

AGP21 Datasheet

Capacitive Diaphragm Vacuum Gauge

- High-precision vacuum measurement
- Long-term stable and reliable performance
- Excellent corrosion resistance
- Standard Modbus RTU communication
- TFT-LCD color screen display
- 0~10V linear voltage output
- 15~30VDC power supply

Product Summary

AGP21 series is a high-precision capacitive diaphragm vacuum gauge. The diaphragm undergoes elastic displacement due to pressure changes. The change in displacement causes a change in capacitance, which is finally measured by a digital circuit and converted into an output signal. The AGP21 series uses Inconel material, which can withstand corrosive process media. It is high accuracy, fast response time, and long-term stability, meeting various application requirements.

AGP21 series supports the switching of three common units: Pa, Torr, and mbar. It is equipped with a standard KF16 pressure interface and can be equipped with different adapters as needed to ensure seamless connection with various equipment and systems.

The accuracy, repeatability, response time and other indicators of the AGP21 series are strictly tested before delivery.

Applications

AGP21 series is used in semiconductor, photovoltaic, petrochemical, vacuum sterilization, vacuum packaging, vacuum drying and other industries. It is especially suitable for processes that require critical low vacuum pressure measurement, such as PECVD/ALD coating process, plasma etching and other processes.



Figure 1. AGP21 series products

1. Outlook

Figure 2 shows the appearance of the AGP21 series, including the KF16 pressure interface, DB9 communication interface, and work interface. The work interface includes an LCD display and operation buttons. From left to right, the three operation buttons represent the up or left key, the down or right key, and the Confirm or return key.

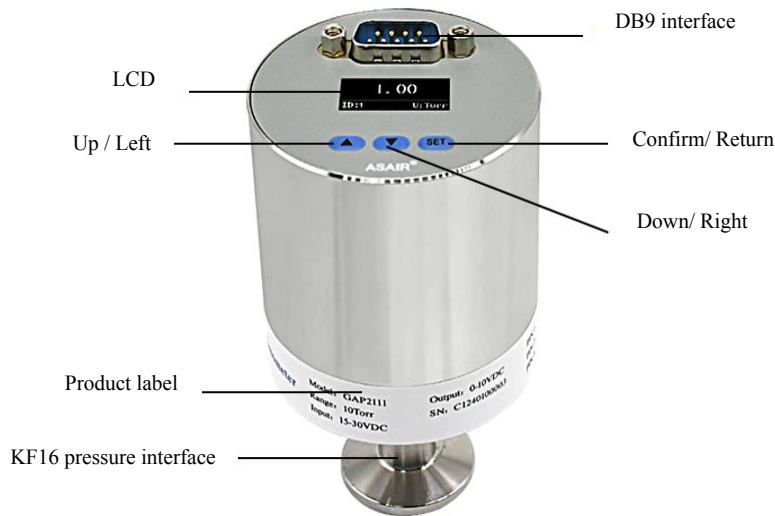


Figure 2. AGP21 outlook

2. Specification and Dimension

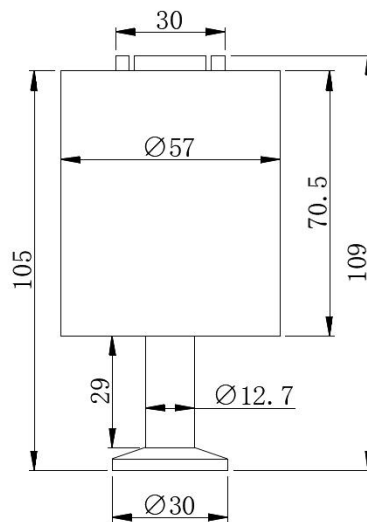


Figure 3. AGP21 dimension (unit:mm, tolerance: ±0.5mm)

3. Interface

3.1 DB9 male connector definition

The communication interface of the AGP21 series is a standard DB9 male connector, the pin diagram of which is shown in Figure 4 and the pin definitions are shown in Table 1.

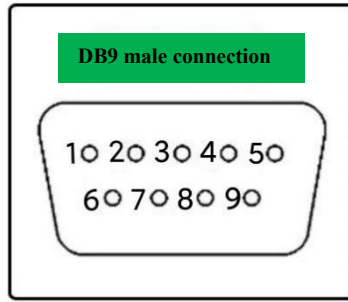


Figure 4. DB9 male connection

Table 1. DB9 connector pin definition

Pin	Description
1	Signal positive
2	RS485 communication A
3	RS485 communication B
4	15 ~ 30 VDC power Positive
6	Power Negative
5、7、8	NC
9	Signal Negative

3.2 AGP21 wire

The wire of the AGP21 series are DB9 female wires, made of UL2464 material, with a total of 9 wires. The actual wires are shown in Figure 5, and the definitions are shown in Table 2.

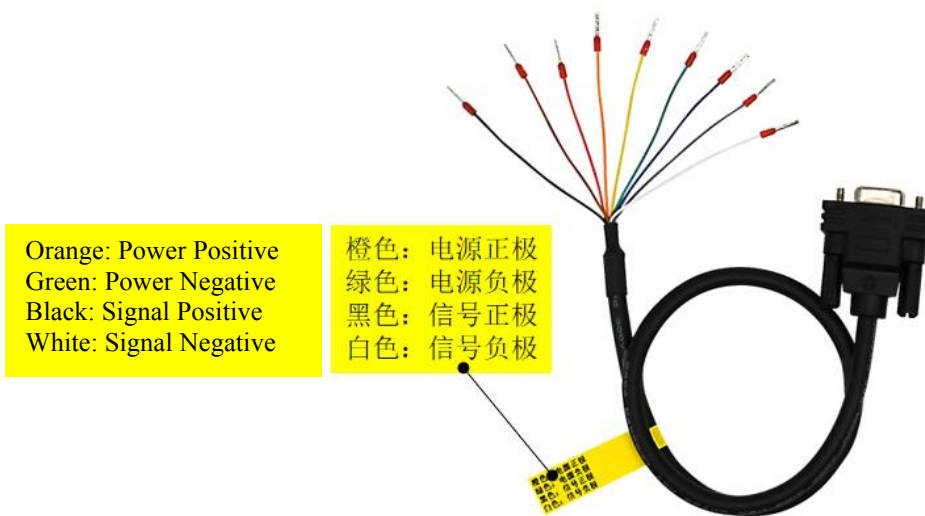


Figure 5. AGP21 series wire

Table 2.AGP21 wire definition

Color	Definition
Black	Signal positive
Brown	RS485 communication A
Red	RS485 communication B
Orange	15 ~ 30 VDC power Positive
Green	Power Negative
Blue, Grey, Yellow	NC
White	Signal Negative

3.3 Flange interface

The pressure interface of the AGP21 series is a standard KF16 flange, which is made of 304 stainless steel and has an electropolishing process on the surface. It can meet the requirements of high vacuum sealing and has the characteristics of easy installation and disassembly, and the joint is not easy to deform. In addition, you can choose adapters from KF16 to other connectors, such as KF16-KF25, KF16-KF40, KF16-1/4 VCR, KF16-1/2 VCR, KF16-1/8 NPT, KF16-1/4 NPT, KF16-1/2 NPT, KF16-1/4 VCO, KF16-1/2 VCO, etc. Please contact the manufacturer for specific needs.

Taking KF16-KF25 as an example, the actual adapter accessories are shown in Figure 6.



Figure 6. Actual picture of KF16-KF25 adapter accessories

4. Technical Parameters

Table 3. AGP21 series technical parameters

Parameters		Description			
Model		AGP2110	AGP2111	AGP2112	AGP2113
Measure range		0~1Torr	0~10Torr	0~100Torr	0~1000Torr
Accuracy		±0.3%Reading			
Response time		≤60ms			
Temperature Effect	Zero point	0.01%FS/°C			
	Full range	0.04%Reading/°C			
Voltage		15 ~30VDC			
Output signal		RS485、0 ~ 10VDC			
Pressure interface		KF16 (Optional adapter for KF16 to other connectors)			
Communication interface		DB9 (optional)			
Unit		Pa, Torr, mbar			
Exposure environment materials		304 stainless steel, Inconel material			
Work temperature		5 ~ 50 °C			
Load pressure		300kPa			
Preheat time		15 minutes			

5. Analog voltage output

AGP21 series provides 0~10V analog voltage output. The voltage output (U, unit: VDC) is a linear function of pressure (P, unit: Torr).

When the model is AGP2110 and the range is 0~1Torr, $U=10P$; when the model is AGP2111 and the range is 0~10Torr, $U=P$; when the model is AGP2112 and the range is 0~100Torr, $U=0.1P$; when the model is AGP2113 and the range is 0~1000Torr, $U=0.01P$.

Taking AGP2111 as an example, its output voltage and pressure function curve is shown in Figure 7.

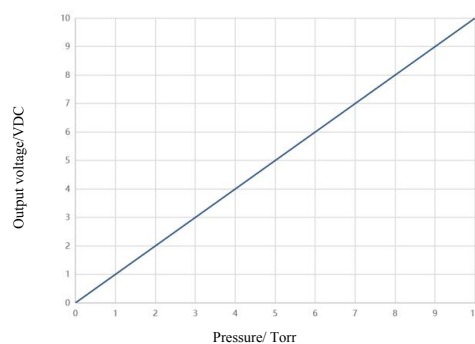


Figure 7. Output voltage and pressure curve (AGP2111)

6. Digital communication output

RS485 communication

The digital output communication method of AGP21 series capacitive thin film vacuum gauge is RS485 communication, and the communication parameters are shown in Table 4.

Table 4. RS485 communication parameters

Communication	Description
Communication protocol	Modbus RTU
Baud rate	4800/9600 (default) /19200/115200bps

As a slave, the default address is 1, which is 0x01, and the maximum address is 255, which is 0xFF; it supports address modification and can be connected to the bus of multiple slaves.

The Modbus RTU communication register definition of the AGP21 series is shown in Table 5.

Table 5. Modbus RTU register definition

Name	Register address	Byte length and type	Read and write properties	Function code
Pressure	0x0000	32bits (float)	Read only	03
AD value	0x0002	32bits (float)	Read only	03
Real time status	0x0004	8bits (byte)	Read only	03
Device address	0x0005	8bits (byte)	Read only	03
Communication rate	0x0006	16bits (short)	Read only	03

Operation examples of AGP21 series are as follows:

When the host reads the instantaneous pressure value of the AGP21 series (the default slave address of the device is 0x01), the host sends a command to the AGP21 series. The data is 01 03 00 00 00 02 C4 0B, and the format is shown in Table 6.

Table 6. Format table for host to send read register command

Host send info	Byte	Example of sending a message (Hex)	Description
Slave address	1	01	Communication slave address
Function code	1	03	read multiple register
Register starting address	2	00 00	Register 0x0000 stores the current pressure value
Read the number of registers	2	00 02	read 1 register
CRC check code	2	C4 0B	CRC code for check

When the host receives the data returned by the AGP21 series, the data is 01 03 04 00 44 C5 47 A9 44, and the format is shown in Table 7.

Table 7. Format table for host to receive AGP21 series H01 register data

Slave send info	Byte	Example of sending a message (Hex)	Description
Slave address	1	01	Communication slave address
Function code	1	03	Read multiple register
Number of data bytes received	1	04	Number of data bytes received
Register data	4	00 44 C5 47	One register is read, and the data returned by the register is single-precision hexadecimal floating-point data, and the data sequence is the right high byte; the value is normal pressure 101000
CRC check code	2	A9 44	CRC code for check

The C language code to calculate the CRC code is as follows:

```
// *ptr Communication sends or receives data byte array
// len Send or receive data byte length (excluding CRC code)
// Returns the calculation result of CRC code, high byte first
unsigned int CRC16(unsigned char * ptr, unsigned char len)
{
    unsigned int crc= 0xFFFF;//initial value initialization
    unsigned char i;
    while(len--)
    {
        crc ^=*ptr++;
        for(i=0;i<8;i++){
            if(crc & 0x1){
                crc>>=1;
                crc^=0xA001;
            }
            else crc>>=1;
        }
    }
    return crc;
}
```

7. Work Interface

7.1 Operation Interface

As shown in Figure 8, after powering on the AGP21 series, the display will display the main page, which displays the current air pressure value, device address and current display unit.

Press the up or down key to enter the first-level menu, which includes three functions: settings, status and return. Select one of the functions, and after confirmation, you can enter the corresponding second-level menu, and so on, there are up to three-level menus. When entering the setting function

menu, you can set the product communication address, communication rate, and display pressure value unit settings. Press the Confirm/Return key to return to the previous menu. The specific operation methods and corresponding function descriptions are shown in Table 8, and the interface display summary is shown in Table 9.



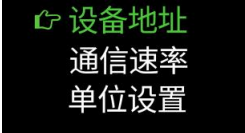






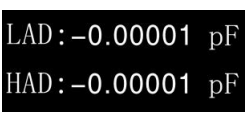



Figure 8. AGP21 series operation interface

Table 8. AGP21 series operation interface

1 st level menu	2 nd level menu	3 rd level menu	Function
Set	Device address	Device address number	The interface displays the current device address. Press the left key to increase the device address, press the right key to decrease the device address, address range: 1~255. Press the SET button to confirm and automatically return to the previous menu
	Communication rate	Device communication rate	The interface displays the current device communication rate. Press the left key to increase the communication rate, press the right key to decrease the communication rate; the default is 9600bps, and can be changed to 4800bps, 115200bps, and 19200bps. Press the SET button to confirm and return to the previous menu
	Unit set	Show unit settings	The interface displays the pressure value unit on the main page. Press the left or right key to change; the default is Torr, and Pa and mbar can be changed. Press the SET button to confirm and return to the previous menu
	Return	/	Return to the previous menu
Status	Display parameters, press the left or right key to pull down the list	/	Displays product-related real-time data, P is the current pressure value; V is the analog voltage output value; LAD is the lower limit of the calibration value; HAD is the upper limit of the calibration value.
Return	/	/	Return to main menu

Table 9. Display information

NO.	Description	Display
1	Over-range pressure value display interface	
2	1 st level menu	
3	2 nd level menu setting	
		
4	Device address adjustment page	
	Communication rate adjustment page	
	Unit settings adjustment page	
5	Status	
6	Status information	
		
7	Return	

7.2 Zero Setting

In order to accurately zero the product, please follow the steps below:

- (1) The product is powered normally and the preheating time is more than 15 minutes;
- (2) Evacuate until the vacuum pressure value reaches the set value, as shown in Table 10;
- (3) In the "Settings" menu, select the "Zero Adjustment" interface, press the SET key, and then return to the vacuum degree display interface. At this time, the vacuum degree display value is 0.00.

Table 10. Pressure setting for zero setting

Model	Measure range	Pressure for zero setting (Torr)
AGP2110	0~1Torr	$< 5 \times 10^{-5}$
AGP2111	0~10Torr	$< 5 \times 10^{-4}$
AGP2112	0~100Torr	$< 5 \times 10^{-3}$
AGP2113	0~1000Torr	$< 5 \times 10^{-2}$

8. Precautions

- (1) When purchasing products, if you need different adapters, please indicate the type of adapter you need.
- (2) The AGP21 series is a non-heated capacitive film gauge. If you need a heated gauge, please contact the manufacturer.
- (3) The vacuum gauge supports installation in any direction, and vertical installation is recommended.
- (4) When installing the vacuum gauge, ensure that the surface of the clamp, sealing ring or other connecting devices is clean and undamaged to avoid air leakage.
- (5) When using the vacuum gauge, please ensure that the power supply voltage is stable and should not exceed the working voltage range.
- (6) During use of the vacuum gauge, the maximum allowable pressure should not be exceeded.
- (7) When there is a product problem with the vacuum gauge, it is not recommended to disassemble or repair it without permission. Please contact the manufacturer.

Warning and Personal Injury

Do not use this product in safety protection devices or emergency stop equipment, or in any other application where the failure of the product may cause personal injury, unless there is a specific purpose or authorization for use. Refer to the product data sheet and instructions before installing, handling, using or maintaining this product. Failure to follow recommendations may result in death or serious personal injury. The company will not be liable for any compensation for personal injury or death resulting therefrom, and is exempt from any claims that may arise against the company's managers and employees, as well as affiliated agents, distributors, etc., including: various costs, claims Fees, attorney fees, etc.

Quality Assurance

Guangzhou Aosong Electronic Co., Ltd. provides direct purchasers of its products with a quality guarantee as shown in the following table (calculated from the date of shipment), with the technical specifications stated in the Aosong Electronics product manual. If the product is proven to be defective during the warranty period, the company will provide free repair or replacement services.

Product	Warranty
AGP21 series capacitive diaphragm vacuum gauge	12 months

Our company is only responsible for products that are defective when used in situations that meet the technical conditions of the product. The company does not make any guarantees regarding the application of the product in non-recommended special scenarios. The company does not make any commitment to the reliability of its products when used in other non-company supporting products or circuits.

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