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KEYENCE

96083E

CCD Thrubeam Type Laser Sensor

IG Series

User's Manual

Read this manual before using in order to achieve maximum performance.
After reading, keep this manual in a safe place so that you can refer to it at any time.



Introduction

This manual describes the basic operations and information of the IG Series.
Read this manual carefully to ensure performance and function of the IG Series for safe use.
Keep this manual in a safe place for future reference.
Make sure this manual is kept by an end user finally.

■ Symbols

The following symbols alert you to matters concerning the prevention of human injury and product damage.

⚠ **DANGER**	**Failure to follow instructions and mishandling the product may lead to death or serious injury.**
⚠ **WARNING**	**Failure to follow the instructions may lead to injury.**
⚠ **CAUTION**	**Failure to follow the instructions may lead to product damage or failure of the product.**

Note **Provides additional information on proper operations.**

Reference Provides advanced and useful information for operation.

Provides reference pages.

Safety Information for IG series

General Precautions

- At startup and during operation, be sure to monitor the functions and performance of this product and confirm normal operation.
- We recommend that you take substantial safety measures to avoid any damage in the event that a problem occurs.
- If the product is modified or used in any way other than those described in the specifications, its functions and performance cannot be guaranteed.
- When this product is used in combination with other devices, the functions and performance may be weaken, depending on the operating conditions, surrounding environment, etc.
- Do not use this product for the purpose of protecting the human body.
- Do not subject each device including peripheral devices to rapid temperature change. Product failure may occur due to condensation.

Safety Precautions on Laser Product

⚠ WARNING	**• This product employs a semiconductor laser for its light source.** **• Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.** **• Follow the instructions mentioned in this manual. Otherwise, injury to the human body (eyes and skin) may result.** **Precautions on class 1 laser products** **• Do not disassemble this product. Laser emission from this product is not automatically stopped when it is disassembled.** **• Do not stare into the beam.**

Sensor Head	IG-010/IG-028
Wavelength	660 nm
Output	62 μW
Pluse width	48 μs
FDA(CDRH)Part1040.10 *	Class 1 Laser Product
IEC60825-1	Class 1 Laser Product

* The classification is based on IEC60825-1 standard following the Laser Notice from FDA (CDRH).

Laser emission stop input

When the laser emission stop input is set for the external input, the laser emission stops by setting the external input to ON (for 2 ms or more). The laser emission continues to stop while the external input is ON. When the external input is set to OFF, the laser is emitted within 2 ms.

Abnormal Conditions

⚠ **WARNING**	**If the following conditions occur, turn OFF the power immediately. Continuing to use this product under abnormal conditions may cause product failure.** • **When water or foreign matter enters the IG Series** • **When the IG Series is dropped or the case is damaged** • **If smoke or unpleasant odor is present.**

Precautions on Use

⚠ **WARNING**	• **Use with the correct power source and voltage. Otherwise, fire, electric shock or product failure may result.** • **Do not attempt to open or modify the IG Series. Doing so may cause fire or electric shock.**
⚠ **CAUTION**	• **Before disconnecting the cables, make sure to turn off the main unit and devices connected to the main unit. Otherwise, the unit may be damaged.** • **Do not turn off the power while setting items. Some or all of the set data may be lost.**

Installation environment

To use this product normally and safely, do not install this product in the following locations. Product failure may occur.

- High-humidity, dusty and poorly-ventilated locations
- High-temperature locations where the unit is exposed to direct sunlight
- Locations where there is corrosive or combustible gas
- Locations where the unit may be directly subjected to vibration or impact
- Locations where water, oil or chemicals may splash onto the unit
- Locations where static electricity tends to be generated

Influence of dirt

Measurement errors may occur due to dust, water, oil, etc.

- Blow away dirt on the transmitter and the receiver with clean air. Wipe with a soft cloth moistened with alcohol for heavy dirt.
- Blow away the dirt attached to the object with clean air or wipe it off.
- If dirt is floating in the measurement range, take adequate measures, such as installing a protection cover or air purging.

Anti-noise prevention

When the unit is installed near noise source such as a power source or high-voltage line, operational errors or product failure may occur. Take adequate measures such as using a noise filter, arranging cables separately or insulating the sensor amplifier and the sensor head.

Warm Up

To use the unit, wait more than 10 minutes after the power is turned on for the circuits to stabilize. The displayed value may gradually drift during this time period.

Power ON Reset

Measurement starts approx. 2.5 seconds after the power is turned on. Furthermore, the judgment output is turned on after the number of times for averaging (response time) elapses.

Other Precautions

Power source

- Noise superimposed on the power supply may cause malfunction. Use a direct current stabilized power source which uses an insulation transformer.
- When using a commercially available switching regulator, make sure to ground the frame ground terminal.

CE and UKCA Markings

Keyence Corporation has confirmed that this product complies with the essential requirements of the applicable EU Directive(s) and UK regulations, based on the following specifications. Be sure to consider the following specifications when using this product in the Member States of European Union and in the United Kingdom.

■ **EMC Directive (CE) and Electromagnetic Compatibility Regulations (UKCA)**

- Applicable Standard (BS)EN IEC60947-5-2, Class A

Remarks: These specifications do not give any guarantee that the end-product with this product incorporated complies with the essential requirements of EMC Directive and Electromagnetic Compatibility Regulations. The manufacturer of the end-product is solely responsible for the compliance on the end-product itself according to EMC Directive and Electromagnetic Compatibility Regulations.

Precautions on UL Certificate

The IG Series complies with the following UL/CSA standards and has obtained the UL/C-UL certifications.

- Applicable standards UL508 Industrial Control Equipment
  CAN/CSA C22.2 No.14-M05 Industrial Control Equipment
- UL File No. E301717
- UL category NRKH, NRKH7

Precautions

- For the IG Series power supply, be sure to use the UL Listing certified power supply that provides class 2 output as defined in NFPA70 (NEC: National Electrical Code) in the U.S.A.
- The IG Series has obtained the UL certification with the combination of the sensor head and sensor amplifier. Make sure to use the IG Series sensor head together with the IG Series sensor amplifier.
- Power supply/Control input/Control output shall be connected to a single Class2 source only.
- Use with over current protection device which is rated 30V or more and not more than 1A.

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Before Use

1

This chapter describes the overview of the IG Series and the name and function of each part.

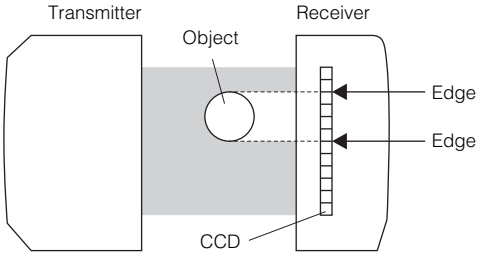
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Measurement Principle

This unit receives laser light from the transmitter. The receiver uses a CCD (Charge Coupled Device) as the receiving detector. The CCD is a linear array of light receiving elements. When a target is placed between the transmitter and receiver, a shadow is caused on the receiver. By detecting the light to dark and dark to light transitions, the unit is able to measure those areas accurately.
For details, refer to "4-3 Setting the Measurement Sensitivity" (page 4-44).

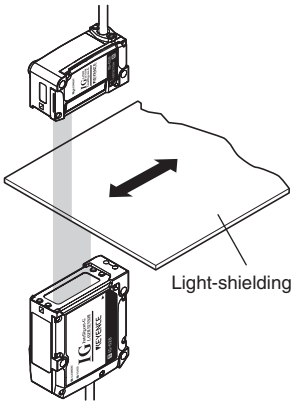


Specialized Measurement Modes

You can select a suitable measurement mode according to the particular application.

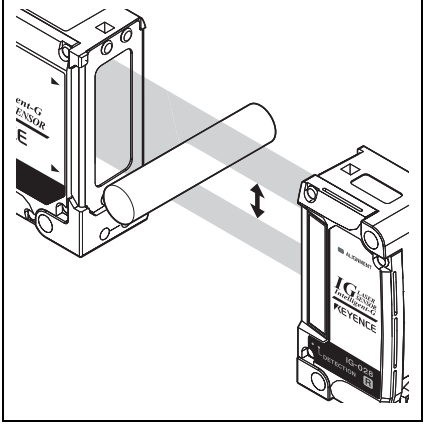
"1. Measurement mode" (page 4-8)

Edge control/Positioning



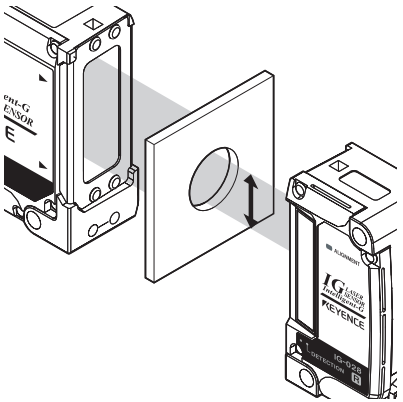
A. Edge control/Positioning mode

Outer diameter/Width measurement



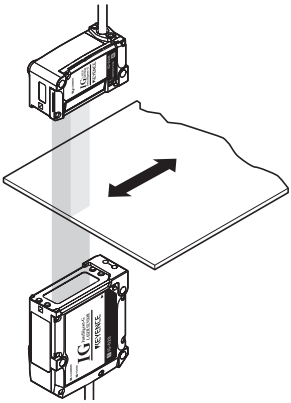
B. Outer diameter/Width measurement mode

Inner diameter



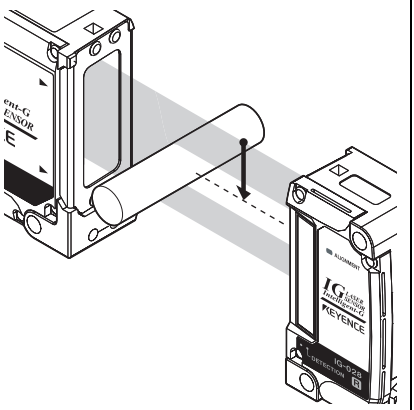
C. Inner diameter

Transparent object Edge control/ Positioning



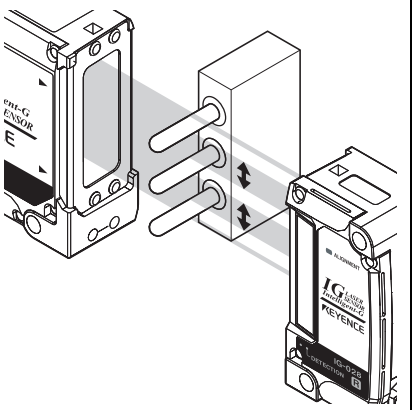
D. Glass edge mode

Center position measurement



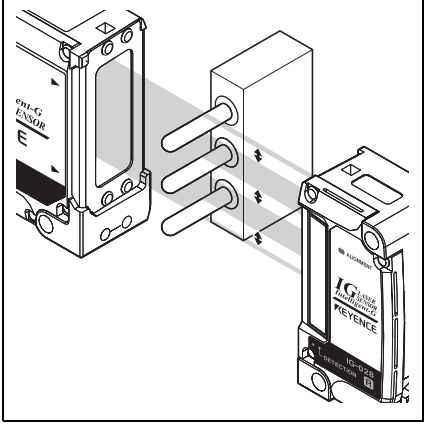
E. Pin position measurement mode

Pitch measurement



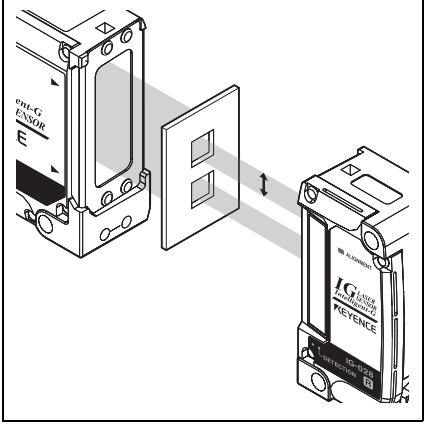
F. Pin interval judgment mode

Multiple diameter measurement



G. Pin diameter judgment mode

Measure the distance between specified edges.



H. Specified edges interval measurement mode

Using the Expansion Units

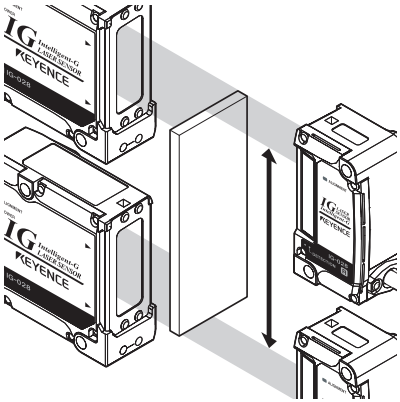
The IG Series include main units (IG-1000, IG-1500) and expansion units (IG-1050, IG-1550). By connecting the expansion unit to the main unit, the IG Series can be used for various purposes.

Calculation function

Tolerance is judged based on the calculated result (calculated value) of measurement value of two units of IG Series and the analog output can be performed.

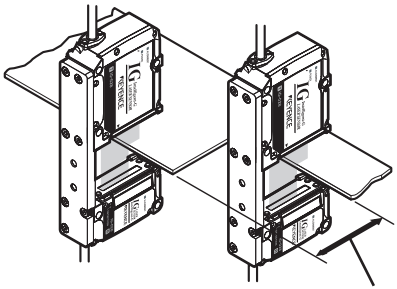
"4-4 Calculation Function" (page 4-47)

■ **Adding the measurement value**



The diameter or width of a target that cannot be measured with one unit can be measured.

■ **Subtracting the measurement value**



The level of a target can be calculated.

Interference prevention function

Mutual interference can be prevented between the additionally installed IG Series units.

"14. Interference prevention function (only for IG-1000/1500)" (page 4-40)

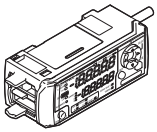
1-2 Checking the Package Contents

The following equipment and accessories are included in the package. Before using the unit, make sure that all items are included.
We have thoroughly inspected the package contents before shipment. However, in the event of defective or broken items, contact your nearest KEYENCE office.

Sensor Amplifier

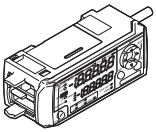
DIN rail mount type

IG-1000 (main unit)



Sensor amplifier x 1
Instruction manual x 1

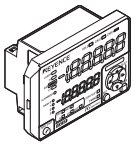
IG-1050 (expansion unit)



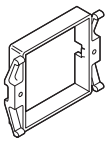
Sensor amplifier x 1

Panel mount type

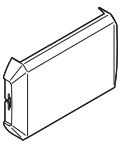
IG-1500 (main unit)



Sensor amplifier x 1



Panel mounting tool x 1



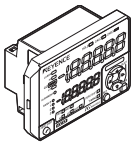
Front protection cover x 1



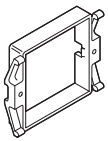
Power/Input-output cable (2 m) x 1
(12 cores)

Instruction manual x 1

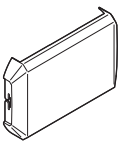
IG-1550 (expansion unit)



Sensor amplifier x 1



Panel mounting tool x 1



Front protection cover x 1



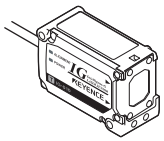
Input-output cable (2 m) x 1
(8 cores)



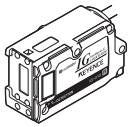
Expansion cable
(50mm) x 1

Sensor Head

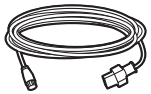
IG-010 (Measurement range: 10 mm)



Transmitter x 1

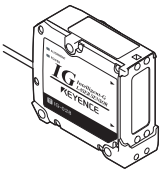


Receiver x 1



Sensor head connection cable (2 m) x 2

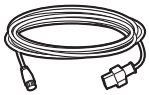
IG-028 (Measurement range: 28 mm)



Transmitter x 1



Receiver x 1

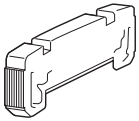


Sensor head connection cable (2 m) x 2

List of Optional Parts

For Sensor amplifier

OP-26751 (For IG-1000/IG-1050)



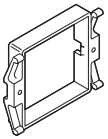
End unit
x 2

OP-35361 (For IG-1550)



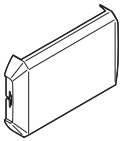
Expansion cable
(300 mm) x 1

OP-4122 (For IG-1500/IG-1550)



Panel mounting
tool x 1

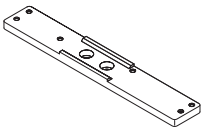
OP-87076 (For IG-1500/IG-1550)



Front protection
cover x 1

For Sensor head

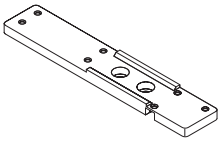
IG-TB01 (Mounting bracket for the IG-010)



Hexagon socket
head bolt x 6
(M3 x 5 mm, with
washer)

Mounting bracket x 1

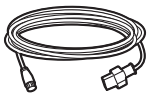
IG-TB02 (Mounting bracket for the IG-028)



Hexagon socket
head bolt x 7
(M3 x 5 mm, with
washer)

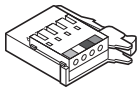
Mounting bracket x 1

OP-87056 (2 m)/OP-87057(5 m)/
OP-87058 (10 m)/OP-87059 (20 m)



Sensor head
connection
cable x 1

OP-84338



Sensor head
cable connector
x 2

Others

IG Configuration Software (IG-H1)

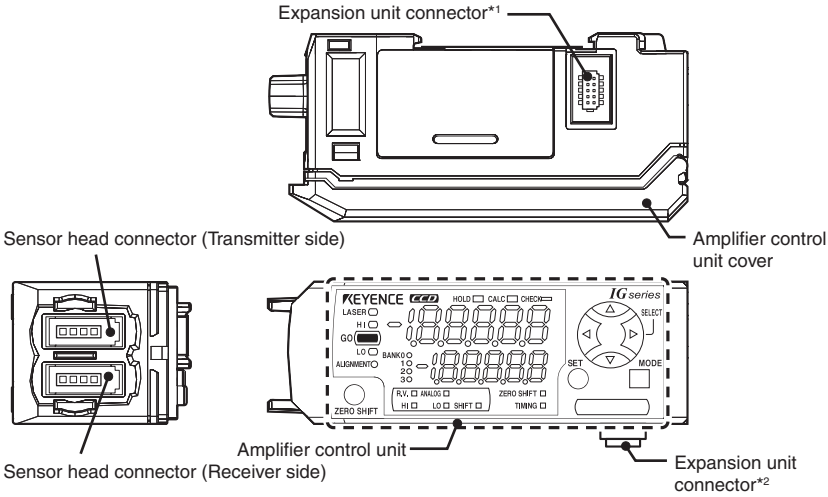


x 1

To use the IG configuration software (IG Configurator), "RS-232C Communication Unit DL-RS1A" is required. For details on DL-RS1A, refer to "RS-232C Communication Unit DL-RS1A User's Manual".

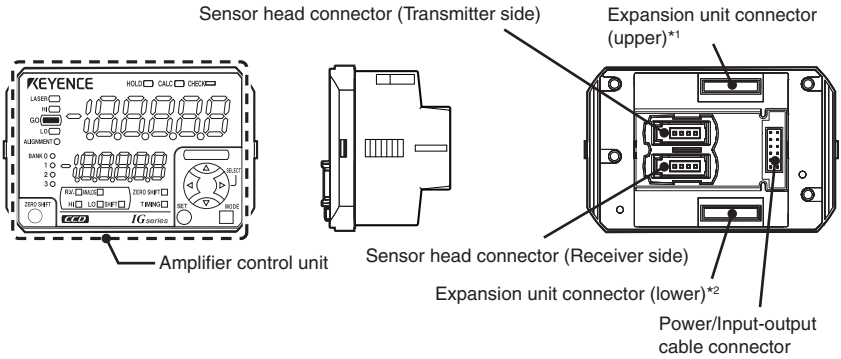
Sensor Amplifier Unit

DIN rail mount type (IG-1000/IG-1050)



*1 When shipped from the factory, the protective cover for expansion slots is installed.
*2 It is not installed on the main unit (IG-1000).

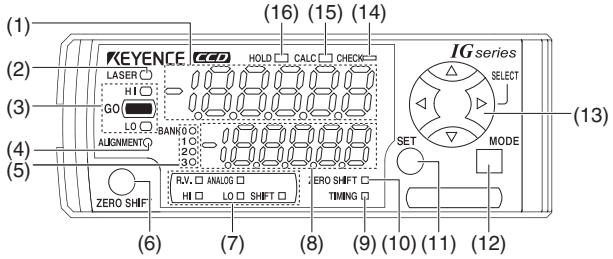
Panel mount type (IG-1500/IG-1550)



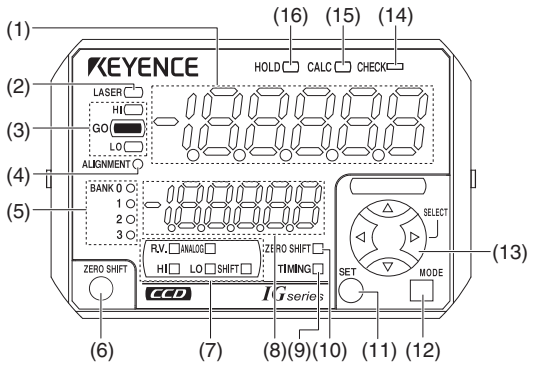
*1 It is not installed on the main unit (IG-1500).
*2 When shipped from the factory, the protective seal is attached.

Amplifier control unit

■ DIN rail mount type (IG-1000/IG-1050)



■ Panel mount type (IG-1500/IG-1550)

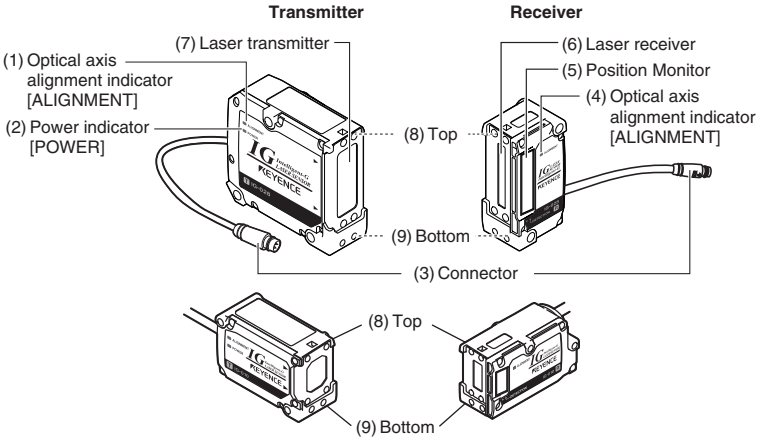


Item		Description
(1)	Main display	Displays the judgment value (P.V.) and each setting item.
(2)	Laser emission indicator	Lights on while the laser beams are emitted.
(3)	judgment indicator	Displays whether the judgment value (P.V.) is HIGH (over the upper limit), GO (within the acceptable range) or LOW (below the lower limit) against the tolerance setting value. "3-6 Setting the Tolerance Setting Value" (page 3-11)
(4)	Optical axis alignment indicator	Lights up when the optical axis is successfully aligned. Align the optical axis when the target is not present and the optical alignment indicator is off. "3-3 Optical Axis Alignment" (page 3-8)
(5)	Bank indicator	Displays a bank in use. "3-8 Bank Function (Registering Multiple Tolerance Setting Values)" (page 3-18)

Item	Description
(6) Zero shift button	Press this button to match the internal measurement value (R.V.) to the shift target value. "3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)
(7) Sub display indicator	Lights up according to the type of values displayed on the sub display.
(8) Sub display	Displays the internal measurement value (R.V.), analog output value and each setting (selection) item.
(9) Timing input indicator	Lights up while the timing input is ON when the timing input (external input) is set to Level. Lights on approx. 0.5 sec. when the timing input is set to Edge and the timing input is turned ON.
(10) Zero shift indicator	Lights up approx. 0.5 sec. when the zero shift button is pressed and released, or the zero shift input (external input) is turned ON.
(11) SET button	Used to automatically adjust the setting values when setting each item.
(12) MODE button	Used when setting each item, starting/ending the setting or moving items.
(13) Arrow button	Used when selecting setting items, changing display contents on the sub display, etc.
(14) Check indicator	Lights up when the edge check output is ON. "9. Edge check function" (page 4-31)
(15) Calculation indicator	Lights up when calculation is in process using the calculation function. "4-4 Calculation Function" (page 4-47)
(16) Hold indicator	Lights up when the judgment value (P.V.) is held. "5. Hold function" (page 4-20)

Sensor Head Unit

IG-028/IG-010



Item	Description
(1) (4) Optical axis alignment indicator	Lights up when the optical axis is successfully aligned. Align the optical axis when the target is not present and the optical alignment indicator is off. "3-3 Optical Axis Alignment" (page 3-8)
(2) Power indicator	Lights on when the power is supplied to the sensor head.
(3) Connector	Connect with the sensor head connection cable.
(5) Position monitor	Used to check the laser light-receiving status, measured parts, etc. "17. Position monitor" (page 4-41)
(6) Laser receiver	Receives laser beams. The surface is covered with the glass.
(7) Laser transmitter	Emits laser beams. The surface is covered with the glass.
(8) Top	Distinguishing between top and bottom is important when installing the sensor head or measuring.
(9) Bottom	

Note

Use the transmitter and receiver in combination of the same serial number. If they are used in combination of the different serial numbers, the operation and accuracy are not guaranteed. The serial number is attached on top of the transmitter and receiver.



Installation and Connection

2

This chapter describes precautions when installing and connecting the IG Series.

2-1 Mounting and Wiring the Sensor Amplifier 2-2

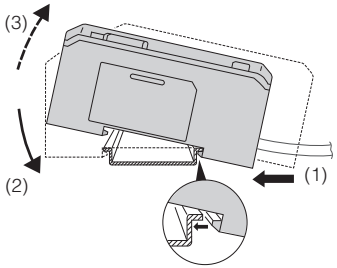
2-2 Connecting and Mounting the Sensor Head..... 2-8

2-1 Mounting and Wiring the Sensor Amplifier

Mounting the Sensor Amplifier

DIN rail mount type, main unit (IG-1000)

1 **Align the claw at the bottom of the main body with the DIN rail. While pushing the main body in the direction of the arrow (1), slant it in the direction of the arrow (2).**



2 **To dismount the sensor, raise the main body in the direction of the arrow (3) while pushing the main body in the direction of the arrow (1).**

DIN rail mount type, expansion unit (IG-1050)

Several expansion units can be used in connection with the main unit.
Up to 3 expansion units can be connected to one main unit.

⚠ **CAUTION**	• **When connecting multiple amplifiers (expansion units), first check to make sure that the power is turned OFF to all of the main and expansion units. Connecting the units with the power turned ON may cause damage to the units.** • **Push the amplifiers (expansion units) as close as possible the main unit. Improper connections may damage the equipment.**

Note

- **When connecting the expansion units, make sure to initialize the connected expansion units and set the output polarity.**

(1) When turning on the amplifier for the first time after connecting the sensor head

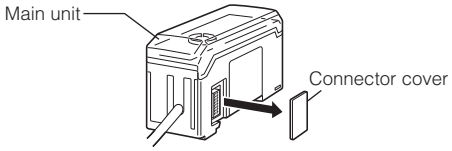
"3-1 Operation When the Power is Turned on for the First Time" (page 3-2)

(2) When performing the initial reset

"3-5 Initial Reset (Initialize)" (page 3-10)

- **Expansion units with different setting of output polarity (such as an NPN output expansion unit to a PNP output main unit) cannot be connected together.**
- **Expansion units of DIN rail mount type cannot be connected to the main unit of panel mount type.**

1 **Remove the expansion protective cover from the IG-1000 (main unit).**

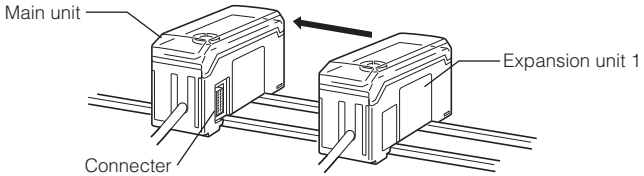


2 **Install the amplifiers (expansion units) on the DIN rail.**

Refer to "DIN rail mount type (Main unit)" for details about how to mount.

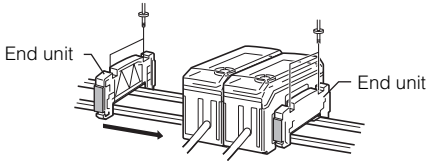
3 **Push the expansion unit into the main unit connector until a clicking sound can be heard.**

The expansion unit additionally installed next to the main unit is referred to as expansion unit 1. Subsequent expansion units are referred to as expansion unit 2, expansion unit 3, etc.



4 **Install the end units (OP-26751: 2 units in a set) (sold separately) on both sides of the amplifiers (main and expansion units). Secure the end units in place with screws on top (2 on each end unit).**

The end units are mounted in the same way as the amplifiers.

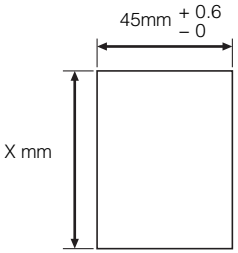


Note **Fix the amplifiers securely using the end units (OP-26751: 2 units in a set) (sold separately) or commercially available DIN rail fixing tool to prevent the amplifiers from slipping the DIN rail or coming off from the DIN rail due to machine vibration.**

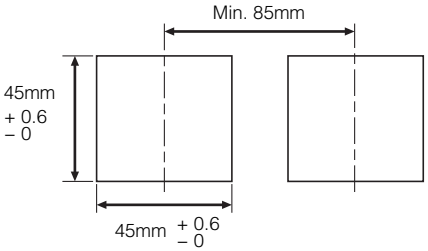
Panel mount type, main unit (IG-1500)

1 **Make a hole on the panel to attach according to the size below.**

When arranging lengthwise to attach



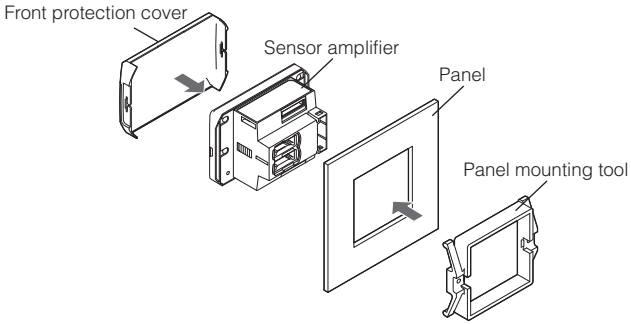
When arranging widthwise to attach



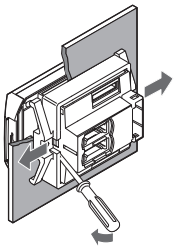
- Panel thickness 1 to 6 mm
- X=48 x (number of amplifiers) -3

2 **Insert the back side of amplifier to the hole of panel.**

3 **Arrange the panel mounting tool in the direction below, fix to the amplifier from the back and attach the front protection cover to the amplifier.**



To remove the panel mounting tool, widen the claws at both ends of the panel mounting tool using a slotted screwdriver, etc. and remove alternately.



Panel mount type, expansion unit (IG-1550)

Several expansion units can be used in connection with the main unit. Up to 3 expansion units can be connected to one main unit.

⚠ CAUTION	• **Turn OFF the power before connecting the expansion cable. Inserting or removing the cable with the power turned on may cause damage to the units.** • **Be sure to completely connect the expansion cable. Improper connections may damage the equipment.**

Note

- **When connecting the expansion units, make sure to initialize the connected expansion units and set the output polarity.**

(1) When turning on the amplifier for the first time after connecting the sensor head

"3-1 Operation When the Power is Turned on for the First Time" (page 3-2)

(2) When performing the initial reset

"3-5 Initial Reset (Initialize)" (page 3-10)

- **Expansion units with different setting of output polarity (such as an NPN output expansion unit to a PNP output main unit) cannot be connected together.**
- **Expansion units of panel mount type cannot be connected to the main unit of DIN rail mount type.**

1 Make holes on the panel to attach according to the number of amplifiers (connected expansion units).

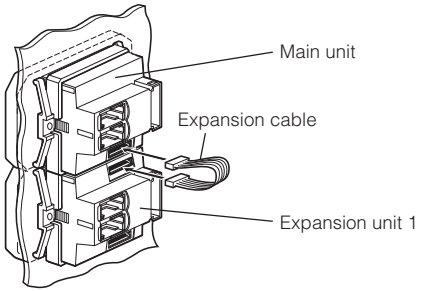
For the panel cutting size, refer to the "Panel mount type, main unit".

2 Install the amplifiers (expansion units) on the panel.

For the amplifier mounting method, refer to the "Panel mount type, main unit".

3 Connect the amplifier (main unit) and amplifier (expansion unit) using the expansion cable (50 mm) supplied with the expansion unit.

The expansion unit additionally installed next to the main unit is referred to as expansion unit 1. Subsequent expansion units are referred to as expansion unit 2, expansion unit 3, etc.



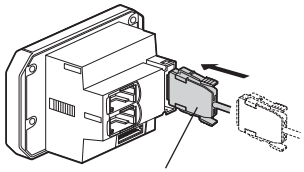
Reference When arranging the amplifiers side by side, the expansion cable of 300 mm (OP-35361) is necessary.

Sensor Amplifier Wiring

Connecting power/Input-output cable (only for panel mount type)

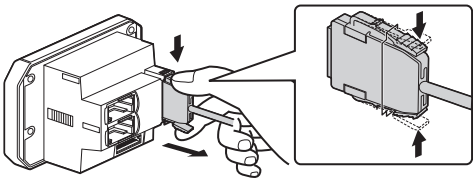
Connect the power/input-output cable to the panel mount type main unit and connect the input-output cable to the expansion units.

To attach



Power/Input-output cable

To remove

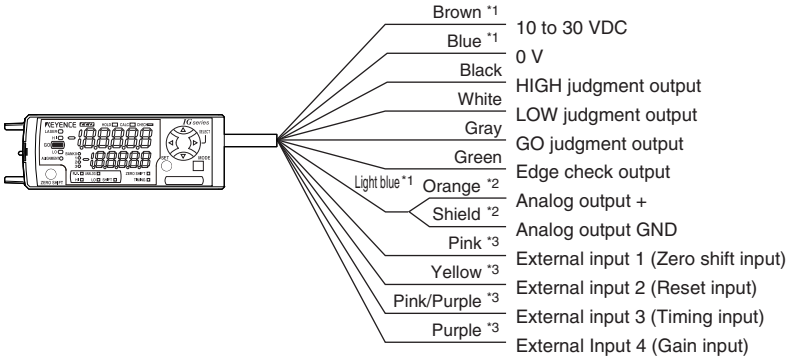


Note

- **The number of core wire of power/input-output cable for the main unit is 12, and the number of core wire of Input-output cable for the expansion units is 8.**
- **Power for the expansion units is supplied from the main unit.**
- **If the input-output is not used for the expansion units, cut the cable at the connector base or terminate the wires properly for future use.**

Power/Input-output cable

"Output Circuit Diagram" (page 5-4)



*1 IG-1050/IG-1550 (expansion units) do not have brown, blue or light blue wires. Power is supplied to the expansion units through IG-1000/IG-1500 (main unit).

*2 The analog output can be set to either "When the power is turned on for the first time" or "When performing the initial reset".
- Not used (OFF)
- 0 to 5 V
- -5 to 5 V
- 1 to 5 V
- 4 to 20 mA

"3-1 Operation When the Power is Turned on for the First Time" (page 3-2)
"3-5 Initial Reset (Initialize)" (page 3-10)

*3 The external input can be selected among the following in addition to the above.
- Bank A input
- Bank B input
- Laser emission stop input
- Not used (OFF)

Gain input can be selected only for the external input 4.
"11. External input" (page 4-33)

Mounting the Sensor Head

Notes for mounting

If the mounting distance between the transmitter and receiver is as follows, the optical axis alignment is not necessary when mounting within the "parallel acceptable range" and "tilt acceptable range".

- IG-010 : 3 to 500 mm
- IG-028 : 50 to 500 mm

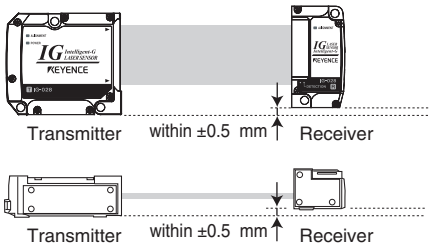
If the distance is beyond the above ranges, align the optical axis after mounting.

"3-3 Optical Axis Alignment" (page 3-8)

Note **The minimum object for detection, linearity and temperature characteristics in the specifications are values when mounting the sensor head within the "parallel acceptable range" and "tilt acceptable range".**

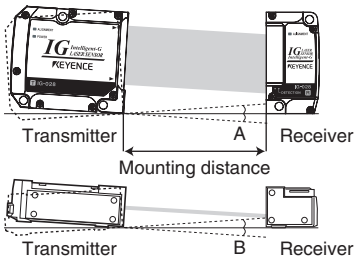
"5-1 Specifications" (page 5-2)

■ **Parallel acceptable range**

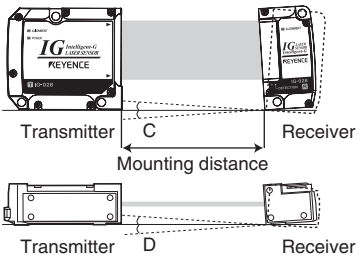


■ **Tilt acceptable range**

Tilt of transmitter



Tilt of receiver



Mounting distance	A	B	C	D
500 mm or less	within ±0.05°	within ±0.05°	within ±1°	within ±2°
100 mm or less	within ±0.2°	within ±0.2°	within ±1°	within ±2°

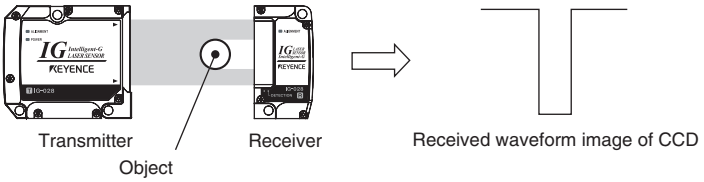
Mounting distance and insertion position of a target

Measurement accuracy changes depending on the mounting distance between the transmitter and receiver of the sensor head and insertion position of the object.

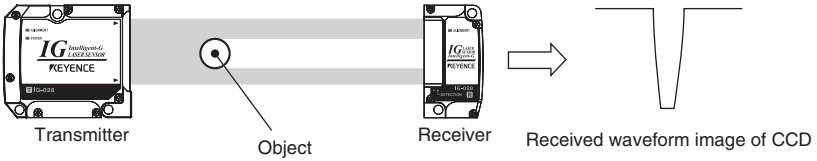
"5-1 Specifications" (page 5-2)

When the mounting distance is long and the object is far from the receiver, the light diffraction caused by the object increases. Because of this, the edge of CCD's light-receiving waveform generated by the object is skewed increasing measurement error.
To increase the measurement accuracy, make the mounting distance as short as possible and move the insertion position of the object closer to the receiver.

When the mounting distance is short and the object is close to the receiver



When the mounting distance is long and the object is far from the receiver

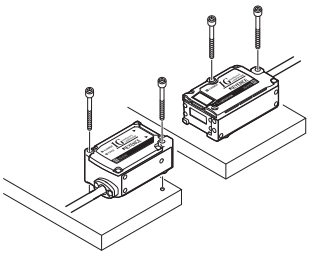


Mounting from the side

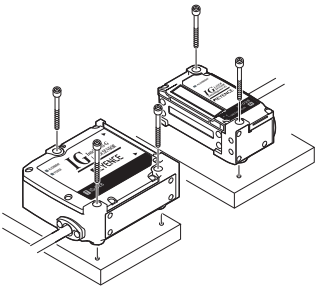
■ Mounting from the sensor side

Fix using the commercially available screws (IG-010: M3, IG-028: M4).
Tightening torque: 1.6 N·m or less

IG-010



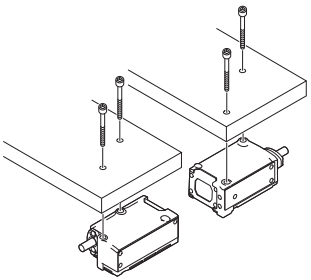
IG-028



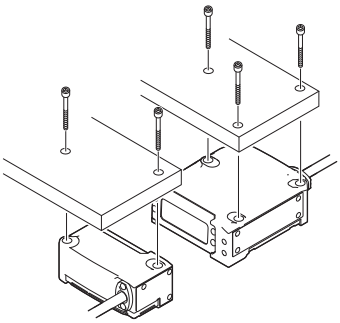
■ Mounting from the jig side

Fix using the commercially available screws (IG-010: M4, IG-028: M5, length: board thickness + 5 mm or less).
Tightening torque: 1.6 N·m or less

IG-010



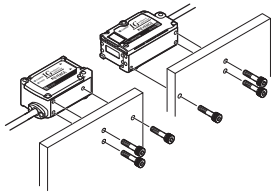
IG-028



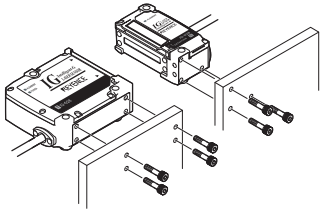
Mounting from the bottom

Fix using the commercially available screws.
IG-010: M3, board thickness +4 mm or less
IG-028: M3, board thickness +5 mm or less
Tightening torque: 1.6 N·m or less

IG-010



IG-028

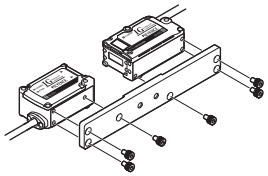


When the mounting bracket (IG-TB01/IG-TB02) is used

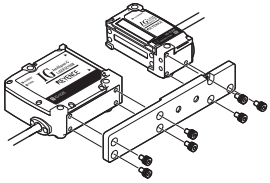
1 **Attach the mounting bracket to the sensor head.**

Press the sensor head to the mounting bracket firmly and fix with the included hexagon socket head bolt (M3, length: 5 mm).
Tightening torque: 1.6 N·m or less

IG-010



IG-028



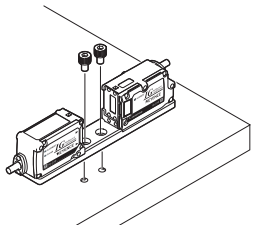
Note **Press the sensor head to the mounting bracket firmly and fix.**



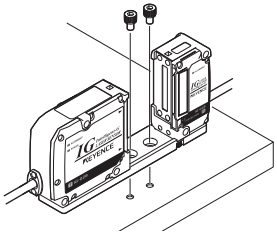
2 **Fix through the mounting holes from the upper part of the mounting bracket.**

Use the commercially available hexagon socket head bolt (M4) to fix the mounting bracket through its holes.

IG-010



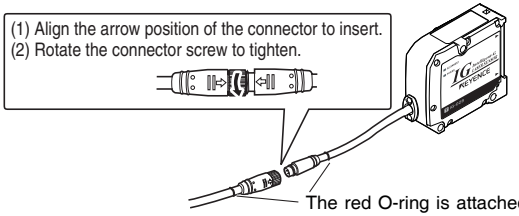
IG-028



Sensor Head Connection

Connecting the sensor head and sensor amplifier

1 **Connect the sensor head connection cable to the transmitter and receiver cables respectively.**

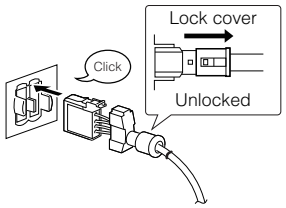


The red O-ring is attached to the transmission cable and blue O-ring to the receiver cable. Connect the sensor head connection cable with red O-ring to the transmitter and connect the sensor head connection cable with blue O-ring to the receiver.

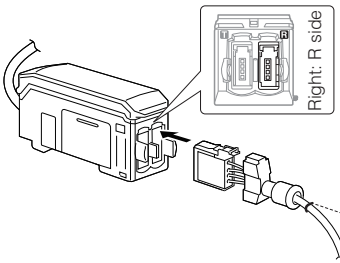
Note **When connecting the connector, be sure to insert it straight, and tighten it securely. (Recommended tightening torque: 0.4 to 0.5 N·m*) If the connection is not tight enough, the connector may be loosened by vibration or other causes, leading to a connection failure.**
(* After tightening it firmly by hand, use pliers or other tools to rotate it about 30° for further tightening.)
If loosely tightened, the environment resistance IP67 cannot be guaranteed.

2 **Connect the sensor head connection cable on the receiver side to the [R] connector of amplifier.**

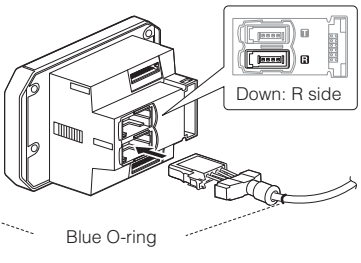
Remove the lock cover of the connector and insert it to the connector (R) of amplifier until a clicking sound can be heard.



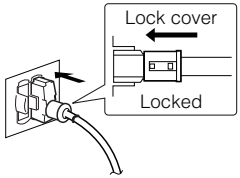
DIN rail mount type
(IG-1000/IG-1050)



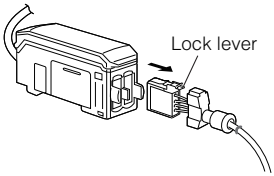
Panel mount type
(IG-1500/IG-1550)



3 **Attach the lock cover to the connector to fix the cable.**



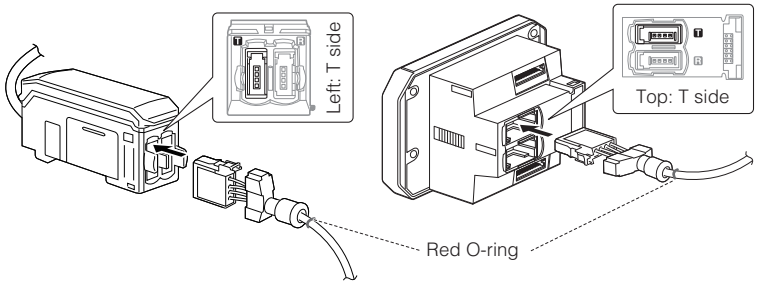
Note **When removing the sensor head connection cable, push the lock lever and pull it out.**



4 **Connect the sensor head connection cable on the transmitter side to the [T] connector of amplifier.**

DIN rail mount type
(IG-1000/IG-1050)

Panel mount type
(IG-1500/IG-1550)

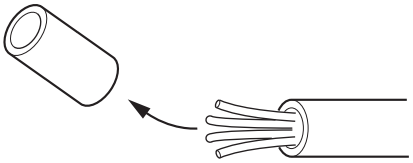


The connection procedure is the same as the one for the receiver.

Attaching the sensor head cable connector (OP-84338)

Cut the sensor head connection cable to the required length and attach the new connector to use the sensor. The attaching method is the same for both transmitter and receiver.

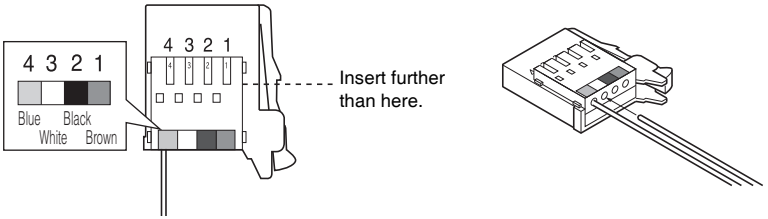
1 **Cut the cable to the required length and strip approx. 15 mm of insulation from the end of the cable.**



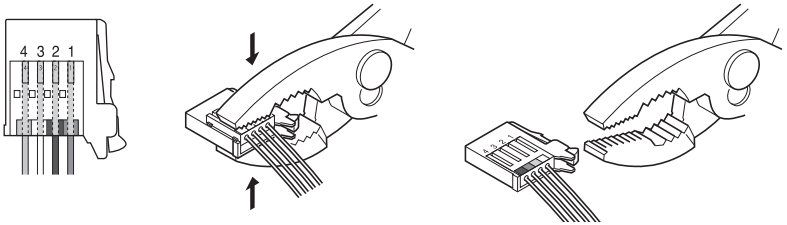
Note **Do not strip the core wire insulation.**

2 **Insert each cable to the end matching to the same color marks on the connector.**

The cables are inserted to the end and tentatively fixed.



3 **Confirm that all cables are inserted to the specified position and crimp them tight parallel using a plier or similar tool.**



Note **If the connector is changed, make sure to connect it to the amplifier and confirm the normal operation.**
If it does not operate normally, crimp the connector again with a plier.
Once the connector is crimped, it cannot be reused.

Basic Operations

3

This chapter describes basic operations and settings for the IG Series.

3-1 Operation When the Power is Turned on for the First Time 3-2
3-2 Operations on the Main Screens 3-3
3-3 Optical Axis Alignment 3-8
3-4 Registering the Standard Waveform (Gain adjustment) 3-9
3-5 Initial Reset (Initialize) 3-10
3-6 Setting the Tolerance Setting Value 3-11
3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.)) ... 3-16
3-8 Bank Function (Registering Multiple Tolerance Setting Values) 3-18
3-9 Key Lock Function 3-21
3-10 Selecting the Display Unit 3-22

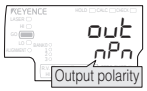
3-1 Operation When the Power is Turned on for the First Time

When the amplifier is turned on for the first time after the sensor head is connected, the initial setting screen appears after a few seconds. Make the initial settings according to the following procedure.
The initial setting is necessary for both the main unit and the expansion units when units are added.

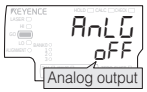
Note **The initial setting screen appears only when the power is turned on for the first time. It will not appear when the power is turned on again. To change these settings, perform the initial reset.**

"3-5 Initial Reset (Initialize)" (page 3-10)

Power ON



[MODE] button



[MODE] button



1 **Press ▲ / ▼ button to select the polarity of judgment output and edge check output, and then press [MODE] button.**

Setting value	Description
nPn	NPN output
PnP	PNP output

2 **Press ▲ / ▼ button to select the type of analog output and press [MODE] button.**

Setting value	Description
oFF	Not output
0-5 u	Analog output after the judgment value (P.V.) is converted to the range from 0 to 5 V.
-5-5 u	Analog output after the judgment value (P.V.) is converted to the range from -5 to 5 V.
1-5 u	Analog output after the judgment value (P.V.) is converted to the range from 1 to 5 V.
4i20r	Analog output after the judgment value (P.V.) is converted to the range from 4 to 20 mA.

"10. Analog output scaling" (page 4-32)

3 **After the setting is complete, [End] blinks several times on the sub display and the main screen appears.**

4 **Perform "3-3 Optical Axis Alignment" (page 3-8) and "3-4 Registering the Standard Waveform (Gain adjustment)" (page 3-9).**

Make other settings as necessary.

3-2 Operations on the Main Screens

R.V. (Internal Measurement Value) and P.V. (Judgment Value)

This section describes R.V. (Internal Measurement Value) displayed on the sub display (lower level) and P.V. (Judgment Value) displayed on the main display (upper level).

R.V. (Internal Measurement Value)

R.V. (Internal Measurement Value) is the value displayed when a target is inserted into the measurement range.

* R.V. = Raw Value

P.V. (Judgment Value)

P.V. (Judgment Value) is the value to set the judgment output to ON/OFF according to the tolerance setting value. Also, the analog output is output based on the P.V..

* P.V. = Present Value

"3-6 Setting the Tolerance Setting Value" (page 3-11)

The judgment value (P.V.) and the internal measurement value (R.V.) are basically the same, however, those values differ only when the hold function and calculation function are used.

"5. Hold function" (page 4-20)

"4-4 Calculation Function" (page 4-47)

Main Display (Upper Level)

The judgment value (P.V.) is displayed on the main display.

The display varies as below according to each function to be used such as Normal, Hold function, Calculation function.



Normal

The same value as the internal measurement value (R.V.) is displayed as a judgment value (P.V.).



When the hold function is used

The judgment value (P.V.) is held according to the hold function settings.

"5. Hold function" (page 4-20)



When the calculation function is used

Main unit: Displays the calculated result (calculation value) with the calculation function as a judgment value (P.V.).

Expansion unit: The same display as for Normal

"4-4 Calculation Function" (page 4-47)

Reference

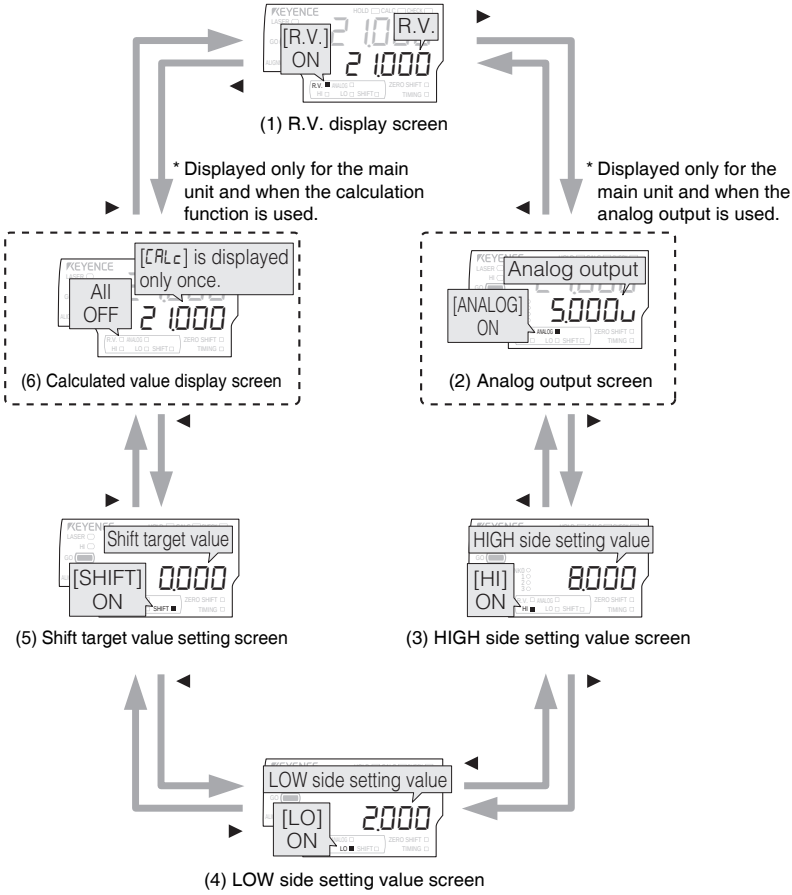
When both the hold function and calculation function are used, the hold indicator [HOLD] and calculation indicator [CALC] light up. The judgment value (P.V.) on the main display is displayed as below.

Main unit: Displays the calculation value (CALC value) as a judgment value (P.V.). Held according to the hold function setting.

Expansion unit: The same display as for Normal. Held according to the hold function setting.

Sub Display (Lower Level)

The sub display can be switched with the arrow buttons ◀ / ▶.
According to the type of displayed value, the sub display indicator [R.V. / ANALOG / HI / LO / SHIFT] lights up.



(1) R.V. display screen

The internal measurement value (R.V.) is displayed. The displayed value is not held.

Reference

In the pin diameter judgment mode or pin interval judgment mode, the measurement values for each pin diameter and each pin interval can be displayed.

"1. Measurement mode" (page 4-8)

(2) Analog output screen (displayed only for the main unit and when the analog output is used)

The voltage value (unit: V) or current value (unit: mA) of the analog output is displayed.

"3-1 Operation When the Power is Turned on for the First Time" (page 3-2)
"3-5 Initial Reset (Initialize)" (page 3-10)

(3) HIGH side setting value screen

The upper limit of the acceptable range (tolerance setting value) for the object is displayed. Also, the setting value can be changed. If the judgment value (P.V.) exceeds the value set here, the HIGH judgment output turns on.

"3-6 Setting the Tolerance Setting Value" (page 3-11)

(4) LOW side setting value screen

The lower limit of the acceptable range (tolerance setting value) for the object is displayed. Also, the setting value can be changed. If the judgment value (P.V.) falls below the value set here, the LOW judgment output turns on.

"3-6 Setting the Tolerance Setting Value" (page 3-11)

(5) Shift target value screen

When the zero shift button is pressed or the zero shift input is set to ON, the internal measurement value (R.V.) is adjusted to the value set here.

"3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)

(6) Calculation value screen (displayed only for the main unit and when the calculation function is used)

The calculated value (CALC value)is displayed. The displayed value is not held.

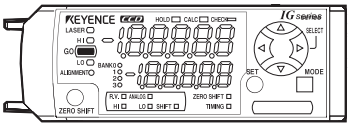
"4-4 Calculation Function" (page 4-47)

Setting Operations

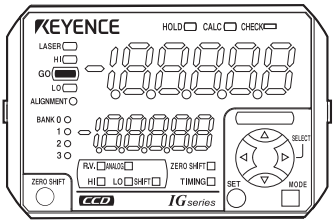
This section explains functions operable on the main screen and functions operable after the display changes to each setting screen.

Functions Operable on the Main Screen

DIN rail mount type (IG-1000/IG-1050)



Panel mount type (IG-1500/IG-1550)



Main screen



Press ◀ or ▶ button.

Switching display on the sub display (lower level)(page 3-4)
Any of the internal measurement value (R.V.), analog output value, HIGH side setting value, LOW side setting value or shift target value are displayed and the settings can be changed.

3-6 Setting the Tolerance Setting Value (page 3-11)
HIGH side setting value and LOW side setting value are set. The judgment is made among HIGH/GO/LOW, and the value is displayed and output.

3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.)) (page 3-16)
The internal measurement value (R.V.) can be shifted (offset) to an arbitrary shift target value.

While pressing down [MODE], press ▲ or ▼ button.

3-8 Bank Function (Registering Multiple Tolerance Setting Values) (page 3-18)
HIGH side setting value, LOW side setting value, shift target value, etc. can be saved at up to four banks and switched.

Press [MODE] and [SET] buttons for approx. 2 seconds.

3-4 Registering the Standard Waveform (Gain adjustment) (page 3-9)
Make sure to do this for stabilized measurement when using for the first time or the setting environment is changed.

Press [MODE] and ▲ buttons for approx. 2 seconds.

or

Press [MODE] and ▼ buttons for approx. 2 seconds.

3-9 Key Lock Function (page 3-21)
This function prevents unwanted button operations during measurement.

Available Functions from the Main Screen

Main screen



Press [MODE] button for approx. 2 seconds.

4-2 Basic Settings and Advanced Settings (page 4-4)

Basic settings

Basic settings such as measurement mode, response time are made.

Advanced settings

More advanced settings such as hold function, delay timer enable the unit to be used in wider applications.

Press ◀ and ▶ buttons for approx. 2 seconds.

4-3 Setting the Measurement Sensitivity (page 4-44)

The measurement sensitivity can be adjusted according to the amount of laser light received.

Press [MODE] and ◀ buttons for approx. 2 seconds.

4-4 Calculation Function (page 4-47)

The internal measurement value (R.V.) of two sets of the sensor amplifier can be calculated (addition or subtraction).

Press [MODE] and ▶ buttons for approx. 2 seconds.

4-5 Calibration Function (page 4-52)

When there is difference between the internal measurement value (R.V.) and the actual dimension of the object, the value can be corrected.

While pressing the [MODE] button, press the [SET] button 5 times.

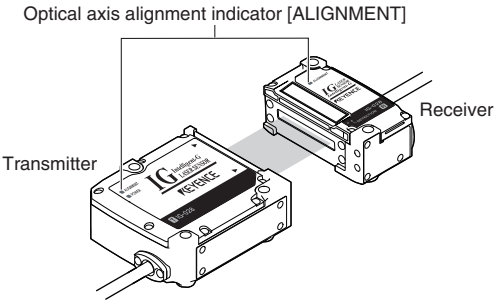
3-5 Initial Reset (Initialize) (page 3-10)

All of the setting items except for the calibration setting and standard waveform registration are initialized.

3-3 Optical Axis Alignment

When the optical axis alignment indicators [ALIGNMENT] of transmitter, receiver and amplifier do not light even if the sensor head is installed and turned on, align the optical axis of the sensor head.

Move the attaching angle of the transmitter and receiver while the target is not present within the measurement range. Then fix the transmitter and receiver near the center of the range where the optical axis alignment indicators [ALIGNMENT] light up.



Reference If the mounting distance between the transmitter and receiver is as follows, the optical axis alignment is not necessary when mounting within the "parallel acceptable range" and "tilt acceptable range".

- IG-010: 3 to 500 mm
- IG-028: 50 to 500 mm

"Notes for mounting" (page 2-8)

3-4 Registering the Standard Waveform (Gain adjustment)

Be sure to register the standard waveform before measuring. The stable measurement is achieved by registering the standard waveform (Gain adjustment).
Register the light-receiving amount as 100 % when a target is not present.

"4-3 Setting the Measurement Sensitivity" (page 4-44)

Register the standard waveform when the unit is used for the first time, the setting environment is changed, or the measurement sensitivity is changed.

The following two methods can be used for registration.

- Press [MODE] and [SET] buttons for approx. 2 seconds.
- Set the external input (Gain input) to ON for 20 ms or more.*

* When the Gain input is set to the external input 4 (purple wire), the standard waveform can be registered by the external input.

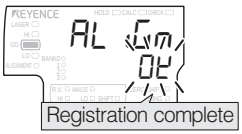
"11. External input" (page 4-33)

1 **Confirm the optical axis alignment indicators [ALIGNMENT] of the transmitter, receiver and amplifier light on.**

If the optical axis alignment indicators are off, align the optical axis.

2 **(1) When registering by button operation**

Press the [MODE] and [SET] button at the same time for approx. 2 seconds. [AL GAn] is displayed on the main display (upper level) and the standard waveform is registered. After the registration is complete, [oK] blinks on the sub display several times and then the main screen is restored.



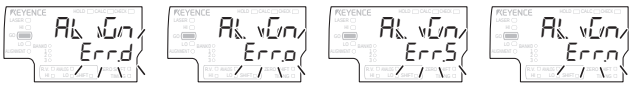
(2) When registering by the external input (Gain input)

Set the external input (Gain input) to ON for 20 ms or more.
When the main screen is displayed, the same display as (1) appears.

Note

- **When the laser transmitter or receiver is dirty, do not register the standard waveform.**
- **If attempting to register the standard waveform while the optical axis alignment indicators [ALIGNMENT] are off, one of the error messages below is displayed and the standard waveform cannot be registered.**
  Also note that even if the optical axis alignment indicators [ALIGNMENT] light on, the error indication shown second from the right may be displayed and the standard waveform may not be registered.

"Error displays and corrective actions" (page A-4)



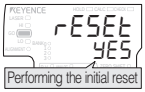
3-5 Initial Reset (Initialize)

If the initial reset is performed, all of the setting items except for the calibration setting and standard waveform registration are initialized. (When the sensor head setting is changed, register the standard waveform again. "3-4 Registering the Standard Waveform (Gain adjustment)" (page 3-9)
Also, with the same operation, the polarity of judgment output and edge check output, and the analog output setting can be changed.

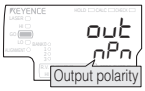
Main screen



While pressing the [MODE] button, press the [SET] button 5 times.



[MODE] button



[MODE] button



[MODE] button



1 While pressing the [MODE] button on the main screen, press the [SET] button 5 times.

[rESEt] is displayed on the main display (upper level).

2 Press ▲ / ▼ button to select [YES] and press the [MODE] button.

If [no] is selected at this point, only the output polarity and analog output settings can be changed without performing the initial reset.

3 Press ▲ / ▼ button to select the output polarity and press the [MODE] button.

Setting value	Description
nPn	NPN output
PnP	PNP output

4 Press ▲ / ▼ button to select the analog output and press the [MODE] button.

Setting value	Description
oFF	Not output
0-5 u	Analog output after the judgment value is converted to the range from 0 to 5 V.
-5-5 u	Analog output after the judgment value is converted to the range from -5 to 5 V.
1-5 u	Analog output after the judgment value is converted to the range from 1 to 5 V.
4-20	Analog output after the judgment value is converted to the range from 4 to 20 mA.

"10. Analog output scaling" (page 4-32)

5 After the initialization is complete, [End] blinks several times on the sub display and the main screen is restored.

Note **While the calculation function is used, perform the initial reset for the main unit first.**

Reference

- When buttons other than the ▲ / ▼ button and [MODE] button are pressed during the initial reset procedure, the initial reset is canceled and the screen in step 2 is restored.
- When you attempt to initialize the unit while the key lock function is set, the screen shown on the right appears and the initialization fails. Cancel the key lock before attempting to initialize the unit.



"3-9 Key Lock Function" (page 3-21)

3-6 Setting the Tolerance Setting Value

The tolerance setting value consists of the upper limit value (HIGH side setting value) and the lower limit value (LOW side setting value). By setting these values, judgments are made in three levels: when the judgment value (P.V.) goes beyond the upper limit (HIGH judgment), when the judgment goes beyond the lower limit (LOW judgment) and when the judgment is within the acceptable range (GO judgment). Then, the judgment indicator and judgment output are turned ON/OFF.

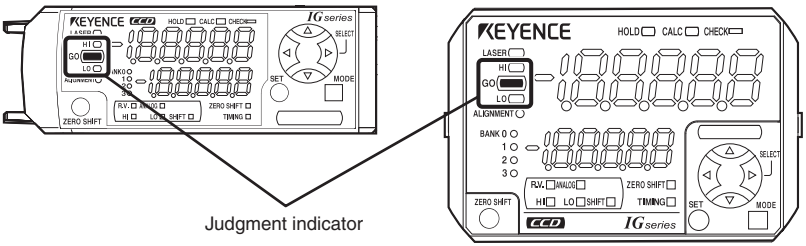
judgment	judgment output *1			judgment indicator *2		
	HIGH	GO	LOW	HI	GO	LO
HIGH	ON	OFF	OFF	Lights in red	Off	Off
GO	OFF	ON	OFF	Off	Lights in green	Off
LOW	OFF	OFF	ON	Off	Off	Lights in red
Error *3	ON	OFF	ON	Lights in red	Off	Lights in red

*1 When the output mode of judgment output is Normal Open (default value) ON/OFF is reversed for Normal Close.
"4. Output mode" (page 4-19)

*2 The judgment indicator ON/OFF condition can be changed.
"18. Display Color" (page 4-43)

*3 "Error displays and corrective actions" (page A-4)

DIN rail mount type (IG-1000/IG-1050) **Panel mount type (IG-1500/IG-1550)**



The tolerance setting value can be set either manually or automatically.

Item		Setting Method
Manual setting		Directly enter the tolerance setting value (HIGH side setting value, LOW side setting value).
Automatic setting	Tolerance tuning	Detect the master workpiece and set the tolerance.
	Two-point tuning	Detect the good target and defective target and set the tolerance.

Note **When setting the tolerance setting value manually using the two-point tuning, make sure to set "HIGH side setting value > LOW side setting value".**

Reference When setting "HIGH side setting value > LOW side setting value", the judgment output is as follows.

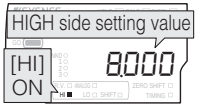
- GO judgment output is not output regardless of the judgment value (P.V.). (When setting HIGH side setting value = LOW side setting value = judgment value (P.V.) and setting the hysteresis to 0.000, GO judgment output is turned on.)
- When the judgment value (P.V.) goes beyond the HIGH side setting value and falls below the LOW side setting value, the HIGH judgment output and LOW judgment output are output at the same time.

Manual Setting

This is the method to directly enter the tolerance setting value (HIGH side setting value, LOW side setting value).

1 **Press the ◀ / ▶ button several times on the main screen. Then display the HIGH side setting value on the sub display (lower level).**

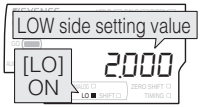
"Sub Display (Lower Level)" (page 3-4)



2 **Press ▲ / ▼ button to set the HIGH side setting value.**

Item	Setting range	Default value
HIGH side setting value	-99.999 to 99.999	8.000

3 **Press the ▶ button once and display the LOW side setting value on the sub display (lower level).**



4 **Press ▲ / ▼ button to set the LOW side setting value.**

Item	Setting range	Default value
LOW side setting value	-99.999 to 99.999	2.000

After setting, press ◀ / ▶ button to return the sub display to the original display as necessary.

Reference As soon as the HIGH side setting value and the LOW side setting value are entered, the judgment and output begin with the new setting value.

Automatic Setting

Tolerance tuning

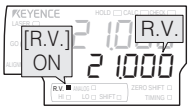
When the target (master workpiece) as a reference is present, the HIGH side setting value (upper limit) and LOW side setting value (lower limit) can automatically be set with the master workpiece measurement value as the center value.

Note **The tolerance tuning cannot be performed when the judgment value (P.V.) is displayed as [-----].**
If attempting to perform, [no.uRL] blinks several times on the main display.

Reference When the judgment value (P.V.) is [-FFFF] and [FFFF], they are regarded as -100.00 and 100.00 respectively. When the tuning result exceeds the setting range (-99.999 to 99.999), the limit value of the setting range is considered as the setting value.

1 **Press the ◀ / ▶ button several times on the main screen. Then display the R.V. display screen on the sub display (lower level).**

"Sub Display (Lower Level)" (page 3-4)



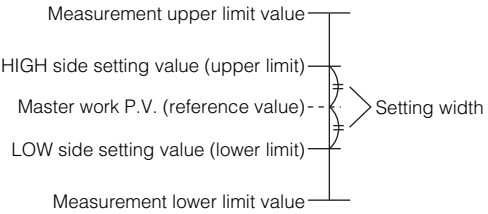
2 **Measure the master workpiece and press the [SET] button.**

The judgment value (P.V.) as a reference value for the tolerance setting is imported.
[SEt] and the tolerance setting width are displayed alternately on the sub display (lower level).

3 **Press ▲ / ▼ button to set the tolerance setting width.**



Item	Setting range	Default value
Setting width	0.000 to 99.999	0.100



4 **Press the [SET] button to complete the tolerance tuning.**

[SEt] blinks on the main display (upper level), and the HIGH side setting value and LOW side setting value are determined. Then, the display returns to the R.V. screen automatically.

Two-point tuning

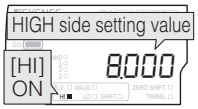
With this method, the median value of the good target and defective target is set as the tolerance setting value when there are good target and HIGH/LOW defective target.

Reference

- When the internal measurement value (R.V.) is [-----], it is regarded as 0.000.
- When the internal measurement value (R.V.) is [-FFFF] and [FFFF], they are regarded as -100.00 and 100.00 respectively.
- When the tuning result exceeds the setting range (-99.999 to 99.999), the limit value of the setting range becomes the setting value.

1 Press the ◀ / ▶ button several times on the main screen. Then display the HIGH side setting value on the sub display (lower level).

"Sub Display (Lower Level)" (page 3-4)



2 Measure the good target and press the [SET] button. (HIGH side 1st point confirmation operation)

The internal measurement value (R.V.) is imported as a good target measurement value.
[h ,5Et] is displayed on the main display (upper level).

3 Measure the HIGH side defective target and press the [SET] button. (HIGH side 2nd point confirmation operation)

The internal measurement value (R.V.) is imported as a measurement value for HIGH side defective target.
After [5Et] blinks on the main display (upper level) , the judgment value (P.V.) is displayed.
On the sub display (lower level), the median value of the good target value (1st point) imported on step 5 and HIGH defective target value (2nd point) is displayed.
Setting the HIGH side setting value (upper limit) is complete.

4 Press the ▶ button once and display the LOW side setting value on the sub display (lower level).

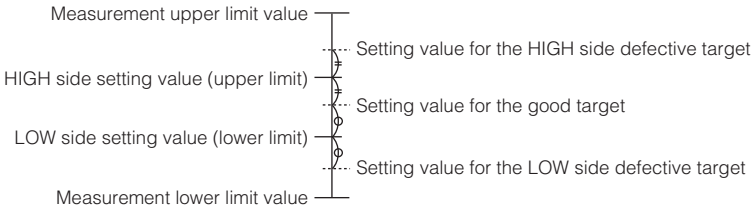


5 **Measure the good target again and press the [SET] button. (LOW side 1st point confirmation operation)**

The internal measurement value (R.V.) is imported as a good target measurement value.
[LoSEt] is displayed on the main display (upper level).

6 **Measure the LOW side defective target and press the [SET] button. (LOW side 2nd point confirmation operation)**

The internal measurement value (R.V.) is imported as a measurement value for LOW side defective target.
After [SEt] blinks on the main display (upper level) , the judgment value (P.V.) is displayed.
On the sub display (lower level), the median value of the good target value (1st point) imported on step 5 and LOW defective target value (2nd point) is displayed.
Setting the LOW side setting value (lower limit) is complete.
The two-point tuning is complete.



3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))

The internal measurement value (R.V.) is shifted (offset) to an arbitrary shift target value. The judgment value (P.V.) is shifted (offset) as well.
The following two methods can be used.

- Press the [ZERO SHIFT] button (within 1 second).
- Set the external input (zero shift input) to ON for 20 ms or more.*

* When the zero shift input is set for the external input 1 (pink wire), the zero shift is enabled by the external input.

"11. External input" (page 4-33)

Setting the Shift Target Value

1 **Press the ◀ / ▶ button several times on the main screen. To display the shift target value on the sub display (lower level).**

"Sub Display (Lower Level)" (page 3-4)



2 **Press ▲ / ▼ button to set the shift target value.**

Item	Setting range	Default value
Shift target value	-99.999 to 99.999	0.000

3 **Press ◀ / ▶ button to return the sub display to the original screen.**

Starting the Zero Shift

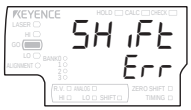
When the following operation is performed on the main screen, the zero shift indicator [ZERO SHIFT] lights up for approx. 0.5 second and the current internal measurement value (R.V.) shifts to the shift target value.

- Press the zero shift button [ZERO SHIFT] (within 1 second).
- Turn ON the zero shift input of external input for 20 ms or more.

Note

- **When the zero shift from the external input is performed, if the power is turned OFF, the previous state before the zero shift function is restored. If you wish to keep the shifted state of the internal measurement value (R.V.) even after the power is turned OFF, set the zero shift value memory function to ON.**

  " 13. Saving zero shift value function" (page 4-39)
- **When the internal measurement value (R.V.) is [-----], the zero shift function cannot be used. After the following screen appears, the main screen is automatically restored.**



Reference

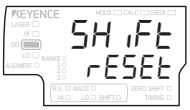
When the zero shift is performed by pressing the zero shift button, the shifted state of the internal measurement value (R.V.) is preserved even after the power is turned off.

Canceling the Zero Shift (Reset)

When the following operation is performed on the main screen, the zero shift is canceled and the internal measurement value (R.V.) returns to the previous state (initial state) before the zero shift function is used.

- Press the zero shift button [ZERO SHIFT] for 2 seconds or more.

The following screen appears after operation.



3-8 Bank Function (Registering Multiple Tolerance Setting Values)

Using the bank function, you can register up to four patterns of specified tolerance settings. By using the bank function, each setting item registered beforehand can be switched easily.

Setting items registered with the bank

Setting items	Reference page
HIGH side setting value	"3-6 Setting the Tolerance Setting Value" (page 3-11)
LOW side setting value	
Shift target value *1	"3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)
Sensitivity setting	"4-3 Setting the Measurement Sensitivity" (page 4-44)
Binarization level	
Number of filters	
Number of pins *2	"1. Measurement mode" (page 4-8)
Edge number 1, edge number 2 *3	

*1 The shifted amount when the internal measurement value (R.V.) is shifted using the zero shift function is saved in each bank.
(example) Suppose the zero shift function is used with bank 0, then the unit is switched to bank 1, and while in bank 1, the zero shift is used again. If the unit is switched back to bank 0, the zero shift associated with bank 0 is recalled.

*2 This can be set only when the measurement mode is set to "Pin interval judgment mode" or "Pin diameter judgment mode".

*3 This can be set only when the measurement mode is set to "Specified edges interval measurement mode".

Note

When the bank is switched, the internal measurement value (R.V.) shows [-----] until the average number of times (response time) elapses.

"3. Average number of times (Response time)" (page 4-17)

How to Switch the Bank

The following two methods can be used to switch the bank.

- Press the button on the amplifier.
- Use the external inputs (Bank A input, Bank B input)*

* When the Bank A input and Bank B input are set for the external inputs, the bank can be switched using the external inputs.

" 11. External input" (page 4-33)

Note

- **When the bank is switched, the internal measurement value (R.V.) shows [-----] until the average number of times (response time) elapses.**

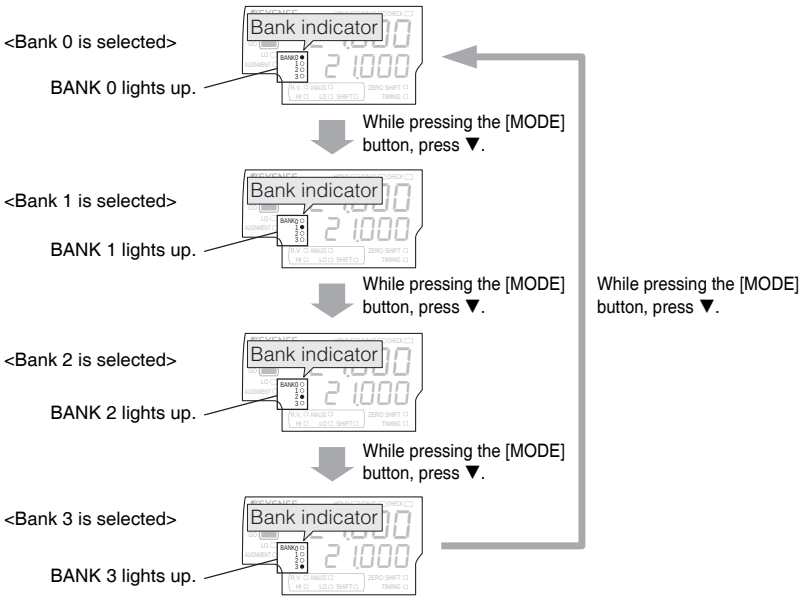
  "3. Average number of times (Response time)" (page 4-17)
- **When the measurement mode is "Pin interval judgment mode" or "Pin diameter judgment mode", if the bank is switched and the setting of number of pins is changed, the judgment value (P.V.) shows [-----] and is held even if the judgment value (P.V.) is held.**

  "1. Measurement mode" (page 4-8)

  "5. Hold function" (page 4-20)

Switching the bank by button operation

While pressing the [MODE] button on the main screen, press the ▲ / ▼ button.
The bank is switched and the bank indicator [BANK 0 to 3] lights up according to the selected bank.



Reference When ▲ is pressed while pressing down the [MODE] button, the screen moves to the opposite direction.

Switching the bank by the external input

When the Bank A input and Bank B input are set for the external inputs, the bank can be switched using the external inputs.

"11. External input" (page 4-33)

1 **Set the key lock function.**

If you switch the bank by the external input, the sensor amplifier must be in a key locked state.

"3-9 Key Lock Function" (page 3-21)

2 **By combining ON/OFF setting of bank A input and bank B input, you can switch the banks.**

- The bank input must be held 20 ms or longer.
  "11. External input" (page 4-33)
- The combinations of bank A input and bank B input are shown in the following table.

Bank	Bank A input	Bank B input
Bank 0	OFF	OFF
Bank 1	ON	OFF
Bank 2	OFF	ON
Bank 3	ON	ON

ON : Short-circuited
OFF: Open

Reference If the external input is not set to bank A or bank B, it is regarded as OFF.
(example) If only Bank A input is set for the external input, only two patterns (bank 0 and bank 1) can be switched using the external input.

3-9 Key Lock Function

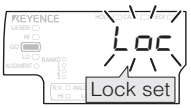
The key lock function prevents unwanted button operations during measurement.
When the key lock function is active, operations other than switching the main screen and canceling the key lock function are disabled.

Reference

If you switch the bank by the external input, the key lock function must be set.
"3-8 Bank Function (Registering Multiple Tolerance Setting Values)" (page 3-18)

Starting the Key Lock

While pressing the [MODE] button on the main screen, press ▲ or ▼ button for 2 seconds or more.
After [LOC] blinks on the main display (upper level) for several seconds, the main screen is restored.



If buttons other than display switching button on the sub display (lower level) are operated in the key-locked state, [LOC] is displayed on the main display (upper level) and setting change operation is ignored.

Canceling the Key Lock (Unlock)

While pressing the [MODE] button, press ▲ or ▼ button for 2 seconds or more.
After [UNL] blinks on the sub display (lower level) for several seconds, the main screen is restored.



3-10 Selecting the Display Unit

When a particular operation is performed during the initial reset, the display unit can be selected among "mm" and "inch". (Initial value: "mm")

"3-5 Initial Reset (Initialize)" (page 3-10)

Main screen



While pressing the [MODE] button, press the [SET] button 5 times.



Press [Mode] and [Zero Shift] buttons for 2 seconds



[MODE] button

1 **While pressing the [MODE] button on the main screen, press the [SET] button 5 times.**

[rESEt] is displayed on the main display (upper level).

2 **Press ▲ / ▼ button to select [YES] and press the [MODE] and [Zero Shift] buttons at the same time for approx. 2 seconds.**

3 **Press ▲ / ▼ button to select the display unit and press the [MODE] button.**

Setting value	Description
mm	mm
inch	inch

Go to step 3 of "3-5 Initial Reset (Initialize)" (page 3-10).

Note **The display unit is not initialized even after performing the initial reset.**

Reference

- If the display unit "inch" is selected, the decimal point positions for the display range and setting range of displayed values with unit "mm" move to the left by one digit.
  (example) Display range -99.99 to 99.99 (mm) → -9.999 to 9.999 (inch)
  Setting range -99.999 to 99.999 (mm) → -9.9999 to 9.9999 (inch)
- If the display unit "inch" is selected, the default values are changed as below.

Item		mm	inch
HIGH side setting value		8.000	0.3000
LOW side setting value		2.000	0.1000
Tolerance setting width		0.100	0.0040
Trigger level		0.100	0.0040
Hysteresis		0.020	0.0010
Analog output scaling	Upper limit	10.000	0.3937
	Lower limit	0.000	0.0000
Calibration Function	SET1	0.000	0.0000
	SET2	5.000	0.2000

Setting Various Functions

4

This chapter describes the various functions of the IG Series.

4-1 Setting Operations 4-2

4-2 Basic Settings and Advanced Settings..... 4-4

4-3 Setting the Measurement Sensitivity..... 4-44

4-4 Calculation Function..... 4-47

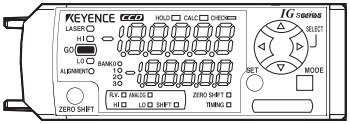
4-5 Calibration Function 4-52

4-1 Setting Operations

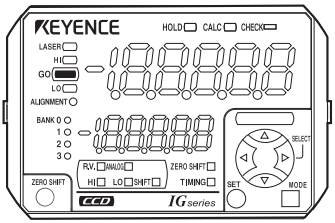
This section explains functions operable on the main screen and functions operable after the display changes to each setting screen.

Functions Available on the Main Screen

DIN rail mount type (IG-1000/IG-1050)



Panel mount type (IG-1500/IG-1550)



Main screen



Press ◀ or ▶ button.

Switching display on the sub display (lower level) (page 3-4)

Any of the internal measurement value (R.V.), analog output value, HIGH side setting value, LOW side setting value or shift target value is displayed and the setting can be changed.

3-6 Setting the Tolerance Setting Value (page 3-11)

HIGH side setting value and LOW side setting value are set. The judgment is made among HIGH/GO/LOW, and the value is displayed and output.

3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.)) (page 3-16)

The internal measurement value (R.V.) can be shifted (offset) to an arbitrary shift target value.

While pressing down [MODE], press ▲ or ▼ button.

3-8 Bank Function (Registering Multiple Tolerance Setting Values) (page 3-18)

HIGH side setting value, LOW side setting value, shift target value, etc. can be saved at up to four banks and switched.

Press [MODE] and [SET] buttons for approx. 2 seconds.

3-4 Registering the Standard Waveform (Gain adjustment) (page 3-9)

Make sure to do this for stabilized measurement when using for the first time or the setting environment is changed.

Press [MODE] and ▲ buttons for approx. 2 seconds.

or

Press [MODE] and ▼ buttons for approx. 2 seconds.

3-9 Key Lock Function (page 3-21)

This function prevents unwanted button operations during measurement.

Functions Available after the Display Changes to Each Setting Screen

Main screen



Press [MODE] button for approx. 2 seconds.

4-2 Basic Settings and Advanced Settings (page 4-4)

Basic settings

Basic settings such as measurement mode, response time are made.

Advanced settings

More advanced settings such as hold function, delay timer enable the unit to be used in wider applications.

Press ◀ and ▶ buttons for approx. 2 seconds.

4-3 Setting the Measurement Sensitivity (page 4-44)

The measurement sensitivity can be adjusted according to the amount of laser light received on the receiver.

Press [MODE] and ◀ buttons for approx. 2 seconds.

4-4 Calculation Function (page 4-47)

The internal measurement value (R.V.) made as a result of a calculation between two sensor amplifiers (addition or subtraction).

Press [MODE] and ▶ buttons for approx. 2 seconds.

4-5 Calibration Function (page 4-52)

When there is difference between the internal measurement value (R.V.) and the actual dimension of the object, the value can be corrected.

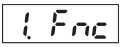
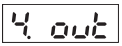
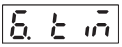
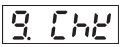
While pressing the [MODE] button, press the [SET] button 5 times.

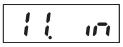
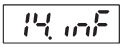
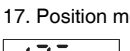
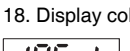
3-5 Initial Reset (Initialize) (page 3-10)

All of the setting items except for the calibration setting and standard waveform registration are initialized.

List of Setting Items

The following items can be set.

Type	Setting items	Description	Reference page
Basic setting	1. Measurement mode 	Select a suitable measurement mode according to the shape of object and applications.	4-8
	2. Measurement direction 	Select either the top side or the bottom side of sensor head as a starting point of measurement.	4-17
	3. Average number of times (Response time) 	By selecting the average number of times, the response time of judgment output is determined.	4-17
	4. Output mode 	According to the judgment value (P.V.), select the output mode (NO/NC) of judgment output ON/OFF.	4-19
Advanced setting	5. Hold function 	The holding method is set for the judgment value (P.V.).	4-20
	6. Timing input 	Set the using method of the timing input used for the hold function.	4-27
	7. Delay timer 	Set the delay timer for the judgment output.	4-27
	8. Hysteresis 	The hysteresis for the tolerance setting value is set.	4-30
	9. Edge check function 	You can check if the measurement is correct by checking the number of edges of object.	4-31
	10. Analog output scaling 	The analog output scaling for the judgment value (P.V.) is set.	4-32

Type	Setting items	Description	Reference page
Advanced setting	11. External input 	Select functions to be assigned to 4 external inputs.	4-33
	12. Saving the standard waveform function 	Make the setting for nonvolatile memory (EEPROM) to save the standard waveform.	4-39
	13. Saving zero shift value function 	Make the setting for nonvolatile memory (EEPROM) to save the state that the display is shifted by the zero shift function.	4-39
	14. Interference prevention function 	Make the setting to use the interference prevention function of the main unit (IG-1000/IG-1500).	4-40
	15. Display digit 	Set the displayed digits of the judgment value (P.V.) and the internal measurement value (R.V.).	4-40
	16. Power saving indication 	Make the setting for the power saving indication of the indicator.	4-41
	17. Position monitor 	Set the display method of the position monitor.	4-41
	18. Display color	Set the illumination color of the judgment indicator and the display color of the main display of the panel mount type amplifier (IG-1500/IG-1550).	4-43

Setting Screen

This section describes operations and setting screen to make the basic settings and the detailed setting.

How to go to the setting screen

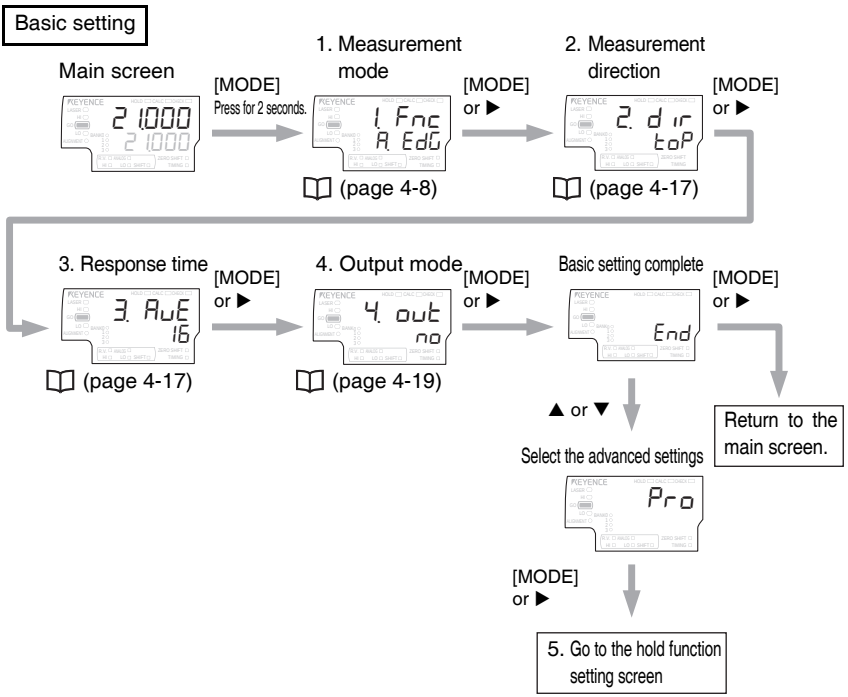
Press the [MODE] button for approx. 2 seconds on the main screen.
The setting screen appears.

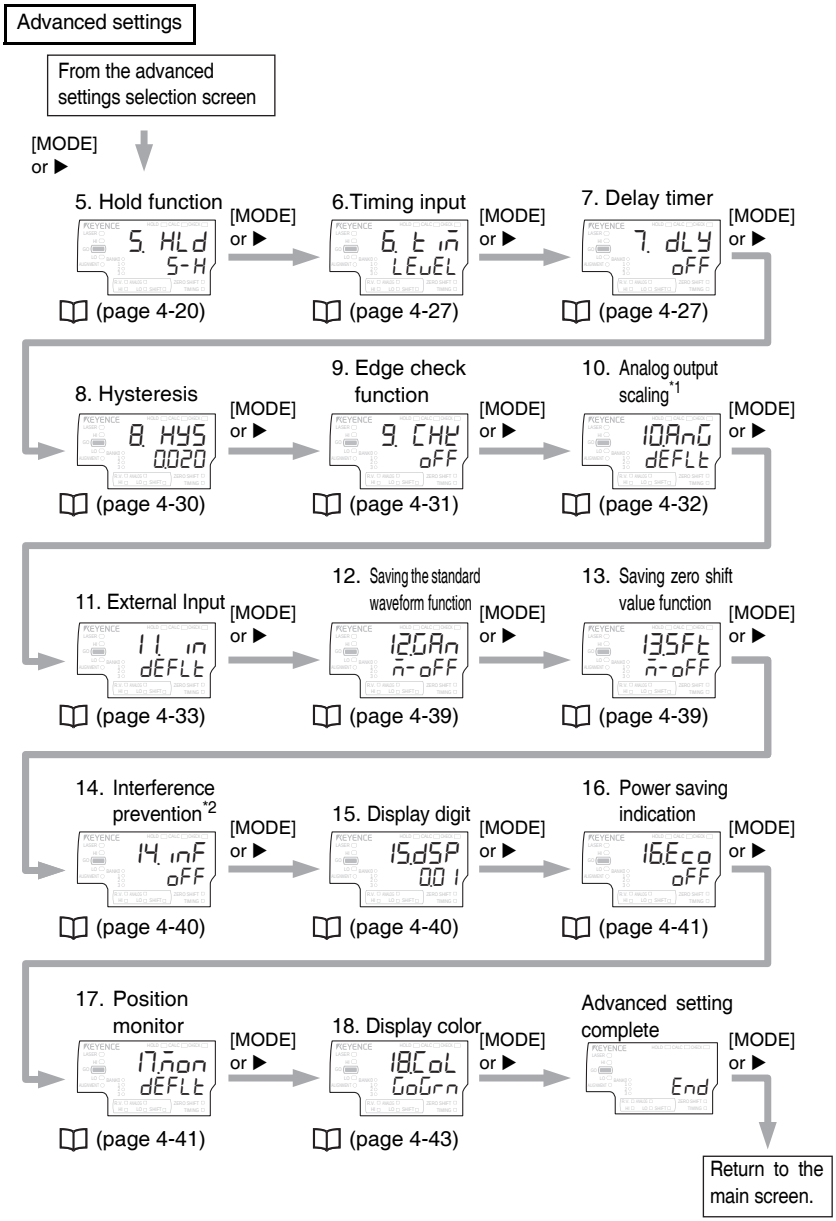
Basic operations on the setting screen

Changing the setting value: ▲ / ▼ button
Go to the next setting item: [MODE] button or ▶ button
Return to the previous setting item: ◀ button
Skip the rest of the setting items and finish: Press and hold the [MODE] button for approx. 2 seconds.

Setting screen view

The setting item is displayed on the main display (upper level) and the setting value is displayed on the sub display (lower level).





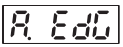
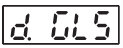
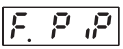
*1 Displayed only for the main unit and when the analog output setting is made.
*2 Displayed only for the main unit with the expansion unit additionally installed.

1. Measurement mode

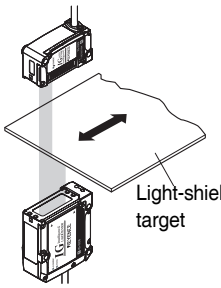
1. Fnc

A suitable measurement mode is set according to the shape of object and applications.

Reference When using modes other than the glass edge mode to measure small targets or a transparent object, set the sensitivity setting to "High sensitivity mode ".
"4-3 Setting the Measurement Sensitivity" (page 4-44)

Measurement mode	Description	Default value
Edge control/ Positioning mode 	This mode is for the measuring of the distance from the edge of the measurement range to the edge of a target. "Edge control/Positioning mode" (page 4-9)	○
Outer diameter/Width Measurement mode 	This mode is for the measuring of the outer diameter or width of a target. "Outer diameter/Width measurement mode" (page 4-10)	
Inner diameter/ Opening Measurement mode 	This mode is for the measuring of the inner diameter. "Inner diameter" (page 4-11)	
Glass edge mode 	The operation is the same as the one for the "Edge control/Positioning mode". Use this mode if the target is transparent such as glass. "Glass edge mode" (page 4-12)	
Pin position Measurement mode 	This mode is for the measuring of the distance from the edge of the measurement range to the center of a cylinder. "Pin position measurement mode" (page 4-13)	
Pin interval judgment mode 	This mode is for measuring the intervals (openings) between pins of all objects accompanying multiple pins lined up and judging if they are within the tolerance range. "Pin interval judgment mode" (page 4-14)	
Pin diameter judgment mode 	This mode is for measuring the pin diameters of all objects accompanying multiple pins lined up and judging if they are within the tolerance range. "Pin diameter judgment mode" (page 4-15)	
Specified edges interval Measurement mode 	This mode is for measuring the distance from one edge to the other of a target. Specify the two edges for measurement. "Specified edges interval measurement mode" (page 4-16)	

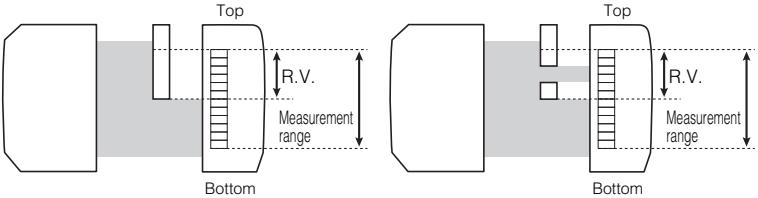
Edge control/Positioning mode



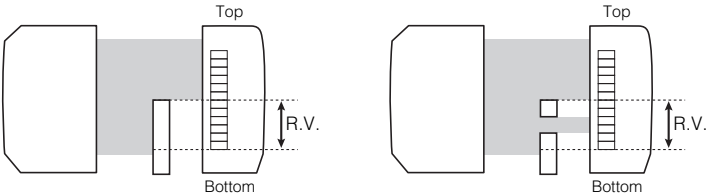
With this mode, the internal measurement value (R.V.) is determined by measuring the distance from the edge of the measurement range to the edge of the target. (light-shielding object).
Use this mode for the edge control or positioning.

■ Details

- **"2. Measurement direction" (page 4-17) When "Top" is selected**
  The distance from the top edge of the measuring range to the bottom most light to dark transition as seen by the receiver is determined as an internal measurement value (R.V.).



- **"2. Measurement direction" (page 4-17) When "Bottom" is selected**
  The distance from the top most light to dark transition as seen by the receiver to the bottom of the measuring range is determined as an internal measurement value (R.V.).

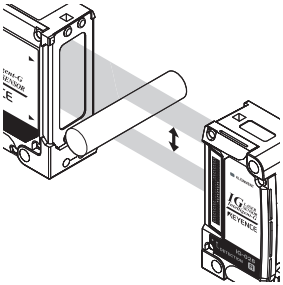


Reference

- If there is no object present , the internal measurement value (R.V.) becomes [-----].
  "2 Display Screen and Output" (page A-9)
- If the target shields light of the entire measurement range, the entire measurement range becomes the internal measurement value (R.V.).

Outer diameter/Width measurement mode

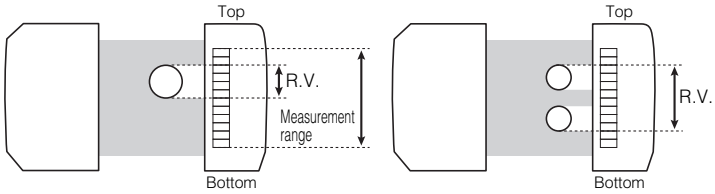




The internal measurement value (R.V.) is determined by measuring the outer diameter or width of the object.

■ Details

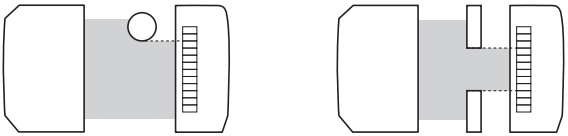
The distance from the top most light to dark transition as seen by the receiver to the bottom most dark to light transition as seen by the receiver is determined as an internal measurement value (R.V.).



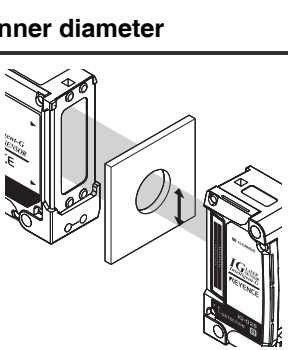
Reference

- If there is no object present , the internal measurement value (R.V.) becomes [-----].

  "2 Display Screen and Output" (page A-9)
- If the object is in the following status, the internal measurement value (R.V.) becomes [-----].



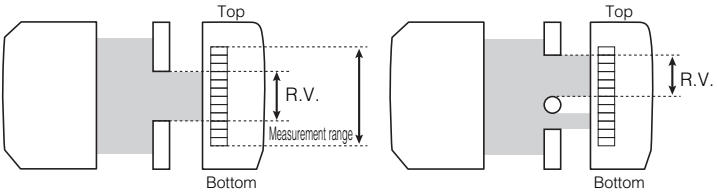
Inner diameter



The internal measurement value (R.V.) is determined by measuring the inner diameter.

■ Details

The distance from the top most dark to light transition as seen by the receiver to the next light to dark transition as seen by the receiver is determined as an internal measurement value (R.V.).

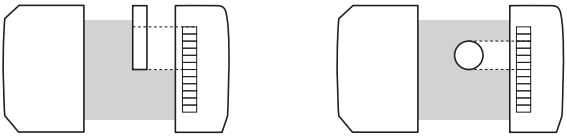


Reference

- If there is no object present , the internal measurement value (R.V.) becomes [-----].

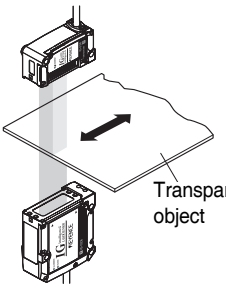
"2 Display Screen and Output" (page A-9)

- If the object is in the following status, the internal measurement value (R.V.) becomes [-----].



Glass edge mode

d. GLS

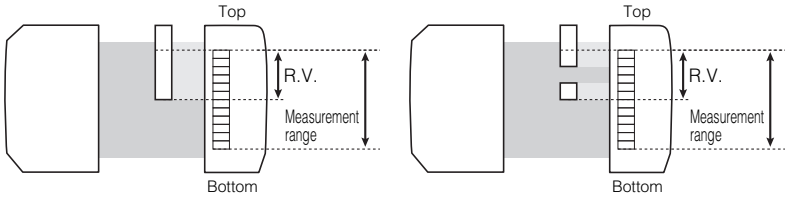


Use this mode if the object is transparent such as glass. With this mode, the internal measurement value (R.V.) is determined by measuring the distance from the edge of the measurement range to the edge of the target.
Use this mode for the edge control or positioning.

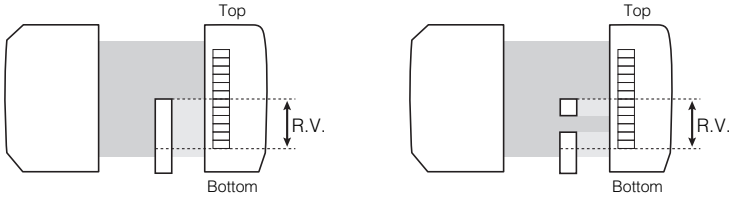
For transparent objects such as glass, more light is blocked by the edge of the target that the interior of the target. The edge is detected by utilizing this feature. The measurement sensitivity value is automatically changed to the value suitable for the detection of the transparent object.

■ Details

- **"2. Measurement direction" (page 4-17) When "Top" is set**
  The distance from the top edge of the measuring range to the bottom most dark to light transition as seen by the receiver is determined as an internal measurement value (R.V.).



- **"2. Measurement direction" (page 4-17) When "Bottom" is set**
  The distance from the top most light to dark transition as seen by the receiver to the bottom of the measuring range is determined as an internal measurement value (R.V.).

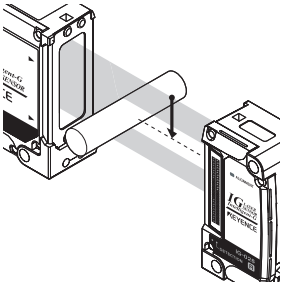


Reference

- If there is no target present , the internal measurement value (R.V.) becomes [-----].
  "2 Display Screen and Output" (page A-9)
- For a target with high degree of transparency, its edge may not be detected correctly even if the glass edge mode is used. In that case, set the measurement sensitivity.
  "4-3 Setting the Measurement Sensitivity" (page 4-44)
- If there is no edge within the measurement range, the distance cannot be measured correctly.

Pin position measurement mode

E. PoS

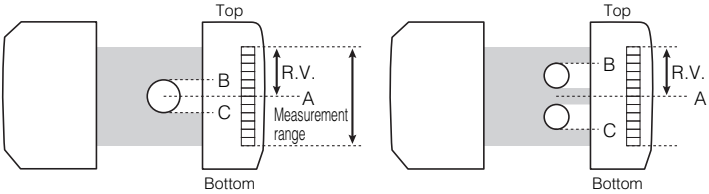


The internal measurement value (R.V.) is determined by measuring the distance from the edge of the measurement range to the center of a target.

■ Details

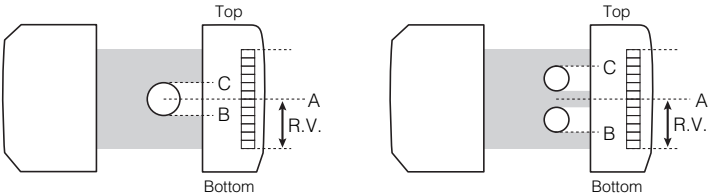
- **"2. Measurement direction" (page 4-17) When "Top" is set**

The position of the top most light to dark transition as seen by the receiver is defined as point B. The position of the bottom most dark to light transition as seen by the receiver is defined as point C. The distance form the top of the measuring range to center point of B and C is the internal measurement value (R.V.).



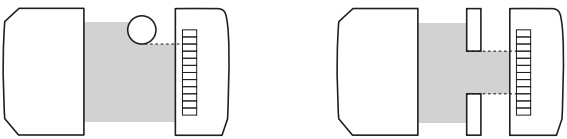
- **"2. Measurement direction" (page 4-17) When "Bottom" is set**

The position of the top most light to dark transition as seen by the receiver is defined as point C. The position of the bottom most dark to light transition as seen by the receiver is defined as point B. The distance form the bottom of the measuring range to center point of B and C is the internal measurement value (R.V.).

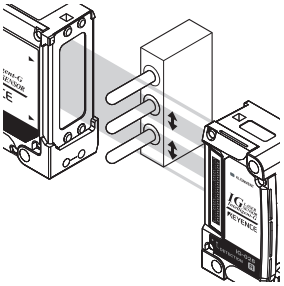


Reference

- If there is no object present , the internal measurement value (R.V.) becomes [-----].
  "2 Display Screen and Output" (page A-9)
- If the object is in the following status, the internal measurement value (R.V.) becomes [-----].



Pin interval judgment mode



The intervals (openings) of transmitted light as seen by the receiver are measured and judged if they are all within the acceptable range.

Note

- **The hold function is fixed to the Sample hold.**
  "5. Hold function" (page 4-20)
- **The analog output is fixed to the lower limit.**
  "10. Analog output scaling" (page 4-32)
- **If the zero shift function is used, the average value of intervals of all pins being measured shifts to the shift target value.**
  "3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)

■ Details

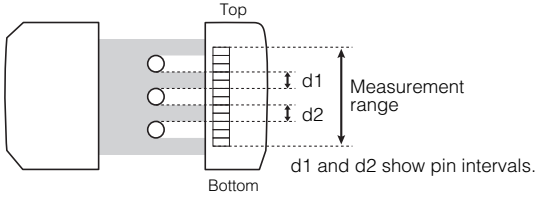
The number of intervals is specified on the number of pins-specifying screen. If the all pin intervals are within the acceptable range, GO judgment is output. If even only one interval is out of the acceptable range, HIGH judgment is output.

"3-6 Setting the Tolerance Setting Value" (page 3-11)

When this mode is used, the judgment value (P.V.) and the internal measurement value (R.V.) represent the measured pin intervals.

When ▲ or ▼ button is pressed on the screen displaying the judgment value (P.V.) and the internal measurement value (R.V.), the number of pin interval counting from the top is displayed can be changed.

(example) When the number of pins is set to 3



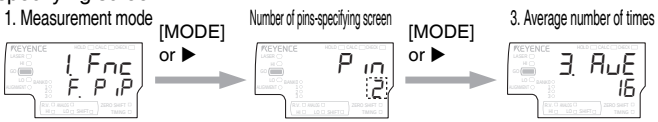
Reference

If the number of pins existing within the measurement range differs from the specified number and the top and bottom edges of CCD is light-blocked, the internal measurement value (R.V.) becomes [-----].

"2 Display Screen and Output" (page A-9)

■ Number of pins-specifying screen

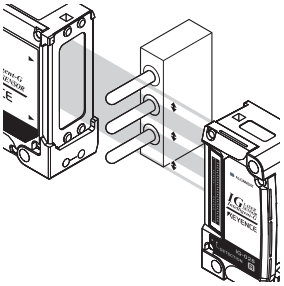
When the pin interval measurement mode is set, the display goes to the number of pins-specifying screen.



Press ▲ / ▼ button on the number of pins-specifying screen to specify the number of pins.

Item	Setting range	Default value
Number of the pins	2 to 14	2

Pin diameter judgment mode



The diameters of all targets in the measuring range are measured and judged if they are all within the acceptable range.

Note

- **The hold function is fixed to the Sample hold.**
  "5. Hold function" (page 4-20)
- **The analog output is fixed to the lower limit.**
  "10. Analog output scaling" (page 4-32)
- **If the zero shift function is used, the average value of diameters of all pins being measured shifts to the shift target value.**
  "3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)

■ Details

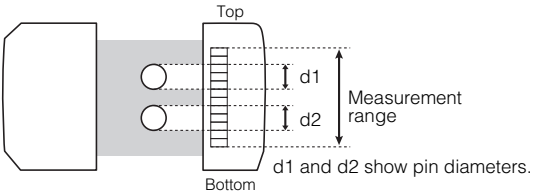
The number of diameters is specified on the number of pins-specifying screen. If all pin diameters are within the acceptable range, GO judgment is output. If even only one diameter is out of the acceptable range, HIGH judgment is output.

"3-6 Setting the Tolerance Setting Value" (page 3-11)

When this mode is used, the judgment value (P.V.) and the internal measurement value (R.V.) represent the measured pin diameters.

When ▲ or ▼ button is pressed on the screen displaying the judgment value (P.V.) and the internal measurement value (R.V.), the number of diameters counting from the top is displayed can be changed.

(example) When the number of pins is set to 2

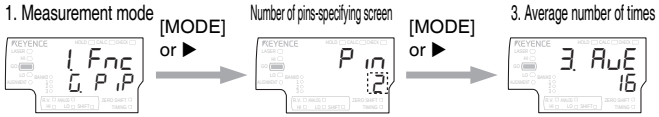


Reference If the number of pins existing within the measurement range differs from the specified number and the top and bottom edges of CCD is light-blocked, the internal measurement value (R.V.) becomes [-----].

"2 Display Screen and Output" (page A-9)

■ Number of pins-specifying screen

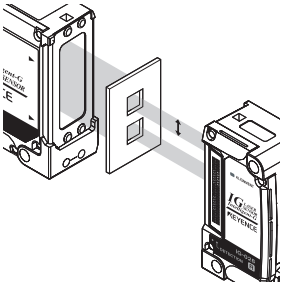
When the pin diameter judgment mode is set, the display goes to the number of pins-specifying screen.



Press ▲ / ▼ button on the number of pins-specifying screen to specify the number of pins.

Item	Setting range	Default value
Number of the pins	2 to 14	2

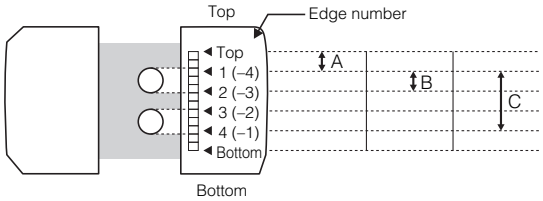
Specified edges interval measurement mode



The internal measurement value (R.V.) is determined by measuring the distance from one edge to the other edge of the target. Specify the two edges for measurement.

■ Specifying the edge

To specify the edge, when counting from the top, use a positive number (1 to 99). When counting from the bottom, use a negative number (-1 to -99).
When specifying the edge of the measurement range on the top side, specify the top. When measuring from the edge of the measurement range on the bottom side, specify the bottom.
(example) Setting for measuring the length of A, B and C with 2 pins of the object.



* The bracket ( ) shows the edge number when counting edges from the bottom side.

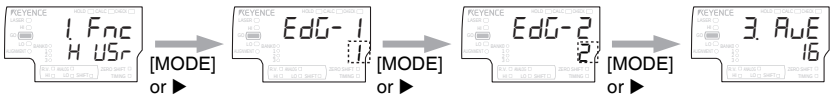
Specified range	Two edge numbers to specify
A	Either Top and 1, or Top and -4
B	Any one of 1 and 2, 1 and -3, -4 and 2, or -4 and -3
C	Any one of 1 and 4, 1 and -1, -4 and 4, or -4 and -1

Reference If there is no specified edge within the measurement range, the internal measurement value (R.V.) is determined as [-----].

"2 Display Screen and Output" (page A-9)

■ Edge number setting screen

When the specified edges interval measurement mode is set, the display goes to the edges number setting screen.



Press ▲ / ▼ button on the edge number setting screen to specify the edge number.
Specify the edge for the top side on the edge number setting screen 1 and set the edge for the bottom side on the edge number setting screen 2. If the setting is made reversely, a negative value will be assigned to the internal measurement value (R.V.).

Item	Setting range	Default value
Edge number	99 to 1, Top (Top), bot (Bottom), -1 to +99	1 or 2

2. Measurement direction

2. dir

This is displayed when any of "Edge control/Positioning mode", "Glass edge mode" or "Pin position measurement mode" is set for "1. Measurement mode" (page 4-8). (If measurement modes other than the above are set, this screen is skipped.)

Item	Setting range	Default value
Measurement Direction	toP (Top), btm (Bottom)	toP

For details, refer to the "1. Measurement mode" (page 4-8).

3. Average number of times (Response time)

3. AvE

The response time is the time from when the sensor head starts the measuring operation and the value at the measurement position is established as an internal measurement value (R.V.) and judgment value (P.V.), to time until when the judgment is output. When the average number of times is increased, the response time becomes longer, and the internal measurement value (R.V.) and judgment value (P.V.) stabilize.

Item	Setting range*1	Default value
Average number of times	hsP / 1 / 2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 / 512 / 1024 / 2048 / 4096	16

*1 When "Pin interval judgment mode" or "Pin diameter judgment mode" is set for "1. Measurement mode" (page 4-8), "hsP" and "512" to "4096" cannot be set.

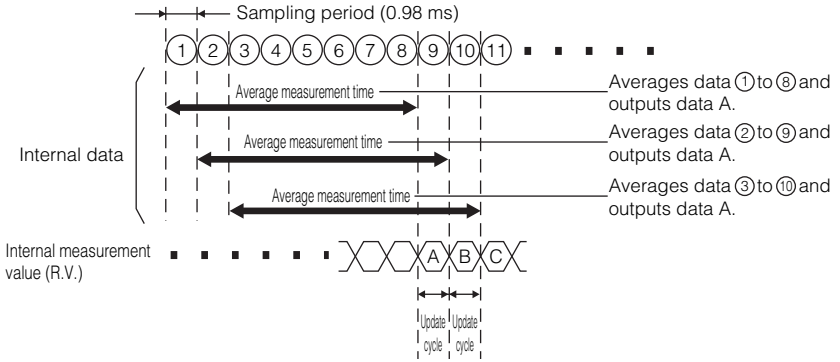
Response time list

Configuration	Average number of times	Sampling cycle (ms)	R.V. update cycle (ms)	Response time (ms) *1
hsp	1	0.49	0.49	1.96
1	1	0.98	0.98	3.92
2	2			4.90
4	4			6.86
8	8			10.78
16	16			18.62
32	32			34.30
64	64			65.66
128	128			128.38
256	256			253.82
512	512		1.96	505.68
1024	1024		3.92	1009.40
2048	2048		7.84	2016.84
4096	4096		15.68	4031.72

*1 Response time when modes other than "Pin interval judgment mode" and "Pin diameter judgment mode" are set for " 1. Measurement mode" (page 4-8)

Reference The same values as the above are assigned for the analog output.

Example When the average number of times is 8



■ **Response time list when "Pin interval judgment mode" and "Pin diameter judgment mode" are set**

Configuration	Average number of times	R.V. update cycle (ms)	Response time (ms) *1
1	1	3.92	6.86
2	2		7.84
4	4		9.80
8	8		13.72
16	16		21.56
32	32	4.90	43.12
64	64	6.86	86.24
128	128	10.78	172.48
256	256	18.62	344.96

*1 Pin interval judgment mode : Response time per pin interval:1 (Number of the pins: 2) When the pin interval is n (number of the pins: n+1), multiply the response time by n.

Pin diameter judgment mode : Response time per number of the pins: 1 When the number of the pins is n, multiply the response time by n.

4. Output mode



According to the judgment value (P.V.), set the output mode (NO/NC) of judgment output ON/OFF and edge check output.

Item	Setting range	Default value
Output mode	no (Normally Open), nc (Normally Close)	no

There are three judgment outputs as below.

- HIGH judgment output (Black wire)
- GO judgment output (Gray wire)
- LOW judgment output (White wire)

The judgment output is turned ON/OFF as below according to the tolerance setting value.

"3-6 Setting the Tolerance Setting Value" (page 3-11)

"9. Edge check function" (page 4-31)

When Normally Open is set

Judgment	Judgment output		
	HIGH	GO	LOW
HIGH	ON	OFF	OFF
GO	OFF	ON	OFF
LOW	OFF	OFF	ON
Error*1	ON	OFF	ON
"-----"*2	OFF	OFF	OFF

When Normally Close is set

Judgment*1	Judgment output		
	HIGH	GO	LOW
HIGH	OFF	ON	ON
GO	ON	OFF	ON
LOW	ON	ON	OFF
Error*1	OFF	ON	OFF
"-----"*2	ON	ON	ON

*1 "Error displays and corrective actions" (page A-4)

*2 When the judgment value (P.V.) is "-----".

Reference

Regardless of the output mode setting, the judgment indicator on the sensor amplifier interlocks the judgment output when Normally Open is set.

"3-6 Setting the Tolerance Setting Value" (page 3-11)

The following is the default state of the judgment indicator. The lighting status can be changed in the items for "18. Display Color".

"18. Display Color" (page 4-43)

Judgment	Judgment output		
	HIGH	GO	LOW
HIGH	Lights in red	Off	Off
GO	Off	Lights in green	Off
LOW	Off	Off	Lights in red
Error	Lights in red	Off	Lights in red
"-----"	Off	Off	Off

5. Hold function

5. HLd

The holding method is set for the judgment value (P.V.).
Functions other than "Auto peak hold" and "Auto bottom hold" are held using the external input (timing input).

Note **When functions other than "Auto peak hold" and "Auto bottom hold" are set, assign the external input 3 (pink/purple wire) to the timing input.**

"11. External input" (page 4-33)

Reference

- While the judgment value (P.V.) is held, the hold indicator on the sensor amplifier lights up.



Hold Function	Description	Default value
Sample hold S-H	When the timing input is turned ON, the judgment value (P.V.) is held. "Sample hold" (page 4-21)	○
Peak hold P-H	The maximum value of the specified period (sampling period) is held as a judgment value (P.V.). "Peak hold" (page 4-22)	
Bottom hold b-H	The minimum value of the specified period (sampling period) is held as a judgment value (P.V.). "Bottom hold" (page 4-23)	
Peak-to-peak hold P-P	The difference between the maximum value and minimum value of the specified period (sampling period) is held as a judgment value (P.V.). "Peak-to-peak hold" (page 4-24)	
Auto peak hold AutoP	According to the specified trigger level, the maximum value sampled is held as a judgment value (P.V.). The external input is not required. "Auto peak hold" (page 4-25)	
Auto bottom hold Autob	According to the specified trigger level, the minimum value sampled is held as a judgment value (P.V.). The external input is not required. "Auto bottom hold" (page 4-26)	

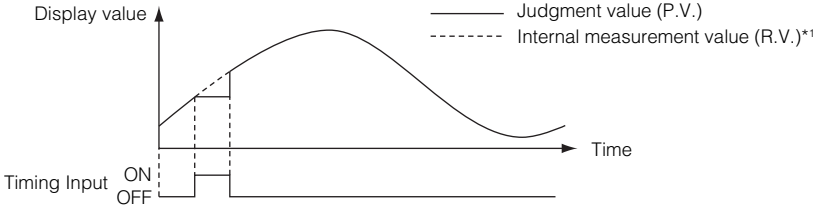
Sample hold

5-H

When the timing input is turned ON, the judgment value (P.V.) is held.

■ When "Level" is set for "6. Timing input" (page 4-27)

The sampling period is from the falling edge of the timing input to the next rising edge. On the rising edge, the judgment value (P.V.) is held.

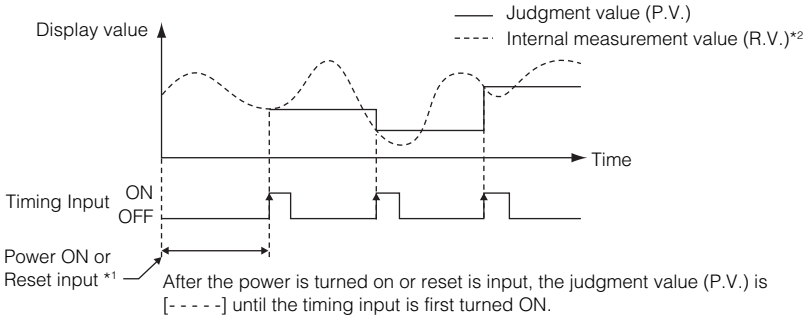


*1 The main unit (IG-1000/IG-1500)displays the calculation value (CALC value) when the calculation function is used.

"4-4 Calculation Function" (page 4-47)

■ When "Edge" is set for "6. Timing input" (page 4-27)

The sampling period is from the rising edge of the timing input to the next rising edge of the timing input. On the rising edge, the judgment value (P.V.) is held.



*1 "11. External input" (page 4-33)

*2 The main unit (IG-1000/IG-1500)displays the calculation value (CALC value) when the calculation function is used.

"4-4 Calculation Function" (page 4-47)

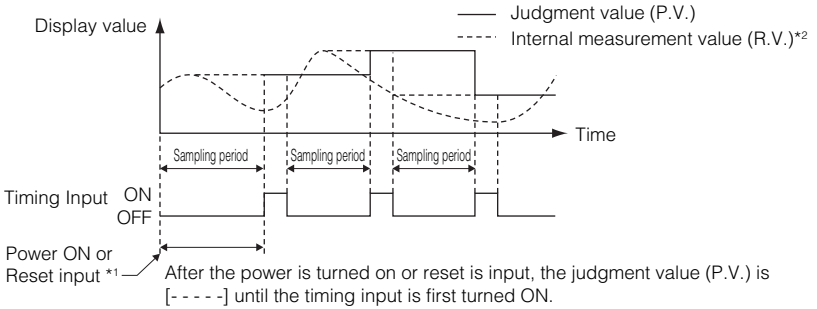
Peak hold

P-H

The maximum value of the specified period (sampling period) is held as a judgment value (P.V.).

■ When "Level" is set for "6. Timing input" (page 4-27)

The sampling period is from the falling edge of the timing input to the next rising edge. On the rising edge, the internal measurement value (R.V.) maximized during the sampling period is held as a judgment value. When the timing input is turned OFF, the next sampling period begins.



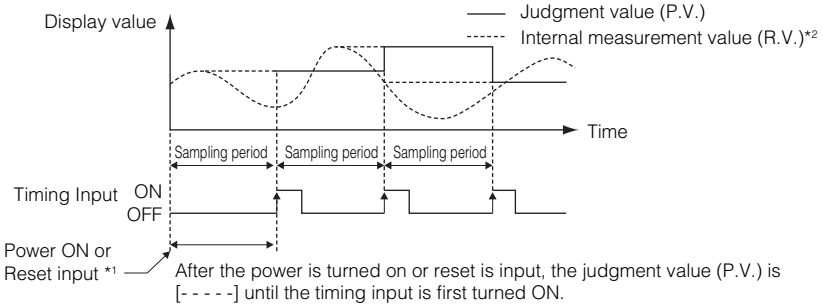
*1 "11. External input" (page 4-33)

*2 The main unit (IG-1000/IG-1500) displays the calculation value (CALC value) when the calculation function is used.

"4-4 Calculation Function" (page 4-47)

■ When "Edge" is set for "6. Timing input" (page 4-27)

The sampling period is from the rising edge of the timing input to the next rising edge of the timing input. On the rising edge, the internal measurement value (R.V.) maximized during the sampling period is held as a judgment value. When the timing input is turned ON, the next sampling period has already begun.



*1 "11. External input" (page 4-33)

*2 The main unit (IG-1000/IG-1500) displays the calculation value (CALC value) when the calculation function is used.

"4-4 Calculation Function" (page 4-47)

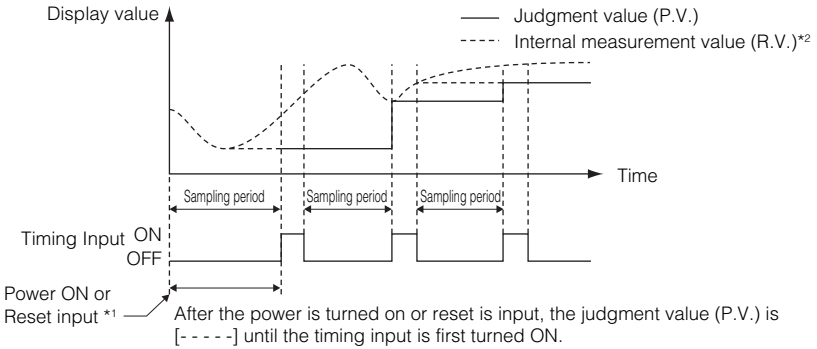
Bottom hold

b-H

The minimum value of the specified period (sampling period) is held as a judgment value (P.V.).

■ When "Level" is set for "6. Timing input" (page 4-27)

The sampling period is from the falling edge of the timing input to the next rising edge. On the rising edge, the internal measurement value (R.V.) minimized during the sampling period is held as a judgment value. When the timing input is turned OFF, the next sampling period begins.



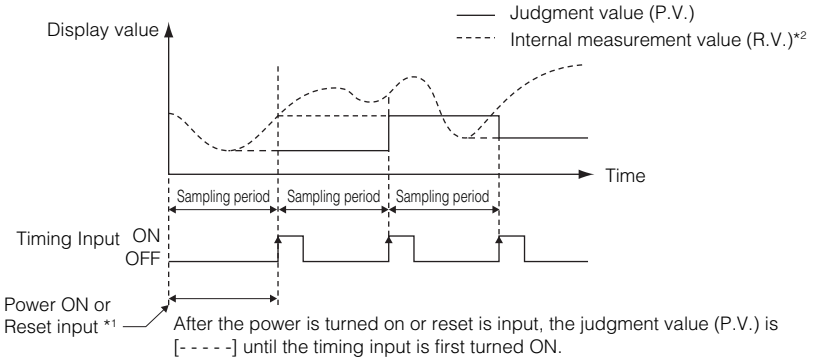
*1 "11. External input" (page 4-33)

*2 The main unit (IG-1000/IG-1500) displays the calculation value (CALC value) when the calculation function is used.

"4-4 Calculation Function" (page 4-47)

■ When "Edge" is set for "6. Timing input" (page 4-27)

The sampling period is from the rising edge of the timing input to the next rising edge of the timing input. On the rising edge, the internal measurement value (R.V.) minimized during the sampling period is held as a judgment value. When the timing input is turned ON, the next sampling period has already begun.



*1 "11. External input" (page 4-33)

*2 The main unit (IG-1000/IG-1500) displays the calculation value (CALC value) when the calculation function is used.

"4-4 Calculation Function" (page 4-47)

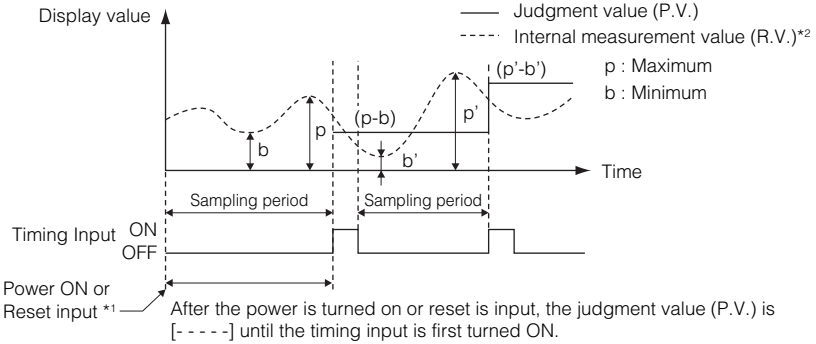
Peak-to-peak hold

P-P

The difference between the maximum value and minimum value of the specified period (sampling period) is held as a judgment value (P.V.).

■ When "Level" is set for "6. Timing input" (page 4-27)

The sampling period is from the falling edge of the timing input to the next rising edge. On the rising edge, the difference between the maximum value and minimum value of the internal measurement value (R.V.) during the sampling period is held as a judgment value (P.V.). When the timing input is turned OFF, the next sampling period begins.



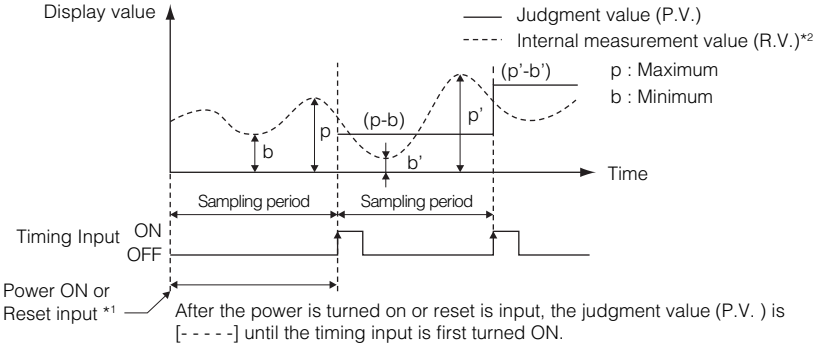
*1 "11. External input" (page 4-33)

*2 The main unit (IG-1000/IG-1500) displays the calculation value (CALC value) when the calculation function is used.

"4-4 Calculation Function" (page 4-47)

■ When "Edge" is set for "6. Timing input" (page 4-27)

The sampling period is from the rising edge of the timing input to the next rising edge of the timing input. On the rising edge, the difference between the maximum value and minimum value of the internal measurement value (R.V.) during the sampling period is held as a judgment value (P.V.). When the timing input is turned ON, the next sampling period has already begun.



*1 "11. External input" (page 4-33)

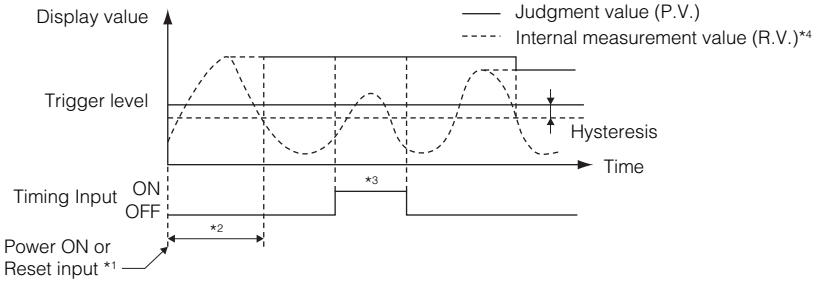
*2 The main unit (IG-1000/IG-1500) displays the calculation value (CALC value) when the calculation function is used.

"4-4 Calculation Function" (page 4-47)

Auto peak hold

AutoP

When the internal measurement value (R.V.) goes beyond the specified trigger level, the sampling begins. When it falls below the trigger level, the sampling finishes. When the sampling finishes, the internal measurement value (R.V.) maximized during the sampling period is held as a judgment value (P.V.).
The external input is not required.

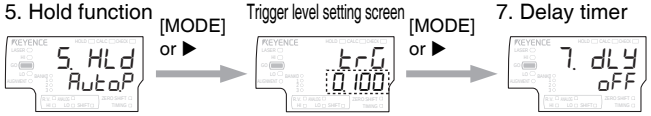


*1 "11. External input" (page 4-33)
*2 After the power is turned on or reset is input, the judgment value (P.V.) is [-----] until the judgment value (P.V.) is first held.
*3 While the timing input is ON, the sampling does not start. If the sampling is already in process, it continues.
*4 The main unit (IG-1000/IG-1500) displays the calculation value (CALC value) when the calculation function is used.
"4-4 Calculation Function" (page 4-47)

Reference
- The operation by the timing input is the same regardless of the "6. Timing input" (page 4-27) setting.
- After the sampling starts, if the internal measurement value (R.V.) becomes "-----" before the sampling falls below the specified trigger level, the sampling is automatically finished and the maximized value during the sampling period is held as a judgment value (P.V.).

■ Trigger level setting screen

When the auto peak hold is set, the display goes to the trigger level setting screen.



Press ▲ / ▼ button on the trigger level setting screen to specify the trigger level.

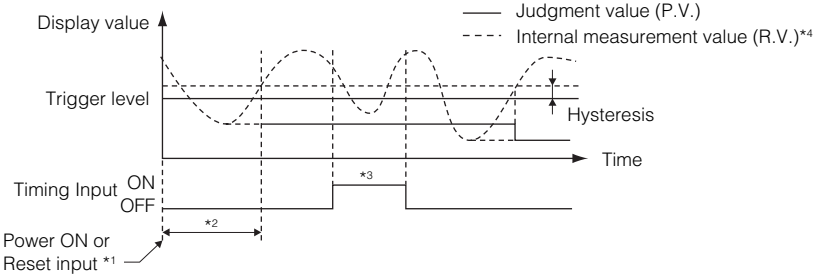
Item	Setting range	Default value
Trigger level	-99.999 to 99.999	0.100

Reference The hysteresis presents the same value as the one set for "8. Hysteresis" (page 4-30).

Auto bottom hold

AutoB

When the internal measurement value (R.V.) falls below the specified trigger level, the sampling begins. When it goes beyond the trigger level, the sampling finishes. When the sampling finishes, the internal measurement value (R.V.) minimized during the sampling period is held as a judgment value (P.V.).
The external input is not required.

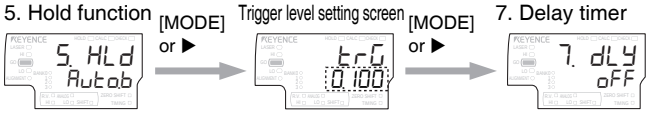


*1 "11. External input" (page 4-33)
*2 After the power is turned on or reset is input, the judgment value (P.V.) is [-----] until the judgment value (P.V.) is first held.
*3 While the timing input is ON, the sampling does not start. If the sampling is already in process, it continues.
*4 The main unit (IG-1000/IG-1500) displays the calculation value (CALC value) when the calculation function is used.
"4-4 Calculation Function" (page 4-47)

Reference
- The operation by the timing input is the same regardless of the "6. Timing input" (page 4-27) setting.
- After the sampling starts, if the internal measurement value (R.V.) becomes "-----" before the sampling goes beyond the specified trigger level, the sampling is automatically finished and the minimized value during the sampling period is held as a judgment value (P.V.).

■ Trigger level setting screen

When the Auto bottom hold is set, the display goes to the trigger level setting screen.

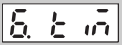


Press ▲ / ▼ button on the trigger level setting screen to specify the trigger level.

Item	Setting range	Default value
Trigger level	-99.999 to 99.999	0.100

Reference The hysteresis presents the same value as the one set for "8. Hysteresis" (page 4-30).

6. Timing input



The external input (timing input) operation used for "5. Hold function" (page 4-20) is set.
If "Auto peak hold" or "Auto bottom hold" is set, this item is skipped.

Item	Setting range	Default value
Timing Input	LEVEL (Level), EDGE (Edge)	LEVEL

For details, refer to the "5. Hold function" (page 4-20).

7. Delay timer

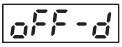


The delay timer for the judgment output is set.
There are three judgment outputs as below.

- HIGH judgment output (Black wire)
- GO judgment output (Gray wire)
- LOW judgment output (White wire)

The judgment output is turned ON/OFF according to the tolerance setting value and the output mode settings.

"3-6 Setting the Tolerance Setting Value" (page 3-11)
"4. Output mode" (page 4-19)

Delay Timer	Description	Default value
Delay timer off 	The delay timer is not used.	○
ON-delay timer 	Time required to change the GO judgment output operation from OFF to ON is delayed for specified time set on the timer. "ON-delay timer" (page 4-28)	
OFF-delay timer 	Time required to change the GO judgment output operation from ON to OFF is delayed for specified time set on the timer. "OFF-delay timer" (page 4-29)	
1-shot timer 	When GO judgment output is turned ON, if the specified time elapses, GO judgment output is automatically turned OFF. "1-shot timer" (page 4-29)	

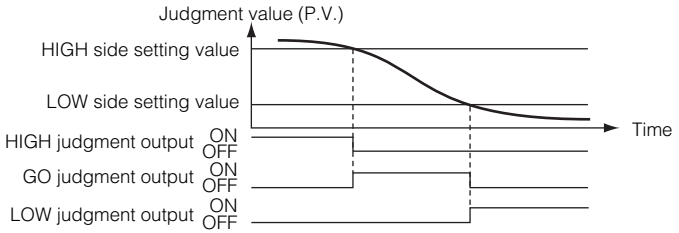
Timing chart

Reference

- The following are the timing charts when the output mode of judgment output is Normally Open (default value). ON/OFF is reversed for Normally Close.
  "4. Output mode" (page 4-19)
- The hysteresis is not taken into account in the following timing charts. Note that the hysteresis affects the ON/OFF timing of the actual judgment output.
  "8. Hysteresis" (page 4-30)

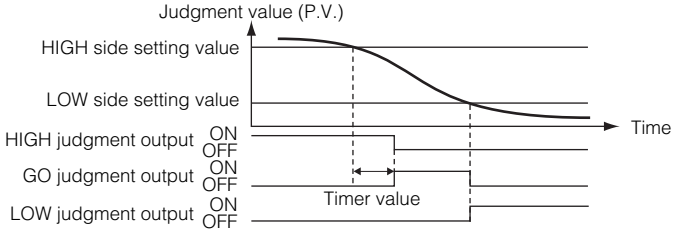
■ Delay timer off

The delay timer is not used.



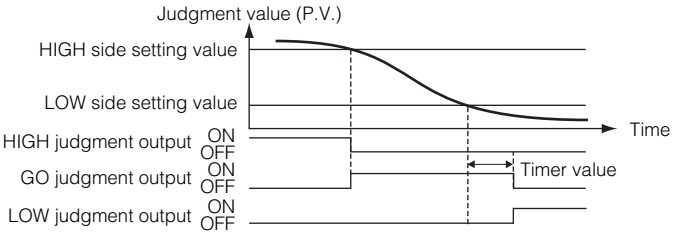
■ ON-delay timer

Time required to change the GO judgment output operation from OFF to ON is delayed for specified time set on the timer. Also, time required to change the HIGH judgment output and LOW judgment output operations from ON to OFF is delayed.



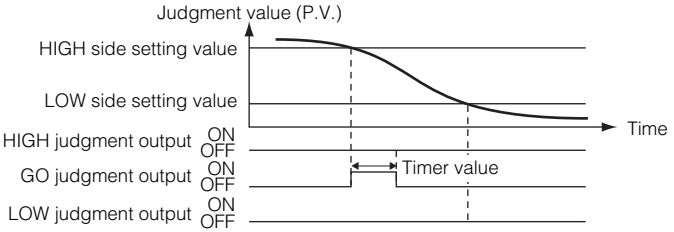
■ **OFF-delay timer**

Time required to change the GO judgment output operation from ON to OFF is delayed for specified time set on the timer. Also, time required to change the HIGH judgment output and LOW judgment output operations from OFF to ON is delayed.



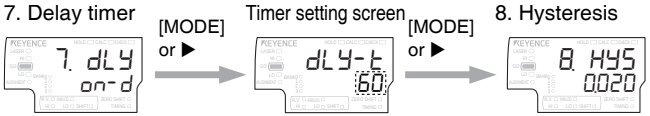
■ **1-shot timer**

When the GO judgment output is turned ON, if the specified time set on the timer elapses, the GO judgment output is forcibly turned OFF. The HIGH judgment output and the LOW judgment output are not turned ON.



Timer setting screen

When the timer settings other than the Delay timers off are set, the display goes to the timer setting screen. (When the Delay timer off is set, this screen is skipped.)



Press ▲ / ▼ button on the timer setting screen to specify the timer.

Item	Setting range	Default value
Timer value	1 to 9999 (ms)	60

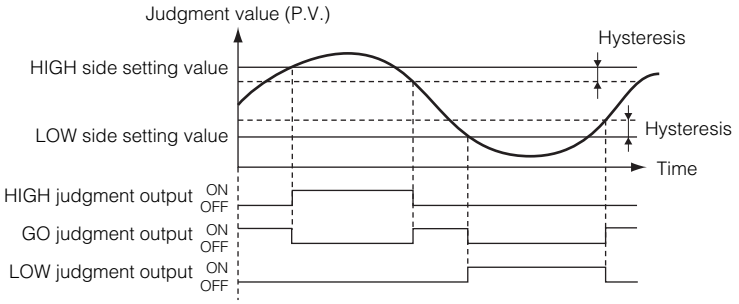
8. Hysteresis

8. HYS

The hysteresis for the tolerance setting value is set.
If the judgment value (P.V.) fluctuates due to the vibration of the object, etc. and the judgment output repeats ON/OFF, increasing the hysteresis value stabilizes ON/OFF.

"3-6 Setting the Tolerance Setting Value" (page 3-11)

Item	Setting range	Default value
Hysteresis	0.000 to 99.999	0.020



Reference

The above is the timing chart when the output mode of judgment output is Normally Open (default value). ON/OFF is reversed for Normally Close.

"4. Output mode" (page 4-19)

9. Edge check function

9. ChE

You can check the validity of a measurement by checking the number of edges in the measuring range.
The examples of use are as follows.

- Preventing abnormal values from being measured due to dust, oil, etc. stuck to the measurement part (Setting B).
- Detecting a foreign object incorporated (setting A or B)
- Confirming that the target is inserted into the measurement range (setting A)

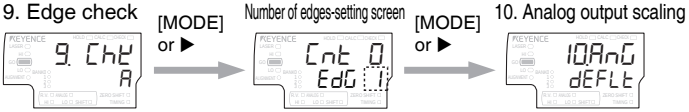
Edge check function	Description	Default value
Off oFF	The edge check function is not used.	○
Setting A A	If the number of edges of the target differs from the specified number, the check indicator [CHECK] lights up and the edge check output (green wire) is turned ON. "Power/Input-output cable" (page 2-7)	
Setting B b	If the number of edges of the target differs from the specified number, the check indicator [CHECK] lights up and the edge check output (green wire) is turned ON. However, if the number of edges of the object is 0 (when the object cannot be measured), the check indicator [CHECK] is turned off and the edge check output is turned OFF. "Power/Input-output cable" (page 2-7)	

Reference

- Set B if you wish to distinguish between the case that the object is not present within the measurement range and the case that the number of edges of the object differs from the specified number.
- The above explanation is applicable to the case when the output mode of judgment output is Normal Open (default value). Only ON/OFF of the edge check output is reversed for Normal Close.
  "4. Output mode" (page 4-19)

Number of edges-setting screen

When the setting A or setting B is set, the display goes to the number of edges-setting screen. (When OFF is set, this screen is skipped.)



Press ▲ / ▼ button on the number of edges-setting screen to specify the number of edges. The number of edges being measured is displayed on the main display (upper level).

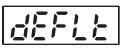
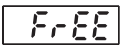
Item	Setting range	Default value
Number of edges	0 to 99	1

10. Analog output scaling

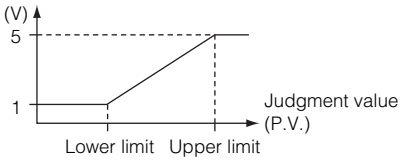


The analog output scaling for the judgment value (P.V.) is set.
If the setting not to output the analog output is set, this screen is skipped.

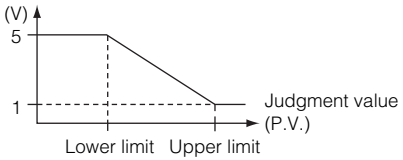
"3-1 Operation When the Power is Turned on for the First Time" (page 3-2)
"3-5 Initial Reset (Initialize)" (page 3-10)

Analog output	Description	Default value
Default setting 	Scaling is not performed.	○
Free range 	Scaling is performed. The analog output range can be changed by specifying the upper limit and lower limit of the judgment value (P.V.).	

Example 1: Lower limit < Upper limit
(Analog output 1 to 5 V)



Example 2: Lower limit > Upper limit
(Analog output 1 to 5 V)

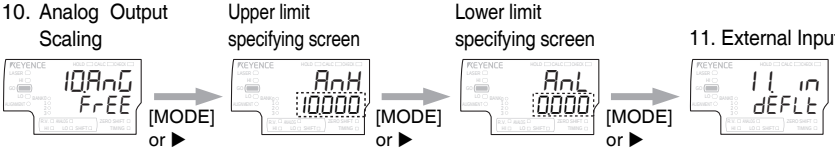


Reference

- If Upper limit = Lower limit is set, the analog output is output as below.
  Judgment value (P.V.) ≤ Upper limit: Analog output lower limit (When 1-5 V → 1 V)
  Judgment value (P.V.) > Upper limit: Analog output upper limit (When 1-5 V → 5 V)
- When "Pin interval measurement mode" or "Pin diameter measurement mode" is set for "1. Measurement mode" (page 4-8), the analog output is fixed to the output lower limit.

Upper limit setting screen and lower limit setting screen

When the free range is set, the display goes to the upper limit setting screen and lower limit setting screen. (When the default is set, these two screens are skipped.)



Press ▲ / ▼ button on each setting screen to specify the upper limit and the lower limit.

Item	Setting range	Default value
Upper limit	-99.999 to 99.999	10.000
Lower limit	-99.999 to 99.999	0.000

11. External input

11. in

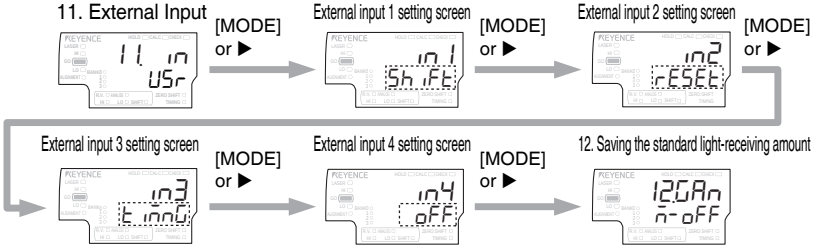
You can select functions to be assigned to four external inputs (External input 1 to 4).

"Power/Input-output cable" (page 2-7)

External Input	Description	Default value
Default setting dEFLt	Functions for the external inputs remain the same as the factory default setting.	○
User setting USr	Functions for the external inputs are changed from the factory default setting.	

External input setting screen

When the user setting is set, each function of the external input 1 to 4 can be set. Functions that can be set differ for each external input. (When the default is set, these four screens are skipped.)



Press ▲ / ▼ button on each setting screen to specify functions.

External Input 1 (Pink wire)

Setting value	Description	Default value
Sh iFt	Zero shift input	○
bnK-A	Bank A input	
bnK-b	Bank B input	
L-StP	Laser emission stop input	
oFF	Not use	

External Input 2 (Yellow wire)

Setting value	Description	Default value
rESEt	Reset input	○
bnK-A	Bank A input	
bnK-b	Bank B input	
L-StP	Laser emission stop input	
oFF	Not use	

External input 3 (Pink/Purple wire)

Setting value	Description	Default value
t iming	Timing Input	○
bnK-A	Bank A input	
bnK-b	Bank B input	
L-oFF	Laser emission stop input	
oFF	Not use	

External Input 4 (Purple wire)

Setting value	Description	Default value
oFF	Not use	○
GA in	Gain input	
bnK-A	Bank A input	
bnK-b	Bank B input	
L-StP	Laser emission stop input	

Reference When the same function is selected for multiple external inputs, if any are ON, ON (OR operation) works.

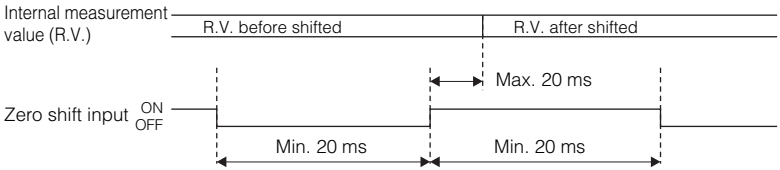
Zero shift input

SHIFT

When the zero shift input is set to ON, the internal measurement value (R.V.) is shifted (offset) to an arbitrary shift target value.

"3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)

■ Timing chart



■ Minimum Input Time

ON time: 20 ms
OFF time: 20 ms

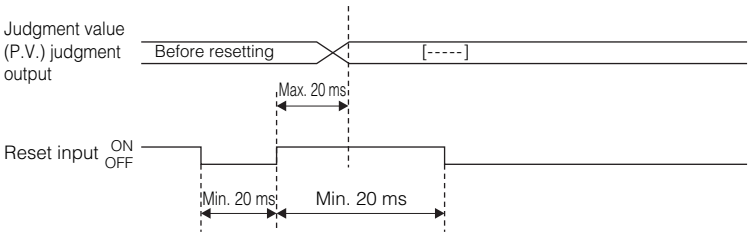
Reset input

RESET

When the reset input is turned ON while using the hold function, the judgment value (P.V.) in the held state is canceled and the value becomes [-----].

"5. Hold function" (page 4-20)

■ Timing chart



■ Minimum Input Time

ON time: 20 ms
OFF time: 20 ms

Timing Input

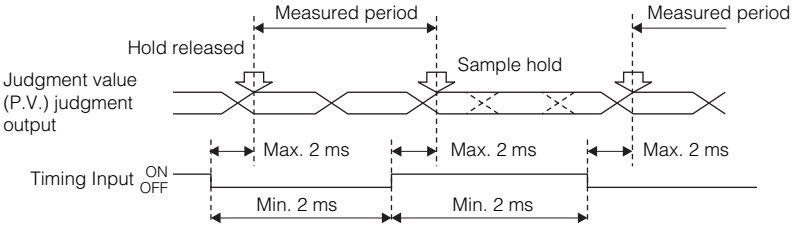


When the timing input is turned ON while using the hold function, the judgment value (P.V.) is held.

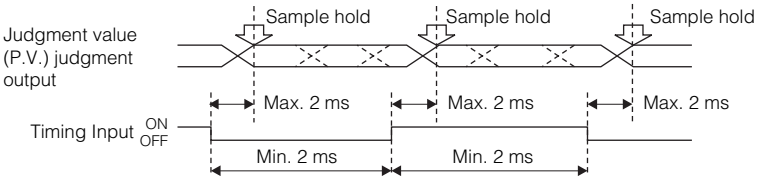
"5. Hold function" (page 4-20)

■ Timing chart

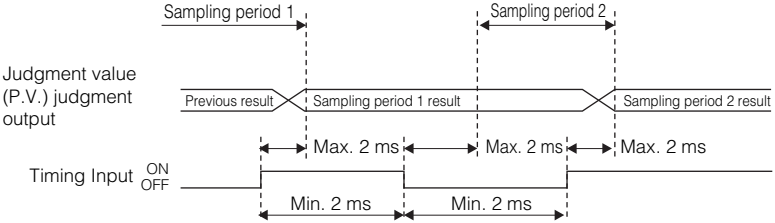
● **When Sample hold is set**
"6. Timing input" (page 4-27) setting: "Level"



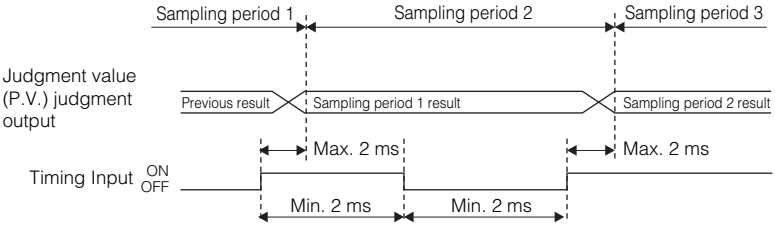
"6. Timing input" (page 4-27) setting: "Edge"



- **When Peak hold, Bottom hold or Peak-to-peak hold is set "6. Timing input" (page 4-27) setting: "Level"**



"6. Timing input" (page 4-27) setting: "Edge"



■ Minimum Input Time

ON time: 2 ms
OFF time: 2 ms

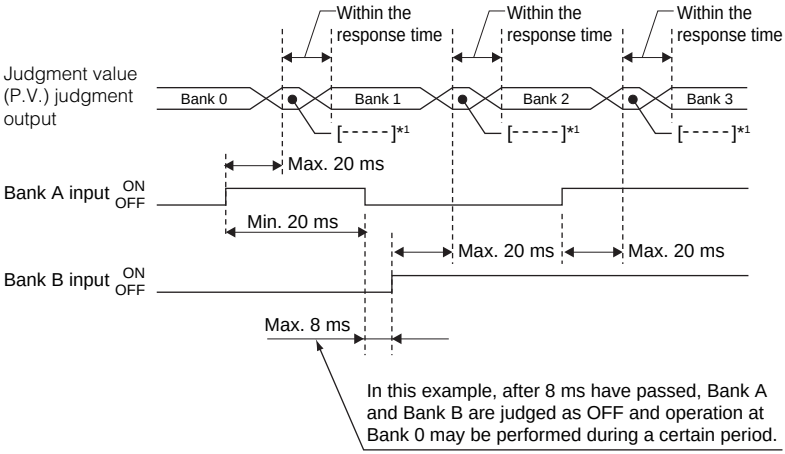
Bank A input/Bank B input

bnK-A bnK-b

By combining ON/OFF setting of bank A input and bank B input, you can switch the banks.

"3-8 Bank Function (Registering Multiple Tolerance Setting Values)" (page 3-18)

■ Timing chart



*1 When the bank is switched, the internal measurement value (R.V.) shows [-----] until the average number of times (response time) elapses.

"3. Average number of times (Response time)" (page 4-17)

Reference When the judgment value (P.V.) is held using the hold function, the judgment value (P.V.) remains held even if ON/OFF for bank A input or bank B input is switched. However, the judgment output changes according to the setting value set for the new bank.

"5. Hold function" (page 4-20)

■ Minimum Input Time

ON time: 20 ms
OFF time: 20 ms

Laser emission stop input

L-StP

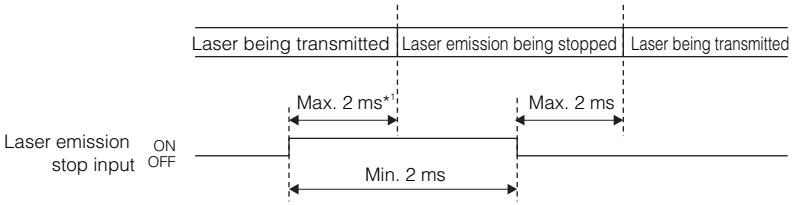
The laser emission continues to stop while the laser emission stop input is ON. The laser emission indicator on the sensor amplifier lights off while the laser emission is stopped.

"Amplifier control unit" (page 1-10)

Reference While the laser emission is stopped, the internal measurement value (R.V.) shows [-----].

"2 Display Screen and Output" (page A-9)

■ Timing chart



*1 After 2.5 ms (max.), the internal measurement value (R.V.) becomes [-----].

■ Minimum Input Time

ON time: 2 ms
OFF time: 2 ms

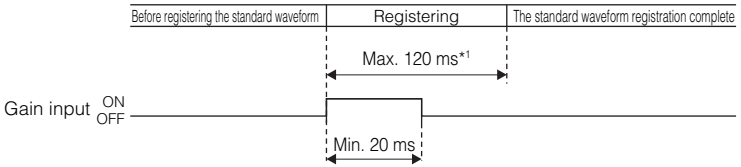
Gain input

GA in

When the Gain input is set to ON, the standard waveform is registered (Gain adjustment).

"3-4 Registering the Standard Waveform (Gain adjustment)" (page 3-9)

■ Timing chart



*1 1.5 sec. is taken when "Nonvolatile memory (EEPROM) storage function" is set for "12. Saving the standard waveform function".

■ Minimum Input Time

ON time: 20 ms
OFF time: 100 ms*1

*1 1.5 sec. is taken when "Nonvolatile memory (EEPROM) storage function" is set for "12. Saving the standard waveform function".

12. Saving the standard waveform function



When the standard waveform is registered (Gain adjustment) with the external input, make the setting for nonvolatile memory (EEPROM) to save the standard waveform.
When the standard waveform is registered with the sensor amplifier button operation, it is saved on the nonvolatile memory (EEPROM) regardless of the setting.

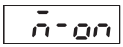
"3-4 Registering the Standard Waveform (Gain adjustment)" (page 3-9)

Note

If the data is written in the nonvolatile memory (EEPROM) over 500 thousand times, the error message is displayed and the setting may not be saved any more. (The measurement operation is possible.)

"Error displays and corrective actions" (page A-4)

When saving on the nonvolatile memory (EEPROM) is not necessary such as when you frequently register the standard waveform with PLC, setting OFF is recommended.

Saving the Standard Waveform	Description	Default value
OFF 	Not save on the nonvolatile memory (EEPROM)	○
ON 	Save on the nonvolatile memory (EEPROM)	

13. Saving zero shift value function



When the zero shift is performed with the external input, make the setting for the nonvolatile memory (EEPROM) to save the shifted status.
When the zero shift is performed with the sensor amplifier button operation, it is saved on the nonvolatile memory (EEPROM) regardless of the setting.

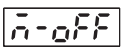
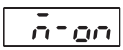
"3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)

Note

If the data is written in the nonvolatile memory (EEPROM) over 1 million times, the error message is displayed and the setting may not be saved any more. (The measurement operation is possible.)

"Error displays and corrective actions" (page A-4)

When saving on the nonvolatile memory (EEPROM) is not necessary such as when you frequently perform the zero shift with PLC, setting OFF is recommended.

Saving the Standard Waveform	Description	Default value
OFF 	Not save on the nonvolatile memory (EEPROM)	○
ON 	Save on the nonvolatile memory (EEPROM)	

14. Interference prevention function (only for IG-1000/1500)

14.inF

This function allows the amplifier to prevent the mutual interference caused by light diffraction between sensor heads.
When the "Interference prevention function setting" is set to ON, this function is effective among the added four amplifiers.
When this setting is OFF, the laser emission timing is synchronized within 20 μs. (When the average number of times is set to hsp: within 40 μs)

"3. Average number of times (Response time)" (page 4-17)
When the expansion units are not installed, this screen is skipped.

Note **When the "Interference prevention function setting" is set to ON, the update timing of the internal data on the main unit and the expansion unit do not match. Therefore, when a moving target is measured using the calculation mode, the measurement value may greatly differ from the actual value.**

"4-4 Calculation Function" (page 4-47)

Interference prevention	Description	Default value
OFF oFF	Interference prevention function OFF	○
ON on	Interference prevention function ON	

15. Display Digit

15.dSP

The number of digits of the judgment value (P.V.), the internal measurement value (R.V.) or the calculation value (CALC value) displayed on the sensor amplifier is set.

Display Digit	Description	Default value
0.001	Truncate a number to 4 decimal places	
0.01	Truncate a number to 3 decimal places	○
0.1	Truncate a number to 2 decimal places	
1	Truncate a number to 1 decimal places	

16. Power saving indication

16.Eco

When button operations are not performed more than one minute, the power saving indication is activated with the sensor amplifier and the sensor head.
The power saving indication is activated as soon as the setting is complete. The normal display is restored by pressing any of the buttons.

Power save function	Sensor Amplifier	Sensor Head	Default value
OFF oFF	Normally ON	Normally ON	○
Half HALF	Animation display*1	Normally ON	
All ALL	All OFF	Only the Power indicator [POWER] is ON.	

*1 Only one segment (horizontal bar in the center) on the main display (upper) flashes, moving in order on the display from right to left. Also, the sub display indicator turns off.



17. Position monitor

17.mon

The display status of the position monitor is set.

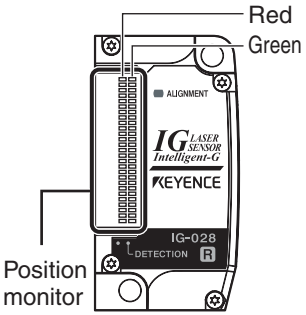
Position monitor	Description	Default value
Default setting dEFLt	Green LED: Only the measured area lights ON. Red LED: Only the light received area lights ON.	○
OK/NG display oK-nG	Green LED: Lights ON for GO judgment. Red LED: Lights ON for HIGH judgment, LOW judgment and error. "3-6 Setting the Tolerance Setting Value" (page 3-11) If GO: red is set for "18. Display Color" (page 4-43), the lighting method for green LED and red LED is reversed.	
Red : Off r-oFF	Green LED: Only the measured part lights ON Red LED: Always OFF	
Off oFF	Green LED: Always OFF Red LED: Always OFF	

■ Position monitor display

Use the position monitor on the side of the sensor head receiver to check the amount of laser light received.
The position monitor display varies depending on "1. Measurement mode" (page 4-8) and "2. Measurement direction" (page 4-17)

Reference

When a transparent object is measured, the red LED may flicker. However, if the green LED lights on in the stable condition, this is not a problem. If desired, set "Red : Off".



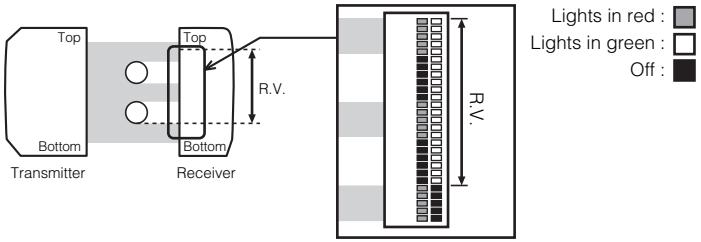
4

Setting Various Functions

- **Display example of the normal setting**
  The range with the green LED ON is the measured target and the internal measurement value (R.V.) is determined. If the green LED all lights off, the internal measurement value (R.V.) is determined as [-----].
  CCD judges that the light enters only the range with the red LED ON (exceeding the binarization level).

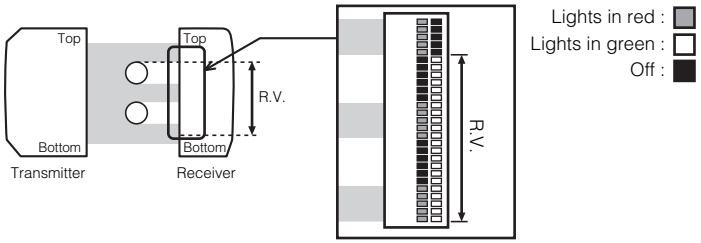
Display pattern 1

1. Measurement mode : Edge control/Positioning [A. Edg], Glass edge [d. GLS]
2. Measurement direction : Top [toP]



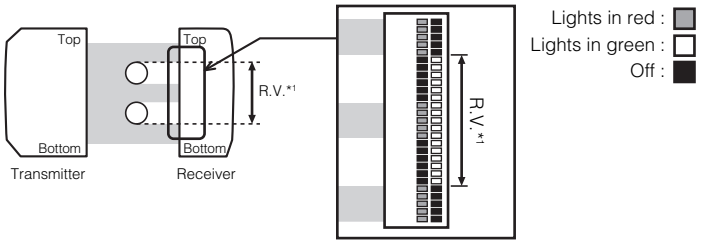
Display pattern 2

1. Measurement mode : Edge control/Positioning [A. Edg], Glass edge [d. GLS]
2. Measurement Direction : Bottom [bti]



Display pattern 3

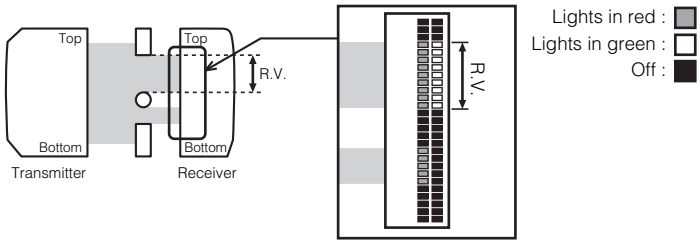
1. Measurement mode : Outer diameter/Width measurement [b. diA],
   Pin interval judgment [F. PiP], Pin diameter judgment [g. Pid]
   Specified edge interval measurement [h. uSr]



*1 When "Pin interval judgment mode" or "Pin diameter judgment mode" is set, this range is not the internal measurement value (R.V.).

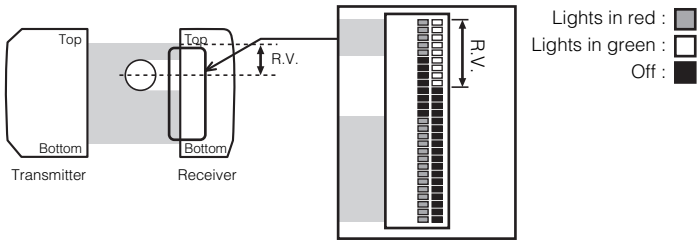
Display pattern 4

1. Measurement mode : Inner diameter/Opening measurement [ɛ. in5]



Display pattern 5

1. Measurement mode : Pin position measurement [E. P05]
2. Measurement direction : Top [toP]



18. Display Color

The light-up color of the judgment indicator is set. The display color for the main display (upper part) can be set at the same time only for the panel mount type amplifier (IG-1500/IG-1550).

"3-6 Setting the Tolerance Setting Value" (page 3-11)

Display color	DIN rail mount type (IG-1000/1050)	Panel mount type (IG-1500/IG-1550)		Default value
	Judgment indicator	Judgment indicator	Main display	
GO Green [GoGrn]	HI: Red GO: Green LO: Red	HI: Red GO: Green LO: Red	GO: Green, otherwise: Red	○
GO Red [GorEd]	HI: Green GO: Red LO: Green	HI: Green GO: Red LO: Green	GO: Red, otherwise: Green	
Always Red [rEd]	HI: Red GO: Red LO: Red	HI: Red GO: Red LO: Red	Always Red display	

4-3 Setting the Measurement Sensitivity

The measurement sensitivity can be adjusted according to the amount of light received. This can be used for various purposes by setting the binarization level and filter value. The following two methods can be used to set the binarization level and the filter value.

(1) According to the purpose, select the "Sensitivity setting" with the binarization level and filter value fixed.
(2) Set the binarization level and the filter value to the arbitrary values respectively (User).

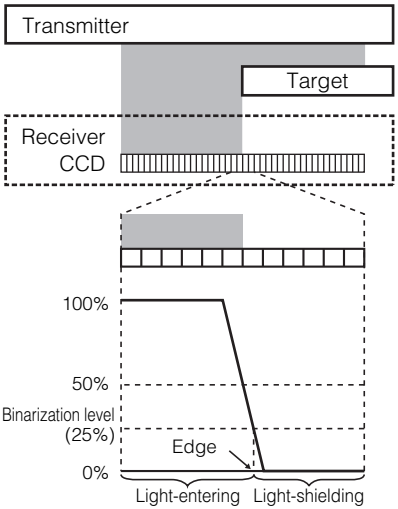
Note **If any of the sensitivity setting, binarization level or filter value is changed, register the standard waveform.**

"3-4 Registering the Standard Waveform (Gain adjustment)" (page 3-9)

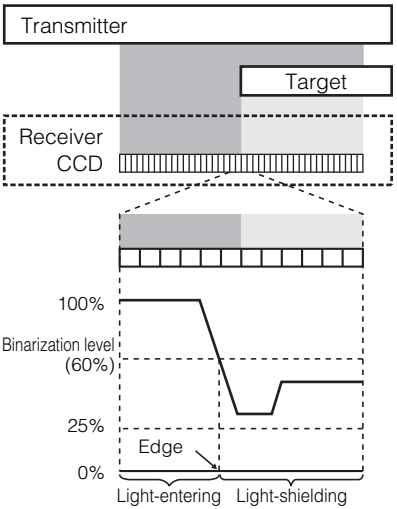
Binarization Level

The setting value to judge either light-entering or light-blocking based on the amount of light received by CCD is referred to as "Binarization level". When the light-receiving amount for the standard waveform registration (Gain adjustment) is considered as 100%, if it falls below the binarization level, it is judged as blocked.
When the object is opaque such as metal, the recommended default value is 25% from the optical characteristics standpoint.
When the object is transparent such as glass, the binarization level is required to be raised. Therefore, the high sensitivity mode is recommended for the sensitivity setting.

For light-blocking objects (i.e. metal)



For transparent objects (i.e. glass)



For transparent objects such as glass, the light-receiving amount decreases at edges. For the glass with high degree of transparency, only the edge can be detected.

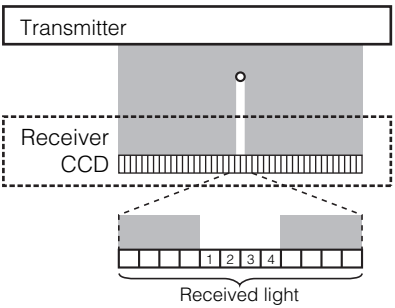
Filter Value

When the filter value is increased, the measurement tends not to be influenced by dirt stuck to the glass cover of the laser transmitter/receiver. When the filter value is decreased, small objects are stably measured.
When the filter value in the "Standard mode" is 9, only if the light-blocking part of CCD continues 9 pixels or more, it is judged as blocked. Also, only if the light-entering part of CCD continues 9 pixels or more, it is judged not blocked.

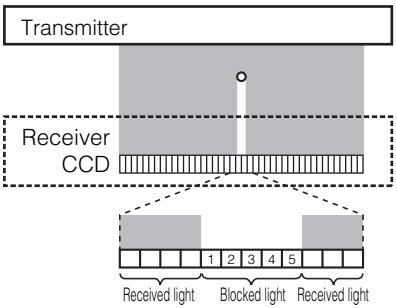
Reference

- If the filter value is increased by 1, the light-blocking part and light-entering part of CCD ignored will be increased by 1 pixel (approx. 0.014 mm).
- Depending on the light diffraction caused due to the mounting distance or measurement position, the size of the object actually ignored changes.

(example) Filter value: 5



The blocked light only covers four pixels and will be judged as received light.



The light blocked covers 5 pixels and will be judged as a blocked area.

Setting Method

Main screen



◀ + ▶ button
2 seconds or more
at the same time

1 **Press ◀ button and ▶ button for approx. 2 seconds on the main screen at the same time.**



2 **Press ▲ / ▼ button to set the sensitivity setting and press ▶ button.**

When selecting settings other than "User", the main screen is restored.
When the "User" is selected, go to step 3.

Setting value	Description	Binarization level	Filter value	Default value
hi	High sensitivity mode This mode is for measuring glass, small targets, thin film or transparent target.	60%	4	
dEFLt	Standard mode	25% [60%]	9[4]	○
Lo	Low sensitivity mode This mode tends not to be influenced by dirt stuck to the transmitter/receiver.	15%	41	
uSr	User	10% to 90% Default value 25%	3 to 50 Default value 9	

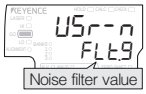
When the glass edge mode is selected for the measurement mode, the value in [ ] is determined.
"1. Measurement mode" (page 4-8)

▶ button
(When [uSr] is selected)



▶ button

3 **Press ▲ / ▼ button to set the binarization level and press ▶ button.**



[MODE] or
▶ button

4 **Press ▲ / ▼ button to set the filter value and press [MODE] or ▶ button.**

The main screen is restored.

Main screen

Reference

- When the [MODE] button is pressed during setting, the main screen is restored while the settings made so far remain effective.
- When ◀ button is pressed, the display returns to the previous screen.

4-4 Calculation Function

The internal measurement value (R.V.) for the "main unit" and the "expansion unit additionally installed next to the main unit (referred to as expansion unit 1)" can be calculated (addition or subtraction).
If there are more than one expansion units, the calculation function can be used between the "main unit" and the "expansion unit 1" only.

There are three calculation modes for the calculation function.
- Addition Mode
- Subtraction Mode
- 2 heads Mode

Note

- **If the measurement mode for the main unit is set to the "Pin interval judgment mode" or "Pin diameter judgment mode", the calculation function cannot be used. If the measurement mode for the expansion unit 1 is set to the "Pin interval judgment mode" or "Pin diameter judgment mode", the mode is automatically changed to the "Edge control/Positioning mode".**
  "1. Measurement mode" (page 4-8)
- **When the calculation function is used, if the average number of times of expansion unit 1 differs from the one of main unit, it is automatically changed to the same setting as the setting for the main unit.**
- **When the average number of times "hsp" is set, the update timing of the internal data on the main unit and the expansion unit does not match. Therefore, when a moving object is measured using the calculation mode, the measurement value may greatly differ from the actual value.**
  "3. Average number of times (Response time)" (page 4-17)

Calculation Value (CALC value)

The calculation result of the internal measurement value (R.V.) for the "main unit" and the "expansion unit 1" is referred to as calculation value (CALC value).
The "main unit" operates with the calculation value (CALC value) considered as a judgment value (P.V.).
The "expansion unit 1" operates with its internal measurement value (R.V.) considered as a judgment value (P.V.).

Reference

- The calculation value (CALC value) can be displayed on the sub display (lower level) on the main unit.
  "Sub Display (Lower Level)" (page 3-4)
- When the hold function is used, the calculation value (CALC value) is not held.
  "5. Hold function" (page 4-20)

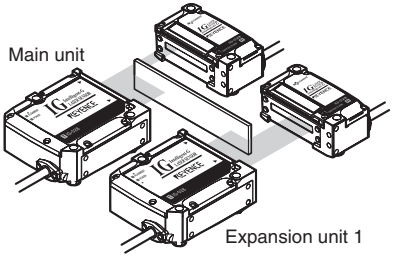
Addition Mode

In the addition mode, the added value of the internal measurement value (R.V.) for the "main unit (A)" and the "expansion unit 1 (B)" is considered as the calculation value (CALC value).

Calculation value = (A's R.V.) + (B's R.V.)

The diameter or width of a large object that cannot be measured with the measurement range of one sensor head can be measured.

Setting example 1

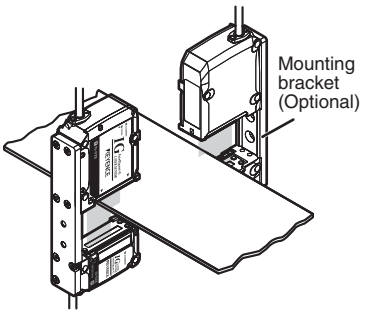


Item	Main unit	Expansion unit
1. Measurement mode	Edge control/Positioning	
2. Measurement direction	Bottom	Top

If the zero shift function is used, the actual diameter or width of the object can be displayed as a calculation value (CALC value).

"3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)

Setting example 2



Item	Main unit	Expansion unit
1. Measurement mode	Edge control/Positioning	
2. Measurement direction	Top	

If the zero shift function is used, the actual diameter or width of the object can be displayed as a calculation value (CALC value).

"3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)

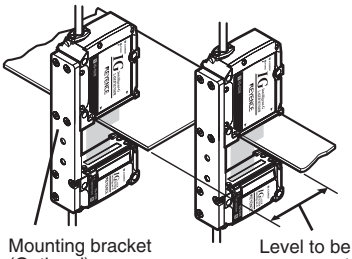
Subtraction Mode

In the subtraction mode, the value obtained by subtracting the internal measurement value (R.V.) for the "expansion unit 1 (B)" from the internal measurement value (R.V.) for the "main unit (A)" is considered as the calculation value (CALC value).

Calculation value = (A's R.V.) - (B's R.V.)

Setting example 1

Only levels can be measured with the parallel movement of the object ignored.



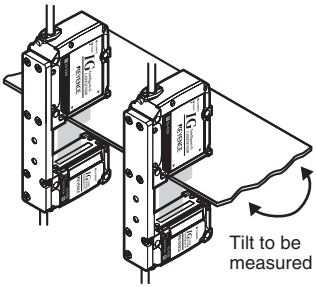
Item	Main unit	Expansion unit
1. Measurement mode	Edge control/Positioning	
2. Measurement direction	Top	

If the zero shift function is used, the actual levels of the object can be displayed as a judgment value (P.V.).

"3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)

Setting example 2

Tilt can be checked with the parallel movement of the object ignored. (If the calculation value is constant, it is judged that the tilt is not present.)



Item	Main unit	Expansion unit
1. Measurement mode	Edge control/Positioning	
2. Measurement direction	Top	

2 heads Mode

The calculation method for the 2 heads mode is the same as the one for the addition mode. The difference (merit) from the addition mode is as follows.

- The display range of the main unit's judgment value (P.V.) is changed to -999.99 to 999.99. This is convenient to display the actual diameter or width of a large object in combination with the zero shift function.

  "3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)
- Settings other than the standard waveform registration (Gain adjustment) or measurement sensitivity setting are not required for the expansion unit 1.

  "3-4 Registering the Standard Waveform (Gain adjustment)" (page 3-9)

  "4-3 Setting the Measurement Sensitivity" (page 4-44)

Note

- **When the 2 heads mode is used, the functions of the "main unit" are restricted as below.**
  1. Measurement mode : Only the Edge control/Positioning mode or Glass edge mode selectable

  "1. Measurement mode" (page 4-8)

  Zero shift function : The zero shift is canceled temporarily. After that, the zero shift is effective only for the calculation value (CALC value), and the internal measurement value (R.V.) is not shifted.

  "3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)
- **When the 2 heads mode is used, screens of "expansion unit 1" other than the following setting screens are not displayed.**
  4. Output mode, 9. Edge check function, 11. External input, 12. Saving the standard waveform function,15. Displayed digit, 16. Power saving indication, 17. Position monitor, 18. Display color

  "4-2 Basic Settings and Advanced Settings" (page 4-4)
- **When the 2 heads mode is used, the functions of the "expansion unit 1" are restricted as below.**
  1. Measurement Mode: Fixed to the same mode as the one for the main unit
  2. Measurement direction: Fixed to "Top"
  3. Average number of times (Response time): Fixed to the same setting as the one for the main unit
  11. External inputs: The zero shift input, timing input and reset input are disabled.

  "4-2 Basic Settings and Advanced Settings" (page 4-4)

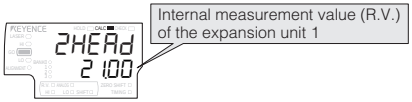
  Zero shift function: The zero shift is canceled. Cannot be used any more.

  "3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)

  Tolerance setting: The tolerance tuning and two-point tuning cannot be used.

  "3-6 Setting the Tolerance Setting Value" (page 3-11)

  Judgment output: Outputs other than the error output during error are not output.
- **When the 2 heads mode is used, the display of the "expansion unit 1" is as below.**



Reference

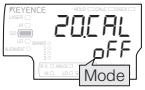
- The display range of the main unit's judgment value (P.V.) is changed to -999.99 to 999.99. Therefore, the following setting range is changed to -999.99 to 999.99 and the value already set becomes ten-fold.
  Tolerance setting value "3-6 Setting the Tolerance Setting Value" (page 3-11)
  Shift target value "3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)
  Trigger level "5. Hold function" (page 4-20)
  Analog Output Scaling "10. Analog output scaling" (page 4-32)
- The setting range of the tolerance setting width ("3-6 Setting the Tolerance Setting Value" (page 3-11)) is changed to 0.00 to 999.99 and the value already set becomes ten-fold.
- The setting range of the hysteresis ("8. Hysteresis" (page 4-30)) is changed to 0.00 to 99.99. (The value already set will not become ten-fold.)

Setting Method (Only Main Unit)

Main screen



[MODE] + ◀ button
2 seconds or more
at the same time



[MODE] or
▶ button

Main screen



1 **Press [MODE] button and ◀ button for approx. 2 seconds on the main screen at the same time.**

[20.cAL] is displayed on the main display (upper level).

2 **Press ▲ / ▼ button to set the mode and press [MODE] or ▶ button.**

Setting value	Description	Default value
oFF	The calculation function is not used.	○
PLuS	Addition Mode	
MinuS	Subtraction Mode	
2hEAd	2 Heads Mode	

If there is no expansion unit additionally installed, the setting cannot be changed from [oFF].

3 **When settings other than "The calculation function is not used" are set on the main screen, the calculation indicator "CALC" lights up.**

Response Time When the Calculation Function is Used

When the calculation function is used, the calculation process is added. Therefore, the response time is delayed.
According to the number of additionally installed expansion units, add the following time to the average number of times (response time) set on the main unit.

"3. Average number of times (Response time)" (page 4-17)

Number of installed units (including the main unit)	Interference prevention function*1 OFF	Interference prevention function ON
2	5 ms	7 ms
3	7 ms	7 ms
4	10 ms	14 ms

*1 "14. Interference prevention function (only for IG-1000/1500)" (page 4-40)

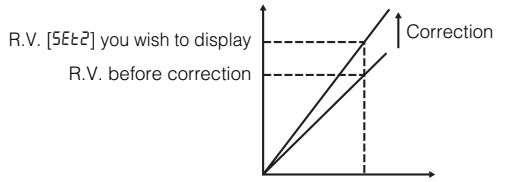
Reference

- When the calculation function is used, the setting of the average number of times (Response time) for the expansion unit is the same as the one for the main unit.
- If connecting RS-232C Communication Unit DL-RS1A or the BCD Output Unit DL-RB1A, add "7 ms" to the value in the table above.

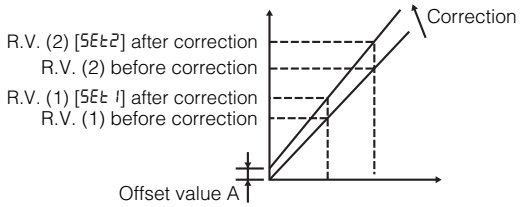
4-5 Calibration Function

When there is difference between the internal measurement value (R.V.) and the actual dimension of the object, the value can be corrected. There are two correction methods as below: One-point calibration and Two-point calibration

One-point calibration
Only tilt (span) is corrected while the zero point (offset) is not corrected.



Two-point calibration
Both the zero point (offset) and the tilt (span) are corrected.



Note

- **If the following conditions are not satisfied, the screen below is displayed when the setting is complete. Make the setting again.**



For one-point calibration

$$0.5 \leq \frac{\text{(R.V. you wish to display)}}{\text{(R.V. before correction)}} \leq 2$$

For two-point calibration

$$0.5 \leq \frac{\text{(R.V. (2) you wish to display) - (R.V. (1) you wish to display)}}{\text{(R.V. (2) before correction) - (R.V. (1) before correction)}} \leq 2$$

-99.999 ≤ (offset value A) ≤ 99.999

"3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)

- **If the measurement mode is set to the "Pin interval judgment mode" or "Pin diameter judgment mode", the calibration function cannot be used. Only "Standard" and "User setting" can be switched on the setting screen.**

"1. Measurement mode" (page 4-8)

Setting Method 1 (One-point Calibration)

Main screen



[MODE] + ▶ button
2 seconds or more
at the same time



▶ button



[SET] button



[SET] button

Main screen

1 **Press [MODE] button and ▶ button for approx. 2 seconds on the main screen at the same time.**

[40.CLb] is displayed on the main display (upper level).

2 **Press ▲ / ▼ button to set [uSr] and press ▶ button.**

Setting value	Description	Default value
dEFLt	Standard	○
uSr	User setting	

3 **Press the [SET] button without the object. (SET 1 Confirmation operation)**

After [SEt 1] blinks on the main display (upper level) several times, [SEt2] is displayed.

4 **Press ▲ / ▼ button to set "R.V. you wish to display" for [SEt2].**

[SEt2] and the current internal measurement value (R.V.) are displayed alternately on the main display (upper level).

Item	Setting range	Default value
SEt2	-99.999 to 99.999	5.000

5 **Press the [SET] button while the "R.V. before correction" is displayed on the main display (upper level). (SET 2 Confirmation operation)**

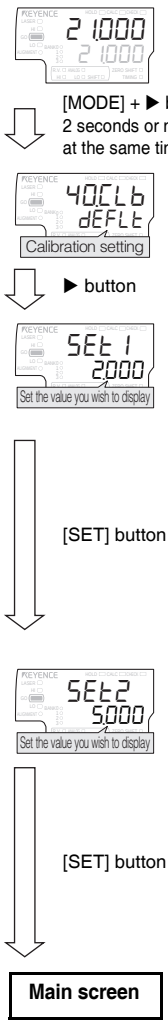
After [SEt2] blinks on the main display (upper level) several times, the setting is complete and the main screen is restored.

Reference

- When ◀ button is pressed, the display returns to the previous screen.
- When the [MODE] button is pressed or both the [MODE] button and ▶ button are continuously pressed at the same time, the setting is canceled and the main screen is restored.
- When ▶ button is pressed in step 4, the setting is canceled and the main screen is restored.

Setting Method 2 (Two-point Calibration)

Main screen



1 **Press [MODE] button and ▶ button for approx. 2 seconds on the main screen at the same time.**

[40.CLb] is displayed on the main display (upper level).

2 **Press ▲ / ▼ button to set [uSr] and press ▶ button.**

Setting value	Description	Default value
dEFLt	Standard	○
uSr	User setting	

3 **Press ▲ / ▼ button to set "R.V. (1) you wish to display" for [SEt 1].**

[SEt 1] and the current internal measurement value (R.V.) are displayed alternately on the main display (upper level).

Item	Setting range	Default value
SEt 1	-99.999 to 99.999	0.000

4 **Press the [SET] button while the "R.V. (1) before correction" is displayed on the main display (upper level). (SET 1 Confirmation operation)**

After [SEt 1] blinks on the main display (upper level) several times, [SEt2] is displayed.

5 **Press ▲ / ▼ button to set "R.V. (2) you wish to display" for [SEt2].**

[SEt2] and the current internal measurement value (R.V.) are displayed alternately on the main display (upper level).

Item	Setting range	Default value
SEt2	-99.999 to 99.999	5.000

6 **Press the [SET] button while the "R.V. (2) before correction" is displayed on the main display (upper level). (SET 2 Confirmation operation)**

After [SEt2] blinks on the main display (upper level) several times, the setting is complete and the main screen is restored.

Reference

- When ◀ button is pressed, the display returns to the previous screen.
- When the [MODE] button is pressed or both the [MODE] button and ▶ button are continuously pressed at the same time, the setting is canceled and the main screen is restored.
- When ▶ button is pressed in step 5, the setting is canceled and the main screen is restored.

Specifications

5

This chapter describes the specifications, circuit diagrams, and dimensions of the IG Series.

5-1 Specifications 5-2

5-2 Circuit Diagram 5-4

5-3 Dimensions 5-6

5-1 Specifications

Sensor Head

Model		IG-010	IG-028
Operation principle		CCD method	
Light source		Visible light semiconductor laser (Wavelength: 660 nm)	
	Laser class	Class1(IEC60825-1,FDA CDRH Part1040.10*1)	
Mounting distance		0 to 1000 mm	0 to 1500 mm
Measurement range		10 mm	28 mm
Sampling cycle		980 µs (When the average number of times is set to H5P: 490 µs)	
Minimum object for detection*2	High sensitivity mode	ϕ0.1 mm (Mounting distance: 100 mm)	ϕ0.1 mm (Mounting distance: 100 mm)
	Standard mode	ϕ0.2 mm (Mounting distance: 40 mm) ϕ0.5 mm (Mounting distance: 500 mm)	ϕ0.2 mm (Mounting distance: 50 mm) ϕ0.5 mm (Mounting distance: 500 mm)
Repetition accuracy*3		5 µm (Mounting distance: 100 mm) 10 µm (Mounting distance: 500 mm) 80 µm (Mounting distance: 1000 mm)	5 µm (Mounting distance: 100 mm) 10 µm (Mounting distance: 500 mm) 80 µm (Mounting distance: 1000 mm) 140 µm (Mounting distance: 1500 mm)
Linearity*4		±0.28 % of F.S. (±28 µm)	±0.1 % of F.S. (±28 µm)
Temperature characteristics*5		±0.03 % of F.S./°C (±3 µm/°C)	±0.01 % of F.S./°C (±3 µm/°C)
Operation status indicator	Transmitter	Optical axis alignment indicator: Green LED Power indicator: Green LED	
	Receiver	Optical axis alignment indicator: Green LED Position monitor: Dual bar LED (Red, Green)	
Environment resistance	Protection structure	IP67	
	Ambient temperature	-10 to +45°C (No freezing)	
	Ambient humidity	35 to 85 % RH (No condensation)	
	Ambient light*6	Incandescent lamp: 5000 lx Sunlight: 5000 lx	
	Vibration resistance	10 to 55 Hz Double amplitude1.5 mm X, Y, Z each axis: 2 hours	
	Pollution degree	2	
Material	Case	Zinc die-cast (Lower case), PBT (Upper case) Poly Arylate (PAR) (Display part), SUS304 (Metal part)	
	Lens cover	Glass	
	Cable	PVC	
Weight (including supplied items)		Approx. 380 g	Approx. 500 g

*1 The classification is based on IEC60825-1 standard following the Laser Notice from FDA (CDRH).

*2 When the object is detected at the center position of the mounting distance.
When the measurement mode is set to the glass edge mode, a glass edge of C0.1 mm or more can be detected with the mounting distance of 500 mm.

*3 When the light is shielded by half at the center position of the mounting distance.
Vibration width when the average number of times is set to 16 and sampling is performed for 30 seconds.
(When the analog output is used, the margin of error of analog output is added.)

*4 When the mounting distance is 100 mm, and light is shielded at 50 mm position from the receiver.
Margin of error to the ideal line.

*5 When the mounting distance is 100 mm, and light is shielded by half at 50 mm position from the receiver.

*6 Excluding when the average number of times is set to "H5P".

Sensor Amplifier

Model		IG-1000	IG-1050	IG-1500	IG-1550
Type		DIN rail mount		Panel mount	
Main unit/Expansion unit		Main unit	Expansion unit	Main unit	Expansion unit
Analog output		Yes	No	Yes	No
Power supply voltage *1		DC10-30V Ripple (P-P) 10 % included, Class2 or LPS			
Power consumption (including analog current output) *2	Normal	2700 mW or less (at 30 V:90 mA or less)		2880 mW or less (at 30 V:96 mA or less)	
	Power save function (HALF)	2300 mW or less (at 30 V: 77 mA or less)			
	Power save function (ALL)	2200 mW or less (at 30 V: 74 mA or less)			
Digital display method		Dual 7-seg display Upper level: Red, 5 digits, Lower level: Green, 5 digits		Dual 7-seg display Upper level: Red/Green, 2 colors, 5 digits, Lower level: Green, 5 digits	
Display range		-99.999 to 99.999, -99.99 to 99.99, -99.9 to 99.9, -99 to 99 (selectable)			
Display resolution		1 μm, 10 μm, 100 μm, 1000 μm (selectable)			
Operation status indicator		Judgment indicator: Red/Green 2 colors LED (HI, LO, GO) Bank indicator: Green LED x 4 Laser emission indicator: Green LED Others: Green LED x 8, Red LED x 3			
Output	Judgment output (selectable between NPN and PNP)	NPN (PNP) Open collector x 3 ch, DC 30 V (Power supply voltage) or less, Residual voltage 1 V (2 V) or less, NO/NC selectable, Max. 50 mA/ch*3			
	Response time (judgment output)	1.96 to 4031.72 ms*4			
	Edge check output (selectable between NPN and PNP)	NPN (PNP) Open collector x 1 ch, DC 30 V (Power supply voltage), Residual voltage 1 V (2 V) or less, NO/NC selectable, Max. 50 mA*3, Response time 20 ms			
	Analog output (selectable among ±5 V, 1-5 V, 0-5 V, 4-20 mA)		Voltage output	Current output	
		Output range	±5 V (full scale 10 V)	4-20 mA (full scale 16 mA)	
		Output resistance	100 Ω	-	
		Maximum load resistance	-	350 Ω	
		Repetition accuracy	±1mV	±1.5 μA	
		Display accuracy	±0.05 % of F.S.	±0.25 % of F.S.	
		Temperature characteristics	±0.005 % of F.S./°C	±0.01 % of F.S./°C	
		Update cycle	Same as sensor head sampling cycle		
		Response delay time	Same as Response time (judgment output)		
		Time constant*5	10 μs (90 % response)	30 μs (90 % response)	
Input	Gain input	Input time: 20 ms or more, Response delay time: 120 ms or less (When saving on nonvolatile memory (EEPROM): 1.5 s)			
	Reset input	Input time: 20 ms or more, Response delay time: 20 ms or less			
	Timing Input	Input time: 2 ms or more, Response delay time: 2 ms or less			
	Zero shift input	Input time: 20 ms or more, Response delay time: 20 ms or less			
	Bank A input/Bank B input	Input time: 20 ms or more, Response delay time: 20 ms or less*6			
	Laser emission stop input	Input time: 2 ms or more, Response delay time: 2 ms or less			
Environment resistance	Ambient temperature	-10 to +50 °C (No freezing)			
	Ambient humidity	35 to 85% RH (No condensation)			
	Vibration resistance	10 to 55 Hz Double amplitude 1.5 mm X, Y, Z each axis: 2 hours			
	Pollution degree	2			
Material		Main unit case/Front sheet: Polycarbonate, Key top: Polyacetal, Cable: PVC			
Weight (including supplied items)		Approx. 150 g	Approx. 140 g	Approx. 170 g	Approx. 165 g

*1 Use with the over current protection device which is rated 30 V or more and not more than 1 A.

*2 Does not include the power consumption of the load. The power consumption with expansion units installed is the total of each amplifier unit's power consumption.
Example: When using one master unit (IG-1000) with two expansion units (IG-1050)
(2700 mW x 1) + (2700 mW x 2) = 8100 mW

*3 When expansion units are added: 20 mA/ch

*4 "3. Average number of times (Response time)" (page 4-17)

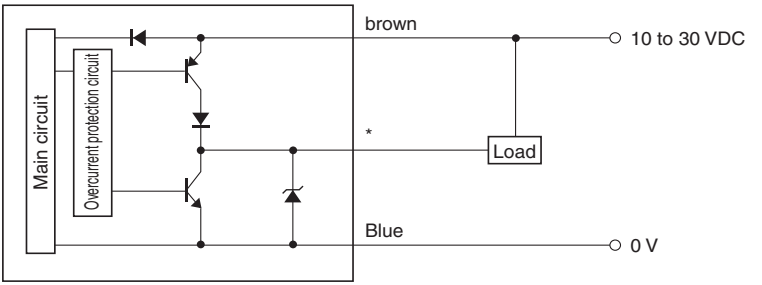
*5 Delay time that occurs from the analog output circuit after the judgment is output.

*6 For detailed time chart, refer to "11. External input" (page 4-33).

5-2 Circuit Diagram

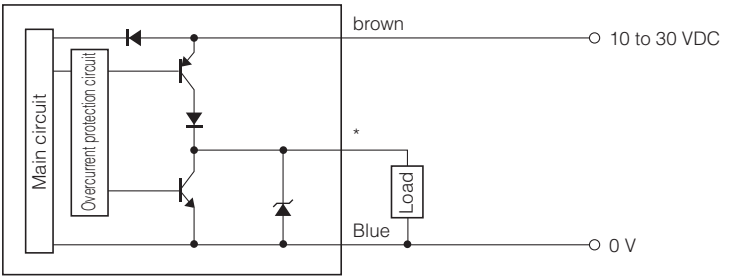
Output Circuit Diagram

When NPN output is selected



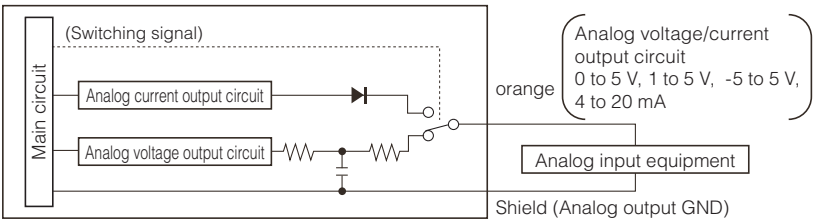
* Black (HIGH judgment output)/White (LOW judgment output)/
Gray (GO judgment output)/Green (edge check output)

When PNP output is selected



* Black (HIGH judgment output)/White (LOW judgment output)/
Gray (GO judgment output)/Green (edge check output)

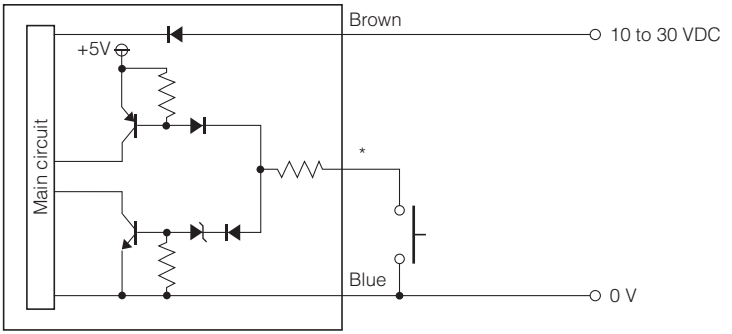
Analog Output Circuit



Note **Do not short-circuit the shield (analog output GND) and blue (0 V).**

Input Circuit Diagram

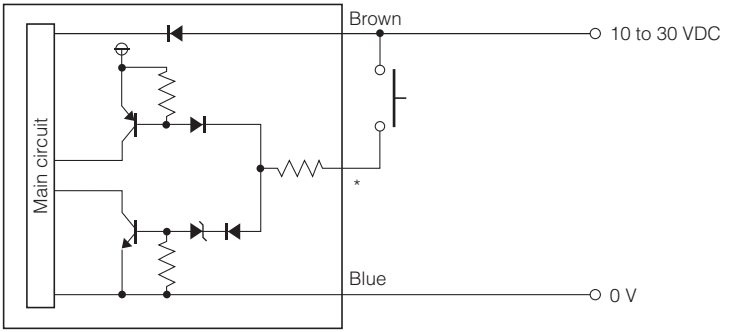
When NPN output is selected



(Short-circuit current 2 mA or less)

* Pink (External input 1)/Yellow (External input 2)/
Pink and Purple(External input 3)/Purple (External input 4)

When PNP output is selected



(Short-circuit current 2 mA or less)

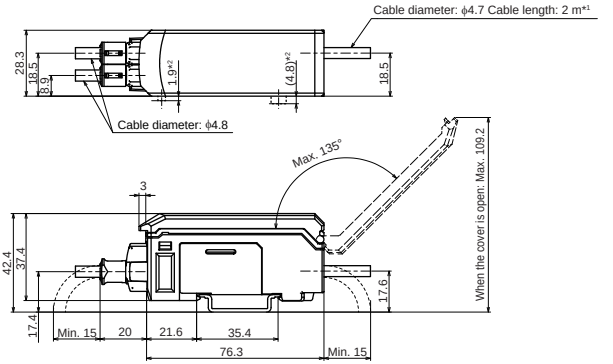
* Pink (External input 1)/Yellow (External input 2)/
Pink and Purple(External input 3)/Purple (External input 4)

5-3 Dimensions

Sensor Amplifier

IG-1000/IG-1050

unit: mm

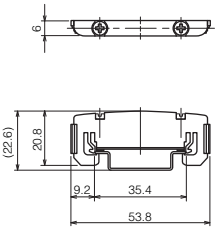


*1 Cable specification : IG-1000 12 cores, Nominal cross-section area brown/blue: 0.20 mm^2, others 0.15 mm^2
: IG-1050 8 cores, Nominal cross-section area: 0.15 mm^2

*2 Not mounted on the IG-1000.

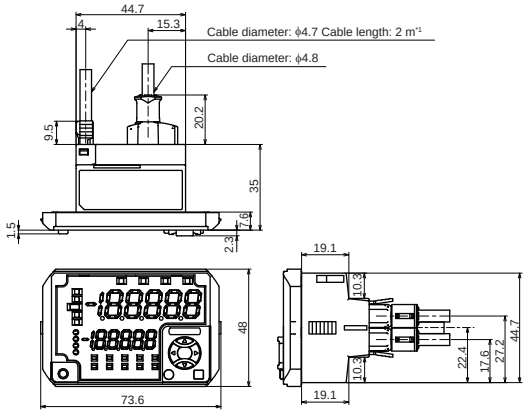
End unit (OP-26751)

unit: mm



IG-1500/IG-1550

unit: mm

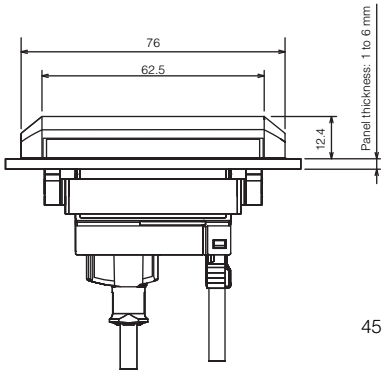


*1 Cable specification : IG-1500 12 cores, Nominal cross-section area brown/blue: 0.20 mm^2, others 0.15 mm^2
: IG-1550 8 cores, Nominal cross-section area: 0.15 mm^2

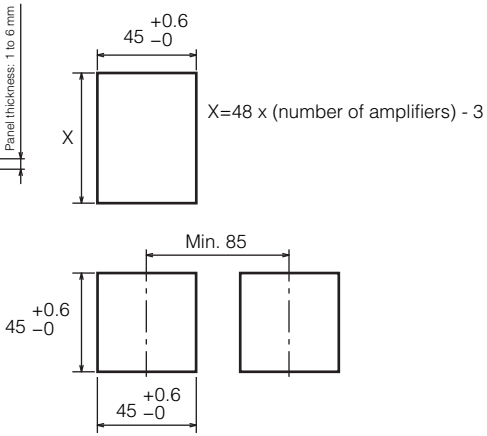
Panel cutout dimensions

unit: mm

When mounting the panel



Panel cutout dimensions

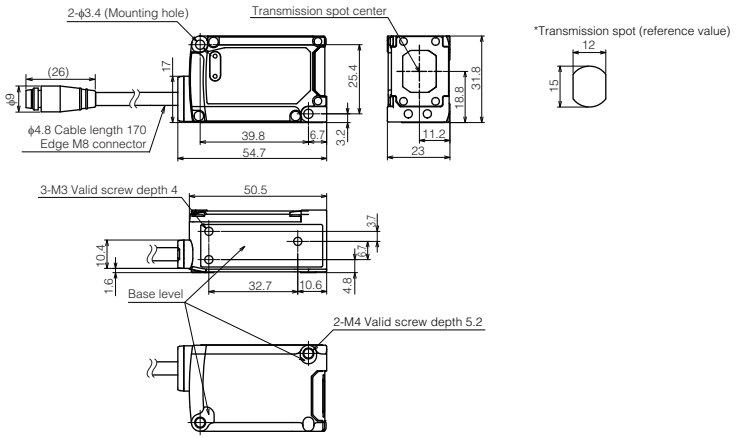


Sensor Head

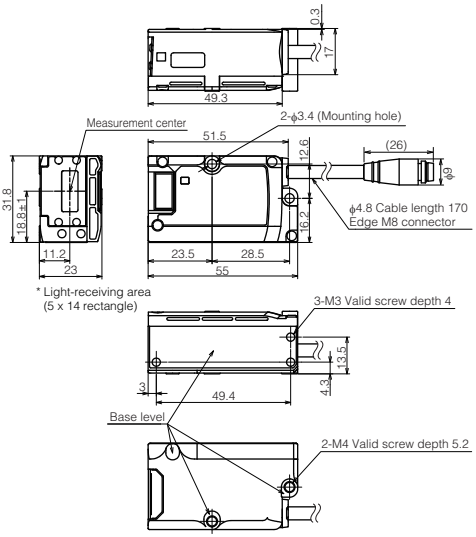
IG-010

unit: mm

■ **Transmitter**



■ **Receiver**

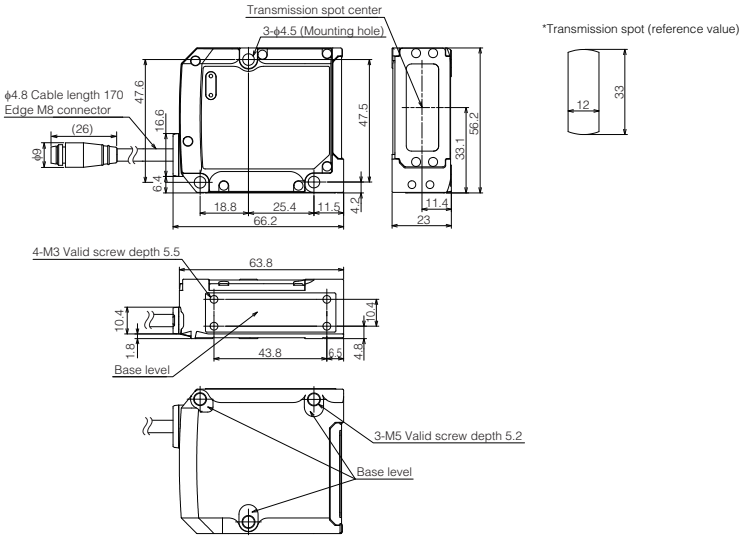


5 Specifications

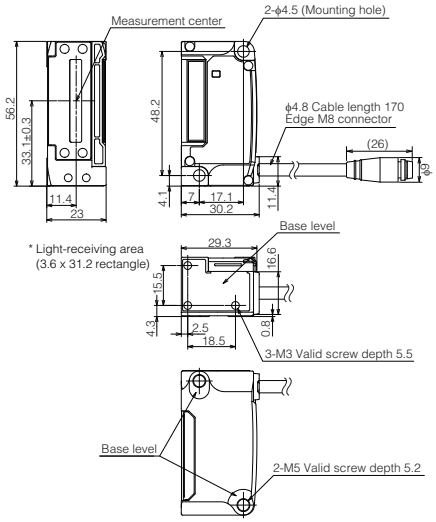
IG-028

unit: mm

■ Transmitter

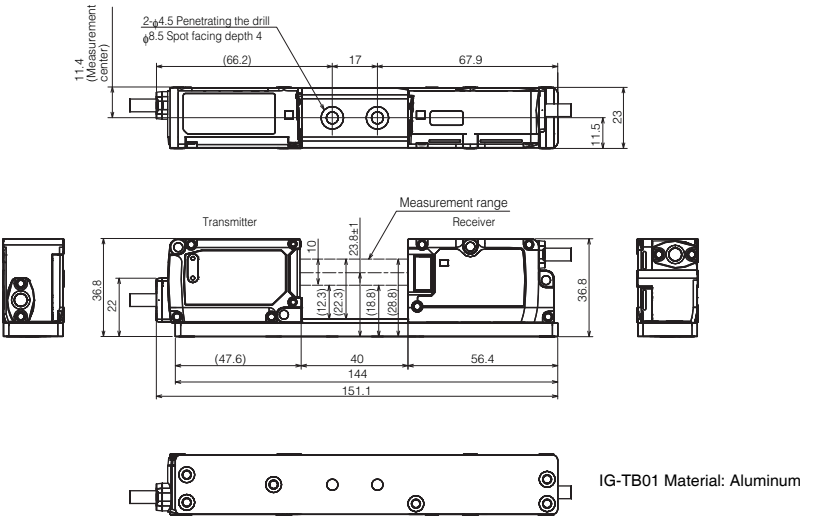


■ Receiver



When the IG-TB01 (for IG-010) is used

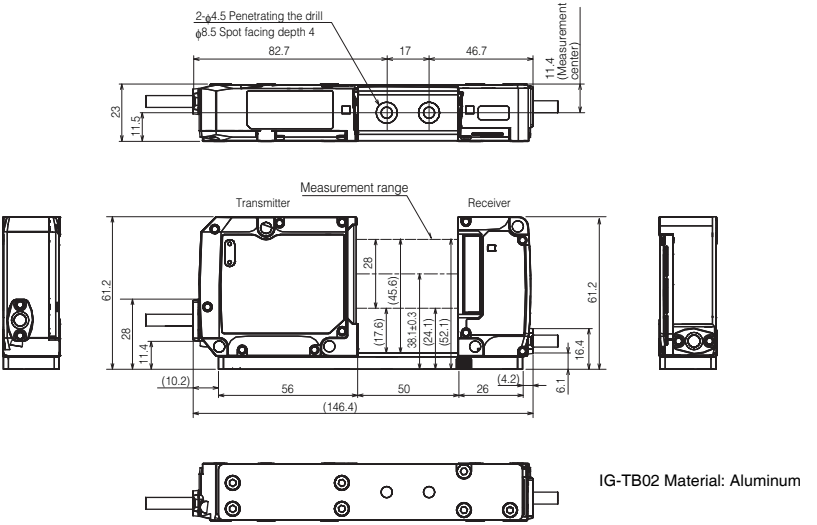
unit: mm



IG-TB01 Material: Aluminum

When the IG-TB02 (for IG-028) is used

unit: mm



IG-TB02 Material: Aluminum

IG Configuration Software (IG-H1)

6

This chapter describes the configuration method for the IG configuration software (IG Configurator: IG-H1).

6-1 Software Licensing Conditions..... 6-2

6-2 Before Use 6-4

6-3 Part Names and Functions..... 6-12

6-4 Configuration Tab 6-14

6-5 Monitor tab..... 6-20

6-6 Menu Bar..... 6-25

6-1 Software Licensing Conditions

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System Environment for Use

To use the IG Configurator, the following system environment is required.

OS	Windows 7 Ultimate / Professional / Home Premium[*1] Windows Vista Ultimate / Business / Home Premium / Home Basic[*2] SP1 or later versions Windows XP Professional / Home Edition[*2] SP2 or later versions Windows 2000 Professional[*3] SP4 or later versions
CPU	Windows 7/Vista: Meets system requirements for the OS Windows XP/2000: Pentium Ⅲ1.2GHz or more
Display language	Japanese or English
Memory capacity	Windows 7/Vista: Meets system requirements for the OS Windows XP/2000: 512MB or more
Display	XGA (1024 x 768 pixel) or more, High Color (16 bit) or more
Hard disk space	100MB or more[*4]
CD-ROM drive	Required
Communication interface	RS-232C (serial) port
Operating condition	.NET Framework 2.0 has been installed.[*5]

*1 Supports both 32 and 64-bit versions. Also, Japanese, English, German, Chinese (simplified), Chinese (traditional) and Korean versions are supported. However, display languages are Japanese and English only.

*2 Only 32bit version is supported. Also, Japanese, English, German, Chinese (simplified), Chinese (traditional) and Korean versions are supported. However, display languages are Japanese and English only.

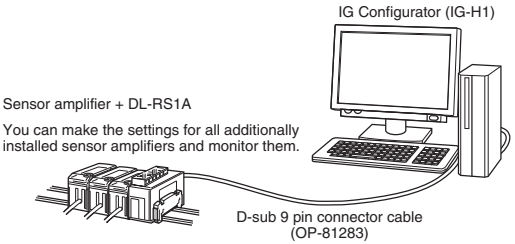
*3 Only Japanese and English versions are supported.

*4 400 MB or more of hard disk space are necessary for a PC with ".NET Framework 2.0" not installed.

*5 If ".NET Framework 2.0" has not been installed onto the PC, ".NET Framework 2.0" is automatically installed when IG Configurator is installed.
The following conditions must be satisfied to install ".NET Framework 2.0".
- 300 MB of hard disk space are secured.
- Windows Installer 3.0 or later versions has been installed.
- Internet Explorer 5 or later versions has been installed.

To use the IG Configurator, "RS-232C Communication Unit DL-RS1A" is required. For details on DL-RS1A, refer to "RS-232C Communication Unit DL-RS1A User's Manual".

Note **The DL-RS1A purchased before July 14, 2009 cannot be used. For details, consult your nearest dealer.**



Installing the IG Configurator

This section describes how to install the IG Configurator.

Preparation for installation

Check the following before installation.

Note **Backing up the data is recommended in case of accidents such CD-ROM damage, etc.**

■ **Hard disk space**

The IG Configurator can be installed only on a hard disk drive. 100 MB of hard disk space at the installation destination are necessary. (400 MB are necessary for a PC with .NET Framework 2.0 not installed.) If the hard disk space is insufficient, secure the space beforehand.

■ **RS-232C (serial) port**

To transfer configuration data from a PC to the IG Series or use the monitor function, make the RS-232C (serial) port of the PC ready to use. For the configuration method, refer to the operation manual of your PC.

■ **Manual file**

This software's manual file is made in PDF file format. Install Adobe Systems' Adobe Reader to view this manual.
This free software can be downloaded from Adobe Systems web site (http://www.adobe.com/).

Notes for Windows XP/2000

■ **User's authority**

If you install IG Configurator on the standard folder (C:\Program Files\KEYENCE\IG Configurator\), set the access right as follows.

- Give the Administrator authority to the users using the IG Configurator.

Notes for Windows Vista

■ User's authority

If you install IG Configurator on the standard folder (C:\Program Files\KEYENCE\IG Configurator\), set the access right as follows.

- Give the Administrator authority to the users using the IG Configurator. If "User Account Control" screen appears during installation, click "Continue (C)".

Installation

This section describes how to install the IG Configurator on a PC, taking the following drive configuration as an example.
C drive : hard disk drive
E drive : CD-ROM drive

Note **For installation, log on as a user having the Administrator authority.**

1 Start Windows and insert "IG-H1" into the CD-ROM drive.

- The installation program starts by the PC's Auto-run function. If the installation program does not start, select "Run" from the Start Menu and enter "e:\setup" on the "Run" menu, then click "OK" button.
- Start installation according to the instruction of the installation program.

■ Folder on which the IG Configurator is installed

The IG Configurator is installed on the folder below when installed with the default setting.
C:\Program Files\KEYENCE\IG Configurator\

Uninstalling the IG Configurator

Use "Add or Remove Programs" on the Control Panel of Windows to uninstall the IG Configurator.

Note **For uninstallation, log on as a user having the Administrator authority.**

Starting and Exiting the IG Configurator

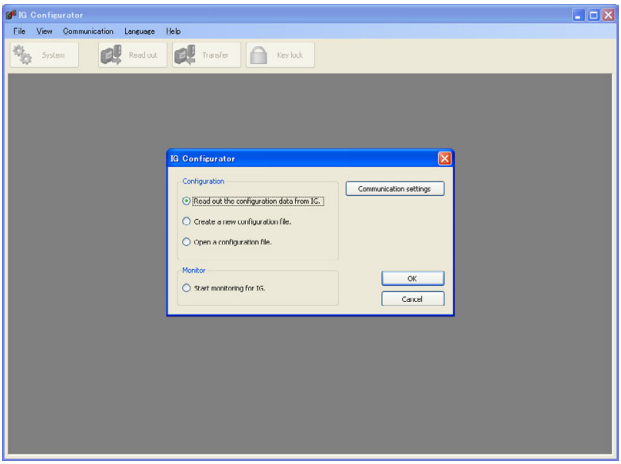
This section describes how to start/exit the IG Configurator.

Start

IG Configurator starts with the following procedure.

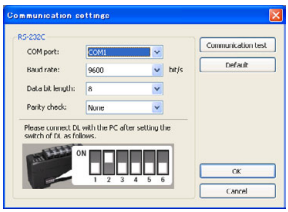
1 **From the Windows [Start] button, select [Program]→[KEYENCE Applications]→[IG Configurator], or double-click the IG Configurator icon.**

The IG Configurator starts, and the main screen and the [How to start] dialog box appears.



2 **Click the [Communication settings] button.**

The [Communication settings] dialog box appears.
Make the communication settings. For the setting method of DL-RS1A, refer to "RS-232C Communication Unit DL-RS1A User's Manual".



RS-232C

Item	Description
COM port	Setting range : Displays all the COM ports equipped with the PC If the COM ports are not present on the PC, the display shows blank and communication with the IG is not available. Default value : COM1
Baud rate	Setting range : 2400 / 4800 / 9600 / 19200 / 38400 Default value : 9600bit/s
Data bit length	Setting range : 7 / 8 Default value : 8
Parity check	Setting range : None/Even/Odd Default value : None

Communication test

Perform the test to check if the communication with the IG is possible.

Note

- **Before clicking [Communications test], check if the PC and the IG Series are properly connected.**
- **Confirm that the IG is turned on.**
- **Confirm the DL-RS1A read/write setting switch is set to RW. If the read/write setting switch is set to R, communication is not possible.**

Default

Return the setting of DL-RS1A to the factory default (default value).

3 Make the communication setting and click [OK]. The display returns to the [How to start] dialog box.

If the [Cancel] button is clicked, the communication setting returns to the pre-changed status and the display returns to the [How to start] dialog box.

4 Select the starting method and click [OK].

Item		Description
Configuration	Read out the configuration data from IG.	Reads the configuration data stored on the IG main unit and starts.
	Create a new configuration file.	Creates a new configuration file.
	Open a configuration file.	Opens a configuration file stored on the PC.
Monitor	Start monitoring for IG.	Communicates with the IG Series main unit and starts in the monitoring status.

Click [Cancel] button to finish the IG Configurator.

Reference When selecting "Create a new configuration file." or "Open a configuration file." to start, step 2 and 3 can be skipped.

■ When [Read out the configuration data from IG.] is selected

When selecting [Read out the configuration data from IG.] to start the IG Configurator, the configuration data is read from the IG Series and the IG Configurator starts.

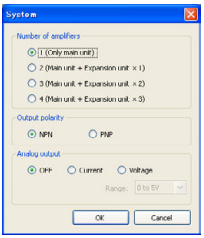
Note

- **Before selecting [Read out the configuration data from IG.], check if the PC and the IG Series are properly connected.**
- **Confirm that the IG is turned on.**
- **Confirm the DL-RS1A read/write setting switch is set to RW. If the read/write setting switch is set to R, communication is not possible.**

■ When [Create a new configuration file.] is selected

When [Create a new configuration file.] is selected, [System] dialog box appears.
When selecting the system configuration of the IG Series and clicking the [OK] button, the configurator starts with the default value for each configuration of the IG Configurator.

"Mounting the Sensor Amplifier" (page 2-2)
"3-1 Operation When the Power is Turned on for the First Time" (page 3-2)



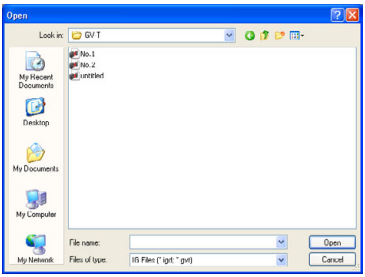
Reference

When clicking the [OK] button while pressing Ctrl + Alt keys, the [Unit] dialog box appears. Then you can select either "mm" or "inch" as a display unit. (Initial value: "mm")



■ When [Open a configuration file.] is selected

When [Open a configuration file.] is selected, [Open] dialog box appears.
When selecting the IG configuration file (*.igd, *.gvt) and clicking the [Open] button, then the configuration file opens.

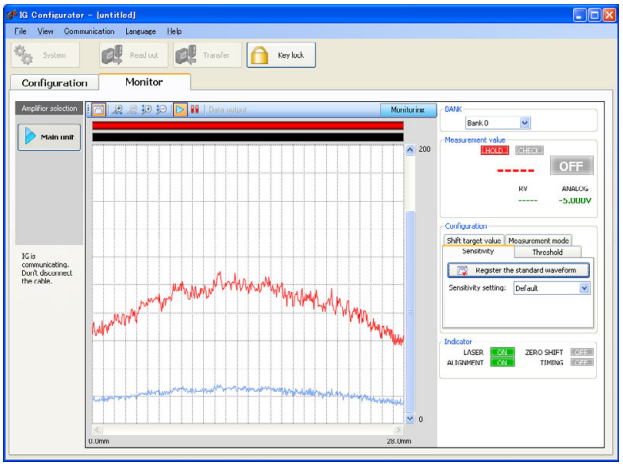


■ When [Start monitoring for IG.] is selected

When selecting [Start monitoring for IG.], the configuration data is read from the IG Series main unit and the monitor screen appears.

Note

- **Before selecting [Start monitoring for IG.], check if the PC and the IG Series are properly connected.**
- **Confirm that the IG is turned on.**
- **Confirm the DL-RS1A read/write setting switch is set to RW. If the read/write setting switch is set to R, communication is not possible.**



Exit

To exit the IG Configurator, select [File]→[Exit] on the menu.

Note

If the setting contents are changed, make sure to save the configuration file before exiting the IG Configurator. If it exits without saving, changed contents are discarded.

If the setting contents have been changed, the confirmation dialog box is displayed.

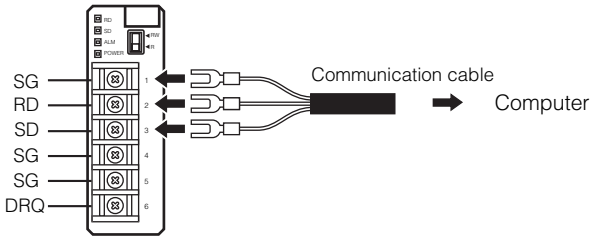
Note

If [No] is clicked, it exits without saving the setting contents.

Connecting with a Computer

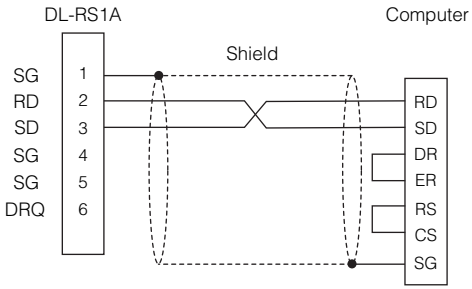
For connecting the DL-RS1A to a PC, refer to "RS-232C Communication Unit DL-RS1A User's Manual".
The direction of RS-232C (serial port) on a PC varies depending on each PC. For connection, refer to the operation manual of your PC.

Connection image of DL-RS1A



* Recommended connection cable
KPEV-SP (1P) wire 2 cores twist shield attached (twisted wire)
Nominal cross-section area 0.16 mm^2 (AWG25) or more

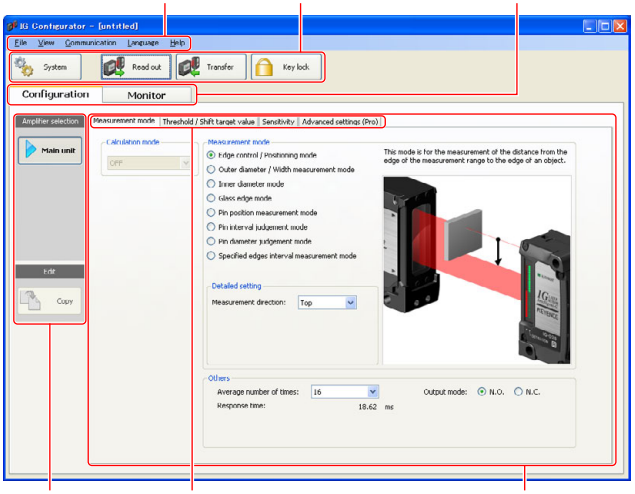
Wire connection



Connecting the Sensor Amplifier and the DL-RS1A

Additionally install the DL-RS1A behind the expansion unit.
For connecting the sensor amplifier with the DL-RS1A, refer to "RS-232C Communication Unit DL-RS1A User's Manual".

Main Window



Menu bar

This bar indicates the menu for operating each function.
For the menu details, refer to "6-6 Menu Bar" (page 6-25) .

Tool bar

This bar contains frequently used functions.

Item	Description
System	Displays the [System configuration] dialog box. "When [Create a new configuration file.] is selected" (page 6-9)
Read out	Reads the configuration data from the IG series and displays. "When [Read out the configuration data from IG.] is selected" (page 6-9)
Transfer	Transfers the configuration data to the IG Series. "Transfer of Configuration data" (page 6-19)
Key lock	Sets the key lock function. "Key Lock Button" (page 6-24)

Configuration/Monitor switching tab

When the tab is switched between the configuration tab and the monitor tab, the main panel display is switched either to the configuration screen or the monitor screen.

"6-4 Configuration Tab" (page 6-14)
"6-5 Monitor tab" (page 6-20)

Main panel

The main panel displays the configuration screen and the monitor screen of the sensor amplifier.

"6-4 Configuration Tab" (page 6-14)
"6-5 Monitor tab" (page 6-20)

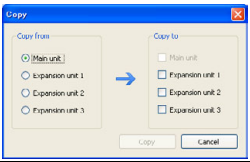
Main panel switching tab

Select the item to set on the main panel.
This is not displayed when the monitor tab is selected.

"6-4 Configuration Tab" (page 6-14)

Sub panel

There are two items: Amplifier selection and Edit

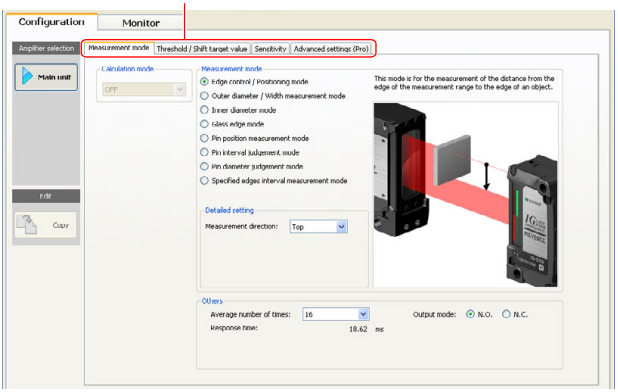
Item	Description
Amplifier selection	Selects the sensor amplifier to set or monitor on the main panel. The display appears according to the amplifier configuration set on the [System configuration] dialog box.
Edit	When the "Copy" button is pressed, the [Copy] dialog box appears. The sensor amplifier configuration can be copied to other sensor amplifiers. This is not displayed when the monitor tab is selected. 

6-4 Configuration Tab

When the configuration tab is selected, the sensor amplifier can be set. The following four tabs can be selected on the main panel switching tab.
Measurement mode, Threshold/Target value for shift, Sensitivity, Advanced Settings(Pro)

Measurement mode tab

Main panel switching tab



Reference For details on each function, refer to the sections below.

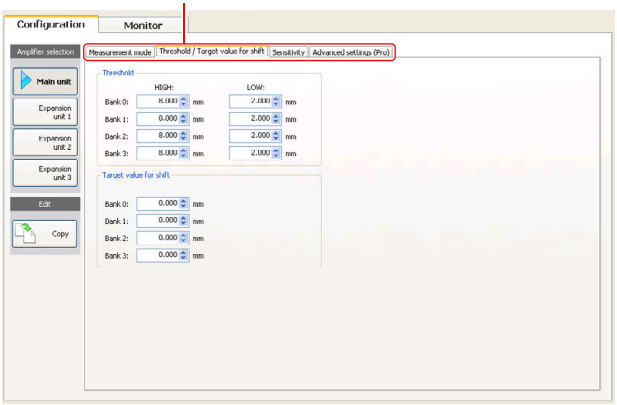
"4-4 Calculation Function" (page 4-47)
"1. Measurement mode" (page 4-8)
"2. Measurement direction" (page 4-17)
"3. Average number of times (Response time)" (page 4-17)
"4. Output mode" (page 4-19)

Item	Description
Calculation mode	This can be set when more than one expansion units are additionally installed to the amplifier. Setting range : OFF (not used)/addition mode/subtraction mode/2 heads mode Default value : OFF
Measurement mode	Sets the measurement mode. The descriptions for the selected measurement mode are displayed at right. Default value : Edge control/Positioning mode
Measurement direction*1	Sets the measurement direction. The descriptions for the selected measurement direction are displayed at right. Setting range : Top/Bottom Default value : Top
Average number of times	Sets the average number of times. Setting range : High speed (hsp) / 1 / 2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 / 512 / 1024 / 2048 / 4096 Default value : 16
Output mode	Sets the output mode. Default value : N.O.

*1 According to the measurement mode, the displayed content varies.
Edge control/Positioning mode, Glass edge mode, Pin position measurement mode : Measurement Direction
Outer diameter/Width measurement mode, Inner diameter/Opening measurement mode : No display.
Pin interval judgment mode, Pin diameter judgment mode : Number of the pins
Specified edges interval measurement mode : Edge number 1, Edge number 2

Threshold (Tolerance Setting Value)/Target value for shift

Main panel switching tab



Reference

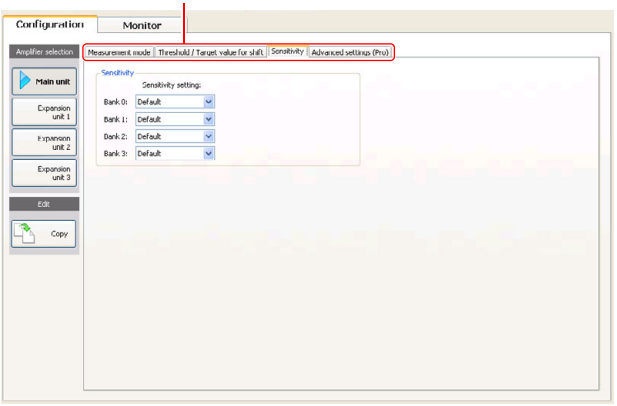
For details on each function, refer to the sections below.

"3-6 Setting the Tolerance Setting Value" (page 3-11)
"3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)
"3-8 Bank Function (Registering Multiple Tolerance Setting Values)" (page 3-18)

Item	Description
Threshold (Tolerance setting value)	Sets HIGH side setting value (HIGH) and LOW side setting value (LOW) for each bank. The same setting range and default value are set for each bank. Setting range : -99.999 to 99.999 HIGH default value : 8.000 LOW default value : 2.000
Target value for shift	Sets the shift target value for each bank. The same setting range and default value are set for each bank. Setting range : -99.999 to 99.999 Default value : 0.000

Sensitivity tab

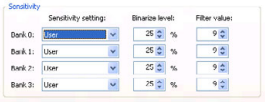
Main panel switching tab



Reference For details on each function, refer to the sections below.

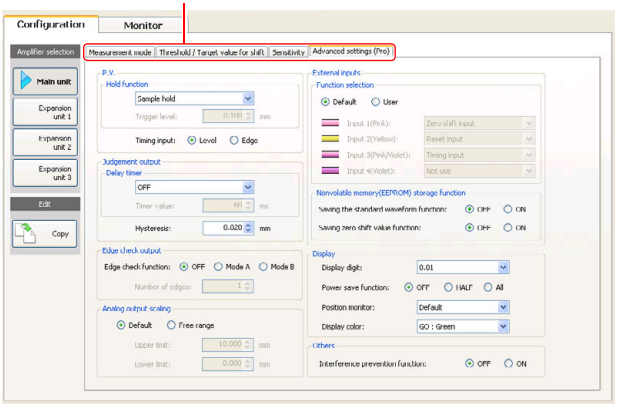
"4-3 Setting the Measurement Sensitivity" (page 4-44)

"3-8 Bank Function (Registering Multiple Tolerance Setting Values)" (page 3-18)

Item		Description
Sensitivity setting		Measures the measurement sensitivity for each bank. The same setting range and default value are set for each bank. Setting range : High sensitivity/Default/Low sensitivity/User Default value : Default
	Binarization Level	If the User is set, the binarization level and filter value can be set.  Setting range : 10 % to 90 % Default value : 25 %
	Filter Value	Setting range : 3 to 50 Default value : 9

Advanced settings tab (Pro)

Main panel switching tab



Reference For details on each function, refer to the sections below.

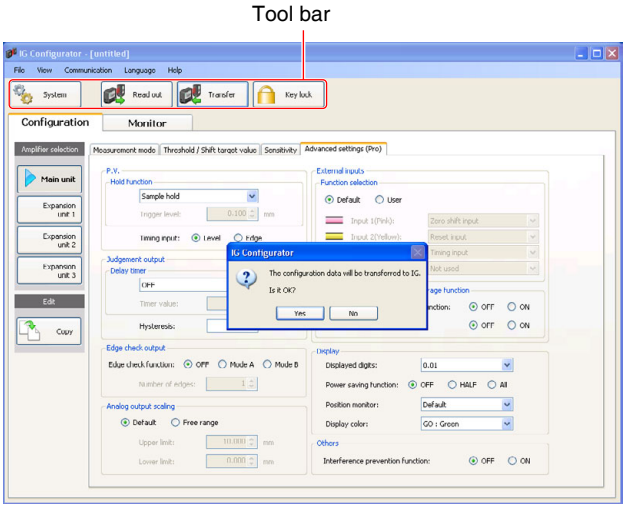
"4-2 Basic Settings and Advanced Settings" (page 4-4)

Item		Description
Hold Function		Setting range : Sample hold/Peak hold/Bottom hold/ Peak-to-peak hold/Auto peak hold/ Auto bottom hold Default value : Sample hold
	Trigger level	When the Auto peak hold or Auto bottom hold is set, the trigger level can be set. Setting range : -99.999 to 99.999 Default value : 0.100
Timing Input		When settings other than the Auto peak hold or Auto bottom hold are set, the timing input can be set. Default value : Level
Delay Timer		Setting range : OFF (not used)/ON-delay/OFF-delay/1-shot Default value : OFF
	Timer value	When values other than OFF are set, the delay time can be set. Setting range : 1 to 9999 Default value : 60
Hysteresis		Setting range : 0.000 to 99.999 Default value : 0.020
Edge check function		Default value: OFF
	Number of edges	When values other than OFF are set, the number of edges can be set. Setting range : 0 to 99 Default value : 1

Item		Description
Analog output Scaling		Default value: Default
	Upper limit	When the free range is set, the upper limit and lower limit can be set. Setting range : -99.999 to 99.999 Default value : 10.000
	Lower limit	Setting range : -99.999 to 99.999 Default value : 0
External Input: Function selection		Default value: Default
	Input1(Pink)	When the User is set, each function of the external input 1 to 4 can be set. Setting range : Zero shift input/Bank A input/Bank B input/ Laser emission stop input/Not use Default value : Zero shift input
	Input 2 (Yellow)	Setting range : Reset input/Bank A input/Bank B input/ Laser emission stop input/Not use Default value : Reset input
	Input 3 (Pink/ Violet)	Setting range : Timing input/Bank A input/Bank B input/ Laser emission stop input/Not use Default value : Timing input
	Input 4 (Violet)	Setting range : Not use/Bank A input/Bank B input/ Laser emission stop input/Gain input Default value : Not use
Saving the standard waveform function		Default value: OFF (Do not save)
Saving zero shift value function		Default value: OFF (Do not save)
Display Digit		Setting range : 0.001 / 0.01 / 0.1 / 1 Default value : 0.01
Power save function		Default value: OFF (Normally ON)
Position monitor		Setting range : Default (initial state)/ OK/NG display/Red : Off / OFF Default value : Default
Display color		Setting range : GO Green/ GO Red/ Normally Red Default value : GO Green
Interference prevention function		Default value : OFF

Transfer of Configuration data

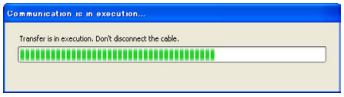
Transfer the configuration data to the IG Series after all settings are complete.
Before transfer, check that the PC (IG Configurator)and the IG Series are properly connected.



Procedure for the transfer of configurations

1 **Click the [Transfer] button on the tool bar.**

2 **Click the [Yes] button on the confirmation dialog box for the transfer of configurations.**



Note **Be careful not to disconnect the IG Series and PC during transmission.**

3 **After the transfer of configurations is complete, the confirmation dialog box appears. Then, if you start monitoring, click [YES] button. If you go back to the configuration, click [No] button.**

When the confirmation dialog box is displayed, the transfer of configuration data is complete. The IG Series starts to operate according to the configuration data transferred.

6-5 Monitor tab

When the monitor tab is selected, the measured status of the IG Series is displayed in real time.

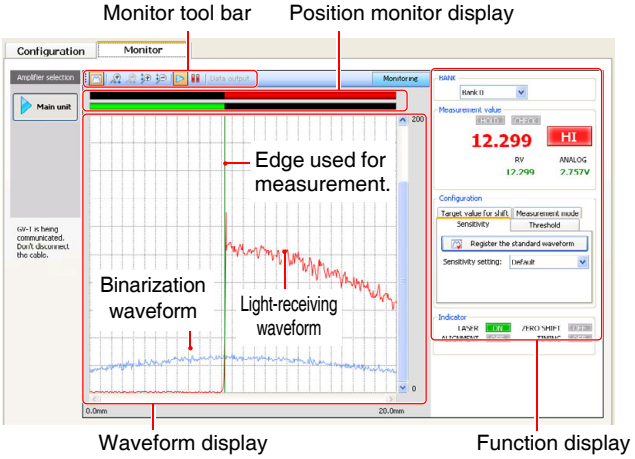
Note

- **Before selecting the monitor tab, check if the PC (IG Configurator) and the IG Series main unit are properly connected.**
- **If the configuration data opened with the IG Configurator and the configuration data stored on the IG Series differ, monitoring is not possible. Read the configuration data from the IG Series or transfer the IG Configurator's configuration data.**

Reference

If the baud rate for communication setting is set to faster, the updating speed of the measured state becomes faster and monitoring can be performed smoothly.

"Starting and Exiting the IG Configurator" (page 6-7)



Position Monitor Display

This displays the similar contents displayed on the position monitor equipped with the sensor head receiver.

"17. Position monitor" (page 4-41)

Note

This offers a more detailed display than on the sensor head. Therefore, the operation of the sensor head receiver may not agree with the position monitor display.

Waveform Display

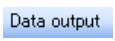
This displays the receiving status of the light-receiving element (CCD) as a waveform.

Item	Description
Horizontal axis	Shows the measurement range of the sensor head. Top side: 0 mm "Sensor Head Unit" (page 1-12)
Vertical axis	Shows the light-receiving amount of each pixel of CCD. Display range: 0 to 255
Light-receiving waveform	Displays the waveform with the red wire which presents the light-receiving amount of each pixel of CCD
Binarization Level	Displays the waveform with the light-blue wire which presents the binarization level of each pixel of CCD. When the light-receiving waveform rises above the binarization level, it is judged as received light. When the light-receiving waveform falls below the binarization level, it is judged as light-blocked. "4-3 Setting the Measurement Sensitivity" (page 4-44)
Edge used for measure-ment.	The edge is the meeting point of the light-receiving waveform and the binarization waveform. The edge used for measurement is displayed with a green wire. Positions and the number of edges change depending on the measurement mode even if it is the same target. "1. Measurement mode" (page 4-8)

Note **The waveform is displayed in the abbreviated form of the data processed inside the sensor. Therefore, the display may not agree completely to the sensor measurement status.**

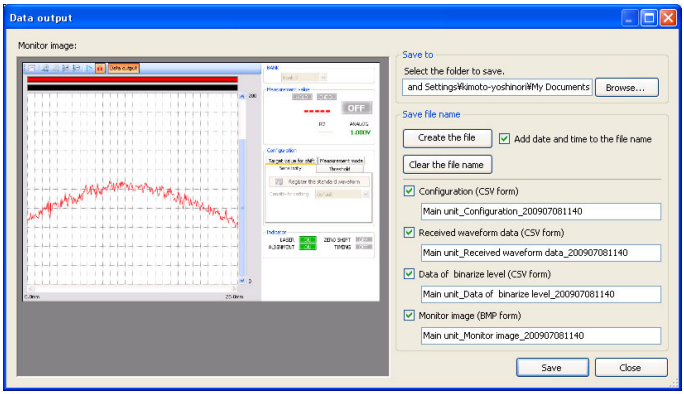
Monitor Tool Bar

These are buttons to operate the waveform display.

Item		Description
	Display of binarization level	Display/No display of the binarization level can be switched by clicking. "4-3 Setting the Measurement Sensitivity" (page 4-44)
	Horizontal axis : Zoom in	Enlarges the horizontal axis of the waveform display. Cannot enlarge when the button is grayed out.
	Horizontal axis : Zoom out	Reduces the horizontal axis of the waveform display. Cannot reduce when the button is grayed out.
	Vertical axis : Zoom in	Enlarges the vertical axis of the waveform display. Cannot enlarge when the button is grayed out.
	Vertical axis : Zoom out	Reduces the vertical axis of the waveform display. Cannot reduce when the button is grayed out.
	Start	Start updating the waveform display by clicking.
	Pause	Stops updating the waveform display by clicking.
		The setting of the sensor amplifier being monitored and the measurement state are saved in a file. The button operation is enabled only when updating the wave display is stopped.

Data output

When the [Data output] button is clicked while updating the waveform is stopped, the [Data output] dialog box appears.
When the [Save] button is clicked, four files of "Configuration (CSV form)", "Received waveform data (CSV form)", "Data of binarization level (CSV form)" and "Monitor image (BMP form)" can be saved to the designated location.

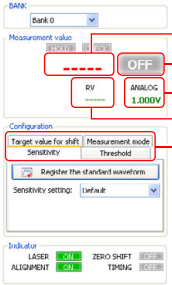


Click the [Close] button after the files are saved.

Item		Description
Save to		Enter directly or click the [Browse] button to specify the destination to save.
Save file name		The file name is made automatically when the [Create the file name] is clicked. When the checkmark for [Add date and time to the file name] is removed, the date and time are not added to the file name automatically created. When the [Clear the file name] button is clicked, the file name created automatically is erased. If the checkmarks before each file are removed, the data is not saved. File names can be entered directly.
	Configuration (CSV form)	The configurations of the sensor amplifier being monitored are all saved in the CSV file format.
	Received waveform data (CSV form)	The light-receiving amount of each pixel of CCD being monitored is saved in the CSV file format.
	Data of binarization level (CSV form)	The binarization level of each pixel of CCD being monitored is saved in the CSV file format.
	Monitor image (BMP form)	Images of the waveform display are saved in the Bitmap format.

Function Screen

The configurations of the sensor amplifier being monitored and the measurement status are displayed.



Judgment value (P.V.) display
Judgment display
Analog output value display
Internal measurement value (R.V.) display
Function selection tab
"Sensitivity tab", "Tolerance setting value tab", "Shift target value tab", "Measurement mode tab" The above four tabs can be selected.

Reference

- For details on each function, refer to the sections below.
  - "15. Display Digit" (page 4-40)
  - "3-4 Registering the Standard Waveform (Gain adjustment)" (page 3-9)
  - "4-3 Setting the Measurement Sensitivity" (page 4-44)
  - "3-6 Setting the Tolerance Setting Value" (page 3-11)
  - "3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)
  - "1. Measurement mode" (page 4-8)
  - "2. Measurement direction" (page 4-17)
- When the calculation function is used, the calculation value (CALC value) is also displayed.
- When the pin interval judgment mode is set for the measurement mode, the judgment value (P.V.) and the internal measurement value (R.V.) of all pin intervals are displayed.
- When the pin diameter judgment mode is set for the measurement mode, the judgment value (P.V.) and the internal measurement value (R.V.) of all pin dimensions are displayed.

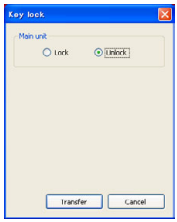
Item		Description
Bank		The currently selected bank is displayed. A different bank can be selected.
Measurement value	Judgment value (P.V.) display	Values are displayed to three decimal places regardless of the setting for the displayed digit of sensor amplifier.
	Internal measurement value (R.V.) display	
	Judgment display	ON/OFF condition of the sensor amplifier's judgment indicator is displayed. HI: HI Judgment indicator ON GO: GO Judgment indicator ON LO: LO Judgment indicator ON OFF: All OFF Err: ERROR
	Analog output value display	Displayed when items other than "OFF" are selected for the system configuration. "When [Create a new configuration file.] is selected" (page 6-9)

Item		Description
Config-uration	Sensitivity tab	When the [Register the standard waveform] button is clicked, the standard waveform can be registered (Gain adjustment). The measurement sensitivity can be set as well. Setting range : High sensitivity/Standard/Low sensitivity/ User (The binarization level and filter value can also be set.)
	Threshold (Tolerance Setting Value) tab	Sets HIGH side setting value (HI) and LOW side setting value (LO). Setting range : -99.999 to 99.999
	Target value for shift tab	When the [Execute zero shift] button is clicked, the zero shift function can be used. The shift target value can be set as well. Setting range : -99.999 to 99.999
	Measurement mode tab	The measurement mode is displayed. According to the measurement mode, "Measurement direction", "Number of pins" "Edge number 1 and edge number 2" can be set. Setting range for the measurement direction : Top/Bottom Setting range for the number of the pins : 2 to 14 Setting range for the edge number 1 and edge number 2 : 99 to 1/Top/Bottom/-1 to -99
Indicator		ON/OFF condition of the sensor amplifier's indicator is displayed.

Key Lock Button

When the key lock button is pressed, the [Key lock] dialog box appears. When [Lock] is selected and [Transfer] is clicked, the IG Series is locked and the display showing the key is being locked appears bottom right.

"3-9 Key Lock Function" (page 3-21)





It is necessary to unlock IG to change configuration.

The setting cannot be changed while the key is locked.
When [Unlock] is selected and [Transfer] is clicked in the [Key lock] dialog box, the key lock is canceled. (The display at the bottom right of the screen disappears.)

6-6 Menu Bar

File

This section describes how to read the configuration file used with the IG Configurator from the computer or save it onto the computer.

■ New...

From the menu, select [File]→[New].
The [System setting] dialog box appears. When selecting the system configuration of the IG Series and clicking the [OK] button, the configurator starts with the default value for each configuration of the IG Configurator.
"When [Create a new configuration file.] is selected" (page 6-9)
Short cut key: Ctrl + N

■ Open...

From the menu, select [File]→[Open].
When the [File open] dialog box appears, specify the saved IG configuration file (*.igd, *.gvt).
Short cut key: Ctrl + O

■ Save

From the menu, select [File]→[Save].
The configuration file being currently edited is saved.
Short cut key: Ctrl + S

Reference When this is saved for the first time, the [Save as] dialog box appears.

■ Save As...

From the menu, select [File]→[Save as].
When the [Save as] dialog box appears, specify the name of the configuration file and save.

■ Export CSV File...

From the menu, select [File]→[CSV output].
When the [Save as] dialog box appears, specify the file name and save.
The system setting and all the setting conditions of sensor amplifier are saved in the CSV file format.

■ **System...**

From the menu, select [File]→[System].
The [System setting] dialog box appears. When selecting the system setting of the IG Series and clicking the [OK] button, the system setting is changed.
Each amplifier's settings before the system setting change are not changed.

Reference This procedure can be performed by clicking the [System] button on the tool bar.

■ **Exit**

From the menu, select [File]→[Exit].
The IG Configurator finishes.
If there are files being edited, the dialog box to confirm save appears.

View

■ **Configuration mode**

From the menu, select [View]→[Configuration mode].
The configuration tab is selected.

"6-4 Configuration Tab" (page 6-14)

■ **Monitor mode**

From the menu, select [View]→[Monitor mode].
The monitor tab is selected.

"6-5 Monitor tab" (page 6-20)

Communication

Note

- **Confirm that the PC and the IG Series are properly connected.**
- **Confirm that the IG is turned on.**
- **Confirm the DL-RS1A read/write setting switch is set to RW. If the read/write setting switch is set to R, communication is not possible.**

■ **Read out the configuration data from IG**

From the menu, select [Communication]→[Read out the configuration data from IG.].
The configuration data is read from the IG series and displayed.

"When [Read out the configuration data from IG.] is selected" (page 6-9)

Reference This procedure can be performed by clicking the [Read out] button on the tool bar.

■ Transfer the configuration data to the IG

From the menu, select [Communication]→[Transfer the configuration data to IG].
The configuration data is transferred to the IG Series.

"Transfer of Configuration data" (page 6-19)

Reference This procedure can be performed by clicking the [Transfer] button on the tool bar.

■ Key Lock

From the menu, select [Communication]→[Key lock].
The [Key lock] dialog box appears. When [Lock] is selected and [Transfer] is clicked, the IG Series is locked.

"Key Lock Button" (page 6-24)

Reference This procedure can be performed by clicking the [Key lock] button on the tool bar.

■ Initial reset (Initialize)

From the menu, select [Communication]→[Initial reset].
The [Initial reset(Initialize)] dialog box appears.
When selecting the sensor amplifier to perform the initial lock and click [Execute], the confirmation dialog box appears.
When [Yes (Y)] is clicked, the selected sensor amplifier is initial-reset (initialized).

"3-5 Initial Reset (Initialize)" (page 3-10)

■ Communication Settings...

From the menu, select [Communication]→[Communication settings].
The [Communication settings] dialog box appears.
For information about the setting procedure, refer to " Start" (page 6-7).

Language

The display language for the IG Configurator is switched.

■ Japanese

From the menu, select [Language]→[Japanese].
When the IG Configurator is restarted, the display language is set to Japanese.

■ English

From the menu, select [Language]→[English].
When the IG Configurator is restarted, the display language is set to English.

Help

■ IG User's Manual

From the menu, select [Help]→[IG User's Manual].
The PDF data of the IG User's Manual is displayed.
Short cut key: F1

■ About IG Configrator

From the menu, select [Help]→[About IG Configrator].
The version information of the IG Configurator is displayed.

Appendix

1 Troubleshooting A-2

2 Display Screen and Output A-9

3 Factory Setting (Default Value) List..... A-10

4 Index A-11

1 Troubleshooting

This section describes corrective actions when errors occur.

Frequently Asked Questions

Problem	Check points	Corrective actions
Nothing is displayed on the amplifier control unit.	Is the power cable connected correctly?	Connect the power cable correctly. "Sensor Amplifier Wiring" (page 2-6)
	Is the sensor amplifier correctly added?	Add the sensor amplifier correctly. "Mounting the Sensor Amplifier" (page 2-2)
	The power saving indication may be working.	Cancel the power saving indication. "16. Power saving indication" (page 4-41)
Values are not displayed.	Is the object within the detection range?	Adjust the object to correctly fall within the measurement range.
	Is there an obstacle within the measurement range?	Remove the obstacle.
	Is the transmitter/receiver correctly mounted?	Mount the transmitter/receiver correctly. "Mounting the Sensor Head" (page 2-8)
	Is the hold function being used?	Check the hold function setting. Input the timing input according to the setting. "5. Hold function" (page 4-20)
	The laser emission may be stopped.	Check whether the laser emission stop input is ON or not. "11. External input" (page 4-33)
	Are the output wire and input wire short-circuited?	Check the wiring. "Sensor Amplifier Wiring" (page 2-6)
The value fluctuates.	Has the standard waveform been registered?	Register the standard waveform. "3-4 Registering the Standard Waveform (Gain adjustment)" (page 3-9)
	Is the average number of times set to small (response time set to fast)?	Increase the average number of times. " 3. Average number of times (Response time)" (page 4-17)
	Is the object or sensor head vibrating?	Take adequate measures to prevent vibration.
	Is dirt or dust stuck to the laser transmitter/receiver?	• Remove the dirt or dust. "Influence of dirt" (page 2) • Change the measurement sensitivity. "4-3 Setting the Measurement Sensitivity" (page 4-44) • Use the edge check function. "9. Edge check function" (page 4-31)
	Is dust, dirt, water or oil stuck to the target?	• Remove the dust, dirt, water, oil, etc. "Influence of dirt" (page 2) • Change the measurement sensitivity. "4-3 Setting the Measurement Sensitivity" (page 4-44)
	Are there airborne droplets of dust, water or oil during use?	• Remove the droplets with air purge, etc. • Change the measurement sensitivity. "4-3 Setting the Measurement Sensitivity" (page 4-44)
	Is there strong ambient light such as a photoelectronic sensor and inverter fluorescent light?	Shield the ambient light to prevent it from entering the laser receiver.

Problem	Check points	Corrective actions
The value fluctuates.	Is there mutual interference?	• Shield the other transmitter laser light to prevent it from entering the laser receiver. • Use the interference prevention function. 📖 "14. Interference prevention function (only for IG-1000/1500)" (page 4-40)
	Is the transmitter/receiver correctly mounted?	Mount the transmitter/receiver correctly. 📖 "Mounting the Sensor Head" (page 2-8)
	Is the mounting distance or the distance between the receiver and the object too long?	Make the mounting distance or the distance between the receiver and the object as short as possible. 📖 "Mounting the Sensor Head" (page 2-8)
	Are the output wire and input wire short-circuited?	Check the wiring. 📖 "Sensor Amplifier Wiring" (page 2-6)
The values are incorrect.	Is the object tilted or located in an incorrect position?	Adjust the object to correctly fall within the measurement range.
	Is the transmitter/receiver correctly mounted?	Mount the transmitter/receiver correctly. 📖 "Mounting the Sensor Head" (page 2-8)
	Is the mounting distance or the distance between the receiver and the object too long?	Make the mounting distance or the distance between the receiver and the object as short as possible. 📖 "Mounting the Sensor Head" (page 2-8)
	Is the transmitter and receiver used in combination of the same serial number?	Use the transmitter and receiver in combination of the same serial number. 📖 "Sensor Head Unit" (page 1-12)
	Is dirt or dust stuck to the laser transmitter/receiver?	• Remove the dirt or dust. 📖 "Influence of dirt" (page 2) • Change the measurement sensitivity. 📖 "4-3 Setting the Measurement Sensitivity" (page 4-44) • Use the edge check function. 📖 "9. Edge check function" (page 4-31)
	Is dust, dirt, water or oil stuck to the object?	• Remove the dust, dirt, water, oil, etc. 📖 "Influence of dirt" (page 2) • Change the measurement sensitivity. 📖 "4-3 Setting the Measurement Sensitivity" (page 4-44)
	Does the ambient operating temperature significantly change?	Keep the ambient operating temperature constant.
	Is the zero shift function correctly set?	Configure the settings correctly. 📖 "3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)
	Is the shift target value set correctly?	
	Is the zero shift input wire connected correctly?	
	Has the standard waveform been registered?	Register the standard waveform. 📖 "3-4 Registering the Standard Waveform (Gain adjustment)" (page 3-9)
	Is the calibration complete correctly?	Redo the calibration. 📖 "4-5 Calibration Function" (page 4-52)
	Are the output wire and input wire short-circuited?	Check the wiring. 📖 "Sensor Amplifier Wiring" (page 2-6)

Problem	Check points	Corrective actions
Button operations are ignored.	Is the key lock function being used?	Cancel the key lock function. "3-9 Key Lock Function" (page 3-21) The connected communication unit <DL-RS1A> read/write setting switch is set to RW. Set the read/write setting switch to R. "RS-232C Communication Unit DL-RS1A User's Manual"
The judgment output cannot be output properly.	Is the output polarity set correctly?	Make the settings for NPN output and PNP output. "3-5 Initial Reset (Initialize)" (page 3-10)
	Is the unit properly wired?	Wire the unit correctly. "Output Circuit Diagram" (page 5-4)
	Is the tolerance setting value set correctly?	Set the tolerance setting value. "3-6 Setting the Tolerance Setting Value" (page 3-11)
	Is the output mode (N.O./N.C.) set correctly?	Set the output mode. "4. Output mode" (page 4-19)
The analog output cannot be output properly.	Is the unit properly wired?	Wire the unit correctly. "Output Circuit Diagram" (page 5-4)
	Is the type of analog output (current/voltage) set correctly?	Set the type of analog output. "3-5 Initial Reset (Initialize)" (page 3-10)
The bank cannot be switched by the external input	Is the key lock function being used?	Use the key lock function. "3-9 Key Lock Function" (page 3-21)
The sensor head indicator does not change.	Is the power voltage used within the specification range?	Use the power voltage within the specification range. "5-1 Specifications" (page 5-2)
	Is there an error message on the sensor amplifier?	Take adequate measures according to the error messages. "Error displays and corrective actions" (page A-4)

Error displays and corrective actions

When an error occurs, an error message appears on the sensor amplifier.

Reference

- If an error occurs, the judgment output becomes error. Also, the edge check output becomes off. (When Normal Open is set)
  "4. Output mode" (page 4-19)
- When [ErC] is displayed, all the judgment output becomes OFF for output protection.
- When an error is displayed, the analog voltage output is fixed to 5.5 V and analog current output is fixed to 3.0 mA.

Error displays	Error contents	Corrective actions
 Head error	The transmitter and receiver are not connected to the sensor amplifier.	Connect the transmitter and receiver correctly. "Sensor Head Connection" (page 2-12)
	The sensor head cable connector is not connected properly.	Make the connection again. "Attaching the sensor head cable connector (OP-84338)" (page 2-14)
	The transmitter is broken.	Replace the transmitter.
	The sensor head cable of transmitter is damaged.	Replace the sensor head cable.

Error displays	Error contents	Corrective actions
 Transmitter/Receiver reverse connection error.	The transmitter and receiver are reversed.	Connect the transmitter and receiver correctly. "Sensor Head Connection" (page 2-12)
 Receiver error	The receiver is not connected to the sensor amplifier.	Connect the receiver correctly. "Sensor Head Connection" (page 2-12)
	The sensor head cable connector is not connected properly.	Make the connection again. "Attaching the sensor head cable connector (OP-84338)" (page 2-14)
	The receiver is broken..	Replace the receiver.
	The sensor head cable of receiver is damaged.	Replace the sensor head cable.
 Transmitter laser error	The laser of the transmitter is broken.	Replace the transmitter.
 Transmitter error	The transmitter is not connected to the sensor amplifier.	Connect the transmitter correctly. "Sensor Head Connection" (page 2-12)
	The sensor head cable connector is not connected properly.	Make the connection again. "Attaching the sensor head cable connector (OP-84338)" (page 2-14)
	The transmitter is broken.	Replace the transmitter.
	The sensor head cable of transmitter is damaged.	Replace the sensor head cable.
 Model mismatch error	The type (measurement range) of transmitter and receiver does not match.	Replace with the same type (measurement range) of the transmitter and receiver.
 Receiver EEPROM error	Reading/writing the nonvolatile memory (EEPROM) storage data failed.	Turn the power on again.
	Data has been written in the nonvolatile memory (EEPROM) over half-million times and malfunction occurred.	Replace the transmitter and receiver.
 Head error (Register the standard waveform)	The standard waveform can not be registered.	Do not turn off the sensor head or disconnect it from the sensor amplifier while registering the standard waveform. Register the Standard Waveform (Gain adjustment) again. "3-4 Registering the Standard Waveform (Gain adjustment)" (page 3-9)

Error displays	Error contents	Corrective actions
 Overcurrent error	Overcurrent beyond specification flows through the judgment output and edge check output	• Wire the unit correctly. "Output Circuit Diagram" (page 5-4) • Check the load and reduce the current to be within the specification range. • Check that the output wire is not touching other wires or the frame.
 EEPROM error	Reading/writing the nonvolatile memory (EEPROM) storage data failed.	Turn the power on again. Perform the initial reset. "3-5 Initial Reset (Initialize)" (page 3-10)
	Data has been written in the nonvolatile memory (EEPROM) over 1 million times and malfunction occurred.	To save the setting values when the power is turned off, replace the sensor amplifier.
	Reference When the standard waveform registration or the zero shift function are used frequently, do not save the settings by these functions on the nonvolatile memory (EEPROM). "12. Saving the standard waveform function" (page 4-39) "13. Saving zero shift value function" (page 4-39)	
 Communication error	Communication cannot be established between the added sensor amplifiers.	Make the setting for the added sensor amplifiers again after the power is turned off. "Mounting the Sensor Amplifier" (page 2-2)
 Additional setting error	While using the calculation function, models other than IG-1050 and IG-1550 are added next to the main unit.	Check the type of sensor amplifier after the power is turned off.
 Calculation error	While using the calculation function, an error is found on the expansion unit (expansion unit 1) added next to the main unit.	Solve the error on the expansion unit 1.
 Standard waveform registration error 1	The light-receiving amount is too small to register the standard waveform (Gain adjustment). (The error is displayed for approx. 3 seconds and the normal screen is restored.)	• Mount the transmitter/receiver correctly. "Mounting the Sensor Head" (page 2-8) • Align the optical axis so the optical axis alignment indicator lights up. "3-3 Optical Axis Alignment" (page 3-8) • Clean the laser transmitter and receiver of the sensor head.
	The standard waveform cannot be registered (Gain adjustment) because the receiver is receiving the laser light of the transmitter connected to another amplifier added. (The error is displayed for approx. 3 seconds and the normal screen is restored.)	Use the transmitter and receiver in combination of the same amplifier connected.

Error displays	Error contents	Corrective actions
 Standard waveform registration error 2	The light-receiving amount is too large to register the standard waveform (Gain adjustment). (The error is displayed for approx. 3 seconds and the normal screen is restored.)	Check whether the external scattering light enters the laser receiver part or not. Then register the standard waveform (Gain adjustment) again. "3-4 Registering the Standard Waveform (Gain adjustment)" (page 3-9)
 Standard waveform registration error 3	The standard waveform cannot be registered (Gain adjustment) because the receiver is receiving the laser light of the transmitter connected to another amplifier added. (The error is displayed for approx. 3 seconds and the normal screen is restored.)	Use the transmitter and receiver in combination of the same amplifier connected.
 Standard waveform registration error 4	The light-receiving waveform is abnormal and the standard waveform cannot be registered (Gain adjustment). (The error is displayed for approx. 3 seconds and the normal screen is restored.)	Register the Standard Waveform (Gain adjustment) again after realigning the optical axis. "3-3 Optical Axis Alignment" (page 3-8) "3-4 Registering the Standard Waveform (Gain adjustment)" (page 3-9)

Non-Error Displays and Corrective Actions

When the judgment value (P.V.) is "-----" the judgment output becomes all OFF (When Normal Open is set), and the analog output is fixed to the output lower limit.

"4. Output mode" (page 4-19)

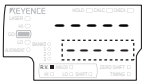
"10. Analog output scaling" (page 4-32)

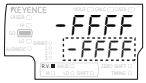
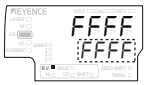
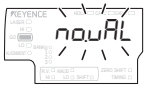
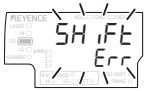
In cases other than the above, the judgment output and analog output keeps the output status immediately before the output.

Reference

If the internal measurement value (R.V.) becomes [-----] because the target is out of the measurement range, the internal measurement value (R.V.) retains the value immediate before the target disappears for the period the response time elapses. After the response time elapses, the internal measurement value (R.V.) becomes [-----].

" 3. Average number of times (Response time)" (page 4-17)

Display	Description	Corrective actions
 The internal measurement value (R.V.) is displayed as "-----".	A target is not in the measurement range. A target cannot be measured.	Adjust the target to correctly fall within the measurement range.
	The laser emission stop input is ON.	Set the laser emission stop input to OFF. Check the wiring of the laser emission stop input. "11. External input" (page 4-33)

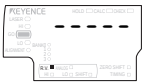
Display	Description	Corrective actions
 The judgment value (P.V.) is displayed as "-----".	The hold function is used and the judgment value (P.V.) is held.	Check the hold function setting. Input the timing input according to the setting. "5. Hold function" (page 4-20)
	The reset input is ON.	Set the reset input to OFF. Check the wiring of the reset input. "11. External input" (page 4-33)
 The internal measurement value (R.V.) is displayed as "-FFFF".	The internal measurement value (R.V.) falls below the lower limit (-99.999) of display range.	• Check the setting for shift target value and shift the display again. "3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16) • Redo the calibration. "4-5 Calibration Function" (page 4-52)
 The internal measurement value (R.V.) is displayed as "FFFF".	The internal measurement value (R.V.) goes beyond the upper limit (99.999) of display range.	
	The key is locked and the button operation is disabled.	Cancel the key lock (Unlock). "3-9 Key Lock Function" (page 3-21)
	The tolerance tuning was performed when the R.V. is [-----].	Perform the tuning when the internal measurement value (R.V.) is displayed with figures (with the object measured). "3-6 Setting the Tolerance Setting Value" (page 3-11)
	When the R.V. is [-----], the zero shift function was used.	Shift the display when the internal measurement value (R.V.) is displayed (with the object measured). "3-7 Zero Shift Function (Shifting the Internal Measurement Value (R.V.))" (page 3-16)
	The SET1 or SET2 value is incorrect and the correction using the calibration function could not be performed.	Perform the calibration within the possible correction range. "4-5 Calibration Function" (page 4-52)
	The button operation is disabled.	The connected communication unit <DL-RS1A> read/write setting switch is set to RW. Set the read/write setting switch to R. "RS-232C Communication Unit DL-RS1A User's Manual"

2 Display Screen and Output

Normally, the judgment value (P.V.) is displayed on the main display (upper level).
This section describes the judgment output and analog output status when displays other than numbers appear on the main display.

Reference The judgment indicator on the sensor amplifier operates in the same way as Normally Open regardless of the output mode setting.

"3-6 Setting the Tolerance Setting Value" (page 3-11)

Display	Judgment output *1		Analog output
	NO	NC	
Error displays*2 "Error displays and corrective actions" (page A-4)	HIGH:ON GO :OFF LOW:ON	HIGH:OFF GO :ON LOW:OFF	Analog voltage output: 5.5 V fixed Analog current output: 3.0 mA fixed
	HIGH:OFF GO :OFF LOW:OFF	HIGH:OFF GO :OFF LOW:OFF	Analog voltage output: 5.5 V fixed Analog current output: 3.0 mA fixed
	HIGH:OFF GO :OFF LOW:OFF	HIGH:ON GO :ON LOW:ON	Analog output range lower limit value fixed (1-5 V: 1V fixed)
	HIGH:OFF GO :OFF LOW:ON	HIGH:ON GO :ON LOW:OFF	Analog output range lower limit value fixed (1-5 V: 1V fixed)
	HIGH:ON GO :OFF LOW:OFF	HIGH:OFF GO :ON LOW:ON	Analog output range upper limit value fixed (1-5 V: 5 V fixed)

*1 The output mode of judgment output can be set to NO (Normal Open) or NC (Normal Close).

"4. Output mode" (page 4-19)

*2 If ErC (Overcurrent error) is displayed, all the judgment outputs are fixed to OFF.

3 Factory Setting (Default Value) List

This section describes the factory settings (default values).
If the initial reset is performed, the default values will be restored as below except for the calibration function.

"3-5 Initial Reset (Initialize)" (page 3-10)

Values set on the main screen

The bank 0 to 3 have the same value.

Setting items	Default value
HIGH side setting value	8.000
LOW side setting value	2.000
Shift target value	0.000

Basic Settings and Advanced Settings

Setting items	Default value	Description
1. Measurement mode	A. Ed9	Edge control/Positioning mode
2. Measurement direction	toP	Top
3. Average number of times (Response time)	16	Average number of times:16
4. Output mode	no	Normal Open
5. Hold function	S-h	Sample hold
6. Timing input	LEvEL	Level
7. Delay timer	oFF	The delay timer is not used.
8. Hysteresis	0.020	0.02 mm
9. Edge check function	oFF	The edge check function is not used.
10. Analog output scaling	dEFLt	Default setting (Not scaled)
11. External Input	dEFLt	Default setting
12. Saving the standard waveform function	ni-oFF	Not save on the nonvolatile memory (EEPROM)
13. Saving zero shift value function	ni-oFF	Not save on the nonvolatile memory (EEPROM)
14. Interference prevention function	oFF	Interference prevention function OFF
15. Display digit	0.01	Truncate a number to 3 decimal places
16. Power saving indication	oFF	Not display the power saving (Normally ON)
17. Position monitor	dEFLt	Normal
18. Display color	9o9rn	GO green

Other functions

Setting items	Default value	Description
Measurement sensitivity	dEFLt	Standard mode
Calculation Function	oFF	The calculation function is not used.
Calibration Function	dEFLt	Standard

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