

Instruction manual
Transmitter Cond Ind 7100 e

METTLER TOLEDO



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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Safety information

Be sure to read and observe the following instructions!

The device has been manufactured using state of the art technology and it complies with 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 Model Cond Ind 7100 e is used for measurement of electrical conductivity and temperature in liquids using electrodeless (toroidal) sensors.

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 Model Cond Ind 7100 e has been designed for electrodeless sensors, in particular for sensors of the InPro7250 Series. 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

Mettler-Toledo GmbH

Process Analytics

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Declaration of conformity
 Konformitätserklärung
 Déclaration de conformité



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 Ind 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

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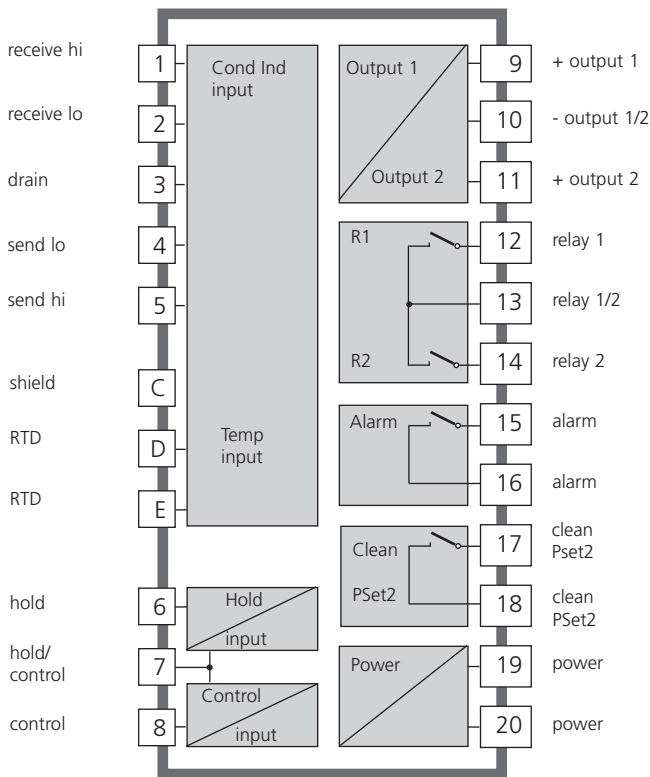
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Version a

Overview of Transmitter Cond Ind 7100 e

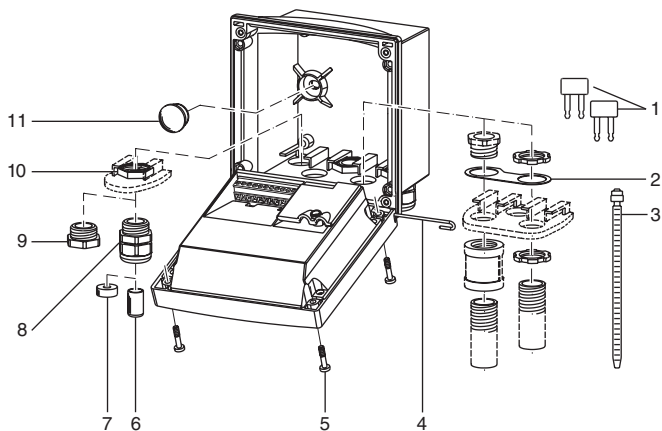


Assembly

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

Fig.: Assembling the enclosure

Mounting plan

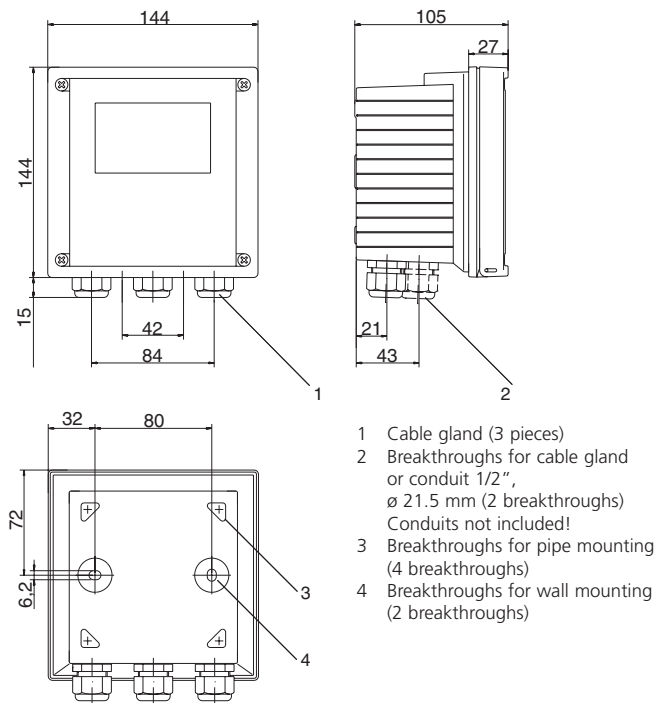
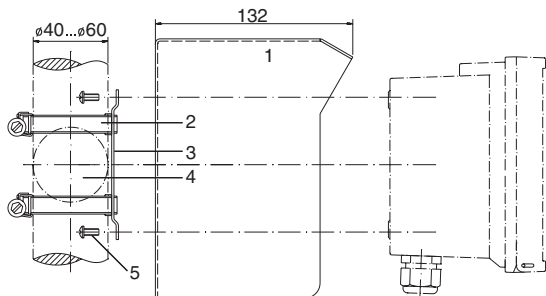


Fig.: Mounting plan

Pipe mounting, panel mounting



- 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

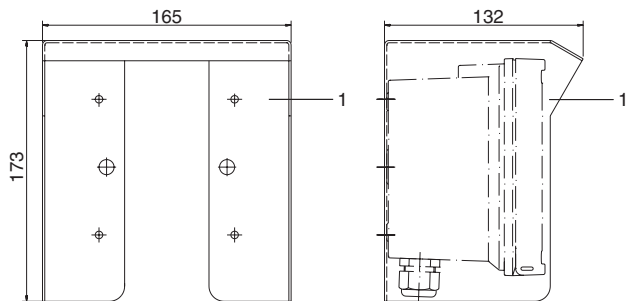
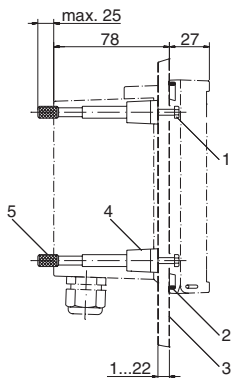


Fig.: Protective hood for wall and pipe mounting



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

Panel cutout 138 x 138 mm
(DIN 43700)

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 mm² (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 107)

Terminal assignments

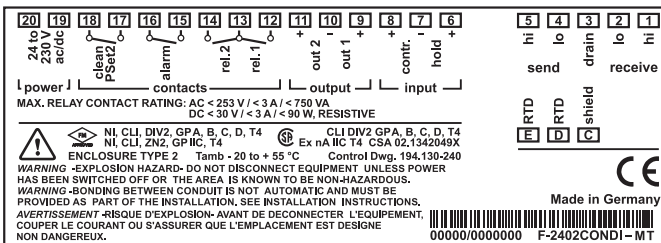
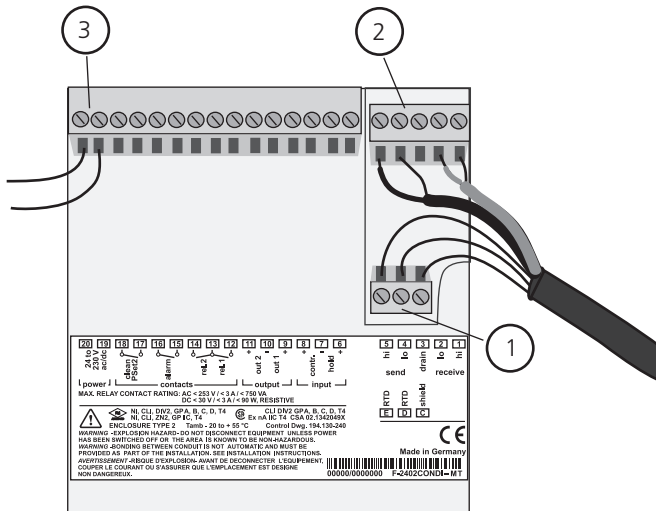


Fig.: Terminal assignments Cond Ind 7100 e



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

Fig.: Information on installation, rear side of device

Division 2 wiring

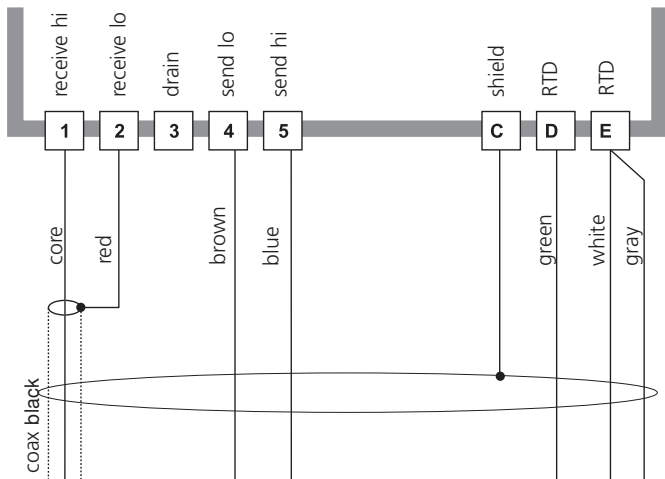


The connections to the Transmitter must be installed in accordance with the National Electric Code (ANSI-NFPA 70) Division 2 hazardous (classified) location non-incendive wiring techniques.

Typical wiring

InPro7250 ST sensor

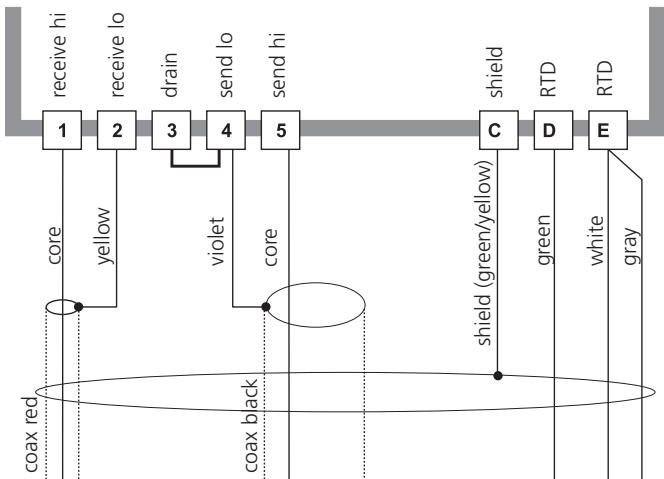
Cond Ind 7100 e



Typical wiring

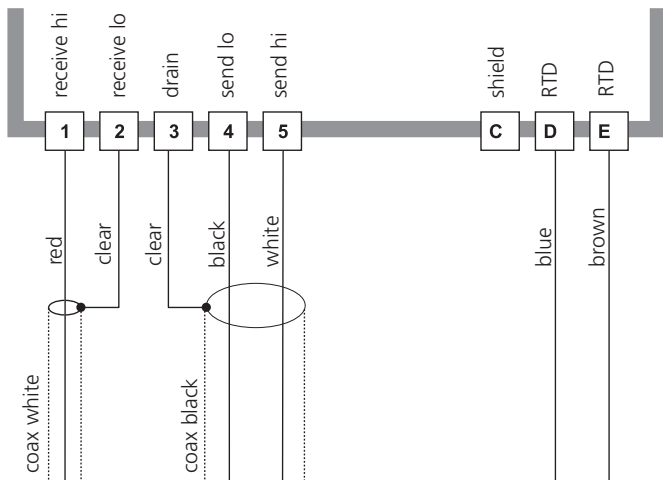
InPro7250 HT sensor

Cond Ind 7100 e



Typical wiring InPro7200 sensor

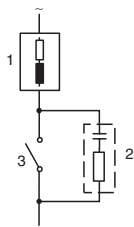
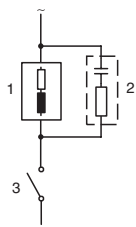
Cond Ind 7100 e



Protective wiring

Protective wiring of switching contacts

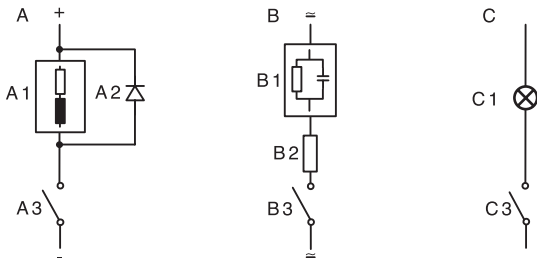
Relay contacts are subjected to electrical erosion. Especially with inductive and capacitive loads, the service life of the contacts will be reduced. For suppression of sparks and arcing, components such as RC combinations, nonlinear resistors, series resistors and diodes should be used.



Typical AC applications with inductive load

- 1 Load
- 2 RC combination, e.g. RIFA PMR 209
Typical RC combinations for 230 V AC:
Capacitor 0.1 μ F / 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/1 W at 24 V / 0.3 A

B3 Contact

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

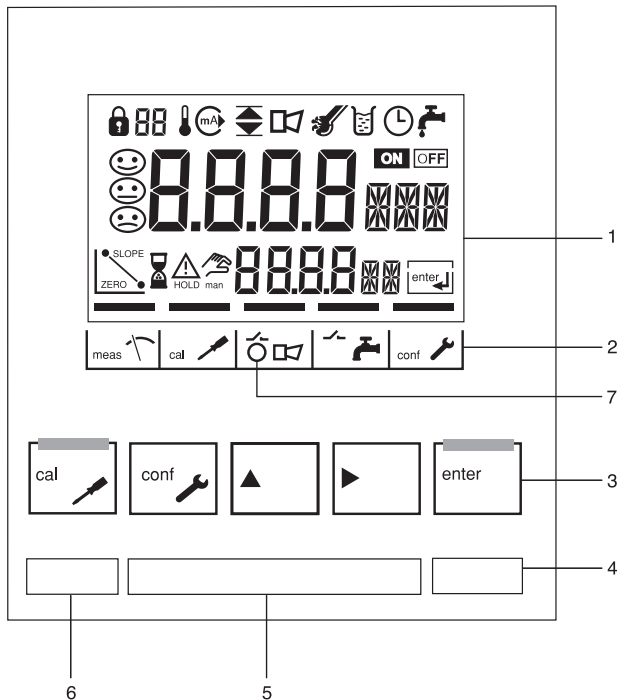
C3 Contact

Warning!

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

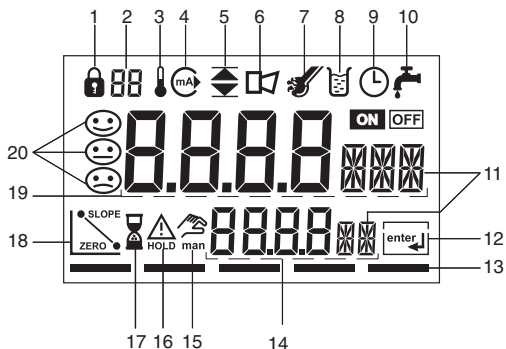
User interface and display

User interface














- | | | | |
|---|--|---|-------------------|
| 1 | Display | 3 | Keypad |
| 2 | Mode indicators (no keys), from left to right: | 4 | Coding |
| | - Measuring mode | 5 | Rating plate |
| | - Calibration mode | 6 | Model designation |
| | - Alarm | 7 | Alarm LED |
| | - Wash contact | | |
| | - Configuration mode | | |

Display



- | | |
|---|--------------------------|
| 1 Mode code entry | 14 Lower display |
| 2 Parameter set 2 selected | 15 Manual temp indicator |
| 3 Temperature | 16 Hold mode active |
| 4 Current output | 17 Waiting time running |
| 5 Limit values | 18 Electrode data |
| 6 Alarm | 19 Main display |
| 7 Sensocheck | 20 Sensoface |
| 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 | |

Operation: Keypad

	Start, end calibration
	Start, end configuration
	Select digit position (selected position flashes)
	Edit digit
	<ul style="list-style-type: none">• Calibration: Continue in program sequence• Configuration: Confirm entries, next configuration step• Measuring mode: Display output current
 ➔ 	Cal Info: Display of cell factor and zero point
 ➔ 	Error Info: Display of last error message
 + 	Start GainCheck device self-test

Sensocheck, Sensoface sensor monitoring

Sensocheck continuously monitors the sensor and its wiring. Sensocheck can be switched off (Configuration, Pg 57).



Sensoface provides information on the conductivity sensor condition. The primary coil and its wirings are continuously monitored for short circuits, the secondary coil and its wirings are checked for open circuits. The three Sensoface indicators inform of the sensor condition.

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:

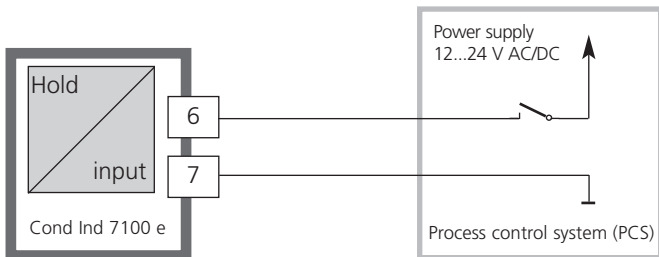


The Hold mode is a safety state during configuration and calibration. Output current is frozen (Last) or set to a fixed value (Fix). Alarm and limit contacts are disabled.

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 a waiting time of 20 s has 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










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The mode codes allow fast access to the functions

Calibration

Key + Code	Description
 0000	Cal Info Display of cell factor and zero point
 1100	Calibration by entry of cell factor
 0110	Calibration by entry of solution
 1105	Product calibration
 1001	Zero point calibration
 1015	Temp probe adjustment

Configuration

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



Press **conf**.

Parameter set 1



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

Parameter set 2

Configure:
"88" appears in the display.



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

Hold



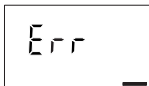
During configuration the Transmitter remains in the Hold mode.



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



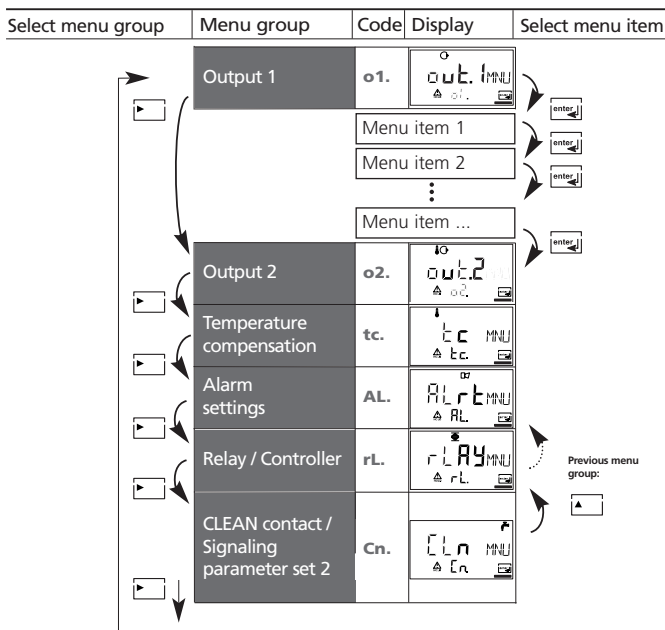
End with **conf**. The measured value and Hold are displayed alternately, "enter" flashes. Press **enter** to end the Hold mode. The measured value is displayed. The output current remains frozen for another 20 s (HOLD icon on, "hourglass" flashes).

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**.



Overview of configuration steps

Code	Menu	Selection / Default
out1	Output 1	
o1.	Sensor selection *	InPro7250 / 7200 / 7201 / 7202 /other
	other *: Entry of cell factor	xx.xxx c
	Enter transfer ratio	xxx.xx
	Meas. frequency selection	8 kHz / 16 kHz
	Select temperature probe	Pt100/Pt1000/NTC100
	Select measured variable	mS/cm, S/m, Conc, SAL
	Select solution (Conc)	NaCl, HCl, NaOH, H ₂ SO ₄ , HNO ₃ (Code 01 ... 10, see Pg 114)
	Select current range	0-20 mA / 4-20 mA
	Characteristic (not for Conc, SAL)	Linear LIN / Logarithmic LOG
	LIN: Enter current beginning	xxxx mS
	Enter current end	xxxx mS
	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
	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
	22 mA signal in the case of temp error	ON / OFF
	Signal behavior during HOLD	Last / Fix
	Fix: Enter fixed value	xxx.x mA


Code	Menu	Selection / Default
tc	Temperature compensation	
tc.	Temperature compensation selection Lin: Input of temp. coefficient	OFF / Lin / nLF xx.xx %/K
ALrt	Alarm settings	
AL.	Select Sensocheck Enter alarm delay LED in HOLD mode	ON / OFF xxxx s ON / OFF
rLAY	Relay 1/2: Limit values, controller	
rL.	Select limit function / controller	LiMIT / CtROL
	L1. Select contact function Select contact response Enter switching point Enter hysteresis Enter delay	Lo / Hi N/O / N/C xxxx xxxx xxxx SEC
	L2. Select contact function Select contact response Enter switching point Enter hysteresis Enter delay	Lo / Hi N/O / N/C xxxx xxxx xxxx SEC
	Ct. Enter controller setpoint Enter neutral zone (P) Controller gain Kc (I) Reset time Tr (D) Rate time To Pulse length/frequency controller PLC: Pulse length PFC: Pulse frequency Select HOLD behavior	xxxx xxxx xxxx % xxxx SEC xxxx SEC PLC / PFC xxxx SEC xxxx /min Y Last / Y Off
CIn	Contact CLEAN / PSEt2	
Cn.	(Select Cleaning/Signal/Parameter set) *	rinse / PSEt 2
	rinse Rinsing interval * Rinse duration * Contact response *	xxx.x h xxxx SEC 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

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 .)	
	 <p>After correct input a welcome text (CONF) is displayed for approx. 3 s</p>	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.)	
	 <p>After correct input a welcome text (CONF) is displayed for approx. 3 s</p>	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.)	
		The Transmitter is in HOLD mode (HOLD icon is on).	
		Select sensor * with ► arrow key. Proceed with enter .	7250 IPR (7200 IPR 7201 IPR 7202 IPR other)
		<p>Note: After each sensor selection the nominal cell factor of the sensor is stored. To adjust the cell factor to the Transmitter, calibrate the sensor afterwards!</p>	


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

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

Configuration





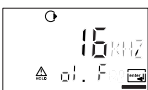



Output 1

Select sensor and temperature probe

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
01.		With other * selected, the sensor parameters are entered separately:	
		<ul style="list-style-type: none"> Enter cell factor *: (Select position using ► arrow key and edit number using ▲.) Proceed with enter. 	
		<ul style="list-style-type: none"> Enter transfer ratio Proceed with enter. 	
		<ul style="list-style-type: none"> Select measuring frequency * with ► arrow key. 	8 KHZ (8 KHZ 16 KHZ)
		Proceed with enter .	
		<ul style="list-style-type: none"> Select temperature probe * with ► arrow key. Proceed with enter. 	1000Pt (100Pt 1000Pt 100NTC)
		Note:	
		When other is called up once more, the last sensor parameters are displayed and can be edited.	


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

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

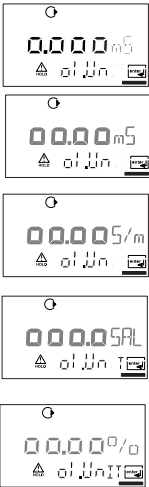
Configuration

Output 1

Select measured variable

Menu group	Code	Display	Select menu item
Output 1	o1.		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.	 <p>The display shows five sequential screens for unit selection. Each screen has a circular arrow icon at the top, a numerical value, and a unit label. The units shown are mS, SAL, S/m, and %. The unit 'mS' is highlighted in gray on the first screen, and 'SAL' is highlighted in gray on the second screen.</p>	<p>Select measured variable:</p> <p>Select with ► arrow key Proceed with enter</p> <p>Conductivity:</p> <ul style="list-style-type: none"> • 0.000 ... 9.999 mS/cm • 00.00 ... 99.99 mS/cm • 000.0 ... 999.9 mS/cm • 0000 ... 1999 mS/cm • 0.000 ... 9.999 S/m • 00.00 ... 99.99 S/m <p>Salinity (SAL):</p> <ul style="list-style-type: none"> • 0.0 ... 45‰ <p>Concentration (Conc)</p> <ul style="list-style-type: none"> • 00.00 ... 99.99 % by wt 	<p>000.0 mS (0.000 mS 00.00 mS 000.0 mS 0000 mS 0.000 S/m 00.00 S/m 00.00 SAL 00.00 % (Conc))</p>

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

Configuration

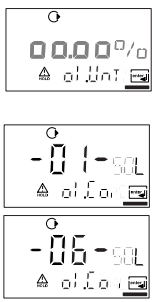
Output 1

Concentration measurement: Select process solution

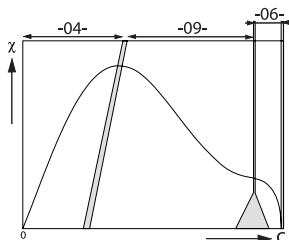
Menu group	Code	Display	Select menu item
Output 1	o1.		Sensor selection
			Select measured variable
			Select solution (Conc)
			Select 0-20 / 4-20 mA
			Characteristic: LIN / LOG
			Enter current beginning
			Enter current end
			Set output filter
			22 mA in the case of error
			Hold mode

End:

Press **conf**, then **enter**

Code	Display	Action	Choices
01.		<p>Only with 00.00 % CoNC you can select the process solution:</p> <p>Select with ► arrow key</p> <p>NaCl* -01-</p> <p>HCl* -02- -07-</p> <p>NaOH* -03- -10-</p> <p>H₂SO₄* -04- -06- -09-</p> <p>HNO₃* -05- -08-</p> <p>Proceed with enter</p> <p>*Ranges: see Pg 114 and the following</p>	<p>-01-SOL</p> <p>(-01-SOL -02-SOL -03-SOL -04-SOL -05-SOL -06-SOL -07-SOL -08-SOL -09-SOL -10-SOL)</p>

Example:
Measurement ranges for sulphuric acid



Concentration curves / ranges

see Pg 114 and the following

The concentration curves of many substances show a maximum. This means that if the substance concentration continues to increase and the temperature remains constant, the conductivity will drop. Therefore, a one-to-one correlation of values is only possible in defined ranges.


These partial ranges must be selected as measurement ranges in the configuration.

Configuration

Output 1


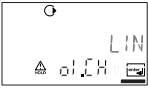


Output current range. LIN/LOG curve

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:

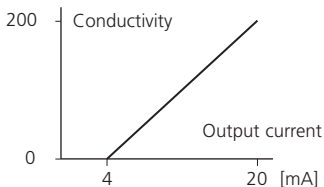
Press **conf**, then **enter**

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) and 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	000.0 mS (xxx.x mS)
		• Enter current end Enter upper end of scale Proceed with enter	100.0 mS (xxx.x mS)

Assignment of measured values: Current beginning and current end

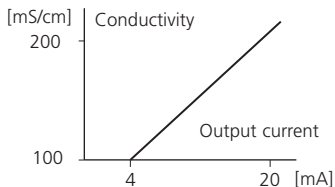
Example 1: Range 0...200 mS/cm

[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

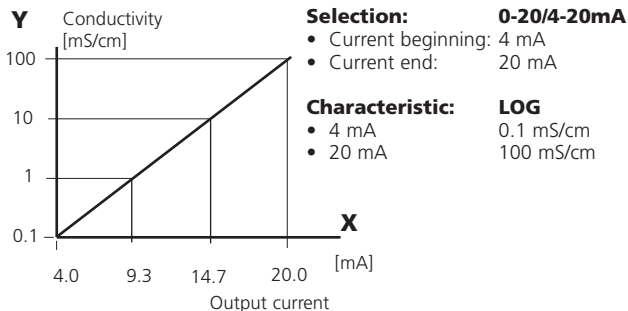
Menu group	Code	Display	Select menu item
Output 1	o1.		Sensor selection
			Select measured variable
			Select solution (Conc)
			Select 0-20 / 4-20 mA
			Characteristic: LOG
			Enter current beginning
			Enter current end
			Set output filter
			22 mA in the case of error
			Hold mode

End:

Press **conf**, then **enter**

Code	Display	Action	Choices
01.		With LOG selected: <ul style="list-style-type: none"> Enter current beginning Enter lower end of scale Select with ► key, edit number with ▲ key, proceed with enter key.	0.1 mS (0.001 mS 0.01 mS 1.0 mS 10 mS 100 mS 1000 mS)
		<ul style="list-style-type: none"> Enter current end Enter upper end of scale Select with ► key, edit number with ▲ key.	100 mS (0.001 mS 0.01 mS 1.0 mS 10 mS 100 mS 1000 mS)
		Proceed with enter .	


Example: Measurement range over 3 decades



Configuration


Output 1

Output filter: Time constant

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.	0 s 0 ... 120 s

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.

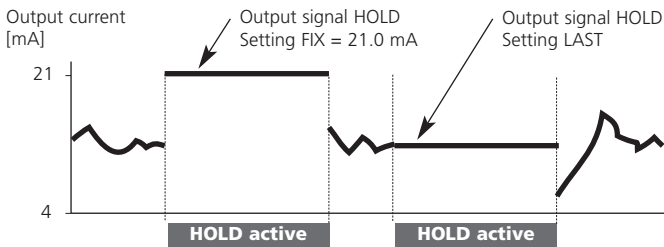
Menu group	Code	Display	Select menu item
Output 1	o1.		Sensor selection
			Select measured variable
			Select solution (Conc)
			Select 0-20 / 4-20 mA
			Characteristic: LIN / LOG
			Enter current beginning
			Enter current end
			Set output filter
			22 mA in the case of error
			Hold mode

End:

Press **conf**, then **enter**

Code	Display	Action	Choices
01.		22 mA signal for error message Select with ► 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 ► 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 (00.0 ... 21.0 mA)

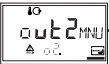
Output signal for HOLD:



Configuration

Output 2

Temperature unit and output current.

Menu group	Code	Display	Select menu item
Output 2	o2.		<ul style="list-style-type: none">Select °C/°FSelect 0-20 / 4-20 mAEnter current beginningEnter current endSet output filter22 mA for temp errorHold mode

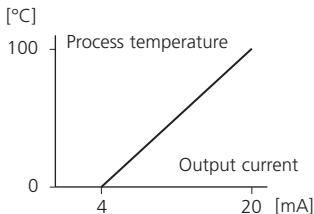
End:

Press **conf**, then **enter**

Code	Display	Action	Choices
o2.		Specify temperature unit: Select with ► key. Proceed with enter .	°C (°C °F)
		Set output current range: Select with ► 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)

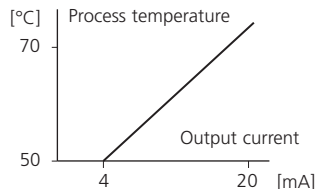
Process temperature: Current beginning and current end

Example 1: Range 0 to 100 °C



Example 2: Range 50 to 70 °C.


Advantage: Higher resolution in range of interest



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 with ► key, edit number with ▲ key, proceed with enter key.	0 s (0 - 120 s)

Time constant of output filter (attenuation)

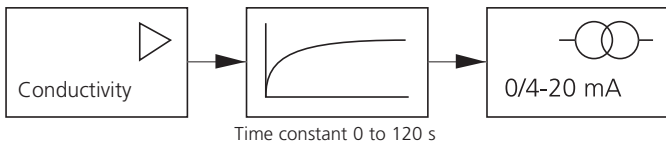
To smoothen the current output 2, a low-pass filter with adjustable filter time constant can be switched on. When there is a jump at the input (100 %), the output level is 63 % after the time constant has been reached.

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:

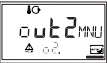
The filter only acts on the current output, not on the display!



Configuration





Output 2

Temperature error. Output current during HOLD.

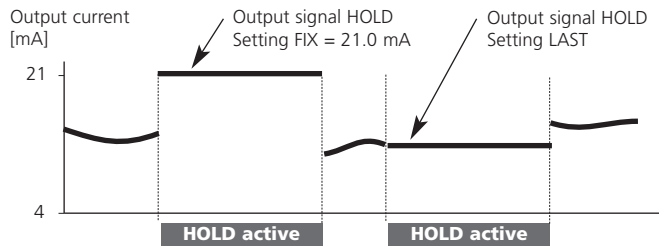
Menu group	Code	Display	Select menu item
Output 2	o2.		Select °C/°F
			Select 0-20 / 4-20 mA
			Enter current beginning
			Enter current end
			Set output filter
			22 mA for temp error
			Hold mode

End:

Press **conf**, then **enter**

Code	Display	Action	Choices
o2.		22 mA signal for error message Select with arrow key. Proceed with enter .	OFF (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 (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.	21.0 mA (00.0 ... 21.0 mA)

Output signal during HOLD:



Configuration





Temperature compensation

Select temperature compensation

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


End:

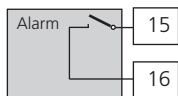
Press **conf**, then **enter**

Code	Display	Action	Choices
tc.		Temperature compensation selection (not for SAL, CONC) OFF: Temperature compensation switched off Select with ► key, proceed with enter	OFF (OFF LIN nLF)
		LIN: Linear temperature compensation with entry of temperature coefficient and reference temperature	
		NLF: Temperature compensation for natural waters to EN 27888	
		Only with linear temperature compensation (LIN) selected: Enter temperature coefficient. Select position with ► key, edit number with ▲ key, proceed with enter key.	02.00%/K (xx.xx%/K)

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 47, 53, 92).

The operating behavior of the alarm contact is shown on Pg 94.




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 ►, proceed with enter .	OFF (ON / OFF)								
		Alarm delay Select with ►, edit number with ▲, proceed with enter .	0010 s (xxxx s)								
		LED in HOLD mode Select with ►, proceed with enter . LED state: <table border="1" data-bbox="393 778 802 906"> <thead> <tr> <th>Configuration</th> <th>Alarm</th> <th>HOLD</th> </tr> </thead> <tbody> <tr> <td>ON</td> <td>on</td> <td>flashes</td> </tr> <tr> <td>OFF</td> <td>flashes</td> <td>off</td> </tr> </tbody> </table>	Configuration	Alarm	HOLD	ON	on	flashes	OFF	flashes	off
Configuration	Alarm	HOLD									
ON	on	flashes									
OFF	flashes	off									

Configuration








Limit function

Relay 1. Use of relays.

Menu group	Code	Display	Select menu item
Relay / Controller	rL.		L1. Contact function
			Contact response
			Enter switching point
			Enter hysteresis
			Delay
			L2. Relay 2 menu group
			Ct. Controller menu group

End:




Press **conf**, then **enter**

Code	Display	Action	Choices
rL.		Use of relays: <ul style="list-style-type: none"> • Limit function (LiMIT) • Controller (CtROL) Select with ►. Proceed with enter .	LiMIT (LiMit CtROL)
		Note: Selecting CtROL leads to Controller menu group Ct .	
L1.		Limit 1 function , see Pg 61. Select with ►. Proceed with enter .	Lo (Lo/Hi)
		Limit 1 contact response N/O: normally open contact N/C: normally closed contact Select with ►. Proceed with enter .	N/O (NO 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 s (0 ... 9999 s)

Configuration

Limit function

Relay 2

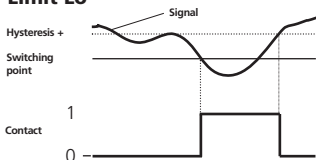
Menu group	Code	Display	Select menu item	
Relay / Controller	rL		L1.	Relay 1 menu group
			L2.	Contact function
				Contact response
				Enter switching point
				Enter hysteresis
				Delay
			Ct.	Controller menu group

End:

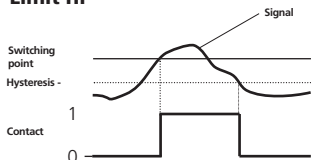
Press **conf**, then **enter**

Code	Display	Action	Choices
L2.		Select Limit 2, see Fig. below. Select with ▶ . Proceed with enter	Hi (Lo/Hi)
		Limit 2 contact response N/O: normally open contact N/C: normally closed contact Select with ▶ . Proceed with enter	N/O (N/O N/C)
		Limit 2 switching point Select with ▶ , edit number with ▲ , proceed with enter .	100.0 mS (xx.xx mS)
		Limit 2 hysteresis Select with ▶ , edit number with ▲ , proceed with enter .	001.0 mS (xx.xx mS)
		Limit 2 delay The contact is activated with delay (deactivated without delay) Select with ▶ , edit number with ▲ , proceed with enter .	0010 s (0 ... 9999 s)

Limit Lo



Limit Hi






Configuration

Controller

(for description see Pg 88 and the following)

Setpoint. Neutral zone.

Menu group	Code	Display	Select menu item	
Relay / Controller	rL.		L1.	Relay 1 menu group
			L2.	Relay 2 menu group
			Ct.	Controller setpoint
				Enter neutral zone
				(P) Controller gain
				(I) Reset time T_R
				(D) Rate time T_D
				Pulse length/Pulse frequency
				PLC: Pulse length
				PFC: Pulse frequency
	HOLD behavior			

End:

Press **conf**, then **enter**

Code	Display	Action	Choices
Ct.		Setpoint Select with ►, edit number with ▲, proceed with enter .	050.0 mS (xxx.x mS)
		Neutral zone (dead band) Select with ►, edit number with ▲, proceed with enter .	001.0 mS (xxx.x mS)
		Controller: P action Select with ►, edit number with ▲, proceed with enter .	0100 % (xxxx %)
		Controller: I action (reset time) Select with ►, edit number with ▲, proceed with enter .	0000 s (xxxx s)
		Controller: D action (rate time) Select with ►, edit number with ▲, proceed with enter .	0000 s (xxxx s)
		Pulse length /Pulse frequency Select with ►. Proceed with enter	PLC (PLC/PFC)
		PLC: Pulse length Select with ►, edit number with ▲, proceed with enter .	0010 s (xxxx s)
		PFC: Pulse frequency Select with ►, edit number with ▲, proceed with enter .	0060 /min (xxxx /min)
		Behavior during HOLD Select with ►. Proceed with enter .	Y Last (Y Off/Y Last)

Configuration

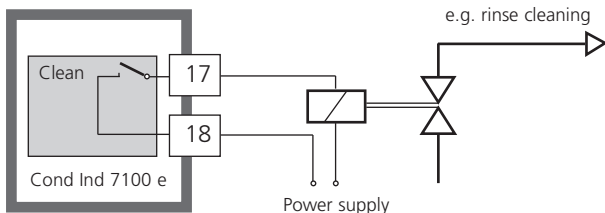
Controlling a rinsing probe or signaling parameter set 2

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

Code	Display	Action (Rinsing probe)	Choices
Cn.		Control of *: <ul style="list-style-type: none"> Rinsing probe (rinse) Signaling parameter set 1/2 Select with ►. Proceed with enter	rinse (rinse / PSEt2) For PSEt2, see next page
		Rinsing interval * Select with ►, edit number with ▲, proceed with enter .	
rinse		Rinse duration * Select with ►, edit number with ▲, proceed with enter .	0060 s (xxxx s)
		Contact response * N/O: normally open contact N/C: normally closed contact Select with ►. Proceed with enter	

Controlling a rinsing probe

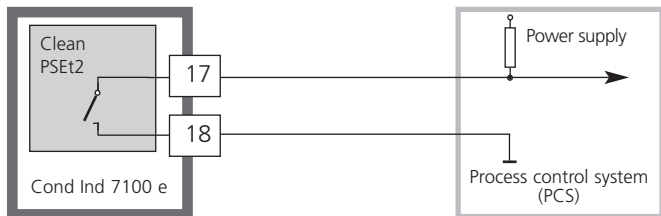
The "Clean" contact can be used to connect a simple rinsing probe. Rinse duration and rinsing interval are defined during configuration. Contact response can be set as N/O, N/C.



Signaling parameter set 2



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.










	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)

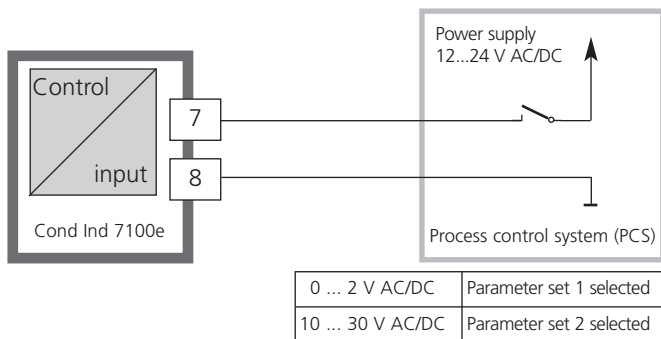
Manually or via a signal at the Control input

Display	Action	Choices
 <p>After correct input a welcome text (CONF) is displayed for approx. 3 s</p>	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 Transmitter returns to measuring mode.	
  	Select: <ul style="list-style-type: none">• Parameter set 1 (MAN)• Parameter set 2 (MAN)• Automatic switchover via Control input (Ctr-EXT) Select with ▶ , 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.	

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, the Control input is set to **Ctr-EXT** during configuration.



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. The sensor data and "Clean/PSEt2" output are only edited in parameter set 1, but are valid for both parameter sets.

Note:

Fill in your configuration data on the following pages.

Code. Parameter	Default setting	Code. Parameter	Default setting
o1. Sensor selection *	InPro7250	rL. Relay function	Limit
o1. Process variable	000.0 mS	L1. Contact function	Lo
o1. Conc solution	-01-	L1. Contact response	N/O
o1. 0/4-20 mA	4-20 mA	L1. Switching point	000.0 mS
o1. Characteristic	LIN	L1. Hysteresis	001.0 mS
o1. Current start (LIN)	000.0 mS	L1. Delay	0010 s
o1. Current end (LIN)	100.0 mS	L2. Contact function	Hi
o1. Current start (LOG)	0.1 mS	L2. Contact response	N/O
o1. Current end (LOG)	100 mS	L2. Switching point	100.0 mS
o1. Filter time	0 s	L2. Hysteresis	001.0 mS
o1. 22mA signal	OFF	L2. Delay	0010 s
o1. Hold behavior	Last	Ct. Setpoint	050.0 mS
o1. Fix current	021.0 mA	Ct. Neutral zone	001.0 mS
o2. Unit °C / °F	°C	Ct. P action	0100 %
o2. 0/4...20mA	4-20 mA	Ct. I action	0000 s
o2. Current start	000.0 °C	Ct. D action	0000 s
o2. Current end	100.0 °C	Ct. PLC/PFC controller	PLC
o2. Filter time	0 s	Ct. Pulse length	0010 s
o2. 22mA signal	OFF	Ct. Pulse frequency	0060 /min
o2. Hold behavior	Last	Ct. Hold behavior	Last
o2. Fix current	021.0 mA	Cn. Rinse/PSEt2 *	rinse
tc. Temp compensation	OFF	Cn. Rinsing interval *	000.0 h
tc. Temp coefficient	02.00%/K	Cn. Rinse duration *	0060 s
AL. Sensocheck	OFF	Cn. Contact response*	N/O
AL. Alarm delay	0010 s		
AL. LED Hold	OFF		

*) 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 selection *	_____	*
o1. Process variable	_____	_____
o1. Solution (Conc)	_____	_____
o1. 0/4-20 mA	_____	_____
o1. Characteristic (LIN/LOG)	_____	_____
o1. Current start	_____	_____
o1. Current end	_____	_____
o1. Filter time	_____	_____
o1. 22 mA signal	_____	_____
o1. Hold behavior	_____	_____
o1. Fix current	_____	_____
o2. Unit °C / °F	_____	_____
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	_____	_____
Cn. Rinse/ PSEt2 *	_____	*
Cn. Rinsing interval *	_____	*
Cn. Rinse duration *	_____	*
Cn. Contact response *	_____	*

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

Calibration

Calibration adjusts the Transmitter to the sensor.

Activate



Activate with **cal**



Enter mode code:

- Entry of cell factor 1100
- With calibration solution 0110
- Product calibration 1105
- Zero point 1001
- Temp probe adjustment 1015

Select with **▶**, edit number with **▲**, proceed with **enter**.

(End with **cal** + **enter**.)

Hold



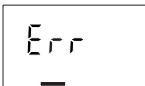
During calibration the Transmitter remains in the Hold mode for reasons of safety.



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



End with **cal**.

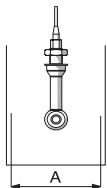
The measured value and Hold are displayed alternately, "enter" flashes. Press **enter** to end the Hold mode. The measured value is displayed. The output current remains frozen for another 20 s (HOLD icon on, "hourglass" flashes).

Information on calibration

Calibration can be performed by:

- Entry of cell factor
- Determining the cell factor with a known calibration solution taking account of the temperature
- Product calibration
- Zero calibration in air or with calibration solution
- Temperature probe adjustment

Note:







If measurements are taken in containers with $A < 110$ mm, be sure to choose the same distance and the same container material (metal/plastic) for calibration.


Caution

- All calibration procedures must be performed by trained personnel. Incorrectly set parameters may go unnoticed, but change the measuring properties.
- When another sensor is used, its sensor data (cell factor, transfer ratio, measuring frequency, temperature probe) must be entered in the configuration menu before calibration.
- Each time a new sensor is connected, the Transmitter must be calibrated.

Calibration by input of cell factor




Input of cell factor with simultaneous display of conductivity and temperature (without temperature compensation)



Display	Action	Remark
	Press cal key. Enter code 1100 Select with ►, edit number with ▲, proceed with enter .	If an invalid code is entered, the Transmitter returns to measuring mode.
	Ready for calibration Dismount and clean sensor	Display (3 s) Transmitter in Hold mode, measured value frozen. Sensoface inactive.
	Enter cell factor: Select with ►, edit number with ▲, proceed with enter . Conductivity and temperature are alternately displayed during the input (lower display). Confirm entry with enter .	
	The entered cell factor and zero point are displayed. Confirm with enter .	

Display	Action	Remark
	<p>Conductivity and temperature are displayed.</p> <p>The measured value is shown in the main display alternately with "Hold". "enter" flashes.</p> <p>Press enter to end calibration.</p>	<p>After end of calibration, the outputs remain in Hold mode for approx. 20 sec.</p>

Calibration with calibration solution

Be sure to use known calibration solutions and the respective temperature-corrected conductivity values (see Calibration solutions Pg 112). During the calibration procedure the temperature should be kept constant.

Display	Action	Remark
	Press cal key. Enter code 0110. Select with ►, edit number with ▲, proceed with enter .	If an invalid code is entered, the Transmitter returns to measuring mode.
	Ready for calibration Dismount and clean sensor	Display (3 s) Transmitter in Hold mode, measured value frozen. Sensoface inactive.
	Immerse sensor in calibration solution. Enter the temperature-corrected conductivity value of the calibration solution: Select with ►, edit number with ▲, proceed with enter . Cell factor and temperature are alternately displayed in the lower display. Confirm entry with enter .	When there has not been an entry for 6 sec, the lower display alternately shows the conductivity and temperature value.

Display	Action	Remark
 <p>The display shows the value 02.11. Above it is a small icon of a beaker. Below the main value are several smaller icons and units: a triangle, a circle, and the text '00.13 uS'.</p>	<p>The determined cell factor and zero point are displayed. Confirm cell factor with enter.</p>	
 <p>The display shows two values: 13.9 mS and 25.2 °C. There are icons for a beaker and a triangle.</p>	<p>Conductivity and temperature are displayed. The measured value is shown in the main display alternately with "Hold". "enter" flashes. Press enter to end calibration.</p>	<p>After end of calibration, the outputs remain in Hold mode for approx. 20 sec.</p>

Product calibration




Calibration by sampling





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

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 measured sample value is then entered in the Transmitter. The new cell factor is calculated from these two values.

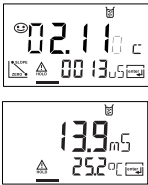
If the sample is invalid, you can take over the value stored during sampling. In that case the old calibration values are stored. Afterwards, you can start a new product calibration.

Display	Action	Remark
	Product calibration step 1: 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	Now the sample can be measured in the lab.

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





Zero calibration in air


Display	Action	Remark
	<p>Press cal key, enter code 1001.</p> <p>Select position with ► key, edit number with ▲ key, proceed with enter key.</p>	<p>Transmitter is in the Hold mode.</p> <p>If an invalid code is entered, Transmitter returns to measuring mode.</p>
	<p>Ready for calibration</p> <p>Dismount and clean sensor. (Sensor must be dry!)</p>	<p>Display (3 s)</p>
 	<p>Modify the zero point until zero is displayed as conductivity value in the lower display.</p> <p>Select with ► .</p> <p>Edit number with ▲ .</p> <p>If required, change the sign of the zero point.</p> <p>Press enter to confirm the zero point.</p>	<p>When there has not been an entry for 6 sec, the lower display alternately shows the conductivity and temperature value.</p>

Display	Action	Remark
	<p>The cell factor and zero point are displayed. Press enter to confirm the calibration data.</p> <p>Conductivity and temperature are displayed.</p> <p>The measured value is shown in the main display alternately with "Hold". "enter" flashes. Place sensor in process.</p>	
	<p>End calibration with enter.</p>	<p>After end of calibration, the outputs remain in Hold mode for approx. 20 sec.</p>




Zero calibration with calibration solution

Calibration solution with low conductivity


Display	Action	Remark
	Press cal key, enter code 1001. Select position with ► key, edit number with ▲ key, proceed with enter key.	Transmitter is in the Hold mode. If an invalid code is entered, Transmitter returns to measur- ing mode.
	Ready for calibration Dismount and clean sensor	Display (3 s)
	Immerse sensor in calibration solution. Modify the value until the lower display shows the conduc- tivity value of the calibra- tion solution. Press enter to confirm cali- bration.	When there has not been an entry for 6 sec, the lower display alternately shows the conduc- tivity and tempera- ture value.
	The cell factor and zero point are displayed. Press enter to confirm the calibration data.	






Display	Action	Remark
	<p>Conductivity and temperature are displayed.</p> <p>Remove the sensor from the calibration solution and clean it.</p> <p>Place sensor in process.</p>	
	<p>The measured value is shown in the main display alternately with "Hold". "enter" flashes.</p> <p>Place sensor in process.</p> <p>End calibration with enter.</p>	<p>After end of calibration, the outputs remain in Hold mode for approx. 20 sec.</p>

Temperature probe adjustment

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

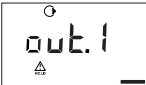

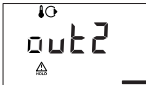



Measurement


Display	Remark
	<p>In the measuring mode the main display shows the configured process variable (conductivity [mS/cm, S/m] or resistivity [MΩ·cm] or concentration [% by wt] or salinity [SAL]) and the lower display the temperature. During calibration you can return to measuring mode by pressing the cal key, during configuration by pressing conf.</p>


Display	Remark
	<p>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.</p>
	<p>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).</p>
 	<p>Sensor monitor for validation of sensor and complete measured-value processing. Loop a defined sensing resistor (e.g. $R = 100 \Omega$) through the sensor as shown in the figure. Press the conf key and enter code 2222. The sensor monitor displays the directly measured resistance and the temperature. If there is a significant difference between resistor value and display, the sensor and its transmission behavior should be checked. Press enter to return to measurement. Note:The Transmitter does not automatically go to Hold mode.</p>
	<p>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).</p>


Diagnostics functions

These functions are used for testing the connected peripherals.

Display	Action / Remarks
 	Specify current for output 1 (current source 1) <ul style="list-style-type: none">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 at output 2 (current source 2) <ul style="list-style-type: none">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.
 	Relay test (manual test of contacts) <ul style="list-style-type: none">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): 1st digit: R1 2nd digit: R2 3rd digit: AL 4th digit: CLN Function test using arrow keys – see left column. When exiting the function (enter), the relays are set corresponding to the measured value.

 Select a relay

 Test 0/1

 Return to measurement

Display	Action / Remarks
<div data-bbox="106 234 298 339"> </div> <div data-bbox="106 361 298 466"> </div> <div data-bbox="106 476 298 529"> <p>Controller characteristic</p> </div> <div data-bbox="106 544 298 753"> </div> <div data-bbox="106 762 298 846"> <p>The arrows indicate which relay (valve) is active:</p> </div> <div data-bbox="106 862 298 1053"> <ul style="list-style-type: none"> ➤ Relay 2 active (Meas. value < setpoint) ➤ Relay 1 active (Meas. value > setpoint) </div> <div data-bbox="106 1072 298 1210"> </div>	<p>Controller test (manual specification of controller output)</p> <ul style="list-style-type: none"> • Press conf, enter code 5559 <p>After function activation "Ctrl" is displayed for approx. 3 sec.</p> <p>With controller turned off, "OFF" is displayed in addition, then return to measuring mode.</p> <p>The function is used to start up control loops or check the actuators.</p> <p>For bumpless changeover to automatic operation (exiting this function), configure an I-action component (reset time).</p> <p>Specify value: Select with ▶, edit number with ▲, proceed with enter.</p> <p>The Transmitter is in Hold mode. Press enter to return to measurement (Hold remains active for another 20 sec).</p> <p>Controller output -100 to 0 %: Relay 2 active</p> <p>Controller output 0 to +100 %: Relay 1 active</p> <p>Momentary controller output (adjusted value has not been stored yet)</p>

Controller functions

PID controller

P controller

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

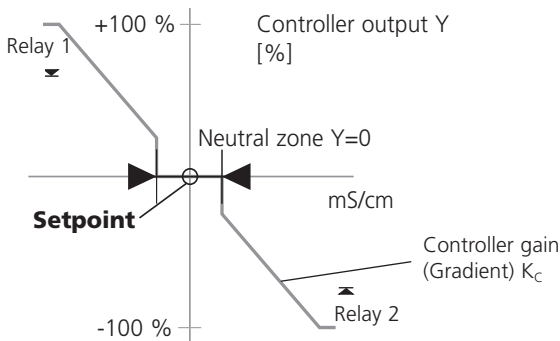
PI controller

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

PID controller

The additional derivative action compensates for
measurement peaks.

Controller characteristic



Controller equations

$$\text{Controller output } Y = Y_P + \frac{1}{T_R} \int Y_P dt + T_D \frac{dY_P}{dt}$$

P action
I action
D action

Proportional action Y_P

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

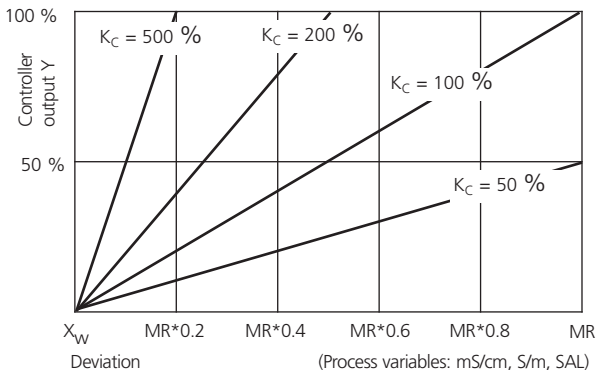
with:
 Y_P Proportional action
 T_R Reset time [s]
 T_D Rate time [s]
 K_C Controller gain [%]

Neutral zone (Y=0)

Tolerated deviation from setpoint.

The setting "1mS/cm" for example, permits a deviation of ± 1 mS/cm from the desired value without activating the controller.

Proportional action (Gradient K_C [%])



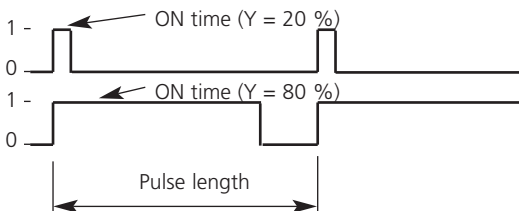
Controller functions

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

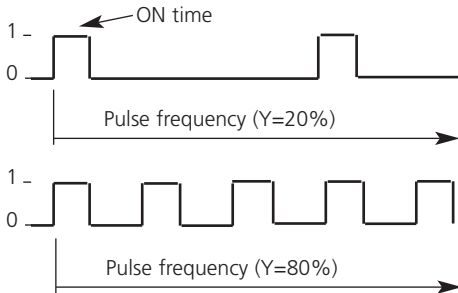


Pulse frequency controller (PFC)


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 (22 mA)	Out 2 (22 mA)
ERR 01	Measured value flashes	Sensor <ul style="list-style-type: none"> • Wrong cell factor • Measurement range exceeded • SAL > 45 ‰ • Sensor connection or cable defective 	x	x	x	
ERR 02	Measured value flashes	Unsuitable sensor <ul style="list-style-type: none"> • Conductance range > 3000 mS 	x	x	x	
ERR 98	"FAIL" flashes	System error Configuration or calibration data defective; completely reconfigure and recalibrate the Transmitter. Memory error in device program	x	x	x	x
ERR 99	"Conf" 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 (22 mA)	Out 2 (22 mA)
ERR 11		Current output 1 Current below 0 (3.8) mA	x	x	x	
ERR 12		Current output 1 Current above 20.5 mA	x	x	x	
ERR 13		Current output 1 Current span too small / too large	x	x	x	
ERR 21	 	Current output 2 Current below 0 (3.8) mA	x	x		x
ERR 22	 	Current output 2 Current above 20.5 mA	x	x		x
ERR 23	 	Current output 2 Current span too small / too large	x	x		x
ERR 33	 	Sensocheck: Primary coil	x	x	x	
ERR 34		Secondary coil	Sensoface active s. Pg. 96			
	 	Temperature outside conversion tables (TC, conc, SAL)	Sensoface active s. Pg. 96			

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
Zero point (cal) 1001								
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) alerts to sensor problems (defective sensor, defective cable).

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 primary coil and its lines for short circuits and the secondary coil and its lines for open circuits. 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	 Short circuit in primary coil Open circuit in secondary coil (see also Error messages Err 33 and Err 34, Page 93).
	Temperature error	 Temperature outside range for TC, conc, SAL

Product line and accessories

Devices	Order No.
Transmitter Cond Ind 7100 e	52 121 127
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 electrodeless sensors for the following fields of applications:

- Chemical process industry
- Pharmaceutical industry
- Food and beverage industry
- Pulp and paper industry
- Water/waste-water treatment

For more information concerning our sensors and housings program, please refer to our website:

<http://www.mtpro.com/transmitters>

Note:

For special applications (chemical resistance, type of mounting), you can also connect sensors from other manufacturers.

Specifications

Conductivity input Input for electrodeless conductivity sensors

Display ranges	Conductivity	0.000 ... 1999 mS/cm
	Concentration	0.00 ... 100.0 % by wt
	Salinity	0.0 ... 45 ‰ (0 ... 35 °C)

Measurement ranges	Conductivity	0.000 ... 9.999 mS/cm
		00.00 ... 99.99 mS/cm
		000.0 ... 999.9 mS/cm
		0000 ... 1999 mS/cm
		0.000 ... 9.999 S/m
		00.00 ... 99.99 S/m
Concentration	00.00 ... 99.99 % by wt	
	Salinity	0.0 ... 45 ‰ (0 ... 35 °C)

Response time (T_{90}) Approx. 2/sec

Measurement error^{1,2,3)} < 1% meas.val. + 0.005 mS

Temperature compensation^{*)}

(Reference temp 25 °C)	(OFF)	Without
	(Lin)	Linear characteristic 00.00 ... 19.99 % /K
	(NLF)	Natural waters to EN 27888 (0 ... 35°C)

Concentration determination

Operating modes: *)

NaCl**	-01-
HCl**	-02-
	-07-
NaOH**	-03-
	-10-
H ₂ SO ₄ **	-04-
	-06-
	-09-
HNO ₃ **	-05-
	-08-

**Ranges: see Pg 114 and the following

See graphs in the Appendix Pg 115 and following

Sensor standardization

Operating modes

- Entry of cell factor with simultaneous display of conductivity and temperature
- Entry of conductivity of calibration solution with simultaneous display of cell factor and temperature
- Product calibration
- Zero point adjustment
- Temperature probe adjustment

Adm. cell factor	00.100 ... 19.999
Adm. transfer ratio	01.00 ... 199.99
Adm. zero point deviation	±0.5 mS/cm

Sensor monitoring

Sensocheck

- Monitoring of primary and wiring for short circuit
- Monitoring of secondary and wiring for open circuit

Sensoface

Provides information on the sensor condition (evaluation of zero point, Sensocheck)

Sensor monitor

Sensor monitor for validation of sensor and complete measured-value processing (Display: resistance / temperature)

Temperature input *)

	Pt100 / Pt1000 / NTC 100 kOhms 2-wire connection, adjustable
Ranges	Pt100 / Pt1000: -20 .. +200 °C (-4 ... +392 °F) NTC100 kOhms -20 ... +130 °C (-4 ... +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)

Specifications

HOLD input

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

CONTROL input

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

Output 1

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

Alarm contact

Contact ratings	Relay contact, floating
	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)
Contact ratings *)	Contacts R1, R2 floating but inter-connected 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

Main display	LC display, 7-segment with icons
Secondary display	Character height 17 mm, unit symbols 10 mm
Sensoface	Character height 10 mm, unit symbols 7 mm
Mode indicators	3 status indicators (friendly, neutral, sad Sensoface)
	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 terephthalate)
 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



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, CO2, 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.

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 Division 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
CO₂ measuring circuit
(Terminals KL. 1, 2, 3, KL. C)

maximum values: $V_{oc} = 10 \text{ V}$ $C_a = 20 \mu\text{F}$
 $I_{sc} = 12 \text{ mA}$ $L_a = 1 \text{ H}$
 $P_o = 15 \text{ mW}$

DF supply circuit
(Terminals KL. 3, 4, 5)

maximum values: $V_{oc} = 10 \text{ V}$ $C_a = 20 \mu\text{F}$
 $I_{sc} = 14 \text{ mA}$ $L_a = 1 \text{ H}$
 $P_o = 35 \text{ mW}$

or DO measuring circuit or
DO measuring circuit (trace elements)
(Terminals KL. 1, 2, 3, 4, 5, KL. C)

maximum values: $V_{oc} = 10 \text{ V}$ $C_a = 20 \mu\text{F}$
 $I_{sc} = 17 \text{ mA}$ $L_a = 1 \text{ H}$
 $P_o = 22 \text{ mW}$

or Cond measuring circuit
(Terminals KL. 1, 2, 3, 4, 5)

maximum values: $V_{oc} = 10 \text{ V}$ $C_a = 20 \mu\text{F}$
 $I_{sc} = 112 \text{ mA}$ $L_a = 8 \text{ mH}$
 $P_o = 140 \text{ mW}$

or CondI measuring circuit
(Terminals KL. 1, 2, 3, 4, 5)

maximum values: $V_{oc} = 7.1 \text{ V}$ $C_a = 100 \mu\text{F}$
 $I_{sc} = 72 \text{ mA}$ $L_a = 20 \text{ mH}$
 $P_o = 128 \text{ mW}$

Temp measuring circuit
(Terminals KL. D, KL. E)

maximum values: $V_{oc} = 5 \text{ V}$ $C_a = 1000 \mu\text{F}$
 $I_{sc} = 10 \text{ mA}$ $L_a = 1 \text{ H}$
 $P_o = 13 \text{ mW}$

OK inputs HOLD, CONTROL
(Terminals KL. 6, 7 and 8, 7)

maximum values: $V_{max} = 30 \text{ V}$ $C_1 = 0$
 $I_{max} = \text{no limitation}$ $L_1 = 0$

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, DIVISION 2, GROUPS A, B, C, D
OR NON-HAZARDOUS LOCATIONS ONLY

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

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

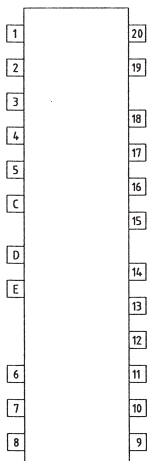
WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER
HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS

AVERTISSEMENT - RISQUE D'EXPLOSION - AVANT DE DECONNECTER L'EQUIPEMENT,
COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DESIGNÉ 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
 CO₂ 5100 e one CO₂ input
 O₂ 4100 e one DO input
 O₂ 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

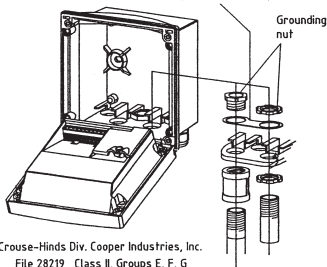
Switching circuits
 ALARM and CLEAN
 (Terminals KL 15, 16 and 17, 18)
 maximum values:
 AC: < 250 V / < 3 A / < 750 VA / resistive load
 DC: < 30 V / < 3 A / < 90 W / resistive load

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 pF
 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: FLR (2x)			Zul. Abweichungen für Maße ohne Toleranzangabe ISO 2768 - m		Oberfläche	Maßstab	Blatt 1/2
						Halbzeug	
			Bearb. Datum Name 07.03.03 dam		Benennung control drawing CSA		
			Gepr.(KOM) 10.3.3 G		Transmitter 2100, 4100, 5100, 7100		
			Freigabe(FGL) 4 4		Zeichnungsnummer 194.130-240		
			Schulzwerk nach DIN 34 beachten				
Nr. AE	Datum	Bearbeiter/FGL KOM			Umgel.ig. ab:		Ersetzt durch:

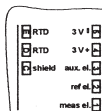
pH sensor group InPro 3xxx

- InPro3200

pH sensor group InPro 4xxx

- InPro4250/120/Pl1000

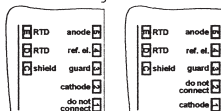
terminal assignment



O₂ sensor group InPro 6xxx

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

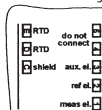
terminal assignment



CO₂ sensor group InPro 5xxx

- CO₂-sensor

terminal assignment



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, auxiliary electrode

-ORP: Redox electrode

-Kathode: cathode of O₂-sensors

-Anode: anode of O₂-sensors

-Guard: guard-electrode of O₂-sensors

-T1: temperature device

-T2: temperature device (zero)

-T3: temperature device (compensation lead)

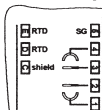
Cond sensor group InPro 70xx-VP

- InPro7000-VP
- InPro7005-VP
- InPro7001/120-VP
- InPro7001/225-VP
- InPro7002/15°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
- InPro7108/15°TC-VP
- InPro7108/2°TC-VP

terminal assignment

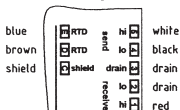


Wire color Patch cord	VP connector pin (on sensor)	Transmitter Cond 7100 e
bare	G	unused
blue	D	3
black	E	4
red	C	D
green	F	E
white	H	2
clear	B	C
white/blue	A	1

Cond sensor group InPro 72xx

- InPro7200
- InPro7201
- InPro7202

terminal assignment



blue
brown
shield

white
black
drain
drain
red

Version: METTLER TOLEDO

Verteiler: FUL (2x)				Zul. Abweichungen für Maße ohne Toleranzangabe ISO 2768 - m	Oberfläche	Maßstab Halbzeug	Blatt 2/2	
				Datum 07.03.03	Name dam	Benennung control drawing CSA Transmitter 2100, 4100, 5100, 7100		
				Gepr. (KON) 10.3.3		Zeichnungsnummer 194.130-240		
				Freigabe(FGL)		Schutzvermerk nach DIN 34 beachten		
Nr. AE	Datum	Beurteiler	FGL KON	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 *)	0.1 mol/l *)	saturated **)
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

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

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

Concentration measurement

Ranges

Substance	Concentration ranges		
NaCl Configuration	0-26 % by wt (0°C) 0-28 % by wt (100°C) -01-		
HCl Configuration	0-18 % by wt (-20 °C) 0-18 % by wt (50 °C) -02-	22-39 % by wt (-20 °C) 22-39 % by wt (50°C) -07-	
NaOH Configuration	0-13 % by wt (0 °C) 0-24 % by wt (100 °C) -03-	15-50 % by wt (0 °C) 35-50 % by wt (100°C) -10-	
H ₂ SO ₄ Configuration	0-26% by wt (-17°C) 0-37% by wt (110°C) -04-	28-88% by wt (-17°C) 39-88% by wt (115°C) -09-	94-99% by wt (-17°C) 89-99% by wt (115°C) -06-
HNO ₃ Configuration	0-30 % by wt (-20°C) 0-30 % by wt (50°C) -05-	35-96 % by wt (-20°C) 35-96 % by wt (50°C) -08-	

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.

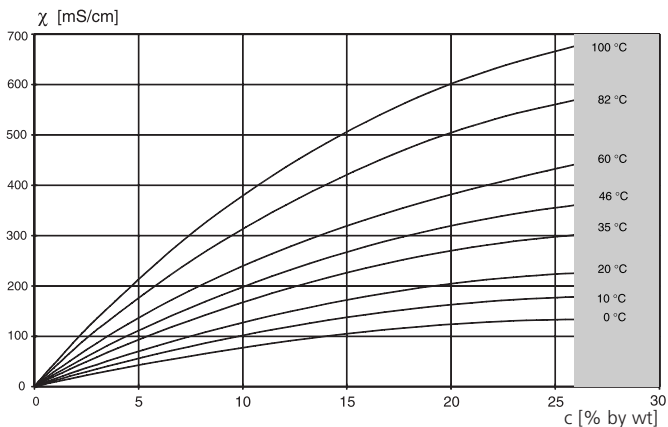
We recommend to calibrate the Transmitter together with the sensor. For exact temperature measurement, you should perform a temperature probe adjustment. For measuring processes with rapid temperature changes, a separate temperature probe with fast response should be used.

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.

Concentration curves

-01- Sodium chloride solution NaCl

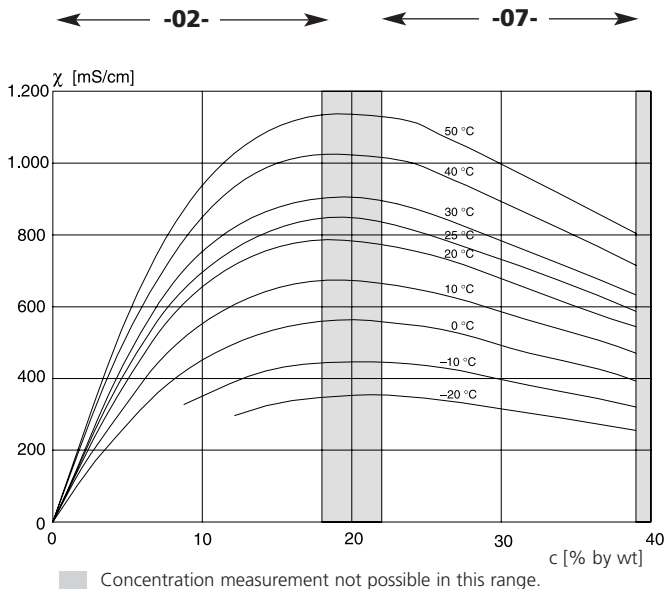
← -01- →



■ Concentration measurement not possible in this range.

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

-02- Hydrochloric acid solution HCl -07-

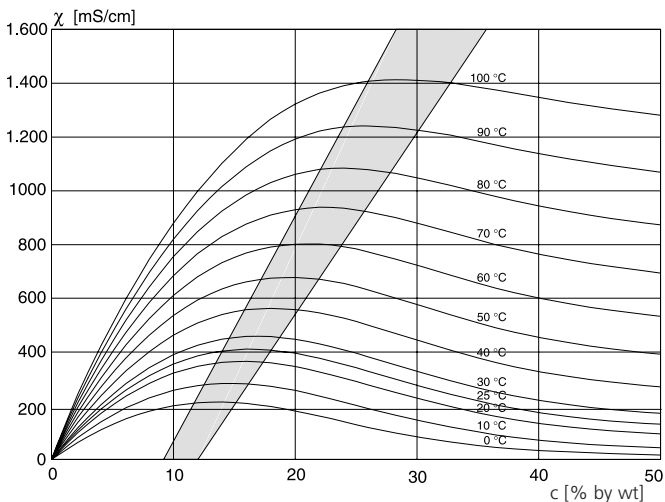


Conductivity in dependence on substance concentration and process temperature for hydrochloric acid (HCl)

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

-03- Sodium hydroxide solution NaOH**-10-**

← -03- → ← -10- →



■ Concentration measurement not possible in this range.

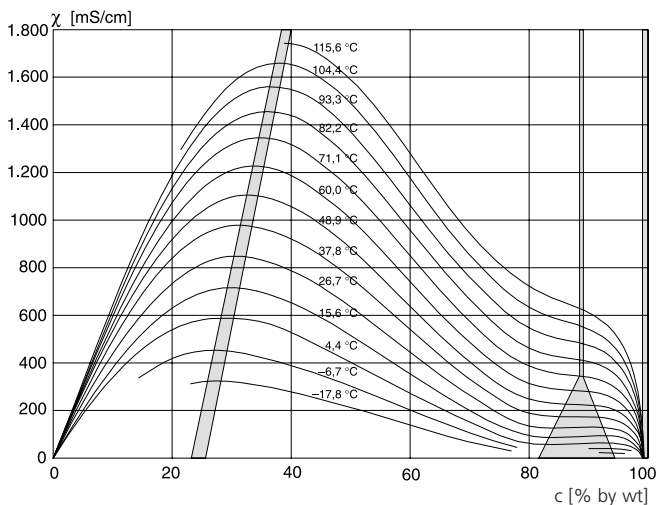
Conductivity in dependence on substance concentration and process temperature for sodium hydroxide solution (NaOH)

-04- Sulfuric acid H₂SO₄

-06-

-09-

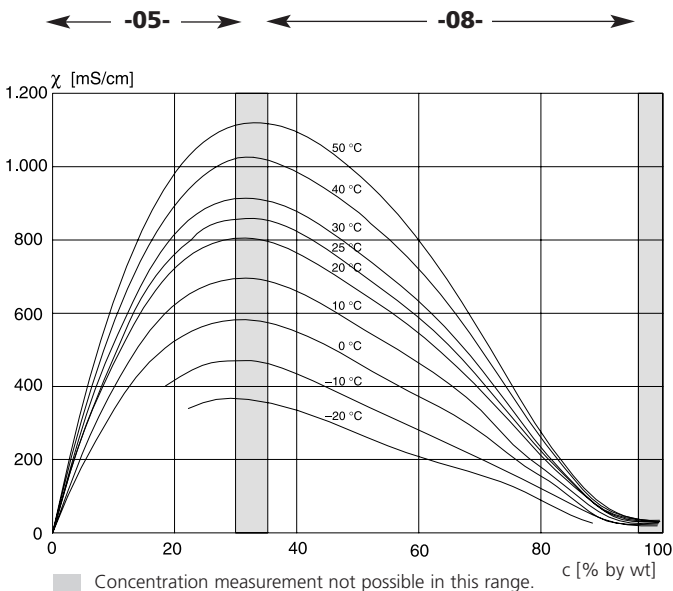
← -04- → ← -09- → -06-



■ Concentration measurement not possible in this range.

Conductivity in dependence on substance concentration and process temperature for sulfuric acid (H₂SO₄)

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

-05- Nitric acid HNO₃**-08-**

Conductivity in dependence on substance concentration and process temperature for nitric acid (HNO₃)

Source: Haase/Sauermann/Dücker; Z. phys. Chem. New Edition, Vol. 46 (1965)

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