Low-cost High Performance

NEW Multi-Purpose CCD Laser Micrometer
IG Series

A Wide Variety of Application Modes for Easy, High-Accuracy Measurements

LASER EDGE SENSOR
Intelligent Sensor
I-SERIES
Thrubeam Digital Laser Sensor with the Highest Level of Stability

REPEATABILITY OF 5 μm 0.20 Mil
LINEARITY OF ± 0.1% (IG-028)

The sensor provides a high level of stability with its multi-wavelength laser and parallel computing chip.

WIDE VARIETY OF APPLICATION MODES

- Edge control mode
- Outer diameter measurement mode
- Inner diameter/Gap measurement mode
- Edge detection of transparent targets
Large Distance between the Transmitter and Receiver

IG-028: Max. 1500 mm 59.06” IG-010: Max. 1000 mm 39.37”

Measurements are performed with up to 28,000 optical axes (IG-028), each of which monitors the amount of light received.

L-CCD* Light-Receiving Element

The sensor recognizes the position of a target and is less sensitive to its environment, making it possible to achieve stable target measurement.

* L-CCD : Linearized-Charge Coupled Device

IP67 Protection

The enclosure is resistant to harsh environments and offers long-term durability.

Display Unit Options

There are two types of display units: panel mount and DIN-rail mount. When a display unit is connected to a communication unit, measurement data can be sent to external devices such as a PLC.
Three Concepts

Intelligent
High accuracy was achieved by using the technology and functions developed for high-accuracy measuring instruments.

Rugged
Developed for use in harsh environments, the IG Series was designed with a strong structure.

Easy
Excellent usability makes it possible to quickly and easily perform stable measurements without any difficult adjustments and settings.

The intelligent I-Series consists of a high-accuracy sensor lineup that realizes low-cost high performance with only the most advanced functions for on-site operations.

High stability and measurement accuracy are achieved with the newly developed optical system

Multi-Wavelength Laser + I-DSP

With conventional lasers, the transmission spot produces a patchy pattern (as shown in the figure to the right). This is a laser-specific interference problem caused by the laser having a single wavelength. The IG Series sensor overcomes this problem by using a multi-wavelength laser. Because shadows are formed on the CCD more clearly, the sensor remains highly stable, even with targets that are conventionally difficult to detect (e.g. transparent objects). With the I-DSP (a parallel computing chip) incorporated in the receiver, the sensor can perform data processing at high speed, reducing noise to a minimum.

Repeatability of 5 μm 0.20 Mil

STABLE DETECTION OF TRANSPARENT & MESH TARGETS
The L-CCD makes it possible to detect a target based on its position. Edge control and positioning of transparent and mesh targets can be performed stably.

Linearity of ±0.1%
Extremely easy to use due to the built-in position monitor

Determining the Part of a Target to be Measured

The position monitor on the IG Series sensors makes it possible to visually check how a target is detected. The user can prevent mounting or setting errors by observing the red lights that indicate the received light position and the green lights that indicate the measurement position.

Easier Optical Axis Alignment

The position monitor makes it easier to align the optical axis. Easily perform optical axis alignment by adjusting the sensor head so that all of the position monitor lights turn red.
**Easy to maintain thanks to excellent environment resistance**

**Key Point: Less Sensitive to Dirt**

Because it uses an L-CCD, the IG Series is less sensitive to materials such as dirt than a sensor that uses a photodiode (PD) as the light-receiving element.

**IP67 Protection**

The enclosure satisfies the IP67 rating based on the IEC standards and remains watertight even after being held at a depth of one meter for 30 minutes. The enclosure is resistant to adverse environments and offers long-term durability.

**Flexible Free-Cut Cable**

The sensor head cable is a robot cable that withstands repeated bending. The cable can be used safely in a position requiring repeated motion.

**Edge Check Function**

The user can check whether a measurement is performed correctly by verifying the number of edges in the field of view.

Example

- Prevent dust or oil from adhering to the measurement unit, which can cause an abnormal measurement value.
- Detect the intrusion of a different type of target.
- Check that a measurement target falls within the measurement range.
Three major application modes

Edge Control and Positioning Mode
The distance from the end of the measurement range to the edge of a target is measured.

Outer Diameter/Width Measurement Mode
The outer diameter or width of a target is measured.

Inner Diameter/Gap Measurement Mode
The inner diameter of a target or a gap between targets is measured.

Five dedicated modes can be selected according to the application

Edge Detection of Transparent Targets
The edges of transparent objects such as glass have low transparency which decreases the amount of light received. The IG Series detects edges exploiting this nature and automatically changes a measurement sensitivity appropriately to detect a transparent target.
**Edge Control and Positioning Mode +**

*Feedback control using edge position control*

*Positioning control of the θ angle of a wafer*

Easy control when used with a servomotor (example)

- Measures a position information
- Amplifier or communication unit
- Outputs the edge position information to a control device. It is possible to send the information via an analog output, BCD output, or RS-232C output according to the type of the control device instead of using a PLC.

**Glass Edge Mode +**

*Positioning of a glass substrate*

*Edge control of a transparent sheet*

Easy measurement with the calculation function

- The main unit of the amplifier can communicate with the expansion units. When positioning an object such as a panel, it is possible to calculate a misalignment amount by calculating the data obtained by two sensor heads.

A−B: Misalignment measurement

B: Y-axis position measurement

C: X-axis position measurement
**Outer Diameter/Width Measurement Mode + Calculation function**

Outer diameter/deformation measurement an extrudate

Abnormal diameters and deformations can be detected in real time by measuring a tube at two axes. The 980 µs high-speed sampling detects even tiny abnormalities.

**Inner Diameter/Gap Measurement Mode + Calculation function**

Gap measurement between rollers

The thickness of a product can be controlled by measuring the gaps of the two sides between the rollers.
EVEN MORE USEFUL WHEN CONNECTED TO A PC

The configuration software, IG Configurator, allows for a wide range of settings to be made including the monitoring of the waveforms of received light and the measurement modes.

Reading and Writing Settings

The user can enter all settings including the measurement modes into a PC and then transfer them to the sensor. The management of setting data is simple and very convenient when two or more sensors are used.

Monitoring Function

Measurement conditions such as the waveforms of received light can be displayed in real time. The mounting and sensitivity settings can also be adjusted more precisely.

Calculation Function

**Addition mode** (if a measurement target is large)

**Setting Example 1**
(length)

**Setting Example 2**
(width)

**Subtraction mode** (to measure the difference in level or inclination)

**Setting Example 1**
(inclination)

**Setting Example 2**
(difference in thickness)

Sensitivity Setting

The set value used to judge whether light enters or is blocked, based on the amount of light received by the CCD, is called the binarization level. The amount of light received when the reference waveform is registered is regarded as the 100% level. The light is judged to be blocked if the amount of light is less than the specified binarization level. The IG Series initially sets a binarization level of 25% and the user can change the level according to the application.

Zero Shift Function

This function shifts an internal measurement value to 0 (to offset the value). When the target value is changed, this function can be used to shift an internal measurement value to the new target value.

*1 DL-RS1A units purchased before July 14, 2009 cannot be used. For details, contact your nearest KEYENCE sales office.
DATA COMMUNICATION

Amplifier Function

NPN/PNP Output Selection (judgment selection)
Both NPN and PNP outputs are supported. The outputs are set the first time the user turns on the power. These settings can subsequently be changed. Judgments are output as HIGH, GO, or LOW.

Analog Output Selection
The following four types of analog outputs can be selected. The output is selected the first time the user turns on the power.

<table>
<thead>
<tr>
<th>Setting value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Not output</td>
</tr>
<tr>
<td>0’~5 V</td>
<td>Analog output after the judgement value is converted to the range from 0 to 5 V.</td>
</tr>
<tr>
<td>-5’~5 V</td>
<td>Analog output after the judgement value is converted to the range of ±5 V.</td>
</tr>
<tr>
<td>1’~5 V</td>
<td>Analog output after the judgement value is converted to the range from 1 to 5 V.</td>
</tr>
<tr>
<td>αPr</td>
<td>Analog output after the judgement value is converted to the range from 4 to 20 mA.</td>
</tr>
</tbody>
</table>

The setting can be changed.

Communication Unit

DL-RB1A  BCD output unit
Use this unit when retrieving numerical data from the IG Series to an external device as digital data. A single communication unit can retrieve data from up to four IG Series display units in BCD.

DL-RS1A  RS-232C communication unit
Use this unit when outputting digital data to an external device with RS-232C signals. It is necessary to connect it to a PC when using the startup support software, IG Configurator. A single communication unit can retrieve data from up to four IG Series display units.

Lineup

Sensor heads
IG-010

Display units (amplifiers)

DIN rail mount type
IG-1000  Main unit
IG-1050  Expansion unit

Panel mount type
IG-1500  Main unit
IG-1550  Expansion unit

Sensor head cables

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Cable length</th>
<th>Model</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 cable included</td>
<td>2 m 6.56’</td>
<td>OP-87056</td>
<td>Approx. 80 g</td>
</tr>
<tr>
<td></td>
<td>5 m 16.4’</td>
<td>OP-87057</td>
<td>Approx. 190 g</td>
</tr>
<tr>
<td></td>
<td>10 m 32.8’</td>
<td>OP-87058</td>
<td>Approx. 360 g</td>
</tr>
<tr>
<td></td>
<td>20 m 65.6’</td>
<td>OP-87059</td>
<td>Approx. 680 g</td>
</tr>
</tbody>
</table>

*1 For the detailed conditions, refer to "Specifications" (page 12).

Bank Function
The bank function can register up to four patterns of specific settings.* For example, in response to a measurement target changeover, this function allows the user to easily switch between the patterns of registered settings.

* HIGH setting value, LOW setting value, binarization level, shift target value, etc.
### Optional accessories for the display unit

<table>
<thead>
<tr>
<th>Type</th>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel front protection cover</td>
<td>OP-87076</td>
<td>The panel front protection cover and panel mounting bracket are included in the panel mount type amplifier. If the supplied cover or bracket is lost or damaged, purchase a new one.</td>
</tr>
<tr>
<td>Panel mounting bracket</td>
<td>OP-4122</td>
<td>Extension cable used for panel mount type amplifier. Use this cable if the standard 50 mm 1.97&quot; cable is not long enough.</td>
</tr>
</tbody>
</table>

### Optional accessories for the communication unit

<table>
<thead>
<tr>
<th>Type</th>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expansion cable: 300 mm 11.81&quot;</td>
<td>OP-35361</td>
<td>Although the DL Series is designed for the DIN-rail mount type only, the optional expansion cable (OP-35361, 300 mm 11.81&quot;) enables communication with the panel mount type display unit.</td>
</tr>
<tr>
<td>DIN-rail mounting bracket</td>
<td>OP-60412</td>
<td>The mounting bracket is used when the expansion cable is used to connect to the panel mount type display unit, in which case a DIN rail is not provided.</td>
</tr>
</tbody>
</table>

### Specifications

#### Sensor heads

<table>
<thead>
<tr>
<th>Model</th>
<th>Appearance</th>
<th>Operation principle</th>
<th>Light source</th>
<th>Measurement range</th>
<th>Sampling cycle</th>
<th>Minimum detectable object **</th>
<th>Repeatability **</th>
<th>Linearity **</th>
<th>Temperature characteristics **</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>IG-010</td>
<td><img src="image1" alt="IG-010" /></td>
<td>CCO method</td>
<td>IEC60825-1</td>
<td>0 to 1000 mm 39.37&quot;</td>
<td>980 μs (When the number of times for averaging is set to 1 (hap)): 490 μs</td>
<td>±0.2 mm ±0.007&quot; (Setting distance: 100 mm 3.94&quot;)</td>
<td>±5 μm ±0.20 Mil (Setting distance: 100 mm 3.94&quot;)</td>
<td>±0.3 % of F.S. (±28 μm ±1.10 Mil)</td>
<td>±0.3 % of F.S./°C (±3 μm ±0.12 Mil/°C)</td>
<td>Approx. 380 g</td>
</tr>
<tr>
<td>IG-028</td>
<td><img src="image2" alt="IG-028" /></td>
<td></td>
<td></td>
<td>0 to 1500 mm 59.06&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Approx. 400 g</td>
</tr>
</tbody>
</table>

*1 The DL-RS1A communication unit is required.
*2 The screws for connecting the sensor head and bracket are included.

#### Optional accessories

<table>
<thead>
<tr>
<th>Type</th>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC software</td>
<td>IG Configurator</td>
<td>IG-H1</td>
</tr>
<tr>
<td>Sensor head mounting brackets</td>
<td>For IG-010</td>
<td>IG-TB01</td>
</tr>
<tr>
<td></td>
<td>For IG-028</td>
<td>IG-TB082</td>
</tr>
<tr>
<td>End unit (Optional)</td>
<td>OP-26751</td>
<td>To connect an additional expansion unit, use the end units to secure the display units on both ends. When connecting additional units, be sure to use the end units. (2 pcs.)</td>
</tr>
<tr>
<td></td>
<td>OP-8706</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OP-35361</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OP-60412</td>
<td></td>
</tr>
</tbody>
</table>

*3 When the light is shielded by half at the center position of the setting distance. Vibration width when the average number of times is set to 16 and sampling is performed for 30 seconds.
*4 When the setting distance is 100 mm 3.94" and light is shielded by half at 50 mm 1.97" position from the receiver. Margin of error to the ideal law.
*5 When the average number of times is set to (hap).

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1. The classification for FDA (CDRH) is implemented based on IEC60825-1 in accordance with the requirements of Laser Notice No.50.
2. The DL Series is designed for the DIN-rail mount type only, the optional expansion cable (OP-35361, 300 mm 11.81") enables communication with the panel mount type display unit.
3. When the measurement mode is set to the glass edge mode, a glass edge of C0.1 mm 0.003" or more can be detected (Setting distance: 500 mm 19.68").
4. When the measurement target object is measured at the center position of the setting distance.
5. When the setting distance is 100 mm 3.94" and light is shielded by half at 50 mm 1.97" position from the receiver.
6. Excluding when the average number of times is set to (hap).
Display unit (amplifier)

Model
- IG-1800
- IG-1850
- IG-1500
- IG-1550

**Main unit/Expansion unit**

- Main unit
- Expansion unit

<table>
<thead>
<tr>
<th>Model</th>
<th>IG-1800</th>
<th>IG-1850</th>
<th>IG-1500</th>
<th>IG-1550</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply voltage</td>
<td>±5 V (full scale 10 V)</td>
<td>±5 V (full scale 10 V)</td>
<td>±5 V (full scale 10 V)</td>
<td>±5 V (full scale 10 V)</td>
</tr>
<tr>
<td>Output resistance</td>
<td>100 Ω</td>
<td>100 Ω</td>
<td>100 Ω</td>
<td>100 Ω</td>
</tr>
<tr>
<td>Maximum load resistance</td>
<td>350 Ω</td>
<td>350 Ω</td>
<td>350 Ω</td>
<td>350 Ω</td>
</tr>
<tr>
<td>Repetition accuracy</td>
<td>±5 μA</td>
<td>±5 μA</td>
<td>±5 μA</td>
<td>±5 μA</td>
</tr>
<tr>
<td>Display accuracy</td>
<td>±0.05 % of F.S.</td>
<td>±0.05 % of F.S.</td>
<td>±0.05 % of F.S.</td>
<td>±0.05 % of F.S.</td>
</tr>
<tr>
<td>Temperature characteristics</td>
<td>±0.005 % of F.S./°C</td>
<td>±0.005 % of F.S./°C</td>
<td>±0.005 % of F.S./°C</td>
<td>±0.005 % of F.S./°C</td>
</tr>
<tr>
<td>Voltage output</td>
<td>4-20 mA (full scale 16 mA)</td>
<td>4-20 mA (full scale 16 mA)</td>
<td>4-20 mA (full scale 16 mA)</td>
<td>4-20 mA (full scale 16 mA)</td>
</tr>
<tr>
<td>Current output</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Gain input</td>
<td>Input time: 20 ms or more, Response delay time: 120 ms or less (Nonvolatile memory (EEPROM) 1.5 s or less)</td>
<td>Input time: 20 ms or more, Response delay time: 120 ms or less (Nonvolatile memory (EEPROM) 1.5 s or less)</td>
<td>Input time: 20 ms or more, Response delay time: 120 ms or less (Nonvolatile memory (EEPROM) 1.5 s or less)</td>
<td>Input time: 20 ms or more, Response delay time: 120 ms or less (Nonvolatile memory (EEPROM) 1.5 s or less)</td>
</tr>
<tr>
<td>Reset input</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
</tr>
<tr>
<td>Timing input</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
</tr>
<tr>
<td>Zero shift input</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
</tr>
<tr>
<td>Bank A input/Bank B input</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
</tr>
<tr>
<td>Laser emission stop input</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
<td>Input time: 20 ms or more, Response delay time: 20 ms or less</td>
</tr>
</tbody>
</table>

**Digital display method**

- NPN (PNP) open collector x3ch, 30 VDC (Power supply voltage) or less, residual voltage ±1 V (2 V) or less, N.O./N.C. selectable Max. 50 mA.ch **1**
- NPN (PNP) open collector x1ch, 30 VDC (Power supply voltage) or less, residual voltage ±1 V (2 V) or less, N.O./N.C. selectable Max. 50 mA.ch **1**
- Voltage output: 1 µm (0.144 MΩ), 10 µm (0.3 MΩ), 100 µm (3.0 MΩ), 1000 µm (30.77 MΩ (selectable))
- Response time (judgement output): 1.96 to 4031.72 ms **2**

**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 (0.06 in)
- Pollution degree: 2

**Number of connectable sensor amplifiers**

- Up to 4 units (including main unit) **1**

**Input**

- Gain input
- Reset input
- Timing input
- Zero shift input
- Bank A input/Bank B input
- Laser emission stop input

**Output**

- Analog output (selectable among ±5V, 1-5V, 0-5V, 4-20mA)
- Voltage output: ±5 V (full scale 10 V)
- Current output: 4-20 mA (full scale 16 mA)
- Output resistance: 100 Ω
- Maximum load resistance: 350 Ω
- Repetition accuracy: ±5 μA
- Display accuracy: ±0.05 % of F.S.
- Temperature characteristics: ±0.005 % of F.S./°C

**Environment**

- 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 (0.06)
- Pollution degree: 2

**Material**

- Main unit case/front sheet: Polycarbonate
- Key top: Polyacetal

**Weight**

- Main body: 150 g
- Expansion unit: 140 g
- Main unit: 170 g
- Expansion unit: 165 g

**Supplied item**

- Main body × 1, Instruction manual × 1 (only for main unit)
- Expansion unit × 2, Switch protection seal, Expansion connector cover

Communication unit (Common specifications)

**Model**

- DL-RB1A
- DL-RS1A

**Appearance**

- DIN rail mount
- Panel mount

**Power supply voltage**

- 20 to 30 VDC, including ripple, Ripple (P-P): 10% max. (Supplied via connected sensor amplifier)

**Power consumption (including analog current output)**

- 27 mA max.
- 25 mA max.

**Number of connectable sensor amplifiers**

- Up to 4 units (including main unit) **1**

**Indicator**

- Alarm indicator lamp (red), Power indicator lamp (green)
- Communication indicator lamp (green +2), Alarm indicator lamp (red), Power indicator lamp (green)

**Communication method**

- Full duplex
- Start-stop

**Synchronization method**

- Start-stop
- Start-stop

**Transmission code**

- ASCII
- ASCII

**Baud rate**

- 2400/4800/9600/19200/38400 (selectable) (factory-setting: 9600 bps)
- 2400/4800/9600/19200/38400 (selectable) (factory-setting: 9600 bps)

**Data bit length**

- 8 bits/7 bits selectable (Factory-setting: 8 bits)
- 8 bits/7 bits selectable (Factory-setting: 8 bits)

**Parity check**

- None/Even/Odd selectable (Factory-setting: None)
- None/Even/Odd selectable (Factory-setting: None)

**Stop bit length**

- 1 bit
- 1 bit

**Data delimiter**

- Data reception: automatically recognizes CR or CR+LF
- Data transmission: Fixed to CR+LF

**Environment resistance**

- Ambient temperature: -10 to +55°C (No condensation)
- Ambient humidity: 35 to 85%RH (No condensation)
- Vibration resistance: 10 to 55 Hz, Double amplitude 1.5 mm (0.06)
- XYZ each axis: 2 hours

**Material**

- Main unit case/front sheet: Polycarbonate
- Main unit case/front sheet: Polycarbonate

**Weight**

- Approx. 46 g
- Approx. 53 g

**Supplied item**

- Instruction manual, End units × 2, Switch protection seal, Expansion connector cover

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**Notes:**

1. A single communication unit can retrieve data from up to 4 display units.
2. DL-RS1A units purchased before July 14, 2009 cannot be used.
### Dimensions

**Sensor amplifier (DIN rail mount type)**

**IG-1000/IG-1050**

*IG-1000*

- Cable diameter ø4.7 ±0.19"
- Cable length 2 m ±0.69"
- Panel thickness 1 0.04" to 6 mm 0.24"

*IG-1050*

- Cable diameter ø4.8 ±0.19"
- Cable length 2 m ±0.69"
- Panel thickness 1 0.04" to 6 mm 0.24"

### Sensor amplifier (Panel mount type)

**IG-1500/IG-1550**

- Cable diameter ø4.7 ±0.19"
- Cable length 2 m ±0.69"
- Panel thickness 1 0.04" to 6 mm 0.24"

### End unit (Optional) (2 pcs.)

**OP-26751**

- Main unit
- Expansion cable
- Expansion unit 1

### Notes on connecting a panel mount type expansion unit

Place the main unit in the top position, and bring the expansion unit into contact with the main unit vertically. For horizontal connection of the panel mount type, the optional expansion cable OP-35361 (300 mm) 11.8" type is required.

### Wiring Diagram

- **Brown**: 10 to 30 VDC
- **Blue**: 0 V
- **Black**: HIGH judgment output
- **White**: LOW judgment output
- **Gray**: GO judgment output
- **Green**: Edge check output
- **Light blue**: Analog output +
- **Orange**: Analog output -
- **Shield**: Analog output GND
- **Pink**: External input 1 (zero shift input)
- **Pink/purple**: External input 2 (reset input)
- **Yellow**: External input 3 (timing input)
- **Purple**: External input 4 (not used)

*1 The brown, blue, and light blue cables are not provided in a IG-1050/IG-1550 unit (expansion unit). The power is supplied to the expansion unit from the IG-1000/IG-1500 unit (main unit).*

*2 For an analog output, OFF (not used), 0 to 5 V, ±5 V, 1 to 5 V, or 4 to 20 mA can be selected.*

*3 For an external input, bank A input, bank B input, laser emission stop input, or OFF (not used) can also be selected.*

*For external input 4, gain input can also be selected.*

*For details, refer to the User's Manual.*