# Instruction Manual

# Alpha DO 500

## 2-Wire Dissolved Oxygen Transmitter

### Dissolved Oxygen / ºC meter

ISO 9001 CERTIFIED CE

68X216876 | Rev 2 | Apr 2008

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# Preface

This manual serves to explain the use of the Alpha DO 500 transmitter. It functions in two ways, firstly as a step by step guide to help you to operate the transmitter. Secondly, it serves as a handy reference guide. It is written to cover as many anticipated applications of the transmitter as possible. If there are doubts in the use of the transmitter, please do not hesitate to contact the nearest Authorized Distributor.

Thermo Scientific will not accept any responsibility for damage or malfunction to the transmitter caused by improper use of the instrument.

Remember to fill in the guarantee card and mail it back to your authorized distributor.

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

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# 1. Introduction

## 1.1 Before You Begin

We thank you for purchasing the Alpha DO 500 Transmitter.

The construction of the Alpha DO 500 Transmitter 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 500 Transmitter.

The instruction manual must always be stored close at hand, in a place accessible to all people working with the Alpha DO 500 Transmitter.

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

Alpha DO 500 Transmitters are intended solely for dissolved oxygen (DO) 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 Alpha DO 500 Transmitter (housings, sensors, etc.).
- Comply with local environmental and operational conditions.

## 1.3 Safety Instructions

- The Alpha DO 500 Transmitter should be installed and operated only by personnel familiar with the instrument and who are qualified for such work.

- A defective Transmitter must neither be installed nor put into service.

- The Alpha DO 500 Transmitter must only be operated under the specified operating conditions (see section 5.9).

- The Alpha DO 500 Transmitter must not be repaired by the customer.

- No modifications to the Alpha DO 500 Transmitter 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 power supply and then undo all electrical connections.
- Remove the unit from the wall / panel.

**Correct Disposal of the Instrument**

When the DO Transmitter is permanently taken out of service, obey the local environmental regulations for correct disposal or send the instrument to your local distributor, they will take care of proper disposal.

# 2. Getting Started

## 2.1 Description of Instrument

The Thermo Scientific **Alpha DO 500 Transmitter** is used for measuring dissolved oxygen and temperature values. The dissolved oxygen values can be measured using industrial dissolved oxygen sensors. The temperature values can be measured using 2-wire or 3-wire Pt100 sensors. The DO 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.

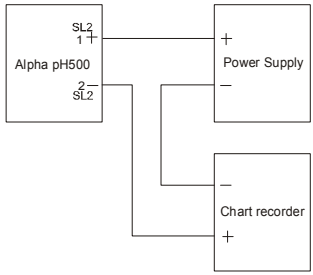
The **Alpha DO 500 Transmitter** has many user-friendly and safety features which include:

- Push-button keypad for calibration and setup
- Built-in non-volatile memory to ensure that calibration and other information are not erased if power supply fails
- Menu-driven program that simplifies setup
- Automatic temperature compensation (ATC)
- Manual temperature compensation setting without the ATC probe, with independent setting for calibration and process temperature
- Large dual display LCD for easy reading with clear multiple annunciators, operational mode indicators and error indicators.
- Galvanically isolated current output of 4 to 20mA
- Hold function to freeze output current (22mA)
- Out of range current indication (3.8mA)
- Protection against electromagnetic interference

**Power Supply Requirements (SL2 Position)**

This transmitter requires a 12 to 24V DC power supply. Other Transmitters and/or a chart recorder may be connected in series.

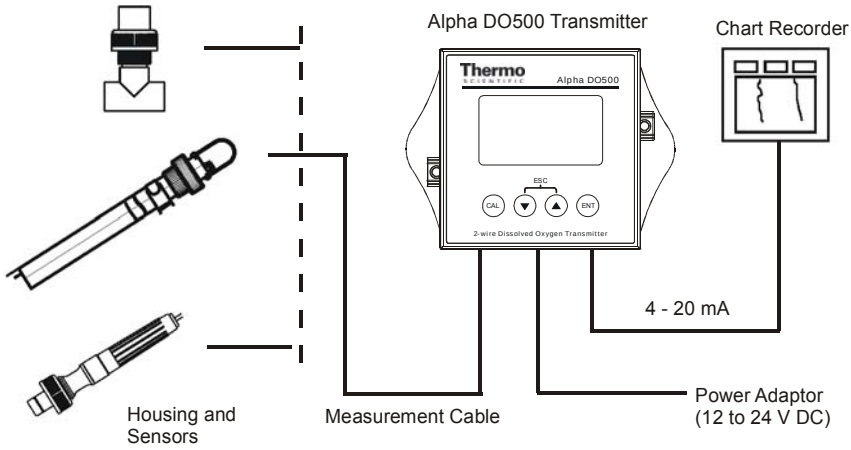
1. Insert positive loop wire from power supply to pin 1, tighten screw.
2. Insert negative loop wire to pin 2, tighten screw. This wire may be linked to a chart recorder or to negative terminal of power supply.



## 2.2 Measurement and Control System

A typical measurement system consists of:

- A Alpha DO 500 Transmitter
- A dissolved oxygen sensor with integrated or separate Pt100 temperature sensor
- An appropriate measurement cable
- An immersion, flow or process assembly
- A chart recorder



## 2.3 Connecting Peripherals

### 2.3.1 Connection Terminals

**Remove Back Cover**:

Remove the screws from the four corners at the back of the DO Transmitter. Remove the back cover. The connectors are exposed on the back PCBA as shown in the Figure 1 below.

**Connectors**:

- SL2 – 12 to 24 V DC power
- SL1 – Dissolved Oxygen electrode & Temperature probe connections (wiring has to be done in the detachable connector

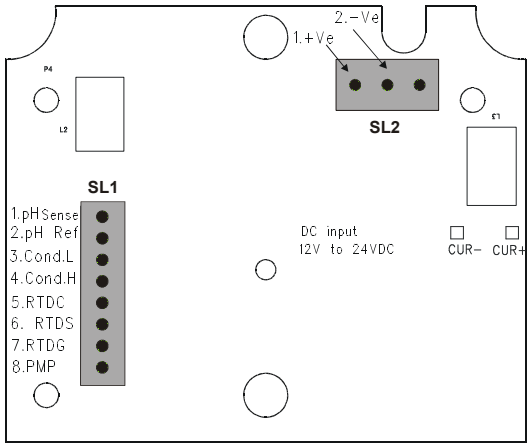



**Figure 1: Outer Side of Back PCBA**

| SL1 Connections | SL 2 Connections |
|---|---|
| 1. DO Input, +ve terminal | 1. DC Power Supply +ve terminal |
| 2. DO Input, -ve terminal | 2. DC Power Supply –ve terminal |
| 3. No Connection | 3. No Connection |
| 4. No Connection | |
| 5. PT100 Compensate (Short to pin 6 for 2-wire RTD) | |
| 6. PT100 Sense | |
| 7. PT100 Ground | |
| 8. No Connection | |

### 2.3.2 Connecting Dissolved Oxygen Electrode

Refer the instruction sheet that comes with your Dissolve Oxygen electrode to identify polarity (+ve and –ve) of DO wires.

1. Connect DO +ve wire to **Pin 1** of SL1 connector
2. Connect DO -ve wire to **Pin 2** of SL1 connector

### 2.3.3 Connecting Temperature Probe

For Automatic Temperature Compensated (ATC) readings, a 100Ω Pt RTD temperature probe (2-wire or 3-wire) can be connected to the Transmitter.

**3-Wire Probe:**

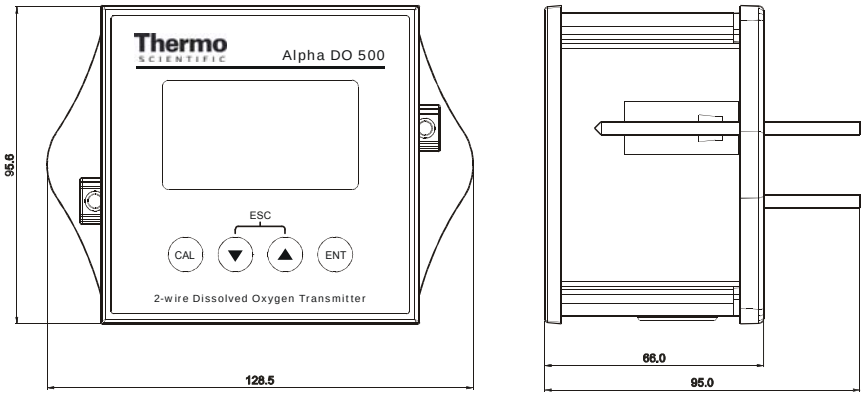
1. Connect PT100 compensate wire to **Pin 5** of SL1 connector
2. Connect PT100 sense wire to **Pin 6** of SL1 connector
3. Connect PT100 GND wire to **Pin 7** of SL1 connector

**2-Wire Probe:**

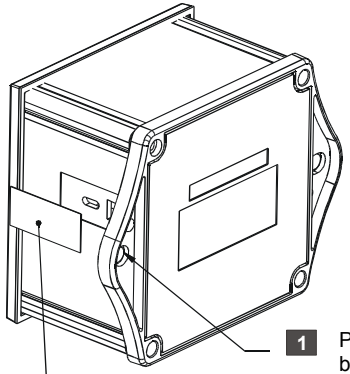
1. Short **Pin 5 & 6** of SL1 connector using a small piece of wire.
2. Connect PT100 sense wire to **Pin 6** of SL1 connector
3. Connect PT100 GND wire to **Pin 7** of SL1 connector

# 2.4 Installation

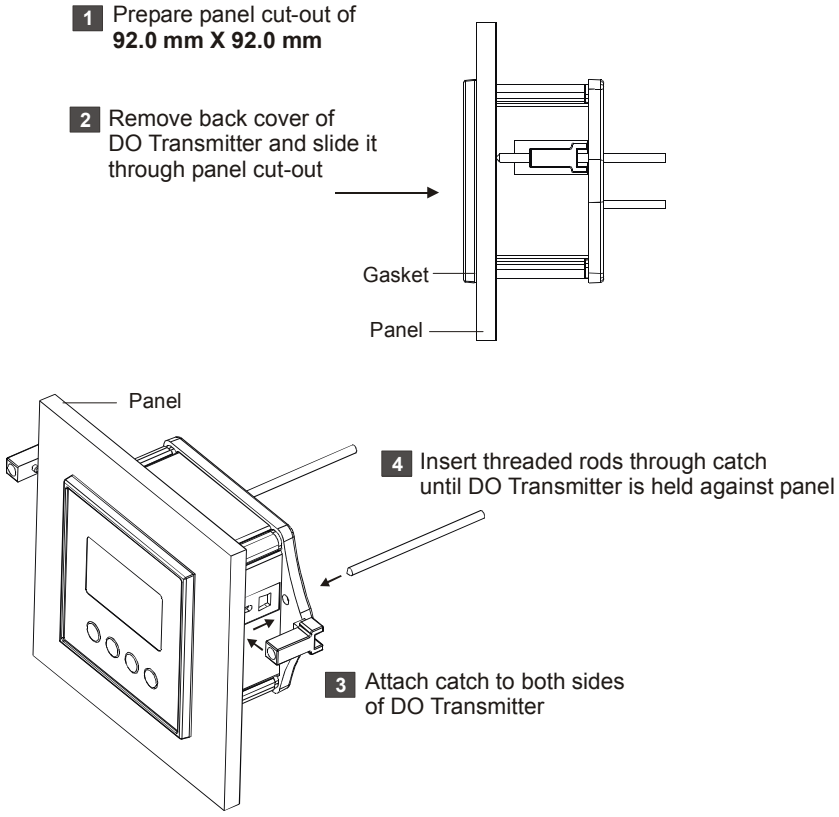
## 2.4.1 Mechanical Dimensions




## 2.4.2 Wall Mount



### 2.4.3 Panel Mount



## 2.5 Display & Keypad

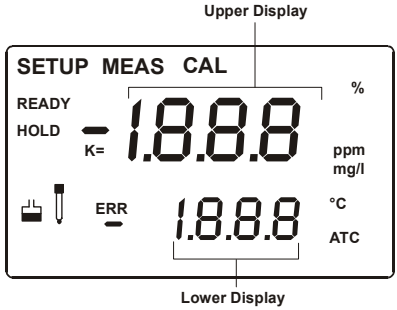
### 2.5.1 Display Overview

The Liquid Crystal Display (LCD) of the Alpha DO 500 Transmitter has two alpha-numerical displays (Upper and a Lower).

- **Upper display:** Measured dissolved oxygen reading (in % saturation or ppm or mg/l) is displayed when the Transmitter is in normal operation (measurement) mode.
- **Lower display:** Measured temperature value is displayed when the Transmitter is in normal operation (measurement) mode. In Calibration mode, calibration points are displayed here.

The two displays indicate function names, options & settings in Setup mode. Refer 'Appendix 2 – Abbreviations Used in LCD' for more details.

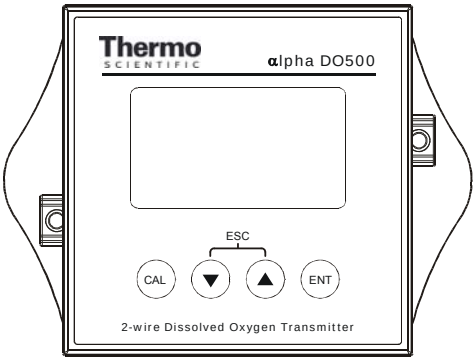
The LCD also consists of various mode indicators, status annunciators and unit of measurement indicators.




| | |
|---|---|
| **Mode Indicators** | |
| **MEAS** | Measurement mode *(Refer Section 3.1)* |
| **SETUP** | Setup mode *(Refer Section 5)* |
| **CAL** | Calibration mode *(Refer Section 4)* |
| **Status Annunciators** | |
| **READY** | Appears when the reading is stable |
| **HOLD** | Appears in Setup mode and Calibration mode to indicate that the relay function is frozen |
| **ATC** | Appears when Automatic Temperature Compensation (ATC) is enabled.<br>Not visible when Manual Temperature Compensation (MTC) is enabled.<br>Flashes if the temperature probe is faulty in its ATC mode. *(Refer Section 5.4)* |
| **ERR** | Appears when an error occurs |
| | Buffer annunciator. Appears in calibration mode or viewing calibrated point |
| | Electrode annunciator. Appears when viewing electrode properties or during calibration error |

| Units of Measurement Indicators | |
|---|---|
| **%** | Dissolved Oxygen in Percentage Saturation |
| **ppm** | Dissolved Oxygen in Parts Per Million |
| **mg/l** | Dissolved Oxygen in milligram per liter |
| **ºC** | Temperature in Celsius *(Refer Section5.4)* |

### 2.5.2 Key Functions

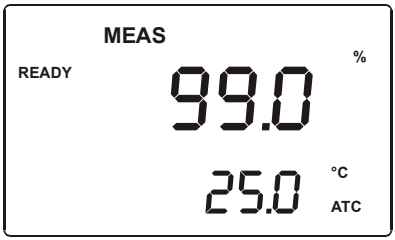



| Key | Description |
|---|---|
| CAL | Enter Calibration mode |
| ENT | Enter Setup mode.<br>Access sub screens (parameters) within a group of settings in Setup mode.<br>Confirm (save) setup parameters and numerical values<br>Start/Confirm calibration in Calibration mode. |
| ▲<br>▼ | Select a group of settings in Setup mode.<br>Select parameters and increment/decrement numerical values in Setup and Calibration modes.<br>(When pressed continuously, speed of values increment/decrement increases)<br>Returns to Measurement mode when both keys are pressed simultaneously. |

# 3. Normal Operation

## 3.1 Measurement mode

When the DO Transmitter is powered on, the display shows all the LCD segments briefly, and then automatically enters into the **Measurement mode**.




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, while the lower display shows the temperature value. The indicator "%", "ppm" or "mg/l" at the upper right side of the display indicates the current measurement mode. (Refer section 5.2 for switching measurement modes)

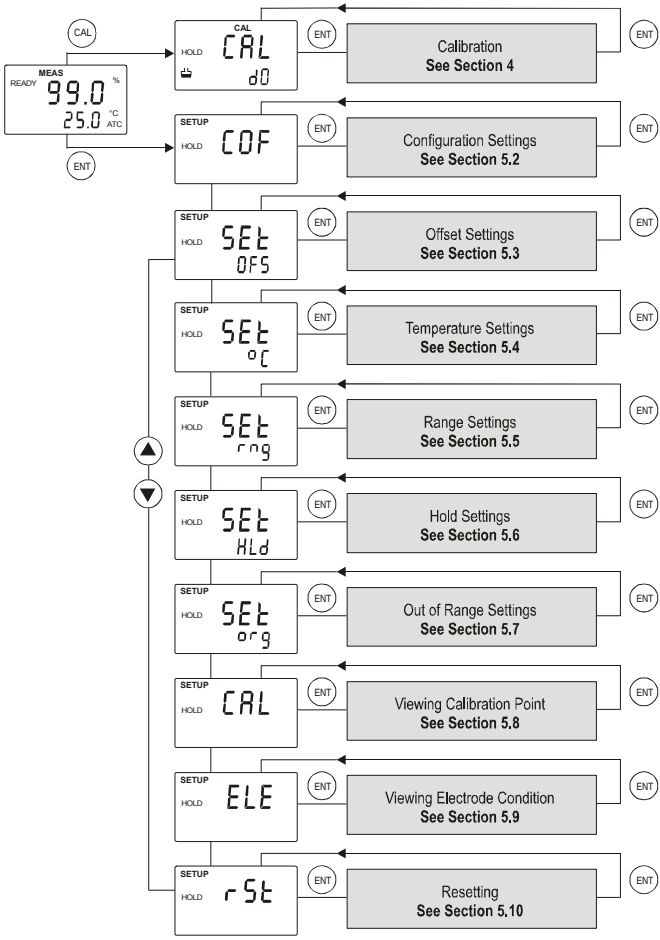
**NOTE:** To guarantee accurate readings, the measuring system (the DO Transmitter and the sensor) must be calibrated regularly.

From measurement mode you can access:

- **Calibration mode** (by pressing **CAL** key)
- **Setup mode** (by pressing **ENT** key)

For more details, refer section 4 for Calibration mode and section 5 for Setup mode.)

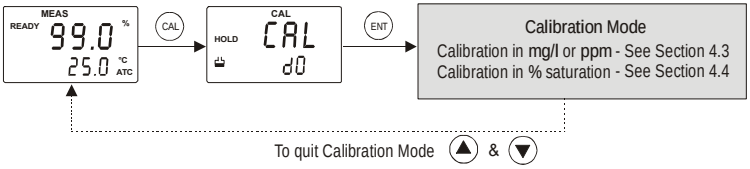
## 3.2 Menu Overview



# 4. Calibration Mode

## 4.1 Entering Calibration Mode

While in measurement mode, press **CAL** key to access calibration mode. LCD indicates '**CAL dO**'.




**NOTES:**

- To exit calibration mode at any time during calibration, **press ▲ and ▼ keys simultaneously** (escape). The DO Transmitter returns to the measurement mode and the old calibration values remain active.
- The calibration is always carried out in the units of measurement (mg/l or ppm or %) selected in setup mode.

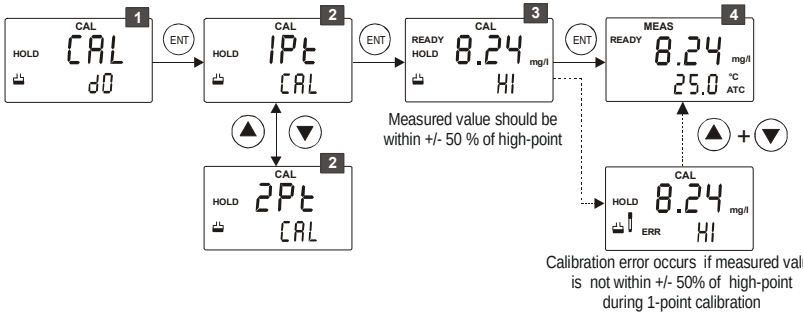
## 4.2 Calibration in mg/l or ppm of Oxygen

The DO Transmitter is capable of calibration of up to 2 points for dissolved oxygen. All new calibration values will automatically override existing calibration data. Make sure the unit of measurement is set to mg/l or ppm. (Refer Section 5.2 for switching unit of measurements).

If you wish to abort the DO calibration, press ▲ and ▼ keys simultaneously and the DO Transmitter reverts to measurement mode.

### 4.2.1 1-Point Calibration

The 1-point calibration is done at **high-point** using **8.24 mg/l** of dissolved oxygen solution.




**1** From measurement mode **press CAL key** to enter calibration mode as described in section 4.1. The LCD shows '**CAL Do**'. **Press ENT key** to begin calibration.

**2** **Select 1-point calibration**: The display shows '**1Pt CAL**'. If '**2Pt CAL**' is shown, press **▲ or ▼ key** to select '**1Pt CAL**'.

**Press ENT key** to confirm the selection.

**3** The buffer annunciator appears in LCD. The lower display shows '**HI**', indicating the high-point is being calibrated. Immerse the electrode in 8.24 mg/l dissolved oxygen solution. Immerse the temperature probe in the solution if ATC is enabled. The upper display shows the measured value of dissolved oxygen of the solution. Allow the reading to stabilize. LCD shows '**READY**' annunciator when the reading is stable.

Press **▲ or ▼ key** to adjust the reading to 8.24 mg/l. The Transmitter allows adjusting up to ±50% of the measured value.

**Press ENT key** to confirm the reading.

**NOTE:** The transmitter does not accept the calibration and shows calibration error if the displayed (measured) value is more than ±50% of the high-point value.

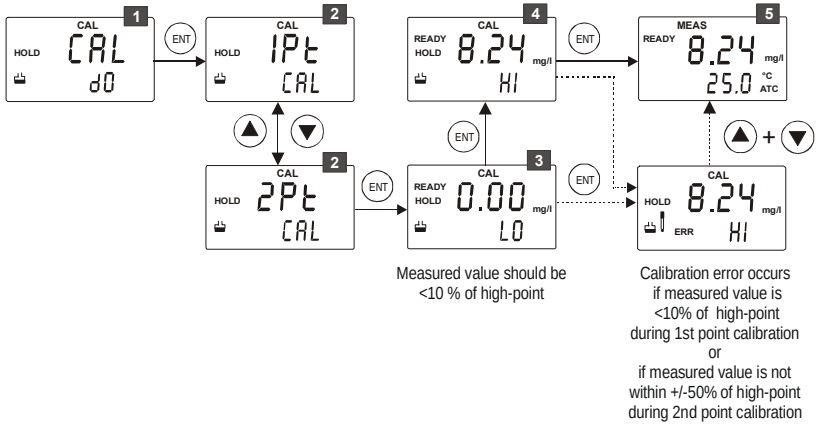
**4** The calibration is completed. The DO Transmitter reverts to measurement mode.

**NOTES:**

- If the displayed value is more than ±10% of the high-point value, the Transmitter indicates a calibration error by showing '**ERR**' and blinking electrode annunciator. If this happens, **press ▲ and ▼ keys** together to return to measurement mode. Restart the calibration from Step1.
- To exit from calibration mode without confirming calibration, press ▲ and ▼ keys together.
- When calibrating with manual temperature compensation, the Transmitter automatically changes from preset 'process temperature' to 'calibration temperature'. After leaving calibration mode, the transmitter switches back to the 'process temperature'. (Refer section 5.4 for temperature settings)

### 4.2.2 2-Point Calibration

The 2-point calibration is carried out at Low-point (zero dissolved oxygen solution) and then at high-point using **8.24 mg/l** of dissolved oxygen solution.




**1** From measurement mode **press CAL key** to enter calibration mode as described in section 4.1. The LCD shows '**CAL Do**'. **Press ENT key** to begin first calibration point.

**2** **Select 2-point calibration**: The display shows '**1Pt CAL**'. Press **▲ or ▼ key** to select '**2Pt CAL**'.

**Press ENT key** to confirm the selection.

**3** The buffer annunciator appears in LCD. The lower display shows '**LO**', indicating the low-point is being calibrated. Immerse the electrode in a low level of dissolved oxygen solution (0.0 mg/l). Immerse the temperature probe in the solution if ATC is enabled. The upper display shows the measured value of dissolved oxygen of the solution. Allow the reading to stabilize. LCD shows '**READY**' annunciator when the reading is stable.

**Press ENT key** to confirm the reading.

**NOTE**: The transmitter proceeds to the second point of calibration if the displayed reading is less than 10% of the high-point value.

**NOTE**: The transmitter does not accept the calibration and shows calibration error if the displayed (measured) value is more than 10% of the high-point value.

**4** If the low-point calibration is successful, the Transmitter proceeds to the second point. The lower display shows '**HI**'. Take the electrode out of low oxygen solution and immerse it in a higher dissolved oxygen concentration (8.24 mg/l) solution.

The upper display shows the measured value of dissolved oxygen of the solution. Allow the reading to stabilize. LCD shows '**READY**' annunciator when the reading is stable.

Press **▲ or ▼ key** to adjust the reading to 8.24 mg/l. The Transmitter allows adjusting up to ±50% of the measured value.

**Press ENT key** to confirm the reading.

**NOTE:** The transmitter does not accept the calibration and shows calibration error if the displayed (measured) value is more than 50% of the high-point value.

**5** The calibration is completed. The DO Transmitter reverts to measurement mode.

**NOTES:**

- If the displayed value is more than ±10% of the high-point value, the Transmitter indicates a calibration error by showing '**ERR**' and blinking electrode annunciator. If this happens, **press ▲ and ▼ keys** together to return to measurement mode. Restart the calibration from Step1.
- To exit from calibration mode without confirming calibration, press ▲ and ▼ keys together.
- When calibrating with manual temperature compensation, the Transmitter automatically changes from preset 'process temperature' to 'calibration temperature'. After leaving calibration mode, the transmitter switches back to the 'process temperature'. (Refer section 5.4 for temperature settings)

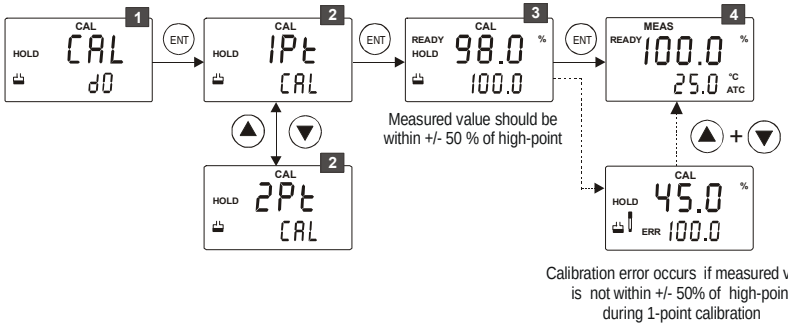
## 4.3 Calibration in% Saturation of Oxygen

The DO Transmitter is capable of calibrating up to 2 points for dissolved oxygen. All new calibration values will automatically override existing calibration data. Make sure the unit of measurement is set to %. (Refer Section 5.2 for switching unit of measurements).

If you wish to abort the operation during DO calibration, press ▲ and ▼ keys simultaneously and the DO Transmitter reverts to measurement mode.

### 4.3.1 1-Point Calibration

The 1-point calibration is done in air (100% oxygen saturation).




**1** From measurement mode **press CAL key** to enter calibration mode as described in section 4.1. The LCD shows '**CAL Do**'. **Press ENT key** to begin first calibration point.

**2** **Select 1-point calibration**: The display shows '**1Pt CAL**'. If '**2Pt CAL**' is shown, press **▲ or ▼ key** to select '**1Pt CAL**'.

**Press ENT key** to confirm the selection.

**3** The buffer annunciator appears in LCD. The lower display shows '**100.0**'. Allow the electrode to equilibrate in air. The upper display shows the measured value of dissolved oxygen saturation. Allow the reading to stabilize. LCD shows '**READY**' annunciator when the reading is stable.

**Press ENT key** to confirm the reading.

**NOTE:** The transmitter does not accept the calibration and shows calibration error if the displayed (measured) value is not within 50% to 150%.

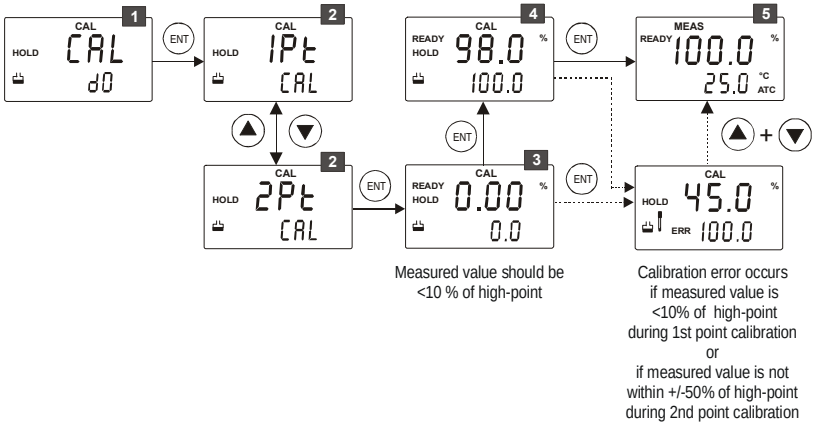
**4** The calibration is completed. The DO Transmitter reverts to measurement mode.

**NOTES:**

- If the displayed value is not within 50% to 150%, the Transmitter indicates a calibration error by showing '**ERR**' and blinking electrode annunciator. If this happens, **press ▲ and ▼ keys** together to return to measurement mode. Restart the calibration from Step1.
- To exit from calibration mode without confirming calibration, press ▲ and ▼ keys together.
- When calibrating with manual temperature compensation, the Transmitter automatically changes from preset 'process temperature' to 'calibration temperature'. After leaving calibration mode, the transmitter switches back to the 'process temperature'. (Refer section 5.4 for temperature settings)

### 4.3.2 2-Point Calibration:

The 2-point calibration is carried out with standard DO buffer of 0% oxygen saturation and then in air (100% oxygen saturation)




**1** From measurement mode **press CAL key** to enter calibration mode as described in section 4.1. The LCD shows '**CAL Do**'. **Press ENT key** to begin first calibration point.

**2** **Select 2-point calibration**: The display shows '**1Pt CAL**'. Press **▲ or ▼ key** to select '**2Pt CAL**'.

**Press ENT key** to confirm the selection.

**3** The buffer annunciator appears in LCD. The lower display shows '**0.0**'. Immerse the electrode in 0% standard DO buffer solution. Immerse the temperature probe in the solution if ATC is enabled. The upper display shows the measured value of dissolved oxygen of the solution. Allow the reading to stabilize. LCD shows '**READY**' annunciator when the reading is stable.

**Press ENT key** to confirm the reading.

**NOTES:**

- The transmitter proceeds to the second point of calibration if the displayed reading is less than 10%
- The transmitter does not accept the calibration and shows calibration error if the displayed (measured) value is more than 10%

**4** If the 0% calibration is successful, the Transmitter proceeds to the second point. The lower display shows '**100.0**'. Take the electrode out of 0% oxygen solution, rinse in clean water, dry it and then allow the electrode to equilibrate in air. The upper display shows the measured value of dissolved oxygen saturation. Allow the reading to stabilize. LCD shows '**READY**' annunciator when the reading is stable.

**Press ENT key** to confirm the reading.

**NOTE:** The transmitter does not accept the calibration and shows calibration error if the displayed (measured) value is not with 50% to 150%

**5** The calibration is completed. The DO Transmitter reverts to measurement mode.

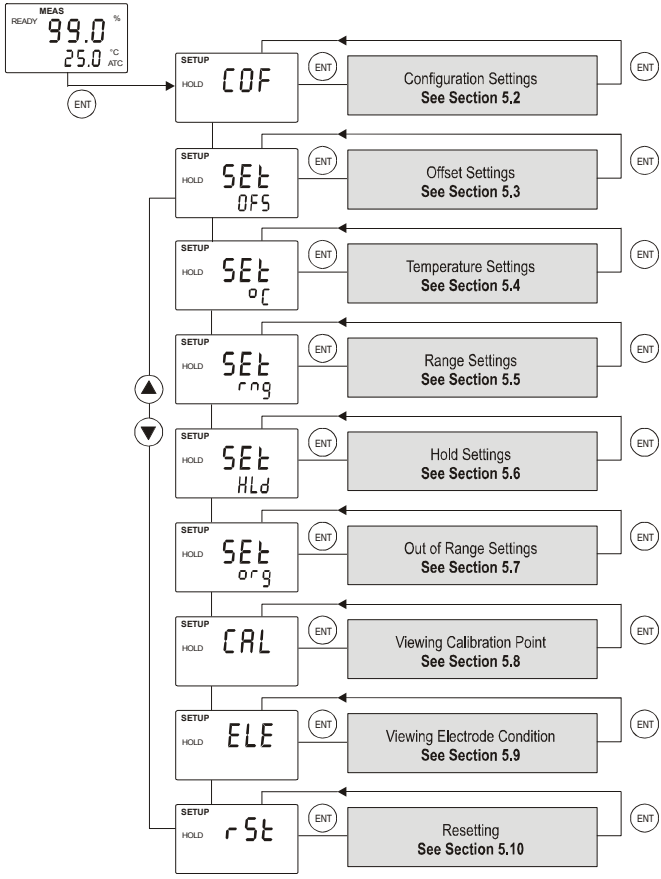
**NOTES:**

- If the displayed value is more than ±10% of the high-point value, the Transmitter indicates a calibration error by showing '**ERR**' and blinking electrode annunciator. If this happens, **press ▲ and ▼ keys** together to return to measurement mode. Restart the calibration from Step1
- To exit from calibration mode without confirming calibration, press ▲ and ▼ keys together
- When calibrating with manual temperature compensation, the Transmitter automatically changes from preset 'process temperature' to 'calibration temperature'. After leaving calibration mode, the transmitter switches back to the 'process temperature' (Refer section 5.4 for temperature settings)

# 5. Setup Mode

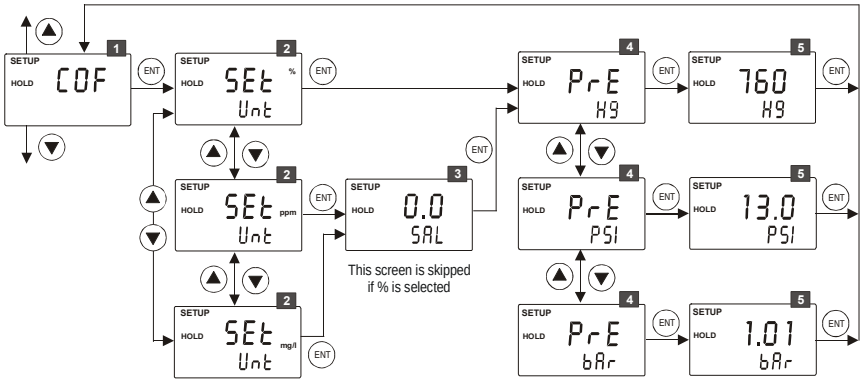
## 5.1 Enter Setup mode

The setup mode allows you to customize the settings of the DO Transmitter to suite your requirements. While in measurement mode, **press the ENT key** to access setup mode. LCD shows '**SETUP**' mode indicator and the first page of setup (**OFS** – offset settings). **Press ▲ or ▼ key** to access other pages of the setup mode. To exit from setup mode any time press **▲ and ▼ keys simultaneously** (escape). The Transmitter returns to measurement mode.



## 5.2 Configuration Settings

Configuration settings let you configure the DO Transmitter to different units of measurements (%, mg/l or ppm) set salinity and pressure values.




**1** From measurement mode **press ENT key** to enter setup mode as described in section 5.1. The LCD shows the first screen of setup mode (**COF**). **Press ENT key** to access configuration setting (COF).

**2** **Selecting unit of measurement for DO:** The display shows the '**SEt Unit**'. The right corner of the LCD shows currently configured unit of measurement for dissolved oxygen.

**Press ▲ or ▼ key** to select the desired unit of measurement (**%** or **ppm** or **mg/l**). **Press ENT key** to confirm your selection.

**If ppm or mg/l is selected for unit of measurement:**

**3** **Setting salinity value**: The lower display shows '**SAL**'. The upper display shows currently configured salinity value. (default is 0.0 ppt)

**Press ▲ or ▼ key** to adjust the upper display to the required salinity value. Allowable range is 0.0 to 50.0ppt.

**Press ENT key** to confirm the value.

**NOTE**: This screen does not appear if **%** was selected in step 2. The DO transmitter moves to step 4.

**4** **Setting units of measurement for pressure**: The upper display shows '**PrE**'. The lower display shows currently configured unit of measurement for pressure. **Press ▲ or ▼ key** to select the required unit of measurement for pressure (**Hg** or **PSI** or **Bar**). **Press ENT key** to confirm the selection.

**5** **Setting pressure value**: The upper display shows previously set pressure value (if any); otherwise it shows the default value. The lower

display shows the unit measurement selected in the step 4.

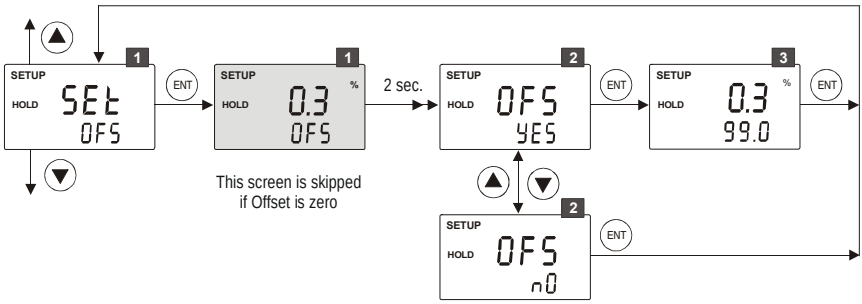
**Press ▲ or ▼ key** to set the required pressure value. **Press ENT key** to confirm the value. The Transmitter reverts to **COF** screen.

**Press ▲ or ▼ key** to access other setup screens or **press ▲ and ▼ key simultaneously** (escape) to return to measurement mode.

## 5.3 Offset Settings

In applications where continuous DO measurement is required, it may not be convenient to remove the electrode for calibration. In such cases, an on-line offset adjustment is recommended. The DO Transmitter allows you set an offset of up to **± 2.00ppm** or **± 2.00 mg/l** or **± 10.0%** to compensate for errors in the electrode.

The DO Transmitter adds or subtracts the offset value from the measured DO value and displays 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** From measurement mode **press ENT key** to enter setup mode as described in section 5.1. The LCD shows the first screen of setup mode (**COFS**). **Press ▲ or ▼ key** to select offset settings screen **(OFS).**

**Press ENT key** to access offset settings (**OFS**).

The Transmitter displays the current offset value (if any) for 2 seconds and switches to the next screen.

**2** **Selecting to modify offset:** The upper display shows '**OFS**'. **Press ▲ or ▼ key** to select '**YES**' or '**nO**'.

- Select **YES** to set an offset (or adjust the existing offset)
- Select **nO** to skip offset adjustment

**Press ENT key** to confirm your selection.

**If 'YES' was selected:**

**3** **Adjust the offset value:** The upper display shows the currently configured offset value (if any), otherwise zero. The lower display shows currently measured DO reading (including the current offset value). Allow the reading to stabilize. LCD shows '**READY**' annunciator when the reading is stable.

**Press ▲ or ▼ key** to adjust the upper display to required offset.

**Press ENT key** to confirm the value. The Transmitter reverts to **OFS** screen.

**If 'nO' was selected:**

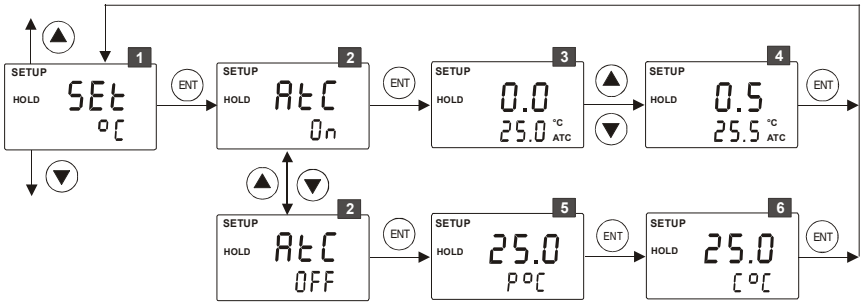
The existing offset value (if any) is unaffected and the Transmitter reverts to **OFS** screen.

**Press ▲ or ▼ key** to access other setup screens or **press ▲ and ▼ key simultaneously** (escape) to return to measurement mode.

## 5.4 Temperature Settings

Temperature settings allow you to enable or disable Automatic Temperature Compensation (ATC) of the Transmitter.

Set the Transmitter to manual temperature compensation (disable ATC) when the temperature of sample or process liquid is constant and a temperature probe is not available. When you disable ATC, the Transmitter allows you to set your **process temperature (PºC)** and **calibration temperature (CºC)**. This allows calibration at a different temperature other than the process temperature.




**1** From measurement mode **press ENT key** to enter setup mode as described in section 5.1. The LCD shows the first screen of setup mode (**COF**). **Press ▲ or ▼ key** to select temperature settings screen (**SEt ºC**).

**Press ENT key** to access temperature settings (**SEt ºC**).

**2** **Enable/disable ATC**: The upper display shows '**AtC**'. The lower display shows the last configured ATC selection ('**On**' or '**OFF**').

**Press ▲ or ▼ key** to enable (**AtC On**) or disable (**AtC OFF**) automatic temperature compensation.

**Press ENT key** to confirm your selection.

**If ATC enabled (AtC On):**

**3** **Setting temperature offset:** The upper display shows the last configured temperature offset value (if any), otherwise zero. The lower display shows currently measured temperature reading (including last configured offset value). LCD shows '**ATC**' annunciator in lower-right corner.

Place a thermometer, which is known to be accurate, in your sample or process liquid. Make sure your temperature probe is placed in the same liquid. Compare the stabilized temperature reading displayed on the Transmitter with the thermometer. If there is a difference between the two readings (offset), you can adjust the reading of the Transmitter. **Press ▲ or ▼ key** to adjust the lower display to the correct temperature value.

4 As the lower display value changes, the Transmitter adjusts the upper display reading automatically to suit the new offset value. Up to ± 10 ºCF offset is allowed.

**Press ENT key** to confirm the value. The Transmitter reverts to **SET ºC** screen.

**If ATC disabled (AtC OFF):**

5 **Setting process temperature**: The lower display shows '**PºC**' and the upper display shows the last configured process temperature. **Press ▲ or ▼ key** to adjust the upper display to desired process temperature. Allowable range: 0.0 to 100.0°C.

**Press ENT key** to confirm the process temperature.

6 **Setting calibration temperature**: The lower display shows '**CºC**' and the upper display shows the last configured calibration temperature. **Press ▲ or ▼ key** to adjust the upper display to desired calibration temperature. Allowable range: 0.0 to 100.0°C.

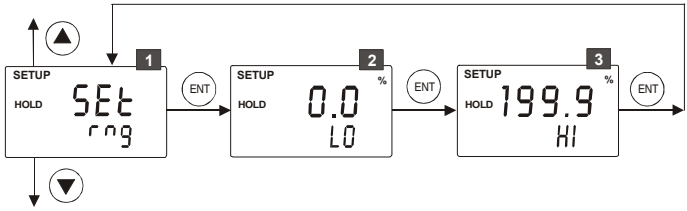
**Press ENT key** to confirm the calibration temperature. The Transmitter reverts to **SET ºC** screen.

**Press ▲ or ▼ key** to access other setup screens or **press ▲ and ▼ key simultaneously** (escape) to return to measurement mode.

## 5.5 Range Settings

The range settings allow you to map the Transmitter output current range (4-20 mA) to dissolve oxygen reading range (Zoom window). You can define the lowest DO reading of the Transmitter to 4mA (**LO**) and the highest DO reading to 20mA (**HI**). The current output can then be connected to a chart recorder to plot the DO variations.

| Unit of Measurement | Zoom Window | |
|---|---|---|
| | Default Lower Limit (LO) | Default Upper Limit (HI) |
| % saturation | 0.00 | 199.9 |
| ppm | 0.00 | 19.9 |
| mg/l | 0.00 | 19.9 |




**1** From measurement mode **press ENT key** to enter setup mode as described in section 5.1. The LCD shows the first screen of setup mode (**COF**). **Press ▲ or ▼ key** to select range settings screen (**SEt rng**).

**Press ENT key** to access range settings (**SEt rng**).

**2** **Select lower limit**: The lower display shows '**LO'**. The upper display shows the last configured lower limit, otherwise the default lower limit. **Press ▲ or ▼ key** to adjust the upper display to desired value.

**Press ENT key** to confirm the value.

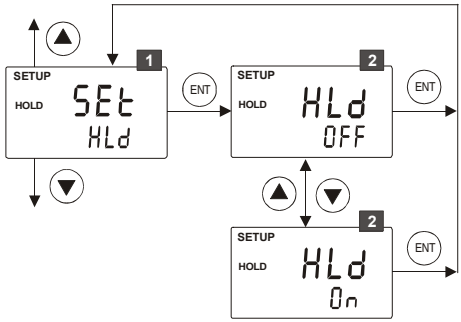
**3** **Select upper limit**: The lower display shows '**HI'**. The upper display shows the last configured upper limit, otherwise the default upper limit. **Press ▲ or ▼ key** to adjust the upper display to desired value.

**Press ENT key** to confirm the value. The Transmitter reverts to **SET rng** screen.

**Press ▲ or ▼ key** to access other setup screens or **press ▲ and ▼ key simultaneously** (escape) to return to measurement mode.

## 5.6 Hold Settings

When you switch the Transmitter to calibration mode or setup mode, the transmitter goes to the 'HOLD' status (indicating '**HOLD**' in the display) and freezes the current output at a specific value. Hold setting allows you to define the output current of the Transmitter when the Transmitter is in 'HOLD' status.




**1** From measurement mode **press ENT key** to enter setup mode as described in section 5.1. The LCD shows the first screen of setup mode (**COF**). **Press ▲ or ▼ key** to select hold settings screen (**SEt HLd**).

**Press ENT key** to access hold settings (**SEt HLd**).

**2** The upper display shows '**HLd**' and the lower display shows the last configured hold setting ('**On**' or '**OFF**'). **Press ▲ or ▼ key** to select the required choice for hold.

- Select **On** to freeze the current output at **22mA**
- Select **OFF** to freeze the current output at its **last measured value**.

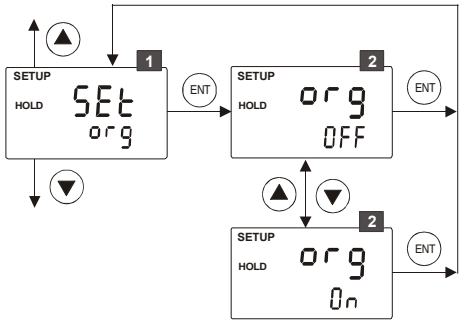
**NOTE:** The last current output value depends on the last measured DO reading and the range settings defined in the section 5.5

**Press ENT key** to confirm your selection. The Transmitter reverts to **SET HLd** screen.

**Press ▲ or ▼ key** to access other setup screens or **press ▲ and ▼ key simultaneously** (escape) to return to measurement mode.

## 5.7 Out of Range Settings

When the Transmitter measures a dissolved oxygen value which does not fall within the DO range (Zoom window) defined in the 'Range Settings', the reading is said to be 'out of range'. Out of range setting allows you to define the output current of the Transmitter when the Transmitter measures an 'out of range' DO reading.




**1** From measurement mode **press ENT key** to enter setup mode as described in section 5.1. The LCD shows the first screen of setup mode (**COF**). **Press ▲ or ▼ key** to select out of range settings screen (**SEt org**).

**Press ENT key** to access out of range settings (**SEt org**).

**2** The upper display shows '**org**' and the lower display shows the last configured out of range setting ('**On**' or '**OFF**'). **Press ▲ or ▼ key** to select the required choice.

- Select **On** to set output current to **3.8mA**
- Select **OFF** to set output current to the boundary values:

**That is:** To set output current to **4mA** when DO reading goes bellow lower limit of the zoom window and,

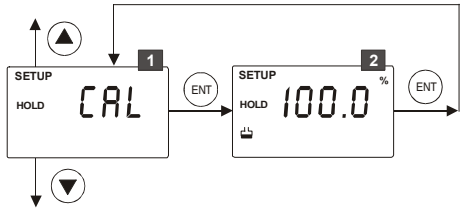
To set output current to **20mA** when the DO reading goes above the upper limit of the zoom window.

**Press ENT key** to confirm your selection. The Transmitter reverts to **SET org** screen.

**Press ▲ or ▼ key** to access other setup screens or **press ▲ and ▼ key simultaneously** (escape) to return to measurement mode.

## 5.8 Viewing Calibration Point

Calibration setting lets you view the high-point at which the calibration has been performed in the Transmitter.




**1** From measurement mode **press ENT key** to enter setup mode as described in section 5.1. The LCD shows the first screen of setup mode (**COF**). **Press ▲ or ▼ key** to select viewing calibration settings screen (**CAL**).

**Press ENT key** to view calibration settings (**CAL**).

**2** The buffer annunciator appears in the LCD. The upper display shows the value of the high-point at which the calibration has been carried out. The corresponding unit of measurement of calibration is displayed.

**NOTE:** If the Transmitter has not been calibrated yet for the currently selected unit of measurement, the LCD shows an empty reading ("---" ) in the upper display.

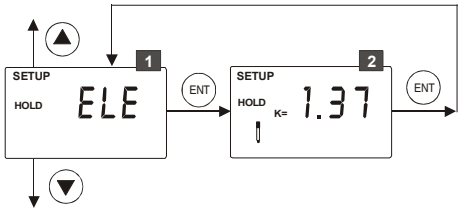
**Press ENT key** to exit calibration settings screen. The Transmitter reverts to **SET CAL** screen.

**Press ▲ or ▼ key** to access other setup screens or **press ▲ and ▼ key simultaneously** (escape) to return to measurement mode.

## 5.9 Viewing Electrode Condition

The electrode condition (correction factor=K) is an indication of its current working condition with respect to its original condition. The correction factor is calculated and stored in the Transmitter each time calibration is done.

Electrode Correction Factor (K) = Theoretical reading of the electrode / Default reading of the electrode




**1** From measurement mode **press ENT key** to enter setup mode as described in section 5.1. The LCD shows the first screen of setup mode (**COF**). **Press ▲ or ▼ key** to select viewing electrode condition screen (**ELE**).

**Press ENT key** to view electrode condition (**ELE**).

**2** The electrode annunciator appears in the LCD. The upper display shows the current correction factor of the electrode (**K**)

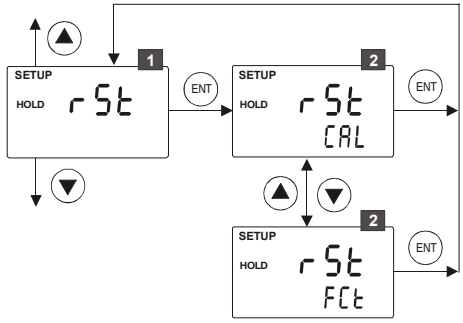
**NOTE:** If the Transmitter has not been calibrated yet for the currently selected unit of measurement, the LCD shows an empty reading ("---" ) in the upper display.

**Press ENT key** to exit the electrode condition screen. The Transmitter reverts to **ELE** screen.

**Press ▲ or ▼ key** to access other setup screens or **press ▲ and ▼ key simultaneously** (escape) to return to measurement mode.

## 5.10 Resetting

Resetting restores the Transmitter to its factory default settings. It resets the calibration to factory defaults without resetting other parameters of the Transmitter.




**1** From measurement mode **press ENT key** to enter setup mode as described in section 5.1. The LCD shows the first screen of setup mode (**COF**). **Press ▲ or ▼ key** to select resetting screen (**rSt**).

**Press ENT key** to access resetting (**rSt**).

**2** The upper display shows '**rSt**'. The lower display shows '**CAL**'. **Press ▲ or ▼ key** to select :

**CAL :** to reset calibration values to factory defaults, when confirmed by pressing ENT key

**FCt :** to reset all the parameters, including calibration, when confirmed by pressing ENT key

**NOTE:** You can **press ▲ and ▼ keys simultaneously** (escape) to exit resetting mode if you do not wish to reset the Transmitter at this time.

**Press ENT key** to confirm the resetting selection. The Transmitter performs reset function. LCD indicates that the reset has been performed by blinking your selection ('CAL' or 'FCt'). The Transmitter reverts to **rSt** screen.

**Press ▲ or ▼ key** to access other setup screens or **press ▲ and ▼ key simultaneously** (escape) to return to measurement mode.

# 6. Technical Specifications

| | |
|---|---|
| **General Specification** | |
| **(a) Dissolved Oxygen (% saturation)** | |
| Measuring Range | 0.00 to 199.9 % |
| Resolution | 0.1 % |
| Relative Accuracy | ± 1.5% of full-scale reading |
| **(b) Dissolved Oxygen (ppm or mg/l)** | |
| Measuring Range | 0.00 to 19.99 ppm or 0.00 to 19.99 mg/l |
| Resolution | 0.01 ppm or 0.01 mg/l |
| Relative Accuracy | ± 1.5% of full-scale reading |
| **(c) Temperature** | |
| Measuring range | 0.0 to +100.0 °C |
| Resolution | 0.1 °C |
| Relative accuracy | ± 0.5 °C |
| Sensor | Pt100 (2 wire or 3 wire) |
| **Calibration** | |
| **(a) Dissolved Oxygen** | |
| Number of calibration points | 1 or 2 points |
| **(b) Temperature** | |
| Offset Adjustment | ± 10 ˚C |
| **Compensation** | |
| Temperature Compensation | Automatic or Manual (0 to 50 °C) |
| Pressure Compensation | 0.74 to 3.00 BAR<br>550 mmHg to 2250 mmHg (225 cmHg)<br>10.7 to 43.5 PSI<br>(Manual setting and automatic correction) |
| Salinity Compensation | 0.0 to 50.0 ppt<br>(Manual setting and automatic correction) |
| **Output Parameters** | |
| Output Current | 4 to 20 mA (Galvanically Isolated) |
| Over/Under Range Output Current | ON Select : 3.8 mA<br>OFF Select: 4 mA (under range), 20 mA (over range) |
| HOLD Output Current | ON Select : 22 mA<br>OFF Select : Last measured current |
| Load Resistance | 600 ohms (max.) at 24V |
| **Display** | |
| LCD | 7 segments display with symbols for status information |
| **Electrical Data and Connections** | |
| DO Input | Screw Terminal (3.5mm pitch) |
| Connection terminal | 8-pin & 3-pin terminal blocks |

| **Other** | |
|---|---|
| Power Input | 12 to 24 VDC |
| Dimensions (W x H x D) | 96mm x 96mm x 66 mm |
| Weight (Estimated) | 210g |
| Ambient Temp. operating range | 0 to 40 $^{o}$C |
| Maximum Relative Humidity | 80% up to 31 $^{o}$C decreasing linearly to 50% at 40$^{o}$C |

# 7. List of Accessories

## 7.1 Thermo Scientific

**Transmitter Replacement and Accessories**

| Item Description | Order Code |
|---|---|
| Alpha DO 500 Transmitter | TSDOCTP0500 |
| General Purpose Epoxy-body Dissolved Oxygen Electrode with PT100, range: 0.50 - 20 ppm, 5m cable length, tinned open-ended | ECDOGEN-S |
| Special Purpose Epoxy-body Low Dissolved Oxygen Electrode with PT100, range: 0.03 -20 ppm, 5m cable length, tinned open-ended. | ECDOTPII-S |
| Set of 5 O-rings & membranes (DOGEN-S) | 01X241605 |
| Set of 5 O-rings & membranes (DOTPII-S) | 01X241606 |
| Large O-ring (DO GENS/TPIIS) | 32X246702 |
| Tool for DOGEN-S Membrane Housing | 15X241503 |
| DO Refilling Electrolyte for EC-DOGEN-S (480ml bottle) | ECDOGENSOLNBT |
| DO Refilling Electrolyte for EC-DOTPII-S (480ml bottle) | ECDOTPIISOLNBT |

## 7.2 Eutech Instruments

**Controller Replacement and Controller Accessories**

| Item Description | Order Code |
|---|---|
| Alpha DO 500 Transmitter | 35151-10 |
| General purpose epoxy-body dissolved oxygen electrode with Pt100 temperature sensor, 0-20 ppm, 10 foot cable length, tinned open-ended. | 35201-50 |
| DO probe maintenance kit; Includes 2 Teflon membranes, 2 membrane O-rings, 1 body seal O-ring, 125mL electrolyte | 35201-70 |
| Set of 5 O-rings & Teflon membranes | 35201-65 |
| Replacement electrolyte solution for 35201-50, 500 mL | 35640-71 |

**NOTE:**

- To order **Eutech** accessories, contact the nearest Oakton distributor

# 8. Troubleshooting

| Problem | Cause | Solution |
|---|---|---|
| Power on, but no display | a) Loose connections<br>b) Power cables not in correct polarity (+ & -)<br>c) Incorrect output voltage of the power supply | a) Ensure cables make good contact<br>b) Re-wire loop cables with correct polarity<br>c) Use a power supply with specified output voltage |
| Unstable dissolved oxygen reading | a) Air bubbles in electrode<br>b) Dirty electrode | a) Tap electrode to remove air bubbles<br>b) Clean electrode and recalibrate |
| Oscillating temperature readings | a) Electrical noise interference | a) Ensure shield wire is properly connected to pin 7 |
| Slow response | a) Dirty / Oily electrode | a) Clean electrode |
| Blinking ATC | a) No temperature probe connection during ATC mode | a) Ensure temperature sensing cable makes good contact |
| Blinking electrode annunciator | a) Error in calibration | a) Ensure calibration standard solution is not contaminated. Ensure electrode is clean. |
| Or (Dissolved oxygen) | a) Dissolved oxygen electrode is not connected | a) Ensure electrode makes good contact with Transmitter |
| Or (Temperature) | a) Temperature probe is not connected when ATC enabled | a) Ensure electrode makes good contact with Transmitter |

# 9. General Information

## 9.1 Warranty

This 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

## 9.2 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

## 9.3 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.

## 9.4 Maintenance and Cleaning

**Maintenance**

The **αlpha DO 500 Transmitter** 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 DO Transmitter may be wiped with a damp, lint-free cloth. A mild household cleaner can also be used if necessary.

# 10. Appendices

## 10.1 Appendix 1 – Salinity vs. Temperature (@ 760mmHg)

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 Transmitter 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 |

## 10.2 Appendix 2 – Abbreviations Used in LCD

| Abbreviation | Description |
|---|---|
| AtC | Automatic Temperature Compensation |
| bAr | Pressure in Bar |
| bUFF | Buffer |
| CAL | Calibration |
| CHg | Pressure in centimeter of mercury |
| CºC | Calibration Temperature |
| ELE | Electrode condition |
| FCt | Factory defaults |
| Hg | Pressure in millimeter of mercury |
| HI | High limit |
| HLd | Hold |
| LO | Low limit |
| OFS | Offset |
| Or | Reading is over range |
| Org | Out of range |
| PºC | Process Temperature |
| PrE | Pressure |
| PSI | Pressure in pounds per square inch |
| rng | Range |
| rSt | Reset |
| Set | Setting |
| Unt | Unit |
| Ur | Reading is under range |
| 1.Pt | 1-point calibration |
| 2.Pt | 2-point calibration |

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