KEYENCE

Vision Sensor with Built-in AI
NEW IV3 Series

All-in-one presence detection solution

Compact model
+
Illumination unit

Compact model

Smart camera

IV3 Series

Ultimate Flexibility for Mistake and Error proofing in manufacturing

AI

AI-based imaging and detection for easy usability

Megapixel
camera

Wide field of
view

Illumination
unit

Long
range

White/
infrared
illumination

Automated
focus
adjustment

Compact
model

SD card

KEYENCE

Rotating
connectors

Smart
camera

1 G Ethernet

Large, dedicated
panel

PoE

IP67

Smart camera and compact model
for use anywhere

IV3 Series Vision Sensor with Built-in AI

AI-based imaging and detection for easy usability

AI

AI-based imaging

The AI generates the optimum detection image with no glare or crushed blacks.

All settings—including illumination intensity, flash method, and exposure time—are automatically configured by the AI. The ideal imaging conditions can be derived for any environment or target conditions to ensure stable detection.
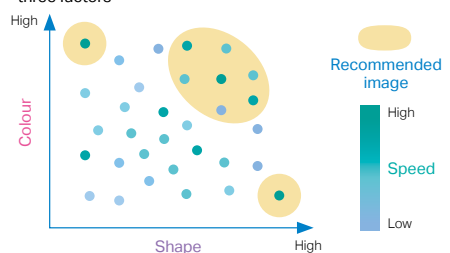
Algorithm

Imaging mechanism

The AI automatically extracts the recommended image from over 1000 imaging conditions. The system scores the acquired images according to three factors—colour, shape, and speed—for automatic extraction of the recommended image.

Three factors for AI-based image extraction

Colour
Clear colour

Shape
Clear shape

Speed
Short capture time
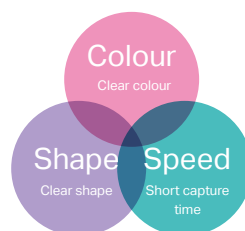
Recommended image extraction based on scoring of three factors

High

Colour

Recommended image

High

Speed

Low

Shape   High

AI-based detection

Simply register OK and NG products to automatically configure the optimal settings for AI-based presence detection.

The built-in AI detects even slight differences to automatically configure the optimal detection settings. Because detection is based on target characteristics, stability can be ensured with no adverse effects from ambient light, individual product variations, or surface conditions.

Algorithm

Detection mechanism

The AI determines the characteristics of registered OK and NG products to enable comprehensive judgement. Accurate judgement is possible even if part of the image is not visible or if the shape changes by extracting the colours, shapes, edges, or other pattern characteristics.
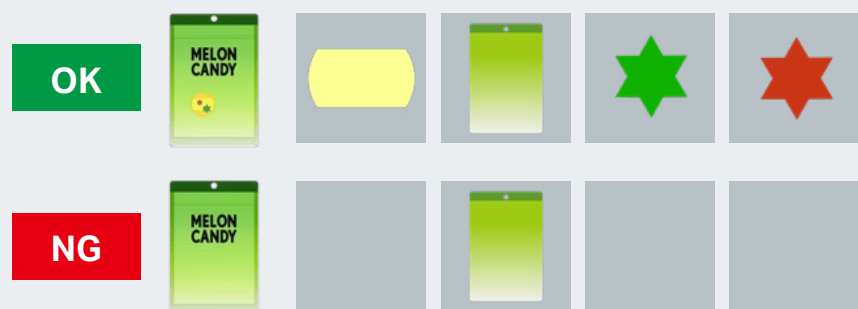
Detection of colours, shapes, edges, and other pattern characteristics

Clear images
for stable detection
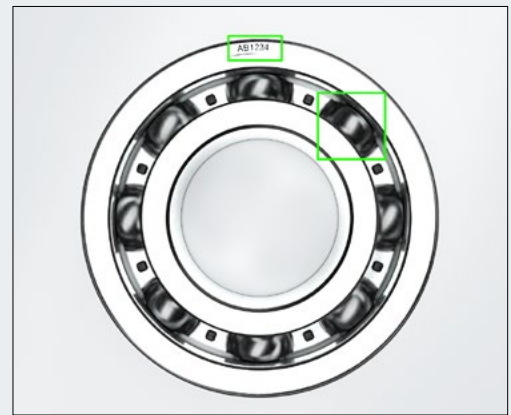
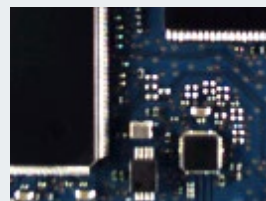## Ultra-wide field of view
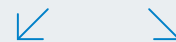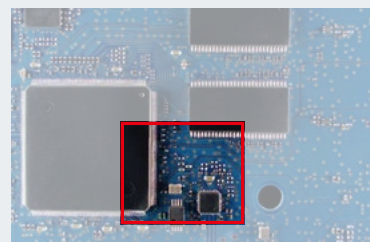37 times wider than conventional models

Conventional
field of view

MAX 1822 × 1364 mm

High resolution
4 times higher than conventional models

Conventional model

IV3 Series

Technology that supports clear image creation

AI-based imaging

All settings—including illumination intensity, flash method, and exposure time—are automatically configured using AI to suit the target, detection locations, differentiation details, and installation environment. The AI determines the best imaging conditions for any environment or target conditions to ensure stable detection.
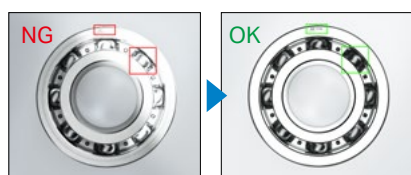
Removal of ambient light

Glare prevention

Surface condition exclusion

Powerful illumination unit

Automatic control of more than 1000 lighting conditions with no influence from ambient light
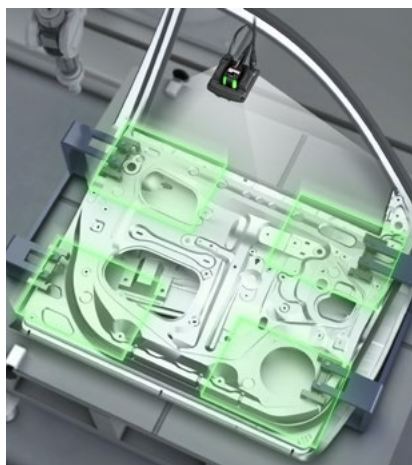
LED lights in ultra-compact model	LED lights in model with built-in amplifier

4 + 12

With illumination unit attached
16

8 + 24

With illumination unit attached
32

Digital zoom + NEW High-speed program switching = Detailed detection of multiple points

The IV3 Series includes a digital zoom function that complements inter-pixel information to create smooth, clear images. Any position on the target can be magnified and analysed even when placing the sensor close to the target is impossible due to installation limitations or if the target is too small. Programs used to magnify any part of the field of view can also be used as needed with automatic program switching at an incredibly fast 100 ms response time to enable detailed detection of multiple points with a single camera.
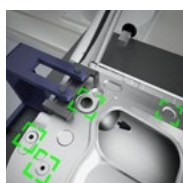
Program 1

Program 2

Program 3

Program 4

Smart camera and compact model for use anywhere

2000 mm

1822 mm

1364 mm

Megapixel camera for long-range detection over a wide field of view

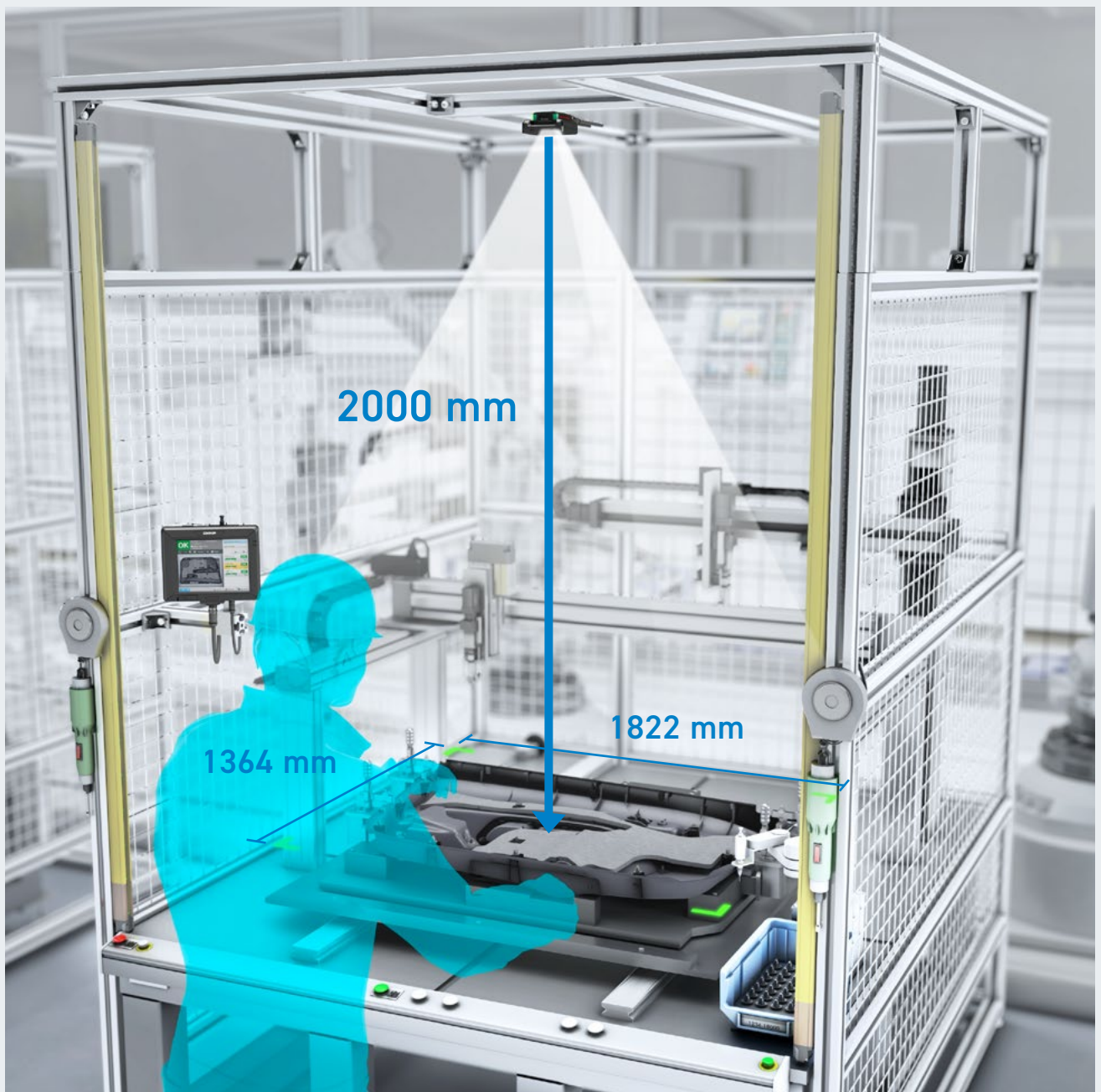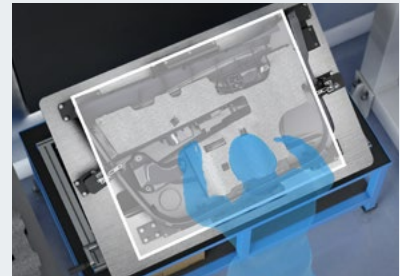Perform differentiation inspections in up to 65 locations with just one device. When using infrared lighting, operators are not distracted even if the sensor head is installed 2000 mm above the workspace.

Conventional models

IV3 Series

High-intensity lighting and AI tools for preventing adverse effects from ambient light

The sensor heads offer 12 times more light intensity than conventional models when used alone or 48 times more powerful when used with an illumination unit. This impressive light intensity enables stable detection with no fluctuations due to ambient light.

Lighting intensity comparison

Illumination intensity (Working distance: 300 mm)

48×

12×

1.0

| Conventional models | IV3 (head only) | IV3 + Illumination unit |
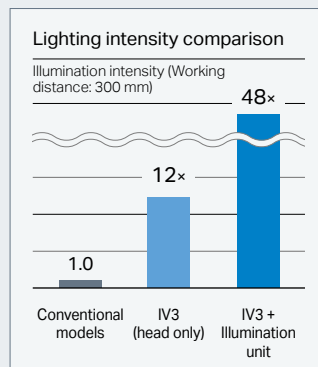
Stable detection, day or night

Unaffected by shadows

No need for an enclosure

No adverse effects from ambient light or imaging environment changes

Significantly reduced time spent from installation to setup with PoE and dual AI

With PoE support, installation is easy even in locations with no power supply or where installing a power supply is difficult. In addition, AI imaging and learning tools can significantly reduce the time spent from image capturing to settings configuration.

Conventional models

Installation   Setup

IV3 Series

Installation   Setup   Significantly reduced time
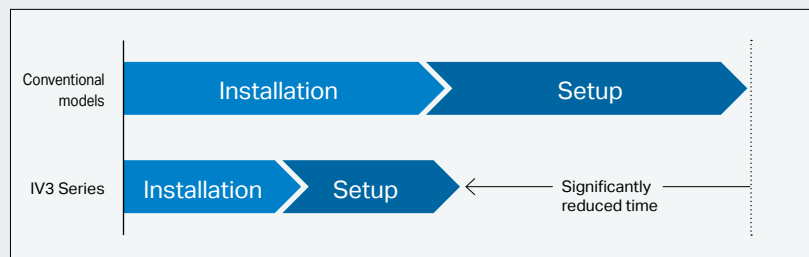
Just one Ethernet cable required
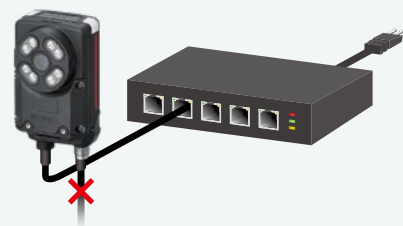
Smart camera and compact model for use anywhere

Automatic assembly processes

Compact design for easy retrofitting or equipment improvement

The small sensor size (24 × 31 × 44.3 mm) allows for flexible, stress-free installation. This opens the door to a wide range of improvements.

Flexible layout with a connector that can be rotated up to 330°

The cable connector can be rotated by up to 330° to match the available space and installation conditions for greater installability.

31 mm

24 mm

44.3 mm
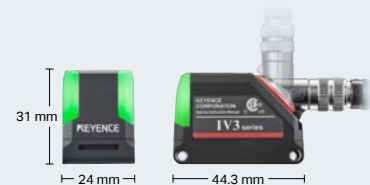
Robot assembly processes

Robust, integrated design with IP67 enclosure

The smart camera is PoE-compatible, allowing for installation with even minimal wiring. The IP67-rated enclosure also ensures safe use even in environments with exposure to water.

Conversion connectors with support for common cables

The conversion connectors make it possible to use any available standard cable.

Power supply cable

M12 A-coded 12-pin (included as standard)
M12 A-coded 4-pin **OP-88631**
M12 L-coded 5-pin **OP-88632**

Ethernet cable

M12 X-coded 8-pin (included as standard)
M12 D-coded 4-pin **OP-88633**

AI-based imaging

Easy extraction of optimal judgement image for anyone

Flow

Mark

Mark the detection area.

15 seconds

The AI automatically extracts the recommended images from over 1000 imaging conditions in about 15 seconds.

Just select

Choose from 4 to 12 images extracted automatically by the AI.
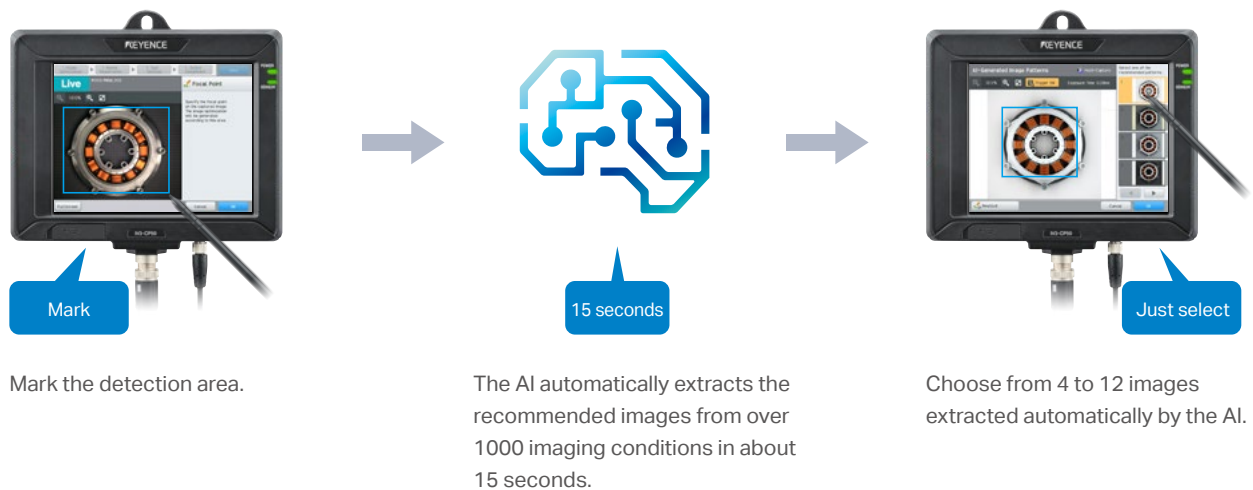
Point 1 Automatic recommended image extraction from over 1000 imaging conditions

The lighting method, intensity, and other conditions are automatically controlled, and the acquired images are scored according to three factors— colour, shape, and speed—to extract between 4 and 12 recommended images. Users need only to mark the inspection area, and the AI will provide images captured under various conditions.

Automatic imaging condition control

Automatic extraction of recommended images
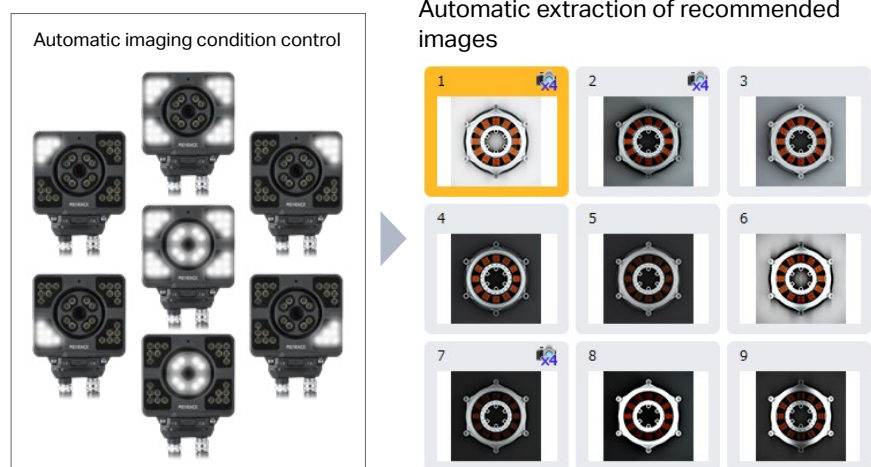
Point 2 Automatic configuration of conditions for the target area

The optimal imaging conditions for the inspection area are configured automatically. Any user can obtain the best imaging conditions simply by marking the area to be inspected.

Marking the entire area ensures a balanced detection of colour and shape.

Marking only the red button emphasises colour.

Marking only a black button emphasises shape.

AI-based detection

Easy configuration of the most stable settings for anyone

Flow

Mark

Mark the detection area.

Just register

Register OK products and NG products.

3 seconds

The AI identifies the characteristics of OK and NG products for automatic generation of the best settings in about 3 seconds.

Point 1 Stable detection even if the imaging environment changes

The AI determines the characteristics of registered OK and NG products for accurate judgement even if part of the image is not visible or if the shape changes, ensuring stable detection.

Registered OK product

Registered NG product

The AI extracts various product characteristics.

Inspection target

Overall judgement: Characteristics are similar to registered OK product

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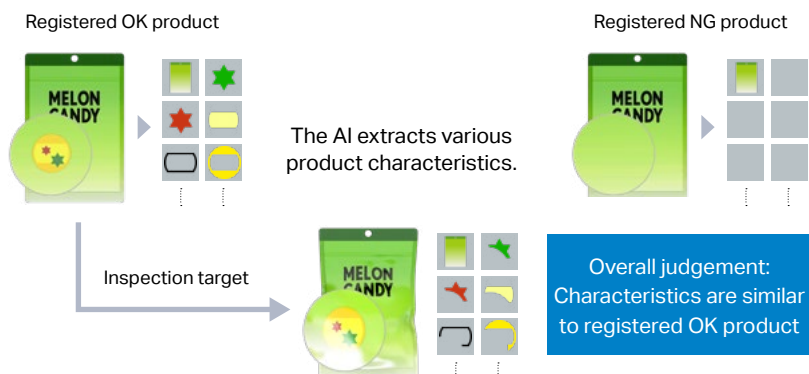
Point 2 One-touch handling of condition changes and product type additions

Product inspection criteria can be easily added with a single touch through additional learning even if various conditions have already been set. Even beginners can use the AI to easily redetermine the optimum settings. This enables inspection under any situation, including if the imaging environment changes or if more product types are added.

Example: Marking presence detection

OK

NG

Support for product type changes

NG Significant build-up

Just press

Additional learning

Judgement: OK

Registration of new NG conditions

OK NG if characters do not match

Just press

Additional learning

Judgement: NG

Various detection tools
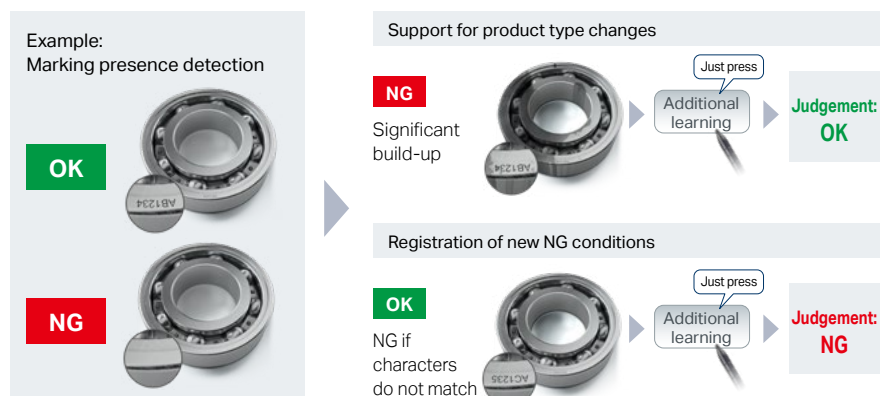
Standard mode

A wide range of detection tools for various targets and applications

New built-in tools

NEW
Learning

NEW
Blob count

Tools

Outline	Colour area	Area	Colour average	Brightness average	Edge pixels
Width	Diameter	Edge presence	Pitch	OCR	Colour/ brightness prohibit

Position adjustment tools

Position adjustment	High-speed position adjustment	NEW Multi-position adjustment

NEW Learning
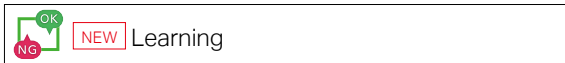
Automatic AI-based differentiation

The built-in AI can detect even slight differences to automatically configure the optimal detection settings simply by registering OK and NG products.

NEW Flexible combination with other detection tools

The learning mode is a new tool that uses registered OK and NG products for differentiation. The learning tool can also be used together with various other tools for even more advanced detection.

Extraction of colours, shapes, edges, and other pattern characteristics

OK Shrink wrapping detected

Difference detected | Difference detected | | | Difference detected

NG No shrink wrapping detected
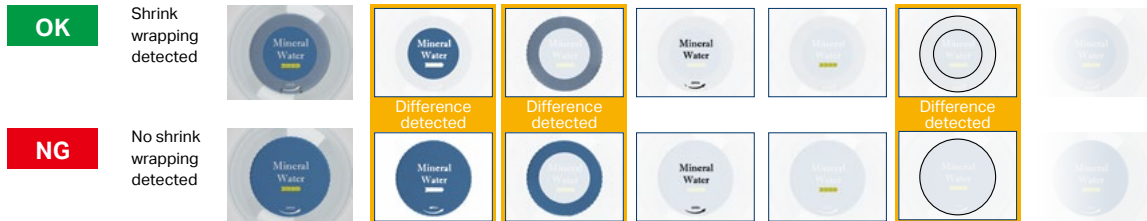
Outline

(Appearance-based difference check of metal components)

Colour area / Area
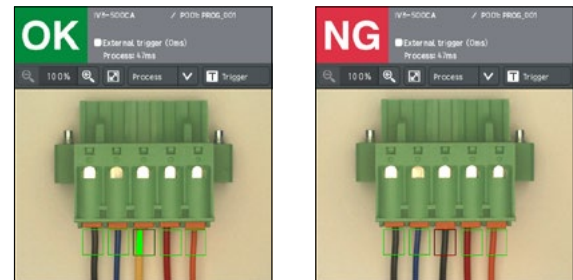
(Connector wiring difference check)

Colour average

(Colour-based cap difference check)

Brightness average

(Type-based difference check of metal components)

Built-in tools

Width
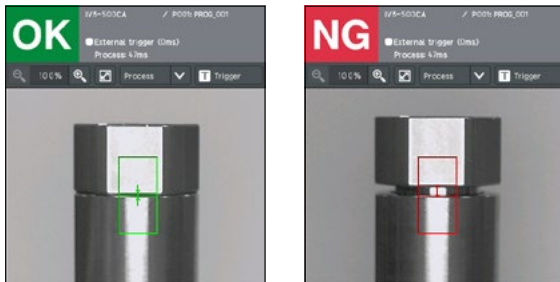
(Component assembly misalignment check)

Diameter
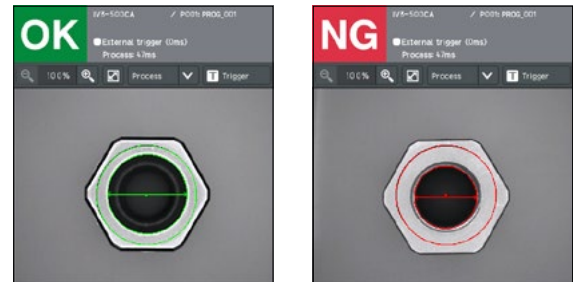
(Diameter-based difference check of metal components)

Edge presence

(Type-based difference check of metal components)

Pitch
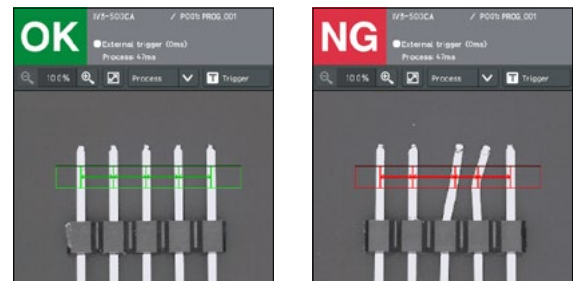
(Pin pitch check)

Edge pixels
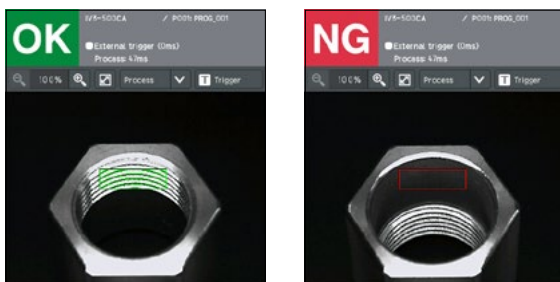
(Tap processing presence detection)

Colour/brightness prohibit
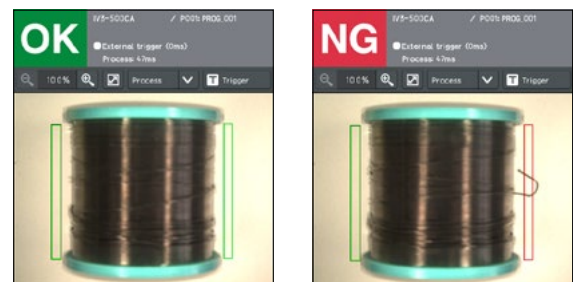
(Wire protrusion detection)

Position adjustment

(Mark presence detection with rotational correction)

NEW Multi-position adjustment
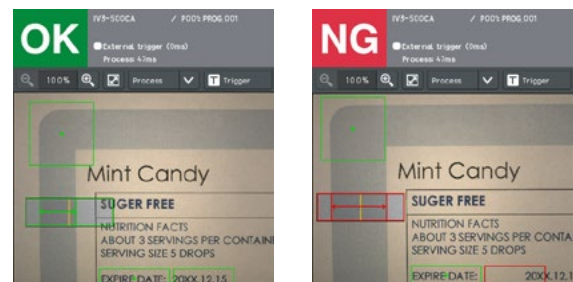
(Label and Expiration date detection)

123 OCR

Inspection based on text, numbers, or dates

Automatic character recognition can be performed simply by enclosing the characters to be detected. There is no need to register a dictionary or configure any other settings required with conventional vision sensors.

(Expiration date-based inspection)

NEW Newly developed OCR algorithm

Characters can be read even if not perfectly aligned. Reading accuracy has been further improved for stable recognition even with misaligned text and text on irregularly shaped surfaces. Reading of lowercase characters and the "+" symbol has also been added for increased capability.

Stable detection even with misaligned text

Support for lowercase characters and "+" symbol

NEW Blob count

Differentiation according to the number of similarly coloured clumps

Specify the detection area to include or exclude certain blobs from detection. In addition to counting, this function can also be used for detecting incomplete areas.
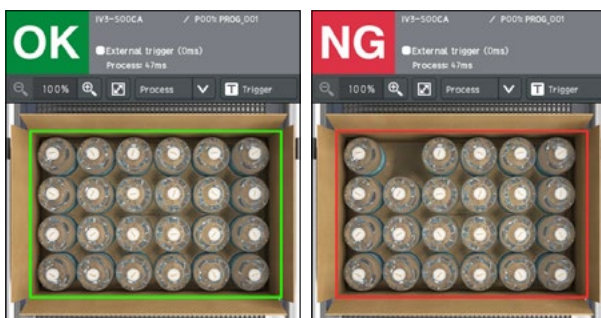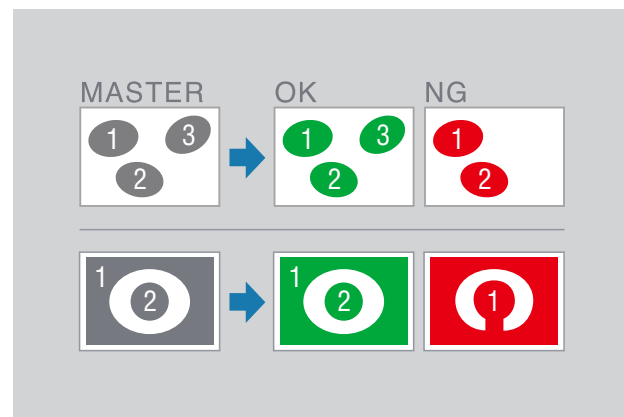
(Beverage bottle count)
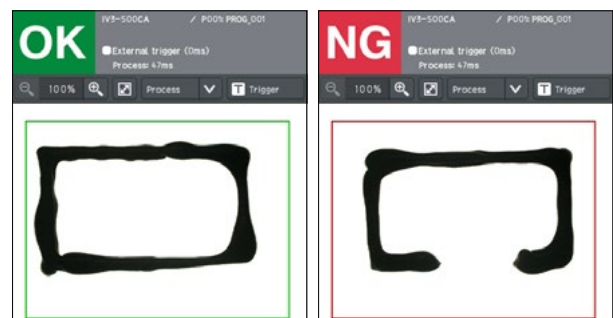
(Sealant interruption inspection)

Various detection tools

Sorting mode

Sort and identify product types while also improving productivity by addressing root causes and shortening processing time

Up to 8 patterns can be registered for product sorting. Registering patterns beforehand can help improve productivity in various ways, including through product type differentiation and sorting, feedback to the next process, and countermeasures against defect factors at the source.

Registration of up to 8 different patterns

Sorting Output differentiation and sorting for up to 8 different product types

Register products in advance to output up to 8 product differentiation and sorting patterns, eliminating the need for complicated PLC control and external devices.

BEFORE

Product type information transmission

Program switch display

Product code   Switch   PLC   **IV3 Series**   OK/NG only

AFTER

No need for external devices

Product code   Switch   PLC   **IV3 Series**   Product A   Product B   Product C

A
B
C
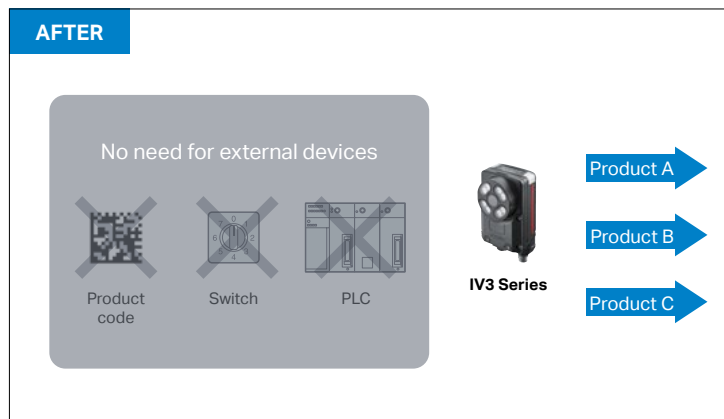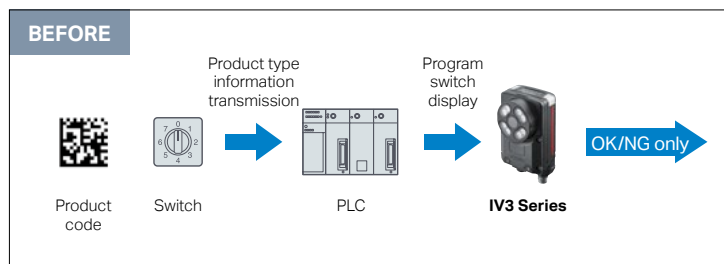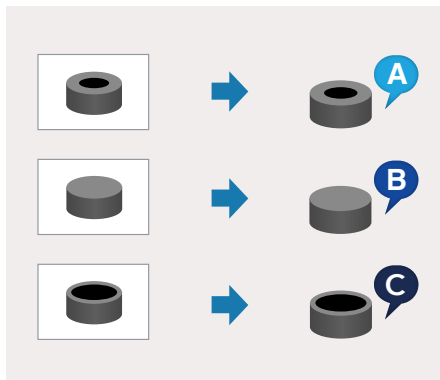
Identifying root causes

Identify the cause of defects to enforce countermeasures at the source

Registering possible NG patterns in advance makes it possible to determine and categorise the types of NGs, enabling countermeasures at the source.

Example: Determining and identifying root causes of NG label application

OK product	No label	Label upside down	Label offset

BEFORE

Conventional models

OK/NG only →

No identification of most frequent NG causes

AFTER

With the IV3	OK product	No label	Label upside down	Label offset
	↓	↓	↓	↓
Main NG cause	OK	Out of labels	Incorrect insertion	Static electricity
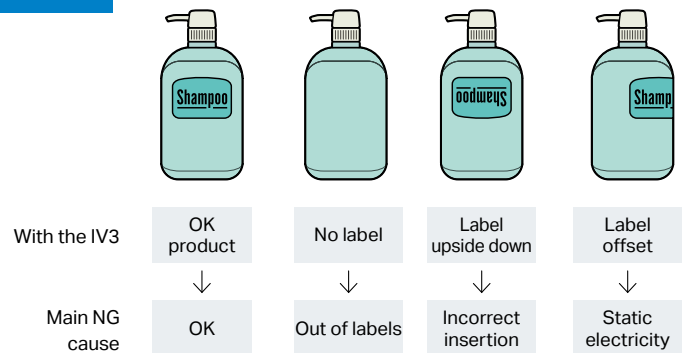
Improving processing time

Decide the next steps more easily

Using pre-registered patterns makes it possible to identify the product conditions. This can help improve equipment processing time by identifying the necessary operations in the next step.

Example: Determining bottle direction to identify next steps

OK product	Front	Right	Back

BEFORE

Conventional models

OK/NG only →

Rotate the bottle one side at a time until the OK side is identified

AFTER

With the IV3	OK product	Front	Right	Back
	↓	↓	↓	↓
Identified next step	Attach label	Rotate 270°	Rotate 180°	Rotate 90°

19
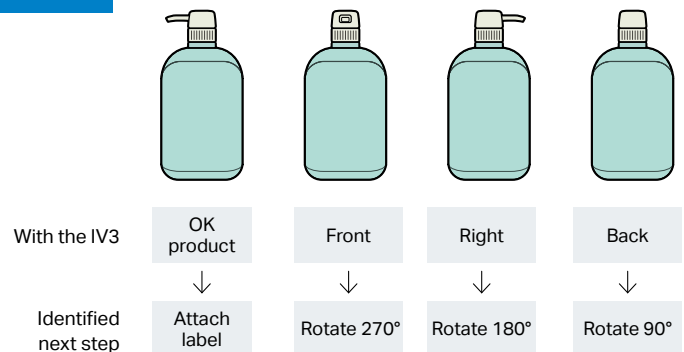
Extensive network compatibility for various equipment types

Communication networks (standard equipment)

Smart camera

Compact model

PROFINET

EtherNet/IP

TCP/IP

Communication unit (DL Series)

Compact model

DeviceNet
DeviceNet®
DL-DN1

CC-Link V2
CC-Link
DL-CL1

PROFIBUS
PROFIBUS
DL-PD1

EtherCAT
EtherCAT®
DL-EC1A

RS-232C

RS-232C
DL-RS1A
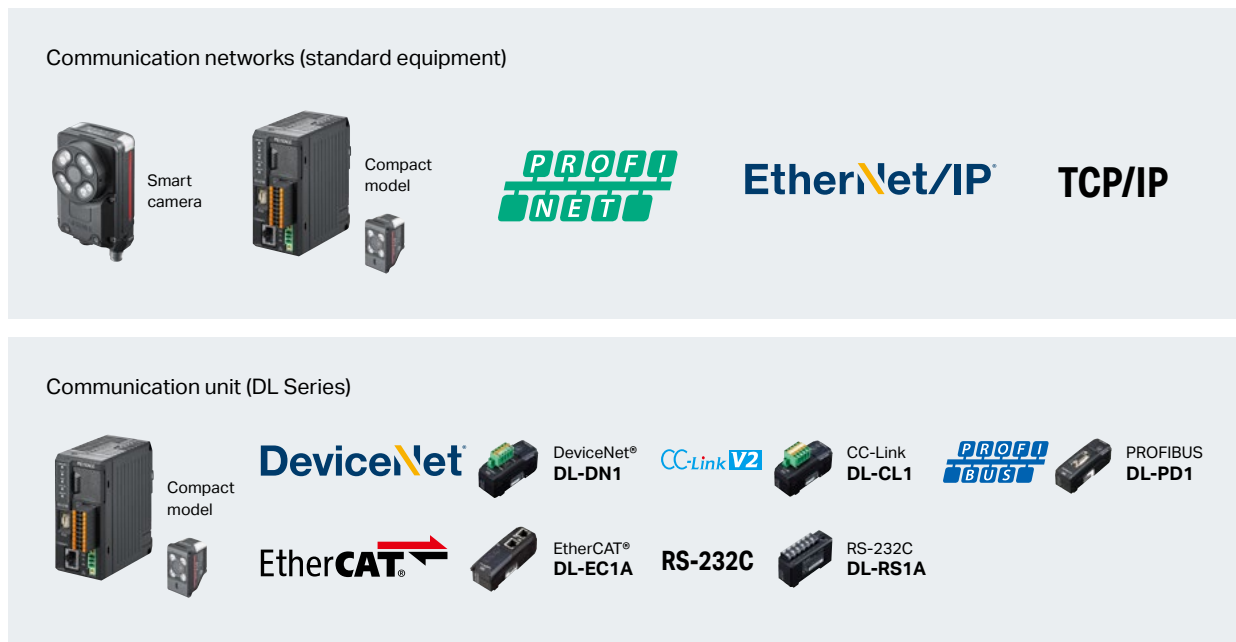
* EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.
* DeviceNet® and EtherNet/IP™ are registered trademarks or trademarks of ODVA.
* CC-Link is a registered trademark or a trademark of Mitsubishi Electric Corporation.

SFTP support for reliable security

The SFTP client function makes it possible to transfer image data to an SFTP server (PC, NAS, PLC). This enables status confirmation and cause analysis support in the event of a problem.

FTP/SFTP client

Image file

SFTP server

PLC
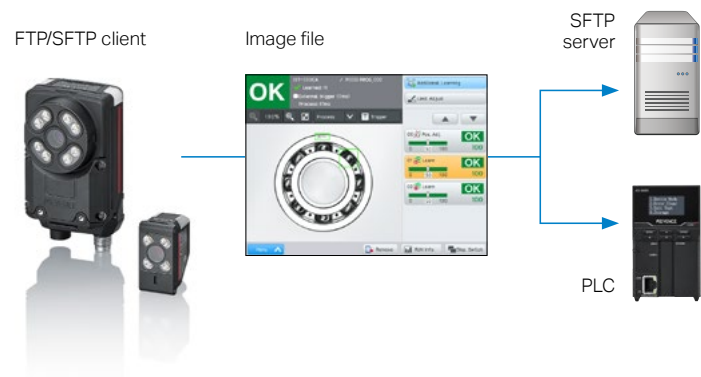
Remote sensor status checking

The Web Monitor function makes it easy for users to check the operation screen, judgement result, and sensor status from a PC, smartphone, or tablet.

PC

Smartphone

Tablet
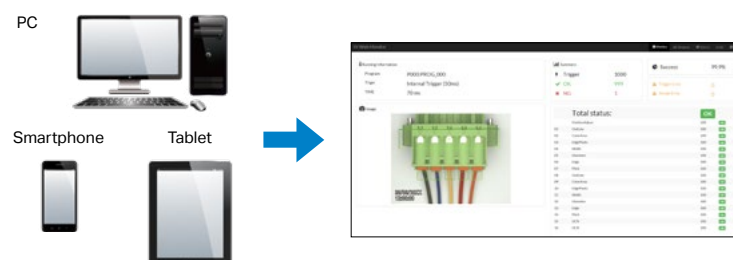
SD card compatibility for reliable line operation even if a problem occurs

Support for up to 128 programs and multi-product production lines

Using an SD card enables up to 128 programs for use in multi-product production lines.

SDHC UHS1 compatibility, high-speed image data storage

Applicable models	SD card	Number of programs	Image data transfer capacity (typical example)
Compact model	16 GB	128 (32 + 96)	Approx. 156,000 images*
Compact model	4 GB	128 (32 + 96)	Approx. 37,000 images*
Smart camera	8 GB	128 (32 + 96)	Approx. 75,000 images*
Compact model + Smart camera	None	32	—

* Extended programs: Not used
File size varies depending on the image when using JPEG format.

Data management and cause analysis support

IV3-Navigator (IV3 software)

Setup flow shows all steps at a glance

Parameter setup fields show the current value

Large, easy to see image

Click and interact directly with parameter settings

Simulation function

Run operations using the sensor. (The image history is recorded.)

Transfer the configuration from the sensor.

Transfer the configuration to the sensor.

Check/modify the configuration.

Use the image history to check operations.

Rerun all tests button

Operation screen display

OK/NG count

At-a-glance status checking of multiple sensors

Connected sensor list NEW

A list of network-connected sensors can be displayed for easy configuration of settings and display switching.
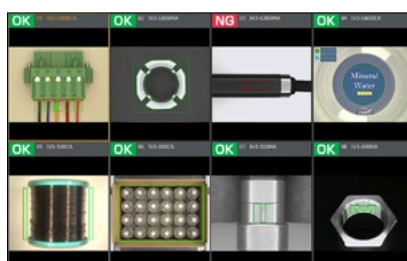
Simultaneous multi-sensor display screen NEW

Display up to sixteen operation screens at once.

Smartphone component check
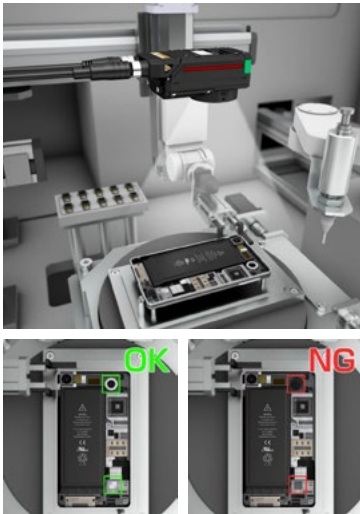
LED lighting check
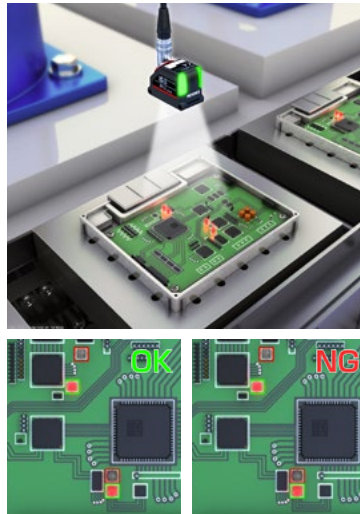
Connector pin breakage check

IC presence check
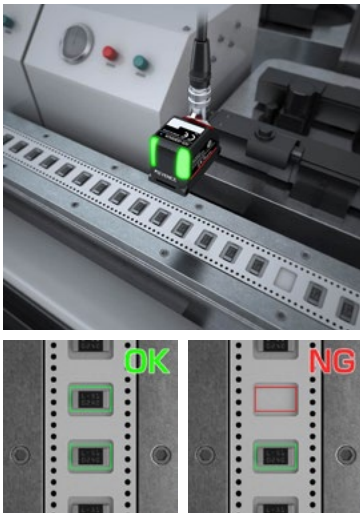
LED direction check
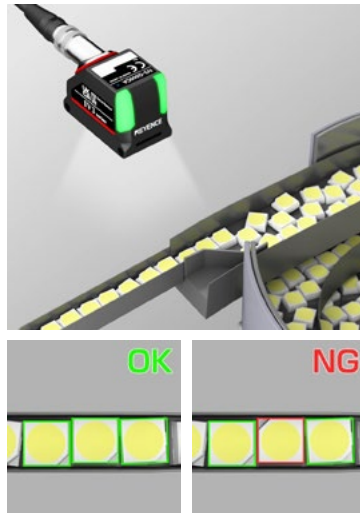
Electronic component presence/
orientation difference check
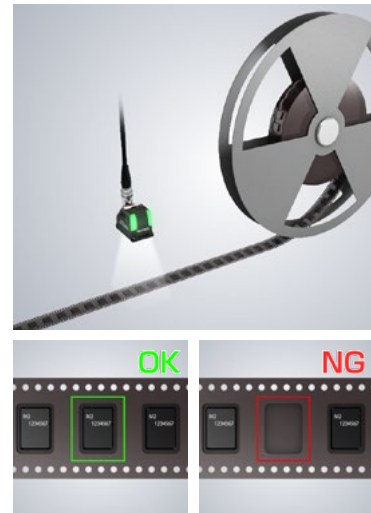
Bearing roller check
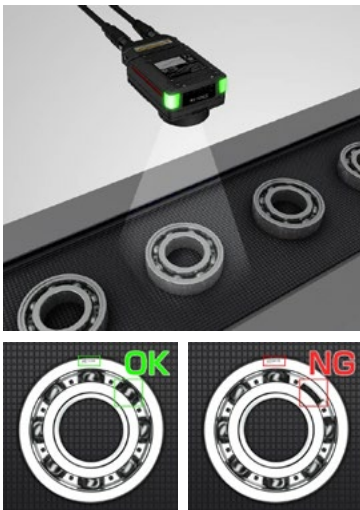
Processing-based metal component
difference check

Double blank material sheet
detection
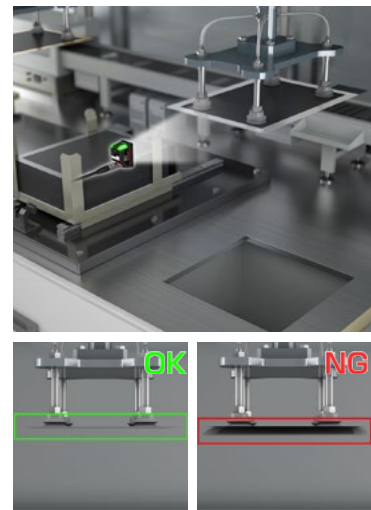
Airbag stitching check

OK NG

Sheet right/left check

OK R NG L
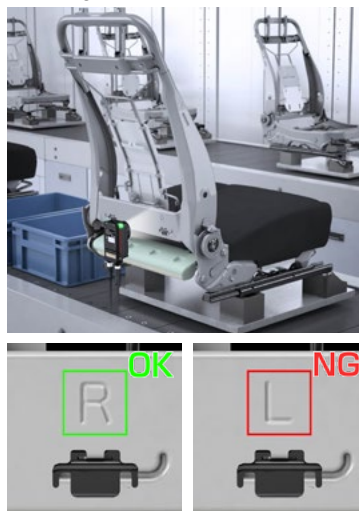
Liquid gasket application check

OK NG
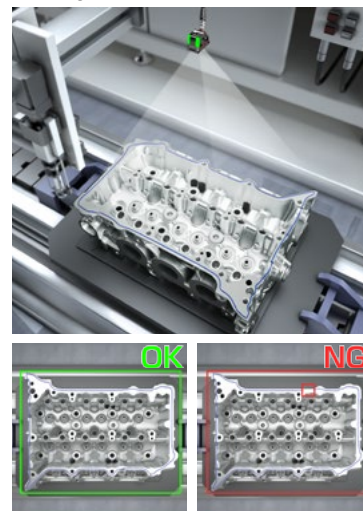
Lithium-ion battery presence check

OK NG
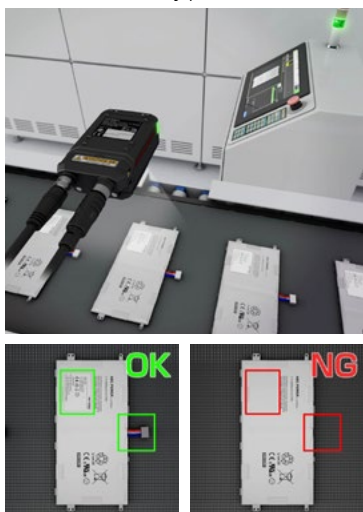
Lithium-ion battery orientation check

OK NG
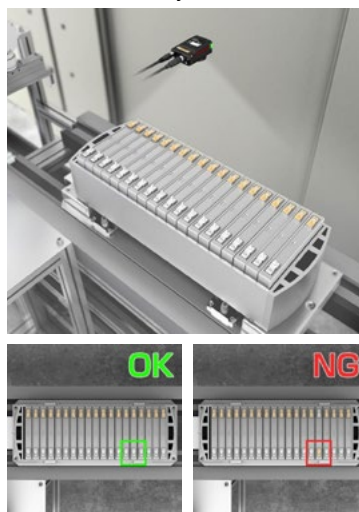
Moulded product form check

OK NG

Bumper bolt check

OK NG
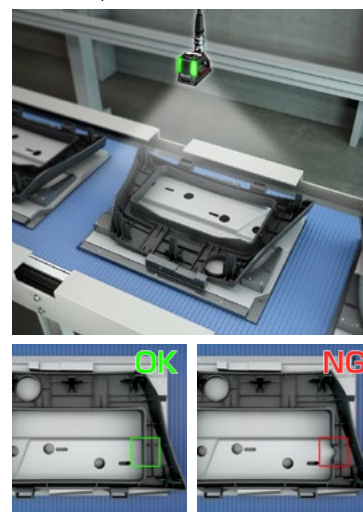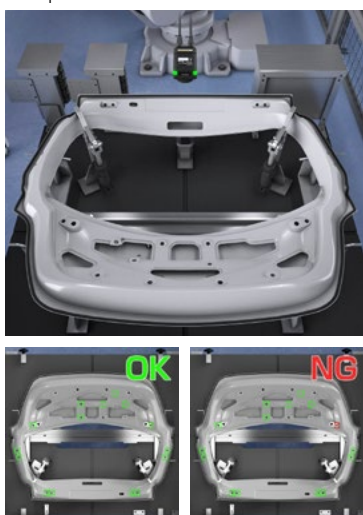
Instrument panel clip presence check

OK NG

Bad mark check on tyres

OK NG

Test kit product check
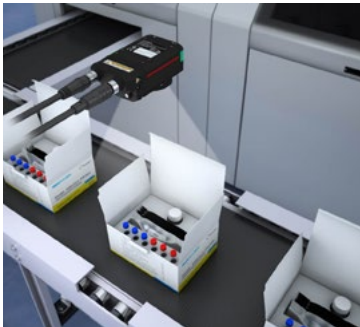
Diaper type check

Chocolate quantity check
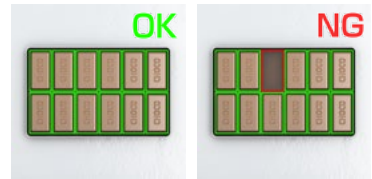
Expiration date print check

Cap tightening check
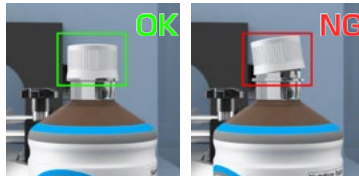
Label type differentiation

Beverage bottle count
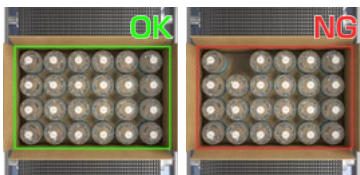
Sealing tape presence
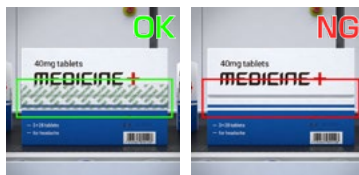
Hot melt presence

Resin part mould check
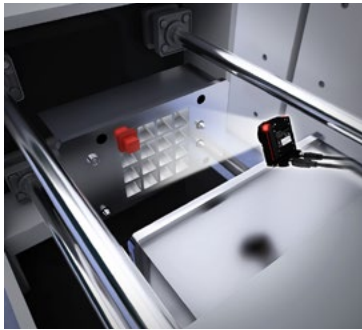
Gear grease check
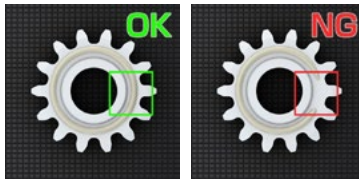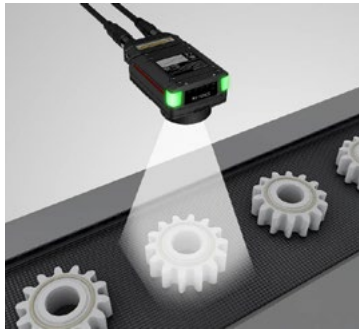
Adhesive application check
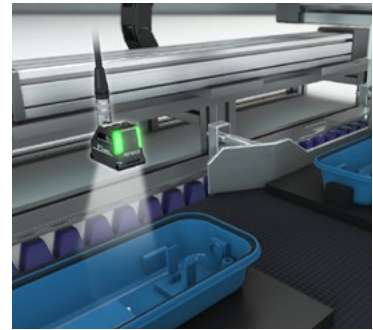
Shipping box stock check
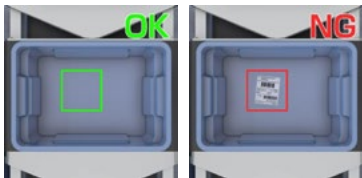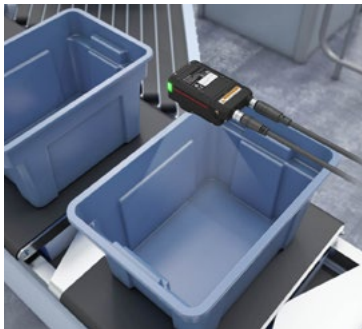
Injector quantity check
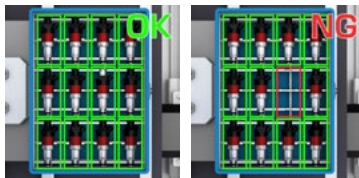
Photocopying machine screw check

Benefits of an ultra-compact head

Ability to meet equipment downsizing and retrofitting needs

Minimal interference with operators or equipment operation

Specifications

Smart camera

Model	IV3-500CA	IV3-500MA	IV3-600CA	IV3-600MA
Type		Standard type		Wide view type
Installed distance *1		50 mm or more		50 mm or more
Field of view (typical example)		Installed distance 50 mm : 22 (H) × 16 (V) mm to Installed distance 3000 mm : 1184 (H) × 888 (V) mm		Installed distance 50 mm : 51 (H) × 38 (V) mm to Installed distance 3000 mm : 2730 (H) × 2044 (V) mm
Image receiving element	1/2.9 inch colour CMOS	1/2.9 inch monochrome CMOS	1/2.9 inch colour CMOS	1/2.9 inch monochrome CMOS
Number of pixels			1280 (H) × 960 (V)	
Focus adjustment			Auto *2	
Exposure time			12 µs to 10 ms	

Light	Illumination	White LED	Infrared LED	White LED	Infrared LED
	Lighting method	Pulse lighting/ continuously lighting is switchable.	Pulse lighting	Pulse lighting/ continuously lighting is switchable.	Pulse lighting

Tool	Available modes	Standard mode / Sorting mode
	Available Tool	Learning, Outline, Colour area*3, Area*4, Edge pixels, Colour average*3, Brightness average*4, Width, Diameter, Edge presence, Pitch, OCR, Colour prohibit *2, Brightness prohibit, Position adjustment, High-speed position adjustment (1-axis edge/2-axis edge), Blob count
	Number of tools *5	Total: 65 tools

Switch settings (programs)		128 programs (when using SD card) / 32 programs (when not using SD card)
Image history*6	Number of storable images	100 images
	Condition	Selectable between NG only, NG and OK near threshold*7, and All

Image data transfer	Transfer destination	Selectable between SD card, FTP server and SFTP server
	Transfer format	Selectable between bmp, jpeg, iv3p, and txt, and file names can be modified
	Transfer conditions	Selectable between NG only, NG and OK near threshold*8, and All

Analysis information*8	RUN display	Tools list (Judgement results, degree of similarity, or degree of similarity bar display)
	RUN information	Switchable between OFF, histogram, processing time, count, and output monitor Histogram: Histogram, degree of similarity (Max., Min., Ave.), Number of OKs, Number of NGs Processing time: Processing time (latest, Max., Min., Ave.) Count: Trigger numbers, Number of OKs, Number of NGs, Trigger errors, Strobe errors Output monitor: ON/OFF status by output

Other functions	Image capture function	Digital zoom (2×, 4×), HDR, High gain, Colour filter*3, White balance*3, Brightness correction, AI capture
	Tool functions	Additional learning, Mask outline, Masking function, Colour extraction/exclusion*3, Colour histogram function*3, Monochrome histogram function*4, Scaling function
	Utilities	Failing sensor list, Failure hold, Test run, I/O monitor, Security settings (Two-factor password), Simulator*9, Additional FTP/SFTP Image Information, Multi-position adjustment, Multi-master image registration, High-speed program switching, Auto program switching, Auto setting backup/restore, Threshold changing in RUN

Indicators		OUT, TRIG, STATUS, LINK/ACT, SD
Input		Switchable between non-voltage input and voltage input For no-voltage input: ON voltage 2 V or lower, OFF current 0.1 mA or lower, ON current 2 mA (short circuit) For voltage input: Maximum input rating 30 V, ON voltage 18 V or higher, OFF current 0.15 mA or lower, ON current 2 mA (for 24 V)
	Number of inputs	6 ports, 3 ports are selectable as IN/OUT
	Function	IN1: External trigger, IN2, IN3, I/O1 to I/O3: Enable by assigning optional functions Assignable functions: Program switching, Clear error, External master image registration, SD card save cancel

Output		Photo MOS relay output, N.O./N.C. Switchable Maximum rating 30 V 50 mA, residual voltage 1.5 V or less *10
	Number of outputs	6 ports, 3 ports are selectable as IN/OUT
	Function	Enable by assigning the optional functions Assignable functions: Total judgement (OK/NG), Run, Busy, Position adjustment result, Judgement result of each tool, Result of the logical operation of each tool, Error, SD card error, Variety discrimination result, Master judgement result

| Power/I/O	Connector	M12 12 pin A code Male connector
	PoE	PoE power Class 3/4/6 *11
Ethernet	Standard	1000BASE-T/100BASE-TX
	Connector	M12 8 pin X code Female connector
Network function		FTP client, SFTP client
Interface compatibility	Built-in Ethernet	EtherNet/IP™, PROFINET*12, TCP/IP non-procedure communication
Expanded memory		microSD card (microSD/microSDHC)*13

Rating	Power voltage	24 VDC +25%/-20% (including ripple)*14
	Consumption current	3.3 A or less (without the AI Lighting unit, and including the output load) 1.8 A or less (AI Lighting unit, and including the output load)*15

Environmental resistance	Operating ambient temperature	0 to +50°C (No freezing)*16
	Operating ambient humidity	35 to 85% RH (No condensation)
	Vibration resistance *17	10 to 55 Hz; double amplitude 1.5 mm; 2 hours in each of the X, Y, and Z directions
	Shock resistance *17	500 m/s², 3 times in each of the 6 directions
	Enclosure rating *18	IP67

Material	Main unit case: Aluminium die-casting/PBT/TPU Indicator light cover: TPU Ethernet connector: Aluminium die-casting/LCP Front cover: Acrylic (hard coating)	Power connector: Aluminium die-casting/LCP Nameplate: PET Water proof cap for the Power connector: PC+ABS alloy Water proof cap for the Ethernet connector: PC
Weight		Approx. 300 g (without the AI Lighting unit) Approx. 495 g (with the AI Lighting unit)

*1 Removing the polarising filter is recommended when used at distances of 3 m or more. *2 The focusing position can be automatically adjusted at the time of installation. Disabled during operation. The focusing position can be registered by programs. *3 Colour type only. *4 Monochrome type only. *5 Tools can be installed by programs. This is the number of detection tools and position adjustment tools. Up to 64 detection tools can be set. The number of detection tools in Sorting mode are eight tools. *6 Saves to the sensor's internal memory. The images saved to the sensor can be backed up to a USB memory stick inserted into the control panel (IV3-CP50) or to the PC where the software for the IV3 Series (IV3-H1) is being used. *7 Learning tool only. *8 Can also be displayed on the control panel (IV3-CP50) or the software for the IV3 Series (IV3-H1). *9 Usable on the software for the IV3 Series (IV3-H1). *10 Make sure to keep a total of each output with 120 mA or less. *11 For a PoE power supply device, IEEE802.3at power class 4 or higher is recommended when using the AI Lighting unit, and IEEE802.3bt power class 6 or higher is recommended when the AI Lighting unit is not used. When using PoE operation may be restricted due to power limitation. *12 Conformance Class B, applicable protocol: LLDP, SNMP. *13 Use only products recommended by KEYENCE. *14 When using the OP-88656 (10 m), the power voltage is 24 V DC +25%/-10% (including ripple). *15 The peak current is designed to be smaller if the AI Lighting unit is mounted. The peak current is greater if the AI Lighting unit is not mounted *16 For situations where the operating ambient temperature will exceed 40°C, follow KEYENCE's specified heat dissipation measures to ensure the case temperature does not exceed the rated maximum temperature (65°C). Check the instruction manual for more information. *17 Except when the dome attachment (IV3-D10) is mounted. *18 Except when the polarising filter (OP-88640/OP-88641/OP-88644/OP-88645) is mounted.

PC software

Model		IV3-H1
Supported sensor		IV3 Series, IV2 Series, IV Series
Recording software		For IV3 Series: IV3-Navigator, For IV2 Series: IV2-Navigator, For IV Series: IV-Navigator
System requirements	Interface	Equipped with the Ethernet (1000BASE-T) interface
	OS*1	Windows 10 Home/Pro/Enterprise Windows 7 (SP1 or higher) Home Premium/Professional/Ultimate; either OS above needs to be pre-installed
	Languages*2	English / Japanese / German / Chinese (Simplified) / Chinese (Traditional) /Korean / Italian / French / Spanish / Portuguese / Czech / Hungarian / Polish / Thai
	Processor	Needs to be compliant with system requirements for OS.
	Memory capacity	4 GB or more
	Required capacity for installation	4 GB or more
	Monitor	Resolution: 1024 × 768 pixel or higher, Display: High Colour (16 bit) or higher
	Operating conditions	.NET Framework 4.5.2 must be installed*3 Microsoft Visual C++ 2017 Redistributable Package must be installed.*3

*1 Supports 32-bit and 64-bit versions. *2 When connected to the IV3 Series. When connected to the IV/IV2 Series, the supported languages are the same as the IV2-H1. *3 If this software is not installed, it will be automatically installed when IV3-H1 is installed.

Control panel

Model		IV3-CP50
Supported sensor		IV3 Series, IV2 Series, IV Series
Display		5.7" TFT colour LCD 640 × 480 dot (VGA)
Backlight	Method	White LED
	Duration	Approx. 50000 hours (25°C)
Touch panel	Method	Analogue resistive
	Actuating force	0.8 N or lower
Indicators		PWR, SENSOR
Ethernet*1	Standard	100BASE-TX
	Connector	M12 4 pin connector
Languages*2		English / Japanese / German / Chinese (Simplified) / Chinese (Traditional) /Korean / Italian / French / Spanish / Portuguese / Czech / Hungarian / Polish / Thai
Expanded memory		USB flash memory*3
Ratings	Power voltage	24 VDC ±10% (including ripple)
	Current consumption	0.3 A or less
Environmental resistance	Operating ambient temperature	0 to +50°C (No freezing)
	Operating ambient humidity *4	35 to 85%RH (No condensation)
	Vibration resistance	10 to 55 Hz, 0.7 mm double amplitude, 2 hours each for X, Y, and Z axes
	Drop resistance	1.3 m over the concrete (2 times each in the arbitrary direction)
	Enclosure rating	IP40
Material		Main unit case: PC / Power connector: brass + Ni coat / Ethernet connector: Zinc + Ni coat, PA / USB connector cover: EPDM / Pen holder: PC / Hook for adapter: POM / LED lamp cover: PC / Mounting adapter: PC / Stylus: POM
Weight		Control panel: Approx. 450 g A mounted with the wall mounting adapter and the stylus: Approx. 485 g

*1 Especially for connecting to the IV3 Series, IV2 Series, and IV Series. *2 When connected to the IV3 Series. When connected to the IV/IV2 Series, the supported languages are the same as the IV2-CP50. *3 Use a product recommended by KEYENCE. *4 If the ambient temperature exceeds 40°C, use the sensor head in the absolute humidity of 40°C 85% RH or lower.

Compact model sensor amplifier

Model		IV3-G120
Available modes		Standard mode / Sorting mode
Tool	Tool with standard mode	Learning, Outline, Colour area*¹, Area*², Edge pixels, Colour average*¹, Brightness average*², Width, Diameter, Edge presence, Pitch, OCR, Colour prohibit *¹, Brightness prohibit, Position adjustment, High-speed position adjustment (1-axis edge/2-axis edge), Blob count
	Number of tools *³	Total: 65 tools
Switch settings (programs)		128 programs (when using SD card) / 32 programs (when not using SD card)
Image history*⁴	Number of storable images	100 images
	Save conditions	Selectable between NG only, NG and OK near threshold*⁵, and All
Image data transfer	Transfer destination	Selectable between SD card, FTP server, and SFTP server
	Transfer format	Selectable between bmp, jpeg, iv3p, and txt, and file names can be modified
	Transfer conditions	Selectable between NG only, NG and OK near threshold*⁵, and All
Analysis information*⁶	RUN display	Tools list (Judgement results, degree of similarity, or degree of similarity bar display)
	RUN information	Switchable between OFF, histogram, processing time, count, and output monitor Histogram: Histogram, degree of similarity (Max., Min., Ave.), Number of OKs, Number of NGs Processing time: Processing time (latest, Max., Min., Ave.) Count: Trigger numbers, Number of OKs, Number of NGs, Trigger errors Output monitor: ON/OFF status by output
Other functions	Image capture function	Digital zoom (2×, 4×), HDR, High gain, Colour filter*¹, White balance*¹, Brightness correction, AI capture
	Tool functions	Additional learning, Mask outline, Masking function, Colour extraction/exclusion*¹, Colour histogram function*¹, Monochrome histogram function*², Scaling function
	Utilities	Failing sensor list, Failure hold, Test run, I/O monitor, Security settings (Two-factor password), Simulator*⁷, Additional FTP/SFTP Image Information, Multi-position adjustment, Multi-master image registration, High-speed program switching, Auto program switching, Auto setting backup/restore, Threshold changing in RUN
Indicators		PWR/ERR, OUT, TRIG, STATUS, LINK/ACT, SD
Input		Switchable between non-voltage input and voltage input For no-voltage input: ON voltage 2 V or lower, OFF current 0.1 mA or lower, ON current 2 mA (short circuit) For voltage input: Maximum input rating 26.4 V, ON voltage 18 V or higher, OFF current 0.15 mA or lower, ON current 2 mA (for 24 V)
	Number of inputs	8 (IN1 to IN8)
	Function	IN1: External trigger, IN2 to IN8: Enable by assigning optional functions Assignable functions: Program switching, Clear error, External master image registration, SD card save cancel
Output		Photo MOS relay output, N.O./N.C. Switchable Maximum rating 26.4 V 50 mA, residual voltage 1.5 V or less*⁸
	Number of outputs	8 (OUT1 to OUT8)
	Function	Enable by assigning the optional functions Assignable functions: Total judgement (OK/NG), Run, Busy, Position adjustment result, Judgement result of each tool, Result of the logical operation of each tool, Error, SD card error, Variety discrimination result, Master judgement result
Ethernet	Standard	1000BASE-T/100BASE-TX
	Connector	RJ-45 8pin connector
Network function		FTP client, SFTP client
Interface compatibility	Built-in Ethernet	EtherNet/IP™, PROFINET*⁹, TCP/IP non-procedure communication
	Communication unit*¹⁰	EtherCAT®, CC-Link, DeviceNet®, RS-232C, PROFIBUS
Expanded memory		SD card (SD/SDHC)*¹¹
Rating	Power voltage	24 VDC ±10% (including ripple)
	Consumption current	2.2 A or less (including a communication unit, without the AI Lighting unit, and including the output load) 3.4 A or less (including a communication unit, with the AI Lighting unit, and including the output load)
Environmental resistance	Ambient temperature	0 to +50°C (No freezing)*¹²
	Relative humidity	35 to 85%RH (No condensation)
Material		Main unit case: PC / I/O terminal block: PA / Ethernet connector: Copper alloy + Ni plating / Main unit rear DIN rail fixing tab: POM / Power connector: PA/POM / Sensor head connector: Zinc + Ni plating/PA / Main unit rear heat sink: Aluminium / Nameplate: PC
Weight		Approx. 300 g

*1 Colour type only. *2 Monochrome type only. *3 Tools can be installed by programs. This is the number of detection tools and position adjustment tools. Up to 64 detection tools can be set. The number of detection tools in Sorting mode are eight tools. *4 Saves to the sensor amplifier's internal memory. The images saved to the sensor amplifier can be backed up to a USB memory stick inserted into the control panel (IV3-CP50) or to the PC where the software for the IV3 Series (IV3-H1) is being used. *5 Learning tool only. *6 Can also be displayed on the control panel (IV3-CP50) or the software for the IV3 Series (IV3-H1). *7 Usable on the software for the IV3 Series (IV3-H1). *8 Make sure to keep a total of each output with 160 mA or less. *9 Conformance Class B, Applicable protocol: LLDP, SNMP. *10 When a communication unit (DL Series) is connected. *11 Use only products recommended by KEYENCE. *12 For situations where the operating ambient temperature will exceed 40°C, follow KEYENCE's specified heat dissipation measures to ensure the case temperature does not exceed the rated maximum temperature (65°C). Check the instruction manual for more information.

Compact model sensor head

Model		IV3-G500CA	IV3-G500MA	IV3-G600CA	IV3-G600MA
Type		Standard type		Wide view type	
Installed distance *¹		50 mm or more		50 mm or more	
Field of view (typical example)		Installed distance 50 mm: 22 (H) × 16 (V) mm Installed distance 3000 mm: 1184 (H) × 888 (V) mm		Installed distance 50 mm: 51 (H) × 38 (V) mm Installed distance 3000 mm: 2730 (H) × 2044 (V) mm	
Image receiving element		1/2.9 inch colour CMOS	1/2.9 inch monochrome CMOS	1/2.9 inch colour CMOS	1/2.9 inch monochrome CMOS
	Number of pixels	1280 (H) × 960 (V)			
Focus adjustment		Auto*²			
Exposure time		12 µs to 9 ms	12 µs to 9 ms*³	12 µs to 9 ms	12 µs to 9 ms*³
Light	Illumination	White LED	Infrared LED	White LED	Infrared LED
	Lighting method	Pulse /continuous lighting is switchable.	Pulse lighting	Pulse /continuous lighting is switchable.	Pulse lighting
Indicators		2 (the same display details for both indicators)			
Environmental resistance	Operating ambient temperature	0 to +50°C (No freezing)*⁴			
	Operating ambient humidity	35 to 85% RH (No condensation)			
	Vibration resistance *⁵	10 to 55 Hz; double amplitude 1.5 mm; 2 hours in each of the X, Y, and Z directions			
	Shock resistance *⁵	500 m/s², 3 times in each of the 6 directions			
	Enclosure rating *⁶	IP67			
Material		Main unit case: Zinc die-casting, Front cover: Acrylic, Operation indicator cover: TPU			
Weight		Approx. 75 g (without the AI Lighting unit) Approx. 225 g (with the AI Lighting unit)			

*1 Removing the polarising filter is recommended when used at distances of 3 m or more. *2 The focus position can be automatically adjusted at the time of installation. This function is deactivated during operation. A different focus position can be registered for each program. *3 When the AI Lighting unit is mounted, the maximum exposure time is 6.25 ms. *4 For situations where the operating ambient temperature will exceed 40°C, follow KEYENCE's specified heat dissipation measures to ensure the case temperature does not exceed the rated maximum temperature (65°C). Check the instruction manual for more information. *5 Except when the dome attachment (IV2-GD05/IV2-GD10) is mounted. *6 Except when the polarising filter (OP-88642/OP-88643/OP-88646/OP-88647) is mounted.

AI imaging illumination unit

Model		IV3-L5C	IV3-L5M	IV3-L6C	IV3-L6M	IV3-LG5C	IV3-LG5M	IV3-LG6C	IV3-LG6M
Compatible sensor		IV3-500CA	IV3-500MA	IV3-600CA	IV3-600MA	IV3-G500CA	IV3-G500MA	IV3-G600CA	IV3-G600MA
Light	Light source	White LED	Infrared LED	White LED	Infrared LED	White LED	Infrared LED	White LED	Infrared LED
Power supply		Power is supplied by the connected sensor							
Environmental resistance	Ambient temperature	0 to +50°C (No freezing)							
	Relative humidity	35 to 85%RH (No condensation)							
	Enclosure rating	IP67*¹							
Material		Case: Aluminium die-casting Front cover: Acrylic				Unit case: Aluminium die-casting/PBT Sensor head connector: Zinc + Ni plating/PA Front cover: Acrylic Cable: PVC, Ni plating, TPEE			
Weight		Approx. 195 g				Approx. 150 g			

*1 Applicable only when mounted to a compatible sensor. Except when the polarising filter (OP-88644/OP-88645/OP-88646/OP-88647) is mounted.

Dimensions (Unit: mm)

Smart camera

Sensor
**IV3-500CA/
IV3-500MA/
IV3-600CA/
IV3-600MA**

4 × M2.5 (Depth: 3.4 mm)
4 × M3 (Depth: 3.3 mm)

5.5 58.5
59.6 40 38.5
14.2 40
(165) (177)

111.9
45.3
ø47

16 15 10
45.3

91

With rotating connector rotated 90 degrees

With AI imaging illumination unit for smart camera attached

100 45.3
42.5 127.4

(107.9)
81.5
27
59.6 29.8 30
Centre of received light
2 × M4 (Depth: 4.1 mm)
(119.9)
Min. 56.5
Min. 56.5

2-axis adjustment mounting bracket **OP-88635**

R2.25
(R45.8) 91.6
25° 29.5
R10 ø3.4

(76.4)
61.6
40
56 40 10
(56) 22.8
23.5 (108.6) 40

12.5 29.5 R10
78
Movable range (39)

Adjustable bracket **OP-88913**

ø12.0
R13
R3.25
240°

30
9
70
12 40
8.5
60.8 57 40
R1.7 114

28.5 30
20 28 43

Movable range (204°)

Control panel **IV3-CP50**

160.1
117 (Effective display area)
(16.4)
125
88.2 (Effective display area)
(52)
(110)
R20 R50
30.1 (Excluding protrusions)

Wiring colour

Wiring colour	Pin No.	Name	Assigning default value	Description
Brown	1	DC24	-	+ side of power
Blue	2	0V	-	- side of power
Pink	6	IN1	Ext. Trigger ↑	Set external trigger. Rising timing (↑) or falling timing (↓) can be set.
Yellow	4	IN2	OFF	Input assignable function • Program bit0 to bit6 • Clear Error • Ext. Master Save • SD Card Save Stop • OFF (not used)
Light blue	5	IN3	OFF	
Black	9	OUT1	Total Status OK	Output assignable function • Total Status OK • Total Status NG • RUN • BUSY • Error • SD card error • Position adjustment • Status result of each tool (Tool 01 to 64) • Logical operation result of each tool (Logic 1 to 4) • Type discrimination result (Type 0 to Type 7) • Master judgement result (Master 00 to Master 07) • OFF (not used)
White	10	OUT2	BUSY	
Grey	11	OUT3	Error	
Purple	3	I/O1*	OFF	
Green	7	I/O2*	OFF	
Red	8	I/O3*	OFF	
Orange	12	OUTCOM	-	Output Common

* The I/O1 to I/O3 can be used by individually selecting IN/OUT.

Cable specification
• Brown / Blue: AWG22
• Black / White / Grey / Orange: AWG25
• Pink / Yellow / Light blue / Purple / Green / Red: AWG28 (without shield)

Connection diagram

Selecting NPN output
When NPN is selected as the Polarity

Sensor External device
24 V power supply (24 VDC)
Load
OUT
OUT COM 24 VDC
IN
0 V of power (NPN)

OUT COM is a common terminal for OUT.
Be sure to connect it to 0 V of the power supply.

Selecting PNP output
When PNP is selected as the Polarity

Sensor External device
24 V power supply (24 VDC)
(PNP)
IN
OUT COM 24 VDC
OUT
Load
0 V of power

OUT COM is a common terminal for OUT.
Be sure to connect it to 24 V of the power supply.

Sensor head
IV3-G500CA/IV3-G500MA/IV3-G600CA/IV3-G600MA

Indicator 30.9 3.1 2 × M4 screw depth: 3.5 24 2 × M4 screw depth: 3.5 12 2 × ø3.2 mounting through-hole Indicator
51.9 38.1 3.1 44.3 18.4 (44.3) 46.4 (104.8)
Centre of received light ø12 18 38.4 ±1.2 24
(30.9) ø4.8 24 Min. 20
29.7 35.7 44.3 (30.9)
34.7 38.4±1.2 Min. 20 IV sensor head to amplifier cable (2 m/5 m/10 m)
(93.1)

With AI imaging illumination unit for compact models attached
31.8 83.6 70.3

Sensor amplifier **IV3-G120**
46 96 94.7 95

Vertical mounting bracket **OP-87908**
21 53 A5052 t = 3.0
R2.2 38.1 R2.2 30° ø20
32.5 5 10° R2.2
4° t2.5

Rear mounting bracket **OP-87909**
R38.1 R2.2 12 12° A5052 t = 3.0
38.1 R2.2
35 10° 40
9 10° R2.2 21
48.1

Adjustable bracket **OP-87910**
36.9 19.5 48.1 ø4.4 38.1 4.5
ø27 5
ø12 3.3 32 12
4.4 ø4.4 35 A5052 t = 3.0

Common mounting bracket
OP-88634 (can also be used for smart camera)
When used with AI imaging illumination unit
6
9.5 R2.25 ø3.4 ø3.4 5.5
30 17.5 ø4.5 22.5 45.5
17.5 9.5
R2.25 7.9 49 63 85 97

2-axis adjustment mounting bracket
OP-88638
R2.25 108.3 33.5 (R45.8) 25° R10
(93.1) ø3.4 33.5 16.5 R10
78.3 49
41 23 8.5 49 41 17.5 Movable range (20.4°)
Movable range (39) 78
23.5 (125.3) 40

Adjustable bracket **OP-88639**
ø12 85 76 30 9
R13.1 10.5 49 30
R3.25 240° 42 23 12 21 30
R1.7 11.4 20 7.5
28 43

Connector pin configuration figure

Terminal No.	Name	Assigning default value	Description
1	IN1	Ext. Trigger ↑	Set external trigger. Rising timing (↑) or falling timing (↓) can be set.
2	IN2	OFF	Input assignable function • Program bit0 to bit6 • Clear Error • Ext. Master Save • SD Card Save Stop • OFF (not used)
3	IN3	OFF	
4	IN4	OFF	
5	IN5	OFF	
6	IN6	OFF	
7	IN7	OFF	
8	IN8	OFF	
9	Unused	Unused	Unused
10	OUT1	Total Status OK (N.O.)	Output assignable function • Total Status OK • Total Status NG • RUN • BUSY • Error • SD card error • Position adjustment • Status result of each tool (Tool 1 to 64) • Logical operation result of each tool (Logic 1 to 4) • Type discrimination result (Type0 to Type7) • Master judgement result (Master 00 to Master 07) • OFF (not used)
11	OUT2	BUSY (N.O.)	
12	OUT3	Error (N.C.)	
13	OUT4	OFF	
14	OUT5	OFF	
15	OUT6	OFF	
16	OUT7	OFF	
17	OUT8	OFF	
18	OUT COM	OUT COM	Output Common

Compatible cable specification: AWG16 to 26

Connection diagram

Selecting NPN output
When NPN is selected as the Polarity

Sensor External device
24 V power supply (24 VDC) Load
OUT
OUT COM 24 VDC
IN (NPN)
0 V of power
FG

OUT COM is a common terminal for OUT.
Be sure to connect it to 0 V of the power supply.

Selecting PNP output
When PNP is selected as the Polarity

Sensor External device
24 V power supply (24 VDC)
IN (PNP)
OUT COM 24 VDC
OUT
Load
0 V of power
FG

OUT COM is a common terminal for OUT.
Be sure to connect it to 24 V of the power supply.

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Component list

Smart camera

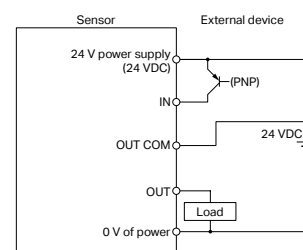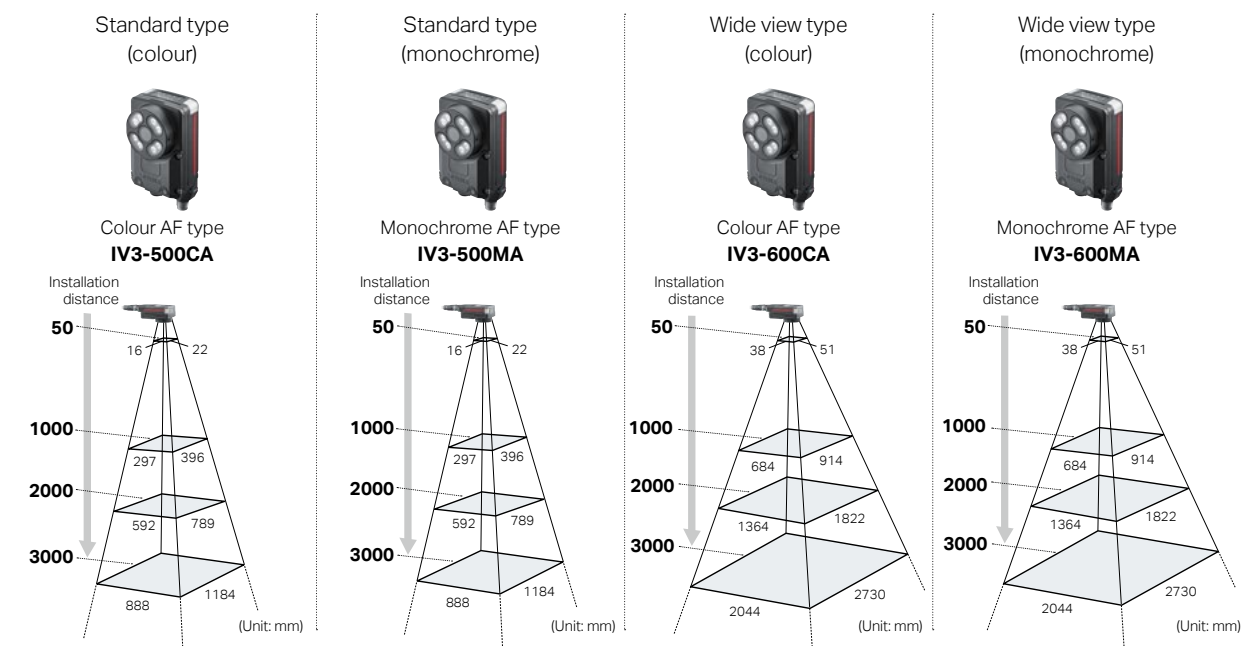| Standard type (colour)	Standard type (monochrome)	Wide view type (colour)	Wide view type (monochrome)
Colour AF type **IV3-500CA**	Monochrome AF type **IV3-500MA**	Colour AF type **IV3-600CA**	Monochrome AF type **IV3-600MA**

IV3-500CA Installation distance
50 — 16 / 22
1000 — 297 / 396
2000 — 592 / 789
3000 — 888 / 1184
(Unit: mm)

IV3-500MA Installation distance
50 — 16 / 22
1000 — 297 / 396
2000 — 592 / 789
3000 — 888 / 1184
(Unit: mm)

IV3-600CA Installation distance
50 — 38 / 51
1000 — 684 / 914
2000 — 1364 / 1822
3000 — 2044 / 2730
(Unit: mm)

IV3-600MA Installation distance
50 — 38 / 51
1000 — 684 / 914
2000 — 1364 / 1822
3000 — 2044 / 2730
(Unit: mm)

* The field of view and optical axis have individual differences.

Smart camera

Micro SD, 8 GB **IV3-MSD8G**

IV3 software **IV3-H1**

12-pin power supply cable
OP-88654 (2 m)
OP-88655 (5 m)
OP-88656 (10 m)

Conversion connector
M12 A-coded 4-pin **OP-88631**
M12 L-coded 5-pin **OP-88632**

24 V

I/O

M12/M12 Ethernet cable
OP-88651 (2 m)
OP-88652 (5 m)
OP-88653 (10 m)

Panel/monitor power cable (M8 4-pin/Strand wire)
OP-87443 (2 m)
OP-87444 (5 m)
OP-87445 (10 m)

Control panel **IV3-CP50**

* When connecting to a PC, the IV3-H1 software and a LAN cable are also required.

Ethernet cable (M12 X-coded 8-pin) NFPA79-compatible
Ethernet M12-RJ45 OP-88664 (2 m)
OP-88665 (5 m)
OP-88666 (10 m)

Conversion connector M12 D-coded 4-pin **OP-88633**

24 V

Attachment

AI imaging illumination unit for smart camera

Illumination model	Head model	Type
IV3-L5C	**IV3-500CA**	Standard (colour)
IV3-L6C	**IV3-600CA**	Wide field of view (colour)
IV3-L5M	**IV3-500MA**	Standard (monochrome)
IV3-L6M	**IV3-600MA**	Wide field of view (monochrome)

Polarising filter
OP-88640 (Colour)
OP-88641 (Monochrome)

Polarising filter for AI imaging illumination unit
OP-88644 (Colour)
OP-88645 (Monochrome)

IV3 dome attachment **IV3-D10**

Mounting bracket

Common mounting bracket **OP-88634**

2-axis adjustment mounting bracket **OP-88635**

Adjustable bracket **OP-88913**

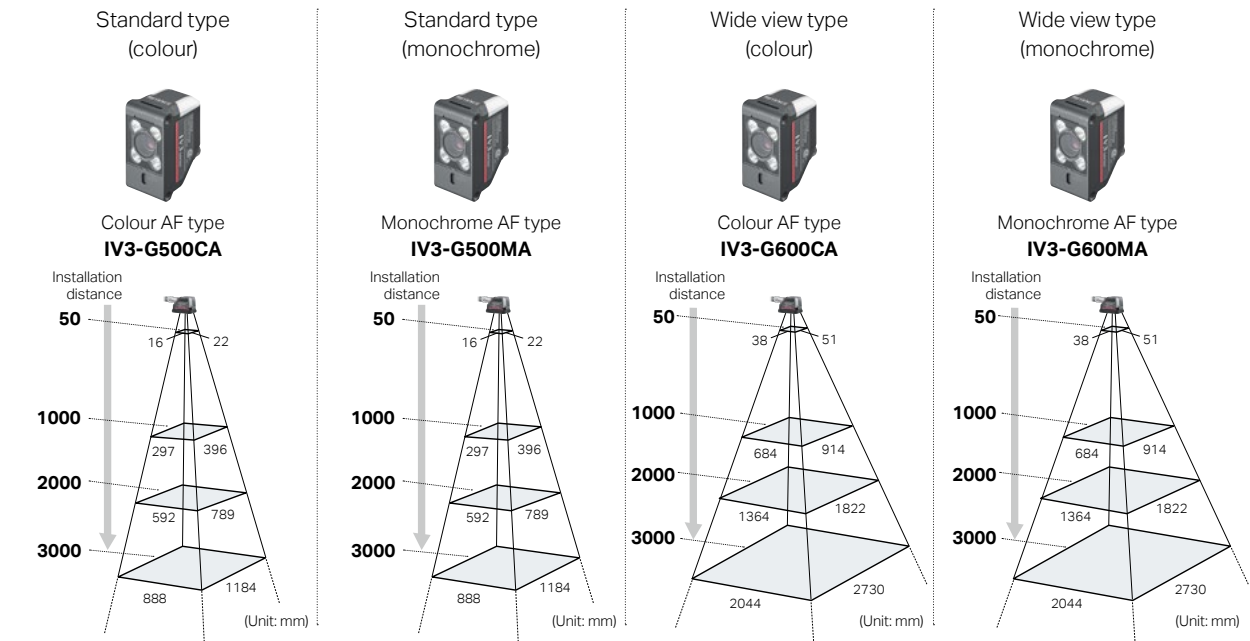### Optional panel accessories

Wall mounting adapter **OP-88349** (Included with IV3-CP50)
Control panel mounting adapter **OP-88350**
Touch panel protective sheet **OP-88351**
Stylus **OP-88352** (Included with IV3-CP50)
USB memory device, 1 GB **OP-87502**

Compact model			

Standard type (colour)

Colour AF type
IV3-G500CA

Installation distance
50
16　22
1000
297　396
2000
592　789
3000
888　1184
(Unit: mm)

Standard type (monochrome)

Monochrome AF type
IV3-G500MA

Installation distance
50
16　22
1000
297　396
2000
592　789
3000
888　1184
(Unit: mm)

Wide view type (colour)

Colour AF type
IV3-G600CA

Installation distance
50
38　51
1000
684　914
2000
1364　1822
3000
2044　2730
(Unit: mm)

Wide view type (monochrome)

Monochrome AF type
IV3-G600MA

Installation distance
50
38　51
1000
684　914
2000
1364　1822
3000
2044　2730
(Unit: mm)

* The field of view and optical axis have individual differences.

Compact model sensor head

I/O

IV3 sensor head to amplifier cable
OP-88648 (2 m)
OP-88649 (5 m)
OP-88650 (10 m)

High-flex robotic cable
OP-88962 (2 m)
OP-88963 (5 m)
OP-88964 (10 m)

Sensor amplifier
IV3-G120

SD card,
16 GB
CA-SD16G

4 GB
KV-M4G

Ethernet cable (M12 4-pin/RJ45)
NFPA79-compatible
Straight cable
OP-87907 (1 m)
OP-87457 (2 m)
OP-87458 (5 m)
OP-87459 (10 m)

L-shaped
OP-88042 (1 m)
OP-88043 (2 m)
OP-88044 (5 m)
OP-88045 (10 m)

Panel/monitor power cable
(M8 4-pin/Strand wire)
OP-87443 (2 m)
OP-87444 (5 m)
OP-87445 (10 m)

Control panel
IV3-CP50

* When connecting to a PC, the IV3-H1 software and a LAN cable are also required.

LAN cable (RJ45/RJ45)
OP-87950 (1 m)
OP-87951 (3 m)
OP-87952 (5 m)
OP-87953 (10 m)

IV3 software
IV3-H1

Communication network devices

DeviceNet® **DL-DN1**
DeviceNet

CC-Link **DL-CL1**
CC-Link V2

EtherCAT® **DL-EC1A**
EtherCAT

RS-232C **DL-RS1A**
RS-232C

PROFIBUS **DL-PD1**
PROFIBUS

Attachment

AI imaging illumination unit for compact models

Illumination model	Head model	Type
IV3-LG5C	IV3-G500CA	Standard (colour)
IV3-LG6C	IV3-G600CA	Wide field of view (colour)
IV3-LG5M	IV3-G500MA	Standard (monochrome)
IV3-LG6M	IV3-G600MA	Wide field of view (monochrome)

Dome attachment (large)
IV2-GD10

Dome attachment (small)
IV2-GD05

Polarising filter
OP-88642 (colour)
OP-88643 (monochrome)

Polarising filter for AI imaging illumination unit
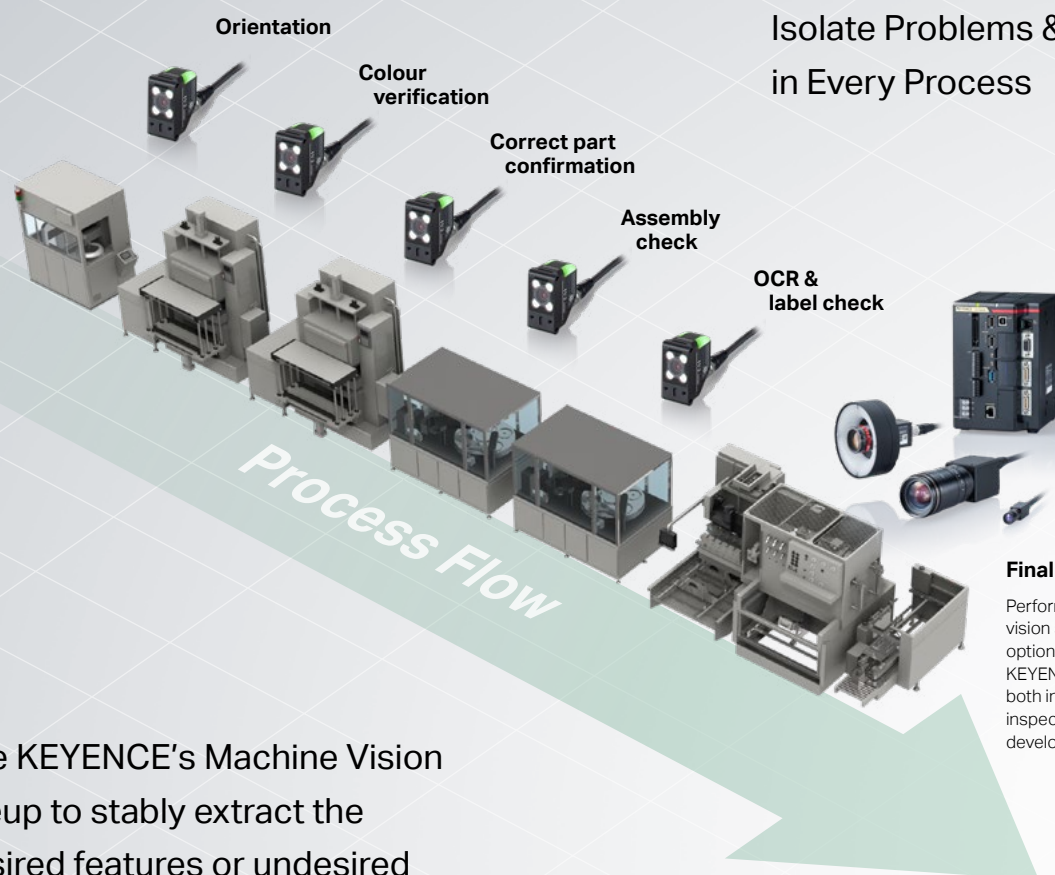**OP-88646** (colour)
OP-88647 (monochrome)

Mounting bracket (head only)

IV3 vertical mounting bracket
OP-87908

IV3 rear mounting bracket
OP-87909

IV3 adjustable bracket
OP-87910

Mounting bracket (when illumination unit is used)

2-axis adjustment mounting bracket
OP-88638

Adjustable bracket
OP-88639

Common mounting bracket
OP-88634

Use "Sensor-Like" **IV3** Series to Isolate Problems & Improve Yield in Every Process

Orientation

Colour verification

Correct part confirmation

Assembly check

OCR & label check

Process Flow

Final inspection

Perform final inspection with KEYENCE vision systems. Featuring resolution options ranging from VGA to 64MP, KEYENCE machine vision employs both industry standard camera inspections as well as KEYENCE developed techniques.

Use KEYENCE's Machine Vision lineup to stably extract the desired features or undesired flaws during final inspection or other critical processes.

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