KEYENCE

I-Series General Catalogue

EtherNet/IP™ DeviceNet™

EtherCAT® PROFIBUS® PROFINET®

THE INTELLIGENT SOLUTION

TO YOUR SENSING PROBLEMS

Vision Sensor
IV Series

High-Accuracy Digital Contact Sensor
GT2 Series

CMOS Analogue Laser Sensor
IL Series

Multi-Purpose CCD Laser Sensor
IG Series

Thrubeam Type Laser Detection Sensor
IB Series

High Power Digital Ultrasonic Sensor
FW Series

Digital Infrared Temperature Sensor
FT Series

High-speed, High-Accuracy Digital Displacement Inductive Sensor
EX-V Series

Open Field Network Unit

Static Eliminator

Electrostatic Sensor

EQUIPPED WITH AUTOMATIC FOCUS MECHANISM

ULTRA-COMPACT HEAD, THE SMALLEST IN ITS CLASS

- Easy-to-use rapid set-up
- STABLE DETECTION Excellent imaging capability
- AFFORDABLY PRICED Reduced installation cost
- 13 selectable head variations

→ P.06

DISPLAY RESOLUTION
0.1 µm

PRECISION
1 µm

- Scale shot system provides absolute values and high precision
- Cycle lifetime: 200 million
- Flexible, free-cut cable
- Lineup includes models with maximum 50 mm stroke and air-actuated types
- NEMA Type 13 and IP67G-rated enclosure rating

→ P.12

DISPLAY RESOLUTION
1 µm

REPEATABILITY
1 µm

- Newly developed optical system ensures stable measurement
- Rugged structure features die-cast optical base
- Extensive lineup for measurements of up to 130 mm
- Flexible, free-cut cable
- IP67-rated enclosure rating

→ P.16

DISPLAY RESOLUTION
1 µm

REPEATABILITY
5 µm

- Multi-wavelength laser and I-DSP provide more stable measurement
- Position monitor
- Flexible, free-cut cable
- Variety of application modes
- IP67-rated enclosure rating

→ P.20

DISPLAY RESOLUTION
0.01%

REPEATABILITY
5 µm

- Multi-wavelength laser and high-sensitivity PD achieve high-accuracy differentiation
- High-speed sampling of 80 µs
- High-accuracy differentiation of 5 µm
- Auto adjustment function
- Alignment LEDs

→ P.24

DISPLAY RESOLUTION
1 mm

- All-purpose sensor provides stable detection of any target
- Lineup includes model with maximum detection distance of 1000 mm
- Features N.O.D. function, which is unaffected by background
- Smallest-in-class M18 metal body
- IP67-rated enclosure rating

→ P.28

DISPLAY RESOLUTION
0.1°C

REPEATABILITY
0.5°C

- Non-contact measurement of surface temperature
- High-speed response of 15 ms
- Laser pointers
- Compact size is smallest in class and only one-fifth that of conventional sensors
- Able to measure temperatures up to 1350°C

→ P.30

HIGH-SPEED SAMPLING
40,000 samples/sec.

RESOLUTION
0.4 µm

- High-speed sampling of 40,000 samples/second for 24-hour monitoring of facilities and products
- Extremely compact sensor head with a diameter of 5.4 mm
- Simple automatic setup completed just by selecting the measurement mode
- IP67 rating ensures the sensor is resistant to water and oil

→ P.34

DL Series → P.38

SJ Series → P.40

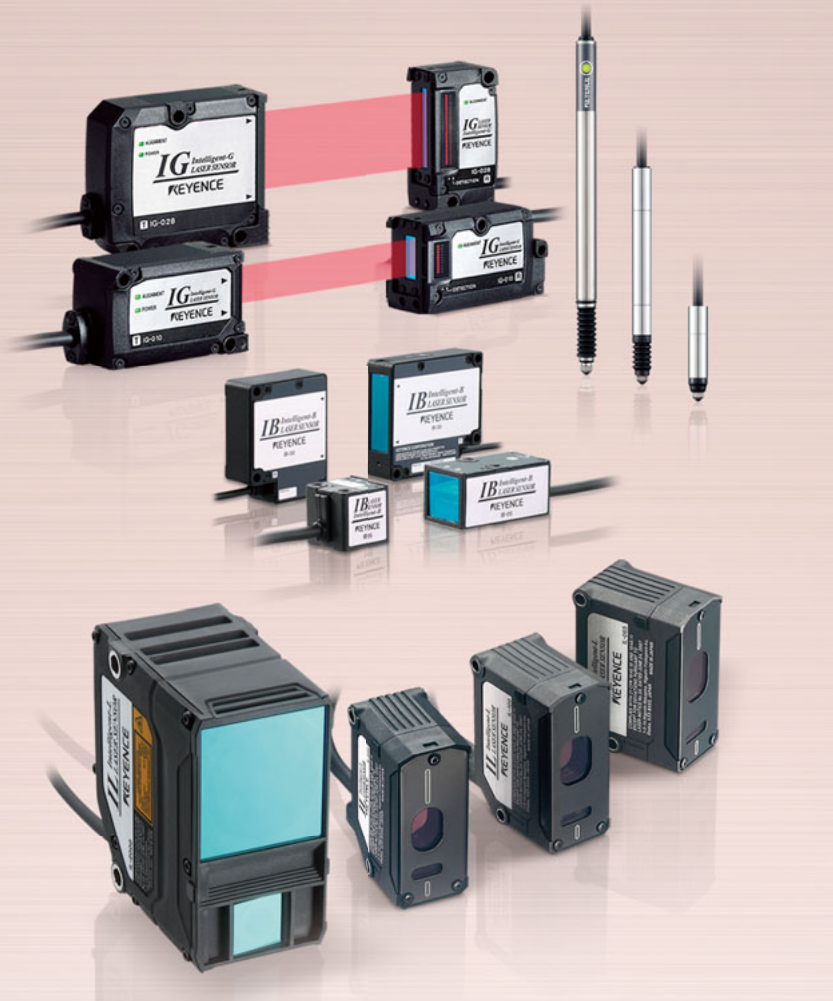
SK Series → P.42

Introducing the solution to your manufacturing issues

The I-Series solves a wide variety of applications with a wide range of detection options, including contact-type, laser, ultrasonic, and temperature sensors. From simple sorting applications to difficult detection tasks, the I-Series provides the solution to a range of issues.

General-Purpose Sensors

- Fibreoptic sensor
- Laser sensor
- Photoelectric sensor
- Colour differentiation sensor
- Proximity sensor



- Vision system
  IV series
- Contact sensor
  GT2 series
- Reflective laser sensor
  IL series
- Thrubeam laser sensor
  IG series

Lower cost — Presence — Differentiation

Having problems on the production line? The I-Series is here to help.

Inductive sensor
EX series

Ultrasonic sensor
FW series

Thrubeam laser sensor
IB series

Infrared temperature sensor
FT series

High-precision Displacement Sensors

Laser displacement sensor

Outer diameter and dimensional measurement system

Image Processing

Image-processing system

Precision

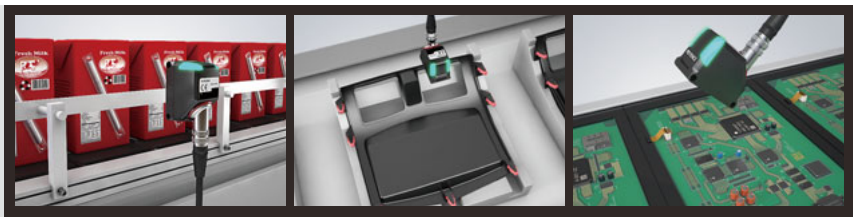
Displacement — Measurement — Higher cost

IV SERIES

ONE MINUTE SETUP

A vision sensor that anyone can use

Installation distance	:	**18 to 2000 mm**
Smallest field of view	:	**4 × 3 mm**
Largest field of view	:	**550 × 412 mm**
Enclosure rating	:	**IP67**



SIMPLY EASY

1 Minute SETUP

SIMPLE ONE-TOUCH SETUP

PC SOFTWARE IS AVAILABLE

AUTOMATIC **BRIGHTNESS ADJUSTMENT**

AUTOMATIC **FOCUSING**

JUST OUTLINE **TOOL SETUP**

Complete in 1 minute

START ····· Approximately 15 seconds ····· Approximately 45 seconds ····· **1 minute**

Both brightness and focus can be adjusted with just the press of one button. Detection tool can easily be set up by just touching or outlining the target. Stable judgements are possible regardless of who performs the setup.

FOR STABLE DETECTION OUTSTANDING OPTICAL TECHNOLOGY

First-in-class automatic focus

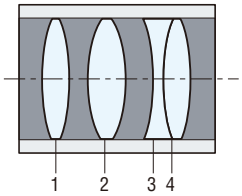
Our first-in-class automatic focus mechanism has evolved even further. We have newly developed this mechanism to be more compact and to have higher accuracy. By designing the automatic focus drive unit and the lens case in the optimal manner, our mechanism is 40% more compact than conventional models. Also, by improving the durability of the drive unit, this compact automatic focus mechanism can operate over a wider range than conventional mechanisms.

Low distortion

HP-QUAD* LENS

The newly developed lens contains 4 layers of glass that achieve low aberration with high light-gathering power, enabling bright, clear images with low distortion for stable detection.

*High Precision-Quad



The Quad lens captures an image of the entire field of view under uniform conditions.

COMPARISON OF DISTORTION

Lighting attachments

DOME LIGHT

Effective in reducing glare. Generating indirect light from various directions ensures the object is uniformly illuminated. No external power supply is necessary, which reduces introduction costs to 1/10th of conventional lights.

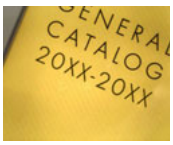
Without dome attachment

With dome attachment [IV-D10]

POLARISED FILTER

Glare from glossy surfaces is reduced because only one direction of the light wave components is transmitted. The compact size enables easy installation.

Without polarised filter



With polarised filter [OP-87436]

*This method is more effective than a polarisation filter at reducing glare.

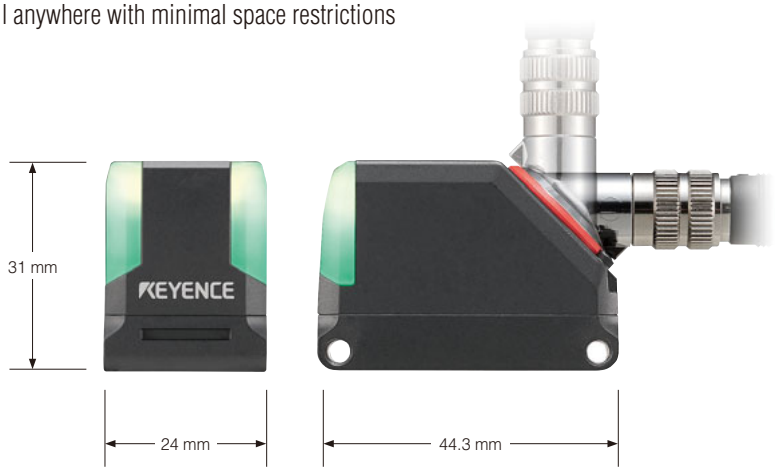
COMPACT HEAD

Width: 24 mm
Height: 31 mm
Depth: 44.3 mm

INSTALL ANYWHERE ULTRA-COMPACT MODEL THAT IS THE SMALLEST IN ITS CLASS

Ultra-compact model

Install anywhere with minimal space restrictions



Flexible layout

A connector that can rotate 330°

The cable connector can be rotated by up to 330° to match the available space and installation conditions. Together with the smallest head size in its class, this ensures a high degree of freedom when it comes to installations.

NEWLY DEVELOPED PATTERN TOOL FOR STABLE DETECTION

SHAPE DETECTION

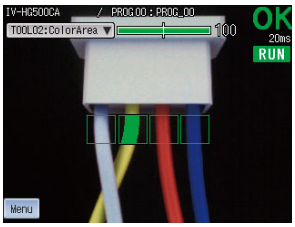
The match percentage of the object is calculated based on the shape of the registered master image. Brightness differences or differences in individual surface conditions, which were previously difficult to handle with normalised correlation methods (pattern matching) can now be identified.

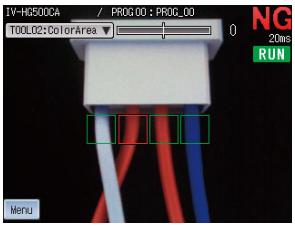
CONTOUR DIFFERENCES

AREA

Using the registered master area (number of pixels) as reference, the difference in area from the inspection object is calculated. When using a colour model, judgement can be made based on the desired area of the specified colour. When using a monochrome model, brightness is judged by the area binarised in black and white.

COLOUR DIFFERENCES

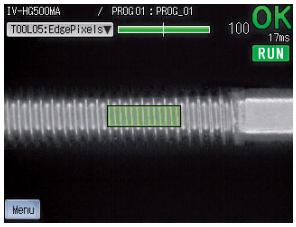


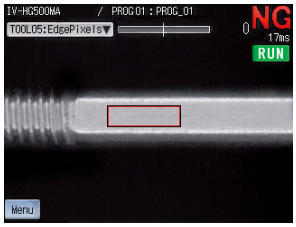


EDGE PIXELS

The match percentage of the object is calculated based on the number of pixels in the edge (outline) of a registered image. This makes it possible to maintain stable detection when the objects' colour is the same but their materials are differing, or when the brightness is changing.

DIFFERENCES IN THE NUMBER OF PIXELS IN AN EDGE

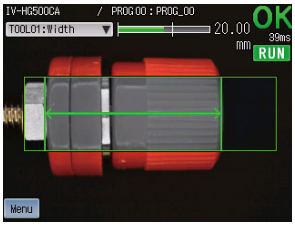


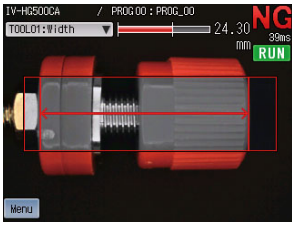


WIDTH/HEIGHT

Differentiate parts by comparing the width between edges on the target to the width of the registered master image. Using the scaling function to convert the actual values makes it possible to intuitively differentiate between products with different widths.

WIDTH DIFFERENCES

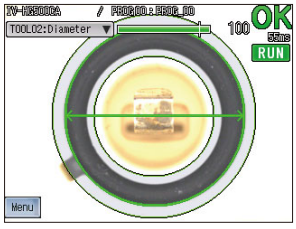


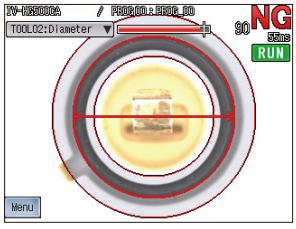


DIAMETER

Differentiate parts by comparing the diameter of the target to the diameter of the registered master image. Even if there is more than one diameter in the inspection area, selecting the diameter to be inspected is simple.

DIFFERENCES IN THE NUMBER OF PIXELS IN AN EDGE

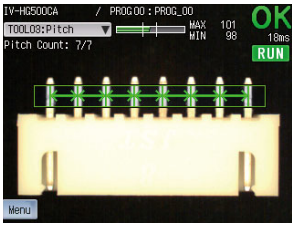


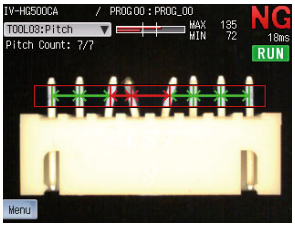


PITCH

Differentiate parts by comparing the pitch width of the target to that of the registered master image. In addition, checking the pitch count is possible, allowing for not only differentiation of product types but also simple inspections for missing or bent pins.

PITCH DIFFERENCES

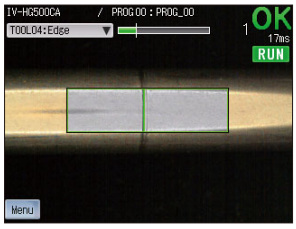


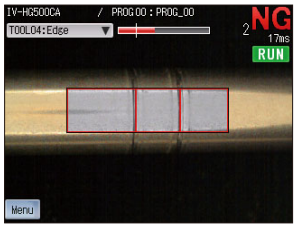


EDGE PRESENCE

Differentiate parts by comparing the number of edges on the target to the number of edges in the registered master image. This allows for even faster and simpler edge count differentiation compared to using the outline tool.

EDGE COUNT DIFFERENCES





POSITION ADJUSTMENT

If the object is misaligned, 100% inspection cannot be achieved because the object may be outside the inspection area. The position adjustment function calculates the amount of misalignment from the master image in order to correct the position, and enable correct judgement. In addition, 360° rotation is supported for high speed tracking. This means you don't need to worry about misalignment of the targets.

DETECTION OF STICKER PRESENCE/ABSENCE BY USING POSITION ADJUSTMENT

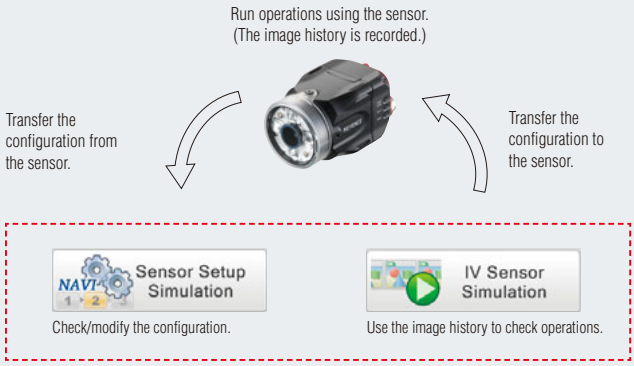
EXTENSIVE PC SOFTWARE AT AN AFFORDABLE PRICE

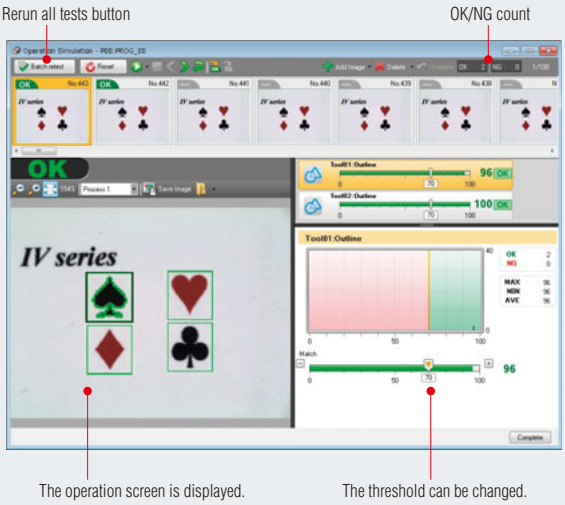
Software for IV Series, “IV-Navigator” IV-H1

The IV Series can be set up with an intelligent monitor (IV-M30) or a PC. As PCs can have a larger display, setup procedures are even easier to understand and can be quickly set up by first time users.

Simulation function

This function allows you to check and modify the program configurations and perform operation simulations based on the image history without connecting the sensor. This enables easy computation of the optimal thresholds while looking at the detection result statistics and histogram, even when you are away from the actual worksite.

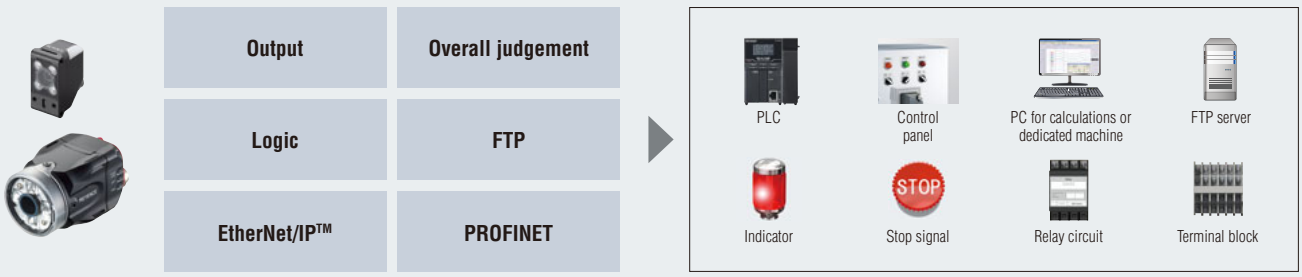




SIMPLE OUTPUT AND COMMUNICATION

Output specifications that support all connected devices

Up to 16 detection results can be freely combined to match the output destination and the usage conditions. The sensor can easily be attached to existing equipment and a PLC is not required. Also, the FTP client function supports image saving and global communication standards.

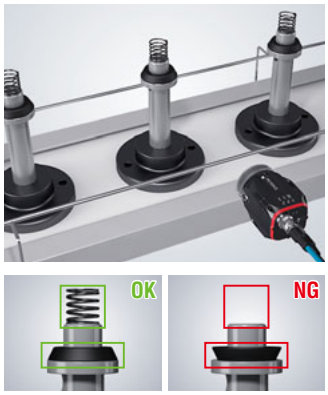


APPLICATIONS

AUTOMOTIVE & METALS

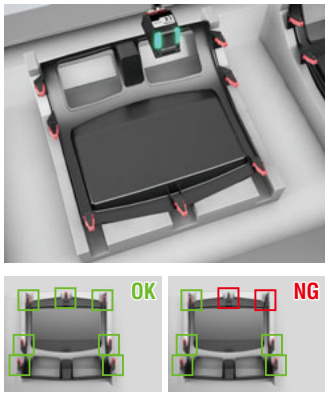
PRESENCE DETECTION

Spring presence detection



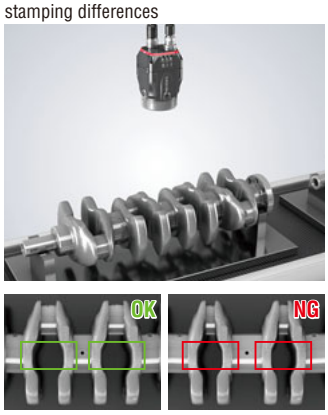
COLOUR

Instrument panel clip presence detection



SHAPE/WIDTH

Vehicle model detection using stamping differences



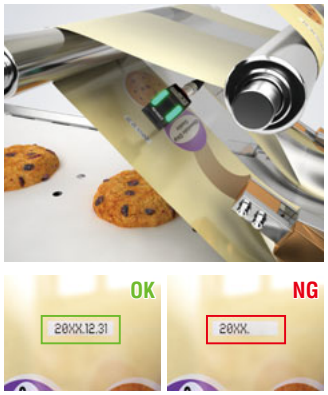
ORIENTATION/ALIGNMENT

Seal front/back detection

FOOD & PHARMACEUTICALS

PRESENCE DETECTION

Missing print detection



COLOUR

Missing straw detection

SHAPE/WIDTH

Product type detection using text differences

ORIENTATION/ALIGNMENT

Label misalignment detection

ELECTRONICS

PRESENCE DETECTION

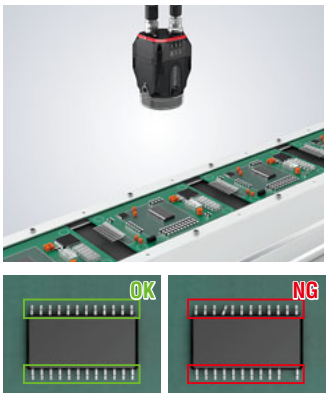
Capacitor printing presence detection

COLOUR

Remote control lighting confirmation

SHAPE/WIDTH

Connector lock confirmation



ORIENTATION/ALIGNMENT

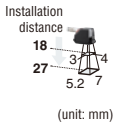
Electronic component presence & direction detection

SPECIFICATION

ULTRA-COMPACT MODELS

ULTRA-NARROW FIELD OF VIEW SENSOR MODEL (WITH ATTACHMENT)

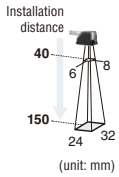
Monochrome AF type
IV-HG150MA
+
Magnifying lens attachment
OP-87902



(unit: mm)

NARROW FIELD OF VIEW SENSOR MODEL

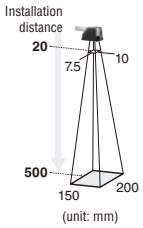
Monochrome AF type
IV-HG150MA



(unit: mm)

STANDARD SENSOR MODEL

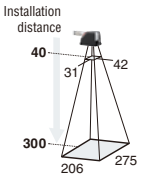
Colour AF type
IV-HG500CA
Monochrome AF type
IV-HG500MA



(unit: mm)

WIDE FIELD OF VIEW SENSOR MODEL (COLOUR)

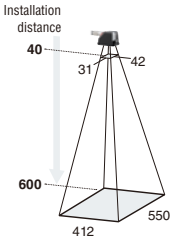
Colour AF type
IV-HG300CA



(unit: mm)

WIDE FIELD OF VIEW SENSOR MODEL (MONOCHROME)

Monochrome AF type
IV-HG600MA

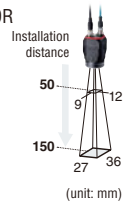


(unit: mm)

AMPLIFIER-INTEGRATED MODELS

CLOSE RANGE SENSOR MODEL

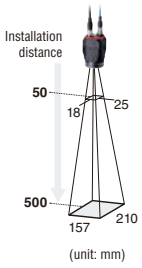
Monochrome AF type
IV-H150MA



(unit: mm)

STANDARD SENSOR MODEL

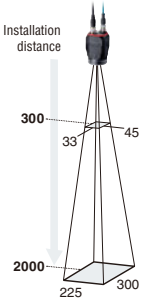
Colour AF type
IV-H500CA
Monochrome AF type
IV-H500MA



(unit: mm)

LONG RANGE SENSOR MODEL

Monochrome AF type
IV-H2000MA



(unit: mm)

AF...Automatic focus model
*View and optical axis has individual differences.

Sensor Head (Ultra-compact models)

Model	IV-HG500CA	IV-HG500MA	IV-HG150MA*	IV-HG300CA	IV-HG600MA
Type	Standard sensor model (Colour)	Standard sensor model (Monochrome)	Narrow field of view sensor model (Monochrome)	Wide field of view sensor model (Colour)	Wide field of view sensor model (Monochrome)
Installed distance/View	Installed distance 20 mm: 10 (H) × 7.5 (V) mm to installed distance 500 mm: 200 (H) × 150 (V) mm		Installed distance 40 mm: 8 (H) × 6 (V) mm to installed distance 150 mm: 32 (H) × 24 (V) mm*	Installed distance 40 mm: 42 (H) × 31 (V) mm to installed distance 300 mm: 275 (H) × 206 (V) mm	Installed distance 40 mm: 42 (H) × 31 (V) mm to installed distance 600 mm: 550 (H) × 412 (V) mm

* Installed distance 18 mm: 4 (H) × 3 (V) mm to installed distance 27 mm: 7 (H) × 5.2 (V) mm when the magnifying lens attachment (OP-87902) is used

Sensor Amplifier (Ultra-compact models)

Model		IV-HG10 (main unit)	IV-HG15 (expansion unit)
Tools	Type	Shape Detection, Area*1, Colour Area*2, Edge Pixels, Width/Height, Diameter, Edge Presence, Pitch, Position Adjustment, High Speed Position Adjustment (1-Axis/2-Axis Adjustment)	
	Number*3	Detection tools: 16 tools, position adjustment tool: 1 tool	
Switch settings (programs)		32 programs	
Rating	Power voltage	24 VDC ±10% (including ripple)	Supplied from main unit
	Current consumption	0.8 A or less. 1.5 A or less when also using an expansion unit (IV-HG15). (The output load is excluded.)	

*1. Monochrome type only *2. Colour type only *3. Tools can be installed by programs.

Sensor (Amplifier-integrated models)

Model		IV-H500CA	IV-H500MA	IV-H150MA	IV-H2000MA
Type		Standard sensor model (Colour)	Standard sensor model (Monochrome)	Short range (Monochrome)	Long range (Monochrome)
Installed distance/View		Installed distance 50 mm: 25 (H) × 18 (V) mm to installed distance 500 mm: 210 (H) × 157 (V) mm		Installed distance 50 mm: 12 (H) × 9 (V) mm to installed distance 150 mm: 36 (H) × 27 (V) mm	Installed distance 300 mm: 45 (H) × 33 (V) mm to installed distance 2000 mm: 300 (H) × 225 (V) mm
Tools	Type	Shape Detection, Colour Area*1, Area*2, Edge Pixels, Width/Height, Diameter, Edge Presence, Pitch, Position Adjustment, High Speed Position Adjustment (1-Axis/2-Axis Adjustment)			
	Number*3	Detection tools: 16 tools, position adjustment tool: 1 tool			
Switch settings (programs)		32 programs			
Rating	Power voltage	24 VDC ±10% (including ripple)			
	Current consumption	0.6 A or less			

*1. Colour type only *2. Possible with both the colour type and monochrome type *3. Tools can be installed by programs.

Monitor

Model		IV-M30
Display		3.5" TFT colour LCD 320 × 240 dot (QVGA)
Rating	Power voltage	24 VDC ±10% (including ripple)
	Current consumption	0.2 A or lower

Software

Model	IV-H1
OS	Windows 7 Home Premium/Professional/Ultimate*1 Windows XP Professional/Home Edition; either of OS above needs to be pre-installed

*1. Supported for 32 bit and 64 bit version.

HIGH-ACCURACY DIGITAL CONTACT SENSOR

Display resolution	:	**0.1 µm**
Precision	:	**1 µm**
Spindle movements	:	**200** million
Enclosure rating	:	**NEMA Type 13, IP67G**

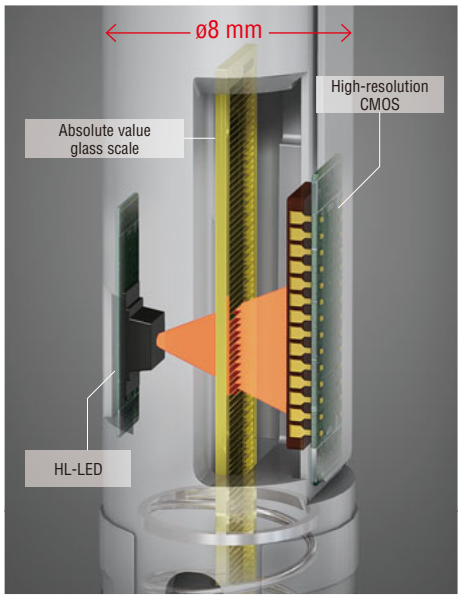
A contact sensor built on new technologies that never experiences tracking errors or forgets the origin position, all thanks to the Scale Shot System II.

HIGHEST ACCURACY IN ITS CLASS

DISPLAY RESOLUTION	ACCURACY
0.1 µm	**1 µm**

Technology of the Scale Shot System II

This innovative system was created based on KEYENCE's newly developed technology. High-intensity illumination from HL-LEDs reliably emits light through the absolute value scale to a high resolution CMOS. Output signals are calculated by the I-Processor, which allows for constant position recognition. All these features are integrated into a slim 8-mm diameter body.



HL-LED

These newly developed point light source LEDs provide even, high-intensity illumination which is 9 times more intense than conventional models.
*HL: High Luminance

HIGH-RESOLUTION CMOS

With high sensitivity, this imaging element receives the LED light that passes through the absolute value glass scale and generates output signals with resolution twice that of conventional models.

I-PROCESSOR

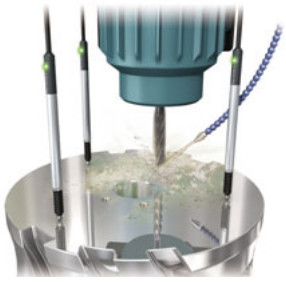
This IC is equipped with a new algorithm that performs high-speed, high-resolution calculation of the output signals transmitted from the CMOS sensor.

Extraordinary detecting durability
200 million cycles *GT2-P12K(L/F)/P12(L/F)

A detecting durability of 200 million cycles has been achieved by using new high-strength linear ball bearings in the spindle. This can greatly reduce maintenance costs and replacement efforts.

NEMA Type 13/IP67G *GT2-P12K(F)/P12(F)
*GT2-S1 and GT2-S5 comply with IP67G

The sensor head, including the connector and cable section, complies with two standards - NEMA Type 13 and IP67G. The sensor head can be mounted almost anywhere, even in environments with splashing water or oil.



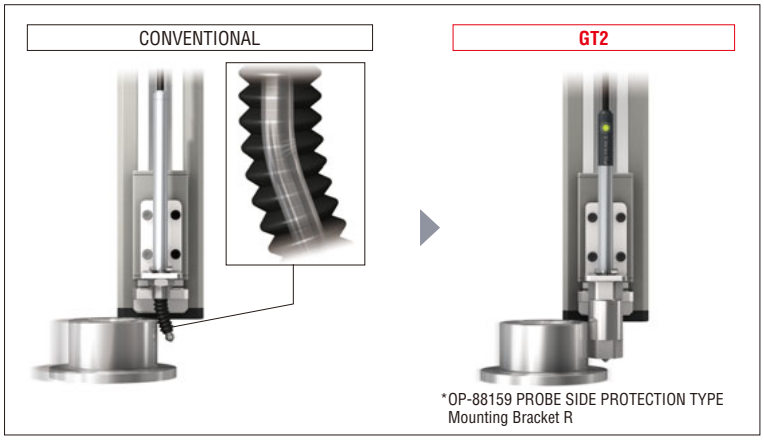
Protection mounting brackets

KEYENCE provides mounting brackets designed to prevent damage when horizontal force is applied to the spindle and when force from the spindle indentation direction is applied to the sensor head. These brackets allow the GT2 Series to be used without fear of damage even in worst-case scenarios.

OP-88159 Mounting Bracket R
+ OP-77680 Roller contact

OP-88158 Mounting Bracket P

OP-88157 Mounting Bracket I



*OP-88159 PROBE SIDE PROTECTION TYPE
Mounting Bracket R

A wide variety of sensor heads

Air push type

- The reduced number of components like guided cylinders and jigs are able to minimise the costs of design.
- Installation and adjustment require less effort, and overall accuracy is ensured by the sensor itself.

Flange-mounting type

- The sensor head and mounting bracket are designed as an integrated piece eliminating the possibility of position misalignment. Position adjustment during installation is also not required.
- The rugged design of the GT2 Series means there's no risk of damaging the sensor head even when clamping the body tightly.

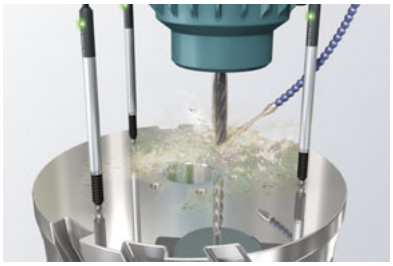
Low stress type

- Low-cost, high-accuracy measurement is possible without being influenced by surface conditions.
- The loading on products is reduced thanks to a low measuring force of just 0.1 N.

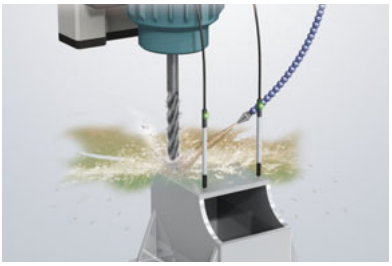
APPLICATION

OILY ENVIRONMENTS

This sensor can be used in processing machines and other harsh environments with splashing oil.



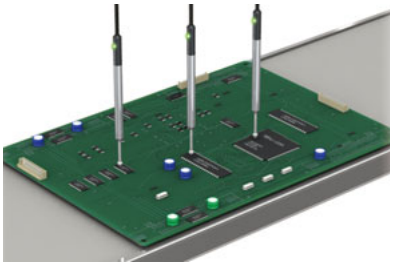
Disc assembly inspection



Dimensional measurement during machining

LOW STRESS

With the low stress type, accurate contact measurements are possible on delicate workpieces.



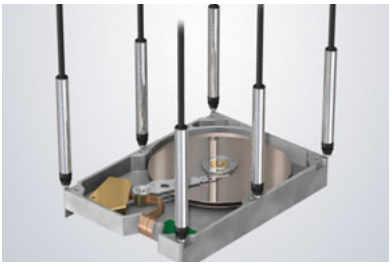
Board assembly check

Smartphone chassis flatness inspection

COMPACT

The sensor can be mounted in tight spaces or close together.

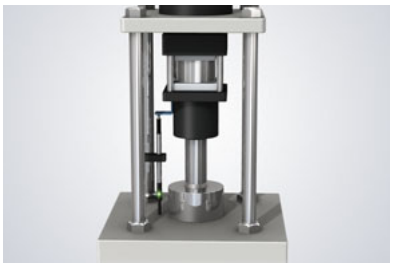
Camshaft runout measurement



Hard disk frame assembly inspection

NO TRACKING ERRORS

The sensor can remember its absolute position even in applications with strong impacts.



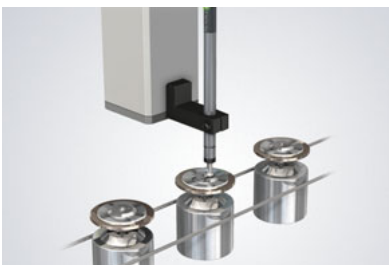
Assembly equipment press fitting inspection

Double feed detection

NO DRIVE UNIT NECESSARY

With the air push type, no unit is needed to drive the sensor, which leads to increased accuracy and decreased costs.

Double label sticker detection



Assembled workpiece height check

SPECIFICATION

Sensor head Pencil type (short-range)

Model		GT2-S1	GT2-S5
Measuring range*1		1 mm	5 mm
Resolution		0.1 µm	
Accuracy (20°C)*2 *4		1 µm (p-p)	
Measuring*3 force	Downward mounting	1.12 N	1.0 N
	Side mounting	1.1 N	0.95 N
	Upward mounting	1.08 N	0.9 N
Enclosure rating		IP67G(JIS)*5 IP67(IEC)	

*1 The measuring range represents the range at which measured values can be displayed. The operating range is the actual movable range of the spindle.
*2 GT2-S1: Within ±0.15 mm from the centre of the measuring range, the width for any 0.1 mm is 1 µm. The entire area is 2 µm. GT2-S5: Within ±0.3 mm from the centre of the measuring range, the width for any 0.2 mm is 1 µm. The entire area is 2 µm.
The linearity for the entire measuring range is ±0.15% of F.S. (F.S. for GT2-S1: 1 mm, GT2-S5: 5 mm)
*3 Representative value at the centre of the measuring range. Please note that the measuring force varies depending on the installation orientation of the dust boot.
*4 Value when the ambient temperature is 20°C.
*5 When an M8 oil-resistant cable (GT2-CHP2M/CHP5M/CHP10M) is used for the sensor head cable.

Sensor head Pencil type

Model		GT2-P12K	GT2-P12KF	GT2-P12KL	GT2-P12	GT2-P12F	GT2-P12L
Measuring range		12 mm					
Resolution		0.1 µm			0.5 µm		
Accuracy (20°C)		1 µm (p-p)			2 µm (p-p)		
Measuring* force	Downward mounting	1.0 N		0.2 N	1.0 N		0.2 N
	Side mounting	0.95 N		0.15 N	0.95 N		0.15 N
	Upward mounting	0.9 N		0.1 N	0.9 N		0.1 N
Enclosure rating		IP67G (JIS) / IP67 (IEC) / NEMA Type 13		–	IP67G (JIS) / IP67 (IEC) / NEMA Type 13		–

* Representative value at the centre of the measuring range. Please note that the measuring force varies depending on whether a dust boot is installed. In addition, add 0.4 N to the above values for the measuring force when using OP-87859.
Note: You may not be able to connect the sensor head to the amplifier unit depending on when the amplifier unit was purchased. For details, contact your local sales office.

Sensor head Standard type

*Representative value at the centre of the measuring range.

Model		GT2-H12K	GT2-H12KF	GT2-H12KL	GT2-H12KLF	GT2-H12	GT2-H12F	GT2-H12L	GT2-H12LF	GT2-H32	GT2-H32L	GT2-H50
Measuring range		12 mm								32 mm		50 mm
Resolution		0.1 µm				0.5 µm						
Accuracy (20°C)		1 µm (p-p)				2 µm (p-p)				3 µm (p-p)		3.5 µm (p-p)
Measuring* force	Downward mounting	1.0 N		0.4 N		1.0 N		0.4 N		2.1 N	1.2 N	3.2 N
	Side mounting	0.9 N		0.3 N		0.9 N		0.3 N		1.8 N	0.9 N	2.8 N
	Upward mounting	0.8 N		0.2 N		0.8 N		0.2 N		1.5 N	0.6 N	2.4 N
Enclosure rating		IP67 (IEC)		–		IP67 (IEC)		–		IP67 (IEC)	–	IP67 (IEC)

Sensor head Air push type

Model		GT2-PA12K	GT2-PA12KL	GT2-PA12	GT2-PA12L	GT2-A12K	GT2-A12KL	GT2-A12	GT2-A12L	GT2-A32	GT2-A50
Measuring range		12 mm								32 mm	50 mm
Resolution		0.1 µm		0.5 µm		0.1 µm		0.5 µm			
Accuracy (20°C)		1 µm (p-p)		2 µm (p-p)		1 µm (p-p)		2 µm (p-p)		3 µm (p-p)	3.5 µm (p-p)
Measuring* force	Downward mounting	1.2 N	0.4 N	1.2 N	0.4 N	1.2 N	0.4 N	1.2 N	0.4 N	2.1 N	3.2 N
	Side mounting	1.15 N	0.35 N	1.15 N	0.35 N	1.1 N	0.3 N	1.1 N	0.3 N	1.8 N	2.8 N
	Upward mounting	1.1 N	0.3 N	1.1 N	0.3 N	1.0 N	0.2 N	1.0 N	0.2 N	1.5 N	2.4 N
Enclosure rating		IP67 (IEC)	–	IP67 (IEC)	–	IP67 (IEC)	–	IP67 (IEC)	–	IP67 (IEC)	IP67 (IEC)
Applied pressure range		0.24 MPa to 0.26 MPa	0.05 MPa to 0.07 MPa	0.24 MPa to 0.26 MPa	0.05 MPa to 0.07 MPa	0.25 MPa to 0.5 MPa					

*This is a representative value when using the GT2-PA12K/PA12 with a pressure of 0.25 MPa.
Note: You may not be able to connect the sensor head to the amplifier unit depending on when the amplifier unit was purchased. For details, contact your local sales office.

Display unit DIN-rail mount type

Type			Model		
			NPN output	PNP output	Line driver output
Loose wire (2 m)	Standard	Main unit	**GT2-71N**	**GT2-71P**	–
		Expansion unit	**GT2-72N**	**GT2-72P**	
	Pulse output		–	–	**GT2-71D**
Connector*	Standard	Main unit	**GT2-71CN**	**GT2-71CP**	–
	Analogue		**GT2-71MCN**	**GT2-71MCP**	
	Standard	Expansion unit	**GT2-72CN**	**GT2-72CP**	

Multi-sensor amplifier unit	Main unit	**GT2-500**
	Expansion unit	**GT2-550**

Up to 5 sensor heads can be connected to 1 amplifier unit
Up to 15 sensor heads can be connected by adding 2 expansion units
* A communication unit (DL Series) is required for output.

Display unit panel mount type

Type		Model	
		NPN output	PNP output
Compact (cable length: 2 m)	Main unit	**GT2-75N**	**GT2-75P**
	Expansion unit	**GT2-76N**	**GT2-76P**
Large display*		**GT2-100N**	**GT2-100P**

* When these amplifier units are not mounted to a panel, an optional mounting bracket should be purchased separately. The I/O connector cable and power cable are not included.

OP-84331

Sensor head cable (sold separately)

Oil-resistant cable (straight)*1		Standard cable (straight)		Standard cable (L-shaped)*2	
GT2-CHP2M	2 m	**GT2-CH2M**	2 m	**GT2-CHL2M**	2 m
GT2-CHP5M	5 m	**GT2-CH5M**	5 m	**GT2-CHL5M**	5 m
GT2-CHP10M	10 m	**GT2-CH10M**	10 m	**GT2-CHL10M**	10 m
		GT2-CH20M	20 m	**GT2-CHL20M**	20 m

*1 To satisfy NEMA Type 13/IP67G with GT2-P12(K)(F), the oil-resistant cable must be used.
*2 Can only be used with the 12 mm type.

Sensor head mounting brackets (sold separately)

Model	OP-76874	OP-84396	OP-76875	OP-87220	OP-84327	OP-87863	OP-88157	OP-88158	OP-88159
Appearance									
Compatible model	GT2-S1/S5/P12(K)(L)/PA12(K)(L)/H12(K)(L)/A12(K)(L)				GT2-H32/H32L/H50 GT2-A32/A50	GT2-S1/S5/P12(K)(L)/ PA12(K)(L)	GT2-S1	GT2-S1/S5/P12(K)(L)/H12(K)(L)	
Type	Commonly used type	Vibration resistant, Reinforced holding force	For side mounting	Vibration resistant, Reinforced holding force/ For side mounting	Vibration resistant, Reinforced holding force	Coupled mounting type	Collision damage prevention		

Contacts

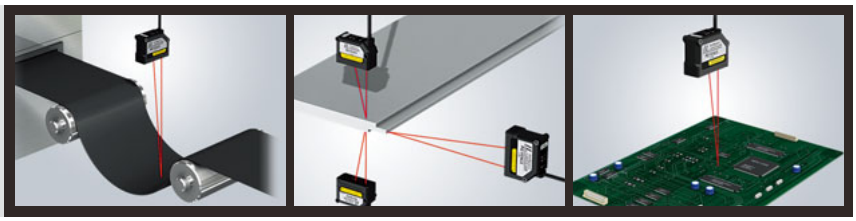
Model	OP-77678	OP-77682	OP-87984	OP-87985	OP-77679	OP-77680	OP-80228	OP-81970	OP-77681	OP-77683	OP-77684
Appearance											
Type	Standard*1	Super-tough*2	Standard (small)*3	Super-tough (small)*4	Flat Plate	Roller	Fluorocarbon Resin	Ceramic	Needle	Offset	Spacer

*1 Standard on the GT2-P(A)12(L/F), GT2-H(A)12(L/F/LF), GT2-H(A)32(L), GT2-H(A)50 *2 Standard on the GT2-P(A)12K(L/F), GT2-H(A)12K(L/F/LF), GT2-S1, GT2-S5 *3 Standard on the GT2-PA12 *4 Standard on the GT2-PA12K

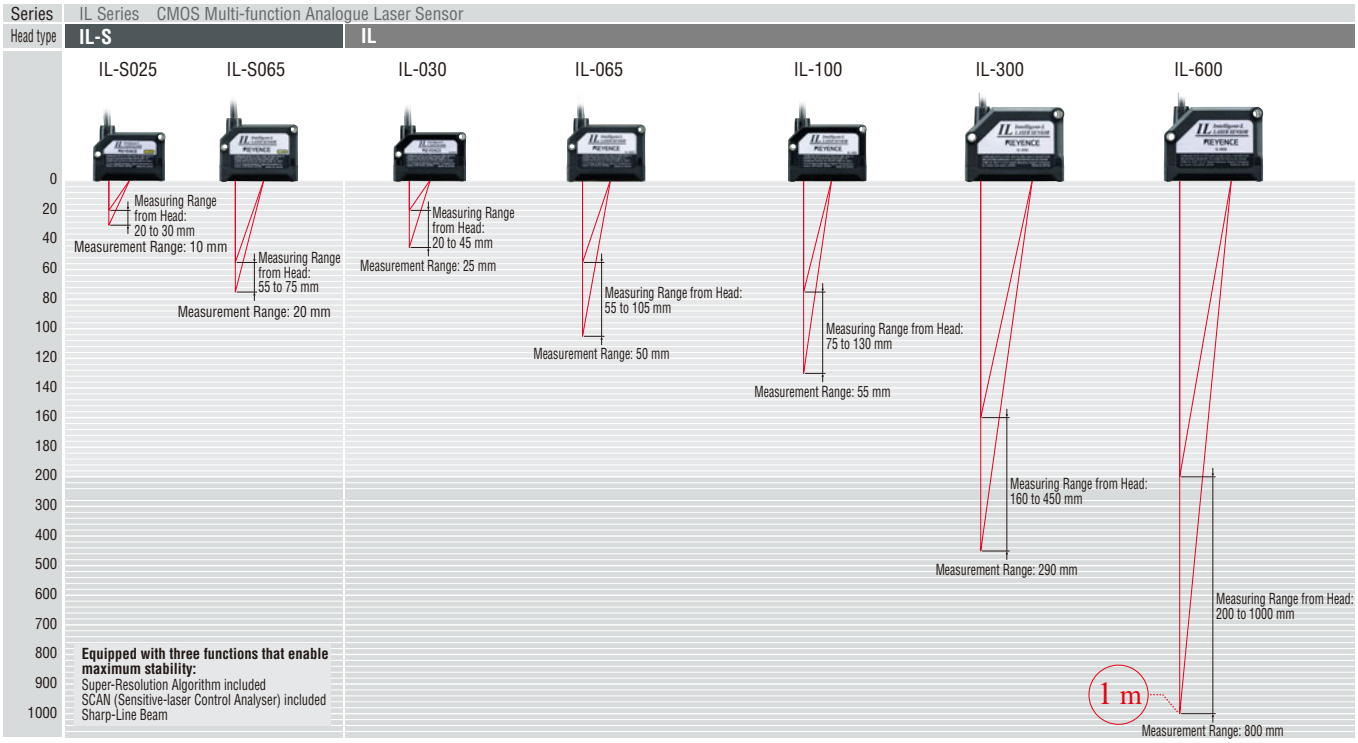
CMOS ANALOGUE LASER SENSOR

IL SERIES

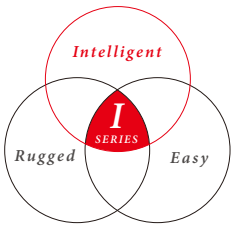
Display resolution	:	**1 µm**
Repeatability	:	**1 µm**
Maximum measurement distance	:	**1000 mm**
Enclosure rating	:	**IP67**



An abundance of head variations for all applications



	IL-S025	IL-S065	IL-030	IL-065	IL-100	IL-300	IL-600
Repeatability	1 µm	2 µm	1 µm	2 µm	4 µm	30 µm	50 µm
Linearity	±0.075% of F.S	±0.05% of F.S	±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
Reference distance	25 mm	65 mm	30 mm	65 mm	100 mm	300 mm	600 mm

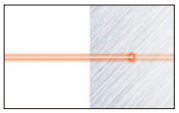


High-precision head + Multi-function amplifier

NEWLY DEVELOPED LSGC INCLUDED + ALL-IN-ONE DESIGN

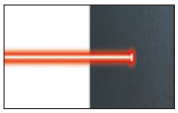
The stable measurement of any given target is possible by sensing the target surface and adjusting the 1,500,000 times dynamic range. Furthermore, in order to further streamline communication with process control systems we have installed application specific functions into the compact amplifier.

Reduced power

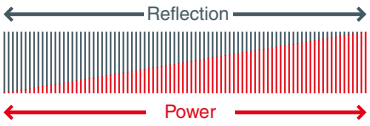


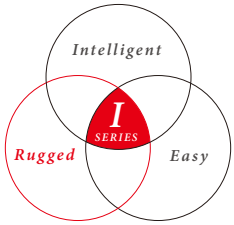
When the workpiece is highly reflective

Increased power



When the workpiece is dark

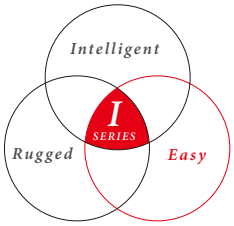




Rugged head structure

DIE CAST METAL USED FOR IP67/OPTICAL BASE

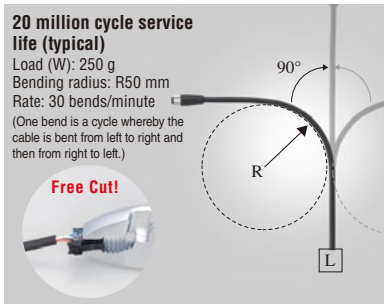
The head structure was redesigned to make it rugged enough to withstand almost any environment. In addition, the housing is made of die cast SUS304 for added strength and protection.



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 60 g*. 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

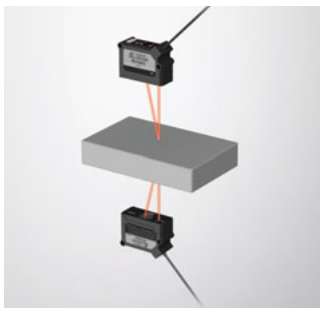


MULTI-FUNCTION AMPLIFIER

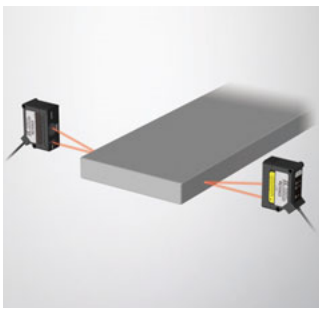
CALCULATION FUNCTION

ADDITION MODE

Setting example 1
(thickness measurement)

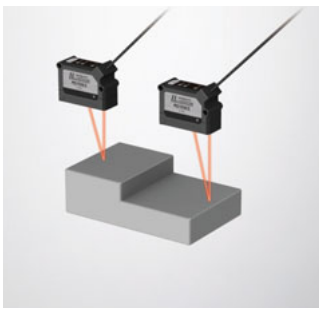


Setting example 2
(width measurement)

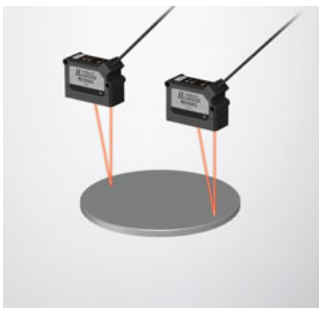


SUBTRACTION MODE

Setting example 1
(Measurement of height difference)

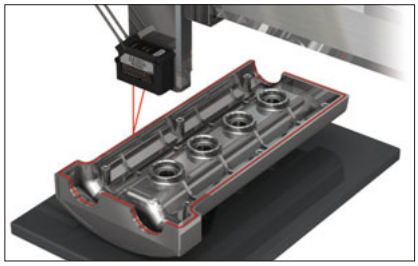


Setting example 2
(Measuring tilt)

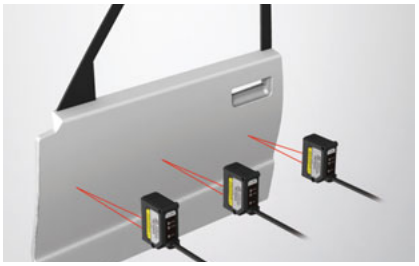


APPLICATIONS

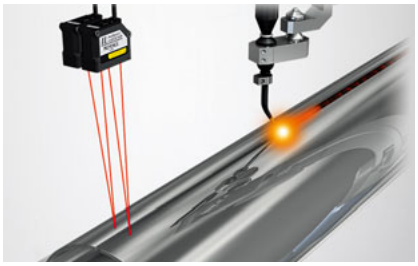
TRANSPORTATION



Control of gasket coating

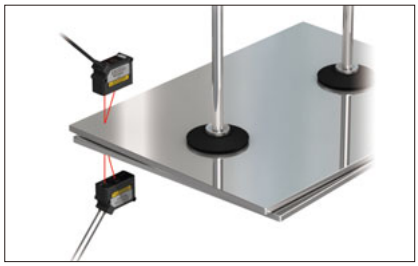


Accuracy checks on an automotive door assembly

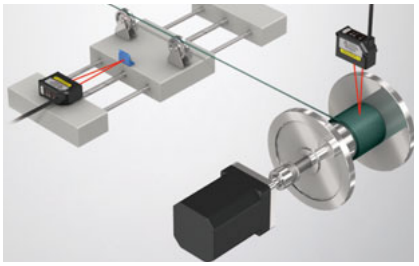


Positional control of welding beads

STEEL INDUSTRY

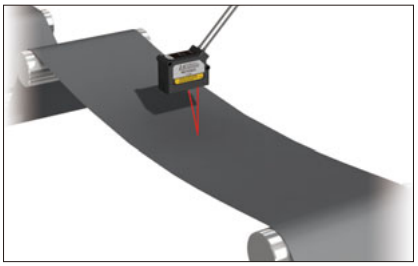


Detection of double sheets



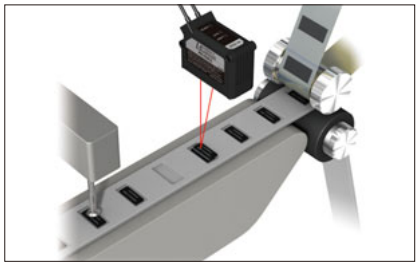
Wire winding process

PLASTIC & RUBBER

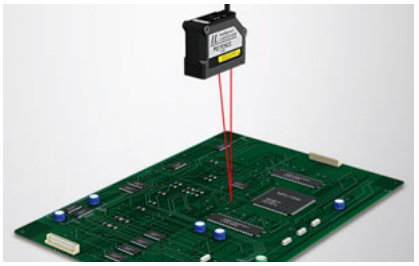


Tension control of sheet material

ELECTRONICS

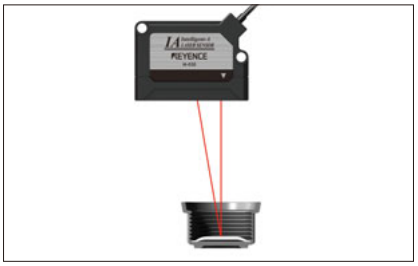


Chip presence/absence and double chip detection



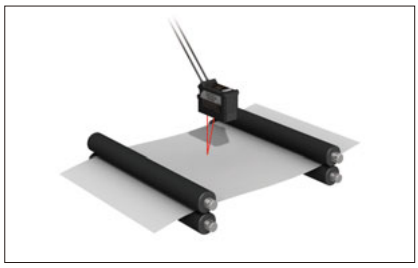
Height controls of a PC board

PLASTICS & RUBBER

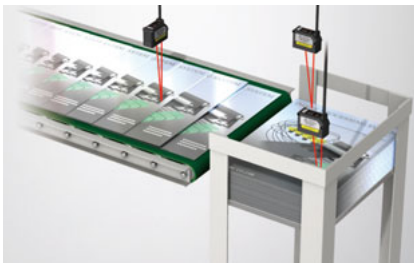


Detecting presence/absence of cap seals

PAPER INDUSTRY

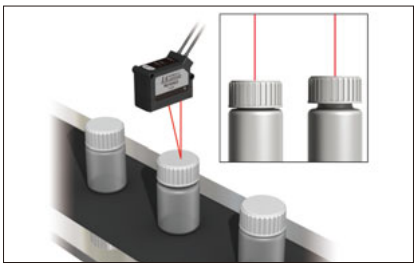


Measurement of paper tension



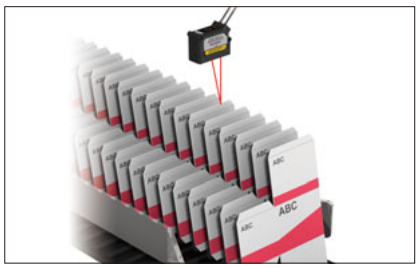
Stacker counting & uneven checks

PHARMACEUTICALS

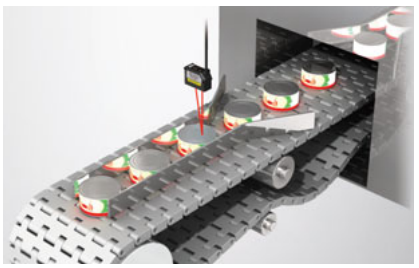


Detection of cap position

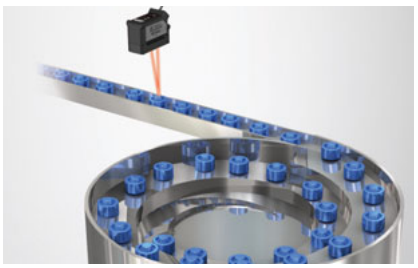
FOOD



Counting of packages



Heat processing inspection of cans



Differentiation of different types of plastic components

SPECIFICATIONS

Sensor heads

Model		IL-S025	IL-S065
Reference distance		25 mm	65 mm
Measurement range		20 to 30 mm	55 to 75 mm
Light source		Red semiconductor laser, wavelength: 655 nm (visible light)	
	Laser class	Class 2 (FDA (CDRH) Part1040.10)*1 Class 2 (IEC60825-1)	
	Output	560 µW	
Spot diameter (at standard distance)		Approx. 25 × 1200 µm	Approx. 55 × 1700 µm
Linearity*2, *3		±0.075% of F.S. (20 to 25 mm) ±0.1% of F.S. (20 to 30 mm)	±0.05% of F.S. (55 to 65 mm) ±0.075% of F.S. (55 to 75 mm)
Repeatability*4		1 µm	2 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		0.03% of F.S./°C	0.02% of F.S./°C
Environmental resistance	Enclosure rating	IP67	
	Ambient light*5	Incandescent lamp: 10000 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. 60 g	Approx. 75 g

*1 The laser classification for FDA (CDRH) is implemented based on IEC60825-1 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-S025: ±5 mm IL-S065: ±10 mm
*4 Value when measuring the KEYENCE standard target (white diffuse object) at the reference distance, sampling rate: 1 ms, and average number of times: 128.
*5 Value when the sampling rate is set to 2 ms or 5 ms.

Sensor heads

Model		IL-030	IL-065	IL-100	IL-300	IL-600
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 (IEC60825-1)	Class 2 (FDA (CDRH) Part1040.10)*1 Class 2 (IEC60825-1)			
	Output	220 µW	560 µW			
Spot diameter (at standard distance)		Approx. 200 × 750 µm	Approx. 550 × 1750 µm	Approx. 400 × 1350 µm	Approx. ø0.5 mm	Approx. ø1.6 mm
Linearity*2, *3		±0.1% of F.S. (25 mm to 35 mm)	±0.1% of F.S. (55 mm to 75 mm)	±0.15% of F.S. (80 mm to 120 mm)	±0.25% of F.S. (160 mm to 440 mm)	±0.25% of F.S. (200 to 600 mm) ±0.5% of F.S. (200 to 1000 mm)
Repeatability*4		1 µm	2 µm	4 µm	30 µm	50 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. 60 g	Approx. 75 g		Approx. 135 g	

*1 The laser classification for FDA (CDRH) is implemented based on IEC60825-1 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: ±5 mm IL-065: ±10 mm IL-100: ±20 mm IL-300: ±140 mm IL-600: ±400 mm
*4 Value when measuring the KEYENCE standard target (white diffuse object) at the reference distance, sampling rate: 1 ms, and average number of times: 128. 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
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-S025/IL-030: 1 µm, IL-S065/IL-065/IL-100: 2 µm, IL-300: 10 µm, IL-600: 50 µm			
	Display range	IL-S025/IL-030/IL-S065/IL-065/IL-100: ±99.999 mm to ±99 mm (4 levels selectable), IL-300/IL-600: ±999.99 mm to ±999 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. 150 g	Approx. 170 g	Approx. 140 g	Approx. 160 g

*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.

IG SERIES

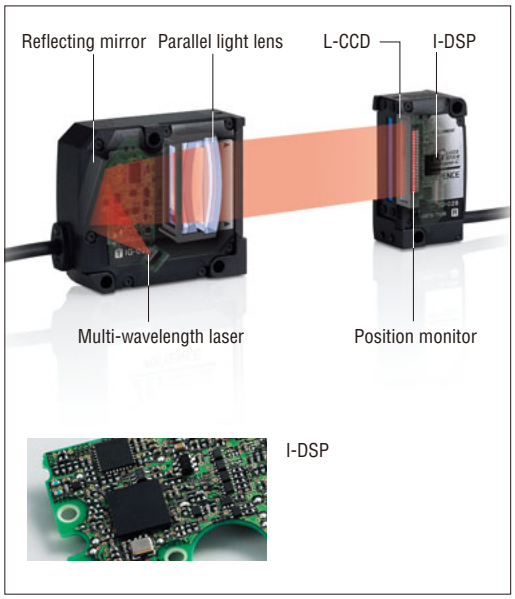
Thrubeam Digital Laser Sensor with a High Level of Stability

Display resolution	:	**1 µm**
Repeatability	:	**5 µm**
Maximum installation distance	:	**1500 mm**
Enclosure rating	:	**IP67**

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.



SPOT IMAGE

Single-wavelength laser (conventional laser sensor)
A patchy pattern appears.

Multi-wavelength laser (IG)
Due to the multi-wavelength laser used, the beam pattern has a more uniform intensity distribution.

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.

Transparent target

Mesh target

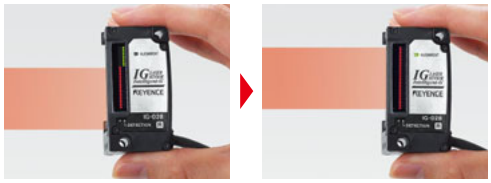
EXTREMELY EASY TO USE DUE TO THE BUILT-IN POSITION MONITOR

Visual Indication of measurement

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.



Optical axis alignment in progress

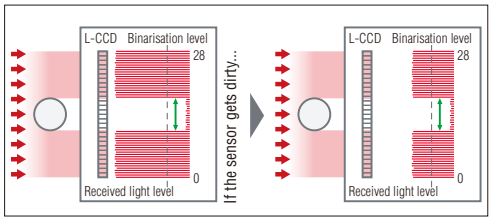
Optical axis alignment complete

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.

Although dirt reduces the total amount of light received, the measurement position is the same.
The shadow of a target is shown.



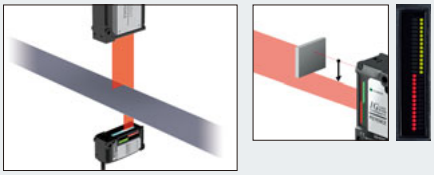
IP67 Protection

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

VARIETY OF APPLICATION MODES

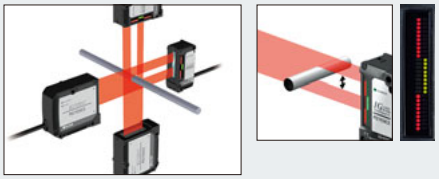
Edge Control and Positioning Mode

The distance from the end of the measurement range to the edge of a target is measured.



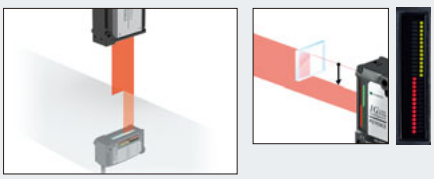
Outer Diameter/Width Measurement Mode

The outer diameter or width of a target is measured.



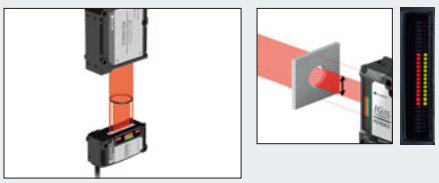
Glass Edge Mode

Measures edges of transparent targets such as glass.



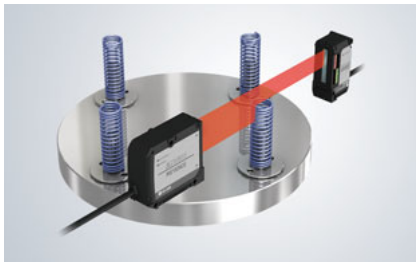
Inner Diameter/Gap Measurement Mode

The inner diameter of a target or a gap between targets is measured.

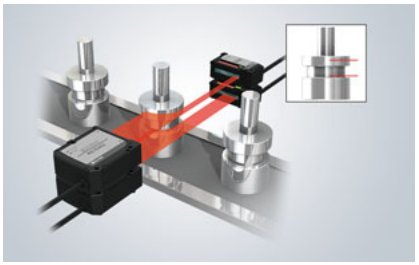


APPLICATIONS

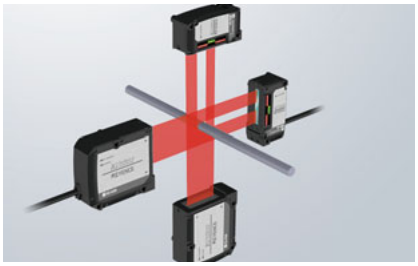
AUTOMOTIVE



Detection of spring height



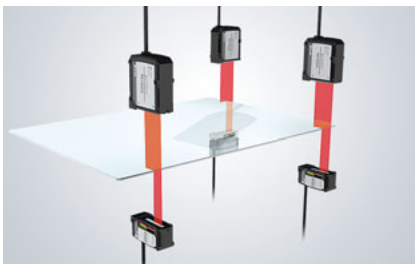
Measurement of groove depth after machining



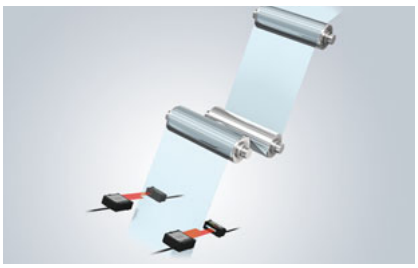
Measurement of brake hose diameter

SEMICONDUCTORS/LCDS

Positioning control of the θ angle of a wafer

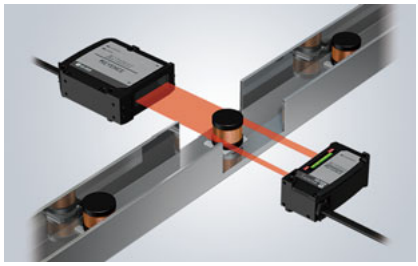


Positioning of a glass substrate

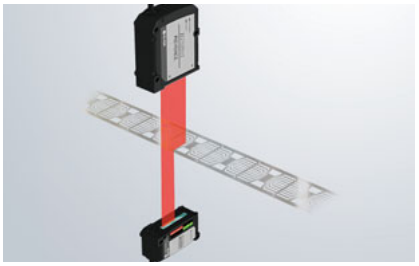


Film edge control

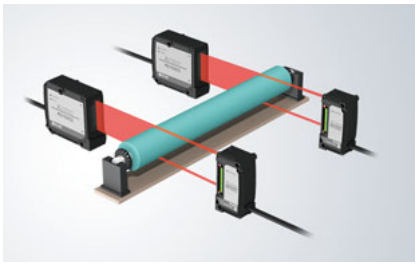
ELECTRONICS



Outer diameter measurement of a part

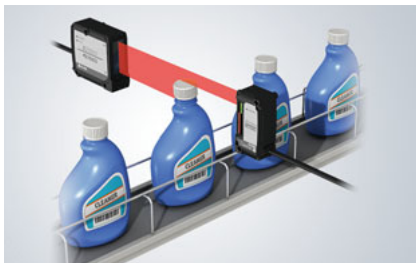


Lead frame edge control

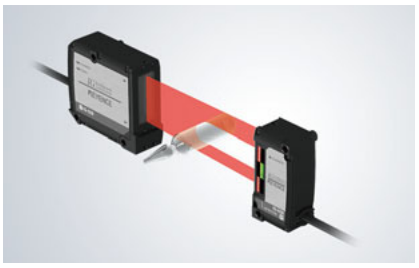


Inspection of roller runout

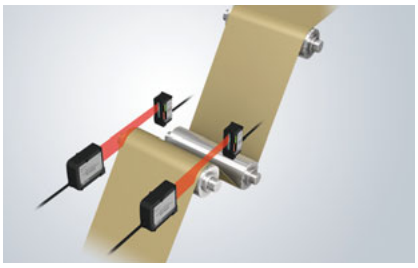
FOOD & PHARMACEUTICALS



Detection of skewed caps

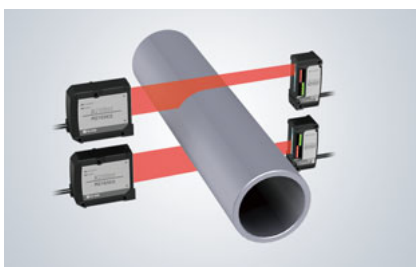


Measuring outer diameter of ampoule

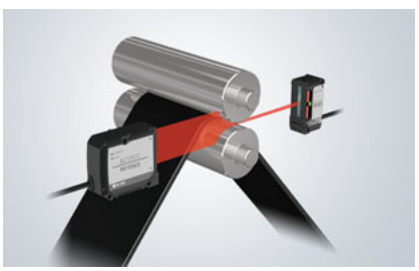


Measuring thickness of noodles

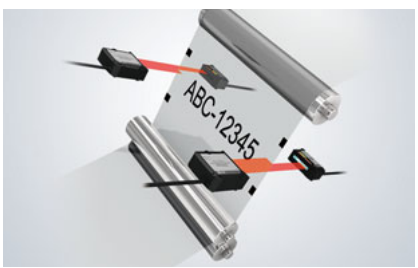
PLASTICS & RUBBER



Measuring outer diameter of pipe



Gap measurement between rollers



Measuring width of transparent film

SPECIFICATIONS

Sensor heads

Model			IG-010	IG-028
Appearance				
Operation principle			CCD method	
Light source			Visible light semiconductor laser (Wavelength: 660 nm)	
	FDA (CDRH) Part 1040.10		Class 1 Laser Product*1	
	IEC60825-1		Class 1 Laser Product	
Mounting distance			0 to 1000 mm	0 to 1500 mm
Measurement range			10 mm	28 mm
Environmental resistance		Enclosure rating	IP67	
Sampling cycle			980 µs (When the number of times for averaging is set to [hsp]: 490 µs)	
Minimum detectable object*2	High sensitivity mode		ø0.1 mm (Setting distance: 100 mm)	ø0.1 mm (Setting distance: 100 mm)
	Standard mode		ø0.2 mm (Setting distance: 40 mm or less), ø0.5 mm (Setting distance: 500 mm)	ø0.2 mm (Setting distance: 50mm or less), ø0.5 mm (Setting distance: 500 mm)
Repeatability*3			5 µm (Setting distance: 100 mm) 10 µm (Setting distance: 500 mm) 80 µm (Setting distance: 1000 mm)	5 µm (Setting distance: 100 mm) 10 µm (Setting distance: 500 mm) 80 µm (Setting distance: 1000 mm) 140 µm (Setting 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)

*1 The classification for FDA (CDRH) is implemented based on IEC60825-1 in accordance with the requirements of Laser Notice No.50.
*2 When the measurement target object is measured at the centre position of the setting distance. When the measurement mode is set to the glass edge mode, a glass edge of C0.1 mm or more can be detected (Setting distance: 500 mm).
*3 When the light is shielded by half at the centre position of the setting distance. Vibration width when the average number of times is set to 16 and sampling is performed for 30 seconds.
(When the analogue output is used, the margin of error of analogue output is added.)
*4 When the setting 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 setting distance is 100 mm and light is shielded by half at 50 mm position from the receiver.

Amplifier unit

Model		IG-1000	IG-1500	IG-1050	IG-1550
Appearance					
Amplifier type		DIN rail mount	Panel mount	DIN rail mount	Panel mount
Main unit/Expansion unit		Main unit		Expansion unit	
Head compatibility		Available			
Display	Display resolution	1 µm, 10 µm, 100 µm, 1000 µm (selectable)			
	Display range	-99.999 to +99.999, -99.99 to +99.99, -99.9 to +99.9, -99 to +99 (selectable)			
	Digital display method	Dual 7-seg display Upper level: Red, 5 digits	Dual 7-seg display Upper level: Red/Green, 2 colours, 5 digits	Dual 7-seg display Upper level: Red, 5 digits	Dual 7-seg display Upper level: Red/Green, 2 colours, 5 digits
	Operation indicator	Judgement indicator: 2-colours (green) LED (HI,GO,LO), Bank indicator: Green LED × 4, Laser emission indicator: Green LED, others: Green LED × 8, red LED × 3			
Output	Analogue voltage output*1	±5 V, 1 to 5 V, 0 to 5 V Output impedance 100 Ω		N/A	
	Analogue current output*1	4 to 20 mA Maximum load resistance 350 Ω			
	Judgement output (selectable between NPN and PNP)	NPN (PNP) open collector × 3ch, 30 VDC (Power supply voltage) or less, residual voltage 1 V (2 V) or less, N.O./N.C. selectable Max. 50 mA/ch*2			
	Response time (judgement output)	1.96 to 4031.72 ms*3			
	Edge check output (selectable between NPN and PNP)	NPN (PNP) open collector × 1ch, 30 VDC (Power supply voltage) or less, residual voltage 1 V (2 V) or less, N.O./N.C. selectable Max. 50 mA,*2 response time 20 ms			

*1 Select one from among ±5 V, 1-5 V, 0-5 V, and 4-20 mA to use.
*2 When expansion units are added: Max. 20 mA/ch
*3 For more details, refer to the User's Manual.

Option

Model	IG-H1	IG-TB01	IG-TB02
Appearance			
Type	PC configuration software*1	For IG-010 Sensor head mounting brackets*2	For IG-028 Sensor head mounting brackets*2
Weight	Approx. 80 g	Approx. 50 g	Approx. 40 g

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

Sensor head cables

Appearance	Cable length	Model	Weight
1 cable included 	2 m*1	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

The cable is common to the transmitter and receiver, and can be used with either of them.
*1 Two cables are included with a sensor head.

This connector is required if the cable is cut.
Connector used to connect to a display unit (2 pcs.)

OP-84338

IB SERIES

Thrubeam delivers high-accuracy differentiation in a diverse range of applications

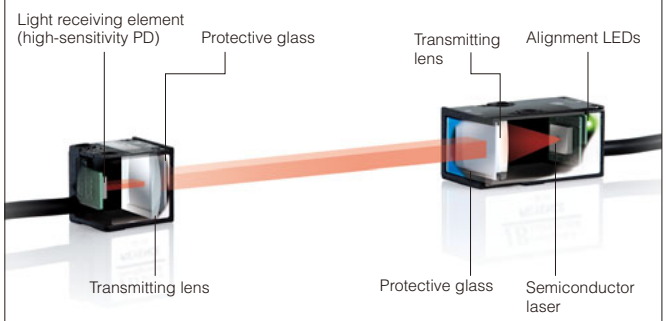
High-precision detection	:	**5 µm**
High-speed sampling	:	**80 µs**
Maximum installation distance	:	**2000 mm**
Smallest detectable object	:	**ø8 µm**

High stability achieved with newly developed optical system and high-sensitivity PD

Multi-wavelength laser and high-sensitivity PD

Normal lasers are single wavelength, therefore due to interference, the pattern becomes patchy, as shown in the diagram on the right. This problem is rectified in the IB Series by utilising laser light with multiple wavelengths. Targets with a high level of difficulty can still be detected with a high degree of stability. Furthermore, by incorporating a high-sensitivity PD within the light-receiving section, data can be processed at high speeds, reducing extraneous fluctuations to the absolute limit.

Mechanism that achieves stable detection



Parallel laser beams sent out by the transmitting lens are condensed onto the light-receiving element (high-sensitivity PD) after passing through the receiving lens. When a target blocks the parallel beams, the intensity of the light entering the light-receiving element is reduced in proportion to the intensity of the shielded light. The light-receiving element (high-sensitivity PD) measures the size and degree of transparency of the target by picking up the intensity of this light.

SPOT IMAGE

Single-wavelength laser (conventional laser sensor)
A patchy pattern appears.

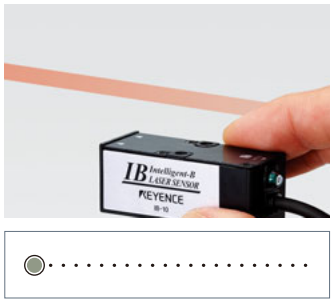
Multi-wavelength laser (IB)
Due to the multi-wavelength laser used, the beam pattern has a more uniform intensity distribution.

High-precision detection	Ultra-long distance
5 µm	**2 m**

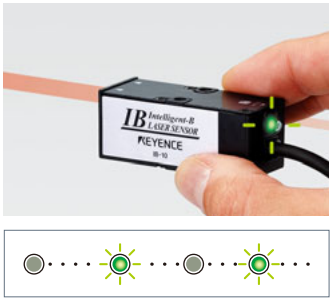
SIMPLE POSITIONING WITH THE ALIGNMENT LED

Easy to align the optical axis

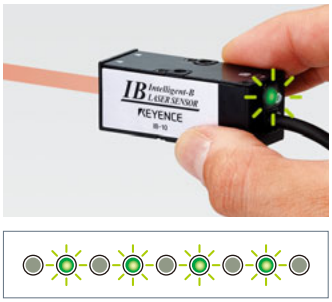
As the optical axis of the laser aligns, the flash frequency of the laser transmitter indicator quickens. Even without looking at the amplifier unit, the optimum position can be achieved easily.



If the optical axis is not aligned the LED turns off.



When the optical axis begins to align, the flashing frequency of the LED quickens.

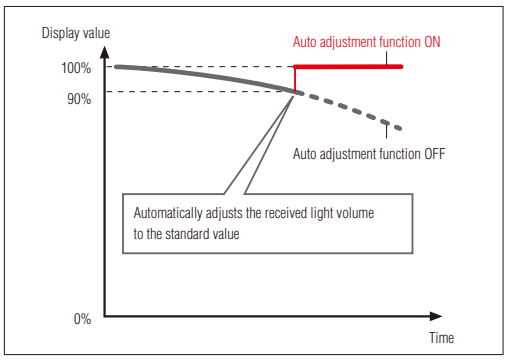


High-speed flashing when the optical axis is aligned.

REDUCED MAINTENANCE WITH THE AUTO ADJUSTMENT FUNCTION

Long-term, stable detection even in environments where the device becomes dirty easily

With the IB Series, should the received light volume decrease due to dirt on the front of the sensor head, the new received light volume can be adjusted to compensate by using the adjustment input. In addition, when the Auto adjustment function recognises no target in the beam path and the received light volume drops below 90%, the sensor compensates for the light loss automatically. Even when used in environments where the device becomes dirty easily, stable detection and a high degree of maintenance-saving has been made possible by the device automatically correcting itself.



VERSATILE LINEUP SUPPORTS A VARIETY OF APPLICATIONS

Lineup includes a ø1 mm beam model and 5, 10, and 30 mm wide-beam models for use in a variety of detection conditions.

IB-01
ø1 mm spot type

High-precision differentiation is possible when detecting minute changes and small workpieces.
(Smallest detectable object: ø8 µm)

IB-05
5 mm beam type

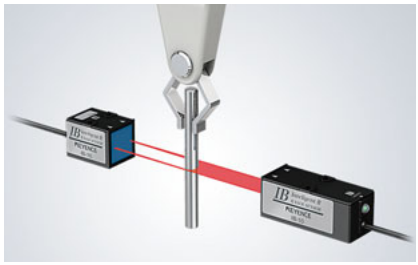
IB-10
10 mm beam type

In cases where workpiece position varies or where a wider detection range is required, 5, 10, and 30 mm beam types are available.

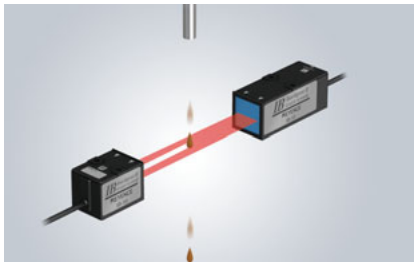
IB-30
30 mm beam type

APPLICATIONS

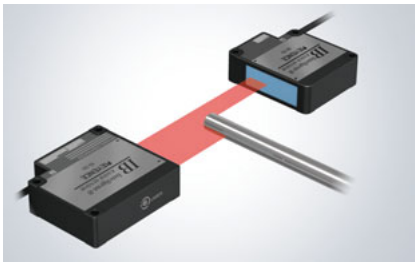
TRANSPORTATION



Differentiation of different types of metal shafts

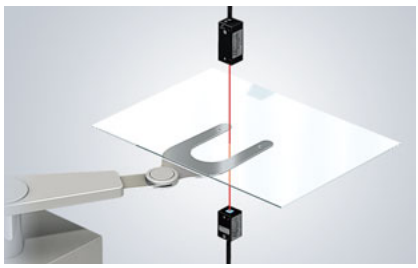


Checking for dripping oil or coatings

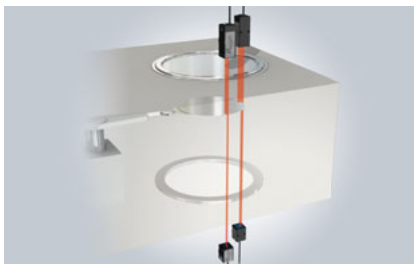


Positioning workpieces

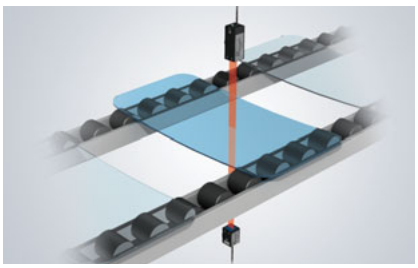
SEMICONDUCTORS/LCDS



Detection of presence/absence of liquid crystal glass

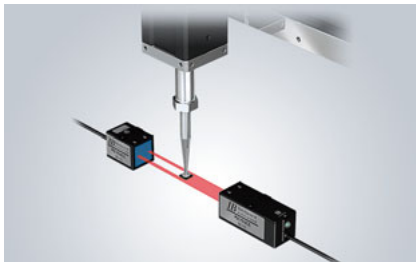


Detection of wafer misalignment

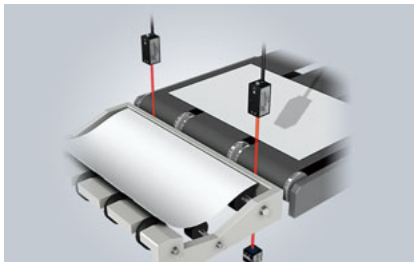


Differentiation of different types of glass

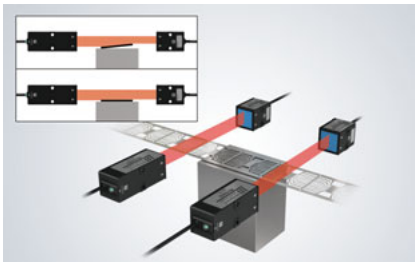
ELECTRONICS



Detection of faulty chip attachment



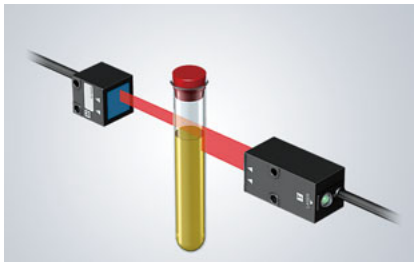
Detection of printer paper feed orientation



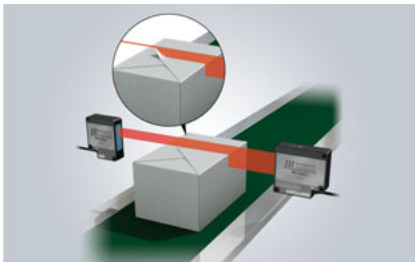
Detection of lead frame seating defects

FOOD & PHARMACEUTICALS

Bottle-neck diameter judgements and detection of cap tightness

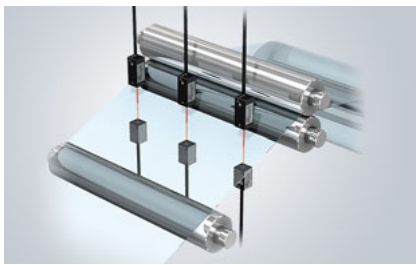


Detecting level of liquid in test tubes

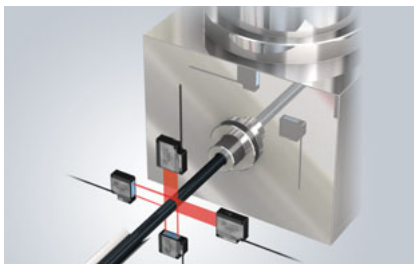


Detecting packaging defects

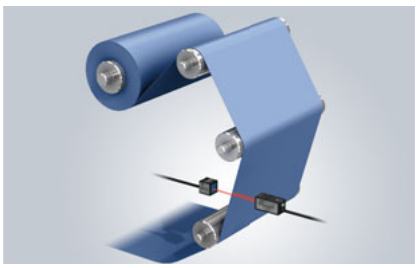
PLASTICS & RUBBER



Differentiation of different films



Differentiation of outer diameter of extruded products



Detecting sheet position

SPECIFICATIONS

Sensor heads

Model		IB-01	IB-05	IB-10	IB-30
Appearance					
Light source		Visible semiconductor laser Wavelength: 660 nm			
	Laser class	Class 1 Laser Product (IEC60825-1, FDA (CDRH) Part1040.10*1)			
Mounting distance		0 to 2000 mm	0 to 300 mm		
Measurement range		ø1 mm (Installation distance 0 to 300 mm) ø1 to 2.5 mm (Installation distance 300 to 2000 mm)	5 mm	10 mm	30 mm
Sampling rate		12,500 times/sec. (80 µs)			
Minimum detectable object*2		ø8 µm (Installation distance 0 to 300 mm) ø8 to 50 µm (Installation distance 300 to 2000 mm)	ø0.05 mm	ø0.1 mm	ø0.2 mm
Repeatability*3		5 µm (distance 0 to 300 mm)	5 µm	5 µm	10 µm
Temperature characteristics*4		±0.2% of F.S./°C	±0.1% of F.S./°C (±5 µm)	±0.1% of F.S./°C (±10 µm)	±0.1% of F.S./°C (±30 µm)

*1 The classification for FDA (CDRH) is implemented based on IEC60825-1 in accordance with the requirements of Laser Notice No.50. *2 Value when measuring the target (white diffuse object) at the middle of the transmitter and receiver position, and at the centre of the measurement range. *3 When distance between transmitter and receiver is set to 300 mm, and light is half-shielded at a position 150 mm from receiver. Deflection width (±2σ) when sampled for 30 seconds with an average number of times set to 64 times.
*4 When distance between transmitter and receiver is set to 100 mm and full light is received.

Amplifier unit

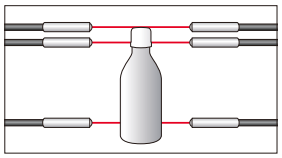
Model		IB-1000	IB-1500	IB-1050	IB-1550
Appearance					
Amplifier type		DIN rail mount	Panel mount	DIN rail mount	Panel mount
Main unit/Expansion unit		Main unit		Expansion unit	
Head compatibility		Yes			
Display	Display resolution	0.01%, 0.1%, 1% (switchable)			
	Display range	-99.999 to 99.999, -99.99 to 99.99, -99.9 to 99.9, -99 to 99 (switchable)			
	Digital display method	Dual 7-segment display Upper level: 5 red digits	Dual 7-segment display Upper level: 2-colour (green/red) 5 digits	Dual 7-segment display Upper level: 5 red digits	Dual 7-segment display Upper level: 2-colour (green/red) 5 digits
	Operation indicator	Judgement indicator: 2-colour (green/red) LED (HI, GO, LO), Bank indicator: Green LED × 4, Laser emission warning indicator: Green LED, Others: Green LED × 8, red LED × 3			
Analogue voltage output*1		±5 V, 1 to 5 V, 0 to 5 V Output impedance 100 Ω		N/A	
Analogue current output*1		4 to 20 mA Maximum load resistance 350 Ω			
Control output*2	Judgement output/ Check output	Open collector (NPN/PNP switchable, N.O./N.C. switchable)			

*1 ±5 V, 1 to 5 V, 0 to 5 V, or 4 - 20 mA should be selected. *2 Rated NPN open collector output: Max. 50 mA/ch (20 mA/ch when expansion units are connected), 30 V or less, residual voltage 1 V or less
Rated PNP open collector output: Max. 50 mA/ch (20 mA/ch when expansion units are connected), 30 V or less, residual voltage 2 V or less.

One device, three roles.
Three-step output for presence and size

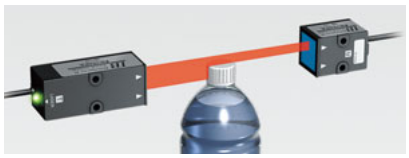
Upper- and lower-limit outputs included as standard. Both presence and size can be determined using a single sensor. Auto timing function eliminates need for timing sensors.

Photoelectric Sensors



Three sensors required for presence, height, and timing.

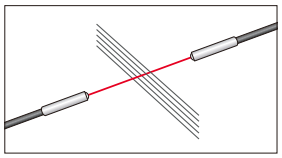
Digital Laser Sensors



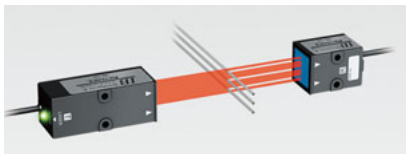
Single sensor measures everything.

Wide beam area eliminates misalignment worries

With a maximum 30 mm wide optical axis, stable detection of misaligned targets is possible.



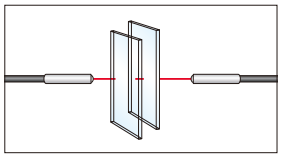
Targets cannot be detected if they stray from the narrow optical axis.



Wide beam area eliminates misalignment worries.

High-precision detection of transparent targets

In addition to detecting the presence of transparent targets, it is possible to differentiate between single/double transparent films, differentiate density, and detect the turbidity of liquids. It is also possible to judge transmissivity using the percentage display function.



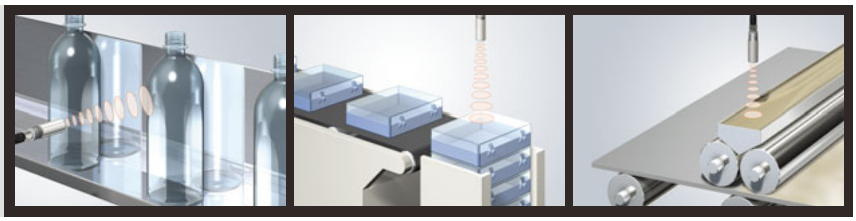
Does not stabilise due to subtle differences in intensity of thrubeam light.

Definitive determination in even the most minute difference in intensity of thrubeam light.

FW SERIES

A reflective-type sensor that can be used with all types of targets including transparent objects, liquid surfaces, and irregularly shaped workpieces

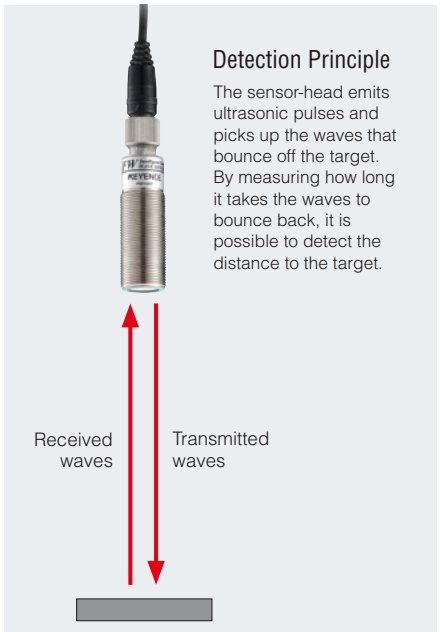
Display resolution	:	**1 mm**
Maximum detection distance	:	**1000 mm**
Enclosure rating	:	**IP67**
Diverse range of amplifier functions		

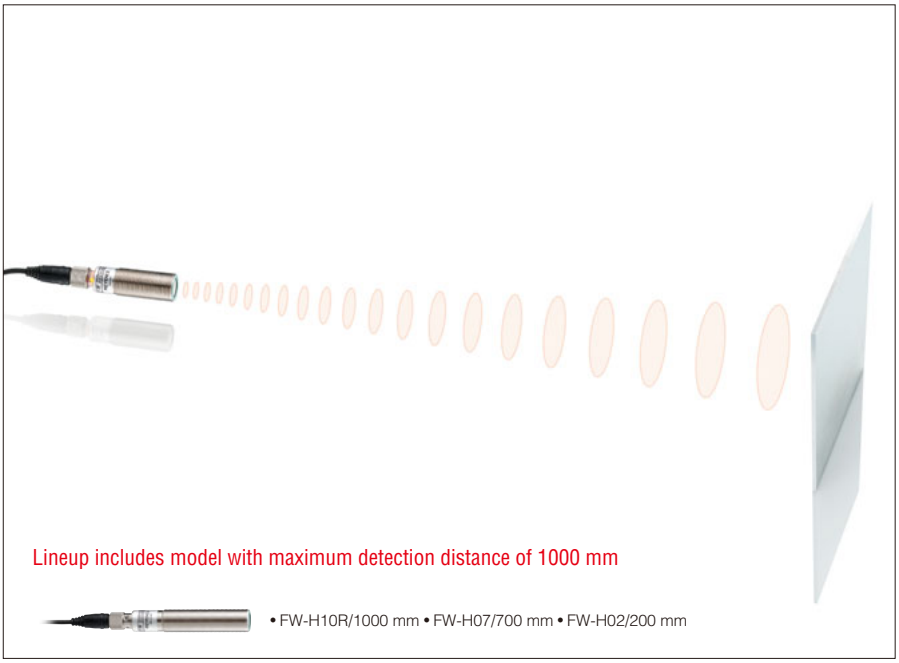


Incredible stability with any type of target

Ultrasonic sensor unaffected by material or colour

The FW Series emits ultrasonic pulses and detects distance based on the time it takes waves to bounce back. The FW is an extremely versatile reflective-type sensor that is not influenced by the colour, pattern, or reflectance of the target surface.





SPECIFICATIONS

Sensor heads (Cable length: 2 m)

Model	FW-H02	FW-H07	FW-H10R
Appearance			
Detecting range*1	50 to 200 mm	150 to 700 mm	150 to 1000 mm
Response speed	250 ms	300 ms	1000 ms
Temperature characteristics*2	0.25% of F.S./°C *3		0.06% of F.S./°C

*1 Dead zones of approx. 2% of F.S. exist at both ends of the detecting range. *2 The errors for the indicated value at 25°C.
*3 The variation of sonic velocity in air generates errors in the negative direction at 25°C and above, or in the positive direction at 25°C and below.

Digital amplifier (Cable length: 2 m)

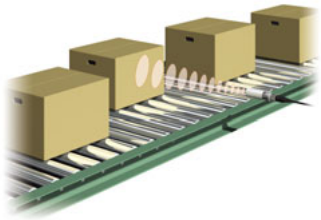
Model	FW-V20 NPN output	FW-V20P PNP output	FW-V25 NPN output	FW-V25P PNP output
Appearance				
Shape	DIN mounting		Panel mounting	
Control output	NPN (PNP) open collector, 100 mA 40 V max. (30 V max. for PNP) Residual voltage: 1 V max., 2 outputs (N.O./N.C. switch-selectable)			
Analogue output	4 to 20 mA, maximum load resistance: 260 Ω			
External input	Bank/external shift input (This input/analogue output is selectable.)			

Options

Model	FW-B01	FW-B02	OP-51476
Appearance			
Item name	Right-angled mounting bracket (PPS made)	Straight mounting bracket (PPS made)	Panel mounting bracket kit
Included/ Sold separately	Sold separately*		(Accessory to the FW-V25/V25P)

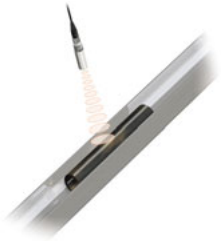
* FW-B01 is included in the FW-H02, FW-H07, FW-H10R respectively.
FW-B02 is optionally available.

Choose from 5 different detection modes for your application



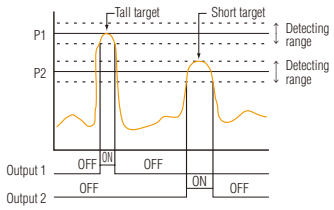
F-1 MODE (General purpose)

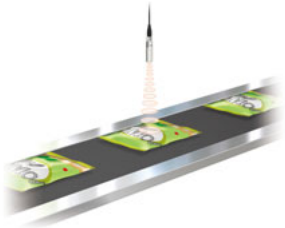
Various sensitivity adjustments are available. For example, “two-point tuning” can be performed by pressing the [SET] button with or without the target in place, and “full automatic tuning” can be performed automatically while the operator moves the target.



F-2 MODE (Detecting a target with a background)

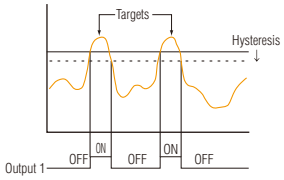
This mode is useful when detecting a target with a background. The target height is displayed with the background as the reference. “One-point zone tuning” is available, which detects only targets at a certain height without detecting the background.





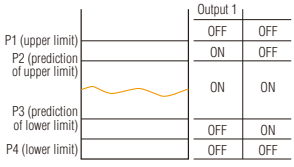
A-1 MODE (Detecting a target on a conveyer)

This mode is optimal for detecting the presence and absence of targets travelling on a conveyer. The target height is displayed with the conveyer as the reference. “Conveyer tuning” is available, which detects only the targets without detecting the vibrations of the conveyer. Output 2 serves as the alarm signal that detects unloading of the conveyer and other abnormalities.



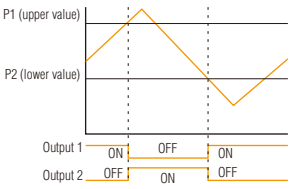
A-2 MODE (Detecting the liquid level)

This mode is suitable for detecting the liquid level. The height of the liquid level is displayed with the bottom of the tank as the reference. Two preset values (upper and lower limits) and two additional preset values for predicting the upper and lower values can be set up to enable monitoring the following four statuses: normal, near the upper limit, near the lower limit, and abnormality of upper and lower limits.

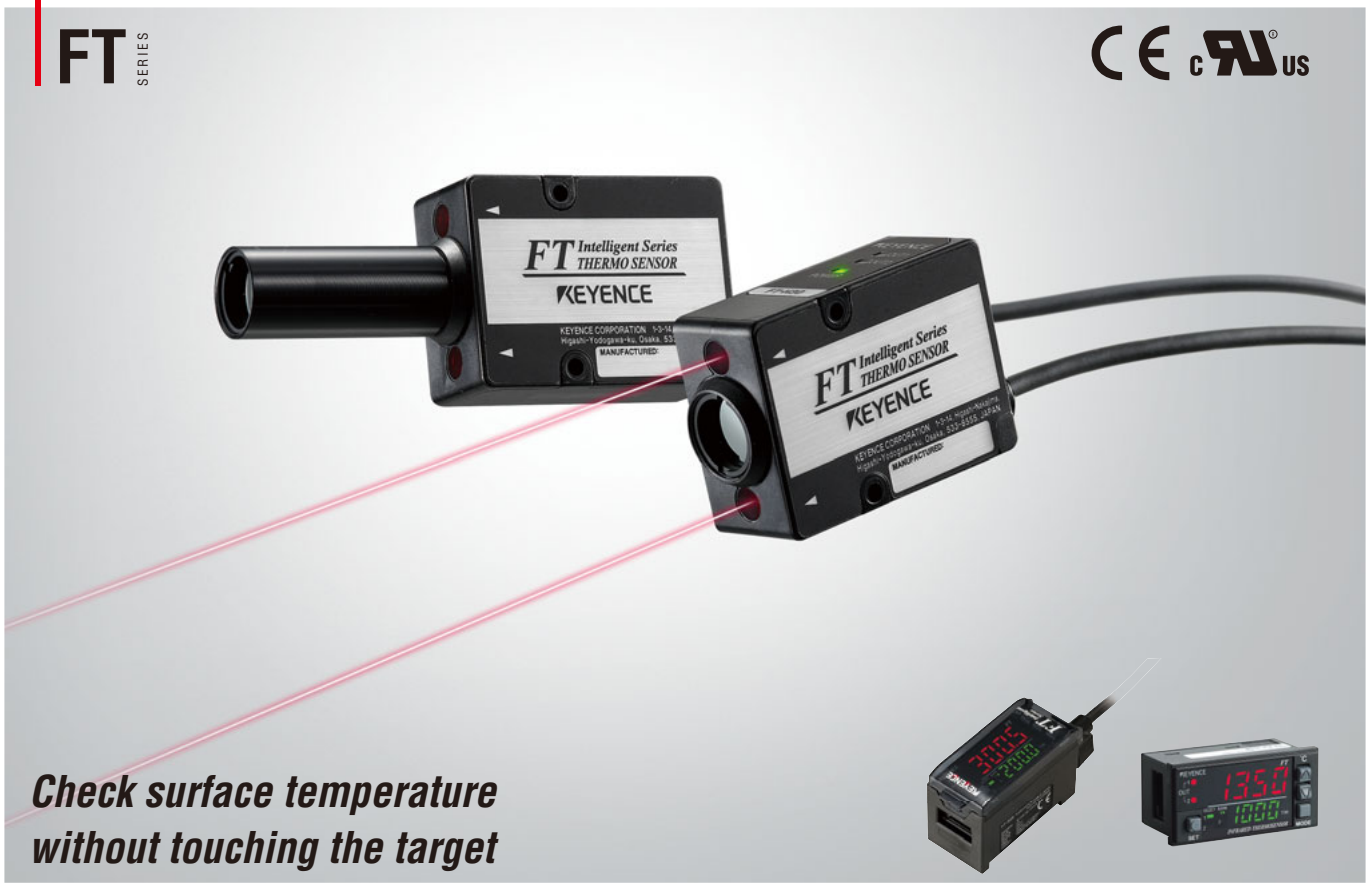


A-3 MODE (Zone control)

This mode is suitable for controlling the pump by detecting the liquid level in a tank, or for controlling the tension of sheet material. The height of the liquid level or the sheet can be displayed by setting the reference level as desired. Two preset values (upper and lower limits) can be set up to control the device: When the upper limit is exceeded, the output is turned off to stop the device, and when the lower limit is exceeded, the output is turned on to activate the device.

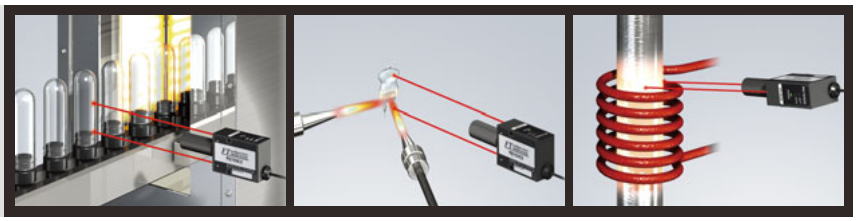


FT SERIES



Check surface temperature without touching the target

Display resolution	:	**0.1°C**
Reproducibility	:	**±0.5°C**
Fast response time	:	**15 ms**
Smallest-in-class	:	One-fifth the size of conventional sensors



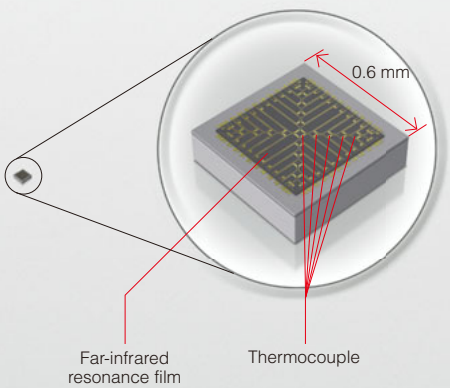
Achieves fast response time without compromising stable measurement

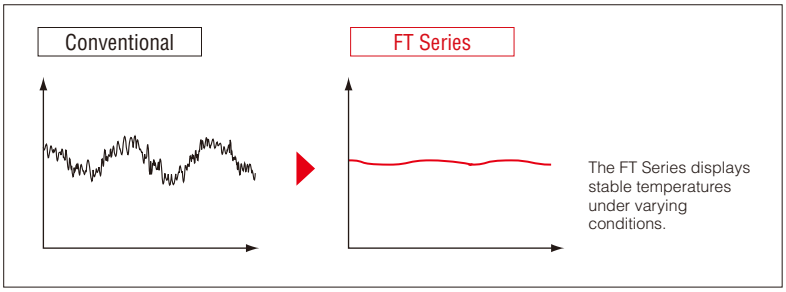
15 ms high-speed response & high stability

KEYENCE has significantly increased the responsiveness of the thermopile that detects temperatures in the FT Series by: reducing the far-infrared resonance film to the minimum thickness and positioning the thermocouples in a geometrically efficient way to detect the absorbed heat quickly and accurately.
To maximise the sensor's stability (the most important element of a sensor) KEYENCE developed an IPC circuit*. This and the suspended sensor design make up the heart of the FLASH Thermo.

* IPC stands for Integral Protection Circuit. This circuit performs an averaging process based on integration. It is a dedicated circuit developed to increase stability.

Thermopile chip of approx. 0.6 mm × 0.6 mm

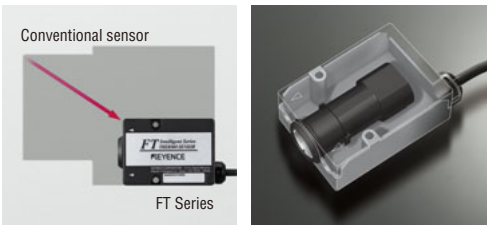




COMPACT HEAD AND LASER POINTER DESIGNED FOR EASY INSTALLATION

20% smaller size

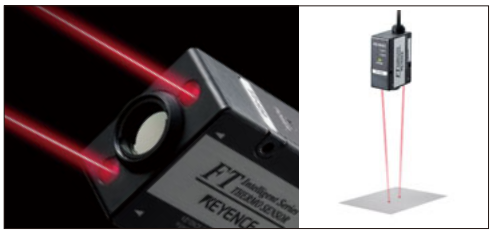
A cylindrical housing with the detecting element inside is suspended inside of the sensor head. This gives a thermal air-buffer between the sensor and the ambient air allowing the sensor size to be minimised.



Laser pointer

Two laser pointers* clearly indicate the detection range making sensor installation simple.

*Class 1 Laser Product (IEC60825-1, FDA(CDRH) Part 1040.10)
The classification for FDA (CDRH) is implemented based on IEC60825-1 in accordance with the requirements of Laser Notice No.50.



AMPLIFIER FUNCTIONS DESIGNED WITH EASE-OF-USE IN MIND

Complex setting calculations are now automatic

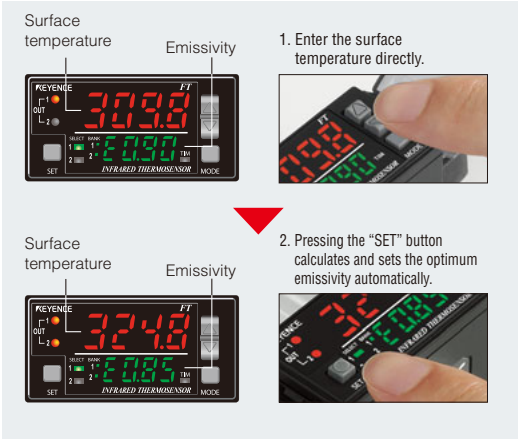
In the past, the correct temperature was displayed only when the emissivity that matched the material of the detection object was set because each material provides a specific emissivity. For the FT Series, the user only has to enter the current temperature of the detection object. This is because the FT Series automatically calculates the emissivity from the entered current temperature.
The user doesn't have to worry about complex emissivity calculations.

What is the emissivity?

If two different materials have the same temperature, the quantity of far-infrared rays being emitted by each differs. Emissivity is based on a scale from 0 to 1 of the quantity of far-infrared rays being emitted from that material.

Example

Water: 0.92 to 0.96
Plastic: 0.85 to 0.95
Stainless steel: 0.45
Ceramic: 0.90 to 0.94

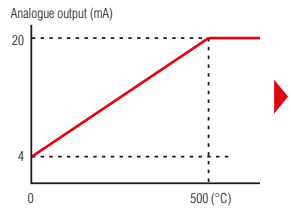


Other functions that expand the scope of applications

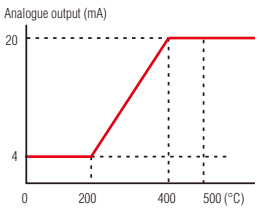
ANALOGUE MONITOR OUTPUTS*

The FT-50AW (P) and FT-55AW (P) provide analogue monitor outputs (4 mA to 20 mA) corresponding to the displayed values. Setting the upper and lower limit values provides simple scaling.

Initial status



When the lower limit value is 200°C and the upper limit value is 400°C



2 OUTPUTS X 4 BANKS

The FT-50AW (P) and FT-55AW (P) can each store two upper-limit outputs and two lower-limit outputs. They can also be configured for up to 4 emissivities. This eliminates the need to reset emissivities for each product changeover.

DISPLAY HOLD FUNCTION

In the past, (amplifiers before the FT-50AW (P) and FT-55AW (P)), it was difficult to confirm the surface temperature of workpieces moving at high speed. The Display Hold function enables the user to confirm the surface temperature of moving workpieces at their own speed since it can store and display the instantaneous maximum temperature.

TIMING FUNCTION*

The Timing function only displays the upper and lower temperatures when the timing input is on. This prevents unnecessary temperature readings like that of the conveyor or background oven regardless of where they fall with respect to the upper and lower temperature settings.

IR MODE

The IR mode displays the quantity of far-infrared rays received by the thermopile so that it acts like an intensity sensor. Because of this, the FT-50AW (P) and FT-55AW (P) could be used just like a photoeye to detect presence or absence of hot materials.

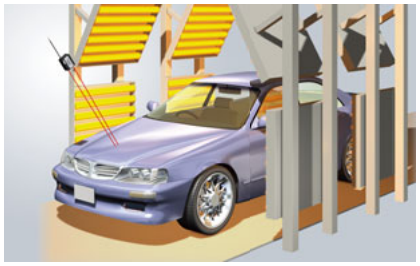
POWER SAVING FUNCTION

The Power Saving function provides simplified display when the sensor is left alone for a fixed time.

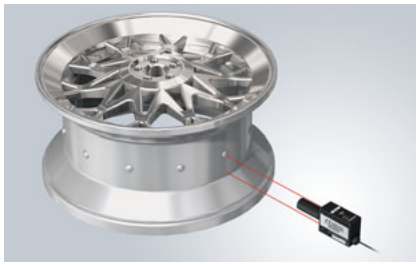
* If the Analogue Monitor Output function or the Timing function is used, up to two banks can be used. If both functions are used, only one bank can be used.

APPLICATIONS

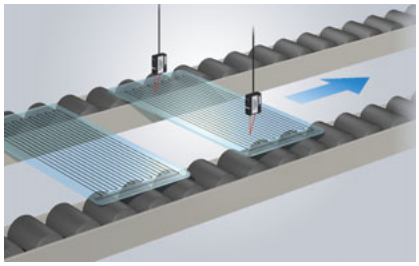
AUTOMOTIVE



Measuring temperature in painting process

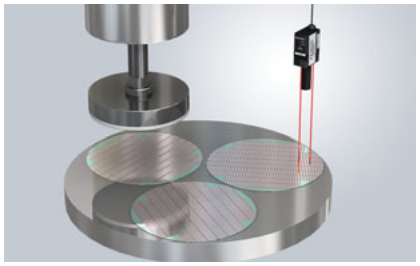


Measuring wheel temperature after heat treatment

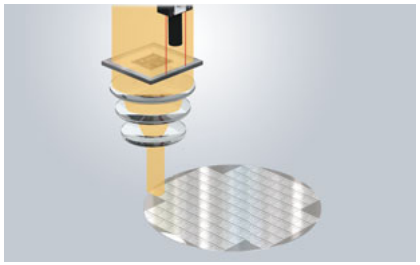


Measuring temperature of vehicle windows

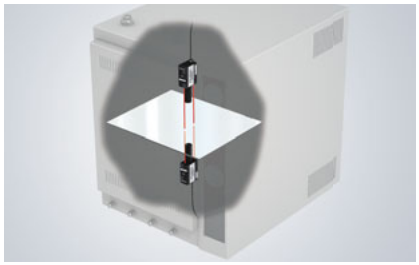
SEMICONDUCTORS/LCDS



Measuring wafer temperature

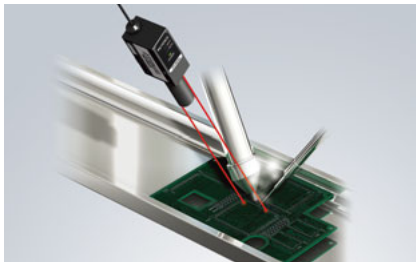


Mask surface temperature

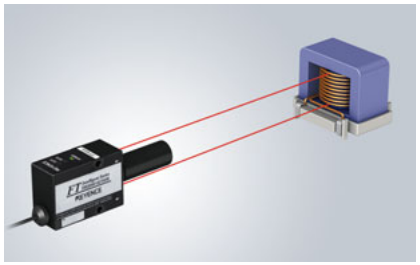


Temperature of glass substrate in chamber

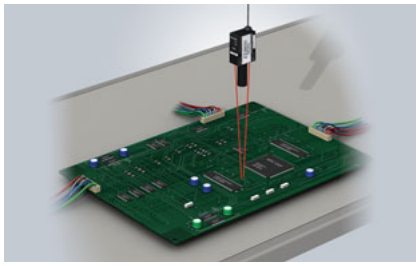
ELECTRONICS



Soldering

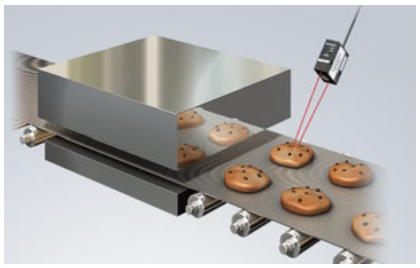


Measuring coil temperature

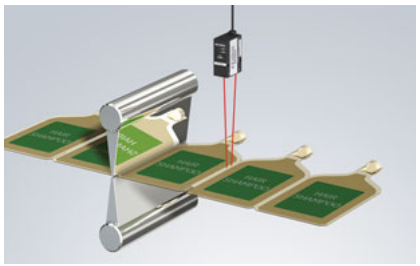


Temperature of resistors on PCB

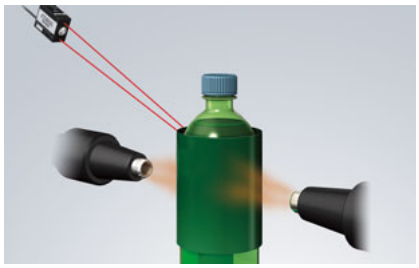
FOOD & PHARMACEUTICALS



Baked goods



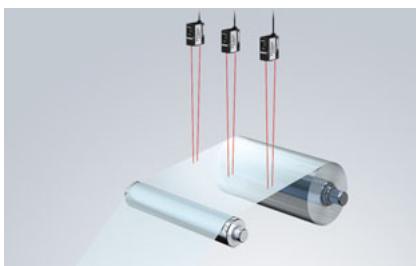
Heat sealing



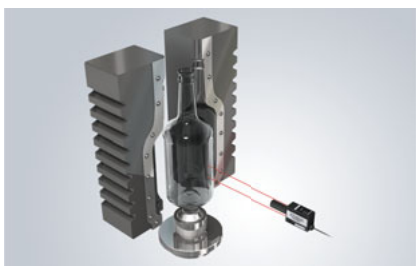
Shrink wrapping

PLASTICS & RUBBER

Residual heat of preformed bottles
(before blow-forming)



Film moulding



Glass moulding temperature

SPECIFICATIONS

Mid to low temperature model (0 to 500˚C)

FT-H50/FT-H30
FT-H20/FT-H10

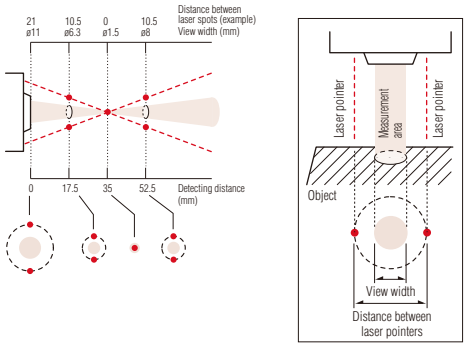
High temperature model (0 to 1350˚C)

FT-H50K/FT-H40K

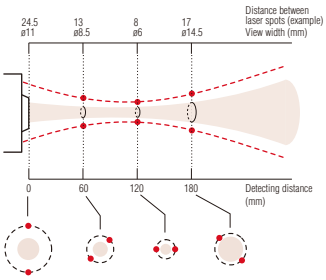
Select by distance

*It is recommended having an allowance for 1.5 times the view width.

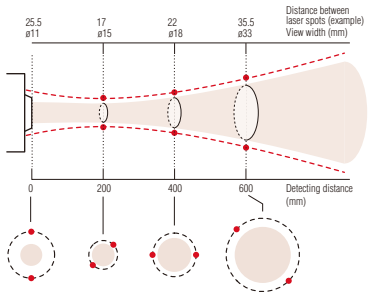
FT-H10



FT-H20

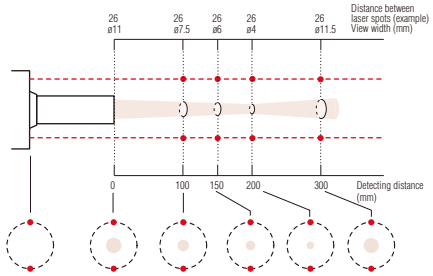


FT-H30

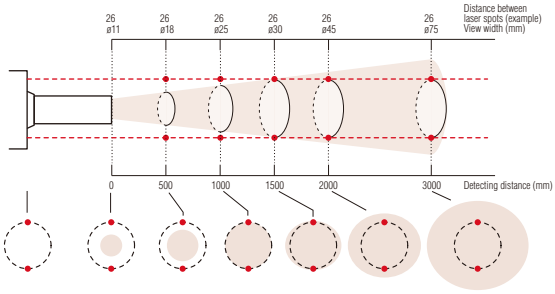


For the FT-H20 and FT-H30 models, the laser pointers appear to rotate clockwise as they travel farther from the source, as shown in the drawing above.

FT-H40K



FT-H50/FT-H50K



Sensor head

Model	FT-H10	FT-H20	FT-H30	FT-H50	FT-H40K	FT-H50K
Appearance						
Type	Mid to low temperature				High temperature	
	Small-spot	Mid-range	Long-range	Ultra long-range	Mid-range	Ultra long-range
Detectable temperature*1	0 to 500°C				0 to 1350°C	
Displayable temperature range	-50 to +520°C				-50 to +1400°C	
Measuring distance/ View diameter (example)	17.5/ø6.3 mm	60/ø8.5 mm	200/ø15 mm	500/ø18 mm	100/ø7.5 mm	500/ø18 mm
	35/ø1.5 mm	120/ø6 mm	400/ø18 mm	1500/ø30 mm	150/ø6 mm	1500/ø30 mm
	52.5/ø8 mm	180/ø14.5 mm	600/ø33 mm	3000/ø75 mm	300/ø11.5 mm	3000/ø75 mm

*1 Repeatability is guaranteed within the rated temperature range.

Amplifier units

Model	FT-50AW	FT-50AWP	FT-55AW	FT-55AWP
Appearance				
Type	DIN-rail mounting type		Panel mounting type	
Control output	NPN	PNP	NPN	PNP
Display resolution	0.1°C or 1°C (when using H10/H20/H30), 1°C (when using H50/H40K/H50K)			
Hysteresis	Variable			
Response speed	HSP, 30, 100, 200, 500, 1000, or 5000 ms can be selected (In HSP: 10 ms typ., 15 ms max.)			
Analogue output	4 to 20 mA, maximum load resistance: 260 Ω The upper- and lower-limit values of the analogue output range can be set optionally.			

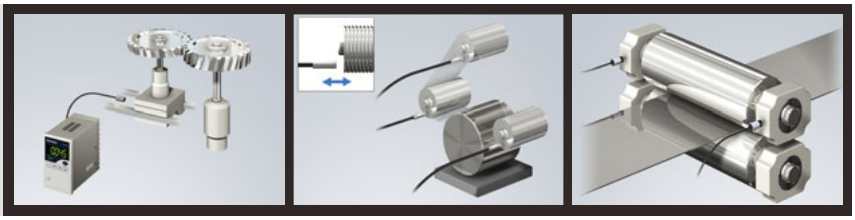
Option

Model	FT-S1	FT-S2	OP-84289	OP-91147	OP-76877	OP-51476	OP-42367	OP-82488
Appearance								
Item name	Robust box with air purge	Germanium window for robust box	Ferrite core	Black-body tape	DIN amplifier mounting bracket	Panel mount bracket set	Head connection connectors (2 pieces)	Power cable
Included/ Sold separately	Sold separately	Sold separately	Sold separately	Sold separately	Included with DIN mounting type amplifier	Included with panel mounting type amplifier	Included with sensor head (mounted)	Included with amplifier
Weight	Approx. 700 g	Approx. 32 g	Approx. 65 g	Approx.145 g	Approx.13 g	Approx. 7 g	Approx. 3 g	Approx. 55 g

EX-V SERIES

High-speed sub-micron displacement sensor with 40,000 samples/sec.

Resolution	:	**0.4 µm**
High-speed sampling	:	**40,000 samples/sec.**
Enclosure rating	:	**IP67**



Best-in-class accuracy and high-speed sampling

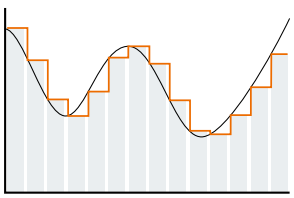
The EX-V Series combines high-speed sampling with a newly developed linearity correction circuit which results in dramatic performance improvement over conventional eddy current systems.

Instantaneous changes can be detected reliably

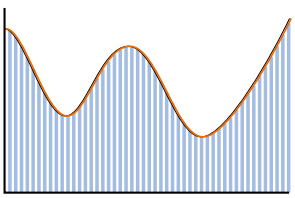
The high-speed digital processing circuit allows for accurate detection of real peak (bottom) values that cannot be detected at conventional sampling speeds.

HIGH-SPEED SAMPLING: 40,000 SAMPLES/SECOND

KEYENCE's conventional model: 2,000/s



EX-V: 40,000/s

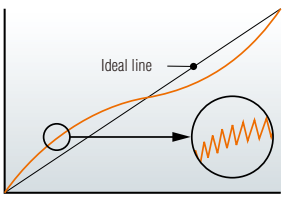


FLL circuit for high accuracy

The FLL (Flat Level Linearise) circuit applies the optimal linearisation correction for each individual sensor head. You can receive measurements with best-in-its-class accuracy and simple setup.

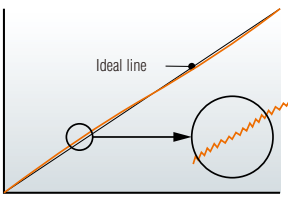
HIGH RESOLUTION: 0.02% OF F.S.; LINEARITY: ±0.3% OF F.S.

KEYENCE's conventional model



Resolution: 0.04% of F.S.
Linearity: ±1% of F.S.

EX-V

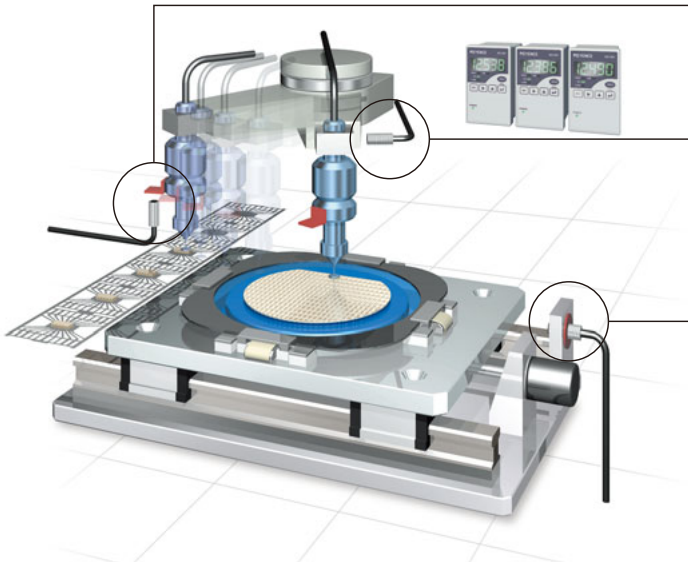


Resolution: 0.02% of F.S.
Linearity: ±0.3% of F.S.

HIGH-PERFORMANCE & SIMPLE SETUP

High-speed, high-accuracy detection allows for 24-hour monitoring of facilities and products, preventing the manufacture of defective products

The high-speed, 40,000 samples/second sampling does not overlook any instantaneous changes. Even high-speed production lines or moving objects can be measured accurately and efficiently. The EX-V Series significantly improves the reliability of facility monitoring system by adding more accurate measurement to the rugged design, which is virtually unaffected by harsh environments.



BOTTOM-DEAD-CENTRE MEASUREMENT

High-accuracy and high-speed sampling enables the detection of minute changes in end of stroke.

VIBRATION MEASUREMENT

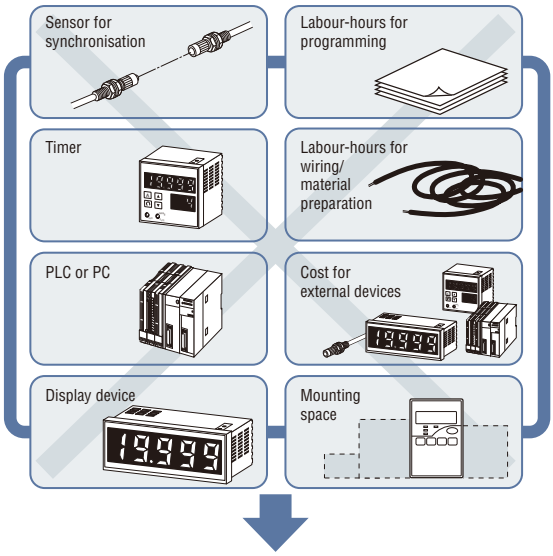
The high-speed sampling of 40,000 times/second allows for reliable detection of abnormal vibrations in facilities.

GAP MEASUREMENT

The rugged, compact sensor head allows for accurate measurement of the position or gap between devices.

Significant reductions in cost/labour-hours at the touch of a button

The optimal program for the application is automatically set by just selecting the measurement mode. There is no need for complicated settings of a trigger input, timer setting or calculations using external devices.



Timer operation or average value calculation can be set at the push of a button on the EX-V digital controller. No PLC or PC is necessary. No external devices are needed for synchronisation.

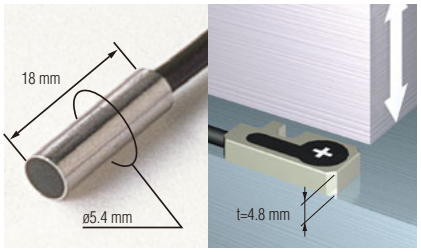
Small and highly resistant sensor head

The sensor head is designed to be resistant against harsh environments, save space and allow for easy maintenance.

RESISTANT AGAINST HARSH ENVIRONMENTS: IP67 RATED

All models are rated as IP67, offering resistance against both water and oil. They offer reliable operation even in harsh environments.

SPACE SAVING: COMPACT OR LOW-PROFILE TYPE AVAILABLE



You can select the optimal sensor head according to the application and available mounting space.

EASY MAINTENANCE

Compatible sensor head

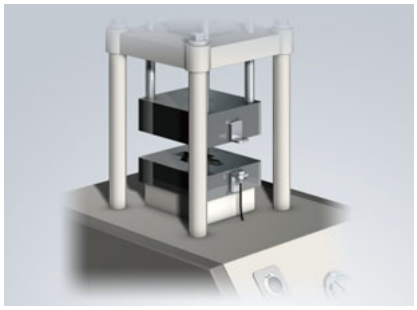
The FLL circuit allows for compatibility among sensor heads of the same model.

Alarm output

The alarm output indicates accidental breakage or disconnection of the sensor head.

APPLICATION

AUTOMOTIVE

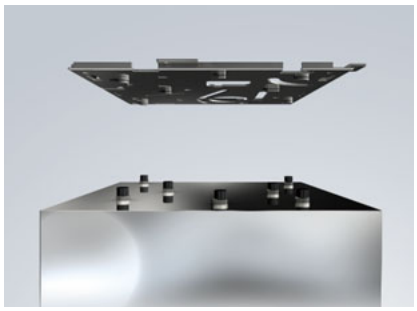


Press bottom-dead-centre detection

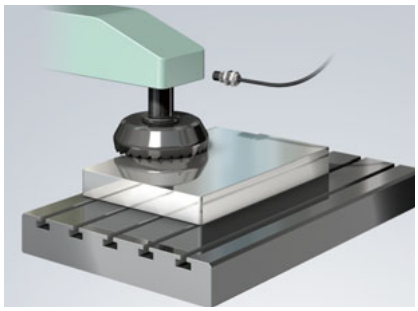
Tyre wire breakage

Gear inspection machine

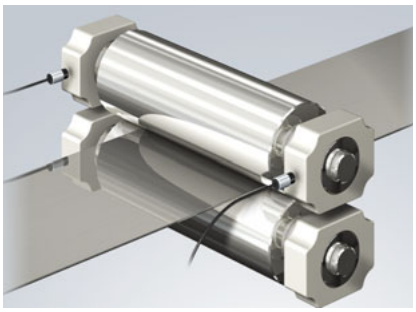
SEMICONDUCTORS/LCDS



Chassis bump height measurement

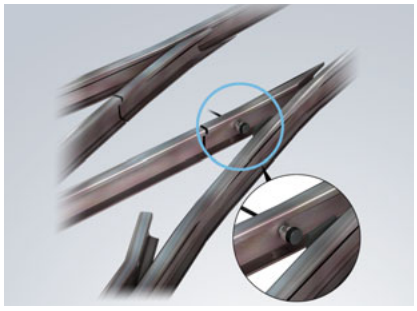


Machine and axis misalignment check

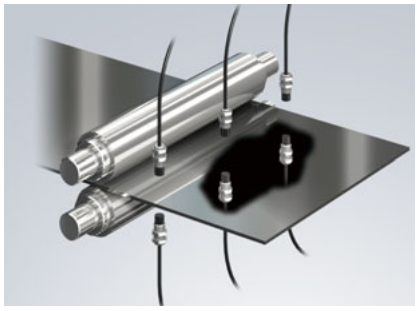


Roller position measurement

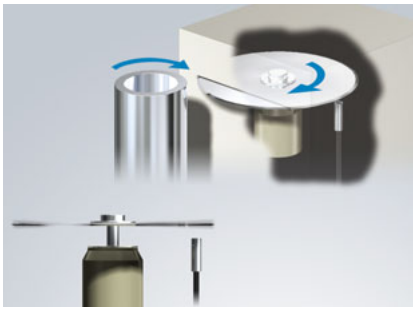
ELECTRONICS



Tongue rail opening

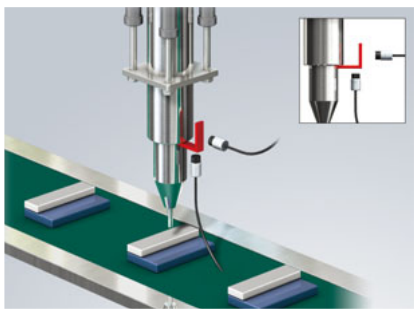


Board thickness detection



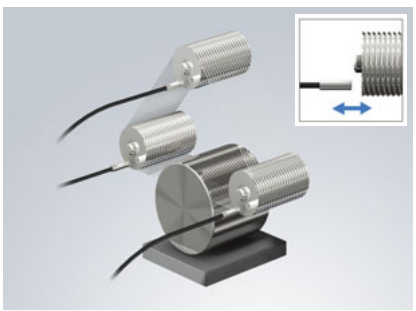
Cutter blade deflection measurement

FOOD & PHARMACEUTICALS



Welding machine bottom-dead-centre detection

Heat seal double feeding



Slicing machine

SPECIFICATION

Type	Model		Appearance	Measuring range (0 / 5 / 10 (mm))	Resolution	Mounting Size
	Sensor head	Controller				
Cylindrical	EX-305V	EX-V01	 ø5.4 × 18 mm	0 to 1 mm	0.4 µm	ø5.4 mm
Threaded	EX-110V	EX-V02	 M10 × 18 mm	0 to 2 mm	0.4 µm	M10
Cylindrical, threaded	EX-416V	EX-V05	 ø14.5 × 20 mm	0 to 5 mm	1 µm	M16
	EX-422V	EX-V10	 ø22 × 35 mm	0 to 10 mm	2 µm	M12
Thin profile	EX-614V	EX-V64	 14 × 30 × 4.8 mm	0 to 4 mm	1 µm	M3 screw × 2

Sensor head

Shape			Cylindrical	Threaded	Cylindrical, threaded		Thin profile
			ø5.4 × 18 mm	M10 × 18 mm	ø14.5 × 20 mm	ø22 × 35 mm	14 × 30 × 4.8 mm
Model	Sensor head		EX-305V	EX-110V	EX-416V	EX-422V	EX-614V
	Controller	NPN	EX-V01	EX-V02	EX-V05	EX-V10	EX-V64
		PNP	EX-V01P	EX-V02P	EX-V05P	EX-V10P	EX-V64P
Measuring range			0 to 1 mm	0 to 2 mm	0 to 5 mm	0 to 10 mm	0 to 4 mm
Display range			-19,999 to +19,999				
Linearity			±0.3% of F.S.				
Resolution (No. of averaging measurements: 64)			0.4 µm	0.4 µm	1 µm	2 µm	1 µm
Sampling rate			40,000 samplings max./sec.*1				
Display rate			20 times/sec.				
Display character			7-segment 2-colour LED				
Range-over alarm			±FFFF is displayed.				
Control input			NPN open-collector or non-voltage contact (Timing input, Reset input, Auto-zero input, Comparator output disable input, Synchronous input, External setting input)/PNP: Applied voltage; 10 to 30 V				
Control output	Tolerance setting		Upper/lower 2-level setting × 4 patterns (selectable)				
	Signal		NPN open-collector (HIGH, GO and LOW): 100 mA max. (40 V max.) PNP open-collector (HIGH, GO and LOW): 100 mA max. (30 V max.)				
	Response time		0.075 ms (at maximum speed)				
	Off-delay time		60 ms				
Strobe output			NPN: 100 mA max. (40 V max.)/PNP: 100 mA max. (30 V max.), Residual voltage: 1 V max. (N.O.)				
Alarm output			NPN: 100 mA max. (40 V max.)/PNP: 100 mA max. (30 V max.), Residual voltage: 1 V max. (N.C.)				
Analogue voltage output	Output voltage		±5 V				
	Impedance		100 Ω				
	Response time		0.075 ms (at maximum speed)				
Temperature fluctuation			0.07% of F.S./°C*2				
Power supply			24 VDC ±10%, Ripple (P-P): 10% max.				
Current consumption			240 mA max.				
Ambient temperature	Sensor head		-10 to +60°C, No freezing				
	Controller		0 to 50°C				
Relative humidity			35 to 85%, No condensation				
Weight	Sensor head (including 3 m cable)		Approx. 45 g	Approx. 55 g	Approx. 75 g	Approx. 200 g	Approx. 60 g
	Controller		Approx. 235 g				

The above data was obtained using an iron target (S45C, SS400, t=1 mm). When measuring aluminium, copper, or stainless steel targets, refer to the linear characteristics for these materials.
*1 When the digital filter function is used, the sampling rate is 20,000 sampling/sec.
*2 When the distance between the sensor head and the target is within 50% of the measuring range.

DL SERIES

Technology to change the face of factory automation
DL supports communication with open field networks

EtherCAT®
DL-EC1A

EtherCAT

PROFINET
DL-PN1

PROFINET

PROFIBUS DP
DL-PD1

PROFIBUS

EtherNet/IP™
DL-EP1

EtherNet/IP

MERIT 1 SAVE WIRING TIME WITH OPEN FIELD NETWORK

When more units are used in combination with each other, more wiring is required.
If communicating with the DL Series, only two wires are required to supply power to the sensor.

CONVENTIONAL

Multiple preparation and wiring steps increased the installation time.

WITH THE DL SERIES

No need to trim the cables Terminal block unnecessary
No additional wiring when replacing/adding sensors
Only a single communication cable is required between the PC/PLC and the DL Series for wiring.

MERIT 2 IMPROVING FUNCTIONALITY THROUGH REMOTE ACCESS WITH FIELD NETWORK

Judgement result monitoring, measurement value readout, input & output control and setting changes can be done via HMI, PLC or PC.

CONVENTIONAL

MONITORING

To check the sensor status, the operator must directly check the sensor amplifier.

CHANGE SETTINGS

Settings must be changed on every single sensor amplifier.

WITH THE DL SERIES

MONITORING

The sensor status can be monitored on an HMI, PLC or PC. Makes it easier to detect problems before an error occurs.

CHANGE SETTINGS

The settings can be changed externally from an HMI, PLC or PC. Changeover times can be reduced.

DeviceNet™
DL-DN1

DeviceNet™

CC-Link
DL-CL1

CC-Link V2

TCP/IP
DL-EN1

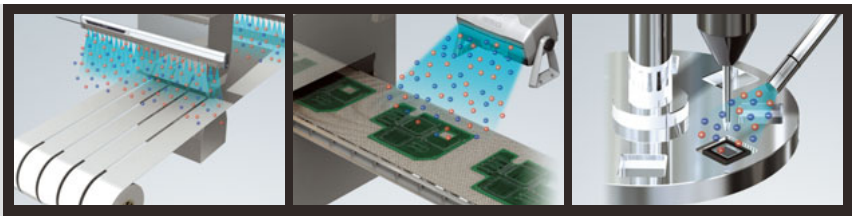
RS-232C
DL-RS1A

BCD
DL-RB1A

SJ SERIES

Eliminates static electricity quickly and effectively.
Improves quality and productivity in the workplace.

- Fastest elimination of static electricity in the industry
- Highly precise ion balance : **±5 V**
- Low maintenance
- Diverse product line

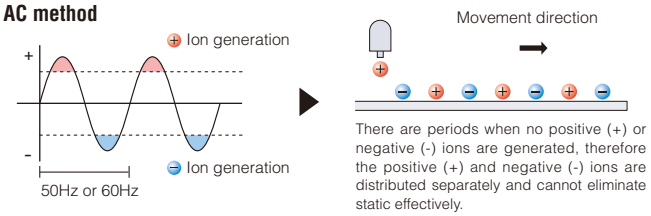


High-speed static elimination and high-precision ion balance

Pulse AC method

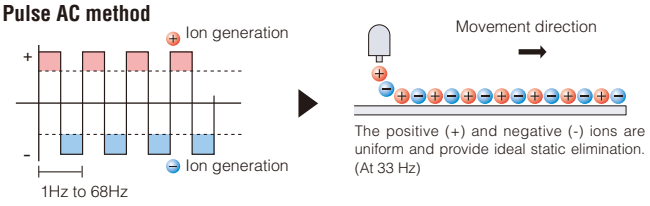
The SJ Series has adopted the pulse AC method that applies alternating high voltage to the electrode probe, producing ions of both polarities. Compared to the conventional AC method, the amount of ions generated is higher and the oscillating frequency can be changed. Therefore, the pulse AC method can be used in all conditions, from high-speed moving applications to static elimination of a work area.

AC method



There are periods when no positive (+) or negative (-) ions are generated, therefore the positive (+) and negative (-) ions are distributed separately and cannot eliminate static effectively.

Pulse AC method

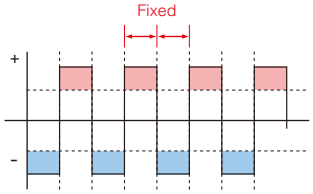


The positive (+) and negative (-) ions are uniform and provide ideal static elimination. (At 33 Hz)

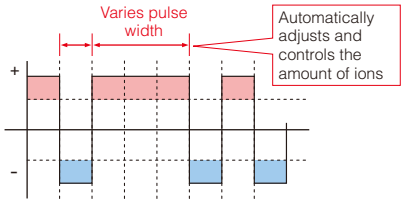
High-precision ion balance with the I.C.C. method

By sensing the ion current generated by the potential difference between the electrode probe and the amount of charge for a workpiece, this method performs calculations and controls the supplied ions based on the amount of charge to achieve rapid static elimination. The I.C.C. method provides high-precision ion balance control for rapid and effective static elimination.

Conventional method



I.C.C. method



NO NEED FOR COMPLICATED SENSOR INSTALLATION
I.C.C. CONTROL WITH BUILT-IN AUTOMATIC SENSING AND FEEDBACK

Automatically control ion balance

The I.C.C. method supplies the optimal balance of ions according to the detected charge, so it does not require any additional calibration during installation or maintenance. This provides quick and effective static elimination.

No need for initial adjustment of ion balance

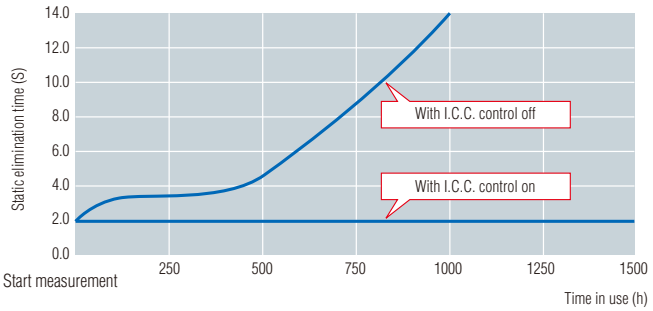
Since the amount of generated ions is controlled automatically, the ion balance does not need to be adjusted.

Ions supplied for high-speed static elimination

Because the ions are supplied according to the amount of charge, high-speed static elimination is possible.

Constant monitoring of ion balance for long-term stability

Automatic adjustment compensates for deterioration in ion balance due to build-up on the electrode probe.



* Measurement conditions for the KEYENCE comparison test

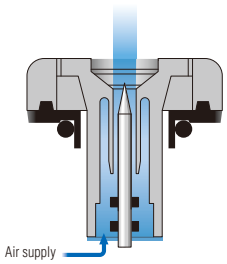
Voltage: +1000 V –> +100 V,
Plate monitor: 150 mm × 150 mm
(20 pF) Installation distance: 300 mm

Maintenance results for static elimination time using I.C.C. (Example)

THE BEST MAINTENANCE-SAVING PERFORMANCE IN THE INDUSTRY

The sheath air guide structure reduces maintenance downtime [5 times less maintenance than conventional models]

The supplied air is conveyed through a three-stage port in the probe cap, fully contained within the air chamber. The air contained in the chamber passes through the channel around the probe to generate a laminar flow. The concave structure at the air outlet blocks external disturbance, resulting in an excellent protective effect. This structure can remarkably reduce adhesion of foreign objects on the electrode probe tip. This results in five times less maintenance than conventional models.



Sheath air guide structure

Cross-sectional view of the electrode probe cap

Maintenance indicators

The SJ-H Series includes a self-diagnosis function that monitors the ion generation level. With the bar LED indicators and alarm outputs, the ioniser alerts you of the need for maintenance.

Normal ion level

Ion level is low.
(Example: Ion level reduction)

Easy electrode probe replacement

Since the electrode probe is attached with a PIN connector or cassette, users can easily replace the electrode probe.

3-way alarm output

The SJ Series provides the self-diagnosis function that monitors three types of abnormalities. If an abnormality is detected, the LED indicators identify the error condition and an external output is activated. Centralised control of ionisers is enabled by monitoring the external output.

CONDITION WARNING

Monitors a high charge level that cannot provide a sufficient static elimination effect.

CLEANING WARNING

Monitors reduction in ion generation level due to dirt or wear of the electrode probe.

ALARM WARNING

Monitors abnormal discharge or damage to the ioniser.

SK SERIES

A new solution for anti-static applications
Simultaneous Measurement of STATIC ELECTRICITY + HUMIDITY

Measuring accuracy : **±10 V**

Measuring range : **±50 kV**

Pin-point measurement of both static charge and humidity

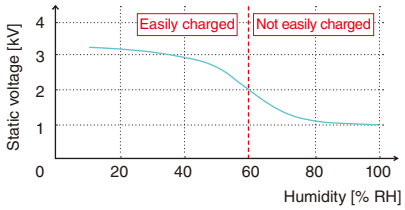
STATIC ELECTRICITY HUMIDITY Simultaneous measurement Industry's first

By measuring the static charge and humidity at the same time, you can more accurately identify whether a particular area is likely to have static-related problems. This helps you consider optimal anti-static measures, including humidification and other static elimination procedures such as installing an ioniser.

Relationship between static electricity and humidity

Static electricity and humidity are correlated: when humidity exceeds 60% RH, static charge is less likely to accumulate. Even during wintertime, when static charges can build up easily due to colder, drier air, static-related problems can be prevented by maintaining a constant level of humidity around target workpieces.

Relationship between humidity and static charge (typical example)



High-precision and wide-range measurements Best in its class

The high-precision surface potential sensor mounted in our new anti-static resin allows the highest level of measuring accuracy in this model class.
KEYENCE can accommodate your needs from high-precision measurements with one-volt unit display resolution to measurements of highly charged objects, up to ±50 kV.

HANDHELD TYPE

Ideal for measurements as needed

SK-H050

180 degree rotating head for flexible measurement

Sensor head adopts a floating structure that rotates 180 degrees. Not only does this make for easy measurement in narrow places, it offers improved shock resistance, as any shock from a drop will not transmit directly to the sensor.

Easy handling and operation

Main body features an ergonomic design with a comfortable, easy-to-hold shape.

Laser pointer to find the reference distance

Dual laser pointers make it simple to identify the optimal measuring distance for high precision measurement.

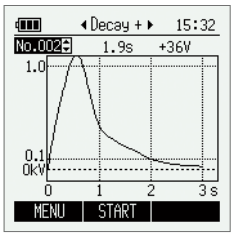
Large, easy-to-read liquid crystal display

A large, highly visible liquid crystal display makes it easy for users to read measurement results on the spot.

Charge monitor function

The SK-H050 features a charge monitor function that measures static elimination speed and ion balance, both of which indicate an ioniser's static elimination capability. This allows users to conveniently measure their ioniser's static elimination capability.

* An ioniser monitoring unit SK-H055, sold separately, is required.



IN-LINE TYPE

Ideal for continuous measurement

SK-050/1000

Compact sensor head

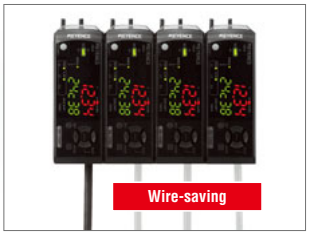
The ultra-small design of the sensor head allows it to be installed almost anywhere, even in limited spaces inside a system.

Clearly visible indicator

Large LED clearly indicates the status even when the sensor head and amplifier are separated.

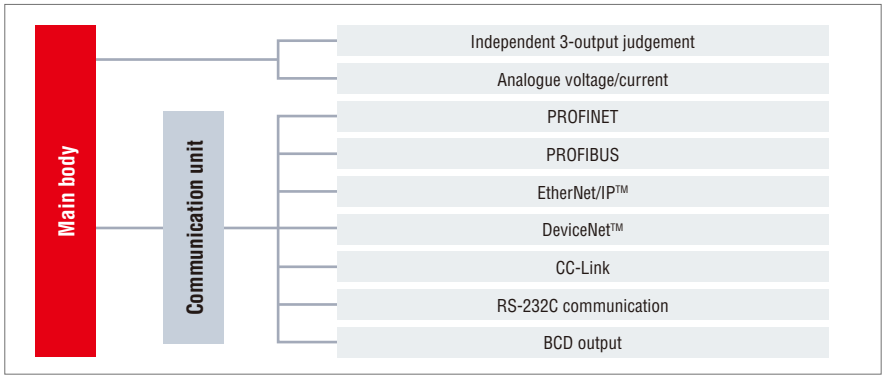
Connectable main unit and expansion units

Up to eight amplifiers can be connected depending on the combination of the main unit and expansion units. This reduces wiring even in applications that require multi-point measurements.



Multiple output options

Standard specifications include an independent 3-output judgement system and analogue voltage/current output. By using a communication unit, data from up to 8 connected main units and expansion units can be transmitted simultaneously. The ability to read data and re-write settings from PCs and PLCs contributes to a significant reduction in man-hours required for setup and operation.



KEYENCE VALUE

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- Specialised Product Expert
- KEYENCE Direct

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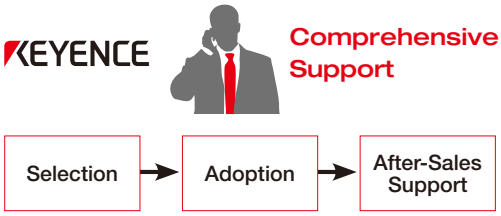

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- On-Site Product Demonstrations
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With most items in stock, received orders can ship the same day, reducing your overhead costs and losses due to work stoppage.

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

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