

# TR250Z Oxygen Sensor User Manual



## Models

- **CM-0134 25% O2 Transmitter**
- **CM-0134- WT 25% O2 Transmitter with Tube Sampling**
- **CM-0150 25% O2 with Mount Shield**
- **CM-0160 95% O2 Transmitter**
- **CM-0160-WT 95% O2 Transmitter with Tube Sampling**
- **CM-0161 95% O2 with Mount Shield**

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## Welcome

Thank you for purchasing the TR250Z Oxygen Sensor. The TR250Z is a long life 25% or 95% oxygen level transmitter that provides multiple analog linear outputs of O<sub>2</sub> concentrations. It's designed to be a rugged, maintenance-free add-on for OEMs or can be used as a desktop device. In addition, it can be calibrated in normal air, or can use a calibration gas of any known oxygen concentration.

**Our goal is to make high-quality, low-cost gas detection and indoor air quality products available to you.**

Please take some time to read through this manual in order to get the most out of your meter. Make sure to visit our website regularly to find more information about this product and to download the software free. Once you download and install the software, you can use the "Check for updates" function under the *Help* menu to search for new updates. Please also pay special attention to the important safeguards shown on the pages ahead.

## Important Safeguards

To reduce the risk of fire, electrical shock and/or injury to persons, basic safety precautions should always be followed when using electrical appliances, including the following:

1. READ ALL INSTRUCTIONS BEFORE USING THIS DEVICE!
2. Use only the supplied power supply to operate the unit.
3. Ensure that when sampling in a closed environment that the tubes are securely fashioned to the device.
4. Do not operate with a blocked off sample path.
5. Do not operate the device if it is malfunctioning.
6. Do not install the device outside in exposed conditions. Due to the nature of the design the enclosure cannot be made water-tight and the unit must not be exposed to water.
7. Do not operate the device with the cover detached.

**SAVE THESE INSTRUCTIONS!**

## Package Contents

Please verify that your package contains the following items before using the unit:

### Contents:

- (1) Meter
- (1) Certificate of Calibration
- (1) User Manual
- (1) Power supply
- (1) 2 Meter USB to RS-485 Cable
- (1) Screen Breather



## Software

Our free Gaslab® software lets you automate the calibration process as well as log data. While it is not required to use the sensor, you may find it useful. To install Gaslab, go to the “Downloads” page (see link below) at CO2Meter.com. For general information about the software, refer to the GasLab® User Manual. <http://www.co2meter.com/pages/downloads>

**IMPORTANT: YOU MUST INSTALL THE SOFTWARE BEFORE CONNECTING YOUR DEVICE TO YOUR COMPUTER**

By installing the software first, you will ensure that the proper drivers are automatically installed on your computer when you plug in the USB device for the first time.

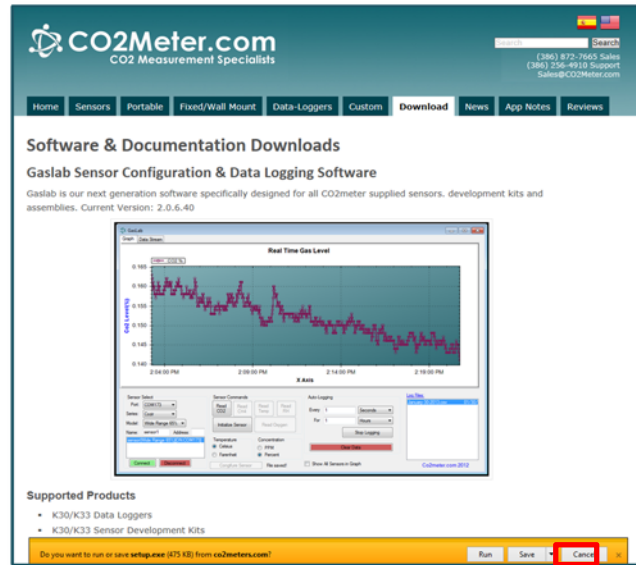
## Minimum System Requirements

To utilize our free software, your computer must meet the following requirements:

- Windows XP SP3 or higher
- Microsoft .Net Framework 3.5 SP1
- Pentium 4 (or newer) operating at 2.4Ghz or faster
- 1GB of Random Access Memory (RAM)
- Hard disk space with at least 20 Megabytes (MB) free (200+MB recommended for logs and application files)

Software is compatible with 64-bit operating systems and is fully tested with Windows.

To install Gaslab, click on the “Install Now” link and then select “Run” when prompted by your browser (as shown on **Error! Reference source not found.**). Follow the steps and instructions prompted by your computer’s operating system. Make sure you have administrator privileges in order to install this program.



## Descriptions

**Display** – Main interface to view current sensor readings and menu state. Will blink “STRT” upon applying power while the sensor warms up and stabilizes.

**LEDs** – are in for lower right corner of the unit on the main PCB and are labeled S, E and P.

**S LED** – Status LED. Blinks every time a complete measurement cycle is performed and the value is updated. Serve’s as a heartbeat for transmitter operation.

**E LED** – Error LED. Will light if any abnormal conditions are detected within the device, primarily the sensor falling out of its recommended operating specifications will trigger this lamp.

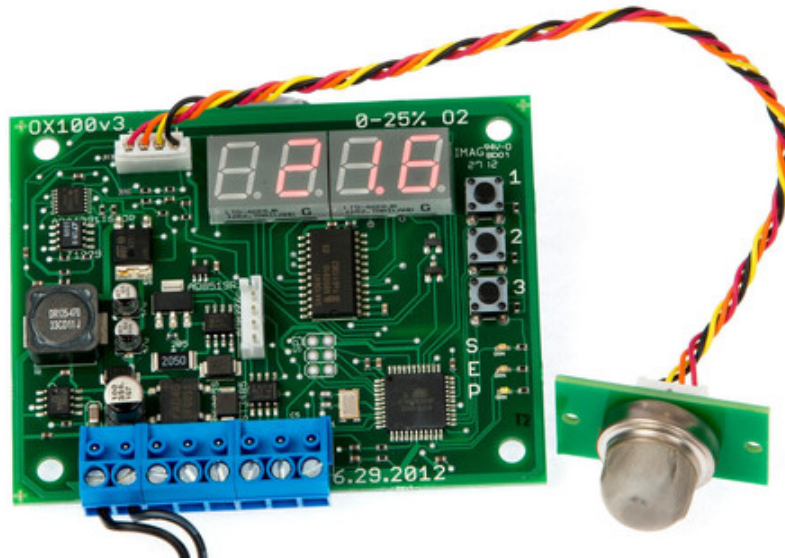
**P LED** – Power LED. Will be on continuously when power is applied to the unit.

**Buttons** - The unit has three surface mount buttons above the LEDs on the PCB. They can be gently and carefully pressed with your finger. These buttons allow you to access all aspects of sensors operation and test or calibrate different functional modules.

## Theory of Operation

The zirconia oxygen sensor utilizes solid-state electrochemical reactions to produce a voltage proportional to the current oxygen. This voltage is then digitalized and filtered to a usable value. The oxygen sensor has also been factory calibrated to meet specifications.

## CM-0134 & CM-0160

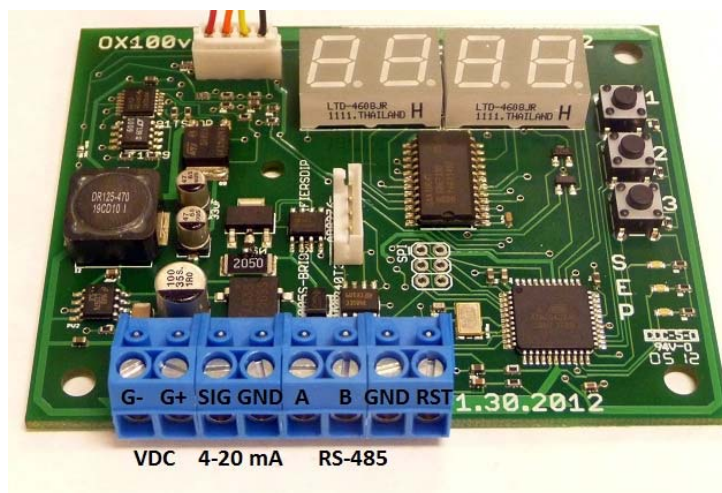


### Standard Operation

The O2 transmitters comes factory calibrated for easy installation. During its life cycle calibration may become periodically necessary. We recommend performing a span O2 calibration every month for guaranteed operation and ensured accuracy. No other calibration is necessary during the life cycle of the sensor.

### Terminal Connectors

1. VDC = G- G+
2. O2 4-20mA = SIG GND
3. RS-485 INTERFACE = A B GND
4. RESET = RST



## Powering the Unit

The unit can be powered by hardwiring 24 VDC power through the MDCM-4FP-2M Cable (included) but sampling units can also be powered by the included 24VDC International wall power supply.

## 0-10V Output (Optional)

To get a 10 volt span (2-10 volt in practice) from a 4-20 mA line, add a 500 ohm resistor from signal to ground.  $500 \text{ ohms} \times .004 \text{ amps} = 2 \text{ volts}$  and  $500 \text{ ohms} \times .020 \text{ amps} = 10 \text{ volts}$ .

Install the resistor at the receiving end, as this eliminates all voltage drops from resistance in the wire.

4-20mA and 2-10V are used so it can be determined if the transmitter is actually present. Less than 4mA or 2V: no transmitter, not connected or no signal.

## LCD Display

The Liquid Crystal Display (LCD) screen shows the following features:

- CO2 in percentage format (##.##%) for 100%

## Calibration

The calibration process varies depending on the type of unit and whether it has optional data logging functionality or not. All units are factory-calibrated with multiple reference points of gas, and have been verified to be accurate within their specific functionality before shipment. However, if the unit is severely jolted or otherwise mechanically disturbed, the sensor can drift requiring recalibration. All calibration procedures follow a single-point calibration routine that effectively shifts the zero-point of the O2 sensor.

Calibration may be performed via MODBUS, manually, or by a USB connection to a PC running GasLab<sup>®</sup> software.

## Calibrating using MODBUS

Calibration via MODBUS requires an RS-485 cable and assumes knowledge of proper coding. Register values are listed at the end of this manual.

## Calibrating using Gaslab

Install the Gaslab software first, then connect the sensor to your PC using a standard mini-USB cable.

Calibration can be performed using either 0% CO2 calibration gas (typically nitrogen) or using a fresh source of air, assumed to be approximately 20.9% O2.

Follow the on-screen prompts specific to your sensor to perform the calibration.

## Manual Calibration

Manual calibration is performed using the 3 on-board buttons and the service menu on the display. To enter the service menu the buttons must be pressed in a factory-set order. This code can be customized before shipment but by default will be 1-2-3. The buttons must be pressed within a half second of each other, or the unit will return to standard operating mode. When in the service menu the unit will not update the current O2 readings. Once you enter the menu the display will read “1234” or for 1 second, then the Product Identification Code will be displayed. This code is important, as it will identify which manual calibration procedure below you should use.

### Product Identification Code

After pressing buttons 1-2-3, the unit will display “1234”, followed by a 4-digit Product Identification Code (PIC). You must know your sensor’s PIC to properly calibrate.

1. If the PIC is “1195” or “1225”, follow the 1195/1225 Calibration Procedure
2. If the PIC is “1295” or “1395”, follow the 1295/1395 Calibration Procedure

### 1195/1225/1425 Calibration

#### Procedure *Fresh Air Calibration*

1. Allow sensor to stabilize for at least 1 hour
2. Ensure the sensor is exposed to fresh air
3. Press 123 to enter the service menu. The display will flash 1234 and the PIC
4. Press 2 to enter the Oxygen submenu
5. Press 2 again to start the calibration
6. Press 3 to Save.

Note: Steps 3-6 must be done quickly or the sensor will exit the calibration mode. You can minimize this by remembering the sequence **1 2 3 2 2 3** to perform manual fresh air calibration.

#### *Zero Point Calibration using 100% Nitrogen*

1. Allow sensor to stabilize for at least hour
2. Apply 100% Nitrogen Calibration Gas to Sensor
3. Wait 5 minutes for stable readings
4. Press 123 to enter service menu. The display will flash 1234 and the PIC
5. Press 2 to enter the Oxygen submenu
6. Press 1 to calibrate to 100% Nitrogen
7. Press 3 to Save. No numbers will be displayed until the sensor is exposed to oxygen again

Note: Steps 4 - 7 must be done quickly or the sensor will exit the calibration mode. You can minimize this by remembering the sequence **1 2 3 2 1 3** to perform manual fresh air calibration.



## 1295/1395/1495 Calibration

### Procedure *Fresh Air Calibration*

1. Allow sensor to stabilize for at least 1 hour
2. Ensure the sensor is exposed to fresh air
3. Press 123 to enter the service menu. The display will flash 1234 and the PIC
4. Press 2 to enter the Oxygen submenu
5. Press 1 to start the calibration
6. Press 3 to Save.

Note: Steps 3-6 must be done quickly or the sensor will exit the calibration mode. You can minimize this by remembering the sequence **1 2 3 2 1 3** to perform manual fresh air calibration.

### *Span Calibration using 70% Oxygen (optional)*

To perform a span calibration, only 70% oxygen gas can be used. If you do not have 70% O<sub>2</sub> test gas, do not attempt a span calibration.

1. Allow sensor to stabilize for at least hour
2. Apply 70% Oxygen Calibration Gas to Sensor
3. Wait 5 minutes for stable readings
4. Press 123 to enter service menu. The display will flash 1234 and the PIC
5. Press 2 to enter the Oxygen submenu
6. Press 2 to calibrate to 70% Oxygen
7. Press 3 to Save. No numbers will be displayed until the sensor is exposed to oxygen again

Note: Steps 4 - 7 must be done quickly or the sensor will exit the calibration mode. You can minimize this by remembering the sequence **1 2 3 2 2 3** to perform manual fresh air calibration.

## Modbus / RS-485

The sensor support MODBUS protocols over RS-485, unidirectional transmission at 9600kbps. Address 0 or FE.

The following Modbus registers are available:

### Input Registers

1. O2 Value, x10
2. Raw ADC Value

### Holding Registers

1. O2 Span Value (4 byte floating number, part 1)
2. O2 Span Value (4 byte floating number, part 2)
3. O2 Pot Value
4. 4-20mA output Zero Value
5. 4-20mA output Span Value (4 byte floating number, part 1)
6. 4-20mA output Span Value (4 byte floating number, part 2)
7. Control Register
8. Status Register

The following commands are available:

0x03 – Read Holding Register

0x04 – Read Input Register

0x06 – Write Holding Register

## Device Specifications

<b>Measuring Range:</b>	
25% O <sub>2</sub>	0-25% vol.
95% O <sub>2</sub>	0-95% vol.
<b>Repeatability:</b>	
0-25% CO <sub>2</sub>	± 0.05%, ± 1 % of measured value
0-95% O <sub>2</sub>	± 0.02%, ± 1 % of measured value
<b>Accuracy</b>	
25% / 95%	±2% full scale
<b>Power Supply:</b>	
Maximum Voltage	24VDC
Minimum Voltage	20VDC
Power Consumption	600mA @ 24VDC
<b>Sensor Ratings:</b>	
Life Expectancy	>15 years
Maintenance Interval	No maintenance required
Warm-up Time	<15 min (instant measurements)
<b>Outputs:</b>	
O <sub>2</sub> Output Value	4-20 mA, linearly scaled 2-10VDC Optional
RS-485	Modbus Interface

## Support

The quickest way to obtain technical support is via email. Please send all support enquires to ***support@co2meter.com***. In your email, please include a clear, concise definition of the problem and any relevant troubleshooting information or steps taken so far, so we can duplicate the problem and quickly respond to your inquiry.

## Warranty

This unit comes with a 90-day limited manufacturer’s warranty, starting from the date the unit was shipped to the buyer.

During this period of time, CO2Meter.com warrants our products to be free from defects in materials and workmanship when used for their intended purpose and agrees to fix or replace (at our discretion) any part or product that fails under normal use. To take advantage of this warranty, the product must be returned to CO2Meter.com at your expense. If, after examination, we determine the product is defective, we will repair or replace it at no additional cost to you.

This warranty does not cover any products that have been subjected to misuse, neglect, accident, modifications or repairs by you or by a third party. No employee or reseller of CO2Meter.com’s products may alter this warranty verbally or in writing.

## Returns

If the product fails under normal use during the warranty period, an RMA (Return Material Authorization) number must be obtained from CO2Meter.com. After the item is received, CO2Meter.com will repair or replace the item at our discretion.

To obtain an RMA number, please call CO2Meter.com at **(877) 678-4259**. When requesting an RMA number, please provide the reason for return and original order number.

If we determine that the product failed due to improper use (water damage, dropping, tampering, electrical damage etc.) or abuse, or if it is beyond the warranty period, we will inform you of the cost to fix or replace your device.

If you are returning your device due to a warranty claim (with an RMA number) and you still have the unit original package, please use it to ship your unit to us. Please make sure to include the provided RMA number on the outside of the box, preferably on the shipping label. Make sure you secure the unit inside the package properly to prevent any damage during transit that could void your device’s warranty. Finally, please ship your device to the address shown under the “Contact Us” section below. CO2Meter.com will not, under any circumstances, be responsible for your shipment expenses and no refund will be issued for shipping charges necessary for you to ship the unit to us.

## Liability

All liabilities under this agreement shall be limited to the actual cost of the product paid to CO2Meter.com. In no event shall CO2Meter.com be liable for any incidental or consequential damages, lost profits, loss of time, lost sales or loss or damage to data, injury to person or personal property or any other indirect damages as the result of use of our products.

## Contact Us

### We are here to help!

If the troubleshooting guide above doesn't help you solving your problem or for more information, please contact us using the information below.

✉ [support@co2meter.com](mailto:support@co2meter.com)

☎ (877) 678-4259 Toll free (M-F 9:00am–6:00pm EST)

📠 (866) 422-2356

🌐 [www.co2meter.com](http://www.co2meter.com)

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