

IM-A-499 June 2000

INSTRUMENTATION AMPLIFIER

WGI-300C SERIES

INSTRUCTION MANUAL



KYOWA
ELECTRONIC INSTRUMENTS CO., LTD.

Thank you for purchasing our product WGI-300C Instrumentation Amplifier. Read this Instruction Manual carefully in order to make full use of the high performance of the Instrument. Do not operate the Instrument in methods other than instructed in this Manual.

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Standard Accessories

The following standard accessories are enclosed with WGI-300C Instrumentation Amplifier (hereinafter referred to as the WGI-300C). After unpacking, check that all the accessories are correctly prepared.

AC input cable	1
Spare fuse (0.5A)	1
Small screwdriver for connecting terminal board	1
Physical unit indicating label:	1
Mounting screws (M3)	4
Warranty	1
Instruction Manual	1

Safety Precautions

■ Prior to use

Read carefully the following safety precautions and instructions before using the WGI-300C. After reading, keep the Manual at hand within your reach.

Take special care for securing safety of the operator and handle the WGI-300C with correct manner.

KYOWA ELECTRONIC INSTRUMENTS CO., LTD. assumes no liability for damages resulting from usages other than described in this Instruction Manual.

■ The following symbols are used for safety operation.

 GND	Indicates "Protective Ground Terminal." Do not forget to ground the terminal of the Instrument having this mark.
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■ The following warning indications are used for safety operation of the Instrument.

 WARNING	Improper handling of the Instrument may result in fatal or severe injury of the operator. To avoid it, the operator must refer to the accompanying instructions in the users' Manual.
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 CAUTION	Improper handling of the Instrument may result in injury of the operator or cause damage to destruction of parts of the product. To avoid it, the operator must refer to the users' Manual
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WARNING

● Power

To prevent fire, before turning ON the power, do not forget to check whether supply voltage in use agrees with the power requirements stated in the specifications of the Instrument.

● Power Cable and Power Supply Receptacle

To prevent an electric shock or fire, use the attached power supply cable and 3P to 2P converter. Connect the power cable only to a power receptacle equipped with protective ground terminal. When the 3P power cable equipped with a ground cable is used, connect it to a 3P power receptacle with a protective ground terminal.

If you use an extension cable without a protection ground cable attached, protection yields no results.

Refer to the Instruction Manual and connect the power cable to the Instrument with power turned OFF and then, connect the power plug to a proper power receptacle.

● Protective Grounding

To prevent an electric shock, protective grounding should be made before turning ON the power. When using a 3P to 2P converter, do not fail to connect the ground wire of the converter securely to the protective ground terminal.

When 2P vinyl power cable is used, do not forget to connect the protective ground terminal with a separate ground wire.

● Essential of Protective Grounding

Protective grounding is essential for preventing an electric shock. Take special care not to cut a protective ground wire that is connected to the exterior of the Instrument or disconnect the protective ground terminal.

● Confirm Protective Ground Function

To prevent an electric shock, always confirm protective ground correctly functions.

If any trouble occurs in protective ground functions including protective ground, fuse holder, etc., do not operate the Instrument.

● Fuse

To prevent fire, use only a fuse with the Instrument specified rated current, voltage and type). Do not use a fuse other than specified or shunt the fuse holder.

For replacing the fuse, disconnect the power cable before replacing the fuse.

● Environment with Inflammable Gas, etc.

To prevent fire or explosions, special care should be taken not to use the Instrument in environment with inflammable gas, vapor, or dust.

● External Connection

To prevent an electric shock, do not forget to ground the protective ground before connecting the Instrument to external devices including measuring target device, external control circuit, etc.

Handling Precautions

Read this Instruction Manual before using the Instrument.

- Ground the Instrument

Terminal No. 10 is connected to the shielding of an transducer cable and the instrument chassis.

- Power supply

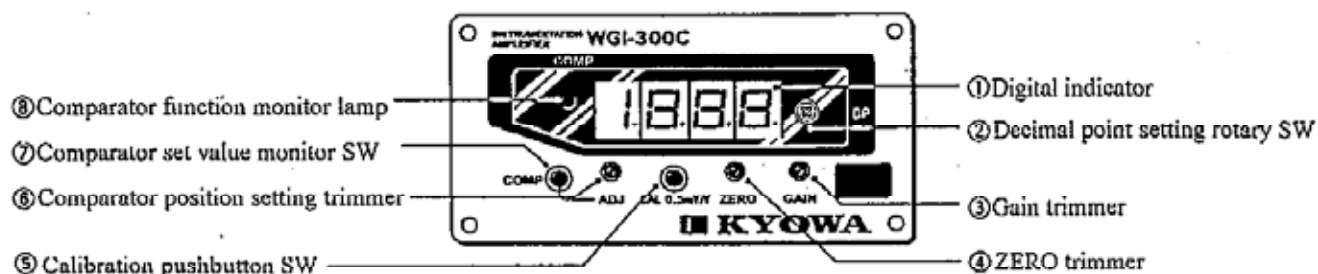
The WGI-300C is operable with 90 to 110V AC, 50 or 60 Hz. Power consumption is maximum 10VA. When operating under poor power condition, it is recommended to use a constant voltage transformer, etc.

- Operating temperature range :-10 to 40 °C

Storing temperature range :-40 to +80 °C

1. Parts and Functions

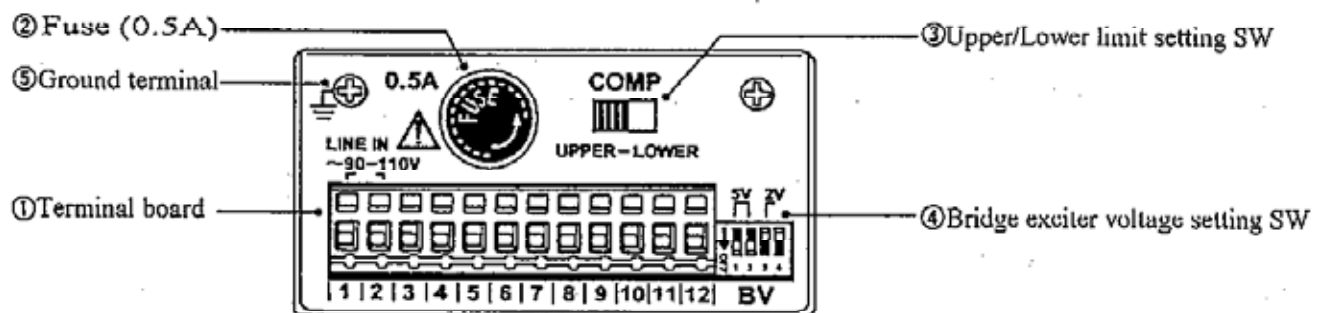
1-1 Front



- ① Digital indicator. A 7-segment LED indicator with approximately 10mm-high character ranging from 000 to 1999. The "– (minus)" sign is added to a negative value. In addition to sensor output readings, it indicates overload or abnormal sensor input. Overload or abnormal sensor input is indicated as follows.
-
- Remove the load. And if there is no change in the reading after then, check the connection or wiring as well as the sensor in use.
- ② Decimal-point-setting Turn this switch with the attached screwdriver and the decimal point lamp lights up. Stop turning the switch until it reaches the required position.
- ③ Gain trimmer [GAIN] Converts input data within the range from 0.5 to 5.0 mV/V into optional numeric values up to 1999 with 2V bridge excitation voltage. In addition, data within the range from 0.5 to 3.0 mV/V is converted up to the above with bridge excitation voltage 5V.
- ④ ZERO trimmer [ZERO] 20-turn (approx.) trimmer allows ZERO adjustment within the range ± 0.3 mV/V. Adjust it with the attached minus screwdriver.
- ⑤ Calibration pushbutton switch. Used to apply calibration voltage relevant to 0.5 mV/V, thereby facilitating gain calibration using calibration factor.

- ⑥ Comparator position setting. Used to set and activate the comparator at an appropriate position between 0 and 1999. The comparator operates only in the positive direction. If the sensor input exceeds the above position (upper limit), the upper relay activates and if the sensor input lowers the above position, the lower relay activates the comparator.
- ⑦ Comparator set value monitor. Indicates a comparator set value on the digital indicator. While pressing the switch, the comparator set value can be monitored on the display.
- ⑧ Comparator function monitor lamp. A LED lamp for monitoring the comparator operation that interlocks with relay operation.

1-2 Rear



- ① Terminal board
100V AC (Nos.1, 2) Power supply input terminal.
Standard power requirements is 100V AC, 50/60 Hz. If power supply other than the above is specified, always check the capacity of this connector satisfies the specifications before connecting to the power supply.
- COMP OUT (Nos. 3, 4, 5) Relay contact output terminals for comparator output.
No.3 terminal. N/C (Normally closed)
No.4 terminal. COM (Common)
No.5 terminal. N/O (Normally opened)
- Transducer input (Nos. 6 to 10) Bridge excitation voltage
5V DC, Max 30 mA (350Ω sensor : 2 units)
2V DC, Max 30 mA (120Ω sensor : 1 unit)
350Ω sensor : 4 units

ANALOG OUTPUT (Nos. 11 & 12)

ANALOG current output. Analog current outputs are rated at +4 to +20 mA against indicated scale of 0 to +1999. Note that no negative output is allowed. Set the load resistance to 600 Ω or less and avoid connecting to a large capacity or inductive load.

(No. 11 terminal : +; No. 12 terminal : -)

ANALOG voltage output. Voltage output terminal for connecting external measuring instruments such as a recorder. The rated voltage is approximately $\pm 2V$ against the indicated scale of up to ± 1999 . Since full scale including the ZERO point do not always coincide, conduct ZERO and span adjustment with the connected measuring instrument. This voltage output is the output of OP-AMP equivalent to LM301A.

Set load resistance to 1 k Ω or more and avoid connecting to a large capacity or inductive load.

(No. 11 terminal : +, No. 12 terminal : -)

A 0.5A fuse used for the 100V AC power supply.

② Fuse. For replacing the fuse, do not forget to turn OFF the power in advance.

③ Upper/lower limit setting switch Used to select the comparator upper/lower limit.
[COMP UPPER/LOWER] Used to select bridge exciter voltage 2V or 5V.

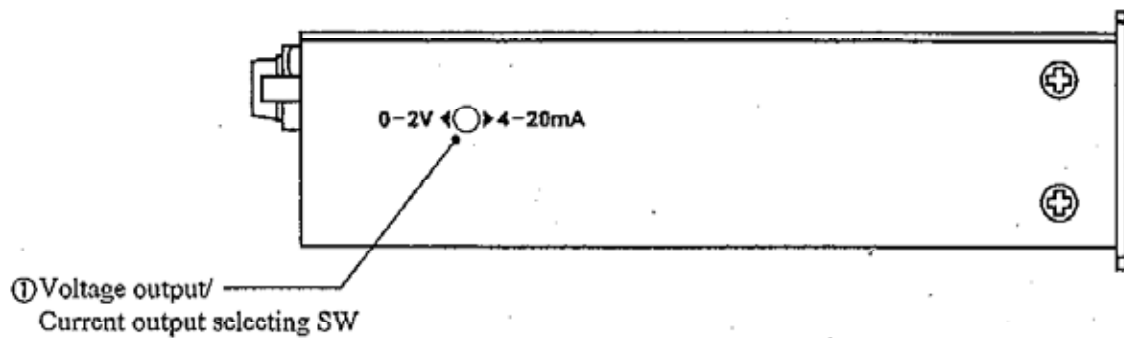
④ Bridge exciter voltage setting 2V : Set dip switches 1 & 2 to [OFF] and 3
switch [B.V] to [ON].

5V : Set dip switches 1 & 2 to [ON] and, 3 to [OFF].

⑤ Ground terminal $\oplus$ Do not use switch combinations other than instructed above (No.4 is unused.)

Do not forget to ground this terminal to prevent an electric shock or an obstacle induced by static electricity.

1-3 Side



- ① Voltage output/current output selecting switch

Used for selecting voltage output or current output of the ANALOG OUTPUT (Terminal board Nos. 11 & 12). Switches the internal toggle switch with the attached screwdriver.

Voltage output : Turn the toggle switch to 0 to 2V side.

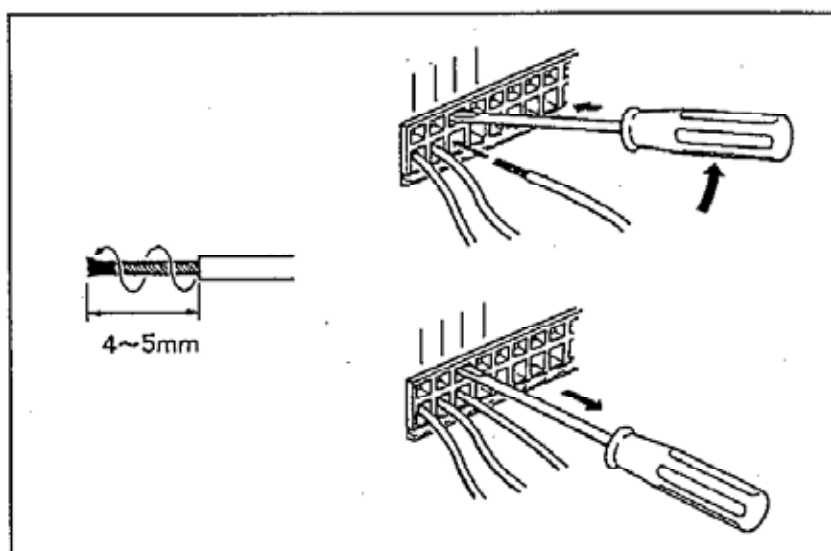
Current output : Turn the toggle switch to 4 to 20 mA side.

2. Connection

2-1 Cable Connection

The external connectors of the WGI-300C adopt cage-clamp terminals, which allows easy connection for any operators.

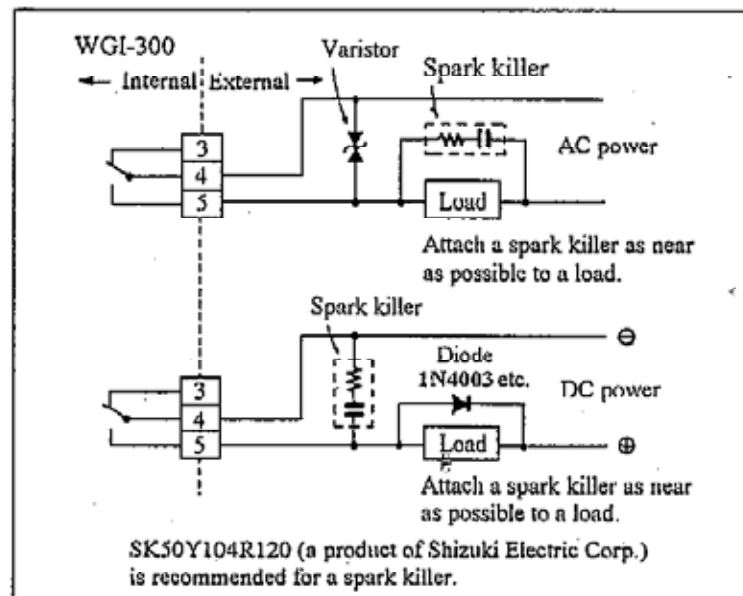
- ① Remove the vinyl coating of the connection cable 4 to 5mm from its end.
- ② Twist the exposed wire ends together to prevent from loosening.
- ③ Forcibly insert the attached screwdriver into the upper hole and boost up.
- ④ Take care not to loosen the exposed wire ends and insert them into the lower hole.
- ⑤ Pull out the screw driver from the hole.
- ⑥ Slightly pull the cable to confirm the cable is firmly clamped.



Notes

- Connectable wires range from 0.2 to 2.5 mm² (AWG24 to AWG14) in cross sectional area.
- Do not attach a press-fit terminal to or solder the wire ends.
- To connect multiple wires, twist their ends together in advance.

Example of connecting external load to the comparator output relay



Cautions

- Connect external load within the rating. (Resistance load : 250V AC, 0.5A)
Overvoltage or Overcurrent may shorten the WGI-300C's service life and cause damage as well.
- Do not shunt or it may damage the WGI-300C.
- It is recommended to connect a noise killer to a load in order to enable the high noise resistance of the WGI-300A.

Notes

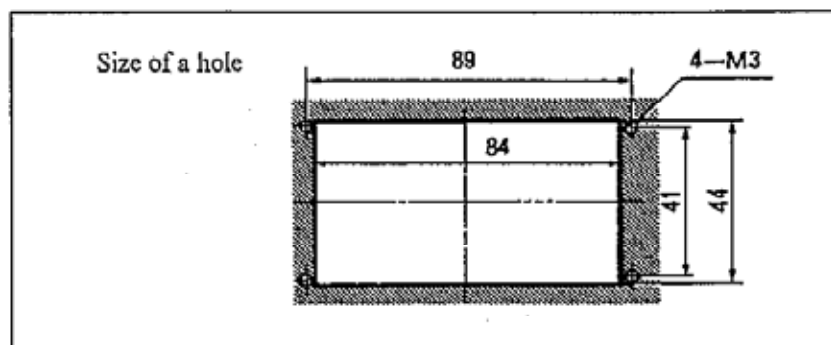
If the WGI-300C is operated in environment with excessive foreign noise, take the following countermeasures.

- Use an input cable as short as possible. Also use a shielded cable and conduct grounding at one point.
- If the input cable is cross-connected or in parallel with a power cable, coat the latter with a conduit pipe or the like. If circumstances do not allow the above, coat the input cable with a conduit pipe and ground the pipe at one point.

2-2 Panel Mounting

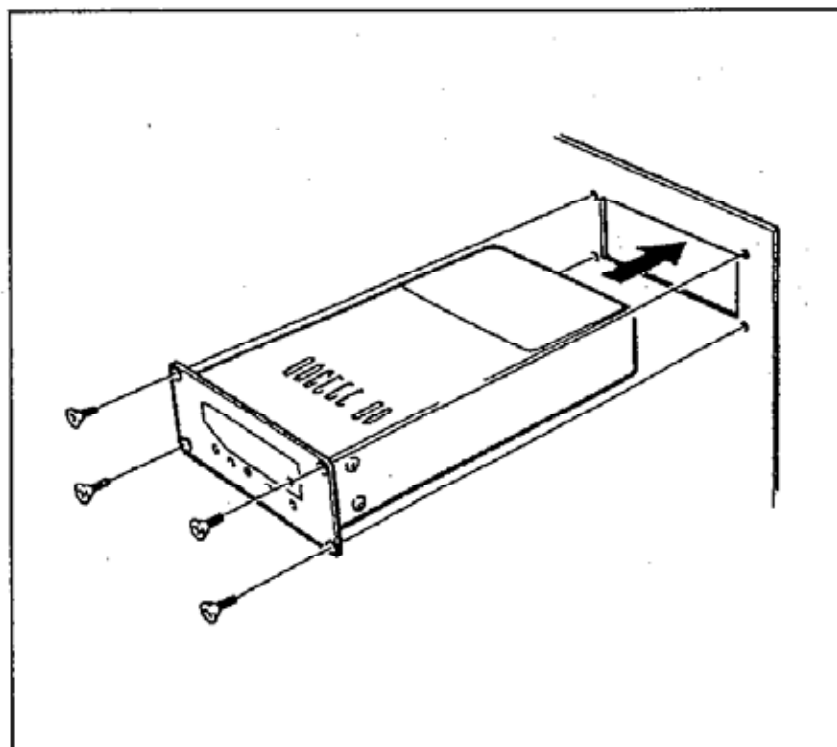
To mount the WGI-300C on the panel, cut the panel according to the following panel cut dimensions and then, mount the WGI-300C by referring to the following procedures in items ① to ③.

- ① Bore a hole through the mounting panel.



- ② Insert the WGI-300C into the panel hole.

- ③ Firmly fix the WGI-300C to the panel with screws.

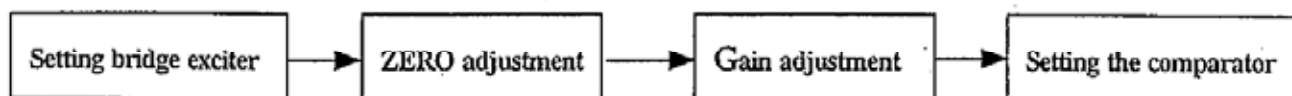


Note

After the WGI-300C is mounted on the panel, special care should be taken not to apply excessive shock or vibration on the WGI-300C during transportation.

3. Adjustment

3-1 Adjustment Procedures



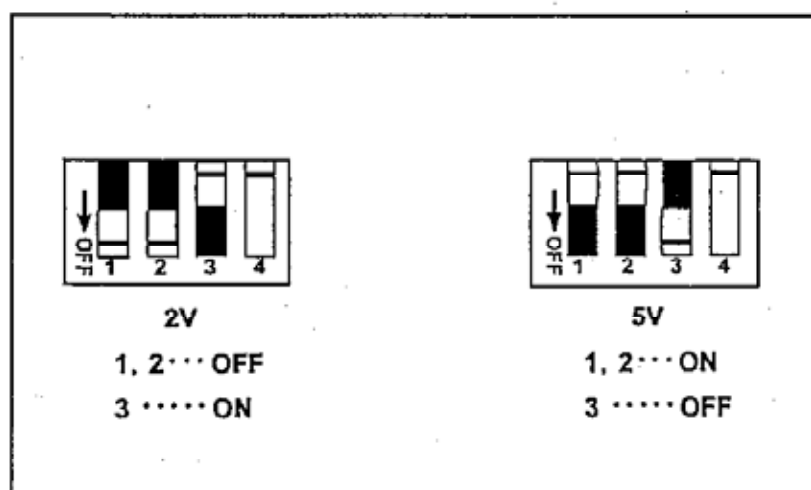
3-2 Setting Bridge Exciter Voltage

Select 2V or 5V for bridge exciter voltage. When using a 350Ω sensor, select 5V, and 2V for 120Ω sensor.

Select 2V or 5V by setting dip switches on the WGI-300C rear as shown in the following figure.

Do not set the dip switches in methods other than instructed . (Switch No. 4 is unused.)

Dip Switches are set to 5V (Standard bridge excitation) prior to shipment.



3-3 ZERO Adjustment

- ① Turn ON the WGI-300C power and leave it as untouched approximately 20 minutes.
- ② Initialize the attached sensor.
- ③ Turn the ZERO trimmer with the attached screwdriver to read [000].

WGI-300C's ZERO adjusting range is ± 0.3 mV/V under the normal set-up.

If it fails to read [000] through turning the ZERO trimmer clockwise or counterclockwise, check the sensor. If the sensor is affected by the initial load such as tare weight, ZERO may not be obtained. In such case, see the following "ZERO correction."

If the reading [1] does not change by turning the ZERO trimmer, faulty sensor input including incorrect connection, short, or shunt may be considered. Check input terminal board and sensor.

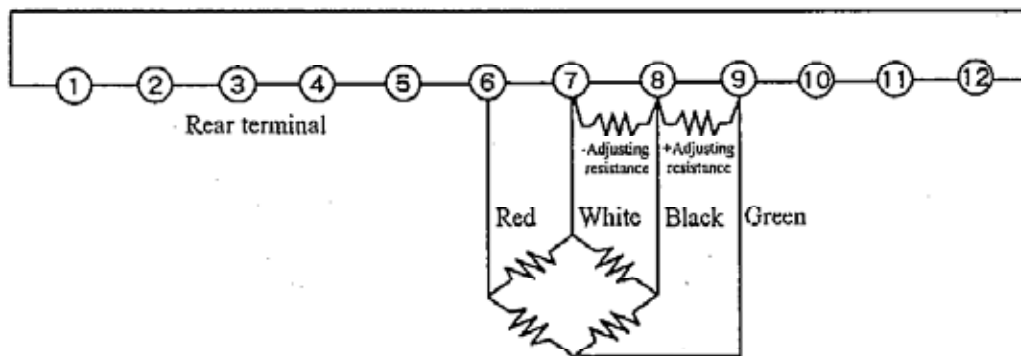
● ZERO correction

In weight measurement, when tare is exceedingly large compared with the measuring target, ZERO trimmer on the WGI-300C side may not be able to obtain ZERO. In such case, it is recommended to connect a resistor to one side of the gage bridge to cancel the unbalanced voltage that is relevant to an initial load affecting the sensor.

- Connect a resistor between input terminals 7 and 8, or between 8 and 9 as shown in the figure.
- To adjust the "Initial value shifted to the + side" to "0," connect the resistor between input terminals 8 and 9, and to adjust the "Initial value shifted to the - side" to "0," connect the resistor between input terminals 7 and 8.
- For resistance values, see the following table.

Although resistance values are described by values of the commercially available E-96 series resistance values, approximate values may be used.

- Since the resistor directly affects the accuracy of the measurement, use the resistor which is superior in temperature characteristics (Temperature coefficient : 50 ppm/°C or less).



Initial Value Shift		ZERO Adjustment Resistance (E-96)	
[$\mu\epsilon$]	[mV/V]	For 350 Ω [k Ω]	For 120 Ω [k Ω]
500	0.25	348	121
1000	0.5	174	59.0
1500	0.75	115	40.2
2000	1.0	86.6	30.1
2500	1.25	69.8	23.7
3000	1.5	57.6	20.0
3500	1.75	49.9	16.9
4000	2.0	43.2	15.0
4500	2.25	38.3	13.3
5000	2.5	34.8	11.8
5500	2.75	31.6	10.7
6000	3.0	28.7	10.0

3-4 Gain Adjustment

Conduct gain adjustment after ZERO adjustment.

3-4-1 Using an actual load

- ① Apply a known actual load to the sensor.
- ② Adjust the gain trimmer so that the reading indicates the known actual load.
- ③ Remove the actual load from the sensor. If the reading does not indicate ZERO, conduct ZERO adjustment and then, conduct gain adjustment once again.

3-4-2 Using the internal calibration function

The internal calibration value of the WGI-300C is 0.5 mV/V. Through this function and by referring to the calibration factor described in the⁶ sensor calibration record, this function is capable of conducting gain adjustment without using the actual load.

Conduct gain adjustment to read a full scale calibration factor with CAL switch pressed.

Full scale refers to N, Pa, N · m, etc. Calibration factor refers to an output voltage (mV/V) per calibration voltage.

If a calibration factor is expressed with $\times 10^{-6}$ strain, convert it by $[0.5 \text{ mV/V} = 1000 \times 10^{-6} \text{ strain}]$.

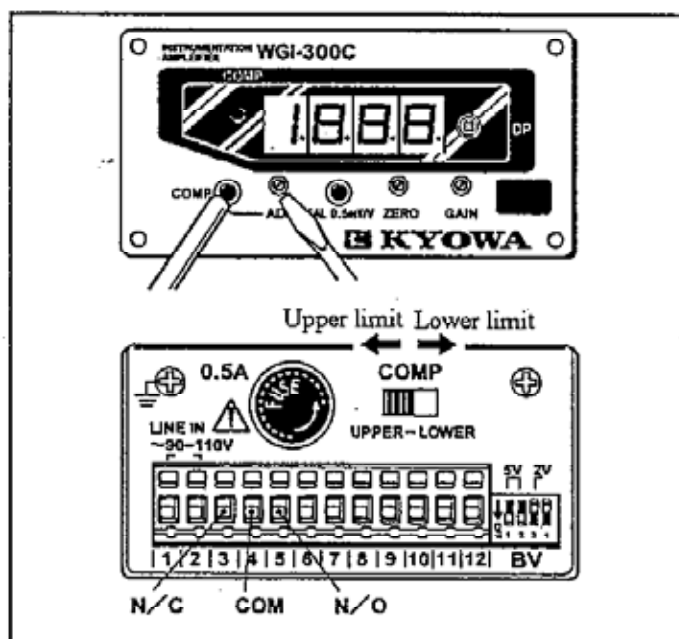
3-5 Setting the Comparator

The WGI-300C has one comparator built-in. This comparator operates only in the positive direction and serves to issue alarm, overload, or underload to the external devices.

While pressing the COMP switch on the front panel, the preset value appears on the screen. See the screen and turn the trimmer (ADJ) on the front panel to set an arbitrary value.

Use the [COMP UPPER- LOWER] limit setting switch on the rear panel to select either upper or lower limit for the comparatator or operation.

Set the limit selecting (slide) switch to [UPPER] side to select the upper limit. Then, the comparator operates when sensor signals exceed the limit.



On the contrary, set the same switch to [LOWER] side to and select the lower limit. Then, the comparator operates when sensor signals is below the limit.
The switch is set to [UPPER] (Standard) side prior to shipment.

Note

- The comparator output is conducted by relay contact.
- No. 4 terminal is COM (common), No. 3 terminal is normally closed (N/C) (i.e. Normally [ON], and when the comparator is operated, [OFF]), and No.5 terminal is normally opened (N/O) (i.e. Normally [OFF], and when the comparator is operated, [ON]).

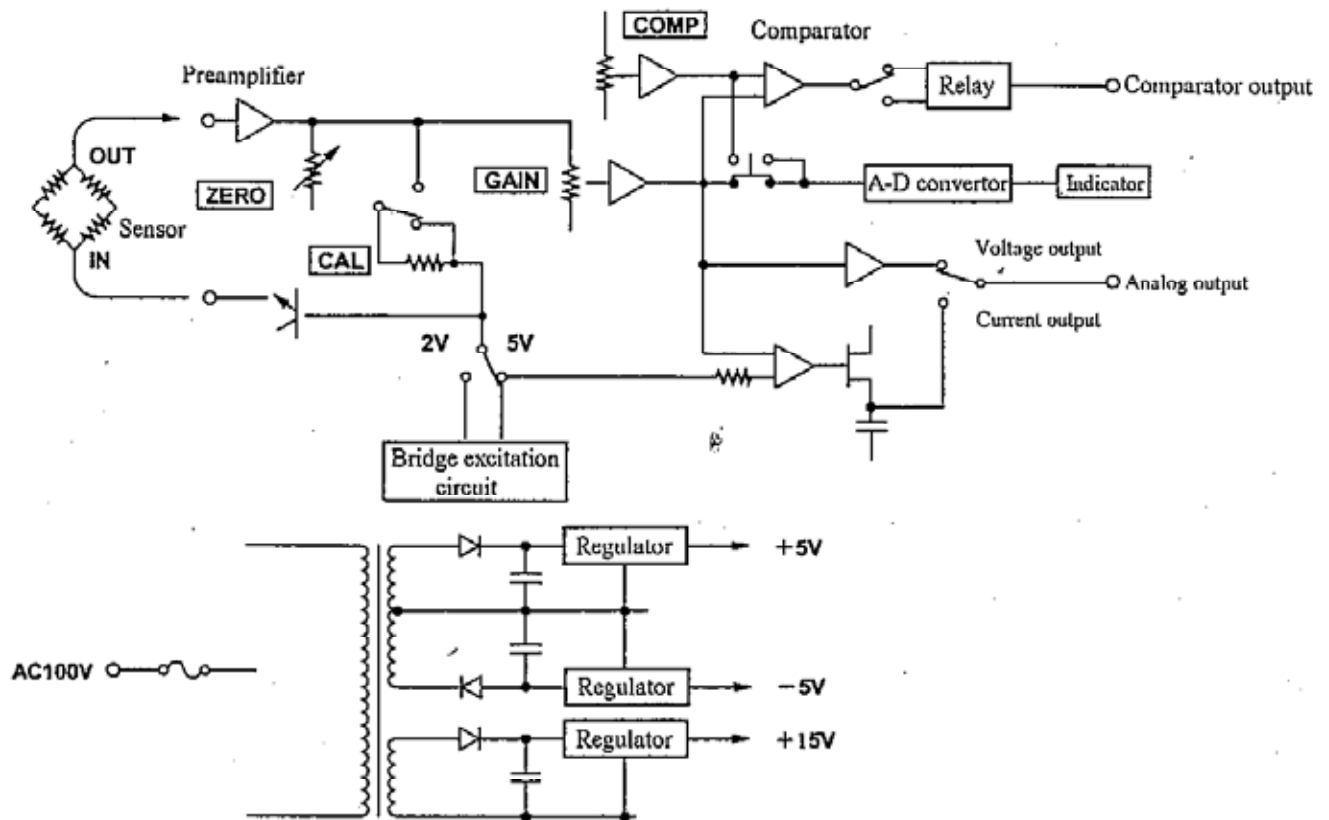
4. SPECIFICATIONS

4-1 Specifications

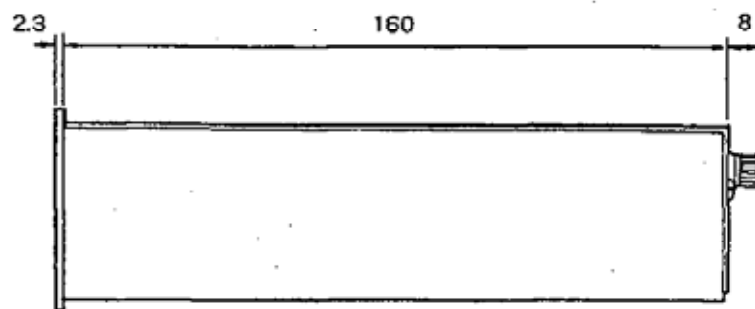
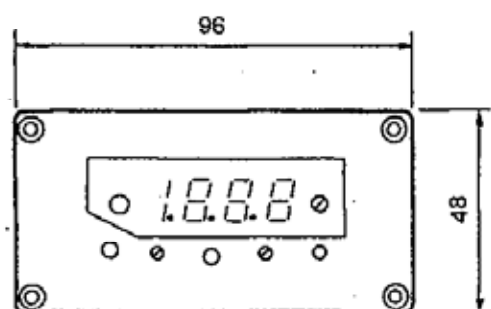
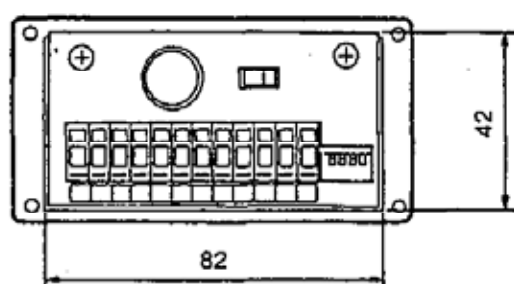
Applicable sensor	Strain gage type transducer
Bridge exciter	5V DC, Max 30 mA (350Ω transducer : 2) 2V DC, Max 30 mA (120Ω transducer : 1, 350Ω transducer : 4) Selected by dip switch.
ZERO adjusting range	Within the range ± 0.3 mV/V
Span adjusting range	Full scales 0.5 mV/V to 5.0 mV/V
Calibration value	0.5mV/V calibration value is applied with a pushbutton switch on the front panel.
Numerical display	000 to 1999 (Minus : " - ") Character height : 10mm, red LED
Decimal point	Set on the arbitrarily position with a rotary switch on the front panel.
Repeat times	Approx. 3 times/second
Non-linearity	0.1% FS ± 1 numeric value (5V excitation voltage at 1 mV/V input)
Stability	ZERO : Within 0.01%/°C (5V excitation voltage at 1 mV/V input) Gain (sensitivity) : Within 0.01%/°C
Current output	Approx. 4 to +20 mA (Corresponds to 0 to 1999 indication) Set load resistance to be 600Ω or less
Voltage output	Approx. 0 to ± 2 V (Corresponds to 0 to ± 1999 indication) Set load resistance to be 1 kΩ or more. (Note: Setting both current output and voltage output at the same time is not allowed.)
Connection to external devices	Cage clump method
Comparator	Point : 1 Select UPPER/LOWER limit with the sliding switch Setting : Trimmer on the front panel. Monitor : Monitors the set value with a switch on the front panel. Output : Relay contact output (IT) Capacity : 250V AC 5A (Resistance load) Service life : 5 million times or more Display : Red LED lights up when relay is activated.

Power requirement	100V AC $\pm$ 10%, 50/60 Hz
Power consumption	Approx. 6.6 VA (When 100V AC)
Fuse	ϕ 5.2 $\times$ 20 mm 0.5A 125V
Operating environment	Temperature : -10 to +40 $^{\circ}$ C Humidity : 80% RH or less (Non-condensing)
Dimensions	96 (H) $\times$ 48 (H) $\times$ 160 (D) (Protruded portion not included)
Weight	Approx. 800g

4-2 Block Diagram



4-3 Dimensional Drawing



5. Optionals

- ① 11 V AC, 200V AC, 220V AC
- ② Green LED
- ③ DC power supply units : 12V DC, 24V DC