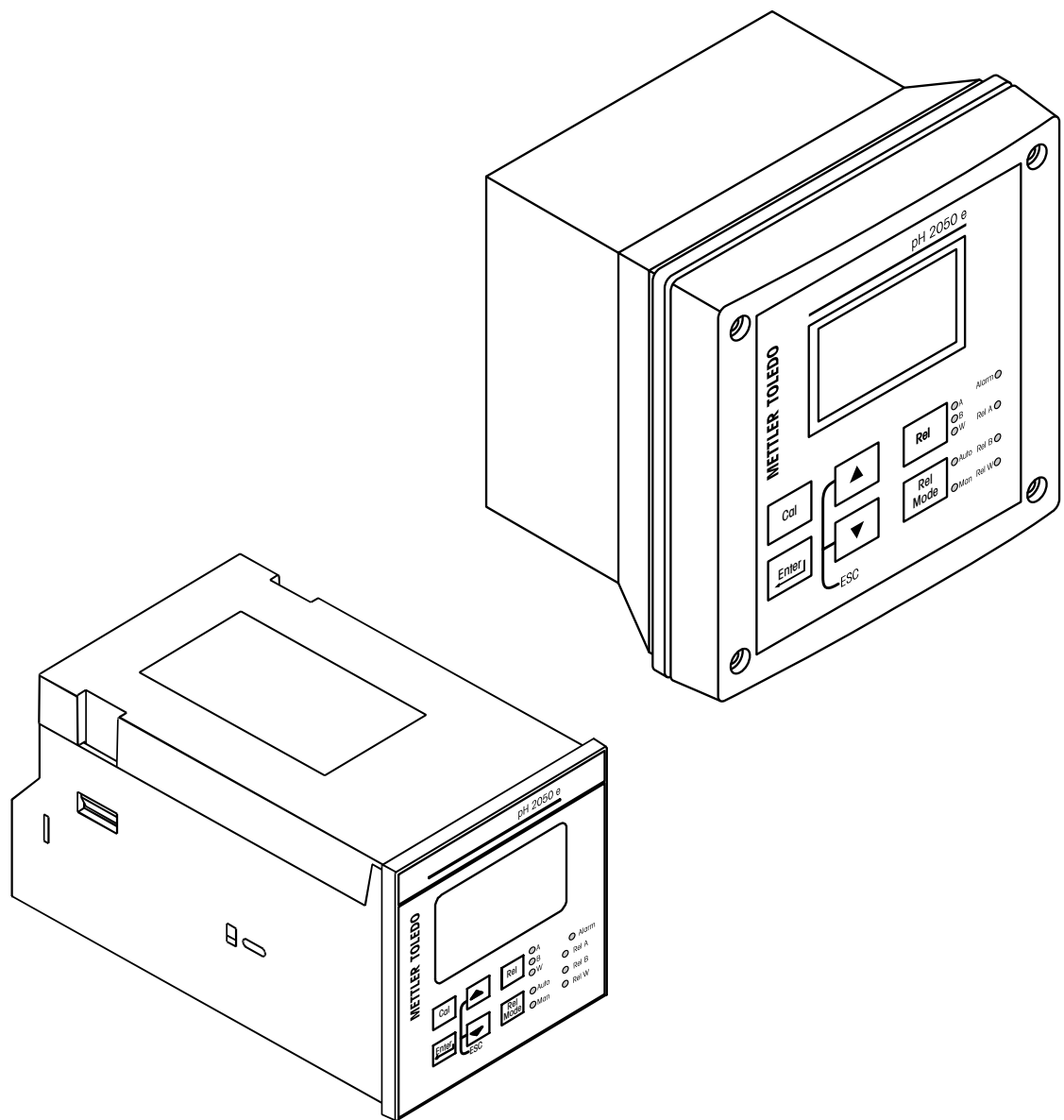


METTLER TOLEDO

pH/ORP Transmitter 2050 e

Instruction manual



pH/ORP Transmitter 2050 e
52 121 140

Preface

This manual serves to explain the use of the pH/ORP Transmitter 2050 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 pH/ORP Transmitter 2050 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.

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1 Introduction

1.1 At the very beginning

We thank you for having purchased the **METTLER TOLEDO pH/ORP Transmitter 2050 e**.

The construction of the pH/ORP Transmitter 2050 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 pH/ORP Transmitter 2050 e.**

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 pH/ORP Transmitter 2050 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 pH/ORP Transmitter 2050 e are intended solely for pH or ORP 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 pH/ORP Transmitter 2050 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 pH/ORP Transmitter 2050 e must only be operated under the specified operating conditions (see section 8).
- The pH/ORP Transmitter 2050 e must not be repaired by the customer.
- The pH/ORP Transmitter 2050 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 pH/ORP Transmitter 2050 e are allowed. The manufacturer/supplier accepts no responsibility for damage caused by unauthorised modifications. The risk is borne entirely by the user.

2 Product description

2.1 Description of unit

The METTLER TOLEDO pH/ORP Transmitter 2050 e is used for measuring pH or ORP and temperature values. The pH or ORP 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.

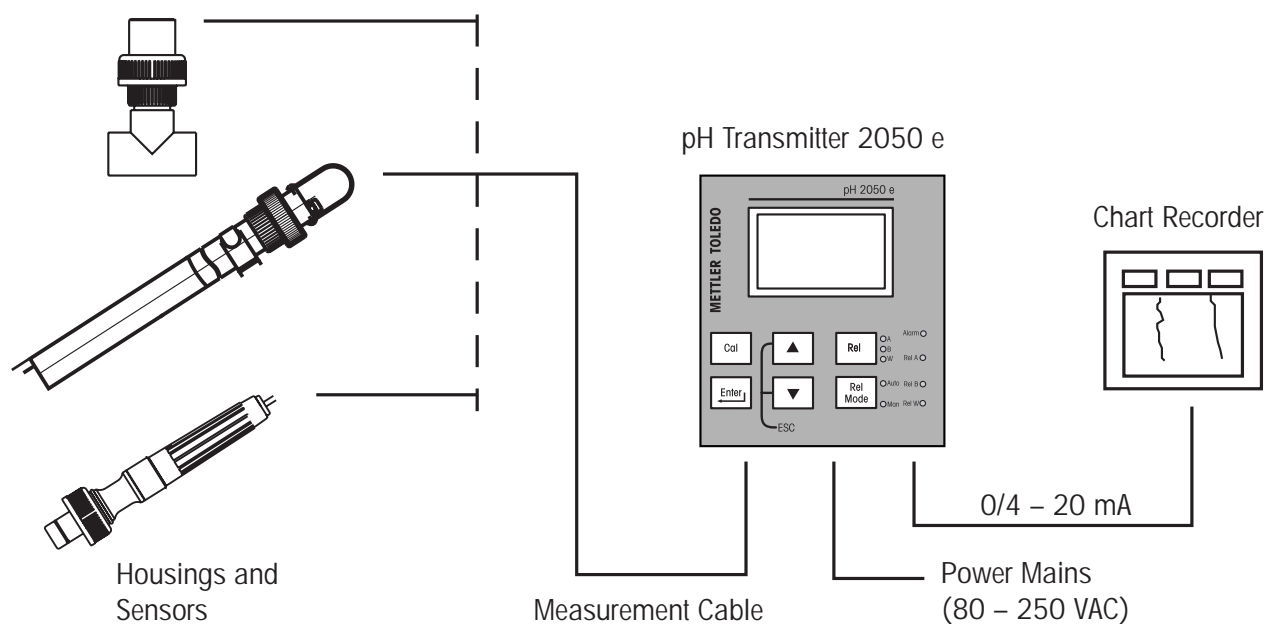
This transmitter has many user-friendly and safety features which include:

- 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 electrode 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 1999 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.
- Asymmetrical/symmetrical input for pH/ORP mode of operation.
- 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

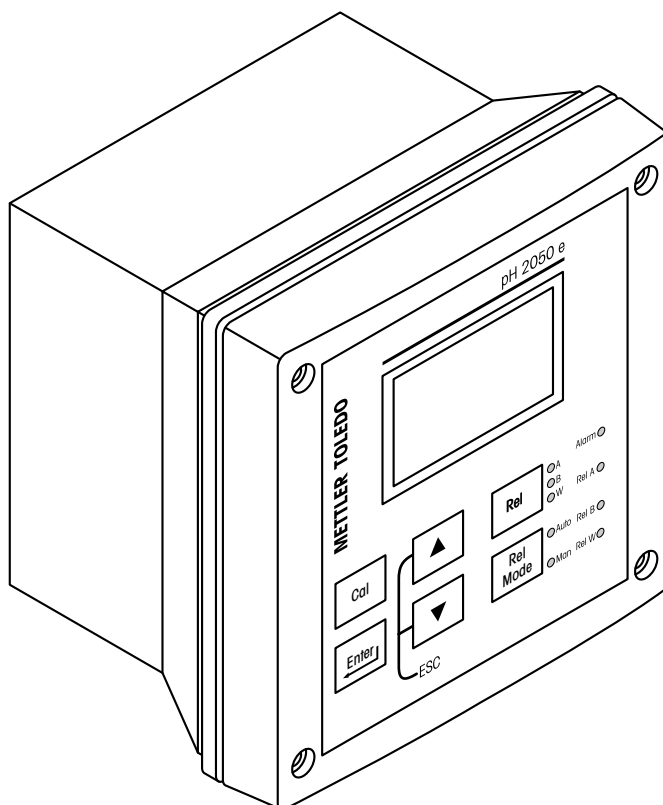
A typical measurement system consists of:

- a pH/ORP process transmitter
- a pH/ORP combination electrode with integrated or separate temperature sensor Pt 100/1000,
- an appropriate pH or ORP measurement cable
- an immersion, flow or process assembly
- a final control element such as pump or valve
- a chart recorder

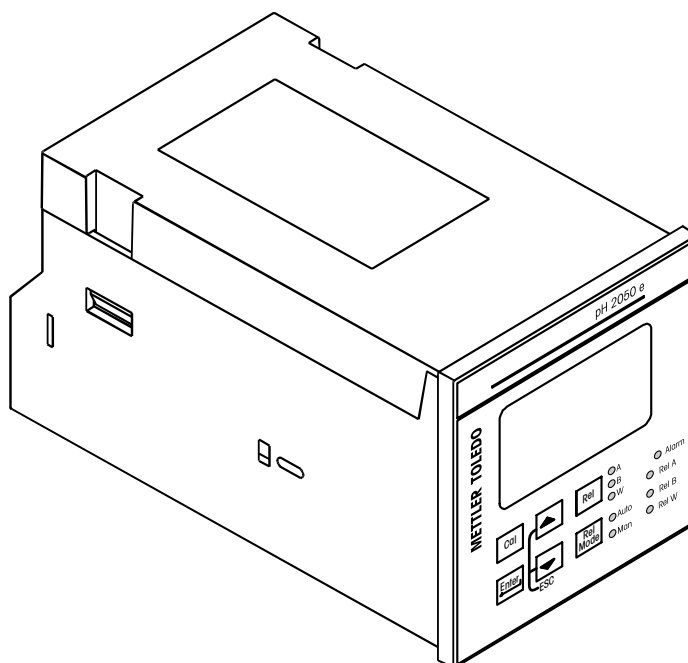


2.3 Unit overview

Wall mounting version

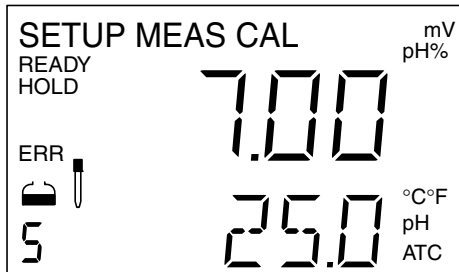


Panel mounting version



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:

- **READY**: Visible after successful calibration
- **HOLD**: Relay position and current output are frozen
- **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 or alarm indicator
- **5**: Visible in symmetrical measurement mode

2.3.2 Key functions

Key	Description
	<ul style="list-style-type: none"> • Enter Calibration mode (requires access code)
	<ul style="list-style-type: none"> • 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
 	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • Switch from AUTO to MANUAL relay operation (requires access code)

2.3.3 LED indicators

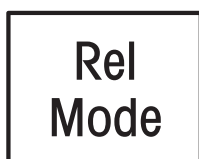
Relay indicators



- A
- B
- W

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
- Man

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

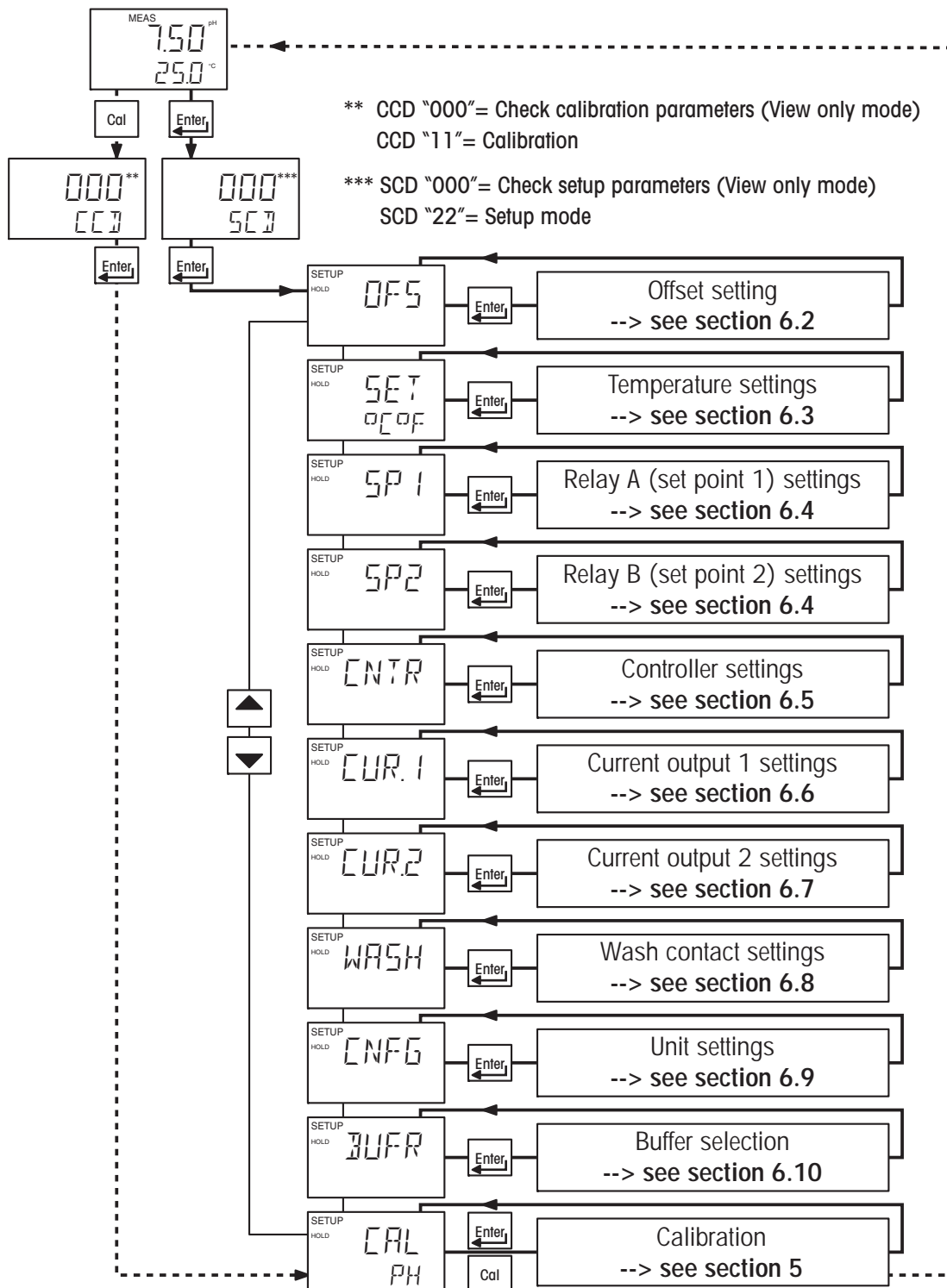
This LED lights if cleaning cycle is on.

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

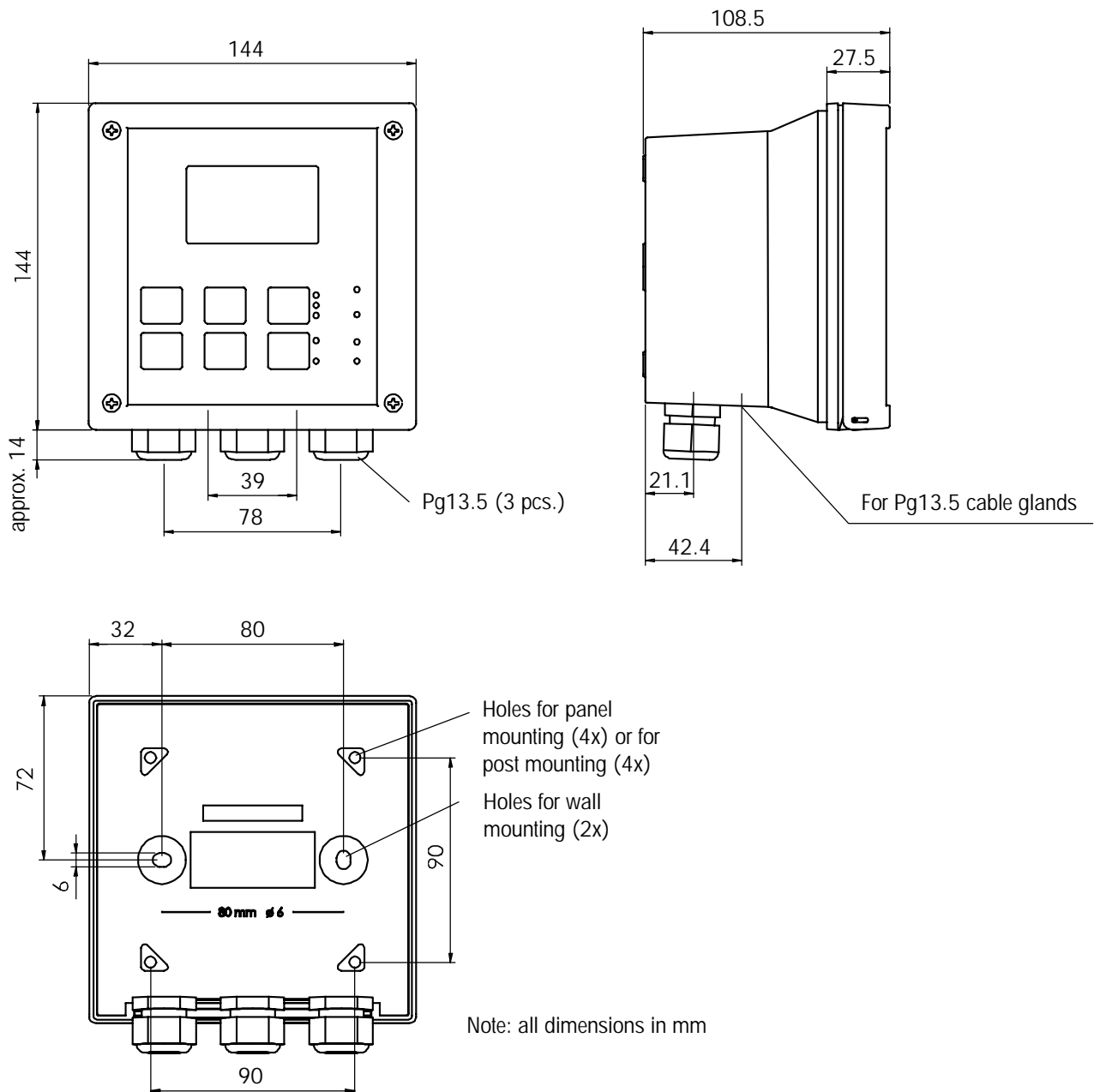
2.3.5 Menu overview



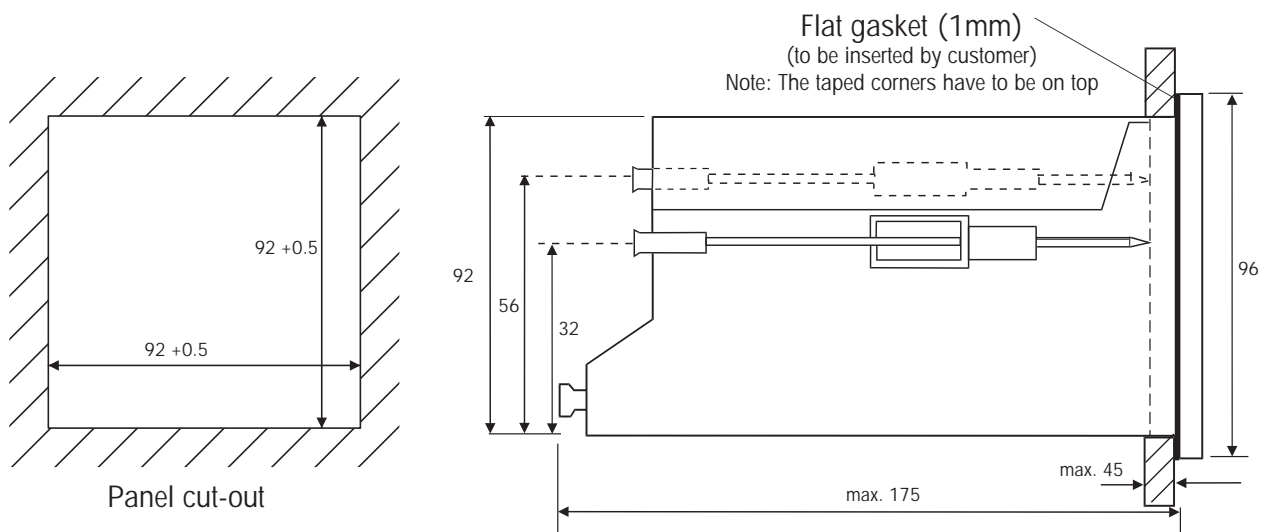
3 Assembly and installation

3.1 Mounting the unit

Wall mounting version



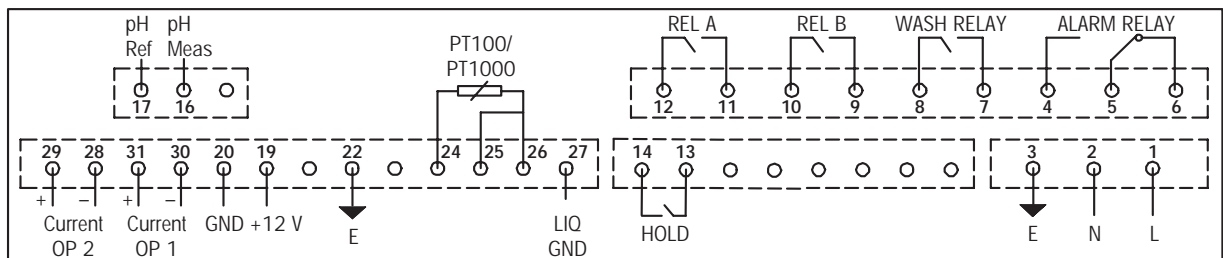
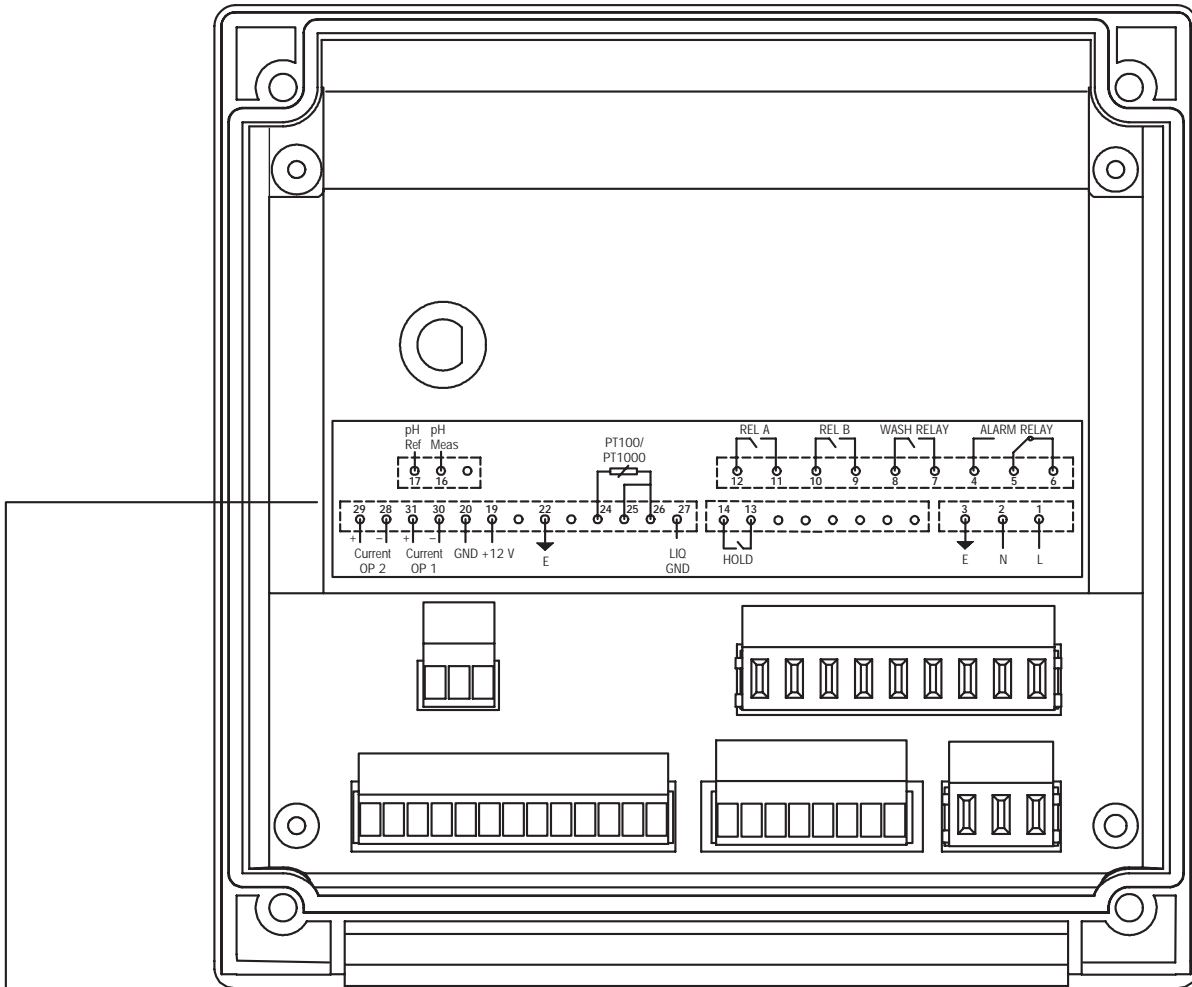
Transmitter housing for wall mounting: protection class IP 65

Panel mounting version

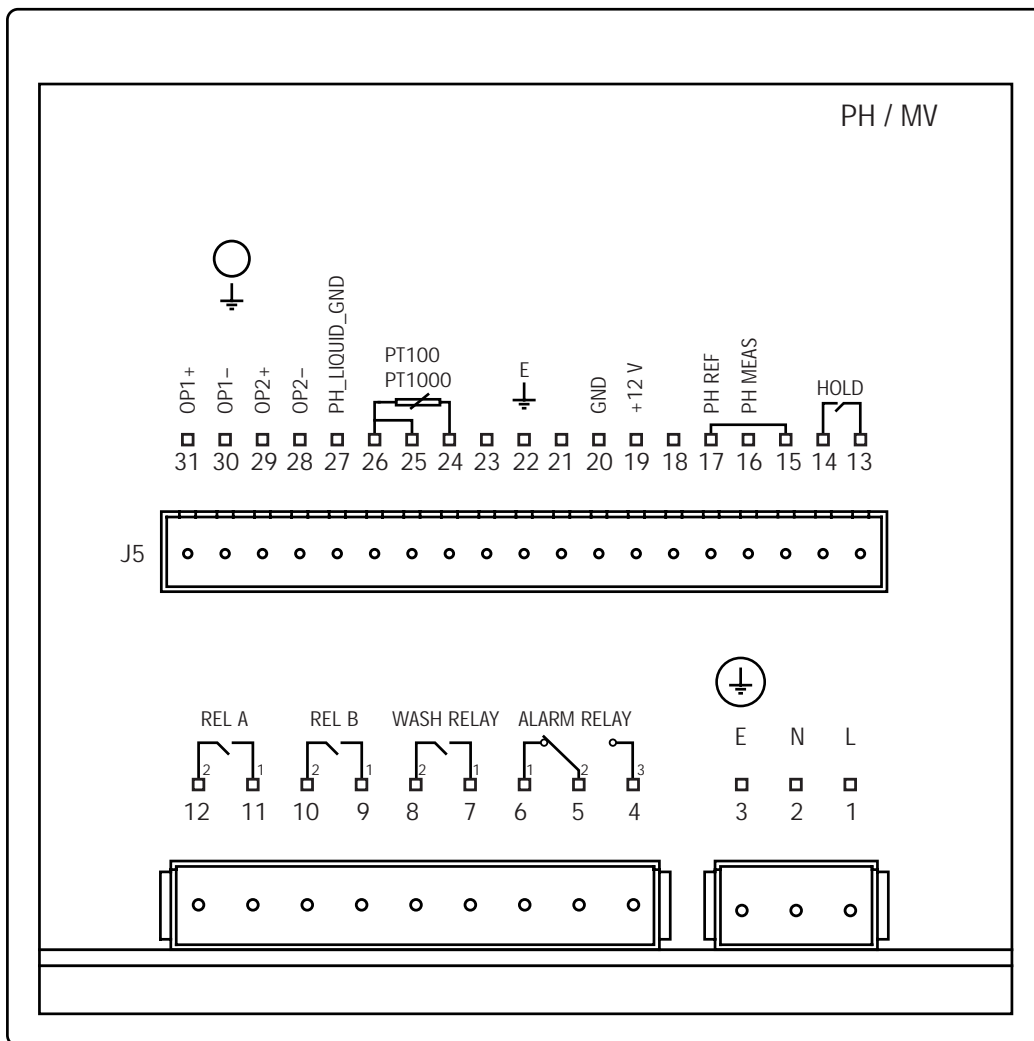
Transmitter housing for panel mounting: protection class IP 54 (front), IP 40 (housing)

3.2 Connection diagram

Connectors wall mounting version



Connectors panel mounting version



VP cable connection

VP cable	Transmitter terminal
A transparent (Glass)	pH MEAS (16)
B red (coax shield/reference)	pH REF (17)
C grey (T3)	PT100 (25) *
D blue (Aux)	pH liquid GND (27) **
E white (T1)	PT100/1000 (26)
F green (T2)	PT100/1000 (24)
G green/yellow (cable shield)	E (22)



* If 2-wire Pt100/Pt1000 is used, put wire bridge between terminal 25 and 26

** Configure the transmitter to the asymmetrical mode if no solution ground electrode or no auxiliary electrode is used



Note: Ex work the unit is configured for PT1000 temperature sensor. If a PT100 is used the unit must be configured via a jumper on the control board of the unit (see Appendix 1).

Coaxial cable connection (combined electrode)

Coaxial cable	Transmitter terminal
Glass electrode	pH MEAS (16)
Reference electrode	pH REF (17)



Note: Configure the transmitter to the asymmetrical mode if no solution ground electrode or no auxiliary electrode is used

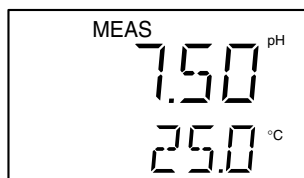
4 Normal operation

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 guarantee 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 pH or ORP value, while the lower display shows either the temperature value if the transmitter is set for pH measurement, or "ORP" if it is set for ORP measurement.

The annunciators "pH", "mV" or "%" at the upper right side of the display indicate the current measurement mode setting whether the transmitter is set for pH, mV or ORP % measurement.

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 in Measurement mode you can switch relay operation mode from automatic to manual. For detailed information refer to **section 7 "Relay operation"**.

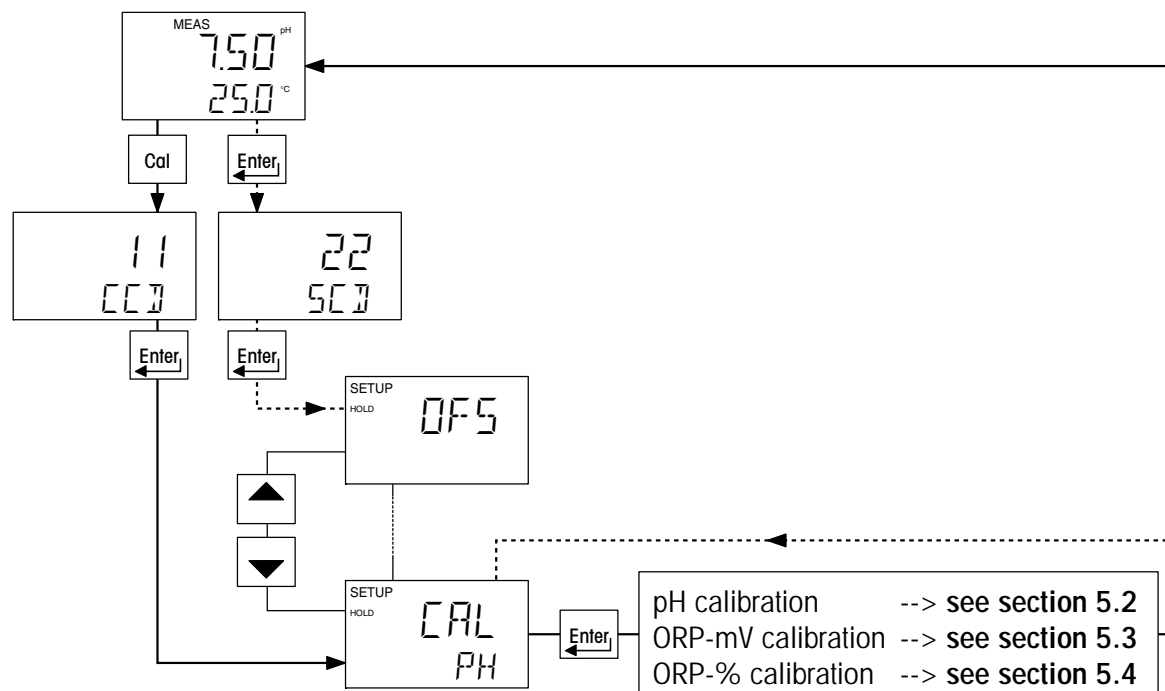
5 Calibration Mode

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).



Important: before carrying out a calibration make sure the transmitter is configured for the buffer set you are using (selecting buffer set see section 6.9, buffer tables see Appendix 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.

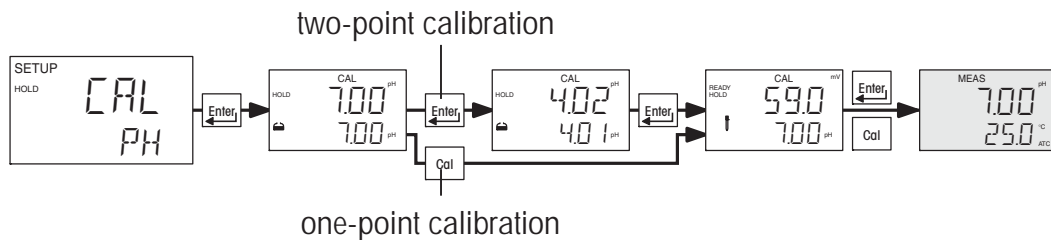
If configured for pH control, the display shows "CAL PH". If configured for ORP control, the display shows "CAL ORP". To start calibration refer to the corresponding section (see illustration above).



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 pH Calibration

This transmitter unit features one-point or two-point calibration with five preset buffer sets or manual buffer entry. Buffer values refer to 25 °C. To calibrate the instrument, you need a standard pH buffer solution that matches one of these values.



1. **Enter Calibration mode** as described in section 5.1. The display should read "CAL PH" (for pH calibration).
Note: If the display reads "CAL ORP", see section 6.9 for procedures on how to switch from ORP to pH readings.
2. **Press the ENTER key** to start calibration. The "CAL" indicator appears at the top of display and the buffer indicator appears in the bottom left corner of the display. The display shows the **actual pH reading** (upper value) and the **buffer value for zero point** (lower value).
3. Place the electrode in the first buffer solution. In ATC mode, you must also immerse the temperature probe in the buffer solution. Likewise for symmetrical mode, you must also immerse the potential matching pin in the buffer.
4. You can conduct either a one-point or a two-point calibration: Press the **ENTER key for two point** calibration or the **CAL key for one point** calibration. The electrode indicator and CAL indicator both flash. The transmitter automatically adjusts the reading to match the buffer value.
5. If one-point calibration was selected, the display will show the slope and offset. If two-point calibration was selected, the lower section of the display will now show its next lower "pH" buffer. Use **▲ and ▼ keys** to select the second buffer from one of the preset values. Remove the electrode from the first buffer, wash and then immerse it into the second buffer. Press the ENTER key, the electrode and CAL indicators will flash. The transmitter adjusts the reading to the second buffer.
6. After calibrating with the second buffer value, the transmitter will automatically display the slope in the upper and the zero point in the lower section of the display.
Note: You can also view the values for zero point and slope without calibration (see section 5.5 for instruction). The zero point and slope are re-determined after each calibration.
7. **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.



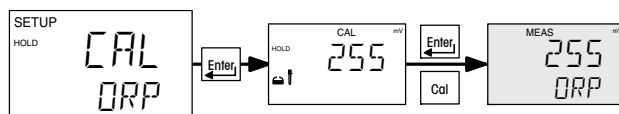
Note: If there is a calibration error the transmitter displays "ERR". In this case, **press the ▲ and ▼ keys** simultaneously (escape) to restart the calibration beginning from step 1.



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 ORP-mV Calibration

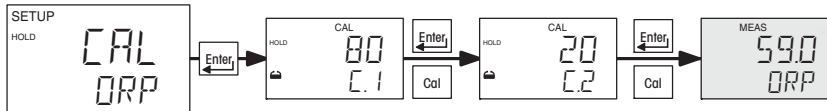
If transmitter is configured for ORP-mV measuring you can perform only a one-point calibration.



1. **Enter Calibration mode as described in section 5.1.** The display should read "CAL ORP". **Note:** If the display reads "CAL PH", see section 6.8 for procedures on how to switch from pH to ORP-mV readings.
2. Place sensor in the ORP solution.
3. **Press the ENTER key** to start calibration. The "CAL" indicator appears on the display. The display shows the current mV output of the electrode without any offset adjustment.
4. **Press the ▲ or ▼ key** to match the mV value to your exact reading.
5. **Press the ENTER key** to confirm. The transmitter calculates the correction factor and returns to the Measurement mode.

5.4 ORP -% Calibration

If transmitter is configured for ORP-% measuring you can perform a calibration at two points using a low concentration sample (20%) and a high concentration sample (80%).



1. **Enter Calibration mode as described in section 5.1.** The display should read "CAL ORP".
Note: If the display reads "CAL PH", see section 6.8 for procedures on how to switch from pH to ORP-% readings.
2. **Press the ENTER key** to start calibration. The display prompts you to place the sensor in the high concentration sample (relative value of 80%).
3. Place sensor in the high concentration sample, then **press the ENTER key**. The electrode and CAL indicators flash. The unit automatically adjusts its reading to match the solution value.
4. The display prompts you to place the sensor in the low concentration sample (relative value of 20%). Remove the electrode from the first standard, wash it well and then immerse it in the 20% standard.
5. When the display stabilizes **press the ENTER key**. The "CAL" indicator flashes and the transmitter adjusts its display to the 20% relative value and exits to the Measurement mode.

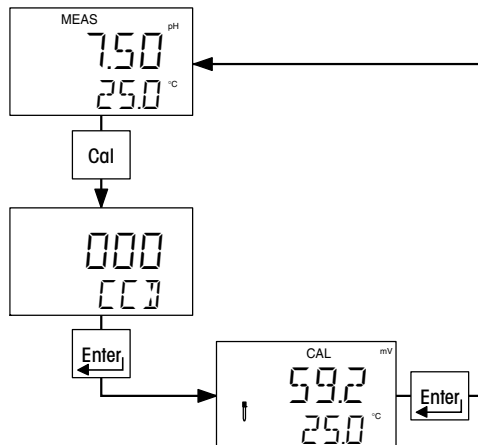


Note: If there is a calibration error, the transmitter displays "ERR". In this case **press the ▲ and ▼ keys** simultaneously (escape) to restart the calibration, beginning from step 1.



Note: If you stop calibration after entering the first value, or if calibration is defective, the transmitter will use its original calibration data.

5.5 View actual zero and slope



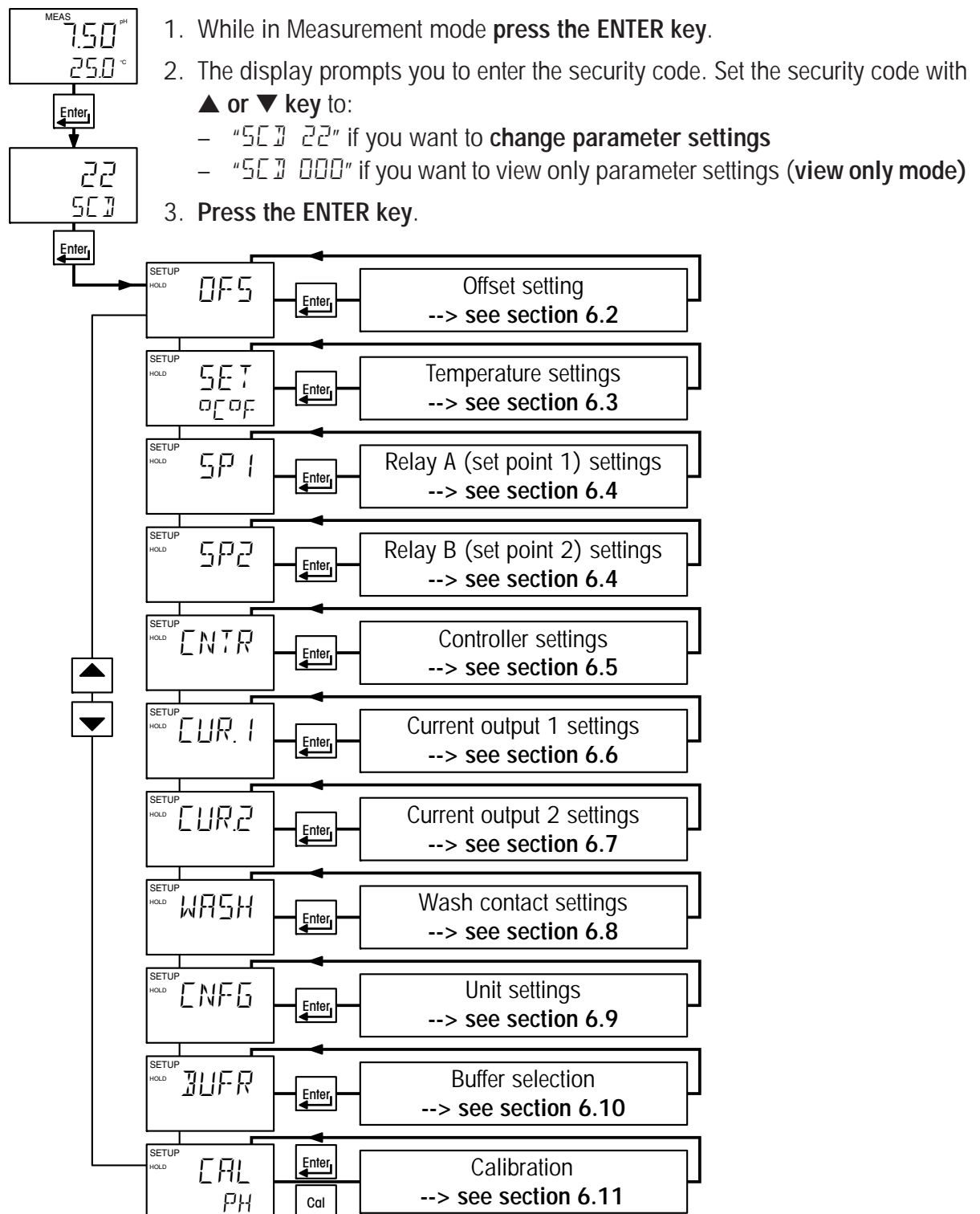
1. While in Measurement mode **press the CAL key**. The display will prompt you to enter a security code. Leave the **security code** at "000" (view only mode).
2. **Press the ENTER key**.
The display shows the slope in mV (upper value) and the pH reading at 0 mV (zero point, lower value).
Note: If no key is pressed for 30 seconds the transmitter automatically returns to the Measurement mode.
3. **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.



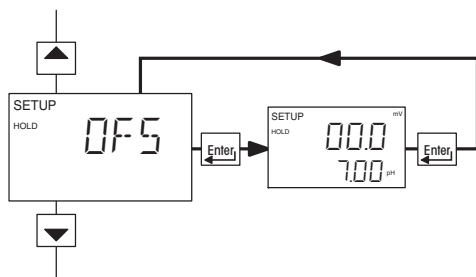
Note: to exit Setup mode at any time **press the ▲ and ▼ key simultaneously** (escape). The transmitter returns to the Measurement mode.

6.2 Electrode Offset (OFS) sub-function

The electrode offset sub-function is only available if the transmitter is configured for pH measuring. Use this subfunction to set an offset that corrects the readings without removing the electrode from the control system. The setting range is ± 120 mV.

The transmitter will add or subtract the offset value from the measured pH and display the corrected value. However, if you need to offset the value beyond the average offset you would expect in your application type, consider a full calibration or even electrode replacement.

1. Take a sample from the system. Record the transmitter's pH reading at the time you take the sample.
2. Measure the pH value of your sample using a calibrated pH tester, hand-held meter, or bench meter. Record the correct pH value.
3. Select the "OFS" subfunction, then **press the ENTER key**.



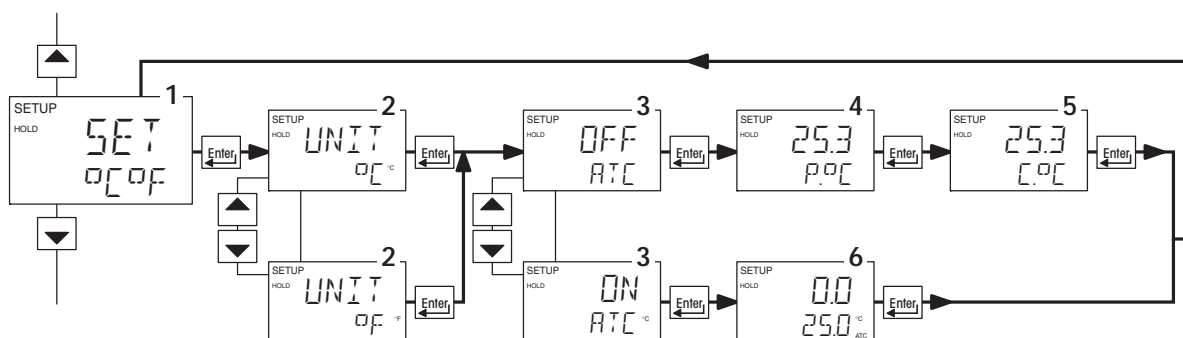
4. The display shows the current **measured pH value** (lower value) and the current **offset value** (upper value). **Press the ▲ or ▼ key** to adjust the pH value noted in Step 2. As the ▲ and ▼ keys are being pressed to adjust the pH value, the offset value also changes. **Press the ENTER key** to confirm the new offset value.
5. Continue with additional Setup procedures, or return to the Measurement mode by pressing the ▲ and ▼ keys (escape) simultaneously.



Note: The offset value is reset during full calibration. See section 5 for full calibration instructions.

Note: The offset subfunction is blanked out during ORP operation.

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

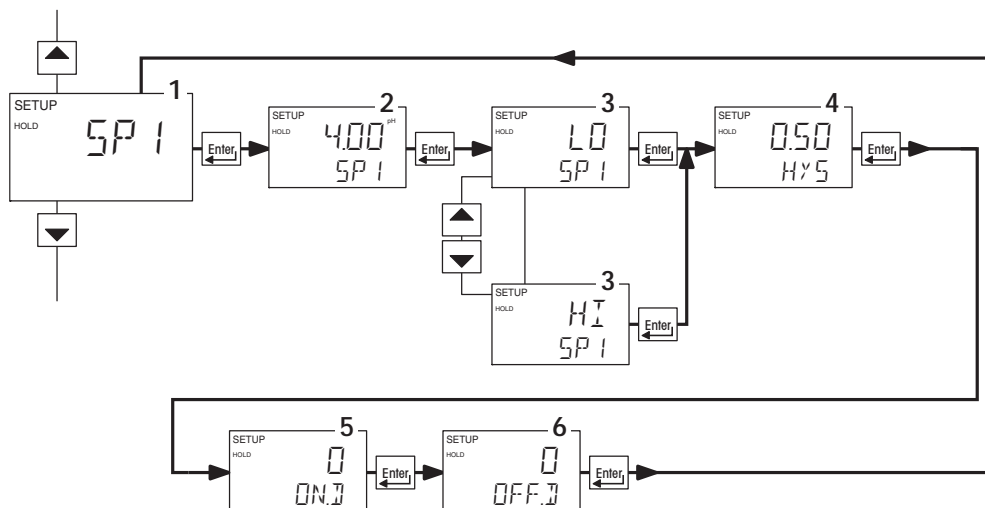


1. Select the "SET °C°F" subfunction, then **press the ENTER key**.
2. **Selecting temperature unit:** press the **▲ or ▼ key** to select the desired temperature unit "°C" or "°F". **Press the ENTER key** to confirm your selection.
3. **Enable/disable ATC mode:** press the **▲ or ▼ key** to enable (ATC 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 buffer 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: –9.9 to 125°C / 15 to 257 °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: –9.9 to 125°C / 15 to 257 °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 down 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 "SP 2" (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.
4. **Setting a hysteresis value:** press the **▲** or **▼** key to select the desired hysteresis (setting ranges: 0.1 to 1.0 pH, 10 to 100mV or 1 to 10%) for set point 1 (set point 2). **Press the ENTER key** to confirm your setting.



Note: This parameter lets you choose the relay function. Select "LO" to activate the relay when the pH/ORP 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".



Note: Hysteresis prevents rapid contact switching if your value is fluctuating near the set point. **Please refer to Appendix 2** for a graphical representation of the hysteresis.

Example: You have set your high set point at pH 9.0 and your hysteresis value at pH 0.5. If your measured value overshoots pH 9.0, the controller's relay activates. The actions of the external device will cause the solution's pH to drop. The relay will deactivate, when the pH value drops below 8.5 pH.

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 1999 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 1999 second 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 1999) you select. **Press the ENTER key** to confirm your setting.

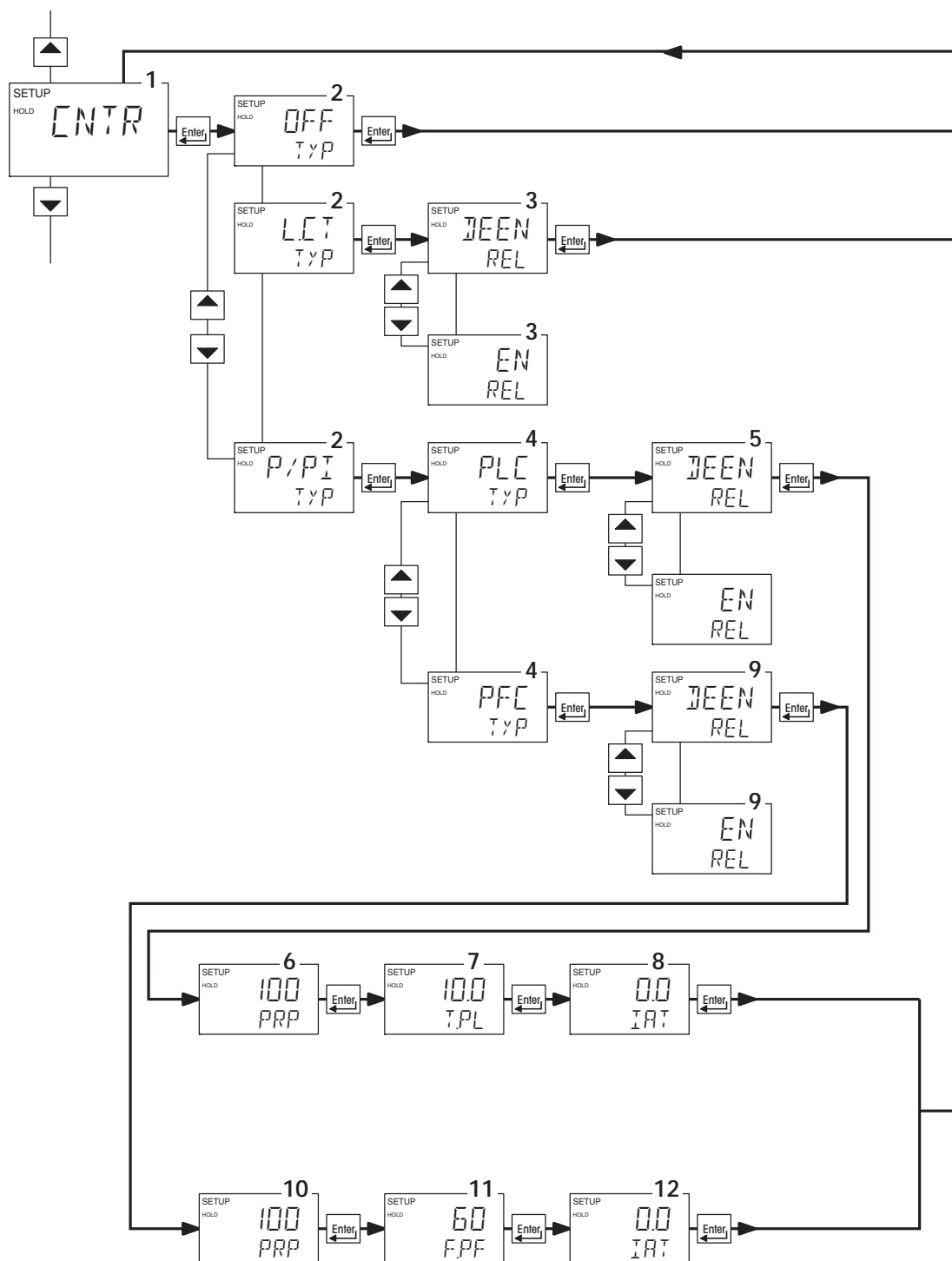


Note: You can set a time delay for each relay, which stops the relay from switching off the moment the value reaches the set point and hysteresis. This controller lets you set a 0 to 1999 second time delay before your relay deactivates.

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 3 for detailed information on controller settings.

Press the ENTER key to confirm your selection.

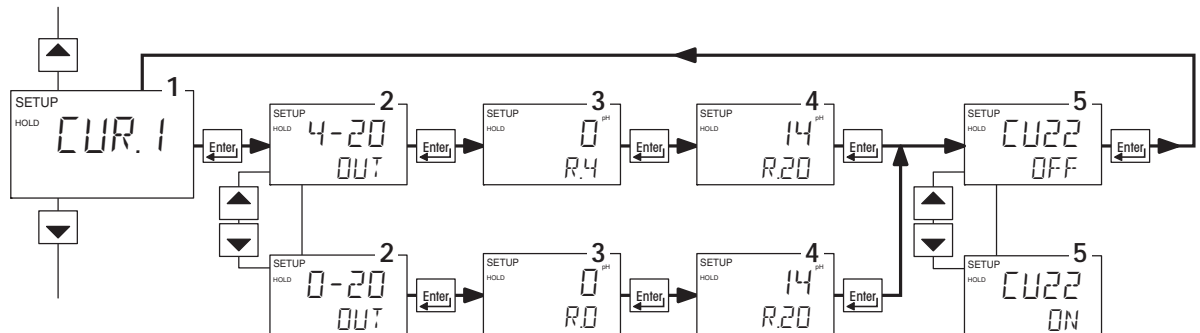
- If the controller is set to **limit value control** (LCT):
 3. **Selecting the relay status under Non-Alarm condition: press the ▲ or ▼ key** to choose the desired relay status (de-energized = "DEEN" or energized = "EN"). **Press the ENTER key** to confirm your selection.
- If the controller is set 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, " $PFCE$ " = 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 pH or mV values.



1. Select the "CUR. 1" 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 pH or ORP value at which the transmitter output will be 4 mA (or 0 mA):** press the ▲ or ▼ key to set the pH or ORP value to be equivalent to 4 mA or 0 mA, respectively. **Press the ENTER key** to confirm your setting.
4. **Setting the pH or ORP value at which the transmitter output will be 20 mA:** press the ▲ or ▼ key to set the pH or ORP 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.

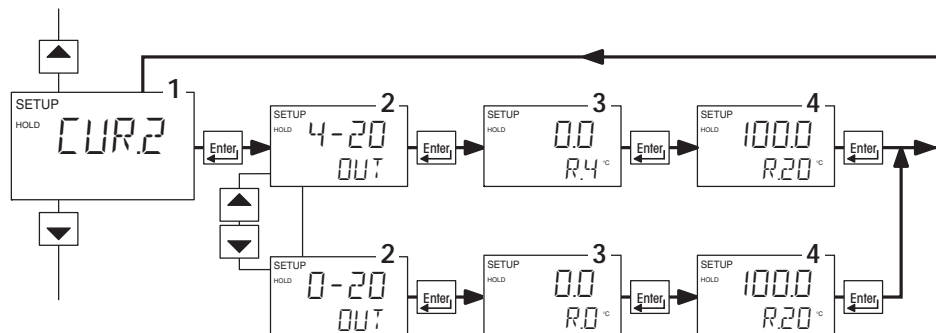


Note: the "CU22" setting (on/off) of current output 1 applies to current output 2 as well.

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.

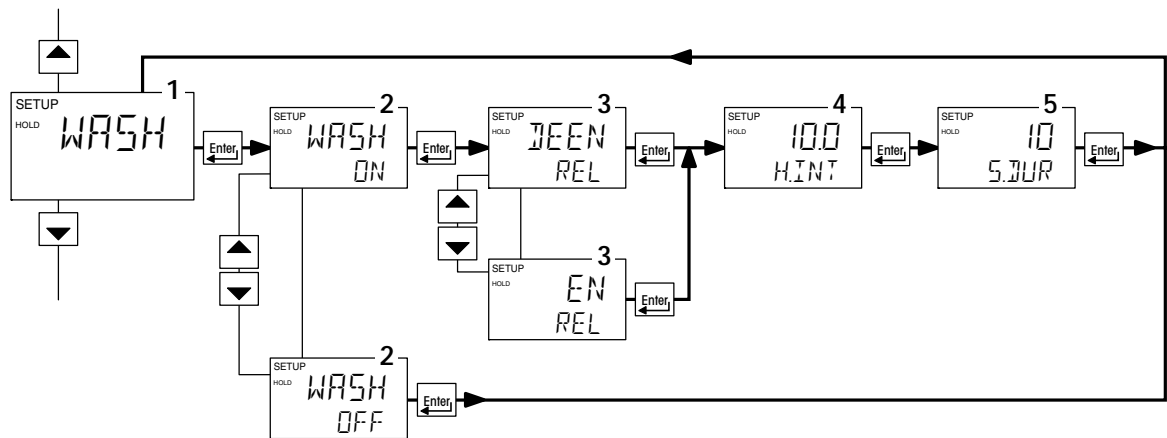


1. Select the "CUR.2" subfunction, then **press the ENTER key**.
2. **Selecting the output type: press the ▲ or ▼ key** to select the desired output type: 0-20 mA or 4-20 mA. **Press the ENTER key** to confirm your selection.
3. **Setting the temperature value at which the transmitter output will be 4 mA (or 0 mA): press the ▲ or ▼ key** to set the temperature value (setting range: -9.9 to 115°C or 15 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: -0.1 to 125°C or 35 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.



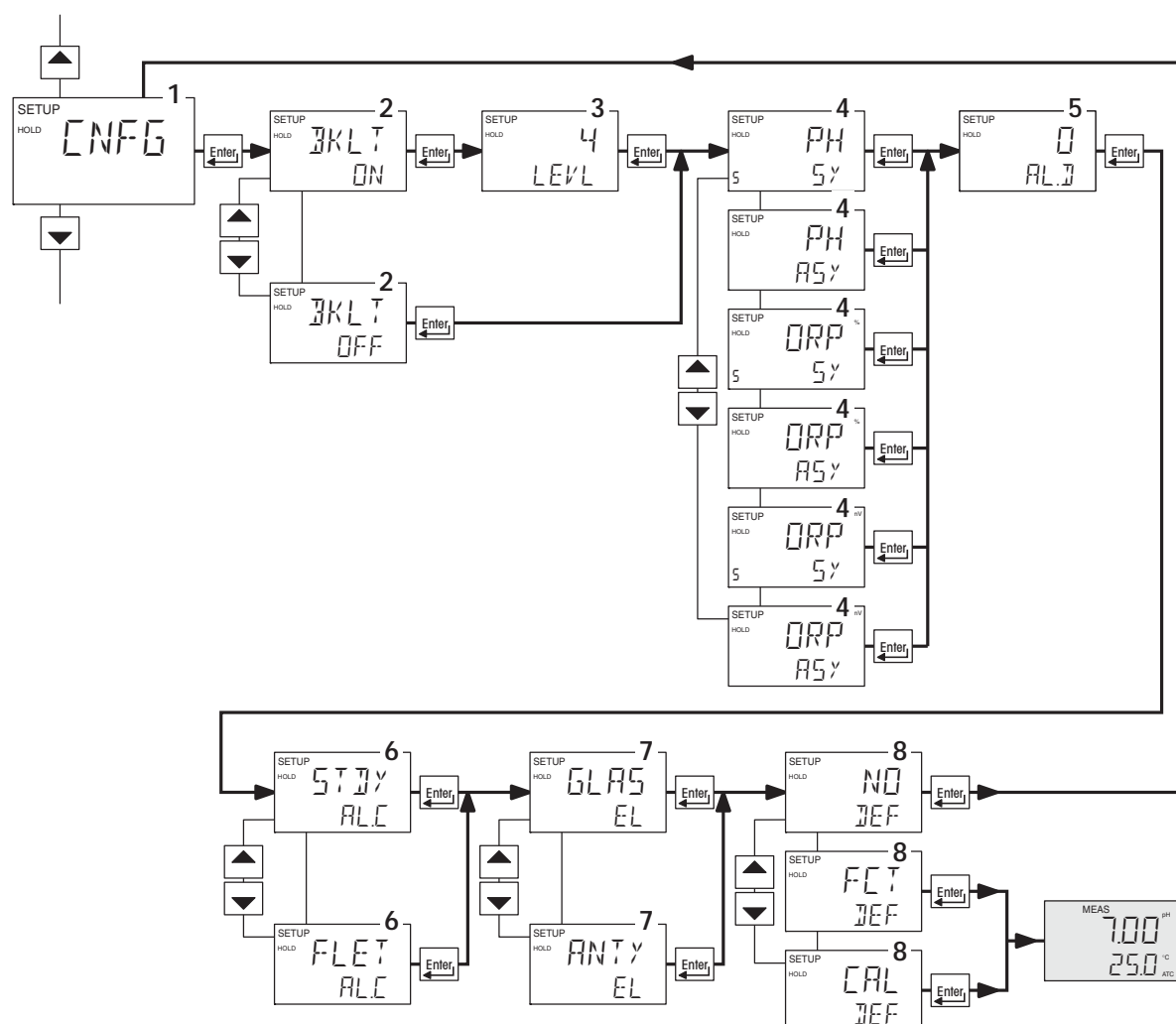
1. Select the "WASH" subfunction, then **press the ENTER** key.
 2. **Enabling/disabling wash function:** press the ▲ or ▼ key to enable (WASH ON) or disable (WASH OFF) wash function. **Press the ENTER** key to confirm your selection.
 3. **Selecting the relay status condition:** press the ▲ or ▼ key 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 199.9 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 1999 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 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 measurement mode:** press the ▲ or ▼ key to select measurement mode:
 - "PH SY" = pH measurement with symmetrical input
 - "PH ASY" = pH measurement with asymmetrical input
 - "ORP % SY" = ORP-% measurement with symmetrical input
 - "ORP % ASY" = ORP-% measurement with asymmetrical input
 - "ORP mV SY" = ORP-mV measurement with symmetrical input
 - "ORP mV ASY" = ORP-mV measurement with asymmetrical input

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 1999 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:

- "STAY" = steady contact
- "FLEET" = 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. **Selecting the sensor type:** press the ▲ or ▼ key to select the sensor type which is connected to the transmitter:

- "GLAS" = glas electrode
- "ANTY" = antimony electrode

Press the ENTER key to confirm your selection.



Note: This parameter is not available in ORP mode.

Note: After each changeover, the factory calibration data for zero point and slope are overwritten. Be sure to recalibrate (see section 5).

8. **Resetting the transmitter settings to factory defaults:** The display shows "NO DEF". Press the ▲ or ▼ key to select:

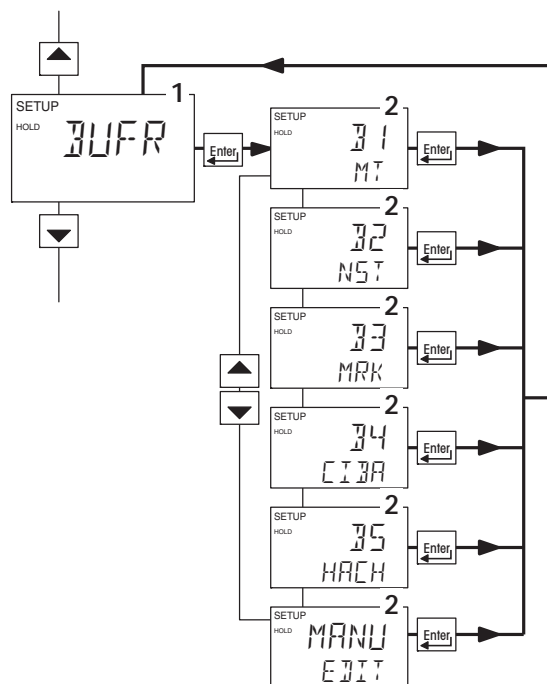
- "NO DEF" = keeps old values active, when confirmed with ENTER
- "FACT DEF" = resets all settings to factory defaults, when confirmed with ENTER
- "CAL DEF" = resets calibration settings to factory defaults, when confirmed with ENTER

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).

6.10 Buffer (BUFR) sub-function

In this subfunction you select the buffer set for calibration.



1. Select the "BUFR" subfunction, then **press the ENTER key**.
2. **Selecting the buffer set:** The display shows the currently selected buffer set. **Press the ▲ or ▼ key** to select the requested buffer:
 - B1 = MT buffer (METTLER TOLEDO)
 - B2 = NST buffer (NIST)
 - B3 = MRK buffer (Merck)
 - B4 = CIBA buffer
 - B5 = HACH buffer
 - MANU EDIT = manual buffer entry

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).



Note: See buffer tables in "Appendix 1".

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.

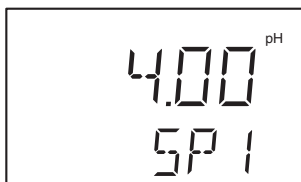
7 Relay Modes

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).

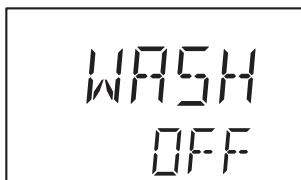
While in Measurement mode press the REL key.



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.

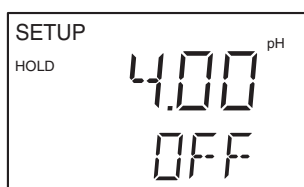
1. While in Measurement mode **press the REL MODE key**.
2. The display prompts you to enter the security code. **Press the ▲ or ▼ key** to set security code to “22”.
3. **Press the ENTER key**. The Manual relay mode is activated and the relay mode LED “MANU” lights.



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 current duration (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

pH Range	-2.00 to 16.00 pH
Resolution	0.01 pH
Relative Accuracy	± 0.01 pH
mV Range	0 to 100.0 % / -1000 to 1000 mV
Resolution	0.1 % / 1 mV
Relative Accuracy	± 1 mV
Temperature	- 9.9 to + 125.0 °C (15.0 to 257.0 °F)
Resolution	0.1
Relative Accuracy	± 0.5 °C (± 1.0 °F)
Sensor	Pt 100 /Pt 1000 (jumper selectable)
Temperature Compensation	Auto / manual

Set-point and Controller Functions

Function (switchable)	limit control P/PI control (pulse length/pulse frequency)
Integral time	0 to 999.9 minutes
Adjustable period with pulse length controller	0.5 to 20 sec.
Adjustable period with pulse frequency controller	60 to 120 pulses/min
Pickup / Dropout delay	0 to 1999 seconds
Wash cycle	0.1 to 199.9 hours
Wash duration	1 to 1999 seconds
Switching pH hysteresis	0.1 to 1 pH
Switching ORP hysteresis	1 to 10.0 % / 10 to 100 mV
Contact outputs, controller	1 SPDT, 3 SPST relays
Switching voltage	max. 250 VAC
Switching current	max. 3A
Switching power	max. 600 VA

Alarm Functions

Function (switchable)	Latching / pulse
Pickup delay	0 to 1999 seconds
Switching voltage	max. 250 VAC
Switching current	max. 3A
Switching power	max. 600 VA

Display

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

EMC Specifications

Emissions	According to EN 50081-1
Susceptibility	According to EN 50082-1

Environmental Conditions

Ambient temp. operating range	0 to +50 °C
Relative humidity	10 to 95%, non-condensing

8.2 Specifications for wall mount version

Electrical Data and Connections

Power Requirements	80 to 250 V AC/DC
Frequency	48 to 62 Hz
Signal Output	Two 0/4 to 20 mA outputs for pH/mV and temperature, galvanically isolated
Load	max. 600 Ω
pH / ORP input	screw terminals
Connection terminal	2x3-pin, 8-pin, 9-pin and 13-pin terminal blocks
Mains fuse	250 mA anti surge

Mechanical Specifications

Dimensions (L x H x W)	144 x 144 x 110 mm
Weight	950 g
Material	PBT
Insulation	NEMA 4X, IP 65

8.3 Specifications for panel mount version**Electrical Data and Connections**

Power requirements	80 to 250 V AC/DC
Frequency	48 to 62 Hz
Signal output	Two 0/4 to 20 mA outputs for pH/mV and temperature, galvanically isolated
Load	max. 600 Ω
pH / ORP input	screw terminals
Connection terminal	3-pin, 9-pin and 19-pin terminal blocks
Mains fuse	250 mA anti surge

Mechanical Specifications

Dimensions (L x H x W)	175 x 96 x 96 mm
Weight	700 g
Material	ABS
Insulation	IP 54 (front) / IP 40 (housing)

9 General Information

9.1 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.

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

9.3 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.

9.4 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.

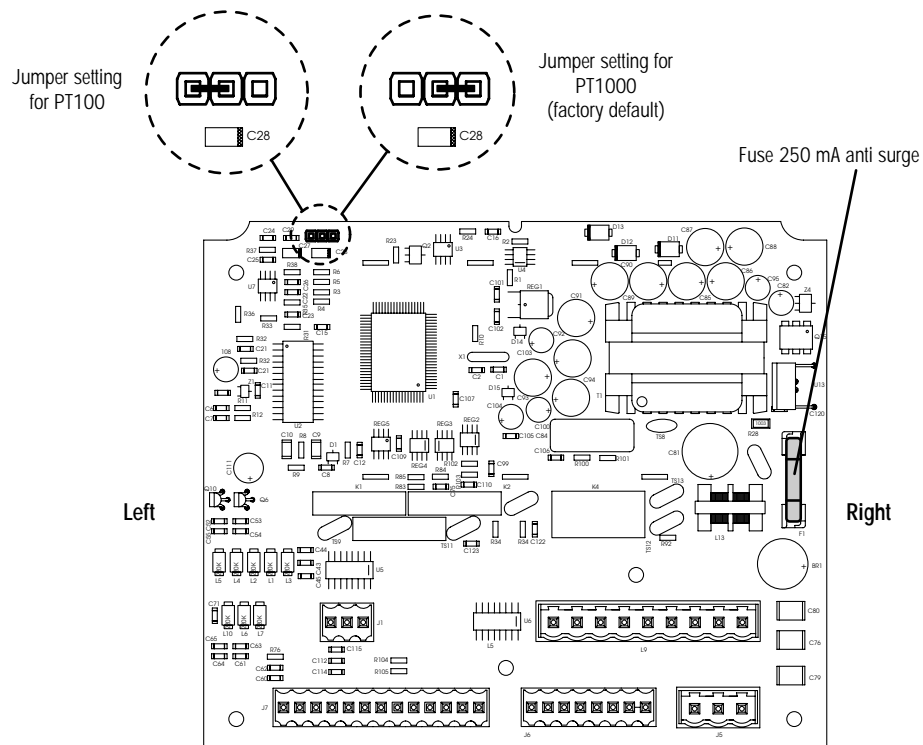
10 Appendices

10.1 Appendix 1 – Unit fuse and jumper settings

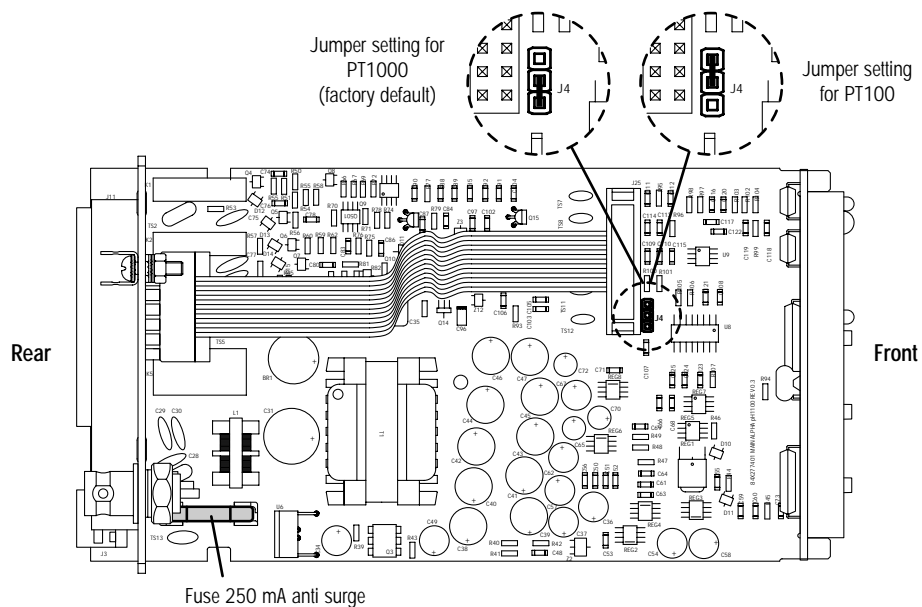


Caution! Before opening the unit to replace the unit fuse or to set the jumper for PT100/PT1000 temperature sensor, make sure the mains cable is separated from the power supply.

Wall mounting version (view from the backside)



Panel mounting version (view from top)



10.2 Appendix 2 – Buffer tables

The following tables show the various pH values at different temperature of the solution during calibration for the buffer sets used in the pH/ORP transmitter 2050 e.

METTLER TOLEDO Buffer

(°C)	pH				
0	2.03	4.01	7.12	9.52	10.32
5	2.02	4.01	7.09	9.45	10.25
10	2.01	4.00	7.06	9.38	10.18
15	2.00	4.00	7.04	9.32	10.12
20	2.00	4.00	7.02	9.26	10.06
25	2.00	4.01	7.00	9.21	10.01
30	1.99	4.01	6.99	9.16	9.97
35	1.99	4.02	6.98	9.11	9.93
40	1.98	4.03	6.97	9.06	9.89
45	1.98	4.04	6.97	9.03	9.86
50	1.98	4.06	6.97	8.99	9.83
55	1.98	4.08	6.98	8.96	9.83
60	1.98	4.10	6.98	8.93	9.83
65	1.99	4.13	6.99	8.90	9.83
70	1.99	4.16	7.00	8.88	9.83
75	2.00	4.19	7.02	8.85	9.83
80	2.00	4.22	7.04	8.83	9.83
85	2.00	4.26	7.06	8.81	9.83
90	2.00	4.30	7.09	8.79	9.83
95	2.00	4.35	7.12	8.77	9.83

NIST Buffer

(°C)	pH			
0	1.67	4.01	6.98	9.46
5	1.67	4.00	6.95	9.36
10	1.67	4.00	6.92	9.33
15	1.67	3.99	6.90	9.28
20	1.68	4.00	6.88	9.23
25	1.68	4.01	6.87	9.18
30	1.68	4.01	6.85	9.14
35	1.69	4.02	6.84	9.10
40	1.69	4.03	6.84	9.07
45	1.70	4.04	6.83	9.04
50	1.71	4.06	6.83	9.01
55	1.71	4.07	6.83	8.99
60	1.72	4.09	6.84	8.96
65	1.73	4.11	6.84	8.94
70	1.74	4.13	6.85	8.92
75	1.75	4.15	6.85	8.90
80	1.77	4.16	6.86	8.89
85	1.78	4.195	6.87	8.87
90	1.79	4.03	6.88	8.85
95	1.81	4.23	6.89	8.83

Merck Buffer

(°C)	pH				
0	2.01	4.05	7.13	9.24	12.58
5	2.01	4.04	7.07	9.16	12.41
10	2.01	4.02	7.05	9.11	12.26
15	2.00	4.01	7.02	9.05	12.10
20	2.00	4.00	7.00	9.00	12.00
25	2.00	4.01	6.98	8.95	11.88
30	2.00	4.01	6.98	8.91	11.72
35	2.00	4.02	6.96	8.88	11.67
40	2.00	4.03	6.95	8.85	11.54
45	2.00	4.04	6.95	8.82	11.44
50	2.00	4.00	6.95	8.79	11.33
55	2.00	4.00	6.95	8.76	11.19
60	2.00	4.00	6.96	8.73	11.04
65	2.00	4.00	6.96	8.72	10.97
70	2.01	4.00	6.96	8.70	10.90
75	2.01	4.00	6.96	8.68	10.80
80	2.01	4.00	6.97	8.66	10.70
85	2.01	4.00	6.98	8.65	10.59
90	2.01	4.00	7.00	8.64	10.48
95	2.01	4.00	7.02	8.64	10.37

CIBA Buffer

(°C)	pH			
0	2.04	4.00	7.10	10.30
5	2.09	4.02	7.08	10.21
10	2.07	4.00	7.05	10.14
15	2.08	4.00	6.90	10.06
20	2.09	4.01	6.88	9.99
25	2.08	4.02	6.98	9.95
30	2.06	4.00	6.96	9.89
35	2.06	4.01	6.95	9.85
40	2.07	4.02	6.94	9.81
45	2.06	4.03	6.93	9.77
50	2.06	4.04	6.93	9.73
55	2.05	4.05	6.91	9.68
60	2.08	4.10	6.93	9.66
65	2.07 **	4.10 **	6.92 **	9.61 **
70	2.07	4.11	6.92	9.57
75	2.04 **	4.13 **	6.92 **	9.54 **
80	2.02	4.15	6.93	9.52
85	2.03 **	4.17 **	6.95 **	9.47 **
90	2.04	4.20	6.97	9.43
95	2.05 **	4.22 **	6.99 **	9.38 **

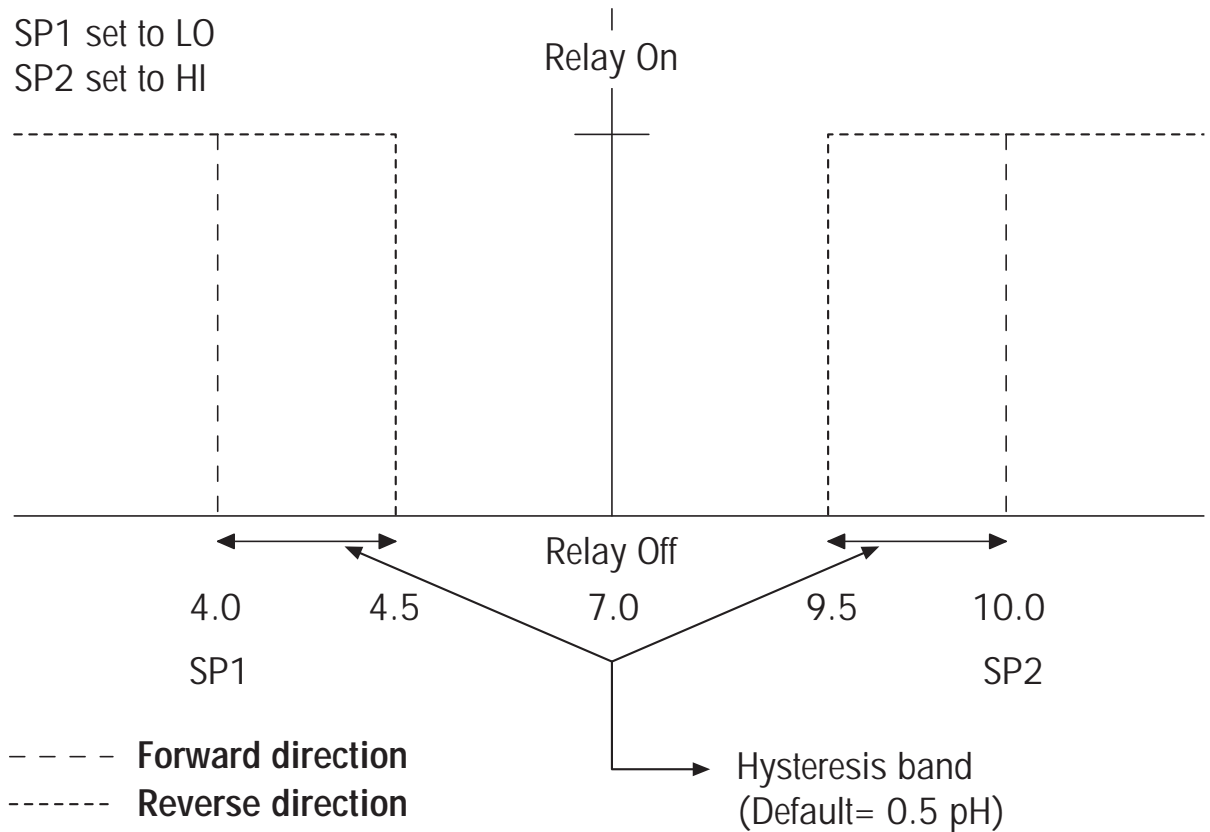
** extrapolated

HACH Buffer

(°C)	pH		
0	4.00	7.14	10.30
5	4.00	7.10	10.23
10	4.00	7.04	10.11
15	4.00	7.04	10.11
20	4.00	7.02	10.05
25	4.01	7.00	10.00
30	4.01	6.99	9.96
35	4.02	6.98	6.92
40	4.03	6.98	6.88
45	4.05	6.98	6.85
50	4.06	6.98	6.82
55	4.07	6.98	6.79
60	4.09	6.99	9.76
65	4.09 **	6.99 **	9.76 **
70	4.09 **	6.99 **	9.76 **
75	4.09 **	6.99 **	9.76 **
80	4.09 **	6.99 **	9.76 **
85	4.09 **	6.99 **	9.76 **
90	4.09 **	6.99 **	9.76 **
95	4.09 **	6.99 **	9.76 **

** values complemented

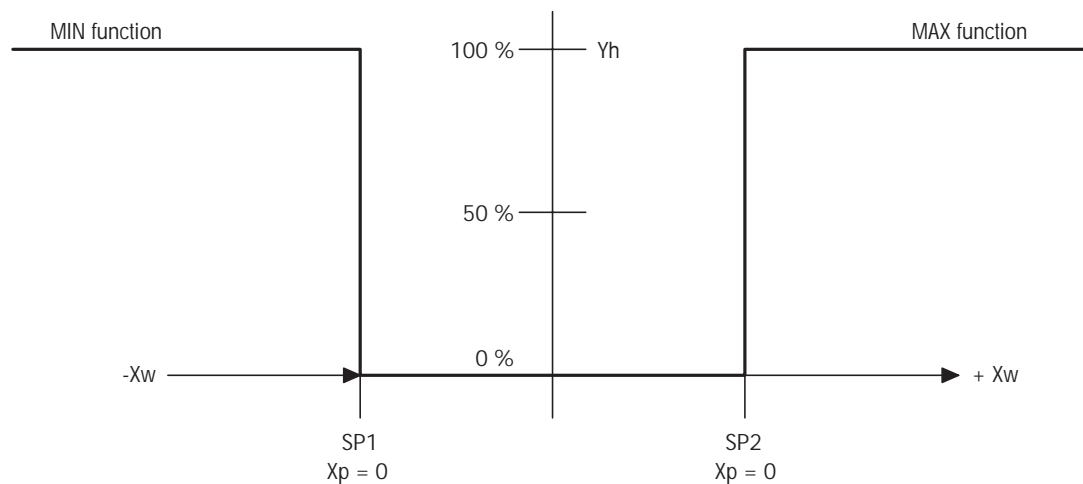
10.3 Appendix 3 – Simple explanation on the function of hysteresis



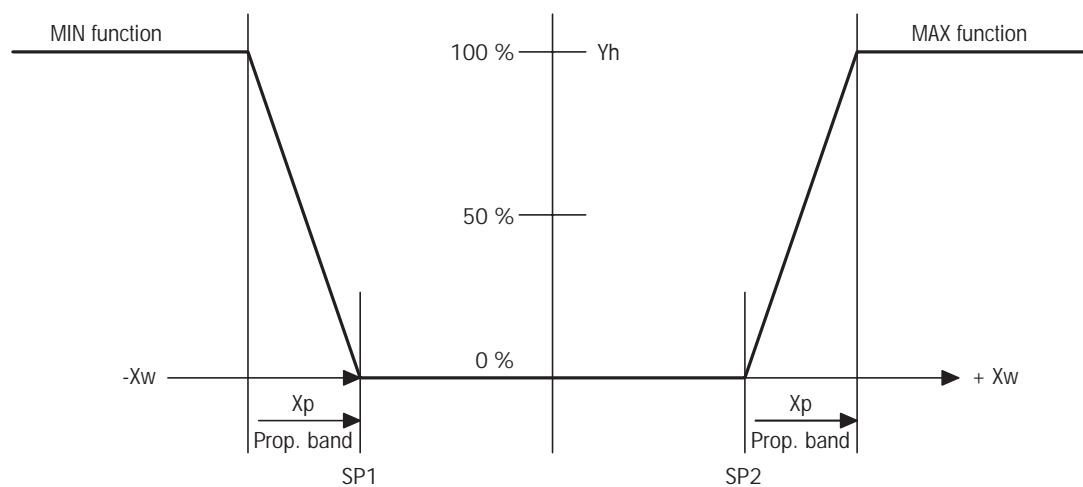
The controller relay activates when the set-point is reached. In the reverse direction, it does not de-activate when the value reaches the set-point. Instead, it continues to be active till the value reaches the amount set by the Hysteresis band.

10.4 Appendix 4 – General instructions concerning controller Setting

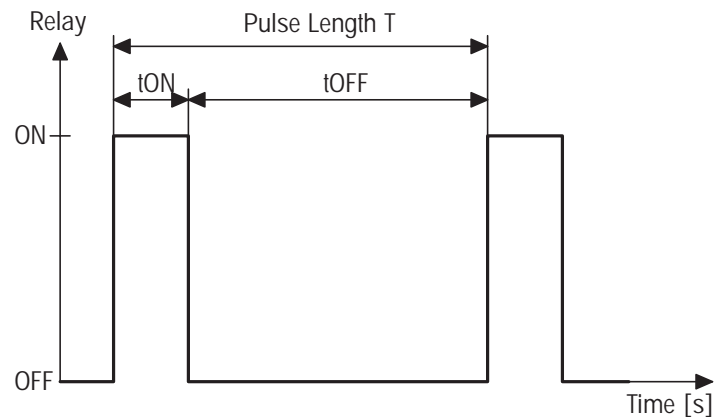
Control characteristic of Controllers used as limit value switch



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 .

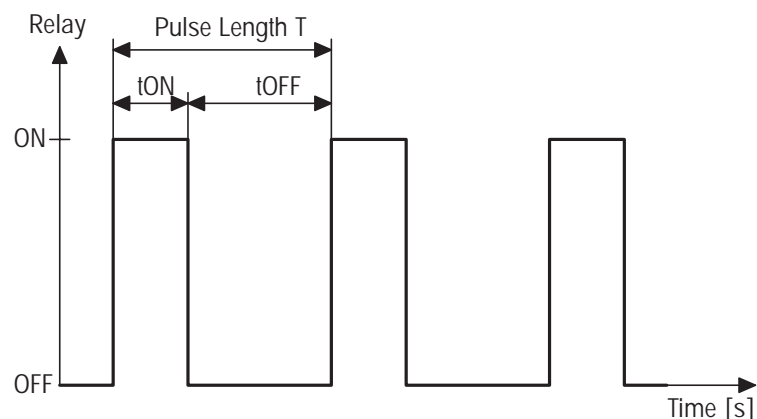
The following applies:

$$t_{ON} + t_{OFF} = T \text{ (Const.)}$$

greater divergence \rightarrow greater t_{ON}

X_p exceeded $\rightarrow t_{ON} = T$ (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 250mS. 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:

$$t_{ON} = \text{Const. (250 msec.)}$$

greater divergence \rightarrow greater f (greater frequency)

X_p exceeded \rightarrow max. frequency

10.5 Appendix 5 – Abbreviations used in menu displays

Abbreviation	Meaning	Abbreviation	Meaning
MEAS	Measurement	T.PL	Pulse length time
CAL	Calibration	F.PF	Pulse frequency time
ENT	Enter	IAT	Integral action time
OFS	Offset	RNG	Range
C.CD	Calibration security code	OUT	Output signal
S.CD	Setup security code	CONF	Configuration
SET	Setting	PH SY	Symmetrical pH mode
ATC	Automatic temperature compensation	PH ASY	Asymmetrical pH mode
SP1	Setpoint 1	ORP SY	Symmetrical ORP mode
SP2	Setpoint 2	ORP ASY	Asymmetrical ORP mode
LO	Low limit	Alr	Alarm
HI	High limit	CIn	Clean
HYS	Hysteresis	STDY	Steady
ON.D	On delay	FLET	Fleet, impulse
OF.D	Off delay	GLAS EL	Glas electrode
CNTR	Controller	ANTY EL	Antimony electrode
L.CT	Limit control	DEF	Default
PLC	Pulse length control	FCT DEF	Factory default
PFC	Pulse frequency control	CAL DEF	Calibration default
PROP	Proportional control	BUFR	Buffer
EN	Energized	MANU	Manual
DEEN	Deenergized	CUR.1	Output current 1
REL	Relay	CUR.2	Output current 2
PRP	Proportional band	WASH	Wash
		CU22	Output current 22mA

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