RPD100

Intelligent Display Pirani Vacuum Gauge

Introduction

The RPD100 Smart Touch-Screen Pirani Vacuum Gauge covers a full measurement range from atmospheric pressure to medium-high vacuum. It delivers reliable measurement accuracy, wide operating span, excellent long-term stability and extended service life. With a cost-effective design, it provides outstanding value for diverse industrial vacuum applications. Equipped with a high-resolution color touch LCD screen, the gauge displays real-time vacuum readings intuitively. It supports multi-program configurable menus and integrates a high-decibel buzzer alarm system, delivering superior human-machine interaction performance.

Engineered with advanced Pirani chips fabricated via precision microfabrication technology, this vacuum gauge ensures exceptional measurement accuracy and consistent performance. The built-in temperature sensing circuit further enhances detection sensitivity and repeatability. Compared with conventional filament-type Pirani gauges, the optimized chip structure features superior contamination resistance, adapting to complex industrial working conditions.

The unit adopts a 1.54-inch IPS capacitive color touch screen with 240×240 high resolution and RGB full-color display. Equipped with high-brightness backlight, it ensures clear visual display even in low-light environments. It supports analog signal output and RS485 digital output through FCC-68 / RJ45 terminals. Fully compatible with third-party vacuum gauges, it enables direct plug-and-play replacement without system recalibration or hardware modification.

Furthermore, the RPD100 can be configured to output various standard industrial signals to meet customized application requirements for different vacuum system scenarios.



Features

- Range from 0.05Pa to 100000Pa
  from $5x10^{-4}$ mbar to 1000mbar
  from $3.75x10^{-4}$Torrr to 750Torr
- Full-touch operation, no physical buttons
- Adjustable output units, configurable alarm setpoints
- High accuracy and repeatability
- Adjustable output curve
- With temperature compensation
- High performance-price ratio

Applications

- Freeze dryer control
- Mass spectrometer control
- Foreline and roughing pressure measurement
- Cryogenic gas cylinders and storage tanks
- Heat treatment / Vacuum furnace
- Process control

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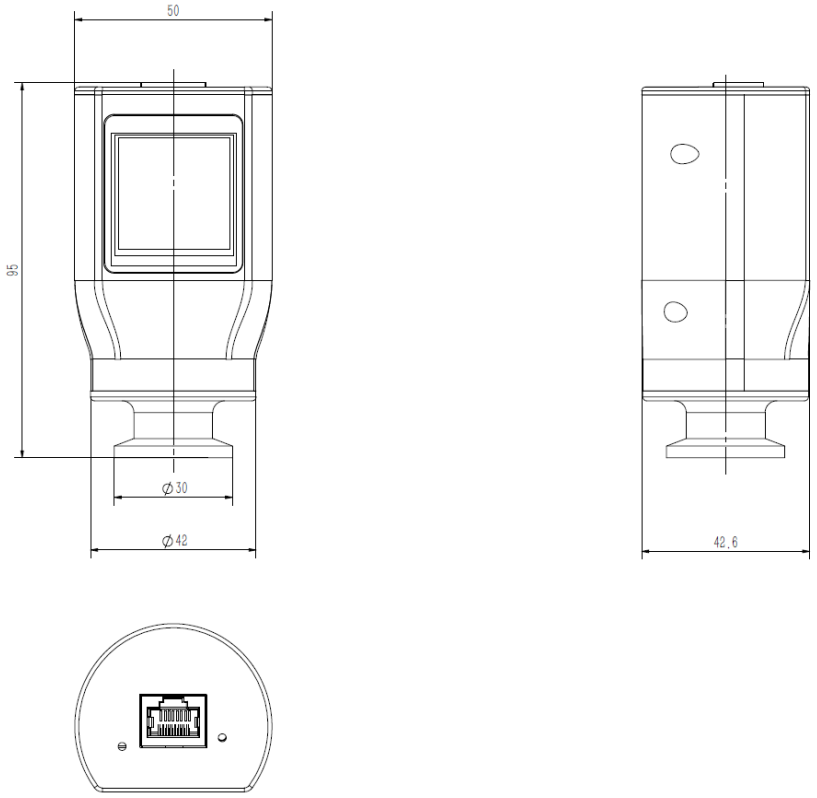
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1. Specifications

(Accuracy and repeatability are typical values measured with N_2 gas at ambient temperature after zero adjustment)

Parameter	Min.	Typ.	Max.	Units	Conditions
Sensor Type	MEMS Pirani thermal conductivity				-
Measurement range	$5x10^{-2}$		100000	Pa	N_2/Air
	$5x10^{-4}$		1000	mbar	
	$3.75x10^{-4}$		750	Torr	
Output voltage	1.9		10	V	Factory-set
Output characteristic	Logarithmic curve				
Accuracy		±50%		mbar	$5x10^{-4}$ ~ $1x10^{-3}$
		±15%		mbar	$1x10^{-3}$ ~ 100
		±50%		mbar	100 ~ 1000
Resolution		1%		Reading	
Repeatability		2%		Reading	$5x10^{-3}$ ~ 100mbar
Response time		0.1		s	
Supply voltage	9	24	30	V	
Current consumption		50		mA	
Identification resistor		27		KΩ	Factory-set
Operating temperature	0		40	℃	
Storage temperature	-20		65	℃	
Overpressure limit			6	bar	
Sensor material	304 stainless steel				Factory-set
Screen resolution	240*240(RGB)			Reading	
Alarm function	Feature				Supports configuration of two alarm thresholds.

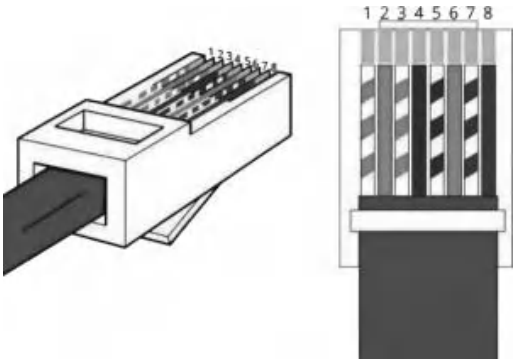
2. Dimensions



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3. Pin assignment

Pin1	V+ (9~30VDC)
Pin2	GND
Pin3	Analog signal output
Pin4	27KΩ identification
Pin5	Analog Signal GND
Pin6	NC
Pin7	RS485, DATA-
Pin8	RS485, DATA+



4. Digital Signal Output

The product adopts the standard Modbus RTU protocol. The default communication parameters are as follows:

- Default device address: 255 (0xFF)
- Baud Rate: 9600
- Data Bits: 8
- Stop Bits: 1
- Parity: None

4.1. Register Access

Pressure readings and device settings are accessed through Modbus holding registers. Use function code 0x03 to read registers and 0x10 to change the device address. The default device address is 255 (0xFF).

4.2. Holding Register Function Definitions

Holding registers — Read: 0x03; write address: 0x10		
Register address	Description	Data Type
0x0000	1. Pressure occupies two consecutive 16-bit registers. Pressure in Pa = raw value / 1000. 2. Big-endian format: most significant word and byte first. 3. Example: 0x05F5E100 = 100000000; pressure = 100000 Pa.	32-bit integer
0x0001		
0x0005	1. Manufacturing year and month. 2. Example: 0x1904 indicates April 2025.	16-bit unsigned integer
0x0006	1. Production batch and Modbus device address. 2. Example: 0x0104 indicates batch 1 and device address 0x04. The manufacturing date is stored in register 0x0005. 3. Default device address: 0xFF (255).	16-bit unsigned integer

4.3. Communication Examples

1. Set the device address (function code 0x10; 0x06 is not supported)

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Instruction	Slave address	Function code	Start address MSB	Start address LSB	Register count MSB	Register count LSB	Byte count	Data4	Data3	Data2	Data1	CRCL	CRCH
Example	0XFF	0X10	0X00	0X05	0X00	0X02	0X04	0X00	0X00	0X00	0X01	0XC5	0XBB

Note: Data1 specifies the new Modbus device address.

Slave response:

Instruction format	Slave address	Function code	Start address MSB	Start address LSB	Register count MSB	Register count LSB	CRCL	CRCH
Example	0XFF	0X10	0X00	0X00	0X00	0X02	0X54	0X16

Note: No information to be parsed in the slave response

2. Read the pressure value (function code 0x03)

Master request:

Instruction format	Slave address	Function code	Start address MSB	Start address LSB	Register count MSB	Register count LSB	CRCL	CRCH
Example	0XFF	0X03	0X00	0X00	0X00	0X02	0XD1	0XD5

Note: 0xFF is the device's general address. If the device's Modbus bus address is known, it can be used directly.

Slave response:

Instruction format	Slave address	Function code	Byte count	Data4	Data3	Data2	Data1	CRCL	CRCH
Example	0XFF	0X03	0X04	0X00	0X01	0X00	0X05	0XC1	0XD7

The pressure data bytes 00 01 00 05 are transmitted most significant byte first. The value 0x00010005 equals 65541 in decimal. Pressure = 65541 / 1000 = 65.541 Pa (data decoding example only).

5. Analog Signal Output

The analog voltage output can be connected to a PLC, a distributed control system (DCS) or a recorder. The output range is configurable. For the logarithmic output characteristic, pressure is calculated as follows:

5.1. Output Voltage and Formula 1

$$P = 10^{\frac{U-c}{1.286}}$$

Where:
U — Analog output voltage in volts.
P — Pressure in the unit listed below.
c — Unit-dependent constant listed below:

U	*P*	*c*
V	mbar	6.143
V	Torr	6.304
V	mTorr/micron	2.448
V	Pa	3.572

5.2. Output Voltage and Formula 2

$$P = 10^{U-c}$$

Where:
U — Analog output voltage in volts.
P — Pressure in the unit listed below.
c — Unit-dependent constant listed below:

U	*P*	*c*
V	mbar	6
V	Torr	6.125
V	mTorr/micron	3.125
V	Pa	4

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5.3. Output Voltage and Formula 3

$$P = 10^{U-c}$$

Where:
U — Analog output voltage in volts.
P — Pressure in the unit listed below.
c — Unit-dependent constant listed below:

U	*P*	*c*
V	mbar	5.5
V	Torr	5.625
V	mTorr/micron	2.625
V	Pa	3.5

5.4. Output Voltage and Formula 4

$$P = 10^{U-c}$$

Where:
U — Analog output voltage in volts.
P — Pressure in the unit listed below.
c — Unit-dependent constant listed below:

U	*P*	*c*
V	mbar	5
V	Torr	5.125
V	mTorr/micron	2.125
V	Pa	3

5.5. Output Voltage and Formula 5

$$P = 10^{U-c}$$

Where:
U — Analog output voltage in volts.
P — Pressure in the unit listed below.
c — Unit-dependent constant listed below:

U	*P*	*c*
V	mbar	5.875
V	Torr	6
V	mTorr/micron	3
V	Pa	3.875

6. Calibration

The gauge is factory-calibrated with nitrogen. Transport vibration or contamination during use may cause measurement drift. If a significant deviation is observed, perform zero and full-scale adjustment as described below. Pirani measurements depend on the thermal conductivity of the gas. Contact the manufacturer for calibration when measuring gases other than air or nitrogen.

6.1. Zero Adjustment

Install the gauge on the vacuum system, preferably under its normal operating conditions. Switch on the gauge and evacuate the system to below 0.0001 Pa. Allow at least 5 minutes for the gauge to reach thermal equilibrium, then proceed as follows:

a) Use a pin to press the recessed adjustment button. Hold it until the LED turns red, then release it.
b) Briefly press the button once. The red LED flashes three times and then goes out.
c) The LED returns to steady green. Zero adjustment is complete and the gauge resumes normal operation.

6.2. Full-Scale Adjustment

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With the gauge exposed to atmospheric pressure, switch it on under its normal operating conditions. Allow at least 5 minutes for thermal equilibrium, then proceed as follows:

a) Use a pin to press and hold the recessed adjustment button. The LED first turns red; continue holding until it turns green, then release the button.
b) Briefly press the button once. The green LED flashes three times and then goes out.
d) The LED returns to steady green. Full-scale adjustment is complete and the gauge resumes normal operation.

7. Function Description

7.1 Start-up Home Screen

The main interface shows real-time vacuum values from the sensor, vacuum measurement unit, function setup icon and unit configuration icon.



The value display area can show up to 6 characters. If the pressure reading collected by the sensor is less than 10, it displays one integer digit and four decimal places in the format x.xxxx; values ranging from 10 to less than 100 are shown as two integer digits plus three decimals (xx.xxx); readings from 100 to less than 1000 adopt three integer digits and two decimals (xxx.xx); values between 1000 and less than 10000 are presented as four integer digits with one decimal place (xxxx.x); any reading of 10000 and above is displayed with 5 to 6 integer digits (xxxxxx).

The unit display area can switch to display Pascal, Torr or mbar according to the selected measurement unit.

7.2 Settings

Tap anywhere on the "Settings" area of the main screen to enter the setting page. This page features four function buttons: two alarm threshold setting buttons labeled "Alarm1" and "Alarm2", a screen orientation adjustment button "Screen", and a "Back" button to return to the main interface.



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Tap "Alarm1" or "Alarm2" to access the parameter configuration interface for Alarm Point 1 or Alarm Point 2, where the corresponding settings can be modified. The interface after entry is shown in the figure below.



(1) Threshold Setting

Tap "High" to switch the alarm trigger mode of the alarm point. When set to "High", the background of the threshold setting area turns red, which means the sensor will trigger an audible alarm when the measured value exceeds the set threshold. Tap "High" again to switch to "Below", and the background will turn yellow, indicating that an audible alarm will be activated when the measured value is less than or equal to the preset value.

(2) Switch Setting

Tap "OFF" to toggle the alarm switch status of the alarm point. When set to "OFF", the background of the switch setting area turns blue, signifying the audible alarm function is disabled. When switched to "ON", the background turns green, indicating the audible alarm function is activated.

(3) Threshold Value Setting

Tap "SetVal" to open the threshold setting page as shown below. The value display area shows the current preset value. The "E4" on the second line stands for scientific notation, representing multiplication by 10000. The yellow upward arrow below the number indicates the digit selected for modification. Tap the right-pointing triangle on the second line to cycle through and select different digits. The up and down arrows increase or decrease the selected digit value respectively. The tick icon serves as the confirm button to save settings and return to the upper menu.



(4) Return Function

Tap "Back" to return to the upper menu page.

Tap "Screen" to enter the screen orientation setting interface for adjusting the display direction. Four orientations are available for free switching, as shown in the figure below.

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7.3 Pressure Units

Tap the "Unit" button on the main screen to enter the unit switching page as shown below. Three pressure units are available for selection: TORR, MBAR and PASCAL. After selecting a target unit, the reading will be automatically converted to match the selected unit, and the background of the chosen unit on the display will turn green to confirm successful setup. Tap the "BACK" button to return to the upper menu.

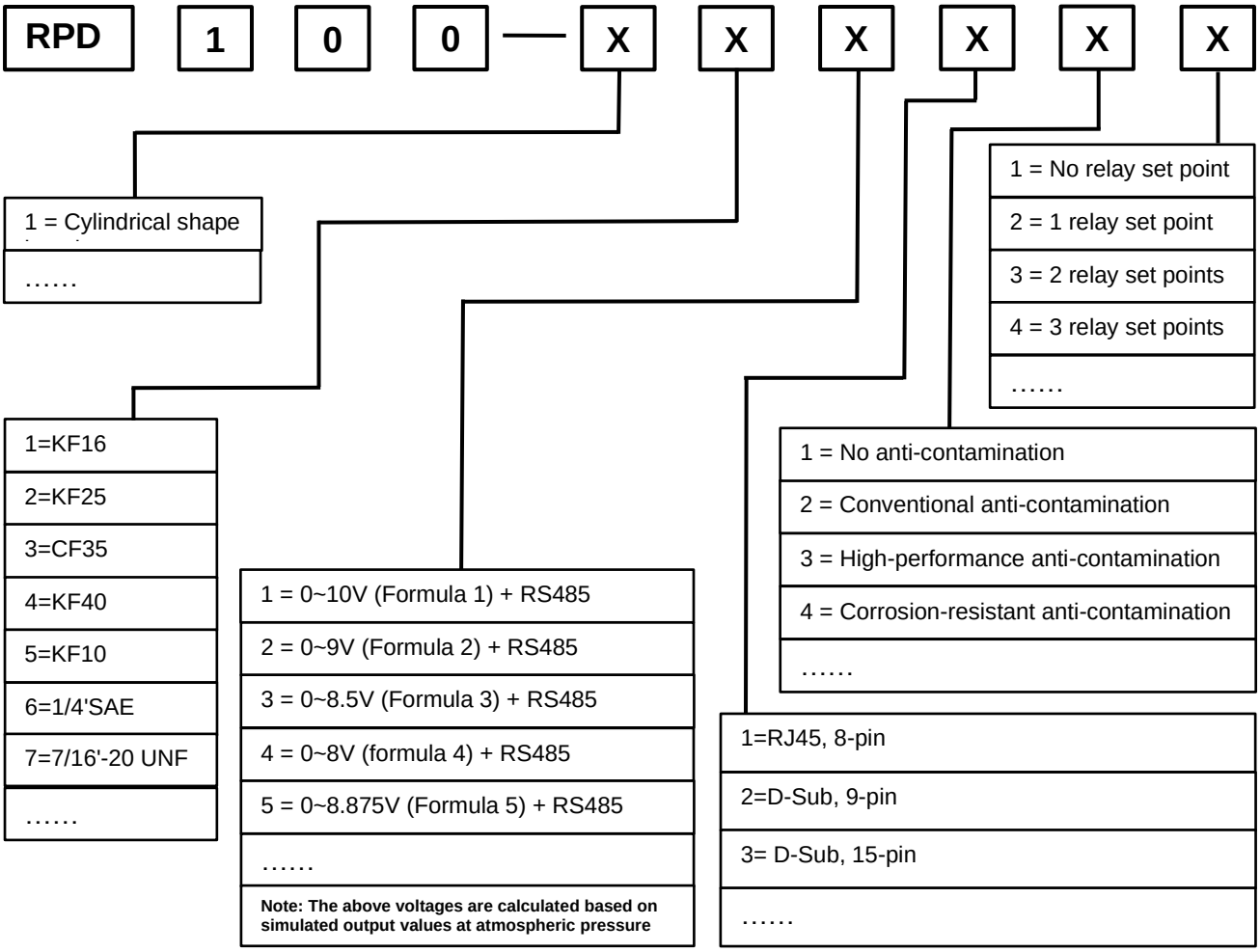


8. Indicator Light Status Description

Steady green — Normal operation.
Steady red — Gauge fault; the microcontroller is not operating normally.
Off — Power supply fault.
Three red flashes — Zero adjustment completed.
Three green flashes — Full-scale adjustment completed.

9. Ordering Information

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The standard model of this series of Pirani vacuum gauges is RPD100-111121. If there are other non-standard models, please consult with RQ for definition.

10. Revision History

Product Datasheet Version Control (RPD100)			
Version	Modification Time	Modification Content	Modifier
V1.0	2026.03	Initial Version	YSC

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