The Art of Measuring. **Knick** ›

Stratos Evo A402
O$_2$ Measurement

Knick ›

Stratos® *Evo*

62.7 %

14:32   30.4 °C

meas

meas   menu   info

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:

Parameter concerned

Left page:
How do I get to the
function
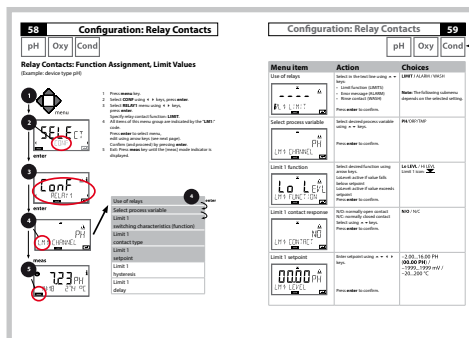
Right page:
Which settings are pro-
vided for this function

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

Introduction

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
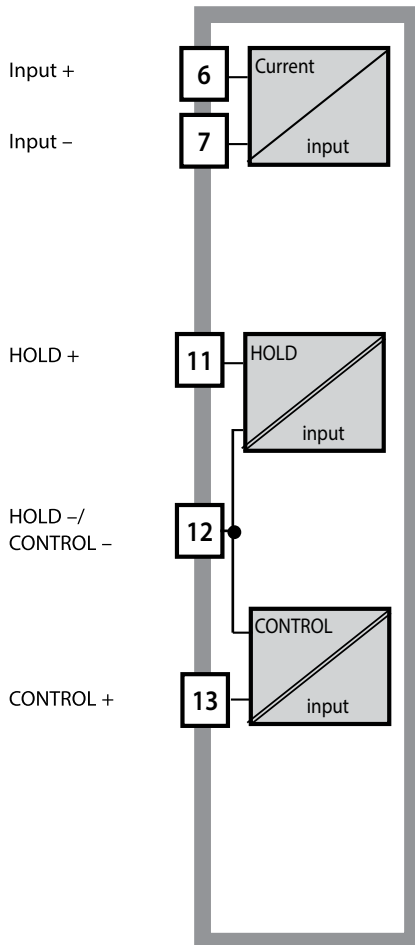100 entries – up to 200 with AuditTrail (additional function, TAN SW-A003).

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
Input +	6	Current	The analog (0) 4 ... 20 mA current input can be used for external pressure or temperature compensation (TAN required).
Input −	7	input	

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.

Input +   6   Current
Input −   7   input

HOLD +   11   HOLD
                    input

HOLD −/
CONTROL −   12

CONTROL
CONTROL +   13   input

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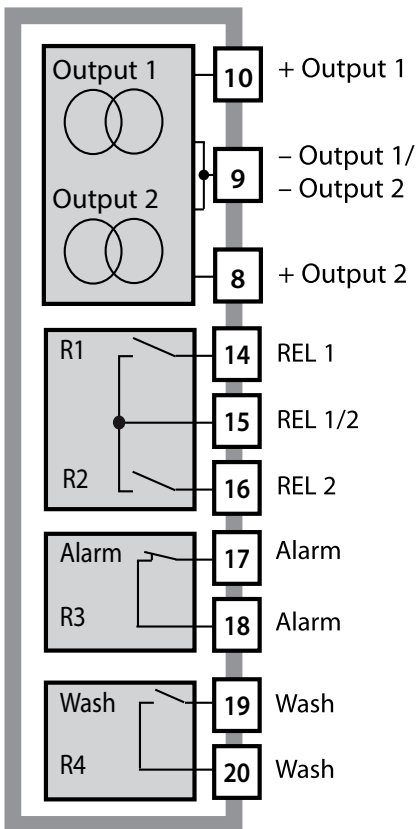
Options
Additional functions can be activated by entering a TAN.

Signal outputs

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

Relay contacts

Four floating relay contacts are available.

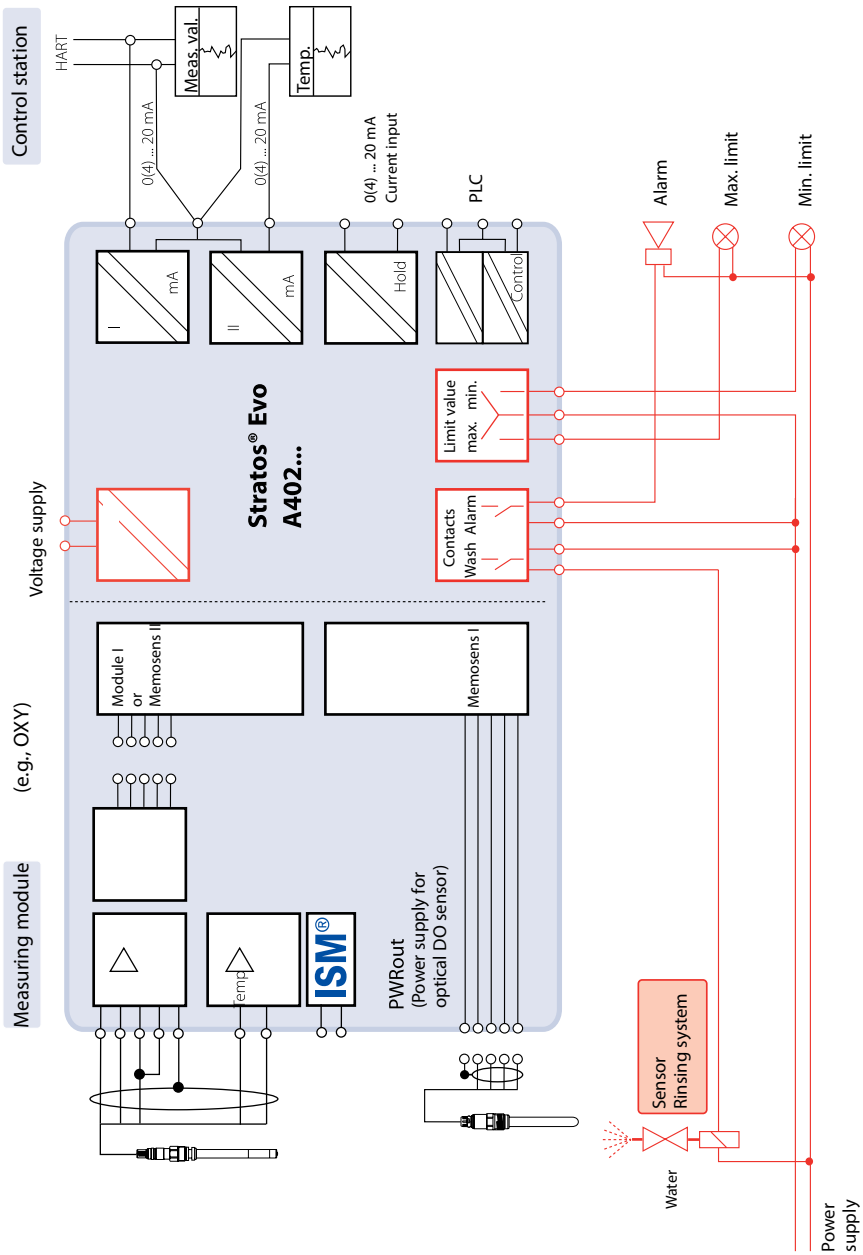|	
Output 1 — 10 + Output 1	**Current outputs**
9 – Output 1/ – Output 2	The floating current outputs (0) 4 ... 20 mA are used for transmitting measured values. An output filter can be programmed, the fault current value can be specified.
Output 2 — 8 + Output 2	
R1 — 14 REL 1	**Relay contacts**
15 REL 1/2	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.
R2 — 16 REL 2	
Alarm — 17 Alarm	**Alarm**
R3 — 18 Alarm	An alarm can be generated by Sensocheck, flow monitoring or current failure.
Wash — 19 Wash	**Wash (cleaning function)**
R4 — 20 Wash	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

mA

II mA

Hold

Control

Limit value
max. min.

**Stratos® Evo
A402...**

Voltage supply

Contacts
Wash Alarm

Module I
or
Memosens II

Memosens I

Measuring module

(e.g., OXY)

ISM®

PWRout
(Power supply for
optical DO sensor)

temp

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
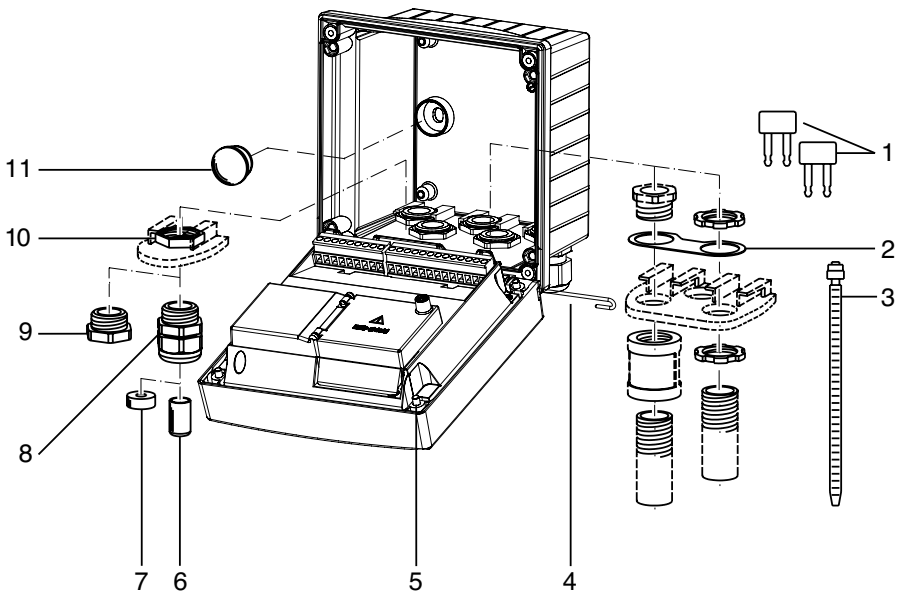
Fig.: Assembling the enclosure

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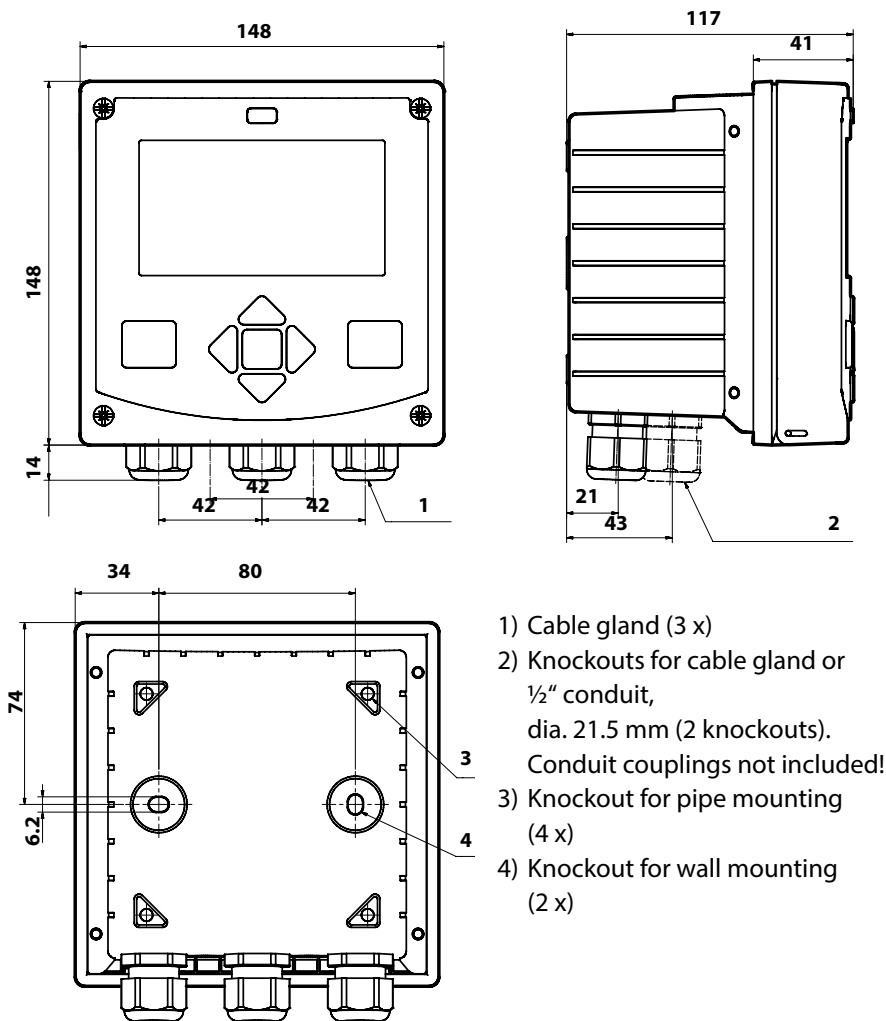
1) Cable gland (3 x)
2) Knockouts for cable gland or
   ½" conduit,
   dia. 21.5 mm (2 knockouts).
   Conduit couplings not included!
3) Knockout for pipe mounting
   (4 x)
4) Knockout for wall mounting
   (2 x)

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

ø40...ø60
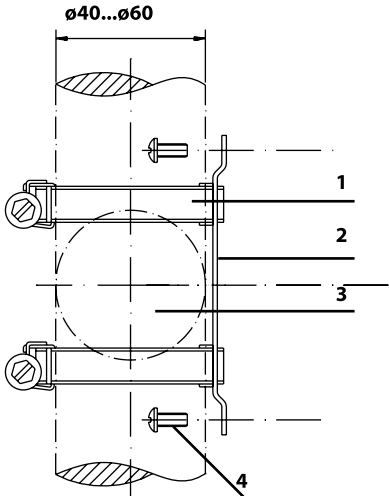
1) Hose clamp with worm gear drive to DIN 3017 (2 x)
2) Pipe-mount plate (1 x)
3) For vertical or horizontal posts or pipes
4) Self-tapping screw (4 x)

1
2
3
4

Fig.: Pipe-mount kit, accessory ZU 0274

199

147

185

91
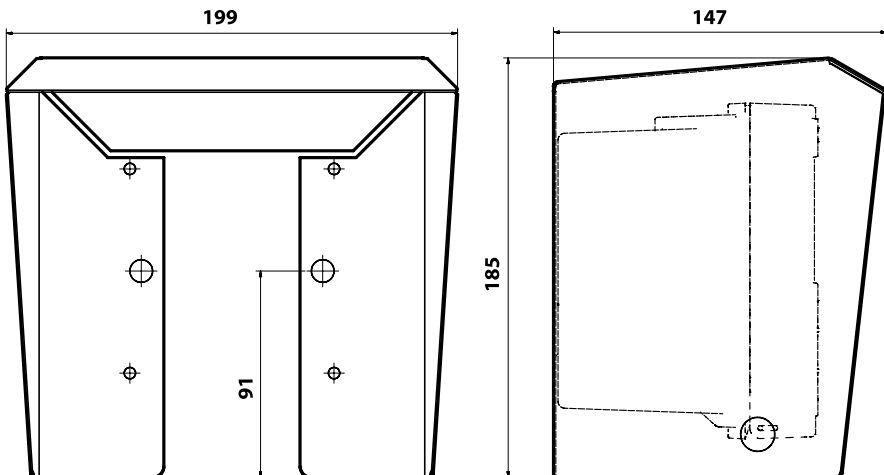
Fig.: Protective hood for wall and pipe mounting, accessory ZU 0737

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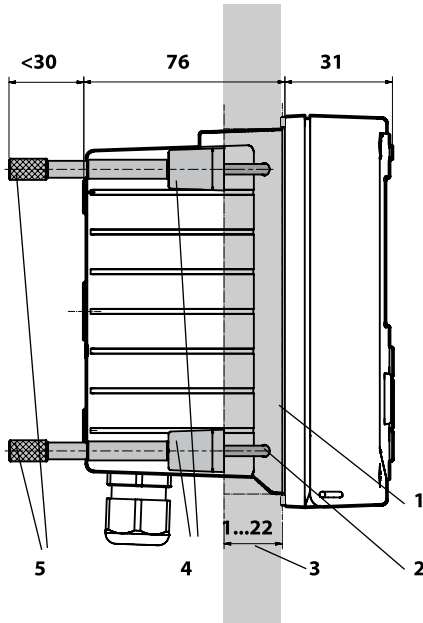
1) Circumferential sealing (1 x)
2) Screws (4 x)
3) Position of control panel
4) Span piece (4 x)
5) Threaded sleeve (4 x)

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)

Slot for measuring module	
Output 1	**10** + Output 1
	9 – Output 1/ – Output 2
Output 2	**8** + Output 2
R1	**14** REL 1
	15 REL 1/2
R2	**16** REL 2
Alarm	**17** Alarm
	18 Alarm

Memosens

+3 V	**1**	RS-485	
		Wash	**19** Wash
			20 Wash
RS 485 A	**2**		
RS 485 B	**3**		
GND/Shield	**4**		
PWR out	**5**		
Input +	**6**	Current	
Input –	**7**	input	
HOLD +	**11**	HOLD input	
HOLD –/ CONTROL –	**12**		Power	**21** Power
		Control	
CONTROL +	**13**	input	**22** Power
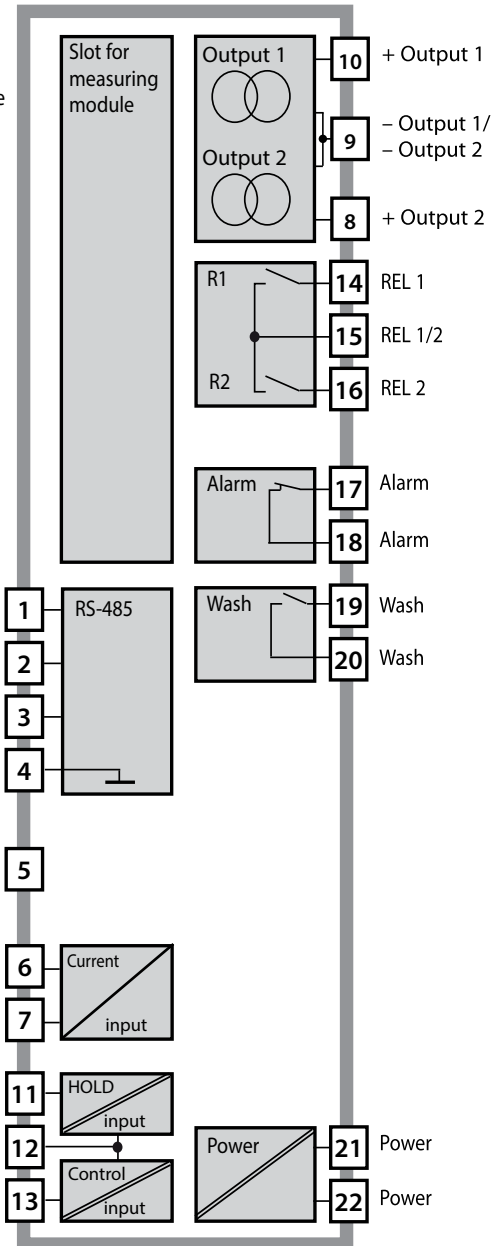
Terminal Assignments

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

22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
24 to 230 V AC/DC		REL3/ WASH		ALARM		REL 2		REL 1	CONTROL	CONTROL/ HOLD	HOLD	0(4) to 20 mA +	−	0(4) to 20 mA +	−	0(4) to 20 mA +	PWR out	WH/CL GND/ SHIELD	YE B	GN A	BN 3 V

Power — Contacts — Digital-In — HART Out 1 — Out 2 — I-In — ⚠ — RS 485

WARNING:
DO NOT SEPARATE WHEN ENERGIZED!   **DO NOT REMOVE OR REPLACE FUSE WHEN ENERGIZED!**

A402N Rating Plate

Knick ›

A4*2N

No. 84192 / 0000000 / 1233

-20 ≤ T$_a$ ≤ +55°C
EnclosureType4X

D-14163Berlin   Made in Germany

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

24 (-15%) to   60 (+10%) V DC,
⎓10 W

⚠ ▣ C €

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)

Areas for placing the
screwdriver to pull out
the terminals

1   22
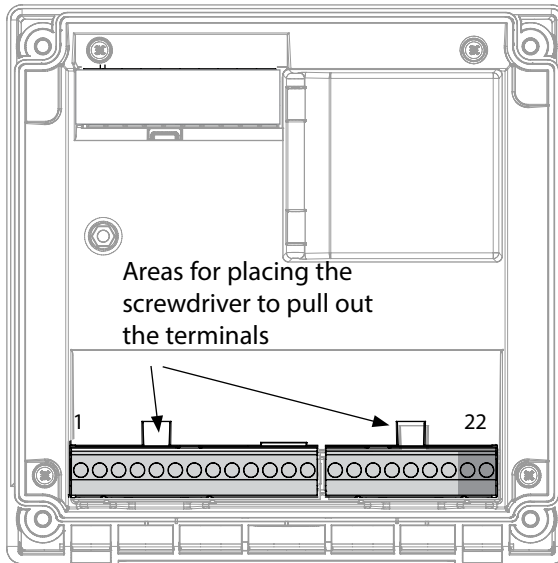
Figure:
Terminals, device opened,
back of front unit

Connecting the Memosens Sensor

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

Terminal assignments

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

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.
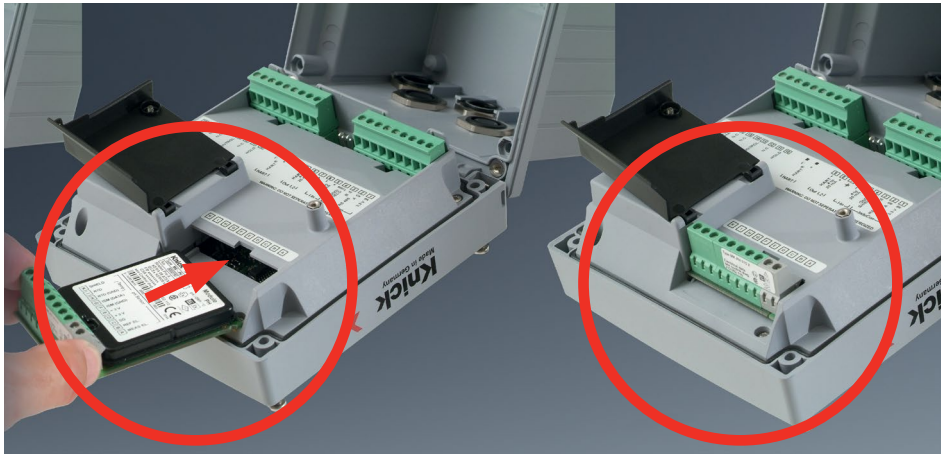
Measuring modules for connection of analog oxygen sensors:

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.

Oxy Module

Cathode

Reference

Anode

Guard

ISM GND

ISM data

RTD

RTD

Shield

A	Oxy input
B	
C	
D	
E	
F	
G	
H	
I	
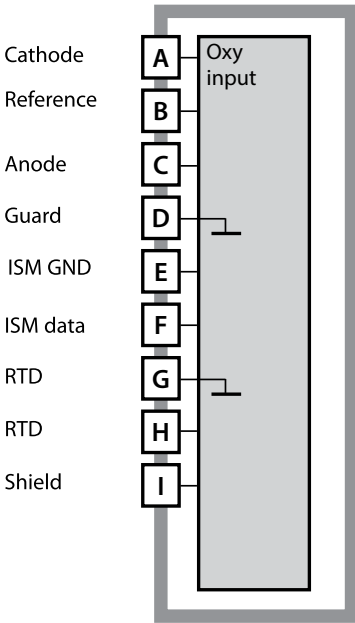
Module for oxygen measurement
Order code MK-OXY045...
See the following pages for wiring examples.

Oxy Sensor

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

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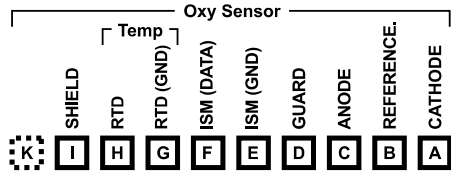
**Terminal plate
of oxygen module**
The terminals are suitable for single or stranded wires up to 2.5 mm^2 (AWG 14).
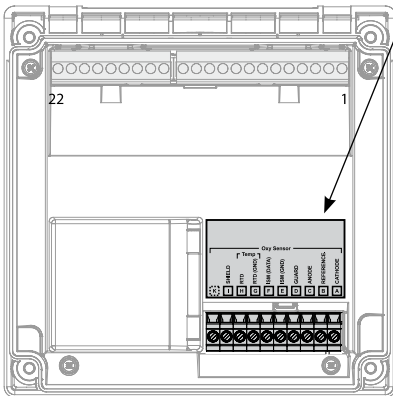
The measuring module comes with a self-adhesive label.
Stick the label to the module slot on the device front. This way, you have the wiring "under control".

22   1

Example 1:

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

Oxy module

cathode	refeence	anode	guard	ISM (GND)	ISM (Data)	RTD (GND)	RTD	shield
A	B	C	D	E	F	G	H	I

Jumper!

Cable VP6

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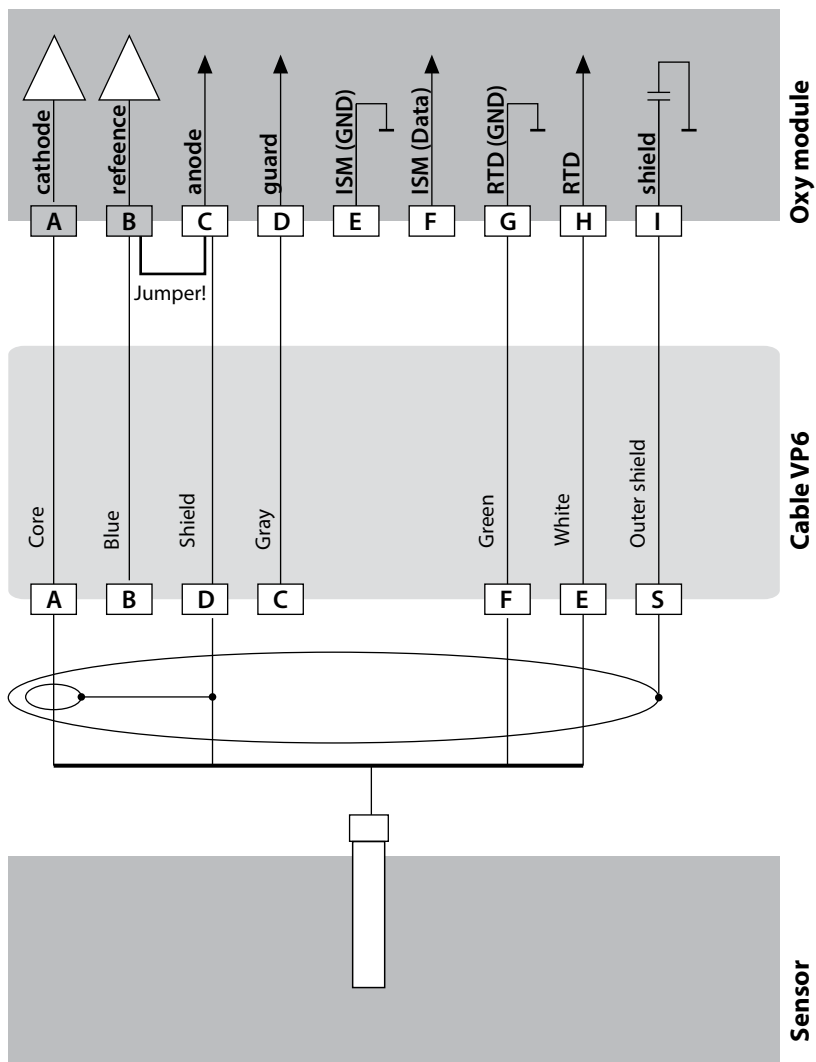
Sensor

Example 2:

Measuring task: Oxygen TRACES (TAN required)

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

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

cathode	A	
refeence	B	
anode	C	Jumper!
guard	D	
ISM (GND)	E	
ISM (Data)	F	
RTD (GND)	G	
RTD	H	
shield	I	

Oxy module

Core	A
Blue	B
Shield	D
Gray	C
Green	F
White	E
Outer shield	S

Cable VP6
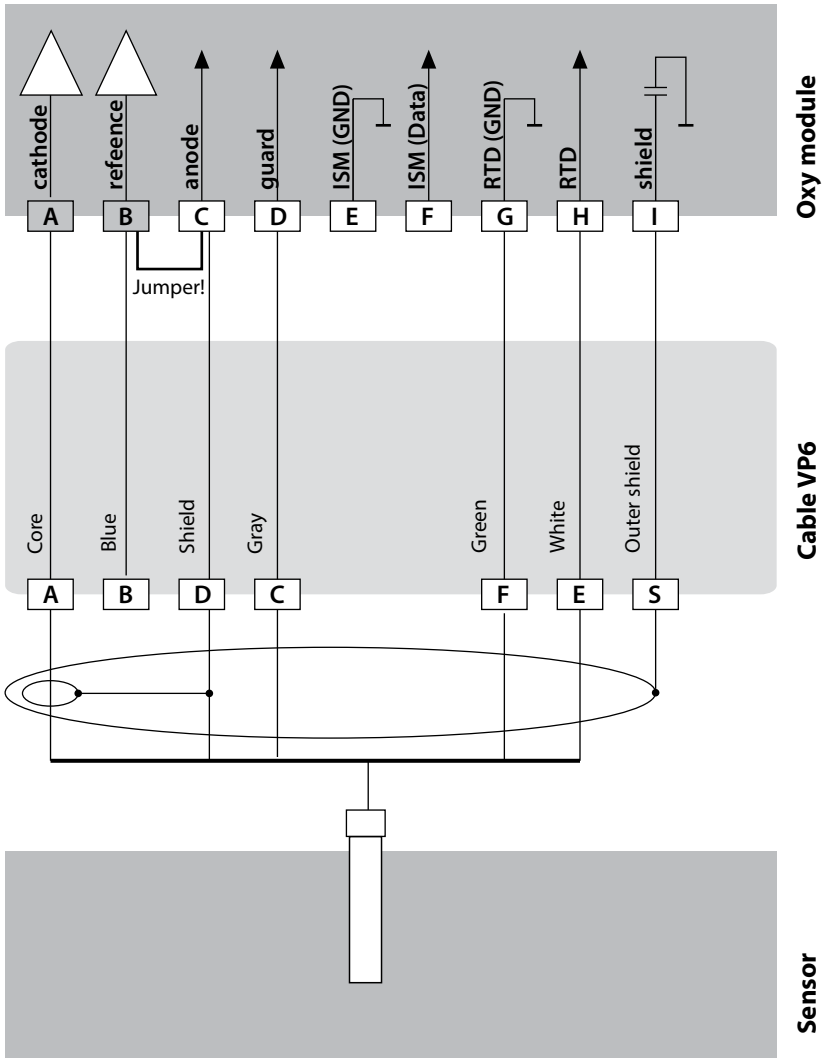
Sensor

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)

Optical Sensor Wiring Example
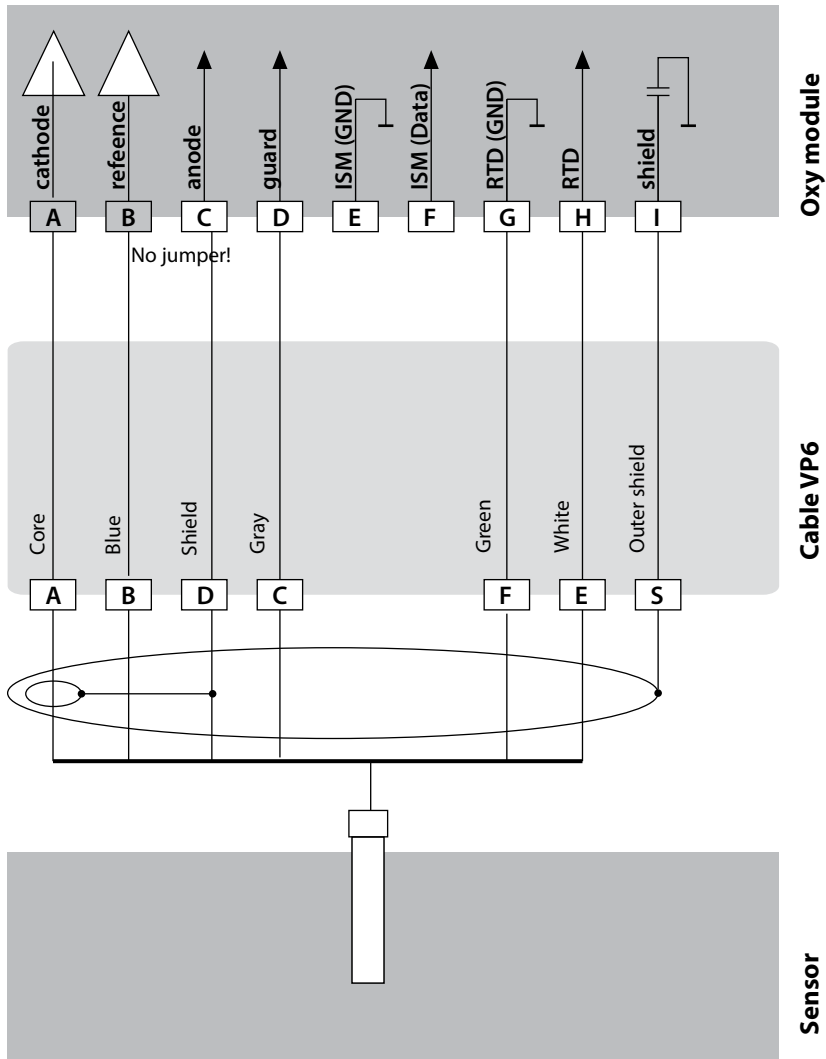
Example 4:

Measuring task:	Connection of optical sensor (LDO)
Sensors (example):	SE 740
Cable (example):	M12 (e.g., CA/M12-005N485)

Device

3 V — 1

RS 485 (A) — 2 — (A) — Gray

RS 485 (B) — 3 — (B) — Pink

GND/shield — 4 — (−) — Brown

PWRout — 5 — (+) — White

Cable

M12 connection

Sensor (LDO, SE 740)
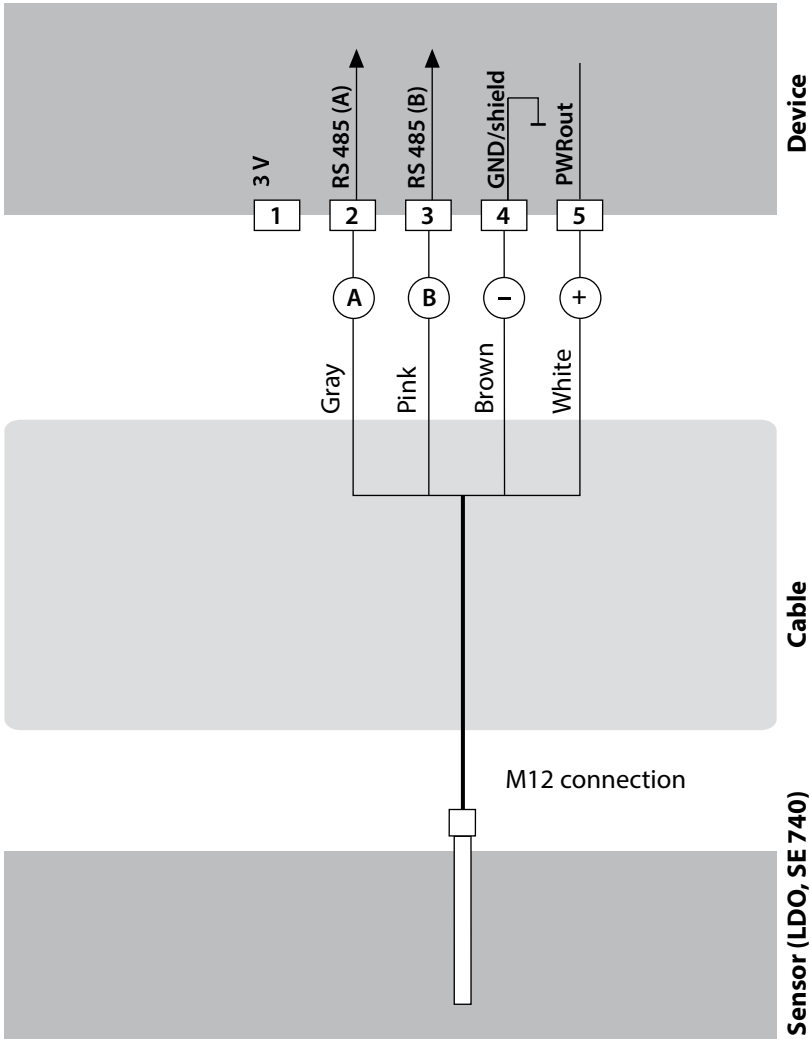
Configuration

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.

Settings and specifications

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

Function selection (The selected function is highlighted.)

Parameters of currently connected sensor

Last calibration (adjustment)

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

Standard connection (sensor A)

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

22

1

Areas for placing the screwdriver to pull out the terminals
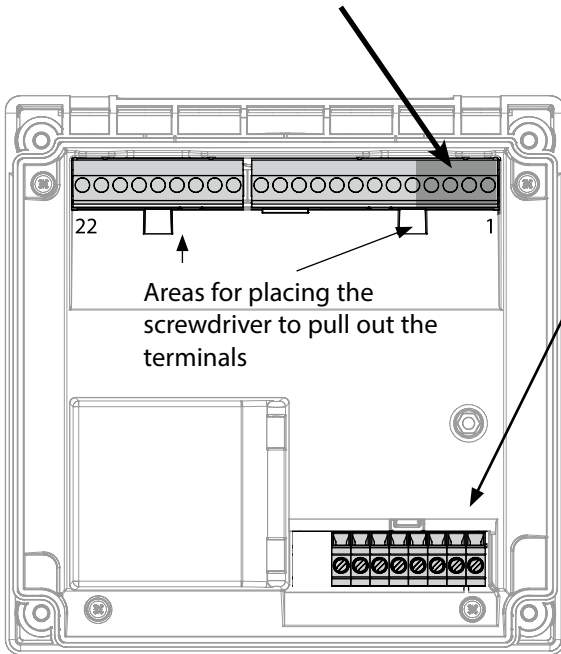
For dual devices (2 measuring channels): (MK-MS095 module) Connection of sensor B

A	Brown	+3 V
B	Green	RS 485 A
C	Yellow	RS 485 B
D	White	GND
E	Transp.	SHIELD

Memosens Cable

Brown	+3 V
Green	RS485 (A)
Yellow	RS485 (B)
White	Power supply – (GND)
Transparent	Shield
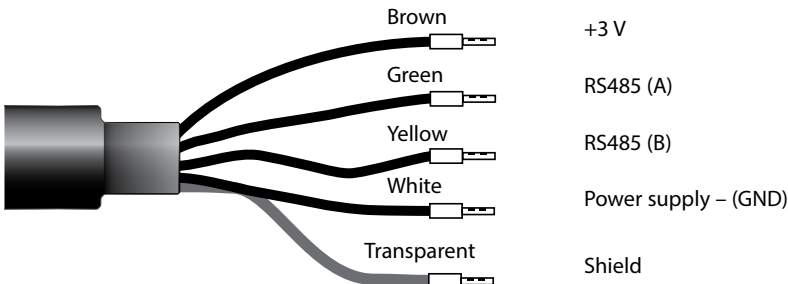
Connecting cable for non-contact inductive digital transmission of measured signals (Memosens).
By providing perfect galvanic isolation between sensor and analyzer/transmitter, the Memosens cable prevents measurement interferences. Any effects of humidity and corrosion are prevented.

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

+3V

RS 485 A

RS 485 B

GND

Shield

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

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

Memosens

RS 485

					CL SHIELD	GND WH	B YE	A GN	3V BN
K	I	H	G	F	E	D	C	B	A
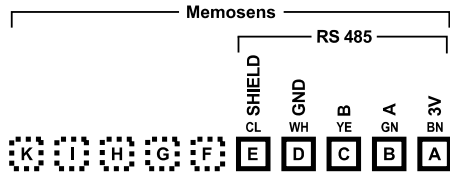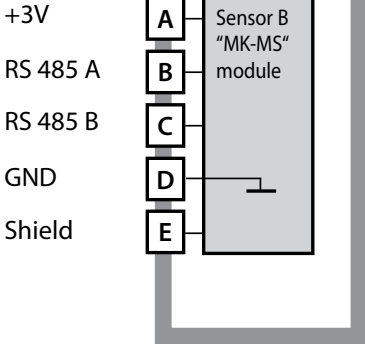
Terminal plate of module
for 2nd Memosens channel
The terminals are suitable for single or
stranded wires up to 2.5 mm^2 (AWG 14).

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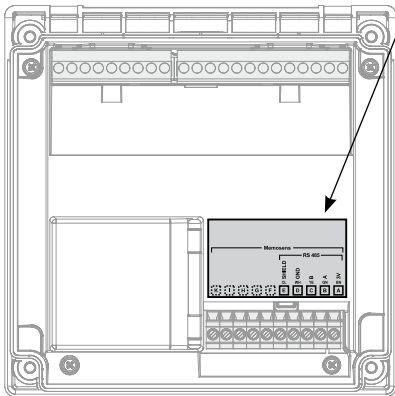
Measuring Mode

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).

Sensoface indicator
(sensor status)

Time

Mode indicator
(measuring)

Hold **meas** key
depressed for calling
the measuring mode
(hitting the key once
more switches the
display)

Active parameter set
(configuration)

Display indicates
OUT1:
e.g., measured
value

Display indicates
OUT2:
e.g., temperature

enter key
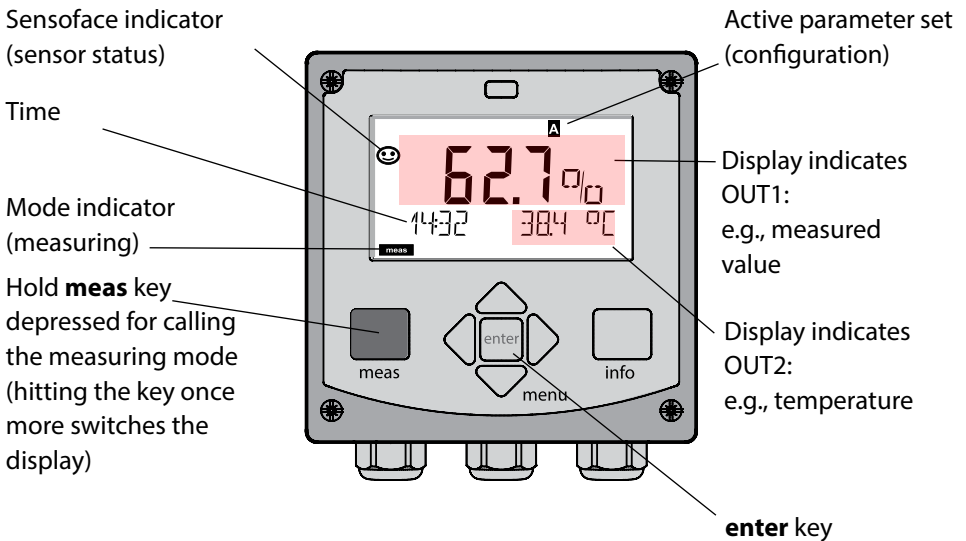
Depending on the configuration, you can set various displays as standard display for the measuring mode (see page 34).

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.

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)
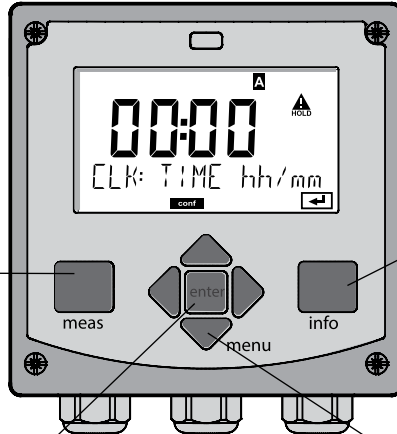
info
- Retrieve information
- Show error messages

menu
- Measuring mode: Call menu

enter
- Configuration: Confirm entries, next configuration step
- Calibration: Continue program flow
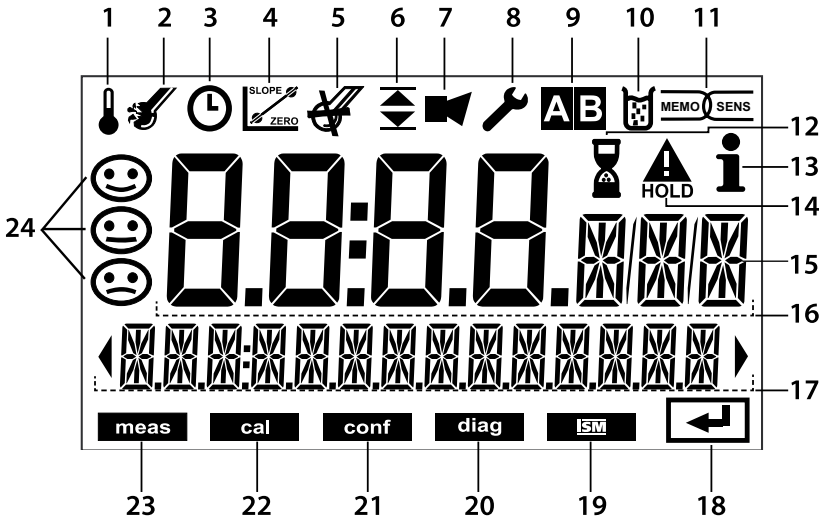
1   Temperature
2   Sensocheck
3   Interval/response time
4   Sensor data
5   Sensocheck
6   Limit message:
     Limit 1 ▼ or Limit 2 ▲
7   Alarm
8   Service
9   Parameter set
10 Calibration
11 Memosens sensor
12 Waiting time running

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)

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

meas key

enter key

meas

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

meas

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"

approx. 2 s

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

To select the operating mode:

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

Selection menu

Selected mode
(blinks)
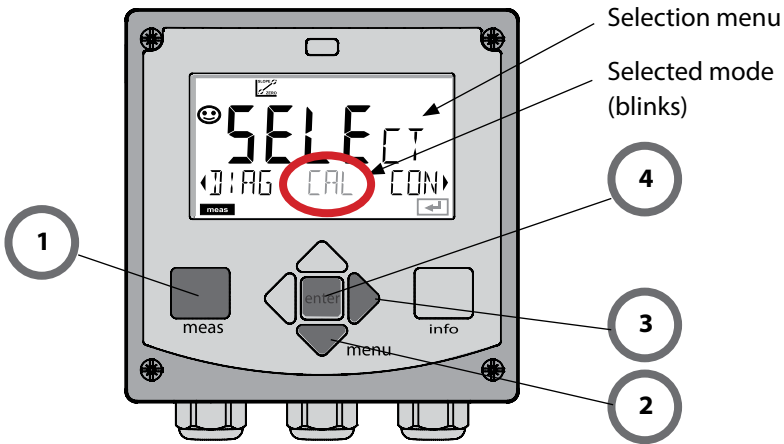
To enter a value:

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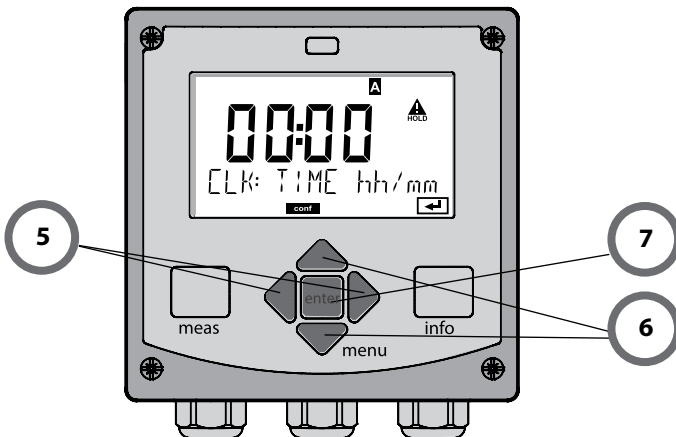
Diagnostics
Display of calibration data, display of sensor data, sensor monitor, performing a device self-test, viewing the logbook entries, display of hardware/software versions of the individual components. The logbook can store 100 events (00...99). They can be displayed directly on the device. The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

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

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

Configuration
You must configure the analyzer for the respective measurement task. In the "Configuration" mode you select the 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:

Output current [mA]

Output signal for HOLD FIX setting = 21.0 mA

Output signal for HOLD LAST setting

21

4

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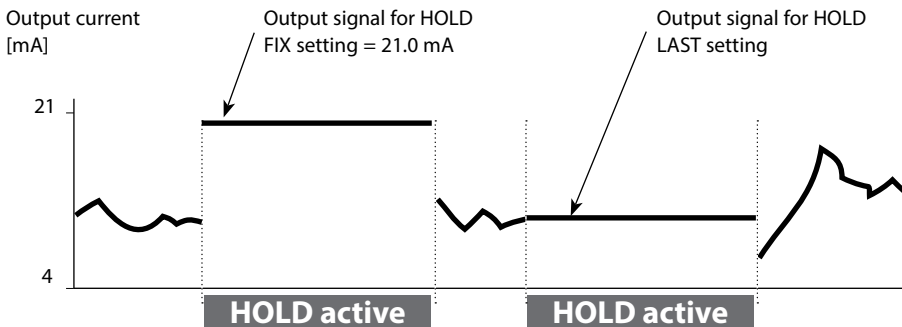
Terminating the HOLD mode
The HOLD mode is exited by switching to measuring mode (hold **meas** key depressed). The display reads "Good Bye". After that, the HOLD mode is exited. When the calibration mode is exited, a confirmation prompt ensures that the installation is ready for operation (e.g.: sensor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

Measuring mode (main display selectable)	**meas** →	TAG display	**meas** →	CLK display	**meas** →	Controller parameter display (if configured)	**meas** →
		↓ after 60 s		↓ after 60 s			
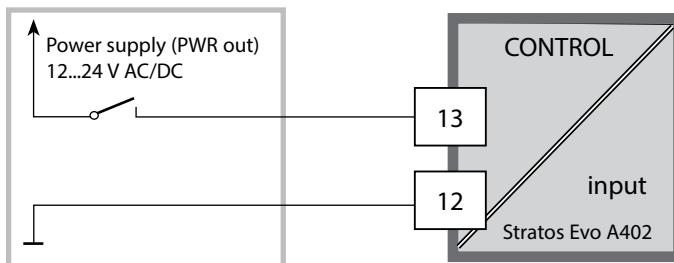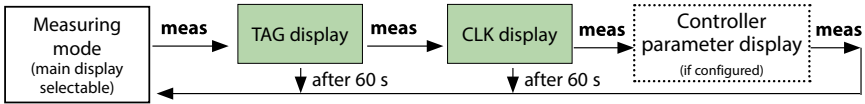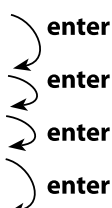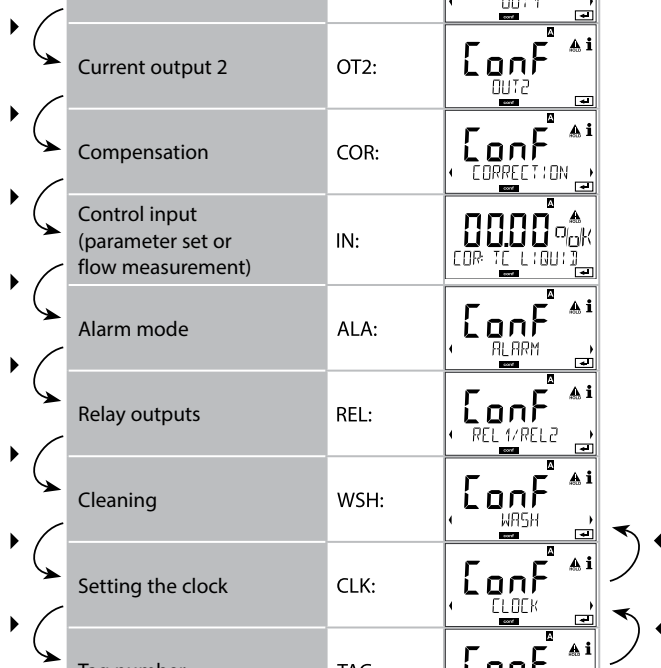
Pressing the **menu** key (down arrow) opens the selection menu.
Select the menu group using the left/right arrow keys.
Pressing **enter** opens a menu item. Press **meas** to return.

DIAG

CALDATA	Display of calibration data
SENSOR	Display of sensor data
SELFTEST	Self test: RAM, ROM, EEPROM, module
LOGBOOK	100 events with date and time
MONITOR	Display of direct sensor values
VERSION	Display of software version, model designation, serial 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:	ConF SENSOR	enter
		Menu item 1		enter
		⋮		enter
		Menu item ...		enter
▶	Current output 1	OT1:	ConF OUT 1	enter
▶	Current output 2	OT2:	ConF OUT2	
▶	Compensation	COR:	ConF CORRECTION	
▶	Control input (parameter set or flow measurement)	IN:	00.00 °C COR TC LIQUID	
▶	Alarm mode	ALA:	ConF ALARM	
▶	Relay outputs	REL:	ConF REL 1/REL2	
▶	Cleaning	WSH:	ConF WASH	◀
▶	Setting the clock	CLK:	ConF CLOCK	◀
▶	Tag number	TAG:	ConF TAG	

Parameter Set A/B: Configurable Menu Groups

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

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

External switchover of parameter sets A/B

You can switch between parameter sets A and B by applying a signal to the CONTROL input (setting: CNTR-IN – PARSET).
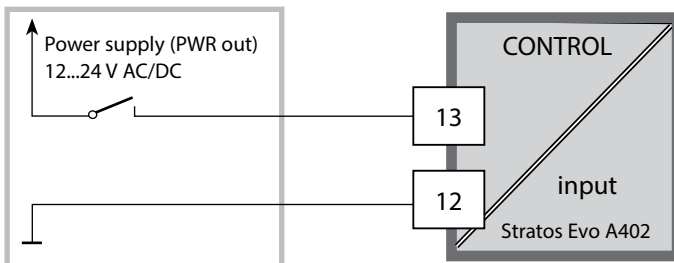
Parameter set A active	0...2 V AC/DC
Parameter set B active	10...30 V AC/DC

Parameter Set A/B: Manual Switchover

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

Parameter Set A/B: Signaling via WASH Contact

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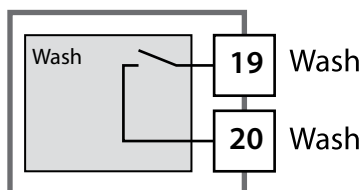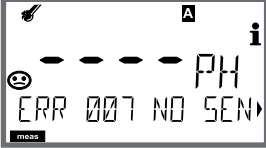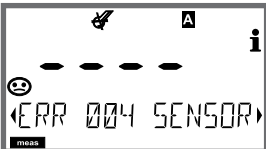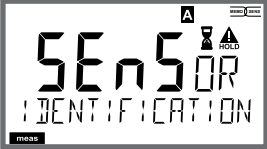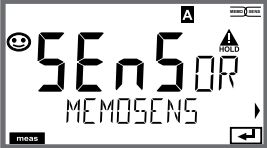
The active parameter set can be signaled using the WASH contact:

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

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

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

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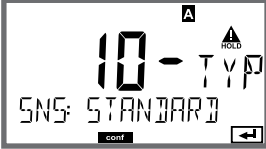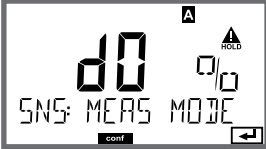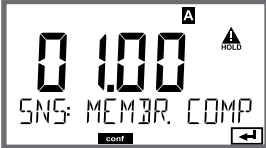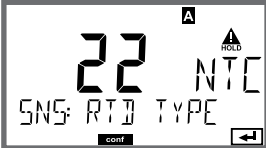
Connected modules are automatically recognized. When a Memosens sensor is connected at initial start-up, the corresponding process variable is loaded and Memosens is configured. In the SERVICE menu you can change the device type. Afterwards, you must select the corresponding calibration mode in the CONF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

1

menu

enter

2

SELECT
CONF

enter

3

ConF
PARSET A

enter

4

ConF
ACK SENSOR OUT

enter

5

SNS: STANDARD

meas

6

62.7 %
14:32   38.4 °C

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

Select sensor type analog/digital
 	
`10 - Typ` `A` `HOLD`
`SNS: STANDARD` `conf`
	Select sensor type using ▲ ▼ keys.
	
	Press **enter** to confirm.
		STANDARD 10 Typ
		TRACES 01 Typ
		SUBTRACES 001 Typ
		ISM
		MEMOSENS
		LDO (SE 740 optical sensor)

Select measuring mode
 	
`dO %` `A` `HOLD`
`SNS: MEAS MODE` `conf`
	Select measuring mode using ▲ ▼ keys.
	DO:
	Measurement in liquids
	GAS:
	Measurement in gases
	Press **enter** to confirm.
		dO %,
		dO mg/l
		dO ppm
		GAS %

Polarization voltage
 	
`-675 mV` `A` `HOLD`
`SNS: U-POL` `conf`
	To be entered separately for measurement/calibration.
	When measuring low oxygen concentrations (traces)
	U-POL MEAS = −500 mV
	Enter V_{pol} using arrow keys.
	Press **enter** to confirm.
		−675 mV
		−400...−1000 mV
		(0000...−1000 mV for trace measurement)
		
		Not for Memosens
		Not for optical sensor

Membrane compensation
 	
`01.00` `A` `HOLD`
`SNS: MEMBR. COMP` `conf`
	Enter membrane compensation using ▲ ▼ ◀ ▶ keys.
	
	Press **enter** to confirm.
		01.00
		00.50...05.00
		
		Not for Memosens
		Not for optical sensor
		Not for ISM sensor

Type of temp probe
 	
`22 NTC` `A` `HOLD`
`SNS: RTD TYPE` `conf`
	Select type of temperature probe using ▲ ▼ keys.
	Press **enter** to confirm.
		22 NTC
		30 NTC
		
		Not for Memosens
		Not for optical sensor
		Not for ISM sensor

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

1 menu

2 SELECT
CONF

enter

3 ConF
PARSET A P

enter

4 ConF
ACT SENSOR OUT

enter

5 SNS: STANDARD

meas

6 62.7 %
14:32   38.4 °C

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

Note for the calibration timer:
When Sensocheck has been activated 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.

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

5

Adaptive Cal Timer (ACT)

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

The adaptive cal timer is reset after each calibration.

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

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

ISM Sensor, Adaptive Maintenance Timer (TTM)
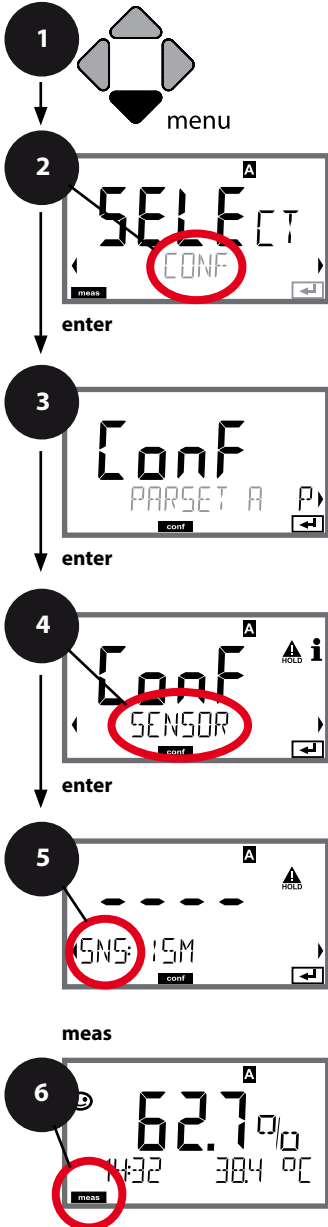
1

menu

2

SELEct
CONF

meas

enter

3

ConF
PARSET A P

conf

enter

4

ConF
SENSOR

conf

enter

5

SNS: ISM

conf

meas

6

62.7 %
14:32   38.4 °C
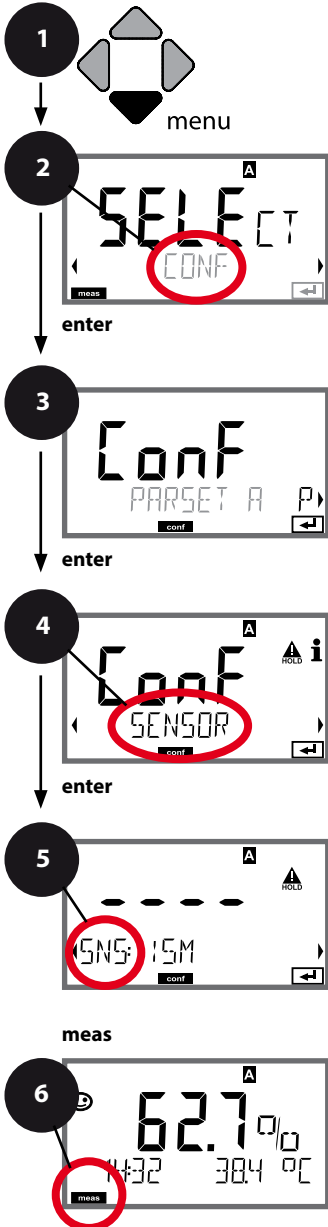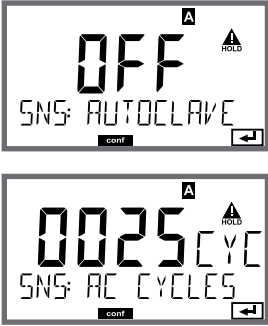
meas

1 Press **menu** key.
2 Select **CONF** using ◀ ▶,
  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	
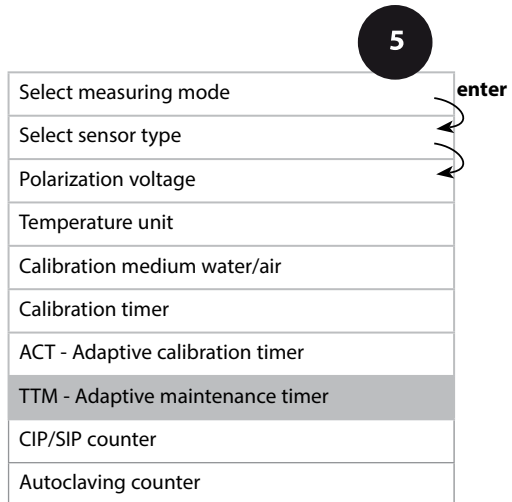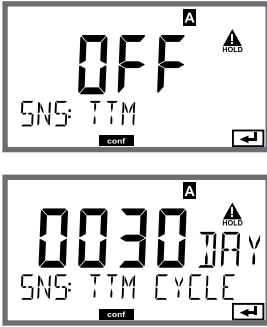
5

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) OFF SNS: TTM 0030 DAY SNS: TTM CYCLE	Select using arrow keys: AUTO: The interval stored in the ISM sensor is used (default 30 days) MAN: The interval is specified manually (0 ... 9999 days) Press **enter** to confirm.	**OFF**/AUTO/MAN
The adaptive maintenance timer can be reset in the SERVICE / SENSOR / TTM menu. Here, the interval is reset to its initial value.		
YES TTM RESET	To do so, select **"TTM RESET = YES"** and confirm by pressing **enter**.	**NO** / YES
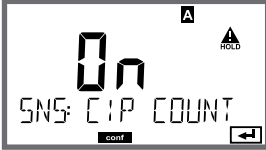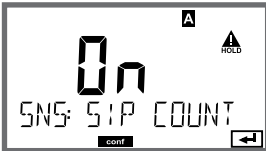
Sensor, **CIP Cleaning Cycles, SIP Sterilization Cycles**

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.

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 **On** SNS: CIP COUNT	Use arrow keys ▲ ▼ to set the CIP counter: OFF: No counter ON: Fixed cleaning cycle (adjust in the next step) Press **enter** to confirm.	**OFF**/ON
CIP cycles **0025**CYC SNS: CIP CYCLES	Only with CIP COUNT ON: Enter max. number of cleaning cycles using ▲ ▼ ◀ ▶ keys Press **enter** to confirm.	0...9999 CYC (**0000 CYC**)
SIP counter **On** SNS: SIP COUNT	Use arrow keys ▲ ▼ to adjust SIP counter: OFF: No counter ON: Max. sterilization cycles (adjust as for CIP counter) Press **enter** to confirm.	**OFF**/ON

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

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.

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

Menu item	Action	Select

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

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

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

Sensor, Sensor Verification (TAG, GROUP)
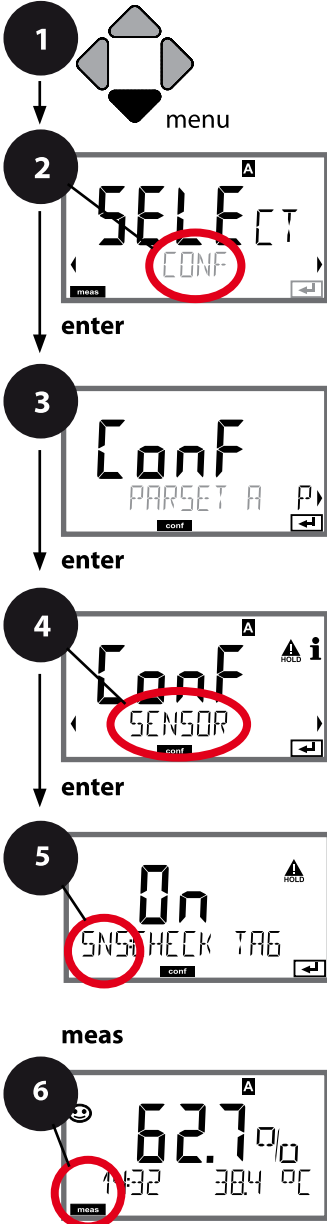
1   Press **menu** key.
2   Select **CONF** using ◀ ▶,
     press **enter**.
3   Select parameter set using ◀ ▶ keys,
     press **enter**.
4   Select **SENSOR** menu using ◀ ▶ keys,
     press **enter**.
5   All items of this menu group are indicated by the
     "SNS:" code.
     Press **enter** to 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.

Select sensor type	enter
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 **On** SNSCHECK TAG ⚠ HOLD conf ↵	Select ON or OFF using ▲ ▼ keys. Press **enter** to confirm. When switched on, the entry for "TAG" in the Memosens sensor is compared to the entry in the analyzer. If the entries differ, a message will be generated.	ON/**OFF**
GROUP **On** SNSCHECK GROUP ⚠ HOLD conf ↵	Select ON or OFF using ▲ ▼ keys. Press **enter** to confirm. Function as described above	ON/**OFF**

Sensor Verification (TAG, GROUP)

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

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

A possibly existing TAG/GROUP will be overwritten.

Device type: Oxy				
Oxy sensor			**Choices**	**Default**
SNS:	(Select text line)		STANDARD 10 Typ TRACES* 01 Typ SUBTRACES* 001 Typ (* requires "Traces" Option) ISM MEMOSENS	STANDARD 10 Typ
	MEAS MODE		dO %, dO mg/l dO ppm, GAS %	dO %
	U-POL		-400...–1000 mV (0000...–1000 mV for traces)	-675 mV
	U-POL CAL			
	MEMBR. COMP.		00.50...03.00	01.00
	RTD TYPE		22 NTC 30 NTC	22 NTC
	TEMP UNIT		°C / °F	°C
	CAL MODE		CAL AIR CAL WTR	CAL AIR
	CAL TIMER		ON/OFF	OFF
	ON	CAL-CYCLE	0...9999 h	0168 h
	Memosens LDO 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 °F / **032.0 °F**
	END 20 mA	− 4 ... 302 °F / **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** 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 %** 000.0 ... 600.0 % 0000 µg/l ... 99.99 mg/l 0000 ppb ... 99.99 ppm 0000 ppm ... 99.99 % (−20 ... 150 °C)
	HYSTERESIS	**000.0 %** 0 ... 50 % full scale
	DELAYTIME	**0010 SEC** 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 MANUAL CNTR INPUT	(no switchover, parameter set A) (manual selection in the "Configuration" menu) (switchover via CNTR control input)

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

Measuring points (TAG / GROUP)		
TAG	The entries are made in the text line.	A...Z, 0...9, – + < > ? / @
GROUP	The entries are made in the text line.	0000...9999
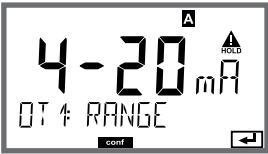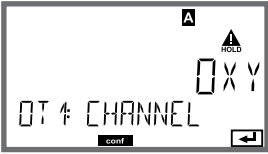
Output Current, Range, Current Start, Current End
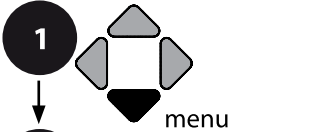
1 Press **menu** key.
2 Select **CONF** using ◄ ►,
press **enter**.
3 Select parameter set using ◄ ► keys,
press **enter**.
4 Select **OUT1** menu using ◄ ► keys,
press **enter**.
5 All items of this menu group are indicated by the "OT1:"
code.
Press **enter** to select menu,
edit using arrow keys (see next page).
Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is
displayed.

| 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 |

5

Menu item	Action	Select

Current range
 	
`4-20 mA`
`OT 1: RANGE`
conf
	Select 4-20 mA or 0-20 mA range using ▲ ▼ keys.
	
	Press **enter** to confirm.
		4-20 mA / 0-20 mA

Process variable
 	
`OXY`
`OT 1: CHANNEL`
conf
	Example: current output 1, device type OXY
	Select using ▲ ▼ keys:
	OXY: oxygen value
	TMP: Temperature
	Press **enter** to confirm.
		OXY / TMP

Current start / end
 	
`000.0 %`
`OT 1: BEGIN 4mA`
conf
	Modify digit using ▲ ▼ keys, select next digit using ◀ ▶ keys.
	
	Press **enter** to confirm.
		000.0 ... 0600 %
		(OXY, Sensor 10)
		0.000 ... 0150 %
		(OXY, Sensor 01, 001 and "Traces" Option)
		–20 ... 150 °C /
		–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%
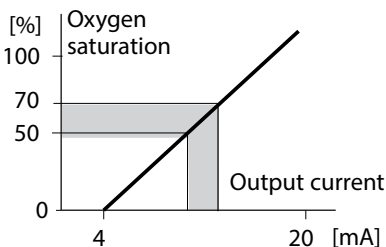
Example 2: Range 50...70%
Advantage: Higher resolution in range of interest
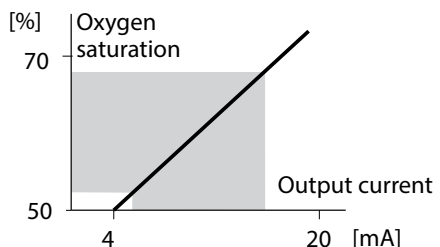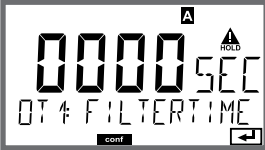
Output Current, Time Averaging Filter

1

menu

2
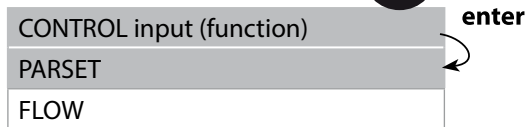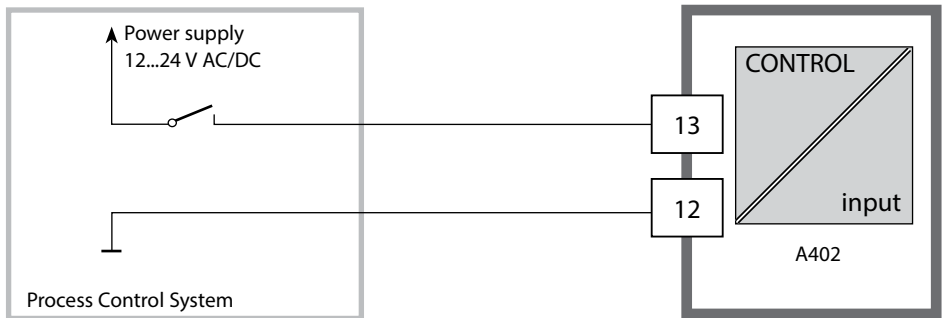
SELECT
CONF

enter

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.

3

ConF
PARSET A P▸

enter

4

ConF
OUT 1

enter

5

0000 SEC
OT 1: FILTERTIME

meas

6

62.7 %
14:32 38.4 °C

Current range	**5** **enter**
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	

5

Menu item	Action	Select
Time averaging filter	Enter value using ▲ ▼ ◄ ► keys.	0...120 SEC (**0000 SEC**)
![display: 0000 SEC / OT 1: FILTERTIME / conf]		
	Press **enter** to confirm.	

Time averaging filter

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

Note:

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

During HOLD the filter is not applied. This prevents a jump at the output.
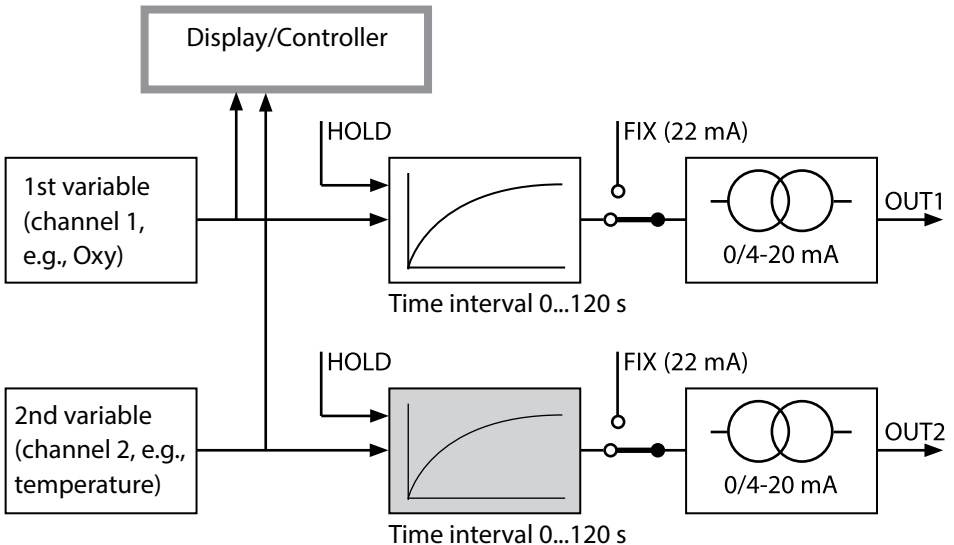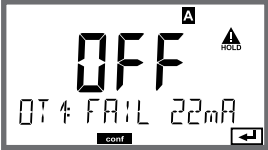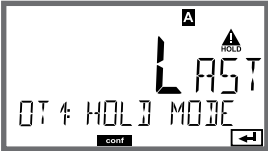
Output Current, Error and HOLD

1 menu

2 SELECT
CONF
enter

3 ConF
PARSET A P
enter

4 ConF
OUT 1
enter

5 OFF
OT 1 FAIL 22mA

meas

6 62.7 %
14:32   38.4 °C

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   **enter**

| 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 |

5

Menu item	Action	Choices
Output current during error message **OFF** OT 1 FAIL 22mA conf	The output current can be set to 22 mA in the case of error messages or error messages. Select ON or OFF using ▲ ▼ keys. Confirm by pressing **enter**	**OFF** / ON
Output current during Sensoface messages **OT1: FACE 22 mA**	The output current can be set to 22 mA in the case of Sensoface messages. Select ON or OFF using ▲ ▼ keys. Confirm by pressing **enter**	**OFF** / ON
Output current during HOLD **LAST** OT 1 HOLD MODE conf	LAST: During HOLD the last measured value is maintained at the output. FIX: During HOLD a value (to be entered) is maintained at the output. Select using ▲ ▼ Press **enter** to confirm.	**LAST**/FIX
Output current for HOLD FIX **12.00 mA** OT 1 HOLD FIX conf	Only with FIX selected: Enter current which is to flow at the output during HOLD Enter value using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	00.00...22.00 mA (**21.00 mA**)

Output signal during HOLD:

Output current [mA]

Output signal for HOLD FIX setting = 21.0 mA

Output signal for HOLD LAST setting

21

4

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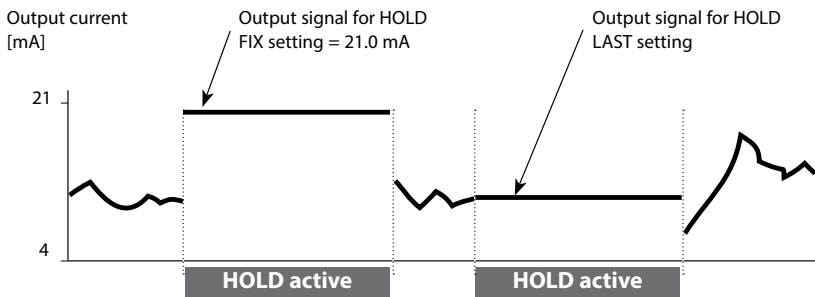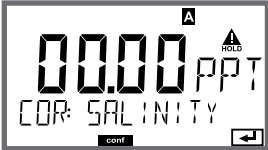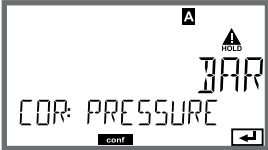
Correction
Salinity Correction, Pressure Correction
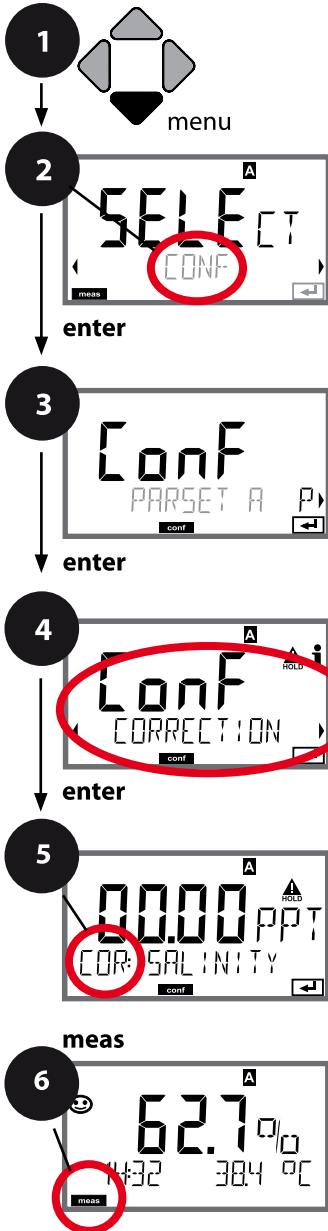
1 Press **menu** key.
2 Select **CONF** using ◂ ▸,
  press **enter**.
3 Select parameter set using ◂ ▸ keys,
  press **enter**.
4 Select **CORRECTION** menu using ◂ ▸ keys, press **enter**.
5 All items of this menu group are indicated by the "COR:"
  code.
  Press **enter** to select menu,
  edit using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

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

5

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

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

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

Manual pressure input `1.013`BAR `COR: PRESSURE`	Enter value using ▲ ▼ ◄ ► keys. Press **enter** to confirm.	Input range: 0.000...9.999 BAR / 000.0...999.9 KPA / 000.0...145.0 PSI **1.013 BAR**
Current input/ Pressure range `4-20`mA `COR: I-INPUT`	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 0.000...9.999 Bar / 000.0...999.9 kPa / 000.0...999.9 PSI

Parameter Set Selection (External Signal)
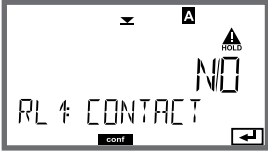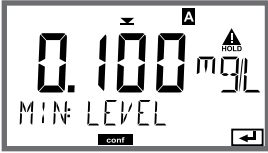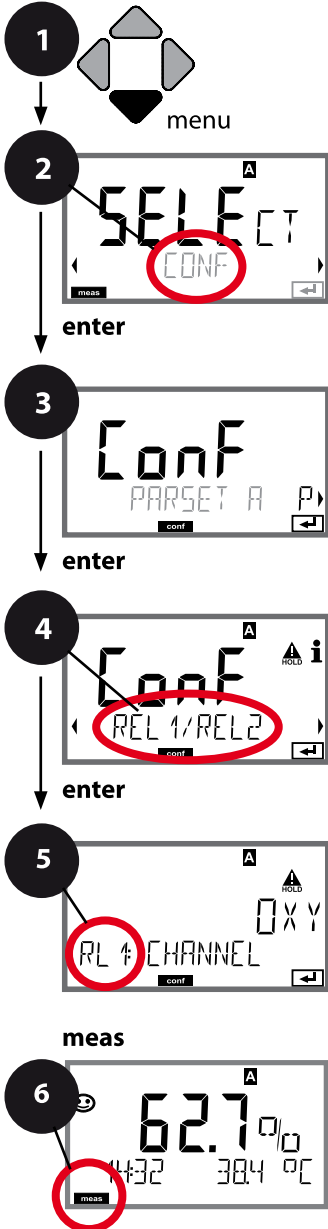

1. Press **menu** key.
2. Select **CONF** using ◀ ▶, press **enter**.
3. Select parameter set A using ◀ ▶ keys, press **enter**.
4. Select **CNTR_IN** menu using ◀ ▶ keys, press **enter**.
5. All items of this menu group are indicated by the "IN:" code.
   Press **enter** to select menu,
   edit using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

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

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)

```
PArSEt
IN : CONTROL
```

External switchover of parameter sets

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

Power supply
12...24 V AC/DC

CONTROL

13

12

input

A402

Process Control System

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

Flow Measurement

1 menu

2 SELE[T
CONF

enter

3 ConF
PARSET A P

enter

4 ConF
CNTR_N

enter

5 PArSEt
IN : CONTROL

meas

6 62.7 %
14:32   38.4 °C
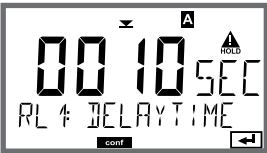
1   Press **menu** key.
2   Select **CONF** using ◀ ▶,
    press **enter**.
3   Select parameter set A using ◀ ▶ keys,
    press **enter**.
4   Select **CNTR_IN** menu using ◀ ▶ keys, press **enter**.
5   All items of this menu group are indicated by the "IN:"
    code.
    Press **enter** to select 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.
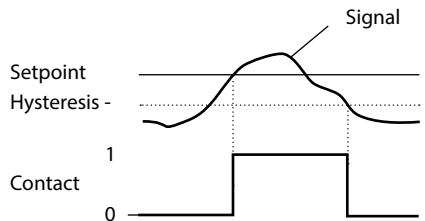
5   **enter**

CONTROL input (function)
PARSET / FLOW
FLOW: ADJUST

5

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

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

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

Display
Flow measurement in measuring mode

☺ **12.34** uS
7.3 L/h   13.27 uS

Display
Flow measurement (sensor monitor)

7.3 L/h
FLOW

Alarm, Alarm Delay, Sensocheck

1

menu

2

SELECT
CONF

meas

enter

3

ConF
PARSET A P

conf

enter

4

ConF
ALARM

conf

enter

5

0010 SEC
ALA: DELAY TIME

conf

meas

6

62.7 %
14:32   38.4 °C

meas

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: Max. flow alarm |
| With flow monitoring: Min. flow alarm |

enter

5

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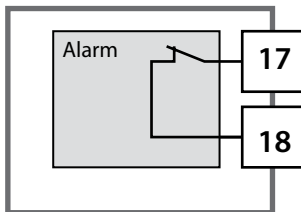
Alarm contact

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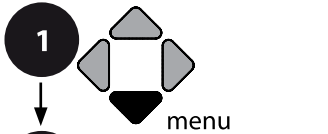
1 Press **menu** key.
2 Select **CONF** using ◀ ▶,
   press **enter**.
3 Select parameter set using ◀ ▶ keys,
   press **enter**.
4 Select **ALARM** menu using ◀ ▶ keys,
   press **enter**.
5 All items of this menu group are indicated by the "ALA:"
   code.
   Press **enter** to select menu,
   edit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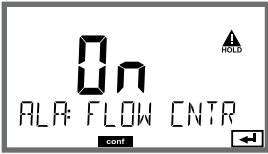
| Alarm: Delay |
| Alarm: Sensocheck |
| Alarm: CONTROL input |
| With flow monitoring: Max. flow alarm |
| With flow monitoring: Min. flow alarm |

5

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

Limit Function, Relay 1

1
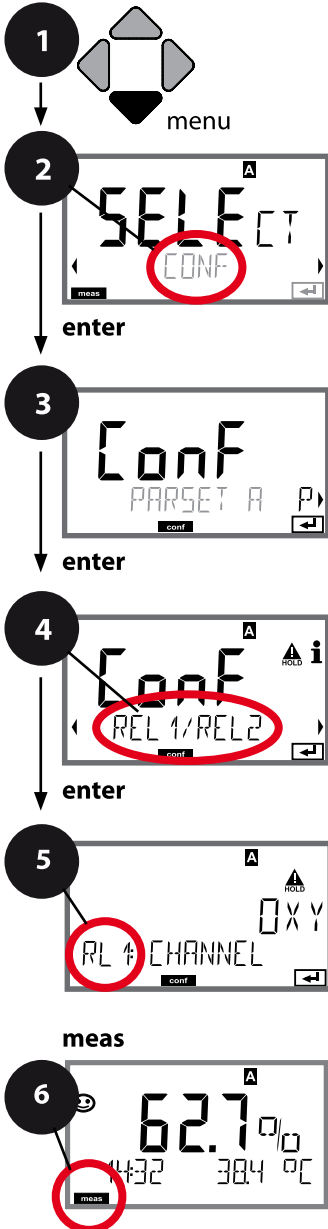
menu

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.

2

SELEᴄᴛ
CONF

enter

3

ᴄonF
PARSET A P▸

enter

4

ᴄonF ⚠ i
◀ REL 1/REL2 ▸

enter

5

OXY
RL 1: CHANNEL

5
Use of relays	**enter**
Select process variable
Limit 1 switching characteristics (function)
Limit 1 contact type
Limit 1 setpoint
Limit 1 hysteresis
Limit 1 delay

meas

6

62.7 %
14:32   38.4 °C
meas

5

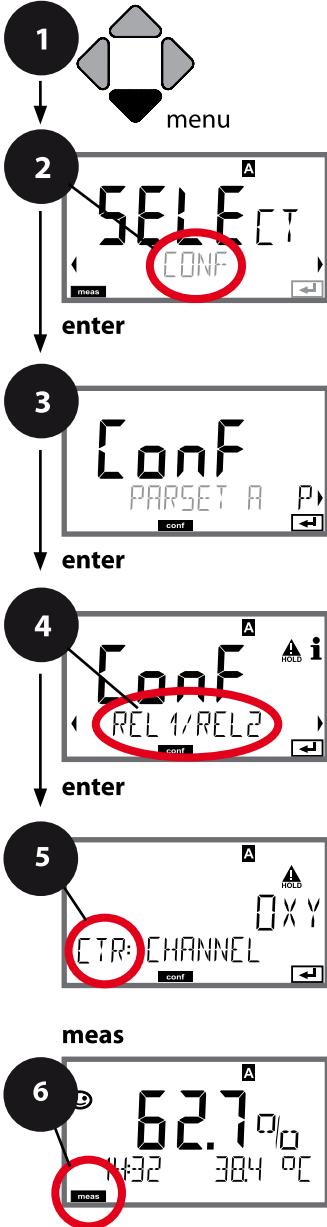| Menu item	Action	Select
Use of relays REL: LIMITS	Select in the text line using ▲ ▼ keys: • Limit function (LIMITS) • Controller (CONTROLLER) Press **enter** to confirm.	**LIMITS** / CONTROLLER **Note:** Selecting CONTROLLER leads to Controller menu group CTR.
Select process variable OXY RL 1: CHANNEL	Select desired process variable using ▲ ▼ keys. Press **enter** to confirm.	Depending on module or Memosens sensor
Limit 1 function Lo LEVL RL 1: FUNCTION	Select desired function using arrow keys. LoLevel: active if value falls below setpoint LoLevel: active if value exceeds setpoint Press **enter** to confirm.	**Lo LEVL** / Hi LEVL Limit 1 icon: ▼
Limit 1 contact response NO RL 1: CONTACT	N/O: normally open contact N/C: normally closed contact Select using ▲ ▼ keys. Press **enter** to confirm.	**N/O** / N/C
Limit 1 setpoint 0.100 mg/L MIN LEVEL	Enter setpoint using ▲ ▼ ◄ ► keys. Press **enter** to confirm.	Depending on module or Memosens sensor

Limit Function, Relay 1

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

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

5
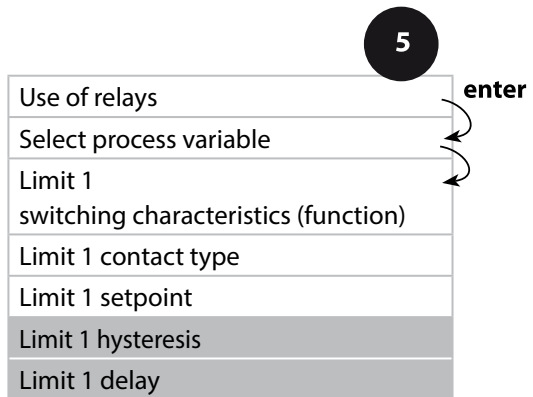
Menu item	Action	Choices
Limit 1 hysteresis **00.50** mg/L RL 1: HYSTERESIS conf	Select hysteresis using ▲ ▼ ◄ ► keys. Confirm by pressing **enter**	0...50 % full scale
Limit 1 delay **0010** SEC RL 1: DELAYTIME conf	The contact is activated with delay (deactivated without delay) Adjust delay using ▲ ▼ ◄ ► keys. Press **enter** to confirm.	0...9999 SEC (**0010 SEC**)

Application of Hysteresis:

Limit Lo

Signal

Hysteresis +
Setpoint

1
Contact
0

Limit Hi

Signal

Setpoint
Hysteresis -

1
Contact
0
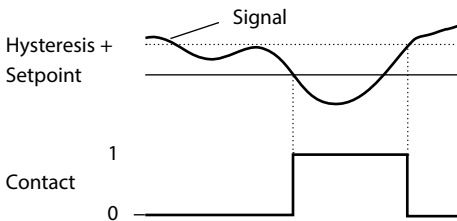
Limit Function, Relay 2

1
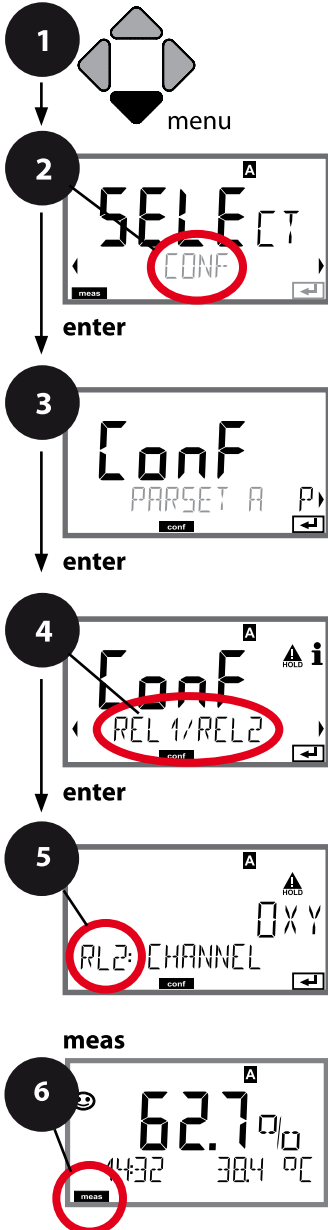
menu

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.

2

SELEct
CONF

enter

3

ConF
PARSET A   P

enter

4

ConF
REL 1/REL 2

enter

5

OXY
RL2: CHANNEL

| 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   **enter**

meas

6

62.7 %
14:32   38.4 °C

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** 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

Signal

Hysteresis +
Setpoint

Contact

1

0

Limit Hi

Signal

Setpoint
Hysteresis -

Contact

1

0
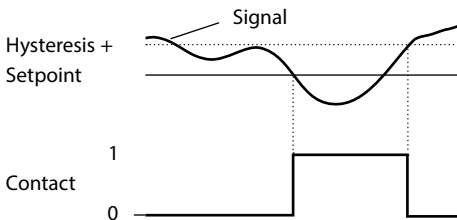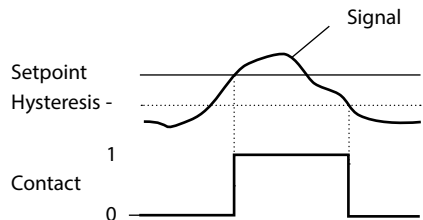
Protective Wiring of Relay Contacts

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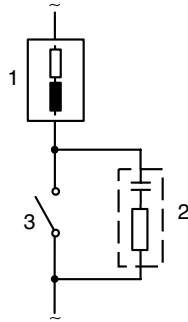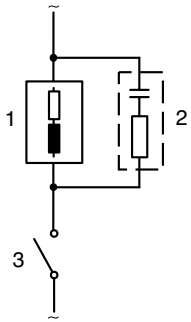
**Typical AC applications
with inductive load**
1 Load
2 RC combination,
        e.g., RIFA PMR 209
        Typical RC combinations for
        230 V AC:
        capacitor 0.1 µF / 630 V,
        resistor 100 Ω / 1 W
3 Contact

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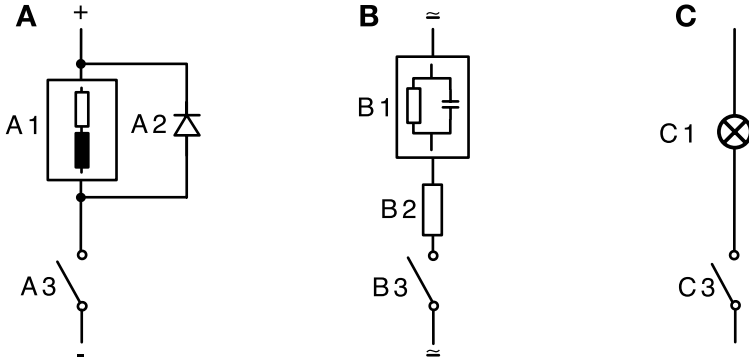
A: DC application with inductive load
B: AC/DC applications with capacitive load
C: Connection of incandescent lamps

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
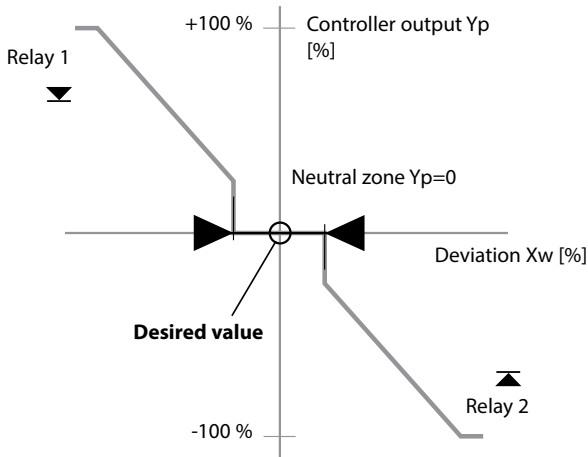
Controller Equations

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

$$\qquad\qquad\qquad\qquad \text{P action} \qquad\qquad \text{I action} \qquad\qquad \text{D action}$$

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)
	5.00 mg/l (for mg/l)
	5.00 ppm (for ppm)

Proportional action Y_P

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

Neutral zone
Tolerated deviation from desired value.

Proportional action (Gradient K_C [%])

$K_C = 500 \%$

$K_C = 200 \%$

$K_C = 100 \%$

$K_C = 50 \%$

Controller output Y

100 %

50 %

X_W

Deviation

| 10 / (1.00) | 20 / (2.00) | 30 / (3.00) | 40 / (4.00) | 50 / (5.00) |
| [10] | [20] | [30] | [40] | [50] |

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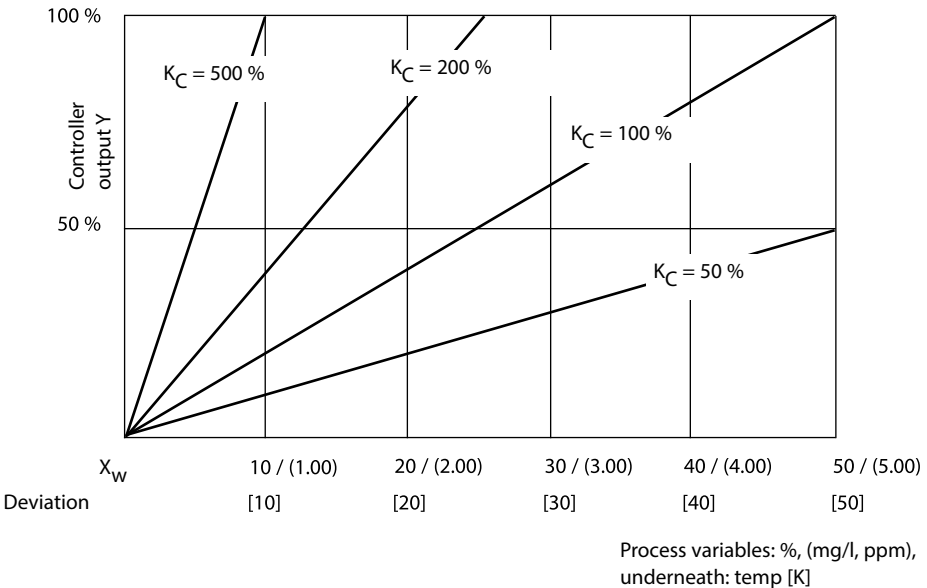
Pulse Length / Pulse Frequency Controller

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
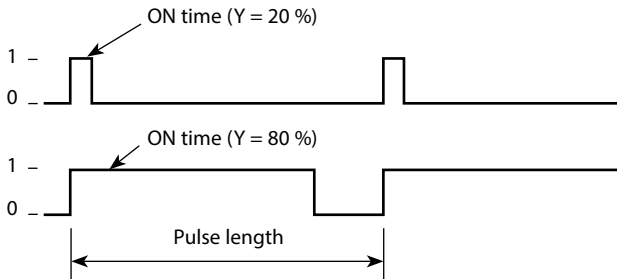
Pulse Frequency Controller (PFC)

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
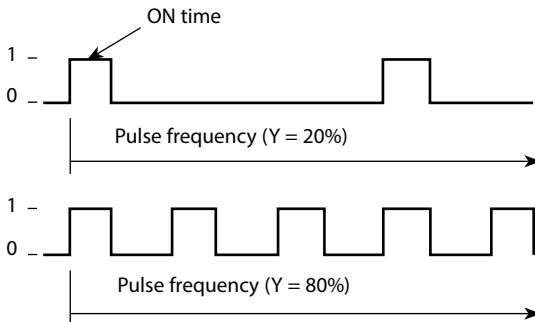
PID controller and behavior during HOLD

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.
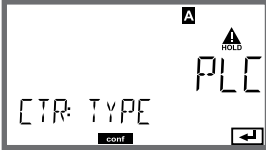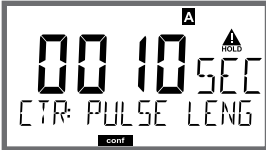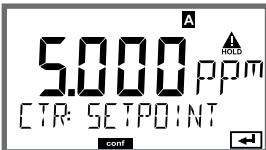
Controller, Process Variable, Controller Type, Setpoint

1

menu

2

SELFcт

CONF

enter

3

ConF

PARSET A   P

enter

4

ConF

REL 1/REL2

enter

5

OXY

CTR: CHANNEL

meas

6

62.7 %

14:32   38.4 °C

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

enter

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

5

Menu item	Action	Select
Use of relays	Select in the text line using ▲ ▼ keys: • Controller (CONTROLLER) Press **enter** to confirm.	**LIMITS** / CONTROLLER Selecting CONTROLLER leads to Controller menu group CTR.
Select process variable A HOLD OXY CTR: CHANNEL conf	Select desired process variable using ▲ ▼ keys. Press **enter** to confirm.	Depending on module or Memosens sensor
Controller type A HOLD PLC CTR: TYPE conf	Pulse length controller (PLC) or pulse frequency controller (PFC) Select using ▲ ▼ keys. Press **enter** to confirm.	**PLC**/PFC
Pulse length A HOLD 0010 SEC CTR: PULSE LENG conf	Only with PLC: Pulse length Adjust using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0...0600 SEC (**0010 SEC**)
Pulse frequency A HOLD 0060 PM CTR: PULSE FREQ conf	Only with PFC: Pulse frequency Adjust using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0...0180 P/M (**0060 P/M**) (pulses per minute)
Desired value A HOLD 5.000 PPM CTR: SETPOINT conf	Adjust setpoint using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	Depending on module or Memosens sensor
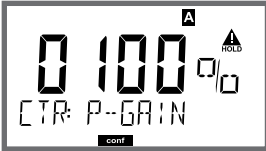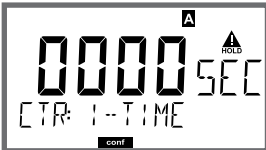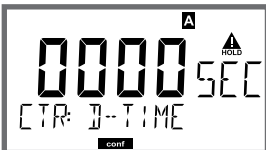
Controller, Neutral Zone, P, I, D Action Components, Behavior during HOLD

1 menu

2 SELEcT CONF
meas

enter

3 ConF
PARSET A P
conf

enter

4 ConF
REL 1/REL 2
conf

enter

5 OXY
CTR: CHANNEL
conf

meas

6 62.7 %
14:32   38.4 °C
meas

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   **enter**

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

5

Menu item	Action	Select
Neutral zone **A** **HOLD** **0.200** ppm CTR: DEAD BAND conf	Adjust neutral zone using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	Depending on module or Memosens sensor
Controller: P action **A** **HOLD** **0100** % CTR: P-GAIN conf	Adjust P action using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	10...9999% (**0100%**)
Controller: I action **A** **HOLD** **0000** SEC CTR: I-TIME conf	Adjust I action using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0...9999 SEC (**0000 SEC**)
Controller: D action **A** **HOLD** **0000** SEC CTR: D-TIME conf	Adjust D action using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0...9999 SEC (**0000 SEC**)
Behavior during HOLD *) **A** **HOLD** **Y LAST** CTR: HOLD MODE conf	Select response using ▲ ▼ keys. Press **enter** to confirm.	**Y LAST** / Y OFF Y LAST: The controller output Y is maintained during HOLD Y OFF: Y = 0 during HOLD (no control)

*) **PID controller and behavior during HOLD**
For a continuous (non-integrating) process, you should use the Y LAST setting.
For an integrating process (closed boiler), you should use Y OFF.
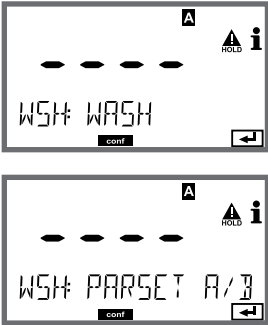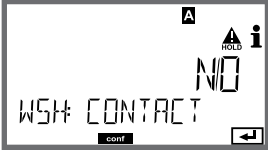
WASH Contact, Controlling a Rinsing Probe or Signaling the Parameter Set
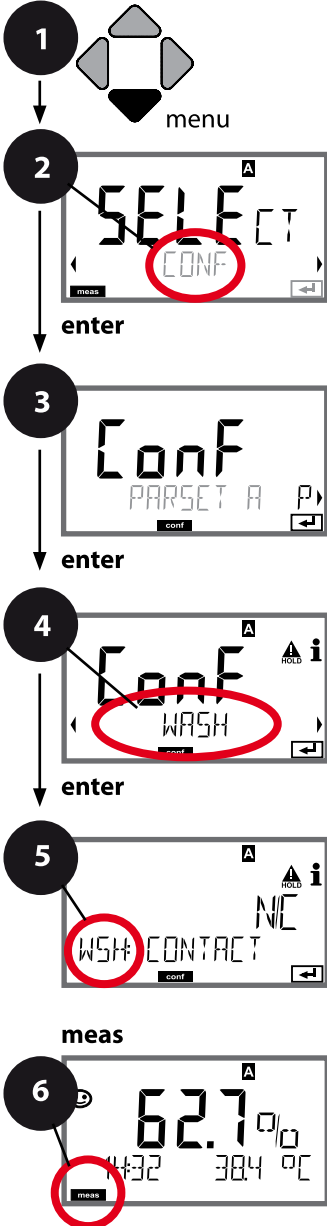
1 Press **menu** key.
2 Select **CONF** using ◀ ▶,
 press **enter**.
3 Select parameter set A using ◀ ▶ keys,
 press **enter**.
4 Select **WASH** menu using ◀ ▶ keys,
 press **enter**.
5 All items of this menu group are indicated by the "WSH:" code.
 Press **enter** to select menu,
 edit using arrow keys (see next page).
 Confirm (and proceed) by pressing **enter**.
6 Exit: Press **meas** key until the [meas] mode indicator is displayed.

Function
Cleaning interval
Cleaning duration
Relax time
Contact type

5

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

Cleaning | Relax time adjustable

Cycle interval   HOLD

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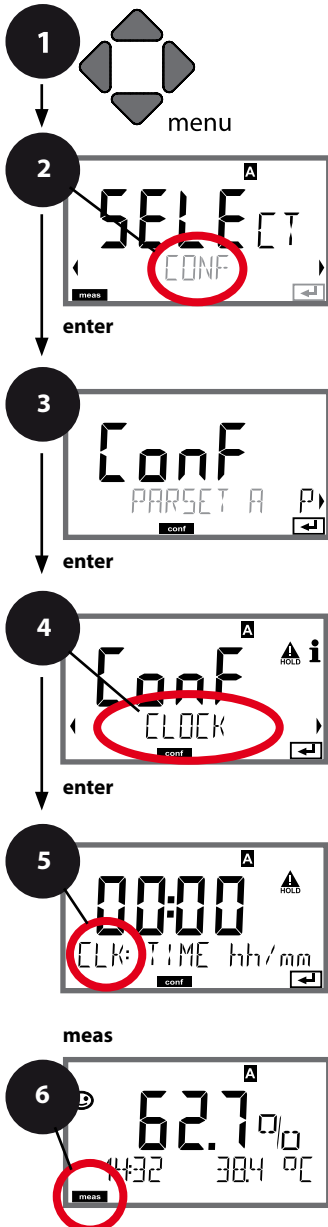
1 Press **menu** key.
2 Select **CONF** using ◄ ▶,
press **enter**.
3 Select parameter set A using ◄ ▶ keys,
press **enter**.
4 Select **CLOCK** or **TAG** using ◄ ▶ keys, press **enter**.
5 All items of this menu group are indicated by the "CLK:"
or "TAG" code.
Press **enter** to select menu,
edit using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

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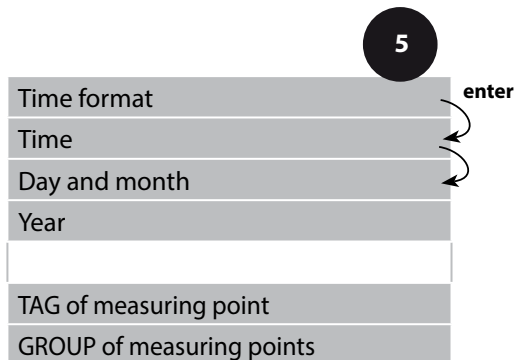
Time and Date

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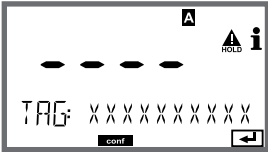
Note:
There is no automatic switchover from winter to summer time!
Be sure to manually adjust the time!

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 of measuring point TAG: XXXXXXXXX	In the lower display line you can enter a designation for the measuring point (TAG) and for a group of measuring points (GROUP) if applicable. Up to 32 digits are possible. By pressing **meas** (repeatedly) in the measuring mode you can view the tag number. Select character using ▲ ▼ keys, select next digit using ◀ ▶ keys. Press **enter** to confirm.	A...Z, 0...9, – + < > ? / @ The first 10 characters are seen in the display without scrolling.
GROUP of measuring points	Select number using ▲ ▼ keys, select next digit using ◀ ▶ keys. Press **enter** to confirm.	0000 ... 9999 **(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.
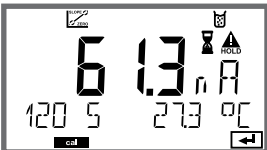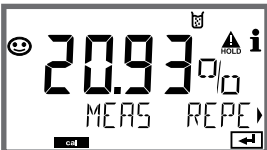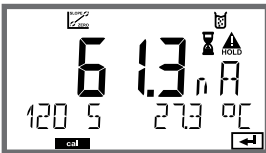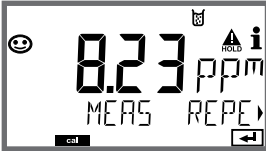
Note
All calibration procedures must be performed by trained personnel. Incorrectly set parameters may go unnoticed, but change the measuring properties.

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
CAL CAL AIR	Select calibration. Place sensor in air, press **enter** to start. Device goes to HOLD mode.	"CAL WATER" or "CAL AIR" is selected in the configuration.
050.0 % REL HUMIDITY	Enter relative humidity using **arrow keys**. Press **enter** to proceed.	Default for relative humidity in air: rH = 50%
1.000 BAR PRESSURE	Enter cal pressure using **arrow keys**. Press **enter** to proceed.	Default: **1.013 bar** Unit: bar/kpa/PSI
61.3 nA 120 S 27.3 °C	Drift check: Display of: sensor current (nA), response time (s), temperature (°C/°F) Press **enter** to proceed.	The drift check can take some minutes.
59.3 nA ZERO 00 1.3nA	Display of calibration data (slope and zero). Press **enter** to proceed.	
20.93 % MEAS REPE▸	Display of selected process variable (here: %vol). Now the device is in HOLD mode: Reinstall the sensor and check whether the measure- ment is OK. MEAS exits calibration, REPEAT permits repetition.	After end of calibration, the outputs remain in HOLD mode for a short time.

Display	Action	Remark
CAL CAL WATER	Select calibration (SLOPE). Immerse sensor in cal medium, press **enter** to start.	"CAL WATER" or "CAL AIR" is selected in the configuration.
1.000 BAR PRESSURE	Enter cal pressure. Press **enter** to proceed.	Default: **1.013 bar** Unit: bar/kpa/PSI
61.3 nA 120 S 27.3 °C	Drift check: Display of: sensor current (nA), response time (s), temperature (°C/°F)	Device goes to HOLD mode. The drift check might take some time.
-59.3 nA ZERO -0.03 nA	Display of calibration data (slope and zero) and Sensoface Press **enter** to proceed.	Related to 25 °C and 1013 mbar
8.23 ppm MEAS REPE▸	Display of selected process value. To exit calibration: Select MEAS ◀ ▶, then **enter**	To repeat calibration: Select REPEAT ◀ ▶, then **enter**
8.22 ppm --- GOOD BYE ---	Place sensor in process. End of calibration	After end of calibration, the outputs remain in HOLD mode for a short time.

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
☺ **SELE**CT ◄DIAG CAL CON►	Select calibration, proceed by pressing **enter**	
CAL ZERO POINT	Ready for calibration. Hourglass blinks. Place sensor in oxygen-free medium	Display (3 sec) Now the device is in HOLD mode.
-0.05 nA ZERO --003 nA	Primary display: zero current. Press **enter** to save this value or correct using **arrow keys** and then save by pressing **enter**. Secondary display: currently measured sensor current	Wait for the value to stabilize, can take 10 ... 30 minutes.
☺ **-59.3** nA ZERO --003 nA	Display of slope Display of new zero current. End calibration by pressing **enter** key, place sensor in process.	Sensoface display
☺ **0.00** %□ i MEAS REPE	The oxygen value is shown in the primary display. To exit calibration: Select MEAS, then **enter**	To repeat calibration: Select REPEAT, then **enter**
☺ **20.93** %□ --- GOOD BYE ---	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.
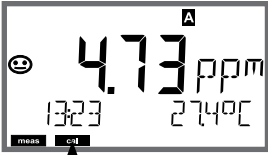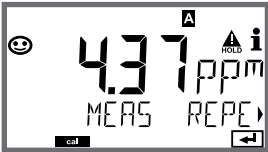
Procedure:

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 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
CAL P_CAL	Select product calibration: P_CAL Press **enter** to proceed.	If you have protected the calibration with a passcode (in the Service menu), the device will return to measuring mode when an invalid code is entered.
CAL PRODUCT STEP 1	Ready for calibration. Hourglass blinks. Press **enter** to proceed.	Display (3 sec)
4.73 ppm STORE VALUE	Take sample and save value. Press **enter** to proceed.	Now the sample can be measured in the lab.

Display	Action	Remark
4.73 ppm ☺ A 13:23 27.4°C meas cal	The device returns to measuring mode.	From the blinking CAL mode indicator, you see that product calibration has not been terminated.
CAL PRODUCT STEP 2 cal	Product calibration step 2: When the sample value has been determined, open the product calibration once more (P_CAL).	Display (3 sec) Now the device is in HOLD mode.
4.37 ppm 2 LAB VALUE cal	The stored value is displayed (blinking) and can be over-written with the measured sample value. Press **enter** to proceed.	
☺ **-59.3** nA ZERO -0.03 nA cal	Display of new slope and zero. Sensoface is active. Press **enter** to proceed.	Related to 25 °C and 1013 mbar To repeat calibration: Select REPEAT, then **enter**
☺ **4.37** ppm i MEAS REPE▸ cal	Display of new oxy value. Sensoface is active. To exit calibration: Select MEAS, then **enter**	To repeat calibration: Select REPEAT, then **enter**
☺ **4.37** ppm --- GOOD BYE --- meas	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.
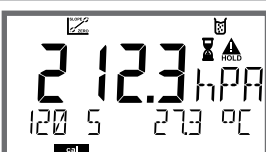
Automatic Calibration in Air

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
CAL CAL AIR cal	Select calibration. Place sensor in air, press **enter** to start. Device goes to HOLD mode.	"CAL WATER" or "CAL AIR" is selected in the configuration.
050.0 % REL HUMIDITY cal	Enter relative humidity using **arrow keys**. Press **enter** to proceed.	Default for relative humidity in air: rH = 50%
1.000 BAR PRESSURE cal	Enter cal pressure using **arrow keys**. Press **enter** to proceed.	Default: **1.013 bar** Unit: bar/kpa/PSI
212.3 hPA 120 S 27.3 °C cal	Drift check: Display of: partial pressure (hPa), response time (s), temperature (°C/°F) Press **enter** to proceed.	The drift check can take some minutes.
☺ **0.156** CSV ZERO 71.23 GRD cal	Display of calibration data Sensoface Stern-Volmer constant Press **enter** to proceed.	
☺ **20.93** % MEAS REPE▸ cal	Display of selected process variable. Now the device is in HOLD mode: Reinstall the sensor and check whether the measurement is OK. MEAS exits calibration, REPEAT permits repetition.	After end of calibration, the outputs remain in HOLD mode for a short time.

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
CAL CAL WATER cal	Select calibration (SLOPE). Immerse sensor in cal medium, press **enter** to start.	"CAL WATER" or "CAL AIR" is selected in the configuration.
1.000 BAR PRESSURE cal	Enter cal pressure Press **enter** to proceed.	Default: **1.013 bar** Unit: bar/kpa/PSI
212.3 hPA 120 S 27.3 °C cal	Drift check: Display of: Partial pressure (hPa) Response time (s) Temperature (°C/°F) Press **enter** to proceed.	Device goes to HOLD mode. The drift check might take some time.
☺ **0.156** CSV ZERO 7123 GRD cal	Display of calibration data Sensoface Stern-Volmer constant Press **enter** to proceed.	Phase angle with $O_2=0$
☺ **8.23** ppm MEAS REPE▸ cal	Display of selected process value. To exit calibration: Select MEAS ◀ ▶, then **enter**	To repeat calibration: Select REPEAT ◀ ▶, then **enter**
☺ **8.22** ppm --- GOOD BYE --- meas	Place sensor in process. 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.
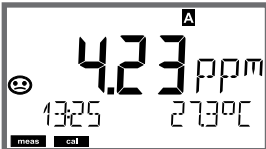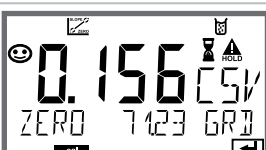
Display	Action	Remark
CAL ZERO POINT	Select calibration. Place sensor in N$_2$, press **enter** to start. Device goes to HOLD mode.	"Zero Point" is selected in the configuration.
0.0 hPA 234 S 273 °C	Drift check: Display of: partial pressure (hPa), response time (s), temperature (°C/°F) Press **enter** to proceed.	The drift check can take some minutes.
0.156 CSV ZERO 7123 GRD	Display of calibration data Sensoface Stern-Volmer constant Press **enter** to proceed.	Phase angle with O$_2$=0
20.93 % MEAS REPE	Display of selected process value. To exit calibration: Select MEAS ◄ ►, then **enter**	To repeat calibration: Select REPEAT ◄ ►, then **enter**
20.93 % MEAS REPE	Place sensor in process. 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.
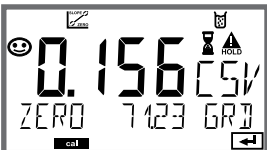
NOTICE!
The reference value must be measured at temperature and pressure conditions similar to those of the process.

Display	Action	Remark
CAL PRODUCT STEP 1 cal	Ready for calibration. Hourglass blinks. Press **enter** to proceed.	Display (3 sec)
4.23 ppm STORE VALUE cal	Press **enter** to save the measured value and to determine the actual oxygen value.	
4.23 ppm ☹ 13:25 27.3°C meas cal	The device returns to measuring mode.	From the blinking CAL mode indicator, you see that product calibration has not been terminated.
CAL PRODUCT STEP 2 cal	When the sample value has been determined, open the product calibration once more (P_CAL).	P_CAL is displayed for 3 sec. Now the device is in HOLD mode.
4.37 ppm 2 LAB VALUE cal	The stored value is displayed (blinking) and can be over-written with the measured sample value. Press **enter** to proceed.	
☺ **0.156** CSV ZERO 7123 GRD cal	Display of calibration data, Sensoface and Stern-Volmer constant Press **enter** to proceed.	
☺ **4.37** ppm MEAS REPE cal	Display of measured OXY value. Sensoface is active. To exit calibration: Select MEAS, then **enter** To repeat calibration: Select REPEAT, then **enter**	After end of calibration, the outputs remain in HOLD mode for a short time.

LDO Offset Correction

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
CAL PRODUCT STEP 1	Ready for calibration. Hourglass blinks. Press **enter** to proceed.	Display (3 sec)
4.23 ppm STORE VALUE	Press **enter** to save the measured value.	
CAL PRODUCT STEP 2	Press **enter** to proceed.	
4.37 ppm 2 LAB VALUE	The stored value is displayed (blinking). Enter offset. Press **enter** to proceed.	You can adjust an offset (%) when the oxygen concentration is below 20 mbar (20 hPa).
0.156 CSV ZERO 7123 GRD	Display of calibration data, Sensoface and Stern-Volmer constant Press **enter** to proceed.	
4.37 ppm MEAS REPE	Display of measured OXY value. Sensoface is active. To exit calibration: Select MEAS, then **enter** To repeat calibration: Select REPEAT, then **enter**	After end of calibration, the outputs remain in HOLD mode for a short time.

Display	Action	Remark
CAL CAL_RTD	Select CAL_RTD calibration method. Press **enter** to proceed.	Wrong settings change the measurement properties!
CAL TEMP ADJUST	Measure the temperature of the process medium using an external thermometer.	Display (3 sec) Now the device is in HOLD mode.
25.0 °C ADJUST 23.5°C	Enter the measured temperature value. Maximum difference: 10 K. Press **enter** to proceed.	Display of actual temperature (uncompensated) in the lower display.
25.0 °C MEAS	The corrected temperature value is displayed. Sensoface is active. To exit calibration: Select MEAS, then **enter**	To repeat calibration: Select REPEAT, then **enter**
20.93 % --- GOOD BYE ---	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.
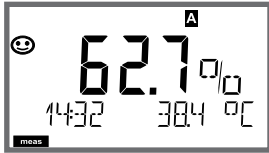
Display	Remark
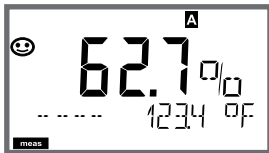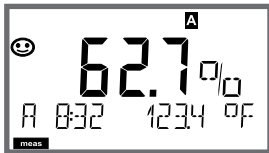
Display | **Remark**

From the configuration or calibration menus, you can switch the device to measuring mode by pressing the **meas** key.

In the measuring mode the upper display line shows the configured process variable (%, 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.

or AM/PM and °F:

Note:

- After prolonged power outage (> 5 days), the time display is replaced by dashes and cannot be used for processing. In that case, enter the correct time and the correct date.

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

1) Selecting the parameter set (if set to "manual" in the configuration).
   Select the desired parameter set using the ◄ ► arrow keys (PARSET A or PARSET B blinks in the lower display line). Press **enter** to confirm.
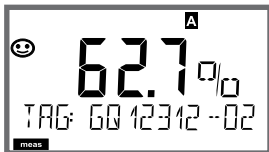
Further displays
(each by pressing **meas**).

2) Display of tag number ("TAG")
3) Display of time and date
4) Display of output currents
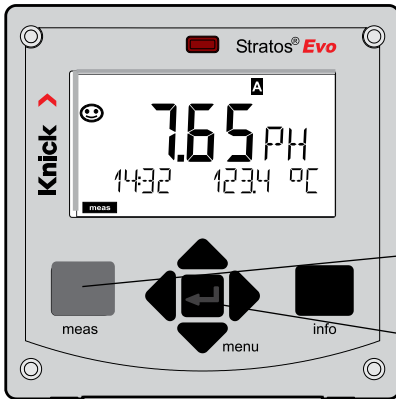
The MAIN DISPLAY is the display which is shown in measuring mode. To call the measuring mode from any other mode, hold the **meas** key depressed for at least 2 sec.

meas key

enter key
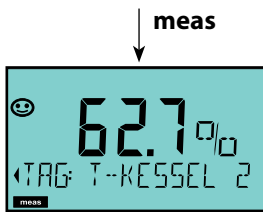
meas

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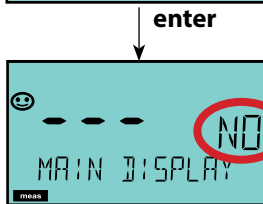
meas

enter

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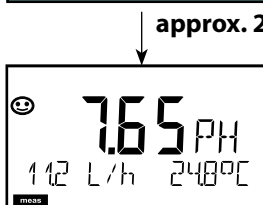
The secondary display shows "MAIN DISPLAY – NO".
Use the **UP** / **DOWN** arrows to select "MAIN DISPLAY – YES" and confirm by pressing **enter**.
The display color changes to white.
This display is now shown in measuring mode.

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

Display	Remark
With activated controller you can also step through the following displays by pressing the **meas** key. When no key has been pressed for 60 sec, the device returns to the standard display.	
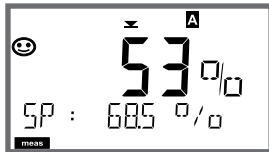
☺ **53** ⁰/□ ⌶ Ⓐ SP : 68.5 ⁰/□ meas	Upper display: Controller output Y The controller output can be modified using ▲ ▼. This allows control systems to be tested and, above all, started smoothly. Lower display: Setpoint Depending on configuration setting: %, mg/l, ppm, or temperature.
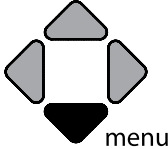
In the Diagnostics mode you can access the following menus without interrupting the measurement:

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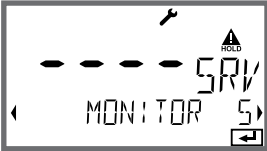LOGBOOK   Viewing the logbook entries
MONITOR   Displaying currently measured values
VERSION   Displaying device type, software version, serial number

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. (Display color changes to turquoise.) Select DIAG using ◀ ▶ keys, confirm by pressing **enter**
Select diagnostics option		Use ◀ ▶ keys to select from: CALDATA SENSOR SELFTEST LOGBOOK MONITOR VERSION See next pages for further proceeding.
Exit	**meas**	Exit by pressing **meas**.
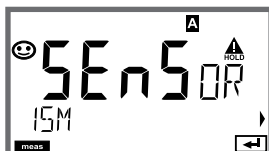
Display	Menu item
d IAG ◀K CALDATA LD▶	**Displaying the calibration data** Select CALDATA using ◀ ▶, confirm by pressing **enter**. Use the ◀ ▶ keys to select the desired parameter from the bottom line of the display (LAST_CAL ZERO SLOPE OFFSET (LDO) NEXT_CAL). The selected parameter is shown in the upper display line.
27.09. 07 ◀CK LAST_CAL CE▶	
☺ **0.00** nA ◀CAL ZERO SLOP▶	
☺ **-30.0** nA ◀RO SLOPE NEX▶	
☺ **24** h ◀E NEXT_CAL	Press **meas** to return to measurement.
☺**SEnSor** STANDARD	**Displaying the sensor data** For analog sensors, the type is displayed, for digital sensors, the manufacturer, type, serial number and last calibration date. In each case Sensoface is active.
☺**SEnSor** ISM	Display data using ◀ ▶ keys, return by pressing **enter** or **meas**.
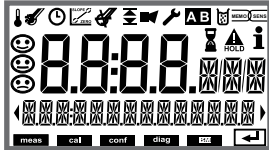
Display	Menu item
	Device self-test (To abort, you can press **meas**.) 1) **Display test**: Display of all segments with changing background colors (white/green/red). Proceed by pressing **enter**
CHECk RAM ---OK---	2) **RAM test:** Hourglass blinks, then display of --PASS-- or --FAIL-- Proceed by pressing **enter**
CHECk EEPROM ---OK---	3) **EEPROM test:** Hourglass blinks, then display of --PASS-- or --FAIL-- Proceed by pressing **enter**
CHECk FLASH ---OK---	4) **FLASH test:** Hourglass blinks, then display of --PASS-- or --FAIL-- Proceed by pressing **enter**
CHECk MODUL ---OK---	5) **Module test:** Hourglass blinks, then display of --PASS-- or --FAIL-- Return to measuring mode by pressing **enter** or **meas**

Display	Menu item
d IAg ‹TA LOGBOOK	**Displaying the logbook entries** Select LOGBOOK using ◀ ▶ , press **enter** to confirm. With the ▲ ▼ keys, you can scroll backwards and forwards through the logbook (entries -00-...-99-), -00- being the last entry. If the display is set to date/time, you can search for a particular date using the ▲ ▼ keys. Press ◀ ▶ to view the corresponding message text.
-00- LOG 14:09 30.09.2005›	
-00- LOG ‹ERR 01 RANGE C›	If the display is set to the message text, you can search for a particular message using the ▲ ▼ keys. Press ◀ ▶ to display the date and time. Press **meas** to return to measurement.
☺**009** CFR 9:23 23.11.2007›	**Extended logbook / Audit Trail (via TAN)** With the ▲ ▼ keys, you can scroll backwards and forwards through the extended logbook (entries -000-...-99-), -000- being the last entry. **Display: CFR** Audit Trail also records function activations (CAL CONFIG SERVICE), some Sensoface messages (cal timer, wear), and opening of the enclosure.

Display	Menu item
⌁ **dIAG** MONITOR diag	**Displaying the currently measured values (sensor monitor)** Select MONITOR using ◂ ▸, press **enter** to confirm. Use the ▲ ▾ keys to select the desired parameter from the bottom line of the display: 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 AUTO-CLAVE). The selected parameter is shown in the upper display line. Press **meas** to return to measurement.
Display examples: **102.3** nA ⚠ HOLD ◂ I_OXY ▸ diag	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)
127 DAY ⚠ HOLD ◂ LIFETIME ▸	Display of remaining dynamic lifetime (only for digital sensors, however not for MEMOSENS)
256 h ⚠ HOLD ◂OPERATION TIME▸	Display of sensor operating time (for digital sensors only)
1.0.2 SW ◂SERIAL-No 0073▸ diag	**Version** Display of **device type, software/hardware/bootloader version** and **serial number** for all device components. Use the ▲ ▾ keys to switch between software and hardware version. Press **enter** to proceed to next device component.
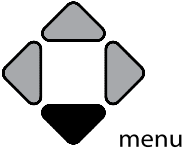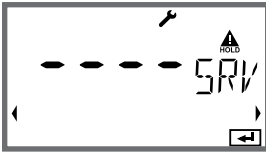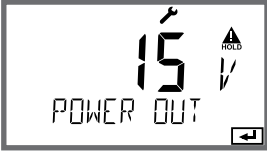
In the Service mode you can access the following menus:
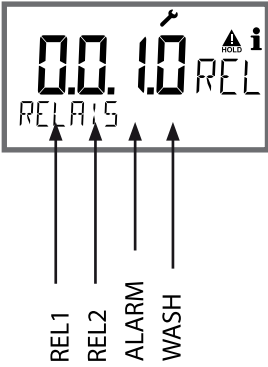
MONITOR	Displaying currently measured values
SENSOR	Displaying the sensor data, with MEMOSENS also resetting the sensor wear counter after replacement of electrolyte/membrane; ISM only: resetting TTM; ISM/LDO: incrementing the autoclaving counter
POWER OUT	Power output (adjustable: 3.1/12/15/24 V)
OUT1	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	menu	Press **menu** key to call the selection menu. Select SERVICE using ◀ ▶ keys, press **enter** to confirm.
Passcode	5555 PASSCODE SERV ▸ meas	Enter passcode "5555" for service mode using the ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.
Display	---- SRV ◀ ▶	In service mode the following icons are displayed: • HOLD triangle • Service (wrench)
Exit	**meas**	Exit by pressing **meas**.

Menu item	Remark
	Displaying currently measured values (sensor monitor) with HOLD mode activated: Select MONITOR using ◄ ▶, press **enter** to confirm. Select variable in the bottom text line using ◄ ▶. The selected parameter is shown in the upper display line. As the device is in HOLD mode, you can perform validations using simulators without influencing the signal outputs. Hold **meas** depressed **for longer than 2 sec** to return to Service menu. Press **meas** once more to return to measurement.
SENSOR / TTM	**Resetting the adaptive maintenance timer** Here, the interval is reset to its initial value. To do so, select "TTM RESET = YES" and confirm by pressing **enter**.
SENSOR / AUTOCLAVE	**Incrementing the autoclaving counter** After having completed an autoclaving process, you must increment the autoclaving count. To do so, select "**YES**" and confirm by pressing **enter**. The device confirms with "INCREMENT AUTOCLAVE CYCLE".
POWER OUT	**POWER OUT, adjusting the output voltage** Here, you can select an output voltage of 3.1/12/15/24 V. When the SE 740 optical oxygen sensor has been selected, the output voltage will be automatically set to 15 V, regardless of the setting in the SERVICE menu.
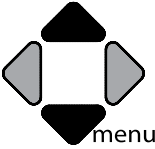
Menu item	Remark
	Specifying the current for outputs 1 and 2: Select OUT1 or OUT2 using the ◄ ► keys, press **enter** to confirm. Enter a valid current value for the respective output using ▲ ▼ ◄ ► keys. Confirm by pressing **enter**. For checking purposes, the actual output current is shown in the bottom right corner of the display. Exit by pressing **enter** or **meas**.
	Relay test (manual test of contacts): Select RELAIS using ◄ ► , press **enter** to confirm. Now the status of the 4 relays is "frozen". The 4 digits of the main display represent the respective states (from left to right: REL1, REL2, ALARM, WASH). The digit for the selected relay blinks. Select one of the 4 relays using the ◄ ► keys, close (1) or open (0) using the ▲ ▼ keys. Exit by pressing **enter**. The relays will be re-set corresponding to the measured value. Press **meas** to return to measurement.

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

Power Disruption while Loading the Process Variable

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

--FIRMW UPDATE--

Action	Key/Display	Remark
Device start	53 % LOADING OXY	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	--FIRMW UPDATE--	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	menu	Press the ▲ ▼ keys simultaneously and hold them depressed while the analyzer is reconnected to the power supply.
Device start	45. % LOADING BASE	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	⌛ – – – – SEARCHING	Then the analyzer searches for a measuring module or Memosens sensor.
Loading the process variable, automatic	🔧 **53** % LOADING OXY	When a module or a sensor has been found, the loading progress is shown in percentages.
Loading the process variable, manual	🔧 ⚠ HOLD OXY ‹ DEVICE TYPE › ↵	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 ...	🔧 ⌛ **100** % LOADING OXY	Make sure that the power supply is not interrupted before the **process variable is fully loaded (100%)**.

Error	Info text (is displayed in case of fault when the Info key is pressed)	Problem Possible causes
ERR 01	NO SENSOR	**Sensor error** Device type not assigned Defective sensor Sensor not connected Break in sensor cable
ERR 02	WRONG SENSOR	**Wrong sensor**
ERR 04	SENSOR FAILURE	**Failure in sensor**
ERR 05	CAL DATA	**Error in cal data**
ERR 11	RANGE	**Display range violation** (see page 137 et seq.)
ERR 12	MV RANGE	**mV range**
ERR 13	TEMPERATURE RANGE	**Temperature range violation** (See "Measuring range" on page 145)
ERR 60	OUTPUT LOAD	**Load error**
ERR 61	OUTPUT 1 TOO LOW	**Output current 1** < 0 (3.8) mA
ERR 62	OUTPUT 1 TOO HIGH	**Output current 1** > 20.5 mA
ERR 63	OUTPUT 2 TOO LOW	**Output current 2** < 0 (3.8) mA
ERR 64	OUTPUT 2 TOO HIGH	**Output current 2** > 20.5 mA

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

Error	Info text (is displayed in case of fault when the Info key is pressed)	Problem Possible causes
ERR 102	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	REL 1/2	Alarm	Time out
Measure	active	active	active	active	-
DIAG	active	active	active	active	60 s
HOLD	as configured	as configured			No
CAL	as configured	as configured			No
CONF	as configured	as configured			20 min
SERVICE	as configured	as configured			20 min
SERVICE OUT 1	manual	as configured			20 min
SERVICE OUT 2	as configured	manual			20 min
SERVICE RELAIS	as configured	as configured	manual	manual	20 min
SERVICE (CODES, DEVICE TYPE; OPTION)	as configured	as configured			20 min
Cleaning function	as configured	as configured			No

Explanation:

■ as configured (Last/Fix or Last/Off)

▮ active

▨ manual

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

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

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

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

pH, hazardous area Zone 2	MK-PH015X
Oxy, hazardous area Zone 2	MK-OXY045X
Cond, hazardous area Zone 2	MK-COND025X
CondI, hazardous area Zone 2	MK-CONDI035X

TAN options

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

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

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

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

Measuring ranges with standard sensors "10"		
	Saturation (–10 ... 80°C)	0.0 ... 600.0 %
	Concentration (–10 ... 80°C)	0.00 ... 99.99 mg/l
	(Dissolved oxygen)	0.00 ... 99.99 ppm
	Volume concentration in gas	0.00 ... 99.99 %vol

Measuring ranges with trace sensors "01"		
(TAN SW-A004)	Saturation (–10 ... 80°C)	0.000 ... 150.0 %
	Concentration (–10 ... 80°C)	0000 ... 9999 µg/l / 10.00 ... 20.00 mg/l
	(Dissolved oxygen)	0000 ... 9999 ppb / 10.00 ... 20.00 ppm
	Volume concentration in gas	0000 ... 9999 ppm / 1.000 ... 50.00 %vol

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

Measuring ranges with trace sensors "001"

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

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

Input correction	Pressure correction *	0.000 ... 9.999 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
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)
(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
	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 (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 (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 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 DC < 30 V / < 3 A / < 90 W
Contact response *	N/C (fail-safe type)
Wash contact	Relay contact, floating
Contact ratings	AC < 250 V / < 3 A / < 750 VA DC < 30 V / < 3 A / < 90 W
Contact response *	N/C or N/O
Min/max limits	Min/max contacts, floating, but inter-connected
Contact ratings	AC < 250 V / < 3 A / < 750 VA DC < 30 V / < 3 A / < 90 W
Contact response *	N/C or N/O
Response delay *	0000 ... 9999 s
Setpoints *	As desired within range
Hysteresis *	User-defined
Real-time clock	Different time and date formats selectable
Power reserve	> 5 days
Display	LC display, 7-segment with icons, colored backlighting
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 Further icons for configuration and messages
Alarm indication	Display blinks, red backlighting
Keypad	Keys: meas, info, 4 cursor keys, enter
2 parameter sets	Parameter set A and B, switchover via CONTROL input or manually
Diagnostics functions	
Calibration data	Calibration date, zero, slope
Device self-test	Automatic memory test (RAM, FLASH, EEPROM)
Display test	Display of all segments
Logbook	100 events with date and time 200 entries (Audit Trail) with extended 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 24 V (-15%) … 60 (+10%) V DC ; 10 W Overvoltage category II, protection class II
Nominal operating conditions	
Ambient temperature	-20 … +55 ℃ / –4 … +131 °F
Transport/Storage temperature	-30 … +70 ℃ / -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 2 knockouts for NPT ½" or rigid metallic conduit
Connections	Terminals, conductor cross section max. 2.5 mm²

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

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

Stratos Evo A402: O2 Measurement

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Software version: 1.x