



BFN -CMS3320

Oxygen(O₂) Monitor

User Manual

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Company Profile

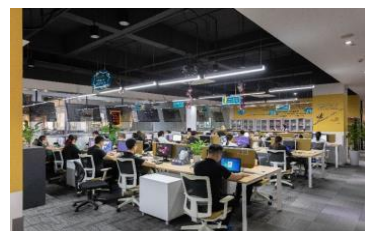
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We Have Applied For And Approved More Than 30 Invention Patents, More Than 30 Utility Model Patents, 3 PCT International Patent, More Than 10 Software Copyrights, More Than 30 Domestic Trademarks, 4 Madrid Trademarks, About 30 Products CE Certified, National Industrial Production Permit, ISO9001, ISO14001,OHSAS18001, ISO13485 System Certification, LA Certification, Domestic Second-Class Medical Device Certification, Multi-Country Medical Device Product Certification And System Certification. Participation In The Preparation Of 6 National Standards, 1 Industry Standard, 3 Group Standard.

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1. Product Introduction



1.1 Product Overview

The CMS3320 Oxygen Monitor Designed By Our Company Uses An Imported, Top-Tier Brand Electrochemical Oxygen Sensor. It Features Fast And Sensitive Response And Strong Anti-Interference Capability. Through Our Company's Unique Compensation Algorithm And Multi-Point Standard Gas Calibration, It Also Offers Long Life, High Precision, High Repeatability, And High Stability. It Is Suitable For Locations Requiring Real-Time Oxygen Concentration Monitoring, Such As Warehouses, Workshops, Chemical Plants, Greenhouse Farms, And Enclosed Living Spaces.

The Device Uses A Wide Voltage 10-30V DC Power Supply, 485 Signal Output, Standard Modbus-RTU Communication Protocol, Configurable Modbus Address, Adjustable Baud Rate, And A Communication Distance Of Up To 2000 Meters.

1.2 Features

- Uses Imported Top-Tier Brand Electrochemical Sensor, Stable And Durable.
- Measuring Range 0-30%0-30% VOL, Other Ranges Can Be Customized.
- High Measurement Accuracy, Up To $\pm 2\% \pm 2\%$ FS, Repeatability Up To 1%1%.
- 485 Communication Interface With Standard Modbus-RTU Protocol, Configurable Address And Baud Rate, Communication Distance Up To 2000 Meters.
- Optional High-Quality OLED Display For On-Site Value Reading, Clearly Visible Even At Night.
- On-Site Power Supply Uses 10-30V10-30V DC Wide Voltage, Adaptable To Various On-Site DC Power Sources.
- Product Uses Wall-Mounted Waterproof Housing, Easy To Install, High Protection Level Suitable For Harsh On-Site Environments.

1.3 Main Technical Specifications

Power Supply	10~30V DC
Output Signal	485
Power Consumption	0.12W
Temperature Measurement Range	-40C°~+80°C
Temperature Accuracy	±0.5C° (25°C)
Humidity Measurement Range	0~100%RH
Humidity Accuracy	±3%RH (60%RH, 25°C)
Operating Temperature	-20~50°C
Operating Humidity	5~95%RH, non-condensing
Pressure Range	90~110kPa
Stability	≤5% of signal value/year
Response Time	≤10s
Warm-up Time	≥5min
Zero Drift (-20~40°C)	±0.3%VOL
Repeatability	≤1%
Service Life	≥24 months
Measuring Range	0~30%VOL
Accuracy	±2%FS
Resolution	0.1%VOL

All specifications above are measured under environmental conditions: Temperature 20°C, Relative Humidity 50%RH, 1 atmospheric pressure, and the target gas concentration does not exceed the sensor's range.

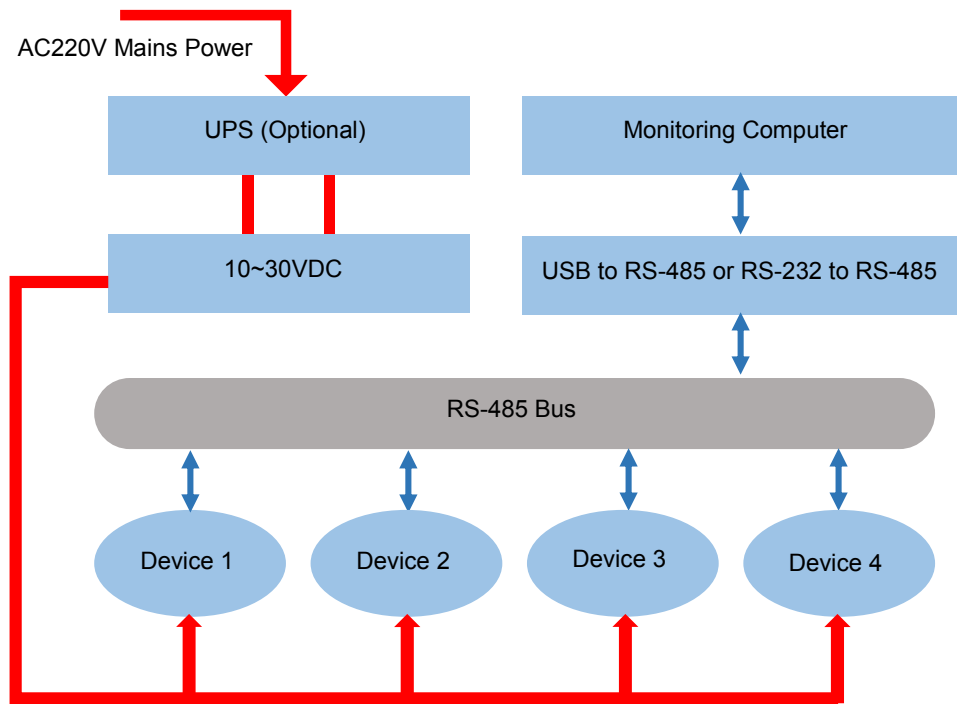
1.4 Product Selection

CMS3319 Series Product Selection Description

Model	Name
CMS3320-A	Oxygen Transmission Transducer/Sensor
CMS3320-B	Oxygen, Temperature, and Humidity 3-in-1 Transmission Transducer/Sensor
CMS3320-C	Wall-mounted Rectangular Housing
CMS3320-D	Rectangular Housing with OLED Screen
CMS3320-E	Extended Type Oxygen Monitor
CMS3320-F	Extended Type Oxygen Monitor with OLED Screen
CMS3320-G	RS485 (ModBus Protocol)
CMS3320-H	Range 0~30%VOL

Note: The 3-in-1 transducer does not come with an OLED screen; only the single gas model has the OLED screen option.

1.5 System Framework Diagram



2. Device Installation Instructions

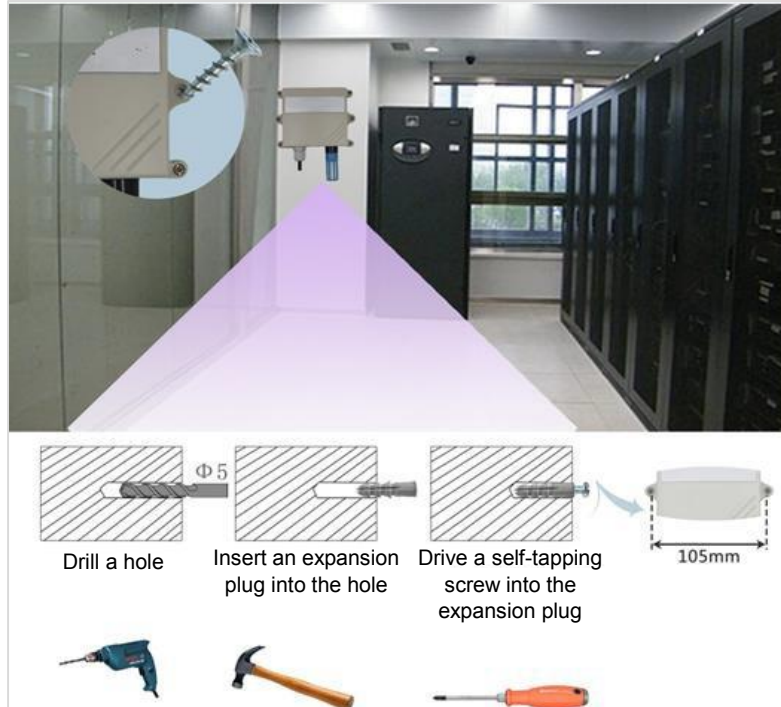
2.1 Pre-Installation Checklist

Accessory List:

No.	Item	Quantity
1	Oxygen Monitor	1 unit
2	Self-tapping Screws	2 pcs
3	Expansion Plugs	2 pcs
4	BFN Warranty Card	1 pc
5	Wiring Instructions	1 pc
6	USB to 485 Converter (Optional)	1 pc
7	Extended Probe Bracket (includes 1 set of expansion screws, included with extended model)	1 set

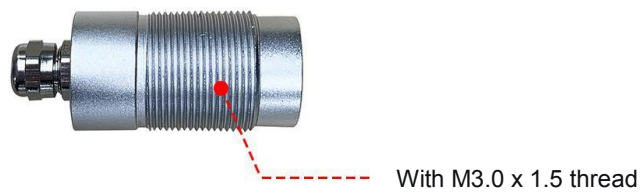
2.2 Installation Procedure Instructions

Installation steps for the device main body:

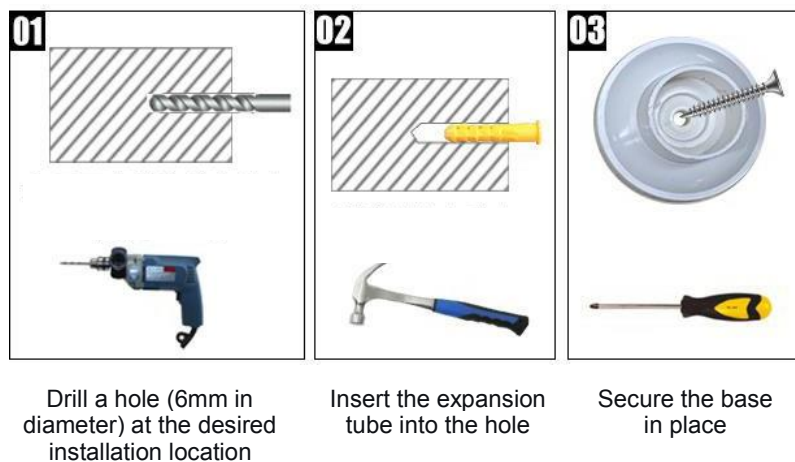


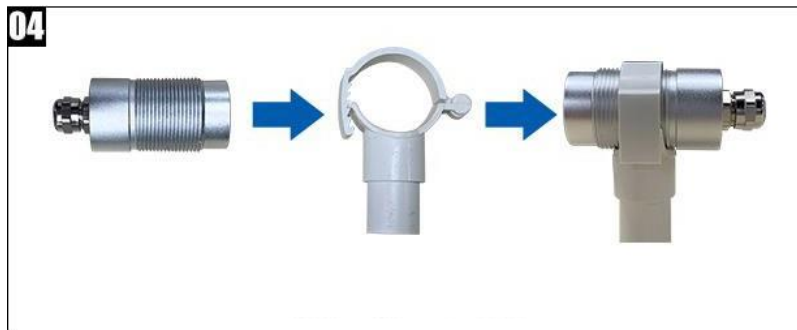
Installation steps for the extended probe:

Threaded Installation:



Bracket Installation:





Fix the probe into the bracket



Insert the bracket into the base



Installation is complete

2.3 Interface Description

Wide Voltage Power Input 10~30V DC is Acceptable. When Wiring The 485 Signal Lines, Ensure The A And B Lines Are Not Reversed. Addresses of Multiple Devices on The Same Bus Must Not Conflict.

	Wire Color	Description
Power supply	Brown	Power Positive (10~30V DC)
	Black	Power Negative
Communication	Yellow	485-A
	Blue	485-B

2.4 485 Field Wiring Instructions

When Connecting Multiple 485 Devices To The Same Bus, Specific Field Wiring Requirements Apply. Please Refer To The "485 Device Field Wiring Manual" In The Documentation Package For Details.

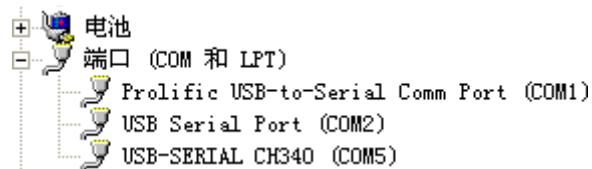
3. Configuration Software Installation and Use

3.1 Software Selection

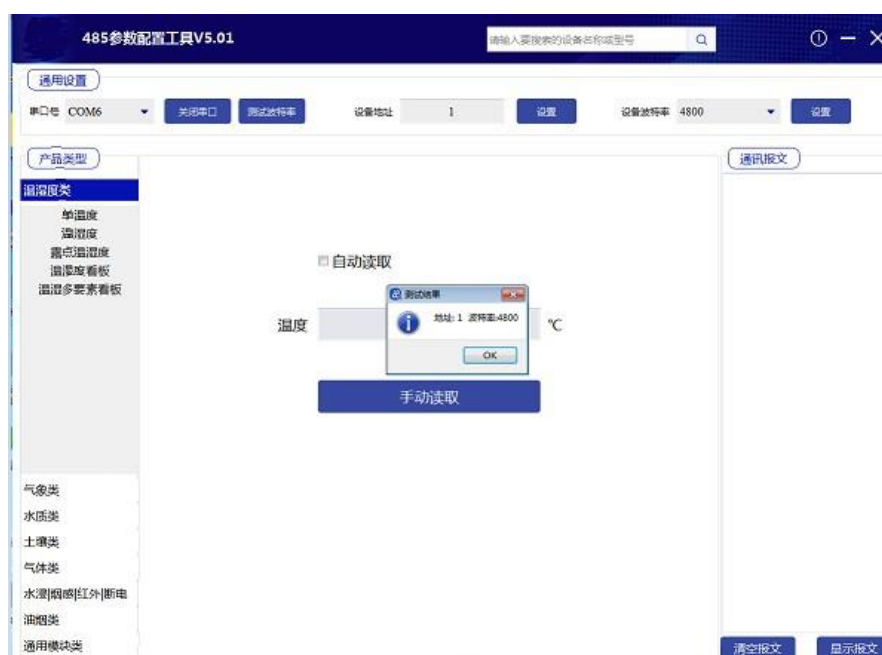
Open The Documentation Package, Navigate to "Debugging Software" --- "485 Parameter Configuration Software", And Open The 485 Parameter Configuration Tool.

3.2 Parameter Settings

1. Select The Correct COM Port (Check COM Ports Via "My Computer -> Properties -> Device Manager -> Ports"). The Image Below Lists Examples Of Driver Names For Different 485 Converters.



2. Connect Only One Device And Power It On. Click The "Test Baud Rate" Button In The Software's 485 Parameter Configuration Tool. The Software Will Detect The Device's Current Baud Rate And Address. The Default Baud Rate Is 4800bit/S, And The Default Address Is 0x01.
3. Modify The Address And Baud Rate According To Usage Needs. The Current Functional Status Of The Device Can Also Be Queried.
4. If The Test Is Unsuccessful, Please Re-Check The Device Wiring And The 485 Driver Installation.
5. Click On The Corresponding Gas To Directly View The Current Real-Time Value.
6. Note: This Software Can Only Set Eight Baud Rates: 1200bit/S, 2400bit/S, 4800bit/S, 9600bit/S, 19200bit/S, 38400bit/S, 57600bit/S, 115200bit/S.



4. Communication Protocol

4.1 Basic Communication Parameters

Coding	8-bit binary
Data Bits	8 bits
Parity Bit	None
Stop Bit	1 bit
Error Check	CRC (Cyclic Redundancy Check)
Baud Rate	1200bit/s, 2400bit/s, 4800bit/s, 9600bit/s, 19200bit/s, 38400bit/s, 57600bit/s, 115200bit/s Configurable, Factory Default is 4800bit/s

4.2 Data Frame Format Definition

Uses ModBus-RTU communication protocol. Format is as follows:

Initial Structure \geq 4 Bytes Time

Address Code =1 Byte

Function Code =1 Byte

Data Area =N Bytes

Error Check =16 Bit CRC Code

End Structure \geq 4 Bytes Time

Address Code: The Address Of The Transducer, Which Must Be Unique On The Communication Network (Factory Default 0×01).

Function Code: Instruction Function Indication Sent By The Master. This Transducer Supports Function Codes 0×03 (Read Register Data), 0×06, 0×10 (Write Register Data). The Data Area Contains The Specific Communication Data. Note That 16-Bit Data Is Sent With The High Byte First!

CRC Code: Two-Byte Check Code.

Master Inquiry Frame Structure:

Address Code	Function Code	Register Start Address	Register Length	Check Code Low	Check Code High
1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte

Slave Response Frame Structure:

Address Code	Function Code	Valid Data Byte Count	Data Area 1	Data Area 2	Data Area N	Check Code
1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes	2 bytes

4.3 Register Addresses

Single Oxygen Device

Register Address	PLC or Configuration Address	Content	Supported Function Codes	Range and Definition Description
0000 H	40001	Oxygen Concentration Value	0x03/0x04	0~300 (Value after expanding by 10 times)
0002 H	40003			

Oxygen, Temperature, and Humidity Integrated Device

Register Address	PLC or Configuration Address	Content	Supported Function Codes	Range and Definition Description
0000 H	40001	Humidity Value	0x03/0x04	0~1000 (Value after expanding by 10 times)
0001 H	40002	Temperature Value	0x03/0x04	-400~800 (Value after expanding by 10 times)
0002 H	40003	Oxygen Concentration Value	0x03/0x04	0~300 (Value after expanding by 10 times)
0032 H	40051	Temperature Calibration Value	0x03/0x04/0x06/0x10	Write after expanding by 10 times
0035 H	40054	Humidity Calibration Value	0x03/0x04/0x06/0x10	Write after expanding by 10 times
0038 H	40057	Oxygen Calibration Value	0x03/0x04/0x06/0x10	Write after expanding by 10 times
07D0 H	42001	Device Address	0x03/0x04/0x06/0x10	1~254 (Factory default 1)
07D1 H	42002	Device Baud Rate	0x03/0x04/0x06/0x10	0=2400bit/s, 1=4800bit/s, 2=9600bit/s, 3=19200bit/s, 4=38400bit/s, 5=57600bit/s, 6=115200bit/s, 7=1200bit/s

4.4 Communication Protocol Examples and Explanations

4.4.1 Read the address and baud rate of the device with address 0x01

Inquiry Frame (Example: Address 0x01, Baud Rate 4800)

Address Code	Function Code	Start Address	Data Length	Check Code Low	Check Code High
0x01	0x03	0x07 0xD0	0x00 0x02	0xC4	0x86

Response Frame

Address Code	Function Code	Valid Bytes	Baud Rate	Address	Check Code Low	Check Code High
0x01	0x03	0x04	0x00 0x01	0x00 0x01	0x6A	0x33

4.4.2 Modify Address

Inquiry Frame (Assuming modifying address to 0x02. Note: The device needs a power cycle after modifying the address)

Address Code	Function Code	Start Address	Modified Value	Check Code Low	Check Code High
0x01	0x06	0x07 0xD0	0x00 0x02	0x08	0x86

Response Frame

Address Code	Function Code	Start Address	Modified Value	Check Code Low	Check Code High
0x01	0x06	0x07 0xD0	0x00 0x02	0x08	0x86

4.4.3 Modify the baud rate of device with address 0x01

Inquiry Frame (Assuming modifying baud rate to 9600. Note: The device needs a power cycle after modifying the baud rate)

Address Code	Function Code	Start Address	Modified Value	Check Code Low	Check Code High
0x01	0x06	0x07 0xD1	0x00 0x02	0x59	0x46

Response Frame

Address Code	Function Code	Start Address	Modified Value	Check Code Low	Check Code High
0x01	0x06	0x07 0xD1	0x00 0x02	0x59	0x46

4.4.4 Read the Oxygen value from device address 0x01

Inquiry Frame (Single oxygen device can read register 00 or 02, 3-in-1 device can only read register 02)

Address Code	Function Code	Start Address	Data Length	Check Code Low	Check Code High
0x01	0x03	0x00 0x02	0x00 0x01	0x25	0xCA

Response Frame (Example: Read oxygen as 10%VOL)

Address Code	Function Code	Returned Valid Bytes	O2 Value	Check Code Low	Check Code High
0x01	0x03	0x02	0x00 0x64	0xB9	0xAF

Oxygen:0064 (hexadecimal) =100 => O2 =10%=10% VOL

4.4.5 Read the Temperature, Humidity, and Oxygen values from device address 0x01

Inquiry Frame

Address Code	Function Code	Start Address	Data Length	Check Code Low	Check Code High
0x01	0x03	0x00 0x00	0x00 0x03	0x05	0xCB

Response Frame

Address Code	Function Code	Byte Count	Humidity Value	Temperature Value	O2 Value	Checksum Low	Checksum High
0x01	0x03	0x06	0x01 0x67	0xFF 0xB5	0x00 0x64	0x35	0x75

Temperature: When below 0°C, the temperature is transmitted in two's complement format. FFB5H (hexadecimal) =-75 => Temperature =-7.5°C

Humidity: 0167H (hexadecimal) =359 => Humidity =35.9% RH

Oxygen: 0064H (hexadecimal) =100 => Oxygen =10% VOL

4.5 Conversion Relationship between Oxygen Measurement Units VOL, ppm, and mg/m³

The conversion formula is based on 25°C and 1atmosphere: $X_{ppm} = (Y_{mg/m^3}) \times (24.45) / (\text{MolecularWeight})$
or $Y_{mg/m^3} = (X_{ppm}) \times (\text{MolecularWeight}) / 24.45$

Applicable for calculating Oxygen (O2): 1%VOL=10000ppm, 1ppm=1.31mg/m³

5. Common Problems and Solutions

Device cannot connect to PLC or computer

Possible reasons:

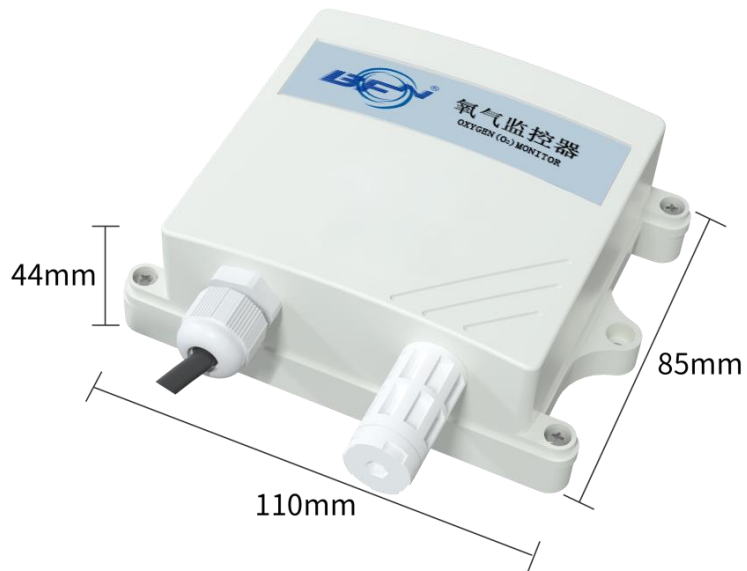
- 1) The Computer Has Multiple COM Ports, And The Incorrect One Is Selected.
- 2) Incorrect Device Address, Or Duplicate Addresses Exist (Factory Default Is All 1).
- 3) Incorrect Baud Rate, Parity, Data Bits, Or Stop Bits.
- 4) Master Polling Interval And Response Waiting Time Are Too Short; Both Should Be Set Above 200ms.
- 5) The 485 Bus Is Disconnected, Or The A And B Lines Are Reversed.
- 6) Too Many Devices Or Wiring Is Too Long. Power Should Be Supplied Locally, A 485 Repeater Added, And A 120Ω Termination Resistor Installed.
- 7) The USB-To-485 Driver Is Not Installed Or Is Damaged.
- 8) Device Is Damaged.

6. Precautions

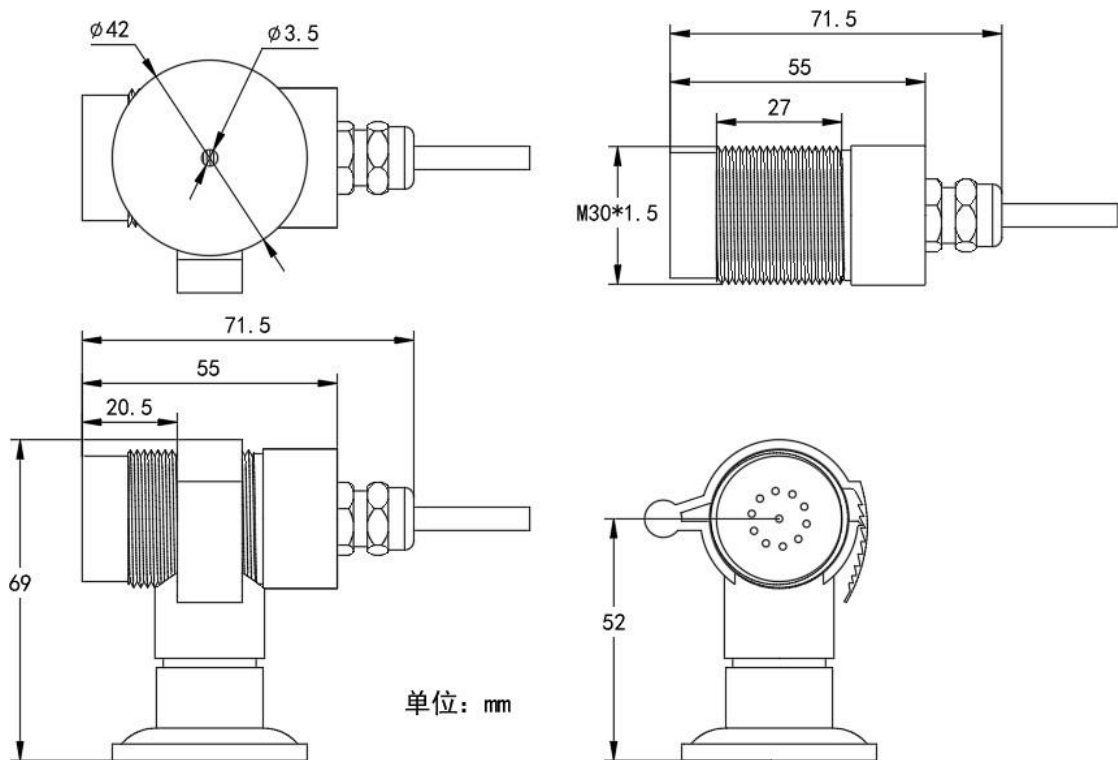
- 1) Do Not Use This Device In Systems Involving Personal Safety.
- 2) Do Not Install The Device In Environments With Strong Air Convection.
- 3) The Device Should Avoid Contact With Organic Solvents (Including Silicone And Other Adhesives), Paints, Chemicals, Oils, And High-Concentration Gases.
- 4) The Device Should Not Be Used For Extended Periods In Environments Containing Corrosive Gases, As Corrosive Gases Can Damage The Sensor.
- 5) Do Not Leave The Device In High Concentrations Of Organic Gases For Long Periods, As Prolonged Exposure Can Cause The Sensor's Zero Point To Drift And Recover Slowly.
- 6) Prohibit Long-Term Storage And Use In High Concentrations Of Alkaline Gases.
- 7) Although This Product Has High Reliability, We Recommend Checking The Device's Response To The Target Gas Before Use To Ensure On-Site Performance.
- 8) When Testing The Device's Response To The Target Gas, The Recommended Method Is To Use A Standard Gas Corresponding To The Target Gas At A Concentration Not Exceeding The Device's Range. Our Company Is Not Responsible For Abnormal Measurement Values Resulting From Testing Using Non-Recommended Methods.

7. Appendix: Housing Dimensions

Overall Dimensions: 110×85×44 mm



Extended Probe Dimensions:



HyORB