ATO-PRN12 Digital display Pirani vacuum gauge
Operation Manual

Integrated Function Vacuum Gauge

- 5-digit LED digital display
- Press the button to set all parameters
- Dual control point setting switch
- Voltage type analog output
- RS485 communication Modbus -RTU, Encoding discs with up to 16 addresses
- Wireless communication 100m super long distance

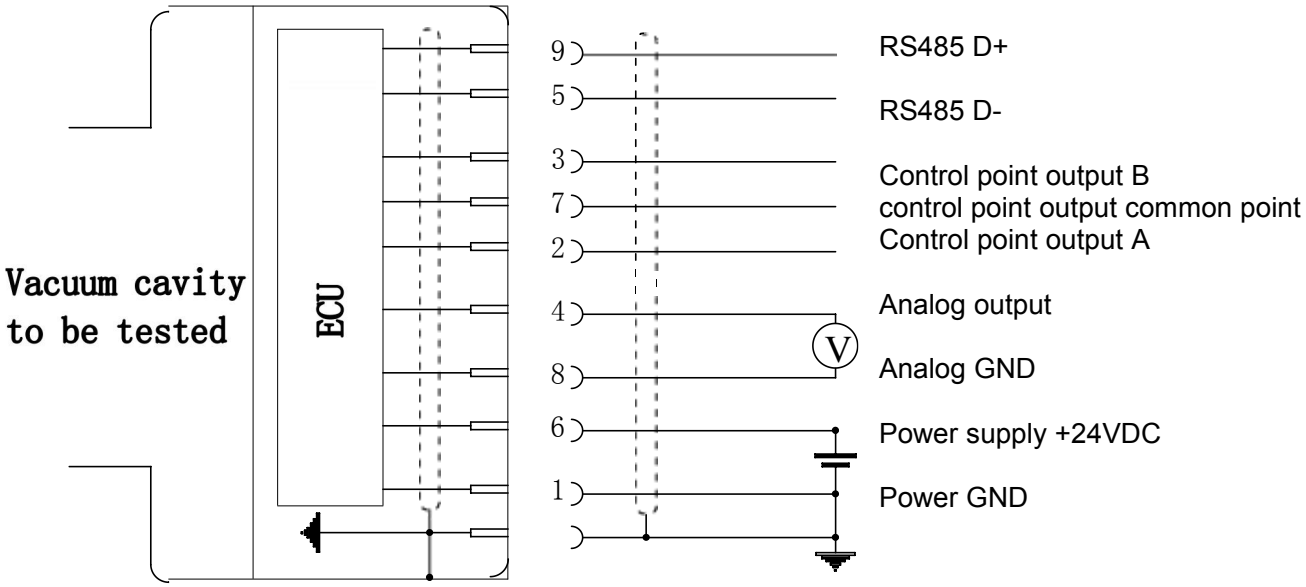
1. Parameters Table

Parameters	numerical value
Measuring range(Air, N2)	1.0×10^{-1} ~1.0×10+5 Pa
Accuracy	1.0×10^{-1} ~1.0×10+4 Pa : ±15% 1.0×10+4 ~1.0×10+5 Pa : ±50%
Repeatability	1.0×10^{-1} ~1.0×10+3 Pa : ±2% 1.0×10+3 ~1.0×10+5 Pa : ±5%
Pressure (absolute pressure)	1.5×10+5 Pa
Reaction time	100 ms
Probe baking temperature	Up to 150° C (up to 250° C for metal type vacuum flanges)
Ambient temperature (operating temperature)	0° C ~ +45° C
Ambient temperature (storage temperature)	-40° C ~ +75° C
Ambient Humidity (Working Humidity)	5 ... 85 %,no condensation
Signal output	5-digit LED display, unit Pa, Torr, mBar for customers to choose
	RS485 (non-isolated) serial port output, baud rate 9600bps
	USB wireless transmitter WFTC-001 communicates with computer
	Displayed on vacuum display unit WGC150
	Analog output +2.5V~+8.5V, minimum impedance 10Ω
Powered by	+5VDC to +24VDC/0.5A, via DBSub9-wire plug
Maximum power consumption	Maximum 2.0W
Degree of protection	IP40, IEC529
Vacuum system connection	Default: DN 16 ISO-KF; others need to be customized

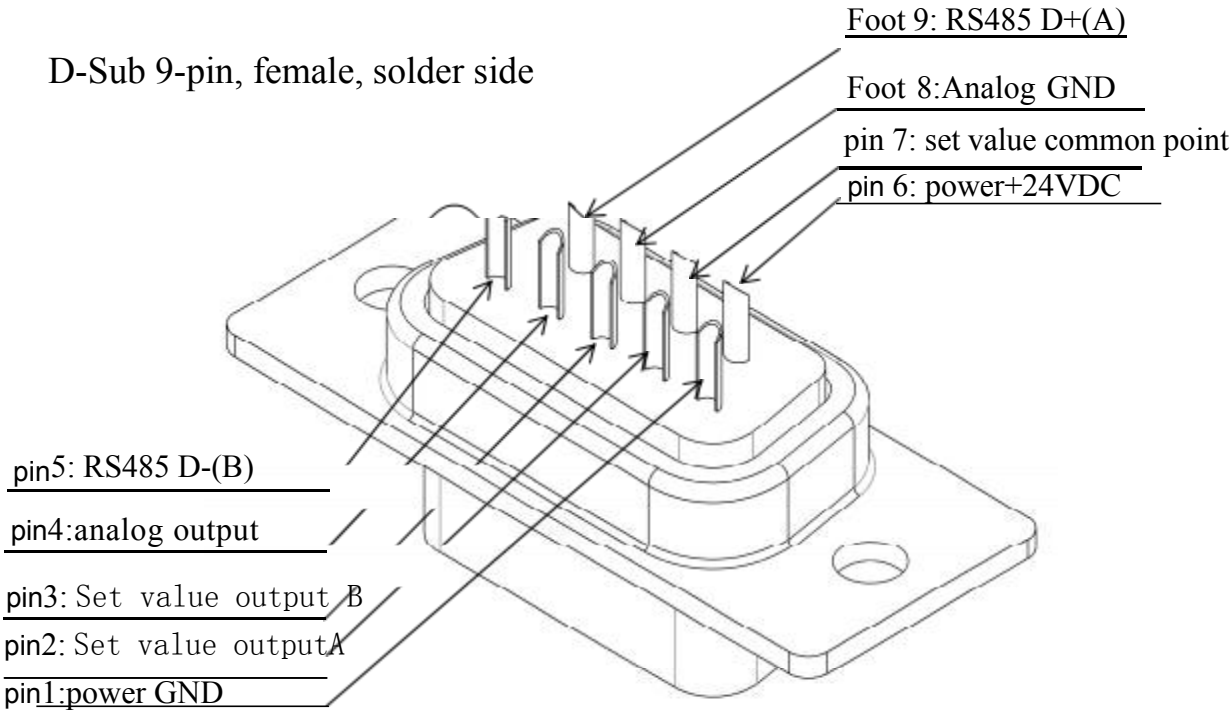
Weight	300g (Standard KF16 flange)
Size	105H X 50W X 32D (Includes KF16 flange)
Materials in contact with vacuum	SS304, SS316L, Kovar 4J50, Filament, Feedthrough glass

Note. We reserve the right to modify this document without prior notice!

2. DBSub9 Pin wire connection



D-Sub 9-pin, female, solder side



Caution

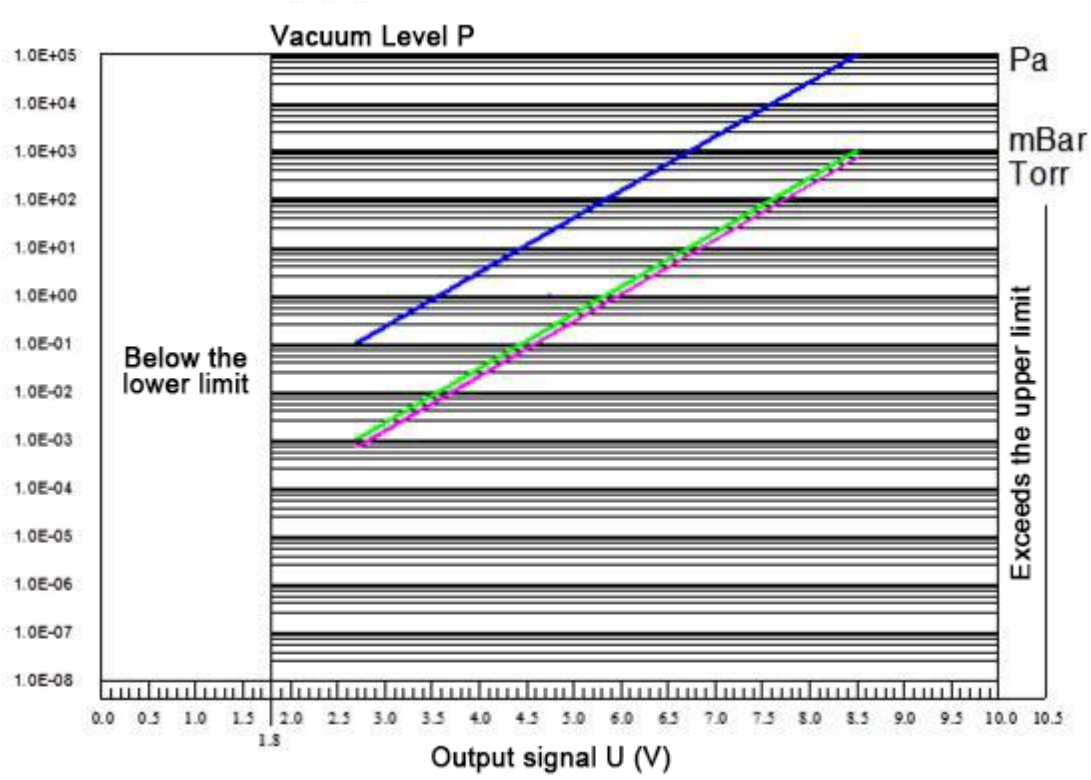
Note the difference in D-Sub 9-pin connectors: male, female, solder side, male side.

3. Analog signal output

Analog signal output

Pin 4/pin 8 of D-Sub 9 connector provides analog voltage value of real-time vacuum degree.

Measurement signal range: +2.5V ~ +8.5VDC, 2.5mV resolution.



$$P=10^{(U-C)} \quad \Longleftrightarrow \quad U=C+\lg P$$

In: P : vacuum degree
U : Voltage (V)
C : Constant (related to units)

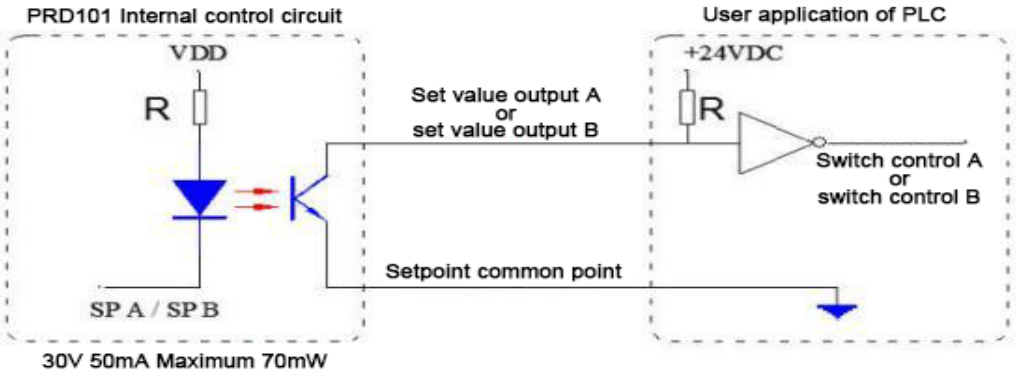
U	P	C
(V)	Pa	3.5
(V)	mBar	5.5
(V)	Torr	5.625

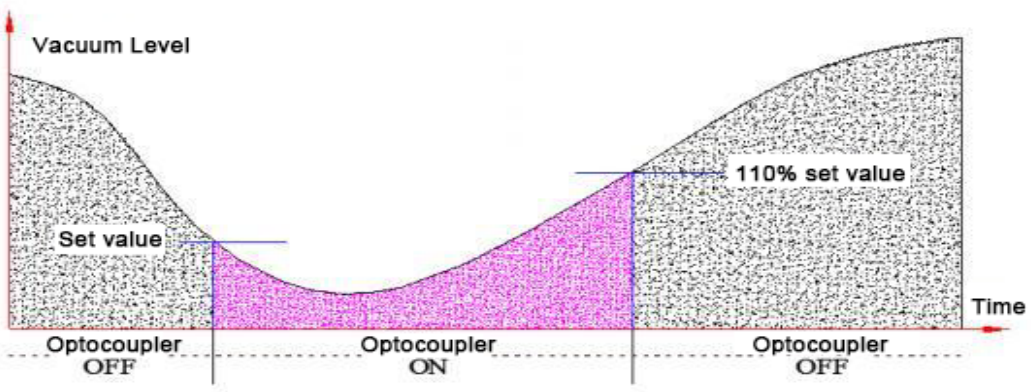
4. Control switch setting

ATO-PRN12 has two independently configurable switching switches, which can be set to control the switching point with the buttons on the face, or can be set through RS485.

The limit value of the toggle switch is 1.0E-1Pa～9.9E+4Pa.

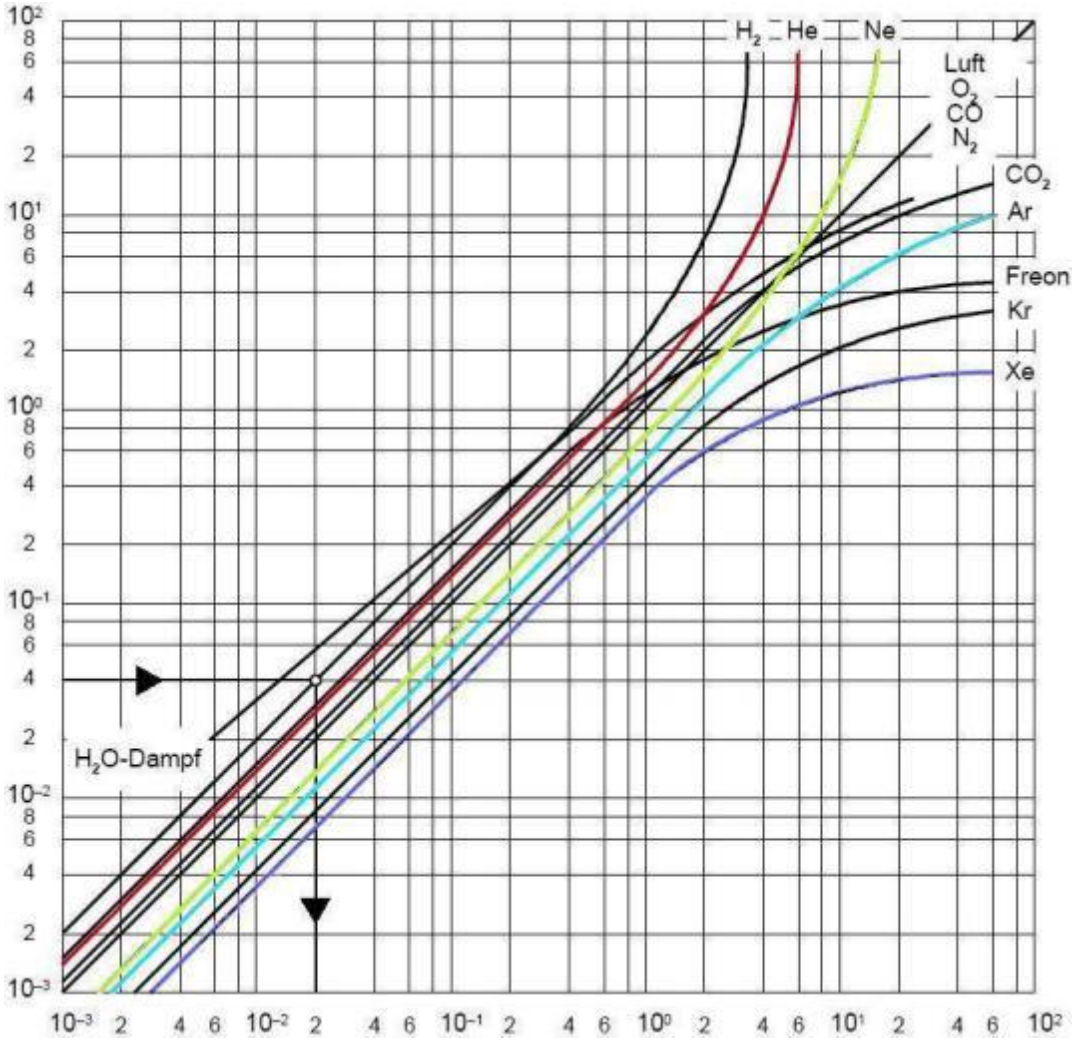
The switch setting value is defined as the state where the optocoupler is switched to on, the output is "ON" when the vacuum pressure is lower than the set value, and the signal output is "OFF" when the vacuum pressure rises to 110% of the set value.





5. Differences in different gas components

For Pirani gauges, the result of the vacuum measurement is related to the gas composition, and all factory units are calibrated with dry air/nitrogen.



6. key operation

Programming button

ATO-PRN12 has 3 buttons, operating these 3 buttons can perform parameter setting and calibration.

- **Atmospheric calibration**

Press the FN key until the LED displays ATP and flashes, then press the forward button ▶, ATO-PRN12 will complete the atmospheric calibration within 3 seconds. The buttons can now be released.

After calibration, the LED displays 1.0 E +5 (Pa), and the analog output is 8.5V.

Before calibration, make sure the vacuum chamber is filled with dry air or N2 status.

- **High Vacuum (Zero) Calibration**

When the pressure is lower than 5.0E-3Pa, press the FN key until the LED displays HUC and flashes, then press the forward button▶ , ATO-PRN12 will complete the high vacuum calibration within 3 seconds. The buttons can now be released. After calibration, the LED displays 1.0 E - 1 (Pa) and the analog output is 2.5V.

- **Set "Setpoint A"**

Press the FN key until the LED displays "one" and flashes, then press ▶ to select the content you want to modify, ▼ press to select the value to be modified, and the set value will be automatically stored and kept in the meter after releasing the key.

- **Set "Setpoint B"**

Press the FN key until the LED displays "2" and flashes, then press ▶ to select the content you want to modify, press ▼ to select the value to be modified, and the set value will be automatically stored and kept in the indicator after releasing the key.

- **Vacuum degree unit selection**

Press the FN key until the LED displays U and flashes, then press ▼, the LED cycle displays Pa "P", Torr "T", and millibar "b", select the unit you want, and after releasing the key, the indicator will display the selected The unit.

- **Address dial key**

When multiple ATO-PRN12 are networked and communicate via RS485 Modbus-RTU or wirelessly, the node address of the machine can be set through the 16-bit address dial switch on the instrument panel. The center arrow points to the address of the machine, and up to 16 hexadecimal 0~F can be connected to the network at the same time.

If you need to assign more than 16 addresses, please contact ATO. to assist you in realizing multi-address settings through software operation.

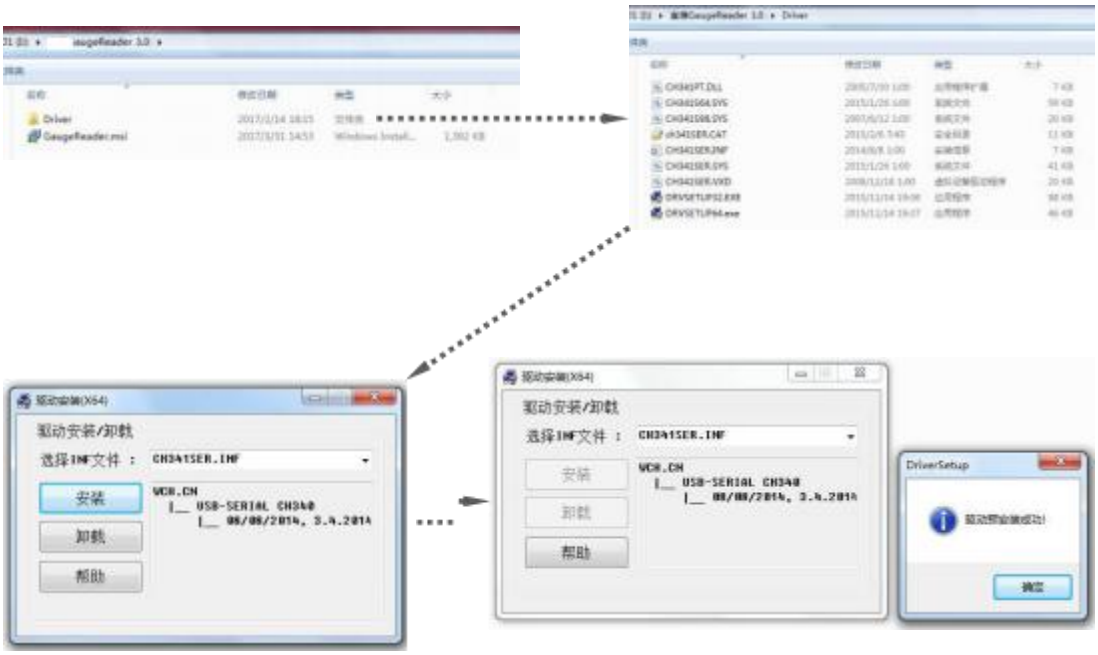
7. ATO-PRN12 USE

7.1 The required power supply of ATO-PRN12 can be directly powered by computer USB interface and communicate directly with the computer. the Install Gauge Reader 3.0 application software on ordinary Win XP, Win7, Win8, Win10, the computer can communicate with ATO-PRN12 in real time.

ATO-PRN12 vacuum gauge **Ordinary desktop or laptop**

7.1.1 USB/RS485 converter driver installation

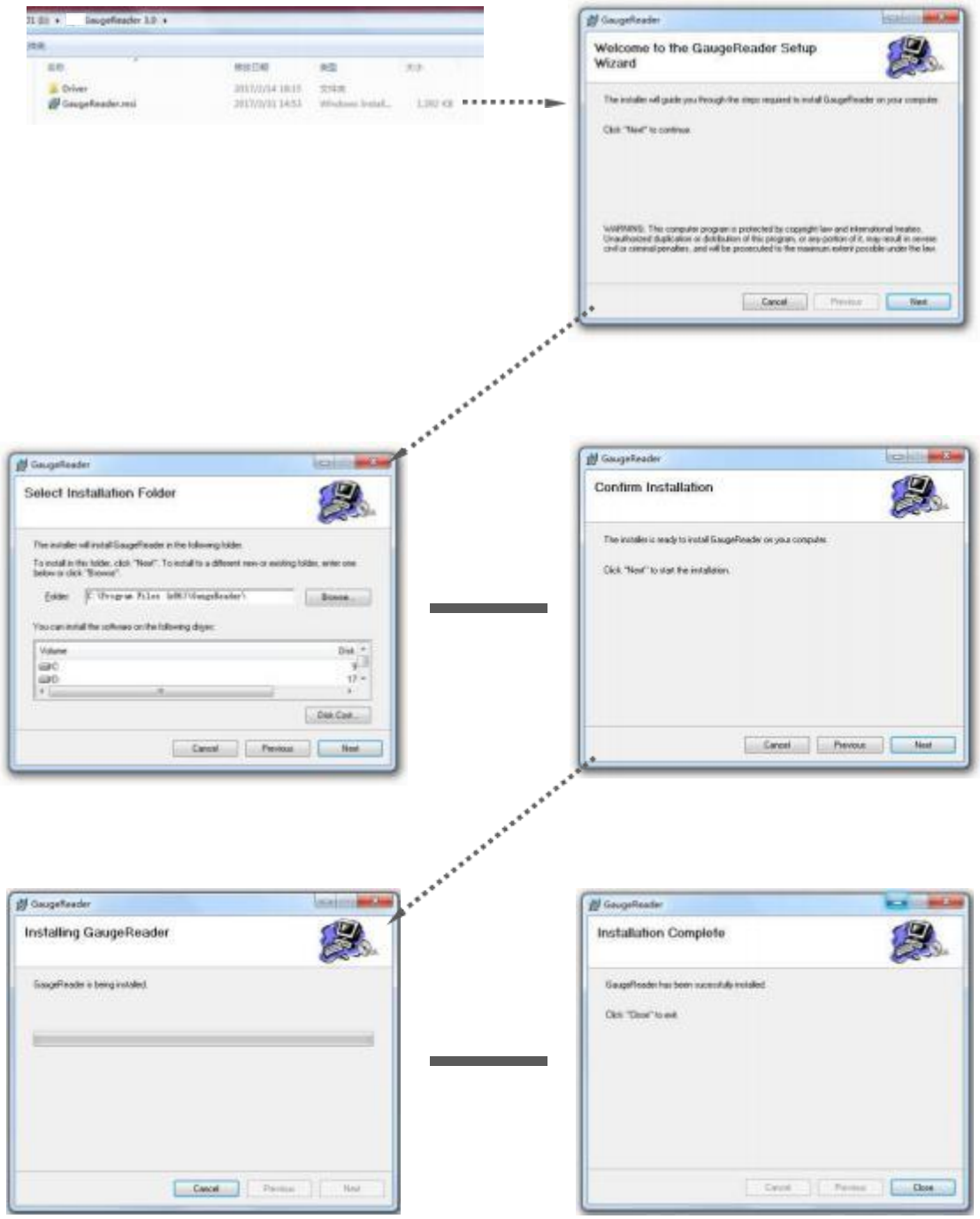
Open the provided software package, select the corresponding driver software according to the number of bits to install the computer operating system and click Install.



After the installation is complete, click OK.

Set the serial port in the computer device manager:
Baud rate: 9600; start bit: 1; data bit: 8; stop bit: 1; parity bit: none

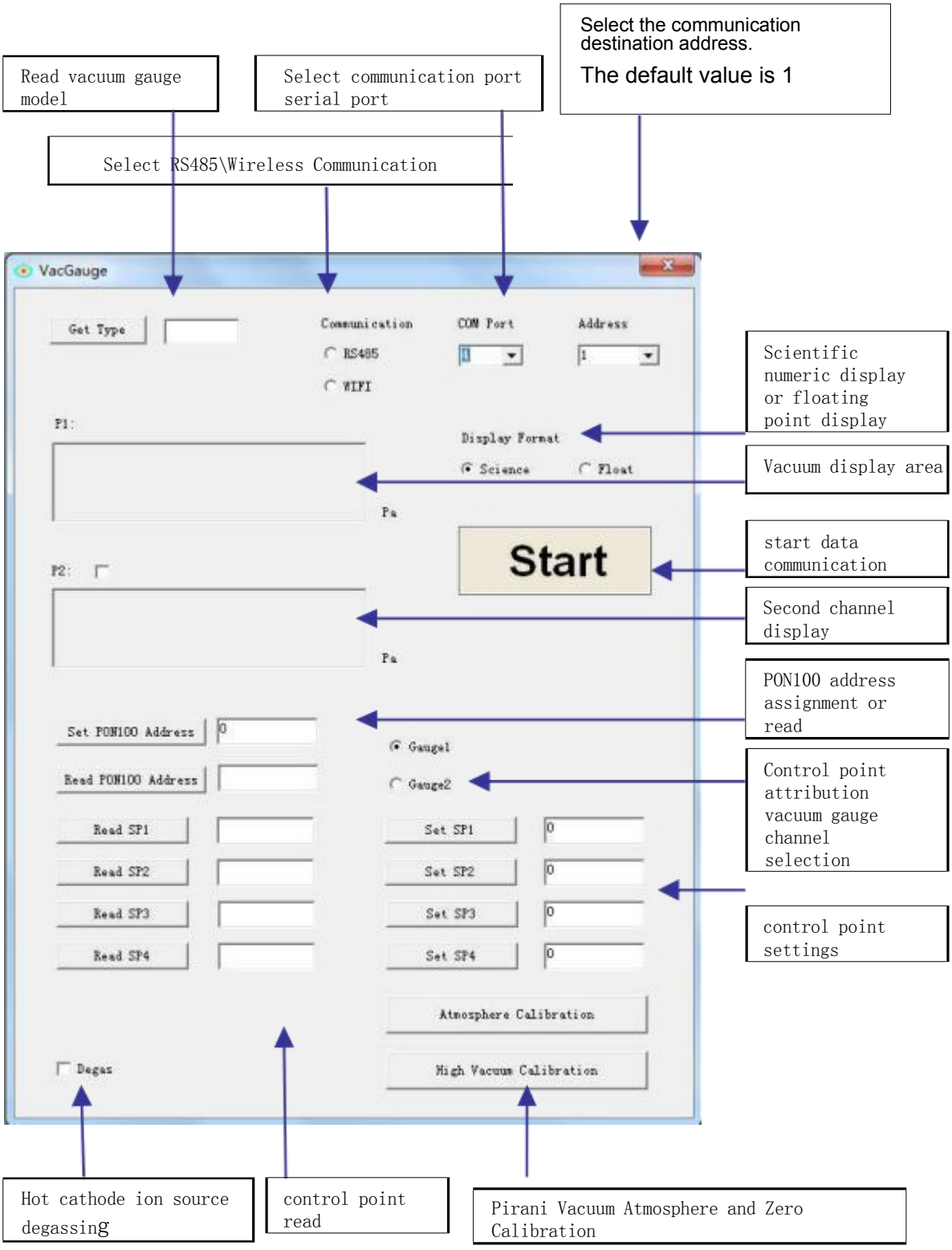
7.1.2 Application software GaugeReader3.0 installation



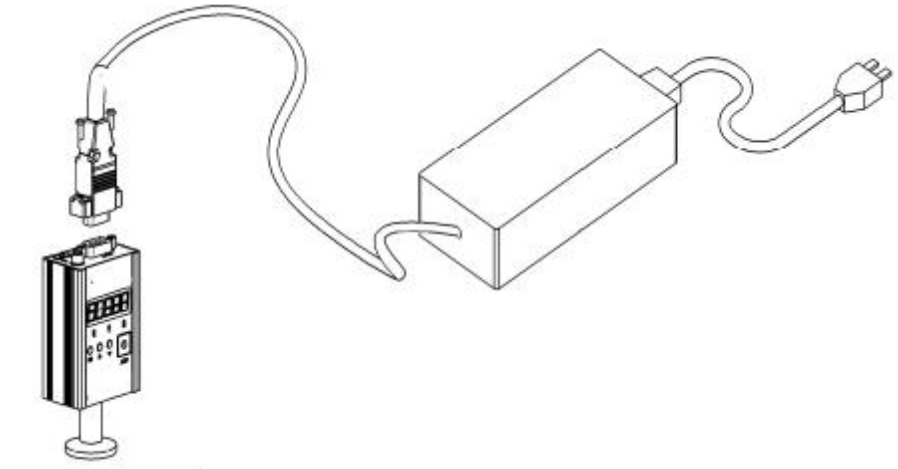
After the installation is complete, an executable file will be generated in the selected file directory: VacGauge.exe

7.1.3 Application software GaugeReader3.0 use

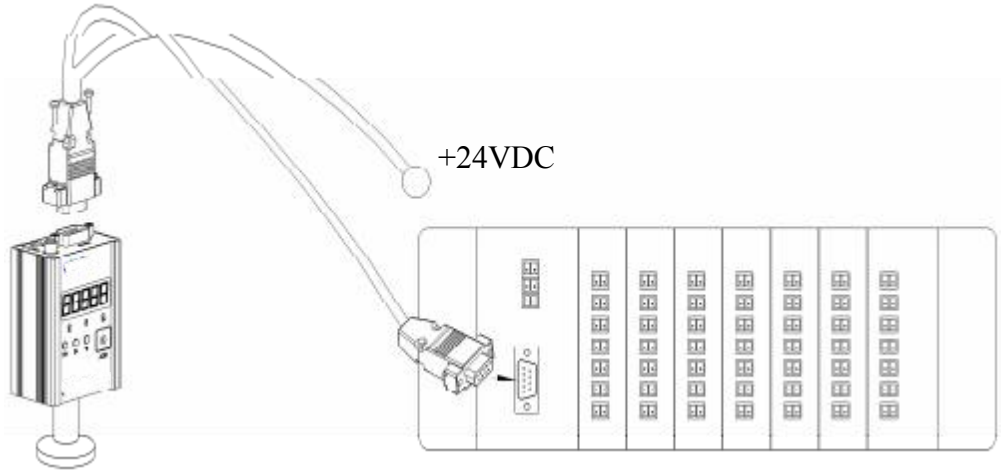
Click "VacGauge.exe" to generate the working interface

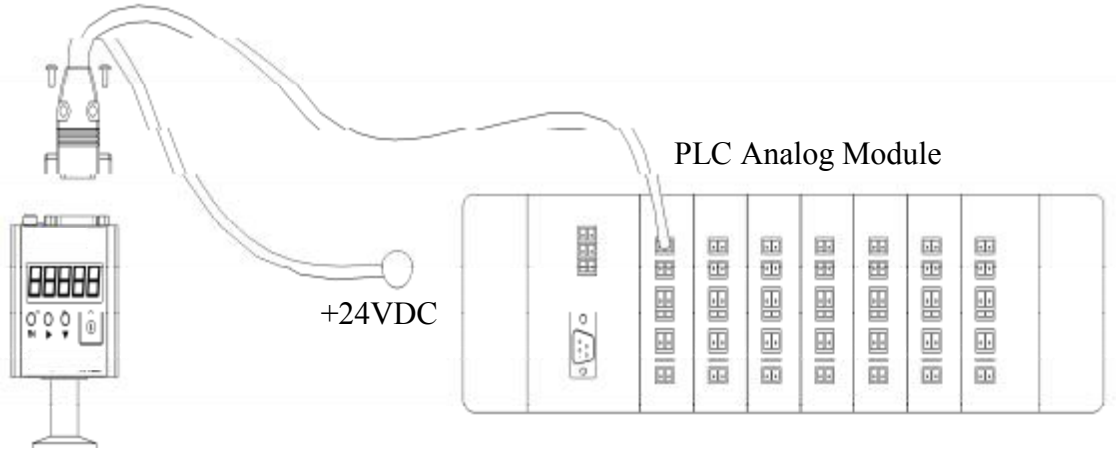


7.2 With +24VDC power adapter, ATO-PRN12 is used as a vacuum gauge with independent display



7.3 PLC communicates with ATO-PRN12 through Modbus-RTU 485, or collects ATO-PRN12 analog voltage



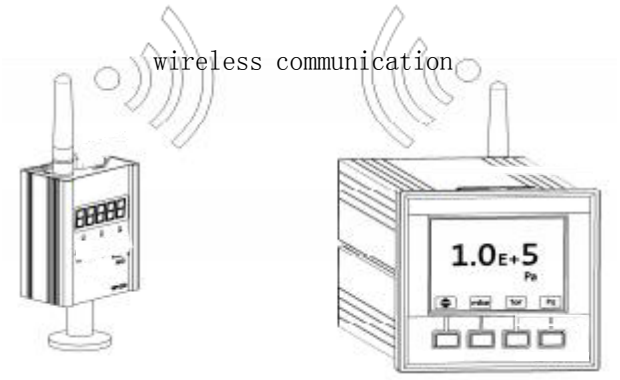


7.4 wireless communication mode

7.4.1 Direct communication between ATO-PRN12 and WGC150

Note: The maximum communication distance in the open air is 100 meters. If controller you have special application requirements, please contact ATO.

- Ensure that the ATO-PRN12 panel address is the same as the WGC150 target address.
- Set the DIP switch on the top of ATO-PRN12 to WiFi mode
- Set WGC 150 communication mode to WiFi model
- WGC150 and ATO-PRN12 implement wireless communication and real-time synchronous display and monitoring



- Insert WFTC-001 into the computer, install the serial port driver software and GaugeReader3.0 application software according to the previous instructions
- ATO-PRN12 panel address is consistent with GaugeReader3.0

interface address setting

- Select WIF and serial number
- Press START to start wireless sampling and real-time monitoring

8. Vacuum gauge MODBUS RTU communication protocol

Communication settings:
Baud rate: 9600
Start bit: 1
Data bits: 8
Stop bits: 1
Check digit: none

Instruction format:

Read command:

- The upper computer sends the vacuum gauge command:

Address	command	Register high address	Register low address	Data word length (upper 8 bits)	Data word length (lower 8 bits)	CRC check (lower 8 bits)	CRC check (upper 8 bits)
0-99	03	00	XX	00	XX	XX	XX

- Vacuum gauge return command:

Address	command	Data byte length(upper 8 bits)	Data byte length(lower 8 bits)	Date	CRC check (lower 8 bits)	CRC check (upper 8 bits)
0-99	03	00	XX	XX bytes	XX	XX

Write command

- The upper computer sends a vacuum gauge instruction:

Address	command	Register high address	Register low address	Data word length (upper 8 bits)	Data word length (lower 8 bits)	Data bytes	Data highest byte
0-99	16	00	XX	00	02	4	Bit31-24

middle byte of data	middle byte of data	middle byte of data	CRC check (lower 8 bits)	CRC check (upper 8 bits)
Bit23-16	Bit15-8	Bit7-0	XX	XX

- Vacuum gauge return command:

Address	command	Register high address	Register low address	Data word length (upper 8 bits)	Data word length (lower 8 bits)	CRC check (lower 8 bits)	CRC check (upper 8 bits)
0-99	16	00	XX	00	02	XX	XX

Register address table:

Register address (hexadecimal)	Data byte length	Storage content
01	2	Vacuum data in scientific notation format for regulation 1
03	2	Vacuum data in scientific notation format for regulation 2
11	2	Vacuum level data in floating point format for regulation 1
13	2	Vacuum level data in floating point format for regulation 2
21	2	Control switch 1 setting vacuum degree floating point data
23	2	Control switch 2 setting vacuum degree floating point data
25	2	Control switch 3 setting vacuum degree floating point data
27	2	Control switch 4 setting vacuum degree floating point data
29	2	Control switch 5 setting vacuum degree floating point data
2B	2	Control switch 6 setting vacuum degree floating point data
31	1	Control switch 1 corresponds to regulation, 1: regulation1; 2: regulation 2
32	1	Control switch 2 corresponds to regulation, 1: regulation 1; 2: regulation 2
33	1	Control switch 3 corresponds to regulation, 1: regulation1; 2: regulation2
34	1	Control switch 4 corresponds to regulation, 1: regulation 1; 2: regulation 2
35	1	Control switch 5 corresponds to regulation, 1: regulation 1; 2: regulation 2
36	1	Control switch 6 corresponds to regulation, 1: regulation 1; 2: regulation 2
40	1	Perform calibration 1: regulation1Atmospheric pressure calibration 2: regulation1Zero calibration 4: regulation2Atmospheric pressure calibration 8: regulation2Zero calibration

Data display method:

Scientific notation format:

For example, the data displayed by the vacuum gauge is 1.2E+3, and the ASCII code of the corresponding data is stored in the register, namely 0x31, 0x32, 0x2b, 0x33.

For example, the data displayed by the vacuum gauge is 1.0E-1, and the data stored in the registers are 0x31, 0x30, 0x2d, 0x31.

Floating point format:

What is stored in the register is a 32-bit floating-point number.

Vacuum gauge address setting:

Set the local address of the vacuum gauge through the GaugeReader3.0 application software interface function, and the address is set to 01 when leaving the factory.

Notice:

This agreement is a general agreement for vacuum gauges and controllers. The specific instruments may not include some of the electrical functions. Please refer to the detailed indicators and usage design of the used instruments during actual programming.

9. Probe Replacement

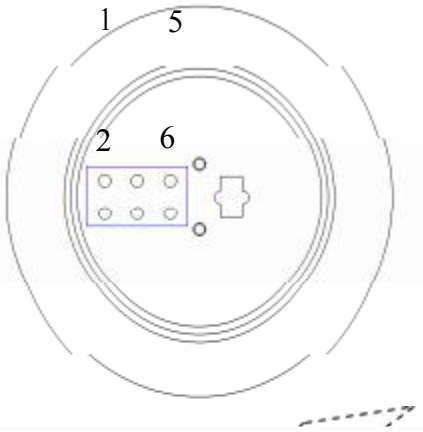
The probe of ATO-PRN12 needs to be replaced when one of the following situations occurs: PG-12

- When ATO-PRN12 shows 1.0E-1Pa in the atmospheric state, it indicates that the filament may have been broken.
- When the atmospheric calibration operation is carried out in the atmospheric state, the ATO-PRN12 can only display below 5.0E+4Pa, but cannot reach the display of 1.0E+5Pa, indicating that the filament may be seriously polluted.
- When the vacuum pressure is less than 5.0E-3Pa for zero calibration operation, ATO-PRN12 cannot reach 1.0E-1Pa display, indicating that the filament may be seriously polluted.

Follow these steps to determine if the probe must be replaced:

1)Loosen the two screws on the lower part of the ATO-PRN12 counterclockwise until the probe can be removed.

2)Use a multimeter to measure the resistance between the pins. One of the following conditions indicates that the probe must be replaced.

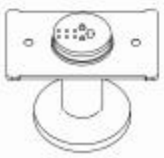


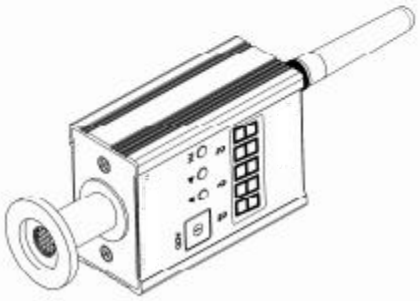
Pin2-Shell: >20MΩ,if less than10 MΩ

Pin6-Shell: >20MΩ,if less than10 MΩ

Pin2-Pin6: 75~85 Ω,if greater than 100 Ω

Pin1-Pin5: 10K@RT,if more than10KΩ

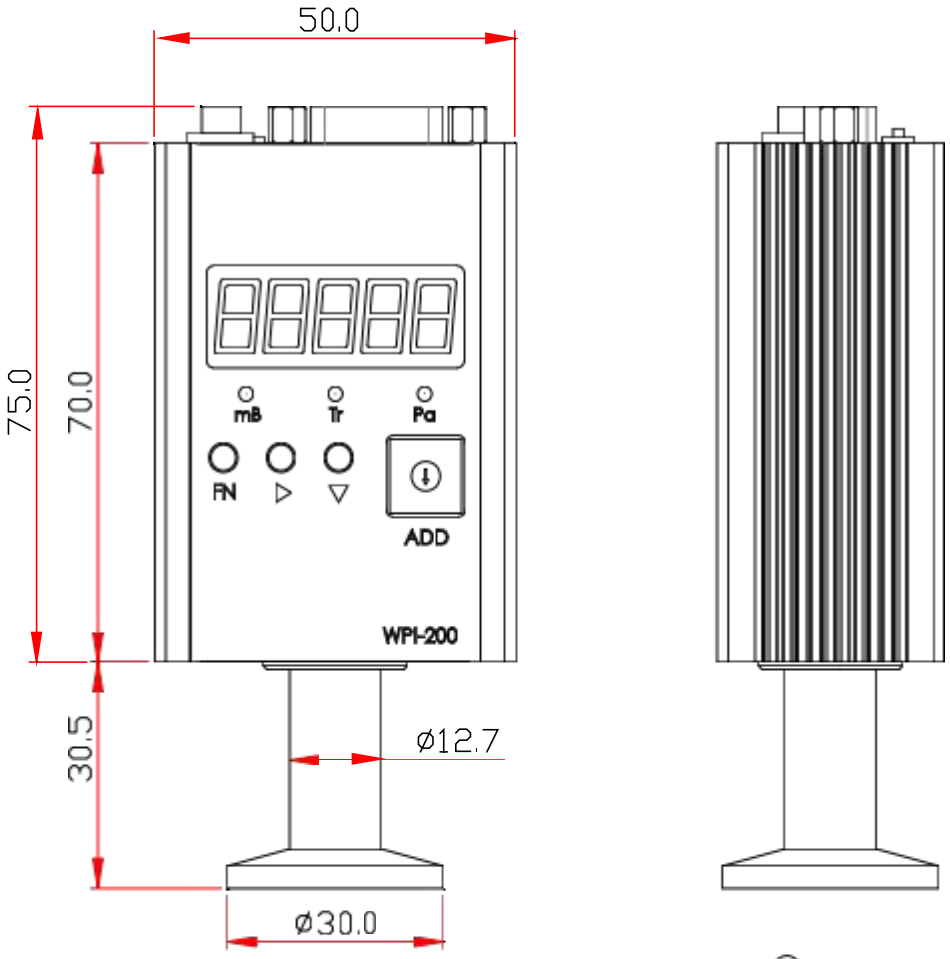




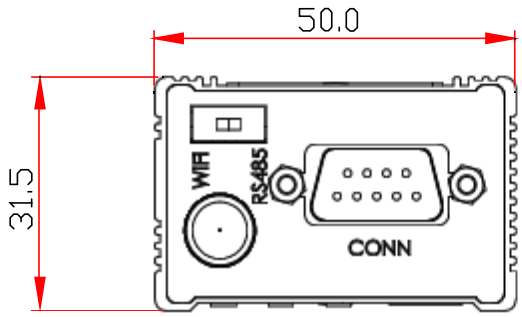
After removing the old probe, insert the new PG-12 probe back into the socket in the shell according to the original direction. The direction of the socket is self-adaptive and unique. Screw the lower two screws in place and tighten them.

Note: When the power is turned on for the first time after replacing the new probe, the atmospheric pressure calibration must be performed, and then the zero point calibration under high vacuum state must be performed. The accuracy of the measurement can only be guaranteed if these two calibrations are carried out successively.

10. Detailed size



KF16 Flange
(Other interfaces are optional)



DB9 electrical interface

Note: All dimensions are in mm; the height of the antenna is 50.0mm, if the wireless communication function is not selected,Capability does not include antenna size.