Vision Sensor

Flagship Model
FZ3 Series

OMRON

5M camera | HDR | PANORAMA | Trapezoidal Correction | Real Color | ×2

# TOP SPEED

## Industry's First Multi-task Processing System Offering Greatest Sensing Performance

## FZ3-900 Series


NEW

realizing

# *Speed Beyond Expectation*





## Significantly Shorter Inspection / Startup Time Thanks to Dual Mega ARCS Engines and Greatest Sensing Performance

The manufacturing environment is changing every second.
OMRON's FZ3-900 series is a vision sensor system perfect for manufacturers who wish to flexibly meet these changing needs to make better products.

Greatest Sensing Performance of FZ3 + Dual Mega ARCS Engines.
The industry's first multi-task processing, the FZ3-900 series not only realizes fast, accurate inspection / measurement flows, but it significantly reduces man-hours and allows more efficient introduction of your vision sensor system as well as its operation from setting adjustment to data collection and analysis.
All inspection steps become faster, while the startup time and initial cost are reduced, which means that the FZ3-900 series vision sensor adds value to your entire manufacturing process.

# Fastest Processing

## Quicker measurement time

Adopting the industry's first parallel processing algorithms, the FZ3-900 series significantly reduces the total processing time from image input to result output.

High speed mode (parallel operation) ▶ p5

## Trigger intervals

OMRON's unique multi-input function enables ultra-high speed processing. Triggers are input at one-half the intervals of a comparable system, resulting in double the tact performance one-half the tact time.

High speed mode (single line) ▶ p5

# First-ever Multi-task Processing

## One controller performs inspections that normally require two units

One controller can independently process triggers for multiple lines. This feature not only significantly reduces the initial equipment cost, but you also need the installation space for only one unit.

Multi-line random-trigger mode ▶ p6

## Faster acquisition of more image measurement data

100% image measurement logging is possible even in inspection processes requiring high accuracy, high speed and multiple cameras. Inspection images can be saved as quality data and utilized in developing suitable manufacturing methods.

High speed logging mode ▶ p6

## Zero downtime for setting adjustment

Even when a defect or abnormal trend occurs, you can check the condition and adjust the relevant settings without stopping the line.

Non-stop adjustment mode ▶ p7

# Greatest Sensing Performance

## Dynamic range Simple lighting environment for ideal imaging

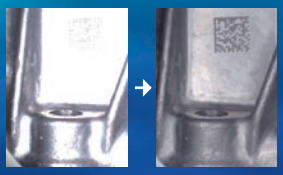


Image from a normal camera

Image from a HDR camera

The conventional difficulty in setting and adjusting lighting conditions is ascribed to the limited dynamic ranges of cameras. FZ3's HDR (High Dynamic Range) function has achieved a high dynamic range, 5000:1 maximum. This function solves existing problems in setting for lighting.

High Dynamic Range (HDR) function ▶ p8

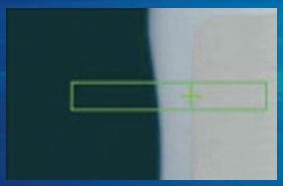
## High resolution High accuracy & wide measurement field

2448 x 2044 pixels

The FZ3-900 series is equipped with a camera offering industry's highest resolution of 5 million pixels. More precise inspections and measurements are enabled by measuring high-resolution images with an advanced image-processing algorithm.

5 million-pixel camera ▶ p10

## Detecting edges and scratches by slightest color differences



Edges are detected reliably even when the contrast between the background and subject is low.

An entirely new imaging technology where a total of 16.77 million colors are captured in a RGB 256 full-color mode for high-speed processing. Color information is processed exactly the same way as when the subject is viewed by human eyes, which means that colors can be accurately differentiated even when the contrast between the background and work is low or the color difference is small.

Real color sensing ▶ p15

# Only Possible with Multi-task System

## Industry's Fastest Inspection & Measurement Processing

[ Patent Pending ]

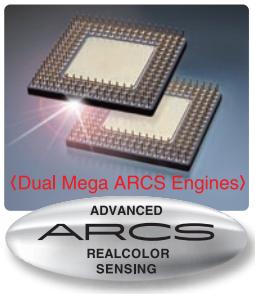
Industry's fastest

### Dual Mega ARCS Engines

×2

The FZ3-900 series is equipped with Dual Mega ARCS Engines to process data twice as fast as when one Mega ARCS Engine is used. This engine achieves multi-task, high-speed processing not heretofore possible.

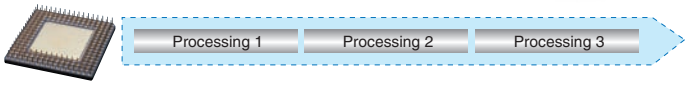
With conventional serial systems, each process can not be started until the previous process is completed.Under the Dual Mega ARCS architecture, two engines perform multiple tasks in parallel to dramatically reduce the inspection time.As a result, you can process more data over a shorter time compared to conventional systems.



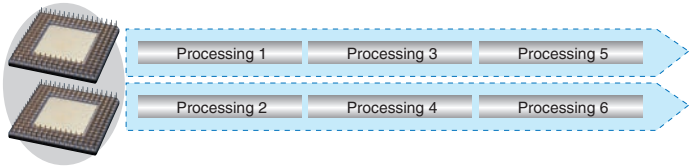

Industry's fastest CPU | P.B.S. architecture

Dual Mega ARCS

**[Conventional processing]**

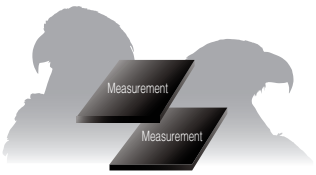


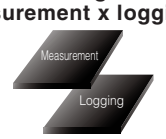

**[Dual processing]**

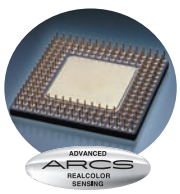



**Only the Dual Mega ARCS architecture can realize a completely parallel processing of measurement, adjustment and logging tasks!**

The key feature of Dual Mega ARCS Engines is that they enable completely parallel processing. Parallel processing not only speeds up inspection, but it also allows the system to behave like having two brains (heads) by letting you inspect two completely different lines with a single vision sensor or adjust parameters during inspection.




| | |
|---|---|
| **Dual processing of <measurement x measurement>**   | **Perfect for applications requiring inspection speed**<br>**[1] High speed mode (parallel operation)**<br>One measurement flow is divided into two to process the two sub-flows in parallel P. 5<br>**[2] High speed mode (single line)**<br>The conventional multi-input function has been improved to achieve even shorter trigger input intervals P. 5 |
| | **Two different inspections with a single unit**<br>**[3] Multi-line random-trigger mode**<br>Two measurement flows can be processed independently P. 6 |
| **Dual processing of <measurement x logging>**   | **Saving all inspection images**<br>**[4] High speed logging mode**<br>Measured images can be saved to an external memory device without affecting the measurement time P. 6 |
| **Dual processing of <measurement x adjustment>**   | **Adjusting and checking settings without stopping production operation**<br>**[5] Non-stop adjustment mode**<br>You can adjust flows and setting parameters during measurement P. 7 |




### What is ARCS?

Short for "Advanced Real Color Sensing," ARCS is OMRON's patented imaging engine capable of processing images in real colors. The FZ3 series real color processing captures and quickly processes vast amounts of color information to achieve ideal sensing close to what human eyes can. It realizes accurate, stable inspection unthinkable with simple filtering. The ARCS processing capability continues to advance with the progress of the FZ series.

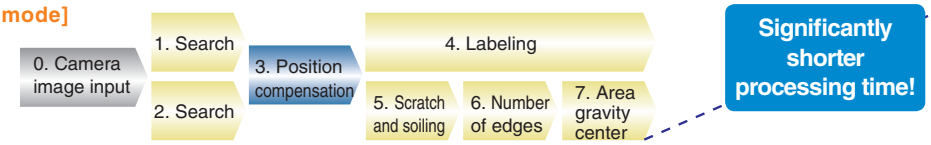
P. 5 Real Color Sensing

## Fastest measurement Highspeed mode (parallel operation)

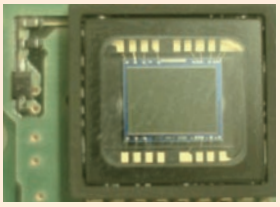
Multiple measurements are processed in parallel with the system making decisions automatically to minimize the total measurement processing time from image input to result output. This significantly reduces the time to output result following a trigger input. This feature is ideal for inspections where more data must be processed or higher resolution is needed.

**[Conventional flow]**

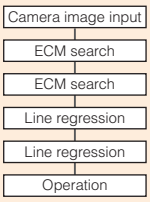

**[Flow in high speed mode]**




### CCD alignment inspection



**(Example) The flow shown below reduces the processing time by 47%**




Parallel measurement flows significantly reduce the measurement time. This function is particularly useful in inspections using high-pixel camera that otherwise take a long measurement time.

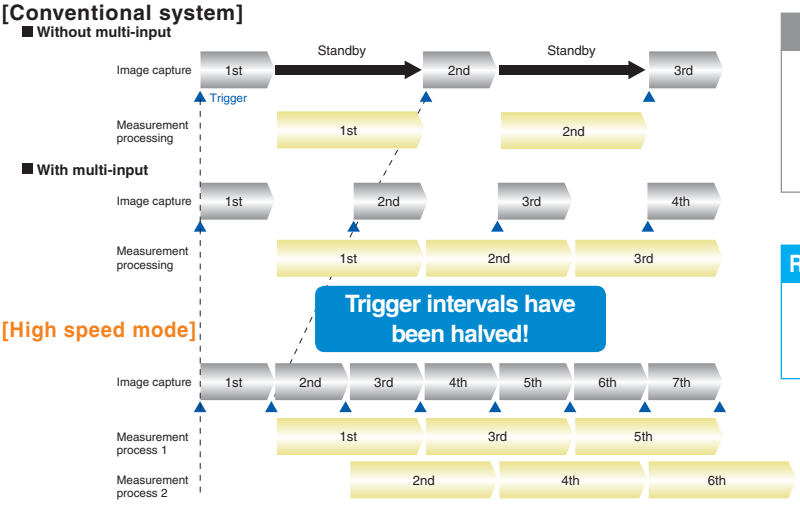
**Effect**

- A shorter tact time can be achieved after consolidating lines or when the utilization ratio is to be improved at subsequent production increases.
- Alignment data and other measurement results can be sent to subsequent processes more quickly.

## Short trigger intervals High speed mode (single line)

OMRON's unique multi-input function has become more advanced. Combined with the parallel processing capability of Dual Mega ARCS Engines, this function halved the trigger intervals of conventional systems. You can add inspection items without affecting the current processing time, which gives you scalability to meet future needs.

**[Conventional system]**




**Issues**

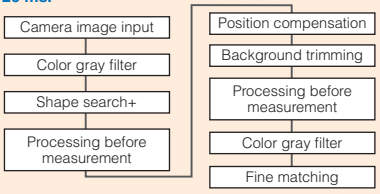
Camera images can also be captured during measurement. If image inputs exceed the buffer capacity, however, trigger intervals cannot be shortened because the minimum trigger interval depends on the measurement processing time.

**Resolution**

Parallel measurement processing halves the trigger intervals of conventional systems. As a result, the inspection tact time is also reduced to a half.

### Appearance inspection of caps

**(Example) The flow shown below halves the trigger intervals of conventional system to only 26 ms.**




The processing flows for first and second triggers are processed in parallel to halve the trigger interval.

**Effect**

Shorter trigger intervals shorten the inspection cycle time.

# Benefit of a Multi-task System

## Reduce the time and cost for setup and operation

### One unit performs inspections that normally require two units Multi-line random trigger mode

Conventional imaging systems cannot perform two inspection processing simultaneously. With Dual Mega ARCS Engines, one controller accepts two trigger inputs simultaneously or randomly to process two different setups parallely or independently.


**Issues**

Before, two controllers were needed to inspect two locations, processes or lines within the required tact time, which added to introduction cost.

**Resolution**

With the FZ3-900 series, on the other hand, two triggers can be input randomly to run two independent inspection processing in parallel.

**Random inspection of lines positioned close to each other**

Even when the timing of work arrival is not at constant intervals, they can be inspected with only one controller.

**Simultaneous inspection of two locations**

This mode is ideal for applications where triggers are not input simultaneously or constantly, such as when the top surface is inspected with a single trigger and side faces with four triggers.

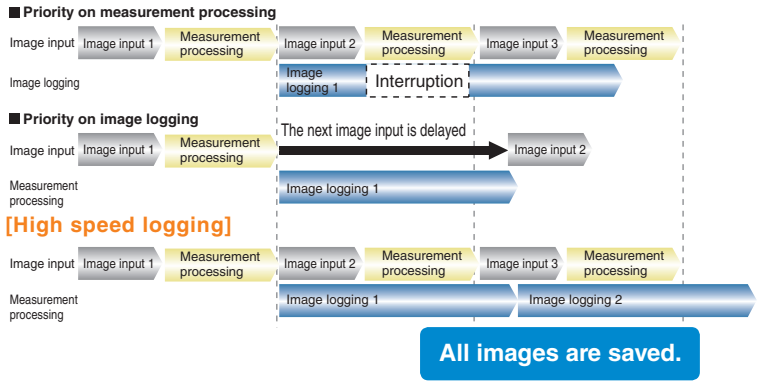
**Effect**

You can reduce the number of controllers to be installed to save installation space, introduction cost and current consumption.

### All images can be saved even during measurement High speed logging mode

Complete parallel processing of measurement and logging means you can also connect high-speed, large-capacity (up to 2 terabytes) hard disk drives. Accordingly, you can save all images on high-speed tact lines, which was difficult to do with conventional systems (*1).

**[Conventional system]**




All images are saved.

*1 All images can be saved under the following conditions:
- 300,000-pixel camera x 1 unit . Measurement time: 33 ms
- Images can be saved continuously for approx. one week when a 2-terabyte HDD is used (based on 8 hours of operation a day).

**Issues**

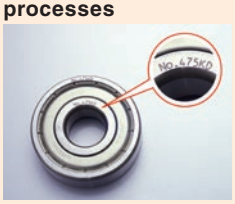
Since logging was not possible during measurement, the user had to choose either measurement or logging. Accordingly, not all images could be saved or image input triggers had to be delayed depending on the measurement trigger intervals.

**Resolution**

Measurement and image logging are processed completely in parallel. As a result, you can save all images.

**Defect inspection on a new product or a line adopting a new manufacturing method**

**Printing inspection in automobile assembly processes**



All images you have saved can be utilized for trend analysis to help establish an appropriate manufacturing method quickly for a new product or a line adopting a new manufacturing method.

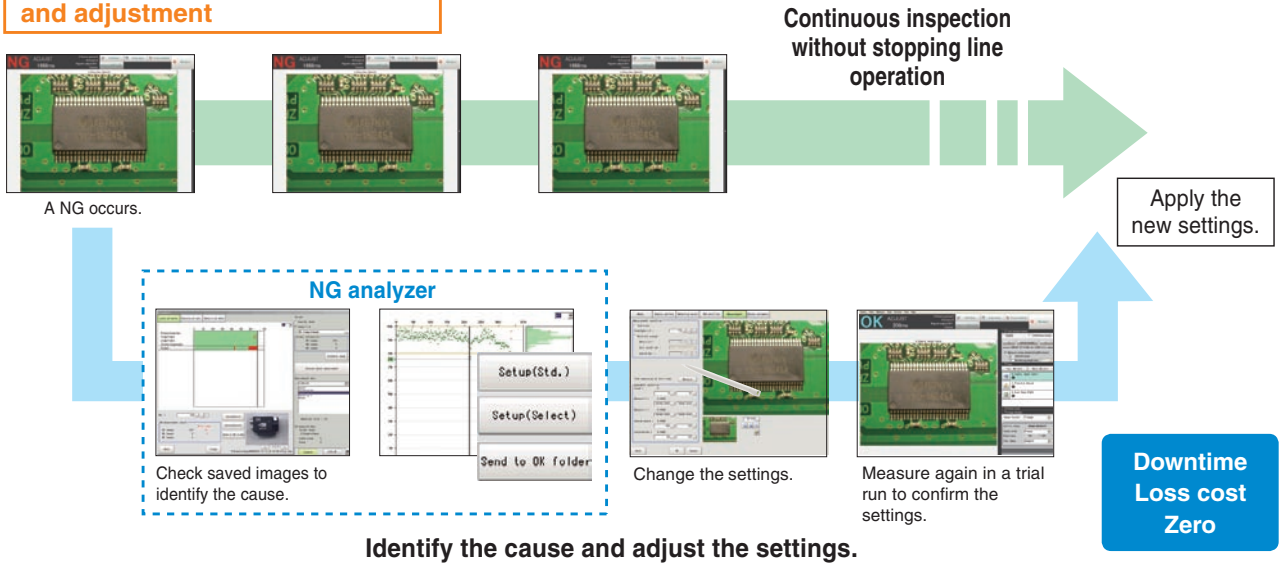
**Effect**

- When a NG occurs, the cause can be identified and remedial actions taken quickly.
- Saving all images leads to more efficient traceability control.

## Zero downtime for setting adjustment  Non-stop adjustment mode

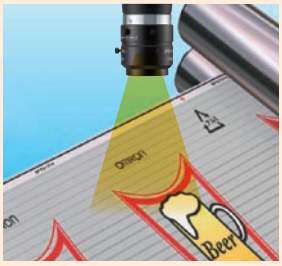
You can check conditions and reconfigure settings while measurement is still in progress if dimensional variations of works, changes in external environment, etc., require adjustments and checks. Since adjustment is possible without stopping the line/inspection, you can eliminate downtime, need to add visual inspections to identify uninspected products, and cost increase associated with them.

**Parallel processing of inspection and adjustment**




**Identify the cause and adjust the settings.**

**Printing / soiling inspection of sheets**



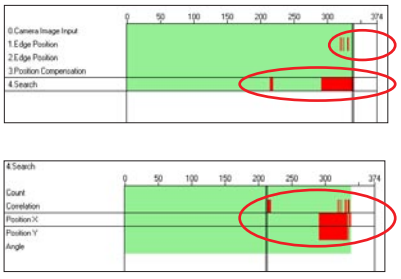
Loss cost can be reduced. Ideal for mass-production processes with a higher unit production volume or 24-hour lines.

**Effect**

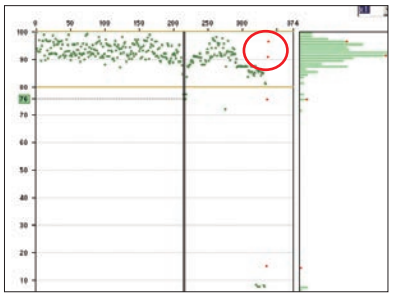
- Results can be checked and adjustment can be made with zero downtime.
- Because the line is not stopped, there is less idle time associated with restarting of the line.

## Doubly effective when combined with the Non-stop adjustment mode NG analyzer

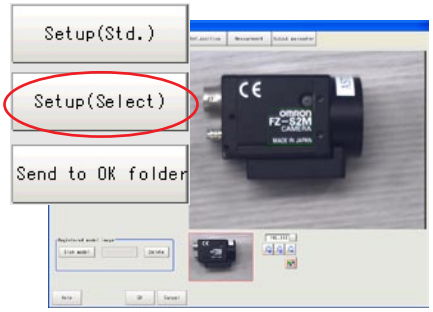
You can display in a structured manner a graph showing the results measured at once on logging images. This lets you identify the cause of a given NG much more quickly. You can also measure all images again after changing a given setting, to check the reliability of the new setting. Adjustment and troubleshooting has never been so quick, simple and reliable.



Processed items and parameters that generated an erroneous judgment can be identified at a glance.



You can check the detailed results of parameters to identify the cause of the NG.




Select a desired measurement result on the graph to switch to the adjustment mode.

# Original HDR Technology

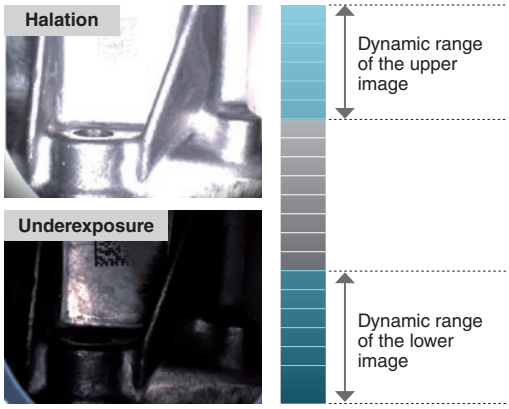
## Making it possible!

## Eliminate the side effects of lighting

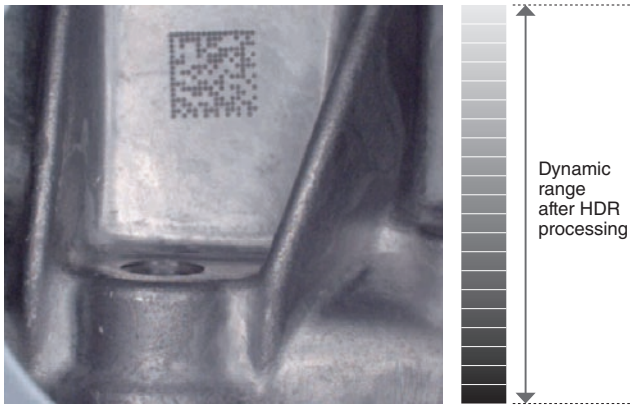
### High Dynamic Range Function

FZ3's high dynamic range minimizes the effects of lighting such as halation and allows highly precise inspections.

**Conventional images**




**HDR image**



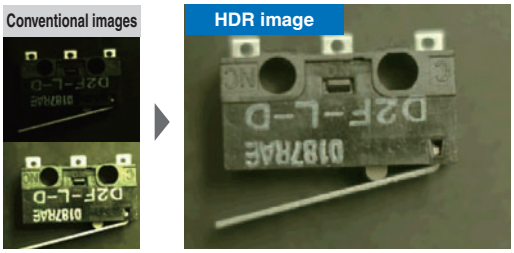

**Defects Undetectable Due to Overexposure or Underexposure**

Any spot outside the dynamic range is blurred by halation or shadow.

**Defects Detectable Even on Reflective or Shadowy Surfaces**

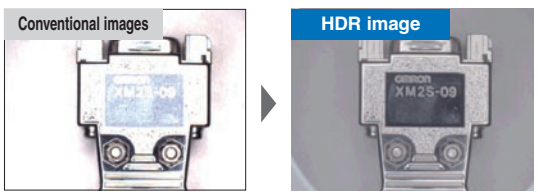
The surface of the workpiece is accurately reproduced and detected even with overexposure or underexposure.

**Reflective and shadowy areas can be reproduced simultaneously under the same lighting conditions.**

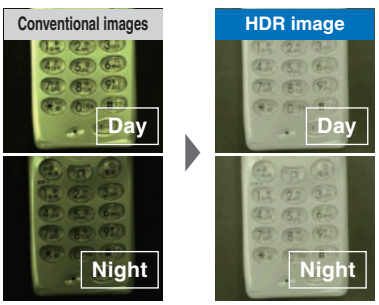



**The reflective surfaces of cylindrically-curved workpieces in which conventional vision sensors have had difficulty can be reproduced.**


**The surfaces of metal workpieces can be reproduced accurately.**




**The influence of changing lighting conditions from day to night are effectively minimized.**



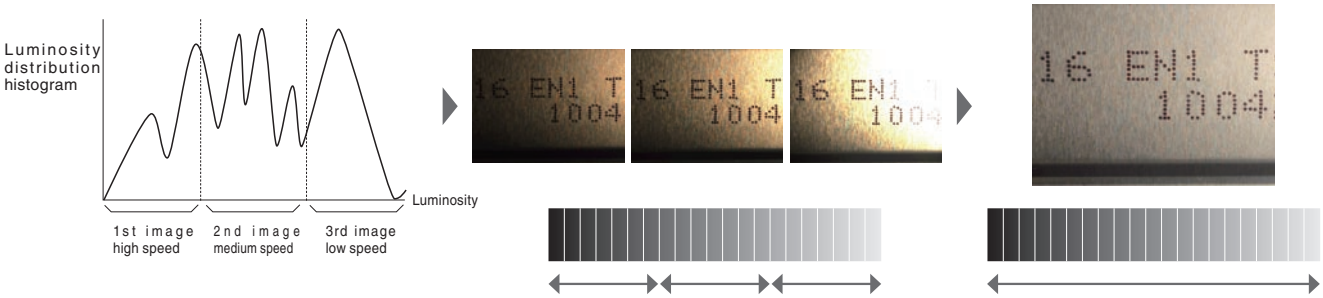
## HDR Image Generation Technology

Dynamic range means the imaging hardware's ability to manage differences in lighting. The higher dynamic range the hardware scores, the clearer images it can generate when imaging objects with a strong contrast in luminosity. Featuring the HDR Image Generation technology, FZ3 can take two or more images of a workpiece at different levels of luminosity by automatically changing its shutter speed and synthesizes them into a single image rapidly. As a result, the bright field where image capture is possible expands 5,000 times in LD ratio compared to a general CCD camera. Accordingly, you can obtain vivid images not possible in processing flows where images are color-depth filtered one by one in real time.

**Instantaneously calculates the luminosity distribution in the field of view, and automatically setting a number of images to be taken and the shutter speed for each image.**

**Continuous imaging at different shutter speeds.**

**Instantaneous synthesis of different images at different levels of luminosity. The wide dynamic range allows you to generate clear images even with overexposure or under changing lighting conditions.**



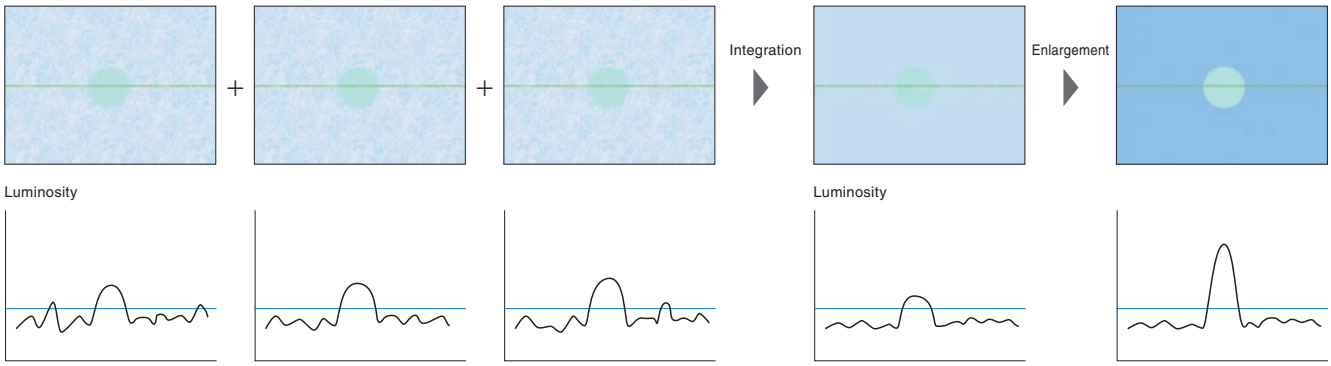

## HDR High-Contrast Mode

The HDR function that quickly produces multiple composite images offers the high-contrast mode. In this mode, images captured at a constant shutter speed are layered on top of one another and output. Before, each image had to be enlarged to increase contrast, and consequently the noise component of the image was also amplified. In the HDR high-contrast mode, on the other hand, multiple images are combined together and then averaged to reduce their noise component, after which the images are enlarged. This way, only the contrast of the area of interest and its background can be increased.

Conventional system
Low contrast makes the surface appear uniform.

HDR high-contrast image
Many scratches and soiled areas can be found.

### Technology of HDR High-Contrast Mode




**There is a low contrast in brightness between the background noises and the thing to be inspected.**

**The contrast is enhanced by integrating and enlarging two or more images.**

# High Resolution Image Generation

## Higher Resolutions and Wider Fields of Vision

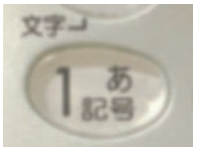
### 5 Million-Pixel Cameras

The new 5 million-pixel cameras allow high precision appearance inspections and measurements that cannot be handled by conventional 2 million-pixel cameras.

Color Type
FZ-SC5M

Black and White Type
FZ-S5M


**5 million pixels**
**(2448×2044 pixels)**

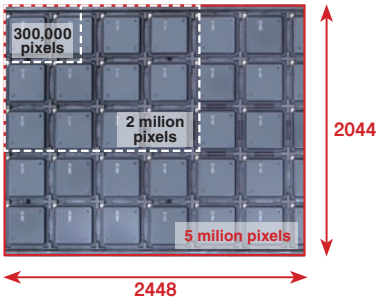



**2 million pixels**
**(1600×1200 pixels)**

#### 1.5-times wider field of vision

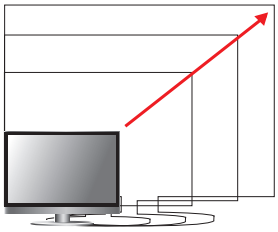
Even a large workpiece can be imaged at one time and the details are very clear

#### Reducing Tact Time



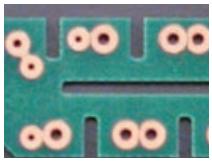

FZ3 takes a single wide-view image of a large workpiece used be imaged in multiple pieces and thus reduces inspection tact time.

#### Reducing Set-up Time

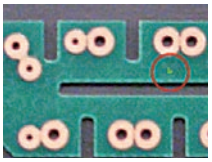


Thanks to the cameras' wider fields of vision, you don't have to move their positions during set up on a production line for different products in different sizes.

#### Making Invisible Defects Visible



**2 million pixels**

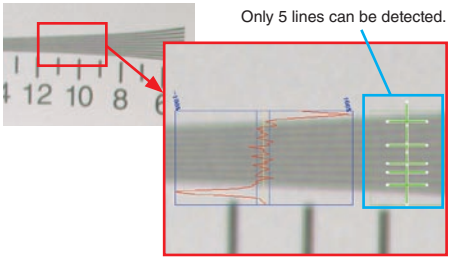


**5 million pixels**

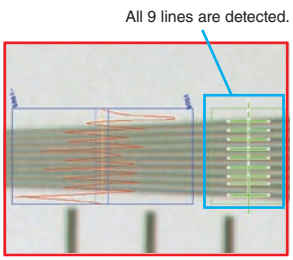
The improved resolution of the system's cameras allows you to detect very slight defects that were impossible for its predecessor to catch.

## High measurement accuracy Lens of over 5 mega pixels

A lineup of high-accuracy lenses is available to fully utilize the high-resolution camera of 5 million pixels or more and thereby realize accurate inspection. The resulting greater contrast and higher resolution ensure accurate positioning check, scratch inspection and other inspection applications where higher accuracy is required.




Normal high-resolution lens




Lens of over 5 mega pixels

* Please contact your OMRON sales representative.

## Autofocus Camera / Intelligent Camera with illumination

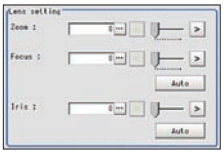
**Autofocus Camera**

Color FZ-SZC100
FZ-SZC15

**Intelligent Camera**

Color FZ-SLC100
FZ-SLC15

These image processing cameras for FA needs are equipped with auto focus functions and lights. You can remotely control the focus, aperture, field of vision and lighting of the cameras installed at a distant from the controllers. You can apply a set of lighting conditions for any particular inspection to different lines by saving the setting data for the inspection into the controller. This function allows prompt setting for each inspection procedure. It also helps reduce setting variations among individual operators.



Setting the focus, aperture and field of vision

### Intelligent Lighting

You can control the brightness levels of up to 8 lights in 256 gradations. Since you can register the most appropriate setting for each lighting task, stable lighting conditions are always ensured.
* Function available only with FZ-SLC100 and FZ-SLC15

Lighting Patterns
8 places can be controlled

Brightness Levels
256 gradations

### Innovative zoom function

With this function, the camera can flexibly respond to inspections on mixed production lines or any changes in its field of vision for additional inspections.

■ Model with Narrow Field of Vision ■ Model with Wide Field of Vision


## Ultra-compact Pen-shaped Camera / Ultra-slim Flat Camera

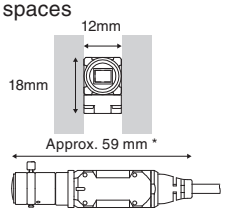
Our high-performance, high-speed 300,000-pixel cameras have been remarkably downsized. They can be installed in spaces which are too small for conventional cameras.

Color FZ-SPC
Black & White FZ-SP

Color FZ-SFC
Black & White FZ-SF

### Most compact and shortest pen-shaped camera in the Industry

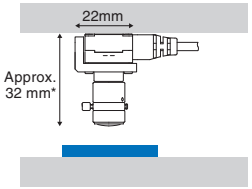
Suitable for use in narrow spaces




*This is the size with nothing other than a lens (FZ-LES3).

### First slim flat camera in the Industry

Suitable for use in spaces with little depth that usually require mirrors



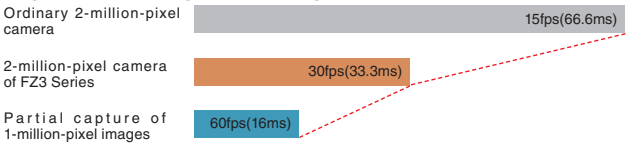

*This is the size with nothing other than a lens (FZ-LES3) and does not include a spacer for installation.

## 2-million-Pixel camera

This high-resolution 2-million-pixel camera (1600 × 1200 pixels) boasts the fastest image capture speed in its class. It is equivalent to the speed of 300,000-pixel cameras. Furthermore, the camera can capture 1-million-pixel images (1600 × 600 pixels) at a speed of 60 fps in the partial capture mode.

Color FZ-SC2M
Black & White FZ-S2M

### High speed image capturing of 30 fps




## 300,000-pixel Camera

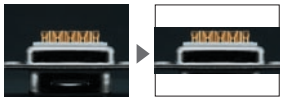
This camera achieves an image capture speed of 80 fps with full VGA resolution of 640 × 480 pixels, saving input time about 4 ms. It features high speed with highest cost performance. Furthermore, it allows faster image capturing in the partial capture mode.

Color FZ-SC
Black & White FZ-S

### High speed image capturing of 80 fps

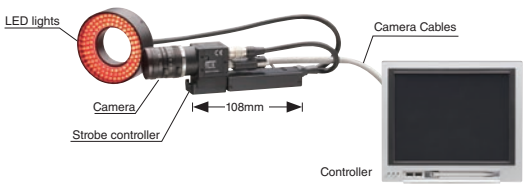

### Partial capture function

This function allows you to specify any part of the workpiece and capture images thereof at a faster speed.Image capturing at a speed of 3 ms maximum is possible.



## Strobe Controller to manage the Lighting Without Complex Wiring and Additional Power Supply

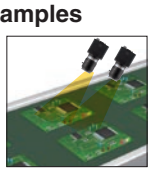
You can easily control lighting by connecting this strobe controller to the camera and the light using a single cable. Unlike ordinary lighting control units built on controllers, you do not need any complex wiring for this strobe controller. This makes the system very easy to handle. You can control all lighting sequences with this controller.



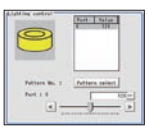

- Small Size for Easy Installation
- No Additional Power Supply Needed
- Simple System With Simple Wiring
- Controlling Lighting from the Controller

### Application Examples

The strobe controller installed on a robot is ideal for robotic inspections.



The controller can prevent mutual interference between different cameras by controlling lighting.



Data of specific lighting conditions can be saved in the controller. In this way, you can save time for setting lighting conditions before conducting each inspection.

# Real-time Image Generation Technology

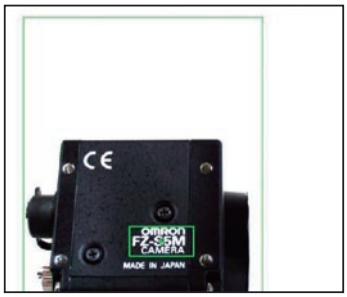
## Ideal for Inspection

[ Patent Pending ]

### Minimizing the effects of the camera position or flutter during the carrying process

## Trapezoidal Distortion Correction

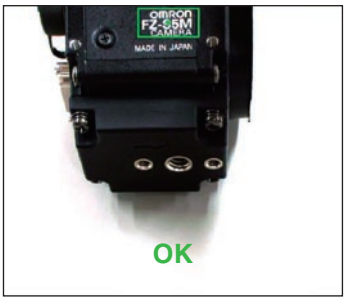
Correcting distorted images shot from an angle. High-precision inspections are ensured even when images are taken from an angle or the carrying process is unstable.



Registered model image

Scroll

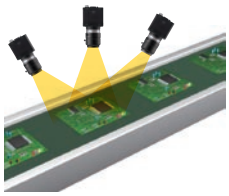

[Conventional system]
Scroll of the subject reduces the correlation value. The model cannot be detected.




[After trapezoidal distortion correction]
Even when scroll occurs, the distortion is compensated to make sure the model is detected stably.

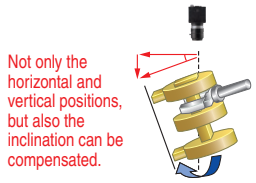
### Cross shots image capture is possible

FZ3 allows space-saving line designs since cameras can be mounted in any small spaces at any angle. Furthermore, you would have no difficulty in finding appropriate spaces for an additional camera for an additional inspection item.



### Coping with any flutter in the carrying process

High-precision inspections are ensured even when there is flutter in the carrying process. Unlike the conventional vision sensors, FZ3 can also correct perspective distortions.




Even when the subject inclines due to the movement of the arm, its position can be compensated.

[ Patent Pending ]

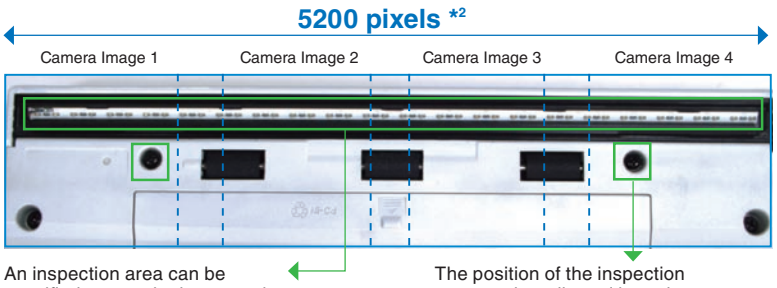
### Precise Inspections of Large Workpieces in Whole

## Ultra-Wide Panorama Image Processing

When taking images of a large workpiece in multiple pieces using two or more cameras, a conventional vision sensor processes the images taken by the cameras separately in order to secure a satisfactory level of resolution. FZ3's panoramic image processing*1 capability allows the measurement of a large or long workpiece in whole by synthesizing the images taken by camera and generating a single image from them.

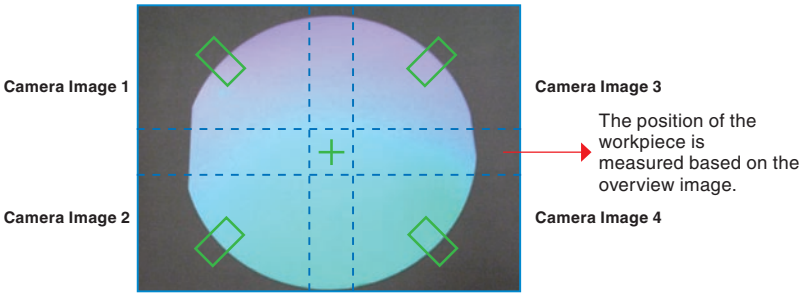
### Wide Panorama

Images taken by two to four 2-million-pixel cameras are put together like a line camera to generate a single image as if it is taken by a single camera when inspecting a horizontally long workpiece.




### Synthesis of up to four images

Up to four images can be synthesized horizontally and vertically in accordance with the shape of the workpiece.




*1 This feature can be performed with cameras of 2 million pixels or less.
*2 The images of four 2 million-pixel cameras overlap each other at their edges, with each overlapping area covering 25% of the entire area of each image.

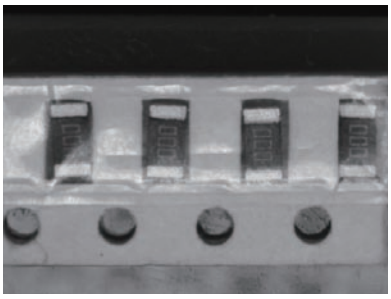
[ Patent Pending ]

# Eliminating reflection of light on the surfaces of moving workpieces

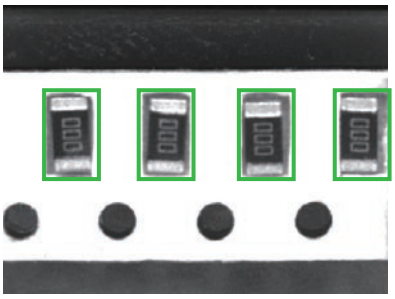
## High-speed Halation Prevention Filter

This feature detects blurs caused by halation or unstable lighting, and automatically make corrections.
It is very useful when workpieces to be inspected are moving at a high speed or inspections are made through a transparent film.

Halation is cut off by capturing images using a special halation-cutoff lamp (FZ-SXCRB7018BR-4S).



Before processing



After processing


Analyzing the color elements captured as specular light (halation)


Automatically choosing the most appropriate filter to prevent halation and generating images most appropriate for inspections

# Removing fringes to detect defects

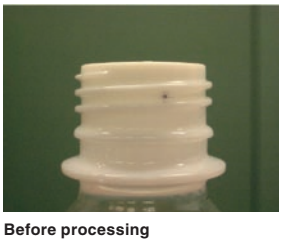
## Fringe-killer Filter

Other than detecting defects by subtraction, FZ3 can also remove some peculiar patterns such as fringes in the background for more stable inspections.

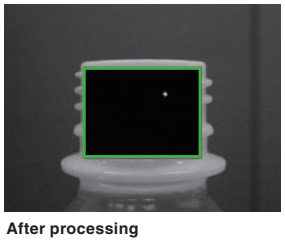
**Conventional images**

**Image processed by the Fringe-killer Filter**

The filter removes fringes in the background and detects defects only even when fringes is as big as defects.



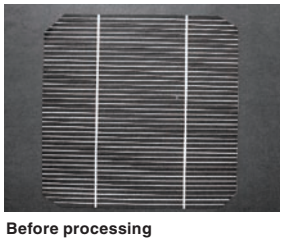
**Before processing**



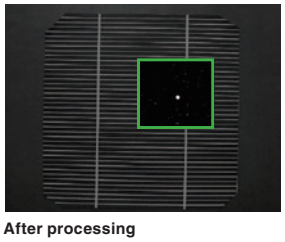
**After processing**

Analyzing images by subtraction and detecting only subtle changes as defects.

Removing horizontal, vertical and lattice fringes



**Before processing**



**After processing**

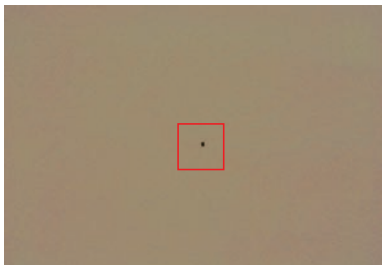
FZ3 can choose the type of fringes to be removed in accordance with the background of each workpiece to be inspected.

# New generation processing items (approx. 60)

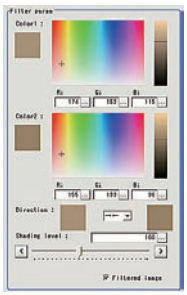
## Filters to optimize input images / Position Correction

### Color shadings elimination filter First in the industry

The filter eliminates Specific background color data that may hamper the detection of defects. It also improves the accuracy of inspection to detect scratches or dirt. This cutting-edge function is made possible only with FZ3's Real Color Sensing technology.



You can easily and immediately eliminate color shading just choose a specific color on the screen.

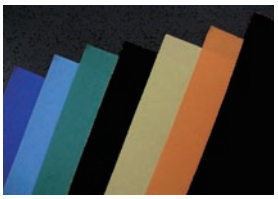


### Color extracting filter

The filter allows the extraction of any specific color from the image. Since you can register up to eight colors, as the colors to be eliminated, you do not need to adjust settings for different processing items. The filter works in two modes, one for extracting the color specified and the other for extracting all colors other than the specified one. You can flexibly switch between the two modes according to requirements for individual inspections.

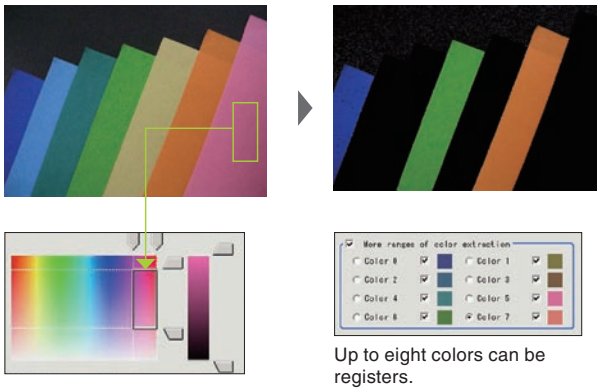
First in the industry All colors other than the ones specified can be extracted. When there are a number of colors you want to extract, this mode saves time in color setting.

Before processing



After processing
Extracting pink and yellow green

You can easily specify any color by just clicking it on the screen. The color chart on the screen, that shows the color you have chosen, enables intuitive operation even for fine adjustments.

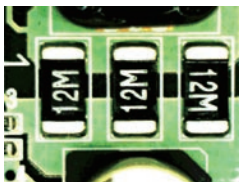


Up to eight colors can be registers.

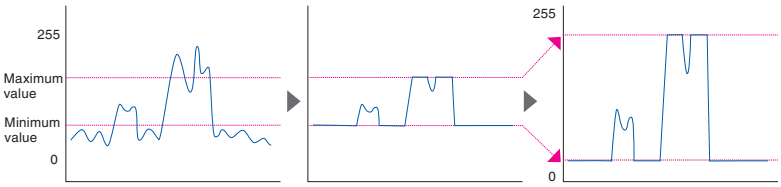
### Elimination of Background

A minimum value and a maximum value are set for each of the RGB colors. Any color depth under the minimum value is specified as "0," and any depth over the maximum value as "255." Then all other depths between them are stretched into a 0 to 255 scale. An area to be inspected is visualized with high contrast while the effects of depths outside this scale are eliminated.

Before processing



After processing




Finding minimum and maximum values of color depth

Cutting any depth outside this scale

Stretching all other depths into the scale and eliminating the effects of depth variation

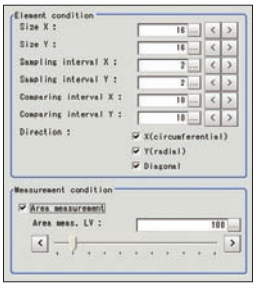
### Rectangular Development of Circular Images First in the industry

This function allows recognition of characters printed along the circumferences of circular surfaces by converting circular images into rectangular forms. The characters can be inspected with the same resolution even after such rectangular development.

# High Precision Inspections of Defect

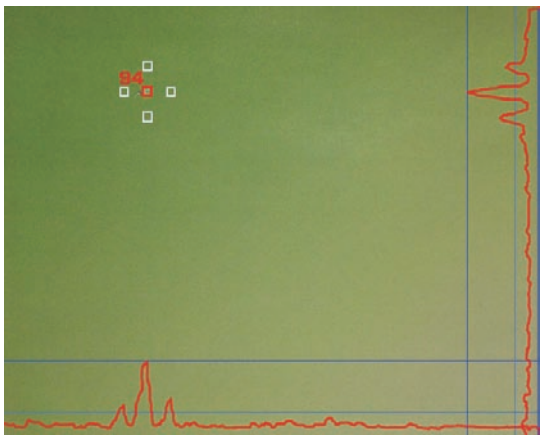
## Inspections of Scratches and Dirt

Subtle scratches and dirt can be detected with more fine-tuned conditions compared to conventional inspections.
Since you can clearly distinguish defects to be detected from the background, the failure detection rate can be decreased.Combined with our 5 million-pixel camera, this function enables much more precise inspections of scratches.




Fine parameters for defect detection allow fine settings at the pixel level.

[ Patent Pending ] Scratch detection profile displayed on the screen

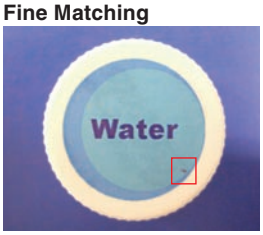


You can confirm wave profiles and comparison elements on the screen. This feature also enables easy thresholding setting and fine adjustments on the screen.

## Fine Matching / Defect

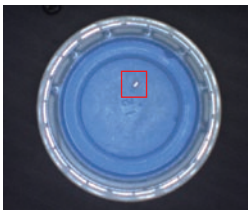
With our Real Color Sensing technology, FZ3 can accurately recognize and process subtle variations in color. This feature helps you detect unpredictable scratches and dirt. High precision defect inspections are possible by using both Fine Matching and Defect flexibly according to the background of each image.

**Fine Matching**




It is useful for detecting scratches, chipped edges or subtle dirt in complex backgrounds.

**Defect**



It is useful for detecting scratches and dirt in plain backgrounds.

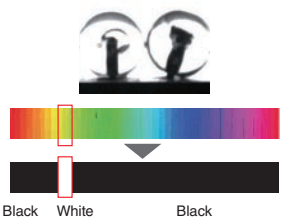
[ Patent Pending ]

## What is Real Color Sensing?

In order to secure stable measurements in different inspection environments, FZ Series feature Omron's proprietary Real Color Sensing processing, in addition to the conventional color image processing.

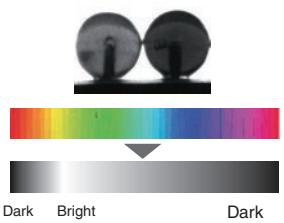
Edges are detected reliably even when the contrast between the background and subject is low.

### Color Segmentation Processing



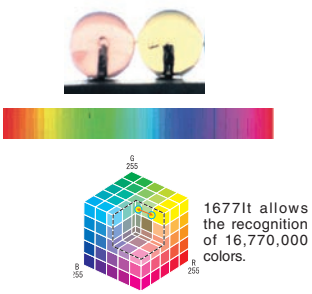

Color images taken by the camera are processed after being converted into black and white pixels. The color extracted is represented as white, and the other colors as black. Based on minimum information, high speed processing is possible. Since color data is limited only to brightness, however, it takes a long time to make optical adjustments for extracting color features.

### Color Image Processing




Color images are converted into 256 levels of black-and-white brightness and the contrasts of specific colors is enhanced. More precise, stable results can be produced compared to color segmentation. However, this method has difficulty in capturing subtle variations in color because all colors are converted into black-and-white brightness levels. Therefore, it is difficult to detect subtle changes in images with low contrast.

### Real Color Sensing




1677It allows the recognition of 16,770,000 colors.

Different colors are represented as different positions in the 3D RGB space. Subtle variations in color can be recognized by representing them as distances between different color pixels comprising this space. Thus, scratches and dirt can be detected accurately even in images with low contrast.

Previous image processing

OMRON FZ series

# New generation processing items (approx. 60)

## High Speed / High Precision Pattern Recoginition

### Shape Search

The geometry correlation search for conducting search based on the profile information of the workpiece ensures greater absorption of dimensional variations among individual works (changes in background, contrast, etc.) and consequently achieves stable detection.

The detection speed is approx. 20 times that of a conventional processing system, which allows for high-speed detection even when images are captured with high-resolution camera.

Registered model image

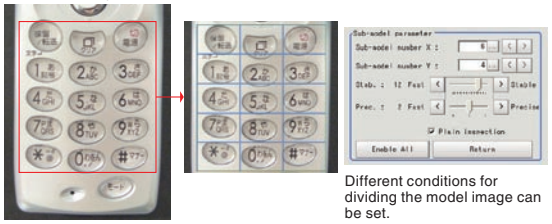
Even low-contrast images are detected stably.

**Compared with geometric correlation search processing by OMRON's conventional system**


**Approx. 20 times faster detection (representative example)**

### Sensitive Search

This allows the recognition of very subtle differences that cannot be detected through ordinary search processes, by dividing the registered model image into several pieces and carefully matching them. Thus you don't have to spend a lot of time for delicate threshold setting.

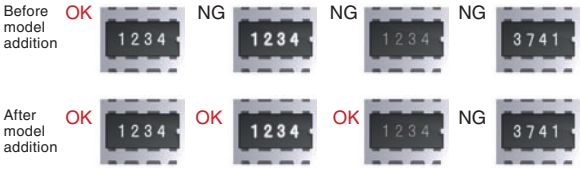


Different conditions for dividing the model image can be set.

### Flexible Search

When inspecting workpieces with some variations in shape, such variations are sometimes recognized erroneously as defects. Flexible Search ensures accurate searches regardless of some variations in print quality or shape, by registering several images of non-defective products as models. It helps you decrease your inspection failure rate by rejecting defective products only.

**■ Inspection of characters on IC chips**

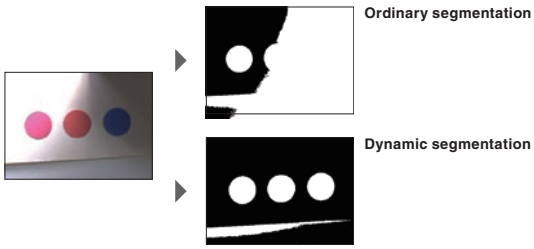



Avoiding inspection failures

## Area / Labeling

### Dynamic segmentation and high-performance labeling

This item features a dynamic segmentation in addition to the conventional labeling. This function ensures the accurate detection of labels by automatically sensing any uneven color depth in the same image and changing thresholds locally.



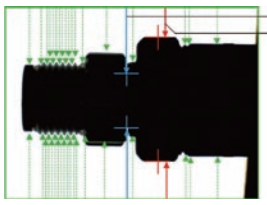

**Easy to sort, Wide variety of conditions to be extracted**

- •Area
- •Gravity (x, y)
- •Main axial angle
- •Major axis, minor axis and ratio of an ellipse
- •Width, height and coordinate (x, y) of a circumscribed rectangle
- •Perimeter
- •Circularity
- •Major axis and minor axis of a rotating rectangle
- •Radius of a inscribed circle
- •Radius of a circumscribed circle
- •Number of holes

## High Performance Edge Detection

### Scan Edge Position,Scan Edge Width

Edge positions and widths can be accurately detected by dividing the area to be inspected into several segments.Scan Edge Position measures the points closest and farthest to the edge as well as the inclination and surface conditions of the workpiece to be inspected. Scan Edge Width measures the local and average widths of the workpiece.This allows the accurate measurement of the positions of the workpiece's peripheral parts as well as its bore diameters.Edge detection method can be chosen from the intensity projection method and the differentiation method.




It is also useful for measuring the depths of grooves on metal shafts.

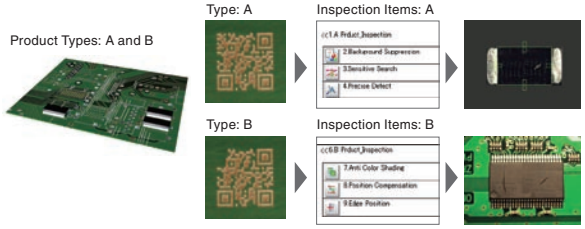
# Character / Code Recognition

## Read Bar Codes / 2D Codes

It allows the detection of the types of products before inspections as well as the collection and accumulation of information on inspections.

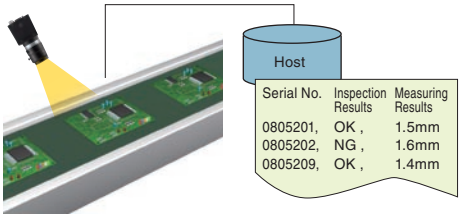
### Switching among different inspection items according to the types of products

Different sets of inspection items can be automatically set for different types of products detected through code reading processes.
The item, that covers all processes from product type detection to inspections without involving the host, can save time for interconnection and programming.



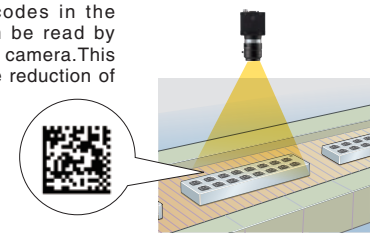

### Collecting and accumulating information on inspections in real time

You can collect the serial numbers of components and measuring results in real time while they are being inspected.The causes of defects can be tracked down immediately by consolidating such serial numbers and measuring results at the host.




### Reading different codes at a time

Two or more different codes in the same field of vision can be read by utilizing a high resolution camera.This function contributes to the reduction of inspection tact time.



### Codes that can be read with FZ3

**Bar codes**


**2D codes**


## Character Inspection / Date Verification

This item allows easy inspections of characters by registering specific characters in the model dictionary and specifying areas to be inspected.

OCR mode: Reading printed characters and outputting them to an external device.
OCV mode: Judging matching with registered models
OCR + Count: Characters counted simultaneously


### Calendar function

Character strings to be inspected are automatically updated by specifying duration of use.It can allows the inspections of encrypted dates (such as "X" representing 10).

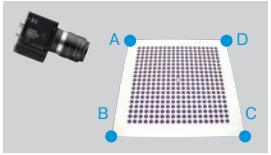

Compatible with various date formats

# Items supporting measurement

## High Precision Calibration

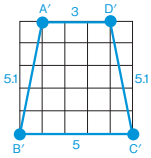
This is a function corresponding to trapezoidal distortion correction.
High precision measurements are possible even when cameras are installed at an angle.

Imaging from an angle



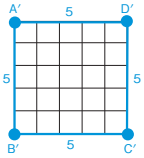

**Conventional calibration**

When trapezoidal distortions are caused by perspective differences, significant calibration errors are observed.




**FZ3**

High precision calibrations are possible for trapezoidal distortions by using parameters considering perspective transformation.




### Coping with geometric computation

## Circle/Line Regression

With this item, you can cope with geometric computation in addition to functional computation.It allows you to relate coordinates very easily while looking at images.

You can obtain the center or radius of a circle from an arbitrary number of points on its perimeter.

You can obtain a straight line, the intersection of two straight lines and its angle, or the distance between a straight line and a point from an arbitrarily selected number of points.

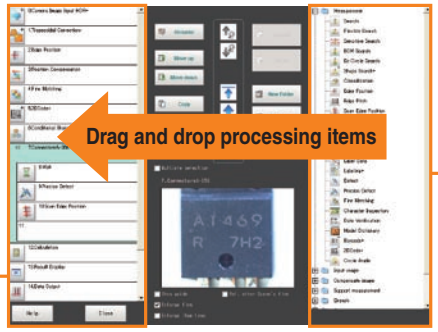
# Easy to use

## Designing

### Easy set-up

### Flow menu

Basic processing items required for various inspections such as image input, measurement, display and output are packaged. FZ3 can immediately support any process, from the initial setup to the launch of a new line, with the setting screen for each processing item from which the user can set the required threshold values and parameters.



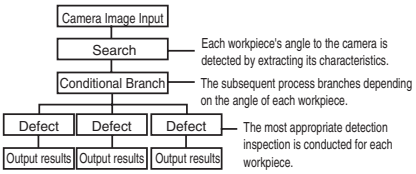

Adopting the setting window for each processing items, required parameters and inspection area can be set easily.

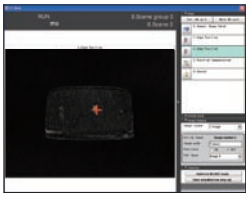
Processing equivalent to programming is achieved by calculating the inspection results and changing the subsequent processes depending on the results.

#### Examples of Processing Flow Customization

**Defect Inspection for Workpieces Carried at Different Angles to the Camera**

In order to inspect workpieces placed and carried at different angles to the camera, the most appropriate settings can be made automatically for each angle.

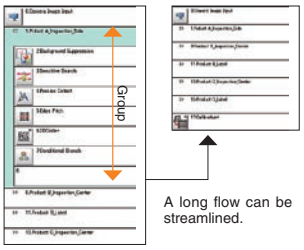


#### Useful Functions in Flow Menu

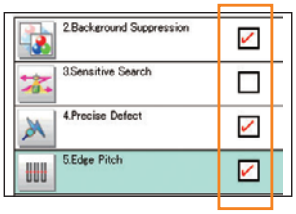
**Flow Group function**

Processing items can be named and grouped.You can efficiently manage a long work flow by assigning a folder to each processing item.




**Performing different processing items at a time**

You can copy or delete two or more processing items at a time by just checking them on the screen.

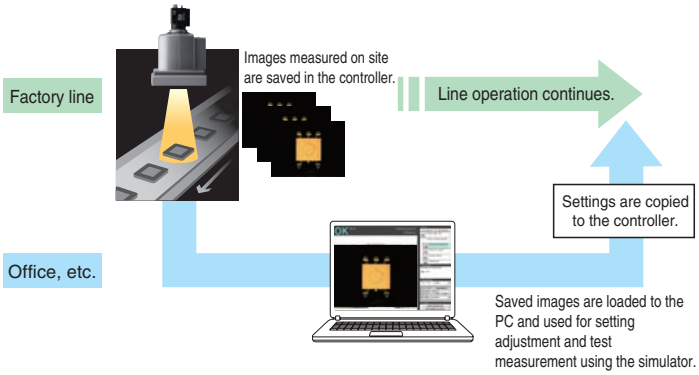



**Copy & paste processing items from another scene.**

You can set up a new flow menu by combining different processing items copied from other scenes.When you want to utilize the setting of other scene, you do not need to make adjustments.


### Test Measurement and Setting and Adjustment On Your PC Without Stopping the Operation

You can use simulation software that operates in the same environment as the controller, to perform all tasks from flow design and test measurement to setting adjustment. You can make adjustments without stopping the line. This saves a lot of time at the production site.

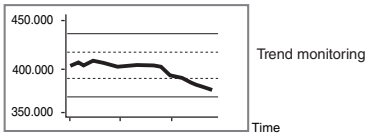



#### Useful Functions for Test Measurement

**Continuous test measurement function**

Settings must be verified with as many images as possible. With OMRON's FZ3, continuous measurements of hundreds of images can be performed by a single click.

Checking the results of continuous measurement in a graph



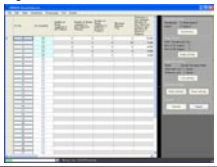

**Judgment monitoring function**

Continuous measurement stops automatically when a defect occurs.
Once the measurement stops, you can select the next course of action right away for efficient testing and verification.

If a defect occurs, measurement stops automatically --> Select the course of action.


Judgment Monitoring Function

Introducing a new software program (VisionOptimizer) that works with the simulation software to calculate optimum settings. See the end of this brochure for details.



## Easy Creation of Ladder Programs Improved PLC Link Function

There are now more models supporting the PLC function that lets you perform serial data communication with the PLC link via simple input operation. This reduces the design man-hours because creating ladder programs for the PLC has become much easier.

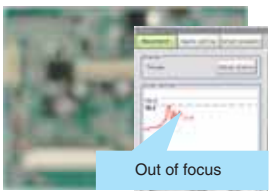
**[Applicable models]** OMRON Corporation SYSMAC CS/CJ/CP/One series
<NEW> Mitsubishi Electric Corporation Q series

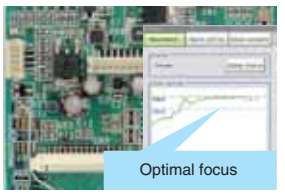
Reading and writing of I/O memory areas can be set easily on the dedicated menu screen.

# On-site Installation / Adjustment

## Optimal Focus / Aperture Settings

Focus and brightness, whose adjustment has depended on experience and feeling, can now be set numerically and visualized in a graph view.
Anyone can find optimal focus and aperture settings quickly, which in turn eliminates setting variations among different individuals and therefore allows more severe inspection accuracy.




- The camera can be set/installed with ease.
- The user is notified every time the focus or lighting has changed.
- As long as the focus and aperture of the master work are set numerically, anyone can reproduce the same condition.

# Operation

## Customizable Screens for User-friendly Operation

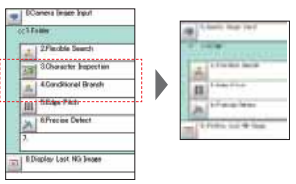
Operating screens can be customized freely and easily according to the inspection details and actual environment of the site.
A full set of customization functions are available to let you not only prevent malfunctions and unexpected downtimes on site, but also take immediate actions should you encounter sudden defects.


### Measurement information

Measurement information to be shown on operating screens can be customized.
You can change the items to be displayed as well as the position and font size of each item.


### Display of Processing Items

You can set "No Display" of any processing items during operation



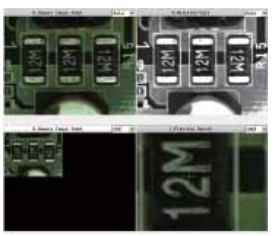
### Shortcut buttons

You can arrange a set of shortcut buttons as you like. With these buttons, you can promptly cope with any defects or adjustments whenever necessary during operation.

Example of customization


### Multi-screen Display, Display of the latest NG image

Displays on the Measurement screen can be changed as you like according to the number of cameras and their purposes.You can display a detail of a workpiece and its overall image at the same time on the screen. This function also enables a comparison between an NG image and the image actually being inspected.



## Controllers

# Best performance for each application

Controllers integrated with LCD

Box-type Controllers

### NEW Dual-task, High-grade, High-speed Controllers

Adopting the industry's first dual-engine architecture, these models can process high grade items via dual parallel flows.


| | | |
|---|---|---|
| Controllers integrated with LCD | Two-camera controllers | FZ3-H900 (NPN) / FZ3-H905 (PNP) |
| | Four-camera controllers | FZ3-H900-10 (NPN) / FZ3-H905-10 (PNP) |
| Box-type Controllers | Two-camera controllers | FZ3-H950 (NPN) / FZ3-H955 (PNP) |
| | Four-camera controllers | FZ3-H950-10 (NPN) / FZ3-H955-10 (PNP) |

### NEW Dual-task, High-speed Controllers

Adopting the industry's first dual-engine architecture, these models can process standard items faster.


| | | |
|---|---|---|
| Controllers integrated with LCD | Two-camera controllers | FZ3-900 (NPN) / FZ3-905 (PNP) |
| | Four-camera controllers | FZ3-900-10 (NPN) / FZ3-905-10 (PNP) |
| Box-type Controllers | Two-camera controllers | FZ3-950 (NPN) / FZ3-955 (PNP) |
| | Four-camera controllers | FZ3-950-10 (NPN) / FZ3-955-10 (PNP) |

## Cameras and Accessories

### Digital cameras

**5 million-pixel**

Color
FZ-SC5M

Black & White
FZ-S5M

**2 million-pixel**

Color
FZ-SC2M

Black & White
FZ-S2M

**300,000-pixel**

Color
FZ-SC

Black & White
FZ-S

### Small digital cameras

**300,000-pixel flat type**

Color
FZ-SFC

Black & White
FZ-SF

**300,000-pixel pen type**

Color
FZ-SPC

Black & White
FZ-SP

### Lenses

High-resolution, low-distortion lenses
FZ-LEH Series

CCTV lens
3Z4S-LE Series

Small lens
FZ-LES Series

### Camera Cables

Camera Cables
FZ-VS

Bend resistant camera cables
FZ-VSB

Right-angle camera cable
FZ-VSL

Long-distance camera cable
FZ-VS2

Long-distance right-angle camera cable
FZ-VSL2

## High-grade, High-speed Controllers

With the industry's fastest CPU, the controllers promptly processe cutting-edge, high grade processing items. Not only a 2 million-pixel camera but also a 5 million-pixel-camera can also be connected the controllers.

| | | |
|---|---|---|
| Controllers integrated with LCD | Two-camera controllers | FZ3-H700 (NPN) / FZ3-H705 (PNP) |
| | Four-camera controllers | FZ3-H700-10 (NPN) / FZ3-H705-10 (PNP) |
| Box-type Controllers | Two-camera controllers | FZ3-H750 (NPN) / FZ3-H755 (PNP) |
| | Four-camera controllers | FZ3-H750-10 (NPN) / FZ3-H755-10 (PNP) |

## High-speed Controllers

High-resolution 5 million-pixel-cameras can be connected to the controllers with the industry's fastest CPU. They are ideal for high speed processing of standard inspection items.

| | | |
|---|---|---|
| Controllers integrated with LCD | Two-camera controllers | FZ3-700 (NPN) / FZ3-705(PNP) |
| | Four-camera controllers | FZ3-700-10(NPN) / FZ3-705-10(PNP) |
| Box-type Controllers | Two-camera controllers | FZ3-750(NPN) / FZ3-755(PNP) |
| | Four-camera controllers | FZ3-750-10(NPN) / FZ3-755-10(PNP) |

## High-grade Controllers

These standard controllers feature our cutting-edge High Grade algorithm. They allow flexible defect solving capability and high speed processing at the same time.

| | | |
|---|---|---|
| Controllers integrated with LCD | Two-camera controllers | FZ3-H300(NPN) / FZ3-H305(PNP) |
| | Four-camera controllers | FZ3-H300-10(NPN) / FZ3-H305-10(PNP) |
| Box-type Controllers | Two-camera controllers | FZ3-H350 (NPN) / FZ3-H355(PNP) |
| | Four-camera controllers | FZ3-H350-10(NPN) / FZ3-H355-10(PNP) |

## Standard Controllers

They cover all standard functions and processing items. Their performance is more than adequate.

| | | |
|---|---|---|
| Controllers integrated with LCD | Two-camera controllers | FZ3-300(NPN) / FZ3-305(PNP) |
| | Four-camera controllers | FZ3-300-10(NPN) / FZ3-305-10(PNP) |
| Box-type Controllers | Two-camera controllers | FZ3-350(NPN) / FZ3-355(PNP) |
| | Four-camera controllers | FZ3-350-10(NPN) / FZ3-355-10(PNP) |

# Peripheral devices

### Intelligent cameras

Narrow field of vision
FZ-SLC15

Wide field of vision
FZ-SLC100

### Autofocus cameras

Narrow field of vision
FZ-SZC15

Wide field of vision
FZ-SZC100

### Cable extension unit

Cable extension unit
FZ-VSJ

### Strobe controller

Strobe controller designed specifically for FZ Series
3Z4S-LT MLEK-C100E1TS2
Manufactured by MORITEX Corporation

### Intelligent camera diffusion plate

Narrow field of vision
FZ-SLC15-DL

Wide field of vision
FZ-SLC-100-DL

### Halation cut illumination

Integrated unit combining light, strobe controller and camera
FZ-SXCRB7018BR-4S

LCD monitor
FZ-M08

Monitor cable
FZ-VM

Parallel cable
FZ-VP

USB memory
FZ-MEM1G

VESA attachment
FZ-VESA

Desktop controller stand
FZ-DS

**FZ3 Series**

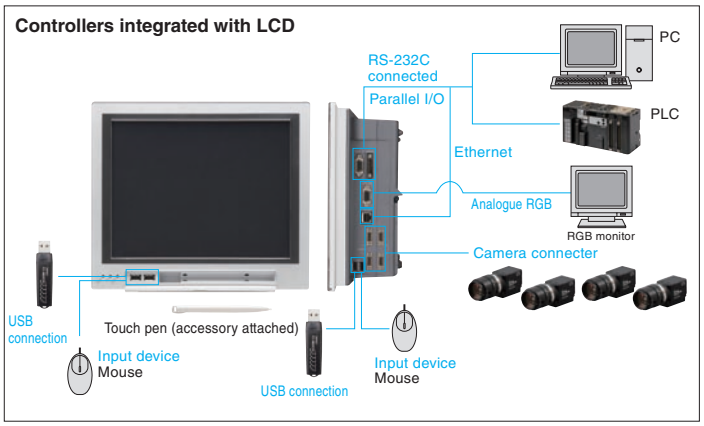
| Item | | Descriptions | | | Model | Remarks |
|---|---|---|---|---|---|---|
| Controllers | Dual-task, High-grade, High-speed Controllers | Controllers integrated with LCD | Two-camera controllers | NPN/PNP | FZ3-H900/FZ3-H905 | With touch pen |
| | | | Four-camera controllers | NPN/PNP | FZ3-H900-10/FZ3-H905-10 | |
| | | Box-type controllers | Two-camera controllers | NPN/PNP | FZ3-H950/FZ3-H955 | — |
| | | | Four-camera controllers | NPN/PNP | FZ3-H950-10/FZ3-H955-10 | |
| | Dual-task, High-speed Controllers | Controllers integrated with LCD | Two-camera controllers | NPN/PNP | FZ3-900/FZ3-905 | With touch pen |
| | | | Four-camera controllers | NPN/PNP | FZ3-900-10/FZ3-905-10 | |
| | | Box-type controllers | Two-camera controllers | NPN/PNP | FZ3-950/FZ3-955 | — |
| | | | Four-camera controllers | NPN/PNP | FZ3-950-10/FZ3-955-10 | |
| | High-grade, High-speed Controllers | Controllers integrated with LCD | Two-camera controllers | NPN/PNP | FZ3-H700/FZ3-H705 | With touch pen |
| | | | Four-camera controllers | NPN/PNP | FZ3-H700-10/FZ3-H705-10 | |
| | | Box-type Controllers | Two-camera controllers | NPN/PNP | FZ3-H750/FZ3-H755 | — |
| | | | Four-camera controllers | NPN/PNP | FZ3-H750-10/FZ3-H755-10 | |
| | High-grade Controllers | Controllers integrated with LCD | Two-camera controllers | NPN/PNP | FZ3-H300/FZ3-H305 | With touch pen |
| | | | Four-camera controllers | NPN/PNP | FZ3-H300-10/FZ3-H305-10 | |
| | | Box-type Controllers | Two-camera controllers | NPN/PNP | FZ3-H350/FZ3-H355 | — |
| | | | Four-camera controllers | NPN/PNP | FZ3-H350-10/FZ3-H355-10 | |
| | High-speed Controllers | Controllers integrated with LCD | Two-camera controllers | NPN/PNP | FZ3-700/FZ3-705 | With touch pen |
| | | | Four-camera controllers | NPN/PNP | FZ3-700-10/FZ3-705-10 | |
| | | Box-type Controllers | Two-camera controllers | NPN/PNP | FZ3-750/FZ3-755 | — |
| | | | Four-camera controllers | NPN/PNP | FZ3-750-10/FZ3-755-10 | |
| | Standard Controllers | Controllers integrated with LCD | Two-camera controllers | NPN/PNP | FZ3-300/FZ3-305 | With touch pen |
| | | | Four-camera controllers | NPN/PNP | FZ3-300-10/FZ3-305-10 | |
| | | Box-type Controllers | Two-camera controllers | NPN/PNP | FZ3-350/FZ3-355 | — |
| | | | Four-camera controllers | NPN/PNP | FZ3-350-10/FZ3-355-10 | |
| Cameras | Intelligent cameras | Wide field of vision | Color | | FZ-SLC100 | Camera + Zoom, Autofocus Lens + Intelligent Lighting |
| | | Narrow field of vision | Color | | FZ-SLC15 | |
| | Autofocus cameras | Wide field of vision | Color | | FZ-SZC100 | Camera + Zoom, Autofocus Lens |
| | | Narrow field of vision | Color | | FZ-SZC15 | |
| | Digital cameras | 300,000 Pixels | Monochrome | | FZ-S | Lens required |
| | | | Color | | FZ-SC | |
| | | 2 million pixels | Monochrome | | FZ-S2M | |
| | | | Color | | FZ-SC2M | |
| | | 5 million pixels | Monochrome | | FZ-S5M | |
| | | | Color | | FZ-SC5M | |
| | Small digital cameras | 300,000-pixel flat type | Monochrome | | FZ-SF | CCTV lens required |
| | | | Color | | FZ-SFC | |
| | | 300,000-pixel pen type | Monochrome | | FZ-SP | |
| | | | Color | | FZ-SPC | |
| Cameras peripheral devices | Intelligent camera diffusion plate | | Wide field of vision | | FZ-SLC100-DL | — |
| | | | Narrow field of vision | | FZ-SLC15-DL | — |
| | CCTV Lenses | | | | 3Z4S-LE Series | — |
| | Extension Tubes | | | | | |
| | Low-distortion Lenses | | | | FZ-LEH5/LEH8/LEH12/LEH16/ LEH25/LEH35/LEH50/LEH75/ LEH100 | Low distortion lens for 2-million pixel cameras and 5 million-pixel cameras |
| | Lenses for small camera | | | | FZ-LES3/LES6/LES16/LES30 | Lens for 300,000-pixel small cameras |
| | Extension Tubes for small camera | | | | FZ-LESR | Extension Tubes for 300,000-pixel small cameras |
| | Halation cut illumination | | | | FZ-SXCRB7018BR-4S | Integrated unit combining special Halation cut illumination, strobe controller and camera (without lens) |
| | | | | | FZ-LTCRB7018BR-4S | Integrated unit combining special Halation cut illumination and strobe controller |
| | | | | | FZ-LTRB7018BR-4S | Special Halation cut illumination only |

| Item | | Descriptions | Model | Remarks |
|---|---|---|---|---|
| Cables | Camera Cable | | FZ-VS | Cable length: 2 m, 5 m, or 10 m (See note 2.) |
| | Bend resistant Camera Cables | | FZ-VSB | Cable length: 2 m, 5 m, or 10 m (See note 3.) |
| | Right-angle Camera Cable (See note 1.) | | FZ-VSL | Cable length: 2 m, 5 m, or 10 m (See note 2.) |
| | Long-distance camera cable | | FZ-VS2 | Cable length: 15 m (See note 4.) |
| | Long-distance right-angle camera cable | | FZ-VSL2 | Cable length: 15 m (See note 4.) |
| | Cable extension unit | | FZ-VSJ | Up to two Extension Units and three Cables can be connected. (Maximum cable length: 45 m (See note 5.)) |
| | Monitor cable | | FZ-VM | Cable length: 2 m or 5 m |
| | Parallel cable | | FZ-VP | Cable length: 2 m or 5 m |
| Peripheral devices | LCD monitor | | FZ-M08 | For Box-type Controllers |
| | USB memory | 1GB | FZ-MEM1G | Capacity: 1 GB |
| | VESA attachment | | FZ-VESA | For installing the LCD integrated-type controller |
| | Desktop controller stand | | FZ-DS | For installing the LCD integrated-type controller |
| Mouse | | | – | Recommended Products (Optical Mouse)<br>• Microsoft Corporation: Compact Optical Mouse, U81 Series |
| External Lighting | | | 3Z4S-LT Series | – |
| Strobe Controller (for FZ Series Vision Sensors) | | | Manufactured by MORITEX Corporation<br>3Z4S-LT MLEK-C100E1TS2 | Required to control external lighting from a Controller |
| Adapter for the strobe controller designed specifically for the 5 million -pixel camera | | | Manufactured by MORITEX Corporation<br>3Z4S-LT LBK-003 | Required to mount a strobe controller on a 5 million-pixel camera |

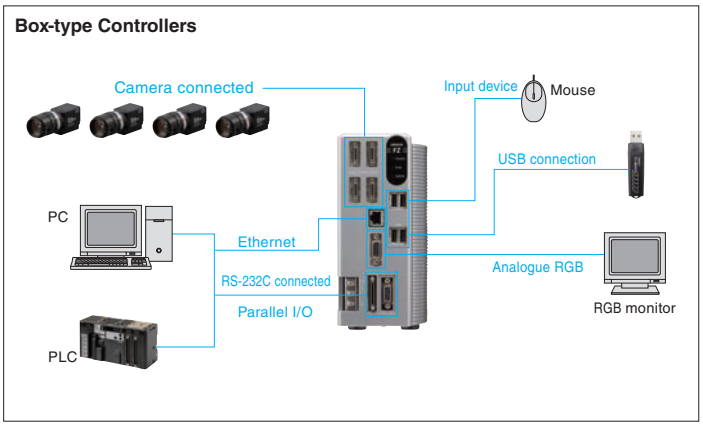
Note 1: This Cable has an L-shaped connector on the Camera end.
2: The 10-m cable cannot be used for the intelligent camera, autofocus camera and 5 million-pixel camera.
3: The 10-m cable cannot be used for the intelligent camera, autofocus camera 2 million-pixel camera and 5 million-pixel camera.
4: The 15-m cable cannot be used for the intelligent camera, autofocus camera and 5 million-pixel camera.
5: The maximum cable length depends on the Camera being connected, and the model and length of the Cable being used.For further information, please refer to the "Cameras / Cables" table in Page 26.

## System configuration

### Controllers integrated with LCD




### Box-type Controllers




## Lenses

### High-resolution, Low-distortion Lenses

| Model | FZ-LEH5 | FZ-LEH8 | FZ-LEH12 | FZ-LEH16 | FZ-LEH25 | FZ-LEH35 | FZ-LEH50 | FZ-LEH75 | FZ-LEH100 |
|---|---|---|---|---|---|---|---|---|---|
| Appearance |  |  |  |  |  |  |  |  |  |
| Focal length | 5mm | 8mm | 12.5mm | 16mm | 25mm | 35mm | 50mm | 75mm | 100mm |
| Brightness | F2.8 | F1.4 | F1.4 | F1.4 | F1.4 | F2 | F2.8 | F2.5 | F2.8 |
| Filter size | M40.5 P0.5 | M27.0 P0.5 | M27.0 P0.5 | M27.0 P0.5 | M27.0 P0.5 | M27.0 P0.5 | M27.0 P0.5 | M34.0 P0.5 | M40.5 P0.5 |

The 5-mm Extension Tubes (3Z4S-LE ML-EXR) cannot be used with FZ-LEH25 Lenses.

### Lenses for small camera

| Model | FZ-LES3 | FZ-LES6 | FZ-LES16 | FZ-LES30 |
|---|---|---|---|---|
| Appearance |  |  |  |  |
| Focal length | 3mm | 6mm | 16mm | 30mm |
| Brightness | F2.0 | F2.0 | F3.4 | F3.4 |

### CCTV Lenses

| 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 | 6mm | 8mm | 12mm | 16mm | 25mm | 35mm | 50mm | 75mm | 100mm |
| 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 | 3Z4S-LE ML-EXR |
|---|---|
| Contents | Set of 7 tubes(40 mm, 20 mm, 10 mm, 5 mm, 2.0 mm, 1.0 mm, and 0.5 mm)<br>Maximum outer diameter: 30 mm dia. |

### Extension Tubes for small camera

| Model | FZ-LESR |
|---|---|
| Contents | Set of 3 tubes(15 mm, 10 mm, 5 mm)<br>Maximum outer diameter: 12 mm dia. |

- 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.

# Ratings and Specifications(Controllers)

## Dual-task, High-grade, High-speed Controllers and Dual-task, High-speed Controllers

| Model | | NPN Output | FZ3-900 | FZ3-900-10 | FZ3-H900 | FZ3-H900-10 | FZ3-950 | FZ3-950-10 | FZ3-H950 | FZ3-H950-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PNP Output | FZ3-905 | FZ3-905-10 | FZ3-H905 | FZ3-H905-10 | FZ3-955 | FZ3-955-10 | FZ3-H955 | FZ3-H955-10 |
| Connected Camera | | | Please refer to the "Camera Connection" table in Page 26. | | | | | | | |
| No. of Cameras | | | 2 | 4 | 2 | 4 | 2 | 4 | 2 | 4 |
| Processing resolution | When connected to a 300,000-pixel camera | | 640(H)×480(V) | | | | | | | |
| | When connected to a 2 million-pixel camera | | 1600(H)×1200(V) | | | | | | | |
| | When connected to a 5 million-pixel camera | | 2448(H)×2044(V) | | | | | | | |
| No. of scenes | | | 32 | | | | | | | |
| Number of logged images (See note 1.) | When connected to a 300,000-pixel camera | Connected to 1 camera | Color camera: 250, Monochrome Camera: 252 | | | | | | | |
| | | Connected to 2 cameras | Color camera: 125, Monochrome Camera: 126 | | | | | | | |
| | | Connected to 3 cameras | Color camera: 83, Monochrome Camera: 84 | | | | | | | |
| | | Connected to 4 cameras | Color camera: 62, Monochrome Camera: 63 | | | | | | | |
| | When connected to a 2 million-pixel camera | Connected to 1 camera | Color camera: 40, Monochrome Camera: 40 | | | | | | | |
| | | Connected to 2 cameras | Color camera: 20, Monochrome Camera: 20 | | | | | | | |
| | | Connected to 3 cameras | Color camera: 13, Monochrome Camera: 13 | | | | | | | |
| | | Connected to 4 cameras | Color camera: 10, Monochrome Camera: 10 | | | | | | | |
| | When connected to a 5 million-pixel camera | Connected to 1 camera | Color camera: 15, Monochrome Camera: 15 | | | | | | | |
| | | Connected to 2 cameras | Color camera: 7, Monochrome Camera: 7 | | | | | | | |
| | | Connected to 3 cameras | Color camera: 5, Monochrome Camera: 5 | | | | | | | |
| | | Connected to 4 cameras | Color camera: 3, Monochrome Camera: 3 | | | | | | | |
| Codes that can be read with FZ3 | | | < Bar Codes > JAN/EAN/UPC (including add-on codes), Code 39, Codabar (NW-7), ITF (Interleaved 2 of 5), Code 93, Code 128, GS1-128, GS1 DataBar (RSS-14 / RSS Limited / RSS Expanded) < 2D Codes > Data Matrix (ECC200), QR Code | | | | | | | |
| 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:1CH | | | | | | | |
| Network communications | | | Ethernet 100BASE-TX/10BASE-T | | | | | | | |
| Parallel I/O | | | (When used in Multi-line random-trigger mode) 17 inputs (RESET, STEP0/ENCTRIG_Z0, STEP1/ENCTRIG_Z1, DSA0 to 1, ENCTRIG_A0 to 1, ENCTRIG_B0 to 1, DI0 to 7), 29 outputs (RUN/BUSY1, BUSY0, GATE0 to 1, OR0 to 1, READY0 to 1, ERROR, STGOUT0 to 3, DO0 to 15) (When used in other mode) 13 inputs (RESET, STEP0/ENCTRIG_Z0, DSA0, ENCTRIG_A0, ENCTRIG_B0, DI0 to 7), 26 outputs (RUN, BUSY0, GATE0, OR0, READY0, ERROR, STGOUT0 to 3, DO0 to 15) | | | | | | | |
| Monitor interface | | | Integrated Controller and LCD 12.1 inch TFT color LCD (Resolution: XGA 1,024 × 768 dots) | | | | Analog RGB video output, 1 channel (Resolution: XGA 1,024 × 768 dots) | | | |
| USB interface | | | 4 channels (supports USB 1.1 and 2.0) | | | | | | | |
| Power supply voltage | | | 20.4 to 26.4 VDC | | | | | | | |
| Current consumption (See note 3.) | When connected to a intelligent or autofocus camera | | 5 A max. | 7.5 A max. | 5 A max. | 7.5 A max. | 5 A max. | 7.5 A max. | 5 A max. | 7.5 A max. |
| | When connected to a 300,000-pixel camera | | 3.7 A max. | 4.9 A max. | 3.7 A max. | 4.9 A max. | 3.7 A max. | 4.9 A max. | 3.7 A max. | 4.9 A max. |
| | When connected to a 2 million-pixel camera | | | | | | | | | |
| | When connected to a 5 million-pixel camera | | | | | | | | | |
| Ambient temperature range | | | Operating: 0 to 45°C, 0 to 50°C (See note 2.), 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. 3.2 kg | Approx. 3.4 kg | Approx. 1.8 kg | Approx. 1.9 kg | Approx. 1.8 kg | Approx. 1.9 kg |
| Accessories | | | Touch pen (one, inside the front panel), Please Read First, Instruction Manual (Setup), 6 mounting brackets | | | | Please Read First, Instruction Manual (Setup) | | | |

Note 1: The image logging capacity changes when multiple cameras of different types are connected at the same time. 2: The operation mode can be changed on the controller menu.
3: The current consumption when the maximum number of cameras supported by each controller are connected. If a strobe controller model is connected to a lamp, the current consumption is as high as when an intelligent camera is connected.

## High-grade, High-speed Controllers and High-speed Controllers

| Model | | NPN Output | FZ3-700 | FZ3-700-10 | FZ3-H700 | FZ3-H700-10 | FZ3-750 | FZ3-750-10 | FZ3-H750 | FZ3-H750-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PNP Output | FZ3-705 | FZ3-705-10 | FZ3-H705 | FZ3-H705-10 | FZ3-755 | FZ3-755-10 | FZ3-H755 | FZ3-H755-10 |
| Connected Camera | | | Please refer to the "Camera Connection" table in Page 26. | | | | | | | |
| No. of Cameras(See note 1.) | | | 2 | 4 | 2 | 4 | 2 | 4 | 2 | 4 |
| Processing resolution | When connected to a 300,000-pixel camera | | 640(H)×480(V) | | | | | | | |
| | When connected to a 2 million-pixel camera | | 1600(H)×1200(V) | | | | | | | |
| | When connected to a 5 million-pixel camera | | 2448(H)×2044(V) | | | | | | | |
| No. of scenes | | | 32 | | | | | | | |
| Number of logged images (See note 2.) | When connected to a 300,000-pixel camera | Connected to 1 camera | Color camera: 250, Monochrome Camera: 252 | | | | | | | |
| | | Connected to 2 cameras | Color camera: 125, Monochrome Camera: 126 | | | | | | | |
| | | Connected to 3 cameras | Color camera: 83, Monochrome Camera: 84 | | | | | | | |
| | | Connected to 4 cameras | Color camera: 62, Monochrome Camera: 63 | | | | | | | |
| | When connected to a 2 million-pixel camera | Connected to 1 camera | Color camera: 40, Monochrome Camera: 40 | | | | | | | |
| | | Connected to 2 cameras | Color camera: 20, Monochrome Camera: 20 | | | | | | | |
| | | Connected to 3 cameras | Color camera: 13, Monochrome Camera: 13 | | | | | | | |
| | | Connected to 4 cameras | Color camera: 10, Monochrome Camera: 10 | | | | | | | |
| | When connected to a 5 million-pixel camera | Connected to 1 camera | Color camera: 11, Monochrome Camera: 11 | | | | | | | |
| | | Connected to 2 cameras | Color camera: 5, Monochrome Camera: 5 | | | | | | | |
| Codes that can be read with FZ3 | | | < Bar Codes > JAN/EAN/UPC (including add-on codes), Code 39, Codabar (NW-7), ITF (Interleaved 2 of 5), Code 93, Code 128, GS1-128, GS1 DataBar (RSS-14 / RSS Limited / RSS Expanded) < 2D Codes > Data Matrix (ECC200), QR Code | | | | | | | |
| 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:1CH | | | | | | | |
| Network communications | | | Ethernet 100BASE-TX/10BASE-T | | | | | | | |
| Parallel I/O | | | 11 inputs (RESET, STEP, DSA, and DI 0 to 7), 26 outputs (RUN, BUSY, GATE, OR, READY, ERROR, STGOUT 0 to 3, and DO 0 to 15) | | | | | | | |
| Monitor interface | | | Integrated Controller and LCD 12.1 inch TFT color LCD (Resolution: XGA 1,024 × 768 dots) | | | | Analog RGB video output, 1 channel (Resolution: XGA 1,024 × 768 dots) | | | |
| USB interface | | | 4 channels (supports USB 1.1 and 2.0) | | | | | | | |
| Power supply voltage | | | 20.4 to 26.4 VDC | | | | | | | |
| Current consumption (See note 4.) | When connected to a intelligent or autofocus camera | | 5 A max. | 7.5 A max. | 5 A max. | 7.5 A max. | 5 A max. | 7.5 A max. | 5 A max. | 7.5 A max. |
| | When connected to a 300,000-pixel camera | | 3.7 A max. | 4.9 A max. | 3.7 A max. | 4.9 A max. | 3.7 A max. | 4.9 A max. | 3.7 A max. | 4.9 A max. |
| | When connected to a 2 million-pixel camera | | | | | | | | | |
| | When connected to a 5 million-pixel camera | | | | | | | | | |
| Ambient temperature range | | | Operating: 0 to 45°C, 0 to 50°C (See note 3.), 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. 3.2 kg | Approx. 3.4 kg | Approx. 1.8 kg | Approx. 1.9 kg | Approx. 1.8 kg | Approx. 1.9 kg |
| Accessories | | | Touch pen (one, inside the front panel), Please Read First, Instruction Manual (Setup), 6 mounting brackets | | | | Please Read First, Instruction Manual (Setup) | | | |

Note 1: When connecting 5 million-pixel cameras, up to two cameras can be connected. 2: The number of logged images will vary when connecting multiple Cameras with different models.
3: The operating mode can be switched from the Controller Menu settings. 4: When the strobe controller is connected to the lights, the controller uses power as much as it does when connected to the intelligent camera.
5: Do not install the firmware for FZ2 in any High Grade High Speed or High Grade controller of the FZ3 series. It will lead to the failure of the controller. For software download, please contact your Omron representative.

### High-grade Controllers and Standard Controllers

| Model | | NPN Output | FZ3-300 | FZ3-300-10 | FZ3-H300 | FZ3-H300-10 | FZ3-350 | FZ3-350-10 | FZ3-H350 | FZ3-H350-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PNP Output | FZ3-305 | FZ3-305-10 | FZ3-H305 | FZ3-H305-10 | FZ3-355 | FZ3-355-10 | FZ3-H355 | FZ3-H355-10 |
| Connected Camera | | | Please refer to the "Camera Connection" table in Page 26. | | | | | | | |
| No. of Cameras | | | 2 | 4 | 2 | 4 | 2 | 4 | 2 | 4 |
| Processing resolution | | | 640(H)×480(V) | | | | | | | |
| No. of scenes | | | 32 | | | | | | | |
| Number of logged images (See note 1.) | When connected to a 300,000-pixel camera | Connected to 1 camera | Color camera: 250, Monochrome Camera: 252 | | | | | | | |
| | | Connected to 2 cameras | Color camera: 125, Monochrome Camera: 126 | | | | | | | |
| | | Connected to 3 cameras | Color camera: 83, Monochrome Camera: 84 | | | | | | | |
| | | Connected to 4 cameras | Color camera: 62, Monochrome Camera: 63 | | | | | | | |
| 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:1CH | | | | | | | |
| Network communications | | | Ethernet 100BASE-TX/10BASE-T | | | | | | | |
| Parallel I/O | | | 11 inputs (RESET, STEP, DSA, and DI 0 to 7), 26 outputs (RUN, BUSY, GATE, OR, READY, ERROR, STGOUT 0 to 3, and DO 0 to 15) | | | | | | | |
| Monitor interface | | | Integrated Controller and LCD 12.1 inch TFT color LCD (Resolution: XGA 1,024 × 768 dots) | | | | Analog RGB video output, 1 channel (Resolution: XGA 1,024 × 768 dots) | | | |
| USB interface | | | 4 channels (supports USB 1.1 and 2.0) | | | | | | | |
| Power supply voltage | | | 20.4 to 26.4 VDC | | | | | | | |
| Current consumption (See note 3.) | When connected to a intelligent or autofocus camera | | 5 A max. | 7.5 A max. | 5 A max. | 7.5 A max. | 5 A max. | 7.5 A max. | 5 A max. | 7.5 A max. |
| | When connected to a 300,000-pixel camera | | 3.7 A max. | 4.9 A max. | 3.7 A max. | 4.9 A max. | 3.7 A max. | 4.9 A max. | 3.7 A max. | 4.9 A max. |
| Ambient temperature range | | | Operating: 0 to 45°C, 0 to 50°C (See note 2.), 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. 3.2 kg | Approx. 3.4 kg | Approx. 1.8 kg | Approx. 1.9 kg | Approx. 1.8 kg | Approx. 1.9 kg |
| Accessories | | | Touch pen (one, inside the front panel), Please Read First, Instruction Manual (Setup), 6 mounting brackets | | | | Please Read First, Instruction Manual (Setup) | | | |

Note 1: The number of logged images will vary when connecting multiple Cameras with different models. 2: The operating mode can be switched from the Controller Menu settings.
3: When the strobe controller is connected to the lights, the controller uses power as much as it does when connected to the intelligent camera.

## Ratings and Specifications(Cameras)

### Intelligent cameras, autofocus cameras

| | FZ-SLC100 | FZ-SLC15 | FZ-SZC100 | FZ-SZC15 |
|---|---|---|---|---|
| Image elements | Interline transfer reading all pixels, 1/3-inch CCD image elements | | | |
| Color/Monochrome | Color | | | |
| Effective pixels | 640(H)×480(V) | | | |
| Pixel size | 7.4(μm)×7.4(μm) | | | |
| Shutter function | Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s | | | |
| Partial function | 12 to 480 lines | | | |
| Frame rate (image read time) | 80fps(12.5ms) | | | |
| Field of vision (See note 2.) | 13 to 100mm (See note1.) | 2.9 to 14.9mm (See note1.) | 13 to 100mm (See note1.) | 2.9 to 14.9mm (See note1.) |
| Installation distance | 70 to 190mm (See note1.) | 35 to 55mm (See note1.) | 77.5 to 197.5mm (See note1.) | 47.5 to 67.5mm |
| LED class (See note 3.) (lighting) | Class 2 | | — | |
| Ambient temperature range | Operating: 0 to 50°C<br>Storage: –25 to 65°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. 500 g | |
| Accessories | Instruction Sheet and hexagonal wrench | | | |

Note 1: Tolerance: ±5% max. 2: The length of the visual field is the lengths along the Y axis. 3: Applicable standards: IEC 60825-1: 1993 + A1: 1997 + A2-2001, EN 60825-1: 1994 + A1: 2002 + A2: 2001

### Digital cameras

| | FZ-S | FZ-SC | FZ-S2M | FZ-SC2M | FZ-S5M | FZ-SC5M |
|---|---|---|---|---|---|---|
| Image elements | Interline transfer reading all pixels, 1/3-inch CCD image elements | | Interline transfer reading all pixels, 1/1.8-inch CCD image elements | | Interline transfer reading all pixels, 2/3-inch CCD image elements | |
| Color/Monochrome | Monochrome | Color | Monochrome | Color | Monochrome | Color |
| Effective pixels | 640(H)×480(V) | | 1600(H)×1200(V) | | 2448(H)×2044(V) | |
| Pixel size | 7.4(μm)×7.4(μm) | | 4.4(μm)×4.4(μm) | | 3.45(μm)×3.45(μm) | |
| Shutter function | Electronic shutter;<br>select shutter speeds from 1/10 to 1/50,000 s | | Electronic shutter;<br>select shutter speeds from 1/10 to 1/50,000 s | | Electronic shutter;<br>select shutter speeds from 1/10 to 1/50,000 s | |
| Partial function | 12 to 480 lines | | 12 to 1200 lines | | 12 to 2044 lines | |
| Frame rate (image read time) | 80fps(12.5ms) | | 30fps(33.3ms) | | 16fps(62.5ms) | |
| Field of vision, installation distance | Selecting a lens according to the field of vision and installation distance | | | | | |
| Ambient temperature range | Operating: 0 to 50°C<br>Storage: –25 to 65°C (with no icing or condensation) | | Operating: 0 to 40°C<br>Storage: –25 to 65°C (with no icing or condensation) | | Operating: 0 to 40°C<br>Storage: –25 to 65°C (with no icing or condensation) | |
| Ambient humidity range | Operating and storage: 35% to 85% (with no condensation) | | | | | |
| Weight | Approx.55g | | Approx. 76g | | Approx.140g | |
| Accessories | Instruction manual | | | | | |

### Small digital cameras

| | FZ-SF | FZ-SFC | FZ-SP | FZ-SPC |
|---|---|---|---|---|
| Image elements | Interline transfer reading all pixels, 1/3-inch CCD image elements | | | |
| Color/Monochrome | Monochrome | Color | Monochrome | Color |
| Effective pixels | 640(H)×480(V) | | | |
| Pixel size | 7.4(μm)×7.4(μm) | | | |
| Shutter function | Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s | | | |
| Partial function | 12 to 480 lines | | | |
| Frame rate (image read time) | 80fps(12.5ms) | | | |
| Field of vision, installation distance | Selecting a lens according to the field of vision and installation distance | | | |
| Ambient temperature range | Operating: 0 to 50°C (camera amp)<br>0 to 45°C (camera head)<br>Storage: –25 to 65°C (with no icing or condensation) | | Operating: 0 to 50°C (camera amp)<br>0 to 45°C (camera head)<br>Storage: –25 to 65°C (with no icing or condensation) | |
| Ambient humidity range | Operating and storage: 35% to 85% (with no condensation) | | Operating and storage: 35% to 85% (with no condensation) | |
| Weight | Approx.150g | | Approx.150g | |
| Accessories | Instruction manual, installation bracket, Four mounting brackets(M2) | | Instruction manual | |

# Ratings and Specifications(LCD Monitor,Cable)

### 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 VDC |
| Current consumption | Approx. 0.7 A max. |
| Ambient temperature range | Operating: 0 to 50°C Storage: –25 to 65°C (with no icing or condensation) |
| Ambient humidity range | Operating and storage: 35 to 85% (with no condensation) |
| Weight | Approx. 1.2 kg |
| Accessories | Instruction Sheet and 4 mounting brackets |

### Camera Cables

| | FZ-VS (2m) | FZ-VSB(2m) | FZ-VSL(2m) |
|---|---|---|---|
| Shock resistiveness (durability) | 10 to 150Hz single amplitude 0.15mm 3 directions, 8 strokes, 4 times | | |
| Ambient temperature range | Operation and storage: 0 to +65°C (with no icing or condensation) | | |
| Ambient humidity range | Operation and storage: 40 to 70%RH (with no condensation) | | |
| Ambient atmosphere | No corrosive gases | | |
| Material | Cable sheath, connector: PVC | | |
| Minimum bending radius | 69mm | 81mm | 69mm |
| Weight | approx.170g | approx.220g | approx.170g |

### Monitor Cable

| | FZ-VM |
|---|---|
| Vibration resistiveness | 10 to 150Hz single amplitude 0.15mm 3 directions, 8 strokes, 4 times |
| Ambient temperature range | Operation: 0 to +50°C; Storage: –20 to +65°C (with no icing or condensation) |
| Ambient humidity range | Operation and storage: 35 to 85%RH (with no condensation) |
| Ambient atmosphere | No corrosive gases |
| Material | Cable sheath: heat-resistant PVC Connector: PVC |
| Minimum bending radius | 75mm |
| Weight | approx.170g |

### Halation cut illumination

General specifications

| | FZ-SXC RB7018BR-4S | FZ-LTC RB7018BR-4S | FZ-LT RB7018BR-4S |
|---|---|---|---|
| Current consumption | 18 W or less (12 VDC, 1.5 A max.) (including camera and strobe controller) | | |
| Vibration resistance | 10 to 150Hz single amplitude 0.35mm (maximum acceleration 50m/s$^2$) 3 directions, 8 strokes, 10 times | | |
| Impact resistance | 150m/s$^2$ 6 directions, 3 times | | |
| Ambient temperature | Operating: 0 to 50°C Storage: -25 to 60°C (with no icing or condensation) | | |
| Ambient humidity | Operation and storage: 35 to 85%RH (with no condensation) | | |
| Ambient atmosphere | No corrosive gases | | |
| Protective structure | IEC60259 IP20 | | |
| Material | Case: zinc-coated steel plate Cover: acrylic board Clasp: stainless steel plate | | |
| Weight including cables | Approx. 600 g | Approx. 500 g | Approx. 400 g |

### Cable Extension Unit

| | FZ-VSJ |
|---|---|
| Power supply voltage (See note 1.) | 11.5 to 13.5 VDC |
| Current consumption (See note 2.) | 1.5 A max. |
| Ambient temperature range | Operating: 0 to 50°C Storage: –25 to 65°C (with no icing or condensation) |
| Ambient humidity range | Operating and storage: 35 to 85% (with no condensation) |
| Maximum Units connectable | 2 Units per Camera |
| Weight | Approx. 240 g |
| Accessories | Instruction Sheet and 4 mounting screws |

Note 1: A power supply must be connected to the Strobe Controller and Camera when connecting a FZ-SLC100/SLC15/SZC100/SZC15 and using a Strobe Controller (3Z4S-LT MLEK-C100E1TS2.)
2: The current consumption is when every Camera and Strobe Controller is connected to a power supply.

### Long-distance Camera Cables

| | FZ-VS2 (15m) | FZ-VSL2(15m) |
|---|---|---|
| Shock resistiveness (durability) | 10 to 150Hz single amplitude 0.15mm 3 directions, 8 strokes, 4 times | |
| Ambient temperature range | Operation and storage: 0 to +65°C (with no icing or condensation) | |
| Ambient humidity range | Operation and storage: 40 to 70%RH (with no condensation) | |
| Ambient atmosphere | No corrosive gases | |
| Material | Cable sheath, connector: PVC | |
| Minimum bending radius | 93mm | |
| Weight | approx.1600g | |

### Parallel Cable

| | FZ-VP |
|---|---|
| Vibration resistiveness | 10 to 150Hz single amplitude 0.15mm 3 directions, 8 strokes, 4 times |
| Ambient temperature range | Operation: 0 to +50°C; Storage: –20 to +65°C (with no icing or condensation) |
| Ambient humidity range | Operation and storage: 35 to 85%RH (with no condensation) |
| Ambient atmosphere | No corrosive gases |
| Material | Cable sheath: heat-resistant PVC Connector: resin |
| Minimum bending radius | 75mm |
| Weight | approx.160g |

Illumination specifications

| | Specifications |
|---|---|
| Source | Blue LED (wavelength: Approx. 470nm) Red LED (wavelength: 630nma) |
| Illumination system | 8 blocks luminous intensity variable illumination |
| Average lifetime | 5,000 hours (Time it takes from manufacture for a 50% reduction in luminous intensity at an ambient temperature of 25°C, maximum brightness, and continuous illumination.) |

# Connection Table

### Camera Connection Table

| Type of camera | Model | Resolution | Standard Controllers (FZ3-3□□, FZ3-3□□-10) | High-grade Controllers (FZ3-H3□□, FZ3-H3□□-10) | High-speed Controllers (FZ3-7□□, FZ3-7□□-10) | High-grade, High-speed Controllers (FZ3-H7□□, FZ3-H7□□-10) | Dual-task, High-speed Controllers (FZ3-H9□□, FZ3-H9□□-10) | Dual-task, High-grade, High-speed Controllers (FZ3-H9□□, FZ3-H9□□-10) |
|---|---|---|---|---|---|---|---|---|
| Intelligent cameras | FZ-SLC100 | 300,000 Pixels | ○ | ○ | ○ | ○ | ○ | ○ |
| | FZ-SLC15 | 300,000 Pixels | ○ | ○ | ○ | ○ | ○ | ○ |
| Autofocus cameras | FZ-SZC100 | 300,000 Pixels | ○ | ○ | ○ | ○ | ○ | ○ |
| | FZ-SZC15 | 300,000 Pixels | ○ | ○ | ○ | ○ | ○ | ○ |
| Digital cameras | FZ-SC | 300,000 Pixels | ○ | ○ | ○ | ○ | ○ | ○ |
| | FZ-S | 300,000 Pixels | ○ | ○ | ○ | ○ | ○ | ○ |
| | FZ-SC2M | 2 million pixels | × | × | ○ | ○ | ○ | ○ |
| | FZ-S2M | 2 million pixels | × | × | ○ | ○ | ○ | ○ |
| | FZ-SC5M | 5 million pixels | × | × | ○ (See note1.) | ○ (See note1.) | ○ | ○ |
| | FZ-S5M | 5 million pixels | × | × | ○ (See note1.) | ○ (See note1.) | ○ | ○ |
| Small digital cameras | FZ-SFC | 300,000 Pixels | ○ | ○ | ○ | ○ | ○ | ○ |
| | FZ-SF | 300,000 Pixels | ○ | ○ | ○ | ○ | ○ | ○ |
| | FZ-SPC | 300,000 Pixels | ○ | ○ | ○ | ○ | ○ | ○ |
| | FZ-SP | 300,000 Pixels | ○ | ○ | ○ | ○ | ○ | ○ |

Note 1: When connecting 5 million-pixel cameras, up to two cameras can be connected.

### Cameras / Cables Connection Table

| Type of camera | Model | Cable length | Intelligent cameras Autofocus cameras | Digital cameras | | | Small digital cameras |
|---|---|---|---|---|---|---|---|
| | | | | 300,000-pixel | 2 million-pixel | 5 million-pixel | Pen type / flat type |
| Camera Cables Right-angle camera cables | FZ-VS FZ-VSL | 2m | ○ | ○ | ○ | ○ | ○ |
| | | 5m | ○ | ○ | ○ | ○ | ○ |
| | | 10m | × | ○ | ○ | × | ○ |
| Bend resistant camera cables | FZ-VSB | 2m | ○ | ○ | ○ | ○ | ○ |
| | | 5m | ○ | ○ | ○ | ○ | ○ |
| | | 10m | × | ○ | × | × | ○ |
| Long-distance camera cable Long-distance right-angle camera cable | FZ-VS2 FZ-VSL2 | 15m | × | ○ | ○ | × | ○ |

# Processing Items

| Group | Icon | Processing Item | | Corresponding Page in the Catalog |
|---|---|---|---|---|
| Inspections / Measurement |  | Search | Used to identify the shapes and calculate the position of measurement objects. | |
| |  | Flexible Search | Recognizing the shapes of workpieces with variation and detecting their positions. | P16 |
| |  | Sensitive Search | Search a small difference by dividing the search model in detail, and calculating the correlation. | P16 |
| |  | ECM Search | Used to search the similar part of model form input image.Detect the evaluation value and position. | |
| |  | Ec Circle Search | Extract circles using "round " shape information and get position, radius and quantity in high preciseness. | P16 |
| |  | Shape Search+ | Used to Search the similar part of models from input image.Defect the evaluation value and position. | P16 |
| |  | Classification | Used when various kinds of products on the assembly line need to be sorted and identified. | |
| |  | Edge Position | Measure position of measurement objects according to the color change in measurement area. | |
| |  | Edge Pitch | Detect edges by color change in measurement area. Used for calculating number of pins of IC and connectors. | |
| |  | Scan Edge Position | Measure peak/bottom edge position of workpieces according to the color change in separated measurement area. | P16 |
| |  | Scan Edge Width | Measure max/min/average width of workpieces according to the color change in separated measurement area. | P16 |
| |  | Color Data | Used for detecting presence and mixed varieties of products by using color average and deviation. | |
| |  | Gravity and Area | Used to measure area, center of gravity of workpices by extracting the color to be measured. | |
| |  | Labeling | Used to measure number, area and gravity of workpieces by extracting registered color. | |
| |  | Label Data | Selecting one region of extracted Labeling, and get that measurement. Area and Gravity position can be got and judged. | |
| |  | Labeling+ | Extract objects of registered color, and measure many features such as number and circularity. | P14 |
| |  | Defect | Used for appearance measurement of plain-color measurement objects such as defects, stains and burrs. | P15 |
| |  | PreciseDefect | Check the defect on the object. Parameters for extraction defect can be set precisely. | P15 |
| |  | Fine Matching | Difference can be detected by overlapping and comparing(matching) registered fine images with input images. | P15 |
| |  | Character Inspection | Recognize character according correlation search with model image registered in [Model Dictionary]. | P17 |
| |  | Date Verification | Reading character string is verified with internal date. | P17 |
| |  | Model Dictionary | Register character pattern as dictionary. The pattern is used in [Character Inspection]. | P17 |
| |  | Barcode+ | Recognize barcode, verify and output decoded characters. | P17 |
| |  | 2DCode+ | Recognize 2D code, verify and output decoded characters. | P17 |
| |  | Circle Angle | Used for calculating angle of inclination of circular measurement objects. | |
| Image Capturing |  | Camera Image Input | To input images from cameras. And set up the conditions to input images from cameras. | |
| |  | Camera Image Input HDR+ | Create high-dynamic range images by acquiring several images with different conditions. | P8 |
| |  | Camera Switching | To switch the cameras used for measurement. Not input images from cameras again. | |
| |  | Measurement Image Switching | To switch the images used for measurement. Not input images from camera again. | |
| Correcting images |  | Position Compensation | Used when positions are differed. Correct measurement is performed by correcting position of input images. | |
| |  | Trapezoidal Correction+ | Rectify the trapezoidal deformed image. | P12 |
| |  | Filtering | Used for processing images input from cameras in order to make them easier to be measured. | |

| Group | Icon | Processing Item | | Corresponding Page in the Catalog |
|---|---|---|---|---|
| Correcting images |  | Backgrond Suppression | To enhance contrast of images by extracting color in specified brightness. | P14 |
| |  | Color Gray Filter | Color image is converted into monochrome images to emphasize specific color. | |
| |  | Extract Color Filter | Convert color image to color extracted image or binary image. | P14 |
| |  | Anti Color Shading | To remove the irregular color/pattern by uniformizing max.2 specified colors. | P14 |
| |  | Stripes Removal Filter+ | Remove the background pattern of stripes. | P13 |
| |  | Halation Cut+ | Remove halation from input image. | P13 |
| |  | Panorama+ | Combine multiple image to create one big image. | P12 |
| |  | Polar Transformation | Rectify the image by polar transformation. Useful for OCR or pattern inspection printed on circle. | P14 |
| Assisting inspections / measurement |  | Calculation | Used when using the judge results and measured values of ProcItem which are registered in processing units. | |
| |  | Line Regression | Used for calculating regression line from plural measurement coodinate. | P17 |
| |  | Circle Regression | Used for calculating regression circle from plural measurement coordinate. | P17 |
| |  | Calibration+ | Transform (X,Y) position to the real coodinate system. | P17 |
| |  | Set Unit Data | Used to change the ProcItem data (setting parameters,etc.) that has been set up in a scene. | |
| |  | Get Unit Data | Used to get one data (measured results, setting parameters,etc.) of ProcItem that has been set up in a scene. | |
| |  | Set Unit Figure | Used for re-setting the figure data (model, measurement area ) registered in an unit. | |
| |  | Get Unit Figure | Used for get the figure data (model, measurement area ) registered in an unit. | |
| |  | Trend Monitor | Used for displaying the information about results on the monitor, facilitating to avoid NG and analyze causes. | |
| |  | Image Logging | Used for saving the measurement images to the memory and USB memory. | |
| |  | Data Logging | Used for saving the measurement data to the memory and USB memory. | |
| |  | Elapsed Time | Used for calculating the elapsed time since the measurement trigger input. | |
| |  | Wait | Processing is stopped only at the set time. The standby time is set by the unit of [ms]. | |
| |  | Focus | Focus setting is supported. | P19 |
| |  | Iris | Focus and aperture setting is supported. | P19 |
| Branching processing |  | Conditional Branch | Used where more than two kinds of products on the production line need to detected separately. | |
| |  | End | This ProcItem must be set up as the last processing unit of a branch. | |
| |  | DI Branch | Same as ProcItem "Branch". But you can change the targets of conditional branching via external inputs. | |
| Outputting results |  | Data Output | Used when you need to output data to the external devices such as PLC or PC via serial ports. | P19 |
| |  | Parallel Data Output | Used when you need to output data to the external devices such as PLC or PC via parallel ports. | |
| |  | Parallel Judgement Output | Used when you need to output judgement results to the external devices such as PLC or PC via parallel ports. | |
| Displaying results on the monitor |  | Result Display | Used for displaying the texts or the figures in the camera image . | |
| |  | Display Image File | Display selected image file. | |
| |  | Display Last NG Image | Display the last NG images. | P19 |

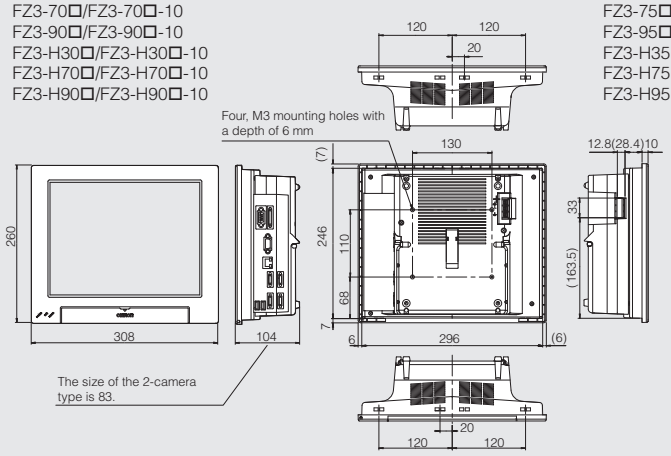
*The items in red are High Grade processing items.

# External Dimensions(Unit:mm)

## FZ3-series Controllers

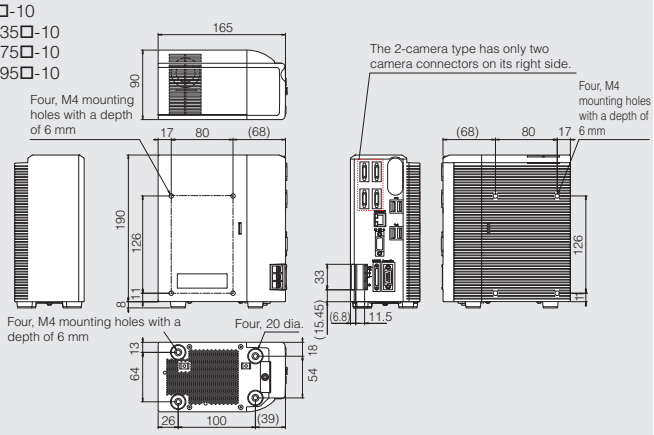
■LCD-integrated type

FZ3-30□/FZ3-30□-10
FZ3-70□/FZ3-70□-10
FZ3-90□/FZ3-90□-10
FZ3-H30□/FZ3-H30□-10
FZ3-H70□/FZ3-H70□-10
FZ3-H90□/FZ3-H90□-10




■Box-type

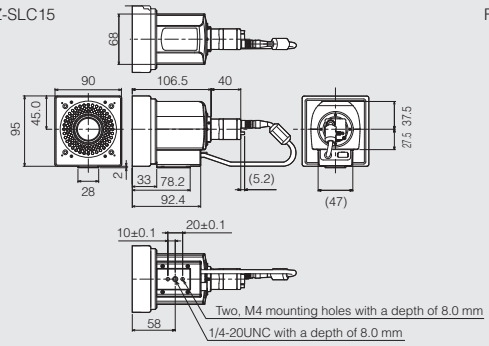
FZ3-35□/FZ3-35□-10
FZ3-75□/FZ3-75□-10
FZ3-95□/FZ3-95□-10
FZ3-H35□/FZ3-H35□-10
FZ3-H75□/FZ3-H75□-10
FZ3-H95□/FZ3-H95□-10



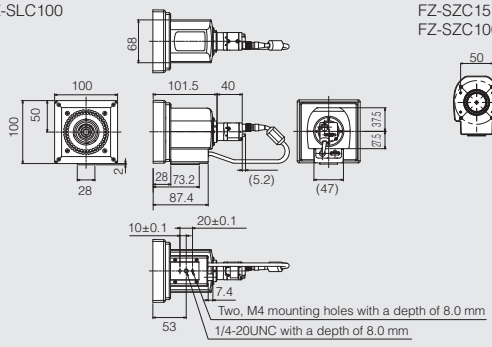

## Cameras

■ Intelligent camera

FZ-SLC15

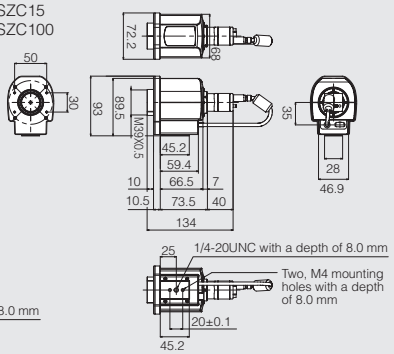



FZ-SLC100




■ Auto focus camera

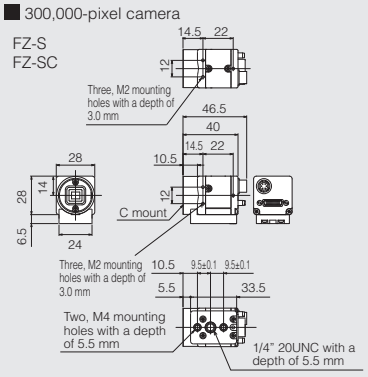
FZ-SZC15
FZ-SZC100




### Digital cameras

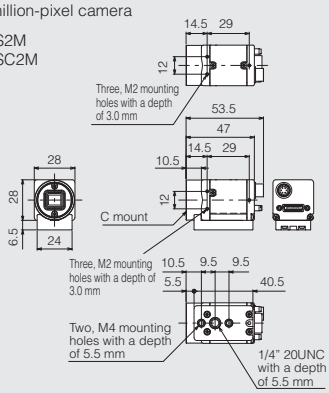
■ 300,000-pixel camera

FZ-S
FZ-SC



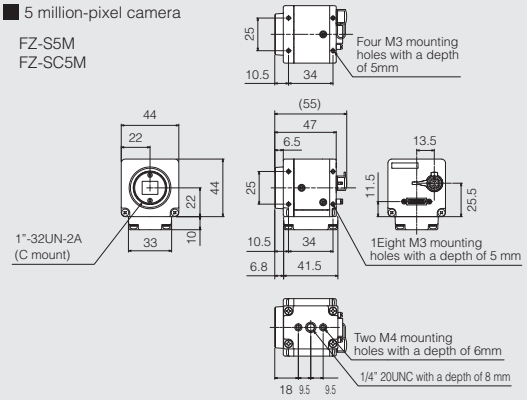

■ 2 million-pixel camera

FZ-S2M
FZ-SC2M




■ 5 million-pixel camera

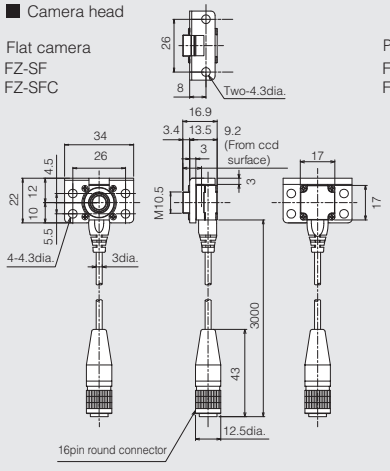
FZ-S5M
FZ-SC5M



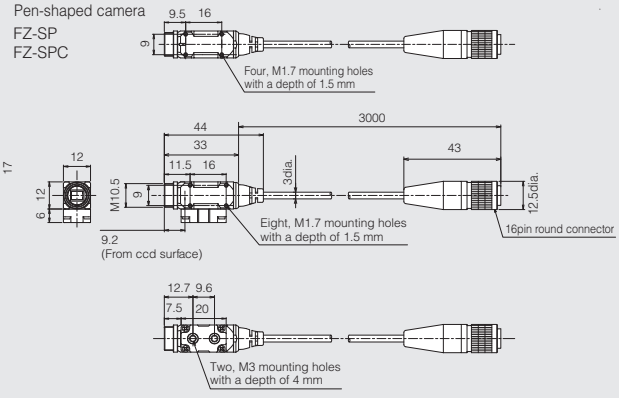

### Small digital cameras

■ Camera head

Flat camera
FZ-SF
FZ-SFC

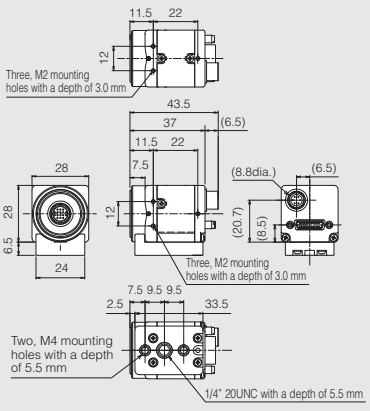



Pen-shaped camera
FZ-SP
FZ-SPC




■ Camera amplifier

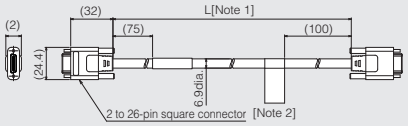
Can be used for both flat cameras and pen-shaped cameras



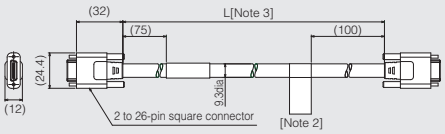
## Cable

### Camera Cable

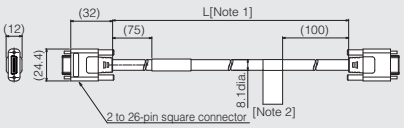
■ Camera Cable(Model FZ-VS)



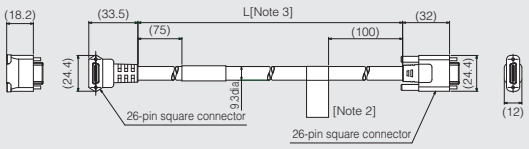

■ Long-distance Camera Cable(Model FZ-VS2)



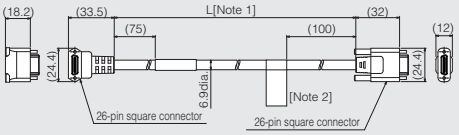

■ Bend resistant Cable(Model FZ-VSB)




■ Long-distance Right-angle Camera Cable(Model FZ-VSL2)

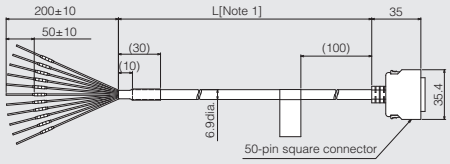



■ Right-angle Camera Cable(Model FZ-VSL)



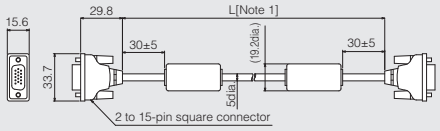

[Note1]:cable is available in 2m/5m/10m.
[Note2]:Each camera cables has polarity. Please ensure that the name plate side of the cable is connected to the controller.
[Note3]:cable is available in 15m.

### Parallel Cable(Model FZ-VP)




[Note1]:cable is available in 2m/5m.

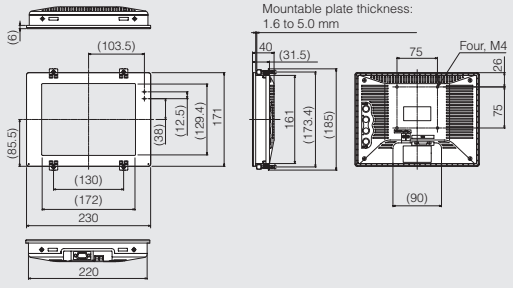
### Monitor Cable(Model FZ-VM)




[Note1]: cable is available in 2m/5m.

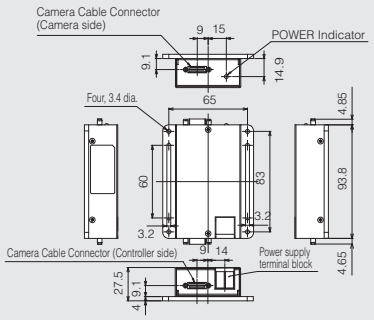
## LCD Monitor

FZ-M08



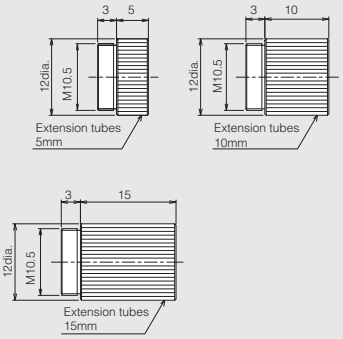

## Camera Cable Extension Unit

FZ-VSJ



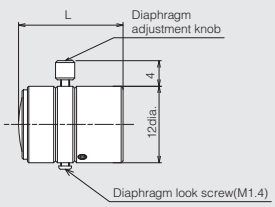

## Extension Tubes for small camera

FZ-LESR




## Lens for small camera

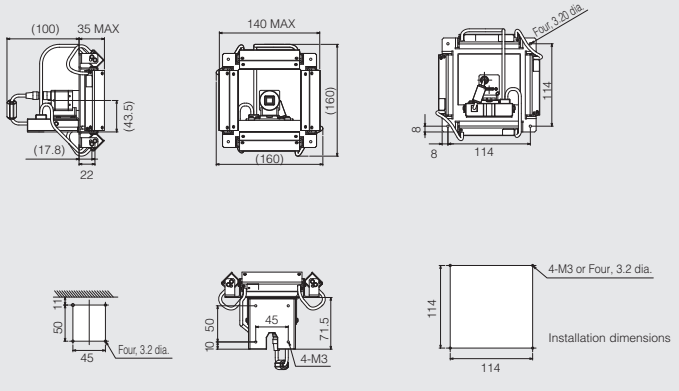
FZ-LES Series




| LensesModel | Focal length | Brightness | Maximum outside diameter | Overall length |
|---|---|---|---|---|
| FZ-LES3 | 3mm | F2.0 | 12 dia. | 16.4mm |
| FZ-LES6 | 6mm | F2.0 | 12 dia. | 19.7mm |
| FZ-LES16 | 16mm | F3.4 | 12 dia. | 23.1mm |
| FZ-LES30 | 30mm | F3.4 | 12 dia. | 25.5mm |

## Special Halation-cutoff Lamp

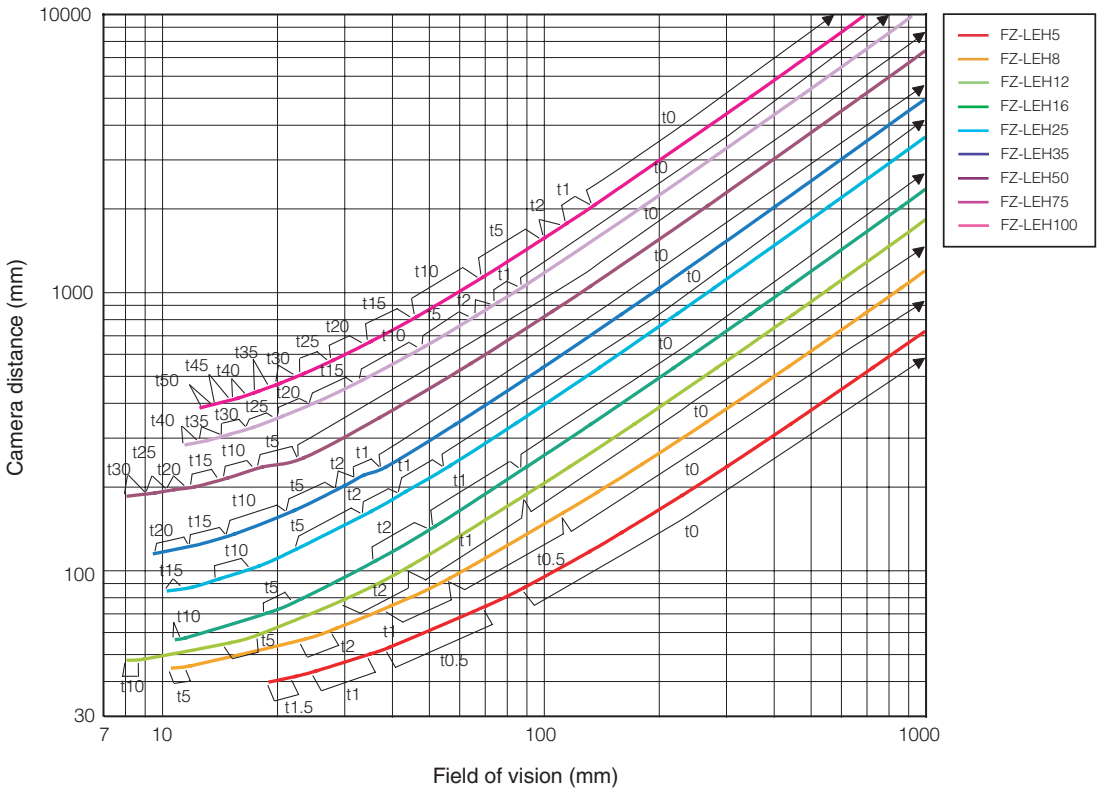
FZ-SXCRB7018BR-4S (camera-integrated type)




Installation dimensions

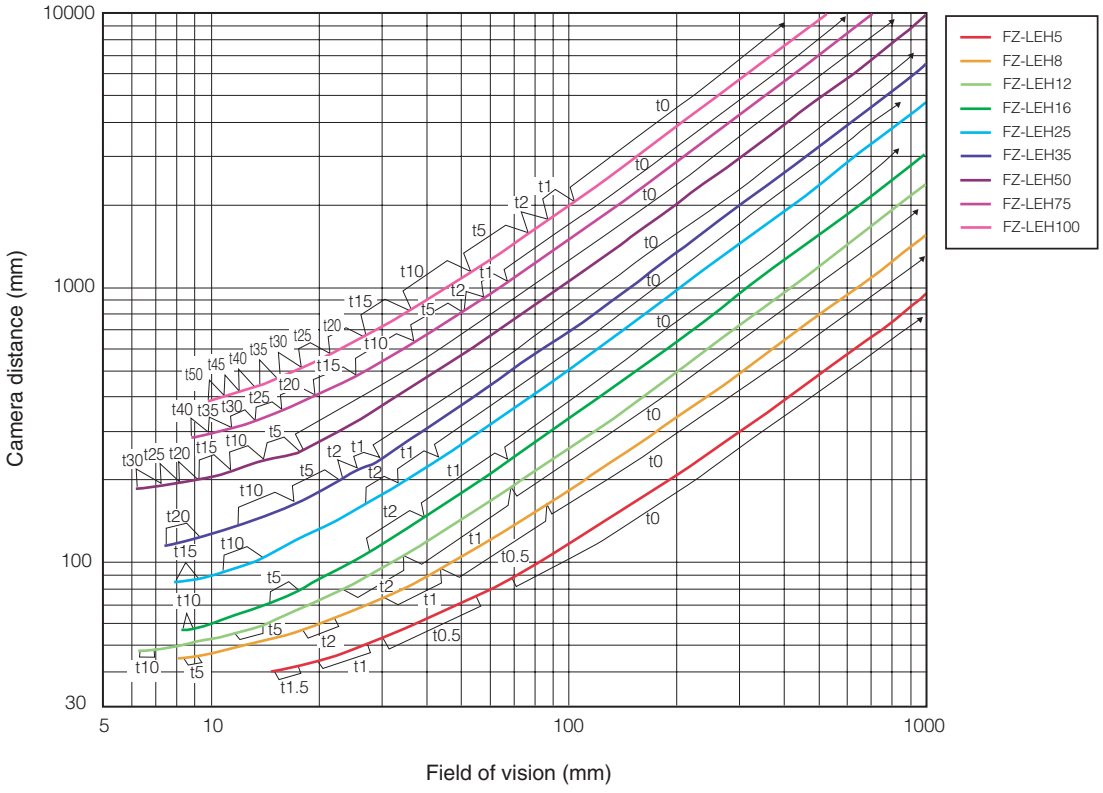
# Optical Chart

**5 million-pixel digital camera FZ-S□5M**



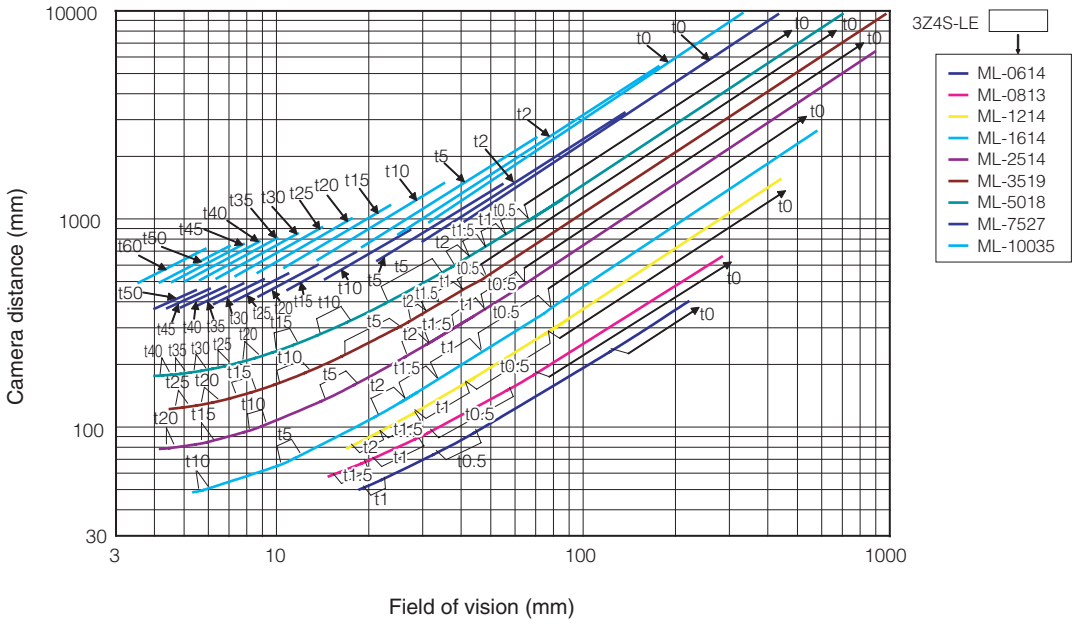

The 5-mm Extension Tubes (3Z4S-LE ML-EXR) cannot be used with FZ-LEH25 Lenses.

**2 million-pixel digital camera FZ-S□2M**

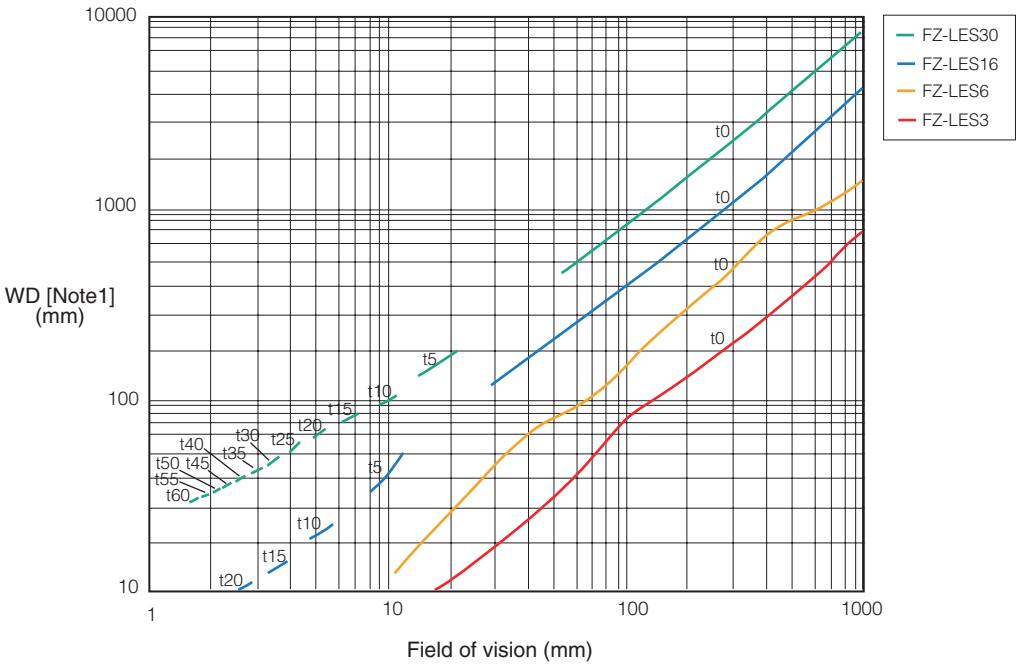



The 5-mm Extension Tubes (3Z4S-LE ML-EXR) cannot be used with FZ-LEH25 Lenses.

### 300,000-pixel digital camera FZ-S□



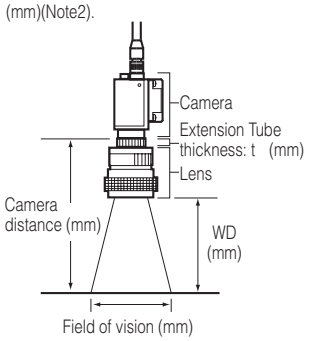

### 300,000-pixel small digital cameras FZ-SF□, FZ-SP□

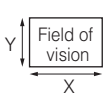



Note1: The vertical axis represents WD, not installation distance.

■ Meaning of Optical Chart

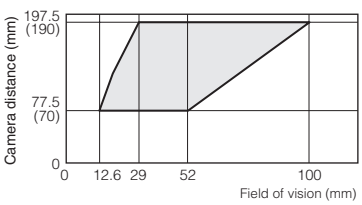
The X axis of the optical chart shows the field of vision (mm)(Note1), and the Y axis of the optical chart shows the camera installation distance (mm)(Note2).



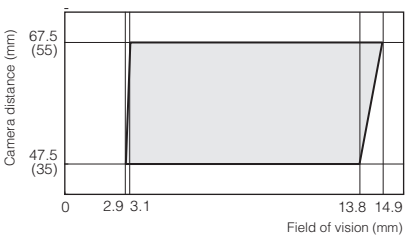

Note1:The lengths of the fields of vision given in the optical charts are the lengths of the Y axis.
2:The vertical axis represents WD for small cameras.

**Intelligent camera, autofocus camera with wide field of vision FZ-S□C100**




*The value in parentheses is for the camera installation distance when using an Intelligent Camera.

**with narrow field of vision FZ-S□C15**




*The value in parentheses is for the camera installation distance when using an Intelligent Camera.
*Be sure to check the Instruction Sheet packed with the product before using an Intelligent Camera or Autofocus Camera.

# Quantitatively Deriving Optimal Setting Conditions

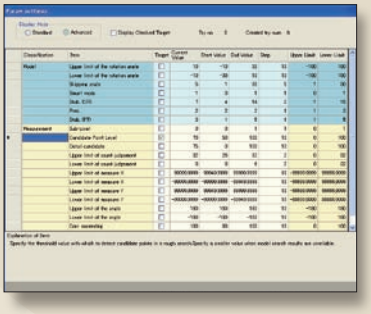
## Industry's First **VisionOptimizer** Software【Patent Pending】

This PC software works in conjunction with simulation software to derive optimal setting conditions.

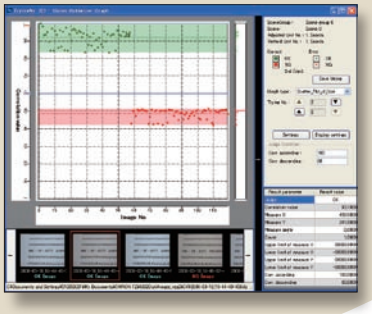
A large amount of image data is used to run inspections on a trial basis while changing the settings.

The results are statistically processed to let you select optimal parameters and conforming models quantitatively and with minimum man-hours.

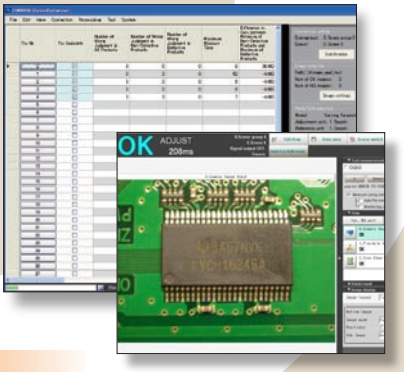
**1.** Automatic verification of saved images



**2.** Quantitative checking of results



**3.** Reflection of optimal setting conditions




**Improved inspection quality**

**Fewer setting man-hours**

**Quantifiable setting know-how**

This document provides information mainly for selecting suitable models. Please read the document User's Manual (Z285) carefully for information that the user must understand and accept before purchase, including information on warranty, limitations of liability, and precautions.

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