

Alpha DO 2000 PPG

Processor/Transmitter

Dissolved Oxygen (ppm / m/L / %)



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Preface

This manual serves to explain the use of the **Alpha DO 2000** 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 **Alpha DO 2000** as possible. If you have any doubts concerning the use of the instrument, please do not hesitate to contact your 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

This Controller/ Transmitter shall be installed and operated only in the manner specified in the Instruction manual. Only skilled, trained or authorised 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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1. Introduction

1.1 Before You Begin

We thank you for purchasing the **Alpha DO 2000**.

The construction of the Alpha DO 2000 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 Alpha DO 2000.**

Thermo Scientific do not accept any liability for damage that may arise from neglecting information given in this manual.

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



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



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

The instruction manual must always be stored close at hand, in a place accessible to all people working with the Alpha DO 2000.

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

1.2 Intended Use

The **Alpha DO 2000** is intended solely for dissolved oxygen 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:

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

1.3 Safety Instructions



- The Alpha DO 2000 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 Alpha DO 2000 must only be operated under the specified operating conditions
- The Alpha DO 2000 must not be repaired by the customer.
- The Alpha DO 2000 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 Alpha DO 2000 are allowed. The manufacturer/supplier accepts no responsibility for damage caused by unauthorized modifications. The risk is borne entirely by the user.

1.4 Taking Out of Service / Correct Disposal of the Unit

Taking out of service

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

Correct disposal of the unit

When the transmitter is permanently 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. Getting Started

2.1 Description of Instrument

The **Alpha DO 2000** is used for measuring dissolved oxygen (in % saturation, mg/l or ppm) and temperature values. The dissolved oxygen 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, chemical and food processing, clean and wastewater control and fish farming.

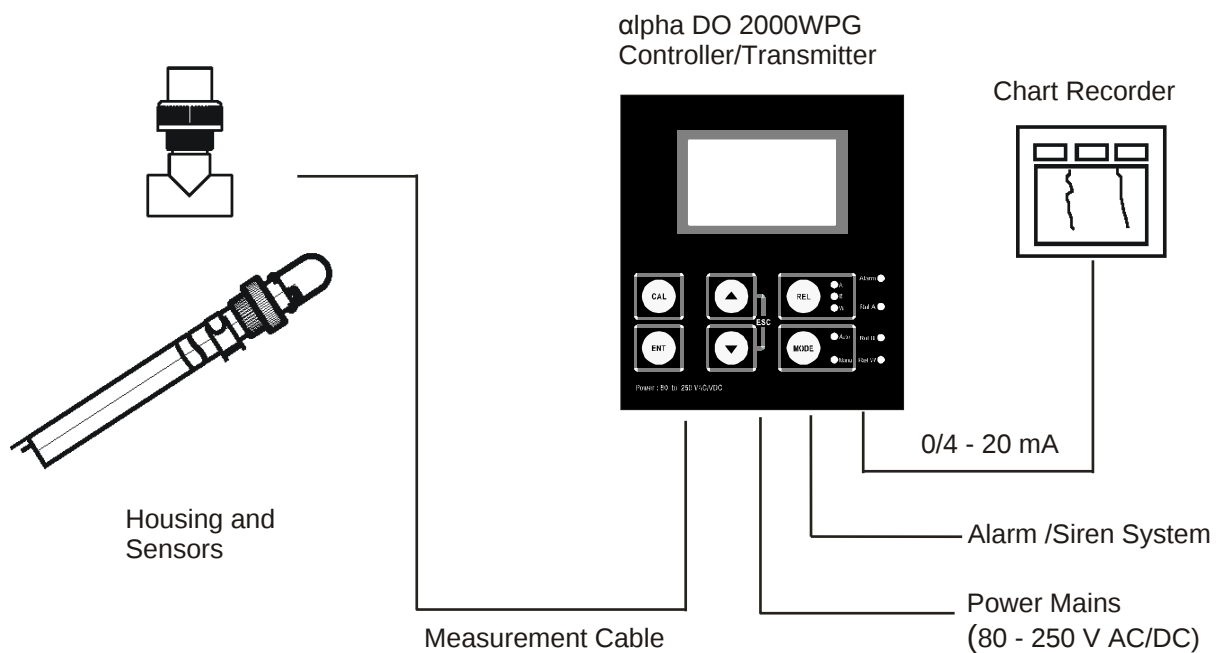
This controller/transmitter has many user-friendly and safety features which include:

- Menu-driven program that simplifies set-up
- Built-in non-volatile memory to ensure that calibration and other information are not erased if power supply fails.
- Push-button for calibration and sensor offset adjustment from the keypad.
- Automatic temperature compensation (ATC).
- Manual temperature compensation setting without the ATC probe, with independent setting for calibration and process temperature.
- Two galvanically isolated current outputs 0/4...20mA.
- 0 to 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.
- 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 NTC 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

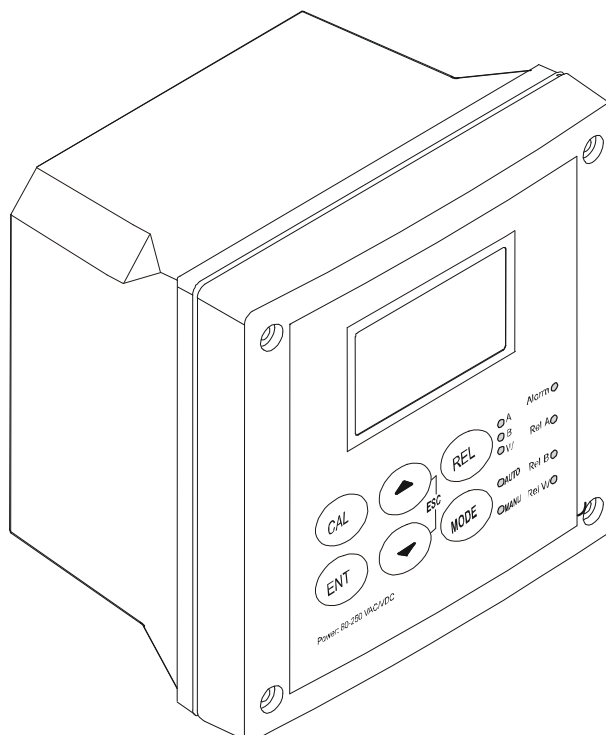
A typical measurement system consists of:

- an Alpha DO 2000 PG dissolved oxygen controller/transmitter
- a dissolved oxygen sensor with integrated or separate temperature sensor
- an appropriate measurement cable
- an immersion, flow or process assembly
- a final control element such as pump or valve
- a chart recorder

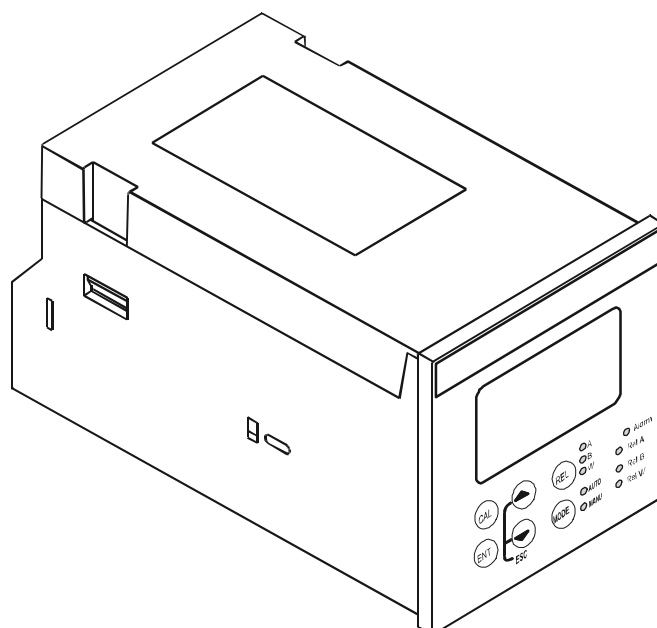


2.3 Overview

Wall mounting version

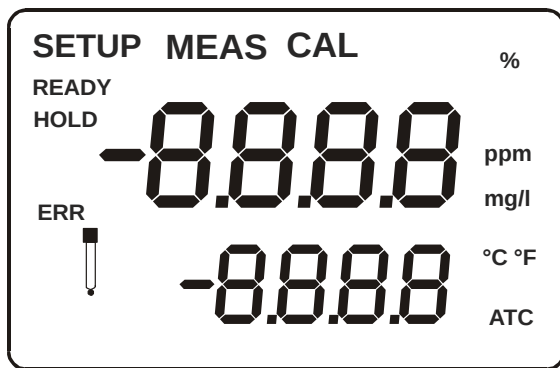


Panel mounting version



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: Setup mode

CAL: Calibration mode

Status indicator:

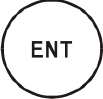
READY: Visible after successful calibration

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

2.3.2 Key Functions

Key	Description
	Enter Calibration mode (requires access code)
	Enter Setup mode (requires access code) Access sub functions (parameters) within a function group of Setup mode Confirm (store) setup parameters and numerical values Start/Confirm calibration in Calibration mode.
	Select function group in the Setup 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
	Toggle between AUTO & MANUAL relay operation modes. (requires access code to switch to MANUAL relay operation mode)

2.3.3 LED Indicators

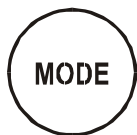
Relay indicators



- 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 ●

LED lights if limit value is exceeded or the ATC probe fails.

Rel A ●

LED lights green if measured value is within the limit for Relay A
LED lights red if measured value exceeds limit for Relay A.

Rel B ●

LED lights green if measured value is within the limit for Relay B
LED lights red if measured value exceeds limit of Relay B

Rel W ●

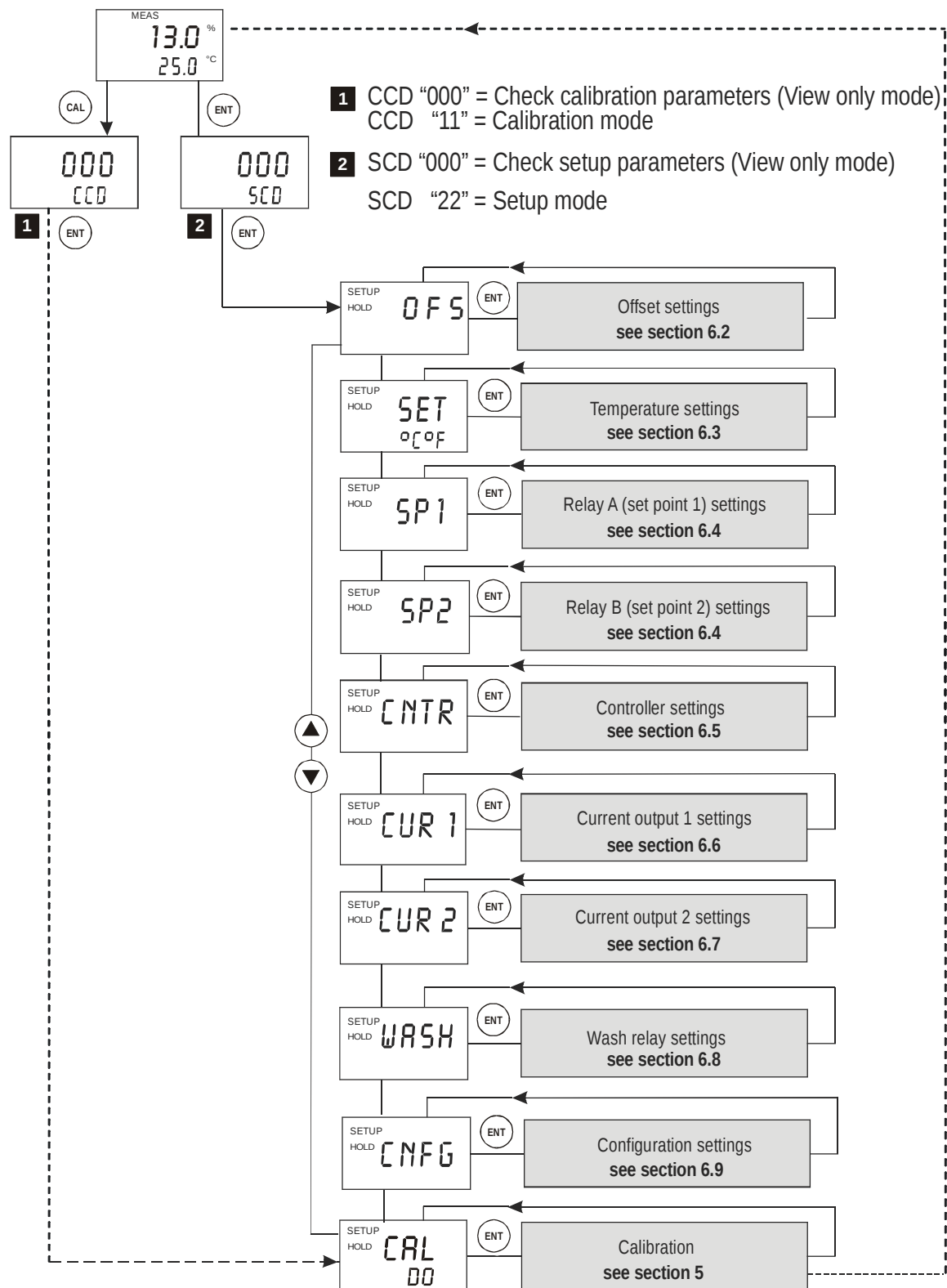
LED lights if cleaning cycle is on.

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 settings
11	Calibration mode/ to start calibration
22	Setup mode/ to configure parameters
22	Manual relay operation mode/ to switch to relay operation mode from AUTO to MANUAL

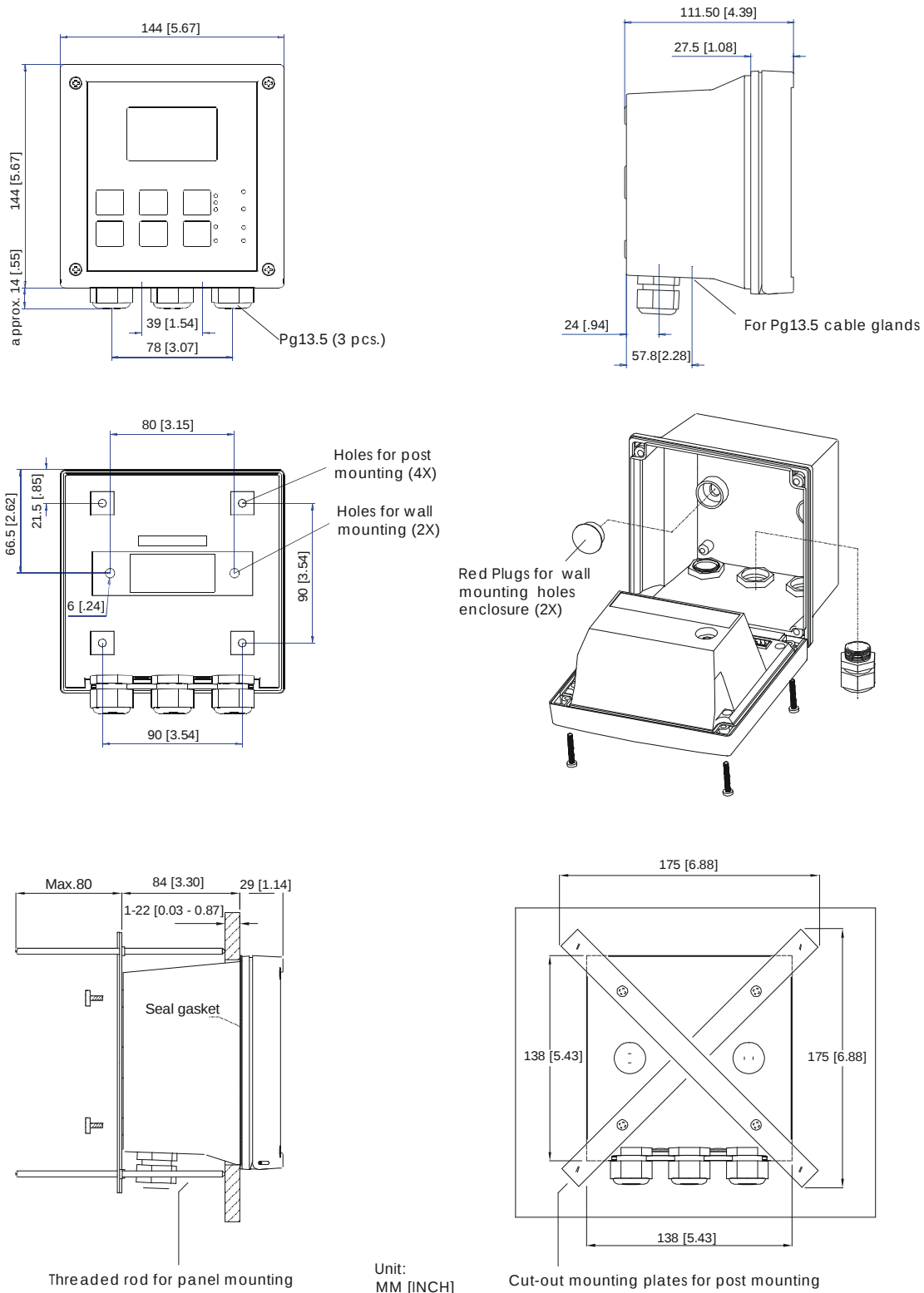
2.3.5 Menu Overview



3. Assembly and Installation

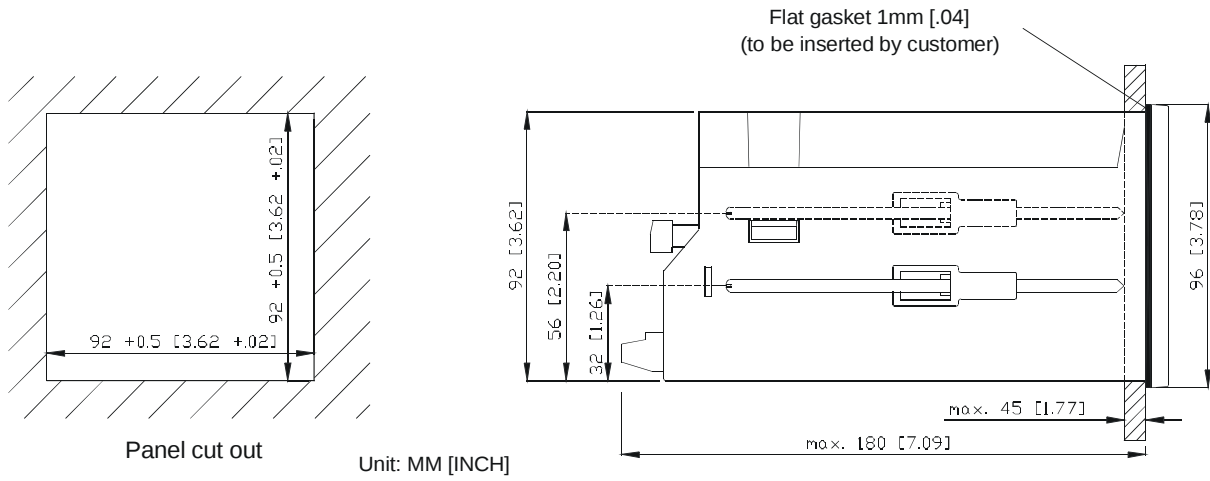
3.1 Mounting the Unit

Wall mount version



Environmental protection class: IP 66, NEMA 4X (housing)

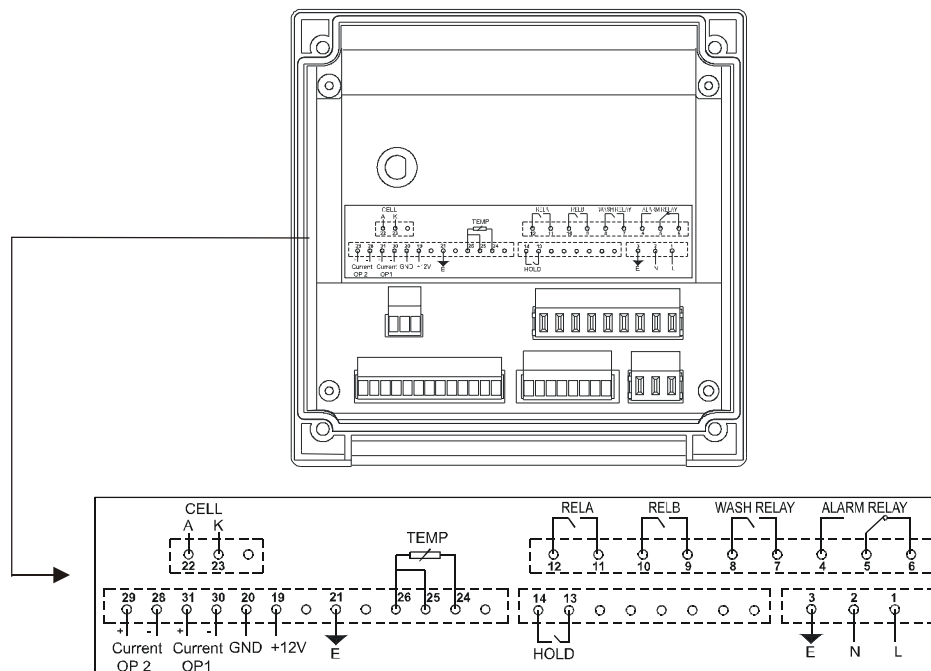
Panel mount version



Environmental protection class: IP 54 (front), IP 40 (housing)

3.2 Connection Diagram

Wall mount version



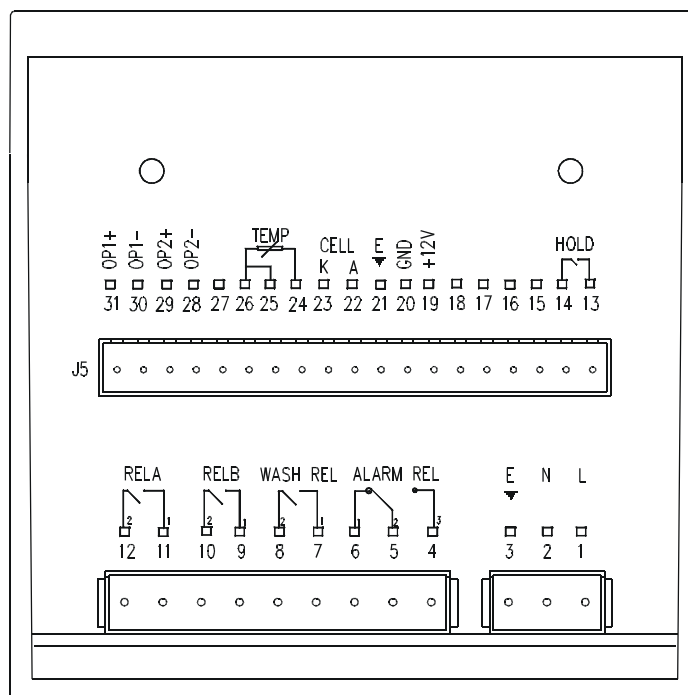
Connections Description

1.	AC mains live wire	14.	Hold function
2.	AC mains neutral wire	19.	12V output power supply
3.	AC mains protective earth wire	20.	12V output ground
4.	Alarm relay (NO)	21.	Earth ground
5.	Alarm relay common	22.	DO input, Anode
6.	Alarm relay (NC)	23.	DO input, Cathode
7.	Wash relay	24.	Temperature – T2
8.	Wash relay	25.	Temperature – N.C
9.	Relay B (SP 2)	26.	Temperature – T1
10.	Relay B (SP 2)	28.	4-20 mA temperature output, -ve
11.	Relay A (SP 1)	29.	4-20 mA temperature output, +ve
12.	Relay A (SP 1)	30.	4-20 mA DO output, -ve
13.	Hold function	31.	4-20 mA DO output, +ve

Probe Cable Connections

Cable Connection	Controller/Transmitter Terminal
Colorless/Center (Cathode)	K (23)
Brown (Anode)	A (22)
Blue (T1)	TEMP (26)
Yellow (T2)	TEMP (24)
Green/Yellow (Cable Outer Shield)	A (22)
Connect jumper wire	From E(21) to A (22)

Panel mount version



Connections Description

1.	AC mains live wire	14.	Hold function
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11.	Relay A (SP 1)	29.	4-20 mA temperature output, +ve
12.	Relay A (SP 1)	30.	4-20 mA DO output, -ve
13.	Hold function	31.	4-20 mA DO output, +ve

Probe Cable Connections

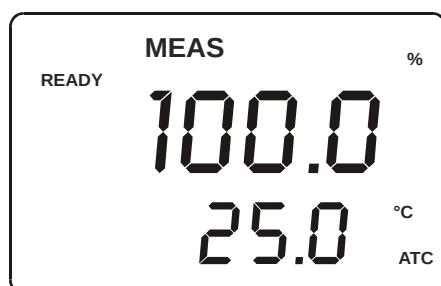
Cable Connection	Controller/Transmitter Terminal
Colorless/Center (Cathode)	K (23)
Brown (Anode)	A (22)
Blue (T1)	TEMP (26)
Yellow (T2)	TEMP (24)
Green/Yellow (Cable Outer Shield)	A (22)
Connect jumper wire	From E(21) to A (22)

4. Normal Operation

4.1 Measurement Mode

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

→ **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 dissolved oxygen value (in %, mg/l or ppm), while the lower display shows the temperature value (in °C or °F)

The annunciators "%", "mg/l" or "ppm" at the upper right side of the display indicate the current measurement mode setting whether the transmitter is set for %, mg/l or ppm measurement.

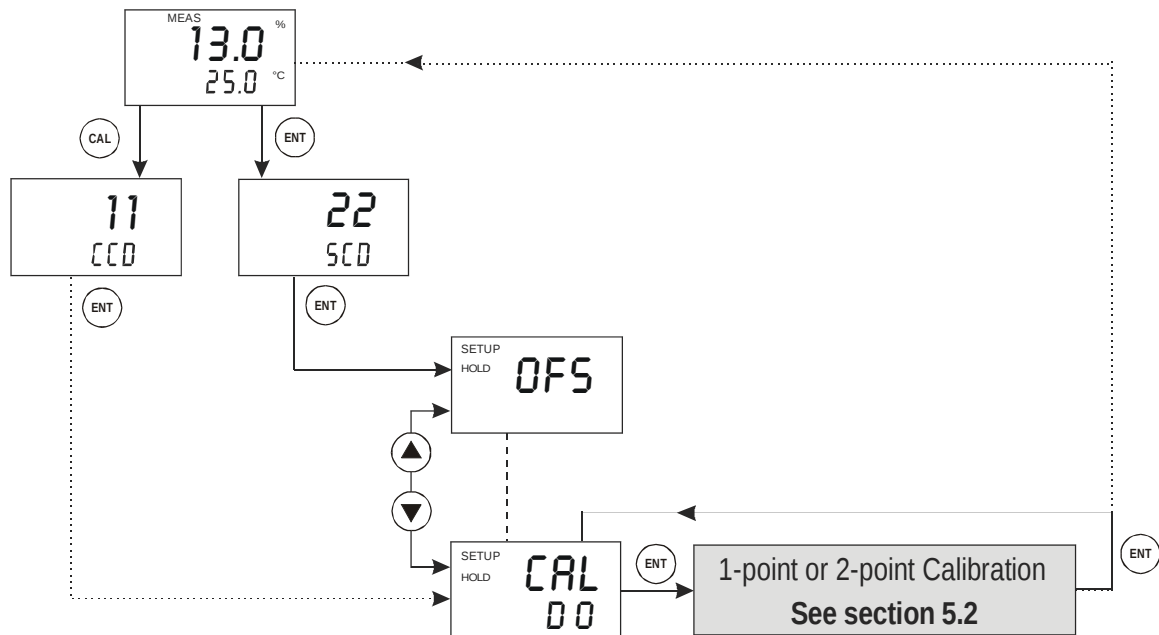
From Measurement mode you can access **Calibration mode** and **Setup mode** by pressing the **CAL** key or **ENT** key followed by the corresponding security code. For detailed information refer to **section 5 "Calibration mode"** or **section 6 "Setup mode"**, respectively.

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



While in Measurement mode **press CAL key** (direct access) or **ENT key** (access via Setup mode).

- If **CAL key** was pressed: The display prompts you to enter the calibration security code (CCD). **Press ▲ or ▼ key** to set the calibration security code to “11”, and then **press ENT key** to confirm the calibration security code.
- If **ENT key** was pressed: The display prompts you to enter the security code (SCD). **Press ▲ or ▼ key** to set the security code to “22”. **Press ENT key** to confirm the security code, and then **press ▲ or ▼ key** to select the calibration sub-function.

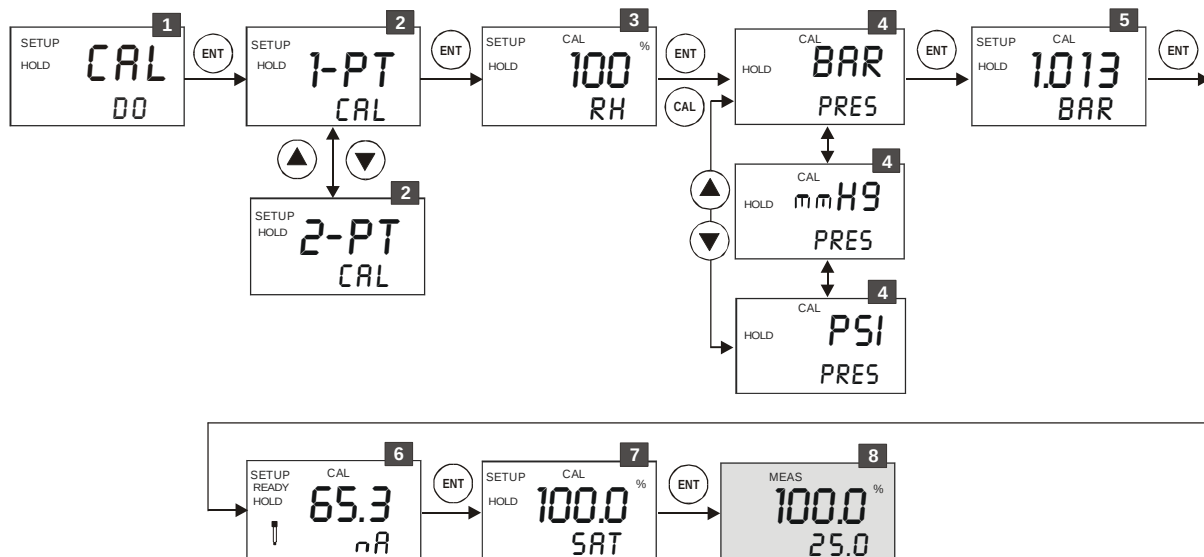
The display shows “CAL DO”. To start calibration, refer to section 5.2.

→ **NOTE:** To exit Calibration mode at any time **press ▲ 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.

5.2 Calibration

Calibration is always carried out in the units (% , mg/l or ppm) selected in the Setup mode. The transmitter allows a 1-point or 2-point calibration for dissolved oxygen.

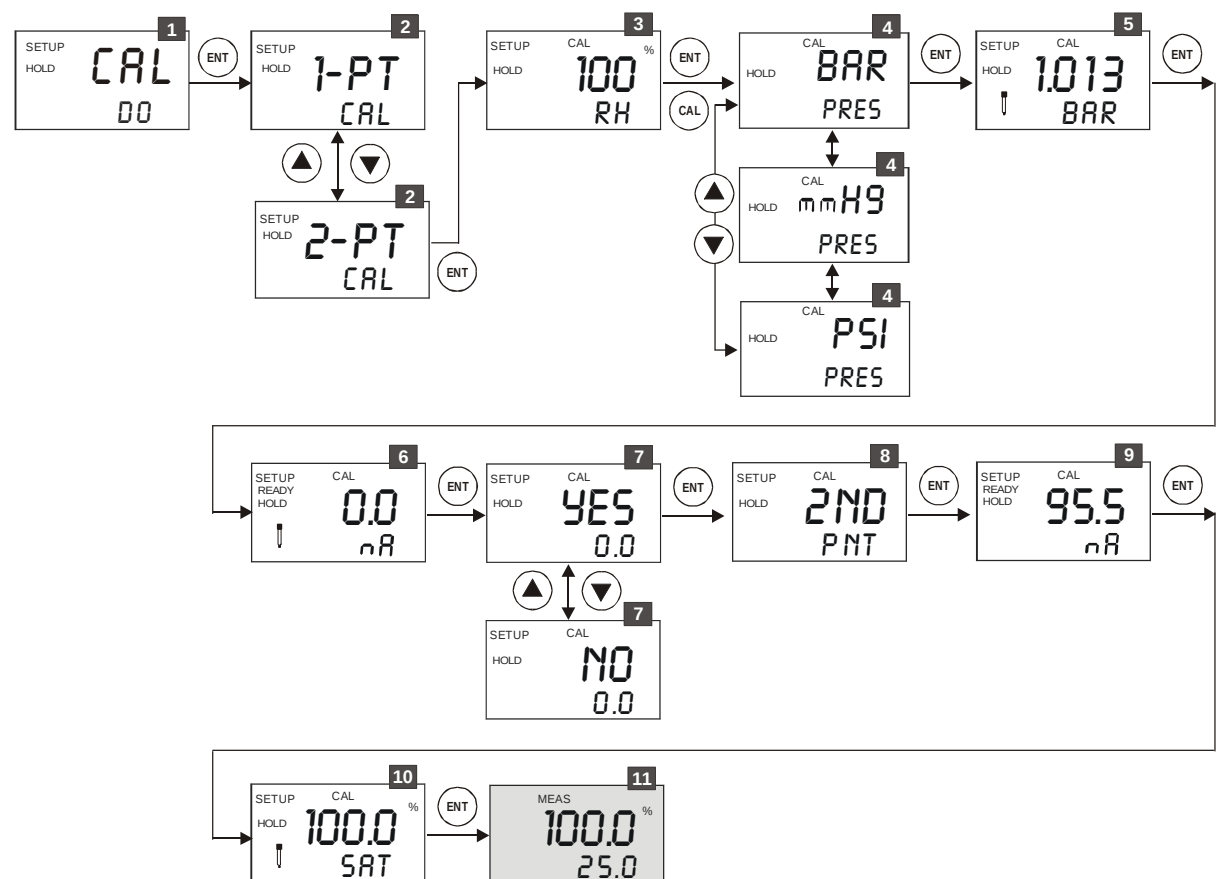
5.2.1 One-Point Calibration



1. **Enter Calibration mode** as described in section 5.1. The display shows "CAL DO". Press **ENT** key to start calibration.
2. The display shows "1-PT CAL" by default. If "2-PT CAL" is shown, use **▲** or **▼** keys to select one-point "1-PT CAL". Press **ENT** key to confirm the 1-point selection.
3. Press **▲** or **▼** key to set the relative humidity. Press **ENT** key to confirm.
4. Press **▲** or **▼** key to select the desired unit for barometric pressure ("BAR", "mmHG" or "PSI"). Press **ENT** key to confirm.
5. Press **▲** or **▼** key to set the barometric pressure according to the selected unit in step 4. Press **ENT** key to confirm.
6. Put sensor in the calibration solution or air. The temperature compensated sensor current (in nA) is displayed. The "CAL" and electrode symbol  start flashing. Once the reading stabilizes, the flashing symbols disappear and "READY" comes on. Press **ENT** key.
7. Default calibration values for saturation or concentration are shown. Press **▲** or **▼** key to select the desired saturation ("SAT %") or concentration ("Con ppm" or "Con mg/l"). Press **ENTER** key to confirm.
8. The transmitter returns to the Measurement mode.

→ **NOTES:**

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

5.2.2 Two-Point Calibration

1. **Enter Calibration mode** as described in section 5.1. The display shows “**CAL DO**”. Press **ENT** key to start calibration.
2. The display shows “**1-PT CAL**” by default. Use **▲** or **▼** keys to select “**2-PT CAL**” (2-point calibration). Press **ENT** key to confirm the 2-point selection.
3. Press **▲** or **▼** key to set the relative humidity. Press **ENT** key to confirm.

4. **Press ▲ or ▼ key** to select the desired unit for barometric pressure ("BAR", "mmHG" or "PSI"). **Press the ENT key** to confirm.
5. **Press ▲ or ▼ key** to set the barometric pressure according to the selected unit in step 4. **Press the ENT key** to confirm.
6. Put sensor in zero point solution or nitrogen. The temperature compensated sensor current for zero point (in nA) is displayed. The "CAL" and electrode symbol  start flashing. Once the reading stabilizes, the flashing symbols disappear and "READY" comes on. **Press ENT key**.
7. **Press ▲ or ▼ key** to accept new zero current with "YES" or to reject the new calibration value with "NO". **Press ENTER key** to confirm your selection

→ **NOTE:** Accepting the zero point will reset the zero offset settings made in OFS menu.

8. The display shows "2ND PNT". **Press ENT key** to proceed with the calibration of slope.
9. Put sensor in the calibration solution or air. The temperature compensated sensor current (in nA) for the second point will be displayed. The "CAL" and electrode symbol  start flashing. Once the reading stabilizes, the flashing symbols disappear and "READY" comes on. **Press ENT key**.
10. Default calibration values for saturation or concentration are shown. **Press ▲ or ▼ key** to select the desired saturation ("SAT %") or concentration ("Con ppm" or "Con mg/l"). **Press ENT key** to confirm.
11. The transmitter returns to the Measurement mode.

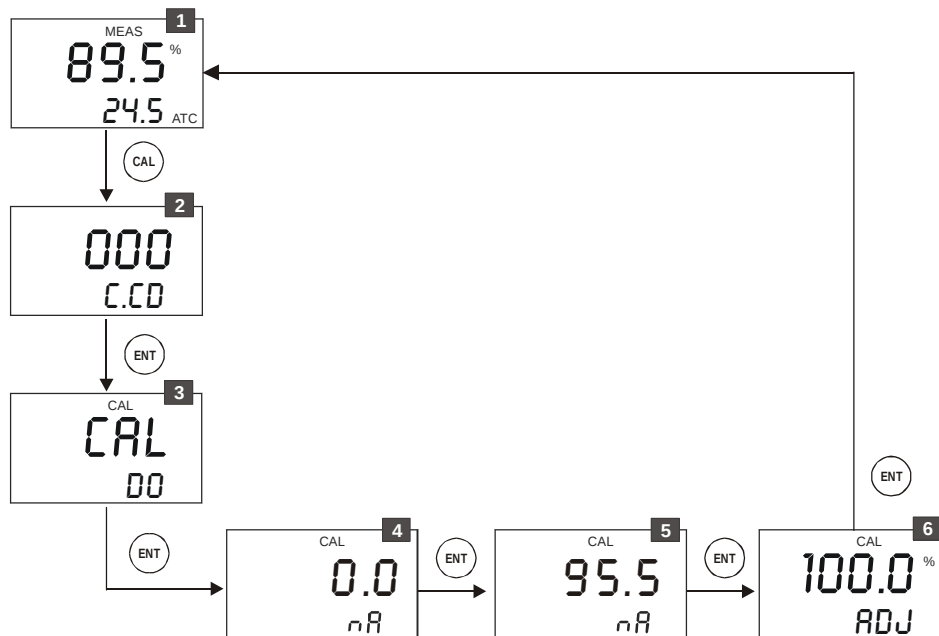
→ **NOTES:**

- If you entered the Calibration mode from the Setup mode, the transmitter will return to the setup menu.
- If there is a calibration error the transmitter displays "ERR". In this case, press ▲ and ▼ keys simultaneously (escape) to restart the calibration beginning from step 1.
- When calibrating with manual temperature compensation, the transmitter automatically changes from the preset process temperature to the calibration temperature. After leaving the Calibration mode, the transmitter switches back to the process temperature (for setting the calibration temperature and the process temperature, see section 6.3).

5.3 View Probe Condition

The probe condition is an indication of its current working condition with respect to its original condition. The probe condition is calculated and stored in the controller each time calibration is done.

You can view probe condition without entering into calibration mode.



1. While in Measurement mode **press CAL key**.
2. The display prompts you to enter the calibration security code (CCD). Leave the **security code at "000"** (view only mode). **Press ENT key**.
3. The display shows "CAL DO". **Press ENT key**.
4. The display shows the zero point current in nA. **Press ENT key**.
5. The display shows the current in nA for the second calibration point. **Press ENT key**.
6. The display shows the selected measuring range in %. **Press ENT key** to return to the Measurement mode.

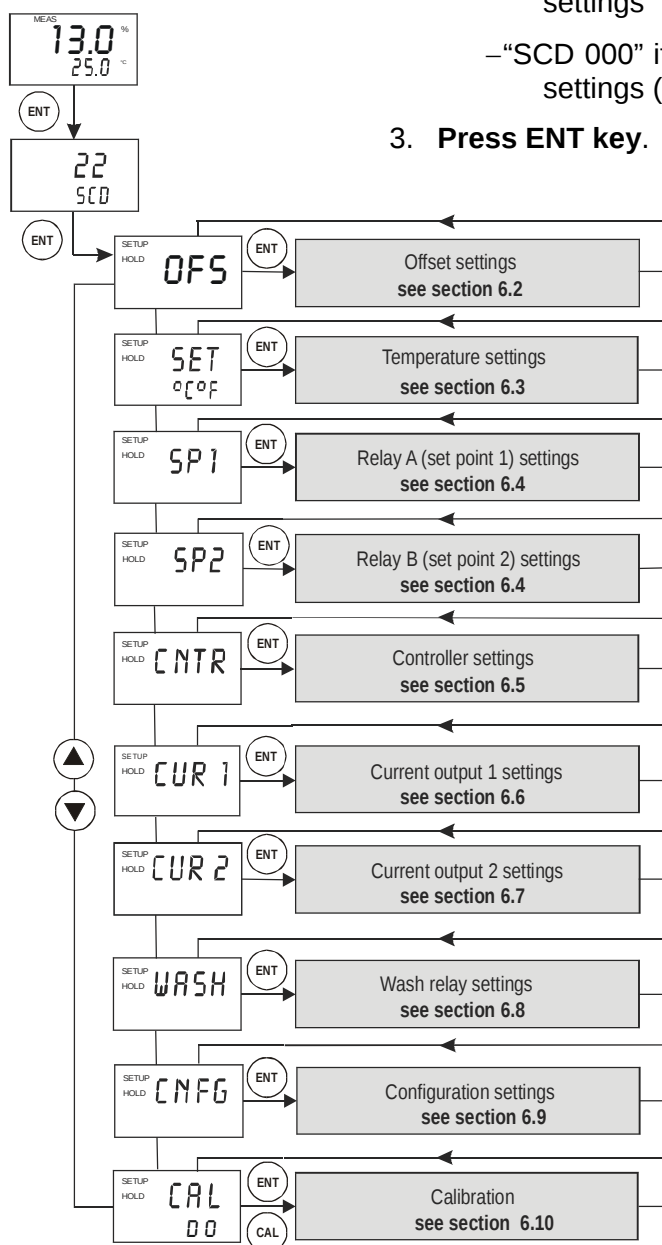
➔ **NOTE:** If no key is pressed for 30 seconds during the above steps, the controller automatically returns to the Measurement mode.

6. Setup Mode

6.1 Enter Setup Mode

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

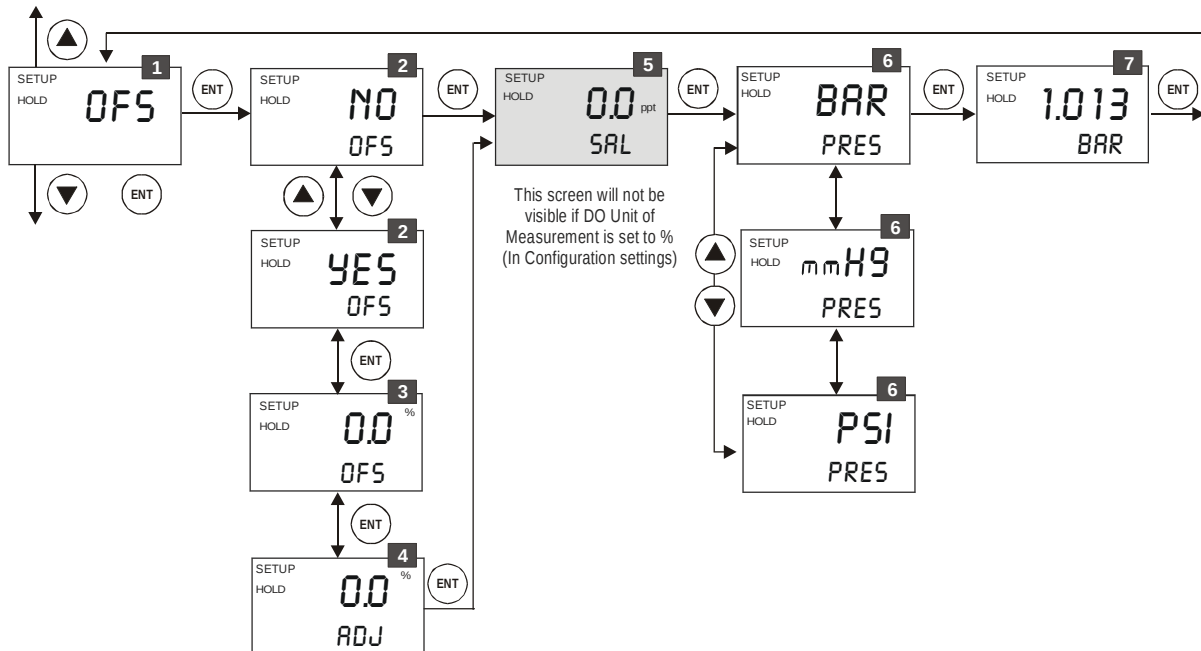
1. While in Measurement mode **press ENT key**.
2. The display prompts you to enter the security code.
Set the security code with **▲ or ▼ key** to:
 - “SCD 22” if you want to change parameter settings
 - “SCD 000” if you only want to view parameter settings (**view only mode**)
3. **Press ENT key.**



➔ **NOTE:** To exit Setup mode at any time **press ▲ and ▼ keys simultaneously** (escape). The transmitter returns to the Measurement mode.

6.2 Electrode Offset Settings (OFS)

The electrode offset settings allow you to zero the transmitter without a sensor. The use of a simulator is recommended. For real zero calibration, use the calibration procedure as described in section 5. If no simulator is used, a 22 kΩ NTC must be connected to pins 24 and 25 of the terminal connector on the backside of the unit (see section 3.2).

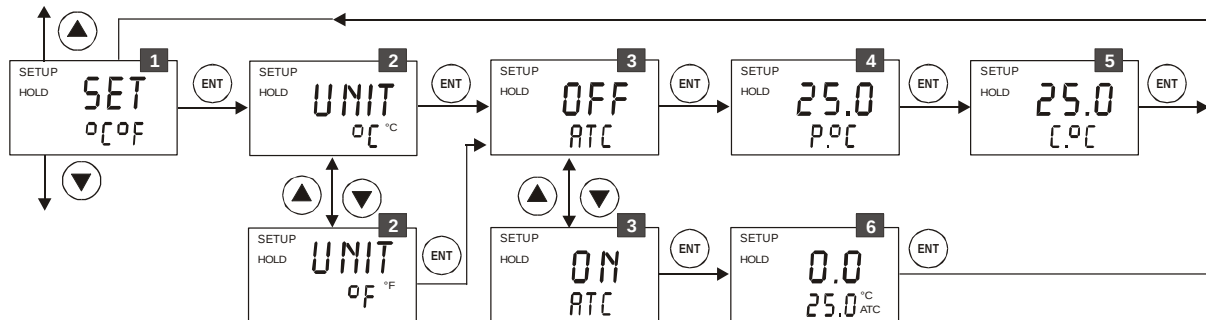


1. From the setup mode select the “OFS” screen and then **press ENT key**.
2. **Selecting to modify offset value:** By default, controller shows “NO OFS”. **Press ▲ or ▼ key** to select “NO” or “YES” for offset adjustment.
 - Select “NO OFS” to skip offset adjustment and move to the next step.
 - Select “YES OFS” to perform offset adjustment.**Press ENT key** to confirm your selection.
 - If “YES OFS” was selected:
3. **Selecting offset value:** The display shows the offset from zero current of the saturation or concentration. If this is within the range of -0.2 nA to 1.1 nA, then the correction can be accepted. **Press ENT key** to confirm.
4. The display shows the offset. **Press ENT key** to confirm.
5. **Setting salinity of the solution (SAL):** This display only appears if the measurement unit is set to “mg/l” or “ppm”. **Press ▲ or ▼ key** to set the salinity of the solution. **Press ENT key** to confirm.
6. **Setting the unit for pressure (PRES):** **Press the ▲ or ▼ key** to set unit (“BAR”, “mmHG”, “PSI”) of the barometric pressure. **Press the ENT key** to confirm.
7. **Setting barometric pressure:** **Press ▲ or ▼ key** to set the barometric pressure according to the selected unit in step 6. **Press ENT key** to confirm.

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

➔ **NOTE:** The offset value is reset during 2-point calibration. See section 5 for full calibration instructions.

6.3 Temperature Setting (SET °C°F)



1. From the setup mode, select the “SET °C°F” screen and then **press ENT key**.
2. **Selecting temperature unit:** Press **▲** or **▼** key to select the desired temperature unit “°C” or “°F”. **Press ENT key** to confirm your selection.
3. **Enable/disable ATC mode:** Press **▲** or **▼** key to enable (ATC ON) or disable (ATC OFF) automatic temperature compensation. **Press ENT key** to confirm your selection.
 - **ATC disabled (ATC OFF):**

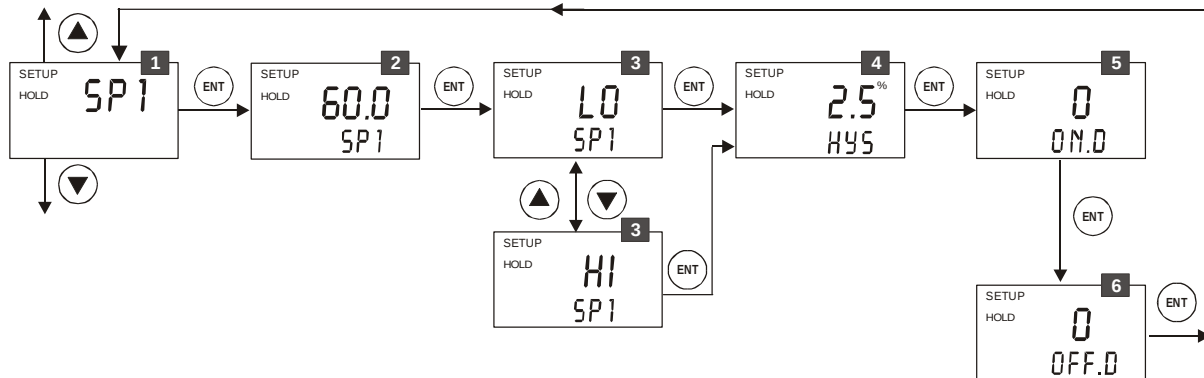
For manual temperature compensation you can set the process and calibration temperatures. This allows calibration at a temperature other than the process temperature.
 - 4. **Setting the process temperature:** Press **▲** or **▼** key to adjust the process temperature in the upper display value (setting range: –9.9 to 125°C / 15 to 257 °F). **Press ENT key** to confirm process temperature.
 - 5. **Setting the calibration temperature:** press **▲** or **▼** key to adjust the calibration temperature in the upper display value (setting range: –9.9 to 125°C / 15 to 257 °F). **Press ENT key** to confirm the calibration temperature.
- **ATC enabled (ATC ON):**
 6. **Setting the temperature offset:** The display shows the current temperature offset (upper display value) and the temperature currently measured (lower display 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 display value. The upper number is automatically adjusted to the offset value. You can offset the temperature by up to ±10°C/±18°F. **Press ENT key** to confirm your setting.

The controller goes back to “SET °C°F” screen.

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

6.4 Control Relay A / Relay B Settings (SP1/SP2)

The SP1 settings define the operating parameters for Relay A; while SP2 defines the operating parameters for Relay B. Since these two settings have the same set-up parameters, only SP1 is described here.



1. From the setup mode, select the “SP1” (Relay A) screen and then **press ENT key**.
2. **Setting set point value:** Press **▲** or **▼** key to enter the value for set point 1 at which your controller will activate. **Press ENT key** to confirm your setting.
3. **Selecting relay function:** Press **▲** or **▼** key to select the desired relay function (“LO”= low or “HI”= high). **Press ENT key** to confirm your selection.

→ **NOTE:** This parameter lets you choose the relay function. Select “LO” to activate the relay when the dissolved oxygen value undershoots the low set point; select “HI” to activate the relay when the value overshoots the high set point. SP1 and SP2 can be selected as “Lo/Lo”, “Lo/Hi”, “Hi/Lo”, or “Hi/Hi”.

4. **Setting a hysteresis value:** Press **▲** or **▼** key to select the desired hysteresis (setting range: 1 to 10% or 0.1 to 1.0 mg/l) for set point 1. **Press 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 low set point at 6.20 mg/l and your hysteresis value at 0.5 mg/l. If your measured value undershoots 6.20 mg/l, the controller’s relay activates. The actions of the external device will cause the value to rise above 6.20 mg/l. The relay will deactivate, when the DO value has increased to 6.70 mg/l (6.20 + 0.50).

5. **Setting the on-delay time lag:** Press **▲** or **▼** key to enter the on-delay time for set point 1. The controller will delay activation of the relay for the number of

seconds (0 to 1999 seconds) you select. **Press 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 1999 seconds time delay before your relay activates.

6. **Setting the off-delay time lag:** press **▲** or **▼** key to enter the off-delay time for set point 1. The controller will delay deactivation of the relay for the number of seconds (0 to 1999 seconds) you select. **Press ENT key** to confirm your setting.

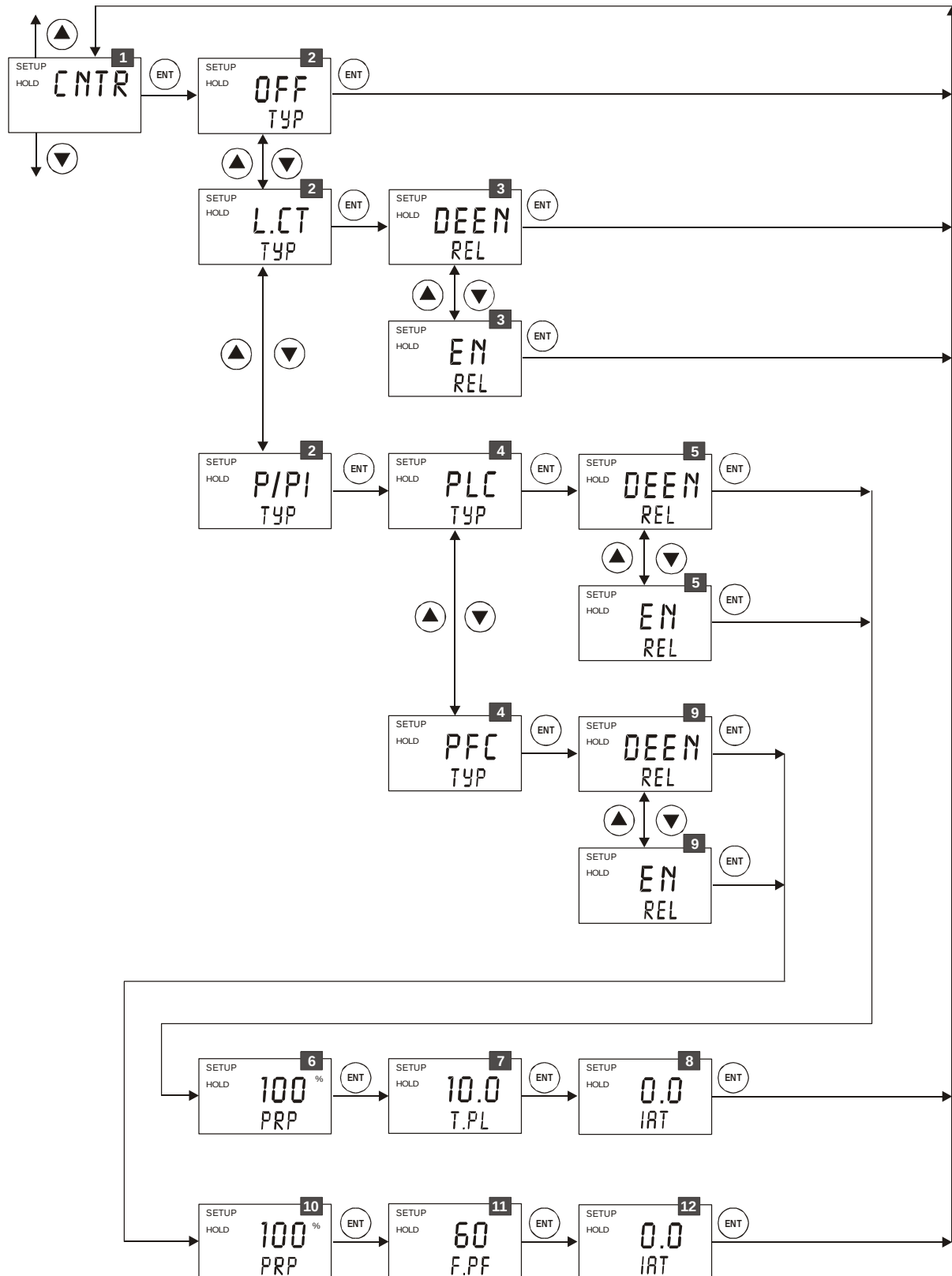
→ **NOTE:** You can set a time delay for each relay, which stops the relay from switching off the moment the value reaches the set point and hysteresis. This controller lets you set a 0 to 1999 seconds time delay before your relay deactivates.

The controller goes back to “SP1” screen.

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

6.5 Controller Settings (CNTR)

The CNTR settings define the controller type and relay status the DO controller.



1. From the setup mode, select the "CNTR" screen and then **press ENT key**.
2. **Selecting the controller type (TYP): Press ▲ 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. When the controller is set to OFF, all the LEDs will be switch off in the Measurement mode
 - 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 3** for detailed information on controller settings.

Press 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 (REL): Press ▲ or ▼ key** to choose the desired relay status (de-energized = "DEEN" or energized = "EN"). **Press ENT key** to confirm your selection.
- If the controller is set to **proportional control (P/PI)**:
4. **Selecting the proportional controller type (TYP): Press ▲ or ▼ key** to select the suitable controller type ("PLC" = pulse length control, "PFC" = pulse frequency control). **Press 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 (REL): Press ▲ or ▼ key** to choose the desired relay status (de-energized = "DEEN" or energized = "EN"). **Press ENT key** to confirm your selection.
 6. **Setting the proportional range (PRP): Press ▲ or ▼ key** to set the proportional range (setting range: 10 to 500%). **Press ENT key** to confirm your setting.
 7. **Setting the pulse length (T.PL): Press ▲ or ▼ key** to set the pulse length (setting range: 0.5 to 20 seconds). **Press ENT key** to confirm your setting.
 8. **Setting the integral action time (IAT): Press ▲ or ▼ key** to set the integral action time (setting range: 0.0 to 999.9 minutes). **Press ENT key** to confirm your setting.

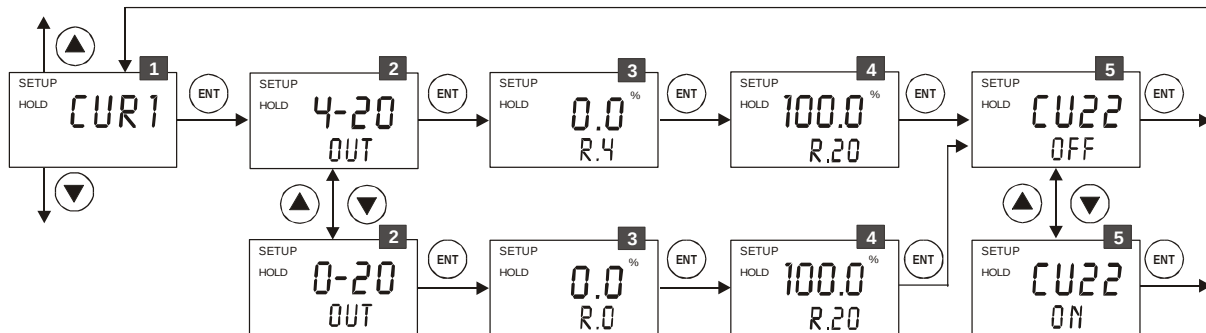
- If the proportional controller type is set to **pulse frequency control (PFC)**:
 9. **Selecting the relay status under Non-Alarm condition (REL):** Press **▲ or ▼ key** to choose the desired relay status (de-energized = “DEEN” or energized = “EN”). Press **ENT key** to confirm your selection.
 10. **Setting the proportional range (PRP):** Press **▲ or ▼ key** to set the proportional range (setting range: 10 to 500%). Press **ENT key** to confirm your setting.
 11. **Setting the pulse frequency (F.PF):** Press **▲ or ▼ key** to set the pulse frequency (setting range: 60 to 120 pulses per minute). Press **ENT key** to confirm your setting.
 12. **Setting the integral action time (IAT):** Press **▲ or ▼ key** to set the integral action time (setting range: 0.0 to 999.9 minutes). Press **ENT key** to confirm your setting.

The controller goes back to “CNTR” screen.

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

6.6 Current Output 1 Settings (CUR 1)

In this section, you set the current output range of the transmitter for dissolved oxygen values.



1. From the setup mode, select the “CUR 1” screen and then **press 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 ENT key** to confirm your selection.
3. **Setting the dissolved oxygen value at which the transmitter output will be 4 mA (or 0 mA):** Press **▲** or **▼** key to set the dissolved oxygen value to be equivalent to 4 mA or 0 mA, respectively. **Press ENT key** to confirm your setting.
4. **Setting the dissolved oxygen value at which the transmitter output will be 20 mA:** Press **▲** or **▼** key to set the dissolved oxygen value to be equivalent to 20 mA. **Press 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 DO value is below or above the values set in step 3 & 4 above. **Press ENT key** to confirm your setting.

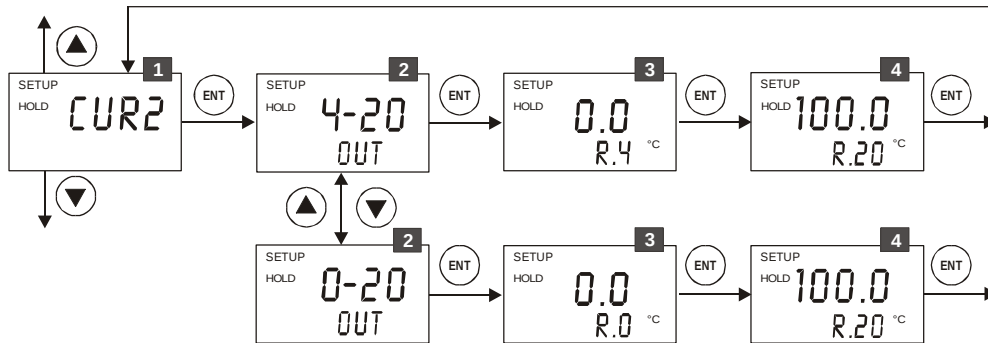
→ **NOTE:** The “CU22” setting (on/off) of current output 1 applies to current output 2 as well.

The controller goes back to “CUR 1” screen.

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

6.7 Current Output 2 Settings (CUR 2)

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



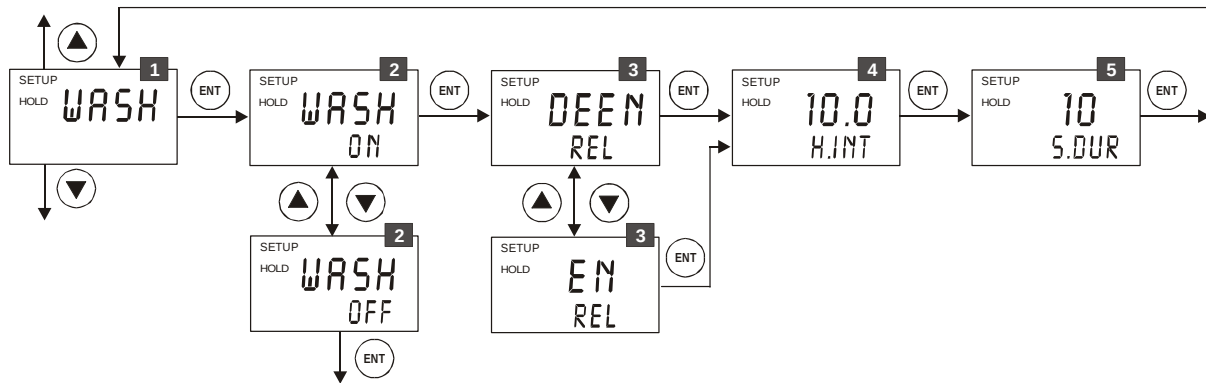
1. From the setup mode, select the “CUR 2” screen and then **press ENT key**.
2. **Selecting the output type: Press ▲ or ▼ key** to select the desired output type: 0-20 mA or 4-20 mA. **Press ENT key** to confirm your selection.
3. **Setting the temperature value at which the transmitter output will be 4 mA (or 0 mA): Press ▲ 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 ENT key** to confirm your setting.
4. **Setting the temperature value at which the transmitter output will be 20 mA: Press ▲ 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 ENT key** to confirm your setting.

The controller goes back to “CUR 2” screen.

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

6.8 Wash Relay Settings (WASH)

In this section, you set the parameters for the wash relay.



1. From the setup mode, select the “WASH” screen and then **press ENT key**.
2. **Enabling/disabling wash function: Press ▲ or ▼ key** to enable (WASH ON) or disable (WASH OFF) wash function. **Press ENT key** to confirm your selection.
 - If “WASH OFF” was selected, the transmitter returns “WASH” sub-function.
 - If “WASH ON was selected:
 3. **Selecting the relay status condition: Press ▲ or ▼ key** to choose desired relay status (de-energized = “DEEN” or energized = “EN”). **Press ENT key** to confirm your selection.
 4. **Setting the wash interval in hours: Press ▲ or ▼ key** to set the desired wash interval (setting range: 0.1 to 199.9 hours). **Press ENT key** to confirm your setting.
 5. **Setting the wash duration in seconds: Press ▲ or ▼ key** to set the desired wash duration (setting range: 1 to 1999 seconds). **Press ENT key** to confirm your setting.

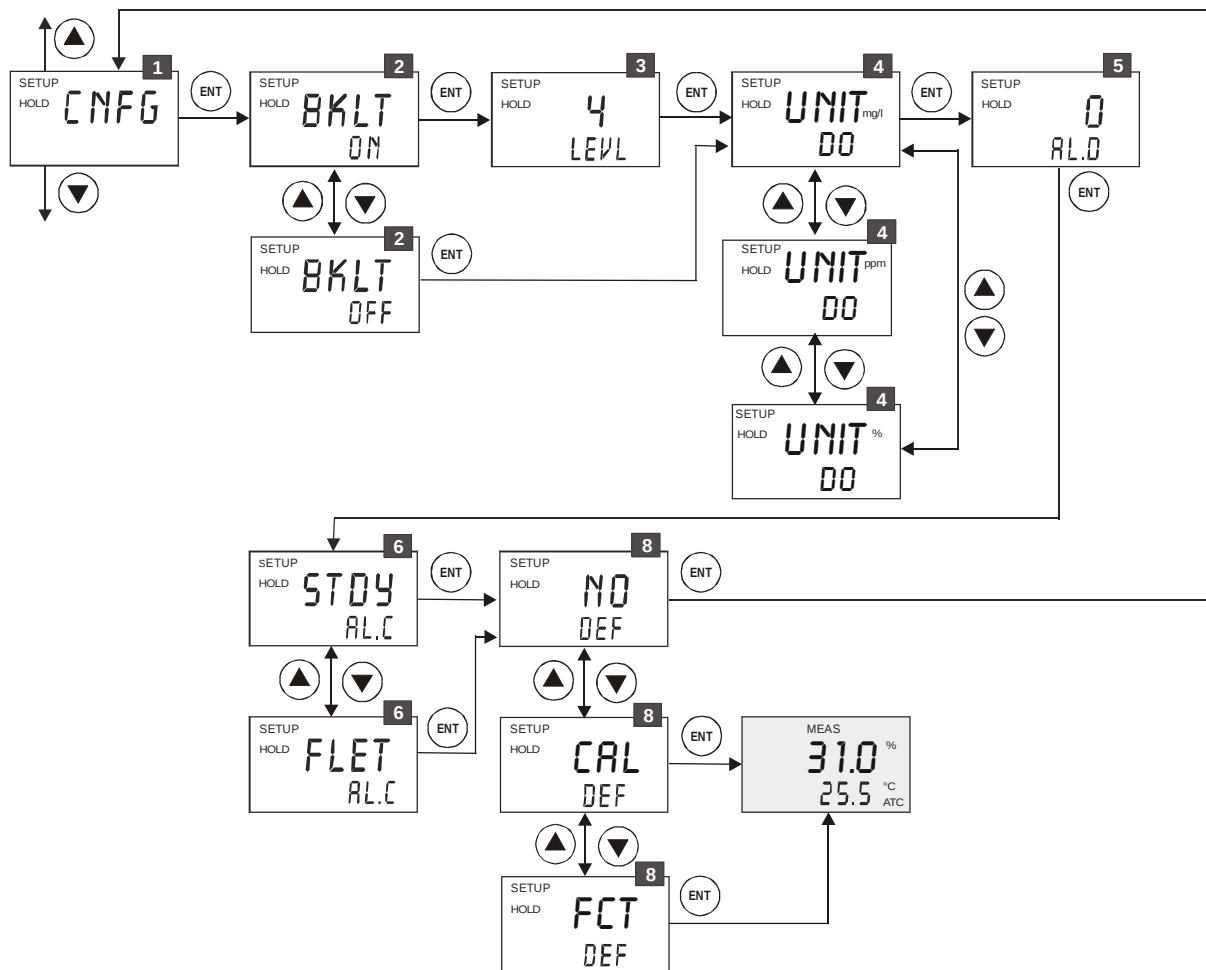
➔ **NOTE:** During wash cycle the transmitter is set to HOLD. For safety reasons, the HOLD function is activated 5 seconds prior and deactivated 10 seconds after the wash cycle.

The controller goes back to “WASH” screen.

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

6.9 Configuration Settings (CNFG)

In this section, you configure the transmitter to suit your requirements.



1. From the setup mode, select the “CNFG” screen and then **press ENT key**.
2. **Enabling/disabling the display backlight:** Press **▲** or **▼** key to switch display backlight on (BKLT ON) or off (BKLT OFF). **Press ENT key** to confirm your selection.
3. **Setting the backlight intensity** (appears only If backlight is on): Press **▲** or **▼** key to set backlight intensity (setting range: minimum 1 to maximum 4). **Press ENT key** to confirm your setting.
4. **Selecting the DO unit of measurement:** Press **▲** or **▼** key to select DO measurement unit (“mg/l” or “ppm” or “%”). **Press ENT key** to confirm your selection.
5. **Setting the alarm delay time:** Press **▲** or **▼** key to set the alarm delay time (setting range: 0 to 1999 seconds). **Press 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 overshoot.

6. **Selecting the alarm contact type:** Press **▲** or **▼** key to select the alarm contact type:

- “STDY” = steady contact
- “FLET” = fleeting (single pulse) contact

Press 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 **▲** or **▼** key to select:

- “NO DEF” = keeps user configured values active, when confirmed with ENT key
- “FCT DEF” = resets all settings to factory defaults, when confirmed with ENT key
- “CAL DEF” = resets all calibration settings to factory defaults, when confirmed with ENT key

Press ENT key to confirm your selection.

- If “NO DEF” was selected, the transmitter returns “CNFG” screen.
Continue with rest of the Setup procedures by pressing **▲** or **▼** key, or return to Measurement mode by pressing **▲** and **▼** keys (escape) simultaneously.
- If “FCT DEF” or “CAL DEF” was selected, the selected function will be executed and the transmitter returns automatically to the Measurement mode.

6.10 Calibration (CAL)

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.

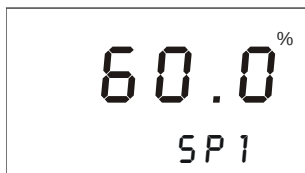
7. Relay Modes

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 relay A or relay B.

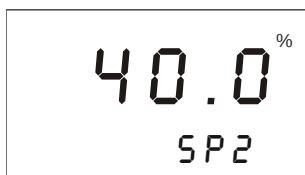
7.1 View Relay Set Points

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 relay set point value for Relay A and LED "A" lights. (The mode of the relay set point will be with respect to the measurement mode before REL key is pressed).



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

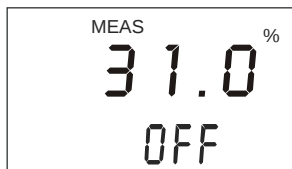
In manual relay mode, you can manually turn “on” and “off” the control devices connected to Relay A, Relay B or Wash relay.

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

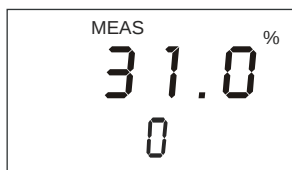
→ **NOTE:** Pressing ENT key at a value other than “22” will cause the transmitter to revert to Measurement mode, and the relays will remain in automatic mode.

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

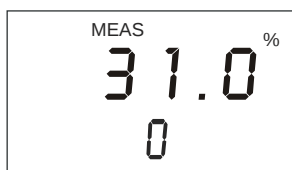
The manual control options now available depend on the control type (limit, pulse frequency, or pulse length) you selected and set in section 6.5.



If you selected Limit control: The display shows the current measured value (in upper display) and “OFF” or “ON” (in lower display) depending on the relay status of the currently selected relay.



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



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

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.

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

8. Technical Specifications

8.1 General Specifications

Dissolved Oxygen

Measuring range	0.00 to 20.00 mg/l or ppm 0.0 to 200.0 %
Resolution	0.01 mg/l or ppm or 0.1 %
Relative accuracy	±1 % of full-scale reading

Temperature

Measuring range	-9.9 to +125.0 °C or +15.0 to +257.0 °F
Resolution	0.1 °C or 0.1 °F
Relative accuracy	±0.5 °C or ±1.0 °F
Sensor	NTC 22 kΩ thermistor

Compensation

Temperature Compensation	Automatic or Manual
Salinity Compensation	0.0 to 50.0 ppt (Manual setting and automatic correction)
Pressure Compensation	0.740 to 3.000 bar 555 to 2250 mmHg 10.73 to 43.51 PSI (Manual setting and automatic correction)

Set-point and Control Function

Function Switchable	Off Limit Control P/PI Control (Pulse length / Pulse frequency)
Integral Action Time (IAT)	0.0 to 999.9 minutes
Adjustable period with pulse length controller	0.5 to 20 seconds
Adjustable period with pulse frequency controller	60 to 120 pulses/min
Pickup / Dropout delay	0 to 2000 seconds
Wash cycle	0.1 to 200.0 hours
Wash duration	1 to 2000 seconds
Switching DO hysteresis	0.1 to 1.0 mg/l or 1.0 to 10.0 %
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 or pulse
Pickup delay	0 to 2000 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
Back light	On/Off selectable with four levels of brightness control

EMC Specifications

Emissions	EN 61326
Susceptibility	EN 61326

Environmental Conditions

Ambient Temperature 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 DO values and temperature, galvanically isolated
Load	max. 600 Ω
DO 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 DO values and temperature, galvanically isolated
Load	max. 600 Ω
DO 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. Accessories

9.1 Replacement Unit

Product Description	Eutech Instruments Order Code	Thermo Scientific Order Code
Alpha DO 2000 Controller / Transmitter, wall mount version	ECDOCTP2000WPG	TSDOCTP2000WPG
Alpha DO 2000 Controller / Transmitter, panel mount version	ECDOCTP2000PPG	TSDOCTP2000PPG

9.2 Other Accessories

Product Description	Order Code
Amperometric Dissolved Oxygen Probe	EC237150
Fermentation Dissolved Oxygen Probe	EC237450
Membrane Kit for EC237450	EC237140
Electrolyte for EC237450	EC237118
Connector Cap for EC237450	EC237137
Cable for EC237450, 5m	EC355089
Cable for EC237450, 10m	EC355136
Panel Mount Kit for Alpha 2000	01X278701

→ NOTE:

Please contact your authorised distributor or dealer for the prices of extension measuring cables and other accessories such as T-joints, electrode assembly, and calibration solutions.

10. General Information

10.1 Warranty

This Controller transmitter is supplied with a one-year warranty against significant deviations in material and workmanship from date of purchase and a six-month warranty for probe. Each instrument will have a warranty card with a specific serial number. The warranty card must be endorsed by the Authorized Distributor at the point of sale.

If repair or adjustment is necessary and has not been the result of abuse or misuse within the designated period, please return – freight pre-paid – and correction will be made without charge. Thermo Scientific/ Eutech will determine if the product problem is due to deviations or customer misuse. Out of warranty products will be repaired on a charged basis.

Exclusions

The warranty on your instrument shall not apply to defects resulting from:

- Improper or inadequate maintenance by customer
- Unauthorized modification or misuse
- Operation outside of the environment specifications of the products

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 3 way (5.08 mm), 9 way (5.08 mm), 13 way (3.5mm), 8 way (3.5mm). 3 way (3.55mm)

Panel mount version:

- Rubber gasket, 1pc
- Catch, 2pcs
- Rod, threaded, 2 pcs
- Connector, one each of 19 way (3.5 mm), 3 way (5.08 mm) and 9way (5.08 mm)

10.3 Return of goods

Authorization must be obtained from our Customer Service Department or authorized distributor before returning items for any reason. A "Return Goods Authorization" (RGA) form is available through our authorized distributor. Please include data regarding the reason the items are to be returned. For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss. Thermo

Scientific will not be responsible for damage resulting from careless or insufficient packing. A restocking charge will be made on all unauthorized returns.

NOTE: Thermo Scientific reserves the right to make improvements in design, construction, and appearance of products without notice.

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 additional protection. Include a brief description of any faults suspected for the convenience of Customer Service Dept., if possible.

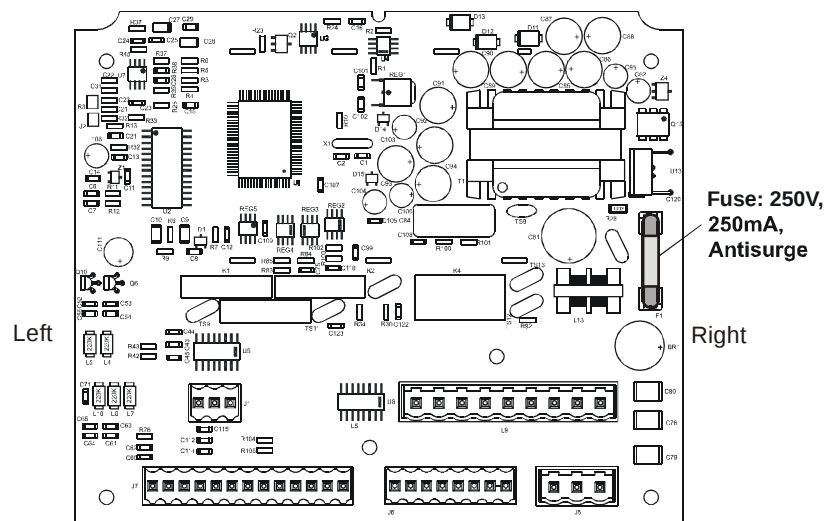
11. Appendices

11.1 Appendix 1 – Replacing Fuse

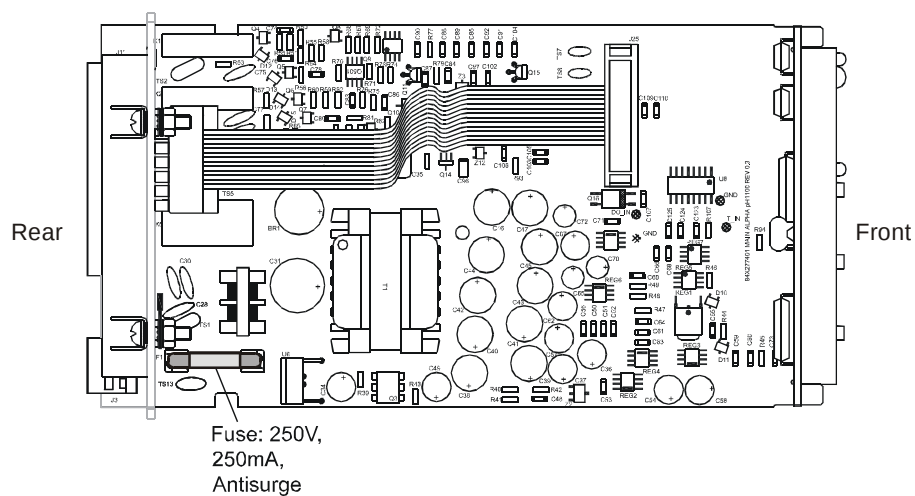


Caution! Before opening the unit to replace the unit fuse, make sure the mains cable is separated from the power supply.

Wall mount version (view from the backside)



Panel mount version (view from top)



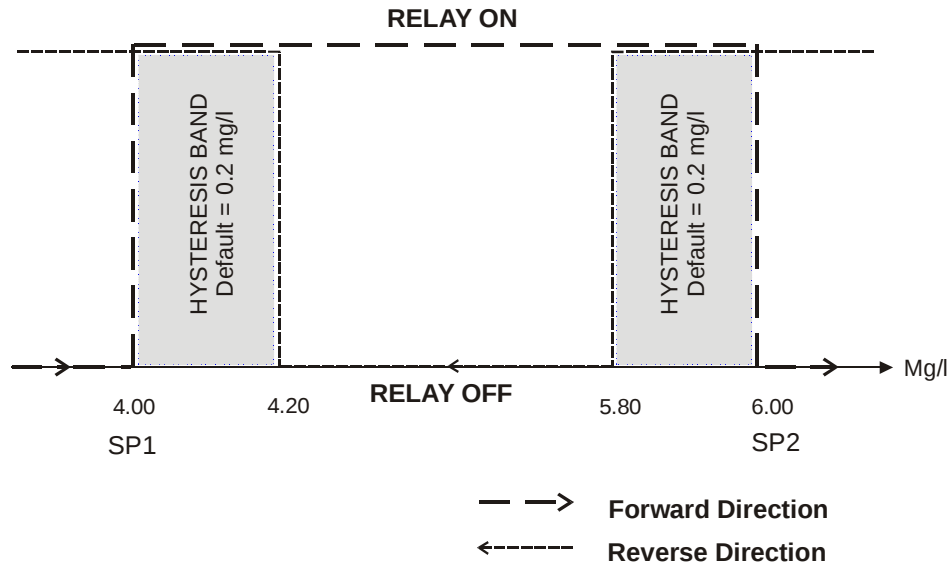
11.2 Appendix 2 – Dissolved Oxygen Values

The following table shows the Dissolved Oxygen values at different salinity values, at different temperatures, at barometric pressure of 760 mmHg. For other pressure levels, the controller automatically corrects the value based on the pressure value input.

Temperature		Salinity- ppt				
°C	°F	0	10	20	30	40
0	32.0	14.6	13.8	13.0	12.1	11.3
1	33.8	14.2	13.4	12.6	11.8	11.0
2	35.6	13.8	13.1	12.3	11.5	10.8
3	37.4	13.4	12.7	12.0	11.2	10.5
4	39.2	13.1	12.4	11.7	11.0	10.3
5	41.0	12.7	12.1	11.4	10.7	10.0
6	42.8	12.8	11.8	11.1	10.5	9.8
7	44.6	12.1	11.5	10.9	10.2	9.6
8	46.4	11.8	11.2	10.6	10.0	9.4
9	48.2	11.5	11.0	10.4	9.8	9.2
10	50.0	11.3	10.7	10.1	9.6	9.0
11	51.8	11.0	10.5	9.9	9.4	8.8
12	53.6	10.7	10.3	9.7	9.2	8.6
13	55.4	10.5	10.1	9.5	9.0	8.5
14	57.2	10.3	9.9	9.3	8.8	8.3
15	59.0	10.1	9.7	9.1	8.6	8.1
16	60.8	9.8	9.5	9.0	8.5	8.0
17	62.6	9.6	9.3	8.8	8.3	7.8
18	64.4	9.4	9.1	8.6	8.2	7.7
19	66.2	9.2	8.8	8.5	8.0	7.6
20	68.0	9.1	8.7	8.3	7.8	7.4
21	69.8	8.9	8.6	8.1	7.7	7.3
22	71.6	8.7	8.4	8.0	7.6	7.1
23	73.4	8.6	8.3	7.9	7.4	7.0
24	75.2	8.4	8.1	7.7	7.3	6.9
25	77.0	8.2	8.0	7.6	7.2	6.7
26	78.8	8.1	7.8	7.4	7.0	6.6
27	80.6	8.0	7.7	7.3	6.9	6.5
28	82.4	7.8	7.6	7.1	6.8	6.4
29	84.2	7.7	7.4	7.0	6.6	6.3
30	86.0	7.6	7.3	6.9	6.5	6.1
31	87.8	7.4	7.1	6.7	6.4	6.0
32	89.6	7.3	7.0	6.6	6.3	5.9
33	91.4	7.2	6.9	6.5	6.2	5.8
34	93.2	7.1	6.8	6.5	6.1	5.7
35	95.0	7.0	6.7	6.4	6.0	5.6
36	96.8	6.8	6.5	6.2	5.9	5.5
37	98.6	6.7	6.4	6.1	5.8	5.4
38	100.4	6.6	6.3	6.0	5.7	5.3
39	102.2	6.5	6.3	5.9	5.6	5.2
40	104.0	6.4	6.3	5.8	5.5	5.2

11.3 Appendix 3 – Simple Explanation on the Function of Hysteresis

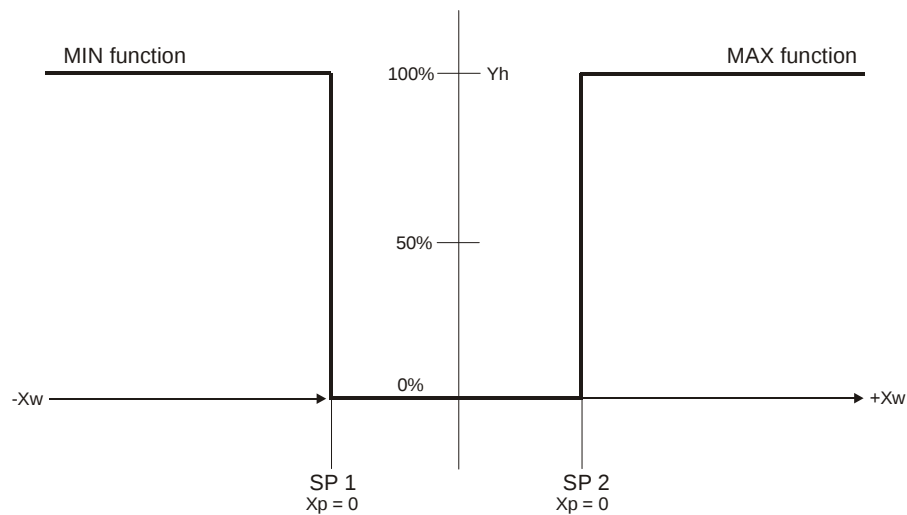
SP1 = 4.00 mg/l & Set to LO
SP2 = 6.00 mg/l & Set to HI



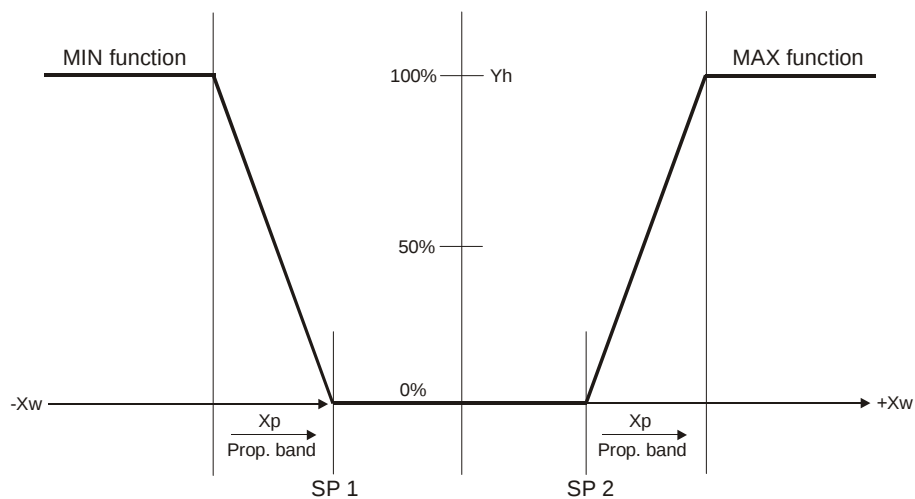
The controller relay activates when the set-point is reached. In the reverse direction, it does not de-activate when the value reaches the set-point. Instead, it continues to be active till the value reaches the amount set by the Hysteresis band.

11.4 Appendix 4 – General Instructions Concerning Controller Setting

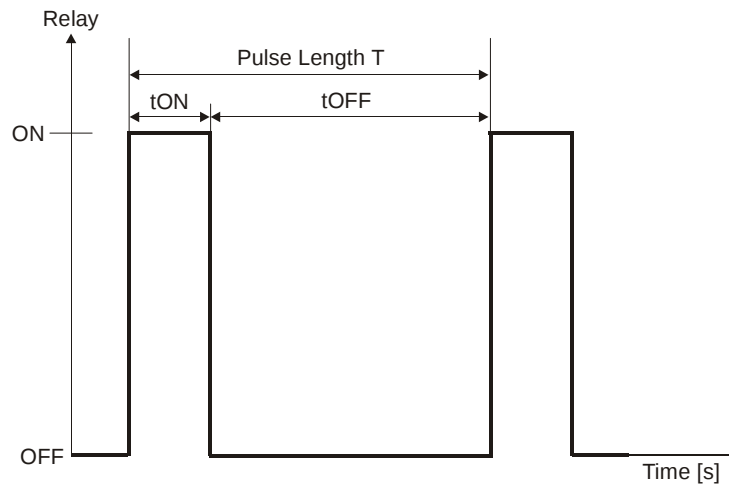
Control characteristic of Controllers used as limit value switch



Control characteristic of P-Controllers as proportional controller



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 .

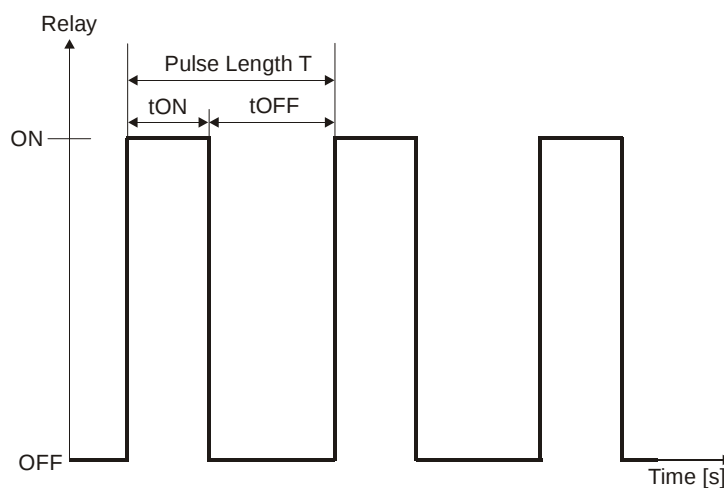
The following applies:

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

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 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 LCD

Abbreviation	Description
AL.D	Alarm delay
ATC	Automatic temperature compensation
BAR	Pressure in bar
BKLT	Back light
C.°C	Calibration temperature
CAL	Calibration
CAL DEF	Calibration default
CCD	Calibration security code
CNFG	Configuration
CNTR	Controller
Con	Concentration
CU22	Out of range current 22mA
CUR 1	Output current 1
CUR 2	Output current 2
DEEN	Deenergized
EN	Energized
ENT	Enter
FCT DEF	Factory default
FLET	Fleet, impulse
F.PF	Pulse frequency
HI	High limit
H.INT	Wash interval in hours
HYS	Hysteresis
IAT	Integral action time
L.CT	Limit control
LEVL	Back light intensity level
LO	Low limit
MANU	Manual
MEAS	Measurement
mmHg	Pressure in mm mercury

Abbreviation	Description
nA	Nano-ampere
OFS	Offset
OFF.D	Off delay
ON.D	On delay
OUT	Output signal
P. °C	Process temperature
PFC	Pulse frequency control
PLC	Pulse length control
PNT	Point
P/PI	Proportional/integral control
PRES	Barometric pressure
PRP	Proportional range
PSI	Ponds per square inch
REL	Relay
RH	Relative humidity
R.0	0 mA Output current
R.4	4 mA Output current
R.20	20 mA Output current
SAL	Salinity
SAT	Saturation
SCD	Setup security code
S.DUR	Wash duration in seconds
SET	Setting
SP1	Setpoint 1
SP2	Setpoint 2
STDY	Steady
T.PL	Pulse length time
TYP	Type
UNIT	measuring unit
WASH	Wash
1-PT	One-Point
2-PT	Two-Point

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