

SPECIFICATION

Product Name: TDLAS CH4 Sensor

Item No.: Gasboard-2500

Version: V0.1([preliminary](#))

Date: Dec 23rd, 2021

Revision

No.	Version	Content	Date
1	V0.1	Preliminary version	2021.12.23

TDLAS CH4 Sensor

Gasboard-2500



Applications

- Underground pipe network
- Underground well (electric manhole covers, gas well)
- Voltage regulator cabinet
- Mining gas leakage alarm

Description

Gasboard-2500 is a methane gas sensor based on self-developed Tunable Diode Laser Absorption Spectroscopy (TDLAS) technology. Our TDLAS gas sensor contains high performance probe and special processing gas chamber with advantage of high accuracy, high sensitivity, wide working temperature range, and longer life time, etc. It also adopts laser light intensity correction and temperature/pressure compensation algorithm to fulfil anti-cross gas interference, working stable at hazardous conditions and complex gas environment.

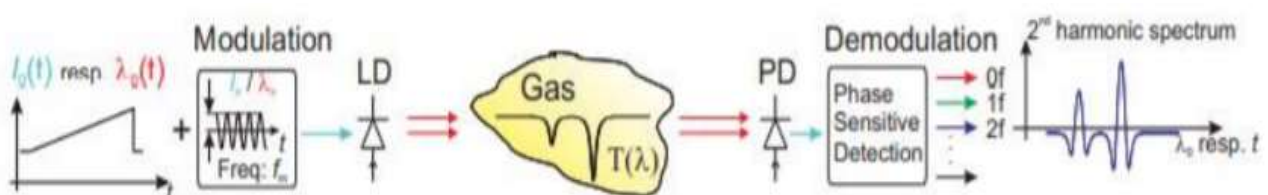
Besides our sensor is ease of installation by implementing modularized design. It could be calibrated through TTL communication interface. Low power consumption with 3.2V~5.5V power supply, which is ease of integration and maintenance for customer.

Features

- Up to 0~100% LEL measurement range (customizable 0~100%vol)
- Fast response, high accuracy, long life span
- TDLAS technique drive unique methane selectivity, no interference from other gases, water vapor, dust particles
- Low power consumption, modularized design, ease of integration

Working Principle

TDLAS sensor consists of tunable laser source, gas chamber, detector and pressure sensor. Laser source emit the light with specific wavelength, the wavelength is modulated by periodic current change, through wavelength scanning to enable central wavelength of output light that match with detected methane absorbing spectrum. The detector measure the amount of absorbing light energy density which is related to methane concentration.



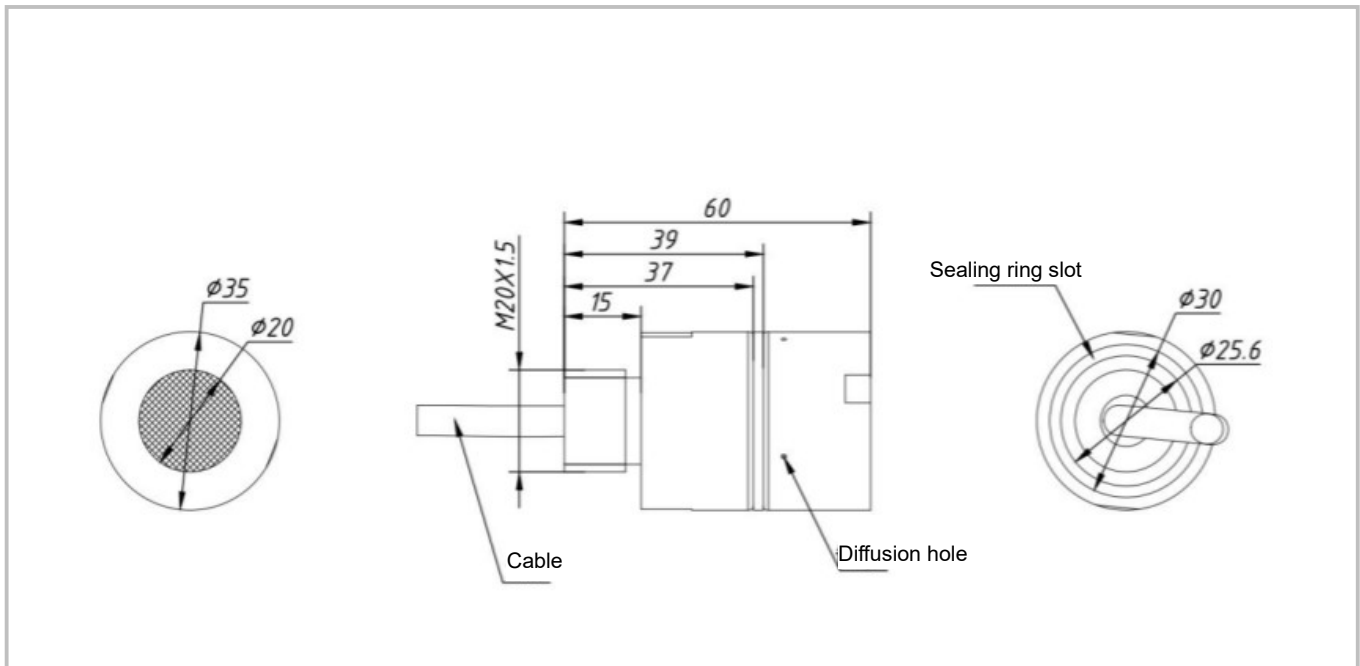
Specifications

Gasboard-2500 Gas Sensor Specification	
Target gas	Methane (CH ₄)
Working principle	Tunable Diode Laser Absorption Spectroscopy (TDLAS)
Measurement range	0~100% LEL
Accuracy	0 ~ 20%LEL ±1%LEL 20~ 60%LEL ±3%LEL 60~ 100%LEL ±5%LEL
Resolution	1% LEL
Response time (T90)	T90 < 20s (Diffusion mode)
Warm-up ^①	<25s
Working temperature	-25 ~ 55°C
Working humidity	0~98%RH
Working pressure range	80 kPa~120kPa
Working voltage	3.2V~5.5V
Working current ^①	≤50mA,Max 150mA
Digital signal format	TTL(3.3V)
IP Grade	IP66
Storage condition	-40 ~ +70°C ; 0~95%RH (non-condensing)
Dimension	35mm*60mm (diameter*length)

Note: 1. The warm-up time and working current are both measured at temperature 25±2°C and atmospheric pressure 101.3kPa.

Product Dimensions

1. Dimensions (Unit: mm)



2. Pin Definition

Pin	Color	Description
1	Red	Power Input(+5v)
2	White	Power Input Terminal (Ground Terminal)
3	Blue	TX
4	Green	RX

Precautions

1. During transportation, the sensor is not allowed to be subjected to severe mechanical shock and exposure to the sun and rain, and is strictly prevented from falling, rolling, and heavy pressure.
2. Please read the specification before use to understand the performance and usage, so as to avoid accident or damage to the instrument caused by mis-operation and not subject to large shocks and shocks. So as not to affect the service life of the instrument.
3. In order to ensure good detection accuracy, the sensor power supply must keep within the specification.
4. Before the calibration ventilation operation, clean the water and stains on the sensor plug.
5. If you encounter problems that cannot be solved, please contact the manufacturer in time, and the sensor probe cannot be disassembled for maintenance.

Gasboard-2500 Sensor Communication Protocol

1. Protocol Overview

The communication mode is TTL (3.3V), which satisfies the MODBUS-RTU (slave mode) protocol and hexadecimal data transmission.

Configuration	Parameter
baud rate	9600
Data bit	8
Pause bit	1
Check bit	None
Flow control	None

2. Serial Communication Protocol Format

2.1 Send read command 03

The host sends the reading module 01 concentration instruction format:

Byte	1	2	3	4	5	6	11	12
Instruction	Address	Function	Register address		register quantity		CRC16	
Response	01	03	00	40	00	01	85	DE

The format of the message returned by the module:

Byte	1	2	3	4	5	6	7
Instruction	Address	Function	Byte	Return data		CRC16	
Response	01	03	02	12	34	B5	33

Note: The returned data is a double-byte signed integer, which is 100 times the actual concentration value when converted into decimal; in the above example, the actual concentration value after conversion of the actual returned data (12,34) is 46.60%.

The first bit of the concentration is the sign bit, and the last 15 bits are the numerical value, such as (80,12) means -0x0012, -0.18%

2.2. Send write command 10

The command format for the host to write the zero value 1% to module 01 is as follows:

Byte	1	2	3	4	5	6	7	8	9	10	11
Instruction	Address	Function code	Register address	Register quantity	Byte quantity	Write	CRC16				
Response	01	10	00	50	00	01	02	00	64	AB	EB

The format of the message returned by the module:

Byte	1	2	3	4	5	6	7	8
Instruction	Address	Function	Register address	Register quantity	CRC16			
Response	01	10	00	50	00	01	01	D8

3. Register content

Register	Function instruction	Read/Write	Data example	Example
0x0040	Concentration	Read only	0x0001	Concentration 0.01%, refer to note 1
0x0041	Temperature	Read only	0x084D	Temperature 21.25°C, refer to note 2
0x0042	Pressure H	Ready only	0x0001	conversion method refers to note 3
0x0043	Pressure L	Ready only	0x8716	conversion method refers to note 3
0x0044	Error code	Ready only	0x0000	refer to note 4
0x0050	Zero calibration	Read and Write	0x0064	Calibration zero point is 0.1%, refer to note 5
0x0051	Calibration	Read and Write	0x03E8	Calibration concentration 10%, refer to note 6
0x0052	Reset to factory setting	Read and Write	0x0001	Reset to factory setting
0x0053	Setting address	Read and Write	0x0002	Revise address 0x0002
0x0054	Set command receipt	Read and Write	0x0001	Zero calibration successfully refer to note 7

Note:

1. $\text{Concentration} = (\text{8 high concentration} * 256 + \text{8 low concentration}) / 100$, the unit is vol;

2. Ambient temperature conversion method:

Ambient temperature = $(8 \text{ bits of high temperature} * 256 + 8 \text{ bits of low temperature}) / 100$, the unit is °C;

(The highest bit represents sign 1-negative number 0-integer)

3. Environmental pressure conversion method:

Pressure H = pressure high 8 bits * 256 + pressure low 8 bits;

Pressure L = pressure high 8 bits * 256 + pressure low 8 bits;

Ambient pressure = $(\text{pressure H} * 65536 + \text{pressure L}) / 100$, the unit is mbar.

4. Status code

The meaning of the status code is shown in the following table:

Status code	Description	Comment
0X00	Normal working	Normal working
0X01	Optical path failure	Light intensity over lower
0X02	Voltage abnormal	Voltage below working voltage
0X04	Internal temperature abnormal	Temperature over 80°C
0X08	temperature sensor abnormality	temperature sensor failure
0X10	Absorption peaks deviated from identification	Abnormal absorption peak

Example:

Function description	Sending data	Return data	Data instruction
Read trouble codes	01 03 00 44 00 01 C4 1F	01 03 02 00 00 B8 44	Data normal
		01 03 02 00 01 79 84	Optical path failure
		01 03 02 00 03 F8 45	Optical path failure + abnormal voltage

5. Zero value conversion method:

Zero adjustment value = (zero adjustment value high 8 digits * 256 + zero adjustment value low 8 digits) / 100, the unit is vol;

6. Correction value conversion method:

Correction value = (high 8 bits of correction value * 256 + low 8 bits of correction value)/100, the unit is vol;

7. Set command receipt query 0x0054

After executing the device parameter setting command, read this byte to query and confirm the result of the command execution. The details are as follows:

Byte	7	6	5	4	3	2	1	0
Content	Reserved				Initialization	Reset to factory setting	Correction	Zero calibration

Bits 7-4: Reserved.

Bit 3: This bit is set to 1 after the initialization command is executed successfully, and needs to be manually cleared to 0 after the query

Bit 2: This bit is set to 1 after the factory reset command is successfully executed, and needs to be manually cleared to 0 after querying

Bit 1: This bit is set to 1 after the correction command is successfully executed, and needs to be manually cleared to 0 after querying

Bit 0: This bit is set to 1 after the zero adjustment command is successfully executed, and needs to be manually cleared to 0 after querying

4. Example instruction

The default device number is 01, and the sent data is shown in the following table:

Function description	Sending data	Return data	Data instruction
Read concentration	01 03 00 40 00 01 85 DE	01 03 02 01 01 78 14	2.57%
Read temperature	01 03 00 41 00 01 D4 1E	01 03 02 08 4D 7F B1	21.25°C
Read pressure	01 03 00 42 00 02 64 1F	01 03 04 00 01 87 16 49 CD	1001.18mbar
Read error code	01 03 00 44 00 01 C4 1F	01 03 02 00 00 B8 44	0
Zero calibration	0110 0050 0001 0200 00AA 00	01 10 00 50 00 01 01 D8	Communication successfully
Correction	01 10 00 51 00 01 02 03 E8 AB 6F	01 10 00 51 00 01 50 18	Communication successfully
Reset	01 10 00 52 00 01 02 00 01 6A 22	01 10 00 52 00 01 A0 18	Communication successfully



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