

# Vision System General Catalog



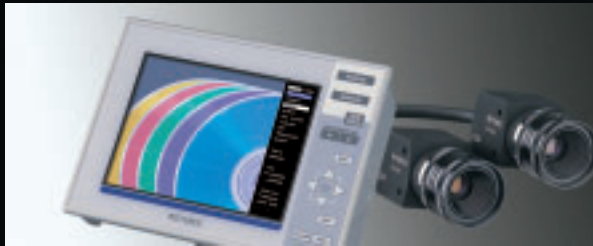
High-Speed Mega-Pixel  
Machine Vision System

**CV-2600** Series



High-Speed Digital  
Machine Vision System

**CV-2100** Series



Advanced Color  
Image Processing

**CV-700** Series



Machine Vision System  
LED Illumination

**CA-D** Series

High-Speed, High-Accuracy  
User-Friendly Machine Vision Systems

# General Catalog Index

## Product Overview-Vision Systems



### High-Speed Mega-Pixel Machine Vision CV-2600

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First in its class 2 mega-pixel CCD | Page 06

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Simple, menu driven processing | Page 11

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### High-Speed Digital Machine Vision CV-2100

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High speed processing of up to 20,000 parts per minute | Page 04

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High repeatability :  $\pm 0.05$  pixels | Page 07

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Simple, menu driven processing | Page 11

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Industry's smallest camera | Page 18

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### Advanced Image Processing CV-700

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Advanced color processing technology enables stable processing in a wide array of applications | Page 20

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All-in-one design simplifies integration | Page 20

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Simple, menu driven processing | Page 21

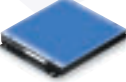
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## Product Overview-Lighting & Peripheral Equipment

Coaxial vertical light  
CA-DX



Backlight  
CA-DS



LED Illumination controller  
CA-DC100



Low-angle light  
CA-DL



Dome light  
CA-DD



Direct-ring light  
CA-DR



Bar light  
CA-DB



### LED Illumination

Multiple lighting units available | Page 24

Long life & maintenance free | Page 24

Low current consumption | Page 24

Intensity adjustment with  
dual light control | Page 24

0.14"  
3.5 mm  
CV-L3



0.24"  
6 mm  
CV-L6



0.63"  
16 mm  
CV-L16



1.97"  
50 mm  
CV-L50



0.32"  
8 mm  
CA-LH8



0.63"  
16 mm  
CA-LH16



0.98"  
25 mm  
CA-LH25



1.97"  
50 mm  
50



### Lenses

Multiple lens options can solve  
almost any vision applications | Page 28

Low-distortion &  
macro lenses available | Page 28

Best in class image contrast | Page 30

8.4" LCD color monitor CA-MN80



Special stand



### Monitors

Space saving, panel mountable  
TFT technology | Page 32

Multiple mounting options | Page 32

A variety of sizes available | Page 34

Providing the versatility, speed,  
and power to solve any application.  
The smart choice in machine vision systems...

## Ultra High Accuracy

2 Mega-Pixel CCD

&

## Ultra High Speed & Versatile

20,000 Parts/Minute

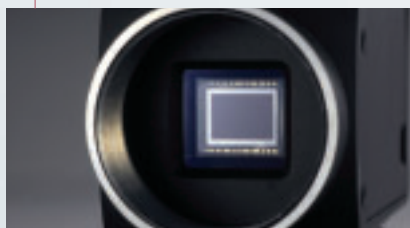
CV-2600  
Series

CV-2100  
Series



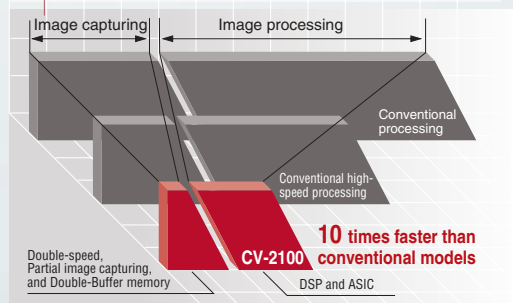
Highest  
in its class

2 mega-pixel  
CCD



Fastest  
in its class

Image processing in  
1/10 the time





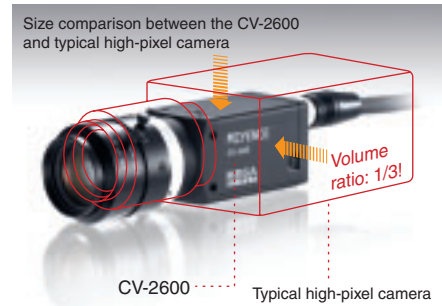
# User-friendly Setup and Operation with CV-2600/2100

## Stable

### Digital Image Data Transfer

The first-in-its-class 2 mega-pixel CCD is built into the industry's smallest camera housing. The digitized image transfer allows processing of a high-resolution image without noise interference.

CV-2600  
Mega-Pixel  
Camera



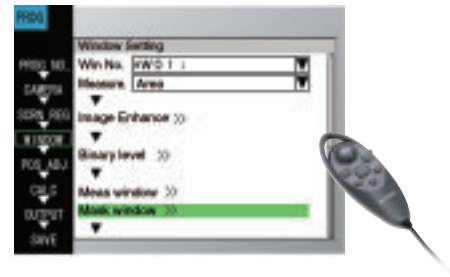
Exceptionally  
Small  
CV-022



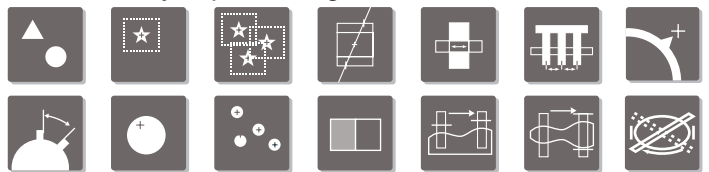
## Easy

### Visual Flow Menu

The programming menus flow from top to bottom, guiding users through the simple setup procedures. Since no PC is required, even novice users can quickly and easily configure all of the powerful vision tools.



A wide variety of processing tools



## Convenient

### On-Screen Statistical Data Processing

The first-in-class statistical function of the CV-2600/2100 allows the user to check the maximum, minimum, and average values of up to 11264 data points. The data is broken down by inspection number and displayed on a histogram and a trend graph, allowing for easy analysis of failed parts and optimization of tolerance settings.



# Higher Accuracy Over a Wider Range

CV-2600

CV-2600/2100

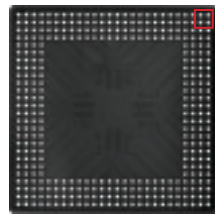
Machining Vision System

## One mega-pixel mode

By cutting out an area of 1 million pixels from the 2 million-pixel CCD, both speed and accuracy can be improved. This supports high speed production line applications.

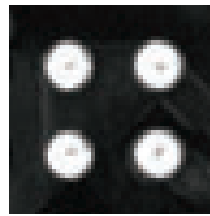
### Better resolution

With the same field of view

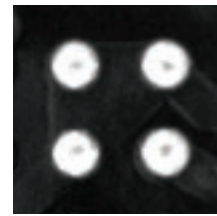


Magnified view

240,000 pixels



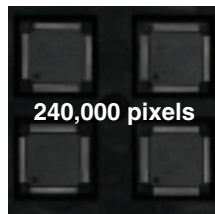
1 million pixels



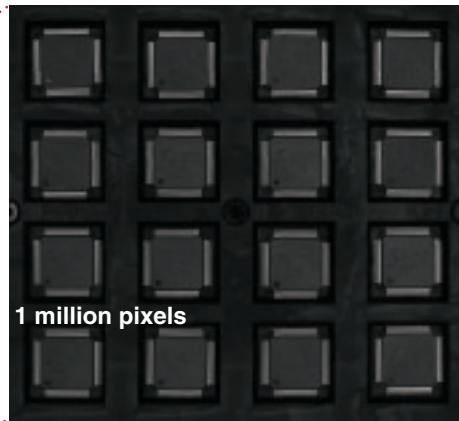
An image with a higher resolution improves measurement accuracy.

### Wider range

With the same precision per pixel



4x magnification



Since a larger FOV can be inspected with the same precision, it is unnecessary to mount or move multiple cameras. This will reduce costs and save on overall production time.

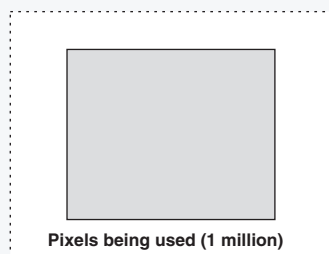
CV-2600

## 2 mega-pixel mode

Industry's first

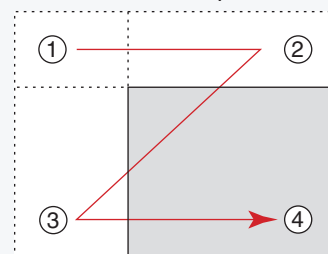
By automatically shifting the 1 million pixel target area, the camera can use the full 2 million pixel image to perform inspections.

Normal mode



Effective pixels of the CCD (2 million)

2 million-pixel mode



By dividing an image into four sections and capturing each image in turn, the camera can use all 2 million pixels.

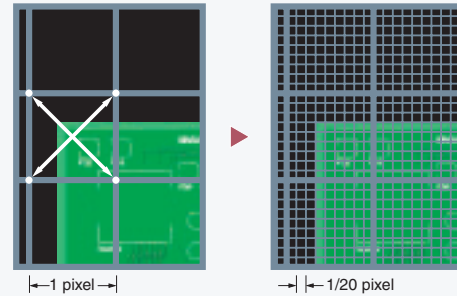


Enabling highly accurate positioning and measurement

CV-2600 CV-2100

## Repeatability of $\pm 0.05$ pixels Highest in its class

The combination of sub-pixel processing and digitalization of image data allows the CV-2600/2100 to achieve high accuracy and repeatability down to  $\pm 0.05$  pixels. Sub-pixel processing allows the display resolution to be reduced to 1/1,000 pixel.

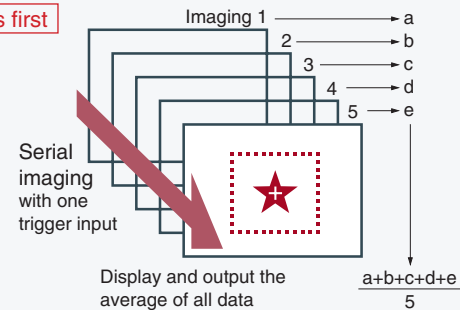


Stabilize the data with repeated imaging

CV-2600 CV-2100

## Serial image capturing mode Industry's first

With serial imaging enabled, a single trigger input will capture and process two or more images (up to 32). If the image is unclear due to environmental conditions or varied due to vibration, the CV-2100/2600 will average multiple images providing stable and reliable data.



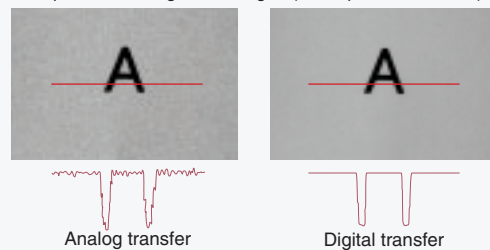
High-quality image with less noise

CV-2600 CV-2100

## Digital image transfer First in its class

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 (conceptual illustration)



Stable processing even with poor lighting conditions

CV-2600 CV-2100

## Highly-sensitive image capturing & Span/Shift function

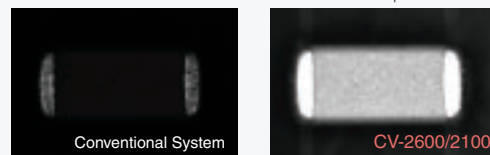
First in its class

The sensitivity of the camera can be adjusted in 81 levels. Setting a higher sensitivity ensures sufficient brightness even while the high-speed shutter is used. Expensive strobe lighting is no longer necessary.

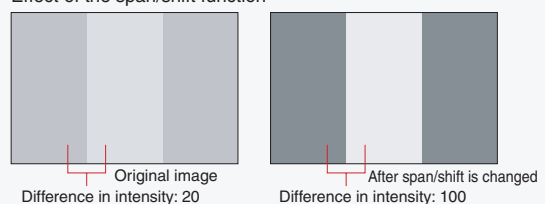
The span/shift function increases the difference in the contrast of low-contrast targets, ensuring more stable image processing.

Effect of the higher sensitivity

Comparison of images with a shutter speed of 1/10,000 sec.  
Note: Under the same conditions with fluorescent lamp illumination



Effect of the span/shift function



# Faster Processing

Ultra high-speed processing through use of a new image-processing engine and double-speed camera

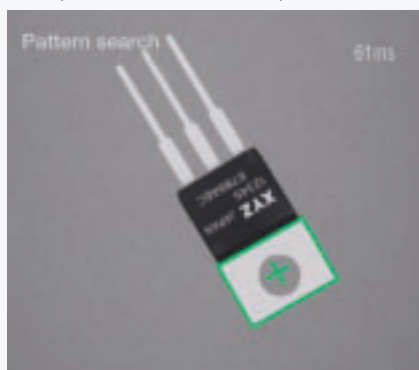
360° real-time search

CV-2600 CV-2100

## High-speed rotation search

**Fastest in its class**

The newly developed ASIC technology specifically designed for mega-pixel capability has achieved an ultra high-speed rotation search. Using normalized correlation, this technology enables real-time search with a minimum speed of 33 ms. (61 ms with CV-2600)



(Search area: 300x300)



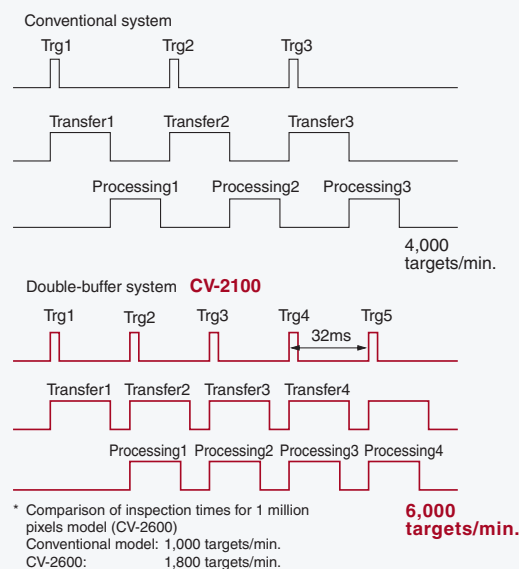
Accepts trigger inputs during image processing

CV-2600 CV-2100

## Double buffer

**First in its class**

The double-buffer memory allows the CV-2100 to accept a trigger input while an image is being processed. As a result, inspection times of approximately 10 ms (6,000 parts/min.) are possible even under the non-interlaced reading mode. (32 ms or 1,800 parts/min. for CV-2600)

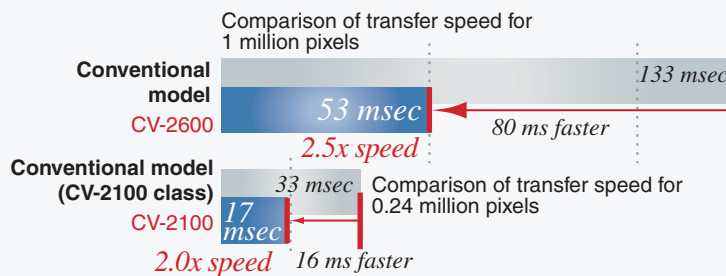


High-speed transfer of a large amount of image data

CV-2600 CV-2100

## 2.5x speed progressive transfer **Fastest in its class**

The high speed CCD and the LVDS (Low Voltage Differential Signal) transfer method operates 2.5 times faster than conventional models. This allows a wide range of applications for production lines.



High-speed transfer of only the required data

CV-2600 CV-2100

## Partial image reading

The image transfer time can be significantly reduced by using the partial image reading function, which transfers only the necessary parts of an image.

Comparison of the processing time for measuring pin pitches



When reading all lines:  
 CV-2100: 20 msec  
 CV-2600: 56 msec

When reading 100 lines:  
 CV-2100: 8 msec  
 CV-2600: 12 msec



# Expanded Functionality

Machine Vision System  
CV-2600/2100



New functions to take advantage of high-resolution images

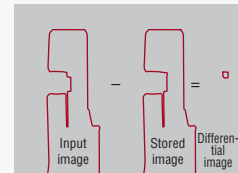
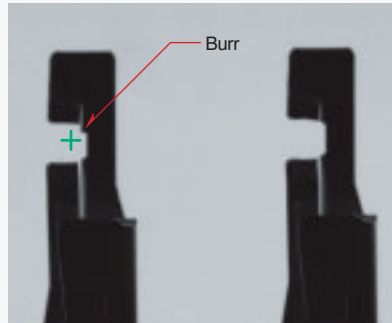
Reliable detection of defects on the outline of a target

CV-2600

## Burr/chip detection First in its class



The CV-2600 Series can detect defects in the outline of a target, which can be difficult with conventional image processing. In addition to the higher image resolution, this function ensures more stable detection of burrs or chips on molded or stamped products.



### Burrs/chips detection

The differences between the input image and pre-registered image are obtained with image calculations. Then, the stain (flaw) inspection is performed using the differential image to detect the presence/absence of defects.

Precisely capture the edge profile of a target

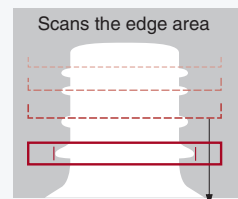
CV-2600

CV-2100

## Trend edge function First in its class



The trend edge function scans in a specified direction within a measurement area and calculates the minimum, maximum, and average position of each point. This function is effective for measuring maximum and minimum outer diameters, and detecting burrs or flash.



### Trend edge

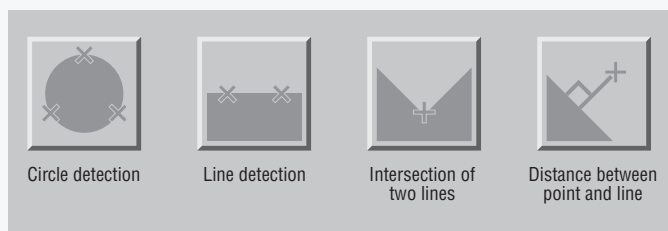
The edge width and position of each point is obtained by scanning only a narrow width in the specified direction. The maximum, minimum, and average values can be obtained from the data of each point.

Sophisticated dimension measurement

CV-2600

## Geometric calculation tools NEW

Basic tools required for geometric dimension measurement are featured on the CV-2600, this includes the intersection point of two lines and the distance between a point and a line. These tools enhance the system's ability to perform complex measurements.



Obtains an optimal image for image processing

CV-2600

CV-2100

## Pre-processing tools Largest variety in its class

Twelve types of image enhancements are available to ensure stable inspection.



### Filter types

- Expand
- Shrink
- Average
- Median
- Edge enhancement
- Edge extraction (X, Y)
- Sobel
- Roberts
- Prewitt
- Laplacian
- Binary

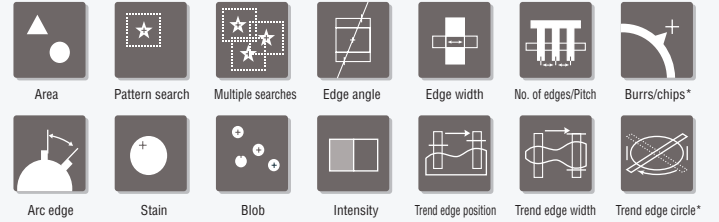
# A Wide Range of Inspection Tools

Suitable for every inspection need

CV-2600 CV-2100

## Basic inspection tools

Features a variety of inspection tools including Area, Pattern search, Multiple searches, Edge angle, Edge width, No. of edges/Pitch, Stain, Blob, Intensity, Trend edge position, and Trend edge width. Ready to solve all of your application needs.



\* CV-2600 only

<p><b>Edge pitch mode</b></p> <p>Measuring the lead pitch on LCD TAB tape</p>	<p><b>Trend edge position mode</b></p> <p>Measuring the coplanarity of connector pins</p>
<p><b>Stain mode</b></p> <p>Inspection of foreign materials in a cap</p>	<p><b>Blob mode</b></p> <p>Inspection of solder balls in BGA</p>
<p><b>Pattern search mode</b></p> <p>Positioning of the CCD in a digital camera</p>	<p>Differentiation of the buttons on a mobile phone</p>

## Other functions

CV-2600 CV-2100

<b>Multiple position adjustments</b>	The positions of two or more detection areas can be adjusted by using multiple position-detection data.
<b>Flexible shape of the inspection area</b>	Up to 64 detection areas can be set for one program. Shapes include Arc, Oval, and Polygon
<b>Automatic area tracking function</b>	The size of the inspection area is automatically adjusted according to the size of the target. Available window shapes include circle, ring and square.
<b>Edge intensity waveform graph</b>	Graphically displays the changes in contrast throughout an inspection window. This allows for stable inspection of edge dimensions.
<b>Illumination correction function</b>	Supports stable detection by automatically compensating for variations in ambient lighting and changes in light intensity over time.
<b>Scaling function</b>	The display measurements can easily be converted to any standard unit of measure.

# Simple Configuration

Machine Vision System  
CV-2600/2100

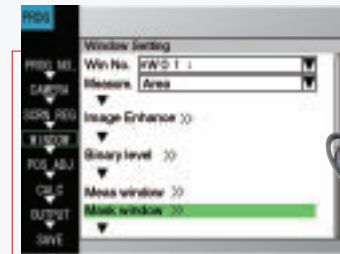


Easy program setup by following the menu from top to bottom

CV-2600 CV-2100

## Vision flow menu

The programming menus flow from top to bottom, guiding users through the simple set up procedures. Since no PC is required, even novice users can quickly and easily program and troubleshoot.



A setting can be made easily using the special console.



The program can be configured by following the menu from top to bottom

Magnified image for easy and reliable setup

CV-2600

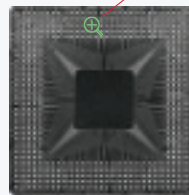
## Image magnification function

NEW

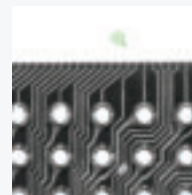
Click the icon.

Any point on the CV-2600 screen can be magnified by 2-8x.

The magnified image can be used for easy setup. The image can also be magnified during operation.



Normal screen



Magnified screen



Scrolling on the magnified image is also available.

Flexible layout of display items

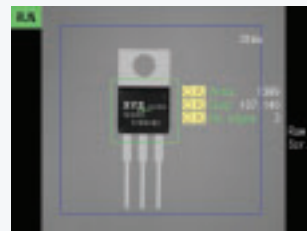
CV-2600 CV-2100

## Display screen customization

Any measurement data, text, or graphics can be specified and positioned on the image allowing the user to create a highly comprehensive display. In addition, the password setting prevents unwanted program changes.



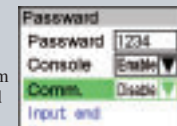
Standard screen



Customized screen

Password setting function

The password setting function protects the program from unauthorized changes.



A Wide range of display modes

CV-2600 CV-2100

## Selectable screen display

Top menu screen



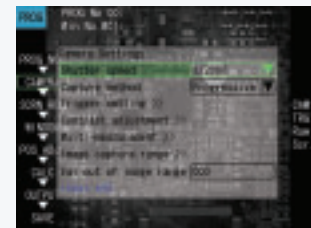
Large icons create an eye-catching, attractive display.

Results listing screen



Multiple judgment results can be viewed on a list display.

Transparent menus



The measurement screen can be monitored with a transparent display while adjusting the settings.

# Troubleshooting Made Easy

Simplified tolerance setting and inspection history analysis

CV-2600

CV-2100

## On-screen statistical data processing First in its class

The first-in-class statistical function of the CV-2600/2100 allows the user to check the maximum, minimum, and average values of up to 11264 data points. The data is broken down by inspection number and displayed on a histogram and a trend graph, allowing for easy analysis of failed parts and optimization of tolerance settings.



Tolerance updates during operation

CV-2600

CV-2100

## Rewrite tolerances without stopping the line

The upper and lower limits of the pre-programmed inspection item can be rewritten during operation. The settings can be changed in real time without stopping the line.



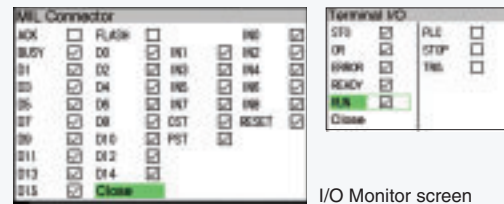
Effective for eliminating faulty wiring and detecting disconnections

CV-2600

CV-2100

## I/O Monitor

The status of input/output terminals can be monitored on the menu screen of the CV-2600/2100, allowing the user to test for faulty wiring and broken wires in advance.



I/O Monitor screen

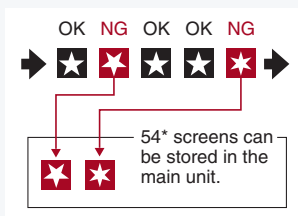
Stores up to 54\* screens

CV-2600

CV-2100

## Save screen function

Up to 54\* screens can be stored in the memory of the CV-2100 during operation without adding extra processing time. This function is useful when checking the history of NG screens, restoring the saved screens, and adjusting the settings for retesting purposes.



\* When using CV-2600: Up to 22 screens

Saving the current screen in bmp format

CV-2600

CV-2100

## Screen capture function

The complete contents of the display screen can be captured and stored directly to a Compact Flash memory card. This function is easy to operate and simplifies the task of generating reports of the inspection results.



# Wide Variety of Output Interfaces



## Ethernet communication

LAN connection is available via 100BaseTX. High-speed transfer of the measured data and images can be performed during operations. The inspection status of two or more CV-2600/2100 units can be monitored on a single PC.



PC

## Compact Flash memory card capability

Measured data and images can be written directly onto a high-capacity 256MB Compact Flash memory card during operations without affecting the processing time. This function is useful for data analysis and trend analysis using spreadsheet software such as Microsoft Excel.

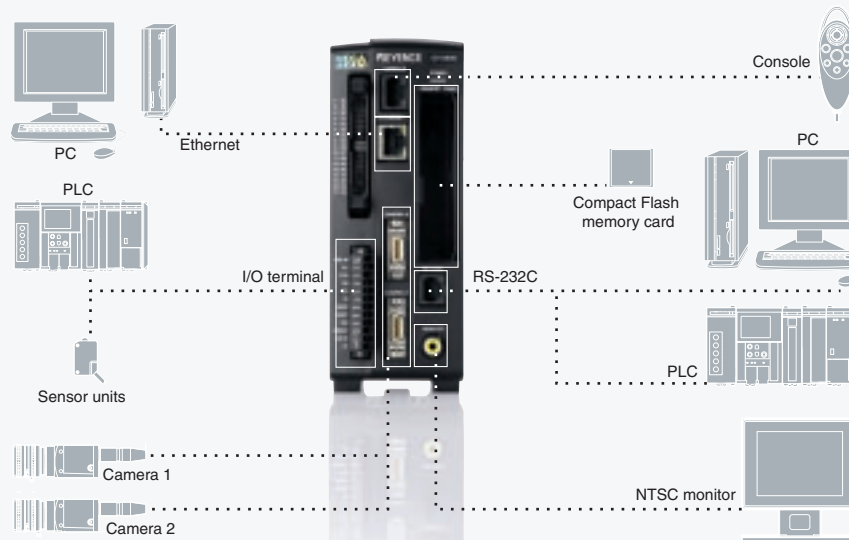


## 2-camera connection

Two newly developed, mega pixel cameras can be connected, enabling simultaneous capturing of images.



## System configuration



## Product lineup and options

Controller  
CV-2600/2100



Console  
(Included with the  
CV-2600/2100)



Camera CV-025/020



Camera cable  
(Cable length:  
9.8' (3 m))  
CV-C3



Camera cable  
(Cable length:  
32.8' (10 m))  
CV-C10



Monitor cable  
(Cable length: 6.6' (2 m))  
(Included with the  
CV-2600/2100)



MIL connector  
with 3-m cable  
OP-42341



RS-232  
Communication  
cable OP-26487



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



Ethernet cable  
OP-42275



256-MB Compact Flash  
memory card: GR-M256  
32-MB Compact Flash  
memory card: NR-M32



# Peripheral Devices

## Camera Cable

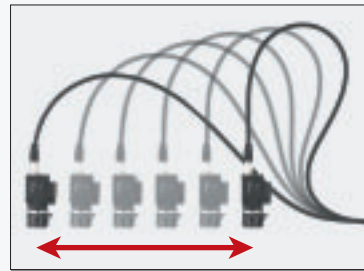
### High-Flex Camera Cable NEW

Ideal for connecting a camera to robots or other moving parts



#### Reliable for over 1 million bend cycles.

This high-flex cable broadens the array of applications that the CV-2100 can be used for by allowing the camera to be mounted on robots or other moving parts.



**Reliable for over 1 million bend cycles**

\* Bend radius = 1.18" (30 mm) (typ.)

A service life 10 times longer than that of conventional cables



#### No change in cable diameter

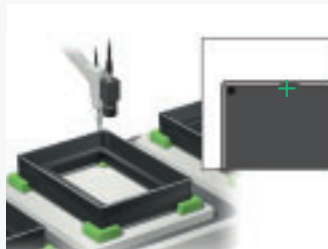
Reengineering of the materials and structure has resulted in improved flexibility without increasing the cable diameter.

#### Applications

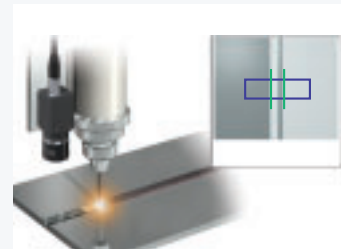
Robot positioning



Detecting breaks in the application of a sealing agent

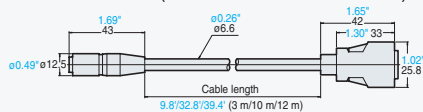


Measuring the width of a welding groove



#### Dimensions

Camera cable (CV-C3R/CV-C7R/CV-C12R)



#### Specifications

Camera cable

MODEL	Cable length	Weight (g)
CV-C3R	9.8' 3 m	220
CV-C7R	23.0' 7 m	450
CV-C12R*	39.4' 12 m	740

Applicable for CV-2100 (camera: CV-020/022)

CV-2600 (camera: CV-025)

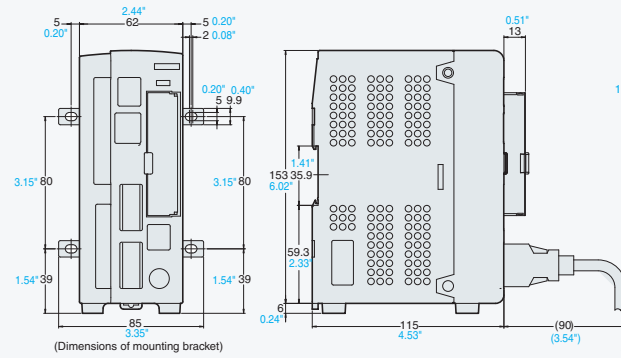
\*CV-C12R can be used for CV-2100 (camera: CV-020) only



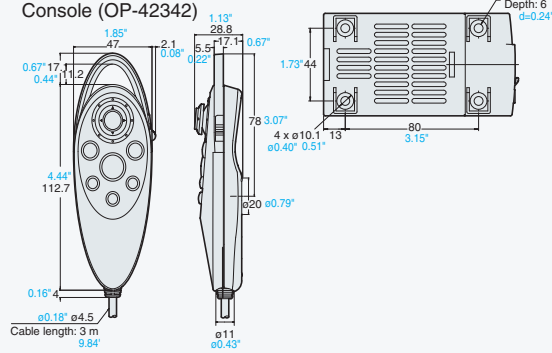
Dimensions

Unit: inch mm

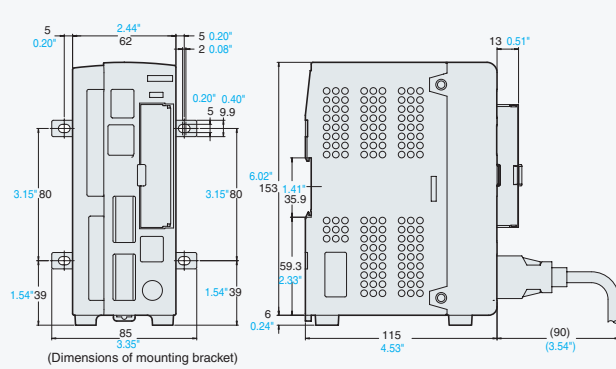
Controller CV-2600



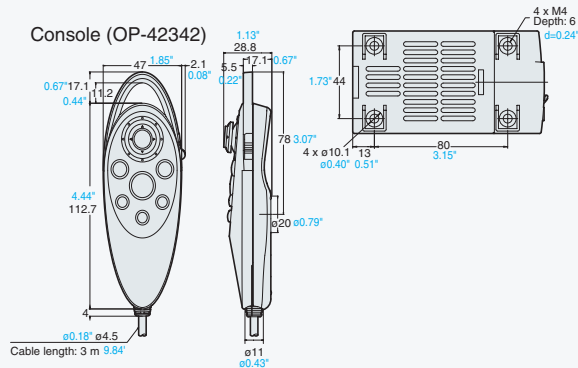
Console (OP-42342)



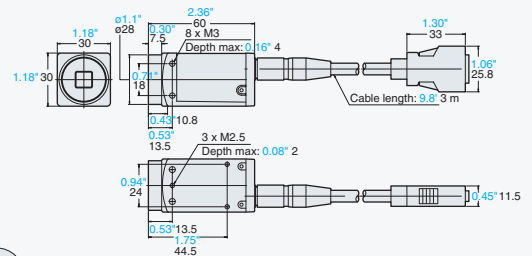
Controller CV-2100



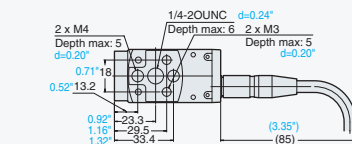
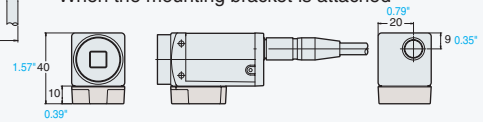
Console (OP-42342)



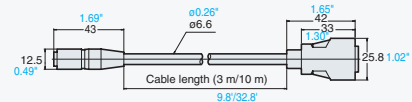
Camera CV-025



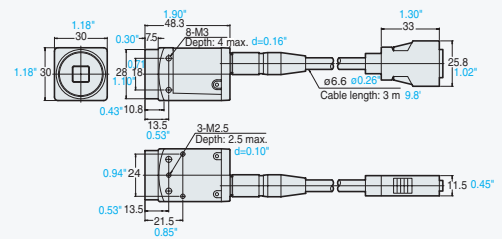
When the mounting bracket is attached



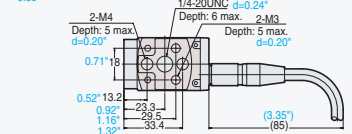
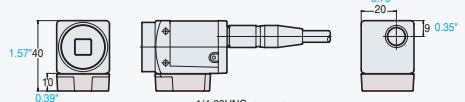
Camera cable (CV-C3/CV-C10)



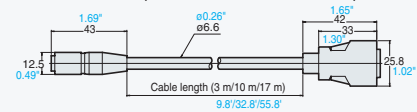
Camera CV-020



When the mounting bracket is attached



Camera cable (CV-C3/CV-C10/CV-C17)



## Specifications

### Controller

Model	CV-2600				
No. of pixels	In normal mode: 980,000 pixels: 1024 (H) x 960 (V) In 2 million-pixel mode (with split capturing): 1,980,000 pixels: 1620 (H) x 1220 (V)				
Camera input	2 cameras (Connectable camera: CV-025 only)				
Process cycle	30 c/sec. (Varies depending on the settings.)				
Program registration	32 programs. Programs can be externally selected.				
No. of registered screens	34 screens (Up to 4 screens/1 program)				
Window setting	Measurement area	64 areas/1 program			
	Mask area	4 areas/1 window			
Function	Measurement mode	Area	Window shape: square, circle, oval, ring, arc, polygon (max: 12 sides), edge detection area, and edge detection circle area		
			Position detection	Pattern search	Multiple searches are available. Window shape: square, circle, oval, and polygon (max: 12 sides)
				Edge detection	Angle measurement available Window shape: square, rotating square, ring, and arc
				Gravity position	Window shape: square, circle, arc, polygon (max: 12 sides), and edge detection circle area
		Trend edge position		Window shape: square, rotating square, ring, and arc	
		Inspection mode	Width measurement	Window shape: square, rotating square, ring, and arc	
			Pitch measurement	Window shape: square, ring, arc, and edge detection circle area	
			No. of edges	Window shape: square, rotating square, ring, and arc	
			Edge angle	Window shape: square	
			Blob (Feature volume)	No. of blobs, gravity, principal axis angle, area, ferret diameter, circumference length, and circularity Window shape: square, circle, oval, ring, arc, polygon (max: 12 sides), edge detection area, and edge detection circle area	
			Stain detection (Burr/chip)	Window shape: square, circle, oval, ring, arc, polygon (max: 12 sides), edge detection area, and edge detection circle area	
			Intensity inspection	Window shape: square, circle, oval, ring, arc, polygon (max: 12 sides), edge detection area, and edge detection circle area	
			Trend edge width	Window shape: square, rotating square, ring, and arc	
		Geometry	Diameter measurement (Max./Min.)	Window shape: ring	
	Geometrical measurement window		Straight line, point		
	Multiple measurement	Split capturing	2 to 4-split capture processing (Auto/manual selectable)		
		Serial capturing	Serial capture processing for up to 32 images (Maximum, minimum and average values)		
	Image capturing setting functions	Target area setting function	Any area of 980,000 pixels can be selected from 1,980,000 pixels for image capturing.		
		Partial image capturing function	Any area of 0 to 959 lines can be selected from 980,000 pixels by specifying the start and end lines. (With interlaced scanning, even-numbered lines only)		
	Correction functions	Position adjustment	Camera gain adjustment	Total/individual adjustments (Up to 64/programs), X-/Y-axis direction, rotation $\pm 180^\circ$	
			Illumination compensation	81 sensitivity levels(1.0/9.0), shift and span adjustment(0.000/9.999)	
			Filter function	1 illumination adjustment window/1 program (2/program when 2 cameras are connected.)	
		Filter function	No. of applications	Up to 9 repeats for 7 steps	
			Filter type	Expand, shrink, average, median, edge enhancement, edge extraction X, edge extraction Y Laplacian, Sobel, Roberts, Prewitt, and Binary (1 step/1 window)	
		Calibration function	X and Y scaling factors can be set for each camera, measurement value conversion, calculation value conversion		
	Calculation functions	Numerical operation	No. of settings	32 calculations/1 program.	
			Four arithmetic operations	Addition, subtraction, multiplication, and division	
			Arithmetic function	Square, maximum, minimum, average, square root, absolute value, remainder, sine, cosine, and a-tangent	
			Geometric calculation function	Distance between two points, angle of a segment connecting two points, circle radius, circle center, average angle, straight line, intersection point, distance between point and line, and line angle	
		Type conversion function	Coordinate-to-constant conversion, constant-to-coordinate conversion, and angle unit conversion		
	Comparator operation	No. of settings	32 operations/1 program		
		Operator	AND, OR, NOT, and XOR		
	Support function	Statistic function	No. of data pieces	11,264 max.	
Statistic			Maximum, minimum, average value, deviation, NG count, and error count		
Screen save		Up to 22 screens can be saved in the main memory.			
Screen customize function		No. of custom screens	1 screen/1 program		
		Customization item	Text: measurement value, judgment result (connected with display color judgment), free text, and fixed text Graphics: line (horizontal, vertical), cross-point, circle, and square		
Online setting update function		Tolerance (including calculation window) and binary level can be rewritten during operation			
CF memory save function		Measurement value, judgment result, NG count, date, measurement image (compression available), stored image (compression available), and setting data			
Setting aid	Histogram display, edge intensity waveform display				
Other	I/O monitor, screen capture function, password function, and retest function				
Memory card *	Compact Flash memory card (GR-M256/NR-M32)				
Interface	Control input	External trigger input	1 input, EV-supported, input rating: 26.4 V max., 3 mA min.		
		Control input	9 inputs. Selecting programs, switching screens, switching windows, registering screens, and capturing screens Input rating: 26.4 V max, 2 mA min.		
	Control output	Universal output	16 outputs. NPN open-collector, 50 mA max (30 V min.)		
		Total comparator output	1 output. NPN open-collector, 50 mA max (30 V min.)		
	Video output	Conforming to NTSC standards			
	RS-232C	Numerical value output and image data (compression available) and control input/output. (Baud rate: 115,200 bit/s max. selectable)			
Ethernet	100 BASE-TX/10 BASE-T (Numerical value output, image data (compression available) and control input/output)				
Display language	English/Japanese selectable				
Power supply voltage	24 VDC $\pm 10\%$				
Current consumption	1 A				
Ambient temperature	0 to 40°C (32 to 104°F), No condensation				
Relative humidity	35 to 85%, No condensation				
Weight	Approx. 510 g				

### Camera

Model	CV-025
Image receiving element	1/1.8-inch CCD image receiving element, square-pixel, all-pixel double-speed reading, 2,010,000 pixels(1628 x 1236)
Scanning system	53ms progressive, 32ms interlaced
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
Lens mount method	C mount
Ambient temperature	0 to 40°C (32 to 104°F), No condensation
Relative humidity	35 to 85%, No condensation
Weight	Approx. 110 g

\* Use of KEYENCE GR-M256 and NR-M32 is recommended.





## Controller

Model		CV-2100		
No. of pixels		512 (H) x 480 (V)		
Camera input		2 points		
Process cycle		100 c/sec. (This varies depending on the settings.)		
Program registration		32 programs. Programs are selectable externally.		
No. of registered screens		64 screens (Up to 4 screens/1 program)		
Window setting	Measurement area	64 areas/1 program		
	Mask area	4 areas/1 program		
Function	Measurement mode	Area sensor	Window shape: square, circle, oval, ring, arc, polygon (max: 12 size), and edge detection area	
		Position detection	Pattern search	Multiple searches are available. Window shape: square, circle, oval, and polygon (max: 12 size)
			Edge detection	Angle measurement available Window shape: square, rotating square, ring, and arc
			Gravity position	Window shape: square, circle, oval, ring, arc, and polygon (max: 12 size)
			Trend edge position	Window shape: square, rotating square, ring, and arc
		Inspection mode	Width measurement	Window shape: square, rotating square, ring, and arc
			Pitch measurement	Window shape: square, ring, and arc
			No. of edges	Window shape: square, rotating square, ring, and arc
			Edge angle	Window shape: square
			Blob (Feature volume)	No. of labels, gravity, principal axis angle, area, ferret diameter, circumference length, and circularity Window shape: square, circle, oval, ring, arc and polygon (max: 12 size)
	Stain detection		Window shape: square, circle, oval, ring, arc, polygon (max: 12 size), and edge detection area	
	Multiple measurement	Split capturing	2 to 4-split capturing processing	
		Serial capturing	Serial capturing processing for up to 32 times (Maximum, minimum and average values)	
	CCD partial image capturing		0 to 479 lines. The starting and end lines can be specified arbitrarily.	
	Correction functions	Position adjustment	Total/individual adjustments (Up to 64 programs), X-/Y-axis direction, rotation $\pm 180^\circ$	
		Camera gain adjustment	9 sensitivity levels, shift and span adjustment	
		Illumination compensation	1 illumination adjustment window/1 program (2/program when 2 cameras are connected.)	
Filter function		Up to 4 applications. Expand, shrink, average, median, edge enhancement, and edge extraction (In X, Y, and XY directions)		
Calculation functions	Calibration function	X and Y scaling factors can be set for each camera.		
	Numerical operation	32 operations/1 program. Operator (four operations, square, maximum, minimum, square root, absolute value, surplus, distance, angle, sine, cosine, and a-tangent)		
Support functions	Comparator operation	32 operations/1 program. Operator (AND, OR, NOT, and XOR)		
	Statistic function	The maximum/minimum, average values, deviation, measurement counts, and NG count of up to 11264 measurements.		
	Screen save	Up to 54 screens can be saved in the main memory.		
	Screen customize function	Text: measurement values, judgment results, free text, and fixed text		
		Figure: line, cross-point, circle, and square		
Online setting update function	The tolerances and binary level can be rewritten during operations.			
CF memory save function	Measurement values, judgment results, NG count, and screens can be saved directly to a CF memory card.			
Major functions	I/O monitor, screen capture function, password function, and retest function			
Memory card *		CompactFlash memory card (GR-M256/NR-M32)		
Interface	Control input	External trigger input	1 point. Input rating: 26.4 V max, 3 mA min.	
		Control input	9 points. Selecting programs, switching screens, switching windows, registering screens, and capturing screens Input rating: 26.4 V max, 2 mA min.	
	Control output	Universal output	16 points. NPN open-collector, 50 mA max (30 V min.)	
		Total comparator output	1 point. NPN open-collector, 50 mA max (30 V min.)	
	Video output	Conforming to NTSC standards		
	RS-232C	Numerical value output and image data and control input/output. (Baud rate: 115,200 bit/s max. selectable)		
Ethernet	100 BASE-TX/10 BASE-T (Numerical value output, image data and control input/output)			
Display language		English/Japanese selectable		
Power supply voltage		24 VDC $\pm 10\%$		
Current consumption		1 A		
Ambient temperature		0 to 40°C (32 to 104°F), No condensation		
Relative humidity		35 to 85%, No condensation		
Weight		Approx. 510 g		

## Camera

Model		CV-020	
Image receiving element		1/3-inch CCD image receiving element, square-pixel, all-pixel double-speed reading, 350,000 pixels	
Scanning system		1/60s progressive, 1/120s interlaced	
Transfer system		Digital serial transfer	
Electronic shutter		1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000 sec.	
Lens mount method		C mount	
Ambient temperature		0 to 50°C (32 to 122°F), No condensation	
Relative humidity		35 to 85%, No condensation	
Weight		Approx. 100 g	

To conform to CE Markings, ferrite core (OP-51400) should be attached to the camera cable.

\* Use of KEYENCE GR-M256 and NR-M32 is recommended.



# CV-022 Series Digital Camera

Industry's smallest camera delivers best-in-class performance

Just one-tenth the size of conventional models

## Super small Smallest in its class

Our original miniaturization technology has resulted in a super small, double-speed, progressive-reading camera. Design flexibility can be greatly increased by mounting the camera in tight spaces where conventional models will not fit.

## Super-small, double-speed digital camera CV-022 Series



### Size comparison with a standard camera

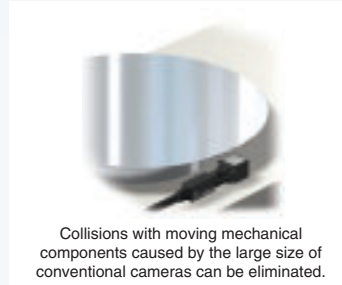


### Compact size makes new applications possible

Checking orientation of miniature chip components



Detecting a wafer notch



Positioning of a small ceramic substrate



### Mounting space can be cut even more using the side-view attachment

The side-view attachment with a built-in precision mirror enables sensor-like lateral mounting, significantly improving the mounting flexibility.

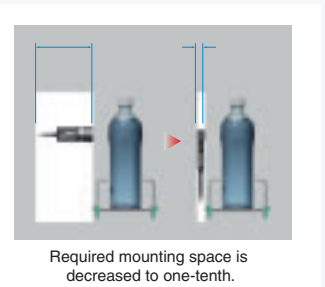


Note:  
The image will be a mirror image.

Mounting the camera inside a packaging machine



Significant decrease in mounting space



Note: CV-022 can only be used with the CV-2100.



## Specifications

### Camera

Model	CV-022H	CV-022U
Description	Camera	Camera control unit
Image receiving element	1/3-inch CCD image receiving element, square-pixel, all-pixel double-speed reading, 350,000 pixels	
Scan speed	1/60s progressive, 1/120s interlaced	
Transfer system	Digital serial transfer	
Electronic shutter	1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000 sec.	
Lens mount method	Special mount (M10.5 P0.5 male)	
Ambient temperature	0 to 50°C (32 to 122°F), No condensation	0 to 45°C (32 to 113°F), No condensation
Relative humidity	35 to 85%, No condensation	
Weight	Approx. 160 g (including cable)	Approx. 65 g

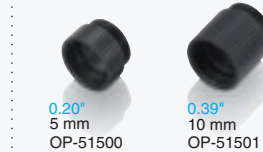
To conform to CE Marking, ferrite core (OP-51400) should be attached to the camera cable.

## Options

### Lens



### Close-up ring



### Polarizing filter



### Side-view attachment



### Small LED ring light



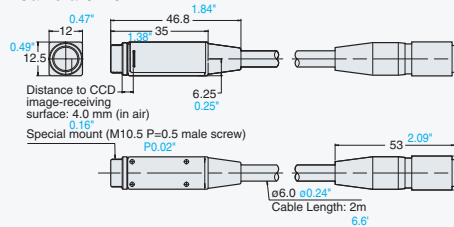
### 1-m cable for connecting the CV-2100



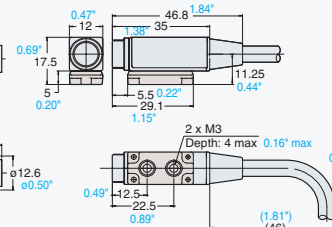
## Dimensions

Unit: inch mm

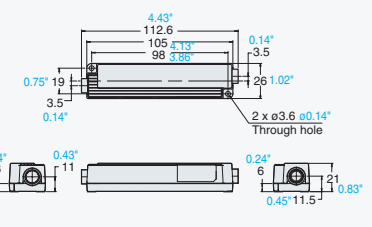
### Camera CV-022H



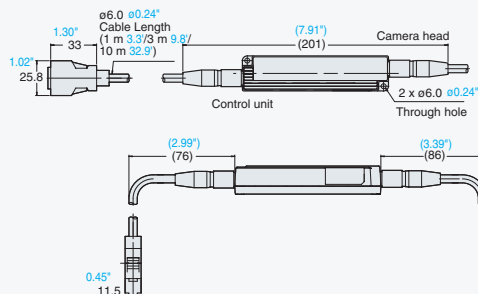
### When a mounting base is attached



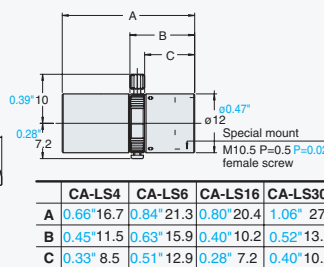
### Camera control unit CV-022U



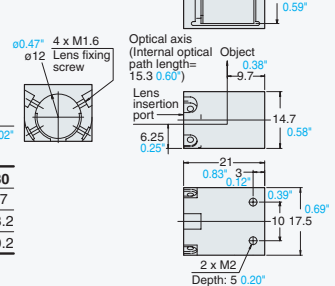
### When a cable is connected



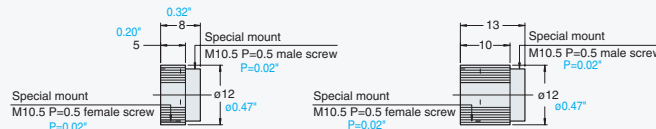
### Lens CA-LS



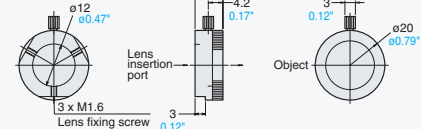
### Side-view attachment OP-51503



### Close-up ring OP-51500 (0.02° 5 mm) OP-51501 (0.39° 10 mm)



### Polarizing filter OP-51502



# CV-700 Series Color Vision System

Provides high-speed color processing and easily achieves stable detection

## Advanced Color Processing Technology

The latest in **color shade processing** allows the CV-700 Series to recognize changes in contrast that cannot be detected by conventional binary processing or gray-scale processing.



## Advanced Color Image Processing CV-700 Series

### Simple, Straightforward Programming Designed for Easy Operation

Simple Programming helps for quick and efficient on-site operation, reducing set-up costs.

### The All-in-One Unit Provides Space and Wiring Savings

One controller can connect up to two cameras. This enables simultaneous multiple point differentiation or measurement of the dimensions of a large size target.

### High-Speed Search & Sub-pixel Measurement

Newly developed special ASIC technology ensures accurate measurement by using sub-pixel processing and a fast 360° rotation search.

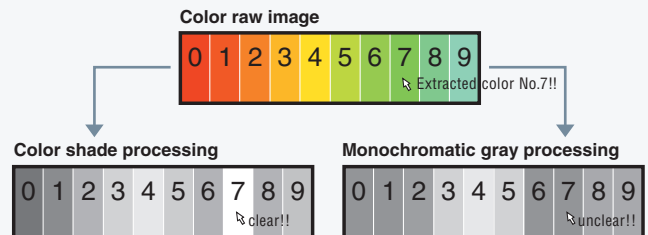
[What is color processing?](#)

## The latest, most accurate color image processing

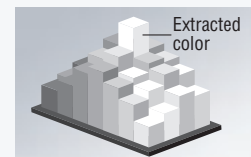
### Color shade processing recognizes the differences in hue and intensity of shade levels.

This process enables accurate inspection and measurement of targets whose edges cannot be recognized with monochromatic gray-scale processing.

After you click on a target point to extract its color, the entire image is converted to a shade hierarchy with the extracted color as the top level.



Click on the target point for color extraction.

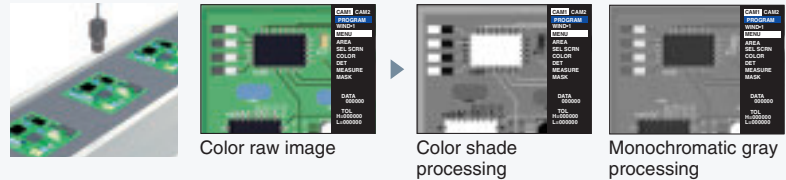


The whole image is converted into a gray shade image with the extracted color as the top level.



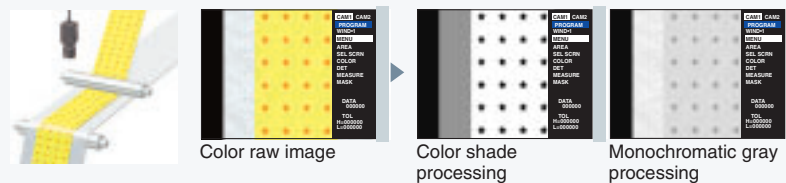
### Color shade processing provides better target differentiation than gray scale, thus improving Pattern Search Stability

Using brightness data in addition to color data allows separation between black and green or white and yellow, which cannot be recognized by monochrome processing. This differentiation improves pattern search stability.



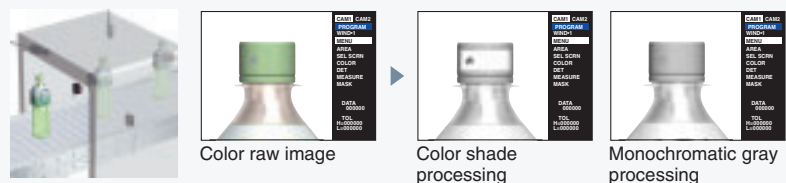
### Accurately measure parts to ±0.3 pixels based on the color data (Edge position measurement becomes more stable)

The color shade processing enables differentiation between colors that cannot be recognized with gray-scale processing. This process also improves the edge position measurement reliability. In addition, accurate measurement and detection can be achieved by using sub-pixel processing.



### Virtually unaffected by uneven or rounded surfaces (Flaw/stain detection becomes more stable)

Due to illumination conditions, it may be difficult to evenly process the image of a target with a rounded surface with binary processing. Color shade processing provides more stable detection regardless of variations in target colors or changes in illumination.



#### Other valuable features

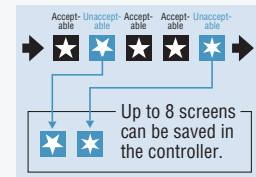
### 256MB/32MB Flash memory card

#### Save 128 inspection settings or 122 images.

The CV-700 Series features a 256MB/32MB Compact Flash card. Screens can also be saved in bitmap format to generate reports.



#### Unacceptable images may be saved on the screen



Up to 128 screens can be saved in a memory card.

#### Screen storage

Up to 8 images can be stored in the internal memory of the CV. In addition, a Compact Flash memory card can be used to record up to 128 screens. (NR-M32)

#### Two camera connection



Two cameras can be controlled simultaneously by one controller. Inspection accuracy can be increased by magnifying the images and using them together.

#### Controller with built-in TFT color LCD monitor

A TFT color LCD monitor and console are built into a compact, low-cost controller.

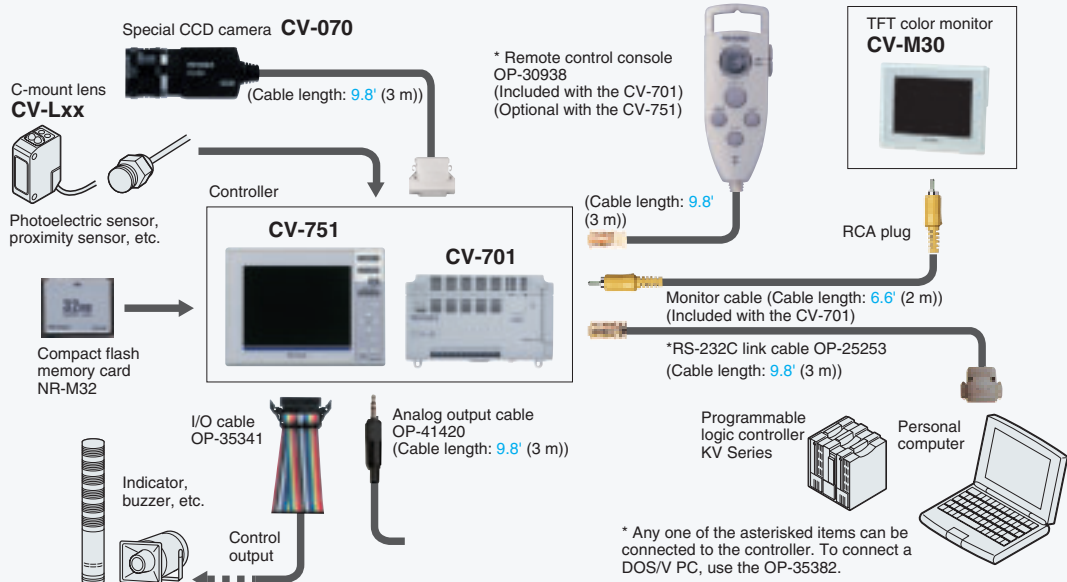
## Specifications

### Controller

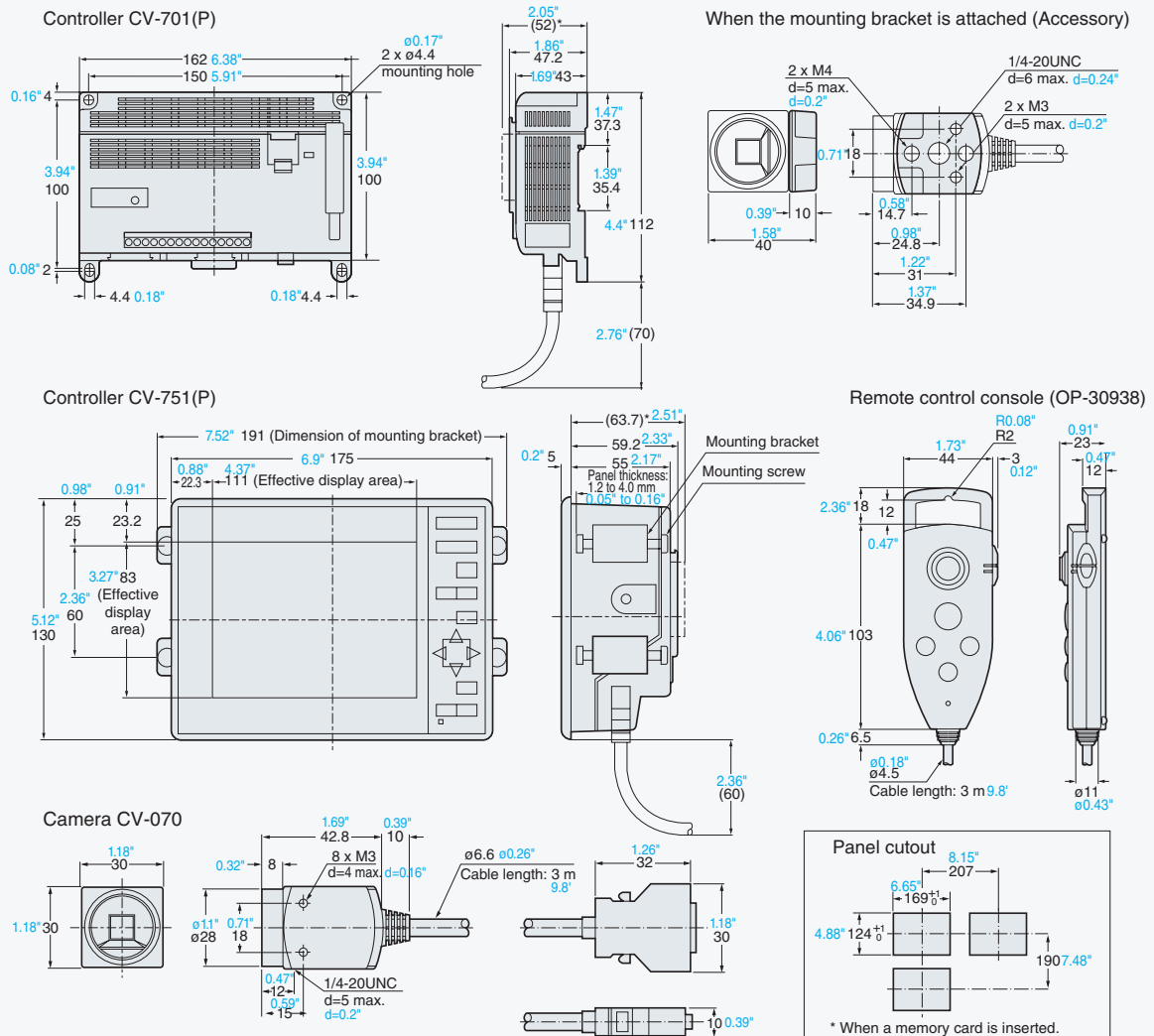
Type		Built-in monitor type	Separate monitor type	
		CV-751(P)	CV-701(P)	
Model		* Input with a remote control console (optional) is also available. 		
No. of pixels		508 (H) x 480 (V)		
Process cycle		30 c/s (Varies depending on the setting)		
Binary level		Color binary processing by color extraction or color shade processing Color can be specified individually for each window		
Program registration		16 programs (8 programs when two cameras are used) (Programs are externally selectable)		
No. of registered screens		16 screens (1 screen/program or 2 screens/program)		
Functions	Mode	Area sensor	8 max./program, Window shape: Circle/square/free square	
		Absolute position detection	4/program, Window shape: Square	
		Relative position detection	4/program, Window shape: Square	
		Inspection mode	Width measurement	8/program, Window shape: Square
			Pitch measurement	8/program, Window shape: Square
			Edge count	8/program, Window shape: Square
			Count	8/program, Window shape: Square/circle
			Flaw detection	8/program, Window shape: Square/circle/ring/arc
	Point sensor	8/program, 8 points/Window		
	Center-of-gravity	8/program, Window shape: Square/circle		
	Adjustment	Position adjustment	Color shade search/Line sensor/Color binary processing (Center of gravity, Major axis inclination, X-/Y-axis direction, ±180° rotation)	
		Illumination adjustment	1 illumination adjustment window/program (two when two cameras are connected)	
		Pre-processing (Filter function)	Expand, Shrink, Median, Average, Edge enhancement, Edge detection, Shading, Lightness-up, Saturation-up, Invert	
	Auto-sequence	Continuous processing of 4 programs max. (Up to 32 inspections [4 programs x 8 windows] can be continuously processed)		
Data calculation	Unit conversion and offset			
Screen save	8 screens			
Setup menu	Stores parameters of initial setting			
Input	Camera input	2		
	Control input	External trigger	1 (Non-voltage input)	
		Program selection	Data input (x4), 16 programs selectable (Non-voltage input)	
		Continuous detection	Detection continued without an external trigger when the program No. is changed while CONT input is ON. (Non-voltage input)	
		Screen registration	2, Screen is registered by a trigger signal while REC input is ON. (Non-voltage input)	
Display/output window selection	Data input (x3), 8 windows selectable (Non-voltage input)			
LCD monitor	Panel	TFT 5.5 inch, full color	Not provided	
	Backlight	Cold cathode fluorescent tube (Average life: Approx. 40,000 hrs)	Not provided	
Memory card	Compact Flash memory			
Video output	Conforms to NTSC standards			
RS-232C interface	1 ch, Numerical value output and control input/output (Baud rate: 38,400 bps max. selectable)			
Control output	NPN	NPN open-collector: 9, 50 mA max. (30 V max.)		
	PNP	PNP open-collector: 9, 50 mA max. (30 V max.)		
Numerical value output	Binary 13 bits, 10 mA max. (30 V max.)			
Analog output	0 to 4 V output, Output impedance: 100Ω			
Display language	English/Japanese selectable			
Power supply voltage	24 VDC ±10%			
Current consumption	1.4 A	700 mA		
Ambient temperature	0 to +40°C (32 to 104°F), No condensation			
Relative humidity	35 to 85%, No condensation			
Weight	Controller: Approx. 900 g	Controller: Approx. 400 g, Remote control console: Approx. 160 g		

### Camera

Model	CV-070
Image pickup element	1/3 inch CCD video element, Square-pixel all reading
Electronic shutter	1/30, 1/50, 1/60, 1/100, 1/125, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/10000
Lens mount method	C mount
Ambient temperature	0 to +40°C (32 to 104°F), No condensation
Relative humidity	35 to 85%, No condensation
Weight	Camera: Approx. 310 g (including 9.8' (3-m) cable)



### Dimensions



# LED Illumination CA-D Series

A wide array of LED illumination units ensure the maximum performance from a machine vision system.



## Blue LED lights are now available NEW

The short wave length characteristics of blue make them an ideal choice for high precision dimensional measurements and other demanding applications.

## Long service life for maintenance-free operation

The long lifetime (20,000 to 30,000 hours\*) reduces the costs required for maintenance. In addition, power consumption is lower when compared to halogen light sources, achieving total cost reduction.

\*The average time required until the light is attenuated by 30% when a red LED element is used alone in an ambient temperature of 25°C (77°F) and an RH of 65%.

## Easy light modulation and on/off control

Adjustment of light intensity and on/off control can be performed easily, allowing the user to set optimal illumination conditions as well as minimize wear on the LED light source.

## Short warm-up time

High-speed strobing of up to 2 LED light sources is possible with the CA-DC100 LED light controller.

## Application

### Detecting printing on aluminum packaging material

Detection is normally difficult or impossible due to the hot spots generated from surface irregularities or glare caused by the film sheet.



Dome light

With direct reflection:



Printing cannot be recognized due to diffused reflections

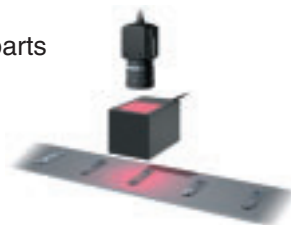
With dome illumination:



Printing becomes clearly visible while background shades are canceled.

### Detecting imprints on press-molded parts

Product number and specification imprints can be recognized by their patterns. Incorrect stamping and mixing of different products can also be detected.



Coaxial vertical light

With direct reflection:



Imprint is unclear.

With coaxial vertical illumination:



The edge of the imprint is enhanced.





## LED illumination

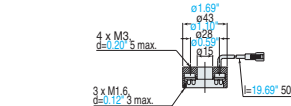
### Direct-ring light CA-DR

Model	LED COLOR	Weight (g)	Power consumption (W)
CA-DRR4F	Red	Approx. 20	1.5
CA-DRW4F	White	Approx. 20	2.9
CA-DRB4F	Blue	Approx. 20	2.9
CA-DRR10F	Red	Approx. 90	8.3
CA-DRW10F	White	Approx. 80	7.9
CA-DRB10F	Blue	Approx. 80	7.9

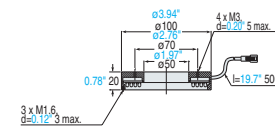
Unit: inch mm



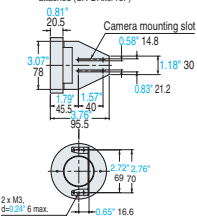
#### CA-DRx4F



#### CA-DRx10F



\* When the mounting bracket is attached (CA-DRx10F)

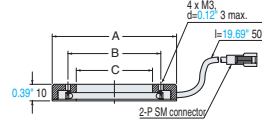


### Low-angle light CA-DL

Model	LED COLOR	Weight (g)	Power consumption (W)
CA-DLR7	Red	Approx. 40	2
CA-DLR12	Red	Approx. 85	3.3



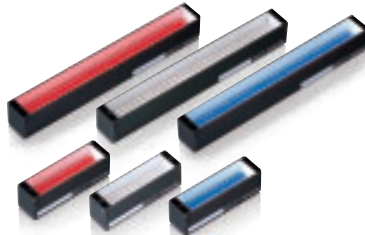
#### CA-DLR7/12



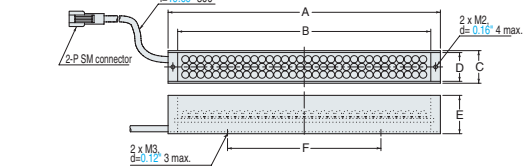
Model	Dimensions					
	A	B	C	D	E	F
CA-DLR7	02.95	075	02.20	056	01.88	046
CA-DLR12	04.92	0125	04.33	0110	03.74	095

### Bar light CA-DB

Model	LED COLOR	Weight (g)	Power consumption (W)
CA-DBR5	Red	Approx. 35	1.7
CA-DBW5	White	Approx. 40	2.9
CA-DBB5	Blue	Approx. 40	2.9
CA-DBR13	Red	Approx. 80	4.2
CA-DBW13	White	Approx. 90	7.3
CA-DBB13	Blue	Approx. 90	7.3



#### CA-DBxxx



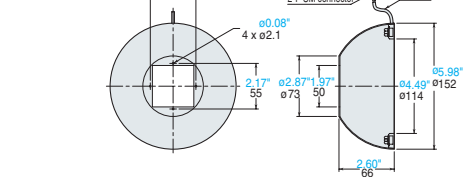
Model	Dimensions						Model	Dimensions					
	A	B	C	D	E	F		A	B	C	D	E	F
CA-DBx5	2.36	1.97	0.67	0.59	0.79	1.18	CA-DBx13	5.59	5.20	0.67	0.59	0.79	3.15
	60	50	17	15	20	30		142	132	17	15	20	80

### Dome light CA-DD

Model	LED COLOR	Weight (g)	Power consumption (W)
CA-DDR15	Red	Approx. 130	11
CA-DDW15	White	Approx. 170	18.8
CA-DOB15	Blue	Approx. 170	18.8



#### CA-DDx15

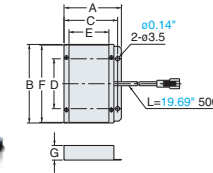


### Backlight CA-DS

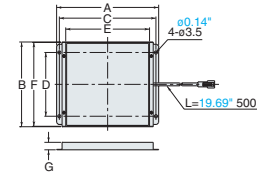
Model	LED COLOR	Weight (g)	Power consumption (W)
CA-DSR3	Red	Approx. 40	3.6
CA-DSW3	White	Approx. 40	5.8
CA-DSB3	Blue	Approx. 40	5.8
CA-DSR9	Red	Approx. 110	14
CA-DSW9	White	Approx. 90	18
CA-DSB9	Blue	Approx. 90	18



#### CA-DSx3



#### CA-DSx7/9



Model	Dimensions							Model	Dimensions						
	A	B	C	D	E	F	G		A	B	C	D	E	F	G
CA-DSR3	1.8	4.6	2.48	63	1.69	43	5.7	4.0	1.26	3.2	2.44	62	1.32	8.2	
CA-DSR9	4.1	11.2	3.66	93	4.17	106	2.76	7.0	3.62	9.2	3.62	9.2	3.22	8.2	
CA-DSW3	1.8	4.6	2.48	63	1.69	43	5.7	4.0	1.26	3.2	2.44	62	1.46	11.7	
CA-DSW9	4.1	11.2	3.66	93	4.17	106	2.76	7.0	3.62	9.2	3.62	9.2	3.03	7.7	0.46
CA-DSB3	1.8	4.6	2.48	63	1.69	43	5.7	4.0	1.26	3.2	2.44	62	1.46	11.7	
CA-DSB9	4.1	11.2	3.66	93	4.17	106	2.76	7.0	3.62	9.2	3.62	9.2	3.03	7.7	0.46

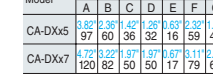
The dimensions of the light-emitting surface are shown in columns E and F.

### Coaxial vertical light CA-DX

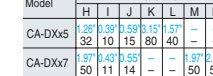
Model	LED COLOR	Weight (g)	Power consumption (W)
CA-DXR5A	Red	Approx. 230	5
CA-DXW5A	White	Approx. 230	4.9
CA-DXB5A	Blue	Approx. 230	4.9
CA-DXR7	Red	Approx. 380	6.7
CA-DXW7	White	Approx. 380	10.1
CA-DXB7	Blue	Approx. 380	10.1



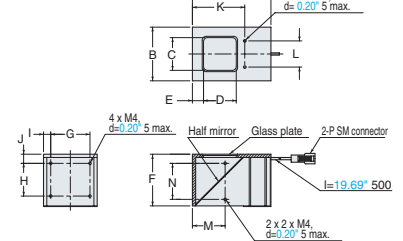
#### CA-DXx5



#### CA-DXx7



#### CA-DXxx



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Vision Systems  
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# LED Illumination CA-D Series

## LED Illumination Controller



CA-DC100

### Specifications



Model		CA-DC100
Output	Light control method	Light-emitting frequency: 100 kHz, pulse width modulation method
	Number of outputs	2 channels
	Voltage	12 V
	Capacitance	30 W max. (20 W per channel)
Input		External control input (EXT), 2 contacts (non-voltage contact input)
Power supply voltage		24 VDC ±10%
Current consumption		1.8 A (under maximum load)
Ambient temperature		0 to +45°C (32 to 113°F), No condensation
Relative humidity		35 to 85%, No condensation
Weight		Approx. 220 g

\* Environment for illumination unit: Ambient temperature of 0 to +40°C (32 to 104°F) and relative humidity of 35 to 65% (no condensation).

### High frequency lights

The high light-emitting frequency of 100 kHz ensures consistent image capture even on high-speed production lines.

### 2-channel connection for a wide range of applications Industry first

Two illumination units can be connected to a single controller. Switching between the two illuminators makes compound inspections and 2-line inspections easy and low cost.

### Limit function to increase LED life Industry first

The limit function prevents light emission from exceeding approx. 60% of the maximum light intensity. This function increases the lifetime of the LEDs.

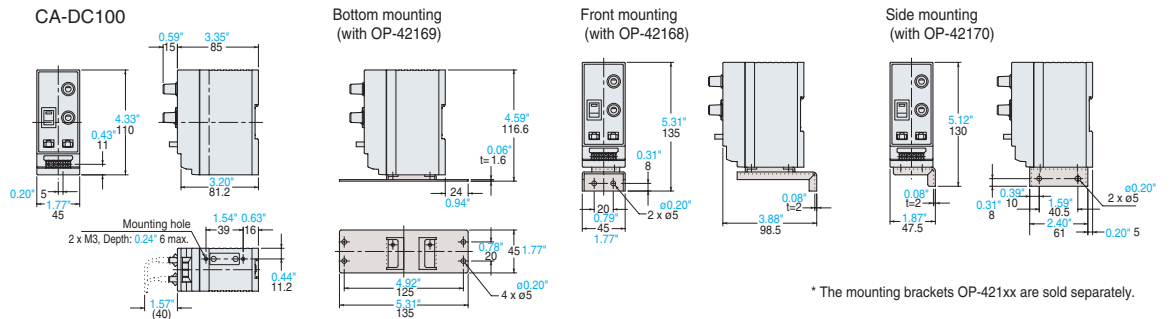
### Din-rail mountable design

The CA-DC100 can be mounted on a DIN rail for easy installation on the site. In addition, various mounting brackets (sold separately) enable installation in many different environments.

### Light adjustment trimmer for fine-tuning

The CA-DC100 features a light adjustment trimmer that allows fine adjustment of the light intensity. The CA-DC100 allows you to switch light emission on and off by external inputs.

### Dimensions Unit: inch mm



\* The mounting brackets OP-421xx are sold separately.



## Options

## Diffuser

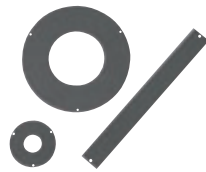


## Glare reduction

Eliminates the LED reflection and inconsistencies generated in capturing the image of reflective targets. (Compatible with direct-ring light and bar light)

Model	Compatible light
OP-42282	CA-DBx13
OP-42283	CA-DBx5
OP-42337	CA-DRx4F
OP-42339	CA-DRx10F

## Polarizer



## For glare prevention

Eliminates glare of reflective targets together with the lens polarizing filter. (Compatible with direct-ring light and bar light)

Model	Compatible light
OP-42280	CA-DBx13
OP-42281	CA-DBx5
OP-42336	CA-DRx4F
OP-42338	CA-DRx10F

## Extension cable

Cable length	Model
6.6' 2m	CA-D2
16.4' 5m	CA-D5

## Precautions for use of LED illumination

- Continuous operation under high temperature and high humidity accelerates the reduction and deterioration of light intensity.
- Reduce heat generation of the product.

## Use the limit function and light-control dial.

When used at the maximum light intensity, the product will produce a great amount of heat, which will have a negative effect on the operating life. It is recommended that the limit function be turned on or the light-control dial be set to 40 to 60%. (Standard features of the CA-DC100.)

## Turn on the LED only when capturing images.

It is recommended to use the on/off external switching function (Standard feature of the CA-DC100) to turn on illumination in sync with image-capturing.

\*The LED is resistant to switching operations and will not deteriorate when turned on and off repeatedly.

## Use the product in an optimum environment for heat radiation and cooling.

Take measures such as installing cooling air and fans or using mounting brackets with good heat-transfer properties.

## Common specifications of LED illumination unit

Ambient temperature	0 to +40°C (32 to 104°F), No condensation
Relative humidity	35 to 65%, No condensation

## Fluorescent Illumination Unit CV-R/CA-R



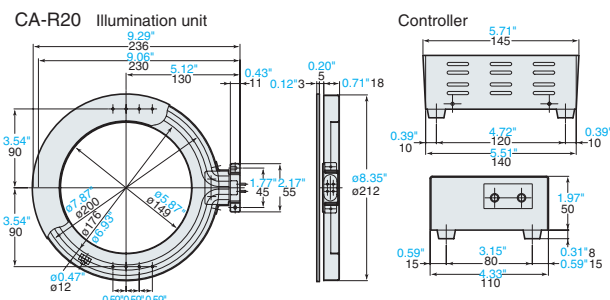
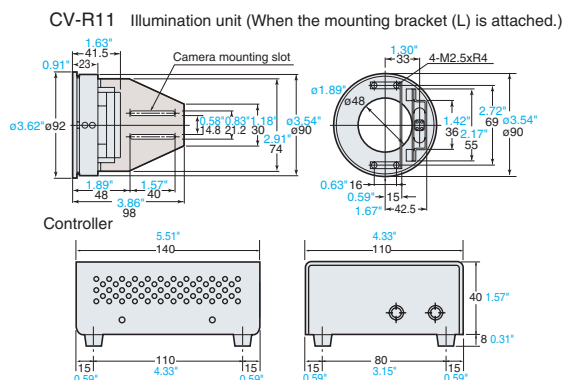
## Specifications



Model	CV-R11	CA-R20
Lighting method	Inverted high-frequency lighting (25 to 35 KHz)	
Luminescent color of lamp	N-EX (daylight white color)	
Dimension of lamp	Outside diameter: $\phi 3.15''$ ( $\phi 80$ mm) Inside diameter: $\phi 2.20''$ ( $\phi 56$ mm)	Outside diameter: $\phi 7.87''$ ( $\phi 200$ mm) Inside diameter: $\phi 6.93''$ ( $\phi 176$ mm)
Lamp life <sup>1</sup>	Approx. 2000 hours average	Approx. 1500 hours average
Power supply voltage	24 VDC $\pm 10\%$	
Current consumption	0.7 A	1.5 A
Ambient temperature	+5 to +40°C (41 to 122°F), No condensation	
Relative humidity	35 to 90%, No condensation	
Weight	Illumination unit	Approx. 150 g
	Controller	Approx. 900 g (Including cable)
Model of replacement lamp	OP-25526	OP-51495

1. The lamp life refers to the average time it takes for the illumination intensity to drop to 70% of the initial illumination intensity<sup>2</sup>; when the lamp is illuminated continuously in a vibration-free environment with an ambient temperature of 25°C (77°F). Note that the life may be shorter according to the conditions of the use environment.
2. The initial illumination intensity refers to the illumination intensity measured at the moment when the lamp, being in mint condition, is turned on for the first time.
3. Consult your sales representatives for conformity of the model to CE Marking.

## Dimensions Unit: inch mm



# Macro Lens CA-LM Series

## Macro Lens Series for High-precision Inspection



### Features of macro lenses

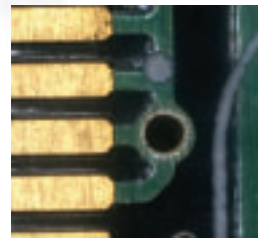
Macro lenses are used to enhance the resolution of an image.

With a typical CCTV lens, many close-up rings need to be attached. As a result, the image becomes dark and the depth of the field becomes shallow.

In addition, there are limitations to the number of close-up rings that can be attached; limiting the maximum zoom of the field view to an optical magnification of 2x. A macro lens should be used in such cases.

Macro lenses are used for high magnification applications including high precision target position detections, and high precision dimensional measurements.

1.97" (50 mm) Lens + close-up adapter



x2 Macro lens



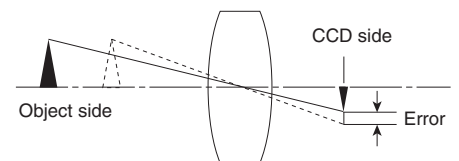
x6 Macro lens



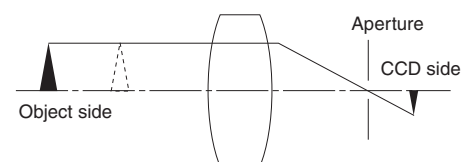
### Telecentric lenses reduce measurement errors

These small but powerful lenses are specifically designed for high accuracy measurement applications. Their high magnification properties (minimum FOV of 0.02" (0.4 mm)) and low image distortion levels make them ideal for minute inspections of critical targets.

#### Ordinary lens



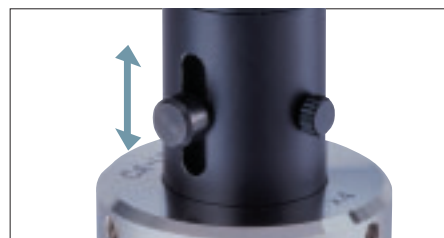
#### Object-side telecentric lens





### Fine focus adjustment simplifies setup

Even though the magnification is fixed, the lens features a fine focus adjustment that enables the user to quickly compensate for variations in target height.

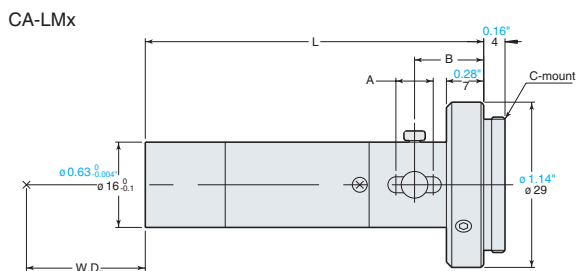


### Specifications

Model	CA-LM2	CA-LM4	CA-LM6	CA-LM8
Shape	Straight			
Optical magnification (Reference magnification)	x2	x4	x6	x8
Allowable variation in magnification	Approx. $\pm 5\%$ of the reference magnification			
WD (With the reference magnification)	2.63" 66.9 mm	2.77" 70.3 mm	2.54" 64.4 mm	2.54" 64.5 mm
Maximum size of applicable image	1/2 inch			
Imaging field of view (With the reference magnification)	1/3 inch	0.07" x 0.09" 1.8 x 2.4 mm	0.04" x 0.05" 0.9 x 1.2 mm	0.02" x 0.03" 0.6 x 0.8 mm
	1/2 inch	0.09" x 0.13" 2.4 x 3.2 mm	0.05" x 0.06" 1.2 x 1.6 mm	0.03" x 0.04" 0.8 x 1.07 mm
Effective F No.	15.4	26.5	39.3	52.4
Depth of field	15.6 Mil 400 $\mu\text{m}$	6.7 Mil 172 $\mu\text{m}$	4.33 Mil 111 $\mu\text{m}$	3.08 Mil 79 $\mu\text{m}$
TV distortion (Max.)	-0.04%	-0.22%	-0.10%	-0.04%
Resolution	0.20 Mil 5.1 $\mu\text{m}$	0.18 Mil 4.5 $\mu\text{m}$	0.17 Mil 4.4 $\mu\text{m}$	0.17 Mil 4.4 $\mu\text{m}$
Mount	C-mount			
Ambient temperature	0 to +50°C (32 to +122°F), 80%, No condensation			
Relative humidity				
Weight	Approx. 57 g	Approx. 58 g	Approx. 64 g	Approx. 67 g

- The value of the depth of field is obtained with theoretical calculations on the assumption of a 1/2" image size and a horizontal resolution of 320 TV lines.
- The resolution is a theoretical value at a distance of 550 nm.
- The ranges of the imaging field of view indicate the reference field of view of each image size. The value can be modified by approx.  $\pm 5\%$  by adjusting the magnification.
- The values of WD indicate the working distance when each lens is used with reference magnification, and they will change by adjusting the magnification.
- The values in the specifications above are obtained based on the optical design value, and individual differences are generated depending on the assembly accuracies.

### Dimensions Unit: inch mm



	CA-LM2	CA-LM4	CA-LM6	CA-LM8
L (Length)	2.50" 63.5	2.73" 69.3	3.17" 80.6	3.56" 95.0
A (Adjustable range)	0.28" 7.0	0.37" 9.3	0.30" 7.7	0.30" 7.6
B (Adjustable position)	0.51" 13.0	0.59" 15.1	0.81" 20.5	1.37" 34.9
C (Coaxial position)	1.21" 30.7	1.25" 31.8	—	—

# High-resolution & Low distortion Lens CA-LH Series



## Low optical distortion Best in its class

An original optical design has been adopted to eliminate distortion, which is often the largest obstacle for dimensional measurements and other applications requiring high accuracy. The CA-LH Series has a low distortion level of 0.01% or lower.\*

\* When using the CA-LH50

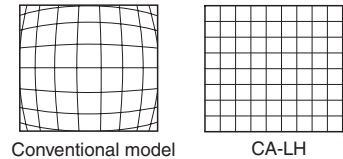
## High resolution and high contrast

The floating mechanism moves the front and rear spherical elements separately, obtaining high resolution from close range to infinity. In addition, the contrast is improved dramatically from conventional products. Even targets with small intensity contrasts can be reproduced reliably without being washed out in the background.

## Large focus range

Using lens extenders/spacers to bring smaller targets in focus can be a hassle when setting up a machine vision application. The CA-LH Series provides an extremely long focus range, which allows for easy camera adjustment during product changeovers.

### Comparison of distortion



Conventional model

CA-LH

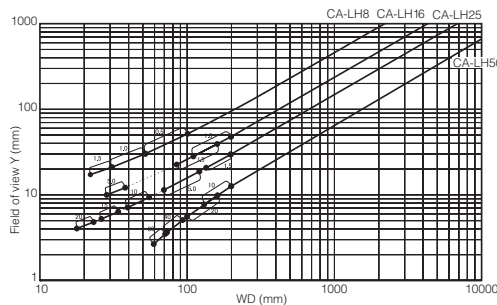
### Comparison of magnified images



Conventional model

CA-LH

## Field of view chart



When the CV-020/-050/-070 is attached. The values on the chart are reference values. Adjustments may be required for installation.

## List of models: specifications of the CA-LH Series

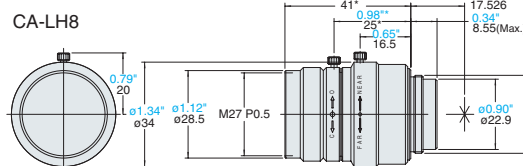
MODEL	CA-LH8	CA-LH16	CA-LH25	CA-LH50
Focal distance	0.31' 8 mm	0.63' 16 mm	0.98' 25 mm	1.97' 50 mm
Aperture	F1.4 to F16	F1.4 to F16	F1.4 to F16	F2.8 to F22
Minimum close-up distance	0.33' 0.1 m	0.66' 0.2 m	0.66' 0.2 m	0.66' 0.2 m
Mount	C-mount			
Screw diameter of filter	1.06" 27.0 mm P0.5	1.01" 25.5 mm P0.5	1.06" 27.0 mm P0.5	1.06" 27.0 mm P0.5
Maximum size of applicable image	2/3 inch			
TV distortion*	-0.6% (-0.28%) max.	-0.05% (-0.1%) max.	-0.04% (-0.02%) max.	-0.03% (-0.01%) max.
Ambient temperature and relative humidity	0 to +50°C (32 to 122°F), 80%, No condensation			
Weights	Approx.83g	Approx.81g	Approx.89g	Approx.92g

\* Indicates the values of 2/3". The values in parenthesis are for 1/3".  
Notes: When connecting the CA-LH8 with a camera other than the CV-025, a close-up ring of 1.5 mm or more is required.

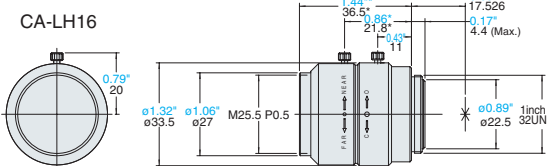
## List of options

Type	Model	Remarks
Close-up ring set for the CA-LH	OP-51612	0.02", 0.04", 0.20", 0.39", 0.87" Thickness: 0.5mm, 1mm, 5mm, 10mm, 22mm
Polarizing filter 25.5	OP-51603	For a 1.00" 25.5-mm screw diameter
Polarizing filter 27	OP-54029	For a 1.06" 27-mm screw diameter

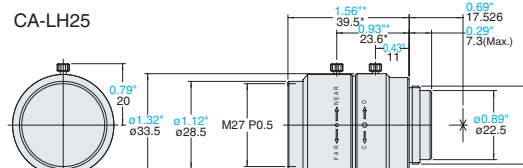
## Dimensions Unit: inch mm



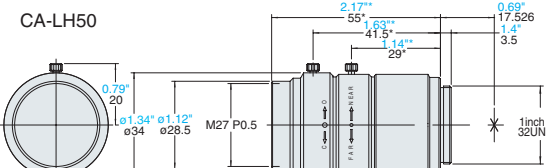
\* Variable depending on the focal distance. Extension amount: 0 to 1.2 mm 0 to 0.05"



\* Variable depending on the focal distance. Extension amount: 0 to 4.5 mm 0 to 0.18"



\* Variable depending on the focal distance. Extension amount: 0 to 4.5 mm 0 to 0.18"



\* Variable depending on the focal distance. Extension amount: 0 to 18.5 mm 0 to 0.73"

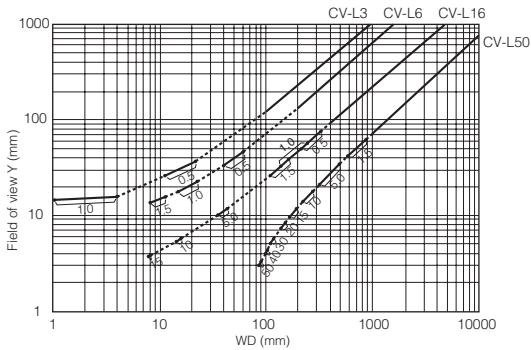


# C-mount Lens CV-L Series

## General-purpose, Compact Size C-mount Lenses



Chart of field of view



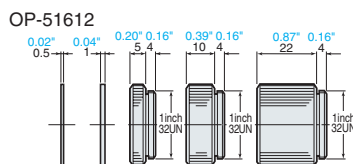
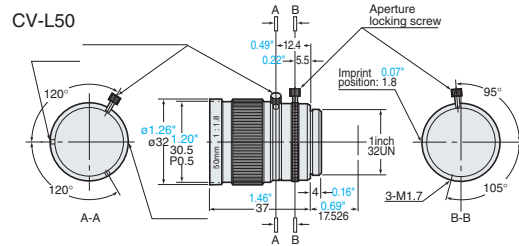
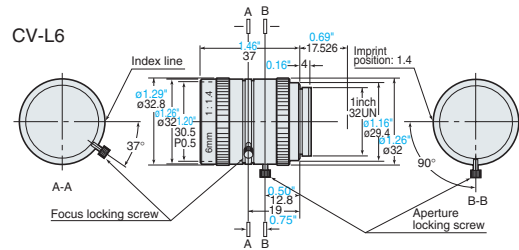
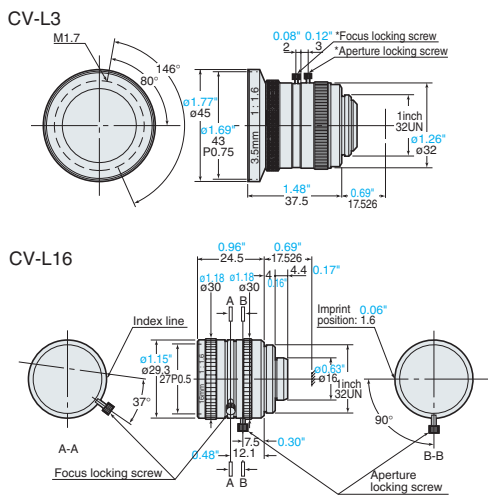
When the CV-020/-050/-070 is attached. The values on the chart are reference values. Adjustments may be required for installation.

List of models

Type	Model	Focal distance
Standard	CV-L16	0.63" 16 mm
Wide-angle	CV-L3	0.14" 3.5 mm
	CV-L6	0.24" 6 mm
Zoom	CV-L50	1.97" 50 mm
Polarizing filter 27	OP-54029	For a 27-mm screw diameter
	OP-54030	For a 30.5-mm screw diameter
Close-up ring set	OP-51612	Thickness: 0.02" 0.04"
		0.20" 0.39" 0.87"
		5 mm, 10 mm, 22 mm

### Dimensions

Unit: inch mm



# 8.4" LCD Color Monitor CA-M Series

High intensity, High-definition Color TFT-LCD 8.4" Monitor

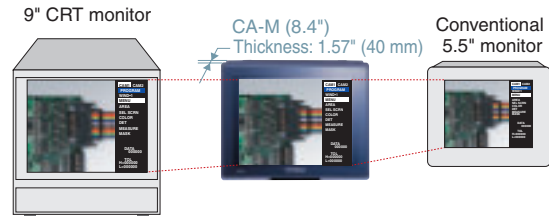
CA-MN80



When mounted on the special stand

### Ultra slim, Space-saving Design

Ultra slim design with a thickness of 1.57" (40 mm) facilitates installation on a control panel.



### IP-65 Rated Environmental Resistance

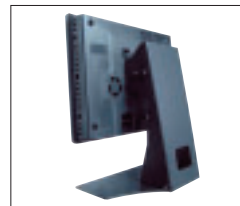
The monitor is protected from breakdown caused by water splashes or power dust, ensuring reliable operations on production sites.

### High-intensity & High-definition Color TFT

The TFT active-matrix system is employed to produce a bright screen and high-definition display with 262,144 colors.

### Wide Range of Mounting Options

In addition to the panel-mounting option, a special stand and pole-mounting bracket are also available for production lines with limited space.



Special stand with holes for locking screws



Pole-mounting bracket Enables installations on any round bars





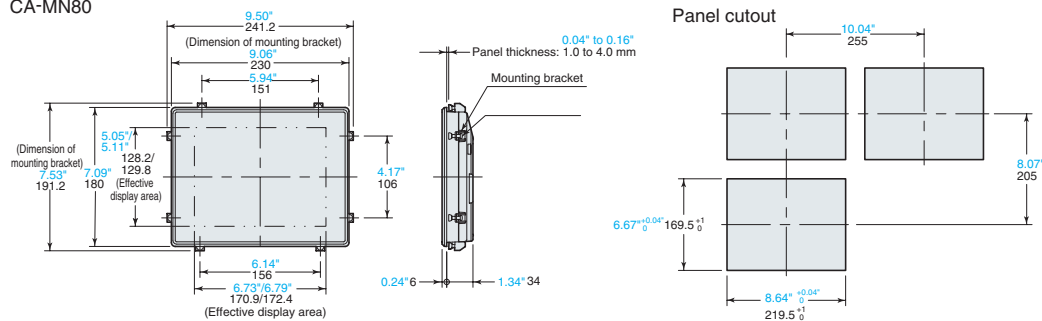
# 8.4" Color LCD Monitor CA-M Series

## Specifications

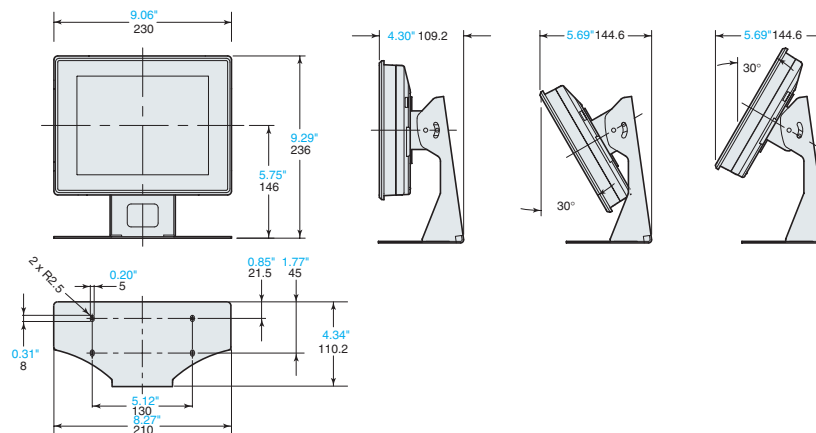
Model		CA-MN80
Display panel	Display element	a-Si TFT active-matrix system
	Display color	262,144 colors
	No. of dots	25.20" 640 (W) x 18.90" 480 (H) dots
	Active display area	6.73" 170.9 (W) x 5.05" 128.2 (H) mm
Backlight	System	Two-way cathodoluminescent tube
	Life	Approx. 50,000 hours average (Vertical installation at 25°C)
Input/Output	Input signal	NTSC composite signal (1.0Vp-p, 75Ω)
	Input signal mode	—
	Connector	RCA pin jack (1 input and 1 output)
Power supply voltage	24 VDC ±10%	
Current consumption	1 A max.	
Ambient temperature	0 to +40°C (32 to 104°F), No condensation	
Relative humidity	35 to 85%, No condensation	
Structure	Panel built-in design. Only the front panel employs an IP-65 Rated dust proof and waterproof structure.	
Weight	Approx. 1200 g	

## Dimensions Unit: inch mm

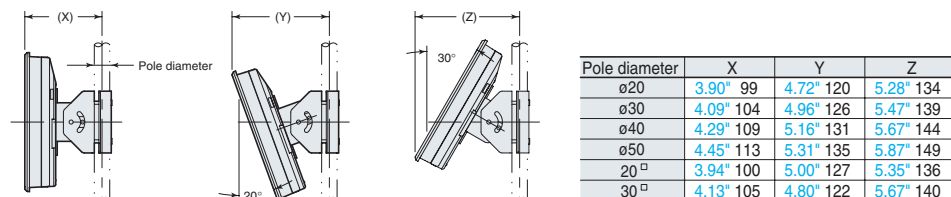
### LCD Monitor CA-MN80



### Monitor Mounting Stand OP-42278



### Pole-mounting Bracket for Monitor OP-42279



## 5.5" LCD Color Monitor CV-M30

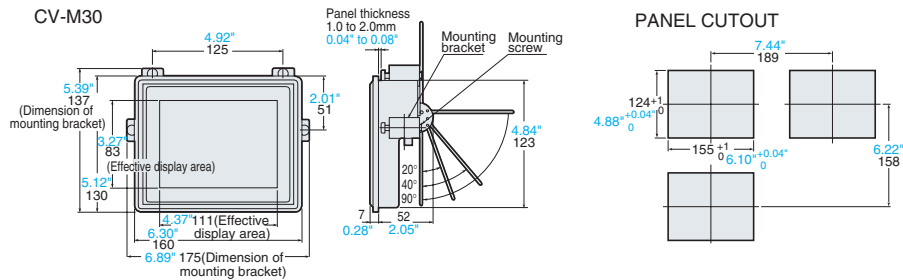


### Specifications



Model	CV-M30	
LCD panel	Display screen size	5.5", 4.38" 111.36 (W) x 3.37" 85.52 (H)mm
	No. of dots	12.60" 320 (W) x 9.45" 240 (H)dots
	Display color	Full color
	Drive system	TFT active-matrix system
Video input	NTSC composite signal 1.0Vp-p 75Ω	
Power supply voltage	24 VDC ±10%	
Current consumption	700mA max.	
Ambient temperature	0 to + 40°C (32 to + 104°F), No condensation	
Relative humidity	35 to 85%, No condensation	
Weight	Approx. 570g	

### Dimensions Unit: inch mm



## 9" CRT Monochrome Monitor CV-M11



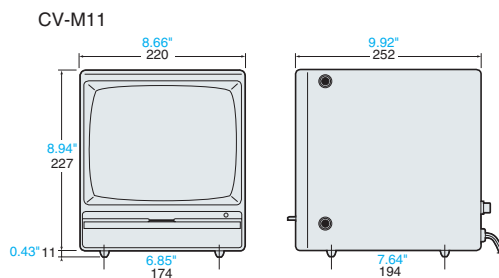
### Specifications



Model	CV-M11
Cathode-ray tube	9 inch
Video input (VS)	NTSC composite signal 1.0 Vp-p 75 Ω
Horizontal resolution	700 TV lines or more
Synchronization system	Asynchronous with power supply
Screen ruling	525 scanning lines
Horizontal scanning frequency	15.75 KHz
Vertical scanning frequency	60 Hz
Power supply	110/120 VAC ±10%
Current consumption	60 VA
Ambient temperature	-5 to +45°C (23 to 113°F), No condensation
Relative humidity	35 to 85%, No condensation
Dimensions (W x H x D)	8.66" x 8.94" x 9.92" 220 x 227 x 252
Weight	Approx. 6 kg

This product does not comply with EMC directives.

### Dimensions Unit: inch mm



# 24 VDC Power Supply Unit CA-U2



## Specifications

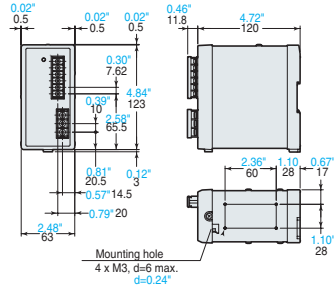


Model		CA-U2
Input conditions	Rated input voltage	100 to 240 VAC (±10%), 50/60 Hz
	Efficiency	78 to 80% (typical)
	Rated input current	1.2 A max.
	Power factor (100/200 VAC)	0.99/0.95 (typical) with maximum load applied
	Leakage current (100/200 VAC)	0.4/0.75 mA max.
	Rush current (100/200 VAC)	18/36 A max. (at 25°C cold start)
	Oversvoltage category	II
Output conditions	Rated output voltage	24 VDC, Class2
	Rated output current	3.5 A (Total of 3 output terminals)
	Ripple/noise voltage	1% (p-p) max.
	Input fluctuation	0.4% max.
	Load fluctuation	0.7% max.
	Starting time (100/200 VAC) <sup>1</sup>	1500/1000 ms max.
Protection	Output holding time	20 ms min. (100 to 240 VAC)
	Oversvoltage <sup>2</sup>	Constant current drops or output is cut off at 3.6 to 4.2 A or higher.
Oversvoltage <sup>1</sup>		Provided
Ambient temperature		-10 to +55°C (14 to 131°F), No condensation. (Refer to derating characteristics)
Relative humidity		-20 to +70°C (-4 to 158°F), No condensation.
Pollution level		2
Withstand voltage		3.0 KVAC 50/60 Hz/1 min (Input-output)
		2.0 KVAC 50/60 Hz/1 min (Input-GND)
		500 VDC/1 min (Output-GND)
Impact resistance		300 m/s <sup>2</sup> , 2 times for each direction of 3 axes
Vibration resistance		10 to 55 Hz, Double amplitude of 1.5 mm max. 2 hours each in X, Y, and Z directions (9.8 m/s <sup>2</sup> max. when mounted on a DIN-rail)
Insulating resistance		100 MΩ min. at 500 VDC (Input-output) (Input-GND) (Output-GND)
Safety standards		UL60950, UL508, CAN/CSA C-22.2 60950-00, EN60950, EN50178
Noise terminal voltage		FCC part 15B class A, EN55011 class A
Radiated interference field strength		FCC part 15B class A, EN55011 class A
Limits for harmonic current emissions		Conforms to EN61000-3-2.
Weight		Approx. 700 g

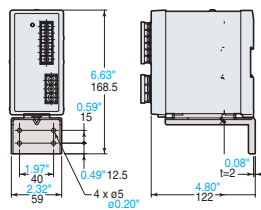
1. Specified with the rated input voltage (100 or 200 VAC) and 100% load applied.
2. Automatic recovery occurs after dropping. When output is interrupted, wait for 1 minute or longer after the input is turned off, and then turn on the input for recovery.
3. Output is cut off by an amplitude interrupting system. When output is interrupted, wait for 1 minute or longer after the input is turned off, and then turn on the input for recovery.

## Dimensions Unit: inch mm

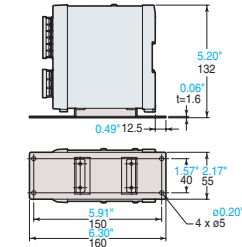
### CA-U2



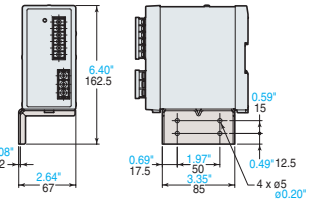
### Front mounting (with OP-42174)



### Bottom mounting (with OP-42175)



### Side mounting (with OP-42176)



# KEYENCE's Sales Service Philosophy

**Effectively designed to solve customers' application problems.**

KEYENCE believes that communication is the foundation to our success and it enables us to quickly respond to our customer's needs.



## *Direct Sales*

KEYENCE's technically trained sales engineers have extensive experience with various applications and industries; this experience allows the most efficient solution to be recommended. In some cases, the application may require the design of a new product. KEYENCE is able to quickly incorporate input from customers into its new product designs. More than 1,500 sales engineers are prepared to assist at every level of a customers' business, from the design and research stage to the production line and beyond.



## *Trial Unit*

KEYENCE recommends that customers purchase the product after evaluating the product's performance on their production line. Customers may select the product of their choice and use it on a free trial basis before actually purchasing the product.



## *Fast Delivery*

KEYENCE has established a fast delivery system to deliver the required products whenever necessary. In emergency cases, this service may also include fast delivery on modified products. Products are shipped from the stocking network centers in Japan, U.S., U.K., Germany, France, Thailand, Malaysia, Singapore, Taiwan and South Korea or from 148 agents in 31 countries on the same day of receipt of an order. All products in the catalog are normally in stock.

Specifications are subject to change without notice.

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