

Alpha pH 2000D

pH/ORP controller/transmitter



Preface

This manual serves to explain the use of the Alpha-pH2000D series pH/ORP controller/transmitter. The manual functions in two ways, firstly as a step by step guide to help the user operate the instrument. Secondly, it serves as a handy reference guide. This instruction manual is written to cover as many anticipated applications of the Alpha-pH2000D pH/ORP controller/transmitter. If you have doubts in the use of the instrument, please do not hesitate to contact the nearest Alpha Authorised Distributor.

The information presented in this manual is subject to change without notice as improvements are made, and does not represent a commitment on part of Thermo Scientific.

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

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Safety Information

The Controller/ Transmitter shall be installed and operated only in the manner specified in the Instruction manual. Only skilled, trained or authorized person should carry out installation, setup and operation of the instrument.

Before powering up the unit, make sure that power source it is connected to, is as specified in the top label. Failure to do so may result in a permanent damage to the unit.

The unit has live and exposed parts inside. If it has to be opened, make sure that the power to the unit is off and disconnected.

The unit is Fuse protected. In the event the fuse has to be replaced, use only those as specified in the manual.

The degree of protection against electric shock will be achieved only by observance of the corresponding installation rules.

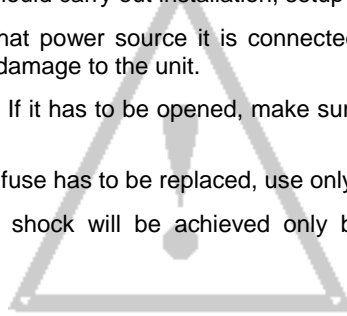


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INTRODUCTION

1.1 At the beginning

We thank you for having purchased the Alpha pH 2000D pH/ORP Controller.

The construction of the pH/ORP Controller 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.

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 Controller.

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

1.2 Intended Use

The Alpha pH 2000D pH/ORP Controllers 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 Alpha pH 2000D should be installed and operated only by personnel familiar with the transmitter and who are qualified for such work.
- A defective controller must neither be installed nor put into service.
- The Alpha pH 2000D must only be operated under the specified operating conditions (see section 8).
- The Alpha pH 2000D must not be repaired by the customer.
- The Alpha pH 2000D must only be opened to replace the unit fuse. 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 Alpha pH 2000D are allowed. The manufacturer/supplier accepts no responsibility for damage caused by unauthorized 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 distributor, they will take care of proper disposal.

2.1 Description of Unit

The Alpha pH 2000D is used for measuring pH and temperature values. The pH values can be measured using industrial differential & combination pH sensors. The temperature values can be measured using 2-wire / 3-wire NTC300 thermistor. The transmitter is available in a wall mounting enclosure. The controller / 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.

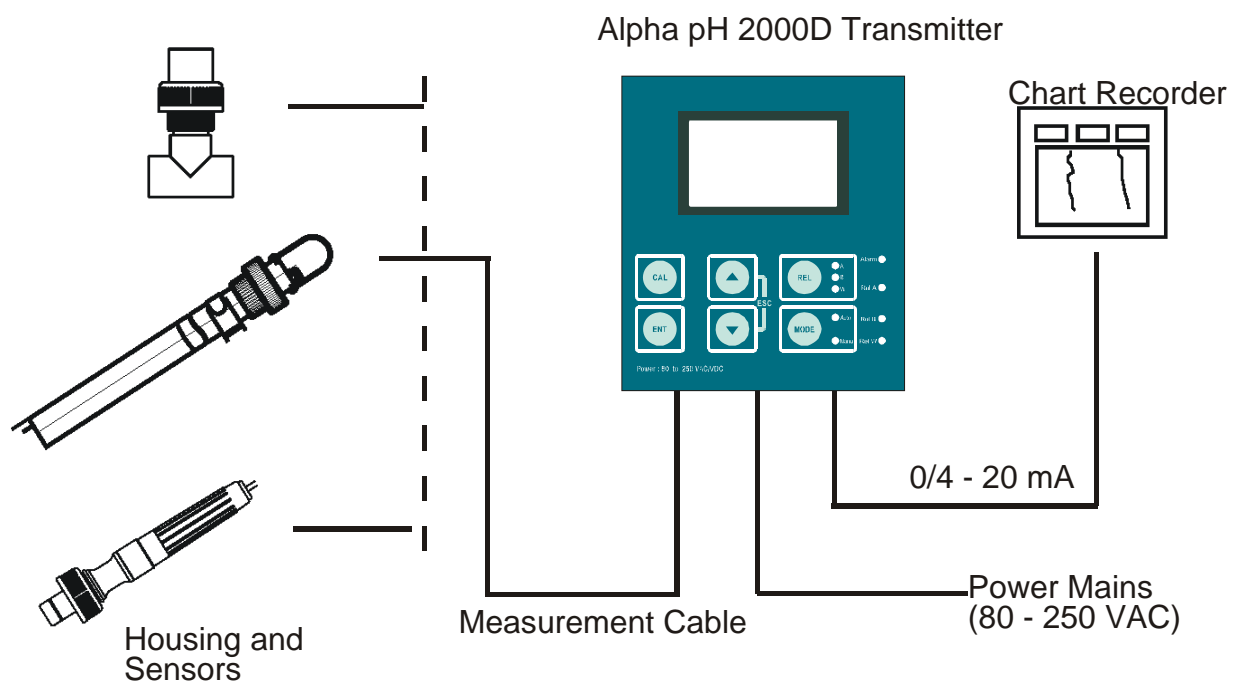
This transmitter has many user-friendly and safety features which include:

- Push-button for calibration and sensor offset adjustment from the keypad.
- Built-in non-volatile memory to ensure that calibration and other information are not erased if power supply fails.
- Menu-driven program that simplifies set-up.
- 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.
- Two switching contacts as set-point relays.
- 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.
- Separate alarm relay alerting you to set point limits exceeded for a certain time and if the NTC300 thermistor 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 lit and UV light protected LC display.

2.2 Measurement and Control System

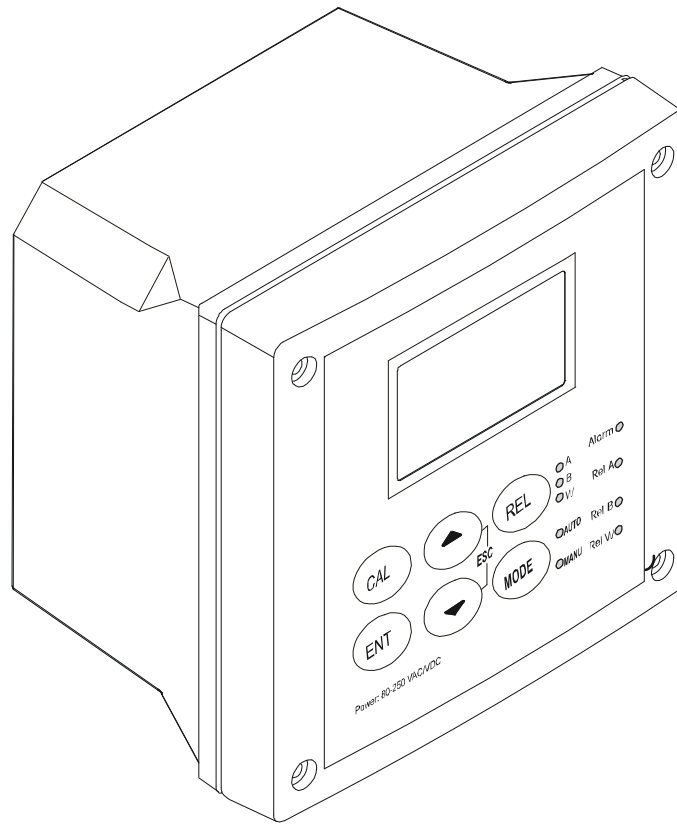
A typical measurement system consists of:

- A pH/ORP process controller
- A pH/ORP combination electrode with integrated or separate temperature sensor NTC300 thermistor.
- An appropriate pH or ORP measurement cable
- An immersion, flow or process assembly with or without a potential matching pin (PMP)
- A final control element such as pump or valve
- A chart recorder



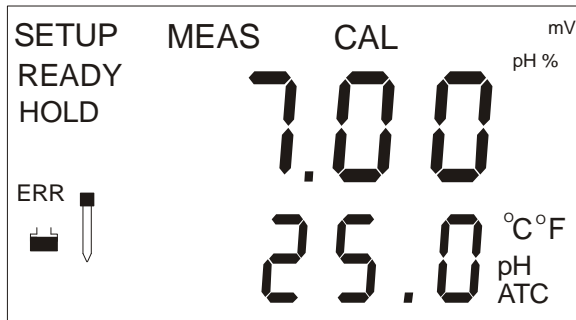
2.3 Unit Overview

Wall 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 indicator:

READY: Visible after successful calibration







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

S: Visible in symmetrical measurement mode

2.3.2 Key functions

Key	Description
	Enter Calibration mode (requires access code)
	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/Confirm 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.
	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
	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
- Manu

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

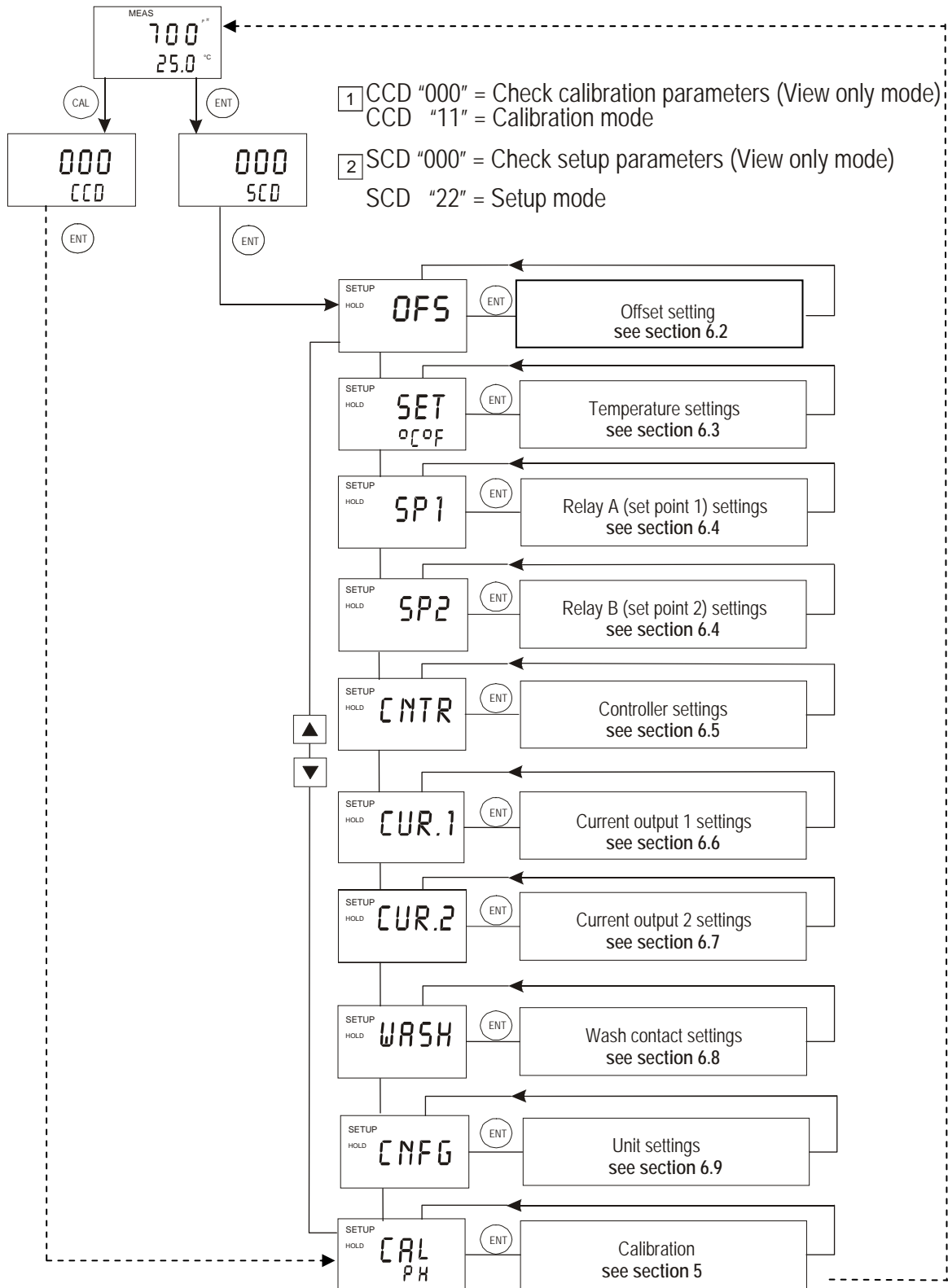
This LED lights if cleaning cycle is on.

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

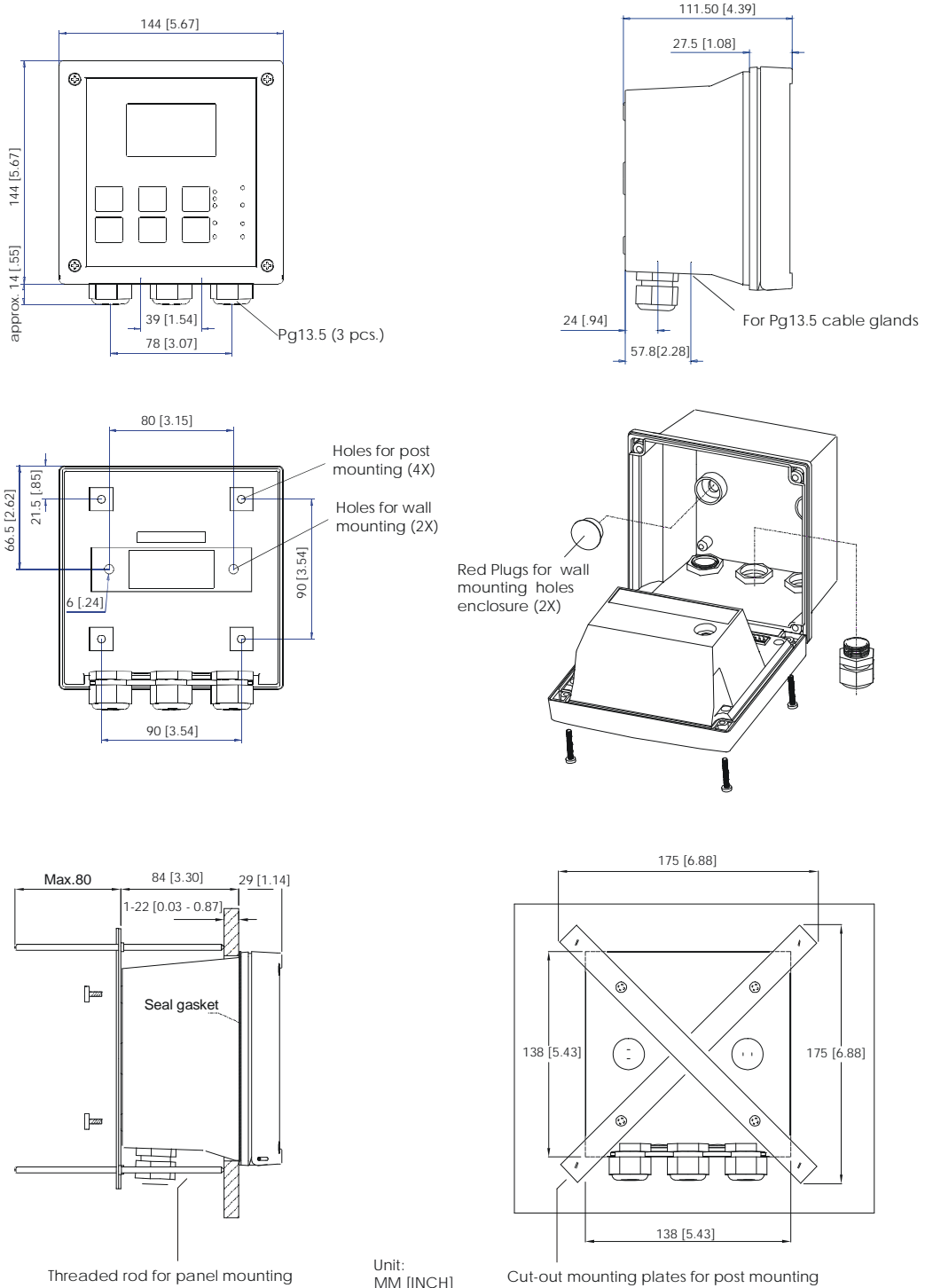
2.3.5 Menu overview



3. Assembly and Installation

3.1 Mounting the Unit

Wall mounting version



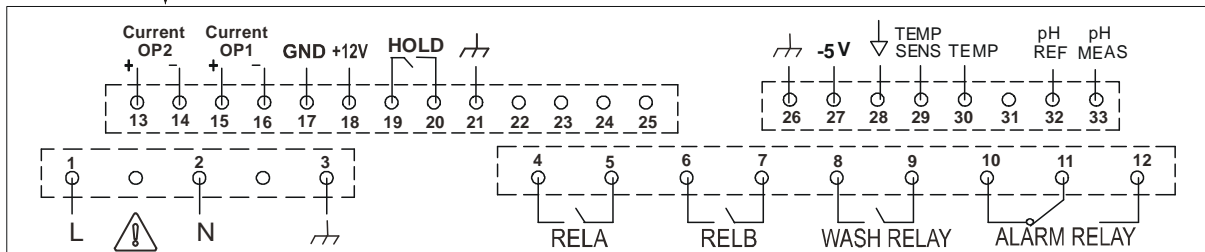
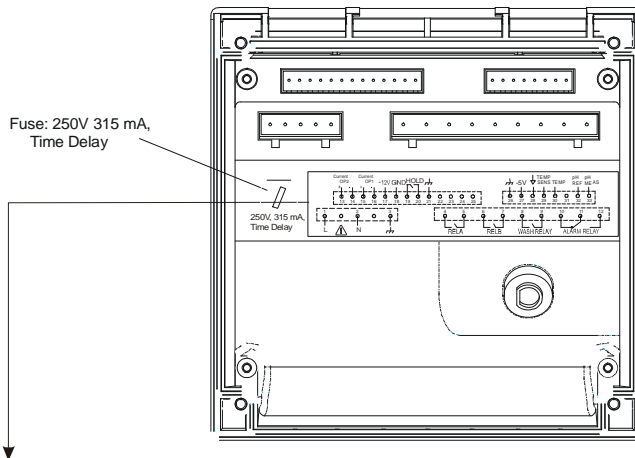
Transmitter housing for wall mounting: protection class IP 65

3.2 Connection Diagram



Caution: Ensure electrical mains are disconnected before proceeding.

Connections for wall mounting version



1.	AC mains live wire	18.	12V output Power supply
2.	AC mains neutral wire	19.	Hold Function
3.	AC mains protective earth wire	20.	Hold Function
4.	Relay A (SP 1)	21.	Earth ground
5.	Relay A (SP 1)	22.	no connection
6.	Relay B (SP 2)	23.	no connection
7.	Relay B (SP 2)	24.	no connection
8.	Wash relay	25.	no connection
9.	Wash relay	26.	Shield (<i>drain wire</i>)
10.	Alarm relay (NC)	27.	-5V to differential pH sensor (<i>White wire</i>)
11.	Alarm relay common	28.	Temperature ground (<i>black wire</i>)
12.	Alarm relay (NO)	29.	Temperature Sense (<i>Yellow wire</i>)
13.	4-20 mA temperature output, +ve terminal	30.	Temperature Input (<i>Yellow wire</i>)
14.	4-20 mA temperature output, -ve terminal	(Internally connected by jumper to terminal 29)	
15.	4-20 mA pH/ORP output, +ve terminal	31.	No connection
16.	4-20 mA pH/ORP output, -ve terminal	32.	pH input, Reference (<i>Green wire</i>)
17.	12V output ground	33.	pH input, Measure (<i>Red wire</i>)



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).



NOTE:

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

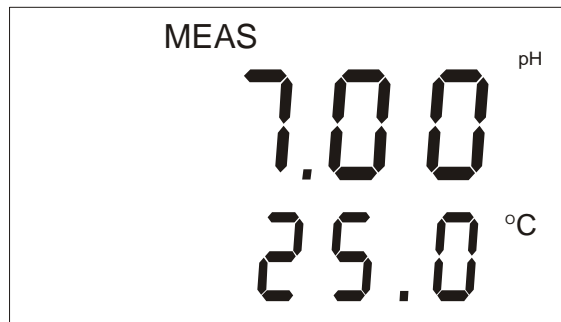
4 Normal Operation

4.1 Measurement Mode

When the controller/transmitter is powered on, the display first shows all segments briefly, after which the controller/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 the temperature value if the controller 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 controlling 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 ENT key followed by the corresponding security code. For detailed information refer to **section 5 "Calibration mode"** or **section 6 "Setup mode"**, respectively.

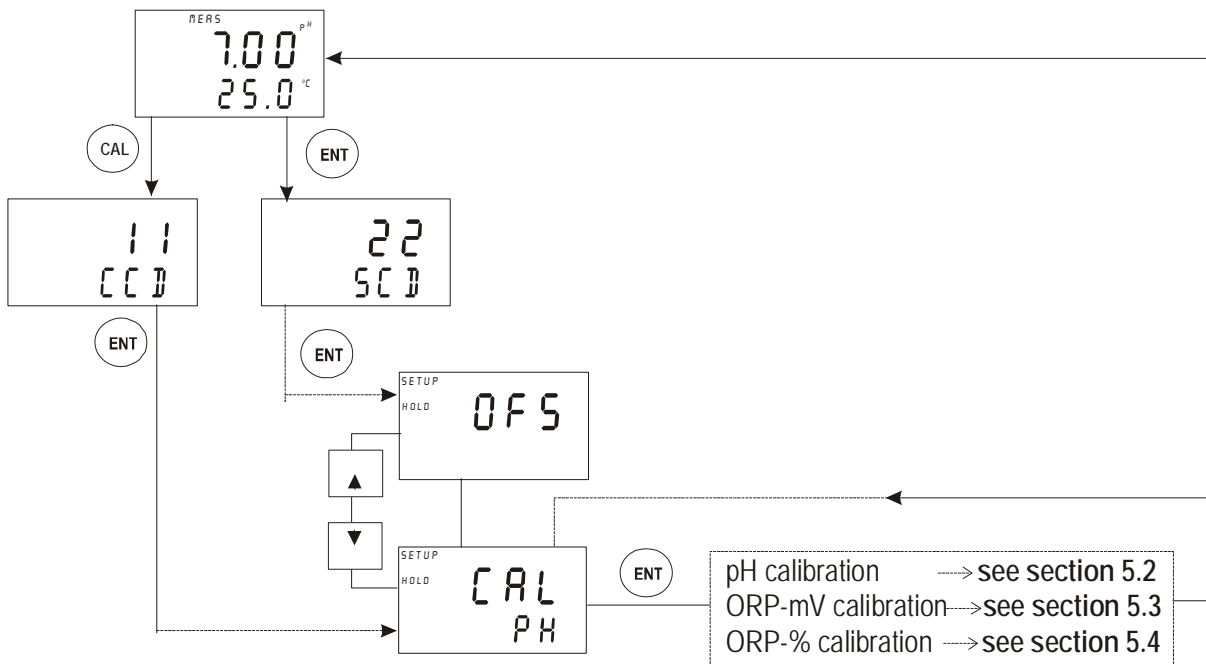
By pressing the **REL** key in Measurement mode you can view the actual relay set points. By pressing the **MODE** key followed by the corresponding security code in Measurement mode you can switch relay operation mode from automatic to manual.

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

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 **ENT 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", and then **press the ENT key** to confirm the calibration security code.
3. If **ENT 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 ENT key** to confirm the security code, and then **press the ▲ or ▼ key** to select the calibration sub-function.

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).



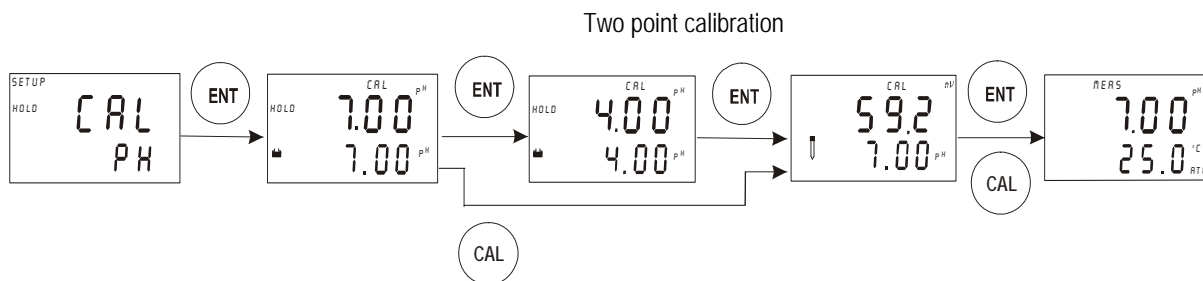
Note: to exit Calibration mode at any time **press the ▲ and ▼ keys simultaneously** (escape). The transmitter returns to the Measurement mode and the old calibration values remain active. The calibration security code automatically resets from "11" to "000" after the transmitter returns to Measurement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



Note: The calibration is always carried out in the units (pH or mV or %) selected in setup mode. The pH controller/transmitter allows a 1-point or 2-point calibration.

5.2 pH Calibration

If the unit of measure is in pH (default), then the calibration is also carried out in pH. This transmitter features a one-point or two-point calibration for pH with five preset buffer sets. Buffer values refer to 25 °C. A standard pH buffer solution that matches one of these values is required to calibrate the instrument.



One point calibration

1. **Enter Calibration mode** as described in section 5.1. The display shows “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 ENT key** to start calibration. The “CAL” indicator appears at the top of display and the buffer indicator appears in the bottom corner of the display. The display shows the **actual pH reading** (upper value) and the **buffer value for zero point** (lower value). For the offset (zero point) calibration, there are two values to choose from. They are pH 7.00 or pH 6.86. **Using the ▲ and ▼ keys**, choose the value that matches with the buffer used.
3. Place the electrode in the first buffer solution. In ATC mode, you must also immerse the temperature probe in the buffer solution.
4. You can conduct either a one-point or a two-point calibration: **Press the ENT for two point** calibration or the **CAL key for one point** calibration. The electrode indicator and CAL indicator both flash for a few seconds. The controller automatically adjusts the reading to match the buffer value.
5. If one-point calibration was selected, the display will show the zero point in the lower section of the display and the slope (default or using previous two-point calibration) in the upper section of the display. Proceed to step 7 after zero point display. 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 these preset value: - pH 1.68, pH 4.01, pH 9.00, pH 9.18 and pH 10.01. Remove the electrode from the first buffer, wash and then immerse it into the second buffer. **Press the ENT key**, the electrode indicator and CAL indicator will flash for a few seconds. The controller adjusts the reading to the second buffer.
6. After calibrating the second buffer value, the controller 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 pre-determined after each calibration.

7. **Press the ENT key** to return to the Measurement mode.

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



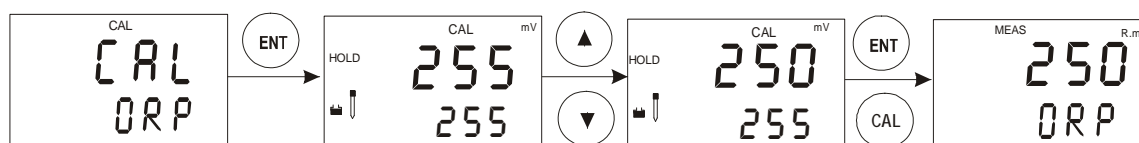
Note: If there is a calibration error, the controller displays “CAL ERR”. If this happens, push both ▲ and ▼ keys (escape) to restart the calibration beginning from Step 1.



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

5.3 ORP-mV Calibration

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



1. Enter Calibration mode as described in section 5.1. The display should read “CAL ORP”.

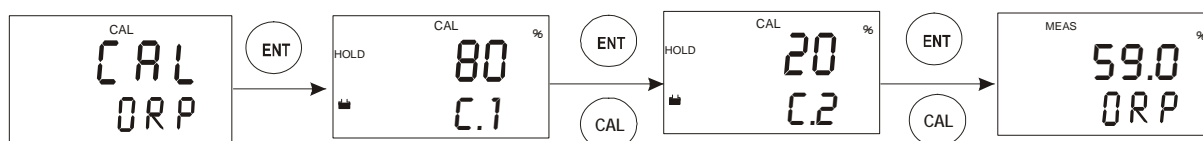


Note: If the display reads “CAL PH”, see section 6.9 for procedures on how to switch from pH to ORP-mV readings.

2. Place sensor in the ORP solution.
3. Press the **ENT** key to start calibration. The “CAL”, buffer and electrode indicator appears on the display. The upper and lower display shows the current mV output of the electrode without any offset adjustment.
4. Press the **▲** or **▼** key to adjust the upper display mV value to match your exact reading.
5. Press the **ENT** key (or **CAL** key) to confirm. The controller calculates the correction factor and returns to the Measurement mode. The “R.mV” annunciator (Relative mV) will be shown on the display indicating that the value displayed is the relative mV value of the default measurement.

5.4 ORP -% Calibration

If controller 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%). To calibrate the controller for ORP %:



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 6.9 for procedures on how to switch from pH to ORP-mV readings.

2. Press the **ENT** 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 high concentration sample, then press the **ENT** key (or **CAL** 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 **ENT** key (or **CAL** key). The electrode and “CAL” indicator flashes and the controller adjust its display to the 20% relative value and exits to the Measurement mode.

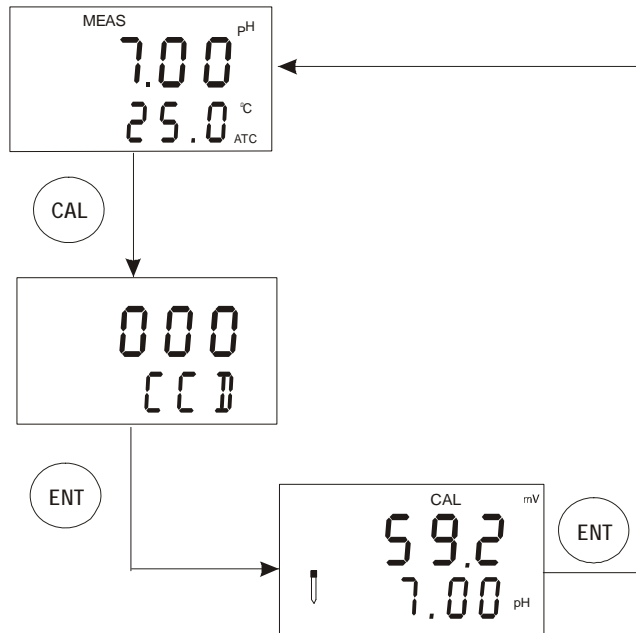


Note: If there is a calibration error, the controller displays “CAL ERR”. If this happens, push both **▲** or **▼** keys (escape) to restart the calibration beginning from Step 1.



Note: If you stop calibration after entering the first value, or if calibration is defective, the controller 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 ENT 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.

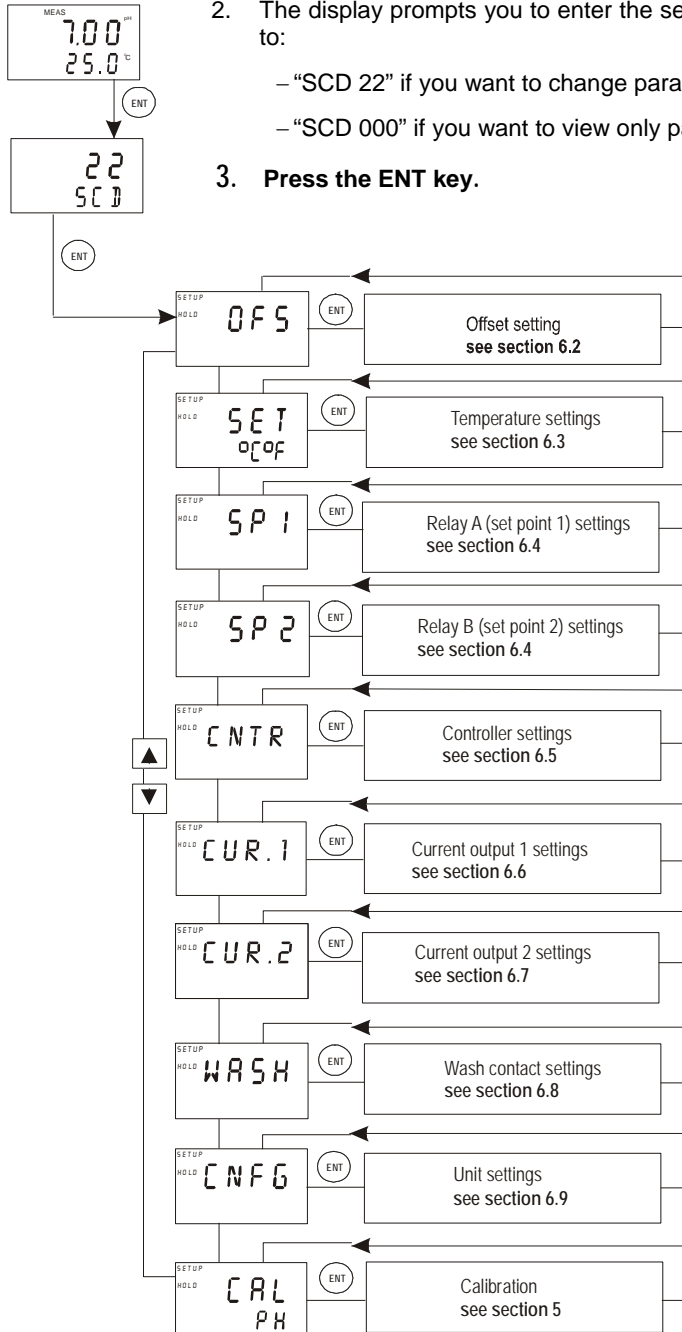
3. **Press the ENT key** to return to the Measurement mode.

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 ENT 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 ENT key.**



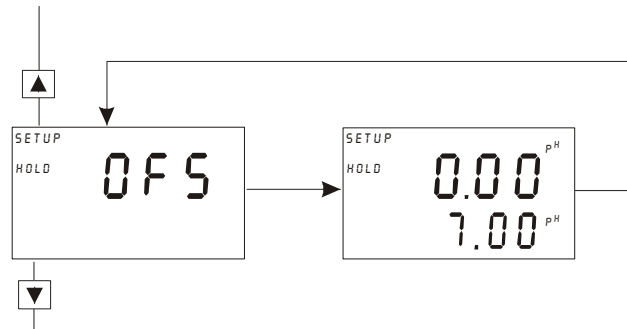
Note: Note: to exit Setup mode at any time press the ▲ and ▼ key simultaneously (escape). The transmitter returns to the Measurement mode.

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 sub-function 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 measuring 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 controller'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" sub-function, and then **press the ENT key**.



4. The display shows the current **measured pH value** (lower section of the display) and the current **offset value** (upper section of the display). **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 ENT 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.

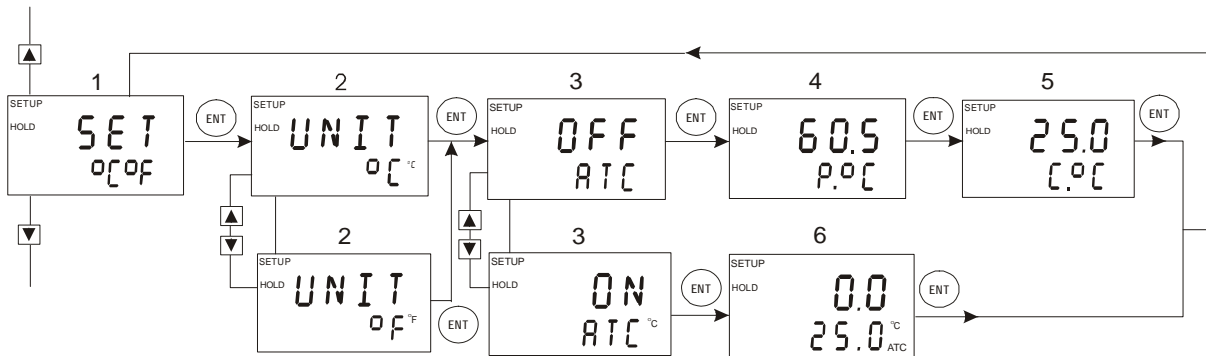


Note: The offset value is reset during full calibration. See section 5 for full calibration instructions.



Note: The offset sub-function is blanked out during ORP operation.

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

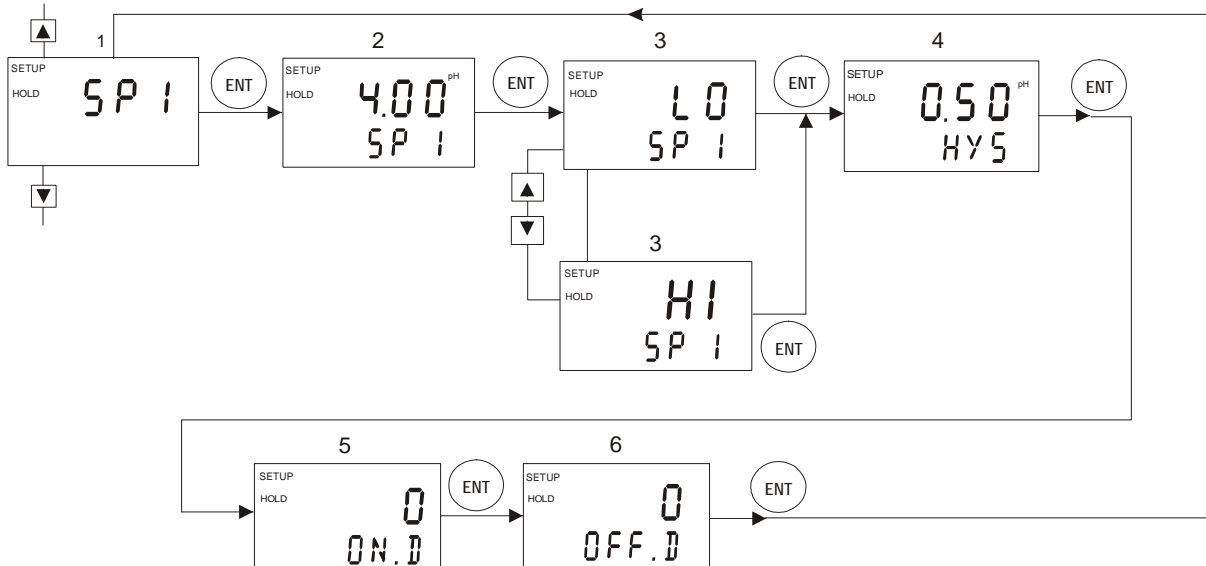


1. Select the “SET °C°F” sub-function, then **press the ENT key**.
2. **Selecting temperature unit: press the ▲ or ▼ key** to select the desired temperature unit “°C” or “°F”. Press the ENTER key to confirm your selection.
3. **Enable/disable ATC mode: press the ▲ or ▼ key** to enable (ATC ON) or disable (ATC OFF) automatic temperature compensation. **Press the ENT 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 ENT 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 ENT 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 **ENT** key to confirm your setting.
 - Continue with additional Setup procedures, or return to the Measurement mode by pressing the ▲ and ▼ key (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 “SP1” (Relay A) or “SP2” (Relay B) sub-function, then **press the ENT key**.
2. **Setting set point value: press the ▲ or ▼ key** to enter the value for set point 1 (set point 2) at which your controller will activate. **Press the ENT 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 ENT key** to confirm your selection.



Note: This parameter lets you choose the relay function. Select “LO” to activate the relay when the pH/ORP value undershoots the set point; select “HI” to activate the relay when the value overshoots the 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: 0.1 to 1.0 pH, 10 to 100mV or 1 to 10%) for set point 1 (set point 2). **Press the ENT 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 pH 10.0 and your hysteresis value at pH 0.5. If your measured value overshoots pH 10.0, 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 9.5 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 2000 seconds) you select. **Press the ENT 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 ENT key** to confirm your setting.

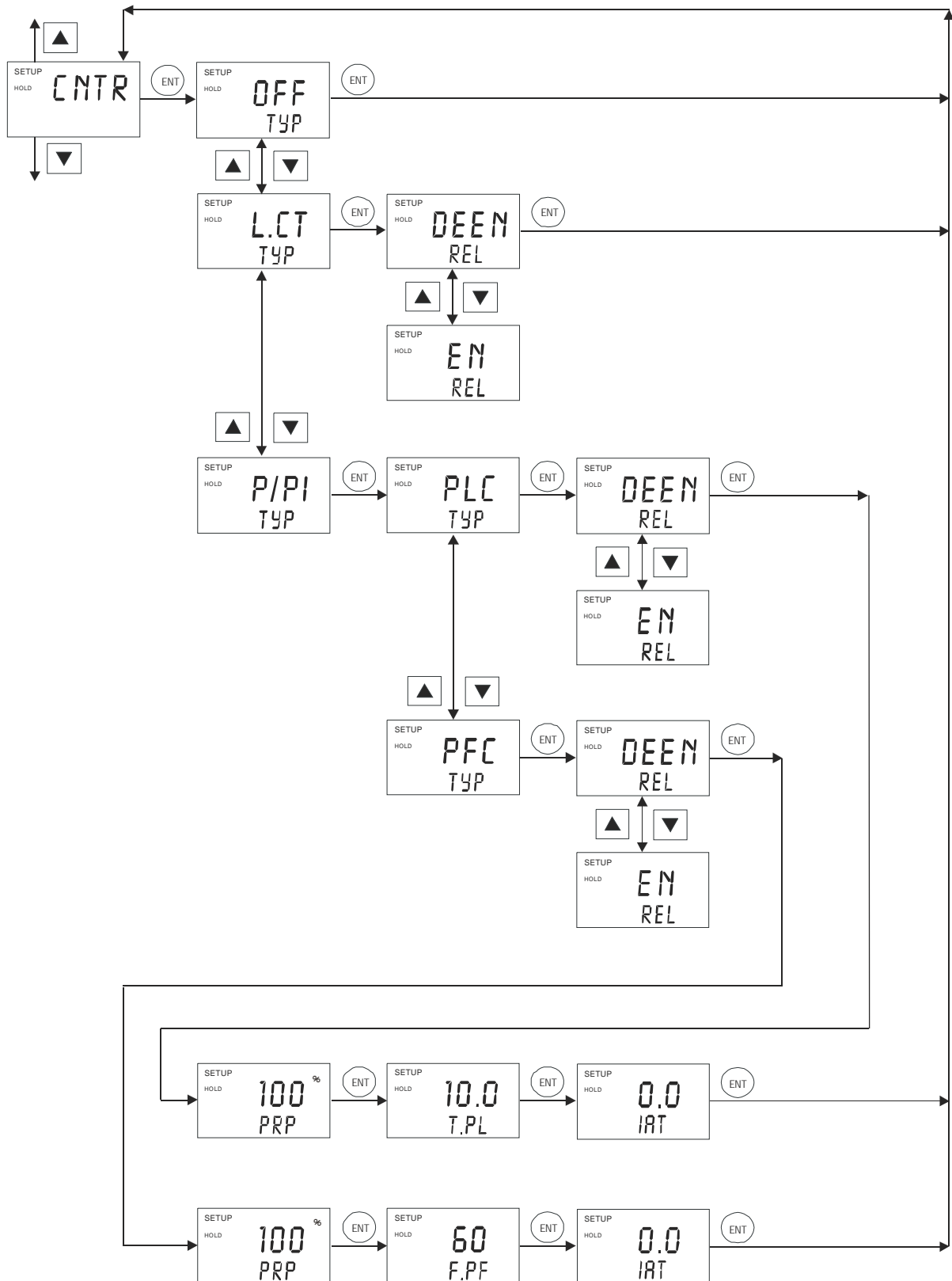


Note: You can set a time delay for each relay, which stops the relay from switching off the moment the value reaches the set point and hysteresis. This controller lets you set a 0 to 2000 seconds time delay before your relay deactivates.

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" sub function, then **press the ENT 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.

– L.CT = 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 ENT key to confirm your selection.

– If the controller is set to **limit value control (L.CT)**:

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 ENT 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 ENT 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 ENT 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 ENT 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 ENT 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 ENT 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 ENT 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 ENT key** to confirm your setting.

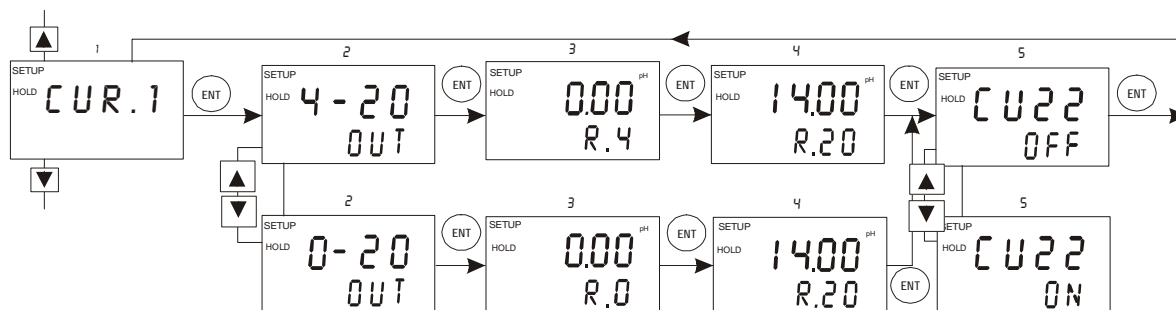
11. **Setting the pulse frequency: press the ▲ or ▼ key** to set the pulse frequency (setting range: 60 to 120 pulses per minute). **Press the ENT key** to confirm your setting.

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 ENT 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 sub-function you set the current output range of the transmitter for pH or ORP values.



1. Select the “CUR.1” sub-function, and then **press the ENT 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 ENT 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 ENT 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 ENT 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 measured pH and ORP value is below or above the values set in points 3 & 4 above. **Press the ENT key** to confirm your setting.

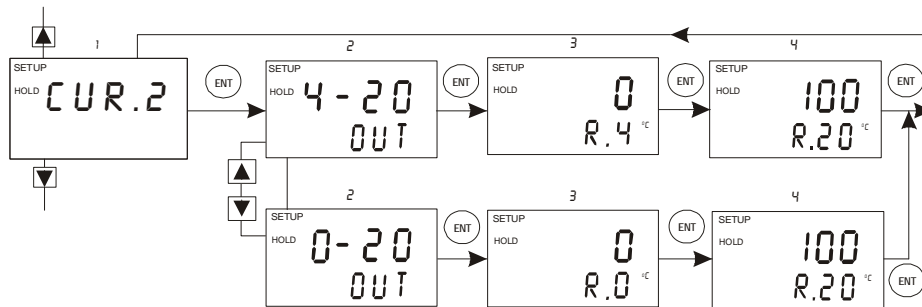


Note: the “CU22” setting (on/off) of current output 1 applies to current output 2 as well.

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 sub-function you set the current output range of the transmitter for temperature values.

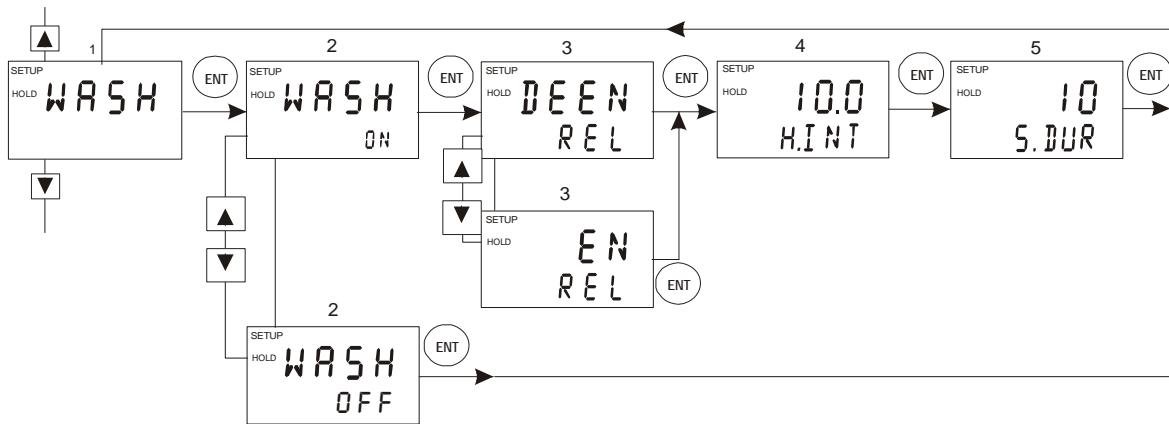


1. Select the "CUR.2" sub-function, then **press the ENT key**.
2. **Selecting the output type: press the ▲ or ▼ key** to select the desired output type: 0-20 mA or 4-20 mA. **Press the ENT key** to confirm your selection.
3. **Setting the temperature value at which the transmitter output will be 4 mA (or 0 mA): press the ▲ or ▼ key** to set the temperature value (setting range: -10.0 to 110.0 °C or 14 to 230 °F for NTC300 thermistor) to be equivalent to 4 mA (or 0 mA). **Press the ENT 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 110.0 °C or 32 to 230 °F for NTC300 thermistor) to be equivalent to 20 mA. **Press the ENT 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 sub-function you set the parameters for the wash relay.



1. Select the “WASH” sub-function, and then **press the ENT key**.
2. **Enabling/disabling wash function: press the ▲ or ▼ key** to enable (WASH ON) or disable (WASH OFF) wash function. **Press the ENT 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 ENT 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 ENT 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 ENT key** to confirm your setting.

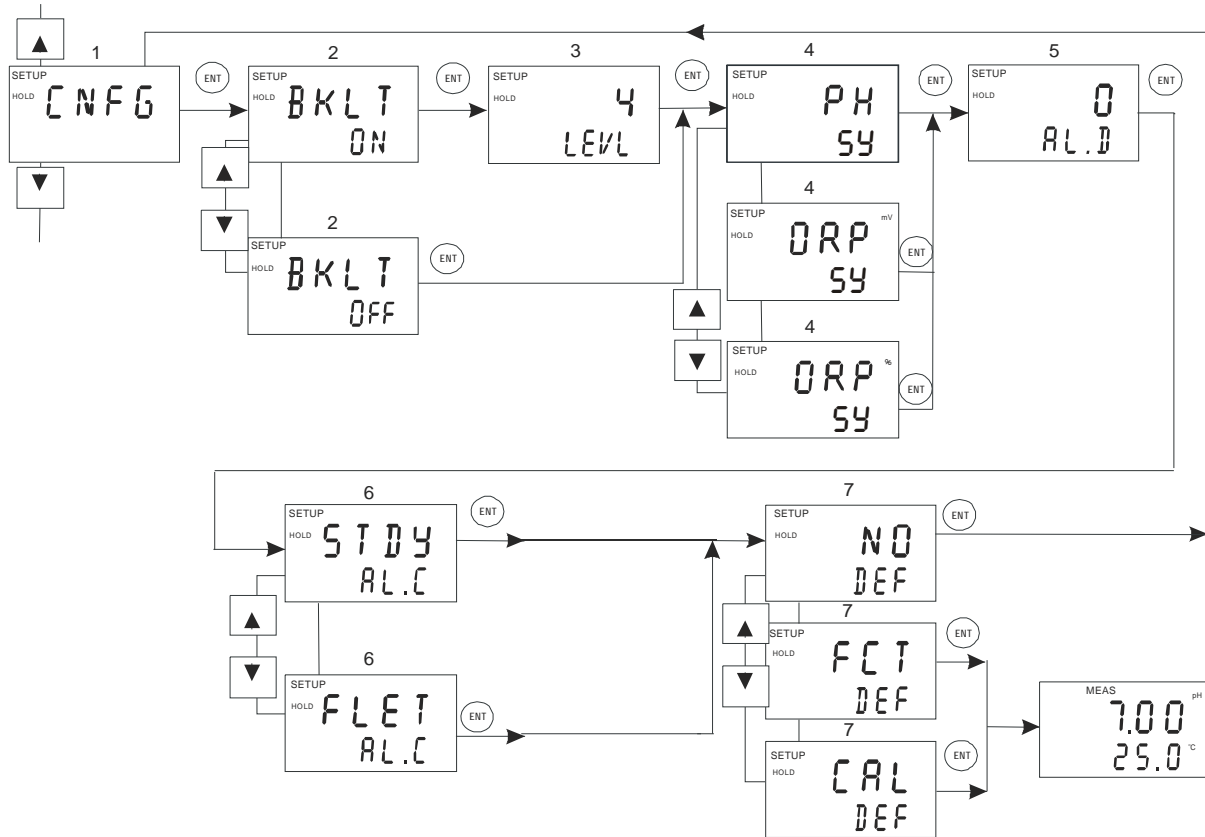


Note: During wash cycle the transmitter is set to HOLD. For safety reasons, the HOLD function is activated 5 seconds prior and deactivated 10 seconds after the wash cycle.

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 sub-function you configure the transmitter to suit your requirements.



1. Select the "CNFG" sub-function, and then **press the ENT key**.
2. **Enabling/disabling the display backlight: press the ▲ or ▼ key** to switch display backlight on (BKLT ON) or off (BKLT OFF). **Press the ENT 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 ENT key** to confirm your setting.
4. **Selecting the unit of measurement: press the ▲ or ▼ key** to select measurement mode:
 - "PH SY" = pH measurement with symmetrical input
 - "ORP mV SY" = ORP-mV measurement with symmetrical input
 - "ORP % SY" = ORP-% measurement with symmetrical input
 - **Press the ENT 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 ENT key** to confirm your setting.



Note: With this parameter you set the delay before the alarm relay activates when the set point has been exceeded.

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 ENT 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. **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 ENT key
 - "CAL DEF" = resets all calibrations to factory defaults, when confirmed with ENT key
 - "FCT DEF" = resets all settings to factory defaults, when confirmed with ENT key

Press the ENT 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 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.

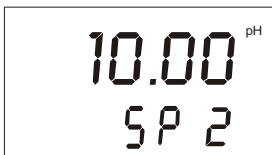
7.1 View relay set points

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

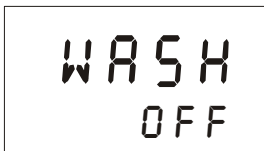
While in Measurement mode press the REL key.



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.

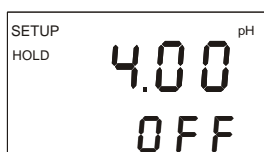
1. While in Measurement mode **press the MODE key**.
2. The display prompts you to enter the security code. **Press the ▲ or ▼ key** to set security code to “22”.
3. **Press the ENT key**. The Manual relay mode is activated and the relay mode LED “Manu” lights.



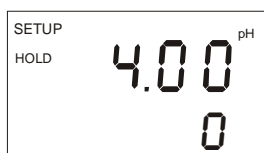
Note: Pressing ENT key at a value other than “22” will cause the transmitter to revert to Measurement mode, and the relays will remain in automatic mode.

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.

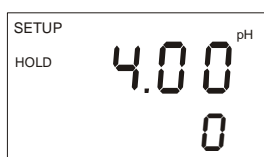
The manual control options now available depend on the control type (limit, pulse frequency, or pulse length) you selected and set in section 6.5.



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: 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 MODE key** to return to Measurement mode. The relays are now back to automatic control.

8 Technical Specifications

8.1 General Specification

(a) pH	
pH Measuring Range	-2.00 to 16.00 pH
Resolution	0.01 pH
Accuracy	± 0.01 pH
(b) mV	
mV Measuring Range	-1000 to 1000 mV
Resolution	1 mV
Accuracy	± 1 mV
(b) mV percentage	
Percentage mV Measuring Range	0 to 100% (for -100 to 100 mV)
Resolution	0.1%
Accuracy	± 0.2 % (or ± 1 mV)
(c) Temperature	
Temperature measuring range	-10.0 to +110.0 °C or +14.0 to +230.0 °F for NTC300
Resolution	0.1 °C or 0.1 °F
Relative accuracy	0.5 °C or 1.0 °F
Sensor	NTC 300 (2 wire)
Compensation	Automatic (± 10 °C/ ± 18 °F offset adjustment) or Manual

8.2 Set-point and control function – Relay 1 & Relay 2

Function Switchable - Selection in Control (CNTR) function of Setup	Off Limit Control P/PI Control (Pulse length / Pulse frequency)
(a) Off	
The control function of the controller is off	SP1 & SP2 function will not appear in setup when Off is selected in CNTR function to off mode
(b) Limit Control & P/PI Control	
Relay contact selection for active mode	Energise (EN) or De-energise (DEEN)
Set Point 1 (SP1)	-2.00 to 16.00 pH or 0 to 100% or -1000 to 1000mV
Set Point 2 (SP2)	-2.00 to 16.00 pH or 0 to 100% or -1000 to 1000mV
Active mode selection (for SP1 & SP2)	LO (Relay is active when measured value < set point) HI (Relay is active when measured value > set point)
Hysteresis (for SP1 & SP2)	0.1 to 1 pH or 1 to 10.0%/ 10 to 100 mV
On (pickup) Delay (for SP1 & SP2)	0 to 2000 seconds
Off (Dropout) Delay (for SP1 & SP2)	0 to 2000 seconds
(c) P/PI Control only	
Proportional Range	10 to 500 %
Integral Action Time (IAT)	0.0 to 999.9 minutes
(c) (1) Pulse Length Control (PLC)	
Pulse Length	0.5 to 20.0 seconds
(c) (2) Pulse Frequency Control (PFC)	
Pulse Frequency	60 to 120 pulses / minutes
Contact Outputs	Two SPST relays
Switching Voltage / Current / Power	Max 250VAC / Max 3A / Max 600VA

8.3 Wash Function – Wash Relay

Relay contact selection for active mode	Energise (EN) or De-energise (DEEN)
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 250VAC / Max 3A / Max 600VA

8.4 Alarm Function – Alarm Relay

Alarm Delay	0 to 2000 seconds
Alarm control	Steady or Fleet (pulse)
Contact Outputs	One SPDT relay
Switching Voltage / Current / Power	Max 250VAC / Max 3A / Max 600VA

8.5 Transmitter Function

(a) Current Output 1 – pH/mV	Proportional to pH/mV measured
Current output selection	4 – 20mA or 0 – 20mA
pH/mV value for 0 or 4mA current	-2.00 to 16.00 pH or 0 to 100% or -1000 to 1000mV
pH/mV value for 20mA current	-2.00 to 16.00 pH or 0 to 100% or -1000 to 1000mV
CU22 function	On - 22mA 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 - 20mA current output for over range or above upper zoom setting
(b) Current Output 2 - Temperature	Proportional to Temperature measured
Current output selection	4 – 20mA or 0 – 20mA
Temperature value for 0 or 4mA current	-10.0 to +100.0°C or +14.0 to +212.0°F for NTC300
Temperature value for 20mA current	0.0 to +110.0°C or +32.0 to +230.0°F for NTC300

8.6 Voltage Output & Hold Function Switch

+12 V Output	11.5 to 12.5 V Output - Max 50 mA
Hold Function Switch	Hold function to freeze output current (0/4...20mA) and release control relays

8.7 Display

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

8.8 Power Supply

Input	80 to 250VAC/DC, 50/60Hz, Approximately 10VA
Main Fuse	315mA Time Delay, 250V, Bussmann BK/GDC-315mA
Pollution Degree	2
Transient Voltage Category	II
Connector	5-pin screw terminal

8.9 Electrical data and Connections

pH/mV Input	8-pin Screw Terminal (3.5mm pitch)
Temperature Input	8-pin Screw Terminal (3.5mm pitch)
Relay 1, Relay 2, Wash Relay & Alarm Relay	9-pin Screw Terminal (7.62mm pitch)
Current Output 1, Current Output 2, 12V output & Hold function switch	13-pin Screw Terminal (3.5mm pitch)
Connection terminal	5-pin, 8-pin, 9-pin & 13-pin terminal connectors

8.10 Mechanical Specifications

Dimensions (W x H x D) - Wall Mount	144 x 144 x 111.5 mm
Weight - Wall Mount	950g (unit) / 1100g (Packed)
Environmental Rating - Wall Mount	NEMA 4X, IP65

8.11 Electromagnetic Compliance (EMC) Specifications

Emitted Interference	EN 61326
Immunity to Interference	EN 61326

8.12 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

9 Accessories

9.1 Replacement Unit

Product Description	Eutech Instruments Order Code
Alpha pH 2000 Controller / Transmitter, wall mount version	EC-PHCTP2000D

9.2.1 Assembly Accessories

Product Description	Eutech Instruments Order Code
pH Differential Electrode with NTC300 thermistor	ECFP21A1A1
ORP Differential Electrode with NTC300 thermistor	ECFR21A1A1



Note: Above pH/OR electrodes can withstand a pressure up to 6 bar pressure. These electrodes have integral 3m measuring cable.

Note: Please contact your authorised distributor or dealer for the prices of extension measuring cables and other accessories like tee joints, electrode assembly, and calibration solutions.

10 General Information

10.1 Warranty

Eutech Instruments/Oakton Instruments warrant 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. Eutech Instruments/Oakton Instruments 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 5 way (5.08 mm), 9 way (7.62mm), 13 way (3.5mm), 8 way (3.5mm)

10.3 Return of goods

Before returning goods for any reason whatsoever, Customer Service Dept. has to be informed in advance. Items must be carefully packed to prevent damage during shipment, and insured against possible damage or loss. Eutech Instruments/ Oakton Instruments 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 Ipha pH 2000D contains no user repairable components. Please contact Eutech Instruments or its distributor if there is any problem with the unit.

Cleaning

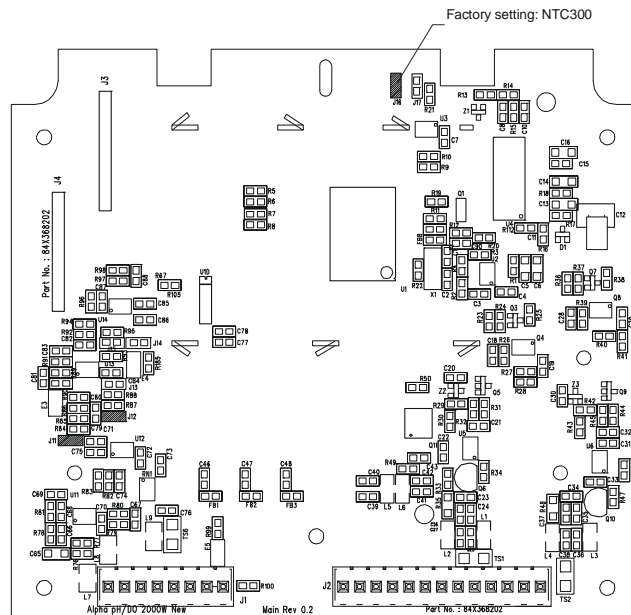
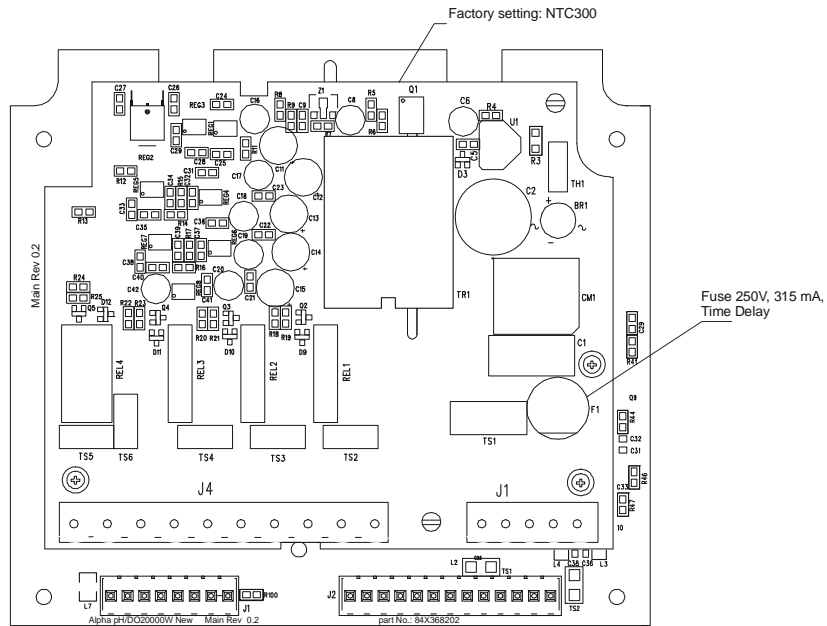
To remove dust, dirt and spots, the external surfaces of the transmitter may be wiped with a damp, lint-free cloth. A mild household cleaner can also be used if necessary.

11.1 Appendix 1 – Unit fuse and jumper settings



Caution! Before opening the unit to replace the unit fuse, make sure the mains cable is separated from the power supply.

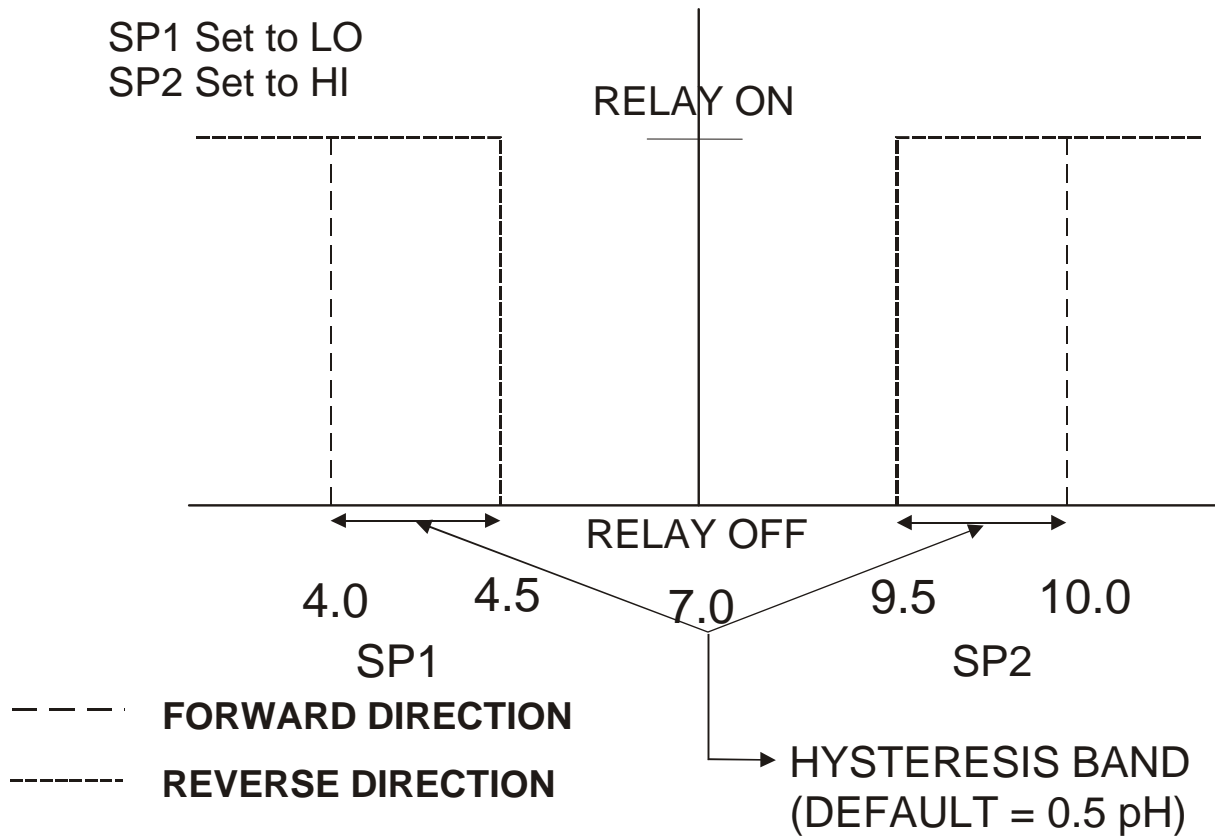
View from both PCBA side



11.2 Appendix 2 – pH buffer values at various temperatures

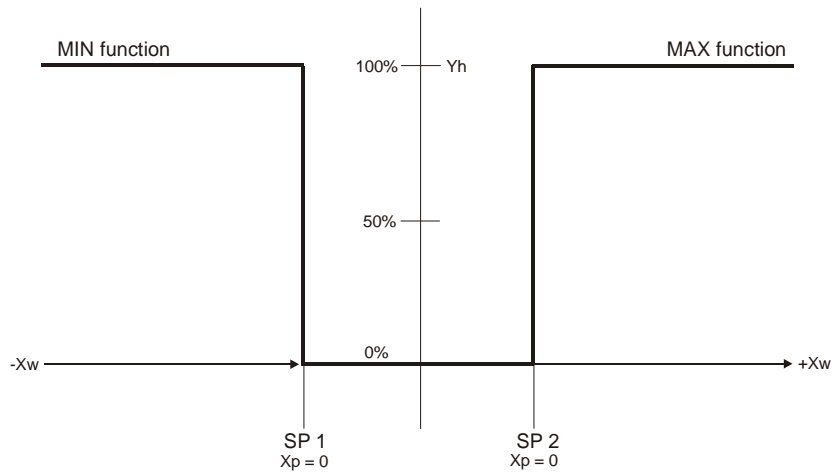
The following table shows the various pH values at different temperature of the solution during calibration.

Temperature (°C)	pH 1.00	pH 4.01	pH 6.86	pH 7.00	pH 9.00	pH 9.18	pH 10.01
0	0.96	4.01	6.98	7.12	9.33	9.47	10.32
5	0.99	4.01	6.95	7.09	9.24	9.38	10.25
10	0.99	4.00	6.92	7.06	9.16	9.32	10.18
15	0.99	4.00	6.90	7.04	9.11	9.27	10.12
20	1.00	4.00	6.88	7.02	9.05	9.22	10.06
25	1.01	4.01	6.86	7.00	9.00	9.18	10.01
30	1.01	4.01	6.85	6.99	8.95	9.14	9.97
35	1.01	4.02	6.84	6.98	8.91	9.10	9.93
40	1.01	4.03	6.84	6.97	8.88	9.07	9.89
45	1.01	4.04	6.83	6.97	8.85	9.04	9.86
50	1.01	4.06	6.83	6.97	8.82	9.01	9.83
55	1.01	4.08	6.83	6.97	8.79	8.99	9.81
60	1.02	4.10	6.84	6.98	8.76	8.96	9.79
70	1.02	4.12	6.85	6.99	8.72	8.92	9.76
80	1.02	4.16	6.86	7.00	8.68	8.89	9.74
90	1.02	4.20	6.88	7.02	8.65	8.85	9.73

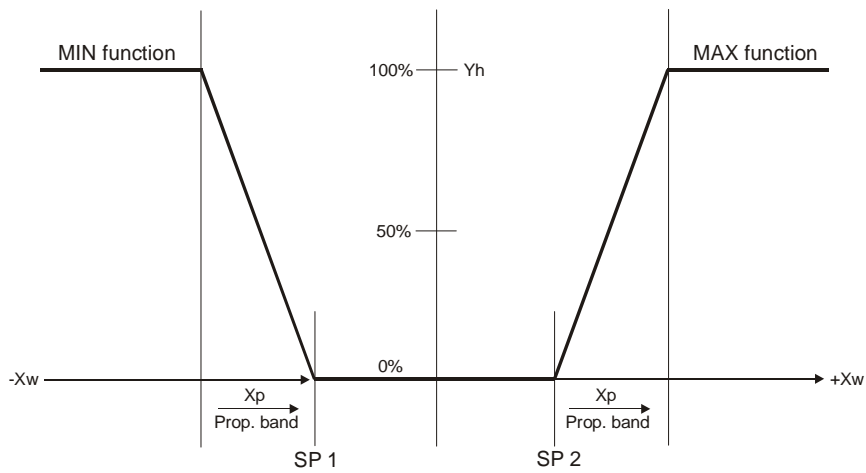


The controller relay activates when the set-point is reached. In the reverse direction, it does not deactivate when the value reaches the set-point. Instead, it continues to be active till the value reaches the amount set by the Hysteresis band.

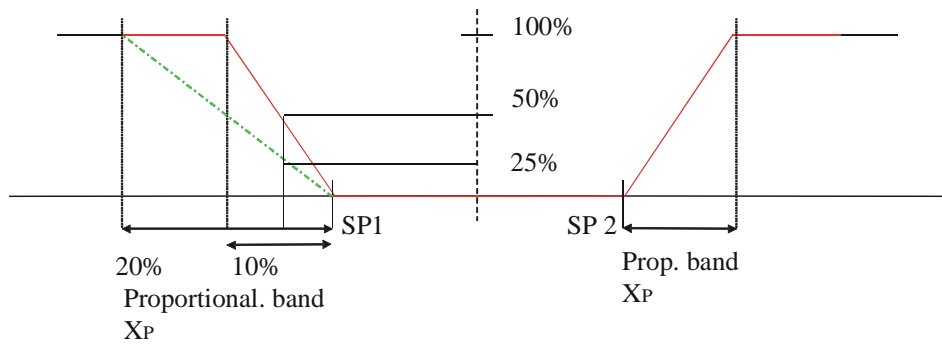
11.4.1 Control characteristic of Controllers used as limit value switch



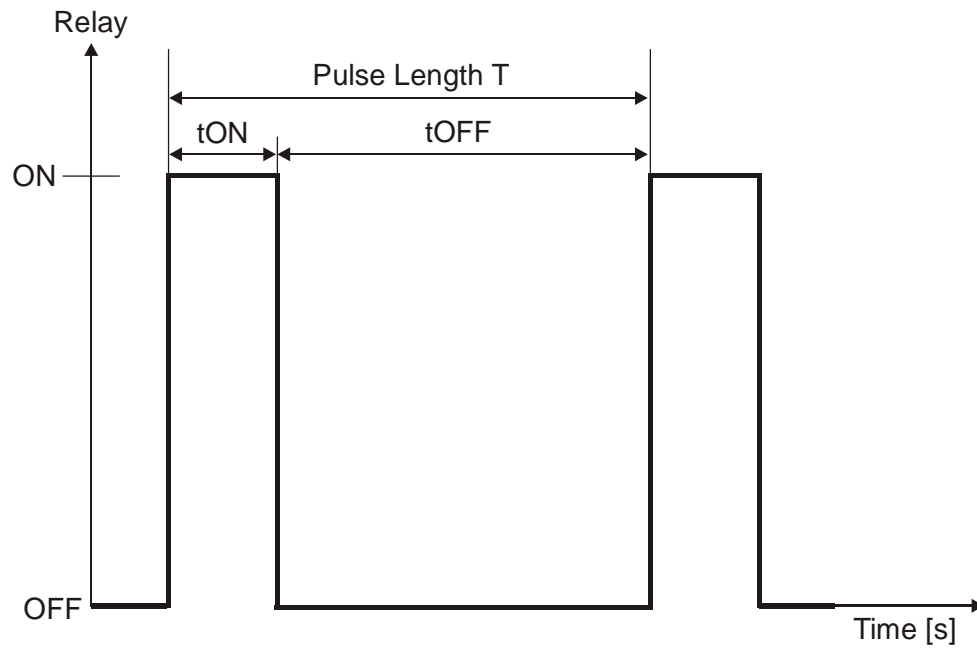
11.4.2 Control characteristic of P-Controllers as proportional controller



11.4.3 Control characteristic of PI-Controllers as proportional integral controller



11.4.4 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 .

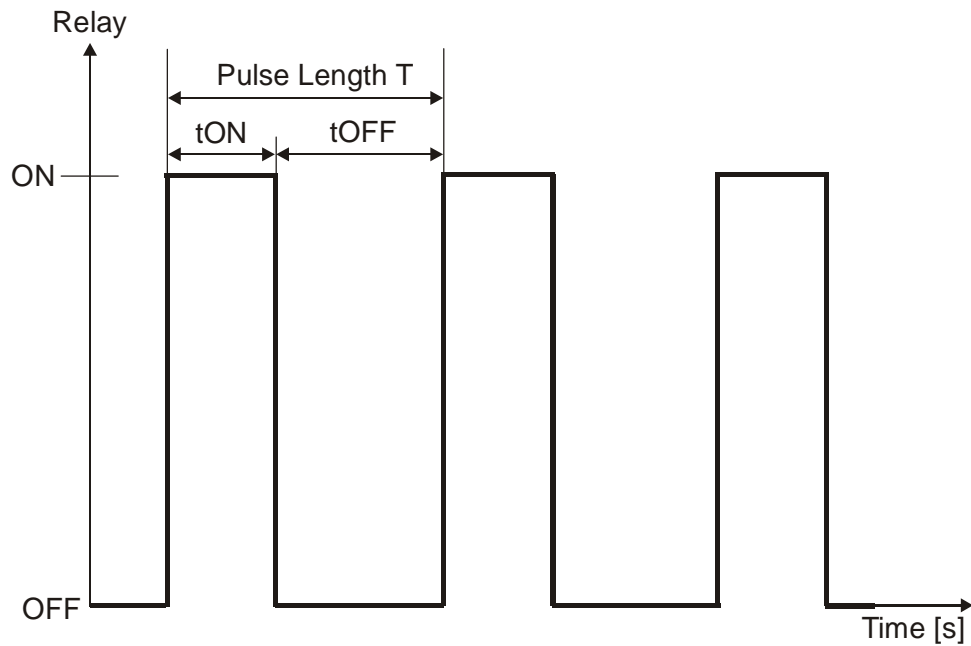
The following applies:

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

greater divergence \rightarrow greater t_{ON}

X_p exceeded $\rightarrow t_{ON} = T$ (relay remains picked up)

11.4.5 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:

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

greater divergence \rightarrow greater f (greater frequency)

X_p exceeded \rightarrow max. frequency

11.5 Appendix 5 – Abbreviations used in menu displays

Abbreviation	Meaning
MEAS	Measurement
CAL	Calibration
ENT	Enter
OFS	Offset
C. CD	Calibration security code
S. CD	Setup security code
SET	Setting
ATC	Automatic temperature calibration
SP1	Set point 1
SP2	Set point 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
EN	Energized
DEEN	Deenergized
REL	Relay
PRP	Proportional band
T. PL	Pulse length time
F. PF	Pulse frequency
IAT	Integral action time
MANU	Manual

Abbreviation	Meaning
CUR. 1	Output current 1
CUR. 2	Output current 2
OUT	Output signal
4 - 20	4 to 20mA
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
CNFG	Configuration
BKLT	Back light
LEVL	Level
PH SY	Symmetrical pH mode
ORP SY	Symmetrical ORP mode
AL. D	Alarm delay
AL.C	Alarm Contact
STDY	Steady
FLET	Fleet, impulse
DEF	Default
FCT DEF	Factory default
CAL DEF	Calibration default

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