

INSTRUMENTATION AMPLIFIER

With

MULTIPURPOSE INDICATOR

WGI-400A

INSTALLATION & SETUP MANUAL

Thank you for purchasing KYOWA's product WGI-400A Instrumentation Amplifier with Multipurpose Indicator.

Read this Instruction Manual carefully in order to make full use of the high performance capabilities of the product.

Do not use the product in methods other than described in this Manual.

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The Manual has been compiled with great care. However, if the need should arise for more information, contact KYOWA or our representatives.

The contents of the Manual are subjected to change without prior notice.

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SAFETY PRECAUTIONS

PRIOR TO USE

This Manual describes detailed instructions for installing and setting up the WGI-400A Instrumentation Amplifier with Multipurpose Indicator (hereinafter referred to as the WGI-400A).

For safe use of the WGI-400A, do not forget to read the “Safety Precautions” prior to use.

KYOWA ELECTRONIC INSTRUMENTS CO., LTD. assumes no liability for any damages resulting from user’s failure to comply with the safety precautions.

SAFETY SYMBOLS

For safety operation of the WGI-400A, the following “**WARNING**” and “**CAUTION**” symbols are used in “Safety Precautions” of this Instruction Manual.

 WARNING	Improper operation of the system may result in death or severe injury of the operator.
 CAUTION	Improper operation of the system may result in injury of the operator and physical damage of the system.

In addition, items in  **CAUTION** may lead to serious consequences. Take special attention to the Safety Symbols.

The following symbols are used in the WGI-400A to call operator’s attention when operating the product.

Safety Symbols used in the WGI-400A.	
 WARNING	Indicates “Handling Precautions.” This symbol is attached to the WGI-400A when it requires to refer to the Instruction Manual for securing safety of the operator and the product.
 CAUTION	Indicates “Protective Ground Terminal.” Always connect to ground before operating the product.



WARNING

- If the potential secondary damage generates in the System due to deterioration of the WGI-400A, always adopt another proper technical measures for safety.
Or, trouble may occur caused by erroneous output or malfunction of the instrument.
- Installation and wiring work should be conducted more than 3 seconds after the power is cutoff.
Or, electric shock hazard or damage of the product may result.
- Do not forget to put a cover on the terminal board.
Or, electric shock hazard may result.
- Special care should be taken not to use the WGI-400A in environment with inflammable gas or vapor. Or, fire hazard may result.
- If the WGI-400A is faulty, emitting smoke or offensive odor, or producing abnormal sound, immediately turn OFF the power.
Or, electric shock or fire hazard may result.
Contact KYOWA's representatives for repair.
- Do not put water or foreign matters into the WGI-400A. In case if any foreign matters are entered, immediately turn OFF the power.
Or, electric shock or fire hazard may result.
Contact KYOWA's representatives for repair.
- If the power cable is damaged, turn OFF the power and replace the cable with a new one.
Or, electric shock or fire hazard may result.
- Always operate the WGI-400A with power voltage specified in this Instruction Manual.
Or, electric shock or fire hazard may result.
- Do not operate the WGI-400A in environment with excessive moisture, dust or oil dust.
Or, electric shock or fire hazard may result.
- Do not disassemble the WGI-400A.
Or, deterioration or malfunction of the instrument may result.
- When it started thundering, do not touch the WGI-400A or cables.
Or, electric shock hazard may result.
- Always connect the protective ground wire to the protective ground terminal.
Or, electric shock hazard or malfunction of the instrument may result.
- In order to assuredly and immediately cut off the power when failure occurred in the system or in WGI-400A, mount an external breaker, etc.

CAUTION

- Before wiring, always confirm the rated power voltage of the WGI-400A and terminal arrangement. Then, conduct wiring in the correct manner.
- Power consumption of the WGI-400A is maximum 6 VA. If it is unavoidably operated in environment with poor power condition, it is recommended to use an insulated constant voltage transformer or the like.
- Special care should be taken when using the WGI-400A in environment with excessive vibration. If the WGI-400A is operated at a location with excessive vibration or with continuous vibration, it may cause measurement error and/or failure of the instrument.
Take care not to drop it during transportation and avoid applying strong impact.
Or, deterioration of the instrument may result.
- Basically, the WGI-400A is designed to be used by connecting a strain gage transducer to the input terminal. Do not use transducers other than the above or deterioration of the instrument may result.
- Before cleaning the panel, always turn OFF the WGI-400A and gently clean with a soft cloth. Do not use paint thinner, benzine, acetone, kerosene or the like.
- Use the WGI-400A by conforming to operating environment specified in this Instruction Manual.
Or, malfunction and/or failure of the instrument may result.
- Power fluctuations of the power supply to the instrument should not exceed $\pm 10\%$ of the nominal voltage.
- Use the product in area where elevation is 2000 m or below.
- Use the product indoors.
- If lightning surges will occur on signal lines, take countermeasures.
- Power fluctuations of the power supply to the instrument should not exceed $\pm 10\%$ of the nominal voltage.
- Use the control cable that is less than 30m in length to connect to this device.

The WGI-400A is an Instrumentation Amplifier with multipurpose indicator that measures and displays load, weight, pressure, displacement, etc. in physical values by connecting to various strain gage transducers such as load cells, pressure meters, displacement meters, etc.

STANDARD ACCESSORIES

The following accessories are enclosed with the WGI-400A. After unpacking, check all the accessories are correctly prepared.

Unit seal	1
Product Warranty	1
Instruction Manual	1
Installation & Setup Manual	1

Reference: Power cable is not included in the accessories. Customers are required to purchase the power cable compatible for your power supply environment.

Optionals: AC power cable for 100 VAC: P-23 and AC power cable for 200 VAC: P-28

TYPES

The WGI-400A has the following types according to optional functions.

Model Name	No Optionals	BCD Output	RS-232C	RS-485	AC Power Supply	DC Power Supply
WGI-400A-00	○				○	
WGI-400A-01		○			○	
WGI-400A-02			○		○	
WGI-400A-03				○	○	
WGI-400A-10	○					○
WGI-400A-11		○				○
WGI-400A-12			○			○
WGI-400A-13				○		○

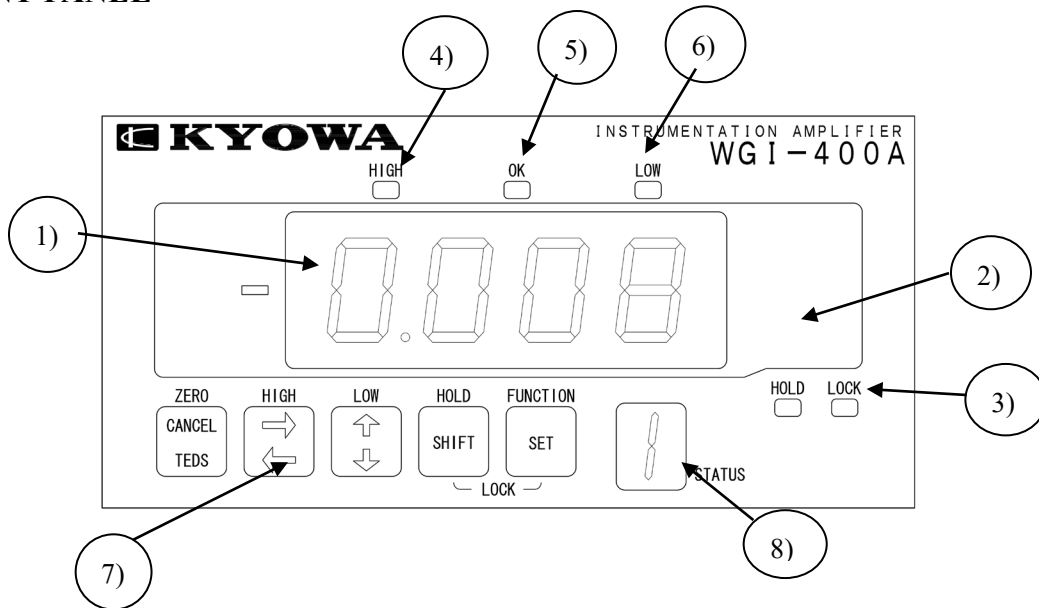
OPERATIONAL RATING

Operational rating and operating environment of the WGI-400A are described in Chapter 3. SPECIFICATIONS.

Always use the WGI-400A within the range of specifications.

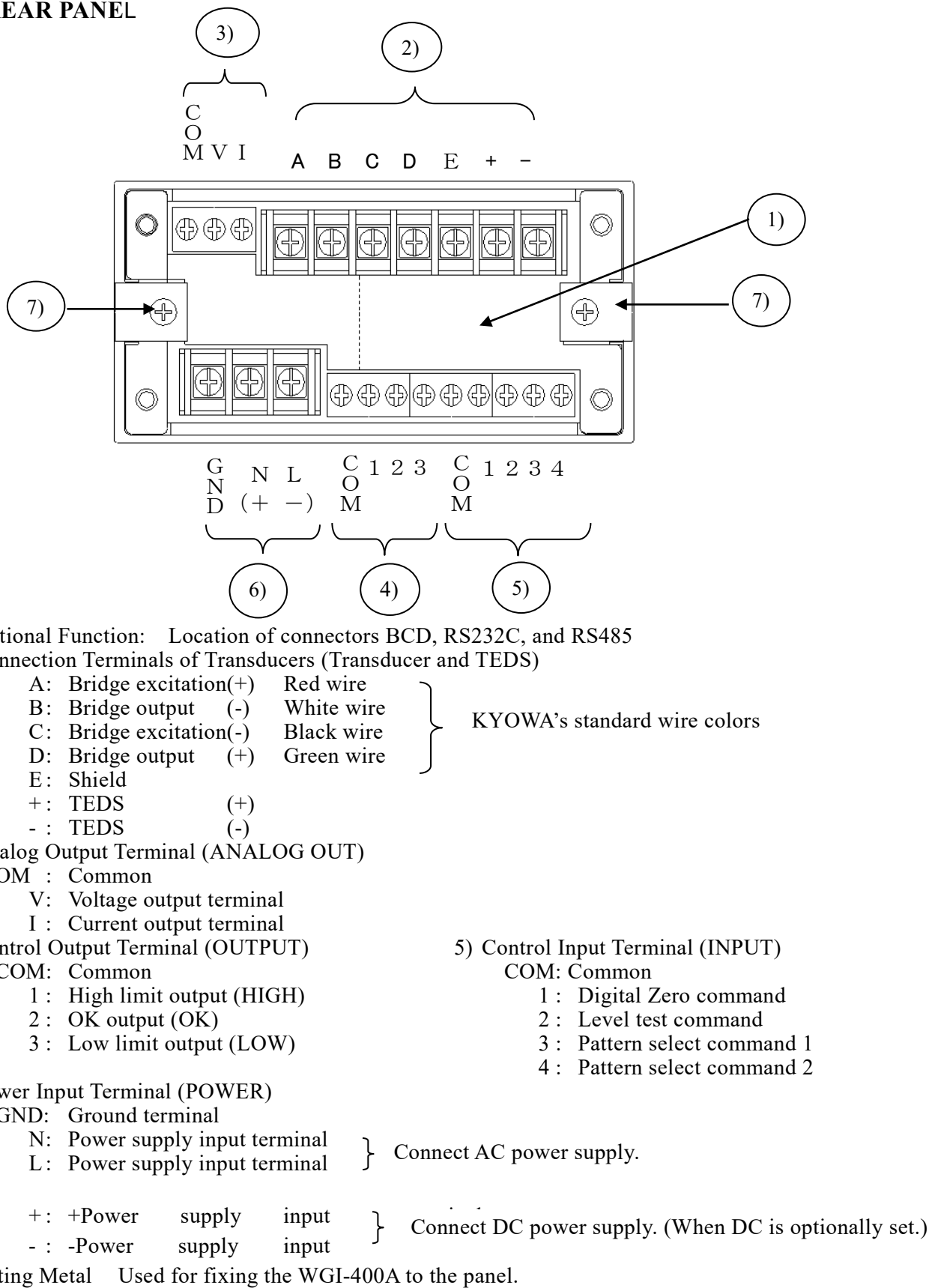
1. PARTS NAMES AND FUNCTIONS

1-1 FRONT PANEL



- 1) Indicator • Displays measured value, various selected functions, and set values.
• Normally, it is displayed with measured value according to the output from transducers. However, if error occurs, error message appears.
- 2) Unit Label • Select the desired unit from the accessory unit label sheet and attach it on this portion.
- 3) [LOCK] LED • When this [LOCK] LED is lit or flickering, no functions are set. Always turn OFF the [LOCK] LED before setting functions.
• However, high/low limit value is displayed even when the [LOCK] LED lit.
- 4) [HIGH] Limit LED • Lights up when the measured value exceeds the high limit value.
• Flickers when the high limit value is displayed.
- 5) [OK] LED • Flickers when the measured value exceeds the low limit value or lowers the high limit value.
- 6) [LOW] Limit LED • Lights up when the measured value is less than the low limit value.
• Flickers when the low limit value is displayed.
- 7) Operation Key • A pushbutton switch to operate the WGI-400A.
One key is used together for multiple functions that are automatically switched according to measuring or setting states.
- 8) Status Indicator..... • In the measuring state, pattern No. is displayed.
• During calibration, minimum-digit numeric value of rated capacity is displayed.

1-2 REAR PANEL

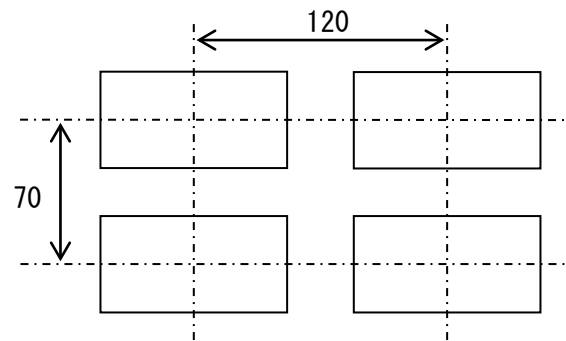
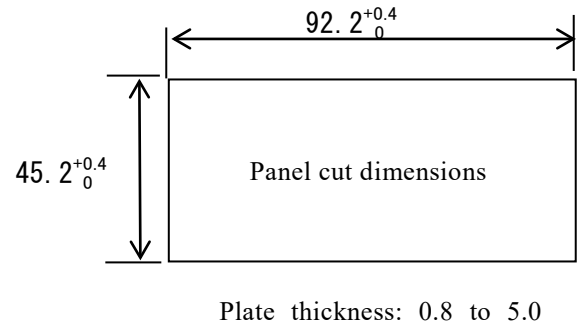


2. CONNECTION

2-1 INSTALLING TO THE PANEL

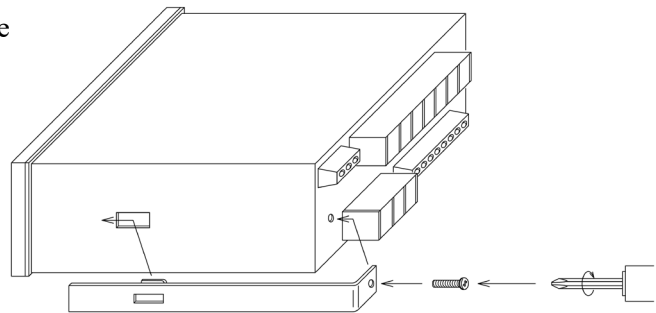
To install the WGI-400A to the panel, prepare a panel according to the specified panel cut dimensions as shown at the right. Then, install the WGI-400A by referring to the following procedures.

- 1) Cut out the panel by referring to the panel cut dimensions.



Panel cut position for mounting multiple WGI-400A

- 2) Remove screws of the fitting metals attached on both sides of the WGI-400A and then, pull out the fitting metal.
- 3) Set the WGI-400A into the panel frame.
- 4) Set the fitting metals on both sides of the WGI-400A.
- 5) Tighten the screws and firmly fix the WGI-400A.



2-2 WIRING

Check terminal Nos. on the rear panel described on Page 6 and correctly wire the cables.

2-2-1 Terminal Board

- Remove the cover from the terminal board before conducting required wirings.
- It is recommended to attach press-fit terminals to the connecting wires.
Use the press fit terminals having the size equivalent to 1.25-3.
- After completing wirings to the terminal board, do not forget to put a cover on the terminal board.

2-2-2 Connecting Power Supply

- Do not forget to check that power voltage is from 100 to 240 VAC ($\pm 10\%$) and use the cable with pressure proof capacity having more than power supply voltage.
- For DC power supply (Optional), check the DC voltage is from 10 to 30 VDC (8W).



Note: Although the WGI-400A may be operated with power supply voltage exceeding the allowable power voltage range, the operation may not be guaranteed. Always use the WGI-400A within the specified power voltage range.

Note: Control input/output and analog output terminals has a tightening torque of 0.5 N·m or less.

2-2-3 Connecting Transducers

- Connect transducers to terminals A to E as described in the following.

(Cable colors are KYOWA's standard color codes.)

- A: Bridge excitation + side (Red)
- B: Bridge output - side (White)
- C: Bridge excitation - side (Black)
- D: Bridge output + side (Green)
- E: Shield
- +: TEDS (+)
- : TEDS (-)

Note: Do not connect the power cable to the TEDS terminal.

- Use as short as possible 4-conductor shield cable (TEDS: 6-conductor cable) for transducer wiring.
In addition, locate the transducer far apart from power lines and wirings interfered with noise.

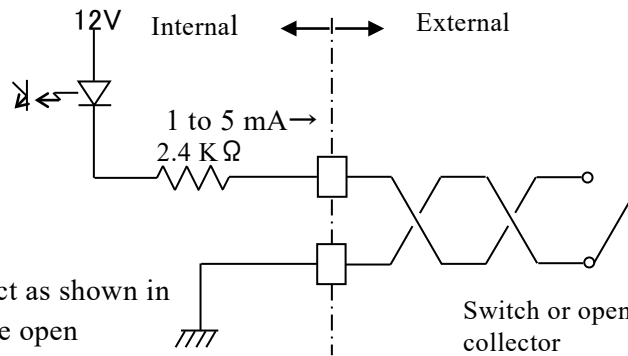
2-2-4 Connecting Control Input Terminal

- Connection of control input terminal (INPUT) is described in the following.

COM: Common

- 1: Digital command
- 2: Level test command
- 3: Pattern select command 1
- 4: Pattern select command 2

- When using the external switch, connect as shown in the right figure. In addition, connect the open collector in the same manner.



Input Connection Diagram

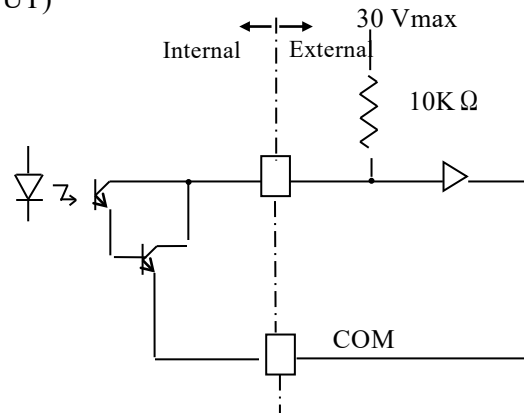
2-2-5 Connecting Control Output Terminal

- Connection of control output terminal (OUTPUT) is described in the following.

COM: Common

- 1: High limit output (HIGH)
- 2: OK output (OK)
- 3: Low limit output (LOW)

- Connect by referring to the right figure.



Output Connection Diagram

2-2-6 Connecting Analog Output Terminal

- Connection of analog output terminal (ANALOG OUTPUT) is described in the following.

COM: Common

V: Voltage output terminal (± 10 V)

I: Current output terminal (4 to 20 mA)

- Always set the current output to load resistance 500 Ω or less and voltage output to 2 k Ω or more.

Reference: Countermeasures against noise for control input/output and analog output terminals

- For more than 1-m long wiring, use twisted cable.
- For more than 3-m long wiring, use 2-conductor shield cable and connect the shield cable to the ground terminal.



Note: Control input/output and analog output terminals has a tightening torque of 0.5 N·m or less.

2-2-7 Connecting BCD Output (Optional Function)

When using BCD output equipped WGI-400A-01 (or WGI-400A-11).

Pin No. and Signal Name (Connector and Cable)

A side (Cable)		B side (Cable)		Cable Color
No.	Signal Name	No.	Signal Name	
A1	Data 1	B1	Data 2	Red
A2	Data 4	B2	Data 8	Gray
A3	Data 10	B3	Data 20	Gray
A4	Data 40	B4	Data 80	Gray
A5	Data 100	B5	Data 200	Green
A6	Data 400	B6	Data 800	Gray
A7	Data 1000	B7	Data 2000	Gray
A8	Data 4000	B8	Data 8000	Gray
A9	POL (- Polarity)	B9	OVER	Gray
A10	EOC (End of Conversion)	B10	ENABLE (Output prohibited)	Green
A11	N.EOC (EOC logic reverse)	B11	(Connection prohibited)	Gray
A12	(Connection prohibited)	B12	(Connection prohibited)	Gray
A13	(Connection prohibited)	B13	(Connection prohibited)	Gray
A14	(Connection prohibited)	B14	(Connection prohibited)	Gray
A15	(Connection prohibited)	B15	(Connection prohibited)	Green
A16	(Connection prohibited)	B16	(Connection prohibited)	Gray
A17	COM	B17	COM	Gray
A18	COM	B18	COM	Gray

Equivalent circuit of signals shall be equivalent with control output. However, ENABLE (Output prohibit) is equivalent with control input.

Note: (1) Connection prohibited terminals are used for adjusting the product on KYOWA's side. Do not connect anything on the customers' side.

(2) Cable colors described in the above table are in the case when the accessory 'BCD output cable for WGI-400A N-43' is used.

Compatible connector: Equivalent to 8822E-036-171-F (KEL CORP. made)

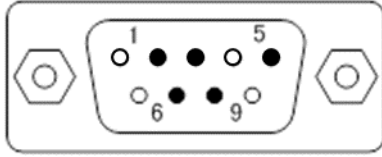
Accessory: BCD output cable for WGI-400A N-43

Cable length 2 m, Cutoff at the end

2-2-8 Connecting RS Output (Optional Function)

When using RS-232C interface equipped WGI-400A-02 and WGI-400A-12.

1) Connector Pin and Signal Name



Pin type (male)

Front view of the RS-232C connector
(D-sub connector) on the rear panel.

Pin No.	Signal Name
1	N.C.
2	RXD (Receive Data)
3	TXD (Transmit Data)
4	N.C.
5	SG
6	N.C.
7	CTS (Clear To Send)
8	RTS (Request To Send)
9	N.C.

2) Signal Specifications

Transmission speed: 9600 bps
Data bit: 7 bits
Parity bit: Odd number parity
Stop bit: 1 bit
Output code: ASCII

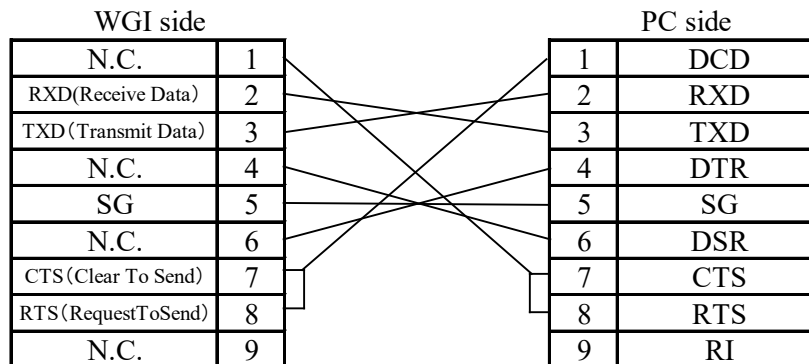
Receive delimiter: CR
Transmit delimiter: CR + LF

The above settings are default values.

3) Connecting to External Devices

(1) Connection

For connecting external devices to the PC, use commercially available RS cross cable (reversible type).



Note: Do not forget to turn OFF both the WGI-400A and external device before connecting to the PC.
Or, the WGI-400A may not operate correctly or cause damage.

(2) Setting External Devices

Set external devices by referring to the WGI-400A signal specifications.

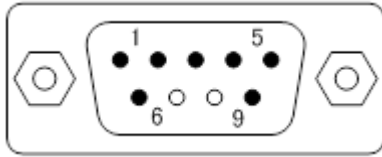
Note: The WGI-400A is not compatible with XON/XOFF control and send brake signal.

2-2-9 Connecting RS-485 Output (Optional Function)

When using RS-485 interface equipped WGI-400-03 and WGI-400-13.

Various functions can be set as well as measured values can be read from external devices.

1) Connector Pins and Signal Names



Pin type (male)

Front view of the RS-485 connector
(D-sub connector) on the rear panel.

Pin No.	Signal Name
1	+(Non-reversing output)
2	+(Non-reversing output)
3	- (Reversing output)
4	- (Reversing output)
5	SG
6	Terminator
7	N.C.
8	N.C.
9	Terminator

2) Signal Specifications

Transmission speed: 9600 bps
 Data bit: 7 bits
 Parity bit: Odd number parity
 Stop bit: 1 bit
 Output code: ASCII

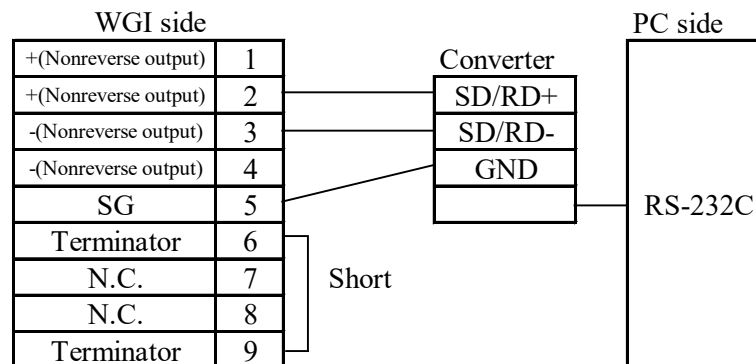
Receive delimiter: CR
 Transmit delimiter: CR + LF

The above settings are default values.

3) Connecting to External Devices

(1) Connection

- For connecting external devices to the PC, use RS-485 ↔ RS-232C converter (Following is a recommended converter).
- Short-circuit connector pins Nos. 6 and 9. Then, terminating resistance applied state is obtained.
- Set the converter switch to DTE.
- Pin Nos. 1 and 2 as well as 3 and 4 are the same functions. Correctly connect the wires.



Recommended converter: SI-30 (RS-485 ↔ RS-232C converter) LINEEYE CORP. made

Note: Do not forget to turn OFF both WGI-400A and external devices before connecting to the PC.
 Or, the WGI-400A may not operate correctly or cause damage.

3 SPECIFICATIONS

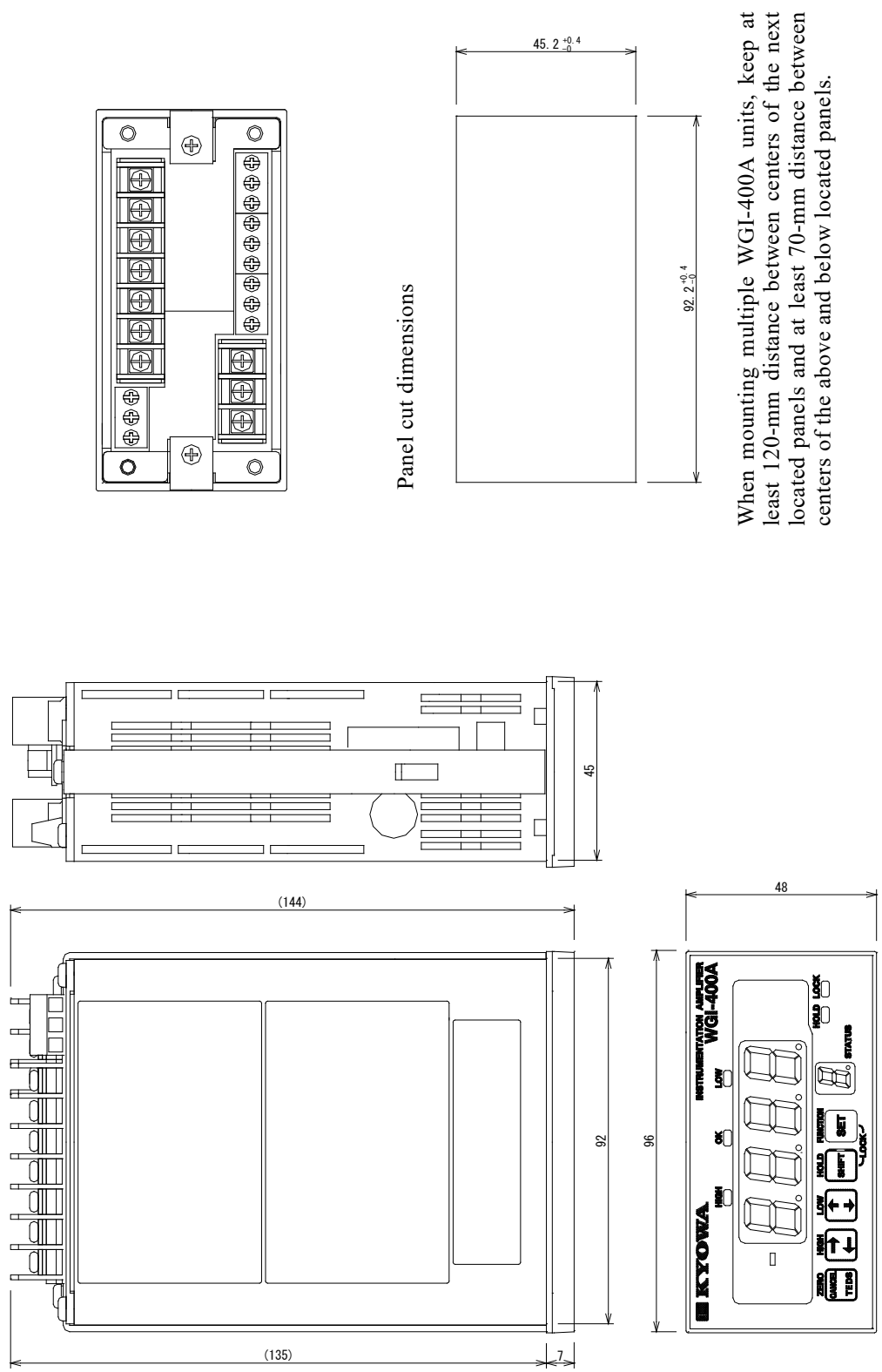
3-1 SPECIFICATIONS

Model Name	WGI-400A Instrumentation Amplifier with Multipurpose Indicator		
The Number of Measuring Channels	1		
Compatible Sensor	Strain Gage Transducer		
Compatible Bridge Resistor	87.5 to 1000 Ω (350 Ω 4 units parallel connection available)		
Bridge Excitation Voltage	2 VDC (Max 30 mA)/4 VDC (Max 50 mA) selectable		
Measuring Range	±3.2 mV/V (Zero adjusting range included)		
Sampling Speed	50 times/second		
Resolution	64000 count/input range in both polarities		
Calibration functions	Actual load calibration, Sensitivity-registered calibration, Numerical value- registered calibration		
Display.....	Display range:±9999		
	Character Height:	14 mm, Red LED	
	Display Speed:	50 times/sec	
Decimal Point.....	Put to anywhere possible		
Zero Adjustment Functions	Any value in the input range is set to digital zero, Execution by key operation or external contact signal		
Smoothing Function	Minimum scale:	1, 2, 5, 10, 20, 50, and 100 counts	
	Moving average:	2, 4, 8, 16, 32, 64, and 128 times	
Auto Zero Compensation Function	Zero tracking (Auto digital Zero within the setting range) Zero Near Zero (Auto Zero display)		
Additional Function	Setting range:	±9999	
Original Value Display Function	±3.200 mV/V		
Level Test Function	Can display arbitrary value		
Temperature Stability	Zero point:	Within ±0.5 μV _{RTI} /°C	
	Sensitivity:	Within ±0.01%/°C	
Non-linearity	Within ±(0.1% FS +1 digit)		
Control Input	The number of points: 4 Zero command, Level test command, Pattern select command 1, and Pattern select command 2		
	Signal capacity:	12 VDC, 5 mA or more	
	Input mode:	Open collector (NPN) or non-voltage contact signal	

Control Output	The number of points: 3 (HIGH, OK, and LOW)	
	Output mode:	Open collector (NPN)
	Load capacity:	30 VDC, 20 mA (Resistance load)
	Pattern function:	Set 4 sets of high/low limit value, Selectable from external signal
	High/Low limit comparator function:	
		The number of points: 2 (HIGH and LOW)
		Setting range: ± 9999
		Comparison speed: 50 times/sec
		Detector function:
		The number of point: 1 (OK)
Analog Output	Select voltage output or current output	
	Voltage output:	± 10 V (Load resistance 2k ohm or more) Arbitrarily scaling available
	Current output:	4 to 20 mA (Load resistance 500 ohm or less) Arbitrarily scaling available
	Response speed:	Approx. 0.25 sec (10 to 90%)
	Non-linearity:	Within $\pm 0.1\%$ FS
	Frequency response:	Approx. 1 Hz ($-3\text{dB} \pm 1\text{dB}$)
TEDS Function	Automatic sensitivity registration (Key operation, When power ON, RS control)	
Power Supply	AC power supply:	100 to 240 VAC , 50/60 Hz Power consumption 6 VA or less
	DC power supply:	10 to 30 VDC Power consumption 8 W or less
Operating Temperature and Humidity Range	-10 to 50 °C, 20 to 85% (Non-condensing)	
Dimensions	96(W) $\times$ 48(H) $\times$ 144(D) mm	
Panel cut dimensions.....	92.2 ^{+0.4} ₀ (W) $\times$ 45.2 ^{+0.4} ₀ (H) mm, Panel thickness 0.8 to 5.0 mm recommend	
Weight	Approx. 300 g (Standard type)	
Accessories	Unit seal, Instruction manual, Product warranty	
Compliance	Directive 2014/30/EU (EMC) Directive 2014/35/EU (LVD) AC models only Installation category II Pollution degree 2 Directive 2011/65/EU, (EU)2015/863 (10 restricted substances) (RoHS)	

3-2 OUTSIDE DRAWING

1) Standard model with no optionals.



When mounting multiple WGI-400A units, keep at least 120-mm distance between centers of the next located panels and at least 70-mm distance between centers of the above and below located panels.



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