

G-TRAN SERIES

Multi-Ionization gauge Sensor Unit

ST200-A,ST200-R

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://www.ulvac.co.jp/download/en/instruction-manual/?category=1009>
This manual is for the following gauges. ST200-A: Serial No. 00001 and higher. ST200-R: Serial No. 00001 and higher.

1. Dedicated application

ST200 can check various settings and status using the dedicated applications below. Please refer to the application instruction manual for details.

- UL-MOBI_Windows (Supported OS : Windows 10 64bit or later)
- UL-MOBI_Android (Supported OS : Android 6.0 or later)

UL-MOBI_Android Google Play



UL-MOBI_Windows

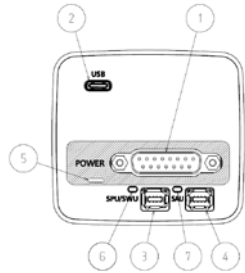
<https://www.ulvac.co.jp/download/en/application/?category=1009>

UL-MOBI_Windows instruction manual

<https://www.ulvac.co.jp/download/en/application/?category=1009>

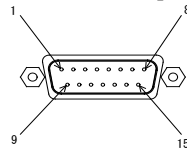
2. Part Names and Functions

2.1. Panel – ST200-A,ST200-R



①	I/O connector	I/O connector for signals including the power supply and data
②	USB connector	Connector to connect with PC or smartphone
③	SPU/SWU connector	Connector (MINI I/O plug) to connect the SPU/SWU Pirani vacuum gauge measuring unit
④	SAU connector	Connector(MINI I/O plug) to connect the SAU pressure sensor unit
⑤	POWER LED	Filament on, Error status indication
⑥	SPU/SWU LED	SPU/SWU status indicate
⑦	SAU LED	SAU status indicate

2.2. I/O connector D-sub 15pin male M2.6 screws



2.2.1. ST200-A

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	Filament ON/OFF	Input a signal to turn the filament on or off *FIL ON signal in ST200 independent mode *FIL OFF signal in combination mode
6	Filament 1/2	Input a signal when selecting filament 2
7	Filament power monitor	Outputs a signal when the filament power exceeds the threshold
8	Pressure signal	Outputs the pressure signal 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

2.2.2. ST200-R

No	Sensor	Function
1	Power supply	Power supply to drive this unit
4	RS-232C Rx/D	RS-232C Rx/D
5	Terminal resistance for RS-485	Terminal resistance for RS-485, connect with pin 13
6	RS-232C Tx/D	RS-232C Tx/D
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

3. 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.

3.1. 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 $\phi 25 \mu\text{m}$, 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.

4. Mode Configurations: PLEASE CHECK

The factory default setting is "2". Mode 2 is automatically recognized and enabled when the power is turned on when operating the ST200 in the stand-alone mode or connecting to each unit (SWU, SPU, and SAU). For detail on mode 3 and 4, please refer to the instruction manual.

No	Mode	Comments
2	Automatic recognition mode (factory setting)	ISG1 S/N: 04050 or later
3	Automatic recognition mode (old output mode)	ISG1 S/N: 00001 to 04049

5. Analog Output

5.1. Pressure conversion equation

$$P = 10^{\{(V - 7.25) / 0.75 + k\}} \Leftrightarrow V = 7.25 + 0.75 \times (\log P - k)$$

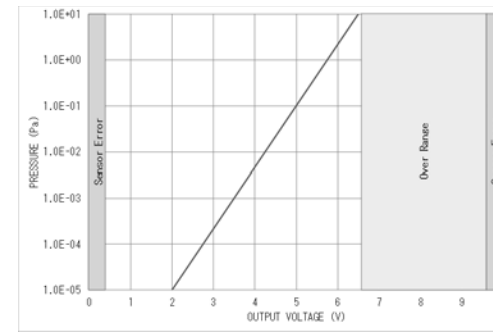
P: Pressure V: Output voltage (V)

Puressure Unit	k (Pressure unit dependent)
Pa	2
Torr	-0.1249
mbar	0

5.2. ST200 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
ST200 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

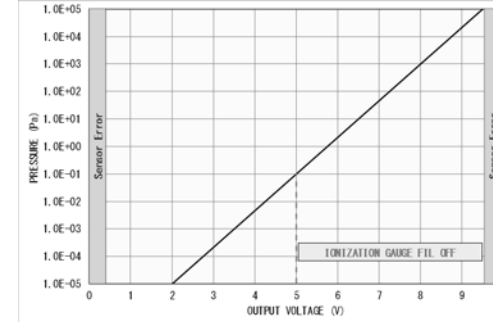
*1: Voltage 0.1 to 2.0V is equivalent to pressure 1×10^{-5} Pa or less.



5.3. SWU combination mode analog output

Operating state	Analog output voltage
During normal measurements	Voltage corresponding to the measured pressure 2.0 to 9.5 V
1×10^{-5} Pa or higher	9.5 V
ST200 filament OFF	Voltage corresponding to the measured by SWU 4.25 V to 9.5 V
ST200 error (Errors such as a filament break)	Voltage corresponding to the measured by SWU 4.25 V to 9.5 V
SWU 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 to 2.0V is equivalent to pressure 1×10^{-5} Pa or less.

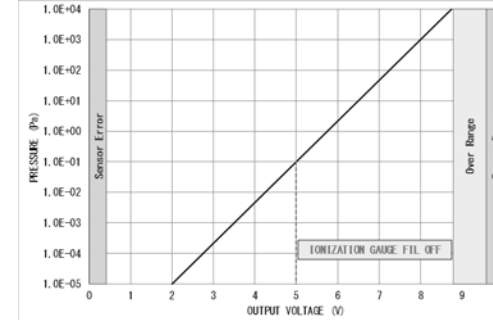


* Error is output even if SWU error.
However, ST200 error is cleared by turning filament off.

5.4. 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
1×10^{-4} Pa or higher	8.75 V
ST200 filament OFF	Voltage corresponding to the measured by SPU 5 V to 8.75V
ST200 error (Errors such as a filament break)	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 to 2.0V is equivalent to pressure 1×10^{-5} Pa or less.

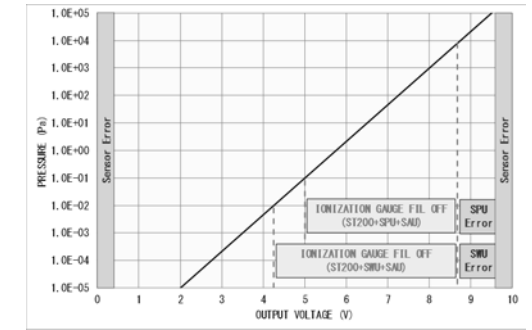


* Error is output even if SPU error.
However, the ST200 error is cleared by turning filament off.

5.5. SAU combination mode analog output

Operating state	Analog output voltage
During normal measurements	Voltage corresponding to the measured pressure 0.27 to 9.5 V
Atmospheric pressure or higher	9.5 V or higher
ST200 filament OFF	Voltage corresponding to the measured by SAU and SWU 4.25 V to 9.5 V SAU and SPU 5 V to 9.5 V
ST200 error (Errors such as a filament break)	Voltage corresponding to the measured by SAU and SWU 4.25 V to 9.5 V SAU and SPU 5 V to 9.5 V
SWU/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 to 2.0V is equivalent to pressure 1×10^{-5} Pa or less.



6. Control Input Signals (ST200-A only)

FIL ON/OFF, FIL 1/2, 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.

7. Control Output Signals (ST200-A 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

7.1. Sensor error signal (ST200-A 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.

7.1.1. ST200 independent mode

Error details	POWER LED	LED states	I/O	Comments
ST200-A/R internal voltage abnormality	Red on	All LEDs off	No.2: Lo	Output 9.9 V or higher
Grid voltage abnormality	Red 1 sec. flashing	POWER LED 1 sec. flashing	No.2: Lo No.4: Hi	Error reset with filament OFF
Filament break error	Red 1 sec. flashing	POWER LED 1 sec. flashing	No.2: Lo No.4: Hi	Output 9.9 V or higher
Pressure protection	Red 3 sec. flashing	All LEDs off	No.2: Lo No.4: Hi	Output 9.9 V or higher

7.1.2. SPU/SWU combination mode

Error details	POWER LED	LED states	I/O	Comments
ST200-A/R internal voltage abnormality	Red on	All LEDs off	No.2: Lo	Output 9.9 V or higher
Grid voltage abnormality	Red 1 sec. flashing	SPU/SWU LED on	No.2: Lo No.4: Hi	Output SWU/SPU pressure
Filament break error	Red 1 sec. flashing	SPU/SWU LED on	No.2: Lo No.4: Hi	Output SWU/SPU pressure
SPU/SWU power supply abnormality Unit cable abnormality	Red on	SPU/SWU LED flashing	No.2: Lo No.4: Hi	Output 9.9 V or higher
Pirani vacuum gauge filament break	Red on	SPU/SWU LED flashing	No.2: Lo No.4: Hi	Output 9.9 V or higher

7.1.3. SAU combination mode

Error details	POWER LED	LED states	I/O	Comments
ST200-A/R internal voltage abnormality	Red on	All LEDs off	No.2: Lo	Output 9.9 V or higher
Grid voltage abnormality	Red 1 sec. flashing	All LEDs on	No.2: Lo No.4: Hi	Output SWU/SPU or SAU pressure
Filament break error				
SWU/SPU Power supply error Unit cable error	Red on	SPU/SWU LED flashing	No.2: Lo No.4: Hi	Output SAU pressure
Pirani vacuum gauge filament break				
SAU Power supply error Unit cable error	Red on	SAU LED flashing	No.2: Lo No.4: Hi	Output 9.9 V or higher

8. Configuring the Setpoints (ST200-A only)

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 ST200-A, setpoint 1, 2, and 3 are all set to around 5×10^{-5} Pa as the factory default.

8.1. Setpoint setting pressure

Pressure range which setpoint operate for pressure sensor, pirani gauge and ST200 is described in the following table.

Type name	Setpoint setting pressure	remarks column
SAU	1×10^{-4} Pa to 1×10^{-5} Pa	
SWU*1	1×10^{-1} Pa to 1×10^{-5} Pa	Automatic switching mode
SWU*2	1×10^{-2} Pa to 1×10^{-5} Pa	the condition filament of ST200 is forcibly OFF
SPU*1	1×10^{-1} Pa to 1×10^{-4} Pa	Automatic switching mode
SPU*2	4×10^{-1} Pa to 1×10^{-4} Pa	the condition filament of ST200 is forcibly OFF
ST200	1×10^{-5} Pa to 1×10^{-1} Pa	

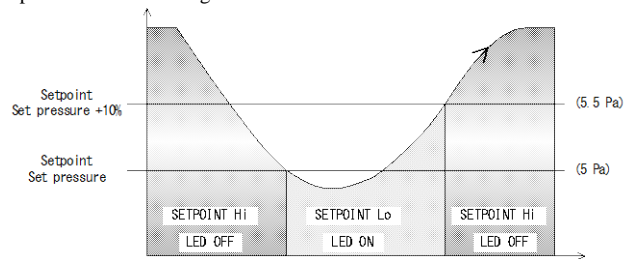
*1: When automatic switch is used, filament of B-A gauge gets ON at 2 Pa, and OFF at 3 Pa. Please be cautious, for instance when setpoint is configured 9 Pa, it gets OFF even tried to turn ON by pirani gauge after "emission current abnormality" of ST200 occurs.

*2: Even when it is used under the condition filament of B-A gauge is forcibly OFF, setpoint can be operated down to 0.4 Pa by SPU, 0.01 Pa by SWU. If emission current abnormality is occurred when filament of ST200 is ON, setpoint configured under 10 Pa gets OFF. Also, when the filament gets OFF forcibly, setpoint for SPU can be ON.

8.2. Setpoint on/off pressure

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

On pressure value: setting
Off pressure value: setting + 10%



8.3. Configuring the setpoints

Setpoint settings can be set using the G-TRAN setting tools "UL-MOBI_Android" and "UL-MOBI_Windows". Please refer to the application instruction manual for details.

9. Adjusting SAU/SWU Pressure

Adjusting the atmospheric pressure of SAU/SWU enables more accurate measurements. Before using a new SAU/SWU, or if there is a discrepancy in the indicated value, please follow the instruction below to adjust it.

For each adjustment use the G-TRAN setting tool "UL-MOBI_Android" "UL-MOBI_Windows" or 1-channel display unit "ISG1". Please refer to the application instruction manual for details.

Adjustment	Adjustment range	
	SAU	SWU
atmospheric	7.1×10^{-4} to 1.2×10^{-5} Pa	1.0×10^{-3} to 1.0×10^{-5} Pa
zero	SWU/SPU pressure display is less than 1,000Pa.	Adjusted automatically. (less than 1.0×10^{-3} Pa)

10. Specifications

Type name	Analog output type: ST200-A Serial Communications Type: ST200-R
Connectable sensors	ST200 gauge head SWT-16(NW16), SWT-25(NW25): 1
Connectable unit	Pirani gauge SWU/SPU : 1 Pressure sensor SAU: 1 *SWU and SPU cannot operate together.
Repeatability (N ₂)	ST200 independent mode: $\pm 2\%$
Measurement gas type	Indicates pressure as sensitivity for N ₂
Emission current	1 mA (1×10^{-3} Pa or lower), 10 uA
DEGAS	Electron bombardment - Emission current 1 mA, grid voltage approx. 330 V, 1×10^{-2} Pa or lower
Sampling time	60 ms, 5 moving average
Analog output	Output voltage: 0 to 10 VDC log output: 0.75 V/1 decade Pressure conversion equation: $V = 7.25 + 0.75 \times (\log P - 2)$
Update time	50msec
Resolution	Approx. 2.5mV
Output impedance	100Ω
Control output signals	Sensor error, setpoint 1/2/3, emission valid, filament power monitor 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, W, Kovar glass, Kovar/Ni plating
Gauge head withstand pressure	2×10^{-5} Pa (absolute pressure) * Take the withstand pressure for flanges, clamps, and other components into account separately.
Gauge head internal volume	SWT-16: 17cm ³ , SWT-25: 19 cm ³
Operating temperature range	10 to 50°C
Heating temperature	Sensor unit only 150°C (with controller ST200 removed). Sensor unit flange part 80°C (Only when the main unit is installed horizontally, the controller ST200 ambient temperature is 50°C or less)
Operating humidity range	15% to 80% RH (no condensation)
Storage temperature	-20 to 65°C (when unpowered, no condensation)
IP code	IP30
Power supply voltage	20 to 28 VDC (ripple, noise 1% or lower) Steady state: 7.0W Degas: 8W Inrush current: 800mA or lower, 4ms or lower
Corresponding standard	CE standard, UKCA standard Validated with SPU, SAU connected The external Display cable 40m The ST200-SWU/SPU,-SAU cable 0.5m* *When using a unit cable of 0.5m or longer, please consider noise separately.
Overvoltage category	Category I: Connected to a circuit that implements measures to limit excessive overvoltage to a sufficiently low level
I/O connector	D-sub 15 pin connector (pin, 2.6 mm screws)
Weight	Controller: Approx. 280 g Gauge head SWT-16: 80 g, SWT-25: 80g
External dimensions	69×63×90 mm (approximate, controller section)

10.1. ST200 independent mode

Measurement gas type (N ₂)	ST200 independent mode: 1×10^{-5} Pa to 1×10^{-1} Pa
Accuracy (N ₂)	ST200 independent mode: 1×10^{-4} Pa to 3×10^{-9} Pa : $\pm 10\%$
POWER LED state	White: Start up Blue: Normal operation Green: ST200 filament on Green blinking: Filament power specified value or more Emission current out of specified value* ¹ Red blinking: Pressure protection, Filament disconnection Emission current specified value or less* ²
Control input signal	FIL ON/OFF, FIL 1/2, DEGAS ON/OFF Open collector input, Negative logic. *When FIL ON/OFF signal is Lo input, the filament of ST200 is OFF.

*1: Supported Serial No. ST200-A: 00200 or later, ST200-R: 00100 or later

*2: Supported Serial No. ST200-A: 00001 to 00199, ST200-R: 00001 to 00099

10.2. SWU combination mode key specifications

Measurement gas type (N ₂)	1×10^{-5} Pa to 1×10^{-1} Pa When pressure falling: SWU is 2Pa or less, SWU⇒ST200 When pressure rising : SWU is 3Pa or more, ST200⇒SWU * ST200 measurements can be forced off with the control signal
Accuracy (N ₂)	Refer to the accuracy for each sensor.
POWER LED state	White: Start up Blue: Normal operation to SWU measurement range Green: ST200 filament on Red: SWU power supply error Green blinking: Filament power specified value or more Emission current out of specified value* ¹ Red blinking: Filament disconnection Emission current specified value or less* ²
Control input signal	FIL ON/OFF, FIL 1/2, DEGAS ON/OFF Open collector input, Negative logic. *When FIL ON/OFF signal is Lo input, the filament of ST200 is OFF.

*1: Supported Serial No. ST200-A: 00200 or later, ST200-R: 00100 or later

*2: Supported Serial No. ST200-A: 00001 to 00199, ST200-R: 00001 to 00099

10.3. SPU combination mode key specifications

Measurement gas type (N ₂)	1×10^{-5} Pa to 1×10^{-4} Pa When pressure falling: SPU is 2Pa or less, SPU⇒ST200 When pressure rising: SPU is 3Pa or more, ST200⇒SPU * ST200 measurements can be forced off with the control signal
Accuracy (N ₂)	Refer to the accuracy for each sensor.
POWER LED state	White: Start up Blue: Normal operation to SPU measurement range Green: ST200 filament on Red: SPU power supply error Green blinking: Filament power specified value or more Emission current out of specified value* ¹ Red blinking: Filament disconnection Emission current specified value or less* ²
Control input signal	FIL ON/OFF, FIL 1/2, DEGAS ON/OFF Open collector input, Negative logic. *When FIL ON/OFF signal is Lo input, the filament of ST200 is OFF.

*1: Supported Serial No. ST200-A: 00200 or later, ST200-R: 00100 or later

*2: Supported Serial No. ST200-A: 00001 to 00199, ST200-R: 00001 to 00099

10.4. SAU combination mode key specifications

Measurement gas type (N ₂)	1×10^{-5} Pa to 1×10^{-5} Pa When pressure falling: SAU is 10000Pa or less, SAU⇒SWU/SPU : SWU/SPU is 2Pa or less, SWU/SPU⇒ST200 When pressure rising : SWU/SPU is 3Pa or more, ST200⇒SWU/SPU : SAU is 10000Pa or more, SWU/SPU⇒SAU *ST200 measurements can be forced off with the control signal
Accuracy (N ₂)	Refer to the accuracy for each sensor.
POWER LED state	White: Start up Blue: Normal operation to SAU, SPU measurement range Green: ST200 filament on Red: SAU, SWU/SPU power supply error Green blinking: Filament power specified value or more Emission current out of specified value* ¹ Red blinking: Filament disconnection Emission current specified value or less* ²
Control input signal	FIL ON/OFF, FIL 1/2, DEGAS ON/OFF Open collector input, Negative logic. *When FIL ON/OFF signal is Lo input, the filament of ST200 is OFF.

*1: Supported Serial No. ST200-A: 00200 or later, ST200-R: 00100 or later

*2: Supported Serial No. ST200-A: 00001 to 00199, ST200-R: 00001 to 00099

10.5. Standard Accessories

Multi-ionization gauge ST200-A/R unit	1 pc.
SWT series sensor for ST200*	1 pc
Quick manual(this manual)	1 copy

*Only when you order at the same time as ST200, it will be attached to ST200 and delivered.

*The sensor model is the one specified when ordering.

10.6. Options

ST200 Sensor	SWT-16(NW16), SWT-25(NW25)
ST200 connector	D-sub 15-pin connector (socket, 2.6 mm screws)
Calibration certificate	General calibration certificate JCSS Calibration certificate
Test results certificate	
Traceability certificate	

Display unit	ISG1 (24 VDC power supply)
Display cable	ST200-display unit cable 2m, 5m, 10m, 15m, 20m, 25m, 30m, 35m, 40m
Display cable	Cable connecting ST200 and display unit 2m, 5m, 10m, 15m, 20m, 25m, 30m, 35m, 40m
Pirani vacuum gauge measuring unit	SWU/SPU
Sensor for Pirani vacuum gauge measuring unit	SWP/WP
Unit cable GUC-P	Cable connecting ST200 and SWU/SPU 0.5m, 1m, 2m
Pressure sensor	SAU
Unit cable GUC-A	Cable connecting ST200 and SAU 0.5m, 1m, 2m * The connector that connects this unit cable and SAU are connected by a cable of about 0.5m.

11. 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: One year from the date of delivery.

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

12. 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. Please use the Certificate of decontamination format at the end of the ST200 instruction manual.

13. Network

ULVAC, Inc.: <https://www.ulvac.co.jp/en/>

Service Centers: https://www.ulvac.co.jp/en/support_info/service/

Sales Offices: https://www.ulvac.co.jp/en/support_info/sales_office/

ULVAC, Inc.
Components Division,
<https://www.ulvac.co.jp/en/>