KEYENCE

NEW **CMOS Multi-Function Analogue Laser Sensor**

IL Series

A wide lineup of measurement ranges capable of solving many applications, from part differentiation to high precision measurement

Intelligent Sensor
I-SERIES

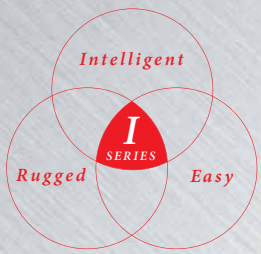
Low-cost High Performance

INTRODUCING THE LASER APPLICATION SENSOR IL SERIES

HEIGHT/ HEIGHT DIFFERENCE	WARPAGE	THICKNESS/WIDTH
POSITIONING	VIBRATION	COUNT

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

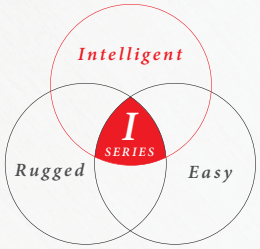
Excellent usability makes it possible to quickly and easily perform stable measurements without any difficult adjustments or settings.

Low-cost
High
Performance

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

Introducing the IL Series

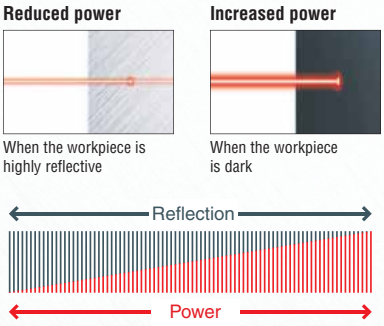
Intelligent Sensor
I-SERIES



High-Precision Head + Multi-Function Amplifier

[Newly developed LSGC included] + [All-in-one design]

The stable measurement of any given target is possible by sensing the target surface and adjusting the 600,000 times dynamic range. 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]

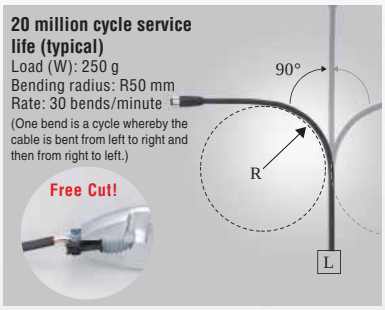
The head structure was redesigned to make it rugged enough to withstand almost any environment. In addition, the housing is made of die cast SUS304 for added strength and protection.

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*. 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-600
Reference distance 600 mm
Measurement range 200 to 1000 mm
Display Resolution 50 µm
Repeatability 300 µm

IL-300
Reference distance 300 mm
Measurement range 160 to 450 mm
Display Resolution 10 µm
Repeatability 50 µm

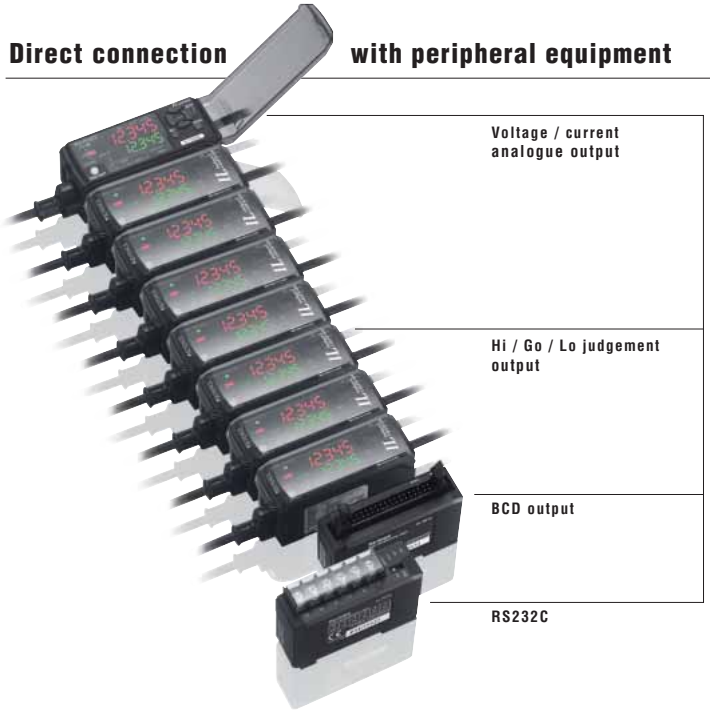
IL-100
Reference distance 100 mm
Measurement range 75 to 130 mm
Display Resolution 2 µm
Repeatability 10 µm

IL-065
Reference distance 65 mm
Measurement range 55 to 105 mm
Display Resolution 2 µm
Repeatability 4 µm

IL-030
Reference distance 30 mm
Measurement range 20 to 45 mm
Display Resolution 1 µm
Repeatability 2 µm

The multi-function amplifier with an all-in-one design

Direct connection with peripheral equipment

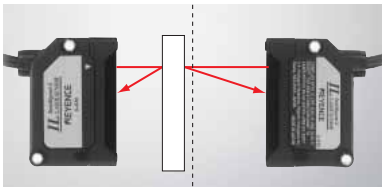


Peripheral equipment

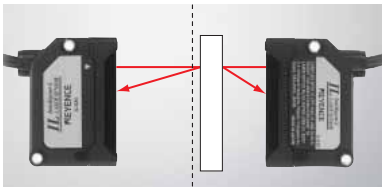
New mode – Thickness calibration function included

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

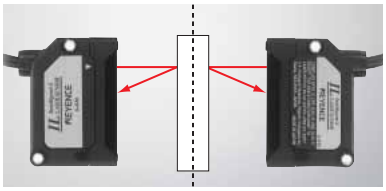
Step 1 Bring the target close to one sensor head and input the thickness data, then push the set button.



Step 2 Bring the same target used in Step 1 close to the opposing sensor head and push the set button.



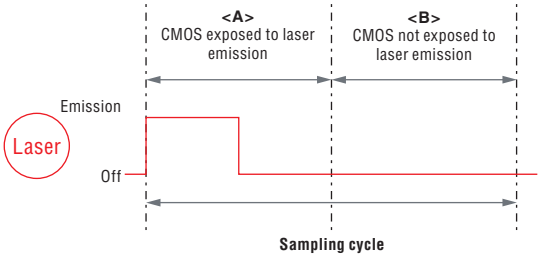
Step 3 Insert a target thicker than the target used in Step 2. Input the thickness data. Then pushing the set button completes calibration.

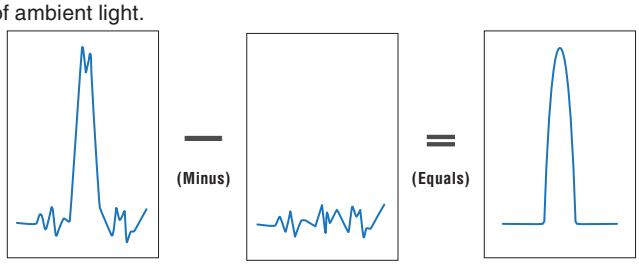


When bringing the target closer to the sensor head in Steps 1 and 2, you are compensating for the misalignments that occur during installation. To set, you can begin with either one of the sensor heads.

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

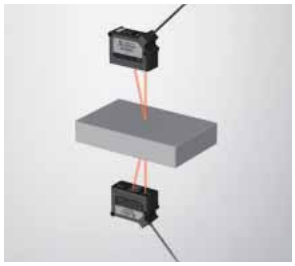
The CMOS waveform of B
Ambient light only

CMOS waveform (difference)
Waveform where the ambient light has been removed

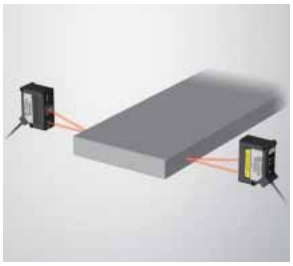
CALCULATION FUNCTION

Addition mode

Setting example 1
(thickness measurement)

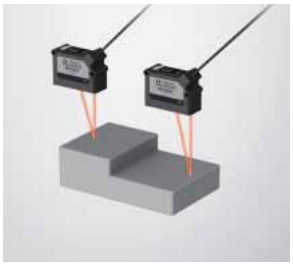


Setting example 2
(width measurement)

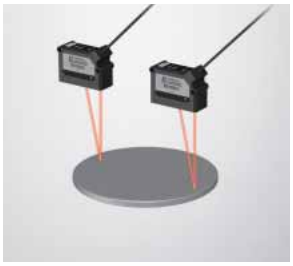


Subtraction mode

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.

Analogue Output Selection

The following five types of analogue outputs can be selected. The output is selected the first time the user turns on the power.

Setting value	Description
oFF	Not output
0-5u	Analogue output after the judgement value is converted to the range from 0 to 5 V.
-5-5u	Analogue output after the judgement value is converted to the range of ±5 V.
1-5u	Analogue output after the judgement value is converted to the range from 1 to 5 V.
4nPr	Analogue output after the judgement value is converted to the range from 4 to 20 mA.

The setting can be changed.

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, shift value, analogue output scaling setting

Mounting method options

Both panel and DIN-rail mount units are available.

IL-1500/1550
Panel mount type

IL-1000/1050
DIN-rail mount type

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 [1]
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.

1. D-sub 9 pin connector cable (OP-81283) can be used for connection.

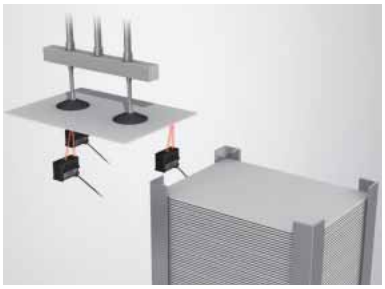
Applications

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 colour changes.

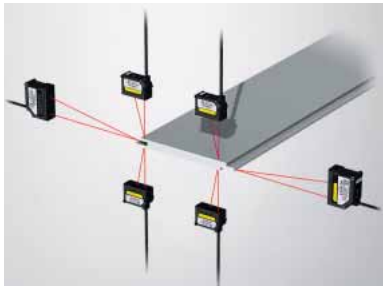
Warpage detection in ceramic boards

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 building material boards

Thickness and width can be simultaneously measured immediately after the extrusion process. In addition, man-hours for setup and product changeovers are reduced using the thickness calibration function.



Packaging material counting

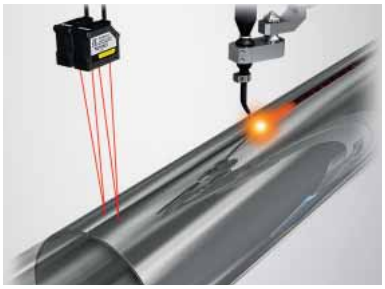
Even in targets with a large amount of shape scatter, reliable counts can still be achieved by detecting rising edges.

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 colour.

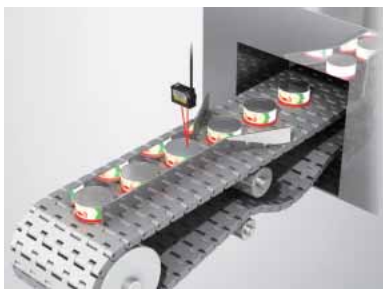
Positional control of welding beads

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.



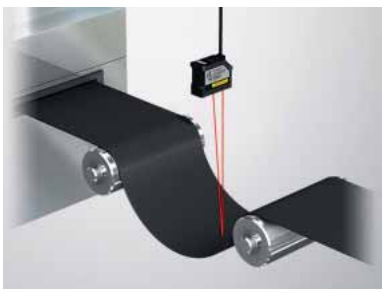
Heat processing inspection of cans

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 colour changes in the cans.



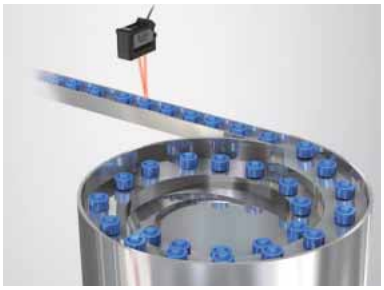
Height controls of a hoop material

By using a long range type of sensor head, it is possible to control height of hoop materials such as steel plates and sheet materials even during transportation.
The sensor head can be installed at a distance of up to 1000 mm.



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.

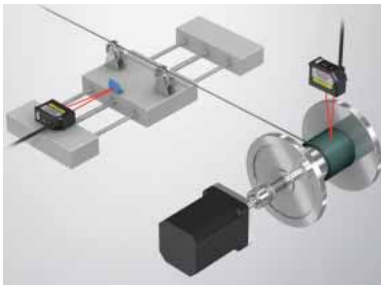


Stacker counting & uneven checks

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 colour 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.

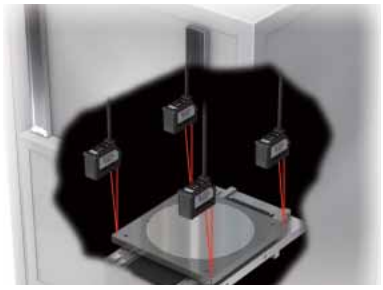


Height controls of a PC board

Controls the PC board height in the mounting and drilling processes. Various kinds of targets can be reliably controlled without being affected by the surface colours of the PC boards.

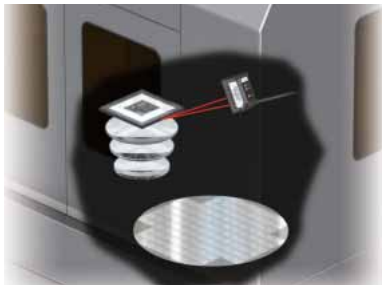
Detection of stage inclination prior to furnace transportation

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.



Wafer measurement inside an inspection machine

Measures the behaviour of each wafer in the machine. Due to the small head size, the IL Series can be installed in compact spaces. This means 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 utilising analogue 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.

Specification

Sensor heads

Model		IL-030	IL-065	IL-100	IL-300	IL-600
Appearance						
Reference distance		30 mm	65 mm	100 mm	300 mm	600 mm
Measurement range		20 to 45 mm	55 to 105 mm	75 to 130 mm	160 to 450 mm	200 to 1000 mm
Light source		Red semiconductor laser, wavelength: 655 nm (visible light)				
	Laser class	Class 1 (FDA (CDRH) Part1040.10) [1.] Class 1 (IEC 60825-1)	Class 2 (FDA (CDRH) Part1040.10) [1.] Class 2 (IEC 60825-1)			
	Output	220 µW	560 µW			
Spot diameter (at standard distance)		Approx. 200 × 750 µm	Approx. 550 × 1750µm	Approx. 400 × 1350 µm	Approx. ø0.5 mm	Approx. ø1.6 mm
Linearity [2. 3.]		±0.1% of F.S.	±0.1% of F.S.	±0.15% of F.S.	±0.25% of F.S.	±0.25% of F.S.(200 to 600 mm) ±0.5% of F.S.(200 to 1000 mm)
Repeatability [4.]		2 µm	4 µm	10 µm	50 µm	300 µm
Sampling rate		0.33/1/2/5 ms (4 levels available)				
Operation status indicators		Laser emission warning indicator: Green LED, Analogue range indicator: Orange LED, Reference distance indicator: Red/Green LED				
Temperature characteristics [3.]		0.05% of F.S./°C	0.06% of F.S./°C	0.06% of F.S./°C	0.08% of F.S./°C	
Environmental resistance	Enclosure rating	IP67				
	Ambient light [5.]	Incandescent lamp: 5000 lux	Incandescent lamp: 7500 lux		Incandescent lamp: 5000 lux	
	Ambient temperature	-10 to +50°C (No condensation or freezing)				
	Relative humidity	35 to 85% RH (No condensation)				
	Vibration	10 to 55 Hz Double amplitude 1.5 mm XYZ each axis: 2 hours				
	Pollution degree	3				
Material		Housing material: PBT, Metal parts: SUS304, Packing: NBR, Lens cover: Glass, Cable: PVC				
Weight		Approx. 60g	Approx. 75g		Approx. 135g	

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. F.S. of each model is as follows. IL-030: ±5mm IL-065: ±10mm IL-100: ±20mm IL-300: ±140mm IL-600: ±400mm
4. Value when measuring the KEYENCE standard target (white diffuse object) at the reference distance, sampling rate: 1 ms, and average number of times: 16. For the IL-300/IL-600, the sampling rate is 2 ms.
5. Value when the sampling rate is set to 2 ms or 5 ms.

Amplifier unit

Model		IL-1000	IL-1500	IL-1050	IL-1550
Appearance					
Type		DIN-rail mount	Panel mount	DIN-rail mount	Panel mount
Main unit/expansion unit		Main unit		Expansion unit	
Head compatibility		Compatible			
Display	Minimum displayable unit	IL-030: 1 µm, IL-065/IL-100: 2 µm, IL-300: 10 µm, IL-600: 50 µm			
	Display range	IL-030/IL-065/IL-100: ±99.999 mm to ±99 mm (4 levels selectable), IL-300/IL-600: ±999.99 mm to ±99 mm (3 levels selectable)			
	Display rate	Approx. 10 times/sec.			
Analogue voltage output [1.]		±5 V, 1 to 5 V, 0 to 5 V Output impedance 100 Ω		None	
Analogue current output [1.]		4 to 20 mA Maximum load resistance of 350 Ω			
Control input [2.]	Bank switch input	Non-voltage input			
	Zero-shift input				
	Stop emission input				
	Timing input				
	Reset input				
Control output [3.]	Judgement output	Open collector output (NPN, PNP changeover possible/N.O., N.C. changeover possible)			
	Alarm output	Open collector output (NPN, PNP changeover possible/N.C.)			
Current	Power voltage [4.]	10 to 30 VDC ripple (P-P) 10% included, Class 2		Supplied by main unit	
	Power consumption	2300 mW or less (at 30 V: 77 mA or less)	2500 mW or less (at 30 V: 84 mA or less)	2000 mW or less (at 30 V: 67 mA or less)	2200 mW or less (at 30 V: 74 mA or less)
Environmental resistance	Ambient humidity	-10 to +50°C (No condensation or freezing)			
	Ambient temperature	35 to 85% RH (No condensation)			
	Vibration	10 to 55 Hz Double amplitude 1.5 mm XYZ each axis: 2 hours			
	Pollution degree	2			
Material		Case / Front sheet: Polycarbonate; Key tops: Polyacetel; Cable: PVC			
Weight (including attachments)		Approx. 150g	Approx. 170g	Approx. 140g	Approx. 160g

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 NPN open collector rated output is: 50 mA max./ch (20 mA when adding an expansion unit) less than 30 V, residual voltage less than 1 V (less than 1.5 V when adding over 6 units including the main unit)
   – The PNP open collector rated output is: 50 mA max./ch (20 mA/ch when adding expansion units), 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. If there are over 6 additional expansion units, please use a power voltage of 20 to 30 V.

Sensor head cables (sold separately)

The cable does not come attached with the sensor head and must be purchased separately.

Appearance	Cable length	Model	Weight
1 cable included 	2 m	**OP-87056**	Approx. 80 g
	5 m	**OP-87057**	Approx. 190 g
	10 m	**OP-87058**	Approx. 360 g
	20 m	**OP-87059**	Approx. 680 g

This connector is required if the cable is cut.

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

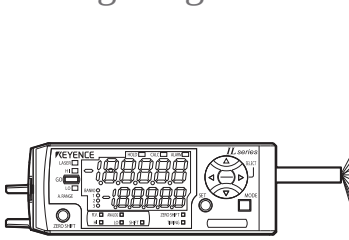
Communication unit

Model		DL-RB1A	DL-RS1A
Appearance			
Power supply voltage		20 to 30 VDC, including ripple, Ripple (P-P): 10% max. Class 2 (Supplied via connected sensor amplifier)	
Power consumption		27 mA max.	25 mA max.
Number of connectable sensor amplifiers		Up to 8 units (including main unit)	
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
Synchronization method		–	Start-stop
Transmission code		–	ASCII
Baud rate		–	2400/4800/9600/19200/38400 bps selectable (Factory-setting: 9600 bps)
Data bit length		–	8 bits/7 bits selectable (Factory-setting: 8 bits)
Parity check		–	None/Even/Odd selectable (Factory-setting: None)
Stop bit length		–	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	
	Ambient humidity	35 to 85%RH (No condensation)	
	Vibration resistance	10 to 55 Hz Double amplitude 1.5 mm XYZ each axis: 2 hours	
Material		Case/Polycarbonate	
Weight		Approx. 46 g	Approx. 53 g

Optional

Type	Appearance	Model	Description	Weight
End unit (Optional)		**OP-26751**	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.)	Approx. 15g
Panel front protection cover [Included in panel mount type amplifier]		**OP-87076**	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.	Approx. 6g
Panel mounting bracket [Included in panel mount type amplifier]		**OP-4122**		Approx. 7g
Expansion cable: 300 mm		**OP-35361**	Extension cable used for panel mount type amplifier. Use this cable if the standard cable is not long enough.	Approx. 10g
DIN-rail mounting bracket		**OP-60412**	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.	Approx. 12g

Wiring Diagram



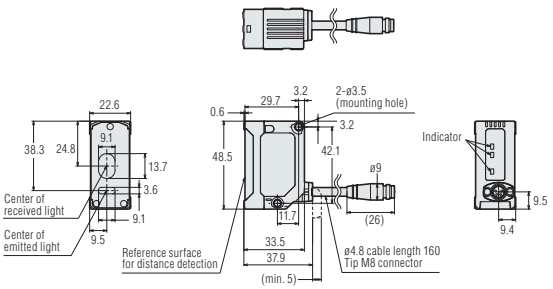
Brown [1]	10 to 30 VDC [4]
Blue [1]	0V
Black	HIGH judgment output
White	LOW judgment output
Gray	GO judgment output
Green	Alarm output
Light blue [1] / Orange [2]	Analogue output +
Shield [2]	Analogue output GND
Pink [3]	External input 1 (zero shift input)
Yellow [3]	External input 2 (reset input)
Pink/purple [3]	External input 3 (timing input)
Purple [3]	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 analogue 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.

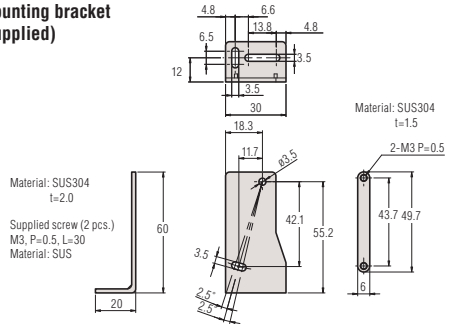
Dimensions

Unit : mm

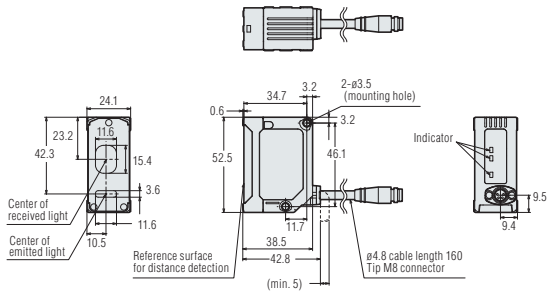
Sensor heads
IL-030



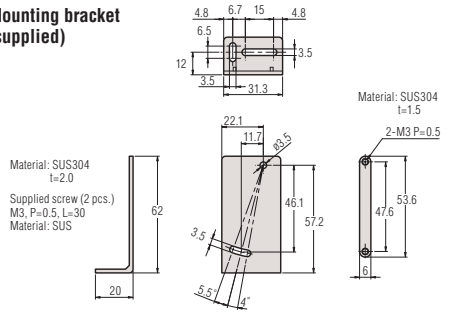
Mounting bracket (supplied)



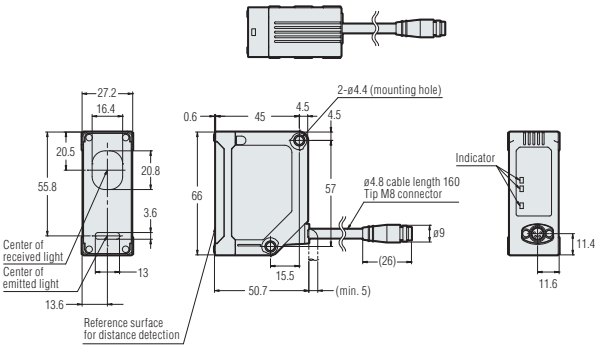
IL-065/100



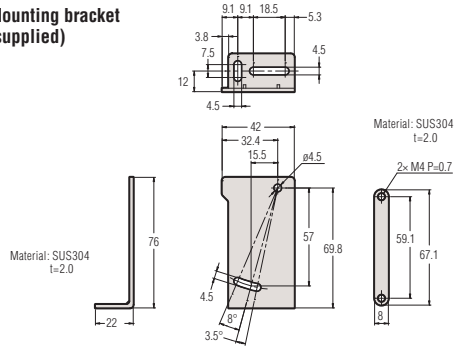
Mounting bracket (supplied)



IL-300/600



Mounting bracket (supplied)

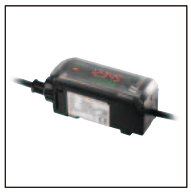


Options

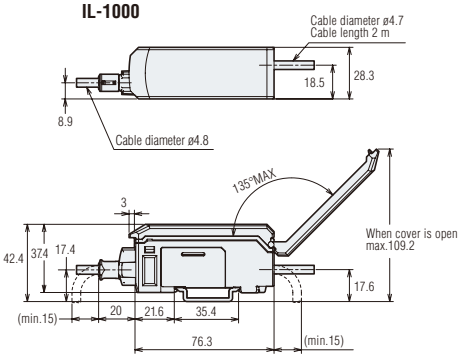
Unit : mm

Amplifier unit (DIN-rail mount type)

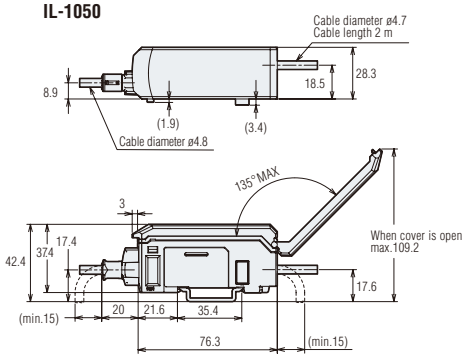
IL-1000/IL-1050



IL-1000

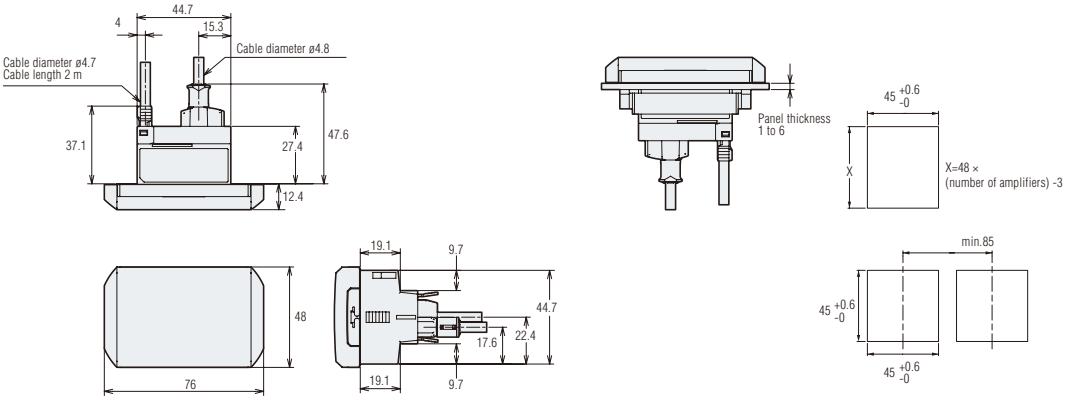


IL-1050



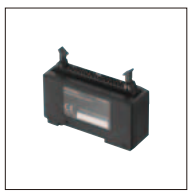
Amplifier unit (Panel mount type)

IL-1500/IL-1550



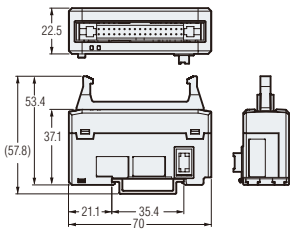
Communication unit (BCD output type)

DL-RB1A

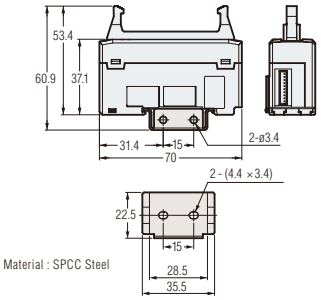


34-pin MIL connector

DIN-rail mount



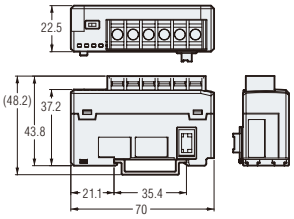
When the mounting bracket is attached OP-60412 (Optional)



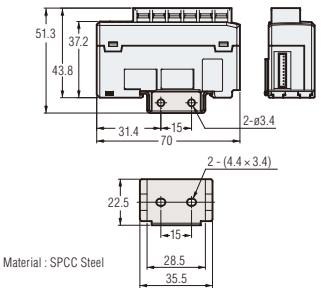
Communication unit (RS-232C communication type)

DL-RS1A

DIN-rail mount



When the mounting bracket is attached OP-60412 (Optional)

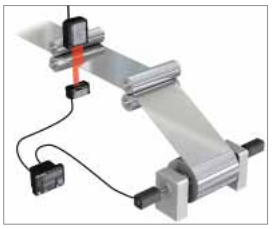


Total Solution Lineup

CCD LASER MICROMETRE

Multi-Purpose CCD Laser Micrometre
IG Series

- Repeatability of 5 µm
- Linearity of ± 0.1% (IG-028)
- Built-in position monitor



Feedback control using edge position control

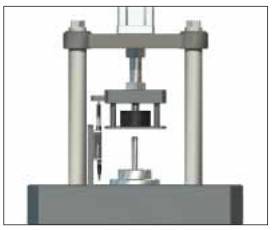
Outer diameter/deformation measurement

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

Resolution	Accuracy
0.1 µm	1 µm



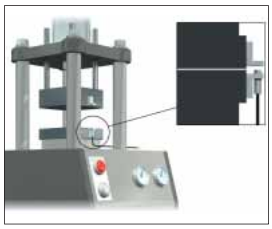
Measurement of defects in a press fit

Detection of crank shaft defects

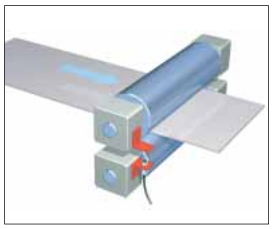
INDUCTIVE DISPLACEMENT

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



Confirmation of the die closure of an IC molding press



Measuring the gap between rollers

KEYENCE

Please visit: www.keyence.com

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

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