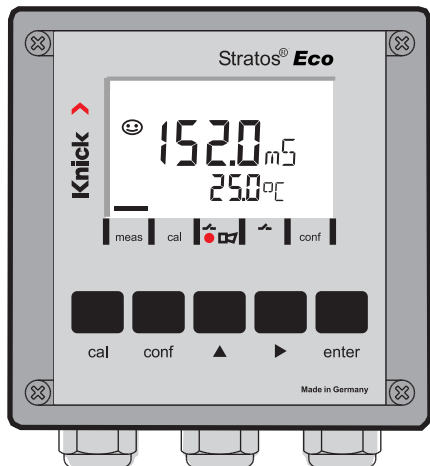


# Stratos<sup>®</sup> Eco 2405 Cond

## Instruction Manual



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Latest Product Information:  
[www.knick.de](http://www.knick.de)

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75495

**Knick >**

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## **Warranty**

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

Sensors, fittings, and accessories: 1 year.

Subject to change 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".

## **Knick**

### **Elektronische Messgeräte**

### **GmbH & Co. KG**

P.O. Box 37 04 15

D-14134 Berlin

Phone: +49 (0)30 - 801 91 - 0

Fax: +49 (0)30 - 801 91 - 200

Internet: <http://www.knick.de>

[knick@knick.de](mailto:knick@knick.de)

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## **Safety information –**

### **Be sure to read and observe the following instructions!**

The device has been manufactured using state of the art technology and it complies with applicable safety regulations.

When operating the device, certain conditions may nevertheless lead to danger for the operator or damage to the device.

### **Caution!**

Commissioning must be carried out by trained experts.

Whenever it is likely that protection has been impaired, the device shall be made inoperative and secured against unintended operation.

The protection is likely to be impaired if, for example:

- the device shows visible damage
- the device fails to perform the intended measurements
- after prolonged storage at temperatures above 70°C
- after severe transport stresses

Before recommissioning the device, a professional routine test in accordance with EN 61010-1 must be performed. This test should be carried out at the manufacturer's factory.

### **Caution!**

Before commissioning it must be proved that the transmitter may be connected with other equipment.



---

## Intended Use

Stratos Eco 2405 Cond is used for measurement of electrical conductivity and temperature in liquids. Fields of application are: biotechnology, chemical industry, environment, food processing, water/waste-water treatment.

The sturdy molded enclosure can be fixed into a control panel or mounted on a wall or at a post.

The protective hood provides additional protection against direct weather exposure and mechanical damage.

The device can be used with all 2- and 4-electrode sensors. It provides two current outputs (for transmission of measured value and temperature, for example), two contacts, and a universal power supply 24 ... 230 V AC/DC, AC: 45 ... 65 Hz.

## Registered Trademarks

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

Stratos<sup>®</sup>

Sensocheck<sup>®</sup>

Sensoface<sup>®</sup>

GainCheck<sup>®</sup>

# Provided Documentation

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## CD-ROM

Complete documentation:

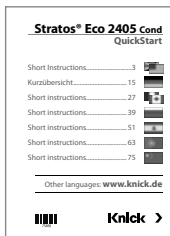
- Instruction manuals
- Safety information
- Short instructions



## Safety Information

In official EU languages and others.

- FM / CSA and Control Drawings
- EC Declarations of Conformity



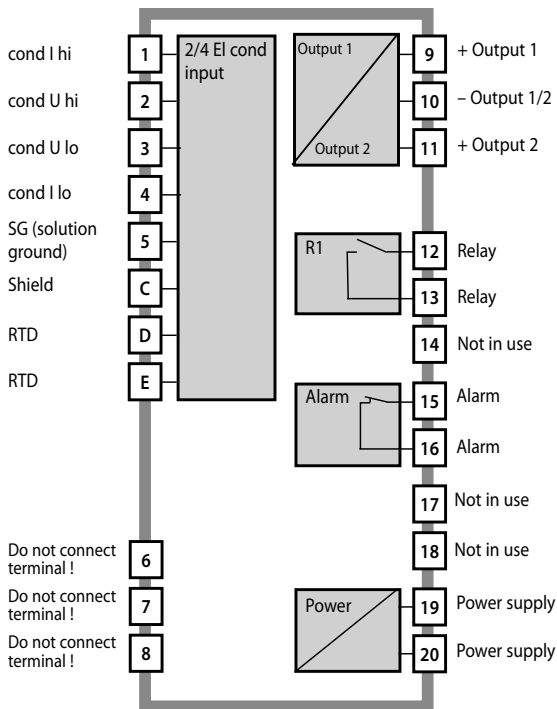
## Short Instructions

In German, English, French, Russian, Spanish, Portuguese, and Chinese.

More languages on CD-ROM and on our website: [www.knick.de](http://www.knick.de)

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

## Overview of Stratos Eco 2405 Cond



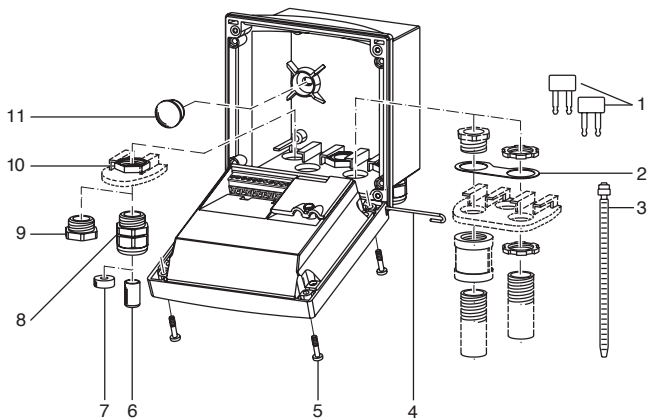
# Assembly

## Package Contents

Check the shipment for transport damage and completeness.

The package should contain:

- Front unit
- Rear unit
- Bag containing small parts
- CD-ROM with documentation
- Specific test report
- Passcode sticker



- |  |  |
|--|--|
| 1 Jumper (2 x)   | 6 Sealing insert (1 x)   |
| 2 Washer (1 x), for conduit mounting:<br>Place washer between enclosure and<br>nut | 7 Rubber reducer (1 x)   |
| 3 Cable tie (3 x)  | 8 Cable gland (3 x)  |
| 4 Hinge pin (1 x), insertable from either<br>side                                  | 9 Filler plug (3 x)  |
| 5 Enclosure screw (4 x)  | 10 Hexagon nut (5 x)   |
|  | 11 Sealing plug (2 x), for sealing in case<br>of wall mounting |

Fig.: Assembling the enclosure

## Mounting Plan

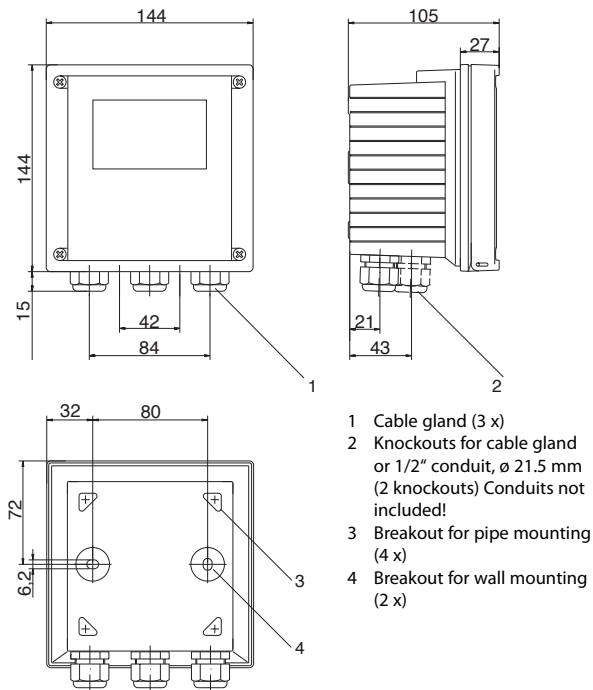
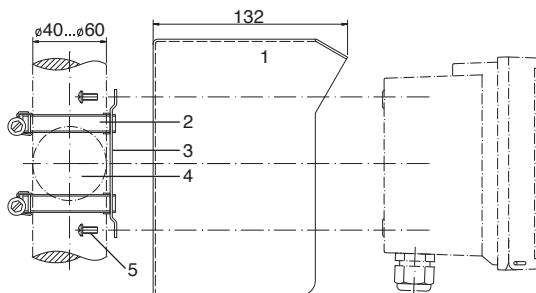


Fig.: Mounting plan (All dimensions in mm!)

## Pipe Mounting, Panel Mounting



- 1 ZU 0276 protective hood (if required)
- 2 Hose clamp with worm gear drive to DIN 3017 (2 x)
- 3 Pipe-mount plate (1 x)
- 4 For vertical or horizontal posts or pipes
- 5 Self-tapping screw (4 x)

Fig.: ZU 0274 pipe-mount kit (All dimensions in mm!)

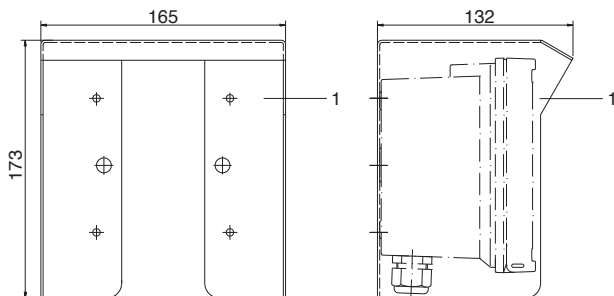
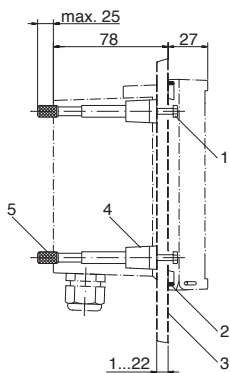


Fig.: ZU 0276 protective hood for wall and pipe mounting  
(All dimensions in mm!)



- 1 Screw (4 x)
- 2 Gasket (1 x)
- 3 Control panel
- 4 Span piece (4 x)
- 5 Threaded sleeve (4 x)

Panel cut-out  
138 x 138 mm (DIN 43700)

Fig.: ZU 0275 panel-mount kit (All dimensions in mm!)

# Installation and Connection

## Installation Instructions

### Caution!

- Installation of the Stratos must be carried out by trained experts in accordance with this instruction 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 20.5 ... 253 V AC/DC.
- All parameters must be set by a system administrator prior to commissioning.

The terminals are suitable for single wires and flexible leads up to 2.5 mm<sup>2</sup> (AWG 14).

### Caution!

Additional safety precautions have to be taken for operation in hazardous locations CSA (CLI, DIV2, GPA,B,C,D T4, Ex nA IIC T4)! (See Appendix: Approvals)!

## Terminal Assignments

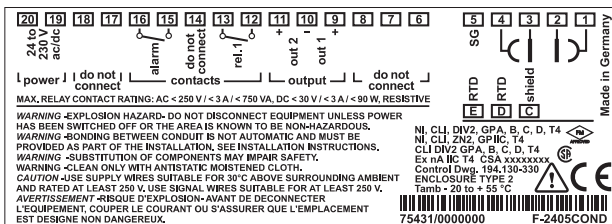
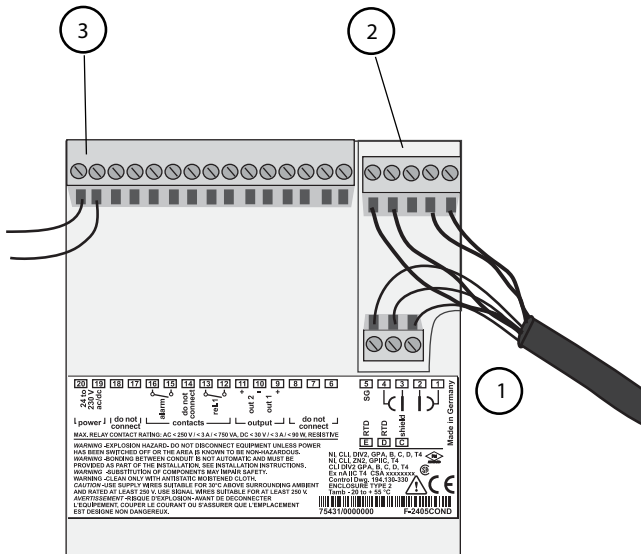


Fig.: Stratos Eco 2405 Cond terminal assignments



- 1 Terminals for temperature probe and outer shield
- 2 Terminals for sensor
- 3 Terminals for power supply

Fig.: Information on installation, rear side of device

## Division 2 Wiring



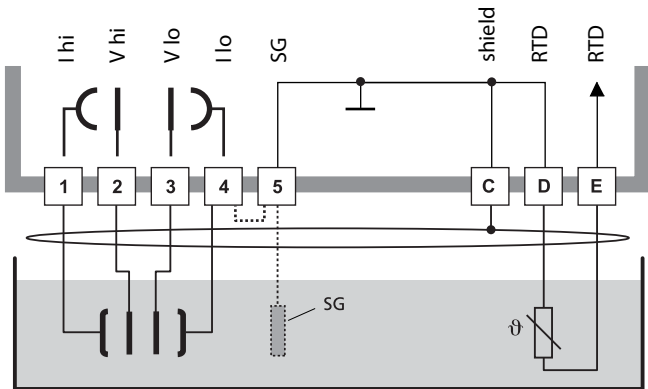
The connections to the device must be installed in accordance with the National Electric Code (ANSI NFPA 70) Division 2 hazardous (classified) location non-incendive wiring techniques.

# Wiring Examples

## Cond measurement with 4-electrode sensor

Any 4-electrode sensors with cell constants from  $0.0050 \text{ cm}^{-1}$  to  $19.9999 \text{ cm}^{-1}$ , with or without temperature detector, can be connected, e.g. SE600, SE603.

Stratos Eco 2405 Cond



### Caution!

Place jumper across terminals 4 and 5!

When using a sensor with Solution Ground connection (SG) or a separate SG connection, the jumper is not required!

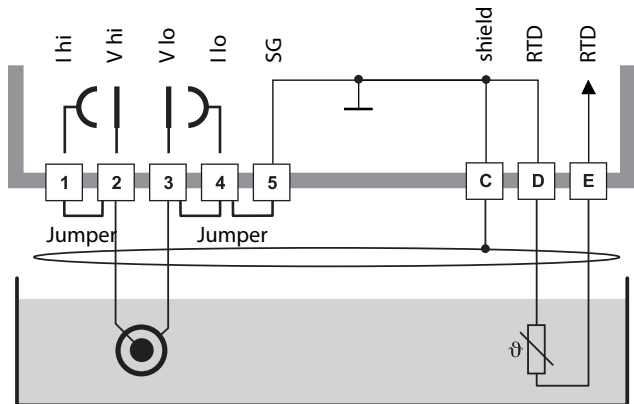
Terminal	1	2	3	4	5	C	D	E	Cell constant
SE660	GY	PK	BU	RD	BN	YE/GN	WH/GN	YE+GN	$0.14...0.38 \text{ cm}^{-1}$
SE603	GY	PK	BU	RD	*	YE/GN	WH/GN	YE+GN	$0.14...0.38 \text{ cm}^{-1}$

\* Connect external SG electrode (or tank wall) to terminal 5!

## Cond measurement with 2-electrode sensor (coaxial electrodes)

Any 2-electrode sensors with cell constants from  $0.0050 \text{ cm}^{-1}$  to  $19.9999 \text{ cm}^{-1}$ , with or without temperature detector, can be connected, e.g. SE610.

Stratos Eco 2405 Cond



### Caution!

Place jumpers:

- across terminals 1 and 2
- across terminals 3 and 4
- across terminals 4 and 5

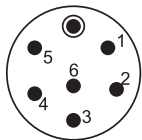
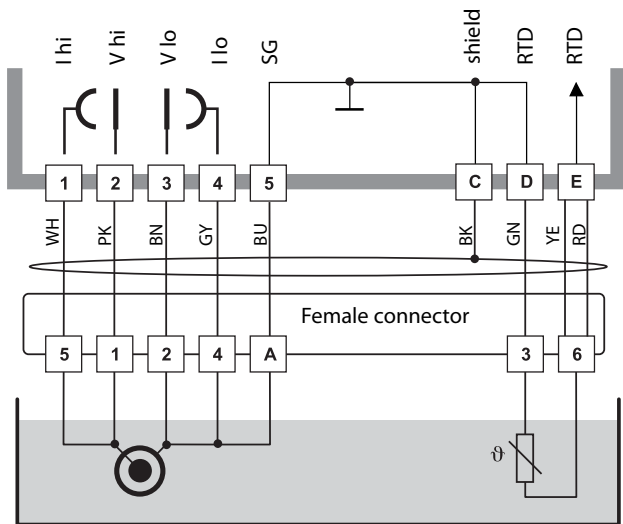
Terminal	2 (jumper 1-2)	3 (jumper 3-4-5)	D	E	C	Cell constant
SE610	BN	WH	GN	YE	BK (shield)	$0.1 \text{ cm}^{-1}$

# Wiring Examples

## Cond measurement with SE604 2-electrode sensor (coaxial electrodes)

Connection using cable ZU 0645 (3 m), ZU 0569 (5 m), ZU 0570 (10 m), ZU 0589 (15 m), ZU 0590 (20 m), or ZU 0660 (30 m)

Stratos Eco 2405 Cond

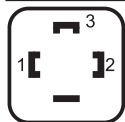
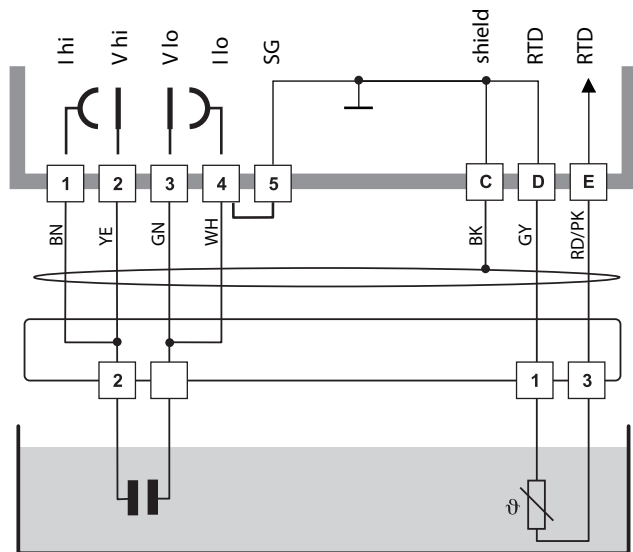


Sensor cap

## Cond measurement with SE630 2-electrode sensor (formerly ZU 0071)

Connection using included GDM connector with 5-m cable

Stratos Eco 2405 Cond



GDM connector

## Wiring Examples

---

### **Sensor Connection Using VP Cables**

Connection diagrams for connecting conductivity sensors using VP cables (e.g. SE620) are provided on request.

Any 2- or 4-electrode sensors with cell constants from  $0.0050 \text{ cm}^{-1}$  to  $19.9999 \text{ cm}^{-1}$ , with or without temperature detector, can be connected.

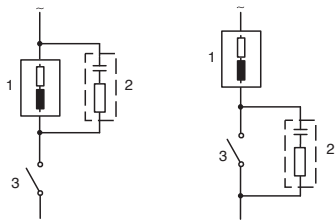


# Protective Wiring of Relay Outputs

---

## Protective Wiring of Relay Contacts

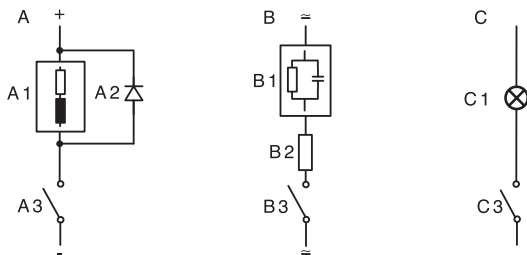
Relay contacts are subjected to electrical erosion. Especially with inductive and capacitive loads, the service life of the contacts will be reduced. For suppression of sparks and arcing, components such as RC combinations, nonlinear resistors, series resistors and diodes should be used.



### 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  $\mu\text{F}$  / 630 V Resistor 100 ohms / 1 W
- 3 Contact

## Typical Protective Wiring Measures



**A: DC application with inductive load**

**B: AC/DC applications with capacitive load**

**C: Connection of incandescent lamps**

A1 Inductive load

A2 Free-wheeling diode, e.g. 1N4007 (Observe polarity)

A3 Contact

B1 Capacitive load

B2 Resistor, e.g.  $8\ \Omega$  / 1 W at 24 V / 0.3 A

B3 Contact

C1 Incandescent lamp, max 60 W / 230 V, 30 W / 115 V

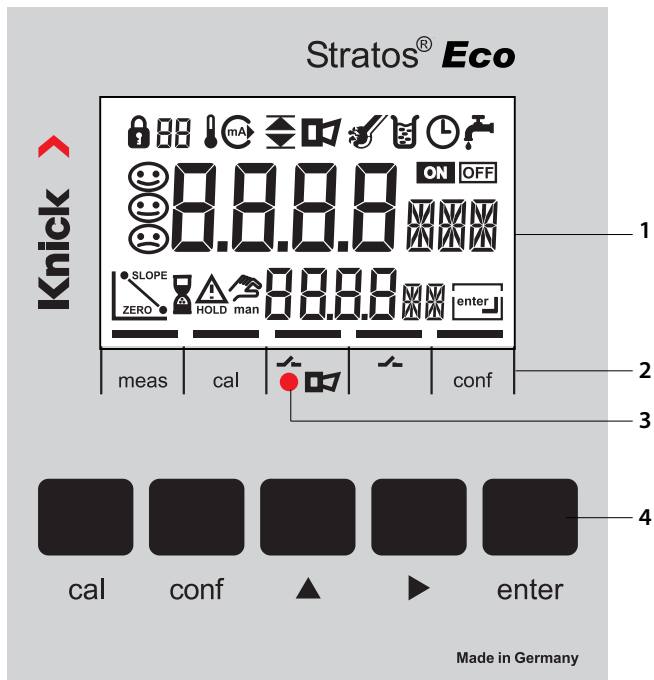
C3 Contact

### Warning!

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

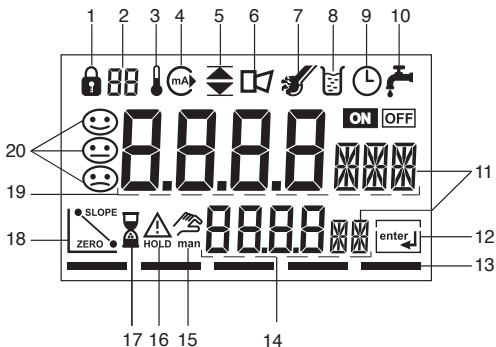
# User Interface and Display

## User Interface



- 1 Display
- 2 Mode indicators (no keys),  
from left to right:
  - Measuring mode
  - Calibration mode
  - Alarm
  - Not in use
  - Configuration mode
- 3 Alarm LED
- 4 Keypad

## Display



- |    |   |    |                           |
|----|---|----|---------------------------|
| 1  | Passcode entry  | 14 | Secondary display         |
| 2  | Not in use  | 15 | Manual temp specification |
| 3  | Temperature   | 16 | Hold mode active          |
| 4  | Current output  | 17 | Waiting time running      |
| 5  | Limit values  | 18 | Sensor data               |
| 6  | Alarm   | 19 | Main display              |
| 7  | Sensocheck  | 20 | Sensoface                 |
| 8  | calibration   |    |                           |
| 9  | Interval/response time  |    |                           |
| 10 | Not in use  |    |                           |
| 11 | Measurement symbol  |    |                           |
| 12 | Proceed with enter  |    |                           |
| 13 | Bar for identifying the device status,<br>above mode indicators,<br>from left to right: |    |                           |
|    | - Measuring mode  |    |                           |
|    | - Calibration mode  |    |                           |
|    | - Alarm   |    |                           |
|    | - Not in use  |    |                           |
|    | - Configuration mode  |    |                           |

## Operation: Keypad

<b>cal</b>	Start, end calibration
<b>conf</b>	Start, end configuration
▶	<ul style="list-style-type: none"><li>• Select digit position (selected position blinks)</li><li>• Menu navigation</li></ul>
▲	<ul style="list-style-type: none"><li>• Edit digit</li><li>• Menu navigation</li></ul>
<b>enter</b>	<ul style="list-style-type: none"><li>• Calibration: Continue in program sequence</li><li>• Configuration: Confirm entries, next configuration step</li><li>• Measuring mode: Display output current</li></ul>

<b>cal → enter</b>	Cal Info, display of calibration data
<b>conf → enter</b>	Error Info: Display of last error message
▶ + ▲	Start GainCheck device self-test

## Sensocheck, Sensoface Sensor Monitoring

Sensocheck continuously monitors the sensor and its wiring. Sensocheck can be switched off (Configuration, Pg 54).



Sensoface provides information on the conductivity sensor condition. Significant sensor polarization effects or an excessive cable capacitance are indicated.



## GainCheck Device Self-Test


A display test is carried out, the software version is displayed, and the memory and measured-value transfer are checked.

Start GainCheck device self-test: ▶ + ▲

## Automatic Device Self-Test

The automatic device self-test checks the memory and measured-value transfer. It runs automatically in the background at fixed intervals.

## Hold Mode

Display: 

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.

If the calibration or configuration mode is exited, the device remains in the Hold mode for safety reasons. This prevents undesirable reactions of the connected peripherals due to incorrect configuration or calibration. The measured value and "HOLD" are displayed alternately.

The device only returns to measuring mode after **enter** is pressed and 20 seconds have passed.

Configuration mode is also exited automatically 20 minutes (timeout) after the last keystroke. The device returns to measuring mode.

Timeout is not active during calibration.

Behavior of output signal:

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 in order to signal the control system that the device is being worked at.

See Configuration Pg 44.

## **Alarm**

Alarm delay is 10 seconds.




During an error message the alarm LED blinks.

Error messages can also be signaled by a 22 mA output current.

The alarm contact is activated by alarm or power failure, see also Pg 55.

# Configuration

In the Configuration mode you set the device parameters.

Activation	<b>conf</b>	Activate with <b>conf</b>
		Enter passcode "1200" Edit parameter using <b>▶</b> and <b>▲</b> , confirm/proceed using <b>enter</b> . (End with <b>conf</b> , then <b>enter</b> .)
<b>HOLD</b>  During configuration the device remains in the Hold mode.		The output current is frozen (at its last value or at a preset fixed value, depending on the configuration), limit and alarm contacts are inactive. Sensoface is off, "Configuration" mode indicator is on.
<b>Input errors</b>		The configuration parameters are checked during the input. In the case of an incorrect input "Err" is displayed for approx. 2 sec. The incorrect parameters cannot be stored. Input must be repeated.
<b>End</b>	<b>conf</b>  <b>enter</b>	End with <b>conf</b> . The measured value and Hold are displayed alternately, "enter" blinks. Press <b>enter</b> key to end the Hold mode. The measured value is displayed. The output current remains frozen for another 20 sec (HOLD icon on, "hourglass" blinks).

## Menu Structure of Configuration

The configuration steps are assigned to different menu groups. With the 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.

The values are edited using the arrow keys.

Pressing **enter** confirms/stores the settings.

Return to measurement: Press **conf**.

Select menu group	Menu group	Code	Display	Select menu item
	Output 1	o1.		
		Menu item 1		
		Menu item 2		
		Menu item ...		
	Output 2	o2.		<p>Previous menu group:</p>
Temperature compensation	tc.			
Alarm settings	AL.			
Relay	rL.			

# Configuration

## Overview of Configuration Steps

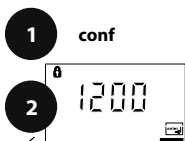
Code	Menu	Selection / Default										
<b>out1</b>	<b>Output 1</b>											
o1.CELL	Select sensor	2-electrode, 4-electrode										
o1.UnIT	Select process variable	μS, mS/cm, MΩ-cm, SAL, Conc										
o1.CoNC	Select solution (Conc), see Pg 39 Codes:	<table border="1"> <tr> <td>NaCl</td> <td>HCl</td> <td>NaOH</td> <td>H<sub>2</sub>SO<sub>4</sub></td> <td>HNO<sub>3</sub></td> </tr> <tr> <td>-1-</td> <td>-2-</td> <td>-3-</td> <td>-4-</td> <td>-5-</td> </tr> </table>	NaCl	HCl	NaOH	H <sub>2</sub> SO <sub>4</sub>	HNO <sub>3</sub>	-1-	-2-	-3-	-4-	-5-
NaCl	HCl	NaOH	H <sub>2</sub> SO <sub>4</sub>	HNO <sub>3</sub>								
-1-	-2-	-3-	-4-	-5-								
o1.rNG	Select current range	0-20 mA / 4-20 mA										
o1. 4mA	Enter current start	xxxx mS										
o1.20mA	Enter current end	xxxx mS										
o1.FtME	Time constant of output filter	xxxx SEC										
o1.FAIL	22 mA signal in the case of error	ON / OFF										
o1.HoLD	Signal behavior during HOLD	Last / Fix										
o1.FIX	Enter fixed value	xxx.x mA										
<b>out2</b>	<b>Output 2</b>											
o2.UnIT	Select temperature unit	°C / °F										
o2. rTD	Select temperature probe	Pt100/Pt1000/NTC30 kΩ/ NTC8.55 kΩ										
o2.rNG	Select current range	0-20 mA / 4-20 mA										
o2. 4mA	Enter current start	xxx.x										
o2.20mA	Enter current end	xxx.x										
o2.FtME	Time constant of output filter	xxxx SEC										
o2.FAIL	22 mA signal for temperature error	ON / OFF										
o2.HoLD	Signal behavior during HOLD	Last / Fix										
o2.FIX	Enter fixed value	xxx.x mA										
<b>tc.</b>	<b>Temperature Compensation</b>											
tc.	Select temp compensation	OFF/Lin/nLF/NaCl/HCl/NH <sub>3</sub>										
tc. LIN	Lin: Enter temperature coefficient	xx.xx %/K										

<b>Code</b>	<b>Menu</b>	<b>Selection / Default</b>
<b>ALrt</b>	<b>Alarm settings</b>	
<b>AL.SnSO</b>	Select Sensocheck	ON / OFF
<b>rLAY</b>	<b>Relay 1: Limit value</b>	
<b>L1.FCT</b>	Select contact function	Lo / Hi
<b>L1.tYP</b>	Select contact response	N/O / N/C
<b>L1.LEVL</b>	Enter setpoint	xxxx
<b>L1.HYS</b>	Enter hysteresis	xxxx
<b>L1.dLY</b>	Enter delay	xxxx SEC

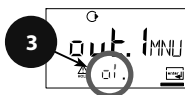
# Configuration

## Output 1

### Select sensor type



Output 1:



enter

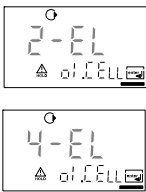
- 1 Press **conf** key.
- 2 Enter passcode **1200**.
- 3 **Output 1** menu group is displayed. All items of this menu group are indicated by the "o1." code.
- 4 Press **enter** to select menu, edit with arrow keys (see Pg 35). Confirm (and proceed) with **enter**.
- 5 End: Press **conf**, then **enter**.

4

<b>o1.CELL</b>	Select sensor
<b>o1.UnIT</b>	Select process variable
<b>o1.CoNC</b>	Select solution (Conc)
<b>o1.rNG</b>	Select 0-20 / 4-20 mA
<b>o1.4mA</b>	Enter current start
<b>o1.20mA</b>	Enter current end
<b>o1.FtME</b>	Set output filter
<b>o1.FAIL</b>	22 mA for error
<b>o1.HoLD</b>	HOLD mode

5

**conf enter**

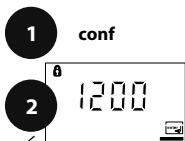
Code	Display	Action	Selection
<b>o1.</b>		Select evaluation method: 2-electrode sensor / 4-electrode sensor Select using <b>▶</b> key, proceed with <b>enter</b> .	<b>2-EI</b> (2-EI / 4-EI)

**Note:** Characters represented in gray are blinking and can be edited.

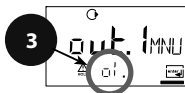
# Configuration

## Output 1

### Select process variable



Output 1:



enter

- 1 Press **conf** key.
- 2 Enter passcode **1200**.
- 3 **Output 1** menu group is displayed. All items of this menu group are indicated by the "o1." code.
- 4 Press **enter** to select menu, edit with arrow keys (see Pg 37). Confirm (and proceed) with **enter**.
- 5 End: Press **conf**, then **enter**.







4

<b>o1.CELL</b>	Select sensor
<b>o1.UnIT</b>	Select process variable
<b>o1.CoNC</b>	Select solution (Conc)
<b>o1.rNG</b>	Select 0-20 / 4-20 mA
<b>o1.4mA</b>	Enter current start
<b>o1.20mA</b>	Enter current end
<b>o1.FtME</b>	Set output filter
<b>o1.FAIL</b>	22 mA for error
<b>o1.HoLD</b>	HOLD mode

enter

5

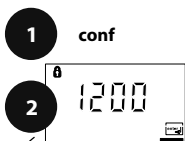
conf enter

Code	Display	Action	Choices
o1.	     	<p><b>Select process variable:</b></p> <p>Select using <b>▶</b> key, proceed with <b>enter</b>.</p> <p><b>Conductivity:</b>            0.000 ... 9.999 <math>\mu\text{S/cm}</math>            00.00 ... 99.99 <math>\mu\text{S/cm}</math>            000.0 ... 999.9 <math>\mu\text{S/cm}</math>            0.000 ... 9.999 <math>\text{mS/cm}</math>            00.00 ... 99.99 <math>\text{mS/cm}</math>            000.0 ... 999.9 <math>\text{mS/cm}</math>            0.000 ... 9.999 <math>\text{S/m}</math>            00.00 ... 99.99 <math>\text{S/m}</math></p> <p><b>Resistivity:</b>            00.00 ... 99.99 <math>\text{M}\Omega\text{-cm}</math></p> <p><b>Salinity (SAL):</b>            0.0 ... 45.0 ‰ (0 ... 35 °C)</p> <p><b>Concentration (Conc):</b>            0.00 ... 9.99% by wt</p>	<p><b>000.0 mS</b>            (0.000 <math>\mu\text{S}</math>            00.00 <math>\mu\text{S}</math>            000.0 <math>\mu\text{S}</math>            0000 <math>\mu\text{S}</math>            0.000 <math>\text{mS}</math>            00.00 <math>\text{mS}</math>            000.0 <math>\text{mS}</math>            0.000 <math>\text{S/m}</math>            00.00 <math>\text{S/m}</math>            00.00 <math>\text{M}\Omega\text{-cm}</math>            000.0 <math>\text{SAL}</math>            00.00 %)</p>

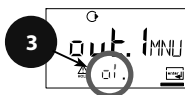
# Configuration

## Output 1

### Concentration measurement: Select process solutions



Output 1:




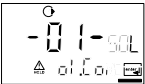




- 1 Press **conf** key.
- 2 Enter passcode **1200**.
- 3 **Output 1** menu group is displayed. All items of this menu group are indicated by the "o1." code.
- 4 Press **enter** to select menu, edit with arrow keys (see Pg 39). Confirm (and proceed) with **enter**.
- 5 End: Press **conf**, then **enter**.

enter

<b>o1.CELL</b>	Select sensor	
<b>o1.UnIT</b>	Select process variable	
<b>o1.CoNC</b>	Select solution (Conc)	
<b>o1.rNG</b>	Select 0-20 / 4-20 mA	
<b>o1.4mA</b>	Enter current start	
<b>o1.20mA</b>	Enter current end	
<b>o1.FtME</b>	Set output filter	
<b>o1.FAIL</b>	22 mA for error	
<b>o1.HoLD</b>	HOLD mode	



conf enter

Code	Display	Action	Choices
o1.		Only with 00.00 % Conc can you select the process solution. Select with arrow key ▶	<b>-01-SOL</b> (-01-SOL -02-SOL -03-SOL -04-SOL -05-SOL)
		<b>-01-</b> NaCl (0.00 ... 9.99 % by wt) (0 ... 120 °C)	
		<b>-02-</b> HCl (0.00 ... 9.99 % by wt) (-20 ... 50 °C)	
		<b>-03-</b> NaOH (0.00 ... 9.99 % by wt) (0 ... 100 °C)	
		<b>-04-</b> H <sub>2</sub> SO <sub>4</sub> (0.00 ... 9.99 % by wt) (-17 ... 110 °C)	
		<b>-05-</b> HNO <sub>3</sub> (0.00 ... 9.99 % by wt) (-20 ... 50 °C)	
		Proceed with <b>enter</b>	

## Concentration Measurement

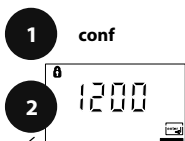
For the solutions listed above, the device can determine the substance concentration from the measured conductivity and temperature values in % by wt. The measurement error is made up of the sum of measurements errors during conductivity and temperature measurement and the accuracy of the concentration curves stored in the device, see Pg 88.

We recommend to calibrate the device together with the sensor. For exact temperature measurement, you should perform a temperature probe adjustment. For measuring processes with rapid temperature changes, a separate temperature probe with fast response should be used.

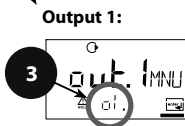
# Configuration

## Output 1

### Output current range, current start, current end



- 1 Press **conf** key.
- 2 Enter passcode **1200**.
- 3 **Output 1** menu group is displayed. All items of this menu group are indicated by the "o1." code.
- 4 Press **enter** to select menu, edit with arrow keys (see Pg 41). Confirm (and proceed) with **enter**.
- 5 End: Press **conf**, then **enter**.



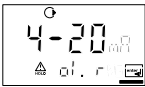


enter

<b>o1.CELL</b>	Select sensor	4
<b>o1.UnIT</b>	Select process variable	
<b>o1.CoNC</b>	Select solution (Conc)	
<b>o1.rNG</b>	Select 0-20 / 4-20 mA	
<b>o1.4mA</b>	Enter current start	
<b>o1.20mA</b>	Enter current end	
<b>o1.FtME</b>	Set output filter	
<b>o1.FAIL</b>	22 mA for error	
<b>o1.HoLD</b>	HOLD mode	

enter

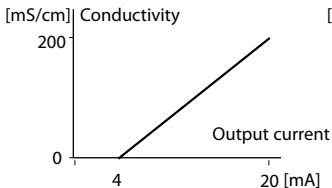


**conf enter**

Code	Display	Action	Choices
o1.		Set output current range Select using $\blacktriangleright$ key, proceed with <b>enter</b> .	<b>4-20 mA</b> (0 - 20 mA/ 4 - 20 mA)
		Current start Enter lower end of scale. Select with $\blacktriangleright$ key, edit number with $\blacktriangle$ key, proceed with <b>enter</b> .	<b>000.0 mS</b> (xxx.x mS)
		Current end Enter upper end of scale. Select with $\blacktriangleright$ key, edit number with $\blacktriangle$ key, proceed with <b>enter</b> .	<b>100.0 mS</b> (xxx.x mS)

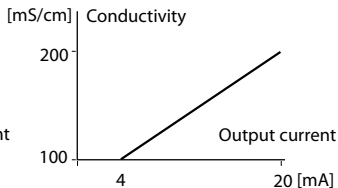
## Assignment of Measured Values: Current Start and Current End

Example 1: Range 0...200 mS/cm



Example 2: Range 100...200 mS/cm

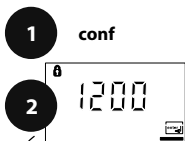
Advantage: Higher resolution in range of interest



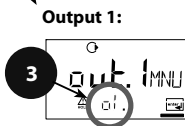
# Configuration

## Output 1

### Time constant of output filter



- 1 Press **conf** key.
- 2 Enter passcode **1200**.
- 3 **Output 1** menu group is displayed. All items of this menu group are indicated by the "o1." code.
- 4 Press **enter** to select menu, edit with arrow keys (see Pg 43). Confirm (and proceed) with **enter**.
- 5 End: Press **conf**, then **enter**.




enter

<b>o1.CELL</b>	Select sensor	4
<b>o1.UnIT</b>	Select process variable	
<b>o1.CoNC</b>	Select solution (Conc)	
<b>o1.rNG</b>	Select 0-20 / 4-20 mA	
<b>o1.4mA</b>	Enter current start	
<b>o1.20mA</b>	Enter current end	
<b>o1.FtME</b>	Set output filter	
<b>o1.FAIL</b>	22 mA for error	
<b>o1.HoLD</b>	HOLD mode	

enter



**conf enter**

Code	Display	Action	Choices
<b>o1.</b>		Time constant of output filter Default setting: 0 s (inactive). To specify a time constant: Select with <b>▶</b> key, edit number with <b>▲</b> key, proceed with <b>enter</b> .	<b>0 sec</b> 0 ... 120 sec

## Time Constant of Output Filter (Attenuation)

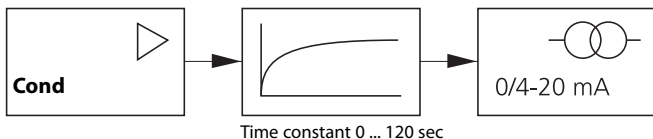
To smoothen the current output, a low-pass filter with adjustable filter time constant can be switched on. When there is a jump at the input (100 %), the output level is at 63 % after the time constant has been reached.

The time constant can be set from 0 to 120 sec.

If the time constant is set to 0 sec, the current output follows the input.

### Please note:

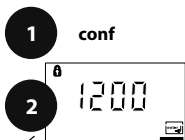
The filter only acts on the current output, not on the display or the limit value!



# Configuration

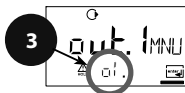
## Output 1

### Output current during Error and HOLD



- 1 Press **conf** key.
- 2 Enter passcode **1200**.
- 3 **Output 1** menu group is displayed. All items of this menu group are indicated by the "o1." code.
- 4 Press **enter** to select menu, edit with arrow keys (see Pg 45). Confirm (and proceed) with **enter**.
- 5 End: Press **conf**, then **enter**.

Output 1:



enter

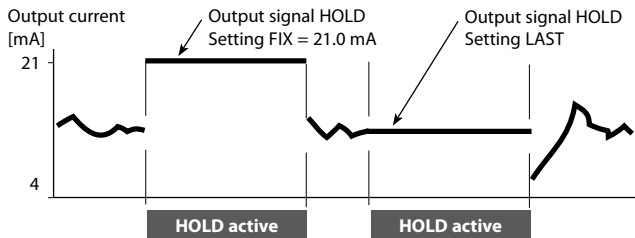
<b>o1.CELL</b>	Select sensor	4
<b>o1.UnIT</b>	Select process variable	
<b>o1.CoNC</b>	Select solution (Conc)	
<b>o1.rNG</b>	Select 0-20 / 4-20 mA	
<b>o1.4mA</b>	Enter current start	enter
<b>o1.20mA</b>	Enter current end	
<b>o1.FtME</b>	Set output filter	enter
<b>o1.FAIL</b>	22 mA for error	
<b>o1.HoLD</b>	HOLD mode	

5

conf enter

Code	Display	Action	Choices
o1.		22 mA signal for error message Select using <b>▶</b> key, proceed with <b>enter</b> .	<b>OFF</b> (OFF / ON)
		Output signal during HOLD LAST: During HOLD the last measured value is maintained at the output FIX: During HOLD a value (to be entered) is maintained at the output Select using <b>▶</b> key, proceed with <b>enter</b> .	<b>LAST</b> (LAST / FIX)
	 	Only with FIX selected: Enter current which is to flow at the output during HOLD Select position with <b>▶</b> key and edit number with <b>▲</b> key. Proceed with <b>enter</b> .	<b>21.0 mA</b> (00.0 ... 21.0 mA)

## Output Signal During HOLD:



# Configuration

## Output 2

### Temperature unit and probe, output current

1 **conf**

2 1200

3 out. 1MNU  
o2.

Output 2:

3 o2.

- 1 Press **conf** key.
- 2 Enter passcode **1200**.
- 3 Select **Output 2** menu group using arrow keys. All items of this menu group are indicated by the "o2." code.
- 4 Press **enter** to select menu, edit with arrow keys (see Pg 47). Confirm (and proceed) with **enter**.
- 5 End: Press **conf**, then **enter**.

enter

o2.UnIT	Select °C/°F	enter
o2. rTD	Select temp probe	enter
o2.rNG	Select 0-20 / 4-20 mA	enter
o2. 4mA	Enter current start	
o2.20mA	Enter current end	
o2.FtME	Set output filter	
o2.FAIL	22 mA for temp error	
o2.HoLD	HOLD mode	

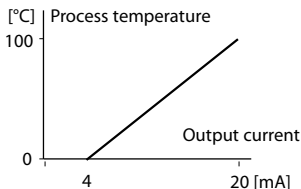
5

**conf enter**

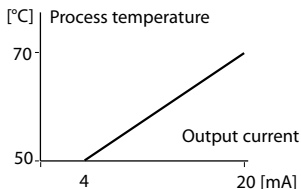
Code	Display	Action	Choices
<b>o2.</b>		Specify temperature unit Select using <b>▶</b> key, proceed with <b>enter</b> .	<b>°C</b> (°C / °F)
		Select temperature probe Select using <b>▶</b> key, proceed with <b>enter</b> .	<b>Pt100</b> (Pt1000, NTC30 kΩ, NTC8.55 kΩ)
		Select output current range Select using <b>▶</b> key, proceed with <b>enter</b> .	<b>4 - 20 mA</b> (4 - 20 mA/ 0 - 20 mA)
		Current start: Enter lower end of scale. Select with <b>▶</b> key, edit number with <b>▲</b> key, proceed with <b>enter</b> .	<b>000.0 °C</b> (xxx.x °C)
		Current start: Enter upper end of scale. Select with <b>▶</b> key, edit number with <b>▲</b> key, proceed with <b>enter</b> .	<b>100.0 °C</b> (xxx.x °C)

## Process Temperature: Current Start and Current End

Example 1: Range 0 ... 100 °C



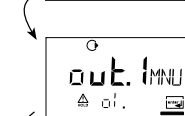
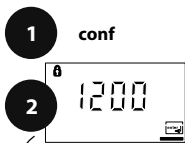
Example 2: Range 50 ... 70 °C  
Advantage: Higher resolution in  
range of interest



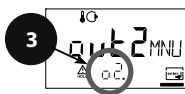
# Configuration

## Output 2

### Time constant of output filter



Output 2:



- 1 Press **conf** key.
- 2 Enter passcode **1200**.
- 3 Select **Output 2** menu group using arrow keys. All items of this menu group are indicated by the "o2." code.
- 4 Press **enter** to select menu, edit with arrow keys (see Pg 49). Confirm (and proceed) with **enter**.
- 5 End: Press **conf**, then **enter**.


enter

<b>o2.UnIT</b>	Select °C/°F
<b>o2. rTD</b>	Select temp probe
<b>o2.rNG</b>	Select 0-20 / 4-20 mA
<b>o2. 4mA</b>	Enter current start
<b>o2.20mA</b>	Enter current end
<b>o2.FtME</b>	Set output filter
<b>o2.FAIL</b>	22 mA for temp error
<b>o2.HoLD</b>	HOLD mode

enter



**conf enter**

Code	Display	Action	Choices
o2.		Time constant of output filter Default setting: 0 sec (inactive). To specify a time constant: Select with <b>▶</b> key, edit number with <b>▲</b> key, proceed with <b>enter</b> .	<b>0 sec</b> (0 ... 120 sec)

## Time Constant of Output Filter

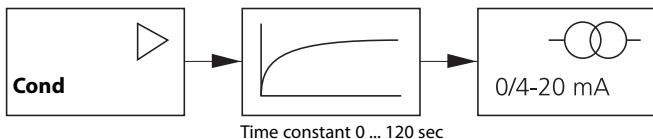
To smoothen the current output, a low-pass filter with adjustable filter time constant can be switched on. When there is a jump at the input (100 %), the output level is at 63 % after the time constant has been reached.

The time constant can be set from 0 to 120 sec.

If the time constant is set to 0 sec, the current output follows the input.

### Please note:

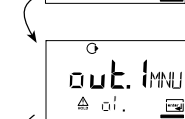
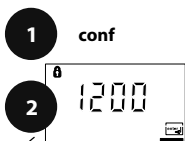
The filter only acts on the current output, not on the display!



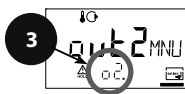
# Configuration

## Output 2

### Temperature error, output current during HOLD



Output 2:



- 1 Press **conf** key.
- 2 Enter passcode **1200**.
- 3 Select **Output 2** menu group using arrow keys. All items of this menu group are indicated by the "o2." code.
- 4 Press **enter** to select menu, edit with arrow keys (see Pg 51). Confirm (and proceed) with **enter**.
- 5 End: Press **conf**, then **enter**.

enter

<b>o2.UnIT</b>	Select °C/°F
<b>o2. rTD</b>	Select temp probe
<b>o2.rNG</b>	Select 0-20 / 4-20 mA
<b>o2. 4mA</b>	Enter current start
<b>o2.20mA</b>	Enter current end
<b>o2.FtME</b>	Set output filter
<b>o2.FAIL</b>	22 mA for temp error
<b>o2.HoLD</b>	HOLD mode

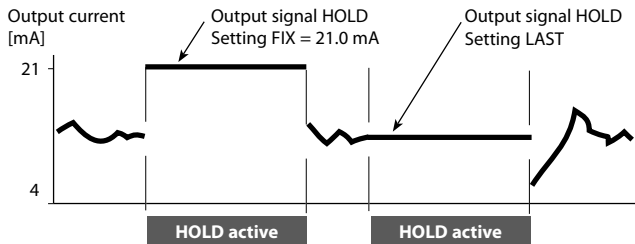
enter



**conf enter**

Code	Display	Action	Choices
o2.		22 mA signal for error message Select using <b>▶</b> key, proceed with <b>enter</b> .	<b>OFF</b> (OFF / ON)
		Output signal during HOLD LAST: During HOLD the last measured value is maintained at the output FIX: During HOLD a value (to be entered) is maintained at the output Select using <b>▶</b> key, proceed with <b>enter</b> .	<b>LAST</b> (LAST / FIX)
	 	Only with FIX selected: Enter current which is to flow at the output during HOLD Select position with <b>▶</b> key and edit number with <b>▲</b> key. Proceed with <b>enter</b> .	<b>21.0 mA</b> (00.0 ... 21.0 mA)


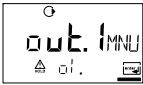

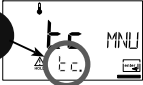
## Output Signal During HOLD:



# Configuration

## Temperature Compensation








### Temp compensation selection

- 1** **conf**
- 2** 
- 
- 
- Temp compensation:**  


- Press **conf** key.
- Enter passcode **1200**.
- Select **Temperature compensation** menu group using arrow keys. All items of this menu group are indicated by the "tc." code.
- Press **enter** to select menu, edit with arrow keys (see Pg 53). Confirm (and proceed) with **enter**.
- End: Press **conf**, then **enter**.

**enter** **tc.** Temp compensation **4**

**5** **conf** **enter**

Code	Display	Action	Choices
tc.		Select temp compensation	<b>OFF</b> (OFF LIN nLF nACL HCL nH3)
		<b>OFF:</b> Temperature compensation switched off Select with ▶ key, proceed with <b>enter</b> .	
		<b>LIN:</b> Linear temperature compensation with entry of temperature coefficient and reference temperature	
		<b>nLF:</b> Temperature compensation for natural waters to EN 27888	
		<b>NaCl (nACL):</b> Temperature compensation for ultrapure water with NaCl traces	
		<b>HCl (HCL):</b> Temperature compensation for ultrapure water with HCl traces	
		<b>NH<sub>3</sub> (nH3):</b> Temperature compensation for ultrapure water with NH <sub>3</sub> traces	
		Only with linear temperature compensation ( <b>LIN</b> ) selected: Enter temperature coefficient. Select position with ▶ key and edit number with ▲ key. Proceed with <b>enter</b> .	<b>02.00%/K</b> (XX.XX %/K)

## Alarm Settings


- 1 Press **conf** key.
- 2 Enter passcode **1200**.
- 3 Select **Alarm settings** menu group using arrow keys. All items of this menu group are indicated by the "AL." code.
- 4 Press **enter** to select menu, edit with arrow keys (see Pg 55). Confirm (and proceed) with **enter**.
- 5 End: Press **conf**, then **enter**.

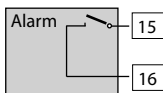
Alarm settings:

enter → **AL.SnSO** Select Sensocheck

5

conf enter

Code	Display	Action	Choices
<b>AL.</b>		Select Sensocheck (continuous monitoring of sensor) Select with <b>▶</b> key, proceed with <b>enter</b> .	<b>OFF</b> (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 provided 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 Pg 44, 50, 73).

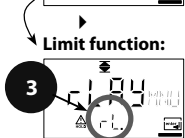
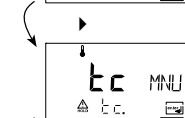
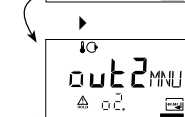
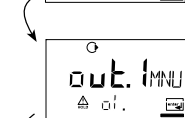
The operating behavior of the alarm contact is shown on Pg 75

The **alarm delay** acts on the LED, the 22 mA signal and the alarm contact.

# Configuration

## Limit Function Relay

- 1 Press **conf** key.
- 2 Enter passcode **1200**.
- 3 Select **Limit function** menu group using arrow keys. All items of this menu group are indicated by the "L1." code.
- 4 Press **enter** to select menu, edit with arrow keys (see Pg 57). Confirm (and proceed) with **enter**.
- 5 End: Press **conf**, then **enter**.

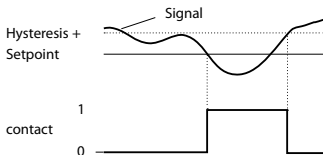


<b>L1.FCT</b>	Contact function
<b>L1.tYP</b>	Contact response
<b>L1.LEVL</b>	Enter setpoint
<b>L1.HYS</b>	Enter hysteresis
<b>L1.dLY</b>	Delay

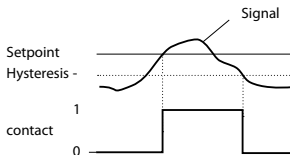
5 **conf enter**

Code	Display	Action	Choices
L1.		Contact function (see below for function principle) Select with <b>▶</b> key, proceed with <b>enter</b> .	<b>Lo</b> (Lo/Hi)
		Contact response N/C: normally closed contact N/O: normally open contact Select with <b>▶</b> key, proceed with <b>enter</b> .	<b>N/O</b> (N/O N/C)
		Setpoint Select with <b>▶</b> key, edit number with <b>▲</b> key, proceed with <b>enter</b> .	<b>000.0 mS</b> (xxx.x mS)
		Hysteresis Select with <b>▶</b> key, edit number with <b>▲</b> key, proceed with <b>enter</b> .	<b>001.0 mS</b> (xxx.x mS)
		Delay The contact is activated with delay (deactivated without delay) Select with <b>▶</b> key, edit number with <b>▲</b> key, proceed with <b>enter</b> .	<b>0010 sec</b> (0 ... 9999 sec)

## Limit Lo



## Limit Hi



# Parameters

---

## Factory Settings of Parameters

### Activation:

Simultaneously press **conf** + right arrow key.

Then enter passcode "4321".

The lower display line reads "Clear". To prevent accidental resetting, "NO" is set as default (blinking in the main display).

Press one of the arrow keys to select "YES" and confirm with **enter**.

### Caution!

Your data (also calibration data) will be overwritten by the factory settings!

Code	Parameters	Factory setting
o1.CELL	Select sensor	2-EL
o1.UnIT	Process variable	000.0 mS
o1.CoNC	Conc solution	-01-
o1. rNG	0/4-20 mA	4-20 mA
o1. 4mA	Current start	000.0 mS
o1.20mA	Current end	100.0 mS
o1.FtME	Filter time	0 s
o1.FAIL	22mA signal	OFF
o1.HoLD	HOLD response	Last
o1.FIX	Fix current	021.0 mA
o2.UnIT	Unit °C / °F	°C
o2.rTD	Temp probe	Pt100
o2.rNG	0/4 ..0.20mA	4-20 mA
o2. 4mA	Current start	000.0 °C
o2.20mA	Current end	100.0 °C
o2.FtME	Filter time	0 s
o2.FAIL	22mA signal	OFF
o2.HoLD	HOLD response	Last
o2.FIX	Fix current	021.0 mA

Code	Parameters	Factory setting
tc.	Temp compensation	OFF
tc.LIN	Temp coefficient	02.00%/K
AL.SnSO	Sensocheck	OFF
L1.FCT	Contact function	Lo
L1.tYP	Contact response	N/O
L1.LEVL	Setpoint	000.0 mS
L1.HYS	Hysteresis	001.0 mS
L1.dLY	Delay	0010 sec

**Please note:**

Fill in your configuration data on the following pages.

**Please note:**

The polarization voltage is factory set to  $1.0000 \text{ cm}^{-1}$ .

# Parameters

---

## Parameters – Individual Settings

Code	Parameter	Setting
o1.CELL	Sensor	
o1.UnIT	Process variable	
o1.CoNC	Solution (Conc)	
o1. rNG	0/4-20 mA	
o1. 4mA	Current start	
o1.20mA	Current end	
o1.FtME	Filter time	
o1.FAIL	22mA signal	
o1.HoLD	HOLD response	
o1.FIX	Fix current	
o2.UnIT	Unit °C / °F	
o2.rTD	Temp probe	
o2.rNG	0/4 ..0.20mA	
o2. 4mA	Current start	
o2.20mA	Current end	

Code	Parameter	Setting
o2.FtME	Filter time	
o2.FAIL	22mA signal	
o2.HoLD	HOLD response	
o2.FIX	Fix current	
tc.	Temp compensation	
tc. LIN	Temp coefficient	
AL.SnSO	Sensocheck	
L1.FCT	Contact function	
L1.tYP	Contact response	
L1.LEVL	Setpoint	
L1.HYS	Hysteresis	
L1.dLY	Delay	



## **Information on Calibration**

Calibration adapts the device to the conductivity sensor.

Calibration can be performed by:







- Input of cell constant (e.g. for ultrapure-water sensors)
- Determining the cell constant with a known calibration solution (conductivity standard)
- Product calibration (calibration by comparison)
- Temperature probe adjustment


### **Please note:**

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

## Calibration by Entry of Cell Constant





Input of cell constant with simultaneous display of uncorrected conductivity value and temperature



Display	Action	Remark
	Press <b>cal</b> key, enter code 1100. Select with <b>▶</b> key, edit number with <b>▲</b> key, proceed with <b>enter</b> .	Device is in the Hold mode. If an invalid code is entered, the device returns to measuring mode.
	Ready for calibration	Display (2 sec)
   	Enter cell constant of connected sensor:  Select using <b>▶</b> , enter number using <b>▲</b>  A change in the cell constant also changes the conductivity value.  Press <b>enter</b> to confirm cell constant.	The lower display shows the measured conductivity value. (When there has not been an entry for 6 sec, the lower display alternately shows the conductivity and temperature value.)

Display	Action	Remark
 <p>The image shows a digital display with two rows of information. The top row displays '10.03' followed by 'mS'. The bottom row displays '26.3' followed by '°C'. There are several small icons: a smiley face in the top left, a triangle in the bottom left, and a battery icon in the bottom right.</p>	<p>The device now displays the conductivity and temperature.</p>	
	<p>The measured value is shown in the main display alternately with "Hold". "enter" blinks. End calibration with <b>enter</b>.</p>	<p>After end of calibration, the outputs remain in Hold mode for approx. 20 sec.</p>

## Calibration with Calibration Solution

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

Display	Action	Remark
	Press <b>cal</b> key, enter code 0110. Select with <b>▶</b> key, edit number with <b>▲</b> key, proceed with <b>enter</b> .	Device is in the Hold mode. If an invalid code is entered, the device returns to measuring mode.
	Ready for calibration Remove and clean sensor	Display (2 sec)
	Immerse sensor in calibration solution.  Determine the temperature-corrected conductivity value of the calibration solution from the corresponding table (see Pg 67).	When there has not been an entry for 6 sec, the lower display alternately shows the cell constant and temperature value.
 	Enter value of calibration solution. Select with <b>▶</b> key, edit number with <b>▲</b> key. Confirm calibration with <b>enter</b> .	The cell constant and temperature are alternately displayed in the lower display during the input.

Display	Action	Remark
 <p>The LCD display shows a smiley face icon, the number 0.10326, a triangle icon, the word CELL, and a battery icon.</p>	<p>The determined cell constant is displayed. Confirm with <b>enter</b>.</p>	
 <p>The LCD display shows a smiley face icon, the number 10.83 mS, a triangle icon, the number 26.3 °C, and a battery icon.</p>	<p>The device now displays the conductivity and temperature.</p>	
	<p>Clean sensor and re-place it in the process. The measured value is shown in the main display alternately with "Hold". "enter" blinks. End calibration with <b>enter</b>.</p>	<p>After end of calibration, the outputs remain in Hold mode for approx. 20 sec.</p>

### Please note:





- Be sure to use known calibration solutions with the respective temperature-corrected conductivity values (see "Calibration Solutions" Pg 86).
- During the calibration procedure the temperature must be kept constant.


## Product Calibration

### Calibration by comparison




For product calibration the measured variable is used as configured: conductivity ( $\mu\text{S}/\text{cm}$ ,  $\text{mS}/\text{cm}$ ,  $\text{S}/\text{m}$ ), resistivity ( $\text{M}\Omega\cdot\text{cm}$ ). During product calibration the sensor remains in the process. The measurement is only interrupted briefly. Calibration is without TC correction.

**Procedure:** The currently measured value is stored in the device for comparison. A sample is measured using a portable meter. The sample value is then entered in the device. The new cell constant is calculated from these two values.


Display	Action	Remark
	Press <b>cal</b> key, enter code 1105. Press <b>▶</b> key to select position, enter number using <b>▲</b> key, confirm with <b>enter</b> .	If an invalid code is entered, the device returns to measuring mode.
		Display (approx. 2 sec)
	Save currently measured value. Proceed with <b>enter</b> .	Perform reference measurement.
	Enter sample value. The new cell constant is calculated.	

Display	Action	Remark
 The image shows a digital LCD display. The main display area shows the number '0.002' in large digits. Below it, the word 'CELL' is displayed. There are several small icons around the display: a smiley face, a battery level indicator, a warning triangle, and a 'CAL' button icon. The background of the display is dark with light-colored text and icons.	The determined cell constant is displayed. Confirm with <b>enter</b> .	New calibration: Press <b>cal</b> .
	The new value is shown in the main display alternately with "Hold", "enter" blinks. End with <b>enter</b> .	After end of calibration, the outputs remain in Hold mode for approx. 20 sec.




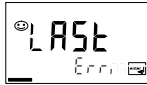
# Temp Probe Adjustment

Display	Action	Remark
	Select calibration Press <b>cal</b> key, enter code 1015. Press <b>▶</b> key to select position, enter number using <b>▲</b> key, confirm with <b>enter</b> .	Wrong settings change the measurement properties! If an invalid code is entered, the device returns to measuring mode.
	Ready for calibration Measure the temperature of the process medium using an external thermometer	Device is in Hold mode. Display approx. 2 sec
	Enter measured temperature value. Select with <b>▶</b> key, edit number with <b>▲</b> key, proceed with <b>enter</b> . End adjustment with <b>enter</b> . HOLD will be deactivated after 20 sec.	Default: Value of secondary display.

## Measurement





Display	Action
	In the measuring mode the main display shows the configured process variable (conductivity, resistivity, or SAL) and the lower display the temperature. During calibration you can return to measuring mode by pressing the <b>cal</b> key, during configuration by pressing <b>conf</b> (waiting time for signal stabilization approx. 20 sec).

# Diagnostics functions

Display	Action
	<b>Display of output currents</b> Press <b>enter</b> while in measuring mode. The current at output 1 is shown in the main display, the current at output 2 in the secondary display. After 5 sec the device returns to measuring mode.
	<b>Display of calibration data (Cal Info)</b> Press <b>cal</b> while in measuring mode and confirm code 0000. The current cell constant is shown in the main display. After 20 sec the device returns to measuring mode (immediate return at pressing <b>enter</b> ).
	<b>Sensor monitor</b> for validation of sensor and complete signal processing. Press <b>conf</b> while in measuring mode and enter code 2222. The measured resistance is shown in the main display, the measuring temperature in the lower display. Press <b>enter</b> to return to measurement.
	<b>Display of last error message (Error Info)</b> Press <b>conf</b> while in measuring mode and confirm code 0000. The last error message is displayed for approx. 20 sec. After that the message will be deleted (immediate return to measurement at pressing <b>enter</b> ).

# Diagnostics Functions















These functions are used for testing the connected peripherals.

Display	Action
	<b>Specify current at output 1</b> Press <b>conf</b> while in measuring mode, enter code 5555. The current indicated in the main display for output 1 can be edited. Select using <b>▶</b> key, edit number using <b>▲</b> key. Confirm entry with <b>enter</b> .
	The entered value will be shown in the secondary display. The device is in Hold mode. Press <b>conf</b> , then <b>enter</b> to return to measurement (Hold remains active for another 20 sec).
	<b>Specify current at output 2</b> Press <b>conf</b> while in measuring mode, enter code 5556. The current indicated in the main display for output 2 can be edited. Select using <b>▶</b> key, edit number using <b>▲</b> key. Confirm entry with <b>enter</b> .
	The entered value will be shown in the secondary display. The device is in Hold mode. Press <b>conf</b> , then <b>enter</b> to return to measurement (Hold remains active for another 20 sec).





























## Error Messages (Error Codes)

Error	Display	Problem Possible causes	Alarm contact	Red LED	Out 1 (22 mA)	Out 2 (22 mA)
<b>ERR 01</b>	Measured value blinks	<b>Sensor</b> <ul style="list-style-type: none"> <li>• Wrong cell constant</li> <li>• Measuring range violation</li> <li>• SAL &gt; 45 ‰</li> <li>• Sensor connection or cable defective</li> </ul>	x	x	x	
<b>ERR 02</b>	Measured value blinks	<b>Unsuitable sensor</b> Conductance range > 3500 mS	x	x	x	
<b>ERR 98</b>	"Conf" blinks	<b>System error</b> Configuration or calibration data defective; completely reconfigure the device using the factory settings. Then calibrate. Memory error in device program	x	x	x	x
<b>ERR 99</b>	"FAIL" blinks	<b>Factory settings</b> 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.	x	x	x	x


## Error Messages (Error Codes)

Error	Icon (blinks)	Problem Possible causes	Alarm contact	Red LED	Out 1 (22 mA)	Out 2 (22 mA)
ERR 03		<b>Temperature probe</b> Open or short circuit Temperature range exceeded	x	x	x	x
ERR 11		<b>Current output 1</b> Current below 0 (3.8) mA	x	x	x	
ERR 12		<b>Current output 1</b> Current above 20.5 mA	x	x	x	
ERR 13		<b>Current output 1</b> Current span too small / too large	x	x	x	
ERR 21	 	<b>Current output 2</b> Current below 0 (3.8) mA	x	x		x
ERR 22	 	<b>Current output 2</b> Current above 20.5 mA	x	x		x
ERR 23	 	<b>Current output 2</b> Current span too small / too large	x	x		x
ERR 33	 	<b>Sensocheck:</b> Wrong or defective sensor / polarization effects at the sensor / cable too long or defective / plug defective	x	x	x	
	 	Temperature outside conversion tables (TC, conc, SAL)	Sensoface active, see Pg 77			

# Operating States

Operating status	Out 1	Out 2	Relay 1 limit value	Alarm contact	Timeout
Measure					
Cal Info (cal) 0000					20 s
Error Info (conf) 0000					20 s
Calibration (cal) 1100					
Calibration (cal) 0110					
Temp adjustment (cal) 1015					
Product calibration (cal) 1105					
Configuration (conf) 1200					20 min
Sensor monitor (conf) 2222					20 min
Current source 1 (conf) 5555					20 min
Current source 2 (conf) 5556					20 min

 active

 as configured (Last/Fix or Last/Off)

# Sensoface

---

The smiley in the display (Sensoface) provides information about the sensor condition (defects, maintenance required, cable capacitance too high). It alerts to significant sensor polarization or excessive cable capacitance e.g. caused by an unsuitable cable or a cable that is too long. The permitted calibration ranges and the conditions for a friendly, neutral, or sad Sensoface are summarized in the following chart. Additional icons refer to the error cause.

## Sensocheck

Continuously monitors the sensor and its wiring. Sensocheck can be switched off. Critical values make the Sensoface “sad” and the corresponding icon blinks:







The Sensocheck message is also output as error message Err 33. The alarm contact is active, the red LED is lit, output current 1 is set to 22 mA (when configured correspondingly). Sensocheck can be switched off during configuration (then Sensoface is also disabled).

**Exception:** After a calibration a smiley is always displayed for confirmation.

## Notice

The worsening of a Sensoface criterion leads to the devaluation of the Sensoface indicator (Smiley becomes “sad”). An improvement of the Sensoface indicator can only take place after calibration or removal of the sensor defect.

Display	Problem	Status
	Sensor defect	 Wrong or defective sensor Significant polarization of sensor Excessive cable capacitance (see also Err 33, Error Messages on Pg 74).
	Temperature error	 Temperature outside range for TC, conc, SAL

**Please note:**

When very fast response times ( $t_{90}$ ) are required, e.g. when detecting separation layers, Sensocheck should be switched off (see "Specifications" Pg 80).



## Product Line and Accessories

<b>Devices</b>	<b>Order No.</b>
Stratos Eco 2405 Cond	2405 Cond

### **Mounting Accessories**

Pipe-mount kit	ZU 0274
Panel-mount kit	ZU 0275
Protective hood	ZU 0276
Input socket for a Pt 100/Pt 1000 with Schott 9908 screwed plug	ZU 0165
Connector for power supply instead of cable gland, Harting HAN 7D, with male insert	ZU 0271
Connector for current output instead of cable gland, Harting HAN 8U, with female insert	ZU 0272

For more information concerning our sensors and fittings product line, please refer to our "Sensors, Fittings, Accessories" catalog:

Download at <http://www.knick.de> or request catalog:

Phone: +49 (0)30 - 801 91 - 0

Fax: +49 (0)30 - 801 91 - 200

E-mail: [knick@knick.de](mailto:knick@knick.de)

# Specifications

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## Conductivity input

Input for 2-electrode/4-electrode sensors

Effective ranges

Conductivity 0.2  $\mu\text{S} \cdot \text{cm}$  ... 1000  $\text{mS} \cdot \text{cm}$

Ranges

Conductivity 0.000 ... 9.999  $\mu\text{S}/\text{cm}$   
00.00 ... 99.99  $\mu\text{S}/\text{cm}$   
000.0 ... 999.9  $\mu\text{S}/\text{cm}$   
0000 ... 9999  $\mu\text{S}/\text{cm}$   
0.000 ... 9.999  $\text{mS}/\text{cm}$   
00.00 ... 99.99  $\text{mS}/\text{cm}$   
000.0 ... 999.9  $\text{mS}/\text{cm}$   
0,000 ... 9.999  $\text{S}/\text{m}$   
00.00 ... 99.99  $\text{S}/\text{m}$

Resistivity 00.00 ... 99.99  $\text{M}\Omega \cdot \text{cm}$

Concentration 0.00 ... 9.99 % by wt

Salinity 0.0 ... 45 ‰ (0 ... 35 °C)

Response time ( $T_{90}$ )

< 1 s (Sensocheck off)

< 3 s (Sensocheck on)

Meas. error<sup>1,2,3)</sup>

< 1 % meas. val. + 0.4  $\mu\text{S} \cdot \text{cm}$

## Concentration determination

Operating modes \*

-01- NaCl  
0.00...9.99 % by wt (0...60 °C)

-02- HCl  
0.00...9.99 % by wt (-20...50 °C)

-03- NaOH  
0.00...9.99 % by wt (0...100 °C)

-04- H<sub>2</sub>SO<sub>4</sub>  
0.00...9.99 % by wt (-17...110 °C)

-05- HNO<sub>3</sub>  
0.00...9.99 % by wt (-20...50 °C)

See graphs in the Appendix, Pg 88

## Sensor standardization

Operating modes	<ul style="list-style-type: none"><li>• Input of cell constant with simultaneous display of conductivity and temperature</li><li>• Input of conductivity of calibration solution with simultaneous display of cell constant and temperature</li><li>• Product calibration</li><li>• Temperature probe adjustment</li></ul>
-----------------	--

Adm. cell constant	00.0050 ... 19.9999 cm <sup>-1</sup>
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## Sensor monitoring

<b>Sensocheck</b>	Polarization detection and monitoring of cable capacitance
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<b>Sensoface</b>	Provides information on the sensor condition (Sensocheck)
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<b>Sensor monitor</b>	Direct display of measured values from sensor for validation (resistance/temperature)
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<b>Temperature input *</b>	Pt100/Pt1000/NTC 30 k $\Omega$ /NTC 8.55 k $\Omega$ (Betatherm) 2-wire connection, adjustable
----------------------------	---

Measuring range	Pt 100/Pt 1000	-20.0 ... +200.0 °C (-4...+392 °F)
	NTC 30 k $\Omega$	-20.0 ... +150.0 °C (-4...+302 °F)
	NTC 8.55 k $\Omega$	-10.0 ... +130.0 °C (+14...+266 °F)

Resolution	0.1 °C / 1 °F
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Meas. error <sup>1,2,3)</sup>	< 0.5 K (< 1K for Pt100; < 1K for NTC > 100°C)
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# Specifications

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<b>Temperature compensation</b>	(OFF)	Without
(reference temp 25°C)	(Lin)	Linear characteristic 00.00 ... 19.99 %/K
	(NLF)	Natural waters to EN 27888
	(nACL)	Ultrapure water with NaCl traces (0...120°C)
	(HCL)	Ultrapure water with HCl traces (0...120°C)
	(nH3)	Ultrapure water with NH <sub>3</sub> traces (0...120°C)

## Output 1

	0/4 ... 20 mA, max. 10 V, floating (galvanically connected to output 2)
Process variable*	Conductivity, resistivity, concentration, salinity
Overrange *	22 mA in the case of error messages
Output filter *	Low-pass, filter time constant 0 ... 120 s
Measurement error <sup>1)</sup>	< 0.3% current value + 0.05 mA
Start/end of scale	As desired within range
Minimum span	5 % of selected range

## Output 2

	0/4 ... 20 mA, max. 10 V, floating (galvanically connected to output 1)
Process variable	Temperature
Overrange *	22 mA in case of temp error messages
Output filter *	Low-pass, filter time constant 0 ... 120 s
Measurement error <sup>1)</sup>	< 0.3% current value + 0.05 mA
Start/end of scale *	-20 ... 300 °C / -4 ... 572 °F
Admissible span	20 ... 320 K / 36 ... 576 °F

## 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)
Alarm delay	10 s

<b>Limit values</b>	Output via relay contact
Contact ratings	AC < 250 V / < 3 A / < 750 VA DC < 30 V / < 3 A / < 90 W
Contact response*	N/O or N/C
Delay *	0000 ... 9999 s
Setpoints*	As desired within range
Hysteresis*	0 ... 50 % full scale
<b>Display</b>	LC display, 7-segment with icons
Main display	Character height 17 mm, unit symbols 10 mm
Secondary display	Character height 10 mm, unit symbols 7 mm
Sensoface	3 status indicators (friendly, neutral, sad face)
Mode indication	4 mode indicators "meas", "cal", "alarm", "config" Further icons for configuration and messages
Alarm indication	Red LED in case of alarm
<b>Keypad</b>	5 keys: [cal] [conf] [▶] [▲] [enter]
<b>Service functions</b>	
Current source	Current specifiable for output 1 and 2 (00.00 ... 22.00 mA)
Device self-test	Automatic memory test (RAM, FLASH, EEPROM)
Display test	Display of all segments
Last Error	Display of last error occurred
Sensor monitor	Display of direct sensor signal (resistance/temperature)
<b>Data retention</b>	Parameters and calibration data > 10 years (EEPROM)
<b>Protection against electric shock</b>	Safe electrical isolation of all extra-low-voltage circuits against mains by double insulation to EN 61010-1

# Specifications

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**Power supply** 24 (-15%)...230 V AC/DC (+10%); appr. 5 VA, 2.5 W  
AC: 45 ... 65 Hz  
Overvoltage category II, protection class II

## Nominal operating conditions

Ambient temperature -20 ... +55 °C  
Transport/Storage temp -20 ... +70 °C  
Relative humidity 10 ... 95% not condensing  
Power supply 24 (-15%) ... 230 V AC/DC (+10%)  
Frequency for AC 45 ... 65 Hz

## EMC

Emitted interference EN 61326-1, EN 61326-2-3  
Class B (residential area)  
Class A for mains > 60 V DC  
Immunity to interference Industry

## Explosion protection

**FM** NI Class I Div 2 Group A, B, C & D, T4 Ta = 55 °C;  
Type 2  
NI Class I Zone 2 Group IIC, T4 Ta = 55°C; Type 2  
**CSA** Class I Div 2 Groups A, B, C and D, T4  
Ex nA IIC T4

## Housing

Molded enclosure made of PBT  
(polybutyleneterephthalate)  
Color Bluish gray RAL 7031  
Mounting

- Wall mounting
- Pipe mounting: Ø 40 ... 60 mm □ 30 ... 45 mm
- Panel mounting,  
cutout to DIN 43 700  
Sealed against panel

Dimensions H 144 mm, W 144 mm, D 105 mm

Ingress protection:	IP 65 / NEMA 4X
Cable glands	3 knockouts for cable glands M20x1.5 2 knockouts for NPT 1/2" or rigid metallic conduit
Weight	Approx.1 kg

\* User-defined

1) To IEC 746 Part 1, at nominal operating conditions

2)  $\pm 1$  count

3) Plus sensor error

# Calibration Solutions

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## Potassium Chloride Solutions (Conductivity in mS/cm)

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

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

2) Data source: Test solutions calculated according to DIN IEC 746-3

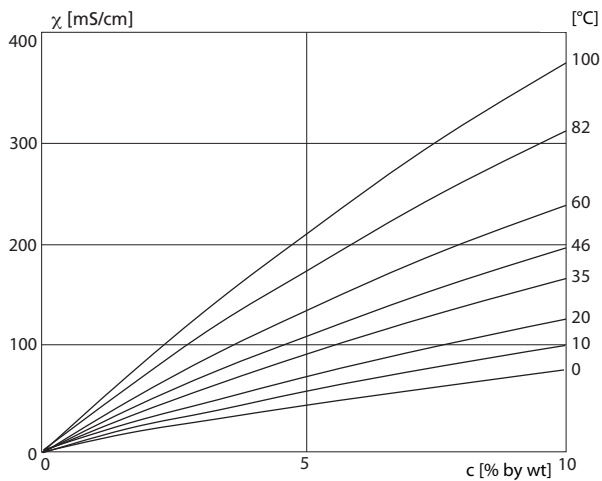
## Sodium Chloride Solutions (Conductivity in mS/cm)

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

# Concentration Curves

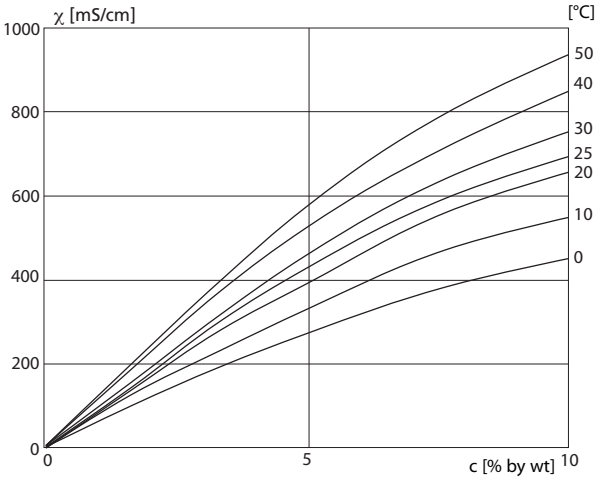
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## -01- Sodium chloride solution NaCl



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

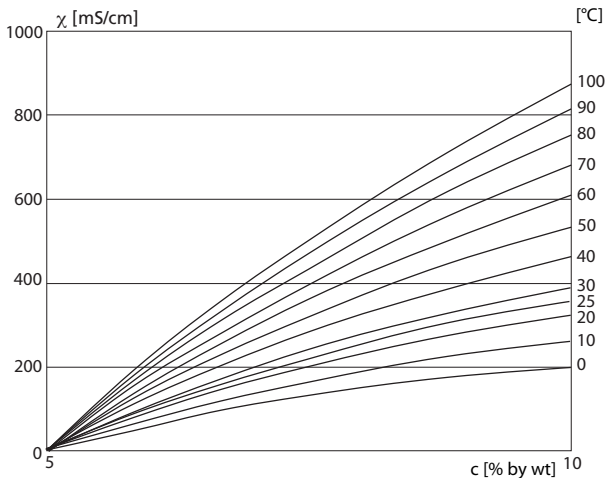
## -02- Hydrochloric acid HCl



Conductivity versus substance concentration and process temperature for hydrochloric acid (HCl)

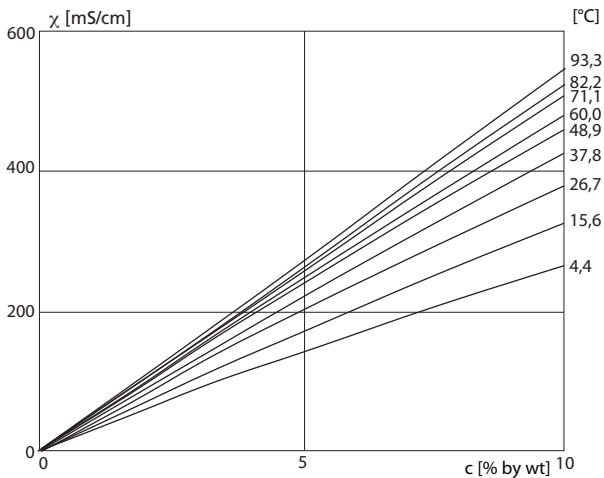
Source: Haase/Sauermann/Dücker; Z. phys. Chem. New Edition, Vol. 47 (1965)

## -03- Sodium hydroxide solution NaOH



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

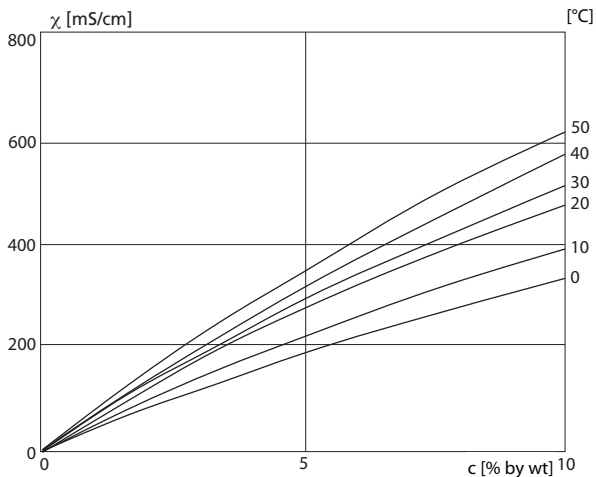
## -04- Sulfuric acid $\text{H}_2\text{SO}_4$



Conductivity versus substance concentration and process temperature for sulfuric acid ( $\text{H}_2\text{SO}_4$ )

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

## -05- Nitric acid $\text{HNO}_3$



Conductivity versus substance concentration and process temperature for nitric acid ( $\text{HNO}_3$ )

Source: Haase/Sauermann/Dücker; Z. phys. Chem. New Edition, Vol. 47 (1965)

<b>Conductance</b>	Conductance $G [S] = 1 / R [\Omega]$
<b>Conductivity</b>	Conductivity $\chi [S/cm] = G [S] \cdot c [1/cm]$
<b>Conductivity sensor</b>	<p>Either 2- or 4-electrode sensors can be connected. The cell constant of the sensor in use must be entered or be determined using a calibration solution taking account of the temperature.</p> <p>A special device variant (Stratos Eco 2405 CondI) is provided for electrodeless sensors.</p>
<b>Passcode</b>	Preset four-digit number to select certain functions.
<b>Sensocheck</b>	Sensocheck monitors the sensor and its wiring. The resulting information is indicated by the Sensoface smileys. Sensocheck can be switched off.
<b>Sensoface</b>	Provides information on the sensor condition. Significant sensor polarization effects or an excessive cable capacitance are indicated..
<b>Temperature coefficient</b>	With temperature compensation activated, the measured value is calculated to the value at the reference temperature (25 °C) using the temperature coefficient.
<b>Temperature compensation</b>	Calculates the measured conductivity value for a reference temperature.

# Approvals – Canada

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## Warnings and Notes to Ensure Safe Operation

### Warning!

Do not disconnect equipment unless power has been switched off.

### Caution!

Clean only with antistatic moistened cloth.

### Caution!

Substitution of components may impair suitability for hazardous locations.

- The equipment shall be installed and protected from mechanical impact and ultraviolet (UV) sources.
- Clean only with a moistened antistatic cloth as potential electrostatic hazard may exist. Service equipment only with conductive clothing, footwear and personal grounding devices to prevent electrostatic accumulation.
- Internal grounding provisions shall be provided for field wiring. Bonding between conduit shall be provided during installation, and all exposed non-current carrying metallic parts shall be bonded and grounded.
- Installation in a Class I, Division 2 or Class I, Zone 2 hazardous location shall be in accordance with the Canadian Electrical Code (CEC Part 1) Section 18 Division 2 wiring methods.
- The equipment shall have a switch or circuit breaker in the building installation (that is in close proximity to the equipment) that is marked as the disconnect switch.
- The enclosure Type 2 is only for indoor use.
- The mains supply voltage fluctuations should not exceed -15/+10 percent of the nominal supply voltage.
- The device shall not be used in a manner not specified by this manual.

**Caution!**

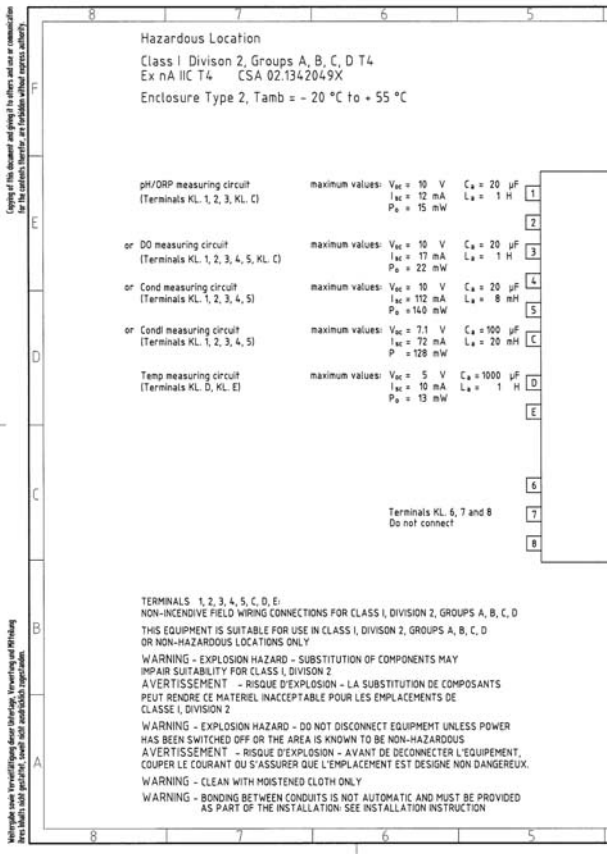
Use supply wires suitable for 30 °C above ambient and rated at least 250 V.

**Caution!**

Use signal wires suitable for at least 250V.

**OBSERVE THE SPECIFICATIONS OF THE CONTROL DRAWING!**

## CSA Control Drawing



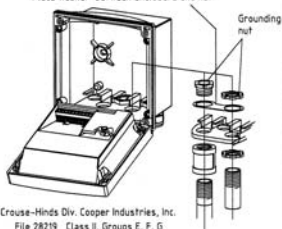
## Stratos Transmitter 2405

Stratos Eco 2405	pH	one pH/ORP input
Stratos Eco 2405	Oxy	one DO input
Stratos Eco 2405	Cond	one Conductivity input for 2-1/4-electrode sensors
Stratos Eco 2405	Cond	one Conductivity input for electrodeless conductivity sensors

20	Power supply circuit (Terminals KL 19, 20)
19	20 to 253 V AC/DC, approx. 5 VA
18	Terminals KL 17 and 18 Do not connect
17	
16	Switching circuit ALARM (Terminals KL 15, 16)
15	maximum values: AC = 253 V / 3 A / 750 VA / resistive load DC = 30 V / 3 A / 90 W / resistive load
14	Terminal KL 14 Do not connect
13	Switching circuit REL 1 (Terminals KL 12, 13)
12	maximum values: AC = 253 V / 3 A / 750 VA / resistive load DC = 30 V / 3 A / 90 W / resistive load
11	Output circuits OUT 1 and OUT 2 (Terminals KL 9, 10 and 11, 10)
10	maximum values: $V_{cc} = 10 \text{ V}$ $C_d = 10 \mu\text{F}$ $I_{sc} = 22 \text{ mA}$ $L_d = 100 \text{ mH}$ $P_o = 220 \text{ mW}$
9	

### Conduit mounting:

Place washer between enclosure and nut



Crouse-Hinds Div. Cooper Industries, Inc.  
File 28219 Class II, Groups E, F, G  
HUB BASIC SCRU-TITE: ST-1, STA-1  
GROUND HUB: SSTG-1, STG-1, STAG-1  
GROUND NUT: STGN-1, STAGN-1  
File 13046 Class I, Zone 1, Ex e II; IP 66  
GROUND HUB BASIC SCRU-TITE: STGK-1, SSTGK-1

Appleton  
File 208042 Class II, Groups E, F, G  
HUBG-50D, HUBL-50D

Thomas & Betts Corporation  
File 23086 Class I, Div 2  
Hub: 370AL, 370  
Grounding Bushing: 3870

Division 2 Wiring Methods:  
The connections of the transmitter are incendive and must be installed in accordance with the Canadian Electrical Code Part I Section 18-Hazardous Locations

Verteiler: FÜL (X)	Zul. Abweichungen für Maße ohne Toleranzangabe ISO 2768 - m	Oberfläche	Halbstaß Nutzweg	Blatt 1
	Bearb.	Datum	Notiz	Bemerkung <b>control drawing CSA Stratos Eco 2405</b>
	Gepr. (KTR)	19.04.08		
	Freigeber(FGL)	10.11.08		Zeichnungsnummer <b>194.130-330</b>
Nr. / AE	Datum	Bearbeiter(FGL, KTR)	Üblich ab	Erstellt durch

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# Passcodes

## Calibration

Key + passcode	Menu item	Page
cal + 0000	CAL info (display of cell constant)	71
cal + 0110	Calibration (with standard solution)	66
cal + 1100	Cell constant adjustment	64
cal + 1105	Product calibration	68
cal + 1015	Temp probe adjustment	70

## Configuration

Key + passcode	Menu item	Page
conf + 0000	Error info (display of last error, erase)	71
conf + 1200	Configuration	30
conf + 2222	Sensor monitor (resistance, temp)	71
conf + 5555	Current source 1 (specify output current)	72
conf + 5556	Current source 2 (specify output current)	72
conf + ▶ + 4321	Factory setting	58