

# **INSTRUMENTATION AMPLIFIER**

**With**

# **MULTIPURPOSE INDICATOR**

# **WGI-400A**

# **INSTRUCTION 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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This Instruction Manual may not be copied or reproduced, in whole or part, without consent of KYOWA.

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 Instruction Manual describes detailed instructions for operating 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.

 <b>WARNING</b>	Improper operation of the system may result in death or severe injury of the operator.
 <b>CAUTION</b>	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.	
 <b>WARNING</b>	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.
 <b>CAUTION</b>	Indicates “Protective Ground Terminal.” Always connect to ground before operating the product.



## WARNING

- 1) 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.
- 2) 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.
- 3) Do not forget to put a cover on the terminal board.  
Or, electric shock hazard may result.
- 4) Special care should be taken not to use the WGI-400A in environment with inflammable gas or vapor.  
Or, fire hazard may result.
- 5) 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.
- 6) 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.
- 7) 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.
- 8) Always operate the WGI-400A with power voltage specified in this Instruction Manual.  
Or, electric shock or fire hazard may result.
- 9) Do not operate the WGI-400A in environment with excessive moisture, dust or oil dust.  
Or, electric shock or fire hazard may result.
- 10) Do not disassemble the WGI-400A.  
Or, deterioration or malfunction of the instrument may result.
- 11) When it started thundering, do not touch the WGI-400A or cables.  
Or, electric shock hazard may result.
- 12) Always connect the protective ground wire to the protective ground terminal.  
Or, electric shock hazard or malfunction of the instrument may result.
- 13) 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

- 1) Before wiring, always confirm the rated power voltage of the WGI-400A and terminal arrangement.  
Then, conduct wiring in the correct manner.
- 2) 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.
- 3) 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.
- 4) 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.
- 5) 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.
- 6) Use the WGI-400A by conforming to operating environment specified in this Instruction Manual.  
Or, malfunction and/or failure of the instrument may result.

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.

## PRINCIPAL FUNCTIONS

- **Calibration Function**  
Calibration values of transducers (sensors) are registered to display load, pressure, etc. in physical values. There are 3 calibration functions such as actual load calibration, sensitivity registering calibration, and numeric value registering calibration.
- **TEDS (Transducer Electronic Data Sheet) (hereinafter referred to as the TEDS) Function**  
With calibration data obtained by TEDS compatible transducers, sensitivity is automatically registered.
- **High/Low Limit Comparator Function**  
The indicated value is compared with the preset high/low limit values and the compared results are externally output as well as indicated on LEDs.
- **Pattern Select Function**  
Four sets of high/low limit values are stored and selected from the external signal.
- **Analog Output Adjusting Function**  
Capable of adjusting voltage output that is proportional to the indicated value.
- **Smoothing Function**  
The number of moving average times and minimum scale are set to decrease unstable indication.
- **Auto Zero Compensation Function**  
Conduct Zero tracking and zero near zero function to stable the Zero display.
- **Level Test Function**  
Displays arbitrary value to adjust the externally connected devices with ease.
- **Optional Function**  
Various optional functions such as RS-232C, RS-485, and BCD output functions are provided so as to be easily connected to an external indicator, printer, sequencer, PC, etc.

## STANDARD ACCESSORIES

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

Unit label .....	1
Warranty .....	1
Inspection Report .....	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 applicable for your power supply specifications.

Optionals: AC power cable for 100 VAC: P-23  
AC power cable for 200 VAC: P-24



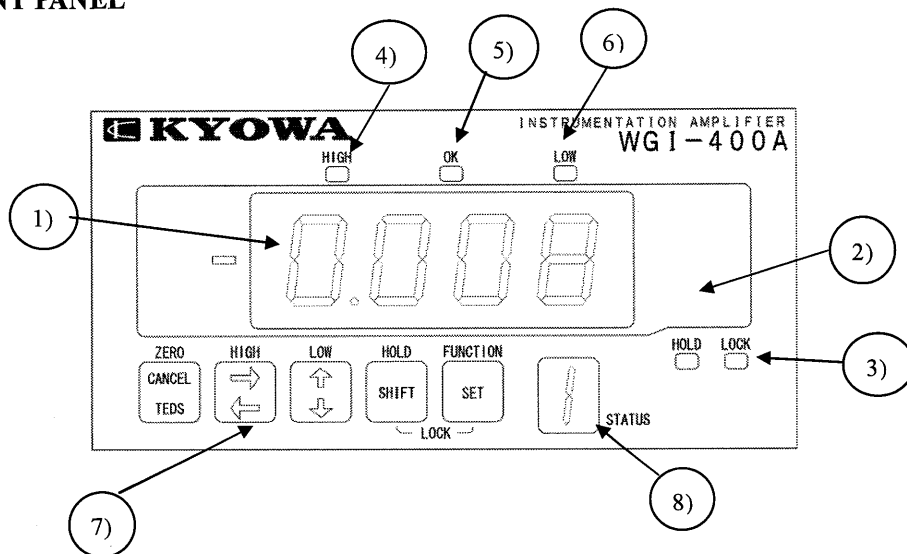
## TYPES

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				○		○

# 1. PARTS NAMES AND FUNCTIONS

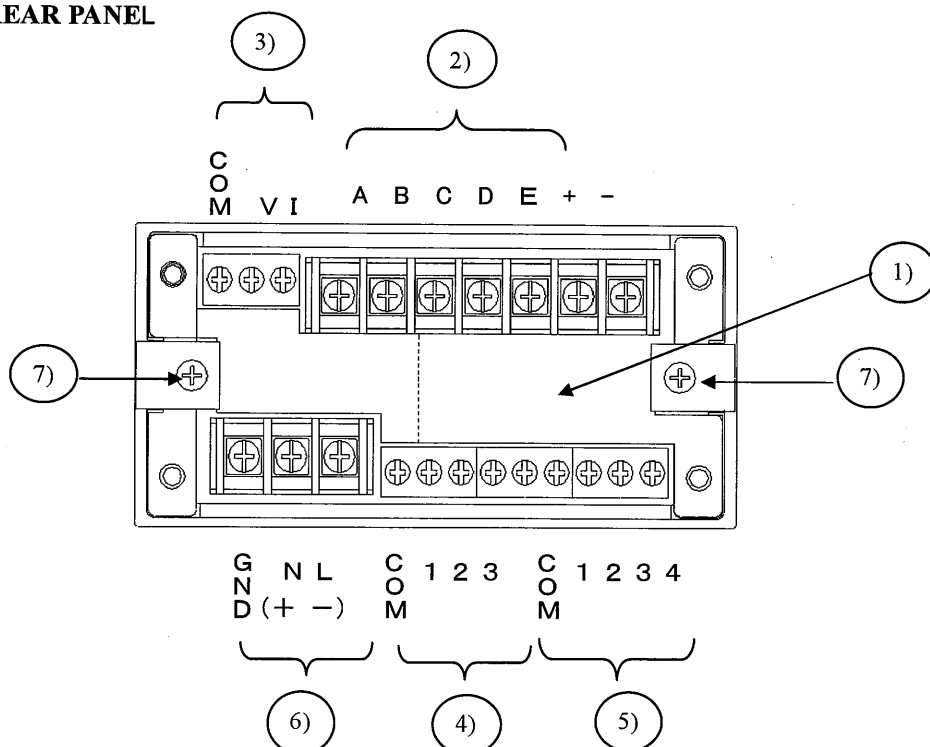
## 1-1 FRONT PANEL



- 1) Indicator .....
  - Displays a measured value, various selected functions, and set values.
  - Normally, it is displayed with the measured value responding to the output from transducers. However, if error occurs, error message appears.
  - See “3-10 ERROR CODE TABLE.”
- 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 output is displayed.

Note: The WGI-400A is not responding to the [HOLD] function.

## 1-2 REAR PANEL



1) Optional Function: Location of connectors of BCD, RS232C, and RS485

2) Connection Terminals of Transducers (Transducer and TEDS)

A: Bridge excitation (+)	Red wire	} KYOWA's standard wire colors
B: Bridge output (-)	White wire	
C: Bridge excitation (-)	Black wire	
D: Bridge output (+)	Green wire	
E: Shield		
+: TEDS (+)		
-: TEDS (-)		

3) Analog Output Terminal (ANALOG OUT)

COM : Common

V: Voltage output terminal

I: Current output terminal

4) Control Output Terminal (OUTPUT)

COM: Common

1 : High limit output (HIGH)

2 : OK output (OK)

3 : Low limit output (LOW)

5) Control Input Terminal (INPUT)

COM: Common

1 : Digital Zero command

2 : Level test command

3 : Pattern select command 1

4 : Pattern select command 2

6) Power Input Terminal (POWER)

GND: Ground terminal

N: Power supply input terminal

L: Power supply input terminal

} Connect AC power supply.

+: +Power supply input terminal

-: -Power supply input terminal

} Connect DC power supply. (When DC is optionally set.)

7) Fitting Metal Used for fixing the WGI-400A to the 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.

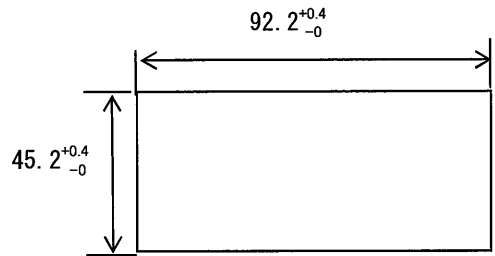
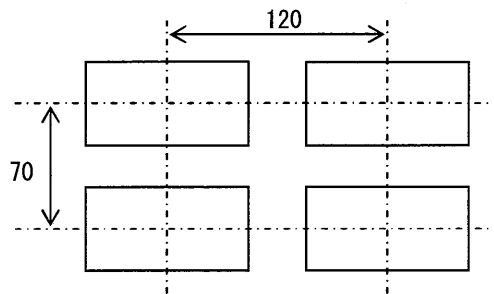
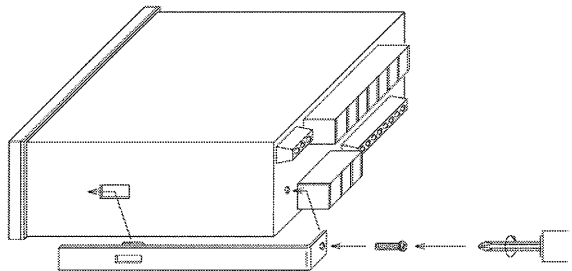


Plate thickness: 0.8 to 5.0 mm



Panel cut position for mounting multiple WGI-400A units.

- 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 7 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 (8 W).



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.

### 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.
- Factory default of bridge excitation voltage is set to 2 V. It can be changed to 4 V. Set the voltage applicable to transducer specifications (recommended excitation voltage) before using the transducer. See function selecting mode 'F-13' and change the setting.

### 2-2-4 Connecting Control Input Terminal

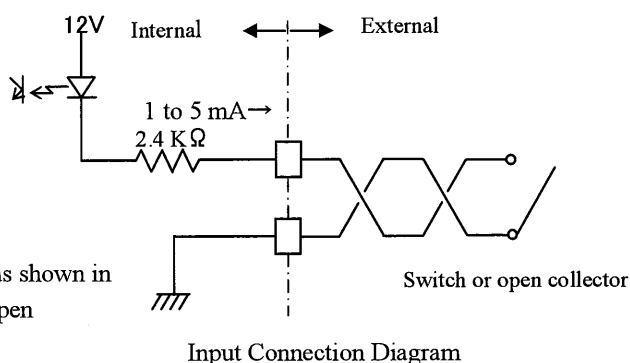
- Connection of control input terminal (INPUT)

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.



### 2-2-5 Connecting Control Output Terminal

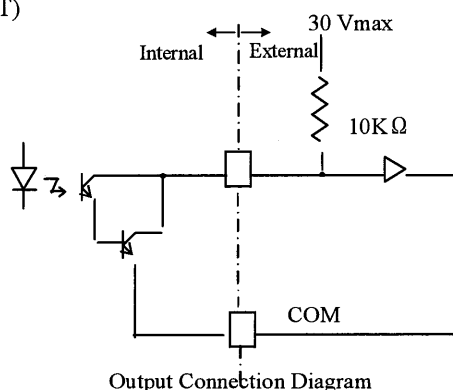
- Connection of control output terminal (OUTPUT)

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.



### 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 ( $\pm 10$  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 kΩ 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.

### 2-2-7 Connecting BCD Output

For connection of BDC output, see the WGI-400A Instruction Manual for Optional Functions.

### 2-2-8 Connecting RS Output

For connection of RS output, see the WGI-400A Instruction Manual for Optional Functions.

### 3. OPERATION AND FUNCTION

This Chapter describes operation and various functions of the WGI-400A.

#### 3-1 SETTING LOCK STATE

The setting [LOCK] function is used to prohibit the change in set values in order to prevent erroneous operation. In the [LOCK] state, changing functions or high/low limit values are not allowed. However, the preset high/low limit values can be monitored (for checking).

**Before changing functions or high/low limit values, do not forget to cancel the [LOCK] state.**

- Power ON and the WGI-400A starts up in measuring state with [LOCK] LED turned ON/ OFF depending on the state before turning OFF the power.
- After changing the desired settings, press the [LOCK] button to be in [LOCK] state to prevent erroneous operation.

How to set and cancel the [LOCK] state are described in the following.

Press the **[HOLD]** + **[FUNCTION]** keys for 2 seconds at the same time.

When the [LOCK] state is ON: Cancels the [LOCK] state ([LOCK] LED lights out)

When the [LOCK] state is OFF: Sets the [LOCK] state ([LOCK] LED lights up.)

Reference: However, even if it is in the [LOCK] state, the external control input terminal (INPUT) operates.

#### 3-2 SELECTING BRIDGE EXCITATION VOLTAGE

Bridge excitation voltage (Excitation voltage) applied to transducers can be selected from either 2 V or 4 V. Select the higher voltage within the recommended excitation voltage range of transducers. Factory default setting is 2 V.

##### 1) Changing to BV select mode.

Press the **[FUNCTION]** key for more than 2 seconds. 'F-01' is displayed to be in function selecting mode.

Press the **[←]** key until 'F-13' appears and then, press the **[SET]** key.

Bridge excitation voltage selecting function is set.

##### 2) Selecting BV Voltage

The current selected BV No. appears and flickers.

Press the **[↑]** key to change the setting (0: BV 2 V, 1: BV 4 V).

And then, press the **[SET]** key.

##### 3) End

Function 'F-13' is displayed. Press the **[CANCEL]** key. Then, the registered bridge excitation voltage is applied to the transducer.

### 3-3 DIGITAL ZERO FUNCTION

Digital Zero function serves to define the reference point of the indicator.

It is as same setting the scale pointer to '0.'

There are 2 methods for defining the reference point (Zero); by key operation and by contact input terminal from the rear panel.

#### 1) Key Operation

Press the **ZERO** key in the measuring mode for 2 seconds and the digital Zero function is activated to set the indication to '0.' If the additional value is set, the determined additional value is displayed.

#### 2) Operation From the Rear Panel

- Short-circuit between rear terminals (INPUT) COM and No. 1 (Zero) to conduct digital Zero function.  
This function is available when the [LOCK] LED is ON.
- When external control input terminals are set to OFF, the WGI-400A shall be in measuring state after conducting the digital Zero function.
- Values adjusted by the above terminals shall be maintained even after the power is cutoff.



### 3-4 CALIBRATION FUNCTION

There are 3 calibration functions appropriate for the required purpose, that is, 'Actual load calibration' that calibrates data by applying already known load to transducers (sensors), 'Sensitivity registering calibration' that conducts calibration by registering a sensitivity value written in the transducer inspection report, and 'Numeric value registering calibration' that calibrates data by registering input value to display Zero.

#### 3-4-1 Actual Load Calibration

Actual load calibration is conducted by applying the actual load (already known load such as weight) to a transducer.

Use a load cell having 'rated capacity: 1 kHz' and 'rated output: 2.004 mV/V.' An example shall be explained to have the indicator display '100.0' when 100-kg load is applied.

##### 1) Conducting Digital Zero

Set the transducer to no load state. Press the **ZERO** key to activate the digital Zero function and to set the indication to '0.' Do not forget to conduct this digital Zero function to register the reference point.

##### 2) Applying Actual Load

Apply the actual load to the transducer.

<Example> Gently apply 100 kg load.

##### 3) Changing to Sensitivity Registering Calibration Mode

Press the **FUNCTION** key for more than 2 seconds. Function 'F-01' is displayed to be in function selecting mode.

Press the **→** key to have the indicator display 'F-02' and press the **SET** key.

Then, the actual load calibration is set.

##### 4) Setting Indicated Value

The currently set indicated value (Rated capacity) is displayed and the highest-order digit flickers.

Press the **→** or **↑** key to set the set the desired value (Actual load value) by ignoring the decimal point.

<Example> Set the indicated value to '1000' and press the **SET** key.

##### 5) Setting Decimal Point Position

The current decimal point position flickers.

Press the **→** key and move the decimal point position.

<Example> Set the indicated value to '100.0' and press the **SET** key.

##### 6) Calibration End

Function 'F-02' is displayed. Press the **CANCEL** key.

Then, the measurement starts with the registered calibration value.

### 3-4-2 Sensitivity Registering Calibration Function

This is a function that calibrates data by registering rated output of a transducer without applying the actual load.

Use a transducer having 'rated capacity: 1 kHz' and 'rated output: 2.004 mV/V.' An example shall be explained to have the indicator display '1.000' when 1-kN load is applied.

#### 1) Conducting Digital Zero

Set the transducer to no load state Press the **ZERO** key to conduct the digital Zero function and to set the indication to '0.'

#### 2) Changing to Sensitivity Registering Calibration Mode

Press the **FUNCTION** key more than 2 seconds. Function 'F-01' is displayed to be in function selecting mode.

Press the **→** key to have the indicator display 'F-03 and press the **SET** key.

Then, the sensitivity registering calibration is set.

#### 3) Setting Rated Output of the Transducer

The currently set rated output value is displayed and the highest-order digit flickers.

Press the **→** or **↑** key to set the rated output of the transducer in 'mV/V' unit.

<Example> Set the indicated value to '2.0040' and press the **SET** key.

At this time, the Status Indicator operates as the minimum digit indicator.

#### 4) Setting Indicated Value

The currently set display rated capacity is displayed and the highest-order digit flickers.

Press the **→** or **↑** key to set the rated capacity of the transducer by ignoring the decimal point.

<Example> Set the indicated value to '1000' and press the **SET** key.

#### 5) Setting Decimal Point Position

The current decimal point position flickers.

<Example> Set the indicated value to '100.0' and press the **SET** key.

#### 6) Calibration End

Function 'F-03' is displayed. Press the **CANCEL** key.

Then, the measurement starts with the registered calibration value.

Reference 1: When setting the rated output, etc. the Status Indicator operates as the minimum digit indicator.

Reference 2: Assume weight is measured with a load cell. Since notation of the load cell rated capacity is Newton [N], the rated capacity is converted into weight unit [kg].

$$\text{Rated capacity [kg]} = \frac{\text{Rated capacity [N]}}{\text{Gravity acceleration [m/s}^2\text{] of the location in use}}$$

### 3-4-3 Numeric Value Registering Calibration

This is a function that calibrates data by setting the indicated value to a reference (Initial) value. Conduct this function after the actual load and sensitivity registering calibrations.

This function is used for pressure transducers for absolute pressure measurement or when already load is applied and unable to obtain the actual load state. By registering the initial value of the transducer written in the inspection report or registering an already measured initial value, a reference point equivalent to unload state can be registered.

#### 1) Changing to Sensitivity Registering Calibration Mode

Press the **FUNCTION** key more than 2 seconds. Function 'F-01' is displayed to be in function selecting mode.

Press the **→** key to have the indicator display 'F-04' and press the **SET** key.

Then, the numeric value registering calibration is set.

#### 2) Setting Initial Value of the Transducer

The currently set reference value is displayed and the highest-order digit flickers.

Press the **→** or **↑** key to set the set the initial value of the transducer in mV/V unit.

After numeric value is determined, press the **SET** key.

At this time, the Status Indicator operates as the minimum digit indicator.

#### 3) Calibration End

Function 'F-04' is displayed. Press the **CANCEL** key.

Then, the measurement starts with the registered calibration value.

Note: Numeric value registering calibration is erased when conducting the actual load calibration and sensitivity registering calibration.

Reference: Although, the rated output of strain gage transducers is generally expressed in [mV/V], it may be expressed in other units. At that time, the obtained data is converted into other units.

$$1 \text{ [mV/V]} = 1000 \text{ [}\mu\text{V/V]} = 2000 \text{ [}\times 10^{-6} \text{ strain]} = 2000 \text{ [}\mu\text{e]} = 2000 \text{ [}\mu\text{m/m]}$$

## 3-5 COMPARATOR FUNCTION

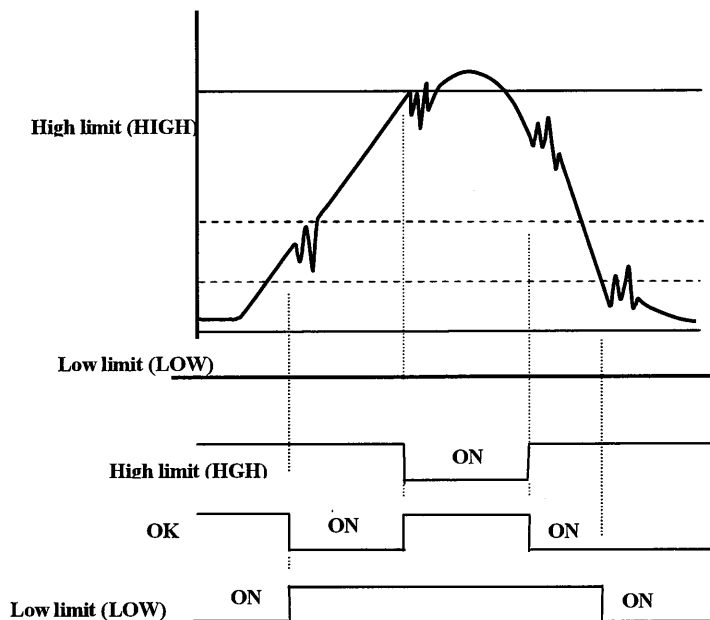
### 3-5-1 High/Low Limit Comparator Function

High/low limit comparator function is a function that compares the indicated value with the high/low limit value and outputs the compared result. The result of comparison is obtained as open collector output from the rear terminal board and is indicated on the [HIGH]/[OK]/[LOW] LEDs on the front panel. The hysteresis (Dead zone) can be set in the set value.

#### 1) Output and LED Display to High/Low Limit Comparison Conditions

- Regarding high limit comparator (HIGH), when the indicated value exceeds the higher limit value, the higher limit output becomes ON.  
On the contrary, when the indicated value lowers the 'higher limit value - hysteresis value,' the higher limit output becomes OFF.
- Regarding low limit comparator (LOW), when the indicated value lowers the lower limit value, the lower limit output becomes ON.  
On the contrary, when the value exceeds the 'lower limit value + hysteresis value,' the lower limit output becomes OFF.

For details, see the following figure.



#### 2) Setting High/Low Limit

- Press the **[HIGH]** (or **[LOW]**) key for 2 seconds in the measuring mode. The current set value is indicated and the highest order digit flickers.  
At this time, the [HIGH] (or [LOW]) LED flickers.
- Select and move the flickering to the desired digit with the **[→]** key and change the numeric value with the **[↑]** key.
- Then, press the **[SET]** key to determine the setting.

#### 3) Setting Hysteresis

Set hysteresis width that turns OFF the once turned ON high/low comparator.

The hysteresis can be separately set for high and low limit comparators.

For how set the hysteresis, see the function selecting mode 'F-10.'

### 3-6 PATTERN FUNCTION

High and low limit values are stored in 4 sets of operation patterns (0 to 3). They can be changed from external control input terminal or by key operation.

#### 1) Writing to Operation Patterns of High/Low Limit Values

When pattern No. (0 to 3) is displayed on the Status Indicator ([STATUS]) on the front panel, the preset high or low limit values are stored as patterns 0 to 3.

Reference: Once stored set value is maintained even after the power is cut off.

#### 2) Selecting Operation Pattern

- Operation pattern can be selected by setting function selecting mode 'F-14.'
- For operation procedures, see function selecting mode 'F-14.'

Note: Selecting operation pattern is enabled when 'Pattern Select Command 1' or 'Pattern Select Command 2' of external control input is set to OFF.

- Operation pattern is selected by 'Pattern Select Command 1' or 'Pattern Select Command 2' of the external control input.

	Pattern Select Command 1	Pattern Select Command 2
Operation pattern 0	Open (OFF)	Open (OFF)
Operation pattern 1	Close (ON)	Open (OFF)
Operation pattern 2	Open (OFF)	Close (ON)
Operation Pattern 3	Close (ON)	Close (ON)

Reference: Operation pattern is selected by giving priority to the external control input. When it is selected by the external control input, set value of Function 'F-14' is cancelled to have the initial value '0.'

### 3-7 LEVEL TEST FUNCTION

Level test function is used for setting the indication of the WGI-400A to a predetermined indicated value. It is used for adjusting the external connected devices or testing the output of the WGI-400A.

#### 1) Setting Function

- Additional Function

0 disabled: Displays the indicated value irrespective of the measured value.

1 enabled: Displays the indicated value by adding the set value to measured value.

- Setting level test value

Level test value is set within the range  $\pm 9999$  and the initial value shall be 1000.

For how to set the level test value, see function selecting mode 'F-25.'

#### 2) Operation

Set value is continuously displayed while the level test command of the control input is set to close (ON).

### 3-8 TEDS FUNCTION

TEDS function of the WGI-400A is a function that reads excitation voltage, rated output, and rated capacity from transducer data with TEDS function (Transducer Data Electronic Sheet) built-in and automatically registers sensitivity and decimal point position.

#### 1) TEDS Function with Initial Value

Set sensors in no-load state as same as in sensitivity registering calibration. Activate the TEDS function and digital Zero is automatically activated to display '0' (No-load Zero). In addition, sensitivity registering calibration is automatically activated and a decimal point position is set.

TEDS function is activated by key operation (Press the **SHIFT** key while pressing the **TEDS** key) or from the RS interface when the power is turned ON. However, in the default value, automatically conducting the TEDS function with the power ON is prohibited. See 'F-20.'

Reference: When replacing a faulty sensor with that of the same type, set only the rated output of 'F-21' to '0: Allow' and set rated capacity and excitation voltage to '1: Prohibit.' At this time, coefficient internally used is only changed and the rated capacity (indicated value) and decimal point position are not changed. If all the settings of the 'F-21' are set to '0: Allow,' indicated value and decimal point position are calculated and obtained.

#### 2) Excitation Voltage

Excitation voltage is set to a high voltage and less than sensor recommended excitation voltage.

<Example> When the recommended excitation voltage is 3 volt, it is set to 2 volt.

#### 3) Calculating calibration coefficient

Calibration coefficient is registered as a value obtained by dividing the sensor rated capacity by the rated output.

#### 4) Digital Zero

Digital Zero activated in TEDS operation is considered as Zero in calibration function and shall be set as a standard Zero point.

#### 5) Indicated Value

Indicated value is shown in 4 digits including rated capacity and a decimal point.

<Example>

5	[N]	=	5.000
50	[N]	=	50.00
500	[N]	=	500.0
5	[kN]	=	5.000
50	[kN]	=	50.00
500	[kN]	=	500.0

#### 6) Connecting Multiple TEDS Sensors

When connecting multiple TEDS sensors (Maximum 4 TEDS) in parallel, calculate the combined rated capacity and rated output as follows.

Rated capacity (Combined): Total sum of rated capacity of sensors

Rated output (Combined): Average of rated output of sensors (Value obtained by dividing sensor total sums by the number of TEDS sensors.)

### 3-9 FUNCTION SELECTING MODE (FUNCTION MODE)

- There are the following selective functions.

F-01: Original value	F-12: Initialize
F-02: Actual Load Calibration	F-13: BV Select
F-03: Sensitivity Registering Calibration	F-14: Operation Pattern
F-04: Numeric Value Registering Calibration	*F-15: RS-1
F-05: Self-Check	*F-16: RS-2
F-06: Analog Output Scale	*F-17: Device ID
F-07: Smoothing	F-20: TEDS Read Operation
F-08: Additional Value	F-21: TEDS Read Items
F-09: Auto Zero Compensation	F-22: Zero When Reading TEDS
F-10: Hysteresis	F-25: Level Test Signal
*F-11: BCD Output Logic	

\*: Setting is available when optional function is added.

#### 3-9-1 Selecting Function

##### 1) Cancelling Setting [LOCK] State

To cancel the [LOCK] state ([LOCK] LED is lit), press the **HOLD** + **FUNCTION** keys for 2 seconds at the same time. Then, the [LOCK] LED lights out.

##### 2) Selecting Functions

- Press the **FUNCTION** key for 2 seconds in measuring state to be in function selecting mode. Then, function 'F-01' is displayed on the indicator to enable the selection of the desired function.
- Press the **→** key or **SHIFT** + **←** keys and select any of the functions from 'F-01' to 'F-25.'
- Press the **SET** key to determine the selected function and to enable the setting change.
- Press the **CANCEL** key in function selecting mode to return to the measuring state.

#### 3-9-2 Key Operation in Setting Mode

- Select the function selecting mode and press the **SET** key. Then, changing the function is enabled.
- To change the set value, operate as follows.

Move digit:	Press the <b>→</b> or <b>SHIFT</b> + <b>←</b> keys.
Change numeric value:	Press the <b>↑</b> or <b>SHIFT</b> + <b>↓</b> keys.
Determine changed value:	Press the <b>SET</b> key.

Then, the changed value is determined and stored in the internal memory.
- When it is not required to set the numeric value, "...." is displayed. With this state, press the **SET** key to enable the selected function.
- Press the **CANCEL** key in the setting mode to return to the function selecting mode.

### 3-9-3 List of Functions

For details of each function, see the following Table 3-9-3.

**Table 3-9-3 Various Functions in Function Selecting Mode**

(1/5)

Function Name	Key Operation and WGI-400A Movement in Function Setting Mode	Functional Description
<b>F-01</b> Original Value	<p>“.....” is displayed. Press the <b>SET</b> key and the input value at this time is displayed in mV/V.</p>	<ul style="list-style-type: none"> <li>• A function that displays the raw output value of the transducer.</li> </ul>
<b>F-02</b> Actual Load Calibration	<p>Note: Before activating the calibration function, always conduct digital Zero function with no load applied to the transducer.</p> <ul style="list-style-type: none"> <li>• Apply load to the transducer</li> <li>• Input a desired numeric value (load) to be indicated and press the <b>SET</b> key.</li> <li>• Set a decimal point and press the <b>SET</b> key. Then, the calibration value is updated. Remove the load.</li> </ul>	<ul style="list-style-type: none"> <li>• A function that applies the actual load to the transducer and sets the indicated value of that time.</li> <li>• For details, see “3-4-1 Actual Load Calibration.”</li> </ul>
<b>F-03</b> Sensitivity Registering Calibration  Initial value:2.000 [mV/V] 4000 Display	<ul style="list-style-type: none"> <li>• Set rated output of the transducer in mV/V and press the <b>SET</b> key.</li> <li>• Input the desired indicated value (rated capacity) and press the <b>SET</b> key.</li> <li>• Set a decimal point and press the <b>SET</b> key. Then, the calibration value is updated.</li> <li>• Setting available range: Less than 9999 per 0.1 mV/V</li> </ul>	<ul style="list-style-type: none"> <li>• A function that conducts calibration by registering the rated output and rated capacity of the transducer without applying the actual load.</li> <li>• For details, see “3-4-2 Sensitivity Registering Calibration Function”</li> </ul>



Table 3-9-3 Various Functions in Function Selecting Mode

(2/5)

Function Name	Key Operation and WGI-400A Movement in Function Setting Mode	Functional Description
<b>F-04</b> Numeric Value Registering Calibration (Calibration Zero Registration)	<ul style="list-style-type: none"> <li>Displays calibration Zero value.</li> <li>Changes the numeric value by key operation. Input the initial value of the transducer.</li> <li>Press the <b>SET</b> key to determine the indicated value.</li> </ul>	<ul style="list-style-type: none"> <li>A function that re-sets the Zero value (a reference value) when calibration.</li> <li>For details, see “3-4-3 Numeric Value Registering Calibration.”</li> </ul>
<b>F-05</b> Self-Check	<p>“.....” is displayed. Press the <b>SET</b> key and all the indicator LEDs light up to conduct self-check. The self-check results are indicated as described at the right.</p> <ul style="list-style-type: none"> <li>If faulty self-check results appear on the indicator, contact KYOWA or our representatives.</li> </ul>	<ul style="list-style-type: none"> <li>A function that self-checks the internal memory and displays the checked results.</li> </ul> <p>Good: Normal E-01: RAM failure E-02: Flash memory failure</p>
<b>F-06</b> Analog Output  Initial value ‘0’: Zero ‘4000’: Full scale	<ul style="list-style-type: none"> <li>Select output 0: Voltage output 1: Current output Select and press the <b>SET</b> key.</li> <li>‘◦’ is displayed on the Status Indicator. Set the indicated value to have the output to ‘0 V or 4 mA’ and press the <b>SET</b> key.</li> <li>‘F’ is displayed on the Status Indicator. Set the indicated value to have the output to ‘10 V or 20 mV/V’ and press the <b>SET</b> key.</li> <li>Setting range: <math>\pm 9999</math></li> </ul>	<ul style="list-style-type: none"> <li>A function that sets and defines Zero and full scale with the indicated value.</li> <li>Select the desired analog output.</li> <li>If the analog output exceeds the full scale value by approximately 5%, about 12 V is output. If it lowers to -full scale, -12 V is output. Current output is outputted in the same manner, approximately 12 mA and 0 mA.</li> </ul>

Table 3-8-3 Various Functions in Function Selecting Mode

(3/5)

Table 5-5-5 Various Functions in Function Setting Mode																				
Function Name	Key Operation and WGI-400A Movement in Function Setting Mode	Functional Description																		
<b>F-07</b> Smoothing     Initial value:     '0.0' Moving average: None Minimum scale:   1	<p>Displays the following items 1) and 2).</p> <table><tr><td>1)   Number of moving average times</td><td>2)   Minimum scale</td></tr></table> <table><tr><td>O:   None</td><td>0:   1</td></tr><tr><td>1:   2 times</td><td>1:   2</td></tr><tr><td>2:   4 times</td><td>2:   5</td></tr><tr><td>3:   8 times</td><td>3:   10</td></tr><tr><td>4:   16 times</td><td>4:   20</td></tr><tr><td>5:   32 times</td><td>5:   50</td></tr><tr><td>6:   64 times</td><td>6:   100</td></tr><tr><td>7:   128 times</td><td></td></tr></table> <p>Select and change values in items 1) and 2) and press the <b>[SET]</b> key.</p> <p>Note: When moving average times is set, response of the analog output is deteriorated.</p>	1)   Number of moving average times	2)   Minimum scale	O:   None	0:   1	1:   2 times	1:   2	2:   4 times	2:   5	3:   8 times	3:   10	4:   16 times	4:   20	5:   32 times	5:   50	6:   64 times	6:   100	7:   128 times		<ul style="list-style-type: none"><li>• A function that stables the indication by smoothing the varying signals from the transducer.</li><li>• Number of moving average times The number of moving average times to average and display the measured value.</li><li>• Minimum scale Minimum unit that varies the indicated value.</li><li>• To set the number of display times relevant for the WGI-300, select '4' in item 1) and set '16.'</li></ul>
1)   Number of moving average times	2)   Minimum scale																			
O:   None	0:   1																			
1:   2 times	1:   2																			
2:   4 times	2:   5																			
3:   8 times	3:   10																			
4:   16 times	4:   20																			
5:   32 times	5:   50																			
6:   64 times	6:   100																			
7:   128 times																				
<b>F-08</b> Additional Value   Initial value: '0'	<ul style="list-style-type: none"><li>• Set the desired additional value and press the <b>[SET]</b> key.</li><li>• Setting range: ±9999</li></ul>	<ul style="list-style-type: none"><li>• A function that adds the desired numeric value to the measured value for display.</li><li>• Conduct digital Zero function with the preset additional value. Then, the obtained value is displayed on the indicator.</li></ul>																		

Table 3-9-3 Various Functions in Function Selecting Mode

(4/5)

Function Name	Key Operation and WGI-400A Movement in Function Setting Mode	Functional Description
<b>F-09</b> Auto Zero Compensation  Initial value: '0' '0.0' '0'	<ul style="list-style-type: none"> <li>'μ' is displayed on the Status Indicator. Set Zero compensation range and press the <b>SET</b> key.</li> <li>'t' is displayed on the Status Indicator. Set the judging time and press the <b>SET</b> key.</li> <li>Zero Compensation range: ±9999</li> <li>Judging time: 0.0 to 9.9 (sec)</li> <li>'2' is displayed on the Status Indicator (ZERO). Set Zero near Zero range and press the <b>SET</b> key.</li> <li>Zero near Zero range: 0 to 9</li> </ul>	<ul style="list-style-type: none"> <li>Zero tracking When it passes the judging time and measured value is within the Zero compensation range, this function activates digital Zero function and automatically Zeros the indicated value.</li> <li>Zero near Zero range When the measured value is within the Zero near Zero range (Within setting range), this function automatically Zeros the indicated value.</li> </ul>
<b>F-10</b> Hysteresis  Initial value: '0' '0'	<ul style="list-style-type: none"> <li>'1' is displayed on the Status Indicator. Set hysteresis of the high limit comparator and press the <b>SET</b> key.</li> <li>'2' is displayed on the Status Indicator. Set hysteresis of the low limit comparator and press the <b>SET</b> key.</li> <li>Setting range: 0 to 9999</li> </ul>	<ul style="list-style-type: none"> <li>A function that sets the hysteresis of the high and low limit comparators (Comparators 1 and 2).</li> </ul>
<b>F-12</b> Initialize	<ul style="list-style-type: none"> <li>Initialize 0: Not initialized 1: Initialized Press the <b>SET</b> key. Then, the set value returns to factory default setting.</li> <li>Calibration value and BV set value are not initialized.</li> </ul>	<ul style="list-style-type: none"> <li>A function that returns the set values to factory default.</li> </ul>
<b>F-13</b> BV Select  Initial value: '0'	<ul style="list-style-type: none"> <li>Set BV set value. 0: 2 V 1: 4 V Select either of the above volts and press the <b>SET</b> key.</li> </ul>	<ul style="list-style-type: none"> <li>A function that selects and changes the bridge excitation voltage.</li> </ul>

Table 3-8-3 Various Functions in Function Selecting Mode

(5/5)

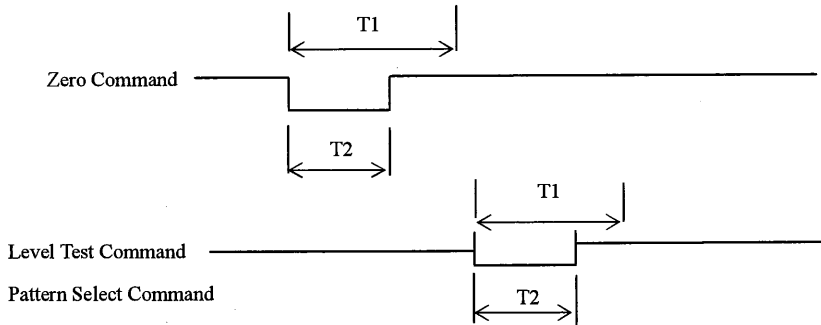
Function Name	Key Operation and WGI-400A Movement in Function Setting Mode	Functional Description
<b>F-14</b> Operation Pattern Initial value: '0'	<ul style="list-style-type: none"> <li>Set value 0: Pattern 0 1: Pattern 1 2: Pattern 2 3: Pattern 3</li> </ul> After selecting the desired pattern, press the <b>SET</b> key.	<ul style="list-style-type: none"> <li>Select high/low limit comparator values from 4 sets of patterns.</li> <li>Factory default is '0.'</li> <li>When no Pattern Select</li> <li>Command from external control input is connected, this function is enabled.</li> </ul>
<b>F-20</b> TEDS Read Operation Initial Value: '0.0.0.1'	Displays the items 1), 2), 3) and 4). 1) External control input (setting not available) 0: Allowed              1: Prohibited 2) RS command 0: Allowed              1: Prohibited 3) Key operation 0: Allowed              1: Prohibited 4) Power ON 0: Allowed              1: Prohibited Select and change items 1), 2), 3), and 4) and press the <b>SET</b> key.	<ul style="list-style-type: none"> <li>Allows or prohibits the TEDS reading operation.</li> <li>In the factory default state, the TEDS reading operation is prohibited with the power ON.</li> </ul>
<b>F-21</b> TEDS Read Items Initial Value: '0.0.0.'	Displays the items 1), 2) and 3). 1) Excitation voltage 0: Allowed              1: Prohibited 2) Rated output 0: Allowed              1: Prohibited 3) Rated capacity 0: Allowed              1: Prohibited Select and change items 1), 2), and 3) and press the <b>SET</b> key.	<ul style="list-style-type: none"> <li>Allows or prohibits the TEDS reading items.</li> <li>In the factory default state, all the TEDS read items are set to '0: Allow.'</li> </ul>
<b>F-22</b> Digital Zero during TEDS Operation Initial Value: '0.'	0: Execute              1: Prohibited Select and press the <b>SET</b> key.	<ul style="list-style-type: none"> <li>Execute or prohibit digital Zeroing during Zero operation.</li> <li>In the factory default state, it is set to '0: Execute.'</li> </ul>
<b>F-25</b> Level Test Signal Initial value: '0' '1000'	<ul style="list-style-type: none"> <li>Display additional function Set value 0: Disabled                   1: Enabled After selecting either of the above, press the <b>SET</b> key.</li> <li>Setting the test value After setting the test value, press the <b>SET</b> key.</li> <li>Setting range: <math>\pm 9999</math></li> </ul>	<ul style="list-style-type: none"> <li>This function operates when the level test command from the control input is ON.</li> <li>Disabled: Displays the level test value irrespective of the indicated value.</li> <li>Enabled: The level test value is added to the indicated value and displayed.</li> </ul>

### 3-10 ERROR CODE TABLE

Error Display	Contents	Countermeasures
OFL1	Measured value is exceeding the input range to the minus side.	Decrease the input signal. Use within 3.2 mV/V.
OFL2	Measured value is exceeding the input range to the plus side.	
OFL3	Indicated value is below -9999.	Decrease the input signal.
OFL4	Indicated value is above 9999.	Re-set the sensitivity registering value.
E-12	Sensitivity registering value is exceeding the specified range.	Change the setting to less than 9999 per 0.1 mV/V.
E-01	Memory (RAM) failure.	Failure Contact KYOWA or our representatives for repair.
E-02	Memory (EEPROM) failure.	

## 4. OPERATION TIMING

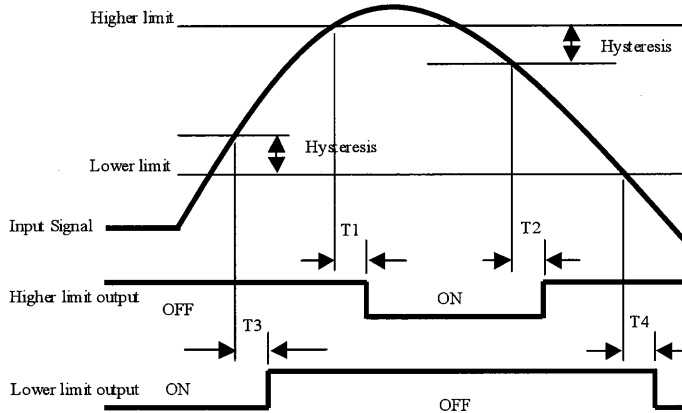
### 4-1 CONTROL INPUT (ZERO, LEVEL TEST, PATTERN SELECT 1, & PATTERN SELECT 2 COMMANDS)



T1: 50 ms .....After short-circuiting the control input signal, maximum delay time until it becomes to be in operating state.

T2: 30 ms .....Minimum signal width of the control input signal.

### 4-2 HIGH/LOW COMPARATOR OUTPUT



T1: 175 ms .....A delay time required for the high limit output to turn ON after the input value exceeds the preset high limit comparator value.

T2: 175 ms .....A delay time required for the high limit output to turn OFF after the input value lowers only by the hysteresis width from the preset high limit comparator value.

T3: 175ms .....A delay time required for the low limit output to turn OFF after the input value lowers only by the hysteresis width from the preset low limit comparator value.

T4: 175ms .....A delay time required for the low limit output to turn ON after the input value lowers the preset low limit comparator value.

### **4-3 DELAY TIME BETWEEN INPUT AND OUTPUT SIGNALS**

Delay time between input and BCD output ..... Maximum 180 ms

Delay time between input and RS output ..... Maximum 180 ms

Delay time between input and DA output ..... Maximum 370 ms

## 5. SPECIFICATIONS

### 5-1 SPECIFICATIONS

Model Name .....	WGI-400A Instrumentation Amplifier with Multipurpose Indicator
The Number of Measuring Channels .....	1
Applicable Sensor .....	Strain Gage Transducer
Applicable Bridge Resistor .....	87.5 to 1000 $\Omega$ (350 $\Omega$ 4 units parallel connection available)
Bridge Excitation Voltage .....	2 VDC (Max 30 mA)/4 VDC (Max 50 mA) selectable
Input Range .....	$\pm 3.2$ mV/V (Zero adjusting range included)
Non-linearity .....	Within $\pm(0.1\%$ FS +1 digit)
Temperature Stability	Zero point: Within $\pm 0.5$ $\mu$ V/RTI/°C Sensitivity: Within $\pm 0.01\%$ /°C
Sampling Speed .....	50 times/second
Display	Display range: $\pm 9999$ Character Height: 14 mm, Red LED Display Speed: 50 times/sec
Calibration Function.....	Actual load calibration, Sensitivity registering calibration, and Numeric value registering calibration
TEDS Function .....	Automatic sensitivity registration (Key operation, When power ON, RS control)
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)
High/Low Limit Comparator Function .....	The number of points: 2 (HGH and LOW) and 1 (OK) points Setting range: $\pm 9999$ Comparison speed: 50 times/sec
Additional Function .....	Setting range: $\pm 9999$
Original Value Measuring Function .....	$\pm 3.200$ mV/V
Pattern Function .....	Set 4 sets of high/low limit value. Selectable from external signal.
Level Test Function .....	Can display arbitrary value.
Control Input .....	The number of points: 4 Zero command, Level test command, Pattern select command 1, and Pattern select command 2
	Signal Format: Contact point (Capacity: 12 VDC, 5 mA or more)



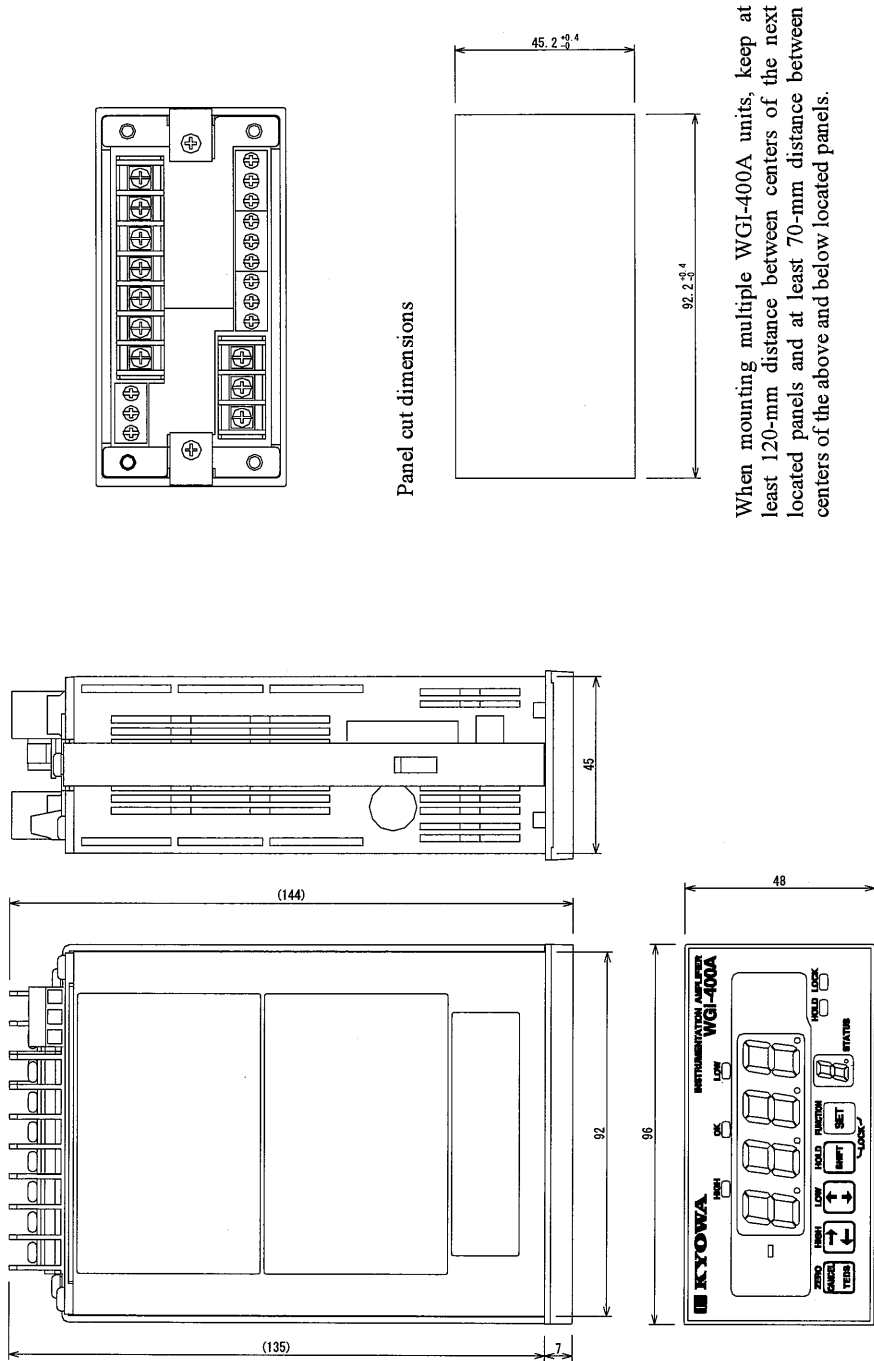
Control Output .....	The number of points: 3	HIGH, OK, and LOW
	Output Format:	Open collector
	Load capacity:	30 VDC, 20 mA (Resistance load)
Analog Output .....	Select voltage output or current output	
	Voltage Output:	±10 V (Load resistance 2 kΩ or more) Arbitrarily scaling available
	Current Output:	4 to 20 mA (Load resistance 500 Ω or less) Arbitrarily scaling available
	Response Speed:	Approx. 0.25 sec (10 to 90%)
	Frequency response:	Approx. 1 Hz
	Non-linearity:	Within ±0.1% FS
Power Supply .....	AC power supply:	100 to 240 VAC ±10%, 50/60 Hz Power consumption 6 VA or less
	DC power supply:	10 to 30 VDC (Custom-ordered) Power consumption 8 W or less
Dimensions .....	96(W) × 48(H) × 144(D) mm (Standard type)	
Weight .....	Approx. 300 g (Standard type)	

## 5-2 ENVIRONMENTAL SPECIFICATIONS

Installation Site .....	Only indoors.	
Rated Altitude .....	2000 m or less	
Transient Overvoltage .....	Anti-impulse category II	
	Allowable impulse noise: 1.5 kV or less	
Operating Temperature Range .....	-10 to 50 °C (Non-condensing)	
Operating Humidity Range .....	20 to 85% RH (Non-condensing)	
Vibration .....	5 to 200 Hz (29.4 m/s <sup>2</sup> )	
	X and Y and Z direction: 10 min	
Connection wiring length .....	Input/output signal wiring, control signal wiring: 30 m or less	
EMC Standard .....	EN613260 + A1 + A2 + A3 (Class A)	
Safety Standard .....	EN61010-1/2001 (Installation Category II, Pollution Degree 2)	
Insulation Resistance .....	100 MΩ (500 VDC)	
Withstand Voltage .....	Between power supply and input/output	
	2000 VAC	1 minute
	Between power supply and the WGI-400A	
	2000 VAC	1 minute
	Mutually between input and output	
	2000 VAC	1 minute

# 5-3 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.