

CAPACITANCE MANOMETER CONTROLLER

MODEL GM-2001/2002

Instruction Manual



This manual is for units of the following serial numbers:

S/N:00001 and higher.

Read this manual before operation and keep it at hand for immediate reference.




Components Division,
ULVAC, Inc.

<http://www.ulvac.co.jp/>


Prior to Use





Thank you for purchasing this ULVAC product.












Upon receipt of the product, verify that is the correct model ordered and that it has not been damaged during transport.

 WARNING	<p>Read this instruction manual before installing, operating, inspecting, or maintaining the product and fully understand the safety precautions, specifications and operating procedures regarding the product.</p>
 WARNING	<p>The copyright of this instruction manual is held by ULVAC, Inc. You are prohibited from copying any portion of this instruction manual without the consent of ULVAC Inc. You are also prohibited from disclosing or transferring this instruction manual to third parties without the express written consent of ULVAC Inc.</p>
 CAUTION	<p>The contents described in this instruction manual are subject to change without prior notice because of changes in specifications or because of product improvements.</p>

Safety Symbols

 WARNING	<p>Safety symbols are used throughout this instruction manual to call the operator's attention to safety. The terminology used in safety symbols is classified below.</p>
--	---

 DANGER	<p>Indicate status of urgency of danger when failure to comply with DANGER results in serious personal injury or death The work ignoring this warning will lead to serious damage to human life or factory facility (including this equipment) at a high probability.</p>
 WARNING	<p>Indicate status of danger when failure to comply with WARNING results in serious worker's injury or death. The work ignoring this warning will cause possibility leading to serious damage to human life or factory facility (including this equipment)</p>
 CAUTION	<p>Indicate status of danger when failure to comply with WARNING results in minor injury or moderate damage. The work ignoring this warning will cause possibility leading to minor damage to worker or breakage to equipment or necessary to adjust.</p>
 Note	<p>Direct hazard is not existed, describe the necessity to know from the viewpoint of worker's safety or correct and safe operation of equipment</p>

 CAUTION	<u>Check wiring</u> For safety, always connect the GND terminal to a ground.
 CAUTION	<u>Usage environment precautions</u> Avoid using the vacuum gauge in locations where it is exposed to water. There is a risk of malfunction, ground leakage, and fire if water penetrates inside the vacuum gauge.
 CAUTION	<u>Ensure ventilation</u> Do not block the vacuum gauge ventilation holes. There is a risk of damage if the ventilation holes are blocked and heat builds up internally. The vacuum gauge reading will also not show the correct value.
 CAUTION	<u>Foreign object insertion warning</u> If metallic or flammable foreign objects enter the inside of the vacuum gauge through openings such as the ventilation holes, remove them. Ensure that objects do not touch the connection terminals on the rear of the control. There is a risk of damage to the vacuum gauge by using it in such a state.
 CAUTION	<u>Check wiring</u> Ensure that the power supply cable (crimping terminal section) does not touch other conductive components on the control, etc.
 CAUTION	<u>Check wiring</u> Check that there are no mistakes with the wiring before turning the power on. There is a risk of damage and fire if wired incorrectly.
 CAUTION	<u>Check power supply voltage</u> Before turning on the power supply, check that the vacuum gauge operating voltage and the supply voltage are the same. If the wrong power supply is mistakenly connected, there is a risk of damage to the vacuum gauge and a risk of fire. GM-2001 supply voltage: 85 to 264 VAC. GM-2002 supply voltage: 24 VDC.
 CAUTION	<u>CCMT-D Series scale-over display</u> On the CCMT-D Series, a pressure value of approx. 1.333×10^N or higher is displayed, even when scale-over. The display does not show "----".
 CAUTION	<u>Operating conditions warning</u> Use the vacuum gauge and capacitance manometer in an environment within the range defined in the specifications.
 CAUTION	<u>Transportation packaging warning</u> When transporting the vacuum gauge, do so in the same state as when it was delivered from the factory. Otherwise, it may be damaged when transported.
 CAUTION	<u>Disposal</u> When disposing of the vacuum gauge, please follow all local laws and regulations. In particular, if the capacitance manometer was used in an atmosphere that can cause harm to the human body, dispose of it through specialized waste handler. Customers are responsible for expenses related to disposal.

Revision History

DATE	No.	Reason
Aug 3, 2011	00	First edition
May 7, 2012	01	Added display range Calculation formula added to recorder output
Nov 1, 2013	02	Quick manual added Optional power cable added Warranty changes Added pollution certificate
Dec. 6, 2019	03	Added product phot to cover Added Revision History Section 1.2. Instruction manual (CD) deleted Section 1.3. Added Option Clerical corrections

Contents

Prior to Use.....	I
Safety Symbols.....	II
Safety Precautions	III
Revision History	V
Contents.....	VI
1. SPECIFICATIONS	1
1.1. SPECIFICATIONS	1
1.2. COMPONENTS	2
1.3. OPTION	2
1.4. DIMENSIONAL DRAWING	3
2. PART NAMES AND FUNCTIONS	4
2.1. FRONT PANEL	4
2.2. REAR PANEL	5
3. CHECK	7
4. INSTALLATION.....	8
4.1. ATTACHING THE SENSOR HEAD	8
4.2. CONNECTING THE SENSOR HEAD CABLE ..	9
4.3. INSTALLING THE CONTROLLER	9
4.4. PRECAUTIONS RELATED TO USAGE	10
4.5. PRECAUTIONS RELATED TO USAGE	10
5. OPERATING PROCEDURE	11
5.1. CAUTIONS IN OPERATION	11
6. SETTING OF CONTOLLER.....	12
6.1. GENEAL FLOWCHART	12
6.2. SELECTION THE RECORDER OUTPUT ...	12
6.2.1. Recorder Output.....	12
6.3. SETTING THE UNIT OF PRESSURE AND POSITION OF DECIMAL POINTPUT.....	14
6.4. DISPLAY AND CHANGE OF SETPOINT VALUE 15	
6.4.1. Setpoint Output	15
6.5. ADJUSTING THE RECORDER (ANALOG) OUTPUT.....	16
6.6. ZERO RESETTING FUNCTION	17
6.7. MEASUREMENT SPEED CHANGING FUNCTION	17
7. TROUBLESHOOTING.....	18
7.1. NO DISPLAY WHEN POWER IS APPLIED .	18
7.2. THE DISPLAY “-----” BLINKS.....	18
7.3. THE DISPLAYED VALUE DOES NOT CHANGE WHEN PRESSURE IS CHANGING.....	18
7.4. PRESSURE INDICATION IS NOT CONSTANT.....	18
7.5. PRESSURE INDICATION IS NOT CONSTANT.....	19
8. WARRANTY.....	20
9. CHINA ROHS DECLARATION	21
10. CERTIFICATE OF CONTAMINATION	22
11. DIMENSIONS	23
11.1. UNIT CABLE WIRING DIAGRAM	23

1. Specifications

1.1. Specifications

Designation	Ceramic Capacitance Manometer Controller
Type	GM-2001, GM-2002
Measurable pressure range	CCMT-1000A/D : 0.000 ~ 133.32kPa CCMT-100A/D : 0.0000 ~ 13.332kPa CCMT-10A/D : 0.00 ~ 1333.2 Pa CCMT-1D : 0.000 ~ 133.32 Pa
Measuring point	One
Display	4 1/2 digits digital display (7 segments LED display)
Display update time	100ms
Display range	CCMT-1000A/D : -13.000 ~ 133.32kPa CCMT-100A/D : -1.3000 ~ 13.332kPa CCMT-10A/D : -130.00 ~ 1333.2 Pa CCMT-1D : -13.000 ~ 133.32 Pa
Display range change function	※Display range has hysteresis for increased pressure and decrease pressure. decrease pressure: <10%FS, move the decimal point increased pressure: >12.5%FS, move the decimal point Example: CCMT-10A (1333.2PaFS) Pressure decrease: 133.3Pa ⇒ 133.32Pa (move the decimal point) Pressure increase: 166.65Pa ⇒ 166.6Pa (move the decimal point)
Accuracy	※Refer to display range change function. High pressure(100%FS~10%FS) : ±0.20%FS±1 digit±0.005%fs/°C Low Pressure(<12.5%FS) : ±0.32%FS±1 digit±0.005%fs/°C Example: CCMT-10A High pressure(1333.2PaFS) : 2.7Pa±0.1Pa±0.0667Pa/°C Low pressure(166.65PaFS) : 0.53Pa±0.01Pa±0.0083Pa/°C
Recorder output signal	DC-1.5 ~ 11.5V(including outside the measurable range) 1)Setting Lin1: 0 ~ 10V CCMT-1000A/D : 0 ~ 100.00kPa CCMT-100A/D : 0 ~ 10.000kPa CCMT-10A/D : 0 ~ 1000.0 Pa CCMT-1D : 0 ~ 100.00 Pa 2)Setting Lin2: 0 ~ 10V CCMT-1000A/D : 0 ~ 10.000kPa CCMT-100A/D : 0 ~ 1.0000kPa CCMT-10A/D : 0 ~ 100.00 Pa CCMT-1D : 0 ~ 10.000 Pa
Recorder Output error	Lin1: ±0.24%FS±0.01%FS/°C Lin2: ±1.20%FS±0.01%FS/°C
Setpoint output	Three, transistor output (open collector) Rated load voltage : 24V DC Maximum load current : 50mA (saturation voltage : 1 V)
Zero correction input	No-voltage contact input Input current: 10mA
Power requirements	GM-2001: AC85 ~ 264V 50/60Hz GM-2002: DC24V±10%
Power consumption	15VA or less
Operating temperature range	10 ~ 40°C
Weight	0.4 kg
Outside dimensions	W96mm×D151mm×H48mm

1.2. Components

The following components are required for operation of this instrument. Make sure that they are at hand. Note that the sensor head and sensor head cable may not be supplied with the controller depending on the type.

- | | |
|------------------------|------|
| (1) Controller GM-200□ | 1 pc |
| (2) Quick manual | 1 pc |

1.3. Option

- | | |
|-----------------|--------------------------------|
| (1) Sensor head | CCMT-1000A/D : 133.32 kPa F.S. |
| | CCMT-100A/D : 13.332 kPa F.S. |
| | CCMT-10A/D : 1333.2 Pa F.S. |
| | CCMT-1D : 133.32 Pa F.S. |

- (2) Sensor head cable 4, 10, 15, 20, 30, 50, 100 m

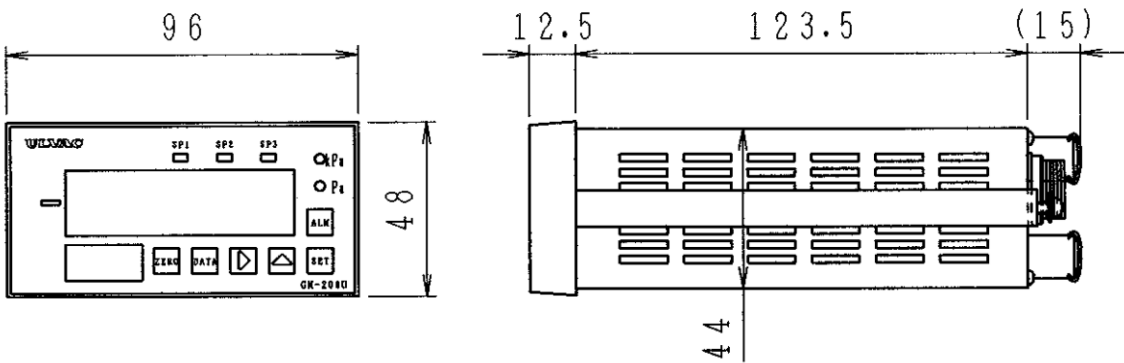
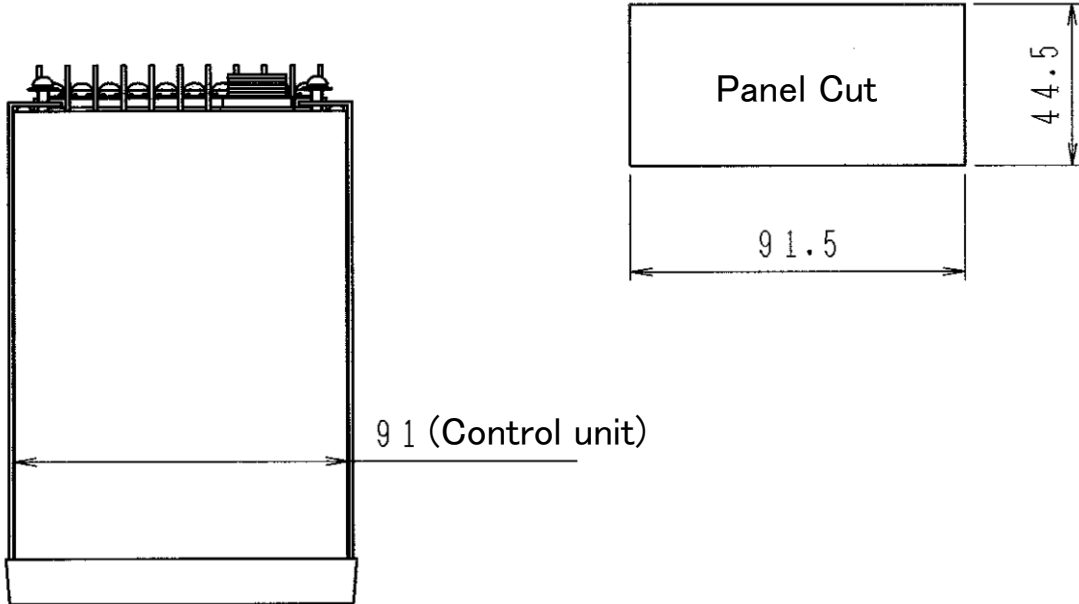
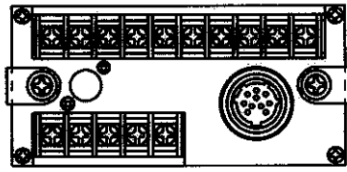
- (3) Power cable 3m (only GM-2001)
The plug specification of supply cable is AC125V / 7A

- (4) Inspection certificate


- (5) JCSS calibration certificate

- (6) General calibration certificate

1.4. Dimensional drawing



2. Part Names and Functions

 CAUTION	CCMT-D Series scale-over display On the CCMT-D Series, a pressure value of approx. 1.333×10^N or higher is displayed, even when scale-over. The display does not show "----".
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2.1. Front Panel

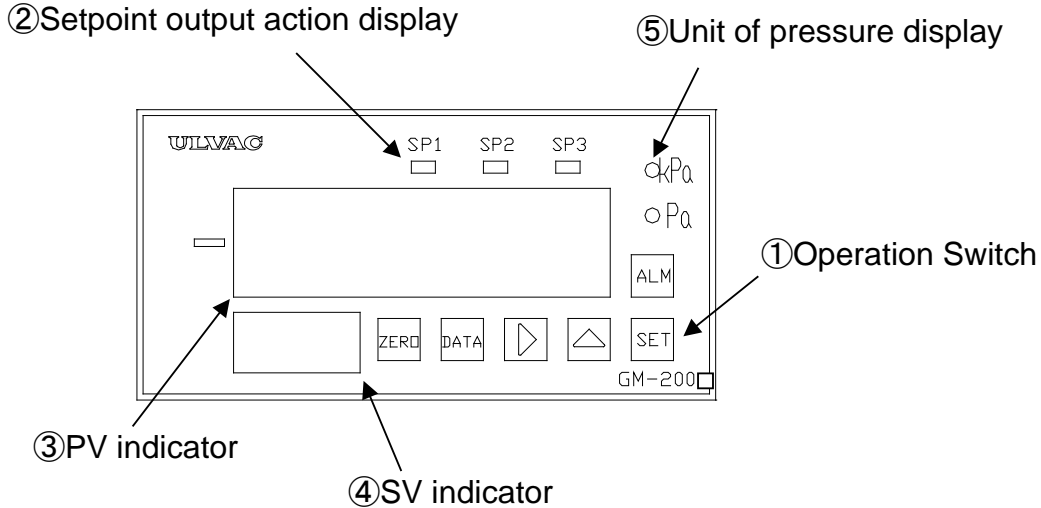




Fig. 2-1 Front panel

① Operation switch

- | | |
|---|---|
| ALM | : Used to display and change the setpoint value. |
| ZER0 | : Used to set and reset the zero point correcting function. |
| DATA | : Used to change data. |
|  ,  | : Used to shift the digit of data when changing |
| SET | : Used to finalize data. |

Refer to “5. OPERATING PROCEDURE” for how to use them.

② Setpoint output action display

The green LED lights when the setpoint is ON.

③ PV indicator

Main indicator that displays the setpoint value and output adjustment set value, in addition to the current measurement value. If the measurement value exceeds the scale or the sensor head is not connected, “___” will be displayed by blinking.

On the CCMT-D Series, a pressure value of approx. 1.333×10^N or higher is displayed, even when scale-over. The display does not show "----".

④ SV indicator

Auxiliary indicator that explains the contents of the PV indicator.






It is blank (no display) in the standard measurement condition. If “Fast” is selected as measurement mode, “F” will be displayed. If the sensor head is not connected, “OFF” will be displayed.

It displayed the auxiliary status when the setpoint is displayed or the output adjustment is set.

⑤ Unit-of-pressure display

The LED for the selected unit of pressure lights up.

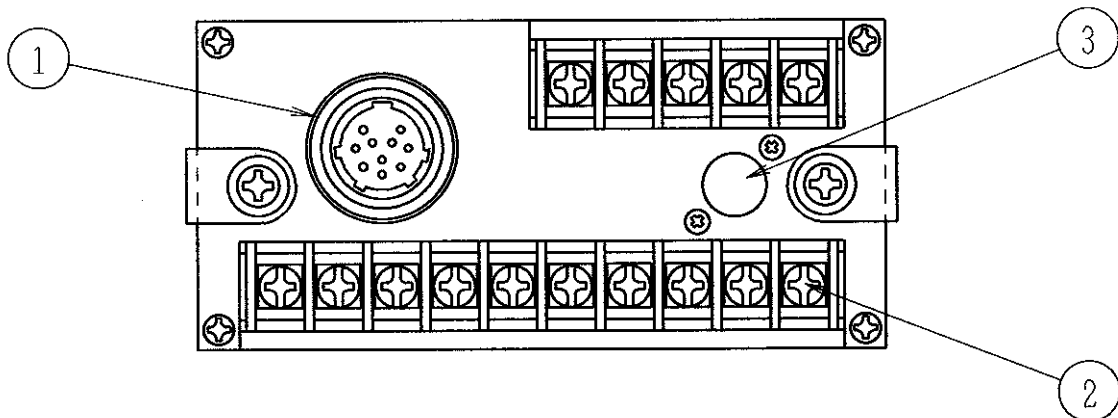
2.2. Rear Panel

 WARNING	<p>Power off Always turn off the power supply to the vacuum gauge when touching the power supply terminals on the rear of the control or when performing work with possibility of touching the power supply terminals. Power supply terminal voltage GM-2001:85 to 264 VAC and GM-2002:24 VDC Because these terminals are applied with the above voltage, you will receive an electric shock if you touch them when the power is on.</p>
 WARNING	<p>Power off Always turn off the power supply when replacing fuses. There is a risk of electric shock by replacing fuses when the power is turned on.</p>
 WARNING	<p>Observe rating Use the specified type of fuse. Do not use a fuse other than the specified type and do not short the fuse holder. There is a risk of damage and fire.</p>
 CAUTION	<p>Check wiring Ensure that the power supply cable (crimping terminal section) does not touch other conductive components on the control, etc.</p>
 CAUTION	<p>Check wiring Check that there are no mistakes with the wiring before turning the power on. There is a risk of damage and fire if wired incorrectly.</p>

- ① Sensor head cable connecting connector
 Connector for connecting the sensor head cable

- ② Input/output terminal block
 I/O terminal block for connecting the power input, input of zero point correcting function, setpoint output, recorder output, etc.
 The 3mm-diameter solderless terminal is best suited for the connection.

- ③ Fuse
 The fuse protects the supply power. Normally, it does not blow out, but if not does, contact your local ILVAC representative without taking further actions.
 Vendor : Littelfuse
 Part Number: 37008000410
 Current : 800mA



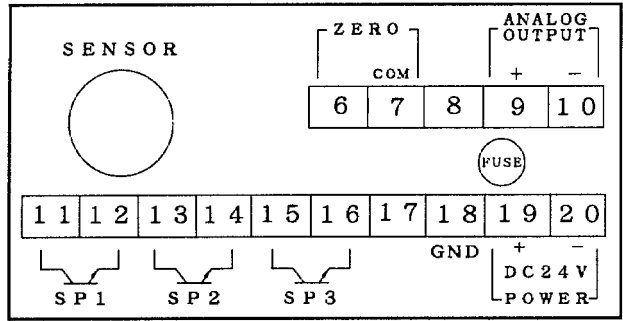
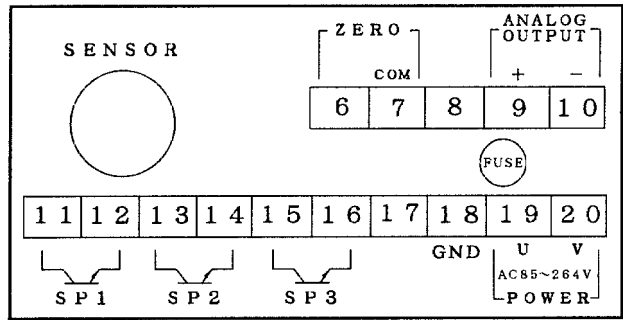





Fig. 2-2 Rear panel

3. CHECK



 WARNING	<p><u>Power off</u> Always turn off the power supply to the vacuum gauge when touching the power supply terminals on the rear of the control or when performing work with possibility of touching the power supply terminals. Power supply terminal voltage GM-2001:85 to 264 VAC and GM-2002:24 VDC Because these terminals are applied with the above voltage, you will receive an electric shock if you touch them when the power is on.</p>
 WARNING	<p><u>Power off</u> Always turn off the power supply when replacing fuses. There is a risk of electric shock by replacing fuses when the power is turned on.</p>
 CAUTION	<p><u>Check wiring</u> Ensure that the power supply cable (crimping terminal section) does not touch other conductive components on the control, etc.</p>

Upon receipt of this instrument, check if it damaged in transit by using the following procedure.
 If you find any problem, contact your local ULVAC representative.

- (1) Is the instrument the correct model you ordered (model of the vacuum gauge, sensor head cable length, type of sensor head, etc.)?
- (2) Is the instrument intact (not damaged or deformed)?
- (3) Connect the power cable only without connecting the sensor head and sensor head cable.
 Turn the power ON in this condition, and “___” will blink on the PV indicator and “OFF” will be displayed on the SV indicator.
 At this time, the recorder output voltage is about 11.5 V.
- (4) Turn the power OFF and unplug the power cable.

4. INSTALLATION

4.1. Attaching the sensor head

 WARNING	<p>Power off</p> <p>Always turn off the power supply to the vacuum gauge when touching the power supply terminals on the rear of the control or when performing work with possibility of touching the power supply terminals.</p> <p>Power supply terminal voltage GM-2001: 85 to 264 VAC GM-2002: 24 VDC</p> <p>Because these terminals are applied with the above voltage, you will receive an electric shock if you touch them when the power is on.</p>			
	<p>Usage environment precautions</p> <p>Do not connect the sensor outside the VCO, VCR, UFC joint specification in a location where the sensor's internal pressure exceeds atmospheric pressure. If the sensor's internal pressure exceeds atmospheric pressure, it may pose a hazard to its surroundings, including to people, if the gauge head flies off its connector.</p> <p>There is also a risk of malfunction or damage to the sensor if the sensor interior exceeds the maximum usable pressure. Where there is a risk of exceeding the maximum usable pressure, ensure that the sensor interior will not exceed the maximum usable pressure with a gate valve.</p>			
Model	CCMT-1000A	CCMT-100A	CCMT-10A	
Maximum usable pressure	160 kPa (abs)	Atmospheric pressure	Atmospheric pressure	
Model	CCMT-1000D	CCMT-100D	CCMT-10D	CCMT-1D
Maximum usable pressure	400 kPa (abs)	260 kPa (abs)	260 kPa (abs)	260 kPa (abs)
 CAUTION	<p>Operating conditions warning</p> <p>Use the vacuum gauge and capacitance manometer in an environment within the range defined in the specifications.</p>			

(1) Measuring position

- a) The vacuum gauge measures the static pressure at the position where the sensor is attached. If there is gas flow in the vacuum system or if there is a source of outgas or a source of high intensity electrons or ions, carefully select the measuring position and install the sensor head in a position where measurement is not affected by them.
- b) The indication of the capacitance manometer is affected by the temperature around the sensor head because of its principles of operation. Select the mounting position so that the ambient temperature does not deviate considerably from the temperatures at the time of calibration (about 25°C)

(2) Attaching the sensor head

- a) Attach the sensor head in such a manner that the plane of the sensor head mounting port is parallel to the flow of gas, especially gas does not enter the sensor head in the form of beam.
- b) Avoid use of the sensor head in a place susceptible to vibration.
- c) If an O-ring is used to mount the sensor head, use one made of material that does not release much outgas, If a rubber pipe or material that releases much outgas like grease is used for the connection of the sensor head, it can be a cause of measurement error.

4.2. Connecting the sensor head cable

- (1) When connecting and fastening the sensor head cable, use care not to exert undue force to the connections between the sensor head and sensor head cable and between the GM-200□ and sensor head cable. Firmly tighten the fixing screw for each connector.
- (2) Lay the sensor head cable away from the power line, if possible, so as to be free the influence of noise and others
- (3) Frictional electricity will be generated between a conductor and insulator if the sensor head cable is moved. This can be a cause of error when a low pressure is measured.
- (4) Avoid installation in a high temperature/high humidity place.

4.3. Installing the controller

(1) Mounting panel

- a) This instrument is the panel mounting type.
- b) The sheet thickness of the mounting panel should be 1.0 to 4.0 mm.
- c) A rectangular hole measuring 91.5 x 44.5 mm is required to mount this instrument.
- d) If the instruments are mounted side by side, provide a spacing between controllers as shown in the figure below.

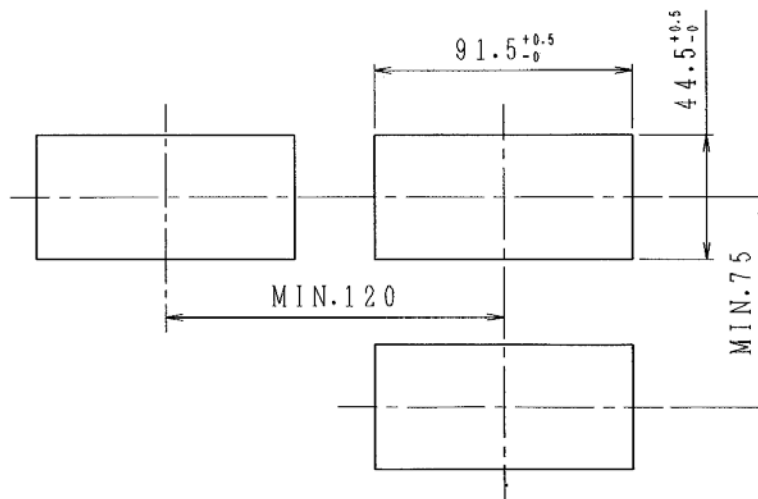


Fig. 4-1 Dimensions of holed in the panel

(2) How to mount

- a) Remove the metal fitting from the controller.
- b) Fit the controller into the front panel.
- c) Attach the metal fittings in the original position from the back of the panel.

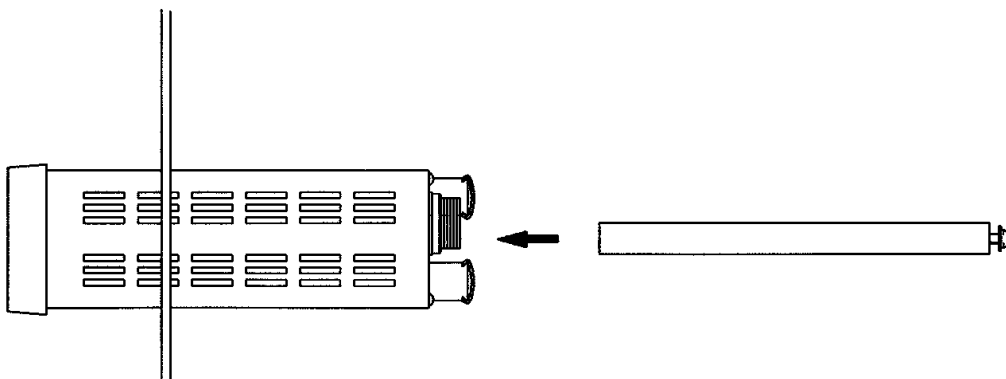







Fig. 4-2 GM-200 □ mounted in panel

4.4. Precautions related to usage

 WARNING	<p>Power off Always turn off the power supply to the vacuum gauge when touching the power supply terminals on the rear of the control or when performing work with possibility of touching the power supply terminals. Power supply terminal voltage GM-2001:85 to 264 VAC and GM-2002: 24 VDC Because these terminals are applied with the above voltage, you will receive an electric shock if you touch them when the power is on.</p>
 CAUTION	<p>Check wiring Check that there are no mistakes with the wiring before turning the power on. There is a risk of damage and fire if wired incorrectly.</p>
 CAUTION	<p>Check wiring Ensure that the power supply cable (crimping terminal section) does not touch other conductive components on the control, etc.</p>
 CAUTION	<p>Check wiring For safety, always connect the GND terminal to a ground.</p>
 CAUTION	<p>Check power supply voltage Before turning on the power supply, check that the vacuum gauge operating voltage and the supply voltage are the same. If the wrong power supply is mistakenly connected, there is a risk of damage to the vacuum gauge and a risk of fire.</p>

Connect the power cable to the connecting terminal block No.19 and 20 on the rear panel using a solderless terminal. Before connection, check the polarity of the power to the GM-2002.

Also ground pin No.18, which is a grounding terminal.

4.5. Precautions related to usage

- (1) Connect Controller GM-200□ and manometer, gauge cable.(refer to Fig. 4-3)
- (2) Tighten a screw well

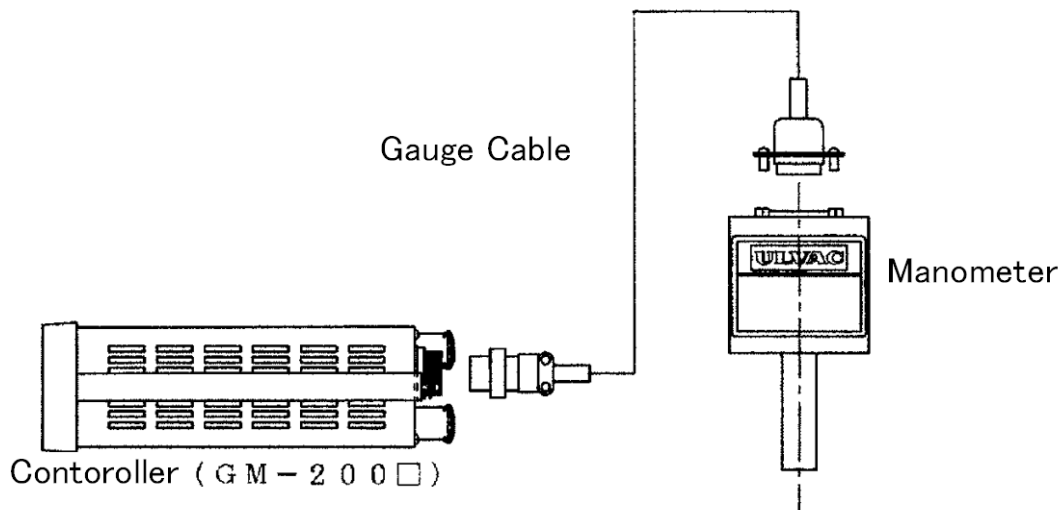


Fig. 4-3 Connection diagram for GM-200□

5. OPERATING PROCEDURE


5.1. Cautions in Operation

- (1) When power is applied to this instrument, measurement starts about three seconds later. However, start measurement more than 30 minutes after turning power ON until the indicated value is stabilized because there can be temperature drift or other problem for some time after power is turned ON.

If the sensor head is used to measure low pressure (for example, CCMT-10A) or if an effective digit below 1/1000 of the full scale of the sensor head is required, start measurement after applying power continuously for more than 2 hours until temperature equilibrium of the sensor head is attained.

Do not turn the power OFF when a series of measurements is being made.

- (2) This controller uses an absolute pressure type vacuum gauge of which measurement value is not affected by the type of gas, but its characteristics may change if the sensor head is exposed to a chemically active gas or a gas with high adsorptivity.
- (3) Refer to the following table, the proof pressure of the sensor head, including when power is not applied.

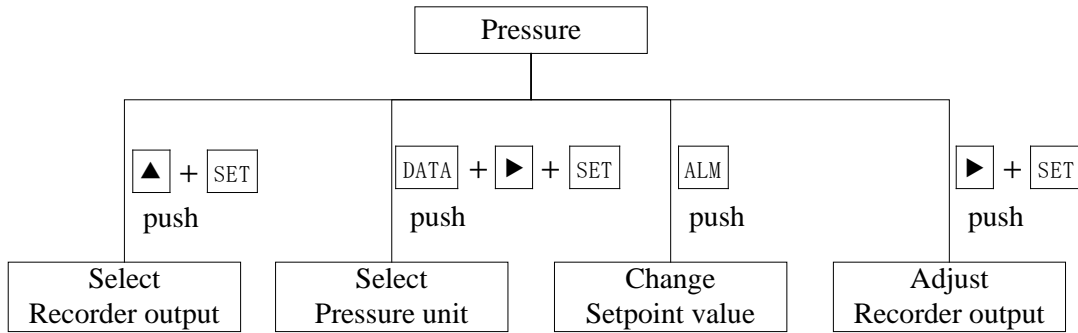
 WARNING	Usage environment precautions			
	<p>Do not connect the sensor outside the VCO, VCR, UFC joint specification in a location where the sensor's internal pressure exceeds atmospheric pressure. If the sensor's internal pressure exceeds atmospheric pressure, it may pose a hazard to its surroundings, including to people, if the gauge head flies off its connector.</p> <p>There is also a risk of malfunction or damage to the sensor if the sensor interior exceeds the maximum usable pressure. Where there is a risk of exceeding the maximum usable pressure, ensure that the sensor interior will not exceed the maximum usable pressure with a gate valve.</p>			
Model	CCMT-1000A	CCMT-100A	CCMT-10A	CCMT-1D
Maximum usable pressure	160 kPa (abs)	Atmospheric pressure	Atmospheric pressure	260 kPa (abs)
Model	CCMT-1000D	CCMT-100D	CCMT-10D	CCMT-1D
Maximum usable pressure	400 kPa (abs)	260 kPa (abs)	260 kPa (abs)	260 kPa (abs)

- (4) Before starting measurement, it is necessary to correct the zero point at a pressure sufficiently lower than the measurement pressure. If the ultimate pressure of a system to which the sensor head is attached is not sufficiently low for zero point correction, the specifications of this instrument may not be met.
- (5) The zero point correction is made by using the 0 ADJ function of the sensor head in conjunction with the zero point correcting function of this controller. The zero adjusting function of the sensor head is for coarse adjustment and that of this controller is for fine adjustment.

The zero point correcting function of this controller is reset by turning the power OFF. So keep this in mind during operation.

6. SETTING OF CONTROLLER

6.1. General flowchart



This data is stored in memory even if the power of this unit is turned off.

6.2. Selection the recorder Output

The recorder (analog) output signals of this instrument include Lin1 and Lin2. Either of them can be selected. (Default setting Lin1)

Pressing the [▲] and [SET] switches simultaneously displays "1" or "2" on the SV indicator for one second. Select a desired output.

(Example) When the sensor head is CCMT-10A

Lin1	0 to 1000.0 Pa	: 0 to 10V
Lin2	0 to 100.0 pa	: 0 to 10 V

6.2.1. Recorder Output

	CAUTION	CCMT-D Series scale-over display On the CCMT-D Series, a pressure value of approx. 1.333×10^N or higher is displayed, even when scale-over. The display does not show "----".
--	----------------	--

The recorder output is delivered within the range of -1.5 to 11.5 V. If the correlation between the recorder output voltage and the indicated (measured) value changes, the recorder output can be adjusted using the output voltage adjusting function. The adjusting procedure will be described later.

The ripple of the recorder output is about 10 mV (p-p).

When CCMT-10A(1333.2 Pa F.S.) is used

Lin1		Lin2	
Pressure (Pa)	Output Voltage (V)	Pressure (Pa)	Output Voltage (V)
-100.0	-1.00	-10.0	-1.00
0.0	0.00	0.0	0.00
1.0	0.01	1.0	0.10
10.0	0.10	10.0	1.00
100.0	1.00	100.0	10.00
1000.0	10.00	115.0	11.5
1150.0	11.5	1000.0	11.5
1333.2	11.5	1333.2	11.5
----.	11.5	----.	11.5

If the CCMT-D Series is used, the display does not show a flashing "----" even when scale-over. A pressure display of approx. 1.333×10^N or higher is shown.

Pressure is converted by the following equation.

$$P = V \times k \times 10 \times L \quad \Leftrightarrow \quad V = P \div (k \times 10 \times L)$$

P : Pressure (Pa)

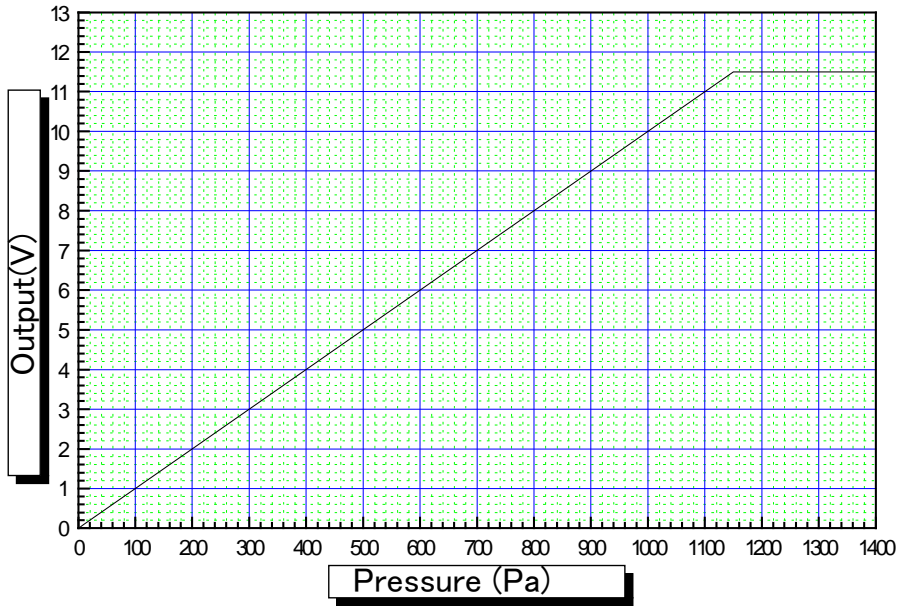
V : recorder output voltage (V)

k : Cf. following list

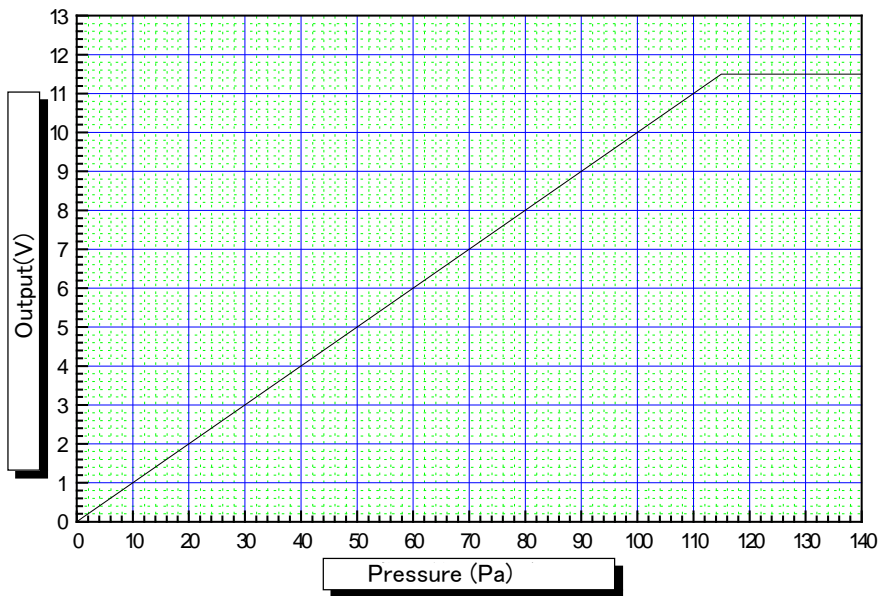
L : setting Lin1:1 setting Lin2:10

K	Sensor Head	
1000	CCMT-1000A	CCMT-1000D
100	CCMT-100A	CCMT-100D
10	CCMT-10A	CCMT-10D
1	-	CCMT-1D


1) Lin1 output graph (Example CCMT-10A)



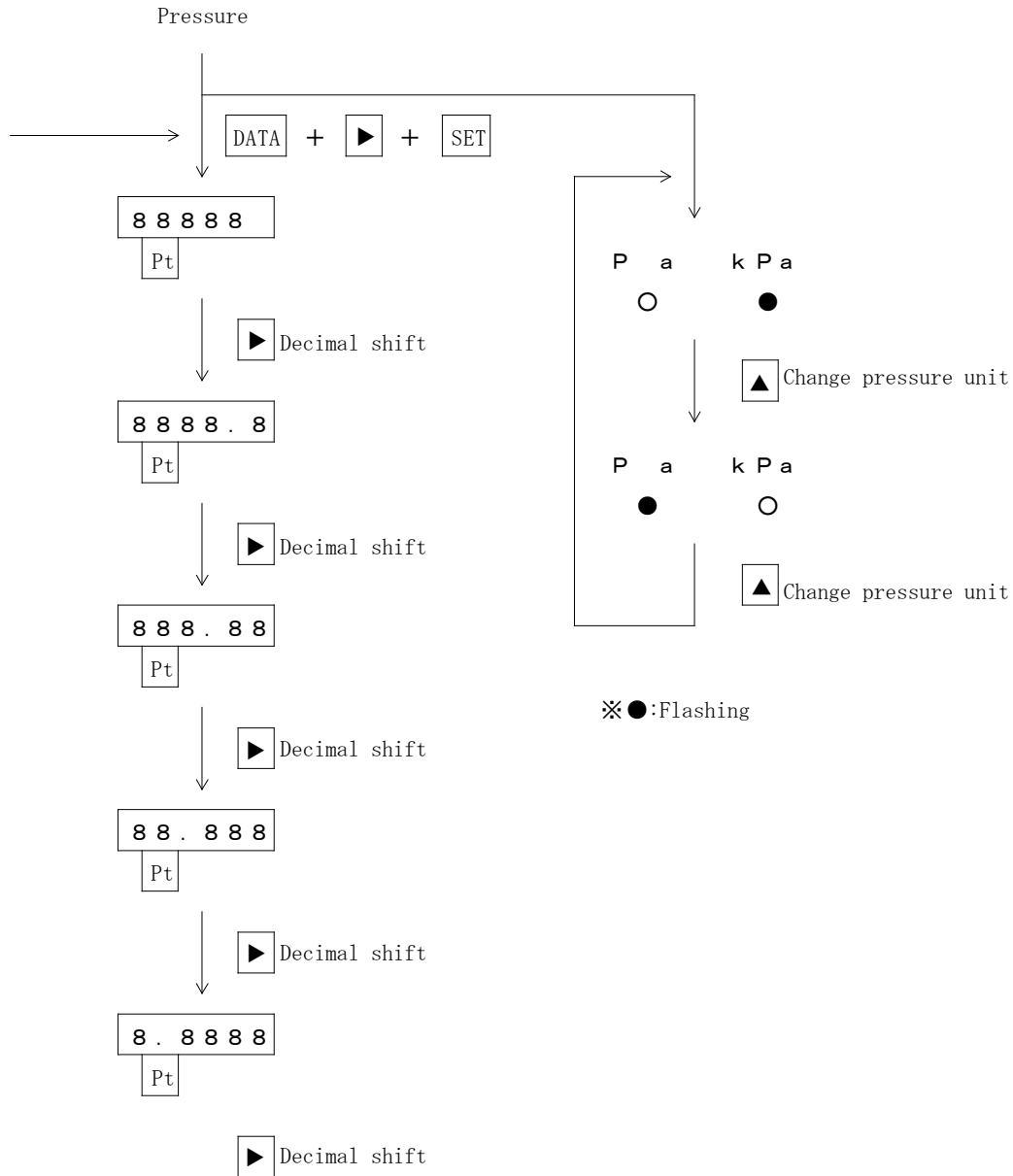
2) Lin2 output graph (Example CCMT-10A)



6.3. Setting the Unit of Pressure and position of Decimal Pointput

 Note	<p><u>The decimal point is automatically shifted</u></p> <p>The decimal point position may differ from the table above when the measurement mode is restored. The reason is that when the measured pressure is below 1/10 of the full scale value of the sensor head, the position of the decimal point is automatically shifted by one digit to enhance the resolution of the measurement value.</p>
---	--

Set the unit of pressure and the position of decimal point according to the sensor head to be used. The following shows how to set them.



- (1) Pressing the [DATA] [▶] and [SET] switches from left to right in order sets up the unit and decimal point switching mode. (“Pt” is displayed on the SV indicator.)
- (2) Press the [▶] and [▲] switches to select a unit and decimal point compatible with the sensor head to be used.

Type and setting of sensor head

Type of sensor head	Position of decimal point	Unit of pressure
CCMT-1000A/D	888.88	kPa
CCMT-100A/D	88.888	kPa
CCMA-10A/D	8888.8	Pa
CCMT-1D	888.88	Pa

*Sensor heads include CCM, CCMT, and CCMR series

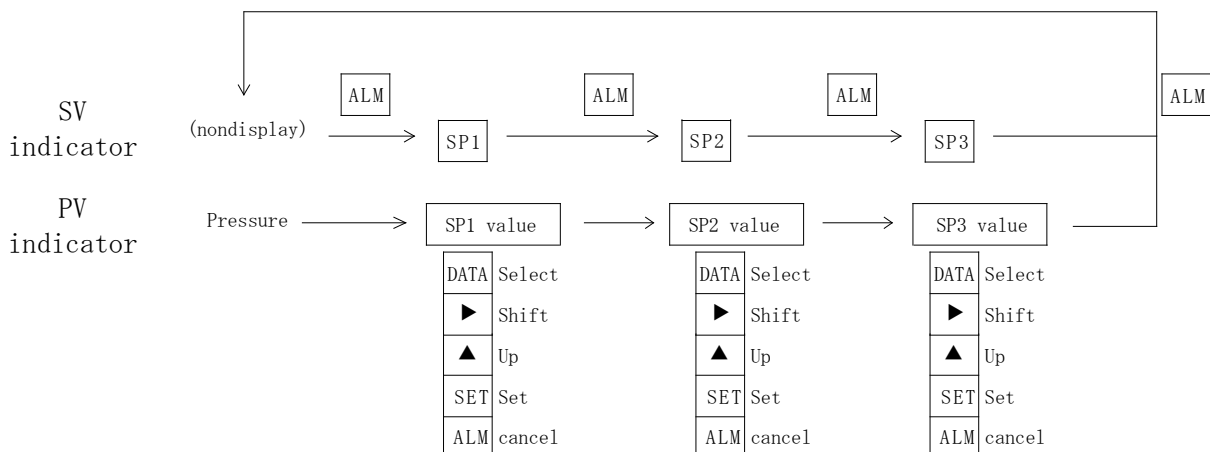
*Defaults set : 88888 and Pa

- (3) Pressing the [SET] switch finalizes the unit and decimal point and sets up the normal measurement mode.

6.4. Display and Change of Setpoint Value

This instrument has three setpoints outputs (SP1, SP2, SP3), each of which can be set independently. Setpoints can be set arbitrarily between 0% and 100%FS(when CCMT-10A is used: 0.00~1333.2Pa).

COMPARISION VALUE SETTING OPERATION FLOW



- ① The setpoint value setting mode and the normal measurement mode can be switched over by pressing the [ALM] switch on the front panel. Select a desired indicator while watching the SV indicator.
(Example) To display/change the value of SETPOINT 1, press the [ALM] switch to display “sp1” on the SV indicator.
- ② To change the setpoint value, press the [DATA] switch, and one of the displayed numerical values will blink. Press the [▶] switch to move the blinking value to the digit to be changed. Upon completion of moving the digit, display the desired value by pressing the [▲] switch. Similarly, set all digits to the desired value using the [▶] and [▲] switches. Pressing the [SET] switch completes the change of setpoint value.
- ③ Upon completion of the display and change of the setpoint, press the [ALM] switch to restore the measurement condition in which nothing is displayed on the SV indicator.

6.4.1. Setpoint Output

The transistor output (open collector) is turned ON (in continuity) when the measurement value is

smaller than the setpoint value, and the condition is maintained continuously for more than 0.5 second.

When the setpoint output is turned ON, the green LED displaying the setpoint output action on the front panel lights up.

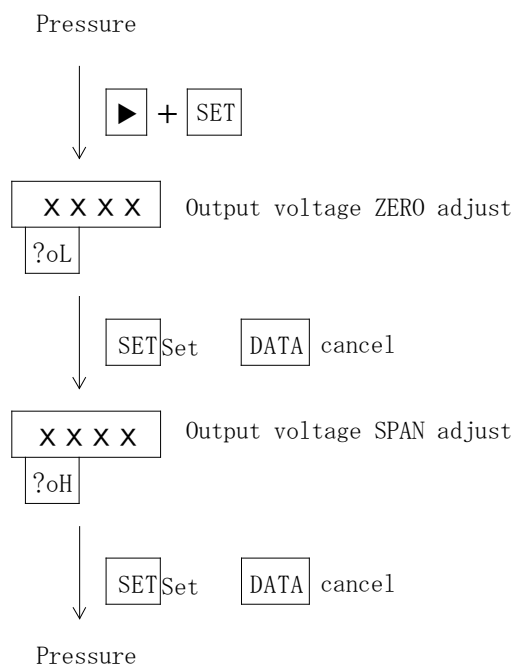
Use the setpoint output load within the following range.

Rated voltage	24 V DC
Maximum rated current	50mA

*The setpoint output is not turned ON for about three seconds after power is turned ON regardless of the measurement value.

6.5. Adjusting the Recorder (Analog) Output

The recorder has been factory adjusted. If the displayed value and the output value differ from each other, adjust the recorder output according to the following procedure.



Data is set with the [▲] switch, and ± of the data can be selected with the [▶] switch. If the “?” on the SV indicator in the figure above displays “_”, data value will be decremented with the [▲] switch and incremented if it is blank.

The recorder output offset is variable from -1500 to +1500 with the [▲] switch and the output voltage at this time is -0.8 to +1.8 V.

The output adjustment range of span is variable from -2500 to +1500, and the output voltage range at this time is +7.0 to +11.8 V.

However, the numerical value displayed in this mode is not directly related to the actual recorder output value. So make adjustment while measuring the output by a voltmeter.

6.6. Zero Resetting Function

This is a function of resetting the indicated value and the recorder (analog) output to zero when resetting is made with the zero input signal or with the switch on the front panel of this instrument.

It is used when making zero adjustment by lowering the pressure at the measuring point to a sufficiently low level before starting measurement.

This function is reset by turning the power OFF. Do not turn the power OFF during a series of measurements.

This function can be used within the range of $\pm 10\%$ of the full scale of the sensor head. Use it in conjunction with the zero adjusting function of the sensor head.

(1) Setting and resetting the zero reset value from the ZERO input terminal

Shorting the ZERO input terminals on the rear panel of this instrument sets the zero reset value, and opening it resets the value. The zero resetting function of this instrument gives priority to the signal from the ZERO input terminal. If the zero resetting function with the front panel switch has been used, the setting will be invalid and a zero reset value from the ZERO input terminal will be set.

(2) Setting the zero reset value with the front panel switch

- ① Hold down the [ZERO] switch on the front panel for more than two seconds.
- ② “0on” is displayed on the SV indicator.
- ③ Pressing the [SET] switch while “0on” is displayed (about 10 seconds) sets the zero reset value, and the PV indicated value becomes “0”.

(3) Resetting the zero reset value with the front panel switch

- ① Hold down the [ZERO] and [DATA] switches on the front panel simultaneously for more than two seconds.
- ② Hold down the [ZERO] and [DATA] switches on the front panel simultaneously for more than two seconds.
- ③ Pressing the [SET] switch while “0on” is displayed (about 10 seconds) reset the zero reset value.

Type	Adjustable range
CCMT-1000A/D	13kPa or less
CCMT-100A/D	1.3kPa or less
CCMT-10A/D	130Pa or less
CCMT-1D	13Pa or less

6.7. Measurement Speed Changing Function

This instrument has two measurement speeds of “Normal mode” and “Fast mode”. Select the “Fast mode” if measurement of high response is required.

The “Normal mode” an “Fast mode” can be switched over by pressing the [DATA] and [SET] switches simultaneously.

If the “Fast mode” is selected, “F” will be displayed on the SV indicator. If the “Normal mode” is selected, nothing will be displayed.

7. Troubleshooting

7.1. No Display When Power is Applied

Possible cause	Corrective action
1) Within 3 second after power is applied 2) Fuse blown out	1) Normal 2) Replace the fuse. Vendor : Littelfuse Part Number: 37008000410 Current : 800mA The fuse used in this instrument does not blow out under normal conditions. If the cause is unknown (for example, the power line was struck by lightning), do not replace it by yourself, but contact your local ULVAC representative for replacement.

7.2. The display “-----” blinks.

Possible cause	Corrective action
1) The measured pressure is higher than the higher limit of the measurement range. (Example) Atmospheric pressure was measured using the sensor head CCM-10A.	1) Normal
2) The sensor head or sensor head cable is not connected	2) Check the sensor head and cable for connection. If the sensor head is not connected, “OFF” is displayed on the SV indicator.

7.3. The Displayed Value does not Change when Pressure is Changing.

Possible cause	Corrective action
1) The measurement mode is not selected (Example) The setpoint value is displayed.	1) Select the measurement mode. If the measurement mode is selected, nothing is displayed on the SV indicator, or “F” is displayed.

7.4. Pressure Indication is not Constant.

Possible cause	Corrective action
1) The measurement mode is not selected (Example) The setpoint value is displayed.	1) Select the measurement mode. If the measurement mode is selected, nothing is displayed on the SV indicator, or “F” is displayed.
2) The selection of the decimal point position and unit of pressure is not compatible with the sensor head.	2) Refer to 6.3
3) The sensor head is contaminated or deteriorated.	3) Replace the sensor head
4) Temperature at the location where the sensor head or controller is installed deviates considerably from 25°C, or temperature variation is great.	4) Install it in a clean and well ventilated place not blown with draft.
5) Zero point adjustment is not made properly.	5) Make zero adjustment again. The zero point adjustment function will be reset by turning the power OFF.

7.5. Pressure Indication is not Constant.

Possible cause	Corrective action
1) Pressure is changing 2) The sensor head is contaminated or deteriorated. 3) There is a leak in the neighborhood of the sensor head or area where the sensor head is attached. 4) Poor contact of the sensor head cable or increase in the resistance of wire due to corrosion or insulation failure.	1) Normal 2) Replace the sensor head 3) Leak in the sensor head → Replace it. Leak in other area → Stop the leak 4) Check the sensor head cable for continuity and insulation.

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: Vacuum gauge (controller)

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 being used (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. China RoHS Declaration



This mark is applied to the electronic information product sold in the People's Republic of China. The figure at the center of the mark is the validity date of environmental protection. This product does not influence the environment, the human body and the property during the period reckoning the manufacturing date as long as the caution for safe use regarding the products are observed.

*The environmental protection validity date is not the product warranty period.

Table1. Making format for names and contents of hazardous substances or elements

Name of parts	Hazardous substances or elements					
	Pb	Hg	Cd	Cr ⁶⁺	PBB	PBDE
Printed Circuit Board	×	○	○	○	○	○
Chassis	○	○	○	×	○	○
Connector	×	○	○	○	○	○
Controller,Transformer	×	○	○	○	○	○
Label	○	○	○	○	○	○
Gauge Head	×	○	○	○	○	○
Cable	×	○	○	○	○	○

O: indicating that content of the hazardous substance or element in all homogeneous materials of the part does not exceed the requirements for concentration limits specified by SJ/T11363-2006.

X: indicating that content of the hazardous substance or element in, at least one kind of, homogeneous materials of the part exceeds the requirements for concentration limits specified by SJ/T11363-2006. Producer may further explain the technical excuse to the items marked with “X” perspecific conditions here.

10. Certificate of Contamination



Form: A003S1268-04

ULVAC Components / Certificate of Decontamination

This is a certificate of decontamination for repair and inspection request of ULVAC Components. 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 consult with your closest local ULVAC service center or sales office if our components are used with toxic gases or contaminated with reactive products or substances produced by reaction.

Product model:

Model:

Serial No.:

Application:

Remarks:

Contaminant (Check an applicable box.)

- I guarantee that above returned item(s) is not contaminated with harmful substances.
- Above returned item(s) is contaminated with the following harmful substances.

	Name of contaminant (molecular formula)	Characteristics
1		
2		
3		
4		
5		

To: ULVAC, Inc

Attn: _____

Date: / / (YYYY/MM/DD)

Your company _____

Division _____

Contact _____

Phone _____

Fax _____

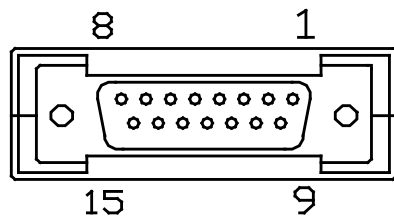
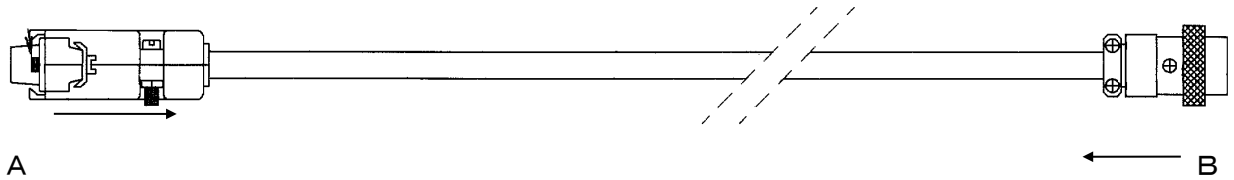
E-mail _____

Please pack returned item(s) carefully before shipment. Any accident occurred during transportation to us caused by contaminant is under your responsibility. It is also to be understood that ULVAC may decline to repair returned item(s) depending on the type of contaminant and degree of contamination, and return it to you.

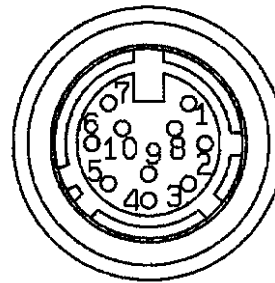
To be filled in by ULVAC	Received by	
Request for MSDS: Yes/No		
ULVAC job No.		

11. Dimensions

11.1. Unit cable wiring diagram



Side A



Side B

PIN No.	Color	Purpose
5	Red	V+
5	Black	AG
6	Green	-15V
7	Brown	+15V
12	White	V-
15	shield	FG

PIN No.	Color	Purpose
6	Black	AG
10	Green	-15V
1	Red	V+
7	White	V-
2	Brown	+15V
3	Shield	FG