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FT-651-059

A-NET CRYSTALION GAUGE

M-332MX

OPERATION MANUAL

5	
4	
3	Mar . 5 .2010
2	Dec . 28 .2009
1	Sep . 11 .2000
EDITION	DATE

Canon ANELVA Corporation

If this product is exported outside Japan, please contact our sales department for more information because a judgment based on the Foreign Exchange and Foreign Trade Control Law is necessary. Furthermore, when this product is transferred or disposed in Japan, please take notice of the place where it is dealt.

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Safety



⚠ WARNING

If the content of this warning is not obeyed where it is shown, it is assumed that there is a risk of causing serious or fatal injury to the user.



⚠ CAUTION

If the content of this warning is not obeyed where it is shown, there is a risk of causing serious personal injury and creating situations that may damage this instrument.

In order to operate this instrument safely and correctly, always observe the safety precautions written below. Canon Anelva shall not accept any liability or guarantee for any damage incurred as a result of mishandling this instrument or failure to observe these safety precautions.



⚠ WARNING

Before opening the controller case, disconnect the power supply connector.



⚠ CAUTION

Use an input power supply in the range of DC 22 V to 26 V. Do not reverse the input polarity.



⚠ CAUTION

Before attaching or detaching the gauge head, disconnect the power supply connector.

Vacuum Gauge Guarantee

Repair or replacement shall be made without charge if any structural or design faults are found, or if a defect occurs due to the liability of Canon ANELVA within a period lasting twelve months after this product is received and inspected.

This guarantee only applies when this product is used correctly according to the instructions of this operation manual and other handling instructions. This guarantee shall not apply to the following causes of failure.

1) Failure resulting from mishandling, incorrect use or storage.

2) Failure resulting from repair work of modifications carried out by any other party except Canon ANELVA.

3) Failure arising from uncontrollable forces: fire, flooding, earthquake, lightening, etc.

This guarantee shall cover the repair or replacement of faulty parts for which only Canon ANELVA is liable. If failure or fault occurs, please contact Canon Anelva's Field Service Division immediately.

See the last page of this manual for the contact addresses.

1 Crystal Ion Gauge M-332MX Outline

The A-NET Crystal Ion Gauge M-332MX is a transducer model vacuum gauge that can measure pressures over a wide range from 4 x 10^{-8} Pa to atmospheric pressure. The vacuum gauge controller and the gauge head are incorporated into a single body.

This vacuum gauge is a combination vacuum gauge that uses a crystal type vacuum gauge (crystal gauge), which employs a crystal oscillator, for measuring in the high-pressure region and a ionization vacuum gauge (B-A gauge) for measuring in the low-pressure region.

By a combination of pressure measurements, it is possible to measure pressures over a wide range from 4 x 10^{-8} Pa to atmospheric pressure by a single vacuum gauge.



Crystal Ion Gauge M-332MX

2 Specifications

Table 1 Specifications

Item	Specification
Gauge head	Model name: MX1 Crystal type vacuum gauge (crystal gauge) and ionization vacuum gauge (B-A gauge) combination gauge
Pressure measurement range	4 x 10^{-8} Pa to atmospheric pressure Crystal gauge measurement range: 1 Pa to atmospheric pressure B-A gauge measurement range: 4 x 10^{-8} Pa to 13 Pa * The lower limit pressure measurement range is indicated by the soft X-ray limit. The lower limit pressure of the effective pressure measurement range varies depending on the gauge head connecting flange together with the pumping system configuration and pumping system operating conditions. (As a guideline, KF flange type: 10^{-6} Pa, ICF flange type: 10^{-7} Pa)
Input power supply	DC 22 to 26 V (Maximum power consumption 12 W: when filament and degas are ON) Note: Due to the inrush current when the power is switched ON, prepare a DC power supply that has current capacity of 1.6 Amps or higher.
Degas method	Grid power ON
Input control signal	① Filament ON/OFF ② Degas ON/OFF ③ Crystal gauge zero reset input ④ Crystal gauge ATM reset input
B-A filament ON/OFF	Controlled by the filament ON/OFF signal.
Crystal gauge zero adjustment	① Manual control: zero is adjusted by the switch on the rear panel.
	② Remote control: zero is adjusted by external input.
	③ Auto mode: when the B-A gauge switches ON, if the B-A measurement pressure remains below the zero reset allowing pressure (1.33 x 10^{-2} Pa) the zero point is automatically adjusted every 5 minutes.
Crystal gauge ATM adjustment	① Manual control: ATM is adjusted by VR on the rear panel. ② Remote control: ATM is adjusted by external input (set to the value set by VR)
Pressure measurement gas type	N_2 gas conversion
Analog output	The crystal gauge measurement pressure and the B-A gauge measurement pressure are output by a single analog signal. Output: LOG output (0 to 10 V)… See Section 6 (3) for details of the analog output. Output impedance: Approx. 100 Ω
B-A unit filament protection operation	Over range (when operating above 13 Pa) and emission error (when over ± 50%) <The error is reset by switching OFF the filament control signal. >
Gauge head filament	Yttoria coated iridium single filament
Gauge head flange type	KF40
Display LED	Crystal gauge operation B-A gauge operation (B-A filament ON/OFF status)
Connector type	D-Sub 15P
External dimensions	See Page 5
Operating environment	Temperature: 5 to 40℃ (electronics included), humidity: 70% or lower Gauge head only temperature resistance: 150℃ maximum

3 Part Names and Functions



Table 2 Part Names and Functions

No.	Name	Function
①	D-Sub 15P connector	D-Sub 15-pin connector used for power supply and input-output signals
②	Crystal LED	Indicates the operating status of the crystal gauge
③	B-A LED	Indicates the operating status of the B-A gauge
④	ATM	Trimmer volume control used for adjusting atmospheric pressure (ATM)
⑤	Zero	Push switch used for adjusting the pressure zero point setting (zero adjustment)
⑤	Controller	Electronics unit
⑥	MX-1	Gauge head

The crystal LED and B-A LED operate as follows.

Table 3 LED Operation

LED	LED Operation	Content	Cause of Error
Crystal	Green flashing	Operating normally	
	OFF	Not operating	No power input, circuit failure
	Red illuminated	Controller internal hardware error	Circuit failure
	Red flashing 1 Note 1	Crystal unit gauge head error	Gauge head not connected, gauge head failure
	Red flashing 2 Note 2	Zero adjustment or ATM adjustment error (the error is output continuously until corrected)	Error when adjusting zero: Zero adjusted at a pressure of 10^{-2} Pa or above, or gauge head contamination Error when adjusting ATM: Adjustment is outside of the ATM adjustment range, or gauge head contamination
B-A	OFF	Filament OFF	
	Green illuminated	Filament ON	
	Green flashing	Filament and Degas ON	
	Red illuminated	Emission current error (The emission current has drifted ± 50% from the standard emission current)	Filament has blown-out
	Red flashing	Filament protection due to over range	The pressure has exceeded the measurement range

4 Part Dimensions

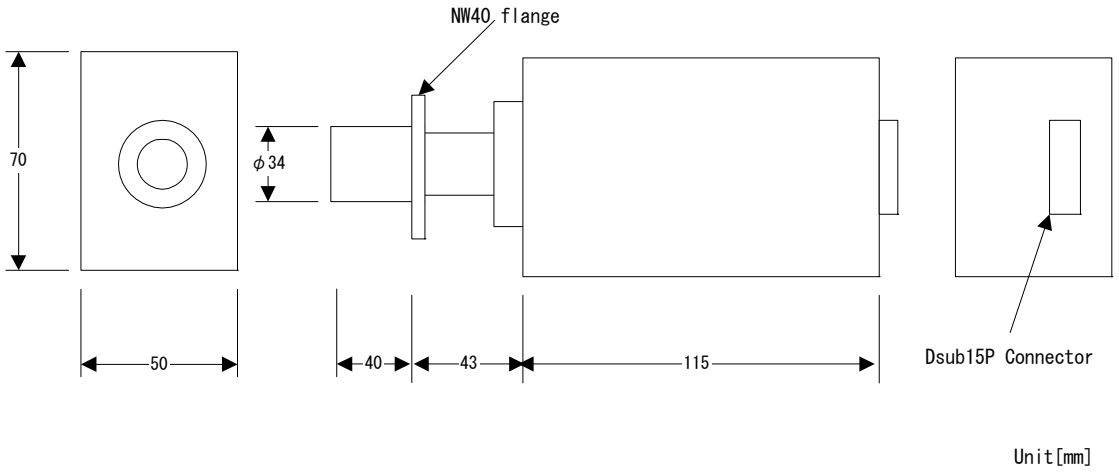


Figure 1 Crystal Gauge M-322XG Dimensions

5 Unpacking and Checking

When you receive this product, immediately open the packaging and check all components are included. Inspect the outside for any external damage.

Components

Crystal gauge M-332MX main unit (with gauge head)	1
D-Sub connector HDAB-15S (Hirose Denki)	1
Plug case HAD-CTH (Hirose Denki)	1
Operation Manual	1

6 Connecting to External Instruments

(1) Remote I/O Connector Pin Layout and Function

Table 4 D-Sub Connector Pin Layout

Pin No.	Function	Remarks
1	DC Input (22 to 26 VDC)	
2	DC Input common (Note 1)	
3	Control signal Vcc IN (24V DC)	Control signal power supply input (Note 2)
4	Control signal Vcc common	
5	Filament ON/OFF input	See Section 6 (2) for the control method.
6	Degas ON/OFF input	
7	Crystal gauge ATM input	
8	Crystal gauge zero input	
9	Not in use (NC)	
10	Not in use (NC)	
11	Analog output	See Section 6 (3) for details
12	Analog GND	
13	Not in use (NC)	
14	Not in use (NC)	
15	Not in use (NC)	

Note 1: Connected to the controller case or the chamber by the gauge head.
Note 2: Control signal power supplies
The control signal Vcc IN can be connected in parallel to the controller power supply. However, if the control signal voltage differs from the controller drive voltage, or if the control signal power supplies are to be insulated from the controller drive power supply, or if the effects of noise are to be considered, connect the control signal Vcc IN to a separate power supply.

(2) Remote Control Input

① Function

Table 5 Remote Control Input Functions

Signal Name	Pin No.	Function
B-A filament inhibit input	5	Prohibits the filament switching ON. (The filament can be forcible switched OFF.)
B-A degas ON/OFF input	6	Switches the B-A gauge degas ON/OFF. However, this function is only enabled when the B-A filament is ON.
Crystal gauge ATM set input	7	Adjusts the crystal gauge ATM. Pay attention that this is set to the pressure value adjusted by VR for ATM adjustment.
Crystal gauge zero set input	8	Sets the crystal gauge zero point. * Sets the zero point by switching OFF → ON → OFF (switching ON for 0.5 to 1 second). (This is the same operation as switching the zero point set switch.)

② Input Electrical Specifications
Input type: Contact input
Current: Approx. 6 mA (when Ext Vcc = 24 V)

③ Input Signal Use Example

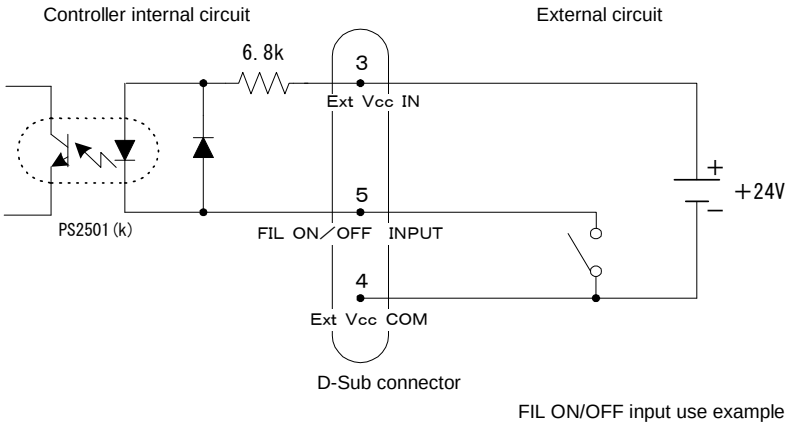


Figure 2 Input Signal Use Example

(3) Analog Output

When the B-A gauge is OFF, the crystal gauge outputs the measured pressure value (however, when the B-A gauge protection is operating, an error is output). When the B-A gauge is ON, it outputs the measured pressure value.

- **Analog signal pressure conversion equation**

Pressure unit = Pa

$V_{out} = 0.6 \times \mathrm{Log}_{10}(\mathrm{Press}/133.33) + 6.875 \leftarrow \rightarrow \mathrm{Press}/133.33 = 10^{((\mathrm{Vout}-6.875)/0.6)}$

- **Conversion table**

Analog Output V_{out} [V]	Error Content
< 0.4	Sensor error
> 9.5	Sensor error (at crystal gauge failure or when B-A gauge protection is operating)

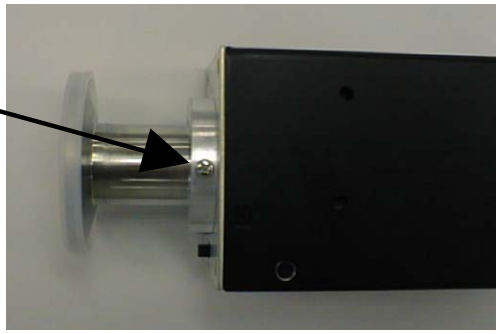
The lowest voltage output during pressure measurement (except when an error occurs) is the value of the measured pressure lower limit value of each gauge (crystal gauge or B-A gauge).

7 Replacing the Gauge Head

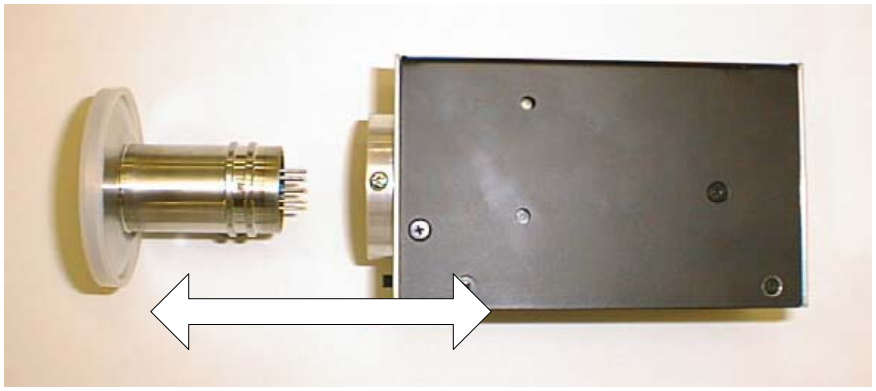
When replacing the gauge head, make sure that electric power is stopped supplying or the remote connector is disconnected. There is a risk of damaging the controller unit.

(1) Detaching the Gauge Head

Loosen this M3 screw to detach the gauge head

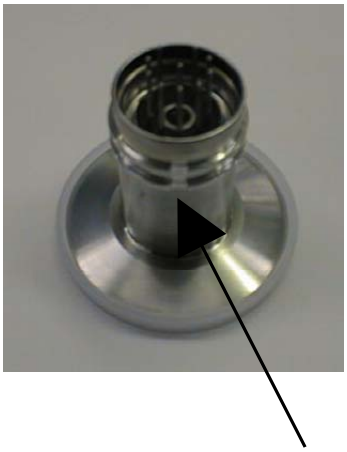


By removing the M3 screw locking the crystal gauge M-332MX gauge head as shown in the above figure, the gauge head can be pulled away and detached.

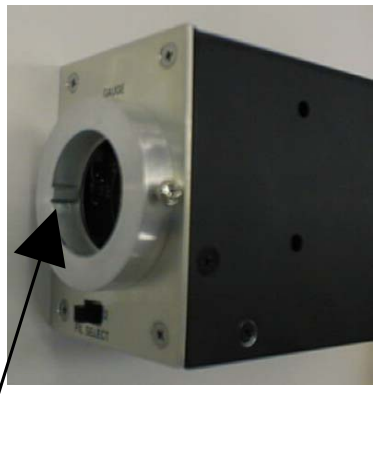


When pulling away the gauge head, be certain to pull it straight. If stress is applied to the pins of the gauge head, there is a risk of a leak occurring at the gauge head pins.

(2) Attaching the Gauge Head



Gauge head insertion guide



Gauge head insertion guide

Check the M3 gauge head locking screw is loose and the gauge head pins are all standing perpendicular. Align the gauge head insertion guides on the gauge head side and the controller side and then insert the gauge straight.
After inserting, tighten the M3 gauge head locking screw to lock the gauge head securely to the controller. If the gauge head is not inserted cleanly into the controller, do not force it. Re-check the M3 screw and gauge head pins and then try again.

When inserting the gauge head, be certain to insert it straight. If stress is applied to the pins of the gauge head, there is a risk of a leak occurring at the gauge head pins. Also, if it is forcibly inserted, the gauge head and the controller may be damaged.

8 Adjusting the Crystal Gauge Unit

By adjusting the crystal gauge, measurements of greater accuracy can be obtained. Adjust the zero point and ATM as follows.

(1) Zero Adjustment

If foreign material becomes stuck to the sensor, the high vacuum pressure reading may drift higher. In this situation, operate the zero point set switch to adjust the zero point.

Procedure:

① Pump down the inside of the vacuum vessel and check the pressure is at 10^{-2} Pa or below.



If the zero point drifts greatly due to insufficient base pressure, the pressure reading will also drift greatly.

② Press the zero set switch on the controller for 1 second or longer. Or, input an ON signal for 1 second or longer by operating from the remote I/O.



The pressure range in which the zero point can be set is where the drift is within approximately 10 Pa compared to when the sensor was new. If this range is exceeded, a zero set error will occur. If the gauge is operating at the correct pressure, the sensor has expired and needs replacing. See Section 7 for the method of replacing the sensor.

③ Automatic Zero Adjustment
In addition to operation ② written above, the zero can be adjusted automatically in conjunction with the B-A gauge.
When the B-A gauge is ON, if the B-A measurement pressure remains below the zero reset allowing pressure (1.33×10^{-2} Pa), the zero point is automatically adjusted every 5 minutes.

(2) ATM Adjustment

When the gauge head has been replaced, if the pressure reading is different compared to other gauges, adjust the ATM pressure.



When adjusting the ATM pressure, also adjust the zero point again.

- **Procedure:**

① Attach a standard vacuum gauge that can measure atmospheric pressure (ionization vacuum gauge, etc.) to the vacuum vessel together with the crystal gauge.

② Pump down the inside of the vacuum vessel and then introduce N_2 gas into the vacuum vessel until the pressure is at atmospheric pressure.

③ Turn the ATM volume control and adjust the pressure signal output until the pressure reading is the same as the one of the standard vacuum gauge.

④ When the ATM pressure has been adjusted by method ③ above and is to be re-adjusted to the same pressure, it can be set by the remote control input.

9 Troubleshooting

For the methods of troubleshooting, see Table 6 below.

Table 6 Troubleshooting

LED	Display	Course of Action
Crystal	LED OFF	Check the power is supplied to the crystal gauge. If not restored even if the power is supplied, contact Canon Anelva.
	Red illuminated	Contact Canon Anelva
	Red flashing 1 Note 1	Check the gauge head is properly connected to the controller. If there is no connection error, the crystal oscillator may have stopped oscillating inside the gauge head due to broken wiring, etc. Replace the gauge head.
	Red flashing 2 Note 2	Error when adjusting zero: Adjust the zero at a pressure of 10^{-2} Pa or below. If there is no improvement, replace the gauge head. Error when adjusting ATM: Adjust the ATM pressure in the adjustment range. If there is no improvement, replace the gauge head.
B-A	Red illuminated	The B-A gauge filament may be broken. Replace the gauge head.
	Red flashing	The measurement may have exceeded the B-A gauge measurement range. Check the pressure.

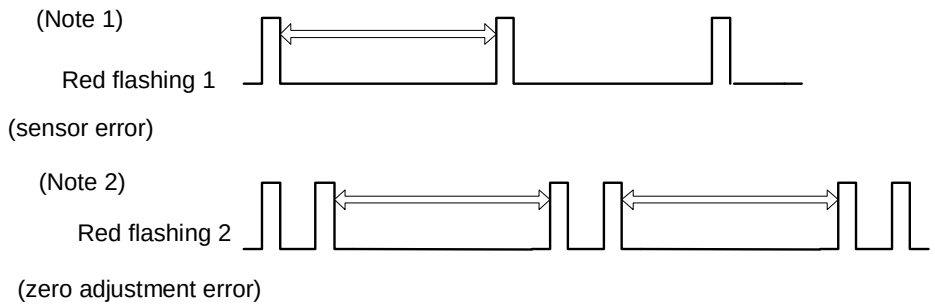


Figure 3 Crystal LED Error Flashing

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