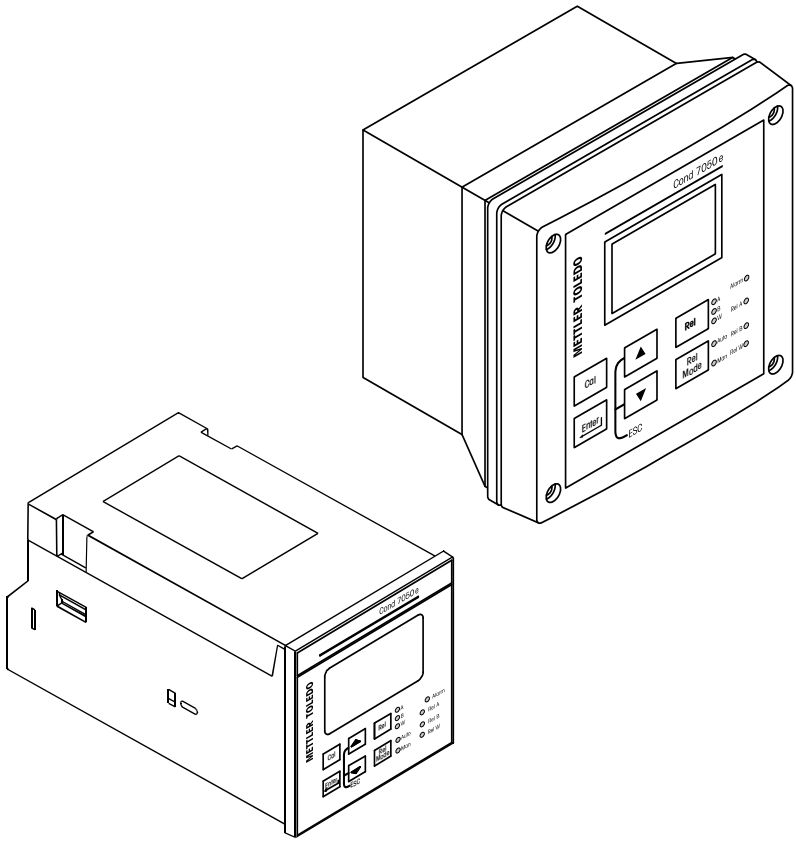
METTLER TOLEDO

Transmitter Cond 7050 e
Instruction manual



Transmitter Cond 7050 e
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Preface

This manual serves to explain the use of the Transmitter Cond 7050 e Series. The manual functions in two ways, firstly as a step by step guide to help the user operate the instrument, and secondly as a handy reference guide. This instruction manual is written to cover as many anticipated applications of the Transmitter Cond 7050 e as possible. If you have any doubts concerning the use of the instrument, please do not hesitate to contact the nearest METTLER TOLEDO Authorized Distributor.

The information presented in this manual is subject to change without notice as improvements are made, and does not represent any commitment whatsoever on the part of METTLER TOLEDO.

METTLER TOLEDO cannot accept any responsibility for damage or malfunction of the unit due to improper use of the instrument.

Contents

1 Introduction 4
1.1 At the very beginning 4
1.2 Intended use 4
1.3 Safety instructions 5
1.4 Putting out of service / Correct disposal of the unit 5
2 Product description. 6
2.1 Description of unit 6
2.2 Measurement and control system 7
2.3 Unit overview 8
3 Assembly and installation 12
3.1 Mounting the unit. 12
3.2 Connection diagram. 14
4 Normal operation 17
5 Calibration mode 18
5.1 Entering Calibration mode. 18
5.2 Calibration 19
5.3 View actual cell constant and calibration factor 20
6 Setup mode 21
6.1 Enter Setup mode 21
6.2 Temperature compensation (TC) sub-function 22
6.3 Setting temperature (Set °C °F) sub-function 23
6.4 Control Relay A / Relay B (SP1/SP2) sub-function 24
6.5 Controller (CNTR) sub-function 26
6.6 Current Output 1 sub-function 29
6.7 Current Output 2 sub-function 30
6.8 Wash relay (WASH) sub-function 31
6.9 Measuring range selection (RANG) sub-function 32
6.10 Configuration (CNFG) sub-function 33
6.11 Calibration (CAL) sub-function 34
7 Relay modes 35
7.1 View relay set points 35
7.2 Manual relay mode 36
8 Technical specifications 37
8.1 General specifications 37
8.2 Specifications for wall mount version 40
8.3 Specifications for panel mount version 41
9 Accessories 42
10 General Information 43
10.1 Warranty 43
10.2 Packaging / Scope of delivery 43
10.3 Return of goods 43
10.4 Guidelines for returning unit for repair. 44
10.5 Maintenance and Cleaning 44
11 Appendices 45
11.1 Appendix 1 – Unit fuse and jumper settings 45
11.2 Appendix 2 – Conductivity of various aqueos solutions at 25 °C / 77 °F 46
11.3 Appendix 3 – Explanation of hysteresis function 47
11.4 Appendix 4 – General instructions concerning controller setting. 48
11.5 Appendix 5 – Abbreviations used in menu displays 50

1 Introduction

1.1 At the very beginning

We thank you for having purchased the **METTLER TOLEDO Transmitter Cond 7050 e.**

The construction of the Transmitter Cond 7050 e employs leading edge technology and complies with safety regulations currently in force. Notwithstanding this, improper use could lead to hazards for the user or a third-party, and/or adverse effects on the plant or other equipment. **Therefore, the operating instructions must be read and understood by the persons involved before work is started with the Transmitter Cond 7050 e.**
METTLER TOLEDO does not accept any liability for damage that may arise from neglecting information given in this manual.

This instruction manual identifies safety instructions and additional information by means of the following symbols:

– This symbol draws attention to **safety instructions and warnings of potential danger** which, if neglected, could result in injury to persons and/or damage to property.

– This symbol identifies **additional information and instructions** which, if neglected, could lead to inefficient operation and possible loss of production.

The instruction manual must always be stored close at hand, in a place accessible to all people working with the Transmitter Cond 7050 e.

If you have questions, which are not or insufficiently answered in this instruction manual, please contact your METTLER TOLEDO supplier. He will be glad to assist you.

1.2 Intended use

METTLER TOLEDO Transmitter Cond 7050 e are intended solely for conductivity and temperature measurement, as described in this instruction manual.
Any other use, or use not mentioned here, that is incompatible with the technical specifications is deemed inappropriate. The operator is solely responsible for any damage arising from such use.

Other prerequisites for appropriate use include:

- observing the instructions, notes and requirements set out in this instruction manual.
- observing all local safety regulations concerning safety at work.
- observing all information and warnings in the documentation dealing with the products used together with the transmitter (housings, sensors, etc.).
- observing the prescribed environmental and operational conditions.

1.3 Safety instructions

- The Transmitter Cond 7050 e should be installed and operated only by personnel familiar with the transmitter and who are qualified for such work.
- A defective transmitter must neither be installed nor put into service.

- The Transmitter Cond 7050 e must only be operated under the specified operating conditions (see section 8).
- The Transmitter Cond 7050 e must not be repaired by the customer.
- The Transmitter Cond 7050 e must only be opened to replace the unit fuse or to set the jumper for Pt100/Pt1000 temperature sensor. This work must be carried out only by personnel familiar with the transmitter and who are qualified for such work. Make sure the mains cable is separated from the power supply before opening the unit.
- No modifications to the Transmitter Cond 7050 e are allowed. The manufacturer/supplier accepts no responsibility for damage caused by unauthorised modifications. The risk is borne entirely by the user.

1.4 Putting out of service / Correct disposal of the unit

Putting out of service

- **First disconnect the unit from the mains,** then undo all electrical connections.
- Remove the unit from the wall / panel.

Correct disposal of the unit

When the transmitter is finally taken out of service, observe the local environmental regulations for correct disposal or send the transmitter to your local METTLER TOLEDO distributor, they will take care of proper disposal.

2 Product description

2.1 Description of unit

The METTLER TOLEDO Transmitter Cond 7050 e is used for measuring conductivity and temperature values. The conductivity values can be measured using limit or P/PI control.
The transmitter is available in two versions, one for panel mounting and one for wall mounting in a enclosure. The transmitter can be used for applications such as water treatment and monitoring, galvanic-decontamination, chemical processing, food processing, clean or wastewater control and neutralization processes.

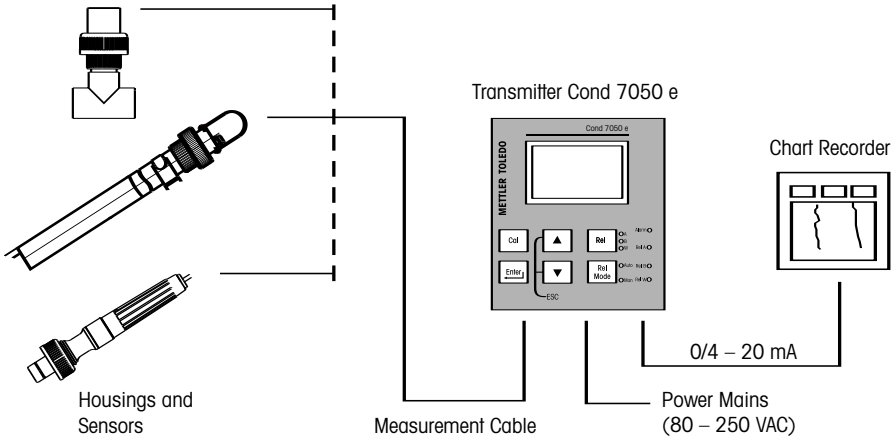
This transmitter has many user-friendly and safety features which include:

- Menu-driven program that simplifies set-up.
- Built-in memory backup to ensure that calibration and other information are not erased if power supply fails.
- Push-button for calibration and sensor offset adjustment from the keypad.
- Automatic temperature compensation (ATC).
- Manual temperature compensation setting without the ATC probe, with independent setting for calibration and process temperature.
- Two galvanically isolated current outputs 0/4…20mA.
- 0 to 2000 seconds time delay adjustment on all relays – minimizes false alarms.
- Separately adjustable high and low set-point hysteresis (dead bands) prevent chattering of relays around the set points.
- Three control modes: limit controller, P controller and PI controller (P/PI controller as pulse length or pulse frequency).
- Large dual display LCD for easy reading with clear multiple annunciators, alarm status, operational and error messages.
- Two switching contacts as set-point relays.
- Separate alarm relay alerting you to set point limits exceeded for a certain time and if the Pt100/Pt1000 wires are broken or disconnected during the ATC function.
- Wash relay.
- Hold function to freeze output current (0/4…20mA) and release control relays.
- LED indicators signal control activities to visually monitor transmitter status from a distance.
- Protection against electromagnetic interference.
- Back lighted and UV light protected LC display.

2.2 Measurement and control system

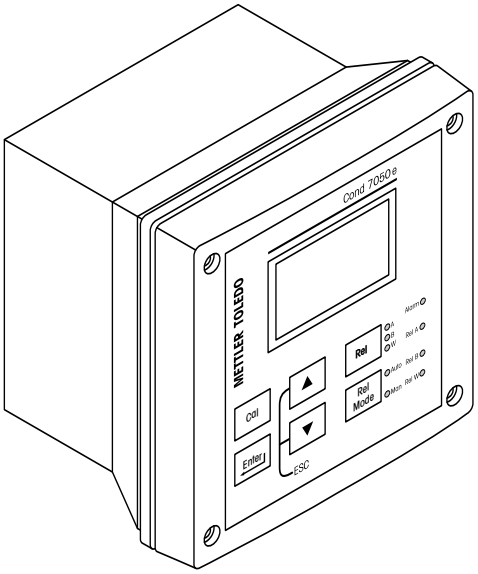
A typical measurement system consists of:

- a conductivity process transmitter
- a conductivity sensor with integrated or separate temperature sensor Pt100/Pt1000,
- an appropriate measurement cable
- an immersion, flow or process assembly
- a final control element such as pump or valve
- a chart recorder

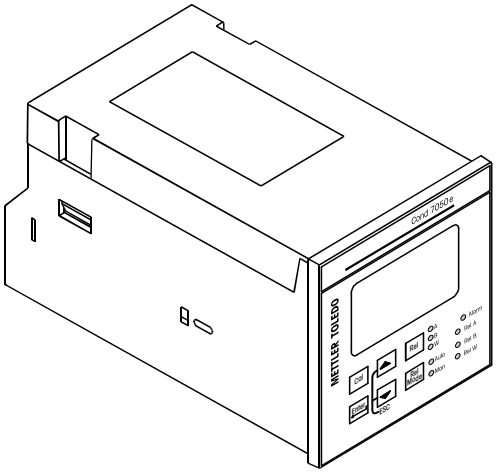


2.3 Unit overview

Wall mounting version

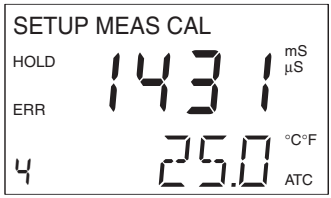


Panel mounting version



2.3.1 Display Overview

The LC display shows two alpha-numerical fields for parameters and measured values as well as various mode and status indicators.



Mode indicators:

- **MEAS:** Measurement mode
- **SETUP:** Set-up mode
- **CAL:** Calibration mode

Status indicators:

- **HOLD:** Unit in "HOLD" mode
- **ATC:** Visible in ATC (Automatic Temperature Compensation) mode. Not visible in the Manual temperature compensation mode. "ATC" flashes if the temperature probe is faulty in its ATC mode
- **ERR:** Error indicator
- **4:** Number of the selected measuring range

2.3.2 Key functions

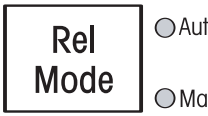
Key	Description
Cal	• Enter Calibration mode (requires access code)
Enter	• Enter Set-up mode (requires access code) • Access sub functions (parameters) within a function group of Set-up mode • Confirm (store) set-up parameters and numerical values • Start calibration in Calibration mode
▲ ▼	• Select function group in the Set-up mode. • Set parameters and numerical values (if key is pressed continuously, the setting speed increases) • Control the relays in MANUAL relay operation • Returns to "Measurement mode" when both keys are pressed simultaneously
Rel	• Display limit values for SP1 and SP2 and settings for wash contact in AUTO relay operation • Toggle between RELAY A, RELAY B or Wash relay in MANUAL relay operation
Rel Mode	• Switch from AUTO to MANUAL relay operation (requires access code)

2.3.3 LED indicators

Relay indicators

If REL key is pressed the LED (A, B or W) indicates to which Relay (A, B or Wash) the displayed limit values refer.

Relay mode indicators



Auto LED lights if relay operation is set to automatic mode.

Man LED lights if relay operation is set to manual mode.

Relay status indicators

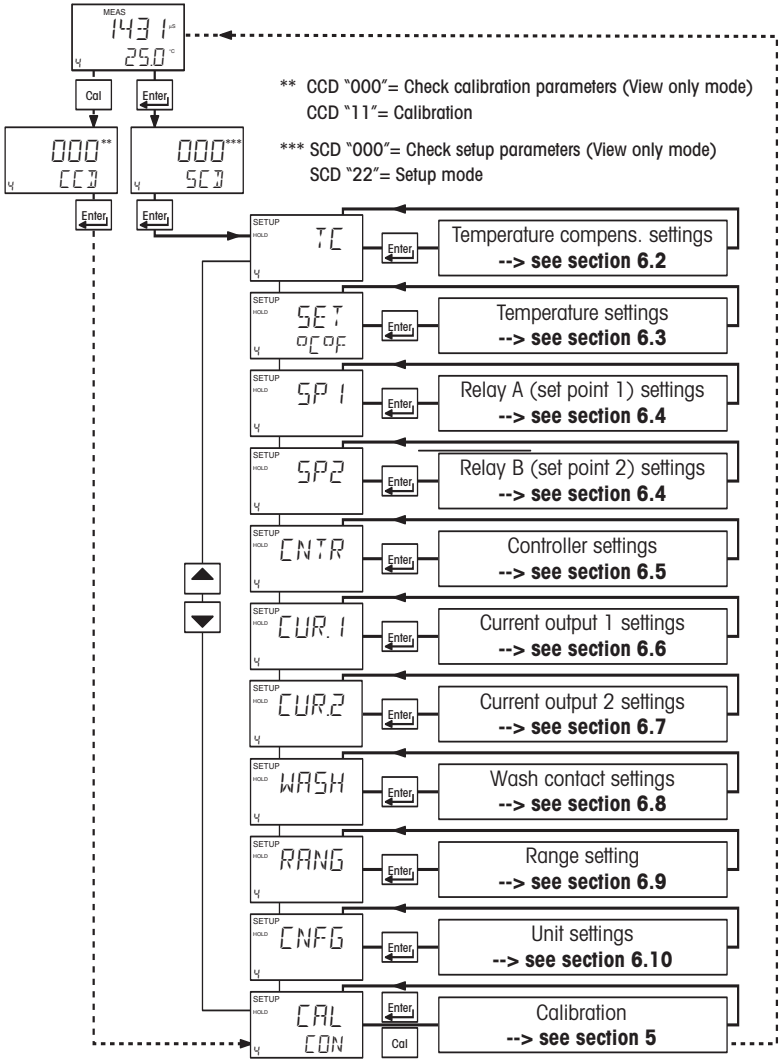
Alarm ○	This LED lights if limit value is exceeded or the ATC probe fails.
Rel A ○	This LED lights green if measured value is within the limit for Relay A or lights red if measured value exceeds limit.
Rel B ○	This LED lights green if measured value is within the limit for Relay B or lights red if measured value exceeds limit.
Rel W ○	This LED lights if cleaning cycle is on.

2.3.4 Security codes

The access to **Calibration mode, Setup mode** and **Manual relay operation mode** is protected with security codes. The security codes are set at the factory and cannot be changed by the user. The following security codes are used:

Security code	Mode/Description
000	**View only mode** to view actual settings
11	**Calibration mode** to start calibration
22	**Setup mode** to configure parameters
22	**Manual relay operation** to switch relay operation mode from automatic to manual

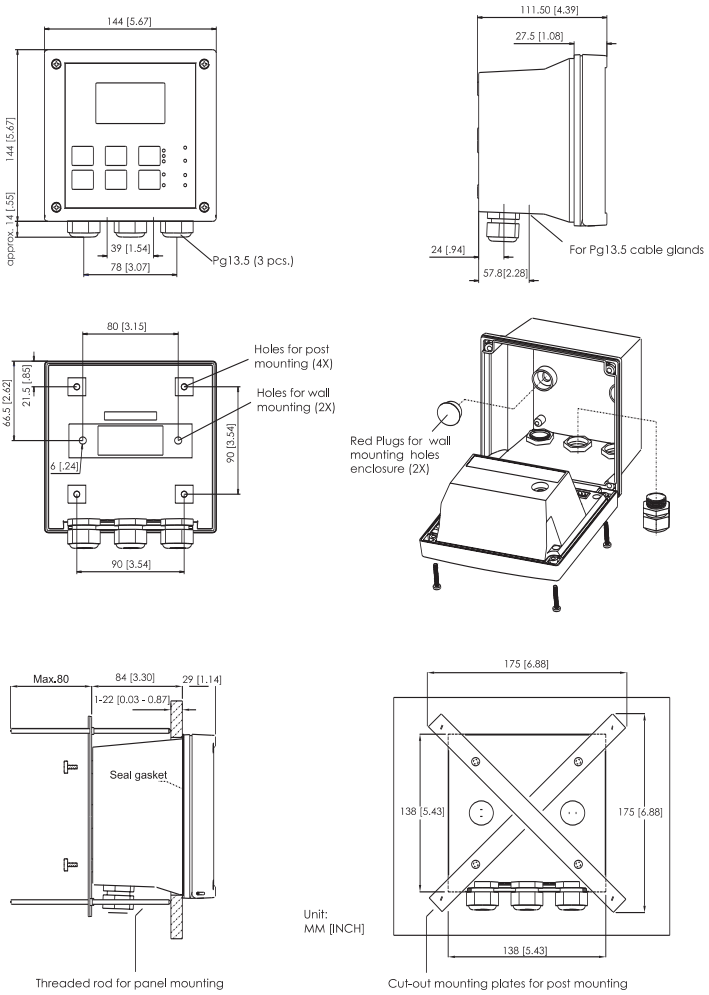
2.3.5 Menu overview



3 Assembly and installation

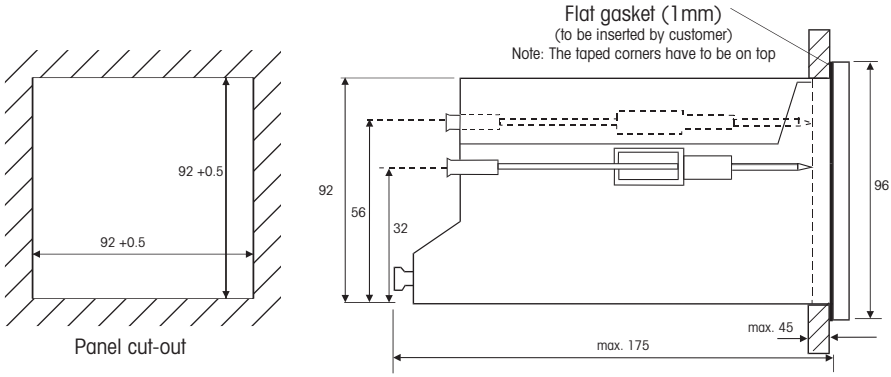
3.1 Mounting the unit

Wall mounting version



Transmitter housing for wall mounting: protection class IP 66

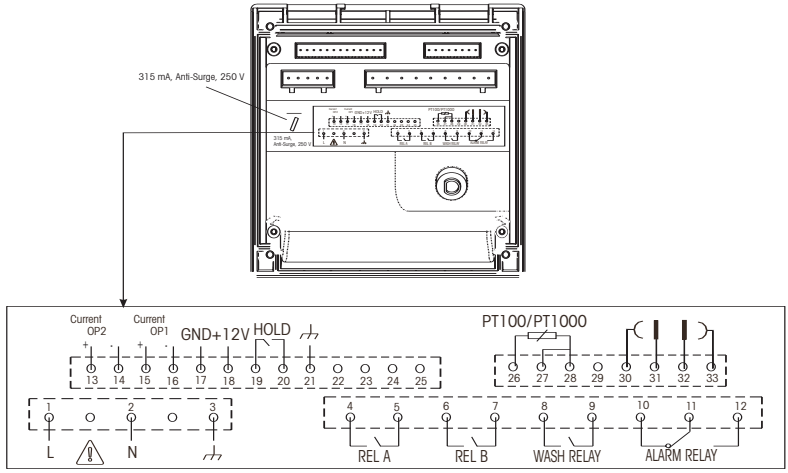
Panel mounting version



Transmitter housing for panel mounting: protection class IP 54 (front), IP 40 (housing)

3.2 Connection diagram

Connectors wall mounting version



1.	AC mains live wire	14.	4 – 20 mA temperature output, -ve terminal	26.	Temperature ground
2.	AC mains neutral wire	15.	4 – 20 mA Conductivity output, +ve terminal	27.	Temperature sense
3.	AC mains protective earth wire	16.	4 – 20 mA Conductivity output, -ve terminal	28.	Temperature input (short to terminal 27 if using 2-wire RTD)
4.	Relay A (SP 1)	17.	12 V ground	29.	no connection
5.	Relay A (SP 1)	18.	12 V Power supply	30.	4 Cell type Conductivity Input
6.	Relay B (SP 2)	19.	Hold function	31.*	4 Cell/2 Cell type Conductivity Input
7.	Relay B (SP 2)	20.	Hold function	32.*	4 Cell/2 Cell type Conductivity Input
8.	Wash relay	21.	Earth ground	33.	4 Cell type Conductivity Input
9.	Wash relay	22.	no connection		
10.	Alarm relay (NC)	23.	no connection		
11.	Alarm relay common	24.	no connection		
12.	Alarm relay (NO)	25.	no connection		
13.	4 – 20 mA temperature output, +ve terminal				

Important: The Alarm relay functions as an "Active Low" device i.e. it switches OFF under Alarm condition. Therefore the Alarm display device should be connected to the 'NC' contacts of the relay (10 & 11).

* When using 2 Cell type Conductivity electrode, terminal 30 should be shorted to terminal 31 and terminal 33 should be shorted to terminal 32.

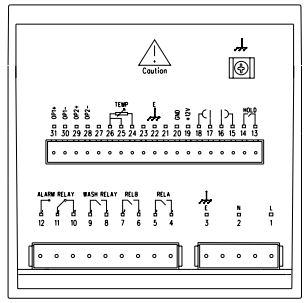
Note:

a) Switch or circuit breaker shall included in the building installation.

b) It shall be in close proximity to the equipment and within easy reach of the operator.

c) It shall be marked as the disconnecting device for the equipment.

Connectors panel mounting version



1.	AC mains live wire	17.*	4 Cell/2 Cell type Conductivity Input
2.	AC mains neutral wire	18.	4 Cell type Condictivity Input
3.	AC mains protective earth wire	19.	12 V Power supply
4.	Relay A (SP 1)	20.	12 V ground
5.	Relay A (SP 1)	21.	no connection
6.	Relay B (SP 2)	22.	Earth ground
7.	Relay B (SP 2)	23.	no connection
8.	Wash relay	24.	Temperature ground
9.	Wash relay	25.	Temperature sense
10.	Alarm relay (NC)	26.	Temperature input (short to terminal 25 if using 2-wire RTD)
11.	Alarm relay common	27.	no connection
12.	Alarm relay (NO)	28.	4 – 20 mA temperature output, ⁻ve terminal
13.	Hold function	29.	4 – 20 mA temperature output, +ve terminal
14.	Hold function	30.	4 – 20 mA Conductivity output, ⁻ve terminal
15.	4 Cell type Conductivity Input	31.	4 – 20 mA Conductivity output, +ve terminal
16.*	4 Cell/2 Cell type Conductivity Input		

Important: The Alarm relay functions as an "Active Low" device i.e. it switches OFF under Alarm condition. Therefore the Alarm display device should be connected to the 'NC' contacts of the relay (10 & 11).

* When using 2 Cell type Conductivity electrode, terminal 15 should be shorted to terminal 16 and terminal 18 should be shorted to terminal 17.

Note:
a) Switch or circuit breaker shall included in the building installation.
b) It shall be in close proximity to the equipment and within easy reach of the operator.
c) It shall be marked as the disconnecting device for the equipment.

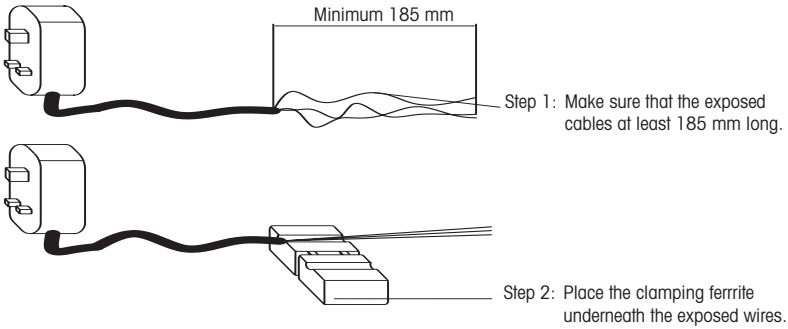
Note: The power cable (L,N & E) need to be connected to the instrument with two turns through enclosed Ferrite ring (Würth Elektronik, accessory part n° 742 712 21) which is supplied as an accessory with the instrument.

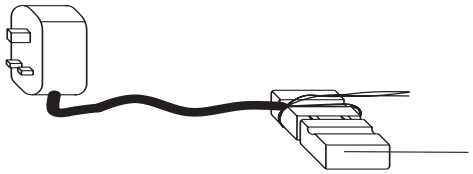
Connection of sensors

Sensor type / Designation	Wire color	Transmitter terminal Wall mounting	Panel mounting
InPro7010 Series			
Inner Electrode	white	31 (wire bridge to 30)	16 (wire bridge to 15)
Outer Electrode	black	32 (wire bridge to 33)	17 (wire bridge to 18)
Earth	shield	21	22
T1	brown	26	24
T2	red	27	25
T3	green	28	26
InPro7000-VP Series			
Internally shorted	white/blue	30	15
Inner Electrode	white	31	16
Outer Electrode	blue	32	17
Internally shorted	black	33	18
Earth	shield	21	22
T1	green	26	24
T2	red	28 (wire bridge to 27)	26 (wire bridge to 25)
	Note: the transparent wire is not used		
InPro7100-VP Series			
Current 1	white/blue	30	15
Voltage 1	white	31	16
Voltage 2	blue	32	17
Current 2	black	33	18
Earth	shield	21	22
T1	green	26	24
T2	red	28 (wire bridge to 27)	26 (wire bridge to 25)
	Note: the transparent wire is not used		

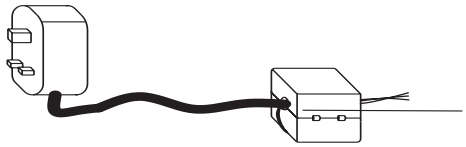
Note: It is strongly suggested that the Ferrite element shall be installed for the panel mount instrument as described below.

Clamping Ferrit Assembly Process

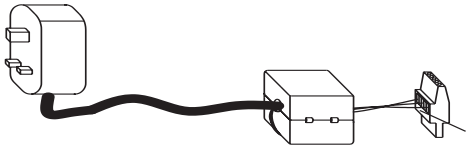




Step 3: Coil the exposed cables around the clamping ferrite.



Step 4: Close the clamping ferrite.



Step 5: Screw the cables into the connector.

4 Normal operation

Measurement mode

When the transmitter is powered on, the display first shows all segments briefly, then the transmitter automatically enters into the **Measurement mode.**

Please note: To guarante accurate readings the measuring system (transmitter and sensor) must be calibrated.

The mode indicator "MEAS" at the top of the display indicates that the transmitter is in Measurement mode. The upper alpha-numerical display shows the measured conductivity value, while the lower display shows the temperature value.

From Measurement mode you can access **Calibration mode** and **Setup mode** by pressing the CAL key or ENTER key followed by the corresponding security code. For detailed information refer to **section 5 "Calibration mode"** or **section 6 "Setup mode",** respectively.

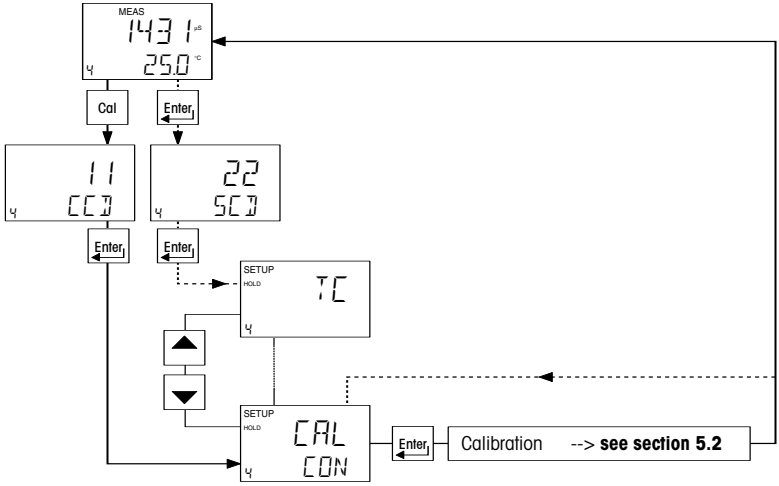
By pressing the **REL** key in Measurement mode you can view the actual relay set points. By pressing the **REL MODE** key followed by the corresponding security code in Measurement mode you can switch relay operation mode from automatic to manual.

For detailed information refer to **section 7 "Relay operation".**

5 Calibration mode

You can access the Calibration mode directly from the Measurement mode by pressing the CAL key and entering the Calibration security code "11". Calibration mode may also be accessed via the Setup mode (see section 6.1).

5.1 Entering Calibration mode



1. While in Measurement mode **press the CAL key** (direct access) or **ENTER key** (access via Setup mode).
2. If **CAL key** was pressed: The display prompts you to enter the calibration security code. **Press the ▲ or ▼ key** to set the calibration security code to **"11"**, then **press the ENTER key** to confirm the calibration security code.

   If **ENTER key** was pressed: The display prompts you to enter the security code. **Press the ▲ or ▼ key** to set the security code to **"22"**. **Press the ENTER key** to confirm the security code, then **press the ▲ or ▼ key** to select the calibration subfunction.

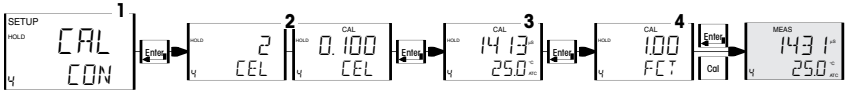
The display shows "CAL CON". To start calibration refer to section 5.2.

Note: to exit Calibration mode at any time **press the ▲ and ▼ key simultaneously** (escape). The transmitter returns to the Measurement mode and the old calibration values remain active. The calibration security code automatically resets from "11" to "000" after the transmitter returns to Measurement mode.

5.2 Calibration

This transmitter features a one-point calibration.

Note: The calibration is always carried out in the specific range selected.



1. **Enter Calibration mode** as described in section 5.1. The display shows "CAL CON".
2. **Press the ENTER key** to start calibration. The display shortly shows the cell type ("2 CELL" or "4 CELL") to which the transmitter is configured.

   Important: If set for a 2 cell operation, make sure that the outer and inner electrode points are shorted on the connector (For wall mount: terminal 30 and 31 shorted and terminal 32 and 33 shorted. For panel mount: terminal 15 and 16 shorted and terminal 17 and 18 shorted.).

   Then the "CAL" indicator appears at the top of display and the transmitter displays its last set **cell constant (k).** Use **▲ and ▼ keys** to adjust the cell constant if necessary.
3. Immerse the sensor in a suitable standard solution, whose value is within the measurement range selected in the transmitter. Agitate the cell in the solution to remove any trapped air-bubbles.

   Note: The calibration standard must have a value that is between 10 % to 100 % of the range selected. For example, if the range in the controller is selected to be 2000 µS (range 4), then the calibration standard value should be 200 µS to 2000 µS.

   Once the reading stabilizes **press the ▲ or ▼ key** to adjust the measured value to that of the standard solution. Press the **ENTER key** to accept the value.
4. The display shows the calibration factor. This serves as a diagnostic feature to indicate the effectiveness of the electrode which will degrade with time and usage. An effective electrode should be within the calibration factor window of 0.60 to 1.40.

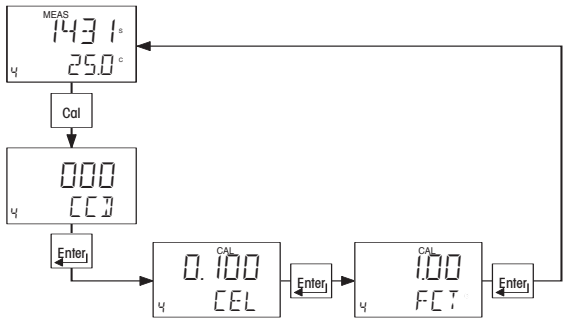
   Note: The acceptable calibration window is ±40 % of the displayed (default) value. If the display is 1000 µS, the values to which it can be adjusted is 600 to 1400 µS. If there is a calibration error the transmitter displays "ERR". In this case, **press the ▲ and ▼ keys** simultaneously (escape) to restart the calibration beginning from step 1.

Press the ENTER key to return to the Measurement mode.

Note: If you entered the Calibration mode from the Setup mode, the transmitter will return to the setup menu.

Note: When calibrating with manual temperature compensation, the transmitter automatically changes from the preset process temperature to the calibration temperature. After leaving the Calibration mode, the transmitter switches back to the process temperature (for setting the calibration temperature and the process temperature, see section 6.3).

5.3 View actual cell constant and calibration factor



1. While in Measurement mode **press the CAL key.** The display will prompt you to enter a security code. Leave the **security code** at **"000"** (view only mode).
2. **Press the ENTER key.** The display shows the actual cell constant.
3. **Press the ENTER key.** The display shows the actual calibration factor. An effective electrode should be within the calibration factor window of 0.60 to 1.40.

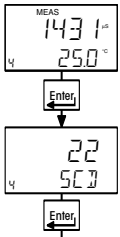
Note: If no key is pressed for 30 seconds the transmitter automatically returns to the Measurement mode.

Press the ENTER key to return to the Measurement mode.

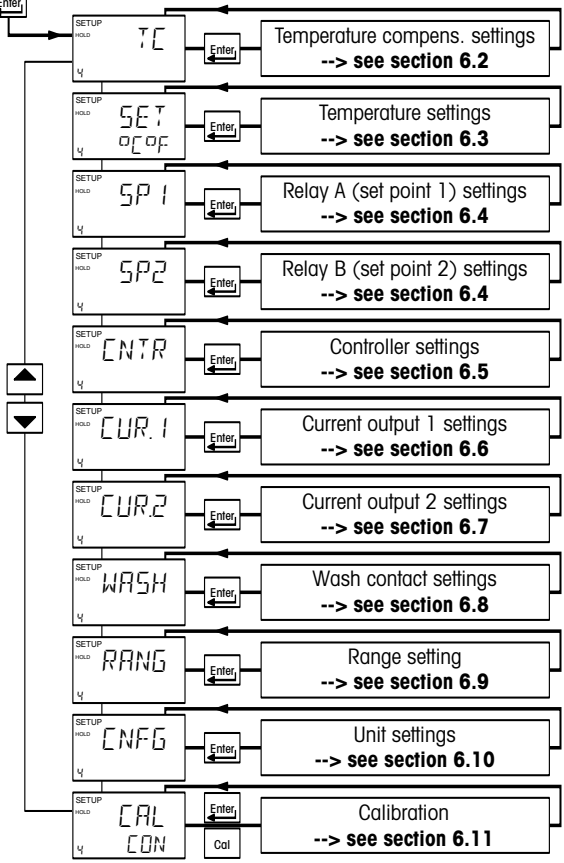
6 Setup mode

6.1 Enter Setup mode

In the Setup mode the transmitter can be configured to your individual requirements.



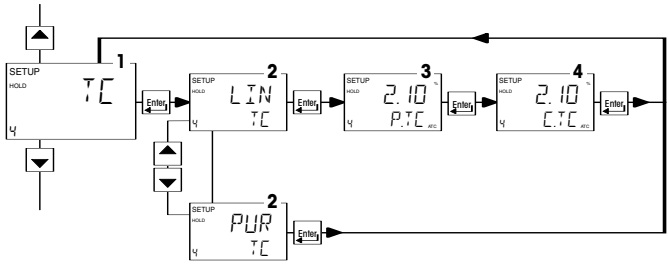
1. While in Measurement mode **press the ENTER key.**
2. The display prompts you to enter the security code. Set the security code with **▲ or ▼ key** to:
   – "SCD 22" if you want to **change parameter settings**
   – "SCD 000" if you want to view only parameter settings (**view only mode)**
3. **Press the ENTER key.**



Note: to exit Setup mode at any time **press the ▲ and ▼ key simultaneously** (escape). The transmitter returns to the Measurement mode.

6.2 Temperature compensation (TC) sub-function

This sub-function allows you to select the correct temperature compensation for optimum operations.

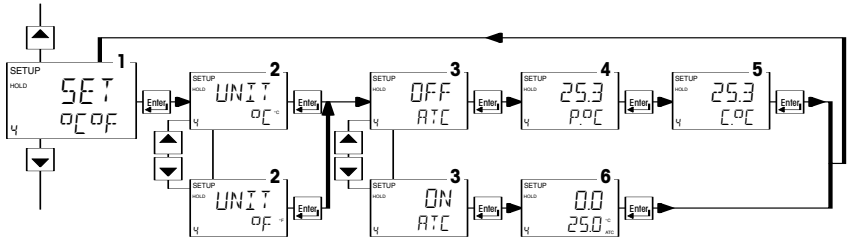


1. Select the "TC" subfunction, then **press the ENTER key.**
2. **Selecting type of temperature compensation: press the ▲ or ▼ key** to select the suitable type of temperature compensation:
   - PUR TC = Pure water temperature compensation
     Use pure water temperature compensation for applications in the pure water or ultra-pure water industries. **Note: "PUR TC" should be selected while working with pure water, usually in the 0–2 µS range.**
   - LIN TC= Linear temperature compensation
     Use linear temperature compensation for all other applications.

   Press the ENTER key to confirm your selection.
   - If linear temperature compensation was selected (LIN TC):
     3. **Selecting the temperature compensation value for process liquid: press the ▲ or ▼ key** to adjust the temperature compensation value (setting range: 0 to 10 %, factory setting: 2.10 %). **Press the ENTER key** to confirm the temperature compensation value.
     4. **Selecting the temperature compensation value for calibration liquid: press the ▲ or ▼ key** to adjust the temperature compensation value (setting range: 0 to 10 %, factory setting: 2.10 %). **Press the ENTER key** to confirm the temperature compensation value.

Continue with additional Setup procedures, or return to the Measurement mode by pressing the ▲ and ▼ keys (escape) simultaneously.

6.3 Setting temperature (Set °C °F) sub-function

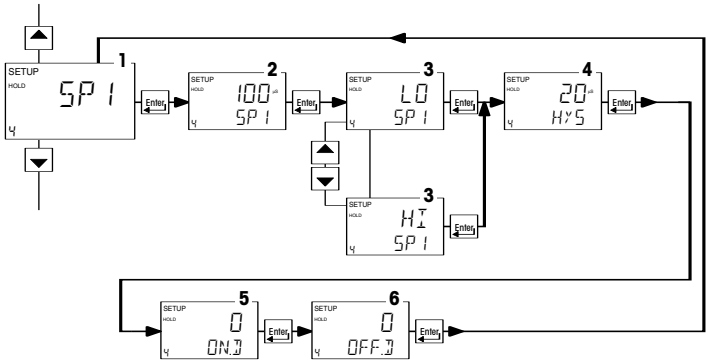


1. Select the "SET °C°F" subfunction, then **press the ENTER key.**
2. **Selecting temperature unit: press the ▲ or ▼ key** to select the desired temperature unit "°C" or "°F". **Press the ENTER key** to confirm your selection.
3. **Enable/disable ATC mode: press the ▲ or ▼ key** to enable (ATC ON) or disable (ATC OFF) automatic temperature compensation. **Press the ENTER key** to confirm your selection.
   - **ATC disabled** (ATC OFF)**:**
     For manual temperature compensation you can set the process and calibration temperatures. This allows calibration at a temperature other than the process temperature.
     Example: setting a calibration temperature of 25 °C lets you calibrate using standard solutions at 25 °C, even if your process temperature is different from 25 °C.
     4. **Setting the process temperature**: **press the ▲ or ▼ key** to adjust the process temperature (upper value, setting range: –10.0 to 125.0°C/14.0 to 257.0 °F). **Press the ENTER key** to confirm process temperature.
     5. **Setting the calibration temperature**: **press the ▲ or ▼ key** to adjust the calibration temperature (upper value, setting range: –10.0 to 125.0 °C/14.0 to 257.0 °F). **Press the ENTER key** to confirm the calibration temperature.
   - **ATC enabled** (ATC ON)**:**
     6. **Setting the temperature offset:** The display shows the current temperature offset (upper value) and the temperature currently measured (lower value). Compare the current temperature displayed on the transmitter to a thermometer known to be accurate. Note the correct temperature value. **Press the ▲ or ▼ key** to adjust the lower value. The upper number indicates the offset value. You can offset the temperature by up to ±10 °C/±18 °F. **Press the ENTER key** to confirm your setting.

Continue with additional Setup procedures, or return to the Measurement mode by pressing the ▲ and ▼ keys (escape) simultaneously.

6.4 Control Relay A/Relay B (SP1/SP2) sub-function

The SP1 sub-function determines the operating parameters for Relay A; while SP2 defines the operating parameters for Relay B. Since these groups have the same set-up parameters, they are described together.



1. Select the "SP 1" (Relay A) or "SP2" (Relay B) subfunction, then **press the ENTER key.**
2. **Setting set point value: press ▲ or ▼ key** to enter the value for set point 1 (set point 2) at which your controller will activate. **Press the ENTER key** to confirm your setting.
3. **Selecting relay function**: **press the ▲ or ▼ key** to select the desired relay function ("LO" = low or "HI" = high). **Press the ENTER key** to confirm your selection.

   Note: This parameter lets you choose the relay function. Select "LO" to activate the relay when the conductivity value undershoots the low set point; select "HI" to activate the relay when the value overshoots the high set point. SP1 and SP2 can be selected as "Lo/Lo", "Lo/Hi", "Hi/Lo", or "Hi/Hi".

4. **Setting a hysteresis value**: **press the ▲ or ▼ key** to select the desired hysteresis (setting range: 1 to 10 % of full scale) for set point 1 (set point 2). **Press the ENTER key** to confirm your setting.

   Note: Hysteresis prevents rapid contact switching if your value is fluctuating near the set point. **Please refer to Appendix 3** for a graphical representation of the hysteresis.

   Example: You have set your high set point at 1900 µS and your hysteresis value is 20 µS. If your measured value overshoots 1900 µS, the controller's relay activates. The actions of the external device will cause the solution's conductivity to drop. The relay will deactivate, when the conductivity value drops below 1880 µS.

5. **Setting the on-delay time lag**: **press the ▲ or ▼ key** to enter the on-delay time for set point 1 (set point 2). The controller will delay activation of the relay for the number of seconds (0 to 2000 seconds) you select. **Press the ENTER key** to confirm your setting.

Note: You can set a time delay for each relay, which stops the relay from switching on the moment the set point is exceeded. This controller lets you set a 0 to 2000 seconds time delay before your relay activates.

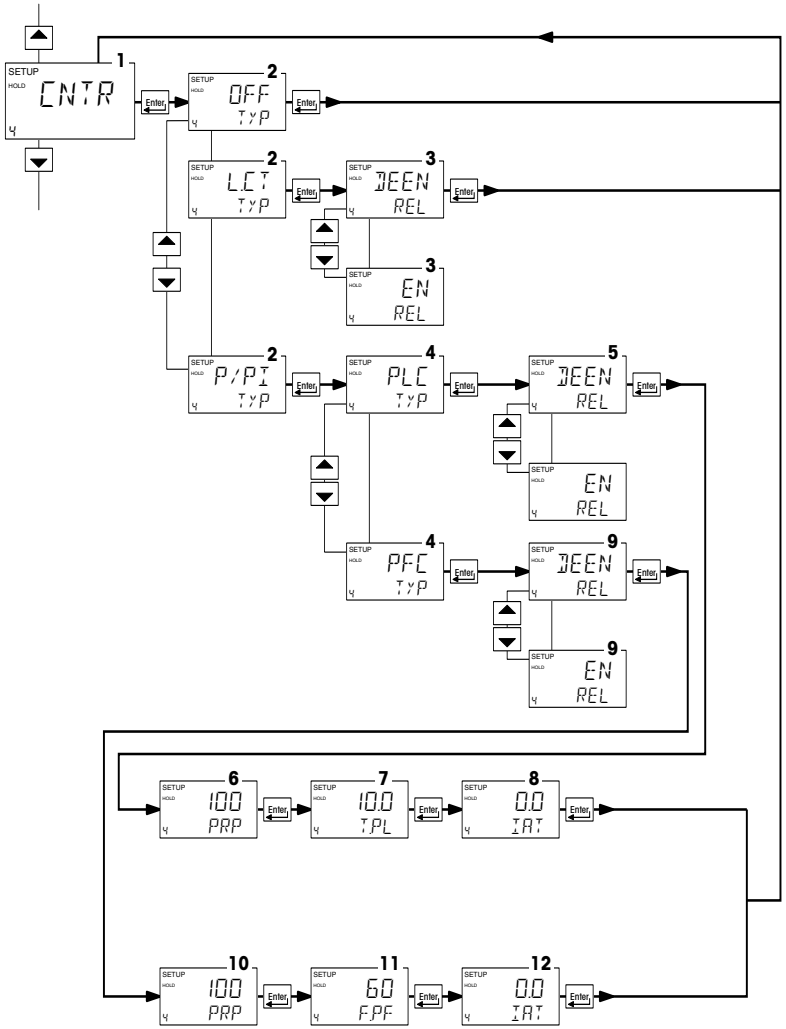
6. **Setting the off-delay time lag**: **press the ▲ or ▼ key** to enter the off-delay time for set point 1 (set point 2). Your controller will delay deactivation of the relay for the number of seconds (0 to 2000 seconds) you select. **Press the ENTER key** to confirm your setting.

Note: You can set a time delay for each relay, which stops the relay from switching off the moment the value reaches the set point and hysteresis. This controller lets you set a 0 to 2000 seconds time delay before your relay deactivates.

Continue with Setup mode procedures, or return to Measurement mode by pressing the ▲ and ▼ keys simultaneously (escape).

6.5 Controller (CNTR) sub-function

The CNTR sub-function determines the **controller's parameters.**



1. Select the "CNTR" subfunction, then **press the ENTER key.**

2. **Selecting the controller type: press the ▲ or ▼ key** to select the suitable controller type:
   - OFF = controller off
     Use control Off to operate controller as a monitor only or to prevent relays from switching.
   - LCT = limit value control (on/off control).
     Use limit control with pumps or valves for fast response
   - P/PI = proportional/integral control
     Use proportional control to operate your pumps smoothly or for precise control of proportioning valves. Use PI controller to eliminate steady state error.

Note: please refer to Appendix 4 for detailed information on controller settings.

Press the ENTER key to confirm your selection.

- If the controller is set to **limit value control** (LCT)**:**

  3. **Selecting the relay status under Non-Alarm condition**: **press the ▲ or ▼ key** to choose the desired relay status (de-energized = "DEEN" or energized = "En"). **Press the ENTER key** to confirm your selection.

- If the controller is set to **proportional control** (P/PI)**:**

  4. **Selecting the proportional controller type**: **press the ▲ or ▼ key** to select the suitable controller type ("PLC" = pulse length control, "PFC" = pulse frequency control).

     Press the ENTER key to confirm your selection.

     - If the proportional controller type is set to **pulse length control** (PLC)**:**

       5. **Selecting the relay status under Non-Alarm condition: press the ▲ or ▼ key** to choose the desired relay status (de-energized = "DEEN" or energized = "En"). **Press the ENTER key** to confirm your selection.
       6. **Setting the proportional range: Press the ▲ or ▼ key** to set the proportional range (setting range: 10 to 500 %). **Press the ENTER key** to confirm your setting.
       7. **Setting the pulse length: Press the ▲ or ▼ key** to set the pulse length (setting range: 0.5 to 20 seconds). **Press the ENTER key** to confirm your setting.
       8. **Setting the integral action time: Press the ▲ or ▼ key** to set the integral action time (setting range: 0.0 to 999.9 minutes). **Press the ENTER key** to confirm your setting.

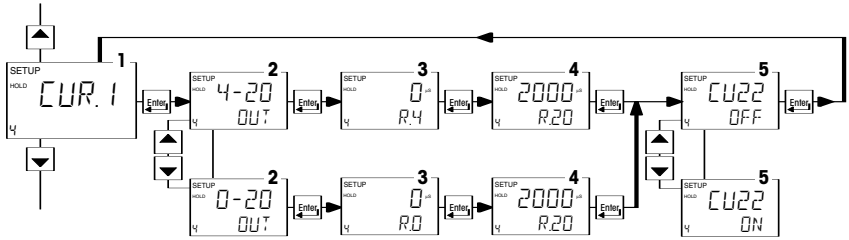
– If the proportional controller type is set to **pulse frequency control** (PFC)**:**

9. **Selecting the relay status under Non-Alarm condition: press the ▲ or ▼ key** to choose the desired relay status (de-energized = "DEEN" or energized = "En"). **Press the ENTER key** to confirm your selection.
10. **Setting the proportional range: press the ▲ or ▼ key** to set the proportional range (setting range: 10 to 500 %). **Press the ENTER key** to confirm your setting.
11. **Setting the pulse frequency: press the ▲ or ▼ key** to set the pulse frequency (setting range: 60 to 120 pulses per minute). **Press the ENTER key** to confirm your setting.
12. **Setting the integral action time: press the ▲ or ▼ key** to set the integral action time (setting range: 0.0 to 999.9 minutes). **Press the ENTER key** to confirm your setting.

Continue with Setup mode procedures, or return to Measurement mode by pressing the ▲ and ▼ keys simultaneously (escape).

6.6 Current Output 1 sub-function

In this subfunction you set the current output range of the transmitter for conductivity values.



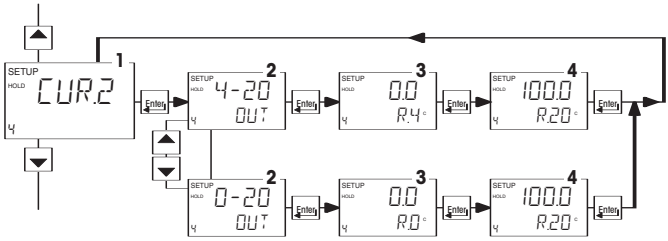
1. Select the "CUR. I" subfunction, then **press the ENTER key.**
2. **Selecting the output type: press the ▲ or ▼ key** to select the desired output type: 0 – 20 mA or 4 – 20 mA. **Press the ENTER key** to confirm your selection.
3. **Setting the conductivity value at which the transmitter output will be 4 mA (or 0 mA): press the ▲ or ▼ key** to set the conductivity value to be equivalent to 4 mA or 0 mA, respectively. **Press the ENTER key** to confirm your setting.
4. **Setting the conductivity value at which the transmitter output will be 20 mA: press the ▲ or ▼ key** to set the conductivity value to be equivalent to 20 mA. **Press the ENTER key** to confirm your setting.
5. **Selecting out of range current: Press the ▲ or ▼ key** to switch "CU22" on or off. If "CU22" is on, the output signal will jump to 22 mA when the measuring range is overshoot. **Press the ENTER key** to confirm your setting.

Note: the "CU22" setting (on/off) of current output 1 applies to current output 2 as well.

Continue with Setup mode procedures, or return to Measurement mode by pressing the ▲ and ▼ keys simultaneously (escape).

6.7 Current Output 2 sub-function

In this subfunction you set the current output range of the transmitter for temperature values.

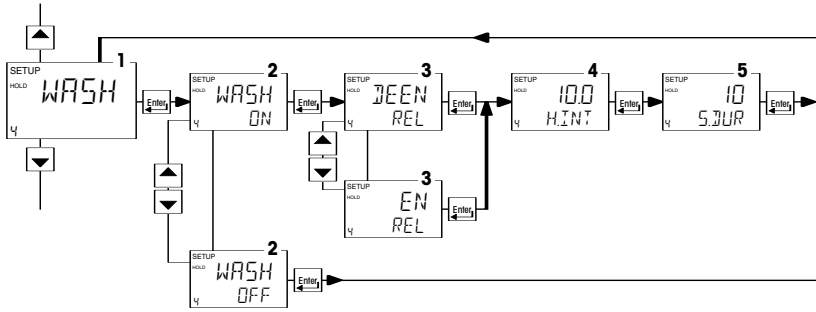


1. Select the "CUR.2" subfunction, then **press the ENTER key.**
2. **Selecting the output type: press the ▲ or ▼ key** to select the desired output type: 0 – 20 mA or 4 – 20 mA. **Press the ENTER key** to confirm your selection.
3. **Setting the temperature value at which the transmitter output will be 4 mA (or 0 mA): press the ▲ or ▼ key** to set the temperature value (setting range: –10.0 to 115.0 °C or 14 to 237 °F) to be equivalent to 4 mA (or 0 mA). **Press the ENTER key** to confirm your setting.
4. **Setting the temperature value at which the transmitter output will be 20 mA: press the ▲ or ▼ key** to set the temperature value (setting range: –0.0 to 125.0 °C or 32 to 257 °F) to be equivalent to 20 mA. **Press the ENTER key** to confirm your setting.

Continue with Setup mode procedures, or return to Measurement mode by pressing the ▲ and ▼ keys simultaneously (escape).

6.8 Wash relay (WASH) sub-function

In this subfunction you set the parameters for the wash relay.



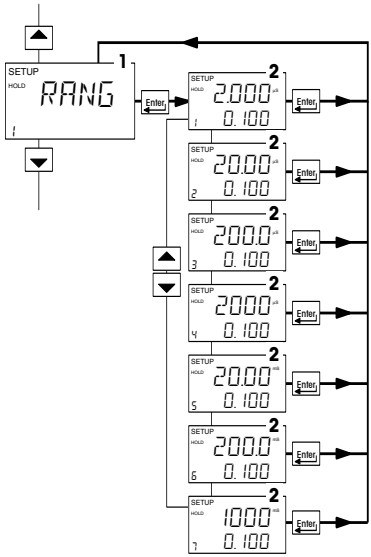
1. Select the "WASH" subfunction, then **press the ENTER key.**
2. **Enabling/disabling wash function: press the ▲ or ▼ key** to enable (WASH ON) or disable (WASH OFF) wash function. **Press the ENTER key** to confirm your selection.
3. **Selecting the relay status condition: press the ▲ or ▼ key** to choose desired relay status (de-energized = "DEEN" or energized = "En"). **Press the ENTER key** to confirm your selection.
4. **Setting the wash interval in hours**: **Press the ▲ or ▼ key** to set the desired wash interval (setting range: 0.1 to 200.0 hours). **Press the ENTER key** to confirm your setting.
5. **Setting the wash duration in seconds: Press the ▲ or ▼ key** to set the desired wash duration (setting range: 1 to 2000 seconds). **Press the ENTER key** to confirm your setting.

Note: During wash cycle the transmitter is set to HOLD. For safety reasons, the HOLD function is activated 5 seconds prior and deactivated 10 seconds after the wash cycle.

Continue with Setup mode procedures, or return to Measurement mode by pressing the ▲ and ▼ keys simultaneously (escape).

6.9 Measuring range selection (RANG) sub-function

In this subfunction you select the measuring range.



1. Select the "RANG" subfunction, then **press the ENTER key.**
2. **Selecting the measuring range:** The display shows the currently selected measuring range. **Press the ▲ or ▼ key** to select the requested measuring range.

Measuring ranges:	**No.**	**Measuring range**	**Resolution**
	1	0.001 ... 2.000 µS/cm	0.001 µS/cm
	2	0.01 ... 20.00 µS/cm	0.01 µS/cm
	3	0.1 ... 200.0 µS/cm	0.1 µS/cm
	4	1 ... 2000 µS/cm	1 µS/cm
	5	0.01 ... 20.00 mS/cm	0.01 mS/cm
	6	0.1 ... 200.0 mS/cm	0.1 mS/cm
	7	1 ... 1000 mS/cm	1 mS/cm

Relative accuracy: ± 1 % of full scale reading (± 2 % > 500 mS/cm)

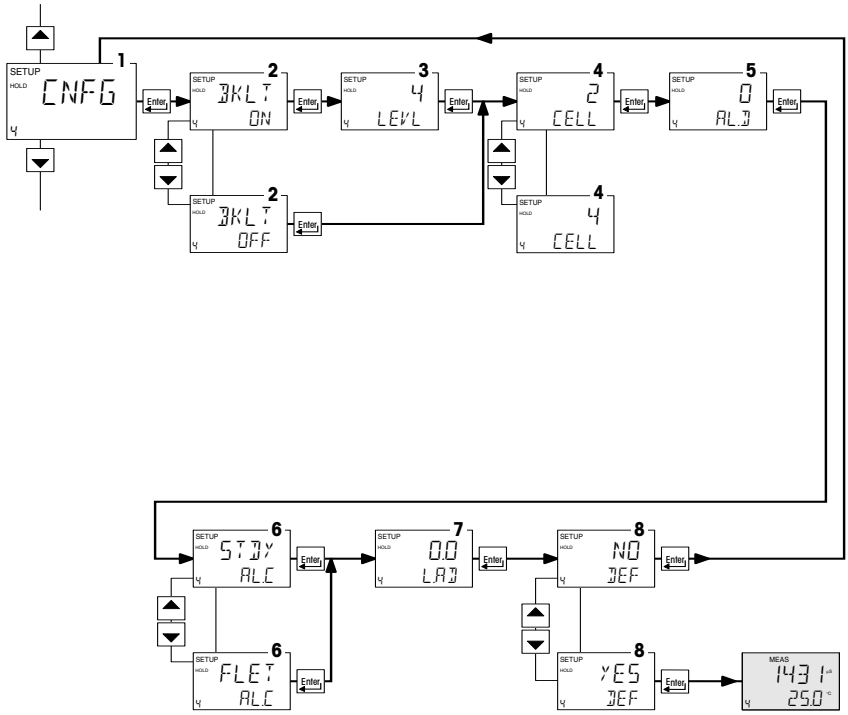
System accuracy: The effective measuring range and the total system accuracy depend on the sensor used with the transmitter. Please refer to the respective sensor documentation.

Press the ENTER key to confirm your selection.

Continue with Setup mode procedures, or return to Measurement mode by pressing the ▲ and ▼ keys simultaneously (escape).

6.10 Configuration (CNFG) sub-function

In this subfunction you configure the transmitter to suit your requirements.



1. Select the "CNFG" subfunction, then **press the ENTER key.**
2. **Enabling/disabling the display backlight: press the ▲ or ▼ key** to switch display backlight on (BKLT ON) or off (BKLT OFF). **Press the ENTER key** to confirm your selection.
3. **Setting the backlight intensity** (appears only if backlight is on): **press the ▲ or ▼ key** to set backlight intensity (setting range: minimum 1 to maximum 4). **Press the ENTER key** to confirm your setting.
4. **Selecting the cell type: press the ▲ or ▼ key** to select "2-cell" or "4-cell type". **Press the ENTER key** to confirm your selection.
5. **Setting the alarm delay time in seconds: press the ▲ or ▼ key** to set the alarm delay time (setting range: 0 to 2000 seconds). **Press the ENTER key** to confirm your setting.

Note: With this parameter you set the period of time before the alarm activates when your set point has been overshoot.

6. **Selecting the alarm contact type**: **press the ▲ or ▼ key** to select the alarm contact type:
   - "STDY" = steady contact
   - "FLET" = fleeting (single pulse) contact

   Press the ENTER key to confirm your selection.

   Note: With this parameter you select whether the alarm contact will operate as a steady contact or a fleeting (single pulse) contact. Pulse contact closing time is 1 second.

7. **Setting the line resistance: press the ▲ or ▼ key** to set the line resistance of the sensor cable connected to the transmitter. **Press the ENTER key** to confirm your setting.

   Note: This feature will be available only if "2 cell" is selected.

8. **Resetting the transmitter settings to factory defaults:** The display shows "NO DEF". **Press the ▲ or ▼ key** to select:
   - "NO DEF" = keeps old values active, when confirmed with ENTER
   - "FCT DEF" = resets all settings to factory defaults, when confirmed with ENTER
   - "CAL DEF" = reset calibration settings to factory defaults, when confirmed with ENTER

   Press the ENTER key. The selected function will be executed and the transmitter returns automatically to the Measurement mode.

Continue with Setup mode procedures, or return to Measurement mode by pressing the ▲ and ▼ keys simultaneously (escape).

6.11 Calibration (CAL) sub-function

The calibration procedure in Setup mode is identical to the procedure in the Calibration mode (see section 5). The only difference is that the transmitter remains in Setup mode (instead of Measurement mode) after calibration is completed.

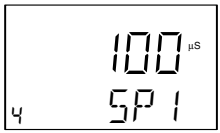
7 Relay modes

You can control devices connected to Relay A, Relay B or wash relay via the front panel of the transmitter. In Automatic mode, the transmitter's set point values activate the relays. In Manual mode, you can manually turn "on" and "off" the control devices connected to the relays.

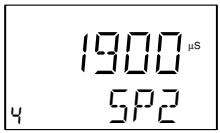
7.1 View relay set points

To view relay setpoints, the relay mode must be set to automatic (standard mode after switch-on, relay mode LED "Auto" lights).

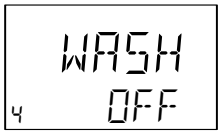
While in Measurement mode press the REL key.



The display shows the set point value for Relay A and LED "A" lights.



After two seconds the display shows the set point value for Relay B and LED "B" lights).



After two seconds the display shows the status of the Wash relay and LED "W" lights. If Wash relay is "off" the display shows "WASH OFF". If Wash relay is "on" the wash interval time and wash duration is displayed.

After an additional two seconds the transmitter will return to Measurement mode.

7.2 Manual relay mode

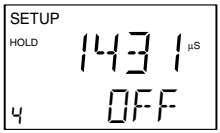
In manual relay mode, you can manually turn "on" and "off" the control devices connected to Relay A, Relay B or Wash relay.

1. While in Measurement mode **press the REL MODE key.**
2. The display prompts you to enter the security code. **Press the ▲ or ▼ key** to set security code to "22".
3. **Press the ENTER key.** The Manual relay mode is activated and the relay mode LED "MAN" lights.

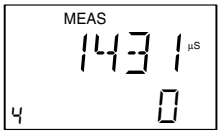
Note: Pressing ENTER key at a value other than "22" will cause the transmitter to revert to Measurement mode, and the relays will remain in automatic mode.

4. **Press the REL key** to select either Relay A, Relay B or Wash relay. The corresponding LED (A, B, or W) turns to red.

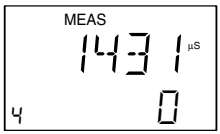
The manual control options now available depend on the control type (limit, pulse frequency, or pulse length) you selected and set in section 6.5.



If you selected Limit control: The display shows the current measured value and "OFF" or "ON" depending on the relay status of the currently selected relay.



If you selected Pulse length control: The display shows the current measured value (upper value) and the on time as a percentage of the current duration set in the CNTR sub-function in setup mode (lower value).



If you selected Pulse frequency control: The display shows the current measured value (upper value) and the pulse frequency (lower value).

5. **Press the ▲ or ▼ key** to change the Relay on/off status, pulse length, pulse frequency or wash function. The relay status LED at the right of the transmitter will also change from Red to Green.

Note: If you wish to manually change the status of relays, press the **REL key** at this point and repeat step 5 for the other two relays. The relay(s) will remain under manual control while you are setting a relay.

6. **Press the REL MODE key** to return to Measurement mode. The relays are now back to automatic control.

8 Technical specifications

8.1 General specifications

Conductivity				
No. Measuring range	Measuring range		resolution	
1	0.000 – 2.000	µS/cm	0.001	µS/cm
2	0.00 – 20.00	µS/cm	0.01	µS/cm
3	0.0 – 200.0	µS/cm	0.1	µS/cm
4	0 – 2000	µS/cm	1	µS/cm
5	0.00 – 20.00	mS/cm	0.01	mS/cm
6	0.0 – 200.0	mS/cm	0.1	mS/cm
7	0 – 1000	mS/cm	1	mS/cm
Relative accuracy	±1 % of full scale reading (±2 % > 500 mS/cm)			
System accuracy	The effective measuring range and the total system accuracy depend on the sensor used with the transmitter. Please refer to the respective sensor documentation.			

Temperature	–10.0 to + 125.0 °C (14.0 to 257.0 °F)
Resolution	0.1 °C / °F
Relative accuracy	±0.5 °C (±1.0 °F)
Sensor	Pt100 / Pt1000 (jumper selectable)
Temperature compensation	Auto / manual (reference at 25 °C)

Set-point and controller functions

Function (switchable) Selection in control (CNTR) function of Setup	Off - (SP1 & SP2 will not appear in Setup) Limit control P/PI control (pulse length/pulse frequency)
Relay A / Relay B operating parameter (for SP1 & SP2)	LO (Relay is active when measured value < set point) HI (Relay is active when measured value > set point)

Switching conductivity hysteresis	0 to 10 % of full scale
Proportional range with proportional control (P/PI)	10 to 500 %
Integral action time (IAT)	0 to 999.9 minutes
Adjustable period with pulse length controller	0.5 to 20 seconds
Adjustable period with pulse frequency controller	60 to 120 pulses/minutes
Pickup/dropout delay	0 to 2000 seconds
Wash cycle	0.1 to 200.0 hours
Wash duration	1 to 2000 seconds
Contact outputs, controller	1 SPDT, 3 SPST relays
Switching voltage/current/power	Max. 250 VAC/max. 3 A/max. 600 VA

Wash function

Relay contact celection for active mode	Energise (EN) or De-en.
Wash cycle interval	0.1 to 200.0 hours
Wash duration	1 to 2000 seconds
Contact outputs	One SPST relay
Switching voltage/current/power	Max. 250 VAC/max. 3 A/max. 600 VA

Alarm functions

Alarm delay	0 to 2000 seconds
Alarm control	Steady or fleet (pulse)
Contact outputs	One SPDT relay
Switching voltage/current/power	Max. 250 VAC/max. 3 A/max. 600 VA

Transmitter functions

Current output 1 – conductivity	Proportional to conductivity measured
Current output selection	4 – 20 mA or 0 – 20 mA
CU22 function	**On** – 22 mA current output for over range or under range or if outside zoom setting **Off** – 0 or 4 mA current output for under range or below lower zoom setting – 20 mA current output for over range or above upper zoom setting
Current output 2 – temperature	Proportional to temperature measured
Current output selection	4 – 20 mA or 0 – 20 mA

Voltage output & Hold function

+12 V output	11.5 to 12.5 V output – max. 50 mA
Hold function switch	Hold function to freeze output current (0/4...20 mA) and release control relays

Display

LCD	UV coat, backlit 14 segments display with symbols for status information
Backlight	On/Off selectable with four level of brightness control

Electromagnetic compliance (EMC) specifications

Emitted interference	EN 61 326
Immunity to interference	EN 61 326

Environmental conditions

Ambient temperature operating range	0 to 40 °C
Maximum relative humidity	80 % up to 31 °C decreasing linearly to 50 % at 40 °C

Power Supply

Input	80 to 250 VAC/DC 50/60 Hz Approx.10 VA
Main fuse	315 mA, Anti-surge, 250 V (panel mount version)
	315 mA, Anti-surge, 250 V (wall mount version)
Pollution degree	2
Transitent voltage category	II

8.2 Specifications for wall mount version

Electrical data and connections

Load	Max. 600 Ω
Conductivity input	Screw terminal
Connection terminals	13-pin, 8-pin, 5-pin and 9-pin terminal blocks

Mechanical specifications

Dimensions (control panel – L × H × W)	144 × 144 × 111.5 mm (5.67 × 5.67 × 4.39 inch)
Weight	950 g
Material	PBT
Protection	NEMA 4X, IP 66

8.3 Specifications for panel mount version

Electrical data and connections

Load	Max. 600 Ω
Conductivity input	Screw terminals
Connection terminals	5-pin, 9-pin and 19-pin terminal blocks

Mechanical specifications

Dimensions (L × H × W)	175 × 96 × 96 mm (6.89 × 3.78 × 3.78 inch)
Weight	700 g
Material	ABS
Protection	IP 54 (front) / IP 40 (housing)

9 Accessories

Sensors

Product Description	Designation
InPro7010, 2-electrode sensor with cell constant 0.01 cm^{-1}, electrode made of titanium, 8 m (25 ft) cable, measuring range up to 20 µS/cm	52 001 708
InPro7011, 2-electrode sensor with cell constant 0.1 cm^{-1}, electrode made of 316L ss, 8 m (25 ft) cable, measuring range up to 200 µS/cm	52 001 709
InPro7012, 2-electrode sensor with cell constant 1.0 cm^{-1}, electrode made of titanium, 8 m (25 ft) cable, measuring range up to 100 mS/cm	52 001 710
InPro7108-VP/CPVC, 4-electrode sensor with cell constant 0.25 cm^{-1}, electrode made of 316L ss, VP connector, measuring range up to 500 mS/cm	52 002 001
InPro7108-VP/PEEK, 4-electrode sensor with cell constant 0.25 cm^{-1}, electrode made of 316L ss, VP connector, measuring range up to 500 mS/cm	52 002 002

Note: Please contact your local METTLER TOLEDO distributor for other sensors suitable for transmitter Cond 7050 e, or refer to the respective sensor brochures.

10 General Information

10.1 Warranty

METTLER TOLEDO warrants this product to be free from significant deviations in material and workmanship for a period of one year from the date of purchase. If repair is necessary and not the result of abuse or misuse within the warranty period, please return by freight pre-paid and amendment will be made without any charge. METTLER TOLEDO's Customer Service Dept. will determine if the product problem is due to deviations or customer abuse. Out-of-warranty products will be repaired on an exchange basis at cost.

10.2 Packaging / Scope of delivery

The instrument is packaged in a corrugated box with an instruction manual and the following accessories:

- Wall mount version:
  - Plug, nylon, red, 2 pcs
  - PG13.5, cable gland, 3 pcs
  - Connectors, one each of 13 way (3.5 mm), 8 way (3.5 mm), 5 way (5.08 mm), 9 way (7.62 mm)
- Panel mount version:
  - Rubber gasket, 1pc
  - Catch, 2 pcs
  - Rod, thread, 2 pcs
  - Connector, one each of 19 way (3.5 mm), 5 way (5.08 mm) and 9 way (5.08 mm)
  - Ferrite element

10.3 Return of goods

Before returning goods for any reason whatsoever, METTLER TOLEDO's Customer Service Dept. have to be informed in advance. Items must be carefully packed to prevent damage during shipment, and insured against possible damage or loss. METTLER TOLEDO will not be responsible for any damage resulting from careless or insufficient packing.

Warning: Shipping damage as a result of inadequate packaging is the user's/distributor's responsibility, whoever applicable. Please follow the guidelines below before shipment.

10.4 Guidelines for returning unit for repair

Use the original packaging material if possible when shipping the unit for repair. Otherwise wrap it with bubble pack and use a corrugated box for better protection. Include a brief description of any faults suspected for the convenience of Customer Service Dept., if possible.

10.5 Maintenance and Cleaning

Maintenance

The transmitter Cond 7050 e contains no user repairable components. Please contact the factory if there is any problems with the unit.

Cleaning

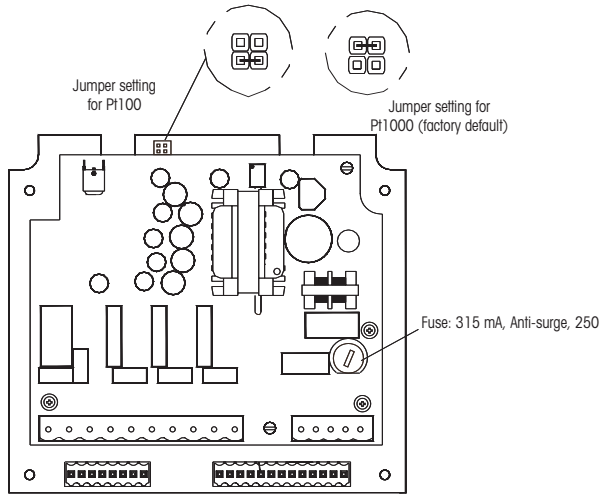
To remove dust, dirt and spots, the external surfaces of the transmitter may be wiped with a damp, lint-free cloth. A mild household cleaner can also be used if necessary.

11 Appendices

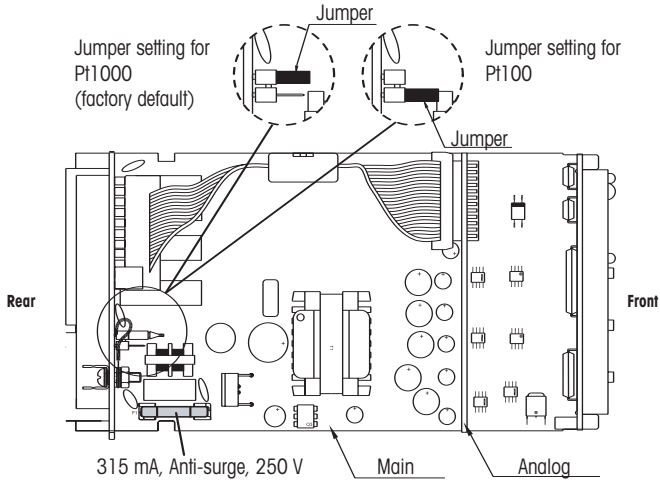
11.1 Appendix 1 – Unit fuse and jumper settings

Caution! Before opening the unit to replace the unit fuse or to set the jumper for Pt100/Pt1000 temperature sensor, make sure the mains cable is separated from the power supply.

Wall mounting version (view from the back side)



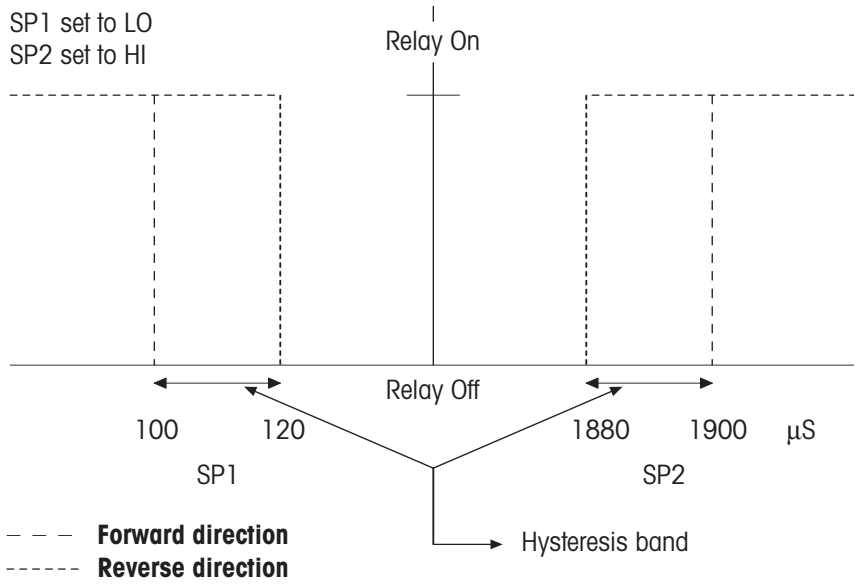
Panel mounting version (view from top)



11.2 Appendix 2 – Conductivity of various aqueos solutions at 25 °C / 77 °F

	Conductivity		Resistivity	
Ultra-pure water	0.055	µS/cm	18.18	MΩ-cm
Power plant boiler water	0.05 – 1	µS/cm	1 – 18	MΩ-cm
Distilled water	0.5	µS/cm	2	MΩ-cm
De-ionized water	0.1 – 10	µS/cm	0.1 – 10	MΩ-cm
De-mineralised water	1 – 80	µS/cm	0.01 – 1	MΩ-cm
Mountain water	10	µS/cm	0.1	MΩ-cm
Drinking water	0.5 – 1	mS/cm	1 – 2	kΩ-cm
Waste-water	0.9 – 9	mS/cm	0.1 – 1	kΩ-cm
Potable water maximum	1.5	mS/cm	0.7	kΩ-cm
Brackish water	1 – 80	mS/cm	0.01 – 1	kΩ-cm
Industrial process water	7 – 140	mS/cm	rarely stated	
Ocean water	53	mS/cm	rarely stated	

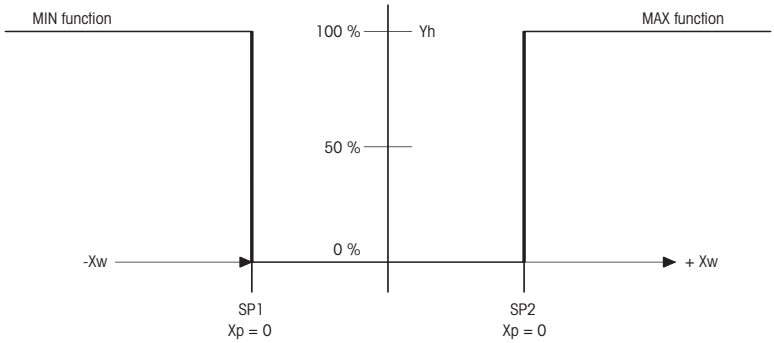
11.3 Appendix 3 – Explanation of hysteresis function



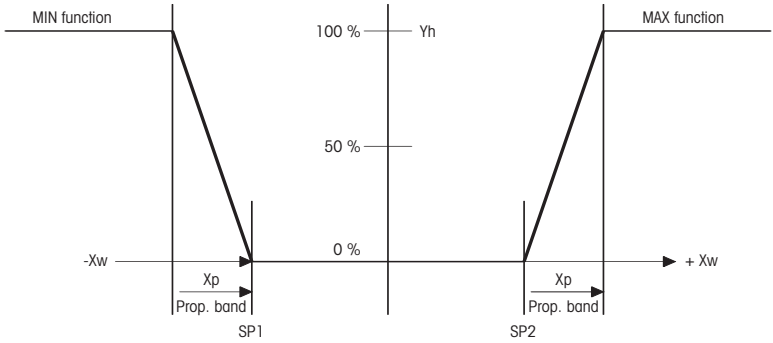
The controller relay activates when the set-point is reached. In the reverse direction, it does not de-activate when the value reaches the set-point. Instead, it continues to be active till the value reaches the amount set by the Hysteresis band.

11.4 Appendix 4 – General instructions concerning controller setting

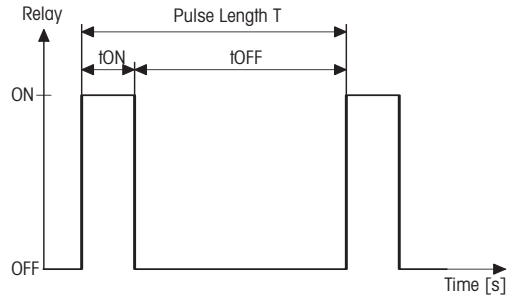
Control characteristic of controllers used as limit value switch



Control characteristic of P-controllers



Control signal of pulse length controllers

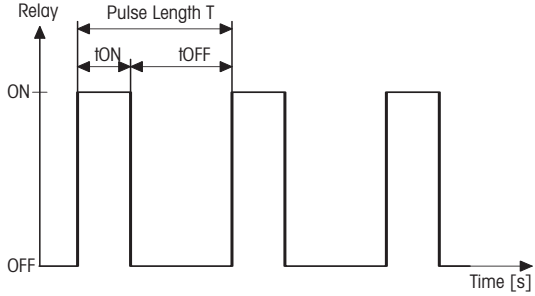


The output relay of the pulse length controller is clock-timed. The switching period T remains constant. Depending on the divergence from the limit value, the switch-on time t_{ON} is increased or decreased in accordance with the proportional range X_p.

The following applies:

$t_{ON} + t_{OFF} = T$ (Const.)
greater divergence ➔ greater t_{ON}
X_p exceeded ➔ $t_{ON} = T$ (**relay remains picked up**)

Control signal of pulse frequency controllers



The output relay of the pulse frequency controller is clock-timed. The pulse duration t_{ON} remains constant at 250 msec. Depending on the divergence from the limit value, the frequency (1/T) is increased or decreased in accordance with the proportional range X_p.

The following applies:

t_{ON} = Const. (250 msec.)
greater divergence ➔ greater f (greater frequency)
X_p exceeded ➔ max. frequency

11.5 Appendix 5 – Abbreviations used in menu displays

Abbreviation	Meaning
MEAS	Measurement
CAL	Calibration
ENT	Enter
C.CD	Calibration security code
S.CD	Setup security code
TC	Temperature coefficient
LIN	Linear temperature compensation
PUR	Pure water temperature compensation
P.TC	Temperature coefficient for process liquid
C.TC	Temperature coefficient for calibration liquid
P.	Process
C.	Calibration
SET	Setting
ATC	Automatic temperature calibration
SP1	Setpoint 1
SP2	Setpoint 2
LO	Low limit
HI	High limit
HYS	Hysteresis
ON.D	On delay
OFF.D	Off delay
CNTR	Controller
L.CT	Limit control
PLC	Pulse length control
PFC	Pulse frequency control
P/PI	Proportional control

Abbreviation	Meaning
EN	Energized
DEEN	Deenergized
REL	Relay
PRP	Proportional band
T.PL	Pulse length time
F.PF	Pulse frequency
IAT	Integral action time
MANU	Manual
CUR. 1	Output current 1
CUR. 2	Output current 2
OUT	Output signal
4 – 20	4 to 20 mA
0 – 20	0 to 20 mA
R.0	Value at 0 mA
R. 4	Value at 4 mA
R. 20	Value at 20 mA
CU22	Out of range output current 22 mA
WASH	Wash
H.INT	Cleaning interval in hours
S.DUR	Cleaning duration in seconds
RANG	Range
CNFG	Configuration
BKLT	Back light
LEVL	Level
AL.C	Alarm contact
STDY	Steady
FLET	Fleet, impulse
AL. D	Alarm delay
L. AD	Line resistance
DEF	Default

Notes:

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