

Graphic Multi Meter

Hardware Setup Manual

(Strain Gauge / Pulse)



Contents

1. Introduction	3
2. Precautions	3
3. Other	4
4. Operating Environment	4
5. Model Codes	5
6. Ratings of Device	6
7. External Dimensions and Mounting Procedure	6
8. Names of Parts	7
9. Terminal Connection Method	8
Power Supply Terminals (M3) and Protective Ground Terminal (M4)	8
Ach / Input Terminals (M3)	8
Bch / Input Connector (D-SUB 15p Female)	10
Control Connector (D-SUB half pitch 26p)	10
RS-232C Connector (rectangular)	13
10. Specifications	14
11. Options	16
Options by Type	16
12. Circuit Configuration of Device	18
13. Warranty and After Service	19

1. Introduction

This manual is to ensure safe and correct use of the product. Be sure to read this manual prior to use. Make sure you correctly understand the content when you use the product.

2. Precautions

To ensure safe use of the product, precautions are indicated by the following symbol marks. Be sure to observe the precautions.



Indicates a potentially hazardous situation which, if mishandled, could result in death or serious injury to the user and/or severe damage to property.



Indicates a potentially hazardous situation which, if mishandled, could result in injury to the user and/or damage to property.

WARNING

- Do not dismantle the unit to carry out modification or repair work. Doing so may result in fire, electric shock, or injury.
- Be sure to provide an external breaker to ensure the power is cut off in the event of this product or other equipment malfunctioning.
- Be sure to ground the product. (JIS Class 3 grounding)
- Be sure to use the product within its ratings.

Using the product in ways other than specified may result in a failure of the protection provided for the product.

* Protection provided for the product refers to the following:

The product has reinforced insulation between the power supply line and the input and output terminals to protect against electric shocks. (When AC power unit is mounted)

It also has basic insulation between the power supply line and casing to prevent against electric shocks.

- Functional insulation is provided between each of the input and output terminals. If a high voltage is applied to each terminal, there is the risk of an electric shock because insufficient insulation protection is provided between the other input and output terminals.

2. Precautions

CAUTION

- Use the product in the specified operating environment.
Using the product in an environment that exceeds the specification range may cause a malfunction or failure.
- Be sure to use the product within its ratings.
Using the product in a manner that exceeds the specification range may cause a malfunction or failure.
- Do not insert any object via the ventilation holes, etc.
Doing so may cause a malfunction or failure.
- A touch panel is attached to the LCD.
Make sure the touch panel is operated with, for example, a stylus pen and is not subjected to extreme mechanical shock. Failing to do so may cause a malfunction or failure.
- When cleaning the display and other parts, do not use substances like thinner, benzine, acetone, and kerosene. Make sure the device is turned off and then wipe it with a soft cloth.

3. Other

- Our company takes no responsibility for special, indirect, and negative damages caused by the use of this product.
- For safety, do not use this product for the purpose of directly or indirectly sensing a human body.
- When using this product in combination with other products, customers themselves need to ensure compliance with applicable standards, laws, and regulations.
This product has CE marking affixed.

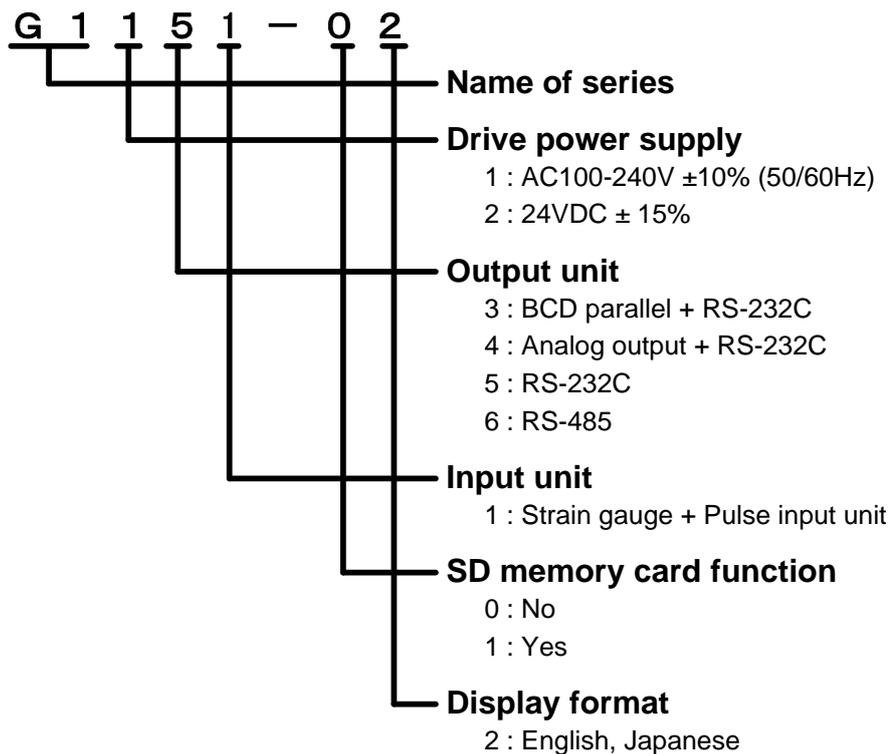
(Compliance standard: EN61326-1/2006, industrial environment Class A, and IEC/EN61010-1/2001)

- The copyright of this document belongs to our company. It is prohibited to reprint, copy, or modify this document in part or whole without permission of our company.
- Other product names appearing in this document are usually trademarks or registered trademarks of their respective holders.
- Specifications, designs, and other information included in this document may be changed due to modification without prior notice.

4. Operating Environment

- Installation location : Indoors only
- Rated altitude : Up to 2000 m
- Transient overvoltage : Impulse withstand category II
- Degree of contamination : 2
- Operating ambient temperature : 0 to 40°C (with no condensation)
- Operating ambient humidity : 35 to 40% RH (with no condensation)
- Vibration (resistance) : 10 to 55 Hz, 0.15 mm single amplitude for 30 minute in each of the X, Y, and Z directions
- Mechanical shock (resistance) : 100 m/s^2 , three times in each of six directions
(top/bottom, front/rear, and left/right)
- Protective structure : IP40 or equivalent

5. Model Codes



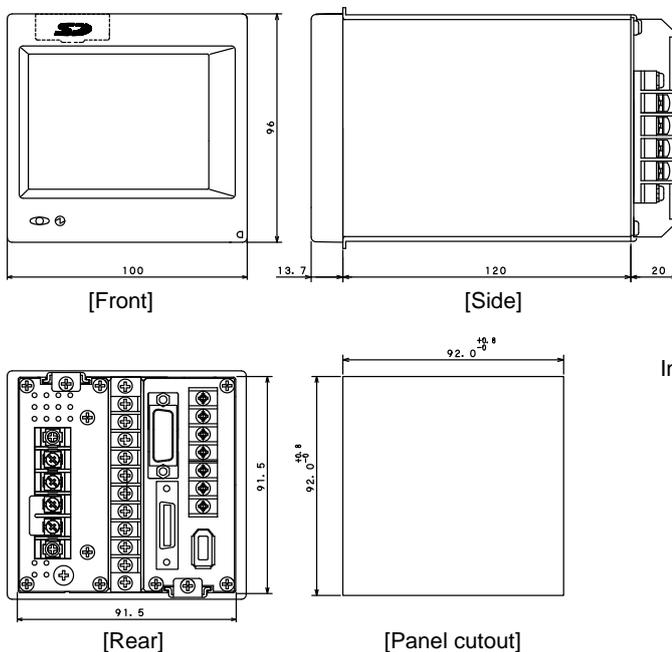
* A comparison output (open collector output) is fitted as standard.

6. Ratings of Device

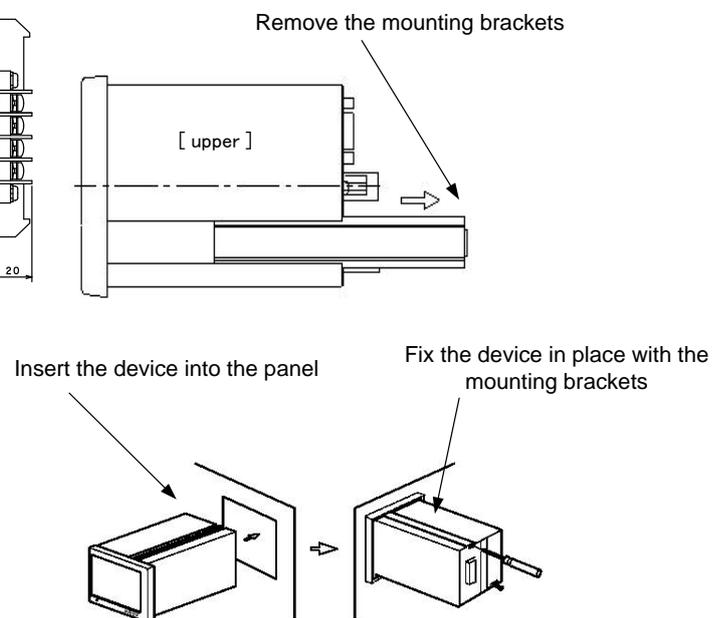
- Power supply : 100 to 240 V AC $\pm 10\%$, 50/60 Hz (Approx. 32 VA)
24V DC $\pm 15\%$ (Approx. 17W)
- Insulation resistance : 100 M Ω (at 500 V DC)
- Withstand voltage : Between the power supply and Protective terminal \rightarrow 1500 V AC/ 3mA for 1 minute
Between inputs and outputs \rightarrow 500 V DC/1 mA for 1 minute
Between inputs and outputs terminal and Protective terminal \rightarrow 500 V DC/1 mA for 1 minute
- Input channel A : For strain gauge maximum 4 mV/V
* Sensor power supply: 2.5 V/5 V/10 V, maximum 120 mA
- Input channel B : For displacement sensor (rotary encoder)
Open collector output type, voltage output type : MAX. 12 V/-8 mA
Line driver output type : 5 V $\pm 10\%$
* Not equipped with a power supply for a displacement sensor.
- Control input: : 5 V DC/-2 mA
- Control output: : 30 V/30 mA or less
(comparison output, error output, synchronous signal output, BUSY output *)
Saturation voltage 1.2VDC or less.
* BUSY output is only available when an SD memory option is installed.

7. External Dimensions and Mounting Procedure

External Dimensions



Attachment Method



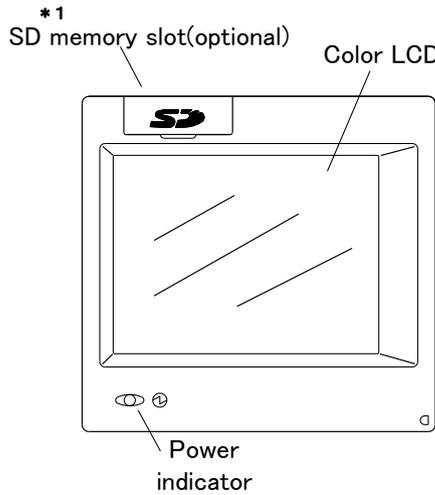
Precautions

The recommended panel thickness is 1 to 5 mm. (Use a metal panel.)

The tightening torque for the mounting brackets is approximately 0.39 Nm.

8. Names of Parts

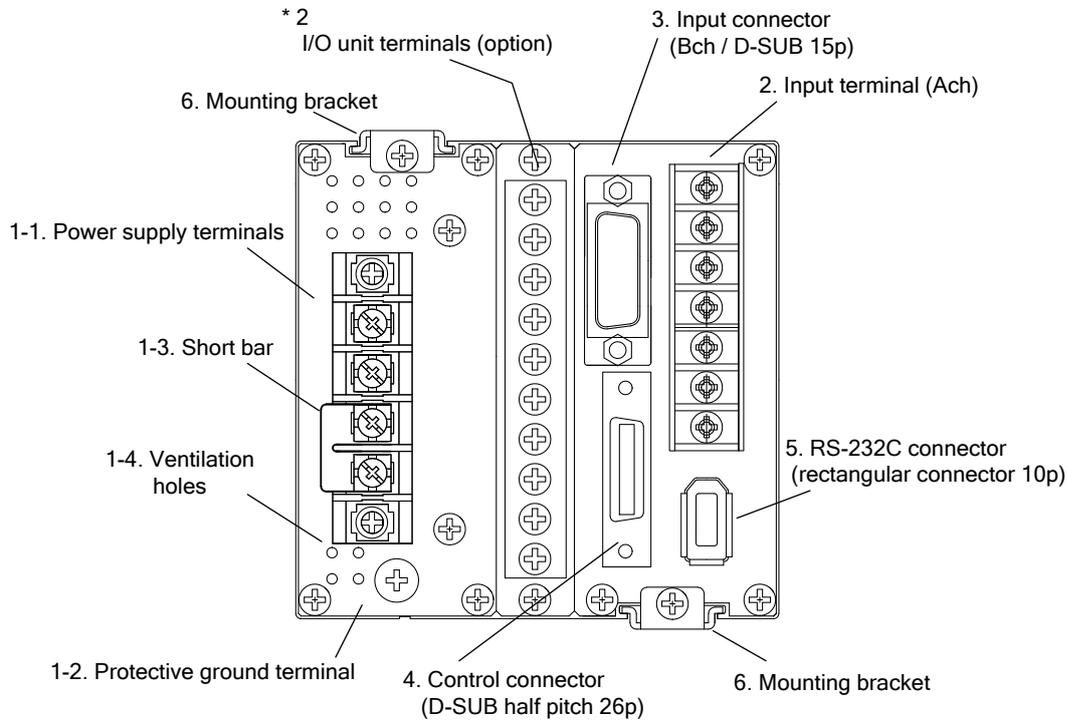
Front



*1: Installing an SD memory card slot is optional

- Color LCD with touch panel
STN color LCD:302 × 240 pixels
Display range:Approximately 74 × 55mm
Backlight lifespan:40,000 hours at 25°C
- Power indicator
Light in green when power is applied

Rear



Name	Function
1-1. Power supply terminals	These are the device power supply terminals.
1.2. Protective ground terminal	This is the protective ground terminal. (JIS Class 3 grounding)
1.3. Short bar	This connects the functional ground terminal and frame terminal.
1.4. Ventilation holes	These holes prevent the device from overheating.
2. Input terminal / Ach	These are for connecting various types of strain gauge, sensors and other external input/output devices.
3. Input connector / Bch	These are for connecting various types of displacement sensor (rotary encoder) and other external input/output devices.
4. Control connector	This is for connecting external control devices for external input/output control.
5. RS-232C connector	This is for connecting to a host PC via a serial cable for performing input/output control.
6. Mounting bracket	This is for fixing the device in place when mounting it to a panel.

*2 : Installing input/output unit terminals is optional.

9. Terminal Connection Method

Power Supply Terminals (M3) and Protective Ground Terminal (M4)

■ Explanation of Terminals

AC power unit :Connect the power supply between the L terminal and N terminal. (100 to 240 V AC $\pm 10\%$, 50/60 Hz)

DC power unit :Connect the power supply between the \oplus terminal and \ominus terminal. (24 V DC $\square 15\%$)

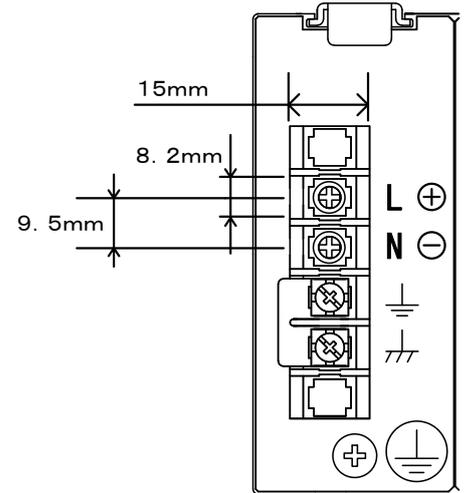
The \perp terminal is coupled at the neutral point between the L terminal and N terminal.

The /// terminal is at the same electric potential as the casing (frame).

The \perp terminal and /// terminal are connected by a short bar.

The $\text{\textcircled{\perp}}$ terminal is the protective ground terminal.

Be sure to ground the equipment. (JIS Class 3 grounding)

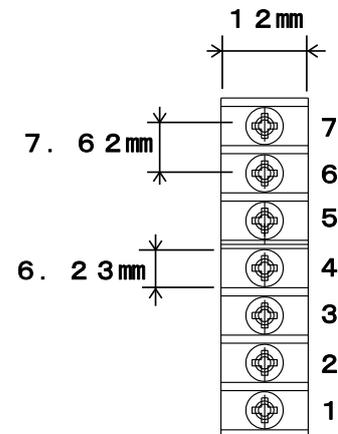


* Use crimp terminals for the connections.

Ach / Input Terminals (M3)

■ Terminal Numbers and Signal Names

Terminal Number	Signal	Description
7	Frame ground	FG
6	+SIG	+input
5	-SIG	-input
4	-EXC	-sensor power supply
3	+EXC	+sensor power supply
2	NC	Vacant terminal
1	NC	Vacant terminal

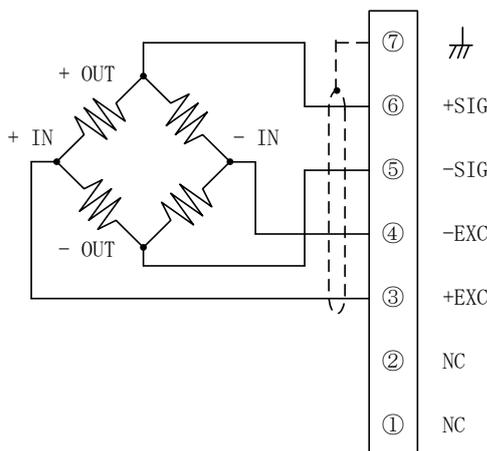


* Use crimp terminals for the connections.

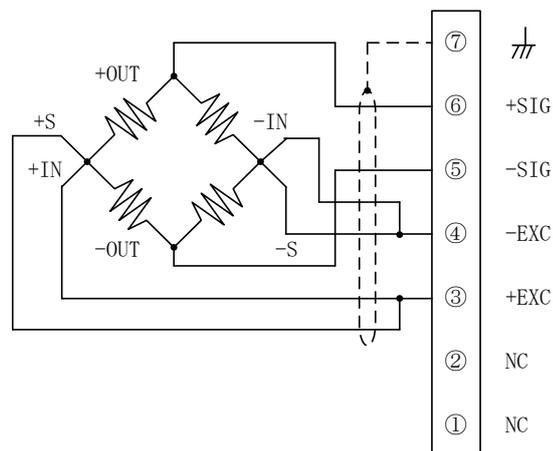
* NC terminal is not use as a junction terminal.

■ Connecting

4 Wire Connection Diagram



6 Wire Connection Diagram

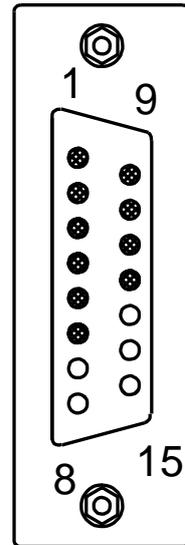


9. Terminal Connection Method

Bch / Input Connector (D-SUB 15p female)

■ Terminal numbers and Signal names

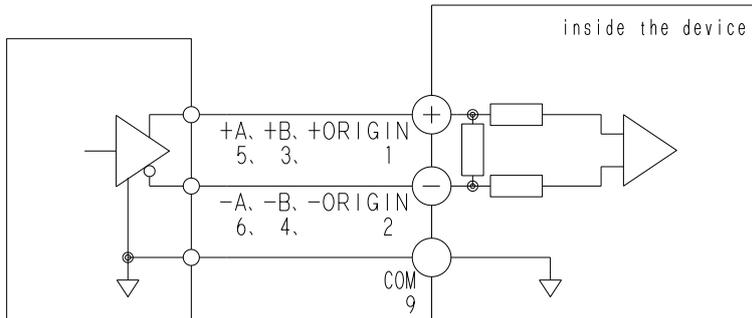
Terminal numbers	Signal names	Descriptions	
1	ORIGIN +	ORIGIN + input	Line driver type
2	ORIGIN -	ORIGIN - input	Line driver type
3	B +	B phase + input	Line driver type
4	B -	B phase - input	Line driver type
5	A +	A phase + input	Line driver type
6	A -	A phase - input	Line driver type
7	NC	Vacant terminal	
8	AUX	Test pin / Nothing should connect	
9	COM	GND COMMON	Common GND
10	ORIGIN	ORIGIN input	Open collector or voltage
11	B	B phase input	Open collector or voltage
12	A	A phase input	Open collector or voltage
13	NC	Vacant terminal	
14	NC	Vacant terminal	
15	NC	Vacant terminal	



* NC, AUX terminal is not use as a junction terminal.

■ Equivalent circuit and connecting

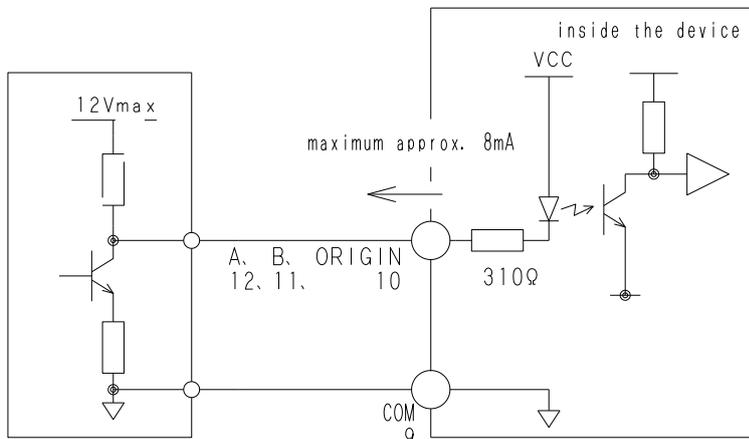
Line driver output type



* Terminal resistance : 270 Ω

* When it is connected the line driver output type : 5V ±10%

Open collector output type / voltage output type



* When it is connected the voltage output type sensor : 12Vmax

9. Terminal Connection Method

Control Connector (D-SUB half pitch 26p)

■ Terminal Numbers and Signal Names

Terminal Numbers	Signal Names	Descriptions	Terminal Numbers	Signal Names	Descriptions
1 (O)	OUT1	Comparison output (open collector NPN)	14 (O)	A-OUTA	Analog output (Ach)
2 (O)	OUT2	Comparison output (open collector NPN)	15 (O)	AG	Analog output (Ach) GND
3 (O)	OUT3	Comparison output (open collector NPN)	16	NC	Vacant pin
4 (O)	OUT4	Comparison output (open collector NPN)	17 (I)	P0	Select pattern
5 (O)	OUT5	Comparison output (open collector NPN)	18 (I)	P1	Select pattern
6 (O)	ERROR	ERROR signal (open collector NPN)	19 (I)	P2	Select pattern
7 (O)	SYNC	Synchronous signal output (open collector NPN)	20 (I)	P3	Select pattern
8 (O)	BUSY	* Busy output (open collector NPN)	21 (I)	GSTART	Start graphics
9 (O)	E.COM	Open collector output common	22 (I)	GSTOP	Stop graphics
10	NC	Vacant pin	23 (I)	RESET	Reset
11 (I)	STA	Hold (Ach)	24 (I)	DZA	Digital zero (Ach)
12 (I)	STB	Hold (Bch)	25 (I)	DZB	Digital zero (Bch)
13 (I)	DG	Digital ground	26 (I)	DG	Digital ground

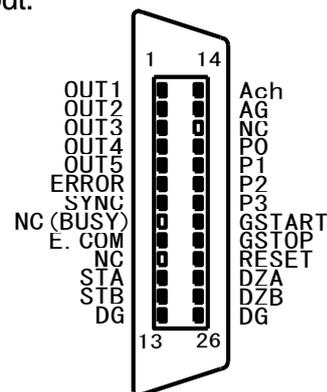
In the table above, (O) and (I) indicate the signal direction: (O) = output and (I) = input.

* BUSY output is only enabled when there is an SD memory card function.

Conformity connector is accessories

Connector type name : 10126-3000PE / Sumitomo 3M

Holder type name : 10326 -52F0-008 / Sumitomo 3M



■ Comparison Output (O), Error Output (O), and Synchronous Signal Output (O) Terminals (Numbers 1 to 7)

These are control output terminals. They are open collector outputs (NPN type).

(Output capacity : 30 V/30 mA, Saturation voltage : 1.2V or less)

Use terminal number 9 (E.COM) as a ground common terminal.

The operation of comparison outputs differs depending on the internal settings of the equipment (basic functions/meter settings).

Comparison output	OUT1	OUT2	OUT3	OUT4	OUT5
Function	1 (O)	2 (O)	3 (O)	4 (O)	5 (O)
Channel A meter	HH	HI	GO	LO	LL
Channel B meter	HH	HI	GO	LO	LL
2-channel meter	HI (Ach)	LO (Ach)	GO *1	HI (Bch)	LO (Bch)
Waveform comparison (Ach)	HI (Ach)	LO (Ach)	GO (Ach)	---	---
Waveform comparison (Bch)	---	---	GO (Bch)	HI (Bch)	LO (Bch)
Waveform and displacement comparison	HI (Ach)	LO (Ach)	GO (Ach)	HI (Bch)	LO (Bch)

*1 : This is only ON when all the HI and LO of both channels are OFF.

For details on operation timing, refer to the advanced version of the instruction manual.

* Terminal number 8 (BUSY output) is also an open collector output terminal (NPN type).

9. Terminal Connection Method

Control Connector (D-SUB half pitch 26p)

■ Input Signal (I) Terminals (Numbers 11 to 13 and 17 to 26)

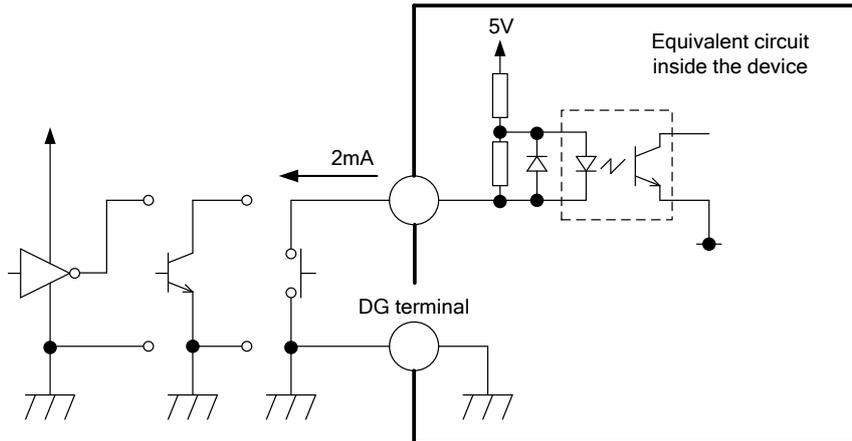
These are control input terminals. Connect each of the control inputs to a transistor (open collector output), IC (buffer, etc.), or non-voltage contact.

Operation is performed with ON/OFF between each of the control inputs and DG terminals.

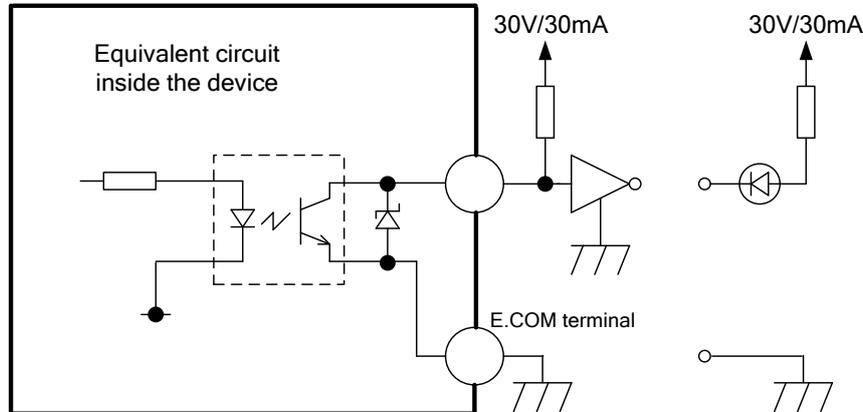
Use the DG terminals (terminal numbers 13 and 26) as ground common terminals.

■ Examples of Connecting to the Equivalent Circuit of a Control Input and Control Output

Control Input



Control Output



* Applying a reverse voltage may cause a failure.

■ Analog Output (O) Terminals (Numbers 14 to 15)

Analog voltages proportional to Ach input are output for monitoring.

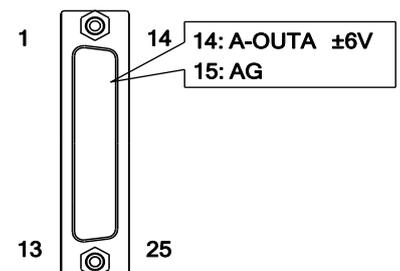
The display value and analog voltage output do not match.

Ach of the input terminal (M3) and the analog output are at non-isolation.

Use terminal number 15 (AG) as a ground common terminal.

Signal Name	Output Channel	Output Range
A-OUTA	Ach	$\pm 4\text{mV/V} \rightarrow \pm 6\text{V}$

* Load resistance: 10 k Ω or more



9. Terminal Connection Method

RS-232C Connector (rectangular)

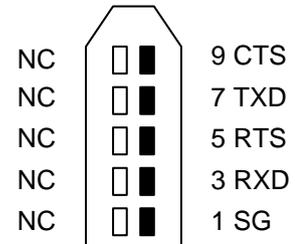
■ Terminal Numbers and Signal Names

Use this connector to connect to a host PC via a serial cable and modify the internal settings of the device.

It can also be used to load measurement data.

(For details on communication settings and commands, refer to the advanced version of the instruction manual.)

Terminal Numbers	Signal Names	Descriptions
1	SG	Signal ground
2	NC	Unused
3	RXD	Receive
4	NC	Unused
5	RTS	Send request
6	NC	Unused
7	TXD	Send
8	NC	Unused
9	CTS	Send permission
10	NC	Unused

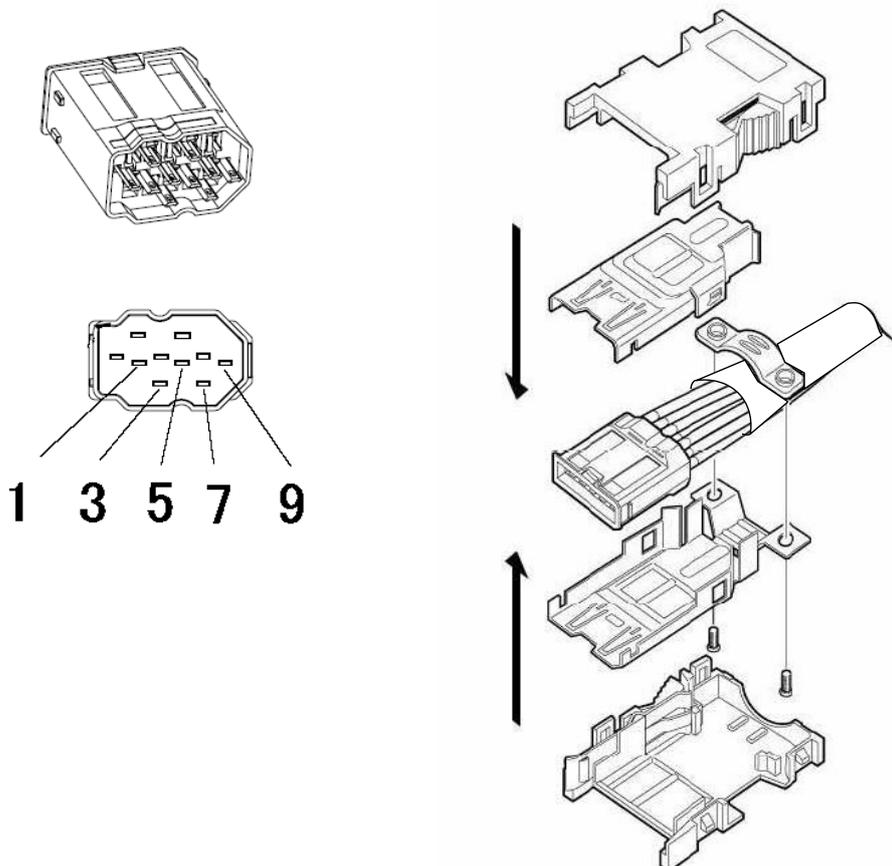


Conformity connector is accessories

Connector type name : 36210-0100 PE / Sumitomo 3M

Holder type name : 36310-3200-008 / Sumitomo 3M

•rectangular connector (363210-0100 pl, 36310-3200-008)



10. Specifications

■ Ach

Sensor power supply	2.5, 5, 10V DC $\pm 10\%$ / 120mA or less
Compatible sensor	Strain gauge type sensor (4 wires) (Up to four 350 Ω strain gauge type sensor can be connected in parallel)
Input signal range	-4mV/V to +4mV/V
Display	By digital scaling
Input compensation range	0.1 to 3mV/V (SPIN value)
Display (load) range	100 to 30,000 (when minimum input sensitivity) / (SPAN value)
Minimum input sensitivity	0.25uV/digit (when sensor power supply of 2.5V) 0.5uV/digit (when sensor power supply of 5V) 1.0uV/digit (when sensor power supply of 10V)
Non linearity	Within $\pm 0.02\%$ FS + 1 digit (when 3mV/V input) / (25°C ± 5 °C)
Equivalent calibration error	Whitin $\pm 0.2\%$ FS
Temperature coefficient	$\pm (0.005\%$ of rdg + 0.5 digit) / °C
Analog filter	Select form 10, 30, 300, and 600 (Hz)

■ Bch

Conformity sensor	Rotary encoder various sensors (Voltage output type, Open collector output type, Line driver output type)
Response frequency	Max. 50kHz
Count range	Approx. 14000000

* Please use conformity sensor (rotary encoder) at 12V or less.

* Note) Line driver output type : 5V $\pm 10\%$

■ Functions Common to Ach / Bch

Operating system	$\Delta\Sigma$ conversion (Ach)
Number of input	2 inputs (Ach, Bch)
Sampling rate	10 to 4000 times/second (can be changed in the settings) Maximum sampling rate when using one channel : 4000 times/second Maximum sampling rate when using two channels : 2000 times/second
Display update interval	0.5 to 12.5 times/second (can be changed in the settings)
Moving average	OFF, 2 to 1024 (can be changed in the settings)
Maximum display	-99999 to 0 to 99999 (full 5 digits)

■ Analog Output for Monitoring

Ach	Strain gauge input : $\pm 4\text{mV/V}$ \rightarrow Approx. $\pm 6\text{V}$
-----	---

■ Common specifications

Backup

Setting data : Written to internal flash ROM.

Digital zero values and display screens : Stored by the secondary battery for approx. 2 weeks from the time power is shut off.

(Time required to fully charge secondary battery : Approx. 80 hours)

11. Options

Options by Type

A memory option and input/output options are available.

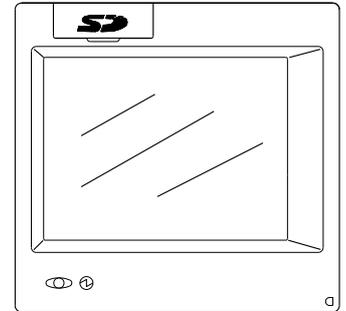
■ Memory Option

An SD memory option is available.

You can select to have a memory option installed by specifying the model code when ordering.

For details, contact an our company sales representative.

SD memory slot (optinal)

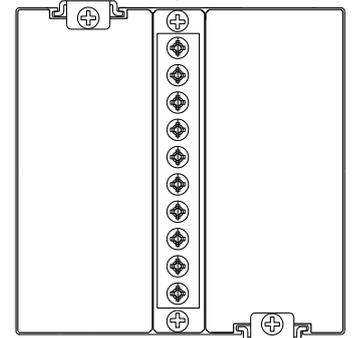


■ Input/Output Options

You can select to have an input/output option installed by specifying the model code when ordering.

Analog signal output, RS-485, and BCD output options are available.

Input/output unit terminals (optinal)



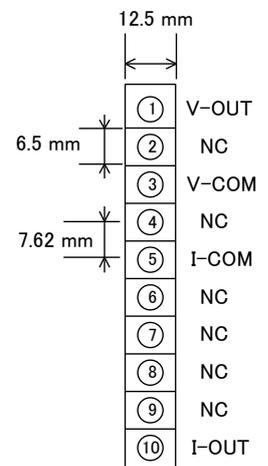
■ Analog Signal Output

A D/A converter is used to output an analog signal.

Select either channel A or B in the internal settings for output proportional to the display value.

Resolution : Equivalent to approximately 16 bits

Output	Range	Allowable Load	Accuracy	Ripple Noise
Voltage	0 to ±10V	10kΩ or more	±0.5% of FS	50mVp-p
Current	4 to 20mA	550Ω or less	±0.5% of FS	25mVp-p



* Accuracy within the range of 23°C ±5°C/35 to 85% RH

* The NC terminal is unused, but do not use it as a junction terminal.

* Use crimp terminals for the connections.

11. Options

Options by Type

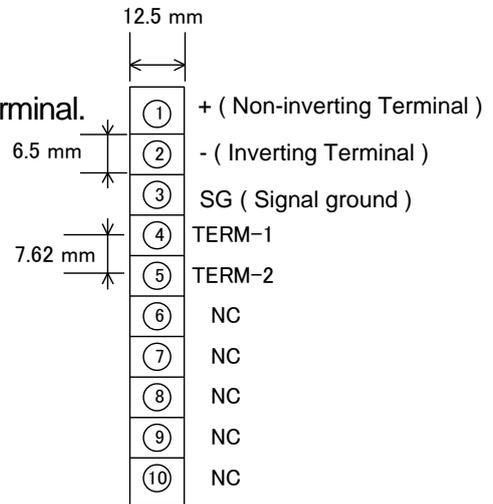
■ RS-485

This connector is used to modify the internal settings of the device. It can also be used to load measurement data. (For details on communication settings and commands, refer to the advanced version of the instruction manual.) Up to 31 devices can be connected in parallel.

Shorting TERM-1 and TERM-2 connects the internal terminator between the lines.

(Terminator resistance : 150 Ω)

* The NC terminal is unused, but do not use it as a junction terminal.



■ BCD Output

5-digit BCD code is output to an open collector (NPN type).

(Output capacity: 30 V/15 mA or less)

Use terminal numbers 27 and 28 (D.COM) as common ground terminals. Select either channel A or B in the internal settings for output proportional to the display value.

* OVER → Over signal

* POL → Polarity signal

* PC → Synchronous signal
(output interval sampling rate)

* ENABLE → The input signal for turning output off.



Terminal No.	I/O	Signal Name	Terminal No.	I/O	Signal Name
1	Output	1	26	---	NC
2	Output	2	27	Common	D.COM
3	Output	4	28	Common	D.COM
4	Output	8	29	Input	+COM
5	Output	10	30	---	NC
6	Output	20	31	---	NC
7	Output	40	32	---	NC
8	Output	80	33	---	NC
9	Output	100	34	---	NC
10	Output	200	35	---	NC
11	Output	400	36	---	NC
12	Output	800	37	---	NC
13	Output	1000	38	---	NC
14	Output	2000	39	---	NC
15	Output	4000	40	---	NC
16	Output	8000	41	---	NC
17	Output	10000	42	---	NC
18	Output	20000	43	---	NC
19	Output	40000	44	---	NC
20	Output	80000	45	---	NC
21	Output	POL	46	---	NC
22	Output	OVER	47	---	NC
23	Input	ENABLE	48	---	NC
24	Input	ENABLE	49	---	NC
25	Output	PC	50	---	NC

* The NC terminal is unused, but do not use it as a junction terminal.

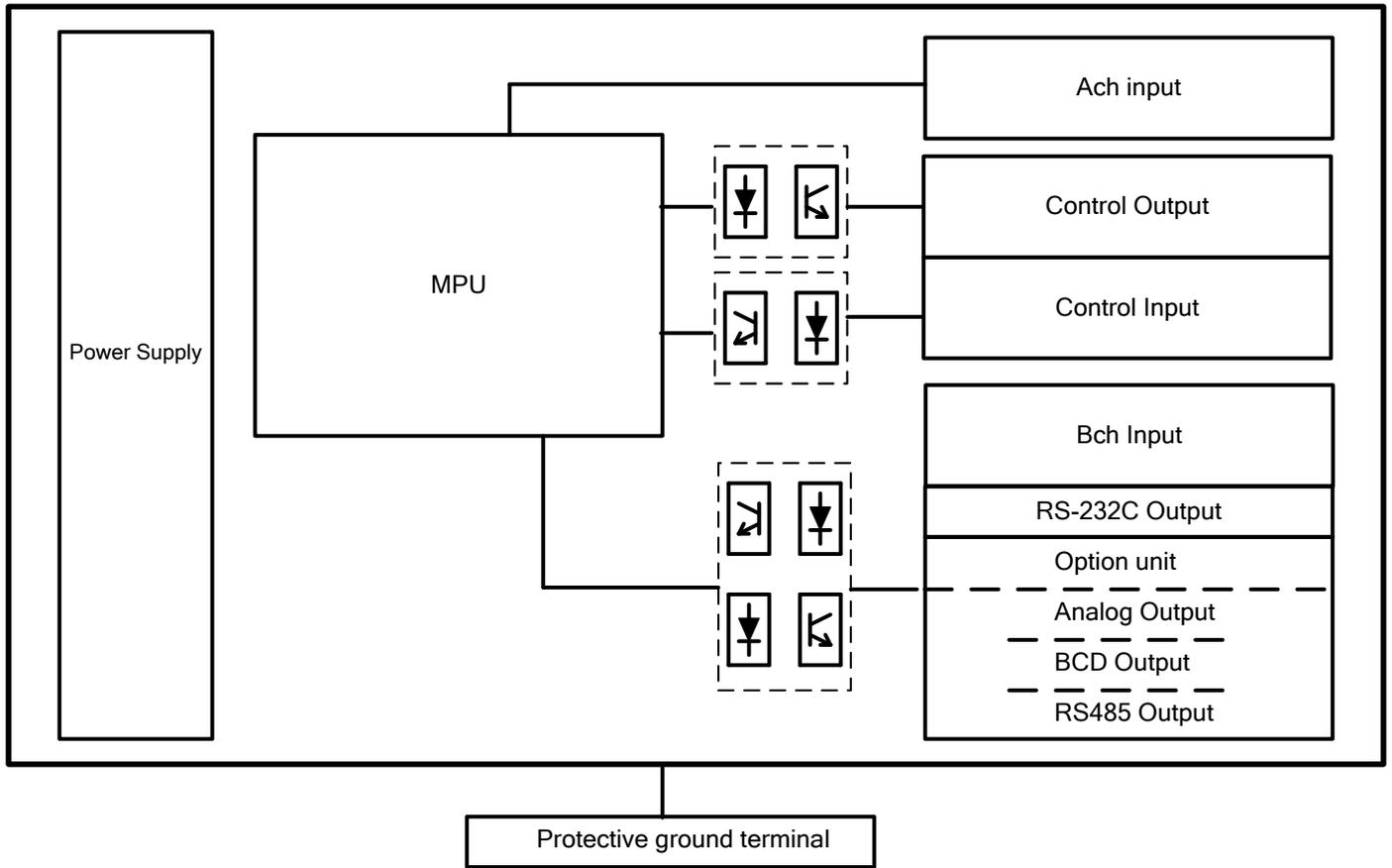
* Connect terminal number 29 (+COM) to the positive side of an external power supply.

* Use the supplied card edge type ribbon cable connector as the connector.

(Hirose Electric HIF5C-50DA-2.54R)

* Compatible cable. UL2651/AWG#28

12. Circuit Configuration of Device



13. Warranty and After Service

■ Warranty Period

One year from the date of delivery.

■ Warranty Coverage

Any failure occurring during the warranty period that is judged to be clearly attributable to our company shall be repaired at no cost to you.

■ After-sales Service

This product is manufactured, tested, inspected, and shipped under stringent quality control. Should the product fail, however, contact (or send the product to) your vendor or our sales office directly. (It is advisable that you send a memo describing the failure in as much detail as possible along with the product returned.)

Before use, ensure the safety of equipment and devices.

When using this product under conditions of in an environment not mentioned in this document, or when considering using this product for applications that may have great impact on human life and properties, therefore, requiring special safety, for example, nuclear energy control, railway, aviation, vehicles, fuel systems, medical equipment, entertainment equipment, and safety equipment, ensure that the product is used well below its rated parameters and performance limit, and give consideration to fail-safe and other safety measures.

watanabe

WATANABE ELECTRIC INDUSTRY CO., LTD.

6-16-19, Jingumae, Shibuya-ku, Tokyo 150-0001, Japan
Phone: (81)3-3400-6141

Homepage <http://www.watanabe-electric.co.jp/en/>