

SPECIFICATION FOR APPROVAL

Product Name : Limit current oxygen sensor module

Specification : GSTB-400H V1.2

Customer :

CUST P/N :

Supplies : Winpower Technology Co., Ltd.

Date :

CUSTOMER APPROVAL	CHK	APPD

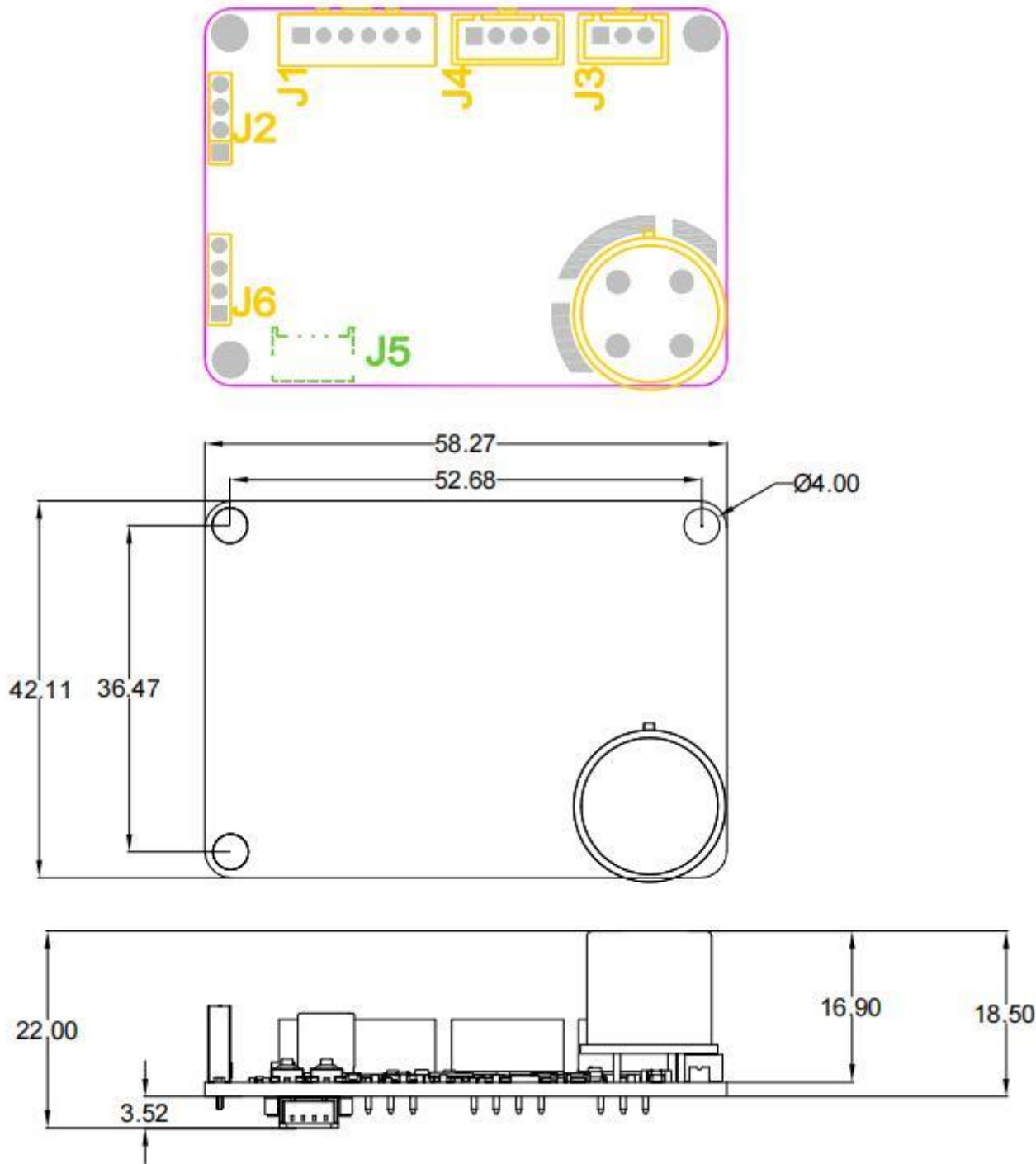
DWN	CHK	APPD

.The product specification is for reference only and shall be signed for confirmation in case of batch supply

.This manual is subject to change without notice. The final interpretation of this product belongs to Winpower Technology Co., LTD.

User Manual

Product dimensions (Unit: mm. Error: $\pm 0.25\text{mm}$) This error is followed where not marked



Picture 1 Package dimensions

Data interface J1 (Model XHB-6A, 1x6P spacing of 2.54 mm, with buckle)

1	12V
2	12V
3	RXD
4	TXD
5	GND
6	GND

Data interface J2 (Model XHB-4AW, 1x4P spacing of 2.54 mm, without buckle)

1	3.3V
2	RXD
3	TXD
4	GND

Power interface J3 (Model XHB-3AW, 1x3P spacing of 2.54 mm, without buckle)

1	12V
2	NC
3	GND

Data interface J4 (1x4P pin array with a spacing of 2.54 mm)

1	3.3V
2	RXD
3	TXD
4	GND

Temperature, humidity and pressure sensor interface J5 (Model MX1.25-4PWT, 1x4P spacing 1.25 mm, Lying sticker)

1	GND
2	3.3V
3	SCL
4	SDA

OLED screen (SSD1306) Interface J6 (1x4P, pitch 2.54 mm, female header)

1	GND
2	3.3V
3	SCL
4	SDA

Technology Characteristics

Measuring gas	Oxygen
Measuring medium	Atmosphere
Gas concentration detection range	0.1%-40% oxygen (other concentrations can be customized)
Concentration resolution	0.01%
Concentration detection accuracy	±1% FS@ (-40 ~ +85°C) °C
Response time (t90)	less than 15 second
Preheating time	60 seconds
Temperature sensor accuracy	±0.3°C (range: -40 ~ +85°C)
Humidity sensor accuracy	±3%RH (range: 0 ~ 100%RH)
Air pressure sensor accuracy	±3 pa (range: 20 ~ 130 kpa)
Sample gas requirements	water removal (no condensation); Dust filtration (< 1 u m)
Service life	No special contamination, ≥5 years

Working Parameter

Working voltage	12V±0.5V DC
Sensor heating voltage	3.3V ± 0.1V
Sensor signal voltage	0.75V ± 0.05V
Intake flow	Diffused
Room temperature power consumption	Normal power: 1.6 - 3.0 W, Transient power: ≤ 5 W
Communication interface	UART (3.3V)
Product size	W58.27mm x D42.11mm x H20.3mm
Operating temperature	-40°C~+85°C
Work humidity	0~100%RH
Working gas pressure	20kpa~130kpa
Operating surface temperature	≤150°C
Storage temperature	-40°C to 100°C
Shelf life	-40°C to 100°C, dry conditions, original packaging conditions, two years
Maximum temperature change rate	±60°C/S

UART communication protocol

Protocol overview

1. Baud rate: 9600bps
2. Character length: 1 bit start bit, 8 bit data bit, 1 bit stop bit, no check
3. The protocol is hexadecimal data, double-byte data, with the high position in the front and the low position in the back.
4. All data hereunder shall be hexadecimal data. E.g. "46" is decimal [70]
5. [xx] is a single byte data (unsigned, 0-255); (xx) is double-byte data, signed (-32768 to +32767), with the highest digit in front. "--" followed by a note.
6. All data are integers, and there may be (100, 10, 1) times the corresponding relationship between the actual display data (related to the specific sensor).
7. The minimum query time 20

Command format

Start symbol (HEAD)	Frame length (LEN)	Command (CMD)	Data 1(DATA1)	---	Data n(DATAN)	Summation check (Check Sum)
11H	XXH	XXH	XXH	---	XXH	XXH

Start symbol	- The value is fixed to 0x11 when the host is queried - The value is fixed to 0x12 when the host writes data - The value is fixed to 0x16 when the module replies
Frame length	Frame length = DATA length + 1 (including CMD + DATA);
Command	Indicates the number of the command. Different commands correspond to different postback contents
Data 1 - Data n	Indicates read or written data of varying length
Summation check	Sum Check (Check Sum) = 256 - (HEAD + LEN + CMD + DATA)

Command number	Corresponding function
0x01	Read the measurement results of the module
0x1E	Read the software version number
0x1F	Querying Firmware Number
0x20	Read the measurement results of the module

Reading measurement results

Host sending	11 01 01 ED ----0x11: indicates query command byte. ----0x01: Followed by a byte ----0x01: indicates the oxygen command number ----0xED: indicates the check word = 0x00-0x11-0x01-0x1e.
Sensor response	16 09 01 DATA1-DATA8 [CS] O₂ concentration = (((DATA1 << 8) DATA2)) / 100 (unit: %), this field will be retained if the function is disabled Environmental temperature = (((DATA3 << 8) DATA4)) / 10 (unit: °C), negative numbers are represented in complement form, this field will be retained if the function is disabled Environmental humidity = (((DATA5 << 8) DATA6)) / 10 (unit: %RH), this field will be retained if the function is disabled Environmental pressure = (DATA7 << 8) DATA8 (unit: hpa), this field will be retained if the function is disabled For example: Response data: 16 09 01 08 2A 01 09 01 C7 03 E8 F1 082A = 2090 0109 = 265 01C7 = 455 03E8 = 1000 0xF1 = 0x00 - 0x16 - 0x09 - 0x01 - 0x08 - 0x2A - 0x01 - 0x09 - 0x01 - 0xC7 - 0x03 - 0xE8; Oxygen concentration = (0x082A) / 100 = 20.90% Ambient temperature = (0x0109) / 10 = 26.5°C Ambient humidity = (0x01C7) / 10 = 45.5%RH Ambient pressure = 0x03E8 = 1000 hpa

Read software version

Host sending	11 01 1E D0 ----0x11: indicates query command byte. ----0x01: Followed by a byte ----0x1E: Query firmware ----0xD0: indicates the check word = 0x00-0x11-0x01-0x1E.
Sensor response	16 09 1E DATA1-DATA8 [CS] Note: DF1-DF8 indicates the ASCII code of a specific version number. For example, when the module version number is 0.02.016, the response data is: 16 09 1E 30 2E 30 32 2E 30 31 36 3E Hexadecimal to ASCII code: 30 2E 30 32 2E 30 31 36 → 0.02.016

Read firmware version

Host sending	11 01 1F CF ----0x11: indicates query command byte. ----0x01: Followed by a byte ----0x1F: Oxygen command number ----0xCF: indicates the check word = 0x00-0x11-0x01-0x1F.
Sensor response	16 09 1F DATA1-DATA10 [CS] Function: Read the firmware version of the module. Instructions: The serial number of the instrument that outputs the software. The serial number ranges from 0 to 9999. Five integers form a 20-digit serial number.

Concentration calibration (single point calibration)

Host sending	12 04 20 DATA1-DATA3 [CS] ----0x12: Start of write data; ----0x04: Data length; ----0x20: Concentration calibration standardization command; ----DATA1: Sensor number, user-defined; ----DATA2: The high 8 bits of calibrated concentration (%) * 100; ----DATA3: The lower 8 bits of the calibrated concentration (%) * 100; ----CS: Check word = 0x00-0x12-0x04-0x20-DATA1-DATA2-DATA3;
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	Function: Sensor calibration and standardization Instructions: Once the sensor is fully heated, place it in an oxygen environment for 30 minutes. Then, send a calibration instruction with the current concentration. After 30 minutes of air exposure, send a calibration instruction with the concentration data. The sensor module will enter the calibration process. Note: If the sensor module has physical buttons, you can use single or double button presses to mimic the concentration calibration instructions. The base concentration is 20.9%. For example: Calibration is carried out in the air. Assuming the oxygen concentration in the air is 20.9%, power on the sensor and place it in an environment with good air circulation, stable temperature and no wind to work for 1 hour, then send the calibration instruction 12 04 20 01 08 2A 97 Calibration is carried out. 0x082A represents an oxygen concentration of $20.9 * 100 = 2090$. The oxygen concentration needs to be kept stable for 1 minute before and after sending the calibration instruction.
Sensor response	16 04 20 DATA1-DATA3 [CS] Function: Receive concentration calibration responses. Instructions: DATA1-DATA3. DATA1 represents the sensor number, and DATA2 DATA3 represents the calibrated concentration data. If the calibration instruction responds, it indicates that the calibration instruction has been sent successfully; otherwise, it fails.

Notice

1. The module is powered by 12V. After powering on and preheating for 1 minute, it starts to output sensor concentration data. The data is output in hexadecimal format, with an output frequency of 1Hz. The output format refers to the sensor response part of the "Read Measurement Results" instruction.
2. After running for 30 minutes, the readings stabilize.
3. Do not plug or unplug the screen/sensor module during operation.
4. Do not blow on the ion flow sensor quickly or spray high-speed air flow while the module is working. Otherwise, it will affect the temperature of the ion flow sensor, resulting in inaccurate concentration output. If you need to blow gas onto the ion flow sensor, the flow rate should be controlled at $\leq 0.5\text{L/min}$.
5. If you need to introduce pressurized gas into the ion flow sensor, please encapsulate the environment and sensor into the gas pipeline and place it at the front of the zirconia ion flow sensor. Otherwise, the oxygen concentration output will be inaccurate. The pressure range is 30-130kpa, and the gas flow rate should be $\leq 0.5\text{L/min}$.
6. When the environmental sensor board is unplugged, the oxygen concentration sensor module will lose the temperature, humidity, and pressure compensation functions.
7. Users must not dismantle it without authorization, including preventing the metal mesh cover from causing irreversible damage.
8. Operating the sensor for a long time beyond the specified measurement range may shorten its service life. The increase in sensor current may cause permanent damage to the electrode.
9. It cannot be used to measure dissolved oxygen in liquid media. This oxygen sensor only measures the oxygen concentration in the gas environment.
10. After long-term storage, if the sensor shows drift, a calibration should be performed before using the sensor according to the manual.
11. It is strictly prohibited for use in the measurement of flammable mixed gas.
12. It is strictly prohibited for the sensor surface to form condensate water.
13. Be cautious of high temperatures! The surface temperature of the zirconia during operation should not exceed 150° . When using, be careful to avoid burns. Do not use in flammable or explosive environments. When in use, keep the zirconia probe suspended and do not touch the wire, the tabletop, the casing, etc.

Naming Definition



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