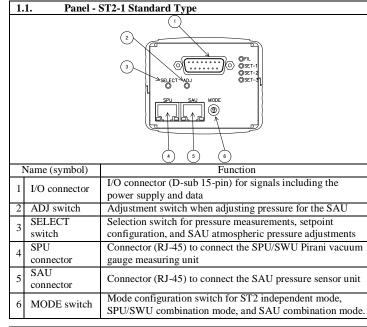


G-TRAN SERIES Multi-Ionization gauge Sensor Unit ST2-1,ST2-2 Quick Manual

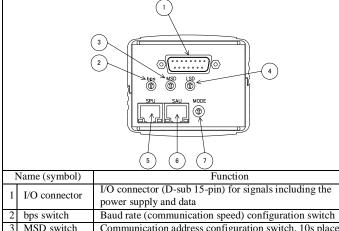
Introduction

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. <u>https://www.ulvac.co.jp/download/en/instruction-manual/</u> This manual is for the following gauges. ST2-1: Serial Nos. 00901 and higher. ST2-2: Serial Nos. 00601 and higher.

. Part Names and Functions

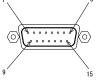


1.2. Panel - ST2-2 Serial Communications Type



	5	mbb switten	communication address configuration switch, ros place
	4	LSD switch	Communication address configuration switch, 1s place
	5	SPU	Connector (RJ-45) to connect the SWU/SPU Pirani vacuum
	5	connector	gauge measuring unit
	6	SAU	Connector (RJ-45) to connect the SAU pressure sensor unit
	0	connector	connector (13 45) to connect the brice pressure sensor unit
	7	MODE switch	Mode configuration switch for ST2 independent mode,
	'	WICDL SWITCH	SWU/SPU combination mode, and SAU combination mode.

1.3. I/O connector D-sub 15 male (M2.6 screws)



1.3.1.	ST2-1 Standard Type	
No	Sensor	Function
1	Power supply	Power supply to drive this unit
2	Sensor error	Outputs the pressure protection signal or a signal during an error such as when there is a filament break
3	Setpoint 1	Outputs a signal during setpoint 1 operation
4	Emission valid Connection signal	Outputs a signal when emission current is normal SPU/SWU and SAU connection check signal
5	FIL ON/OFF	Input a signal to turn the filament on or off * FIL ON signal in ST2 independent mode * FIL OFF signal in combination mode
7	FIL power monitor	Outputs a signal when the FIL power exceeds the threshold
8	Pressure signal/setpoint setting output	Outputs the pressure signal and the setpoint setting output
9	Power supply GND	Ground for the power supply that drives this unit
10	Signal GND	Output signal ground
11	Setpoint 2	Outputs a signal during setpoint 2 operation
13	DEGAS ON/OFF	Input a signal during DEGAS ON
14	Setpoint 3	Outputs a signal during setpoint 3 operation
15	Signal GND	Output signal ground
Case	FG	Frame ground

1.3.2. ST2-2 Serial Communications Type

No	Sensor	Function
1	Power supply	Power supply to drive this unit
4	RS-232C RxD	RS-232C RxD
5	Terminal resistance for RS-485	Terminal resistance for RS-485, connect with pin 13
6	RS-232C TxD	RS-232C TxD
8	Analog output	Outputs the pressure signal
9	Power supply GND	Ground for the power supply that drives this unit
10	RS-485-	RS-485-
12	RS-485+	RS-485+
13	RS-485 (for terminal resistance connection)	Terminal resistance for RS-485, connect with pin 5
14	RS-232C GND	RS-232C ground
15	GND	Output signal ground
Case	FG	Frame ground

2. Attaching this unit

The pressure measurement measures the static pressure at the location where the gauge head is connected. When installed in environments with a flow in the vacuum system or environments with emitted gas sources or strong generation sources of electrons or ions, use caution in selecting the measurement location and attach this unit in a relatively unaffected location.

2.1. Attaching the gauge head

• Attach this unit so that the gauge head attachment opening surface is parallel to the gas flow. In particular, ensure that gases do not enter the gauge head interior like a beam.

• The Pirani vacuum gauge head filament is thin at $\varphi 25~\mu m$, so avoid use as much as possible in locations with large amounts of vibrations. The biggest cause of filament breaks is from mechanical shock, so use caution regarding the installation location and handling.

• Use an O-ring to attach the gauge head that releases little gas. There is a risk of measurement errors or the gauge head operating life will decrease if materials that release a large quantity of gas, such as rubber tubing or grease, are used in the gauge head connection.

3. Mode Configurations : PLEASE CHECK

Configure the mode prior to use. The default is SPU combination mode. Please refer to a manual for the details.

reie	refer to a manual for the details.						
No	Mode	Comments					
0	ST2 independent mode	Ionization gauge only					
1	ST2+SWU/SPU combination mode	Pirani vacuum gauge and ionization gauge ISG1 S/N: 04050~					
2	ST2+SWU/SPU+SAU combination mode	Pressure sensor, Pirani vacuum gauge, ionization gauge ISG1 S/N: 04050~					
3	ST2+SWU/SPU combination mode	Pirani vacuum gauge and ionization gauge ISG1 S/N: 00001~04049					
4	ST2+SWU/SPU+SAU combination mode	Pressure sensor, Pirani vacuum gauge, ionization gauge ISG1 S/N: 00001~04049					

XSWU and SPU cannot be used at the same time.

4. Analog Output

1. Pressure conversion equation

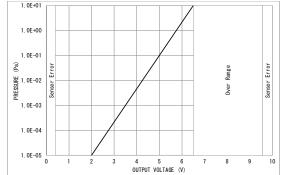
 $P = 10^{\{(V - 7.25)/0.75 + C\}} \Leftrightarrow V = 7.25 + 0.75 \times (\log P - C)$ P: Pressure V: Output voltage (V)

P: Pressure V: Output voltage (V)				
Puressure Unit	C (Pressure unit dependent)			
Pa	2			
Torr	-0.1249			
mbar	0			

4.2. ST2 independent mode analog output

Operating state	Analog output voltage	
Filament off	9.9 V or higher	
During normal measurements	Voltage corresponding to the measured pressure 2.0 to 6.5 V	
ST2 error (Errors such as a filament break)	9.9 V or higher	
Power supply voltage abnormality, sensor unit fault, etc.	0.1 V or less	

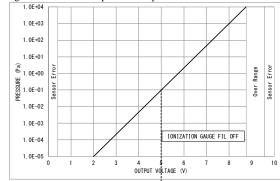
*1: Voltage: $0.1 < V \le 2.0$ is equivalent to pressure: $\le 1 \times 10^{-5}$ Pa.



4.3. SPU combination mode analog output

Operating state	Analog output voltage		
During normal measurements	Voltage corresponding to the measured pressure 2.0 to 8.75 V		
1x10 ⁺⁴ Pa or higher	8.75 V		
ST2 error (Errors such as a filament break)	Voltage corresponding to the measured by SPU 5 V to 8.75V		
Ionization gauge FIL OFF	Voltage corresponding to the measured by SPU 5 V to 8.75V		
SPU error (Errors such as a filament break)	9.9 V or higher		
Power supply voltage abnormality, sensor unit fault, etc.	0.1 V or less		

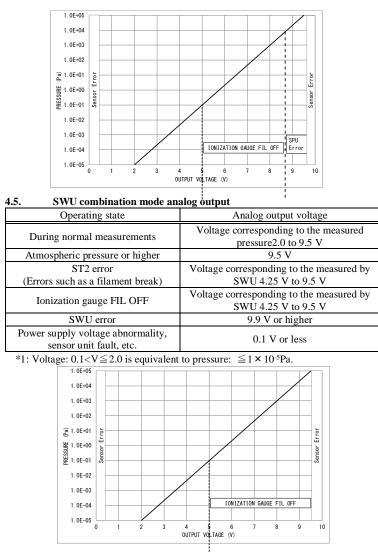
*1: Voltage: $0.1 < V \le 2.0$ is equivalent to pressure: $\le 1 \times 10^{-5}$ Pa.



* Error is output even if SPU error. However, ionization gauge error is cleared by turning FIL off.

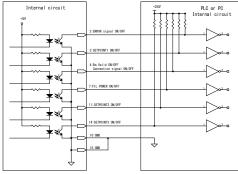
4.4. SAU combination mode analog output			
Operating state	Analog output voltage		
During normal measurements	Voltage corresponding to the measured pressure 2.0 to 9.5 V		
Atmospheric pressure or higher	9.5 V or higher		
ST2 error (Errors such as a filament break)	Voltage corresponding to the measured by SAU and SPU 5 V to 9.5 V SWU and SPU 4.25 V to 9.5 V		
Ionization gauge FIL OFF	Voltage corresponding to the measured by SAU and SPU 5 V to 9.5 V SWU and SPU 4.25 V to 9.5 V		
SPU error (Errors such as a filament break)	Voltage corresponding to the measured by SAU 8.677 V to 9.5V		
SAU error	9.9 V or higher		
Power supply voltage abnormality, sensor unit fault, etc.	0.1 V or less		

*1: Voltage: $0.1 < V \le 2.0$ is equivalent to pressure: $\le 1 \times 10^{-5}$ Pa.



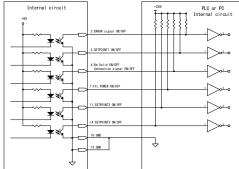
5. Control Input Signals (ST2-1 only)

FIL ON/OFF and DEGAS ON/OFF are input with this unit's I/O connector. When using these signals, short between the pin of the signal to operate and the GND terminal.



6. Control Output Signals (ST2-1 only)

Sensor error and setpoint signals are output from this unit's I/O connector in open collector format. Photocoupler rating: $30 V_{MAX}$, $50 mA_{MAX}$, 70 mW



6.1. Sensor error signal (ST2-1 Standard Type only)

Sensor errors are signals that are output when an error occurs on this units. When a sensor error occurs, the signal becomes low output. When a sensor error occurs, the POWER/ERROR LED turns red and the pressure signal output becomes 9.9 V or higher.

6.1.1. ST2 independent mode

Error details	POWER LED	LED states	I/O	Comments
ST2-1/2 internal voltage abnormality	Red on	All LEDs off	No.2: Lo	Output 9.9 V or higher
Grid voltage abnormality Filament break error	Red on	FIL LED 1 sec. flashing	No.2: Lo No.4: Hi	Error reset with FIL OFF
Pressure protection	Red on	FIL LED 3 sec. flashing	No.2: Lo No.4: Hi	with Fill OFF

6.1.2. SWU / SPU combination mode

Error details	POWER LED	LED states	I/O	Comments
ST2-1/2 internal voltage abnormality	Red on	All LEDs off	No.2: Lo	Output 9.9 V or higher
Grid voltage abnormality Filament break error	Red on	FIL LED 1 sec. flashing	No.2: Lo No.4: Hi	Error reset with FIL OFF
SWU / SPU power supply abnormality Unit cable abnormality Pirani vacuum gauge filament break	Red on	SPU LED Flashing	No.2: Lo No.4: Hi	Output 9.9 V or higher

6.1.3. SAU combination mode

Error details	POWER LED	LED states	I/O	Comments
ST2-1/2 internal voltage abnormality	Red on	All LEDs off	No.2: Lo	
Grid voltage abnormality FIL break error	Red on	FIL LED 1 sec. flashing	No.2: Lo No.4: Hi	Error reset with FIL OFF
SWU/SPU power supply abnormality Unit cable abnormality Pirani vacuum gauge Filament break	Red on	SPU LED Flashing	No.2: Lo No.4: Hi	Outputs SAU pressure
SAU power supply fault Unit cable abnormality	Red on	SAU LED Flashing	No.2: Lo No.4: Hi	Output 9.9 V or higher

7. Configuring the Setpoints

The setpoint is a function that outputs an external signal and illuminates LEDs when the pressure falls below the configured pressure. The configured pressure value is called the setpoint.

To use a setpoint, follow this explanation and configure the necessary items. On the ST2-1, setpoint 1, 2, and 3 are all set to around 5x10-5 Pa (approx. 2.5 V) as the factory default.

7.1. Setpoint setting pressure

Pressure range which setpoint operate for pressure sensor, pirani gauge and ionization gauge is described in the following table.

		0
Type name	Setpoint setting pressure	remarks column
SAU	$1 \times 10^{+4}$ Pa $\sim 1 \times 10^{+5}$ Pa	
SPU ^{**1}	$1 \times 10^{+1} Pa \sim 1 \times 10^{+4} Pa$	automatic switch
SPU [*] 2	$4 \times 10^{-1} Pa \sim 1 \times 10^{+4} Pa$	the condition filament of the ionization
		gauge is forcibly OFF
ST2	5×10^{-8} Pa $\sim 1 \times 10^{+1}$ Pa	
SWU^{*1}	$1 \times 10^{+1}$ Pa ~ $1 \times 10^{+5}$ Pa	automatic switch
SWU [*] 2	1×10^{-2} Pa $\sim 1 \times 10^{+5}$ Pa	the condition filament of the ionization
		gauge is forcibly OFF

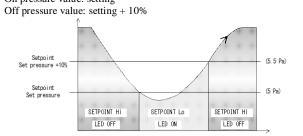
*1: When automatic switch is used, filament of ionization gauge gets ON at 2 Pa, and OFF at 3 Pa. Please be cautious, for instance when setpoint is configured 9 Pa, it gets OFF even tried to turn ON by pirani gauge after "emission current abnormity" of ionization gauge occurs.

*2: Even when it is used under the condition filament of ionization gauge is forcibly OFF, setpoint can be operated down to 0.4 Pa by SPU, 0.01 Pa by SWU. If emission current abnormity is occurred when filament of ionization gauge is ON, sepoint configured under 10 Pa gets OFF. Also, when the filament gets OFF forcibly, setpoint for SPU/SWU can be ON.

7.2. Setpoint on/off pressure

The pressure to turn on the setpoint and the pressure to turn it off possess hysteresis.

On pressure value: setting



7.3. Configuring the setpoints

Analog output becomes the setpoint adjustment voltage mode by pressing the "SELECT" button. The setpoint adjustment voltage changes between 0.27 and 9.5 V.

Coarse adjustment: Push the <ADJ> button and keep it depressed, the setpoint value sweeps.

Fine adjustment: Push the <ADJ> button at short time, the setpoint value changes by one unit.

When the voltage reaches the voltage you wish to set, press the "SELECT " button to set it.

8. Adjusting SAU/SWU Pressure

You can take even more accurate measurements by adjusting the pressure for the SAU/SWU.

Before using a new SAU/SWU, or when you see a deviation in the reading, adjust this unit following procedure below.

Adjustment	Adjustment range		
	SAU	SWU	
atmospheric	7.1x10 ⁺⁴ Pa to 1.2x10 ⁺⁵ Pa	1.0x10 ⁺³ Pa to 1.0x10 ⁺⁵ Pa	
zero	SPU pressure display is less	Adjusted automatically.	
	than 1,000Pa.	(less than 1.0x10 ⁻³ Pa)	

(1) Press the "ADJ" button.

(2) Check that the SAU LED is flashing.

(3) Press the "ADJ" button.

- You can cancel the adjustments by pressing the "SELECT" button when the SAU LED is flashing.
- (4) When POWER LED is off, the flashing LED of SAU will light up. When SAU LED flash means that pressure rate is out of atmospheric adjustment area.

9. Specifications

5. Specifications			
Type name	Standard Type : ST2-1		
	Serial Communications Type : ST2-2		
Connectable sensors	ST2 gauge head SWT-16(NW16), SWT-25(NW25)		
	SWU/SPU Pirani vacuum gauge measuring unit: 1		
	(option)		
	SAU pressure sensor unit: 1 (option)		
Measurement pressure	ST2 independent mode: 1x10 ⁻⁵ Pa to 1x10 ⁺¹ Pa		
range (N ₂)			
Accuracy (N ₂)	ST2 independent mode: $1x10^{-4}$ Pa to $3x10^{+0}$ Pa: $\pm 10\%$		
Repeatability (N ₂)	ST2 independent mode: $1x10^{-4}$ Pa to $3x10^{+0}$ Pa: $\pm 2\%$		
Measurement gas type	Indicates pressure as sensitivity for N ₂		
Emission current	2 mA (1x10 ⁻² Pa or lower), 10 uA		
DEGAS	Electron bombardment - Emission current 2 mA, grid		
	voltage approx. 330 V, 1x10 ⁻³ Pa or lower		
Sampling time	50 ms, 5x moving average		
Analog output	Output voltage: 0 to 10 VDC, log output: 0.75 V/1		
	decade		
	Pressure conversion equation: P=10^{(V-7.25)/0.75+2}		
Update time	50msec		
Resolution	Approx.2.5mV		
Output error	±20mV		
Output impedance	lkΩ		
Control input signals	FIL ON/OFF、DEGAS ON/OFF		
	Operates with open collector input, negative logic		
Control output signals	Sensor error, setpoint 1/2/3, emission valid, filament		
	current abnormality		
	Rating: 24 V _{MAX} , 50 mA _{MAX} , saturation voltage 1 V		
Serial communications	RS232C, RS-485 9600/19200/38400bps		
Gauge head material	Filament : Ir/Y ₂ O ₃ -coated		
-	Others : PtC-Mo, SUS304, FeNiCo, Glass, Ni		
Gauge head withstand	SWT: 2x10 ⁺⁵ Pa (absolute pressure)		
pressure	* Take the withstand pressure for flanges, clamps, and		
	other components into account separately.		
Gauge head internal	SWT-16: 17cm ³ , SWT-25: 19cm ³		
volume			
Operating temperature	10~50°C		
range			
Operating humidity	15% to 80% RH (no condensation)		
range			

Storage temperature	-20 to 65°C (when unpowered, no condensation)	Baffle	Baffle for N	W16, Baffle for NW25
IP code	IP30	Connector for ST2	D-sub15 pin connector (socket type, 2.6mm screw)	
Power supply voltage	20 to 28 VDC (ripple, noise 1% or lower) Standard: about 8W Degas: <19W	Calibration certificate Test results certificate	General calibration certificate JCSS Calibration certificate	
	Power ON: <6A, <4ms	Traceability certificate		
Corresponding	CE standard, UKCA standard	Display unit	1CH	ISG1 (24 VDC power supply)
standard	Validated with SPU, SAU connected The external Display cable 40m		4CH	IM1R1 (24 VDC power supply) IM2R1 (100 VAC power supply)
	The ST2-SWU/SPU,-SAU cable 0.5m* *When using a unit cable of 0.5m or longer, please	Display cable	ST2-display unit cable 2m, 5m, 10m, 15m, 20m, 25m, 30m, 35m, 40m	
Overvoltage category	consider noise separately. Category I: Connected to a circuit that implements	Pirani vacuum gauge measuring unit	SWU/SPU	
	measures to limit excessive overvoltage to a sufficiently low level	Sensor for Pirani vacuum gauge measuring unit	SWP/WP	
I/O connector	D-sub 15-pin 2.6 mm screws	Unit cable GUC-P	0	
Sensor weight	Controller: Approx. 530 g, Sensor(SWT-16/25): 80 g			
External dimensions	144 x 75 x 62 mm (approximate, controller section)	Pressure sensor	SAU	
	tion mode key specifications	Unit cable GUC-A		cting ST2 and SAU 0.5m, 1m, 2m le is connected to SAU.

9.1. SPU com	bination mode key specifications
Measurement	1x10 ⁻⁵ Pa to 1x10 ⁺⁴ Pa
pressure range	When pressure falling: Automatically switches from Pirani
1 0	vacuum gauge to ionization gauge at $2x10^{+0}$ Pa(SPU)
	When pressure rising: Automatically switches from
	ionization gauge to Pirani vacuum gauge at 3x10 ⁺⁰ Pa(SPU)
	* Ionization gauge measurements can be forced off with the
	control signal
Accuracy	Refer to the accuracy for each sensor.
POWER/ERROR	Blue on: Operating normally
LED state	Red on : ST2-1/2, SPU power supply abnormality, etc.
Control input	FIL ON/OFF, DEGAS ON/OFF
signals	Operates with open collector input, negative logic
Signais	* When the FIL ON/OFF signal is low input, the ionization
	gauge is FIL OFF
0.2 CAU	
9.2. SAU com Measurement	bination mode key specifications 1x10 ⁻⁵ Pa to 1x10 ⁺⁵ Pa
pressure range	When pressure falling: Automatically switches from the
pressure range	pressure sensor to Pirani vacuum gauge at $1 \times 10^{+4}$ Pa(SAU)
	When pressure falling: Automatically switches from Pirani
	vacuum gauge to ionization gauge at $2x10^{+0}$ Pa(SWU/SPU)
	When pressure rising: Automatically switches from ionization
	gauge to Pirani vacuum gauge at $3 \times 10^{+0}$ Pa(SWU/SPU)
	When pressure rising: Automatically switches from Pirani
	vacuum gauge to pressure sensor at $1 \times 10^{+4}$ Pa(SAU)
	* Ionization gauge measurements can be forced off with the
	control signal
Accuracy	Refer to the accuracy for each sensor.
POWER/ERROR	Blue on: Operating normally
LED state	Red on : ST2-1/2, SWU/SPU or SAU power supply
LLD state	abnormality, etc.
Control input	FIL ON/OFF, DEGAS ON/OFF
signals	Operates with open collector input, negative logic
Signais	* When the FIL ON/OFF signal is low input, the ionization
	gauge is FIL OFF
9.3. SWU con	ibination mode key specifications
Measurement	1x10 ⁻⁵ Pa to 1x10 ⁺⁵ Pa
pressure range	When pressure falling: Automatically switches from the
pressure runge	pressure sensor to Pirani vacuum gauge at $1 \times 10^{+5}$ Pa(SWU)
	When pressure falling: Automatically switches from Pirani
	vacuum gauge to ionization gauge at $2x10^{+0}$ Pa(SWU)
	When pressure rising: Automatically switches from ionization
	gauge to Pirani vacuum gauge at 3x10 ⁺⁰ Pa(SWU)
	When pressure rising: Automatically switches from Pirani
	vacuum gauge to pressure sensor at $1 \times 10^{+5}$ Pa(SWU)
	* Ionization gauge measurements can be forced off with the
	control signal
Accuracy	Refer to the accuracy for each sensor.
POWER/ERROR	Blue on: Operating normally
LED state	Red on : ST2-1/2, or SWU power supply abnormality, etc.
Control input	FIL ON/OFF, DEGAS ON/OFF
signals	Operates with open collector input, negative logic
	* When the FIL ON/OFF signal is low input, the ionization
	gauge is FIL OFF
	0.0
9.4. Standar	d Accessories

9.4. Standard Accessories

Standard Treeebbs				
Multi-ionization gauge ST2-1/2 unit		1 pc.		
SWT series Sensor for ST2*		1 pc		
Quick manual(this manual)		1 copy		
 *Only when you order at the same time as ST2, it will be attached to ST2 and delivered. *The sensor model is the one specified when ordering. 9.5. Options 				
Gauge Head	1	esh type): SWT-16, SWT-25		
	71	-16 (with Baffle), SWT-25 (with		
	Baffle)			

10. 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: This unit

Duration of guarantee: Within 1 year from the date of delivery

Warrantee 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 warrantee 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

- 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 damnification 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

- 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.

11. Certificate of Decontamination

Please enter the operating condition/trouble symptom of your vacuum gauge in this form and submit it to your local ULVAC service station or sales office after signing it. Available for download from ULVAC website.

12. 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