

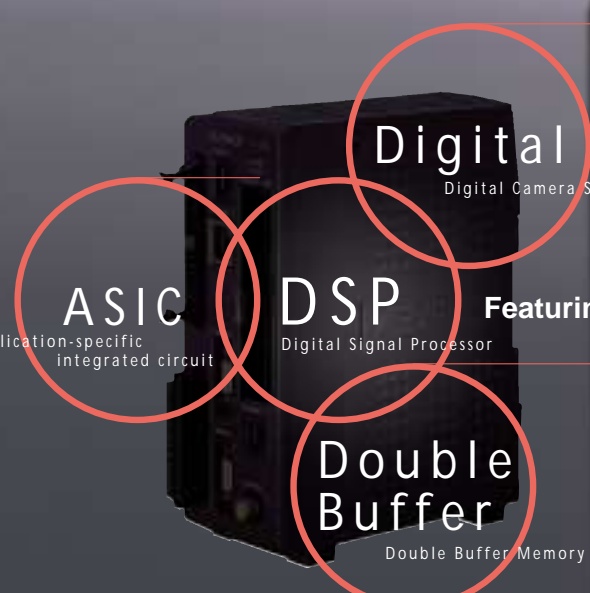
Featuring a
New Image-Processing
Engine

Ultra High-Speed Processing

Up to 20,000 parts/min.

Combines High-Speed Processing and High-Performance Capability

CV-2100 Series



Digital
Digital Camera System

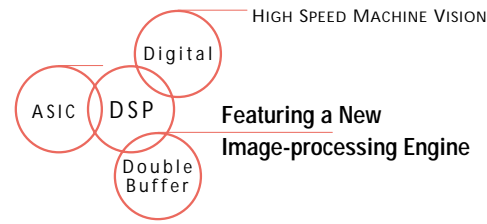
ASIC
Application-specific integrated circuit

DSP
Digital Signal Processor

Double Buffer
Double Buffer Memory

Featuring a new image-processing engine

By employing DSP and ASIC technology, the CV-2100 has achieved the fastest processing speed in its class. Furthermore, the double buffer memory and digital image transfer create a high speed, extremely accurate vision system that outperforms high-end models.

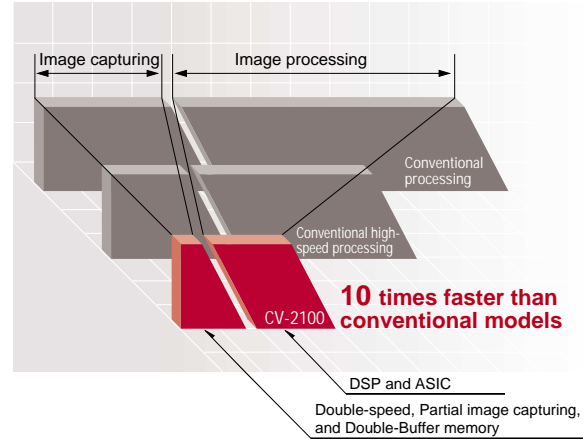


Fastest in its class

Ultra-high-speed processing of 20,000 parts/min.

The combination of a new image-processing engine, double-speed progressive camera, and partial image capturing function produces a minimum processing time of 3 ms (20,000 times/min.*).

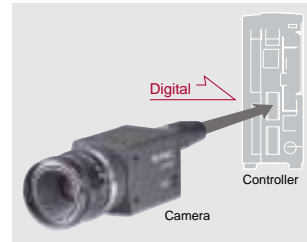
* At a shutter speed of 1/20000 seconds with 12-line reading. Produces a minimum of 10 ms (6,000 parts/min.) for 1-screen interlaced reading.



First in its class

Digital image transfer

The image data captured onto the CCD is converted to digital data within the camera unit and then transferred to the controller. As a result, the image will not deteriorate and is resistant to noise interference.

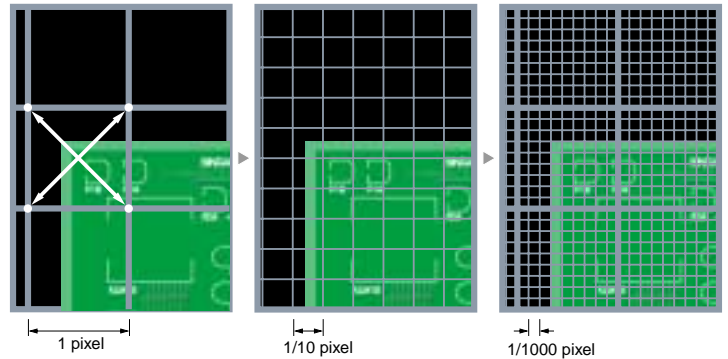


NEW

Repeatability of ±0.05 pixels

Enabling highly accurate positioning and measurement

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



First in its class

On-screen statistical data processing

Simplified tolerance setting and inspection history analysis

The first-in-class statistical function of the CV-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.



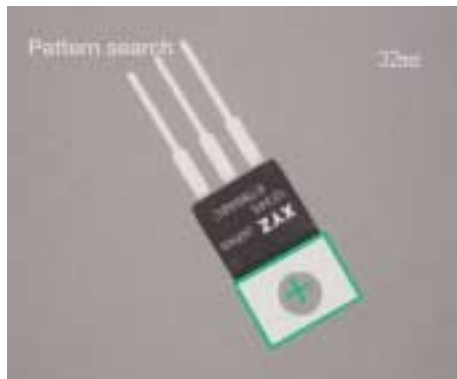
Unmatched image processing speed

Fastest in its class

High-speed rotation search

Realizing a 360° real-time search

The newly developed ASIC technology produces an ultra high-speed rotation search. The 360° rotation search uses normalized correlation (for stability in poor lighting conditions) and enables a real-time search with a minimum speed of 33 ms.



(Search area: 300x300)



NEW

Super-sensitive imaging

Fast shutter speed under low-intensity illumination

The CV-2100 series features a 9-level camera sensitivity adjustment function. A super-sensitive setting ensures sufficient brightness even when a high-speed shutter is used to compensate for fast production lines. This eliminates the need for high-intensity illumination (strobe light). The costs required for installing the unit into a high-speed line will be reduced.



Comparison of images at a shutter speed of 1/10000

Conventional Model



CV-2100

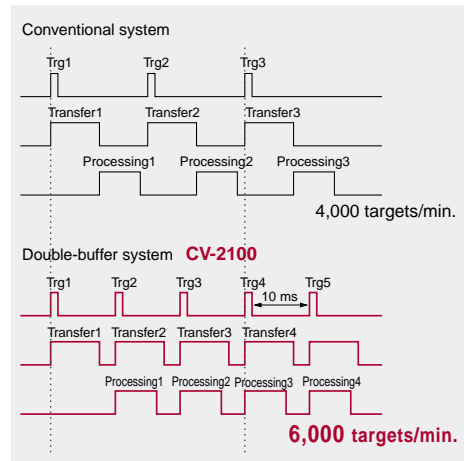
Note: Comparison is made under identical conditions lit by fluorescent light.

First in its class

Double buffer

Accepts trigger inputs during image processing

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 (6000 times/min.) are possible even under the non-interlaced reading mode.



NEW

Partial image reading

High-speed transfer of only necessary data

The time required for transferring images can be reduced dramatically by using the high-speed image transfer function of the quad-speed (8.3 ms interlace) camera and the partial image reading function that transfers only the selected image data.



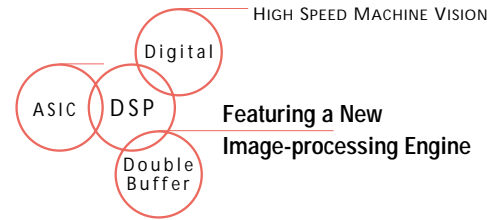
Comparison of the processing time for measuring pin pitches

When reading all lines: 20 ms



When reading 100 lines: 8 ms

High-end processing functions

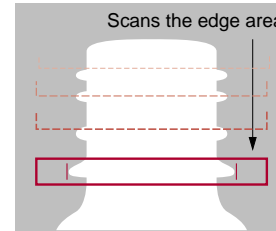
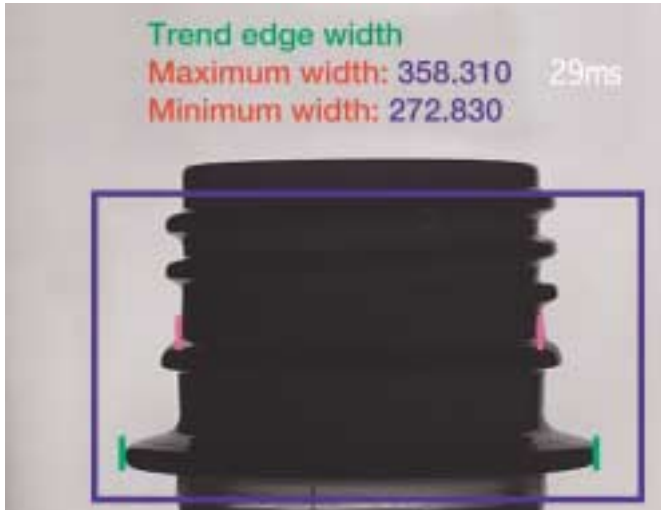


First in its class

Trend edge function

Precisely captures the edge profile of a target

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.

NEW

Edge area correction

Adjusts to the size of the target

While performing inspections, the measurement area can be automatically changed according to the target size by recognizing the outline of the target.



Small-size chip (OK product with no flaws)



Large-size chip (NG product with flaws)

NEW

Pre-processing tools

Obtains an optimal image for image processing

Eight types of pre-processing filters can be applied to adjust for target variations and improve lighting conditions.



Filter types

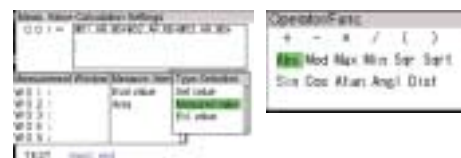
- Expand
- Shrink
- Average
- Median
- Edge enhancement
- Edge extraction (X, Y, XY)

NEW

Operation tools

Console-operated, easy-to-set data calculation functions

Simple calculation functions, including arithmetic, trigonometric, and logic operations, can be easily created.



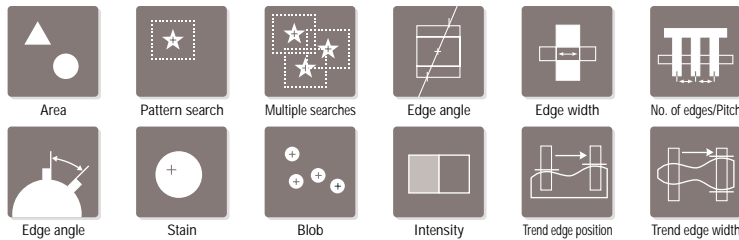
Wide range of inspection modes

NEW

Basic inspection tools

Suitable for every inspection need

Features various 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.



Stain mode



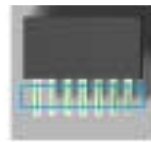
Inspection of flaws on the bottom of a beverage can
Detects flaws on the bottom of aluminum beverage cans

Pattern search mode



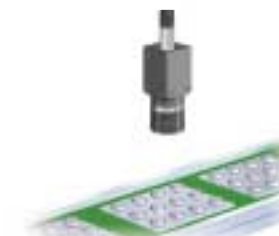
Detecting marks on a fiberglass PCB
Measures the position and angle of marks on a PCB

Edge pitch mode



Inspection of the lead pitch of a connector
Measures the center pitch of connector pins

Blob mode



Counting the number of tablets
Counts the number of properly shaped tablets

Edge position mode



Measuring the notch position of a gear
Detects the notch on the inner diameter of a gear and detects/checks the angle

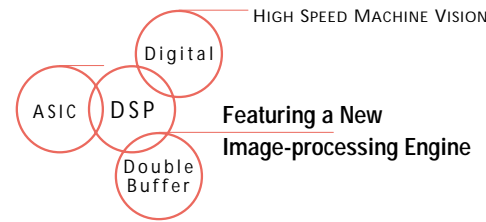
Intensity mode



Differentiating the correct/incorrect sides of a chip component
Differentiates the correct/incorrect sides of a chip based on the difference in brightness

Other functions

Enabling multiple position adjustments	The positions of two or more detection areas can be adjusted by using multiple position-detection data.
Flexible shape of the inspection area	Up to 64 detection areas can be set up for one program. Shapes include Rectangle, Arc, Ring, Ellipse, and Polygon
Illumination correction function	Supports stable detection by automatically compensating for the variation of ambient lighting and change of lighting intensity over time.
Scaling function	The display measurements can easily be converted to any unit of measure that is desired.
Split screen display function	The screen can be split vertically or horizontally in the desired proportion when using two cameras.
Adjustable shutter speed	Reliably captures images of targets traveling at high line speeds.

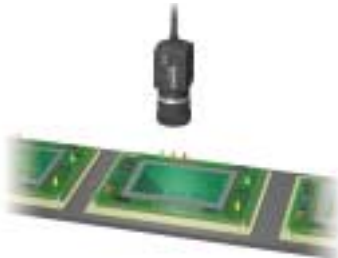


Expanded tool selection

Typical Application Modes

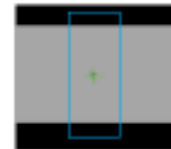
A single sensor covers every application from presence/absence detection to accurate position or dimension measurement.

Presence/absence mode



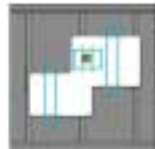
Checking LED mounting
Detects whether each colored LED is mounted at the proper position.

Flaw/dirt detection mode



Detecting flaws or pinholes in sheet material
Detects whether sheet material has any flaws, dirt or pinholes.

Outer edge/Inner edge mode



Checking the dimension of pressed parts
Measures the width or hole diameter in pressed parts

Blob mode



Checking missing bearing rollers/balls
Counts the number of rollers or balls in a bearing to detect if any of them are missing.

Pitch/Gap mode



Measuring the pitch between connector leads
Measures the pitch between connector pins and detects bent or missing pins

Edge position mode



Detecting the liquid level in a container
Detects the surface of the liquid in a container as an edge to check the amount being filled.

Absolute position mode



Checking robotic handling
Measures the coordinates of the target position and adjusts the position of robotic handling.

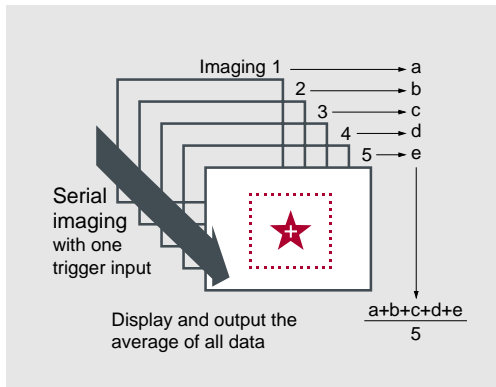
High end accuracy and diagnostic tools

First in its class

Serial image capturing mode

Stabilizes the data with repeated imaging

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 will average multiple images providing stable and reliable data.

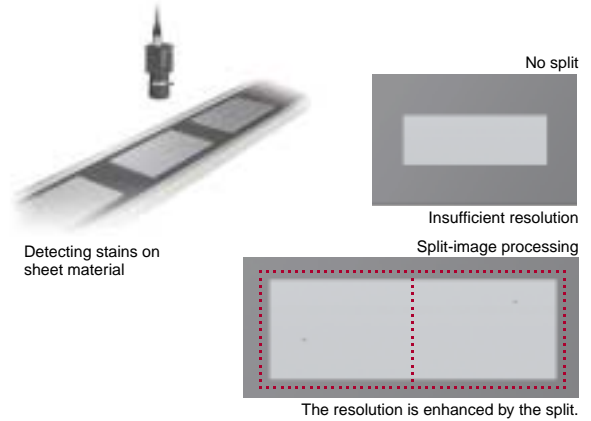


NEW

Split-image capturing mode

Increases resolution with image magnification

The processing results are shown for up to four trigger inputs. High-resolution measurement and inspection can be achieved by imaging and processing a single target from extended viewpoints.



NEW

Tolerance updates during operations

Rewrites 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.



NEW

I/O Monitor

Effective for eliminating faulty wiring and detecting disconnections

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

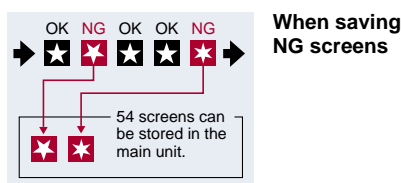


NEW

Save screen function

Stores up to 54 screens

Up to 54 screens can be stored in the memory of the CV-2100 during operations without taking 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.



NEW

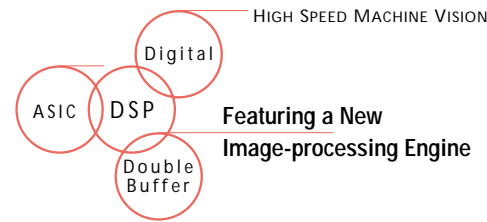
Screen capture function

Saving the current screen in bmp format

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



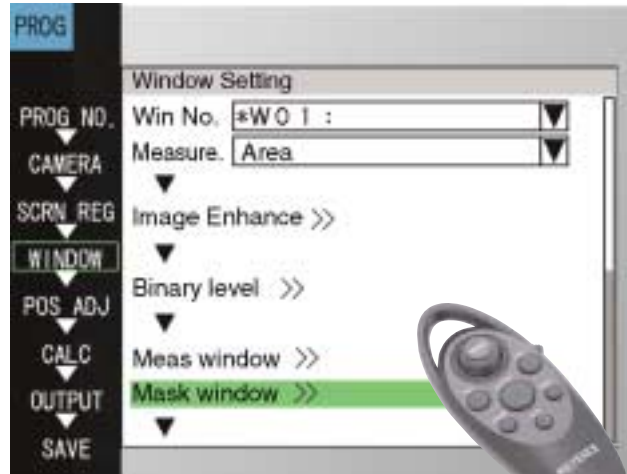
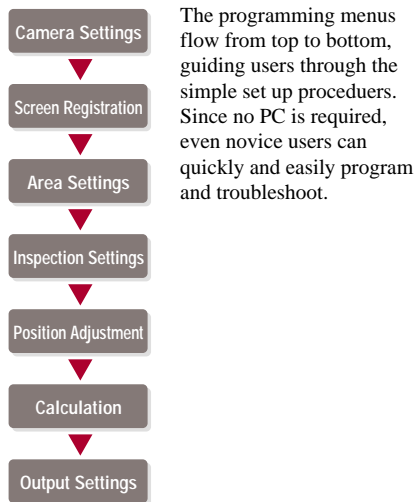
Simple operations



NEW

Vision flow menu

Easy program setup by following the menu from top to bottom



A setting can be made easily using the special console.



NEW

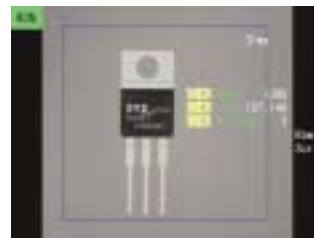
Display screen customization

Flexible layout of display items

Any measurement data, text, or graphics can be specified and positioned on the display 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 settings from unauthorized changes.

NEW

Selectable screen display

Wide range of display modes

Top menu screen



Large icons create an eye-catching, attractive display.

Transparent menus



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

Results listing screen



Multiple judgment results can be viewed on a list display.

Extended I/O interfaces

Ethernet communication NEW

LAN connection is available via 10BaseT/100BaseTX. High-speed transfer of the measured data and images can be performed during operations. The inspection status of two or more CV-2100 units can be monitored on a single PC.



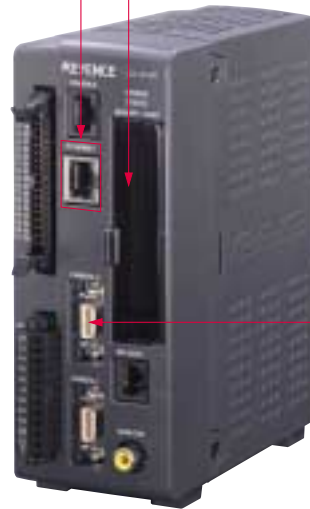
Compact Flash memory card capability

Measured data and images can be written directly onto a high-capacity 256MB Compact Flash memory card during operations (approx. 900 images) without affecting the processing time. This function is useful for data analysis and trend analysis using spreadsheet software such as Microsoft Excel.

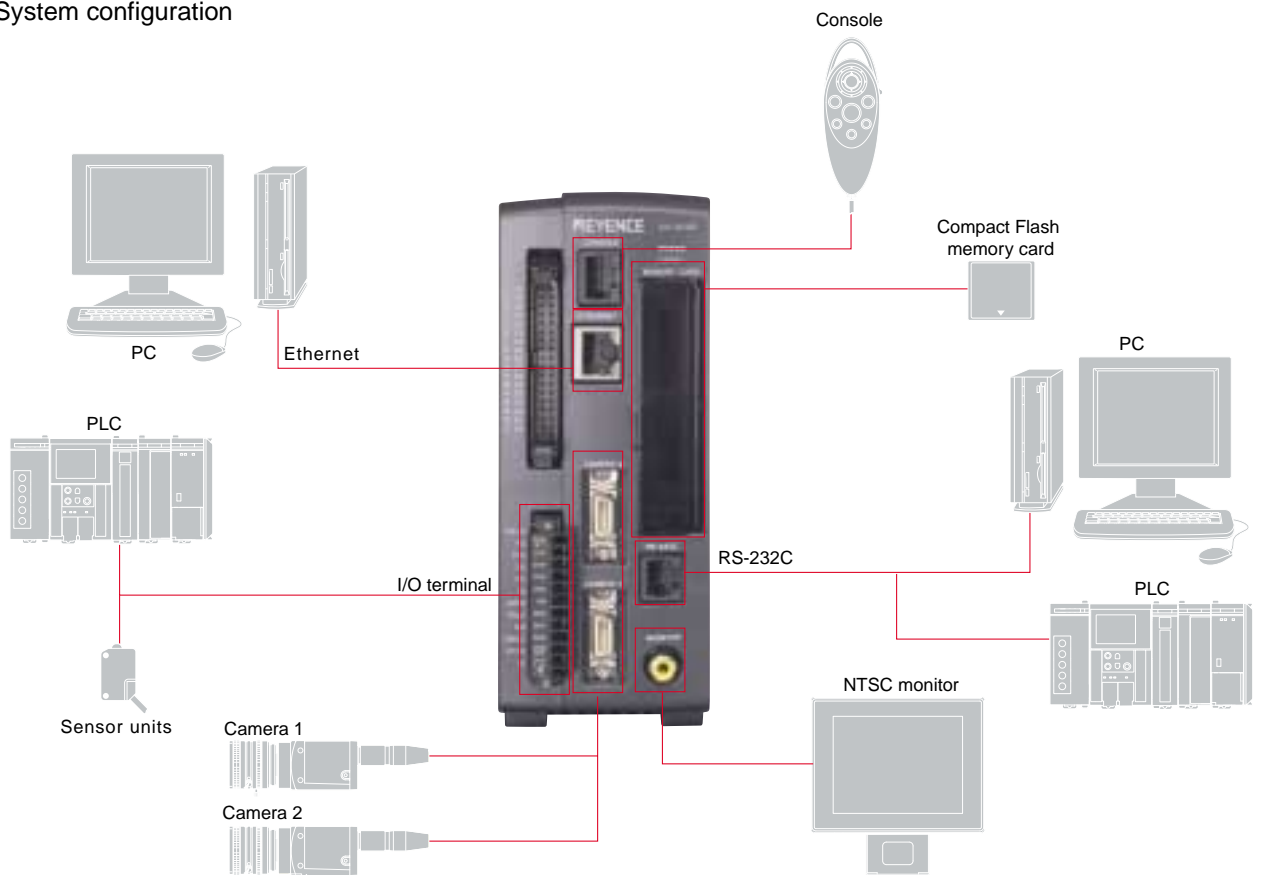


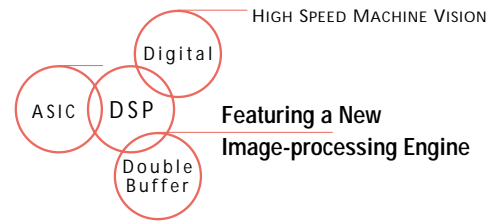
2-camera connection

Two newly developed, double-speed progressive scan cameras can be connected, enabling simultaneous capturing of images.



System configuration





Peripheral devices

Illumination units

LED Illumination CA-D Series

Coaxial incident dome type
CA-DX



Low-angle type
CA-DL



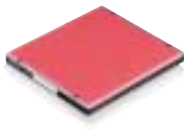
Direct-ring type
CA-DR



LED Illumination controller
CA-DC100



Backlight type
CA-DS



Dome type
CA-DD



Bar type
CA-DB



24 VDC Power Supply Unit
CA-U2



Fluorescent illumination CV-R11



Lens

Macro lens CA-LM Series

2x
CA-LM2



4x
CA-LM4



6x
CA-LM6



8x
CA-LM8



CCTV Lens CV Series

3.5 mm
CV-L3



6 mm
CV-L6



16 mm
CV-L16



50 mm
CV-L50



Close-up ring set
OP-35406



Monitor

8.4" LCD color monitor CA-MN80



Stand



OP-42278

Pole-mounting bracket



OP-42279

Product lineup and options

Controller CV-2100



Console (Included with the CV-2100)



Camera CV-020



Camera mounting bracket
(Included with the CV-020)



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



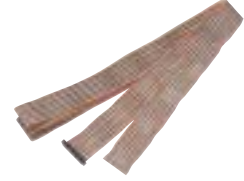
Camera cable
(Cable length: 10 m) CV-C10



Monitor cable (Cable length: 2 m)
(Included with the CV-2100)



Parallel connector with
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



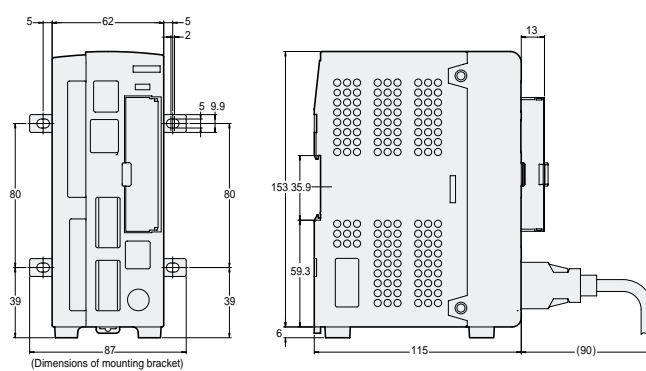
256-MB Compact Flash
memory card GR-M256
32-MB Compact Flash
memory card NR-M32



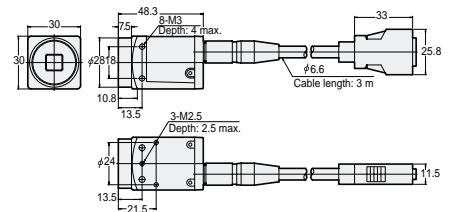
Dimensions

Unit: mm

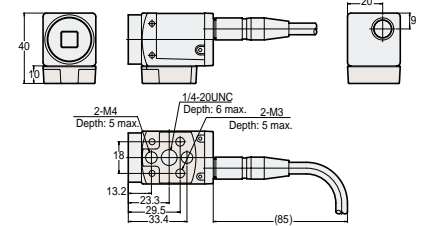
Controller CV-2100



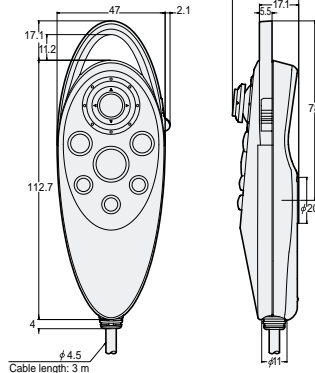
Camera CV-020



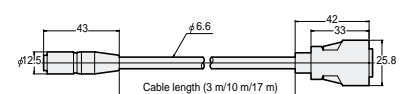
When the resin fitting is attached



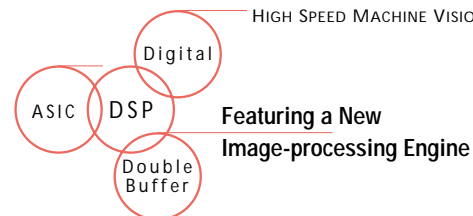
Console



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



Specifications



Controller

Model	NPN	CV-2100		
	PNP	CV-2100P		
No. of pixels		512 (H) x 480 (V)		
Camera input		2 cameras		
Process cycle		100 c/sec. (This varies depending on the settings.)		
Program registration		32 programs. Programs can be 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 windows		
Function	Measurement mode	Area sensor	Window shape: square, circle, ellipse, ring, arc, polygon (max: 12 sides), and edge detection area	
		Position detection	Pattern search	Multiple searches are available. Window shape: square, circle, ellipse, and polygon (max: 12 sides)
			Edge detection	Angle measurement available Window shape: square, rotating square, perimeter, and arc
			Gravity position	Window shape: square, circle, ellipse, perimeter, arc, and polygon (max: 12 sides)
			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, perimeter, and arc
			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, ellipse, ring, arc and polygon (max: 12 sides)	
	Stain detection		Window shape: square, circle, ellipse, perimeter, arc, polygon (max: 12 sides), and edge detection area	
	Intensity inspection		Window shape: square, circle, ellipse, perimeter, arc, polygon (max: 12 sides), and edge detection area	
	Multiple measurement	Split capturing	2 to 4-split capture processing	
Serial capturing		Serial capture 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/window. Expand, shrink, average, median, edge enhancement, and edge extraction (In X, Y, and XY directions)		
	Calibration function	X and Y scaling factors can be set for each camera.		
Operation functions	Numerical operation	32 operations/1 program. Operator (four operations, square, maximum, minimum, square root, absolute value, remainder, distance, angle, sine, cosine, and a-tangent)		
	Comparator operation	32 operations/1 program. Operator (AND, OR, NOT, and XOR)		
Support functions	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 Graphic: 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.		
Memory card *1	Major functions	I/O monitor, screen capture function, password function, and retest function		
		CompactFlash memory card (GR-M256/NR-M32)		
Interface	Control input	External trigger input	1 input. 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/PNP open-collector, 50 mA max (30 V min.)	
		Total comparator output	1 output. NPN/PNP open-collector, 50 mA max (30 V min.)	
	Video output		Conforming to the NTSC system	
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		
Rating	Power supply voltage	24 VDC $\pm 10\%$		
	Current consumption	1 A		
Environment	Ambient temperature	0 to 40°C		
	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
Environment	Ambient temperature	0 to 50°C
	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-700 Series Compact Controller 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.



Controller with built-in TFT color LCD monitor

Compact Flash Memory

2-camera connection

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

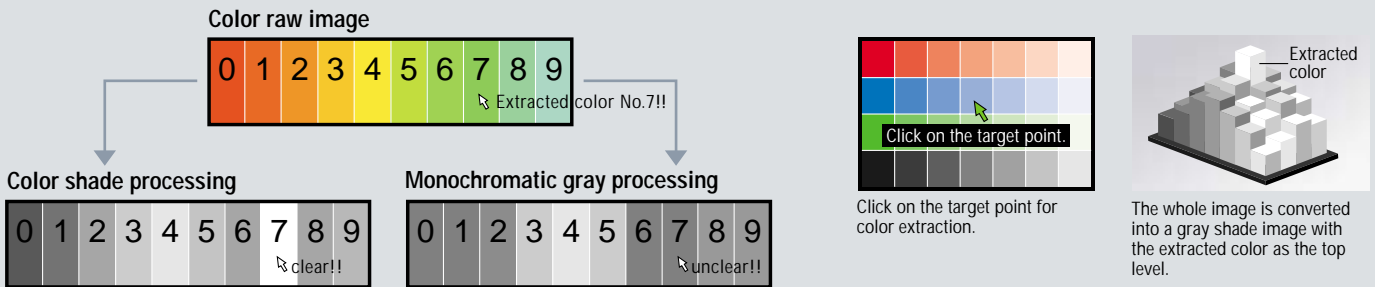
One controller can connect to two cameras. This enables simultaneous multiple point differentiation or measurement of the dimensions of a large size target.

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 image processing available in vision systems today.

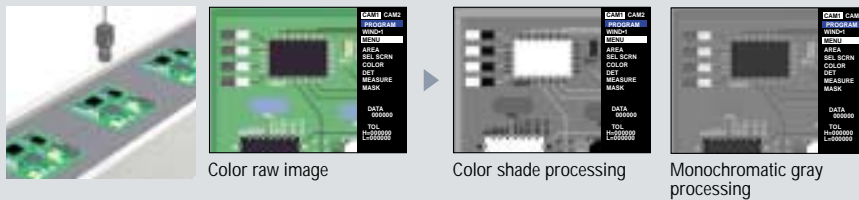


Color shade processing recognizes the differences in hue and intensity of shade levels.

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

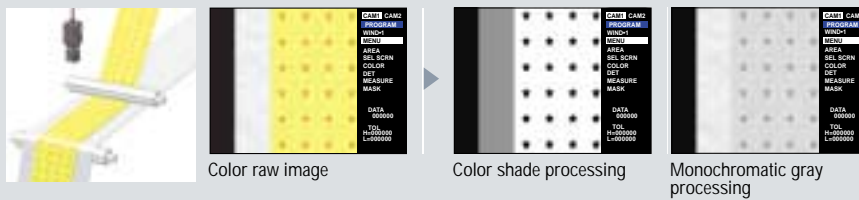
After you click on a target point to extract its color, the entire image is converted to a shade hierarchy with the extracted color as the top level.

Color data provides better target differentiation than black and white data thus Improving Pattern Search Stability



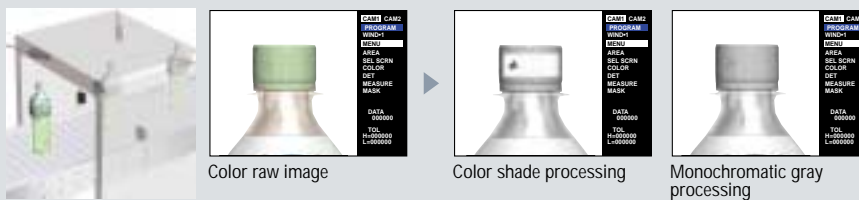
Using brightness data in addition to color data allows separation between black and green or white and yellow, which cannot be recognized by monochrome processing. This differentiation improves pattern search stability.

Measures targets in unit of 0.1 pixel 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 the color shade processing with the sub-pixel processing.

Hardly affected by uneven or rounded surfaces (Flaw/stain detection becomes more stable)



It may be difficult to evenly process the image of a target with a rounded surface with the binary processing due to illumination conditions. Color shade processing provides more stable detection regardless of variation in target colors or change in illumination.

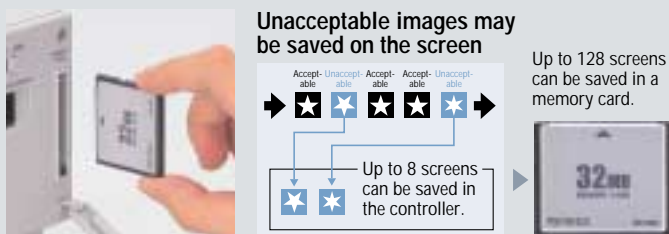
Value and Space Economy

32MB Flash memory card

Save or read 128 inspection settings or 122 images. The CV-700 Series features a 32MB Compact Flash card. Screens can also be saved in bitmap format to generate reports.

Screen storage

Up 8 to images can be stored in the internal memory of the CV. In addition, a 32 MB compact flash memory card can be used to record up to 128 screens.



Two camera connection

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

Controller with built-in TFT color LCD monitor

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