

SPECIFICATION

Product Name: Electrochemical CO Sensor Module

Item No.: ECO-5011A-01

Version: V220915C-01

Date: Sep 27, 2022

Revision

No.	Version	Content	Date
1	V0.1	Preliminary version	2022.09.27
2	V0.2	Change storage temperature “-20 ~ +60°C” to “-20 ~ +70°C”	2022.09.29

Electrochemical CO Sensor Module

ECO-5011A-01



Applications

- Residential and commercial CO detector
- Industrial CO monitoring
- Indoor and underground parking lot ventilation control
- Fire alarm
- Automotive safety alarm
- Smart home CO monitoring

Description

ECO-5011A-01 module is a battery operable ECO-5011 electrochemical sensor with good selectivity and stability. It is a combination of mature electrochemical detection technology and sophisticated circuit design, which can accurately measure CO in the air. Each sensor has UART interface, which can be calibrated separately and connected with user's device easily.

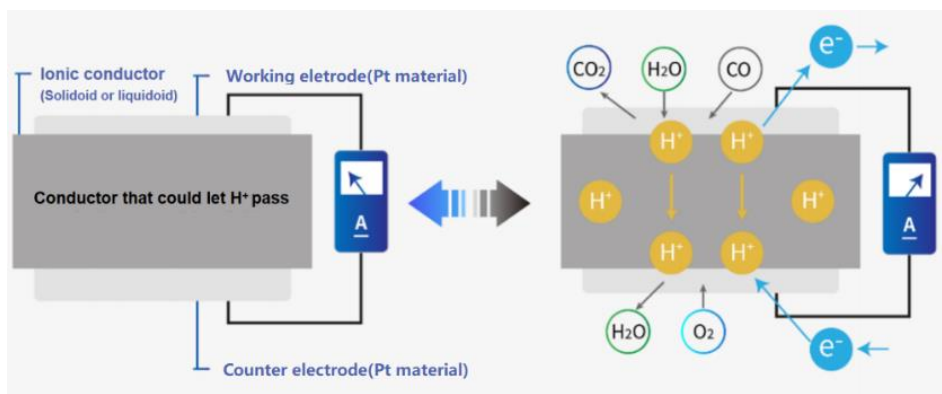
Features

- Battery operable
- Easy to be integrated into user's device
- Long lifetime (10 years), good long-term stability
- With temperature compensation and output
- Factory calibrated; no user calibration required
- Maintenance free

Working Principle

ECO-5011A-01 is a fuel cell type gas sensor. Carbon monoxide and oxygen undergo a corresponding redox reaction on the working and counter electrode, then release charges to form currents.

The generated current is proportional to the CO concentration and follows Faraday's law. The CO concentration can be determined by measuring the current.

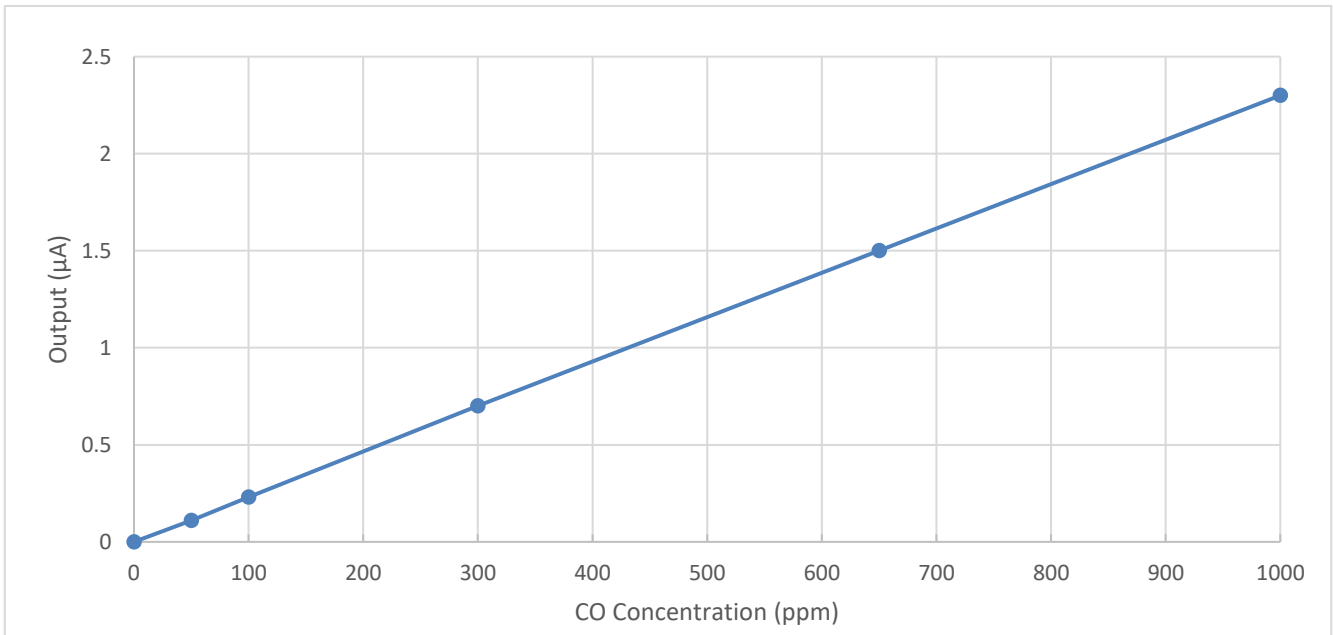


Specifications

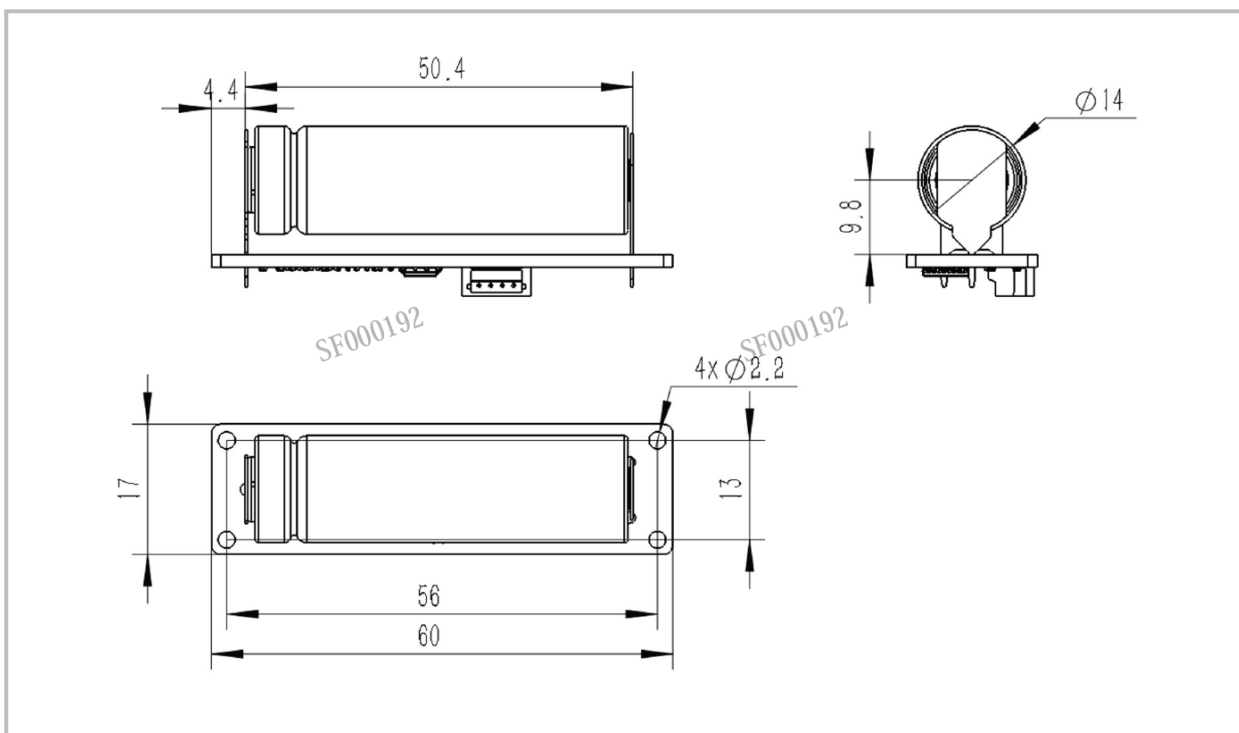
ECO-5011A-01 Gas Sensor Module Specification	
Target gas	Carbon monoxide (CO)
Working principle	Electrochemical technology
Measurement range	0~1000ppm
Accuracy	± 5ppm or ± 5%, whichever is larger
Repeatability	± 2% of reading
Resolution	0.5ppm
Response time (T90)	<60s
Zero drift (-20°C-40°C)	≤10ppm (equivalent to CO)
Long-term output drift	<3% of reading/year
Working Voltage	4.5 ~ 5.5V DC
Working Current	≤15mA
Output	UART TTL (3.3V)
Working temperature	-20 ~ +60°C
Storage temperature	-20 ~ +70°C
Relative humidity	5~99%RH (non-condensing)
Lifetime	10 years
Weight	<20g

Sensitivity Characteristic Curve

ECO-5011A-01 measured a typical sensitivity characteristic curve under standard test conditions ($20\pm 2^{\circ}\text{C}$, 50%RH). The vertical coordinate represents sensor's current output (μA) in CO gas, the horizontal coordinate represents CO gas concentration (ppm). It shows a high linearity within $\pm 5\%$ in the range of 0-1000ppm, figure as below:



Product Dimensions (Unit: mm)



Interface and Pin Definition

尺寸 \ Pin数	2P	3P	4P	5P	6P	7P	8P	9P	10P	11P	12P	13P	14P	15P
A	1.50	3.00	4.50	6.00	7.50	9.00	10.50	12.00	13.50	15.00	16.50	18.00	19.50	21.00
B	3.60	5.10	6.60	8.10	9.60	11.10	12.60	14.10	15.60	17.10	18.60	20.10	21.60	23.10
C	2.80	4.30	5.80	7.30	8.80	10.30	11.80	13.30	14.80	16.30	17.80	19.30	20.80	22.30
D	6.00	7.50	9.00	10.50	12.00	13.50	15.00	16.50	18.00	19.50	21.00	22.50	24.00	25.50

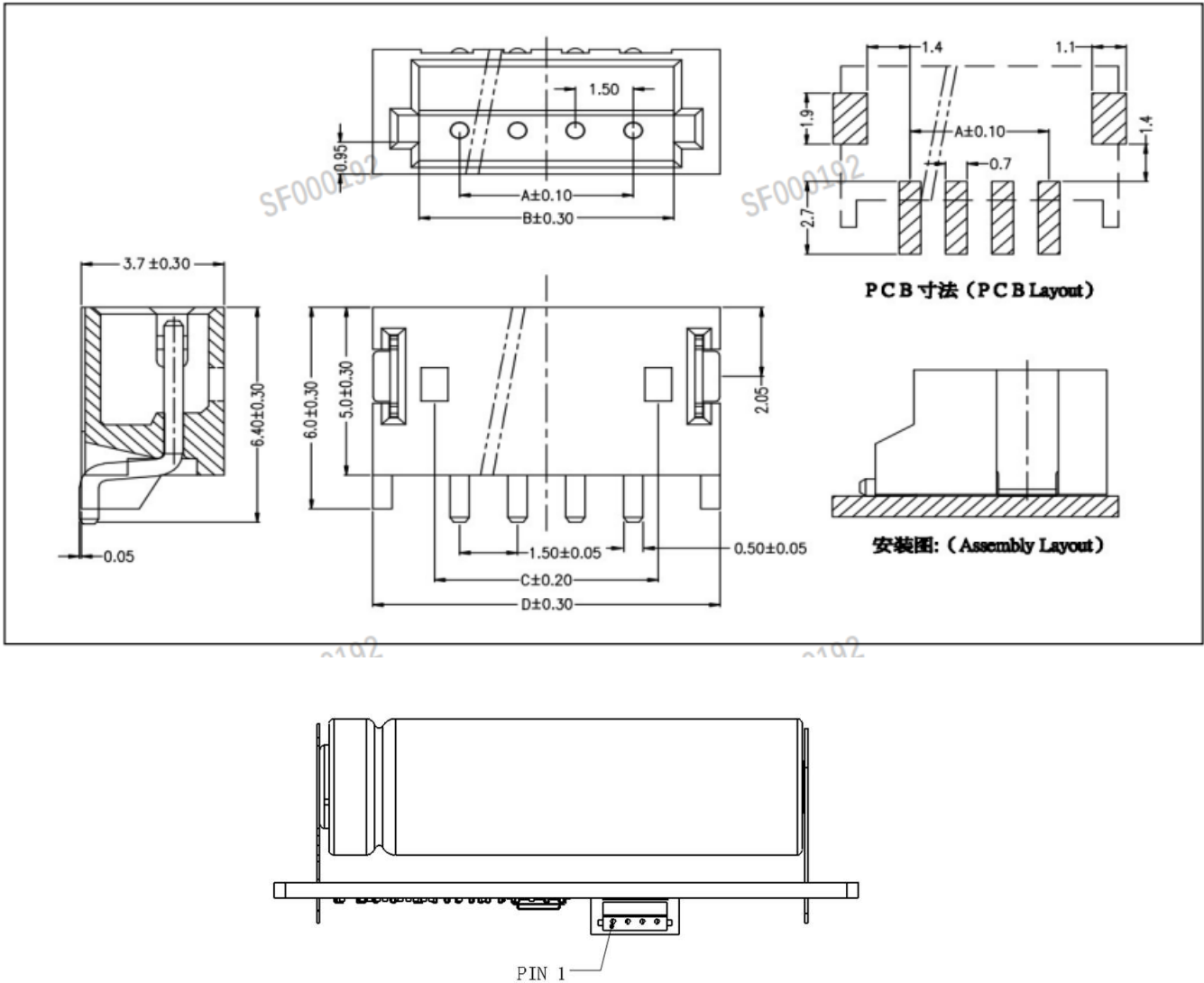


Figure 1: Interface and Connector Definitions

Table 1: Pin definition

No.	Pin	Description
1	GND	Power Input (Ground)
2	VCC	Power Input (+5V)
3	RXD	UART Receive
4	TXD	UART Send

UART Communication Protocol

1. Protocol Overview

- 1) The data in this protocol is all hexadecimal data. For example, "46" for decimal [70].
- 2) [xx] is for single-byte data (unsigned, 0-255); for double data, higher byte is in front of lower byte.
- 3) Baud rate: 9600; Data Bits: 8; Stop Bits: 1; Parity: No

2. Format of Serial Communication Protocol

Host sending format:

Start bit	Length	Command	Data 1	...	Data n	Check sum
HEAD	LEN	CMD	DATA1	...	DATA _n	CS
11H	XXH	XXH	XXH	...	XXH	XXH

Detail description on protocol format

Protocol format	Detail description
Start bit	Host sending fixed as [11H], Module response fixed as [16H]
Length	The frame byte length. LEN=data length+1(incl.CMD+DATA)
Command	Command
Data	Read or write data, length is not fixed
Check sum	The frame length and data (fault information and measurement results) are added by byte to get the lower byte of the checksum CS= 256-(HEAD+LEN+CMD+DATA)

3. Command Table of Serial Communication Protocol

No.	Function	Command	Function
1	Read CO Concentration	0x01	Read concentration of CO
2	Zero Adjustment	0x03	Adjust zero point of the sensor
3	Calibration	0x36	Calibrate concentration of CO
4	Inquiry Instrument Serial Number	0x1F	Inquiry Instrument Serial Number
5	Inquiry Firmware Version	0x1E	Inquiry Firmware Version

4. Protocol Detail Description

4.1 Read CO concentration

Send: 11 01 01 ED

Respond: 16 05 01 DF1-DF2 DF3-DF4 [CS]

Explanation:

(1) CO concentration = (DF1*256 + DF2)/10 (ppm)

(2) Temperature = (DF3*256 + DF4)/10 -50 (°C)

4.2 Zero Adjustment

Send: **11 02 03 00 [CS]**

Respond: **16 02 03 00 [CS]**

Explanation:

Send this command will adjust zero point of the sensor.

4.3 Inquiry Instrument Serial Number

Send: **11 01 1F CF**

Respond: **16 11 1F DF1~DF16 [CS]**

Explanation:

DF1~DF16 is the serial number of the instrument.

4.4 Inquiry Firmware Version

Send: **11 01 1E D0**

Respond: **16 0B 1E DF1~DF10 [CS]**

Explanation:

ASCII code of DF1~DF10 is the firmware version of the instrument.

Important reminding

The usage conditions of the ECO-5011A-01 module will vary with the specific application of different customers. It is recommended to consult our technicians before use, especially when the customer's test target gas is not in the list, our company will not assume any responsibility for any use that has not been professionally tested by our company.

Precautions

1. The power-on aging time should not be less than 30 minutes.
2. If the water in ECO-5011A-01 sensor container gets quickly frozen (usually due to mishandling), sensor characteristics may get changed irreversibly. To avoid such a risk, please keep the detecting electrode facing upwards when using ECO-5011A-01.
3. It is forbidden to plug and unplug the sensor on the module or change the electronic components on the module.
4. If in need of a wider working temperature (current range is $-20 \sim +60^{\circ}\text{C}$), please contact Cubic for more supports.

After-Sales Services and Consultancy

Cubic Sensor and Instrument Co.,Ltd.

Tel: +86 (0)27 81628827 Fax: +86 (0)27 81628821

Add: Fenghuang No.3 Road, Fenghuang Industrial Park, Eastlake Hi-tech Development Zone,
Wuhan 430205, China

Website: www.gassensor.com.cn

Email: info@gassensor.com.cn