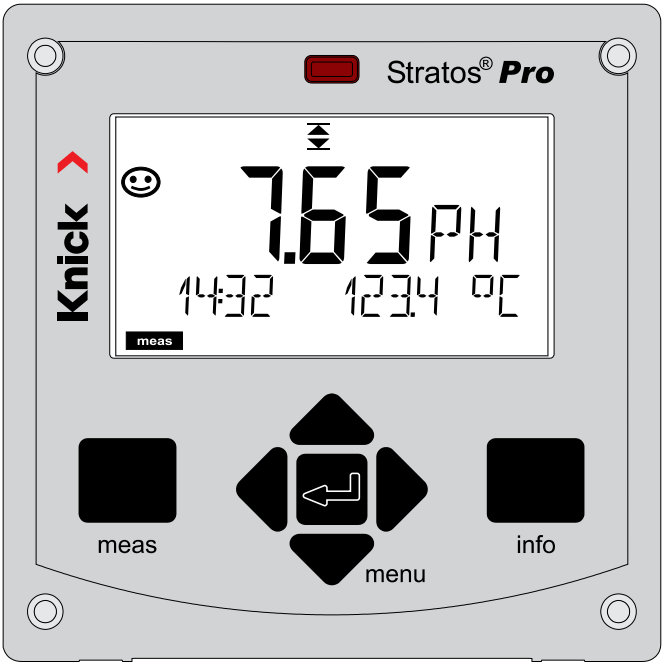
The Art of Measuring. Knick

Stratos® Pro A231(N/X)

FOUNDATION Fieldbus

User Manual
English

Fieldbus Foundation



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Registered Trademarks

The following names are registered trademarks. For practical reasons they are shown without trademark symbol in this manual.

- CaliMat®
- Calimatic®
- Memosens®
- MemoSuite®
- Sensocheck®
- Sensoface®
- Stratos®

Subject to change without notice

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.

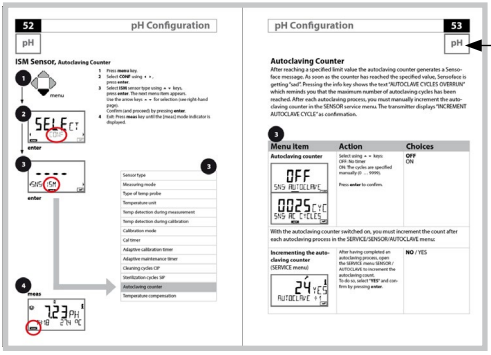
Disposal

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

8 Documents Supplied

Safety Instructions
In official EU languages and others

Quickstart Guides
Installation and first steps:
- Operation
- Menu structure
- Calibration
- Error messages and recommended actions

Specific Test Report

Electronic Documentation
Manuals + Software

Ex Devices:

Control Drawings

EU Declarations of Conformity

Up-to date documentation available on our website:

www.knick.de

Intended Use

Stratos Pro A231N / A231X is a 2-wire analyzer with digital communication via FOUNDATION Fieldbus (FF). The analyzer has an input for digital Memosens sensors. Interchangeable measuring modules enable operation with analog sensors.
Power is supplied via the FOUNDATION Fieldbus.
The **Stratos Pro A231X** is suitable for use in hazardous areas.
The sturdy molded enclosure can be fixed into a control panel or mounted on a wall or at a post. The protective hood is optionally available to provide additional protection against direct weather exposure and mechanical damage.

You can select one of the following measuring functions:

- pH value
- ORP
- Conductivity, 2-/4-electrode sensors
- Conductivity, toroidal sensors
- Oxygen

Possible fields of application are:

- Biotechnology
- Chemical industry
- Pharmaceutical industry
- Environmental engineering
- Food technology
- Power station engineering
- Water/wastewater

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 (eg, alarm: red).

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.

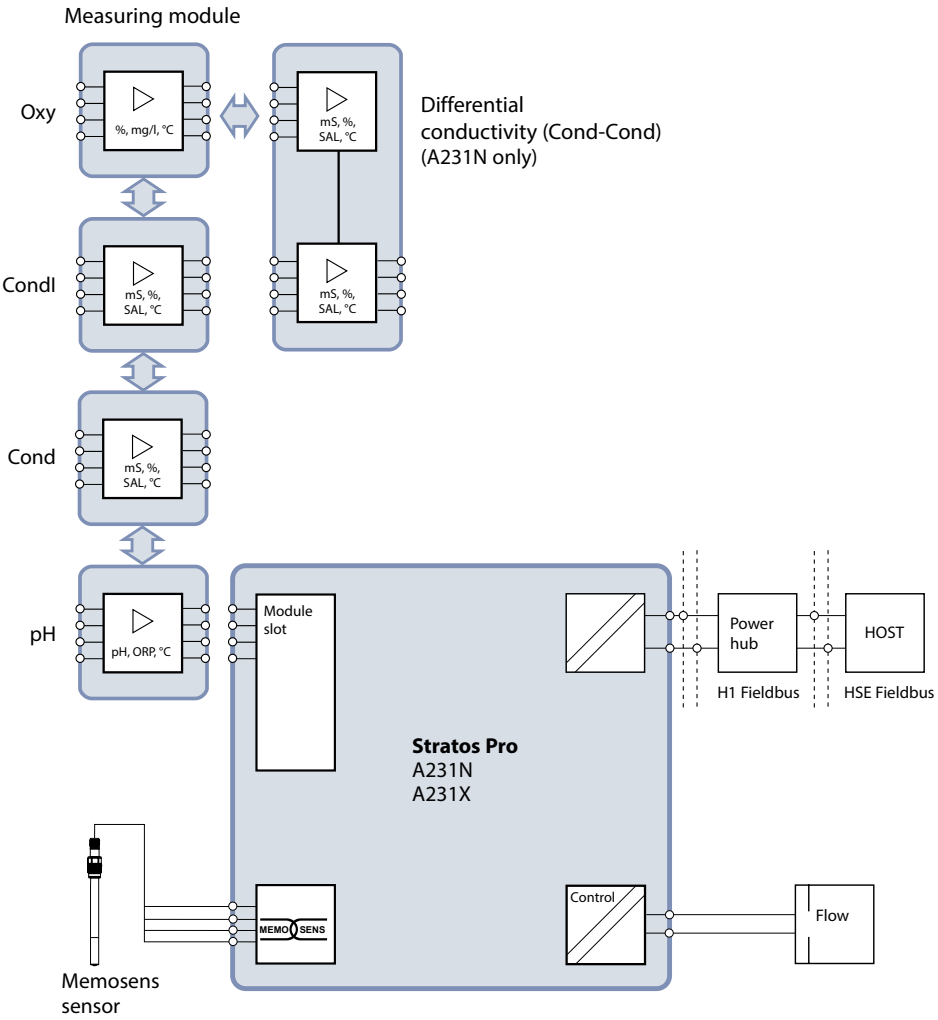
Data Logger
The logbook (Audit Trail) can handle up to 100 entries.

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 pH buffer solutions.
In addition, you can enter an individual pH buffer set.

Door contact
When the enclosure is opened, a reed contacts opens, which automatically generates a logbook entry.

Control
Input for flow monitoring (floating, digital control input).


Measuring module
Oxy
%, mg/l, °C
mS, %, SAL, °C
Differential conductivity (Cond-Cond) (A231N only)
CondI
mS, %, SAL, °C
mS, %, SAL, °C
Cond
mS, %, SAL, °C
pH
pH, ORP, °C
Module slot
Power hub
HOST
H1 Fieldbus
HSE Fieldbus
Stratos Pro
A231N
A231X
MEMOSENS
Control
Flow
Memosens sensor

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

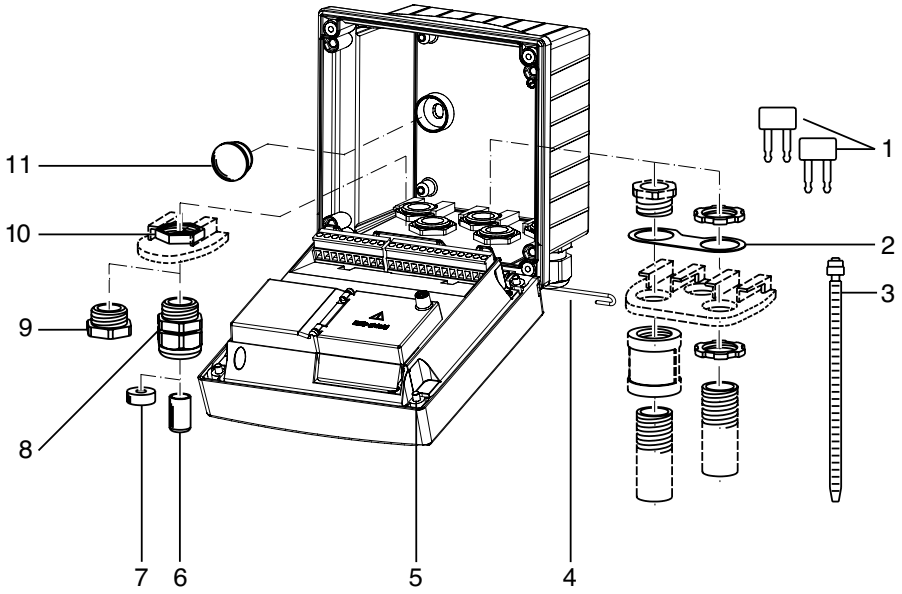
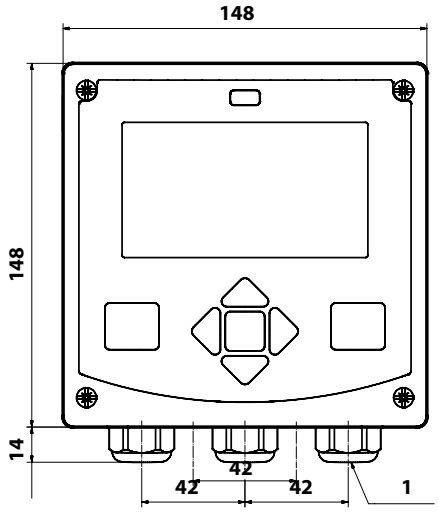
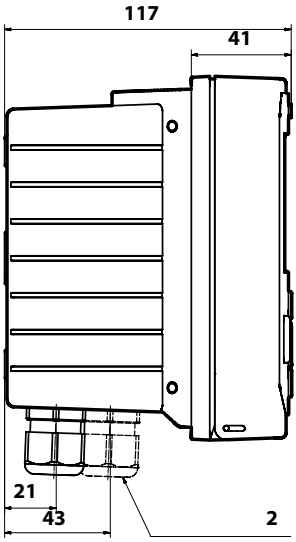


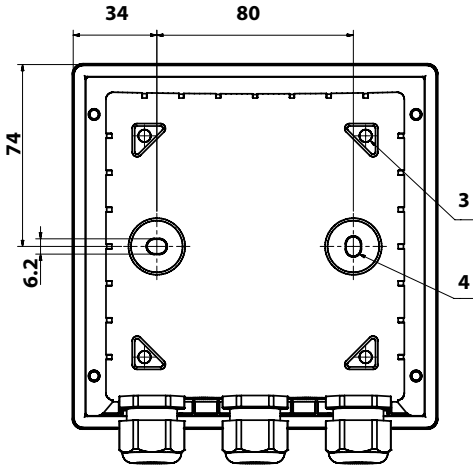
Fig.: Assembling the enclosure

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 M20x1.5 (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





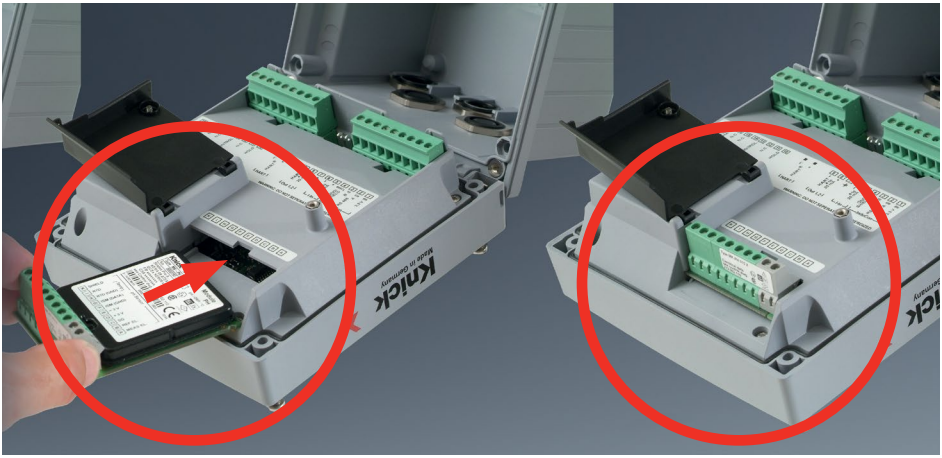


1) Cable gland (3 x)
2) Knockouts for cable gland or ½" conduit, ø 21.5 mm (2 knockouts). Conduits not included!
3) Knockout for pipe mounting (4 x)
4) Knockout for wall mounting (2 x)

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

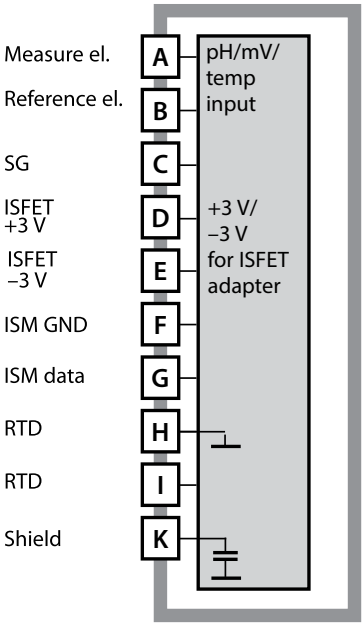


Measuring modules for connection of analog sensors:
pH, oxygen (Oxy), conductivity (Cond, CondI, Cond-Cond)

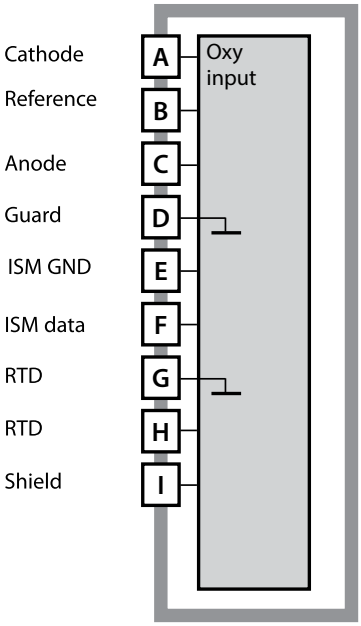
Measuring modules for the connection of analog sensors are simply inserted into the module slot.

Changing the Measuring Function

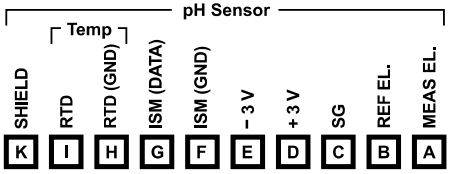
When you replace the measuring module, you must select the corresponding measuring function in the "Service" menu.



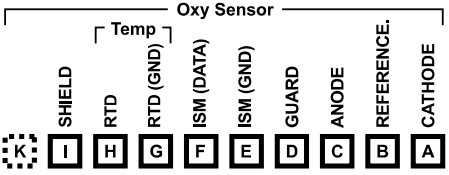
Module for pH measurement
Order code MK-PH015N / MK-PH015X
For wiring examples, see documentation CD or www.knick.de.



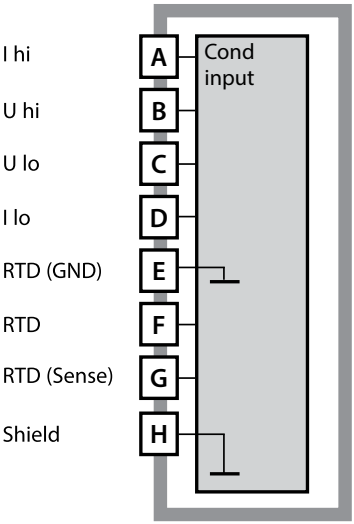
Module for dissolved-oxygen measurement
Order code MK-OXY045N / MK-OXY045X
For wiring examples, see documentation CD or www.knick.de.



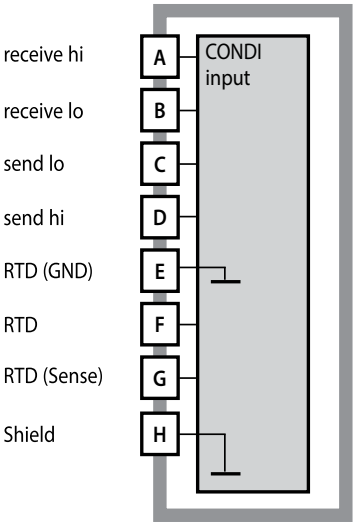
Terminal plate of pH module
The terminals are suitable for single or stranded wires up to 2.5 mm² (AWG 14).



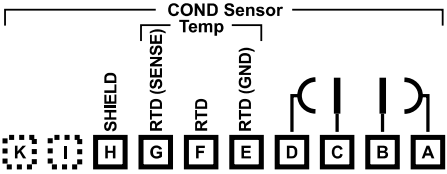
Terminal plate of oxygen module
The terminals are suitable for single or stranded wires up to 2.5 mm² (AWG 14).



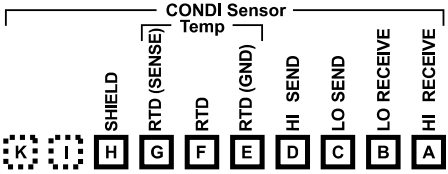
Module for contacting conductivity measurement (COND)
Order code MK-COND025N / MK-COND025X
For wiring examples, see documentation CD or www.knick.de.



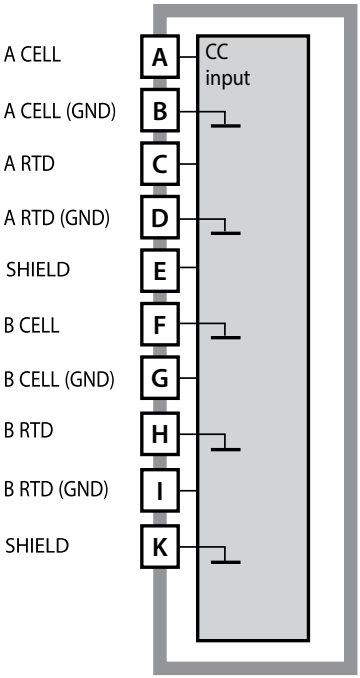
Module for inductive conductivity measurement (CONDI)
Order code MK-CONDI035N / MK-CONDI035X
For wiring examples, see documentation CD or www.knick.de.



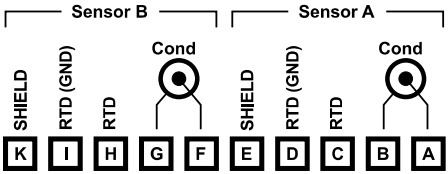
Terminal plate of COND module
The terminals are suitable for single or stranded wires up to 2.5 mm² (AWG 14).



Terminal plate of CONDI module
The terminals are suitable for single or stranded wires up to 2.5 mm² (AWG 14).



Dual-conductivity module (COND-COND)
Order code MK-CC065N
For wiring examples, see documentation CD or www.knick.de.



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

Changing the Measuring Function

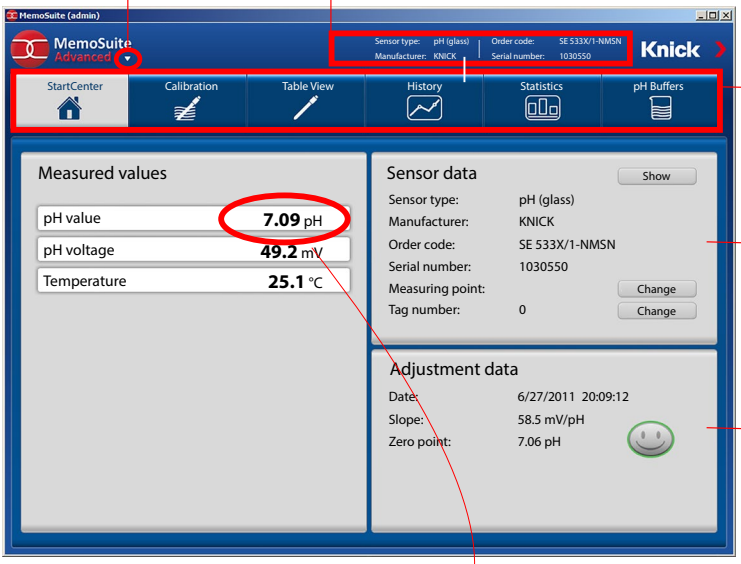
In the "Service" menu you can select another measuring function at any time.

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

Connected sensor: Sensor type, manufacturer, order code and serial number



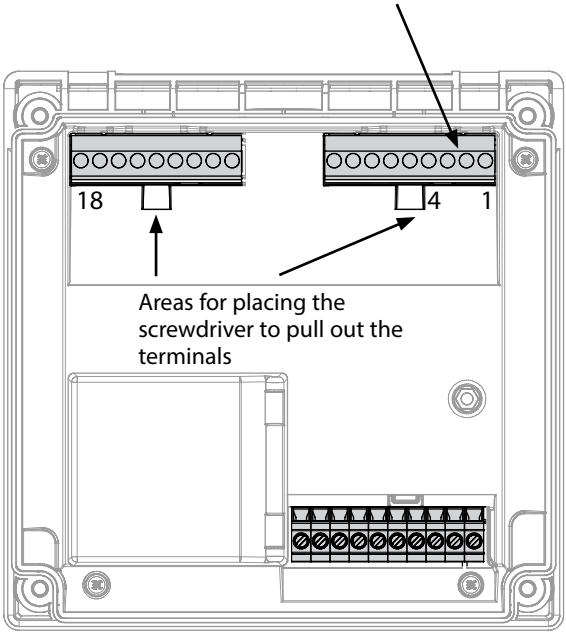
Function selection: The selected function is highlighted.

Connected sensor: Sensor type, manufacturer, order code and serial number, measuring point and tag number

Last adjustment

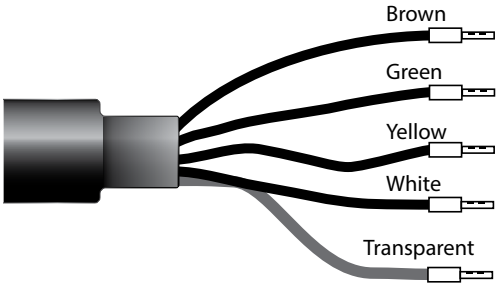
You can magnify a measured-value display at a click of the mouse.

Terminals for Memosens		
1	Brown	+3V
2	Green	RS 485 A
3	Yellow	RS 485 B
4	White/Transparent	GND/Shield



NOTICE: Remove the measuring module!

Memosens Cable



Connecting cable for contactless inductive digital transmission of measured signals (Memosens).
By providing perfect galvanic isolation between sensor and analyzer/transmitter, the Memosens cable prevents measurement interferences. Any effects of humidity and corrosion are prevented.

Specifications

Material	TPE
Cable diameter	6.3 mm
Length	up to 100 m
Process temperature	–20 °C … 135 °C
Ingress protection	IP 68

Order Codes

	Cable type	Cable length	Order code
Memosens	Ferrules	3 m	CA/MS-003NAA
		5 m	CA/MS-005NAA
		10 m	CA/MS-010NAA
		20 m	CA/MS-020NAA
	M12 plug, 8-pin	3 m	CA/MS-003NCA
		5 m	CA/MS-005NCA
Memosens Ex*	Ferrules	3 m	CA/MS-003XAA
		5 m	CA/MS-005XAA
		10 m	CA/MS-010XAA
		20 m	CA/MS-020XAA
	M12 plug, 8-pin	3 m	CA/MS-003XCA
		5 m	CA/MS-005XCA

Other cable lengths or cable types are available on request.

* Ex-certified ATEX II 1G Ex ia IIC T3/T4/T6 Ga

A231N Terminal Assignments

The terminals are suitable for single or stranded wires up to 2.5 mm² (AWG 14).

A231N Rating Plate

Conductor Cross-Sections

With a tightening torque of 0.5 to 0.6 Nm, the following conductor cross-sections are permitted:

Connection	Cross-section
Conductor cross-section rigid/flexible	0.2 … 2.5 mm²
Conductor cross-section flexible with ferrule without plastic sleeve	0.25 … 2.5 mm²
Conductor cross-section flexible with ferrule with plastic sleeve	0.2 … 1.5 mm²

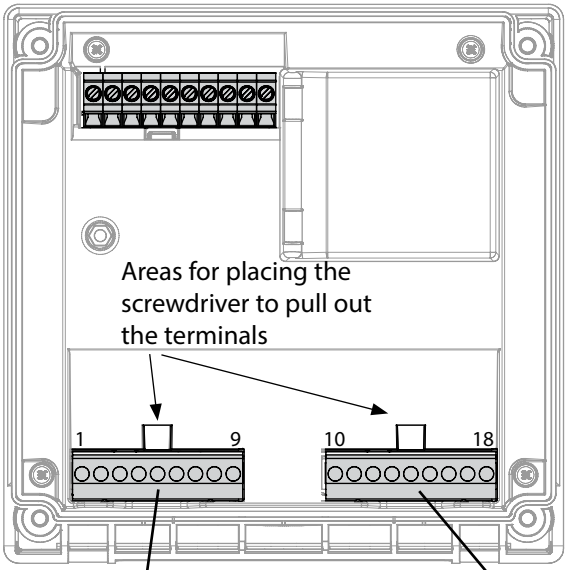


Figure:
Terminals, device opened, back of front unit

Terminal row 1

1	+3V	Memosens
2	RS 485 A	
3	RS 485 B	
4	GND/Shield	
5	n. c.	
6	n. c.	
7	Equipot. bonding	
8	Control	
9	Control	

Terminal row 2

10	FF-H1	BUS FF
11	FF-H1	
12	Shield	
13	n. c.	
14	n. c.	
15	n. c.	
16	n. c.	
17	n. c.	
18	n. c.	

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 have selected the sensor type in the Configuration menu, the device will read the calibration data from the sensor and use them for calculating the measured value.

Commissioning

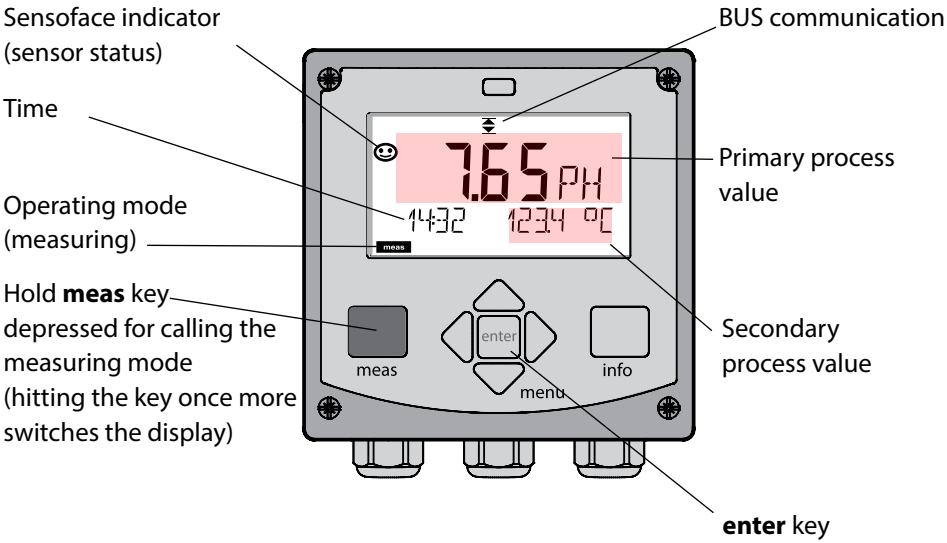
Upon initial start-up, the analyzer automatically recognizes a connected module and adjusts the software correspondingly. When you replace the measuring module, you must select the corresponding measuring function in the "Service" menu.

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 (eg, Diagnostics, Service): Hold **meas** key depressed (> 2 s).



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
- Time and date

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

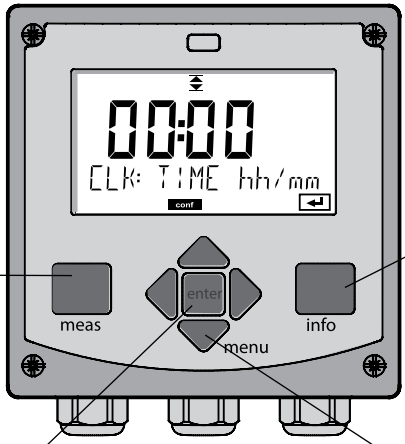
NOTICE:
You must configure the analyzer for the respective measurement task.

Up / Down arrows

- Menu: Increase/decrease a numeral
- Menu: Selection

Left / Right arrows

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



meas

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

info

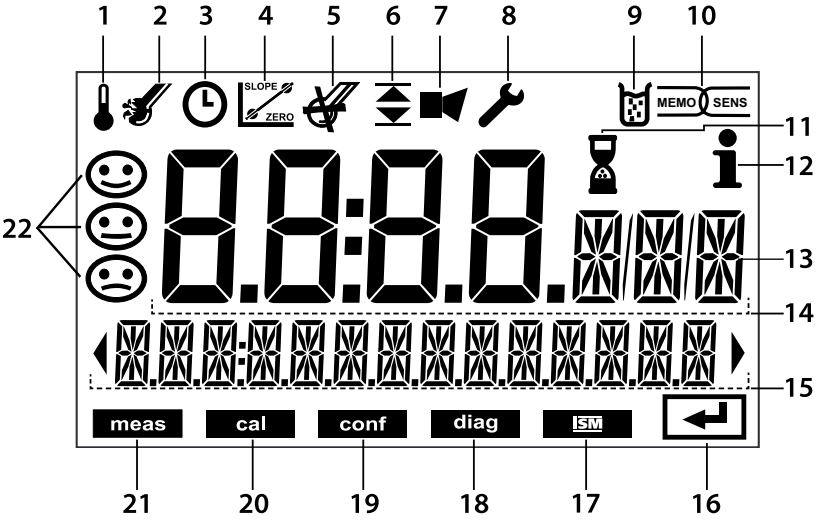
- Retrieve information
- Show error messages

enter

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

menu

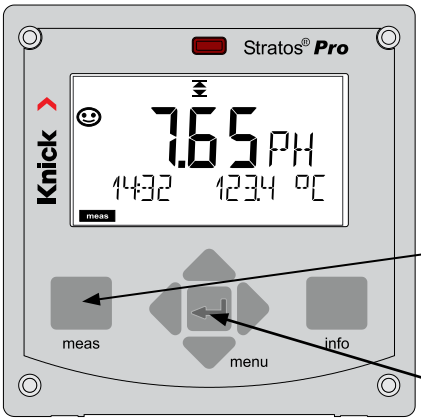
- Measuring mode: Call menu



1 Temperature
2 Sensocheck
3 Interval/response time
4 Sensor data
5 Sensocheck
6 BUS communication
7 Alarm
8 Service
9 Cal timer expired
10 Digital sensor
11 Waiting time running
12 Info available
13 Unit symbols
14 Main display
15 Secondary display
16 Proceed using enter
17 ISM sensor
18 Diagnostics
19 Configuration mode
20 Calibration mode
21 Measuring mode
22 Sensoface

Signal Colors (Display Backlighting)

Red	Alarm (in case of fault: display values blink)
Red blinking	Input error: illegal value or wrong passcode
Yellow	Calibration, Configuration, Service
Turquoise	Diagnostics
Green	Info
Magenta	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.

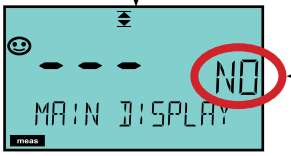
meas key

enter key

meas

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

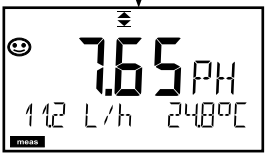
enter



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

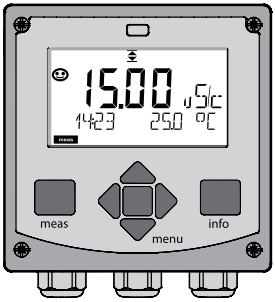
The secondary display shows "MAIN DISPLAY – NO".
Use the **UP** / **DOWN** arrows to select "MAIN DISPLAY – YES"
and confirm by pressing **enter**.
The display color changes to white.
This display is now shown in measuring mode.

Approx. 2 s

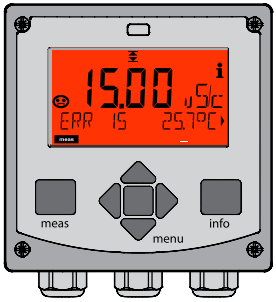


Color-Coded User Interface

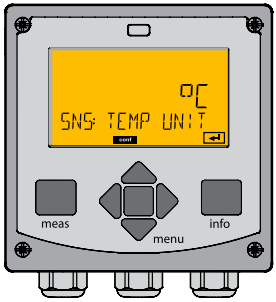
The color-coded user interface guarantees increased operating safety.
Operating modes are clearly signaled.
The normal measuring mode is white. Information text appears on a green screen and the diagnostic menu appears on turquoise. The yellow screen for calibration, configuration and service is quickly 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 significantly reduced.



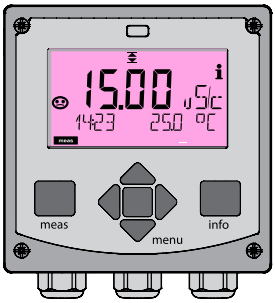
White:
Measuring mode



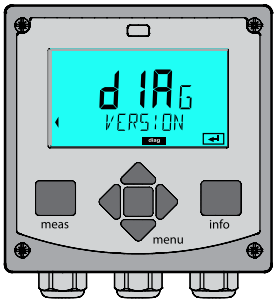
Red blinking:
Alarm, error



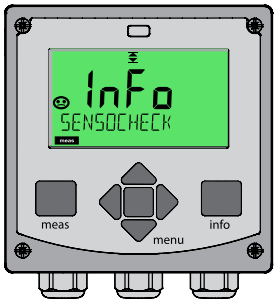
Yellow:
Calibration, Configuration, Service



Magenta:
Maintenance request



Turquoise:
Diagnostics



Green:
Information texts

Diagnostics (DIAG)
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.

Calibration (CAL)
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 remains in the HOLD mode until it is stopped by the operator.

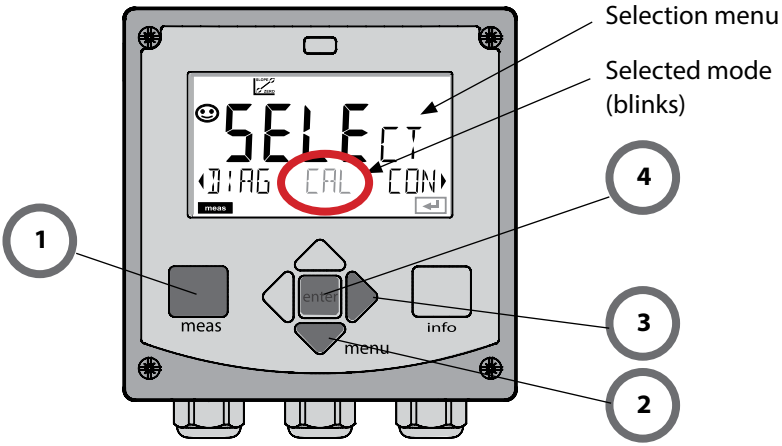
Configuration (CONF)
You must configure the analyzer for the respective measurement task. In the "Configuration" mode you select the adjusted measuring function, the connected sensor, the measuring range to be transmitted, and the conditions for warning and alarm messages.
Configuration mode is automatically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

Service (SERVICE)
Assigning passcodes, selecting the device type (pH/oxy/conductivity), resetting to factory settings.

Selecting the Operating Mode

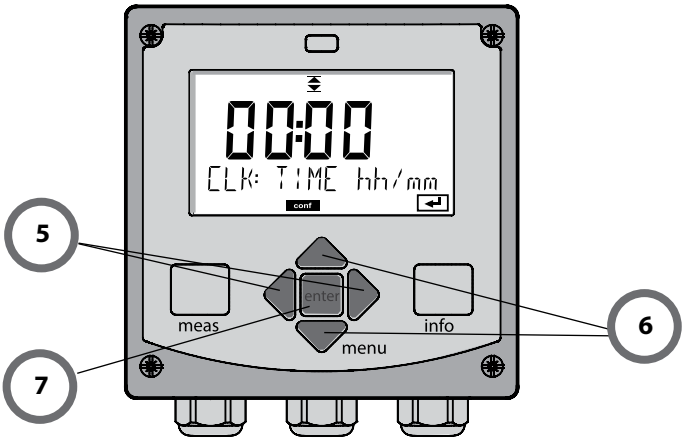
To select the operating mode:

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



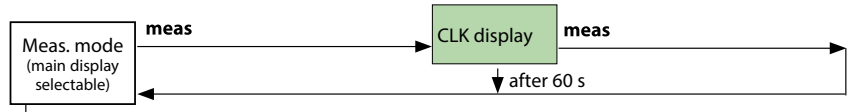
To enter a value:

5) Select numeral: left / right arrow
6) Change numeral: up / down arrow
7) Confirm entry by pressing **enter**



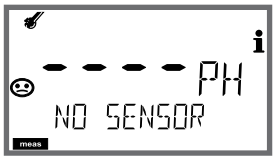
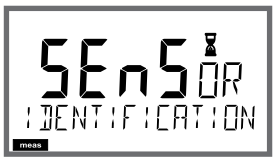
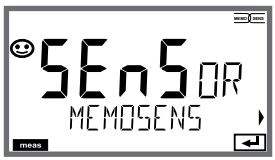
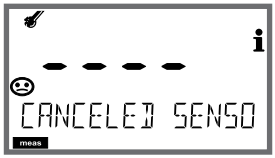
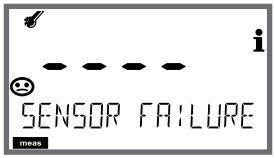
Alarm

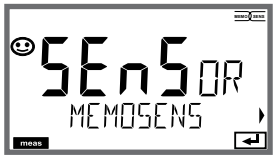
When an error has occurred, **Err xx** is displayed immediately.
Only after expiry of a user-defined delay time will the alarm be registered and entered in the logbook.
During an alarm the display blinks, the display backlighting turns **red**.
2 sec after the failure event is corrected, the alarm status will be deleted.



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 (Audit Trail)
	MONITOR	Display of direct sensor values
	VERSION	Display of software version, model designation, serial no.
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	pH	Configuring a pH/ORP sensor
	Cond	Configuring a 2-/4-electrode conductivity sensor
	CondI	Configuring a CondI Sensor
	Oxy	Configuring an oxygen sensor
	Cond-Cond	Configuring a sensor for dual conductivity measurement
SERVICE (Access via code, factory setting: 5555)	DEVICE TYPE	Select process variable
	SIMULATE	Activating/deactivating the simulation mode
	MONITOR	Display of measured values for validation (simulators)
	SENSOR	Sensor (resetting diagnostics messages)
	CODES	Configuring the passcodes
	DEFAULT	Reset to factory setting

Step	Action/Display	Remark
Connect sensor.		Before a Memosens sensor is connected, the error message "NO SENSOR" is displayed.
Wait until the sensor data are displayed.		The hourglass in the display blinks.
Check sensor data.	 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 (time-out).
Possible error message		
Sensor worn out. Replace sensor.		When this error message appears, the sensor cannot be used any more. Sensoface is sad.
Sensor defective. Replace sensor.		When this error message appears, the sensor cannot be used. Sensoface is sad.

Step	Action/Display	Remark
Disconnect and remove old sensor.		
Install and connect new sensor.		Temporary messages which are activated during the replacement are indicated but not entered in the logbook.
Wait until the sensor data are displayed.		
Check sensor data.	 View sensor information using ◀ ▶ keys, confirm using **enter**.	You can view the sensor manufacturer and type, serial number and last calibration date.
Check measured values.		

pH

pH Configuration				Choices DEFAULT **in bold**
SNS:				**STANDARD** | ISFET | MEMOSENS | PFAUDLER | ISM
	MEAS MODE			**pH** | mV | ORP | pH/ORP
	RTD TYPE (STANDARD, ISFET, PFAUDLER)			100 PT | **1000 PT** | 30 NTC | 8,55 NTC | BALCO
	TEMP UNIT			**°C** | °F
	TEMP MEAS			**AUTO** | MAN |BUS
	MAN			-50 … 250 °C (**025.0 °C**) -58 … 482 °F **(077.0 °F)**
	TEMP CAL			**AUTO** | MAN |BUS
	MAN			-50 … 250 °C (**025.0 °C**) -58 … 482 °F **(077.0 °F)**
	NOM ZERO [1]			0.00 … 14.00 PH **(7.00 PH)**
	NOM SLOPE [1]			30.0 … 60.0 mV (**059.2 mV)**
	PH_ISO [1]			0.00 … 14.00 PH **(07.00 PH)**
	CALMODE			**AUTO** | MAN | DAT
	AUTO	**BUFFER SET**		-01- MT **-02- KNC** -03- CIB -04- NST -05- STD -06- HCH -07- WTW -08- HMT -09- RGC -10- DIN -U1- USR
	CAL TIMER [2]			**OFF** | FIX | AdAPT
	FIX	AdAPT	**CAL-CYCLE** [2]	**xxxx h (0168 h)**
	ACT [3]			**OFF** | AUTO | MAN
	MAN		**ACT CYCLE** [3]	0 … 2000 DAY **(0007 DAY)**
	TTM [3]			**OFF** | AUTO | MAN**)**
	MAN		**TTM CYCLE** [3]	0 … 2000 DAY **(0030 DAY)**

pH Configuration			Choices DEFAULT **in bold**
SNS:	**CIP COUNT**		ON | **OFF**
	ON	**CIP CYCLES** [3]	0 … 9999 CYC (**0000 CYC**)
	SIP COUNT		ON | **OFF**
	ON	**SIP CYCLES** [3]	0 … 9999 CYC (**0000 CYC**)
	AUTOCLAVE [3]		ON | **OFF**
	ON	**AC CYCLES** [3]	xxxx CYC (**0000 CYC**)
COR:	**TC SELECT**		**OFF** | LIN | PURE WTR | USER TAB
	LIN	**TC LIQUID**	-19.99 … +19.99 %/K **(00.00 %/K)**
	USER TAB	**EDIT TABLE**	**NO** | YES
		YES	0 … 100 °C in 5 °C steps
IN:	**FLOW ADJUST**		0 … 20 000 l/L **(12 000 l/L)**
ALA:	**ALARM DELAY**		0 … 600 SEC **(010 SEC)**
	SENSOCHECK		ON | **OFF**
	HOLD		OFF | **LAST**
CLK:	**CLK FORMAT**		**24h** | 12h
	CLK TIME		hh:mm | hh.mm (A/M) **(00.00)**
	CLK DAY/MONTH		dd.mm **(01.01.)**
	CLK YEAR		yyyy **(2014)**

[1] with PFAUDLER sensors only

[2] omitted for ISM sensors

[3] with ISM sensors only

38 pH Configuration (Template for Copy)

pH

Parameter		Default	User setting
	Sensor type	STANDARD	
	Measuring mode	pH	
	Type of temp probe	1000 PT	
	Temperature unit	°C	
	Measurement temp	AUTO	
	Measurement temp, manual	25.0 °C (77.0 °F)	
	Calibration temp	AUTO	
	Calibration temp, manual	25.0 °C (77.0 °F)	
	Zero point[1)]	7.00 pH	
	Slope[1)]	59.2 mV	
	PH ISO[1)]	7.00 pH	
	Calibration mode	AUTO	
SNS:	Buffer set	-02- KNC (Knick)	
	Calibration timer[2)]	OFF	
	Calibration cycle	168 h	
	Adaptive cal timer (ACT)[3)]	OFF	
	Calibration cycle ACT[3)]	30 DAY	
	Adaptive maintenance timer (TTM)[3)]	OFF	
	Maintenance cycle (TTM)[3)]	365 DAY	
	CIP counter	OFF	
	CIP cycles	0000 CYC	
	SIP counter	OFF	
	SIP cycles	0000 CYC	
	Autoclaving counter[3)]	OFF	
	Autoclaving cycles[3)]	0000 CYC	

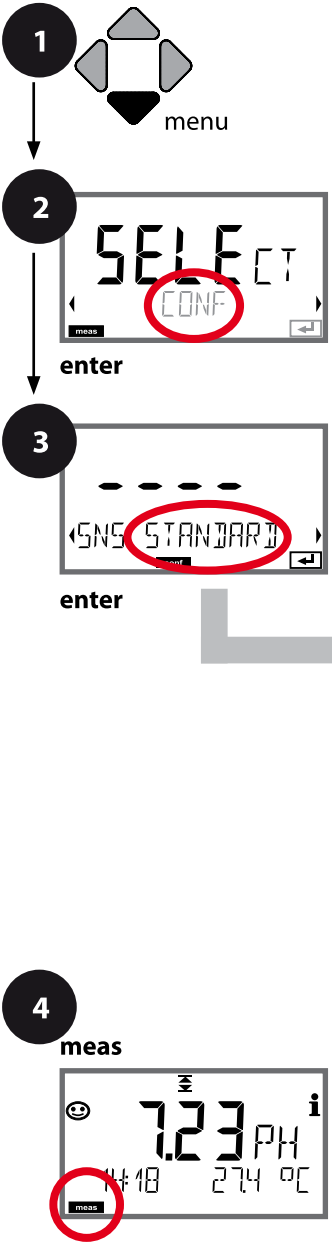
Parameter		Default	User setting
COR:	Temperature compensation	OFF	
	Temperature compensation, LINEAR	00.00%/K	
	Temperature compensation, USER	NO	
IN:	Flow meter (pulses/liter)	12 000 l/L	
ALA:	Delay	10 s	
	Sensocheck	OFF	
	HOLD mode	LAST	
CLK:	Time format	24h	
	Time hh/mm	00.00	
	Day/Month	01.01.	
	Year	2014	

[1)] with PFAUDLER sensors only
[2)] omitted for ISM sensors
[3)] with ISM sensors only

pH

Device Type: pH

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.

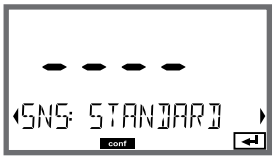
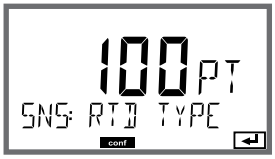
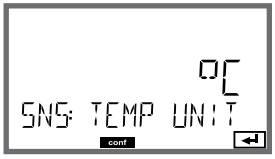


1 Press **menu** key.
2 Select **CONF** using ◀ ▶, press **enter**.
3 Select sensor type using ▲ ▼ (eg, STANDARD). Press **enter**. The next menu item appears. Use the arrow keys ▲ ▼ for selection (see right-hand page). Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

3

Sensor type
Measuring mode
Type of temp probe
Temperature unit
Temp detection during measurement
Temp detection during calibration
Calibration mode
Cal timer
Adaptive calibration timer
Adaptive maintenance timer
Cleaning cycles CIP
Sterilization cycles SIP
Autoclaving counter
Temperature compensation

3

Menu item	Action	Choices
Sensor type 	Select sensor type using ▲ ▼ keys. Press **enter** to confirm.	**STANDARD** ISFET MEMOSENS PFAUDLER ISM
Measuring mode	Select measuring mode using ▲ ▼ keys. Press **enter** to confirm.	**pH** mV ORP
Type of temp probe 	(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
Temperature unit 	Select °C or °F using ▲ ▼ keys. Press **enter** to confirm.	**°C** °F

pH

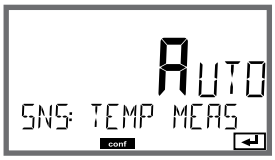
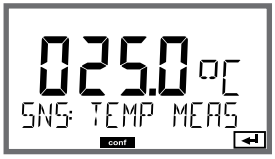
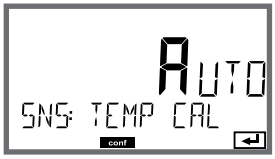
Sensor, Temp Detection during Calibration, Calibration Mode

1 Press **menu** key.
2 Select **CONF** using ◀ ▶, press **enter**.
3 Select sensor type using ▲ ▼ (eg, STANDARD). Press **enter**. The next menu item appears. Use the arrow keys ▲ ▼ for selection (see right-hand page). Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

3

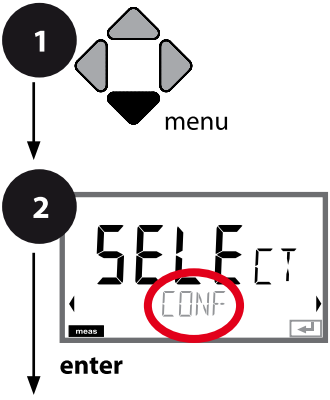
Sensor type
Measuring mode
Type of temp probe
Temperature unit
Temp detection during measurement
Temp detection during calibration
Calibration mode
Cal timer
Adaptive calibration timer
Adaptive maintenance timer
Cleaning cycles CIP
Sterilization cycles SIP
Autoclaving counter
Temperature compensation

3

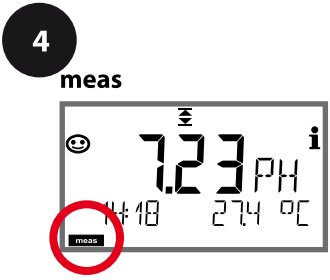
Menu item	Action	Choices
Temperature detection during measurement 	Select mode using ▲ ▼ keys: AUTO: Measured by sensor MAN: Direct input of temperature, no measurement (see next step) BUS: Value from AO block Press **enter** to confirm.	**AUTO** MAN BUS
(Manual temperature) 	Modify value using ▲ ▼ keys, select next digit using ◀ ▶ keys. Press **enter** to confirm.	–50 …250 °C **(25.0 °C)** (–58 …482 °F) **(77.0 °F)**
Temp detection during calibration 	AUTO: Measured by sensor MAN: Direct input of temperature, no measurement (see next step) BUS: Value from AO block Press **enter** to confirm.	**AUTO** MAN BUS
(Manual temperature)	See line 2	
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



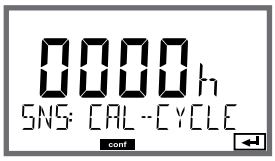
1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select sensor type using ▲ ▼ (eg, STANDARD).
Press **enter**. The next menu item appears.
Use the arrow keys ▲ ▼ for selection (see right-hand page).
Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.



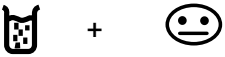
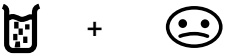
3

Sensor type
Measuring mode
Type of temp probe
Temperature unit
Temp detection during measurement
Temp detection during calibration
Calibration mode
Cal timer
Adaptive calibration timer
Adaptive maintenance timer
Cleaning cycles CIP
Sterilization cycles SIP
Autoclaving counter
Temperature compensation

3

Menu item	Action	Choices
Calibration Timer 	Adjust CALTIMER using ▲ ▼ : OFF: No timer FIX: Fixed cal cycle (adjust in the next step) AdAPT: Maximum cal cycle (adjust in the next step) Press **enter** to confirm.	**OFF** FIX AdAPT 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 	Only with FIX/ADAPT: Modify value using ▲ ▼ keys, select next digit using ◀ ▶ keys. Press **enter** to confirm.	0 … 9999

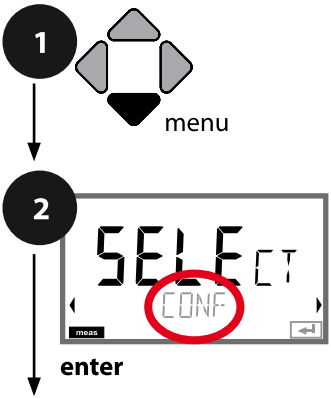
Note for the calibration timer:
When Sensocheck has been activated, the Sensoface indicator reminds you when the calibration interval is about to expire:

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

The time remaining until the next due calibration can be seen in the diagnostics menu (see Diagnostics chapter, from page 138 onwards).

pH

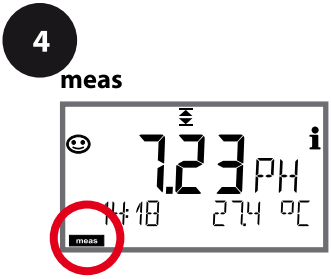
ISM Sensor, Adaptive Cal Timer (ACT)



1 Press **menu** key.
2 Select **CONF** using ◀ ▶,
press **enter**.
3 Select **ISM** sensor type using ▲ ▼ keys,
press **enter**. The next menu item appears.
Use the arrow keys ▲ ▼ for selection (see right-hand page).
Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

3

Sensor type
Measuring mode
Type of temp probe
Temperature unit
Temp detection during measurement
Temp detection during calibration
Calibration mode
Cal timer
Adaptive calibration timer
Adaptive maintenance timer
Cleaning cycles CIP
Sterilization cycles SIP
Autoclaving counter
Temperature compensation

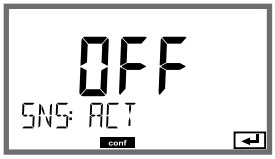


Adaptive Cal Timer (ACT)

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.

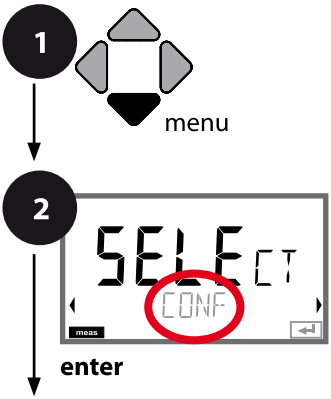
The adaptive cal timer is reset after each calibration.

3

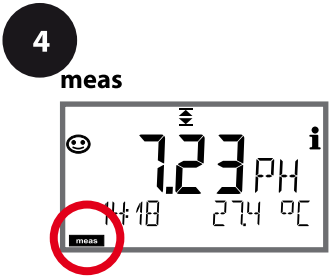
Menu item	Action	Choices
Adaptive cal timer (ACT)  	Select using ▲ ▼ keys: OFF: No timer AUTO: The interval stored in the ISM sensor is used. MAN: The interval is specified manually (0 ... 9999 days). Default ACT = OFF Default ACT CYCLE = 7 days Confirm by pressing **enter**	**OFF** AUTO MAN

pH

ISM Sensor, Adaptive Maintenance Timer (TTM)



1 Press **menu** key.
2 Select **CONF** using ◀ ▶, press **enter**.
3 Select **ISM** sensor type using ▲ ▼ keys, press **enter**. The next menu item appears. Use the arrow keys ▲ ▼ for selection (see right-hand page). Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.



3

Sensor type
Measuring mode
Type of temp probe
Temperature unit
Temp detection during measurement
Temp detection during calibration
Calibration mode
Cal timer
Adaptive calibration timer
Adaptive maintenance timer
Cleaning cycles CIP
Sterilization cycles SIP
Autoclaving counter
Temperature compensation

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. 2000 days).
Stressing influences (temperature, measurement in extreme ranges) shorten the timer interval.

3

Menu item	Action	Choices
Adaptive maintenance timer (TTM) 	Select using ▲ ▼ keys: OFF: No timer AUTO: The interval stored in the ISM sensor is used. MAN: The interval is specified manually (0 ... 2000 days). Default TTM = OFF Default TTM CYCLE = 30 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.		
	To do so, select **"TTM RESET = YES"** and confirm by pressing **enter**.	**NO** YES

pH

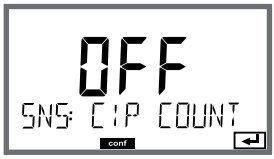
Sensor, CIP / SIP Cycles

1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select sensor type using ▲ ▼ (eg, STANDARD).
Press **enter**. The next menu item appears.
Use the arrow keys ▲ ▼ for selection (see right-hand page).
Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

3

Sensor type
Measuring mode
Type of temp probe
Temperature unit
Temp detection during measurement
Temp detection during calibration
Calibration mode
Cal timer
Adaptive calibration timer
Adaptive maintenance timer
Cleaning cycles CIP
Sterilization cycles SIP
Autoclaving counter
Temperature compensation

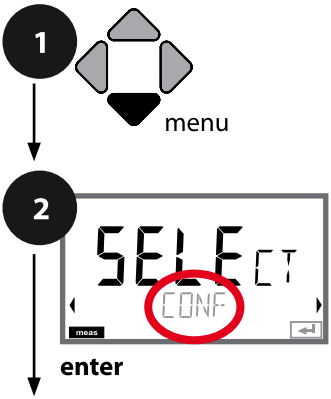
3

Menu item	Action	Choices
Cleaning cycles CIP 	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 SIP 	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**

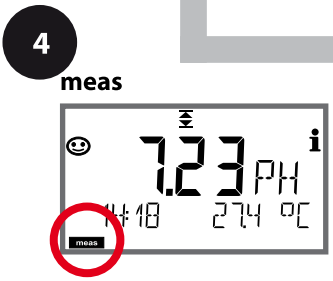
Logging the cleaning and sterilization cycles with connected sensor helps measuring the load on the sensor.
Suitable for biochemical applications (process temp approx. 0...50 °C, CIP temperature > 55 °C, SIP temperature > 115 °C).

pH

ISM Sensor, Autoclaving Counter



1 Press **menu** key.
2 Select **CONF** using ◀ ▶,
press **enter**.
3 Select **ISM** sensor type using ▲ ▼ keys,
press **enter**. The next menu item appears.
Use the arrow keys ▲ ▼ for selection (see right-hand page).
Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.



3

Sensor type
Measuring mode
Type of temp probe
Temperature unit
Temp detection during measurement
Temp detection during calibration
Calibration mode
Cal timer
Adaptive calibration timer
Adaptive maintenance timer
Cleaning cycles CIP
Sterilization cycles SIP
Autoclaving counter
Temperature compensation

Autoclaving Counter

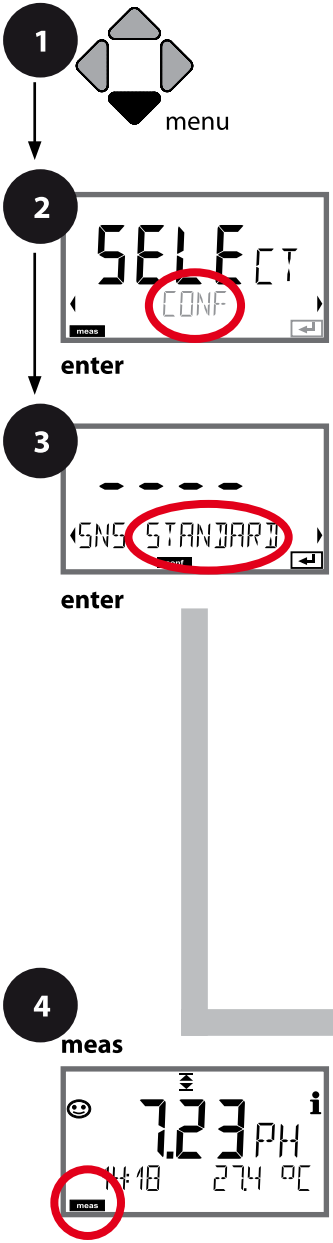
After reaching a specified limit value the autoclaving counter generates a Sensoface message. As soon as the counter has reached the specified value, Sensoface is getting "sad". Pressing the info key shows the text "AUTOCLAVE CYCLES OVERRUN" which reminds you that the maximum number of autoclaving cycles has been reached. After each autoclaving process, you must manually increment the autoclaving counter in the SENSOR service menu. The transmitter displays "INCREMENT AUTOCLAVE CYCLE" as confirmation.

3

Menu item	Action	Choices
Autoclaving counter 	Select using ▲ ▼ keys: OFF: No timer ON: The cycles are specified manually (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) 	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

pH

Temperature Compensation of Process Medium (pH)

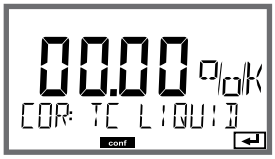


1 Press **menu** key.
2 Select **CONF** using ◂ ▸, press **enter**.
3 Select sensor type using ▲ ▼ (eg, STANDARD). Press **enter**. The next menu item appears. Use the arrow keys ▲ ▼ for selection (see right-hand page). Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

3

Sensor type
Measuring mode
Type of temp probe
Temperature unit
Temp detection during measurement
Temp detection during calibration
Calibration mode
Cal timer
Adaptive calibration timer
Adaptive maintenance timer
Cleaning cycles CIP
Sterilization cycles SIP
Autoclaving counter
Temperature compensation

3

Menu item	Action	Choices
Temperature compensation of process medium 	For pH measurement only: Select temperature compensation of the process medium. OFF: No compensation LIN: Linear compensation PURE WTR: Ultrapure water USER TAB: User-defined table Select using ◂ ▸, press **enter** to confirm.	**OFF** LIN PURE WTR USER TAB
Temperature compensation, linear 	Only with LIN: Enter the linear temperature compensation of the process medium. Enter value using ▲ ▼ ◂ ▸ keys Press **enter** to confirm.	–19.99...+19.99 %/K
Temperature compensation 	Only with USER TAB: 0 … 100 °C in 5 °C steps	**NO** YES

pH

Support of Pfaudler Sensors

or pH sensors with a zero point other than pH 7 and/or deviating slope, eg, pH sensors with a zero point at pH 4.6

You select a Pfaudler sensor in the pH configuration menu (see page 36).
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 (0.00 … 14.00 pH, default: 07.00 pH)
SNS: NOM SLOPE (30.0 … 60.0 mV, default: 59.2 mV)
SNS: PH_ISO (0.00 … 14.00 pH, 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 sensor 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.

Cond

Cond Configuration			Choices DEFAULT **in bold**
SNS:			**2-ELECTRODE** | 4-ELECTRODE | MEMOSENS
	CELLFACTOR[1)]		00.0050 – 19.9999 c **(01.0000c)**
	MEAS MODE		**Cond** | Conc % | SAL ‰ | USP µS/cm | TDS
	Cond	**DISPLAY UNIT**	0.000 µS/cm 00.00 µS/cm 000.0 µS/cm 0000 µS/cm 0.000 mS/cm 00.00 mS/cm **000.0 mS/cm** 0.000 S/cm 00.00 S/cm 00.00 MΩ
	Conc %	**SOLUTION**	**-01- (NaCl)** -02- (HCl) -03- (NaOH) -04- (H2SO4) -05- (HNO3)
	TEMP UNIT		**°C** | °F
	TEMPERATURE		**AUTO** | MAN |BUS
	AUTO	**RTD TYPE**[1)]	**100 PT** 1000 PT 100 NI 8.55 NTC 30 NTC
	MAN	**TEMPERATURE**	-50 … 250 °C **(025.0 °C)** -58 … 482 °F **(077.0 °F)**
	CIP COUNT		ON | **OFF**
	SIP COUNT		ON | **OFF**

Cond Configuration		Choices DEFAULT **in bold**
ALA:	**ALARM DELAY**	0 … 600 SEC **(010 SEC)**
	SENSOCHECK	ON | **OFF**
	HOLD	OFF | **LAST**
CLK:	**CLK FORMAT**	**24h** | 12h
	CLK TIME	hh:mm | hh.mm (AM/PM) **(00.00)**
	CLK DAY/MONTH	dd.mm **(01.01.)**
	CLK YEAR	yyyy **(2014)**

[1] omitted for Memosens sensors
[2] only for MEAS MODE = TDS
[3] only for MEAS MODE = USP

60 Cond Configuration (Template for Copy)

Cond

Parameter		Default	User setting
SNS:	Sensor type	2-ELECTRODE	
	Cell factor[1)]	01.0000 c	
	Measuring mode	Cond	
	Cond range	000.0 mS/cm	
	Concentration determination	-01- (NaCL)	
	Temperature unit	°C	
	Measurement temp	AUTO	
	Type of temp probe[1)]	1000 PT	
	Measurement temp, manual	25.0 °C (77.0 °F)	
	Calibration temp	AUTO	
	Calibration temp, manual	25.0 °C (77.0 °F)	
	CIP counter	OFF	
	SIP counter	OFF	
COR:	Temperature compensation	OFF	
	Temperature compensation, LINEAR	00.00%/K	
	Reference temperature, LINEAR	25.0 °C (77.0 °F)	
	TDS factor[2)]	1.0	
	USP factor[3)]	100.0 %	
IN:	Flow meter (pulses/liter)	12 000 l/L	
ALA:	Delay	10 s	
	Sensocheck	OFF	
	HOLD mode	LAST	
CLK:	Time format	24h	
	Time hh/mm	00.00	
	Day/Month	01.01.	
	Year	2014	

[1)] omitted for Memosens sensors

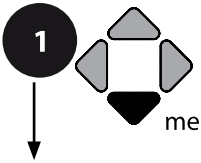
[2)] for MEAS MODE = TDS

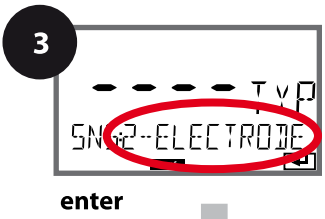
[3)] for MEAS MODE = USP

Cond

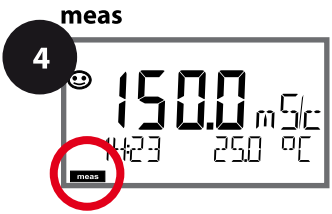
Device Type: Cond

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.



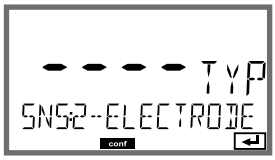
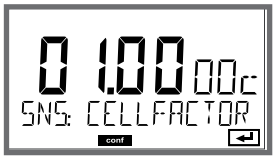
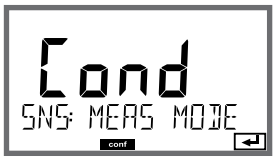
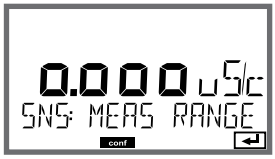


1 Press **menu** key.
2 Select **CONF** using ◀ ▶, press **enter**.
3 Select sensor type using ▲ ▼ keys, press **enter**. The next menu item appears.
Use the arrow keys ▲ ▼ for selection (see right-hand page).
Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.



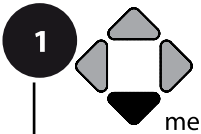
3
Sensor type
Enter cell factor
Measuring mode
Cond range
Concentration determination Conc
Temperature unit
Temperature detection
Type of temp probe
Cleaning cycles CIP
Sterilization cycles SIP
Temperature compensation

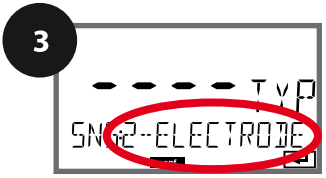
3

Menu item	Action	Choices
Sensor type 	Select sensor type using ▲ ▼ keys. Press **enter** to confirm.	**2-ELECTRODE** 4-ELECTRODE MEMOSENS
Cell factor 	Modify value using ▲ ▼ keys, select next digit using ◀ ▶ keys. Press **enter** to confirm.	00.0050 … 19.9999 c **(01.0000 c)**
Measuring mode 	Select desired mode using ▲ ▼ keys. Press **enter** to confirm.	**Cond** Conc % Sal ‰ USP µS/cm TDS
Cond 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- (H2SO4) -05- (HNO3) -06- (H2SO4) -07- (HCl) -08- (HNO3) -09- (H2SO4) -10- (NaOH)

Cond

Sensor, Temperature Unit, Temp Detection, Temperature Probe

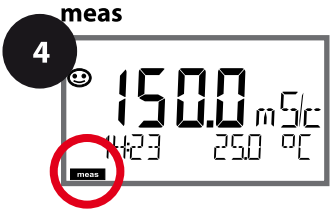




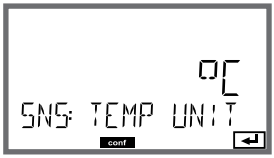
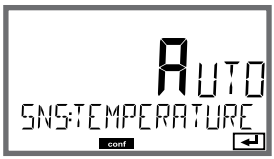
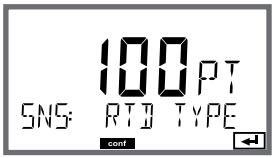
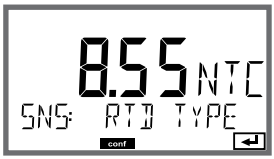
1 Press **menu** key.
2 Select **CONF** using ◂ ▸, press **enter**.
3 Select sensor type using ▲ ▼ keys, press **enter**. The next menu item appears.
Use the arrow keys ▲ ▼ for selection (see right-hand page).
Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

3

Sensor type
Enter cell factor
Measuring mode
Measuring range
Concentration determination
Temperature unit
Temperature detection
Type of temp probe
Cleaning cycles CIP
Sterilization cycles SIP
Temperature compensation

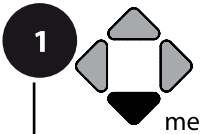


3

Menu item	Action	Choices
Temperature unit 	Select °C or °F using ▲ ▼ keys. Press **enter** to confirm.	**°C** / °F
Temp detection 	Select mode using ▲ ▼ keys: AUTO: Measured by sensor MAN: Direct input of temperature, no measurement (see next step) BUS: Value from AO block Press **enter** to confirm.	**AUTO** MAN BUS
Type of temp probe  	(not for Memosens) Select type of temperature probe using ▲ ▼ keys. Press **enter** to confirm.	100 PT **1000 PT** 100 Ni 8.55 NTC 30 NTC
(Manual temperature) 	Modify value using ▲ ▼ keys, select next digit using ◀ ▶ keys. Press **enter** to confirm.	–50…250 °C **(25.0 °C)** (–58…482 °F) **(77.0 °F)**

Cond

Sensor, CIP / SIP Cycles

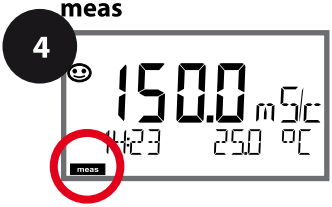


1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select sensor type using ▲ ▼ (eg, STANDARD).
Press **enter**. The next menu item appears.
Use the arrow keys ▲ ▼ for selection (see right-hand page).
Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

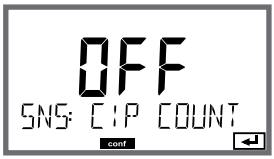
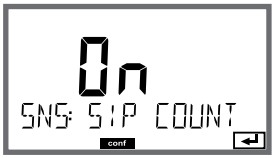
3

Sensor type
Enter cell factor
Measuring mode
Measuring range
Concentration determination
Temperature unit
Temperature detection
Type of temp probe
Cleaning cycles CIP
Sterilization cycles SIP
Temperature compensation

meas



3

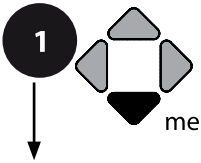
Menu item	Action	Choices
CIP Cleaning cycles on/off 	Select ON or OFF using ▲ ▼ keys. Activates/deactivates logging in logbook Press **enter** to confirm.	ON/**OFF**
SIP Sterilization cycles on/off 	Select ON or OFF using ▲ ▼ keys. Activates/deactivates logging in logbook Press **enter** to confirm.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

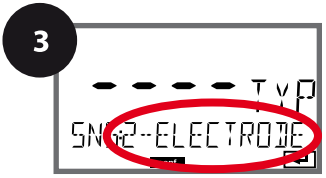
The cleaning and sterilization cycles are logged to measure the load on the sensor. Suitable for biochemical applications (process temp approx. 0...50 °C, CIP temperature > 55 °C, SIP temperature > 115 °C).

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

Cond

Temperature Compensation (Cond)

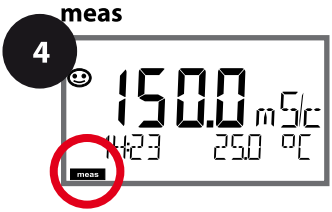




1 Press **menu** key.
2 Select **CONF** using ◂ ▸, press **enter**.
3 Select sensor type using ▲ ▼ keys, press **enter**. The next menu item appears.
Use the arrow keys ▲ ▼ for selection (see right-hand page).
Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

3

Sensor type
Enter cell factor
Measuring mode
Measuring range
Concentration determination
Temperature unit
Temperature detection
Type of temp probe
Cleaning cycles CIP
Sterilization cycles SIP
Temperature compensation



3

Menu item	Action	Choices
Temperature compensation 	Select desired compensation using ▲ ▼ keys: **OFF:** Temperature compensation switched off	**OFF** LIN NLF nACL HCL nH3 nAOH
	LIN: Linear temperature compensation Select desired temperature coefficient and reference temperature using ▲ ▼ **keys**.	TC LIQUID **00.00** … +19.99 %/K REF TEMP -20 … 200 °C **(25.0 °C)** 4 … 392 °F **(077.0 °F)**
	NLF: Temperature compensation for natural waters to EN 27888	
	nACl: Temperature compensation for ultrapure water with NaCl traces	
	HCL: Temperature compensation for ultrapure water with HCl traces	
	nH3: Temperature compensation for ultrapure water with NH_3 traces Confirm by pressing **enter**	
	NaOH (without figure)	

CondI

CondI Configuration			Choices DEFAULT **in bold**
SNS:			**SE 655** | SE 656 | SE 660 | SE 670| SE 680 | MEMOSENS | OTHER
	OTHER	**RTD TYPE**	100 PT **1000 PT** 30 NTC
	OTHER	**CELLFACTOR**	XX.XXx **(01.980)**
	OTHER	**TRANS RATIO**	XXX.Xx **(120.00)**
	MEAS MODE		**Cond** | Conc % | SAL ‰ | TDS
	Cond	**DISPLAY UNIT**	0.000 mS/c [1)] 00.00 mS/c **000.0 mS/c** 0000 mS/c 0.000 S/m 00.00 S/m
	Conc	**SOLUTION**	**-01- (NaCl)** -02- (HCl) -03- (NaOH) -04- (H2SO4) -05- (HNO3) -06- (H2SO4) -07- (HCl) -08- (HNO3) -09- (H2SO4) -10- (NaOH)
	TEMP UNIT		**°C** | °F
	TEMPERATURE		**AUTO** | MAN |BUS
	MAN	**TEMPERATURE**	-50 … 250 °C **(025.0 °C)** -50 … 482 °F **(077.0 °C)**
	CIP COUNT		ON | **OFF**
	SIP COUNT		ON | **OFF**

CondI Configuration			Choices DEFAULT **in bold**
COR:	**TC SELECT**		**OFF** | LIN | nLF | nACL | HCL | nH3 | nAOH
	LIN	**TC LIQUID**	0 … +19.99 %/K **(00.00 %/K)**
	LIN	**REF TEMP**	-20 … 200 °C **(25.0 °C)** 4 … 392 °F **(077.0 °F)**
	TDS FACTOR[2)]		0.0 … 1.0 **(1.0)**
IN:	**FLOW ADJUST**		0 … 20 000 l/L **(12 000 l/L)**
ALA:	**ALARM DELAY**		0 … 600 SEC **(010 SEC)**
	SENSOCHECK		ON | **OFF**
	HOLD		OFF | **LAST**
CLK:	**CLK FORMAT**		**24h** | 12h
	CLK TIME		hh:mm | hh.mm (AM/PM) **(00.00)**
	CLK DAY/MONTH		dd.mm **(01.01.)**
	CLK YEAR		yyyy **(2014)**

[1)] 0.000 mS/cm range blocked for SE 660 sensor

[2)] for MEAS MODE = TDS

72 **CondI Configuration** (Template for Copy)

CondI

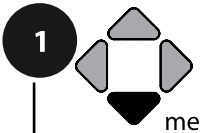
Parameter		Default	User setting
SNS:	Sensor type	SE 655	
	Type of temp probe	1000 PT	
	Cell factor	01.980 c	
	Transfer ratio	120.00	
	Measuring mode	Cond	
	Cond range	000.0 mS/cm	
	Concentration determination	-01- (NaCl)	
	Temperature unit	°C	
	Temperature	AUTO	
	Manual temp	25.0 °C (77.0 °F)	
	CIP counter	OFF	
	SIP counter	OFF	
COR:	Temperature compensation	OFF	
	Temperature compensation, LINEAR	00.00%/K	
	Reference temperature, LINEAR	25.0 °C (77.0 °F)	
	TDS factor[1)]	1.0	
IN:	Flow meter (pulses/liter)	12 000 l/L	
ALA:	Delay	10 s	
	Sensocheck	OFF	
	HOLD mode	LAST	
CLK:	Time format	24h	
	Time hh/mm	00.00	
	Day/Month	01.01.	
	Year	2014	

[1)] for MEAS MODE = TDS

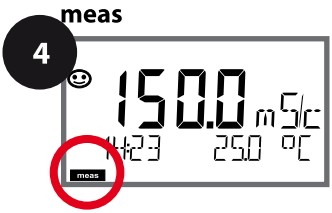
Condl

Device Type: Condl

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.



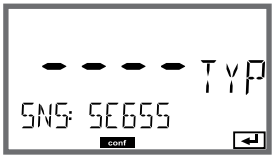
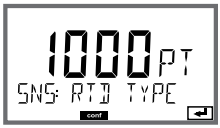
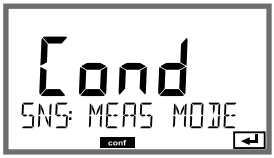
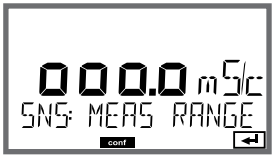
1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select sensor type using ▴ ▾ (eg, SE 655).
Press **enter**. The next menu item appears.
Use the arrow keys ▴ ▾ for selection (see right-hand page).
Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.



3

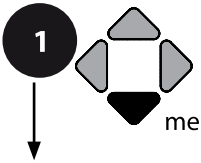
Sensor type
Temperature probe
Cell factor
Transfer ratio
Measuring mode
Measuring range
Concentration determination
Temperature unit
Temperature detection
Cleaning cycles CIP
Sterilization cycles SIP
Temperature compensation

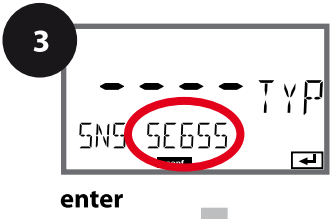
3

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

CondI

Sensor, Concentration Determination, Temperature Unit



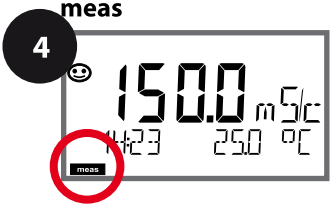


1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select sensor type using ▴ ▾ (eg, SE 655).
Press **enter**. The next menu item appears.
Use the arrow keys ▴ ▾ for selection (see right-hand page).
Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

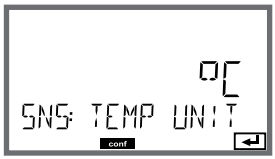
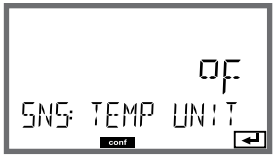
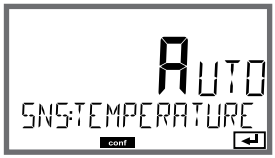
3

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

meas

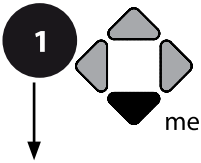


3

Menu item	Action	Choices
Concentration determination 	**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- (H2SO4) -05- (HNO3) -06- (H2SO4) -07- (HCl) -08- (HNO3) -09- (H2SO4) -10- (NaOH)
Temperature unit  	Select °C or °F using ▲ ▼ keys. Press **enter** to confirm.	**°C** / °F
Temp detection 	Select mode using ▲ ▼ keys: AUTO: Measured by sensor MAN: Direct input of temperature, no measurement (see next step) BUS: Value from AO block Press **enter** to confirm.	**AUTO** MAN BUS
(Manual temperature) 	Modify value using ▲ ▼ keys, select next digit using ◀ ▶ keys. Press **enter** to confirm.	–50…250 °C **(25.0 °C)** (–58…482 °F) **(77.0 °F)**

CondI

Sensor, Cleaning Cycles, Sterilization Cycles

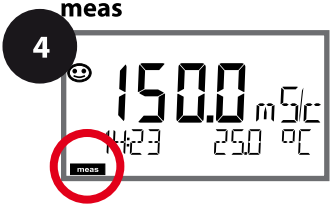


1 Press **menu** key.
2 Select **CONF** using ◀ ▶, press **enter**.
3 Select sensor type using ▲ ▼ (eg, SE 655). Press **enter**. The next menu item appears. Use the arrow keys ▲ ▼ for selection (see right-hand page). Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

3

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

meas



3

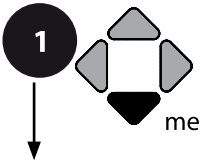
Menu item	Action	Choices
CIP Cleaning cycles on/off 	Select ON or OFF using ▲ ▼ keys. Activates/deactivates logging in logbook Press **enter** to confirm.	ON/**OFF**
SIP Sterilization cycles on/off 	Select ON or OFF using ▲ ▼ keys. Activates/deactivates logging in logbook Press **enter** to confirm.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

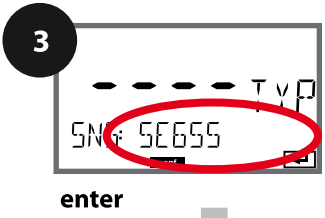
The cleaning and sterilization cycles are logged to measure the load on the sensor. Suitable for biochemical applications (process temp approx. 0...50 °C, CIP temperature > 55 °C, SIP temperature > 115 °C).

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

CondI

Temperature Compensation (CondI)



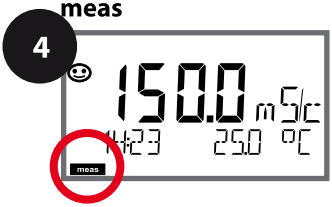


1 Press **menu** key.
2 Select **CONF** using ◀ ▶, press **enter**.
3 Select sensor type using ▲ ▼ keys, press **enter**. The next menu item appears.
Use the arrow keys ▲ ▼ for selection (see right-hand page).
Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

3

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

meas



3

Menu item	Action	Choices
Temp compensation 	Select desired compensation using ▲ ▼ keys: **OFF:** Temperature compensation switched off	**OFF** LIN NLF nACL HCL nH3 nAOH
	LIN: Linear temperature compensation Select desired temperature coefficient and reference temperature using ▲ ▼ keys.	TC LIQUID **00.00** … +19.99 %/K REF TEMP -20 … 200 °C **(25.0 °C)** 4 … 392 °F **(077.0 °F)**
	NLF: Temperature compensation for natural waters to EN 27888	
	nACl: Temperature compensation for ultrapure water with NaCl traces	
	HCL: Temperature compensation for ultrapure water with HCl traces	
	nH3: Temperature compensation for ultrapure water with NH_3 traces Confirm by pressing **enter**	
	NaOH (without figure)	

Oxy

Oxy Configuration				Choices DEFAULT **in bold**
SNS:				**STANDARD** | TRACES | SUBTRACES | MEMOSENS | ISM
	MEAS MODE			**dO %** | dO mg/l | dO ppm | GAS %
	U-POL MEAS[1)]			0000 … -1000 mV **(-675 mV)**
	U-POL CAL[1)]			0000 … -1000 mV **(-675 mV)**
	MEMBR.COMP [1) 3)]			00.50 … 03.00 **(01.00)**
	RTD TYPE [1) 3)]			**22 NTC** | 30 NTC
	TEMP UNIT			**°C** | °F
	CALMODE[2)]			**CAL AIR** | CAL WTR
	CAL TIMER [3)]			ON | **OFF**
	ON	CAL CYCLE		0 … 9999 h **(0168 h)**
	ACT[4)]			**OFF** | AUTO | MAN
	MAN	**ACT CYCLE**		0 … 9999 DAY **(0030 DAY)**
	TTM[4)]			**OFF** | AUTO | MAN**)**
	MAN	**TTM CYCLE**		0 … 2000 DAY **(0365 DAY)**
	CIP COUNT			ON | **OFF**
	ON	**CIP CYCLES**[4)]		0 … 9999 CYC **(0000 CYC)**
	SIP COUNT			ON | **OFF**
	ON	**SIP CYCLES**[4)]		0 … 9999 CYC **(0000 CYC)**
	AUTOCLAVE			ON | OFF
	ON		**AC CYCLES**[4)]	0 … 9999 CYC **(0000 CYC)**
COR:	**SALINITY**			00.00 … 45.00 ppt **(00.00 ppt)**
	PRESSURE UNIT			**BAR** | KPA | PSI
	PRESSURE			MAN | BUS
	MAN	BAR	**PRESSURE**	0.000 … 9.999 BAR **(1.013 BAR)**
	MAN	KPA	**PRESSURE**	000.0 … 999.9 KPA **(100 KPA)**
	MAN	PSI	**PRESSURE**	000.0 … 145.0 PSI **(14.5 PSI)**

Oxy Configuration		Choices DEFAULT **in bold**
IN:	**FLOW ADJUST**	0 … 20 000 l/L **(12 000 l/L)**
ALA:	**ALARM DELAY**	0 … 600 SEC **(010 SEC)**
	SENSOCHECK	ON | **OFF**
	HOLD	OFF | **LAST**
CLK:	**CLK FORMAT**	**24h** | 12h
	CLK TIME	hh:mm | hh.mm (AM/PM) **(00.00)**
	CLK DAY/MONTH	dd.mm **(01.01.)**
	CLK YEAR	yyyy **(2014)**

1) omitted for MEMOSENS
2) omitted for MEAS MODE = GAS %
3) omitted for ISM
4) only for ISM

84 Oxy Configuration (Template for Copy)

Oxy

Parameter		Default	User setting
SNS:	Sensor type	STANDARD	
	Measuring mode	dO %	
	Polarization voltage, measurement [1]	-675 mV	
	Polarization voltage, calibration [1]	-675 mV	
	Membrane compensation [1] [3]	01.00	
	Type of temp probe [1] [3]	22 NTC	
	Temperature unit	°C	
	Calibration mode [2]	CAL AIR	
	Calibration timer [3]	OFF	
	Calibration cycle	7 DAY	
	Adaptive cal timer (ACT) [4]	OFF	
	Calibration cycle (ACT) [4]	30 DAY	
	Adaptive maintenance timer (TTM) [4]	OFF	
	Maintenance cycle (TTM) [4]	365 DAY	
	CIP counter	OFF	
	CIP cycles [4]	0000 CYC	
	SIP counter	OFF	
	SIP cycles [4]	0000 CYC	
	Autoclaving counter [4]	OFF	
	Autoclaving cycles [4]	0000 CYC	
COR:	Salinity	00.00 ppt	
	Pressure unit	BAR	
	Pressure measurement	MAN	
	Manual pressure, BAR	1.013 bar	
	Manual pressure, KPA	100 KPA	
	Manual pressure, PSI	14.5 PSI	

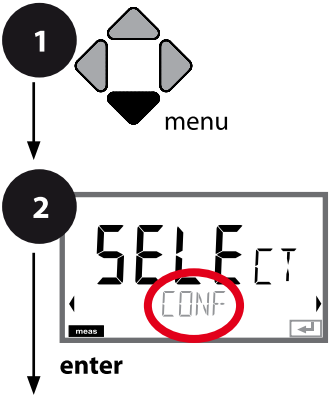
Parameter		Default	User setting
IN:	Flow meter (pulses/liter)	12 000 l/L	
ALA:	Delay	10 s	
	Sensocheck	OFF	
	HOLD mode	LAST	
CLK:	Time format	24h	
	Time hh/mm	00.00	
	Day/Month	01.01.	
	Year	2014	

[1] omitted for Memosens
[2] omitted for MEAS MODE = GAS %
[3] omitted for ISM
[4] only for ISM

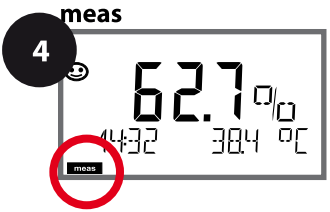
Oxy

Device Type: Oxy

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.

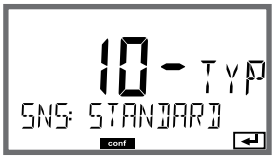
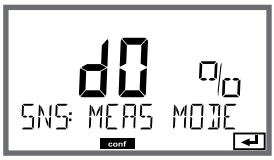
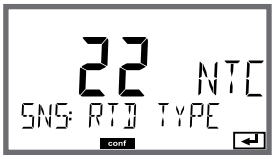


1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select sensor type using ▲ ▼ (eg, STANDARD).
Press **enter**. The next menu item appears.
Use the arrow keys ▲ ▼ for selection (see right-hand page).
Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.



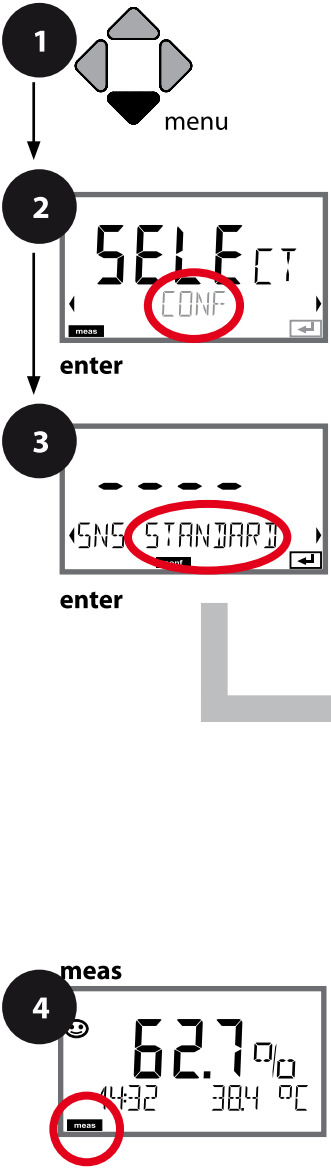
3
Sensor type
Measuring mode
Polarization voltage during meas/cal
Membrane compensation
Type of temp probe
Temperature unit
Calibration mode water/air
Cal timer
Adaptive calibration timer
Adaptive maintenance timer
Cleaning cycles CIP
Sterilization cycles SIP
Autoclaving counter
Salinity
Pressure unit
Pressure correction

3

Menu item	Action	Choices
Sensor type 	Select sensor type using ▲ ▼ keys. Press **enter** to confirm.	**STANDARD** TRACES SUBTRACES MEMOSENS ISM
Measuring mode 	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 	To be entered separately for measurement and calibration. When measuring low oxygen concentrations (traces) U-POL MEAS = –500 mV Enter V_{pol} using arrow keys. Press **enter** to confirm.	**–675 mV** 0000 … -1000 mV ***Not for Memosens***
Membrane compensation 	Enter membrane compensation using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	**01.00** 00.50 … 03.00 ***Not for Memosens*** ***Not for ISM sensor***
Type of temp probe 	Select type of temperature probe using ▲ ▼ keys. Press **enter** to confirm.	**22 NTC** 30 NTC ***Not for Memosens*** ***Not for ISM sensor***

Oxy

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

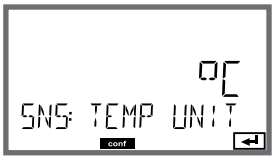
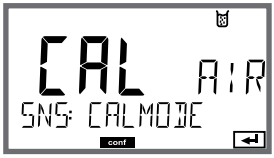


1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select sensor type using ▲ ▼ (eg, STANDARD).
Press **enter**. The next menu item appears.
Use the arrow keys ▲ ▼ for selection (see right-hand page).
Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

3

Sensor type
Measuring mode
Polarization voltage during meas/cal
Membrane compensation
Type of temp probe
Temperature unit
Calibration mode air/water
Cal timer
Adaptive calibration timer
Adaptive maintenance timer
Cleaning cycles CIP
Sterilization cycles SIP
Autoclaving counter
Salinity
Pressure unit
Pressure correction

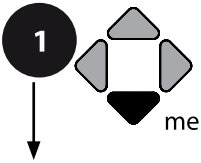
3

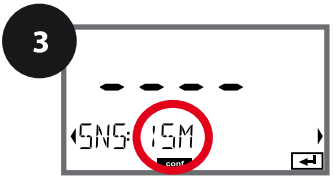
Menu item	Action	Choices
Temperature unit 	Select temperature unit using ▲ ▼ keys. Press **enter** to confirm.	**°C** °F
Calibration mode air/water 	Select calibration medium using ▲ ▼ keys. AIR: Air as cal medium WTR: Air-saturated water as cal medium Press **enter** to confirm.	**CAL_AIR** CAL_WTR
Calibration Timer 	Select/deselect calibration timer using ▲ ▼ keys Press **enter** to confirm.	ON **OFF**
(ON: Calibration cycle) 	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, the Sensoface indicator reminds you when the calibration interval is about to expire (beaker icon and smiley). The time remaining until the next due calibration can be seen in the diagnostics menu (see Diagnostics chapter, from page 138 onwards).

Oxy

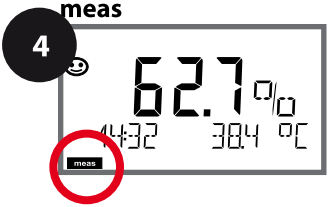
ISM Sensor, Adaptive Cal Timer (ACT)





1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select **ISM** sensor type using ▲ ▼ keys,
press **enter**. The next menu item appears.
Use the arrow keys ▲ ▼ for selection (see right-hand page).
Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

3
Sensor type
Measuring mode
Polarization voltage during meas/cal
Membrane compensation
Type of temp probe
Temperature unit
Calibration mode air/water
Cal timer
Adaptive calibration timer
Adaptive maintenance timer
Cleaning cycles CIP
Sterilization cycles SIP
Autoclaving counter
Salinity
Pressure unit
Pressure correction

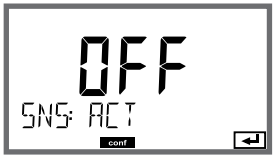


Adaptive Cal Timer (ACT)

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. 2000 days). Stressing influences (temperature, measurement in extreme ranges) shorten the timer interval.

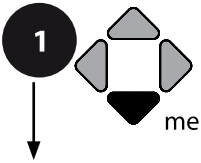
The adaptive cal timer is reset after each calibration.

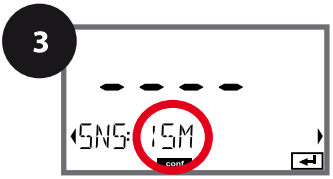
3

Menu item	Action	Choices
Adaptive cal timer (ACT)  	Select using ▲ ▼ : OFF: No timer AUTO: The interval stored in the ISM sensor is used. MAN: The interval is specified manually (0 ... 2000 days). Default ACT CYCLE: 30 days Press **enter** to confirm.	**OFF** AUTO MAN

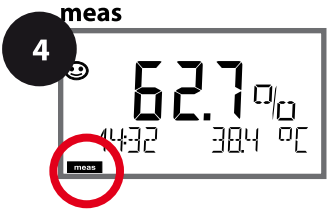
Oxy

ISM Sensor, Adaptive Maintenance Timer (TTM)





1 Press **menu** key.
2 Select **CONF** using ◂ ▸, press **enter**.
3 Select **ISM** sensor type using ▲ ▼ keys, press **enter**. The next menu item appears. Use the arrow keys ▲ ▼ for selection (see right-hand page). Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.



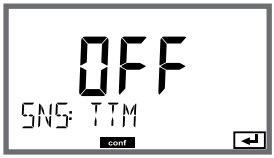
3

Sensor type
Measuring mode
Polarization voltage during meas/cal
Membrane compensation
Type of temp probe
Temperature unit
Calibration mode air/water
Cal timer
Adaptive calibration timer
Adaptive maintenance timer
Cleaning cycles CIP
Sterilization cycles SIP
Autoclaving counter
Salinity
Pressure unit
Pressure correction

Adaptive Maintenance Timer (TTM, Time to Maintenance)

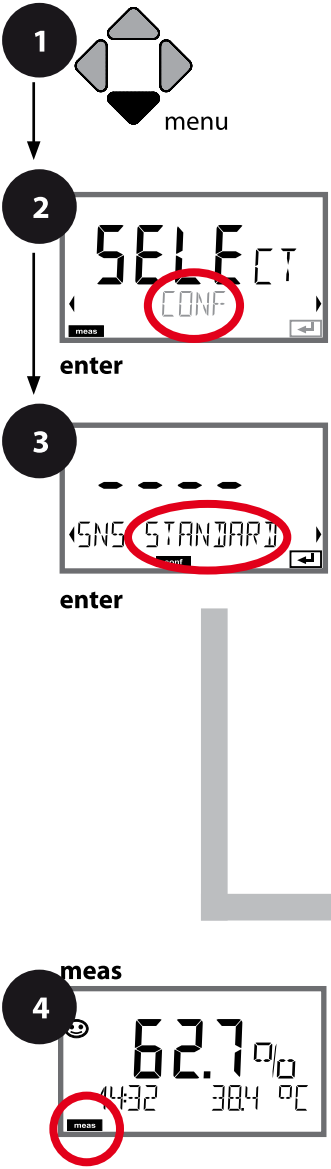
By issuing a Sensoface message, the adaptive maintenance timer reminds you to service the sensor. After expiration of the interval, Sensoface is getting "sad". Pressing the **info** key shows the text "OUT OF MAINTENANCE CHECK ELECTROLYTE AND MEMBRANE" which reminds you that a sensor maintenance is due. The TTM interval is either read automatically from the sensor settings or can be specified manually (max. 2000 days). Stressing influences (temperature, measurement in extreme ranges) shorten the timer interval.

3

Menu item	Action	Choices
Adaptive maintenance timer (TTM)  	Select using arrow keys: AUTO: The interval stored in the ISM sensor is used. MAN: The interval is specified manually (0 ... 2000 days). Default TTM CYCLE: 365 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.		
	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 ◂ ▸, press **enter**.
3 Select sensor type using ▲ ▼ (eg, STANDARD). Press **enter**. The next menu item appears. Use the arrow keys ▲ ▼ for selection (see right-hand page). Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

3

Sensor type
Measuring mode
Polarization voltage during meas/cal
Membrane compensation
Type of temp probe
Temperature unit
Calibration mode air/water
Cal timer
Adaptive calibration timer
Adaptive maintenance timer
Cleaning cycles CIP
Sterilization cycles SIP
Autoclaving counter
Salinity
Pressure unit
Pressure correction

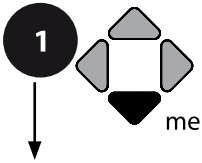
3

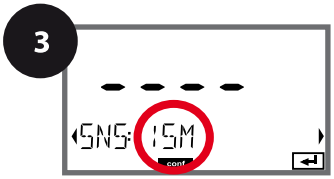
Menu item	Action	Choices
CIP counter 	Adjust CIP counter using ▲ ▼: OFF: No counter ON: Fixed cleaning cycle (adjust in the next step) Press **enter** to confirm.	ON **OFF**
CIP cycles 	Only with CIP COUNT ON: Enter max. number of cleaning cycles using ▲ ▼ ◀ ▶ keys Press **enter** to confirm.	**0000** … 9999 CYC
SIP counter 	Adjust SIP counter using ▲ ▼: OFF: No counter ON: Max. sterilization cycles (adjust as for CIP counter) Press **enter** to confirm.	ON **OFF**

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).

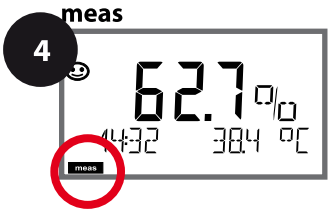
Oxy

ISM Sensor, Autoclaving Counter





1 Press **menu** key.
2 Select **CONF** using ◂ ▸, press **enter**.
3 Select **MEMOSENS** or **ISM** sensor type using ▲ ▼ keys, press **enter**. The next menu item appears.
Use the arrow keys ▲ ▼ for selection (see right-hand page).
Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.



3

Sensor type
Measuring mode
Polarization voltage during meas/cal
Membrane compensation
Type of temp probe
Temperature unit
Calibration mode air/water
Cal timer
Adaptive calibration timer
Adaptive maintenance timer
Cleaning cycles CIP
Sterilization cycles SIP
Autoclaving counter
Salinity
Pressure unit
Pressure correction

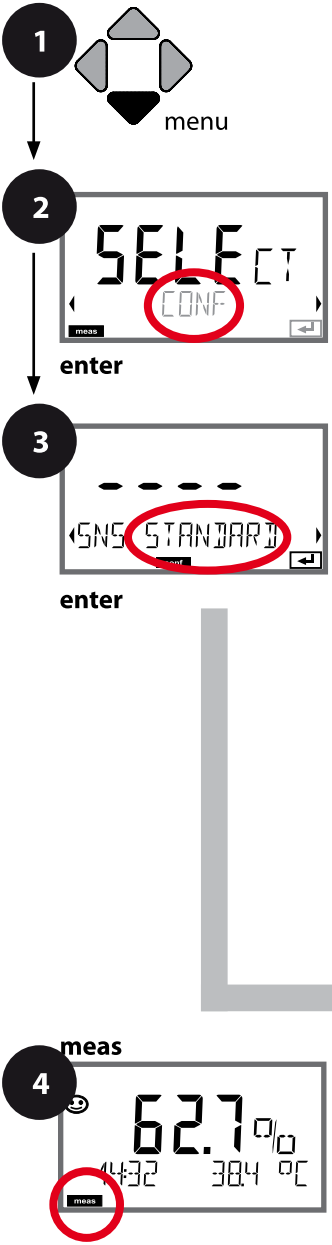
Autoclaving Counter

After reaching a specified limit value the autoclaving counter generates a Sensoface 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 autoclaving counter in the SENSOR service menu. The transmitter displays "INCREMENT AUTOCLAVE CYCLE" as confirmation.

3

Menu item	Action	Choices
Autoclaving counter 	Select using arrow keys: OFF: No counter ON: The cycles are specified manually (**0000** … 9999). Press **enter** to confirm.	ON **OFF** ***For ISM only***
With the autoclaving counter switched on, you must increment the count after each autoclaving process:		
Incrementing the autoclaving counter (SERVICE menu) 	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

Correction (Oxy), Salinity Correction, Pressure Correction

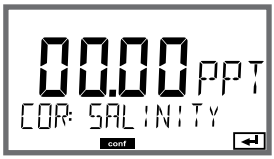
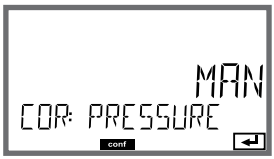


1 Press **menu** key.
2 Select **CONF** using ◂ ▸, press **enter**.
3 Select sensor type using ▲ ▼ (eg, STANDARD). Press **enter**. The next menu item appears. Use the arrow keys ▲ ▼ for selection (see right-hand page). Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

3

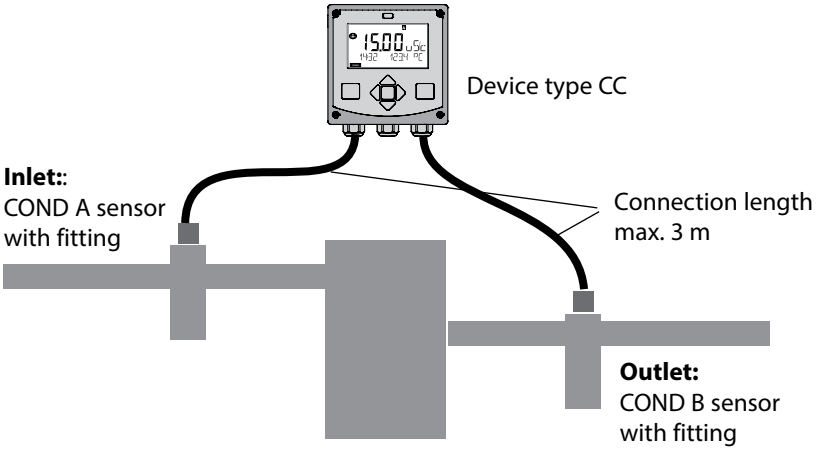
Sensor type
Measuring mode
Polarization voltage during meas/cal
Membrane compensation
Type of temp probe
Temperature unit
Calibration mode air/water
Cal timer
Adaptive calibration timer
Adaptive maintenance timer
Cleaning cycles CIP
Sterilization cycles SIP
Autoclaving counter
Salinity
Pressure unit
Pressure correction

3

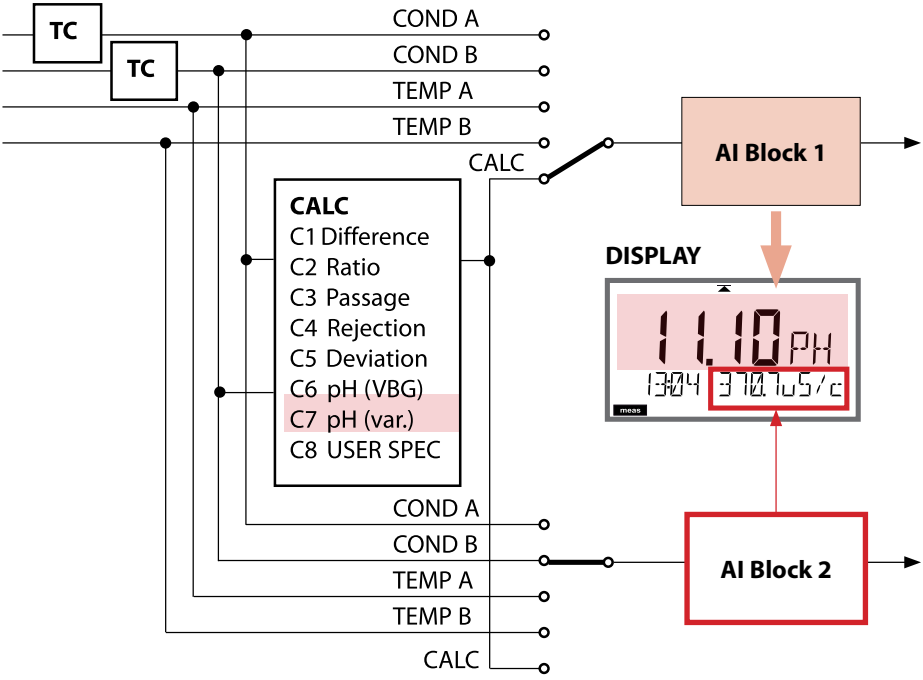
Menu item	Action	Choices
Salinity 	Adjust salinity correction using ▲ ▼: Press **enter** to confirm.	**00.00 ppt** xx.xx ppt
Pressure unit 	Select desired pressure unit using ▲ ▼. Press **enter** to confirm.	**BAR** KPA PSI
Pressure correction 	Select using ▲ ▼ keys: MAN: Manual input BUS: Value from AO block Press **enter** to confirm.	MAN BUS
Manual pressure input 	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** **100 KPA** **14.5 PSI**

CC

Sensors A and B – Arrangement



Channel selection and display assignment



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 VGB Alkalizing agent: NaOH	11+log ((COND A – COND B /3)/243)
-C7-	Variable pH value, factors specifiable (see also page 103)	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

*) Input of user-specific parameters possible

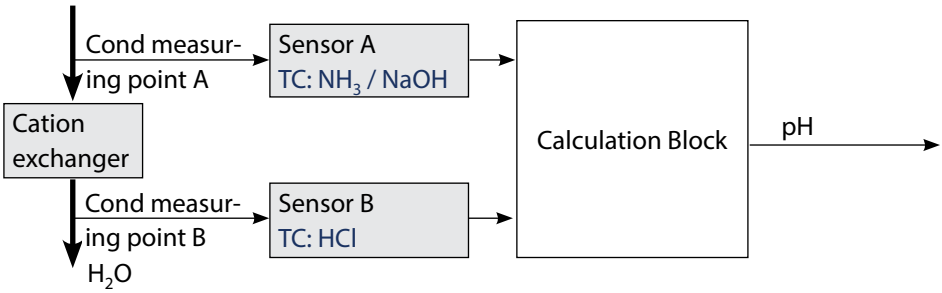
CC

Calculating the pH Value by Means of Dual Conductivity Measurement

When monitoring boiler feedwater in power plants, dual conductivity measurement can be used to calculate the pH value. 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.



Extract from VGB-S-006-00-2012-09-DE (Translation):

Calculated pH Value

To obtain a correct pH measurement, a great number of conditions must be observed. In practice, the pH value of the power plant feedwater is therefore calculated from the specific conductivity and the cation conductivity using the method described below.

When only one single alkalizing agent is used, such as ammonia, sodium hydroxide or lithium hydroxide, the pH in the range of 7.5 to 10.5 can be calculated as follows:

$$\mathrm{pH}_{\mathrm{NH_3}} = \log\left(\frac{\mathrm{X}_v - {}^1\!/_3\,\mathrm{X}_h}{273}\right) + 11$$

$$\mathrm{pH}_{\mathrm{NaOH}} = \log\left(\frac{\mathrm{X}_v - {}^1\!/_3\,\mathrm{X}_h}{243}\right) + 11$$

$$\mathrm{pH}_{\mathrm{LiOH}} = \log\left(\frac{\mathrm{X}_v - {}^1\!/_3\,\mathrm{X}_h}{228}\right) + 11$$

X_v = Conductivity

X_h = Cation conductivity

The conductivity values used for calculating the pH must be temperature compensated.

This calculation method is basically applicable. With increasing cation conductivity values, however, a decreasing accuracy must be tolerated.
(Translation of extract from VGB-S-006-00-2012-09-DE, pages 62, 63)

CC

Configuration			Choices DEFAULT **in bold**
BUS:	**ADDRESS**		0000 … **0126**
SENSOR A			
S_A:	**CELLFACTOR (A)**[1)]		0.0050 … 1.9999 **(0.0290)**
	TC SELECT (A)		**OFF** | LIN | nLF | nACL | HCL | nH3 | nAOH
	LIN	**TC LIQUID (A)**	00.00 … +19.99 %/K **(00.00 %/K)**
	LIN	**REF TEMP (A)**	-20 … 200 °C **(25.0 °C)** 4 … 392 °F **(077.0 °F)**
SENSOR B			
S_B:	**CELLFACTOR (B)**[1)]		0.0050 … 1.9999 **(0.0290)**
	TC SELECT (B)		**OFF** | LIN | nLF | nACL | HCL | nH3 | nAOH
	LIN	**TC LIQUID (B)**	00.00 … +19.99 %/K **(00.00 %/K)**
	LIN	**REF TEMP (B)**	-20 … 200 °C **(25.0 °C)** 4 … 392 °F **(077.0 °F)**
MEAS MODE			
MES:	**MEAS RANGE**[2)] (applies to channels A and B)		0.000 µS/cm **00.00 µS/cm** 000.0 µS/cm 0000 µS/cm 00.00 MΩ
	TEMP UNIT		**°C** | °F
	CALCULATION		ON | **OFF**
	ON		**-C1- DIFFERENCE** -C2- RATIO -C3- PASSAGE -C4- REJECTION -C5- DEVIATION -C6- PH VGB -C7- PH VARIABLE -C8- USER SPEC
	-C6-	**PH VGB**	**nAOH** | LiOH | nH3
	-C7-	**COEFFICIENT**	00.00 … 99.99 **(11.00)**
	-C7-	**FACTOR 1**	01.00 … 10.00 **(03.00)**
	-C7-	**FACTOR 2**	0100 … 0500 **(0243)**
	-C8-	**PARAMETER W**	xxxx E-3 **(1000 E-3)**
	-C8-	**PARAMETER A**	xxx.x E-3 **(000.0 E-3)**
	-C8-	**PARAMETER B**	xxxx E-4 **(000.0 E-4)**

Configuration		Choices DEFAULT **in bold**
IN:	**FLOW ADJUST**	0 … 20 000 l/L **(12 000 l/L)**
ALA:	**ALARM DELAY**	0 … 600 SEC **(010 SEC)**
	SENSOCHECK	ON | **OFF**
	HOLD	OFF | **LAST**
CLK:	**CLK FORMAT**	**24h** | 12h
	CLK TIME	hh:mm | hh.mm (A/M) **(00.00)**
	CLK DAY/MONTH	dd.mm **(01.01.)**
	CLK YEAR	yyyy **(2014)**

[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:

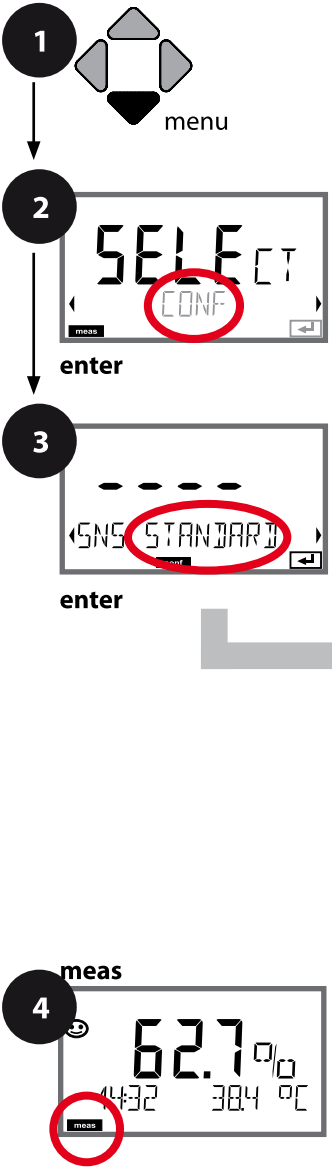
Selected resolution	Displayed range (or floating-point editor)			
	x.xxx µS/cm	xx.xx µS/cm	x.xxx µS/cm	xxxx µS/cm
x.xxx µS/cm				
xx.xx µS/cm				
xxx.x µS/cm				
xxxx µS/cm				

106 CC Configuration (Template for Copy)

CC

Parameter		Default	User setting
S_A:	Cell factor A	0.0290	
	Temperature compensation A	OFF	
	Temperature compensation, LINEAR	00.00%/K	
	Reference temperature, LINEAR	25.0 °C (77.0 °F)	
S_B:	Cell factor B	0.0290	
	Temperature compensation B	OFF	
	Temperature compensation, LINEAR	00.00%/K	
	Reference temperature, LINEAR	25.0 °C (77.0 °F)	
MES:	Measuring range	00.00 µS/cm	
	Temperature unit	°C	
	Calculation	OFF	
	CALCULATION ON	-C1- DIFFERENCE	
	-C6- PH VGB	nAOH	
	-C7- COEFFICIENT	11.00	
	-C7- FACTOR 1	03.00	
	-C7- FACTOR 2	0243	
	-C8- PARAMETER W	1000 E-3	
	-C8- PARAMETER A	000.0 E-3	
	-C8- PARAMETER B	000.0 E-4	
IN:	Flow meter (pulses/liter)	12 000 l/L	
ALA:	Delay	10 s	
	Sensocheck	OFF	
	HOLD mode	LAST	
CLK:	Time format	24h	
	Time hh/mm	00.00	
	Day/Month	01.01.	
	Year	2014	

Flow Measurement



1 Press **menu** key.
2 Select **CONF** using ◀ ▶, press **enter**.
3 Select sensor type using ▲ ▼ (eg, STANDARD). Press **enter**. The next menu item appears. Use the arrow keys ▲ ▼ for selection (see right-hand page). Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

3

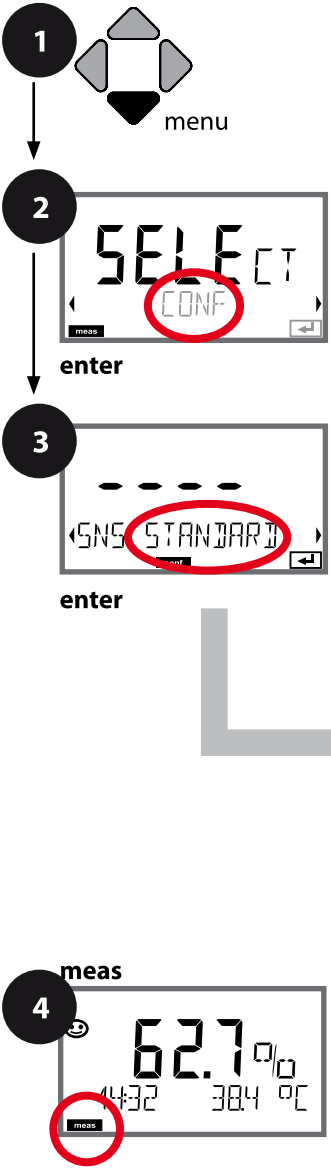
Menu item	Action	Choices
Adjust to flow meter: 	You must adjust the device to the flow meter used. Enter value using ▲ ▼ keys. Press **enter** to confirm.	0 … 20 000 pulses/liter **0 … 12 000 pulses/liter**

Display
Flow measurement in measuring mode

Display
Flow measurement (sensor monitor)

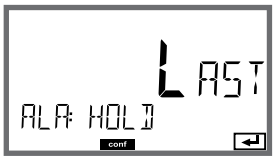
Note: The response speed may be reduced because the values are averaged.

Alarm, Alarm Delay, Sensocheck

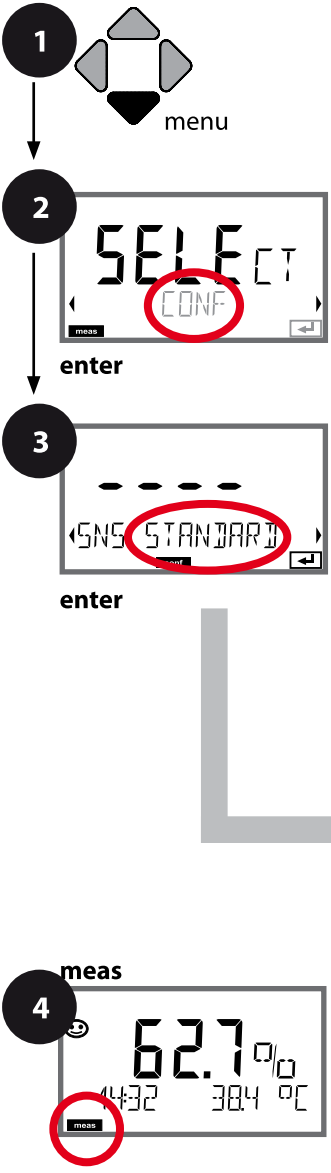


1 Press **menu** key.
2 Select **CONF** using ◀ ▶, press **enter**.
3 Select sensor type using ▲ ▼ (eg, STANDARD). Press **enter**. The next menu item appears. Use the arrow keys ▲ ▼ for selection (see right-hand page). Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

3

Menu item	Action	Choices
Alarm delay 	Enter alarm delay using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm. The alarm delay time delays the color change of the display backlighting to red.	0 … 600 SEC (**010 SEC**)
Sensocheck 	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**
HOLD 	Status of measured value during calibration OFF: Measured value and status are updated as usual. LAST: Measured value and status remain at their last value (Last Usable Value).	OFF **LAST**

Setting the Time and Date



1 Press **menu** key.
2 Select **CONF** using ◀ ▶, press **enter**.
3 Select sensor type using ▲ ▼ (eg, STANDARD). Press **enter**. The next menu item appears. Use the arrow keys ▲ ▼ for selection (see right-hand page). Confirm (and proceed) by pressing **enter**.
4 Exit: Press **meas** key until the [meas] mode indicator is displayed.

3

Menu item	Action	Choices
Time format	Select time format using ▲ ▼ keys. Press **enter** to confirm.	**24h** 12h
Time	Enter time using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	hh:mm hh.mm (A/M) **00.00**
Day and month	Enter day and month using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	dd.mm **01.01.**
Year	Enter year using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	yyyy **2014**

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 and the correct date.
- There is no automatic switchover from winter to summer time!
  Be sure to manually adjust the time!

pH

Please 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.

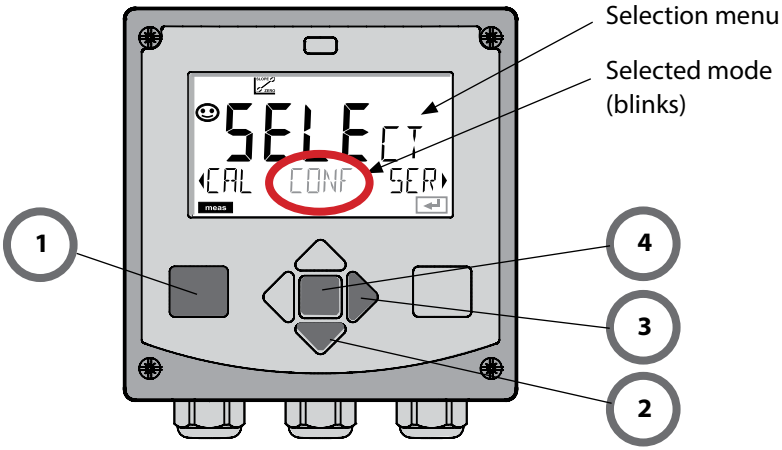
When using ISFET sensors or sensors with a zero point other than pH 7, the nominal zero point must be adjusted each time a new sensor is connected. This is important if you want to obtain reliable Sensoface messages. The Sensoface messages issued during all further calibrations are based on this basic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

CAL_PH	Depending on configuation 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	

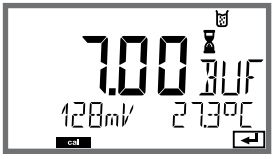
To preset CAL_PH (CONF menu / configuration):

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.



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
	Select Calibration. Press **enter** to proceed.	
	Ready for calibration. Hourglass blinks.	Display (3 sec)
	Immerse sensor in a pH 7.00 buffer. Enter the temperature-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.
	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.

Display	Action	Remark
	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.
	Use the arrow keys to select: • Repeat (repeat calibration) or • Measure Press **enter** to confirm.	
	Place sensor in process. Press **enter** to exit zero calibration.	

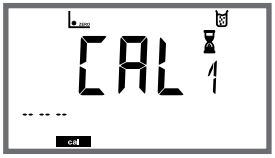
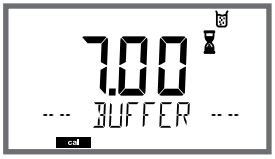
Note for Zero Adjustment

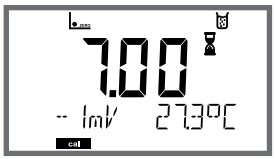
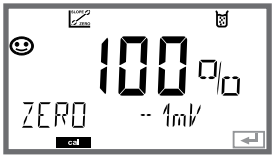
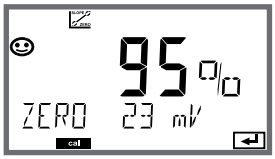
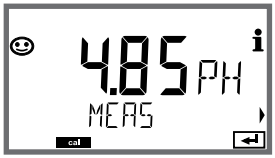
After having adjusted the zero offset, be sure to calibrate the sensor following one of the procedures as described on the next pages.

118 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.

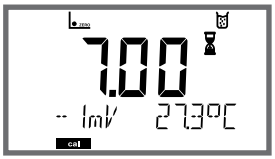
Display	Action	Remark
	Select Calibration. Press **enter** to proceed.	
	Ready for calibration. Hourglass blinks. Select calibration method: CAL_PH Press **enter** to proceed.	Display (3 sec)
	Remove the sensor, clean it, and immerse it in the first buffer solution (it does not matter which solution is taken first). Press **enter** to start.	
	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.
	Buffer recognition terminated, the nominal buffer value is displayed, then zero point and temperature.	

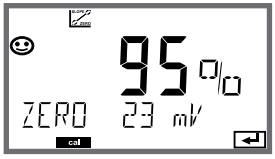
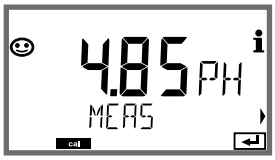
Display	Action	Remark
	Stability check. The measured value [mV] is displayed, "CAL2" and "enter" are blinking. Calibration with the first buffer is terminated. Remove the sensor from the first buffer solution and rinse it thoroughly. **Use the arrow keys to select:** • END (1-point cal) • CAL2 (2-point 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.	When 2-point cal is exited:

120 pH: Manual Calibration

pH

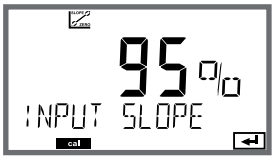
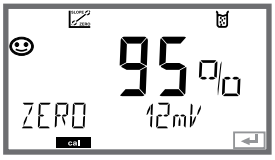
The MAN calibration mode and the type of temperature detection are selected during **configuration**. For calibration with manual buffer specification, you must enter the pH value of the buffer solution used in the device for the proper temperature. Any desired buffer solution can be used for calibration.

Display	Action	Remark
	Select Calibration. Press **enter** to proceed.	
	Ready for calibration. Hourglass blinks.	Display (3 sec)
	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.
  	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.

Display	Action	Remark
	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: Sensoface is active. Exit by pressing **enter**
	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.
	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).
	**Use the arrow keys to select:** • MEAS (exit) • REPEAT Press **enter** to proceed.	When 2-point cal is exited:

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
	Select Calibration. Press **enter** to proceed.	
	"Data Input" Ready for calibration. Hourglass blinks.	Display (3 sec)
	Enter asymmetry potential [mV]. Press **enter** to proceed.	
	Enter slope [%].	
	The device displays the new slope and asymmetry potential (at 25 °C). Sensoface is active.	
	Use the arrow keys to select: • MEAS (exit) • REPEAT Press **enter** to proceed.	

Slope: Converting % to mV

Converting Slope [%] to Slope [mV] at 25 °C

%	mV
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

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

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 – eg, 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 Commonly Used 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

Display	Action	Remark
	Select ORP calibration, proceed with **enter**	
	Remove the sensor and temperature probe, clean them, and immerse them in the redox buffer.	Display (3 sec)
	Enter setpoint value for redox buffer. Press **enter** to proceed.	
	The ORP delta value is displayed (based on 25°C). Sensoface is active. Press **enter** to proceed.	
	To repeat calibration: Select REPEAT. To exit calibration: Select MEAS, then **enter**	

Product Calibration

pH | Oxy | Cond

(Example: pH)

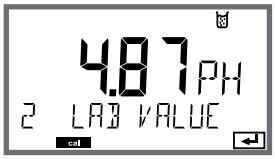
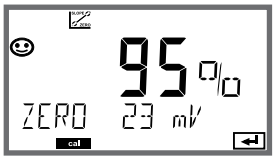
Calibration by sampling (one-point calibration).
During product calibration the sensor remains in the process.
The measurement process is only interrupted briefly.

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
	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.
	Ready for calibration. Hourglass blinks. Press **enter** to proceed.	Display (3 sec)
	Take sample and save value. Press **enter** to proceed.	Now the sample can be measured in the lab.

Display	Action	Remark
	The device returns to measuring mode.	From the blinking CAL mode indicator, you see that product calibration has not been terminated.
	Product calibration step 2: When the sample value has been determined, open the product calibration once more (P_CAL).	Display (3 sec)
	The stored value is displayed (blinking) and can be overwritten with the measured sample value. Press **enter** to proceed.	
	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.		

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 (eg, 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.

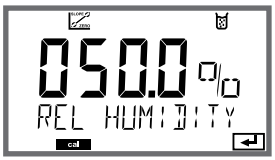
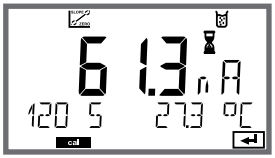
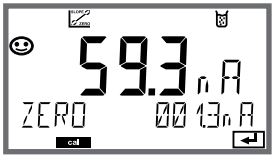
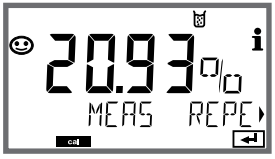
Common Combination: Process Variable / Calibration Mode

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

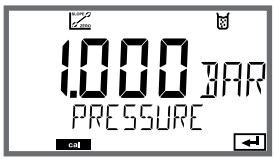
Below, the calibration procedure for a slope calibration in air is described. Of course, other combinations of process variable and calibration mode are possible.

Slope Calibration in Air

Oxy

Display	Action	Remark
	Select calibration. Place sensor in air, press **enter** to start.	"Medium water" or "Medium air" is selected in the configuration.
	Enter relative humidity using **arrow keys** Press **enter** to proceed.	Default for relative humidity in air: rH = 50%
	Enter cal pressure using **arrow keys**. Press **enter** to proceed.	Default: **1.000 bar** Unit: bar/kpa/PSI
	Drift check: Display of: sensor current (nA), response time (s), temperature (°C/°F) Press **enter** to proceed.	The drift check can take some minutes.
	Display of calibration data (slope and zero). Press **enter** to proceed.	
	Display of selected process variable (here: %vol). MEAS exits calibration, REPEAT permits repetition.	

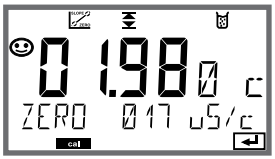
Slope Calibration in Water

Display	Action	Remark
	Select calibration (SLOPE). Immerse sensor in cal medium, start with **enter**	"Medium water" or "Medium air" is selected in the configuration.
	Enter cal pressure Press **enter** to proceed.	Default: **1.000 bar** Unit: bar/kpa/PSI
	Drift check: Display of: sensor current (nA), response time (s), temperature (°C/°F)	The drift check might take some time.
	Display of calibration data (slope and zero) and Sensoface Press **enter** to proceed.	Related to 25 °C and 1013 mbar
	Display of selected process value. To exit calibration: Select MEAS ◂ ▸, then **enter**	To repeat calibration: Select REPEAT ◂ ▸, then **enter**
	Place sensor in process. End of calibration	

Conductivity: Calibration

Cond

Input of temperature-corrected value of calibration solution with simultaneous display of cell factor (cell constant).

Display	Action	Remark
	Select Calibration. Press **enter** to proceed. Select CAL_SOL calibration method. Press **enter** to proceed.	
	Ready for calibration. Hourglass blinks.	Display (3 sec)
	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
	Contacting conductivity measurement (COND) The determined cell factor is displayed. The "hourglass" icon is blinking. Proceed by pressing **enter**	
	**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
	Display of selected process variable (here: mS/cm). MEAS exits calibration, REPEAT permits repetition.	
	With MEAS selected: Press **enter** to exit calibration.	Display of conductivity and temperature, Sensoface is active. 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.

134 Inductive Conductivity: Calibration

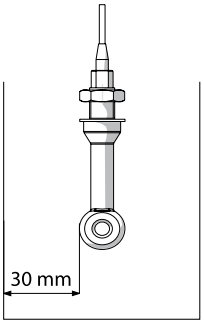
CondI

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



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 sampling (product calibration) or in a suitable calibration beaker with dimensions and material corresponding to the process conditions.

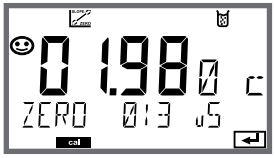
Selecting a Calibration Mode

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

Calibration by Input of Cell Factor

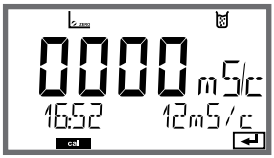
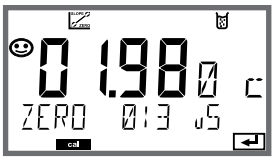
You can directly enter the value for the cell factor of a sensor. The value must be known, eg, determined beforehand in the laboratory. The selected process variable and the temperature are displayed. This method is suitable for all process variables.

Display	Action	Remark
	Select Calibration. Press **enter** to proceed. Select CAL_CELL calibration method. Press **enter** to proceed.	
	Ready for calibration. Hourglass blinks.	Display (3 sec)
	Enter cell factor. Press **enter** to proceed.	The selected process variable and the temperature are displayed.
	The device shows the calculated cell factor and zero point (at 25 °C). Sensoface is active.	
	Use the arrow keys to select: • MEAS (exit) • REPEAT Press **enter** to proceed.	

Please refer to the Specifications for the nominal cell factor.
When measuring in a restricted space, the individual cell factor must be determined.

Condl

Zero Calibration in Oxygen-Free Gas

Display	Action	Remark
	Select Calibration. Press **enter** to proceed. Select CAL_ZERO calibration method. Press **enter** to proceed.	
	Ready for calibration. Hourglass blinks.	Display (3 sec)
	**Calibration in oxygen-free gas (e.g., nitrogen)** Edit digits until the lower display indicates Zero Press **enter** to proceed.	
	The device shows the cell factor (at 25 °C) and the zero point. Sensoface is active.	
	Use the arrow keys to select: • MEAS (exit) • REPEAT Press **enter** to proceed.	

Display	Remark
 or AM/PM and °F: 	From the configuration or calibration menus, you can switch the device to measuring mode by pressing the **meas** key. In the measuring mode the upper display line shows the configured process variable (pH, ORP [mV] or temperature), the lower display line shows the time and the second configured process variable (pH, ORP [mV] or temperature). The [meas] mode indicator lights. **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 and the correct date.

By pressing the **meas** key you can step through the following displays.

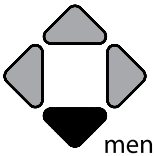
1) Primary process value
2) Secondary process value
3) Flow
4) Pressure (Oxy only)
5) Calculation (Cond-Cond only)
6) Measured value of sensor A (Cond-Cond only)
7) Measured value of sensor B (Cond-Cond only)
8) Time and date

When no key has been pressed for 60 sec, the device returns to MAIN DISPLAY.

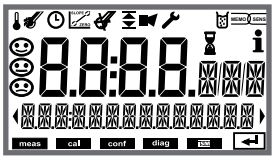
In the Diagnostics mode you can access the following menus without interrupting the measurement:

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

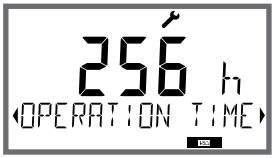
Access to diagnostics can be protected with a passcode (SERVICE menu).

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 ◀ ▶ keys to select the desired parameter from the bottom line of the display: LAST_CAL, ISFET-ZERO, ZERO, SLOPE or 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). 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**.

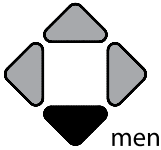
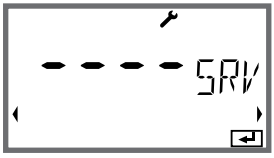
Display	Menu item
	**Device self-test** (To abort, you can press **meas**.) 1) **Display test**: Display of all segments with changing background colors (white/green/red). Proceed by pressing **enter**
	2) **RAM test:** Hourglass blinks, then display of --PASS-- or --FAIL-- Proceed by pressing **enter**
	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**

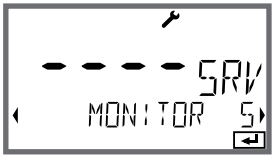
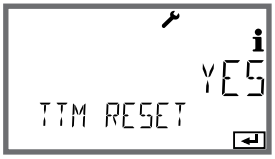
Display	Menu item
	Displaying the logbook entries Select LOGBOOK using ◀ ▶, press **enter** to confirm. With the ▲ ▼ keys, you can scroll backwards and forwards through the **Audit Trail** log (entries 00 … 99), 00 being the last entry.
	If the display is set to date/time, you can search for a particular 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. In addition, function activations (CAL, CONFIG, SERVICE), some Sensoface messages (cal timer, wear), and opening of the enclosure (door contact) can be displayed.
	Press **meas** to return to measurement.

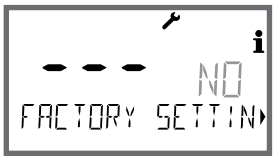
Display	Menu item
	Sensor monitor: Displaying the currently measured values (example: pH) Select MONITOR using ◀ ▶, press **enter** to confirm. Use the ◀ ▶ keys to select the desired parameter from the bottom line of the display: mV_PH, mV_ORP, RTD, TEMP, R_GLASS, R_REF or FLOW. For digital sensors in addition: OPERATION TIME, SENSOR WEAR, LIFETIME, CIP, SIP and AUTOCLAVE. For ISM sensors in addition: ACT (adaptive calibration 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: 	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)
	Display of remaining dynamic lifetime (only for digital sensors, however not for MEMOSENS)
	Display of sensor operating time (for digital sensors only)
	Version Display of **device type, software/hardware version** and **serial numbe**r for all device components. Use the ▲ ▼ keys 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:

SENSOR	ISM only: Resetting the adaptive maintenance timer, incrementing the autoclaving counter
DEVICE TYPE	Selecting the measuring function
MONITOR	Displaying currently measured values
SIMULATE	Activating/deactivating the simulation mode
CODES	Assigning and editing passcodes
DEFAULT	Resetting the device to factory settings

Action	Key/Display	Remark
Activate Service		Press **menu** key to call the selection menu. Select SERVICE using ◀ ▶ keys, press **enter** to confirm.
Passcode		Enter passcode "5555" for service mode using the ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.
Display		Service mode is indicated by the **Service** (wrench) icon.
Exit	**meas**	Exit by pressing **meas**.

Menu item	Remark
	**Displaying the currently measured values (sensor monitor)** Select MONITOR using ◂ ▸, press **enter** to confirm. Select the process variable in the bottom text line using ◂ ▸. The selected variable is shown in the main display. 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".

Menu item	Remark
	Assigning passcodes: In the "SERVICE - CODES" menu you can assign passcodes to DIAG, 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.
	**Reset to factory settings:** In the "SERVICE - DEFAULT" menu you can reset the device to factory settings. **NOTICE!** After a reset to factory setting the device must be reconfigured completely, including the sensor and Fieldbus parameters!
	Device type: Changing the measuring function, eg, after having replaced a Memosens sensor.
	Simulation: Enabling simulation on the Fieldbus.

pH

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 03	CANCELED SENSOR	**Sensor devaluated**
ERR 04	SENSOR FAILURE	**Failure in sensor**
ERR 05	CAL DATA	**Error in cal data**
ERR 10	ORP RANGE	**ORP display range violation**
ERR 11	PH RANGE	**pH display range violation**
ERR 12	MV RANGE	**mV range**
ERR 13	TEMPERATURE RANGE	**Temperature range violation**
ERR 15	SENSOCHECK GLASS-EL	**Sensocheck glass**
ERR 16	SENSOCHECK REF-EL	**Sensocheck ref.**
ERR 69	TEMP. OUTSIDE TABLE	**Temperature value outside table**

Error	Info text (is displayed in case of fault when the Info key is pressed)	Problem Possible causes
ERR 94	FB BLOCK ALARM	**Alarm in function block** eg, target and actual mode do not match or Al limits are exceeded
ERR 95	SYSTEM ERROR	**System error** Restart required. If error still persists, send in the device for repair.
ERR 96	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 97	NO MODULE INSTALLED	**No module** Module, inserting
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	**Factory settings error**
ERR 102	FAILURE BUFFERSET -U1-	**Parameter error** Specifiable buffer set U1

Cond

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 03	CANCELED SENSOR	**Sensor devaluated**
ERR 04	SENSOR FAILURE	**Failure in sensor**
ERR 05	CAL DATA	**Error in cal data**
ERR 10	CONDUCTANCE TOO HIGH	**Conductance range exceeded** Conductance > +3500 mS
ERR 11	RANGE CONDUCTIVITY RANGE CONCENTRATION RANGE SALINITY LIMIT USP	**Measuring range violation** Conductivity > +999.9 mS/cm or > +99.99 S/m or < 1 MΩ cm Concentration > Table limit (see page 278 et seq.) Salinity > 45.0 ‰ Conductivity ≥ USP limit value
ERR 13	RANGE TEMPERATURE	**Temperature range violation** (see page 253)
ERR 15	SENSOCHECK	**Sensocheck**

Error	Info text (is displayed in case of fault when the Info key is pressed)	Problem Possible causes
ERR 94	FB BLOCK ALARM	**Alarm in function block**
ERR 95	SYSTEM ERROR	**System error** Restart required. If error still persists, send in the device for repair.
ERR 96	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 97	NO MODULE INSTALLED	**No module** Module, inserting
ERR 98	CONFIGURATION FAILURE	**Error in configuration or calibration data** Configuration or calibration data defective; completely reconfigure and recalibrate the device.
ERR 99	SYSTEM FAILURE	**Factory settings error**

Condl

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 03	CANCELED SENSOR	**Sensor devaluated**
ERR 04	SENSOR FAILURE	**Failure in sensor**
ERR 05	CAL DATA	**Error in cal data**
ERR 10	CONDUCTANCE TOO HIGH	**Conductance range exceeded** Conductance > +3500 mS
ERR 11	RANGE CONDUCTIVITY RANGE CONCENTRATION RANGE SALINITY	**Measuring range violation** Conductivity > +1999 mS/cm or > +99.99 S/m or < 1 MΩ cm Concentration > Table limit (see page 278 et seq.) Salinity > 45.0 ‰
ERR 13	RANGE TEMPERATURE	**Temperature range violation** (see page 253)
ERR 15	SENSOCHECK	**Sensocheck**
ERR 69	TEMP. OUTSIDE TABLE	**Temperature value outside table**

Error	Info text (is displayed in case of fault when the Info key is pressed)	Problem Possible causes
ERR 94	FB BLOCK ALARM	**Alarm in function block**
ERR 95	SYSTEM ERROR	**System error** Restart required. If error still persists, send in the device for repair.
ERR 96	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 97	NO MODULE INSTALLED	**No module** Module, inserting
ERR 98	CONFIGURATION FAILURE	**Error in configuration or calibration data** Configuration or calibration data defective; completely reconfigure and recalibrate the device.
ERR 99	SYSTEM FAILURE	**Factory settings error**
ERR 100 … **ERR 255**	VOID PARAMETER	**Invalid parameter**

Oxy

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 03	CANCELED SENSOR	**Sensor devaluated**
ERR 04	SENSOR FAILURE	**Failure in sensor**
ERR 05	CAL DATA	**Error in cal data**
ERR 11	RANGE DO SATURATION RANGE DO CONCENTRATION RANGE GAS CONCENTRATION	**Display range violation** SAT saturation [%] or CONC concentraton or GAS volume concentration
ERR 12	RANGE SENSOR CURRENT	**Sensor current exceeded**
ERR 13	TEMPERATURE RANGE	**Temperature range violation**
ERR 14	OUT OF INTERNAL TABLE	**Tables exceeded**
ERR 15	SENSOCHECK	**Sensocheck**
ERR 17	OUT OF CAL TIME CALIBRATE OR CHANGE SENSOR	**Cal timer expired** (ACT for ISM)
ERR 18	SENSOR ZERO/SLOPE CALI-BRATE OR CHANGE SENSOR	**Cal timer expired** (ACT for ISM)

Error	Info text (is displayed in case of fault when the Info key is pressed)	Problem Possible causes
ERR 20	SENSOR DRIFT CALIBRATE OR CHANGE SENSOR	**Sensor response**
ERR 21	SENSOR WEAR CHECK ELECTROLYTE AND MEMBRANE	**Memosens sensor wear**
ERR 22	CIP-CYCLES OVERRUN	**CIP cycles exceeded**
ERR 23	SIP-CYCLES OVERRUN	**SIP cycles exceeded**
ERR 24	ZERO xx.xx nA	**Zero**
ERR 25	SLOPE xxxx nA	**Slope**
ERR 26	TMAX xxx.x °C	**Max. temp (CIP/SIP)**

Oxy

Error	Info text (is displayed in case of fault when the Info key is pressed)	Problem Possible causes
ERR 94	FB BLOCK ALARM	**Alarm in function block**
ERR 95	SYSTEM ERROR	**System error** Restart required. If error still persists, send in the device for repair.
ERR 96	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 97	NO MODULE INSTALLED	**No module** Module, inserting
ERR 98	CONFIGURATION FAILURE	**Error in configuration or calibration data** Configuration or calibration data defective; completely reconfigure and recalibrate the device.
ERR 99	SYSTEM FAILURE	**Factory settings error**
ERR 102	INVALID PARAMETER U-POL	**Parameter error** Polarization voltage
ERR 103	INVALID PARAMETER MEMBR. COMP	**Parameter error** Membrane correction

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 03	CANCELED SENSOR	**Sensor devaluated**
ERR 04	SENSOR FAILURE	**Failure in sensor**
ERR 05	CAL DATA	**Error in cal data**
Channel A		
ERR 10	A CONDUCTANCE TOO HIGH	**Conductance value out of range: > 250 mS**
ERR 11	A RANGE CONDUCTANCE	**Cond > 9999 µS/cm or < 0.1 kΩ cm**
ERR 13	A TEMPERATURE RANGE	**Temperature range violation**
ERR 15	A SENSOCHECK	**Sensocheck**
Channel B		
ERR 40	B CONDUCTANCE TOO HIGH	**Conductance value out of range: > 250 mS**
ERR 41	B RANGE CONDUCTANCE	**Cond > 9999 µS/cm or < 0.1 kΩ cm**
ERR 43	B TEMPERATURE RANGE	**Temperature range violation**
ERR 45	B SENSOCHECK	**Sensocheck**
ERR 59	INVALID CALCULATION	**Invalid calculations**

CC

Error	Info text (is displayed in case of fault when the Info key is pressed)	Problem Possible causes
ERR 94	FB BLOCK ALARM	**Alarm in function block**
ERR 95	SYSTEM ERROR	**System error** Restart required. If error still persists, send in the device for repair.
ERR 96	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 97	NO MODULE INSTALLED	**No module** Module, inserting
ERR 98	CONFIGURATION FAILURE	**Error in configuration or calibration data** Configuration or calibration data defective; completely reconfigure and recalibrate the device.
ERR 99	SYSTEM FAILURE	**Factory settings error**

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.

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).

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.

Standard Version	Order no.
Stratos Pro A231N (basic unit for measurement with digital sensors)	A231N
Interchangeable modules for measurement with analog sensors	
pH	MK-PH015N
Oxy	MK-OXY045N
Cond	MK-COND025N
CondI	MK-CONDI035N
CC	MK-CC065N

Version for hazardous areas	Order no.
Stratos Pro A231X (basic unit for measurement with digital sensors)	A231X
Interchangeable modules for measurement with analog sensors	
pH, Ex	MK-PH015X
Oxy, Ex	MK-OXY045X
Cond, Ex	MK-COND025X
CondI, Ex	MK-CONDI035X

Accessories	Order No.
Pipe-mount kit	ZU 0274
Panel-mount kit	ZU 0738
Protective hood	ZU 0737

Please contact us for further information or if you have any questions concerning our product range:

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Introduction

The FOUNDATION Fieldbus (FF) can be flexibly used in process, building and manufacturing automation. Fieldbuses replace conventional 4-20 mA technology and enable bidirectional data transmission. The entire communication between the devices and the automation system as well as the process control station takes place over the bus system, and all operating and device data are exclusively transmitted over the fieldbus.

Aims and Advantages of Fieldbus Technology

- Simplified commissioning and configuration
- Evaluation of diagnostics data
- Reduced installation costs
- Simplified planning
- Safe operation
- Additional features

Important Features

- Powering the field devices via the bus
- Intrinsic safety for application in hazardous locations
- Devices can be disconnected from and reconnected to the bus during operation
- Up to 32 devices per Fieldbus segment
- Communication according to IEC 61158-2
- Transfer rate 31.25 kbits/s
- "Publisher/Subscriber" mode of operation
- Tree, line or star topology

Device Certification

The FOUNDATION Fieldbus is an open bus standard which enables devices of different manufacturers to be integrated in one system. This is only feasible when all the devices exactly meet the specification. The devices are therefore certified by the FOUNDATION Fieldbus organization.

Basic Knowledge Required
The user should have a basic working knowledge of FOUNDATION Fieldbus communication. This is particularly required for configuration and operation.

Device Descriptions
The Device Descriptions (DD) contain all necessary information to correctly interpret the device data. Predefined device descriptions (Standard DD) describe the most important parameters. Device-specific functions and parameters are defined in an extended device description.

Signal Processing
The signal coming from the sensor is first processed in the Transducer Block. The results are transferred to a function block. The function block processes the process value (input parameter) using defined algorithms, releasing it for use by other function blocks.

Device Types
The "Data Link Layer" of the Fieldbus Foundation protocol defines 3 device types:
- The **Active Link Master** plans all activities as "Link Active Scheduler" (LAS). It controls the complete data traffic on the bus. Several Link Masters on one bus increase safety, but only one is active at a time.
- **Basic devices** are peripheral devices such as valves, drives, transmitters or analyzers. They can react acyclically to servicing, configuration and diagnostic tasks of the master. The Link Master cyclically reads the measurement data with status.
- **Bridges** can connect a network from different bus systems.

Central Communication Control (Link Active Scheduler)
The Link Active Scheduler (LAS) controls and schedules the communication on the bus. The LAS controls the bus activities using specific commands which it broadcasts to the fieldbus devices. Since the LAS also polls unassigned device addresses, it is possible to integrate devices during operation. Devices that are capable of becoming the LAS are called "Link Masters".

Types of Communication
The FOUNDATION Fieldbus (FF) uses two types of communication:

- **Cyclic Services** (Scheduled Communication) are used to transmit measurement data with status information. The Link Active Scheduler maintains a list of transmission times for all data in all devices that need to be cyclically transmitted. When it is time to transmit data, the LAS issues a "Compel Data (CD)" start signal to the respective device. Upon receipt of the "Compel Data" signal, the device broadcasts the data to all devices on the fieldbus.
- **Acyclic Services** (Unscheduled Communication) are used for device configuration, remote maintenance and diagnostics during operation. Each device can send acyclic messages during the cyclic data exchange. The LAS grants permission to a device to broadcast acyclic messages by issuing a "Pass Token (PT)" message. Upon receipt of the "Pass Token", the device starts data transmission.

The Block Model

The device parameters in the FOUNDATION Fieldbus protocol are assigned to different block types according to their characteristics. The different block types contain parameter groups and their functions.

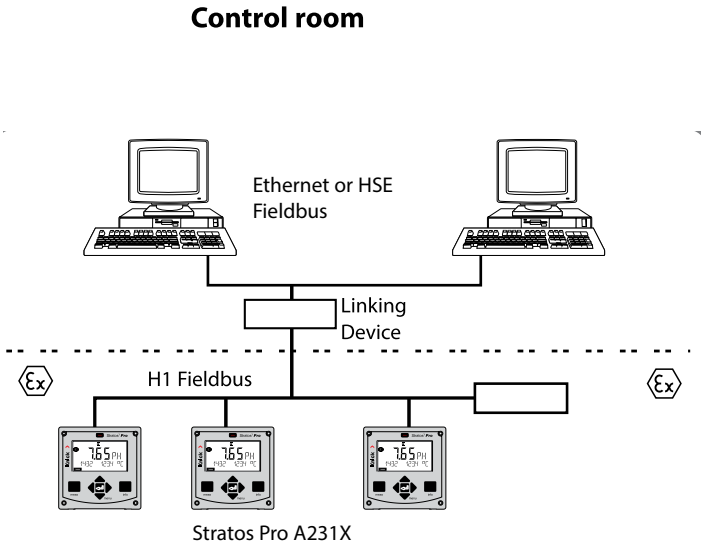
The FF protocol contains:

- a **Resource Block**
- One or more **Function Blocks**
- One or more **Transducer Blocks**

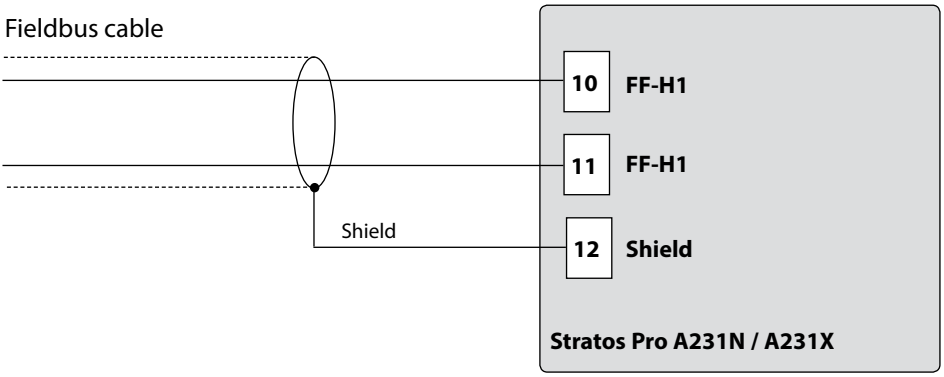
The Stratos Pro A231N / A231X consists of the following blocks:

- 1 x Resource Block
- 1 x Transducer Block (AITB)
- 10 Function Blocks, consisting of:
  - 8 x AI (Analog Input)
  - 1 x AO (Analog Output)
  - 1 x DI (Digital Input)

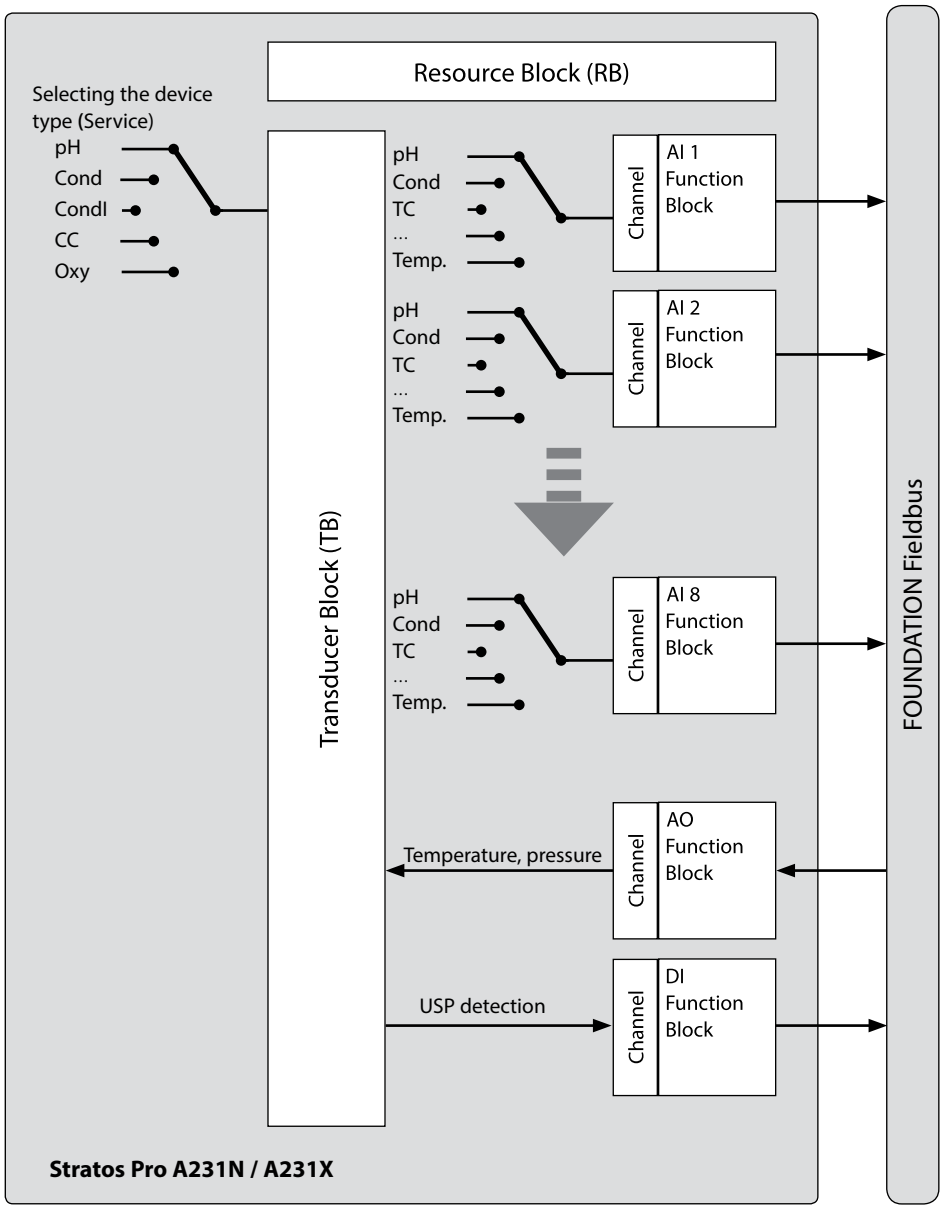
Typical Configuration



In hazardous locations the electrical connections to the FOUNDATION Fieldbus are made in accordance with FISCO.
(FISCO = Fieldbus Intrinsically Safe Concept, www.fieldbus.org)



Schematic Diagram of Block Types



Resource Block (RB)

The resource block contains device-specific information, which clearly identifies a device, such as:

- Device name and manufacturer
- Device type

Block Status

The RS_STATE parameter indicates the operating status of the resource block:

- Standby The resource block is in OOS (out of service) mode. The other blocks cannot be executed.
- Online The resource block is in **Auto** mode, which is the normal state.

Write Protection

With the WRITE_LOCK parameter, you can set a write protection for the device:

- UNLOCKED Device can be written to (default)
- LOCKED Device is locked.

Key Lock

With the DEVICE_LOCK parameter, you can set a key lock in the CAL, CONF, and SERVICE modes.

- UNLOCKED Device can be operated via keypad.
- LOCKED Key lock is active.

Transducer Block (TB)

The transducer block contains all device information, such as calibration data and sensor type. A device may have several transducer blocks, eg, for diagnostic, process variable or display.
The transducer block provides for acyclic data transmission. Calibration, configuration, and maintenance commands coming from the control station are processed in the transducer block.
The sensor signal is first preprocessed in the transducer block. From here, the measured value is sent to the Analog Input blocks where it can be further processed (limit values, scaling).

You can use transducer blocks to manipulate the input and/or output parameters of a function block. Examples are:

- Calibration of measuring data
- Product calibration
- Parameter setting
- Logbook
- Sensor diagnostics

In the transducer block you can configure the device via Fieldbus.

Signal Processing

The process variables are assigned to specific channels and are connected to input function blocks (AI).

Operating Mode

The MODE_BLK MODE_BLK is used to configure the operating mode:

- Automatic
- OOS (out of service)
- Manual

Function Block (FB)

Function blocks describe a device's tasks and functions, which are controlled by the transmission schedules.
The FOUNDATION Fieldbus specification has defined sets of standard function blocks which can be used to describe all basic functions, eg:

- Analog Input (AI)
- Analog Output (AO)
- Digital Input (DI)
- Digital Output (DO)

Analog Input (AI)

The AI function block is a universal interface for transmitting the process variable to the fieldbus. AI function blocks allow simulating the input and output of the function block. They are used for cyclic transmission of measured values.

Selecting the Process Variables and Units

The process variables of the Transducer Block are assigned to the function block via the **Channel** parameter. The corresponding measurement unit is selected in the XD_SCALE parameter or the UNITS sub-parameter.

Measured Value Status

The application process provides a status for each measured value. This status must be represented/modified by the fieldbus processor using standardized, fieldbus-specific processes. There are additional conditions that change the status.

AI Blocks for pH

Process variable	FF channel	FF unit
pH value	1	pH = 1422
pH voltage	2	mV = 1243
ORP	3	mV = 1243
Glass impedance	4	Ω = 1281
Reference impedance	5	Ω = 1281
Temperature	6	°C = 1001 °F = 1002
Slope	7	% = 1342
Zero point	8	mV = 1243
Cal timer	9	h = 1059
Wear	10	% = 1342
Flow	11	l/h = 1353

AI Blocks for Cond

Process variable	FF channel	FF unit
Conductivity	16	µS/cm = 1586
Temperature	6	°C = 1001 °F = 1002
Concentration	18	% = 1342
Salinity	19	g/kg = 65522
TDS	20	mg/l = 65523
Resistivity	21	MΩ * cm = 1587
Cell constant	22	1/cm = 1607
Flow	11	l/h = 1353

CondI Oxy

AI Blocks for CondI

Process variable	FF channel	FF unit
Conductivity	16	µS/cm = 1586
Temperature	6	°C = 1001 °F = 1002
Concentration	18	% = 1342
Salinity	19	g/kg = 65522
TDS	20	mg/l = 65523
Cell factor	22	1/cm = 1607
Zero point	8	µS = 1290
Flow	11	l/h = 1353

AI Blocks for Oxy

Process variable	FF channel	FF unit
Saturation	12	% = 1342
Concentration	13	ppm = 1423 mg/l = 65523
Vol. concentration	14	%vol = 65526
Partial pressure	15	mbar = 1138
Temperature	6	°C = 1001 °F = 1002
Slope	7	nA = 1213
Zero point	8	nA = 1213
Cal timer	9	h = 1059
Wear	10	% = 1342
Flow	11	l/h = 1353

AI Blocks for Cond-Cond

Process variable	FF channel	FF unit
Conductivity A	23	µS/cm = 1586
Temperature A	6	°C = 1001 °F = 1002
Conductivity B	24	µS/cm = 1586
Temperature B	26	°C = 1001 °F = 1002
Cell factor A	22	1/cm = 1607
Cell factor B	8	1/cm = 1607
Flow	11	l/h = 1353
Compensation	25	Without = 0
Resistivity A	21	1587
Resistivity B	27	1587

Analog Output (AO)

The AO function block sends the value specified by the Fieldbus to the device. You can enter a temperature or pressure value, for example, which is then used by the device.

Channel no.	Module type	Text	Info	XD_SCALE
30	PH, COND, CONDI, OXY	Temperature		°C, °F
31	OXY	Pressure		mbar, hPa, psi

DO Block
The two DO blocks are not executed.

Digital Input (DI Block)
The digital input is used for USP detection (with Cond only, "good"/"bad" assessment of water quality).

Channel	Text
89	USP

Parameter OUT_D

Bit	Value	Meaning
0	1	USP limit exceeded
1	1	Reduced USP limit exceeded

Field Diagnostics

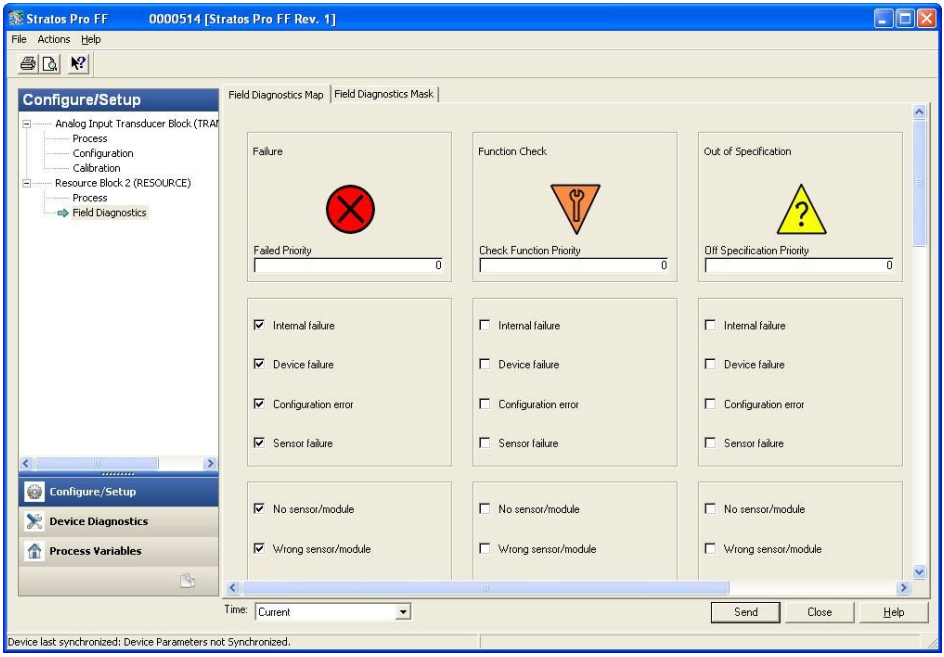
With the FF-912 specification, the FOUNDATION Fieldbus allows obtaining a wide range of diagnostic data from the running process. Four alarm classes are used in accordance with the NAMUR recommendations:

- Function check (please check the function)
- Failure (Error: failure caused by device or process)
- Maintenance required
- Out of specification

The field device provides a 32-bit field with error messages Here, the highest bit has the highest priority. The user can sort these bits into different groups and enable/disable the corresponding alarm messages (Alarm Broadcast Enable).
Each error message has a RECOMMENDED_ACTION parameter. The corresponding text is specified in the Device Description (DD). When an error occurs, the control system can display the corresponding error message text.

Note: The user must set the priority to at least 1 to ensure that a message is displayed.

Configuration can be performed using AMS from Emerson Process Management, for example.



Example: Field Diagnostics configuration

Overview of Field Diagnostics

BIT	ERR	CondItion Name	Default Map NE107	
0		Check function (reserved for ITK test)		
1	ERR 23	Autoclaving counter exceeded	Maint	
2	ERR 24	CIP cycles exceeded	Maint	
3	ERR 25	SIP cycles exceeded	Maint	
4	ERR 102	Parameter error: User Buffer -U1-	Maint	
5		Reserved		
6		Reserved		
7		Reserved		
8	ERR 22	Sensor wear (Memosens)	Maint	
9	ERR 18	Maintenance counter exceeded	Maint	
10	ERR 17	Cal timer expired	Maint	
11	ERR 21	Sensor response time exceeded (drift)	Maint	
12		Calibration data bad	Maint	
13	ERR 15	Sensocheck (glass impedance, reference impedance)	Maint	
14		Reserved		
15		Reserved		
16	ERR 14	Temperature value outside table	Offspec	
17	ERR 13	Temperature range violation	Offspec	
18		Measuring range violation	Offspec	
19		Reserved		
20		Calibration is active	Check	
21	ERR	Configuration is active	Check	
22	ERR	Service is active	Check	

	RECOMMENDED_ACTION	Measured value status
	Replace the sensor	0x80 Good, non-specific
	Replace the sensor	0x80 Good, non-specific
	Replace the sensor	0x80 Good, non-specific
	Check the user table	0x80 Good, non-specific
	Check sensor and replace if required	0x80 Good, non-specific
	Clean the sensor	0x80 Good, non-specific
	Calibrate or replace the sensor	0x50 Uncertain, Sens_Conv_ not_acc
	Calibrate or replace the sensor	0x50 Uncertain, Sens_Conv_ not_acc
	Calibrate or replace the sensor	0x50 Uncertain, Sens_Conv_ not_acc
	Check the sensor	0x10 Bad Sensor failure
	Check the sensor	0x10 Bad Sensor failure
	Check the sensor	0x10 Bad Sensor failure
	Check the sensor	0x10 Bad Sensor failure
	Finish calibration	0x44 Uncertain, LUV/Good*
	Finish calibration	0x44 Uncertain, LUV/Good*
	Finish calibration	0x44 Uncertain, LUV/Good*

BIT	ERR	CondItion Name	Default Map NE107	
23		Reserved		
24	ERR	Calibration data error	Fail	
25	ERR 03	Sensor devaluated	Fail	
26	ERR 96	Wrong module/sensor	Fail	
27	ERR 96	No sensor/module	Fail	
28		Sensor defective	Fail	
29	ERR 98	Configuration data defective	Fail	
30	ERR 99	Factory settings error	Fail	
31	ERR 95	Failure of internal communication / System error	Fail	

* depending on parameter setting

Note: Invalid values are set to 0 and have a bad status.

	RECOMMENDED_ACTION	Measured value status
	Calibrate or replace the sensor	0x10 Bad Sensor failure
	Replace the sensor	0x10 Bad Sensor failure
	Check the configuration or insert correct module/sensor	0x10 Bad Sensor failure
	Check the sensor connection	0x10 Bad Sensor failure
	Return defective sensor to manufacturer	0x10 Bad Sensor failure
	Check the configuration parameters	0x0C Bad Device failure
	Return defective device to manufacturer	0x0C Bad Device failure
	Switch device off and then on again	0x0C Bad Device failure

Commissioning on the FOUNDATION Fieldbus

Only when the Stratos is competently configured, can the FOUNDATION Fieldbus communication function correctly. Different configuration tools from different manufacturers are available (eg, NI-FBUS Configurator from National Instruments).
They can be used to configure the device and the FOUNDATION Fieldbus.

Note: Be sure to observe the operating instructions and the menu guidance of the control system (DCS) or the configuration tool during installation and configuration via the control system.

Installing the DD (Device Description):
During initial installation, the device description must be integrated into the control system (eg, Delta V from Emerson Process).
(DD file formats: *.sy5,*.ff5 or older formats: *.sym and *.ffo)
For network projecting, you require the CFF file (Common File Format).

These files can be obtained from:
- the included CD
- on the internet at **www.knick.de**
- the Fieldbus Foundation: www.fieldbus.org

Identifying the Transmitter

There are several possibilities to identify a FF transmitter in the network. The most important one is the "Device Identifier" or DEV_ID. It consists of the manufacturer ID, device type, and serial number XXXXXXX.

Manufacturer ID Knick	MANUFAC_ID	= 0x000102
Device type Stratos Pro A231:	DEV_TYPE	= 0xA231

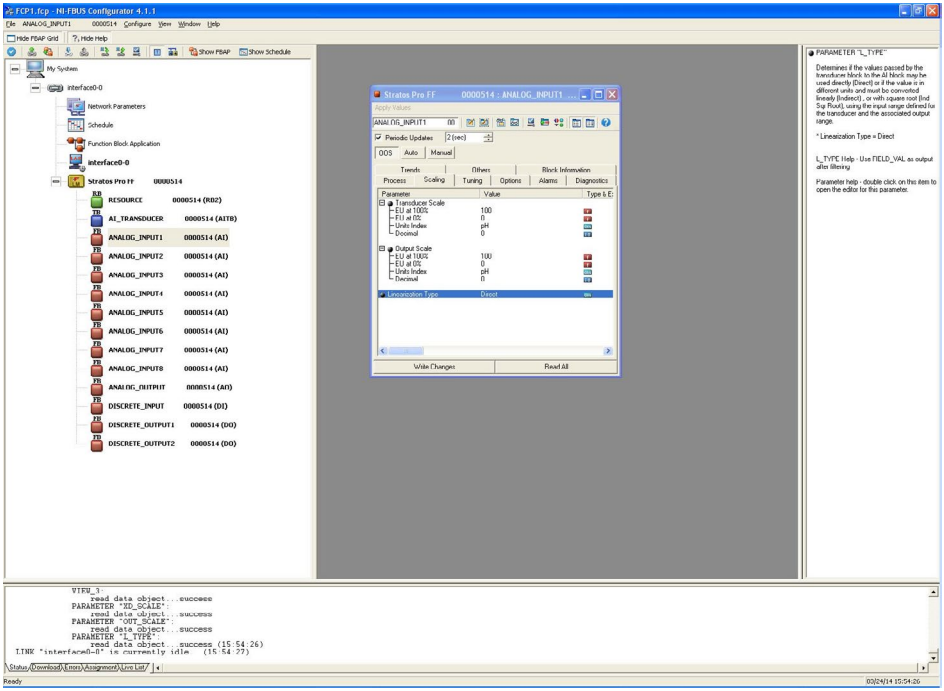
Initial Commissioning

1) Supply the device with power.
2) Open the configuration program of the control system.
3) Load DD and CFF file.
4) Assign desired tag name to the field device (PD_TAG).

Configuring the Resource Blocks (RB)

5) Set WRITE_LOCK parameter to "NOT LOCKED".
6) Set MODE_BLK. TARGET to Auto.

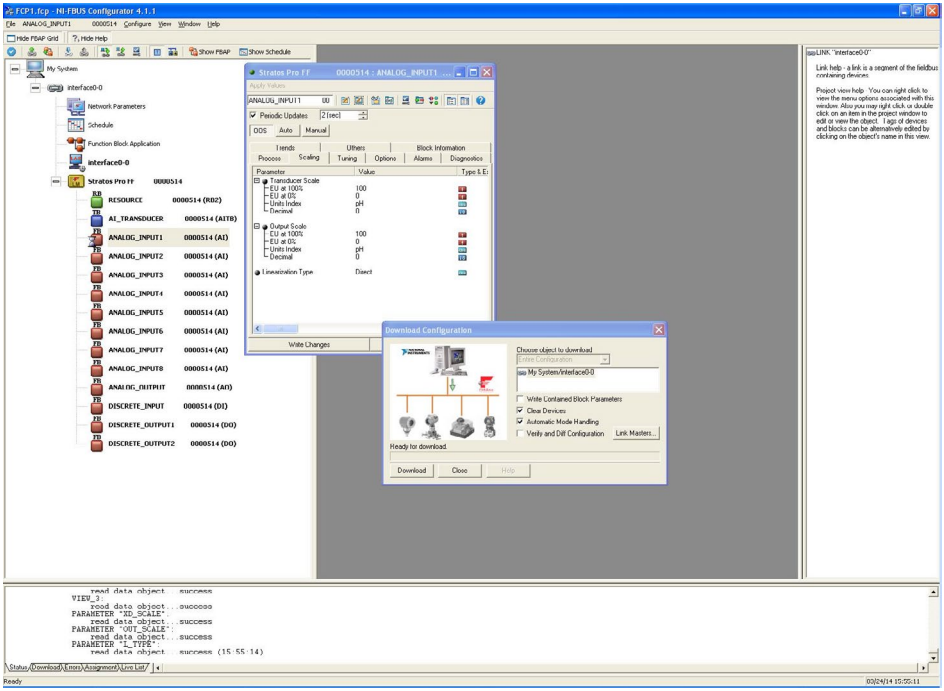
Setting the AI Block Parameters



7) Set MODE_BLK. TARGET to OOS (Out Of Service).
8) Select the desired process variable from the CHANNEL parameter (see tables from page 169 onwards).
9) Select the unit belonging to the process variable from the XD_SCALE parameter.
10) Select the unit belonging to the process variable from the OUT_SCALE parameter.
11) Set the LIN_TYPE linearization type to "Direct".

Note: If these steps are not properly executed, the "Block Configuration Error" is generated when the block is set to "Auto".

This step is mandatory since otherwise the target mode of the Analog Input Block cannot be set to "Auto".
Using the NI-FBUS Configurator from National Instruments, for example, you can graphically connect the function blocks and then load the system configuration in the device.



12) Download all data and parameters to the field device.
13) Set the target modes of all Analog Input Blocks to “Auto”.

Alarm

The BLOCK_ALM parameter sends the status of the process alarms to the control system. This parameter specifies whether an alarm must be acknowledged via the control system.

Bus Parameters of Standard Transducer Block (TB)

Index	Parameter	Description	
1	ST_REV	Identification counter which is incremented with every change of configuration parameters	
2	TAG-DESC	Unambiguous TAG in the system, can be specified by the user	
3	STRATEGY	Can be used to identify grouping of blocks	
4	ALERT_KEY	Value can be written by the user for alarm handling	
5	MODE_BLK	Target Actual Permitted Normal	
6	BLOCK_ERR	Parameter containing a summary of all alarms	
7	UPDATE_EVENT	Unacknowledged Update State Time Stamp Static Rev Relative Index	
8	BLOCK_ALM	Unacknowledged Alarm State Time Stamp Sub-code Value	
9	TRANSDUCER_DIRECTORY	Directory that specifies the number and the starting indices of the transducers in the transducer block.	
10	TRANSDUCER_TYPE	Denotes the transducer block type.	
11	XD_ERROR	Contains the highest priority alarm that has been activated in the TB_DETAILED_STATUS parameter	
12	COLLECTION_DIRECTORY	Directory that specifies the number, starting indices and DD item IDs of the data collection in each transducer within the TB	
13	PRIMARY_VALUE	Primary value	
14	PV_UNIT	Reserved	
15	VALUE_AO	Value for analog output	
16	VALUE_DI	Value for digital input	
17	VALUE_DO	Value for digital output	

	Default Value	R/W	Bytes	Data Type	Range
		R	2		
	Text		32		
	0		2		
	0		1		
	Available Modes: Automatic, Out Of Service (OOS), Manual		1 1 1 1		
			2		
	0 0 0 0 0	R	1 1 8 2 2		
	0 0 0 0 0	R	1 1 8 2 1		
		R	4		
	65535 = other	R	2		
	0	R	1		
		R	36		
		R/W	5	FLOAT_S	
		R/W	2	U16 V	
		R/W	5	FLOAT_S	
		R/W	2	DISC_2	
		R/W	2	DISC_2	

Bus Parameters of Manufacturer-Specific Transducer Block (TB)

Index	Parameter	Description	
18	Meas Type	Select measuring mode	
19	pH	Parameter: pH	
	Sensortype	Select pH sensor type	
	Meas Mode	Select measuring mode	
	RTD Type	Select temperature sensor type	
	Temperature Unit	Select temperature unit of display	
	Temperature Meas	Select temperature detection during measurement	
	Temperature Meas Manual Value	Enter temperature value (MAN)	
	Temperature Calibration	Select temperature detection during calibration	
	Temperature Cal Manual Value	Enter temperature value (MAN)	
	Nominal Zero	Enter nominal zero for Pfaudler sensors	
	Nominal Slope	Enter nominal slope for Pfaudler sensors	
	pH Iso	Enter pHiso value for Pfaudler sensors	
	Calibration Mode	Select calibration mode	
	Buffer Set	Select buffer set (AUTO)	
	Calibration Timer	Select calibration timer	
	Calibration Cycle	Set calibration cycle	
	ACT	Select adaptive cal timer (ISM only)	
	ACT Cycle	Select adaptive cal cycle (ISM only)	
	TTM	Select adaptive maintenance timer (ISM only)	
	TTM Cycle	Select adaptive maintenance cycle (ISM only)	
	CIP Count	Switch cleaning cycles on/off	
	CIP Cycles	Enter cleaning cycles (ON)	
	SIP Count	Enable/disable sterilization cycles	
	SIP Cycles	Enter sterilization cycles (ON)	
	Autoclave	Enable/disable autoclaving counter	
	AC Cycles	Enter autoclaving cycle (ON)	
	Tc Select	Select temperature compensation	
	Tc Liquid	Enter value for linear temperature compensation (LIN)	

	Default Value	R/W	Bytes	Data Type	Range
	0 = pH	R/W	1	U8	0-5
		R/W		Record	
	0 = Standard	R/W	1	U8	0-20
	0 = pH	R/W	1	U8	0-2
	0 = 100 PT	R/W	1	U8	0-8
	0 = °C	R/W	1	U8	0-1
	0 = Auto	R/W	1	U8	0-2
	0	R/W	4	Float	
	0 = Auto	R/W	1	U8	0-2
	0	R/W	4	Float	
	7.0	R/W	4	Float	0-16
	59.2	R/W	4	Float	30-60
	7.0	R/W	4	Float	0-14
	0 = Auto	R/W	1	U8	0-2
	0 = -00- Knick	R/W	1	U8	0-255
	0 = Off	R/W	1	U8	0-2
	168	R/W	4	Float	0-9999
	0 = Off	R/W	1	U8	0.2
	30	R/W	4	Float	0-9999
	0 = Off	R/W	1	U8	0-2
	365	R/W	4	Float	0-2000
	0 = Off	R/W	1	U8	0-1
	0	R/W	2	U16	0-9999
	0 = Off	R/W	1	U8	0-1
	0	R/W	2	U16	0-9999
	0 = Off	R/W	1	U8	0-1
	0	R/W	2	U16	0-9999
	0 = Off	R/W	1	U8	0-3
	0	R/W	4	Float	-19.99-19.99

Cond

Bus Parameters of Manufacturer-Specific Transducer Block (TB)

Index	Parameter	Description	
20	Conductivity	Parameter: conductivity	
	Sensortype	Select Cond sensor type	
	Meas Mode	Select measuring mode	
	Display Unit	Select measuring range	
	Solution	Concentration determination	
	RTD Type	Select temperature sensor type	
	Temperature Unit	Select temperature unit of display	
	Temperature	Select temperature detection during measurement	
	Temperature Manual Value	Enter temperature value (MAN)	
	CIP Count	Switch cleaning cycles on/off	
	SIP Count	Enable/disable sterilization cycles	
	Tc Select	Select temperature compensation	
	Tc Liquid	Enter value for linear temperature compensation (LIN)	
	Reference Temperature	Enter value for reference temperature (LIN)	
	Tds Factor	Enter TDS factor (Meas Mode = TDS)	
	Usp Factor	Enter USP factor (Meas Mode = USP)	

	Default Value	R/W	Bytes	Data Type	Range
		R/W		Record	
	0 = 2-Electrode	R/W	1	U8	0-20
	0 = Cond	R/W	1	U8	0-2
	0 = 000.0 mS/cm	R/W	1	U8	0-8
	0 = -01- (NaCl)	R/W	1	U8	0-1
	0 = 100 PT	R/W	1	U8	0-2
	0 = °C	R/W	1	U8	
	0 = Auto	R/W	1	U8	0-2
	0	R/W	4	Float	
	0 = Off	R/W	1	U8	0-16
	0 = Off	R/W	1	U8	30-60
	0 = Off	R/W	1	U8	0-14
	0	R/W	4	Float	0-2
	0	R/W	4	Float	0-255
	0	R/W	4	Float	0-2
	0	R/W	4	Float	0-9999

CondI

Bus Parameters of Manufacturer-Specific Transducer Block (TB)

Index	Parameter	Description	
21	Toroidal Conductivity	Parameter: inductive conductivity	
	Sensortype	Select Cond sensor type	
	Meas Mode	Select measuring mode	
	Display Unit	Select measuring range	
	Solution	Concentration determination	
	RTD Type	Select temperature sensor type	
	Temperature Unit	Select temperature unit of display	
	Temperature	Select temperature detection during measurement	
	Temperature Manual Value	Enter temperature value (MAN)	
	CIP Count	Switch cleaning cycles on/off	
	SIP Count	Enable/disable sterilization cycles	
	Tc Select	Select temperature compensation	
	Tc Liquid	Enter value for linear temperature compensation (LIN)	
	Reference Temperature	Enter value for reference temperature (LIN)	
	Tds Factor	Enter TDS factor (Meas Mode = TDS)	

	Default Value	R/W	Bytes	Data Type	Range
		R/W		Record	
	0 = SE 655	R/W	1	U8	0-4
	0 = Cond	R/W	1	U8	0-2
	0 = 0.000 mS/cm	R/W	1	U8	0-5
	0 = -01- (NaCl)	R/W	1	U8	0-9
	0 = 100 PT	R/W	1	U8	0-5
	0 = °C	R/W	1	U8	0-1
	0 = Auto	R/W	1	U8	0-2
	0	R/W	4	Float	25.0
	0 = Off	R/W	1	U8	0-1
	0 = Off	R/W	1	U8	0-1
	0 = Off	R/W	1	U8	0-5
	0	R/W	4	Float	0-19.99
	0	R/W	4	Float	
	0	R/W	4	Float	

Oxy

Bus Parameters of Manufacturer-Specific Transducer Block (TB)

Index	Parameter	Description	
22	Disolved Oxygen	Parameter: Oxy	
	Sensortype	Select sensor type	
	Meas Mode	Select measuring mode	
	Polarization Voltage Meas	Enter polarization voltage during meas	
	Polarization Voltage Cal	Enter polarization voltage during cal	
	Membran Compensation	Enter membrane compensation	
	RTD Type	Select temperature sensor type	
	Temperature Unit	Select temperature unit of display	
	Calibration Mode	Select calibration mode	
	Calibration Timer	Enable/disable calibration timer	
	Cal Cycle	Set calibration cycle (ON)	
	ACT	Select adaptive cal timer (ISM only)	
	ACT Cycle	Select adaptive cal cycle (ISM only)	
	TTM	Select adaptive maintenance timer (ISM only)	
	TTM Cycle	Select adaptive maintenance cycle (ISM only)	
	CIP Count	Switch cleaning cycles on/off	
	CIP Cycles	Enter cleaning cycles (ON)	
	SIP Count	Enable/disable sterilization cycles	
	SIP Cycles	Enter sterilization cycles (ON)	
	Autoclave	Enable/disable autoclaving counter	
	AC Cycles	Enter autoclaving cycle (ON)	
	Salinity	Enter salinity correction	
	Pressure Unit	Select pressure unit	
	Pressure	Select pressure correction	
	Pressure Manual Value	Enter pressure value (MAN)	

	Default Value	R/W	Bytes	Data Type	Range
		R/W		Record	
	0 = Standard	R/W	1	U8	0-4
	0 = DO%	R/W	1	U8	0-2
	0	R/W	4	Float	
	0	R/W	4	Float	
	0	R/W	4	Float	
	4 = 22 NTC	R/W	1	U8	4-5
	0 = °C	R/W	1	U8	0-1
	0 = Cal air	R/W	1	U8	0-1
	0 = Off	R/W	1	U8	0-2
	168	R/W	4	Float	0-9999
	0 = Off	R/W	1	U8	0-2
	30	R/W	4	Float	0-9999
	0 = Off	R/W	1	U8	0-2
	365	R/W	4	Float	0-2000
	0 = Off	R/W	1	U8	0-1
	0	R/W	2	U16	0-9999
	0 = Off	R/W	1	U8	0-1
	0	R/W	2	U16	0-9999
	0 = Off	R/W	1	U8	0-1
	0	R/W	2	U16	0-9999
	0	R/W	4	Float	
	0 = BAR	R/W	1	U8	0-2
	0 = MAN	R/W	1	U8	0-1
	0	R/W	4	Float	

CC

Bus Parameters of Manufacturer-Specific Transducer Block (TB)

Index	Parameter	Description	
23	Cc	Parameter: conductivity-conductivity	
	Tc Select A	Select temperature compensation	
	Tc Liquid A	Enter value for linear temperature compensation (LIN)	
	Reference Temperature A	Enter value for reference temperature (LIN)	
	Tc Select B	Select temperature compensation	
	Tc Liquid B	Enter value for linear temperature compensation (LIN)	
	Reference Temperature B	Enter value for reference temperature (LIN)	
	Meas Range	Select measuring range	
	Temp Unit	Select temperature unit of display	
	Calculation	Switch calculation on/off	
	Calculation Type	Select calculation type (ON)	
	Factor 1	Enter factor 1 (-C7-)	
	Factor 2	Enter factor 2 (-C7-)	
	Parameter A	Enter factor 1 (-C8-)	
	Parameter A	Enter factor 2 (-C8-)	
	Parameter B	Enter factor 3 (-C8-)	
24	Flow Adjust	Enter flow measurement (pulses/liter)	
25	Alarm Delay	Enter alarm delay in seconds	
26	Sensocheck	Enable/disable Sensocheck	

	Default Value	R/W	Bytes	Data Type	Range
		R/W		Record	
	0 = Off	R/W	1	U8	0-6
	0	R/W	4	Float	0-19.99
	0	R/W	4	Float	
	0 = Off	R/W	1	U8	0-6
	0	R/W	4	Float	0-19.99
	0	R/W	4	Float	
	1 = 00.00 µS/cm	R/W	1	U8	22-25, 55
	0 = °C	R/W	1	U8	0-1
	0 = Off	R/W	1	U8	0-1
	0 = -C1- Difference	R/W	1	U8	0-7
	3	R/W	4	Float	
	243	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	12000	R/W	4	Float	0-20000
	10	R/W	4	Float	0-600
	1 = On	R/W	1	U8	0-1

Bus Parameters of Manufacturer-Specific Transducer Block (TB)

Index	Parameter	Description	
27	Clock	Parameter: clock	
	Format	Select time format	
	Minute	Enter minutes	
	Hour	Enter hours	
	am or pm	Select AM / PM	
	Day	Enter day	
	Month	Enter month	
	Year	Enter year	

	Default Value	R/W	Bytes	Data Type	Range
		R/W		Record	
	0 = 24 h	R/W	1	U8	0-1
	0	R/W	1	U8	0-59
	0	R/W	1	U8	0-24
	0 = am	R/W	1	U8	0-1
	1	R/W	1	U8	1-31
	1	R/W	1	U8	1-12
	2000	R/W	2	U16	2000-2099

pH

Bus Parameters of Manufacturer-Specific Transducer Block (TB)

Index	Parameter	Description	
28	pH Tc Liquid Table	Table for temperature compensation (TC_SELECT = user tab) Values from 0 °C to 100 °C in 5 °C steps	
	0 °C	Enter value for 0 °C	
	5 °C	Enter value for 5 °C	
	10 °C	Enter value for 10 °C	
	15 °C	Enter value for 15 °C	
	20 °C	Enter value for 20 °C	
	25 °C	Enter value for 25 °C	
	30 °C	Enter value for 30 °C	
	35 °C	Enter value for 35 °C	
	40 °C	Enter value for 40 °C	
	45 °C	Enter value for 45 °C	
	50 °C	Enter value for 50 °C	
	55 °C	Enter value for 55 °C	
	60 °C	Enter value for 60 °C	
	65 °C	Enter value for 65 °C	
	70 °C	Enter value for 70 °C	
	75 °C	Enter value for 75 °C	
	80 °C	Enter value for 80 °C	
	85 °C	Enter value for 85 °C	
	90 °C	Enter value for 90 °C	
	95 °C	Enter value for 95 °C	

Note: Use a configuration tool such as the **AMS Device Manager** from Emerson Process for convenient data entry.

	Default Value	R/W	Bytes	Data Type	Range
		R/W		Record	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	

Bus Parameters of Manufacturer-Specific Transducer Block (TB)

Index	Parameter	Description	
29	pH User Buffer 1	Table for 1st buffer solution (BUFFER = User buffer)	
	Nominal Value	Enter nominal value (25 °C) for 1st pH buffer	
	0 °C	Enter value for 1st pH buffer	
	5 °C	Enter value for 1st pH buffer	
	10 °C	Enter value for 1st pH buffer	
	15 °C	Enter value for 1st pH buffer	
	20 °C	Enter value for 1st pH buffer	
	25 °C	Enter value for 1st pH buffer	
	30 °C	Enter value for 1st pH buffer	
	35 °C	Enter value for 1st pH buffer	
	40 °C	Enter value for 1st pH buffer	
	45 °C	Enter value for 1st pH buffer	
	50 °C	Enter value for 1st pH buffer	
	55 °C	Enter value for 1st pH buffer	
	60 °C	Enter value for 1st pH buffer	
	65 °C	Enter value for 1st pH buffer	
	70 °C	Enter value for 1st pH buffer	
	75 °C	Enter value for 1st pH buffer	
	80 °C	Enter value for 1st pH buffer	
	85 °C	Enter value for 1st pH buffer	
	90 °C	Enter value for 1st pH buffer	
	95 °C	Enter value for 1st pH buffer	

	Default Value	R/W	Bytes	Data Type	Range
		R/W		Record	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	

Bus Parameters of Manufacturer-Specific Transducer Block (TB)

Index	Parameter	Description	
30	pH User Buffer 2	Table for 2nd buffer solution (BUFFER = User buffer)	
	Nominal Value	Enter nominal value (25 °C) for 2nd pH buffer	
	0 °C	Enter value for 2nd pH buffer	
	5 °C	Enter value for 2nd pH buffer	
	10 °C	Enter value for 2nd pH buffer	
	15 °C	Enter value for 2nd pH buffer	
	20 °C	Enter value for 2nd pH buffer	
	25 °C	Enter value for 2nd pH buffer	
	30 °C	Enter value for 2nd pH buffer	
	35 °C	Enter value for 2nd pH buffer	
	40 °C	Enter value for 2nd pH buffer	
	45 °C	Enter value for 2nd pH buffer	
	50 °C	Enter value for 2nd pH buffer	
	55 °C	Enter value for 2nd pH buffer	
	60 °C	Enter value for 2nd pH buffer	
	65 °C	Enter value for 2nd pH buffer	
	70 °C	Enter value for 2nd pH buffer	
	75 °C	Enter value for 2nd pH buffer	
	80 °C	Enter value for 2nd pH buffer	
	85 °C	Enter value for 2nd pH buffer	
	90 °C	Enter value for 2nd pH buffer	
	95 °C	Enter value for 2nd pH buffer	
31	Sample Product	Start step 1 of product calibration.	
32	Stored Value	Display value saved for product calibration - step 1.	
33	Reference Value	Step 2 of product calibration: Enter value of sample.	
34	Calibration Product Step	Progress of calibration	
35	Calibration Result	Result of last calibration	
36	Logbook Entry	Specify group index that is to be read	
37	Logbook Binary Data	Raw data of logbook	
38	Logbook Erase	Logbook entries are deleted	

	Default Value	R/W	Bytes	Data Type	Range
				Record	
	1	R	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	0 = No operation	R/W	1	U8	
	0	R	4	Float	
	0	R/W	4	Float	
	0	R	1	U8	
	0 = Good	R/W	1	U8	
	0	R/W	1	U8	
		R	78	U8	
	0 = No operation	R/W	1	U8	

Bus Parameters of Manufacturer-Specific Transducer Block (TB)

Index	Parameter	Description	
39	Sensor	Sensor data	
	Status	Status display	
	Runtime	Operating time of digital sensor	
	SIP Cycles	SIP cycles	
	CIP Cycles	CIP cycles	
	TTM	Adaptive maintenance timer	
	DLI	Indicates when the sensor must be replaced (ISM only) (Dynamic Lifetime Indicator)	
	ACT	Adaptive calibration timer	
	Autoclave	Autoclaving	
	Wear	Sensor wear for Memosens pH or Oxy sensors	
	Smiley	Sensoface status	
	Calibration Timer	Cal timer	
40	Sensor Request Binary	Request data of sensor information	
41	Sensor Response Binary	Response data of sensor information	
42	Slope	pH slope with read/write access	
43	Zero	pH zero with read/write access	
44	Isfet Offset	ISFET offset with read/write access (ISM only)	
45	ORP Zero	ORP zero with read/write access	
46	Slope	Oxygen slope with read/write access	
47	Zero	Oxygen zero with read/write access	
48	rH	Relative humidity during calibration [%]	
49	Cellconstant	Enter cell constant	
50	Cellfactor	Enter cell factor	
51	Install	Installation factor	
52	Zero	Enter zero point	
53	Trans Ratio	Enter transfer ratio	
54	Cellfactor A	Enter cell factor for sensor A (CC only)	
55	Cellfactor B	Enter cell factor for sensor B (CC only)	
56	Calibration Time	Last calibration (date)	
57	Hold	Select measured value status during calibration, configuration and service	

	Default Value	R/W	Bytes	Data Type	Range
				Record	
	0	R	2	U16	
	0	R	4	Float	
	0	R	2	U16	
	0	R	2	U16	
	0	R	4	Float	
	0	R	4	Float	
	0	R	4	Float	
	0	R	4	Float	
	0	R	4	Float	
	0	R	2	U16	
	0	R	4	Float	
		R/W	20	Oct	
		R	32	Oct	
	59.2	R/W	4	Float	
	7.0	R/W	4	Float	
	0	R/W	4	Float	
	0	R/W	4	Float	
	60.0	R/W	4	Float	
	0	R/W	4	Float	
	100	R/W	4	Float	
	0.75	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
	0	R/W	4	Float	
	0	R/W	4	Float	
	1	R/W	4	Float	
	1	R/W	4	Float	
		R/W	19	Oct	
	0 = Off	R/W	1	U8	

Bus Parameters of Manufacturer-Specific Transducer Block (TB)

Index	Parameter	Description	
58	Version	Version	
	Device Serial No	Serial number of device	
	Device Software Version	Software version	
	Device Hardware Version	Hardware version	
	Meas Module Serial No.	Serial number of digital sensor	
	Meas Module Software Version	Software serial number of digital sensor	
	Meas Module Hardware Version	Hardware serial number of digital sensor	

	Default Value	R/W	Bytes	Data Type	Range
		R		Record	
	0	R	4	U32	
	0	R	8	Oct	
	0	R	2	Oct	
	0	R	16	Oct	
	0	R	8	Oct	
	0	R	2	Oct	

Bus Parameters of Manufacturer-Specific Transducer Block (TB)

Index	Parameter	Description	
59	Value pH [pH]	pH value	
	Status	pH status	
	Value pH [pH]	pH value	
60	Value mV [mV]	mV value	
	Status	mV status	
	Value mV [mV]	mV value	
61	Value ORP [mV]	ORP value	
	Status	ORP status	
	Value ORP [mV]	ORP value	
62	Value Glass Impedance [MOhm]	Glass impedance value	
	Status	Glass impedance status	
	Value Glass Impedance [MOhm]	Glass impedance value	
63	Value Reference Impedance [kOhm]	Reference impedance value	
	Status	Reference impedance status	
	Value Reference Impedance [kOhm]	Reference impedance value	
64	Value Temperature	Temperature value	
	Status	Temperature status	
	Value Temperature	Temperature value	
65	Temperature Unit	Select temperature unit	
66	Value Calibration Timer [h]	Cal timer value	
	Status	Cal timer status	
	Value Calibration Timer [h]	Cal timer value	
67	Value Slope	Slope value	
	Status	Slope status	
	Value Slope	Slope value	
68	Slope Unit	Select unit for slope	
69	Value Zero	Zero point value	
	Status	Zero point status	
	Value Zero	Zero point value	

	Default Value	R/W	Bytes	Data Type	Range
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
	1001 = °C	R	2	U16	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
	1342 = %	R	2	U16	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	

Bus Parameters of Manufacturer-Specific Transducer Block (TB)

Index	Parameter	Description	
70	Value Wear [%]	Sensor wear value (Memosens pH/Oxy sensors)	
	Status	Sensor wear status (Memosens pH/Oxy sensors)	
	Value Wear [%]	Sensor wear value (Memosens pH/Oxy sensors)	
71	Value Flow [l/h]	Flow value	
	Status	Flow status	
	Value Flow [l/h]	Flow value	
72	Value DO Saturation Air [%]	Air saturation value	
	Status	Air saturation status	
	Value DO Saturation Air [%]	Air saturation value	
73	Value DO Concentration	Concentration value	
	Status	Concentration status	
	Value DO Concentration	Concentration value	
74	DO Concentration Unit	Select unit for concentration	
75	Volume Conc [Vol %]	Gas concentration value	
	Status	Gas concentration status	
	Volume Conc [Vol %]	Gas concentration value	
76	Value Partial Pressure [mbar]	Partial pressure value	
	Status	Partial pressure status	
	Value Partial Pressure [mbar]	Partial pressure value	
77	Value Conductivity	Conductivity value	
	Status	Conductivity status	
	Value Conductivity	Conductivity value	
78	Conductivity Unit	Select unit for conductivity	
79	Specific Resi. [MOhm*cm]	Resistivity value	
	Status	Resistivity status	
	Specific Resi. [MOhm*cm]	Resistivity value	

	Default Value	R/W	Bytes	Data Type	Range
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
	1423 = ppm	R	2	U16	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
	1552 = µS/cm	R	2	U16	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	

Bus Parameters of Manufacturer-Specific Transducer Block (TB)

Index	Parameter	Description	
80	Value Concentration [%]	Concentration value	
	Status	Concentration status	
	Value Concentration [%]	Concentration value	
81	Value Conductance	Conductance value	
	Status	Conductance status	
	Value Conductance	Conductance value	
82	Value Salinity [g/kg]	Salt content value	
	Status	Salt content status	
	Value Salinity [g/kg]	Salt content value	
83	Value Tds [mg/l]	TDS value	
	Status	TDS status	
	Value Tds [mg/l]	TDS value	
84	Value Conductivity 2 [µS/cm]	CC: 2nd conductivity value	
	Status	CC: Status of 2nd conductivity value	
	Value Conductivity 2 [µS/cm]	CC: 2nd conductivity value	
85	Value Calculation	CC: Value calculated acc. to calculation type	
	Status	CC: CC: Status of value calculated acc. to calculation type	
	Value Calculation	CC: Value calculated acc. to calculation type	
86	Value Cell [1/cm]	Cell factor value	
	Status	Cell factor status	
	Value Cell [1/cm]	Cell factor value	
87	Value Temperature 2	CC: 2nd temperature value	
	Status	CC: Status of 2nd temperature value	
	Value Temperature 2	CC: 2nd temperature value	
88	Temperature 2 Unit	CC: Select temperature unit	
89	Unit	Unit used during product calibration	
90	Current Error	Currently active error	
91	Specific Resi.2 [MOhm*cm]	CC: 2nd resistivity value	
	Status	Status of 2nd resistivity value	
	Specific Resi. [MOhm*cm]	2nd resistivity value	
92	Sensor Fix data	Sensor data	
	Sensor Serial No.	Serial number of digital sensor	
	Sensor Order No.	Order number of digital sensor	
	Tag	Tag number (TAG) of digital sensor	
	Manufacturer	Manufacturer	
	Initial Operation	Date of initial commissioning	

	Default Value	R/W	Bytes	Data Type	Range
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
	1001 = °C	R	2	U16	
	0	R	2	U16	
	0 = NO FAILURE	R	1	U8	
		R		FLOAT_S	
	0	R	1	U8	
	0.0	R	4	Float	
		R		Record	
	0	R	16	Oct	
	0	R	18	Oct	
	0	R	32	Oct	
	0	R	16	Oct	
	0	R	19	Oct	

Product Calibration

With three parameters, product calibration for pH, Cond, CondI, Oxy and Cond-Cond can be performed via Fieldbus.

Typical pH Product Calibration via Fieldbus

1) Set CAL_SAMPLE_PRD parameter to Sample. The device saves the pH value of the sample. After the writing, the parameter is automatically reset to NOP.
2) Read out CAL_SAMPLE_PRD_STORED_VAL parameter. It contains the stored value.
3) Write lab value of the sample in the CAL_PRODUCT parameter.
   The CAL_SAMPLE_PRD_STORED_VAL parameter is reset to zero. Now the device is calibrated.

Note: When step 1 has been performed directly on the site on the device, the operation on the Fieldbus as described in point 1 is omitted.

Device Registration

Manufacturer	Knick Elektronische Messgeräte GmbH & Co.KG Beuckestr. 22 Berlin, 14163 Germany	
Model	Stratos Pro FF A231N / A231X	
Type	Measuring System for Liquid Analysis	
H1 ITK Profile	6	
Manufacturer Identification (MANUFAC_ID)	0x000102	
Device Type (DEV_TYPE)	0xA231	
Device Revision (DEV_REV)	0x01	
Stack Communication Profiles	31PS	
H1 Physical Layer Profiles	511	
Device Test Campaign	IT096600	
Stack Test Campaign	CT0178FF	
H1 Physical Layer Test Report	PT-459	
Device Descriptions	0101.FFO	(CRC: 0x3CE6564B)
	0101.SYM	(CRC: 0x5027E875)
	0101.FF5	(CRC: 0x158232C8)
	0101.SY5	(CRC: 0x5027E875)
Capability File	010101.CFF	(CRC: 0x27C0AEAF)
Mandatory Features	Resource Block Alarms and Events Function Block Linking Trending Multi-Bit Alert Reporting Field Diagnostics	
Function Blocks	Analog Input Analog Output Discrete Input Discrete Output	
Registration Number	IT/096600/1	
Registration Program	FF-524 2.0	
Date Issued	2014-08-25	

Authorized Mark

Use of mark subject to Graphic Identity Standards Guide (MT-042)

FOUNDATION

Richard J. Timoney
President and Chief Executive Officer

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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!
- All parameters must be set by a system administrator prior to commissioning.

Terminals

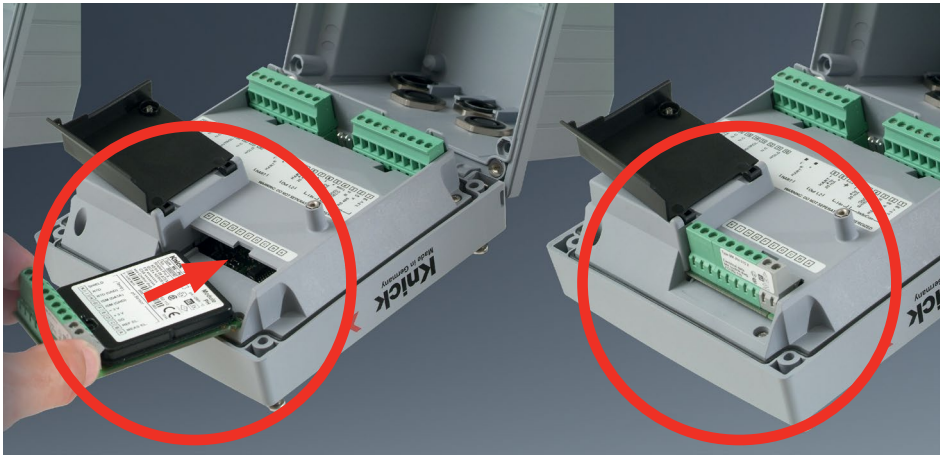
With a tightening torque of 0.5 to 0.6 Nm, the following conductor cross-sections are permitted:

Connection	**Cross-section**
Conductor cross-section rigid/flexible	0.2 … 2.5 mm^2
Conductor cross-section flexible with ferrule without plastic sleeve	0.25 … 2.5 mm^2
Conductor cross-section flexible with ferrule with plastic sleeve	0.2 … 1.5 mm^2

Application in Hazardous Locations

(Stratos Pro A231X only)

When using the device in a hazardous location, observe the specifications of the Control Drawing.



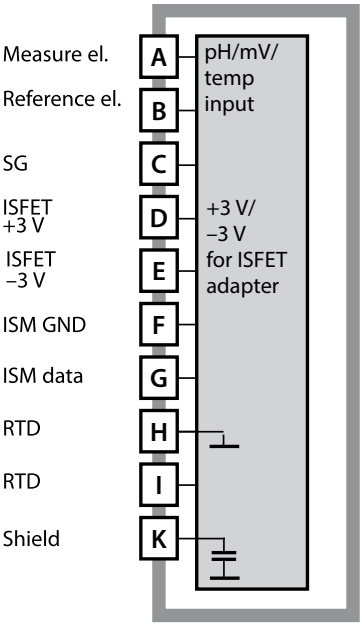
Measuring modules for connection of analog sensors:
pH, oxygen (Oxy), conductivity (Cond, CondI, Cond-Cond)

Measuring modules for the connection of analog sensors are simply inserted into the module slot.

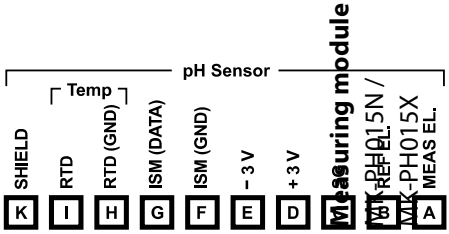
Changing the Measuring Function

When you replace the measuring module, you must select the corresponding measuring function in the "Service" menu.

pH

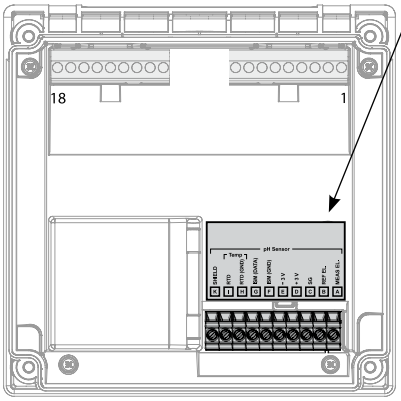


Module for pH Measurement
Order code MK-PH015N / MK-PH015X
See the following pages for wiring examples.



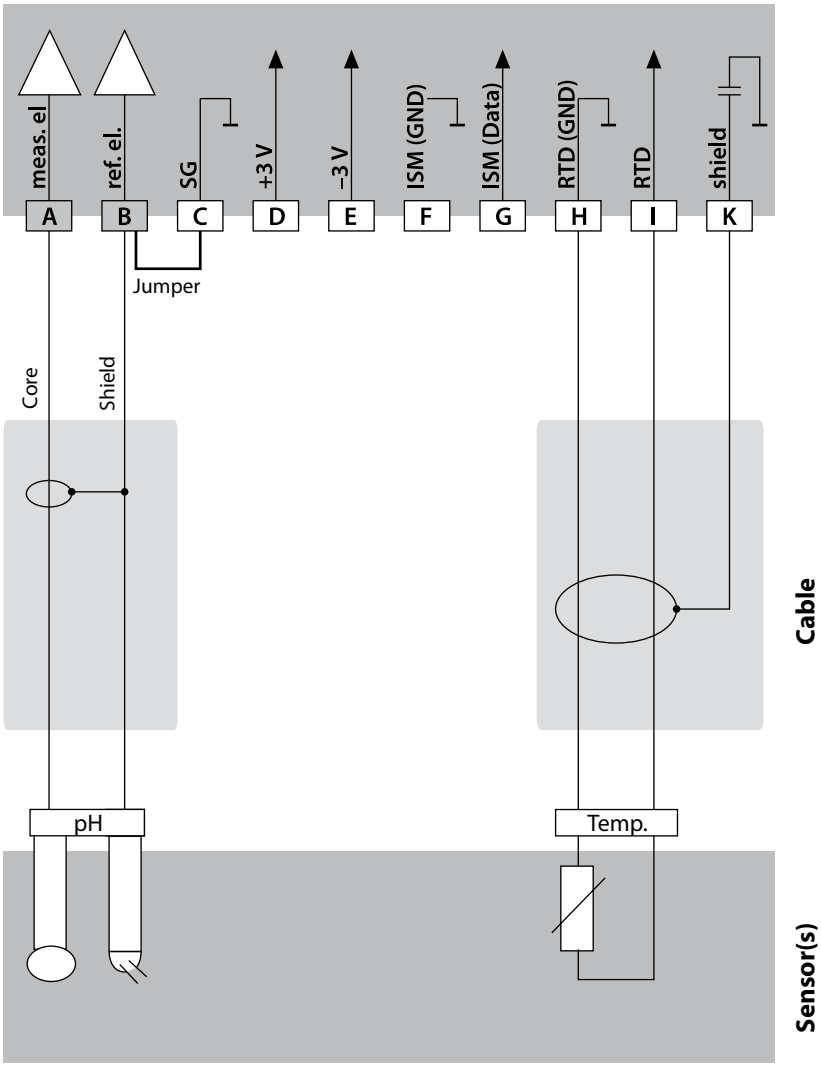
Terminal Plate of pH Module
The terminals are suitable for single or stranded wires up to 2.5 mm² (AWG 14).

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".



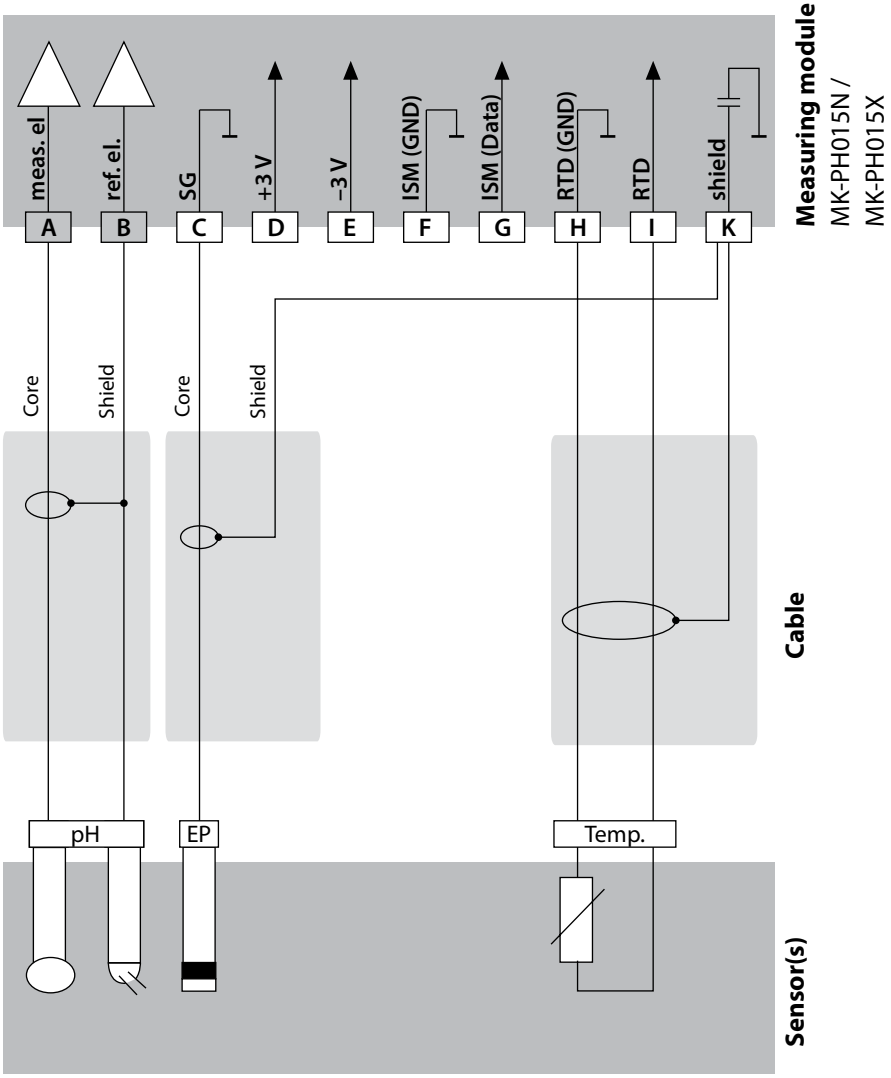
Example 1

Measuring task: pH, temperature, glass impedance
Sensor: pH sensor, eg, SE 555X/1-NS8N, cable: ZU 0318
Temperature detector: separate



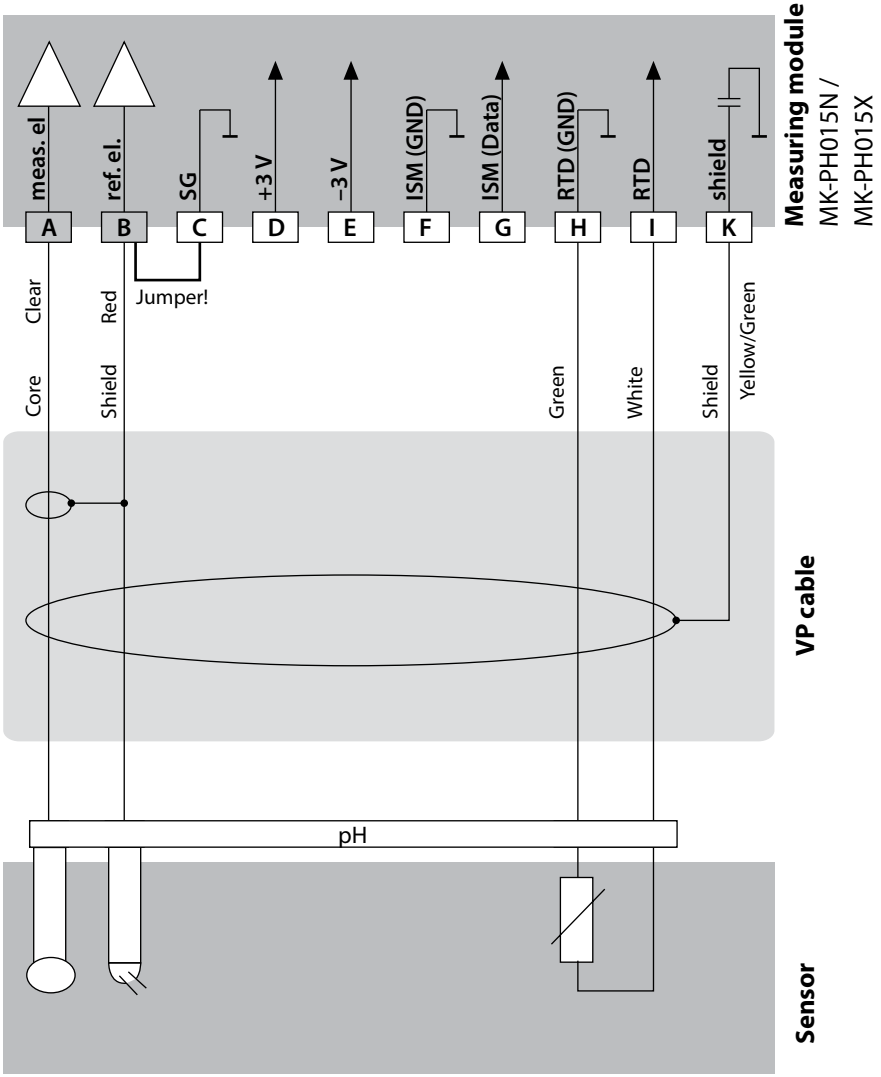
Example 2

Measuring task:	pH/ORP, temperature, glass impedance, ref. impedance
Sensor:	pH sensor, eg, SE 555X/1-NS8N, cable: ZU 0318
Temperature detector:	separate
Equipotential bonding electrode:	ZU 0073



Example 3

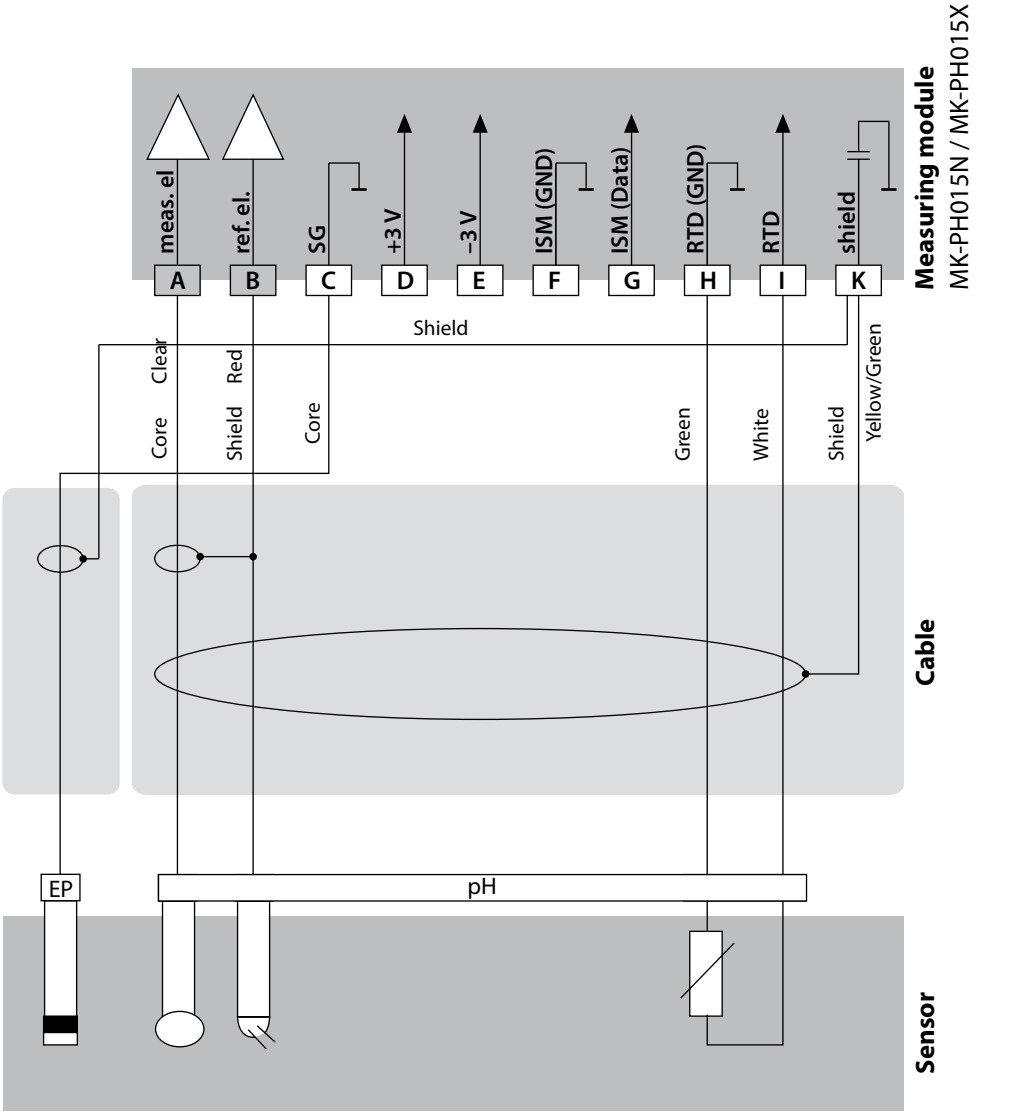
Measuring task:	pH, temperature, glass impedance
Sensor:	pH sensor, eg, SE 554X/1-NVPN
Cable:	CA/VP6ST-003A (ZU 0313)
Temperature detector:	integrated



pH

Example 4

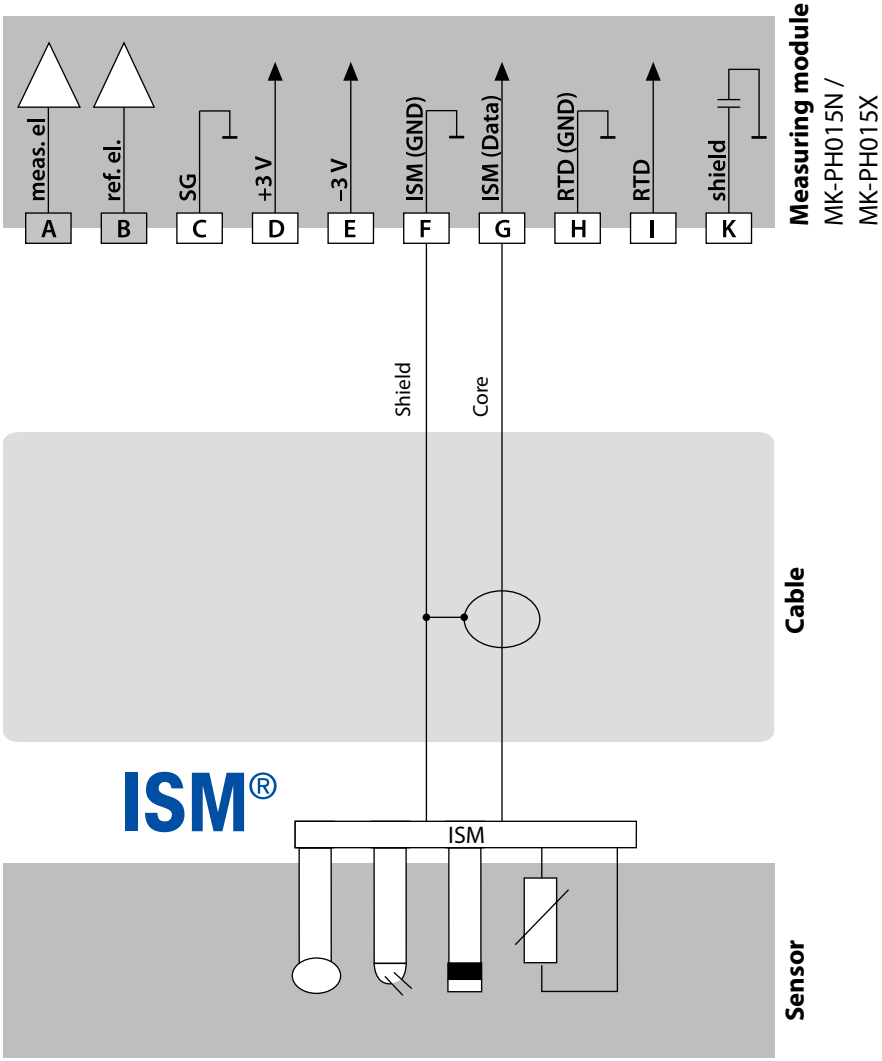
Measuring task:	pH/ORP, temperature, glass impedance, ref. impedance
Sensor:	pH sensor, eg, SE 555X/1-NVPN, cable: ZU 0313
Temperature detector:	integrated
Equipotential bonding electrode:	ZU 0073



Example 5

NOTICE: Do not connect an additional analog sensor!

Measuring task:	pH/ORP, temperature, glass impedance, ref. impedance
Sensor:	pH sensor, eg, ISM digital, cable: AK9
Temperature detector:	integrated
Equipotential bonding electrode:	integrated

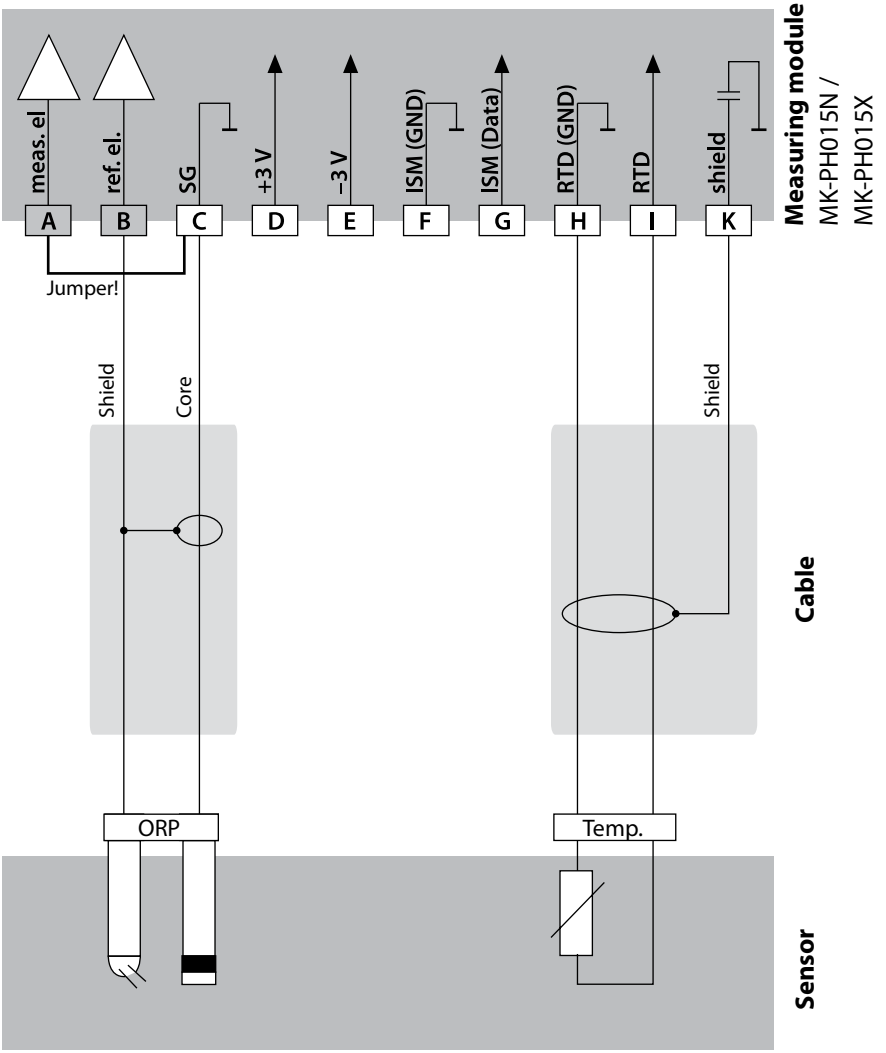


pH

Example 6

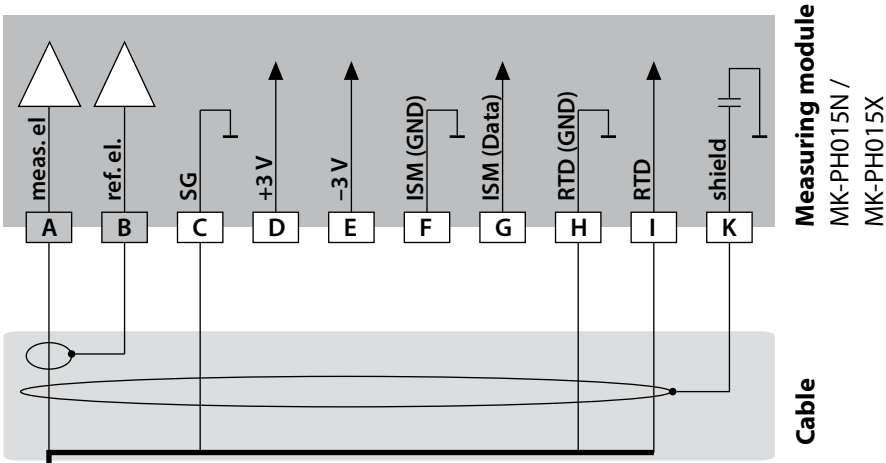
Note: Switch off Sensocheck!

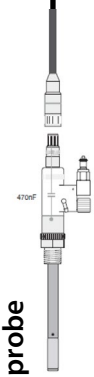
Measuring task:	ORP, temperature, ref. impedance
Sensor:	ORP sensor, eg, SE 564X/1-NS8N, cable: ZU 0318
Temperature detector:	separate



Example 7

Connecting a Pfaudler probe

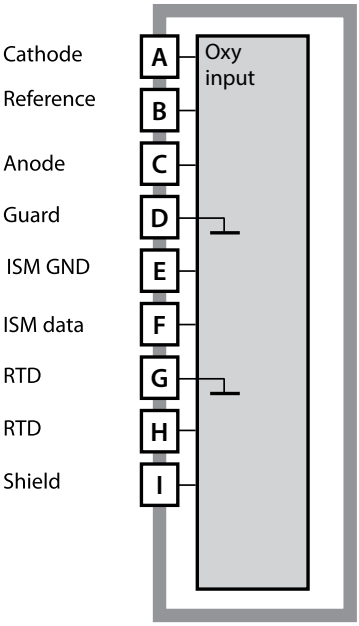




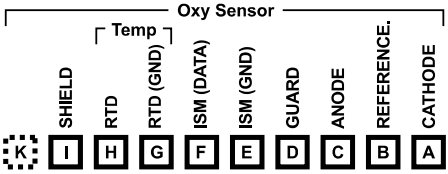
Pfaudler probe

	Module	pH Reiner with equip.bond., VP screw cap	Differential Models 18/40 with equip.bond.	Models 03/04 with equip. bonding	Models 03/04 without equip. bonding
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

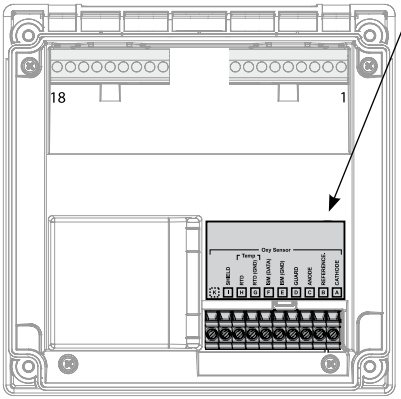
Oxy



Module for Oxygen Measurement
Order codes:
MK-OXY045N / MK-OXY045X
See the following pages for wiring examples.



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



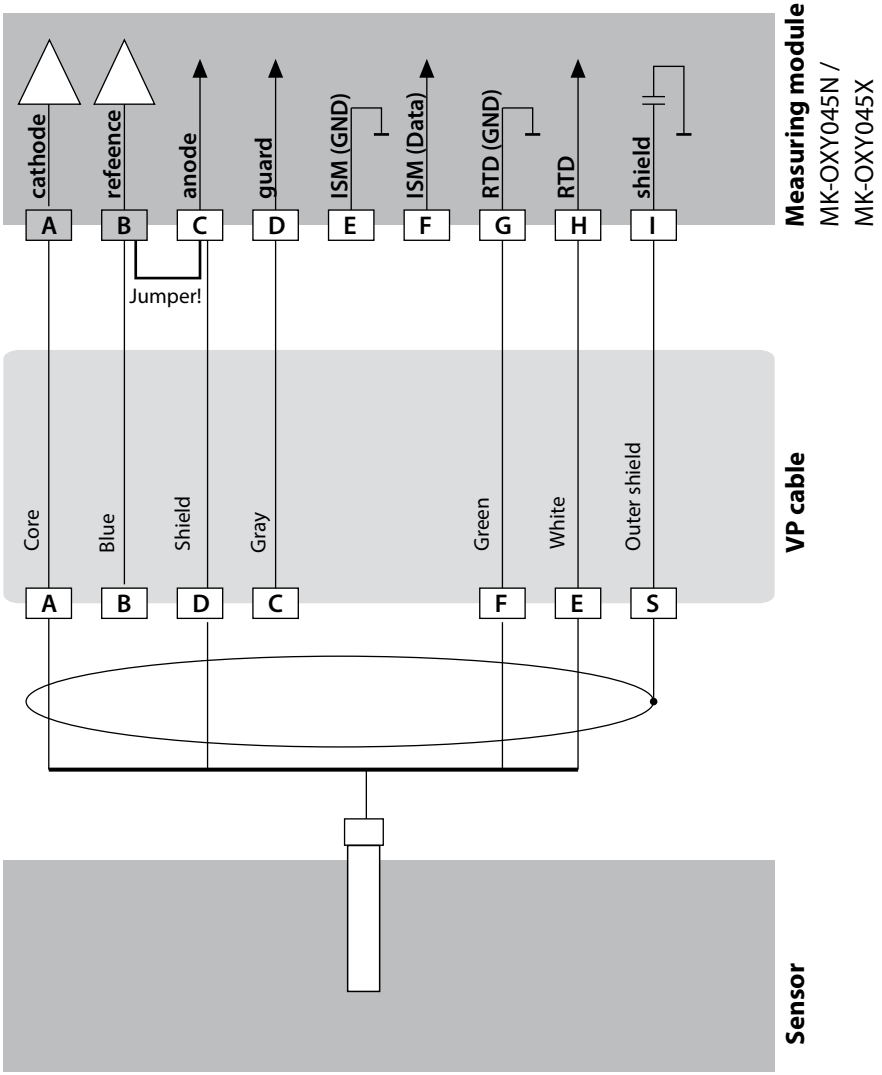
The measuring module comes with a self-adhesive label. Stick the label to the module slot on the device front. This way, you have the wiring "under control".

Example 1

Measuring task: Oxygen STANDARD

Sensors (example): "10" (eg, SE 706, InPro 6800)

Cable (example): CA/VP6ST-003A



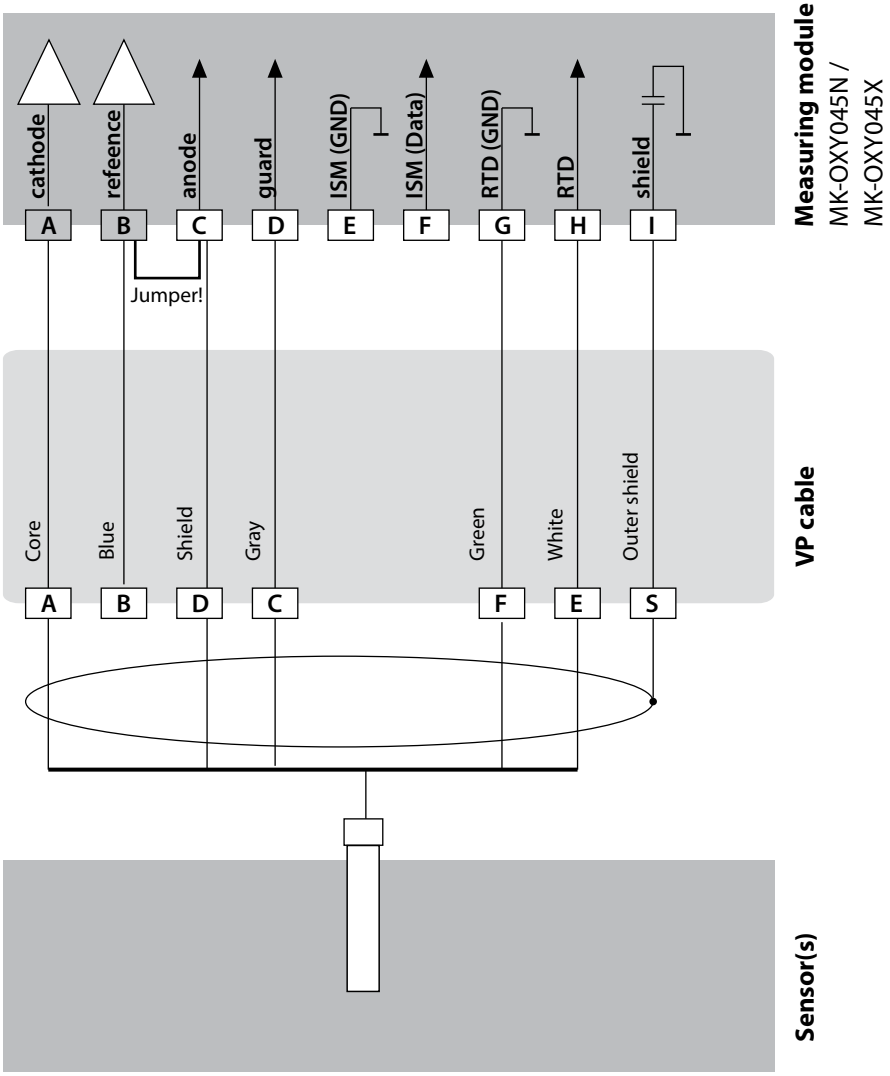
Oxy

Example 2

Measuring task: Oxygen TRACES

Sensors (example): "01" (eg, SE 707, InPro 6900)

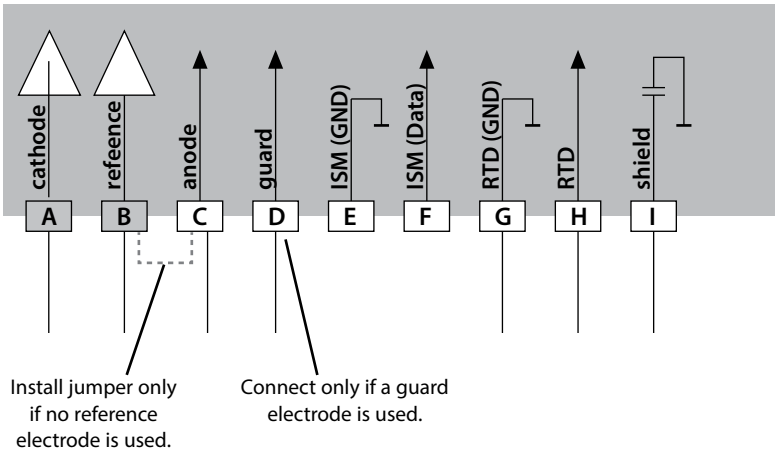
Cable (example): CA/VP6ST-003A



Example 3

Measuring task: Oxygen SUBTRACES

Sensors (example): “001“, see Specifications page 257



Start-Up

When a Memosens 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

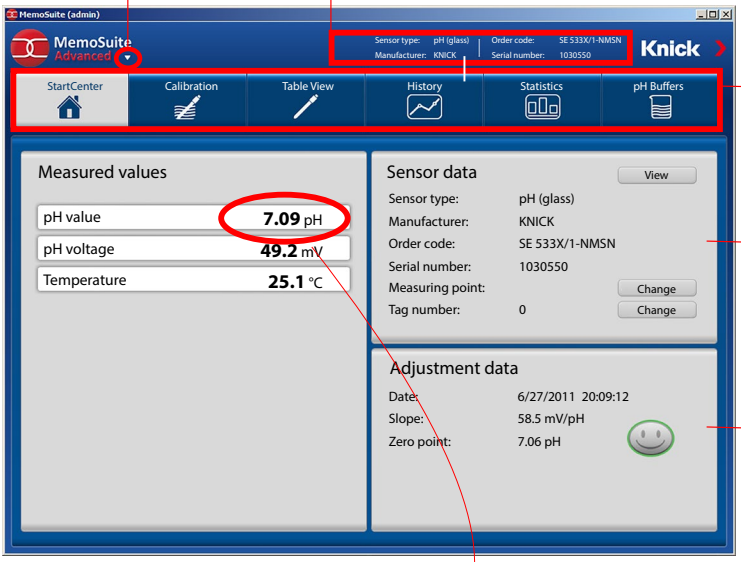
In the "Service" menu you can select another measuring function at any time.

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

Connected sensor: Sensor type, manufacturer, order code and serial number



Function selection: The selected function is highlighted.

Connected sensor: Sensor type, manufacturer, order code and serial number, measuring point and tag number

Last adjustment

You can magnify a measured-value display at a click of the mouse.

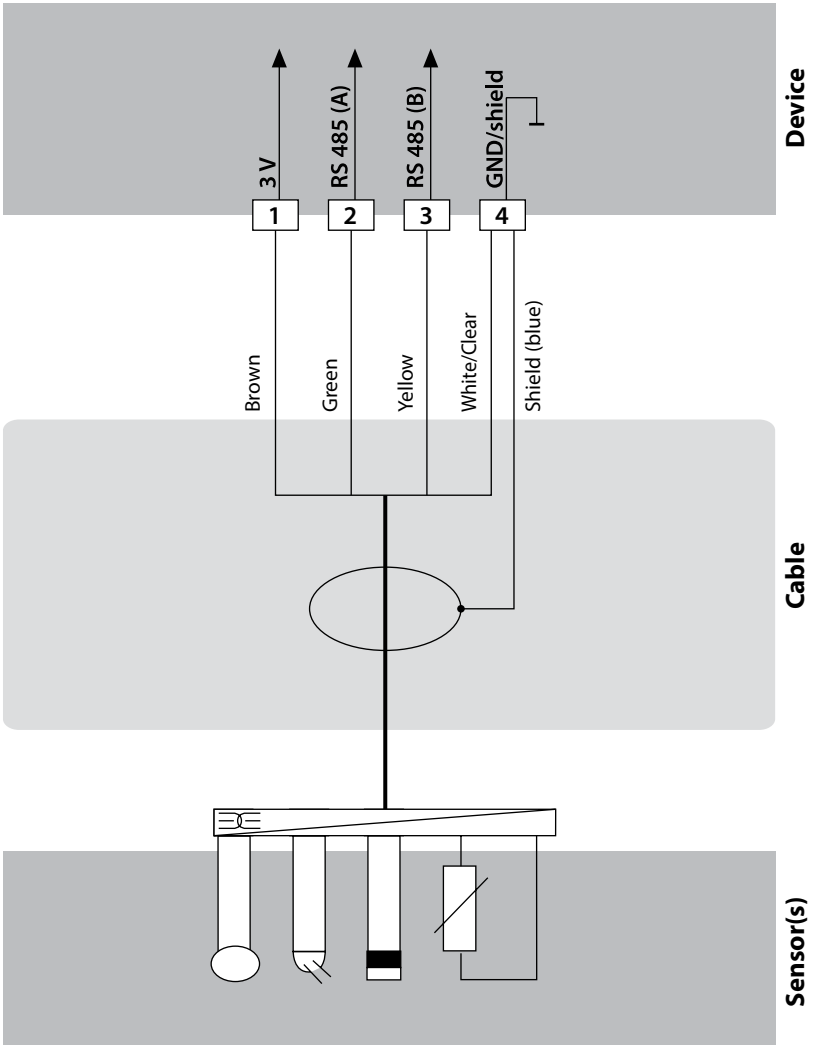
Example 1

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

Sensors (example): SE 554N/1-AMSN, Memosens

Cable (example): CA/MS-003NAA

Connection to RS-485 interface. Remove the measuring module!



pH

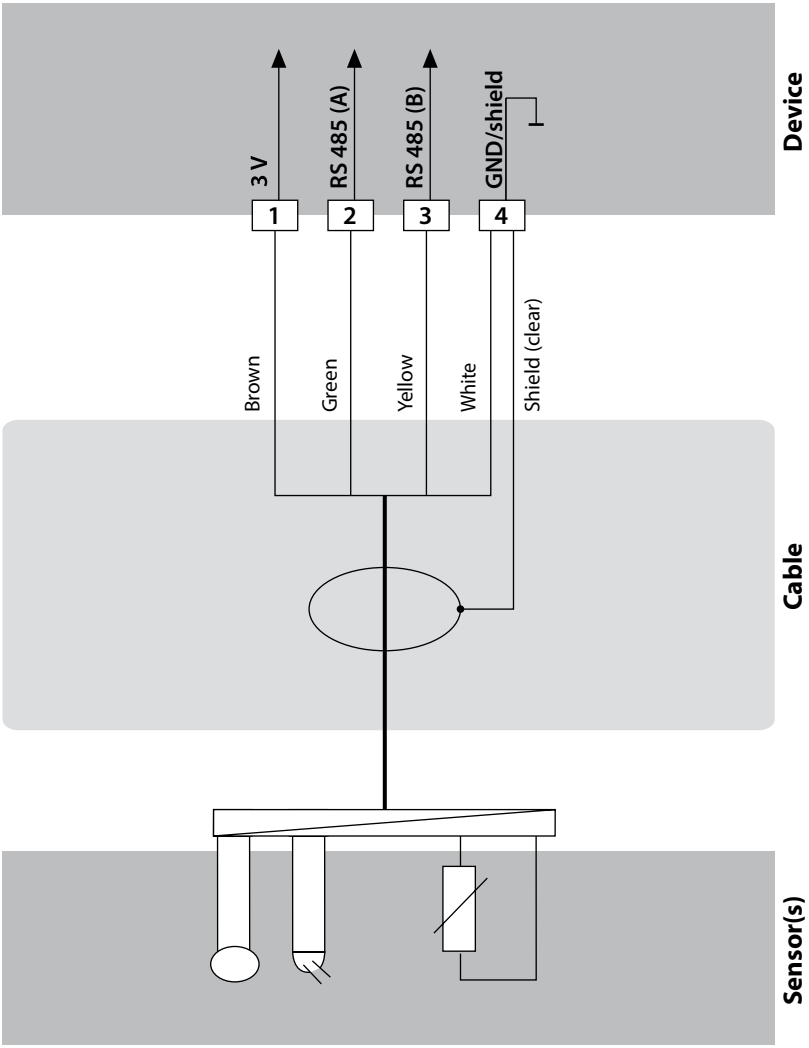
Example 2

Measuring task: pH/ORP, temp, glass impedance

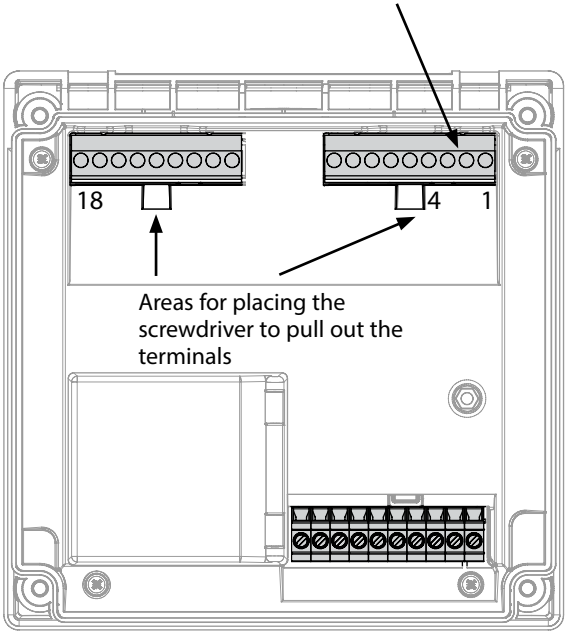
Sensors (example): SE 555X/1-NMSN Memosens

Cable (example): CA/MS-003XAA

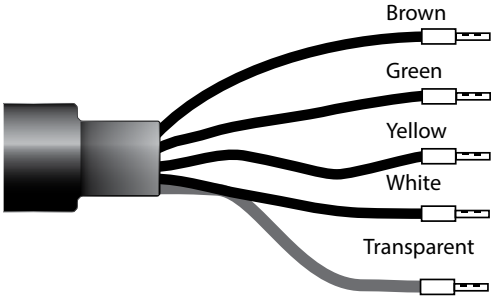
Connection to RS-485 interface. Remove the measuring module!



Terminals for Memosens		
1	Brown	+3V
2	Green	RS 485 A
3	Yellow	RS 485 B
4	White/Transparent	GND/Shield



Memosens Cable



Power supply +

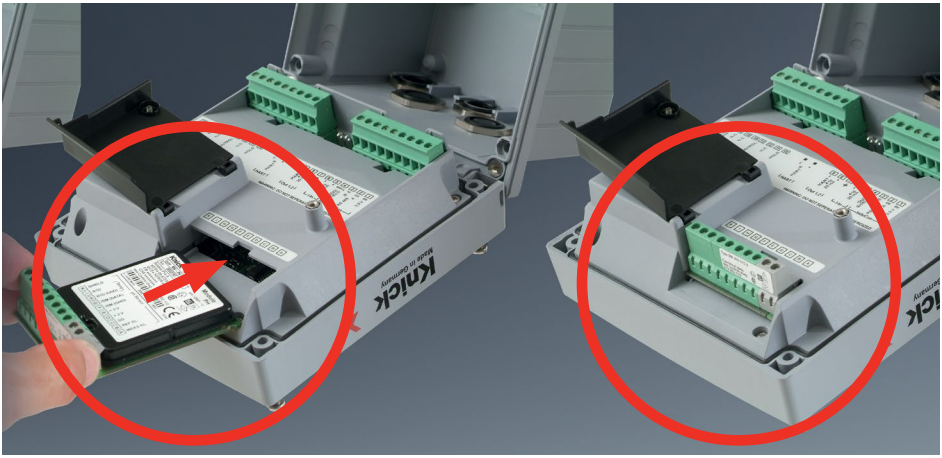
RS485 (A)

RS485 (B)

Power supply – (GND)

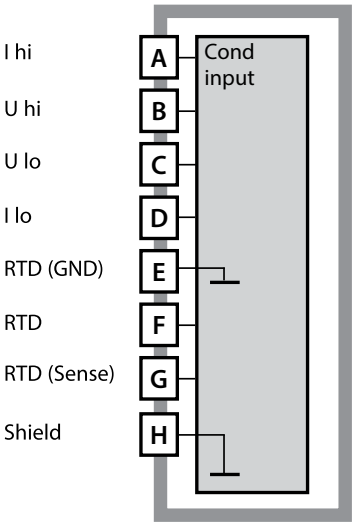
Shield

Cond

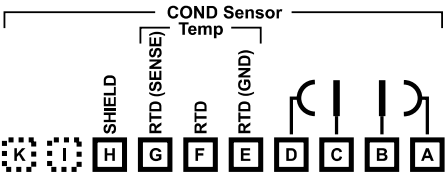


Measuring modules for connection of analog sensors (Cond, CondI, dual conductivity Cond-Cond):

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.

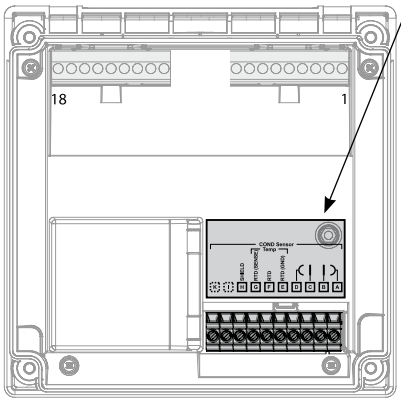


Module for Contacting Conductivity Measurement (Cond)
Order code
MK-COND025N / MK-COND025X
See the following pages for wiring examples.



Terminal Plate of Module for Cond Measurement
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".

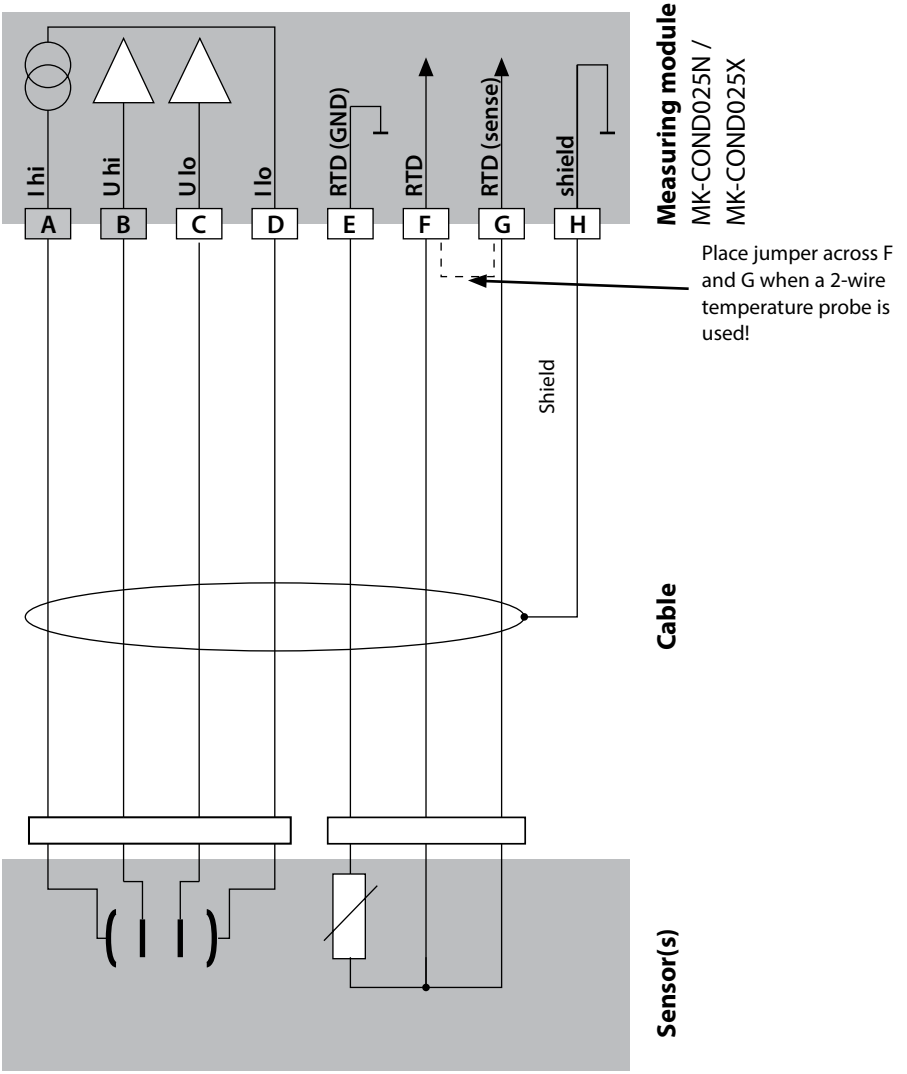


Cond

Example 1

Measuring task: Conductivity, temperature

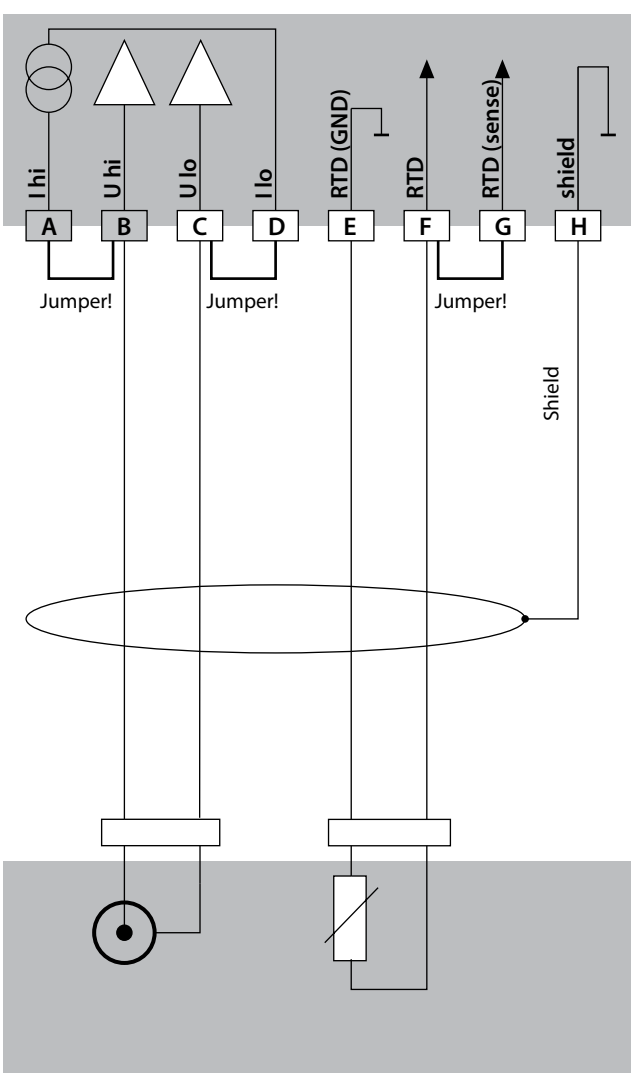
Sensors (principle): 4 electrodes



Example 2

Measuring task: Conductivity, temperature

Sensors (principle): 2 electrodes, coaxial



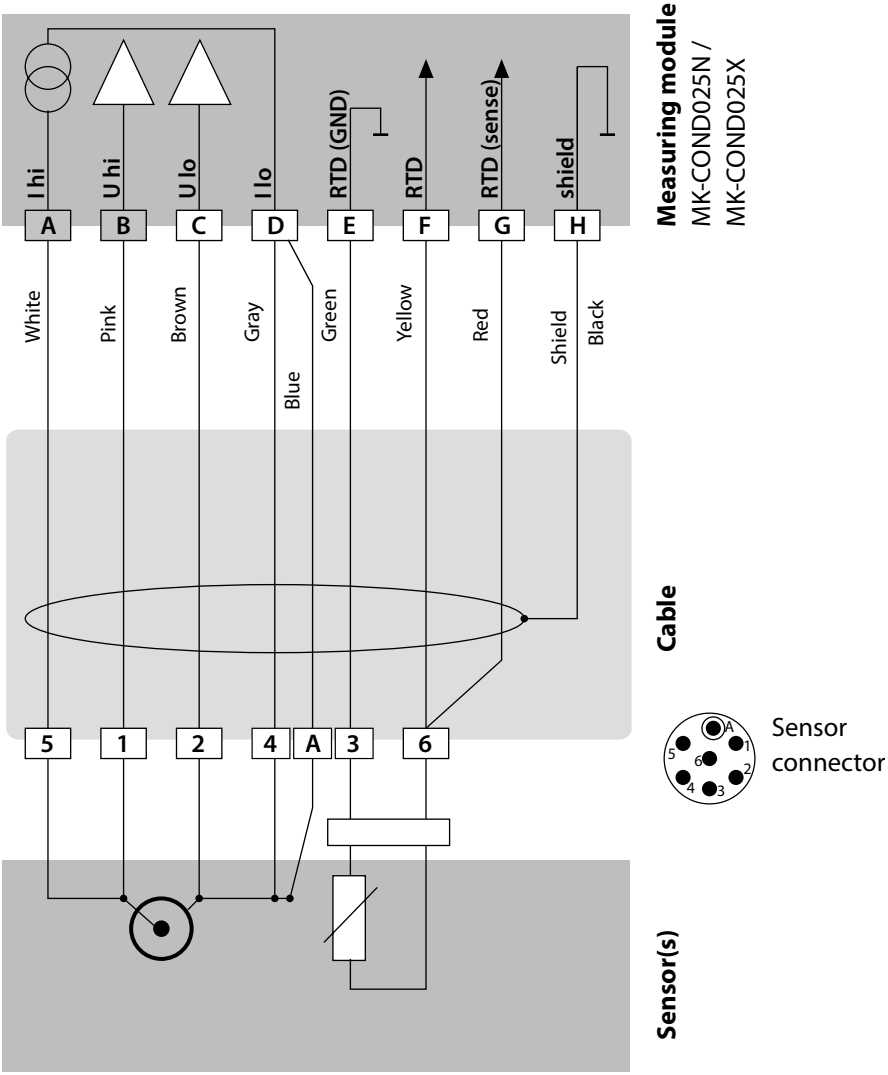
Cond

Example 3

Measuring task: Conductivity, temperature

Sensors (example): SE 604

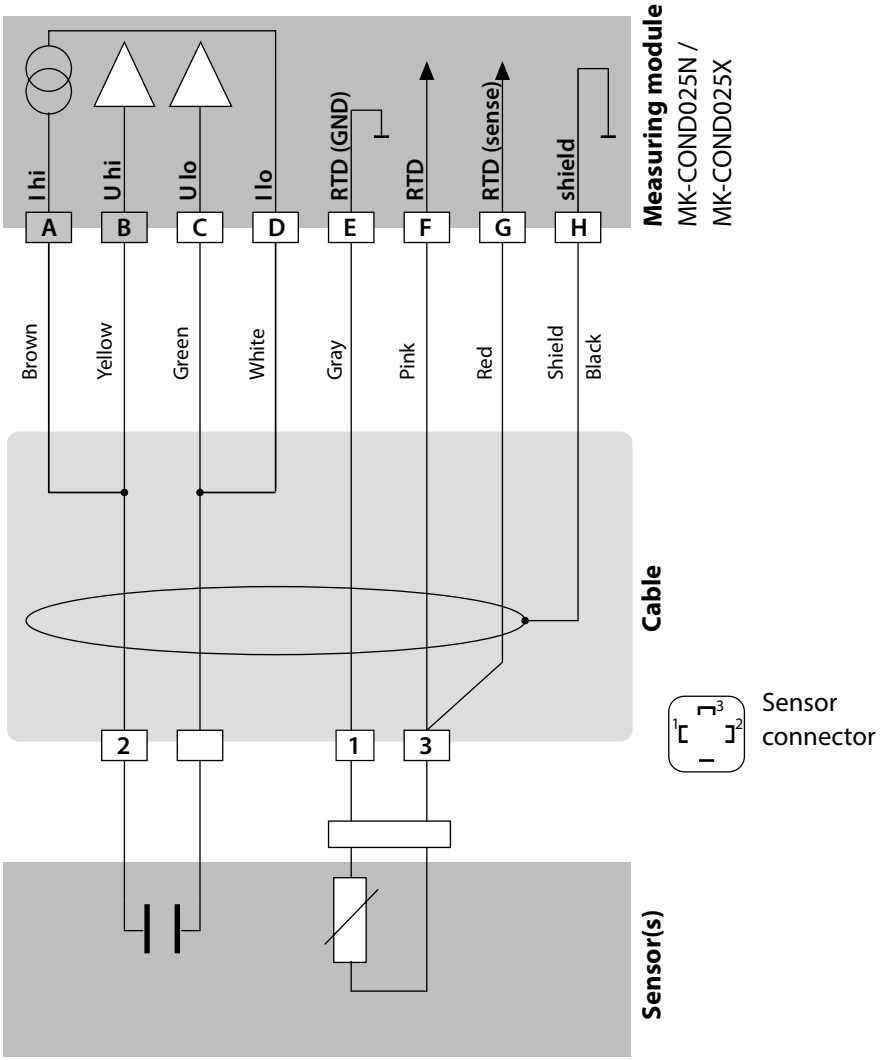
Cable: ZU 0645



Example 4

Measuring task: Conductivity, temperature

Sensors (example): SE 630

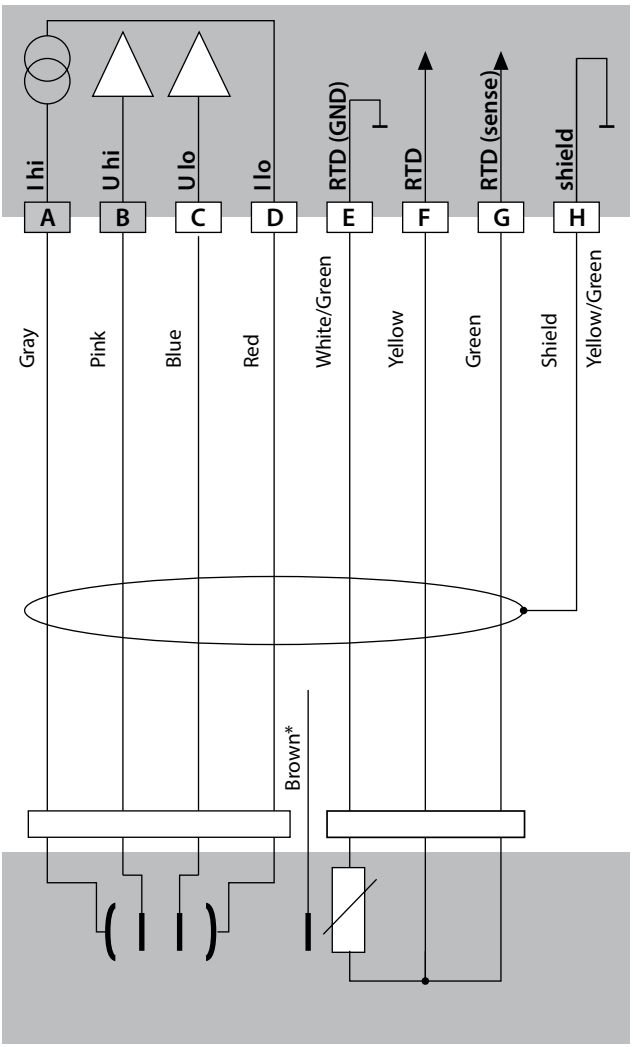


Cond

Example 5

Measuring task: Conductivity, temperature

Sensors (example): SE 600 / SE 603 4-EL fringe-field sensor



* Do not connect

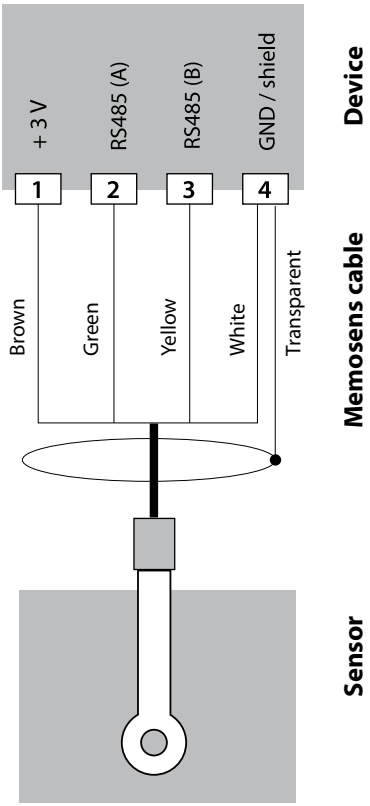
Example 6

Measuring task: Conductivity, temperature

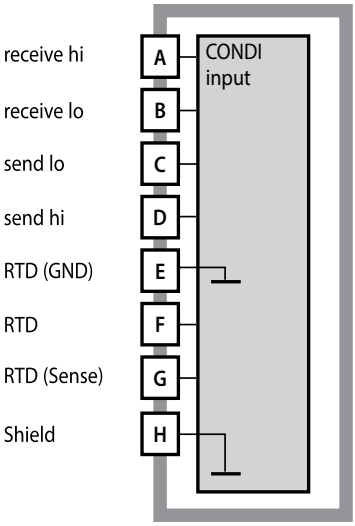
Sensor: Memosens

NOTICE: Connection to RS-485 interface!

Remove the measuring module.



Connect the Memosens sensor to the RS-485 interface of the device.

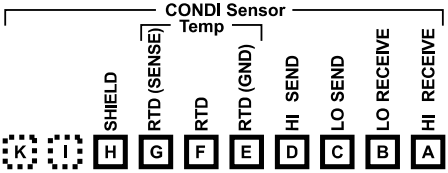


Module for Inductive Conductivity Measurement (CondI)

Order code

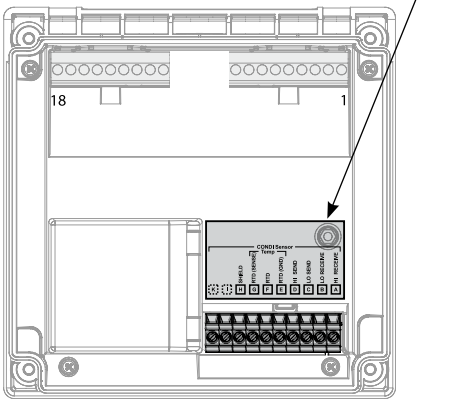
MK-CONDI035 N / MK-CONDI035X

See the following pages for wiring examples.



Terminal Plate of CondI Module

The terminals are suitable for single or stranded wires up to 2.5 mm² (AWG 14).

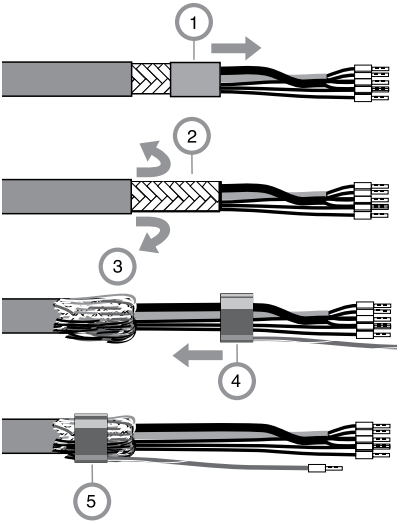


The measuring module comes with a self-adhesive label. Stick the label to the module slot on the device front. This way, you have the wiring "under control".

Condl

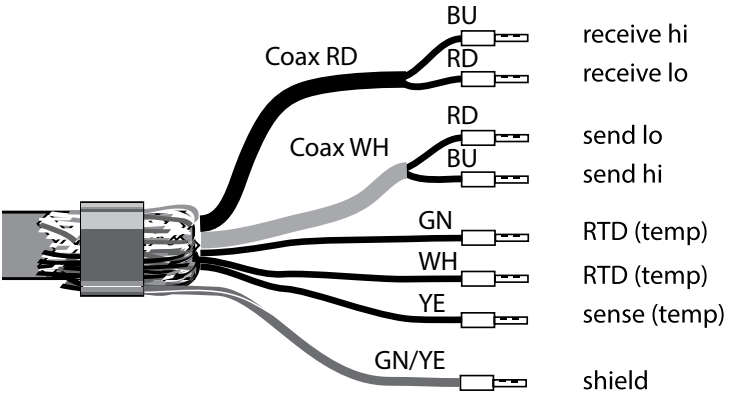
Preparing the Shield Connection

Pre-assembled special cable for SE 655 / SE 656 sensors



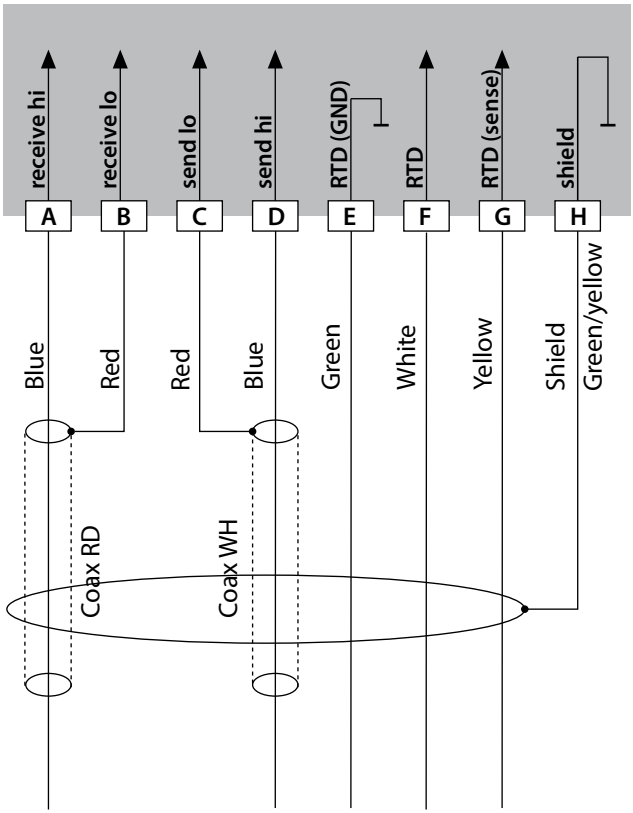
- Insert the special cable through the cable entry into the terminal compartment.
- Remove the already separated part of the cable insulation (1).
- Turn the shielding mesh (2) over the cable insulation (3).
- Then shift the crimp ring (4) over the shielding mesh and tighten it using a pince (5)

The pre-assembled special cable:



Measuring task: Conductivity, temperature

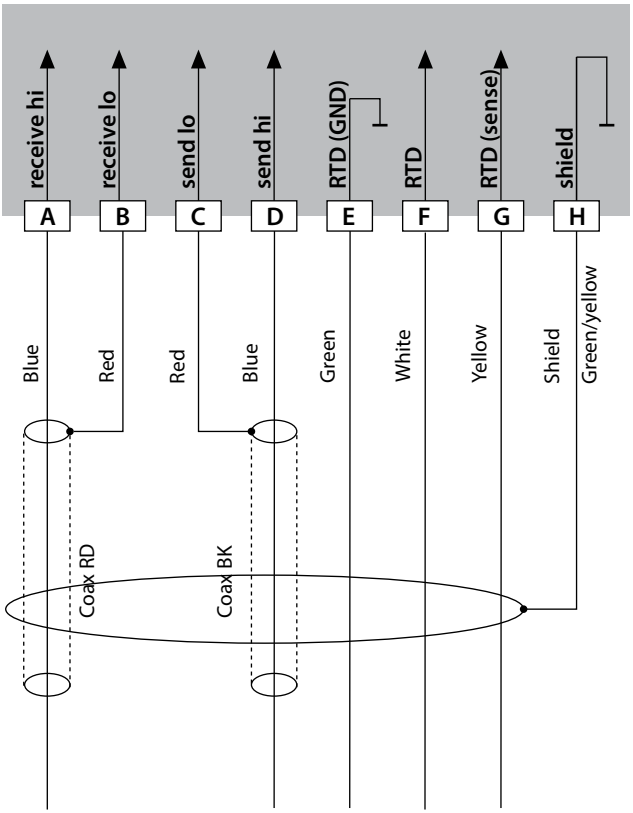
Sensors: SE 655/SE 656



CondI

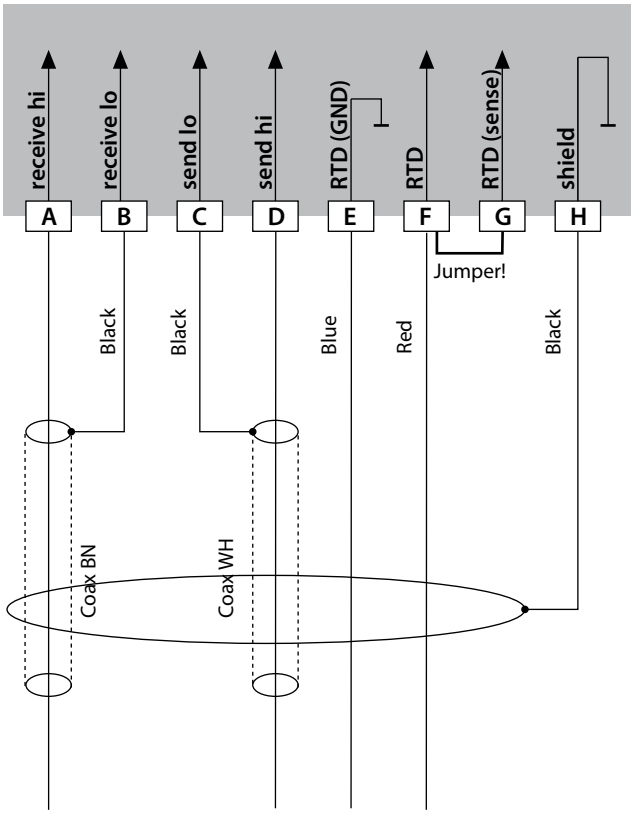
Measuring task: Conductivity, temperature

Sensor: SE 660



Measuring task: Conductivity, temperature

Sensor: Yokogawa ISC40 (Pt 1000)



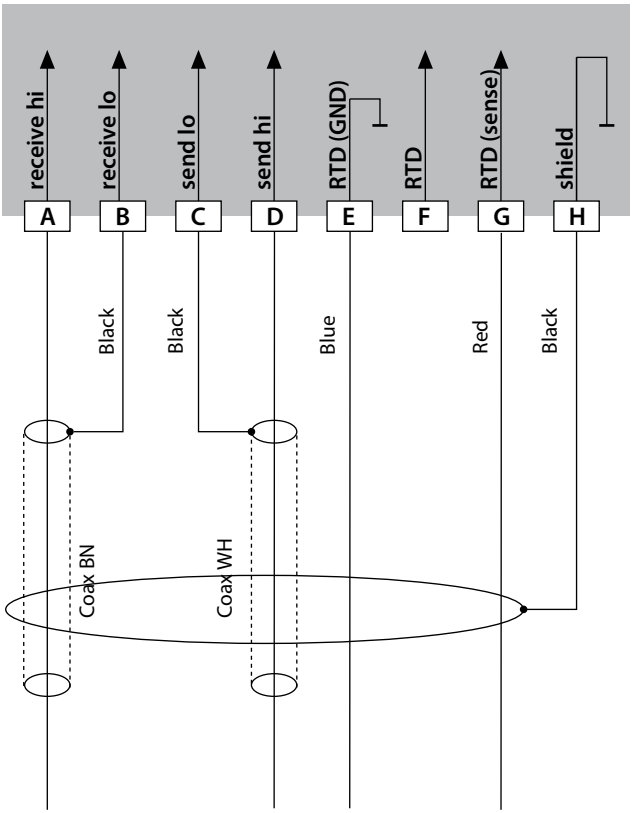
Configuration settings for this sensor:

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

CondI

Measuring task: Conductivity, temperature

Sensor: Yokogawa IC40S (NTC 30k)



Configuration settings for this sensor:

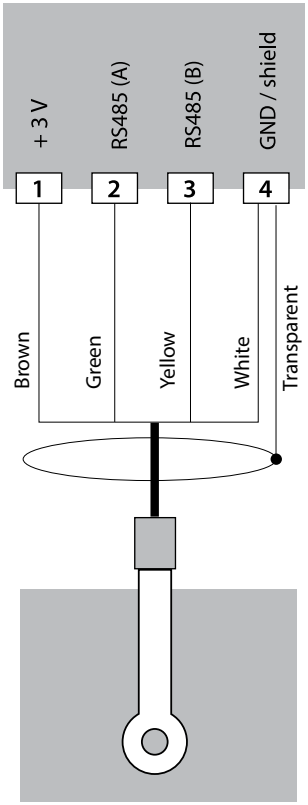
Sensor:	Conductivity, temperature
SENSOR	OTHER
RTD TYPE	30 NTC
CELL FACTOR	approx. 1.7
TRANS RATIO	125

Measuring task: Conductivity, temperature

Sensor: SE 670/C1, SE 680 /D1, SE 680N-C1N4U00M

NOTICE: Connection to RS-485 interface!

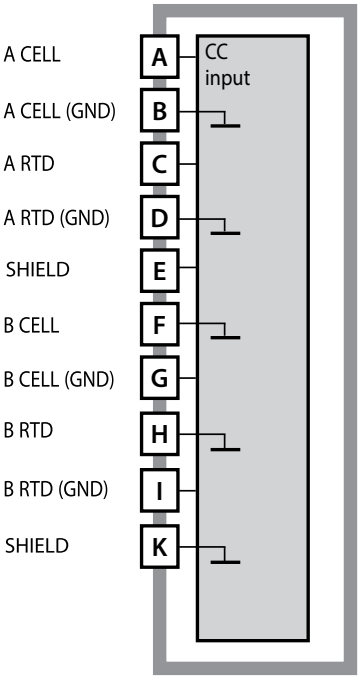
Remove the measuring module.



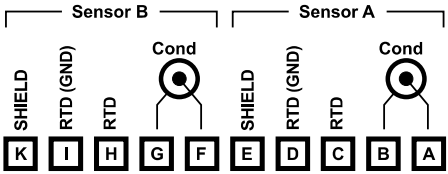
When the SE 670/C1 (SE 680/D1) sensor is selected in the Configuration menu, the default values are taken as calibration data. They can then be modified by calibration.

NOTICE: The calibration data of the SE 670/C1 (SE 680/D1) are saved in the analyzer and not in the sensor.

CC

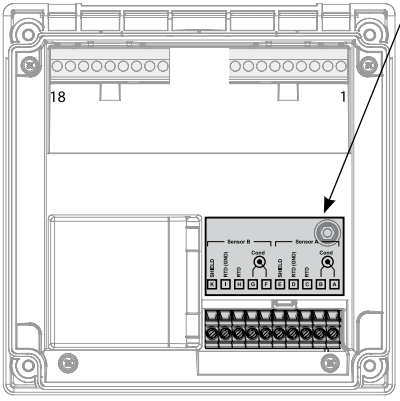


Dual-Conductivity Module
Order code MK-CC065N
See the following pages for wiring examples.



Terminal Plate
Dual Conductivity Measurement
The terminals are suitable for single or stranded wires up to 2.5 mm² (AWG 14).

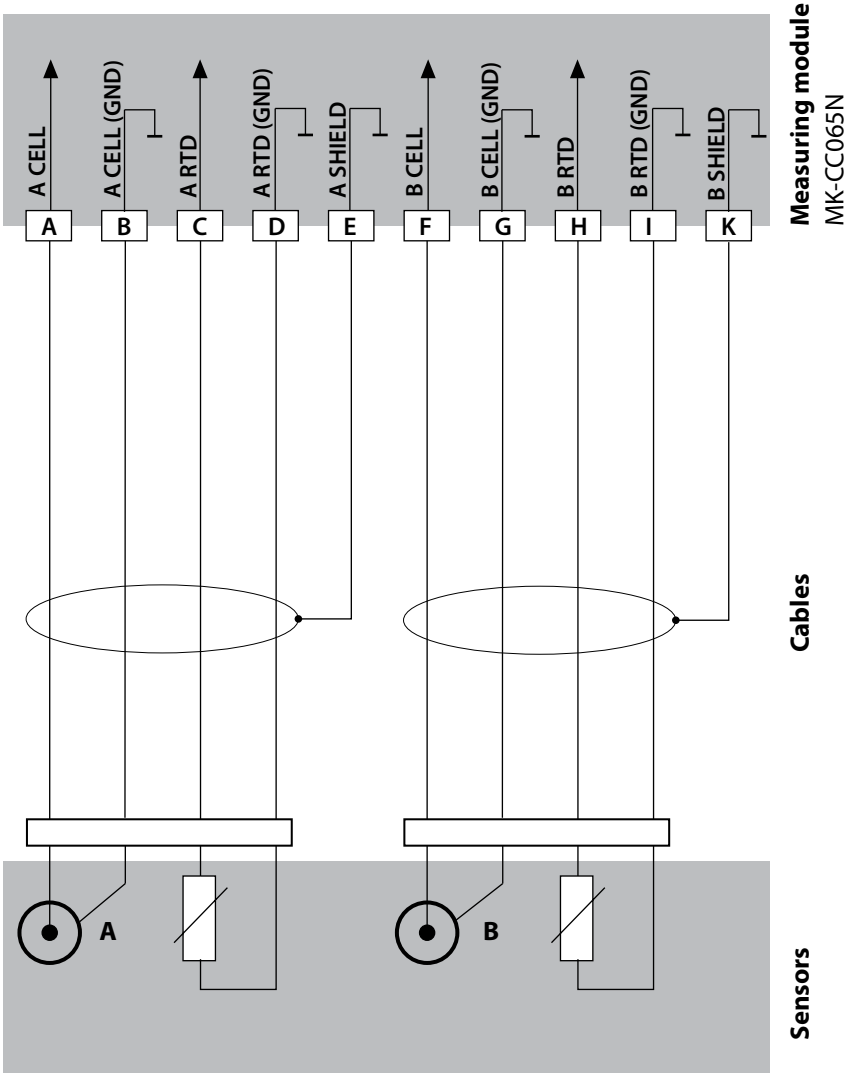
The measuring module comes with a self-adhesive label. Stick the label to the module slot on the device front. This way, you have the wiring "under control".



Example 1

Measuring task: Dual conductivity, temperature

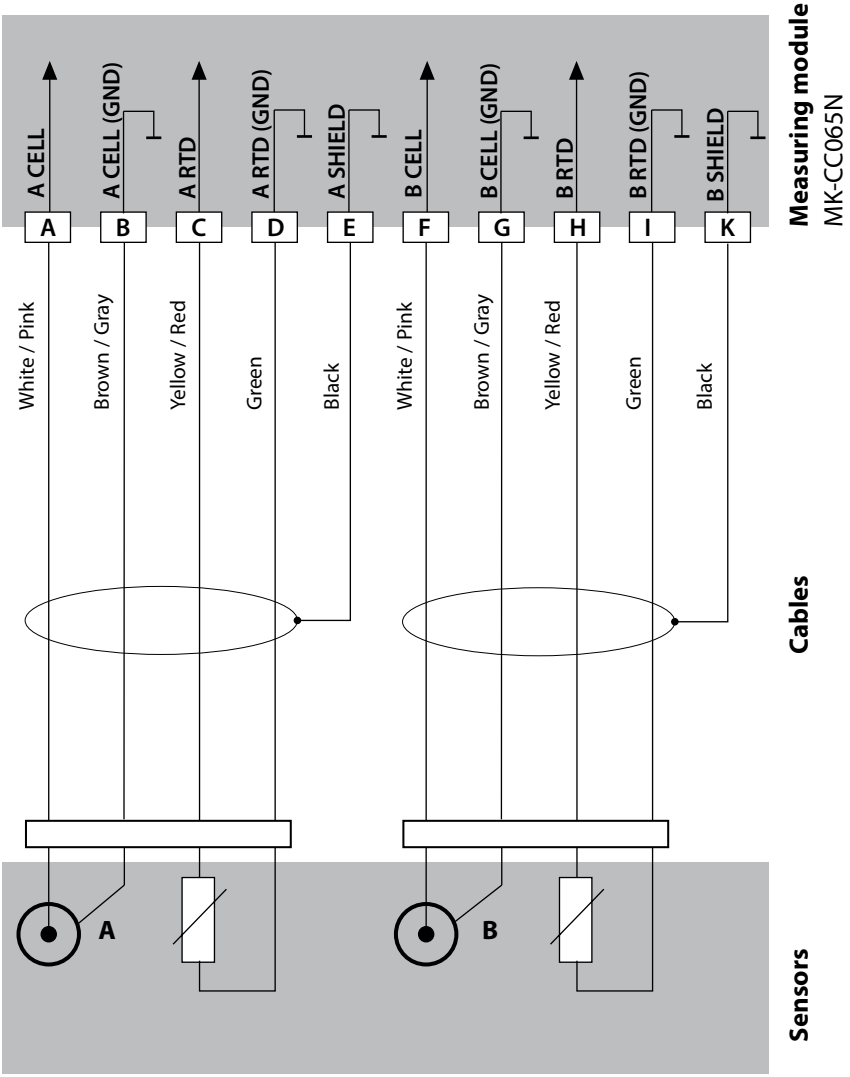
Sensors (principle): 2 coaxial sensors



CC

Example 2

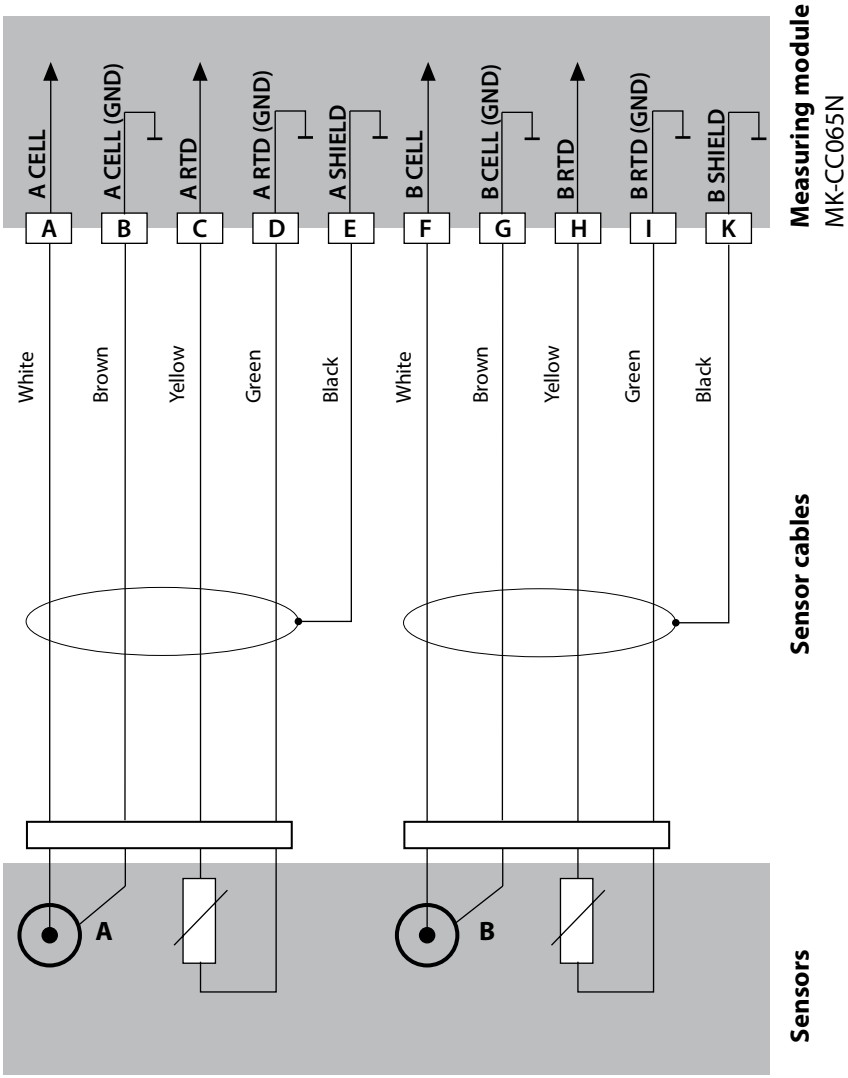
Measuring task:	Dual conductivity, temperature
Sensors:	2 x SE 604
Cable:	2 x ZU 0645



Example 3

Measuring task: Dual conductivity, temperature

Sensors: 2 x SE 610



BUS communication	FOUNDATION Fieldbus FF-H1
Physical interface	To EN 61158-2 (IEC 1158-2), MBP-IS
Operating mode	Bus-powered with constant current consumption
Supply voltage	FISCO ≤ 17.5 V (trapezoidal or rectangular characteristic) Linear characteristic ≤ 26 V
Min. supply voltage	9 V
Max. supply voltage	32 V (non Ex)
Current consumption	< 20 mA
Max. current in case of fault *	20.4 mA
Explosion protection (A231X)	see Control Drawing or www.knick.de
Data retention	Parameters and calibration data > 10 years (EEPROM)
EMC	EN 61326
Emitted interference	Class B (residential area)
Immunity to interference	Industry
Nominal operating conditions	
Ambient temperature	-20 … +65 °C for hazardous area, T4: -20 … +65 °C for hazardous area, T6: -20 … +50 °C
Transport/Storage temperature	-20 … +70 °C
Relative humidity	10 … 95% not condensing (assembly mounted in housing)
Bus connection	3 pluggable terminals equipotential bonding
CONTROL input	Galvanically separated optocoupler)
Function	Flow measurement (FLOW)
FLOW	Pulse input for flow measurement 0 ... 100 pulses/s Display 00.0 … 99.9 l/h
Real-time clock	Different time and date formats selectable
Power reserve	> 5 days
Adjustable via bus	
RoHS conformity	According to EU directive 2011/65/EU

* including current increase due to the integrated Fault Disconnection Electronic (FDE)

Display	LC display, 7-segment with icons
Main display	Character height approx. 22 mm, unit symbols approx. 14 mm
Secondary display	Character height approx. 10 mm
Backlighting	Multi-color, may be switched off for temperature code T6
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	Red backlighting in case of alarm
Keypad	Keys: meas, info, 4 cursor keys, enter Material: EPDM
FDA 21 CFR Part 11	Access control by editable passcodes Logbook entry in the case of configuration changes Message and logbook entry when enclosure is opened
Diagnostics functions	
Calibration data	Calibration date, zero, slope, response time
Device self-test	Automatic memory test (RAM, FLASH, EEPROM)
Display test	Display of all segments
Logbook	Audit Trail: 100 events with date and time
Service functions	
Sensor monitor	Display of direct sensor signals
Device type	Specifying the device type
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	148 mm x 148 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, tightening torque: 0.5 ... 0.6 Nm. Conductor cross-section rigid/flexible: 0.2 … 2.5 mm^2 Conductor cross-section flexible with ferrule without plastic sleeve: 0.25 … 2.5 mm^2 Conductor cross-section flexible with ferrule with plastic sleeve: 0.2 … 1.5 mm^2

pH

pH/mV input	Input for pH or ORP sensors or ISFET		
	Input	Glass electrode or ISFET	
	Input	Reference electrode	
	Input	ORP electrode (eg, platinum) or auxiliary electrode for impedance measurement	
Measuring range	-1500 … +1500 mV		
Display range	pH value	-2.00 … +16.00	
	ORP	-1999 … +1999 mV	
Glass electrode input[4)]	Input resistance	> 1 x 10^{12} Ω	
	Input current	< 1 x 10^{-12} A	
	Impedance range	0,5 … 1000 MΩ (±20%)	
Reference electrode input[4)]	Input resistance	> 1 x 10^{10} Ω	
	Input current	< 1 x 10^{-10} A	
	Impedance range	0.5 … 200 kΩ (±20%)	
Measurement error[1,2,3)]	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	2.00/4.01/7.00/10.01/12.00	
	-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- USER	Specifiable buffer set with 2 buffer solutions	
Zero adjustment	±200 mV (ISFET only) (±750 mV with Memosens ISFET)		
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	
Temperature input	Pt100 / Pt1000 / NTC 30 kΩ * 2-wire connection, adjustable	
Measuring range	Pt 100/Pt 1000	-20.0 … +200.0 °C (-4 … +392 °F)
	NTC 30 kΩ	-20.0 … +150.0 °C (-4 … +302 °F)
	NTC 8.55 kΩ (Mitsubishi)	-10.0 … +130.0 °C (+14 … +266 °F)
	Balco 3 kΩ	-20.0 … +130.0 °C (-4 … +266 °F)
Adjustment range	10 K	
Resolution	0.1 °C (0.1 °F)	
Measurement error[1,2,3)]	< 0.5 K (< 1 K for Pt100; < 1 K for NTC 30 kΩ >100°C)	
TC of process medium	Linear –19.99 … +19.99 %/K (reference temp. 25 °C) Table: 0 … 95 °C, user-defined in 5-K steps	
ISM input	"One wire" interface for operation with ISM (digital sensors) (6 V / Ri= approx. 1.2 kΩ)	
Memosens interface	Memosens (terminals 1 … 4)	
Data In/Out	Asynchronous interface, RS 485, 9600/19200 Bd	
Power supply	Terminal 1: +3.08 V/10 mA, Ri < 1 Ω, short-circuit-proof	
Adaptive calibration timer*	Interval 0000 … 9999 h (Pat. DE 101 41 408)	
Diagnostics functions		
Calibration data	Calibration date, zero, slope, response time	
Power output	for operating an ISFET adapter +3 V / 0.5 mA -3 V / 0.5 mA	
Sensocheck	Automatic monitoring of glass and reference electrode (can be switched off)	
Delay	Approx. 30 s	
Sensoface Evaluation of	Provides information on the sensor condition (can be switched off) Zero/slope, calibration interval, Sensocheck, wear	

* user-defined
1) to EN 60746-1, at nominal operating conditions
2) ± 1 count
3) plus sensor error
4) at room temperature

Oxy

Standard Version	Sensors: SE 706, InPro 6800, Oxyferm	
Input range	Meas. current -600 … +2 nA	Resolution 10 pA
Measurement error[1,2,3)]	< 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	
Trace measurement	Sensors: SE 706/707; InPro 6800/6900; Oxyferm/Oxygold	
Input range I [4)]	Meas. current -600 … +2 nA	Resolution 10 pA
Measurement error[1,2,3)]	< 0.5% meas. val. + 0.05 nA + 0.005 nA/K	
Input range II [4)]	Meas. current -10,000 … +2 nA	Resolution 166 pA
Measurement error	< 0.5% meas. val. + 0.8 nA + 0.08 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"		
	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 ppb / 1.000 ... 50.00 %vol

Measuring ranges with "001" trace sensors (not supported by Memsosens sensors)		
	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 ppb / 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 bar / 999.9 kPa / 145.0 PSI manually or through BUS AO Block
	Salinity correction	0.0 … 45.0 g/kg
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 mbar)
Calibration range	Zero point	±2 nA
Trace sensor "01"	Slope	200 ... 550 nA (at 25°C, 1013 mbar)
Calibration range	Zero point	±3 nA
Trace sensor "001"	Slope	2000 ... 9000 nA (at 25°C, 1013 mbar)
Calibration timer *	Interval 0000 … 9999 h	
Pressure correction *	Manually 0.000 ... 9.999 bar / 999.9 kPa / 145.0 PSI	
Memosens interface	Memosens (terminals 1 … 4)	
Data In/Out	Asynchronous interface, RS 485, 9600/19200 Bd	
Power supply	Terminal 1: +3.08 V/10 mA, Ri < 1 Ω, short-circuit-proof	

* user-defined
1) to EN 60746-1, at nominal operating conditions
2) ± 1 count
3) plus sensor error
4) automatic range selection

Cond

Cond input	Input for 2-/4-electrode sensors or Memosens	
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)	
Measuring 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 to 9.999 mS/cm 00.00 to 99.99 mS/cm 000.0 to 999.9 mS/cm 0.000 ... 9.999 S/m 00.00 ... 99.99 S/m
	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 (T_{90})	Approx. 1 s
Measurement error[1,2,3]	< 1 % meas. val. + 0.4 µS • c	

Temp compensation *	OFF	Without
(Reference temp user defined)	LIN	Linear characteristic 00.00...19.99 %/K
(Reference temp 25°C)	nLF	Natural waters to EN 27888
	nACL	NaCl from 0 (ultrapure water) to 26% by wt (0 ..120°C)
	HCL	Ultrapure water with HCl traces (0...120°C)
	nH3	Ultrapure water with NH_3 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- H_2SO_4	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- H_2SO_4	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- HNO_3	35 – 96% by wt (-20 °C)	... 35 – 96% by wt (50 °C)
	-09- H_2SO_4	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
	Entry of conductivity of calibration solution with simultaneous display of cell factor and temperature
	Product calibration for conductivity
	Temp probe adjustment (10 K)
Permissible cell factor	00.0050...19.9999 cm^{-1}
Memosens interface	Memosens (terminals 1 … 4)
Data In/Out	Asynchronous interface, RS 485, 9600/19200 Bd
Power supply	Terminal 1: +3.08 V/10 mA, Ri < 1 Ω, short-circuit-proof

* user-defined
1) to EN 60746-1, at nominal operating conditions
2) ± 1 count
3) plus sensor error

CondI

CONDI input	Input for toroidal conductivity sensors: SE 655, SE 656, SE 660, SE 670, SE 680(N/X)-C1N4U00M	
Measuring ranges	Conductivity:	0.000 ... 1999 mS/cm
	Concentration:	0.00 … 100.0 % by wt
	Salinity	0.0 … 45.0 ‰ (0 … 35 °C)
Measuring ranges	Conductivity	0.000 … 9.999 mS/cm (not with SE 660)
		00.00 ... 99.99 mS/cm
		000.0 ... 999.9 mS/cm
		0000 ... 1999 mS/cm
		0.000 ... 9.999 S/m
		00.00 ... 99.99 S/m
	Concentration	0.00 … 9.99 % / 10.0 … 100.0 %
	Salinity	0.0 ...45.0 ‰ (0 … 35 °C)
	Response (T_{90})	Approx. 1 s
Measurement error[1,2,3)]	< 1% meas. val. + 0.005 mS	
Temp compensation *	OFF	Without
(Reference temp user defined)	LIN	Linear characteristic 00.00...19.99 %/K
(Reference temp 25°C)	nLF	Natural waters to EN 27888
	nACL	Ultrapure water with NaCl traces (0...120°C)
	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- H_2SO_4	0 – 26% by wt (-17 °C) ... 0 – 37% by wt (110 °C)
	-05- HNO_3	0 – 30% by wt (-20 °C) ... 0 – 30% by wt (50 °C)
	-06- H_2SO_4	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- HNO_3	35 – 96% by wt (-20 °C) ... 35 – 96% by wt (50 °C)
	-09- H_2SO_4	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
	Entry of conductivity of calibration solution with simultaneous display of cell factor and temperature
	Product calibration for conductivity
	Zero adjustment
	Temp probe adjustment (10 K)
Permissible cell factor	00.100...19.9999 cm^{-1}
Permissible transfer ratio	010.0 … 199.9
Permissible offset	± 0.5 mS
Permissible installation factor	0.100 … 5.000
Sensocheck	Monitoring of primary and secondary coils and lines for open circuit and of primary coil and lines for short circuit
Delay	Approx. 30 s
Sensoface	Provides information on the sensor condition (zero point, Sensocheck)
Sensor monitor	Direct display of measured values from sensor for validation (resistance/temperature)
Temperature extrapolation	Extrapolation of the temperature using the TICK method in the case of a significant change (for standard sensors SE 670 / SE 680 only)
Memosens interface	Memosens (terminals 1 … 4)
Data In/Out	Asynchronous interface, RS 485, 9600/19200 Bd
Power supply	Terminal 1: +3.08 V/10 mA, Ri < 1 Ω, short-circuit-proof

* user-defined
1) to EN 60746-1, at nominal operating conditions
2) ± 1 count
3) plus sensor error

CC

COND inputs A/B	2 inputs for 2-el. sensors,via MK module only		
Measuring range	0 … 30,000 µS * c		
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	
		00.00 … 99.99 MΩ cm	
	Response (T_{90})	Approx. 1 s	
Measurement error[1,2,3]	< 1 % meas. val. + 0.4 µ * c		
Memosens interface	Memosens (terminals 1 … 4)		
Data In/Out	Asynchronous interface, RS 485, 9600/19200 Bd		
Power supply	Terminal 1: +3.08 V/10 mA, Ri < 1 Ω, short-circuit-proof		
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 (0...120°C)	
	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)	
Sensor standardization			
Channel A/B	Input of cell factor with simultaneous display of conductivity and temperature		
Permissible cell factor	0.0050...1.9999 cm^{-1}		
Calculations (CALC)	-C1- Difference	A-B	[µS/cm]
	-C2- Ratio	A/B	00.00 … 19.99
	-C3- Passage	B/A * 100	000.0 ... 199.9 %
	-C4- Rejection	(A-B)/A * 100	-199.9 ... 199.9 %
	-C5- Deviation	(B-A)/A * 100	-199.9 ... 199.9 %
	-C6- pH value	Acc. to VGB regulation	[pH]
	-C7- pH value	variable, specifiable factors	[pH]
	-C8- User spec	(DAC Degassed Acid Conductivity)	[µS/cm]
Temperature input A/B *	Pt1000, 2-wire connection		
Measuring range	-50 … +200 °C (-58 ... +392 °F)		
Resolution	0.1 °C (0.1 °F)		
Measurement error[1,2,3]	0.5 K (1 K > 100 °C)		

* user-defined
1) to EN 60746-1, at nominal operating conditions
2) ± 1 count
3) plus sensor error

-01- Mettler-Toledo
(corresponds to former "Knick technical buffers")
Nominal values at 25 °C: 2.00 / 4.01 / 7.00 / 9.21

°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

pH

-02- Knick CaliMat
(Values also apply to Merck-Titrisols, Riedel-de-Haen Fixanals.)
Nominal values at 20 °C: 2.00 / 4.00 / 7.00 / 9.00 / 12.00

°C	pH				
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

Knick CaliMat Buffer Solutions

pH value [20 °C]	Quantity	Order No.
2.00 ± 0.02	250 ml	CS-P0200/250
4.00 ± 0.02	250 ml	CS-P0400/250
4.00 ± 0.02	1000 ml	CS-P0400/1000
4.00 ± 0.02	3000 ml	CS-P0400/3000
7.00 ± 0.02	250 ml	CS-P0700/250
7.00 ± 0.02	1000 ml	CS-P0700/1000
7.00 ± 0.02	3000 ml	CS-P0700/3000
9.00 ± 0.02	250 ml	CS-P0900/250
9.00 ± 0.02	1000 ml	CS-P0900/1000
9.00 ± 0.02	3000 ml	CS-P0900/3000
12.00 ± 0.05	250 ml	CS-P1200/250

-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	2.07	4.01	6.95	9.85
40	2.06	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
70	2.07	4.11	6.92	9.57
80	2.02	4.15	6.93	9.52
90	2.04	4.20	6.97	9.43

pH

-04- Technical buffers to NIST
Nominal values at 25 °C: 1.68 / 4.00 / 7.00 / 10.01 / 12.46

°C	pH				
0	1.67	4.00	7.12	10.32	13.42
5	1.67	4.00	7.09	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	1.68	4.00	7.02	10.06	12.64
25	1.68	4.01	7.00	10.01	12.46
30	1.68	4.02	6.99	9.97	12.30
35	1.69	4.03	6.98	9.93	12.13
40	1.69	4.03	6.98	9.89	11.99
45	1.70	4.05	6.98	9.86	11.84
50	1.71	4.06	6.97	9.83	11.71
55	1.72	4.08	6.97		11.57
60	1.72	4.09	6.97		11.45
65	1.73	4.10	6.98		
70	1.74	4.13	6.99		
75	1.75	4.14	7.01		
80	1.77	4.16	7.03		
85	1.78	4.18	7.05		
90	1.79	4.21	7.08		
95	1.81	4.23	7.11		

-05- NIST standard buffers
NIST Standard (DIN 19266 : 2001)
Nominal values at 25 °C: 1.679 / 4.006 / 6.865 / 9.180

°C	pH			
0	1.666	4.010	6.984	9.464
5	1.668	4.004	6.950	9.392
10	1.670	4.001	6.922	9.331
15	1.672	4.001	6.900	9.277
20	1.676	4.003	6.880	9.228
25	1.680	4.008	6.865	9.184
30	1.685	4.015	6.853	9.144
35	1.688	4.021	6.844	9.102
40	1.697	4.036	6.837	9.076
45	1.704	4.049	6.834	9.046
50	1.712	4.064	6.833	9.018
55	1.715	4.075	6.834	8.985
60	1.723	4.091	6.836	8.962
70	1.743	4.126	6.845	8.921
80	1.766	4.164	6.859	8.885
90	1.792	4.205	6.877	8.850
95	1.806	4.227	6.886	8.833

Note:
The actual pH values of the individual batches of the reference materials are documented 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 provides examples of pH(PS) values for orientation.

pH

-06- HACH buffers
Nominal values at 25 °C: 4.01 / 7.00 / 10.01 (±0.02)

°C	pH		
0	4.00	7.11	10.30
5	4.00	7.08	10.23
10	4.00	7.05	10.17
15	4.00	7.03	10.11
20	4.00	7.01	10.05
25	4.01	7.00	10.01
30	4.01	6.98	9.96
35	4.02	6.97	9.92
40	4.03	6.97	9.88
45	4.05	6.96	9.85
50	4.06	6.96	9.82
55	4.07	6.96	9.79
60	4.09	6.96	9.76

-07- WTW techn. buffers
Nominal values at 25 °C: 2.00 / 4.01 / 7.00 / 10.00

°C	pH			
0	2.03	4.00	7.12	10.32
5	2.02	4.00	7.09	10.25
10	2.01	4.00	7.06	10.18
15	2.00	4.00	7.04	10.12
20	2.00	4.00	7.02	10.01
25	2.00	4.01	7.00	10.01
30	1.99	4.02	6.99	9.97
35	1.99	4.03	6.98	9.93
40	1.98	4.03	6.98	9.89
45	1.98	4.05	6.98	9.86
50	1.98	4.06	6.97	9.83
55	1.98	4.08	6.97	
60	1.98	4.09	6.97	
65	1.99	4.10	6.98	
70	2.00	4.13	6.99	
75	2.00	4.14	7.01	
80	2.00	4.16	7.03	
85	2.00	4.18	7.05	
90	2.00	4.21	7.08	
95	2.00	4.23	7.11	

pH

-08- Hamilton Duracal buffers

Nom. values at 25 °C: 2.00 ±0.02 / 4.01 ±0.01 / 7.00 ±0.01 / 10.01 ±0.02 / 12.00 ±0.05

°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

-09- Reagecon buffers
Nominal values at 25 °C: 2.00 / 4.00 / 7.00 / 9.00 / 12.00

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

pH

-10- DIN 19267 buffers
Nominal values at 25 °C: 1.09 / 4.65 / 6.79 / 9.23 / 12.75

°C	pH				
0	1.08	4.67	6.89	9.48	
5	1.08	4.67	6.87	9.43	
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

-U1- Specifiable Buffer Set

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:

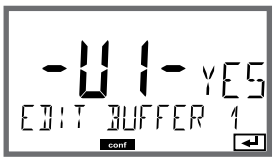
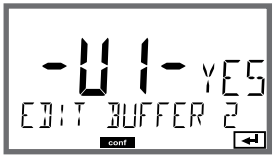
- All values must lie in the range pH 0 ... 14.
- Maximum difference between two adjacent pH values (5 °C step width) of the same buffer solution: pH 0.25
- The values of buffer solution 1 must be lower than those of buffer solution 2: The difference between values for identical temperatures must be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

Note: Use a configuration tool such as the **SIMATIC PDM** from Siemens for convenient data entry.

pH

Step	Action/Display	Remark
Select buffer set -U1- (CONFIG / SNS menu)		
Select buffer solution 1 for editing.	 Select "YES" using up/ down key.	You are prompted for confirmation to prevent accidental changes of the settings.
Editing the values Buffer solution 1	 Edit: using arrow keys, press **enter** to confirm and proceed to next temperature value. 	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.		The difference between buffer solutions for identical temperatures must be greater than 2 pH units.

-U1- Specifiable Buffer Set

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		

Cond

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	

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

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

278 Concentration Measurement

Cond | CondI

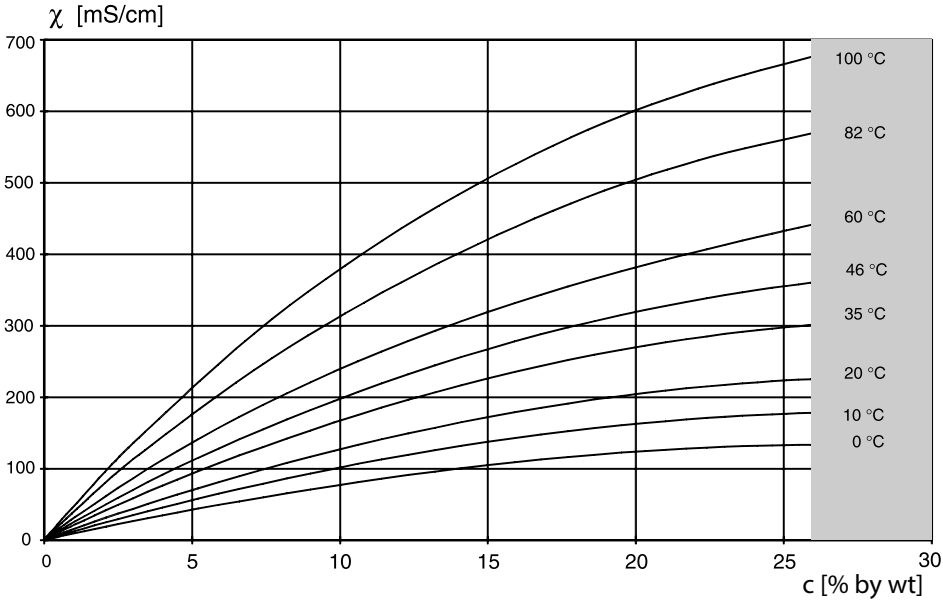
Measuring Ranges

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

For the solutions listed above, the device can determine the substance concentration from the measured conductivity and temperature values in % by weight.
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, eg, 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.

-01- Sodium Chloride Solution NaCl

-01-

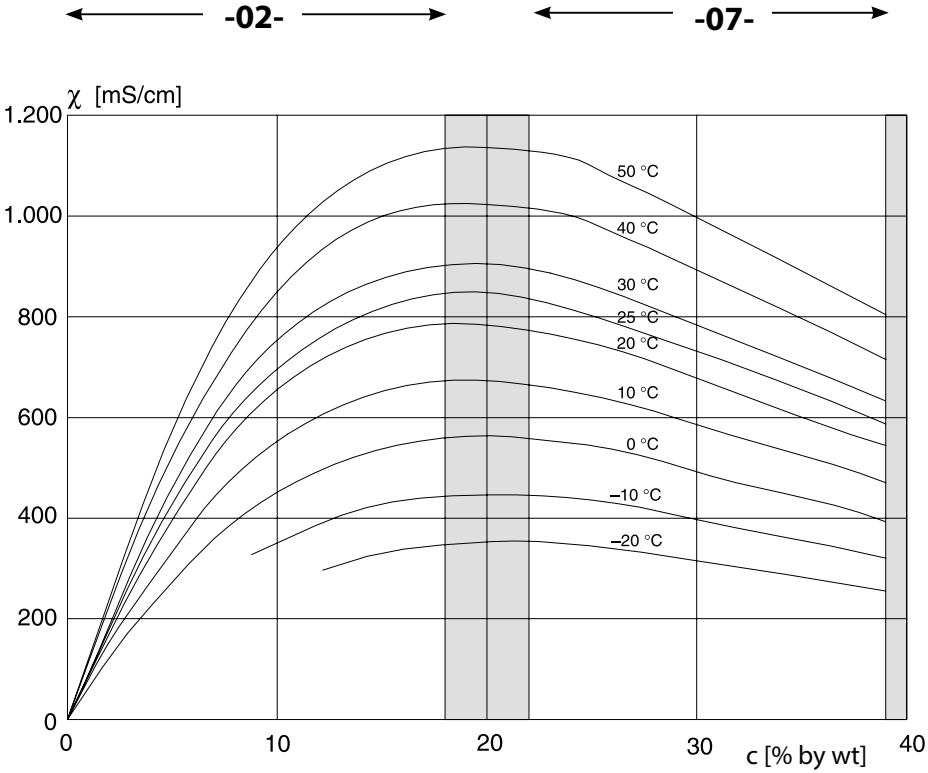


Concentration measurement not possible in this range.

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

Cond CondI

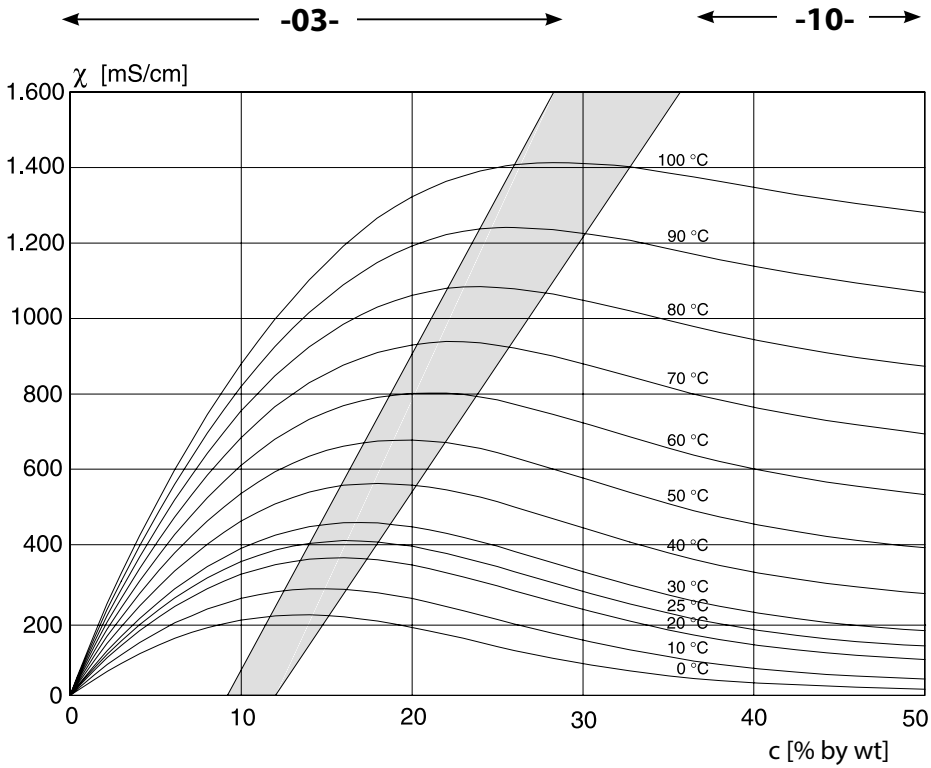
-02- Hydrochloric Acid HCl
-07-



Concentration measurement not possible in this range.

Conductivity versus substance concentration and process temperature for hydrochloric acid (HCl)
Source: Haase/Sauermann/Dücker; Z. phys. Chem. New Edition, Vol. 47 (1965)

-03- Sodium Hydroxide Solution NaOH -10-

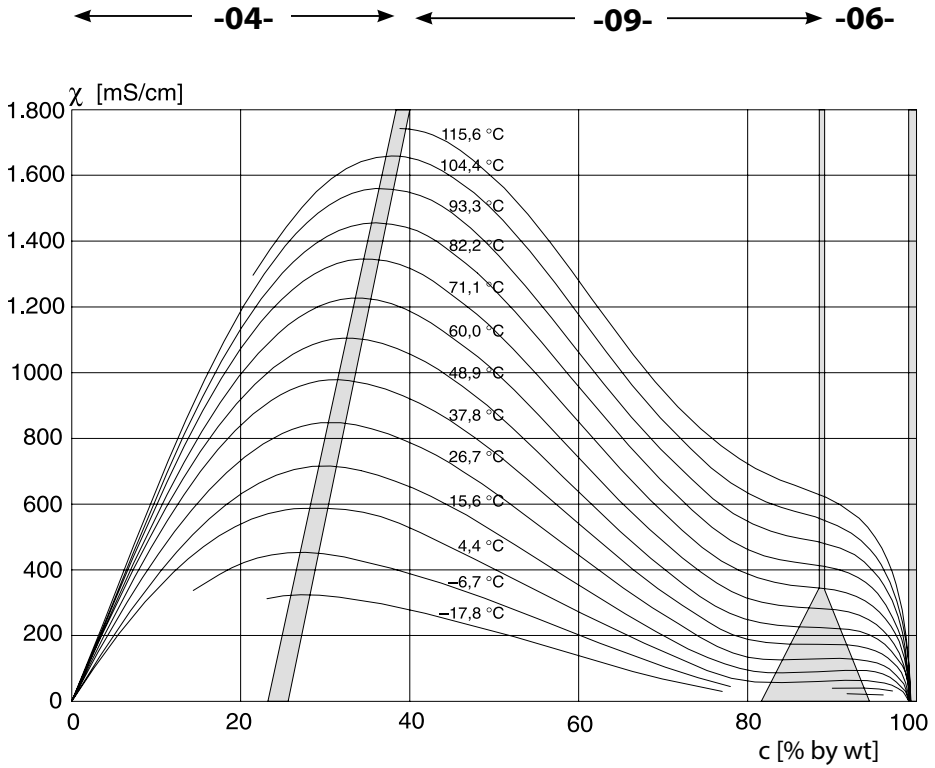


Concentration measurement not possible in this range.

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

Cond | CondI

-04- Sulfuric Acid H_2SO_4
-06-
-09-

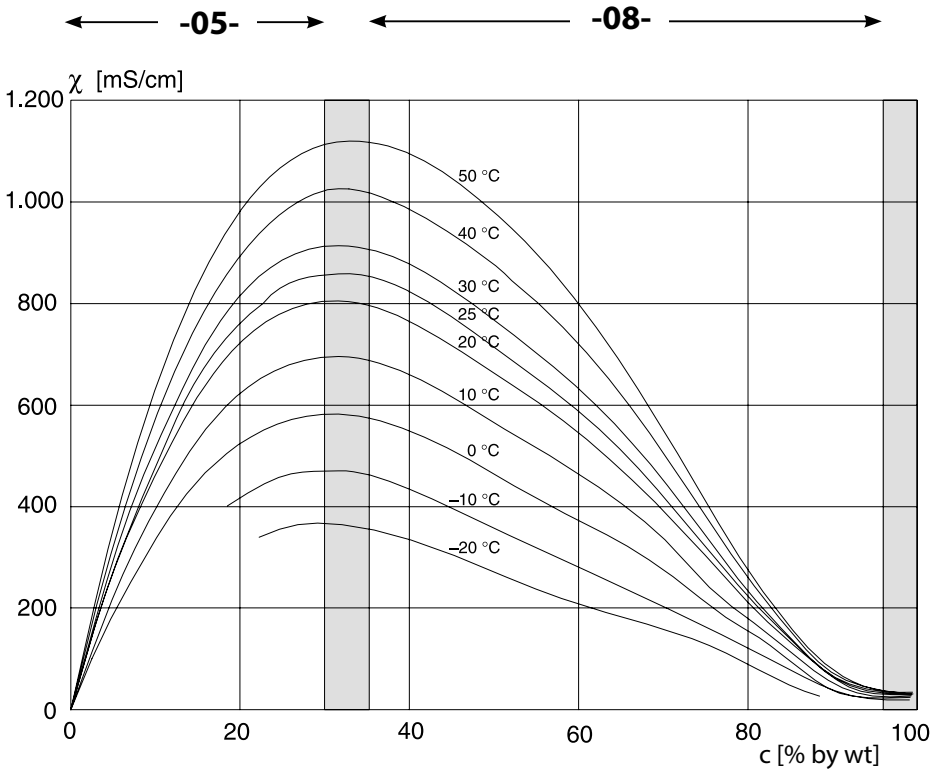


Concentration measurement not possible in this range.

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

Source: Darling; Journal of Chemical and Engineering Data; Vol.9 No.3, July 1964

-05- Nitric Acid HNO_3
-08-



Conductivity versus substance concentration and process temperature for nitric acid ($HN0_3$)
Source: Haase/Sauermann/Dücker; Z. phys. Chem. New Edition, Vol. 47 (1965)

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