

# OMRON

Vision Sensors

FZ Series

## World's First "Real Color Sensing"

Advanced Color Perception



realizing

# Seeing Colors with Humanlike Precision



■ “Advanced Real Color Sensing (ARCS)”

■ Revolutionary Intelligent Camera  
with Auto Focus Function

■ Integrated Controller and LCD for Easier Operation

Real Color Sensing

Intelligent Camera

Integrated Controller  
and LCD

Fits On-site Needs

Applications and  
Measurement Items

Specifications

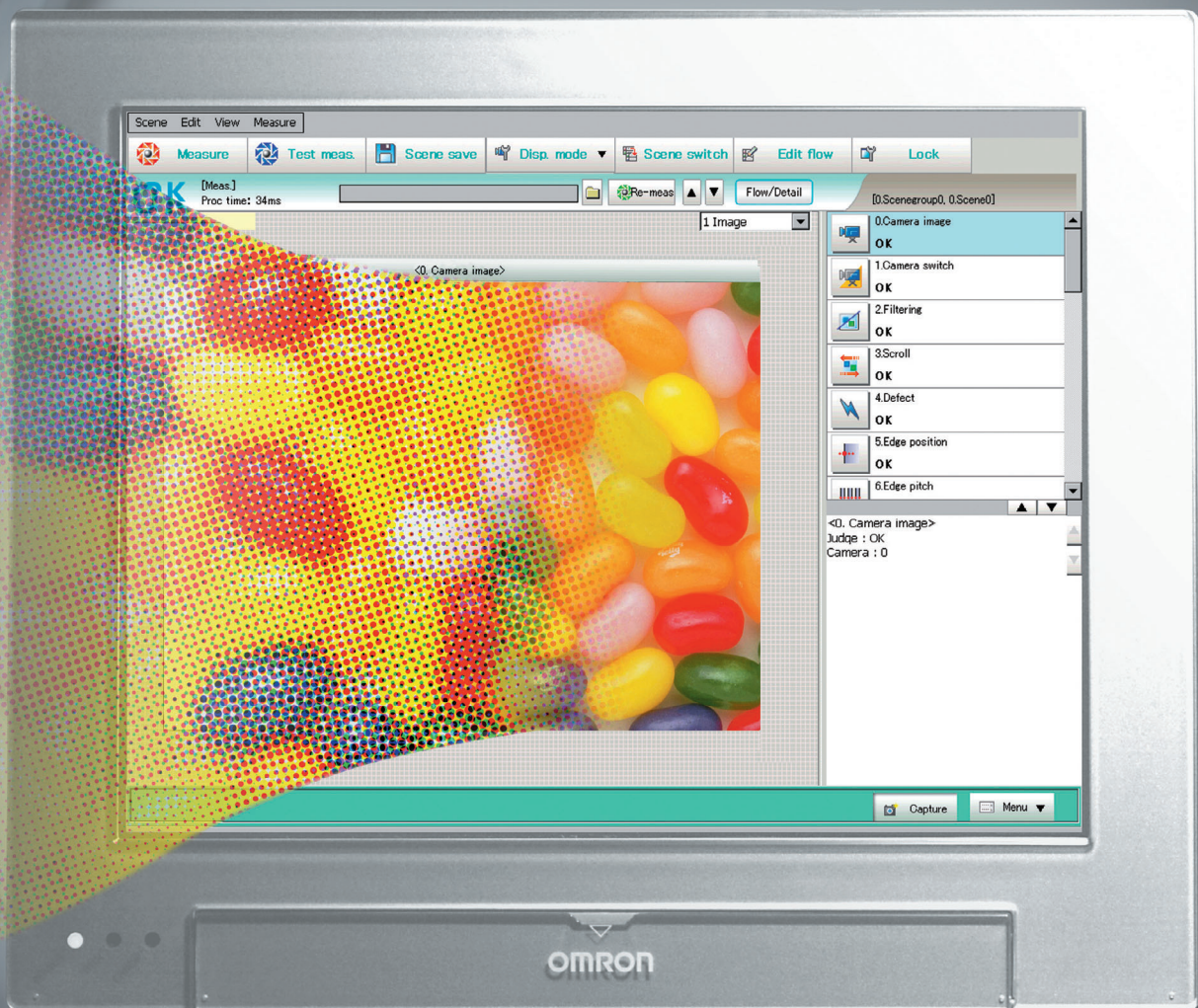


Note: ARCS is an acronym for Advanced Real Color Sensing.

# The World of Real Color Sensing\*

\*Patent Pending

The “Advanced Real Color Sensing (ARCS)” Engine  
instantly processes up to  
16.77 million colors.

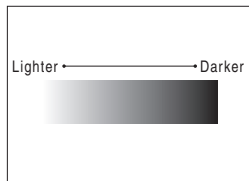


## Humanlike Sensing with ARCS

The “ARCS (Advanced Real Color Sensing)” Engine achieves high-precision sensing. This technology is 65,536 times better than earlier processing technology, where measurements were based on monochrome contrast.

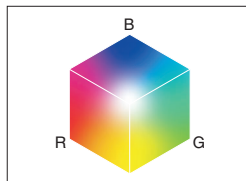
An amazing 16.77 million colors are captured and processed at high speed to approach human color perception.

### 256 colors

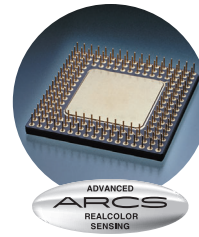


The amount of image information was reduced with monochrome processing. Lighting and other adjustments were required to extract the features of the workpiece.

### 16.77 million colors



With “Real Color Sensing”, the inspection workpiece and the image being processed are the same, so the image does not need to be adjusted.



### Previous Monochrome Processing



Converted to gradations of gray so color differentiation is not possible if the shape is the same.

### Real Color Processing



Both shape and color information is processed so the target item can be detected from other workpieces of the same shape.

## Applications

“Real Color Sensing” can also be used in applications such as detecting differences in gold or black gloss and multi-color defect judgments, where judgments used to be unstable. “Real Color Sensing” makes a quantum leap in the applicable range for image sensing.

### Previous Monochrome Processing



Detecting Gold Plating on Connectors

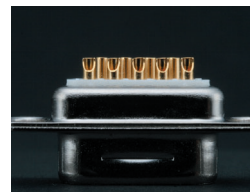
No contrast is discernable so inspection is not possible.

### Previous Color Extraction Processing



Difficult to extract only gold color because of surface gloss.

### Real Color Processing



Large volume of data enables stable inspections.

Inspecting LED Indicator Arrangement



No contrast is discernable so inspection is not possible.



Color extraction settings required for each color.

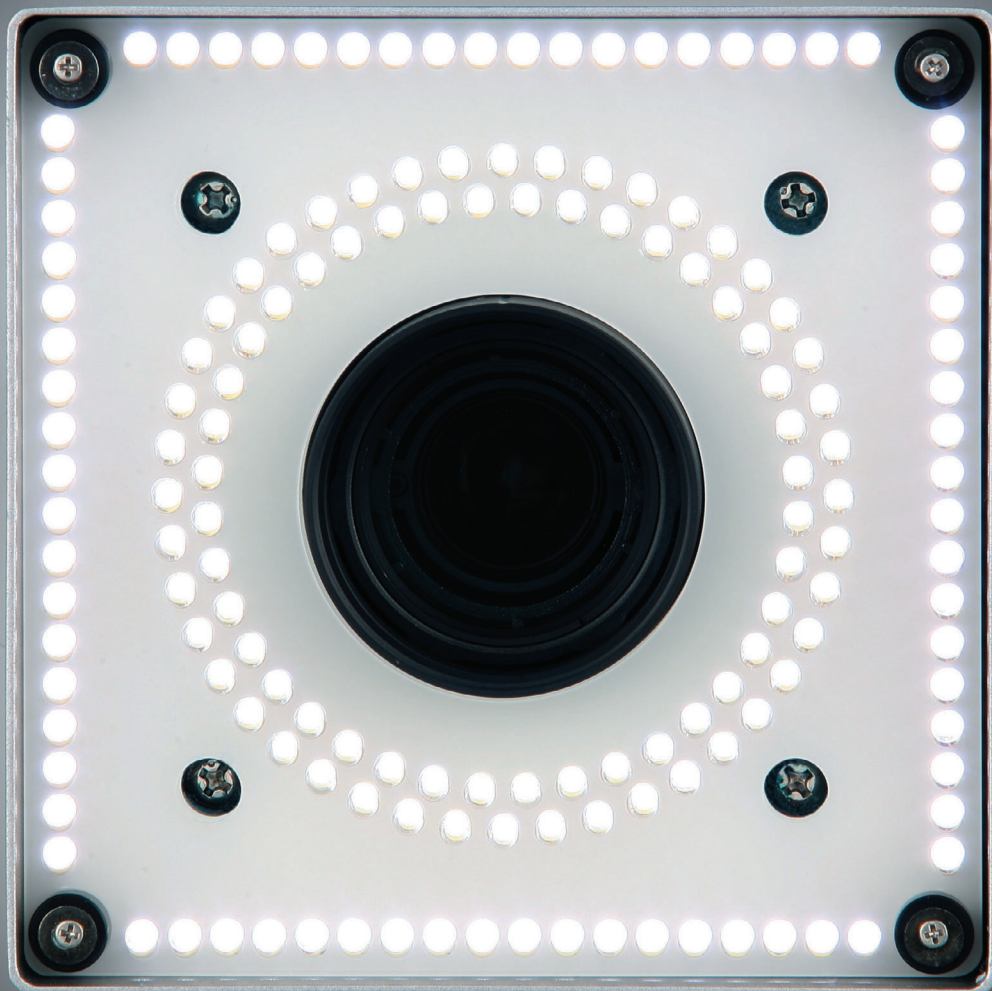


Stable inspections are possible even without filtering or other settings.

# *Revolutionary "Intelligent Camera\*" with Autofocus Function*

\*Patent Pending

Focusing and aperture adjustment that used to require highly skilled operators are now completely automated.



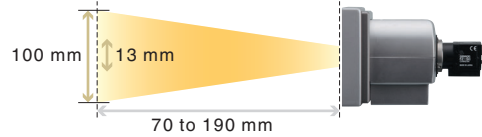
### Zoom Functions

The Intelligent Camera is a radically new camera module that covers the approximately 3 to 15 mm and 13 to 100 mm fields of vision with two lenses (see note). The Intelligent Camera has the flexibility for applications such as production lines for multiple models where setup changes are frequent and field of vision changes required by additional specifications.

#### Model with Narrow Field of Vision



#### Model with Wide Field of Vision

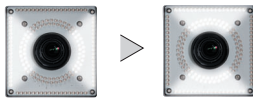


Note: The field of vision changes depending on the distance from the lighting to the workpiece. For details, check Ratings and Specifications and the optical graphs for each camera.

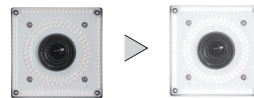
### Intelligent Lighting

The distinguishing feature of “Real Color Sensing” is the uniform irradiation of the field of vision by using white LED lighting. A variety of lighting patterns are available for selection. The optimum lighting pattern can also be registered to enable the use of stable lighting.

#### Light pattern (4 points individually controlled)

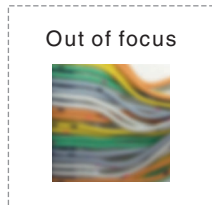


#### Light modulation level (256 gradations)



### Autofocus and Autoiris

Focus and aperture adjustments that have always depended on human experience and perception are now completely automated, enabling stable measurement without variation.



Settings vary because manual adjustment relies on human



No variations with autofocus and autoiris.



### Remote Control

All settings can be controlled from the Controller, allowing remote monitoring and control of focus, aperture, field of vision, and lighting of cameras in remote locations. Set values can be managed from the Controller, allowing application to multiple production lines and quick setup changes.

# Integrated Controller and LCD for Easier Operation

Touch-pen input enables intuitive, Windows-style screen operation.

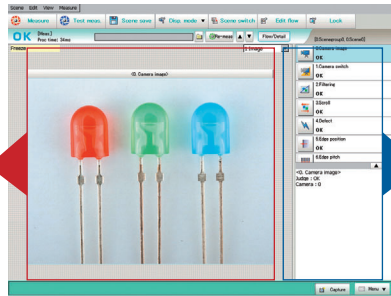
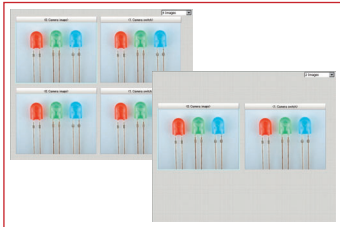
This compact, multifunctional Controller-LCD features four USB ports.



## Multi-layout Screen

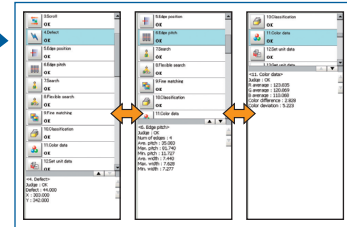
### Flexible Measurement Image Layout

Up to four images can be displayed on a single screen. Select the display layout to match the number of cameras or to suit the application.



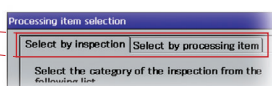
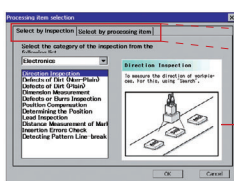
### Flexible Selection of Measurement Result Items

The display area for judgment results or detailed results from a series of measurements can be arranged to suit the application.

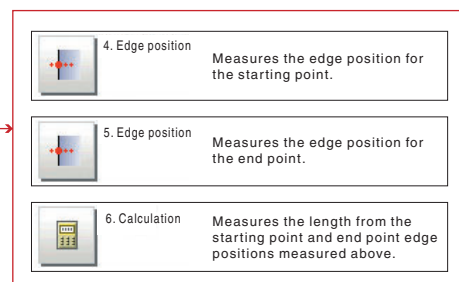


## Select from Inspection Items

Select the inspection: the required processing items will be automatically registered. For example, if *Dimension Measurement* is selected, then the two Edge Position processing items and the Calculation processing item will automatically be selected.



Automatic settings



The processing items for an application are easily selected.



### ■ Windows-style Screen Operation for Better Viewability

Easier operation achieved through the use of Windows-style operation, with extensive use of menus and command lists.

Frequently used functions displayed on toolbars.

Past measurement images can also be displayed.

Results from each measurement series can be viewed.

Touch pen operation.

Online Manual  
The manual is now provided online. Settings procedures and terminology can now be viewed anytime right on the Controller.

### ■ Integrated Controller and LCD

The LCD and Controller in one Unit-compact and space-saving. Slimmer wiring and power supply sections together with four USB ports for expansion.

Simple selection and installation complete with just a camera and Controller.





2 USB ports on front

Industry-first four USB ports on front and side

2 USB ports on side

### Suitable for Wide Range of Operation Systems

Note: The desktop stand is optional (sold separately).

- As an interface for saving measurement images and settings data  USB memory
- As an interface to the manual  USB memory
- As an interface for operation   Mouse or other peripheral device

Note: The operation of mouses and other peripheral devices other than the recommended ones may not be reliable.

### ■ Flexible Installation Design

Compact and space-saving Integrated Controller-LCD enables flexible installation in a variety of FA environments. The type of installation can be selected to match the application.

Installation beside a production line using a VESA attachment

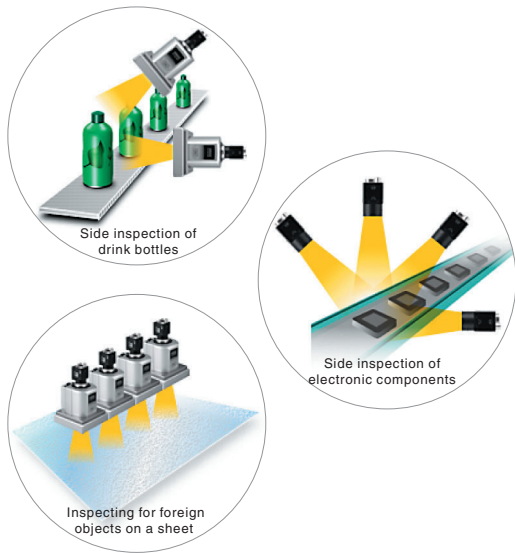
Note: VESA attachment available separately (optional).

# More Advanced to Fit On-site Needs

## Input Devices with Flexibility to Suit Inspection Process

### ■ Four-camera Control

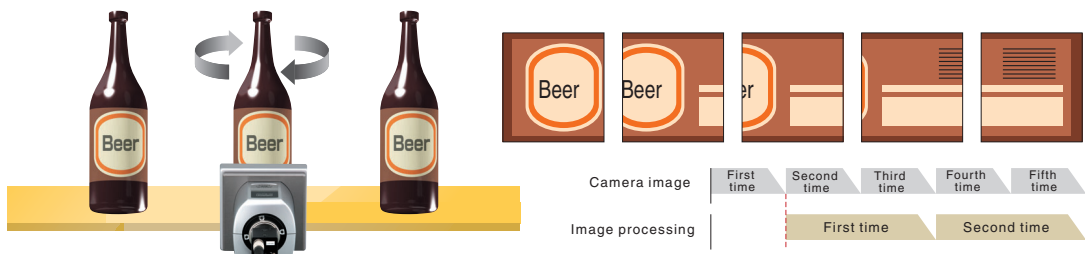
The FZ Series now includes a Controller with the capacity to connect to up to four cameras, making this Controller perfect for applications requiring inspection at multiple points at the same time, e.g., side inspection of electronic components and side inspection of drink bottles.



Note: The FZ-350-10 Box-type Controller also supports connection to up to 4 cameras.

### ■ Multi-input Function

Each camera can now capture up to 16 images. The next image can be captured during measurement processing. This function is effective, for example, in applications where multiple measurements are required for each workpiece, e.g., inspections of rotating workpieces.



### ■ Ultra Fast Camera (with partial function)

High-speed image capture at 80 frames/sec. - the first in the industry for CCD cameras. Input time is reduced by approx. 4 ms compared to earlier models. Image capture can be even faster if the partial function is used.

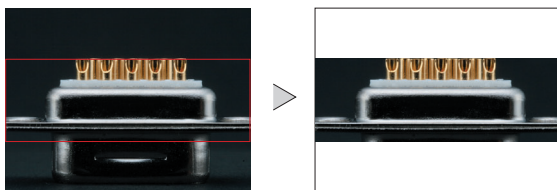
#### ■ High-speed image capture at 80 frames/s

Intelligent Camera (See note.) (80) frames/sec.  
Image capture speed



Double-speed Camera (earlier model) (60) frames/sec.  
Image capture speed

#### ■ Select Any Measurement Position



Note: Does not include shutter time (exposure time). There is a delay of approximately 4 ms from when the image is captured to when measurement starts.

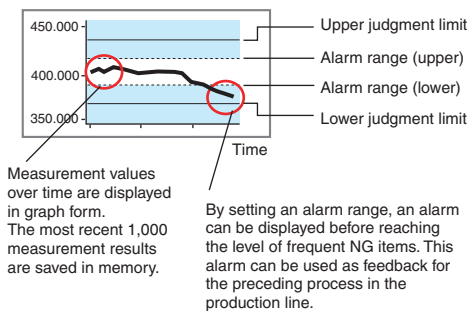


## Ease of Use On-site Also Improved

### Checking

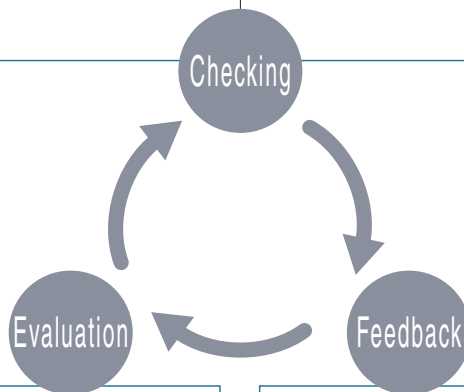
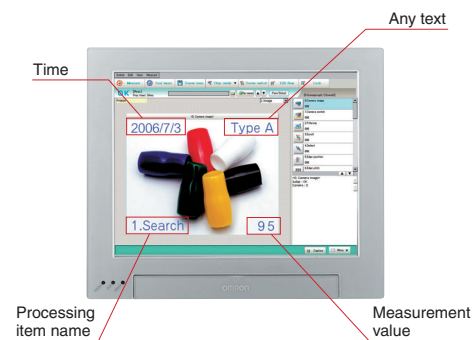
#### ■ Trend Monitor Function

Monitoring of measurement value trends can help prevent production of large numbers of defective products and can be useful in analyzing the cause when NG items are produced.



#### ■ Customized Results Display Function

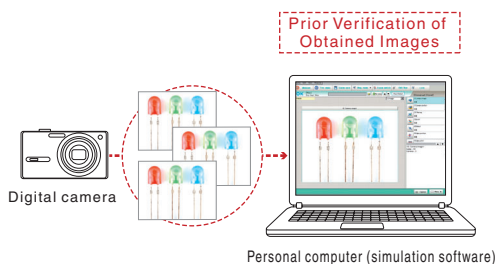
Text and graphic objects can be displayed in the image display area for easier checking of measurement results.



### Evaluation

#### ■ Simulation Software

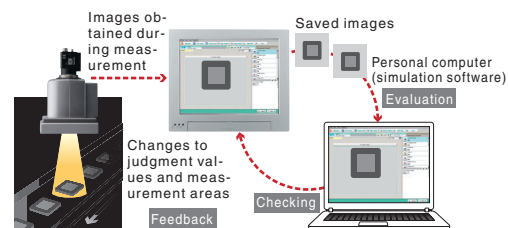
Trial measurements can be performed on a computer using prepared images. Settings, startup, and adjustments can be verified in advance without requiring a Controller.



### Feedback

#### ■ Online Edit Function

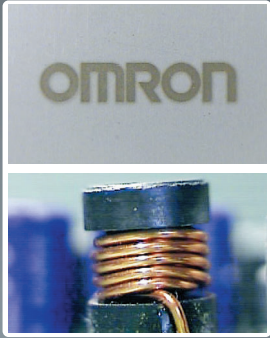
Saved screens can be verified in advance using the simulation software on a personal computer, then fed back to the Controller. This allows setting changes to be made without having to stop the line, to minimize unnecessary rejections in production.



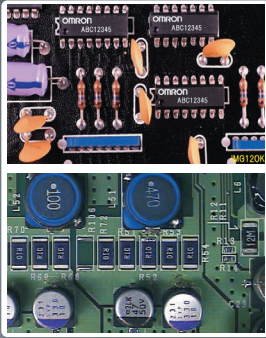
Note: There are some functions for which settings cannot be changed during operation, e.g., model registration.

# Real Color Broadens the Range of Sensing Applications

## Metal components industry



## Automotive components industry



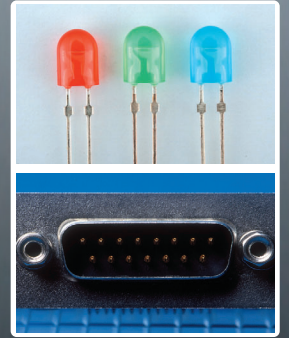
## Food packaging industry



## Pharmaceutical industry



## Electronic components industry

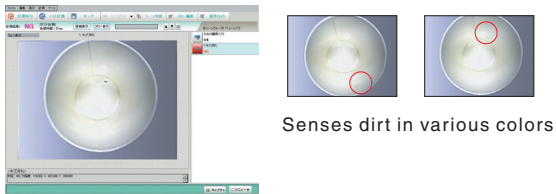


### Defect



#### Dirt on Paper Cups

Dirt in colors can be detected without having to change the lighting color or installation position.



#### Other Applications

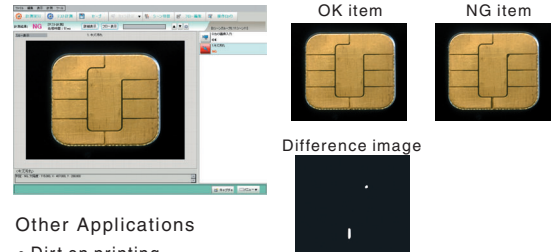
- Dirt and burrs on resin-molded products
- Grease on metal processing surfaces, etc.

### Fine Matching



#### Surface Defects on Metal Parts

Because there are no effects from the background color or pattern, surface defects on components with complicated shapes and dirt on patterns can be easily detected.



#### Other Applications

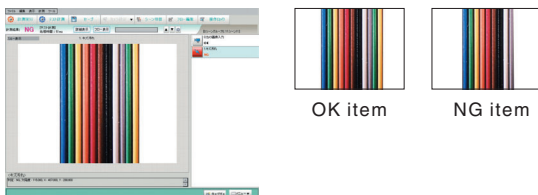
- Dirt on printing
- Dirt on food labels, etc.

### Search



#### Electrical Cable Arrangement

Inspections using both shape and color data can be performed by registering a model only once. Repeated color extraction is not necessary.



#### Other Applications

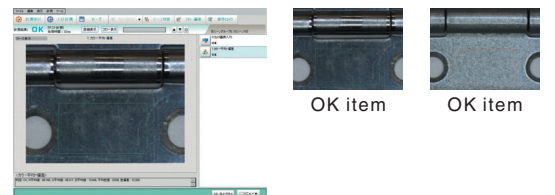
- Button positions on instrument panels
- LED arrangements on PCBs, etc.

### Color Data



#### Mixing of Incorrect Metal Components

The existence of gloss in similar colors and minute differences in colors can be determined with high stability -- something that was difficult with previous Sensor models.

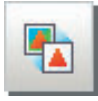


#### Other Applications

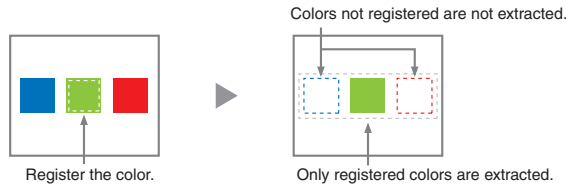
- Inspecting for plating, etc

# Versatile Measurement Processing Items

## Color Area



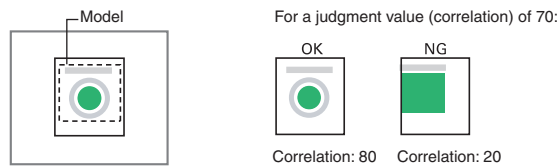
The color to be measured is specified and the area measured. The center of gravity position can also be measured.



## Search



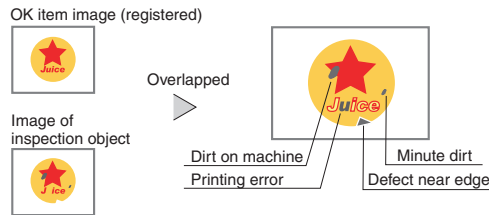
Features of the measurement object are registered as an image pattern (model) and the parts of the input image that most resemble the model are found to provide the correlation and the position.



## Fine Matching



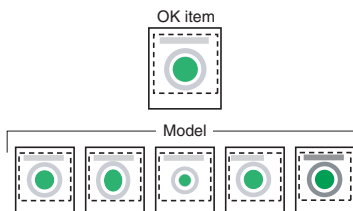
A registered OK item image and the input image are overlapped (matched) and the differences between the images are detected at high speed and with great precision.



## Flexible Search



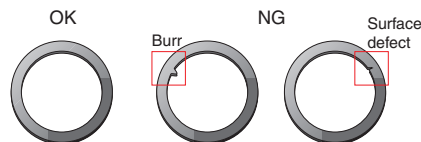
Finds the part in the input image that most resembles the multiple registered models and detects the correlation (similarity) and position.



## Defect



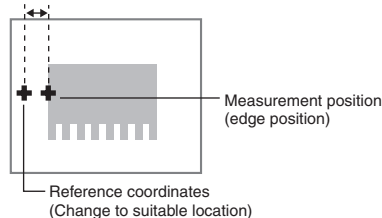
Performs defect (surface defect) inspections based on variations in brightness within the measurement region.



## Edge Position



Uses changes in color within the measurement region to inspect the position of the measurement object.



■ Basic Configuration

Controller with LCD



Box-type Controller



## Ordering Information

	Name		Model	Remarks	
Controllers	Controller with LCD	Two-camera Controller	NPN	FZ-300	With touch pen
			PNP	FZ-305	
		Four-camera Controller	NPN	FZ-300-10	
			PNP	FZ-305-10	
	Box-type Controller	Two-camera Controller	NPN	FZ-350	---
			PNP	FZ-355	
		Four-camera Controller	NPN	FZ-350-10	
			PNP	FZ-355-10	
Cameras	Intelligent Cameras	Wide field of vision	FZ-SLC100	Camera, zoom lens, and Intelligent Lighting	
		Narrow field of vision	FZ-SLC15		
	Digital Color Camera	FZ-SC	CCTV lens required.		
Cables	Camera Cable		FZ-VS	Cable length: 2 m, 5 m, and 10 m	
	Crooked-proof Camera Cable		FZ-VSB	Cable length: 2 m, 5 m, and 10 m	
	Right-angle Camera Cable (See note 1.)		FZ-VSL	Cable length: 2 m	
	Parallel Cable		FZ-VP	Cable length: 2 m and 5 m	
	Monitor Cable		FZ-VM	For Box-type Controllers: Cable length: 2 m and 5 m	
Peripheral devices	LCD Monitor		FZ-M08	For Box-type Controllers	
	USB Memory		FZ-MEM256	Capacity: 256 MB	
	VESA Attachment		FZ-VESA	For installation of Controller with LCD	
	Desktop Stand		FZ-DS	For installation of Controller with LCD	
	Mouse		---	Recommended products (optical mouse) Microsoft Corporation: Compact Optical Mouse U81 Series	
	CCTV Lens		3Z4S-LE Series (See note 2.)	---	
	External Lighting		3Z4S-LT Series (See note 2.)	---	
	Strobe Controller (for FZ Series Vision Sensors)		Manufactured by MORITEX Corporation 3Z4S-LT MLEK-C100E1TS (See note 2.)	Required to control external lighting from a Controller.	

Note 1: The Right-angle Cable has an L-shaped connector on the Camera side.  
Note 2: 3Z4S-LE, -LT Series are not yet released for overseas.

## Ratings and Specifications

### Controllers

	FZ-300	FZ-305	FZ-300-10	FZ-305-10	FZ-350	FZ-355	FZ-350-10	FZ-355-10
Connected Camera	FZ-SLC100, FZ-SLC15, FZ-SC							
No. of Cameras	2		4		2		4	
Processing resolution	640 × 480 (H × V)							
No. of scenes	32							
Backup memory	36 screens							
Operation	Touch pen, mouse, etc.				Mouse or similar device			
Settings	Create series of processing steps by editing the flowchart (Help messages provided).							
Serial communications	RS-232C/422A: 1 channel							
Network communications	Ethernet 100Base-TX/10Base-T							
Parallel I/O	10 inputs, 22 outputs (excluding common terminals)							
I/O type	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP
Monitor interface	Integrated Controller and LCD 12.1 inch TFT color LCD Resolution: XGA 1,024 × 768 dots				Analog RGB video output, 1 channel			
USB interface	4 channels (supports USB 1.1 and 2.0)							
Power supply voltage	20.4 to 26.4 V DC							
Current consumption (See note.) Connected to FZ-SLC	5 A max.		7.5 A max.		5 A max.		7.5 A max.	
Current consumption (See note.) Connected to FZ-SC	3.7 A max.		4.9 A max.		3.7 A max.		4.9 A max.	
Ambient temperature range	Operating: 0 to 50°C, Storage: -20 to 65°C (with no icing or condensation)							
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)							
Weight	Approx. 3.2 kg		Approx. 3.4 kg		Approx. 1.8 kg		Approx. 1.9 kg	
Accessories	Touch pen (one, inside the front panel), <i>Please Read First, Instruction Manual (Setup)</i> , 6 mounting brackets				<i>Please Read First, Instruction Manual (Setup)</i>			

Note: The current consumptions are for when the maximum number of Cameras are connected.

### Camera

	FZ-SLC100	FZ-SLC15	FZ-SC
Image elements	Interline transfer reading all pixels		
Pixel size	7.4 × 7.4 (μm)		
Shutter function	Electronic shutter; select from 8 shutter speeds (1/120 to 1/20,000 s) using menu.		
Partial function (partial image capture function)	12 to 480 lines		
Frame rate (image read time)	80 fps (12.5 ms)		
Visual field	13 to 100 mm (See note 1.)	2.9 to 14.9 mm (See note 1.)	Select CCTV lens to suit the field of vision and camera distance.
Camera distance	70 to 190 mm	35 to 55 mm (See note 1.)	
LED class (See note 2.) (lighting)	Class 2		
Ambient temperature range	Operating: 0 to 50°C, storage: -25 to 60°C (with no icing or condensation)		
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)		
Weight	Approx. 670 g	Approx. 700 g	Approx. 55 g
Accessories	<i>Instruction Sheet</i> and hexagonal wrench	<i>Instruction Sheet</i> and hexagonal wrench	<i>Instruction Sheet</i>

Note 1: Tolerance: ±5% max.

Note 2: Applicable standards: IEC 60825-1: 1993 + A1: 1997, EN 60825-1: 1994 + A1: 2002 + A2: 2001

### LCD Monitor

	FZ-M08
Size	8.4 inches
Type	Liquid crystal color TFT
Resolution	1,024 × 768 dots
Input signal	Analog RGB video input, 1 channel
Power supply voltage	21.6 to 26.4 V DC
Current consumption	Approx. 0.7 A max.
Ambient temperature range	Operating: 0 to 50°C, storage: -20 to 60°C (with no icing or condensation)
Ambient humidity range	Operating and storage: 20% to 85% (with no icing or condensation)
Weight	Approx. 1.2 kg
Accessories	<i>Instruction Sheet</i> and 4 mounting brackets

Real Color Sensing

Intelligent Camera

Integrated Controller and LCD

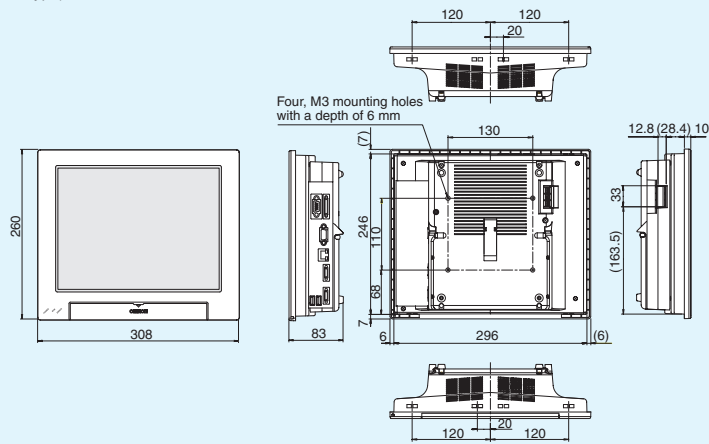
Fits On-site Needs

Applications and Measurement Items

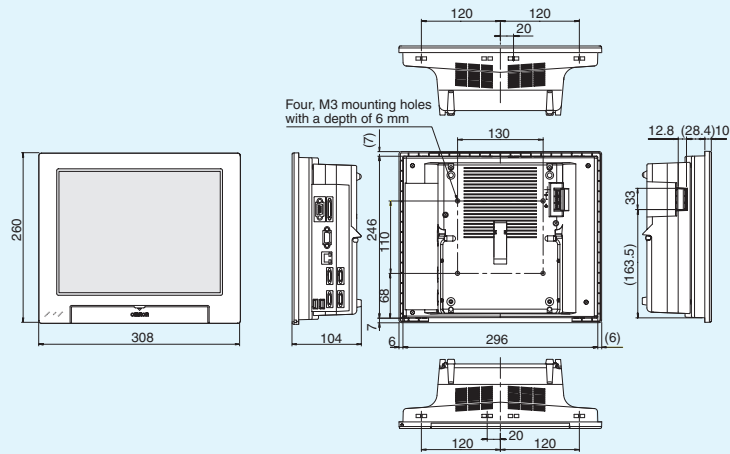
Specifications

## External Dimensions (mm)

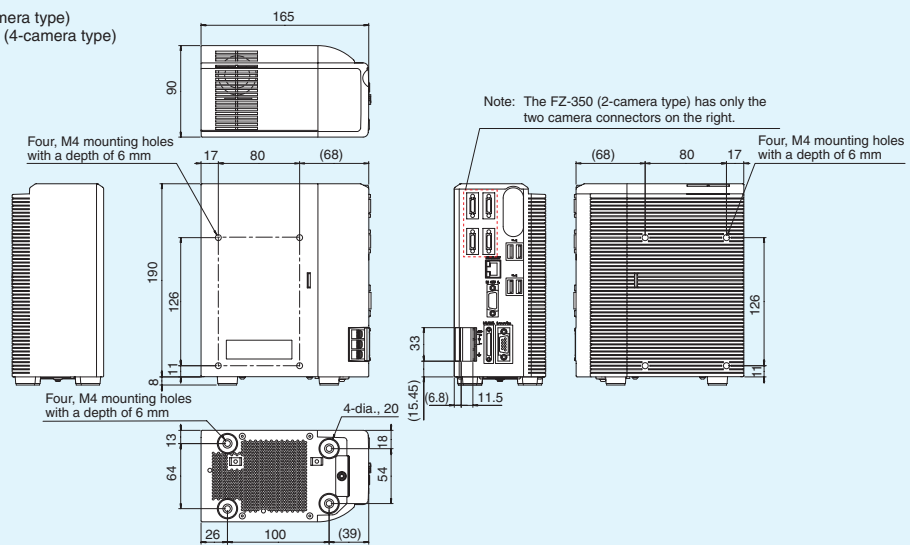
### Controller with LCD FZ-300, FZ-305 (2-camera type)



### FZ-300-10, FZ-305-10 (4-camera type)



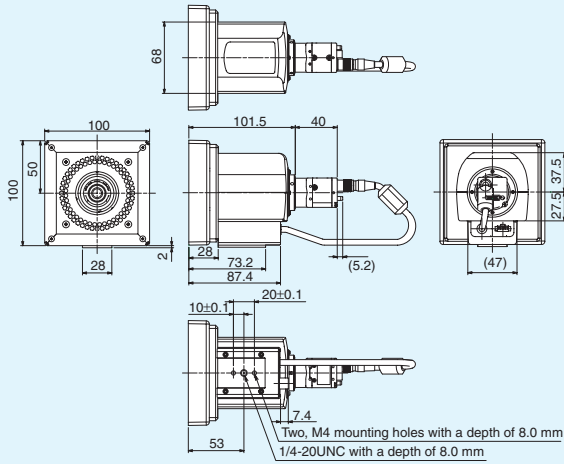
### Box-shaped Controller FZ-350, FZ-355 (2-camera type) FZ-350-10, FZ-355-10 (4-camera type)



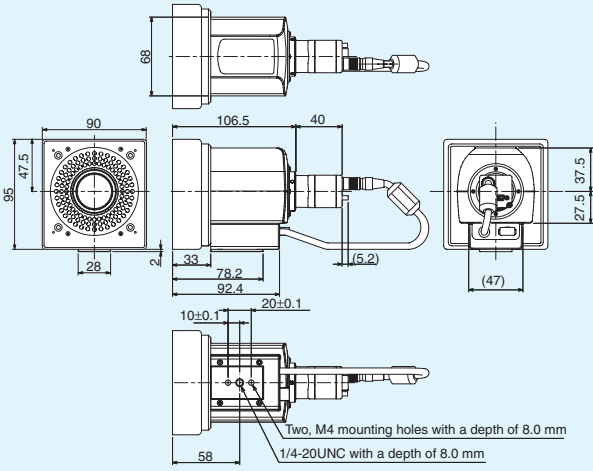


## External Dimensions (mm)

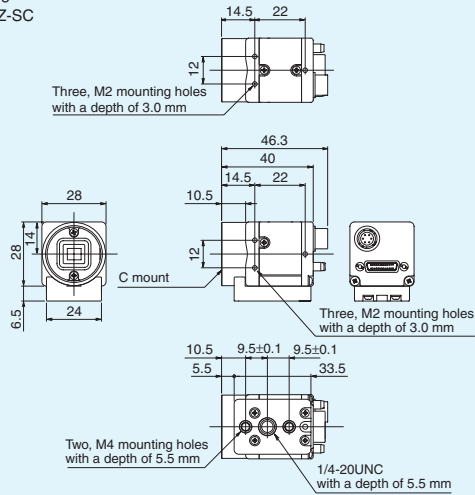
Intelligent Camera  
FZ-SLC100 (Wide field of vision model)



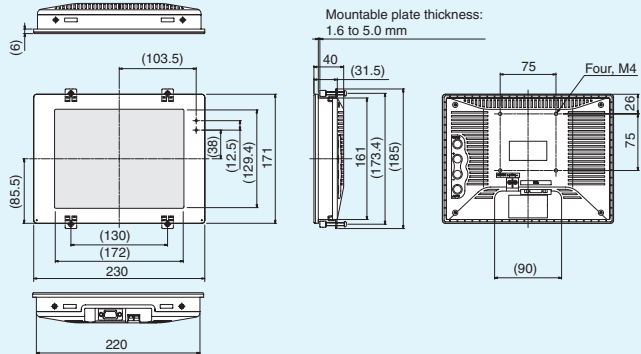
Intelligent Camera  
FZ-SLC15 (Narrow field of vision model)



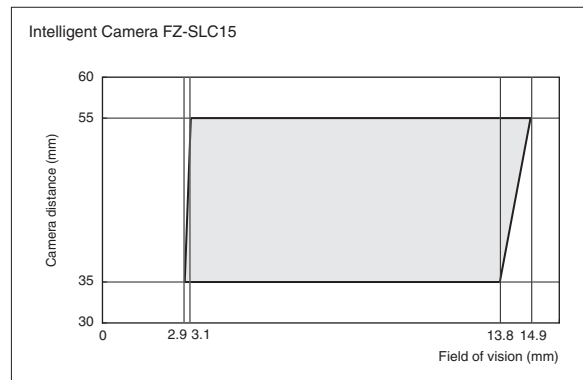
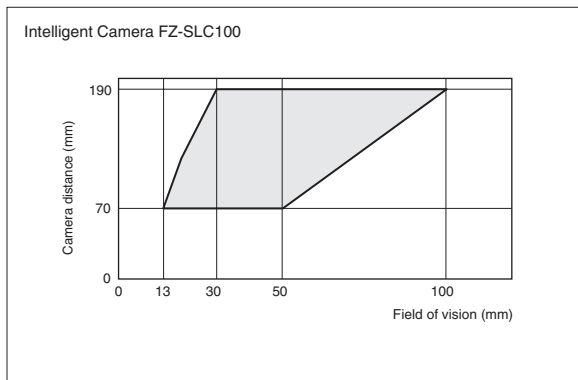
Digital Color Camera  
FZ-SC



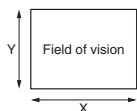
LCD Monitor  
FZ-M08



## Optical Graph



Note 1: For information on how to use Intelligent Cameras, refer to the user's manual packed with the product.  
2: The lengths of the fields of vision given in the optical graphs are the lengths of the Y axis.

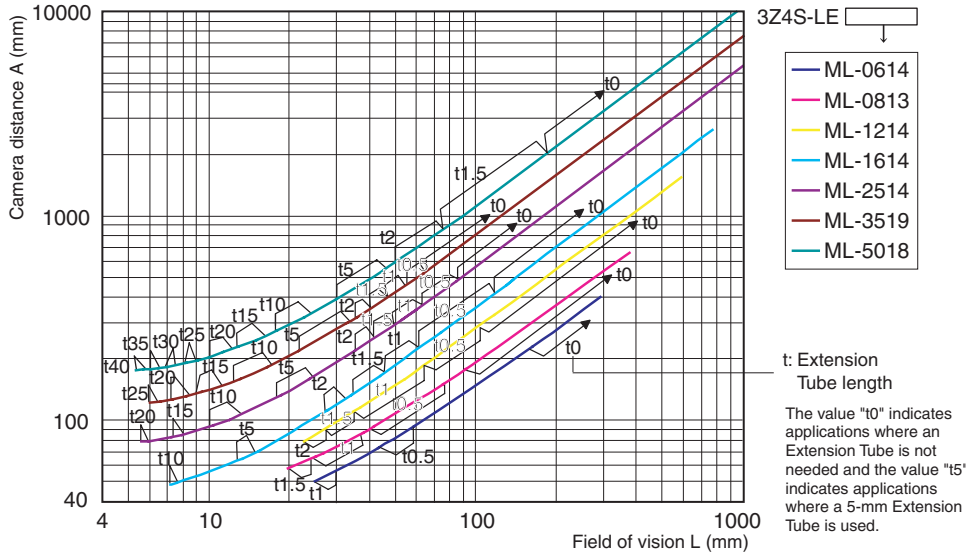


## ■ CCTV Lenses

### ■ Optical Graph

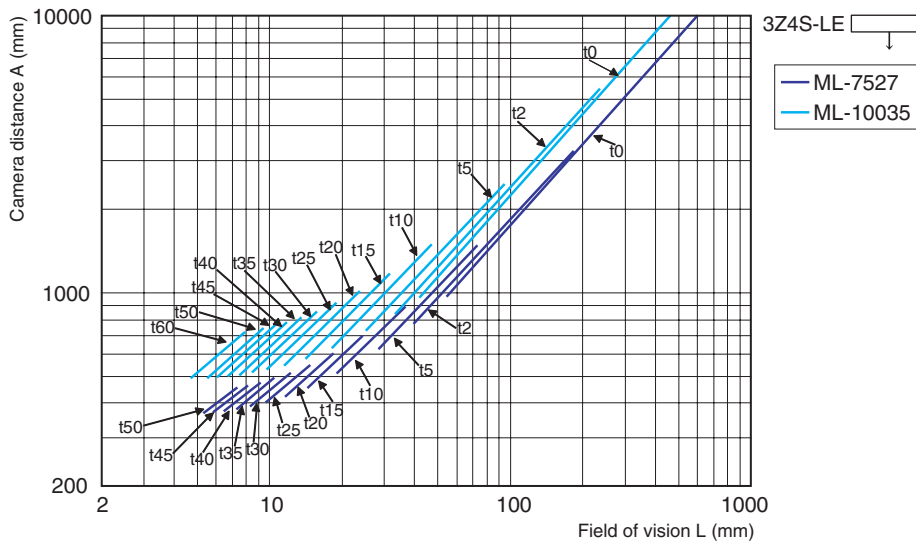
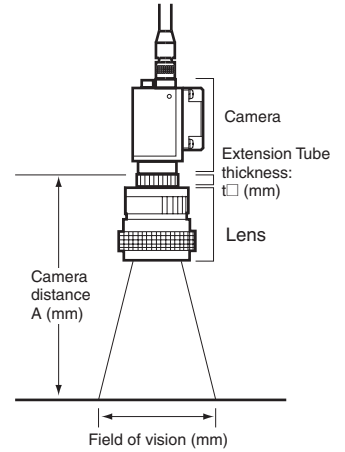
If using the FZ-SC Camera (Camera only), refer to the optical graph below and select the lens and Extension Tubes. The lens to be selected will depend on the size of the measurement object and the camera distance.

#### Camera Only FZ-SC






### ■ Meaning of Optical Graph


The X axis of the graph shows the field of vision L (mm), and the Y axis shows the camera distance A (mm).



## ■ CCTV Lenses

	CCTV Lens									
Model	3Z4S-LE ML-0614	3Z4S-LE ML-0813	3Z4S-LE ML-1214	3Z4S-LE ML-1614	3Z4S-LE ML-2514	3Z4S-LE ML-3519	3Z4S-LE ML-5018	3Z4S-LE ML-7527	3Z4S-LE ML-10035	
Appearance										
Focal length	6 mm	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm	75 mm	100 mm	
Brightness	F1.4	F1.3	F1.4	F1.4	F1.4	F1.9	F1.8	F2.7	F3.5	
Filter size	M27 P0.5	M25.5 P0.5	M27 P0.5	M27 P0.5	M27 P0.5	M27 P0.5	M30.5 P0.5	M30.5 P0.5	M30.5 P0.5	

## ■ Extension Tubes

Model	Contents							
3Z4S-LE ML-EXR	Thickness: 40 mm	20 mm	10 mm	5 mm	2.0 mm	1.0 mm	0.5 mm	Set of 7 tubes
								Maximum outer diameter: 30 mm dia.

## ■ Precautions

Do not use the 0.5-mm, 1.0-mm, and 2.0-mm Extension Tubes attached to each other. Since these Extension Tubes are placed over the threaded section of the Lens or other Extension Tube, the connection may loosen when more than one 0.5-mm, 1.0-mm or 2.0-mm Extension Tube are used together. Reinforcement may be required for combinations of Extension Tubes exceeding 30 mm if the Camera is subject to vibration.

Real Color Sensing

Intelligent Camera

Integrated Controller  
and LCD

Fits On-site Needs

Applications and  
Measurement Items

Specifications

This document provides information mainly for selecting suitable models. Please read the Instruction Sheet carefully for information that the user must understand and accept before purchase, including information on warranty, limitations of liability, and precautions.

**Note: Do not use this document to operate the Unit.**

**OMRON Corporation**  
Industrial Automation Company

**Sensing Devices Division H.Q.,  
Application Sensors Division**  
Shiokoji Horikawa, Shimogyo-ku,  
Kyoto, 600-8530 Japan  
Tel: (81)75-344-7068/Fax: (81)75-344-7107

**Regional Headquarters**

**OMRON EUROPE B.V.**  
Sensor Business Unit,  
Carl-Benz-Str. 4 D-71154 Nufringen,  
Germany  
Tel: (49)7032-811-0/Fax: (49)7032-811-199

**OMRON ELECTRONICS LLC**  
1 East Commerce Drive, Schaumburg,  
IL 60173 U.S.A.  
Tel: (1)847-843-7900/Fax: (1)847-843-8568

**OMRON ASIA PACIFIC PTE. LTD.**  
83 Clemenceau Avenue,  
#11-01, UE Square,  
239920 Singapore  
Tel: (65)6835-3011/Fax: (65)6835-2711

**OMRON (CHINA) CO., LTD.**  
Room 2211, Bank of China Tower,  
200 Yin Cheng Road (M),  
Shanghai, 200120 China  
Tel: (86)21-5037-2222/Fax: (86)21-5037-2200

**Authorized Distributor:**

Note: Specifications subject to change without notice.

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