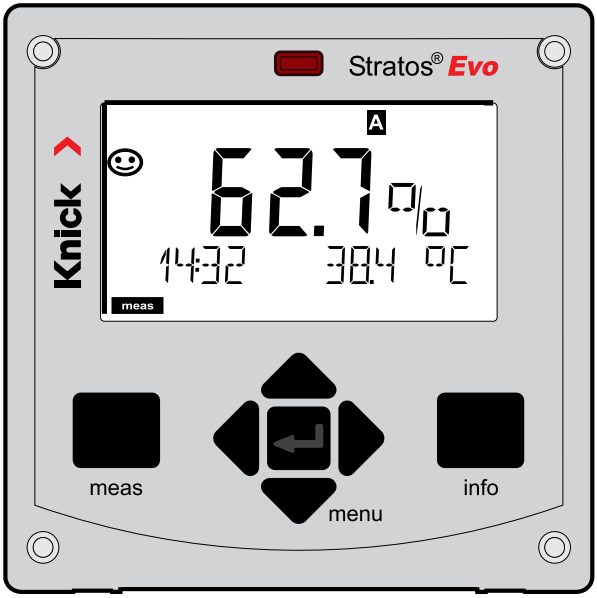
The Art of Measuring. Knick

User Manual
English

# Stratos Evo A402
# $O_2$ Measurement




Latest Product Information: www.knick.de

# Table of Contents

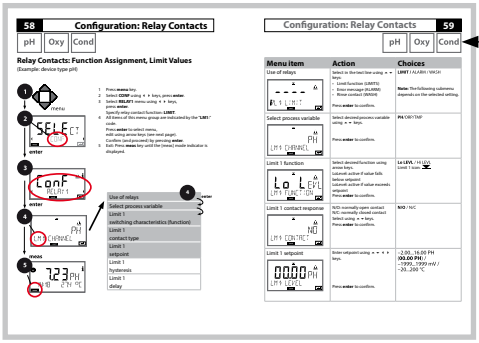
Subject to change without notice

**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




**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).

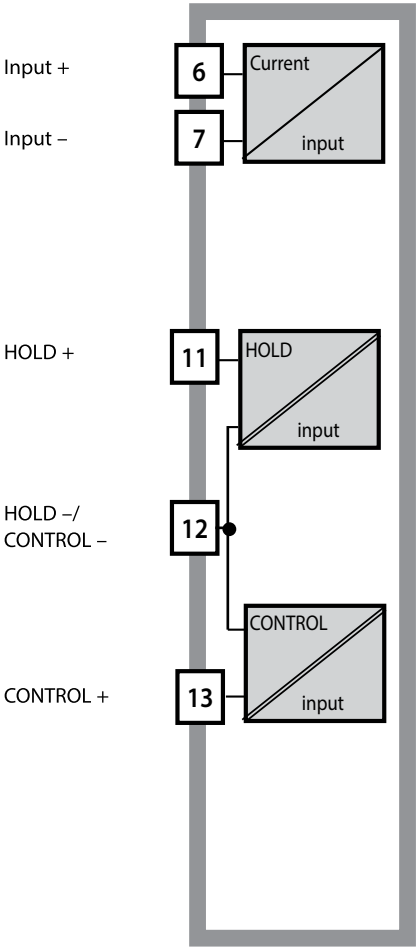
**Diagnostics functions**
The "Sensocheck" automatic sensor monitoring and the "Sensoface" function for clear indication of the sensor condition provide excellent diagnostics.

**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

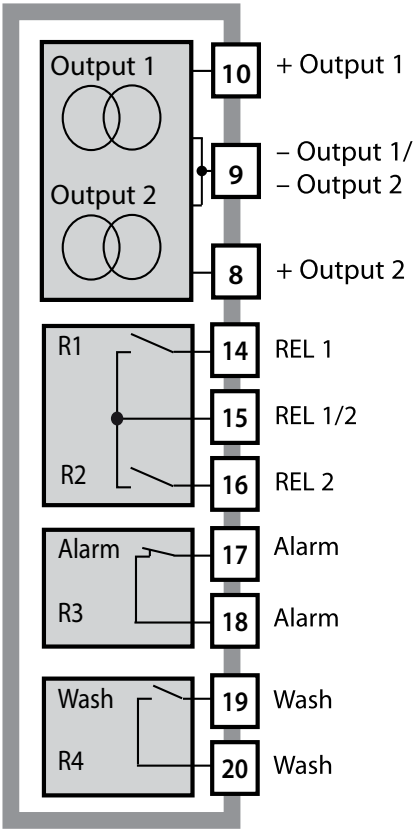
Current is provided through a universal power supply 80 ... 230 V AC, 45 ... 65 Hz / 24 ... 60 V DC.

## 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.



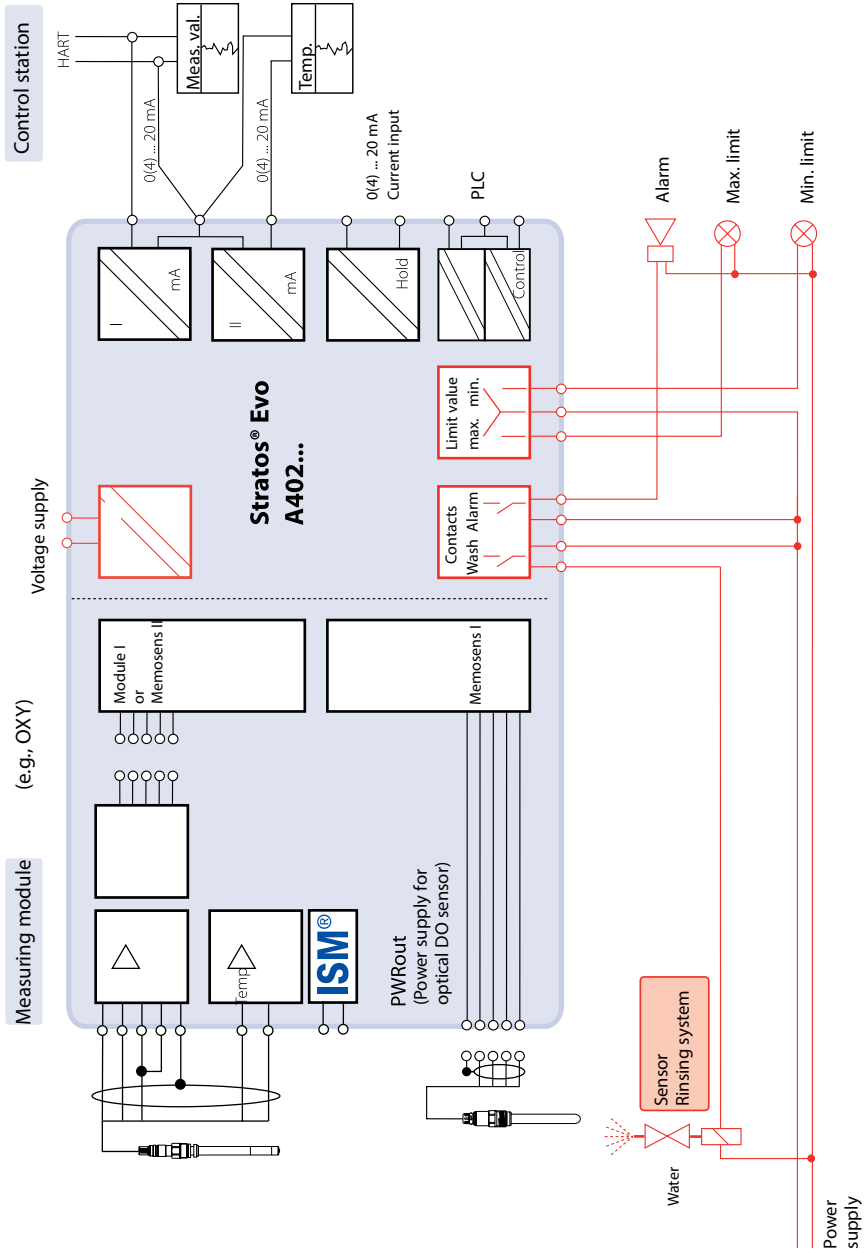

**Current outputs**
The floating current outputs (0) 4 ... 20 mA are used for transmitting measured values. An output filter can be programmed, the fault current value can be specified.

**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
I
mA
II
mA
Hold
Control
Stratos® Evo
A402...
Limit value
max. min.
Contacts
Wash Alarm
Voltage supply
Module I
or
Memosens II
Memosens I
Measuring module
(e.g., OXY)
Temp
ISM®
PWRout
(Power supply for
optical DO sensor)
Sensor
Rinsing system
Water
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

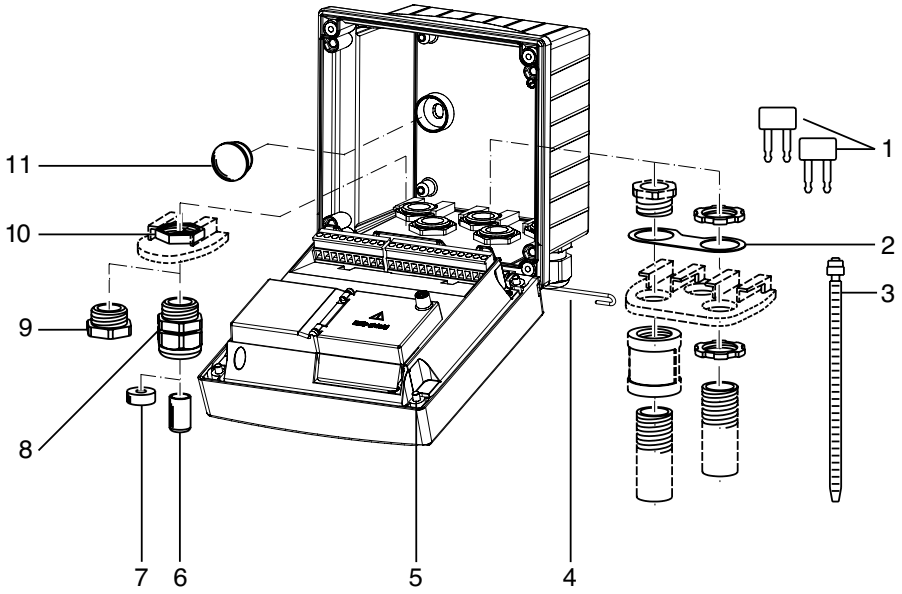
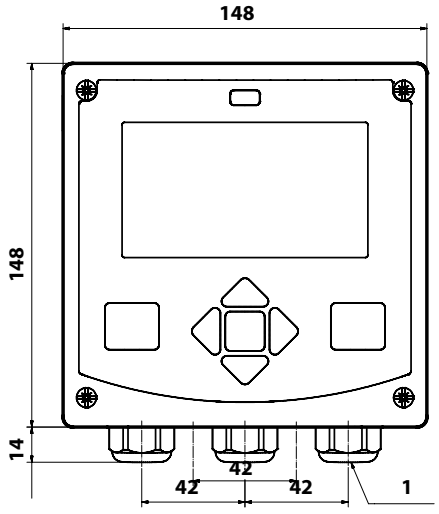
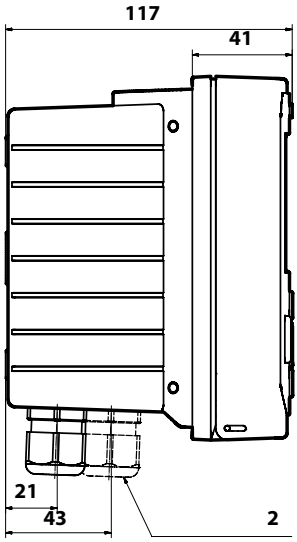


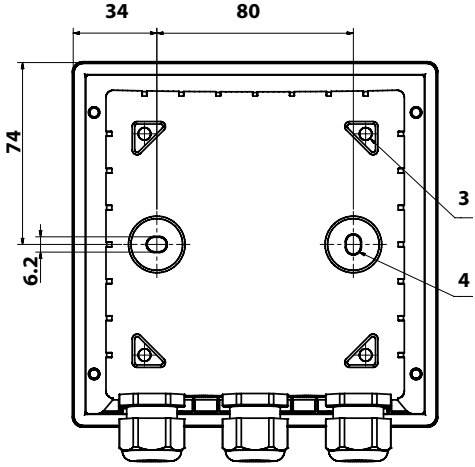

Fig.: Assembling the enclosure

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



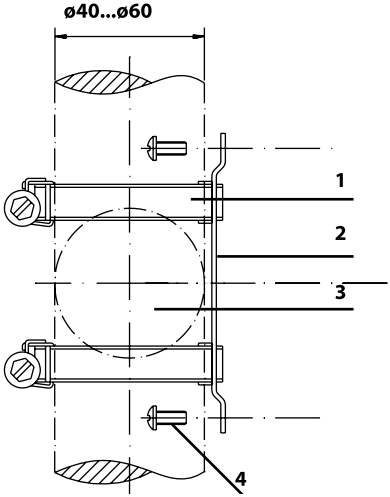

1) Cable gland (3 x)
2) Knockouts for cable gland or ½" conduit, dia. 21.5 mm (2 knockouts). Conduit couplings not included!
3) Knockout for pipe mounting (4 x)
4) Knockout for wall mounting (2 x)

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

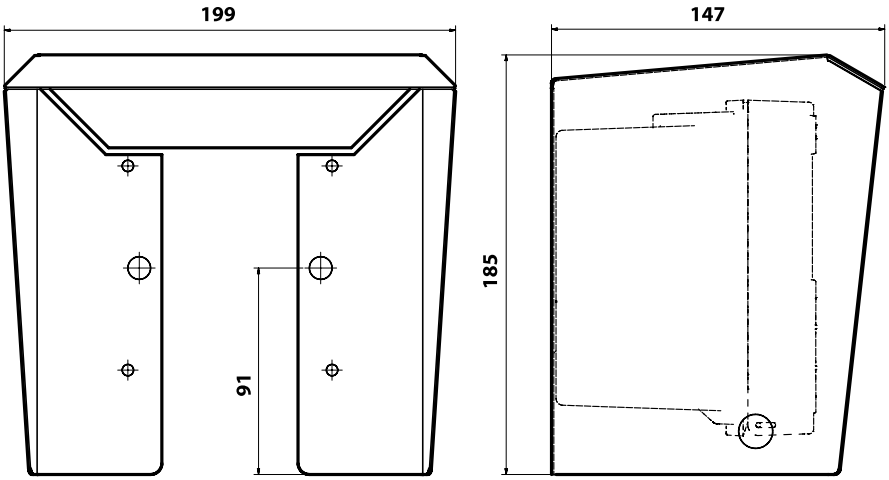
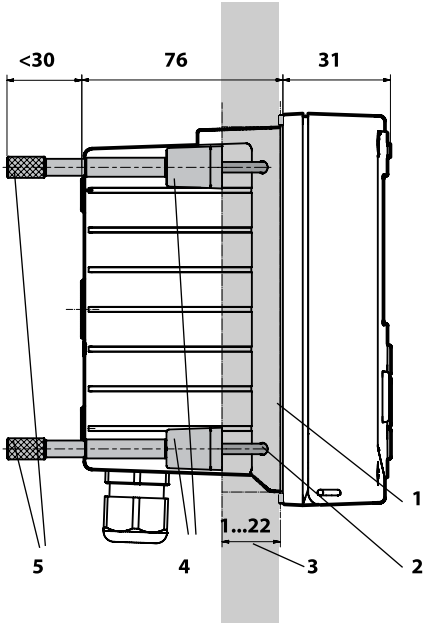



Fig.: Protective hood for wall and pipe mounting, accessory ZU 0737

## Panel Mounting



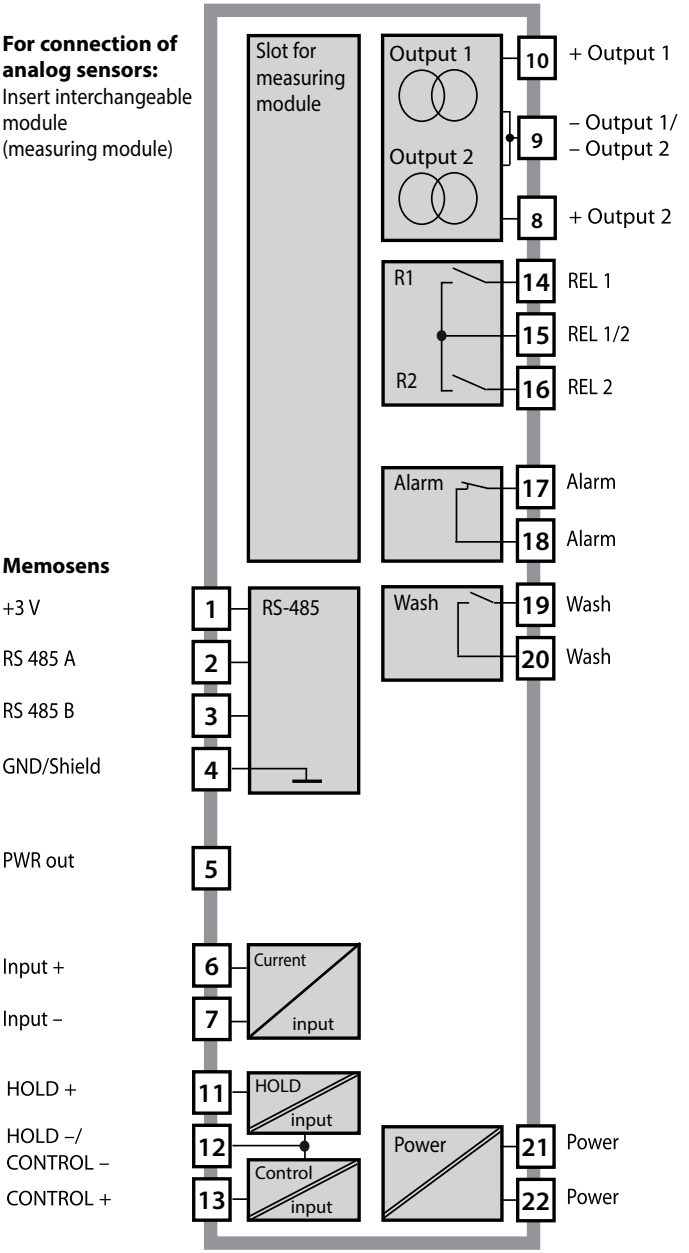

1) Circumferential sealing (1 x)
2) Screws (4 x)
3) Position of control panel
4) Span piece (4 x)
5) Threaded sleeve (4 x)

Cutout
138 x 138 mm (DIN 43700)

Fig.: Panel-mount kit, accessory ZU 0738

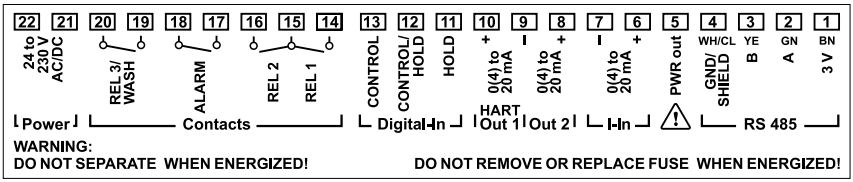
All dimensions in mm

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

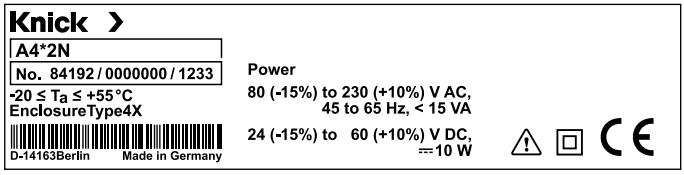


## Terminal Assignments

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)

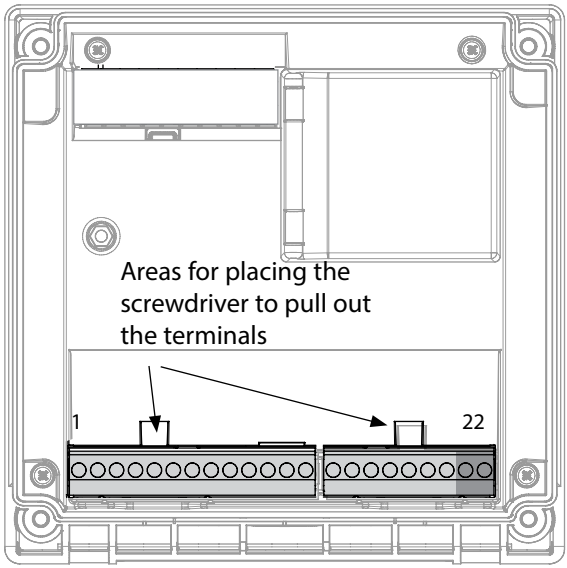



Figure:
Terminals, device opened,
back of front unit

## 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 | |

# 20 Selecting the Measuring Function

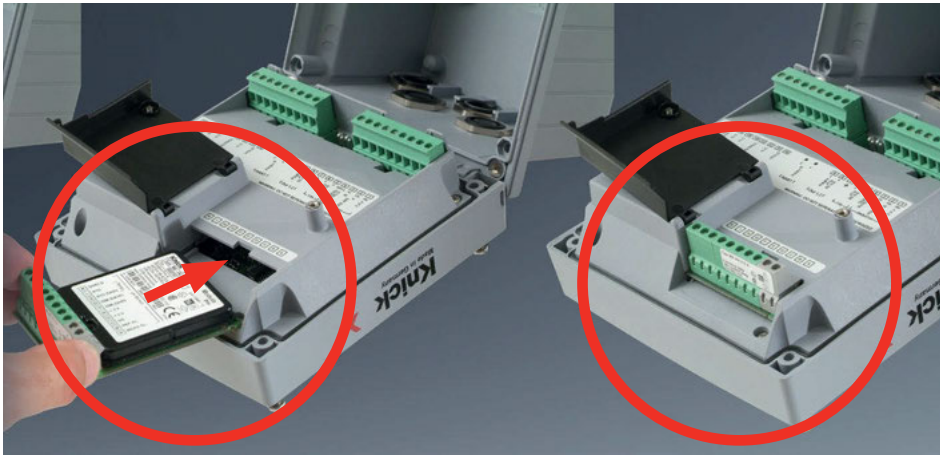
## Start-Up

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

This does not apply to the connection of Memosens sensors. Here, you will be prompted to select the desired measuring function upon first start-up.

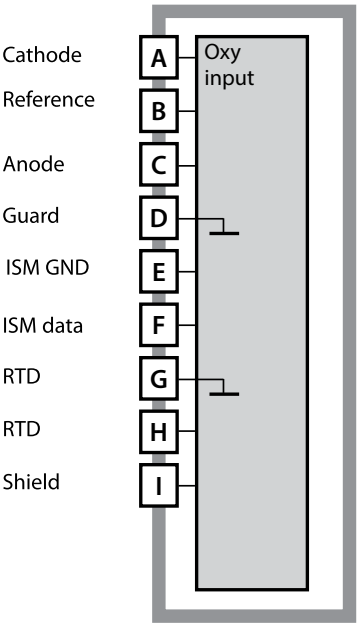
## Changing the Measuring Function

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

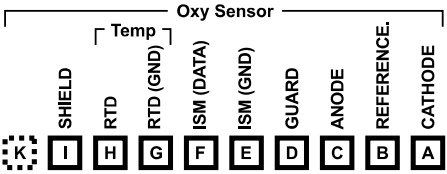


**Measuring modules for connection of analog oxygen sensors:**

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

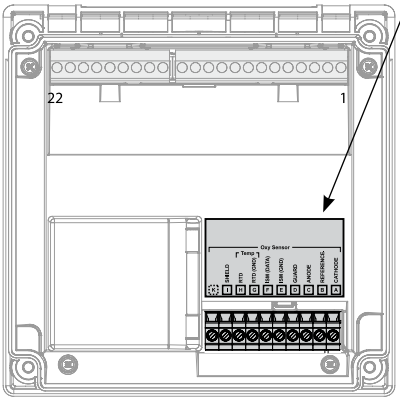



**Module for oxygen measurement**
Order code MK-OXY045...
See the following pages for wiring examples.



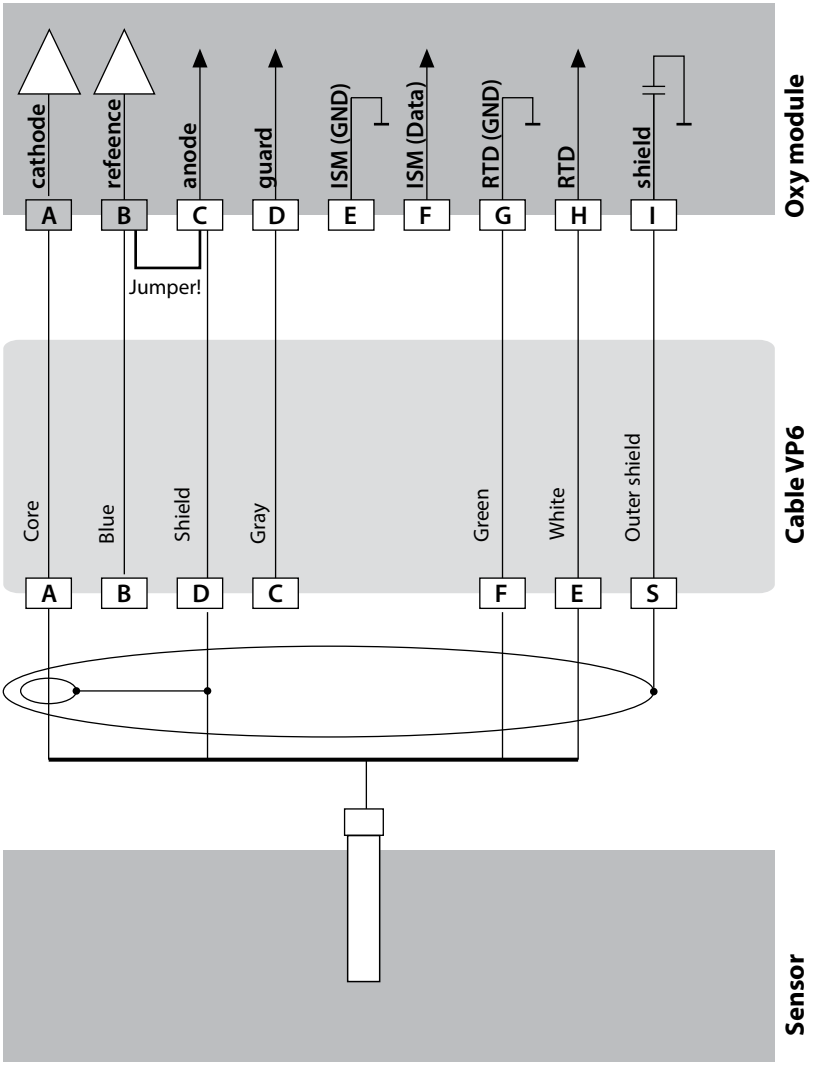

**Terminal plate of oxygen module**
The terminals are suitable for single or stranded wires up to 2.5 mm$^2$ (AWG 14).

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



**Example 1:**

| | |
|---|---|
| Measuring task: | Oxygen STANDARD |
| Sensors (example): | "10" (e.g., SE 706, InPro 6800) |
| Cable (example): | CA/VP6ST-003A (ZU 0313) |

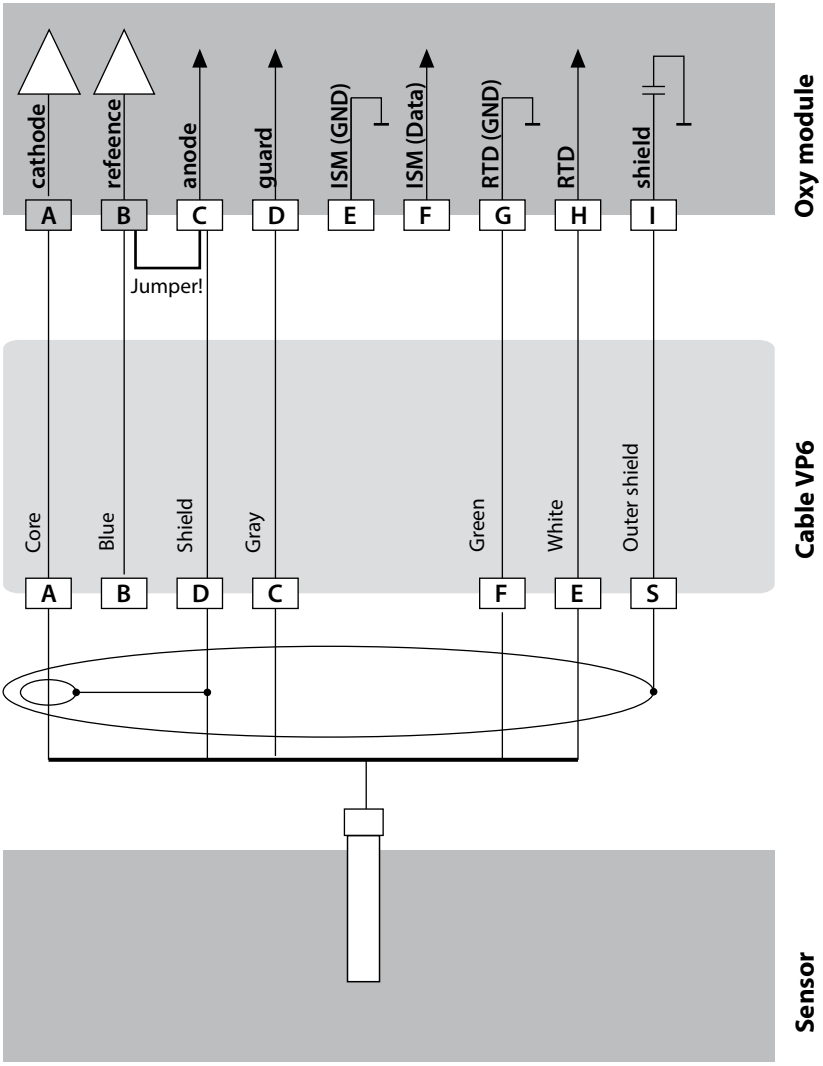


**Example 2:**

Measuring task: Oxygen TRACES (TAN required)

Sensors (example): "01" (e.g., SE 707, InPro 6900)

Cable (example): CA/VP6ST-003A (ZU 0313)

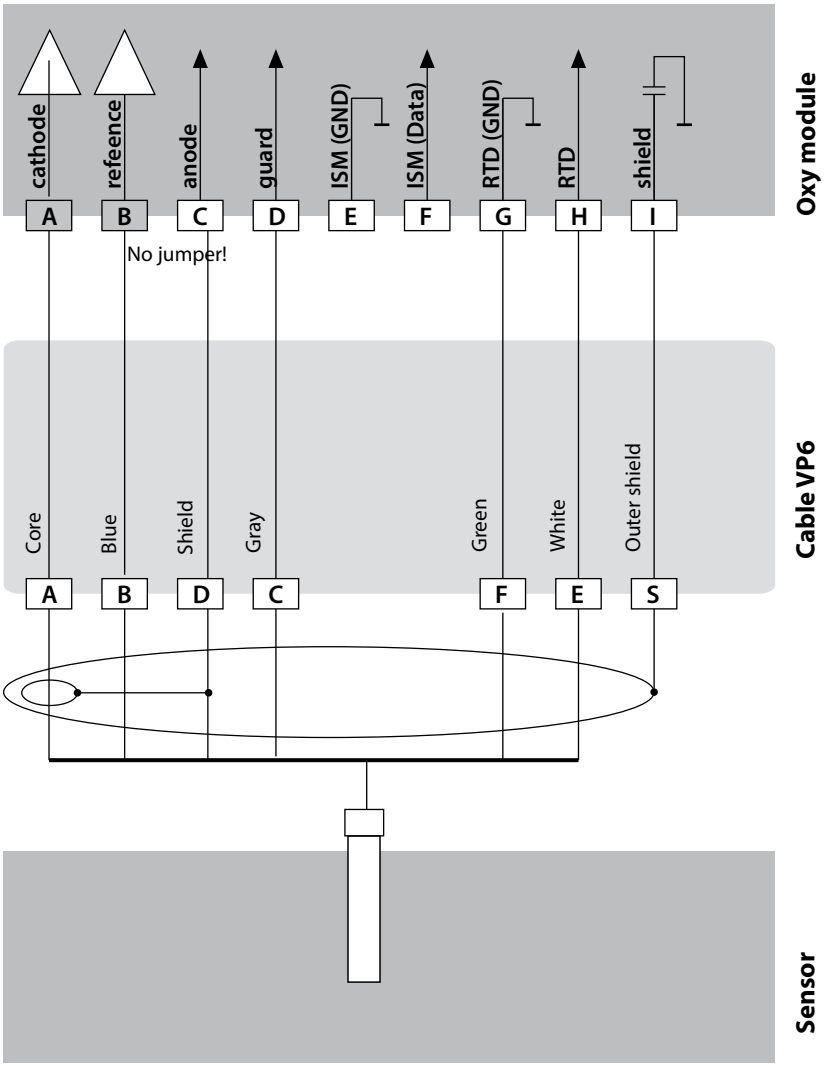


**Example 3:**

Measuring task: Oxygen SUBTRACES (TAN required)

Sensors (example): Type "001", sensor with guard ring and reference electrode

Cable (example): CA/VP6ST-003A (ZU 0313)



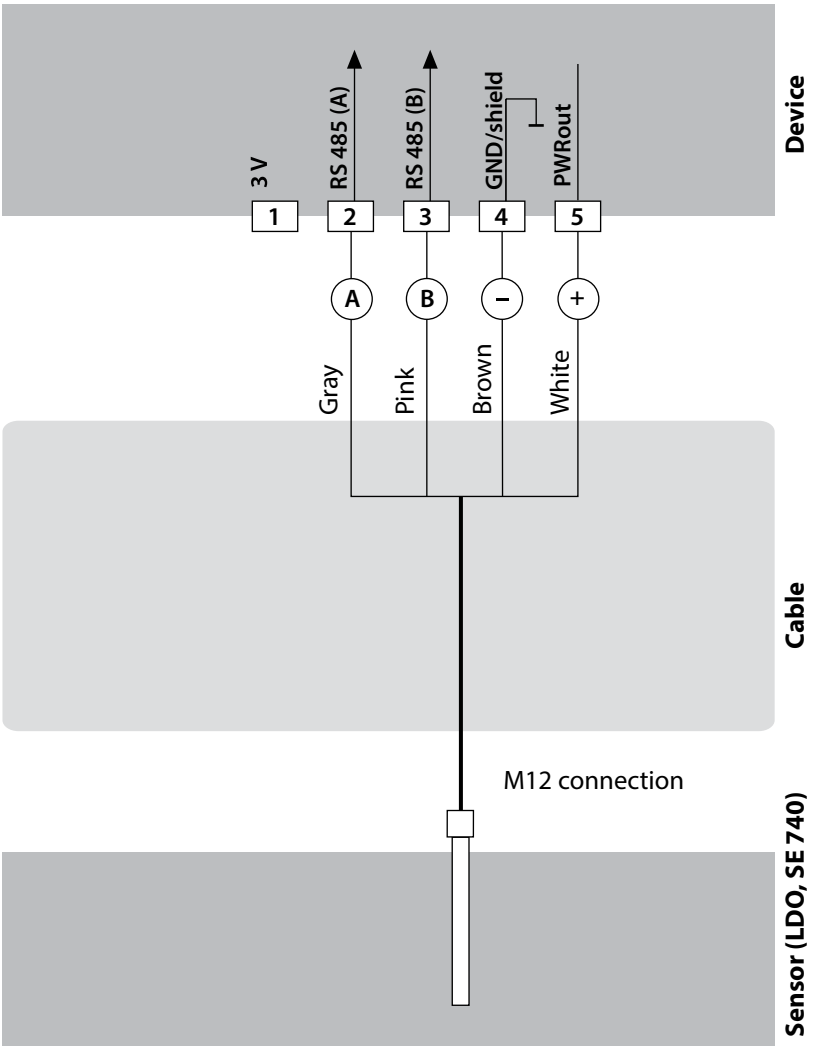
# 26 Optical Sensor Wiring Example

**Example 4:**

Measuring task: Connection of optical sensor (LDO)

Sensors (example): SE 740

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




## Configuration

1. Connect the sensor as shown above.
2. Switch the analyzer on, open the SERVICE menu (passcode: 5555), and select device type "OXY".
3. Open the Configuration menu (CONFIG) and select LDO as sensor.

## Start-Up

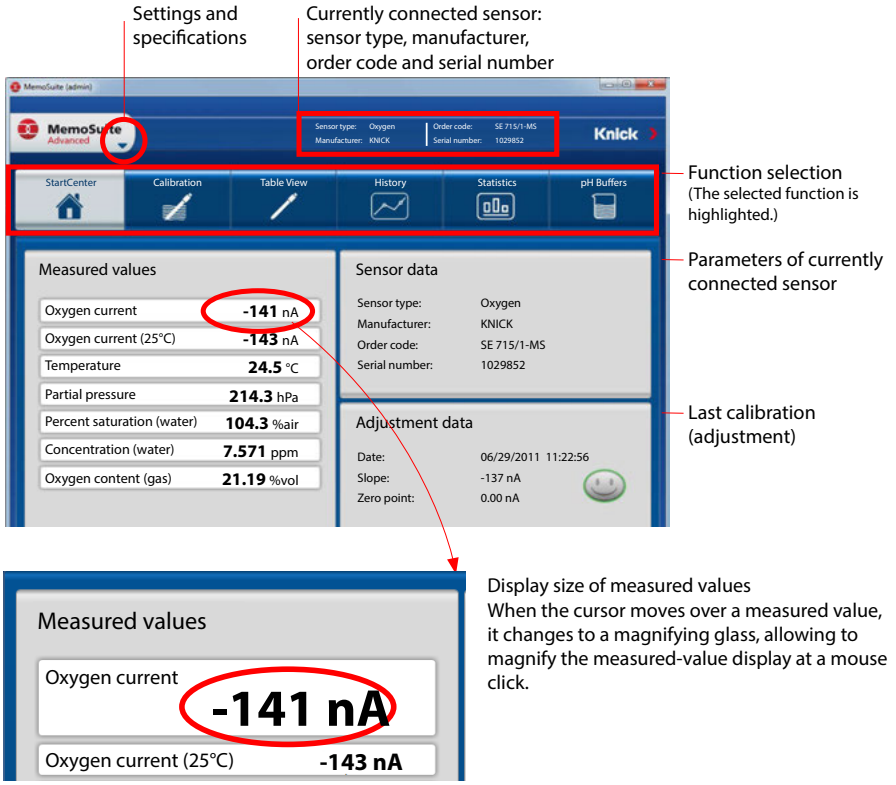
When you start up the analyzer for the first time, you will be prompted to select the desired measurement procedure (a connected Memosens sensor will not be identified automatically).

## Changing the Measuring Function

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

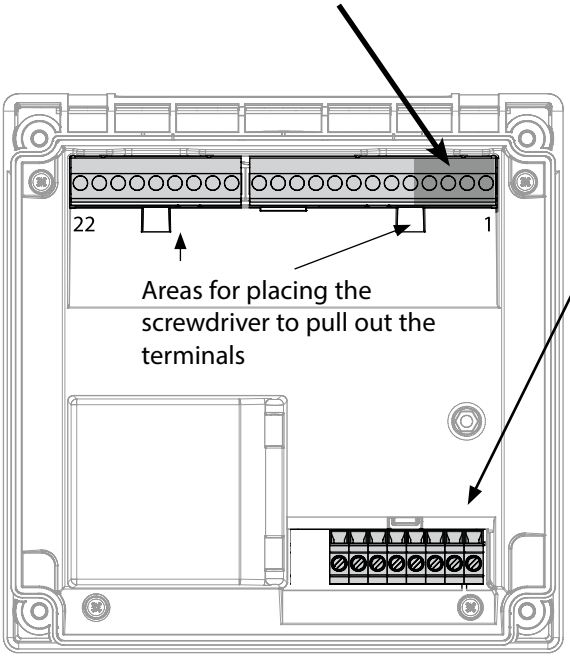
## Calibration and Maintenance in the Lab

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.



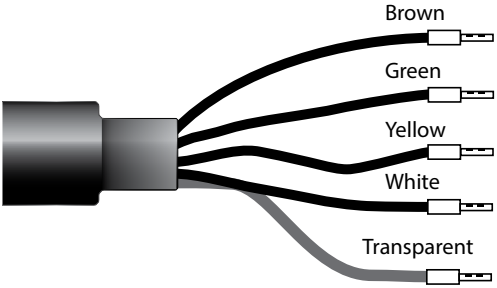
# Connecting a Memosens Sensor

| 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 (2 measuring channels): (MK-MS095 module) 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

RS485 (A)

RS485 (B)

Power supply – (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 |

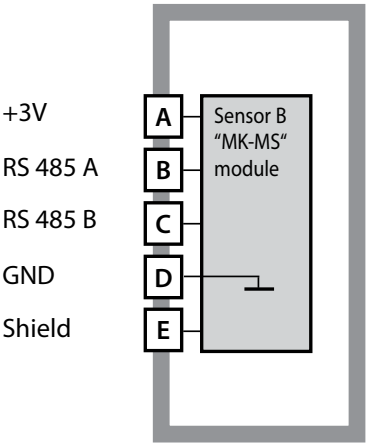
## Order Codes

| | 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 |

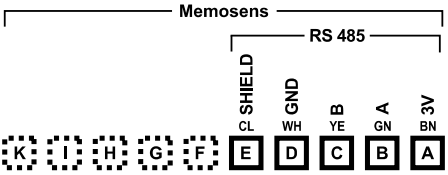
Other cable lengths or cable types are available on request.

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

# 30 Module for 2nd Memosens Channel

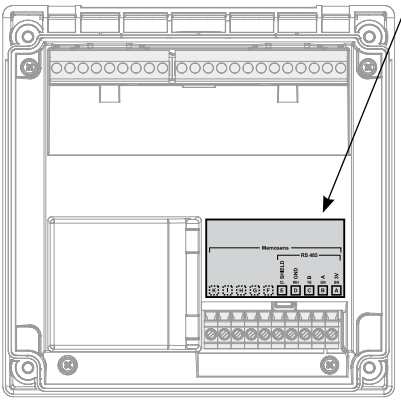



**Module for 2nd Memosens channel**
Order code MK-MS095...



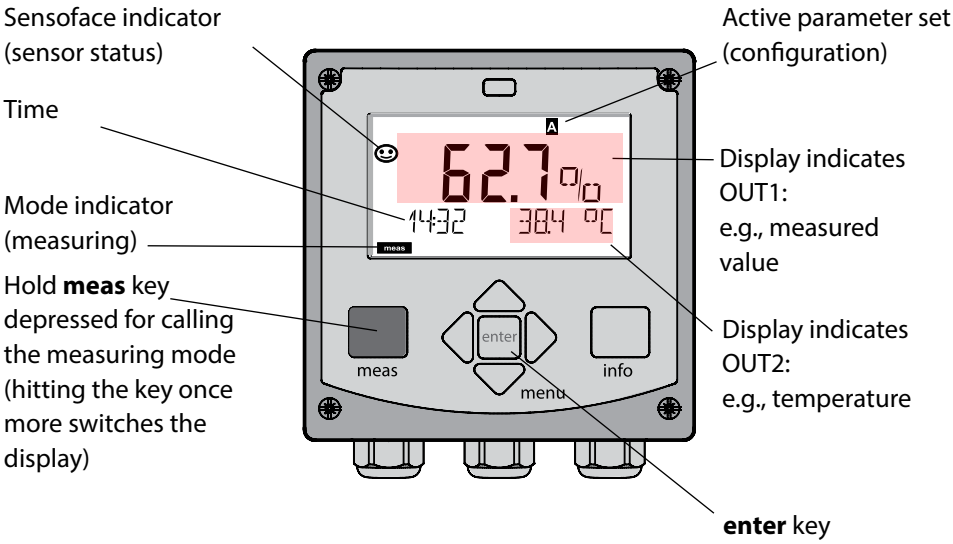

**Terminal plate of module for 2nd Memosens channel**
The terminals are suitable for single or stranded wires up to 2.5 mm² (AWG 14).

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".



## 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 34).

**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.

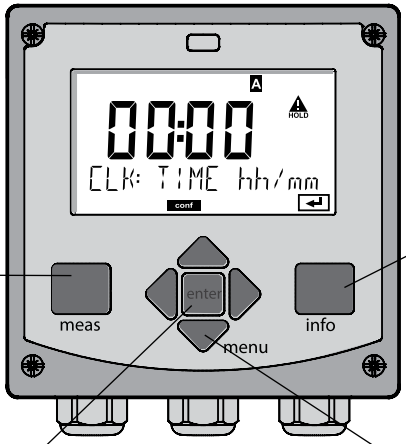
# The Keys and Their Functions

**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**

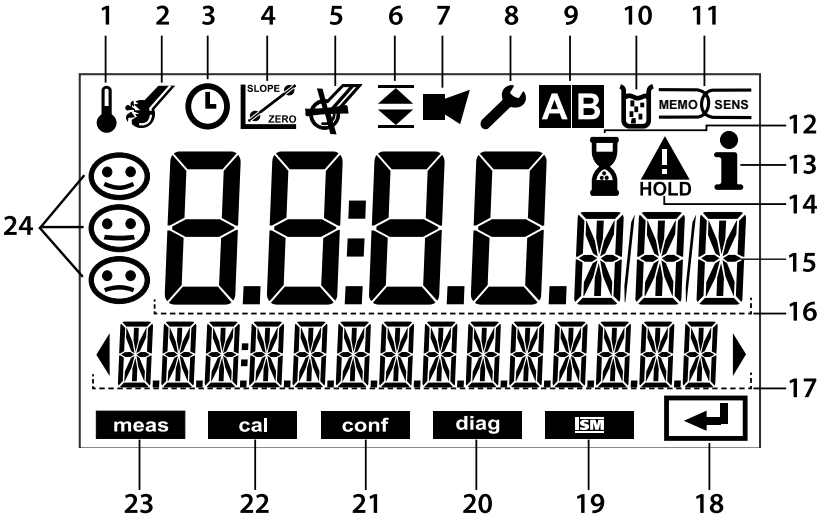
- Retrieve information
- Show error messages

**enter**

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

**menu**

- Measuring mode: Call menu

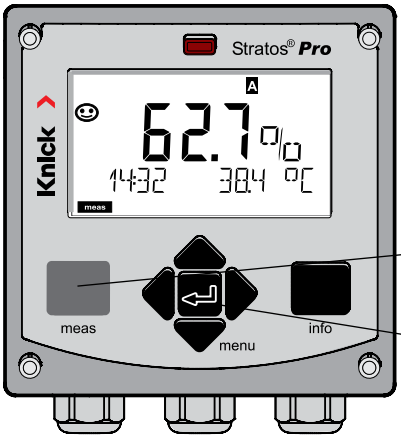



1 Temperature
2 Sensocheck
3 Interval/response time
4 Sensor data
5 Sensocheck
6 Limit message:
Limit 1 ▼ or Limit 2 ▲
7 Alarm
8 Service
9 Parameter set
10 Calibration
11 Memosens sensor
12 Waiting time running
13 Info available
14 HOLD mode active
15 Unit symbols
16 Primary process value
17 Secondary display
18 Proceed using enter
19 ISM sensor
20 Diagnostics
21 Configuration mode
22 Calibration mode
23 Measuring mode
24 Sensoface

## Signal Colors (Display Backlighting)

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

# Display in Measuring Mode

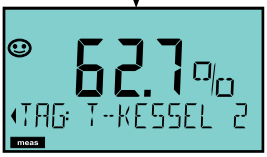



The MAIN DISPLAY is the display which is shown in measuring mode. To call the measuring mode from any other mode, hold the **meas** key depressed for at least 2 sec.

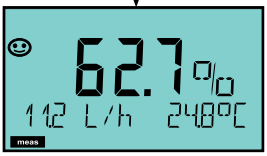
**meas** key

**enter** key

**meas**

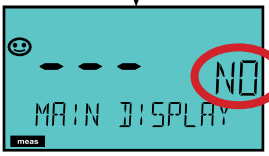



**meas**




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

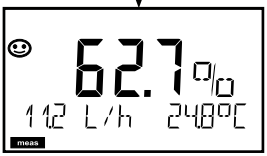
**enter**



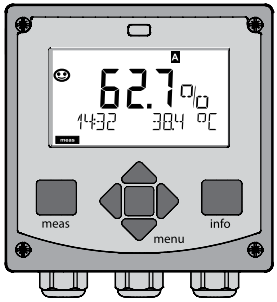

Press **enter** to select a display as MAIN DISPLAY.

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

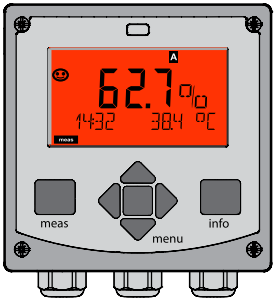
**approx. 2 s**



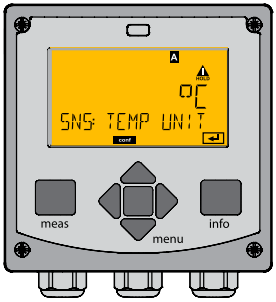
The color-coded user interface guarantees increased operating safety. Operating modes are clearly signaled.
The normal measuring mode is white. Information text appears on a green screen and the diagnostic menu appears on turquoise. The orange HOLD mode (e.g., during calibration) is quickly visible as 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.



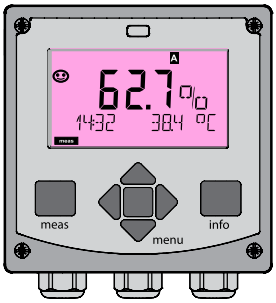

White:
Measuring mode



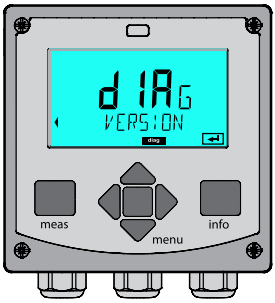

Red blinking:
Alarm, error



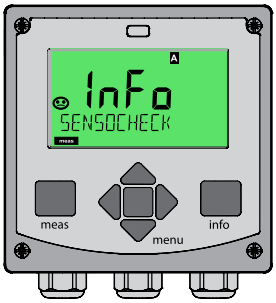

Orange:
HOLD mode




Magenta:
Maintenance request




Turquoise:
Diagnostics

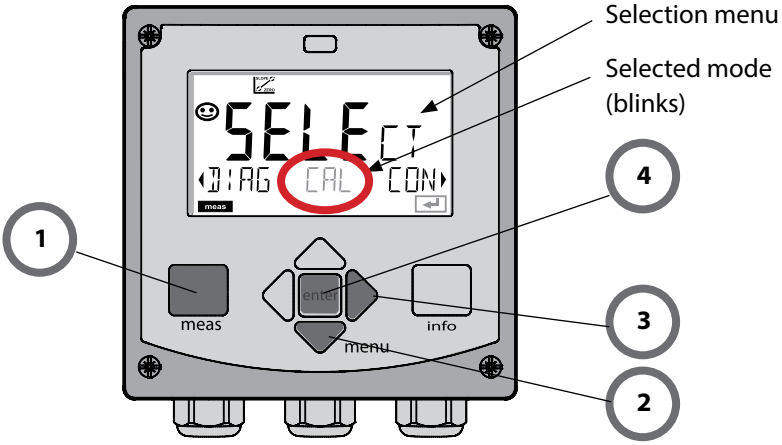



Green:
Info texts

# 36 Selecting the Mode / Entering Values

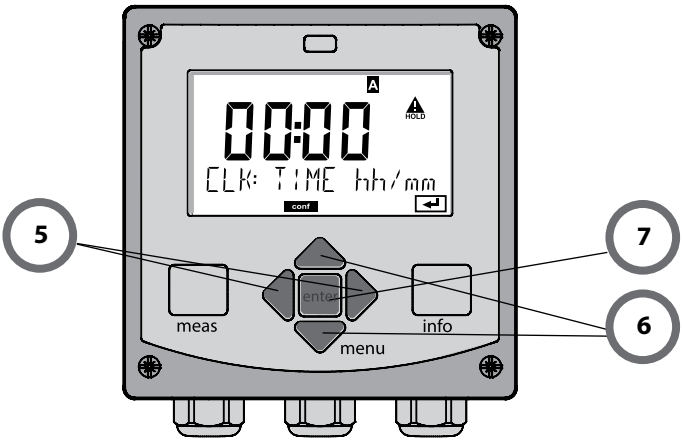
## To select the operating mode:

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.**

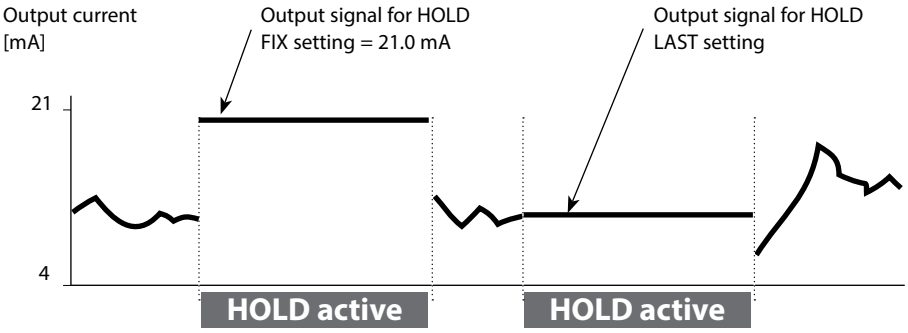
**Service**
Maintenance functions (current source, relay test, controller test), passcode assignment, device type selection, reset to factory settings, enabling of options (TAN).

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 |

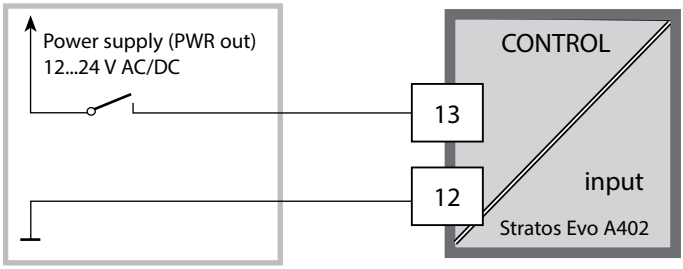
**Alarm**

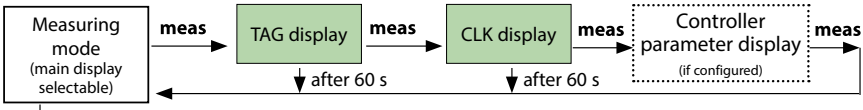
When an error has occurred, **Err xx** is displayed immediately.
Only after expiry of a user-defined delay time will the alarm be registered and entered in the logbook.
During an alarm the display blinks, the display backlighting turns **red**.
Error messages can also be signaled by a 22 mA output current (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 | Oxy | Adjustment (WTR/AIR) / zero adjustment / 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 | SNS: |   | 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: |   | |

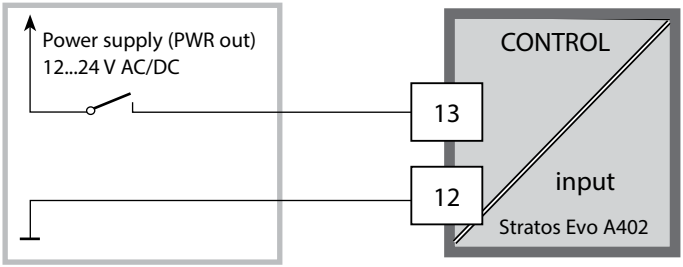
## Parameter Set A/B: Configurable Menu Groups

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

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

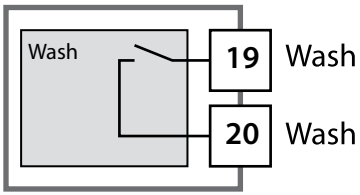



| | |
|---|---|
| Parameter set A active | 0...2 V AC/DC |
| Parameter set B active | 10...30 V AC/DC |

## Parameter Set A/B: Manual Switchover

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

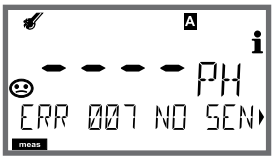
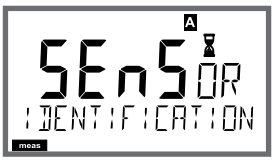
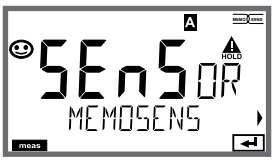
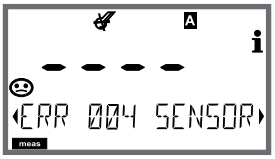
## Parameter Set A/B: Signaling via WASH Contact

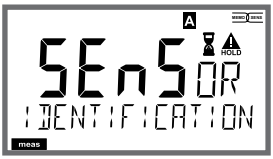
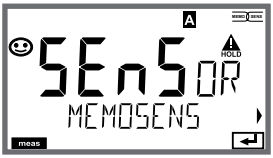


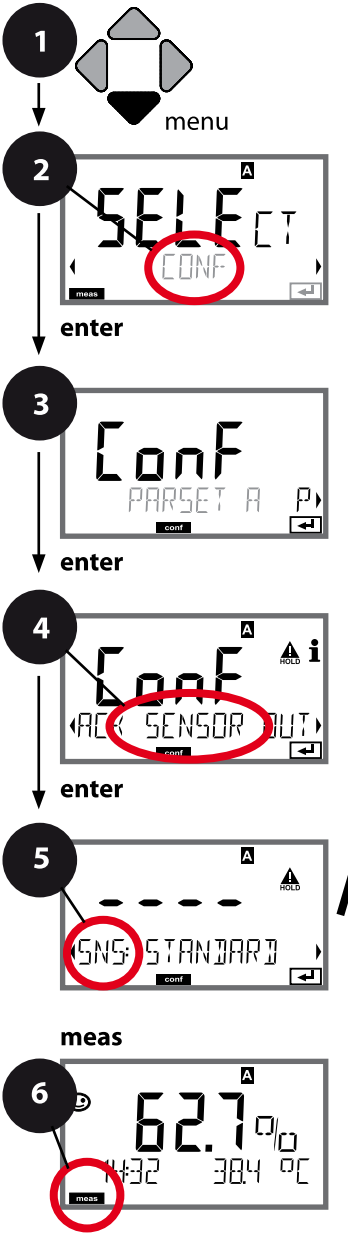

The active parameter set can be signaled using the WASH contact:

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

# Connecting a Memosens Sensor

| Step | Action/Display | Remark |
|---|---|---|
| Connect sensor |  | Before a Memosens sensor is connected, the error message "NO SENSOR" is displayed. |
| Wait until the sensor data are displayed. |  | The hourglass in the display blinks. |
| Check sensor data |  <br>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.<br>Replace sensor |  | When this error message appears, the sensor cannot be used.<br>Sensoface is sad. |

| Step | Action/Display | Remark |
|---|---|---|
| Select HOLD mode<br>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 |  <br>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.<br>Hold **meas** key depressed: Device switches to measuring mode. | |




## Device Type: Oxy

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

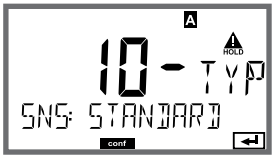
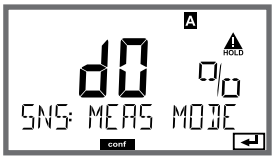
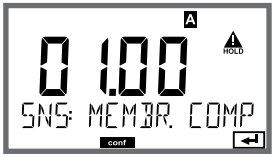
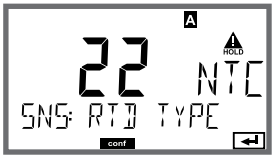
1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **SENSOR** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "SNS:" code.
Press **enter** to select menu,
edit using arrow keys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

5

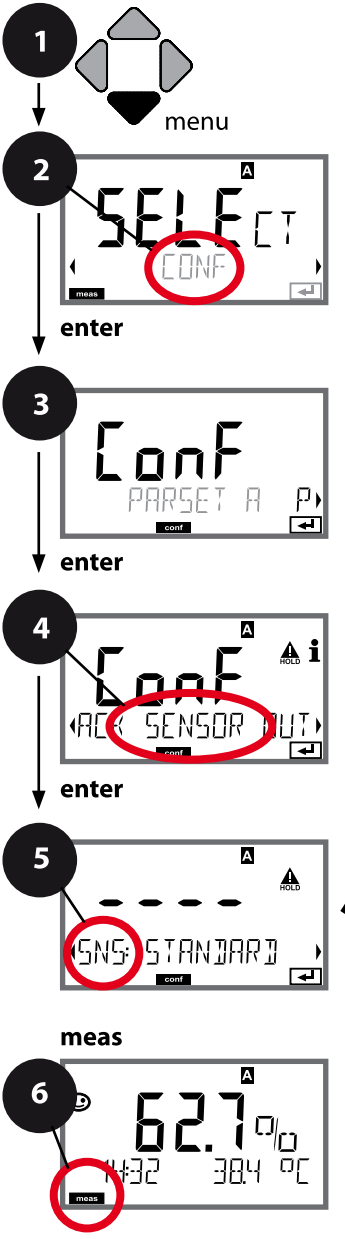
| |
|---|
| Select sensor type |
| Select measuring mode |
| Polarization voltage |
| Membrane compensation |
| Type of temp probe |
| Temperature unit |
| Calibration medium water/air |
| Calibration timer |
| ACT - Adaptive calibration timer |
| TTM - Adaptive maintenance timer |
| CIP/SIP counter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

enter

5

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

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

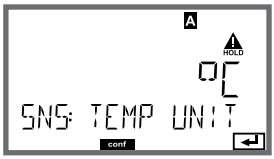
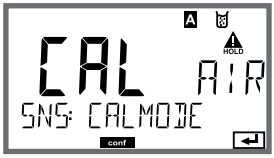
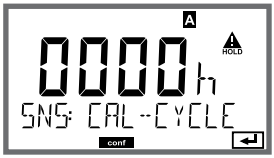



1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **SENSOR** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "SNS:" code.
Press **enter** to select menu,
edit using arrow keys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

**5**

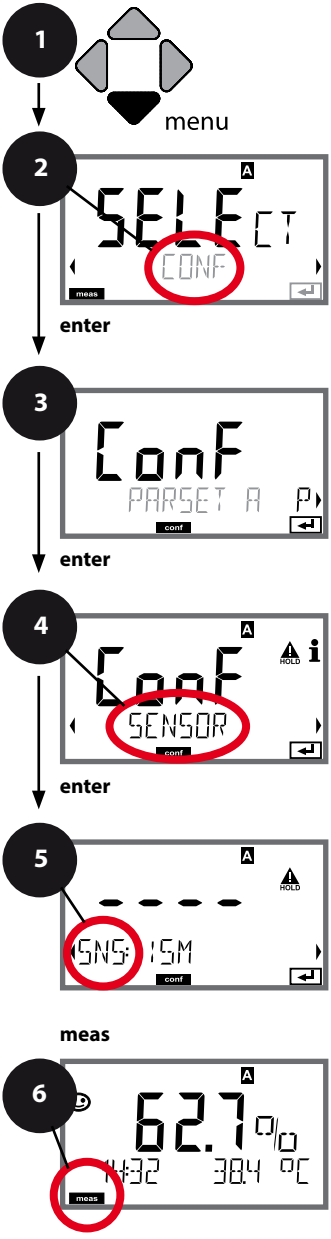
| |
|---|
| Select sensor type **enter** |
| Select measuring mode |
| Polarization voltage |
| Membrane compensation |
| Type of temp probe |
| Temperature unit |
| Calibration medium water/air |
| Calibration timer |
| ACT - Adaptive calibration timer |
| TTM - Adaptive maintenance timer |
| CIP/SIP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

5

| Menu item | Action | Select |
|---|---|---|
| Temperature unit<br>  | Select temperature unit using ▲ ▼ keys.<br><br>Press **enter** to confirm. | **°C**<br>°F |
| Medium: air/water<br>  | Select calibration medium using ▲ ▼ keys.<br>AIR:<br>Air as cal medium<br>WTR:<br>Air-saturated water as cal medium<br><br>Press **enter** to confirm. | **CAL_AIR**<br>CAL_WTR |
| Calibration timer<br>  | Select/deselect calibration timer using ▲ ▼ keys<br><br>Press **enter** to confirm. | **OFF**<br>ON |
| (ON: calibration cycle)<br>  | Enter calibration cycle in hours using ▲ ▼ ◀ ▶ keys<br><br>Press **enter** to confirm. | 0...9999 h<br>**0168 h** |

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

## ISM Sensor, Adaptive Cal Timer (ACT)




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

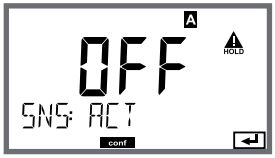
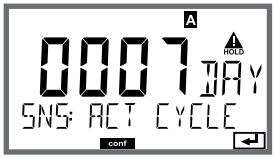
5

## Adaptive Cal Timer (ACT)

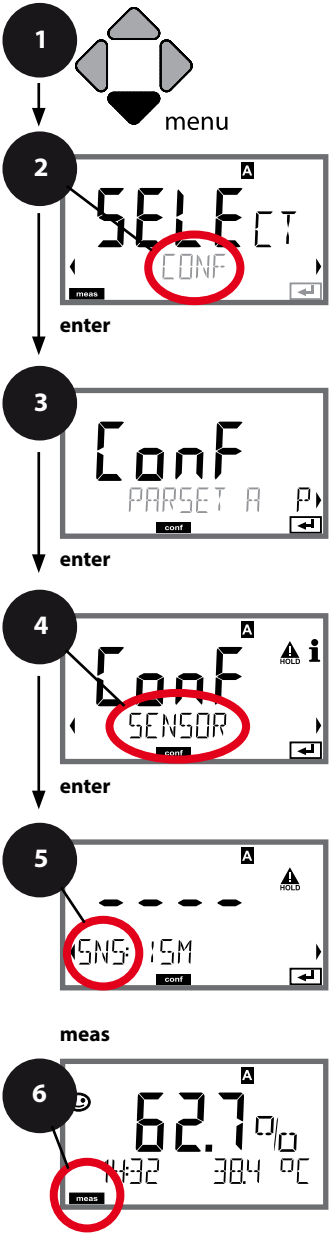
By issuing a Sensoface message, the adaptive calibration timer reminds you to calibrate the sensor. After expiration of the interval, Sensoface is getting "sad". Pressing the info key shows the text "OUT OF CAL TIME CALIBRATE SENSOR" which reminds you that a calibration is due. The ACT interval is either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

The adaptive cal timer is reset after each calibration.

You can configure the current outputs so that a Sensoface message generates a 22-mA error signal, see page 69.

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

## ISM Sensor, Adaptive Maintenance Timer (TTM)




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

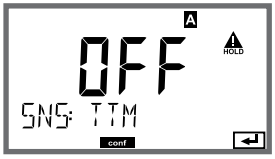
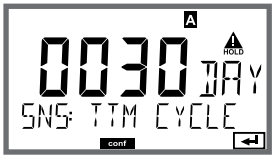
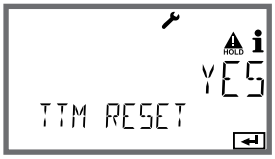
5

## **Adaptive Maintenance Timer** (TTM, Time to Maintenance**)**

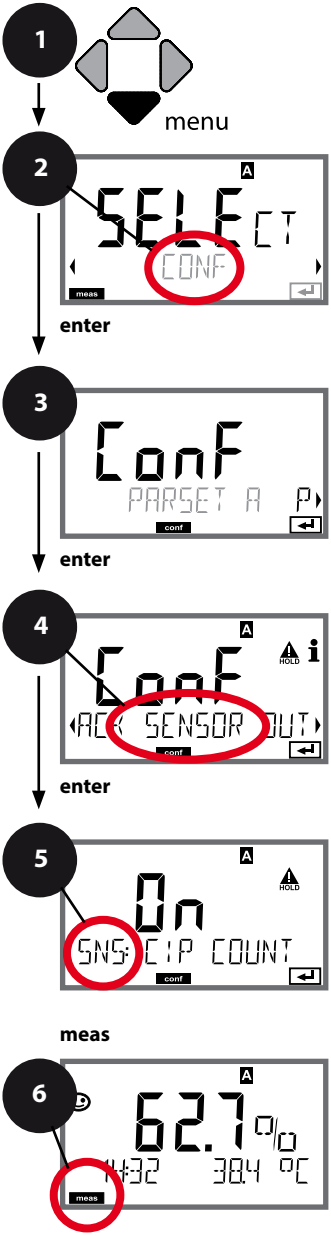
By issuing a Sensoface message, the adaptive maintenance timer reminds you to service the sensor. After expiration of the interval, Sensoface is getting "sad". Pressing the info key shows the text "OUT OF MAINTENANCE CLEAN SENSOR" which reminds you that a sensor maintenance is due. The TTM interval is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

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

You can configure the current outputs so that a Sensoface message generates a 22-mA error signal, see page 69.

| Menu item | Action | Select |
|---|---|---|
| **Adaptive maintenance timer (TTM)**<br>  <br>  | Select using arrow keys:<br>AUTO:<br>The interval stored in the ISM sensor is used (default 30 days)<br>MAN:<br>The interval is specified manually (0 ... 9999 days)<br><br>Press **enter** to confirm. | **OFF**/AUTO/MAN |
| The adaptive maintenance timer can be reset in the SERVICE / SENSOR / TTM menu. Here, the interval is reset to its initial value. | | |
|  | To do so, select **"TTM RESET = YES"** and confirm by pressing **enter**. | **NO** / YES |

## Sensor, CIP Cleaning Cycles, SIP Sterilization Cycles

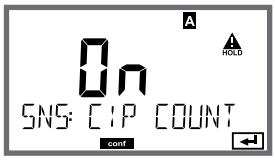
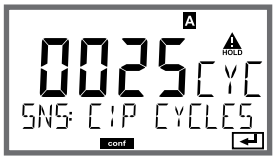
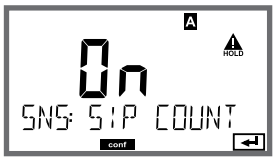



1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **SENSOR** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "SNS:" code.
Press **enter** to select menu,
edit using arrow keys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

**5**

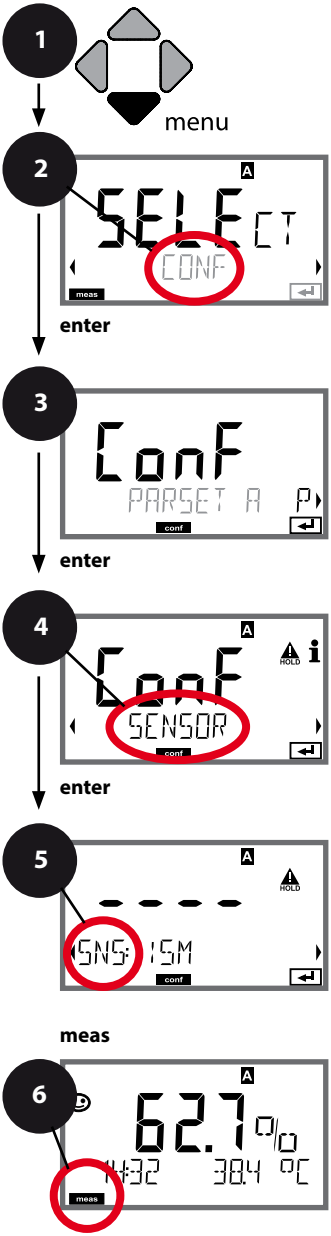
| |
|---|
| Select measuring mode **enter** |
| Select sensor type |
| Polarization voltage |
| Temperature unit |
| Medium: water/air |
| Calibration timer |
| ACT - Adaptive calibration timer |
| TTM - Adaptive maintenance timer |
| CIP counter, cleaning cycles |
| CIP cleaning cycles |
| SIP counter,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

5

| Menu item | Action | Select |
|---|---|---|
| CIP counter<br>  | Use arrow keys ▲ ▼<br>to set the CIP counter:<br>OFF: No counter<br>ON: Fixed cleaning cycle<br>(adjust in the next step)<br>Press **enter** to confirm. | **OFF**/ON |
| CIP cycles<br>  | Only with CIP COUNT ON:<br>Enter max. number of cleaning cycles using ▲ ▼ ◀ ▶ keys<br><br>Press **enter** to confirm. | 0...9999 CYC<br>(**0000 CYC**) |
| SIP counter<br>  | Use arrow keys ▲ ▼<br>to adjust SIP counter:<br>OFF: No counter<br>ON: Max. sterilization cycles<br>(adjust as for CIP counter)<br>Press **enter** to confirm. | **OFF**/ON |

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

## ISM Sensor, Autoclaving Counter




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.

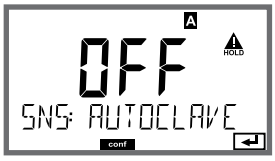
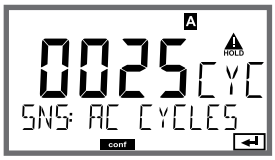
**5**

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

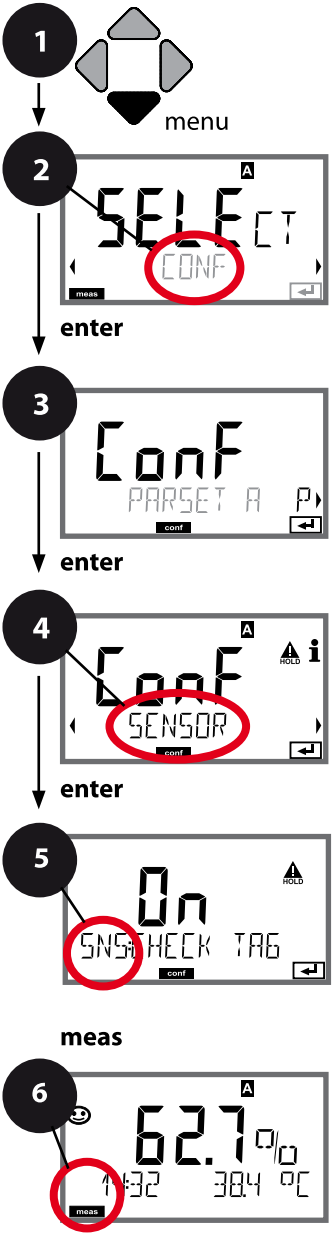
5

## Autoclaving Counter

After reaching a specified limit value the autoclaving counter generates a Sensoface message. As soon as the counter has reached the specified value, Sensoface is getting "sad". Pressing the info key shows the text "AUTOCLAVE CYCLES OVERRUN" which reminds you that the maximum number of autoclaving cycles has been reached. After each autoclaving process, you must manually increment the autoclaving counter in the SENSOR service menu. The transmitter displays "INCREMENT AUTOCLAVE CYCLE" as confirmation. You can configure the current outputs so that a Sensoface message generates a 22-mA error signal, see page 69.

| Menu item | Action | Select |
|---|---|---|
| **Autoclaving counter**<br>  <br>  | Select using arrow keys:<br>ON:<br>Enter the number of cycles (0 ... 9999).<br><br>Press **enter** to confirm. | **OFF** / ON |
| With the autoclaving counter switched on, you must increment the count after each autoclaving process in the SERVICE/SENSOR/AUTOCLAVE ... menu: | | |
| **Incrementing the autoclaving counter** (SERVICE menu)<br>  | After having completed an autoclaving process, open the SERVICE menu SENSOR / AUTOCLAVE to increment the autoclaving count.<br>To do so, select "**YES**" and confirm by pressing **enter**. | **NO** / YES |

## Sensor, Sensor Verification (TAG, GROUP)



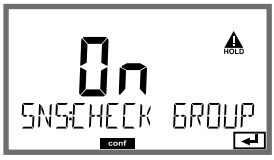

1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **SENSOR** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "SNS:" code.
Press **enter** to select menu,
edit using arrow keys (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 measuring mode |
| Temperature unit |
| Calibration medium water/air |
| Calibration timer |
| ACT - Adaptive calibration timer |
| TTM - Adaptive maintenance timer |
| CIP/SIP counter |
| Autoclaving counter |
| CHECK TAG |
| CHECK GROUP |

5

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

| Device type: Oxy | | | | | |
|---|---|---|---|---|---|
| **Oxy sensor** | | | | **Choices** | **Default** |
| SNS: | (Select text line) | | | STANDARD 10 Typ<br>TRACES* 01 Typ<br>SUBTRACES* 001 Typ<br>(* requires "Traces" Option)<br>ISM<br>MEMOSENS | STANDARD 10 Typ |
| | MEAS MODE | | | dO %, dO mg/l<br>dO ppm, GAS % | dO % |
| | U-POL | | | -400...–1000 mV<br>(0000...–1000 mV for traces) | -675 mV |
| | U-POL CAL | | | | |
| | MEMBR. COMP. | | | 00.50...03.00 | 01.00 |
| | RTD TYPE | | | 22 NTC<br>30 NTC | 22 NTC |
| | TEMP UNIT | | | °C / °F | °C |
| | CAL MODE | | | CAL AIR<br>CAL WTR | CAL AIR |
| | CAL TIMER | | | ON/OFF | OFF |
| | ON | CAL-CYCLE | | 0...9999 h | 0168 h |
| | Memosens<br>LDO<br>ISM | ACT (Adaptive Calibration Timer) (for ISM only) | | OFF / AUTO / MAN | OFF |
| | | MAN | ACT CYCLE | 0...9999 DAY | 0007 DAY |
| | | TTM (Time To Maintenance) (for ISM only) | | OFF / AUTO / MAN | OFF |
| | | MAN | TTM CYCLE | 0...9999 DAY | 0030 DAY |
| | | CIP COUNT | | ON/OFF | OFF |
| | | ON | CIP CYCLES | 0...9999 CYC | 0025 CYC |
| | | SIP COUNT | | ON/OFF | OFF |
| | | ON | SIP CYCLES | 0...9999 CYC | 0025 CYC |
| | | AUTOCLAVE | | ON/OFF | OFF |
| | | ON | AC CYCLES | 0...9999 CYC | 0000 CYC |
| | | CHECK TAG | | ON/OFF | OFF |
| | | CHECK GROUP | | ON/OFF | OFF |

| Configuration (default in bold print) | | | |
|---|---|---|---|
| **Current output 1** | | | **Oxy** |
| OT1: | RANGE | | **4 ... 20 mA** /0 ... 20 mA |
| | CHANNEL | | **OXY** / TMP |
| | OXY dO % | BEGIN 4 mA (0 mA) | **000.0** ... 600.0 **%** |
| | | END 20 mA | 000.0 ... **600.0 %** |
| | OXY dO mg/l | BEGIN 4 mA (0 mA) | 0000 µg/l ... 99.99 mg/l |
| | | END 20 mA | 0000 µg/l ... 99.99 mg/l |
| | OXY dO ppm | BEGIN 4 mA (0 mA) | 0000 ppb ... 99.99 ppm |
| | | END 20 mA | 0000 ppb ... 99.99 ppm |
| | OXY GAS % | BEGIN 4 mA (0 mA) | 0000 ppm ... 99.99 % |
| | | END 20 mA | 0000 ppm ... 99.99 % |
| | TMP °C | BEGIN 4 mA (0 mA) | – 20 ... 150 °C / **000.0 °C** |
| | | END 20 mA | – 20 ... 150 °C / **100.0 °C** |
| | TMP °F | BEGIN 4 mA (0 mA) | – 4 ... 302 °C / **032.0 °F** |
| | | END 20 mA | – 4 ... 302 °C / **212.0 °F** |
| | FILTERTIME | | 0...120 SEC / **120 SEC** |
| | FAIL 22 mA | | ON / **OFF** |
| | FACE 22 mA | | ON / **OFF** |
| | HOLD MODE | | **LAST** / FIX |
| | FIX | HOLD-FIX | 4 ... 22 mA / **021.0 mA** |
| **Current output 2** | | | **Default setting CHANNEL: TMP (other settings like OT1)** |

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

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

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

| Relay contacts REL1, REL2 | | |
|---|---|---|
| REL | **LIMITS**<br>CONTROLLER | The following submenu depends on the selected setting. |
| RL1 | CHANNEL | **OXY** / TMP / FLOW |
| | FUNCTION | **Lo LEVL** / Hi LEVL |
| | CONTACT | **N/O** / N/C |
| | LEVEL | **000.0 %**<br>000.0 ... 600.0 %<br>0000 µg/l ... 99.99 mg/l<br>0000 ppb ... 99.99 ppm<br>0000 ppm ... 99.99 %<br>(–20 ... 150 °C) |
| | HYSTERESIS | **000.0 %**<br>0 ... 50 % full scale |
| | DELAYTIME | **0010 SEC**<br>0000 ... 9999 s |
| RL2 | See RL1 for configuration; default setting: CHANNEL = TMP | |

| Configuration (default in bold print) | | |
|---|---|---|
| **PID controller** | | **Oxy** |
| CTR | CHANNEL | **OXY** / 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 |

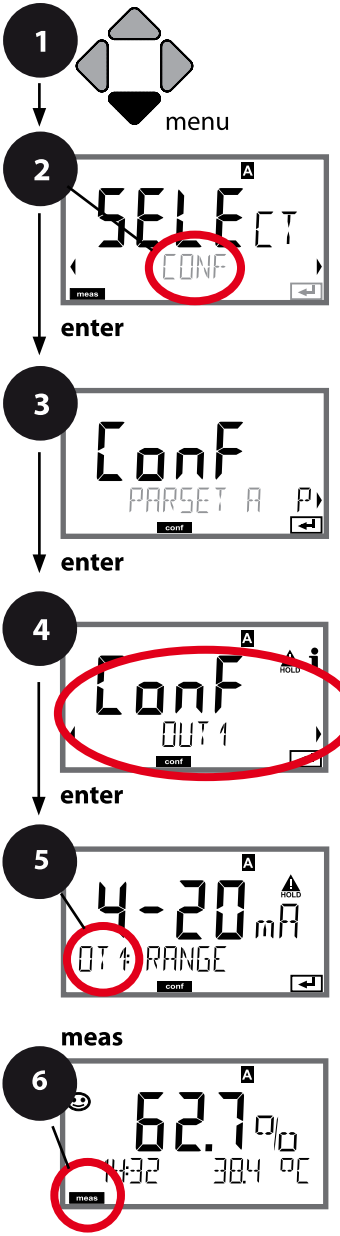
| Rinse contact WASH | | |
|---|---|---|
| WSH | **WASH** / PARSET A/B | Rinse contact / Signaling the active parameter set |
| | WASH CYCLE | 0.0 ... 999.9 h (**000.0 h**) |
| | WASH TIME | 0 ... 1999 s (**0060 SEC**) |
| | RELAX TIME | RELAX TIME 0000 ... 1999 s **(0030 s)** |
| | CONTACT | **N/O** / N/C |

| Selecting the parameter set PARSET | | |
|---|---|---|
| PAR | PARSET FIX A<br>MANUAL<br>CNTR INPUT | (no switchover, parameter set A)<br>(manual selection in the "Configuration" menu)<br>(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 |

## Output Current, Range, Current Start, Current End



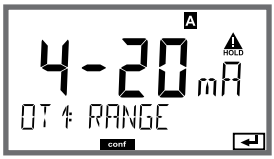
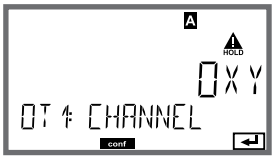

1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **OUT1** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "OT1:" code.
Press **enter** to select menu,
edit using arrow keys (see 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

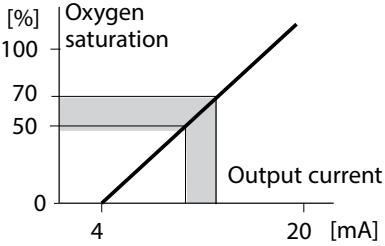
5

| Menu item | Action | Select |
|---|---|---|
| Current range   | Select 4-20 mA or 0-20 mA range using ▲ ▼ keys.<br><br>Press **enter** to confirm. | **4-20 mA** / 0-20 mA |
| Process variable   | **Example: current output 1, device type OXY**<br>Select using ▲ ▼ keys:<br>OXY: oxygen value<br>TMP: Temperature<br>Press **enter** to confirm. | **OXY** / TMP |
| Current start / end   | Modify digit using ▲ ▼ keys, select next digit using ◀ ▶ keys.<br><br>Press **enter** to confirm. | 000.0 ... 0600 %<br>(OXY, Sensor 10)<br>0.000 ... 0150 %<br>(OXY, Sensor 01, 001 and "Traces" Option)<br>–20 ... 150 °C /<br>–4 ... 302 °F (TMP) |

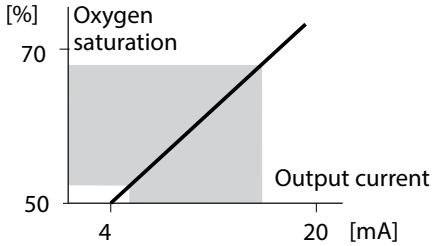
For **process variables comprising several decades**, decimal point and dimension can be shifted using the ◀ ▶ cursor keys.
Then, the desired number is entered using ◀ ▶ and ◀ ▶. For measurement in gases (GAS), this method is used to switch between ppm and % for volume concentration (10000 ppm = 1 %).

### Assignment of measured values: Current start and current end

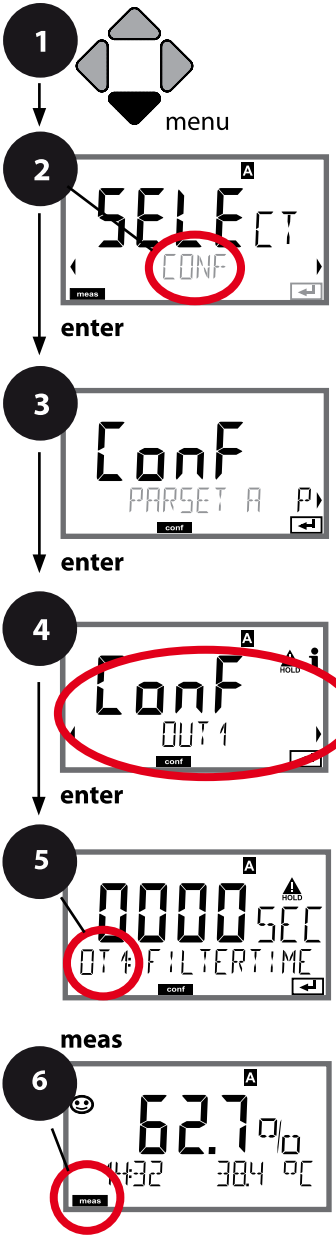
Example 1: Range 0...100%




Example 2: Range 50...70%
Advantage: Higher resolution in range of interest



## Output Current, Time Averaging Filter



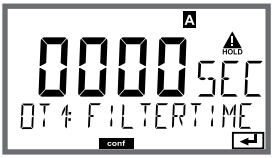

1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **OUT1** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "OT1:" code.
Press **enter** to select menu,
edit using arrow keys (see 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.<br><br>Press **enter** to confirm. | 0...120 SEC<br>(**0000 SEC**) |



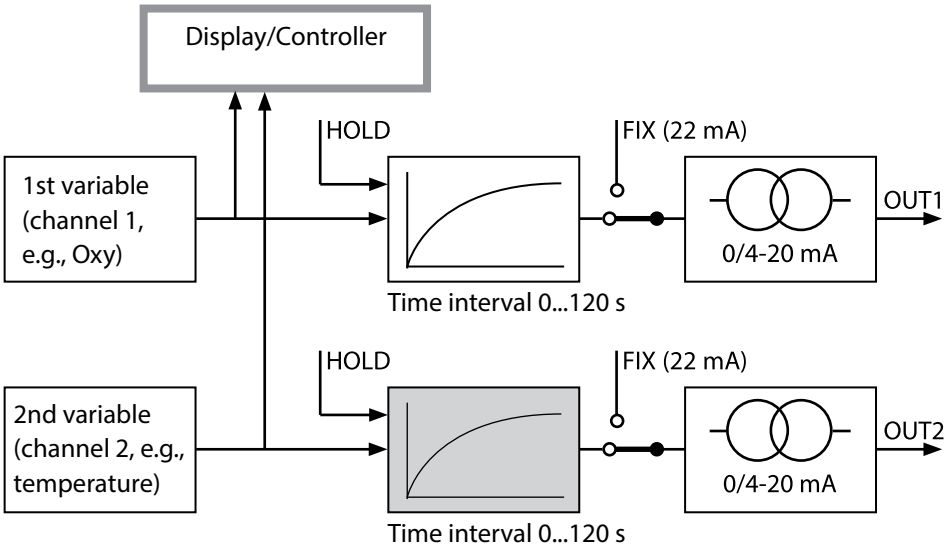
**Time averaging filter**

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.

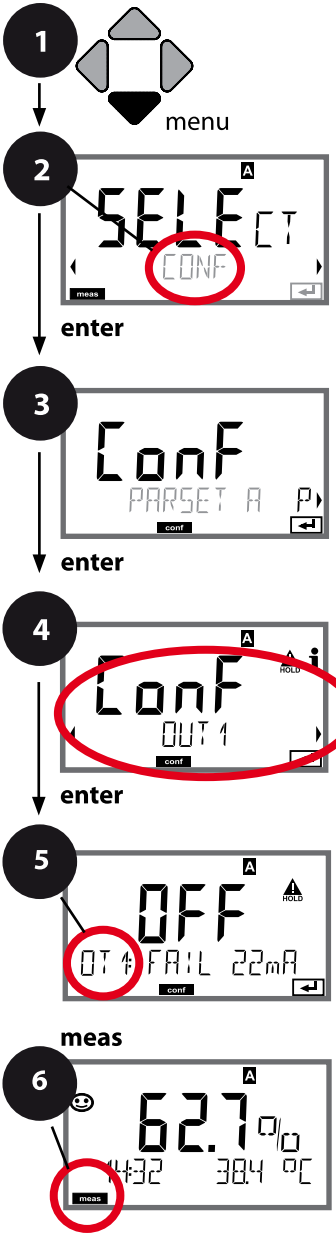
**Note:**

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



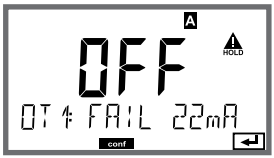
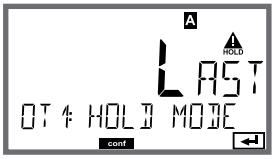

1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **OUT1** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "OT1:" code.
Press **enter** to select menu,
edit using arrow keys (see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

5

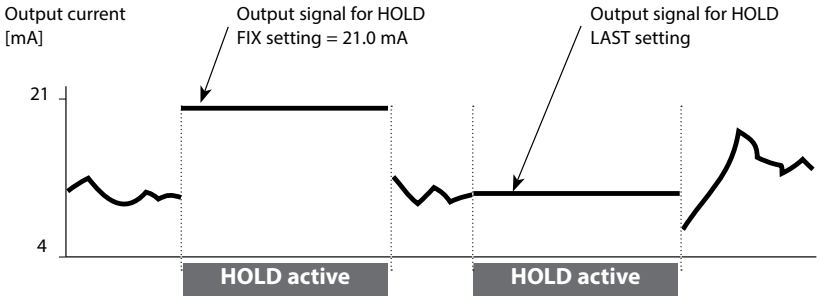
| |
|---|
| Current range |
| Process variable |
| Current start |
| Current end |
| Time averaging filter |
| Output current during error message |
| Output current for Sensoface message |
| Output current during HOLD |
| Output current for HOLD FIX |

enter

5

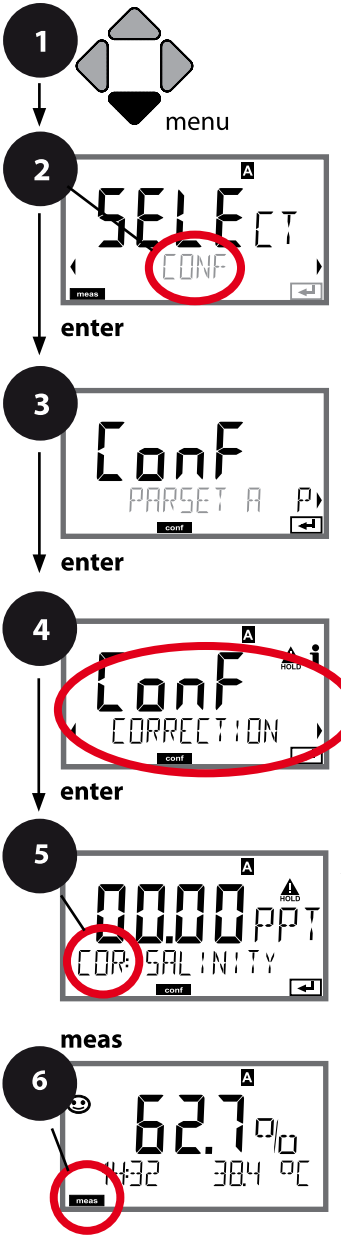
| Menu item | Action | Choices |
|---|---|---|
| Output current during error message   | The output current can be set to 22 mA in the case of error messages or error messages.<br>Select ON or OFF using ▲ ▼ keys.<br>Confirm by pressing **enter** | **OFF** / ON |
| Output current during Sensoface messages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

**Output signal during HOLD:**



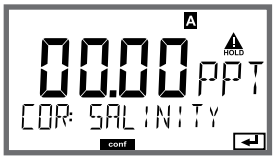
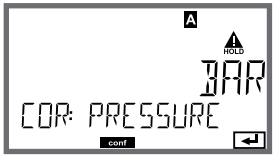
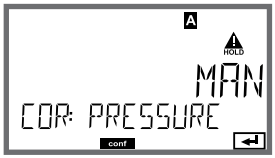
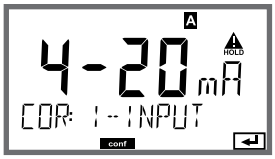
# Correction

## Salinity Correction, Pressure Correction

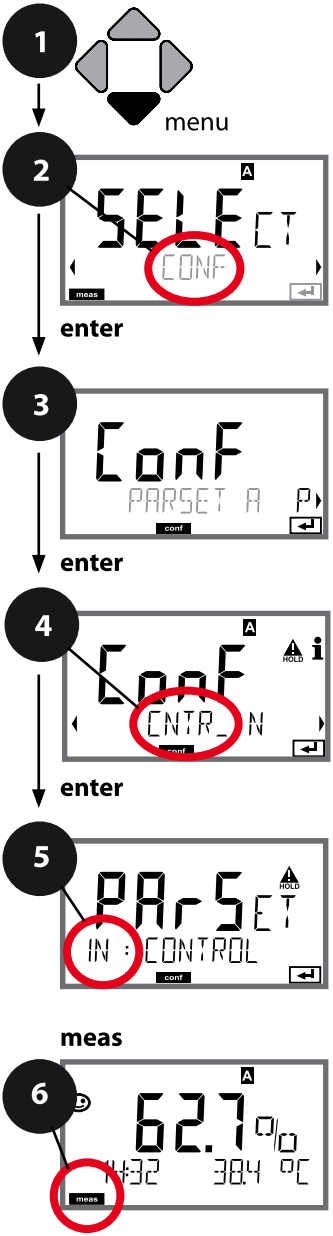



1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **CORRECTION** menu using ◂ ▸ keys, press **enter**.
5 All items of this menu group are indicated by the "COR:" code.
Press **enter** to select menu,
edit using arrow keys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

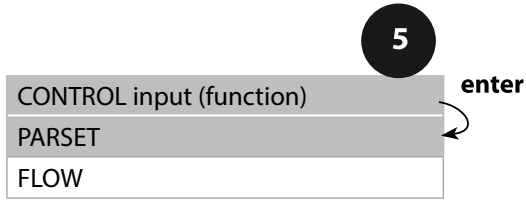
5

| Menu item | Action | Choices |
|---|---|---|
| Enter salinity<br>  | Enter the salinity of the process medium.<br>Enter value using ▲ ▼ ◀ ▶ keys.<br>Press **enter** to confirm. | 00.00...45.00 ppt |
| Enter pressure unit<br>  | Select desired pressure unit using ▲ ▼ keys.<br>Press **enter** to confirm. | **Bar**/kPa/PSI |
| Enter pressure correction<br>  | Select using ▲ ▼ keys:<br>MAN (manual input)<br>Press **enter** to confirm. | **MAN** / EXT |
| Manual pressure input<br>  | Enter value using ▲ ▼ ◀ ▶ keys.<br>Press **enter** to confirm. | Input range:<br>0.000...9.999 BAR /<br>000.0...999.9 KPA /<br>000.0...145.0 PSI<br><br>**1.013 BAR** |
| **Current input**/<br>Pressure range<br>  | With external pressure input, select current input 0(4) ... 20 mA and the pressure parameters for current start and end using ▲ ▼ ◀ ▶ keys. | **0 ... 20 mA** / 4 ... 20 mA<br><br>0.000...9.999 Bar /<br>000.0...999.9 kPa /<br>000.0...999.9 PSI |

## 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.

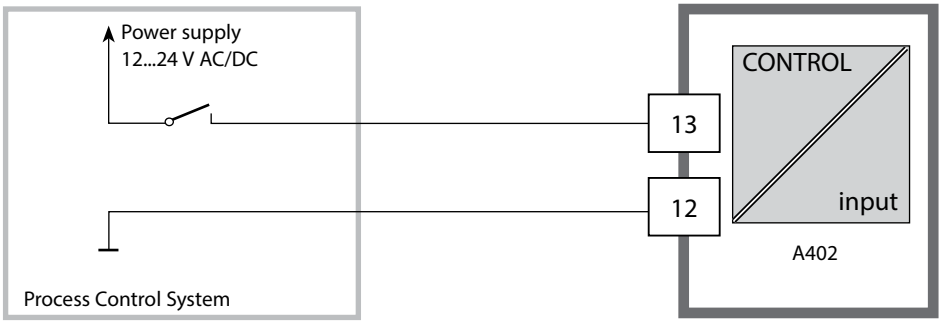


5

| 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) |

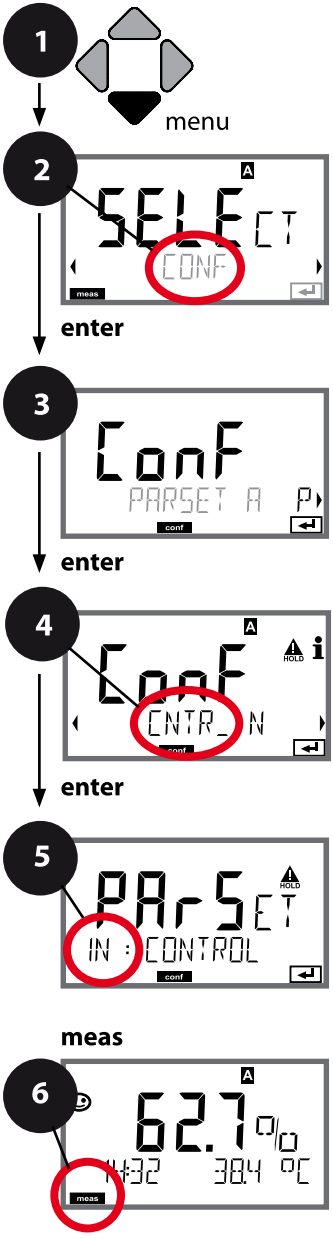
**External switchover of parameter sets**

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).

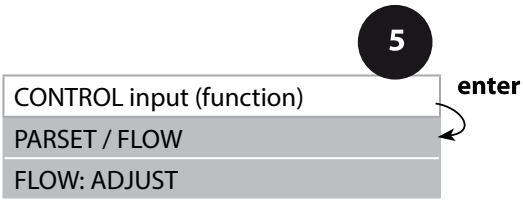



| | |
|---|---|
| Parameter set A | 0...2 V AC/DC |
| Parameter set B | 10...30 V AC/DC |

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

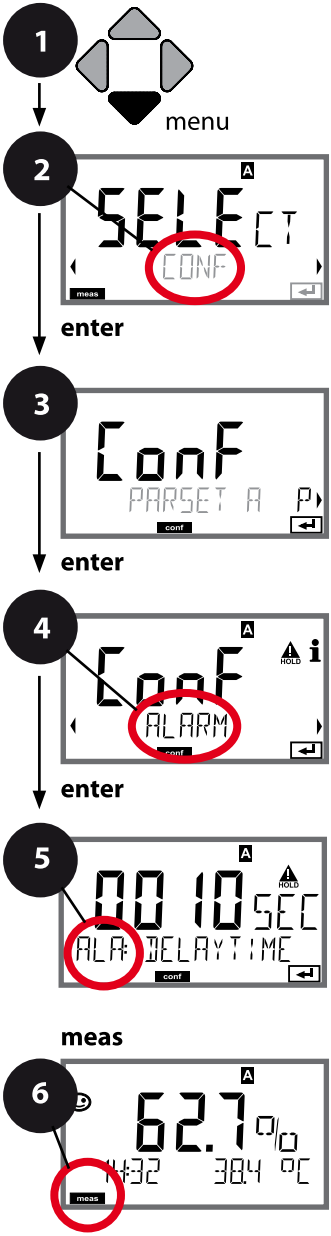
In the alarm menu you can configure flow monitoring.
When you have set CONTROL to FLOW, you can specify 2 additional limit values for maximum and minimum flow. If the measured value lies outside this range, an alarm message and a 22-mA error signal (if configured) will be generated.

**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



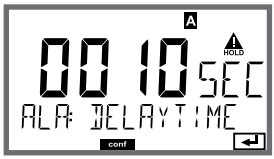
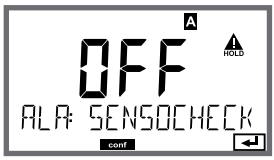

1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **ALARM** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "ALA:" code.
Press **enter** to select menu,
edit using arrow keys (see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

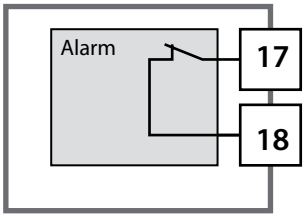
5

| |
|---|
| Delay |
| Sensocheck |
| Alarm: CONTROL input |
| With flow monitoring:<br>Max. flow alarm |
| With flow monitoring:<br>Min. flow alarm |

enter

5

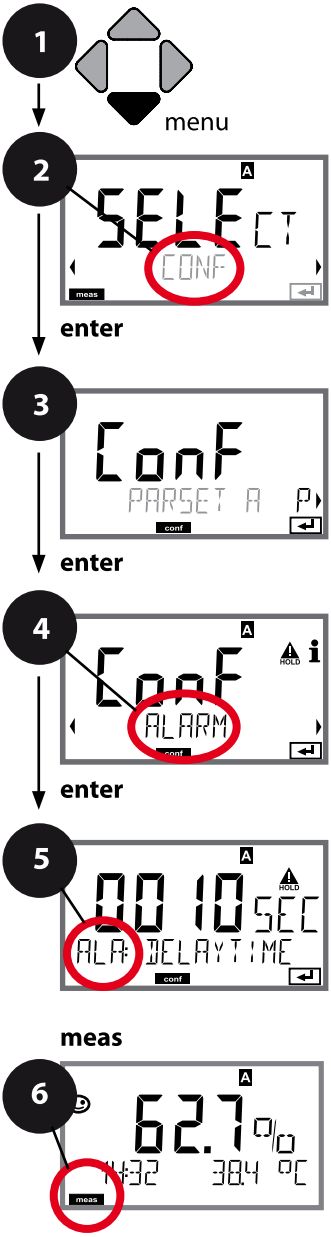
| Menu item | Action | Select |
|---|---|---|
| Alarm delay<br>  | Enter alarm delay using ▲ ▼ ◀ ▶ keys.<br>Press **enter** to confirm. | 0...600 SEC<br>(**010 SEC**) |
| Sensocheck<br>  | Select Sensocheck (continuous monitoring of sensor membrane and lines).<br>Select ON or OFF using ▲ ▼ keys.<br>Press **enter** to confirm.<br>(At the same time, Sensoface is activated. With OFF, Sensoface is also switched off.) | ON / **OFF** |




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

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)



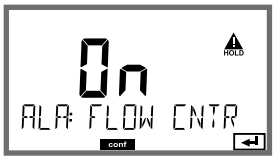

1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **ALARM** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "ALA:" code.
Press **enter** to select menu,
edit using arrow keys (see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

5

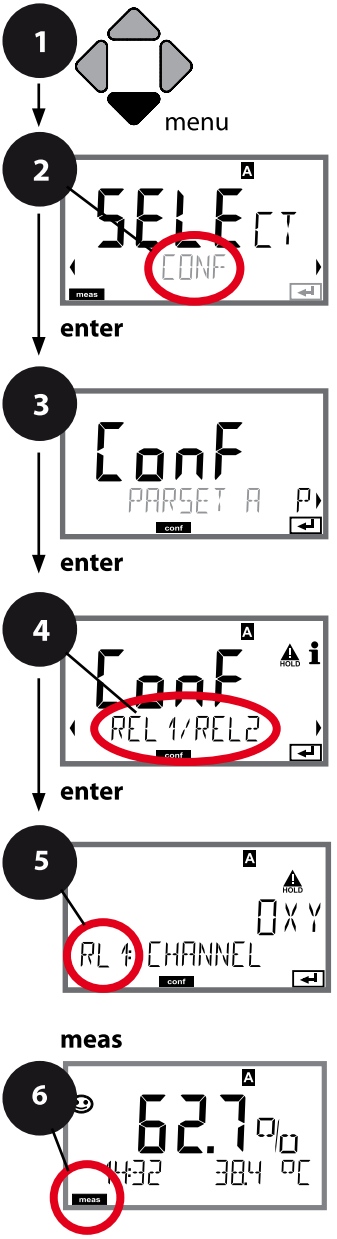
| |
|---|
| Alarm: Delay |
| Alarm: Sensocheck |
| Alarm: CONTROL input |
| With flow monitoring:<br>Max. flow alarm |
| With flow monitoring:<br>Min. flow alarm |

**enter**

5

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

## Limit Function, Relay 1

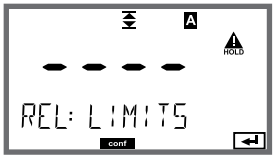
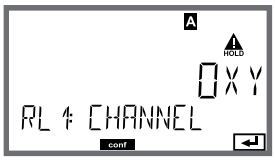
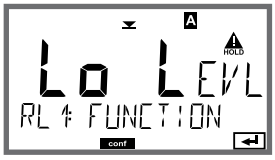
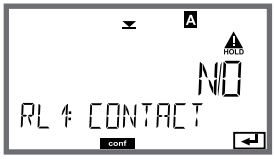
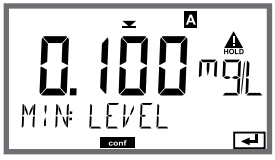



1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸,
press **enter**.
4 Select **REL1/REL2** menu using ◂ ▸ keys, press **enter**.
5 All items of this menu group are indicated by the "RL1:" code.
Press **enter** to select menu,
edit using arrow keys (see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

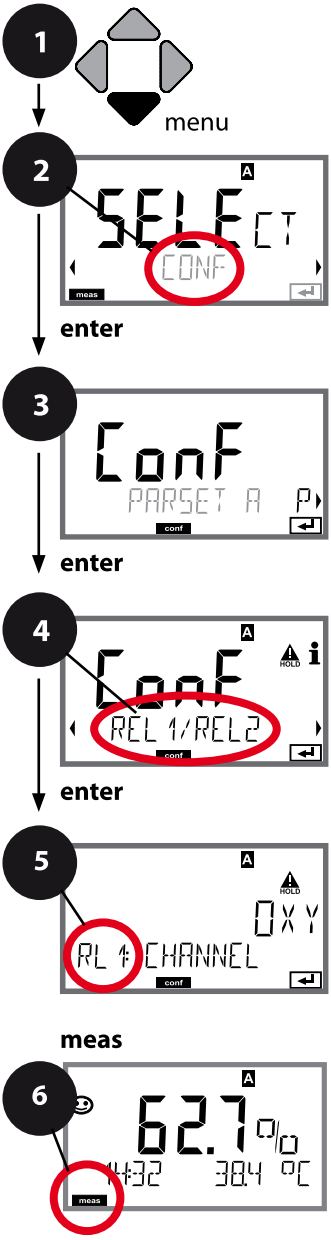
5

| | |
|---|---|
| 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<br>  | Select in the text line using ▲ ▼ keys:<br>• Limit function (LIMITS)<br>• Controller (CONTROLLER)<br><br>Press **enter** to confirm. | **LIMITS** / CONTROLLER<br><br>**Note:** Selecting CONTROLLER leads to Controller menu group CTR. |
| Select process variable<br>  | Select desired process variable using ▲ ▼ keys.<br><br>Press **enter** to confirm. | Depending on module or Memosens sensor |
| Limit 1 function<br>  | Select desired function using arrow keys.<br>LoLevel: active if value falls below setpoint<br>LoLevel: active if value exceeds setpoint<br>Press **enter** to confirm. | **Lo LEVL** / Hi LEVL<br><br>Limit 1 icon: ▼ |
| Limit 1 contact response<br>  | N/O: normally open contact<br>N/C: normally closed contact<br>Select using ▲ ▼ keys.<br>Press **enter** to confirm. | **N/O** / N/C |
| Limit 1 setpoint<br>  | Enter setpoint using ▲ ▼ ◀ ▶ keys.<br><br>Press **enter** to confirm. | Depending on module or Memosens sensor |

## Limit Function, Relay 1

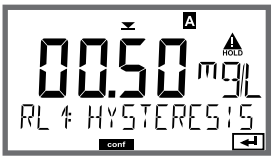



1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set using ◂ ▸ keys,
press **enter**.
4 Select **REL1/REL2** menu using ◂ ▸ keys, press **enter**.
5 All items of this menu group are indicated by the "RL1:" code.
Press **enter** to select menu,
edit using arrow keys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

**5** **enter**

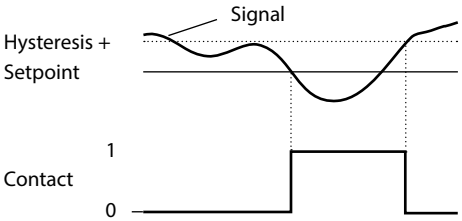
| |
|---|
| Use of relays |
| Select process variable |
| Limit 1<br>switching characteristics (function) |
| Limit 1 contact type |
| Limit 1 setpoint |
| Limit 1 hysteresis |
| Limit 1 delay |

5

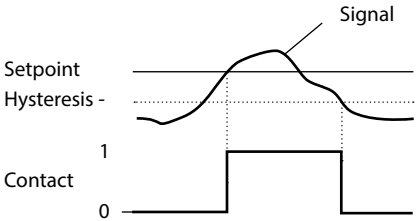
| Menu item | Action | Choices |
|---|---|---|
| Limit 1 hysteresis<br>  | Select hysteresis using ▲ ▼ ◀ ▶ keys.<br><br>Confirm by pressing **enter** | 0...50 % full scale |
| Limit 1 delay<br>  | The contact is activated with delay (deactivated without delay)<br>Adjust delay using ▲ ▼ ◀ ▶ keys.<br><br>Press **enter** to confirm. | 0...9999 SEC<br>(**0010 SEC**) |

**Application of Hysteresis:**

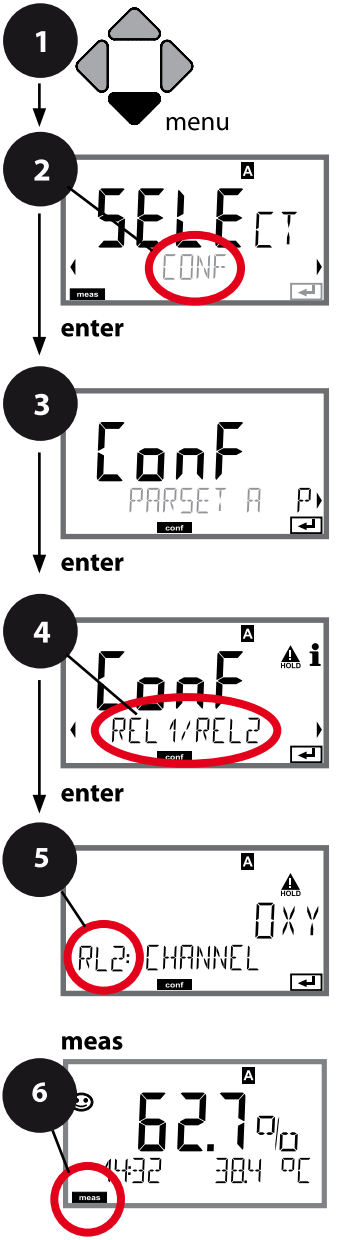
**Limit Lo**




**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**

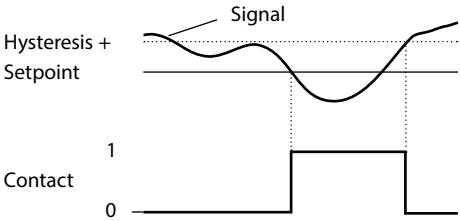
| |
|---|
| Use of relays |
| Select process variable |
| Limit 2 switching characteristics (function) |
| Limit 2 contact type |
| Limit 2 setpoint |
| Limit 2 hysteresis |
| Limit 2 delay |

5

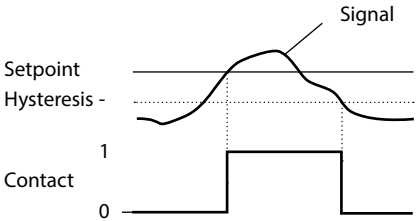
| Menu item | Action | Choices |
|---|---|---|
| Select process variable (CHANNEL) | Select desired process variable using ▲ ▼ keys. Press **enter** to confirm. | **OXY**/TMP/FLOW |
| Limit 2 function (FUNCTION) | Select desired function using arrow keys. Press **enter** to confirm. | Lo LEVL / **Hi LEVL**<br>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. | Within measuring range |
| Limit 2 hysteresis (HYSTERESIS) | Select hysteresis using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm. | 0...50 % full scale |
| 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**

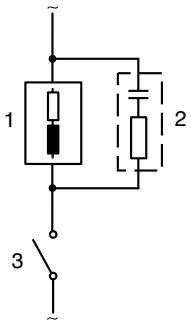


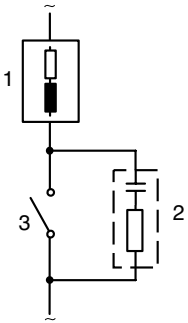

**Limit Hi**



**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.

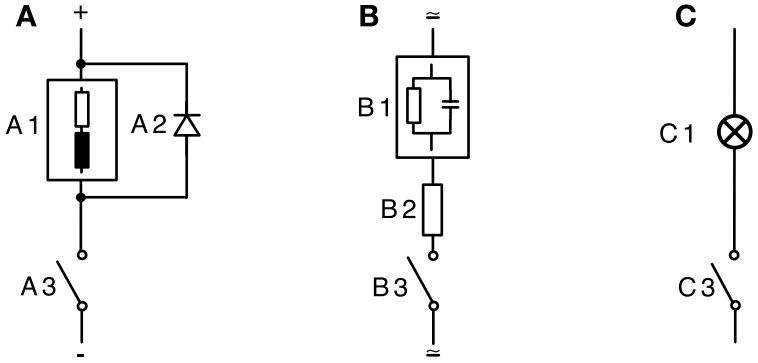



**Typical AC applications with inductive load**

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!**

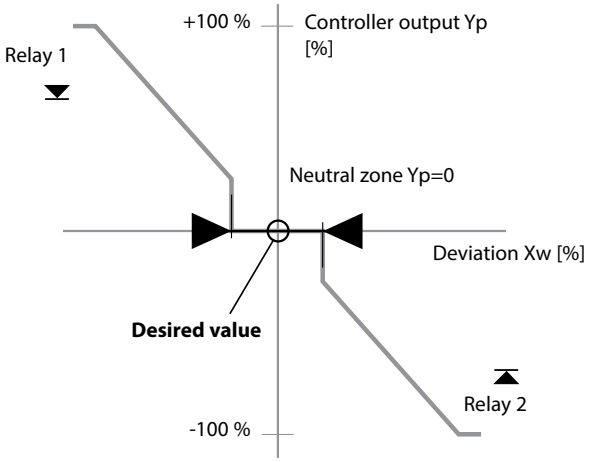
**Typical Applications**

**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 [%] |
| Constant | 0 % (for % $O_2$ or % Air)<br>5.00 mg/l (for mg/l)<br>5.00 ppm (for ppm) |

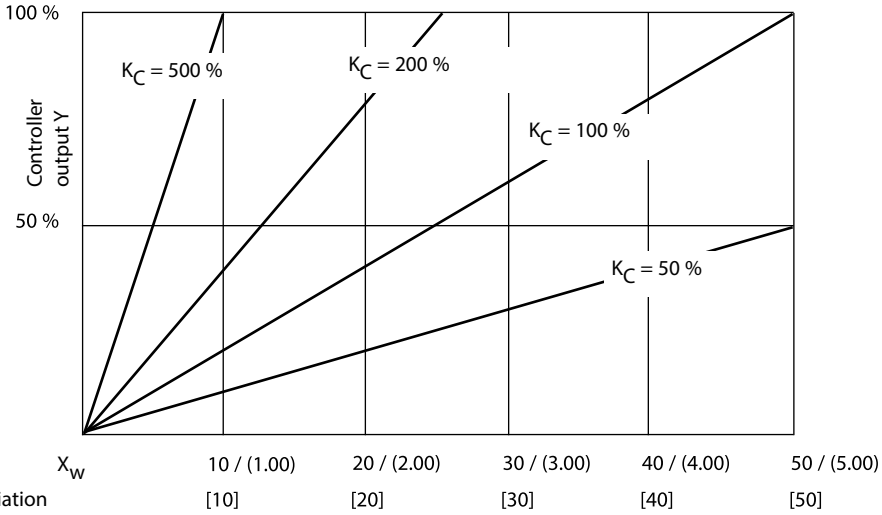
Proportional action $Y_P$

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

### Neutral zone

Tolerated deviation from desired value.

### Proportional action (Gradient $K_C$ [%])



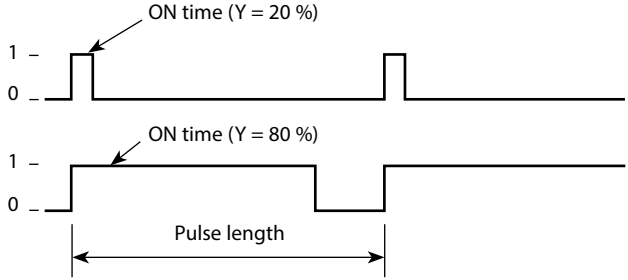

Process variables: %, (mg/l, ppm),
underneath: temp [K]

# 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.

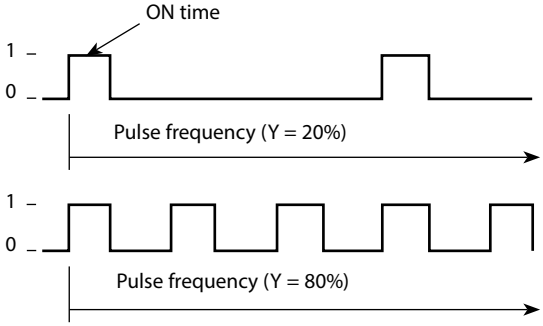
### Output signal (relay contact) of pulse length controller




## 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

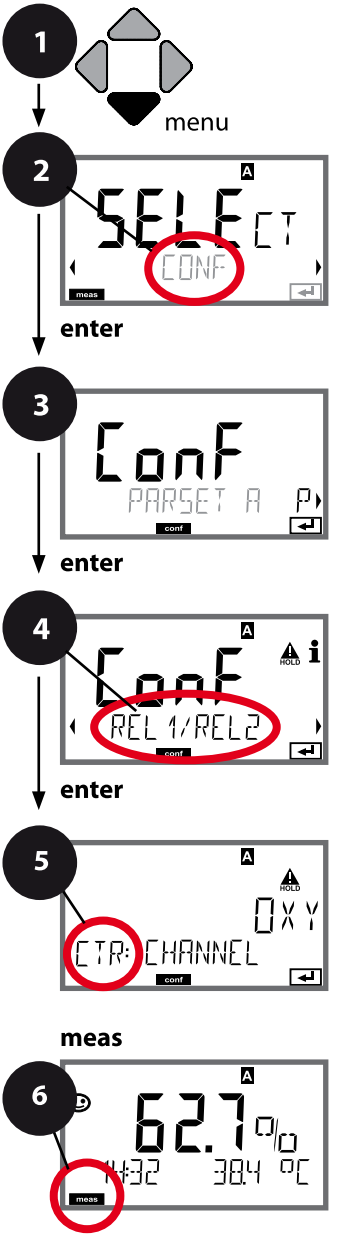



## PID controller and behavior during HOLD

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

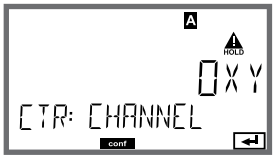
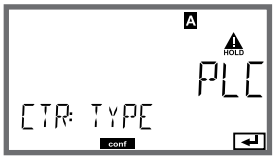
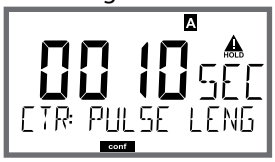
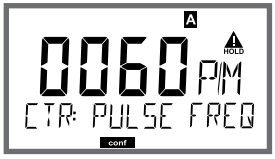
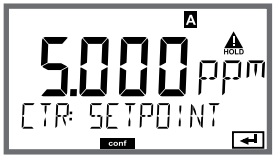



1 Press **menu** key.
2 Select **CONF** using ◂ ▸, press **enter**.
3 Select parameter set using ◂ ▸ keys, press **enter**.
4 Select **REL1/REL2** menu using ◂ ▸ keys, press **enter**.
5 All items of this menu group are indicated by the "CTR:" code.
Press **enter** to select menu, edit using arrow keys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

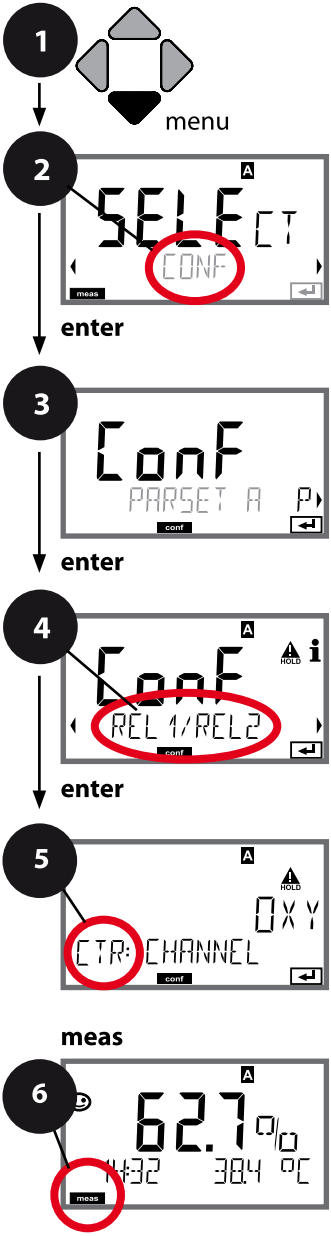
5

| | |
|---|---|
| Use of relays | enter |
| Select process variable | |
| Controller type | |
| Pulse length | |
| Pulse frequency | |
| Desired value | |
| Neutral zone<br>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:<br>• Controller (CONTROLLER)<br><br>Press **enter** to confirm. | **LIMITS** / CONTROLLER<br><br>Selecting CONTROLLER leads to Controller menu group CTR. |
| Select process variable<br>  | Select desired process variable using ▲ ▼ keys.<br><br>Press **enter** to confirm. | Depending on module or Memosens sensor |
| Controller type<br>  | Pulse length controller (PLC) or pulse frequency controller (PFC)<br>Select using ▲ ▼ keys.<br>Press **enter** to confirm. | **PLC**/PFC |
| Pulse length<br>  | Only with PLC: Pulse length<br>Adjust using ▲ ▼ ◀ ▶ keys.<br><br>Press **enter** to confirm. | 0...0600 SEC<br>(**0010 SEC**) |
| Pulse frequency<br>  | Only with PFC: Pulse frequency<br>Adjust using ▲ ▼ ◀ ▶ keys.<br><br>Press **enter** to confirm. | 0...0180 P/M<br>(**0060 P/M**)<br><br>(pulses per minute) |
| Desired value<br>  | Adjust setpoint using ▲ ▼ ◀ ▶ keys.<br><br>Press **enter** to confirm. | Depending on module or Memosens sensor |

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

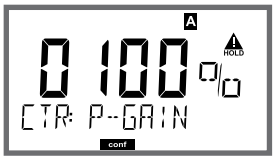
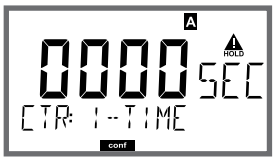
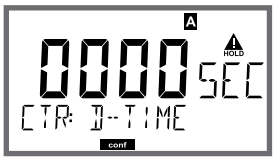



1 Press **menu** key.
2 Select **CONF** using ◂ ▸, press **enter**.
3 Select parameter set using ◂ ▸ keys, press **enter**.
4 Select **REL1/REL2** menu using ◂ ▸ keys, press **enter**.
5 All items of this menu group are indicated by the "CTR:" code.
Press **enter** to select menu, edit using arrow keys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

5

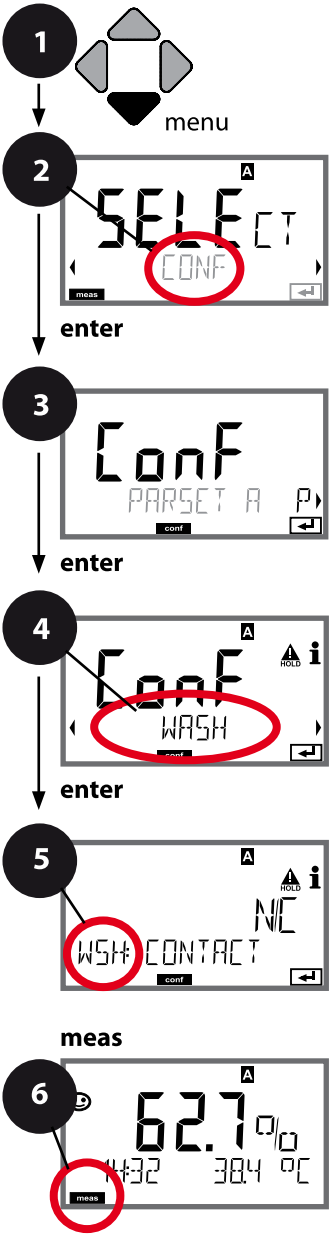
| | |
|---|---|
| Use of relays | enter |
| Select process variable | |
| Controller type | |
| Pulse length | |
| Pulse frequency | |
| Desired value | |
| Neutral zone | |
| Controller: P action | |
| Controller: I action | |
| Controller: D action | |
| Behavior during HOLD | |

5

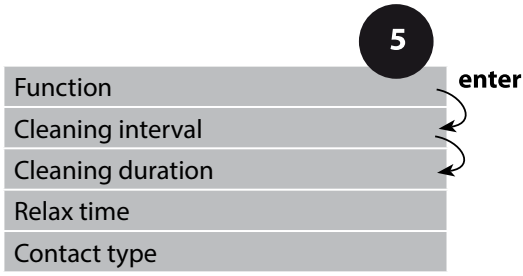
| Menu item | Action | Select |
|---|---|---|
| Neutral zone   | Adjust neutral zone using ▲ ▼ ◀ ▶ keys.<br>Press **enter** to confirm. | Depending on module or Memosens sensor |
| Controller: P action   | Adjust P action using ▲ ▼ ◀ ▶ keys.<br>Press **enter** to confirm. | 10...9999%<br>(**0100%**) |
| Controller: I action   | Adjust I action using ▲ ▼ ◀ ▶ keys.<br>Press **enter** to confirm. | 0...9999 SEC<br>(**0000 SEC**) |
| Controller: D action   | Adjust D action using ▲ ▼ ◀ ▶ keys.<br>Press **enter** to confirm. | 0...9999 SEC<br>(**0000 SEC**) |
| Behavior during HOLD *)   | Select response using ▲ ▼ keys.<br>Press **enter** to confirm. | **Y LAST** / Y OFF<br>Y LAST:<br>The controller output Y is maintained during HOLD<br>Y OFF:<br>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.

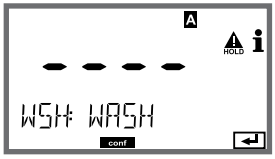
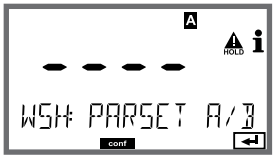
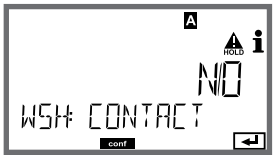
## WASH Contact, Controlling a Rinsing Probe or Signaling the Parameter Set

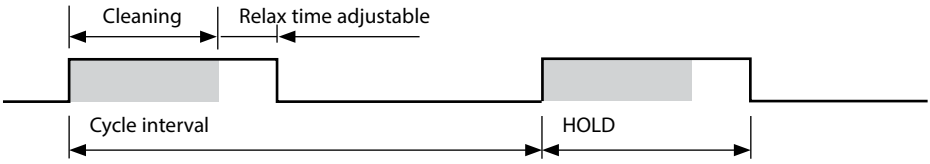



1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
press **enter**.
3 Select parameter set A using ◂ ▸ keys,
press **enter**.
4 Select **WASH** menu using ◂ ▸ keys,
press **enter**.
5 All items of this menu group are indicated by the "WSH:" code.
Press **enter** to select menu,
edit using arrow keys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

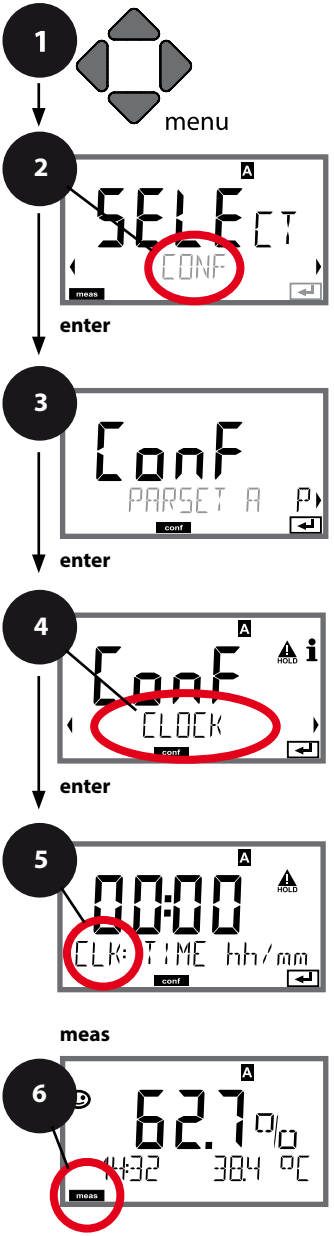


5

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



## Time and Date, Measuring Point (TAG, GROUP)




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 format | enter |
| Time | |
| Day and month | |
| Year | |
| | |
| TAG of measuring point | |
| GROUP of measuring points | |

## 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:**

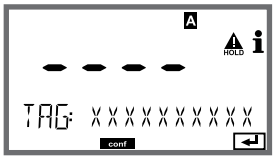
There is no automatic switchover from winter to summer time!

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<br>of measuring point<br>  | 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.<br>Up to 32 digits are possible.<br>By pressing **meas** (repeatedly) in the measuring mode you can view the tag number. Select character using ▲ ▼ keys,<br>select next digit using ◀ ▶ keys.<br>Press **enter** to confirm. | A...Z, 0...9, – + < > ? / @<br><br>The first 10 characters are seen in the display without scrolling. |
| GROUP<br>of measuring points | Select number using ▲ ▼ keys,<br>select next digit using ◀ ▶ keys.<br>Press **enter** to confirm. | 0000 ... 9999<br>**(0000)** |

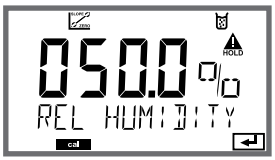
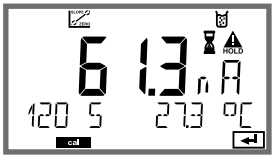
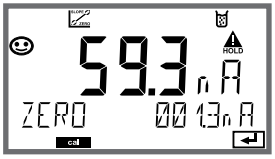
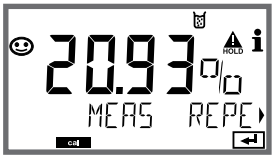
Calibration adapts the device to the individual sensor characteristics.
For best performance, you should always calibrate in air.
Compared to water, air is a calibration medium which is easy to handle, stable, and thus safe. In the most cases, however, the sensor must be removed for a calibration in air.
When dealing with biotechnological processes which require sterile conditions, the sensor cannot be removed for calibration. Here, calibration must be performed directly in the process medium (e.g., after sterilization and aeration).
In the field of biotechnology, for example, often saturation is measured and calibration is performed in the process medium for reasons of sterility.
For other applications where concentration is measured (water control etc.), calibration in air has proved to be useful.

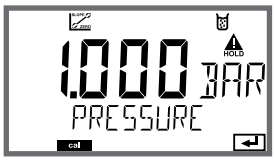
**Note**
All calibration procedures must be performed by trained personnel. Incorrectly set parameters may go unnoticed, but change the measuring properties.

## Common Combination: Process Variable / Calibration Mode

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

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

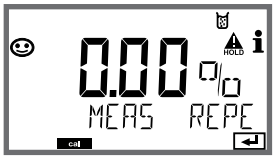
| Display | Action | Remark |
|---|---|---|
|  | Select calibration.<br>Place sensor in air,<br>press **enter** to start.<br>Device goes to HOLD mode. | "CAL WATER" or<br>"CAL AIR" is selected in the configuration. |
|  | Enter relative humidity using **arrow keys**.<br><br>Press **enter** to proceed. | Default for relative humidity in air:<br>rH = 50% |
|  | Enter cal pressure using **arrow keys**.<br>Press **enter** to proceed. | Default: **1.013 bar**<br>Unit: bar/kpa/PSI |
|  | Drift check:<br>Display of:<br>sensor current (nA),<br>response time (s),<br>temperature (°C/°F)<br>Press **enter** to proceed. | The drift check can take some minutes. |
|  | Display of calibration data (slope and zero).<br>Press **enter** to proceed. | |
|  | Display of selected process variable (here: %vol). Now the device is in HOLD mode: Reinstall the sensor and check whether the measurement is OK.<br>MEAS exits calibration,<br>REPEAT permits repetition. | After end of calibration, the outputs remain in HOLD mode for a short time. |

| Display | Action | Remark |
|---|---|---|
|  | Select calibration (SLOPE).<br>Immerse sensor in cal medium, press **enter** to start. | "CAL WATER" or "CAL AIR" is selected in the configuration. |
|  | Enter cal pressure.<br><br>Press **enter** to proceed. | Default: **1.013 bar**<br>Unit: bar/kpa/PSI |
|  | Drift check: Display of: sensor current (nA), response time (s), temperature (°C/°F) | Device goes to HOLD mode.<br><br>The drift check might take some time. |
|  | Display of calibration data (slope and zero) and Sensoface<br><br>Press **enter** to proceed. | Related to 25 °C and 1013 mbar |
|  | Display of selected process value.<br>To exit calibration:<br>Select MEAS ◂ ▸, then **enter** | To repeat calibration:<br>Select REPEAT ◂ ▸, then **enter** |
|  | Place sensor in process.<br>End of calibration | After end of calibration, the outputs remain in HOLD mode for a short time. |

# Zero Calibration

Flawless, amperometric oxygen sensors have a low zero current. Therefore, a zero calibration is only recommended for measurement of oxygen traces.

When a zero calibration is performed, the sensor should remain for at least 10 to 30 minutes in the calibration medium (sulfite solution or nitrogen) in order to obtain stable, non-drifting values.
During zero calibration, a drift check is not performed. Zero current of a flawless sensor is notably less than 0.5 % of air current.

| Display | Action | Remark |
|---|---|---|
|  | Select calibration,<br>proceed by pressing **enter** | |
|  | Ready for calibration.<br>Hourglass blinks.<br>Place sensor in oxygen-free medium | Display (3 sec)<br>Now the device is in HOLD mode. |
|  | Primary display:<br>zero current.<br>Press **enter** to save this value or correct using **arrow keys** and then save by pressing **enter**.<br>Secondary display:<br>currently measured sensor current | Wait for the value to stabilize, can take 10 ... 30 minutes. |
|  | Display of slope<br>Display of new zero current. End calibration by pressing **enter** key, place sensor in process. | Sensoface display |
|  | The oxygen value is shown in the primary display.<br>To exit calibration:<br>Select MEAS, then **enter** | To repeat calibration:<br>Select REPEAT, then **enter** |
|  | End of calibration | After end of calibration, the outputs remain in HOLD mode for a short time. |

## Calibration by Sampling (One-Point Calibration)

During product calibration the sensor remains in the process.
The measurement process is only interrupted briefly.

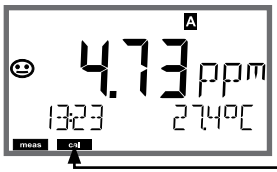
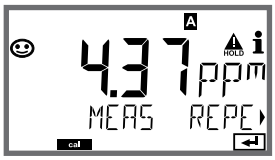
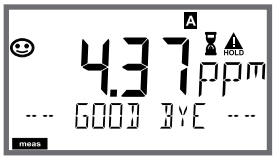
**Procedure:**

During sampling the currently measured value is stored in the device. The device immediately returns to measuring mode. The cal mode indicator blinks and reminds you that calibration has not been terminated. The reference value is measured on the site, e.g., using a portable meter in a bypass.

This value is then entered in the device. The new value for slope or zero is calculated from the stored value and the reference value. From the measured value, the device automatically recognizes whether a new slope or zero must be calculated (above approx. 5 % saturation: slope, below: zero).

If the sample is invalid, you can take over the measured value saved during sampling instead of the reference value. In that case the old calibration values remain stored. Afterwards, you can start a new product calibration. The following describes a product calibration with slope correction – a product calibration with zero correction is performed correspondingly.

| Display | Action | Remark |
|---|---|---|
|  | Select product calibration: P_CAL<br>Press **enter** to proceed. | If you have protected the calibration with a passcode (in the Service menu), the device will return to measuring mode when an invalid code is entered. |
|  | Ready for calibration.<br>Hourglass blinks.<br>Press **enter** to proceed. | Display (3 sec) |
|  | Take sample and save value.<br>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:<br>When the sample value has been determined, open the product calibration once more (P_CAL). | Display (3 sec)<br>Now the device is in HOLD mode. |
|  | The stored value is displayed (blinking) and can be overwritten with the measured sample value.<br>Press **enter** to proceed. | |
|  | Display of new slope and zero.<br>Sensoface is active.<br><br>Press **enter** to proceed. | Related to 25 °C and 1013 mbar<br>To repeat calibration:<br>Select REPEAT, then **enter** |
|  | Display of new oxy value.<br>Sensoface is active.<br>To exit calibration:<br>Select MEAS, then **enter** | To repeat calibration:<br>Select REPEAT, then **enter** |
|  | End of calibration | After end of calibration, the outputs remain in HOLD mode for a short time. |

**Calibrating/Adjusting the SE 740 Optical Oxygen Sensor**
Every oxygen sensor has its individual slope (Stern-Volmer constant cvs) and its individual zero point (phase angle). Both values are altered, for example, by aging.
For sufficiently high accuracy of oxygen measurement, the analyzer must be regularly adjusted for the sensor data (adjustment).

**Calibration/Adjustment Methods**
- Automatic calibration in water/air
- Zero calibration
- Product calibration (saturation/concentration/partial pressure)
- Offset correction

**Recommendations for Calibration**
It is always recommended to calibrate in air. Compared to water, air is a calibration medium which is easy to handle, stable, and thus safe. In the most cases, however, the sensor must be removed for a calibration in air. In certain processes the sensor cannot be removed for calibration. Here, calibration must be performed directly in the process medium (e.g. by means of a product calibration).

If there is a temperature difference between the calibration medium and the measured medium, you must keep the sensor in the respective medium for several minutes before and after calibration in order to achieve stable measured values.
The type of calibration pressure detection is preset during parameter setting.

# 110 LDO Slope Calibration in Air

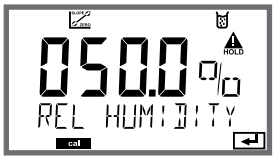
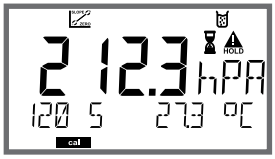
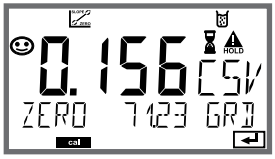
**Automatic Calibration in Air**

The slope is corrected using the saturation value (100 %), similar to air saturation of water. Since this analogy only applies to water-vapor saturated air (100 % relative humidity) and often the calibration air is less humid, the relative humidity of the calibration air must also be specified. If you do not know the exact value of the relative humidity of the calibration air, you can take the following reference values for a sufficiently precise calibration:

- Ambient air: 50 % rel. humidity (average)
- Bottled gas (synthetic air): 0 % rel. humidity

**NOTICE!**

The sensor membrane must be dry. Be sure to keep temperature and pressure constant during calibration. If there is a temperature difference between calibration medium and measured medium, you must keep the sensor in the respective medium for several minutes before and after calibration.

| Display | Action | Remark |
|---|---|---|
|  | Select calibration.<br>Place sensor in air,<br>press **enter** to start.<br>Device goes to HOLD mode. | "CAL WATER" or<br>"CAL AIR" is selected in the configuration. |
|  | Enter relative humidity using **arrow keys**.<br><br>Press **enter** to proceed. | Default for relative humidity in air:<br>rH = 50% |
|  | Enter cal pressure using **arrow keys**.<br>Press **enter** to proceed. | Default: **1.013 bar**<br>Unit: bar/kpa/PSI |
|  | Drift check:<br>Display of:<br>partial pressure (hPa),<br>response time (s),<br>temperature (°C/°F)<br>Press **enter** to proceed. | The drift check can take some minutes. |
|  | Display of calibration data<br>Sensoface<br>Stern-Volmer constant<br>Press **enter** to proceed. | |
|  | Display of selected process variable. Now the device is in HOLD mode: Reinstall the sensor and check whether the measurement is OK.<br>MEAS exits calibration,<br>REPEAT permits repetition. | After end of calibration, the outputs remain in HOLD mode for a short time. |

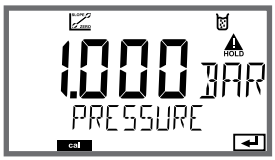
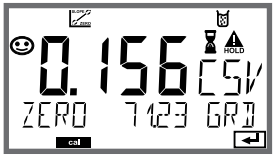
# 112 LDO Slope Calibration in Water

**Automatic Calibration in Water**

The slope is corrected using the saturation value (100 %) of water in equilibrium with air.

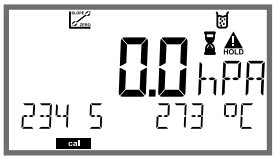
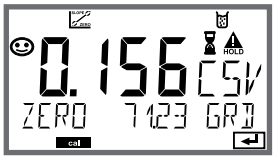
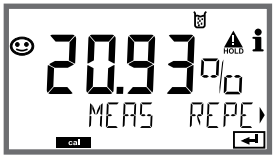
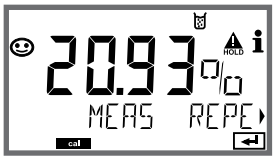
**NOTICE!**

The calibration medium must be in equilibrium with air. Oxygen exchange between water and air is very slow. Therefore, it takes a relatively long time until water is saturated with atmospheric oxygen. If there is a temperature difference between calibration medium and measured medium, you must keep the sensor in the respective medium for several minutes before and after calibration.

| Display | Action | Remark |
|---|---|---|
|  | Select calibration (SLOPE).<br>Immerse sensor in cal medium, press **enter** to start. | "CAL WATER" or "CAL AIR" is selected in the configuration. |
|  | Enter cal pressure<br><br>Press **enter** to proceed. | Default: **1.013 bar**<br>Unit: bar/kpa/PSI |
|  | Drift check: Display of:<br>Partial pressure (hPa)<br>Response time (s)<br>Temperature (°C/°F)<br>Press **enter** to proceed. | Device goes to HOLD mode.<br><br>The drift check might take some time. |
|  | Display of calibration data<br>Sensoface<br>Stern-Volmer constant<br>Press **enter** to proceed. | Phase angle with $O_2$=0 |
|  | Display of selected process value.<br>To exit calibration:<br>Select MEAS ◀ ▶, then **enter** | To repeat calibration:<br>Select REPEAT ◀ ▶, then **enter** |
|  | Place sensor in process.<br>End of calibration | After end of calibration, the outputs remain in HOLD mode for a short time. |

**Zero Correction**

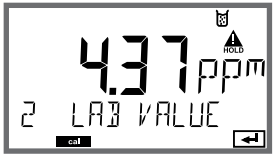
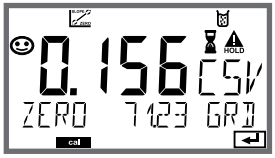
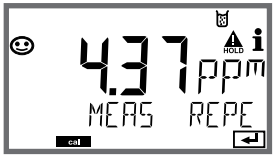
For trace measurements below 500 ppb, the zero point should be calibrated.
If you want to perform a zero correction, then you should keep the sensor in the calibration medium (eg, $N_2$ or sulfite solution) until the measured value has stabilized. This may well take several minutes. After that, you can start the calibration process.

| Display | Action | Remark |
|---|---|---|
|  | Select calibration.<br>Place sensor in $N_2$,<br>press **enter** to start.<br>Device goes to HOLD mode. | "Zero Point" is selected in the configuration. |
|  | Drift check:<br>Display of:<br>partial pressure (hPa),<br>response time (s),<br>temperature (°C/°F)<br>Press **enter** to proceed. | The drift check can take some minutes. |
|  | Display of calibration data<br>Sensoface<br>Stern-Volmer constant<br>Press **enter** to proceed. | Phase angle with $O_2$=0 |
|  | Display of selected process value.<br>To exit calibration:<br>Select MEAS ◂ ▸, then **enter** | To repeat calibration:<br>Select REPEAT ◂ ▸,<br>then **enter** |
|  | Place sensor in process.<br>End of calibration | After end of calibration, the outputs remain in HOLD mode for a short time. |

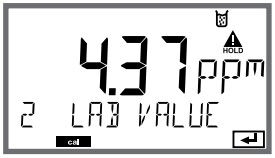
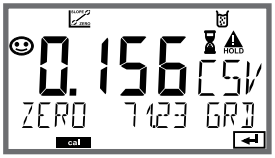
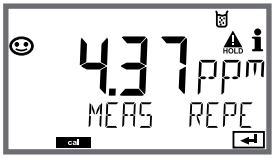
**Product Calibration (Calibration with Sampling)**
When the sensor cannot be removed – e.g. for sterility reasons – its slope can be determined with "sampling". To do so, the currently measured process value is saved by the analyzer. Directly afterwards, you determine a reference value using a portable meter, for example. Then, you enter this reference value into the process analysis system.

## NOTICE!

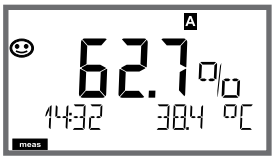
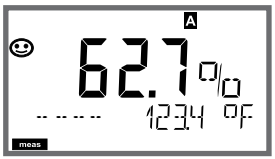
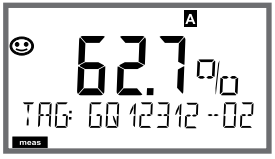
The reference value must be measured at temperature and pressure conditions similar to those of the process.

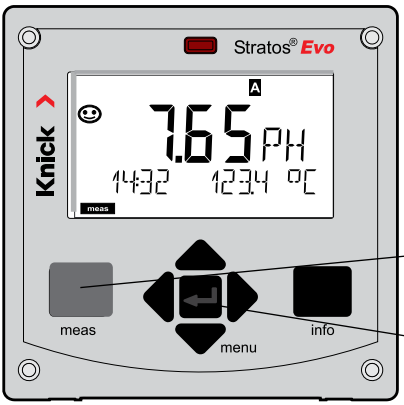
| Display | Action | Remark |
|---|---|---|
|  | Ready for calibration.<br>Hourglass blinks.<br>Press **enter** to proceed. | Display (3 sec) |
|  | Press **enter** to save the measured value and to determine the actual oxygen value. | |
|  | The device returns to measuring mode. | From the blinking CAL mode indicator, you see that product calibration has not been terminated. |
|  | When the sample value has been determined, open the product calibration once more (P_CAL). | P_CAL is displayed for 3 sec.<br>Now the device is in HOLD mode. |
|  | The stored value is displayed (blinking) and can be over-written with the measured sample value.<br>Press **enter** to proceed. | |
|  | Display of calibration data, Sensoface and Stern-Volmer constant<br>Press **enter** to proceed. | |
|  | Display of measured OXY value.<br>Sensoface is active.<br>To exit calibration:<br>Select MEAS, then **enter**<br>To repeat calibration:<br>Select REPEAT, then **enter** | After end of calibration, the outputs remain in HOLD mode for a short time. |

When measuring in the oxygen trace range, you can use the product calibration menu to adjust an offset. The offset can only be determined for measured values < 20 mbar. For higher values, the analyzer corrects the slope and adjusts the Stern-Volmer constant in the sensor.
The offset is stored in the device, not in the sensor. It may be max. 2 mbar (approx. 1 % sat or 0,055 ppm / 0.055 mg/l).

| Display | Action | Remark |
|---|---|---|
|  | Ready for calibration.<br>Hourglass blinks.<br>Press **enter** to proceed. | Display (3 sec) |
|  | Press **enter** to save the measured value. | |
|  | Press **enter** to proceed. | |
|  | The stored value is displayed (blinking).<br>Enter offset.<br>Press **enter** to proceed. | You can adjust an offset (%) when the oxygen concentration is below 20 mbar (20 hPa). |
|  | Display of calibration data,<br>Sensoface and<br>Stern-Volmer constant<br>Press **enter** to proceed. | |
|  | Display of measured OXY value.<br>Sensoface is active.<br>To exit calibration:<br>Select MEAS, then **enter**<br>To repeat calibration:<br>Select REPEAT, then **enter** | After end of calibration, the outputs remain in HOLD mode for a short time. |

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

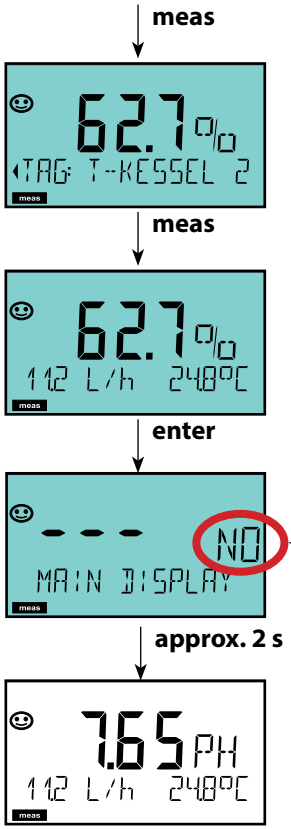
| Display | Remark |
|---|---|
|  <br>or AM/PM and °F:<br>  <br>  | From the configuration or calibration menus, you can switch the device to measuring mode by pressing the **meas** key.<br>In the measuring mode the upper display line shows the configured process variable (%, mg/l, ppm or temperature), the lower display line shows the time and the second configured process variable (%, mg/l, ppm or temperature). The [meas] mode indicator lights and the active parameter set (A/B) is indicated.<br>**Note:**<br>• 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 different displays. When no key has been pressed for 60 sec, the device returns to MAIN DISPLAY. | |
|  <br>  <br>  | 1) Selecting the parameter set (if set to "manual" in the configuration).<br>Select the desired parameter set using the ◀ ▶ arrow keys (PARSET A or PARSET B blinks in the lower display line). Press **enter** to confirm.<br><br>Further displays<br>(each by pressing **meas**).<br><br>2) Display of tag number ("TAG")<br>3) Display of time and date<br>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

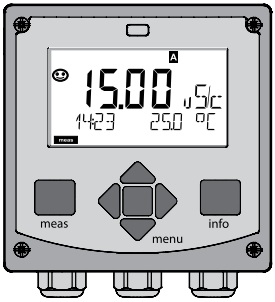



By pressing **meas** briefly you can step through further displays such as tag number (TAG) or flow (L/h).
These displays are turquoise. After 60 sec they switch back to the main display.

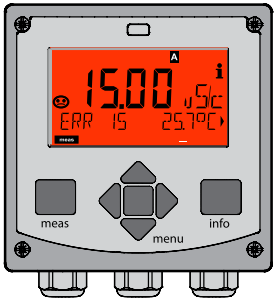
Press **enter** to select a display as MAIN DISPLAY.

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.

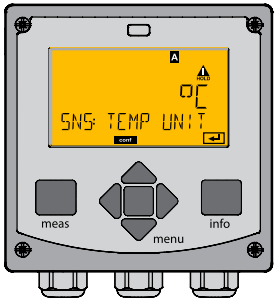
The color-coded user interface guarantees increased operating safety. Operating modes are clearly signaled.
The normal measuring mode is white. Information text appears on a green screen and the diagnostic menu appears on turquoise. The orange HOLD mode (e.g., during calibration) is quickly visible as 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.



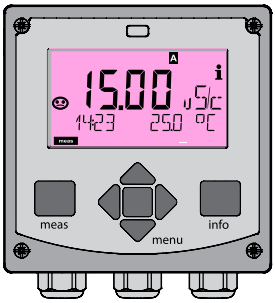

White:
Measuring mode



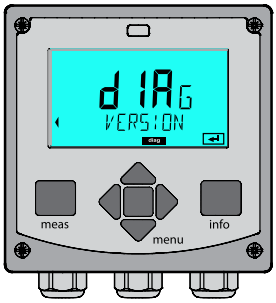

Red blinking:
Alarm, error



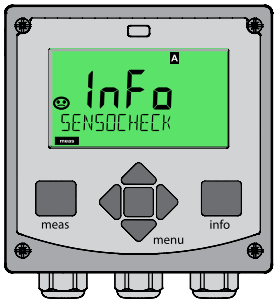

Orange:
HOLD mode



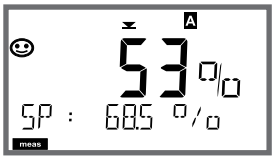

Magenta:
Maintenance request




Turquoise:
Diagnostics




Green:
Info texts

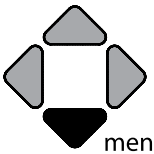
| Display | Remark |
|---|---|
| **With activated controller**<br>you can also step through the following displays by pressing the **meas** key. When no key has been pressed for 60 sec, the device returns to the standard display. | |
|  | Upper display: Controller output Y<br>The controller output can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

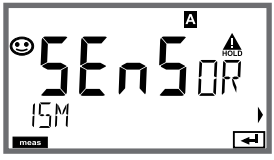
In the Diagnostics mode you can access the following menus without interrupting the measurement:

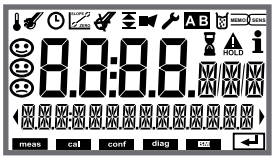
| | |
|---|---|
| CALDATA | Viewing the calibration data |
| SENSOR | Viewing the sensor data |
| SELFTEST | Starting a device self-test |
| LOGBOOK | Viewing the logbook entries |
| MONITOR | Displaying currently measured values |
| VERSION | Displaying device type, software version, serial number |

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

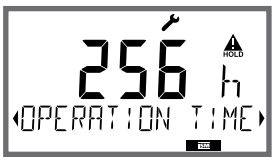
**Note:**
HOLD is not active during Diagnostics mode!

| Action | Key | Remark |
|---|---|---|
| Activate diagnostics |  menu | Press **menu** key to call the selection menu.<br>(Display color changes to turquoise.)<br>Select DIAG using ◂ ▸ keys, confirm by pressing **enter** |
| Select diagnostics option | | Use ◂ ▸ keys to select from:<br>CALDATA SENSOR SELFTEST<br>LOGBOOK MONITOR VERSION<br>See next pages for further proceeding. |
| Exit | **meas** | Exit by pressing **meas**. |

| Display | Menu item |
|---|---|
|  <br>  <br>  <br>  <br>  | **Displaying the calibration data**<br>Select CALDATA using ◂ ▸, confirm by pressing **enter**.<br>Use the ◂ ▸ keys to select the desired parameter from the bottom line of the display (LAST_CAL ZERO SLOPE OFFSET (LDO) NEXT_CAL).<br>The selected parameter is shown in the upper display line.<br><br>Press **meas** to return to measurement. |
|  <br>  | **Displaying the sensor data**<br>For analog sensors, the type is displayed, for digital sensors, the manufacturer, type, serial number and last calibration date.<br>In each case Sensoface is active.<br><br>Display data using ◂ ▸ keys, return by pressing **enter** or **meas**. |

| Display | Menu item |
|---|---|
|  | **Device self-test**<br>(To abort, you can press **meas**.)<br>1) **Display test**: Display of all segments with changing background colors (white/green/red).<br>Proceed by pressing **enter** |
|  | 2) **RAM test:** Hourglass blinks,<br>then display of --PASS-- or --FAIL--<br>Proceed by pressing **enter** |
|  | 3) **EEPROM test:** Hourglass blinks,<br>then display of --PASS-- or --FAIL--<br>Proceed by pressing **enter** |
|  | 4) **FLASH test:** Hourglass blinks,<br>then display of --PASS-- or --FAIL--<br>Proceed by pressing **enter** |
|  | 5) **Module test:** Hourglass blinks,<br>then display of --PASS-- or --FAIL--<br>Return to measuring mode<br>by pressing **enter** or **meas** |

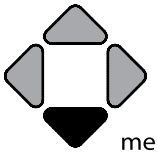
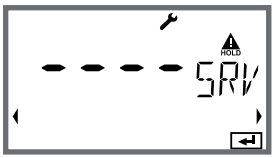
| Display | Menu item |
|---|---|
|  | **Displaying the logbook entries**<br>Select LOGBOOK using ◀ ▶, press **enter** to confirm.<br><br>With the ▲ ▼ keys, you can scroll backwards and forwards through the logbook (entries -00-...-99-), -00- being the last entry. |
|  | If the display is set to date/time,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

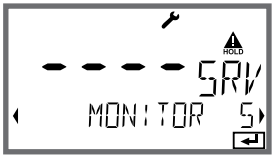
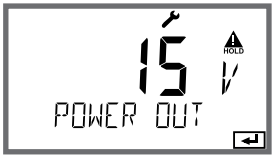
| Display | Menu item |
|---|---|
|  | **Displaying the currently measured values (sensor monitor)**<br>Select MONITOR using ◂ ▸, press **enter** to confirm. Use the ▲ ▼ keys to select the desired parameter from the bottom line of the display: OXY RTD I-INPUT (for digital sensors also: OPERATION TIME ACT (adaptive cal timer) TTM (adaptive maintenance timer) DLI (Dynamic Life Time Indicator) CIP SIP AUTOCLAVE). The selected parameter is shown in the upper display line.<br>Press **meas** to return to measurement. |
| Display examples: | |
|  | Display of directly measured value (for validation, sensor can be immersed in a calibration solution, for example, or the device is checked by using a simulator) |
|  | Display of remaining dynamic lifetime (only for digital sensors, however not for MEMOSENS) |
|  | Display of sensor operating time (for digital sensors only) |
|  | **Version**<br>Display of **device type, software/hardware/bootloader version** and **serial number** for all device components.<br>Use the ▲ ▼ keys to switch between software and hardware version. Press **enter** to proceed to next device component. |

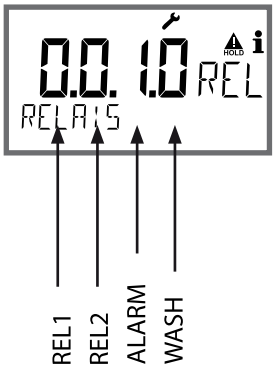
In the Service mode you can access the following menus:

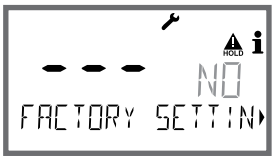
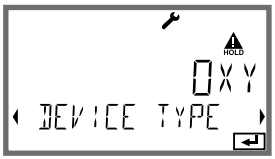
| | |
|---|---|
| MONITOR | Displaying currently measured values |
| SENSOR | Displaying the sensor data, with MEMOSENS also resetting the sensor wear counter after replacement of electrolyte/membrane;<br>ISM only: resetting TTM;<br>ISM/LDO: incrementing the autoclaving counter |
| POWER OUT | Power 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 |  | Press **menu** key to call the selection menu.<br>Select SERVICE using ◂ ▸ keys, press **enter** to confirm. |
| Passcode |  | Enter passcode "5555" for service mode using the ▴ ▾ ◂ ▸ keys.<br><br>Press **enter** to confirm. |
| Display |  | In service mode the following icons are displayed:<br>• HOLD triangle<br>• Service (wrench) |
| Exit | **meas** | Exit by pressing **meas**. |

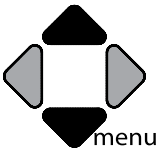
| Menu item | Remark |
|---|---|
|  | **Displaying currently measured values (sensor monitor) with HOLD mode activated:**<br>Select MONITOR using ◂ ▸, press **enter** to confirm.<br>Select variable in the bottom text line using ◂ ▸.<br>The selected parameter is shown in the upper display line.<br>As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

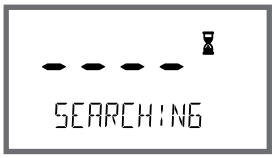
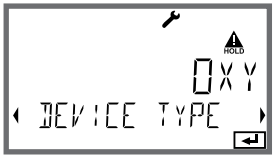
| Menu item | Remark |
|---|---|
|  | **Specifying the current for outputs 1 and 2:**<br>Select OUT1 or OUT2 using the ◂ ▸ keys, press **enter** to confirm.<br>Enter a valid current value for the respective output using ▲ ▼ ◂ ▸ keys.<br>Confirm by pressing **enter**.<br>For checking purposes, the actual output current is shown in the bottom right corner of the display.<br>Exit by pressing **enter** or **meas**. |
|  | **Relay test (manual test of contacts):**<br>Select RELAIS using ◂ ▸, press **enter** to confirm.<br>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).<br>The digit for the selected relay blinks.<br>Select one of the 4 relays using the ◂ ▸ keys, close (1) or open (0) using the ▲ ▼ keys.<br>Exit by pressing **enter**.<br>The relays will be re-set corresponding to the measured value.<br><br>Press **meas** to return to measurement. |

| Menu item | Remark |
|---|---|
|  | **Assigning passcodes:**<br>In the "SERVICE - CODES" menu you can assign passcodes to DIAG, HOLD, CAL, CONF and SERVICE modes (Service preset to 5555).<br>**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.<br>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:**<br>In the "SERVICE - DEFAULT" menu you can reset the device to factory settings.<br>**NOTICE!**<br>After a reset to factory setting the device must be reconfigured completely, including the sensor parameters! |
|  | **Option request:**<br>Communicate the serial number and hardware/software version of your device to the manufacturer. These data can be viewed in the Diagnostics/Version menu.<br>The "transaction number" (TAN) you will then receive is only valid for the device with the corresponding serial number.<br>**Releasing an option:**<br>Options come with a "transaction number" (TAN). To release the option, enter this TAN and confirm by pressing **enter**. |
|  | **Device type:**<br>Changing the measuring function, e.g., after having replaced a Memosens sensor.<br>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**<br>Device type not assigned<br>Defective sensor<br>Sensor not connected<br>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 11** | RANGE | **Display range violation**<br>(see page 137 et seq.) |
| **ERR 12** | MV RANGE | **mV range** |
| **ERR 13** | TEMPERATURE RANGE | **Temperature range violation**<br>(See "Measuring range" on page 145) |
| **ERR 60** | OUTPUT LOAD | **Load error** |
| **ERR 61** | OUTPUT 1 TOO LOW | **Output current 1**<br>< 0 (3.8) mA |
| **ERR 62** | OUTPUT 1 TOO HIGH | **Output current 1**<br>> 20.5 mA |
| **ERR 63** | OUTPUT 2 TOO LOW | **Output current 2**<br>< 0 (3.8) mA |
| **ERR 64** | OUTPUT 2 TOO HIGH | **Output current 2**<br>> 20.5 mA |

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

| Error | Info text (is displayed in case of fault when the Info key is pressed) | Problem Possible causes |
|---|---|---|
| **ERR 102** | INVALID PARAMETER U-POL | **Configuration error** Polarization voltage |
| **ERR 103** | INVALID PARAMETER MEMBR. COMP | **Configuration error** Membrane correction |
| **ERR 104** | INVALID PARAMETER CONTROLLER | **Configuration error** Controller |
| **ERR 105** | INVALID SPAN I-INPUT | **Configuration error** Current input |

**Sensoface messages:**

| | |
|---|---|
| Calibration timer expired: | OUT OF CAL TIME CALIBRATE OR CHANGE SENSOR |
| TTM for ISM: | OUT OF MAINTENANCE CHECK ELECTROLYTE AND MEMBRANE |
| DLI for ISM: | END OF LIFETIME CHANGE SENSOR OR INNERBODY |
| Sensor zero/slope: | SENSOR ZERO/SLOPE CALIBRATE OR CHANGE SENSOR |
| Sensor response: | SENSOR DRIFT CALIBRATE OR CHANGE SENSOR |
| Sensor wear (MS): | SENSOR WEAR CHECK ELECTROLYTE AND MEMBRANE |
| Sensor wear (LDO, SE 740) | SENSOR WEAR CHANGE SENSOR CAP |
| Autoclaving counter: | AUTOCLAVE CYCLES OVERRUN |
| CIP cycles exceeded: | CIP-CYCLES OVERRUN |
| SIP cycles exceeded: | SIP-CYCLES OVERRUN |
| 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.

| 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:

| **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 |

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

*) user-defined

1) according to IEC 746 Part 1, at normal operating conditions

| | | |
|---|---|---|
| **Measuring ranges with trace sensors "001"** | | |
| **(TAN SW-A004)** | Saturation (–10 ... 80°C) | 0.000 ... 150.0 % |
| | Concentration (–10 ... 80°C) | 000.0 ... 9999 µg/l / 10.00 ... 20.00 mg/l |
| | (Dissolved oxygen) | 000.0 ... 9999 ppb / 10.00 ... 20.00 ppm |
| | Volume concentration in gas | 000.0 ... 9999 ppm / 1.000 ... 50.00 %vol |
| **Polarization voltage** | 0 ... –1000 mV | |
| | Default –675 mV (resolution < 5 mV) | |
| Permissible guard current | ≤ 20 µA | |
| **Input correction** | Pressure correction * | 0.000 ... 9.999 bar / 999.9 kPa / 145.0 PSI |
| | | manually or through current input 0(4) ... 20 mA |
| | Salinity correction | 0.0 ... 45.0 g/kg |
| **Measurement using SE 740 (optical sensor)** | | |
| Measuring range | 0 … 300 % air saturation | |
| Detection limit | 0.01 %vol | |
| Response time $t_{98}$ | < 30 s (at 25 °C, from air to nitrogen) | |
| **Operating modes** | GAS | Measurement in gases |
| | DO | Measurement in liquids |
| **Display ranges, standard** | | |
| Saturation (–10 ... 80°C) | 0.0 ... 600.0 % | |
| Concentration (–10 ... 80°C) | 0.00 ... 99.99 mg/l | |
| (Dissolved oxygen) | 0.00 ... 99.99 ppm | |
| Volume concentration in gas | 0.00 ... 99.99 %vol | |
| **Display ranges, traces (TAN)** | | |
| Saturation (–10 ... 80°C) | 0.000 ... 150.0 % | |
| Concentration (–10 ... 80°C) | 0000 ... 9999 µg/l / 10.00 ... 20.00 mg/l | |
| (Dissolved oxygen) | 0000 ... 9999 ppb / 10.00 ... 20.00 ppm | |
| Volume concentration in gas | 0000 ... 9999 ppm / 1.000 ... 50.00 %vol | |

| | | |
|---|---|---|
| **Sensor standardization *** | | |
| Operating modes * | CAL_AIR Automatic calibration in air | |
| | CAL_WTR Automatic calibration in air-saturated water | |
| | P_CAL Product calibration | |
| | CAL_ZERO Zero calibration | |
| Calibration range | Zero point | ± 2 nA |
| Standard sensor "10" | Slope | 25 ... 130 nA (at 25 °C, 1013 mbar) |
| Calibration range | Zero point | ± 2 nA |
| Trace sensor "01" | Slope | 200 ... 550 nA (at 25 °C, 1013 mbar) |
| Calibration range | Zero point | ± 3 nA |
| Trace sensor "001" | Slope | 2000 ... 9000 nA (at 25 °C, 1013 mbar) |
| Calibration timer * | Interval 0000 ... 9999 h | |
| Pressure correction * | Manual 0.000 ... 9.999 bar / 999.9 kPa / 145.0 PSI | |
| **Sensocheck** | Monitoring of membrane and electrolyte and the sensor wires for short circuits or open circuits (can be switched off) | |
| Delay | Approx. 30 s | |
| **Sensoface** | Provides information on the sensor condition<br>Evaluation of zero/slope, response, calibration interval, wear, Sensocheck (can be switched off), sensor verification (TAG, GROUP) | |
| **Temperature input** | NTC 22 kΩ / NTC 30 kΩ * | |
| | 2-wire connection, adjustable | |
| Measuring range | -20.0 ... +150.0 °C / -4 to +302 °F | |
| Adjustment range | 10 K | |
| Resolution | 0.1 °C / 0.1 °F | |
| Measurement error [1)] | < 0.5 K (< 1 K at > 100 °C) | |
| **ISM input** | "One wire" interface for operation with ISM (digital sensors)<br>(6 V / Ri= approx. 1.2 kΩ) | |

| | | | |
|---|---|---|---|
| **Input** | for Memosens or optical sensors (SE 740) | | |
| Data In/Out | Asynchronous interface, RS-485, 9600/19200 Bd | | |
| Power supply | Terminal 1: +3.08 V/10 mA, Ri < 1 ohm, short-circuit-proof | | |
| | Terminal 5: 3.1 … 24 V/1W in four discrete levels (3.1/12/15/24 V), short-circuit-proof (levels are software-selectable), 15 V automatic with SE 740 sensor selected | | |
| **I input (TAN)** | 4 ... 20 mA / 50 ohms | | |
| Function | Input of pressure or temperature values from external sensors | | |
| Resolution | Approx. 0.05 mA | | |
| Measurement error [1)] | < 1% current value + 0.1 mA | | |
| **Door contact** | Outputs a signal when the door is open<br>Logbook entry (FDA) | | |
| **HOLD input** | Galvanically separated (optocoupler) | | |
| Function | Switches device to HOLD mode | | |
| Switching voltage | 0 ... 2 V AC/DC | HOLD inactive | |
| | 10 ... 30 V AC/DC | HOLD active | |
| **CONTROL input** [*] | Galvanically separated (optocoupler) | | |
| Function | Selecting parameter set A/B or flow measurement (FLOW) | | |
| Parameter set A/B | Control input | 0 ... 2 V AC/DC | Parameter set A |
| | | 10 ... 30 V AC/DC | Parameter set B |
| FLOW | Pulse input for flow measurement 0 ... 100 pulses/s | | |
| | Display | 00.0 … 99.9 l/h | |
| **Output 1** | 0/4 ... 20 mA, max. 10 V, floating<br>(terminals 8 / 9, galvanically connected to output 2) | | |
| Overrange [*] | 22 mA in the case of error messages | | |
| Characteristic | Linear, with conductivity measurement also bilinear or logarithmic | | |
| Output filter [*] | $PT_1$ filter, time constant 0 ... 120 s | | |
| Measurement error [1)] | < 0.25% current value + 0.025 mA | | |
| **Output 2** | 0/4 ... 20 mA, max. 10 V, floating<br>(terminals 9 / 10, galvanically connected to output 1) | | |
| Overrange [*] | 22 mA in the case of error messages | | |
| Characteristic | Linear, with conductivity measurement also bilinear or logarithmic | | |
| Output filter [*] | $PT_1$ filter, time constant 0 ... 120 s | | |
| Measurement error [1)] | < 0.25% current value + 0.025 mA | | |

*) user-defined

1) according to IEC 746 Part 1, at normal operating conditions

| | |
|---|---|
| **Power Out**<br>Power supply | Power supply output for operating optical sensors (SE 740), selectable between 3.1 V / 12 V / 15 V / 24 V, short-circuit-proof (for SE 740 fixed to 15 V), max. power 1 W |
| **Alarm contact** | Relay contact, floating |
| Contact ratings | AC < 250 V / < 3 A / < 750 VA<br>DC < 30 V / < 3 A / < 90 W |
| Contact response * | N/C (fail-safe type) |
| **Wash contact** | Relay contact, floating |
| Contact ratings | AC < 250 V / < 3 A / < 750 VA<br>DC < 30 V / < 3 A / < 90 W |
| Contact response * | N/C or N/O |
| **Min/max limits** | Min/max contacts, floating, but inter-connected |
| Contact ratings | AC < 250 V / < 3 A / < 750 VA<br>DC < 30 V / < 3 A / < 90 W |
| Contact response * | N/C or N/O |
| Response delay * | 0000 ... 9999 s |
| Setpoints * | As desired within range |
| Hysteresis * | User-defined |
| **Real-time clock** | Different time and date formats selectable |
| Power reserve | > 5 days |
| **Display** | LC display, 7-segment with icons, colored backlighting |
| 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 face) |
| Mode indicators | meas, cal, conf, diag<br>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,<br>switchover via CONTROL input or manually |
| **Diagnostics functions** | |
| Calibration data | Calibration date, zero, slope |
| Device self-test | Automatic memory test (RAM, FLASH, EEPROM) |
| Display test | Display of all segments |
| Logbook | 100 events with date and time<br>200 entries (Audit Trail) with extended logbook (TAN) |

*) user-defined

1) according to IEC 746 Part 1, at normal operating conditions

| | |
|---|---|
| **Service functions** | |
| Current source | Current specifiable for output 1 and 2 (00.00 ... 22.00 mA) |
| Sensor monitor | Display of direct sensor signals (mV/temperature/operating time) |
| Relay test | Manual control of relay contacts |
| Device type | Selecting the measuring function |
| **Data retention** | Parameters, calibration data, logbook > 10 years (EEPROM) |
| **Electrical safety** | Protection against electric shock by protective separation of all extra-low-voltage circuits against mains according to EN 61010-1 |
| **Explosion protection** (A402B) | see Control Drawing or www.knick.de |
| **EMC** | EN 61326 |
| Emitted interference | Class B (residential environment) |
| Immunity to interference | Industrial environment |
| **RoHS conformity** | according to EC directive 2002/95/EC |
| **Power supply** | 80 V (-15%) … 230 (+10%) V AC ; ≤ 15 VA ; 45 … 65 Hz<br>24 V (-15%) … 60 (+10%) V DC ; 10 W<br>Overvoltage category II, protection class II |
| **Nominal operating conditions** | |
| Ambient temperature | -20 … +55 °C / –4 … +131 °F |
| Transport/Storage temperature | -30 … +70 °C / -22 … +158 °F |
| Relative humidity | 10 ... 95 % not condensing |
| **Enclosure** | Molded enclosure made of PBT/PC, glass fiber reinforced |
| Mounting | Wall, pipe/post or panel mounting |
| Color | Gray, RAL 7001 |
| Ingress protection | IP 67 / NEMA 4X outdoor (with pressure compensation) |
| Flammability | UL 94 V-0 |
| Dimensions | H 148 mm, W 148 mm, D 117 mm |
| Control panel cutout | 138 mm x 138 mm to DIN 43 700 |
| Weight | 1.2 kg (1.6 kg incl. accessories and packaging) |
| Cable glands | 3 knockouts for M20 x 1.5 cable glands<br>2 knockouts for NPT ½" or rigid metallic conduit |
| Connections | Terminals, conductor cross section max. 2.5 $mm^2$ |

*) user-defined

1) according to IEC 746 Part 1, at normal operating conditions

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

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

**D**

**M**



**N**



**O**

**P**

**T**

**W**



**Z**

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**Stratos Evo A402: O2 Measurement**

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