGE		**4 ... 20 mA** 0 ... 20 mA
	CHANNEL		**COND** TMP
	OUTPUT (Current output curve)		**LIN** / BILIN / LOG (LOG for S/cm and S/m only)
	LIN	BEGIN 0/4 mA	Floating-point input, **000.0 mS/c**
		END 20 mA	Floating-point input, **100.0 mS/c**
	LOG	BEGIN 0/4 mA	**Selectable decades:** S/cm: 1.0 µS/cm* / 10.0 µS/c* / 100.0 µS/c* / **1.0 mS/c** / 10.0 mS/c / 100.0 mS/c / 1000 mS/c S/m: 0.001 S/m / 0.01 S/m / 0.1 S/m / 1.0 S/m / 10.0 S/m / 100 S/m
		END 20 mA	Decades (see above) **100.0 mS/c**
	BI LIN	BEGIN 0/4 mA	Range depending on selected channel
		END 20 mA	Range depending on selected channel
		CORNER X	Conditions for bilinear characteristic: Vertex X: BEGIN ≤ CORNER X ≤ END (rising) BEGIN ≥ CORNER X ≥ END (falling)
		CORNER Y	Default: 12 mA Vertex Y: (0 mA) 4 mA ≤ CORNER Y ≤ 20 mA
	TMP °C	BEGIN 0/4 mA	– 50 ... 250 °C (**000.0 °C**)
		END 20 mA	– 50 ... 250 °C (**100.0 °C**)
	TMP °F	BEGIN 0/4 mA	– 58 ... 482 °F (**032.0 °F**)
		END 20 mA	– 58 ... 482 °F (**212.0 °F**)

Current output 2	**Default setting CHANNEL: TMP** **(other settings like OT1)**

Correction			Cond
COR	TC SELECT		**OFF** / LIN / NLF / NaCl* / HCl* / NH$_3$*
	LIN	TC LIQUID	00.00 ... 19.99 %/K (**00.00 %/K**)
		REF TEMP	000.0 ... 199.9 °C (**025.0 °C**)

*) not for toroidal conductivity sensors

pH	Oxy	Cond

Configuration (default in bold print)		
CNTR_IN input		
IN	CONTROL	**PARSET** / FLOW
	FLOW FLOW ADJUST	0 ... 20000 pulses/liter (**12000 pulses/liter**)

Alarm		
ALA	DELAYTIME	0 ... 600 s (**0010 SEC**)
	SENSOCHECK	ON / **OFF**
	FLOW CNTR	ON / **OFF**
	ON FLOW MIN	0 ... 99.9 liters/h (**005.0 liters/h**)
	FLOW MAX	0 ... 99.9 liters/h (**025.0 liters/h**)

Relay contacts REL1, REL2			
REL	**LIMITS CONTROLLER**	The following submenu depends on the selected setting.	
RL1	CHANNEL	**PH** / ORP / TMP **OXY** / TMP / FLOW	**COND** / TMP / FLOW
	FUNCTION	**Lo LEVL** / Hi LEVL	
	CONTACT	**N/O** / N/C	
	LEVEL	**00.00 pH** −2.00 ... 16.00 pH (−1999 ... 1999 mV) (−20 ... 200 °C) **000.0 %** 000.0 ... 600.0 % 0000 µg/l ... 99.99 mg/l 0000 ppb ... 99.99 ppm 0000 ppm ... 99.99 % (-20 ... 150 °C)	**000.0 mS/cm**
	HYSTERESIS	**00.50 pH** 0.00 ... 10.00 pH (0 ... 2000 mV) (0 ... 100 °C / 0 ... 180 °F) **000.0 %** 0 ... 50 % full scale	**005.0 mS/cm** 0 ... 50 % full scale
	DELAYTIME	**0010 SEC** 0000 ... 9999 s	
RL2	See RL1 for configuration; default setting: CHANNEL = TMP		

pH	Oxy	Cond

Configuration (default in bold print)

PID controller		pH	Oxy	Cond
CTR	CHANNEL	**PH** / ORP / TMP	**OXY** / TMP	**COND** / TMP
	TYPE	PLC / PFC		
	PLC	00001 ... 0600 s (**0010 s**)		
	PFC	0001 ... 0180 min $^{-1}$ (**0060 min $^{-1}$**)		
	SETPOINT	within measuring range		
	DEAD BAND	0 ... 50 % full scale		
	P-GAIN	10 ... 999 % (**0100 %**)		
	I-TIME	0 ... 9999 s (**0000 s**)		
	D-TIME	0 ... 9999 s (**0000 s**)		
	HOLD MODE	**Y LAST** / Y OFF		

Rinse contact WASH

WSH	**WASH** / PARSET A/B	Rinse contact / Signaling the active parameter set
	WASH CYCLE	0.0 ... 999.9 h (**000.0 h**)
	WASH TIME	0 ... 1999 s (**0060 SEC**)
	CONTACT	**N/O** / N/C

Selecting the parameter set PARSET

PAR	PARSET FIX A (no switchover, parameter set A)
	MANUAL (manual selection in the "Configuration" menu)
	CNTR INPUT (switchover via CNTR control input)

Time/date

CLK	FORMAT	**24 h** / 12 h	
	24 h	hh:mm	
	12 h	hh:mm (AM / PM)	00 ... 12:59 AM / 1 ... 11:59 PM
	DAY / MONTH	dd.mm	
	YEAR	2000 ... 2099	

Tag number (TAG)

TAG	The entries are made in the text line.

pH **Oxy** **Cond**

Output Current, Range, Current Start, Current End

(Example: current output 1, device type pH)
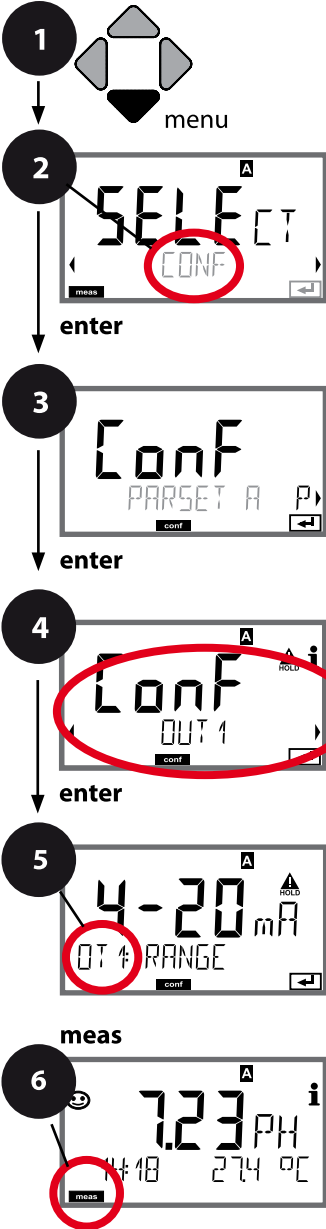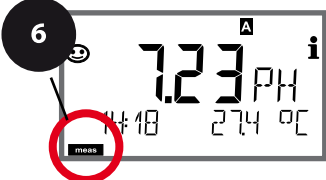
1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶ keys,
   press **enter**.
4 Select **OUT1** menu using ◀ ▶ keys press,
   enter.
5 All items of this menu group are indicated by the "OT1:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

Current range	enter
Process variable	
Current start	
Current end	
Time averaging filter	
Output current during error message	
Output current during HOLD	
Output current for HOLD FIX	

5
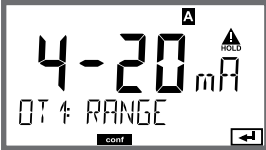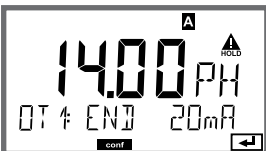
Menu item	Action	Choices
Current range **4-20mA** OT 1: RANGE conf	Select 4-20 mA or 0-20 mA range using ▲ ▼ keys. Press **enter** to confirm.	**4-20 mA** / 0-20 mA
Process variable PH OT 1: CHANNEL conf	**Example: current output 1, device type pH** Select using ▲ ▼ keys. PH: pH value ORP: ORP value TMP: Temperature Press **enter** to confirm.	**PH**/ORP/TMP
Current start 00.00PH OT 1: BEGIN 4mA conf	Modify digit using ▲ ▼ keys, select next digit using ◄ ► keys. Press **enter** to confirm.	−2...16 pH (PH) −1999...1999 mV (ORP) −20...300 °C / −4...572 °F (TMP)
Current end 14.00PH OT 1: END 20mA conf	Enter value using ▲ ▼ ◄ ► keys. Press **enter** to confirm.	−2...16 pH (PH) −1999...1999 mV (ORP) −20...300 °C / −4...572 °F (TMP)

Assignment of measured values: Current start and current end

Example 1: Range pH 0...14
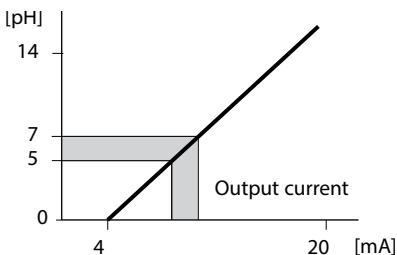
Example 2: Range pH 5...7
Advantage: Higher resolution in range of interest

[pH]
14
7
5
0
4   20   [mA]
Output current

[pH]
7
5
4   20   [mA]
Output current
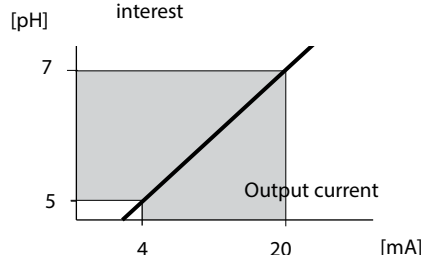
Cond

Output Current, Characteristic

(Device type Cond(I) only. Example: current output 1)

1 menu

2 SELECT CONF

enter

3 ConF PARSET A P

enter

4 ConF OUT 1

enter
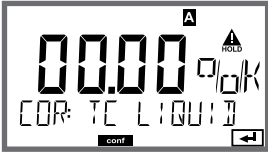
5 bi LIN OT1 OUTPUT

meas

6 150.0 mS/c N:23 25.0 °C

1 Press **menu** key.
2 Select **CONF** using ◄ ► keys, press **enter**.
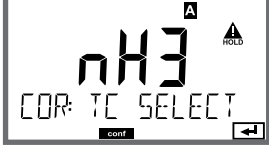3 Select parameter set using ◄ ► keys, press **enter**.
4 Select **OUT1** menu using ◄ ► keys press, **enter**.
5 All items of this menu group are indicated by the "OT1:" code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is displayed.

5 **enter**

| Current range |
| Process variable |
| LIN/biLIN/LOG output* |
| Current start |
| Current end |
| Bilinear: Vertex X |
| Bilinear: Vertex Y |
| Time averaging filter |
| Output current during error message |
| Output current during HOLD |
| Output current for HOLD FIX |

*) with Cond(I) only

5

Menu item	Action	Choices
Output current curve	Select using ▲ ▼ keys, confirm by pressing **enter**	**LIN** Linear characteristic biLIN Bilinear curve LOG Logarithmic curve
Current start and current end	Enter value using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	Entered value applies to selected process variable/range. If the adjusted range is exceeded, the device automatically switches to the next higher range (Autorange)
Bilinear curve: Vertex X/Y	Enter value using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	Entered value applies to selected vertex of bilinear curve "Corner X" (process variable) and "Corner Y (output current) – see figure below.

Vertex of bilinear curve

Output current [mA]
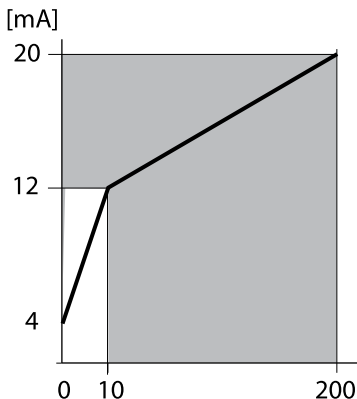
Example:
Current range 4 ... 20 mA,
Current start: 0 µS/cm
Current end: 200 µS/cm
Vertex:
"CORNER X": 10 µS/cm (process variable)
"CORNER Y": 12 mA (output current)
Result: The output current change in the range 0 ... 10 µS/cm is much greater than in the range 10 ... 200 µS/cm.

Process variable [µS/cm]

Output Current, Logarithmic Curve

Nonlinear output current characteristic: allows measurements over several decades, e.g. measuring very low values with a high resolution and high values with a low resolution.
Parameters required: Start and end value

Possible start and end values
The start value must be at least one decade lower than the end value. Start value and end value must be specified in the same units (either in µS/cm or in S/m, see listing):

1,0 µS/cm	
10,0 µS/cm	0,001 S/m
100,0 µS/cm	0,01 S/m
1,0 mS/cm	0,1 S/m
10,0 mS/cm	1,0 S/m
100,0 mS/cm	10,0 S/m
1000 mS/cm	100 S/m

The start value
is the next decade value below the lowest measured value.

The end value
is the next decade value above the highest measured value.

The number of decades results from:
Number of decades = log (end value) – log (start value)
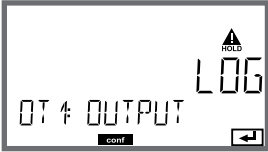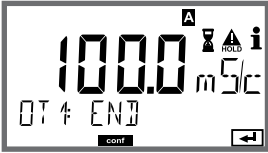
The output current value is defined as follows:

$$\text{Output current} = 16\,\text{mA} * \frac{\log(\text{measured value}) - \log(\text{start value})}{\text{Number of decades}} + 4\,\text{mA}$$

5
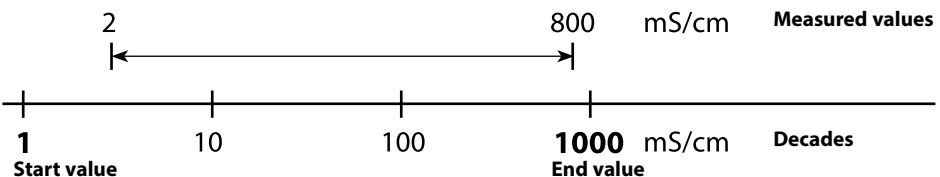
Menu item	Action	Choices
Logarithmic curve Output current	Select using ▲ ▼ keys, confirm by pressing**enter**	**LOG** Logarithmic curve biLIN Bilinear curve LIN Linear characteristic
Start value	Enter value using ▲ ▼ ◄ ► keys. Press **enter** to confirm.	Start value of logarithmic output curve
End value	Enter value using ▲ ▼ ◄ ► keys. Press **enter** to confirm.	End value of logarithmic output curve

Possible start and end values for the logarithmic curve

S/cm:

1.0 µS/cm, 10.0 µS/cm, 100.0 µS/cm,
1.0 mS/cm, 10.0 mS/cm, 100.0 mS/cm, 1000 mS/cm

S/m:

0.001 S/m, 0.01 S/m, 0.1 S/m, 1.0 S/m, 10.0 S/m, 100 S/m

pH | **Oxy** | **Cond**

Current Output: Time Averaging Filter

(Example: current output 1, device type pH)

1 menu

2 SELE CT
CONF

enter

3 ConF
PARSET A P

enter

4 ConF
OUT 1

enter

5 0000 SEC
OT1: FILTERTIME

meas

6 7.23 PH
14:18 27.4 °C

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶ keys,
   press **enter**.
4 Select **OUT1** menu using ◀ ▶ keys press,
   enter.
5 All items of this menu group are indicated by the "OT1:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

5   **enter**

| Current range |
| Process variable |
| Current start |
| Current end |
| Time averaging filter |
| Output current during error message |
| Output current during HOLD |
| Output current for HOLD FIX |

| pH | Oxy | Cond |

5

Menu item	Action	Choices
Time averaging filter	Enter value using ▲ ▼ ◀ ▶ keys.	0...120 SEC (**0000 SEC**)
	Press **enter** to confirm.	

Time averaging filter

To smoothen the current output, a low-pass filter with adjustable filter time constant can be switched on. When there is a jump at the input (100 %), the output level is at 63 % after the time interval has been reached. The time interval can be set from 0 to 120 sec. If the time interval is set to 0 sec, the current output directly follows the input.

Note:

The filter only acts on the current output, not on the display, the limit values, or the controller!

During HOLD the filter is not applied. This prevents a jump at the output.
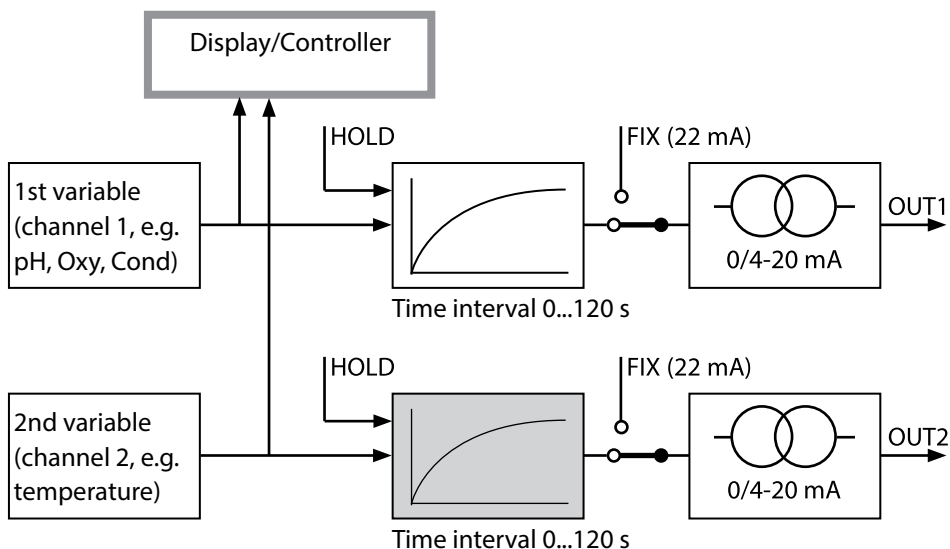
pH | **Oxy** | **Cond**

Output Current, Error and HOLD

(Example: current output 1, device type pH)

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶ keys,
   press **enter**.
4 Select **OUT1** menu using ◀ ▶ keys press,
   enter.
5 All items of this menu group are indicated by the "OT1:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

Current range
Process variable
Current start
Current end
Time averaging filter
Output current during error message
Output current during HOLD
Output current for HOLD FIX

| pH | Oxy | Cond |

5

Menu item	Action	Choices
Output current during error message	The output current can be set to 22 mA in the case of error messages or Sensoface messages. Select error messages (FAIL) or Sensoface messages (FACE) as trigger signal using ▲ ▼ ◄ ► keys. Press **enter** to confirm.	**OFF** / FAIL / FACE
Output current during HOLD	LAST: During HOLD the last measured value is maintained at the output. FIX: During HOLD a value (to be entered) is maintained at the output. Select using ▲ ▼ Press **enter** to confirm.	**LAST**/FIX
Output current for HOLD FIX	Only with FIX selected: Enter current which is to flow at the output during HOLD Enter value using ▲ ▼ ◄ ► keys. Press **enter** to confirm.	00.00...22.00 mA (**21.00 mA**)

Output signal during HOLD:

Output current [mA]

Output signal for HOLD FIX setting = 21.0 mA

Output signal for HOLD LAST setting

21

4

HOLD active   HOLD active

pH

Temperature Compensation of Process Medium (pH)
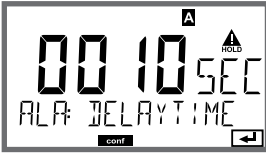

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
  press **enter**.
3 Select parameter set using ◀ ▶ keys,
  press **enter**.
4 Select **CORRECTION** menu using ◀ ▶ keys, press **enter**.
5 All items of this menu group are indicated by the "COR:"
  code.
  Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
  displayed.

pH temp compensation
Process medium (linear)

pH

5

Menu item	Action	Choices
Temperature compensation of process medium **OFF** COR: TC SELECT	For pH measurement only: Select temperature compensation of the process medium. Linear: LIN Select using ◀ ▶, press **enter** to confirm.	**OFF** / LIN
Temperature compensation, linear **00.00** %/K COR: TC LIQUID	Enter the linear temperature compensation of the process medium. Enter value using ▲ ▼ ◀ ▶ keys Press **enter** to confirm.	–19.99...+19.99 %/K

Cond

Temperature Compensation (Cond)
Selecting the compensation method
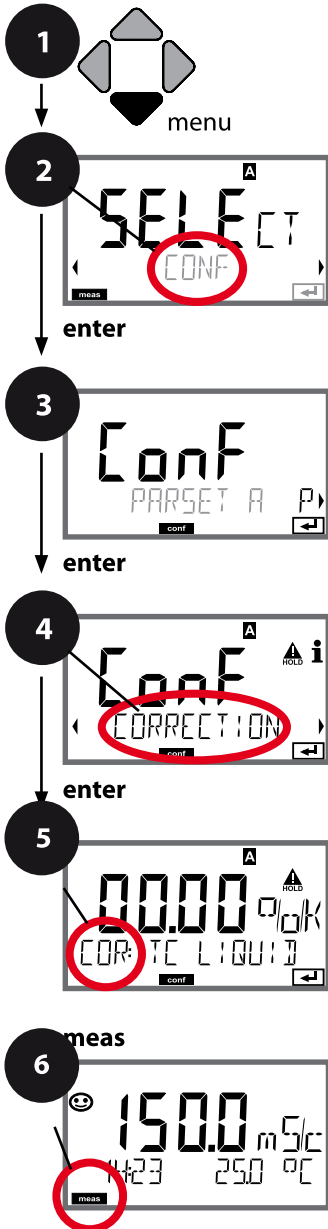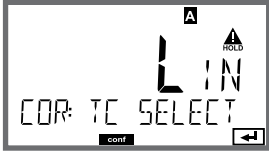
1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
  press **enter**.
3 Select parameter set using ◀ ▶ keys,
  press **enter**.
4 Select **CORRECTION** menu using ◀ ▶ keys, press **enter**.
5 All items of this menu group are indicated by the "COR:" code.
  Confirm (and proceed) by pressing **enter**.
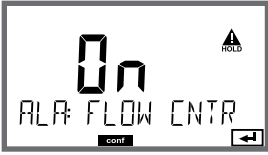6 Exit: Press **meas** key until the [meas] mode indicator is displayed.

1

menu

2

SELECT
CONF

enter

3

ConF
PARSET A P▸

enter

4

ConF
CORRECTION

enter

5

00.00 %/K
COR: TC LIQUID

5

Cond temp compensation
Process medium

6

meas

150.0 mS/c
14:23   25.0 °C

5

Menu item	Action	Choices
Temperature compensation	Select desired compensation using ▲ ▼ keys: **OFF:** Temperature compensation switched off	**OFF** A HOLD COR: TC SELECT conf
	LIN: Linear temperature compensation with entry of temperature coefficient	**LIN** A HOLD COR: TC SELECT conf
	nLF: Temperature compensation for natural waters to EN 27888	**nLF** A HOLD COR: TC SELECT conf
	NaCl: Temperature compensation for ultrapure water with NaCl traces	**nACL** A HOLD COR: TC SELECT conf
	HCl: Temperature compensation for ultrapure water with HCl traces	**HCL** A HOLD COR: TC SELECT conf
	NH3: Temperature compensation for ultrapure water with NH_3 traces Confirm by pressing **enter**	**nH3** A HOLD COR: TC SELECT conf
	NaOH (without figure)	

Oxy

Correction (Oxy)
Salinity Correction, Pressure Correction
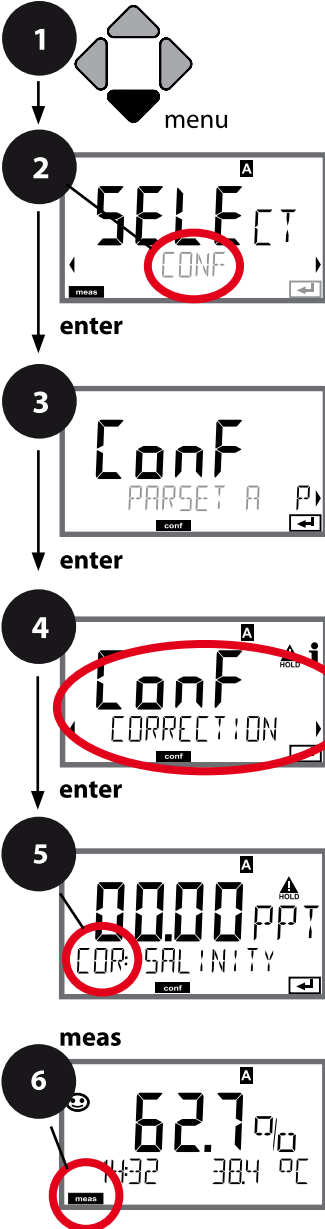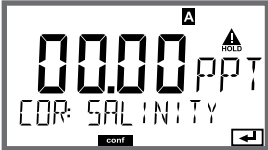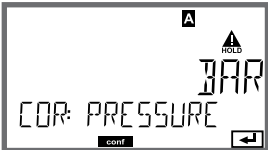
1 menu

2 SELECT
CONF

enter

1. Press **menu** key.
2. Select **CONF** using ◀ ▶ keys,
   press **enter**.
3. Select parameter set using ◀ ▶ keys,
   press **enter**.
4. Select **CORRECTION** menu using ◀ ▶ keys, press **enter**.
5. All items of this menu group are indicated by the "COR:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6. Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

3 ConF
PARSET A P▶

enter

4 ConF
CORRECTION

enter

5

| Salinity |
| Pressure unit |
| Pressure correction |
| Manual pressure input |

enter

5 00.00 PPT
COR: SALINITY

meas

6 62.7 %
14:32   38.4 °C

5

Menu item	Action	Choices
Enter salinity `00.00` PPT `COR: SALINITY` A HOLD conf	Enter the salinity of the process medium. Enter value using ▲ ▼ ◄ ► keys. Press **enter** to confirm.	00.00...45.00 ppt

Enter pressure unit
 	
`BAR`
`COR: PRESSURE`
A HOLD conf
	Select desired pressure unit using ▲ ▼ keys.
	
	Press **enter** to confirm.
		Bar/kPa/PSI

Enter pressure correction
 	
`MAN`
`COR: PRESSURE`
A HOLD conf
	Select using ▲ ▼ keys:
	MAN (manual input)
	Press **enter** to confirm.
		MAN / EXT

Manual pressure input `1.013` BAR `COR: PRESSURE` A HOLD conf	Enter value using ▲ ▼ ◄ ► keys. Press **enter** to confirm.	Input range: 0.000...9.999 BAR / 000.0...999.9 KPA / 000.0...145.0 PSI **1.013 BAR**

pH | **Oxy** | **Cond**

Parameter Set Selection (External Signal)

1

menu

2

SELECT
CONF
meas

enter

3

ConF
PARSET A P▸
conf

enter

4

ConF
CNTR_IN
conf

enter

5

PArSEt
IN : CONTROL
conf

1 Press **menu** key.
2 Select **CONF** using ◂ ▸ keys,
   press **enter**.
3 Select parameter set A using ◂ ▸ keys,
   press **enter**.
4 Select **CNTR_IN** menu using ◂ ▸ keys, press **enter**.
5 All items of this menu group are indicated by the "IN:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
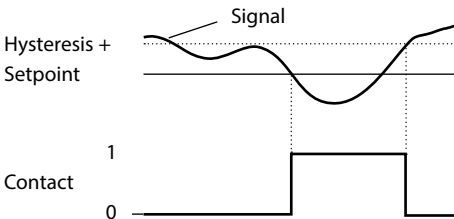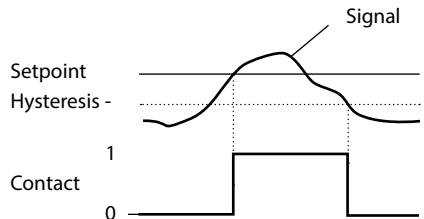6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

5

| CONTROL input (function) | **enter** |
| PARSET |
| FLOW |

meas

6

62.7 %
14:32   38.4 °C
meas

pH   **Oxy**   **Cond**

5
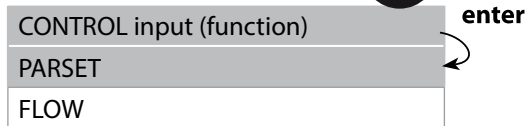
Menu item	Action	Choices
Select function of CONTROL input	Select using ◄ ► keys, confirm by pressing **enter**	**PARSET FIX A /** MANUAL / CNTR INPUT (selecting parameter set A/B via signal at CONTROL input)

```
PArSet
IN : CONTROL
conf
```

External switchover of parameter sets

The parameter set A/B can be activated from outside by sending a signal to the CONTROL input (e.g. from the process control system).

Power supply
12...24 V AC/DC

13

CONTROL

12

input

A402

Process control system
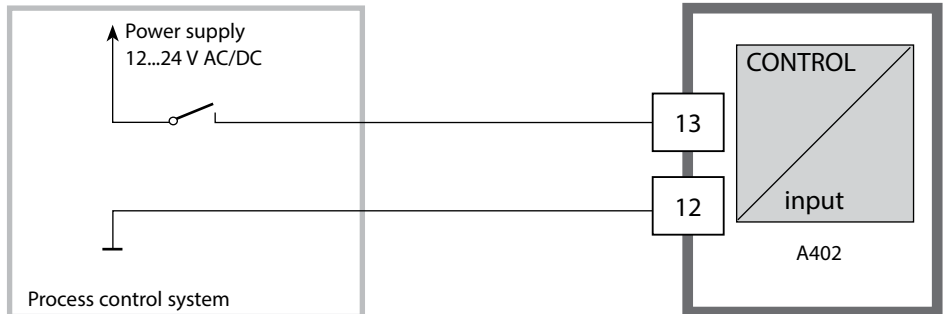
| Parameter set A | 0...2 V AC/DC |
| Parameter set B | 10...30 V AC/DC |

pH | **Oxy** | **Cond**

Flow Measurement

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set A using ◀ ▶ keys,
   press **enter**.
4 Select **CNTR_IN** menu using ◀ ▶ keys, press **enter**.
5 All items of this menu group are indicated by the "IN:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

1 menu

2 SELEct
A
CONF
meas

enter

3 ConF
PARSET A P▸
conf

enter

4 ConF
A
HOLD i
◀ CNTR_IN ▶
conf

enter

5 PArSEt
HOLD
IN : CONTROL
conf

| CONTROL input (function) | **enter** |
| PARSET / FLOW |
| FLOW: ADJUST |

5

meas

6 62.7 %
A
14:32   38.4 °C
meas

5

Menu item	Action	Choices
Select function of CONTROL input **PArSEt** IN : CONTROL conf	Select using ▲ ▼ keys, confirm by pressing **enter**	**PARSET** (selecting parameter set A/B via signal at CONTROL input)
FLOW IN : CONTROL conf		Flow (for connecting a pulse-output flow meter)
Adjust to flow meter: **1200** o/L IN ADJUST FLOW conf	**With "Flow" selected**, you must adjust the device to the flow meter used. Enter value using arrow keys, confirm by pressing **enter**	**12000 pulses/liter**

In the alarm menu you can configure flow monitoring. When you have set CONTROL to FLOW, you can specify 2 additional limit values for maximum and minimum flow. If the measured value lies outside this range, an alarm message and a 22-mA error signal (if configured) will be generated.

Display
Flow measurement in measuring mode

12.34 uS
7.3 L/h   13.27 uS
meas

Display
Flow measurement (sensor monitor)

7.3 L/h
FLOW
diag

pH	**Oxy**	**Cond**

Alarm, Alarm Delay, Sensocheck

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
  press **enter**.
3 Select parameter set using ◀ ▶ keys, press **enter**.
4 Select **ALARM** menu using ◀ ▶ keys, press **enter**.
5 All items of this menu group are indicated by the "ALA:" code.
  Press **enter** to select menu,
  edit using arrow keys (see next page).
  Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is displayed.

Delay
Sensocheck
Alarm: CONTROL input
With flow monitoring: Max. flow alarm
With flow monitoring: Min. flow alarm

| pH | Oxy | Cond |

5

Menu item	Action	Choices
Alarm delay **0010** SEC ALA DELAYTIME conf	Enter alarm delay using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0...600 SEC **010 SEC**)
Sensocheck **OFF** ALA SENSOCHECK conf	Select Sensocheck (continuous monitoring of sensor membrane and lines). Select ON or OFF using ▲ ▼ keys. Press **enter** to confirm. (At the same time, Sensoface is activated. With OFF, Sensoface is also switched off.)	ON/**OFF**
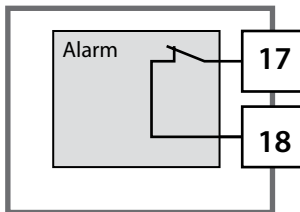
Alarm contact
The alarm contact is closed during normal operation (N/C). It opens in the case of alarm or power outage. As a result, a failure message is output even in the case of line breakage (fail-safe behavior). For contact ratings, see Specifications.

Alarm — 17 / 18

Error messages can also be signaled by a 22-mA output current (see Error messages and Configuration Output 1/Output 2).
Operating behavior of the alarm contact: see Operating States table.
The alarm delay time delays the color change of the display backlighting to red, the 22-mA signal (if configured), and the alarm contact switching.

pH	Oxy	Cond

Alarm, CONTROL Input (FLOW MIN, FLOW MAX)
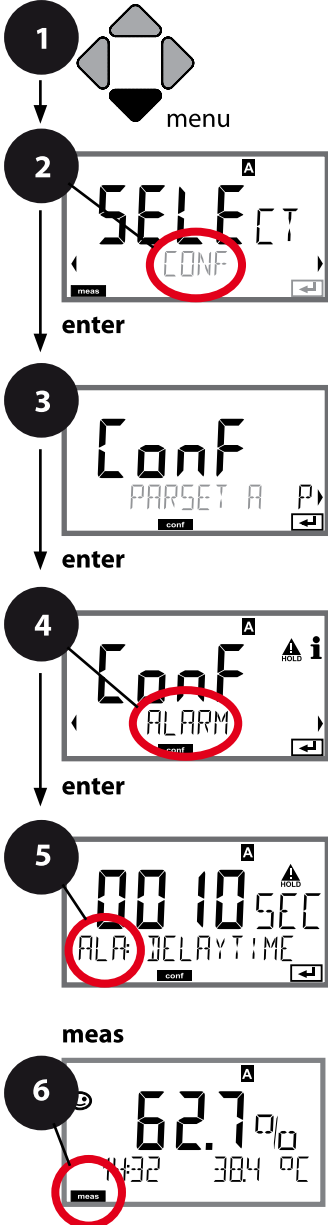
1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶ keys,
   press **enter**.
4 Select **ALARM** menu using ◀ ▶ keys,
   press **enter**.
5 All items of this menu group are indicated by the "ALA:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

1 menu

2 SELECT CONF

enter

3 ConF PARSET A P▸

enter

4 ConF ALARM

enter

5 0010 SEC ALA:DELAYTIME

meas

6 62.7 % 14:32 38.4 °C

5	
Alarm: Delay	**enter**
Alarm: Sensocheck	
Alarm: CONTROL input	
With flow monitoring: Max. flow alarm	
With flow monitoring: Min. flow alarm	

5

Menu item	Action	Choices
CONTROL input **On** ALA FLOW CNTR HOLD conf	The **CONTROL input** can generate an alarm when assigned to "FLOW" (flow monitoring) in the CONF menu: **FLOW CNTR** **Flow measurement:** allows monitoring the minimum and maximum flow (pulse counter)	ON/**OFF** (FLOW MIN, FLOW MAX.)
Alarm Minimum flow **FLOW MIN**	Specify value	Default: 05.00 liters/h
Alarm Maximum flow **FLOW MAX**	Specify value	Default: 25.00 liters/h

pH	Oxy	Cond

Limit Function, Relay 1

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶ keys, press enter.
4 Select **REL1/REL2** menu using ◀ ▶ keys, press **enter**.
5 All items of this menu group are indicated by the "RL1:" code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is displayed.

1

menu

2

SELEct

CONF

meas

enter

3

ConF

PARSET A   P▸

conf

enter

4

ConF

▲ i
HOLD

◀ REL 1/REL2 ▶

conf

enter

5

▲
HOLD

PH

RL 1: CHANNEL

conf

5

Use of relays	**enter**
Select process variable	
Limit 1 switching characteristics (function)	
Limit 1 contact type	
Limit 1 setpoint	
Limit 1 hysteresis	
Limit 1 delay	

meas

6

A i

7.23 PH

14:18   27.4 °C

meas

5
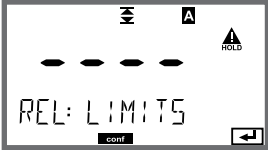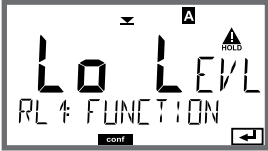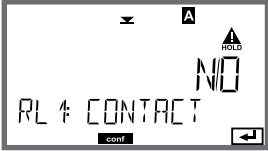
Menu item	Action	Choices
Use of relays REL: LIMITS conf	Select in the text line using ▲ ▼ keys: • Limit function (LIMITS) • Controller (CONTROLLER) Press **enter** to confirm.	**LIMITS** / CONTROLLER **Note:** Selecting CONTROLLER leads to Controller menu group CTR.
Select process variable PH RL 1: CHANNEL conf	Select desired process variable using ▲ ▼ keys. Press **enter** to confirm.	depending on Memosens sensor
Limit 1 function Lo LEVL RL 1: FUNCTION conf	Select desired function using arrow keys. LoLevel: active if value falls below setpoint LoLevel: active if value exceeds setpoint Press **enter** to confirm.	**Lo LEVL** / Hi LEVL Limit 1 icon: ▼
Limit 1 contact response NO RL 1: CONTACT conf	N/O: normally open contact N/C: normally closed contact Select using ▲ ▼ keys. Press **enter** to confirm.	**N/O** / N/C
Limit 1 setpoint 02.00 PH RL 1: LEVEL conf	Enter setpoint using ▲ ▼ ◄ ► keys. Press **enter** to confirm.	depending on module or Memosens sensor

pH | **Oxy** | **Cond**

Limit Function, Relay 1

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
 press **enter**.
3 Select parameter set using ◀ ▶ keys,
 press **enter**.
4 Select **REL1/REL2** menu using ◀ ▶ keys, press **enter**.
5 All items of this menu group are indicated by the "RL1:"
 code.
 Press **enter** to select menu,
 edit using arrow keys (see next page).
 Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
 displayed.

1

menu

2

SELE CT
CONF
meas

enter

3

ConF
PARSET A P▸
conf

enter

4

ConF
REL 1/REL2
conf

enter

5

PH
RL 1:CHANNEL
conf

meas

6

7.23 PH
14:18 27.4 °C
meas

5

Use of relays	**enter**
Select process variable	
Limit 1 switching characteristics (function)	
Limit 1 contact type	
Limit 1 setpoint	
Limit 1 hysteresis	
Limit 1 delay	

pH | Oxy | Cond

5

Menu item	Action	Choices

Limit 1 hysteresis
 	
`00.50 PH`
`RL 1 HYSTERESIS`
`conf`
	Select hysteresis using ▲ ▼
	◀ ▶ keys.
	
	Press **enter** to confirm.
		depending on module or
		Memosens sensor

Limit 1 delay
 	
`0010 SEC`
`RL 1 DELAYTIME`
`conf`
	The contact is activated with
	delay (deactivated without
	delay)
	Adjust delay using ▲ ▼ ◀ ▶
	keys.
	
	Press **enter** to confirm.
		0...9999 SEC
		(**0010 SEC**)

Application of Hysteresis:

Limit Lo

Hysteresis +
Setpoint

Signal

Contact

1

0

Limit Hi

Setpoint
Hysteresis -

Signal

Contact

1

0

pH | **Oxy** | **Cond**

Limit Function, Relay 2

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶ keys,
   press **enter**.
4 Select **REL1/REL2** menu using ◀ ▶ keys, press **enter**.
5 All items of this menu group are indicated by the "RL2:"
   code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
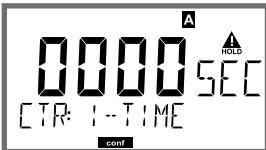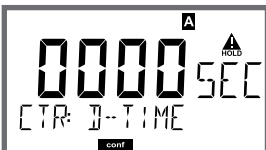6 Exit: Press **meas** key until the [meas] mode indicator is
   displayed.

Use of relays
Select process variable
Limit 2 switching characteristics (function)
Limit 2 contact type
Limit 2 setpoint
Limit 2 hysteresis
Limit 2 delay

5

Menu item	Action	Choices
Select process variable (CHANNEL)	Select desired process variable using ▲ ▼ keys. Press **enter** to confirm.	depending on module or Memosens sensor
Limit 2 function (FUNCTION)	Select desired function using arrow keys. Press **enter** to confirm.	Lo LEVL / **Hi LEVL** Limit 2 icon: ▲
Limit 2 contact type (CONTACT)	N/O: normally open contact N/C: normally closed contact Select using ▲ ▼ keys. Press **enter** to confirm.	**N/O** / N/C
Limit 2 setpoint (LEVEL)	Enter setpoint using ▲ ▼ ◄ ► keys. Press **enter** to confirm.	depending on module or Memosens sensor
Limit 2 hysteresis (HYSTERESIS)	Select hysteresis using ▲ ▼ ◄ ► keys. Press **enter** to confirm.	depending on module or Memosens sensor
Limit 2 delay (DELAYTIME)	The contact is activated with delay (deactivated without delay) Adjust delay using ▲ ▼ ◄ ► keys. Press **enter** to confirm.	0...9999 SEC (**0010 SEC**)

Application of Hysteresis:

Limit Lo

Signal

Hysteresis + Setpoint

Contact   1

0

Limit Hi

Signal

Setpoint Hysteresis -

Contact   1

0

Protective Wiring of Relay Contacts
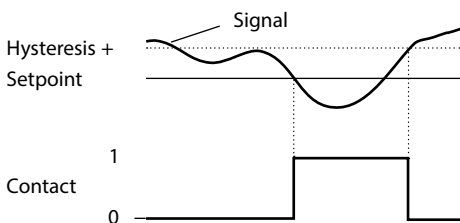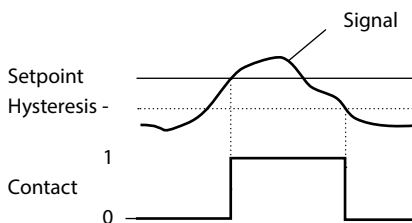
pH	Oxy	Cond

Protective Wiring of Relay Contacts

Relay contacts are subject to electrical erosion. Especially with inductive and capacitive loads, the service life of the contacts will be reduced. For suppression of sparks and arcing, components such as RC combinations, nonlinear resistors, series resistors and diodes should be used.
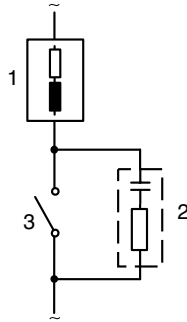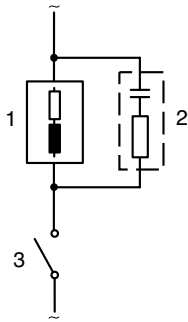
Typical AC applications with inductive load

1. Load
2. RC combination,
   e.g. RIFA PMR 209
   Typical RC combinations for 230 V AC:
   capacitor 0.1 µF / 630 V,
   resistor 100 Ω / 1 W
3. Contact

Typical Protective Wiring Measures
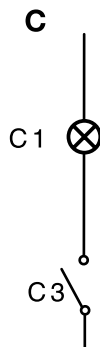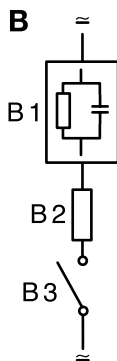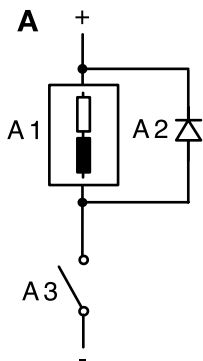
A: DC application with inductive load
B: AC/DC applications with capacitive load
C: Connection of incandescent lamps

A1   Inductive load
A2   Free-wheeling diode, e.g. 1N4007 (Observe polarity)
A3   Contact
B1   Capacitive load
B2   Resistor, e.g. 8 Ω / 1 W at 24 V / 0.3 A
B3   Contact
C1   Incandescent lamp, max 60 W / 230 V, 30 W / 115 V
C3   Contact

⚠ **WARNING!**

Make sure that the maximum ratings of the relay contacts are not exceeded even during switching!

pH **Oxy** **Cond**

Typical applications

P controller
Application for integrating control systems (e.g. closed tank, batch processes).

PI controller
Application for non-integrating control systems (e.g. drains).

PID Controller
The additional derivative action compensates for measurement peaks.

Controller characteristic

+100 %   Controller output Yp
[%]

Relay 1
▼

Neutral zone Yp=0

Deviation Xw [pH]

Desired value

Relay 2
▲

-100 %
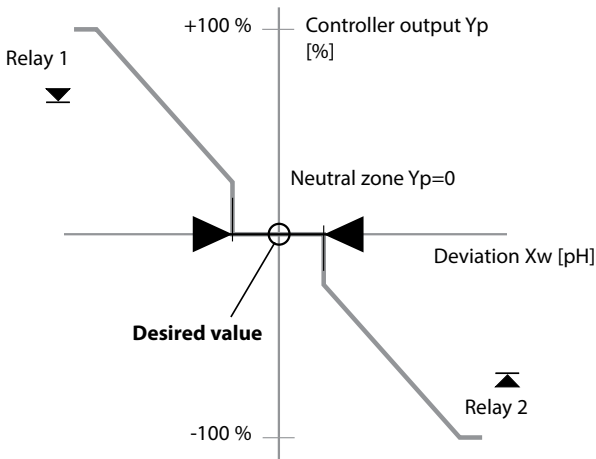
PID Controller

pH	Oxy	Cond

Controller Equations

Controller output $Y = \quad Y_P \quad + \quad \dfrac{1}{T_R} \displaystyle\int Y_P dt \quad + \quad T_D \dfrac{dY_P}{dt}$

$\qquad\qquad\qquad$ P action $\qquad\qquad$ I action $\qquad\qquad$ D action

Proportional action Y_P

$Y_P = \dfrac{\text{Setpoint - Meas. value}}{\text{Constant}} \quad * \quad K_C$

with:

Y_P	Proportional action
T_N	Reset time [s]
T_D	Rate time [s]
K_C	Controller gain [%]
Constant	5 (for pH)
	500 mV (for ORP)

Neutral zone

Tolerated deviation from desired value.
With the setting "1 pH", for example, a deviation of $\pm$ 0.5 pH from the desired value is tolerated.

Proportional action (Gradient K_C [%])
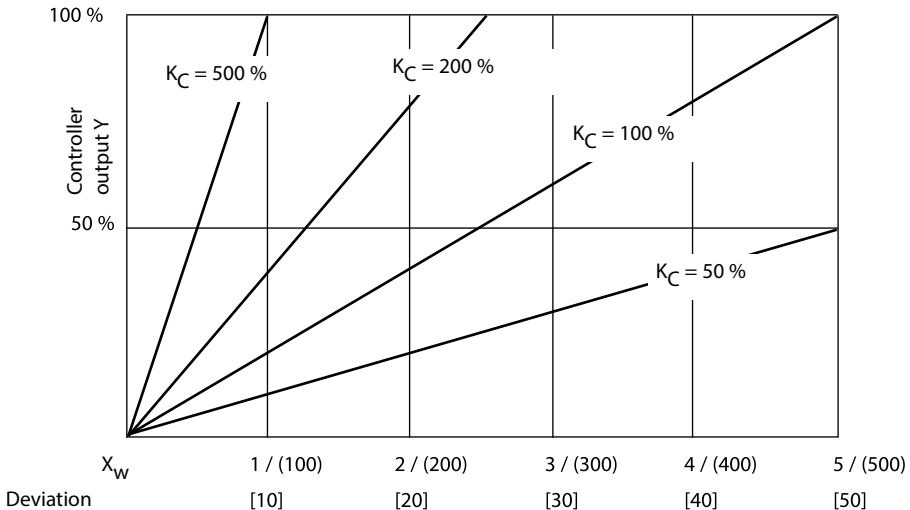
Process variables: pH/ (mV),
underneath: temp [K]

pH | Oxy | Cond

Pulse Length / Pulse Frequency Controller

Pulse Length Controller (PLC)

The pulse length controller is used to operate a valve as an actuator. It switches the contact on for a time that depends on the controller output. The period is constant. A minimum ON time of 0.5 sec is maintained even if the controller output takes corresponding values.

Output signal (relay contact) of pulse length controller
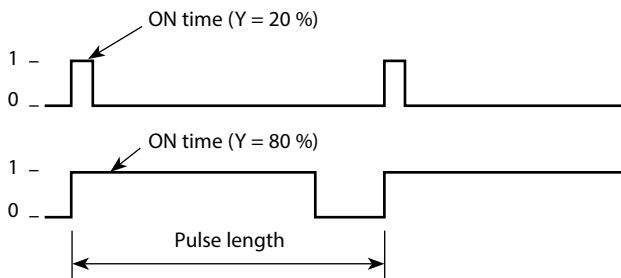
Pulse Frequency Controller (PFC)

The pulse frequency controller is used to operate a frequency-controlled actuator (metering pump). It varies the frequency with which the contacts are switched on. The maximum pulse frequency [pulses/min] can be defined. It depends on the actuator.

The contact ON time is constant. It is automatically calculated from the user-defined maximum pulse frequency:

Output signal (relay contact) of pulse frequency controller
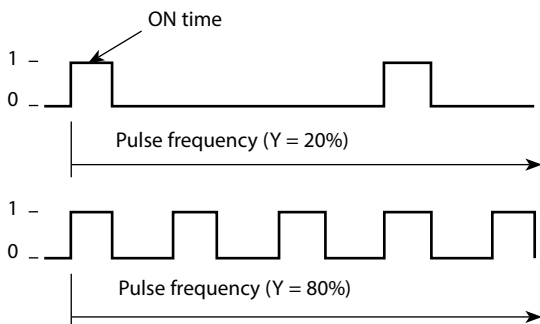
pH **Oxy** **Cond**

Controller, Process Variable, Controller Type, Setpoint

1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
  press **enter**.
3 Select parameter set using ◀ ▶ keys,
  press **enter**.
4 Select **REL1/REL2** menu using ◀ ▶ keys, press **enter**.
5 All items of this menu group are indicated by the "CTR:"
  code.
  Press **enter** to select menu,
  edit using arrow keys (see next page).
  Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
  displayed.

5
Use of relays
Select process variable
Controller type
Pulse length
Pulse frequency
Desired value
Neutral zone
Controller: P action
Controller: I action
Controller: D action
Behavior during HOLD

5
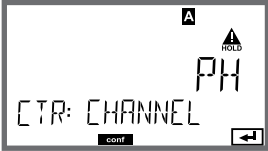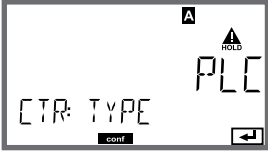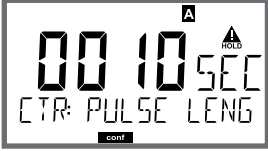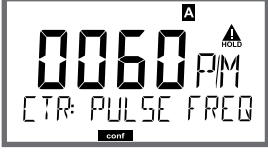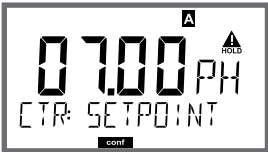
Menu item	Action	Choices
Use of relays	Select in the text line using ▲ ▼ keys: • Controller (CONTROLLER) Press **enter** to confirm.	**LIMITS** / CONTROLLER Selecting CONTROLLER leads to Controller menu group CTR.
Select process variable A HOLD PH CTR: CHANNEL conf	Select desired process variable using ▲ ▼ keys. Press **enter** to confirm.	depending on module or Memosens sensor
Controller type A HOLD PLC CTR: TYPE conf	Pulse length controller (PLC) or pulse frequency controller (PFC) Select using ▲ ▼ keys. Press **enter** to confirm.	**PLC**/PFC
Pulse length A HOLD 0010 SEC CTR: PULSE LENG conf	Only with PLC: Pulse length Adjust using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0...0600 SEC (**0010 SEC**)
Pulse frequency A HOLD 0060 P/M CTR: PULSE FREQ conf	Only with PFC: Pulse frequency Adjust using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0...0180 P/M (**0060 P/M**) (pulses per minute)
Desired value A HOLD 07.00 PH CTR: SETPOINT conf	Adjust setpoint using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	depending on module or Memosens sensor

pH   **Oxy**   **Cond**

Controller, Neutral Zone, P, I, D Action Components, Behavior during HOLD
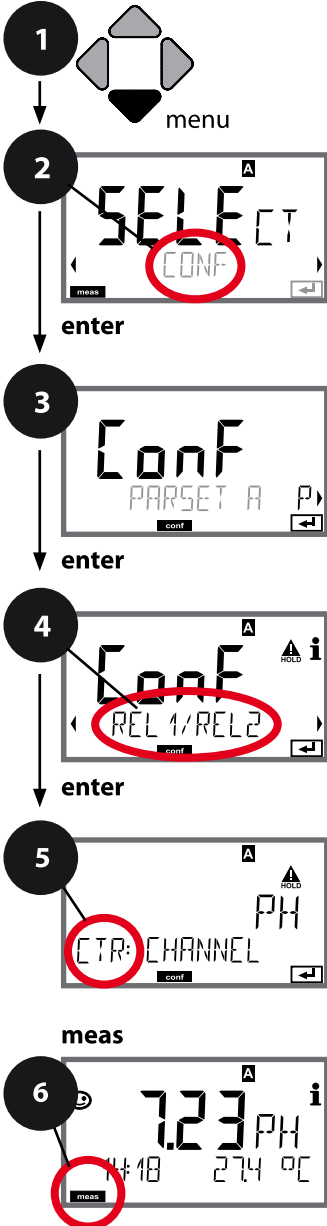
1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set using ◀ ▶,
   press **enter**.
4 Select **REL1/REL2** menu using ◀ ▶ keys, press **enter**.
5 All items of this menu group are indicated by the "CTR:" code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is displayed.

5
Use of relays
Select process variable
Controller type
Pulse length
Pulse frequency
Desired value
Neutral zone
Controller: P action
Controller: I action
Controller: D action
Behavior during HOLD

5
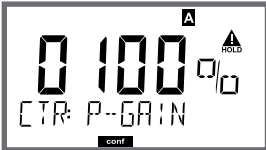
Menu item	Action	Choices

Neutral zone
 	
`01.00 PH`
`CTR: DEAD BAND`
A HOLD conf
	Adjust neutral zone using ▲ ▼ ◀ ▶ keys.
	
	Press **enter** to confirm.
		depending on module or Memosens sensor

Controller: P action
 	
`0100 %`
`CTR: P-GAIN`
A HOLD conf
	Adjust P action using ▲ ▼ ◀ ▶ keys.
	
	Press **enter** to confirm.
		10...9999%
		(**0100%**)

Controller: I action
 	
`0000 SEC`
`CTR: I-TIME`
A HOLD conf
	Adjust I action using ▲ ▼ ◀ ▶ keys.
	
	Press **enter** to confirm.
		0...9999 SEC
		(**0000 SEC**)

Controller: D action
 	
`0000 SEC`
`CTR: D-TIME`
A HOLD conf
	Adjust D action using ▲ ▼ ◀ ▶ keys.
	
	Press **enter** to confirm.
		0...9999 SEC
		(**0000 SEC**)

Behavior during HOLD
 	
`Y LAST`
`CTR: HOLD MODE`
A HOLD conf
	Select response using ▲ ▼ keys.
	
	Press **enter** to confirm.
		Y LAST / Y OFF

pH | **Oxy** | **Cond**

WASH Contact, Controlling a Rinsing Probe or Signaling the Parameter Set
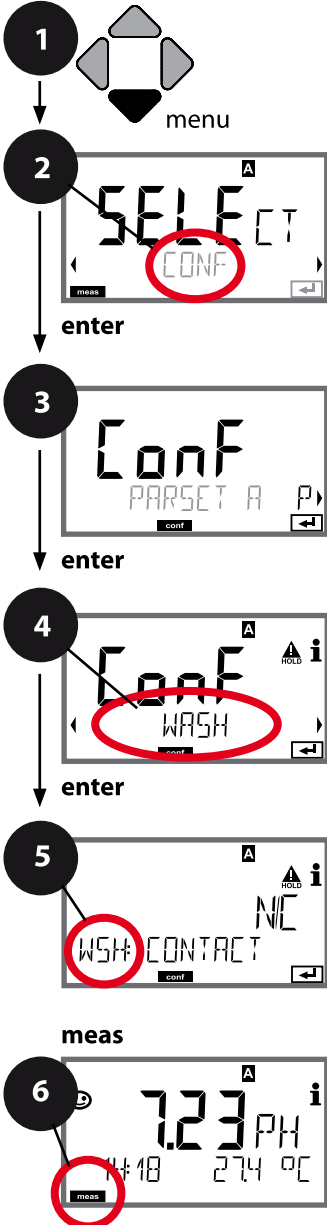
1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
   press **enter**.
3 Select parameter set A using ◀ ▶,
   enter.
4 Select **WASH** menu using ◀ ▶ keys,
   press **enter**.
5 All items of this menu group are indicated by the "WSH:" code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is displayed.

| Function |
| Cleaning interval |
| Cleaning duration |
| Contact type |

pH	Oxy	Cond

5
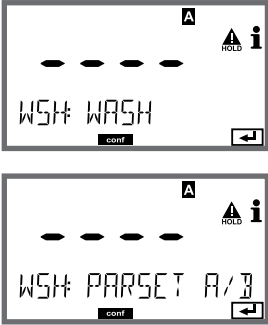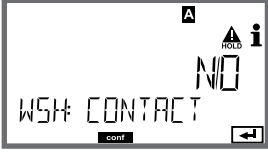
Menu item	Action	Choices
Function ⚠ i HOLD A – – – – WSH WASH conf ↵ A ⚠ i HOLD – – – – WSH PARSET A/B conf ↵	Select WASH contact function using ▲ ▼ keys. Press **enter** to confirm.	**WASH** / PARSET A/B WASH: Controlling a rinsing probe With PARSET A/B selected, the contact signals: "Parameter set A" (open contact) "Parameter set B" (closed contact)
Cleaning interval A ⚠ HOLD **000.0** h WSH WASH CYCLE conf ↵	Only with WASH: Adjust value using ▲ ▼ ◄ ► keys. Press **enter** to confirm.	0.0...999.9 h (**000.0 h**)
Cleaning duration A ⚠ i HOLD **0060** SEC WSH WASH TIME conf ↵	Only with WASH: Adjust value using ▲ ▼ ◄ ► keys. Press **enter** to confirm.	0...9999 SEC (**0060 SEC**)
Contact type A ⚠ i HOLD NO WSH CONTACT conf ↵	Only with WASH: N/O: normally open contact N/C: normally closed contact Select using ▲ ▼ keys. Press **enter** to confirm.	**N/O** / N/C

Cleaning | Relax time (approx. 30 s)

Cycle interval | HOLD
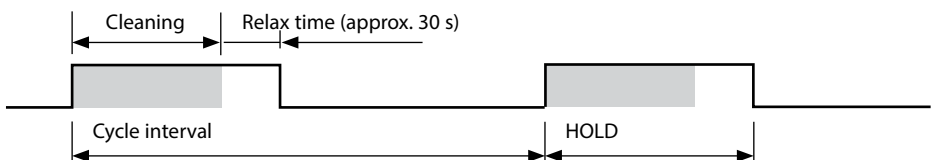
pH	**Oxy**	**Cond**

Time and Date, Tag Number

(Example: device type pH)
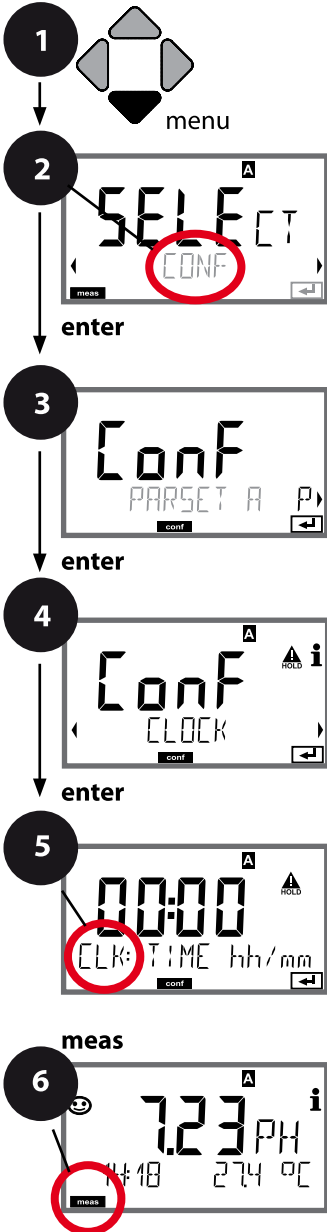
1 Press **menu** key.
2 Select **CONF** using ◀ ▶ keys,
  press **enter**.
3 Select parameter set A using ◀ ▶,
  enter.
4 Select **CLOCK** menu using ◀ ▶ keys,
  press **enter**.
5 All items of this menu group are indicated by the "**CLK:**" code.
  Press **enter** to select menu,
  edit using arrow keys (see next page).
  Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is displayed.

5	
Time format	enter
Time	
Day and month	
Year	
Tag number	

5

pH   Oxy   Cond

Time and Date

Control of the calibration and cleaning cycles is based on the time and date of the integrated real-time clock.

In measuring mode the time is shown in the lower display.

When using digital sensors, the calibration data is written in the sensor head.

In addition, the logbook entries (cf Diagnostics) are provided with a time stamp.

Please note:

- After prolonged power outage (> 5 days) the time display is replaced by dashes and cannot be used for processing.
  In that case, enter the correct time.
- There is no automatic switchover from winter to summer time!
  Be sure to manually adjust the time!

Tag Number ("TAG")
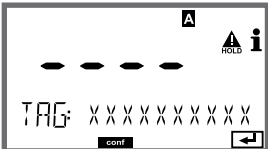
You can enter a designation for the point of measurement (tag number) in the lower display line.

Up to 32 digits are possible.

Pressing **meas** (repeatedly) in the measuring mode indicates the tag number.

Being part of the device configuration, the "TAG" can be read out via IrDA.

A standardized tag number helps, for example, to correctly re-install a device after repair.

Menu item	Action	Choices
Tag number TAG: ✕✕✕✕✕✕✕✕✕✕	Select character using ▲ ▼ keys, select next digit using ◀ ▶ keys. Press **enter** to confirm.	A...Z, 0...9, – + < > ? / @ The first 10 characters are seen in the display without scrolling.

pH

Note:

- All calibration procedures must be performed by trained personnel. Incorrectly set parameters may go unnoticed, but change the measuring properties.

- The response time of the sensor and temperature probe is considerably reduced when the sensor is first moved about in the buffer solution and then held still.

The device can only operate properly when the buffer solutions used correspond to the configured set. Other buffer solutions, even those with the same nominal values, may demonstrate a different temperature response.
This leads to measurement errors.

When using ISFET sensors or sensors with a zero point other than pH 7, the nominal zero point must be adjusted each time a new sensor is connected. This is important if you want to obtain reliable Sensoface messages. The Sensoface messages issued during all further calibrations are based on this basic calibration.

Calibration is used to adapt the device to the individual sensor characteristics, namely asymmetry potential and slope.
Access to calibration can be protected with a passcode (SERVICE menu).
First, you open the calibration menu and select the calibration mode:
(With MSPH-MSPH multichannel operation, you have to select the sensor first.)

CAL_PH	Depending on configuration setting:	
	AUTO	Automatic buffer recognition (Calimatic)
	MAN	Manual buffer input
	DAT	Input of premeasured electrode data
CAL_ORP	ORP calibration	
P_CAL	Product calibration (calibration with sampling)	
ISFET-ZERO	Zero adjustment. Required for ISFET sensors. Subsequently you can conduct either a one or a two-point calibration.	
CAL_RTD	Temperature probe adjustment	

To preset CAL_PH (CONF menu / configuration):

1) Hold **meas** key depressed (> 2 s) (measuring mode)
2) Press **menu** key: the selection menu appears
3) Select CONF mode using left / right arrow key
4) Select "SENSOR" – "CALMODE": AUTO, MAN, or DAT.
   Press **enter** to confirm.

Selection menu

Selected mode (blinks)
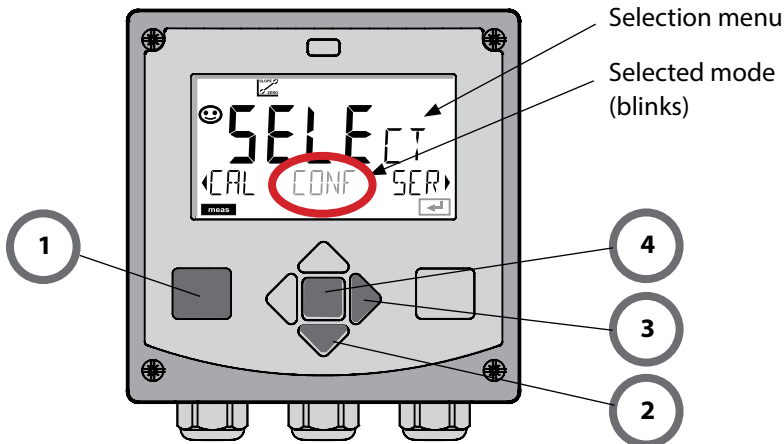
Zero Adjustment

pH
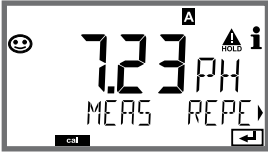
This adjustment allows the use of ISFET sensors with differing nominal zero (pH only). The function is available when ISFET has been select during configuration. Zero adjustment is disabled for any other sensors.
The adjustment is made using a zero buffer (pH 7.00).
Permitted range for buffer value: pH 6.5 ... 7.5. Temperature-corrected input.
Maximum zero offset: ± 200 mV.

Display	Action	Remark
CAL ◀ ISFET-ZERO ▶ cal	Select Calibration. Press **enter** to proceed.	
CAL ISFET-ZERO cal	Ready for calibration. Hourglass blinks.	Display (3 sec) Now the device is in HOLD mode.
7.00 BUF 127mV 27.3°C cal	Immerse sensor in a pH 7.00 buffer. Enter the tempera-ture-corrected pH value in the range 6.50 to 7.50 using the arrow keys (see buffer table). Press **enter** to confirm.	If the zero offset of the sensor is too large (> ±200 mV), a CAL ERR error message is generated. In that case the sensor cannot be calibrated.
7.00 BUF 128mV 27.3°C cal	Stability check. The measured value [mV] is displayed. The "hourglass" icon is blinking.	Note: Stability check can be stopped (by pressing **enter**). However, this reduces calibration accuracy.

pH

Display	Action	Remark
☺ **129** mV ISFET-ZERO	At the end of the adjustment procedure the zero offset [mV] of the sensor is displayed (based on 25 °C). Sensoface is active. Press **enter** to proceed.	This is not the final calibration value of the sensor! Asymmetry potential and slope must be determined with a complete 2-point calibration.
☺ **7.23** PH MEAS REPE▸	Use the arrow keys to select: • Repeat (repeat calibration) or • Measure Press **enter** to confirm.	
☺ **7.23** PH --- GOOD BYE ---	Place sensor in process. End zero calibration with **enter**.	After end of calibration, the outputs remain in HOLD mode for a short time.

Note for zero adjustment:
After having adjusted the zero offset, be sure to calibrate the sensor following one of the procedures as described on the next pages.
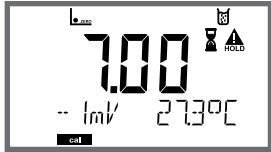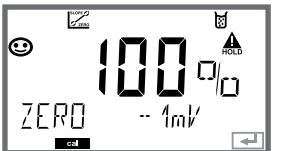
pH: Automatic Calibration

pH

The AUTO calibration mode must have been preset during **configuration**. Make sure that the buffer solutions used correspond to the configured buffer set. Other buffer solutions, even those with the same nominal values, may demonstrate a different temperature response. This leads to measurement errors.
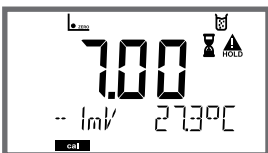
Display	Action	Remark
☺ **5ELE**ст ◀DIAG CAL CON▶ meas	Select Calibration. Press **enter** to proceed.	
CAL CAL_PH	Ready for calibration. Hourglass blinks. Select calibration method: CAL_PH Press **enter** to proceed.	Display (3 sec) Now the device is in HOLD mode.
CAL 1 1421 27.3°C cal	Remove the sensor, clean it, and immerse it in the first buffer solution (it does not matter which solution is taken first). Press **enter** to start.	
CAL 1 - - - - cal	Buffer recognition. While the "hourglass" icon is blinking, the sensor remains in the first buffer solution.	To reduce the sensor response time, first move it about in the buffer solution and then hold it still.
7.00 --- BUFFER --- cal	Buffer recognition terminated, the nominal buffer value is displayed, then zero point and temperature.	

pH
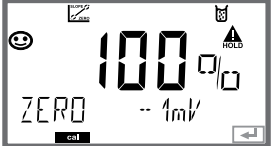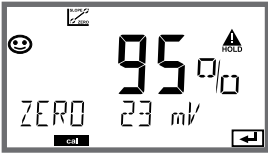
Display	Action	Remark
	Stability check. The measured value [mV] is displayed, "CAL2" and "enter" are blinking. Calibration with the first buffer is terminated. Remove the sensor from the first buffer solution and rinse it thoroughly. **Use the arrow keys to select:** • END (1-point cal) • CAL2 (2-point cal) • REPEAT Press **enter** to proceed.	**Note:** Stability check can be stopped after 10 sec (by pressing **enter**). However, this reduces calibration accuracy. Display for 1-point cal: Sensoface is active. Exit by pressing **enter**
	2-point calibration: Immerse sensor in second buffer solution. Press **enter** to start.	The calibration process runs as for the first buffer.
	Retract sensor out of second buffer, rinse off, re-install. Press **enter** to proceed.	The slope and asymmetry potential of the sensor (based on 25 °C) are displayed.
	Use the arrow keys to select: • MEAS (exit) • REPEAT Press **enter** to proceed. Exit: HOLD is deactivated with delay.	When 2-point cal is exited:

pH: Manual Calibration

pH
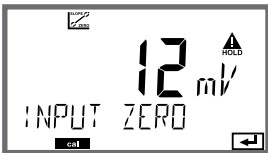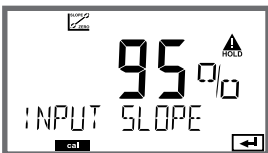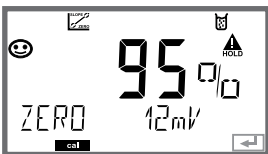
The MAN calibration mode and the type of temperature detection are selected during **configuration**. For calibration with manual buffer specification, you must enter the pH value of the buffer solution used in the device for the proper temperature. Any desired buffer solution can be used for calibration.

Display	Action	Remark
CAL CAL_PH	Select Calibration. Press **enter** to proceed.	
CAL BUFFER MANUAL	Ready for calibration. Hourglass blinks.	Display (3 sec) Now the device is in HOLD mode.
CAL M1 702PH 27.4°C	Remove the sensor and temperature probe, clean them, and immerse them in the first buffer solution. Press **enter** to start.	When manual input of temperature has been configured, the temp value in the display blinks and can be edited using the arrow keys.
07.00 BUF 14.31 27.4°C / 7.00 -- ImV 27.3°C	Enter the pH value of your buffer solution for the proper temperature. While the "hourglass" icon is blinking, the sensor and temperature probe remain in the buffer solution.	The response time of the sensor and temperature probe is considerably reduced when the sensor is first moved about in the buffer solution and then held still.

pH

Display	Action	Remark
- 1 ZRO CAL2	At the end of the stability check, the value will be saved and the asymmetry potential will be displayed. Calibration with the first buffer is terminated. Remove the sensor and temp probe from the first buffer solution and rinse them thoroughly. **Use the arrow keys to select:** • END (1-point cal) • CAL2 (2-point cal) • REPEAT Press **enter** to proceed.	**Note:** Stability check can be stopped after 10 sec (by pressing **enter**). However, this reduces calibration accuracy. Display for 1-point cal: 100 % ZERO -- 1mV Sensoface is active. Exit by pressing **enter**
CAL M2 4.03PH 27.3°C	2-point calibration: Immerse sensor and temperature probe in the second buffer solution. Enter pH value. Press **enter** to start.	The calibration process runs as for the first buffer.
95 % ZERO 23 mV	Rinse sensor and temperature probe and reinstall them. Press **enter** to proceed.	Display of slope and asymmetry potential of the sensor (based on 25 °C).
4.85 PH MEAS	**Use the arrow keys to select:** • MEAS (exit) • REPEAT Press **enter** to proceed. Exit: HOLD is deactivated with delay.	When 2-point cal is exited: 4.85 PH --- GOOD BYE ---

pH: Premeasured Sensors

pH

The DAT calibration mode must have been preset during configuration.
You can directly enter the values for slope and asymmetry potential of a sensor.
The values must be known, e.g. determined beforehand in the laboratory.

Display	Action	Remark
CAL CAL_PH	Select Calibration. Press **enter** to proceed.	
CAL DATA INPUT	"Data Input" Ready for calibration. Hourglass blinks.	Display (3 sec) Now the device is in HOLD mode.
12 mV INPUT ZERO	Enter asymmetry potential [mV]. Press **enter** to proceed.	
95 % INPUT SLOPE	Enter slope [%].	
95 % ZERO 12mV	The device displays the new slope and asymmetry potential (at 25 °C). Sensoface is active.	
7.23 PH MEAS	**Use the arrow keys to select:** • MEAS (exit) • REPEAT Press **enter** to proceed.	Exit: HOLD is deactivated with delay.

Converting slope [%] to slope [mV/pH] at 25 °C

%	mV/pH
78	46.2
80	47.4
82	48.5
84	49.7
86	50.9
88	52.1
90	53.3
92	54.5
94	55.6
96	56.8
98	58.0
100	**59.2**
102	60.4

Converting asymmetry potential to sensor zero point

$$ZERO = 7 - \frac{V_{AS}\,[mV]}{S\,[mV/pH]}$$

ZERO = Sensor zero

V_{AS} = Asymmetry potential

S = Slope

ORP (Redox) Calibration

pH

The potential of a redox sensor is calibrated using a redox (ORP) buffer solution. In the course of that, the difference between the measured potential and the potential of the calibration solution is determined according to the following equation. During measurement this difference is added to the measured potential.

$$mV_{ORP} = mV_{meas} - \Delta mV$$

mV_{ORP}	=	displayed ORP
mV_{meas}	=	direct sensor potential
ΔmV	=	delta value, determined during calibration

The sensor potential can also be related to another reference system – e.g. the standard hydrogen electrode. In that case the temperature-corrected potential (see table) of the reference electrode used must be entered during calibration. During measurement, this value is then added to the ORP measured.

Please make sure that measurement and calibration temperature are the same since the temperature behavior of the reference electrode is not automatically taken into account.

Temperature dependence of reference systems measured against SHE

Temperature [°C]	Ag/AgCl/KCl 1 mol/l [ΔmV]	Ag/AgCl/KCl 3 mol/l [ΔmV]	Thalamid [ΔmV]	Mercury sulfate [ΔmV]
0	249	224	-559	672
10	244	217	-564	664
20	240	211	-569	655
25	236	207	-571	651
30	233	203	-574	647
40	227	196	-580	639
50	221	188	-585	631
60	214	180	-592	623
70	207	172	-598	613
80	200	163	-605	603

pH

Display	Action	Remark
CAL CAL_ORP	Select ORP calibration. Press **enter** to proceed.	
CAL ORP ADJUST	Remove the sensor and temperature probe, clean them, and immerse them in the redox buffer.	Display (3 sec) Now the device is in HOLD mode.
220 mV SOLUTION 27.5°C	Enter setpoint value for redox buffer. Press **enter** to proceed.	
☺ **213** mV ORP-DELTA	The ORP delta value is displayed (based on 25°C). Sensoface is active. Press **enter** to proceed.	
223 mV MEAS	To repeat calibration: Select REPEAT. To exit calibration: Select MEAS, then **enter**	After end of calibration, the outputs remain in HOLD mode for a short time.

Product Calibration

pH	Oxy	Cond

(Example: pH)

Calibration by sampling (one-point calibration).
During product calibration the sensor remains in the process.
The measurement process is only interrupted briefly.
Procedure:
1) The sample is measured in the lab or directly on the site using a portable meter.
   To ensure an exact calibration, the sample temperature must correspond to the
   measured process temperature.
   During sampling the device saves the currently measured value and then returns
   to measuring mode. The "calibration" mode indicator blinks.
2) In the second step you enter the measured sample value in the device. From the
   difference between the stored measured value and entered sample value, the
   device calculates the new asymmetry potential.
If the sample is invalid, you can take over the value stored during sampling. In that
case, the old calibration values are stored. Afterwards, you can start a new product
calibration.
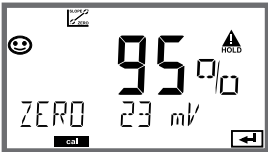
Display	Action	Remark
CAL P_CAL	Select product calibration: P_CAL Press **enter** to proceed.	If you have protected the calibration with a passcode (in the Service menu), the device will return to measuring mode when an invalid code is entered.
CAL PRODUCT STEP 1	Ready for calibration. Hourglass blinks. Press **enter** to proceed.	Display (3 sec)
4.73 PH STORE VALUE	Take sample and save value. Press **enter** to proceed.	Now the sample can be measured in the lab.

Display	Action	Remark
☺ **4.73**PH 13:23 27.4°C meas cal	The device returns to measuring mode.	From the blinking CAL mode indicator, you see that product calibration has not been terminated.
CAL HOLD PRODUCT STEP 2 cal	Product calibration step 2: When the sample value has been determined, open the product calibration once more (P_CAL).	Display (3 sec) Now the device is in HOLD mode.
4.87PH HOLD 2 LAB VALUE cal	The stored value is displayed (blinking) and can be overwritten with the measured sample value. Press **enter** to proceed.	
☺ **95**% HOLD ZERO 23 mV cal	Display of new asymmetry potential (based on 25°C). Sensoface is active. To exit calibration: Select MEAS, then **enter**	To repeat calibration: Select REPEAT, then **enter**
End of calibration	After end of calibration, the outputs remain in HOLD mode for a short time.	

Oxy

Calibration adapts the device to the individual sensor characteristics.

It is always recommended to calibrate in air.

Compared to water, air is a calibration medium which is easy to handle, stable, and thus safe. In the most cases, however, the sensor must be removed for a calibration in air.

When dealing with biotechnological processes which require sterile conditions, the sensor cannot be removed for calibration. Here, calibration must be performed directly in the process medium (e.g. after sterilization and aeration).

In the field of biotechnology, for example, often saturation is measured and calibration is performed in the process medium for reasons of sterility.

For other applications where concentration is measured (water control etc.), calibration in air has proved to be useful.

Note
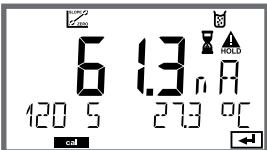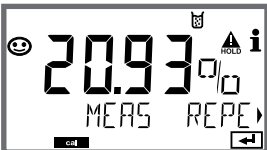
All calibration procedures must be performed by trained personnel. Incorrectly set parameters may go unnoticed, but change the measuring properties.
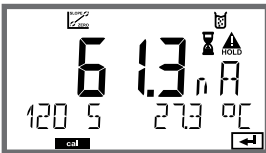
Common Combination:
Process Variable / Calibration Mode

Measurement	Calibration	Application
Saturation	Water	Biotechnology; sensor cannot be removed for calibration (sterility)
Concentration	Air	Waters, open basins

Below, the calibration procedure for a slope calibration in air is described. Of course, other combinations of process variable and calibration mode are possible.

Slope Calibration (Medium: Air)

Oxy
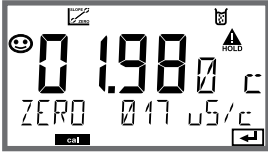
Display	Action	Remark
CAL MEDIUM AIR	Select calibration. Place sensor in air, press **enter** to start. Device goes to HOLD mode.	"Medium water" or "Medium air" is selected in the configuration.
050.0 %₀ REL HUMIDITY	Enter relative humidity using **arrow keys** Press **enter** to proceed.	Default for relative humidity in air: rH = 50%
1.000 BAR PRESSURE	Enter cal pressure using **arrow keys**. Press **enter** to proceed.	Default: **1.000 bar** Unit: bar/kpa/PSI
61.3 nA 120 S 27.3 °C	Drift check: Display of: sensor current (nA), response time (s), temperature (°C/°F) Press **enter** to proceed.	The drift check can take some minutes.
59.3 nA ZERO 001.3nA	Display of calibration data (slope and zero). Press **enter** to proceed.	
20.93 %₀ MEAS REPE▸	Display of selected process variable (here: %vol). Now the device is in HOLD mode: Reinstall the sensor and check whether the measurement is OK. MEAS exits calibration, REPEAT permits repetition.	After end of calibration, the outputs remain in HOLD mode for a short time.

Oxy

Display	Action	Remark
CAL ⏳ ⚠ HOLD MEDIUM WATER cal	Select calibration (SLOPE). Immerse sensor in cal medium, start with **enter**	"Medium water" or "Medium air" is selected in the configuration.
1.000 BAR ⚠ HOLD PRESSURE cal	Enter cal pressure Press **enter** to proceed.	Default: **1.000 bar** Unit: bar/kpa/PSI
61.3 nA ⏳⚠ HOLD 120 S 27.3 °C cal	Drift check: Display of: sensor current (nA), response time (s), temperature (°C/°F)	Device goes to HOLD mode. The drift check might take some time.
☺ **-59.3** nA ⚠ HOLD ZERO -0.03 nA cal	Display of calibration data (slope and zero) and Sensoface Press **enter** to proceed.	Related to 25 °C and 1013 mbars
☺ **8.23** ppm ⚠ HOLD i MEAS REPE▸ cal	Display of selected process value. To exit calibration: Select MEAS ◂ ▸, then **enter**	To repeat calibration: Select REPEAT ◂ ▸, then **enter**
☺ **8.22** ppm ⏳⚠ HOLD --- GOOD BYE --- meas	Place sensor in process. End of calibration	After end of calibration, the outputs remain in HOLD mode for a short time.

Conductivity: Calibration

Cond

Input of temperature-corrected value of calibration solution with simultaneous display of cell factor

Display	Action	Remark
☺ **SELE**CT ◁DIAG CAL CON▷ meas	Select Calibration. Press **enter** to proceed. Select CAL_SOL calibration method. Press **enter** to proceed.	
CAL SOLUTION cal	Ready for calibration. Hourglass blinks.	Display (3 sec) Now the device is in HOLD mode.
12.88 mS/c 0 1.0021c 25.3°C cal	Immerse sensor in calibration solution. Enter the temperature-corrected value of the calibration solution using the arrow keys (see table). Press **enter** to confirm.	Lower line: display of cell factor and temperature
☺ **CELL** c 012345 1/cm cal	**Contacting conductivity measurement (COND)** The determined cell factor is displayed. The "hourglass" icon is blinking. Proceed by pressing **enter**	
☺ **01.980** c ZERO 017 uS/c cal	**Inductive conductivity measurement (CONDI)** The determined cell factor and zero point are displayed. The "hourglass" icon is blinking. Proceed by pressing **enter**	

Display	Action	Remark
☺ **12.65** mS/c ⓘ MEAS REPE▸ cal	Display of selected process variable (here: mS/cm). Now the device is in HOLD mode: Reinstall the sensor and check whether the measurement is OK. MEAS exits calibration, REPEAT permits repetition.	
☺ **12.65** mS/c --- GOOD BYE --- meas	With MEAS selected: Press **enter** to exit calibration.	Display of conductivity and temperature, Sensoface is active. After end of calibration, the outputs remain in HOLD mode for a short time. After display of GOOD BYE, the device automatically returns to measuring mode.

Please note:

- Be sure to use known calibration solutions and the respective temperature-corrected conductivity values (see table on calibration solution).
- Make sure that the temperature does not change during the calibration procedure.

CondI

Note:
- All calibration procedures must be performed by trained personnel. Incorrectly set parameters may go unnoticed, but change the measuring properties.

Calibration can be performed by:
- Determining the cell factor with a known calibration solution taking account of the temperature
- Input of cell factor
- Sampling (product calibration)
- Zero calibration in air or with calibration solution
- Temperature probe adjustment
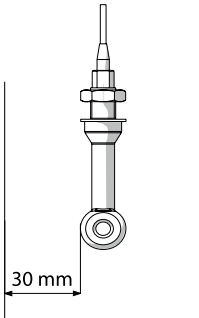
30 mm

Note:
When the sensor is installed in a pipe/tank at a distance less than 30 mm from the wall, you should perform the calibration either with the sensor installed by means of a reference measurement (product calibration) or in a suitable calibration beaker with dimensions and material corresponding to the process conditions.

Selecting a calibration mode

Calibration adapts the device to the individual sensor characteristics.
Access to calibration can be protected with a passcode (SERVICE menu).
First, you open the calibration menu and select the calibration mode:
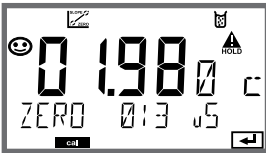
CAL_SOL	Calibration with calibration solution
CAL_CELL	Calibration by input of cell factor
P_CAL	Product calibration (calibration with sampling)
CAL_ZERO	Zero calibration
CAL_RTD	Temperature probe adjustment

CondI

Calibration by input of cell factor

You can directly enter the value for the cell factor of a sensor. The value must be known, e.g. determined beforehand in the laboratory. The selected process variable and the temperature are displayed. This method is suitable for all process variables.
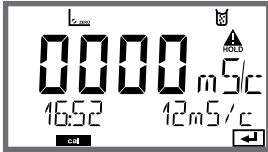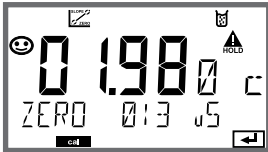
Display	Action	Remark
☺ **SELE**ct ◀DIAG CAL CON▶ meas	Select Calibration. Press **enter** to proceed. Select CAL_CELL calibration method. Press **enter** to proceed.	
CAL CELLFACTOR	Ready for calibration. Hourglass blinks.	Display (3 sec) Now the device is in HOLD mode.
01.12₃ 1288mS/c 23.4°C	Enter cell factor. Press **enter** to proceed.	The selected process variable and the temperature are displayed.
☺ **01.98**₀ c ZERO 013 uS	The device shows the calculated cell factor and zero point (at 25 °C). Sensoface is active.	
☺ **12.65** mS/c MEAS REPE▶	**Use the arrow keys to select:** • MEAS (exit) • REPEAT Press **enter** to proceed.	Exit: HOLD is deactivated after a short time.
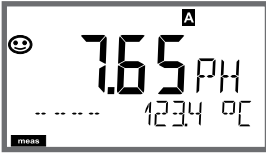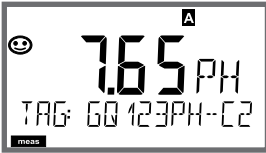
Please refer to the Specifications for the nominal cell factor.
When measuring in a restricted space, the individual cell factor must be determined.

Zero Calibration

Condl

Zero calibration in air / with calibration solution

Display	Action	Remark
`°SELEct` `DIAG CAL CON` `meas`	Select Calibration. Press **enter** to proceed. Select CAL_ZERO calibration method. Press **enter** to proceed.	
`CAL` `ZERO POINT`	Ready for calibration. Hourglass blinks.	Display (3 sec) Now the device is in HOLD mode.
`0000 mS/c` `16:52 12mS/c` `cal`	**Calibration in air.** Edit digits until the lower display indicates Zero **Calibration with solution** Edit digits until the lower display indicates the solution value Press **enter** to proceed.	
`°01.980 c` `ZERO 013 µS` `cal`	The device shows the cell factor (at 25 °C) and the zero point. Sensoface is active.	
`°12.65 mS/c` `MEAS REPE` `cal`	**Use the arrow keys to select:** • MEAS (exit) • REPEAT Press **enter** to proceed.	Exit: HOLD is deactivated after a short time.

Display	Remark
☺ 7.65 PH ▲ 14:32 123.4 °C meas or AM/PM and °F: **☺ 7.65 PH** ▲ A 8:32 123 °F meas **☺ 7.65 PH** ▲ -- -- -- 123.4 °C meas	From the configuration or calibration menus, you can switch the device to measuring mode by pressing the **meas** key. In the measuring mode the main display shows the configured process variable (pH, ORP [mV] or temperature), the secondary display shows the time and the second configured process variable (pH, ORP [mV] or temperature). The [meas] mode indicator lights and the active parameter set (A/B) is indicated. **Note:** • After prolonged power outage (> 5 days), the time display is replaced by dashes and cannot be used for processing. In that case, enter the correct time.

By pressing the **meas** key you can step through the following displays. When no key has been pressed for 60 sec, the device returns to MAIN DISPLAY.

☺ 7.65 PH ▲ ◀ PARSET-B meas	1) Selecting the parameter set (if set to "manual" in the configuration). Select the desired parameter set using the ◀ ▶ - arrows (PARSET A or PARSET B blinks in the lower display line). Press **enter** to confirm.
☺ 7.65 PH ▲ TAG: GQ123PH-C2 meas	Further displays (each by pressing **meas**). 2) Display of tag number ("TAG") 3) Display of time and date
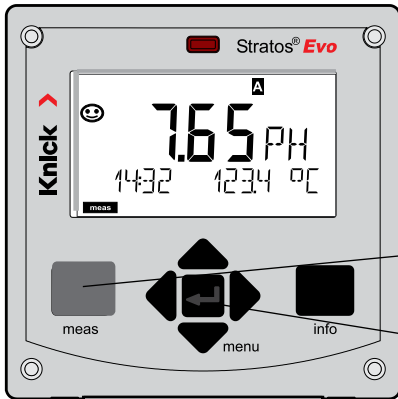
The MAIN DISPLAY is the display which is shown in measuring mode. To call the measuring mode from any other mode, hold the **meas** key depressed for at least 2 sec.

meas key

enter key
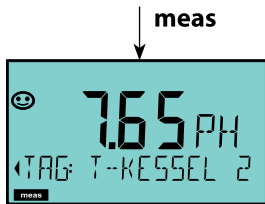
By pressing **meas** briefly you can step through further displays such as tag number (TAG) or flow (L/h).
These displays are turquoise. After 60 sec they switch back to the main display.
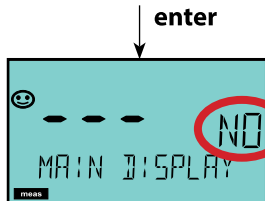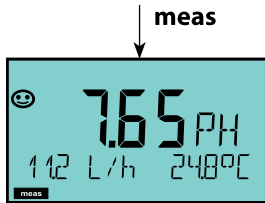
Press **enter** to select a display as MAIN DISPLAY.

The secondary display shows "MAIN DISPLAY – NO".
Use the **UP** / **DOWN** arrows to select "MAIN DISPLAY – YES"
and confirm by pressing **enter**.
The display color changes to white.
This display is now shown in measuring mode.

The color-coded user interface guarantees increased operating safety. Operating modes are clearly signaled.

The normal measuring mode is white. Information text appears on a green screen and the diagnostic menu appears on turquoise. The orange HOLD mode (e.g. during calibration) is quickly visible as is the magenta screen which indicates asset management messages for predictive diagnostics – such as maintenance request, pre-alarm and sensor wear.

The alarm status has a particularly noticeable red display color and is also signaled by flashing display values. Invalid inputs or false passcodes cause the entire display to blink red so that operating errors are noticeably reduced.

White:
Measuring mode

Red blinking:
Alarm, errors

Orange:
HOLD mode

Magenta:
Maintenance request

Turquoise:
Diagnostics

Green:
Information texts

Display	Remark

With activated controller

you can also step through the following displays by pressing the **meas** key. When no key has been pressed for 60 sec, the device returns to the standard display.
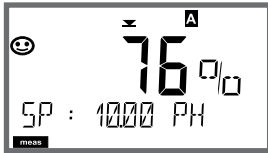
☺ **76** % SP : 10.00 PH meas	Main display: Controller output Y Secondary display: Setpoint Depending on configuration setting: pH, mV, or temperature.
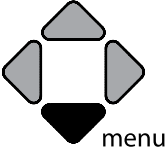
In the Diagnostics mode you can access the following menus without interrupting the measurement:

CALDATA	Viewing the calibration data
SENSOR	Viewing the sensor data
SELFTEST	Starting a device self-test
LOGBOOK	Viewing the logbook entries
MONITOR	Displaying currently measured values
VERSION	Displaying device type, software version, serial number

Access to diagnostics can be protected with a passcode (SERVICE menu).

Note:
HOLD is not active during Diagnostics mode!

Action	Key	Remark
Activate diagnostics	menu	Press **menu** key to call the selection menu. (Display color changes to turquoise.) Select DIAG using ◀ ▶ keys, confirm by pressing **enter**
Select diagnostics option		Use ◀ ▶ keys to select from: CALDATA SENSOR SELFTEST LOGBOOK MONITOR VERSION See next pages for further proceeding.
Exit	**meas**	Exit by pressing **meas**.
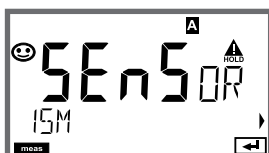
Display	Menu item
	Displaying the calibration data (Example: pH) Select CALDATA using ◀ ▶ , confirm by pressing **enter**. Use the ◀ ▶ ikeys to select the desired parameter from the bottom line of the display (LAST_CAL ISFET-ZERO ZERO SLOPE NEXT_CAL). The selected parameter is shown in the main display.
	Press **meas** to return to measurement.
	Displaying the sensor data For analog sensors, the type is displayed (STANDARD / ISFET), Cannot be operated with digital transmitters. For digital sensors, the manufacturer, type, serial number and last calibration date are displayed. In each case Sensoface is active. Display data using ◀ ▶ keys, return by pressing **enter** or **meas**.
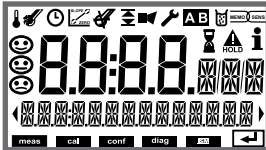
Display	Menu item

Device self-test

(To abort, you can press **meas**.)

1) **Display test**: Display of all segments with changing background colors (white/green/red). Proceed by pressing **enter**

2) **RAM test:** Hourglass blinks, then display of --PASS-- or --FAIL-- Proceed by pressing **enter**

3) **EEPROM test:** Hourglass blinks, then display of --PASS-- or --FAIL-- Proceed by pressing **enter**

4) **FLASH test:** Hourglass blinks, then display of --PASS-- or --FAIL-- Proceed by pressing **enter**

5) **Module test:** Hourglass blinks, then display of --PASS-- or --FAIL-- Return to measuring mode by pressing **enter** or **meas**

Display	Menu item
d IAG ‹TA LOGBOOK diag	**Displaying the logbook entries** Select LOGBOOK using ◄ ►, press **enter** to confirm. With the ▲ ▼ keys, you can scroll backwards and forwards through the logbook (entries -00-...-99-), -00- being the last entry.
-00- LOG 14:09 30092005 ► diag	If the display is set to date/time, you can search for a particular date using the ▲ ▼ keys. Press ◄ ► to view the corresponding message text. If the display is set to the message text, you can search for a particular message using the ▲ ▼ keys. Press ◄ ► to display the date and time.
-00- LOG ‹ERR 01 RANGE C› diag	Press **meas** to return to measurement.
009 CFR 9:23 23112007 ► diag	**Extended logbook / Audit Trail (via TAN)** With the ▲ ▼ keys, you can scroll backwards and forwards through the extended logbook (entries -000-...-99-), -000- being the last entry. **Display: CFR** Audit Trail also records function activations (CAL CONFIG SERVICE), some Sensoface messages (cal timer, wear), and opening of the enclosure.

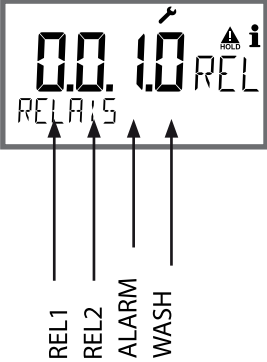| **Display**	**Menu item**
d 1A G MONITOR ◄ ▶ diag ↵	**Displaying the currently measured values** **(sensor monitor – example: pH)** Select MONITOR using ◄ ▶ , press **enter** to confirm. Use the ◄ ▶ keys to select the desired parameter from the bottom line of the display: mV_PH mV_ORP RTD R_GLASS R_REF I-INPUT (for digital sensors also: OPERATION TIME SENSOR WEAR LIFETIME CIP SIP AUTOCLAVE, for ISM sensors in addition: ACT (adaptive cal timer), TTM (adaptive maintenance timer), DLI (Dynamic Life Time Indicator)). The selected parameter is shown in the main display. Press **meas** to return to measurement.
Display example: - 176 mV ◄ mV_PH ▶ diag	Display of mV_pH (for validation, sensor can be immersed in a calibration solution, for example, or the device is checked by using a simulator)
127 DAY 🔧 ⚠HOLD ◄ LIFETIME ▶	Display of remaining dynamic lifetime (only for digital sensors, however not for MEMOSENS)
256 h 🔧 ⚠HOLD ◄ OPERATION TIME ▶	Display of sensor operating time (for digital sensors only)
1.0.2 SW ◄ SERIAL-No 0073 ▶ diag ↵	**Version** Display of **device type, software/hardware version** and **serial numbe**r for all device components. Use the ▲ ▼ arrows to switch between software and hardware version. Press **enter** to proceed to next device component.
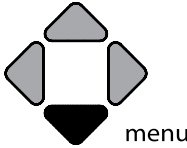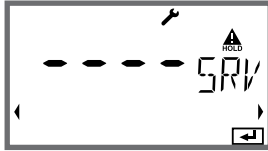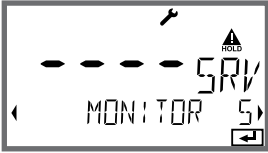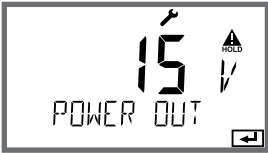
In the Service mode you can access the following menus:

MONITOR	Displaying currently measured values
SENSOR	ISM only:
	Reset TTM
	Increment autoclaving counter
POWER OUT	Power output (adjustable: 3.1/12/15/24 V)
OUT1	Testing current output 1
OUT2	Testing current output 2
RELAY	Testing the function of the 4 relays
CONTROL	Testing the controller function
IRDA	Activating and communicating via the IrDA interface
CODES	Assigning and editing passcodes
DEVICE TYPE	Selecting the measuring function
DEFAULT	resetting the device to factory settings
OPTION	enabling options via TAN.

Note:

HOLD is active during Service mode!

Action	Key/Display	Remark
Activate Service	menu	Press **menu** key to call the selection menu. Select SERVICE using ◀ ▶ keys, press **enter** to confirm.
Passcode	5555 PASSCODE SERVI▸ meas ↵	Enter passcode "5555" for service mode using the ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.
Display	🔧 HOLD – – – – SRV ◀ ▶ ↵	In service mode the following icons are displayed: • HOLD triangle • Service (wrench)
Exit	**meas**	Exit by pressing **meas**.

Menu item	Remark
	Displaying currently measured values (sensor monitor) with HOLD mode activated: Select MONITOR using ◀ ▶ , press **enter** to confirm. Select variable in the bottom text line using ◀ ▶ . The selected parameter is shown in the main display. As the device is in HOLD mode, you can perform validations using simulators without influencing the signal outputs. Hold **meas** depressed for longer than 2 sec to return to Service menu. Press **meas** once more to return to measurement.
SENSOR / TTM	**Resetting the adaptive maintenance timer** Here, the interval is reset to its initial value. To do so, select "TTM RESET = YES" and confirm by pressing **enter**.
SENSOR / AUTOCLAVE	**Incrementing the autoclaving counter** After having completed an autoclaving process, you must increment the autoclaving count. To do so, select "**YES**" and confirm by pressing **enter**. The device confirms with "INCREMENT AUTOCLAVE CYCLE"
POWER OUT	**POWER OUT, adjusting the output voltage** Here, you can select an output voltage of 3.1/12/15/24 V. When the SE 740 optical oxygen sensor has been selected, the output voltage will be automatically set to 15 V, regardless of the setting in the SERVICE menu.

Menu item	Remark
12.2 mA OUT 1 12.2mA	**Specifying the current for outputs 1 and 2:** Select OUT1 or OUT2 using the ◀ ▶ keys, press **enter** to confirm. Enter a valid current value for the respective output using ▲ ▼ ◀ ▶ keys. Confirm by pressing **enter**. For checking purposes, the actual output current is shown in the bottom right corner of the display. Exit by pressing **enter** or **meas**.
0.0. 1.0 REL RELAIS REL1 REL2 ALARM WASH	**Relay test (manual test of contacts):** Select RELAIS using ◀ ▶, press **enter** to confirm. Now the status of the 4 relays is "frozen". The 4 digits of the main display represent the respective states (from left to right: REL1, REL2, ALARM, WASH). The digit for the selected relay blinks. Select one of the 4 relays using the ◀ ▶ keys, close (1) or open (0) using the ▲ ▼ keys. Exit by pressing **enter**. The relays will be re-set corresponding to the measured value. Press **meas** to return to measurement.

Menu item	Remark
$\overset{\text{🔧}}{\underset{\text{DIAG HOL▸}}{\textbf{0000}\,\text{PWD}}}$	**Assigning passcodes:** In the "SERVICE - CODES" menu you can assign passcodes to DIAG, HOLD, CAL, CONF and SERVICE modes (Service preset to 5555). **When you have lost the Service passcode**, you have to request an "Ambulance TAN" from the manufacturer specifying the serial number and hardware version of your device. To enter the "Ambulance TAN", call the Service function and enter passcode 7321. After correct input of the ambulance TAN the device signals "PASS" for 4 sec and resets the Service passcode to 5555.
$\overset{\text{🔧}}{\underset{\text{FACTORY SETTIN▸}}{\text{- - -}\;\;\overset{\text{i}}{\text{NO}}}}$	**Reset to factory settings:** In the "SERVICE - DEFAULT" menu you can reset the device to factory settings. **Caution!** After a reset to factory setting the device must be reconfigured completely, including the sensor parameters!
$\overset{\text{🔧}}{\underset{\text{OPT: LOGBOOK}}{\textbf{0000}\,\text{TAN}}}$	**Option request:** Communicate the serial number and hardware/software version of your device to the manufacturer. These data can be viewed in the Diagnostics/Version menu. The "transaction number" (TAN) you will then receive is only valid for the device with the corresponding serial number. **Releasing an option:** Options come with a "transaction number" (TAN). To release the option, enter this TAN and confirm by pressing **enter**.
$\overset{\text{🔧}}{\underset{\text{◂ DEVICE TYPE ▸}}{\text{PH}}}$	**Device type:** Changing the measuring function, e.g. after having replaced a Memosens sensor. Not possible with a measuring module installed.

Error	Info text (is displayed in case of fault when the Info key is pressed)	Problem Possible causes
ERR 01	NO SENSOR	**Sensor error** Device type not assigned Sensor defective Sensor not connected Break in sensor cable
ERR 02	WRONG SENSOR	**Wrong sensor**
ERR 04	SENSOR FAILURE	**Failure in sensor**
ERR 05	CAL DATA	**Error in cal data**
ERR 10	ORP RANGE CONDUCTANCE TOO HIGH	**Display range violation** ORP: < -1999 mV or > 1999 mV Conductivity: Conductance > 3500 mS
ERR 11	RANGE	**Display range violation**
ERR 12	MV RANGE	**mV range**
ERR 13	TEMPERATURE RANGE	**Temperature range violation**
ERR 15	SENSOCHECK GLASS-EL	**Glass Sensocheck (pH)**
ERR 60	OUTPUT LOAD	**Load error**
ERR 61	OUTPUT 1 TOO LOW	**Output current 1** < 0 (3.8) mA
ERR 62	OUTPUT 1 TOO HIGH	**Output current 1** > 20.5 mA
ERR 63	OUTPUT 2 TOO LOW	**Output current 2** < 0 (3.8) mA
ERR 64	OUTPUT 2 TOO HIGH	**Output current 2** > 20.5 mA

Error	Info text (is displayed in case of fault when the Info key is pressed)	Problem Possible causes
ERR 95	SYSTEM ERROR	**System error** Restart required. If error still persists, send in the device for repair.
ERR 97	WRONG MODULE	**Module does not correspond to measuring function** Correct the setting in the SERVICE / DEVICE TYPE menu. Afterwards, configure and calibrate the device.
ERR 98	CONFIGURATION ERROR	**Error in configuration or calibration data** Configuration or calibration data defective; completely reconfigure and recalibrate the device.
ERR 99	DEVICE FAILURE	**Error in factory settings** EEPROM or RAM defective This error message only occurs in the case of a total defect. The device must be repaired and recalibrated at the factory.
ERR 100	INVALID SPAN OUT1	**Span Out1 configuration error** Selected span too small
ERR 101	INVALID SPAN OUT2	**Span Out2 configuration error** Selected span too small

Error	Info text (is displayed in case of fault when the Info key is pressed)	Problem Possible causes
ERR 102	pH: FAILURE BUFFERSET -U1-	**Parameter error** Specifiable buffer set U1
	Oxy: INVALID PARAMETER U-POL	**Parameter error** Polarization voltage
	MSPH/MSPH, MSPH/MSOXY: A FAILURE BUFFERSET -U1-	**Parameter error** Specifiable buffer set U1, sensor A
ERR 103	Oxy: INVALID PARAMETER MEMBR. COMP	**Parameter error** Membrane correction
ERR 104	INVALID PARAMETER CONTROLLER	**Parameter error** Controller
ERR 105	INVALID SPAN I-INPUT	**Parameter error** Current input
ERR 106	INVALID CHANNEL SELECTION OUT1/2	**CC:** Out1/Out2 channel not assigned (disabled) **MSPH/MSPH, MSPH/MSOXY:** Currents not assigned
ERR 107	INVALID CHANNEL SELECTION RELAYS	**CC:** Relay channel not assigned (disabled) **MSPH/MSPH, MSPH/MSOXY:** Limit values not assigned
ERR 108	MSPH/MSPH, MSPH/MSOXY: INVALID CHANNEL SELECTION CONTROL	Controller not assigned
	Cond, Condl, CC: OUT1 INVALID CORNER X/Y	Bilinear curve: Invalid vertex point
ERR 109	Cond, Condl, CC: OUT1 INVALID CORNER X/Y	Bilinear curve: Invalid vertex point

Sensocheck, Sensoface sensor monitoring

Sensocheck continuously monitors the sensor and its wiring. The three Sensoface indicators provide information on required maintenance of the sensor. Additional icons refer to the error cause.
Pressing the **info** key shows an information text.

Please note:
The worsening of a Sensoface criterion leads to the devaluation of the Sensoface indicator (Smiley gets "sad"). An improvement of the Sensoface indicator can only take place after calibration or removal of the sensor defect.

Sensoface message
The Sensocheck message is also output as error message Err 15. The alarm contact is active, the display backlighting turns red (when configured correspondingly). Sensoface can be output as a 22-mA signal via the current outputs.

Disabling Sensocheck and Sensoface
Sensocheck can be switched off in the configuration menu (then Sensoface is also disabled).
Exception:
After a calibration, a smiley is always displayed for confirmation.

Operating status	OUT 1	OUT 2	REL1/2	Time out
Measure	active	active	active	-
DIAG	active	active	active	60 s
CAL	as configured	as configured		No
CONF	as configured	as configured		20 min
SERVICE	as configured	as configured		20 min
SERVICE OUT 1	manual	as configured		20 min
SERVICE OUT 2	as configured	manual		20 min
SERVICE RELAY	as configured	as configured	manual	20 min
Cleaning function	as configured	as configured		No
HOLD	as configured	as configured		No

Explanation:
- ▮ (black) as configured (Last/Fix or Last/Off)
- ▮ (gray) active
- ▨ (hatched) manual

Devices (basic digital devices)	Order no.
Stratos Evo A402N	A402N
Stratos Evo A402B (operation in hazardous locations, Zone 2)	A402B

Interchangeable modules for measurement with analog sensors or 2nd Memosens channel

pH	MK-PH015N
Oxy	MK-OXY045N
Cond	MK-COND025N
CondI	MK-CONDI035N
CC	MK-CC065N
2nd Memosens channel	MK-MS095N

Interchangeable modules for measurement with analog sensors,
hazardous area Zone 2

pH, hazardous area Zone 2	MK-PH015B
Oxy, hazardous area Zone 2	MK-OXY045B
Cond, hazardous area Zone 2	MK-COND025B
CondI, hazardous area Zone 2	MK-CONDI035B

TAN options

HART	SW-A001
Logbook	SW-A002
Extended logbook (AuditTrail)	SW-A003
Trace-oxygen measurement	SW-A004
Current input	SW-A005
ISM digital	SW-A006
Pfaudler	SW-A007

Mounting accessories	Order no.
Pipe-mount kit	ZU 0274
Panel-mount kit	ZU 0738
Protective hood	ZU 0737
M12 socket for sensor connection with Memosens cable / M12 connector	ZU 0860

For more information concerning our sensors and fittings product line, please refer to our "Sensors, Fittings, Accessories" catalog:
Download at http://www.knick.de or request catalog:
Phone: +49 (0)30 - 801 91 - 0
Fax: +49 (0)30 - 801 91 - 200
Email: knick@knick.de

Specifications

pH

pH

Display range	pH value	-2.00 ... 16.00	
(depending on sensor)	ORP	-1999 ... 1999 mV	
	Temperature	-20.0 ... 200.0 °C (-4 ... + 392 °F)	
Measurement error [1]	pH value	< 0.02	TC: 0.002 pH/K
	mV value	< 1 mV	TC: 0.1 mV/K

pH sensor standardization [*]   pH calibration

Operating modes	AUTO	Calibration with Calimatic automatic buffer recognition
	MAN	Manual calibration with entry of individual buffer values
	DAT	Data entry of pre-measured electrodes
	Product calibration	

Calimatic buffer sets [*]	-01- Mettler-Toledo	2.00/4.01/7.00/9.21
	-02- Knick CaliMat	2.00/4.00/7.00/9.00/12.00
	-03- Ciba (94)	2.06/4.00/7.00/10.00
	-04- NIST technical	1.68/4.00/7.00/10.01/12.46
	-05- NIST standard	1.679/4.006/6.865/9.180
	-06- HACH	4.01/7.00/10.01
	-07- WTW techn. buffers	2.00/4.01/7.00/10.00
	-08- Hamilton	4.01/7.00/10.01/12.00
	-09- Reagecon	2.00/4.00/7.00/9.00/12.00
	-10- DIN 19267	1.09/4.65/6.79/9.23/12.75
	-U1-	Specifiable buffer set with 2 buffer solutions

Max. calibration range	Asymmetry potential	±60 mV (±750 mV for Memosens ISFET)
	Slope	80 ... 103 % (47.5 ... 61 mV/pH)
	(possibly restricting notes from Sensoface)	

ORP sensor standardization [*]   ORP calibration (zero adjustment)

Max. calibration range	-700 ... +700 ΔmV

Calibration timer   Interval 0000 ... 9999 h (Patent DE 101 41 408)

Sensocheck   Automatic monitoring of glass electrode

Delay	Approx. 30 s

Sensoface
Provides information on the sensor condition (can be switched off)
Evaluation of zero/slope, calibration interval, Sensocheck

TC of process medium   Linear -19.99 ... +19.99 %/K, ultrapure water

Reference temperature	25 °C

[*]   user-defined
[1]   according to IEC 746 Part 1, at normal operating conditions

Temperature input	Pt100 / Pt1000 / NTC / Balco [*)] 2-wire connection, adjustable	
Measuring range	Pt 100/Pt 1000	-20.0 ... +200.0 ℃ / -4 ... +392 ℉
	NTC 30 kΩ	-20.0 ... +150.0 ℃ / -4 ... +302 ℉
	NTC 8.55 kΩ (Mitsubishi)	-10.0 ... +130.0 ℃ / +14 ... +266 ℉
	Balco 3 kΩ	-20.0 ... +130.0 ℃ / -4 ... +266 ℉
Adjustment range	10 K	
Resolution	0.1 ℃ / 0.1 ℉	
Measurement error [1)]	< 0.5 K (< 1K for Pt100; < 1K for NTC >100℃)	

ISM input	"One wire" interface for operation with ISM (digital sensors) (6 V / Ri= approx. 1.2 kΩ)
Power output	for operating an ISFET adapter
	+3 V / 0.5 mA
	-3 V / 0.5 mA

Oxy

Standard	Sensors: SE 706, InPro 6800, Oxyferm	
Input range	Measuring current 0 ... 600 nA Resolution 10 pA	
Measurement error [1]	< 0.5% meas. val. + 0.05 nA + 0.005 nA/K	
Operating modes	GAS	Measurement in gases
	DO	Measurement in liquids
Display ranges	Saturation (–10 ... 80°C)	0.0 ... 600.0 %
	Concentration (–10 ... 80°C)	0.00 ... 99.99 mg/l
	(Dissolved oxygen)	0.00 ... 99.99 ppm
	Volume concentration in gas	0.00 ... 99.99 %vol
Polarization voltage	–400 ... –1000 mV	
	Default –675 mV (resolution < 5 mV)	
Permissible guard current	≤ 20 µA	
Traces (TAN SW-A004)	Sensors: SE 706/707; InPro 6800/6900/6950; Oxyferm/Oxygold	
Input range I [1]	Measuring current 0 ... 600 nA Resolution 10 pA	
Measurement error [1]	< 0.5% meas. val. + 0.05 nA + 0.005 nA/K	
Input range II [1]	Measuring current 0 ... 100000 nA	Resolution 166 pA
Measurement error	< 0.5% meas. val. + 0.8 nA + 0.008 nA/K	
Operating modes	GAS	Measurement in gases
	DO	Measurement in liquids
Measuring ranges with standard sensors "10"		
	Saturation (–10 ... 80°C)	0.0 ... 600.0 %
	Concentration (–10 ... 80°C)	0.00 ... 99.99 mg/l
	(Dissolved oxygen)	0.00 ... 99.99 ppm
	Volume concentration in gas	0.00 ... 99.99 %vol
Measuring ranges with trace sensors "01"		
(TAN SW-A004)	Saturation (–10 ... 80°C)	0.000 ... 150.0 %
	Concentration (–10 ... 80°C)	0000 ... 9999 µg/l / 10.00 ... 20.00 mg/l
	(Dissolved oxygen)	0000 ... 9999 ppb / 10.00 ... 20.00 ppm
	Volume concentration in gas	0000 ... 9999 ppm / 1.000 ... 50.00 %vol

*) user-defined
[1] according to IEC 746 Part 1, at normal operating conditions

Measuring ranges with trace sensors "001"

(TAN SW-A004)	Saturation (–10 ... 80°C)	0.000 ... 150.0 %
	Concentration (–10 ... 80°C)	000.0 ... 9999 µg/l / 10.00 ... 20.00 mg/l
	(Dissolved oxygen)	000.0 ... 9999 ppb / 10.00 ... 20.00 ppm
	Volume concentration in gas	000.0 ... 9999 ppm / 1.000 ... 50.00 %vol

Polarization voltage	0 ... –1000 mV
	Default –675 mV (resolution < 5 mV)
Permissible guard current	≤ 20 µA

Input correction	Pressure correction [*)]	0.000 ... 9.999 bars / 999.9 kPa / 145.0 PSI
		manually or through current input 0(4) ... 20 mA
	Salinity correction	0.0 ... 45.0 g/kg

Measurement using SE 740 (optical sensor)

Measuring range	0 … 300 % air saturation
Detection limit	0.01 %vol
Response time t_{98}	< 30 s (at 25 °C, from air to nitrogen)

Operating modes	GAS	Measurement in gases
	DO	Measurement in liquids

Display ranges, standard

Saturation (–10 ... 80°C)	0.0 ... 600.0 %
Concentration (–10 ... 80°C)	0.00 ... 99.99 mg/l
(dissolved oxygen)	0.00 ... 99.99 ppm
Volume concentration in gas	0.00 ... 99.99 %vol

Display ranges, traces (TAN) — Monitoring of membrane and electrolyte and the sensor wires for short circuits or open circuits (can be disabled)

Saturation (–10 ... 80°C)	0.000 ... 150.0 %
Concentration (–10 ... 80°C)	0000 ... 9999 µg/l / 10.00 ... 20.00 mg/l
(dissolved oxygen)	0000 ... 9999 ppb / 10.00 ... 20.00 ppm
Volume concentration in gas	0000 ... 9999 ppm / 1.000 ... 50.00 %vol

Oxy

Sensor standardization *)

Operating modes *)	CAL_AIR Automatic calibration in air	
	CAL_WTR Automatic calibration in air-saturated water	
	P_CAL Product calibration	
	CAL_ZERO Zero calibration	
Calibration range	Zero point	± 2 nA
Standard sensor "10"	Slope	25 ... 130 nA (at 25°C, 1013 mbars)
Calibration range	Zero point	± 2 nA
Trace sensor "01"	Slope	200 ... 550 nA (at 25°C, 1013 mbars)
Calibration range	Zero point	± 3 nA
Trace sensor "001"	Slope	2000 ... 9000 nA (at 25°C, 1013 mbars)
Calibration timer *)	Interval 0000 ... 9999 h	
Pressure correction *)	Manual 0.000 ... 9.999 bars / 999.9 kPa / 145.0 PSI	

Sensocheck	Monitoring of membrane and electrolyte and the sensor wires for short circuits or open circuits (can be disabled)
Delay	Approx. 30 s

Sensoface	Provides information on the sensor condition Evaluation of zero/slope, response, calibration interval, wear, Sensocheck, can be disabled

---

Temperature input	NTC 22 kΩ / NTC 30 kΩ *)
	2-wire connection, adjustable
Measuring range	-20.0 ... +150.0 °C / -4 ... +302 °F
Adjustment range	10 K
Resolution	0.1 °C / 0.1 °F
Measurement error [1]	< 0.5 K (< 1 K at > 100 °C)

ISM input	"One wire" interface for operation with ISM (digital sensors) (6 V / Ri= approx. 1.2 kΩ)

COND input	Input for 2-/4-electrode sensors or Memosens	
Display ranges	Conductivity	0.000 ... 9.999 µS/cm
		00.00 ... 99.99 µS/cm
		000.0 ... 999.9 µS/cm
		0000 ... 9999 µS/cm
		0.000 ... 9.999 mS/cm
		00.00 ... 99.99 mS/cm
		000.0 ... 999.9 mS/cm
		0.000 ... 9.999 S/cm
		00.00 ... 99.99 S/cm
	Resistivity	00.00 … 99.99 MΩ · cm
	Concentration	0.00 ... 100 %
	Temperature	−20.0 … +150.0 °C (−4.0 ... +302.0 °F)
	Salinity	0.0 ... 45.0 ... (0 ... 35 °C)
	Response (T90)	Approx. 1 s
Measuring ranges	2-EL sensors: 0.2 µS * c … 200 mS * c 4-EL sensors: 0.2 µS * c … 1000 mS * c (Conductance limited to 3500 mS)	
Measurement error [1]	< 1 % meas. val. + 0.4 µS * c	
Temp compensation [*] (reference temp 25°C)	(OFF)	Without
	(LIN)	Linear characteristic 00.00 ... 19.99 %/K
	(NLF)	Natural waters to EN 27888
	(NACL)	NaCl from 0 (ultrapure water) to 26% by wt
	(HCL)	Ultrapure water with HCl traces (0 ... 120 °C)
	(NH3)	Ultrapure water with NH3 traces (0 ... 120 °C)
	(NaOH)	Ultrapure water with NaOH traces (0 ... 120 °C)
Concentration determination	-01- NaCl	0 – 26% by wt (0 °C) ... 0 – 28% by wt (100 °C)
	-02- HCl	0 – 18% by wt (-20 °C) ... 0 – 18% by wt (50 °C)
	-03- NaOH	0 – 13% by wt (0 °C) ... 0 – 24% by wt (100 °C)
	-04- H2SO4	0 – 26% by wt (-17 °C) ... 0 – 37% by wt (110 °C)
	-05- HNO3	0 – 30% by wt (-20 °C) ... 0 – 30% by wt (50 °C)
	-06- H2SO4	94 – 99% by wt (-17 °C) ... 89 – 99% by wt (115 °C)
	-07- HCl	22 – 39% by wt (-20 °C) ... 22 – 39% by wt (50 °C)
	-08- HNO3	35 – 96% by wt (-20 °C) ... 35 – 96% by wt (50 °C)
	-09- H2SO4	28 – 88% by wt (-17 °C) ... 39 – 88% by wt (115 °C)
	-10- NaOH	15 – 50% by wt (0 °C) ... 35 – 50% by wt (100 °C)

Sensor standardization	Input of cell factor with simultaneous display of selected process variable and temperature
	Input of conductivity of calibration solution with simultaneous display of cell factor and temperature
	Product calibration for conductivity
	Temperature probe adjustment
Sensocheck	Polarization detection
Delay	Approx. 30 s
Sensoface	Provides information on the sensor condition
Sensor monitor	Direct display of measured values from sensor for validation (resistance/temperature)

*) user-defined
1) according to IEC 746 Part 1, at normal operating conditions

pH   Oxy   Cond

Input	for Memosens or optical sensors (SE 740) or digital toroidal conductivity sensors
Data In/Out	Asynchronous interface, RS 485, 9600/19200 Bd
Power supply	Terminal 1: +3.08 V/10 mA, Ri < 1 ohm, short-circuit-proof
	Terminal 5: 3.1 … 24 V/1W in four discrete levels (3.1/12/15/24 V), short-circuit-proof (levels are software-selectable), 15 V automatic with SE 740 sensor selected

I input (TAN)	4 ... 20 mA / 50 ohms
Function	Input of pressure or temperature values from external sensors
Resolution	Approx. 0.05 mA
Measurement error [1]	< 1% current value + 0.1 mA

Door contact	Outputs a signal when the door is open
	Logbook entry (FDA)

HOLD input	Galvanically separated (OPTO coupler)	
Function	Switches device to HOLD mode	
Switching voltage	0 ... 2 V (AC/DC)	HOLD inactive
	10 ... 30 V (AC/DC)	HOLD active

CONTROL input [*]	Galvanically separated (OPTO coupler)		
Function	Selecting parameter set A/B or flow measurement (FLOW)		
Parameter set A/B	Control input	0 ... 2 V (AC/DC)	Parameter set A
		10 ... 30 V (AC/DC)	Parameter set B
FLOW	Pulse input for flow measurement 0 ... 100 pulses/s		
	Display:	00.0 … 99.9 l/h	

Output 1	0/4 ... 20 mA, max. 10 V, floating (terminals 8 / 9, galvanically connected to output 2)
Overrange [*]	22 mA in the case of error messages
Characteristic	Linear, with conductivity measurement also bilinear and logarithmic
Output filter [*]	PT_1 filter, time constant 0 ... 120 s
Measurement error [1]	< 0.25% current value + 0.025 mA

Output 2	0/4 ... 20 mA, max. 10 V, floating (terminals 9 / 10, galvanically connected to output 1)
Overrange [*]	22 mA in the case of error messages
Characteristic	Linear, with conductivity measurement also bilinear and logarithmic
Output filter [*]	PT_1 filter, time constant 0 ... 120 s
Measurement error [1]	< 0.25% current value + 0.025 mA

[*]   user-defined
[1]   according to IEC 746 Part 1, at normal operating conditions

pH | **Oxy** | **Cond**

Power Out Power supply	Output for operating optical sensors (SE 740), selectable between 3,1 V / 12 V / 15 V / 24 V, short-circuit-proof (for SE 740 fixed to 15 V), max. power 1 W
Alarm contact	Relay contact, floating
Contact ratings	AC < 250 V / < 3 A / < 750 VA DC < 30 V / < 3 A / < 90 W
Contact response *)	N/C (fail-safe type)
Wash contact	Relay contact, floating
Contact ratings	AC < 250 V / < 3 A / < 750 VA DC < 30 V / < 3 A / < 90 W
Contact response *)	N/C or N/O
Min/max limits	Min/max contacts, floating, but inter-connected
Contact ratings	AC < 250 V / < 3 A / < 750 VA DC < 30 V / < 3 A / < 90 W
Contact response *)	N/C or N/O
Response delay *)	0000 ... 9999 s
Setpoints *)	As desired within range
Hysteresis *)	User-defined
Real-time clock	Different time and date formats selectable
Power reserve	> 5 days
Display	LC display, 7-segment with icons, colored backlighting
Main display	Character height approx. 22 mm, unit symbols approx. 14 mm
Secondary display	Character height approx. 10 mm
Text line	14 characters, 14 segments
Sensoface	3 status indicators (friendly, neutral, sad face)
Mode Indicators	meas, cal, conf, diag Further icons for configuration and messages
Alarm indication	Display blinks, red backlighting
Keypad	Keys: meas, info, 4 cursor keys, enter
2 parameter sets	Parameter set A and B, switchover via CONTROL input or manually
Diagnostics functions	
Calibration data	Calibration date, zero, slope
Device self-test	Automatic memory test (RAM, FLASH, EEPROM)
Display test	Display of all segments
Logbook	100 events with date and time 200 entries (Audit Trail) with extended logbokk (TAN)

*) user-defined
1) according to IEC 746 Part 1, at normal operating conditions

pH | Oxy | Cond

Service functions	
Current source	Current specifiable for output 1 and 2 (00.00 ... 22.00 mA)
Sensor monitor	Display of direct sensor signals (mV/temperature/operating time)
Relay test	Manual control of relay contacts
Device type	Selecting the measuring function
Data retention	Parameters, calibration data, logbook > 10 years (EEPROM)
Electrical safety	Protection against electric shock by protective separation of all extra-low-voltage circuits against mains according to EN 61010-1
Explosion protection (not for first deliveries) see included "Certificates" booklet or www.knick.de	Global: IECEx Zone 2, 22 Europe: ATEX Zone 2, 22 USA: FM Cl I/II/III Div 2; Zone 2, 22 Canada: CSA Cl I/II/III Div 2; Zone 2, 22
EMC	EN 61326
Emitted interference	Class B (residential area)
Immunity to interference	Industry
RoHS conformity	according to EC directive 2002/95/EC
Power supply	80 V (-15%) ... 230 (+10%) V AC ; ≤ 15 VA ; 45 ... 65 Hz 24 V (-15%) ... 60 (+10%) V DC ; 10 W (The device operates at 15 V min., in that case the safe function of the relays cannot be guaranteed, however.) Overvoltage category II, protection class II
Test voltage	2.5 kV AC
Nominal operating conditions	
Ambient temperature	-20 ... +55 °C
Transport/Storage temperature	-30 ... +70 °C
Relative humidity	10 ... 95% not condensing
Housing	Molded enclosure made of PBT/PC, glass-reinforced
Mounting	Wall, pipe/post or panel mounting
Color	Gray, RAL 7001
Ingress protection	IP 67 / NEMA 4X outdoor (with pressure compensation)
Flammability	UL 94 V-0
Dimensions	H 148 mm, W 148 mm, D 117 mm
Control panel cutout	138 mm x 138 mm to DIN 43 700
Weight	1.2 kg (1.6 kg incl. accessories and packaging)
Cable glands	3 knockouts for M20 x 1.5 cable glands 2 knockouts for NPT ½" or rigid metallic conduit
Connections	Terminals, conductor cross section max. 2.5 mm²

[*)] user-defined
[1)] according to IEC 746 Part 1, at normal operating conditions

Specifications

pH Oxy Cond

HART communication	Digital communication via FSK modulation of output current 1
	Device identification, measured values, status and messages, parameter setting, calibration, records
Conditions	Output current ≥ 3.8 mA and load resistance ≥ 250 ohms

*) user-defined
1) according to IEC 746 Part 1, at normal operating conditions

Inserting a Module
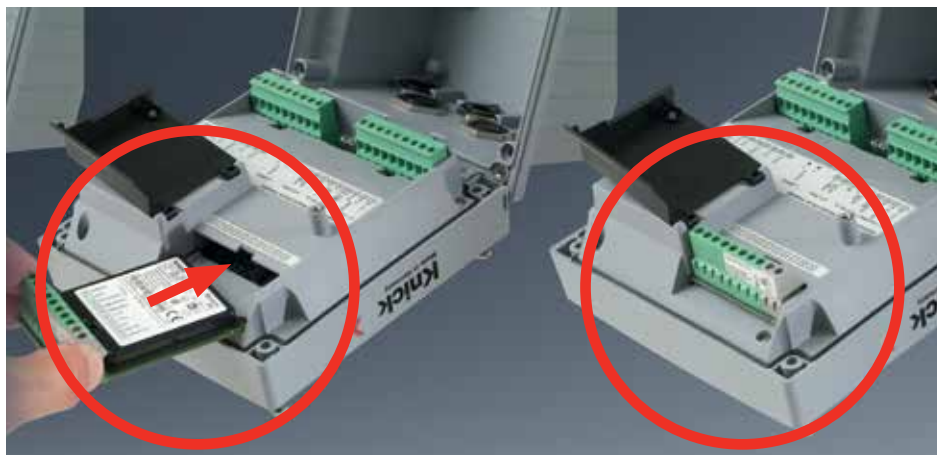
**Measuring modules for connection of analog sensors
(pH, Oxy, Cond, CondI, dual conductivity CC):**

Measuring modules for the connection of analog sensors are simply inserted into the module slot. Upon initial start-up, the analyzer automatically recognizes the module and adjusts the software correspondingly. When you replace the measuring module, you must select the corresponding measuring function in the "Service" menu.

Measuring module for 2nd Memosens channel
If you want to measure two process variables using Memosens sensors, you must insert a Memosens module for the second channel. See Page 236.
The operating mode for multi-channel measurement ("device type") must be selected in the Service menu.
The following combinations are possible:
Memosens pH + Memosens pH
Memosens pH + Memosens Oxy

Installation Instructions

- Installation of the device must be carried out by trained experts in accordance with this user manual and as per applicable local and national codes.
- Be sure to observe the technical specifications and input ratings during installation!
- Be sure not to notch the conductor when stripping the insulation!
- Before connecting the device to the power supply, make sure that its voltage lies within the range 80 to 230 V AC/DC or 24 to 60 V DC.
- A signal current supplied to the current input must be galvanically isolated. If not, connect an isolator module.
- All parameters must be set by a system administrator prior to commissioning.

Terminals:

suitable for single or stranded wires up to 2.5 mm^2 (AWG 14)

Application in hazardous locations:

For use in hazardous locations, see separate "Certificates" document:

- IECEx
- ATEX

pH Module

Measure el.	**A**	pH/mV/ temp input
Reference el.	**B**	
SG	**C**	
ISFET +3 V	**D**	+3 V/ −3 V for ISFET adapter
ISFET −3 V	**E**	
ISM GND	**F**	
ISM data	**G**	
RTD	**H**	
RTD	**I**	
Shield	**K**	
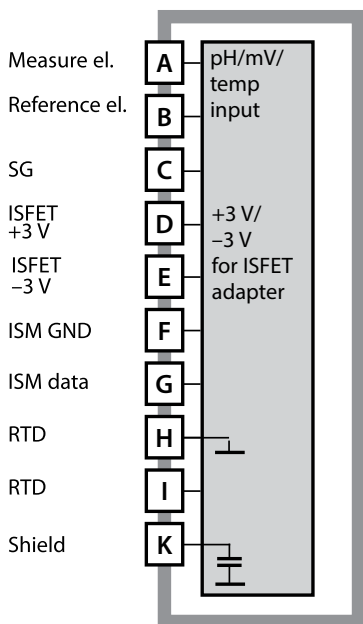
Module for pH measurement
Order code MK-PH015
See the following pages for wiring examples.
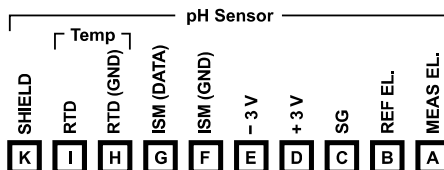
pH Sensor

		Temp							
SHIELD	RTD	RTD (GND)	ISM (DATA)	ISM (GND)	− 3 V	+ 3 V	SG	REF EL.	MEAS EL.
K	**I**	**H**	**G**	**F**	**E**	**D**	**C**	**B**	**A**

Terminal plate of pH module
The terminals are suitable for single or stranded wires up to 2.5 mm^2 (AWG 14).
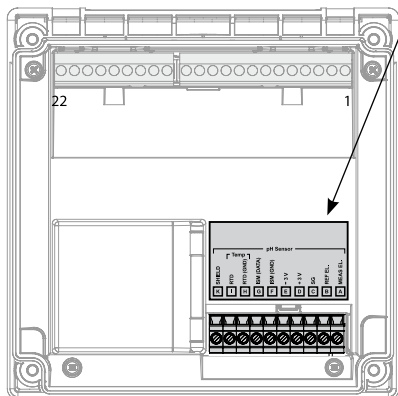
The measuring module comes with a self-adhesive label. Stick the label to the module slot on the device front. This way, you have the wiring "under control".

Example 1:

Measuring task:	pH, temperature, glass impedance
Sensors (example):	HA 405-DXK-58 (Mettler-Toledo)
Cable (example):	AS9 ZU 0318 (Knick)
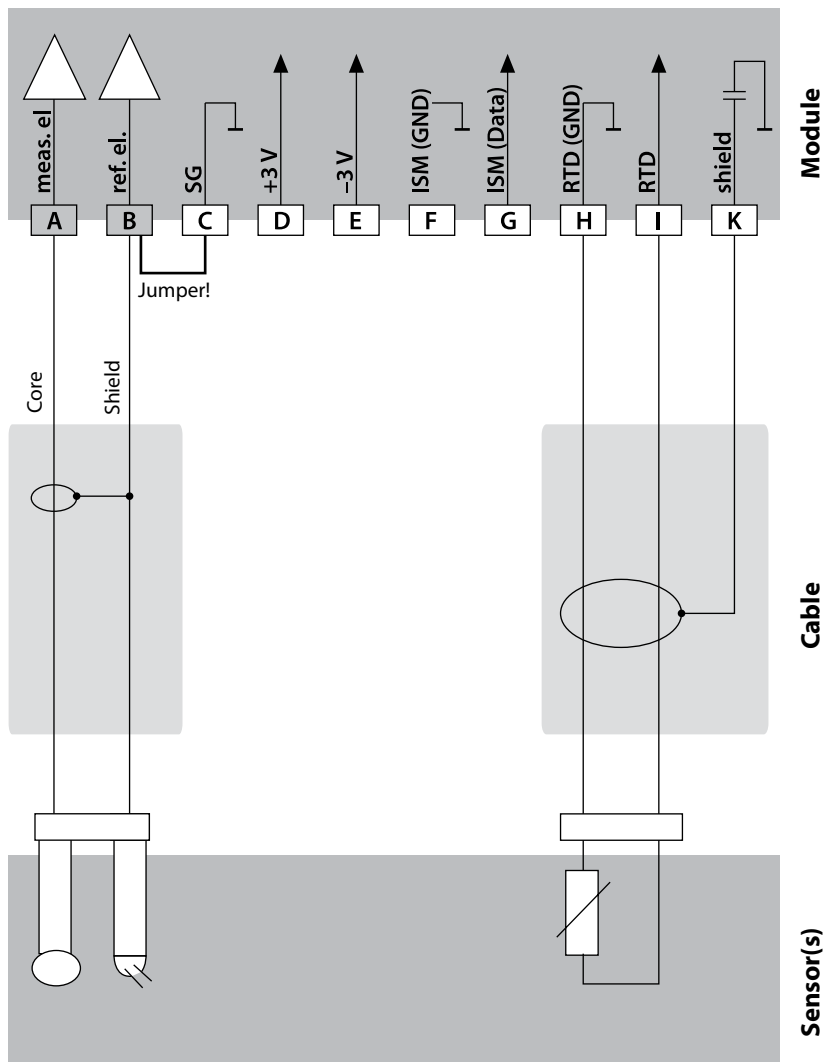
Example 2:

Measuring task:	pH/ORP, temp, glass impedance, ref. impedance
Sensors (example):	pH: HA 405-DXK-58 (Mettler-Toledo),
	Pt: ZU 0073 (Knick)
Cable (example):	2x AS9 ZU 0318 (Knick)
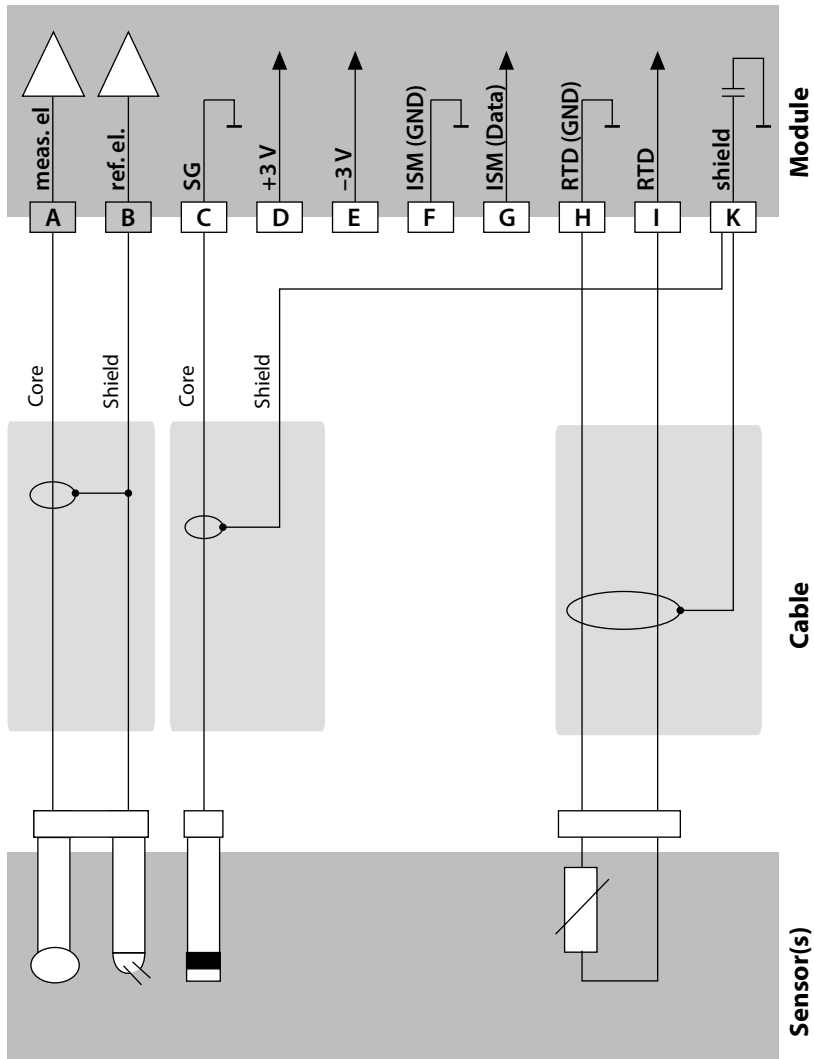
Example 3:

Measuring task:	pH, temp, glass impedance
Sensors (example):	SE 533 (Knick)
Cable (example):	VP6 ZU 0313 (Knick)
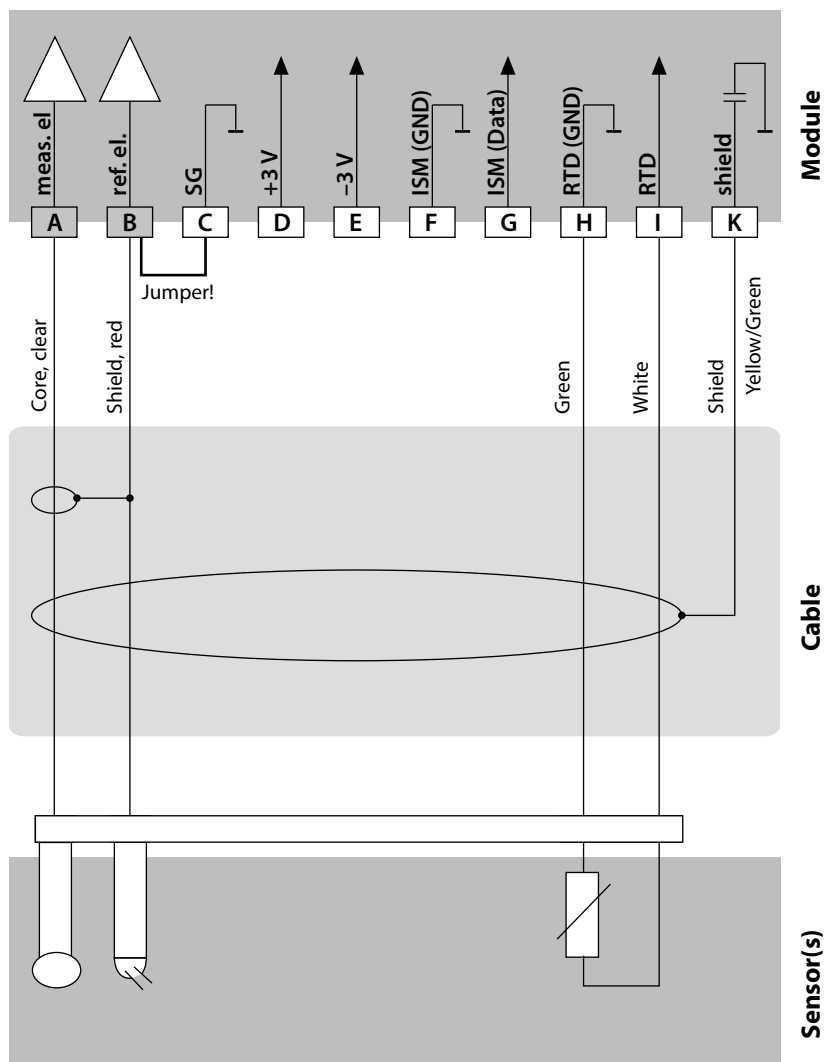
Example 4:

Measuring task:	pH/ORP, temp, glass impedance, ref. impedance
Sensors (example):	pH: SE 533 (Knick)
	Pt: ZU 0073 (Knick)
Cable (example):	VP6 ZU 0313 (Knick) or AS9 ZU 0318 (Knick)
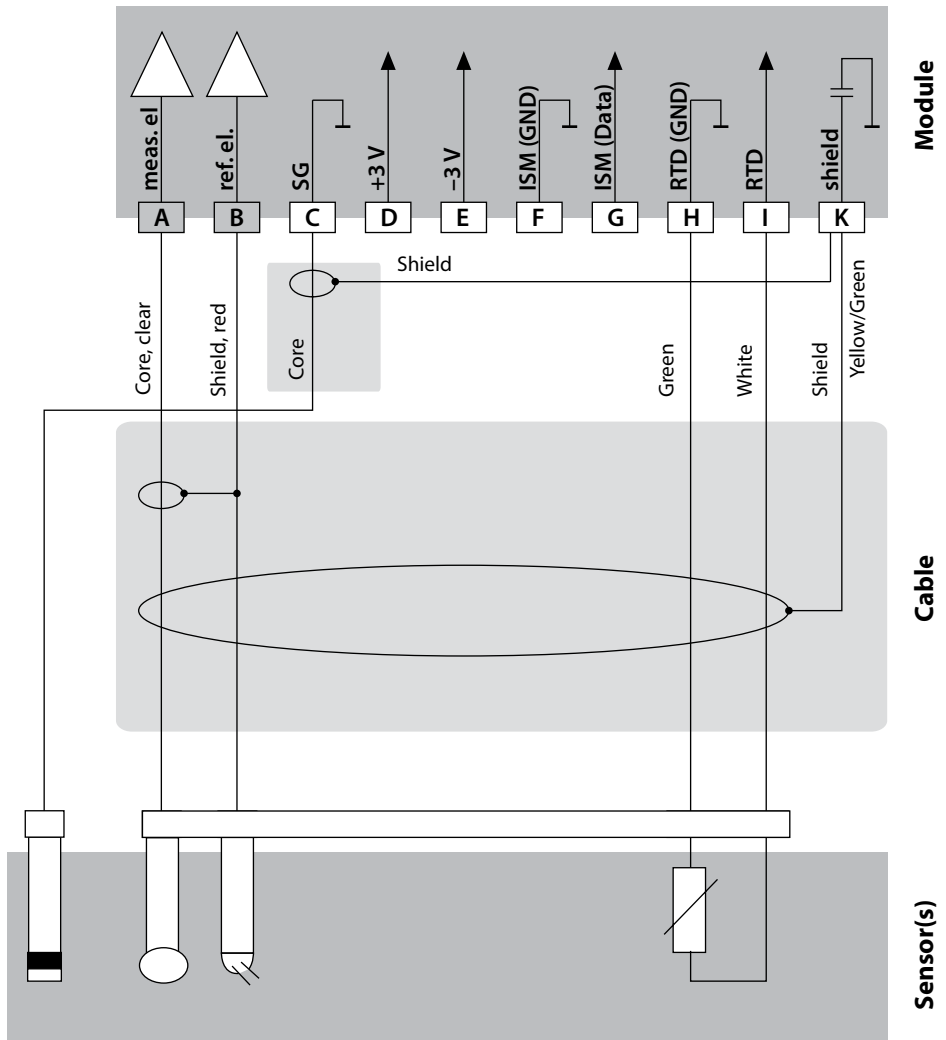
Example 5:

Measuring task:	pH/ORP, temp, glass impedance, ref. impedance
Sensors (example):	InPro 4260 (Mettler-Toledo)
Cable (example):	VP6 ZU 0313 (Knick)

Module

A	B	C	D	E	F	G	H	I	K
meas. el	ref. el.	SG	+3 V	–3 V	ISM (GND)	ISM (Data)	RTD (GND)	RTD	shield

Core, clear
Shield, red
Blue
Green
White
Shield
Yellow/Green
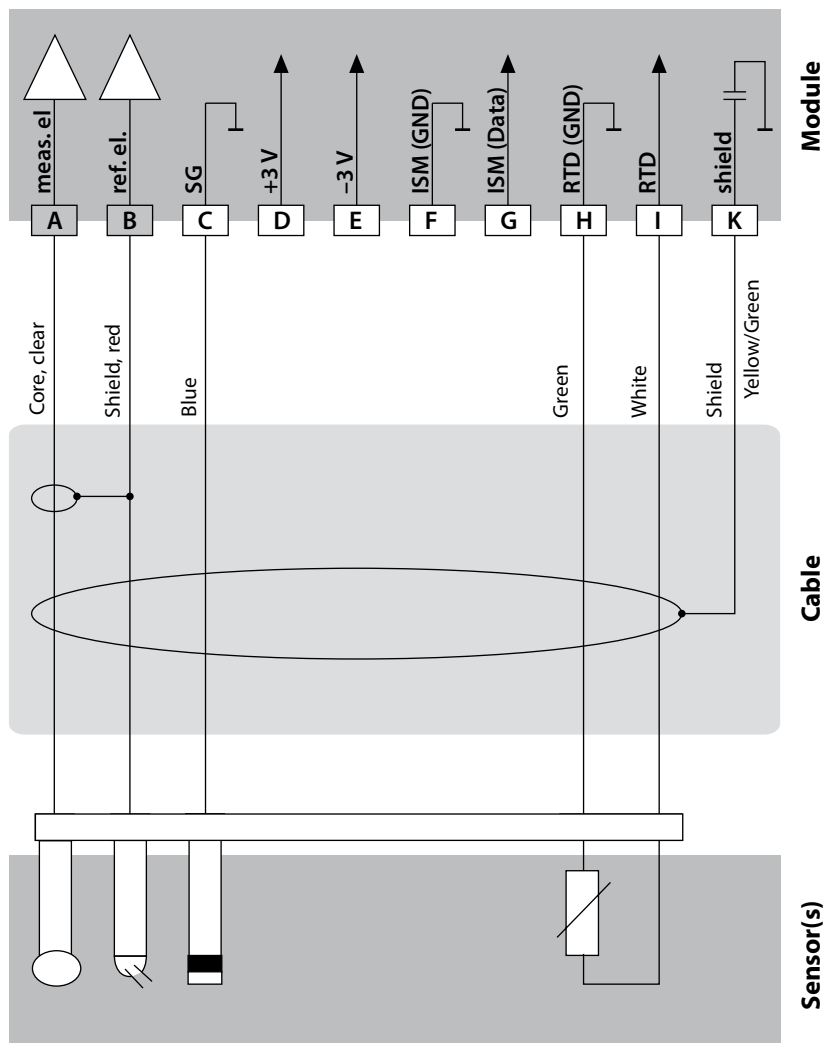
Cable

Sensor(s)

Example 6:

Measuring task:	pH, temp (safe areas only)
Sensors (example):	InPro 3300 ISFET (Mettler-Toledo)
Cable (example):	ZU 0582 (Knick)
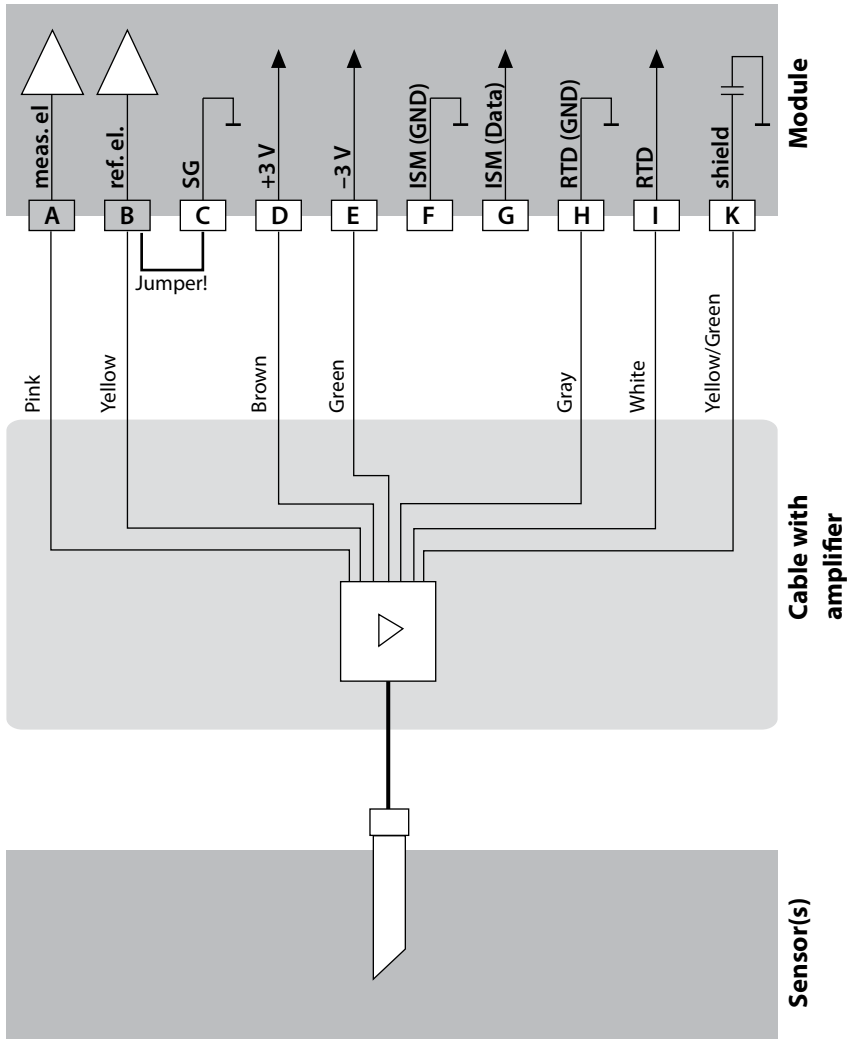
Example 7:

Caution!

Do not connect an additional analog sensor!

Measuring task: pH/ORP, temp, glass impedance, ref. impedance

Sensors (example): ISM digital InPro 4260i (Mettler-Toledo)

Cable (example): AK9 (Mettler-Toledo)

ISM
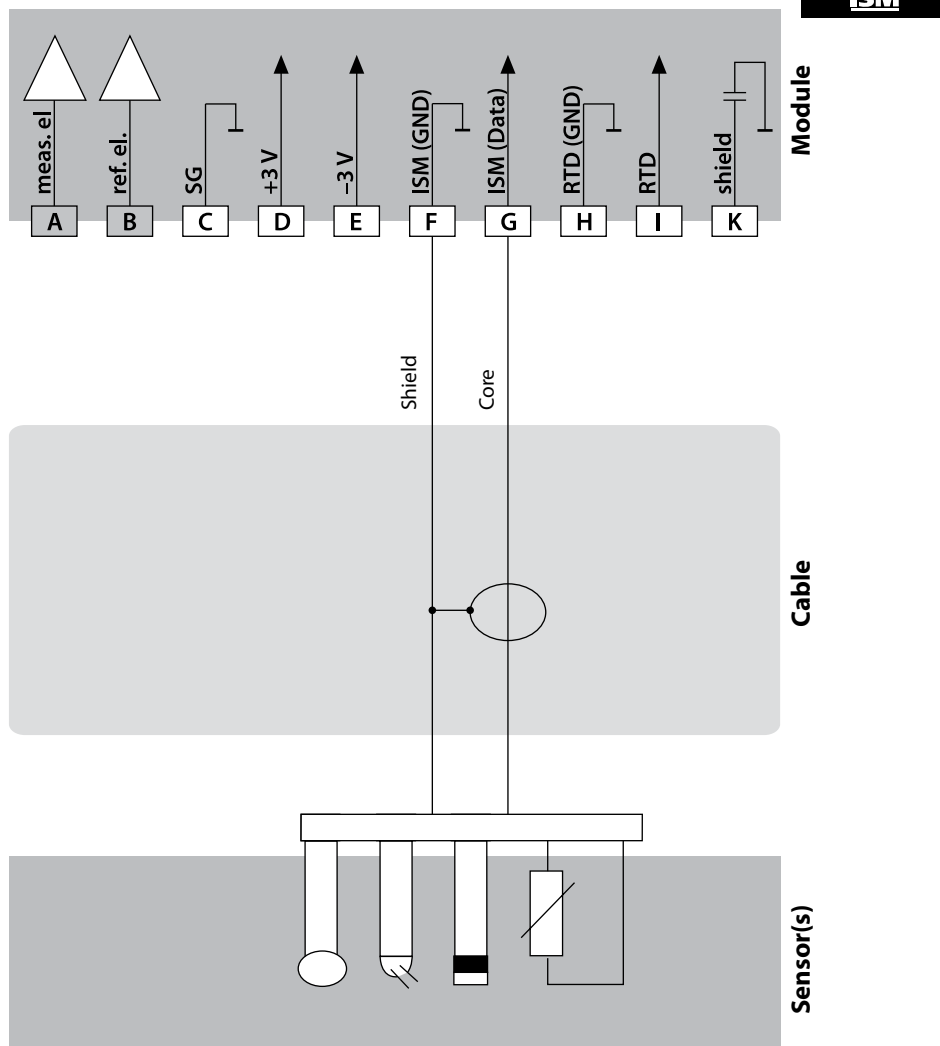
Example 8 – Note: Switch off Sensocheck!

Measuring task:	ORP, temp, glass impedance, ref. impedance
Sensors (example):	ORP: SE 535 (Knick)
Cable (example):	AS9 ZU 0318 (Knick)
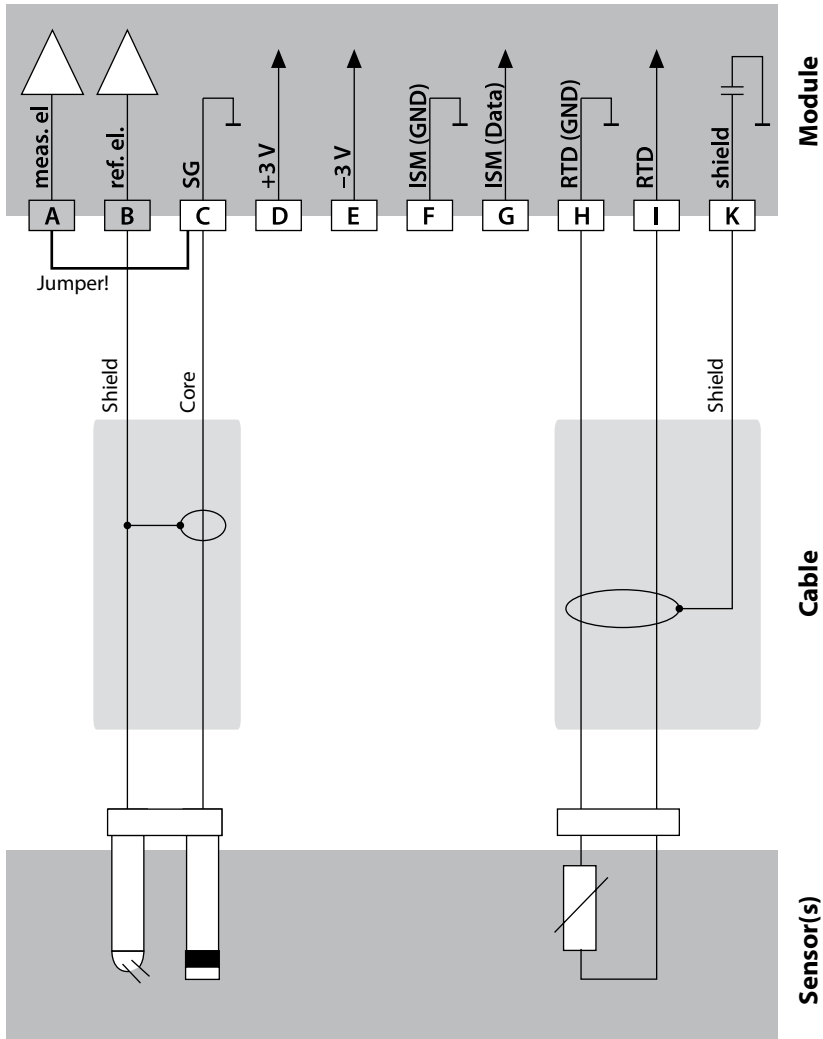
Example 9:

Connecting a Pfaudler probe (requires TAN SW-A007):
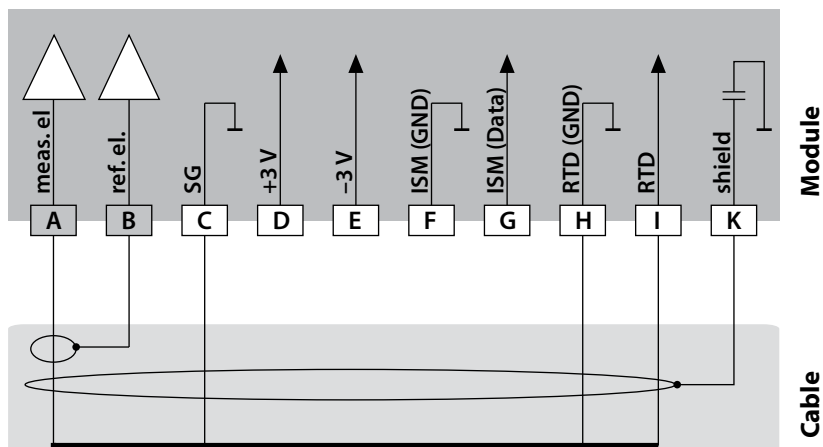
	Module	pH Reiner with equip.bond., VP screw cap	Differential Models 18/40 with equip.bond.	Models 03/04 with equip. bond.	Models 03/04 without equip. bond.
A	meas	Coax core	Coax white	Coax white	Coax white
B	ref	Coax shield	Coax brown	Coax brown	Coax brown
C	SG	Blue	Blue	Blue	Jumper B/C
D					
E					
F					
G					
H	RTD (GND)	Green	Brown	Brown	Brown
I	RTD	White	Green, Black	Green, Black	Green, Black
K	Shield	Green/Yellow, Gray	Orange, Violet	Orange, Violet	Orange, Violet

Cathode — A
Reference — B
Anode — C
Guard — D
ISM GND — E
ISM data — F
RTD — G
RTD — H
Shield — I

Oxy input
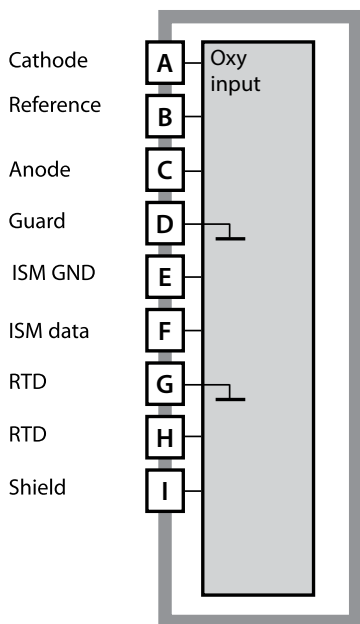
Module for dissolved-oxygen measurement
Order code MK-OXY045
See the following pages for wiring examples.
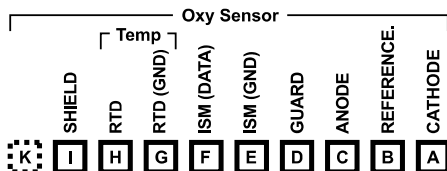
	Oxy Sensor								
		Temp							
SHIELD	RTD	RTD (GND)	ISM (DATA)	ISM (GND)	GUARD	ANODE	REFERENCE.	CATHODE
K	I	H	G	F	E	D	C	B	A

Terminal plate of DO module
The terminals are suitable for single or stranded wires up to 2.5 mm² (AWG 14).
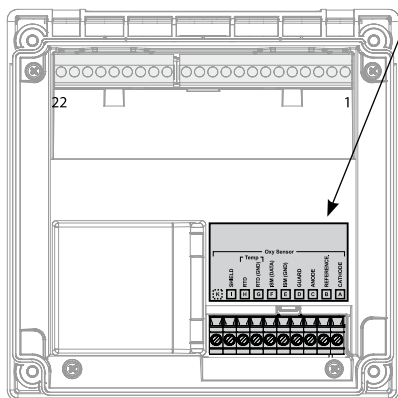
The measuring module comes with a self-adhesive label. Stick the label to the module slot on the device front. This way, you have the wiring "under control".
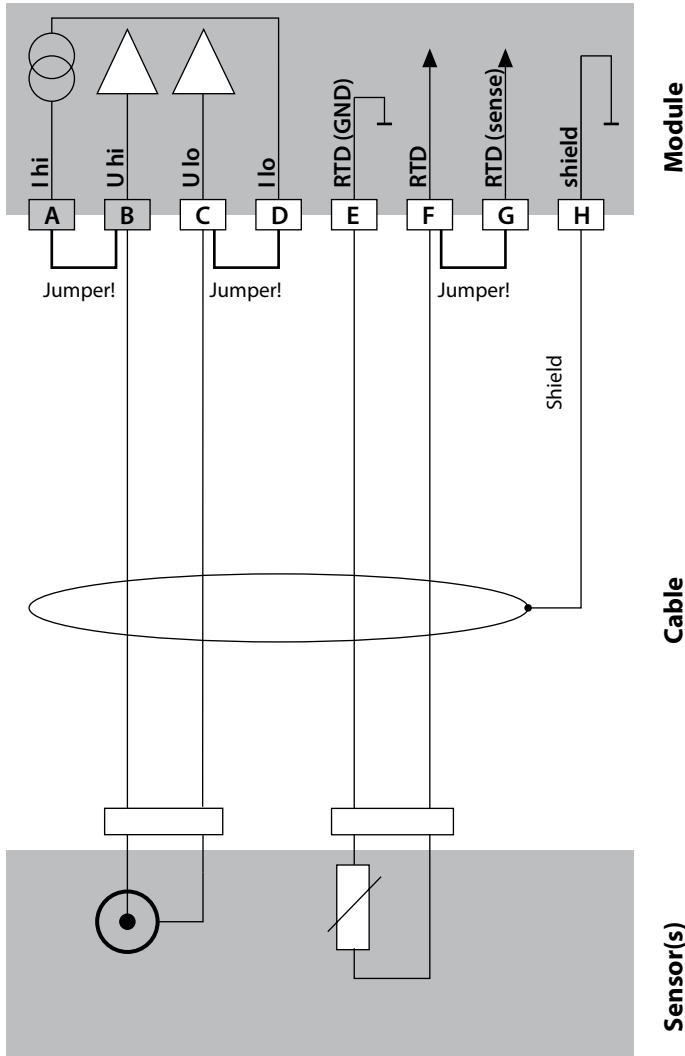
Example 1:

Measuring task:	Oxygen STANDARD
Sensors (example):	"10" (e.g. SE 706, InPro 6800)
Cable (example):	VP 6 ZU 0313 (Knick)
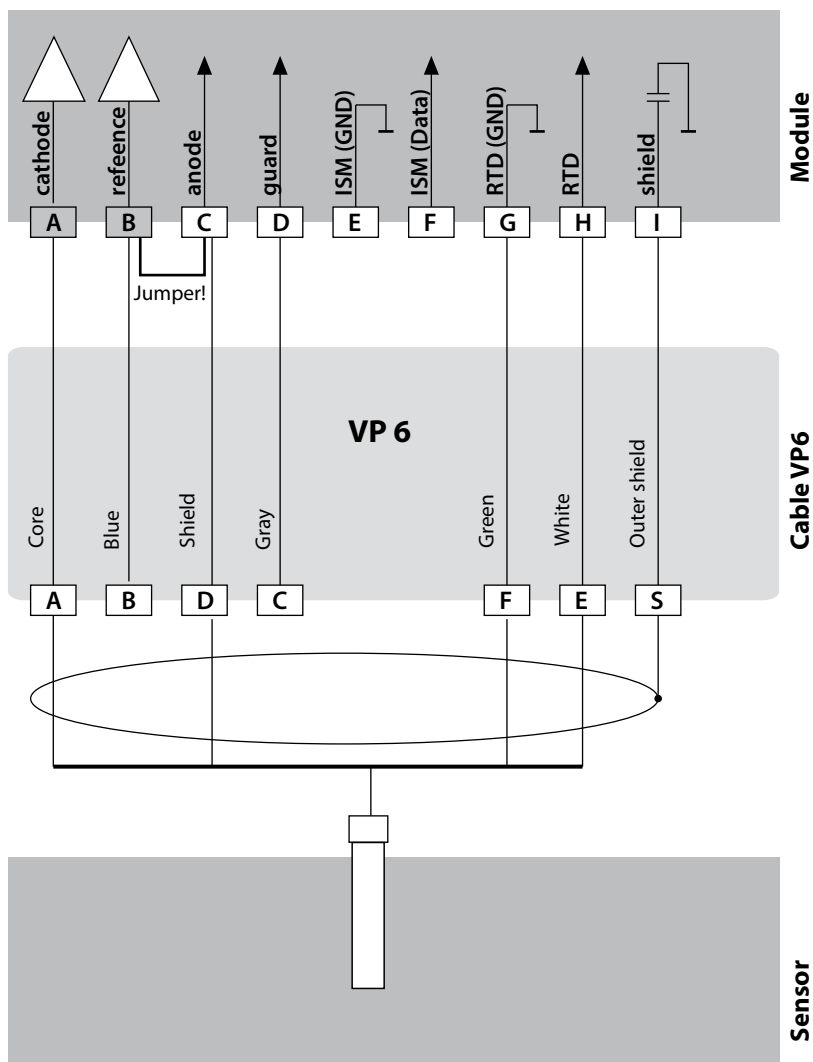
Example 2:

Measuring task:	Oxygen TRACES (TAN required)
Sensors (example):	"01" (e.g. SE 707, InPro 6900)
Cable (example):	VP6 ZU 0313 (Knick)

Module

cathode **A**

refeence **B**

anode **C**

Jumper!

guard **D**

ISM (GND) **E**

ISM (Data) **F**

RTD (GND) **G**

RTD **H**

shield **I**

VP 6

Cable VP6

Core **A**

Blue **B**

Shield **D**

Gray **C**

Green **F**

White **E**

Outer shield **S**
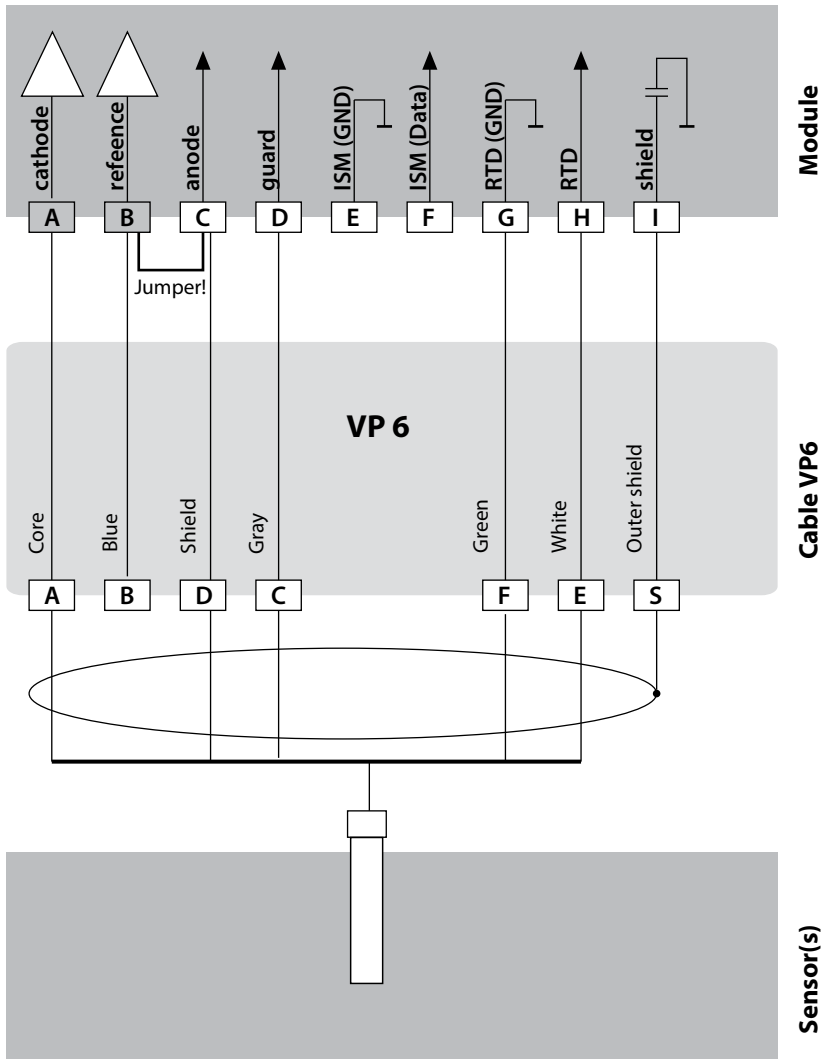
Sensor(s)

Example 3:

Measuring task:	Oxygen SUBTRACES (TAN required)
Sensors (example):	"001" (e.g. SE 708, InPro 6950)
Cable (example):	VP6 ZU 0313 (Knick)

Module

cathode   **A**
refeence   **B**   No jumper!
anode   **C**
guard   **D**
ISM (GND)   **E**
ISM (Data)   **F**
RTD (GND)   **G**
RTD   **H**
shield   **I**

VP 6

Cable VP6

Core   **A**
Blue   **B**
Shield   **D**
Gray   **C**
Green   **F**
White   **E**
Outer shield   **S**
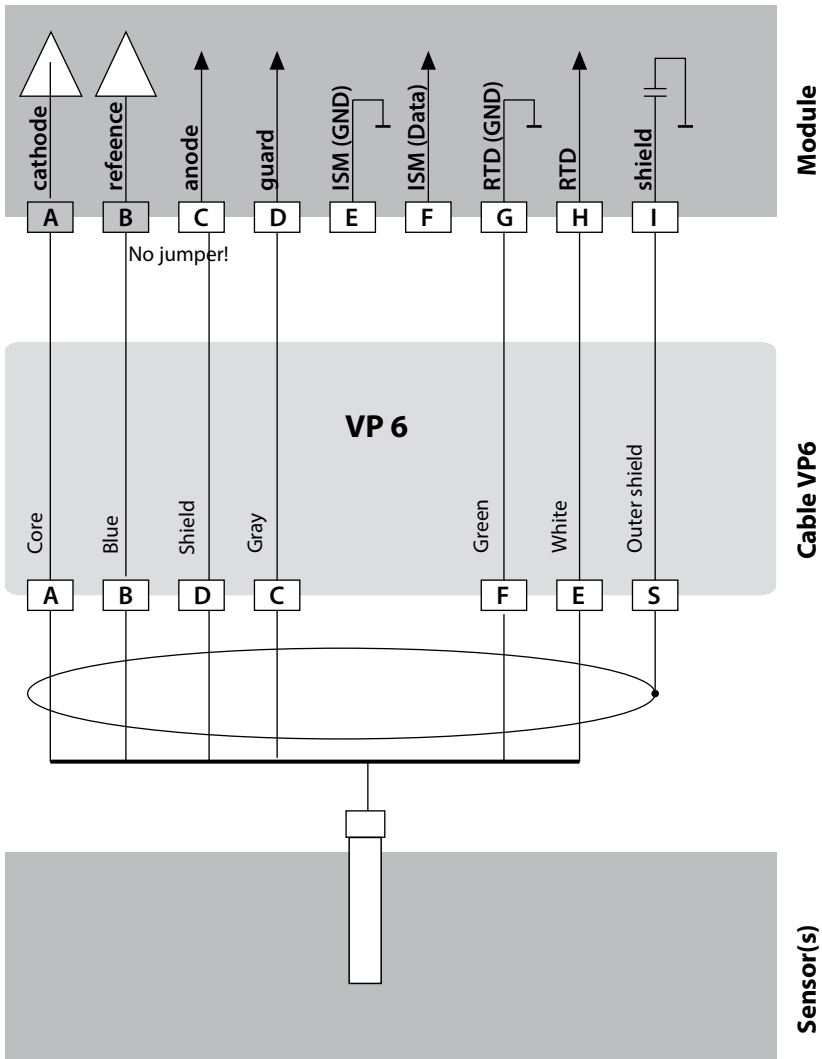
Sensor(s)

Example: **Optical oxygen sensor**

Measuring task: Connection of optical sensor (LDO)

Sensors (example):   SE 740

Cable (example):   M12 (e.g. CA/M12-005N485)
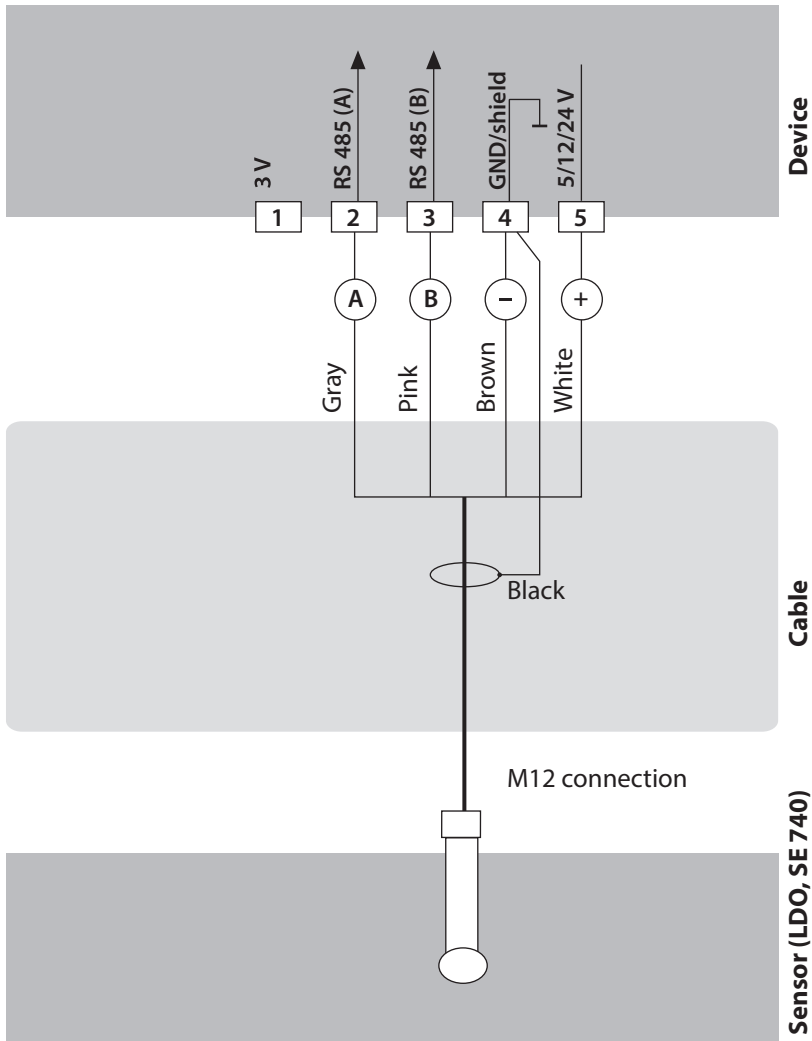
Start-Up

When you start up the analyzer for the first time, you will be prompted to select the desired measuring function.

Changing the Measuring Function

In the "Service" menu you can select another measuring function at any time.

Calibration and Maintenance in the Lab

The "MemoSuite" software allows calibrating Memosens sensors under reproducible conditions at a PC in the lab. The sensor parameters are registered in a database. Documenting and archiving meet the demands of FDA CFR 21 Part 11. Detailed reports can be output as csv export for Excel. MemoSuite is available as accessory and comes in the versions "Basic" and "Advanced": www.knick.de.

Settings and specifications

Currently connected sensor: Sensor type, manufacturer, order code and serial number

Function selection (The selected function is highlighted.)

Parameters of currently connected sensor

Last calibration (adjustment)

Display size of measured values
When the cursor moves over a measured value, it changes to a magnifying glass, allowing to magnify the measured-value display at a mouse click.

Example 1:

Measuring task:	pH/ORP, temp, glass impedance, ref. impedance
Sensors (example):	SE 533-NMS (Knick), Memosens
Cable (example):	CA/MS-003-NAA (Knick)
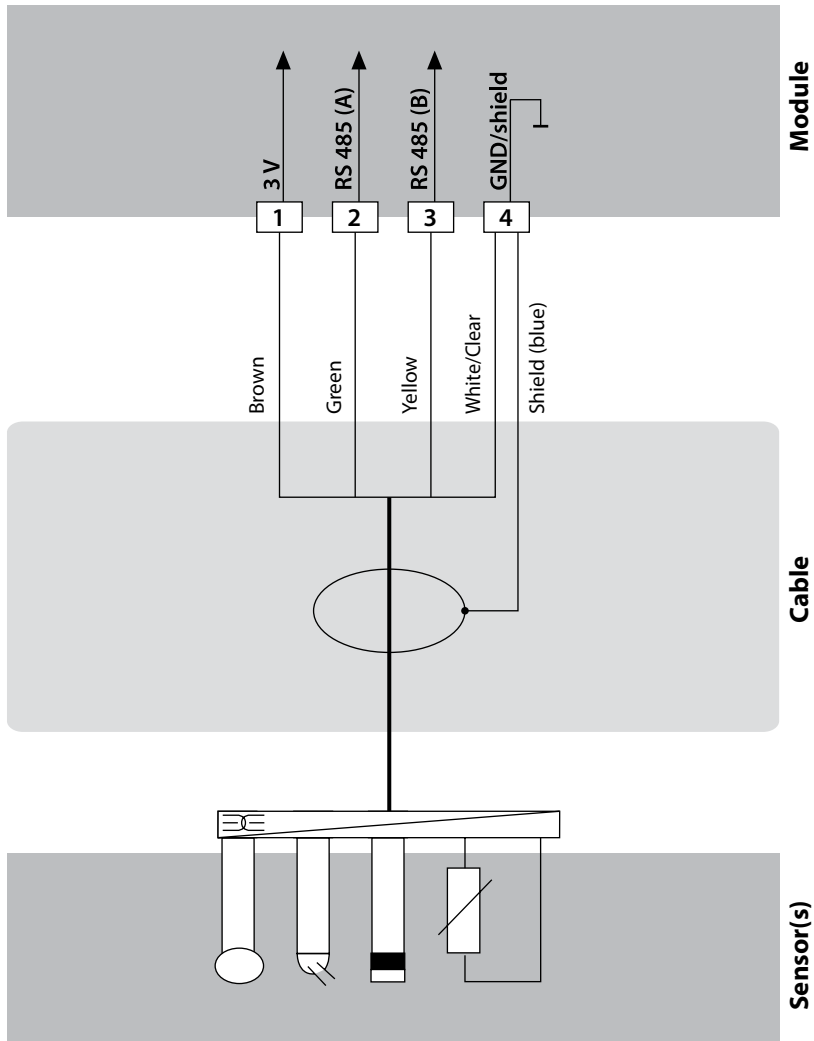
Example 2:

Measuring task:	pH/ORP, temp, glass impedance, ref. impedance
Sensors (example):	Orbisint CPS 11 D Memosens
Cable (example):	CYK 10
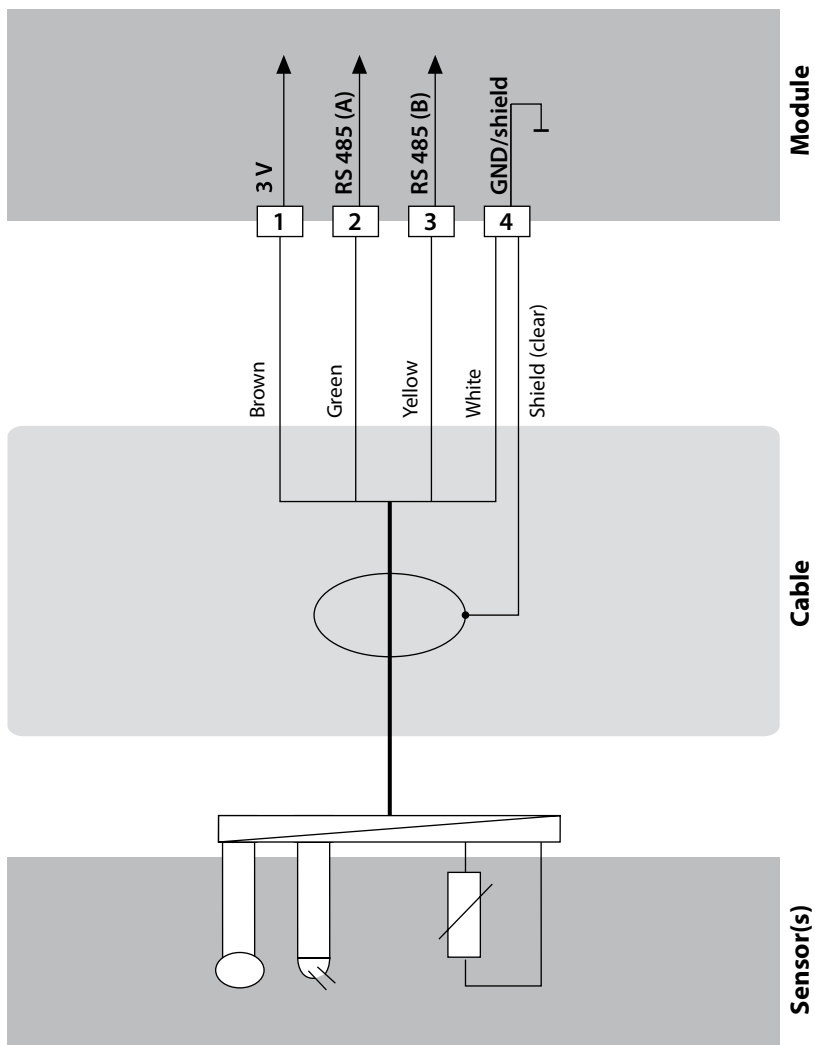
Standard connection (sensor A)

1	Brown	supply
2	Green	RS 485 A
3	Yellow	RS 485 B
4	White/Transp.	GND/shield

22   1

Areas for placing the
screwdriver to pull out the
terminals

For dual devices (2 measuring channels): (MK-MS095 module) Connection of sensor B

A	Brown	supply
B	Green	RS 485 A
C	Yellow	RS 485 B
D	White	GND
E	Transp.	SHIELD

Memosens Cable

Brown — Power supply +

Green — RS485 (A)

Yellow — RS485 (B)

White — Power supply – (GND)

Transparent — Shield

Power supply

RS 485 A

RS 485 B

GND

Shield
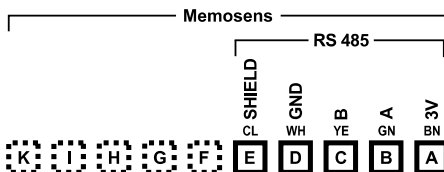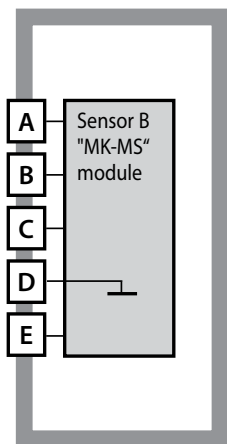
A	Sensor B "MK-MS" module
B	
C	
D	
E	

Module for 2nd Memosens channel
Order code MK-MS095
See the following pages for wiring examples.

**Terminal plate of module
for 2nd Memosens channel**
The terminals are suitable for single or stranded wires up to 2.5 mm^2 (AWG 14).

The measuring module comes with a self-adhesive label. Stick the label to the module slot on the device front. This way, you have the wiring "under control".
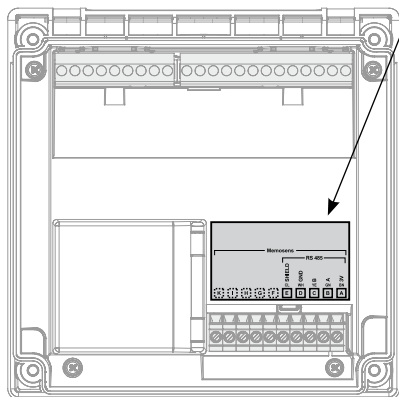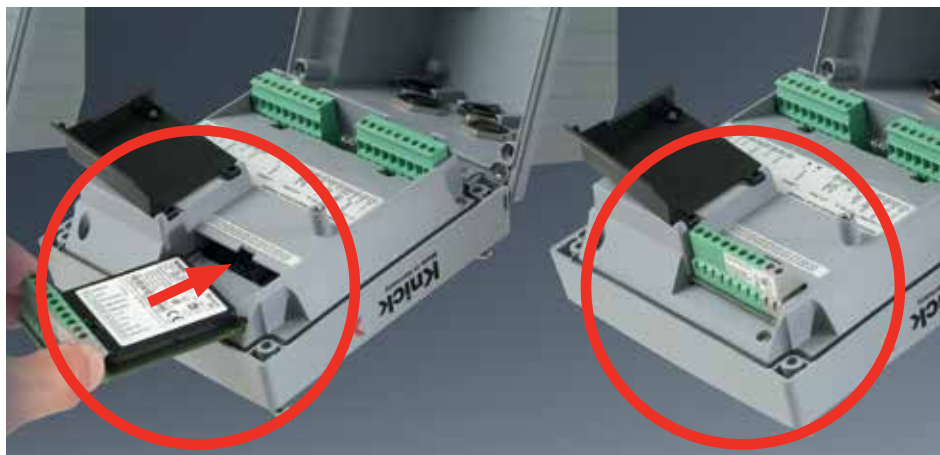
**Measuring modules for connection of analog sensors
(Cond, CondI, dual conductivity CC):**

Measuring modules for the connection of analog sensors are simply inserted into the module slot. Upon initial start-up, the analyzer automatically recognizes the module and adjusts the software correspondingly. When you replace the measuring module, you must select the corresponding measuring function in the "Service" menu.

I hi   **A** | Cond input

V hi   **B**

V lo   **C**

I lo   **D**

RTD (GND)   **E**

RTD   **F**
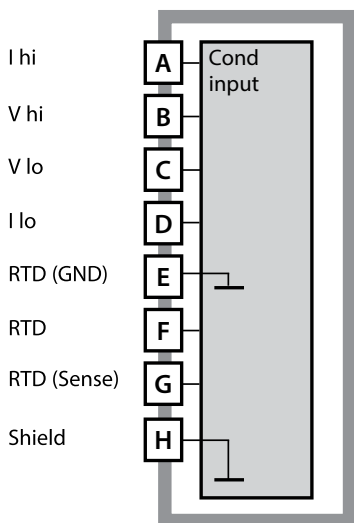
RTD (Sense)   **G**

Shield   **H**

Module for contacting conductivity measurement (Cond)

Order code MK-COND025
See the following pages for wiring examples.

COND Sensor Temp

SHIELD   RTD (SENSE)   RTD   RTD (GND)

K   I   **H**   **G**   **F**   **E**   **D**   **C**   **B**   **A**
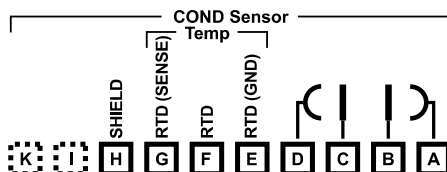
Terminal plate of module for Cond measurement

The terminals are suitable for single or stranded wires up to 2.5 mm^2 (AWG 14).
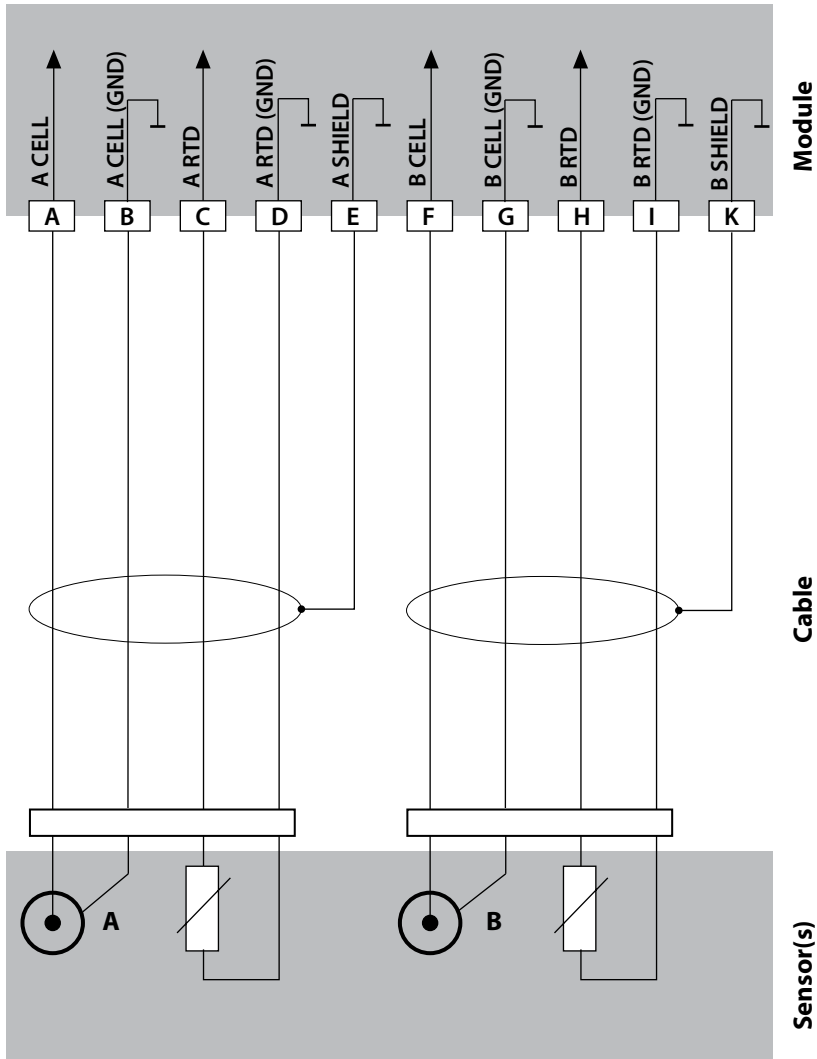
The measuring module comes with a self-adhesive label. Stick the label to the module slot on the device front. This way, you have the wiring "under control".

22   1
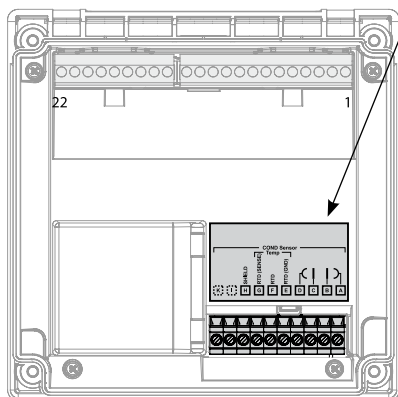
Example 1:

Measuring task:	Conductivity, temperature
Sensors (principle):	4 electrodes

Place jumper across F and G when a 2-wire temperature probe is used!
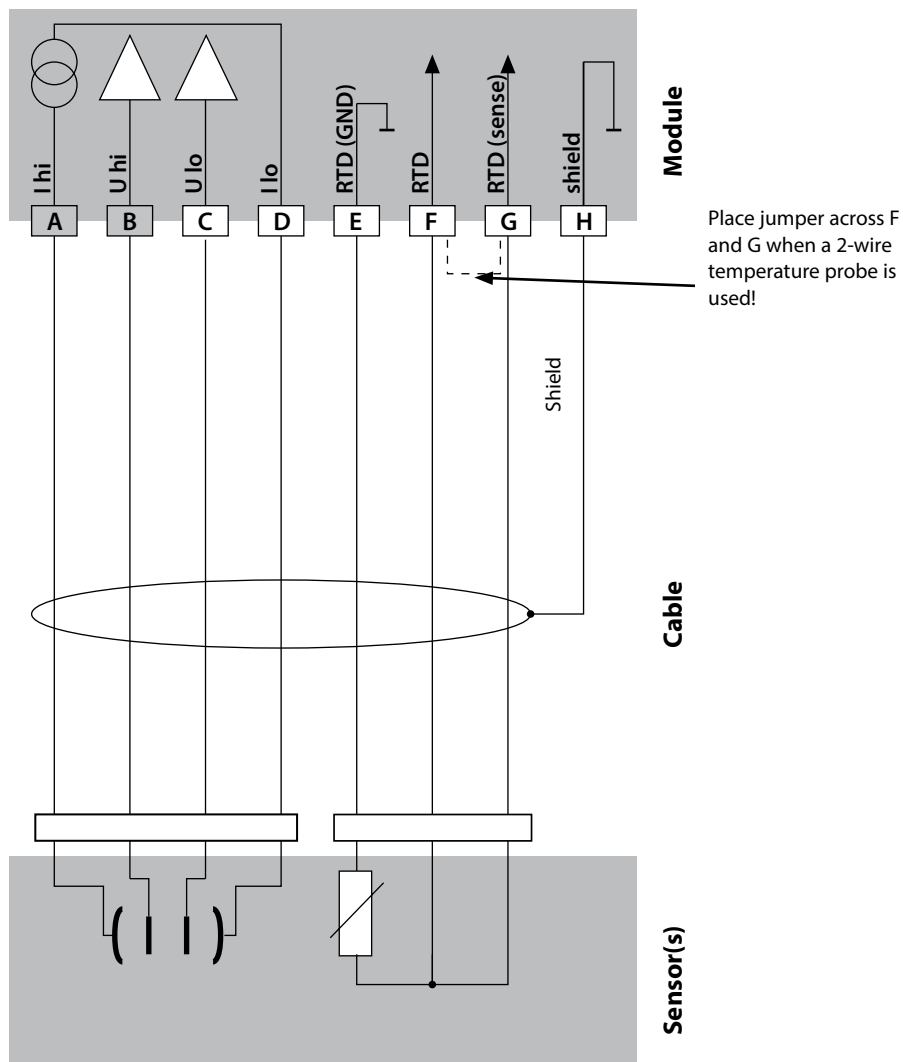
Example 2:

Measuring task:	Conductivity, temperature
Sensors (principle):	2 electrodes, coaxial

Example 3:

Measuring task:	Conductivity, temperature
Sensors (example):	SE 604 (Knick)
Cable:	Schaltbau cable

Schaltbau connector
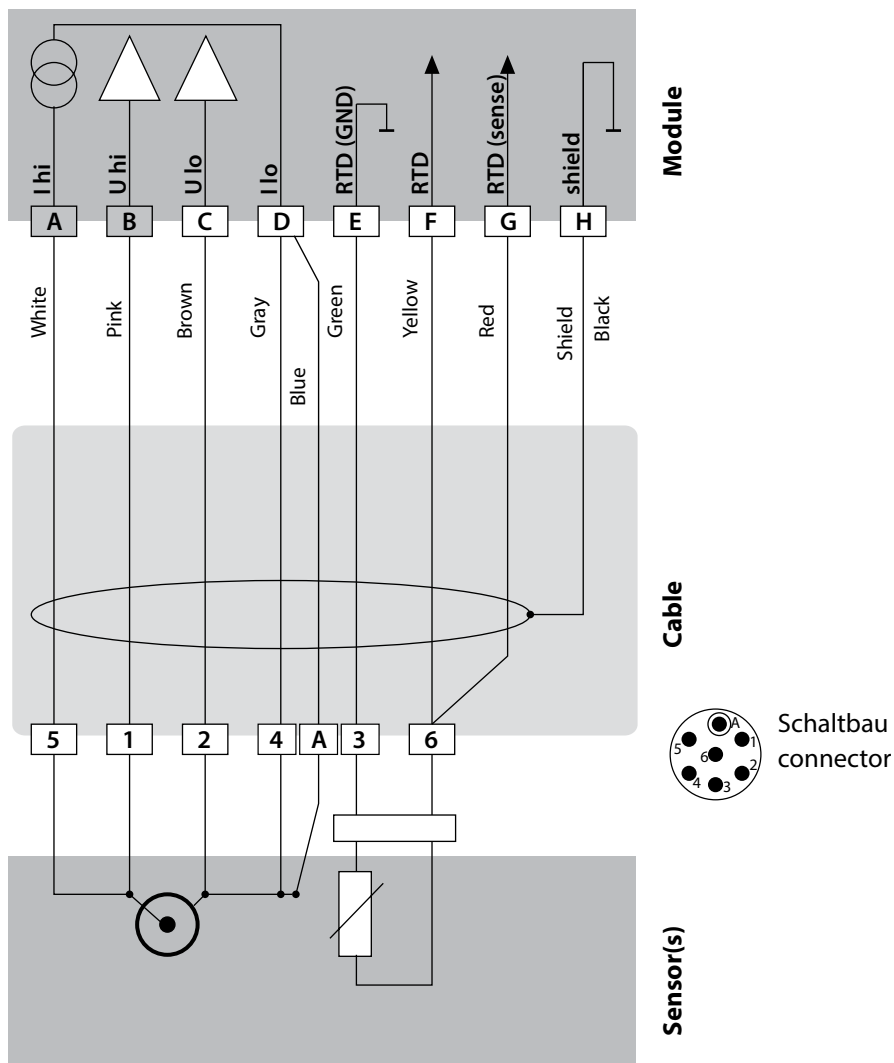
Example 4:

Measuring task: Conductivity, temperature

Sensors (example):   SE 630 (Knick)

                       Connection via GDM connector

GDM connector
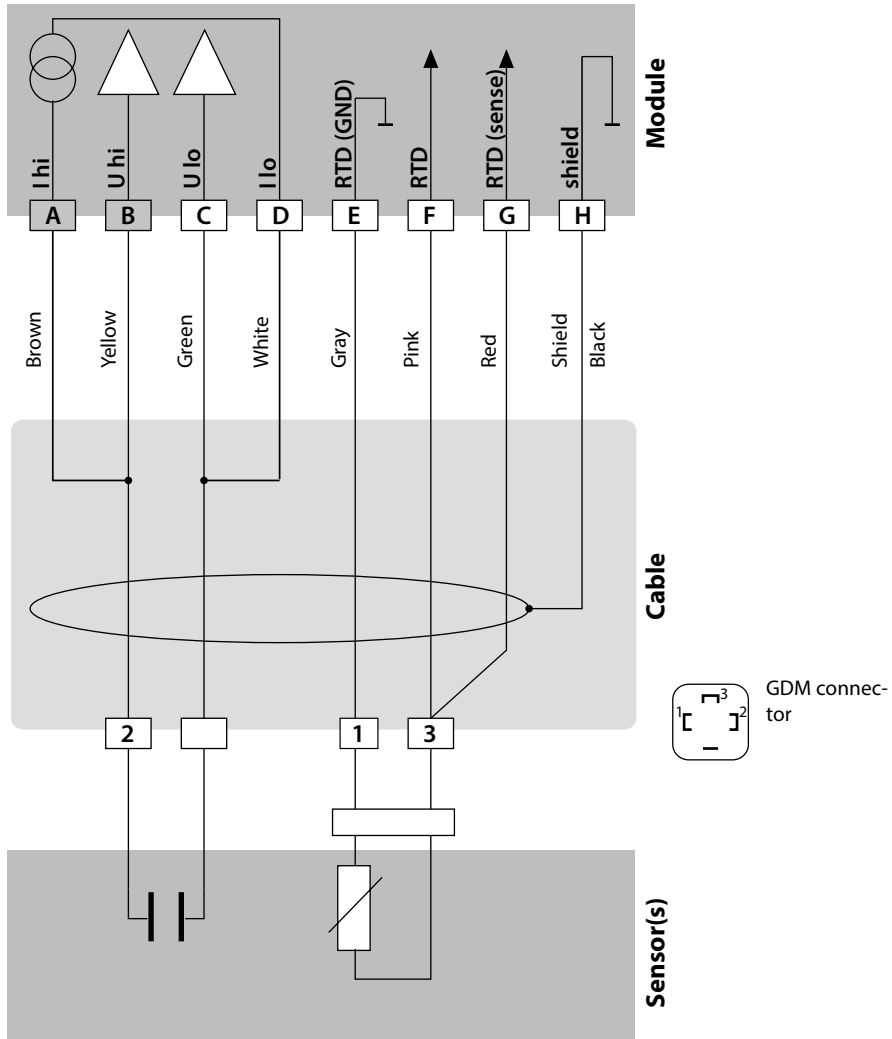
Example 5:

Measuring task: Conductivity, temperature

Sensors (example):   SE 600 / SE 603 4-EL fringe-field sensor (Knick)
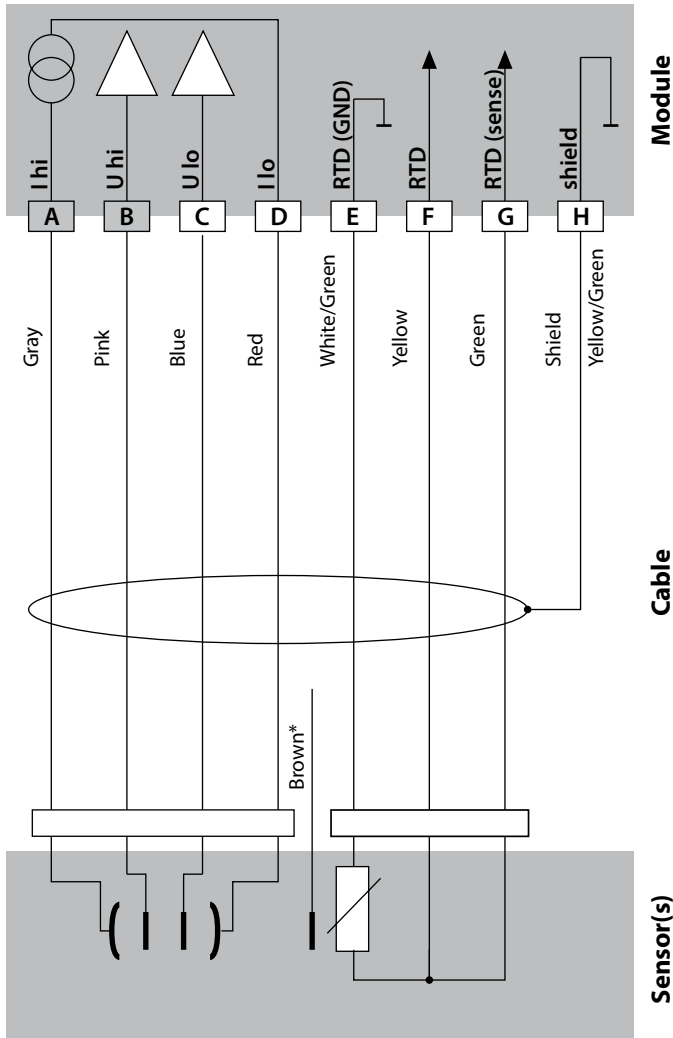
* Do not connect

Example 6:

Measuring task:	Conductivity, temperature
Sensor:	Memosens
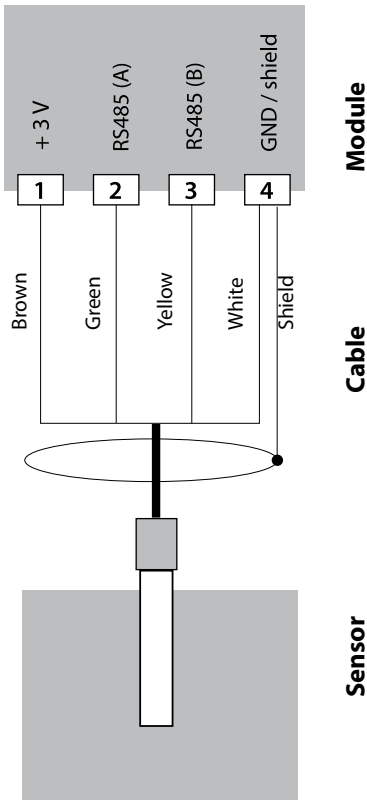
Connect the Memosens sensor to the RS-485 interface of the device. When you start up the analyzer for the first time, you will be prompted to select the desired measuring function.

Example 7:

Measuring task:	Conductivity, temperature
Sensors (example):	SE 604-MS (Knick), Memosens
Cable (example):	CYK 10

receive hi — A — CONDI input

receive lo — B

send lo — C

send hi — D

RTD (GND) — E

RTD — F

RTD (Sense) — G

Shield — H
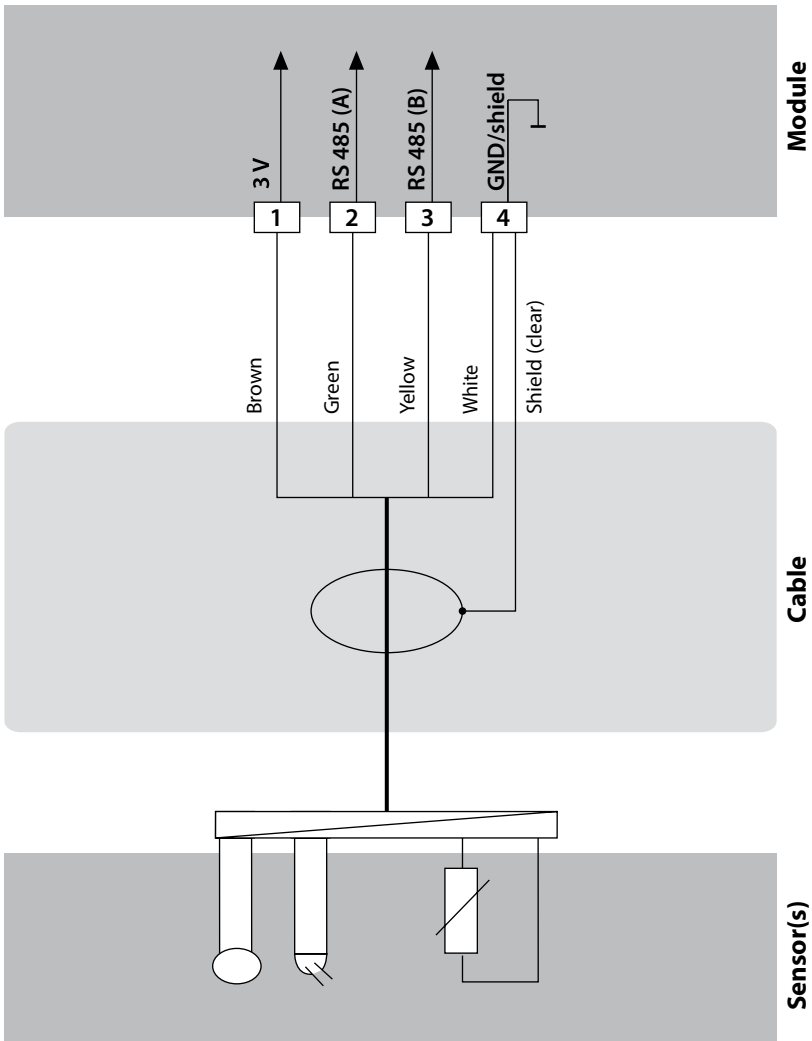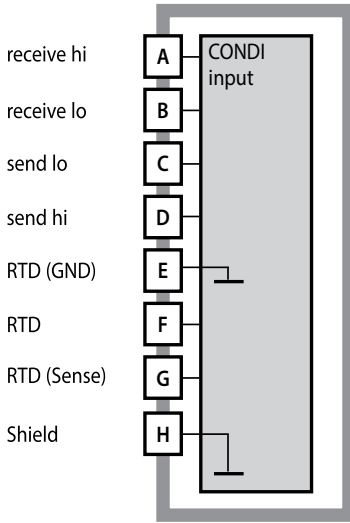
Module for inductive conductivity measurement (CondI)

Order code MK-CONDI035
See the following pages for wiring examples.
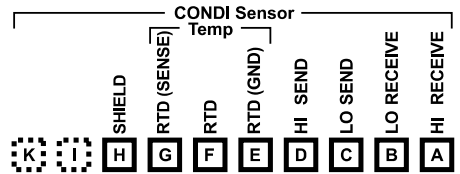
CONDI Sensor

| K | I | H | G | F | E | D | C | B | A |

SHIELD — H
RTD (SENSE) — G
RTD — F
RTD (GND) — E
HI SEND — D
LO SEND — C
LO RECEIVE — B
HI RECEIVE — A

Temp

Terminal plate of CondI module

The terminals are suitable for single or stranded wires up to 2.5 mm^2 (AWG 14).

The measuring module comes with a self-adhesive label. Stick the label to the module slot on the device front. This way, you have the wiring "under control".

22   1
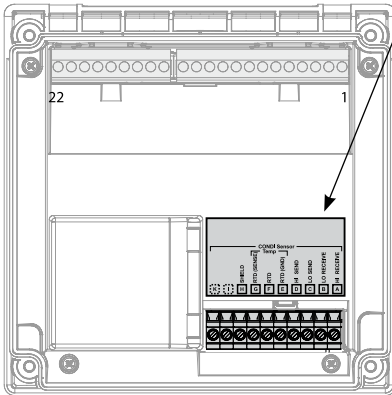
Preparing the Shield Connection

Pre-assembled special cable for SE 655 / SE 656 sensors
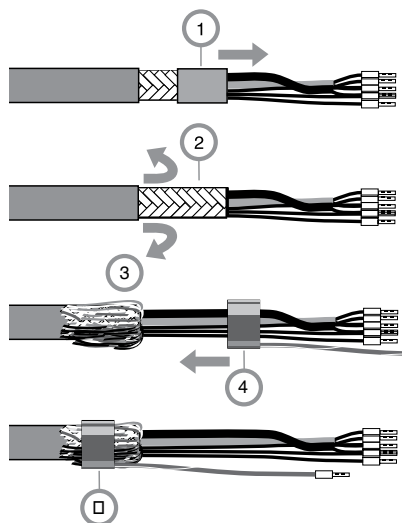
- Insert the special cable through the cable entry into the terminal compartment.
- Remove the already separated part of the cable insulation (1).
- Turn the shielding mesh (2) over the cable insulation (3).
- Then shift the crimp ring (4) over the shielding mesh and tighten it using a pince (5)

The pre-assembled special cable:

Coax RD	BU	receive hi
	RD	receive lo
Coax WH	RD	send lo
	BU	send hi
	GN	RTD (temp)
	WH	RTD (temp)
	YE	sense (temp)
	GN/YE	shield
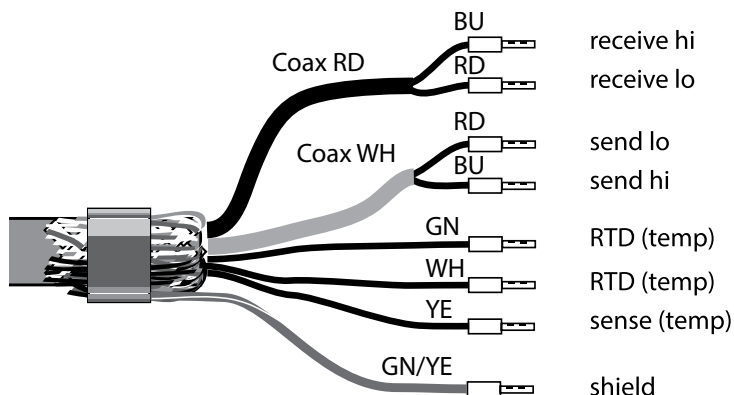
Measuring task: Conductivity, temperature

Sensors: SE 655/SE 656 sensor

                       Connecting the pre-assembled cable
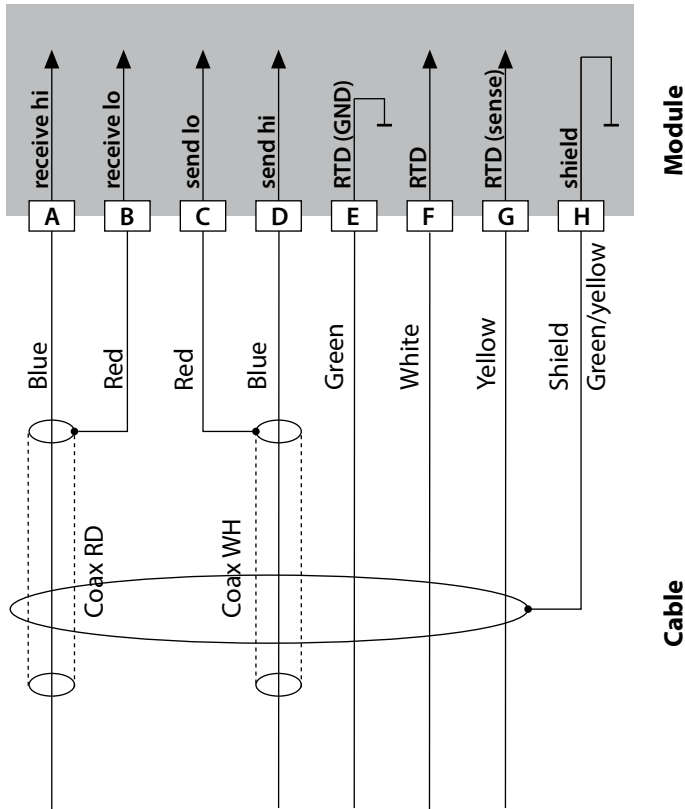
Measuring task: Conductivity, temperature
Sensor: SE 660 sensor

Module

receive hi	receive lo	send lo	send hi	RTD (GND)	RTD	RTD (sense)	shield
A	B	C	D	E	F	G	H

Blue
Red
Red
Blue
Green
White
Yellow
Shield
Green/yellow

Coax RD
Coax BK

Cable
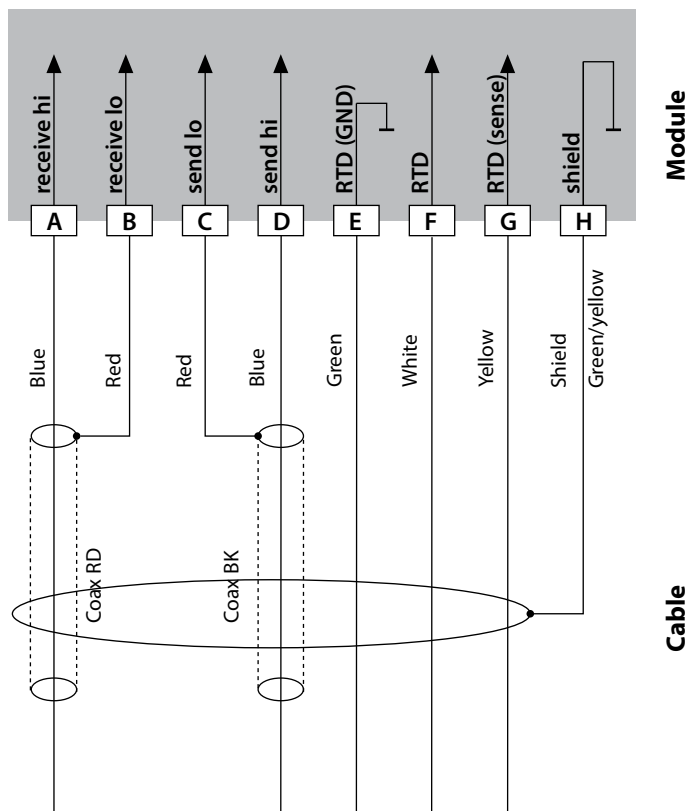
Measuring task: Conductivity, temperature
Sensor: Yokogawa ISC40 (Pt 1000)
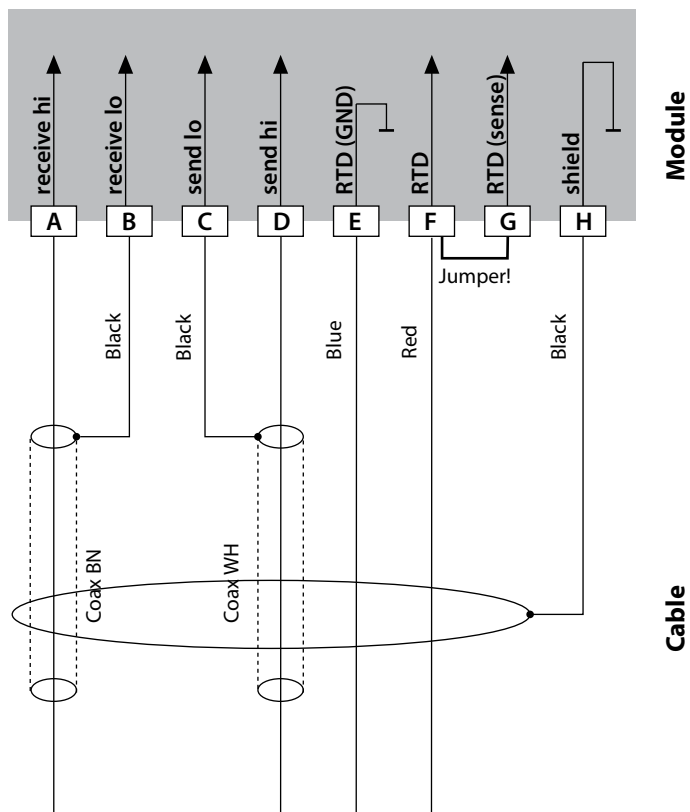
Configuration settings for this sensor:

SENSOR	Conductivity, temperature
Sensor:	OTHER
RTD TYPE	1000Pt
CELL FACTOR	1.88
TRANS RATIO	125

Measuring task: Conductivity, temperature

Sensor: Yokogawa IC40S (NTC 30k)
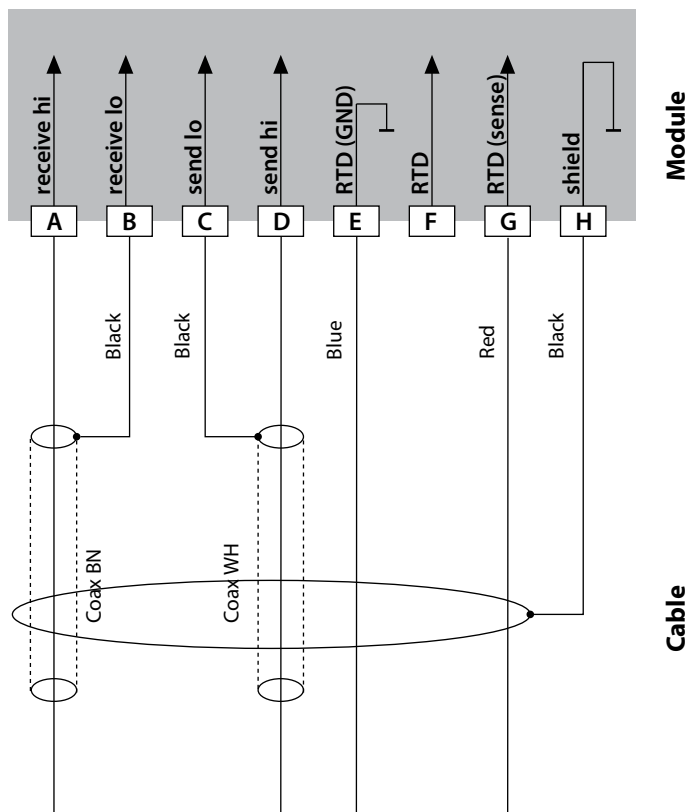
Configuration settings for this sensor:

SENSOR	Conductivity, temperature
Sensor:	OTHER
RTD TYPE	30 NTC
CELL FACTOR	approx. 1.7
TRANS RATIO	125

Measuring task: Conductivity, temperature

Sensor: SE 670, SE 680

Caution! Connection to RS-485 interface!

Remove the measuring module.
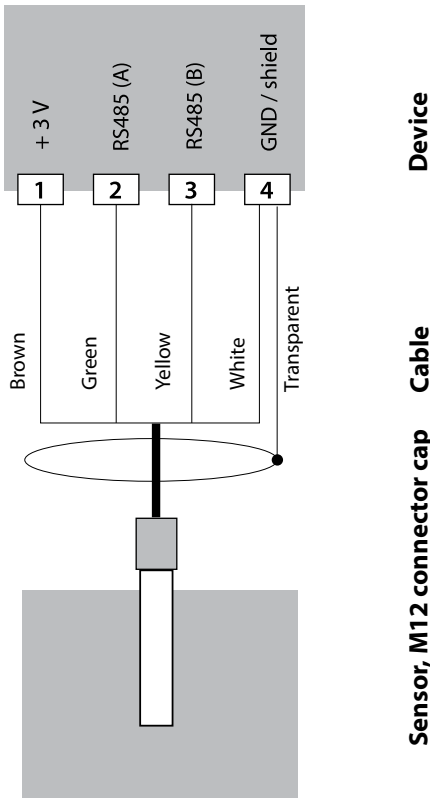
Connect the SE 670 sensor to the RS-485 interface of the device. When the SE 670 sensor is selected in the Configuration menu, the default values are taken as calibration data. They can then be modified by calibration.

Caution: The calibration data are saved in the analyzer and not in the sensor.

A CELL   **A**   CC input

A CELL (GND)   **B**

A RTD   **C**

A RTD (GND)   **D**

SHIELD   **E**

B CELL   **F**

B CELL (GND)   **G**

B RTD   **H**

B RTD (GND)   **I**

SHIELD   **K**
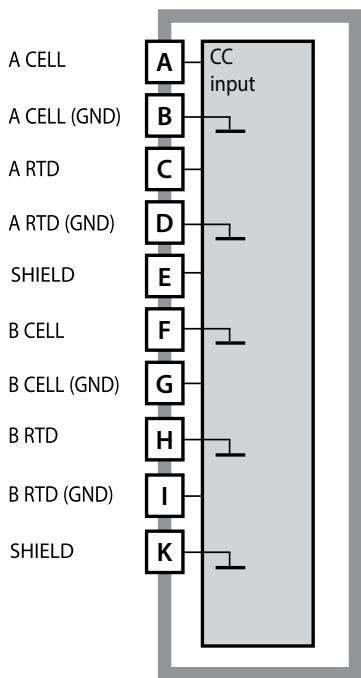
Module for 2 x conductivity measurement

Order code MK-CC065
See the following pages for wiring examples.
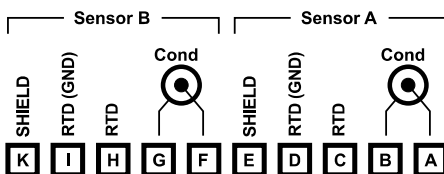
Sensor B				Sensor A			
SHIELD	RTD (GND)	RTD	Cond	SHIELD	RTD (GND)	RTD	Cond
K	I	H	G F	E	D	C	B A

Terminal plate
for 2 x conductivity measurement

The terminals are suitable for single or stranded wires up to 2.5 mm^2 (AWG 14).

The measuring module comes with a self-adhesive label. Stick the label to the module slot on the device front. This way, you have the wiring "under control".
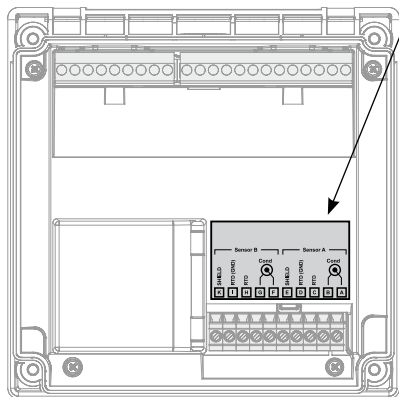
Example 1:

Measuring task:	Dual conductivity, temperature
Sensors (principle):	2 electrodes, coaxial

Example 2:

Measuring task:	Dual conductivity, temperature
Sensors:	SE 604, 2 electrodes

Terminal	Signal
A	A CELL
B	A CELL (GND)
C	A RTD
D	A RTD (GND)
E	A SHIELD
F	B CELL
G	B CELL (GND)
H	B RTD
I	B RTD (GND)
K	B SHIELD

Module

Cable

Sensor(s)

White / Pink — Brown / Gray — Yellow / Red — Green — Black

White / Pink — Brown / Gray — Yellow / Red — Green — Black

A

B
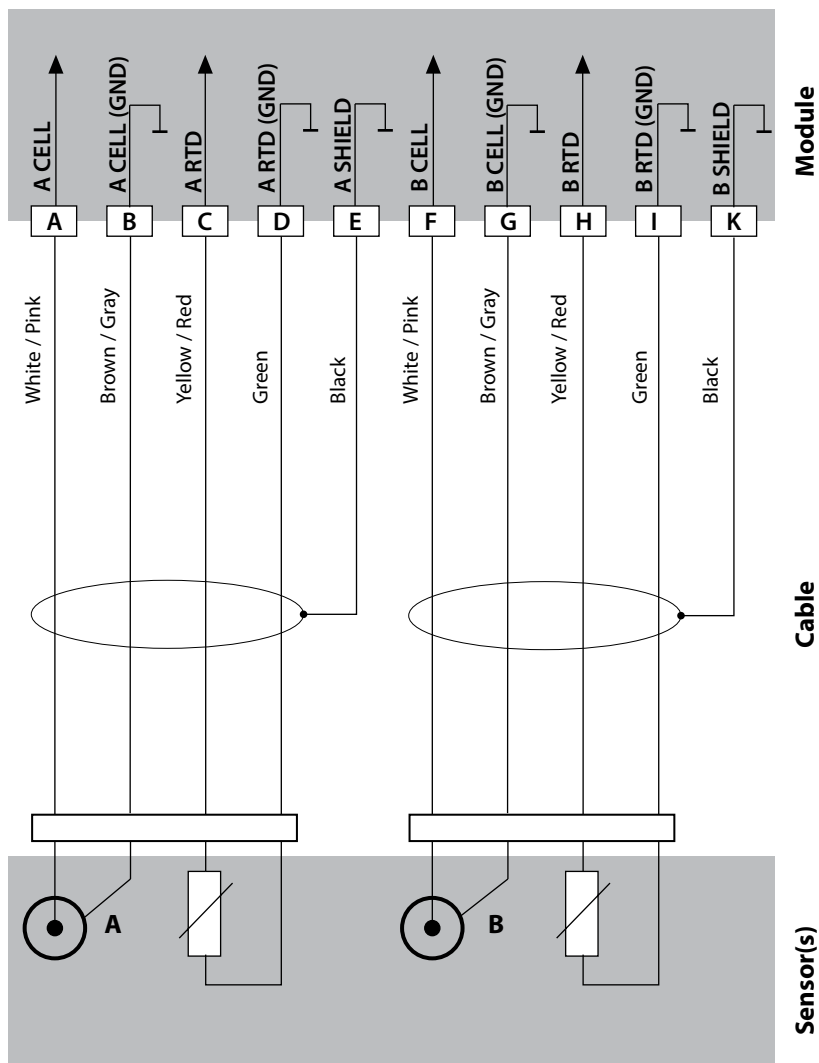
Example 3:

Measuring task:	Dual conductivity, temperature
Sensors:	SE 610, 2 electrodes
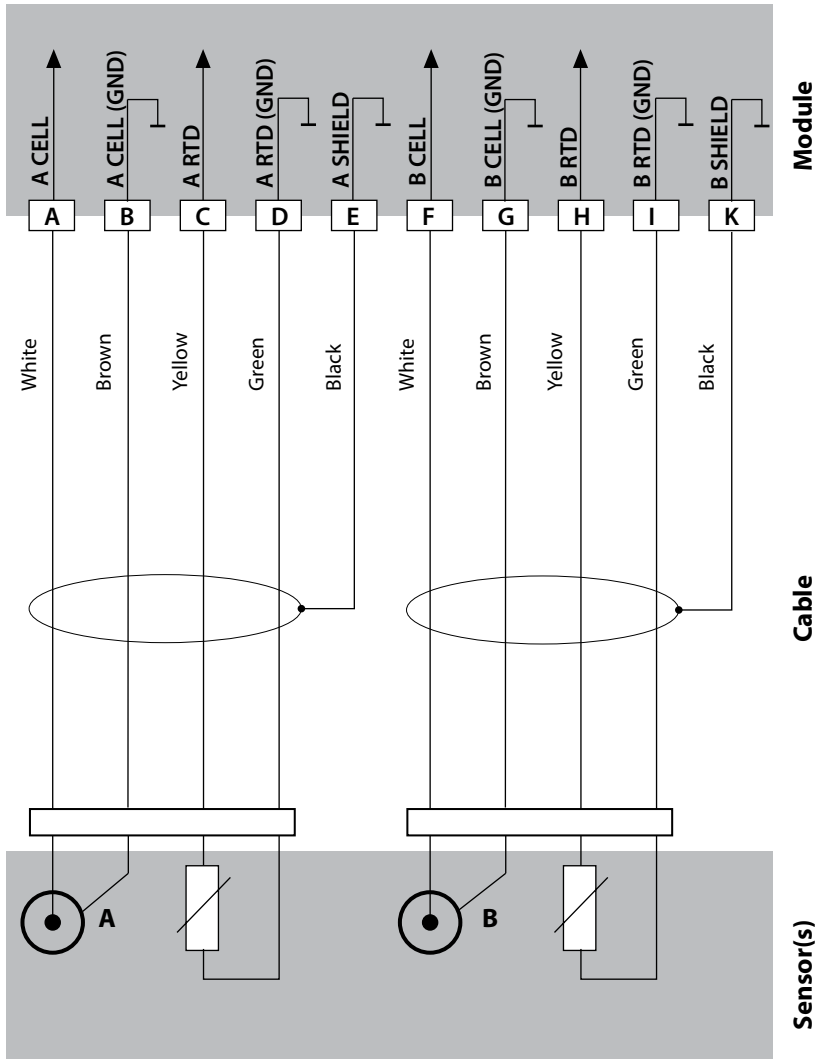
pH

-01-   Mettler-Toledo
            (corresponds to former "Knick technical buffers")

°C	pH			
0	2.03	4.01	7.12	9.52
5	2.02	4.01	7.09	9.45
10	2.01	4.00	7.06	9.38
15	2.00	4.00	7.04	9.32
20	2.00	4.00	7.02	9.26
25	**2.00**	**4.01**	**7.00**	**9.21**
30	1.99	4.01	6.99	9.16
35	1.99	4.02	6.98	9.11
40	1.98	4.03	6.97	9.06
45	1.98	4.04	6.97	9.03
50	1.98	4.06	6.97	8.99
55	1.98	4.08	6.98	8.96
60	1.98	4.10	6.98	8.93
65	1.99	4.13	6.99	8.90
70	1.99	4.16	7.00	8.88
75	2.00	4.19	7.02	8.85
80	2.00	4.22	7.04	8.83
85	2.00	4.26	7.06	8.81
90	2.00	4.30	7.09	8.79
95	2.00	4.35	7.12	8.77

-02-   Knick CaliMat
       (Values also apply to Merck-Titrisols, Riedel-de-Haen Fixanals.)

°C	pH				
Order No.	CS-P0200A/...	CS-P0400A/...	CS-P0700A/...	CS-P0900A/...	CS-P1200A/...
0	2.01	4.05	7.09	9.24	12.58
5	2.01	4.04	7.07	9.16	12.39
10	2.01	4.02	7.04	9.11	12.26
15	2.00	4.01	7.02	9.05	12.13
20	**2.00**	**4.00**	**7.00**	**9.00**	**12.00**
25	2.00	4.01	6.99	8.95	11.87
30	2.00	4.01	6.98	8.91	11.75
35	2.00	4.01	6.96	8.88	11.64
40	2.00	4.01	6.96	8.85	11.53
50	2.00	4.01	6.96	8.79	11.31
60	2.00	4.00	6.96	8.73	11.09
70	2.00	4.00	6.96	8.70	10.88
80	2.00	4.00	6.98	8.66	10.68
90	2.00	4.00	7.00	8.64	10.48

pH

-03-   Ciba (94) buffers
       Nominal values: 2.06 4.00 7.00 10.00

°C	pH			
0	2.04	4.00	7.10	10.30
5	2.09	4.02	7.08	10.21
10	2.07	4.00	7.05	10.14
15	2.08	4.00	7.02	10.06
20	2.09	4.01	6.98	9.99
25	2.08	4.02	6.98	9.95
30	2.06	4.00	6.96	9.89
35	2.06	4.01	6.95	9.85
40	2.07	4.02	6.94	9.81
45	2.06	4.03	6.93	9.77
50	2.06	4.04	6.93	9.73
55	2.05	4.05	6.91	9.68
60	2.08	4.10	6.93	9.66
65	2.07*	4.10*	6.92*	9.61*
70	2.07	4.11	6.92	9.57
75	2.04*	4.13*	6.92*	9.54*
80	2.02	4.15	6.93	9.52
85	2.03*	4.17*	6.95*	9.47*
90	2.04	4.20	6.97	9.43
95	2.05*	4.22*	6.99*	9.38*

* extrapolated

-04-   Technical buffers to NIST

°C	pH				
0	1.67	4.00	7.115	10.32	13.42
5	1.67	4.00	7.085	10.25	13.21
10	1.67	4.00	7.06	10.18	13.01
15	1.67	4.00	7.04	10.12	12.80
20	1.675	4.00	7.015	10.06	12.64
25	**1.68**	**4.005**	**7.00**	**10.01**	**12.46**
30	1.68	4.015	6.985	9.97	12.30
35	1.69	4.025	6.98	9.93	12.13
40	1.69	4.03	6.975	9.89	11.99
45	1.70	4.045	6.975	9.86	11.84
50	1.705	4.06	6.97	9.83	11.71
55	1.715	4.075	6.97	9.83*	11.57
60	1.72	4.085	6.97	9.83*	11.45
65	1.73	4.10	6.98	9.83*	11.45*
70	1.74	4.13	6.99	9.83*	11.45*
75	1.75	4.14	7.01	9.83*	11.45*
80	1.765	4.16	7.03	9.83*	11.45*
85	1.78	4.18	7.05	9.83*	11.45*
90	1.79	4.21	7.08	9.83*	11.45*
95	1.805	4.23	7.11	9.83*	11.45*

* Values complemented

pH

-05-   NIST standard buffers
       NIST Standard (DIN 19266 : 2000-01)

°C	pH				
0					13.423
5	1.668	4.004	6.950	9.392	13.207
10	1.670	4.001	6.922	9.331	13.003
15	1.672	4.001	6.900	9.277	12.810
20	1.676	4.003	6.880	9.228	12.627
25	**1.680**	**4.008**	**6.865**	**9.184**	**12.454**
30	1.685	4.015	6.853	9.144	12.289
37	1.694	4.028	6.841	9.095	12.133
40	1.697	4.036	6.837	9.076	11.984
45	1.704	4.049	6.834	9.046	11.841
50	1.712	4.064	6.833	9.018	11.705
55	1.715	4.075	6.834	8.985	11.574
60	1.723	4.091	6.836	8.962	11.449
65					11.330
70	1.743	4.126	6.845	8.921	11.210
75					11.100
80	1.766	4.164	6.859	8.885	10.990
85					10.890
90	1.792	4.205	6.877	8.850	10.790
95	1.806	4.227	6.886	8.833	10.690

Please note:

The actual pH values of the individual batches of the reference materials are docu-
mented in a certificate of an accredited laboratory. This certificate is supplied with
the respective buffers. Only these pH(S) values shall be used as standard values for
the secondary reference buffer materials. Correspondingly, this standard does not
include a table with standard pH values for practical use. The table above only pro-
vides examples of pH(PS) values for orientation.

-06- HACH buffers

Nominal values: 4.01 7.00 10.01 (± 0,02 at 25 °C)

°C	pH		
0	4.00	7.118	10.30
5	4.00	7.087	10.23
10	4.00	7.059	10.17
15	4.00	7.036	10.11
20	4.00	7.016	10.05
25	4.01	7.000	10.01
30	4.01	6.987	9.96
35	4.02	6.977	9.92
40	4.03	6.970	9.88
45	4.05	6.965	9.85
50	4.06	6.964	9.82
55	4.07	6.965	9.79
60	4.09	6.968	9.76
65	4.10*	6.98*	9.71*
70	4.12*	7.00*	9.66*
75	4.14*	7.02*	9.63*
80	4.16*	7.04*	9.59*
85	4.18*	7.06*	9.56*
90	4.21*	7.09*	9.52*
95	4.24*	7.12*	9.48*

* Values complemented

-07- WTW techn. buffers

°C	pH			
0	2.03	4.01	7.12	10.65
5	2.02	4.01	7.09	10.52
10	2.01	4.00	7.06	10.39
15	2.00	4.00	7.04	10.26
20	2.00	4.00	7.02	10.13
25	**2.00**	**4.01**	**7.00**	**10.00**
30	1.99	4.01	6.99	9.87
35	1.99	4.02	6.98	9.74
40	1.98	4.03	6.97	9.61
45	1.98	4.04	6.97	9.48
50	1.98	4.06	6.97	9.35
55	1.98	4.08	6.98	
60	1.98	4.10	6.98	
65	1.99	4.13	6.99	
70	2.00	4.16	7.00	
75	2.00	4.19	7.02	
80	2.00	4.22	7.04	
85	2.00	4.26	7.06	
90	2.00	4.30	7.09	
95	2.00	4.35	7.12	

-08- Hamilton Duracal buffers

°C	pH				
0	1.99	4.01	7.12	10.23	12.58
5	1.99	4.01	7.09	10.19	12.46
10	2.00	4.00	7.06	10.15	12.34
15	2.00	4.00	7.04	10.11	12.23
20	2.00	4.00	7.02	10.06	12.11
25	**2.00**	**4.01**	**7.00**	**10.01**	**12.00**
30	1.99	4.01	6.99	9.97	11.90
35	1.98	4.02	6.98	9.92	11.80
40	1.98	4.03	6.97	9.86	11.70
45	1.97	4.04	6.97	9.83	11.60
50	1.97	4.05	6.97	9.79	11.51
55	1.98	4.06	6.98	9.75	11.42
60	1.98	4.08	6.98	9.72	11.33
65	1.98	4.10*	6.99*	9.69*	11.24
70	1.99	4.12*	7.00*	9.66*	11.15
75	1.99	4.14*	7.02*	9.63*	11.06
80	2.00	4.16*	7.04*	9.59*	10.98
85	2.00	4.18*	7.06*	9.56*	10.90
90	2.00	4.21*	7.09*	9.52*	10.82
95	2.00	4.24*	7.12*	9.48*	10.74

* Values complemented

pH

-09-   Reagecon buffers

°C	pH				
0°C	*2.01	*4.01	*7.07	*9.18	*12.54
5°C	*2.01	*4.01	*7.07	*9.18	*12.54
10°C	2.01	4.00	7.07	9.18	12.54
15°C	2.01	4.00	7.04	9.12	12.36
20°C	2.01	4.00	7.02	9.06	12.17
25°C	**2.00**	**4.00**	**7.00**	**9.00**	**12.00**
30°C	1.99	4.01	6.99	8.95	11.81
35°C	2.00	4.02	6.98	8.90	11.63
40°C	2.01	4.03	6.97	8.86	11.47
45°C	2.01	4.04	6.97	8.83	11.39
50°C	2.00	4.05	6.96	8.79	11.30
55°C	2.00	4.07	6.96	8.77	11.13
60°C	2.00	4.08	6.96	8.74	10.95
65°C	*2.00	*4.10	*6.99	*8.70	*10.95
70°C	*2.00	*4.12	*7.00	*8.67	*10.95
75°C	*2.00	*4.14	*7.02	*8.64	*10.95
80°C	*2.00	*4.16	*7.04	*8.62	*10.95
85°C	*2.00	*4.18	*7.06	*8.60	*10.95
90°C	*2.00	*4.21	*7.09	*8.58	*10.95
95°C	*2.00	*4.24	*7.12	*8.56	*10.95

* Values complemented

-10- DIN 19267 buffers

°C	pH				
0	1,08	4,67	6,89	9,48	13,95*
5	1,08	4,67	6,87	9,43	13,63*
10	1,09	4,66	6,84	9,37	13,37
15	1,09	4,66	6,82	9,32	13,16
20	1,09	4,65	6,80	9,27	12,96
25	**1,09**	**4,65**	**6,79**	**9,23**	**12,75**
30	1,10	4,65	6,78	9,18	12,61
35	1,10	4,65	6,77	9,13	12,45
40	1,10	4,66	6,76	9,09	12,29
45	1,10	4,67	6,76	9,04	12,09
50	1,11	4,68	6,76	9,00	11,89
55	1,11	4,69	6,76	8,96	11,79
60	1,11	4,70	6,76	8,92	11,69
65	1,11	4,71	6,76	8,90	11,56
70	1,11	4,72	6,76	8,88	11,43
75	1,11	4,73	6,77	8,86	11,31
80	1,12	4,75	6,78	8,85	11,19
85	1,12	4,77	6,79	8,83	11,09
90	1,13	4,79	6,80	8,82	10,99
95	1,13*	4,82*	6,81*	8,81*	10,89*

* Values extrapolated

-U1- Specifiable Buffer Set

pH

You can specify a buffer set with 2 buffer solutions in the temperature range of
0 ... 95 °C, step width: 5 °C.
To do so, select buffer set -U1- in the configuration menu.
As delivered, the Ingold technical buffer solutions pH 4.01 / 7.00 are stored as buffer
set and can be edited.
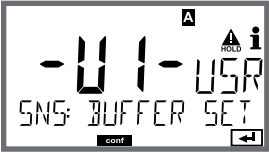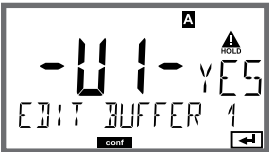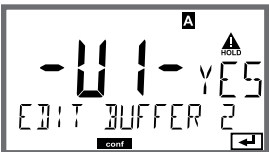
Conditions for the specifiable buffer set:

• All values must lie in the range pH 0 ... 14.
• Maximum difference between two adjacent pH values
  (5 °C step width) of the same buffer solution: pH 0.25
• The values of buffer solution 1 must be lower than those of
  buffer solution 2:
  The difference between values for identical temperatures must be greater than
  2 pH units.

Faulty entries are indicated in measuring mode by the
"FAIL BUFFERSET -U1-" message.

The 25 °C value is always used for buffer display during calibration.

Step	Action/Display	Remark
Select buffer set -U1- (CONFIG / SNS menu)	-U1-USR SNS: BUFFER SET	
Select buffer solution 1 for editing.	-U1-YES EDIT BUFFER 1 Select "YES" using up/down arrow.	You are prompted for confirmation to prevent accidental changes of the settings.
Editing the values Buffer solution 1	04:01PH BUFFER 1 00°C Edit: using arrow keys, press **enter** to confirm and proceed to next temperature value. 04.35PH BUFFER 1 95°C	Enter the values for the first buffer solution in 5°C steps. The difference to the next value must not exceed 0.25 pH unit.
Select buffer solution 2 for editing.	-U1-YES EDIT BUFFER 2	The difference between buffer solutions for identical temperatures must be greater than 2 pH units.

-U1- Specifiable Buffer Set

pH

Buffer set U1:

Fill in your configuration data or use the table as original for copy.

Temperature (°C)	Buffer 1	Buffer 2
5		
10		
15		
20		
25		
30		
35		
40		
45		
50		
55		
60		
65		
70		
75		
80		
85		
90		
95		

Potassium Chloride Solutions
(Conductivity in mS/cm)

Temperature	Concentration[1]		
[°C]	0.01 mol/l	0.1 mol/l	1 mol/l
0	0.776	7.15	65.41
5	0.896	8.22	74.14
10	1.020	9.33	83.19
15	1.147	10.48	92.52
16	1.173	10.72	94.41
17	1.199	10.95	96.31
18	1.225	11.19	98.22
19	1.251	11.43	100.14
20	1.278	11.67	102.07
21	1.305	11.91	104.00
22	1.332	12.15	105.94
23	1.359	12.39	107.89
24	1.386	12.64	109.84
25	1.413	12.88	111.80
26	1.441	13.13	113.77
27	1.468	13.37	115.74
28	1.496	13.62	
29	1.524	13.87	
30	1.552	14.12	
31	1.581	14.37	
32	1.609	14.62	
33	1.638	14.88	
34	1.667	15.13	
35	1.696	15.39	
36		15.64	

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1   Data source: K. H. Hellwege (Editor), H. Landolt, R. Börnstein: Zahlenwerte und Funktionen ...,
     volume 2, part. volume 6

Cond

Sodium Chloride Solutions
(Conductivity in mS/cm)

Temperature	Concentration		
[˚C]	0.01 mol/l [1]	0.1 mol/l [1]	Saturated [2]
0	0.631	5.786	134.5
1	0.651	5.965	138.6
2	0.671	6.145	142.7
3	0.692	6.327	146.9
4	0.712	6.510	151.2
5	0.733	6.695	155.5
6	0.754	6.881	159.9
7	0.775	7.068	164.3
8	0.796	7.257	168.8
9	0.818	7.447	173.4
10	0.839	7.638	177.9
11	0.861	7.831	182.6
12	0.883	8.025	187.2
13	0.905	8.221	191.9
14	0.927	8.418	196.7
15	0.950	8.617	201.5
16	0.972	8.816	206.3
17	0.995	9.018	211.2
18	1.018	9.221	216.1
19	1.041	9.425	221.0
20	1.064	9.631	226.0
21	1.087	9.838	231.0
22	1.111	10.047	236.1
23	1.135	10.258	241.1
24	1.159	10.469	246.2
25	1.183	10.683	251.3
26	1.207	10.898	256.5
27	1.232	11.114	261.6
28	1.256	11.332	266.9
29	1.281	11.552	272.1
30	1.306	11.773	277.4
31	1.331	11.995	282.7
32	1.357	12.220	288.0
33	1.382	12.445	293.3
34	1.408	12.673	298.7
35	1.434	12.902	304.1
36	1.460	13.132	309.5

1 Data source: Test solutions calculated according to DIN IEC 746-3
2 Data source: K. H. Hellwege (Editor), H. Landolt, R. Börnstein: Zahlenwerte und Funktionen ..., volume 2, part. volume 6

Measuring Ranges

Substance	Concentration ranges		
NaCl	0-26% by wt (0 °C)		
	0-26% by wt (100 °C)		
Configuration	**-01-**		
HCl	0-18% by wt (-20 °C)	22-39% by wt (-20 °C)	
	0-18% by wt (50 °C)	22-39% by wt (50 °C)	
Configuration	**-02-**	**-07-**	
NaOH	0-13% by wt (0 °C)	15-50 % by wt (0 °C)	
	0-24% by wt (100 °C)	35-50% by wt (100 °C)	
Configuration	**-03-**	**-10-**	
H_2SO_4	0-26% by wt (-17 °C)	28-77% by wt (-17 °C)	94-99% by wt (-17 °C)
	0-37% by wt (110 °C)	39-88% by wt (115 °C)	89-99% by wt (115 °C)
Configuration	**-04-**	**-09-**	**-06-**
HNO_3	0-30% by wt (-20 °C)	35-96% by wt (-20 °C)	
	0-30% by wt (50 °C)	35-96% by wt (50 °C)	
Configuration	**-05-**	**-08-**	

For the solutions listed above, the device can determine the substance concentration from the measured conductivity and temperature values in % by wt. The measurement error is made up of the sum of measurements errors during conductivity and temperature measurement and the accuracy of the concentration curves stored in the device. We recommend to calibrate the device together with the sensor, e.g. directly to concentration using the CAL_CELL method. For exact temperature measurement, you should perform a temperature probe adjustment. For measuring processes with rapid temperature changes, use a separate temperature probe with fast response.

When measuring processes such as dilution or intensification of CIP solutions (Clean-In-Place), it is helpful to switch between the parameter sets for measuring the process medium and for measuring the CIP solution.

Cond

-01- Sodium chloride solution NaCl

◀——————————— **-01-** ————————————▶
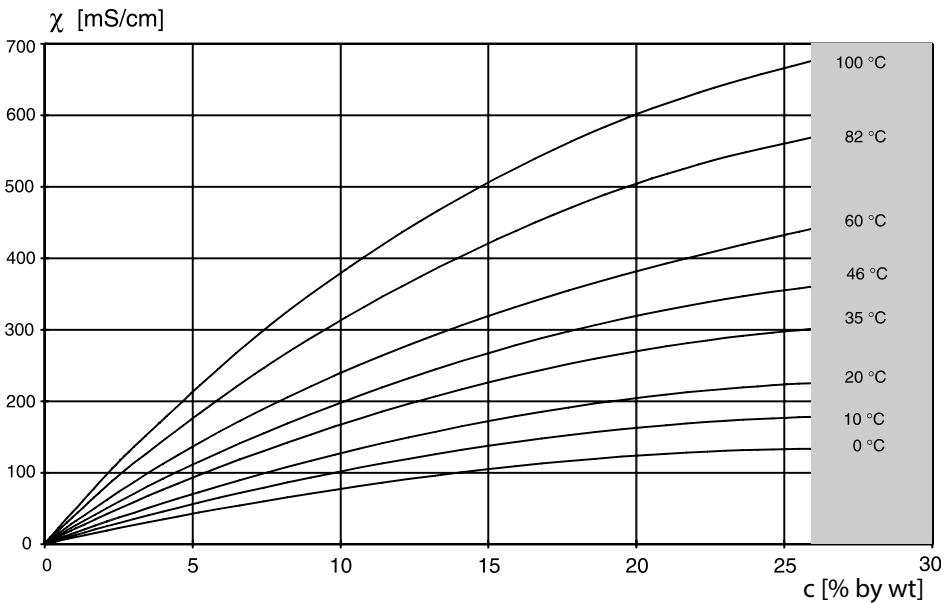
χ [mS/cm]

100 °C

82 °C

60 °C

46 °C

35 °C

20 °C

10 °C

0 °C

c [% by wt]

Concentration measurement not possible in this range.

Conductivity versus substance concentration and process temperature for sodium chloride solution (NaCl)

-02- Hydrochloric acid HCl
-07-
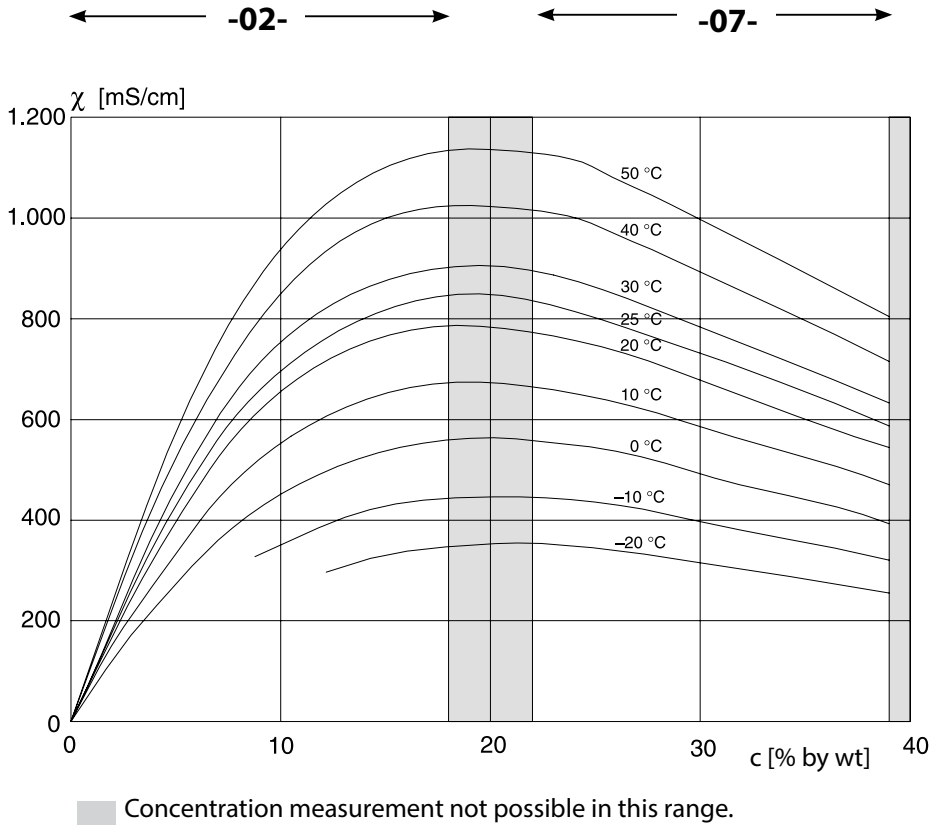
Conductivity versus substance concentration and process temperature for hydrochloric acid (HCl)

-03- Sodium hydroxide solution NaOH
-10-

Concentration measurement not possible in this range.

Conductivity versus substance concentration and process temperature
for sodium hydroxide solution (NaOH)

-04- Sulfuric acid H_2SO_4
-06-
-09-

←———— **-04-** ————→ ←———— **-09-** ————→ **-06-**
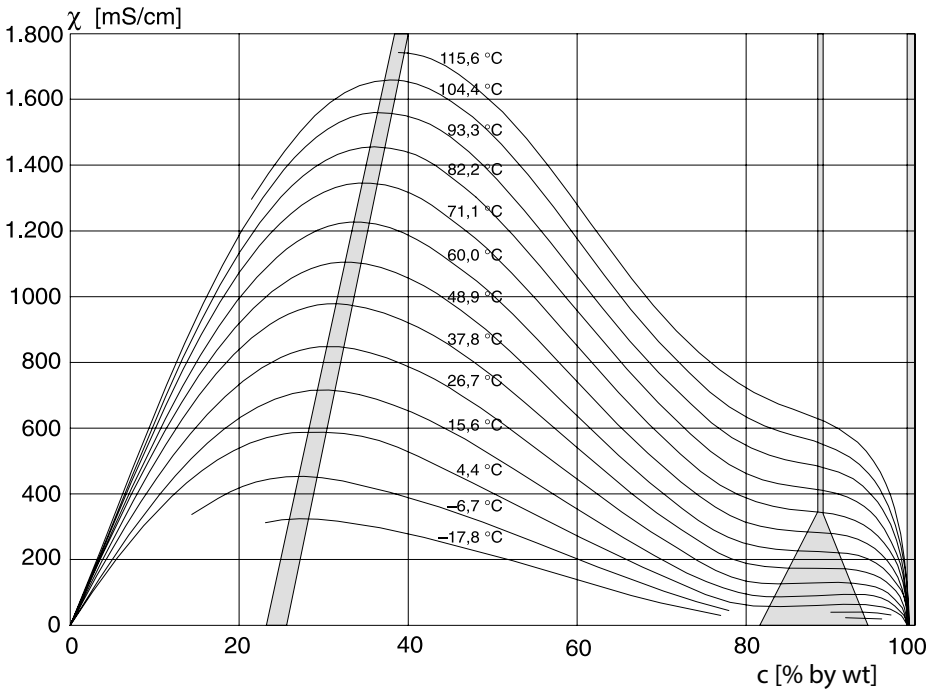
χ [mS/cm]

- 115,6 °C
- 104,4 °C
- 93,3 °C
- 82,2 °C
- 71,1 °C
- 60,0 °C
- 48,9 °C
- 37,8 °C
- 26,7 °C
- 15,6 °C
- 4,4 °C
- −6,7 °C
- −17,8 °C

c [% by wt]

Concentration measurement not possible in this range.

Conductivity versus substance concentration and process temperature for sulfuric acid (H_2SO_4)

Cond

-05- Nitric acid HNO_3
-08-

Concentration measurement not possible in this range.
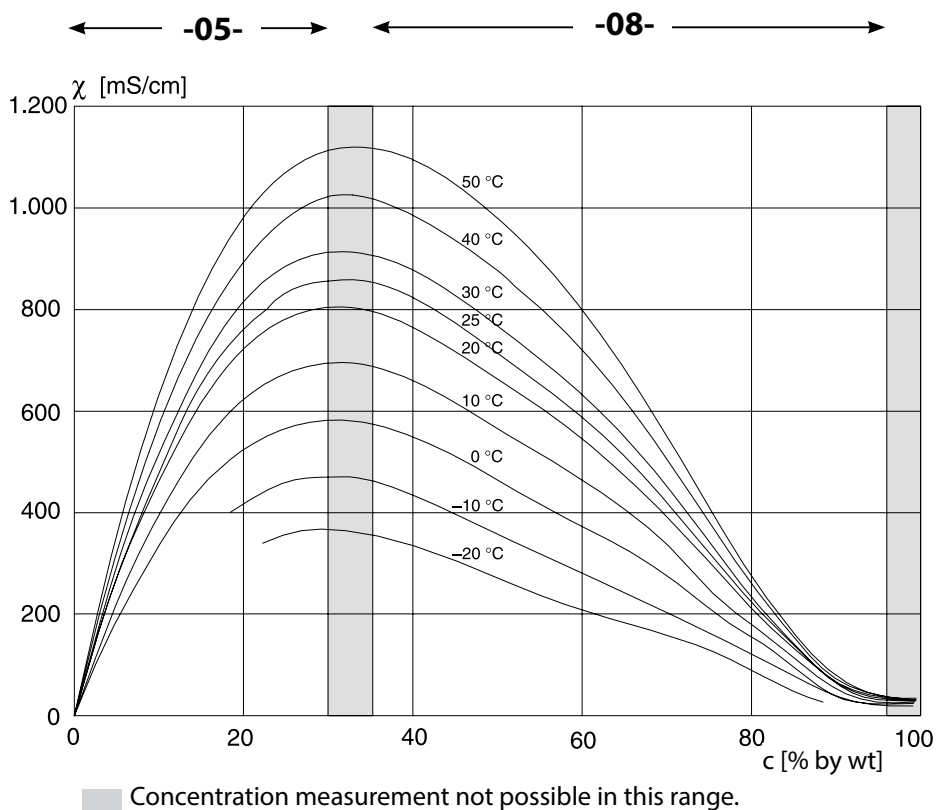
Conductivity versus substance concentration and process temperature for nitric acid (HNO_3)
Source: Haase/Sauermann/Dücker; Z. phys. Chem. New Edition, Vol. 47 (1965)

CE