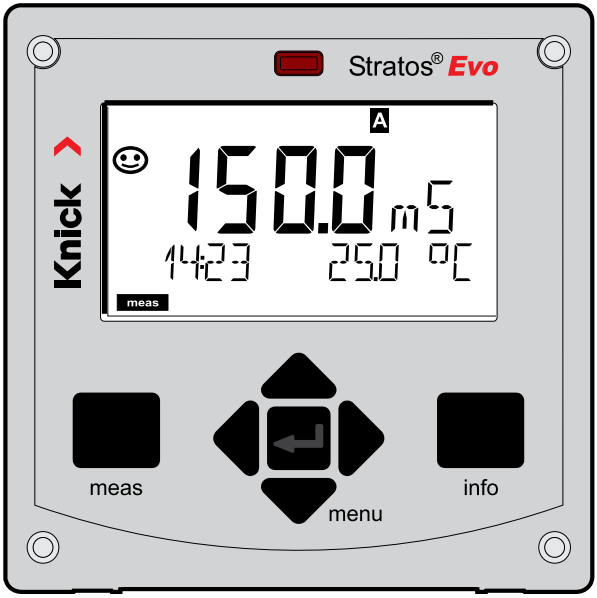
The Art of Measuring. Knick

User Manual
English

Stratos Evo A402
Conductivity Measurement



Latest Product Information: www.knick.de

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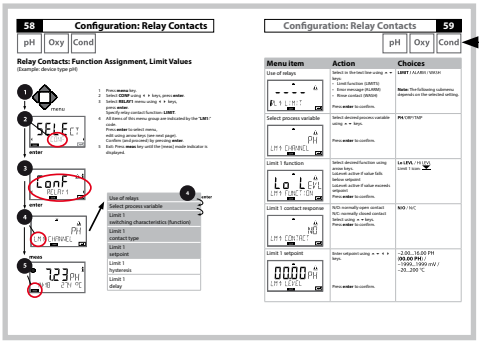
Subject to change without notice

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

6 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

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

You can select one of the following measuring functions:
- pH
- ORP
- Oxygen
- Oxygen, optical
- Conductivity measurement (conductive/inductive)
- Dual conductivity measurement using two analog sensors
- Dual measurement of pH/pH and pH/Oxy using two Memosens sensors

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

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

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

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

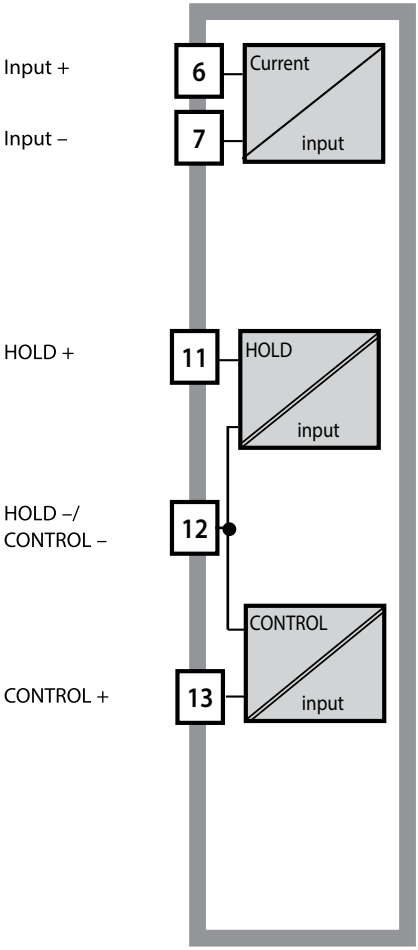
Diagnostics functions
The "Sensocheck" automatic sensor monitoring and the "Sensoface" function for clear indication of the sensor condition provide excellent diagnostics.

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

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

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

Control inputs



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

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

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

Power supply

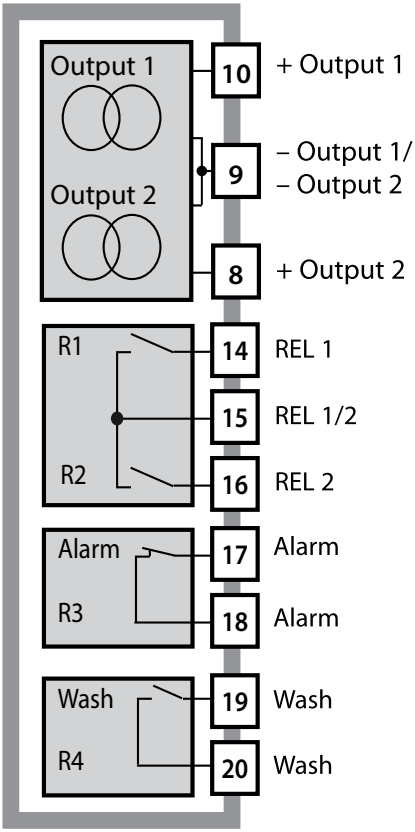
Current is provided through a universal power supply 80 ... 230 V AC, 45 ... 65 Hz / 24 ... 60 V DC.

Options

Additional functions can be activated by entering a TAN.

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

Relay contacts
Four floating relay contacts are available.



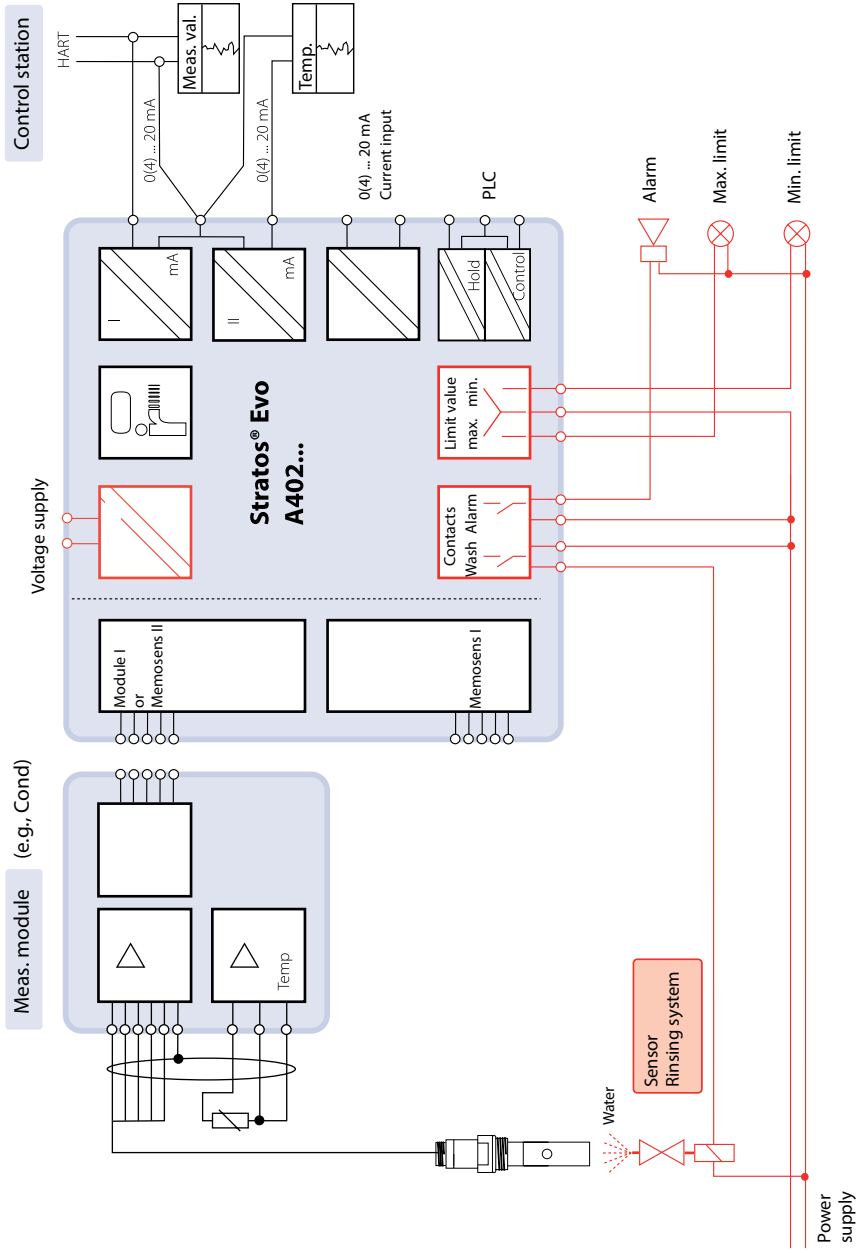
Current outputs
The floating current outputs (0) 4 ... 20 mA are used for transmitting measured values. An output filter can be programmed, the fault current value can be specified.

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

Alarm
An alarm can be generated by Sensocheck, flow monitoring or current failure.

Wash (cleaning function)
This contact can be used for controlling a rinsing probe or for indicating the active parameter set.

PID controller
Configurable as pulse length or pulse frequency controller.


Control station
HART
Meas. val.
Temp.
0(4) ... 20 mA
0(4) ... 20 mA
0(4) ... 20 mA
Current input
PLC
Alarm
Max. limit
Min. limit
Voltage supply
Stratos® Evo
A402...
I
mA
II
mA
Hold
Control
Limit value
max. min.
Contacts
Wash Alarm
Module I
or
Memosens II
Memosens I
Meas. module
(e.g., Cond)
Temp
Water
Sensor
Rinsing system
Power
supply

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

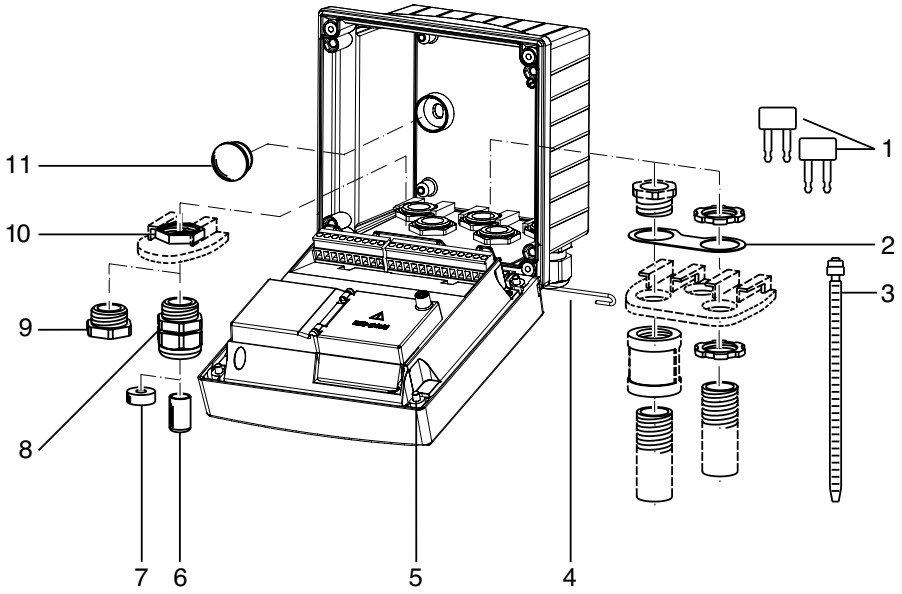
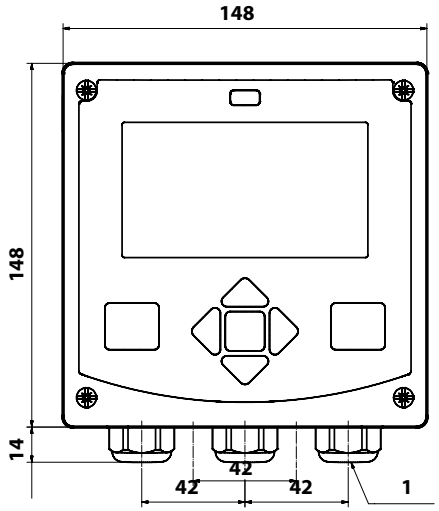
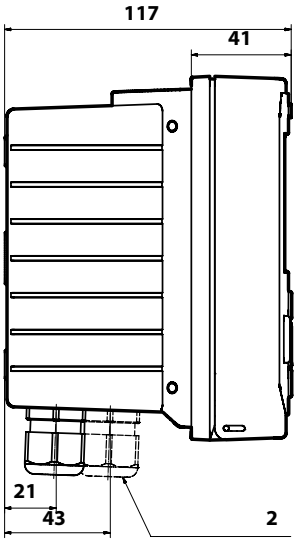


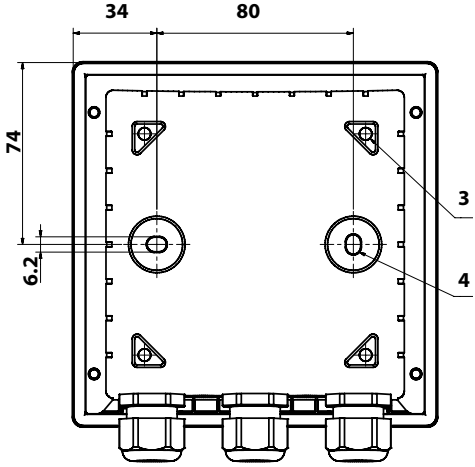
Fig.: Assembling the enclosure

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







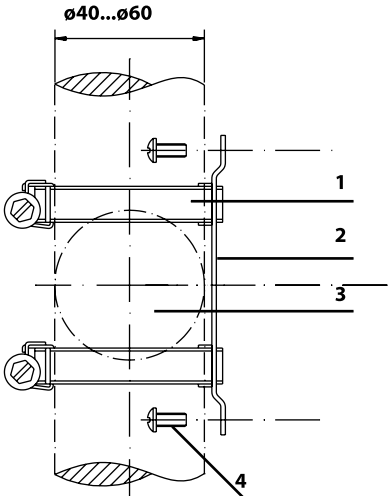
1) Cable gland (3 x)
2) Knockouts for cable gland or ½" conduit, dia. 21.5 mm (2 knockouts). Conduit couplings not included!
3) Knockout for pipe mounting (4 x)
4) Knockout for wall mounting (2 x)

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

Pipe Mounting, Protective Hood



1) Hose clamp with worm gear drive to DIN 3017 (2 x)
2) Pipe-mount plate (1 x)
3) For vertical or horizontal posts or pipes
4) Self-tapping screw (4 x)

Fig.: Pipe-mount kit, accessory ZU 0274

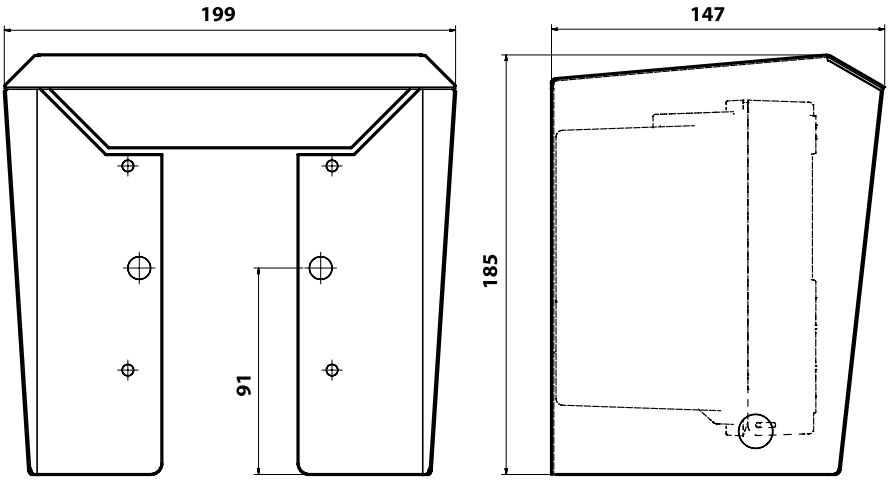
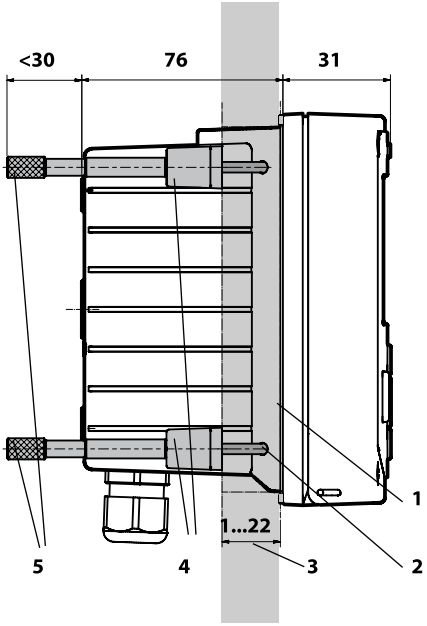


Fig.: Protective hood for wall and pipe mounting, accessory ZU 0737

Panel Mounting



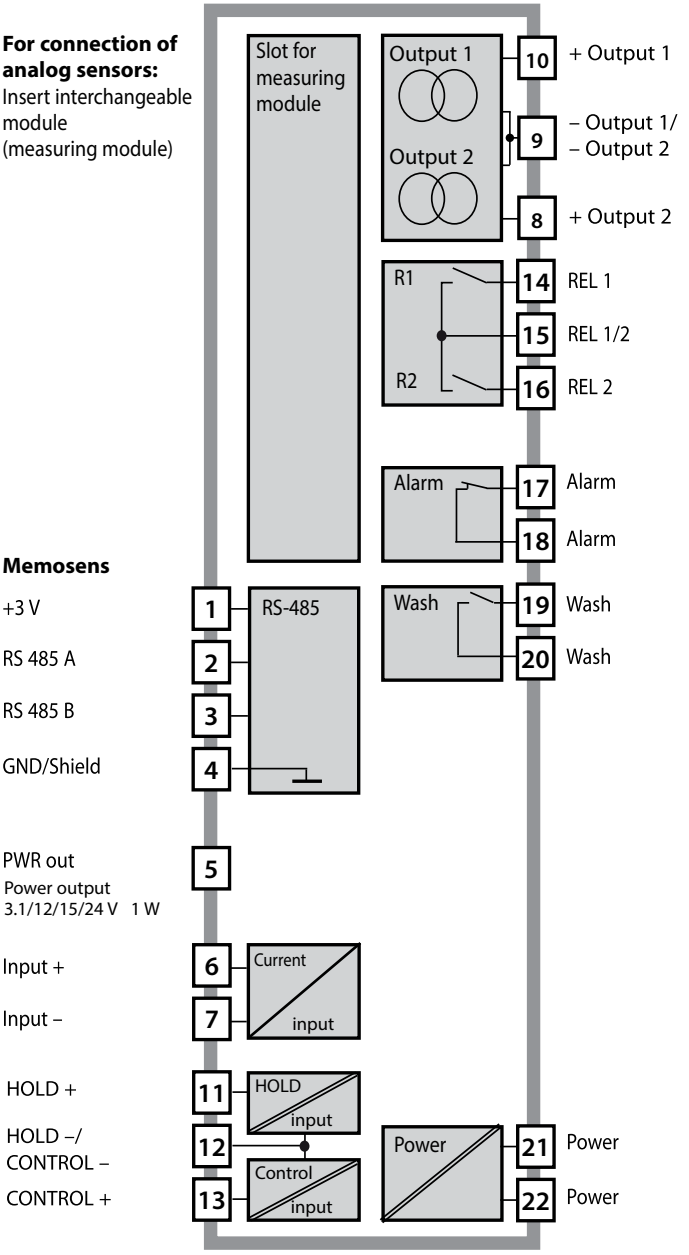
1) Circumferential sealing (1 x)
2) Screws (4 x)
3) Position of control panel
4) Span piece (4 x)
5) Threaded sleeve (4 x)

Cutout
138 x 138 mm (DIN 43700)

Fig.: Panel-mount kit, accessory ZU 0738

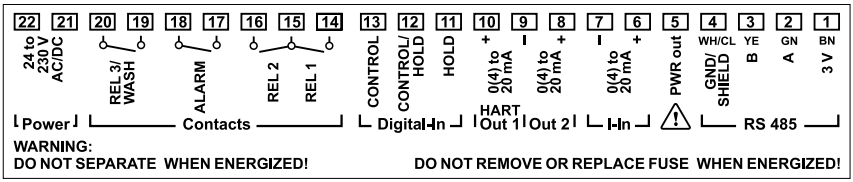
All dimensions in mm

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

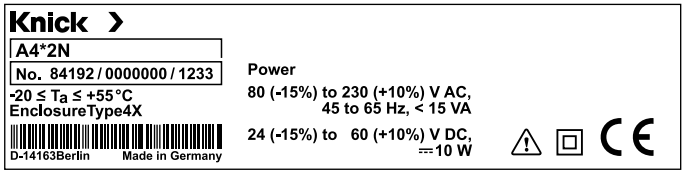


Terminal Assignments

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



A402N Rating Plate



Installation Instructions

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

Terminals

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

Application in Hazardous Locations

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

Power Supply

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

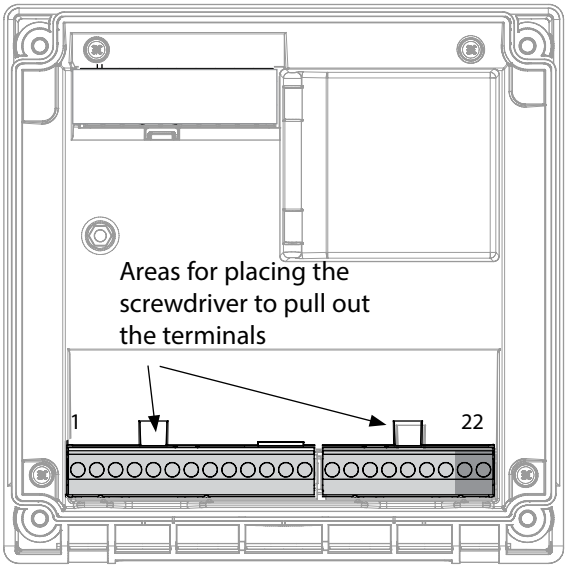


Figure:
Terminals, device opened,
back of front unit

Connecting the Memosens Sensor

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

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

Start-Up

When you start up the analyzer for the first time, you will be prompted to select the desired measurement procedure (a connected Memosens sensor will not be identified automatically).

Changing the Measuring Function

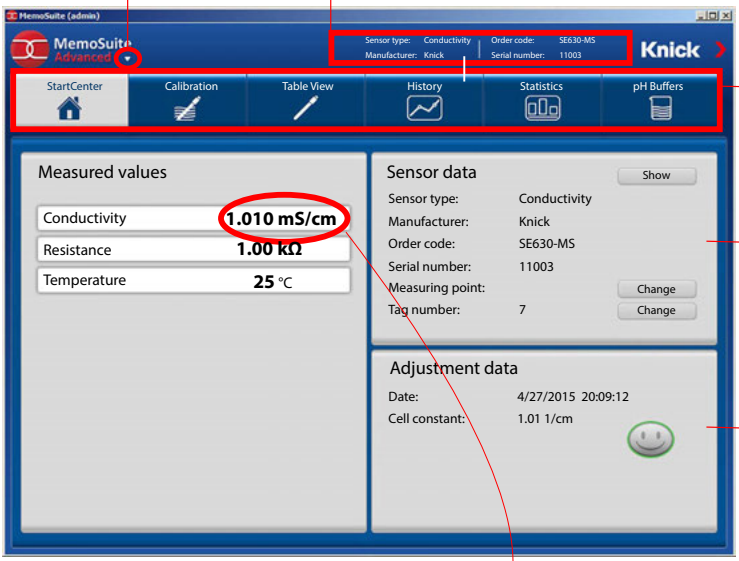
In the "Service" menu you can select another measuring function at any time.

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



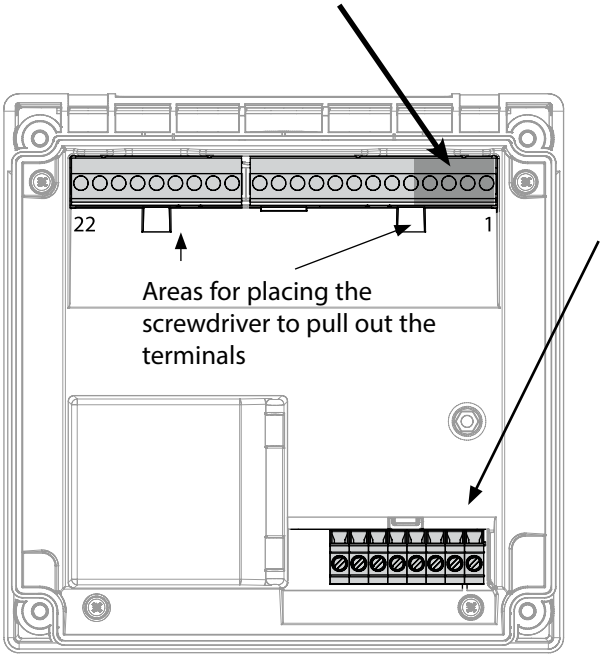
Function selection: The selected function is highlighted.

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

Last adjustment

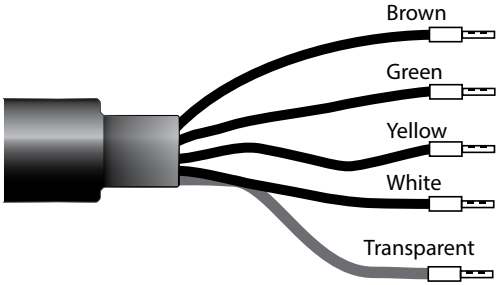
You can magnify a measured-value display at a click of the mouse.

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



For dual devices Connection of sensor B		
A	Brown	+3 V
B	Green	RS 485 A
C	Yellow	RS 485 B
D	White	GND
E	Transp.	SHIELD

Memosens Cable



+3 V

RS-485 (A)

RS-485 (B)

GND

Shield

Connecting cable for non-contact 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

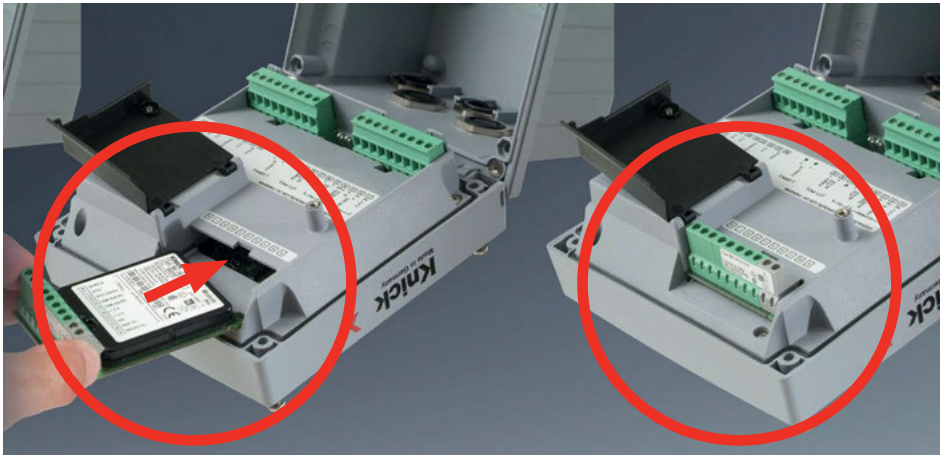
Material	TPE
Cable diameter	6.3 mm
Length	up to 100 m
Process temperature	–20 °C … +135 °C / –4 … +275 °F
Ingress protection	IP 68

Order Codes

	Cable type	Cable length	Order number
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



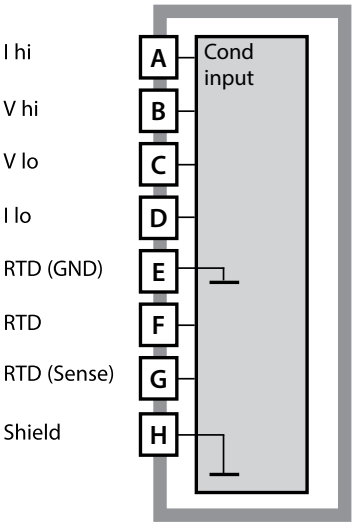
Measuring modules for connection of analog conductivity sensors:
Measuring modules for the connection of analog sensors are simply inserted into the module slot. Upon initial start-up, the analyzer automatically recognizes the module and adjusts the software correspondingly. When you replace the measuring module, you must select the corresponding measuring function in the "Service" menu.
This does not apply to the multi-channel module for dual conductivity measurement and to the connection of Memosens sensors. Here, you will be prompted to select the desired measuring function upon first start-up.

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

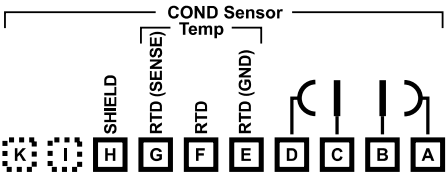
Changing the Measuring Function

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

Cond

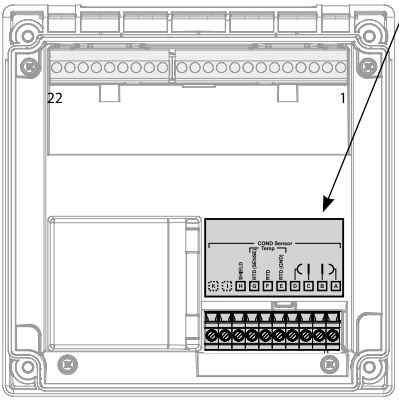


Module for contacting conductivity measurement (Cond)
Order code MK-COND025...
See the following pages for wiring examples.



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

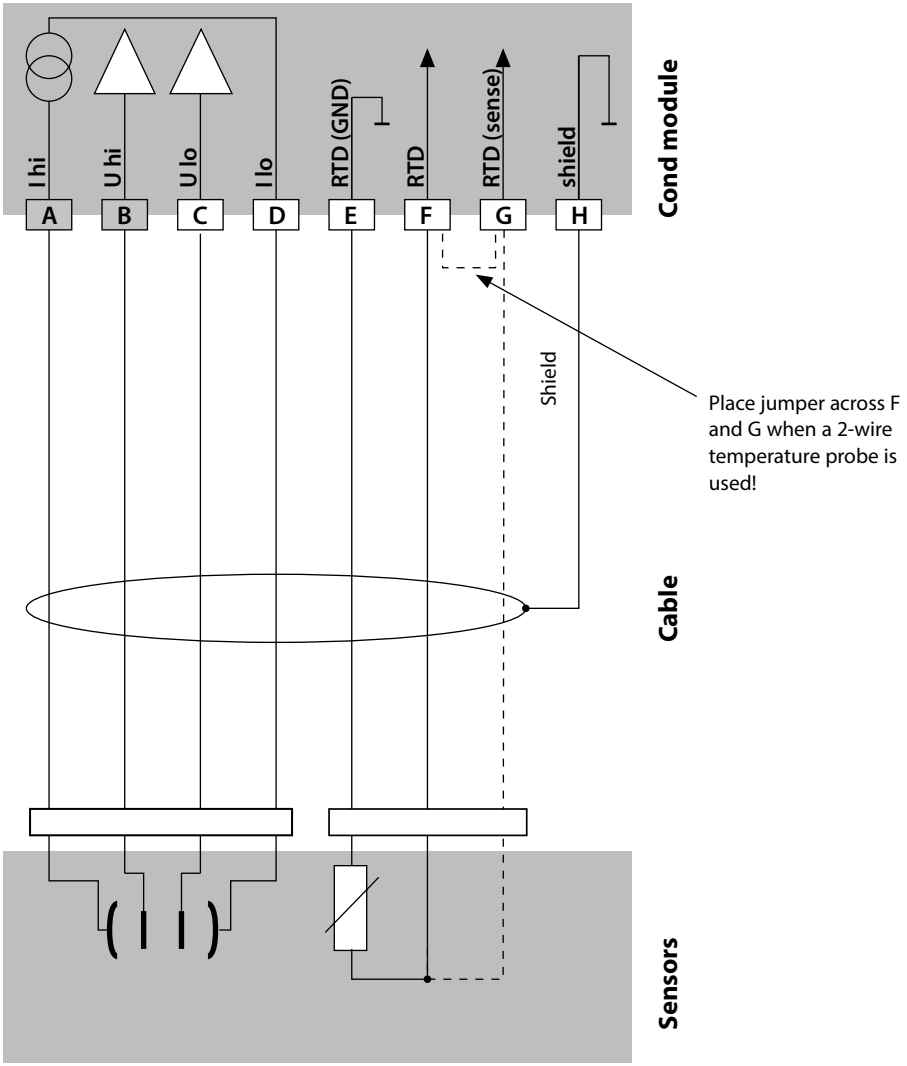
The measuring module comes with a self-adhesive label.
Stick the label to the module slot on the device front. This way, you have the wiring "under control".



Example 1:

Measuring task: Conductivity, temperature

Sensors (principle): 4 electrodes

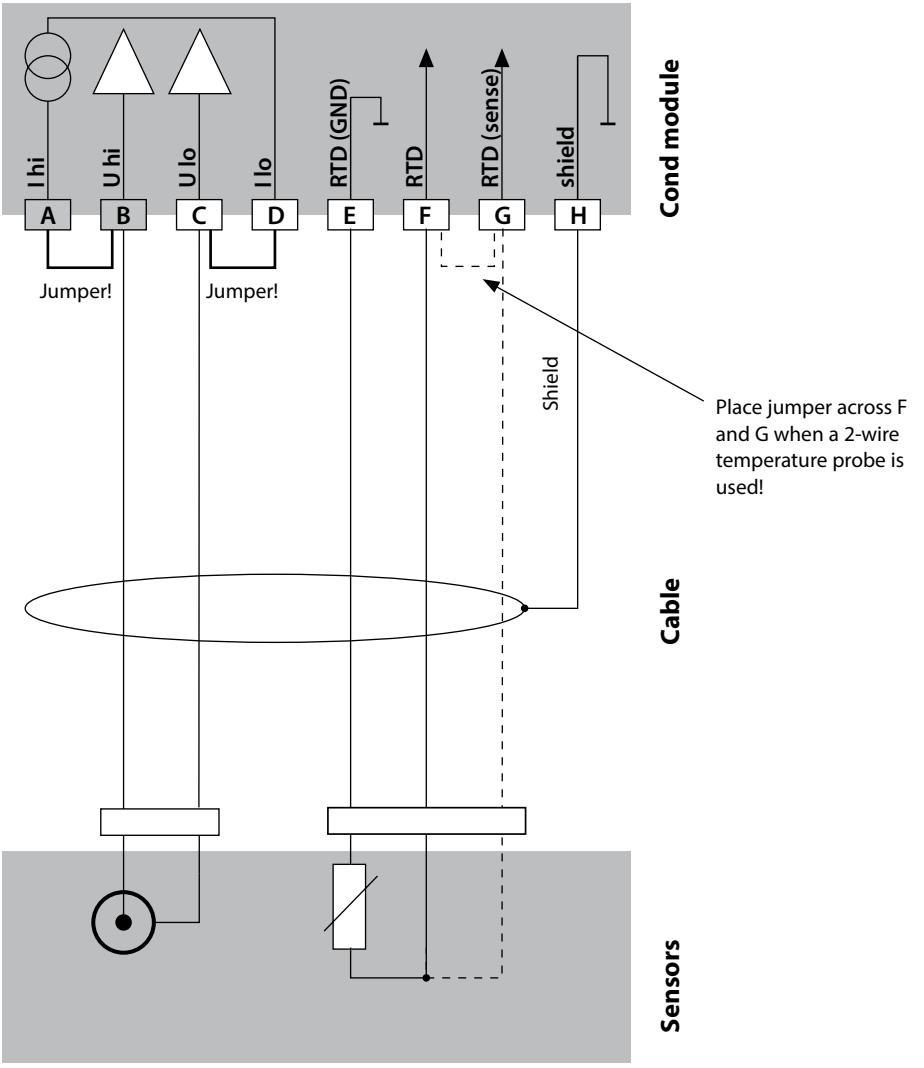


Cond

Example 2:

Measuring task: Conductivity, temperature

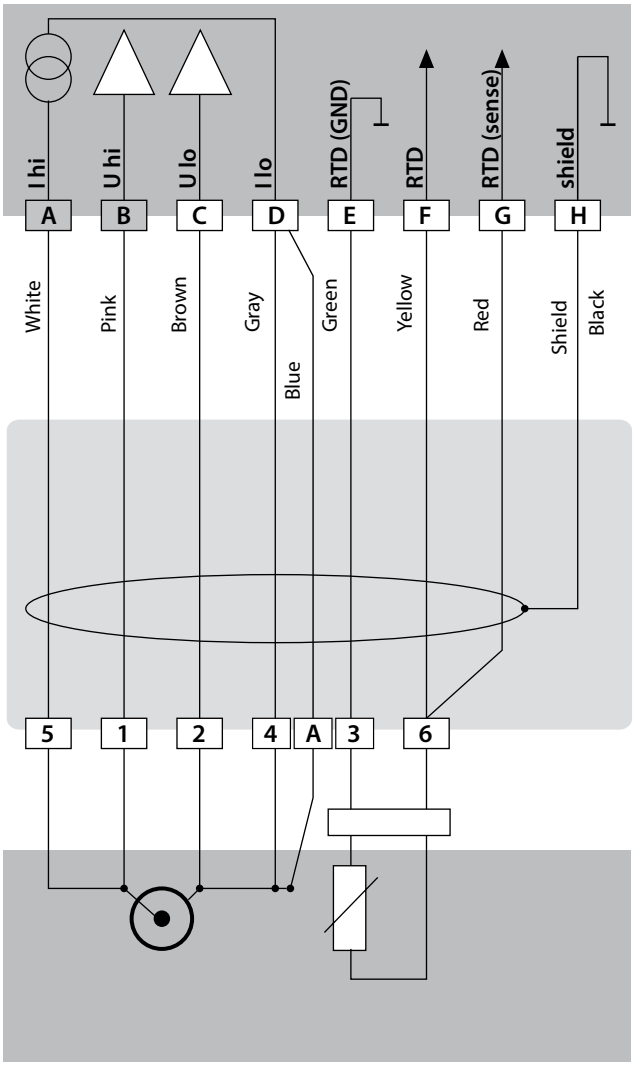
Sensors (principle): 2 electrodes, coaxial



Example 3:

Measuring task: Conductivity, temperature

Sensors (example): SE 604, cable: ZU 0645



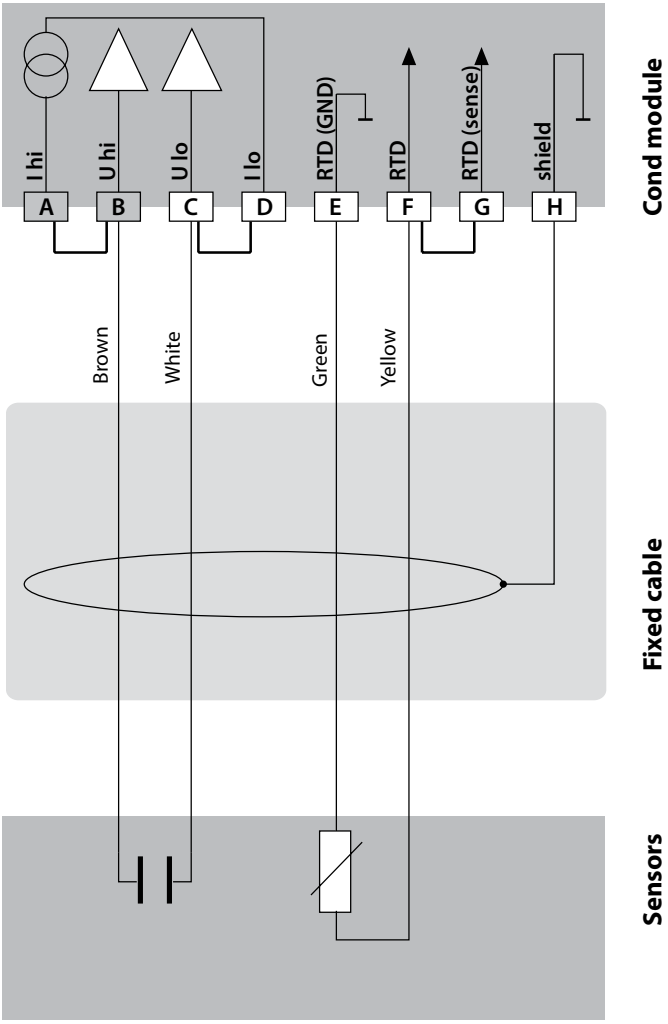
Connector of sensor head

Cond

Example 4:

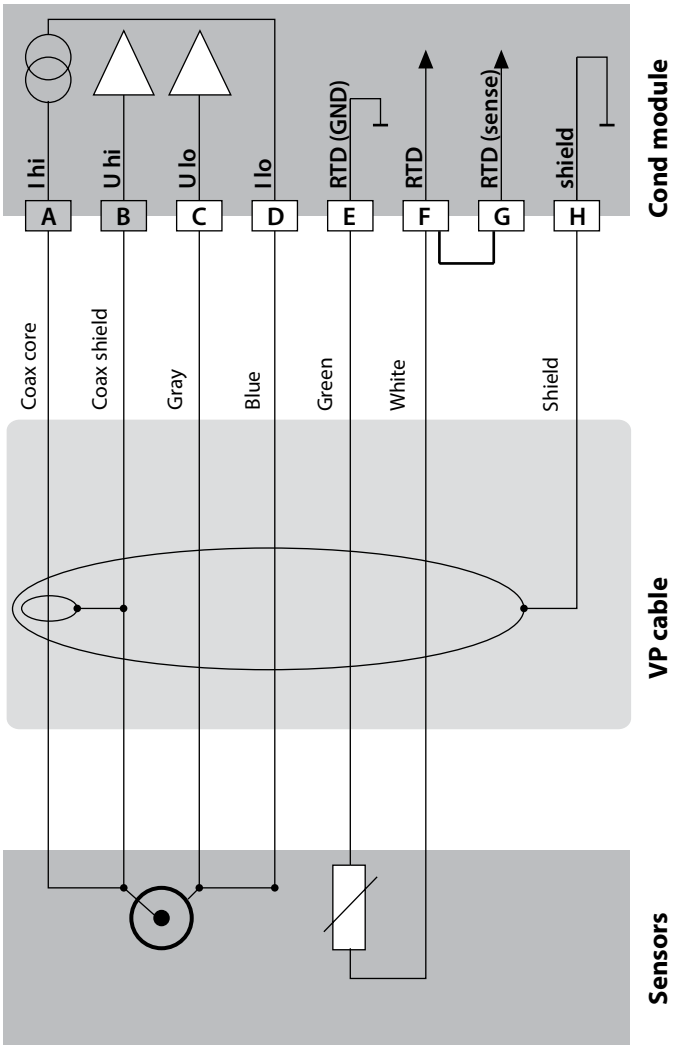
Measuring task: Conductivity, temperature

Sensors (example): SE 610



Example 5:

Measuring task:	Conductivity, temperature
Sensors (example):	SE 620
VP cable	e.g., CA/VP6ST-003A

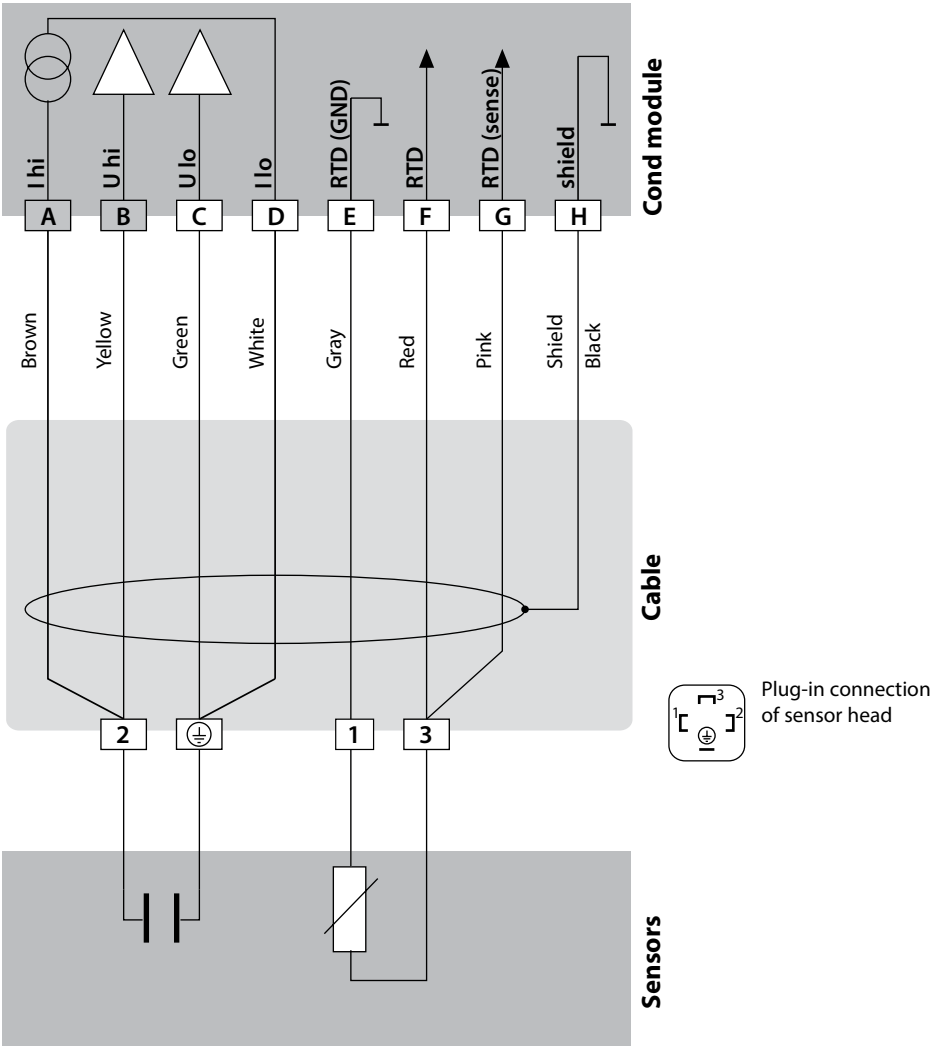


Cond

Example 6:

Measuring task: Conductivity, temperature

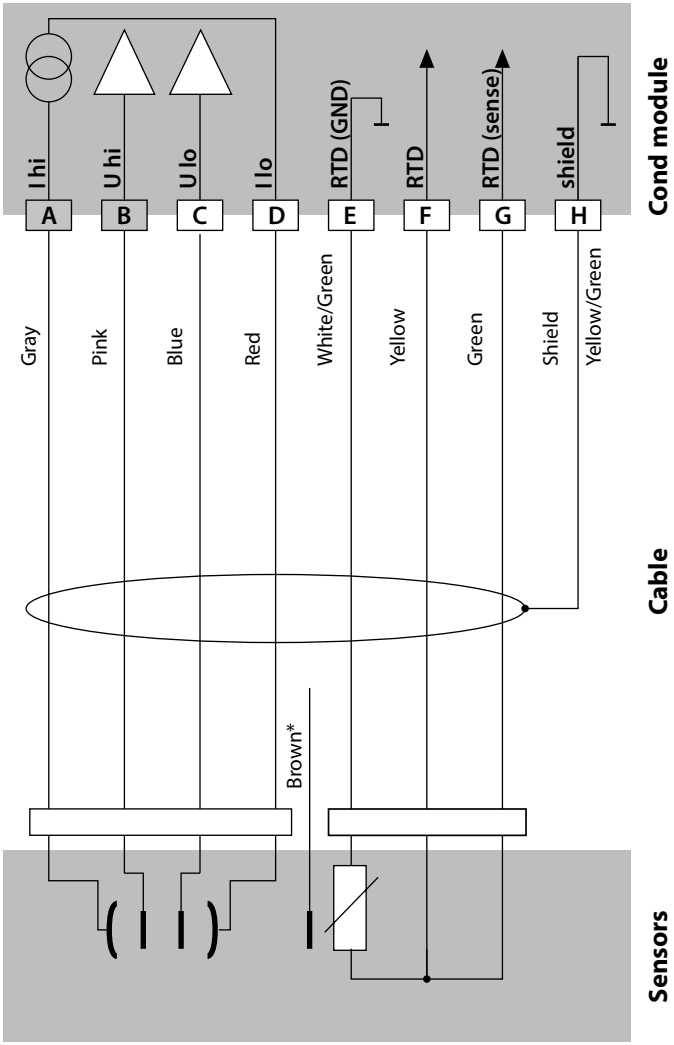
Sensors (example): SE 630



Example 7:

Measuring task: Conductivity, temperature

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



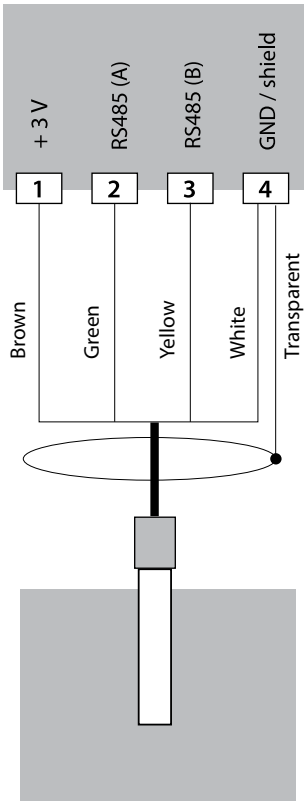
* Do not connect

Cond

Example 8:

Measuring task: Conductivity, temperature

Sensor: Memosens



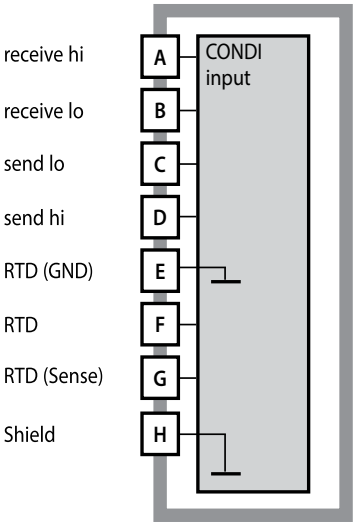
Device

Memosens cable

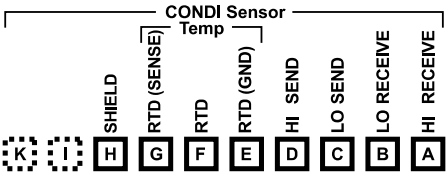
Sensor

Examples:
SE 604(X)-MS
SE 605H-...
SE 615/1-MS
SE 630(X)-MS

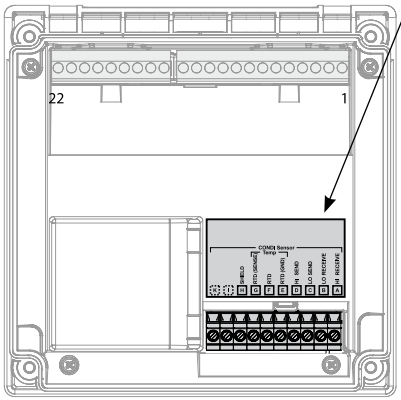
Connect the Memosens sensor to the RS-485 interface of the device.



Module for inductive conductivity measurement (CondI)
Order code MK-CONDI035...
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).

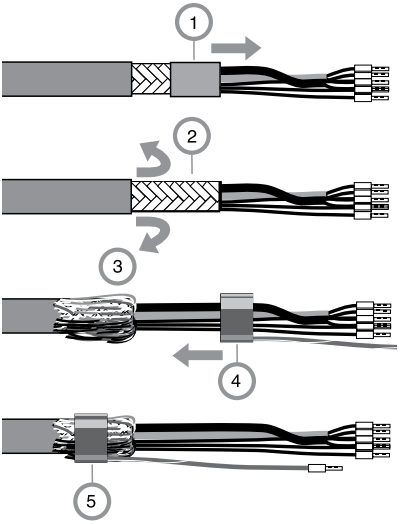


The measuring module comes with a self-adhesive label.
Stick the label to the module slot on the device front. This way, you have the wiring "under control".

Condl

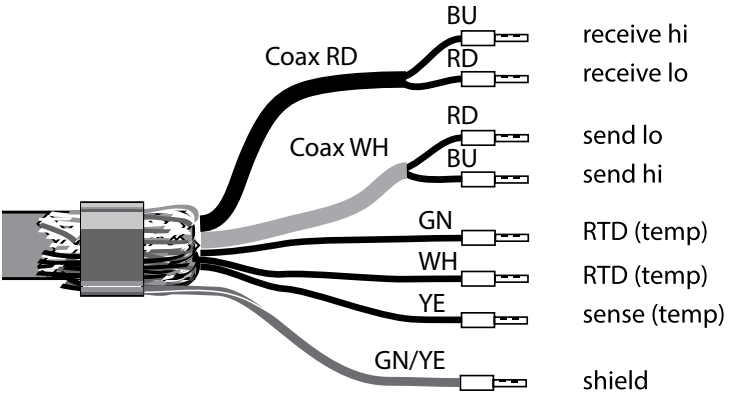
Preparing the Shield Connection

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)

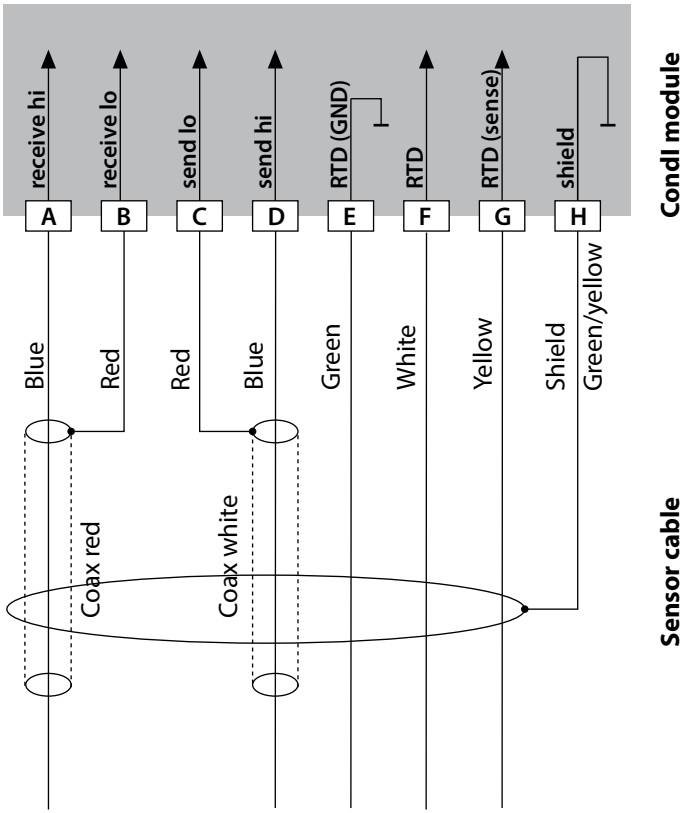
The pre-assembled special cable:



Example 1:

Measuring task: Noncontacting conductivity, temperature

Sensors: SE 655 or SE 656

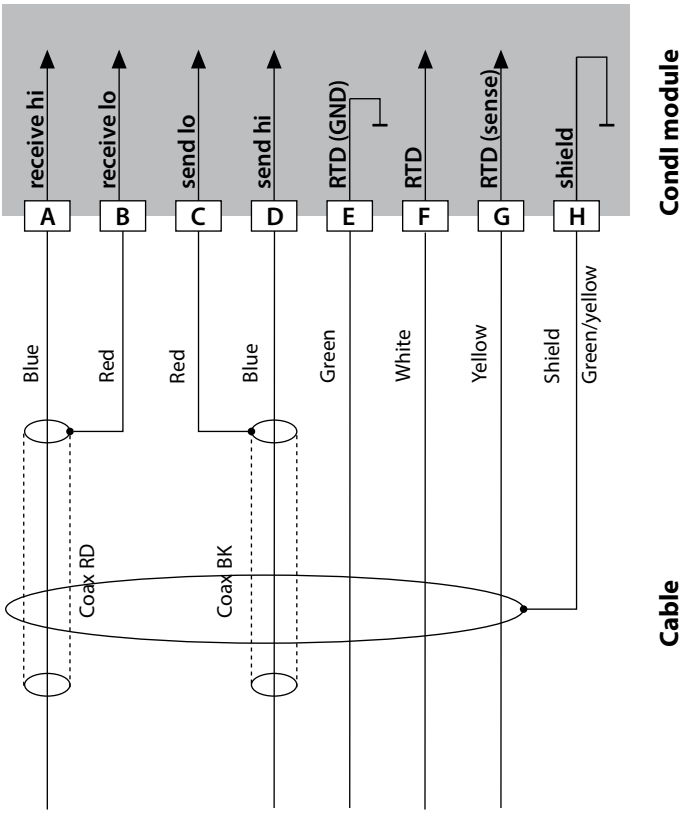


CondI

Example 2:

Measuring task: Conductivity, temperature

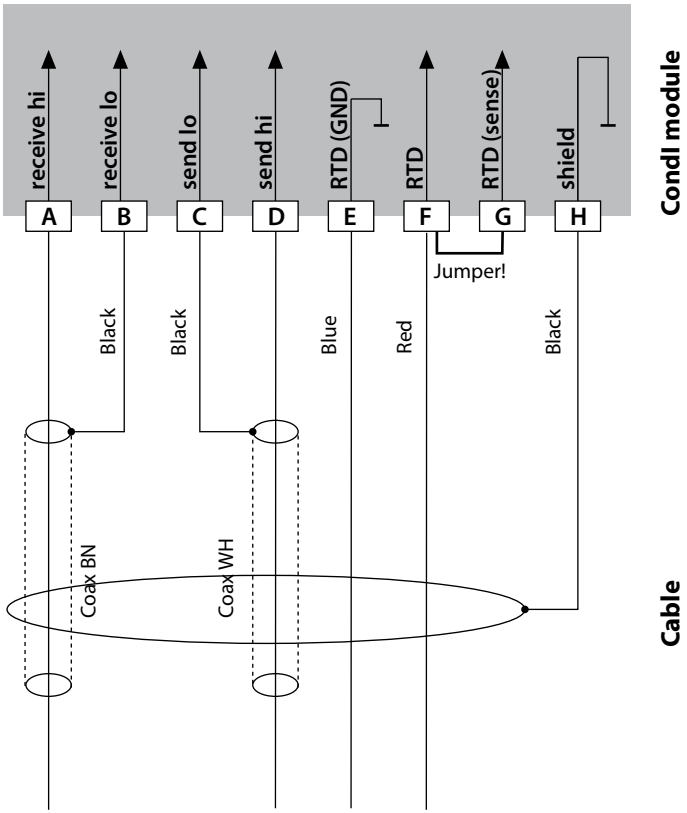
Sensor: SE 660



Example 3:

Measuring task: Conductivity, temperature

Sensor: Yokogawa ISC40 (Pt1000)



Configuration settings for this sensor:

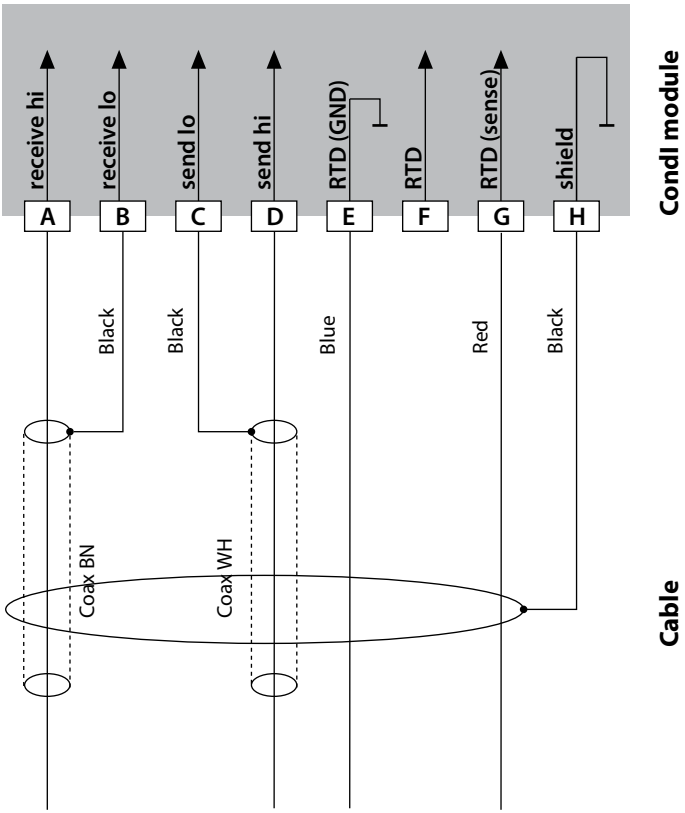
Sensor:	Conductivity, temperature
SENSOR	OTHER
RTD TYPE	1000Pt
CELL FACTOR	1.88
TRANS RATIO	125

CondI

Example 4:

Measuring task: Conductivity, temperature

Sensor: Yokogawa IC40S (NTC 30k)

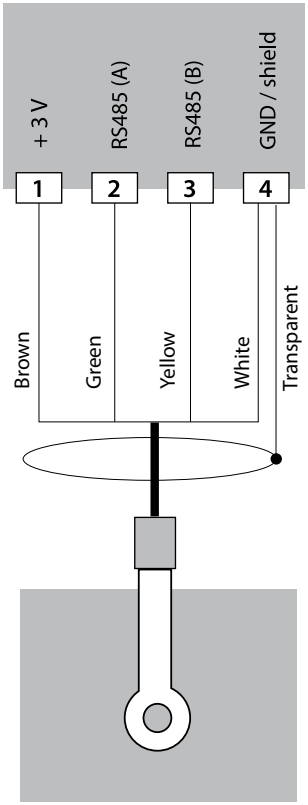


Configuration settings for this sensor:

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

Example 5:

Measuring task: Noncontacting conductivity, temperature
Sensor: SE 670, SE 680
Cable: CA/M12-005NA

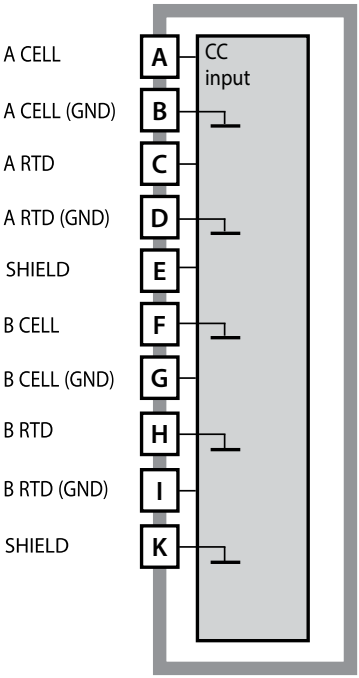


Cable types:
M12/ferrules

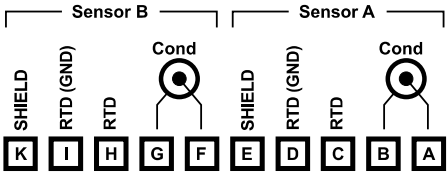
5 m	CA/M12-005NA
10 m	CA/M12-010NA
20 m	CA/M12-020NA

Connect the SE 670 / SE 680 sensor to the RS-485 interface of the device. When SE 670 / SE 680K is selected as sensor in the Configuration menu, the default values are taken as calibration data. They can then be modified by calibration.
All calibration data of the SE 680M sensor with Memosens protocol are stored in the sensor.

Cond Cond

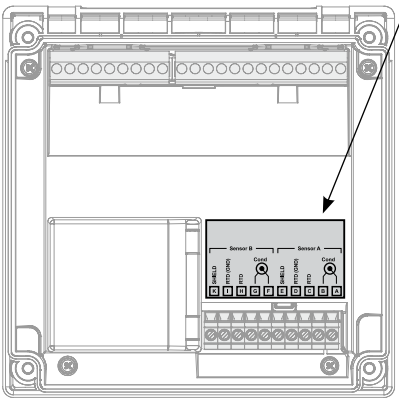


Module for dual conductivity measurement
Order code MK-CC065...
See the following pages for wiring examples.



Terminal plate for 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".

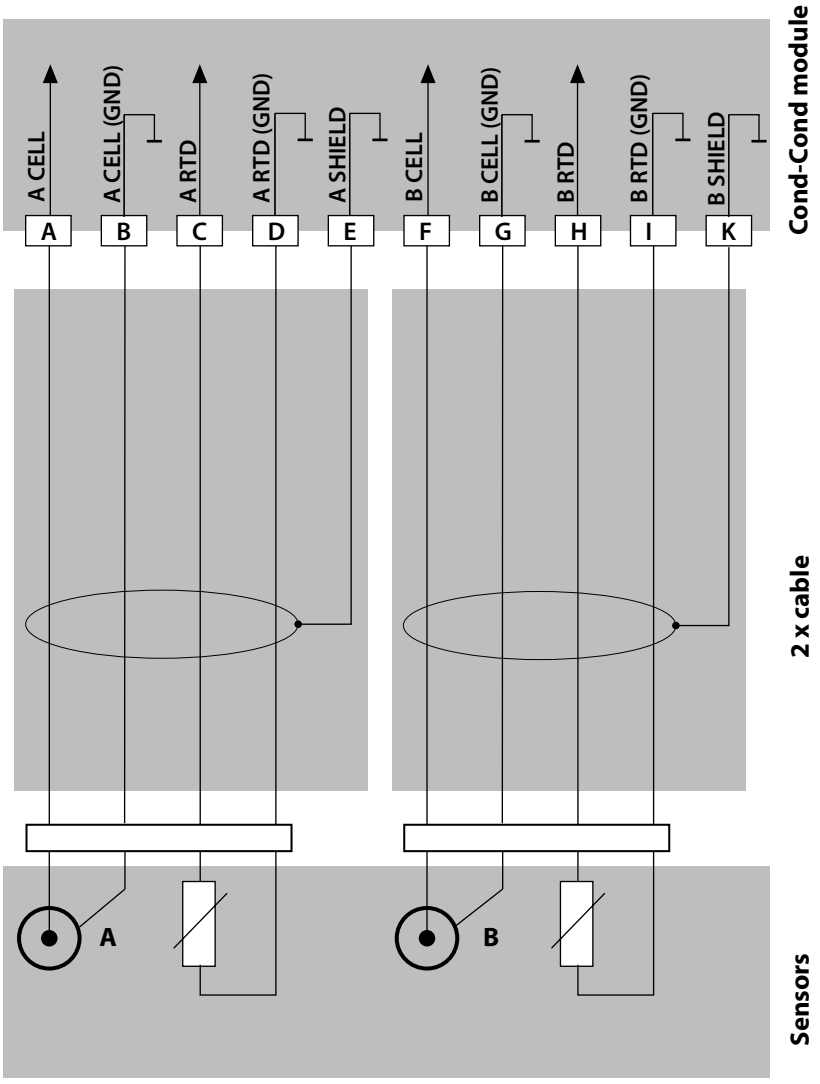


Cond-Cond Wiring Examples

Example 1:

Measuring task: Dual conductivity, temperature

Sensors (principle): 2 x 2-electrode sensor



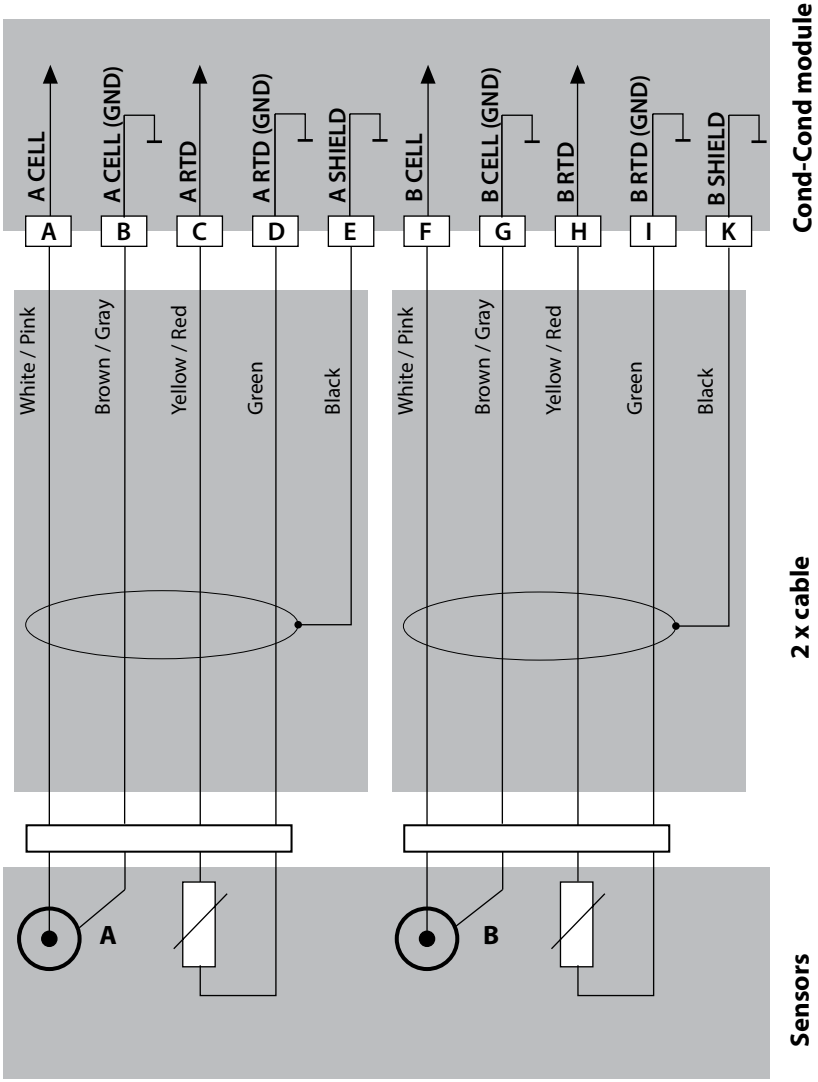
Cond | Cond

Example 2:

Measuring task: Dual conductivity, temperature

Sensors: 2 x SE 604

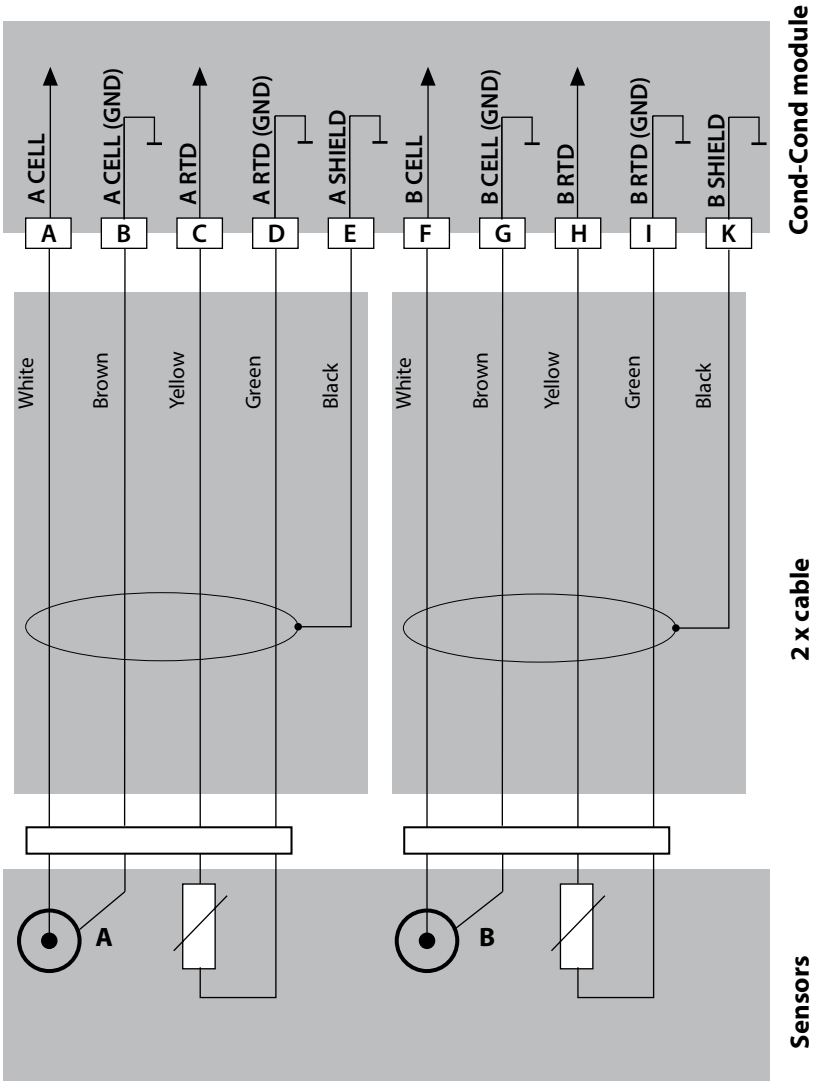
Cable: 2 x ZU 0645



Example 3:

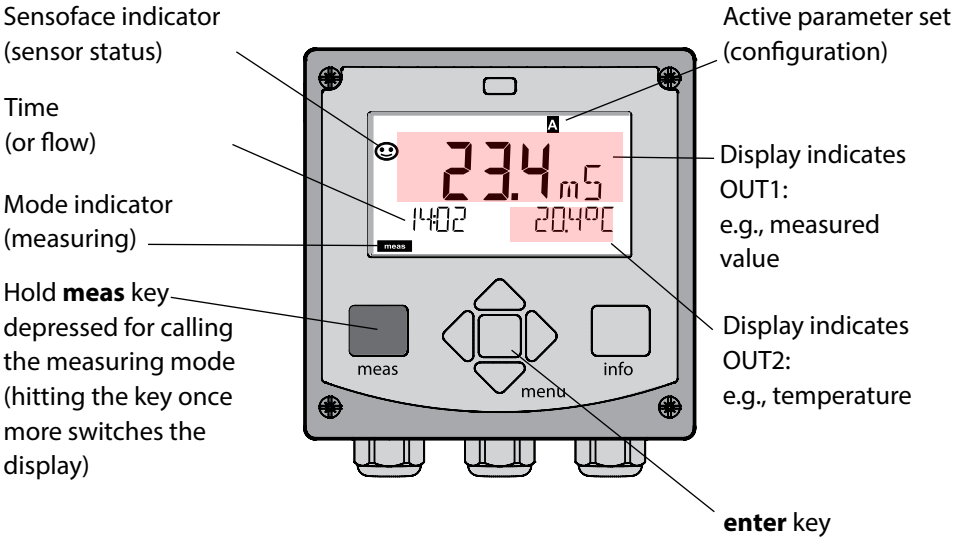
Measuring task: Dual conductivity, temperature

Sensors: 2 x SE 610



Measuring Mode

Prerequisite: A Memosens sensor is connected or a measuring module is installed with a corresponding analog sensor connected.
After the operating voltage has been connected, the analyzer automatically goes to "Measuring" mode. To call the measuring mode from another operating mode (e.g., Diagnostics, Service): Hold **meas** key depressed (> 2 s).



Depending on the configuration, you can set various displays as standard display for the measuring mode (see page 47).

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

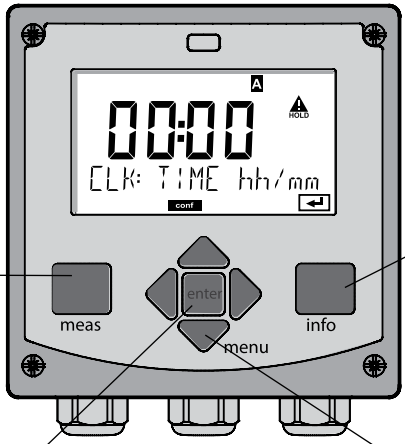
NOTICE:
You must configure the analyzer for the respective measurement task.

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 (temporarily for approx. 60 s)

info

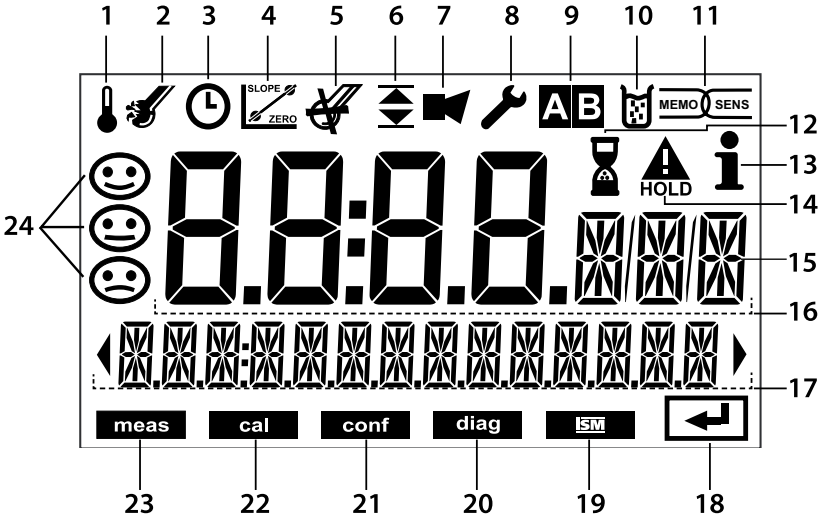
- Retrieve information
- Show error messages

enter

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

menu

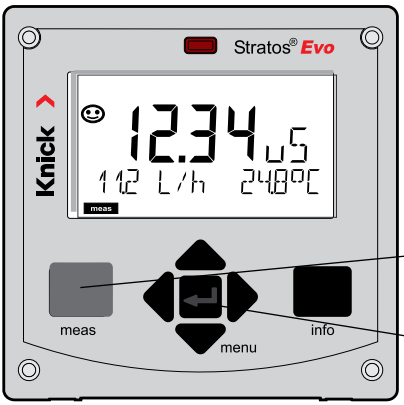
- Measuring mode: Call menu



1 Temperature
2 Sensocheck
3 Interval/response time
4 Sensor data
5 Sensocheck
6 Limit message:
Limit 1 ▼ or Limit 2 ▲
7 Alarm
8 Service
9 Parameter set
10 Calibration
11 Memosens sensor
12 Waiting time running
13 Info available
14 HOLD mode active
15 Unit symbols
16 Primary process value
17 Secondary display
18 Proceed using enter
19 Not used
20 Diagnostics
21 Configuration mode
22 Calibration mode
23 Measuring mode
24 Sensoface

Signal Colors (Display Backlighting)

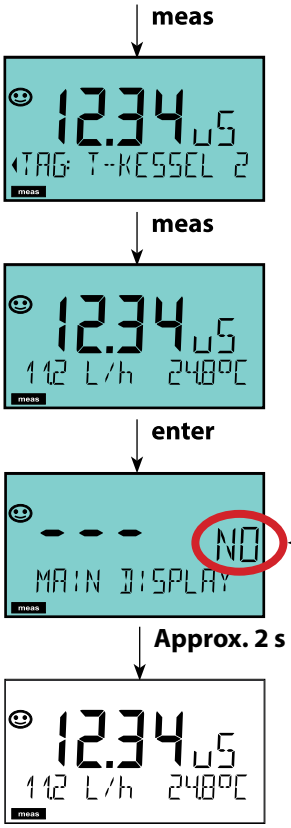
Red	Alarm (in case of fault: display values blink)
Red blinking	Input error: illegal value or wrong passcode
Orange	HOLD mode (Calibration, Configuration, Service)
Turquoise	Diagnostics
Green	Info
Magenta	Sensoface message (pre-alarm)



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

meas key

enter key



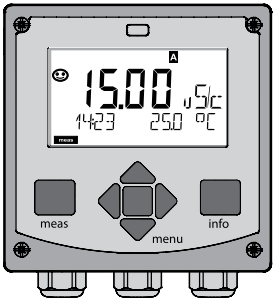
By pressing **meas** briefly you can step through further displays such as tag number (TAG) or flow (L/h).
These displays are turquoise. After 60 sec they switch back to the main display.

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

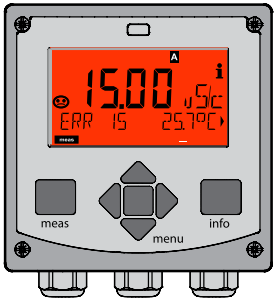
The secondary display shows "MAIN DISPLAY – NO".
Use the **UP** / **DOWN** arrows to select "MAIN DISPLAY – YES"
and confirm by pressing **enter**.
The display color changes to white.
This display is now shown in measuring mode.

Color-Coded User Interface

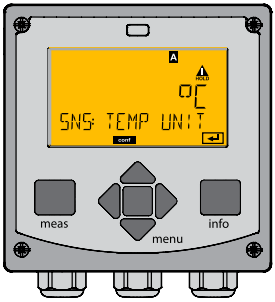
The color-coded user interface guarantees increased operating safety.
Operating modes are clearly signaled.
The normal measuring mode is white. Information text appears on a green screen and the diagnostic menu appears on turquoise. The orange HOLD mode (e.g., during calibration) is quickly visible as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



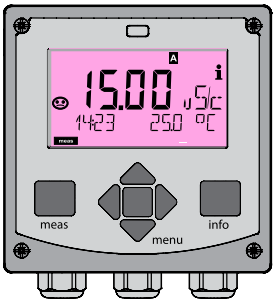
White:
Measuring mode



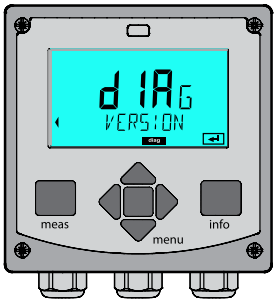
Red blinking:
Alarm, error



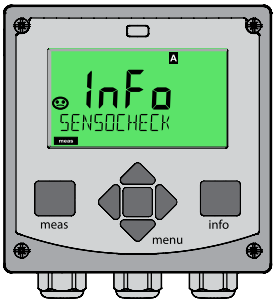
Orange:
HOLD mode



Magenta:
Maintenance request



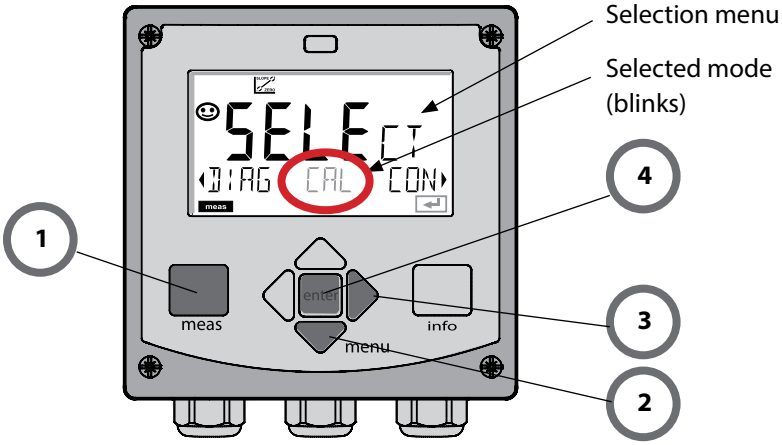
Turquoise:
Diagnostics



Green:
Info texts

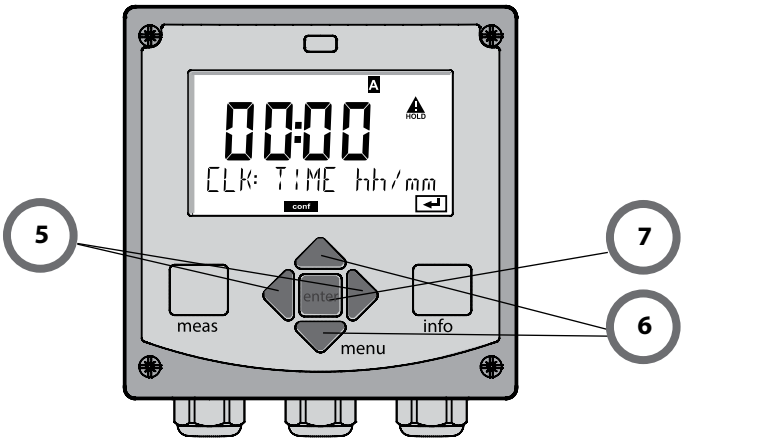
To select the operating mode:

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



To enter a value:

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



Diagnostics
Display of calibration data, display of sensor data, sensor monitor, performing a device self-test, viewing the logbook entries, display of hardware/software versions of the individual components. The logbook can store 100 events (00...99). They can be displayed directly on the device. The logbook can be extended to 200 entries using a TAN (Option).

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

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

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

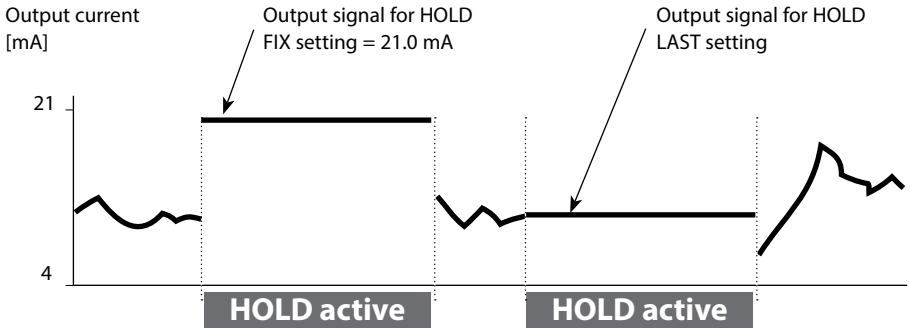
Service
Maintenance functions (current source, relay test, controller test), passcode assignment, device type selection, reset to factory settings, enabling of options (TAN).

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

Output signal response

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

Output signal during HOLD:



Terminating the HOLD mode

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

External activation of HOLD

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

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

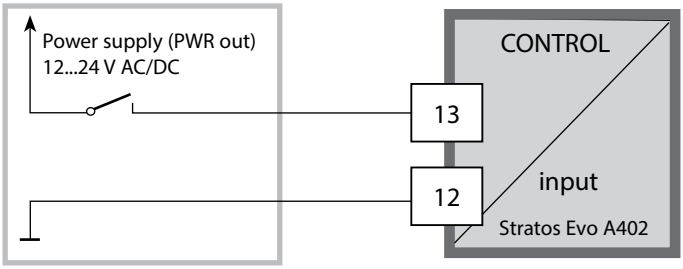
Alarm

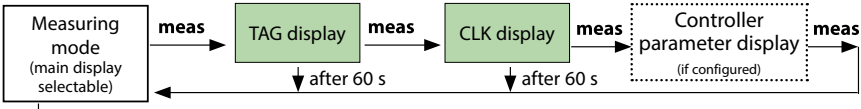
When an error has occurred, **Err xx** is displayed immediately.
Only after expiry of a user-defined delay time will the alarm be registered and entered in the logbook.
During an alarm the display blinks, the display backlighting turns **red**.
Error messages can also be signaled by a 22 mA output current (when configured correspondingly).
The alarm contact is activated by alarm or power failure. 2 sec after the failure event is corrected, the alarm status will be deleted.
The 22-mA signal can also be triggered by Sensoface messages (configurable).

Generating a message via the CONTROL input
(min. flow / max. flow)

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

When preset to flow measurement
CONF/CNTR_IN/CONTROL = FLOW
an alarm can be generated when the measured flow exceeds a specified range:
CONF/ALA/FLOW CNTR = ON
CONF/ALA/FLOW min (specify value, default: 5 liters/h)
CONF/ALA/FLOW max (specify value, default: 25 liters/h)





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

DIAG	CALDATA	Display of calibration data
	SENSOR	Display of sensor data
	SELFTEST	Self test: RAM, ROM, EEPROM, module
	LOGBOOK	100 events with date and time
	MONITOR	Display of direct sensor values
	VERSION	Display of software version, model designation, serial no.
HOLD		Manual activation of HOLD mode, e.g., for sensor replacement. The signal outputs behave as configured (e.g., last measured value, 21 mA)
CAL	pH	pH adjustment / ORP adjustment / product calibration
	Oxy	Adjustment (WTR/AIR) / zero adjustment / product cal.
	COND(I)	Adjustment with solution / cell factor input / prod. cal.
	CAL_RTD	Adjustment of temperature probe
CONF	PARSET A	For configuring parameter set A / B see "Overview of Configuration" on next page.
	PARSET B	
SERVICE (Access via code, factory setting: 5555)	MONITOR	Display of measured values for validation (simulators)
	SENSOR	Sensor (resetting diagnostics messages)
	POWER OUT	Selecting the output voltage (3.1 V / 12 V / 15 V / 24 V)
	OUT1	Current source, output 1
	OUT2	Current source, output 2
	RELAIS	Relay test
	CONTROL	Controller: manual specification of controller output
	CODES	Specifying access codes for operating modes
	DEVICE TYPE	Selecting the device type
	DEFAULT	Reset to factory setting
	OPTION	Enabling an option via TAN

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

Select menu group	Menu group	Code	Display	Select menu item
	Sensor selection (multi-channel device: select sensor A / sensor B)	SNS: (S_A / S_B)		enter
		Menu item 1		enter
		⋮		enter
		Menu item ...		enter
	Current Output 1	OT1:		
	Current output 2	OT2:		
	Compensation	COR:		
	Control input (parameter set or flow measurement)	IN:		
	Alarm mode	ALA:		
	Relay outputs	REL:		
	Cleaning	WSH:		
	Setting the clock	CLK:		
	Tag number	TAG:		

Note:
With Cond-Cond, the two parameter sets are replaced by the two sensors A and B.

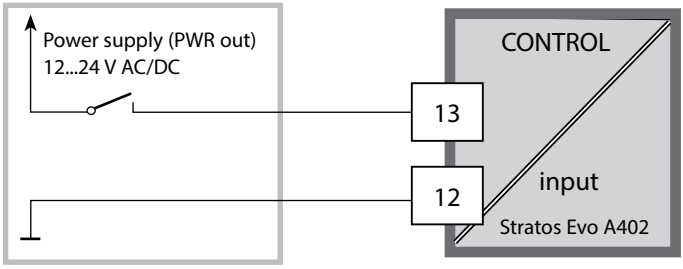
Parameter Set A/B: Configurable Menu Groups

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

Menu group	Parameter set A	Parameter set B
SENSOR	Sensor selection	---
OUT1	Current output 1	Current output 1
OUT2	Current output 2	Current output 2
CORRECTION	Compensation	Compensation
CNTR_IN	Control input	---
ALARM	Alarm mode	Alarm mode
REL 1/REL 2	Relay outputs	Relay outputs
WASH	Cleaning (not for Cond-Cond devices)	---
PARSET	Parameter set selection (not for Cond-Cond devices)	---
CLOCK	Setting the clock	---
TAG	TAG of measuring point	
GROUP	GROUP of measuring points	

External switchover of parameter sets A/B

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



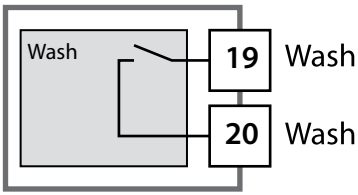
Parameter set A active	0...2 V AC/DC
Parameter set B active	10...30 V AC/DC

Parameter Set A/B: Manual Switchover

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

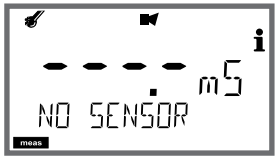
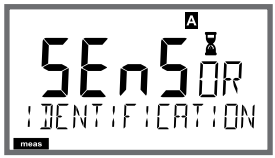
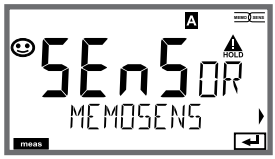
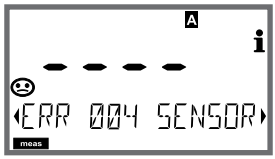
Parameter Set A/B: Signaling via WASH Contact

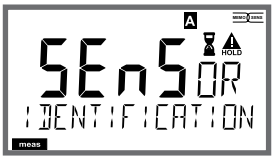
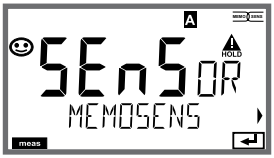
(not for device type CC)



The active parameter set can be signaled using the WASH contact:

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

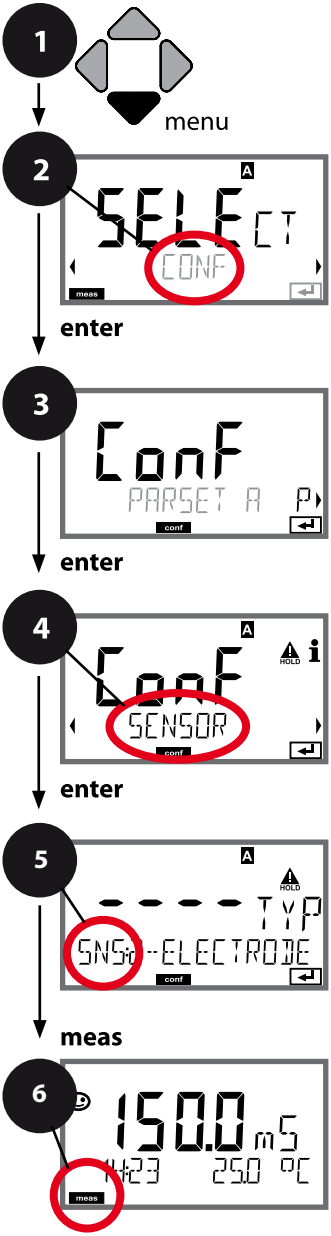
Step	Action/Display	Remark
Connect sensor		First select "Sensor type Memosens" or "SE680-M" in the Configuration. **Note:** When no Memosens sensor is connected, the error message "NO SENSOR" is displayed.
Wait until the sensor data are displayed.		The hourglass in the display blinks.
Check sensor data	 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 (timeout).
Possible error message		
Sensor defective. Replace sensor		When this error message appears, the sensor cannot be used. Sensoface is sad.

Step	Action/Display	Remark
Select HOLD mode A sensor should only be replaced during HOLD mode to prevent unintended reactions of the outputs or contacts.	Press **menu** key to call the selection menu, select HOLD using the ◀ ▶ keys, press **enter** to confirm.	Now the device is in HOLD mode. The HOLD mode can also be activated externally via the HOLD input. During HOLD the output current is frozen at its last value or set to a fixed value.
Disconnect and remove old sensor		
Install and connect new sensor.		Temporary messages which are activated during the replacement are indicated but not output to the alarm contact and 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		
Exit HOLD	Hit **meas** key: Return to the selection menu. Hold **meas** key depressed: Device switches to measuring mode.	

Overview of Cond Sensor Configuration

Cond sensor			Choices	Default
SNS:			2-ELECTRODE 4-ELECTRODE MEMOSENS	2-ELECTRODE
	2-EL / 4-EL	CELLFACTOR	00.0000 - 19.9999 c	01.0000 c
	MEAS MODE		Cond Conc % Sal ‰ USP µS/cm	Cond
	Cond	MEAS RANGE	x.xxx µS/cm xx.xx µS/cm xxx.x µS/cm xxxx µS/cm x.xxx mS/cm xx.xx mS/cm xxx.x mS/cm x.xxx S/m xx.xx S/m xx.xx MΩ	xxx.x mS/cm
	Conc	Solution	-01- (NaCl) -02- (HCl) -03- (NaOH) -04- (H2SO4) -05- (HNO3) -06- (H2SO4) -07- (HCl) -08- (HNO3) -09- (H2SO4) -10- (NaOH) -11-(H_2SO_4•SO_3) (oleum)	-01- (NaCl)
	TEMP UNIT		°C / °F	°C
	TEMPERATURE (EXT. only with I-input enabled via TAN)		AUTO MAN EXT (only if enabled via TAN)	AUTO
	AUTO	RTD TYPE	100 PT 1000 PT 8.55 NTC 30 NTC Ni100	100 PT
	MAN	TEMPERATURE	–50 ... 250 °C (–58 ... 482 °F)	025.0 °C (077.0 °F)

Cond



Device Type: Cond

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

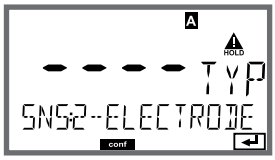
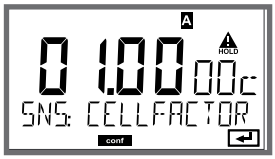
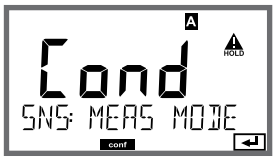
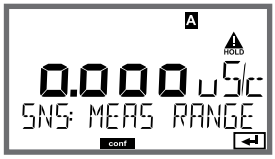
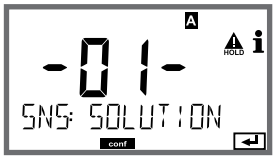
1 Press **menu**.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **SENSOR** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "SNS:" code.
Press **enter** to select menu,
edit using arrow keys (see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

5

Select sensor type
Enter cell constant
Select measuring mode
Select measuring range
Concentration determination
Temperature unit
Temperature detection
Select type of temp probe
Cleaning cycles
Sterilization cycles
CHECK TAG
CHECK GROUP

enter

5

Menu item	Action	Choices
Select sensor type 	Select sensor type using ▲ ▼ keys. Press **enter** to confirm.	**2-ELECTRODE** 4-ELECTRODE MEMOSENS
Enter cell constant 	Modify digit using ▲ ▼ keys, select next digit using ◀ ▶ keys. Press **enter** to confirm.	00.0050 ... 19.9999 c (**01.0000 c**)
Select measuring mode 	Select desired mode using ▲ ▼ keys. Press **enter** to confirm.	**Cond** Conc % Sal ‰ USP µS/cm
Select measuring range 	**For cond measurement only** Select desired measuring range using ▲ ▼ keys. Press **enter** to confirm.	x.xxx µS/cm, xx.xx µS/cm xxx.x µS/cm, xxxx µS/cm x.xxx mS/cm, xx.xx mS/cm **xxx.x mS/cm**, x.xxx S/m xx.xx S/m, xx.xx MΩ
Concentration determination 	**For conc measurement only** Select desired concentration solution using ▲ ▼ keys. Press **enter** to confirm.	**-01- (NaCl)** -02- (HCl) -03- (NaOH) -04- (H_2SO_4) -05- (HNO_3) -06- (H_2SO_4) -07- (HCl) -08- (HNO_3) -09- (H_2SO_4) -10- (NaOH) -11-(H_2SO_4•SO_3) (oleum)

USP Function

Cond

According to the "USP" directive (U.S.Pharmacopeia), Section 645 "Water Conductivity" the conductivity of pharmaceutical waters can be monitored online. To do so, the conductivity is measured without temperature compensation and is compared with limit values (see table on next page).
The water is usable when the conductivity is below the USP limit. If the conductivity values are higher, further test steps must be performed according to the directive.
To increase safety, the USP limit value can be reduced in the device. To do so, a factor (%) is specified.

Configuration steps

- **SNS** menu group:
  When USP function has been selected, the measuring range is fixed to 00.00.....99.99 µS/cm. Temperature compensation is switched off.
  Temperature is monitored.

- Access **REL** menu group and select USP FUNCT. as limit function.
  Relays 1 and 2 can now be used as USP limit contacts.

- Reduced limit contact **REL1**:
  Enter USP factor (reduced USP limit, configurable in the range 10 %...100 %).
  Set contact response for relay 1.
  Set delay time.

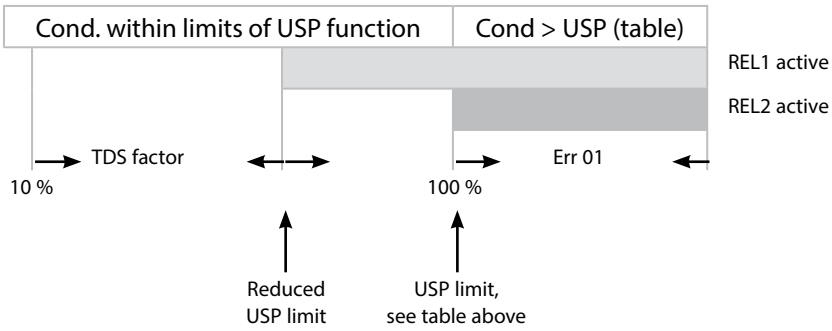
- Limit contact **REL2**:
  REL 2 is permanently set to the USP limit (100%).
  Set contact response for relay 2.
  Set delay time.

Temperature/conductivity table as per USP

Temp (°C)	Cond (µS/cm)	Temp (°C)	Cond (µS/cm)
0	0.6	55	2.1
5	0.8	60	2.2
10	0.9	65	2.4
15	1.0	70	2.5
20	1.1	75	2.7
25	1.3	80	2.7
30	1.4	85	2.7
35	1.5	90	2.7
40	1.7	95	2.9
45	1.8	100	3.1
50	1.9		

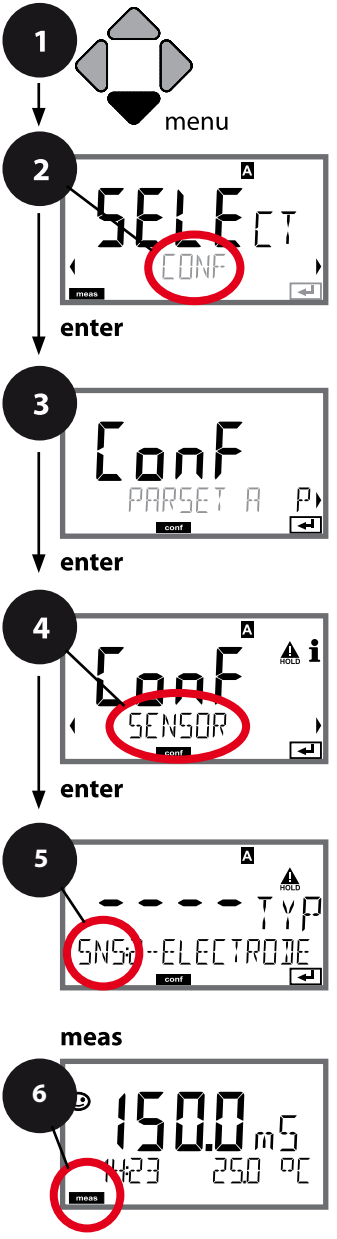
Limit values for USP function

Limit contact response REL1 and REL2



Cond

Sensor, Temperature Unit, Temp Detection, Temperature Probe



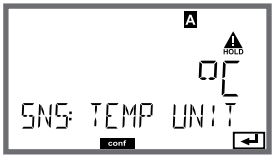
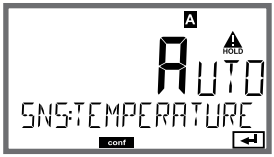
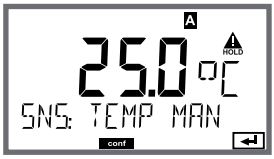
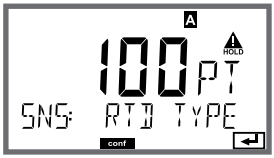
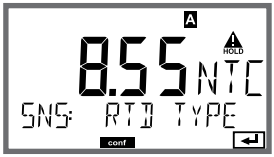
1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **SENSOR** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "SNS:" code.
Press **enter** to select menu,
edit using arrow keys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

5

Select sensor type
Enter cell constant
Select measuring mode
Select measuring range
Concentration determination
Temperature unit
Temperature detection
Select type of temp probe
Cleaning cycles
Sterilization cycles
CHECK TAG
CHECK GROUP

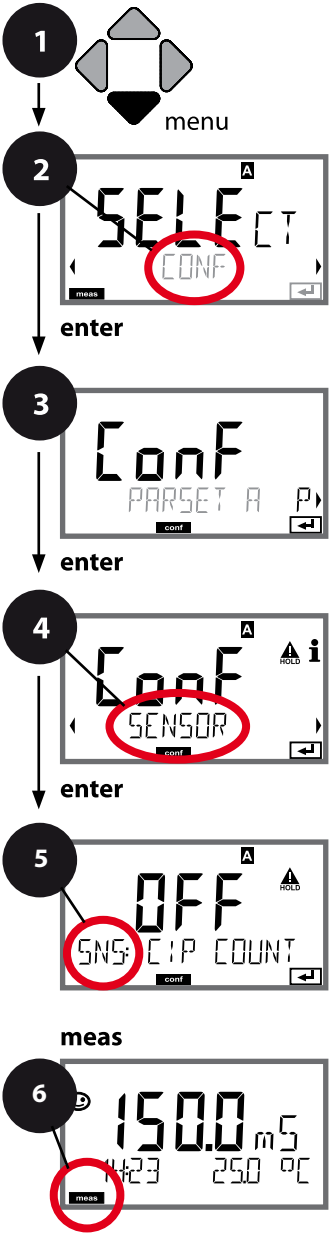
enter

5

Menu item	Action	Select
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) EXT: Temperature specified via current input (only if enabled via TAN) Press **enter** to confirm.	**AUTO** MAN EXT
(Manual temperature) 	Modify digit using ▲ ▼ keys, select next digit using ◀ ▶ keys. Press **enter** to confirm.	–50...250 °C (–58...482 °F)
Select type of temp probe  	(not for Memosens) Select type of temperature probe using ▲ ▼ keys. Press **enter** to confirm.	**100 PT** 1000 PT 30 NTC 8.55 NTC Ni100

Cond

Sensor, Cleaning Cycles, Sterilization Cycles

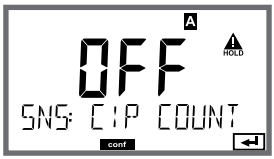
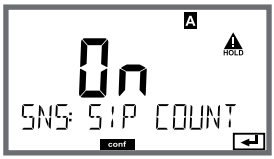


1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **SENSOR** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "SNS:" code.
Press **enter** to select menu,
edit using arrow keys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

5 enter

Select sensor type
Enter cell constant
Select measuring mode
Select measuring range
Concentration determination
Temperature unit
Temperature detection
Select type of temp probe
Cleaning cycles
Sterilization cycles
CHECK TAG
CHECK GROUP

5

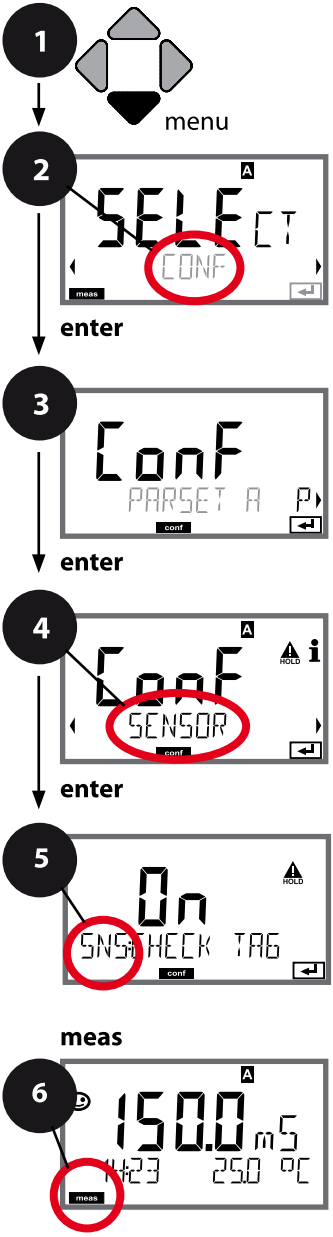
Menu item	Action	Choices
CIP / SIP		
Cleaning cycles on/off 	Select ON or OFF using ▲ ▼ keys. Activates/deactivates logging in extended logbook Press **enter** to confirm.	ON/**OFF**
Sterilization cycles on/off 	Select ON or OFF using ▲ ▼ keys. Activates/deactivates logging in extended logbook Press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

The cleaning and sterilization cycles are logged to measure the load on the sensor. Suitable for biochemical applications (process temperature approx. 0 ... +50 °C / +32 ... +122 °F, CIP temperature > +55 °C / +131 °F, SIP temperature > +115 °C / +239 °F).

Note:
A CIP or SIP cycle is only entered into the logbook 2 hours after the start to ensure that the cycle is complete.
With Memosens sensors, an entry is also made in the sensor.

CondI

Sensor, Sensor Verification (TAG, GROUP)



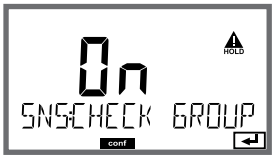
1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **SENSOR** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "SNS:" code.
Press **enter** to select menu,
edit using arrow keys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

5

enter

Select sensor type
Enter cell constant
Select measuring mode
Select measuring range
Concentration determination
Temperature unit
Temperature detection
Select type of temp probe
Cleaning cycles
Sterilization cycles
CHECK TAG
CHECK GROUP

5

Menu item	Action	Choices
TAG 	Select ON or OFF using ▲ ▼ keys. Press **enter** to confirm. When switched on, the entry for "TAG" in the Memosens sensor is compared to the entry in the analyzer. If the entries differ, a message will be generated.	ON/**OFF**
GROUP 	Select ON or OFF using ▲ ▼ keys. Press **enter** to confirm. Function as described above	ON/**OFF**

Sensor Verification (TAG, GROUP)

When Memosens sensors are calibrated in the lab, it is often useful and sometimes even mandatory that these sensors will be operated again at the same measuring points or at a defined group of measuring points. To ensure this, you can save the respective measuring point (TAG) or group of measuring points (GROUP) in the sensor. TAG and GROUP can be specified by the calibration tool or automatically entered by the transmitter. When connecting an MS sensor to the transmitter, it can be checked if the sensor contains the correct TAG or belongs to the correct GROUP. If not, a message will be generated, Sensoface gets "sad", and the display backlighting turns magenta (purple). The "sad" Sensoface icon can also be signaled by a 22 mA error current. Sensor verification can be switched on in the Configuration in two steps as TAG and GROUP if required.

When no measuring point or group of measuring points is saved in the sensor, e.g., when using a new sensor, Stratos enters its own TAG and GROUP. When sensor verification is switched off, Stratos always enters its own measuring point and group. A possibly existing TAG/GROUP will be overwritten.

Cond

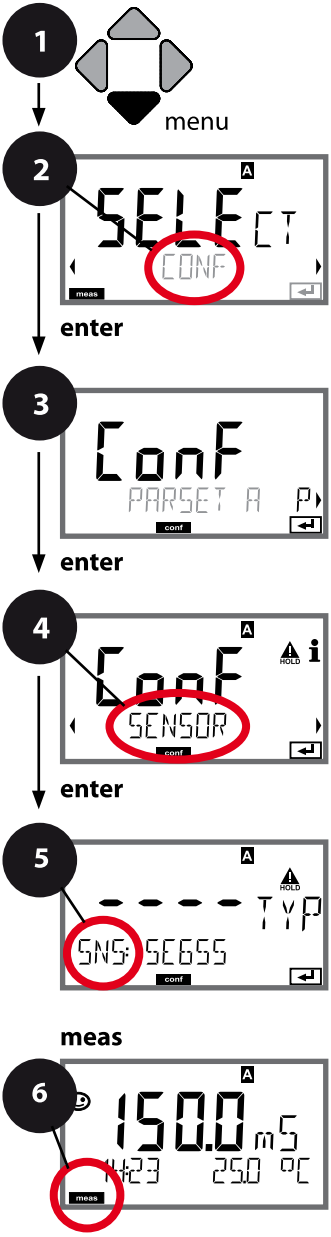
Overview of Condl Sensor Configuration

Condl Sensor			Choices	Default
SNS:			SE 655 SE 656 SE 660 SE 670 SE 680-K, SE 680-M, MEMOSENS, OTHER	SE 655
	OTHER	RTD TYPE	100PT / 1000PT / 30 NTC	1000PT
		CELL FACTOR	XX.XXx	01.980
		TRANS RATIO	XXX.Xx	120.0
	MEAS MODE		Cond Conc % Sal ‰	Cond
	Cond	MEAS RANGE	xxx.x µS/cm x.xxx mS/cm xx.xx mS/cm xxx.x mS/cm x.xxx S/m xx.xx S/m	x.xxx mS/cm
	Conc	Solution	-01- (NaCl) -02- (HCl) -03- (NaOH) -04- (H2SO4) -05- (HNO3) -06- (H2SO4) -07- (HCl) -08- (HNO3) -09- (H2SO4) -10- (NaOH) -11-(H_2SO_4•SO_3) (oleum)	-01- (NaCl)
	TEMP UNIT		°C / °F	°C

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.



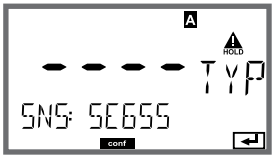
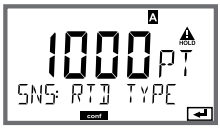
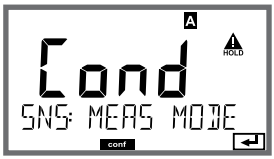
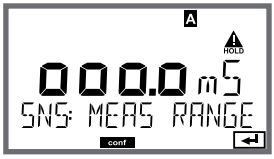
1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **SENSOR** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "SNS:" code.
Press **enter** to select menu,
edit using arrow keys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

5

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

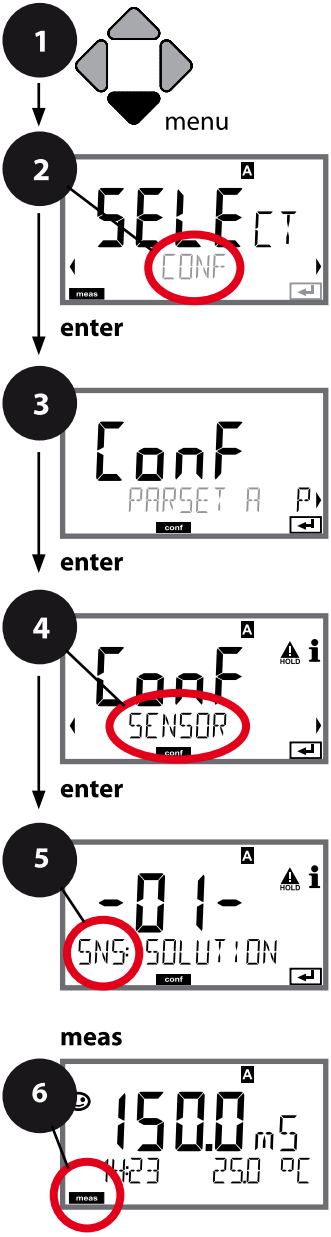
enter

5

Menu item	Action	Choices
Sensor type 	Select sensor type using ▲ ▼ keys. Press **enter** to confirm.	**SE 655** SE 656 SE 660 SE 670 SE680-K SE 680-M MEMOSENS OTHER
Temperature probe  Cell factor Transfer ratio 	**Only with OTHER:** Select type of temperature probe using ▲ ▼ keys. Press **enter** to confirm. Enter cell factor using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm. Enter transfer ratio using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	**1000PT** 100PT 30 NTC **01.980** XX.XXx **120.00** XXX.Xx
Measuring mode 	Select desired mode using ▲ ▼ keys. Press **enter** to confirm.	**Cond** Conc % Sal ‰
Range 	**For cond measurement only** Select desired measuring range using ▲ ▼ keys. Press **enter** to confirm.	xxx.x µS/cm, **x.xxx mS/cm**, xx.xx mS/cm xxx.x mS/cm, x.xxx S/m xx.xx S/m

Condl

Sensor, Concentration Determination, Temperature Unit

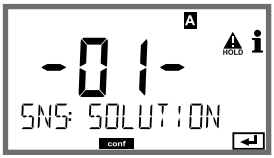
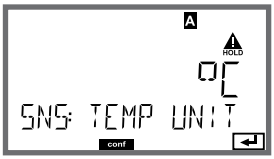
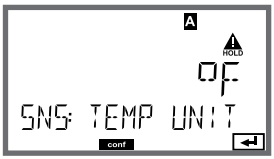


1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **SENSOR** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "SNS:" code.
Press **enter** to select menu,
edit using arrow keys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

5 enter

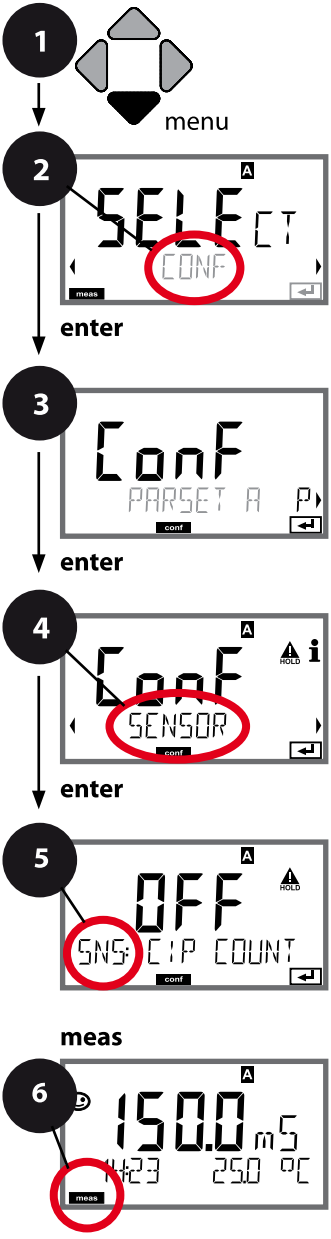
Sensor type
Temperature probe
Cell factor
Transfer ratio
Measuring mode
Measuring range
Concentration determination
Temperature unit
Cleaning cycles
Sterilization cycles
CHECK TAG
CHECK GROUP

5

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- (H_2SO_4) -05- (HNO_3) -06- (H_2SO_4) -07- (HCl) -08- (HNO_3) -09- (H_2SO_4) -10- (NaOH) -11-(H_2SO_4•SO_3) (oleum)
Temperature unit  	Select °C or °F using ▲ ▼ keys. Press **enter** to confirm.	**°C** / °F

Condl

Sensor, Cleaning Cycles, Sterilization Cycles

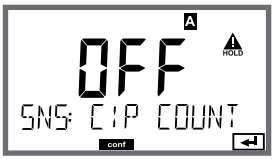
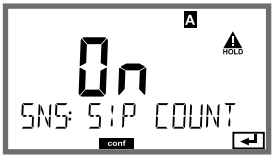


1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **SENSOR** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "SNS:" code.
Press **enter** to select menu,
edit using arrow keys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

5 enter

Select sensor type
Select temp probe
Select cell factor
Select transfer ratio
Select measuring mode
Select measuring range
Concentration determination
Temperature unit
Cleaning cycles
Sterilization cycles
CHECK TAG
CHECK GROUP

5

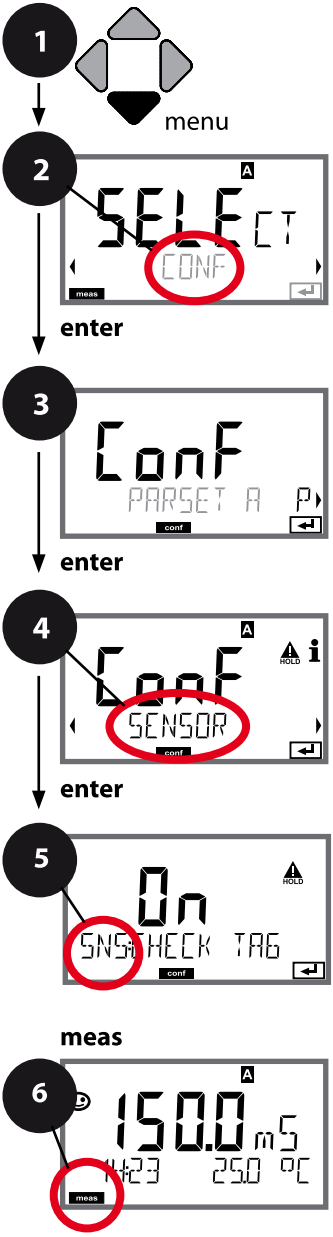
Menu item	Action	Select
CIP / SIP		
Cleaning cycles on/off 	Select ON or OFF using ▲ ▼ keys. Activates/deactivates logging in extended logbook Press **enter** to confirm.	ON/**OFF**
Sterilization cycles on/off 	Select ON or OFF using ▲ ▼ keys. Activates/deactivates logging in extended logbook Press **enter**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

The cleaning and sterilization cycles are logged to measure the load on the sensor. Suitable for biochemical applications (process temperature approx. 0 ... +50 °C / +32 ... +122 °F, CIP temperature > +55 °C / +131 °F, SIP temperature > +115 °C / +239 °F).

Note:
A CIP or SIP cycle is only entered into the logbook 2 hours after the start to ensure that the cycle is complete.
With Memosens sensors, an entry is also made in the sensor.

CondI

Sensor, Sensor Verification (TAG, GROUP)

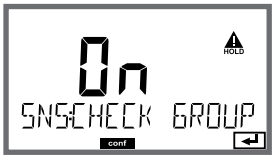


1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **SENSOR** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "SNS:" code.
Press **enter** to select menu,
edit using arrow keys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

5 **enter**

Select sensor type
Select temp probe
Select cell factor
Select transfer ratio
Select measuring mode
Select measuring range
Concentration determination
Temperature unit
Cleaning cycles
Sterilization cycles
CHECK TAG
CHECK GROUP

5

Menu item	Action	Choices
TAG 	Select ON or OFF using ▲ ▼ keys. Press **enter** to confirm. When switched on, the entry for "TAG" in the Memosens sensor is compared to the entry in the analyzer. If the entries differ, a message will be generated.	ON/**OFF**
GROUP 	Select ON or OFF using ▲ ▼ keys. Press **enter** to confirm. Function as described above	ON/**OFF**

Sensor Verification (TAG, GROUP)

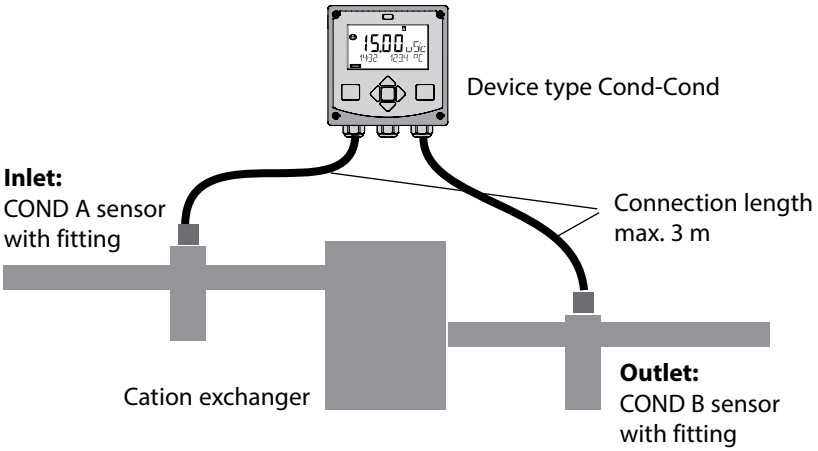
When Memosens sensors are calibrated in the lab, it is often useful and sometimes even mandatory that these sensors will be operated again at the same measuring points or at a defined group of measuring points. To ensure this, you can save the respective measuring point (TAG) or group of measuring points (GROUP) in the sensor. TAG and GROUP can be specified by the calibration tool or automatically entered by the transmitter. When connecting an MS sensor to the transmitter, it can be checked if the sensor contains the correct TAG or belongs to the correct GROUP. If not, a message will be generated, Sensoface gets "sad", and the display backlighting turns purple. The "sad" Sensoface icon can also be signaled by a 22 mA error current. Sensor verification can be switched on in the Configuration in two steps as TAG and GROUP if required.

When no measuring point or group of measuring points is saved in the sensor, e.g., when using a new sensor, Stratos enters its own TAG and GROUP. When sensor verification is switched off, Stratos always enters its own measuring point and group. A possibly existing TAG/GROUP will be overwritten.

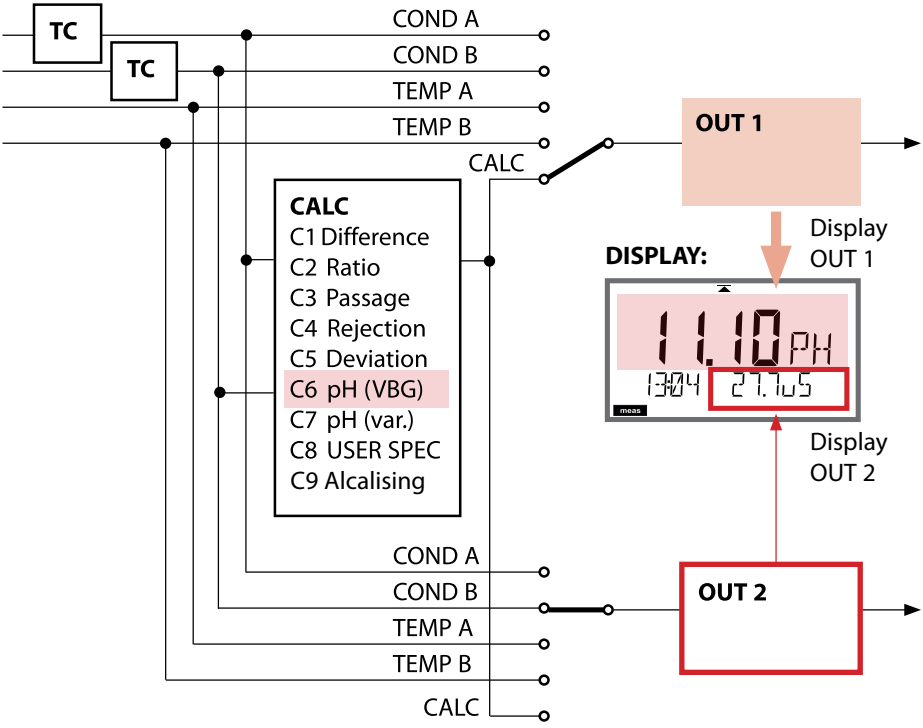
Device Type: Cond-Cond

Cond | Cond

Sensors A and B – Arrangement



Channel selection and display assignment



Cond | Cond

Calculations (CALC)

CONF	Calculation	Formula
-C1-	Difference	COND A – COND B
-C2-	Ratio	COND A / COND B
-C3-	Passage	COND B / COND A * 100
-C4-	Rejection	(COND A – COND B) / COND A * 100
-C5-	Deviation	(COND B – COND A) / COND A * 100
-C6-**	pH value acc. to VBG S-006	Additional specifications possible for calculating the consumption of the ion exchanger (size, capacity, efficiency)
	Alkalizing agent NaOH	11+log((COND A – COND B /3)/243)
	Alkalizing agent NH3	11+log((COND A – COND B /3)/273)
	Alkalizing agent LiOH	11+log((COND A – COND B /3)/228)
	EXCHER CAP	ON / **OFF** **Displaying the remaining capacity:** Diagnostics / Monitor menu After replacement of the ion exchanger an entry must be made in the SERVICE menu.
	EXCHER SIZE	Input of ion exchanger size
	CAPACITY	Input of ion exchanger capacity
	EFFICIENCY	Input of ion exchanger efficiency
-C7-	Variable pH value, factors specifiable	C+log((Cond A -Cond B / F1) / F2) / F3
	COEFFICIENT	Coefficient C
	FACTOR 1	Factor F1
	FACTOR 2	Factor F2
	FACTOR 3	Factor F3

Cond | Cond

-C8-	USER SPEC* (DAC) PARAMETER W, A, B specifiable	
-C9- **	ALCALISING	Concentration of the alcalizing agent selecting NaOH, NH3, LiOH
	nAOH	Concentration calculation
	nH3	Concentration calculation
	LiOH	Concentration calculation

*) Input of user-specific parameters possible

**) With C6 and C9, the concentration of the alkalizing agent can be shown in the measurement display and in the sensor monitor and be switched to the current outputs.

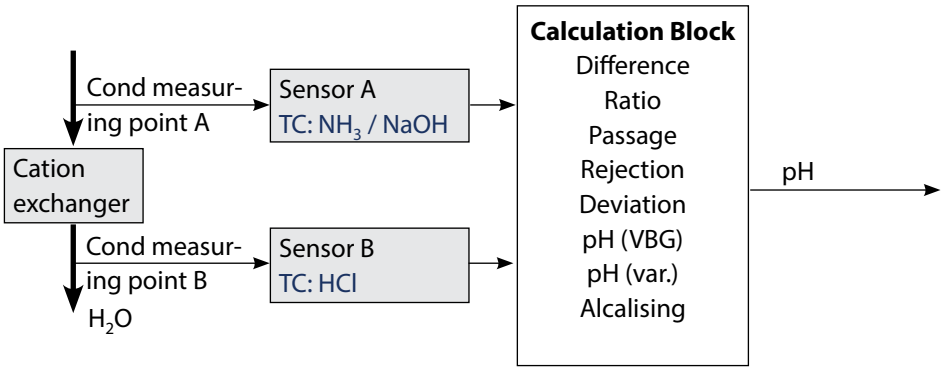
Calculating the pH Value by Means of Dual Conductivity Measurement

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



Cond Cond

Configuration			Select	Default
SENSOR A				
S_A	CELLFACTOR A [1]		0.0050 ... 1.9999	0.0290
	TC SELECT		OFF LIN, NLF, NaCl HCl, NH3,NaOH	OFF
	LIN	TC LIQUID	00.00 ... +19.99 %/K	00.00 %/K
SENSOR B				
S_B	CELLFACTOR B [1]		0.0050 ... 1.9999	0.0290
	TC SELECT		OFF LIN, NLF, NaCl HCl, NH3,NaOH	OFF
	LIN	TC LIQUID	00.00 ... +19.99 %/K	00.00 %/K
MEAS MODE				
MEAS	MEAS RANGE [2] (this setting applies to both channels, A and B)		o.ooo µS/cm oo.oo µS/cm o.ooo µS/cm oooo µS/cm oo.oo MOhm	oo.oo µS/cm
	TEMP UNIT		°C/°F	°C
	CALCULATION		ON/OFF	OFF
	ON	(Selected in text line)	-C1- DIFFERENCE -C2- RATIO -C3- PASSAGE -C4- REJECTION -C5- DEVIATION -C6- PH-VGB -C7- PH-VARIABLE -C8- USER SPEC -C9- ALCALISING	-C1- DIFFERENCE
	-C6-	Alkalizing agent	NaOH, NH3, LiOH	NaOH
		Entries for Calculating the Consumption of the Ion Exchanger		
		EXCHER CAP [3]	ON / OFF	OFF
		EXCHER SIZE [3]	00.50 … 5.00 LTR	00.50 LTR
		CAPACITY [3]	1.000 … 5.000 VAL	1.000 VAL
		EFFICIENCY [3]	50.00 … 100.0 %	100.0 %

Configuration			Select	Default
MEAS MODE				
MEAS	-C7-	COEFFICIENT	00.00 ... 99.99	11.00
		FACTOR 1	01.00 ... 10.00	03.00
		FACTOR 2	0100 ... 0500	0243
		FACTOR 3	0.001 ... 9.999	1.000
	-C8-	PARAMETER W	xxxx E-3	1000 E-3
		PARAMETER A	xxx.x E-3	000.0 E-3
		PARAMETER B	xxx.x E-4	000.0 E-4
	-C9-	ALCALISING	NaOH, NH3, LiOH	NaOH

1) The cell constant can be modified by an entry in the configuration menu or by calibration (one storage position). This means, a cell constant 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				

3) Entries for calculating the consumption of the ion exchanger: Activate with EXCHER CAP = ON. Messages in the Diagnostics / Monitor menu.

Cond

Device Type: Cond				
Cond sensor			**Choices**	**Default**
SNS:			2-ELECTRODE 4-ELECTRODE MEMOSENS	2-ELECTRODE
	2-EL / 4-EL	CELLFACTOR [1]	00.0000 - 19.9999 c	01.0000 c
	MEAS MODE		Cond Conc % Sal ‰ USP µS/cm	Cond
	Cond	MEAS RANGE [2]	x.xxx µS/cm xx.xx µS/cm xxx.x µS/cm xxxx µS/cm x.xxx mS/cm xx.xx mS/cm xxx.x mS/cm x.xxx S/m xx.xx S/m xx.xx MΩ	xxx.x mS/cm
	Conc	Solution	-01- (NaCl) -02- (HCl) -03- (NaOH) -04- (H2SO4) -05- (HNO3) -06- (H2SO4) -07- (HCl) -08- (HNO3) -09- (H2SO4) -10- (NaOH) -11- H_2SO_4•SO_3 (oleum)	-01- (NaCl)
	TEMP UNIT		°C / °F	°C
	TEMPERATURE (EXT. only with I-input enabled via TAN)		AUTO MAN EXT (only if enabled via TAN)	AUTO
	AUTO	RTD TYPE	100 PT 1000 PT 8.55 NTC 30 NTC Ni100	100 PT
	MAN	TEMPERATURE	–50 ... 250 °C (–58 ... 482 °F)	025.0 °C (077.0 °F)

Device Type: Condl

Condl Sensor			Choices	Default
SNS:			SE 655, SE 656, SE 660, SE 670, SE 680-K, SE 680-M, MEMOSENS, OTHER	SE 655
	OTHER	RTD TYPE	100PT / 1000PT / 30 NTC	1000PT
		CELL FACTOR	XX.XXx	01.980
		TRANS RATIO	XXX.Xx	120.0
	MEAS MODE		Cond Conc % Sal ‰	Cond
	Cond	MEAS RANGE	xxx.x µS/cm x.xxx mS/cm xx.xx mS/cm xxx.x mS/cm x.xxx S/m xx.xx S/m	x.xxx mS/cm
	Conc	Solution	-01- (NaCl) -02- (HCl) -03- (NaOH) -04- (H2SO4) -05- (HNO3) -06- (H2SO4) -07- (HCl) -08- (HNO3) -09- (H2SO4) -10- (NaOH) -11- ($H_2SO_4 \cdot SO_3$) (Oleum)	-01- (NaCl)
	TEMP UNIT		°C / °F	°C
	CHECK TAG		ON / OFF	OFF
	CHECK GROUP		ON / OFF	OFF

1) With Memosens, the cell constant is automatically loaded from the sensor. When switching from Memosens to 2-/4-electrode sensor, the cell constant is set to the default value 01.0000 c and then must be entered manually.
2) The range selection allows selecting the maximum resolution. If the upper limit of this range is exceeded, the device automatically switches to the next higher range.

Configuration (default in bold print)				
Current output 1			**Cond**	
OT1:	RANGE		**4 ... 20 mA** 0 ... 20 mA	
	CHANNEL		**COND,** CONC, SAL, USP TMP	
	OUTPUT (Current output curve)		**LIN** / BILIN / LOG (LOG for S/cm and S/m only)	
	LIN	BEGIN 0/4 mA	Floating-point input, **000.0 mS/c**	
		END 20 mA	Floating-point input, **100.0 mS/c**	
	LOG	BEGIN 0/4 mA	**Selectable decades:** S/cm: 1.0 µS/cm* / 10.0 µS/c* / 100.0 µS/c* / **1.0 mS/c** / 10.0 mS/c / 100.0 mS/c / 1000 mS/c S/m: 0.001 S/m / 0.01 S/m / 0.1 S/m / 1.0 S/m / 10.0 S/m / 100 S/m	
		END 20 mA	Decades (see above) **100.0 mS/c**	
	BI LIN	BEGIN 0/4 mA	Range depending on selected channel	
		END 20 mA	Range depending on selected channel	
		CORNER X	Conditions for bilinear characteristic: Vertex X: BEGIN ≤ CORNER X ≤ END (rising) BEGIN ≥ CORNER X ≥ END (falling)	
		CORNER Y	Default: 12 mA Vertex Y: (0 mA) 4 mA ≤ CORNER Y ≤ 20 mA	
	TMP °C	BEGIN 0/4 mA	– 50 ... 250 °C (**000.0 °C**)	
		END 20 mA	– 50 ... 250 °C (**100.0 °C**)	
	TMP °F	BEGIN 0/4 mA	– 58 ... 482 °F (**032.0 °F**)	
		END 20 mA	– 58 ... 482 °F (**212.0 °F**)	
	FILTERTIME		0...120 SEC	0000 SEC
	22mA-FAIL		ON/OFF	OFF
	HOLD MODE		LAST/FIX	LAST
	FIX	HOLD-FIX	(0) 4...22 mA	021.0 mA

* not for toroidal conductivity sensors

Configuration (default in bold print)	
Current output 2	**Default setting CHANNEL: TMP (other settings like OT1)**

Correction				Cond	
COR:	TC SELECT			**OFF** LIN, NLF, NaCl Compensation for ultrapure water: NaCl, HCL, NH3, NaOH	
	LIN	TC LIQUID		00.00 ... 19.99 %/K (**00.00 %/K**)	
		REF TEMP		000.0 ... 199.9 °C (**025.0 °C**)	
	EXT	I-INPUT		0–20 mA / 4–20 mA	4...20 mA
	I-INPUT	°C	BEGIN 4 mA	–50...250 °C	000.0 °C
			END 20 mA	–50...250 °C	100.0 °C
		°F	BEGIN 4 mA	–58...482 °F	
			END 20 mA	–58...482 °F	

* not for toroidal conductivity sensors

Configuration (default in bold print)			
CNTR_IN input			
IN:	CONTROL		**PARSET** / FLOW
	FLOW	FLOW ADJUST	0 ... 20000 pulses/liter (**12000 pulses/liter**)
Alarm			
ALA:	DELAYTIME		0 ... 600 s (**0010 SEC**)
	SENSOCHECK		ON / **OFF**
	TEMP CHECK		ON / **OFF**
	FLOW CNTR*)		ON / **OFF**
	ON	FLOW MIN**)	0 ... 99.9 Liter/h (**005.0 Liter/h**)
		FLOW MAX**)	0 ... 99.9 Liter/h (**025.0 Liter/h**)
Relay contacts REL1, REL2			
REL:	**LIMITS** CONTROLLER	The following submenu depends on the selected setting.	
RL1:	CHANNEL	**COND**, CONC, SAL, USP, TMP	
	FUNCTION	**Lo LEVL** / Hi LEVL	
	CONTACT	**N/O** / N/C	
	LEVEL	**000.0 mS/cm**	
	HYSTERESIS	**005.0 mS/cm** 0 ... 50 % full scale	
	DELAYTIME	**0010 SEC** 0000 ... 9999 s	
RL2:	See RL1 for configuration; default setting: CHANNEL = TMP		
USP function			
USP:	USP FACTOR	010.0 ... **100.0 %**	
	CONTACT REL1	**N/O**, N/C	
	DELAYTIME	**0000**...9999 SEC	
	CONTACT REL2	**N/O**, N/C	
	DELAYTIME	**0000**...9999 SEC	

Monitoring the sensor lines for breakage

The sensor lines are monitored for breakage when the temperature is used for calculating the conductivity or concentration. If the sensor or line is broken, an alarm will be generated (output current FIX or 22 mA, depending on the configuration). If you want to output a conductivity value that is independent of the measured temperature (uncompensated), you can monitor the sensor lines for breakage by setting "TEMP CHECK" to "ON" in the Alarm menu.

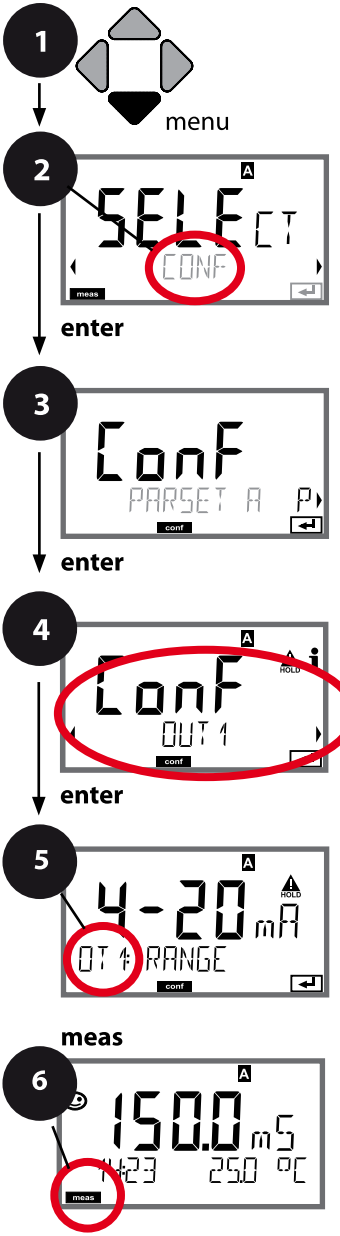
Configuration (default in bold print)		
PID controller		**Cond**
CTR:	CHANNEL	**COND** / TMP
	TYPE	PLC / PFC
	PLC	00001 ... 0600 s (**0010 SEC**)
	PFC	0001 ... 0180 min $^{-1}$ (**0060 min $^{-1}$**)
	SETPOINT	within measuring range
	DEAD BAND	0 ... 50 % full scale
	P-GAIN	10 ... 999 % (**0100 %**)
	I-TIME	0 ... 9999 s (**0000 SEC**)
	D-TIME	0 ... 9999 s (**0000 SEC**)
	HOLD MODE	**Y LAST** / Y OFF
Rinse contact WASH		
WSH:	**WASH** / PARSET A/B	Rinse contact / Signaling the active parameter set
	WASH CYCLE	0.0 ... 999.9 h (**000.0 h**)
	WASH TIME	0 ... 1999 s (**0060 SEC**)
	CONTACT	**N/O** / N/C
Selecting the parameter set PARSET		
PAR:	PARSET FIX A MANUAL CNTR INPUT	(no switchover, parameter set A) (manual selection in the "Configuration" menu) (switchover via CNTR control input)

Time/date			
CLK	FORMAT	**24 h** / 12 h	
	24 h	hh:mm	
	12 h	hh:mm (AM / PM)	00 ... 12:59 AM / 1 ... 11:59 PM
	DAY / MONTH	dd.mm	
	YEAR	2000 ... 2099	
Measuring points (TAG / GROUP)			
TAG	The entries are made in the text line.		A...Z, 0...9, – + < > ? / @
GROUP	The entries are made in the text line.		0000...9999

* These menu items appear only if selected.

** Hysteresis fixed at 5% of threshold value

Output Current, Range, Current Start, Current End



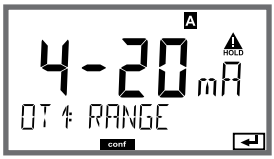
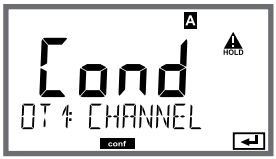
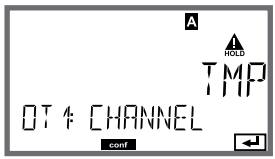
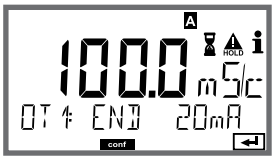
1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **OUT1** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "OT1:" code.
Press **enter** to select menu,
edit using arrow keys (see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

5

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

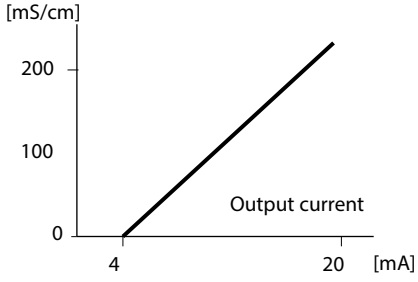
enter

5

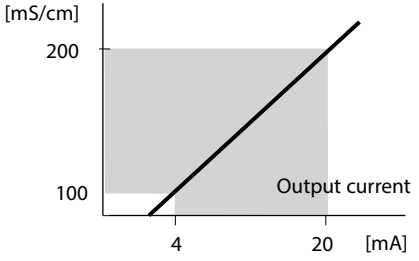
Menu item	Action	Select
Current range 	Select 4-20 mA or 0-20 mA range using ▲ ▼ keys. Press **enter** to confirm.	**4-20 mA** / 0-20 mA
Process variable 	Select using ▲ ▼ keys. Cond: Conductivity TMP: Temperature Press **enter** to confirm. Then select characteristic (LIN/biLIN/LOG).	**Cond**/TMP 
Current start	Modify digit using ▲ ▼ keys, select next digit using ◀ ▶ keys. Press **enter** to confirm.	Entered value applies to selected process variable/range. If the adjusted range is exceeded, the device automatically switches to the next higher range (Autorange)
Current end 	Enter value using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	Entered value applies to selected process variable/range. If the adjusted range is exceeded, the device automatically switches to the next higher range (Autorange)

Assignment of measured values: Current start and current end

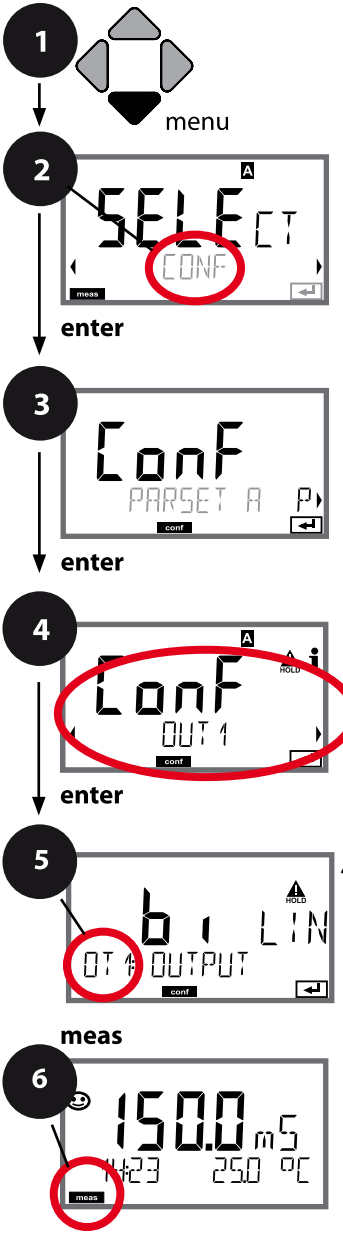
Example 1: Measuring range 0 … 200 mS/cm



Example 2: Measuring range 100 … 200 mS/cm
Advantage: Higher resolution in range of interest



Output Current, Characteristic



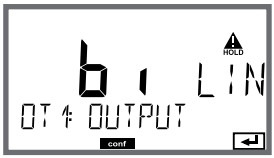
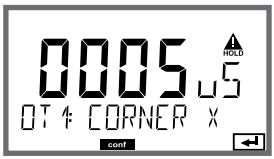
1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **OUT1** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "OT1:" code.
Press **enter** to select menu,
edit using arrow keys (see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

5

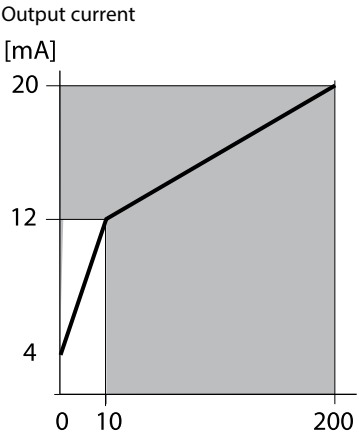
Current range
Process variable
LIN/biLIN/LOG output
Current start
Current end
Bilinear: Vertex X
Bilinear: Vertex Y
Time averaging filter
Output current during error message
Output current for Sensoface message
Output current during HOLD
Output current for HOLD FIX

enter

5

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

Vertex of bilinear curve



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

Output Current, Logarithmic Curve

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

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

1.0 µS/cm	
10.0 µS/cm	0.001 S/cm
100.0 µS/cm	0.01 S/cm
1.0 mS/cm	0.1 S/cm
10.0 mS/cm	1.0 S/cm
100.0 mS/cm	10.0 S/cm
1000 mS/cm	100 S/cm

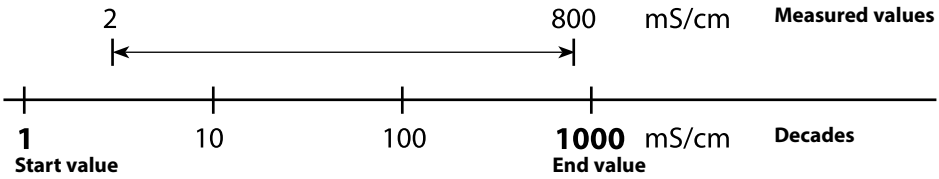
The start value
is the next decade value below the lowest measured value.

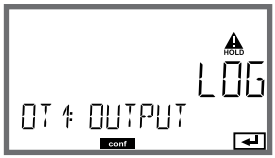
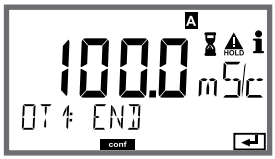
The end value
is the next decade value above the highest measured value.

The number of decades results from:
Number of decades = log (end value) – log (start value)

The output current value is defined as follows:

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



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

Possible start and end values for the logarithmic curve

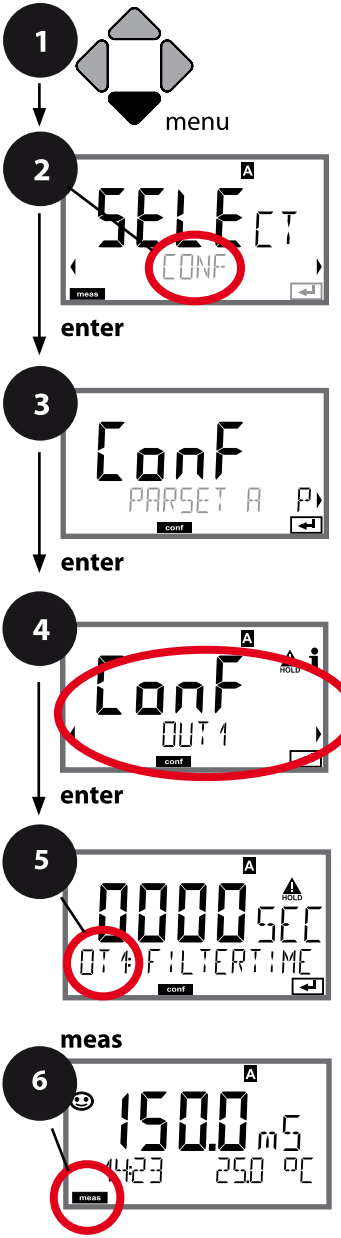
S/cm:

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

S/m:

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

Output Current, Time Averaging Filter



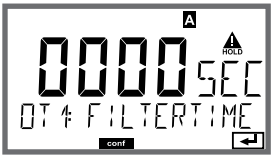
1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **OUT1** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "OT1:" code.
Press **enter** to select menu,
edit using arrow keys (see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

5

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

enter

5

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

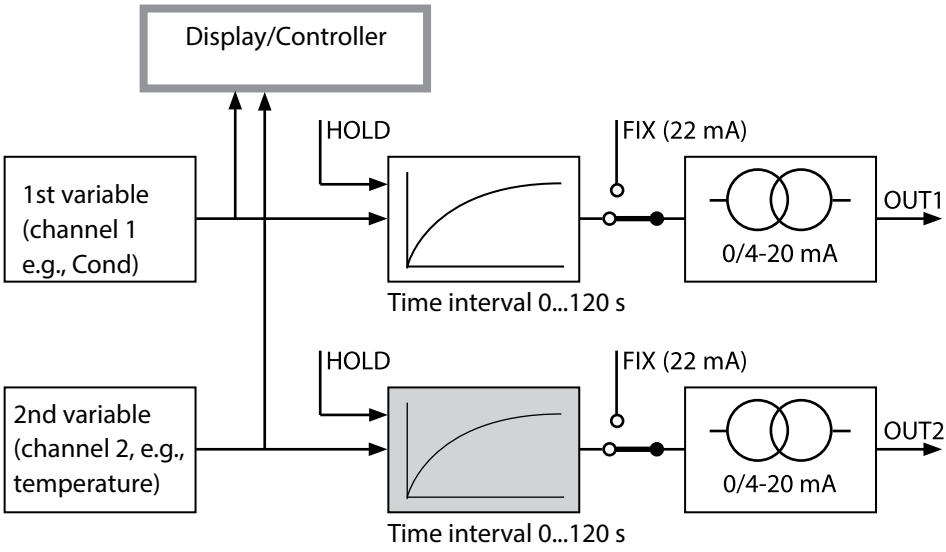
Time averaging filter

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

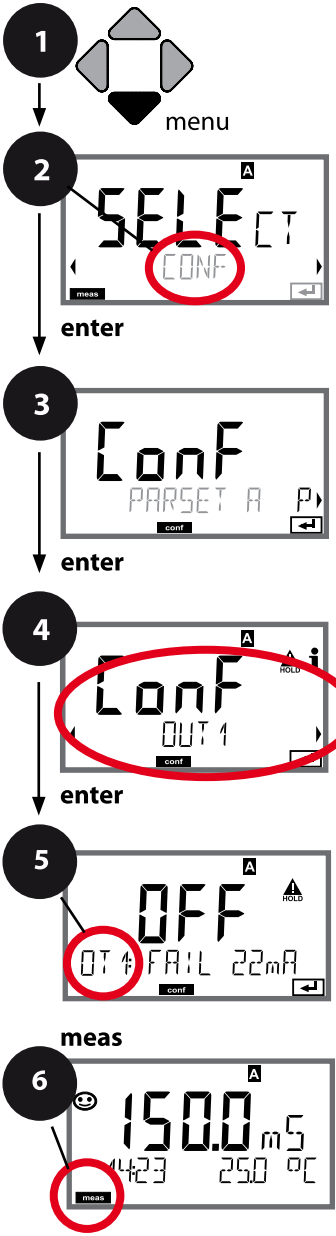
Note:

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

During HOLD the filter is not applied. This prevents a jump at the output.



Output Current, Error and HOLD



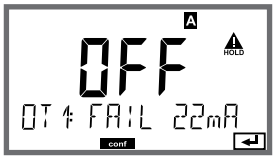
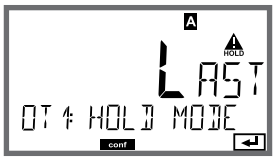
1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **OUT1** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "OT1:" code.
Press **enter** to select menu,
edit using arrow keys (see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

5

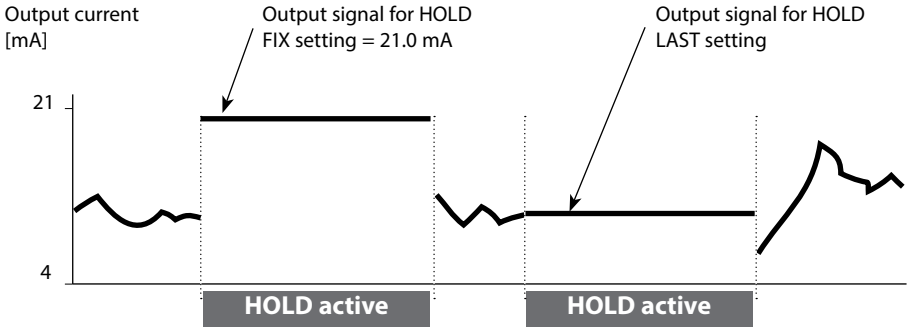
Current range
Process variable
Current start
Current end
Time averaging filter
Output current during error message
Output current for Sensoface message
Output current during HOLD
Output current for HOLD FIX

enter

5

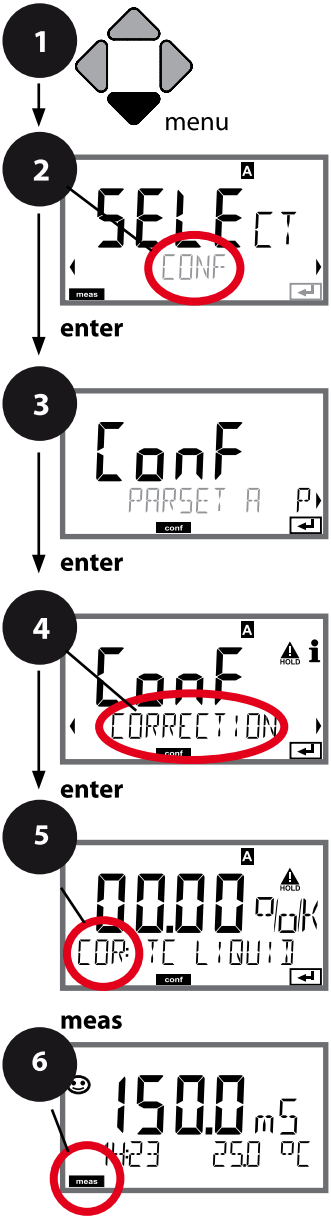
Menu item	Action	Choices
Output current during error message 	The output current can be set to 22 mA in the case of error messages. Select ON or OFF using ▲ ▼. Press **enter** to confirm.	**OFF** / ON
Output current during Sensoface messages **OT1: FACE 22 mA**	The output current can be set to 22 mA in the case of Sensoface messages. Select ON or OFF using ▲ ▼. Press **enter** to confirm.	**OFF** / ON
Output current during HOLD 	LAST: During HOLD the last measured value is maintained at the output. FIX: During HOLD a value (to be entered) is maintained at the output. Select using ▲ ▼. Press **enter** to confirm.	**LAST**/FIX
Output current for HOLD FIX	Only with FIX selected: Enter current which is to flow at the output during HOLD Enter value using ▲ ▼ ◀ ▶. Press **enter** to confirm.	00.00...22.00 mA (**21.00 mA**)

Output signal during HOLD:



Temperature Compensation

Selecting the compensation method



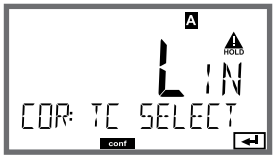
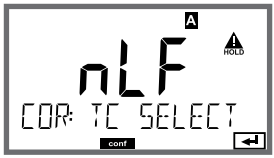
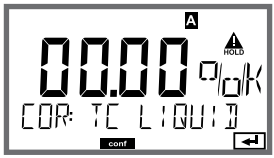
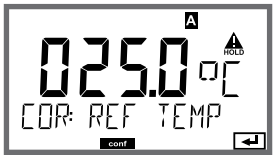
1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **CORRECTION** menu using ◂ ▸ keys, press **enter**.
5 All items of this menu group are indicated by the "COR:" code.
Confirm (and proceed) by pressing **enter**.
6 Exit: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

5

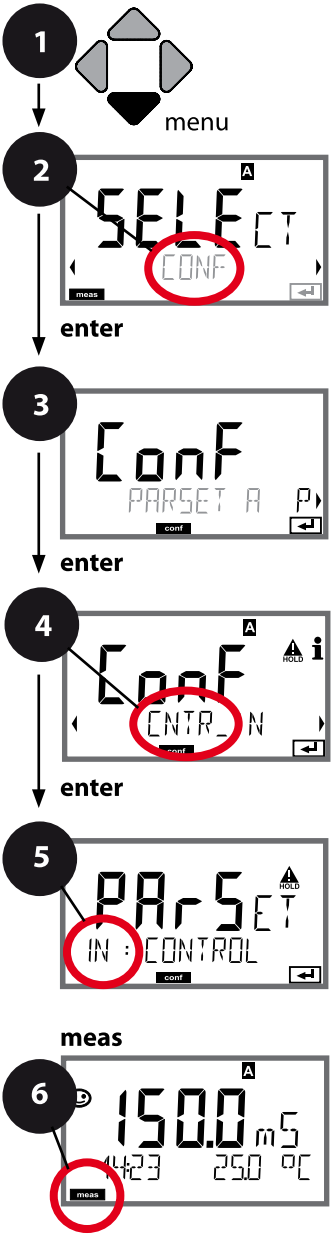
Temperature compensation
Temperature compensation of process medium
Enter reference temperature

enter

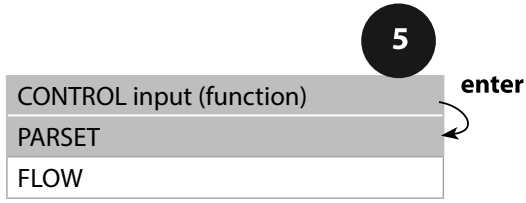
5

Menu item	Action	Choices
Temperature compensation	Select desired compensation using ▲ ▼ keys: **OFF:** Temperature compensation switched off	
	LIN: Linear temperature compensation with entry of temperature coefficient and reference temperature	
	nLF: Temperature compensation for natural waters to EN 27888	
	NaCl, HCL, NH3, NaOH: Ultrapure water with traces of impurity (0 ... +120 °C / +32 ... +248 °F)	
Temperature compensation of process medium	**With linear compensation only:** Step 1: Enter temperature compensation of the process medium.	
Enter reference temperature	Step 2: Enter reference temperature Enter value using ▲ ▼ ◀ ▶ keys Press **enter** to confirm. Permissible range 0 ... 199.9 °C	

Parameter Set Selection (External Signal)



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

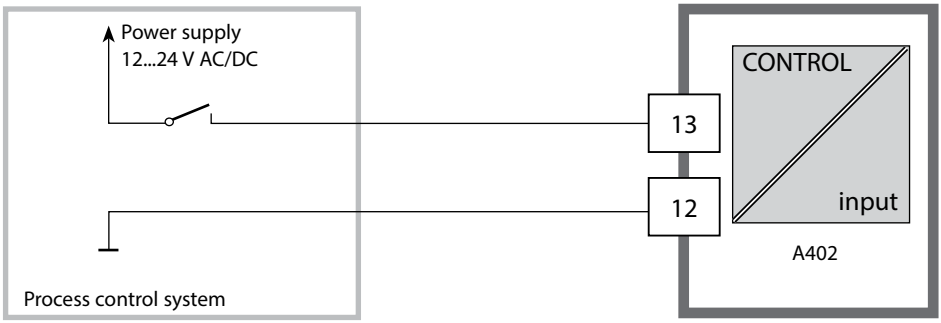


5

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

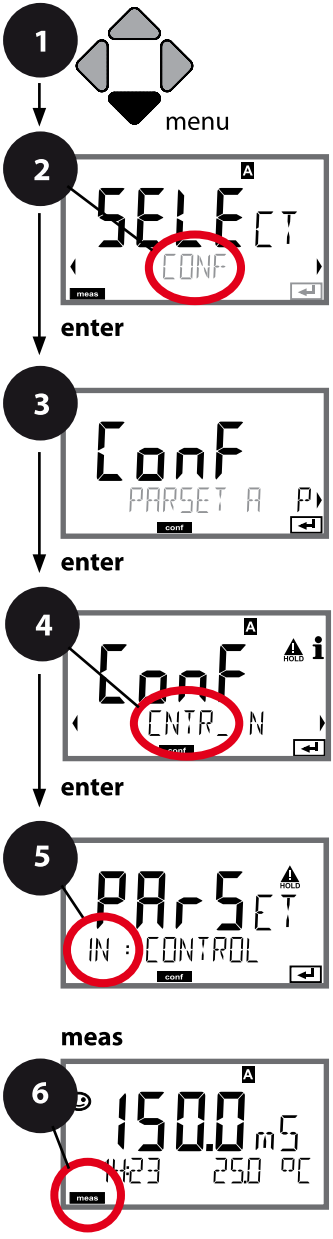
External switchover of parameter sets

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

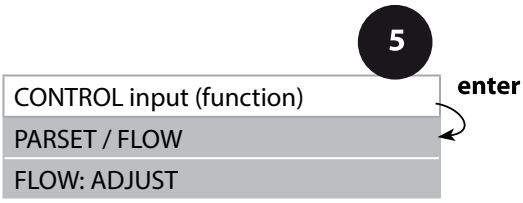


Parameter set A	0...2 V AC/DC
Parameter set B	10...30 V AC/DC

Flow Measurement



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



5

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

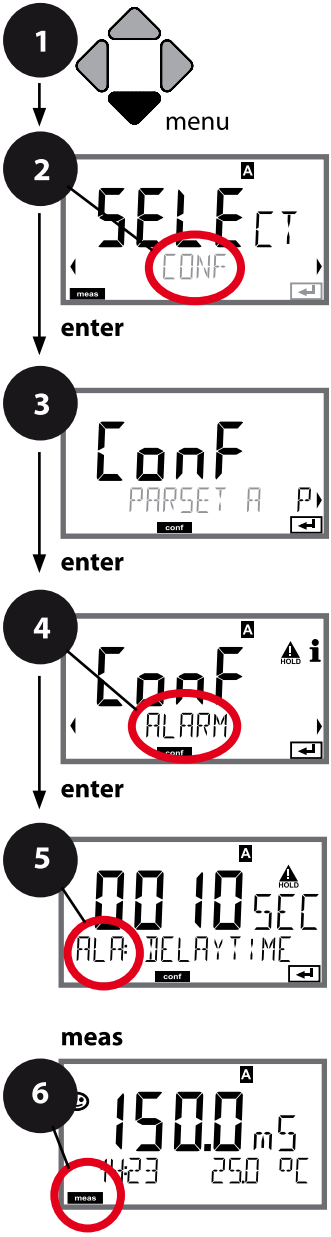
In the alarm menu you can configure flow monitoring.
When you have set CONTROL to FLOW, you can specify 2 additional limit values for maximum and minimum flow. If the measured value lies outside this range, an alarm message and a 22-mA error signal (if configured) will be generated.

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

Display
Flow measurement in measuring mode

Display
Flow measurement (sensor monitor)

Alarm, Alarm Delay, Sensocheck, Tempcheck



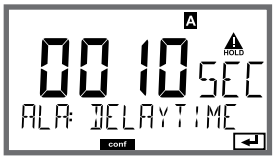
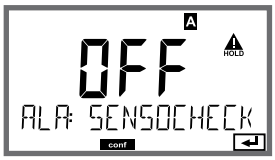
1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **ALARM** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "ALA:" code.
Press **enter** to select menu,
edit using arrow keys (see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

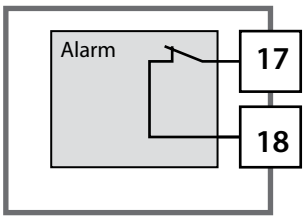
5

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

enter

5

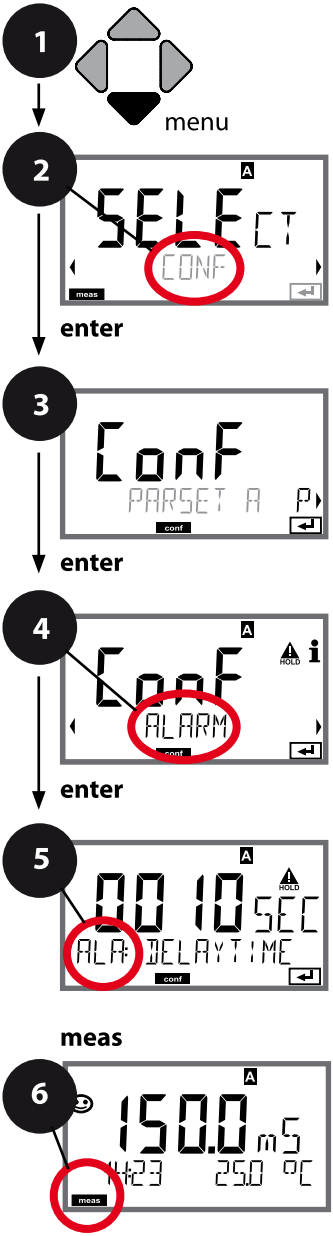
Menu item	Action	Choices
Alarm delay 	Enter alarm delay using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0...600 SEC (**010 SEC**)
Sensocheck 	Select Sensocheck (continuous monitoring of lines). Select ON or OFF using ▲ ▼ keys. Press **enter** to confirm. (At the same time, Sensoface is activated. With OFF, Sensoface is also switched off.)	ON/**OFF**
Tempcheck (see page 90)	To monitor the temperature probe with TC OFF selected: Select Tempcheck ON using ▲ ▼ keys. Press **enter** to confirm. Now, the temperature probe will be monitored.	ON/**OFF**



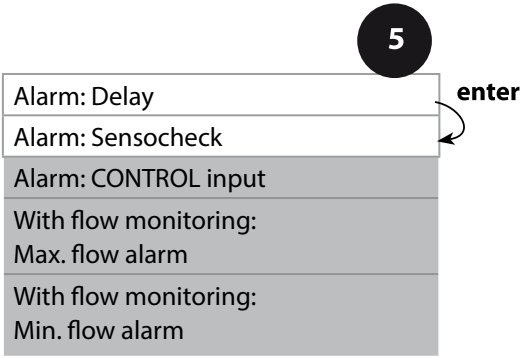
Alarm Contact
The alarm contact is closed during normal operation (N/C).
It opens in the case of alarm or power outage. As a result, a failure message is output even in the case of line breakage (fail-safe behavior). For contact ratings, see Specifications.

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

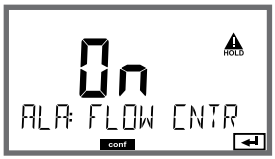
Alarm, CONTROL Input (FLOW MIN, FLOW MAX)



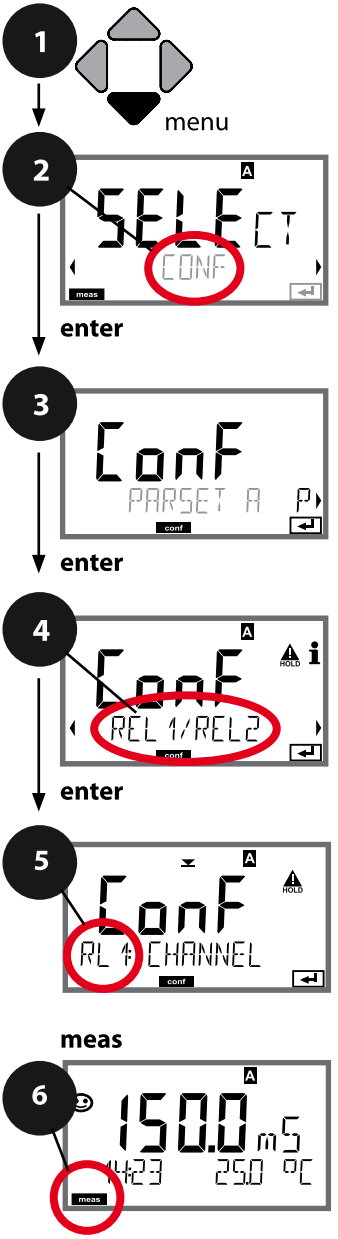
1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **ALARM** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "ALA:" code.
Press **enter** to select menu,
edit using arrow keys (see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



5

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

Limit Function, Relay 1

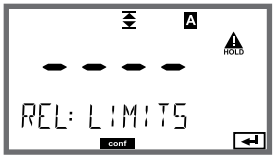
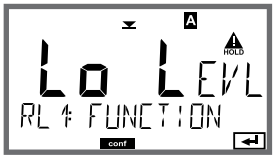
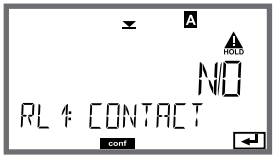
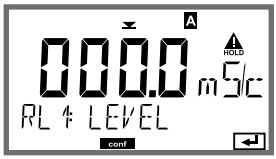


1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸,
press **enter**.
4 Select **REL1/REL2** menu using ◂ ▸ keys, press **enter**.
5 All items of this menu group are indicated by the "RL1:" code.
Press **enter** to select menu,
edit using arrow keys (see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

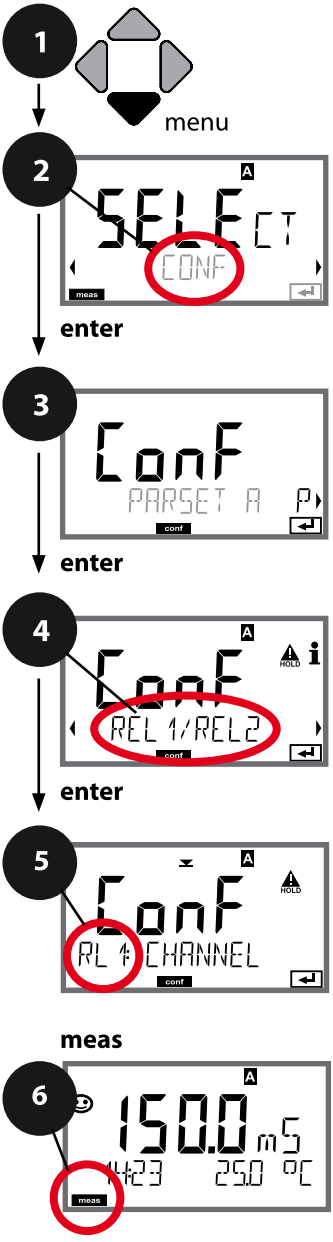
5

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

5

Menu item	Action	Select
Use of relays 	Select in the text line using ▲ ▼ keys: • Limit function (LIMITS) • Controller (CONTROLLER) • USP function (USP) Press **enter** to confirm.	**LIMITS** / CONTROLLER (not with MΩ as process variable!) / USP FUNCT (only with USP selected!). **Note:** Selecting CONTROLLER leads to Controller menu group (CTR), selecting USP FUNCT to USP function menu group.
Select process variable 	Select desired process variable using ▲ ▼ keys. Press **enter** to confirm.	Depending on module or Memosens sensor
Limit 1 function 	Select desired function using arrow keys. LoLevel: active if value falls below setpoint LoLevel: active if value exceeds setpoint Press **enter** to confirm.	**Lo LEVL** / Hi LEVL Limit 1 icon: ▼
Limit 1 contact response 	N/O: normally open contact N/C: normally closed contact Select using ▲ ▼ keys. Press **enter** to confirm.	**N/O** / N/C
Limit 1 setpoint 	Enter setpoint using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	Depending on module or Memosens sensor

Limit Function, Relay 1



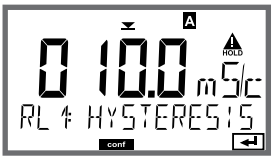
1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **REL1/REL2** menu using ◂ ▸ keys, press **enter**.
5 All items of this menu group are indicated by the "RL1:" code.
Press **enter** to select menu,
edit using arrow keys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

5

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

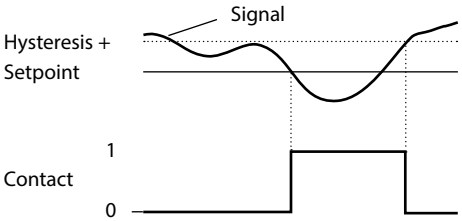
enter

5

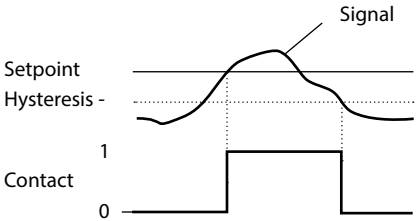
Menu item	Action	Select
Limit 1 hysteresis 	Select hysteresis using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	Depending on module or Memosens sensor
Limit 1 delay	The contact is activated with delay (deactivated without delay) Adjust delay using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0...9999 SEC **(0010 SEC)**

Application of Hysteresis:

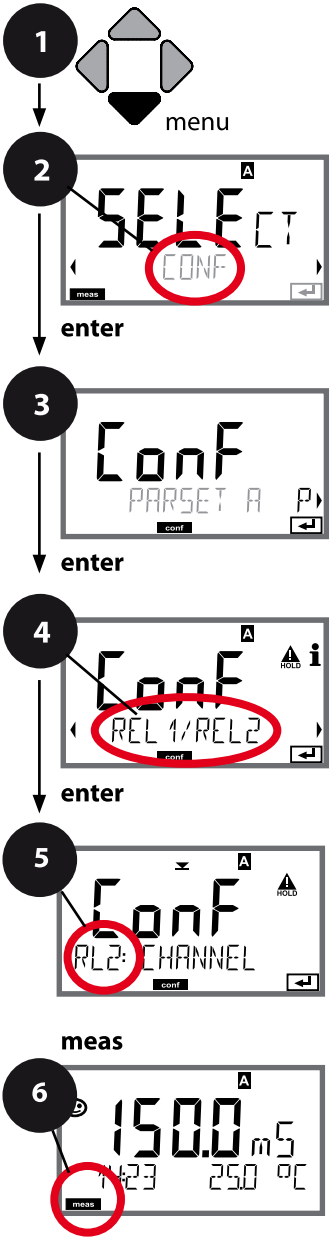
Limit Lo



Limit Hi



Limit Function, Relay 2



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

5

enter

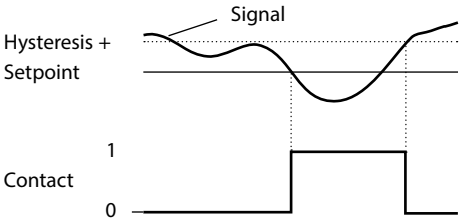
Use of relays
Select process variable
Limit 2 switching characteristics (function)
Limit 2 contact type
Limit 2 setpoint
Limit 2 hysteresis
Limit 2 delay

5

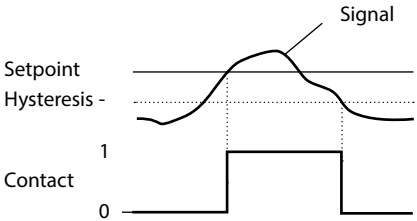
Menu item	Action	Select
Select process variable (CHANNEL)	Select desired process variable using ▲ ▼ keys. Press **enter** to confirm.	Depending on module or Memosens sensor
Limit 2 function (FUNCTION)	Select desired function using arrow keys. Press **enter** to confirm.	Lo LEVL / **Hi LEVL** Limit 2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

Application of Hysteresis:

Limit Lo

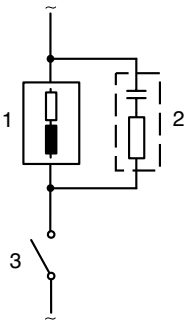


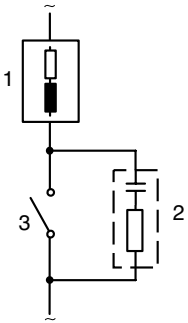
Limit Hi



Protective Wiring of Relay Contacts

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

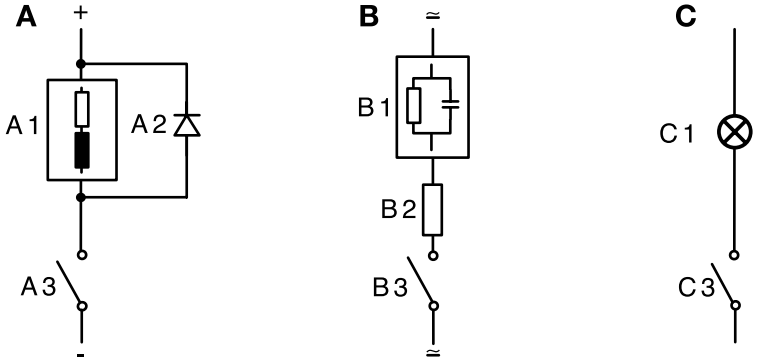




Typical AC applications with inductive load

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

Typical Protective Wiring Measures



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

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

WARNING!

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

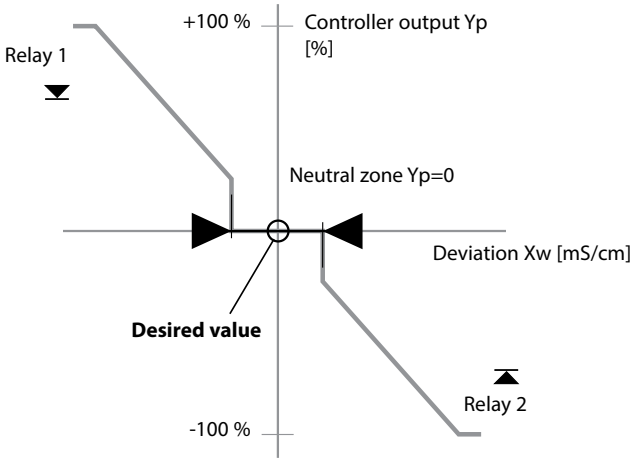
Typical Applications

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

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

PID controller
The additional derivative action compensates for measurement peaks.

Controller Characteristic



Controller Equations

$$\text{Controller output } Y = \underbrace{Y_P}_{\text{P action}} + \underbrace{\frac{1}{T_R}\int Y_P dt}_{\text{I action}} + \underbrace{T_D \frac{dY_P}{dt}}_{\text{D action}}$$

with:

Y_P	Proportional action
T_N	Reset time [s]
T_D	Rate time [s]
K_C	Controller gain [%]

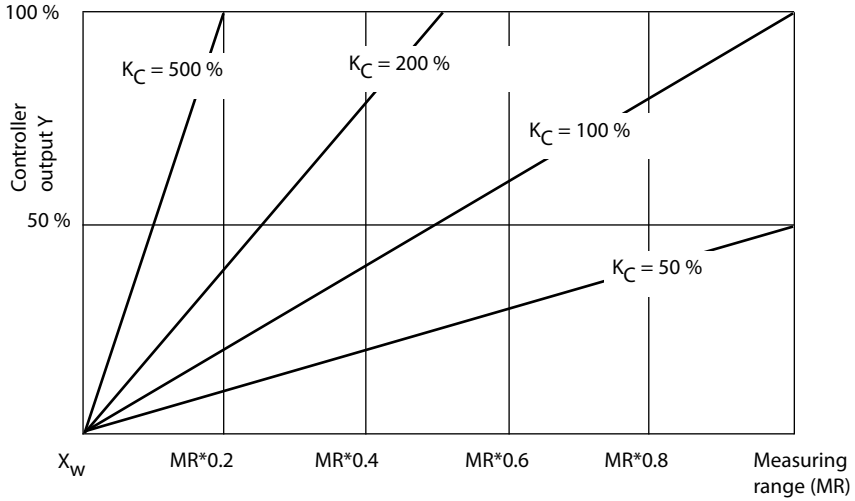
Proportional action Y_P

$$Y_P = \frac{\text{Setpoint - Meas. value}}{\text{Measuring range}} * K_C$$

Neutral Zone (Y=0)

Tolerated deviation from setpoint.
With the setting "1 mS/cm", for example, a deviation of ± 0.5 mS/cm from the setpoint does not activate the controller.

Proportional Action (Gradient K_C [%])

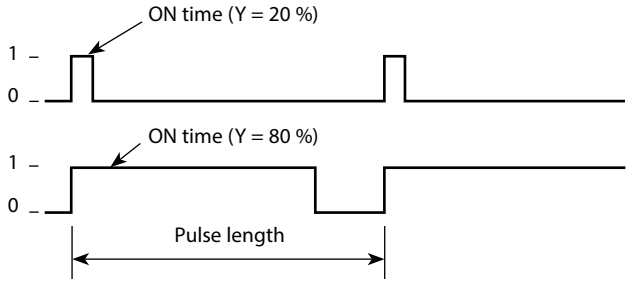


Pulse Length / Pulse Frequency Controller

Pulse Length Controller (PLC)

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

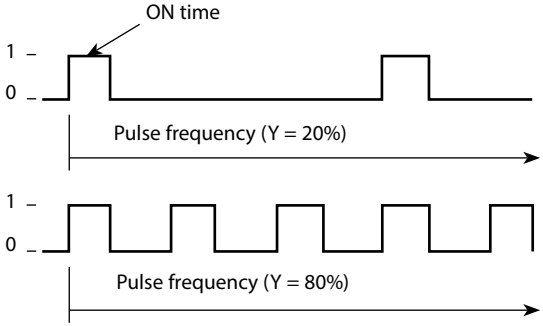
Output signal (relay contact) of pulse length controller



Pulse Frequency Controller (PFC)

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

Output signal (relay contact) of pulse frequency controller

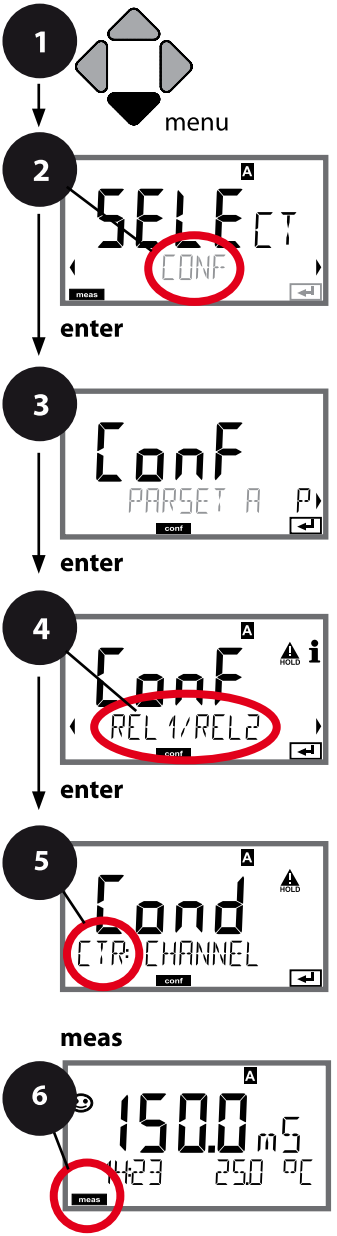


PID controller and behavior during HOLD

The following setting can be made for the controller: HOLD MODE = Y LAST/ Y OFF.
Y LAST: The controller output Y is maintained during HOLD
Y OFF: Y = 0 during HOLD (no control)

For a continuous (non-integrating) process, you should use the Y LAST setting.
For an integrating process (closed boiler), you should use Y OFF.

Controller, Process Variable, Controller Type, Setpoint

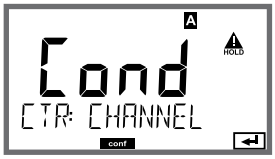
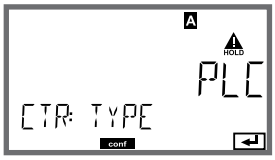
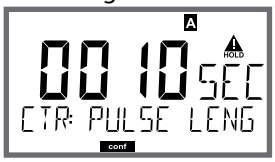
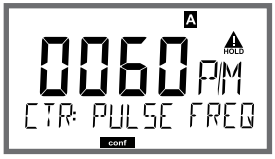


1 Press **menu** key.
2 Select **CONF** using ◂ ▸, press **enter**.
3 Select parameter set using ◂ ▸ keys, press **enter**.
4 Select **REL1/REL2** menu using ◂ ▸ keys, press **enter**.
5 All items of this menu group are indicated by the "CTR:" code.
Press **enter** to select menu, edit using arrow keys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

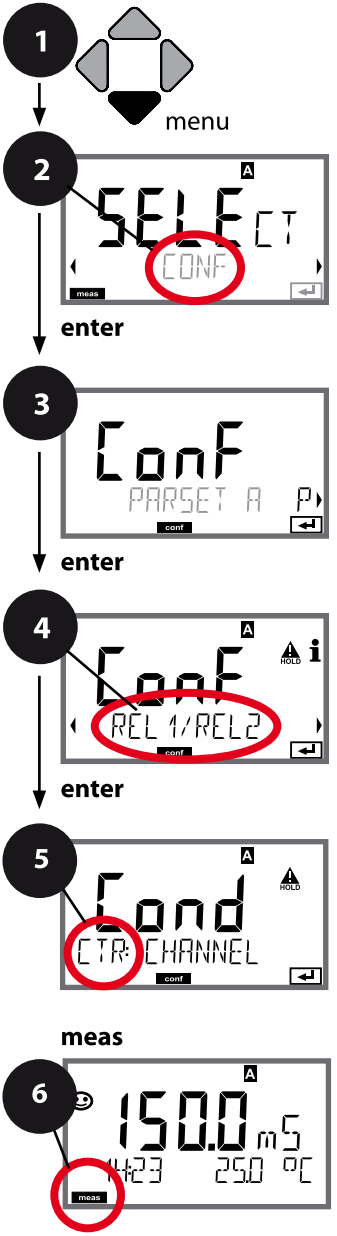
5

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

5

Menu item	Action	Select
Use of relays	Select in the text line using ▲ ▼ keys: • Controller (CONTROLLER) Press **enter** to confirm.	**LIMITS** / CONTROLLER Selecting CONTROLLER leads to Controller menu group CTR.
Select process variable 	Select desired process variable using ▲ ▼ keys. Press **enter** to confirm.	Depending on module or Memosens sensor
Controller type 	Pulse length controller (PLC) or pulse frequency controller (PFC) Select using ▲ ▼ keys. Press **enter** to confirm.	**PLC** / PFC
Pulse length 	Only with PLC: Pulse length Adjust using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0...0600 SEC **(0010 SEC)**
Pulse frequency 	Only with PFC: Pulse frequency Adjust using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0...0180 P/M (**0060 P/M**) (pulses per minute)
Setpoint 	Adjust setpoint using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	Depending on module or Memosens sensor

Controller, Neutral Zone, P, I, D Action Components, Behavior during HOLD



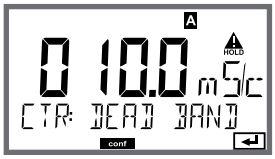
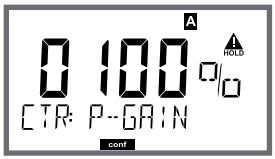
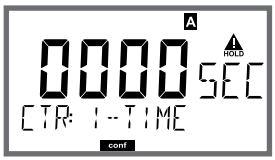
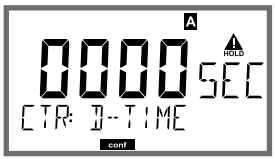
1 Press **menu** key.
2 Select **CONF** using ◂ ▸, press **enter**.
3 Select parameter set using ◂ ▸ keys, press **enter**.
4 Select **REL1/REL2** menu using ◂ ▸ keys, press **enter**.
5 All items of this menu group are indicated by the "CTR:" code.
Press **enter** to select menu, edit using arrow keys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

5

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

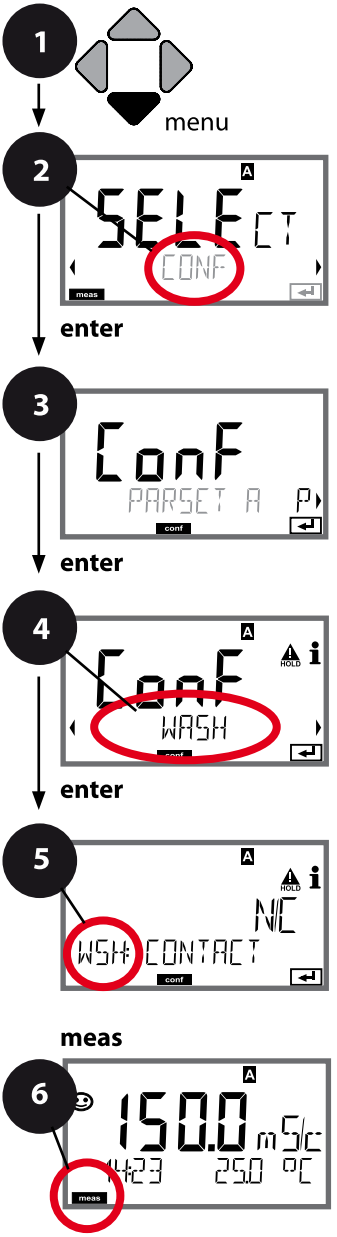
enter

5

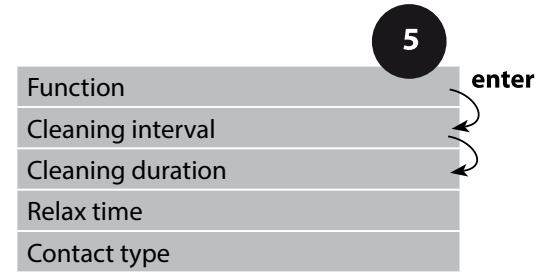
Menu item	Action	Select
Neutral zone 	Adjust neutral zone using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	Depending on module or Memosens sensor
Controller: P action 	Adjust P action using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	10...9999% (**0100%**)
Controller: I action 	Adjust I action using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0...9999 SEC (**0000 SEC**)
Controller: D action 	Adjust D action using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0...9999 SEC (**0000 SEC**)
Behavior during HOLD*	Select response using ▲ ▼ keys. Press **enter** to confirm.	**Y LAST** / Y OFF Y LAST: The controller output Y is maintained during HOLD Y OFF: Y = 0 during HOLD (no control)

*) **PID controller and behavior during HOLD**
For a continuous (non-integrating) process, you should use the Y LAST setting.
For an integrating process (closed boiler), you should use Y OFF.

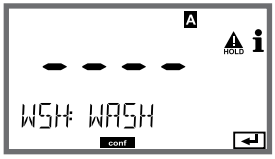
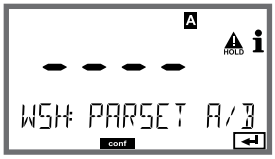
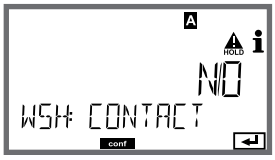
WASH Contact, Controlling a Rinsing Probe or Signaling the Parameter Set

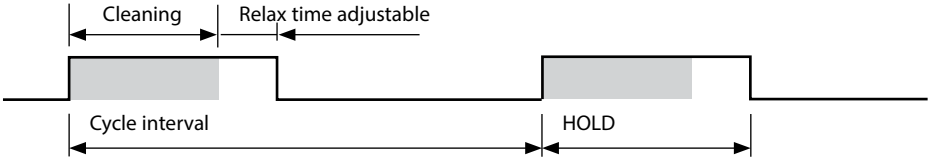


1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set A using ◂ ▸ keys,
press **enter**.
4 Select **WASH** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "WSH:" code.
Press **enter** to select menu,
edit using arrow keys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

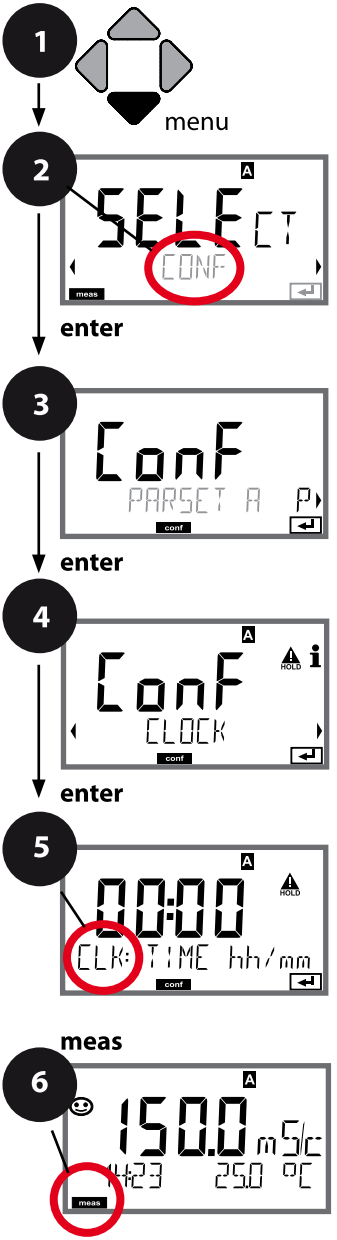


5

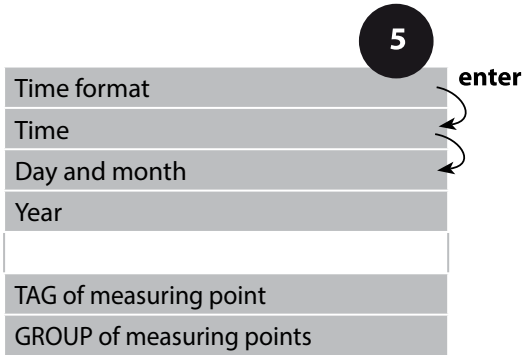
Menu item	Action	Choices
Function  	Select WASH contact function using ▲ ▼ keys. Press **enter** to confirm.	**WASH** / PARSET A/B WASH: Controlling a rinsing probe With PARSET A/B selected, the contact signals: "Parameter set A" (open contact) "Parameter set B" (closed contact)
Cleaning interval 	Only with WASH: Adjust value using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0.0...999.9 h (**000.0 h**)
Cleaning duration 	Only with WASH: Adjust value using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0...9999 SEC (**0060 SEC**) Relax time: 0000...1999 SEC **(0030 SEC)**
Contact type 	Only with WASH: N/O: normally open contact N/C: normally closed contact Select using ▲ ▼ keys. Press **enter** to confirm.	**N/O** / N/C



Time and Date, Measuring Point



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



5

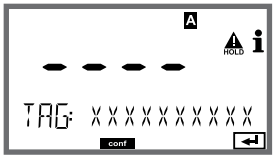
Time and Date

Control of the calibration and cleaning cycles is based on the time and date of the integrated real-time clock.
In measuring mode the time is shown in the lower display. When using digital sensors, the calibration data is written in the sensor head. In addition, the logbook entries (cf Diagnostics) are provided with a time stamp.

Note:
There is no automatic switchover from winter to summer time!
Be sure to manually adjust the time!

Sensor Verification (TAG, GROUP)

When Memosens sensors are calibrated in the lab, it is often useful and sometimes even mandatory that these sensors will be operated again at the same measuring points or at a defined group of measuring points. To ensure this, you can save the respective measuring point (TAG) or group of measuring points (GROUP) in the sensor. TAG and GROUP can be specified by the calibration tool or automatically entered by the transmitter. When connecting an MS sensor to the transmitter, it can be checked if the sensor contains the correct TAG or belongs to the correct GROUP. If not, a message will be generated, Sensoface gets "sad", and the display backlighting turns magenta (purple). The "sad" Sensoface icon can also be signaled by a 22 mA error current. Sensor verification can be switched on in the Configuration in two steps as TAG and GROUP if required.
When no measuring point or group of measuring points is saved in the sensor, e.g., when using a new sensor, Stratos enters its own TAG and GROUP. When sensor verification is switched off, Stratos always enters its own measuring point and group. A possibly existing TAG/GROUP will be overwritten.

Menu item	Action	Choices
TAG of measuring point 	In the lower display line you can enter a designation for the measuring point (TAG) and for a group of measuring points (GROUP) if applicable. Up to 32 digits are possible. By pressing **meas** (repeatedly) in the measuring mode you can view the tag number. Select character using ▲ ▼ keys, select next digit using ◀ ▶ keys. Press **enter** to confirm.	A...Z, 0...9, – + < > ? / @ The first 10 characters are seen in the display without scrolling.
GROUP of measuring points	Select number using ▲ ▼ keys, select next digit using ◀ ▶ keys. Confirm by pressing **enter**	0000 ... 9999 **(0000)**

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 constant (cell factor for toroidal sensors) with a known calibration solution
- entering the cell constant (cell factor for toroidal sensors)
- sampling (product calibration)
- zero calibration in air or with calibration solution (toroidal sensors)
- temperature probe adjustment

Selecting a Calibration Mode for 2-/4-Electrode Sensors

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:

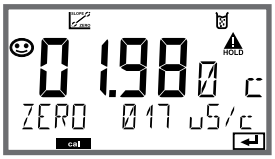
CAL_SOL	Calibration with calibration solution
CAL_CELL	Calibration by entry of cell constant
P_CAL	Product calibration (calibration with sampling)
CAL_RTD	Temperature probe adjustment

Selecting a Calibration Mode for Toroidal Sensors

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

134 Calibration with Calibration Solution

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

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) Now the device is in HOLD mode.
	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 constant (cell factor) and temperature
	Contacting conductivity measurement (Cond) The determined cell constant 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). Now the device is in HOLD mode: Reinstall the sensor and check whether the measurement is OK. MEAS exits calibration, REPEAT permits repetition.	
	With MEAS selected: Press **enter** to exit calibration.	Display of conductivity and temperature, Sensoface is active. After end of calibration, the outputs remain in HOLD mode for a short time. After display of GOOD BYE, the device automatically returns to measuring mode.

Please note:

- Be sure to use known calibration solutions and the respective temperature-corrected conductivity values (see "Calibration Solutions" tables).
- Make sure that the temperature does not change during the calibration procedure.

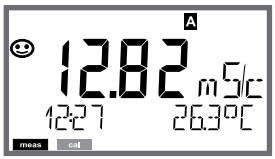
Calibration by sampling – for product calibration, the uncompensated conductivity (µS/cm, mS/cm, S/m) is used.
During product calibration the sensor remains in the process. The measurement process is only interrupted briefly.

Procedure:

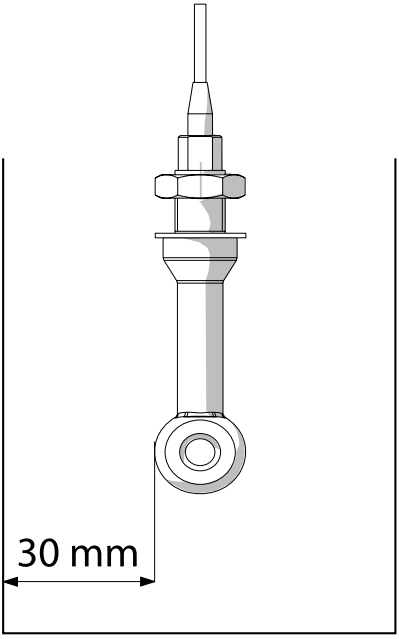
1) The sample is measured in the lab or directly on the site using a portable meter. To ensure an exact calibration, the sample temperature must correspond to the measured process temperature.
   During sampling the analyzer saves the currently measured value and then returns to measuring mode. Then, 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 cell constant (the new cell factor for toroidal sensors).

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 Calibration. Press **enter** to proceed. Select P_CAL calibration method. Press **enter** to proceed.	
	Ready for calibration. Hourglass blinks.	Display (3 sec) Now the device is in HOLD mode.
	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	Display (3 sec) Now the device is in HOLD mode.
	The stored value is displayed (blinking) and can be overwritten with the lab value. Press **enter** to proceed.	
	Display of new cell constant / cell factor (based on 25°C). Sensoface is active. To exit calibration: Select MEAS, then **enter**	To repeat calibration: Select REPEAT, then **enter**
	End of calibration	After end of calibration, the outputs remain in HOLD mode for a short time.

Display	Action	Remark
	Select Calibration. Press **enter** to proceed. Select CAL_RTD calibration method. Press **enter** to proceed.	Wrong settings change the measurement properties!
	Measure the temperature of the process medium using an external thermometer.	Display (3 sec) Now the device is in HOLD mode.
	Enter the measured temperature value. Maximum difference: 10 K. Press **enter** to proceed.	Display of actual temperature (uncompensated) in the lower display.
	The corrected temperature value is displayed. Sensoface is active. To exit calibration: Select MEAS, then **enter** To repeat calibration: Select REPEAT, then **enter**	After end of calibration, the outputs remain in HOLD mode for a short time.
	After calibration is ended, the device will switch to measuring mode.	



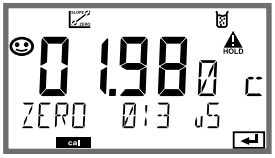
Please note:
When the sensor is installed in a pipe/tank at a distance less than 30 mm from the wall, you should perform the calibration either by means of sampling (product calibration) with the sensor installed or in a suitable calibration beaker with dimensions and material corresponding to the process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

140 Calibration by Input of Cell Factor

CondI

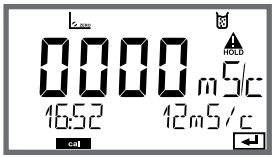
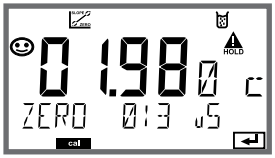
Calibration by input of cell factor (toroidal sensors)

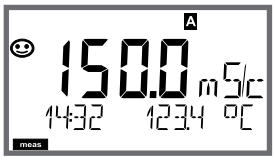
You can directly enter the value for the cell factor of a sensor. The value must be known, eg, determined beforehand in the laboratory. The selected process variable and the temperature are displayed. This method is suitable for all process variables.

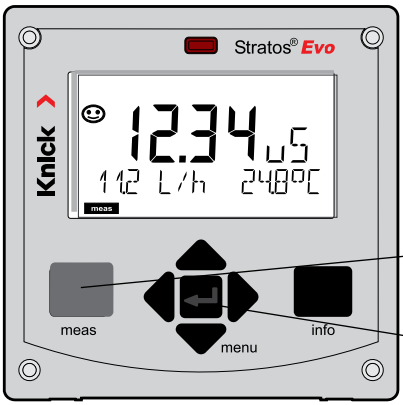
Display	Action	Remark
	Select Calibration. Press **enter** to proceed. Select CAL_CELL calibration method. Press **enter** to proceed.	
	Ready for calibration. Hourglass blinks.	Display (3 sec) Now the device is in HOLD mode.
	Enter cell factor. Press **enter** to proceed.	The selected process variable 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.	Exit: HOLD is deactivated after a short time.

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

Zero calibration in air / with calibration solution (toroidal sensors)

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) Now the device is in HOLD mode.
	**Calibration in air** Edit digits until the lower display indicates Zero. **Calibration in air (AIR-SET) for SE680-M and Memosens sensors:** Press **enter** to start AIR-SET. When zero point and cell factor are displayed, press **enter** to confirm.	
	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.	Exit: HOLD is deactivated after a short time.

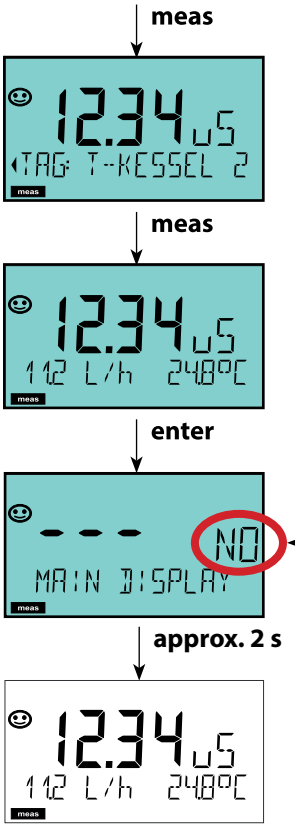
Display	Remark
 or AM/PM and °F: 	From the configuration or calibration menus, you can switch the device to measuring mode by pressing the **meas** key. In the measuring mode the upper display line shows the configured process variable (Cond or temperature), the lower display line shows the time and the second configured process variable (Cond or temperature). The [meas] mode indicator lights and the active parameter set (A/B) is indicated. A/B is not displayed with parameter set Fix A. **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. When no key has been pressed for 60 sec, the device returns to the standard display.	
 	1) Selecting the parameter set (if set to "manual" in the configuration). Select the desired parameter set using the ◂ ▸ arrow keys (PARSET A or PARSET B blinks in the lower display line). Press **enter** to confirm. Further displays (each by pressing **meas**). 2) Display of tag number ("TAG") 3) Display of time and date 4) Display of output currents



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

meas key

enter key

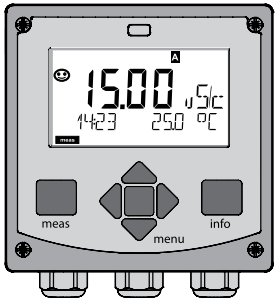


By pressing **meas** briefly you can step through further displays such as tag number (TAG) or flow (L/h).
These displays are turquoise. After 60 sec they switch back to the main display.

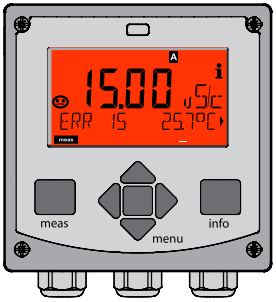
Press **enter** to select a display as MAIN DISPLAY.

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

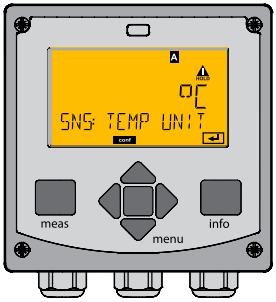
The color-coded user interface guarantees increased operating safety. Operating modes are clearly signaled.
The normal measuring mode is white. Information text appears on a green screen and the diagnostic menu appears on turquoise. The orange HOLD mode (e.g., during calibration) is quickly visible as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



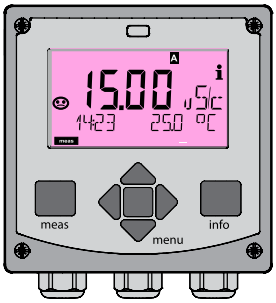
White:
Measuring mode



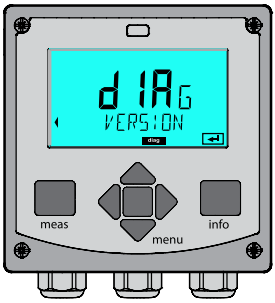
Red blinking:
Alarm, error



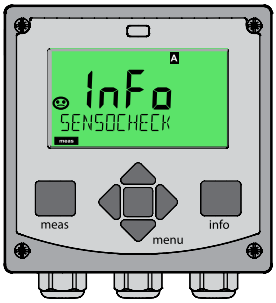
Orange:
HOLD mode



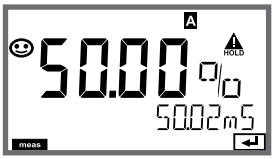
Magenta:
Maintenance request



Turquoise:
Diagnostics



Green:
Info texts

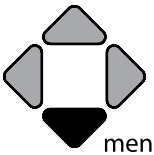
Display	Remark
With activated controller you can also step through the following displays by pressing the **meas** key. When no key has been pressed for 60 sec, the device returns to the standard display.	
	Upper display: Controller output Y The controller output can be modified using ▲ ▼. This allows control systems to be tested and, above all, started smoothly. Lower display: Setpoint Depending on configuration setting: conductivity or temperature.

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

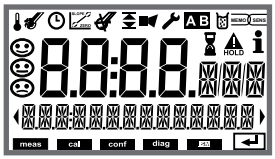
CALDATA	Viewing the calibration data
SENSOR	Viewing the sensor data
SELFTEST	Starting a device self-test
LOGBOOK	Viewing the logbook entries
MONITOR	Displaying currently measured values, Remaining capacity of the ion exchanger
VERSION	Displaying device type, software version, serial number

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

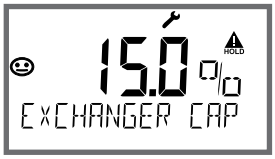
Note:
HOLD is not active during Diagnostics mode!

Action	Key	Remark
Activate diagnostics		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
 	Display of calibration data Select CALDATA using ◂ ▸, confirm by pressing **enter**. Use the ◂ ▸ keys to select the desired parameter from the bottom line of the display: The selected parameter is shown in the upper display line. Press **meas** to return to measurement.

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**

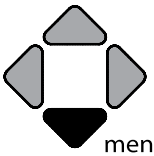
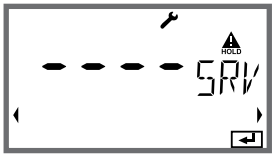
Display	Menu item
	Displaying the logbook entries Select LOGBOOK using ◀ ▶, press **enter** to confirm. With the ▲ ▼ keys, you can scroll backwards and forwards through the logbook (entries -00-...-99-), -00- being the last entry. If the display is set to date/time, you can search for a particular date 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. Press **meas** to return to measurement.
	Extended logbook / Audit Trail (via TAN) With the ▲ ▼ keys, you can scroll backwards and forwards through the extended logbook (entries -000-...-99-), -000- being the last entry. **Display: CFR** Audit Trail also records function activations (CAL CONFIG SERVICE), some Sensoface messages (cal timer, wear), and opening of the enclosure.

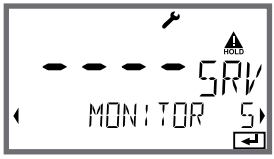
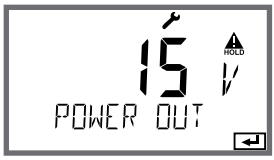
Display	Menu item
 Display example: Remaining capacity of the ion exchanger 	**Displaying the currently measured values (sensor monitor)** Select MONITOR using ◀ ▶, press **enter** to confirm. Use the ◀ ▶ keys to select the desired parameter from the bottom line of the display (R_COND G_COND RTD TEMP I-INPUT (Option)). The selected parameter is shown in the upper display line. When calculating the consumption of the ion exchanger has been activated in the configuration, the sensor monitor shows the remaining capacity of the ion exchanger. Press **meas** to return to measurement.
	Version Display of **device type, software/hardware/boot-loader version** and **serial number** for all device components. Use the ▲ ▼ keys to switch between software and hardware version. Press **enter** to proceed to next device component.

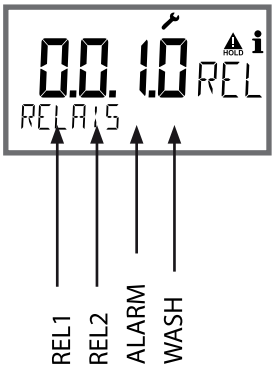
In the Service mode you can access the following menus:

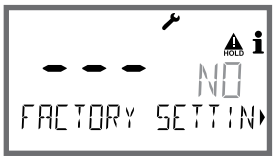
MONITOR	Displaying currently measured values
NEW EXCHANGER	Resetting the consumption calculation after replacement of ion exchanger
POWER OUT	Power output (adjustable: 3.1/12/15/24 V)
OUT1	Testing current output 1
OUT2	Testing current output 2
RELAIS	Testing the function of the 4 relays
CONTROL	Testing the controller function
CODES	Assigning and editing passcodes
DEVICE TYPE	Selecting the measuring function
DEFAULT	Resetting the device to factory settings
OPTION	Enabling options via TAN

Note:
HOLD is active during Service mode!

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

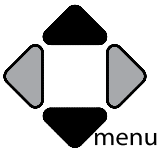
Menu item	Remark
	**Displaying currently measured values (sensor monitor) with HOLD mode activated:** Select MONITOR using ◂ ▸, press **enter** to confirm. Select variable in the bottom text line using ◂ ▸. The selected parameter is shown in the upper display line. As the device is in HOLD mode, you can perform validations using simulators without influencing the signal outputs. Hold **meas** depressed **for longer than 2 sec** to return to Service menu. Press **meas** once more to return to measurement.
NEW EXCHANGER 	When you have replaced the ion exchanger, select "YES" to reset the consumption calculation.
POWER OUT 	**POWER OUT, adjusting the output voltage** Here, you can select an output voltage of 3.1/12/15/24 V.

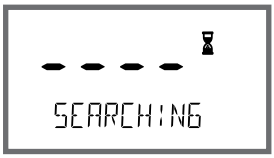
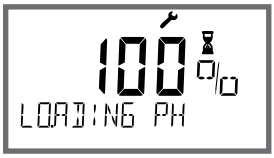
Menu item	Remark
	Specifying the current for outputs 1 and 2: Select OUT1 or OUT2 using the ◂ ▸ keys, press **enter** to confirm. Enter a valid current value for the respective output using ▴ ▾ ◂ ▸ keys. Confirm by pressing **enter**. For checking purposes, the actual output current is shown in the bottom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

Menu item	Remark
	Assigning passcodes: In the "SERVICE - CODES" menu you can assign passcodes to DIAG, HOLD, CAL, CONF and SERVICE modes (Service preset to 5555). **When you have lost the Service passcode,** you have to request an "Ambulance TAN" from the manufacturer specifying the serial number and hardware version of your device. To enter the "Ambulance TAN", call the Service function and enter passcode 7321. After correct input of the ambulance TAN the device signals "PASS" for 4 sec and resets the Service passcode to 5555.
	**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 parameters!
	Option request: Communicate the serial number and hardware/software version of your device to the manufacturer. These data can be viewed in the Diagnostics/Version menu. The "transaction number" (TAN) you will then receive is only valid for the device with the corresponding serial number. **Releasing an option:** Options come with a "transaction number" (TAN). To release the option, enter this TAN and confirm by pressing **enter**.
	Device type: Changing the measuring function, e.g., after having replaced a Memosens sensor. Not possible with a measuring module installed.

Power Disruption while Loading the Process Variable

In very rare cases it seems that the analyzer cannot be operated because it remains in "Firmware Update" mode – indicated by the --FIRMW UPDATE-- message.
This occurs when the power is disrupted while the process variable is loaded.
Follow the instructions below to fix the error.

Action	Key/Display	Remark
Device start		If the power supply is disrupted while the process variable is loaded (e.g., during initial start-up or when changing the process variable), the following can occur:
Reconnecting the power supply		After the power supply has been reconnected, the analyzer starts and then remains in --FIRMW UPDATE-- mode. If this occurs, disconnect the power supply.
Restoring the factory settings		Press the ▲ ▼ keys simultaneously and hold them depressed while the analyzer is reconnected to the power supply.
Device start		Release the keys when the display shows LOADING BASE. The analyzer will restart with the BASE software when 100 % is reached.

Action	Key/Display	Remark
Searching for the process variable		Then the analyzer searches for a measuring module or Memosens sensor.
Loading the process variable, automatic		When a module or a sensor has been found, the loading progress is shown in percentages.
Loading the process variable, manual		If neither module nor sensor are found, the display shows DEVICE TYPE. The selected process variable blinks. You can modify it using the ▲ ▼ keys. Press **enter** to load the process variable displayed.
Loading ...		Make sure that the power supply is not interrupted before the **process variable is fully loaded (100%)**.

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 Defective sensor Sensor not connected Break in sensor cable
ERR 02	WRONG SENSOR	**Wrong sensor**
ERR 04	SENSOR FAILURE	**Failure in sensor**
ERR 05	CAL DATA	**Error in cal data**
ERR 10	CONDUCTANCE TOO HIGH Device type Cond-Cond: Channel A	**Measuring range of conductance exceeded**
ERR 11	RANGE CONDUCTIVITY Device type Cond-Cond: Channel A	**Display range violation**
ERR 13	TEMPERATURE RANGE Device type Cond-Cond: Channel A	**Temperature range violation**
ERR 15	SENSOCHECK Device type Cond-Cond: Channel A	**Sensor or line error**
ERR 40	CONDUCTANCE TOO HIGH Device type Cond-Cond: Channel B	**Measuring range of conductance exceeded**
ERR 41	RANGE CONDUCTIVITY Device type Cond-Cond: Channel B	**Display range violation**
ERR 43	TEMPERATURE RANGE Device type Cond-Cond: Channel B	**Temperature range violation**
ERR 45	SENSOCHECK Device type Cond-Cond: Channel B	**Sensor or line error**

Error	Info text (is displayed in case of fault when the Info key is pressed)	Problem Possible causes
ERR 59	INVALID CALCULATION	**Invalid calculations**
ERR 60	OUTPUT LOAD	**Load error**
ERR 61	OUTPUT 1 TOO LOW	**Output current 1** < 0 (3.8) mA
ERR 62	OUTPUT 1 TOO HIGH	**Output current 1** > 20.5 mA
ERR 63	OUTPUT 2 TOO LOW	**Output current 2** < 0 (3.8) mA
ERR 64	OUTPUT 2 TOO HIGH	**Output current 2** > 20.5 mA
ERR 72	FLOW TOO LOW	Flow too low
ERR 73	FLOW TOO HIGH	Flow too high
ERR 74	CATION EXCHANGER INVALID CALCULATION	Flow too low or no flow: Flow ≤ 4.00 l/h; calculated pH value: < 7.5 or > 10.5; conductivity values: B ≥ 3 x A

Error	Info text (is displayed in case of fault when the Info key is pressed)	Problem Possible causes
ERR 95	SYSTEM ERROR	**System error** Restart required. If error still persists, send in the device for repair.
ERR 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 installed**
ERR 98	CONFIGURATION ERROR	**Error in configuration or calibration data** Configuration or calibration data defective; completely reconfig-ure and recalibrate the device.
ERR 99	DEVICE FAILURE	**Error in factory settings** EEPROM or RAM defective This error message only occurs in the case of a total defect. The device must be repaired and recalibrated at the factory.

Error	Info text (is displayed in case of fault when the Info key is pressed)	Problem Possible causes
ERR 104	INVALID PARAMETER CONTROLLER	**Configuration error** Controller
ERR 105	INVALID SPAN I-INPUT	**Configuration error** Current input
ERR 106	INVALID CHANNEL SELECTION OUT1/2	**Cond-Cond:** Out1/Out2 channel not assigned (disabled)
ERR 107	INVALID CHANNEL SELECTION RELAYS	**Cond-Cond:** Relay channel not assigned (disabled)
ERR 108	**Cond, CondI, Cond-Cond:** OUT1 INVALID CORNER X/Y	Bilinear curve: Invalid vertex point
ERR 109	**Cond, CondI, Cond-Cond:** OUT2 INVALID CORNER X/Y	Bilinear curve: Invalid vertex point
ERR 110	CATION EXCHANGER CAPACITY	Capacity of ion exchanger used up – replace

Sensoface messages:

Cell factor monitoring	SENSOR CELL FACTOR CALIBRATE OR CHANGE SENSOR
Table monitoring (TC/Conc/Sal/USP)	OUT OF INTERNAL TABLE
Zero point monitoring	SENSOR ZERO CALIBRATE OR CHANGE SENSOR
Cell factor / zero point monitoring	SENSOR ZERO/CELL FACTOR CALIBRATE OR CHANGE SENSOR
Sensor TAG does not correspond to device entry.	WRONG SENSOR TAG
Sensor GROUP does not correspond to device entry.	WRONG SENSOR GROUP xxxx

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).
Sensoface can be output as a 22-mA signal via the current outputs.

Disabling Sensocheck and Sensoface

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

Monitoring function for device type Cond-Cond
When the remaining capacity of the ion exchanger is at 20 %,
the wrench icon is displayed to indicate a maintenance request
together with the "CATION EXCHANGER CAPACITY" info message.
When capacity is depleted (0%),
the **ERR 110** error message is displayed in addition.
Without Sensoface!

Operating status	OUT 1	OUT 2	REL1/2	Alarm	Time out
Measure					-
DIAG					60 s
HOLD					No
CAL					No
CONF					20 min
SERVICE					20 min
SERVICE OUT 1					20 min
SERVICE OUT 2					20 min
SERVICE RELAIS					20 min
SERVICE (CODES, DEVICE TYPE; OPTION)					20 min
Cleaning function					No

Explanation:

as configured (Last/Fix or Last/Off)

active

manual

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

Interchangeable modules for measurement with analog sensors or 2nd Memosens channel	
pH	MK-PH015N
Oxy	MK-OXY045N
Cond	MK-COND025N
CondI	MK-CONDI035N
Cond-Cond	MK-CC065N
2nd Memosens channel	MK-MS095N

Interchangeable modules for measurement with analog sensors, hazardous area Zone 2	
pH, hazardous area Zone 2	MK-PH015X
Oxy, hazardous area Zone 2	MK-OXY045X
Cond, hazardous area Zone 2	MK-COND025X
CondI, hazardous area Zone 2	MK-CONDI035X

TAN options	
HART	SW-A001
Logbook	SW-A002
Extended logbook (AuditTrail)	SW-A003
Oxygen trace measurement	SW-A004
Current input	SW-A005
ISM digital	SW-A006
Pfaudler	SW-A007

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

Up-to-date information:
www.knick.de
Phone: +49 30 80191-0
Fax: +49 30 80191-200
Email: info@knick.de

Cond

"Device Type" Cond

Sensor input, digital	Memosens conductivity sensors	
Display ranges	Conductivity	0.000 ... 9.999 µS/cm
		00.00 ... 99.99 µS/cm
		000.0 ... 999.9 µS/cm
		0000 ... 9999 µS/cm
		0.000 ... 9.999 mS/cm
		00.00 ... 99.99 mS/cm
		000.0 ... 999.9 mS/cm
		0.000 ... 9.999 S/cm
		00.00 ... 99.99 S/cm
	Resistivity	00.00 … 99.99 MΩ · cm
	Concentration	0.00 ... 100 %
	Salinity	0.0 ...45.0 ‰
	Measurement error	See sensor specifications
Measuring range	See Memosens sensor	
Temperature compensation*	(OFF)	Without
	(LIN) Reference temp specifiable	Linear characteristic 00.00 ... 19.99 %/K
	(NLF) Ref. temp 25 °C/77 °F	Natural waters acc. to EN 27888
	(NaCl) Ref. temp 25 °C/77 °F	NaCl from 0 (ultrapure water) to 26% by wt
	(HCl) Ref. temp 25 °C/77 °F	Ultrapure water with HCl traces (0 ... +120 °C / +32 ... +248 °F)
	(NH_3) Ref. temp 25 °C/77 °F	Ultrapure water with NH_3 traces (0 ... +120 °C / +32 ... +248 °F)
	(NaOH) Ref. temp 25 °C/77 °F	Ultrapure water with NaOH traces (0 ... +120 °C / +32 ... +248 °F)
Concentration determination*	–01– NaCl	0 – 26 wt% (0 °C /32 °F) ... 0 – 28 wt% (100 °C/212 °F)
	–02– HCl	0 – 18 wt% (-20 °C /-4 °F) ... 0 – 18 wt% (50 °C/122 °F)
	–03– NaOH	0 – 13 wt% (0 °C /32 °F) ... 0 – 24 wt% (100 °C/212 °F)
	–04– H_2SO_4	0 – 26 wt% (-17 °C/1.4 °F)…0 – 37 wt% (110 °C/230 °F)
	–05– HNO_3	0 – 30 wt% (-20 °C /-4 °F) ... 0 – 30 wt% (50 °C/122 °F)
	–06– H_2SO_4	94 – 99 wt% (17 °C/1.4 °F)…89 – 99 wt% (115 °C/239 °F)
	–07– HCl	22 – 39 wt% (-20 °C/-4 °F)…22 – 39 wt% (50 °C/122 °F)
	–08– HNO_3	35 – 96 wt% (-20 °C/-4 °F)…35 – 96 wt% (50 °C/122 °F)
	–09– H_2SO_4	28 – 88 wt% (17 °C/1.4 °F)…39 – 88 wt% (115 °C/239 °F)
	–10– NaOH	15 – 50 wt% (0 °C/32 °F)…35 – 50 wt% (100 °C/212 °F)
	–11– $H_2SO_4 \cdot SO_3$ (oleum)	13 – 45 wt% (0 °C /32 °F) ... 13 – 45 wt% (120 °C/248 °F)

Sensocheck	Polarization detection	
	Delay	Approx. 30 s
Sensoface	Provides information on the sensor condition	
Sensor monitor	Direct display of measured values from sensor for validation (resistance/temperature)	

* User-defined

CondI

"Device Type" CondI

Sensor input, digital	Digital toroidal conductivity sensors (SE 670 / SE680-K/SE680-M/Memosens)	
Measuring range	Conductivity	0.000 ... 1999 mS/cm
	Concentration	0.00 ... 100.0 wt%
	Salinity	0.0 ... 45.0 ‰ (0 ... 35 °C / +32 ... +86 °F)
Measuring ranges	Conductivity	000.0 ... 999.9 µS/cm
		0.000 ... 9.999 mS/cm
		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 / +32 ... +86 °F)
	Response time (T90)	Approx. 1 s
	Temperature	–20 ... +150 °C /–4 ... +302 °F
	Temperature extrapolation	Quick extrapolation of the temperature in the case of a significant change (SE 670 / SE 680)
	Measurement error	See sensor specifications
Temperature compensation*	(OFF)	Without
	(Lin)	Linear characteristic 00.00 to 19.99 %/K
	(NLF)	Natural waters acc. to EN 27888
	(NaCl)	NaCl from 0 to 26 wt% (0 ... 120 °C /–4 ... +248 °F)
	Ultrapure water	NaCl, HCl, NH_3, NaOH
Concentration determination*	–01– NaCl	0 – 26 wt% (0 °C /32 °F) ... 0 – 28 wt% (100 °C/212 °F)
	–02– HCl	0 – 18 wt% (-20 °C /-4 °F) ... 0 – 18 wt% (50 °C/122 °F)
	–03– NaOH	0 – 13 wt% (0 °C /32 °F) ... 0 – 24 wt% (100 °C/212 °F)
	–04– H_2SO_4	0 – 26 wt% (-17 °C/1.4 °F)…0 – 37 wt% (110 °C/230 °F)
	–05– HNO_3	0 – 30 wt% (-20 °C /-4 °F) ... 0 – 30 wt% (50 °C/122 °F)
	–06– H_2SO_4	94 – 99 wt% (17 °C/1.4 °F)…89 – 99 wt% (115 °C/239 °F)
	–07– HCl	22 – 39 wt% (-20 °C/-4 °F)…22 – 39 wt% (50 °C/122 °F)
	–08– HNO_3	35 – 96 wt% (-20 °C/-4 °F)…35 – 96 wt% (50 °C/122 °F)
	–09– H_2SO_4	28 – 88 wt% (17 °C/1.4 °F)…39 – 88 wt% (115 °C/239 °F)
	–10– NaOH	15 – 50 wt% (0 °C/32 °F)…35 – 50 wt% (100 °C/212 °F)
	–11– $H_2SO_4 \cdot SO_3$ (oleum)	13 – 45 wt% (0 °C /32 °F) ... 13 – 45 wt% (120 °C/248 °F)

Sensor standardization	– Input of cell factor with simultaneous display of conductivity/temperature – Input of conductivity of calibration solution with simultaneous display of cell factor and temperature – Product calibration – Zero adjustment – Installation factor – Temp probe adjustment (10 K)	
	Permissible cell factor	00.100 ... 19.999/cm
	Permissible transfer ratio	010.0 ... 199.9
	Permissible zero offset	±0.5 mS/cm
	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, cell factor, installation factor, Sensocheck, TAG/GROUP sensor verification)	
Sensor monitor	Direct display of measured values from sensor for validation (resistance/temperature)	

* User-defined

Cond Cond

COND inputs A/B	Two inputs for two 2-electrode sensors			
Measuring range	0 … 30,000 µS • c			
Display ranges	Conductivity	0.000 ... 9.999 mS/cm		
		00.00 ... 99.99 mS/cm		
		000.0 ... 999.9 mS/cm		
		0000 ... 9999 µS/cm		
		00.00 … 99.99 MΩ cm		
	Response time (T90)	Approx. 1 s		
Measurement error [1]	< 1 % meas. val. + 0.4 µS • c			
Temperature compensation*	(OFF)	Without		
	(Lin)	Linear characteristic 00.00 to 19.99 %/K		
	(NLF)	Natural waters acc. 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)		
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 directive VGB S-006	[pH]
	-C7-	pH value	variable, specifiable factors	[pH]
	-C8-	User spec (DAC Degassed Acid Conductivity) [µS/cm]		
	-C9-	Concentration of the alkalizing agent (VGB S-006)		
Sensocheck	Polarization detection and monitoring of cable capacitance Delay approx. 30 s			
Sensoface	Provides information on the sensor condition, Sensocheck, flow monitoring, ion exchanger monitoring			
Sensor monitor	Direct display of measured values from sensor for validation (resistance/temperature)			
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]	0.5 K (1 K > 100 °C)			

* User-defined

I input	4 ... 20 mA / 50 Ω		
(SW-A005)	Function	Input of pressure or temperature values from external sensors	
	Resolution	Approx. 0.05 mA	
	Characteristic	Linear, bilinear, logarithmic	
	Measurement error[1)]	< 1% current value + 0.1 mA	
Door contact	outputs a signal when the door is open		
	Entry to extended logbook (FDA)		
HOLD input	Galvanically separated (optocoupler)		
(SW-A005)	Function	Switches device to HOLD mode	
	Switching voltage	0 ... 2 V AC/DC	HOLD inactive
		10 ... 30 V AC/DC	HOLD active
CONTROL input* (SW-A005)	Galvanically separated (optocoupler)		
	Function	Selecting parameter set A/B or flow measurement (FLOW)	
	Switching voltage	0 ... 2 V AC/DC	Parameter set A
		10 ... 30 V AC/DC	Parameter set B
	FLOW	Pulse input for flow measurement	
		0 ... 100 pulses/sec	
	Display	00.0 … 99.9 l/h	
Output 1	0/4 ... 20 mA, max. 10 V, floating (galvanically connected to output 2), HART communication		
	Overrange*	22 mA in the case of error messages	
	Characteristic	Linear, bilinear, logarithmic	
	Output filter*	PT_1 filter, time constant 0 ... 120 s	
	Measurement error[1)]	< 0.25% current value + 0.025 mA	
	Start/end of scale*	Configurable within the measuring range of the selected process variable	
Output 2	0/4 ... 20 mA, max. 10 V, floating (galvanically connected to output 1)		
	Overrange*	22 mA in the case of error messages	
	Characteristic	Linear, bilinear, logarithmic	
	Output filter*	PT_1 filter, time constant 0 ... 120 s	
	Measurement error[1)]	< 0.25% current value + 0.025 mA	
	Start/end of scale*	Configurable within the measuring range of the selected process variable	

Power Out	Power output, e.g., for supplying additional transmitters or relay contacts (signal evaluation via I input)		
	Power supply	Selectable between	
		3.1 V / 12 V / 15 V / 24 V, short-circuit-proof	
		Power	max. 1 W
Alarm contact	Relay contact, floating		
	Contact ratings	AC < 250 V / < 3 A / < 750 VA	
		DC < 30 V / < 3 A / < 90 W	
	Contact response	N/C (fail-safe type)	
	Response delay*	0 … 600 s	
Wash contact or parameter set A/B	Relay contact, floating		
	Contact ratings	AC < 250 V / < 3 A / < 750 VA	
		DC < 30 V / < 3 A / < 90 W	
	Contact response*	N/C or N/O	
	Wash contact*)	Interval	0.0 ... 999.9 h
		(0.0 h = cleaning function switched off)	
		Cleaning	0 ... 1999 s
	Parameter set A/B	Signaling parameter set A/B	
	Contact response	Contact open: Parameter set A active	
		Contact closed: Parameter set B active	
Min/max limits	Min/max contacts, floating, but inter-connected		
	Contact ratings	AC < 250 V / < 3 A / < 750 VA	
		DC < 30 V / < 3 A / < 90 W	
	Contact response*	N/C or N/O	
	Response delay*	0 ... 9999 s	
	Setpoints*	As desired within range	
	Hysteresis*	User-defined	
PID process controller	Output via limit contacts		
	Setpoint specification*	Within selected range	
	Neutral zone Cond / Condl*	Max. 50 % of selected range / 0 … 50 K	
	Proportional action*	Controller gain Kp: 10 ... 9999 %	
	Integral action*	Reset time Tr: 0 … 9999 s (0 s = no integral action)	
	Derivative action*	Rate time Td: 0 ... 9999 s (0 s = no derivative action)	
	Controller type*	Pulse length controller or pulse frequency controller	
	Pulse period*	1 ... 600 s, min. turn-on time 0.5 s (pulse length controller)	
	Max. pulse frequency*	1 ... 180/min (pulse frequency controller)	

Real-time clock	Different time and date formats selectable	
	Power reserve	> 5 days
Display	LC display, 7-segment with icons, colored backlighting	
	Primary display	Character height approx. 22 mm
		Unit symbols approx. 14 mm
	Secondary display	Character height approx. 10 mm
	Text line	14 characters, 14 segments
	Sensoface	3 status indicators
		(friendly, neutral, sad smiley).
	Mode Indicators	meas, cal, conf, diag
		Further icons for configuration and messages
	Alarm indication	Display blinks, red backlighting
Keypad	Keys	meas, info, 4 cursor keys, enter
2 parameter sets	Parameter set A and B	(not with MK-CC 065 module)
	switchover via CONTROL input or manual	
Diagnostics functions	Calibration data	Depending on the selected process variable
	Device self-test	Automatic memory test (RAM, FLASH, EEPROM)
	Display test	Display of all segments
	Logbook (SW-A002)	Recording of events, 100 entries
	Extended logbook	Audit trail recording according to 21 CFR Part 11
	(SW-A003)	200 entries
HART communication (SW-A001)	Digital communication via FSK modulation of output current 1, HART version 6	
	Device identification, measured values, status and messages, parameter setting, calibration, records	
	Conditions	Output current ≥ 3.8 mA Load resistance ≥ 250 Ω
FDA 21 CFR Part 11	Access control by editable passcodes	
	Logbook entry and flag via HART in the case of configuration changes	
	Message and logbook entry when enclosure is opened	
Service functions	Current source	Current specifiable for output 1 / 2 (00.00 ... 22.00 mA)
	Manual controller	Controller output entered directly (start of control process)
	Sensor monitor	Display of direct sensor signals
	Relay test	Manual control of relay contacts

Data retention	Parameters, calibration data, logbook > 10 years (EEPROM)	
Electrical safety	Protection against electric shock by protective separation of all extra-low-voltage circuits against mains according to EN 61010-1	
Explosion protection A402B	See Control Drawing or www.knick.de	
EMC	EN 61326	
	Emitted interference	Class B (residential environment)
	Immunity to interference	Industry
RoHS conformity	according to EC directive 2002/95/EC	
Power supply	80 V (-15%) ... 230 (+10%) V AC ; ≤ 10 W ; 45 … 65 Hz	
	24 V (-15%) … 60 (+10%) V DC ; 10 W	
	Overvoltage category II, protection class II	
Nominal operating conditions	Ambient temperature	-20 ... +55 °C
	Transport/Storage temperature	-30 ... +70 °C
	Relative humidity	10 ... 95 % not condensing
Housing	Molded enclosure made of PBT/PC, glass-reinforced	
	Mounting	Wall, pipe/post or panel mounting
	Color	Gray, RAL 7001
	Ingress protection	IP 67 / NEMA 4X outdoor (with pressure compensation)
	Flammability	UL 94 V-0
	Dimensions	H 148 mm, W 148 mm, D 117 mm
	Control panel cutout	138 mm x 138 mm to DIN 43 700
	Weight	1.2 kg
	Cable glands	3 knockouts for M20 x 1.5 cable glands
		2 knockouts for NPT ½" or rigid metallic conduit
	Connections	Terminals, conductor cross section max. 2.5 mm^2

* User-defined

1) Acc. to EN 60746-1, at nominal operating conditions

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

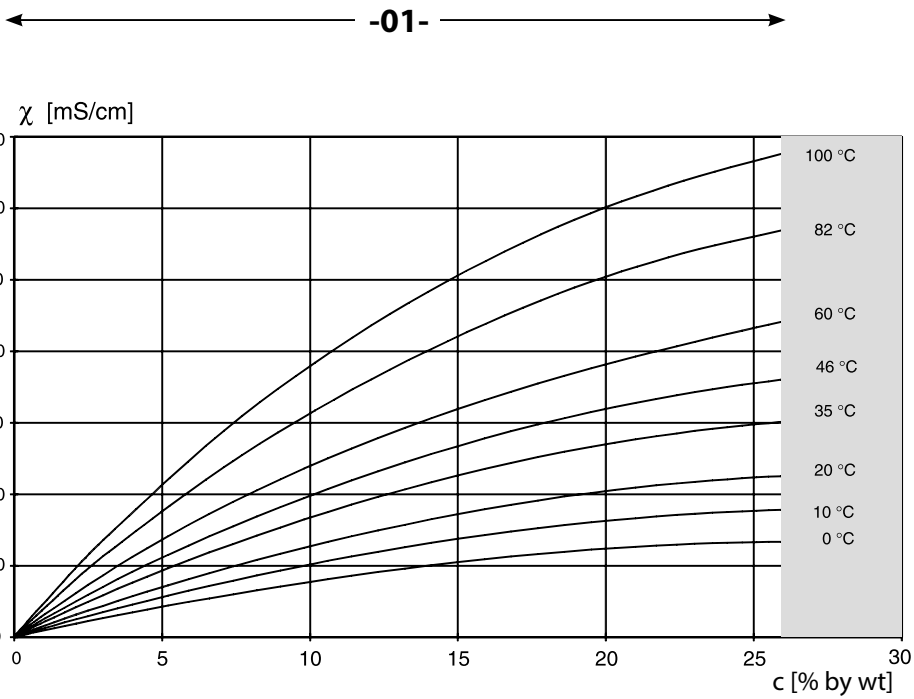
2 Data source: K. H. Hellwege (Editor), H. Landolt, R. Börnstein: Zahlenwerte und Funktionen ..., volume 2, part. volume 6

Measuring Ranges (01 ... 11)

Substance	Concentration ranges		
NaCl Configuration	0-26 wt% (0 °C / +32 °F) 0-26 wt% (+100 °C / +212 °F) **-01-**		
HCl Configuration	0-18 wt% (–20 °C / –4 °F) 0-18 wt% (+50 °C / +122 °F) **-02-**		22-39 wt% (–20 °C / –4 °F) 22-39 wt% (+50 °C / +122 °F) **-07-**
NaOH Configuration	0-13 wt% (0 °C / +32 °F) 0-24 wt% (+100 °C / +212 °F) **-03-**		15-50 wt% (0 °C / +32 °F) 35-50 wt% (+100 °C / +212 °F) **-10-**
H_2SO_4 Configuration	0-26 wt% (-17 °C/-1.4 °F) 0-37 wt% (+110 °C/+230 °F) **-04-**	28-77 wt% (-17 °C/-1.4 °F) 39-88 wt% (+115 °C/+239 °F) **-09-**	94-99 wt% (-17 °C/-1.4 °F) 89-99 wt% (+115 °C/+239 °F) **-06-**
HNO_3 Configuration	0-30 wt% (–20 °C / –4 °F) 0-30 wt% (+50 °C / +122 °F) **-05-**		35-96 wt% (–20 °C / –4 °F) 35-96 wt% (+50 °C / +122 °F) **-08-**
$H_2SO_4 \cdot SO_3$ (Oleum) Configuration	13-45 wt% (0 °C / +32 °F) 13-45 wt% (+120 °C / +248 °F) **-11-**		

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

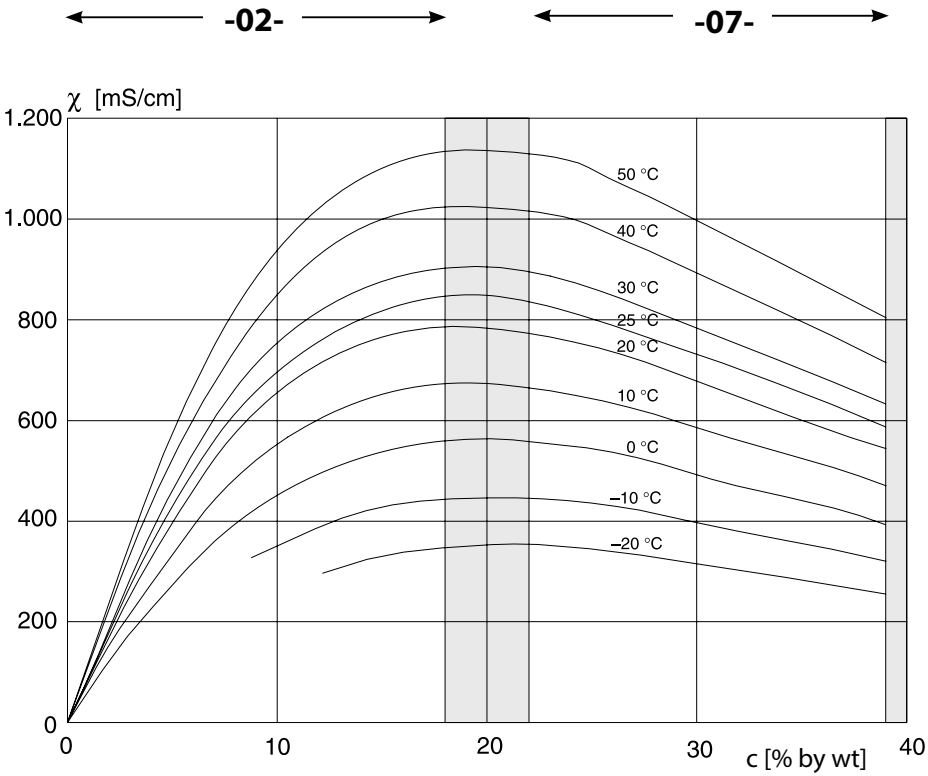
-01- Sodium chloride solution NaCl



Concentration measurement not possible in this range.

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

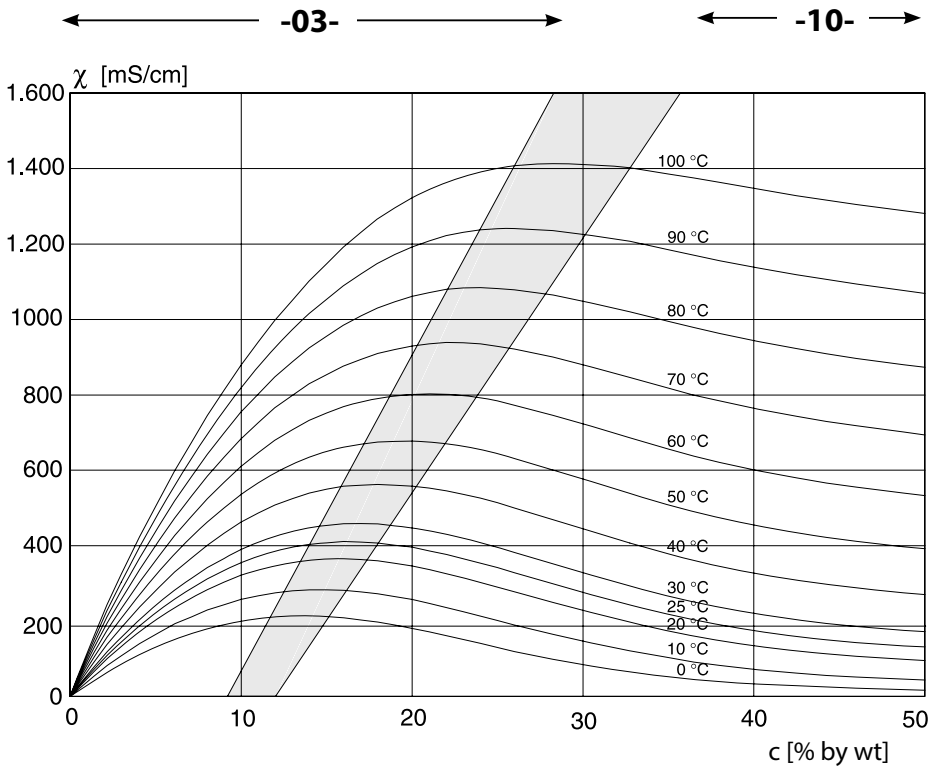
-02- Hydrochloric acid HCl
-07-



Concentration measurement not possible in this range.

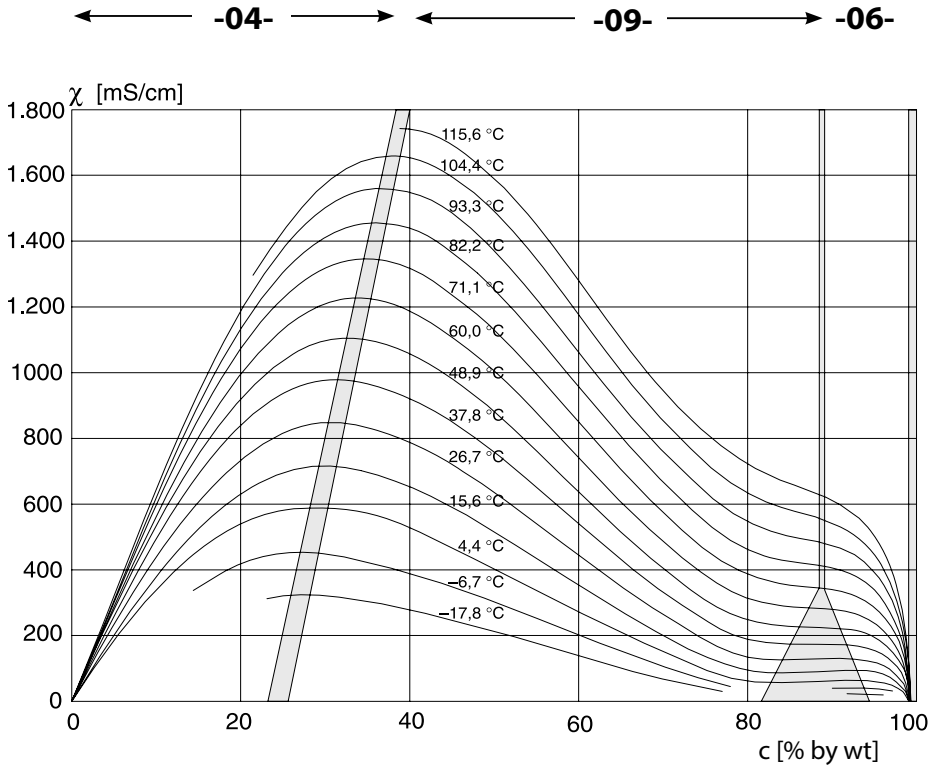
Conductivity versus substance concentration and process temperature for hydrochloric acid (HCl)
Source: Haase/Sauermann/Dücker; Z. phys. Chem. New Edition, Vol. 47 (1965)

-03- Sodium hydroxide solution NaOH -10-



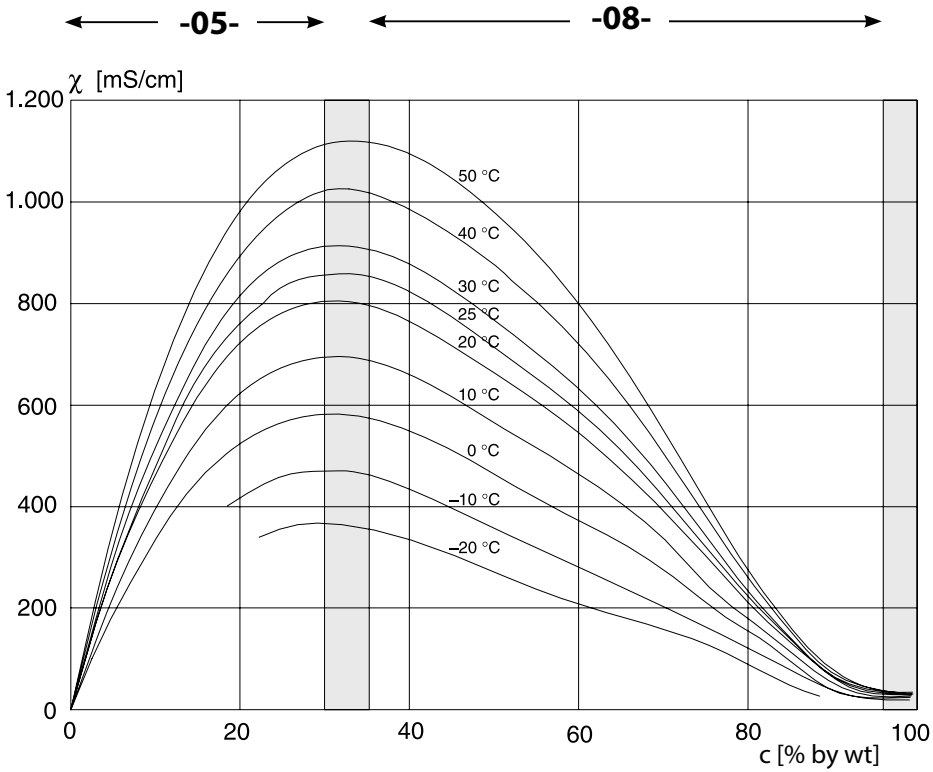
Conductivity versus substance concentration and process temperature for sodium hydroxide solution (NaOH)

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



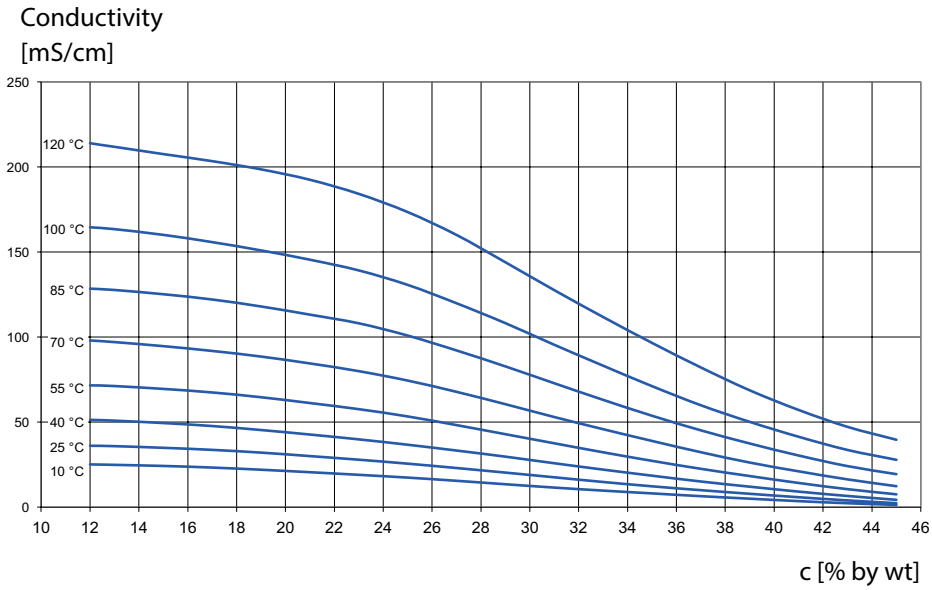
Conductivity versus substance concentration and process temperature for sulfuric acid (H_2SO_4)
Source: Darling; Journal of Chemical and Engineering Data; Vol.9 No.3, July 1964

-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)

-11- Oleum $H_2SO_4 \cdot SO_3$



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