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Find the *Keyence CV-3502P* at our website: ***Click HERE***

KEYENCE

NEW **Multi-camera Universal Machine Vision System**

CV-3000 Series

DIGITAL



Raising the Bar for Machine Vision Performance

Lightning Fast

20,000 parts per minute processing speed

Best Resolution in its class

2 mega pixel color and monochrome cameras

Variety of camera choices

8 types of monochrome and color cameras

First in its class

Simultaneous imaging by four cameras/mixed connection

CE

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Providing the ultimate flexibility with a wide variety of camera choices using the industry's highest-performance image processing engine.





NEW **Ultra-high-speed digital vision system controller CV-3500 supporting multiple cameras**

CV-3000 Series
"Triple processors" allow use on high-speed lines

3 Triple Processor | 2 Double-Speed Camera | 2 Double Buffer

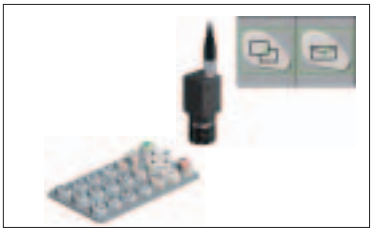
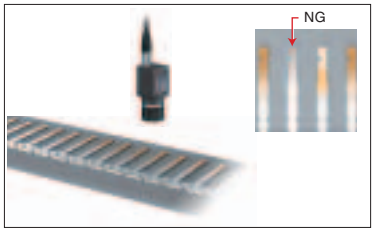
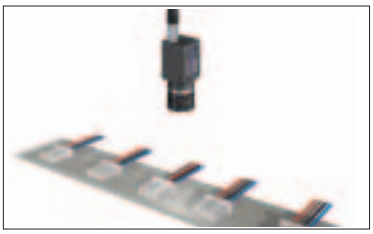
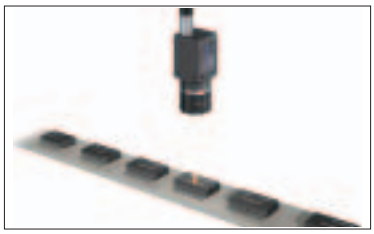
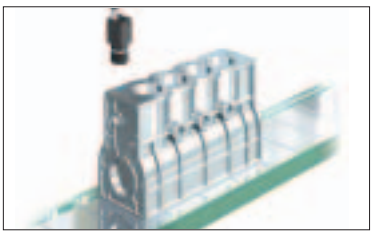
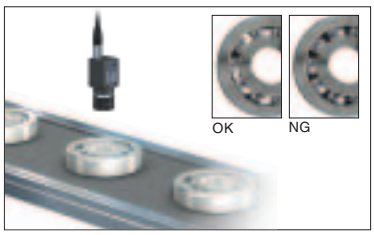
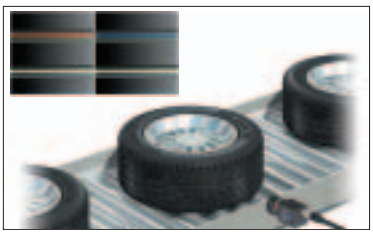
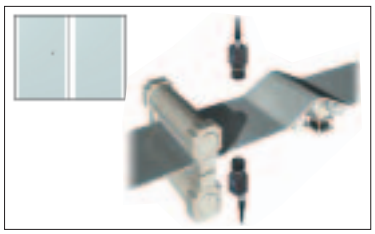
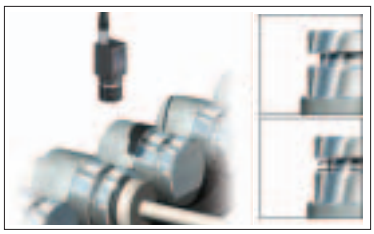
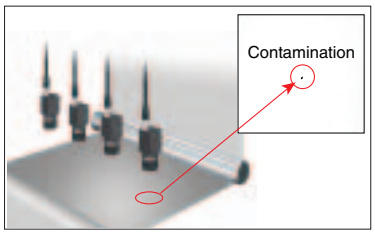
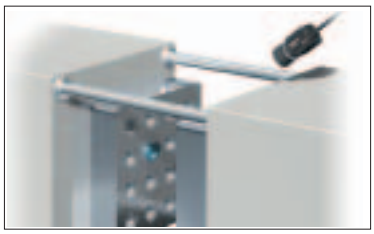
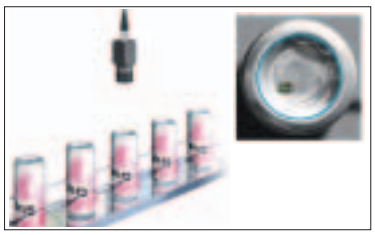
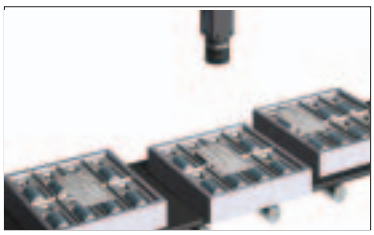
In addition to a lightning fast RISC CPU chip, the CV-3000 Series controller uses two DSP chips to achieve image-processing speeds twice that of conventional models. The cameras have also been geared towards high-speed production. Both the 240,000 pixel models and 2,000,000 pixel models use KEYENCE's double buffer technology to cut image transfer times in half!

Choose the camera that meets your specific application needs
8 types of camera variations

MEGA DIGITAL | HI-SPEED DIGITAL | SUPER-SMALL DIGITAL | ULTRA-SMALL DIGITAL

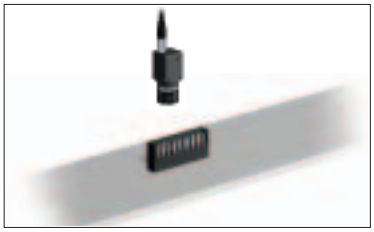
The CV-3000 Series controller allows any of the 8 available cameras to be connected to the same unit. This means that you have the flexibility to choose the best camera arrangement according to your specific application needs. In addition to this, the CV-3502 controller has an expansion unit that allows the simultaneous operation of up to 4 cameras!

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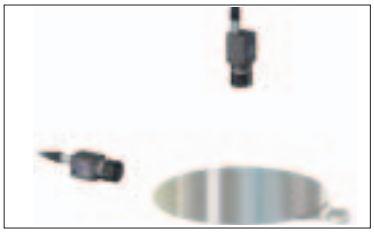
	Part identification	Defect inspection	Presence/absence detection
ELECTRICAL/ELECTRONIC	 Differentiation of the buttons on a mobile phone	 Inspection of burnt marks/short-circuit of connector resin	 Detecting defective pin plating
	 Checking correct cable assembly	 Inspection of trimmer switch position	 Detecting “reject” marks on electronic components
AUTOMOBILE/METAL	 Differentiation of cylinder blocks	 Crankshaft porosity detection	 Detecting the presence/absence of bearing grease
	 Differentiation of tires	 Inspection of flaws on a steel plate	 Detecting the groove defect in a piston head
FOOD, PHARMACEUTICAL & OTHERS	 Inspection of different types of medicine capsules	 Inspection of pinholes and foreign materials on a sheet	 Detecting molded products remaining in a mold
	 Inspection of plastic cups and printing	 Inspection of stains on the bottom of beverage cans	 Detecting the presence/absence of package inserts and missing items

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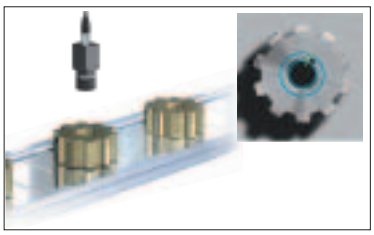
Dimension measurement



Measuring the coplanarity of connector pins



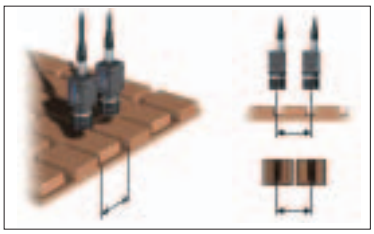
Positioning confirmation for silicon wafers



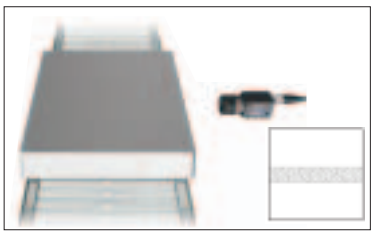
Measuring the notch position of a gear



Measuring deformation of metal materials

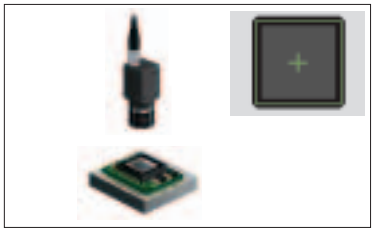


Pitch measurement of construction boards

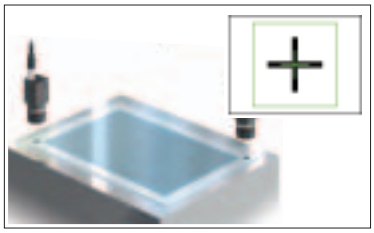


Measuring the thickness of building materials

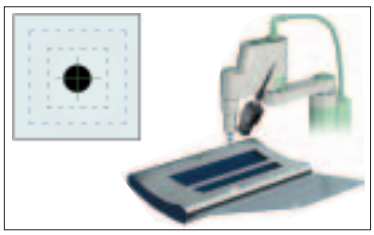
Positioning



Positioning of a CCD device



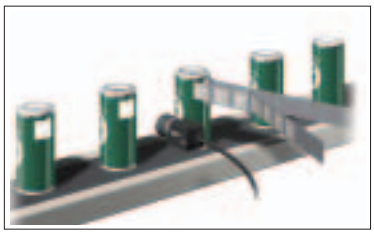
Positioning of LCD glass substrates



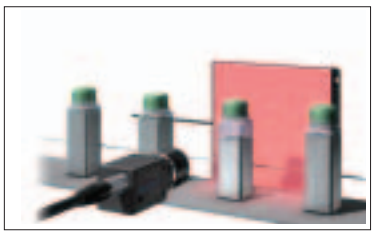
Position control of a robot



Checking fit of body panels

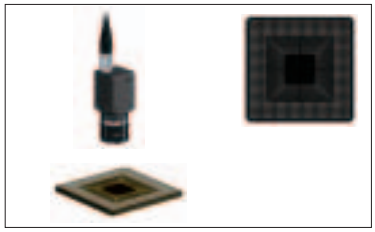


Checking mispositioned labels

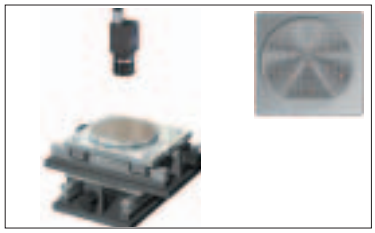


Detecting liquid level in a bottle

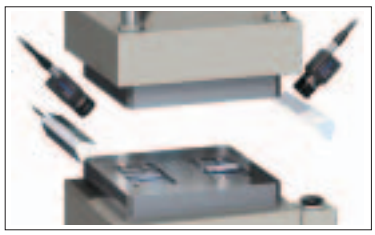
Counting



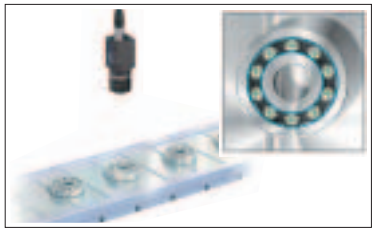
Checking BGA solder balls



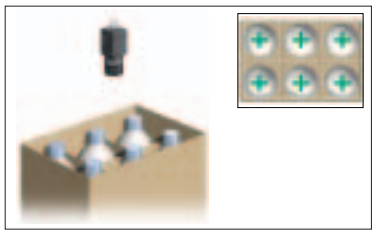
Detecting ink marks on a silicon wafer



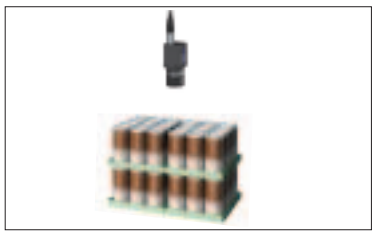
Check correct seating of parts for die protection



Counting bearing balls



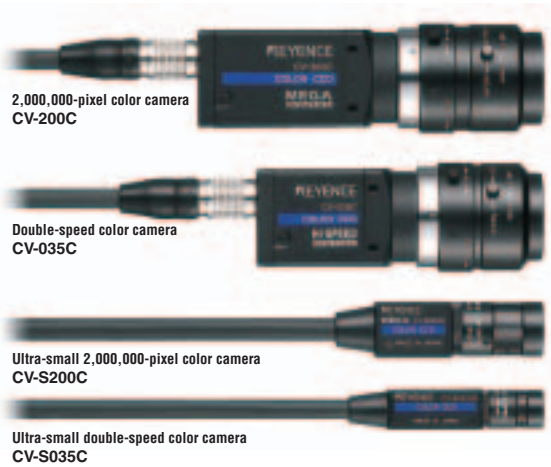
Counting items in a carton

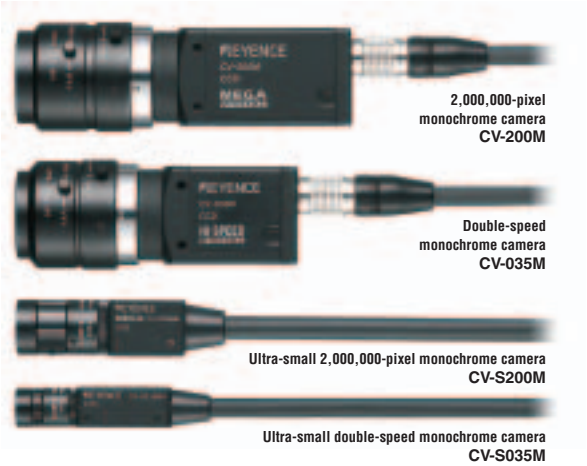


Counting beverage cans

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Advanced controller with triple processors and 8 camera options provides exceptional performance. A single CV-3500 controller provides an optimum cost to performance solution to wide variety of application problems.





KEY FEATURES

Application Specific Cameras 6

First in in its class
Multiple camera system

Fastest processing speed in its class 8

Fastest in its class
Triple processsors push speeds to 10 times that of conventional models

First in its class
20,000 parts per minute, double-speed color camera

Superior color processing 9

NEW **Advanced Color extraction Engine (A.C.E.)**

NEW **Simple, reliable color selection method**

Enhanced inspection tools 10

NEW **Upgraded trend edge function**

NEW **Stain inspection tool**

Simple and reliable operations 13

NEW **New vision flow menu for intuitive operation**

NEW **Custom menu**

NEW **Simultaneous shift function**

NEW **Administrator mode/user mode switch function (with password)**

Advanced Color extraction Engine (A.C.E.)

using the latest in color processing technology to closely mimic the differentiation capabilities of the human eye



Combining our A.C.E. with cameras that have the best specifications in the industry, like 2,000,000-pixel double-speed color processing, the CV-3000 Series provides extremely stable, fast, high-precision color processing(*1).

KEYENCE's proprietary interfaces also provide simple, reproducible extraction settings.

*1 This processing is possible when a color camera is connected.

16 powerful inspection tools

that enable you to solve a variety of application challenges



The CV-3000 Series software contains 16 powerful inspection tools, including the KEYENCE original **Stain** and **Pattern Sort** tools, to tackle today's most difficult machine vision applications. When using the tools individually or in combination with each other, the system can be configured to obtain presence/absence data, position information, and dimensional measurements.

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Highest in its class

8 types of cameras that can be chosen according to application needs

You can choose the optimum camera according to your application. For example, you can choose a color megapixel camera for high-resolution appearance inspection, a double-speed camera for inspections where the processing speed has the highest priority, and a small double-speed camera for installation where space is an issue.

2,000,000-pixel series



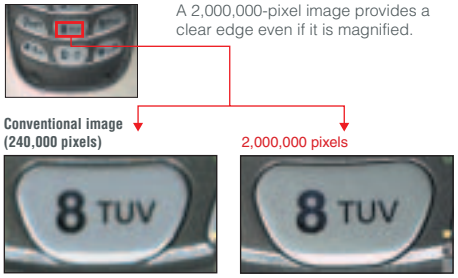
MEGA DIGITAL

Color camera
CV-200C

Monochrome camera
CV-200M

The CV-3000 Series employs a highest-in-its-class 2,000,000-pixel color CCD, making it possible to collectively process all 2,000,000 pixels. Suitable for appearance inspection that requires high-resolution and dimension measurement.

<Comparison of magnified images>



240,000-pixel double-speed series



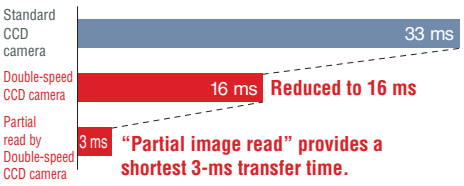
HI-SPEED DIGITAL

Color camera
CV-035C

Monochrome camera
CV-035M

For color vision applications, KEYENCE has adopted a CCD with a double-speed progressive drive method drastically reducing the image transfer time from 33 ms (conventional time) to 16 ms. KEYENCE has also adopted a partial read function that uses only a part of the CCD to achieve lightning-fast 3-ms transfer.

<Comparison between image transfer times>



Ultra-small series



SUPER-SMALL DIGITAL

2,000,000-pixel color camera
CV-S200C

2,000,000-pixel monochrome camera
CV-S200M

The size of cameras has been reduced while leaving their performance abilities intact. This makes it possible to build the cameras into impossibly small spaces. The 0.47" (12 mm)-240,000-pixel type and 0.67" (17 mm)-2,000,000-pixel type are available in color and monochrome so that you can choose resolutions tailored to your needs. The side viewer attachment provides sensor-like lateral installation.



Side viewer attachment



ULTRA-SMALL DIGITAL

240,000-pixel color camera
CV-S035C

240,000-pixel monochrome camera
CV-S035M

<Comparison with the size of the conventional model (for CV-S035C)>



☐ 0.47" (12 mm) (ultra-small size that is 1/10 of the conventional camera volume)

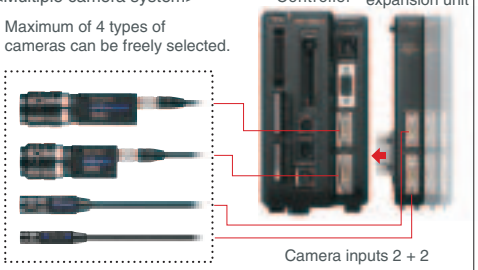
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First in its class Multiple camera system

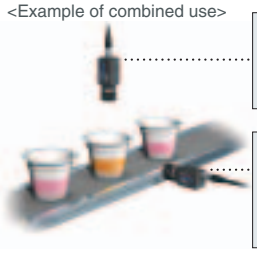
KEYENCE has expanded on its multi-camera connection technology to allow simultaneous use of up to 4 cameras on one controller. Any combination of the 8 cameras available for the CV-3000 Series can be used together. The connected cameras provide simultaneous imaging and simultaneous processing(*). In addition, the system can flexibly cope with future additions and modifications to the inspection specifications.

<Multiple camera system>

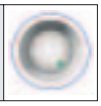
Maximum of 4 types of cameras can be freely selected.



<Example of combined use>



Camera 1
2,000,000-pixel camera
[Stain detection]



Camera 2
240,000-pixel camera
[Product sorting]



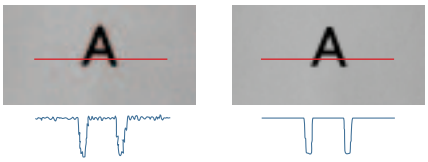
If the two cameras do not require high-resolution, using the 240,000-pixel camera provides a cost reduction.

* The camera expansion unit can only be connected to the CV-3502 controller.

Digital image transfer

The image data captured with the camera is transferred to the controller in digital format. A high-quality image with less degradation than conventional analog transfer significantly improves measurement accuracy.

<Comparison of magnified images>



Analog transfer　　Digital transfer

First in its class Highly-sensitive image capturing & span/shift function

The sensitivity of the camera can be adjusted in 81 levels. Setting a higher sensitivity ensures sufficient brightness even when the high-speed shutter is being used. Expensive strobe lighting is no longer necessary. The span/shift function that can individually adjust R, G, and B increases the difference in the contrast of low-contrast targets, ensuring more stable image processing.

<Effect of increased sensitivity>



Conventional model　　CV-3000 Series

Image comparison at a shutter speed of 1/10000
(* Comparison under the same fluorescent lamp illumination conditions)

<Effect of the span/shift function>



Original image　　After span/shift change
(After R-component span change)

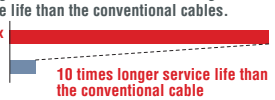
High-flex cable

High-flex performance that is 10 times that of the conventional models significantly reduces the risk of breakage when connecting a camera to the moving part of a device or a robot. Reserching various materials and designs has achieved the same cable diameters as the conventional models.



High-flex performance over 1,000,000 bend cycles* *Bend radius: 1.18" (30 mm) (typical example)

- The high-flex cable has a 10 times longer service life than the conventional cables.



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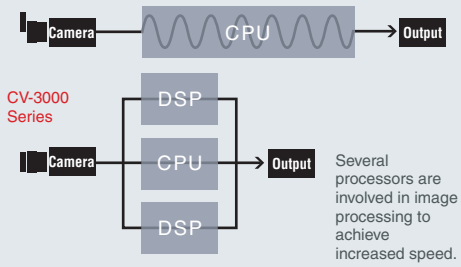
Fastest in its class Triple processors push speeds to 10 times that of conventional models

The CV-3000 Series contains two digital signal processors (DSPs) suitable for image processing (three processors in total). This increases speed by distributing the work normally done by 1 CPU between 3 processors.

(Comparison of processing speeds between the conventional products and CV-3000 Series in 360° rotation search with extra tools)



<Comparison between conventional processing performed by one CPU and processing performed by three processors>



Several processors are involved in image processing to achieve increased speed.

<Single tool time list> Processing area: 200 x 160

Tool name	Area	Edge position	Stain mode	Shade processing
Processing time	0.77 ms	0.5 ms	0.83 ms	0.5 ms

Achieves 1-ms-or-less processing time

20,000 parts per minute, double-speed color camera

Combining triple processors with a double-speed color camera* has achieved ultra-high-speed processing. This enables the CV-3000 Series to sufficiently cope with high-speed production lines.

(*CV-035C/CV-S035C)

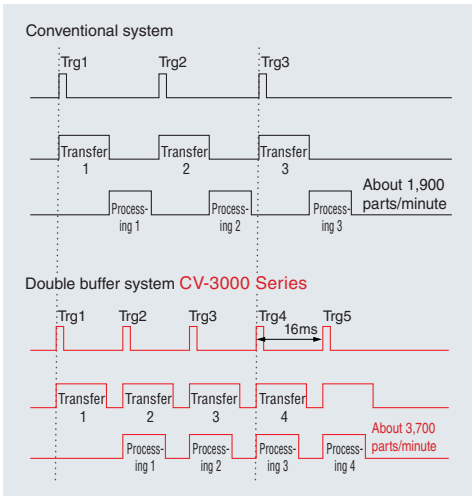
<Appearance inspection of chip components>
The time required for dimension measurement through multiple edge detection, defect detection in stain mode, and position adjustment is only 13 ms. (Use of partial image reading)



Fastest in its class Double buffer

The double buffer memory allows the CV-3000 Series to accept the next trigger input when an image is being processed. This enables an inspection tact time of about 16 ms (about 3,700 parts/minute)* even in non-interlaced reading mode.

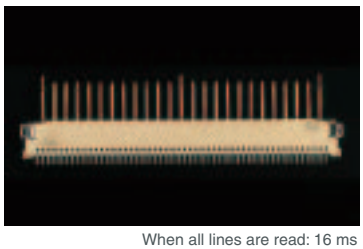
(* When the CV-035C is used and the image processing time is 15 ms)



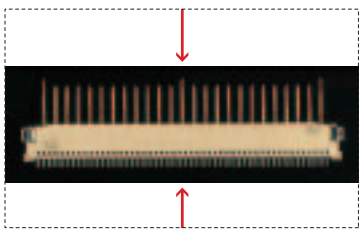
Partial image reading

The partial image reading function enables you to significantly reduce the image transfer time because it transfers only the necessary image data.

(Comparison of image transfer time in CV-035C)



When all lines are read: 16 ms



When 200 lines are read: 7 ms

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NEW Advanced Color extraction Engine (A.C.E.)

The CV-3000 Series uses an Advanced Color extraction Engine (A.C.E.) that employs an HSB extraction system, achieving high color extraction capability for both “color shade processing” and “color binary conversion”. This stabilizes conventionally unstable processing.

New color shade processing (patent pending)

New color shade processing can adjust shade inclinations in hue, saturation, and brightness to an optimum level. It can convert low contrast targets to images with clear shade difference, reducing the costs of man-hours and peripheral devices such as illumination.



Shade processing does not become stable because the contrast difference is low.



New color shade processing
This image can be stably processed because the contrast difference is high.

<Conventional system>



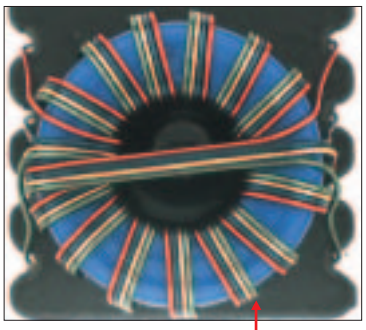
Gray processing

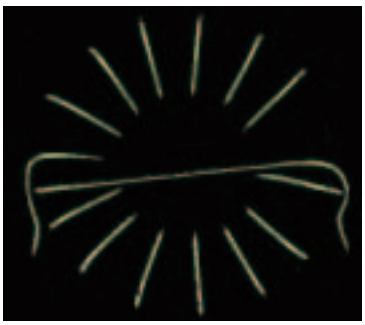


Conventional color shade processing
This image cannot be stably processed as is because the cotrast difference is low.

New color binary conversion processing

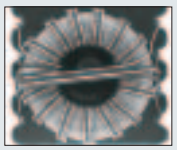
New color binary conversion processing can stably extract low-brightness colors such as dark green and blue, a problem that typically plagues conventional color systems.



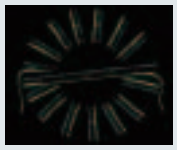


New color binary conversion processing
Stably extracts only green.

<Conventional system>



Monochrome picture
Monochrome processing cannot distinguish between colors with the same concentration.



Conventional color picture
The ability to distinguish colors with low brightness is limited.

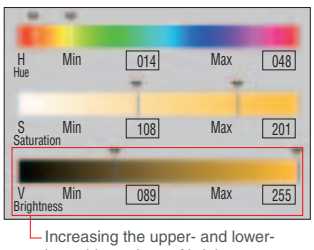
NEW Simple, reliable color selection method

Besides KEYENCE’s own “point & click” method of color extraction, user’s now have the ability to fine tune the color selection through numerical alterations. This new method provides an objective, highly reproducible setting. You can also adjust colors while viewing the color bar, adding to the intuitive color selection interface.

<Example of color setting from color bar>



Color extraction using the “point & click” method



Increasing the upper- and lower-boundries values of brightness on the color bar further reduces brightness fluctuation.

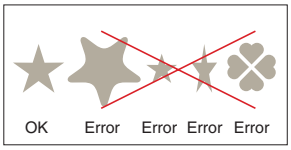


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NEW Pattern sort tool provides inspection flexibility

To cope with a change in size or shape of an expected search target, the CV-3000 Series can register up to 256 patterns. This allows the CV-3000 Series to find and differentiate targets despite production variations, ensuring stable detection.
Furthermore, through group registration by target, the classification function can easily be configured to sort up to 256 target variations.

Conventional search



The conventional pattern search system cannot search for a target if the target shape has changed.

Pattern Sort tool



The Pattern Sort tool enables stable detection through preliminary registration of an expected target.

The Pattern Sort tool enables accurate detection of the alignment mark by choosing the optimum pattern among 256 previously registered patterns. This feature is also available with a 360° rotation search.

Pattern list registration screen



Through compression, the number of images that can be registered is remarkably increased. (Approx. 10 times larger capacity than conventional systems)

NEW Differential inspection

The differential inspection function compares captured images with registered images and extracts the difference between the two. Tolerances can be set on these differences depending on the application.

Registered image (non-defective)



Captured image (defective)



Differential image



The print was cancelled and only a flaw was extracted as defective. The differential inspection function can be used even if the workpiece is rotating.

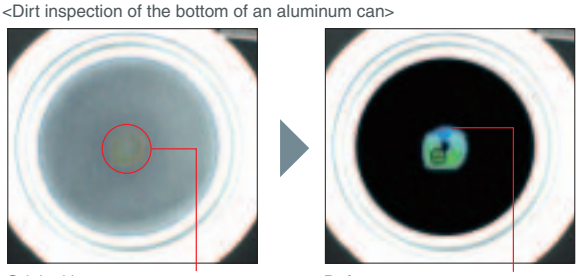
NEW Stain inspection tool

The CV-3000 Series comes equipped with an inspection tool that searches for defects by comparing the average contrast levels on the surface of a target. Compared to color binary processing, the stain tool will actually detect minute differences in a target even with changes in illumination. The defect distribution display function enables you to quickly view what judgment has been made in image processing.

Defect distribution display function

The defect distribution display function colors and displays a defective part in blue, green, yellow, or red according to the contrast difference between the defect and the surrounding background. With this function, you can intuitively understand the degree of the difference between the parts you want to detect as defects and those you don't.

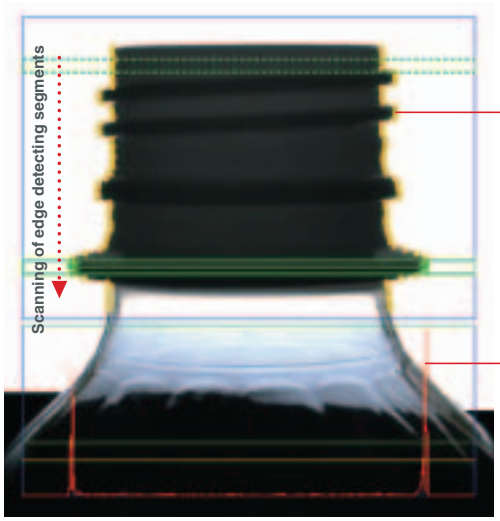
<Dirt inspection of the bottom of an aluminum can>



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NEW Upgraded trend edge function

An upgraded version of KEYENCE's trend edge tool, which scans a set inspection area to obtain maximum, minimum and average edge dimensions, has been added to increase the flexibility and stability of edge detection. It is now possible to extract data from each inspection point and take measurements from extrapolated lines and circles.

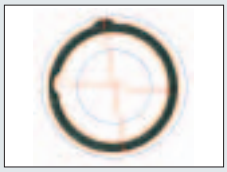


Displays detected edge position an outputs the individual results

Provides edge intensity waveforms for each segment.

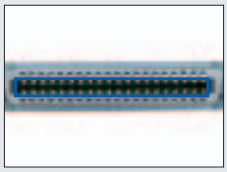
Detects the edge width and edge position of each point while moving narrow segments in fine pitches.

<Measuring the outer diameter of the O ring>



Measures the inner and outer diameters of the O ring with up to 5,000 points and outputs the maximum value, minimum value, and average value. Can also output all measured data.

<Measuring connector terminal gaps>



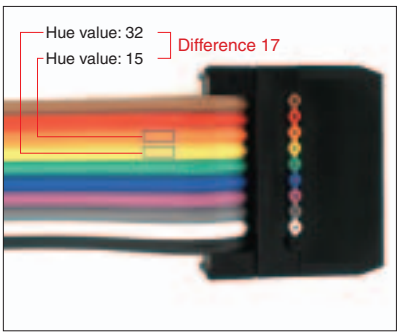
Enclose the entire length of a connector to obtain a pitch value for each pin set.

NEW Color inspection function

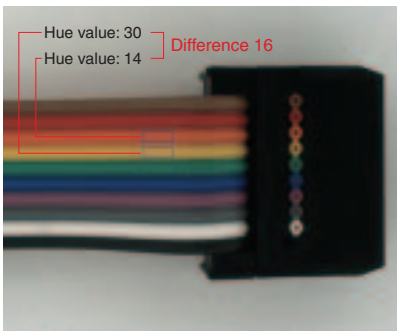
The color inspection function quantifies a target using the three values of hue, saturation, and brightness. This function provides more accurate judgment because it discriminates colors by numeric values, not like the conventional method in which colors are discriminated by area values after color extraction*.

(* Color inspection is possible only when a color camera is connected.)

<Normal status>



<When illumination decreases>

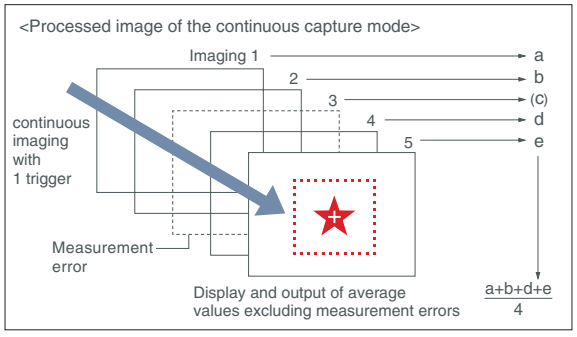


Even if illumination decreases, stable color discrimination is possible because there is a constant hue difference between orange and yellow.

NEW Continuous capture mode

The continuous capture mode continuously performs image processing several times after a single trigger input. If an inspection is unstable due to poor lighting conditions or line vibration, an average value can be obtained by capturing several images of the same target. In addition, false readings and errors can be eliminated by using the data exclusion function (patent pending)

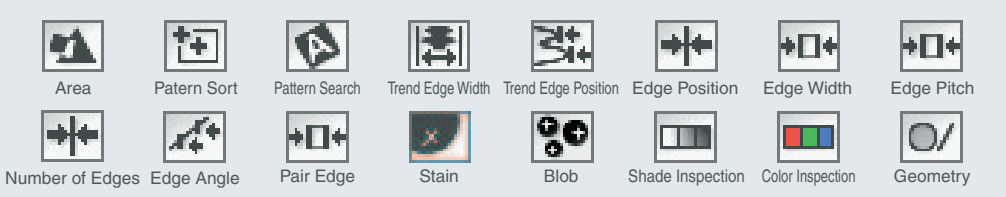
<Processed image of the continuous capture mode>



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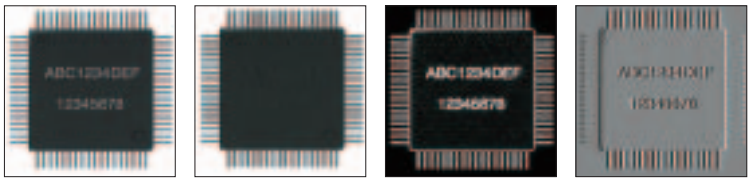
16 types of inspection tools

A large number of inspection tools are available to meet the needs of even the most demanding machine vision applications. The modes can be used individually to solve simple problems or in combination with each other for complex image processing



Best in its class Abundant pre-processing

In addition to common filters such as expansion, shrink, and sobel, the CV-3000 Series incorporates color binary conversion processing and color shade processing as pre-processing functions. Up to 14 types of filters can be set per window.



Original image | Expansion + shrink | Sobel | Edge extraction x

Illumination adjustment function

The illumination adjustment function automatically returns the brightness of a captured image to that of the registered image before inspection. This reduces malfunctions due to illumination degradation and variation of external light.



Original image | Illumination adjustment OFF | Illumination adjustment ON

Conditional branch function

The conditional branch function enables you to set whether to perform the execution of an inspection window depending on the output result of another inspection window.

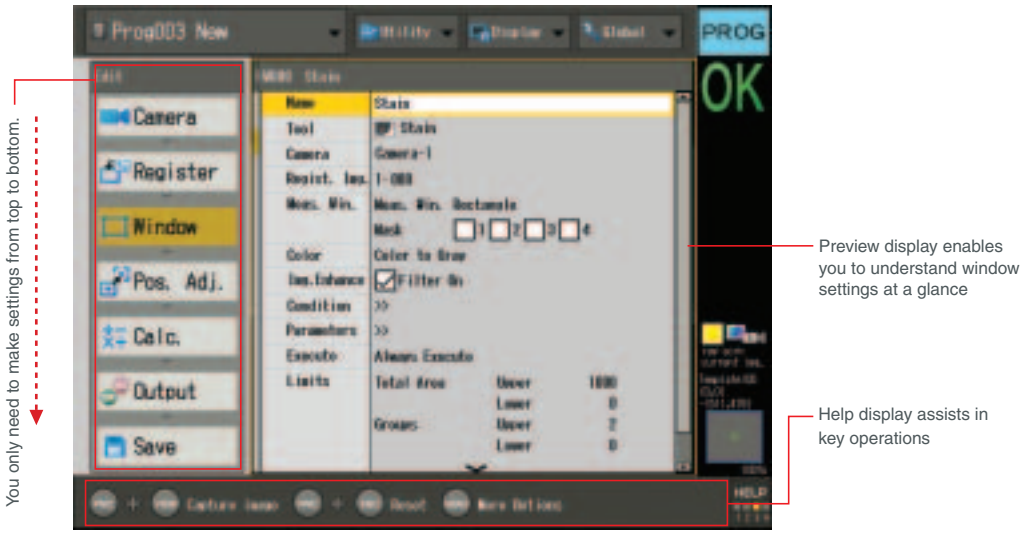
Other functions

Command memory	The CV-3000 Series comes with 128 memory points that can be altered during operation through the external inputs or the remote control console.
Auto-Adjusting inspection area	Enables you to create an area (rectangle, circle) that changes in real-time with an edge position or an operation value.
Scaling function	Enables you to scale the displayed number of pixels to real world values.
I/O monitor function	Enables you to monitor the status of an I/O signal during setup or operation.
Screen capture function	Enables you to capture a display screen and store it on a memory card in bitmap format.
File management function	Enables you to copy and format files in the main unit memory or memory card without a PC.
Individual trigger input/ individual stroke output support	Supports individual trigger input and individual strobe light output for time-difference imaging between several cameras.
Batch retest function	Enables you to collectively re-measure several saved images using the current settings.

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Best in its class New vision flow menu for intuitive operation

KEYENCE has further improved its vision flow menu to insure a user-friendly setup. This intuitive menu flows from top to bottom, guiding users through the simple setup procedures.



NEW Custom menu

The custom menu allows you to display only necessary menu items. For example, the normal menu view can be reduced to only display settings for color extraction and limit setup. This will help to simplify programming and prevent unauthorized system tampering.



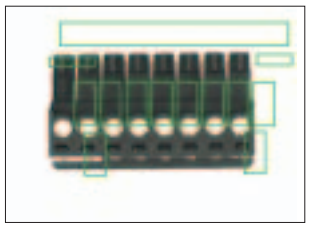
In the past, it was possible to alter all the items in setting menus. For this reason, there was a risk that users might alter items mistakenly.



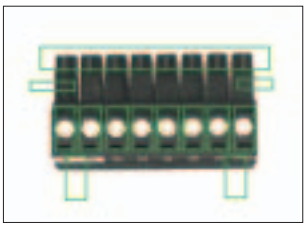
After the display menu is customized, only the items required for daily operation are displayed, so operators can easily understand the settings. This reduces the risk that operators will perform an incorrect operation.

NEW Simulataneous shift function

This enables you to collectively move several inspection windows. Even if you must change the location of a window because the location of the target has changed, you do not have to move each inspection window individually. This greatly reduces adjustment time.



Displaced window location



Adjustment result by using the simultaneous shift function

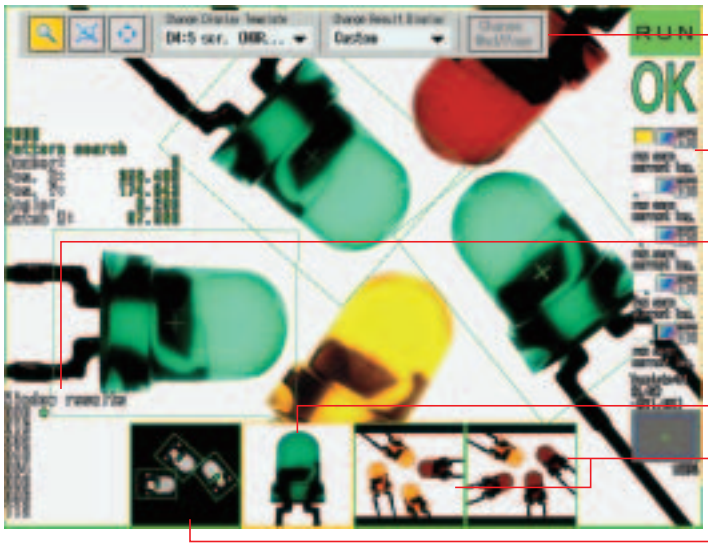
Administrator mode/user mode switch function (with password)

The administrator mode/ user mode enables you to manage the operational changes with the use of passwords while in administrator mode. This prevents unauthorized changes to the system. Combining this function with the custom menu permits only specific functions to be accessed in user mode.

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SVGA monitor output

KEYENCE has adopted a high-resolution SVGA (800 x 600 dots) monitor output for superior image quality. This function enables you to quickly monitor the operational status of the inspection at an extensive level. Multiple inspection images can be monitored simultaneously, eliminating the need to switch the screens on the remote console.



View bar

Provides screen operations such as zoom function and display switching.

Screen information display

Displays the status of each camera.

Window judgment result list

Lists the judgment results of a total of 128 windows.

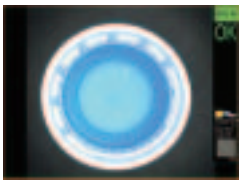
Master workpiece reference image

Past NG images

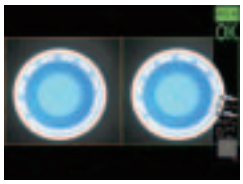
Image processed after color extraction

NEW Selectable screen display formats

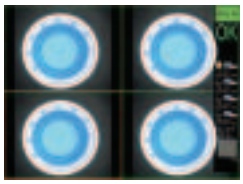
Choose from nine available screen display formats to match your application needs. Display cameras and display contents can be chosen per screen, making it possible to view current images on the main screen while viewing past NG images and registered images on subscreens.



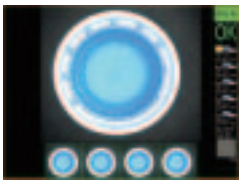
Display of one screen



Display of two screens



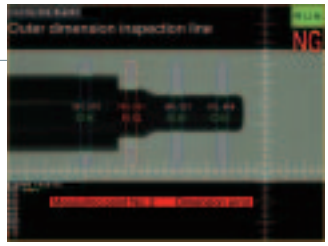
Display of four screens



Display of five screens

NEW Custom display function

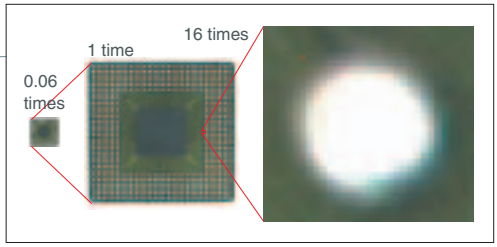
The custom display function enables you to freely create desired displays such as the judgment results of measured values in a specific window. With this function, you can also create and display custom text and graphics.



Example of custom display

NEW Zoom display function

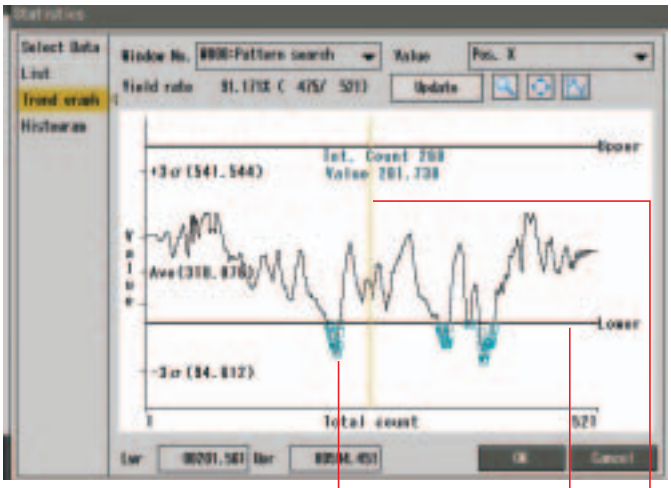
The zoom display function enables you to continuously zoom the display screen from 0.06 times to 16 times. You can use this function regardless of the operation status or programming menu.



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NEW Statistical processing

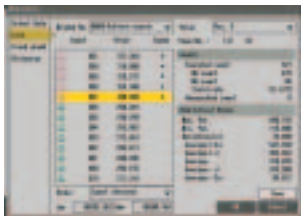
The statistical function enables you to store up to 20,000 points of measurement data in the internal memory of the unit and easily check the maximum value, minimum value, average value, standard deviation, NG count, and yield, all without having to connect to an external PC. This function also enables you to display trend graphs and histograms and make on-the-fly changes to limits based on the results of the gathered data. Up to 511* previously captured images can also be accessed directly on the graph. (*using the CV-035M or CV-S035M).



Trend graph display



Histogram display



Measured values list screen

Screen storage mark

The data with a square mark contains a saved image. Clicking this icon calls up the image.



Simultaneous display of images and measurement results

Tolerance

Displays the upper or lower limit.

Vertical cursor

Displays the measured values of the selected data and measurement count.

Best in its class Screen save function

The screen save function enables you to save inspected images to the internal memory or a memory card. With this function, you can view the past NG images even during operation.

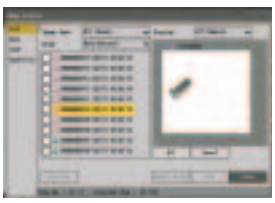
<Maximum number of images that can be saved by camera*>

Save to internal memory

Type of camera	Number of images
240,000 monochrome pixels	511
240,000 color pixels	170
2,000,000 monochrome pixels	64
2,000,000 color pixels	21

Save to 1GB memory card

Type of camera	Number of images
240,000 monochrome pixels	4089
240,000 color pixels	1378
2,000,000 monochrome pixels	530
2,000,000 color pixels	177



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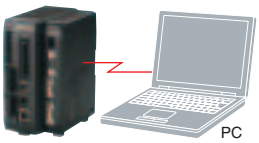
Flexible interface options



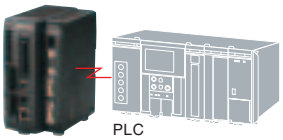
Memory card
1GB large-capacity memory card can save up to 1,000 programs. You can access programs in the memory card using the same operation as in the internal memory. Measurement data can also be directly output to the card.



USB 2.0 terminal
USB 2.0 allows for quick transfer of image data and settings from your PC.



232C communication
The CV3000 Series enables PLC link with KEYENCE KV Series* or other manufacturers' PLCs, as well as communications with a PC.
The CV3000 Series can directly communicate with a PLC data memory without using a ladder program.
*Only available outside U.S.



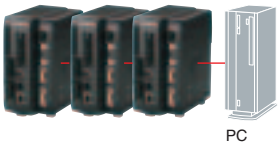
Camera cable connection
The camera cable connection is recessed so that dead space is minimized when the control panel is installed.

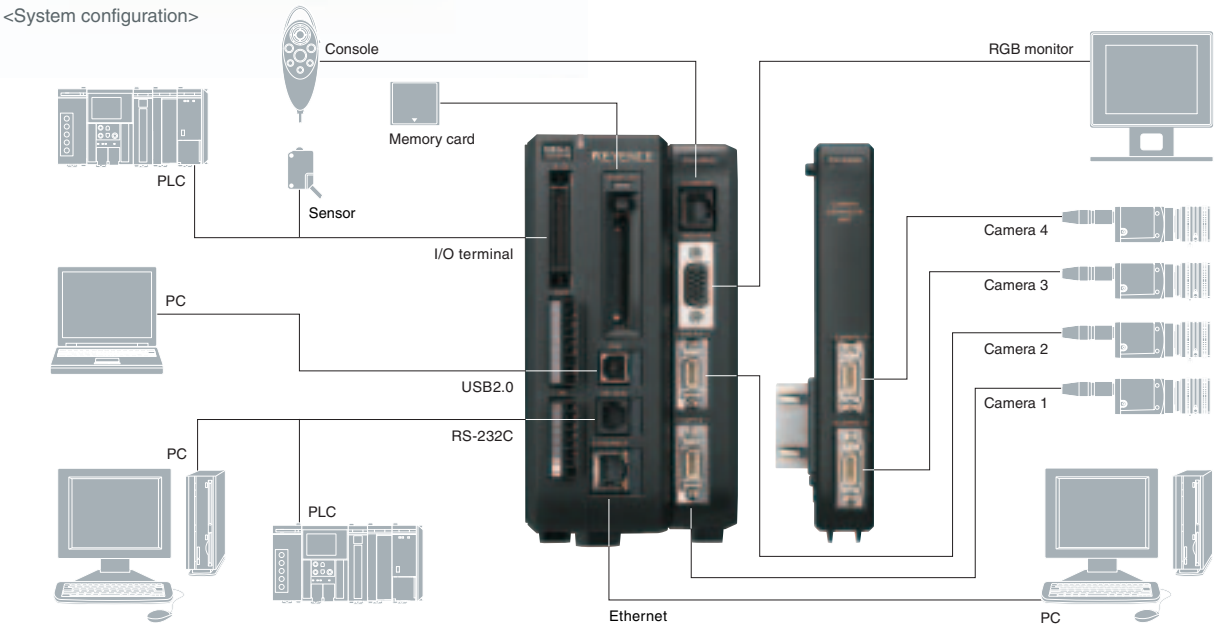


Camera expansion unit connection
Used to connect camera expansion unit CV-E300 when three or four cameras are used.



Ethernet PLC link function
Through LAN connection via 100Base-TX, you can monitor the inspection status of several controllers from a single PC. The CV3000 Series also supports Ethernet PLC link, enabling ultra-high-speed communication without using a ladder program.





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Product lineup and options

Controllers and accessories

High performance model
CV-3502/3502P



Standard model
CV-3002/3002P



Camera expansion unit
CV-E300



Console (accessory)



Color cameras

2,000,000-pixel color camera
CV-200C



240,000-pixel double-speed color camera
CV-035C



Ultra-small 2,000,000-pixel color camera
CV-S200C



Ultra-small 240,000-pixel double-speed color camera
CV-S035C



Monochrome cameras

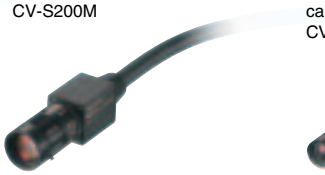
2,000,000-pixel monochrome camera
CV-200M



240,000-pixel double-speed monochrome camera
CV-035M



Ultra-small 2,000,000-pixel monochrome camera
CV-S200M



Ultra-small 240,000-pixel double-speed monochrome camera
CV-S035M



Options

Camera cable
CV-C3 (9.9' 3m)/
CV-C10 (33.0' 10m)/
CV-C17 (55.8' 17m)/
OP-51499 (3.3' 1m)



High-flex camera cable
CV-C3R (9.9' 3m)/
CV-C7R (23.0' 7m)/
CV-C12R (39.4' 12m)



Monitor cable (9.9' 3 m)
OP-66842



Expansion I/O cable
(9.9' 3 m)
OP-51657



RS-232C communication cable
(8.2' 2.5 m)
OP-26487



Ethernet cable (9.9' 3 m)
OP-66843



USB cable (6.6' 2 m)
OP-66844



Communication cable conversion connector
9-pin: OP-26486
25-pin: OP-26485



Memory card
1GB CV-M1G
256MB GR-M256



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Specifications (controller)

Controller

Model		**NPN**	CV-3502	CV-3002
		PNP	CV-3502P	CV-3002P
No. of pixels			2,000,000-pixel mode: 1600 (H) x 1200 (V), about 1,920,000 pixels 1,000,000-pixel mode: 1024 (H) x 960 (V), about 980,000 pixels When CV-200C, CV-S200C, CV-200M, and CV-S200M are connected Standard mode: 512 (H) x 480 (V), about 240,000 pixels When CV-035C, CV-S035C, CV-035M, and CV-S035M are connected	512 (H) x 480 (V), about 240,000 pixels
Camera input			2 color/monochrome cameras (support for CV-200C, CV-S200C, CV-035C, CV-S035C, CV-200M, CV-S200M, CV-035M, and CV-S035M, possible mixed connection) Connecting expansion unit CV-E300 provides 2-point expansion and connection of up to 4 points.	2 color/monochrome cameras (support for CV-035C, CV-S035C, CV-035M, and CV-S035M, possible mixed connection)
No. of registered settings			Up to 1,000 settings can be registered in each of the main unit memory and memory card (dependent on memory capacity and settings), possible external switching	
Number of screens that can be registered			1000 screens max./setting (Depends on the internal memory and memory card capacity), can be compressed and saved	
Internal memory capacity (Max. number of settings that can be registered, for reference [1])			Approx. 45 MB (1000 settings)	Approx. 15 MB (550 settings)
Window setting	**Measurement area**		128 windows/program	
	Mask area		4 areas/window	
	Area shape (depending on the inspection mode to be used, some area shapes are restricted)		Rectangle, rotating rectangle, circle, ellipse, circumference, arc, polygon (up to 12 angles), Auto-adjusting rectangle, Auto-adjusting circle	
Color extraction function (valid only when a color camera is connected)			Color binary, color shade, gray (color corresponds to numeric value specification with HSB values)	
Measurement tool	**Area measurement**		Area (color binary, monochrome binary)	
	Position detection		Pattern search (support of multiple detections), Pattern Sort, edge position, trend edge position, blob (gravity center position)	
	Inspection mode	**Edge tool**	Edge width, edge pitch, No. of edges, edge angle, pair edge, trend edge width	
		Feature inspection	Blob (No. of labels, gravity, principal axis angle, area, ferret diameter, circumference length, degree of circularity)	
		Stain/dirt inspection	Stain detection (support of differential stain detection through combined use with the differential filter, detection of multiple positions through grouping, and stability display)	
		Sorting	Pattern Sort (256 types max.)	
		Shade inspection	Shade inspection, color inspection (valid only when a color camera is connected)	
		Geometry	Display of points, lines, and circle areas where the operation result can be cited	
Continuous capture function			1-to-32-times continuous capture processing (maximum value, minimum value, average value), possible exclusion of the measurement error value from the measurement result	
Execution condition setting function			Enables you to set execution or non-execution that works with the measurement judgment results (OK/NG) of other optional windows per measurement window.	
Image capturing setting function	**Processing area setting function**		Enables you to specify a 980,000-pixel area (1024 (H) x 960 (V)) in any position as the processing area within 1,920,000 pixels (1,000,000-pixel mode). Enables you to specify a 240,000-pixel area (512 (H) x 480 (V)) in any position as the processing area within 320,000 pixels (standard mode).	Enables you to specify a 240,000-pixel area (512 (H) x 480 (V)) in any position as the processing area within 320,000 pixels.
	Scan mode (valid only when a monochrome camera is connected)		Progressive/interlace switching	
	Capturing start/end line setting function		Enables you to set any capturing start/end line within the image capturing range (for interlace, this specification is made in units of 2 lines).	
Correction functions	**Position adjustment**		Batch/individual adjustments (up to 64 settings), X, Y, ±180° rotation	
	Camera gain adjustment		Camera sensitivity adjustment (0.1 unit of 1.0 to 9.0), offset adjustment, span adjustment (supports settings in 16 tone levels; also supports RGB individual settings when a color camera is connected)	
	White balance adjustment (valid only when a color camera is connected)		Manual setting with white paper	
	Filter function	**Count**	9-time repetition for the same type, 13 levels (for binary and difference, 1 level/window)	
		Type	Expansion, shrink, averaging, median, edge enhancement, edge extraction X, edge extraction Y, Sobel, Prewitt, Roberts, Laplacian, binary, difference, illumination adjustment	
Calculation function	**Numerical operation**	**No. of settings**	128 calculation /program	
		Type	Four arithmetic operations, arithmetic function, comparison operator, geometric calculation function, coordinate conversion function, type conversion function, logical operator, journalizing function, system function, time axis operation function	
	Command memory		128 rewritable command memories are installed from the external devices and console during operation.	
Support functions	**Statistics analysis**	**No. of data Statistical item**	Up to 20,000 data points(support of batch save to memory card) Maximum value, minimum value, average value, deviation (3σ), OK/NG count in total judgment	
	Screen save (valid when monochrome and color cameras are connected)		Standard mode: Up to 511 screens/169 screens, 1,000,000-pixel mode: Up to 127 screens/41 screens, 2,000,000-pixel mode: Up to 63 screens/22 screens (Maximum value when one monochrome camera and one color camera are connected and the accumulation condition is "All")	Up to 511 screens/169 screens (Maximum value when one monochrome camera and one color camera are connected and the accumulation condition is "All")
	programming aid functions	**Display aid**	Enables you to perform screen display zoom, edge differentiation waveform display, profile display, and stain stability display during setup or operation.	
		Batch move	Enables you to collectively move selected windows in X and Y directions during setup.	
	Display template setting function	**No. of display templates**	10 patterns/setting (of the 10 patterns, 4 patterns are the specified values) Possible external switching	
		No. of screens that can be displayed simultaneously	Enables you to simultaneously display up to 5 screens (when 5-screen horizontal splitting or 5-screen vertical splitting is selected).	
		Hold image	Past images (NG images) can be displayed as hold images (up to 3 times before). The measurement result and measurement time can also be referenced (depending on the camera connection status, the displayable count changes from 0 to 3 times).	
	Screen customization function	**No. of customization screens**	10 screens/program, character string : Measured value, judgment result, optional character, fixed character, figure	
	Custom menu function		Enables you to create a shortcut menu to an optional setting screen (20 menus/program).	
	Operation rewrite function		Enables you to rewrite upper- and lower-limit tolerances and command memories during operation.	
	Memory card save function		Supports measured values, judgment results, NG count, measurement images (can be compressed and saved), saved images (can be compressed and saved), capture images, statistics analysis data, and direct save during inspection operation (excluding settings).	
	Others		Image capture function, password function, retest function, file management function, I/O monitor, RS232C monitor (with the log save function)	
Memory card			Supports NR-M32 (32MB), GR-M256 (256MB), CV-M1G (1GB), VFAT, and FAT32.	
Interface	**Control input**	**External trigger input**	2 points, simultaneous 2-camera capturing or individual capturing selectable, EV support, input rating: 26.4 V max., 3 mA min.	
			Simultaneous capturing of up to 4 cameras (excluding the color mega-pixel camera)or individual capturing selectable (If CV-E300 is not connected, up to 2 monochrome or color cameras can be simultaneously captured.)	Simultaneous 2-camera capturing or individual capturing selectable
		Control input	18 points, input rating: 26.4 V max., 2 mA min.	
	Control output	**Universal output**	27 points (including 2 FLASH output points that work with an external trigger), NPN/PNP open collector, 50 mA max. (30 V min.)	
		Total comparator output	1 point, NPN/PNP open collector, 50 mA max. (30 V min.)	
	Monitor output		Analog RGB output, SVGA 800 x 600 (24-bit color, 60 Hz)	
	Communication port		RS232C (maximum baud rate: 115200 bps)/Ethernet (100BASE-TX/10BASE-T)/USB (USB2.0 HI-SPEED supported) Numerical value output, image data (compressed output available), control I/O available, simultaneous use of 3 ports available	
		PLC link	Numerical value output that uses RS232C port, control I/O, and simultaneous use of Ethernet and USB ports available. A series and Q series of Mitsubishi Electric Corporation, and SYSMACC series and CJ/CJ1 series of Omron Corporation: Support via each link unit	
Display language			Japanese/English/German selectable	
Power supply voltage			DC24V±10%	
Current consumption			1.8 A (2-camera connection and maximum load)/2.8 A (4-camera connection and maximum load)	1.4 A (2-camera connection and maximum load)
Ambient temperature			2-camera connection: 32 to 122°F (0 to 50°C) megapixel camera connection: 32 to 113°F (0 to 45°C) 4-camera connection: 32 to 113°F (0 to 45°C) megapixel camera connection: 32 to 104°F (0 to 40°C)	32 to 122°F (0 to +50°C)
Relative humidity			35 to 85%, no condensation	
Weight			Approx. 950 g	

*1 For one standard mode monochrome camera, one registered image (compressed image) and nine measurement windows (Typical)

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Specifications (camera)

Camera (CV-200C/CV-200M/CV-S200C/CV-S200M)

Model	Camera (CV-200C/CV-200M)	Camera (CV-S200C/CV-S200M)
Image receiving element	1/1.8 -inch color CCD image receiving element, square-pixel/all-pixel reading, 2,010,000 pixels (CV-200C) 1/1.8 -inch monochrome CCD image receiving element, square-pixel/all-pixel reading, 2,010,000 pixels (CV-200M)	1/1.8 -inch color CCD image receiving element, square-pixel/all-pixel reading, 2,010,000 pixels (CV-S200C) 1/1.8 -inch monochrome CCD image receiving element, square-pixel/all-pixel reading, 2,010,000 pixels (CV-S200M)
Number of valid pixels	1,920,000 pixels 1600 (H) x 1200 (V)[1]	
Scanning system	Progressive (59 ms: 2,000,000-pixel mode, 48 ms: 1,000,000-pixel mode) Interlace: CV-200M only (34 ms: 2,000,000-pixel mode, 26 ms: 1,000,000-pixel mode)	Progressive (59 ms: 2,000,000-pixel mode, 48 ms: 1,000,000-pixel mode) Interlace: CV-S200M only (34 ms: 2,000,000-pixel mode, 26 ms: 1,000,000-pixel mode)
Transfer system	Digital serial transfer	
Electronic shutter	1/15, 1/30, 1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000, 0.05 msec to 9000 msec can be set with numeric values.	
Lens mount method	C mount	Special mount (M15.5 P0.5 male)
Ambient temperature	32 to 104ºF (0 to +40ºC)	Head: 32 to 104ºF (0 to 40ºC), relay unit: 32 to 104ºF (0 to 40ºC) (however, 95ºF (35ºC) max. in partial capturing 50 lines or lower)
Relative humidity	35 to 85%, No condensation	
Weight	Approx. 110 g (not including lens)	Head: Approx. 210 g (including the cable, not the lens), relay unit: Approx. 70 g

*1 In 1,000,000-pixel mode, 980,000 pixels (1024 x 960) among 1,920,000 pixels serve as the processing area.

Camera (CV-035C/CV-035M/CV-S035C/CV-S035M)

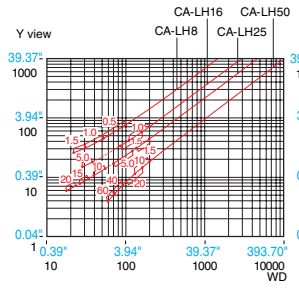
Model	Camera (CV-035C/CV-035M)	Camera (CV-S035C/CV-S035M)
Image receiving element	1/3 -inch color CCD image receiving element, square-pixel/all-pixel reading, 350,000 pixels 1/3 -inch monochrome CCD image receiving element, square-pixel/all-pixel reading, 350,000 pixels	1/3 -inch color CCD image receiving element, square-pixel/all-pixel reading, 350,000 pixels 1/3 -inch monochrome CCD image receiving element, square-pixel/all-pixel reading, 350,000 pixels
Number of valid pixels	320,000 pixels 657 (H) x 492 (V) [2]	
Scanning system	Progressive (16 ms) Interlace: CV-035M only (9ms)	Progressive (16 ms) Interlace: CV-S035M only (9 ms)
Transfer system	Digital serial transfer	
Electronic shutter	1/15, 1/30, 1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000, 0.05 msec to 9000 msec can be set with numeric values.	
Lens mount method	C mount	Special mount (M10.5 P0.5 male)
Ambient temperature	32 to 122ºF (0 to +50ºC)	Head: 32 to 122ºF (0 to 50ºC), relay unit: 32 to 104ºF (0 to 40ºC)
Relative humidity	35 to 85%, No condensation	
Weight	Approx. 100 g (not including lens)	Head: Approx. 160 g (including the cable, not the lens), relay unit: Approx. 70 g

*2 In standard mode, 240,000 pixels (512 x 480) among 320,000 pixels serve as the processing area.

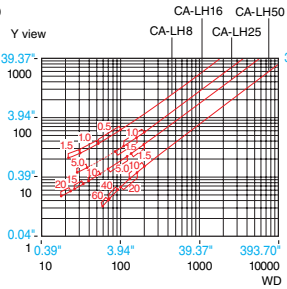
Lens selection charts

Unit: inch mm

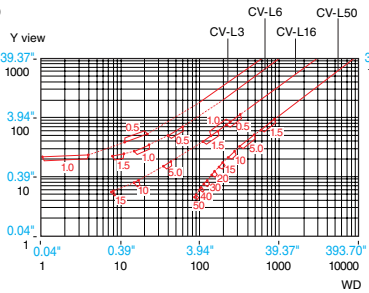
CV-200C/CV-200M
(When CA-LH Series is installed)



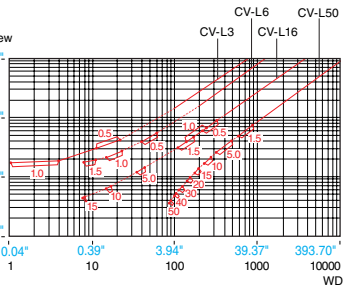
CV-200C/CV-200M
(When CA-LH Series is installed,1,000,000-pixel mode)



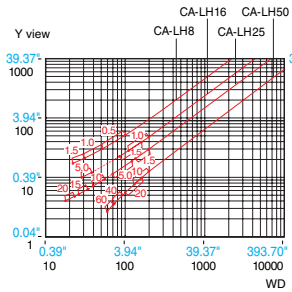
CV-200C/CV-200M
(When CV-L Series is installed)



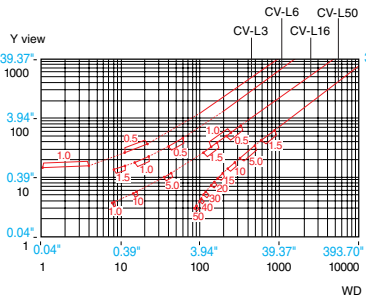
CV-200C/CV-200M
(When CA-L Series is installed,1,000,000-pixel mode)



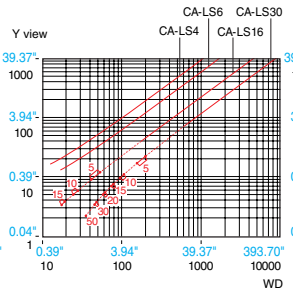
CV-035C/CV-035M
(When CA-LH Series is installed)



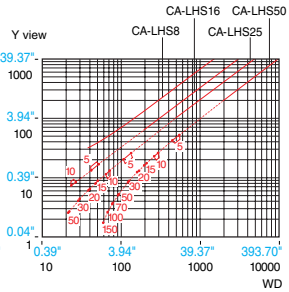
CV-035C/CV-035M
(When CV-L Series is installed)



CV-S035C/CV-S035M
(When CA-LS Series is installed)



CV-S200C/CV-S200M
(When CA-LHS Series is installed)



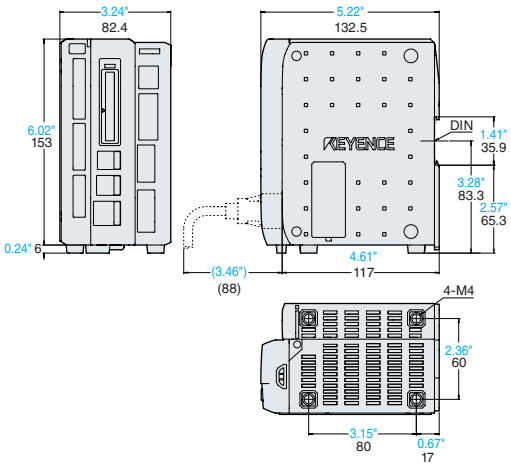
Values in the table are merely reference values; they may have to be adjusted during installation.

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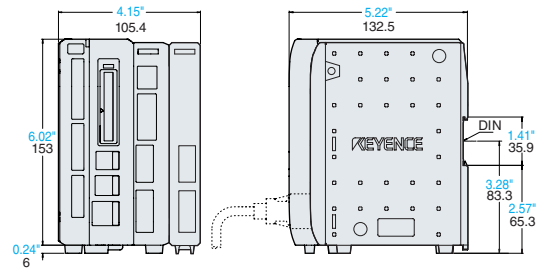
Unit: inch mm

Dimensions

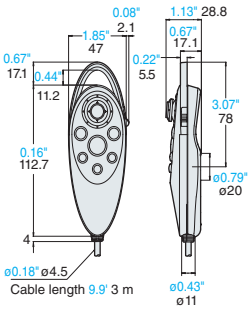
Controller CV-3502(P)/ CV-3002(P)



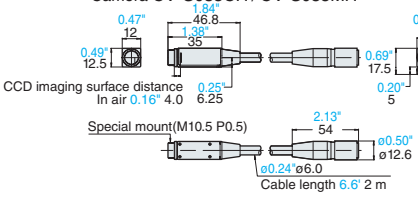
When camera expansion unit CV-E300 is installed (CV-3502(P) only)



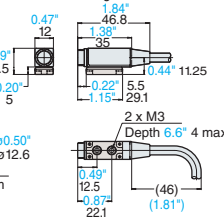
Console



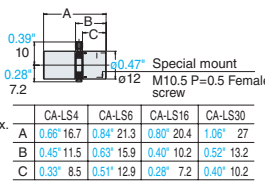
Camera CV-S035CH / CV-S035MH



When a mounting bracket is installed

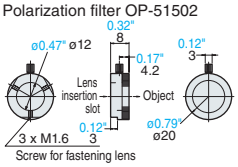


Lens CA-LS □

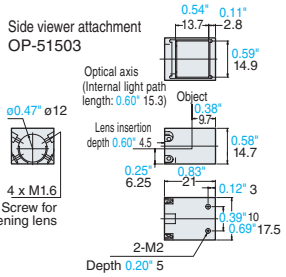


	CA-LS4	CA-LS6	CA-LS16	CA-LS30
A	0.66" 16.7	0.84" 21.3	0.80" 20.4	1.06" 27
B	0.45" 11.5	0.63" 15.9	0.40" 10.2	0.52" 13.2
C	0.33" 8.5	0.51" 12.9	0.28" 7.2	0.40" 10.2

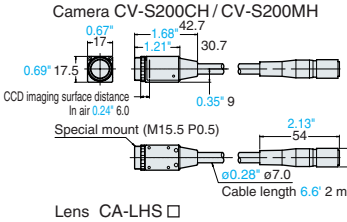
Polarization filter OP-51502



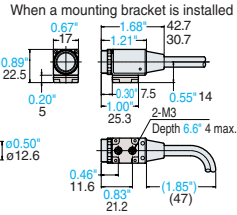
Side viewer attachment OP-51503



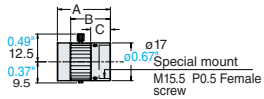
Camera CV-S200CH / CV-S200MH



When a mounting bracket is installed

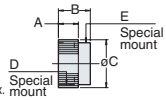


Lens CA-LHS □



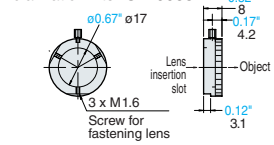
	CA-LHS8	CA-LHS16	CA-LHS25	CA-LHS50
A	1.59" 40.4	0.94" 23.9	0.98" 24.9	1.59" 40.4
B	1.13" 28.6	0.70" 17.9	0.73" 18.6	1.07" 27.1
C	0.77" 19.6	0.35" 8.9	0.38" 9.6	0.71" 18.1

Closeup ring OP-51500 (0.20" 5)/ OP-51501 (0.39" 10)/ OP-66830 (0.20" 5)/ OP-66831 (0.39" 10)

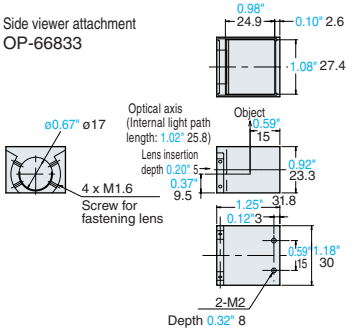


	OP-51500	OP-51501	OP-66830	OP-66831
A	0.20" 5	0.39" 10	0.20" 5	0.39" 10
B	0.32" 8	0.51" 13	0.32" 8	0.51" 13
C	0.47" 12	0.47" 12	0.67" 17	0.67" 17
D	M10.5 P=0.5 Female screw		M15.5 P=0.5 Female screw	
E	M10.5 P=0.5 Male screw		M15.5 P=0.5 Male screw	

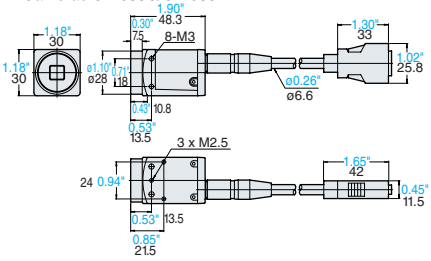
Polarization filter OP-66832



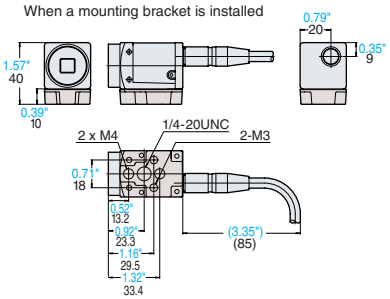
Side viewer attachment OP-66833



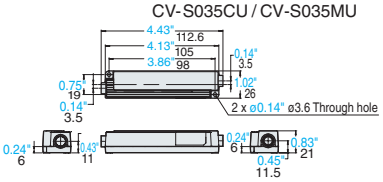
Cameras CV-035C/CV-035M



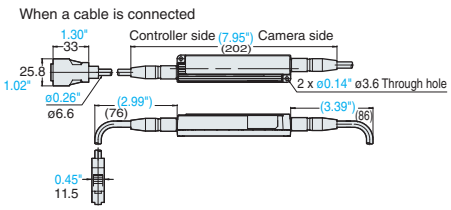
When a mounting bracket is installed



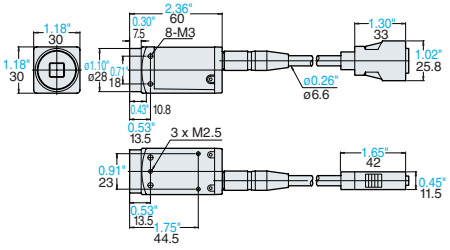
Camera control unit CV-S200CU / CV-S200MU / CV-S035CU / CV-S035MU



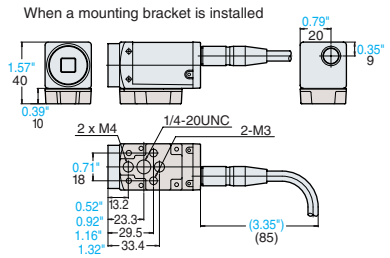
When a cable is connected



Camera CV-200C / CV-200M



When a mounting bracket is installed

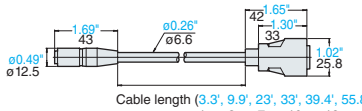


Camera cable

CV-C3 (9.9' 3 m)/ CV-C10 (33' 10 m)/CV-C17 (55.8' 17 m)
OP-51499 (3.3' 1m)

High-flex camera cable

CV-C3R (9.9' 3 m)/ CV-C7R (33' 7 m)/CV-C12R (39.4' 12 m)



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Peripheral devices

CA-LH Series High-resolution, low-distortion lens optimum for megapixel image processing

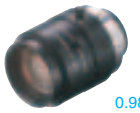
High-resolution lens



0.32"
8 mm
CA-LH 8



0.63"
16 mm
CA-LH16

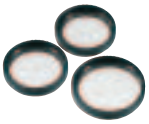


0.98"
25 mm
CA-LH25



1.97"
50 mm
CA-LH50

Protective filter for lens



Lens diameter For 0.98" 25 mm CA-LF 25
For 1.06" 27 mm CA-LF 27
For 1.18" 30 mm CA-LF 30

CA-LM Series Telecentric macro lens



2X
CA-LM2



4X
CA-LM4



6X
CA-LM6



8X
CA-LM8



0.5-to-1-time
CA-LM0510

CA-LHS Series CV-S200C/CV-S200M dedicated lens

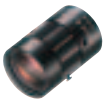
High-resolution lens



0.32"
8 mm
CA-LHS8



0.63"
16 mm
CA-LHS16



0.98"
25 mm
CA-LHS25



1.97"
50 mm
CA-LHS50

Closeup ring



0.20"
5 mm
OP-66830



0.39"
10 mm
OP-66831

Polarization filter



OP-66832

Side viewer attachment



CA-LS Series CV-S035C/CV-S035M dedicated lens

High-resolution lens



0.16"
4 mm
CA-LS4



0.24"
6 mm
CA-LS6



0.63"
16 mm
CA-LS16



1.18"
30 mm
CA-LS30

Closeup ring



0.20"
5 mm
OP-51500



0.39"
10 mm
OP-51501

Polarization filter

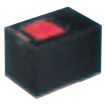


OP-51502

Side viewer attachment



CA-D Series LED Illumination



Coaxial vertical light
CA-DX



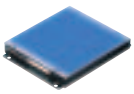
Low-angle light
CA-DL



Direct-ring light
CA-DR



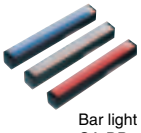
LED Illumination controller
CA-DC100



Backlight
CA-DS

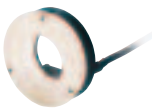


Dome light
CA-DD



Bar light
CA-DB

Fluorescent Illumination Unit



Fluorescent illumination
CV-R11

Monitor



8.4" LCD color monitor
CA-MP80

Power Supply Unit



24 VDC Power Supply Unit
CA-U2

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ADDITIONAL USEFUL PRODUCTS

MERITS OF LASER MARKING

- It can clearly mark on curved, rough or soft objects.
- It minimizes shock, and does not damage products.
- It can mark small characters (less than 1 mm).
- It can mark on moving objects on high-speed production lines without stopping the line.

HIGH POWER LASER MARKER

ML-G9300 Series



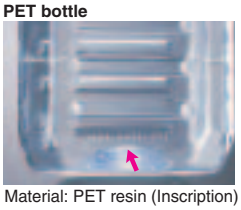
- World's highest power : 30 W output
- World's highest speed : 600 characters/second
- Laser Power Stability within ±5%

Harness



Material: Vinyl chloride
(Color-developed)

PET bottle



Material: PET resin (Inscription)

Character size (Typical examples)

0123456789
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz

Logo mark

bmp/jpg data



2D Code

Data Matrix　QR　MICRO QR

Bar code

CODE39

2 of 5　ITF

Arch/Angle alignment



COMPLETELY AIR-COOLED ULTRA-COMPACT LASER MARKER

MD-H9800 Series

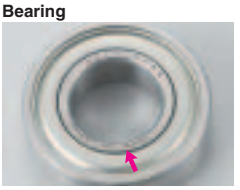


- Environmental resistance
- Air-cooled method
- Clear marking equivalent to a 30 W water-cooled system

Light bulb



Bearing



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