

SK00-8431-E7-013-02

**ULVAC**

**G-TRAN SERIES**

**SENSOR UNIT**

**MODEL SP1 PIRANI VACUUM GAUGE**

**SPECIFICATIONS**



This manual is for the Pirani vacuum gauges  
of the following serial numbers.

Serial No. 00001 and higher

**Components Division,  
ULVAC , Inc.**

# 1. SPECIFICATIONS

## 1.1 Key Specifications

Name	Pirani vacuum gauge sensor unit Model SP1	
Connectable sensor head	1 pc.	
Compatible sensor head	WP-01,WP-02,WP-03,WP-16	
Measurable pressure range	$4.0 \times 10^{-1}$ to $3.0 \times 10^3$ 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	
	Setpoint actuating set value -2	
Control output signal	Open collector output, negative logic [24 V <sub>MAX</sub> , 50 mA <sub>MAX</sub> , 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	24 VDC $\pm 2$ V, 90 mA (sensor unit alone)	
Input/output connector	D-sub 15-pin (M2.6 screw)	
Weight of main unit	190 g (not including sensor head)	
Outside dimensions	Dimensional drawing.	

## 1.2 Standard Accessories

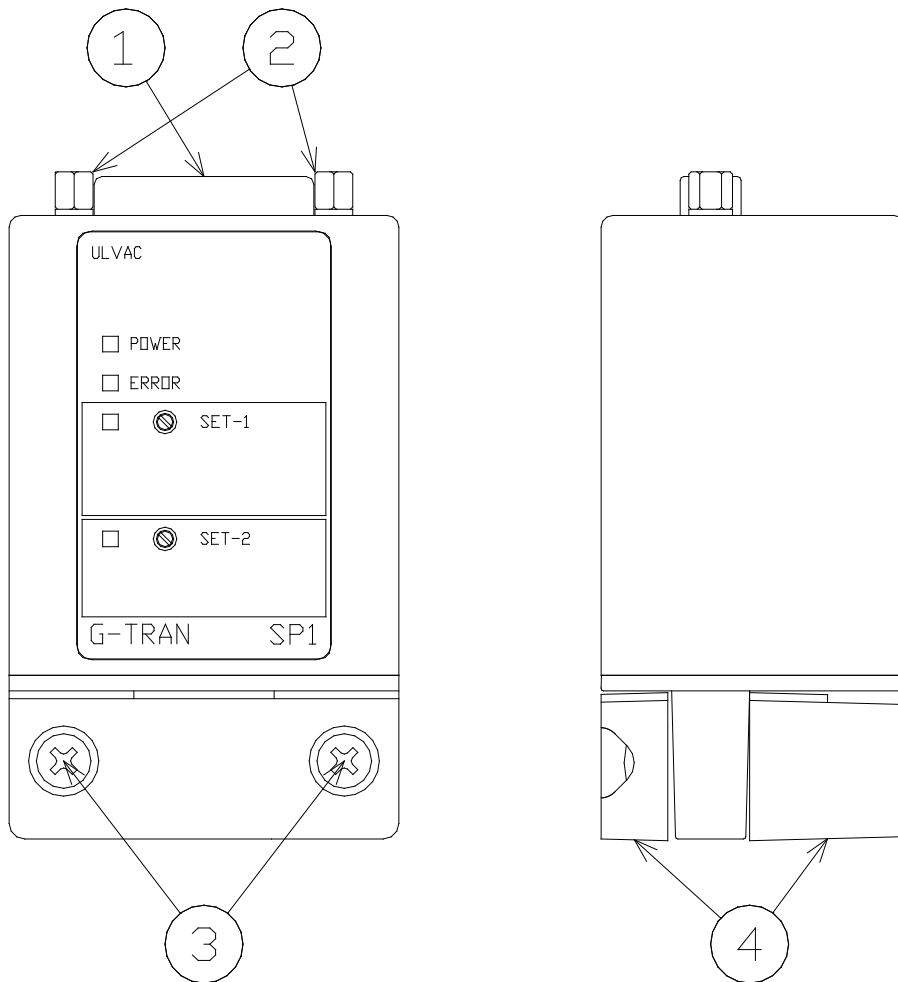
Connector	D-sub 15 socket (M2.6 screw)	1 pc
Clamp hood		1 pc
Quick manual		1 pc

## 1.3 Options

Display unit	
1CH Digital	Model ISG1( 24VDC power supply type) End of sale: ISP1, ISP2, IAP2
4CH Digital	Model IM1R1(24VDC power supply type) Model IM2R1(100VAC power supply type)
Sensor head	See 3.1 Key Specifications "Compatible sensor head" and page 11.
Display cable	2 m, 5 m, and 10 m (between measuring unit and display unit)
Inspection certificate	
Calibration certificate	
JCSS calibration certificate	
Traceability certificate	

## 2. NOMENCLATURE AND FUNCTIONS

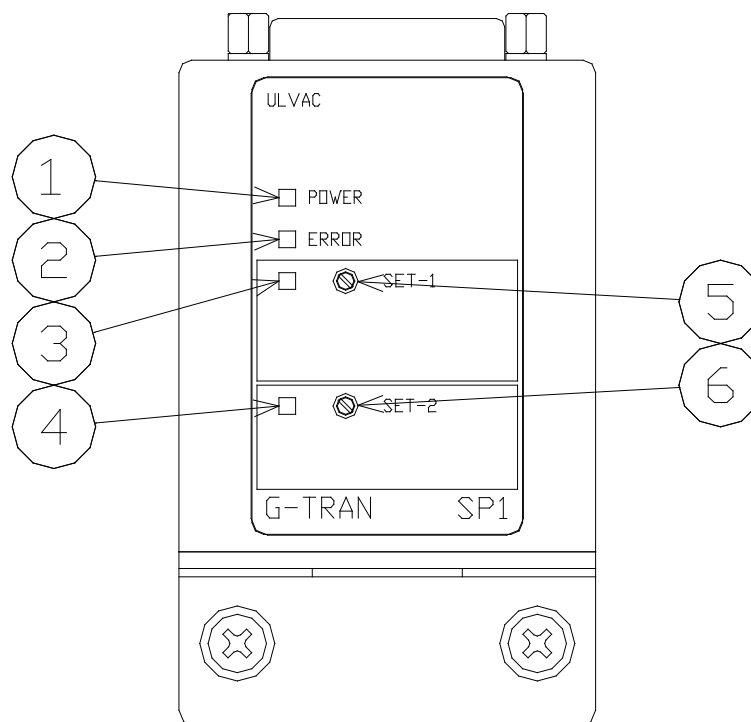
### 2.1 Assembly



Assembly

No.	Component	Function
①	I/O connector	I/O connector for power supply, data and signal (D-sub 15-pin)
②	Screw	Screw for clamp hood (M2.6)
③	Clamp screw	Sensor head clamping screw (M4)
④	Sensor head clamp	Clamp that clamps and fixes the sensor head

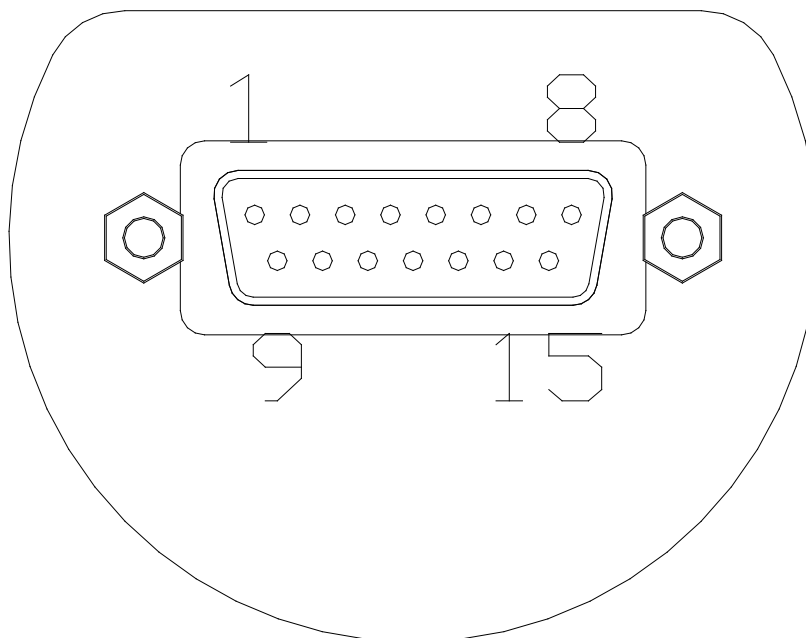
## 2.2 Front Panel



Front panel

No.	Component	Function
①	POWER lamp(POWER)	Lights when power is supplied to the sensor unit.
②	ERROR lamp (ERROR)	Lights when the sensor head filament has burnt out.
③	SET-1 lamp (SET-1)	Lights when setpoint 1 is actuated.
④	SET-2 lamp (SET-2)	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.

## 2.3 Input/Output Connector



Input/output connector pin arrangement

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	→	
9	Power ground	←	Power
10	OUT-COM (Ground)	←	Remote host display unit
11	Setpoint 2 actuating signal 2	→	
14	Setpoint 2 set value	→	
15	Ground	←	

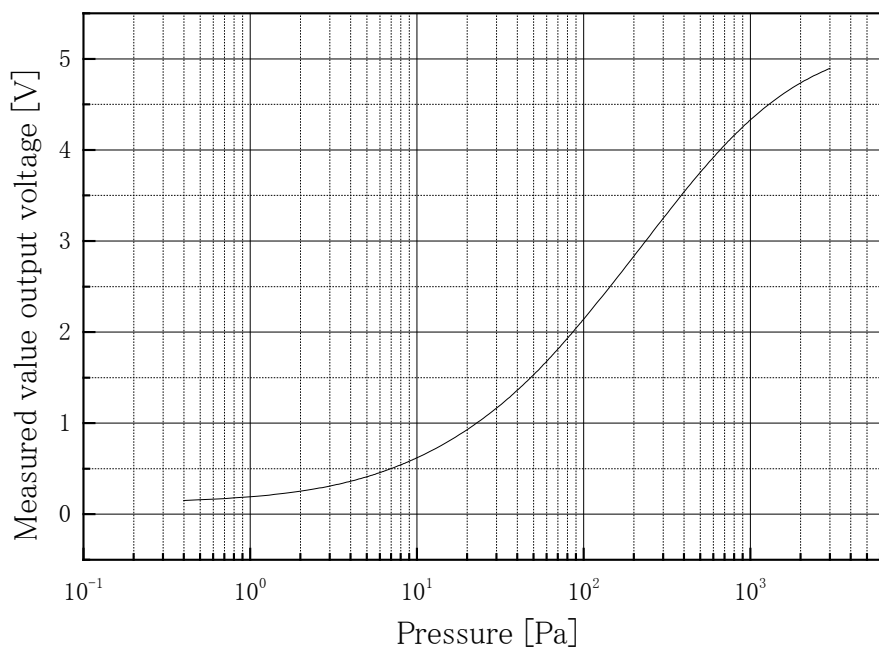
\* Terminals not mentioned here are not used. Do not make wiring connection to terminals not mentioned above.

### 3. Measurement Value Output

#### 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 9 for the relationship between the pressure and the measurement value output voltage.



Pressure-measurement value output graph

#### 3.2 Measurement value outputs in each condition

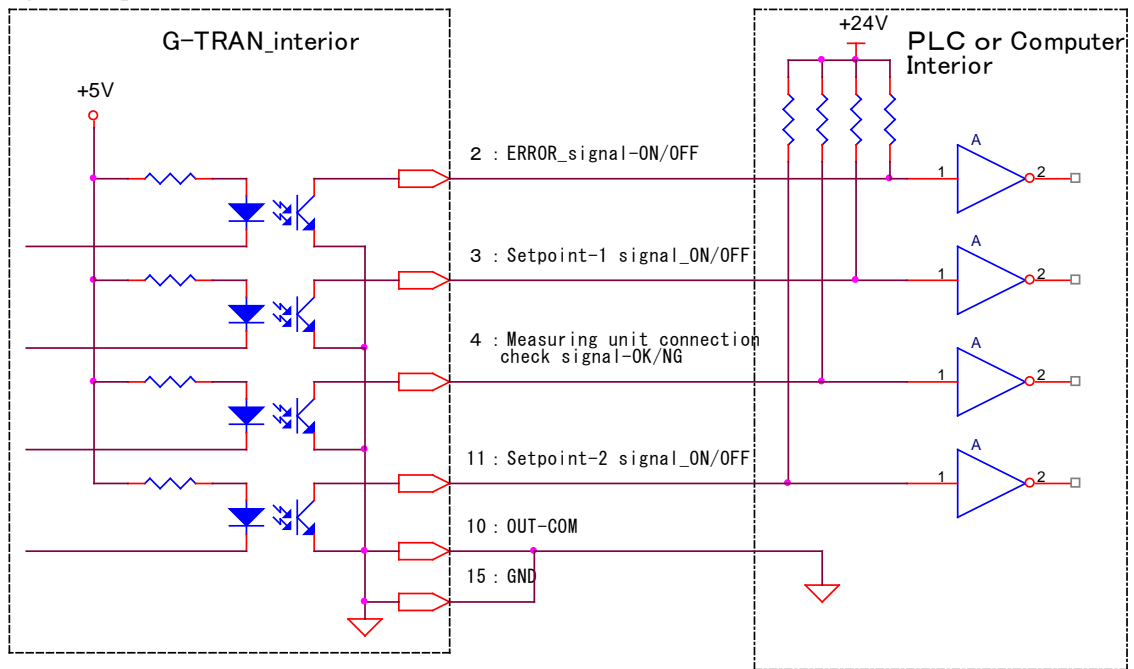
Table gives the measurement value outputs in several conditions that can occur during measurement.

Measurement Value Output Voltages

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

## 4. I/O signal output

### Signal Output



Signal output internal circuit diagram



## 5. 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
- 2) Sensor head on delivery

### 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 conform 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.

The content of this document is subject to change without notice in future.

## 5. APPENDIX

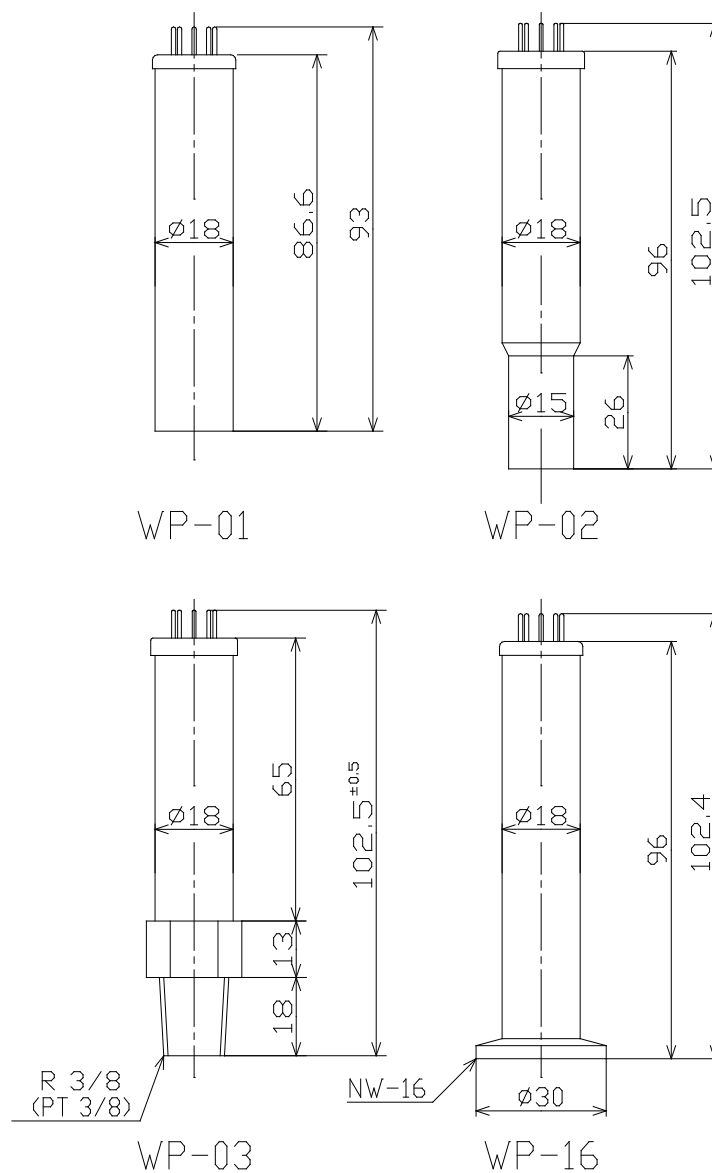
### 5.1 Pressure-Measurement Value List

Pressure [Pa]	Measurement value output [V]	Pressure [Pa]	Measurement value output [V]	Pressure [Pa]	Measurement value output [V]
4.0E-01	0.152	5.4E+00	0.430	1.4E+01	0.756
5.0E-01	0.159	5.5E+00	0.435	1.5E+01	0.787
6.0E-01	0.166	5.6E+00	0.439	1.6E+01	0.817
7.0E-01	0.172	5.7E+00	0.444	1.7E+01	0.846
8.0E-01	0.179	5.8E+00	0.448	1.8E+01	0.875
9.0E-01	0.186	5.9E+00	0.453	1.9E+01	0.902
1.0E+00	0.192	6.0E+00	0.457	2.0E+01	0.929
1.1E+00	0.198	6.1E+00	0.462	2.1E+01	0.955
1.2E+00	0.205	6.2E+00	0.466	2.2E+01	0.980
1.3E+00	0.211	6.3E+00	0.471	2.3E+01	1.005
1.4E+00	0.217	6.4E+00	0.475	2.4E+01	1.030
1.5E+00	0.223	6.5E+00	0.480	2.5E+01	1.053
1.6E+00	0.229	6.6E+00	0.484	2.6E+01	1.077
1.7E+00	0.235	6.7E+00	0.488	2.7E+01	1.100
1.8E+00	0.241	6.8E+00	0.493	2.8E+01	1.122
1.9E+00	0.247	6.9E+00	0.497	2.9E+01	1.144
2.0E+00	0.253	7.0E+00	0.501	3.0E+01	1.165
2.1E+00	0.259	7.1E+00	0.505	3.1E+01	1.186
2.2E+00	0.264	7.2E+00	0.510	3.2E+01	1.207
2.3E+00	0.270	7.3E+00	0.514	3.3E+01	1.227
2.4E+00	0.276	7.4E+00	0.518	3.4E+01	1.247
2.5E+00	0.282	7.5E+00	0.522	3.5E+01	1.267
2.6E+00	0.287	7.6E+00	0.526	3.6E+01	1.286
2.7E+00	0.293	7.7E+00	0.530	3.7E+01	1.305
2.8E+00	0.298	7.8E+00	0.534	3.8E+01	1.324
2.9E+00	0.304	7.9E+00	0.538	3.9E+01	1.343
3.0E+00	0.309	8.0E+00	0.543	4.0E+01	1.361
3.1E+00	0.315	8.1E+00	0.547	4.1E+01	1.379
3.2E+00	0.320	8.2E+00	0.551	4.2E+01	1.397
3.3E+00	0.325	8.3E+00	0.555	4.3E+01	1.414
3.4E+00	0.331	8.4E+00	0.559	4.4E+01	1.431
3.5E+00	0.336	8.5E+00	0.562	4.5E+01	1.448
3.6E+00	0.341	8.6E+00	0.566	4.6E+01	1.465
3.7E+00	0.346	8.7E+00	0.570	4.7E+01	1.481
3.8E+00	0.352	8.8E+00	0.574	4.8E+01	1.498
3.9E+00	0.357	8.9E+00	0.578	4.9E+01	1.514
4.0E+00	0.362	9.0E+00	0.582	5.0E+01	1.530
4.1E+00	0.367	9.1E+00	0.586	5.1E+01	1.545
4.2E+00	0.372	9.2E+00	0.590	5.2E+01	1.561
4.3E+00	0.377	9.3E+00	0.593	5.3E+01	1.576
4.4E+00	0.382	9.4E+00	0.597	5.4E+01	1.591
4.5E+00	0.387	9.5E+00	0.601	5.5E+01	1.606
4.6E+00	0.392	9.6E+00	0.605	5.6E+01	1.621
4.7E+00	0.397	9.7E+00	0.609	5.7E+01	1.636
4.8E+00	0.401	9.8E+00	0.612	5.8E+01	1.650
4.9E+00	0.406	9.9E+00	0.616	5.9E+01	1.664
5.0E+00	0.411	1.0E+01	0.620	6.0E+01	1.678
5.1E+00	0.416	1.1E+01	0.656	6.1E+01	1.692
5.2E+00	0.421	1.2E+01	0.690	6.2E+01	1.706
5.3E+00	0.425	1.3E+01	0.724	6.3E+01	1.720

Pressure [Pa]	Measurement value output [V]	Pressure [Pa]	Measurement value output [V]	Pressure [Pa]	Measurement value output [V]
6.4E+01	1.733	2.4E+02	3.019	7.4E+02	4.098
6.5E+01	1.747	2.5E+02	3.061	7.5E+02	4.109
6.6E+01	1.760	2.6E+02	3.102	7.6E+02	4.120
6.7E+01	1.773	2.7E+02	3.141	7.7E+02	4.130
6.8E+01	1.786	2.8E+02	3.178	7.8E+02	4.141
6.9E+01	1.799	2.9E+02	3.214	7.9E+02	4.151
7.0E+01	1.812	3.0E+02	3.249	8.0E+02	4.161
7.1E+01	1.824	3.1E+02	3.282	8.1E+02	4.171
7.2E+01	1.837	3.2E+02	3.314	8.2E+02	4.180
7.3E+01	1.849	3.3E+02	3.346	8.3E+02	4.190
7.4E+01	1.861	3.4E+02	3.376	8.4E+02	4.199
7.5E+01	1.873	3.5E+02	3.405	8.5E+02	4.208
7.6E+01	1.885	3.6E+02	3.433	8.6E+02	4.217
7.7E+01	1.897	3.7E+02	3.461	8.7E+02	4.226
7.8E+01	1.909	3.8E+02	3.487	8.8E+02	4.235
7.9E+01	1.921	3.9E+02	3.513	8.9E+02	4.243
8.0E+01	1.932	4.0E+02	3.538	9.0E+02	4.252
8.1E+01	1.944	4.1E+02	3.562	9.1E+02	4.260
8.2E+01	1.955	4.2E+02	3.586	9.2E+02	4.268
8.3E+01	1.966	4.3E+02	3.609	9.3E+02	4.276
8.4E+01	1.977	4.4E+02	3.631	9.4E+02	4.284
8.5E+01	1.988	4.5E+02	3.652	9.5E+02	4.292
8.6E+01	1.999	4.6E+02	3.673	9.6E+02	4.300
8.7E+01	2.010	4.7E+02	3.694	9.7E+02	4.307
8.8E+01	2.021	4.8E+02	3.714	9.8E+02	4.315
8.9E+01	2.031	4.9E+02	3.733	9.9E+02	4.322
9.0E+01	2.042	5.0E+02	3.752	1.0E+03	4.329
9.1E+01	2.052	5.1E+02	3.771	1.1E+03	4.396
9.2E+01	2.063	5.2E+02	3.789	1.2E+03	4.453
9.3E+01	2.073	5.3E+02	3.806	1.3E+03	4.504
9.4E+01	2.083	5.4E+02	3.824	1.4E+03	4.548
9.5E+01	2.093	5.5E+02	3.840	1.5E+03	4.588
9.6E+01	2.103	5.6E+02	3.857	1.6E+03	4.624
9.7E+01	2.113	5.7E+02	3.873	1.7E+03	4.656
9.8E+01	2.123	5.8E+02	3.888	1.8E+03	4.685
9.9E+01	2.132	5.9E+02	3.904	1.9E+03	4.711
1.0E+02	2.142	6.0E+02	3.919	2.0E+03	4.735
1.1E+02	2.235	6.1E+02	3.933	2.1E+03	4.757
1.2E+02	2.319	6.2E+02	3.948	2.2E+03	4.777
1.3E+02	2.397	6.3E+02	3.962	2.3E+03	4.796
1.4E+02	2.471	6.4E+02	3.975	2.4E+03	4.813
1.5E+02	2.539	6.5E+02	3.989	2.5E+03	4.829
1.6E+02	2.604	6.6E+02	4.002	2.6E+03	4.844
1.7E+02	2.666	6.7E+02	4.015	2.7E+03	4.858
1.8E+02	2.724	6.8E+02	4.027	2.8E+03	4.871
1.9E+02	2.779	6.9E+02	4.040	2.9E+03	4.883
2.0E+02	2.832	7.0E+02	4.052	3.0E+03	4.895
2.1E+02	2.882	7.1E+02	4.064		
2.2E+02	2.930	7.2E+02	4.075	Atm. Pressure	5 V or more
2.3E+02	2.975	7.3E+02	4.087	Open	9 V or more

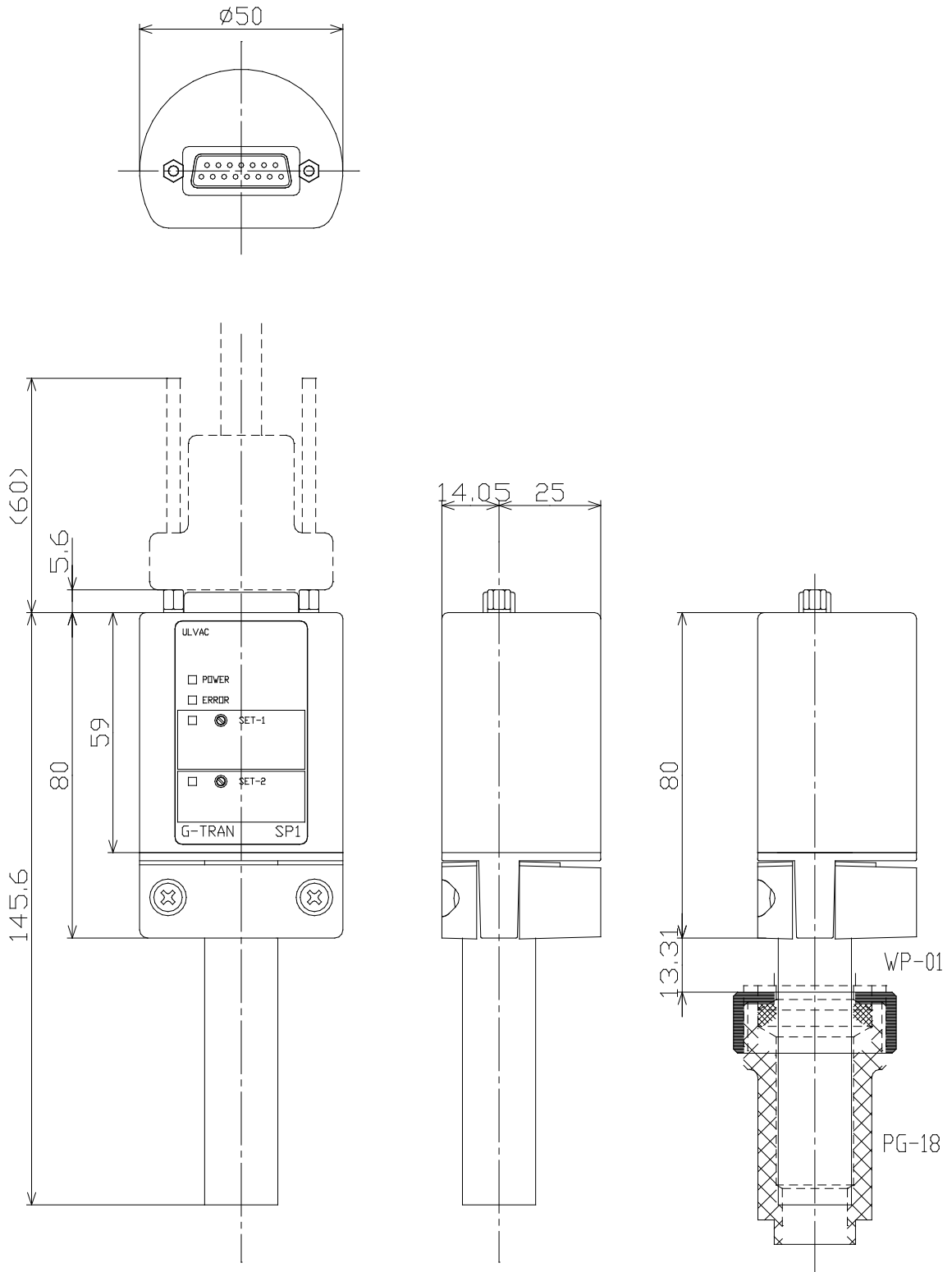
## 5.2 Related Drawings

### 5.2.1 Compatible Sensor Heads



Compatible sensor heads

Sensor head model name	Mounting port diameter	Filament material	Case material
WP-01	18 mm dia.	Pt (25 $\mu$ m dia.)	BS (Ni plating)
WP-02	15 mm (18 mm) dia.	Pt (25 $\mu$ m dia.)	BS (Ni plating)
WP-03	R 3/8 (PT 3/8)	Pt (25 $\mu$ m dia.)	BS (Ni plating)
WP-16	NW-16 (30 mm dia.)	Pt (25 $\mu$ m dia.)	BS (Ni plating)



Dimensional drawing