KEYENCE

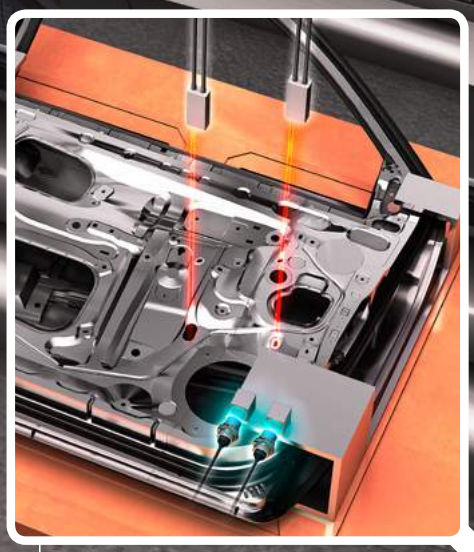
NEW Vision Sensor
IV Series

1 Minute SETUP

AUTO FOCUS

VISION SENSOR

Intelligent sensor
I-SERIES



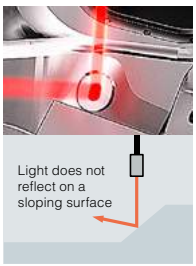
Example of Conventional Presence Detection

Easy, stable detection with a single vision sensor unit

BENEFITS OF USING A VISION SENSOR FOR PRESENCE DETECTION

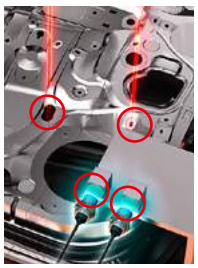
Can be used with difficult to detect workpieces.

The vision sensor enables detection in environments such as sloping surfaces where light does not reflect well, which were previously unstable with a photoelectric sensor.



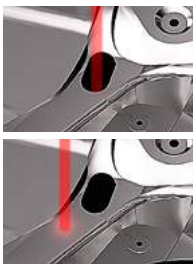
A single unit can be used for multiple parts presence inspections.

Up to 16 tools can be utilised for each captured image.



Sensor can also detect regardless of part position variations

With the position adjustment function, detection is performed simply by placing the detection object within the imaging area.



Detection is not possible when the position is misaligned.

Vision Sensor

FOR PRESENCE DETECTION

New ideas for handling difficult detection

Conventionally difficult cases that require multiple sensors can now be handled easily and at low cost with one “IV Series vision sensor”. Our unbeatable vision and presence sensor experience enables KEYENCE to introduce a new style of presence detection.

EASY-TO-USE

1 Minute SETUP

Startup is completed in around 1 minute thanks to “Easy Navigation”.

STABLE DETECTION

OUTSTANDING IMAGING CAPABILITY

Clear images are realised with the high-intensity illumination and high-performance lenses, equipped as standard.

AFFORDABLY PRICED

REDUCE INTRODUCTION COSTS

Choose from 8 different sensor heads to suit your needs and reduce costs.

Intelligent sensor I-SERIES

Simply easy
1 Minute SETUP

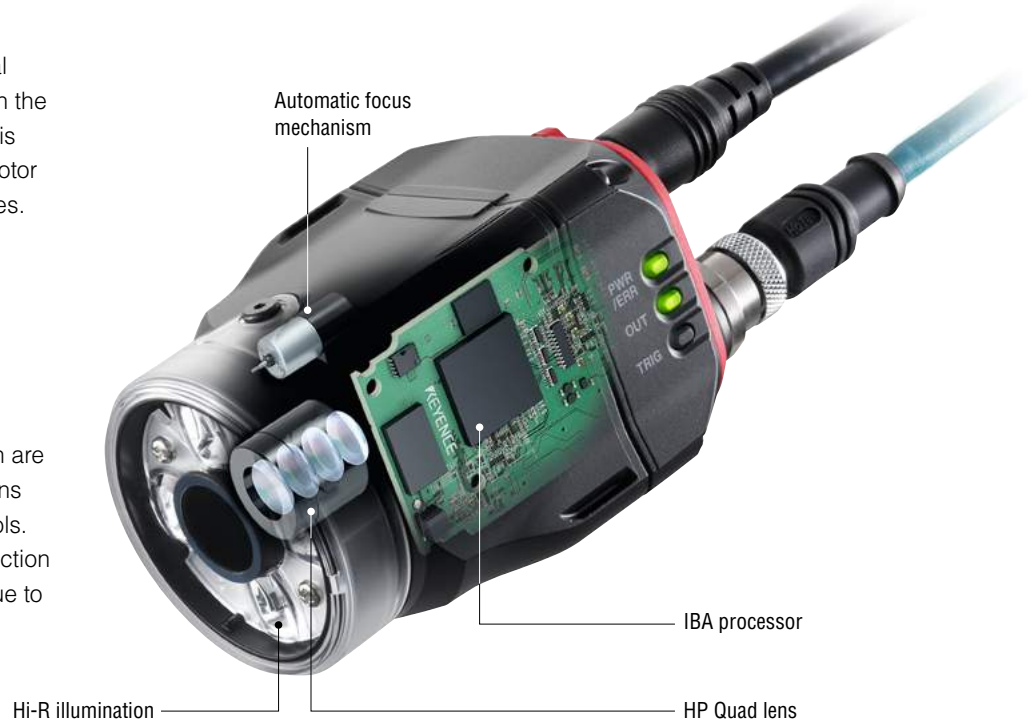
AUTO FOCUS & BRIGHTNESS

Automatic focus

Focusing, which used to be a manual process, is now done automatically in the IV Series. One-touch quick focusing is done by a unique automatic focus motor developed exclusively for the IV Series.

Automated, one-touch brightness adjustment

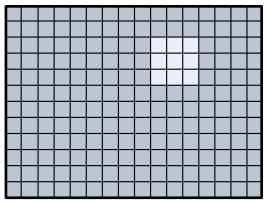
Gain, exposure time, and illumination are adjusted automatically, and operations are completed with one-touch controls. As anyone can now shoot clear detection images, there are fewer variations due to differing imaging skills.



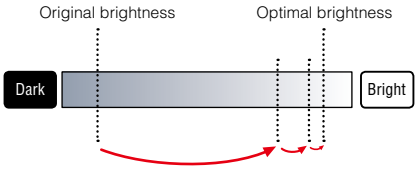
AUTOMATIC BRIGHTNESS ADJUSTMENT

IBA - INTELLIGENT BRIGHTNESS ADJUST -

With the newly developed algorithm installed in the IBA processor, the brightness is automatically adjusted to the optimum level in an instant. Additionally, our unique methods enable high-speed automatic adjustment without any adverse effects from the background.



By dividing the screen into multiple pixel blocks, presence/absence of the workpiece is recognised where the brightness has changed.



Instead of gradually moving towards the optimum brightness, adjustments can be made faster by making one large adjustment close to the optimum brightness and then performing fine adjustments.

SIMPLE ONE-TOUCH SETUP

Easy navigation

Simply follow the setup flow from “single touch imaging” to output setup. The intuitive touch screen operation allows startup to be completed in about one minute, without the need for referring to manuals.

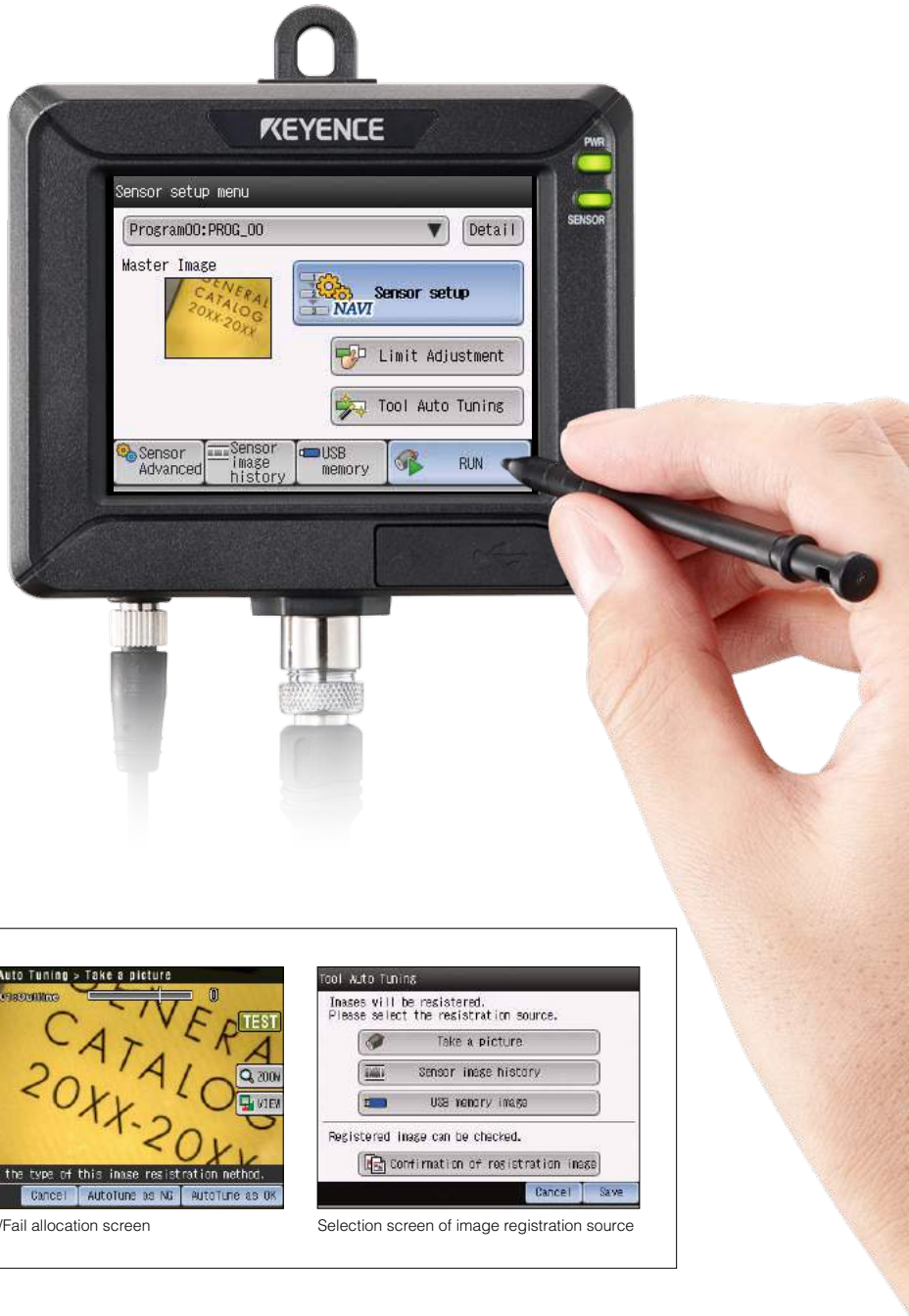
Single touch imaging

↓

Tool setup

↓

Output setup



TOOL AUTO TUNE

Multiple master and defective object images can be taken with Pass/Fail judgment attached to enable automatic adjustment of thresholds and parameters to optimum values. Images can be shot immediately, read from the image history or read from USB memory.

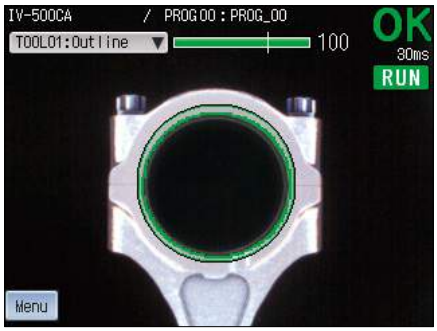
Pass/Fail allocation screen

Selection screen of image registration source

Stable Detection

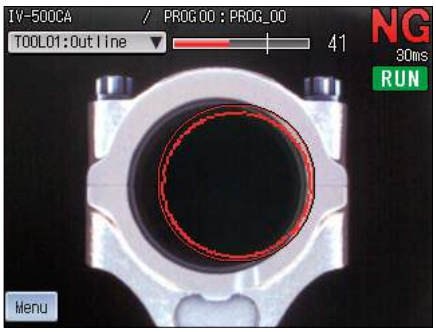
Newly developed pattern tool for stable detection

Shape Detection



PASS

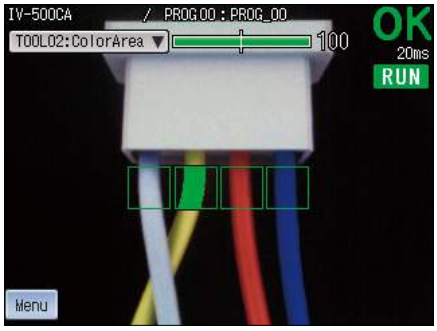
Model type detection by internal diameter difference of metal part



FAIL

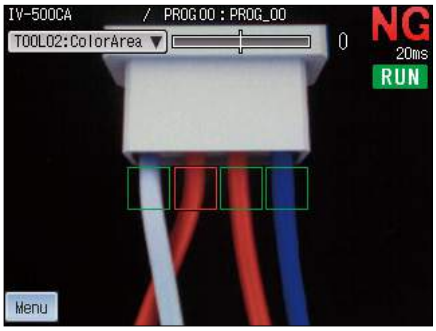
The match percentage of the object is calculated based on the registered master shape information. Brightness differences or differences in individual surface conditions, which were previously difficult to handle with normalised correlation methods (pattern matching) can be identified.

Area



PASS

Detection by cable colour difference



FAIL

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

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 judgment. In addition, 180° high-speed tracking is supported for rotation tracking. This means you don't need to worry about misalignment of the workpieces.

PASS

Detection of sticker presence/absence by using position adjustment

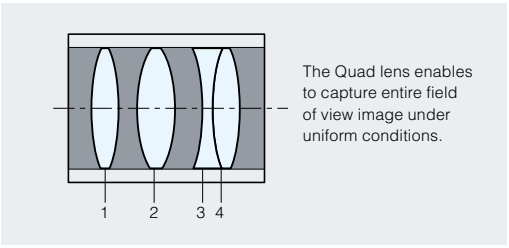
FAIL

Technology for stable detection

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.

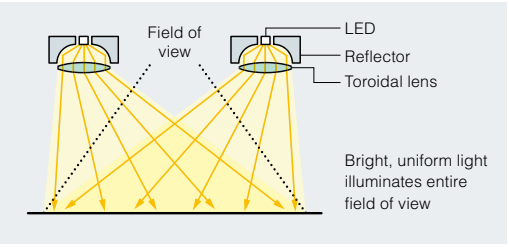
*High Precision-Quad



Hi-R* illumination

Our pursuit of an even more efficient reflector shape with less LED light intensity loss has enabled the realisation of outstanding brightness and uniformity.

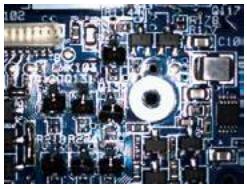
*High Reflection

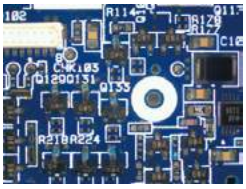


HS-HDR* FUNCTION

Detection is stabilised by widening the light-receiving sensitivity range when dispersion occurs in the reflection. High speeds are realised by adjusting within a single image capturing.

*High Speed HDR


HS-HDR function OFF


HS-HDR function ON

POLARISED FILTER

Glare from glossy work 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
[USING OP-87436]

DOME LIGHT [USING IV-D10]

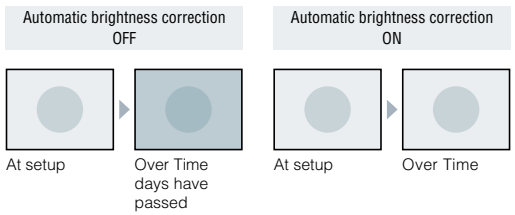
Effective in reducing glare. Generating indirect light from various directions ensures the object is uniformly illuminated. This method is generally more effective than a polarisation filter at reducing glare.


Without dome attachment


With dome attachment

AUTOMATIC BRIGHTNESS CORRECTION

When the illumination has deteriorated over time, image brightness is corrected automatically so that it does not become darker. When a brightness standard is set with a master image at installation, screen brightness can be maintained.



Enhanced Utilities

Versatile use, reasonable price

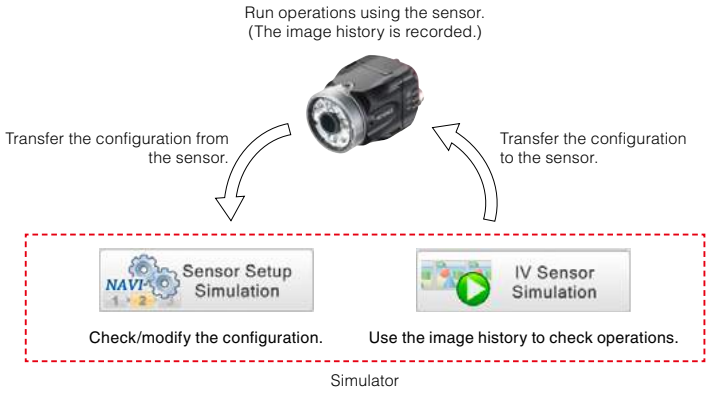
Software for IV Series, **IV-H1**

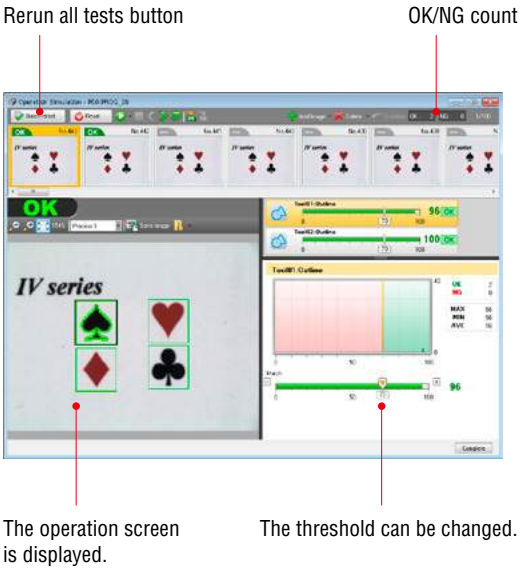
IV-Navigator

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

Simulation Function NEW

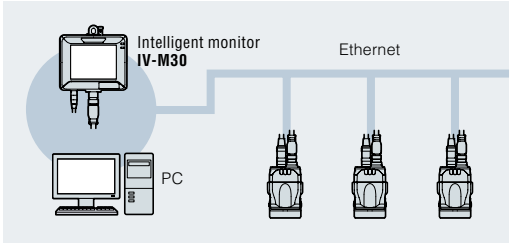
This function allows you to check and modify the program configurations and perform operation simulations based on the image history, without connecting the sensor.
This enables easy computation of the optimal thresholds while looking at the detection result statistics and histogram, even when you are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





Remote Operation

The IV Series can be setup and monitored via Ethernet. Naturally, remote setup procedures are just as easy as normal operations.
(Can be performed on a PC or an IV-M30 intelligent monitor.)



Useful functions that suit the operating environment

Excellent Interface Support

The IV Series is equipped with EtherNet/IP and PROFINET communication functions, which are most commonly requested by global companies with offices around the world. PLC compatibility makes for a stress-free introduction of the IV Series into your PLC-based systems. You only need one Ethernet cable to connect, which prevents erroneous wiring and reduces time spent on wiring.

Logic Function

Output conditions can be specified with results from multiple tools, involving AND, OR, and inversion. The output can be changed according to the usage situation. For example, you might use the OK output to check for products, while the NG output could be used when eliminating defective products.
The sensors themselves offer a versatile set-up, which allows for easy installation in existing systems with or without PLCs.

FTP Client Function

Images detected by sensors are automatically transferred to the FTP server using the FTP client function. The IV Series also meets the requirements resulting from increased demand for traceability. You can save all images or send only NG images to analyse failed products.

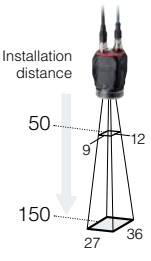
Our Sensor Lineup to Suit Your Needs

SENSOR LINEUP

Close range sensor model

Monochrome AF type
IV-150MA

Monochrome MF type
IV-150M



(unit: mm)

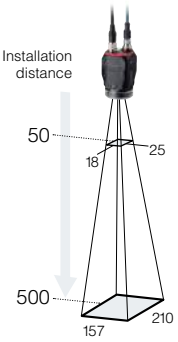
Standard sensor model

Colour AF type
IV-500CA

Colour MF type
IV-500C

Monochrome AF type
IV-500MA

Monochrome MF type
IV-500M

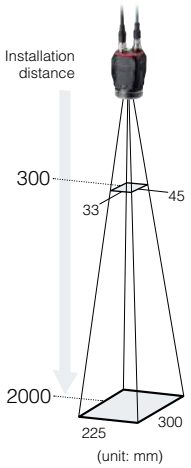


(unit: mm)

Long range sensor model

Monochrome AF type
IV-2000MA

Monochrome MF type
IV-2000M



(unit: mm)

AF…Automatic focus model
MF…Manual focus model

* View and optical axis has individual differences.
*The field of vision is halved when the digital zoom function (monochrome type only) is used.

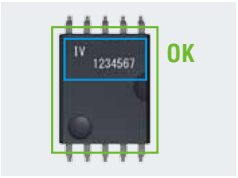
Environmental Resistance IP67
(sensor)

Complies with the IP67 enclosure rating, which is based on IEC/JIS standards. Can be used safely in a dusty or wet environment.

Drop impact resistance 1.3 m
(intelligent monitor)

The IV-M30 has a tough construction that can resist impacts. It clears the 1.3 m drop test performed under standard usage conditions (KEYENCE standard).

Presence detection and direction detection for electrical components

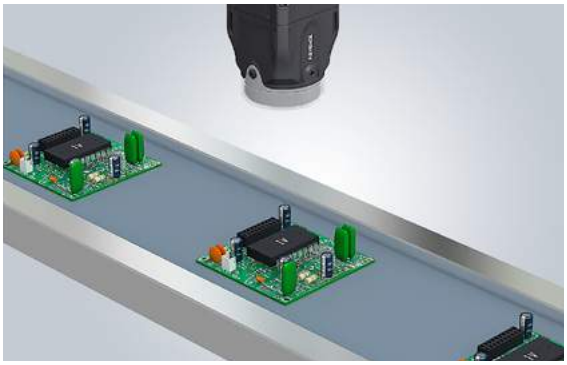


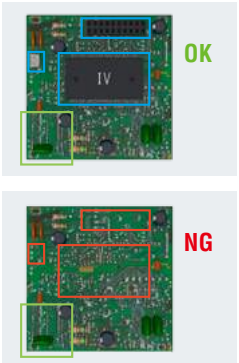
Detects the direction of the IC in carrier tape

Using the position adjustment tool, stable detection can be achieved even when work has moved in the carrier tape. High speed adjustment enables detection without slowing down the processing time of the unit.

Area | Position adjustment

PC board mounting check



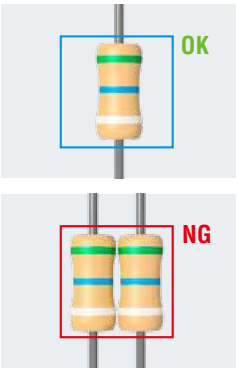


Checks the presence of mounting parts on the PCB

Many parts can be checked as up to 16 tools can be arranged. Furthermore, up to 32 programs can be set, supporting multiple product lines.

Area | Position adjustment | HS-HDR | 16 tools

Overlapping electronic component detection

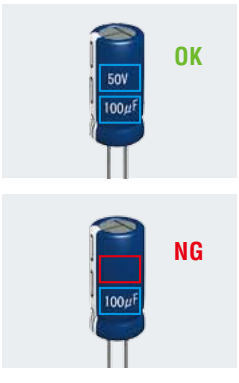


Detects overlapping (resistance) electronic components

Colour variation and unevenness can be detected with a colour camera. Both presence and overlap can be detected as area detection can be set with upper and lower thresholds.

Area

Capacitor print presence

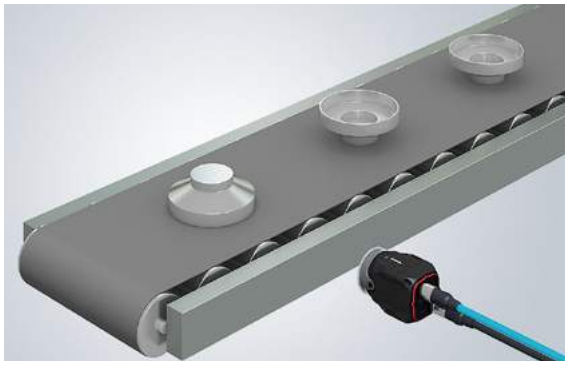


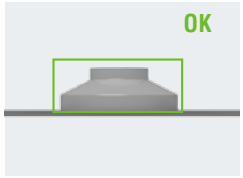
Detects print presence on a capacitor

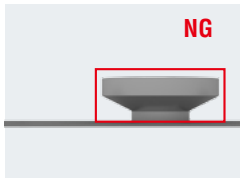
Fine characters, which are conventionally difficult to stably detect with a dot scanning sensor can be detected stably using the scanning area.

Area

Detection of part orientation





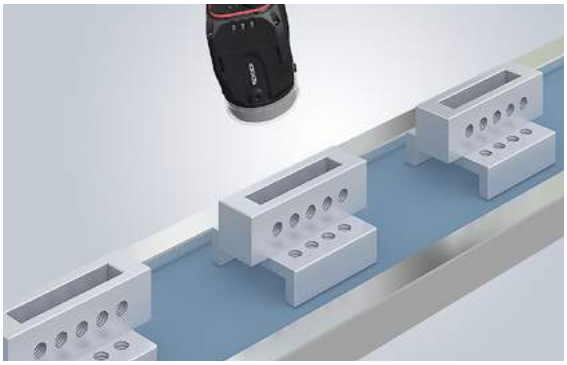


The direction of parts is detected to prevent incorrect assembly in later processes

As shape inspection is able to search for patterns within the entire screen, stable detection is possible even if a minor misalignment has occurred during conveyance.

Shape detection | HS-HDR

Shaving presence detection

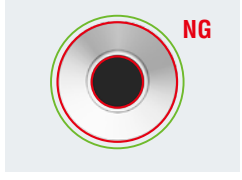


Detects whether a processed metal part contains threads

The polarisation filter and HS-HDR function enable stable detection, even for metal work with non-uniform reflection.

Thread detection | HS-HDR

Grease application check

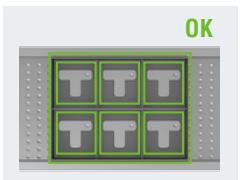


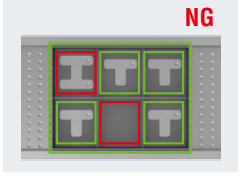
Checks the presence of grease on metallic parts

Stable detection can be achieved by reducing glare, which tends to occur frequently in grease detection, using the HS-HDR.

Area | Position adjustment | HS-HDR

Proper part confirmation





Detects the presence and type of parts on a tray

As up to 16 tools can be arranged, settings can be programmed for each pocket to enable stable detection.

Shape detection | Position adjustment | HS-HDR | 16 tools

Label presence and misalignment detection

Detects the presence and misalignment of bottle labels

By using in combination with a position adjustment tool, misalignment can be detected using items such as the bottle cap as a reference position.

Shape detection | Position adjustment

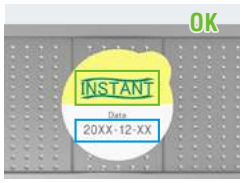
Hot-melt presence

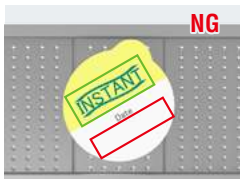
Detects the presence of hot-melt on medicine box flaps

By using area measurement instead of point measurement, it is possible to achieve stable detection on uneven surfaces.

Area

Print presence



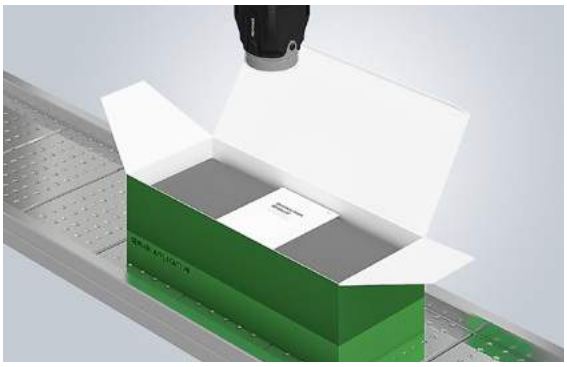


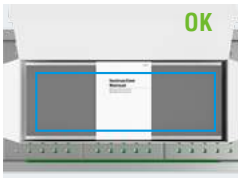
Detects the presence of printing

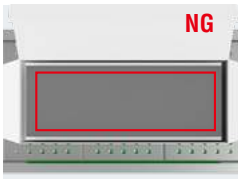
The 360° rotary position compensation function enables stable detection, regardless of cup orientation.

Area | Position adjustment

Package insert presence





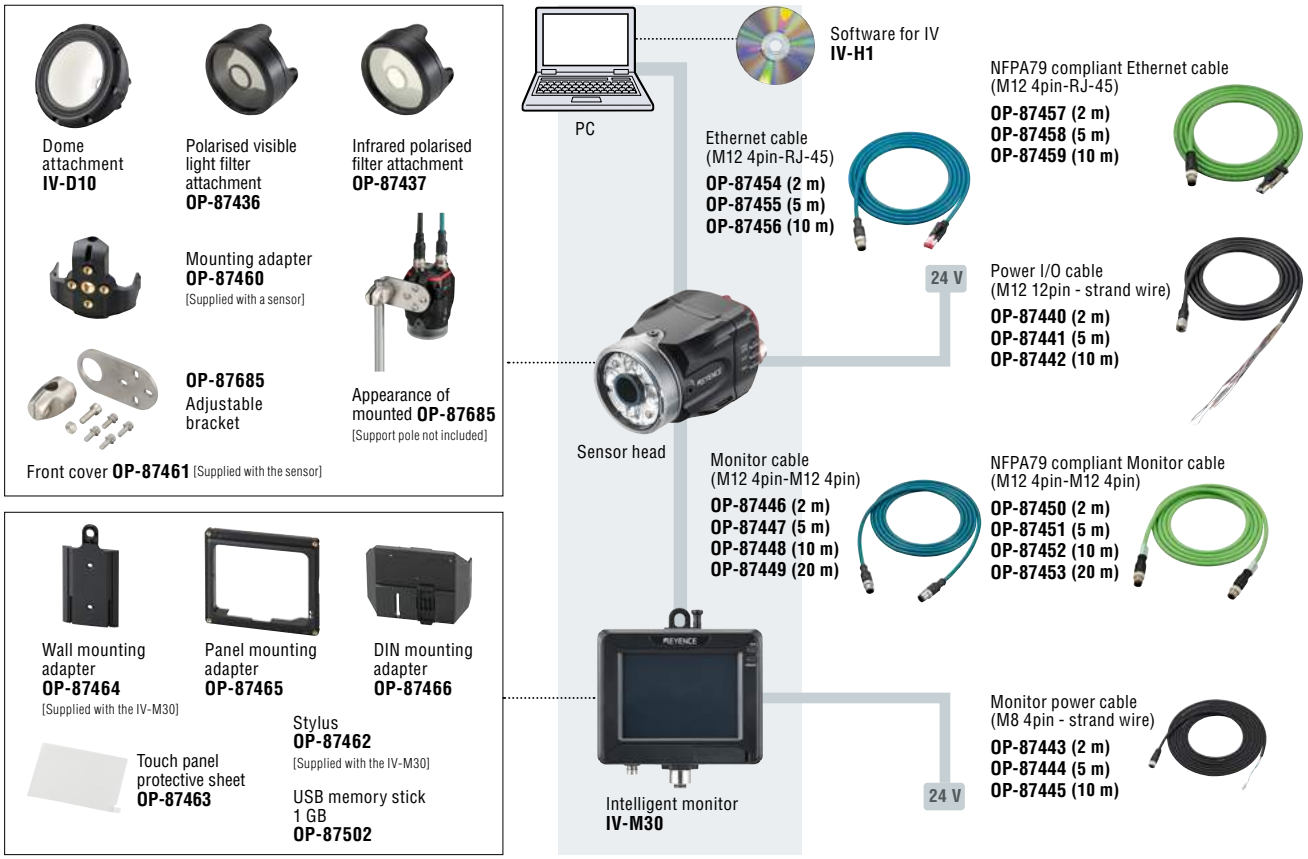


Detects the presence of an insert enclosed within packaging

Because the area can be set flexibly, stable detection is achieved even if the insert position varies due to packaging conditions.

Area

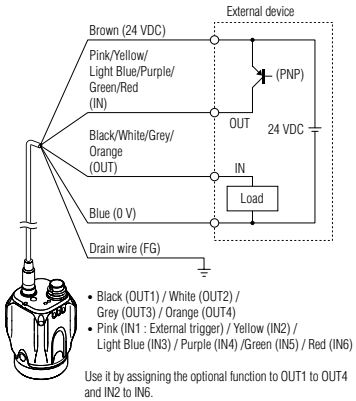
SYSTEM CONFIGURATION



WIRING/CIRCUIT DIAGRAM

SELECTING PNP OUTPUT

When PNP is selected in I/O format



Use it by assigning the optional function to OUT1 to OUT4 and IN2 to IN6.

Wiring colour	Name	Assigning default value	Description
Brown	24 VDC	-	+ side of power
Blue	0 V	-	- side of power GND of input-output cable
Black	OUT1	Total judge (N.O.)	Output assignable function • Total judge • Total judge NG • RUN • BUSY • Error • Pos. Adj. • Judge result of each tool (Tool 1 to Tool 16) • Result of the logical operation of each tool (Logic 1 to Logic 4) • OFF (not used)
White	OUT2	BUSY (N.O.)	
Grey	OUT3	Error (N.C.)	
Orange	OUT4	OFF	
Pink	IN1	External trigger ↑	Set external trigger. Activation timing (↑) or deactivation timing (↓) can be set.

Wiring colour	Name	Assigning default value	Description
Yellow	IN2	OFF	Input assignable function • Program bit0 to bit4 • Clear error • External master • OFF (not used)
Light Blue	IN3	OFF	
Purple	IN4	OFF	
Green	IN5	OFF	
Red	IN6	OFF	
Drain	FG	-	Insulated frame

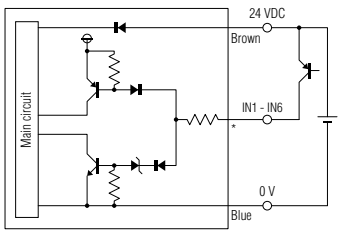
Cable specification
- Brown/Blue/Black/White/Grey/Orange: AWG25
- Pink/Yellow/Light Blue/Purple/Green/Red: AWG28
- With braided shield cable (with drain cable)

INPUT CIRCUIT

Voltage input (When PNP output is selected)

When PNP is selected in I/O format, the circuit becomes voltage input circuit.

- Input maximum rating : 26.4 V
- ON voltage : 15 V or higher
- ON current : 2 mA (for 24V)
- OFF current : 0.2 mA or lower



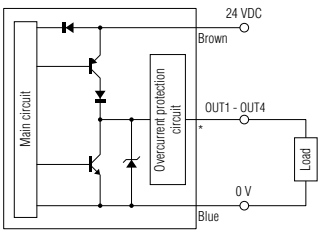
*Pink (IN1 : External trigger) / Yellow (IN2) / Light Blue (IN3) / Purple (IN4) / Green (IN5) / Red (IN6)
Use by assigning the optional functions to IN2 to 6

OUTPUT CIRCUIT

When PNP output is selected

When PNP is selected in I/O format, the circuit becomes open collector PNP output circuit.

- Maximum rating : 26.4 V, 50 mA
- Remaining voltage : 2 V or lower



*Black (OUT1) / White (OUT2) / Grey (OUT3) / Orange (OUT4)
Use by assigning the optional functions to OUT1 to OUT4

SENSOR

Model		IV-500CA	IV-500C	IV-500MA	IV-500M	IV-150MA	IV-150M	IV-2000MA	IV-2000M
Installed distance		Standard distance (50 to 500 mm)				Short range (50 to 150 mm)		Long range (300 to 2000 mm)	
View		Installed distance 50 mm: 25 (H) x 18 (V) mm to Installed distance 500 mm: 210 (H) x 157 (V) mm				Installed distance 50 mm: 12 (H) x 9 (V) mm to Installed distance 150 mm: 36 (H) x 27 (V) mm		Installed distance 300 mm: 45 (H) x 33 (V) mm to Installed distance 2000 mm: 300 (H) x 225 (V) mm	
Image sensor		1/3 inch colour CMOS		1/3 inch monochrome CMOS					
	Pixel	752 (H) x 480 (V)							
Focus adjustment		Auto*1	Manual	Auto*1	Manual	Auto*1	Manual	Auto*1	Manual
Exposure time		1/10 to 1/50000		1/10 to 1/25000		1/20 to 1/25000		1/10 to 1/25000	
Lights	Illumination	White LED		Red LED				Infrared LED	
	Lighting method	Pulse lighting/DC lighting is switchable							
Tools	Type	Outline search, Colour area*7, Area*8, Position adjustment							
	Number*2	Detection tools: 16 tools, Position adjustment tool: 1 tool							
Switch settings (programs)		32 programs							
Image history*3	Numbers	100 images*4		300 images*5					
	Condition	NG only/All is selectable							
Analysis information*6		OFF/Statistics/Histograms is switchable Statistics: Processing time (latest value, MAX, MIN, AVE), number of OKs, number of NGs, trigger numbers, trigger errors, judgment results list by tools Histograms: Histogram, matching degree (latest value, MAX, MIN, AVE), numbers of OKs, numbers of NGs							
Other functions		HDR, HighGain, Colour filters*7, Digital zoom*8, Brightness correction, Tilt correction, White balance*7, Mask outline, Mask area, Test run, ToolAutoTune, Input monitor, Output test, Security settings, Simulator*9							
Indicators		PWR/ERR, OUT, TRIG, STATUS, LINK/ACT							
Input		Non-voltage input/voltage input is switchable For non-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 15 V or higher, OFF current 0.2 mA or lower, ON current 2 mA (for 24 V)							
	Inputs	6 inputs (IN1 to IN6)							
	Function	IN1: External trigger, IN2 to IN6: Enable by assigning the optional functions Assignable functions: Program switching, Clear error, External master image registration							
Output		Open collector output NPN/PNP is switchable, N.O./N.C. is switchable For open collector NPN output: Maximum rating 26.4 V 50 mA, remaining voltage 1.5 V or lower For open collector PNP output: Maximum rating 26.4 V 50 mA, remaining voltage 2 V or lower							
	Outputs	4 outputs (OUT1 to OUT4)							
	Function	Enable by assigning the optional functions Assignable functions: Total judge result, RUN, BUSY, Error, Position adjustment result, Judge result of each tool, Result of the logical operation of each tool							
Ethernet*10	Standard	100BASE-TX/10BASE-T							
	Connector	M12 4pin connector							
Network function		FTP client, EtherNet/IP, PROFINET							
Rating	Power voltage	24 VDC ± 10% (including ripple)							
	Current consumption	0.6 A or less							
Environmental resistance	Ambient temperature	0 to +50˚C (No freezing)							
	Relative humidity	35 to 85%RH (No condensation)							
	Vibration	10 to 55 Hz, 1.5 mm double amplitude, 2 hours each for X, Y, and Z axes							
	Shock resistance	500m/s² 6 different directions in 3 times							
	Enclosure rating*11	IP67							
Material		Main unit case: Aluminium die-casting, Packing: NBR, Front Cover: Acrylic, Mounting adapter: POM							
Weight		Approx. 270 g							

*1 The focusing position can be automatically adjusted at the time of installation. Deactivated during the operation. Focusing position can be registered by program.
*2 Tools can be installed by programs.
*3 Saves to the memory in the sensor. The images saved in the sensor can be backed up to the USB memory installed to the intelligent monitor (IV-M30) or to the PC by the software for IV (IV-H).
*4 When using the FTP client function ; 70 pictures
*5 When using the FTP client function ; 210 pictures
*6 This can be displayed on the intelligent monitor (IV-M30) or by software for IV (IV-H1).
*7 Colour type only.
*8 Monochrome type only.
*9 Simulator can be used with the IV software (IV-H1).
*10 This is for connection with the intelligent monitor (IV-M30) or software for IV (IV-H1).
*11 Except when polarised filter attachment (OP-87436/OP-87437) is mounted

MONITOR

Model		IV-M30
Display		3.5" TFT colour LCD 320 x 240 dot (QVGA)
Touch panel	Method	Analogue resistive
	Actuating force	0.8 N or less
Backlight	Method	White LED
	Duration	Approx. 50000 hours (25˚C)
Indicators		PWR, SENSOR
Ethernet *1	Standard	100BASE-TX/10BASE-T
	Connector	M12 4pin connector
Languages		Japanese / English / German / Simplified Chinese / Traditional Chinese / Italian / French / Spanish / Portuguese / Korean
Expanded memory		USB memory *2
Rating	Power voltage	24 VDC ± 10% (including ripple)
	Current consumption	0.2 A or lower
Environmental resistance	Ambient temperature	0 to + 50˚C (No freezing)
	Relative humidity *3	35 to 80 % RH (No condensation)
	Vibration	10 to 55 Hz, 0.7 mm double amplitude, 2 hours each for X, Y, and Z axes
	Drop impact resistance	1.3 m over the concrete (2 times each in the arbitrary direction)
	Enclosure rating	IP40
Material		Polycarbonate
Weight		Approx. 180 g

*1 This is dedicated for connection with IV-series sensor.
*2 Use the KEYENCE recommended product.
*3 If the ambient temperature is over 40˚C, use it in the absolute humidity of 40˚C 80% RH or lower.

SOFTWARE

Model		IV-H1
System requirements	Interface	Equip the Ethernet (100BASE-TX) interface
	OS	Windows 7 Home Premium/Professional/Ultimate *1 Windows XP Professional/HomeEdition; either of OS above needs to be pre-installed
	Languages	Japanese / English / German / Simplified Chinese / Traditional Chinese / Italian / French / Spanish / Portuguese / Korean
	Processor	Windows 7: needs to be compliant with system requirements for OS Windows XP: Pentium III or better, Clock speed 1 GHz or faster
	Memory capacity	Windows 7: needs to be compliant with system requirements for OS Windows XP: 512 MB or more (1 GB or more is recommended)
	Required capacity for installation	1 GB or more
	Monitor	Resolution 1024 x 768 pixel or higher, Display colour High Colour (16 bit) or higher
	Operating conditions	.NET Framework 2.0 SP2 needs to be installed *2

*1 Supported for 32bit and 64bit version.
*2 If .NET Framework 2.0 is not installed, this will be automatically installed at the time of IV-H1 installation.

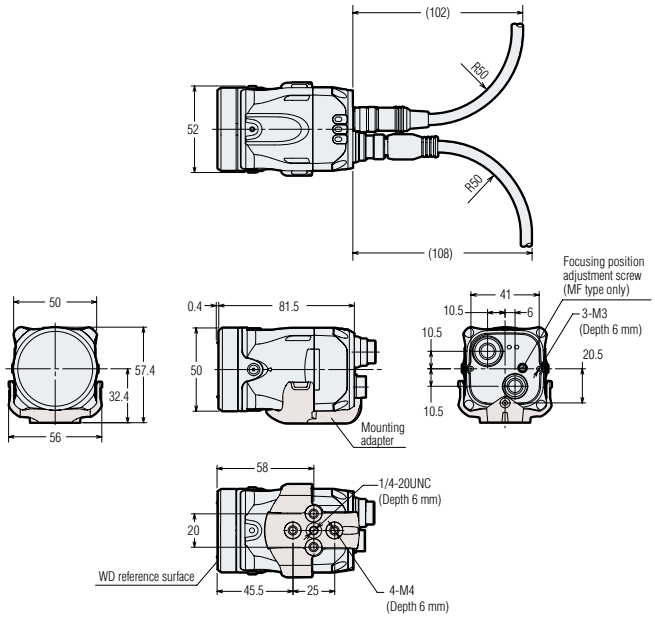
*Windows is a registered trademark of Microsoft Corporation in the United States and/or other countries.

DIMENSIONS

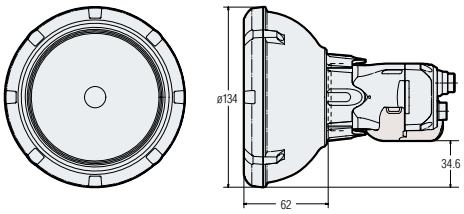
Unit: mm

Sensor

IV-500C/IV-150M/IV-500M/IV-2000M/
IV-500CA/IV-150MA/IV-500MA/IV-2000MA

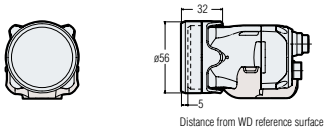


With dome attachment



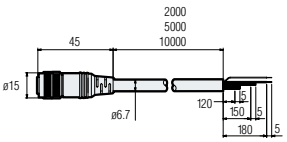
* When using dome attachment, please set the workpiece within the range of 0 to 50 mm from the top.
* Dome attachment can be used for standard distance and close range types.

With polarised filter attachment

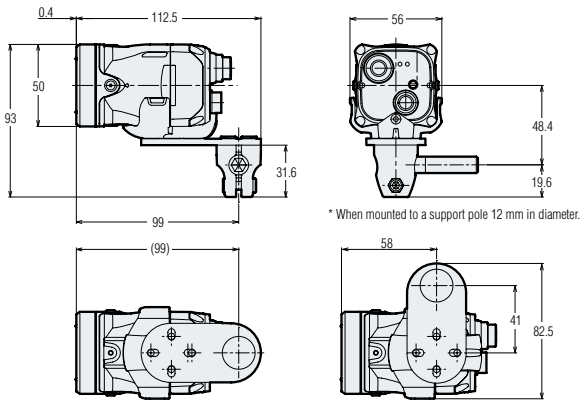


Power I/O cable

OP-87440 (2 m)/
OP-87441 (5 m)/
OP-87442 (10 m)

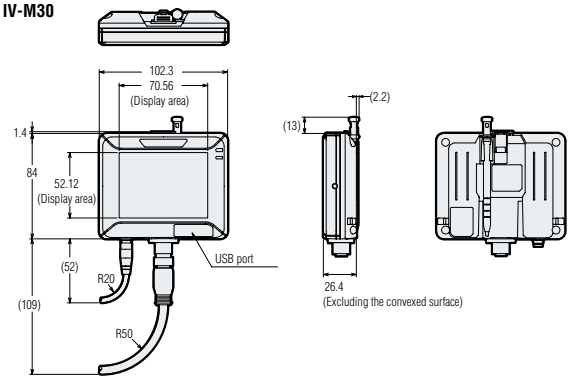


With OP-87685

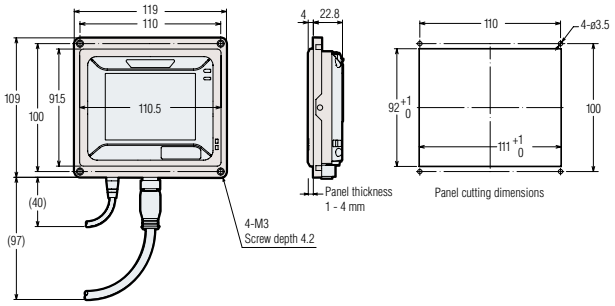


Intelligent monitor

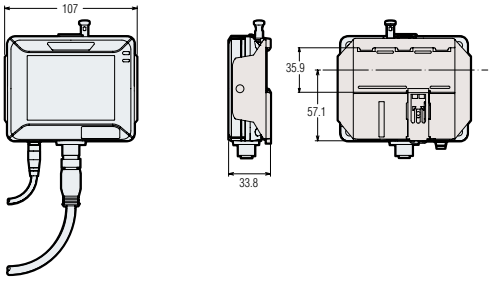
IV-M30



Using the panel mounting adapter

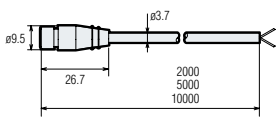


Using the DIN mounting adapter



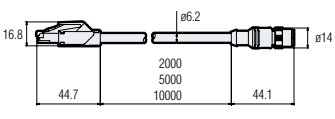
Monitor power cable

OP-87443 (2 m)/OP-87444 (5 m)/OP-87445 (10 m)



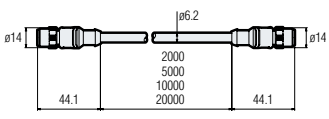
Ethernet cable

OP-87454 (2 m)/OP-87455 (5 m)/OP-87456 (10 m)

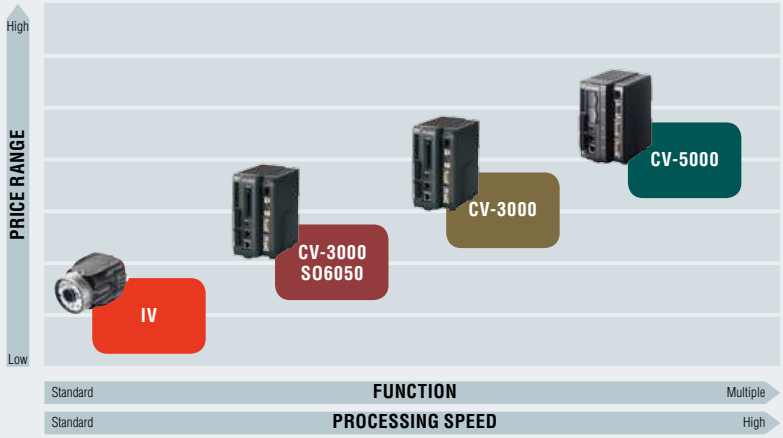


Monitor cable

OP-87446 (2 m)/OP-87447(5 m)/
OP-87448(10 m)/OP-87449(20 m)



VISION SYSTEM LINEUP



Providing lineups comprising the units for various purpose such as building full-scale vision system to detection or existence check at reasonable price. The lineups covering the needs of all customers to resolve the every issue appears on-site.

FUNCTION DETAILS

			IV	CV-3000 SO6050	CV-3000	CV-5000
Camera	Maximum No. of cameras		1	2	4	4
	Variation		8	4	8	16
	No. of pixels	310,000 pixels	✓	✓	✓	✓
		2 megapixels	—	—	✓	✓
		5 megapixels	—	—	—	✓
	Colour camera support		✓	✓	✓	✓
	Line scan camera support		—	—	—	—
Controller	Image processing engine		Single core	Single core	Single core	Single core (High-speed type)
	Processing speed		Standard	Standard	Standard	High-speed
	I/O		✓	✓	✓	✓
	Light extension unit support		—	—	—	✓
	Touch screen support		—	—	—	—
Inspection mode	Basic tool	Area	✓	✓	✓	✓
		Detection	✓	✓	✓	✓
		Edge	—	✓	✓	✓
		Flaw and stain	—	—	✓	✓
		OCR	—	—	✓	✓
	Utility	Statistical analysis	✓	✓	✓	✓
		Screen customisation	—	✓	✓	✓
		Editing during operation	—	—	—	—
		PC simulation	✓	✓	✓	✓
	Other function	Position adjustment	✓	✓	✓	✓
		Calculation	—	✓	✓	✓
		Preprocessing filter	—	Powerful	Powerful	Ultra powerful
		Numeric output	—	✓	✓	✓
		Image calculation	—	—	—	—
		Image saving	✓	✓	✓	✓
Lens			Unselectable	Selectable	Selectable	Selectable
Lighting			Unselectable	Selectable	Selectable	Selectable
Feature			• Easy-to-use • Stable detection • Affordably priced	• Simultaneous connection with 2 cameras • Concurrent use of monochrome and colour cameras is acceptable. • Possible to use 128 windows at detection/inspection	• 20,000 parts per minute processing speed • 2 mega pixel colour and monochrome camera • 8 types of monochrome and colour cameras • Simultaneous imaging by four cameras/mixed connection	• 3 + 1 Processor System • 11× high-speed CCD camera. • Sixteen different camera types

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KIB1-1033

IV-KIB-C2-GB 1053-1 626105 Printed in Japan