

PV500V2

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SENSORSMICRO
PHOTOELECTRIC
SENSORSAREA
SENSORSLIGHT CURTAINS /
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COMPONENTSPRESSURE /
FLOW
SENSORSINDUCTIVE
PROXIMITY
SENSORSPARTICULAR
USE SENSORSSENSOR
OPTIONSSIMPLE
WIRE-SAVING
UNITSWIRE-SAVING
SYSTEMSMEASUREMENT
SENSORSSTATIC ELECTRICITY
PREVENTION
DEVICESLASER
MARKERS

PLC

HUMAN MACHINE
INTERFACESENERGY CONSUMPTION
VISUALIZATION
COMPONENTS

FA COMPONENTS

MACHINE VISION
SYSTEMSUV CURING
SYSTEMS

Applications

Machine Vision
SystemsPV230/PV200/
PV200 MC

PV500V2



Wider variety of solution tools for higher accuracy and user friendliness

Features

• High speed and High accuracy

- "4+1" Penta-Processor and pipeline (parallel) processing for ultra high speed inspections
- Two-portion image capture at the fastest speed in its class at maximum 2 msec by Gigabit Ethernet
- Triple Buffer for full online adjustment without stopping the running production line

• High productivity

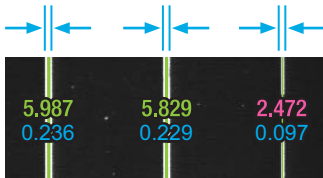
- Capable of program rewriting, editing, and testing in RUN mode
- Customizable free-layout screens compatible with an XGA high-definition monitor
- Eight languages and nine fonts available for global use

• Solutions

- 21 types of image preprocessing filters
- A variety of solution tools, including Smart Edge for circles/lines, Geometric Operation, and Connector Checker
- "PVWIN" setup software for easy setup and continuous simulation
Available for download from our website free of charge.

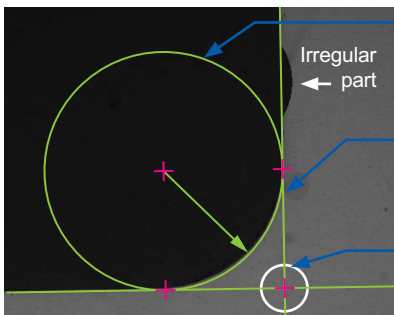
NEW FUNCTION

Easy-to-operate, High accuracy measurement



Line width

A function for measuring the width and linearity and detecting chipped parts of strip-shaped objects. Even if a middle part is cut, this function can measure the maximum and minimum values of the entire object excluding the cut part.



Virtual circle

A function for detecting a center and measuring the radius of arcs and parts of circles.

Estimated straight line

A function for accurate approximation of linear components with irregularities or noise

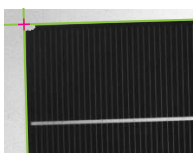
Intersection of two lines

A function for detecting the intersection of two lines.

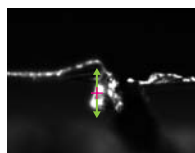
No mathematical formulas are required for applying this function.

Smart Edge (Circle) / (Line): A function for accurate approximation of circles / lines. This function detects a maximum of 3,000 edge points for a line and 3,600 for a circle in one area, dramatically improving the accuracy of the measurement of dimensions and positions.

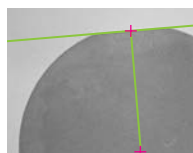
Versatile application



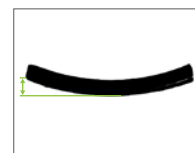
Intersection coordinate /
angle measurement



Burr height
measurement



Angle/perpendicular
distance measurement

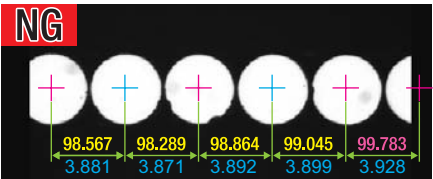


Warpage height
measurement

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LASER SENSORS
PHOTOELECTRIC SENSORS
MICRO PHOTOELECTRIC SENSORS
AREA SENSORS
LIGHT CURTAINS / SAFETY COMPONENTS
PRESSURE / FLOW SENSORS
INDUCTIVE PROXIMITY SENSORS
PARTICULAR USE SENSORS
SENSOR OPTIONS
SIMPLE WIRE-SAVING UNITS
WIRE-SAVING SYSTEMS
MEASUREMENT SENSORS
STATIC ELECTRICITY PREVENTION DEVICES
LASER MARKERS
PLC
HUMAN MACHINE INTERFACES
ENERGY CONSUMPTION VISUALIZATION COMPONENTS
FA COMPONENTS
MACHINE VISION SYSTEMS
UV CURING SYSTEMS

Applications
Machine Vision Systems
PV230/PV200/ PV200 MC
PV500V2

Easy-to-read and use, Customizable display



Character/Figure Drawing

A function for drawing text (multi-lingual), measured values, cross marks, arrow marks (dimension lines), rectangles, and ellipses. This function allows drawn items to be displayed following the calculation results or detected positions, and it is possible to specify the character size and fill regions. It is also possible to switch the drawn item colors or turn on/off the display of the items according to the pass/fail check results so that users can get inspection results more easily.

HIGH SPEED AND 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 **PV500V2** in production sites.

Triple buffer

The three technologies, including Penta-Processor, DSP processing, and pipeline processing, enabled Triple Buffer processing.

Testing function reduces risks.

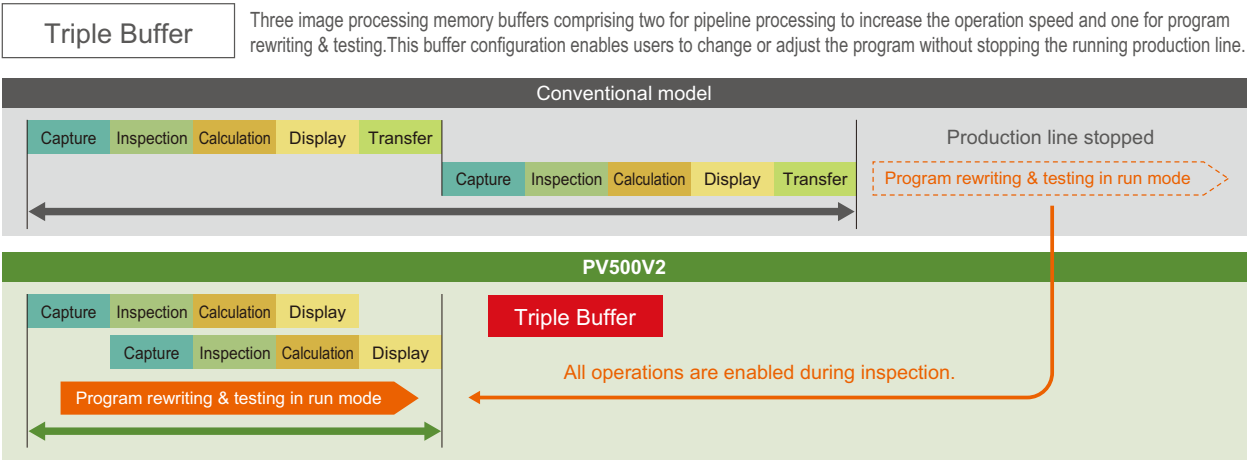
Programs can be tested using stored images without stopping the running production line, preventing defects from being caused by a program editing error.

Programs can be changed in run mode without affecting productivity.

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.



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HIGH PRODUCTIVITY

This system 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

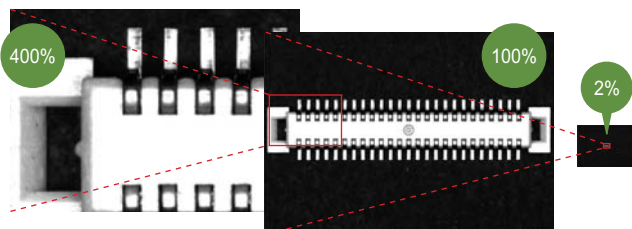
PV500V2 has been designed by pursuing high productivity, work efficiency, and user friendliness at all stages from the image processor introduction evaluation through operation for full-scale production after introduction to reduce the operation time and burden on users, and to support the display of 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.

Zoom

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



Screen customization and free layout

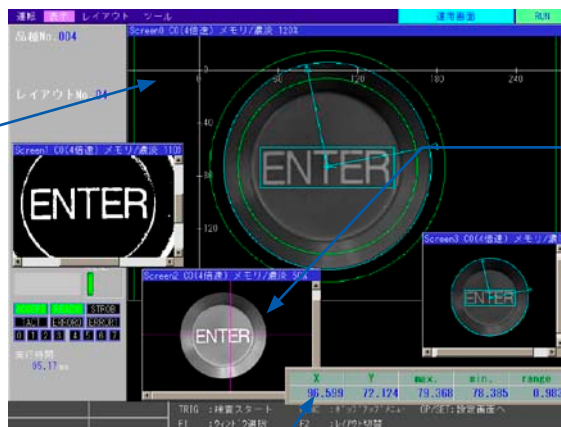
The XGA screen (1,024 × 768 pixels) can display a maximum of four images and four pages of the Data R/W screen (a maximum of 120 data items). Up to 32 different layouts can be set by customizing the each size, position, overlapping order, display color, etc. Information displayed can be switched according 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.

Unit conversion axes

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



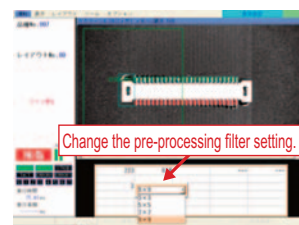
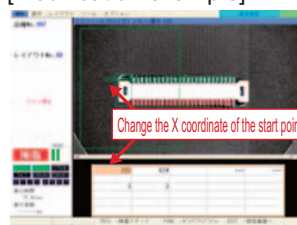
Marker function

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.

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 example]



SOLUTIONS

A wide variety of tools for resolving issues are available, such as image preprocessing 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 preprocessing filters

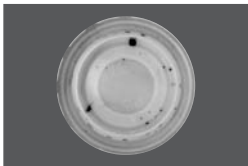
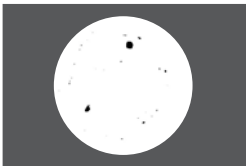

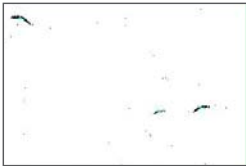


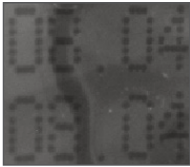
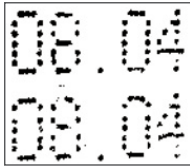
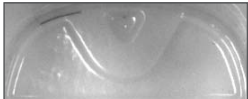

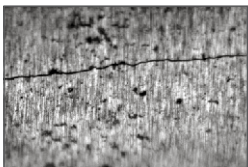
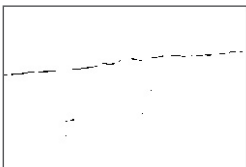
21 types of image preprocess filters are available.

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"> • Tophat • Dynamic • Frequency Extraction
Noise removal	<ul style="list-style-type: none"> • Dilation • Erosion • Erosion → Dilation • Dilation → Erosion
Rotating and flipping	<ul style="list-style-type: none"> • Rotation • Reflect

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

Application example	Original image	Processed image	Filter used
Checking container lids for adhesion of foreign substances			Tophat
Checking films/sheets for scratches/wrinkles			Grey difference 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			Grey difference Tophat
Checking sintered parts for breaks/cracks			Grey difference Tophat

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DEVICESLASER
MARKERS

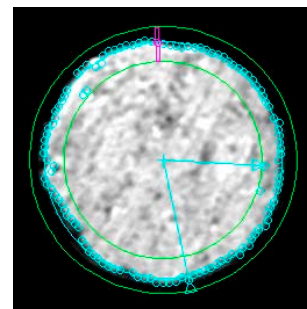
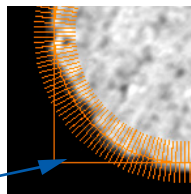
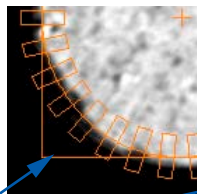
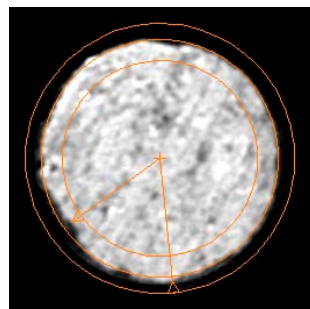
PLC

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PV500V2

Smart edge (for circles)

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

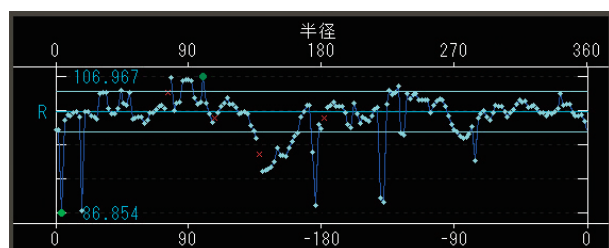
3 × 30 pixels, 120-cell search: 5.8 msec
3 × 30 pixels, 360-cell search: 12.3 msec

Operation principle

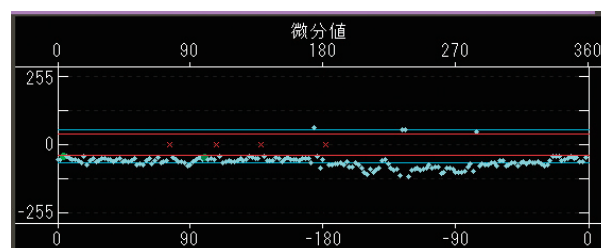
1. A target arc area is set, edge points included in the area are searched, the circle or arc contour is detected.
2. The circle shape is identified with high accuracy based on the valid edge points in accordance with the virtual circle detection conditions, and the center, radius, and diameter are calculated.
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 evaluation criteria/noise removal/distance



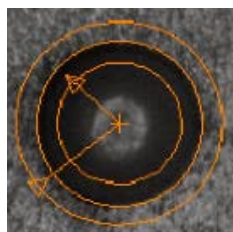
- Setting of the edge detection conditions/edge thresholds



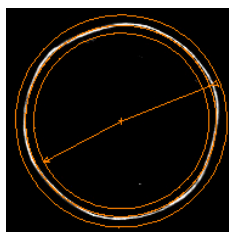
Application example

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 (position correction).

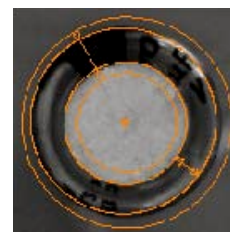
Circle center



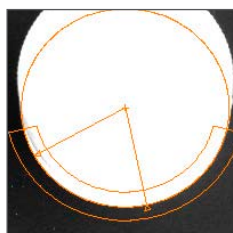
Radius (max and min) and circularity



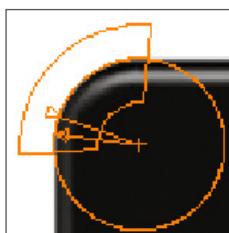
Ring width (max and min)



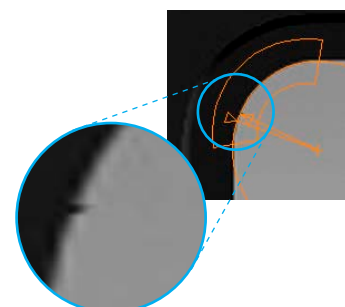
Ellipse radius and center



Corner center and radius

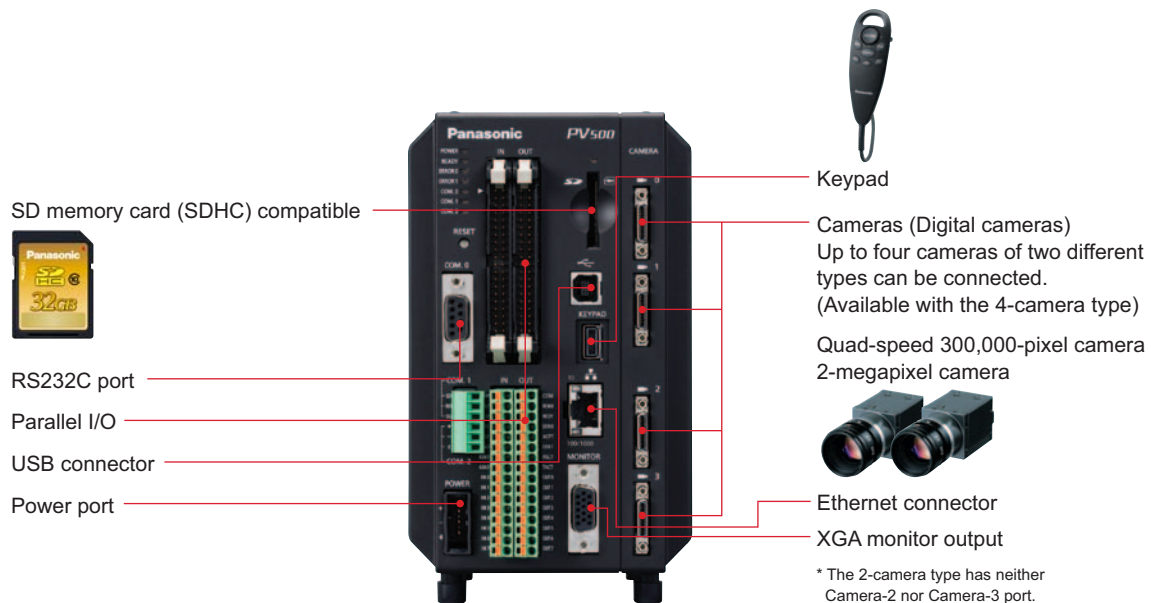


Detection of burrs and chippings on the circumference



SYSTEM CONFIGURATION

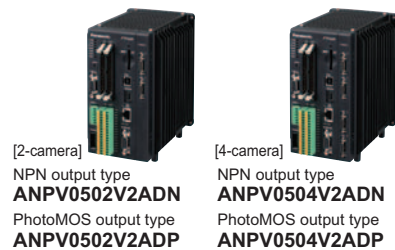
Equipped with a full selection of interfaces essential for image processing devices of the future



PART NUMBERS

Controller units / Cameras / Monitors / Keypads

PV500V2 IMAGECHECKER Main units



Digital cameras for PV500V2



Keypads



Camera cables for PV500V2



Flexible camera cables



Quad-speed camera lenses



Megapixel camera lenses



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



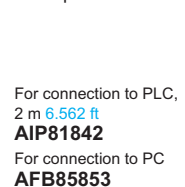
XGA monitor



Monitor cables



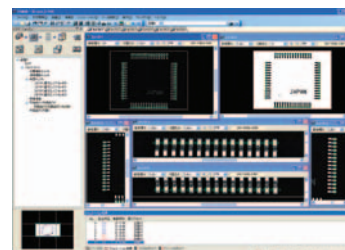
COM port cable



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

Available for download from our website free of charge.



PV Series Setup Software
IMAGECHECKER®
PVWIN

FIBER SENSORS

LASER SENSORS

PHOTO-ELECTRIC SENSORS

MICRO PHOTO-ELECTRIC SENSORS

AREA SENSORS

LIGHT CURTAINS / SAFETY COMPONENTS

PRESSURE / FLOW SENSORS

INDUCTIVE PROXIMITY SENSORS

PARTICULAR USE SENSORS

SENSOR OPTIONS

SIMPLE WIRE-SAVING UNITS

WIRE-SAVING SYSTEMS

MEASURE-MENT SENSORS

STATIC ELECTRICITY PREVENTION DEVICES

LASER MARKERS

PLC

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ENERGY CONSUMPTION VISUALIZATION COMPONENTS

FA COMPONENTS

MACHINE VISION SYSTEMS

UV CURING SYSTEMS

Applications

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SPECIFICATIONS

General specifications

Item	Specifications
Rated operating voltage	24 V 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 +32 to +113 °F (no freezing or condensation) 4-camera type: 0 to +40 °C +32 to +104 °F (no freezing or condensation)
Storage ambient temperature	-20 to +60 °C -4 to +140 °F (no freezing or condensation)
Ambient humidity during use	35 to 85 % RH (at 25 °C 77 °F , no freezing or condensation)
Storage ambient humidity	35 to 85 % RH (at 25 °C 77 °F , 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 0.030 in. , 30 minutes each in the X, Y, and Z directions
Shock resistance	196 m/s ² , 5 times each in the X, Y and Z directions
Insulation resistance (initial value)	100 Ω or higher (measured by a 500 V DC megger) Input and output terminals – Power and ground terminals Input and output terminals – Non-energized metal part Power terminal – Non-energized metal part
Breakdown voltage (initial value)	500 V AC for 1 min (600 V AC for 1 sec), Cutoff current: 10 mA (Note) 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 77 °F)
Weight	Approx. 1.6 kg (with terminal blocks and connectors)

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

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 Image display: Through/Memory/NG object images Display effects: Gray scale/ Binarization group/Preprocessing group Zoom function (2 to 400 %) Display area (1,024 × 768). 16,770,000 colors
Processing methods	Gray scale processing, binary processing
Number of connected cameras	2-camera type: Up to two cameras, 4-camera type: Up to four cameras (Select from: Quad-speed 300,000-pixel camera and 2,000,000-pixel 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 cameras is one line, and that for the 2,000,000-pixel camera is 100 lines.
Shutter speed	30 μs to 1,000 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 • Smart Edge (Circle) / (Line) function added. • Binary Window, Gray Window, Binary Edge • Gray Edge, Feature Extraction, Smart Matching, Line, Flaw Detection • Connector (Binary Window) / (Gray Window) / (Gray Edge) • Smart Edge (Circle) / (Line) • Geometry Calculation • Character/Figure Drawing
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.
Binarization level group	26 levels/product type, 256-gray scale (0 to 255)
Preprocessing 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)

Functional specifications

Item	Specifications	
Input/ Output	Cameras	From the quad-speed 300,000-pixel camera (640 × 480) and 2,000,000-pixel camera (1,600 × 1,200) up to two and four cameras can be attached to the 2-camera type and 4-camera type units respectively.
	Monitor output	XGA (1,024 × 768) output
	Memory card	SD memory card
	Serial	RS-232C × 1, Ethernet × 1 PLC link function supported models: Panasonic Industrial Devices SUNX's FP series PLCs, Mitsubishi Electric: A, Q, FX (FX1N) and FX-2N (FX2N, FX3U, FX3UC) series OMRON: C, CV and CS1 series Allen-Bradley: SLC500 Fuji Electric: MICREX-SX SPH series
	USB	Compatible USB2.0, AB type
	Parallel	Phoenix terminals: 14 inputs / 15 outputs MIL terminals: 32 inputs / 32 outputs
	Keypad input	1 connector for dedicated keypad (ANPVP**)

Item	Specifications	
Processing resolution	2,000,000-pixel camera: 1,600 horizontal × 1,200 vertical pixels Quad-speed 300,000-pixel camera: 640 horizontal × 480 vertical pixels	
Numerical computation	1,000 formulae/product type max., including those for evaluation result output (depends on setting data) Calculations involving output values of inspection functions	
	Operators	Four fundamental operations (+, -, ×, ÷), bracket operations, trigonometric functions (14 types), comparison functions (6 types), math functions (15 types), geometric functions (18 types)
	Statistic data operation items	Scan count / Pass count / Fail count / Average / Distribution / Max. / Min. / Range / Pass average / Pass distribution / Pass max. / Pass min. / Pass range / Fail average / Fail distribution / Fail max. / Fail min. / Fail range User limit: 1000 items/product type max.
	Other operation items	Previous data of numerical computation and evaluation result outputs, general-purpose registers
	Number of substitution items	16 items/formula
Evaluation result output	1,000 formulae/product type max., including those for numerical computation (depends on setting data) Substitution for and logical calculation of evaluation results from checkers and numerical computations	
	Others	NOT / AND / OR / XOR / Brackets
	Number of substitution items	16 items/formula
	Others	Overall evaluation condition setting, Image storing condition setting, Image output condition setting, Parallel output setting (8 outputs from OUT 0 to OUT 7 and 16 outputs from OUT 0 to OUT 15, 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 computation results, numerical computation evaluation results, evaluation output results, statistical results possible. Change of upper/lower limits of numerical computation in the table in RUN mode possible.	
Conversion data	Coordinates, coordinate origin, horizontal and vertical coefficients can be set for each camera to obtain actual dimensions.	
	Operators	Comment input
Marker	8 markers/product type max. for each camera Graphic display on the operation screen Selectable from eight colors	
	Shapes	Rectangle / Circle / Ellipse / Polygon / Straight line / Cross line
Collective movement	Collective movement of set checkers in units of position/rotation correction groups. Set the movement to Yes/No. Position and rotation correction checkers cannot be moved.	
Template	Re-registration position	Setting position/Correction position
Re-registration setting	Display	Yes / No
Execution mode	Execution all	Execution of all checkers
	Branch execution	Branch blocks (0 to 9) can be set.
	Designated execution	Blocks to be executed (0 to 9) can be set.