TDLAS Methane (CH4) Sensor

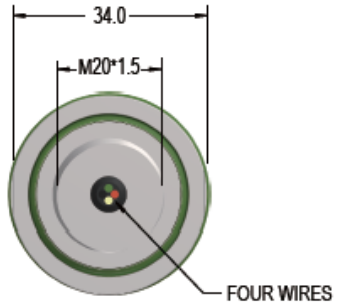
PN: TDL-LELM-1000

The TDLAS CH4 gas sensor developed by Senovol utilizes Tunable Diode Laser Absorption Spectroscopy (TDLAS) to achieve accurate and reliable measurement of specific methane. Our product incorporates a laser, photodetector (PD), and gas cell in a miniaturized integrated package, ensuring high precision, stability, and reliability.

Features

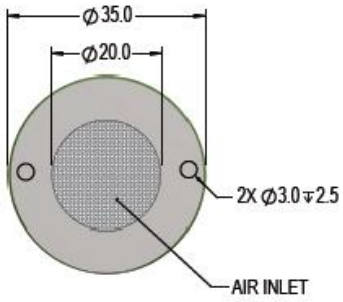
- Selective Measurement: Highly selective measurements specifically target methane gas, minimizing false readings from other gases or environmental factors.
- Enhanced Measuring Precision and Stability: Offers exceptional precision and stability in measurements. Ensures accurate and reliable results.
- Long Lifespan: With a solid-state design and minimal maintenance requirements, this sensor offers a long lifespan, reducing the need for frequent replacements and associated costs.
- Low Maintenance: The solid-state design eliminates the need for frequent calibration, reducing maintenance requirements and saving time and resources.
- Humidity Interference-Free: This sensor is designed to operate without interference from humidity, ensuring accurate methane detection.
- Optimal Optical Path Efficiency: Achieves high absorption efficiency in the optical path. Maximizes the utilization of light for improved performance.

Product Dimensions



Top View

Side View



Bottom View

All dimensions in mm

Performance

Principle	TDLAS
Target Gas	Methane (CH4)
Measurement range	0 ~ 5%VOL (0 ~ 100%LEL)
Accuracy	±3%LEL FS@25ºC
	±7%LEL FS@-40ºC ~ +60ºC
Resolution	0.01%VOL (0.2%LEL)
Response time	< 25s
Warm-up time	< 30s

Mechanical

Enclosure	Stainless steel
Weight	200 grams

Electrical

Supply voltage	3.3 ~ 5.0V DC
Power consumption	< 0.2W
Output	3.3V TTL
Communication	UART
Operating Current (RT)	35mA (Typ.)
	320mA (Max.)

Environmental

Temperature range	-40ºC ~ +60ºC
Pressure range	1atm ± 10%
Humidity range	0% ~ 98%RH non-condensing

info@senovol.com www.senovol.com

Lifetime

Storage temp	-40 ºC ~ 85 ºC
Operating lifetime	5 years
Storage life	5 years in original packaging
Warranty	24 months

Approvals

Pending

Explosion-proof, EMC, Waterproof and dustproof design

Installation

The output signals from the sensor pins are different. Inappropriate use of the pins in product design will affect the sensor's functionality. Exposure to high concentrations of solvent vapors should be avoided under any circumstances. If the sensor is used in extreme environmental conditions, please contact us for more details.

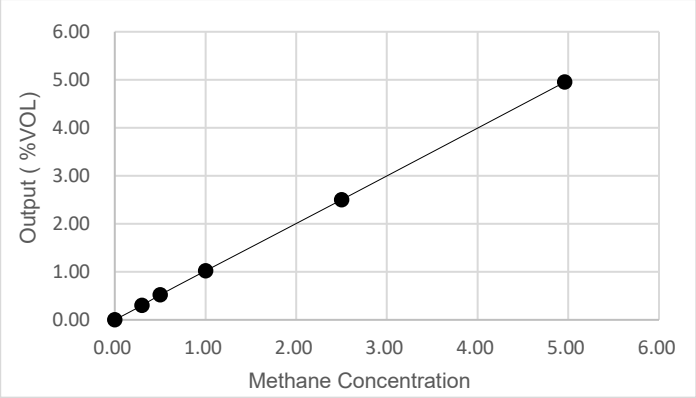
Pinout Details

Red	Black	Yellow	Green
+5V	GND	Rx	Tx

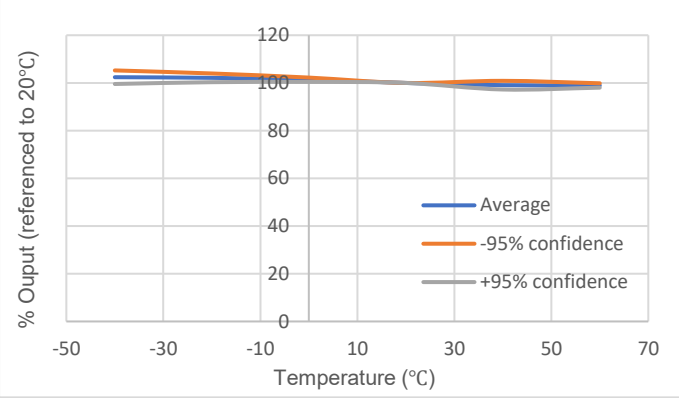
Variability due to humidity

±0.01%VOL or 5% of readings (whichever is greater) @ 25℃

Linearity



Temperature Compensation



Application

- Oil and Gas Industry: Monitor methane emissions in production, refining, and distribution facilities to ensure compliance with environmental regulations.
- Landfill Management: Detect and quantify methane gas emissions from landfills, supporting effective emissions reduction strategies and regulatory compliance.
- Agriculture: Measure methane levels in livestock farms to assess environmental impact and optimize feeding and ventilation systems.
- Industrial Safety: Implement methane monitoring in confined spaces, power plants, and manufacturing facilities to ensure worker safety and prevent potential accidents.

Note

This sensor is used in gas detection instruments. The instrument’s user guide must be read carefully, and all calibration procedures must be followed using certified target calibration gas before each use to ensure accuracy. Customers are strongly advised to validate sensor performance for their specific product designs or applications, using this document as a reference.

TDLAS CH4 (PN: TDL-LELM-1000) Gas Sensor Serial Port Communication Protocol

1. Communication Setting

Configuration	Parameter
Baud Rate	115200
Stop bits	1
Data bits	8
Check bit	None
Flow control	None

2. Data Output Format

2.1 When the sensor is in the detection state, the output is in the form of an active fixed-length string output totaling 29 bytes in the following format:

Function Code		Concentration	Space	Temperature	Space	Pressure	Space	Status Code	Space	XOR Check Code	Carriage Return	Line Feed
Byte Sequence Number		1-7	8	9-13	14	15-21	22	23-24	25	26-27	28	29
Bit Length of a Byte		7	1	5	1	7	1	2	1	2	1	1
Unit		%VOL	-	℃	-	mbar	-	-	-	-	-	-
Example	ACSII	+000.00	<SP>	+21.4	<SP>	1001.01	<SP>	00	<SP>	28	<CR>	<LF>
	HEX	2B 30 30 30 2E 30 30	20	2B 32 31 2E 34	20	31 30 30 31 2E 30 31	20	30 30	20	32 38	0D	0A

2.2 XOR Parity Check Method in Serial Communication:

The XOR calculation is performed sequentially from the first byte of data, proceeding to the next byte, and so on. The result of each XOR operation is then used as the input for the next calculation. This continues until all 25 bytes have been processed and a final one-byte checksum is produced. The checksum is then converted into two characters for output. If the result is a hexadecimal value like 0x28, the characters '2' and '8' would be the output. In the case of letters, the output will always be in uppercase.

For example:
Example 1: When the concentration is 0.00% VOL, the temperature is 21.4°C and the pressure is 1001.01 mbar, the output is as follows:

+000.00 +21.4 1001.01 00 28 <CR><LF>

Example 2: When the concentration is 2.01% VOL, the temperature is -9.4°C and the pressure is 989.12 mbar, the output is as follows:

+002.01 -09.4 0989.12 00 2D <CR><LF>

3. Status Code

Bytes 23 and 24 of the default mode output represent ASCII status codes that indicate the sensor's operating status. These two ASCII bytes are converted into corresponding BCD (Binary-Coded Decimal) codes. Each byte is transformed into a 4-bit hexadecimal value. Specifically, the ASCII code of the 23rd byte is converted to form the high 4 bits, while the 24th byte's ASCII code forms the low 4 bits, resulting in a total of 8 bits. These 8 bits, derived from the 23rd and 24th bytes, each represent different fault conditions in the system. The details are as follows:

Byte 23				Byte 24			
D8	D7	D6	D5	D4	D3	D2	D1
Reserved	Temperature Control Exception Flag	Temperature and Pressure Sensor Communication Exception Flag	Calibration Flag	Low Light Intensity Flag	High Light Intensity Flag	Absorption Peak Deviation Flag	Reserved
Default 0	1: Temperature Control Exception 0: Normal Communication	1: Communication Exception 0: Normal Communication	1: Not Calibrated 0: Calibrated	1: Too Low 0: Normal	1: Too High 0: Normal	1: Deviation 0: No Deviation	Default 0

Examples：

1. The product operates normally: The status code is 00, with the ASCII code of the 23rd byte being 0X30, which corresponds to the BCD code B0000. The ASCII code of the 24th byte is 0X30, which also corresponds to the BCD code B0000. The corresponding flag bit is B0000 0000.
2. Absorption peak out of range: The status code is 02, with the ASCII code of the 23rd byte being 0X30, which corresponds to the BCD code B0000. The ASCII code of the 24th byte is 0X32, which also corresponds to the BCD code B0010. The corresponding flag bit is B0000 0010.
3. If the temperature control is abnormal and the light intensity is too high at the same time, the status code is 44, with the ASCII code of the 23rd byte being 0X34, which corresponds to the BCD code B0100. The ASCII code of the 24th byte is 0X34, which also corresponds to the BCD code B0100. The corresponding flag bit is B0100 0100.
4. If the temperature control is abnormal, the temperature and pressure sensor communication is abnormal, the product is not calibrated, the light intensity is too small and the absorption peak is out of range, the status code is 7A, with the ASCII code of the 23rd byte being 0X37, which corresponds to the BCD code B0111. The ASCII code of the 24th byte is 0X41, which also corresponds to the BCD code B1010. The corresponding flag bit is B0111 1010.