

**Panasonic**  
ideas for life

Machine Vision System  
*IMAGECHECKER*  
**PV500**

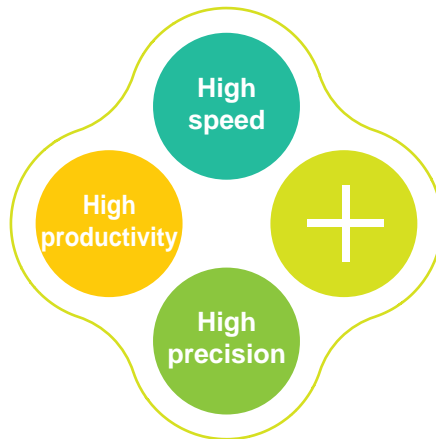


Ultra  
High  
Speed  
Vision  
System





**IMAGECHECKER**  
**PV500**



# Solutions for wider applications

PV500 features further advanced solutions to provide high speed, high precision, and high productivity required for machine vision in production sites.

## High Speed, High Accuracy ----- P.4 ~

- Penta-processor & DSP processing
- Pipeline processing
- Triple buffer
- Designated execution/branch execution
- Individual camera trigger control and two-portion image capture
- High-speed communications and storage  
(Built-in memory/Ethernet/SD memory card)

## High Productivity ----- P.6 ~

- Setup and operation support New function added
- PVWIN setup software
- Utility New function added

## + Solutions ----- P.8 ~

- Image preprocess filters New function added
- Matching
- Flaw detection New function added
- Smart edge (Circle) New function added
- Connector checker
- Inspections of a variety of points  
of a variety of products New function added

# High Speed, High Accuracy



The advanced ultra-high speed pipeline processing technology allows program editing and testing to be performed without stopping production line operations even during full-scale mass production.

The outstanding ultra-high speed processing performance supports the user-friendliness and high productivity of PV500 in production sites.

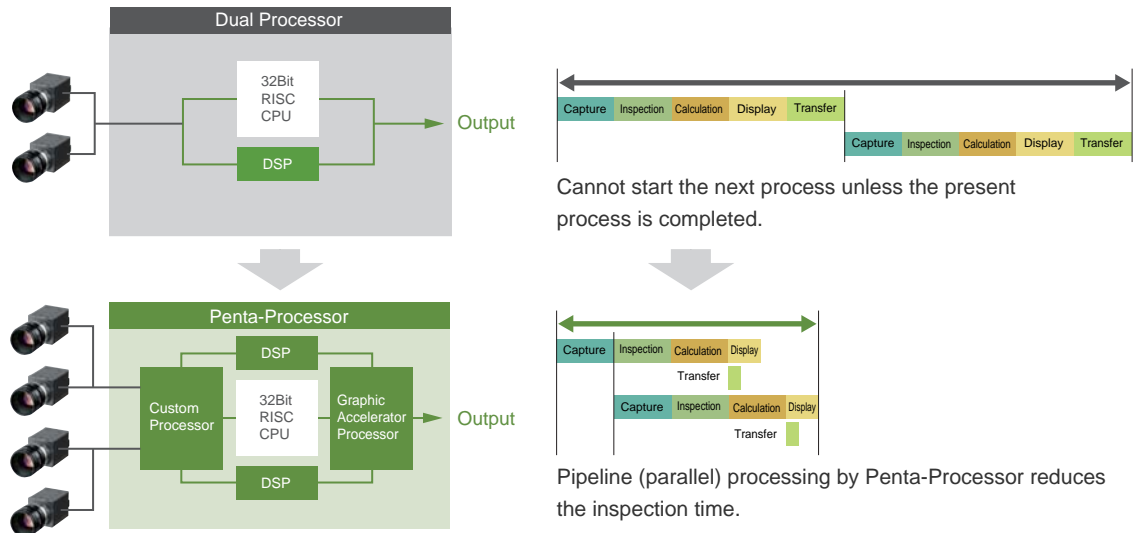
## Penta-processor, DSP processing, & pipeline processing

### "4+1" Penta-Processor for ultra high speed processing

Consists of a processor exclusively for image capture and transfer, a high-speed RISC-CPU, two image-processing DSPs, and a processor exclusively for display processing.

- Pipeline (parallel) processing by Penta-Processor allows image processing operations to be carried out without influence from display processing operations.
- Image transfer, image processing, inspection processing, calculation, and display processing operations can be carried out asynchronously, achieving ultra high speed processing.
- DSP processing: The two high-speed DSPs as an engine dedicated to image processing perform preprocessing filtering in real time.
- Fan-less structure and high hardware reliability in standalone mode

### [Process comparison with our conventional model]



## Triple buffer

The three technologies, including Penta-Processor, DSP processing, and pipeline processing, enabled triple buffer processing.

### Testing function reduces risks.

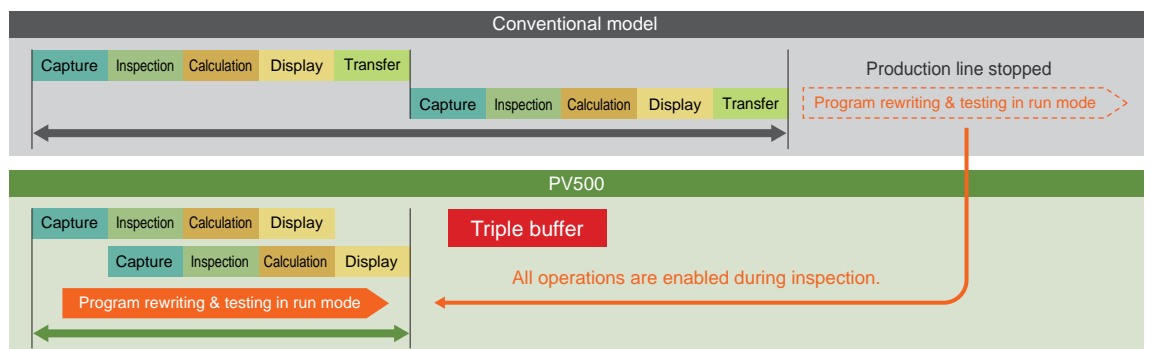
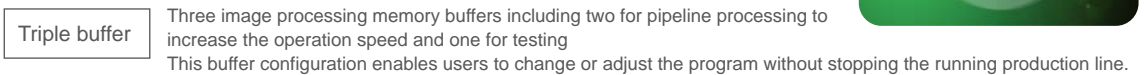
Programs can be tested using stored images without stopping the running production line, preventing defects from being caused by a program editing error.

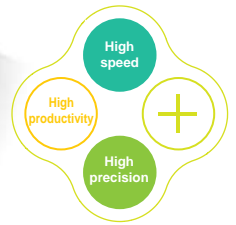
### Programs can be changed in run mode without affecting productivity. (Patent pending)

Programs can be changed without stopping the running production line, allowing smooth adjustments for product type switching or precision improvements.

### Inspection settings can be modified at any time.

Inspection settings can be quickly modified at any time on the Data R/W screen.



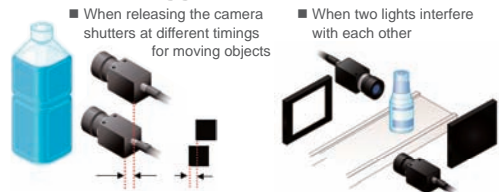


## Individual camera trigger control and two-portion image capture

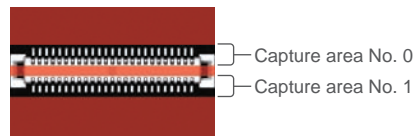
A trigger signal can be individually prepared for each camera to capture images at the appropriate timing. In addition, it is also possible to individually set a delay timer for each camera (0 to 999.9 msec). This function resolves timing errors caused by the camera installation position, limitations on the existing photoelectric switch, etc.

In partial capture mode, images of two areas can be captured. The quad-speed 300,000-pixel camera can complete image capturing in a minimum of 2 msec. The camera shutter speed can be set to any value in a range from 30  $\mu$ sec to 1,000 msec, which accommodates differences in the color or contrast among inspection object types.

### [Individual trigger control examples]



### [Two-portion image capture]



Inspection time can be reduced (2 msec min.) by capturing images of target areas only (up to two portions).

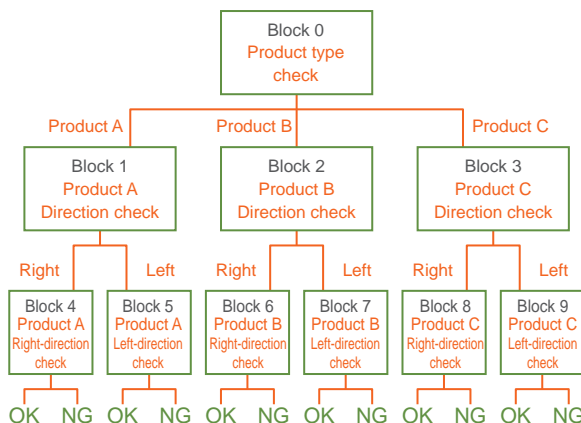
## Designated execution/branch execution

High-speed inspections are possible without a product type switching operation even if inspections to be executed should be switched due to high-mix production or depending on conditions.

"The "branch execution" or "designated execution" options can be chosen for each product type.

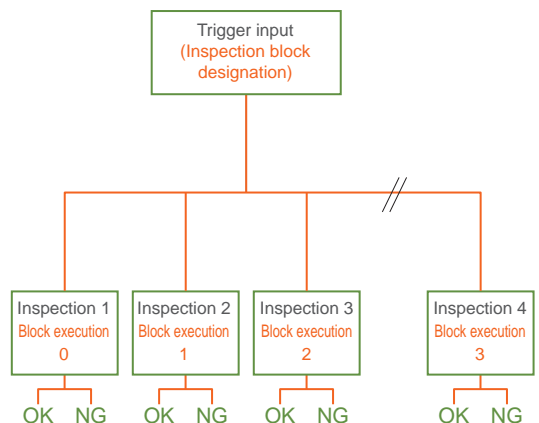
### Branch execution

Up to nine branches can be set to choose an inspection to be executed depending on the test results.



### Designated execution

Up to ten different inspections can be executed immediately after a trigger signal is input without spending time for product type switching operations.



## High-speed communications and storage (Built-in memory/ Ethernet/ SD memory card)

### Inspection result data output

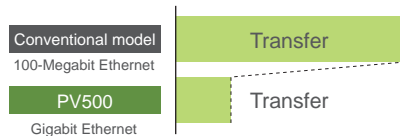
Compatible with parallel I/O (16-bit processing handshake), RS232C (115.2 kHz), Ethernet (Gigabit).

### Image data

Up to 598 images captured by the 300,000-pixel camera and 86 images captured by the 2-megapixel camera can be stored in the built-in memory in real time (without increasing the processing time).

A 32 GB SD memory card can store a maximum of about 16,500 images captured by the 2-megapixel camera or 90,000 images captured by 300,000-pixel camera.

The Gigabit Ethernet LAN port allows image transfers at three to five times the speed of 100-Megabit Ethernet. Via this port, one image captured by the 300,000-pixel camera can be transferred in 80 msec.\*

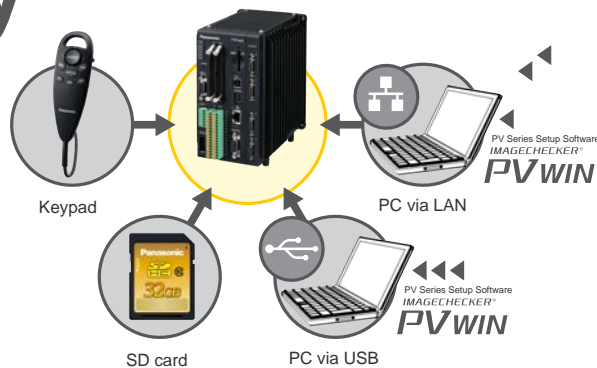


\* Depends on the connected equipment.



# High Productivity

Panasonic Electric Works has developed the world's first triple buffer system (patent pending), which allows full on-line adjustments, including area changing, parameter changing, testing, and program rewriting, during a production line operation. Triple buffer allows final on-site program adjustments to be done without stopping the production line operation. In addition, the screen customization and other assistance functions support operators working on production sites where there are many restrictions.



## Setup and operation support

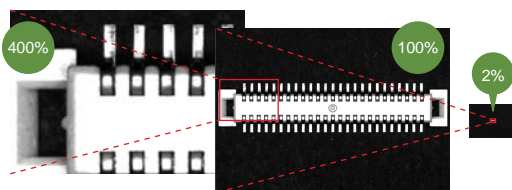
PV500 has been designed by pursuing high productivity, work efficiency, and user friendliness at all stages from the image processor introduction evaluation through operation for full-scale production after introduction to reduce the operation time and burden on users, and to support the display of appropriate inspection information.

### Rewriting in RUN mode

The triple buffer enables operators to carry out final on-site adjustment work, such as program editing and corrected program testing, without stopping the production line operation. [Patent pending]

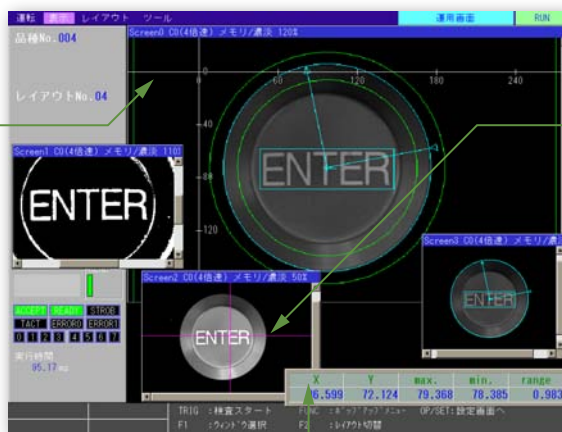
### Zoom

Image displays can be zoomed in the 2 to 400% range.



### Unit conversion axes

X and Y axes indicate the scale converted into the actual dimensions. (Separately settable for each camera)



### Marker function

A straight line, rectangle, circle, ellipse, and cross line can be displayed at any position. The display position can be specified by using external signals.

### Global support

Eight languages and nine fonts are available. In combination with PVWIN PC setup software, text can also be indicated in the Data R/W screen in addition to the menu screen.

言語選択 Japanese	语言选择 Simplified Chinese	Lingua Italian
Language English	언어선택 Korean	Langue French
語言選擇 Traditional Chinese	Sprache German	Idioma Spanish

### Screen customization and free layout

The XGA screen (1024 x 768 pixels) can display a maximum of four images and four pages of the Data R/W screen (a maximum of 120 data items). Up to 32 different layouts can be set by customizing the size, position, overlapping order, display color, etc. of each window. The information displayed can be switched according to the status by using an external signal as well as the keypad.

### Operation customization by external signals

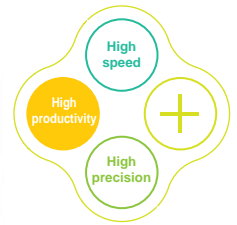
Operations, such as image data output and print screen, can be assigned to ASSIGN 0 to 5 external signals.

### Data R (Read)/W (Write) function

There are cases where tuning of the inspection area, preprocessing parameters, etc. is required even after finalizing a program. Such minor modifications can be quickly made in RUN mode without replacing the program or moving to the setting screen (80 items/page, up to four pages). In combination with PVWIN setup software, any text data can be indicated (eight languages and nine fonts).

[Modification examples]





## Utility

### Checker list

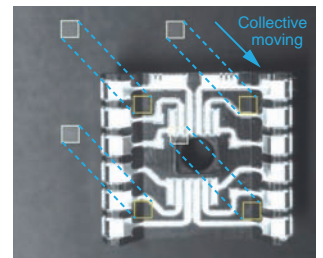
The checker list shows the on/off state of each inspection function and the inspection results so that users can check the program outline. It is possible to jump to the setting screen for a selected function and edit the settings.



Choose and jump

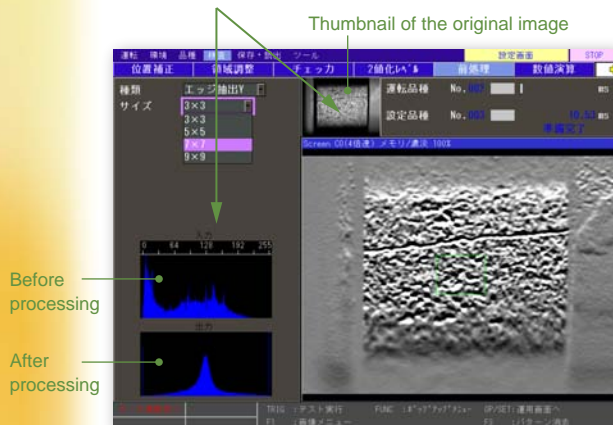
### Collective moving of inspection areas

This function is essential to simultaneously move multiple inspection areas for the purpose of fine adjustment of the target position. The areas can be chosen by camera, position correction group, or inspection checker type.



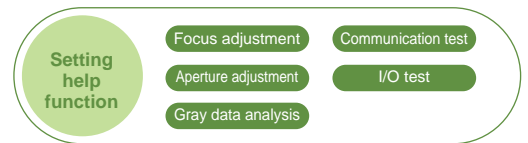
### Histogram

In the image preprocessing and the binarization setting screens, both the original image and its histogram are displayed as guidance for processing.



### Setting help

This setting help function provides support with a quantitative approach to focus adjustment, aperture adjustment, parallel setting, and other setting operations that previously relied on users' guesswork. The parallel input/output monitor function allows connections with external equipment to be easily checked.



This function also supports the testing of text communications via Ethernet and RS232C.

### Password protection

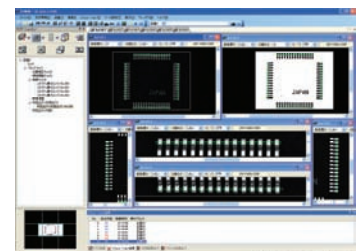
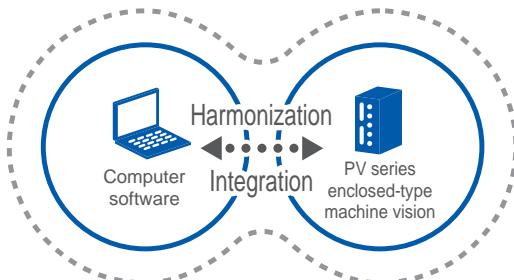
The operation for switching to the setting screen can be password-protected to prevent incorrect settings due to an unintended keypad operation. The password can have a maximum of 15 digits (from 84 alphanumeric and symbol characters).

### Splash screen

The splash (startup) screen can be changed to an original screen, such as a screen suitable for the user's equipment or a screen including a brand logo. (A bitmap with a maximum size of 1024 x 768 pixels)

## PVWIN setup software

- Integration of hardware reliability and software operability
- Off-line continuous simulation
- Programs rewritable from a PC connected to the LAN or USB port in RUN mode without stopping production



PV Series Setup Software  
IMAGECHECKER®  
**PVWIN**

Download PVWIN for free from: <http://panasonic-denko.co.jp/ac>

# Solutions

A wide variety of tools for resolving issues are available, such as image preprocess filters and checker functions.

In addition, the user friendliness and operability have been improved.

The tools enable high reliability stable inspections required by users and reduce the number of man-hours required for programming, enhancing the productivity.

## Image preprocess filters

New

21 types of image preprocess filters are available.

Reliable inspections are possible even under non-uniform lighting conditions or in the case of images with noise.

- Preprocess filters: 21 types
- Preprocess groups: A maximum of 5 groups/camera
- Preprocess steps: A maximum of 10 steps/group

Main purpose	Filter name
Flaw detection	<ul style="list-style-type: none"> <li>● Tophat</li> <li>● Dynamic</li> <li>● Frequency Extraction</li> </ul>
Noise removal	<ul style="list-style-type: none"> <li>● Dilation</li> <li>● Erosion</li> <li>● Erosion → Dilation</li> <li>● Dilation → Erosion</li> </ul>
Rotating and flipping	<ul style="list-style-type: none"> <li>● Rotation</li> <li>● Reflect</li> </ul>

Main purpose	Filter name
Contour enhancement	<ul style="list-style-type: none"> <li>● Sobel</li> <li>● Prewitt</li> <li>● Laplacian</li> <li>● Edge Extraction X</li> <li>● Edge Extraction Y</li> <li>● Sharpen</li> </ul>
Blurring	<ul style="list-style-type: none"> <li>● Median</li> <li>● Smoothing</li> </ul>
Gray scale changing	<ul style="list-style-type: none"> <li>● Auto Correction</li> <li>● Area Averaging</li> <li>● Gray Cut</li> <li>● Correction settings</li> </ul>

Application example	Original image	Processed image	Filter used
Checking container lids for adhesion of foreign substances			Tophat
Checking films/sheets for scratches/wrinkles			Frequency Extraction Area Averaging
Detecting dirt on transparent sheets			Dynamic
Extracting printed characters (deleting the background)			Dynamic
Checking the inside of containers for adhesion of foreign substances			Frequency Extraction Tophat
Checking sintered parts for breaks/cracks			Frequency Extraction Tophat

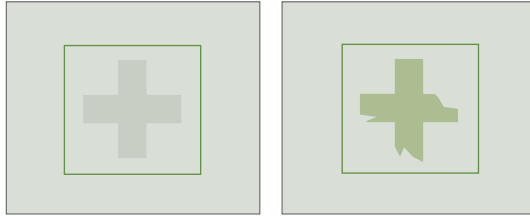




## Matching

### [Low contrast matching]

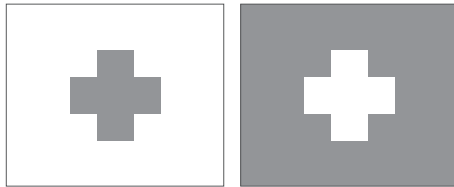
Reliable detection is possible even if the object image has a low contrast (the contrast between the background and the object (workpiece) is low) or if the object is chipped.



Detects low-contrast images. Detects partly chipped marks.

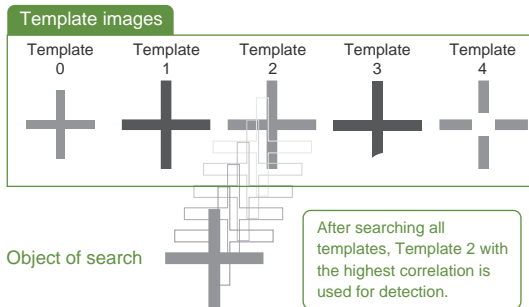
### [Black/white inversion]

Even negative images can be detected.



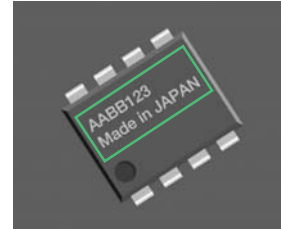
### [Multiple template search]

A high-precision inspection is possible by searching a maximum of 64 templates in the same search area to detect a result with the highest correlation.



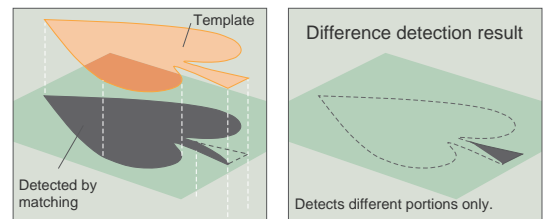
### [360° rotation search]

The matching function has been upgraded. Even if object positions are rotated up to 360°, they can be inspected. Even if objects are roughly positioned, a high-precision inspection is possible.



### [Difference detection]

Based on the position information obtained by the matching function, the registered object and detected object are overlapped and compared on a pixel-by-pixel basis. Any pixels with a difference in brightness over a certain level are detected. The area value of such pixels can then be used to make pass/fail evaluations.



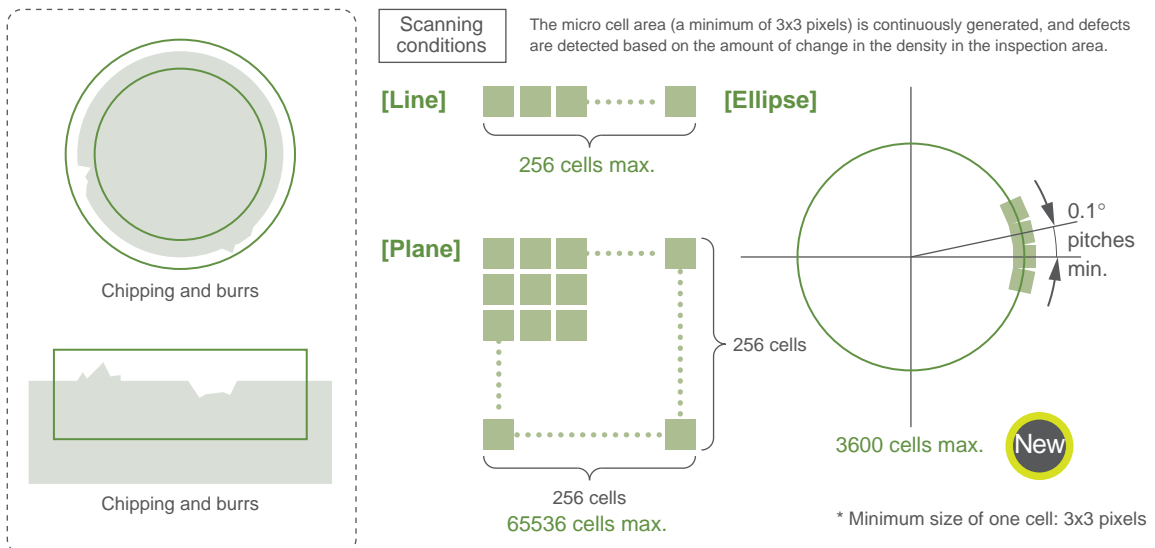
### [Common template registration]

Common templates of alignment marks can be shared. The same template can be used for all product types, preventing variations in the inspection accuracy among different product types. Duplication of registration can be avoided, saving on the total memory space. Individual registration by product type is also available.

## Flaw detection

This function is ideal for appearance inspections for scratches, stains, chipped edges, burrs, and other flaws in objects, which are indispensable elements of in-process inspections.

The inspection is carried out based on the gray scale comparison with neighboring parts, even enabling the detection of minor scratches, stains, and chipping.

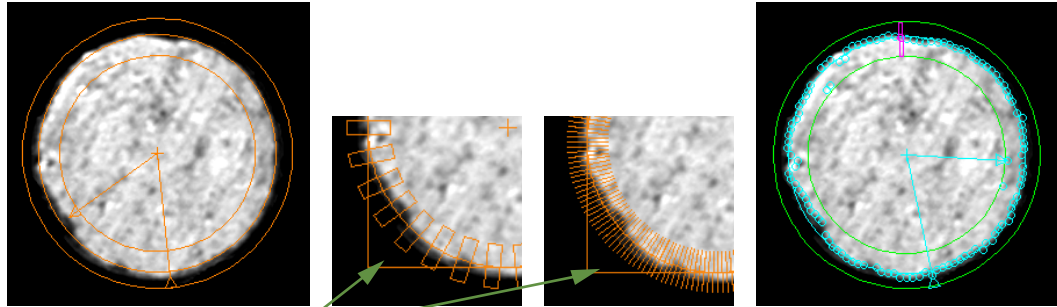


# Solutions

## Smart edge (Circle)

New

This is a function for obtaining the circle center, radius, diameter, and deviation based on the positions of the object's edge points.



Edge point search results

One cell can have a minimum width of one pixel (linear scanning), and a maximum of 3,600 cells can be set per 0.1°.

Processing speed

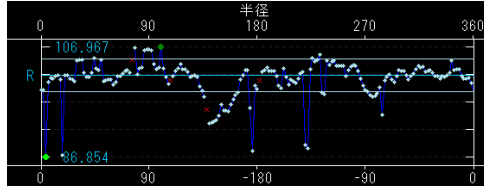
3 x 30 pixels, 120-cell search: 5.8 msec  
3 x 30 pixels, 360-cell search: 12.3 msec

### [Operation principle]

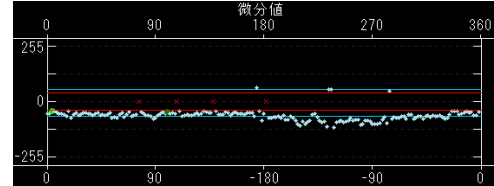
1. A target arc area is set, edge points included in the area are searched, the circle or arc contour is detected.
2. The circle shape is identified with high accuracy based on the valid edge points in accordance with the virtual circle detection conditions, and the center, radius, and diameter are calculated.
3. In addition, pass/fail checks are conducted for edge points selected in accordance with the evaluation criteria.

### [Criteria setting in graph form]

Threshold setting by judgement limits/denoising/distance



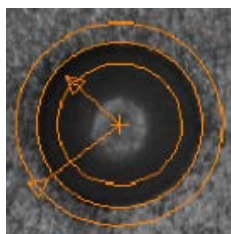
Setting of the edge detect conditions/edge thresholds



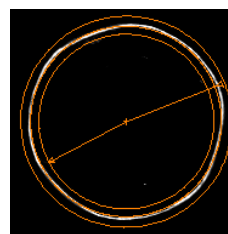
### [Application example]

In addition to the center and radius of the circle, the circularity, diameter, and ring width can be measured by preparing only one area. The applicable shapes include circles, ellipses, and arcs (a part of a circle, a rounded corner). It is also possible to have another inspection area track the detected center.

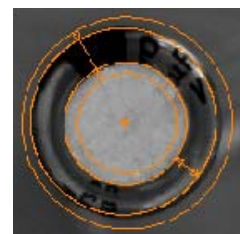
#### Circle center



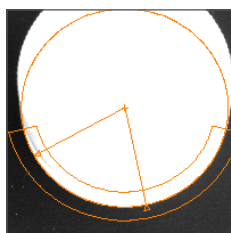
#### Radius (max and min) and circularity



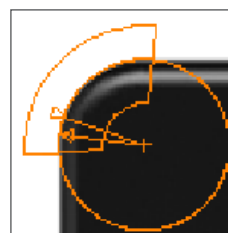
#### Ring width (max and min)



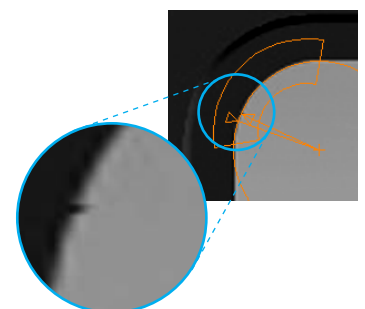
#### Ellipse radius and center



#### Corner radius and center



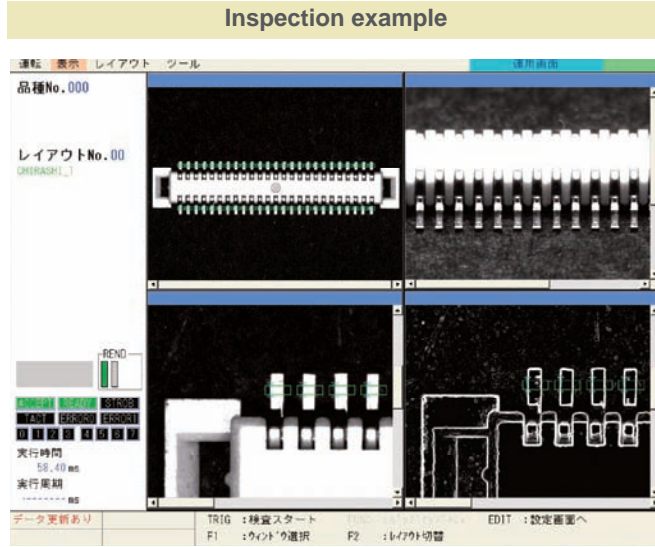
#### Detection of burrs and chippings on the circumference





## Connector checker

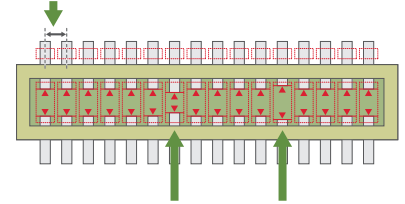
PV500 features four types of checkers exclusively designed for connector inspections, which was previously very time-consuming, requiring only one area to be prepared. These checkers make it easier to add product types and modify settings, and significantly reduce the required number of man-hours.



### Inspection example

### [Pin pitch inspection]

This function measures the distance between the edges of each pair of adjacent pins and evaluates the results based on the preset upper and lower limits. Data of the "start point", "end point", and "number of pins" should be input.

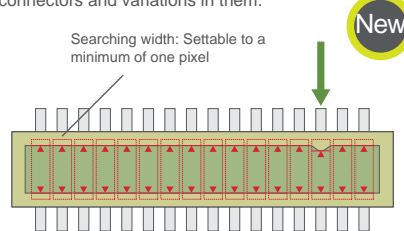


### [Inside pin gap inspection]

This function inspects the gap between facing ends of pins. Simply input the number of pins, and the data will be attached. The upper and lower limits of the gap can be set.

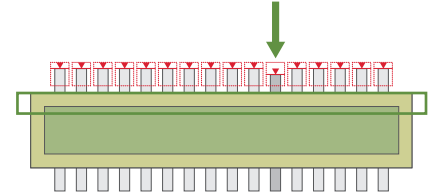
### [Width measurement]

This function measures the maximum and minimum widths of burrs and deformations of resin parts of connectors and variations in them.



### [Pin coplanarity inspection]

This function detects raised pins. In the same way as the pin pitch inspection, adjust the position using one checker and input the number of pins, and the data will be attached. Then simply input the threshold.



## Inspections of a variety of points of a variety of products

- Both the built-in memory and an SD memory card can store data for up to 25,600 product types.

- Maximum registrable number of checkers: 1,000 checkers/type  
[Checker types]

Line, binary window, gray window, binary edge, gray edge, feature extraction, smart matching, flaw detection, three connectors (binary window, gray window, and gray edge), and smart edge (circles) --- A total of 12 types

- Maximum registrable number of numerical computation expressions: 1,000 expressions/type

A variety of operators for numerical computation are available: Four fundamental operations (+, -, x, ?), bracket operation, trigonometric function (14 types), comparison function (6 types), mathematical function (15 types), geometric function (18 types), and statistical function (18 types).

- Slice level groups: 26 groups/type

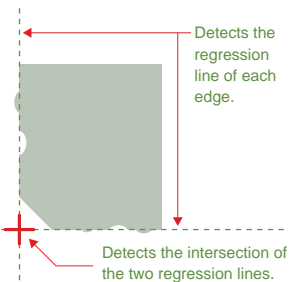
- Execution blocks: 10 blocks/type

- Position adjustment: 1,000 checkers/type Area adjustment: 1,000 checkers/type

Example:  
Despite some noise,  
the coordinates of  
corners can be detected  
with high accuracy.

Max. 1,000  
expressions

New



# System Configuration

IMAGECHECKER  
**PV500**

Equipped with a full selection of interfaces essential for image processing devices of the future

SD memory card (SDHC) compatible

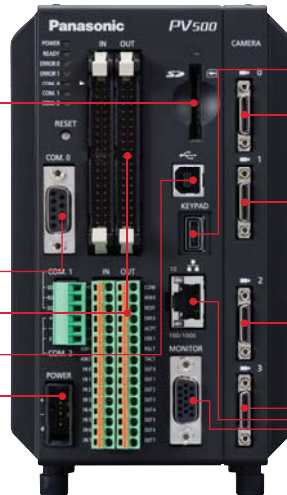


RS232C port

Parallel I/O

USB connector

Power port



Keypad

Cameras (Digital cameras)

Up to four cameras of two different types can be connected.  
(Available with the four-camera type)

Quad-speed 300,000-pixel camera  
2-megapixel camera



Ethernet connector

XGA monitor output

\* The 2-camera type has neither Camera-2 nor Camera-3 port.

## Part Numbers

Controller units/  
Cameras/  
Monitors/  
Keypads

PV500 IMAGECHECKER units



[2-camera type]

NPN output type  
ANPV0502ADN  
PhotoMOS relay output type  
ANPV0502ADP

[4-camera type]

NPN output type  
ANPV0502ADN  
PhotoMOS relay output type  
ANPV0502ADP

Cameras for PV500



Quad-speed  
300,000-pixel camera  
ANPVC1040

2-megapixel  
camera  
ANPVC1210

Keypads



3 m type:  
ANPVP03  
10 m type:  
ANPVP10

Camera cables for PV500



3 m type:  
ANPVC8103  
5 m type:  
ANPVC8105  
10 m type:  
ANPVC8110

Flexible camera cables



3 m type:  
ANPVC8103R  
5 m type:  
ANPVC8105R  
10 m type:  
ANPVC8110R

Quad-speed camera lenses



f=6 with lock  
ANB842NL

f=8.5 with lock  
ANB843L

f=16 with lock  
ANB845NL

f=16 with lock  
ANM88161

f=25 with lock  
ANB846NL

f=25 with lock  
ANM88251

f=50 with lock  
ANB847L

f=50 with lock  
ANM88501

2-megapixel camera lenses



f=16  
ANPVL162

f=25  
ANPVL252

f=50  
ANPVL502

Adapter rings  
(for the quad-speed cameras and  
2-megapixel cameras)



5 mm x 1 ring  
ANB84805

40, 20, 10, 5, 1,  
0.5 mm x 1 ring  
ANB848

XGA monitors



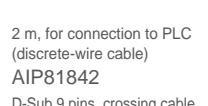
10.4 inches  
ANPVM11021

Monitor cables



3m  
ANMX83313  
5m  
ANMX83315

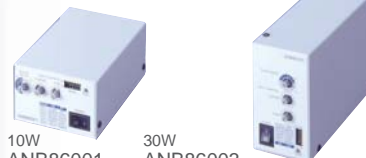
COM port cable



2 m, for connection to PLC  
(discrete-wire cable)  
AIP81842  
D-Sub 9 pins, crossing cable  
AIP81862N  
Computer connection cable  
AFB85853

LED lighting  
equipment for  
image  
processing

Digital power supply units for LED lighting



10W  
ANB86001

30W  
ANB86003

Direct lighting: **Rings**  
The small-sized rings emit high-intensity light.



φ50  
AULDR2  
-50RD

φ50  
AULDR2  
-50SW

φ70  
AULDR2  
-70RD

φ70  
AULDR2  
-70SW

Indirect lighting (light guiding): **Rings**  
The uniform surface emits anti-glare indirect light.



φ74  
AULKR-70A

φ102  
AULFR-100

Transmitted lighting: **Flat panels**  
Uniform light emission ensures reliable inspection.



AULDL-TP2727

AULDL-TP4335

AULFL-100

Coaxial surface lighting  
The special half mirror reduces image ghosts.



AULFV-34

AULFV-50A

Direct lighting: **Bars**  
Compact size and high intensity



AULDL-4215

AULDL-4215-SW

Extension  
cables for  
lighting

Power supply extension cables

Extension cable for the 12 V (red)  
LED-lighting power supply  
3 m, 2-pin connector  
AUCB-3  
Extension cable for the 24 V (white)  
LED-lighting power supply  
3 m, 3-pin connector  
AUFCEB-3

External light control cable

External light control cable for  
ANB86001 and ANB86003, 3m  
AUEXCB-B3

Options for AULDR2-50 series

Exclusive adapter for AULDR2-50 series  
(Required for installing the polarizer/diffuser)  
AUAD-LDR50B  
Exclusive polarizer for AULDR2-50 series  
AUPL-LDR-50B  
Exclusive diffuser for AULDR2-50 series  
AUDF-LDR-50B

Options for AULDR2-70 series

Exclusive polarizer for AULDR2-70 series  
AUPL-LDR-70A  
Exclusive diffuser for AULDR2-70 series  
AUDF-LDR-70A

Advanced  
appearance  
inspection

## IMAGECHECKER AG50V3

High-precision, highly functional appearance inspections  
(detection of scratches, cracks, chips, etc.)  
Compatible with megapixel cameras  
PC programming and gray-scale image processing



- Number of connectable cameras: 4\*1
- Camera types:
  - 1-megapixel type (1024 x 960)
  - Double-speed 240,000-pixel type (512 x 480)
- Monitor: VGA/NTSC
- Max. product types: 256

High speed,  
high productivity

## IMAGECHECKER PV500

"4+1" Penta-Processor for ultra-high speed  
gray-scale image processing  
Setting and test runs are possible during the  
inspection process.



- Number of connectable cameras: 4\*2
- Camera types:
  - Quad-speed 300,000-pixel camera (640 x 480)
  - 2-megapixel type (1600 x 1200)
- Monitor: XGA
- Max. product types: 25,600

Color inspection

## MICRO-IMAGECHECKER AX40

Color and gray scale image processing  
Full set of interfaces with CompactFlash  
card and Ethernet



- Number of connectable cameras: 2\*1
- Camera types:
  - Color inspection
  - 240,000-pixel type (512 x 480)
- Monitor: VGA
- Max. product types: 16

Versatile  
high-performance  
models

## MICRO-IMAGECHECKER PV310

Ultra high-speed, gray scale image processing  
Full set of interfaces with CompactFlash card and  
Ethernet



- Number of connectable cameras: 4\*3
- Camera types:
  - Standard 240,000-pixel type (512x 480)
  - Double-speed 240,000-pixel type (512 x 480)
- Monitor: VGA
- Max. product types: 64

## MICRO-IMAGECHECKER A210/A110

MultiChecker V2 Series  
Compact-size, gray scale image processing  
(2-camera type/1-camera type)



- Number of connectable cameras:  
2 (A210) / 1 (A110)\*1
- Camera types:
  - Standard 240,000-pixel type (512x 480)
  - Double-speed 240,000-pixel type (512 x 480)
- Monitor: NTSC
- Max. product types: 64 (A210) / 32 (A110)

## MICRO-IMAGECHECKER A230

Optical character recognition &  
character checker type



- Number of connectable cameras: 2\*1
- Camera types:
  - Standard 240,000-pixel type (512x 480)
  - Double-speed 240,000-pixel type (512 x 480)
- Monitor: NTSC
- Max. product types: 32

\*1: Same-type cameras \*2 Different type cameras can be mixed. \*3 Same-type cameras (The camera switching unit is required to use four cameras.)

## Customized LED light sources

24 V DC type

### NTN Series

The brightness, shape, number of  
lamps, and installation method can be  
customized to fit purposes of use.

Connection with ANB86001 or  
ANB86003 LED lighting power supply  
enables continuous lighting.

These LED light sources can be used  
only with 24 V DC.

Do not use with any other power  
voltage.

Contact for inquiries about NTN series  
customizable LED light sources

#### Single unit series



**Single unit**  
Wide angle: NTN141  
Diffusion: NTN142  
(External dimensions of the unit:  
80 mm x 50 mm)

#### Line unit series

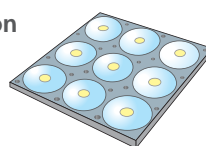


**2-lamp type**  
Wide angle: NTN138  
Diffusion: NTN139  
(External dimensions: 180 mm x  
44 mm)

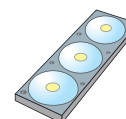


**4-lamp type**  
Wide angle: NTN136  
Diffusion: NTN137  
(External dimensions: 280 mm x  
44 mm)

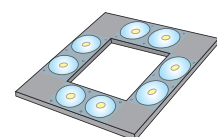
#### Customization examples



Plane type



Linear type



Frame type

New Business Promotion Department, Lighting Manufacturing Business Unit, Panasonic Electric Works Co., Ltd.  
Address: 1048 Kadoma, Kadoma-city, Osaka 571-8686, Japan Tel: +81-6-6909-5734

# Specifications

## General specifications

Item	Specifications
Rated operating voltage	24V DC
Operating voltage range	21.6 to 26.4 V DC (including ripples)
Rated current consumption	1.5 A max. (2-camera type) / 2.0 A max. (4-camera type)
Ambient temperature during use	2-camera type: 0 to +45°C (no freezing or condensation) 4-camera type: 0 to +40°C (no freezing or condensation)
Storage ambient temperature	-20 to +60°C (no freezing or condensation)
Ambient humidity during use	35 to 85%RH (at 25°C (no freezing or condensation))
Storage ambient humidity	35 to 85%RH (at 25°C (no freezing or condensation))
Noise immunity	1,000 V, Pulse width: 50 ns, 1 μs (using the noise simulator method)
Vibration resistance	10 to 55 Hz, 1 sweep/min, double amplitude of 0.75 mm, 30 minutes each in the X, Y, and Z directions
Shock resistance	196 m/s <sup>2</sup> , 5 times each in the X, Y and Z directions
Insulation resistance	100 MΩ or higher (measured by a 500 V DC megger) *
(initial value)	Input and output terminals -- Power and ground terminals Input and output terminals -- Non-energized metal part Power terminal -- Non-energized metal part
Breakdown voltage	500 V AC for 1 min (600 V AC for 1 sec), Cutoff current: 10 mA *
(initial value)	Input and output terminals -- Power and ground terminals Input and output terminals -- Non-energized metal part Power terminal -- Non-energized metal part
Battery life	Approx. 10 years (at 25°C)
Weight	Approx. 1.6 kg (incl. terminal blocks and connectors)

\* The evaluation was carried out with the primary side power supply varistor and capacitor removed from the internal circuit of the unit.

## Functional specifications

Item	Specifications
Input/Output	Cameras
	Quad-speed 300,000-pixel camera (640x480) and 2-megapixel camera (1600x1200)
	Up to two cameras can be attached to the 2-camera type unit, and four to the 4-camera type unit.
	Monitor output
	XGA (1024x768) output
	Memory card
	SD memory card
	Serial
	RS-232C x 1, Ether net x 1
	PLCs compatible with the RS232C PLC link function
	Panasonic Electric Works: FP Series
	Mitsubishi Electric: A, Q, FX (FX1N), and FX-2N series (FX2N, FX3U, and FX3UC)
	OMRON: C, CV, and CS1 series
	Allen-Bradley: SLC500
	Fuji Electric: MICREX-SX SPH series
	USB
	USB 2.0, A-B type
	Parallel
	Phoenix terminals: 14 inputs / 15 outputs
	MIL terminals: 32 inputs / 32 outputs
	Keypad input
	1 connector for dedicated keypad (ANPVP**)

## Image processing functional specifications

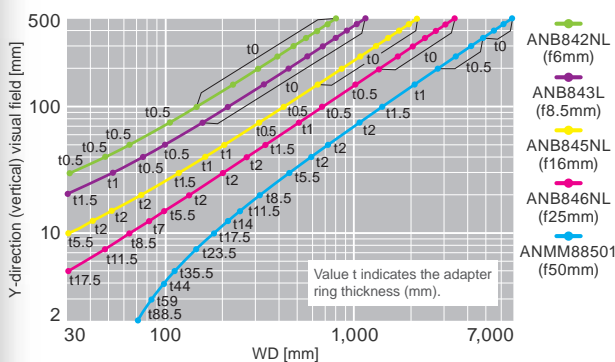
Item	Specifications
Menu display	Eight languages (nine fonts) switchable
Monitor display (XGA)	Split-screen display of up to four camera images
	Zoom function (2 to 400%)
	Image display: Through/Memory/NG object images
	Display effects: Gray Scale/Thresholding Group/Pre-processing Group
	Display area (1024 x 768), 16,770,000 colors
Processing methods	Gray scale processing, thresholding processing
Number of connected cameras	2-camera type: Up to two cameras 4-camera type: Up to four cameras (Select between the quad-speed 300,000-pixel camera and the 2-megapixel camera.)
Camera connection	Mini camera link connector for connection by camera link (PoCL)
Trigger input	Select from: All cameras, individual cameras, detection trigger (all)
Capture method	Frame mode only. Partial capture of up to two portions
	In partial capture mode, the minimum capture area to be set for the quad-speed 300,000-pixel camera is one line, and that for the 2-megapixel camera is 100 lines.
Shutter speed	30 μs to 1000 ms (Set in increments of 10 μs)
Gain setting range	0.25 to 1.0
No. of product types	25,600 types max. (depends on setting data)
Inspection functions (Checkers)	1,000 checkers/product type max. (depends on setting data)
	- Position adjustment - Position/rotation adjustment - Rotation adjustment
	- Area size adjustment - Binary window - Gray window - Binary edge
	- Gray edge - Feature extraction - Smart matching - Line - Flaw detection
	- Connector(binary window) - Connector(gray window)
	- Connector(gray edge) - Smart edge (circles)
Inspection operation mode	Sequential processing: Mode compatible with the conventional model. After completing the result output, the next image capture for inspection can be started.
	Parallel processing: After completing the first image capture, the image capture for the next inspection can be started immediately. Image capture and inspection can be processed concurrently.
Slice level group	26 levels/product type, 256-gray scale (0 to 255)
Preprocess filters	Preprocessing filters: 21 types
	For each product type, 5 groups/camera, 10 stages max.
	(Dilation, Erosion, Erosion → Dilation, Dilation → Erosion, Auto correction, Gray cut, Area averaging, Correction settings, Median, Smoothing, Sobel, Prewitt, Laplacian, Edge extraction X, Edge extraction Y, Sharpen, Tophat, Dynamic, Frequency extraction, Rotation, and Reflect

Item	Specifications
Processing	2-megapixel camera: 1600 horizontal x 1200 vertical pixels
resolution	Quad-speed 300,000-pixel camera: 640 horizontal x 480 vertical pixels
Numerical	1,000 formulae/product type max., including those for evaluation result output (depends on setting data)
calculation	Calculations involving output values of inspection functions
Operators	Four fundamental operations (+, -, x, /), bracket operators, trigonometric functions (14 types), comparison functions (6 types), math functions (15 types), geometric functions (18 types)
Statistic data	Scan count/OK count/NG count/Average/Variance/Max./Min./Range/
operation items	OK average/OK variance/OK judgement max./OK judgement min./OK range/NG average/NG variance/NG judgement max./NG judgement min./NG range
	User limit: 1000 items /product type max.
Other operation items	Previous data of numerical calculation and judgement results, general-purpose registers
Number of reference operators	16 items/formula
Judgement	1,000 formulae/product type max., including those for numerical calculation (depends on setting data)
	Substitution for and logical calculation of evaluation results from checkers and numerical computations
Operators	NOT/AND/OR/XOR/Brackets
Number of substitution items	16 items/formula
Others	Total judgement conditions, save image conditions, Image output conditions, parallel output setting (8 outputs from OUT0 to OUT7 and 16 outputs from OUT0 to OUT15, or all setting output)
Data R/W	Four-window display of up to 80 (5x16) cells/product type on screen in table form in RUN mode
	Substitution of title input, checker conditions/results, numerical calculation results, numerical calculation judgement results, judgement results, statistical results possible.
	Change of upper/lower limits of numerical computation in the table in RUN mode possible.
Conversion	Coordinates, coordinate origin, horizontal and vertical coefficients can be set for each camera to obtain actual dimensions.
data	Others
Marker	Comment input
Shapes	8 markers/product type max. for each camera. Graphic display on the operation screen. Selectable from eight colors
Group move	Rectangle/Ellipse/Polygon/Line/Cross
Template settings	Collective movement of set checkers in units of position/rotation adjustment groups
Execution mode	Set the movement to Yes/No. Position and rotation adjustment checkers cannot be moved.
	Position: Set position/Adjusted position
	Display: Yes/No
	Execution all: Execution of all checkers
	Automatic switch: Destination blocks (0 to 9) can be set.
	User defined: Blocks to be executed (0 to 9) can be set.

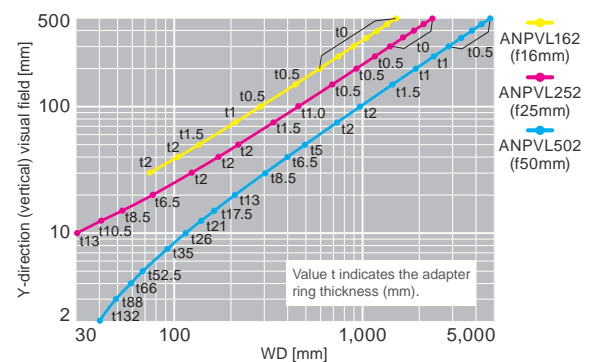
• The above specifications are of PV500 with firmware Ver1.6 installed.  
• An OCR type is also available. Please consult us.

# Visual fields

Quad-speed 300,000-pixel camera: ANPVC1040



2-megapixel camera: ANPVC1210

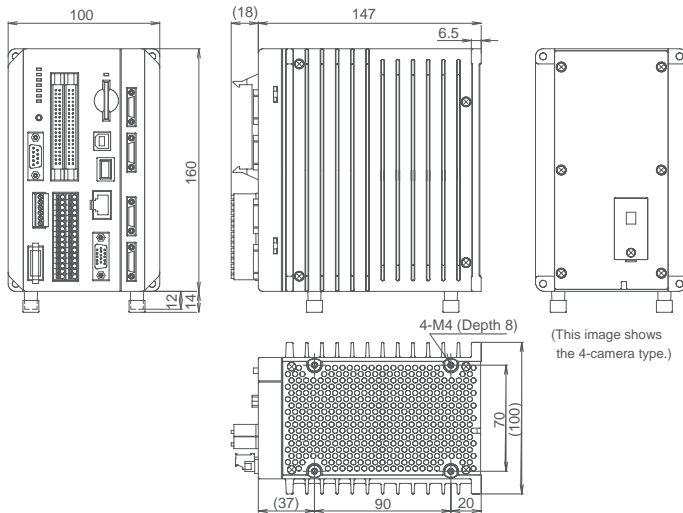


The X-direction (horizontal) visual field is the Y-direction visual field multiplied by 1.3.  
\* Please use these values as reference purposes only. Check the details with the PV500 User's Manual.

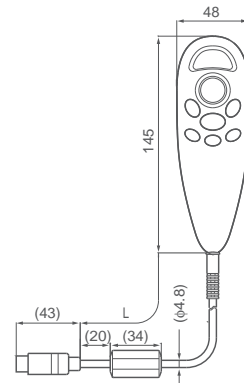
# Dimensional Drawing (Unit: mm)

Controller unit/  
Camera/  
Monitor/  
Keypad

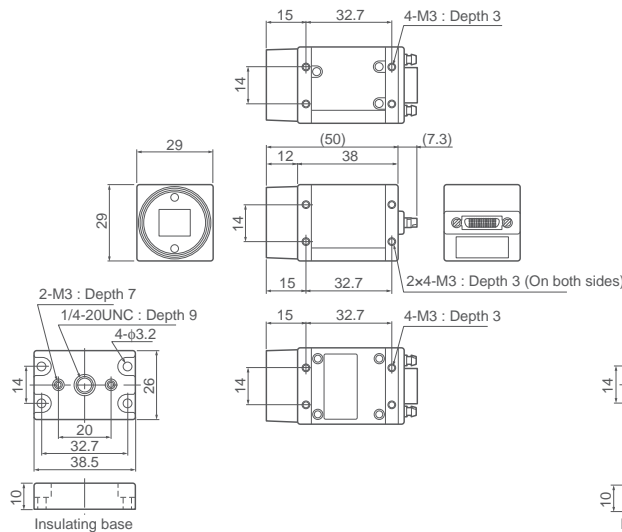
● **Controller unit ANPV050\*\*\*\* (4-camera type)**



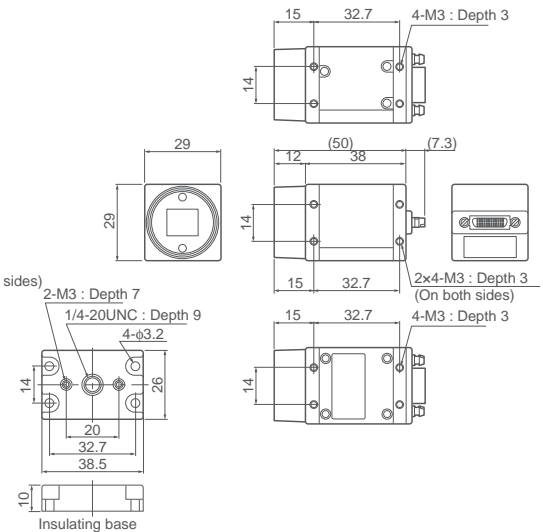
● **Operation keypad ANPVP\*\***



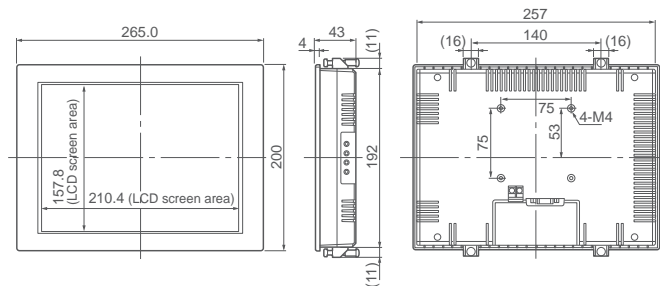
● **Quad-speed 300,000-pixel camera ANPV01040**



● **2-megapixel camera ANPVC1210**

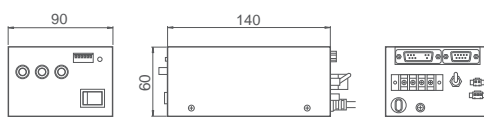


● **XGA monitor ANPVM11021**

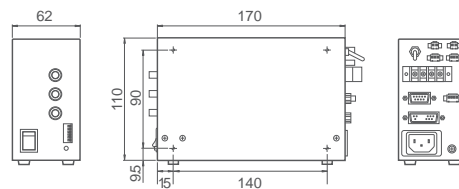


LED lighting  
equipment  
for image  
processing

● **Digital power supply units for LED lighting ANB86001**



**ANB86003**



These materials are printed on ECF pulp.  
These materials are printed with earth-friendly vegetable-based (soybean oil) ink.



Please contact.....

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