INTRODUCING THE LASER APPLICATION SENSOR IL SERIES

CMOS Multi-Function Analog Laser Sensor
IL Series

- Thickness
- Warpage
- Height difference

NEW

Intelligent Sensor I SERIES

INTELLIGENT LASER APPLICATION SENSOR IL SERIES

- Height/Height difference
- Warpage
- Thickness/width
- Positioning
- Vibration
- Count

Low-cost High Performance
VARIETY OF USES AT LOW COST
Compact and lightweight laser displacement sensor

Intelligent
High precision was achieved by using state-of-the-art technology and functions specifically developed for high-accuracy measurement instruments.

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

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

Introducing the IL Series

The intelligent I-Series consists of a high-precision sensor lineup that realizes low-cost and high performance with only the most advanced functions for on-site operations.
High-Precision Head + Multi-Function Amplifier

[Measurement with higher stability] + [All-in-one design]

The IL Series automatically controls and optimizes laser power according to the reflectance of the target. As a result, stable measurement is possible for almost any target from black rubber to highly reflective metal surfaces. Furthermore, in order to further streamline communication with process control systems we have installed application specific functions into the compact amplifier.

Rugged Head Structure

[Die cast metal used for IP67/optical base]

The head structure was redesigned to make it rugged enough to withstand almost any environment. In addition, the optical base is made of die cast SUS304 for added strength and protection.

Compact Head Design + Easy Mounting

[Smallest body in its class] + [Hi-flex cable]

The IL Series has achieved the smallest head housing in its class by adopting the unique aspherical lens. The weight of the head is a mere 60g* (2.1 oz). The sensor head cable is designed with a robot cable. This cable is specifically designed for high cycle service life and makes the sensor ideal for robotics or other high cycle applications.

*IL-030

IL-100
- Reference distance: 100 mm 3.94"
- Measurement range: 75 to 130 mm 2.95" to 5.12"
- Display Resolution: 2 µm 0.08 Mil
- Repeatability: 10 µm 0.39 Mil

IL-065
- Reference distance: 65 mm 2.56"
- Measurement range: 55 to 105 mm 2.17" to 4.13"
- Display Resolution: 2 µm 0.08 Mil
- Repeatability: 4 µm 0.16 Mil

IL-030
- Reference distance: 30 mm 1.19"
- Measurement range: 20 to 45 mm 0.79" to 1.77"
- Display Resolution: 1 µm 0.04 Mil
- Repeatability: 2 µm 0.08 Mil
The multi-function amplifier with an all-in-one design

Direct connection with peripheral equipment

Hi / Go / Lo judgement output
Voltage / current analog output
BCD output
RS232C

Peripheral equipment
PLC, etc.
Analog controller, etc.
Data logger, etc.
PC

New mode – Thickness calibration function included

3-step easy calibration
With conventional devices, calibration had to be conducted on each and every individual sensor head, however, as the IL Series has a dedicated mode that allows calibration to be completed in 3 simple steps.

Step 1: Bring the target close to one sensor head and input the thickness data, then push the set button.
Step 2: Bring the same target used in Step 1 close to the opposing sensor head and push the set button.
Step 3: Insert a target thicker than the target used in Step 2. Input the thickness data. Then pushing the set button completes calibration.

When bringing the target closer to the sensor head in Steps 1 and 2, you are compensating for the misalignments that occur during installation. To set, you can begin with either one of the sensor heads.

Ambient light elimination function included

In order to counteract any ambient light interference, the IL Series automatically activates the ambient light elimination function when the sampling cycle is set to ‘2 ms’ or ‘5 ms’, reducing the effects of ambient light.

The CMOS waveform of A
Ambient light is present

The CMOS waveform of B
Ambient light only

CMOS waveform (difference)
Waveform where the ambient light has been removed
Multi-function amplifier

CALCULATION FUNCTION

Addition mode
Setting example 1
(thickness measurement)

Setting example 2
(width measurement)

Subtraction mode
Setting example 1
(Measurement of height difference)

Setting example 2
(Measuring tilt)

FUNCTION CHOICES

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 five 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 ~ Su</td>
<td>Analog output after the judgement value is converted to the range from 0 to 5 V.</td>
</tr>
<tr>
<td>-5 ~ Su</td>
<td>Analog output after the judgement value is converted to the range of ±5 V.</td>
</tr>
<tr>
<td>1 ~ 5 Su</td>
<td>Analog output after the judgement value is converted to the range from 1 to 5 V.</td>
</tr>
<tr>
<td>4 ~ 20 mA</td>
<td>Analog output after the judgement value is converted to the range from 4 to 20 mA.</td>
</tr>
</tbody>
</table>

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.

Mounting method options
Both panel and DIN-rail mount units are available.

Communication Unit
DL-RB1A
BCD output unit
Use this unit when retrieving numerical data from the IL Series to an external device as digital data. A single communication unit can retrieve data from up to 8 IL Series display units via BCD.

DL-RS1A
RS-232C communication unit
Use this unit when outputting digital data to an external device with RS-232C signals. In addition the unit can be used to externally program the amplifiers.
Applications

Height difference measurements of a plastic extrusion

Provides constant monitoring by measuring the height using 2 sensors simultaneously, then calculates the height difference using the calculation function in the amplifier. Reliable detection is possible even if the product type or color changes.

Warpage detection in ceramic boards

As the sensor head is compact, multiple point measurements of small-scale boards are possible. By calculating the measurement data externally, simultaneous measurements of positioning and warpage are possible.

Thickness/width measurements of a plaster board

Easy setup using the thickness calibration mode. Setup man-hours are reduced using the thickness calibration function, thus product changeovers can be conducted with ease.

Packaging material counting

Even in targets with a large amount of shape scatter, reliable counts can still be achieved by detecting rising edges.

Accuracy checks on an automotive door assembly

When assembling automotive doors, by simultaneously measuring multiple points, the assembly accuracy can be evaluated. Reliable detection is possible regardless of body color.

Positional control of welding beads

Through external calculations of height data from the sensor, the device detects the position of the weld seam. Welding accuracy can be improved via measurement data feedback to the welder.

Heat processing inspection of cans

By observing the expansion displacement of a can after heat processing, the results of heat processing can be evaluated. Reliable differentiation can still be conducted even if there are color changes in the cans.

Vibration measurements of a washing machine

Easy mounting due to a compact and lightweight head. By recording the analog output using a data logger, the IL Series can be used for defect analyses and in research and development.
Differentiation of different types of plastic components

Reliable differentiation, even in highly variable small parts, using a high-precision sensor head. Even when the variety changes, external changeover of up to 4 patterns is possible by setting items in the bank function.

Stacker device counts and stacking disturbances

The IL Series counts how many items are being transported along a conveyer, in addition to the non-contact detection of uneven stacking in the stacker. Reliable detection regardless of color changes in the targets.

Wire winding process

Prevents irregular winding by monitoring the traverser position. In addition, feedback control to the device is possible by measuring the volume wound into the bobbin at the same time.

Deflection measurements in a PC board

Non-contact, reliable detection of board displacements during strength inspections. A maximum sampling speed of 0.33 ms is possible, allowing for real-time measurements of displacement.

Detection of stage inclination prior to furnace transportation

Calculates the inclination by measuring multiple points on the stage prior to transferring to the furnace. Transferring the product after correcting the inclination allows for consistent temperature control.

Behavior detection in an operational unit

Measures the behavior of each unit in the device. Due to the small head footprint, the IL series can be installed in compact spaces. This means that the IL series can be installed even after the machinery has been set up.

Misalignment measurement and presence detection of a wafer/glass in a cassette.

Measures the presence and protrusion of glass in a cassette. Stable detection is possible even if positional misalignments occur in the cassette itself by utilizing analog processing.

Measuring the height of a chip after bonding

Measures the height of the board pre-bonding and the chip post-mounting, allowing control of the post-processing suction nozzle and dispenser nozzle feedback.
The cable does not come attached with the sensor head and must be purchased separately.

Sensor heads

<table>
<thead>
<tr>
<th>Model</th>
<th>IL-030</th>
<th>IL-065</th>
<th>IL-100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>Reference distance</td>
<td>30 mm 1.18&quot;</td>
<td>65 mm 2.56&quot;</td>
<td>100 mm 3.94&quot;</td>
</tr>
<tr>
<td>Measurement range</td>
<td>20 to 45 mm 0.79&quot; to 1.77&quot;</td>
<td>55 to 105 mm 2.17&quot; to 4.13&quot;</td>
<td>75 to 130 mm 2.95&quot; to 5.12&quot;</td>
</tr>
<tr>
<td>Light source</td>
<td>Laser class</td>
<td>Class 1 (21 CFR Part1040.10) 1</td>
<td>Class 2 (21 CFR Part1040.10)</td>
</tr>
<tr>
<td></td>
<td>Output</td>
<td>220 µW</td>
<td>560 µW</td>
</tr>
<tr>
<td>Spoil diameter (at standard distance)</td>
<td>Approx. 200 x 750 µm 7.88 x 29.53 µm</td>
<td>Approx. 550 x 1750µm 21.65 x 68.9 µm</td>
<td>Approx. 400 x 1530 µm 15.75 x 53.15 µm</td>
</tr>
<tr>
<td>Linearity</td>
<td>±0.1% of F.S. (F.S.=±5 mm 0.20&quot;, 25 to 35 mm 0.98% to 1.39&quot;)</td>
<td>±0.1% of F.S. (F.S.=±10 mm 0.39&quot;, 55 to 75 mm 2.17% to 2.95&quot;)</td>
<td>±0.15% of F.S. (F.S.=±20 mm 0.79&quot;, 80 to 120 mm 3.15% to 4.72&quot;)</td>
</tr>
<tr>
<td>Repeatability</td>
<td>2 µm 0.08 M</td>
<td>4 µm 0.16 M</td>
<td>10 µm 0.39 M</td>
</tr>
<tr>
<td>Sampling rate</td>
<td>0.33/1/2/5 ms (4 levels available)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation status indicators</td>
<td>Laser emission warning indicator: Green LED, Analog range indicator: Orange LED, Reference distance indicator: Red/Green LED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature characteristics</td>
<td>0.05% of F.S./°C (F.S.=±5 mm 0.20&quot;, 25 to 35 mm 0.98% to 1.39&quot;)</td>
<td>0.06% of F.S./°C (F.S.=±10 mm 0.39&quot;, 55 to 75 mm 2.17% to 2.95&quot;)</td>
<td>0.06% of F.S./°C (F.S.=±20 mm 0.79&quot;, 80 to 120 mm 3.15% to 4.72&quot;)</td>
</tr>
</tbody>
</table>

Amplifier unit

<table>
<thead>
<tr>
<th>Model</th>
<th>IL-1000</th>
<th>IL-1500</th>
<th>IL-1050</th>
<th>IL-1550</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>DIN-rail mount</td>
<td>Panel mount</td>
<td>DIN-rail mount</td>
<td>Panel mount</td>
</tr>
<tr>
<td>Type</td>
<td>Compatible</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum displayable unit</td>
<td>IL-030: 1 µm 0.04 Mil</td>
<td>IL-065, IL-100: 2 µm 0.08 Mil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display range</td>
<td>±99,999 mm to ±99 mm (4 levels selectable)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display rate</td>
<td>Approx. 10 times / sec.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog voltage output</td>
<td>±5 V, 1 to 5 V, 0 to 5 V Output impedance 100 Ω</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog current output</td>
<td>4 to 20 mA Maximum load resistance of 350 Ω</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control input 2</td>
<td>Bank switch input</td>
<td>Non-voltage input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero-shift input</td>
<td>Stop emission input</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timing input</td>
<td>Reset input</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control output 2</td>
<td>Judgement output</td>
<td>Open collector output (NPN, PNP changeover possible/N.O., N.C. changeover possible)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alarm output</td>
<td>Open collector output (NPN, PNP changeover possible/N.O.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>Power voltage 2</td>
<td>10 to 30 VDC ripple (P-P) 10% included, Class 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power consumption</td>
<td>2300 mW or less (at 30 V; 77 mA or less)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ambient humidity</td>
<td>-10 to +50°C 14 to 122°F (No condensation or freezing)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ambient temperature</td>
<td>35 to 85% RH (No condensation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vibration</td>
<td>10 to 55 Hz 1.5 mm 0.06&quot; in the X, Y and Z directions, 2 hours respectively</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Environmental resistance

<table>
<thead>
<tr>
<th>Material</th>
<th>Housing material: PBT Metal parts: SUS304 Packing: NBR Lens cover: Glass Cable: PVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>Approx. 60g</td>
</tr>
</tbody>
</table>

1. The laser classification for FDA (CDRH) is implemented based on IEC 60825-1 in accordance with the requirements of Laser Notice No.50.
2. Value when measuring the KEYENCE standard target (white diffuse object).
3. Value when measuring the KEYENCE standard target (white diffuse object) at the reference distance, sampling rate: 1 ms, and average number of times: 16.
4. Value when the sampling rate is set to 2 ms or 5 ms.

Sensor head cables (sold separately)
The cable does not come attached with the sensor head and must be purchased separately.

<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 6.6 ft</td>
<td>OP-8766</td>
<td>Approx. 63 g</td>
</tr>
<tr>
<td></td>
<td>5 m 16.4 ft</td>
<td>OP-8767</td>
<td>Approx. 190 g</td>
</tr>
<tr>
<td></td>
<td>10 m 32.8 ft</td>
<td>OP-8768</td>
<td>Approx. 360 g</td>
</tr>
<tr>
<td></td>
<td>20 m 65.6 ft</td>
<td>OP-8769</td>
<td>Approx. 689 g</td>
</tr>
</tbody>
</table>

This connector is required if the cable is cut.

Connector used to connect to a display unit (2 pcs.) OP-84338

---

1. Select and use one of ±5 V, 1 to 5 V, 0 to 5 V or 4 to 20 mA.
2. Assign an input of your choice to the 4 external input lines before using.
3. – The PNP open collector rated output is: 50 mA max./ch (20 mA when adding an expansion unit) less than power voltage, and less than 2 V residual voltage (less than 2.5 V when adding over 6 units including the main unit)
4. The laser classification for FDA (CDRH) is implemented based on IEC 60825-1 in accordance with the requirements of Laser Notice No.50.
## Communication unit

<table>
<thead>
<tr>
<th>Model</th>
<th>Appearance</th>
<th>DL-R81A</th>
<th>DL-RS1A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power supply voltage</strong></td>
<td>20 to 30 VDC, including ripple. Ripple (P-P): 10% max. Class 2 (Supplied via connected sensor amplifier)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td>27 mA max.</td>
<td>25 mA max.</td>
<td></td>
</tr>
<tr>
<td><strong>Number of connectable sensor amplifiers</strong></td>
<td>Up to 8 units (including main unit)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Indicator</strong></td>
<td>Alarm indicator lamp (red), Power indicator lamp (green)</td>
<td>Communication indicator lamp (green × 2), Alarm indicator lamp (red), Power indicator lamp (green)</td>
<td></td>
</tr>
<tr>
<td><strong>Communication method</strong></td>
<td>–</td>
<td>Full duplex</td>
<td></td>
</tr>
<tr>
<td><strong>Synchronization method</strong></td>
<td>–</td>
<td>Start-stop</td>
<td></td>
</tr>
<tr>
<td><strong>Transmission code</strong></td>
<td>–</td>
<td>ASCII</td>
<td></td>
</tr>
<tr>
<td><strong>Baud rate</strong></td>
<td>–</td>
<td>2400/4800/9600/19200/38400 bps selectable (Factory-setting: 9600 bps)</td>
<td></td>
</tr>
<tr>
<td><strong>Data bit length</strong></td>
<td>–</td>
<td>8 bits/7 bits selectable (Factory-setting: 8 bits)</td>
<td></td>
</tr>
<tr>
<td><strong>Parity check</strong></td>
<td>–</td>
<td>None/Even/Odd selectable (Factory-setting: None)</td>
<td></td>
</tr>
<tr>
<td><strong>Stop bit length</strong></td>
<td>–</td>
<td>1 bit</td>
<td></td>
</tr>
<tr>
<td><strong>Data delimiter</strong></td>
<td>–</td>
<td>Data reception: automatically recognizes CR or CR+LF, Data transmission: Fixed to CR+LF</td>
<td></td>
</tr>
<tr>
<td><strong>Ambient temperature</strong></td>
<td>-10 to +55°C</td>
<td>14 to 131°F</td>
<td></td>
</tr>
<tr>
<td><strong>Ambient humidity</strong></td>
<td>35 to 85% RH (No condensation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Vibration resistance</strong></td>
<td>10 to 55 Hz Double amplitude: 1.5 mm 0.06” XYZ each axis: 2 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Material</strong></td>
<td>Main unit case: Polycarbonate</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>Approx. 46 g</td>
<td>Approx. 53 g</td>
<td></td>
</tr>
</tbody>
</table>

## Optional

<table>
<thead>
<tr>
<th>Type</th>
<th>Appearance</th>
<th>Model</th>
<th>Description</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>End unit (Optional)</td>
<td></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>
<td>Approx. 15 g</td>
</tr>
<tr>
<td>Panel front protection cover</td>
<td></td>
<td>OP-87676</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>
<td>Approx. 6 g</td>
</tr>
<tr>
<td>Panel mounting bracket</td>
<td></td>
<td>OP-4122</td>
<td></td>
<td>Approx. 7 g</td>
</tr>
<tr>
<td>Expansion cable: 300 mm 11.81&quot;</td>
<td></td>
<td>OP-35361</td>
<td>Extension cable used for panel mount type amplifier. Use this cable if the standard cable is not long enough.</td>
<td>Approx. 10 g</td>
</tr>
<tr>
<td>DIN-rail mounting bracket</td>
<td></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>
<td>Approx. 12 g</td>
</tr>
</tbody>
</table>
Dimensions

Sensor heads
IL-030

IL-065/100

Options

Amplifier unit (DIN-rail mount)
IL-1000/IL-1050

Amplifier unit (Panel mount type)
IL-1500/IL-1550
Options

Communication unit (BCD output type)
DL-RB1A

34-pin MIL connector

Communication unit (RS-232C communication type)
DL-RS1A

Wiring Diagram

Brown ¹
Blue ¹
Black
White
Gray
Green
Light blue
Orange ³
Shield ²
Pink ⁴
Yellow ⁵
Pink/purple ⁴
Purple ⁴

10 to 30 VDC
0V
HIGH judgment output
LOW judgment output
GO judgment output
Alarm output
Analog output +
Analog output GND
External input 1 (zero shift input)
External input 2 (reset input)
External input 3 (timing input)
External input 4 (not used)

1. The brown, blue, and light blue cables are not provided in a IL-1050/IL-1550 unit (expansion unit). The power is supplied to the expansion unit from the IL-1000/IL-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 details, refer to the User’s Manual.
4. If there are over 6 additional expansion units, please use a power voltage of 20 to 30 V.
Total Solution Lineup

CCD LASER MICROMETER

Multi-Purpose CCD Laser Micrometer
IG Series
- Repeatability of 5 µm (0.20 Mil)
- Linearity of ± 0.1% (IG-028)
- Built-in position monitor

CONTACT SENSOR

High-precision Contact Digital Sensor
GT2 Series
- High accuracy in the entire measurement range
- Good temperature characteristics
- No tracking errors
- Absolute position detection

INDUCTIVE DISPLACEMENT

Digital Inductive Displacement Sensor
EX-V Series
- Resolution of 0.02% of F.S.
- Linearity of ± 0.3% of F.S.
- Ultra high-speed sampling of 25 µs

SAFETY INFORMATION
Please read the instruction manual carefully in order to safely operate any KEYENCE product.