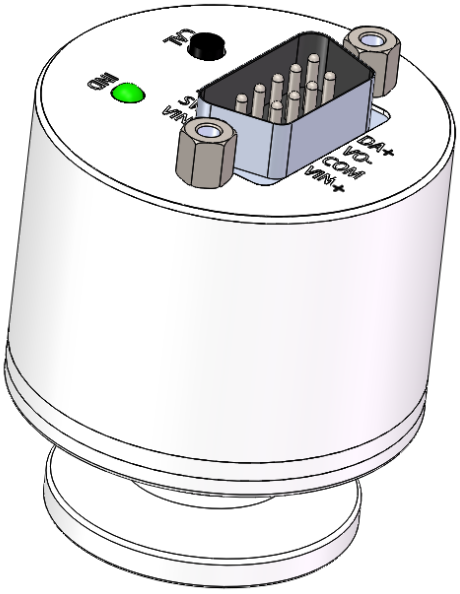
宜准 INSTRUE



Smart one push calibration
Three control setpoint relays
Support analog voltage and RS485 output
Better stability due to built in temperature compensation
Stainless steel metal shell, strong anti-interference ability
Full range high precision, insensitive to gas type above 2KPa

PNP102 Piezo and Pirani Combined Vacuum Gauge

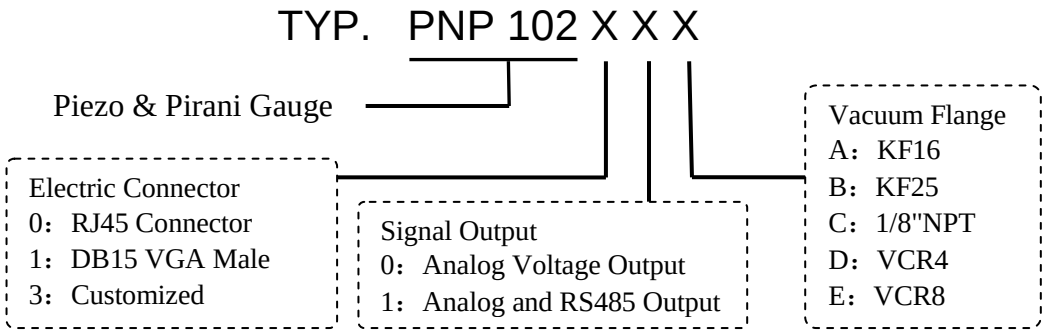
Operation Manual

INSTRUE, Makes Vacuum Measurement *Easier.*

PNP102 is composed of differential pressure MEMS piezoelectric diaphragm sensor and Pirani sensor. The two sensors realize seamless transition in measurement. It has integrated electronic control circuit, RS485 digital communication, analog voltage output and three setpoint relays as process control.

For continuous vacuum process equipment vacuum system, PNP102 not only realizes the pressure measurement of atmospheric pressure standard, high precision vacuum breaking, fast reaction and high repetition, but also has a wide range from atmospheric pressure to 0.1pa. It is an ideal vacuum lock and wide range vacuum pressure monitoring and control sensor.

Pnp102 is widely used in vacuum oven, photovoltaic electronics, semiconductor technology, vacuum coating, chemical reactor, food packaging, medical devices and other industries.



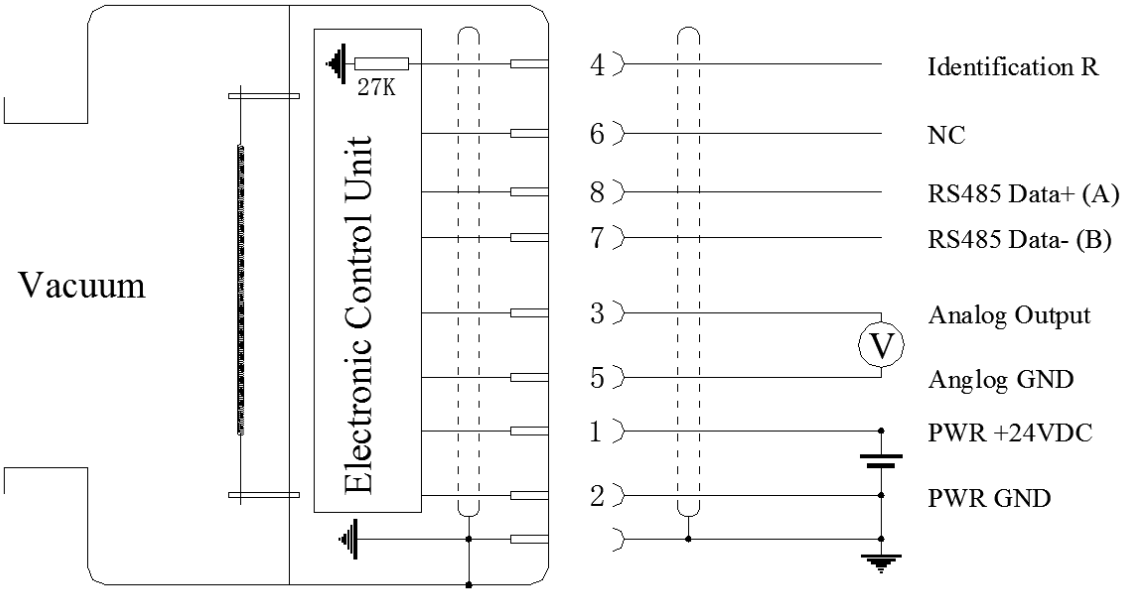
1. Specifications

Parameters	Technical Data
Measurement Range	5.0×10^{-2} ~ $1.5\times10^{+5}$ Pa
Accuracy	$3.0\times10^{+3}$ ~ $1.5\times10^{+5}$ Pa： ±2.5% of reading（Piezo）
	$1.0\times10^{+0}$ ~ $3.0\times10^{+3}$ Pa： ±15% of reading（Pirani）
	5.0×10^{-2} ~ $1.0\times10^{+0}$ Pa： ±20% of reading（Pirani）
Repeatability	±2 % of full range
Pressure withstand	$2.0\times10^{+5}$ Pa
Response Time	RS485 communication：100 ms； Analog Voltage Output：50ms
Working Environment	Temp. 0 ºC ~ +50 ºC；humidity 5 ... 85 % （No condensation）
Signal Output	RS485 Modbus-RTU，baud rate 9600 bps
	Analog Output: 0.0V ~ +10.3VDC, Min. impedance:10KΩ
	Setpoint control：Solid state relay，60VDC 500mA max load
Power Supply	+16VDC ~ +32VDC/0.5A, max. power consumption 1.0W
Vacuum flange	Standard: DN 16 ISO-KF; others optional
Weight and Size	135g，49mmH*35mmD
Materials on Vacuum	SS304，tungsten ，nickel，aluminum, fluororubber

Note : Due to R & D and new product launch, INSTRUE reserves the right to modify this document. Please keep in touch with the original factory!

2. Pin Assignment

2.1 PNP10201A



FCC-68 Connector

Pin1: Power +24VDC

Pin2: Power GND

Pin3: Measurement Signal

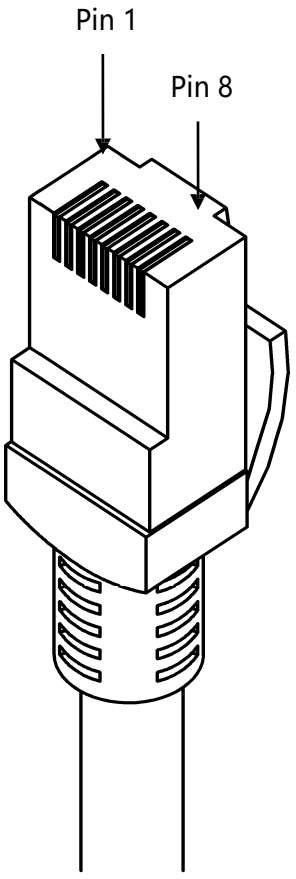
Pin4: Identification 27K

Pin5: Signal Common

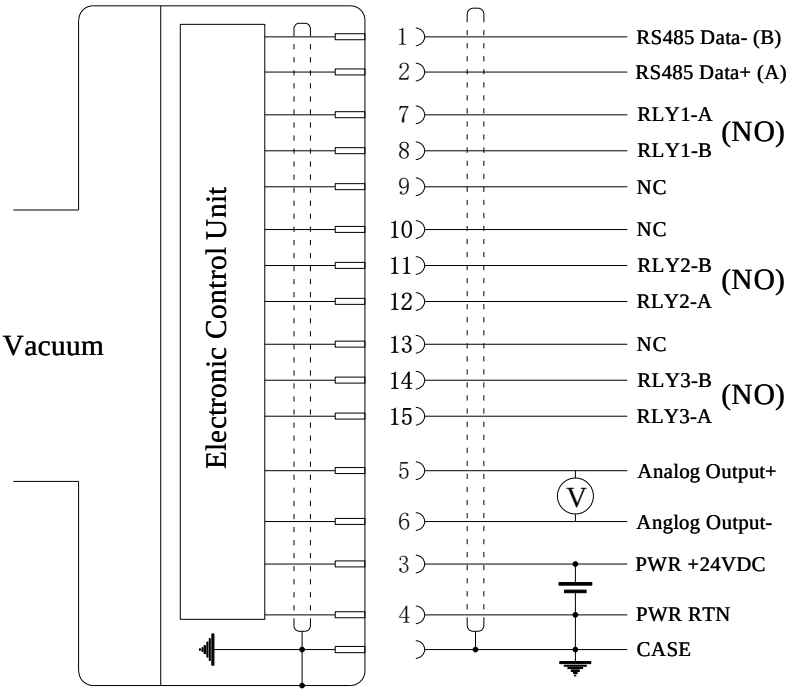
Pin6: NC

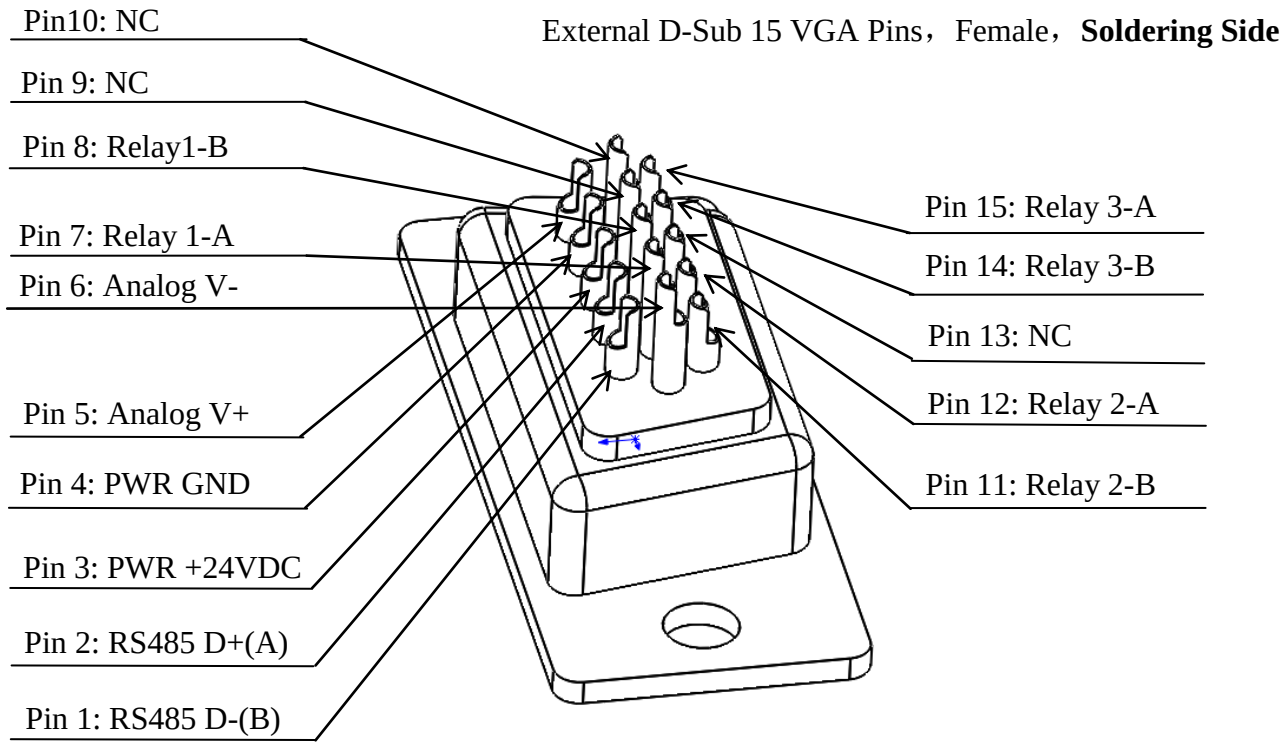
Pin7: RS485, Data-

Pin8: RS485, Data+



2.2 PNP10211A: D-Sub 15 VGA Male





External D-Sub 15 VGA Pins，Female，**Soldering Side**

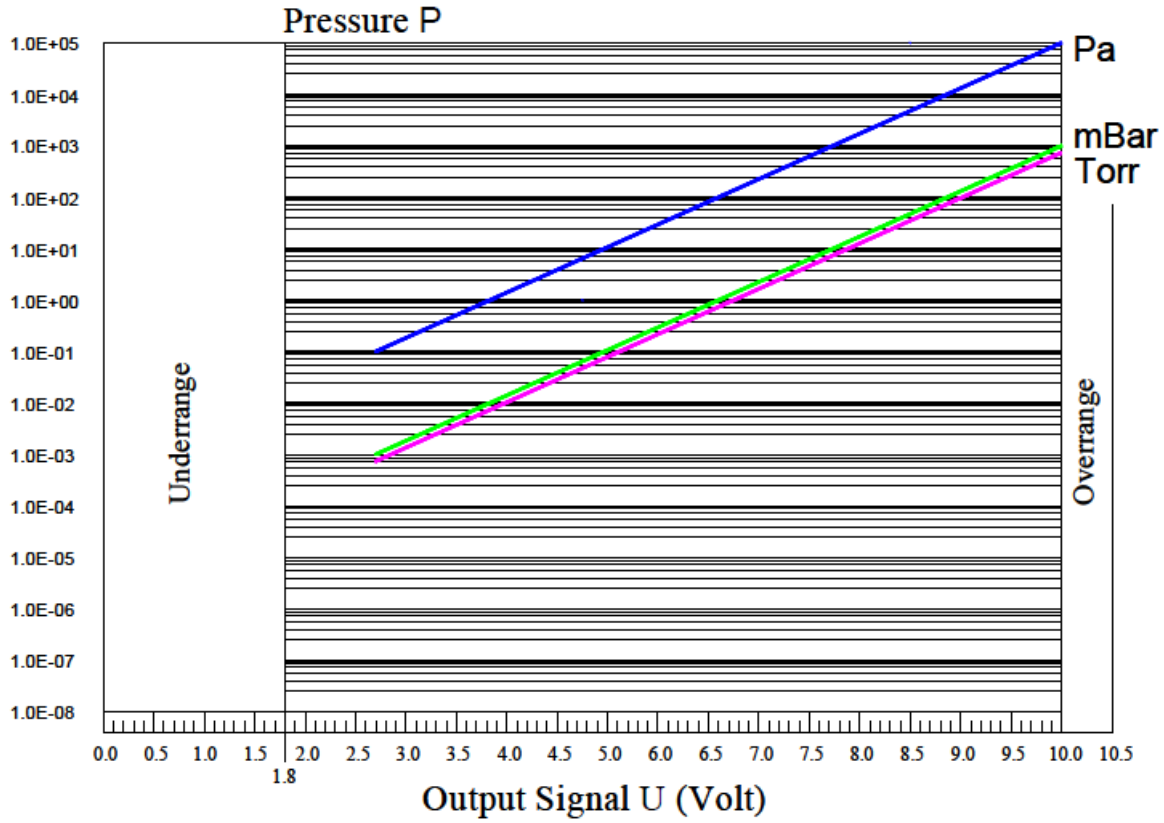
Caution

Pay Attention on D-Sub 9：Male, Female, Socket, Soldering Side.

3. Analog Output Signal

The voltage at Pin3/Pin5 of RJ45 or Pin6/Pin6 of DB15VGA connector corresponds to real-time vacuum measurement.

Output Range PNP102: +2.286VDC ~ +10.0VDC



$$P=10^{((U-c)/1.286)} \Longleftrightarrow U=c+1.286\times \lg P$$

P: Vacuum Pressure

U: Analog Voltage (V)

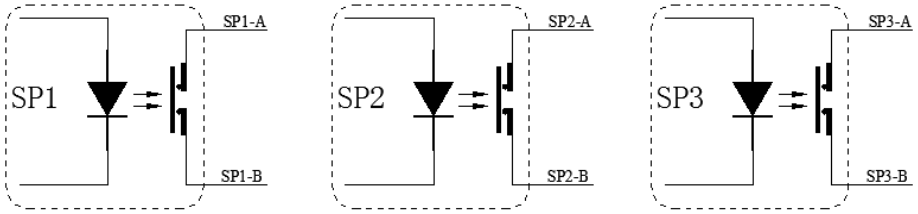
C: Constant

U	P	C
(V)	Pa	3.572
(V)	mBar	6.143
(V)	Torr	6.304

4. Setpoint Relay Setting

PNP10211A has three solid state relays that can be set independently, and the vacuum pressure at the switching point can be set through the INSTRUE GaugeReader Application software. The contact capacity of the relay is 60VDC 0.5A.

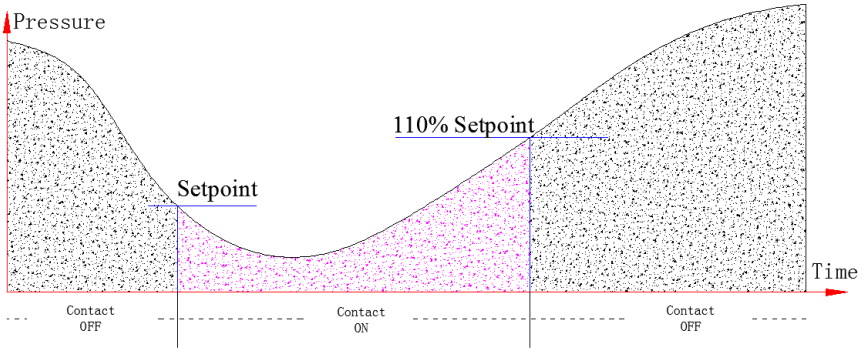
PNP10201A doesn't have the control relay.



Three Solid State Relay Control

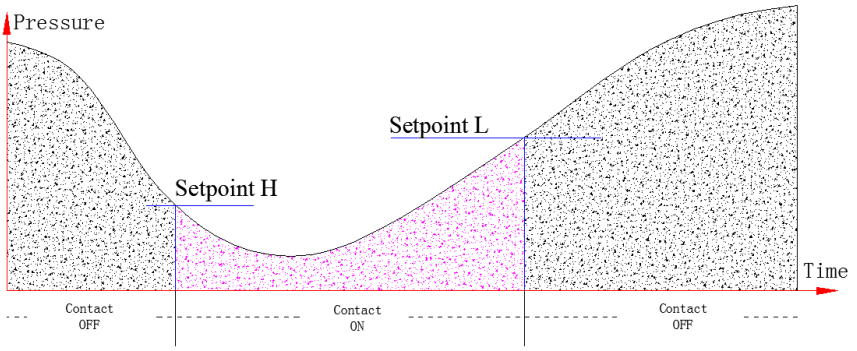
There are two ways to set relay control points. 1) single point control mode and 2) dual-point interval control mode. The standard configuration is single-point control mode. If dual-point interval control mode is needed, please confirm it when ordering.

1) Single point control mode



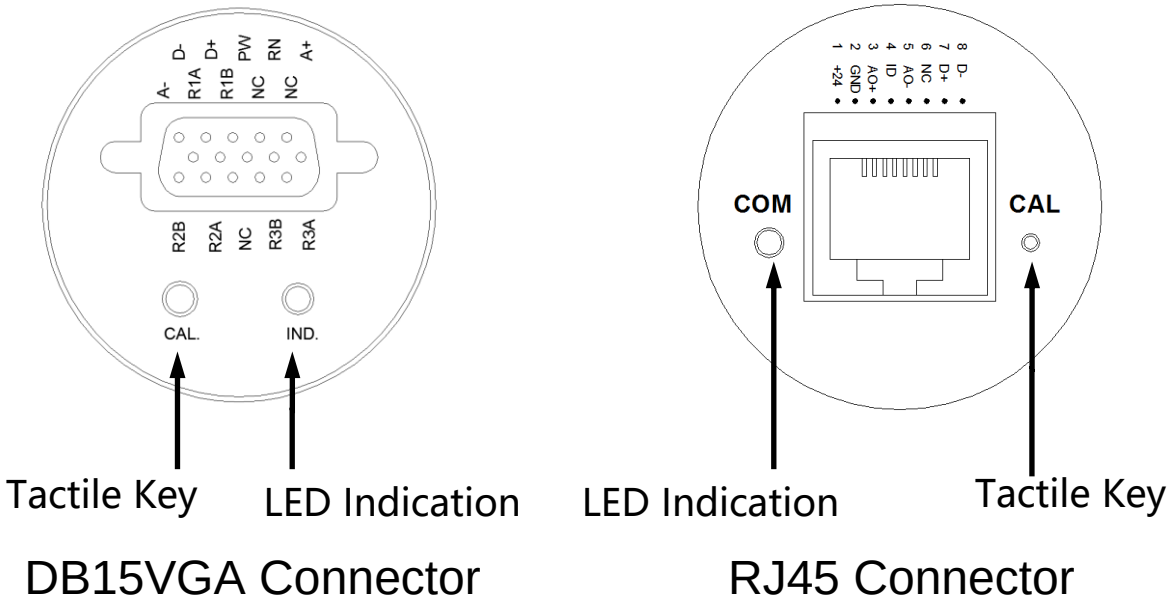
Single Point Control Setting

2) Dual-point interval control mode



Dual Point Interval Control Setting

5. Tactile Calibration Key (Top Diagram)



Calibration Method

- The LED indicator is on after power on and flashes once when RS485 communication transmission one time.
- Before calibration, ensure that the vacuum gauge has warmed up for more than 30 minutes.
- **Atmospheric calibration:**

Ensure that the vacuum measuring port is under atmospheric pressure, insert a round rod with a diameter less than 1.5mm into the adj (CAL) round hole, press it down and keep it for 3 seconds after feeling the action of the tactile switch touching, and observe that the COM LED flashes continuously for three times, indicating that the vacuum gauge saves the current measured pressure as the atmospheric pressure as 1.0E+5Pa, and completes the atmospheric calibration process.

- **Zero calibration:**

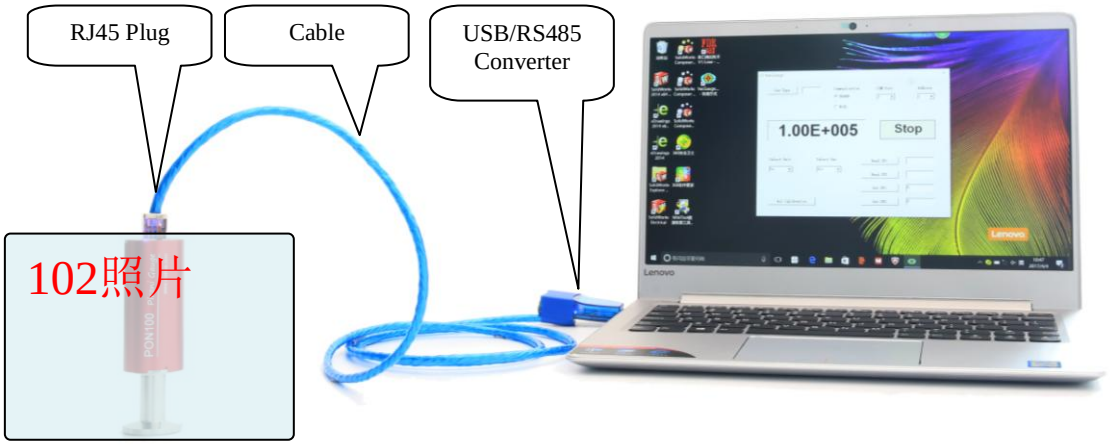
Ensure that the pressure at the vacuum measuring port is less than 5.0E-3Pa, insert a round rod with a diameter of less than 1.5mm into the adj (CAL) round hole, press it down and keep it for 3 seconds after feeling the action of the tactile switch touching, and observe that the COM LED flashes continuously for three times, indicating that the vacuum gauge takes the current measured pressure as the zero pressure of the vacuum gauge, and saves it as 1.0E-1Pa to complete the zero calibration process.

Note: after pressing the calibration button, the vacuum gauge will automatically determine the atmospheric calibration or zero calibration according to the measured pressure range.

6. INSTRUE reading software Gauge Reader 3.0

This Section 6 and 7 are only applicable to PON100 model with RS485 function.

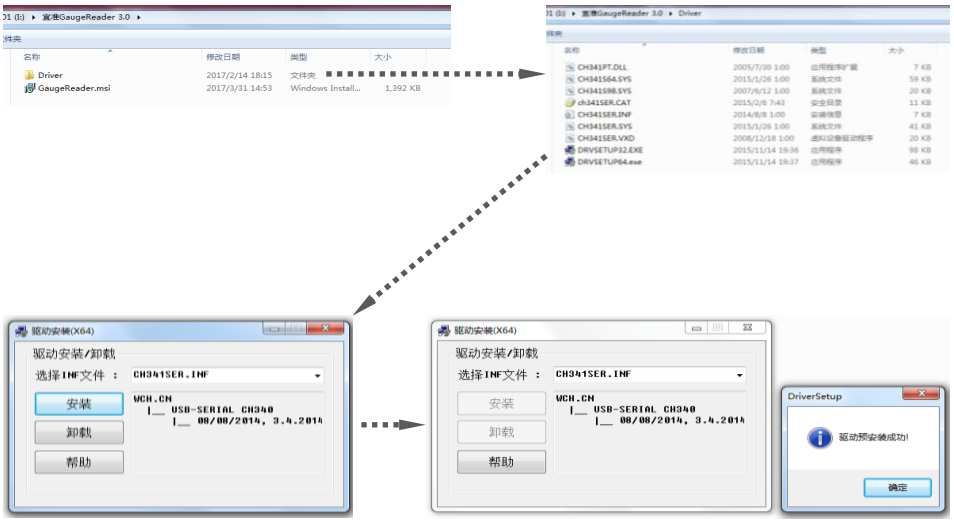
Install Gauge Reader 3.0 application software on ordinary Win XP, Win7, Win8 or Win10, and the computer can communicate with pon100 in real time through a USB/RS485 converter. (the vacuum gauge needs to be powered by separate + 24VDC)



PNP102 Gauge

6.1 USB / RS485 Converter Driver Installation

Open the folder supplied by INSTRUE, find the software packages that should be installed on the computer and click the appropriate driver file to install.

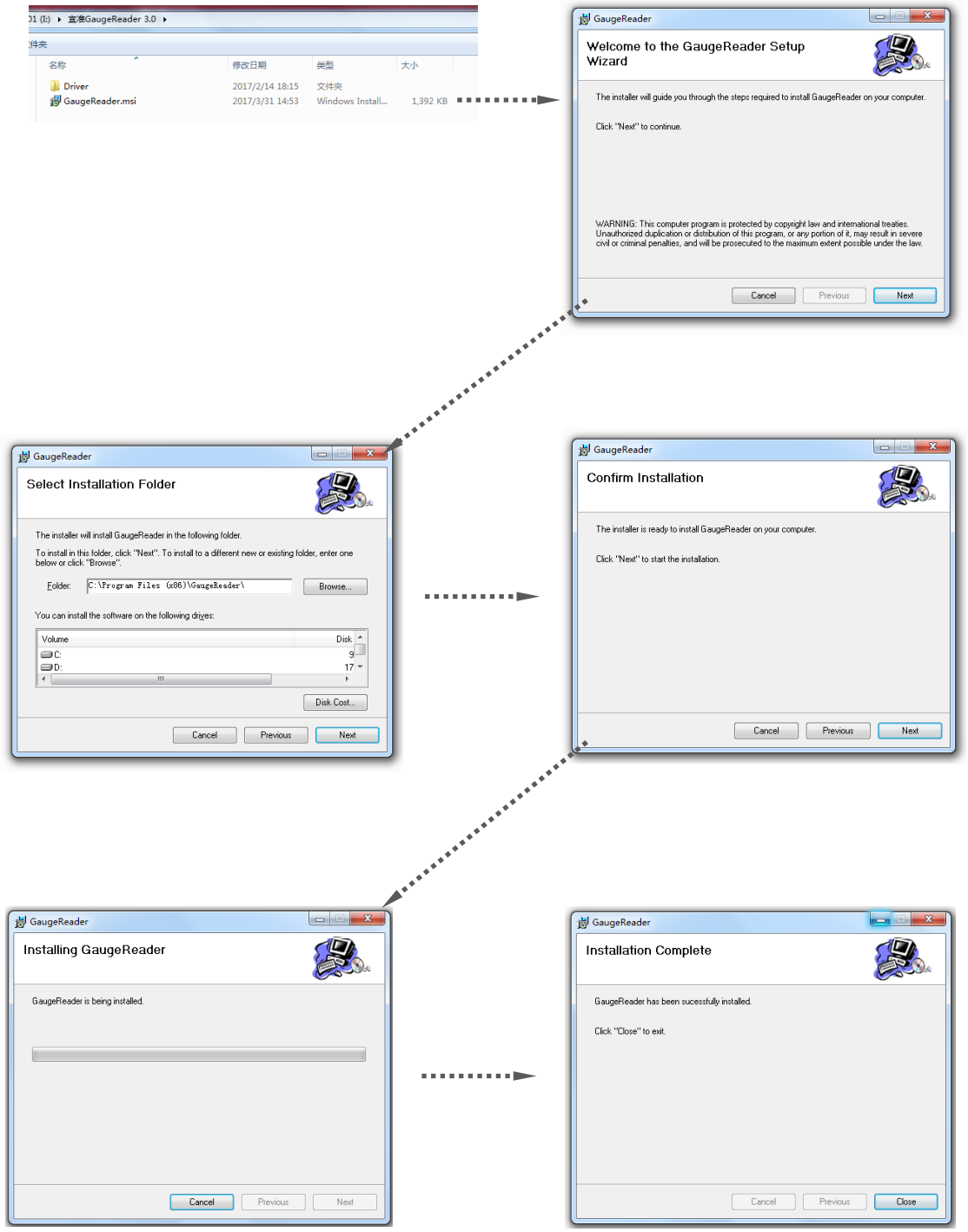


After installation, click OK.

Set the serial port in the computer device manager:

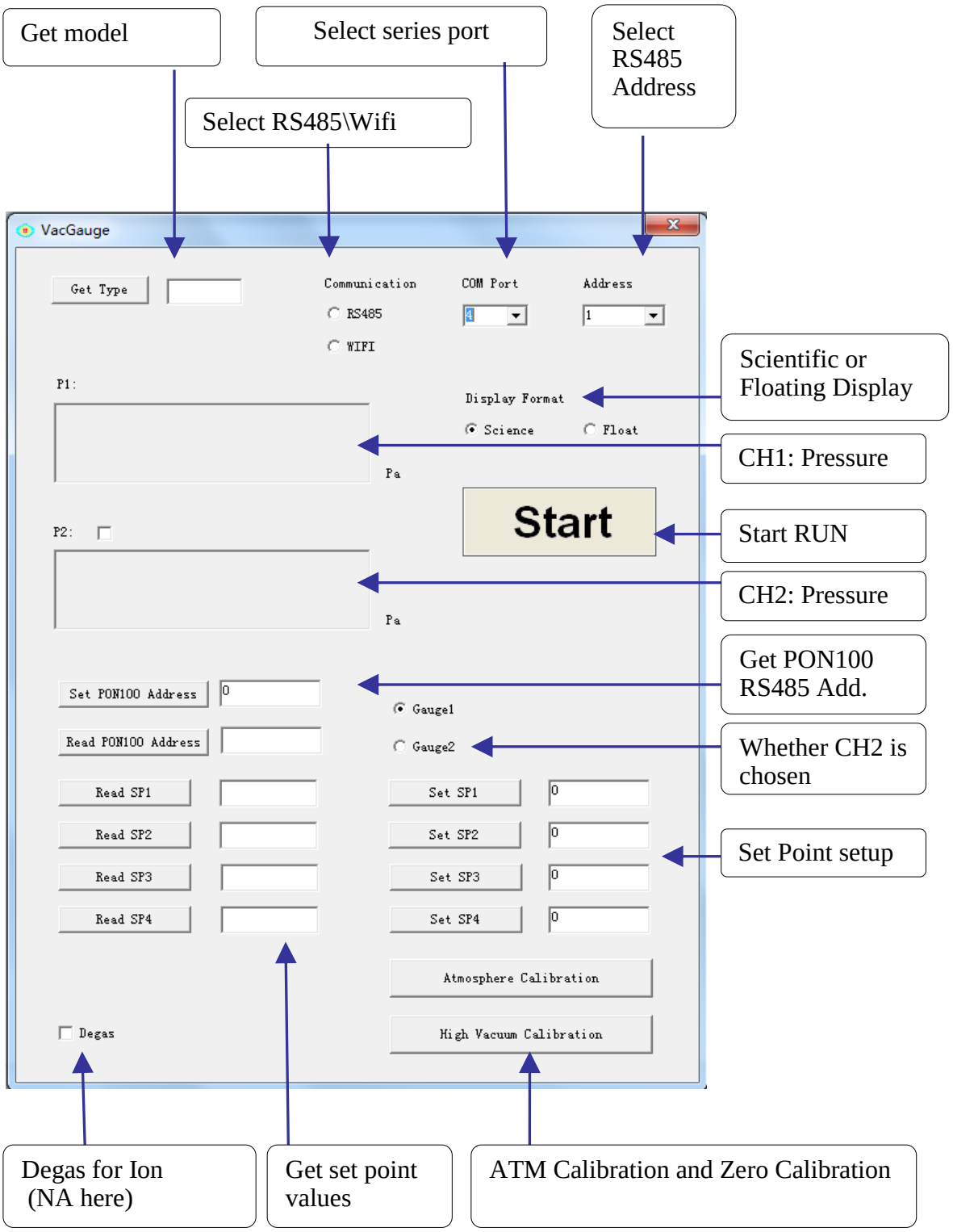
Baud rate: 9600; Start bit: 1; Data bit: 8; Stop bit: 1; Check bit: None

6.2 Application software GaugeReader3 0 installation



After installation, an executable file is generated in the selected folder: VacGauge. exe

6.3 Use application software GaugeReader3 0



7. RS485 MODBUS RTU Communication Protocol

1) Communication Setup：

Baud rate：9600 Start Bit：1 Data Bit：8 Stop Bit：1
Checkout bit：No

2) Instruction format：

a. Read instruction：

- Upper computer sends instructions to vacuum gauge：

Add	Command	Register Hi	Register Low	Data Word（Hi 8bit）	Data Word（Low 8bit）	CRC Check（Low8bit）	CRC Check（Hi 8bit）
1-99	03	00	XX	00	XX	XX	XX

- Return Instruction：

Add	Command	Data Byte	Data	CRC Check（Low 8bit）	CRC Check（Hi 8bit）
1-99	03	XX	XX Byte	XX	XX

b. Write Instruction:

- Upper computer sends instructions to vacuum gauge：

Add	Command	Register Hi	Register Low	Data Length（Hi 8bit）	Data Length（Low 8bit）	Data Byte	Highest Data Byte
1-99	16	00	XX	00	02	4	Bit31-24

Data Mid Byte	Data Mid Byte	Data Mid Byte	CRC Check（Low 8bit）	CRC Check（Hi 8bit）
Bit23-16	Bit15-8	Bit7-0	XX	XX

- Return Instruction：

Add	Command	Register Hi	Register Low	Data Length（Hi 8bit）	Data Length（Low 8bit）	CRC Check（Low 8bit）	CRC Check（Hi 8bit）
1-99	16	00	XX	00	02	XX	XX

3) Register address table：

Register address （16hexadecimal）	Data byte length	Storage content
01	2	Gauge Ch1: Vacuum data of scientific counting format
03	2	Gauge CH2: Vacuum data of scientific counting format
11	2	Gauge Ch1: Vacuum data of floating point format
13	2	Gauge CH2: Vacuum data of floating point format
21	2	Set Point 01: Floating Format
23	2	Set Point 02: Floating Format
25	2	Set Point 03: Floating Format
27	2	Set Point 04: Floating Format
29	2	Set Point 05: Floating Format
2B	2	Set Point 06: Floating Format
31	1	Set Point 01 correspond Gauge 1：Gauge Ch1；2：Gauge Ch2
32	1	Set Point 02 correspond Gauge 1：Gauge Ch1；2：Gauge Ch2
33	1	Set Point 03 correspond Gauge 1：Gauge Ch1；2：Gauge Ch2
34	1	Set Point 04 correspond Gauge 1：Gauge Ch1；2：Gauge Ch2
35	1	Set Point 05 correspond Gauge 1：Gauge Ch1；2：Gauge Ch2
36	1	Set Point 06 correspond Gauge 1：Gauge Ch1；2：Gauge Ch2
40	1	Implement Calibration: 1：Gauge Ch1 atmosphere 2：Gauge Ch1 Zero 4：Gauge Ch2 atmosphere 8：Gauge Ch2 Zero

7.1 Data display format：

7.1.1 Scientific count format：

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

For example, the vacuum gauge displays the data 1.0E-1, and the data stored in the register are 0x31, 0x30, 0x2d and 0x31.

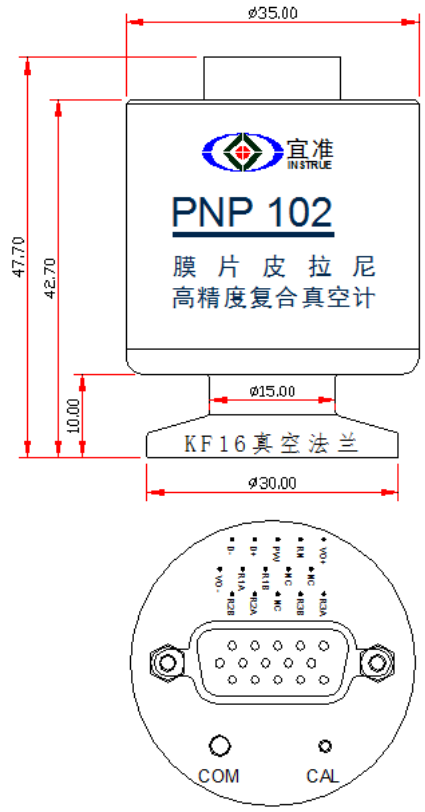
7.1.2 Floating format：

The 32 bit floating number is stored in the register.

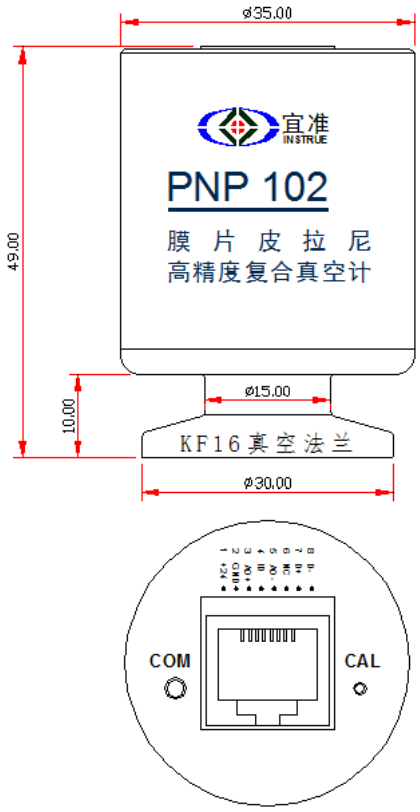
7.1.3 Vacuum gauge address setting：

Through Gauge Reader 3.0 application software interface, you can set the vacuum meter local address, factory address set to 01.

8. Dimensions（mm）



PNP102 DB15VGA



PNP102 RJ45