Instruction manual

Transmitter Cond 7100 e

Order number: 52 121 152

METTLER TOLEDO

66829

Warranty

Defects occurring within 1 year from delivery date shall be remedied free of charge at our plant (carriage and insurance paid by sender).

Subject to change without notice.

Return of products under warranty

Please contact METTLER TOLEDO’s Customer Service Dept. 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 (Directive 2002/96/EC of January 27, 2003)
Please observe the applicable local or national regulations concerning the disposal of “waste electrical and electronic equipment”.

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Subject to technical changes. Mettler-Toledo GmbH, 05/04.
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Safety information

Be sure to read and observe the following instructions!

The device has been designed in accordance with the state of the art and complying with the applicable safety regulations. When operating the device, certain conditions may nevertheless lead to danger for the operator or damage to the device.

Caution!
Commissioning may only 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 by the manufacturer.

Caution!
Before commissioning it must be proved that the device may be connected with other equipment.

Intended use

The Transmitter Cond 7100 e 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.

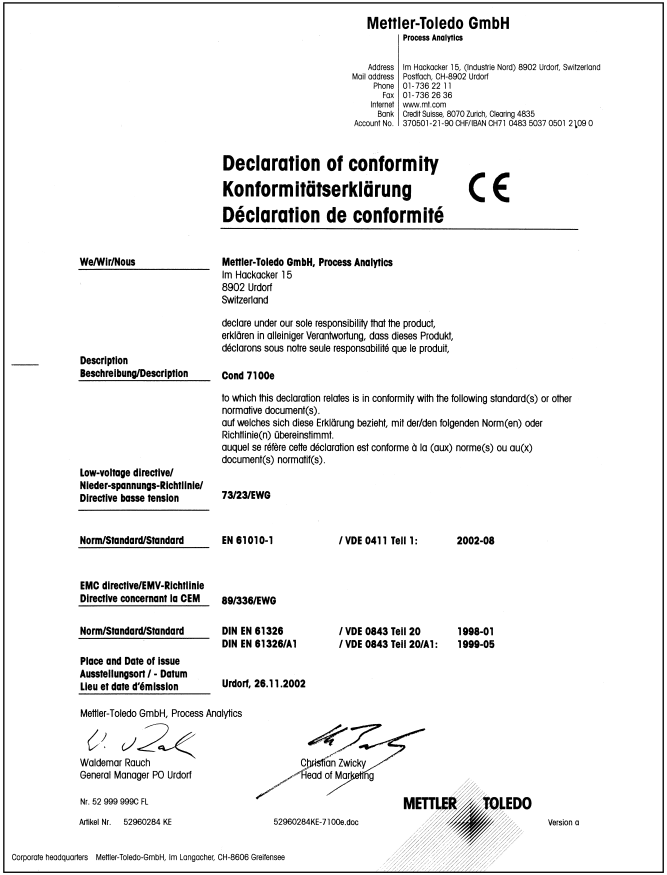
The rugged molded enclosure can be fixed into a control panel or mounted on a wall or at a post. The protective hood provides additional protection against direct weather exposure and mechanical damage.
The Transmitter has been designed for 2- and 4-electrode sensors.
It provides a second current output for temperature measurement, a PID controller (making use of the relay contacts), and a universal power supply for 24 ... 230 V AC/DC.
For CIP applications, you can switch between two parameter sets.

Trademarks

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

InPro®
EasyClean®

EC Declaration of Conformity



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Account No. | 370501-21-90 CHF/IBAN CH71 0483 5037 0501 2109 0

Declaration of conformity
Konformitätserklärung
Déclaration de conformité

CE

We/Wir/Nous	**Mettler-Toledo GmbH, Process Analytics** Im Hackacker 15 8902 Urdorf Switzerland declare under our sole responsibility that the product, erklären in alleiniger Verantwortung, dass dieses Produkt, déclarons sous notre seule responsabilité que le produit,
Description **Beschreibung/Description**	**Cond 7100e** to which this declaration relates is in conformity with the following standard(s) or other normative document(s). auf welches sich diese Erklärung bezieht, mit der/den folgenden Norm(en) oder Richtlinie(n) übereinstimmt. auquel se réfère cette déclaration est conforme à la (aux) norme(s) ou au(x) document(s) normatif(s).
Low-voltage directive/ **Nieder-spannungs-Richtlinie/** **Directive basse tension**	**73/23/EWG**
Norm/Standard/Standard	**EN 61010-1 / VDE 0411 Teil 1: 2002-08**
EMC directive/EMV-Richtlinie **Directive concernant la CEM**	**89/336/EWG**
Norm/Standard/Standard	**DIN EN 61326 / VDE 0843 Teil 20 1998-01** **DIN EN 61326/A1 / VDE 0843 Teil 20/A1: 1999-05**
Place and Date of issue **Ausstellungsort / - Datum** **Lieu et date d'émission**	**Urdorf, 26.11.2002**

Mettler-Toledo GmbH, Process Analytics

Waldemar Rauch
General Manager PO Urdorf

Christian Zwicky
Head of Marketing

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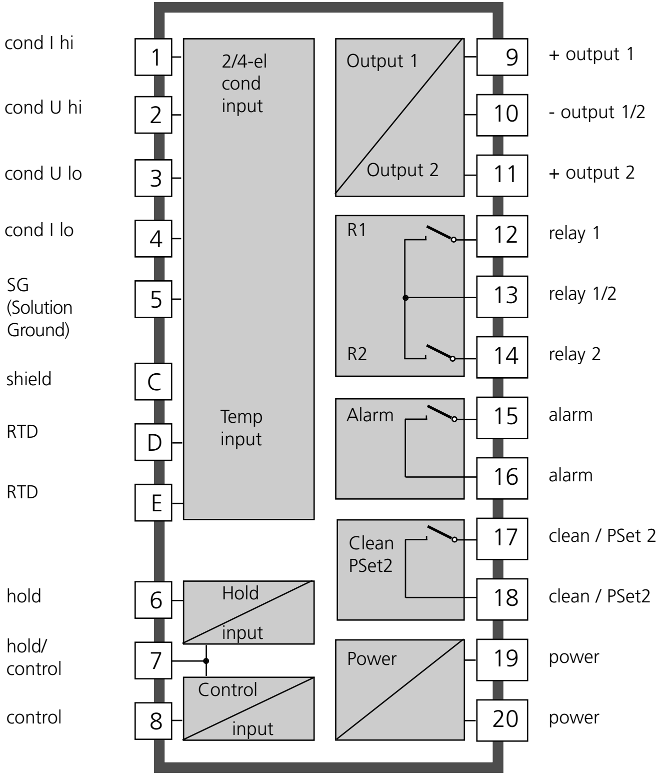
METTLER TOLEDO

Version a

Corporate headquarters Mettler-Toledo-GmbH, Im Langacher, CH-8606 Greifensee

Overview of Transmitter Cond 7100 e

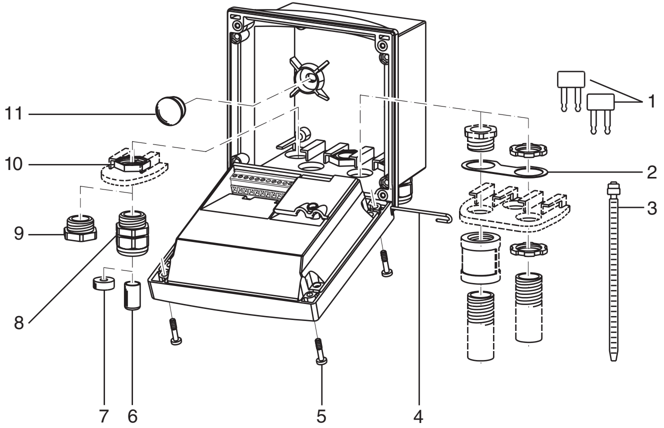

cond I hi
1
2/4-el cond input
Output 1
Output 2
9
+ output 1
cond U hi
2
10
- output 1/2
cond U lo
3
11
+ output 2
cond I lo
4
R1
12
relay 1
SG (Solution Ground)
5
13
relay 1/2
R2
14
relay 2
shield
C
Temp input
Alarm
15
alarm
RTD
D
16
alarm
RTD
E
Clean PSet2
17
clean / PSet 2
18
clean / PSet2
hold
6
Hold input
hold/ control
7
Power
19
power
control
8
Control input
20
power

Assembly

Package contents

Check the shipment for transport damage and completeness.
The package should contain:

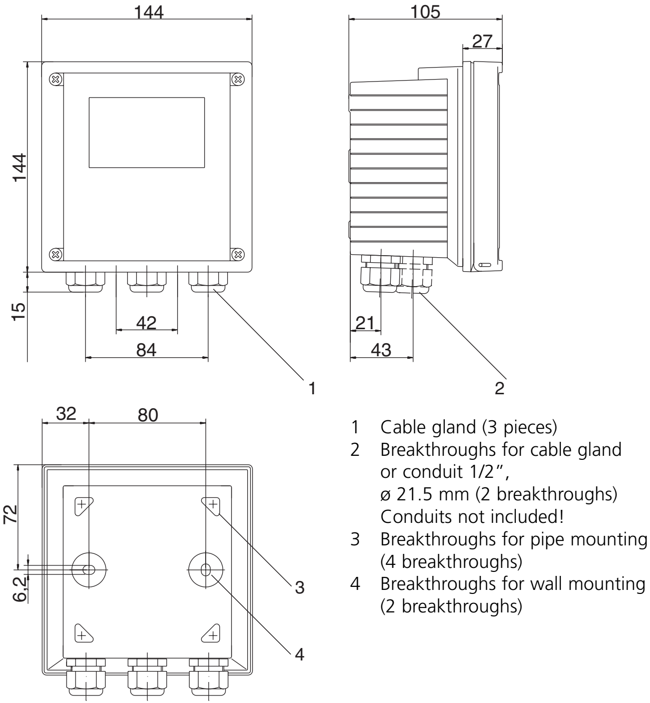
- Front unit
- Lower case
- Bag containing small parts
- Instruction manual
- Specific test report



1 Jumper (2 piece)
2 Washer (1 piece), for conduit mounting: place washer between enclosure and nut
3 Cable ties (3 pieces)
4 Hinge pin (1 piece), insertable from either side
5 Enclosure screws (4 pieces)
6 Sealing inserts (1 piece)
7 Rubber reducer (1 piece)
8 Cable glands (3 pieces)
9 Filler plugs (3 pieces)
10 Hexagon nuts (5 pieces)
11 Sealing plugs (2 pieces), for sealing in case of wall mounting

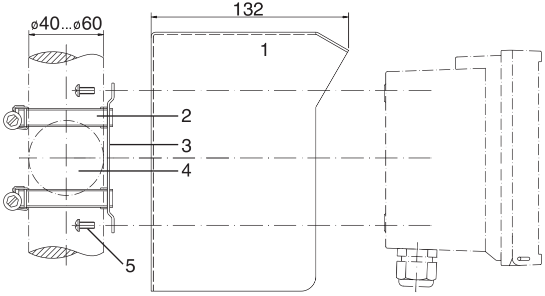
Fig.: Assembling the enclosure

Mounting plan



1 Cable gland (3 pieces)
2 Breakthroughs for cable gland or conduit 1/2”, ø 21.5 mm (2 breakthroughs) Conduits not included!
3 Breakthroughs for pipe mounting (4 breakthroughs)
4 Breakthroughs for wall mounting (2 breakthroughs)

Fig.: Mounting plan


132
ø40...ø60
1
2
3
4
5

1 Protective hood (if required)
2 Hose clamps with worm gear drive to DIN 3017 (2 pieces)
3 Pipe-mount plate (1 piece)
4 For vertical or horizontal posts or pipes
5 Self-tapping screws (4 pieces)

Fig.: Pipe-mount kit

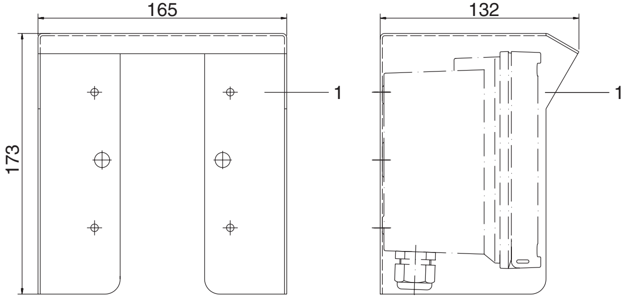
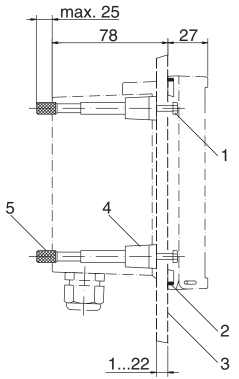

165
173
1
132
1

Fig.: Protective hood for wall and pipe mounting


max. 25
78
27
1
5
4
2
1...22
3

1 Screws (4 pieces)
2 Gasket (1 piece)
3 Panel
4 Span pieces (4 pieces)
5 Threaded sleeves (4 pieces)

Fig.: Panel-mount kit

Installation and connection

Information on installation

Caution!

- The Transmitter may only be installed 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.
- 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 to 253 V AC/DC.
- When commissioning, a complete configuration must be carried out by the system administrator.

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

Warning!

Additional safety precautions have to be taken for applications in hazardous locations to CSA (CLI DIV2 GPA,B,C,D T4, Ex nA IIC T4)! (See Pg 105)

Terminal assignments

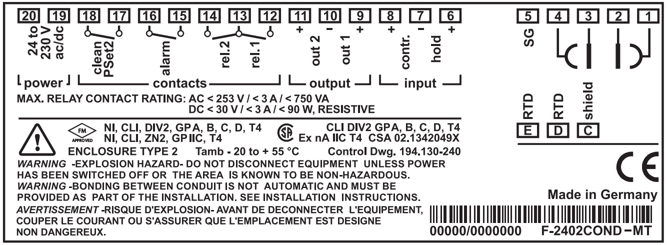
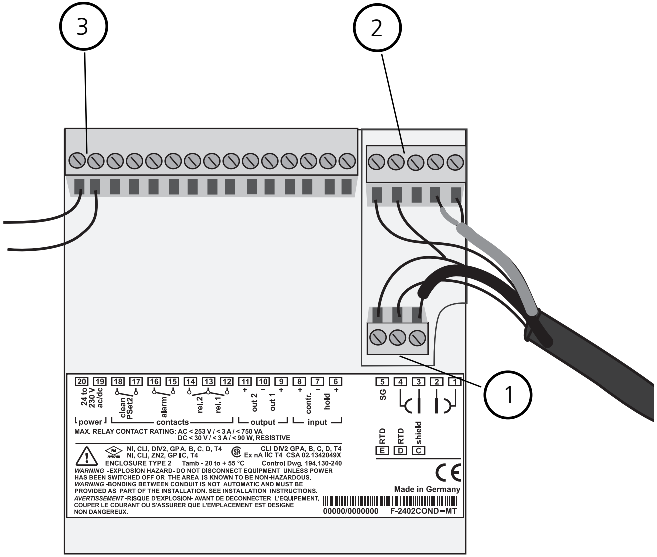

20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
24 to 230 V ac/dc
clean PSet2
alarm
rel.2
rel.1
out 2
out 1
contr.
hold
+ – + + – +
power
contacts
output
input
MAX. RELAY CONTACT RATING: AC < 253 V / < 3 A / < 750 VA
DC < 30 V / < 3 A / < 90 W, RESISTIVE
FM APPROVED
NI, CLI, DIV2, GP A, B, C, D, T4
NI, CLI, ZN2, GP IIC, T4
CLI DIV2 GPA, B, C, D, T4
Ex nA IIC T4 CSA 02.1342049X
ENCLOSURE TYPE 2 Tamb - 20 to + 55 °C Control Dwg. 194.130-240
WARNING -EXPLOSION HAZARD- DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.
WARNING -BONDING BETWEEN CONDUIT IS NOT AUTOMATIC AND MUST BE PROVIDED AS PART OF THE INSTALLATION. SEE INSTALLATION INSTRUCTIONS.
AVERTISSEMENT -RISQUE D'EXPLOSION- AVANT DE DECONNECTER L'EQUIPEMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DESIGNE NON DANGEREUX.
5 4 3 2 1
SG
RTD
RTD
shield
E D C
CE
Made in Germany
00000/0000000 F-2402COND–MT

Fig.: Terminal assignments Cond 7100 e



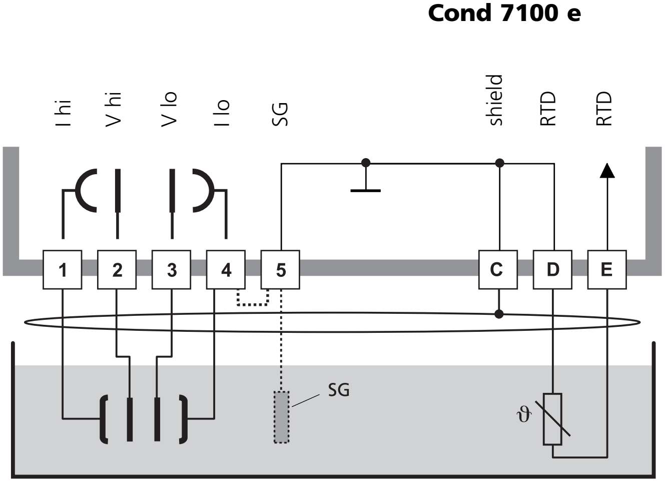
1 Terminals for temperature probe and outer shield
2 Terminals for conductivity sensor
3 Terminals for power supply

Fig.: Information on installation, rear side of device

Division 2 wiring

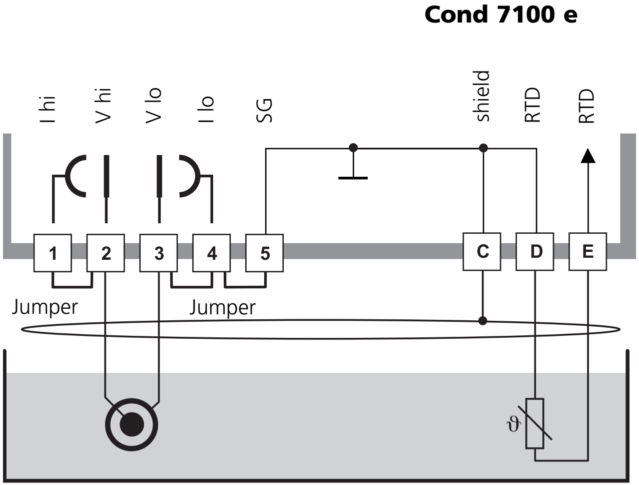
The connections to the Transmitter must be installed in accordance with the National Electric Code (ANSI-NFPA 70) Division 2 hazardous (classified) location, non-incendive wiring techniques.

Cond measurement with 4-electrode sensor


Cond 7100 e
I hi
V hi
V lo
I lo
SG
shield
RTD
RTD
1
2
3
4
5
C
D
E
SG
ϑ

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!

Cond measurement with 2-electrode sensor (coaxial electrodes)

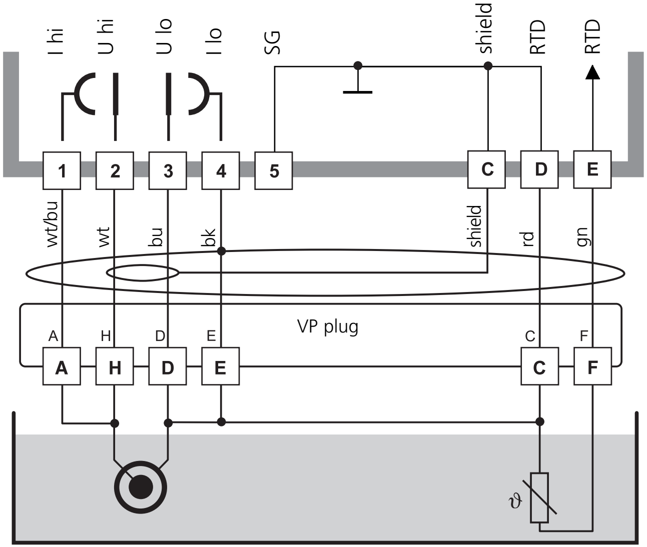

Cond 7100 e
I hi
V hi
V lo
I lo
SG
shield
RTD
RTD
1
2
3
4
5
C
D
E
Jumper
Jumper
ϑ

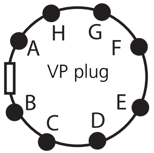
Caution!

Place jumpers:	across terminals 1 and 2
	across terminals 3 und 4
	across terminals 4 and 5

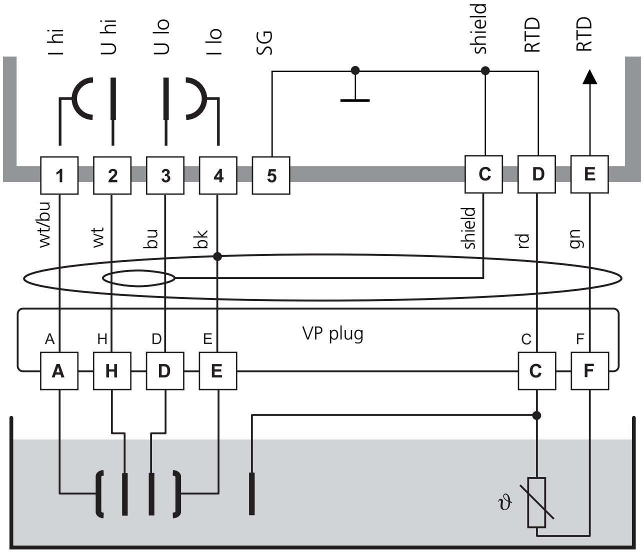
Cond measurement with Mettler-Toledo 2-electrode sensor via VP plug

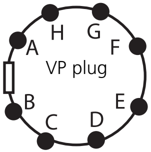
Cond 7100 e


I hi
U hi
U lo
I lo
SG
shield
RTD
RTD
1
2
3
4
5
C
D
E
wt/bu
wt
bu
bk
shield
rd
gn
VP plug
A
H
D
E
C
F
A
H
D
E
C
F
ϑ


H
G
A
F
VP plug
B
E
C
D

Cond measurement with Mettler-Toledo 4-electrode sensor via VP plug

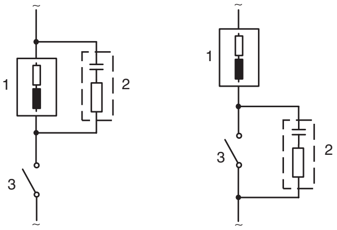

I hi
U hi
U lo
I lo
SG
shield
RTD
RTD
1
2
3
4
5
C
D
E
wt/bu
wt
bu
bk
shield
rd
gn
VP plug
A
H
D
E
C
F
A
H
D
E
C
F
ϑ


H
G
A
F
VP plug
B
E
C
D

Protective wiring of switching outputs

Protective wiring of relay contacts

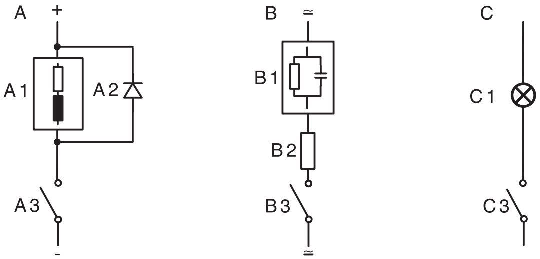
Relay contacts are subjected to electrical erosion. Especially with inductive and capacitive loads, the service life of the contacts will be reduced. For suppression of sparks and arcing, components such as RC combinations, nonlinear resistors, series resistors and diodes should be used.



Typical AC applications with inductive load

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

Typical protective wiring measures



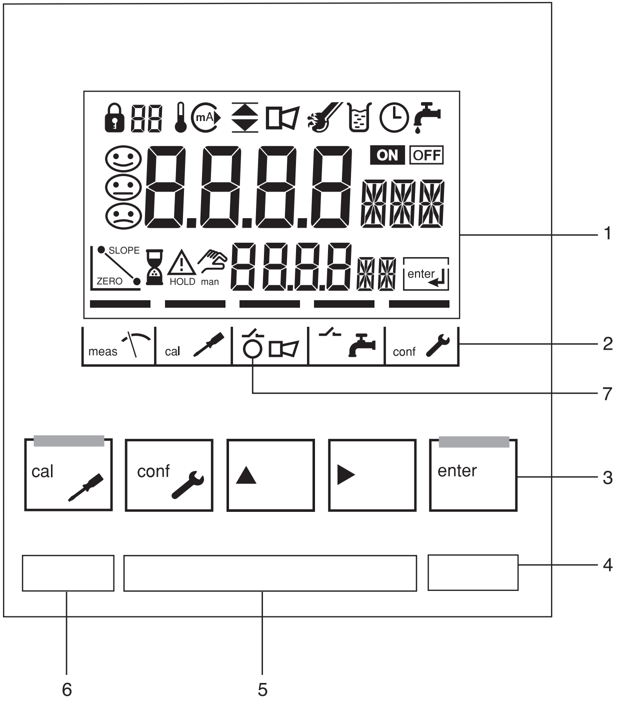
A: DC application with inductive load
B: AC/DC applications with capacitive load
C: Connection of incandescent lamps

A1	Inductive load
A2	Free-wheeling diode, e.g. 1N4007 (Observe polarity)
A3	Contact
B1	Capacitive load
B2	Resistor, e.g. 8 Ohms/1W at 24V/0.3A
B3	Contact
C1	Incandescent lamp, max 60W/230V, 30W/115V
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


ON
OFF
SLOPE
ZERO
HOLD
man
enter
meas
cal
conf
cal
conf
enter
1
2
7
3
4
6
5

1 Display

2 Mode indicators (no keys), from left to right:
  - Measuring mode
  - Calibration mode
  - Alarm
  - Wash contact
  - Configuration mode

3 Keypad

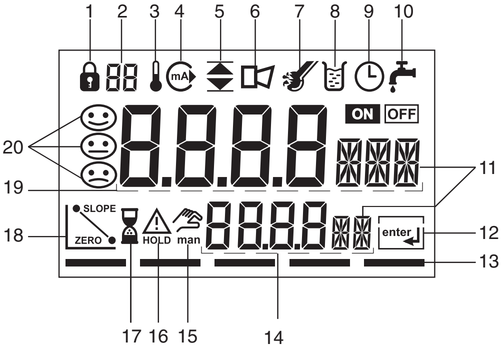
4 Coding

5 Rating plate

6 Model designation

7 Alarm LED

Display


1
2
3
4
5
6
7
8
9
10
20
19
18
11
12
13
17
16
15
14
ON
OFF
SLOPE
ZERO
HOLD
man
enter

1 Mode code entry

2 Parameter set 2 selected

3 Temperature

4 Current output

5 Limit values

6 Alarm

7 Sensocheck

8 Calibration

9 Interval/response time

10 Wash contact

11 Measurement symbols

12 Proceed with enter

13 Bar for identifying the device status, above mode indicators from left to right:
  - Measuring mode
  - Calibration mode
  - Alarm
  - Wash contact
  - Configuration mode

14 Lower display

15 Manual temp indicator

16 Hold mode active

17 Waiting time running

18 Electrode data

19 Main display

20 Sensoface

cal	Start, end calibration
conf	Start, end configuration
▶	Select digit position (selected position flashes)
▲	Edit digit
enter	• Calibration: Continue in program sequence • Configuration: Confirm entries, next configuration step • Measuring mode: Display output current

cal ➤ enter	Cal Info, display of cell constant
conf ➤ enter	Error Info, display last error message
▶ + ▲	Start GainCheck device self-test

Safety functions

Sensocheck, Sensoface sensor monitoring

Sensocheck continuously monitors the sensor and lines. Sensocheck can be switched off (Configuration, Pg 55).

☺ 😐 ☹

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.

Safety functions

Hold mode

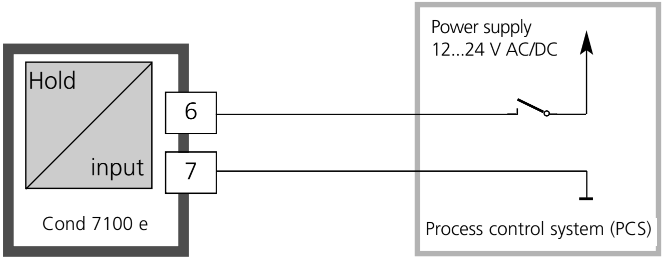
Display:

⚠ HOLD

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

To activate the Hold mode from outside

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



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

Mode codes

The mode codes allow fast access to the functions

Calibration

Key + Code	Description
cal 0000	**Cal Info** Display of cell constant
cal 0110	**Calibration** by entry of solution
cal 1100	**Calibration** by entry of cell constant
cal 1105	**Product calibration**
cal 1015	**Adjusting temp probe**

Configuration

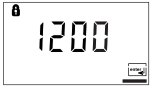
Key + Code	Description
conf 0000	**Error Info** Display of last error
conf 1200	**Configuring parameter set 1**
conf 1288	**Configuring parameter set 2**
conf 2222	**Sensor monitor** Display resistance and temp
conf 7654	**Parameter set 1/2** Switchover internal / external
conf 5555	**Current source 1** Output current 1 specified
conf 5556	**Current source 2** Output current 2 specified
conf 5557	**Relay test** Manual test of contacts
conf 5559	**Manual controller** Manual specification of controller output

Configuration

In the Configuration mode you set the device parameters. The Transmitter can store two different parameter sets and switch between them. Sensor data and "Clean/PSEt2" output are edited in parameter set 1 only. They are valid for both parameter sets.

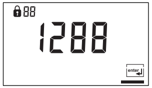
Configuring — conf — Press **conf**.

Parameter set 1
Configure:



Enter mode code "1200":
Edit parameter set 1 with ▶ and ▲, confirm/proceed with **enter**.

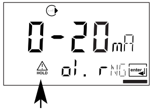
Parameter set 2
Configure:
"88" appears in the display.


88
1288
enter

Enter mode code "1288":
Edit parameter set 2 with ▶ and ▲, confirm/proceed with **enter**.

Hold ⚠ HOLD

During configuration the Transmitter remains in the Hold mode.


0-20mA
o1. rNG
enter

HOLD icon

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. The controller is in the configured state, Sensoface is off, mode indicator "Configuration" is on.

Input errors

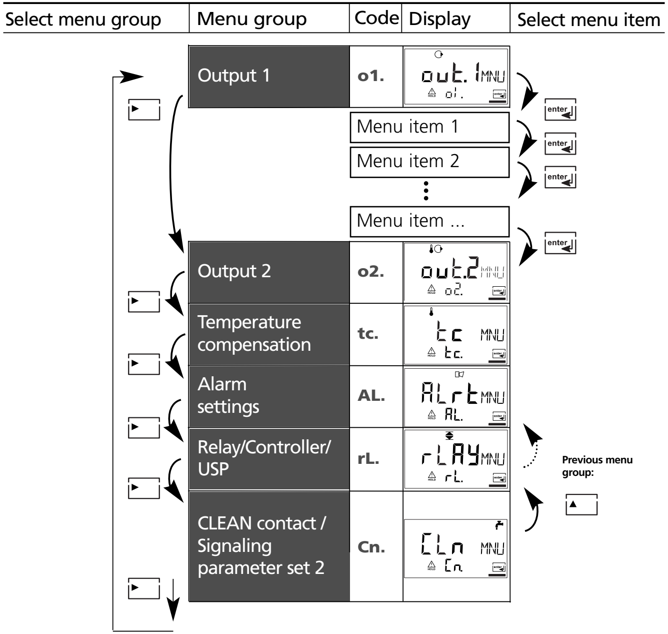
The configuration parameters are checked during the input. In the case of an incorrect input "Err" is displayed for approx. 3 s. The incorrect parameters cannot be stored. Input must be repeated.

End — conf — enter

End with **conf**. The measured value and Hold are displayed alternately, "**enter**" flashes. End Hold mode with **enter**. The display shows the measured value. The output current remains frozen for another 20 s (HOLD icon on, "hourglass" flashes).

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.
out.1 MNU
o1.
Menu item 1
Menu item 2
Menu item ...
enter
Output 2
o2.
out.2 MNU
o2.
Temperature compensation
tc.
tc MNU
tc.
Alarm settings
AL.
ALrt MNU
AL.
Relay/Controller/ USP
rL.
rLAY MNU
rL.
CLEAN contact / Signaling parameter set 2
Cn.
CLn MNU
Cn.
Previous menu group:

Overview of configuration steps

Code	Menu	Selection / Default
out1	Output 1	
o1.	Sensor selection *	2-electrode, 4-electrode
	Select measured variable	µS, mS/cm, MΩ·cm, SAL, Conc, USP
	Select solution (Conc) see Pg 112 Codes:	NaCl / HCl / NaOH / H_2SO_4 / HNO_3 -1- / -2- / -3- / -4- / -5-
	Select current range	0-20 mA / 4-20 mA
	Characteristic (not for SAL, Conc, USP)	Linear / Logarithmic
	LIN: Enter current beginning	xxxx
	Enter current end	xxxx
	LOG: Enter current beginning	in decades: 0.001 ... 1000
	Enter current end	in decades: 0.001 ... 1000
	Time constant of output filter	xxxx SEC
	22 mA signal for error messages	ON / OFF
	Signal behavior during HOLD	Last / Fix
	Fix: Enter fixed value	xxx.x mA
out2	Output 2	
o2.	Select temperature unit	°C / °F
	Selection of temperature probe *	Pt100; Pt1000; NTC 8.55k NTC 30k
	Select current range	0-20 mA / 4-20 mA
	Enter current beginning	xxx.x
	Enter current end	xxx.x
	Time constant of output filter	xxxx SEC
	Temp error signaled by 22 mA	ON / OFF
	Signal behavior during HOLD	Last / Fix
	Fix: Enter fixed value	xxx.x mA
tc	Temperature compensation	
tc.	Temperature compensation selection	OFF / Lin / nLF / NaCl / HCl / NH_3
	Lin: Input of temp coefficient	xx.xx %/K
ALrt	Alarm settings	
AL.	Select Sensocheck	ON / OFF
	Enter alarm delay	xxxx SEC
	LED in HOLD mode	ON / OFF

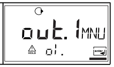
Code	Menu	Selection / Default
rLAY	Relay 1/2: Limits, controller, USP function	
rL.	Select limit function / Controller / USP	LiMIT / CtROL / USP
	L1. Select contact function	Lo / Hi
	Select contact response	N/O / N/C
	Enter switching point	xxxx
	Enter hysteresis	xxxx
	Enter delay	xxxx SEC
	L2. Select contact function	Lo / Hi
	Select contact response	N/O / N/C
	Enter switching point	xxxx
	Enter hysteresis	xxxx
	Enter delay	xxxx SEC
	Enter controller setpoint	xxxx
	Ct. Enter neutral zone	xxxx
	(P) Controller gain K_C	xxxx %
	(I) Reset time T_R	xxxx SEC
	(D) Rate time T_D	xxxx SEC
	Controller	PLC / PFC
	PLC: Pulse length	xxxx SEC
	PFC: Pulse frequency	xxxx /min
	Select HOLD behavior	Y Last / Y Off
	U1. Enter reduced USP factor	xxxx %
	Select contact response	N/O / N/C
	Enter delay	xxxx SEC
	U2. Select contact response	N/O / N/C
	Enter delay	xxxx SEC
Cln	Contact CLEAN / PSEt2	
Cn.	Select as cleaning contact / Signal for parameter set 2 *	rinse / PSEt2
	rinse Rinsing interval	xxx.x h
	Rinse duration	xxxx SEC
	Contact response	N/O / N/C

*) These parameters are only edited in parameter set 1.
They are valid for both parameter sets.

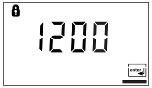
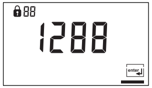
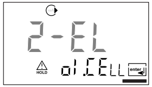
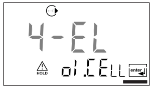
Configuration

Output 1

Select sensor type

Menu group	Code	Display	Select menu item
Output 1	o1.		Sensor selection
			Select measured variable
			Select solution (Conc)
			Select 0-20 / 4-20 mA
			Characteristic: LIN / LOG
			Enter current beginning
			Enter current end
			Set output filter
			22 mA in the case of error
			Hold mode

End:
Press **conf**, then **enter**

Code	Display	Action	Choices
o1.		Select configuration (Press **conf**.)	
	 **After correct input a welcome text (CONF) is displayed for approx. 3 s**  **After correct input a welcome text (CONF) is displayed for approx. 3 s**	For parameter set 1: Enter mode code “1200” (Select position using ► arrow key and edit number using ▲. When the display reads “1200”, press **enter** to confirm.) For parameter set 2: Enter mode code “1288” (Select position using ► arrow key and edit number using ▲. When the display reads “1288”, press **enter** to confirm.)	
	⚠ HOLD	The Transmitter is in HOLD mode (HOLD icon is on).	
	 	Select sensor * 2-electrode sensor / 4-electrode sensor Select with arrow key Proceed with **enter**	**2-EL** (2-El/ 4-El)

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

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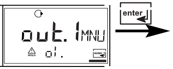
*) These parameters are only edited in parameter set 1.
They are valid for both parameter sets.

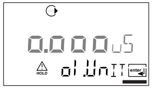
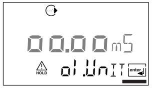
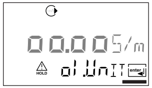
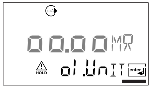
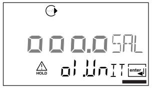
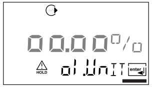
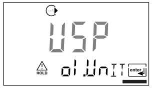
Configuration

Output 1

Select measured variable

Menu group	Code	Display	Select menu item
Output 1	o1.	 out.1 MNU o1. enter	Sensor selection **Select measured variable** Select solution (Conc) Select 0-20 / 4-20 mA Characteristic: LIN / LOG Enter current beginning Enter current end Set output filter 22 mA in the case of error Hold mode

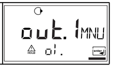
End:
Press **conf**, then **enter**

Code	Display	Action	Choices
o1.		Select measured variable: Select with arrow key Proceed with **enter**	**000.0 mS** (0.000 µS 00.00 µS (USP) 000.0 µS 0000 µS 0.000 mS 00.00 mS 000.0 mS 0.000 S/m 00.00 S/m 00.00 MΩ 0.00 SAL 00.00 % USP)
	 0.000 µS o1.UnIT  00.00 mS o1.UnIT  00.00 S/m o1.UnIT	Conductivity: • 0.000 ... 9.999 µS/cm • 00.00 ... 99.99 µS/cm • 000.0 ... 999.9 µS/cm • 0.000 ... 9.999 mS/cm • 00.00 ... 99.99 mS/cm • 000.0 ... 999.9 mS/cm • 0.000 ... 9.999 S/m • 00.00 ... 99.99 S/m	
	 00.00 MΩ o1.UnIT	Resistivity: • 00.00 ... 99.99 MΩ·cm	
	 000.0 SAL o1.UnIT	Salinity (SAL): • 0.0 ... 45.0 ‰ (0 ... 35 °C)	
	 00.00 % o1.UnIT	Concentration (Conc): • 0.00 ... 9.99 % by wt	
		USP – automatic range • 00.00 ... 99.99 µS/cm	

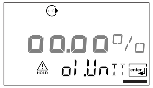
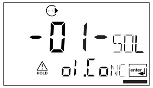
Note: Characters represented in gray are flashing and can be edited.

Configuration

Output 1
Concentration measurement: Select process solutions

Menu group	Code	Display	Select menu item
Output 1	**o1.**		Sensor selection Select measured variable **Select solution (Conc)** Select 0-20 / 4-20 mA Characteristic: LIN / LOG Enter current beginning Enter current end Set output filter 22 mA in the case of error Hold mode

End:
Press **conf**, then **enter**

Code	Display	Action	Choices
o1.	 	Only with 00.00 % Conc, you can select the process solution: Select with ► key **-01-** NaCl (0.00 ... 9.99 % by wt) (0 ... 120 °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_2SO_4 (0.00 ... 9.99 % by wt) -17 ... 110 °C) **-05-** HNO_3 (0.00 ... 9.99 % by wt) (-17 ... 50 °C) Proceed with **enter**	**-01-SOL** (-01-SOL -02-SOL -03-SOL -04-SOL -05-SOL)

Concentration measurement

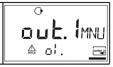
For the solutions listed above, the Transmitter can determine the substance concentration from the measured conductivity and temperature values in % by wt. The measurement error is made up of the sum of measurements errors during conductivity and temperature measurement and the accuracy of the concentration curves stored in the Transmitter (see Pg 112).
We recommend to calibrate the Transmitter 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. When measuring processes such as dilution or intensification of CIP solutions (Clean-In-Place), it is helpful to switch between the parameter sets for measuring the process medium and for measuring the CIP solution.

Configuration

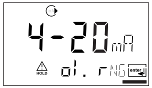
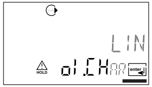
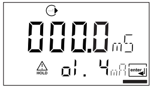
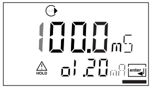
Output 1

Output current range. LIN/LOG curve

LIN curve: Current beginning / end

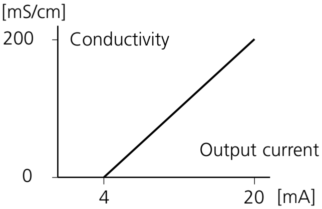
Menu group	Code	Display	Select menu item
Output 1	o1.		Sensor selection Select measured variable Select solution (Conc) **Select 0-20 / 4-20 mA** **Characteristic: LIN / LOG** **Enter current beginning** **Enter current end** Set output filter 22 mA in the case of error Hold mode

End:
Press **conf**, then **enter**

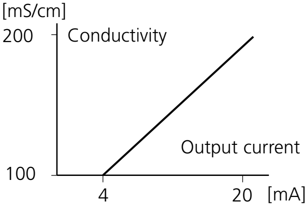
Code	Display	Action	Choices
o1.		Set output current range Select with ► key Proceed with **enter**	**4-20 mA** (0 - 20 mA/ 4 - 20 mA)
		Select output characteristic Select with ► key Proceed with **enter** (Step omitted for % (Conc) or SAL)	**LIN** (LIN / LOG)
	 	With LIN selected: • Enter current beginning Enter lower end of scale Select with ► key, edit number with ▲ key, proceed with **enter** key. • Enter current end Enter upper end of scale Proceed with **enter**	**000.0 mS** (depending on selected range) **100.0 mS** (depending on selected range)

Assignment of measured values: Current beginning and current end

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

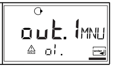


Example 2: Range 100...200 mS/cm
Advantage: Higher resolution in range of interest

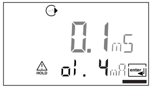
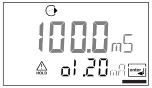


Configuration

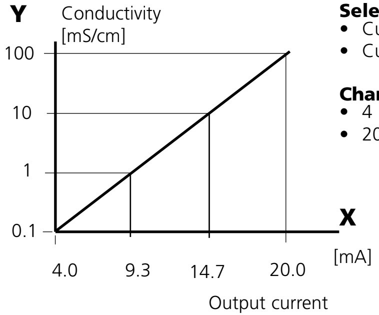
Output 1
Output current range. LOG curve
Current beginning/end

Menu group	Code	Display	Select menu item
Output 1	**o1.**		Sensor selection Select measured variable Select solution (Conc) Select 0-20 / 4-20 mA Characteristic: LOG Enter current beginning Enter current end Set output filter 22 mA in the case of error Hold mode

End:
Press **conf**, then **enter**

Code	Display	Action	Choices
o1.		With **LOG** selected: • Enter lower end of scale (= current beginning) Select with ► key, edit number with ▲ key, proceed with **enter** key.	**0.1 mS** (depending on selected range, in decades: 0.001 ... 1000)
		• Enter upper end of scale (= current end) Select with ► key, edit number with ▲ key, proceed with **enter** key.	**100 mS** depending on selected range, in decades: 0.001 ... 1000)

Example: Measurement range over 3 decades

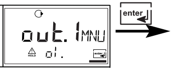


Selection:	**0-20/4-20mA**
• Current beginning:	4 mA
• Current end:	20 mA
Characteristic:	**LOG**
• 4 mA	0.1 mS/cm
• 20 mA	100 mS/cm

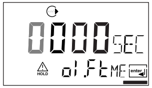
Configuration

Output 1

Time constant of output filter

Menu group	Code	Display	Select menu item
Output 1	**o1.**		Sensor selection Select measured variable Select solution (Conc) Select 0-20 / 4-20 mA Characteristic: LIN / LOG Enter current beginning Enter current end **Set output filter** 22 mA in the case of error Hold mode

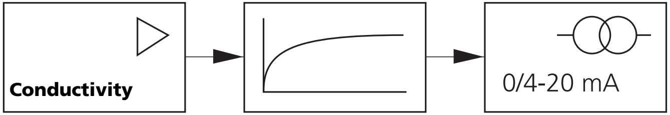
End:
Press **conf**, then **enter**

Code	Display	Action	Choices
o1.		Time constant of output filter Default setting: 0 s (inactive). To specify a time constant: Select with ► key, edit number with ▲ key, proceed with **enter** key.	**0000 SEC** (0000 ... 0120 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 63 % after the time constant has been reached.
The time constant can be set from 0 to 120 s.
If the time constant is set to 0 s, the current output follows the input.

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

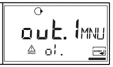


Time constant 0 to 120 s

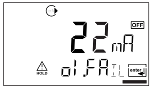
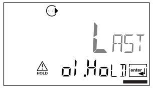
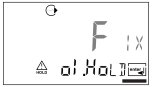
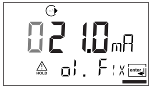
Configuration

Output 1

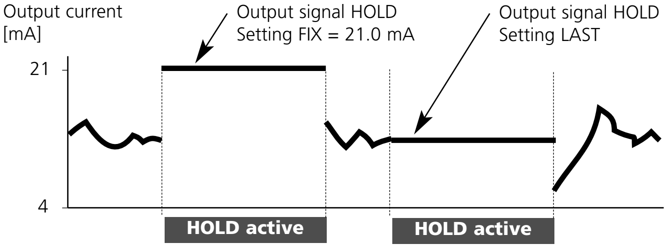
Output current during Error and HOLD.

Menu group	Code	Display	Select menu item
Output 1	o1.		Sensor selection Select measured variable Select solution (Conc) Select 0-20 / 4-20 mA Characteristic: LIN / LOG Enter current beginning Enter current end Set output filter 22 mA in the case of error Hold mode

End:
Press **conf**, then **enter**

Code	Display	Action	Choices
o1.		22 mA signal for error message Select with ► arrow key. Proceed with **enter**	**OFF** (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 with ►arrow key. Proceed with **enter**	**LAST** (LAST / FIX)
	 	Only with FIX selected: Enter current which is to flow at the output during HOLD Select position with ► key, edit number with ▲ key, proceed with **enter** key.	**021.0 mA** (000.0 - 022.0 mA

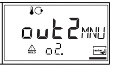
Output signal for HOLD:



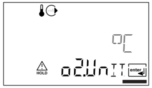
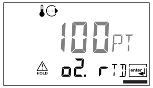
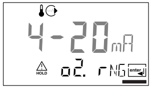
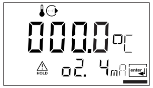
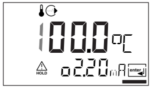
Configuration

Output 2

Temperature unit and probe, output current.

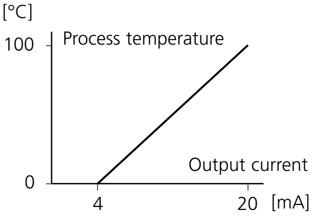
Menu group	Code	Display	Select menu item
Output 2	**o2.**		Select °C/°F
			Select temp probe
			Select 0-20 / 4-20 mA
			Enter current beginning
			Enter current end
			Set output filter
			22 mA for temp error
			Hold mode

End:
Press **conf**, then **enter**

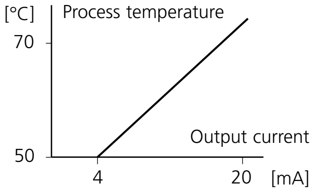
Code	Display	Action	Choices
o2.		Specify temperature unit Select with ► arrow key Proceed with **enter**	**°C** (°C / °F)
		Select temperature probe * Select with ► arrow key Proceed with **enter**	**100 PT** 1000 PT 8.55 NTC 30 k NTC
		Set output current range Select with arrow key Proceed with **enter**	**4-20 mA** (4 - 20 mA/ 0 - 20 mA)
		Current beginning: Enter lower end of scale. Select with ►, edit number with ▲, proceed with **enter**.	**000.0 °C** (xxx.x °C)
		Current end: Enter upper end of scale. Select with ►, edit number with ▲, proceed with **enter**.	**100.0 °C** (xxx.x °C)

Process temperature: Current beginning and end

Example 1: Range 0 to 100 °C



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



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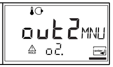
*) These parameters are only edited in parameter set 1.
They are valid for both parameter sets.

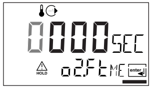
Configuration

Output 2

Time constant of output filter.

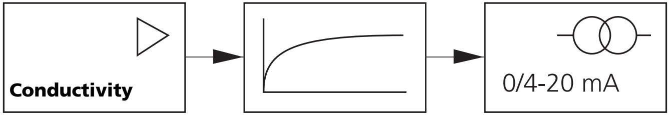
Menu group	Code	Display	Select menu item
Output 2	o2.		Select °C/°F Select 0-20 / 4-20 mA Enter current beginning Enter current end **Set output filter** 22 mA for temp error Hold mode

End:
Press **conf**, then **enter**

Code	Display	Action	Choices
o2.		Time constant of output filter Default setting: 0 s (inactive). To specify a time constant: Select position with ► key, edit number with ▲ key, proceed with **enter** key.	**0000 SEC** (0000 - 0120 SEC)

Time constant of output filter (attenuation)
To smoothen the current output 2, 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 63 % after the time constant has been reached.
The time constant can be set from 0 to 120 s.
If the time constant is set to 0 s (default), the current output follows the input.

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

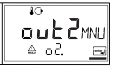


Time constant 0 to 120 s

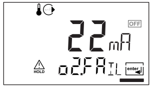
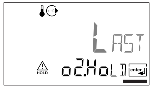
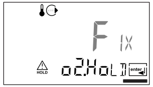
Configuration

Output 2

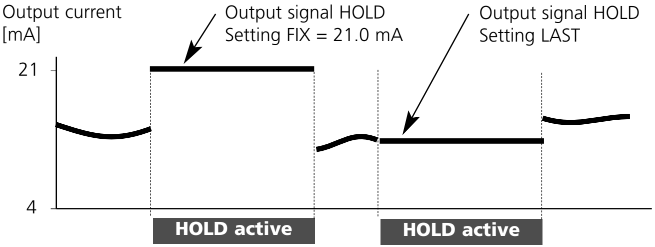
Temperature error. Output current during HOLD.

Menu group	Code	Display	Select menu item
Output 2	o2.		Select °C/°F Select 0-20 / 4-20 mA Enter current beginning Enter current end Set output filter **22 mA for temp error** **Hold mode**

End:
Press **conf**, then **enter**

Code	Display	Action	Choices
o2.		22 mA signal for error message Select with ► arrow key. Proceed with **enter**	**OFF** (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 with ► arrow key. Proceed with **enter**	**LAST** (LAST / FIX)
	 021.0 mA o2. FIX	Only with FIX selected: Enter current which is to flow at the output during HOLD Select position with ► key, edit number with ▲ key, proceed with **enter** key.	**021.0 mA** (000.0 ... 022.0 mA)

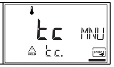
Output signal during HOLD:

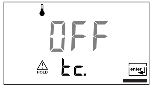
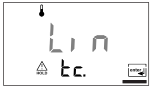
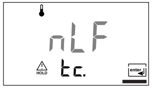
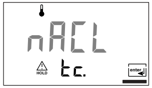
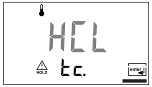
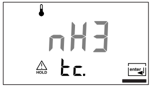
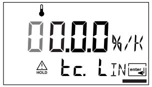


Configuration

Temperature compensation

Selecting temperature compensation

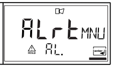
Menu group	Code	Display	Select menu item
Temperature compensation	tc.		Selecting temperature compensation

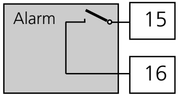
Code	Display	Action	Choices
tc.		Select temp compensation (not for USP) **OFF:** Temperature compensation switched off Select with ► key. Proceed with **enter**	**OFF** (OFF LIN nLF nACL HCL nH3)
		**LIN:** Linear temperature compensation with entry of temperature coefficient and reference temperature	
		**nLF:** Temperature compensation for natural waters to EN 27888	
		**NaCl (nACL):** Temperature compensation for ultrapure water with NaCl traces	
		**HCl (HCL):** Temperature compensation for ultrapure water with HCl traces	
		**NH3 (nH3):** Temperature compensation for ultrapure water with NH_3 traces	
		Only with linear temperature compensation (**LIN**) selected: Enter temperature coefficient. Select with ► key, edit number with ▲ key, proceed with **enter** key.	**02.00%/K** (XX.XX %/K)

End:
Press **conf**, then **enter**

Configuration

Alarm settings

Menu group	Code	Display	Select menu item
Alarm settings	AL.		Select Sensocheck Delay LED in HOLD mode End: Press **conf**, then **enter**



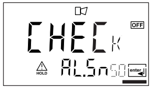
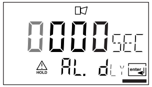
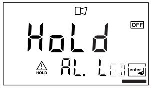
Alarm contact

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 45, 51, 88).

The operating behavior of the alarm contact is shown on Pg 90.

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

Code	Display	Action	Choices
AL.		Select Sensocheck (Continuous monitoring of sensor properties) Select with ► key. Proceed with **enter.**	**OFF** (ON / OFF)
		Alarm delay Select with ►, edit number with ▲, proceed with **enter**.	**0010 SEC** (0000 - 0600 SEC)
		LED in HOLD mode Select with ► key. Proceed with **enter.**	**OFF** (ON / OFF)

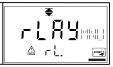
LED state:

Configuration	Alarm	HOLD
ON	on	flashes
OFF	flashes	off

Configuration

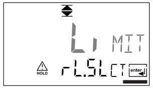
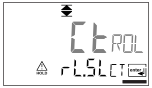
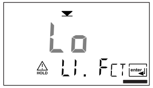
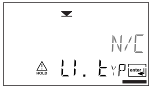
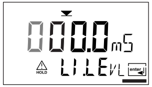
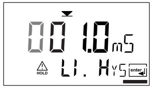
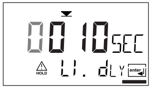
Limit function

Use of relays. Settings of relay 1

Menu group	Code	Display	Select menu item
Relay/Controller/ USP	rL.		Use of relays

L1.	Contact function
	Contact response
	Enter switching point
	Enter hysteresis
	Delay
L2.	Relay 2 menu group
Ct.	Controller menu group
U1	USP: Relay 1
U2	USP: Relay 2

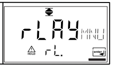
End:
Press **conf**, then **enter**

Code	Display	Action	Choices
rL.	  	Use of relays: • Limit function (LiMIT) • Controller (CtROL) • USP function Select with ► key. Proceed with **enter.** **Note:** Selecting • **CtROL** leads to Controller menu **Ct.** • **USP** leads to relay for USP menu **U1 U2**	**LiMIT** (LiMIT CtROL USP)
L1.		Limit 1 function , see Page 59. Select with ► key. Proceed with **enter.**	**Lo** (Lo/Hi)
		Limit 1 contact response N/O: normally open contact N/C: normally closed contact Select with ► key. Proceed with **enter.**	**N/O** (N/O N/C)
		Limit 1 switching point Select with ►, edit number with ▲, proceed with **enter**.	**000.0 mS** (xxxx)
		Limit 1 hysteresis Select with ►, edit number with ▲, proceed with **enter**.	**001.0 mS** (xxxx)
		Limit 1 delay The contact is activated with delay (deactivated without delay) Select with ►, edit number with ▲, proceed with **enter**.	**0010 SEC** (xxxx SEC)

Configuration

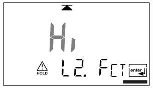
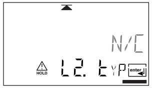
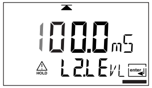
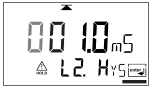
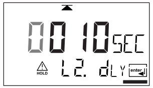
Limit function

Settings of relay 2

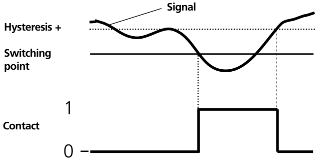
Menu group	Code	Display	Select menu item
Relay/Controller/ USP	**rL.**		Use of relays

L1.	Relay 1 menu group
L2.	Contact function
	Contact response
	Enter switching point
	Enter hysteresis
	Delay
Ct.	Controller menu group
U1	USP: Relay 1
U2	USP: Relay 2

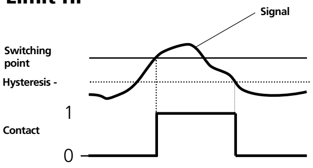
End:
Press **conf**, then **enter**

Code	Display	Action	Choices
L2.		Select Limit 2 (see Fig. below). Select with ► key. Proceed with **enter.**	**Hi** (HI/Lo)
		Limit 2 contact response N/O: normally open contact N/C: normally closed contact Select with ► key. Proceed with **enter.**	**N/O** (N/O N/C)
		Limit 2 switching point Select with ►, edit number with ▲, proceed with **enter**.	**100.0 mS** (xxxx)
		Limit 2 hysteresis Select with ►, edit number with ▲, proceed with **enter**.	**001.0 mS** (xxxx)
		Limit 2 delay The contact is activated with delay (deactivated without delay) Select with ►, edit number with ▲, proceed with **enter**.	**0010 SEC** (xxxx SEC)

Limit Lo



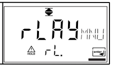
Limit Hi



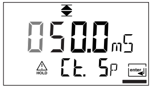
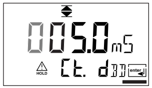
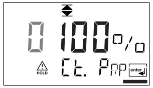
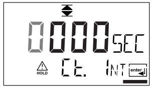
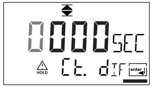
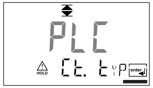
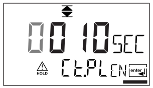
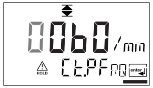
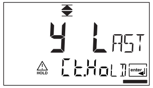
Configuration

Controller (for description see Pg 84)

Setpoint. Neutral zone.

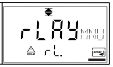
Menu group	Code	Display	Select menu item
Relay/Controller/ USP	rL.		Use of relays
			L1. Relay 1 menu group
			L2. Relay 2 menu group
			Ct. Controller setpoint
			Enter neutral zone
			(P) Controller gain
			(I) Reset time TR
			(D) Rate time TD
			Pulse length / Pulse frequency
			PLC: Pulse length
			PFC: Pulse frequency
			HOLD behavior
			U1 USP: Relay 1
			U2 USP: Relay 2

End:
Press **conf**, then **enter**

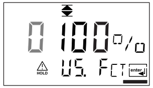
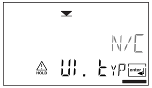
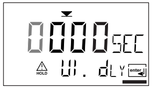
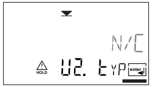
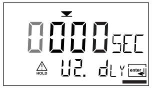
Code	Display	Action	Choices
Ct.		Setpoint Select with ►, edit number with ▲, proceed with **enter**.	**050.0 mS** (xxxx)
		Neutral zone (dead band) Select with ►, edit number with ▲, proceed with **enter**.	**001.0 mS** (xxxx)
		Controller: Proportional action Select with ►, edit number with ▲, proceed with **enter**.	**0100 %** (0010 ... 9999 %)
		Controller: Integral (reset time) Select with ►, edit number with ▲, proceed with **enter**.	**0000 SEC** (xxxx SEC)
		Controller: Derivative (rate time) Select with ►, edit number with ▲, proceed with **enter**.	**0000 SEC** (xxxx SEC)
		Pulse length /Pulse frequency Select with ► key. Proceed with **enter.**	**PLC** (PFC)
		PLC: Pulse length Select with ►, edit number with ▲, proceed with **enter**.	**0010 SEC** (0001 ... 0600 SEC)
		PFC: Pulse frequency Select with ►, edit number with ▲, proceed with **enter**.	**0060 /min** (0001 ... 0180 /min)
		Behavior during HOLD Select with ► key. Proceed with **enter.**	**Y Last** (Y Off/ Y Last)

Configuration

Setting of relays for USP function

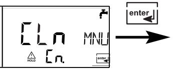
Menu group	Code	Display	Select menu item	
Relay/Controller/ USP	**rL.**		Use of relays	
			L1.	Relay 1 menu group
			L2.	Relay 2 menu group
			Ct.	Controller menu group
			U1	Enter USP factor
				Contact response relay 1
				Delay relay 1
			U2	Contact response relay 2
				Delay relay 2

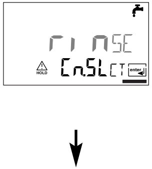
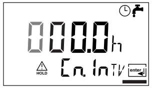
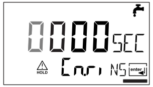
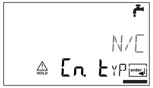
End:
Press **conf**, then **enter**

Code	Display	Action	Choices
U1		With USP function selected, relays 1 and 2 are used for USP function (see Pg 94) USP must have been selected as measured variable. For function of relay 1, see Pg 95. Enter reduced USP factor 10 ... 100%	**100 %** (10 ... 100 %)
		Select: Contact response relay 1 N/O: normally open contact N/C: normally closed contact Select with ► key. Proceed with **enter.**	**N/O** (N/O N/C)
		Enter delay. Select with ►, edit number with ▲, proceed with **enter**.	**0000 SEC** (xxxxx SEC)
U2		For function of relay 2, see Pg 95. Select contact response N/O: normally open contact N/C: normally closed contact Select with ► key. Proceed with **enter.**	**N/O** (N/O N/C)
		Enter delay. Select with ►, edit number with ▲, proceed with **enter**.	**0000 SEC** (xxxxx SEC)

Configuration

Control of rinsing probe or Signaling parameter set 2

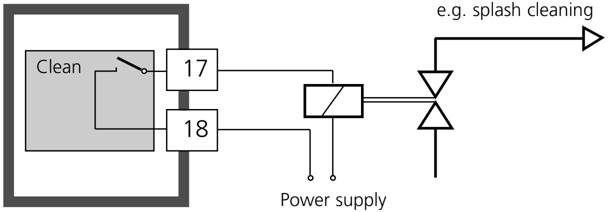
Menu group	Code	Display	Select menu item
Contact: CLEAN / PSEt2	Cln	 CLn MNU Cn enter	Select CLEAN / PSEt2 Rinsing interval Rinse duration Contact response

Code	Display	Action (Rinsing probe)	Choices
Cn.	 rinSE CnSLCT	Function selection: • Control of rinsing probe (rinse) • Signaling parameter set 2 active Select with ► key. Proceed with **enter.**	**rinse** (rinse / PSEt2) Choices PSEt2: see next page
rinse	 000.0h CnInTV	Rinsing interval Select with ►, edit number with ▲, proceed with **enter**.	**000.0 h** (xxx.x h)
	 0000SEC CnrinS	Rinse duration Select with ►, edit number with ▲, proceed with **enter**.	**0060 SEC** (0000 ... 1999 SEC)
		Select contact response N/O: normally open contact N/C: normally closed contact Select with ► key. Proceed with **enter.**	**N/O** (N/O N/C)

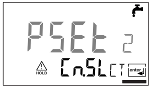
*) These parameters are only edited in parameter set 1. They are valid for both parameter sets.

Controlling a rinsing probe

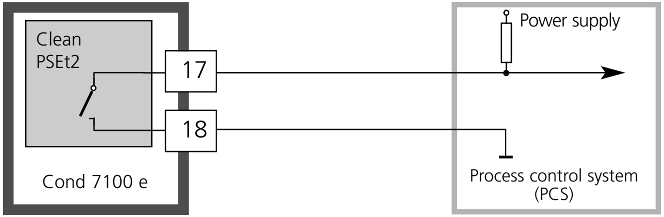
The "Clean" contact can be used to connect a simple rinsing probe. Rinse duration and rinsing interval are defined during configuration. Contact response can be set as N/O, N/C.

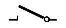
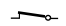

e.g. splash cleaning
Clean
17
18
Power supply

Signaling parameter set 2


PSEt 2
CnSLCT

Depending on the selected parameter set, the relay is active or inactive. The signal can be used for superordinated process control systems. Parameter set 2 is indicated by "88" in the upper left corner of the display.

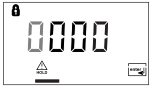
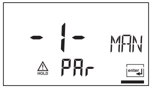
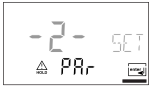
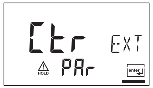
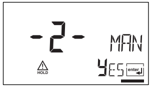
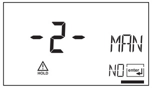

Clean
PSEt2
17
18
Cond 7100 e
Power supply
Process control system
(PCS)

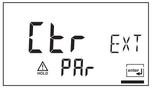
	Parameter set 1 selected
	Parameter set 2 selected

Power supply:
AC< 250 V / < 3 A / < 750 VA
DC< 30 V / < 3 A / < 90 W

Selecting parameter set 1/2

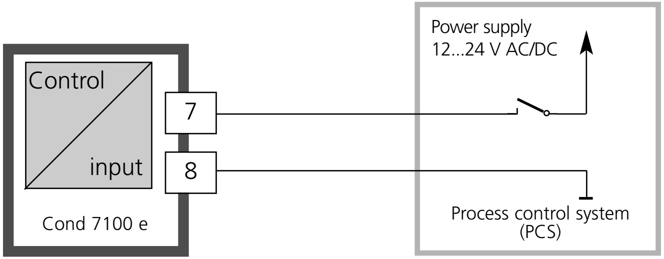
Manually or via a signal at the Control input

Display	Action	Choices
 **After correct input a welcome text (CONF) is displayed for approx. 3 s**	Select parameter set Press **conf**, enter code 7654 Select with ►, edit number with ▲, proceed with **enter**. Wrong settings change the measurement properties! If an invalid code is entered, the device returns to measuring mode.	
  	Select: • Parameter set 1 (MAN) • Parameter set 2 (MAN) • Automatic switchover via Control input (Ctr-XT) Select with ► key. Proceed with **enter.**	**-1-** (-1- MAN -2-MAN Ctr-EXT) Ctr-EXT: see next page →
 	With **-1-** or **-2-** selected: Since the complete device configuration is changed in one step, there is a security prompt (No/Yes). **Note:** When pressing **enter** directly, the selection is not stored. Activation of parameter set 2 is indicated by “88” in the upper left corner of the display.	

Display	Action	Choices
	With Control input **Ctr-EXT** selected: You can switch between the parameter sets by applying an external signal to the Control input see below.	

External switchover of parameter sets

The parameter set can be selected from outside by sending a signal to the Control input (e.g. from the process control system). To do so, **Ctr-EXT** is set during configuration.



0 ... 2 V AC/DC	Parameter set 1 selected
10 ... 30 V AC/DC	Parameter set 2 selected

Note:
Parameter set 2 is indicated by “88” in the upper left corner of the display.

Default settings of parameter sets

Two complete parameter sets are stored in the EEPROM. As delivered, the two sets are identical but can be edited.

Note:

Fill in your configuration data on the following pages.

Code. Parameter	Default setting
o1. Sensor selection *	2-EL
o1. Process variable	000.0 mS
o1. Conc solution	-01-
o1. 0/4-20 mA	4-20 mA
o1. Characteristic	LIN
o1. Current start (LIN)	000.0 mS
o1. Current end (LIN)	100.0 mS
o1. Current start (LOG)	0.1 mS
o1. Current end (LOG)	100 mS
o1. Filter time	0 s
o1. 22mA signal	OFF
o1. Hold behavior	Last
o1. Fix current	021.0 mA
o2. Unit °C / °F	°C
o2. Temp probe *	Pt 100
o2. 0/4...20mA	4-20 mA
o2. Current start	000.0 °C
o2. Current end	100.0 °C
o2. Filter time	0 s
o2. 22mA signal	OFF
o2. Hold behavior	Last
o2. Fix current	021.0 mA
tc. Temp compensation	OFF
tc. Temp coefficient	02.00%/K
AL. Sensocheck	OFF
AL. Alarm delay	0010 s
AL. LED Hold	OFF

Code. Parameter	Default setting
L1. Contact function	Lo
L1. Contact response	N/O
L1. Switching point	000.0 mS
L1. Hysteresis	001.0 mS
L1. Delay	0010 s
L2. Contact function	Hi
L2. Contact response	N/O
L2. Switching point	100.0 mS
L2. Hysteresis	001.0 mS
L2. Delay	0010 s
Ct. Setpoint	050.0 mS
Ct. Neutral zone	001.0 mS
Ct. P action	0100 %
Ct. I action	0000 s
Ct. D action	0000 s
Ct. PLC/PFC controller	PLC
Ct. Pulse length	0010 s
Ct. Pulse frequency	0060 /min
Ct. Hold behavior	Last
U1 USP factor	100 %
U1 Contact response	N/O
U1 Delay	0000 s
U2 Contact response	N/O
U2 Delay	0000 s
Cn. Rinse/ PSEt2 *	rinse
Cn. Rinsing interval *	000.0 h
Cn. Rinse duration *	0060 s
Cn. Contact type *	N/O

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*) These parameters are only edited in parameter set 1. They are valid for both parameter sets.

Parameter set - user settings

Code. Parameter	**Setting** P1 (conf 1200)	 P2 (conf 1288)
o1. Sensor *	____________	*
o1. Process variable	____________	____________
o1. Solution (Conc)	____________	____________
o1. 0/4-20 mA	____________	____________
o1. Characteristic (LIN/LOG)	____________	____________
o1. Current start (LIN)	____________	____________
o1. Current end (LIN)	____________	____________
o1. Current start (LOG)	____________	____________
o1. Current end (LOG)	____________	____________
o1. Filter time	____________	____________
o1. 22mA signal	____________	____________
o1. Hold behavior	____________	____________
o1. Fix current	____________	____________
o2. Unit °C / °F	____________	____________
o2. Temp probe *	____________	*
o2. 0/4...20mA	____________	____________
o2. Current start	____________	____________
o2. Current end	____________	____________
o2. Filter time	____________	____________
o2. 22mA signal	____________	____________
o2. Hold behavior	____________	____________
o2. Fix current	____________	____________
tc. Temp compensation	____________	____________
tc. Temp coefficient	____________	____________
AL. Sensocheck	____________	____________
AL. Alarm delay	____________	____________
AL. LED Hold	____________	____________

Code. Parameter	**Setting** P1 (conf 1200)	 P2 (conf 1288)
rL. Relay function	____________	____________
L1. Contact function	____________	____________
L1. Contact response	____________	____________
L1. Switching point	____________	____________
L1. Hysteresis	____________	____________
L1. Delay	____________	____________
L2. Contact function	____________	____________
L2. Contact response	____________	____________
L2. Switching point	____________	____________
L2. Hysteresis	____________	____________
L2. Delay	____________	____________
Ct. Setpoint	____________	____________
Ct. Neutral zone	____________	____________
Ct. P action	____________	____________
Ct. I action	____________	____________
Ct. D action	____________	____________
Ct. PLC/PFC controller	____________	____________
Ct. Pulse length	____________	____________
Ct. Pulse frequency	____________	____________
Ct. Hold behavior	____________	____________
U1 USP factor	____________	____________
U1 Contact response	____________	____________
U1 Delay	____________	____________
U2 Contact response	____________	____________
U2 Delay	____________	____________
Cn Rinse / PSEt2 *	____________	*
Cn Rinsing interval *	____________	*
Cn Rinse duration *	____________	*
Cn Contact response *	____________	*

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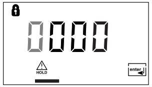
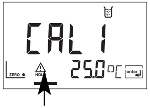
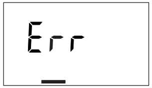
*) These parameters are only edited in parameter set 1.
They are valid for both parameter sets.

Calibration

Calibration adjusts the device to the sensor.

Activate	cal	Activate with **cal**
		Enter mode code: • Input of cell constant 1100 • With calibration solution 0110 • Product calibration 1105 • Temp probe adjustment 1015 Select with ►, edit number with ▲, proceed with **enter**. (End with **cal enter**.)
Hold During calibration the Transmitter remains in the Hold mode.	HOLD  HOLD icon	Output current is frozen (last value or preset fixed value, depending on configuration), limit and alarm contacts are inactive. The controller is in the configured state, Sensoface is off, “Calibration” mode indicator is on.
Input errors		The calibration parameters are checked during the input. In the case of an incorrect input ”Err” is displayed for approx. 3 s. The incorrect parameters cannot be stored. Input must be repeated.
End	cal enter	End with **cal**. The measured value and Hold are displayed alternately, “**enter”** flashes. Press **enter** to end the Hold mode. The measured value is displayed. The output current remains frozen for another 20 s (HOLD icon on, “hourglass” flashes).

Information on calibration

Calibration adapts the Transmitter to the conductivity sensor. Calibration can be performed by:

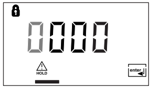
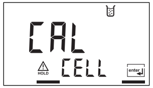
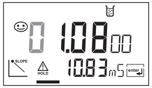
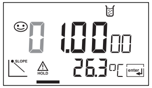
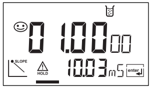
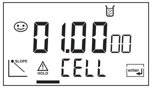
- Input of cell constant (e.g. for ultrapure-water sensors)
- Determining the cell constant with a known calibration solution
- Sampling (product calibration)
- Temperature probe adjustment

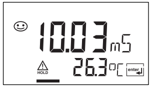
Note:

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

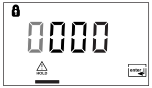
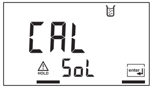
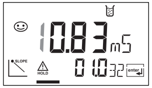
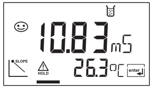
Calibration by input of cell constant

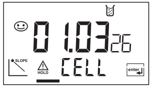
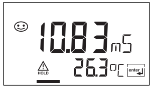
Input of cell constant with simultaneous display of conductivity and temperature

Display	Action	Remark
 0000 HOLD enter	Press **cal** key, enter code 1100 Select with ►, edit number with ▲, proceed with **enter**.	Transmitter is in Hold mode. If an invalid code is entered, the Transmitter returns to measuring mode.
 CAL CELL HOLD enter	Ready for calibration	Display (3 s)
 0 1.0800 10.83 mS SLOPE HOLD enter  0 1.0000 26.3 °C SLOPE HOLD enter  0 1.0000 10.03 mS SLOPE HOLD enter  0 1.0000 CELL SLOPE HOLD enter	Enter cell constant of connected sensor: Select with ►, edit number with ▲, proceed with **enter**. A change in the cell constant also changes the conductivity value. Press **enter** to confirm cell constant.	The lower display shows the 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
 10.03 mS 26.3 °C HOLD enter	The Transmitter now displays the conductivity and temperature.	
	The measured value is shown in the main display alternately with “Hold”. “enter” flashes. End calibration with **enter**.	After end of calibration, the outputs remain in Hold mode for approx. 20 sec.

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

Display	Action	Remark
	Press **cal** key, enter code 0110 Select with ►, edit number with ▲, proceed with **enter**.	Transmitter is in Hold mode. If an invalid code is entered, the Transmitter returns to measuring mode.
	Ready for calibration Dismount and clean sensor	Display (3 s)
	Immerse sensor in calibration solution. Determine the temperature-corrected conductivity value of the calibration solution from the corresponding table (see Pg 110 and the following).	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 ►, edit number with ▲, proceed with **enter**. Press **enter** to confirm the calibration data.	The cell constant and temperature are alternately displayed in lower display during the input.

Display	Action	Remark
	The determined cell constant is displayed. Confirm with **enter**.	
	The Transmitter now displays the conductivity and temperature.	
	Clean sensor and re-place it in the process. The measured value is shown in the main display alternately with “Hold”. “enter” flashes. End calibration with **enter**.	After end of calibration, the outputs remain in Hold mode for approx. 20 sec.

Notes:

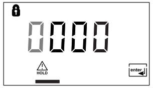
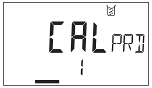
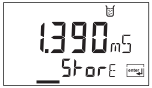
- Be sure to use known calibration solutions and the respective temperature-corrected conductivity values.
  (see “Calibration solutions” Pg. 110 and the following).
- During the calibration procedure the temperature must be kept constant.

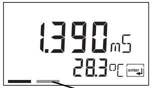
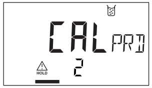
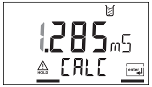
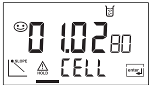
Product calibration

Calibration by sampling

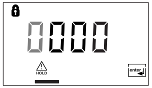
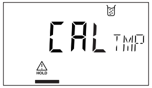
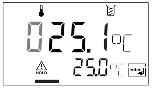
For product calibration the measured variable is used as configured: Conductivity (µS/cm, mS/cm, S/m), resistivity (MΩ·cm). During product calibration the sensor remains in the process. The measurement is only interrupted briefly.
Calibration is without TC correction.

Procedure: During sampling the currently measured value is stored in the Transmitter. The Transmitter immediately returns to measuring mode. The calibration mode indicator flashes and reminds you that calibration has not been terminated.
The sample is measured in the lab or directly on the site using a portable meter. The lab value is then entered in the Transmitter. The new cell constant is calculated from these two values.
If the sample is invalid, you can take over the value stored during sampling. In that case the old calibration values are stored. Afterwards, you can start a new product calibration.

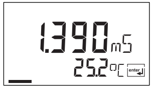
Display	Action	Remark
	Product calibration 1st step: Press **cal** key, enter code 1105. (Select position with ► key, edit number with ▲ key, proceed with **enter** key.)	If an invalid code is entered, the Transmitter returns to measuring mode.
		Display (approx. 3 sec)
	Take sample and store value. Proceed with **enter**	The sample is measured in the lab or directly on the site.

Display	Action	Remark
	Measuring mode: From the flashing CAL mode indicator you see that sample calibration has not been terminated.	While the sample value is determined, the Transmitter is in measuring mode.
	Product calibration 2nd step: When the sample value has been determined, call up the product calibration once more (**cal**, code 1105).	Display (approx. 3 sec)
	Enter lab value. The new cell constant is calculated.	
	The new cell constant is displayed. Confirm with **enter**.	New calibration: Press **cal**.
	The measured value is shown in the main display alternately with “Hold”. “enter” flashes. End with **enter**.	After end of calibration, the outputs remain in Hold mode for approx. 20 sec.

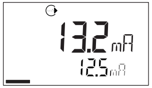
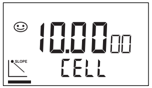
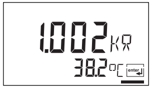
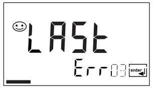
Temperature probe adjustment

Display	Action	Remark
	Activate calibration (Press **cal**, enter 1015) Select position with ► key, edit number with ▲ key, proceed with **enter** key.	Wrong settings change the measurement properties! If an invalid code is entered, the Transmitter returns to measuring mode.
	Ready for calibration	Transmitter is in Hold mode (Display for approx. 3 sec)
	Measure the temperature of the process medium using an external thermometer. Enter measured temperature value: Select with ► key, edit number with ▲ key, proceed with **enter** key. End adjustment with **enter**. HOLD will be deactivated after 20 sec.	Default: Current value of secondary display.

Measurement

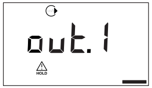
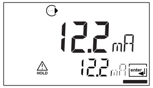
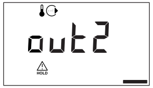
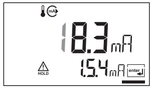
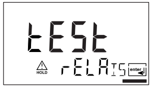
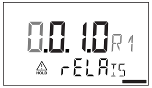
Display	Remark
	In the measuring mode the main display shows the configured process variable (conductivity, resistivity, salinity), the lower display shows the temperature. During calibration you can return to measuring mode by pressing the **cal** key, during configuration by pressing **conf** (waiting time for measured-value stabilization approx. 20 sec).

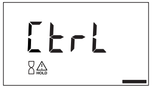
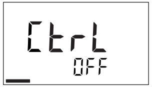
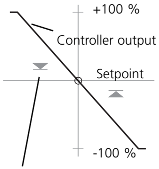
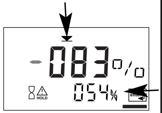
Diagnostics functions

Display	Remark
	**Display of output currents** Press **enter** 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 Transmitter returns to measuring mode.
	**Display of calibration data (Cal Info)** Press **cal** while in measuring mode and confirm code 0000. The current cell constant is shown in the main display. After 20 sec the Transmitter returns to measuring mode (immediate return at pressing **enter**).
	**Sensor monitor** for validation of sensor and complete measured-value processing. Press **conf** 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 **enter** to return to measurement.
	**Display of last error message** **(Error Info)** Press **conf** 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 **enter**).

Diagnostics functions

These functions are used for testing the connected peripherals.

Display	Action / Remarks
 	**Specify current for output 1 (current source 1)** • Press **conf**, enter code 5555 The current indicated in the main display for output 1 can be edited. Select with ► key, edit number with ▲ key, proceed with **enter** key. The actually measured current is shown in the secondary display. The Transmitter is in Hold mode. Press **conf,** then **enter** to return to measurement (Hold remains active for another 20 sec).
 	**Specify current for output 2 (current source 2)** • Press **conf**, enter code 5556 The current indicated in the main display for output 2 can be edited. Select with ►, edit number with ▲, proceed with **enter**. The actually measured current is shown in the secondary display. The Transmitter is in Hold mode. Press **conf,** then **enter** to return to measurement (Hold remains active for another 20 sec).
  ► Select a relay ▲ Test 0/1 enter Return to measurement	**Relay test (manual test of contacts)** • Press **conf**, enter code 5557 The relays are frozen. This state is indicated in the display. The 4 digits in the display correspond to the 4 relays (as on terminal plate): 1. Digit: R1 2. Digit: R2 3. Digit: AL 4. Digit: CLN Function test using arrow keys – see left column. When exiting the function (**enter**), the relays are set corresponding to the measured value.

Display	Action / Remarks
  **Controller characteristic**  The arrows indicate which relay (valve) is active: ▲ Relay 2 active (Meas. value > setpoint) ▼ Relay 1 active (Meas. value < setpoint) 	**Controller test (manual specification of controller output)** • Press **conf**, enter code 5559 After function activation "Ctrl" is displayed for approx. 3 sec. With controller turned off, "OFF" is displayed in addition, then return to measuring mode. The function is used to start up control loops or check the actuators. For bumpless changeover to automatic operation (exiting this function), configure an I-action component (reset time). Specify value: Select with ►, edit number with ▲, proceed with **enter**. The Transmitter is in Hold mode. Press **enter** to return to measurement (Hold remains active for another 20 sec). Controller output -100 to 0 %: Relay 2 active Controller output 0 to +100 %: Relay 1 active Momentary controller output (adjusted value has not been stored yet)

Controller functions

PID controller

P controller

Application in integrating systems
(e.g. closed tanks, batch processes).

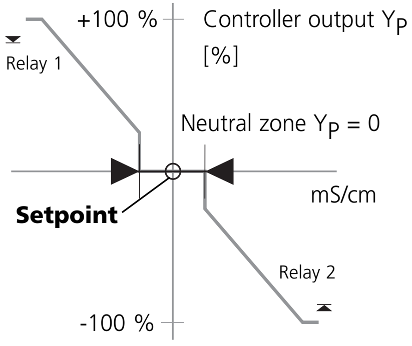
PI controller

Application in non-integrating systems
(e.g. drains).

PID controller

The additional derivative action compensates for measurement peaks.

Controller characteristic



Controller equations

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

Proportional action Y_P

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

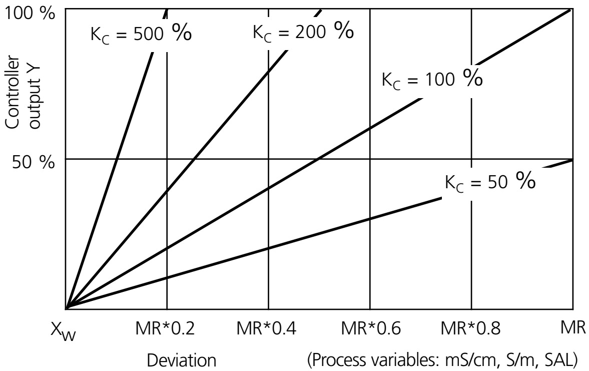
with:

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

Neutral zone (Y=0)

Tolerated deviation from setpoint.
With the setting “1mS/cm” a deviation of ± 0.5 mS/cm from the desired value does not activate the controller.

Proportional action (Gradient K_C [%])

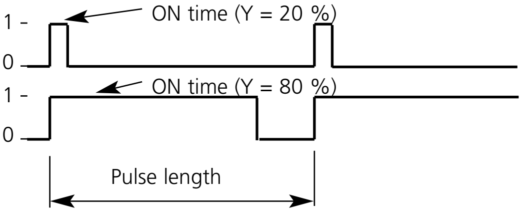


Pulse length / pulse frequency controller

Pulse length controller (PLC)

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

Output signal (switching contact) of pulse length controller

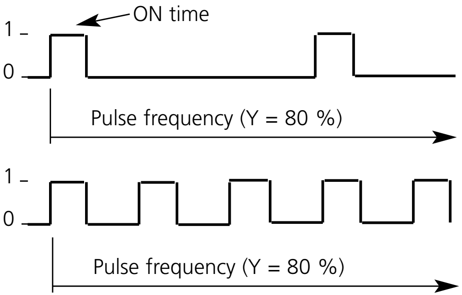


Pulse frequency controller (PFC)

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 (switching contact) of pulse frequency controller



Error messages (Error Codes)

Errors	Display	Problem Possible causes	Alarm contact	Red LED	Out 1 (22mA)	Out 2 (22mA)
ERR 01	Measured value flashes	**Sensor** • Wrong cell constant • Measurement range violation • SAL > 45 ‰ • Sensor connection or cable defective	x	x	x	
ERR 02	Measured value flashes	**Unsuitable sensor** Conductance range > 3500 mS	x	x	x	
ERR 98	"Conf" flashes	**System error** Configuration or calibration data defective. Completely reconfigure and recalibrate the device. Memory error in device program	x	x	x	x
ERR 99	"FAIL" flashes	**Factory settings** EEPROM or RAM defective This error message only occurs in the case of a complete defect. The Transmitter must be repaired and recalibrated at the factory.	x	x	x	x
ERR 03	🌡	**Temperature probe** Open or short circuit Temperature range exceeded	x	x	x	x

Errors	Symbol (flashes)	Problem Possible causes	Alarm contact	Red LED	Out 1 (22mA)	Out 2 (22mA)
ERR 11	mA	**Current output 1** Current below 0 (3.8) mA	x	x	x	
ERR 12	mA	**Current output 1** Current above 20.5 mA	x	x	x	
ERR 13	mA	**Current output 1** Current span too small / too large	x	x	x	
ERR 21	mA 🌡	**Current output 2** Current below 0 (3.8) mA	x	x		x
ERR 22	mA 🌡	**Current output 2** Current above 20.5 mA	x	x		x
ERR 23	mA 🌡	**Current output 2** Current span too small / too large	x	x		x
ERR 33		**Sensocheck**: Wrong or defective sensor / Polarization effects at the sensor / cable too long or defective / plug defective	x Sensoface active s. Pg 92	x	x	
🌡	☹	• Temperature outside conversion tables (TC, Conc, SAL)	Sensoface active s. Pg 92			

Operating states

Operating state	Out 1	Out 2	Rel.1/2 Controller	Rel.1/2 Limit value	Cleaning contact	Alarm contact	LED	Time out
Measurement	▨	▨	▨	▨	▨	▨	▨	
Cal Info (cal) 0000	▨	▨	▨	▨	▨	▨	▨	20 s
Error Info (conf) 0000	▨	▨	▨	▨	▨	▨	▨	20 s
Calibration (cal) 1100	■	■	■					
Calibration (cal) 0110	■	■	■					
Temp adjustment (cal) 1015	■	■	■					
Product cal 1 (cal) 1105	▨	▨	▨	▨	▨	▨	▨	
Product cal 2 (cal) 1105	■	■	■					
Conf par set 1 (conf) 1200	■	■	■					20 min
Conf par set 2 (conf) 1288	■	■	■					20 min
Parameter set 1/2 (conf) 7654	■	■	■					20 min

Operating state	Out 1	Out 2	Rel.1/2 Controller	Rel.1/2 Limit value	Cleaning contact	Alarm contact	LED	Time out
Sensor monitor (conf) 2222	■	■	■					20 min
Current source 1 (conf) 5555	▨	■	■					20 min
Current source 2 (conf) 5556	■	▨	■					20 min
Relay test (conf) 5557	■	■	■					20 min
Manual controller (conf) 5559	■	■	▨					20 min
Cleaning function	■	■	■		▨			
HOLD input	■	■	■					

Explanation:

▨ active

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

Sensoface

The little 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 flashes:

The Sensocheck message is also output as error message Err 33. The alarm contact is active, the red LED is lighted, 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.

Note
The worsening of a Sensoface criterion leads to the devaluation of the Sensoface indicator (Smiley becomes "sad"). To reset the Sensoface indicator, the defect must be remedied and the Transmitter be calibrated.

Display	Problem	Status
	Sensor defect	☹ Wrong or defective sensor Significant polarization of sensor Excessive cable capacitance (also see error message Err 33, Pg 89).
🌡 ☹	Temperature error	☹ Temperature outside range for TC, conc, SAL

Note:
When very fast response times (t_{90}) are required, e.g. when detecting separation layers, Sensocheck should be switched off (see "Specifications" Pg 98).

USP function

According to the “USP” directive (U.S. Pharmacopeia), Section 645 “Water Conductivity”, the conductivity of pharmaceutical waters can be monitored online. To do so, the conductivity is measured without temperature compensation and is compared with limit values (see “Temperature/conductivity table as per USP” on Pg 95).
The water is usable if the conductivity is below the USP limit. For higher conductivities, further test steps must be performed according to the directive.
To increase safety the USP limit value can be reduced in the Transmitter. To do so, a factor (%) is entered.

Configuration steps

- **out1** menu group:
  When USP function has been selected, the measurement range is fixed to 00.00 ... 99.99 µS/cm. Temperature compensation is switched off. Temperature is monitored (see Pg 35).

- In the **rL.** menu group select USP as limit function.
  Relays 1 and 2 can now be used as USP limit contacts (see Pg 57).

- Reduced limit contact **U1** (Relay 1):
  Enter USP factor (reduced limit, configurable in the range 10 % ... 100 %)
  Set contact response for relay 1.
  Set delay time (see Pg 63).

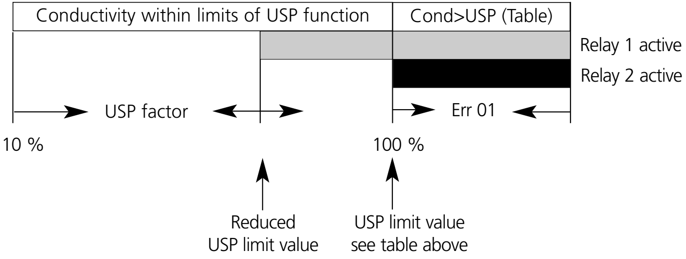
- Limit contact **U2**
  Set contact response for relay 2.
  Set delay time (see Pg 63).

Temperature/conductivity table as per USP

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

Limits for USP function

Limit contact response U1 (Relay 1) and U2 (Relay 2)


Conductivity within limits of USP function
Cond>USP (Table)
Relay 1 active
Relay 2 active
USP factor
Err 01
10 %
100 %
Reduced
USP limit value
USP limit value
see table above

Product line and accessories

Devices	**Order No.**
Transmitter Cond 7100 e	52 121 126
Mounting accessories	
Pipe-mount kit	52 120 741
Panel-mount kit	52 120 740
Protective hood	52 120 739

Sensors

Mettler-Toledo GmbH, Process Analytics offers a wide range of 2-electrode and 4-electrode sensors for the following fields of applications:
- Chemical process industry
- Pharmaceutical industry
- Food and beverage industry
- Water/waste-water

For more information concerning our sensors and housings program, please refer to http://www.mt.com.

Specifications

Conductivity input	Input for 2-electrode/4-electrode sensors	
Meas. range	Conductivity	0.2 µS · c to 1000 mS · c
Ranges *)	Conductivity	0.000 ... 9.999 µS/cm 00.00 ... 99.99 µS/cm 000.0 ... 999.9 µS/cm 0000 ... 9999 µS/cm 0.000 ... 9.999 mS/cm 00.00 ... 99.99 mS/cm 000.00 ... 999.9 mS/cm
		0.000 ... 9.999 S/m 00.00 ... 99.99 S/m
	Resistivity	00.00 ... 99.99 MΩ · cm
	Concentration	0.00 ... 9.99 % by wt
	Salinity	0.0 ... 45 ‰ (0 ... 35 °C)
Response time (T_{90})	< 1 s (Sensocheck off) < 3 s (Sensocheck on)	
Measurement error 1,2,3)	< 1 % meas. val. +0.4 µS · c	

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_2SO_4	0.00 ... 9.99% by wt (-17 ... 110°C)
-05-	HNO_3	0.00 ... 9.99% by wt (-17 ... 50°C)

See graphs on Pg 112 and the following.

Sensor standardization

Operating modes

- Input of cell constant with simultaneous display of conductivity and temperature
- Input of onductivity of calibration solution with simultaneous display of cell constant and temperature
- Product calibration
- Temperature probe adjustment

Adm. cell constant	00.0050 ... 19.9999 cm^{-1}

Sensor monitoring	
Sensocheck	Polarization detection and monitoring of cable capacitance
Sensoface	Provides information on the sensor condition (Sensocheck)
Sensor monitor	Direct display of measured values from sensor for validation (resistance / temperature)
USP function	Water monitoring in the pharmaceutical industry (USP) with possibility to enter a limit value (%) Output via relay contact

Temperature input *)

	Pt100 / Pt1000/ NTC 30 kΩ / NTC 8.55 kΩ (Betatherm) 2-wire connection, adjustable	
Ranges	Pt100 / Pt1000:	-20 .. +200 °C (-4 ... +392 °F)
	NTC 30 kΩ	-20 ... +150 °C (-4 ... +302 °F)
	NTC 8.55 kΩ	-10 ... +130 °C (+14 ... +266 °F)
Resolution	0.1 °C / 1 °F	
Measurement error 1,2,3)	0.5 K (<1 K for Pt100; <1 K for NTC >100 °C)	

Temperature compensation *)
(Reference temp 25 °C)

(OFF)	none
(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_3 traces (0...120°C)

HOLD input	Galv. separated (OPTO coupler)
Function	Switches device to HOLD mode
Switching voltage	0 ... 2 V (AC/DC) inactive 10 ... 30 V (AC/DC) active

CONTROL input	Galv. separated (OPTO coupler)
Function	Switch-over to second parameter set
Switching voltage	0 ... 2 V (AC/DC) Parameter set 1 10 ... 30 V (AC/DC) Parameter set 2

Output 1	0/4 ... 20 mA, max. 10 V, floating (galv. connected to output 2)
Measured variable *)	Conductivity, resistivity, concentration, or salinity
Characteristic	Linear or logarithmic
Overrange *)	22 mA in the case of error messages
Output filter *)	Low-pass, filter time constant 0 ... 120 s
Measurement error 1)	< 0.3 % current value + 0.05 mA
Start/end of scale	As desired within range
Min. span	LIN: 5 % of selected range LOG: 1 decade

Output 2	0/4 ... 20 mA, max. 10 V, floating (galv. connected to output 1)
Process variable	Temperature
Overrange *)	22 mA in the case of temp error messages
Output filter *)	Low-pass, filter time constant 0 ... 120 s
Meas. error 1)	< 0.3 % current value + 0.05 mA
Start/end of scale *)	-20 to 200 °C / -4 ... 392 °F
Adm. span	20 ... 320 K (36 to 608 °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	0000 ... 0600 s

Limit values	Output via relay contacts R1, R2 (see PID process controller) Contacts R1, R2 floating but inter-connected
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
Switching points *)	As desired within range
Hysteresis *)	0 ... 50 % full scale

PID process controller	Output via relay contacts R1, R2 (see limit values)
Setpoint *)	As desired within range
Neutral zone *)	As desired within range
Proportional action *)	Controller gain K_C: 0010 ... 9999 %
Integral action *)	Reset time T_R: 0000 ... 9999 s (0000 s = no integral action)
Derivative action *)	Rate time T_D: 0000 ... 9999 s (0000 s = no derivative action)
Controller type *)	Pulse length or pulse frequency controller
Pulse period *)	0001 ... 0600 s, min. ON time 0.5 s (pulse length controller)
Max. pulse frequency *)	0001 ... 0180 min^{-1} (pulse frequency controller)

Cleaning function / Parameter set 2 *)

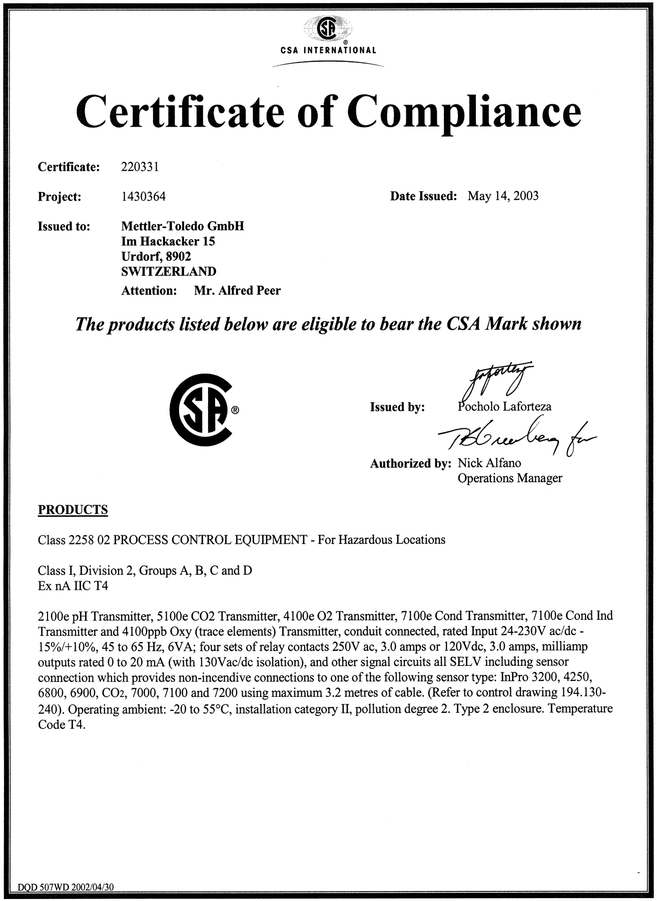
Clean / PSEt2	Relay contact, floating, for controlling a rinsing probe or signaling that 2nd parameter set is active
Contact ratings	AC< 250 V / < 3 A / < 750 VA DC< 30 V / < 3 A / < 90 W
Contact response	N/O when signaling parameter set 2 N/O or N/C when used as cleaning contact *)
Rinsing interval *)	000.0 ... 999.9 h (000.0 h = cleaning function switched off)
Rinse duration *)	0000 ... 1999 s

Specifications

Display	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 Sensoface)
Mode indicators	5 status bars “meas”, “cal”, “alarm”, “cleaning”, “config” 18 further icons for configuration and messages
Alarm indication	Red LED in case of alarm or HOLD, user defined
Keypad	5 keys: [cal] [conf] [►] [▲] [enter]
Service functions	
Current source	Current specifiable for output 1 and 2 (00.00 to 22.00mA)
Manual controller	Controller output entered directly (start of control process)
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)
Relay test	Manual control of the four switching contacts
Parameter sets *)	Two selectable parameter sets for different process phases Switchover via CONTROL input or manually Signaling via relay contact PSEt2
Data retention	Parameters and calibration data > 10 years (EEPROM)

Protection against electrical shock	Protective separation of all extra-low-voltage circuits against mains by double insulation as per EN 61010-1
Power supply	24 (-15%) to 230 V AC/DC (+10%); approx. 5 VA, 2.5 W AC: 45 to 65 Hz; Overvoltage category II, Class II
Nominal operating conditions	
Ambient temperature	-20 to +55 °C
Transport/Storage temp	-20 to +70 °C
Relative humidity	10 to 95 % not condensing
Power supply	24 (-15%) to 230 V AC/DC (+10%)
Frequency for AC	45 to 65 Hz
EMC	EN 61326
Emitted interference	Class B (residential environment) Class A for mains supply > 60 V DC
Immunity to interference	Industrial environment
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
Enclosure	Molded enclosure made of PBT (polybutylene terephtalate)
Color	Bluish gray RAL 7031
Assembly	• Wall mounting • Pipe mounting: dia 40 to 60 mm, □ 30 to 45 mm • Panel mounting, cutout to DIN 43 700 Sealed against panel
Dimensions	H 144 mm, B 144 mm, T 105 mm
Ingress protection	IP 65 / NEMA 4X
Cable glands	3 breakthroughs for cable glands M20x1.5 2 breakthroughs 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) ± 1 count
3) Plus sensor error



CSA INTERNATIONAL

Certificate of Compliance

Certificate: 220331

Project: 1430364 **Date Issued:** May 14, 2003

Issued to: **Mettler-Toledo GmbH**
Im Hackacker 15
Urdorf, 8902
SWITZERLAND
Attention: **Mr. Alfred Peer**

The products listed below are eligible to bear the CSA Mark shown

Issued by: Pocholo Laforteza

Authorized by: Nick Alfano
Operations Manager

PRODUCTS

Class 2258 02 PROCESS CONTROL EQUIPMENT - For Hazardous Locations

Class I, Division 2, Groups A, B, C and D
Ex nA IIC T4

2100e pH Transmitter, 5100e CO2 Transmitter, 4100e O2 Transmitter, 7100e Cond Transmitter, 7100e Cond Ind Transmitter and 4100ppb Oxy (trace elements) Transmitter, conduit connected, rated Input 24-230V ac/dc -15%/+10%, 45 to 65 Hz, 6VA; four sets of relay contacts 250V ac, 3.0 amps or 120Vdc, 3.0 amps, milliamp outputs rated 0 to 20 mA (with 130Vac/dc isolation), and other signal circuits all SELV including sensor connection which provides non-incendive connections to one of the following sensor type: InPro 3200, 4250, 6800, 6900, CO_2, 7000, 7100 and 7200 using maximum 3.2 metres of cable. (Refer to control drawing 194.130-240). Operating ambient: -20 to 55°C, installation category II, pollution degree 2. Type 2 enclosure. Temperature Code T4.

DQD 507WD 2002/04/30

Warnings and notes to ensure safe operation

Warning: Do not disconnect equipment unless power has been switched off.
Warning: Clean only with antistatic moistened cloth.
Warning: 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.
- Do not use the equipment in a manner not specified in this documentation.
- **Caution:** Use supply wires suitable for 30 °C above ambient and rated at least 250 V.
- **Caution:** Use signal wires suitable for at least 250 V.

SPECIAL INSTRUCTIONS FOR FIELD REPRESENTATIVES

None

Hazardous Location

Class I Divison 2, Groups A, B, C, D T4
Ex nA IIC T4   CSA 02.1342049X

Enclosure Type 2, Tamb = - 20 °C to + 55 °C

Installation category II, pollution degree 2

pH/ORP measuring circuit or
CO_2 measuring circuit
(Terminals KL. 1, 2, 3, KL. C)
maximum values: V_{oc} = 10 V C_a = 20 μF
I_{sc} = 12 mA L_a = 1 H
P_o = 15 mW

DF supply circuit
(Terminals KL. 3, 4, 5)
maximum values: V_{oc} = 10 V C_a = 20 μF
I_{sc} = 14 mA L_a = 1 H
P_o = 35 mW

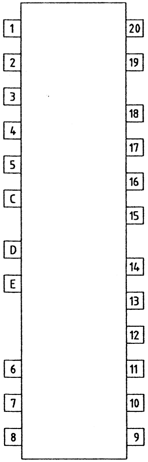
or DO measuring circuit or
DO measuring circuit (trace elements)
(Terminals KL. 1, 2, 3, 4, 5, KL. C)
maximum values: V_{oc} = 10 V C_a = 20 μF
I_{sc} = 17 mA L_a = 1 H
P_o = 22 mW

or Cond measuring circuit
(Terminals KL. 1, 2, 3, 4, 5)
maximum values: V_{oc} = 10 V C_a = 20 μF
I_{sc} = 112 mA L_a = 8 mH
P_o = 140 mW

or Condl measuring circuit
(Terminals KL. 1, 2, 3, 4, 5)
maximum values: V_{oc} = 7.1 V C_a = 100 μF
I_{sc} = 72 mA L_a = 20 mH
P = 128 mW

Temp measuring circuit
(Terminals KL. D, KL. E)
maximum values: V_{oc} = 5 V C_a = 1000 μF
I_{sc} = 10 mA L_a = 1 H
P_o = 13 mW

OK inputs HOLD, CONTROL
(Terminals KL. 6, 7 and 8, 7)
maximum values: V_{max} = 30 V C_i = 0
I_{max} = no limitation L_i = 0



TERMINALS 1, 2, 3, 4, 5, C, D, E:
NON-INCENDIVE FIELD WIRING CONNECTIONS FOR CLASS I, DIVISION 2, GROUPS A, B, C, D

THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISON 2, GROUPS A, B, C, D
OR NON-HAZARDOUS LOCATIONS ONLY

WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISON 2

AVERTISSEMENT - RISQUE D'EXPLOSION - LA SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATERIEL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE I, DIVISION 2

WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMEMT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS

AVERTISSEMENT - RISQUE D'EXPLOSION - AVANT DE DECONNECTER L'EQUIPEMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DESIGNE NON DANGEREUX.

WARNING - 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.

WARNING - 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.

THE EQUIPMENT SHALL BE INSTALLED AND PROTECTED FROM MECHANICAL IMPACT AND ULTRAVIOLET (UV) SOURCES.

Transmitter 2100 e, 4100 e, 4100 ppb, 5100 e, 7100 e

pH 2100 e	one pH/ORP input with DF supply circuit
CO_2 5100 e	one CO_2 input
O_2 4100 e	one DO input
O_2 4100 ppb	one DO input (measurement of trace elements)
Cond 7100 e	one Conductivity input for 2-/4-electrode sensors
Cond Ind 7100 e	one Conductivity input for electrodeless conductivity sensors

Power supply circuit
(Terminals Kl. 19, 20)
24 to 230 V AC/DC -15% / +10 %
45 to 65 Hz

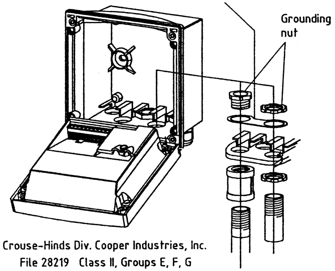
Switching circuits
ALARM and CLEAN
(Terminals KL. 15, 16 and 17, 18)
maximum values:
AC: < 250 V / < 3 A / <750 VA / resistive load
DC: < 30 V / < 3 A / < 90 W / resistive load

Switching circuits
REL. 1 and REL. 2
(Terminals KL. 12, 13 and 14, 13)
maximum values:
AC: < 250 V / < 3 A / <750 VA / resistive load
DC: < 30 V / < 3 A / < 90 W / resistive load

Output circuits
OUT 1 and OUT 2
(Terminals KL. 9, 10 and 11, 10)
maximum values:
V_{oc} = 10 V C_a = 10 μF
I_{sc} = 22 mA L_a = 100 mH
P_o = 220 mW

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

Installation in a Class I, Division 2 or Class I, Zone 2 hazardous locations shall be in accordance with the Canadian Electrical Code C22.1 Section 18 Division 2 wiring methods.

Version: METTLER TOLEDO

Verteiler:
FUL (2x)

Zul. Abweichungen für Maße ohne Toleranzangabe
ISO 2768 - m

Oberfläche

Maßstab

Blatt 1/2

Halbzeug

	Datum	Name
Bearb.	07.03.03	dam
Gepr.(KON)	10.3.3	
Freigabe(FGL)	4	4

Benennung
control drawing CSA
Transmitter 2100, 4100, 5100, 7100

Schutzvermerk nach DIN 34 beachten

Zeichnungsnummer
194.130-240

Nr.	AE	Datum	Bearbeiter	FGL KON

Ungültig ab:

Ersetzt durch:

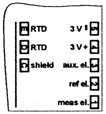
pH sensor group InPro 3xxx

- InPro3200

pH sensor group InPro 4xxx

- InPro4250/120/Pt1000

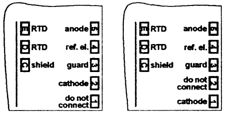
terminal assignment


RTD
RTD
shield
3 V-
3 V+
aux. el.
ref el.
meas el.
5
4
3
2
1

O_2 sensor group InPro 6xxx

- InPro6900/12
- InPro6910/12
- InPro6800/12
- InPro6800/25

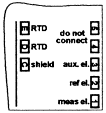
terminal assignment


RTD
RTD
shield
anode
ref. el.
guard
cathode
do not connect
RTD
RTD
shield
anode
ref. el.
guard
do not connect
cathode

CO_2 sensor group InPro 5xxx

- CO_2-sensor

terminal assignment


RTD
RTD
shield
do not connect
aux. el.
ref el.
meas el.

Cable: VP6-HT/XM, VP6-ST/XM

	A	B	C	D	E	F	Shield
Cable type X Koax+4L measuring system	Core/ transparent	Shield/ red	grey	blue	white	green	yellow/ green
pH + BE + Temp	pH	BE	(T3)		T1	T2	
ORP + BE + Temp	ORP	BE	(T3)		T1	T2	
pH + BE + Temp + ORP/HE	pH	BE	(T3)	HE/ORP	T1	T2	
pH + BE + Temp (CO_2-sensor)	pH	BE	(T3)		T1	T2	Shaft
OX (2P) + Temp (InPro6100/6800)	Kathode	Anode			T1	T2	Shaft
OX (2P) + Guard +Temp (InPro6900)	Kathode	Anode	Guard		T1	T2	Shaft

Legende:
- -pH: pH-Lead-off
- -BE: reference electrode
- -HE: solution ground, auxilliary electrode
- -ORP: Redox electrode
- -Kathode: cathode of O_2-sensors
- -Anode: anode of O_2-sensors
- -Guard: guard-electrode of O_2-sensors
- -T1: temperature device
- -T2: temperarure device (zero)
- -T3: temperature device (compensation lead)

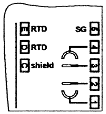
Cond sensor group InPro 70xx-VP

- InPro7000-VP
- InPro7005-VP
- InPro7001/120-VP
- InPro7001/225-VP
- InPro7002/1.5"TC-VP
- InPro7002/2"TC-VP

Cond sensor group InPro 71xx-VP

- InPro7108-VP/CPVC
- InPro7108-VP/PEEK
- InPro7108-VP/PEEK/HA-C22
- InPro7108-25/40-VP
- InPro7108-25/40/HA-C22-VP
- InPro7108-26/65-VP
- InPro7108-25/65/HA-C22-VP
- InPro7108/1.5"TC-VP
- InPro7108/2"TC-VP

terminal assignment

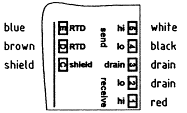

RTD
RTD
shield
SG
4
3
2
1

Wire color Patch cord	VP connector pin (on sensor)	Transmitter Cond 7100 e
bare	G	unused
blue	D	3
black	E	4
red	C	D
green	F	E
white	H	2
clear	B	C
white/blue	A	1

Condl sensor group InPro 72xx

- InPro7200
- InPro7201
- InPro7202

terminal assignment


blue
brown
shield
RTD
RTD
shield
send
hi
lo
drain
receive
lo
hi
white
black
drain
drain
red

Version: METTLER TOLEDO

Verteiler:
FUL (2x)

Nr. AE Datum Bearbeiter FGL KON

Zul. Abweichungen für Maße ohne Toleranzangabe
ISO 2768 - m

Oberfläche

	Datum	Name
Bearb.	07.03.03	dam
Gepr.(KON)	10.3.3	
Freigabe(FGL)	"	"

Schutzvermerk nach DIN 34 beachten

Maßstab

Blatt 2/2

Halbzeug

Benennung
control drawing CSA
Transmitter 2100, 4100, 5100, 7100

Zeichnungsnummer
194.130-240

Ungültig ab:

Ersetzt durch:

Calibration solutions

Potassium chloride solutions

(Conductivity in mS/cm)

Temperature [°C]	**Concentration** * 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	

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

Sodium chloride solutions

(Conductivity in mS/cm)

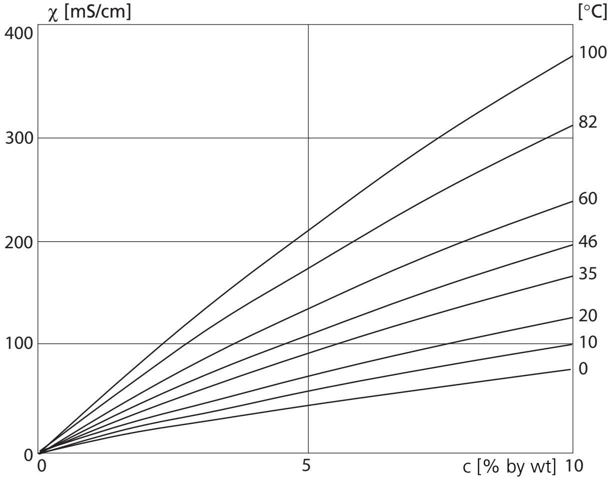
Temperature [°C]	**Concentration** 0.01 mol/l 1)	0.1 mol/l 1)	saturated 2)
0	0.631	5.786	134.5
1	0.651	5.965	138.6
2	0.671	6.145	142.7
3	0.692	6.327	146.9
4	0.712	6.510	151.2
5	0.733	6.695	155.5
6	0.754	6.881	159.9
7	0.775	7.068	164.3
8	0.796	7.257	168.8
9	0.818	7.447	173.4
10	0.839	7.638	177.9
11	0.861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

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

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

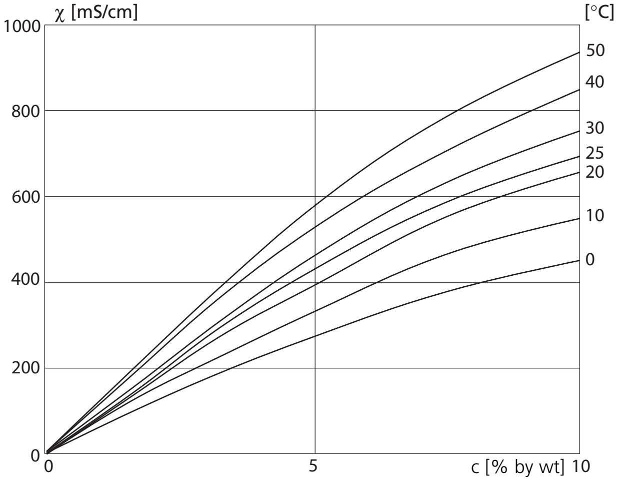
Concentration curves

-01- Sodium chloride solution NaCl



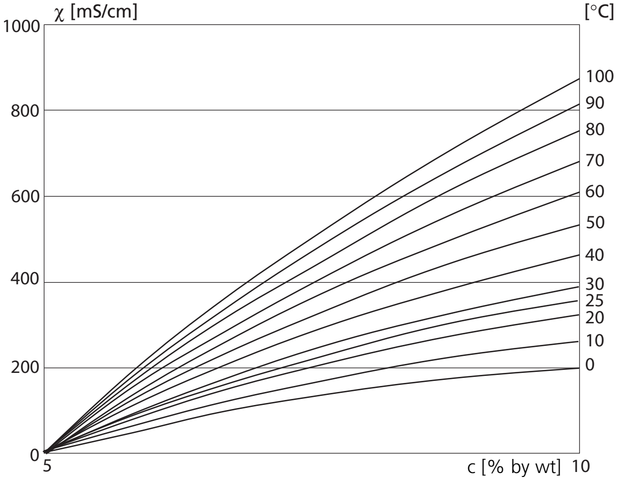
Conductivity in dependence on substance concentration and process temperature for sodium chloride solution (NaCl)

-02- Hydrochloric acid solution HCl



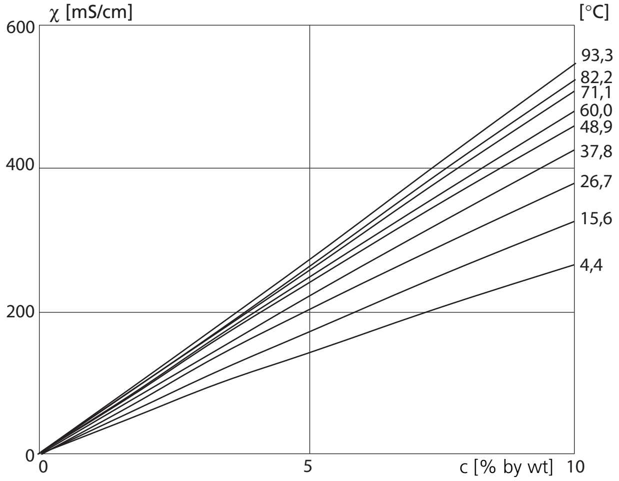
Conductivity in dependence on substance concentration and process temperature for hydrochloric acid (HCl)
Source: Haase/Sauermann/Dücker; Z. phys. Chem. New Edition, Vol. 47 (1965)

-03- Sodium hydroxide solution NaOH



Conductivity in dependence on substance concentration and process temperature for sodium hydroxide solution (NaOH)

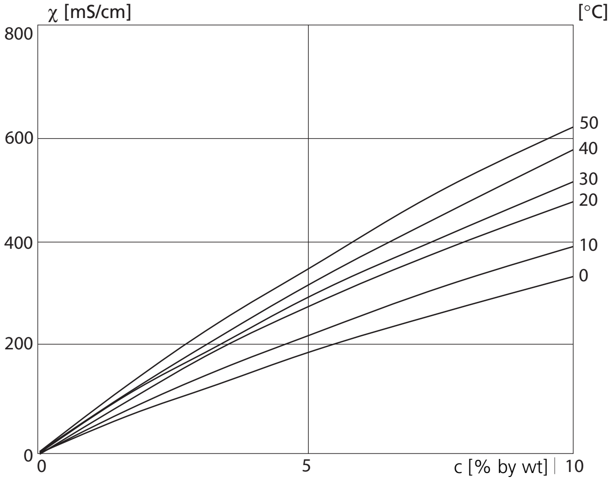
-04- Sulfuric acid H_2SO_4



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

Concentration curves

-05- Nitric acid HNO_3



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

Conductance	Conductance G [S] $= 1 / R$ [Ω]
Conductivity	Conductivity χ [S/cm] $= G$ [S] $\cdot c$ [1/cm]
Conductivity sensor	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. A special device variant (Cond Ind 7100 e) is provided for electrodeless sensors.
Temperature coefficient	With temperature compensation activated, the measured value is calculated to the value at the reference temperature (25 °C) using the temperature coefficient.
Temperature compensation	Calculates the measured conductivity value for a reference temperature.

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