

# SPECIFICATION

**Product Name: Ultrasonic Oxygen Sensor**

**Module Item No.: 7500C**

**Version: V0.2**

**Date: June 29, 2020**

# Revision

No.	Version	Content	Reviser	Date
1	V0.1	First Edition	Mei Yang	2018-11-01
2	V0.2	1. Company Name Amendment	Una Zhan	2020-6-29

# Ultrasonic Oxygen Sensor Module Gasboard 7500C



## Applications

- ✧ Family and Medical Oxygen Concentrator/Generator
- ✧ Flow of Clean Gas Measurement
- ✧ Gas Detection in Binary Gas (include  $O_2$ )

## Description

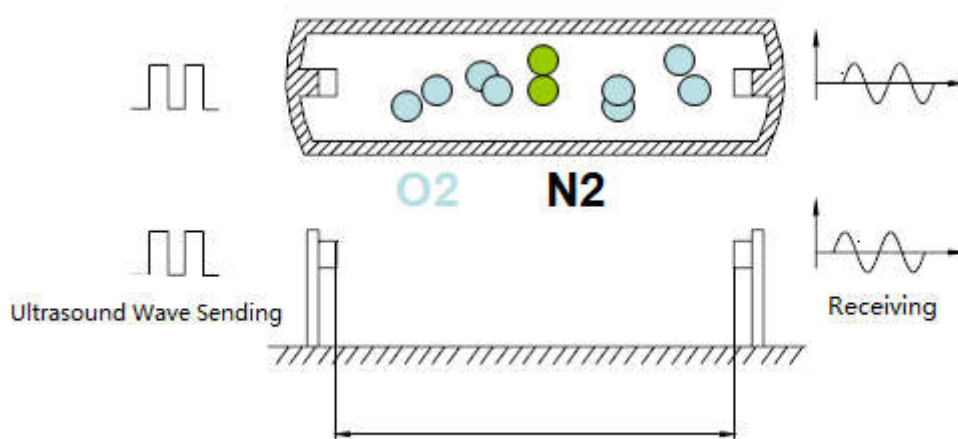
The gasboard-7500c ultrasonic oxygen sensor module is an economical and practical sensor for measuring oxygen flow and concentration in binary gas. This product is a new type of gas sensor newly developed by our company to meet the market demand. It adopts the diffused gas detection method to make the data more stable and effective and has stronger anti-noise capability. Small size, unrestricted inlet and outlet gas direction, wide voltage supply and other characteristics, the product is more flexible and reliable.

## Features

- ✧ Diffusion and Ultrasonic Technology Adopted
- ✧ Small size, Fast Response, Stable, Great Accuracy
- ✧ Full Scale Course Temperature Compensation
- ✧ Factory Calibration, No Need Calibrated by Users
- ✧ Wide Voltage Input, Long Lifespan, Auto-calibration, Maintenance-free.

## Working Principle

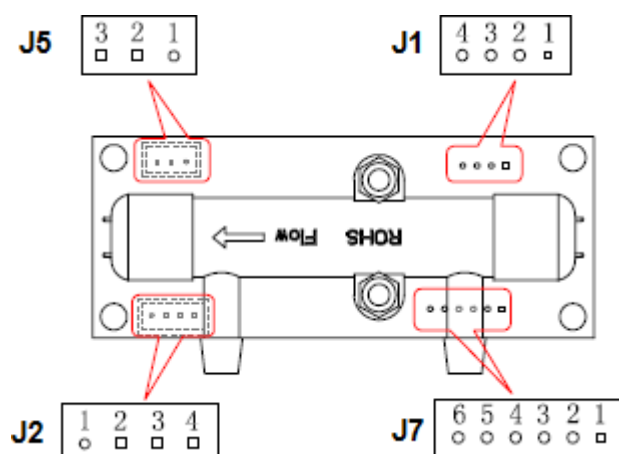
Ultrasonic concentration detection theory: when the binary gas mixture composition has molecular weight difference, sound travel speed varies from different gas composition.



## Specifications

Ultrasonic Oxygen Sensor Specification	
Working Principle	Ultrasonic Technology
Detection Range	O2 Concentration: 0~100% O2 Flow: 0~10L/min
Detection Accuracy	O2 Concentration: $\pm 1.8\%FS$ @(10~45)°C O2 Flow: $\pm 0.2L/min$ @(10~45)°C
Resolution	O2 Concentration: 0.1% O2 Flow: 0.1L/min
Response Time	1.5s
Operating Conditions	10~50°C ; 0~95%RH (Non-condensing)
Storage Condition	-20~60°C ; 0~95%RH (Non-condensing)
Work Voltage	DC 5.0V-12.0V
Average Work Current	<30mA
Communication Interface	UART_TTL(3.3V)
Product Size	W70*H28*D20 mm
Life Span	≥5 years

## Pin Definition



**Drawing 1** Gasboard-7500C Pin Definition

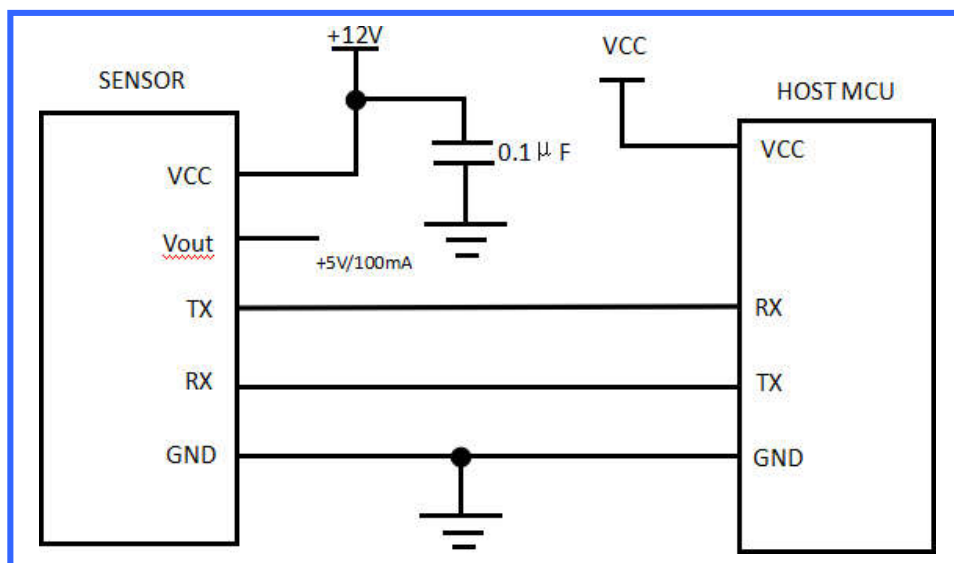
### Pin Definition List

J1			J2		
NO	PIN	Description	NO	PIN	Description
1	GND	Power Supply Output	1	Vout	+5V/100mA Power Supply Output /5V-12V Power Supply Input
2	Vout1	0-2.5V Output Pin, Correspond 0%-100% Oxygen Concentration ( Customized Option )	2	Rx	UART-Rx Receiving (3.3V)
3	Vout2	0-2.5V Output Pin, Correspond 0-10L/min Oxygen Concentration ( Customized Option )	3	Tx	UART-Rx Sending (3.3V)
4	Vout	+12V /100mA, Power Supply Input	4	GND	Power Supply Output

J5			J7		
NO	PIN	Description	NO	PIN	Description
1	VCC	5-12VDC , External Power Supply Input Pin	1	Alarm Output	Alarm Output (Customized Options )
2	NC	No Definition			
3	GND	Public Power Supply Input Pins			

## Reference Circuit

Application Scenarios: UART TTL 3.3V Serial Output



Drawing 2 UART Communication Connection Circuit

# Communication Protocol

## Communication Protocol

### 1. Protocol Overview

- 1) Baud Rate: 9600, Data Bits: 8, Stop Bits: 1, Parity: No, Flow Control: No
- 2) The protocol data are hexadecimal data, for example "46" is [70] in decimal.
- 3) [xx] is single byte data(unsigned, 0-255); In double byte, the high byte is in front of low byte.

### 2. UART Communication Protocol Format

#### PC Send Format

Start Character	Length	Command	Data 1	.....	Data n	Check Sum
HEAD	LEN	CMD	DATA1	.....	DATAn	CS
11H	XXH	XXH	XXH	.....	XXH	XXH

#### Protocol Format Description

Protocol Format	Detailed Description
Start Character	PC sending is fixed to [11H], module response is fixed to[16H]
Length	Length of frame byte, =data length+1 (include CMD+DATA)
Command	Directive Number
Data	Read or writing data, the length is variable
Check Sum	The sum of data accumulation, =256-(HEAD+LEN+CMD+DATA)

### 3. UART Protocol Order Number List

NO	Function name	Command no
1	Read the measurement result of O2	0x01
3	Read the software version number	0x1E
5	Inquiry instrument serial number	0x1F

### 4. Detailed Description

#### 4.1 Read the Measurement Result of O2

**Send:** 11 01 01 ED

**Response:** 16 09 01 DF1-DF8 [CS]

**Function:** Read the Measurement Result of O2

**Description:** O2 Concentration = ( DF1\*256 + DF2 ) /10 ( Vol % )

O2 Flow Value = ( DF3\*256+ DF4 ) /10 ( L/min )

O2 Temperature Value = ( DF5\*256+ DF6 ) /10 ( °C )

**Notice :** DF7-DF8 Reserved

## Response Example

**Response** : 16 09 01 00 CD 00 00 00 E0 00 00 33

**Description** :

Hexadecimal Convert into Decimal : CD is 205 ; E0 is 224

O2 Concentration  $= (0 \times 256 + 205) / 10 = 20.5$  (20.5%) O2

Flow Value  $= (0 \times 256 + 0) / 10 = 0$  (L/min)

O2Temperature Value  $= (0 \times 256 + 224) / 10 = 22.4$  (22.4℃)

## 4.2 Read the Software Version Number

**Send** : 11 01 1E D0

**Response** : 16 09 1E DF1-DF8 [CS]

**Function** : Read the software version number

**Description** : D DF1-DF8 refers to the ASCII code of particular version number.

**For Example** : when module version number is 0.02.611, response data :

16 09 1E 30 2E 30 32 2E 30 31 36 3E

Hexadecimal Convert into ASCII Code:

0.02.016

## 4.3 Inquiry Instrument Serial Number

**Send** : 11 01 1F CF

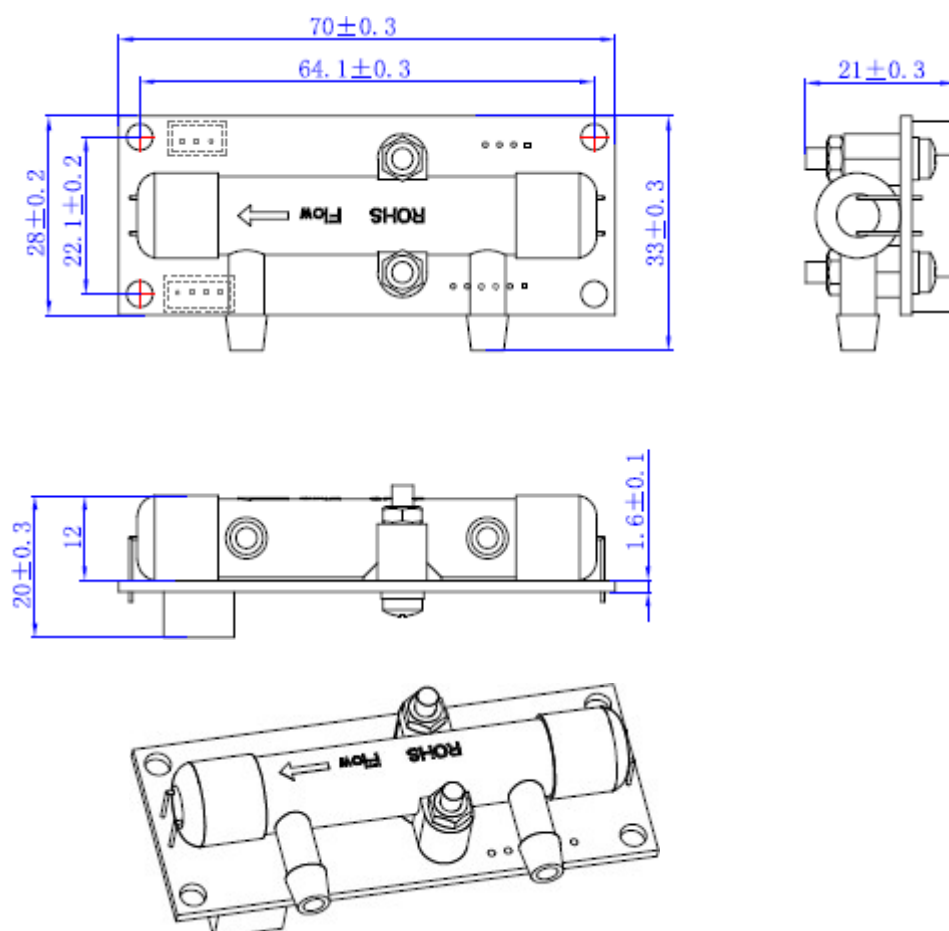
**Response**: 16 0B 1F (SN1) (SN2) (SN3) (SN4) (SN5) [CS]

**Function**: Read serial number for module firmware

**Explanation** : Instrument serial number of output software. SNn range is 0~9999, 5 integer type constitute 20 serial number.



## Dimension

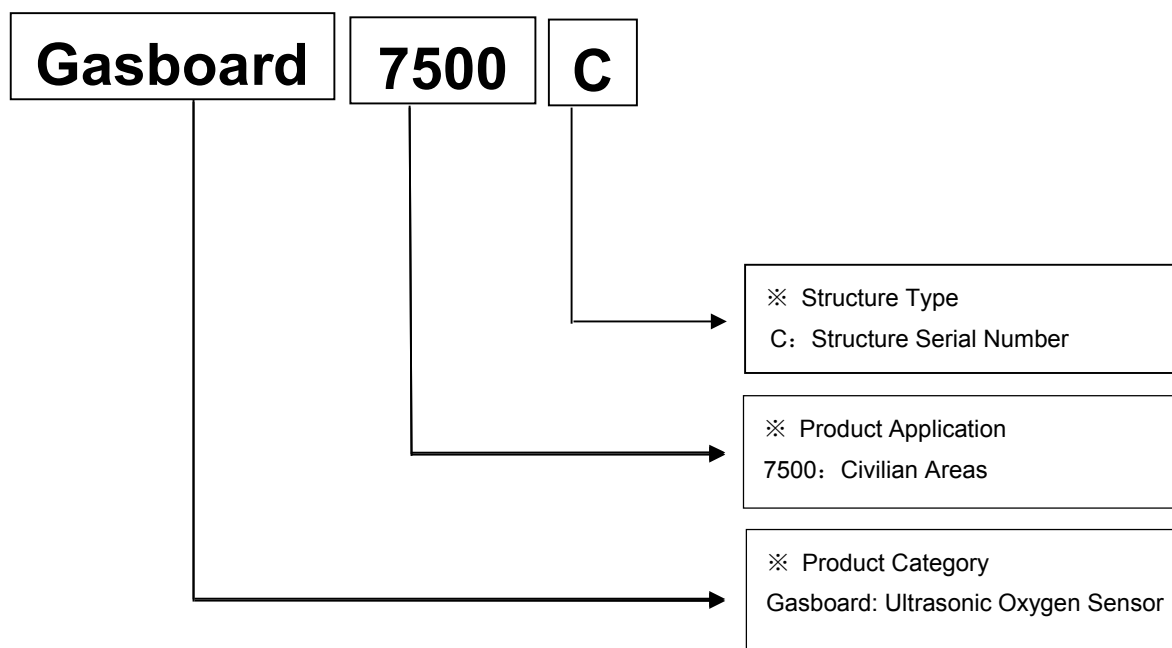


**Drawing 3** (Unit:mm, Tolerance:±0.2mm)

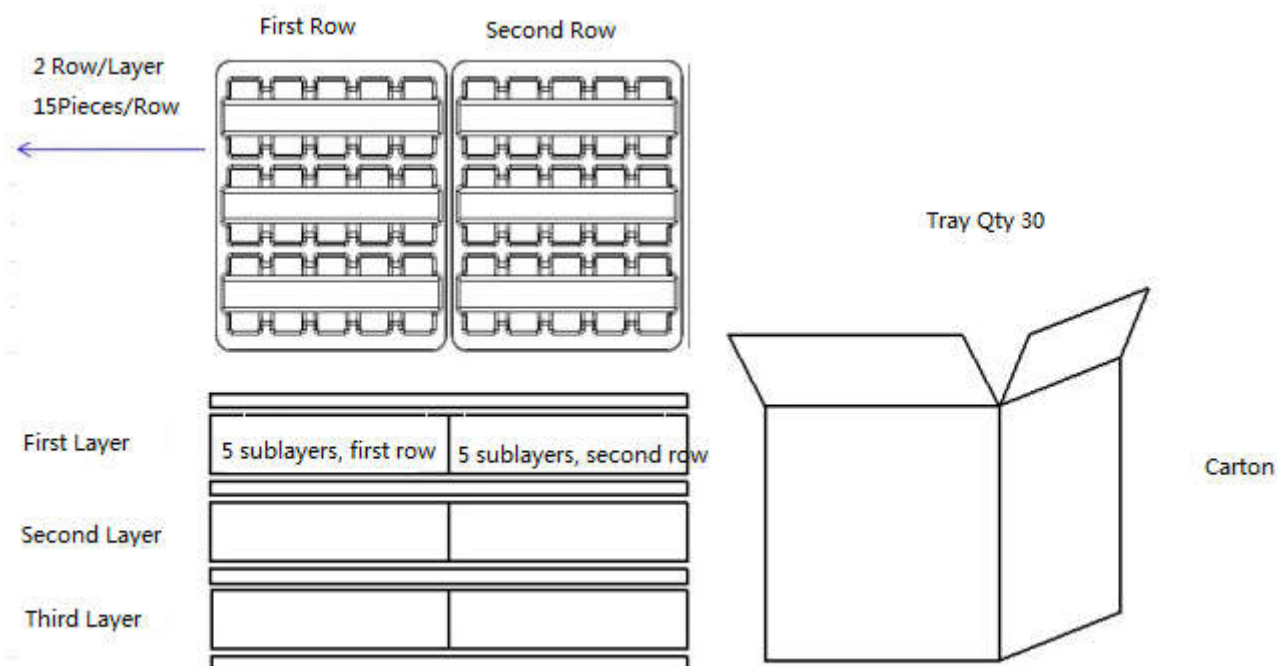
## Reliability Testing

Item	Requirement	Criterion	Sample (n) Failed (c)
Flow Performance	Indoor temperature requirement: $25\pm 2^{\circ}\text{C}$ , humidity $(50\pm 10)\% \text{RH}$ , after the sensor connect with serial port and power on, switch over the flow in 3L/min、5L/min、8L/min respectively to measure oxygen concentration and accuracy.	Make new tests in different oxygen flow, all can meet deviation criterion.	n=70 c=0
Low Temperature Storage	Storing the sensor for 96H with no power under $-20^{\circ}\text{C}\pm 2^{\circ}\text{C}$ environment condition, then test measurement deviation under normal temperature condition.	After staying under normal temperature condition for 2 hours, the test all can meet deviation criterion.	n=0 c=0
Low Temperature Operation	Indoor temperature requirement: $-10\pm 2^{\circ}\text{C}$ , test measurement deviation of sensor under normal temperature condition after operating for 96H with electricity.	After staying under normal temperature condition for 2 hours, the test all can meet deviation criterion.	
High Temperature Storage	Storing the sensor for 96H with no power under $60^{\circ}\text{C}\pm 2^{\circ}\text{C}$ environment condition, then test measurement deviation under normal temperature condition.	After staying under normal temperature condition for 2 hours, the test all can meet deviation criterion.	
High Temperature Operation	Indoor temperature requirement: $50\pm 2^{\circ}\text{C}$ , test measurement deviation of sensor under normal temperature condition after operating for 96H with electricity.	After staying under normal temperature condition for 2 hours, the test all can meet deviation criterion.	
High-low Temperature Shock	Keep the sensor under $-20^{\circ}\text{C}$ for 60 mins, then switch to $60^{\circ}\text{C}$ in 10s and stay for another 60 mins, this is one cycle. Totally 10 cycles with the sensor power off.	After staying under normal temperature condition for 2 hours, the sensor accuracy should meet the specification standard.	
High Temp & Humidity	High temp & humidity ( $40\pm 2^{\circ}\text{C}$ , 95%RH), after work under rated voltage for 500H, test measurement deviation under normal temperature condition.	After staying under normal temperature condition for 2 hours, the sensor accuracy should meet the specification standard.	
Salt Spray Test	Standard :GB/T2423.17, place the sensor in the salt fog box under $35^{\circ}\text{C}$ and spray with NaCl solution (5%) for 24 hours, then flush with distilled water and dry with airflow.	Keep the sensor under standard environment more than 1 h and less than 2 h, should no appearance defect, no corrosion.	n=2 c=0
Vibration Test	Bare sensor should bear the specified vibration test in X/Y/Z direction, frequency range 10~55~10Hz/min, amplitude 1.5mm, scan circulation 2 hours.	No appearance defect after vibration test, the sensor can meet basic performance test standard.	n=4 c=0
Package Drop Test	Drop height: set the height as specified weight according to standard GB/T 4857.18. Make the drop test according to the GB/T4857.5 standard. Test sequence is one corner, three edges, six sides.	No appearance defect after drop test, no components fall off, the sensor should work normally.	n=1 ctn c=0

## Product Code Instruction



## Packing Information



Qty/Layer	Small Tray Qty	Big Tray Qty	Sensor per Carton	Carton Dimension	Packing Material
30 pcs	5 layers	3 layers	450pcs	W395 * L320 * H470mm	Anti-static Plastic Tray

## User Attention

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Please confirm before starting to test:

- (1) Sample gas needs to be pretreated to make sure that the sensor entrance is clean, no water and no oil.
- (2) Connect the sensor vent pipe with outside air to ensure the safety of emissions and ensure no blocking phenomenon.
- (3) Do not smoke or use open flame near the sensor.
- (4) The integrity of the pipeline must be ensured in use to avoid gas leakage caused by pipeline rupture. When the leaked gas contains poisonous and explosive gases, it may cause serious accidents.
- (5) When exhausting, please connect the exhaust pipe to the outdoor atmospheric environment, do not make it diffuse in the sampling device or indoor. Do not allow moisture to enter the sensor, or it may cause electric shock or short circuit in the instrument.
- (6) The inlet pressure of the sensor must be within the specified range to avoid the loss or leakage of the pipeline due to excessive pressure.
- (7) Non-professionals or without the permission of the manufacturer, do not disassemble the sensor, otherwise the sensor damage are not under the warranty or repair services.
- (8) Please read the instructions carefully before using the sensor to avoid personal injury or damage to the sensor.

## After-Sales Services and Consultancy

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