

Instruction manual

Transmitter Cond 7100 e/2(X)H

METTLER TOLEDO



70082

Warranty

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

Subject to change without notice.

Return of products under warranty

Please contact METTLER TOLEDO's Customer Service Dept. before returning a defective device. Ship the cleaned device to the address you have been given. If the device has been in contact with process fluids, it must be decontaminated/disinfected before shipment. In that case, please attach a corresponding certificate, for the health and safety of our service personnel.



Disposal (Directive 2002/96/EC of January 27, 2003)
Please observe the applicable local or national regulations concerning the disposal of "waste electrical and electronic equipment".



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Subject to technical changes. Mettler-Toledo GmbH, 06/05.
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Be sure to read and observe the following instructions!

The device has been designed 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.

Safety precautions for installation

- The stipulations of EN 60079-10 / EN 60079-14 must be observed during commissioning.
- The **Transmitter Cond 7100 e/2H** is approved for measurements in FM Class I Div II.
- The **Transmitter Cond 7100 e/2XH** is approved for operation in the following locations: ATEX, FM Zone 1 with measurement in Zone 0, and FM Class I Div 1.

Connection to supply units

- **Transmitter Cond 7100 e/2H:** Before connecting this device to a supply unit, make sure that its output voltage cannot exceed 30 V DC.
Do not use alternating current or mains power supply!
- **Transmitter Cond 7100 e/2XH:** This device may only be connected to an explosion-proof power supply unit (for input ratings refer to annex of EC-Type-Examination Certificate). Before commissioning it must be made sure that the connections to other equipment such as power supply unit and cables are intrinsically safe.

Terminals:

suitable for single wires / flexible leads up to 2.5 mm² (AWG 14)

Note for cleaning in a hazardous location

To protect against electrostatic discharge, the device may only be cleaned with a damp cloth in hazardous locations.

Intended use

The Transmitter Cond 7100 e/2(X)H is used for measurement of electrical conductivity and temperature in liquids. Fields of application are: biotechnology, chemical industry, environment, food processing, water/waste-water treatment. The rugged molded enclosure can be fixed into a control panel or mounted on a wall or at a post. The protective hood provides additional protection against direct weather exposure and mechanical damage. The Transmitter has been designed for 2- and 4-electrode sensors.

- The **Transmitter Cond 7100 e/2H** is approved for measurements in FM Class I Div II.
- The **Transmitter Cond 7100 e/2XH** is approved for operation in the following locations: ATEX, FM Zone 1 with measurement in Zone 0, and FM Class I Div 1.

Trademarks

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

InPro® is a registered trademark of Mettler-Toledo.

HART® is a registered trademark of the HART Communication Foundation.

EC Declaration of Conformity

Mettler-Toledo GmbH

Process Analytics

Adresse Im Hackacker 15 (Industrie Nord), CH-8902 Urdorf, Schweiz
Briefadresse Postfach, CH-8902 Urdorf
Telefon 01-736 22 11
Telefax 01-736 26 36
Internet www.mt.com
Bank Credit Suisse First Boston, Zürich /Acc. 0835-370601-21-90)

Declaration of conformity Konformitätserklärung Déclaration de conformité



We/Wir/Nous

Mettler-Toledo GmbH, Process Analytics
Im Hackacker 15
8902 Urdorf
Switzerland

Description

Beschreibung/Description

declare under our sole responsibility that the product,
erklären in alleiniger Verantwortung, dass dieses Produkt,
déclarons sous notre seule responsabilité que le produit,

Cond 7100/2(X)H

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).

Explosionsschutzrichtlinie
Explosion Protection / Pro-
tection contre les explosions

94/9/EG

EMC Directive/EMV-Richtlinie
Directive concernant la CEM

89/336/EWG
SR 734.5, VEMV

Low-voltage directive/Nieder-
spannungs-Richtlinie/
Directive basse tension

73/23/EWG
SR 734.26, NEV

Place and Date of issue
Ausstellungsort / - Datum
et date d'émission

Urdorf, August 22, 2003

Mettler-Toledo GmbH, Process Analytics

Waldemar Rauch
General Manager PO Urdorf

Christian Wicky
Head of Marketing

Norm/Standard/Standard

EN 50 014
EN 50 020
EN 61326/ VDE 0843 Teil 20
EN 61010 Teil/ VDE 0411 Teil 1

METTLER TOLEDO

Artikel Nr.: 52960318 KE

Dateiname: 52960318KE-7100-2(X)H-Internet-2.doc

Version b

Sitz der Gesellschaft Mettler-Toledo GmbH, Im Langacher, CH-8606 Greifensee

Conformity with FDA 21 CFR Part 11

METTLER TOLEDO

In their directive “Title 21 Code of Federal Regulations, 21 CFR Part 11, Electronic Records; Electronic Signatures” the US American health agency FDA (Food and Drug Administration) regulates the production and processing of electronic documents for pharmaceutical development and production. This results in requirements for measuring devices used for corresponding applications. The following features ensure that the measuring devices of the Transmitter Cond 7100 e/2(X)H Series meet the demands of FDA 21 CFR Part 11:

Electronic Signature

Access to the device functions is regulated and limited by individually adjustable codes – “Passcodes” (for Passcode Editor see Page 56, overview of factory settings see Page 33).

This prevents unauthorized modification of device settings or manipulation of the measurement results. Appropriate use of these passcodes makes them suitable as electronic signature.

Audit Trail

Every (manual) change of device settings can be automatically documented. For that purpose, each change is marked by a “Configuration Change Flag”, which can be interrogated and documented via HART communication. Then the changed device settings/parameters can also be retrieved and documented via HART communication.

EC-Type-Examination Certificate



Translation

(1) **EC-TYPE EXAMINATION CERTIFICATE**

(2) Equipment or Protective System intended for use in potentially explosive atmospheres - **Directive 94/9/EC**

(3) EC-Type Examination Certificate Number



TÜV 99 ATEX 1433

(4) Equipment or Protective System: transmitter type Cond 7100/2X*

(5) Manufacturer: Mettler Toledo GmbH

(6) Address: CH-8902 Urdorf, Im Hackacker 15

(7) This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) The TÜV Hannover/Sachsen-Anhalt e.V., TÜV Certification Body N° 0032 in accordance with Article 9 of the Council Directive 94/9/EC of March 23, 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential report N° 99/PX10591.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50 014:1997

EN 50 020:1994

(10) If the sign "X" is placed after the certification number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified equipment or protective system. If applicable, further requirements of this Directive apply to the manufacture and supply of this equipment or protective system.

(12) The marking of the equipment or protective system shall include the following:



II 2 (1) G EEx ib [ia] IIC T6

TÜV Hannover/Sachsen-Anhalt e.V.
TÜV CERT-Zertifizierungsstelle
Am TÜV 1
D-30519 Hannover

Hannover, 1999-06-04


Head of the
Certification Body



This certificate may only be reproduced without any change, schedule included.
Excerpts or changes shall be allowed by the TÜV Hannover/Sachsen-Anhalt e.V.

page 1/3



(13)

SCHEDULE

(14) **EC-TYPE EXAMINATION CERTIFICATE N° TÜV 99 ATEX 1433**

(15) Description of equipment or protective system

The transmitter type Cond 7100/2X* is used for the recognition and processing of electrochemical quantities.

The maximum permissible ambient temperature is 55°C.

Electrical data

Current loop in type of protection "Intrinsic Safety" EEx ib IIC
(terminals 10, 11) only for the connection to a certified intrinsically safe circuit with the following maximum values:

$$U_i = 30 \text{ V}$$

$$I_i = 100 \text{ mA}$$

$$P_i = 0.8 \text{ W}$$

$$\text{effective internal capacitance } C_i = 20 \text{ nF}$$

$$\text{effective internal inductance } L_i = 0.2 \text{ mH}$$

Conductivity measuring loop in type of protection "Intrinsic Safety" EEx ia IIC
(terminals 1, 2, 3, 4, 5)

Maximum values:

$$U_C = 10 \text{ V}$$

$$I_C = 145 \text{ mA}$$

$$P_C = 145 \text{ mW}$$

$$R_i = 34.5 \text{ } \Omega$$

Characteristic: linear

$$\text{effective internal capacitance } C_i = 5 \text{ nF}$$

The effective internal inductance is negligibly small.

$$\text{max. permissible external capacitance } C_e = 3 \text{ } \mu\text{F}$$

$$\text{max. permissible external inductance } L_e = 1 \text{ mH}$$

Temperature measuring loop ... in type of protection "Intrinsic Safety" EEx ia IIC
(terminals 7, 8)

Maximum values:

$$U_C = 5 \text{ V}$$

$$I_C = 3.5 \text{ mA}$$

$$P_C = 5 \text{ mW}$$

$$R_i = 1590 \text{ } \Omega$$

Characteristic: linear

$$\text{effective internal capacitance } C_i = 250 \text{ nF}$$

The effective internal inductance is negligibly small.



Schedule EC-type examination certificate N° TÜV 99 ATEX 1433

max. permissible external capacitance $C_o = 100 \mu\text{F}$
max. permissible external inductance $L_o = 1 \text{ H}$

EP
(Terminal 9)

for the connection to the equipotential bonding system

The current loop is safely separated from the conductivity measuring loop and the temperature measuring loop up to a voltage of 60 V. The conductivity measuring loop and the temperature measuring loop are galvanically connected.

(16) Test documents are listed in the test report No. 99/PX10591.

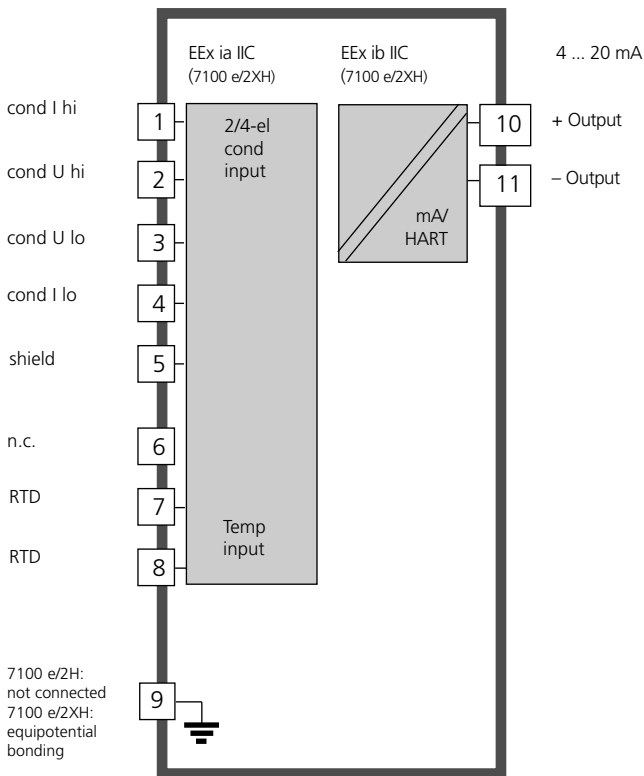
(17) Special condition for safe use

none.

(18) Essential Health and Safety Requirements

no additional ones

Overview of Transmitter Cond 7100 e/2(X)H

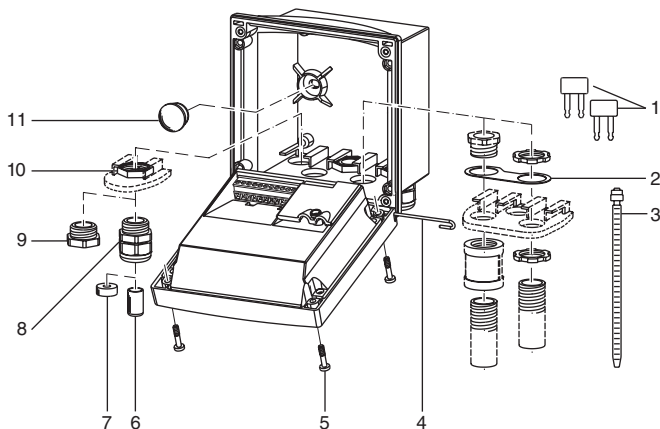


Assembly

Packing list

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

- Front unit of Transmitter
- 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

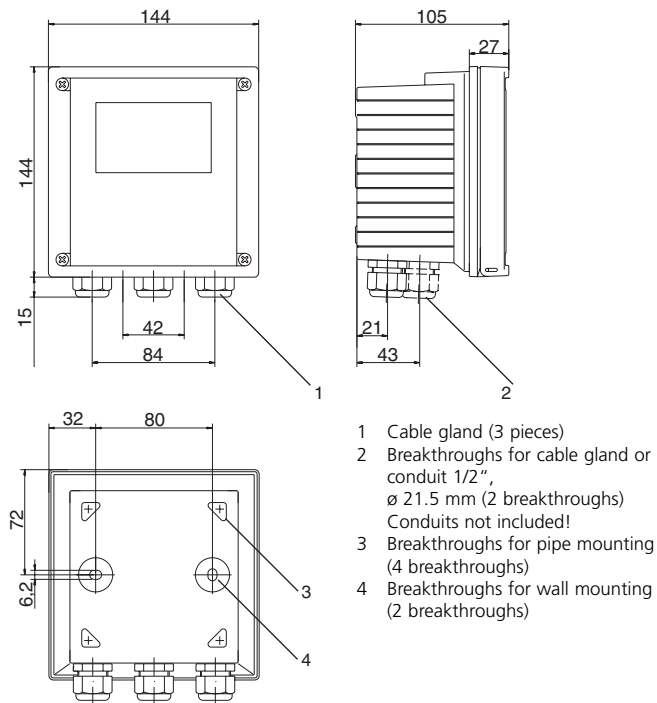
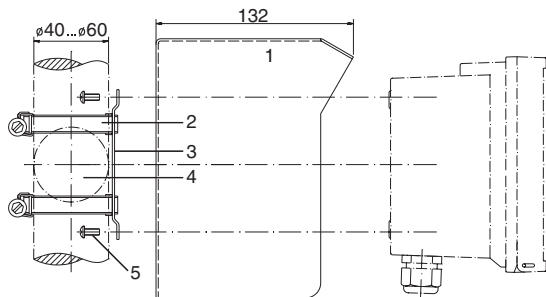


Fig.: Mounting plan

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

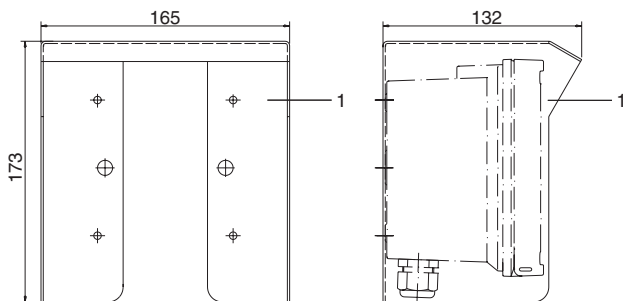
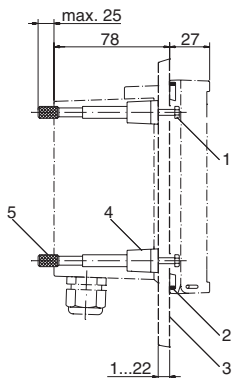


Fig.: Protective hood for wall and pipe mounting



- 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

- Installation may only be carried out by trained experts in accordance with this instruction manual and as per applicable local and national codes.
- Be sure to observe the technical specifications and input ratings.
- Be sure not to notch the conductor when stripping the insulation.
- When commissioning, a complete configuration must be carried out by the system administrator.

Connection to supply units

- **Transmitter Cond 7100 e/2H:** Before connecting this device to a supply unit, make sure that its output voltage cannot exceed 30 V DC. Do not use alternating current or mains power supply!
- **Transmitter Cond 7100 e/2XH:** This device may only be connected to an explosion-proof power supply unit (for input ratings refer to annex of EC-Type-Examination Certificate).

Terminals: suitable for single wires /flexible leads up to 2.5 mm² (AWG 14)

Warning!

Additional safety precautions have to be taken for applications in hazardous locations to CSA!
(See Pg 93 et seq.)

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.

FM Control Drawing: Refer to page 90.

Terminal assignments

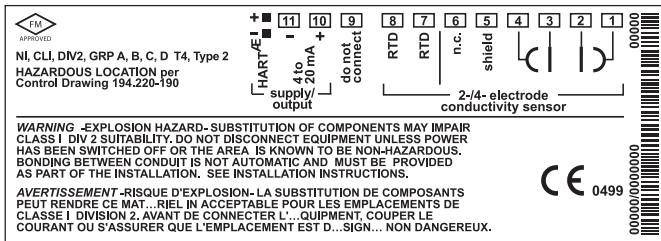


Fig.: Terminal assignments Transmitter Cond 7100 e/2H

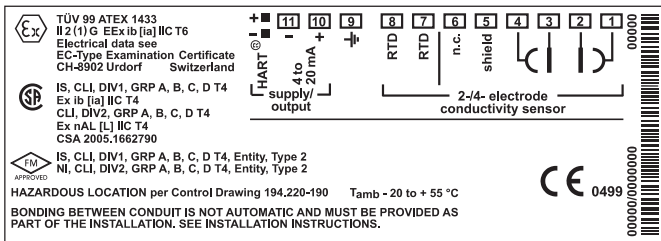
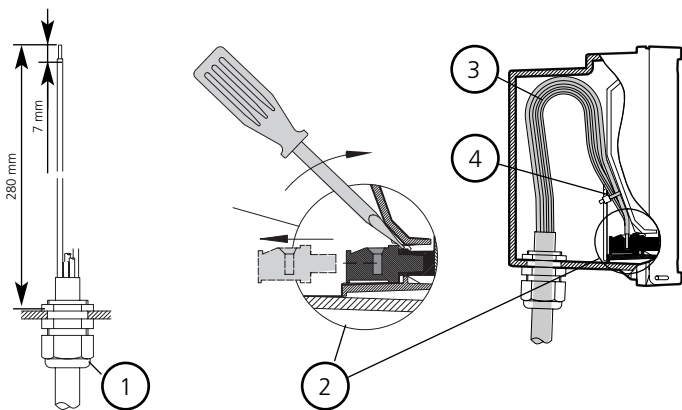


Fig.: Terminal assignments Transmitter Cond 7100 e/2XH



- 1** Recommended stripping lengths for multi-core cables
- 2** Pulling out the terminals using a screwdriver (also see **6**)
- 3** Cable laying in the device
- 4** Connecting lines for loop current
- 5** Cover for electrode and temperature probe terminals
- 6** Area for placing the screwdriver to pull out the terminals
- 7** Connection of handheld terminal

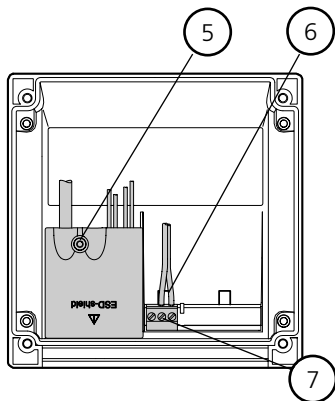
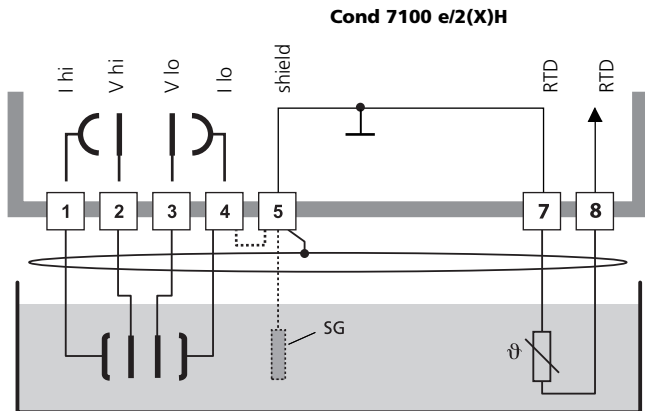


Fig.: Information on installation, rear side of device

Wiring examples

Cond measurement with 4-electrode sensor

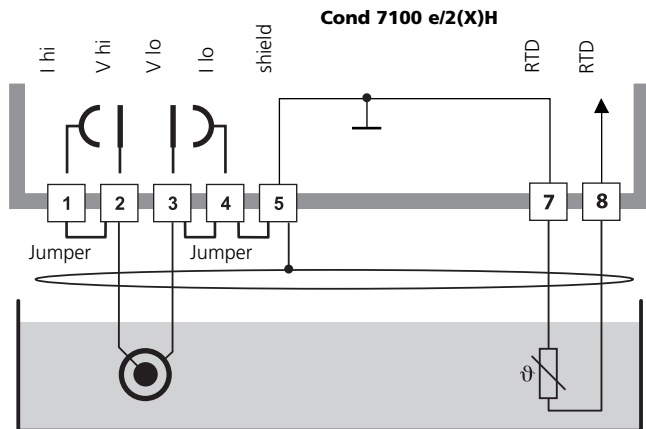


Caution!

Place jumper across terminals 4 and 5!

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

Cond measurement with 2-electrode sensor (coaxial electrodes)

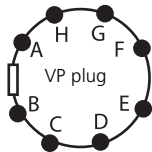
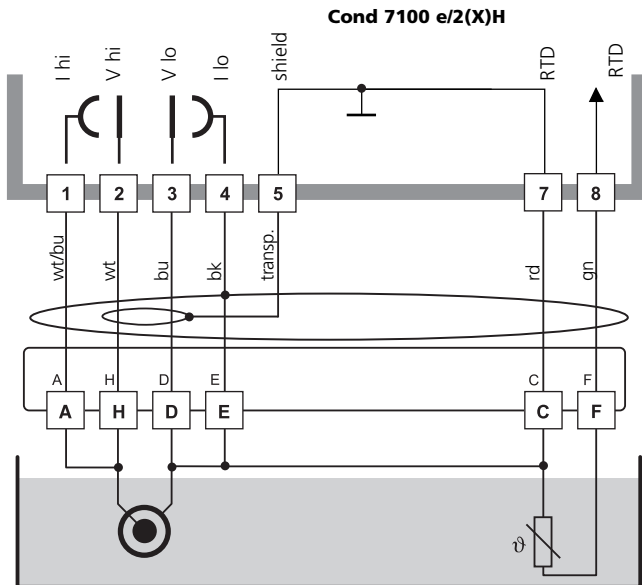


Caution!

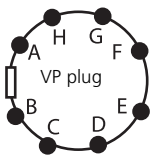
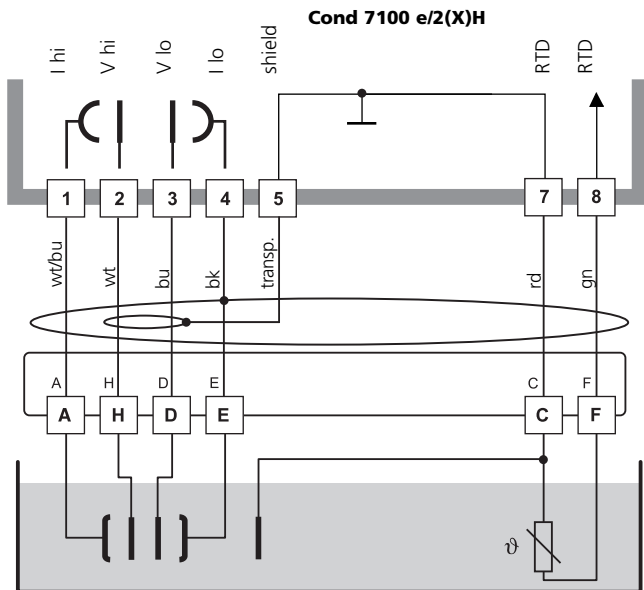
Place jumpers: across terminals 1 and 2
across terminals 3 and 4
across terminals 4 and 5

Wiring examples

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

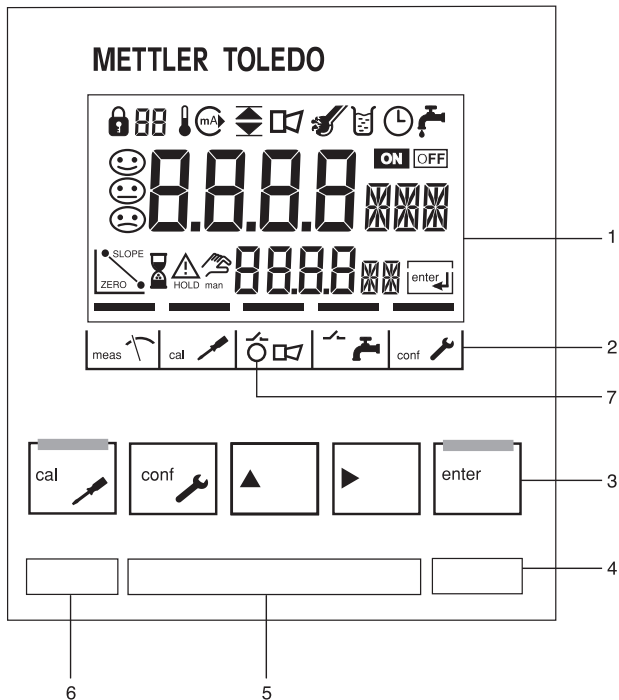


Cond measurement with Mettler-Toledo 4-electrode sensor via VP plug



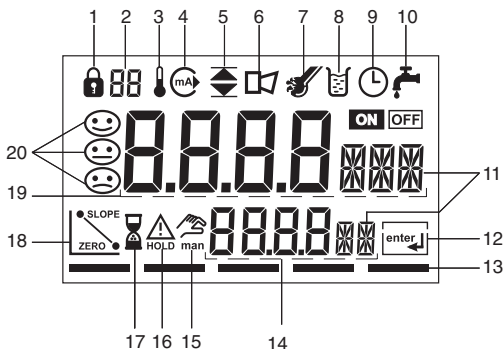
User interface and display

User interface



- 1 Display
- 2 Mode indicators (no keys),
from left to right:
 - Measuring mode
 - Calibration mode
 - Alarm
 - Wash contact (Model 7100 Cond only)
 - Configuration mode
- 3 Keypad
- 4 Coding
- 5 Rating plate
- 6 Model designation
- 7 Alarm LED












Display



- | | | | |
|----|----------------------------------------------------------------------------------|----|---------------------------|
| 1 | Passcode entry | 14 | Lower display |
| 2 | Display of measured variable* | 15 | Manual temp specification |
| 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 symbol | | |
| 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 | | |

* Not in use

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 constant
 → 	Error Info: Display of last error message
 + 	Start GainCheck device self-test

Safety functions

Sensocheck, Sensoface sensor monitoring



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



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

GainCheck device self test

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


Start GainCheck device self-test:  + 

Automatic device self-test

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

Safety functions

Hold mode

Display: 

The Hold mode is a safety state during configuration and calibration. The loop current is frozen (Last) or set to a fixed value (Fix).

If the calibration or configuration mode is exited, the Transmitter remains in the Hold mode for safety reasons. This prevents undesirable reactions of the connected peripherals due to incorrect configuration or calibration. The measured value and "HOLD" are displayed alternately. The Transmitter only returns to measuring mode after **enter** is pressed and 20 seconds have passed.

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

Timeout is not active during calibration.

Behaviour of output signal:

Last: The loop current is frozen at its last value.
Recommended during short configuration procedures.
The process should not change decisively during configuration. Changes are not noticed with this setting!

Fix: The loop current is set to a value that is noticeably different from the process value in order to signal the control system that the Transmitter is being worked at.

For configuration see Pg 51.

Outputs

Current output / Loop current

The loop current is controlled by the process variable selected in the configuration.

The current beginning and end can be set to represent any desired value. To check connected peripherals (e.g. limit switches, controllers), the loop current can be manually specified (see Pg. 41).

HART communication

The Transmitter Cond 7100 e/2(X)H can be remote-controlled via HART communication. It can be configured using a hand-held terminal or from the control room. Measured values, messages and device identification can be downloaded at any time. This allows easy integration also in fully automatic process cycles.

A list of the HART commands can be found in the "Transmitter Cond 7100 e/2(X)H Transmitter-Specific Command Specification": www.mtpro.com/transmitters.

Alarm

The alarm delay is configurable.

Error messages can also be signaled by a 22 mA loop current (see Configuration, Pg 55).






The alarm LED on the front panel can be configured as follows:

HOLD off:	Alarm: LED flashing
HOLD on:	Alarm: LED on. HOLD: LED flashing.





Passcodes (Factory settings)

The passcodes allow fast access to the functions


Calibration

Key+passcode	Description	Page
 0000	Cal Info	67
 1100	Calibration: Entry of cell constant	60
 0110	Calibration: Calibration solution	62
 1105	Product calibration	64
 1015	Temp probe adjustment	66

Configuration

Key+passcode	Description	Page
 0000	Error Info Display last error and erase	70
 1200	Configuration	34
 2222	Sensor monitor Display resistance and temp	67
 5555	Current source Specify output current	68

Passcode editor

Key+passcode	Description	Page
 1989	Administrator passcode Changing the passcodes	56

Configuration

In the Configuration mode you set the device parameters.

Activate



Activate with **conf**



Enter passcode "1200"^{*)}
Edit parameter with **▶** and **▲**,
confirm/continue with **enter**.
(End with **conf**, then **enter**.)

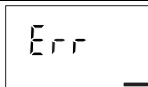
Hold



HOLD icon

During configuration the Transmitter remains in the Hold mode for reasons of safety. The loop current is frozen (at its last value or at a preset fixed value, depending on the configuration), 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. End Hold mode with **enter**. The display shows the measured value. The output current remains frozen for another 20 s (HOLD icon on, "hourglass" flashes).

*) Factory setting, for passcode editing see Pg 56

Menu structure of configuration

The configuration steps are assigned to different menu groups:

- Current output (code: o1.)
- Temperature compensation (code: tc.)
- Alarm settings (code: AL.)

With the arrow keys you can jump between the individual menu groups. Each menu group contains menu items for setting the parameters.

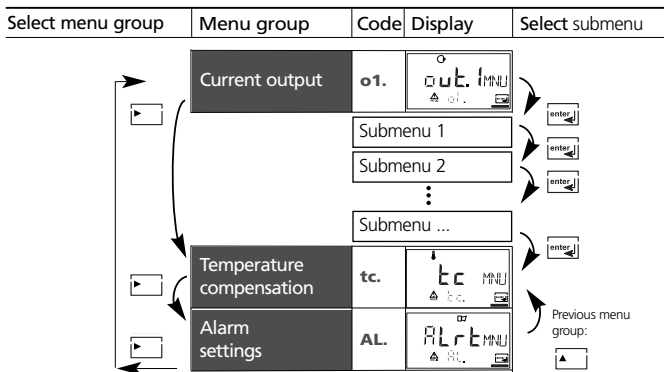


Example:

"o1." is displayed with all menu items of the "Current output" menu group.

Pressing **enter** accesses the submenus. The values are edited using the arrow keys. Pressing **enter** confirms/stores the settings.

Return to measurement: Press **conf**. Press **enter** to confirm safety prompt. After 20 sec the Transmitter will be in measuring mode again.



Overview of configuration steps

Code	Menu	Selection / Default										
out1	Current output	(Factory setting bold print)										
o1.CELL	Sensor selection	2-electrode , 4-electrode										
o1.UnIT	Select measured variable	μS , mS/cm , S/m, M Ω -cm, SAL, %, USP										
o1.CoNC	Select solution (Conc), see Pg 42 Codes:	<table border="1"> <thead> <tr> <th>NaCl</th> <th>HCl</th> <th>NaOH</th> <th>H₂SO₄</th> <th>HNO₃</th> </tr> </thead> <tbody> <tr> <td>-01-</td> <td>-02-</td> <td>-03-</td> <td>-04-</td> <td>-05-</td> </tr> </tbody> </table>	NaCl	HCl	NaOH	H ₂ SO ₄	HNO ₃	-01-	-02-	-03-	-04-	-05-
NaCl	HCl	NaOH	H ₂ SO ₄	HNO ₃								
-01-	-02-	-03-	-04-	-05-								
o1.CHAR	Characteristic linear / logarithmic (not for SAL, Conc, USP)	LIN / LOG										
o1.4mA	LIN: Enter current beginning	xxxx mS (000.0 mS)										
o1.20mA	Enter current end	xxxx mS (000.0 mS)										
o1.4mA	LOG: Enter current beginning	in decades: 0.001 ... 1000 mS (0.100 mS)										
o1.20mA	Enter current end	in decades: 0.001 ... 1000 mS (100.0 mS)										
o1.FtME	Time constant of output filter	xxxx SEC (0000 SEC)										
o1.FAIL	22 mA signal for error messages	ON / OFF										
o1.HoLD	Signal behavior during HOLD	Last / Fix										
o1.FIX	Fix: Enter fixed value	xxx.x mA (021.0 mA)										
tc	Temperature compensation											
tc.UnIT	Select temperature unit	$^{\circ}\text{C}$ / $^{\circ}\text{F}$										
tc.rTD	Select temperature probe	Pt100 /Pt1000/NTC30/NTC8.55										
tc.	Select temperature compensation (not for SAL)	OFF /LIN/NLF (natural waters)/ -01- FCT (NaCl traces) -02- FCT (HCl traces) -03- FCT (NH ₃ traces)										
tc.lin	Lin: Enter temperature coefficient	xx.xx %/K (02.00 %/K)										
ALrt	Alarm settings											
AL.SnSO	Select Sensocheck	ON / OFF										
AL.dLY	Enter alarm delay	0000 ... 0600 SEC (0010 SEC)										
AL.LED	LED in HOLD mode	ON / OFF										

Individual settings

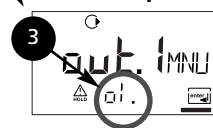
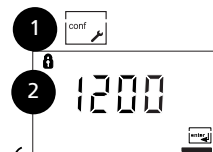
METTLER TOLEDO

(Original for copy)

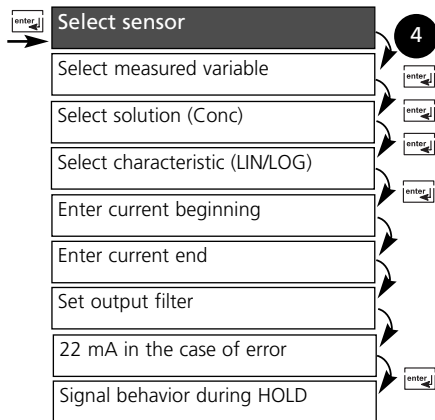
Code	Parameter	Factory setting	Individual setting
o1.CELL	Sensor type	<u>2-EL</u>	_____
o1.UnIT	Measurement unit	<u>mS/cm</u>	_____
o1.CoNC	Concentration	<u>NaCl</u>	_____
o1.CHAR	Characteristic (LIN/LOG)	<u>LIN</u>	_____
o1.4mA	Current start	<u>000.0 mS</u>	_____
o1.20mA	Current end	<u>100.0 mS</u>	_____
o1.FtME	Filter time	<u>0000 SEC</u>	_____
o1.FAIL	22mA signal	<u>OFF</u>	_____
o1.HoLD	Hold behavior	<u>LAST</u>	_____
o1.FIX	Fix current	<u>021.0 mA</u>	_____
tc.UnIT	Unit °C / °F	<u>°C</u>	_____
tc.rTD	Temp probe	<u>Pt 100</u>	_____
tc.	Temperature compensation	<u>OFF</u>	_____
tc.LIN	TC process medium	<u>02.00 %/K</u>	_____
AL.SnSO	Sensocheck	<u>OFF</u>	_____
AL.dLY	Alarm delay	<u>0010 SEC</u>	_____
AL.LED	LED in HOLD mode	<u>OFF</u>	_____

Configuration



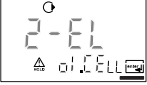

Current output: Select sensor type.



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



*) Factory setting, for passcode editing see Pg 56

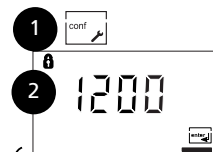
Code	Display	Action	Choices
o1.		Select configuration (Press conf.)	
	 <p>After correct input a welcome text (CONF) is displayed for approx. 3 sec.</p>	Enter passcode "1200" (Select position with ▶ key and edit number with ▲ key. When the display reads "1200", press enter to confirm.)	
		The Transmitter is in HOLD mode (HOLD icon is on).	
	 	Select sensor 2-electrode sensor / 4-electrode sensor Select with ▶ arrow key Proceed with enter	2-EL (2-El/ 4-El)

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

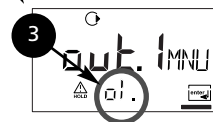
*) Factory setting

Configuration

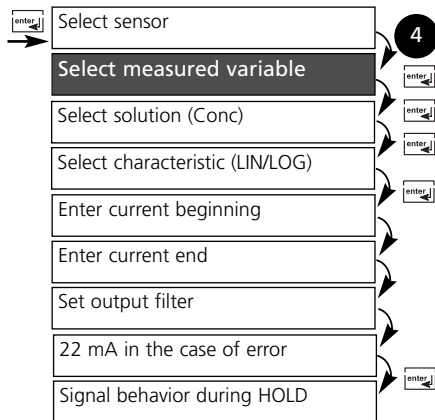
Current output: Select measured variable







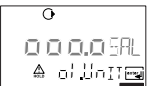


Current output:



1. Press **conf** key.
2. Enter passcode **1200**^{*)}.
3. Select **Current output** menu group using arrow keys. All items of this menu group are indicated by the code "01."
4. Press **enter** to select menu, edit with arrow keys (see Pg 41). Confirm (and proceed) with **enter**.
5. End: Press **conf**, then **enter**



*) Factory setting

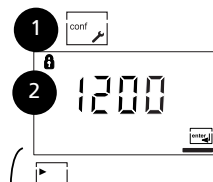
Code	Display	Action	Choices
01.		Select measured variable:	000.0 mS
		Select with ▶ arrow key Proceed with enter	(0.000 μS 00.00 μS 000.0 μS 0000 μS 0.000 mS 00.00 mS 000.0 mS
		Conductivity:	0.000 S/m 00.00 S/m
		<ul style="list-style-type: none"> • 0.000 ... 9.999 μS/cm • 00.00 ... 99.99 μS/cm • 000.0 ... 999.9 μS/cm • 0000 ... 9999 μS/cm • 0.000 ... 9.999 mS/cm • 00.00 ... 99.99 mS/cm • 000.0 ... 999.9 mS/cm • 0.000 ... 9,999 S/m • 00.00 ... 99.99 S/m 	0.000 MΩ 00.00 MΩ 0.00 SAL 00.00 % USP)
		Resistivity:	• 00.00 ... 99.99 MΩ·cm
		Salinity (SAL):	• 0.0 ... 45.0 ‰ (0 ... 35 °C)
		Concentration (Conc):	• 0.00 ... 9.99 % by wt
		USP:	• 00.00 ... 99.99 μS/cm

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

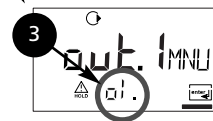
Configuration

Output 1

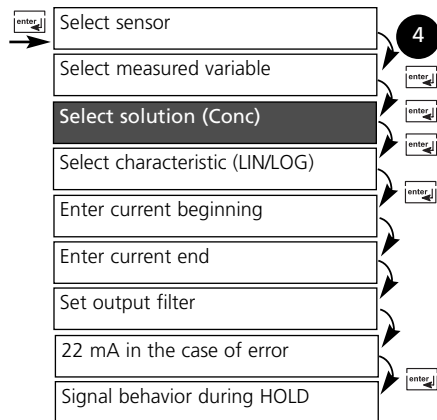
Concentration measurement: Select process solutions



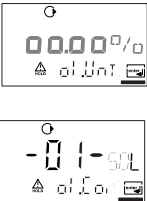
Current output:



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



*) Factory setting

Code	Display	Action	Choices
01.		<p>Only with 000.0 % you can select the process solution:</p> <p>Select with ► arrow key</p> <p>-01- NaCl (0.00 ... 9.99 % by wt) (0 ... 100 °C)</p> <p>-02- HCl (0.00 ... 9.99 % by wt) (0 ... 50 °C)</p> <p>-03- NaOH (0.00 ... 9.99 % by wt) (0 ... 100 °C)</p> <p>-04- H₂SO₄ (0.00 ... 9.99 % by wt) (0 ... 110 °C)</p> <p>-05- HNO₃ (0.00 ... 9.99 % by wt) (0 ... 50 °C)</p> <p>Proceed with enter</p>	<p>-01-SOL</p> <p>(-01-SOL -02-SOL -03-SOL -04-SOL -05-SOL)</p>

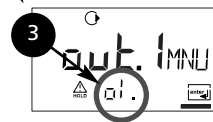
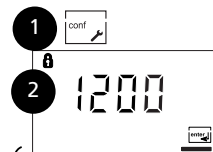
Concentration measurement

For the solutions listed above, the Transmitter can determine the substance concentration from the measured conductivity and temperature values in % by wt. The measurement error is made up of the sum of measurements errors during conductivity and temperature measurement and the accuracy of the concentration curves stored in the Transmitter, see Pg 84 et seq.

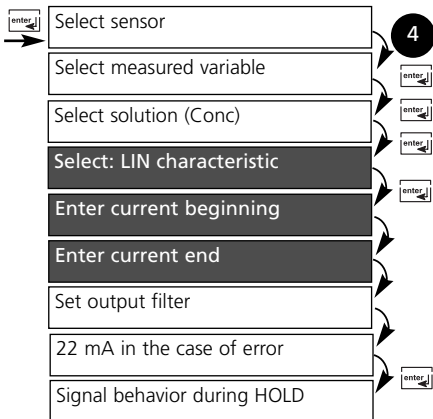
We recommend to calibrate the Transmitter together with the sensor, preferably in the same conductivity range as measured later. For exact temperature measurement, you should perform a temperature probe adjustment. For measuring processes with rapid temperature changes, a separate temperature probe with fast response should be used.

Configuration

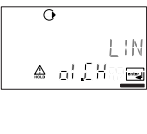
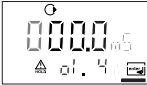
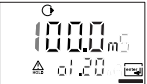
Output current. LIN characteristic. Current start / end



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

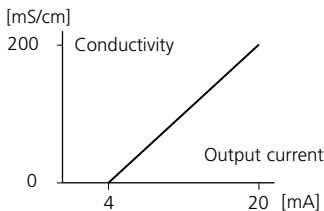


*) Factory setting

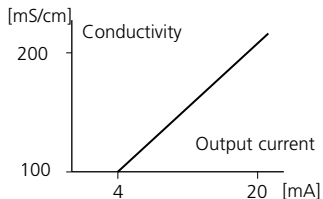
Code	Display	Action	Choices
01.		Select output characteristic Select with ▶ arrow key Proceed with enter (Step omitted for % (Conc) or SAL)	LIN (LIN / LOG)
		With LIN selected: • Enter current start (lower end of scale). Select with ▶ key, edit number with ▲ key, proceed with enter .	000.0 mS (xxx.x mS)
		• Enter current end (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

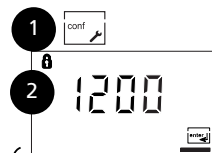


Example 2: Range 100...200 mS/cm
Advantage: Higher resolution in range of interest

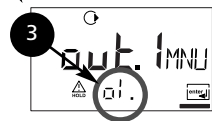


Configuration

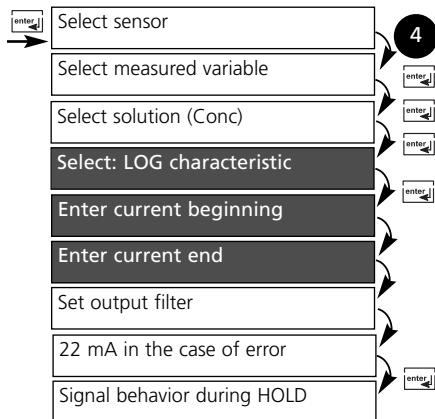
Output current. LOG characteristic. Current start / end





Current output:



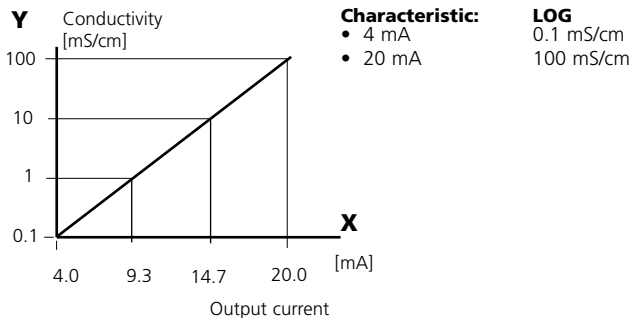
1. Press **conf** key.
2. Enter password **1200**).
3. Select **Current output** menu group using arrow keys. All items of this menu group are indicated by the code "01."
4. Press **enter** to select menu, edit with arrow keys (see Pg 47). Confirm (and proceed) with **enter**.
5. End: Press **conf**, then **enter**



*) Factory setting

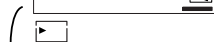
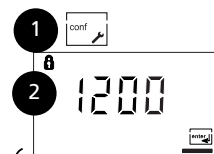
Code	Display	Action	Choices
01.		With LOG selected: <ul style="list-style-type: none"> Enter lower end of scale (=current start) Select with ▶ key, edit number with ▲ key, proceed with enter .	0.1 mS (0.1 mS 1.0 mS 10 mS 100 mS 1000 mS)
		<ul style="list-style-type: none"> Enter upper end of scale (=current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

Example: Measurement range over 3 decades

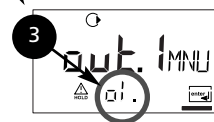


Configuration

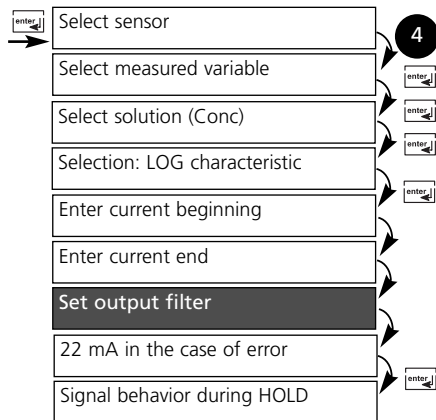
Output. Time constant of output filter




Current output:



1. Press **conf** key.
2. Enter passcode **1200**.*
3. Select **Current output** menu group using arrow keys. All items of this menu group are indicated by the code "o1."
4. Press **enter** to select menu, edit with arrow keys (see Pg 49). Confirm (and proceed) with **enter**.
5. End: Press **conf**, then **enter**



*) Factory setting

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	0 sec 0 ... 120 sec

Time constant of output filter (attenuation)

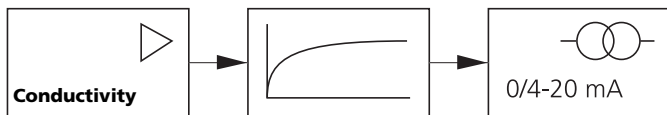
To smoothen the current output, a low-pass filter with adjustable filter time constant can be switched on. When there is a jump at the input (100 %), the output level is 63 % after the time constant has been reached.

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

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

Note:

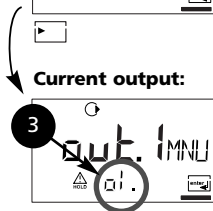
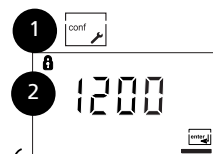
The filter only acts on the current output, not on the display!



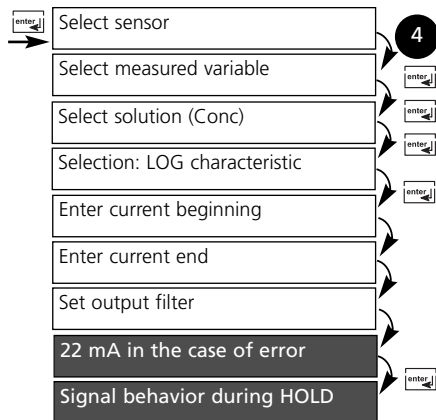
Time constant 0 - 120 sec

Configuration

Output. Output current during Error and HOLD.



1. Press **conf** key.
2. Enter passcode **1200**).
3. Select **Current output** menu group using arrow keys. All items of this menu group are indicated by the code "o1."
4. Press **enter** to select menu, edit with arrow keys (see Pg 51). Confirm (and proceed) with **enter**.
5. End: Press **conf**, then **enter**

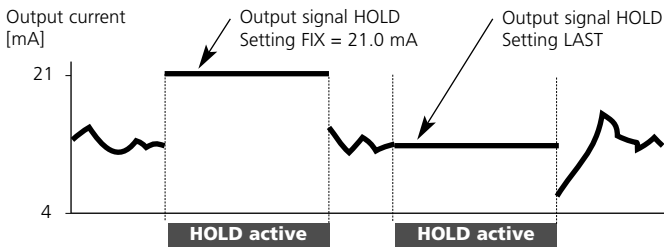


*) Factory setting

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 and edit number with ▲ key. Proceed with enter	021.0 mA (04.0 ... 22.0 mA)

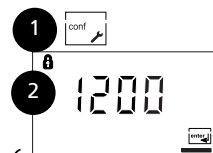
Output signal during HOLD:

(see Pg 30)

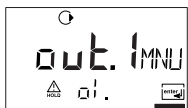


Configuration

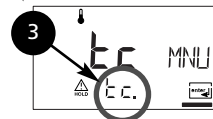
Temperature compensation



Current output:



Temp compensation:



Select °C°F

Select temperature probe

Select temperature compensation

4



5



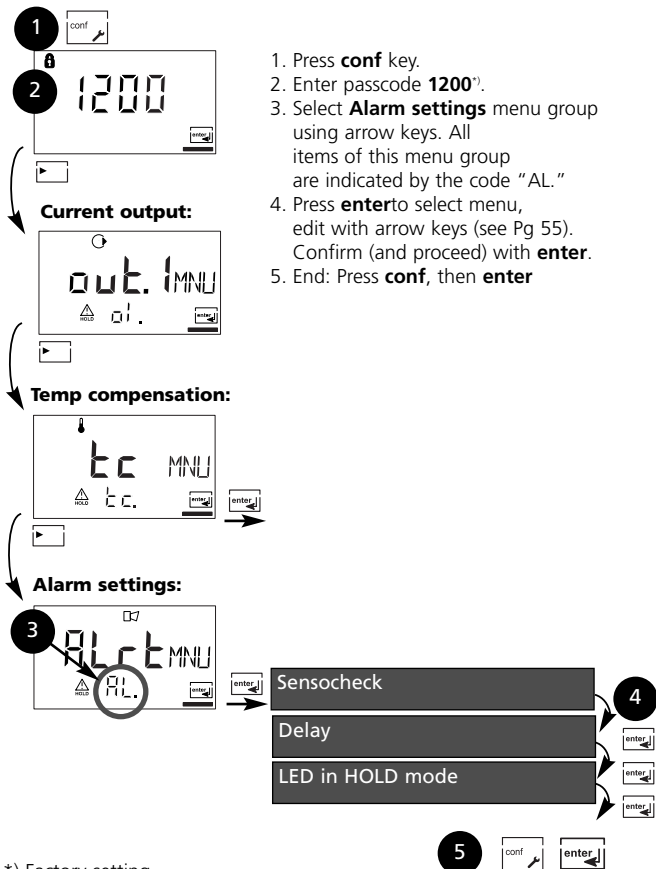
*) Factory setting




Code	Display	Action	Choices
tc.		Specify temperature unit Select with ▶ arrow key Proceed with enter	°C (°F)
		Select temperature probe Select with ▶ arrow key Proceed with enter	Pt100 (PT1000, NTC30, NTC8.55)
		Temp compensation selection (not for USP, CONC, SAL) OFF: Temperature compensation switched off. Select with ▶ key, proceed with enter LIN: Linear temperature compen- sation with entry of temperature coefficient and reference tempera- ture. nLF: Temperature compensation for natural waters to EN 27888 NaCl (nACL): Temperature compen- sation for ultrapure water with NaCl traces HCl (HCL): Temperature compensation for ultrapure water with HCl traces NH₃ (nH3): Temperature compensation for ultrapure water with NH ₃ traces	OFF (OFF LIN nLF nACL HCL nH3)
	Only with linear temperature compen- sation (LIN) selected: Enter temperature coefficient*). Select position with ▶ key, edit num- ber with ▲ key. Proceed with enter	02.00%/K (XX.XX %/K)	

*) Reference temperature 25 °C

Configuration

Alarm settings



Code	Display	Action	Choices								
AL.		Select Sensocheck (Continuous monitoring of sensor properties) Select with ▶ key. Proceed with enter	OFF (ON / OFF)								
		Alarm delay Select with ▶ key, edit number with ▲ key, proceed with enter	0010 s (xxxx s)								
		LED in HOLD mode Select with ▶ key, proceed with enter LED in HOLD mode: <table border="1" data-bbox="397 791 801 905"> <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									







Passcodes according to FDA 21 CFR Part 11






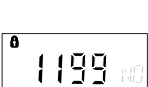
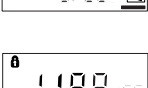
Access to the device functions can be protected with adjustable passcodes if required.

If such a protection is not required, you should use the preset passcodes.

To call up passcode editor:

Press **conf** key and enter Administrator passcode (Factory setting: **1989**).

Display	Action	Remark
	1. Press conf key. 2. Enter Administrator passcode (1989): Welcome text is displayed	This text is displayed for approx. 3 s
	"Cal Info" Edit: Arrow keys Proceed with: enter Cancel: conf	Default setting: 0000
	"Cal - Input of cell constant" Edit: Arrow keys Proceed with: enter Cancel: conf	Default setting: 1100
	"Cal - with cal solution" Edit: Arrow keys Proceed with: enter Cancel: conf	Default setting: 0110
	"Product calibration" Edit: Arrow keys Proceed with: enter Cancel: conf	Default setting: 1105
	"Temp probe adjustment" Edit: Arrow keys Proceed with: enter Cancel: conf	Default setting: 1015

Display	Action	Remark
	<p>"Error Info" Edit: Arrow keys Proceed with: enter Cancel: conf</p>	Default setting: 0000
	<p>"Configuration" Edit: Arrow keys Proceed with: enter Cancel: conf</p>	Default setting: 1200
	<p>"Sensor monitor" Edit: Arrow keys Proceed with: enter Cancel: conf</p>	Default setting: 2222
	<p>"Current source" Edit: Arrow keys Proceed with: enter Cancel: conf</p>	Default setting: 5555
	<p>"Administrator passcode" Edit: Arrow keys Proceed with: enter Cancel: conf</p>	Default setting: 1989
	<ul style="list-style-type: none"> • "NO" to cancel new Administrator passcode Proceed with enter (old passcode) Cancel: conf (old passcode) 	<p>Caution! If you have lost the Administrator passcode, the Passcode Editor cannot be called up! Please consult our technical support!</p>
	<ul style="list-style-type: none"> • "YES" to take over new Administrator passcode Select "YES" with arrow keys. Accept with enter (new passcode) Cancel: conf (old passcode) 	

Calibration

Calibration adjusts the device to the sensor.

Activate



Activate with **cal**



Enter passcode*):

- 1100 Entry of cell constant
 - 0110 With calibration solution
 - 1105 Product calibration
 - 1015 Temp probe adjustment
- Select with **▶** key, edit number with **▲** key, proceed with **enter** key (End with **cal** + **enter**.)

Hold



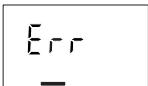
During calibration the Transmitter remains in the Hold mode.



HOLD icon

The loop current is frozen (at its last value or at a preset fixed value, depending on the configuration), Sensoface is off, mode indicator "Calibration" 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**.

Safety prompt:

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 sec (HOLD icon on, "hourglass" flashes).

*) Factory setting, for passcode editing see Pg 56

Information on calibration

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

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







Note:

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


Particularly with stray-field sensors the cell constant can strongly vary when the sensor is mounted in restricted space. In that case, the cell constant should be determined with the sensor mounted using a calibration solution or by a reference measurement at the product.

Calibration by entry of cell constant

Input of cell constant with simultaneous display of the uncompensated conductivity value and the temperature

Display	Action	Remark
	Press cal key, enter passcode 1100*) Select with ▶ key, edit number with ▲ key, proceed with enter	Transmitter is in Hold mode. If an invalid passcode is entered, the Transmitter returns to measuring mode.
	Ready for calibration	Display (3 s)
   	Enter cell constant of connected sensor: Select with ▶ key, edit number with ▲ key. A change in the cell constant also changes the conductivity value. Press enter to confirm cell constant.	The lower display shows the conductivity value. (When there has not been an entry for 6 sec, the lower display alternately shows the conductivity and temperature value.)




*) Factory setting

Display	Action	Remark
	<p>The Transmitter now displays the conductivity and temperature.</p> <p>The measured value is shown in the main display alternately with "Hold"; "enter" flashes. End calibration with enter.</p>	<p>Safety prompt</p> <p>After end of calibration, the outputs remain in Hold mode for approx. 20 sec.</p>



Calibration with calibration solution

(not for measured variables: S/m, SAL, % (Conc), USP)

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

Display	Action	Remark
	Press cal key, enter passcode 0110*) Select with ▶ key, edit number with ▲ key, proceed with enter	Transmitter is in Hold mode. If an invalid pass- code is entered, Transmitter returns to measuring mode.
	Ready for calibration Dismount and clean sensor	Display (3 sec)
	Immerse sensor in calibration solution. Determine the temperature- corrected conductivity value of the calibration solution from the corresponding table (see Pg 82).	When there has not been an entry for 6sec, the lower display alternately shows the cell constant and temperature value.
	Enter value of calibration solution. Select with ▶ key, edit number with ▲ key. Press enter to confirm the calibration data.	The cell constant and temperature are alternately displayed in the lower display during the input.

*) Factory setting

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

Notes : (also see Pg 59)

- Be sure to use known calibration solutions and the respective temperature-corrected conductivity values. (see "Calibration solutions" Pg 82 et seq.).
- During the calibration procedure the temperature must be kept constant.
- For a good mass transfer, the solution should be stirred.
- The configured measuring range is automatically used when this calibration routine is selected. If the measuring range (measured variable) is S/m, SAL, % (Conc), or USP, an error message is displayed for 3 s and the routine stopped.

Product calibration




Calibration by sampling

For product calibration the measured variable is used as configured: Conductivity ($\mu\text{S}/\text{cm}$, mS/cm , S/m), resistivity ($\text{M}\Omega\cdot\text{cm}$). During product calibration the sensor remains in the process. The measurement is only interrupted briefly.





Calibration is without TC correction.

Procedure: 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. To ensure an exact calibration, the sample temperature should correspond to the measured process temperature. The sample value is then entered in the Transmitter. The new cell constant is calculated from these two values. If the sample is invalid, you can take over the value stored during sampling. In that case the old calibration values are stored. Afterwards, you can start a new product calibration.




Display	Action	Remark
	<u>Product calibration step 1:</u> Press cal key. Enter passcode 1105*). (Press ▶ key to select position, enter number using ▲ key, confirm with enter)	If an invalid passcode is entered, the Transmitter returns to measuring mode.
		Display (approx. 3 sec)
	Take sample and store value. Proceed with enter	The sample is measured in the lab or directly on the site.

*) Factory setting


Display	Action	Remark
	<p>Measuring mode:</p> <p>From the flashing CAL mode indicator you see that product calibration has not been terminated.</p>	<p>While the sample value is determined, the Transmitter is in measuring mode.</p>
	<p><u>Product calibration step 2:</u> When the sample value has been determined, call up the product calibration once more (cal, passcode 1105”).</p>	<p>Display (approx. 3 sec)</p>
	<p>Enter lab value. The new cell constant is calculated.</p>	
	<p>The new cell constant is displayed.</p> <p>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>Safety prompt. After end of calibration, the outputs remain in Hold mode for approx. 20 sec.</p>

*) Factory setting


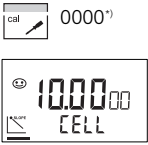


Temp probe adjustment

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

Measurement

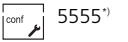


Display	Remark
	In the measuring mode the main display shows the configured process variable (conductivity, concentration, resistivity, salinity), the lower display shows the temperature. During calibration you can return to measuring mode by pressing the cal key, during configuration by pressing conf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

*) Factory setting

Entry/display	Remark
	<p>Display of output currents Press enter while in measuring mode. For 5 sec, the secondary display shows the output current instead of the temperature</p>
	<p>Display of calibration data (Cal Info) Press cal while in measuring mode and enter passcode 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. Press conf while in measuring mode and enter passcode 2222*). The measured resistance is shown in the main display, the measuring temperature in the lower display. Press enter to return to measurement.</p>
	<p>Display of last error message (Error Info) Press conf while in measuring mode and enter passcode 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>

*) Factory setting





















Diagnostics functions

Entry/display	Action / Remarks
  	<p>Specify output current for testing the connected peripherals</p> <ul style="list-style-type: none">• Press conf, enter passcode 5555*) <p>The output current indicated in the main display can be modified. Select with ▶ key, edit number with ▲ key, proceed with enter.</p> <p>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).</p>

Cleaning


To remove dust, dirt and spots, the external surfaces of the device may be wiped with a damp, lint-free cloth. A mild household cleaner may also be used if necessary.


*) Factory setting

Operating state	Out	LED	Time out
Measurement			
Cal Info (cal) 0000			20 s
Error Info (conf) 0000			20 s
Calibration (cal) 1100			
Temp adjustment (cal) 1015			
Product cal 1 (cal) 1105			
Product cal 2 (cal) 1105			
Configuration (conf) 1200			20 min
Sensor monitor (conf) 2222			20 min
Current source (conf) 5555			20 min


Explanation:








 active

 as configured (Last/Fix or Last/Off)

 LED flashes during HOLD (configurable)

Error messages (error codes)

Error	Display	Problem Possible causes	Red LED	Out 1 (22 mA)
ERR 01	Measured value flashes	Sensor <ul style="list-style-type: none"> • Wrong cell constant • Measurement range violation • SAL > 45 ‰ • Sensor connection or cable defective • USP limit exceeded 	x	x
ERR 02	Measured value flashes	Unsuitable sensor Conductance range > 3500 mS	x	x
ERR 98	"Conf" flashes	System error Configuration or calibration data defective. Completely reconfigure and recalibrate the device. Memory error in device program	x	x
ERR 99	"FAIL" flashes	Factory settings EEPROM or RAM defective This error message only occurs in the case of a total defect. The Transmitter must be repaired and recalibrated at the factory.	x	x
ERR 03		Temperature probe Open or short circuit Temperature range exceeded	x	x

Error	Symbol (flashes)	Problem Possible causes	Red LED	Out 1 (22 mA)
ERR 11		Current output Current below 3.8 mA	x	x
ERR 12		Current output Current above 20.5 mA	x	x
ERR 13		Current output Current span too small / too large	x	x
ERR 33	 	Sensocheck: Wrong or defective sensor / Polarization effects at the sensor / cable too long or defective / plug defective	x	x
			Sensoface active see Pg 73	
	 	Temperature outside conversion tables (TC, Conc, SAL)	independent of Sensoface	

Sensoface

(Sensochek must have been activated during configuration.)

The little smiley in the display (Sensoface) provides information about the sensor condition (defects, maintenance required, cable capacitance too high).

It alerts to significant sensor polarization or excessive cable capacitance e.g. caused by an unsuitable cable or a cable that is too long. The permitted calibration ranges and the conditions for a friendly, neutral, or sad Sensoface are summarized in the following chart. Additional icons refer to the error cause.

Sensochek

Continuously monitors the sensor and its wiring.

Sensochek can be switched off. Critical values make the Sensoface “sad” and the corresponding icon flashes:







The Sensochek message is also output as error message Err 33. The red LED is lighted, the output current is set to 22 mA (when configured correspondingly). Sensochek can be switched off during configuration (then Sensoface is also disabled). Exception: After a calibration a Smiley is always displayed for confirmation.

Note:

The worsening of a Sensoface criterion leads to the devaluation of the Sensoface indicator (Smiley becomes “sad”).

To reset the Sensoface indicator, the defect must be remedied and the Transmitter be calibrated.

Display	Problem	Status
	Sensor defect	 Wrong or defective sensor Significant polarization of sensor Excessive cable capacitance (also see error message Err 33, Pg 71).
	Temperature error	 Temperature outside range for TC, conc, SAL

Note:

When very fast response times (t_{90}) are required, e.g. when **detecting separation layers**, Sensocheck should be switched off (see "Specifications" Pg 76).

Product line and accessories

Devices	Order No.
Transmitter Cond 7100 e/2H	52 120 903
Transmitter Cond 7100 e/2XH	52 120 905
Mounting accessories	
Pipe-mount kit	52 120 741
Panel-mount kit	52 120 740
Protective hood	52 120 739

Sensors

Mettler-Toledo GmbH, Process Analytics offers a wide range of 2-electrode and 4-electrode sensors for the following fields of applications:

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

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

Specifications

Conductivity input

Effective range

Ranges *

Input for 2-electrode/4-electrode sensors

Conductivity 4-EL 0.2 $\mu\text{S} \cdot \text{c}$... 1000 $\text{mS} \cdot \text{c}$

Conductivity 2-EL 0.2 $\mu\text{S} \cdot \text{c}$... 200 $\text{mS} \cdot \text{c}$

Conductivity 0,000 ... 9.999 $\mu\text{S}/\text{cm}$

00.00 ... 99.99 $\mu\text{S}/\text{cm}$

000.0 ... 999.9 $\mu\text{S}/\text{cm}$

0000 ... 9999 $\mu\text{S}/\text{cm}$

0.000 ... 9.999 mS/cm

00.00 ... 99.99 mS/cm

000.0 ... 999.9 mS/cm

0.000 ... 9.999 S/m

00.00 ... 99.99 S/m

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

Concentration 0.00 ... 9.99 % by wt

Salinity 0.0 ... 45 ‰ (0 ... 35 °C)

USP 00.00 ... 99.99 $\mu\text{S}/\text{cm}$

Measurement error ^{1,2,3)}

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

Concentration determination

Operating modes: *

-01- NaCl 0,00 ... 9.99 % by wt (0 ... 100 °C)

-02- HCl 0,00 ... 9.99 % by wt (0 ... 50 °C)

-03- NaOH 0,00 ... 9.99 % by wt (0 ... 100 °C)

-04- H₂SO₄ 0.00 ... 9.99 % by wt (0 ... 110 °C)

-05- HNO₃ 0.00 ... 9.99 % by wt (0 ... 50 °C)

See graphs in the Appendix Pg 84 and following

Sensor standardization

Operating modes

- Input of cell constant with simultaneous display of conductivity and temperature
 - Input of conductivity of calibration solution with simultaneous display of cell constant and temperature
 - Product calibration
 - Temperature probe adjustment
- 00.0050 ... 19.9999 cm^{-1}

Adm. cell constant

Sensor monitoring

Sensocheck

Polarization detection and monitoring of cable capacitance

Sensoface

Provides information on the sensor condition (Sensocheck)

Sensor monitor

Direct display of measured values from sensor for validation (resistance / temperature)

USP function

Water monitoring in the pharmaceutical industry (USP)

Temperature input *

Pt100 / Pt1000/ NTC 30 k Ω /
NTC 8.55 k Ω (Betatherm)

2-wire connection, adjustable

Ranges

Pt100/Pt1000: -20 .. +200 °C
(-4 ... 392 °F)

NTC 30 k Ω -20 ... +150 °C
(-4 ... 302 °F)

NTC 8.55 k Ω -10 ... +130 °C
(+14 ... 266 °F)

Resolution

0.1 °C / 1 °F

Measurement error ^{1,2,3)}

0.5 K

(< 1K for Pt100; < 1K for NTC > 100°C)

Temperature compensation *
(Reference temp 25 °C)

(OFF) none

(Lin) Linear characteristic 00.00 ... 19.99 %/K

(NLF) Natural waters to EN 27888

(nACL) Ultrapure water with NaCl traces (0...120°C)

(HCL) Ultrapure water with HCl traces (0...120°C)

(nH3) Ultrapure water with NH₃ traces (0...120°C)

Specifications

Loop current

Supply voltage

Measured variable *

Characteristic

Overrange *

Output filter *

Measurement error ¹⁾

Start/end of scale

Min. span

Current source function

4 ... 20 mA floating

14 ... 30 V

Conductivity, resistivity, concentration, or salinity

Linear or logarithmic

22 mA in the case of error messages

Low-pass, filter time constant 0 ... 120 sec

< 0.3 % current value + 0.05 mA

As desired within range

LIN: 5 % of selected range

LOG: 1 decade

3.8 mA ... 22 mA

HART communication

Digital communication by FSK modulation of loop current, reading of device identification, measured values, status and messages, reading and writing of parameters, start of product calibration, signaling of configuration changes according to FDA 21 CFR Part 11

Display

Main display

Secondary display

Sensoface

LC display, 7-segment with icons

Character height 17 mm, unit symbols 10 mm

Character height 10 mm, unit symbols 7 mm

3 status indicators (friendly, neutral, sad Smiley)

Status indication

4 mode indicators "meas", "cal", "alarm", "config"

Alarm indication

18 further icons for configuration and messages

Red LED in case of alarm or HOLD, user defined

Keypad

5 keys: [cal] [conf] [▶] [▲] [enter]

* User-defined

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

2) ± 1 count

3) Plus sensor error

Service functions

Current source	Loop current specifiable 3.8 ... 22.00 mA
Device self-test	Automatic memory test (RAM, FLASH, EEPROM)
Display test	Display of all segments
Last Error	Display of last error occurred
Sensor monitor	Display of direct, uncorrected sensor signal (resistance/temperature)
Passcodes	Modifiable according to FDA 21 CFR Part 11 "Electronic Signatures"

Data retention

Parameters and calibration data > 10 years (EEPROM)

EMC

EN 61326	EN 61326
Emitted interference:	Class B (residential area)
	Class A
Immunity to interference:	Industry

Explosion protection

7100 e/2XH:	ATEX	TÜV 99 ATEX 1433 II 2(1) G EEx ib [ia] IIC T6
	FM	FMRC J.I. 300580 ISA/1/ABCD/T4 NW/2/ABCD/T4
	CSA	1662790 CI I, Div 1, Gr ABC & D T4; Ex ib [ia] IIC T4 CI I, Div 2, Gr ABC & D T4; Ex nAL[L] IIC T4
7100 e/2H:	FM	FM 300580 NW/2/ABCD/T4

Nominal operating conditions

Ambient temperature	-20 ... +55 °C
Transport/Storage temp	-20 ... +70 °C
Supply voltage	14... 30 V

Specifications

Enclosure

Color

Assembly

Dimensions

Ingress protection

Cable glands

Weight

Molded enclosure made of PBT

(polybutylene terephthalate)

Bluish gray RAL 7031

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

Sealed against panel

H 144 mm, B 144 mm, T 105 mm

IP 65/NEMA 4X

(USA, Canada: indoor use only)

3 breakthroughs for cable glands

M20x1.5, 2 breakthroughs for NPT 1/2" or

Rigid Metallic Conduit

Approx. 1 kg

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)

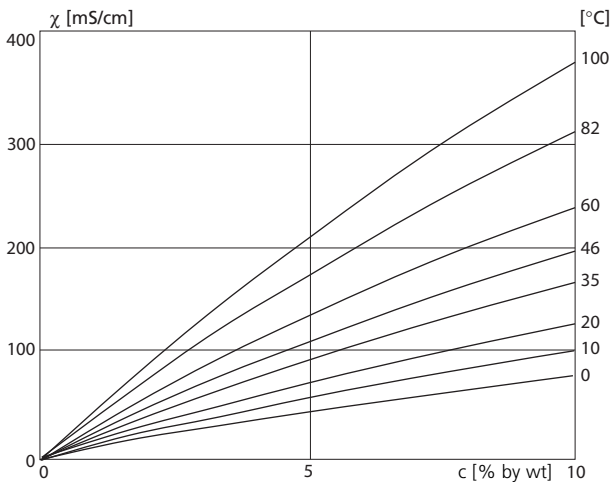
Temperature [°C]	Concentration		
	0.01 mol/l *	0.1 mol/l *	saturated **
0	0.631	5.786	134.5
1	0.651	5.965	138.6
2	0.671	6.145	142.7
3	0.692	6.327	146.9
4	0.712	6.510	151.2
5	0.733	6.695	155.5
6	0.754	6.881	159.9
7	0.775	7.068	164.3
8	0.796	7.257	168.8
9	0.818	7.447	173.4
10	0.839	7.638	177.9
11	0.861	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

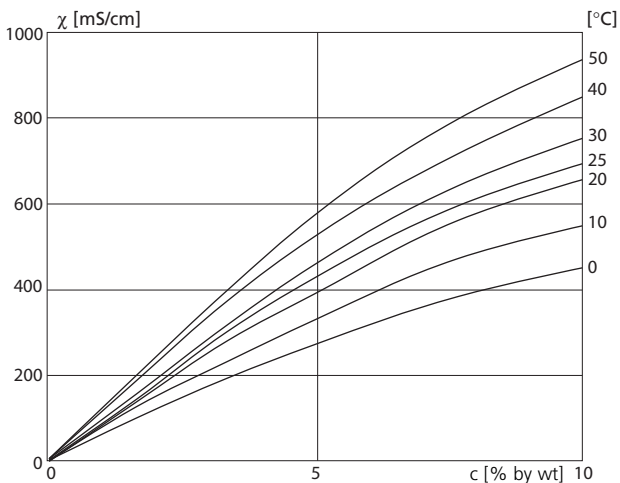
**) Data source: K. H. Hellwege (Editor), H. Landolt, R. Börnstein: Zahlenwerte und Funktionen ..., volume 2, part. volume 6

Concentration curves

-01- Sodium chloride solution NaCl



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

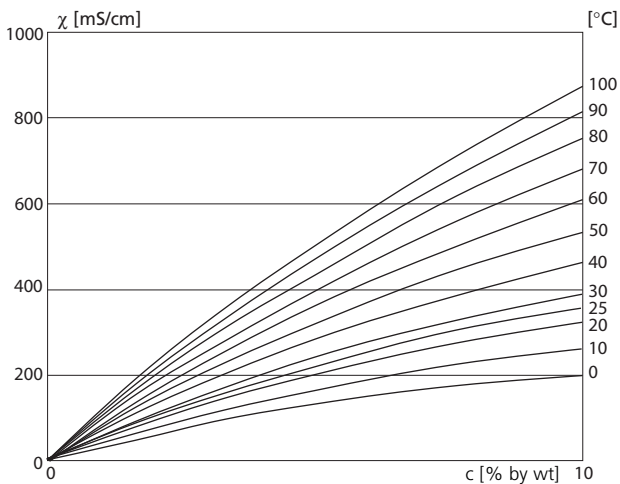
-02- Hydrochloric acid HCl

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

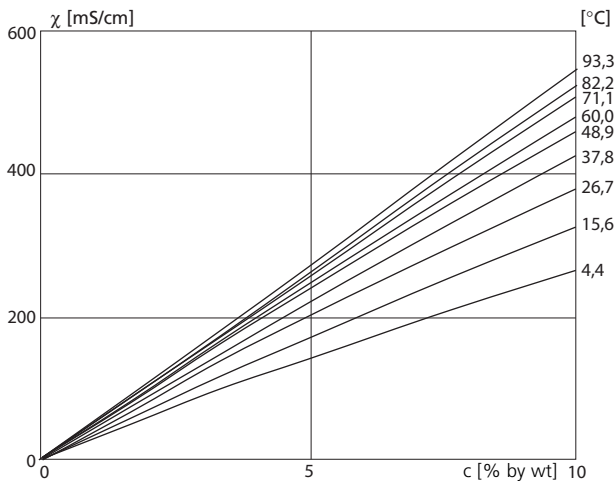
Source: Haase/Sauermann/Dücker; Z. phys. Chem. New Edition, Vol. 47 (1965)

Concentration curves

-03- Sodium hydroxide solution NaOH



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

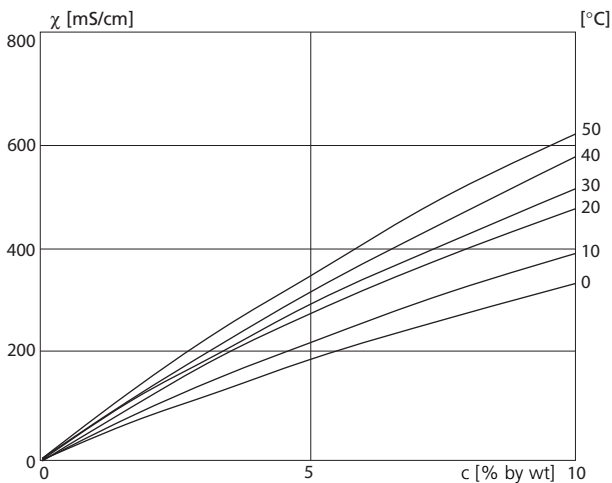
-04- Sulphuric acid H₂SO₄

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

Concentration curves

-05- Nitric acid HNO_3



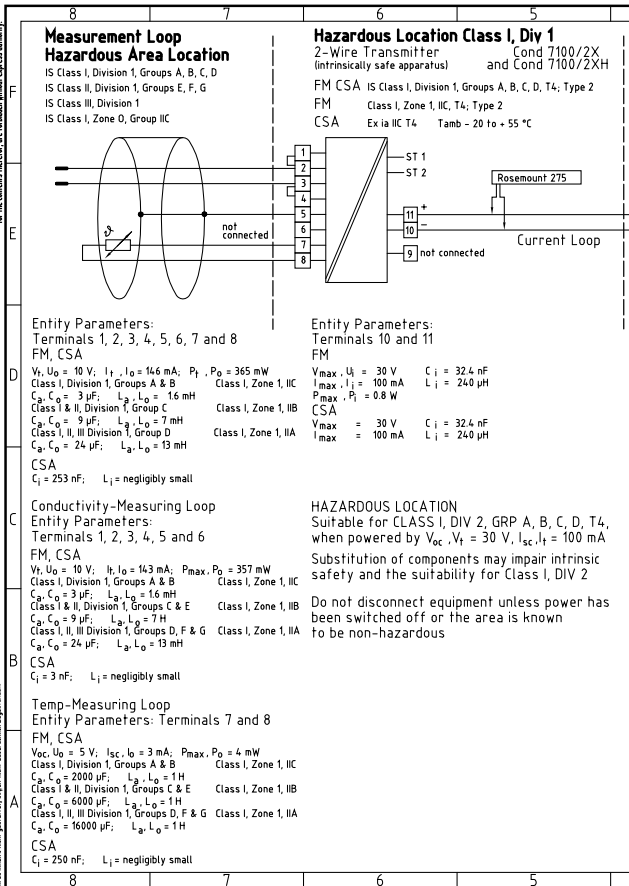
Conductivity in dependence on substance concentration and process temperature for nitric acid (HNO_3)

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

FM Control Drawing

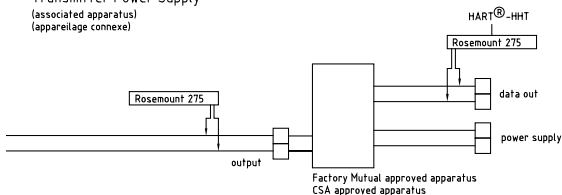
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Non-Hazardous Location

Transmitter Power Supply
(associated apparatus)
(appareil connexe)



NOTES :

- 1: $V_{max} \cdot U_i > V_{oc} \cdot V_t$ or U_o $I_{max} \cdot I_i > I_{sc} \cdot I_t$ or I_o $P_{max} > P_o$
 $C_i \cdot C_{cable} < C_A$ or C_o $L_i + L_{cable} < L_A$ or L_o
- 2: Installation must be in accordance with the National Electrical Code (ANSI/NFPA 70) and ANSI/ISA RP12.6 in US, Canadian Electric Code (Can3-M421) in Canada.
- 3: Associated apparatus must be FMRC and CSA Approved and must be used in an FMRC and CSA Approved configuration. Use of the Rosemount Model 275 Communicator in Zones is not an FMRC Approved configuration. The control drawing for the associated apparatus must be followed when installing this equipment.
- 4: Control equipment connected to the associated apparatus must not use or generate more than 250 V.
- 5: The intrinsically safe equipment connecting to 1, 2, 3, 4, 5, 6 and 7, 8 must be FMRC and CSA Approved or be simple apparatus (a device which will neither generate nor store more than 1.2 V, 0.1 A, 25 mW or 20 mJ).
- 6: No revisions to drawing without prior FMRC and CSA Approval.
- 7: Use of the Rosemount Model 275 Communicator is FM Approved for Division use only, see note 3. When using the Rosemount Model 275 Communicator in the loop between the associated apparatus and the Stratos 2211X Cond 2-Wire Transmitter, the maximum loop inductance must be less than the marked L_A of the associated apparatus to account for the L_{sc} from the Model 275 Communicator. Refer to the Rosemount Installation Drawing 00275-0081 to determine the allowable loop inductance.
- 8: The Rosemount Model 275 Communicator is not approved by CSA for use in the entity concept. For CSA application the Rosemount Model 275 Communicator must only be used on the non-hazardous side of the barrier/transmitter power supply.

Version METTLER TOLEDO

Verteiler: FUL (2x)			Zul. Abweichungen für Maße ohne Toleranzangabe ISO 2768 - m		Oberfläche	Maßstab Halbzeug	Page 1/2
				Datum	Name	Benennung	
				Bearb.	21.06.99	dam	control drawing FM
				Gepr.(KOM)			Cond Transmitter 7100/2X, 7100/2XH
				Freigebe(FGL)			
				Schutzvermerk nach DIN 34 beachten		Zeichnungsnummer	
3	Page 2	05.01.05	dam			194.220-190	
2	product improvement	11.07.00	dam				
1	product improvement	10.03.00	dam				
Nr.	AE	Datum	Bearbeiter	FG KOM		Umgültig ab:	
						Ersetzt durch:	

Explosion protection



Certificate of Compliance

Certificate: 1662790

Master Contract: 220331

Project: 1662790

Date Issued: May 18, 2005

Issued to: Mettler-Toledo GmbH
Im Hackacker 15
Urdorf, 8902
SWITZERLAND

Attention: Mr. Michael Haas

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



Issued by: K. Atkins

Authorized by: 
Nick Alfano
Operations Manager

PRODUCTS

CLASS 2258 04 - PROCESS CONTROL EQUIPMENT - Intrinsically Safe Entity - For Hazardous Locations

Class I, Division 1, Groups A, B, C and D

Ex ib [ia] IIC

Transmitters Models 2100/2XH, 7100/2XH and Models 4100/2XH, input rated 30V, 4-20 mA, intrinsically safe devices provides intrinsically safe outputs to simple apparatus, pH, conductivity and oxygen probes when connected per control drawings 194.120-170, 194.220-190 and 194.320-190, 194.401-120. Maximum Ambient Temperature 55°C, Temperature Code T4.

For all models the input entity parameters are:

Terminals	Ui, Vmax	Ii, Imax	Pi, Pmax	Ci	Li
10, 11 or 14,15	30V	100mA	0.8W	32.4nF	0.24mH

Output entity parameters are:

2100/2XH

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.

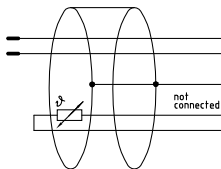
OBSERVE THE SPECIFICATIONS OF THE CONTROL DRAWING!

CSA Control Drawing

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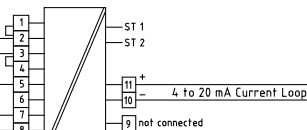
Measurement Loop Hazardous Area Location

IS Class I, Division 1, Groups A, B, C, D
IS Class II, Division 1, Groups E, F, G
IS Class III, Division 1
IS Class I, Zone O, Group IIC



Hazardous Location Class I, Div 1

2-Wire Transmitter (intrinsically safe apparatus) Cond 7100/2X and Cond 7100/2XH
IS Class I, Division 1, Groups A, B, C, D, T4
Ex ib [ia] IIC T4 Tamb - 20 to + 55 °C; Type 2



Entity Parameters: Terminals 10/11
with HART® Communication: Terminals 10/11
Interface inputs ST1, ST2
 $V_{max}, U_i = 30\text{ V}$ $I_{max}, I_i = 100\text{ mA}$ $P_{max}, P_i = 800\text{ mW}$
 $C_i = 32.4\text{ nF}$ $L_i = 24.0\text{ }\mu\text{H}$
with HART® Communication
 $C_i = 0.103\text{ }\mu\text{F}$

HAZARDOUS LOCATION
Suitable for CLASS I, DIV 2, GRP A, B, C, D, T4, when powered by $V_{oc}, U_o = 30\text{ V}$, $I_{sc}, I_o = 100\text{ mA}$
Substitution of components may impair intrinsic safety and the suitability for Class I, DIV 2
Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous

Conductivity Measuring Loop

Terminals 1, 2, 3, 4, 5, 6	Uo, Vsc	Io, Isc	Po	Co, Ca	Lo, La
IIC (GRP A, B)	10V	143mA	357mW	3µF	1.3mH
IIB (GRP C)	10V	143mA	357mW	9µF	5mH
IIC (GRP D)	10V	143mA	357mW	24µF	10mH

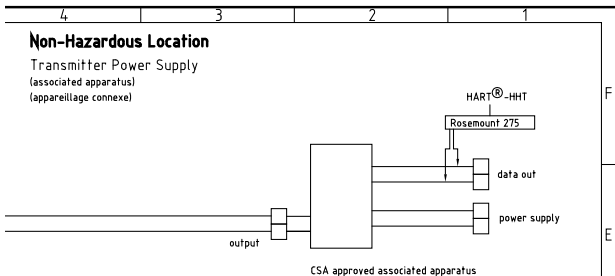
Temperature Measuring Loop

Terminals 7, 8	Uo, Vsc	Io, Isc	Po	Co, Ca	Lo, La
IIC (GRP A, B)	5V	3mA	4mW	100µF	1H
IIB (GRP C)	5V	3mA	4mW	300µF	1H
IIC (GRP D)	5V	3mA	4mW	800µF	1H

All Combined Outputs

Terminals 1, 2, 3, 4, 5, 6, 7, 8	Uo, Vsc	Io, Isc	Po	Co, Ca	Lo, La
IIC (GRP A, B)	10V	146mA	365mW	3µF	1.3mH
IIB (GRP C)	10V	146mA	365mW	9µF	5mH
IIC (GRP D)	10V	146mA	365mW	24µF	10mH

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NOTES :

$$1: V_{max} \cdot U_i > V_{oc} \cdot U_o \qquad I_{max} \cdot I_i > I_{sc} \cdot I_o \qquad P_{max} \cdot P_i > P_o$$

$$C_i + C_{cable} < C_A \text{ or } C_o \qquad L_i + L_{cable} < L_A \text{ or } L_o$$

- 2: Installation must be in accordance with the Canadian Electric Code - Part 1
- 3: Associated apparatus must be CSA Approved and must be used in an CSA Approved configuration.

The control drawing for the associated apparatus must be followed when installing this equipment.
- 4: Control equipment connected to the associated apparatus must not use or generate more than 250 V.
- 5: The intrinsically safe equipment connecting to 1, 2, 3, 4, 5, 6 and 7, 8 must be CSA Approved or be simple apparatus (a device which will neither generate nor store more than 1.2 V, 0.1 A, 25 mW or 20 mJ).
- 6: No revisions to drawing without prior CSA Approval.
- 7: The Rosemount Model 275 Communicator must only be used on the non-hazardous side of the barrier/transmitter power supply

Version METTLER TOLEDO

Verteiler: FUL (Zx)		Zul. Abweichungen für Maße ohne Toleranzangabe		Oberfläche	Maßstab Halbzeug	Page 2/2
		ISO 2768 - m				
		Datum	Neue	Benennung		
		Bearb.	21.06.99	control drawing CSA Cond Transmitter 7100/2X, 7100/2XH		
		Gepr. (JKO)	dam			
		Freigabe(FGL)		Zeichnungsnummer		
		Schutzmerk nach DIN 34 beachten		194.220-190		
3	Page 2	05.01.05	dam			
2	product improvement	CSA	11.07.00			
1	product improvement	10.03.00	dam			
Nr.	AE	Datum	Bearbeiter	FGL	KOR	Ungültig ab:
						Ersetzt durch:

Conductance Conductance $G [S] = 1 / R [\Omega]$

Conductivity Conductivity $\chi [S/cm] = G [S] \cdot c [1/cm]$

Conductivity sensor Either 2- or 4-electrode sensors can be connected. The cell constant of the sensor in use must be entered or be determined using a calibration solution taking account of the temperature.
A special device variant (Transmitter Cond Ind 7100 e/2(X)H) is provided for electrodeless sensors.

Temperature coefficient With temperature compensation activated, the measured value is calculated to the value at the reference temperature (25 °C) using the temperature coefficient.

Temperature compensation Calculates the measured conductivity value for a reference temperature.

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Management-System
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