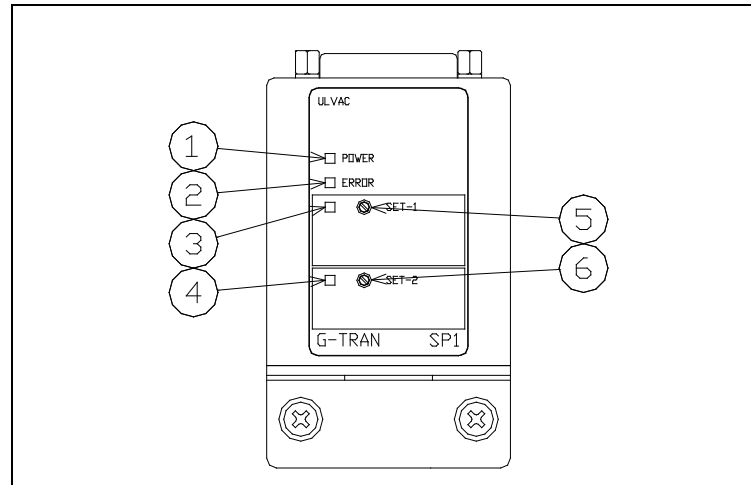


G-TRAN Series Pirani Vacuum Gauge Model SP1 Quick Manual

Introduction
 This quick manual is for quick check of operation and display of the product. Please refer to instruction manual in advance for detailed information about operation, precautions and safety for proper use.
 Available for download from ULVAC website. <https://showcase.ulvac.co.jp/en>
 This manual is for the following gauges. Serial Nos. 00001 and higher.

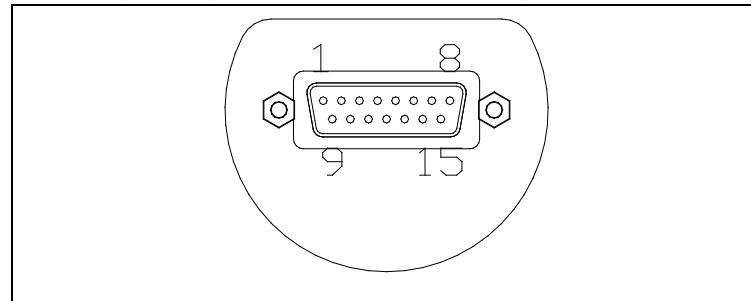
1. Nomenclature and Functions

1.1. Front Panel



Component	Function
(1) POWER lamp	Lights when power is supplied to the sensor unit.
(2) ERROR lamp	Lights when the sensor head filament has burnt out.
(3) SET-1 lamp	Lights when setpoint 1 is actuated.
(4) SET-2 lamp	Lights when setpoint 2 is actuated.
(5) SET-1 setting trimmer (SET-1)	Sets the value of setpoint 1 by adjustment of trimmer.
(6) SET-2 setting trimmer (SET-2)	Sets the value of setpoint 2 by adjustment of trimmer.

1.2. Input/Output Connector (D-sub15 pin M2.6mm screw)



Terminal No.*	Sensor unit	Direction of signal	Connected to
1	Power supply +24 V	←	POWER
2	Open signal	→	Remote host display unit
3	Setpoint actuating signal 1	→	
4	Measuring unit connection check signal	→	
7	Setpoint 1 set value	→	
8	Measurement value	→	POWER
9	Power ground	-	
10	OUT-COM (Ground)	-	
11	Setpoint 2 actuating signal 2	→	
14	Setpoint 2 set value	→	
15	Ground	-	

*Terminals not mentioned here are not used. Do not make wiring connection to terminals not mentioned above.

2. Installation

2.1. Preparations

- 1) Unpack the unit and check quantities.
- 2) Check components for possible damage.

2.2. Installation

2.2.1. Installing the sensor head to the sensor unit

Turn the clamp screw to loosen the clamp. Install the sensor head according to the following procedure.

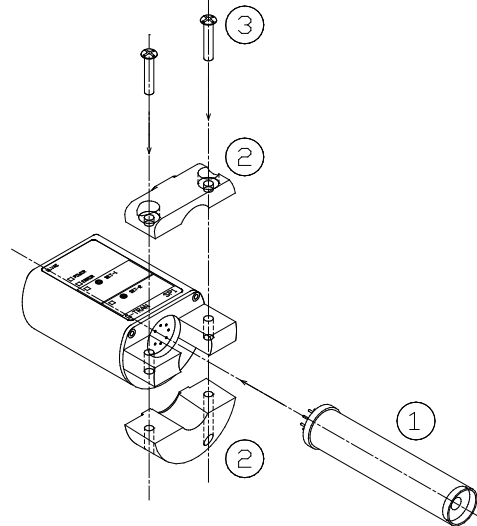
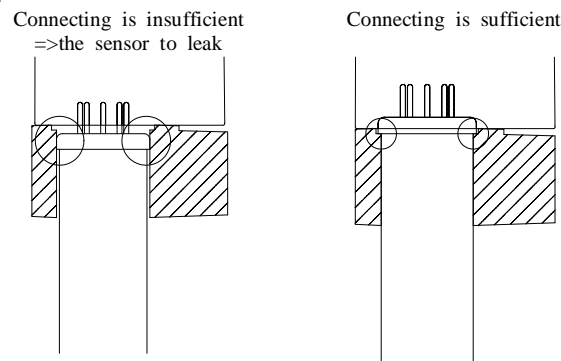


Fig. 2-1 Installing the sensor head

- 1) Insert the sensor head in the direction of pin, as shown in the figure.
- 2) Hold the sensor head with the clamp.
- 3) Tighten the screw to fix the sensor head.

Please note the following three points when installing the measuring element to the Pirani gauge SP1.
 There is a risk of breakage of gauge head in case of wrong use.

- 1 Please tightening the Clamping screw till eliminate the rattling. Do not tighten more when is enough tight.
 Recommend torque : 0.4N/m or less
- 2 Please tighten the clamping screw in parallel with the same torque tight.
 Do not tight the screw till the end, one by one. Tighten both clamp screw with same torque.
- 3 Install the sensor head to the sensor unit SP1 , caution under 3 points. If don't caution , Sensor head may be damaged.



2.2.2. Installing the sensor unit

Install the sensor head to the gauge port of the vacuum system.

1) Measuring position

This gauge measures the static pressure in the position where the sensor head is installed. If there is a gas flow, source of outgas or intense electrons or ions in the vacuum system, carefully select the measuring position so that measurement is least affected by them.

Because of the principles of the Pirani gauge, the measurement value is affected by the ambient temperature of the sensor head. Be careful that the ambient temperature deviates noticeably from the temperature at the time of calibration (25° C).

2) Installing the sensor head

Install the sensor head in such a manner that the plane of the sensor mounting port is parallel to gas flow. Ensure that gas does not enter the sensor head in the form of beam. (See Fig. 2-2.)

- Mount the filament perpendicularly to gravity, if possible. (See Fig. 2-2.)

• The sensor head filament is as thin as 25 μm. Avoid use in a place where vibration is at a high level. Also be careful in selecting the installation place and handling because mechanical impact is responsible for filament burnout in most cases.

• O-rings to be used in installing the sensor head should be as free from outgas as possible. Use of rubber pipes or grease that release much outgas can be a cause of error.

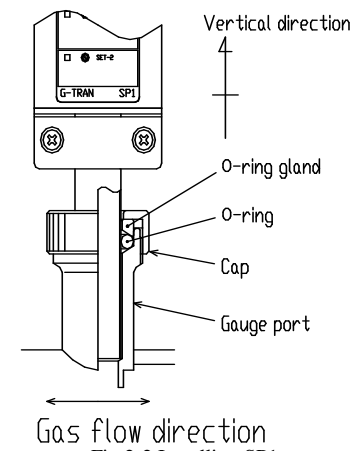


Fig. 2-2 Installing SP1

2.2.3. Electrical connection

Make electrical connection referring to the pin arrangement on chapter 1.

Install the sensor head first and then make electrical connection.

• The power GND [9-pin], OUT-COM [10-pin] and GND [15-pin] are common after being filtered inside. Use power +24 V [1-pin] and power GND [9-pin] for connection of the power line. If other GND is used, the instrument may be subject to noise.

• Fix the cable so that undue force is not exerted to the connection of the cable.

• Securely tighten the connector fixing screws.

• In supplying power to the sensor unit, do not mistake pin numbers.

3. Cautions in handling

• Make measurement more than one minute after turning on power and the output is stabilized.

• For precision measurement, wait for more than 10 minutes after turning on power and the temperature equilibrium of the sensor head is established.

• Do not turn off the power to the sensor head during a sequence of measurements.

• The characteristics of the sensor head may change if it is exposed to a chemically active or highly adsorptive gas. In that event, fill the sensor head with nitrogen or inert gas or dry air with the sensor head energized with power and pump it. Repeat this operation (purging). It may be restored to the original condition. However, do not spray such gas to the opening of the sensor head for purging. If there is no prospect of the characteristic being restored, replace the sensor head with a new one.

• The Pirani gas is sensitive to all types of gas, but the sensitivity varies with the type of gas. The unit displays pressure by assuming gas to be nitrogen.

4. Output signal

Signals are outputted from the connector at the top of the sensor unit in the open collector format. Fig. 4-1 shows its internal circuit.

4.1. Setpoint actuating signal [SET-1 ON/OFF] [SET-2 ON/OFF]

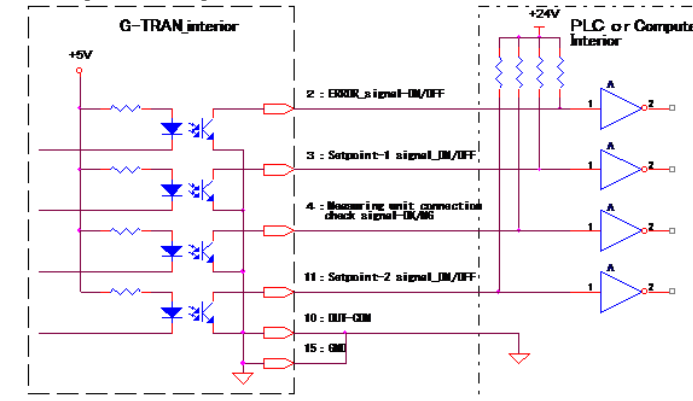
The internal transistor is actuated when the measured value is lower than the set pressure. (Lo output when setpoint is ON.)

See chapter 1 for the pin numbers.

4.2. Filament open signal [ERR ON/OFF]

Transistor is actuated if the sensor head filament burns out (Lo output when open). At this time, the setpoint output is off.

See chapter 1 for the pin numbers.



Output rating [24 VMAX, 50 mA MAX, saturation voltage is 1V]

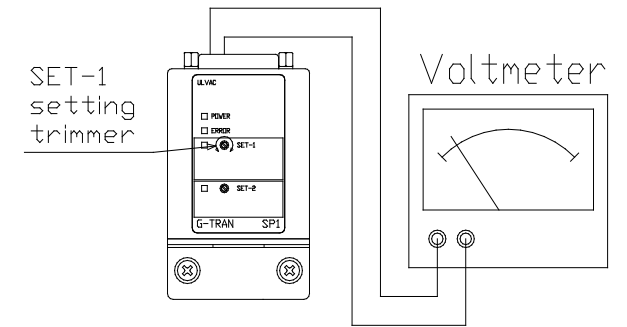
Fig. 4-1 Signal output internal circuit diagram

5. Setting of setpoint

To use the setpoint, make necessary settings according to the following procedure. (Both setpoints 1 and 2 are factory set at near 1.4×10^2 Pa (approx. 2.5 V).)

Connect a voltmeter between the setpoint set value and ground of the SP1 I/O connector. The set voltage is outputted between the setpoint set value and ground by turning the setpoint setting trimmer.

The output voltage is the same as the measured pressure curve. Read the voltage value of a pressure point to be set from the conversion table and turn the trimmer for adjustment so that the voltage is obtained. Turning the trimmer clockwise increases the set value. The trimmer is a three-turn trimmer. If it is turned beyond the higher limit of rotation, it will click and be idle.



6. Functions

6.1. Setpoint [SET-1 ON/OFF] [SET-2 ON/OFF]

6.1.1. Setpoint

Setpoint function outputs a signal indicating if the measured pressure is below a certain pressure value. The signal is outputted in the open collector form (Lo output when setpoint is ON).

The rating of the output is [24 VMAX, 50 mA MAX, saturation voltage is 1V].

6.1.2. Setting of setpoint

The setpoint value is set with a trimmer on the SP1 front panel.

Values that can be set are 4.0×10^{-1} to 3.0×10^3 Pa as with the measurement range.

6.2. Open filament detection [ERR ON/OFF]

6.2.1. What is open detection?

The open detection function outputs a signal indicating that the sensor head filament has burnt out. The form of the output signal is open collector (Lo output when open).

The rating of the output is [24VMAX, 50 mA MAX, saturation voltage is 1V].

6.2.2. Confirmation of open filament

The figure below shows the connection diagram for the Pirani gauge sensor head filament. Check continuity referring to this diagram. The resistance value of the filament is about 13 ohms under atmospheric pressure.

Note: When checking the filament for continuity, do not feed a current of more than 10 mA to the filament to avoid shorter life of filament.

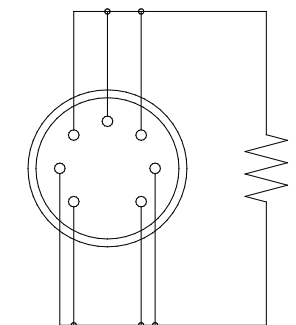


Fig. 6-1 Sensor head (WP-01, 02, 03, 16) filament connection diagram

6.2.3. When the display unit is used

The open signal of the display unit is outputted upon receiving an open signal from the measuring unit (sensor unit, box unit). Whenever using an open signal from the display unit, connect [pin 2] of the sensor unit and that of the display unit. Otherwise, the open signal from the display unit will not be displayed.

6.3. Measurement Value Output

6.3.1. Measurement value voltage output form

All measurable pressure ranges are outputted by an analog voltage of 0 to 10 volts (non-linear). See page 27 for the relationship between the pressure and the measurement value output voltage.

6.3.2. Measurement value outputs in each condition

Table 6-1 gives the measurement value outputs in several conditions that can occur during measurement.

Operating condition	Measurement value output voltage
In normal measurement	Voltage corresponding to measured pressure
When filament is open	9 V or more
Atmospheric pressure	5 V or more
Below measurable lower limit	0 V

Table 6-1 Measurement Value Output Voltages

7. Specifications

7.1. Key Specifications

Name	Pirani vacuum gauge sensor unit Model SP1	
Connectable sensor head	One pc.	
Compatible sensor head	WP-01, WP-02, WP-03, WP-16	
Measurable pressure range	$4.0 \times 10^{-1} \sim 3.0 \times 10^3$ [Pa]	
Measurement Accuracy (when shipped from factory)	0.4Pa ~ 10Pa : $\pm 50\%$ 10Pa ~ 50Pa : $\pm 30\%$ 51Pa ~ 760Pa : $\pm 15\%$ 760Pa ~ 1000Pa : $\pm 30\%$ 1000Pa ~ 3000Pa : $\pm 50\%$	
Sensor head interchangeability	Within $\pm 3\%$ at filament resistance value	
Operating temperature range	10 to 40°C	
Control input signal	None	
Data output	0 V to 10 VDC, non-linear	
	Measurement data	
	Setpoint actuating set value -1: data	
	Setpoint actuating set value -2: data	
Control output signal	0 V to 10 VDC, non-linear [24V _{MAX} , 50mA _{MAX} , saturation voltage is 1V]	
	Open signal [ON/OFF]	
	Setpoint actuating signal -1 [ON/OFF]	
	Setpoint actuating signal -2 [ON/OFF]	
LED display	POWER	SET-1
	ERROR	SET-2
Power supply	DC24V \pm 2V,90mA (sensor unit alone)	
Input/output connector	D-sub15 pin M2.6mm screw	
Weight of main unit	190 g (not including sensor head)	
Outside dimensions	About $\phi 50 \times 146$ mm (including sensor head)	

7.2. Standard Accessories

Connector	D-sub 15 socket	M2.6 screw	1pc.
Clamp hood			1 pc.
Quick manual	(This paper)		1copy

7.3. Options

Display unit	1CH Digital	ISG1(24VDC power supply type)
	4CH Digital	IM1R1(24VDC power supply type) IM2R1(100VAC power supply type)
Sensor head	See Key Specifications "Compatible sensor head" .	
Display cable	2 m, 5 m, and 10 m (between measuring unit and display unit)	

8. Warranty

This product was shipped after rigid company inspection. However, in case any failure occurs under ULVAC's responsibility, such as defect in manufacturing and damage during transportation, Buyer shall inform ULVAC, Inc. or the local ULVAC representatives. ULVAC will repair or exchange it at free of charge.

Warrantable Items

- 1) This unit

Duration of guarantee

One (1) year after shipping date from ULVAC

Warranty scope

- 1) Domestic business in Japan: Product, which has damage, caused by a failure on delivery.
- 2) Direct export transaction: Product, which has damage, caused by a failure on delivery. The warranty scope shall confirm to the new INCOTERMS.
- 3) Products not satisfying meet the standard specifications although the product is used under the normal service conditions such as temperature range and power etc.

Response procedure

- 1) Domestic business in Japan: ULVAC send a replacement or Buyer return the defective items to ULVAC, Inc. or to the local ULVAC representatives for repair. If field service is required, Buyer shall ask ULVAC, Inc. or the local ULVAC representatives.
- 2) Direct export transaction: ULVAC send a replacement or Buyer return the defective items to ULVAC, Inc. or to the local ULVAC representatives for repair. Return charge shall be paid by Buyer.

Disclaimer

- 1) Failure occurred after expiration of warranty period
- 2) Failure caused by force majeure, such as fire, storm and flood damage, earthquake, lightning strike, war etc.
- 3) Failure occurred due to carelessness handling or faulty usage
- 4) Products remodeled, disassembled or repaired without ULVAC's acceptance
- 5) Failure occurred under abnormal environment, such as intense electromagnetic field, radiation, high-temperature, high-humidity, flammable gases, corrosive gases, dust etc.
- 6) Failure occurred by noise
- 7) Product deficiency or secondary damage occurred to Buyer, from law suit to ULVAC by third party for patent infringement.
- 8) Sensor head being used (expiration of life, measurement error, etc.)
- 9) Sensor head cable in use (cable burnout due to improper installation, poor contact, etc.)

Others

- 1) In case, special agreement or memorandum for specifications is made individually, the descriptions are prior to this article "13 Product Warranty".
- 2) Buyer shall inform ULVAC when this product is exported out of Japan. In the meantime, Buyer shall take necessary procedures according to Foreign Exchange and Foreign Trade Law.
- 3) As for the question and consultation, Buyer shall check the model and serial number and ask the local representative or ULVAC, Inc.
- 4) The content of this document is subject to change without notice in future.

9. Certificate of Decontamination

All material must be certified as decontaminated and this certificate must be submitted to your closest local ULVAC service center or sales office prior to shipment. The form is available for download from ULVAC website.

10. Network

ULVAC, Inc: <http://www.ulvac.co.jp/eng/index.html>

Service Centers: <http://www.ulvac.co.jp/eng/support/service/index.html>

Sales Offices: http://www.ulvac.co.jp/eng/support/sales_office/index.html

