



# Oxygen Sensing – LuminOx ppm Modbus Register Set

This document details the Modbus register set developed to control and analyse data from the LuminOx ppm oxygen sensor.



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# 1 DEFINITIONS

The following definitions apply to WARNINGS, CAUTIONS, ACTIONS and NOTES used throughout this manual.



## WARNING:

The warning symbol is used to indicate instructions that, if they are not followed, can result in minor, serious or even fatal injuries to personnel.



## CAUTION:

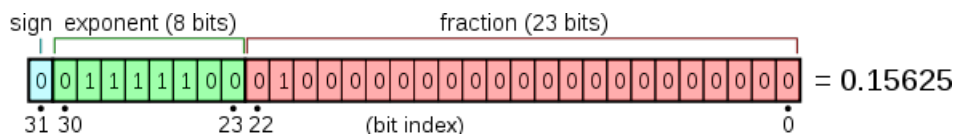
The caution symbol is used to indicate instructions that, if they are not followed, can result in damage to the equipment (hardware and/or software), or a system failure occurring.

**ACTION:** How data from the device should be used during normal operation.

**NOTE:** Operating conditions or statements pertaining to the recommended action.

The following terminology and acronyms are used throughout this manual:

- **Input registers** – are read only 16-bit registers. Valid address range starts at 30001.
- **Holding registers** – are read / write 16-bit registers. Valid address range starts at 40001.
- **MSB** – Most Significant Bits.
- **LSB** – Least Significant Bits.
- **EEPROM** - Electrically Erasable Programmable Read-Only Memory.
- **32-bit Integers** – Unsigned 32-bit integers are split over two 16-bit registers where the MSB and LSB are identified.
- **Floating point numbers** – are digitally represented using the IEEE–754 format. Single precision floating point numbers are used throughout and they require 32-bits of data. Since a Modbus register holds 16-bits, it takes two registers to represent a floating point number. The IEEE 754 standard specifies a binary32 as having:
  - Sign bit: 1 bit
  - Exponent width: 8 bits
  - Significand precision: 24 bits (23 explicitly stored)



For example, 20.7 in IEEE 754 format is: 0 10000011 01001011001100110011010

## 2 MODBUS SETUP

**NOTE:** Background reading is strongly recommended if there is no prior knowledge of Modbus. A good place to start is [www.modbus.org](http://www.modbus.org), where the specification and resources can be obtained in the technical resources page.

The RS232 TTL Modbus interface is configured as follows:

- **Modbus mode:** RTU
- **Address:** One
- **Baudrate:** 9600
- **Parity:** None
- **Stopbits:** Two

### 3 MODBUS REGISTERS

**NOTE:** Default values are shown in **bold**.

**NOTE:** Values shown in grey are reserved, not applicable or indicate that they should not be changed.

#### 3.1 Serial Registers

Table 3-1 – Serial - Input Registers

Name	Register Address	Description	Actions / Notes
<b>Serial Status</b>	0x762B (30251)	<b>0 = Error</b> Error committing serial changes to memory <b>1 = Not Ready</b> Serial changes are currently not permitted <b>2 = Ready</b> Serial changes are permitted <b>3 = Busy</b> Serial changes in process <b>4 = Complete</b> Serial changes committed to memory, system will restart in 1s with the new communication settings	<b>ACTION:</b> Monitor in system <b>NOTE:</b> Used in Table 3-2 below.

Table 3-2 – Serial - Holding Registers

Name	Register Address	Description / Valid Values	Actions / Notes
<b>Serial Address<sup>a</sup></b>	0x9D3B (40251)	<b>1-247</b>	<b>ACTION:</b> Set/Monitor in system
<b>Reserved</b>	0x9D3C (40252)	Reserved	
<b>Reserved</b>	0x9D3D (40253)	Reserved	
<b>Serial Control</b>	0x9D3E (40254)	<b>0 = Idle</b> <b>1 = Save and reset</b>	

<sup>a</sup> LuminOx ppm evaluation kit; sensor serial address set to 1.

## 3.2 Temperature Registers

Table 3-3 – Temperature - Input Registers

Name	Register Address	Description	Actions / Notes
<b>Temperature ID</b>	0x7725 (30501)	0101	<b>ACTION:</b> For reference <b>NOTE:</b> Unique identifier
<b>Temperature Warning</b>	0x7726 (30502)	16-bit bitmask Each bit represents an individual warning state 0 = No fault Temperature within normal operating range 14 = Greater Temperature above valid operating limit 15 = Less Temperature below valid operating limit	<b>ACTION:</b> Monitor in system <b>NOTES:</b> Warnings are not retained on power loss.
<b>Temperature Error</b>	0x7727 (30503)	16-bit bitmask Each bit represents an individual error state	<b>ACTION:</b> Monitor in system <b>NOTES:</b> Errors are not retained on power loss.
<b>Temperature Uncalibrated Value</b>	0x7728 (30504)	Floating point IEEE 754 (MSB 16-bits)  Unit = °C	<b>ACTION:</b> Monitor in system
	0x7729 (30505)	Floating point IEEE 754 (LSB 16-bits)  Unit = °C	
<b>Temperature Calibrated Value</b>	0x772A (30506)	Floating point IEEE 754 (MSB 16-bits)  Unit = °C Valid Range = -10 to 35	<b>ACTION:</b> Monitor in system
	0x772B (30507)	Floating point IEEE 754 (LSB 16-bits)  Unit = °C Valid Range = -10 to 35	
<b>Temperature Status</b>	0x772C (30508)	0 = Loading System initialising, no temperature measurements 1 = OFF No temperature measurements 2 = Standby No temperature measurements 3 = Reserved <b>4 = ON</b> Valid temperature measurements 5 = Reserved 6 = Calibration Invalid temperature measurements, calibration in process	<b>ACTION:</b> Monitor in system

Table 3-4 – Temperature - Holding Registers

Name	Register Address	Description / Valid Values	Actions / Notes
<b>Temperature Control</b>	0x9E35 (40501)	Reserved	<b>ACTION:</b> Monitor in system <b>NOTE:</b> The temperature measurement cannot be switched off.
<b>Clear Temperature Warning</b>	0x9E36 (40502)	<b>0 = Idle</b> 1 = Clear warning (Reserved)	<b>ACTION:</b> None <b>NOTE:</b> Any warning present in <i>Temperature Warning</i> (30502) will auto clear if the condition that caused the warning is removed.
<b>Clear Temperature Error</b>	0x9E37 (40503)	<b>0 = Idle</b> 1 = Clear Error	<b>ACTION:</b> None <b>NOTE:</b> If an error present in <i>Temperature Error</i> (30503) has forced <i>Temperature Status</i> to <i>OFF</i> (30508 = 1) the error may be cleared using this register. If the error persists, contact <a href="mailto:technical@sstsensing.com">technical@sstsensing.com</a> for guidance.

### 3.3 Pressure Registers

Table 3-5 – Pressure - Input Registers

Name	Register Address	Description	Actions / Notes
<b>Pressure ID</b>	0x781F (30751)	0102	<b>ACTION:</b> For reference <b>NOTE:</b> Unique identifier
<b>Pressure Warning</b>	0x7820 (30752)	16-bit bitmask Each bit represents an individual warning state 0 = No fault Pressure within normal operating range 14 = Greater Pressure above valid operating limit 15 = Less Pressure below valid operating limit	<b>ACTION:</b> Monitor in system <b>NOTES:</b> Warnings are not retained on power loss.
<b>Pressure Error</b>	0x7821 (30753)	16-bit bitmask Each bit represents an individual error state	<b>ACTION:</b> Monitor in system <b>NOTES:</b> Errors are not retained on power loss.
<b>Pressure Uncalibrated Value</b>	0x7822 (30754)	Floating point IEEE 754 (MSB 16-bits) Unit = mbar	<b>ACTION:</b> Monitor in system
	0x7823 (30755)	Floating point IEEE 754 (LSB 16-bits) Unit = mbar	
<b>Pressure Calibrated Value</b>	0x7824 (30756)	Floating point IEEE 754 (MSB 16-bits) Unit = mbar Valid Range = 500 to 1200	<b>ACTION:</b> Monitor in system
	0x7825 (30757)	Floating point IEEE 754 (LSB 16-bits) Unit = mbar Valid Range = 500 to 1200	
<b>Pressure Status</b>	0x7826 (30758)	0 = Loading System initialising, no pressure measurements 1 = OFF No pressure measurements 2 = Standby No pressure measurements 3 = Reserved <b>4 = ON</b> Valid pressure measurements 5 = Reserved 6 = Calibration Invalid pressure measurements, calibration in process	<b>ACTION:</b> Monitor in system

Table 3-6 – Pressure - Holding Registers

Name	Register Address	Description / Valid Values	Actions / Notes
<b>Pressure Control</b>	0x9F2F (40751)	Reserved	<b>ACTION:</b> Monitor in system <b>NOTE:</b> The pressure measurement cannot be switched off.
<b>Clear Pressure Warning</b>	0x9F30 (40752)	<b>0 = Idle</b> 1 = Clear warning (Reserved)	<b>ACTION:</b> None <b>NOTE:</b> Any warning present in <i>Pressure Warning</i> (30752) will auto clear if the condition that caused the warning is removed.
<b>Clear Pressure Error</b>	0x9F31 (40753)	<b>0 = Idle</b> 1 = Clear Error	<b>ACTION:</b> None <b>NOTE:</b> If an error present in <i>Pressure Error</i> (30753) has forced <i>Pressure Status</i> to <i>OFF</i> (30758 = 1) the error may be cleared using this register. If the error persists, contact <a href="mailto:technical@sstsensing.com">technical@sstsensing.com</a> for guidance.

### 3.4 ppO<sub>2</sub> Registers

Table 3-7 – ppO<sub>2</sub> - Input Registers

Name	Register Address	Description	Actions / Notes
<b>ppO<sub>2</sub> ID</b>	0x7919 (31001)	0103	<b>ACTION:</b> For reference <b>NOTE:</b> Unique identifier
<b>ppO<sub>2</sub> Warning</b>	0x791A (31002)	16-bit bitmask Each bit represents an individual warning state 0 = No fault ppO <sub>2</sub> within normal operating range 14 = Greater ppO <sub>2</sub> above valid operating limit 15 = Less ppO <sub>2</sub> below valid operating limit	<b>ACTION:</b> Monitor in system <b>NOTES:</b> Warnings are not retained on power loss.
<b>ppO<sub>2</sub> Error</b>	0x791B (31003)	16-bit bitmask Each bit represents an individual error state	<b>ACTION:</b> Monitor in system <b>NOTES:</b> Errors are not retained on power loss.
<b>ppO<sub>2</sub> Uncalibrated Value</b>	0x791C (31004)	Floating point IEEE 754 (MSB 16-bits)  Unit = mbar	<b>ACTION:</b> Monitor in system <b>NOTES:</b> This value can be greater than or less than the sensor range and is used to determine measurement stability during the calibration process.  Refer to instructions on page 3-14.
	0x791D (31005)	Floating point IEEE 754 (LSB 16-bits)  Unit = mbar	
<b>ppO<sub>2</sub> Calibrated Value</b>	0x791E (31006)	Floating point IEEE 754 (MSB 16-bits)  Unit = mbar Valid Range = 0 to 1.2	<b>ACTION:</b> Monitor in system <b>NOTE:</b> Refer to instructions on page 3-14.
	0x791F (31007)	Floating point IEEE 754 (LSB 16-bits)  Unit = mbar Valid Range = 0 to 1.2	
<b>ppO<sub>2</sub> Status</b>	0x7920 (31008)	0 = Loading System initialising, no ppO <sub>2</sub> measurements 1 = OFF No ppO <sub>2</sub> measurements 2 = Standby No ppO <sub>2</sub> measurements 3 = Reserved <b>4 = ON</b> Valid ppO <sub>2</sub> measurements 5 = Reserved 6 = Calibration Invalid O <sub>2</sub> measurements, calibration in process	<b>ACTION:</b> Monitor in system <b>NOTE:</b> Refer to instructions on page 3-14.

Name	Register Address	Description	Actions / Notes
<b>ppO<sub>2</sub> Offset Status (Calibration)</b>	0x7921 (31009)	0 = Error Error during the calibration process 1 = Not Ready Calibration is currently disabled <b>2 = Ready</b> Calibration enabled 3 = Busy Calibration in progress 4 = Complete Calibration complete	<b>ACTION:</b> Monitor in system <b>NOTE:</b> Refer to instructions on page 3-14.
<b>ppO<sub>2</sub> Gain Status (Calibration)</b>	0x7922 (31010)	0 = Error Error during the calibration process 1 = Not Ready Calibration is currently disabled <b>2 = Ready</b> Calibration enabled 3 = Busy Calibration in progress 4 = Complete Calibration complete	<b>ACTION:</b> Monitor in system <b>NOTE:</b> Refer to instructions on page 3-14.
<b>ppO<sub>2</sub> DAC (Diagnostic)</b>	0x7923 (31011)	32-bit integer (MSB 16-bits) Unit = (0.8mv) steps Valid range = 0 to 65535	<b>ACTION:</b> Monitor in system
	0x7924 (31012)	32-bit integer (LSB 16-bits) Unit = (0.8mv) steps Valid range = 0 to 65535	
<b>ppO<sub>2</sub> DAC Status (Diagnostic)</b>	0x7925 (31013)	0 = Error Error during the diagnostic index change process 1 = Not Ready Diagnostic values are currently disabled <b>2 = Ready</b> Diagnostic values enabled	<b>ACTION:</b> Monitor in system
<b>ppO<sub>2</sub> ADC Background (Diagnostic)</b>	0x7926 (31014)	32-bit integer (MSB 16-bits) Unit = (0.8mv) steps Valid range = 0 to 65535	<b>ACTION:</b> Monitor in system
	0x7927 (31015)	32-bit integer (LSB 16-bits) Unit = (0.8mv) steps Valid range = 0 to 65535	

Name	Register Address	Description	Actions / Notes
<b>ppO<sub>2</sub> ADC Background Status (Diagnostic)</b>	0x7928 (31016)	0 = Error Error during the diagnostic index change process 1 = Not Ready Diagnostic values are currently disabled <b>2 = Ready</b> Diagnostic values enabled	<b>ACTION:</b> Monitor in system
<b>ppO<sub>2</sub> ADC Peak (Diagnostic)</b>	0x7929 (31017)	32-bit integer (MSB 16-bits) Unit = (0.8mv) steps Valid range = 0 to 65535	<b>ACTION:</b> Monitor in system
	0x792A (31018)	32-bit integer (LSB 16-bits) Unit = (0.8mv) steps Valid range = 0 to 65535	
<b>O<sub>2</sub> ADC Peak Status (Diagnostic)</b>	0x792B (31019)	0 = Error Error during the diagnostic index change process 1 = Not Ready Diagnostic values are currently disabled <b>2 = Ready</b> Diagnostic values enabled	<b>ACTION:</b> Monitor in system

Table 3-8 – ppO<sub>2</sub> Sensor - Holding Registers

Name	Register Address	Description / Valid Values	Actions / Notes
ppO <sub>2</sub> Control	0xA029 (41001)	Reserved	<b>ACTION:</b> Monitor in system
Clear ppO <sub>2</sub> Warning	0xA02A (41002)	<b>0 = Idle</b> 1 = Clear warning (Reserved)	<b>ACTION:</b> None <b>NOTE:</b> Any warning present in <i>ppO<sub>2</sub> Warning</i> (31002) will auto clear if the condition that caused the warning is removed.
Clear ppO <sub>2</sub> Error	0xA02B (41003)	<b>0 = Idle</b> 1 = Clear error	<b>ACTION:</b> Set in system <b>NOTE:</b> If an error present in <i>ppO<sub>2</sub> Error</i> (31003) has forced <i>ppO<sub>2</sub> Status</i> to OFF (31008 = 1) the error may be cleared using this register. If the error persists, contact <a href="mailto:technical@sstsensing.com">technical@sstsensing.com</a> for guidance.
ppO <sub>2</sub> Offset (Calibration)	0xA02C (41004)	Floating point IEEE 754 (MSB 16-bits)  Unit = mbar Valid Range = 0 to 0.1	<b>ACTION:</b> Set/Monitor in system <b>NOTES:</b> Any changes are saved in EEPROM and retained on power loss. Default = <b>0.01</b> .  Refer to instructions on <a href="#">page 3-14</a> .
	0xA02D (41005)	Floating point IEEE 754 (LSB 16-bits)  Unit = mbar Valid Range = 0 to 0.1	
ppO <sub>2</sub> Offset Control (Calibration)	0xA02E (41006)	<b>0 = Idle</b> 1 = Apply Calibration 2 = Reset Status	<b>ACTION:</b> Set in system <b>NOTE:</b> Refer to instructions on <a href="#">page 3-14</a> .
ppO <sub>2</sub> Gain (Calibration)	0xA02F (41007)	Floating point IEEE 754 (MSB 16-bits)  Unit = mbar Valid Range = 0.1 to 1.2	<b>ACTION:</b> Set/Monitor in system <b>NOTES:</b> Any changes are saved in EEPROM and retained on power loss. Default = <b>1.0</b> .  Refer to instructions on <a href="#">page 3-14</a> .
	0xA030 (41008)	Floating point IEEE 754 (LSB 16-bits)  Unit = mbar Valid Range = 0.1 to 1.2	
ppO <sub>2</sub> Gain Control (Calibration)	0xA031 (41009)	<b>0 = Idle</b> 1 = Apply Calibration 2 = Reset Status	<b>ACTION:</b> Set in system <b>NOTE:</b> Refer to instructions on <a href="#">page 3-14</a> .

## 3.5 O<sub>2</sub> Registers

Table 3-9 – O<sub>2</sub> Sensor - Input Registers

Name	Register Address	Description	Actions / Notes
<b>O<sub>2</sub> ID</b>	0x7A13 (31251)	0104	<b>ACTION:</b> For reference <b>NOTE:</b> Unique identifier
<b>O<sub>2</sub> Warning</b>	0x7A14 (31252)	16-bit bitmask Each bit represents an individual warning state 0 = No fault O <sub>2</sub> within normal operating range 14 = Greater O <sub>2</sub> above valid operating limit 15 = Less O <sub>2</sub> below valid operating limit	<b>ACTION:</b> Monitor in system <b>NOTES:</b> Warnings are not retained on power loss.
<b>O<sub>2</sub> Error</b>	0x7A15 (31253)	16-bit bitmask Each bit represents an individual error state	<b>ACTION:</b> Monitor in system <b>NOTES:</b> Errors are not retained on power loss.
<b>O<sub>2</sub> Uncalibrated Value</b>	0x7A16 (31254)	Floating point IEEE 754 (MSB 16-bits)  Unit = ppm	<b>ACTION:</b> Monitor in system <b>NOTES:</b> This value can be greater than or less than the ppm sensor range and is used to determine measurement stability during the calibration process.  Used in Section 3.6 on page 3-14.
	0x7A17 (31255)	Floating point IEEE 754 (LSB 16-bits)  Unit = ppm	
<b>O<sub>2</sub> Calibrated Value</b>	0x7A18 (31256)	Floating point IEEE 754 (MSB 16-bits)  Unit = ppm Valid Range = 0 to 1200	<b>ACTION:</b> Monitor in system <b>NOTE:</b> Used in Section 3.6 on page 3-14.
	0x7A19 (31257)	Floating point IEEE 754 (LSB 16-bits)  Unit = ppm Valid Range = 0 to 1200	
<b>O<sub>2</sub> Status</b>	0x7A1A (31258)	0 = Loading System initialising, no O <sub>2</sub> measurements 1 = OFF No O <sub>2</sub> measurements 2 = Standby No O <sub>2</sub> measurements 3 = Reserved <b>4 = ON</b> Valid O <sub>2</sub> measurements 5 = Reserved 6 = Calibration Invalid O <sub>2</sub> measurements, calibration in process	<b>ACTION:</b> Monitor in system <b>NOTE:</b> Used in Section 3.6 on page 3-14.

Name	Register Address	Description	Actions / Notes
<b>O<sub>2</sub> Offset Status (Calibration)</b>	0x7A1B (31259)	0 = Error Error during the offset calibration process 1 = Not Ready Offset calibration is currently disabled <b>2 = Ready</b> Offset calibration enabled 3 = Busy Offset calibration in progress 4 = Complete Offset calibration complete	<b>ACTION:</b> Monitor in system <b>NOTES:</b> Used in Section 3.6.1 on page 3-14.
<b>O<sub>2</sub> Gain Status (Calibration)</b>	0x7A1C (31260)	0 = Error Error during the gain calibration process 1 = Not Ready Gain calibration is currently disabled <b>2 = Ready</b> Gain calibration enabled 3 = Busy Gain calibration in progress 4 = Complete Gain calibration complete	<b>ACTION:</b> Monitor in system <b>NOTES:</b> Used in Section 3.6.2 on page 3-14.
<b>O<sub>2</sub> DAC (Diagnostic)</b>	0x7A1D (31261)	32-bit integer (MSB 16-bits) Unit = (0.8mv) steps Valid range = 0 to 65535	<b>ACTION:</b> Monitor in system
	0x7A1E (31262)	32-bit integer (LSB 16-bits) Unit = (0.8mv) steps Valid range = 0 to 65535	
<b>O<sub>2</sub> DAC Status (Diagnostic)</b>	0x7A1F (31263)	0 = Error Error during the diagnostic index change process 1 = Not Ready Diagnostic values are currently disabled <b>2 = Ready</b> Diagnostic values enabled	<b>ACTION:</b> Monitor in system
<b>O<sub>2</sub> ADC Background (Diagnostic)</b>	0x7A20 (31264)	32-bit integer (MSB 16-bits) Unit = (0.8mv) steps Valid range = 0 to 65535	<b>ACTION:</b> Monitor in system
	0x7A21 (31265)	32-bit integer (LSB 16-bits) Unit = (0.8mv) steps Valid range = 0 to 65535	

Name	Register Address	Description	Actions / Notes
<b>O<sub>2</sub> ADC Background (Diagnostic)</b>	0x7A22 (31266)	0 = Error Error during the diagnostic index change process 1 = Not Ready Diagnostic values are currently disabled <b>2 = Ready</b> Diagnostic values enabled	<b>ACTION:</b> Monitor in system
<b>O<sub>2</sub> ADC Peak (Diagnostic)</b>	0x7A23 (31267)	32-bit integer (MSB 16-bits) Unit = (0.8mv) steps Valid range = 0 to 65535	<b>ACTION:</b> Monitor in system
	0x7A24 (31268)	32-bit integer (LSB 16-bits) Unit = (0.8mv) steps Valid range = 0 to 65535	
<b>O<sub>2</sub> ADC Peak (Diagnostic)</b>	0x7A25 (31269)	0 = Error Error during the diagnostic index change process 1 = Not Ready Diagnostic values are currently disabled <b>2 = Ready</b> Diagnostic values enabled	<b>ACTION:</b> Monitor in system

Table 3-10 – O<sub>2</sub> Sensor - Holding Registers

Name	Register Address	Description / Valid Values	Actions / Notes
<b>O<sub>2</sub> Control</b>	0xA123 (41251)	Reserved	<b>ACTION:</b> Monitor in system <b>NOTE:</b> The O <sub>2</sub> measurement cannot be switched off.
<b>Clear O<sub>2</sub> Warning</b>	0xA124 (41252)	<b>0 = Idle</b> 1 = Clear warning (Reserved)	<b>ACTION:</b> None <b>NOTE:</b> Any warning present in <i>O<sub>2</sub> Warning</i> (31252) will auto clear if the condition that caused the warning is removed.
<b>Clear O<sub>2</sub> Error</b>	0xA125 (41253)	<b>0 = Idle</b> 1 = Clear Error	<b>ACTION:</b> Set in system <b>NOTE:</b> If an error present in <i>O<sub>2</sub> Error</i> (31253) has forced <i>O<sub>2</sub> Status</i> to <i>OFF</i> (31258 = 1) the error may be cleared using this register and an attempt made to reset the status by setting the <i>O<sub>2</sub> Control</i> to <i>Reset Status</i> (41256 = 2 or 41259 = 2). If the error persists, contact <a href="mailto:technical@sstsensing.com">technical@sstsensing.com</a> for guidance.
<b>O<sub>2</sub> Offset (Calibration)</b>	0xA126 (41254)	Floating point IEEE 754 (MSB 16-bits)  Unit = ppm Valid Range = 0 to 100	<b>ACTION:</b> Set/Monitor in system <b>NOTES:</b> Any changes are saved in EEPROM and retained on power loss. Default = <b>10</b> .  Used in <a href="#">Section 3.6.1</a> on <a href="#">page 3-14</a> .
	0xA127 (41255)	Floating point IEEE 754 (LSB 16-bits)  Unit = ppm Valid Range = 0 to 100	
<b>O<sub>2</sub> Offset Control (Calibration)</b>	0xA128 (41256)	<b>0 = Idle</b> 1 = Apply Calibration 2 = Reset Status	<b>ACTION:</b> Set in system <b>NOTE:</b> Used in <a href="#">Section 3.6.1</a> on <a href="#">page 3-14</a> .
<b>O<sub>2</sub> Gain (Calibration)</b>	0xA129 (41257)	Floating point IEEE 754 (MSB 16-bits)  Unit = ppm Valid Range = 10 to 1200	<b>ACTION:</b> Set/Monitor in system <b>NOTES:</b> Any changes are saved in EEPROM and retained on power loss. Default = <b>1000</b> .  Used in <a href="#">Section 3.6.2</a> on <a href="#">page 3-14</a> .
	0xA12A (41258)	Floating point IEEE 754 (LSB 16-bits)  Unit = ppm Valid Range = 10 to 1200	
<b>O<sub>2</sub> Gain Control (Calibration)</b>	0xA12B (41259)	<b>0 = Idle</b> 1 = Apply Calibration 2 = Reset Status	<b>ACTION:</b> Set in system <b>NOTE:</b> Used in <a href="#">Section 3.6.2</a> on <a href="#">page 3-14</a> .

## 3.6 Calibrating the Sensor

### 3.6.1 Offset Calibration

1. Confirm *O<sub>2</sub> Offset Status (Calibration) = Ready* (31259 = 2).

2. Apply a “zero” (Offset) gas of a known ppm value over the sensor.

**NOTE:** The “zero” gas MUST have an Oxygen concentration less than 100ppm; it is recommended that the “zero” gas is less than 25ppm.

**NOTE:** Recommended flow rate is one litre per minute.

3. Monitor *O<sub>2</sub> Uncalibrated Value* (31254 and 31255) and wait at least 30 minutes until the value stabilises.

**NOTE:** Wait time based on purging from air.

4. Input the “zero” gas value (ppm) into *O<sub>2</sub> Offset (Calibration)* (41254 and 41255).

5. Set *O<sub>2</sub> Offset Control (Calibration)* to *Apply Calibration* (41256 = 1).

6. During the calibration routine *O<sub>2</sub> Offset Status (Calibration)* will change to *Busy* (31259 = 3) and *O<sub>2</sub> Status* will change to *Calibration* (31258 = 6). *O<sub>2</sub>* measurements are not valid during this phase.

7. When the calibration routine is complete *O<sub>2</sub> Offset Status (Calibration)* will change to *Complete* (31259 = 4) and *O<sub>2</sub> Status* will return to *ON* (31258 = 4).

8. Set *O<sub>2</sub> Offset Control (Calibration)* to *Reset Status* (41256 = 2) to return *O<sub>2</sub> Offset Status (Calibration)* to *Ready* (31259 = 2).

9. Confirm the *O<sub>2</sub> Calibrated Value* (31256 and 31257) is within  $\pm 2$  ppm of the calibration gas applied. If not, repeat [Steps 3 to 8](#) and allow the *O<sub>2</sub> Uncalibrated Value* (31254 and 31255) to stabilise for a longer period. If multiple calibration attempts do not result in an accurate calibration, contact [technical@sstsensing.com](mailto:technical@sstsensing.com) for guidance.

### 3.6.2 Gain Calibration

The Offset is the main calibration point, however, if a “span” (Gain) calibration is required:

1. Confirm *O<sub>2</sub> Gain Status (Calibration) = Ready* (31260 = 2).

2. Apply a “span” (Gain) gas of a known ppm value over the sensor.

**NOTE:** The “span” gas MUST have an Oxygen concentration greater than 100ppm; it is recommended that the “span” gas is the maximum of the working range or, if available, 1000ppm should be used.

**NOTE:** Recommended flow rate is one litre per minute.

3. Monitor *O<sub>2</sub> Uncalibrated Value* (31254 and 31255) and wait at least 10 minutes until the value stabilises.

**NOTE:** Wait time based on purging from air.

4. Input the “span” gas value (ppm) into *O<sub>2</sub> Gain (Calibration)* (41257 and 41258).

5. Set *O<sub>2</sub> Gain Control (Calibration)* to *Apply Calibration* (41259 = 1).

6. During the calibration routine *O<sub>2</sub> Gain Status (Calibration)* will change to *Busy* (31260 = 3) and *O<sub>2</sub> Status* will change to *Calibration* (31258 = 6). *O<sub>2</sub>* measurements are not valid during this phase.

7. When the calibration routine is complete *O<sub>2</sub> Gain Status (Calibration)* will change to *Complete* (31260 = 4) and *O<sub>2</sub> Status* will return to *ON* (31258 = 4).

8. Set *O<sub>2</sub> Gain Control (Calibration)* to *Reset Status* (41259 = 2) to return *O<sub>2</sub> Gain Status (Calibration)* to *Ready* (31260 = 2).
9. Confirm the *O<sub>2</sub> Calibrated Value* (31256 and 31257) is within  $\pm 2$  ppm of the calibration gas applied. If not, repeat [Steps 3 to 8](#) and allow the *O<sub>2</sub> Uncalibrated Value* (31254 and 31255) to stabilise for a longer period. If multiple calibration attempts do not result in an accurate calibration, contact [technical@sstsensing.com](mailto:technical@sstsensing.com) for guidance.



## REFERENCE DOCUMENTS

Reference documents are listed below. The SST documentation list is not exhaustive, always refer to the [SST website](#) for the latest information.

Part Number	Title
<b>DS-0154</b>	Oxygen Sensing – LuminOx ppm Series Datasheet
<b>UG-015</b>	Oxygen Sensing – LuminOx ppm Series User’s Guide



### INFORMATION

As customer applications are outside of SST Sensing Limited’s control, the information provided is given without legal responsibility. Customers should test under their own conditions to ensure that the equipment is suitable for their intended application.

For technical assistance or advice, please contact [technical@sstsensing.com](mailto:technical@sstsensing.com).

**General Note:** SST Sensing Ltd. reserves the right to make changes to product specifications without notice or liability. All information is subject to SST Sensing Ltd.'s own data and considered accurate at time of going to print

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