

# Vision Sensor FZ4 Series

Keep on Evolving to the top of Image Sensing



» Speed evolution by Quad Processing

» Shape Search II : Cutting edge algorithm for search evolution

# Keep on Evolving

Speed and accuracy determine the basic performance of sensing. Usability efficiently puts that performance to work. OMRON's FZ Series of Vision Sensors represent an evolutionary journey that takes these three aspects from the past and into the future to allow you to increase quality.





**FZ4**  
-1100

**Class No.1 speed**

- Quad Processing
- 2.4GHz

➤ P4



**Speed**

**Greatest Detection Class No.1 speed**

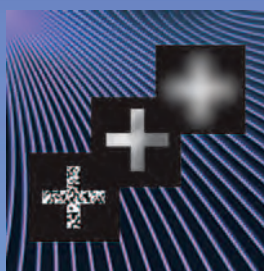
- Shape Search II

➤ P6

**Image Filters**

- Brightness Correct Filter
- Stripe Removal Filter II
- Precise Calibration

➤ P18



**Accuracy**

**Utility**

- Remote Operation
- User Data

➤ P11

➤ P13



**Usability**

Class No.1 speed

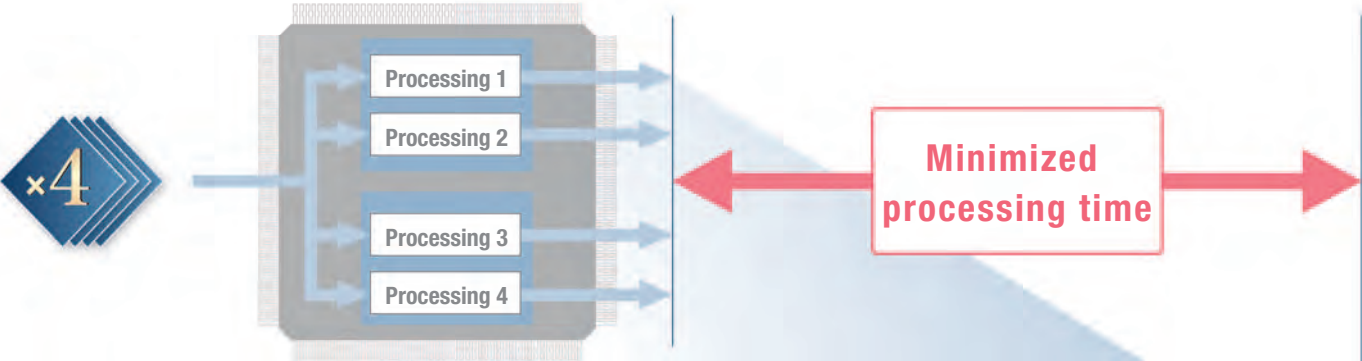
## Quad Processing

Single processing led to dual processing, and now the FZ4 takes evolution one step farther with quad processing featuring multi-core, multi-thread operation. Parallel execution of the process flow is automatically calculated to achieve optimum allocation of tasks according to the processor load to achieve the fastest processing in this class. The rapidly-evolving Intel® processors are used. Performance is maximized with a unique software structure that is matched to the processors.

## Four-track Parallel Processing

Software that has been designed specifically for quad processing automatically determines the faster processing scheme. Maximum speed has been achieved even for High-resolution Cameras and search processing, both of which place a high load on the system.

### Quad Processing

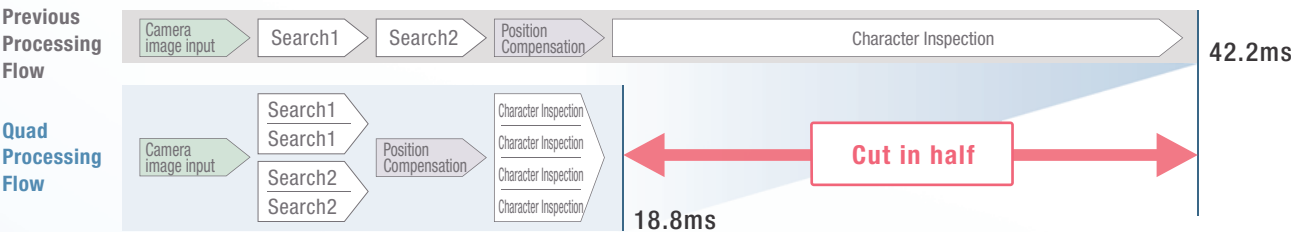


### Previous Single-task Processing



### Example of Faster Operation with Quad Processing

The optimum processing scheme to minimize the time from image input to results output is automatically determined to perform parallel processing.



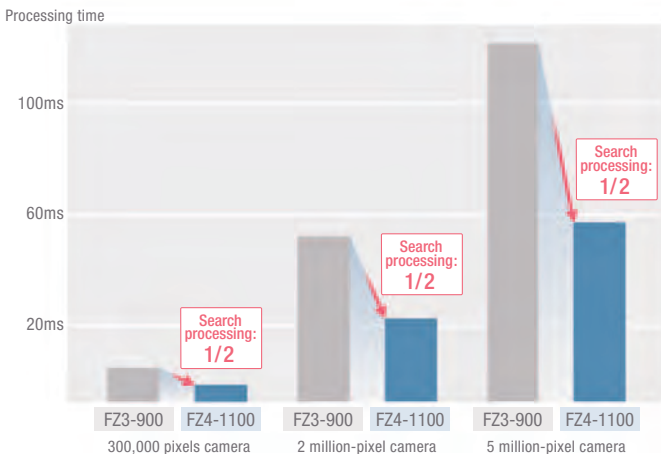


## High-speed Processing for High-resolution Images of 5 Million Pixels

### Twice the Processing Speed

Multi-core processing distributes processing to increase speed even for individual processes. The results are the most apparent for high-resolution images.

Search Speed Comparison



Note: Comparison of monochrome images.

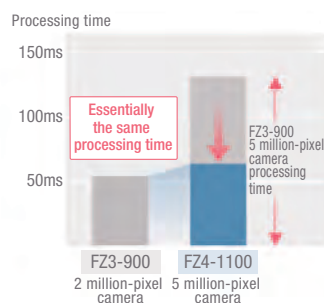
### Increase Quality without Increasing Takt Time

Even if the takt time takes priority, you can still process high-resolution and Real Color images with limited affect on the takt time. We can help you increase quality for both color and resolution.

Speed Comparison for Position Compensation and Defect Inspection

#### Resolution

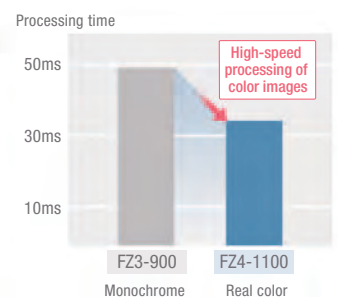
The FZ4-1100 and its quad processing can let you change from a 2-million to a 5-million-pixel Camera with essentially no increase in the processing time.



Note: Comparison of monochrome images.

#### Color Processing

The FZ4-1100 and its quad processing can handle real-color images in less time than previous Vision Sensors could handle monochrome images.



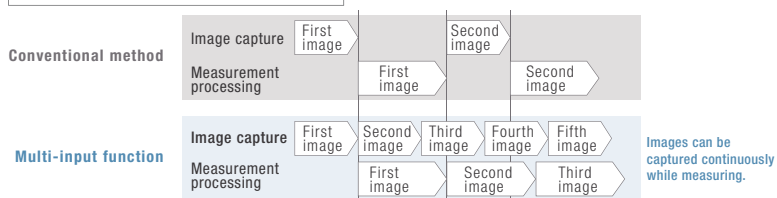
Note: Comparison for 2-million-pixel Cameras.

#### Multi-input Function

#### Faster processing by preceding image capture and inspection in parallel Up to 32 image capture\*

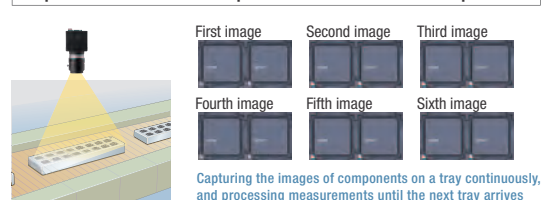
Each camera has its own image buffer for storing image data that is separate from the main memory used for measurement processing. This allows for up to 32 frames of continuous high-speed image capture even while the main memory is processing measurement data.

Difference from conventional method



\*The number of images that can be taken depends on the Controller and the Camera that is connected to it. Refer to the user's manual for details.

Inspection of characters printed on electronic components



Greatest Detection



Class No.1 Speed

## A Revolution in Searching Power. Shape Search II

The technology to find image patterns forms the basis of image sensing. The FZ4 features the Shape Search II, a new processing item that focuses on outline information. Even with overlapping images, tilting, or deformation, both the accuracy of recognizing image patterns and the speed of processing high-resolution images are ensured.

### Maximizing Detection Performance

#### Deformation and Tilting



The FZ4 handles image deformation caused by the location of the workpieces when the Camera is installed at an angle, and it handles workpiece inclination.



Shape Search II



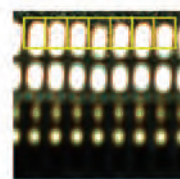
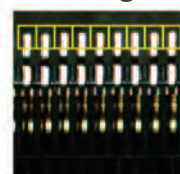
Previous Pattern Search

#### Contrast



Stable detection is possible even for variations in contrast caused by lighting or workpiece orientation.

#### Blurring



Robust processing handles image blurring caused by variations in workpiece height. Detection is possible for high-precision lenses even if a limited amount of blurring occurs.

#### Noise



#### Defects

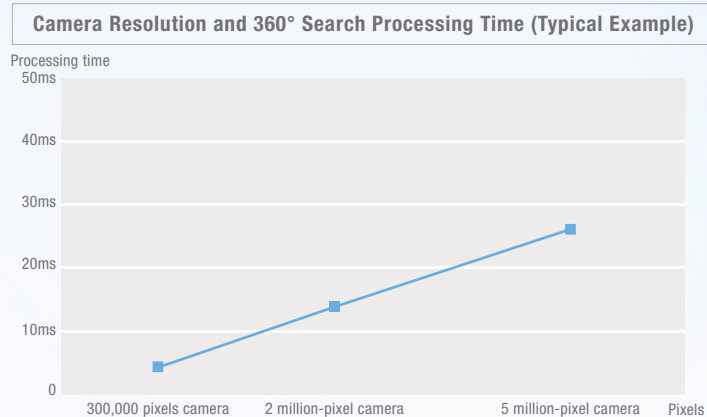


The center portion is traced even for incomplete marks that result from light reflections or noise caused by overlapping with the workpiece to simplify troublesome alignment mark detection.

## Maximizing Speed

### High-speed Processing at High Resolution Throughout 360° Rotation

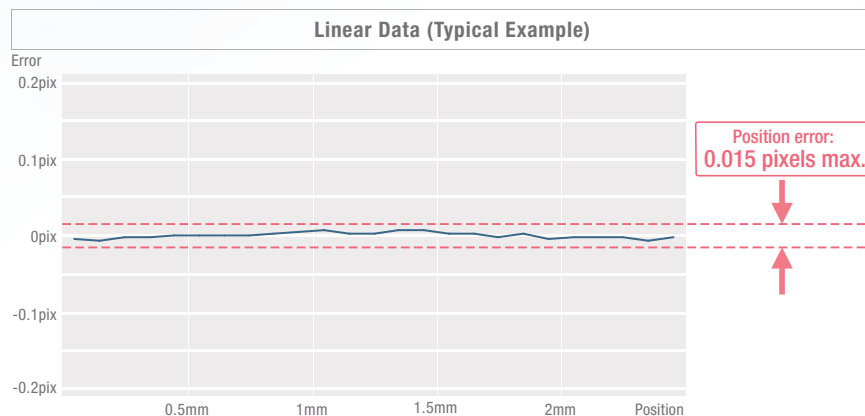
With previous searching, the processing time was greatly increased if the workpiece was rotated or if the image resolution increased. With Shape Search II, processing time is not greatly delayed throughout 360° rotation or if resolution is increases. Manufacturing takt time can be reduced and inspection items can be added to help increase quality.



## Maximizing Stability

### Industry-leading positional precision

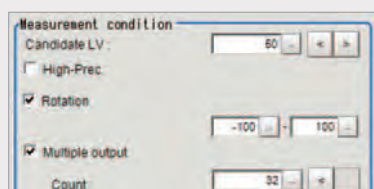
After finding the general position and orientation of the workpiece, position information on edge points enables finding the precise position and orientation. The edge point position information instead of image density information is used to detect positions more precisely than with normal searching methods.



## Optimizing Settings

Detection performance, speed, and stability mean that you do not need to adjust detailed parameter settings. You can quickly achieve the optimum settings and minimize setting errors caused by trying to increase performance or caused by worker differences.

Parameters can be quickly determined according to the application.

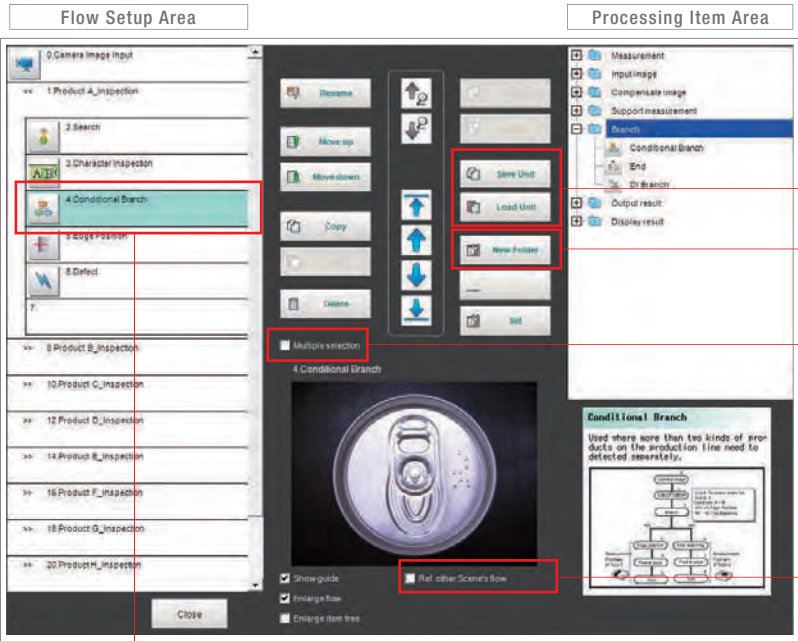


Set the parameters and register models to complete the setup.

# Easily Take Advantage of a Wide Range of Functions

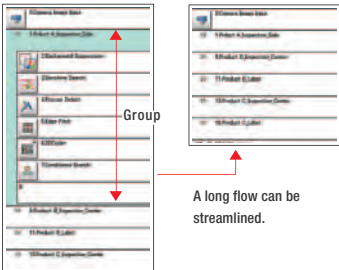
Program-free Design, Unique Menus for Easy Operation Onsite, and a Touch Panel.  
Even long, complex processing flows can be easily set up by essentially anyone with easy operating procedures.

## Program-free Flow Menus for Quick Processing Design



**Save and Load Processing Units**  
You can temporarily save data when studying parameters or load data from other scene groups for an even wider range of application.

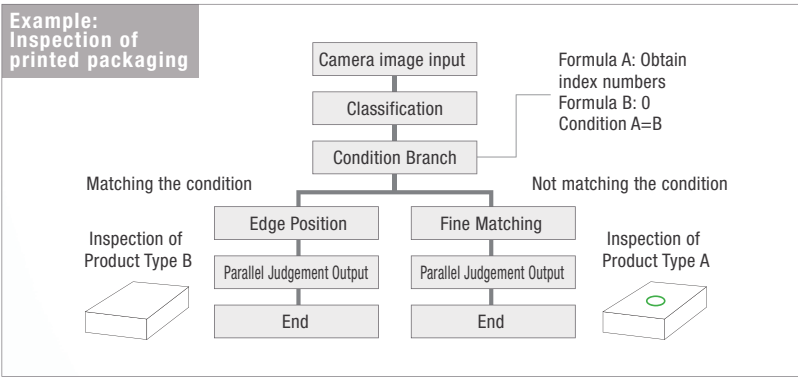
**Flow Group function**  
Processing items can be named and grouped. You can efficiently manage a long work flow by assigning a folder to each processing item.



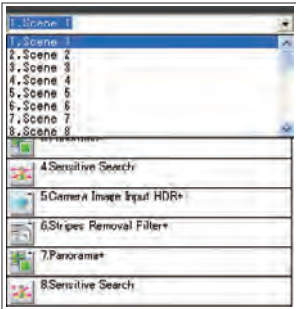
**Performing different processing items at a time**  
You can copy or delete two or more processing items at a time by just checking them on the screen.



**Conditional Branching / DI Branching**  
Flow menus can be changed later by branching and looping according to measurement results and input conditions. Flow menu designing at the programming level is possible through a simple process of specifying a processing item for Input Condition Branching.



**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.



### Intuitive Operation on a Touch Panel

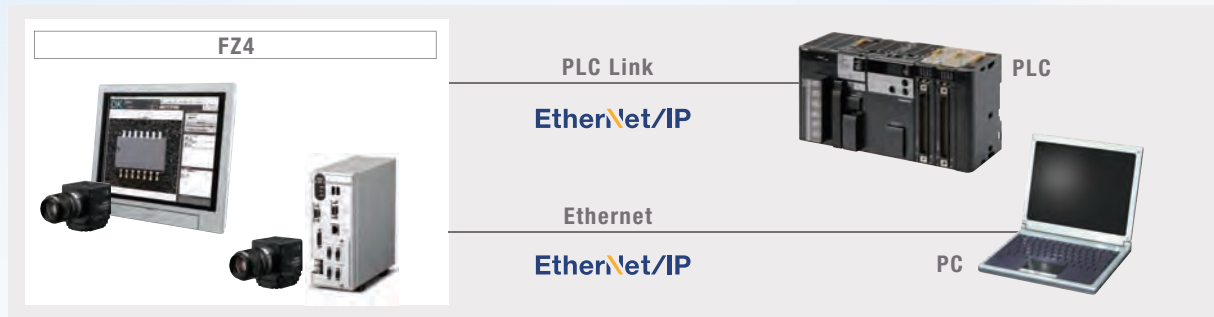
The recent popularity of tabloid HMI is indicative of the intuitive visualization of the direct on-screen operation of functions and inspection locations that helps to increase efficiency. The touch operation of FZ menus have been praised not only in design work, but in the procedures that are required for daily operation.



# Seamless Communications with Peripheral Devices

You can seamlessly link external devices, such as PLCs, computers, actuators, and much more.

High-speed communications with a host enables a wider range of operation and management.



## Easier Commissioning and Increased Range of Operation and Management

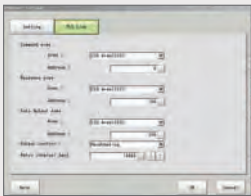
### PLC Link Function

#### Easy Creation of Ladder Programs

A PLC Link function is included to reduce the effort in ladder programming and raise the design efficiency for serial communications and standard Ethernet.

**Applicable PLCs**

- OMRON CS, CJ, CP, and NSJ Series
- Mitsubishi Electric Q Series



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

### Communications Monitoring and Checking

#### Smooth Commissioning and Troubleshooting of Communications

Convenient monitoring functions are provided that let you see if communications is established correctly and if wiring is correct. Confirmations when commissioning the system and analysis during communications troubleshooting go smoothly.

**I/O Monitor**

Display of signal output status

Virtual signal inputs

**Checking Serial Communications**

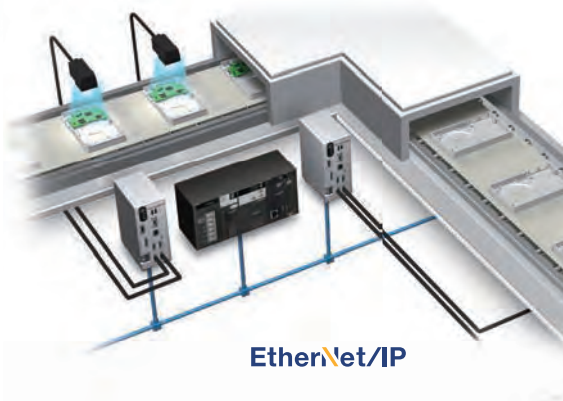
Display of communications test results

Sending of test commands

### EtherNet/IP

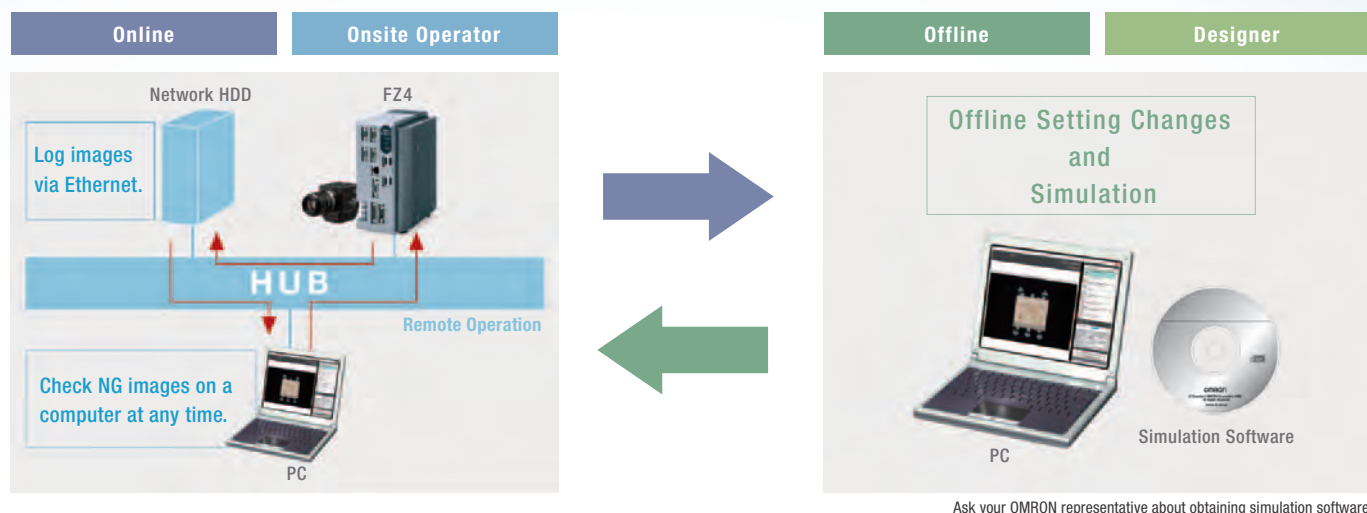
#### High-capacity, High-speed Data Communications

EtherNet/IP is a widely used communication protocol in factories around the world. You can easily connect to OMRON PLCs or any other vendor device that supports EtherNet/IP to enable high-speed communication.



## Optimum Operation both Online and Offline

Connections to a network hard disk drive or network computer enables a wide range of operation possibilities. You can log measurement images longterm, or you can perform verifications and adjustments on a computer without stopping the Vision Sensor.



## New Operation Schemes through Network Applications

### 1 Daily Monitoring

You can store NG image in a network HDD to check the NG images every day on a computer without reducing inspection performance. Or you can start simulation software on your computer to remeasure and analyze NG images.

### 2 Periodic Adjustments and Inspection Adjustments

The non-stop adjustment function lets you change Controller settings without stopping the production line. With remote operation, you can perform operations without going onsite.

### 3 Handling Unstable Inspections or Measurement Failure

The user sends the designer the image data, setting data, and parameter settings. The designer can use the simulation software on the computer to check the situation and change the settings on the simulation software. The altered scene data can be returned to the user and loaded to the system to complete the adjustments. This enables smooth modifications without requiring that the designer visit the site.

### 4 Adding Inspections or Making Changes for New Models

Based on the images to be inspected, settings are made on the simulation software on a familiar computer. The scene data is sent to the user to easily add the new settings.

## Ideal for History Management

### Convert Parameter Settings to CSV Data

CSV files allow you to easily understand the parameter settings. Also, you can easily change any of the settings. If you save the standard settings, you easily find incorrect setting changes by comparing the data for differences. You can attach CSV files to email and have them uploaded to the Vision Sensor to enable easy adjustments even when troubleshooting from a remote location.

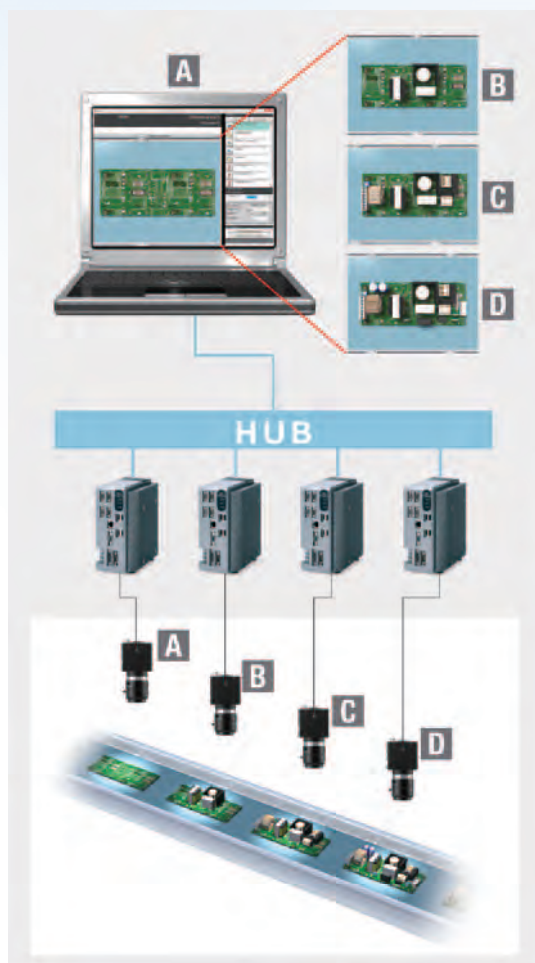
| Standard settings |            |      |      | Current parameter settings |            |      |      |
|-------------------|------------|------|------|----------------------------|------------|------|------|
| #4                | Defect     | キズ汚損 | 0    | #4                         | Defect     | キズ汚損 | 0    |
| overallJudge      | 総合判定反映     |      | 0    | overallJudge               | 総合判定反映     |      | 0    |
| upperDefect       | 欠陥検出サイズ上限値 | 6    | 6    | upperDefect                | 欠陥検出サイズ上限値 |      | 6    |
| lowerDefect       | 欠陥検出サイズ下限値 | 6    | 6    | lowerDefect                | 欠陥検出サイズ下限値 |      | 6    |
| criteriaValue     | 欠陥度判定値     | 100  | 100  | criteriaValue              | 欠陥度判定値     |      | 200  |
| #5                | Search     | サーチ  | 0    | #5                         | Search     | サーチ  | 0    |
| rotation          | 回転有無       |      | 0    | rotation                   | 回転有無       |      | 0    |
| endAngle          | 回転角度上限値    | 180  | 180  | endAngle                   | 回転角度上限値    |      | 180  |
| startAngle        | 回転角度下限値    | -180 | -180 | startAngle                 | 回転角度下限値    |      | -180 |
| angleSkip         | 読み角度       | 5    | 5    | angleSkip                  | 読み角度       |      | 5    |
| smartMode         | スマートモード    | 1    | 1    | smartMode                  | スマートモード    |      | 1    |
| stability         | 安定度 (相関)   | 1.0  | 1.0  | stability                  | 安定度 (相関)   |      | 1.0  |
| accuracy          | 精度         | 2    | 2    | accuracy                   | 精度         |      | 2    |
| searchSpeed       | サーチ速度      | 3    | 3    | searchSpeed                | サーチ速度      |      | 3    |
| referencePosX     | 基準座標X      | 320  | 320  | referencePosX              | 基準座標X      |      | 320  |
| referencePosY     | 基準座標Y      | 240  | 240  | referencePosY              | 基準座標Y      |      | 240  |
| upperCorrelation  | 相関値上限値     | 100  | 100  | upperCorrelation           | 相関値上限値     |      | 100  |
| lowerCorrelation  | 相関値下限値     | 60   | 60   | lowerCorrelation           | 相関値下限値     |      | 50   |
| saveModeling      | モデル登録画像保存  | 0    | 0    | saveModeling               | モデル登録画像保存  |      | 0    |

# Centralize Monitoring and Adjustment of Scattered Sensors

## Remote Operation

You can check the status and adjust the settings of many FZ4 on one computer.

This enables efficient adjustment of Camera images when commissioning a system and application of test adjustment results.



### Application Example 1

## Operating Several FZ4 from One Location

1

When commissioning a line, from one location you can adjust the Camera images from all of the FZ4 located along the line. There's no need to go to and from remote Controllers, and you can compare Camera images under various conditions to adjust them.

2

If setting changes are necessary to add a new model, you can do all the required work at the same time without making trips to all of the Controllers.

3

You can easily balance the thresholds between Controllers when increasing inspection stability through testing at the production line.

### Application Example 2

## Displaying Images from Many FZ4 on One Monitor

1

You can save space because you do not need to install more than one monitor.

2

Even if the Controllers are separated from each other, the adjustments can be made from the same location to reduce the load on workers and reduce adjustment time.

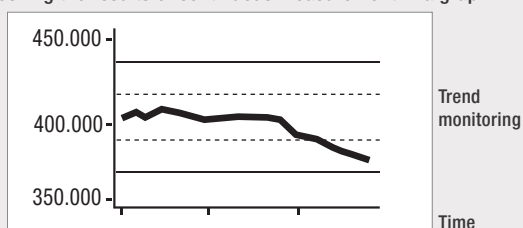
Note: Ask your OMRON representative about obtaining simulation software for a computer.

## Useful Functions for Test Measurement

### Continuous test measurement function

Settings must be verified with as many images as possible. With OMRON's FZ4, continuous measurements of hundreds of images can be performed by a single click.

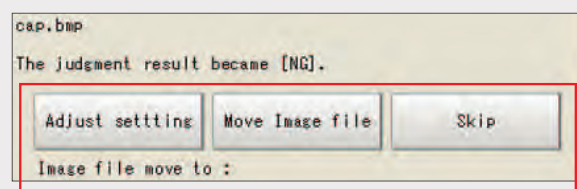
Checking the results of continuous measurement in a graph



### 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

# Customize Screens for Easier Operation

You can easily customize the operating screens according to the inspections or onsite conditions. This helps you prevent downtime that can result from operating mistakes or measurement failure. There are also many customization functions for troubleshooting unexpected problems.

## Customization of Displays

The flexible customization of the RUN mode view is possible. Not only items to be displayed but also their layout and sizes of characters used can also be changed. This enables the creation of the most easy-to-use displays for the on-site operators.

### Example of customization

- Enlarged judgement result, RUN, and processing time

OK RUN 1ms

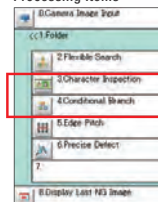
- Enlarged only measurement flow

Pin Inspection

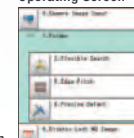
## Compact Flow Displays

These convenient displays help prevent mistakes in operation and make it easy to see the results of processing.

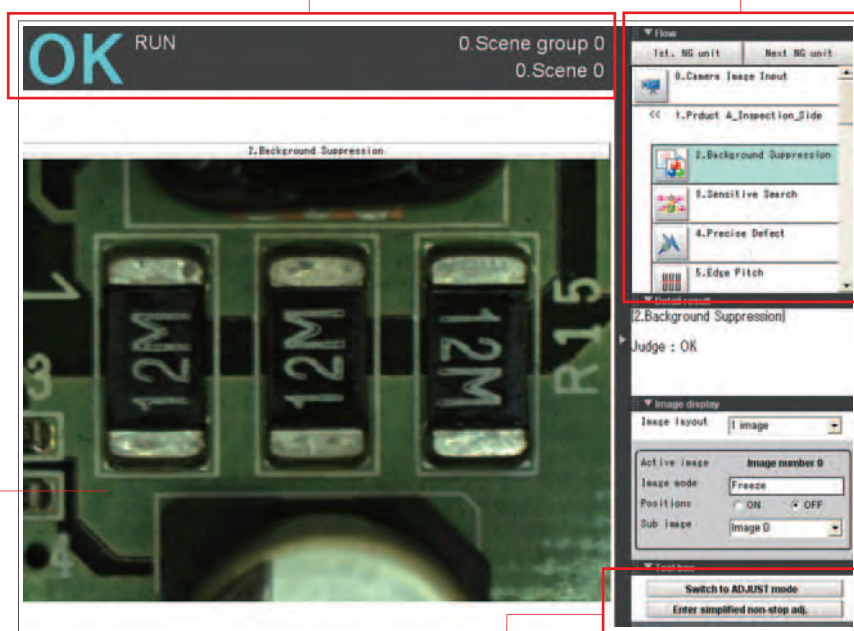
### Actual Flow of Processing Items



### Display on Operating Screen



Hidden



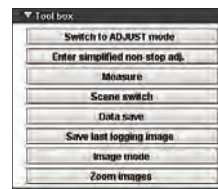
## Multi-screen Display, Display of the latest NG image

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.



## Shortcut buttons

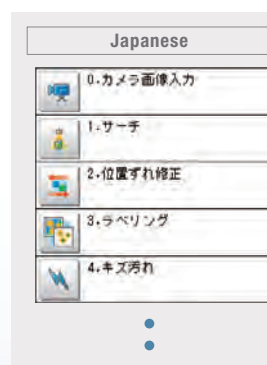
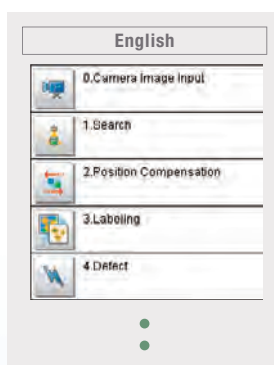
You can arrange a set of shortcut buttons as you like. With these buttons, you can promptly cope with any problems or adjustments whenever necessary during operation.



Example of customization

## Change the Message Language (English, Chinese, or Japanese)

You can make the settings in English and then change the display language to Chinese or Japanese. Display the language that is best for the workers in the country of application.



**NEW**

# User Data

## Ideal for Managing Inspection Standards and for Statistical Analysis of Inspection Results

New functionality has been added that enables using shared data within scene groups as constants and variables in the measurement flow. With the shared data, you can use the measurement flow in many new ways, including standard values, conditional branching flags, and counters.

### Application Example 1

### Unified Management of Judgment Values

When setting up complex scene data, such as the data required for inspection of many different models, you can unify management of important judgment values for inspections to easily manage and then adjust them later. Also, if you isolate in advance the settings that are critical to inspection performance (and normally known only to the designer) as user data, the locations that require adjustment can be clarified so that the user can more easily make adjustments.

Adjustment of All User Data in a List

| User data list |         |                           |
|----------------|---------|---------------------------|
| No.            | Data    | Comment                   |
| 0              | 60.0000 | Mark 1-A Search Judgement |
| 1              | 60.0000 | Mark 1-B Search Judgement |
| 2              | 80.0000 | Mark 2-A Search Judgement |
| 3              | 80.0000 | Mark 2-B Search Judgement |
| 4              | 0.0000  | NG Counter                |
| 5              | 0.0000  |                           |
| 6              | 0.0000  |                           |
| 7              | 0.0000  |                           |
| 8              | 0.0000  |                           |

### Application Example 2

### Statistical Information on Productivity Indices

User data can be used as variables that can be read and written in the inspection flow. It can also be used for counters for the number of inspected workpieces or the number of NG workpieces. Math functions can be used to calculate failure rates and display them onscreen so that productivity can be checked at any time.

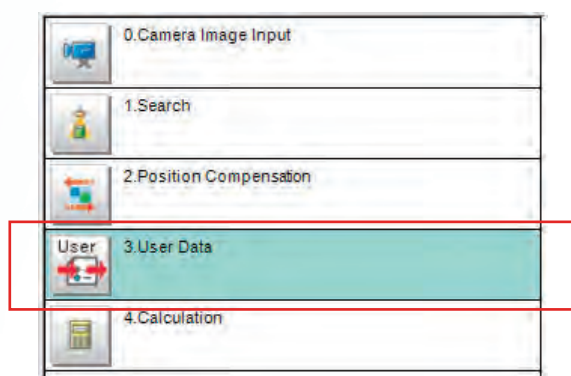
Indices Displayed Onscreen with the Result Display Function

|                   |              |
|-------------------|--------------|
| Inspection        | 19480510 pcs |
| Failure           | 10 pcs       |
| Percent Defective | 0.51 %       |

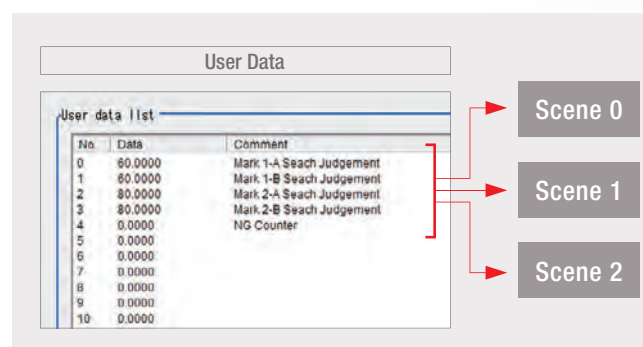


## Application Method

All you have to do is set a User Data processing item in the inspection flow.



The data that is set as user data is used as shared constants and variables in different scenes.



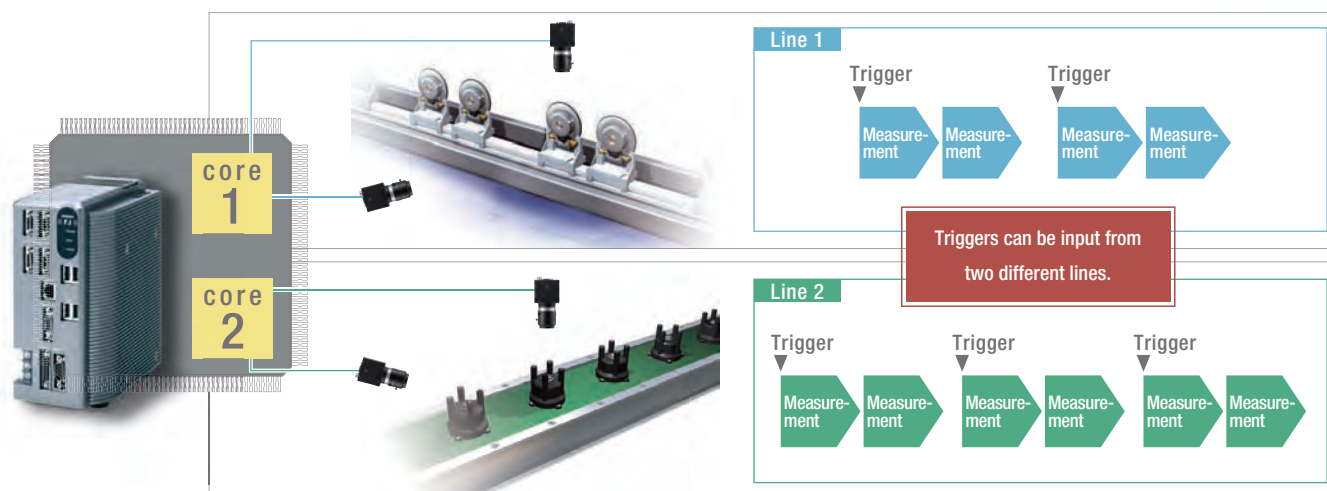
## Applications of Quad Processing

### Perform the Work of Two Controllers with Only One Controller

#### Multi-line random-trigger



With quad processors, different triggers from two lines can be input to one Controller to process two scenes in parallel and yet independently. Even if one line stops, the lines are completely independent of each other, so the other line continues to operate.

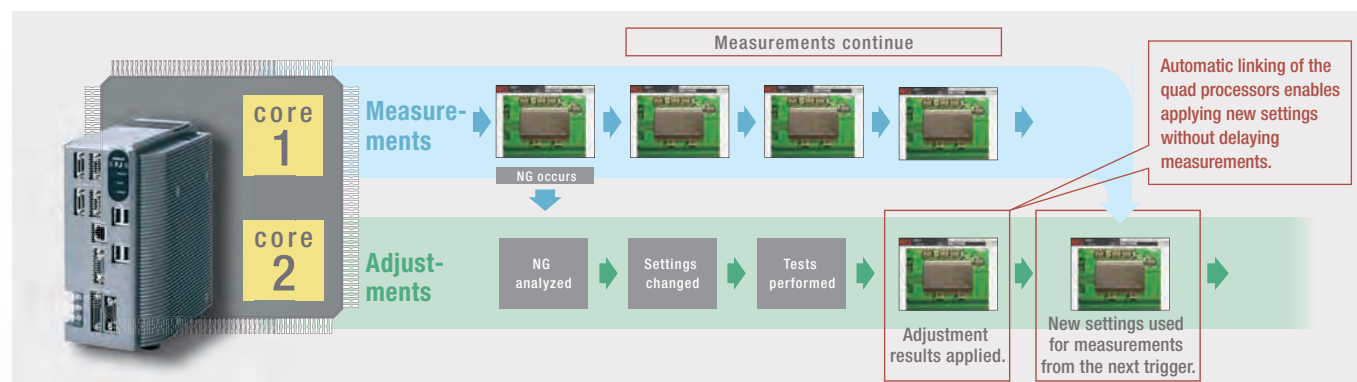


### Making Confirmations and Adjustments without Stopping Production

#### Non-stop adjustment

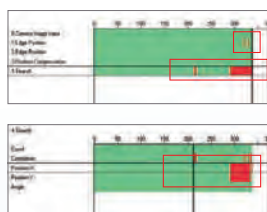


Parallel processing on quad processors not only speeds up measurements, but it enables parallel processing of measurements and adjustments. Automatic distributed quad processing means that measurements are not delayed when adjustments are applied.



#### 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.



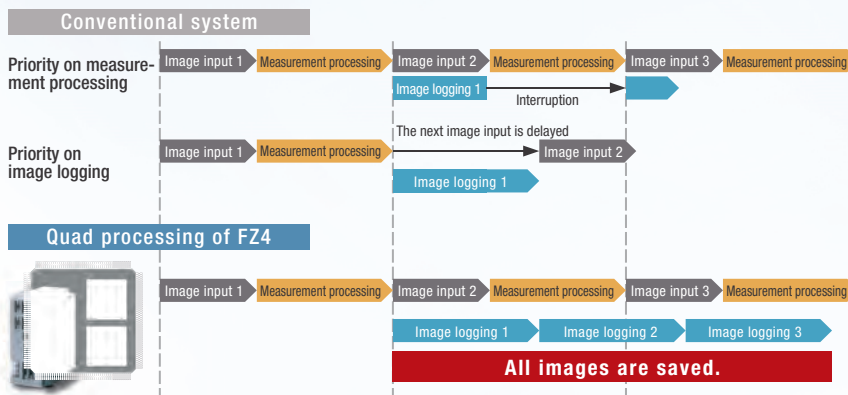
# Save All Images Even during Measurements

## High speed logging



The quad processors can also perform completely parallel processing of measurements and logging, enabling high-speed connection to a high-capacity hard disk (3 terabytes). You can save all of the images for a high-speed line, something that was not previous possible.\*1 And by analyzing trends for all of the saved images, you can quickly isolate the cases of NGs and formulate countermeasures.

\*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 3-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.

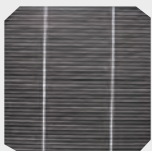
### Resolution

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

### Application Example

## Application Example for Saving All Images

Defect inspection on a new product or a line adopting anew 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.

**NEW**

## More Convenience in Saving Images

It's now even more convenient to save measurement images for operational analysis, such as isolating cases of NGs and recording measurement results. You can therefore make setup work more efficient and help to increase throughput.

### Save Images Directly in JPEG or BMP Format

You can easily view images on a computer or attach them to reports. With BMP files, you can measure them again on the FZ4.

### Save Both Filtered and Unfiltered Images

You can save both the filtered images that were actually measured and the raw images taken directly from the Camera. You can therefore tell if an NG was caused by the input image or by the filter settings.

### Restricting the Areas of Saved Images

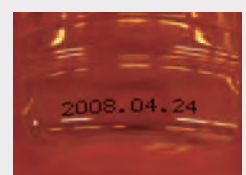
By restricting the areas that are saved, file sizes are smaller so you can continue to log even more files.



### Filtered Images



### Unfiltered Images



# Optimum Performance for Almost Any Application

## Digital Cameras

It does not matter if priority is on speed, resolution, or installation space, there is a Camera that is ideal for your application.

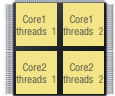
| Digital Cameras                                                                    |            |                                                                                     |            |                                                                                     |            |                                                                                       |            |                                                                                       |            |  |  |
|------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------|------------|---------------------------------------------------------------------------------------|------------|---------------------------------------------------------------------------------------|------------|--|--|
| 2 million pixels                                                                   |            | 300,000 pixels                                                                      |            | 300,000 pixels High-speed                                                           |            | 300,000 pixels small flat type                                                        |            | 300,000-pixels small pen type                                                         |            |  |  |
|   |            |    |            |    |            |    |            |    |            |  |  |
| FZ-SC2M                                                                            | FZ-S2M     | FZ-SC                                                                               | FZ-S       | FZ-SHC                                                                              | FZ-SH      | FZ-SFC                                                                                | FZ-SF      | FZ-SPC                                                                                | FZ-SP      |  |  |
| Color                                                                              | Monochrome | Color                                                                               | Monochrome | Color                                                                               | Monochrome | Color                                                                                 | Monochrome | Color                                                                                 | Monochrome |  |  |
| 1600(H)×1200(V)                                                                    |            | 640(H)×480(V)                                                                       |            | 640(H)×480(V)                                                                       |            | 640(H)×480(V)                                                                         |            | 640(H)×480(V)                                                                         |            |  |  |
| 33.3ms                                                                             |            | 12.5ms                                                                              |            | 4.9ms                                                                               |            | 12.5ms                                                                                |            | 12.5ms                                                                                |            |  |  |
| 40ms                                                                               |            |                                                                                     |            |                                                                                     |            |                                                                                       |            |                                                                                       |            |  |  |
| 30ms                                                                               |            |                                                                                     |            |                                                                                     |            |                                                                                       |            |                                                                                       |            |  |  |
| 20ms                                                                               |            |                                                                                     |            |                                                                                     |            |                                                                                       |            |                                                                                       |            |  |  |
| 10ms                                                                               |            |                                                                                     |            |                                                                                     |            |                                                                                       |            |                                                                                       |            |  |  |
|  |            |  |            |  |            |  |            |  |            |  |  |
|                                                                                    |            |                                                                                     |            | —                                                                                   |            |                                                                                       |            |                                                                                       |            |  |  |
|                                                                                    |            |                                                                                     |            | — (*)                                                                               |            |                                                                                       |            |                                                                                       |            |  |  |
|                                                                                    |            |                                                                                     |            | —                                                                                   |            |                                                                                       |            |                                                                                       |            |  |  |
|                                                                                    |            |                                                                                     |            | —                                                                                   |            |                                                                                       |            |                                                                                       |            |  |  |

\*Synchronized control of external light is possible if a Strobe Controller is also used.

All Cameras can be connected to

## Controllers

You can connect any Camera to the FZ4-series Controllers. There is no need to select a Controller specifically for the Camera. Select the Controller that has the optimum processors for the required speed.

| FZ4-series                                                                                                            |                  |                                                                                                                                           |  |                                                                                                                                 |  |                                                                                                                                |  |                                                                                                                       |  |  |  |                                                                                                            |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------|--|-----------------------------------------------------------------------------------------------------------------------|--|--|--|------------------------------------------------------------------------------------------------------------|--|--|--|
| Quad Processing High-speed Controllers                                                                                |                  |                                                                                                                                           |  | Performance Models                                                                                                              |  |                                                                                                                                |  | Standard Controller                                                                                                   |  |  |  |                                                                                                            |  |  |  |
| <br>Controller Integrated with LCD |                  |                                                                                                                                           |  | <br>Box-type Controller                      |  |                                                                                                                                |  | <br>Controller Integrated with LCD |  |  |  | <br>Box-type Controller |  |  |  |
| FZ4-1100 series                                                                                                       |                  |                                                                                                                                           |  | FZ4-700 series                                                                                                                  |  |                                                                                                                                |  | FZ4-600 series                                                                                                        |  |  |  |                                                                                                            |  |  |  |
| CPU                                                                                                                   |                  | <br>Dual cores × two threads<br><b>Core i5 2.4 GHz</b> |  | <br>Single core<br><b>Core 2 Duo 2.2 GHz</b> |  | <br>Single core<br><b>Celeron 2.0 GHz</b> |  |                                                                                                                       |  |  |  |                                                                                                            |  |  |  |
| Maximum Camera pixels                                                                                                 | 5 million pixels | Yes                                                                                                                                       |  | Yes                                                                                                                             |  | Yes                                                                                                                            |  |                                                                                                                       |  |  |  |                                                                                                            |  |  |  |
|                                                                                                                       | 2 million pixels | Yes                                                                                                                                       |  | Yes                                                                                                                             |  | Yes                                                                                                                            |  |                                                                                                                       |  |  |  |                                                                                                            |  |  |  |
|                                                                                                                       | 300,000 pixels   | Yes                                                                                                                                       |  | Yes                                                                                                                             |  | Yes                                                                                                                            |  |                                                                                                                       |  |  |  |                                                                                                            |  |  |  |
|                                                                                                                       | 360,000 pixels   | Yes                                                                                                                                       |  | Yes                                                                                                                             |  | Yes                                                                                                                            |  |                                                                                                                       |  |  |  |                                                                                                            |  |  |  |
| Maximum number of Cameras                                                                                             |                  | 4 max                                                                                                                                     |  | 4 max *1                                                                                                                        |  | 4 max *1                                                                                                                       |  |                                                                                                                       |  |  |  |                                                                                                            |  |  |  |
| Touch panel                                                                                                           |                  | Yes(Controller Integrated with LCD)                                                                                                       |  | Yes(Controller Integrated with LCD)                                                                                             |  | Yes(Controller Integrated with LCD)                                                                                            |  |                                                                                                                       |  |  |  |                                                                                                            |  |  |  |
| Monitor output                                                                                                        |                  | Analog RGB/XGA                                                                                                                            |  | Analog RGB/XGA                                                                                                                  |  | Analog RGB/XGA                                                                                                                 |  |                                                                                                                       |  |  |  |                                                                                                            |  |  |  |
| High-Grade Processing Items *2                                                                                        |                  | Yes(H-series only)                                                                                                                        |  | Yes(H-series only)                                                                                                              |  | Yes(H-series only)                                                                                                             |  |                                                                                                                       |  |  |  |                                                                                                            |  |  |  |

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

\*2 Refer to page 35 for details on high-grade (HG) processing items.

### Intelligent Cameras with Lighting and Focus Mechanism

360,000-pixels



| FZ-SQ010F     | FZ-SQ050F | FZ-SQ100F | FZ-SQ100N |
|---------------|-----------|-----------|-----------|
| Color         | Color     | Color     | Color     |
| 752(H)×480(V) |           |           |           |
| 16.7ms        |           |           |           |
|               |           |           |           |
| Yes           |           |           |           |
| Yes           |           |           |           |
| —             |           |           |           |
| Yes           |           |           |           |

any of the FZ4-series Controllers

Lite Model



Box-type Controller

FZ4-L350 series



Single core  
**Atom 1.6 GHz**

Yes

Yes

Yes

Yes

4 max \*1

—

Analog RGB/XGA

—

**Extremely Popular  
Camera**

**Intelligent compact cameras**

High-power lighting is built in and a polarizing filter is provided so that you can take clear images simply by installing the Camera. This Camera is ideal for simple presence or judgment inspections, or as an additional camera.

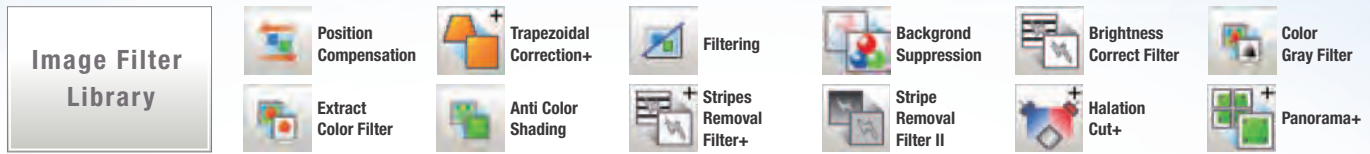


Equipped with  
Polarizing Filter to  
Cut Regular Reflection



## Image Creation Technology Has Also Advanced

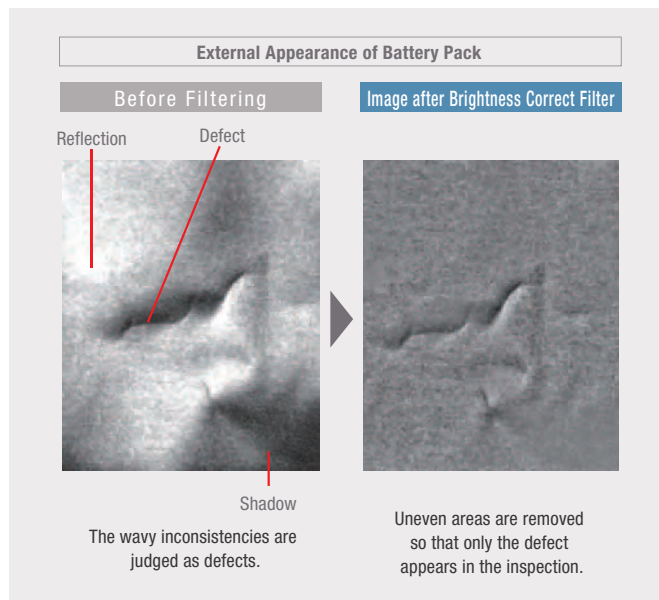
A library of image filters is provided to enable stable images regardless of severe onsite conditions or workpiece status.



**NEW**

### Brightness Correct Filter

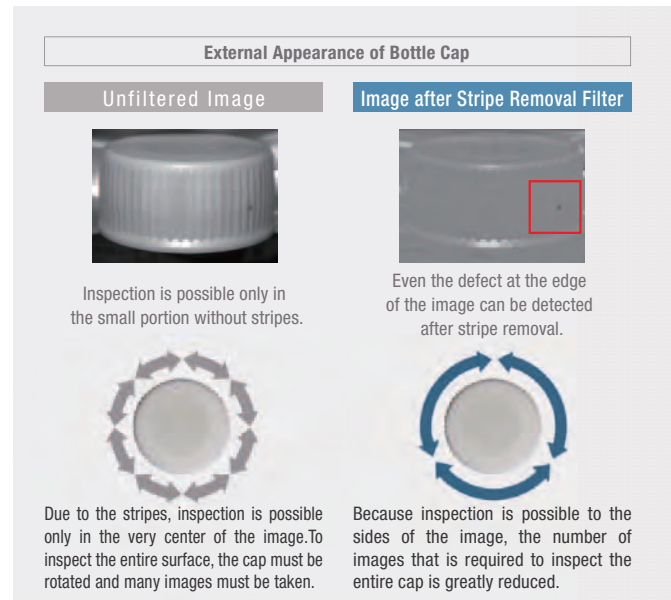
These filter cut out uneven lighting and changes in brightness caused by workpiece surface irregularities to make characteristic features stand out clearly.



**NEW**

### Stripe Removal Filter II

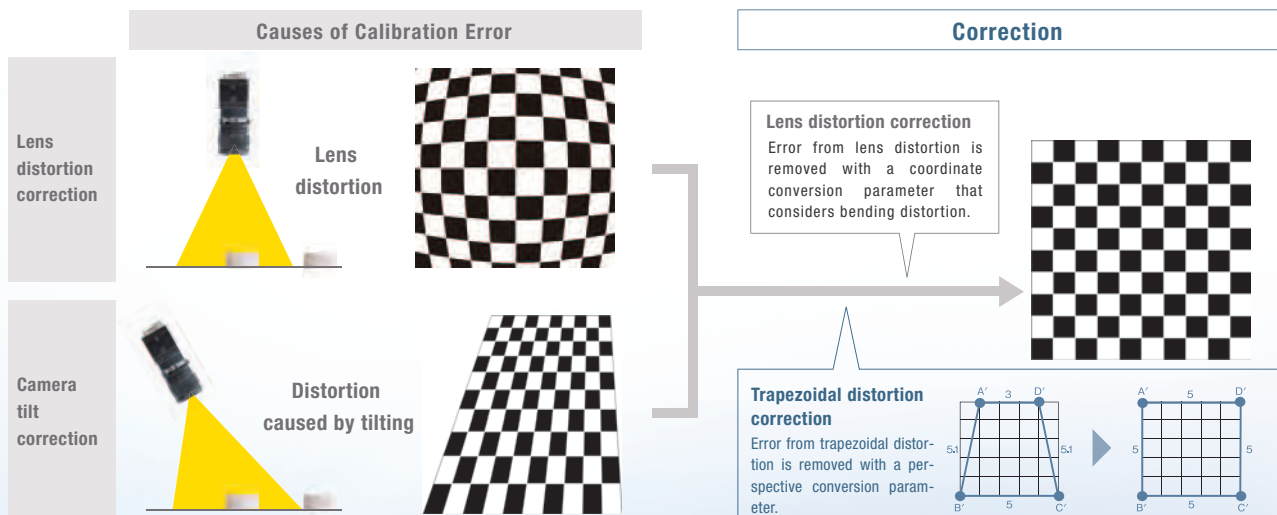
The stripped pattern is filtered out so that only required aspects are shown clearly. Vertical, horizontal, and diagonal stripes can be removed.



**NEW**

### Precise Calibration

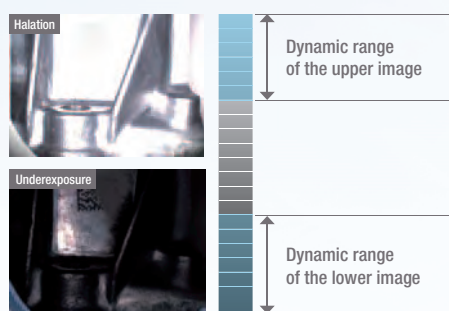
When ultra-high-precision is required, it is necessary to align the coordinates of the Camera's field of vision with the actual coordinate system.



## High Dynamic Range Function Patent Pending

FZ4's high dynamic range minimizes the effects of lighting such as halation and allows highly precise inspections.

### Conventional images



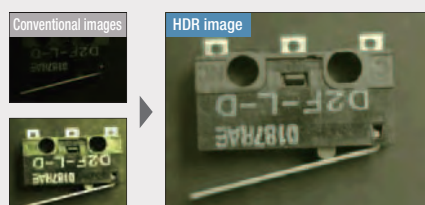
**Defects Undetectable Due to Overexposure or Underexposure**  
Any spot outside the dynamic range is blurred by halation or shadow.

### HDR image



**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.**



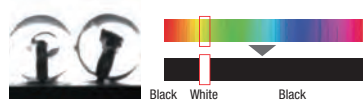
**The reflective surfaces of cylindrically-curved workpieces in which conventional vision sensors have had difficulty can be reproduced.**



## What is Real Color Sensing? Patented

In order to secure stable measurements in different inspection environments, FZ4 Series feature Omron's proprietary Real Color Sensing processing, in addition to the conventional color image processing.

### Color Segmentation Processing



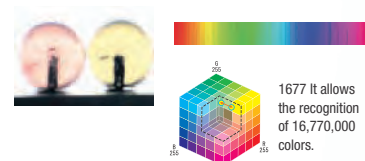
Color images taken by the camera are processed after being converted into black and white pixels. The color extracted is represented as white, and the other colors as black. Based on minimum information, high speed processing is possible. Since color data is limited only to brightness, however, it takes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



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.



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

Previous image processing

OMRON FZ4 series

# Complete Processing Library To Handle a Wide Range of

There are now even more processing items that help you quickly solve inspection and measurement problems.

## Searching

You can detect minute differences without false detections.

To achieve that, we provide a complete array of search processes that meet onsite requirements.



Search



Sensitive Search



Flexible Search



ECM Search



Ec Circle Search



Shape Search+



Shape Search II

### 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



## Edges

Measure positions, widths, or number of edges.

These processing items let you measure positions, widths, and the number of edges from edge information.



Edge Position



Edge Pitch



Scan Edge Position



Scan Edge Width



Circular Scan Edge Position

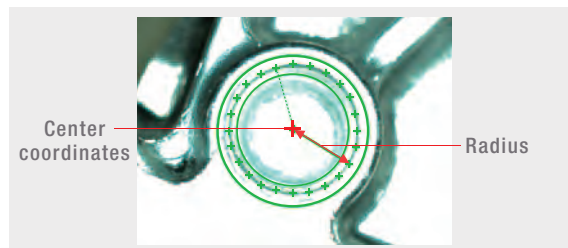


Circular Scan Edge Width

NEW

### Circular Scan Edge Position

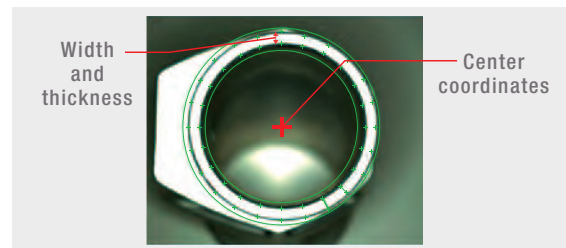
You can measure the center coordinates, diameter, and radius of a round workpiece without performing any calculations simply by drawing one measurement region.



NEW

### Circular Scan Edge Width

You can measure the center coordinates, width, and thickness of a ring-shaped workpiece without performing any calculations.



## Areas



Gravity and Area



Labeling



Labeling+

These processing items let you measure sizes, positions of centers of gravity, and the number of objects.

# Different Types of Inspections

## Defects

These processing items are ideal for external appearance inspections for damage, foreign matter, etc.



Defect



Precise Defect



Fine Matching

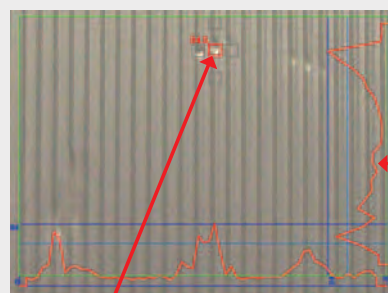
### Inspections of Scratches and Dirt

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. Profiles of defects and comparison elements can be displayed on the screen in real time. You can adjust by confirming the settings and detection results on the image.

Fine parameters for defect detection allow fine settings at the pixel level. Combined with our 5 million-pixel camera, this function enables much more precise inspections of scratches.



Scratch detection profile displayed on the screen  
**Patent Pending**



Comparison element display  
Intervals and sizes of comparing elements are displayed.

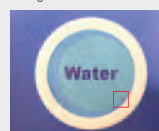
Profile display  
Defects of each direction for detection are displayed as wave profiles.

### Fine Matching / Defect

With our Real Color Sensing technology, FZ4 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.



## Character Inspections

These processing items provide the functions that are required for character inspections of dates, lot numbers, etc.



Character Inspection



Date Verification

## Codes

These processing items can read bar codes and 2D codes from Camera images.



Barcode+



2D Code+

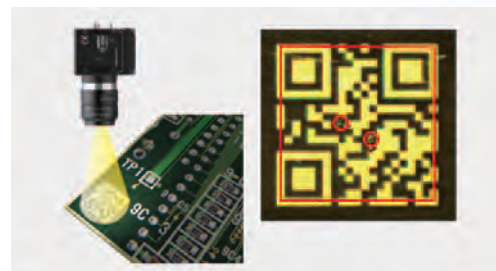


2D Code

**NEW**

### 2D Code

You can automatically correct for damaged codes and errors, and you can display corrected portions in red for visual emphasis. Locations that require modification are quickly understood for rapid feedback to printing devices.



## Special Processing

Frequently uses functions are also provided in these convenient processing items.



Classification



Color Data



Circle Angle

## Ordering Information

| Item                                                                                                                                                                                                          | Descriptions                           | High-Grade Proc' Items | No. of cameras | Output | Model                      | Remarks        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------------|----------------|--------|----------------------------|----------------|
| FZ4 Series<br>Controllers <div>   </div> | Quad Processing High-speed Controllers | ○                      | 2              | NPN    | FZ4-H1100 (See note 4.)    | With touch pen |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-H1105 (See note 4.)    |                |
|                                                                                                                                                                                                               |                                        |                        | 4              | NPN    | FZ4-H1100-10 (See note 4.) |                |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-H1105-10 (See note 4.) |                |
|                                                                                                                                                                                                               |                                        | —                      | 2              | NPN    | FZ4-H1150 (See note 3.)    | —              |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-H1155 (See note 3.)    |                |
|                                                                                                                                                                                                               |                                        |                        | 4              | NPN    | FZ4-H1150-10 (See note 3.) |                |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-H1155-10 (See note 3.) |                |
|                                                                                                                                                                                                               | High-speed Controllers                 | ○                      | 2              | NPN    | FZ4-1100 (See note 2.)     | With touch pen |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-1105 (See note 2.)     |                |
|                                                                                                                                                                                                               |                                        |                        | 4              | NPN    | FZ4-1100-10 (See note 2.)  |                |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-1105-10 (See note 2.)  |                |
|                                                                                                                                                                                                               |                                        | —                      | 2              | NPN    | FZ4-1150 (See note 2.)     | —              |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-1155 (See note 2.)     |                |
|                                                                                                                                                                                                               |                                        |                        | 4              | NPN    | FZ4-1150-10 (See note 2.)  |                |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-1155-10 (See note 2.)  |                |
|                                                                                                                                                                                                               | Standard Controllers                   | ○                      | 2              | NPN    | FZ4-H700 (See note 1.)     | With touch pen |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-H705 (See note 1.)     |                |
|                                                                                                                                                                                                               |                                        |                        | 4              | NPN    | FZ4-H700-10 (See note 1.)  |                |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-H705-10 (See note 1.)  |                |
|                                                                                                                                                                                                               |                                        | —                      | 2              | NPN    | FZ4-H750 (See note 1.)     | —              |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-H755 (See note 1.)     |                |
|                                                                                                                                                                                                               |                                        |                        | 4              | NPN    | FZ4-H750-10 (See note 1.)  |                |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-H755-10 (See note 1.)  |                |
|                                                                                                                                                                                                               | Lite Controllers                       | ○                      | 2              | NPN    | FZ4-600 (See note 2.)      | With touch pen |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-605 (See note 2.)      |                |
|                                                                                                                                                                                                               |                                        |                        | 4              | NPN    | FZ4-600-10 (See note 2.)   |                |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-605-10 (See note 2.)   |                |
|                                                                                                                                                                                                               |                                        | —                      | 2              | NPN    | FZ4-650 (See note 2.)      | —              |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-655 (See note 2.)      |                |
|                                                                                                                                                                                                               |                                        |                        | 4              | NPN    | FZ4-650-10 (See note 2.)   |                |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-655-10 (See note 2.)   |                |
|                                                                                                                                                                                                               | Box-type controllers                   | —                      | 2              | NPN    | FZ4-L350 (See note 2.)     | —              |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-L355 (See note 2.)     |                |
|                                                                                                                                                                                                               |                                        |                        | 4              | NPN    | FZ4-L350-10 (See note 2.)  |                |
|                                                                                                                                                                                                               |                                        |                        |                | PNP    | FZ4-L355-10 (See note 2.)  |                |

Note 1: The production of the FZ4-series Controllers FZ4-(H)75□/(H)75□-10, FZ4-(H)70□/(H)70□-10 were discontinued at the end of March 2015.

2: The production of the FZ4-series Controllers FZ4-110□/-110□-10/-115□/-115□-10, FZ4-60□/-60□-10/-65□/-65□-10, FZ4-L35□/-L35□-10 were discontinued at the end of October 2015.

3: The production of the FZ4-series Controllers FZ4-H65□/-H65□-10, FZ4-H115□/-H115□-10 were discontinued at the end of September 2016.

4: The production of the FZ4-series Controllers FZ4-H110□/-H110□-10, FZ4-H60□/-H60□-10 will be discontinued at the end of March 2018.

| Item                       |                                                                                     | Descriptions                     |                              | Model      | Remarks                                                                                   |                                                                            |
|----------------------------|-------------------------------------------------------------------------------------|----------------------------------|------------------------------|------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Cameras                    |    | Digital Cameras                  | 2 million pixels             | Color      | FZ-SC2M                                                                                   | Lens required                                                              |
|                            | Monochrome                                                                          |                                  | FZ-S2M                       |            |                                                                                           |                                                                            |
|                            | 300,000 pixels                                                                      |                                  | Color                        | FZ-SC      |                                                                                           |                                                                            |
|                            |                                                                                     |                                  | Monochrome                   | FZ-S       |                                                                                           |                                                                            |
|                            |    | High-speed Cameras               | 300,000 pixels               | Color      | FZ-SHC                                                                                    |                                                                            |
|                            | Monochrome                                                                          |                                  | FZ-SH                        |            |                                                                                           |                                                                            |
|                            |    | Small Digital Cameras            | 300,000-pixel flat type      | Color      | FZ-SFC                                                                                    | Lenses for small camera required                                           |
|                            | Monochrome                                                                          |                                  | FZ-SF                        |            |                                                                                           |                                                                            |
|                            |    |                                  | 300,000-pixel pen type       | Color      | FZ-SPC                                                                                    |                                                                            |
|                            |                                                                                     |                                  |                              | Monochrome | FZ-SP                                                                                     |                                                                            |
|                            |   | Intelligent Compact Cameras      | Narrow view                  | Color      | FZ-SQ010F                                                                                 | Camera + Manual Focus Lens + High power Lighting                           |
|                            | Standard view                                                                       |                                  | Color                        | FZ-SQ050F  |                                                                                           |                                                                            |
|                            |   |                                  | Wide View (long-distance)    | Color      | FZ-SQ100F                                                                                 |                                                                            |
|                            |                                                                                     |                                  | Wide View (short-distance)   | Color      | FZ-SQ100N                                                                                 |                                                                            |
| Cameras Peripheral Devices |  | CCTV Lenses                      |                              |            | 3Z4S-LE Series                                                                            | —                                                                          |
|                            | Extension Tubes                                                                     |                                  |                              |            |                                                                                           |                                                                            |
|                            |  | Low-distortion Lenses            |                              |            | 3Z4S-LE SV-0614H/SV-0814H/SV-1214H/SV-1614H/SV-2514H/SV-3514H/SV-5014H/SV-7525H/SV-10028H | Low distortion lens for 2-million pixel cameras and 5million-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                            |
|                            |  | For Intelligent Compact Camera   | Mounting Brackets            |            | FQ-XL/-XL2                                                                                | —                                                                          |
|                            |  |                                  | Polarizing Filter Attachment |            | FQ-XF1                                                                                    |                                                                            |

| Item               | Descriptions                                                                        |                                                           | Cable length:      | Model        | Remarks                                                                                                                            |
|--------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------|--------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------|
| Cables             |    | Camera Cable                                              | 2 m                | FZ-VS3 2M    | —                                                                                                                                  |
|                    |                                                                                     |                                                           | 3 m                | FZ-VS3 3M    |                                                                                                                                    |
|                    |                                                                                     |                                                           | 5 m                | FZ-VS3 5M    |                                                                                                                                    |
|                    |                                                                                     |                                                           | 10 m (See note 2.) | FZ-VS3 10M   |                                                                                                                                    |
|                    |    | Bend resistant Camera Cable                               | 2 m                | FZ-VSB3 2M   |                                                                                                                                    |
|                    |                                                                                     |                                                           | 3 m                | FZ-VSB3 3M   |                                                                                                                                    |
|                    |                                                                                     |                                                           | 5 m                | FZ-VSB3 5M   |                                                                                                                                    |
|                    |                                                                                     |                                                           | 10 m (See note 2.) | FZ-VSB3 10M  |                                                                                                                                    |
|                    |    | Right-angle Camera Cable (See note 1.)                    | 2 m                | FZ-VSL3 2M   |                                                                                                                                    |
|                    |                                                                                     |                                                           | 3 m                | FZ-VSL3 3M   |                                                                                                                                    |
|                    |                                                                                     |                                                           | 5 m                | FZ-VSL3 5M   |                                                                                                                                    |
|                    |                                                                                     |                                                           | 10 m (See note 2.) | FZ-VSL3 10M  |                                                                                                                                    |
|                    |    | Bend resistant Right-angle Camera Cable (See note 1.)     | 2 m                | FZ-VSLB3 2M  |                                                                                                                                    |
|                    |                                                                                     |                                                           | 3 m                | FZ-VSLB3 3M  |                                                                                                                                    |
|                    |                                                                                     |                                                           | 5 m                | FZ-VSLB3 5M  |                                                                                                                                    |
|                    |                                                                                     |                                                           | 10 m (See note 2.) | FZ-VSLB3 10M |                                                                                                                                    |
| Peripheral devices |    | Long-distance Camera Cable                                | 15m (See note 3.)  | FZ-VS4 15M   | Up to two Extension Units and three Cables can be connected.<br>(Maximum cable length: 45 m (See note 4.))                         |
|                    |    | Long-distance Right-angle Camera Cable (See note 1.)      | 15m (See note 3.)  | FZ-VSL4 15M  |                                                                                                                                    |
|                    |    | Cable Extension Unit                                      | —                  | FZ-VSJ       | —                                                                                                                                  |
|                    |   | Monitor Cable                                             | 2 m                | FZ-VM 2M     | —                                                                                                                                  |
|                    |                                                                                     |                                                           | 5 m                | FZ-VM 5M     |                                                                                                                                    |
|                    |  | Parallel I/O Cable                                        | 2 m                | FZ-VP 2M     | —                                                                                                                                  |
|                    |                                                                                     |                                                           | 5 m                | FZ-VP 5M     |                                                                                                                                    |
|                    |  | Parallel I/O Cable for Connector-terminal Conversion Unit | 2 m                | FZ-VPX 2M    | Connector-Terminal Block Conversion Units can be connected<br>(Recommended Products: OMRON XW2RJ50G-T, XW2R-E50G-T, XW2R-P50G-T).  |
|                    |                                                                                     |                                                           | 5 m                | FZ-VPX 5M    |                                                                                                                                    |
|                    |  | LCD Monitor                                               | —                  | FZ-M08       | For Box-type Controllers                                                                                                           |
|                    |  | USB Memory                                                | 2 GB               | FZ-MEM2G     | Capacity: 2 GB                                                                                                                     |
|                    |                                                                                     |                                                           | 8 GB               | FZ-MEM8G     | Capacity: 8 GB                                                                                                                     |
|                    |  | VESA Attachment                                           | —                  | FZ-VESA      | For installing the LCD integrated-type controller                                                                                  |
|                    |  | Desktop Controller Stand                                  | —                  | FZ-DS        | For installing the LCD integrated-type controller                                                                                  |
|                    |  | Display/USB Switcher                                      | —                  | FZ-DU        | —                                                                                                                                  |
|                    |  | Lighting Controller                                       | For FL-Series      | FL-TCC1      | Required to control external lighting from a Controller                                                                            |
|                    | —                                                                                   | External Lighting                                         | —                  | FL Series    | —                                                                                                                                  |
|                    | —                                                                                   | Mouse                                                     | —                  | —            | Mouse Recommended Products<br>Driverless wired mouse<br>(A mouse that requires the mouse driver to be installed is not supported.) |

Note 1: This Cable has an L-shaped connector on the Camera end.

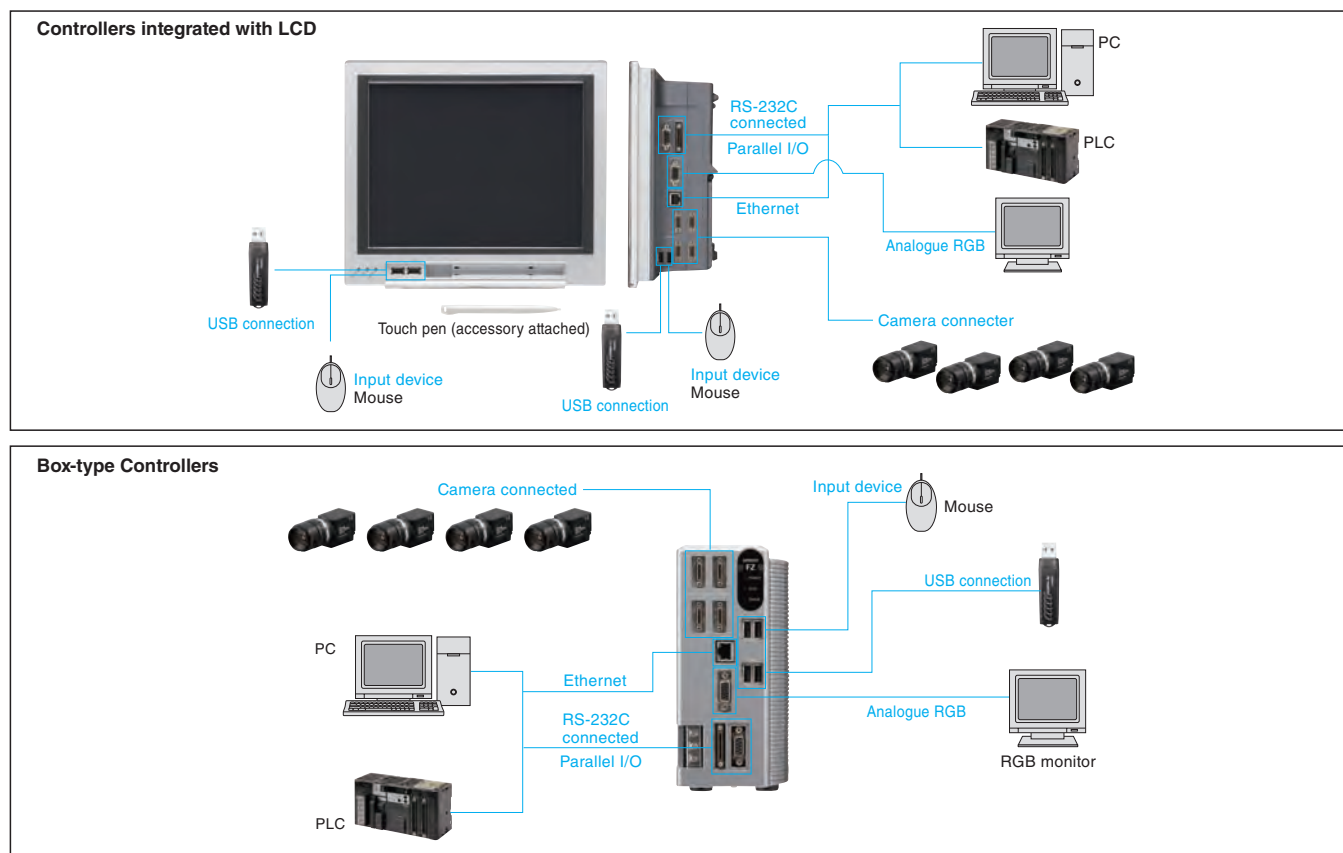
2: The 10-m cable cannot be used for the 5 million-pixel camera.

3: The 15-m cable cannot be used for the 5 million-pixel camera.

4: 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 33.

## System configuration



## Lenses

### High-resolution, Low-distortion Lenses

| Model                      | 3Z4S-LE SV-0614H | 3Z4S-LE SV-0814H | 3Z4S-LE SV-1214H | 3Z4S-LE SV-1614H | 3Z4S-LE SV-2514H | 3Z4S-LE SV-3514H | 3Z4S-LE SV-5014H | 3Z4S-LE SV-7525H | 3Z4S-LE SV-10028H |
|----------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|
| Appearance/Dimensions (mm) |                  |                  |                  |                  |                  |                  |                  |                  |                   |
| Focal length               | 6 mm             | 8 mm             | 12 mm            | 16 mm            | 25 mm            | 35 mm            | 50 mm            | 75 mm            | 100 mm            |
| Brightness                 | F1.4             | F1.4             | F1.4             | F1.4             | F1.4             | F1.4             | F1.4             | F2.5             | F2.8              |
| Filter size                | M40.5 P0.5       | M35.5 P0.5       | M27 P0.5         | M27 P0.5         | M27 P0.5         | M35.5 P0.5       | M40.5 P0.5       | M34.0 P0.5       | M37.5 P0.5        |

### CCTV Lenses

| Model                      | 3Z4S-LE SV-03514V | 3Z4S-LE SV-04514V | 3Z4S-LE SV-0614V | 3Z4S-LE SV-0813V | 3Z4S-LE SV-1214V | 3Z4S-LE SV-1614V | 3Z4S-LE SV-2514V | 3Z4S-LE SV-3518V |
|----------------------------|-------------------|-------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Appearance/Dimensions (mm) |                   |                   |                  |                  |                  |                  |                  |                  |
| Focal length               | 3.5 mm            | 4.5 mm            | 6 mm             | 8 mm             | 12 mm            | 16 mm            | 25 mm            | 35 mm            |
| Brightness                 | F1.4              | F1.4              | F1.4             | F1.3             | F1.4             | F1.4             | F1.4             | F1.8             |
| Filter size                | —                 | —                 | M27 P0.5         | M25.5 P0.5       | M27 P0.5         | M27 P0.5         | M27 P0.5         | M27 P0.5         |

| Model                      | 3Z4S-LE SV-5018V | 3Z4S-LE SV-7527V | 3Z4S-LE SV-10035V |
|----------------------------|------------------|------------------|-------------------|
| Appearance/Dimensions (mm) |                  |                  |                   |
| Focal length               | 50 mm            | 75 mm            | 100 mm            |
| Brightness                 | F1.8             | F2.7             | F3.5              |
| Filter size                | M30.5 P0.5       | M30.5 P0.5       | M30.5 P0.5        |

### Lenses for small camera

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

### Extension Tubes

| Model    | 3Z4S-LE SV-EXR                                                                                                  |
|----------|-----------------------------------------------------------------------------------------------------------------|
| Contents | Set of 7 tubes<br>(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<br>(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 is required to protect against vibration when Extension Tubes exceeding 30 mm are used.

## Ratings and Specifications (Controllers)

### FZ4 series Quad Processing High-speed Controllers

| Model                                                 |                                                 |                        | NPN Output                                                                                                                                                                                                                                                         | FZ4-1100       | FZ4-1100-10          | FZ4-1150       | FZ4-1150-10                     | FZ4-H1100      | FZ4-H1100-10         | FZ4-H1150      | FZ4-H1150-10 |
|-------------------------------------------------------|-------------------------------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------|----------------|---------------------------------|----------------|----------------------|----------------|--------------|
|                                                       |                                                 |                        | PNP Output                                                                                                                                                                                                                                                         | FZ4-1105       | FZ4-1105-10          | FZ4-1155       | FZ4-1155-10                     | FZ4-H1105      | FZ4-H1105-10         | FZ4-H1155      | FZ4-H1155-10 |
| Controller type                                       |                                                 |                        | Controllers integrated with LCD                                                                                                                                                                                                                                    |                | Box-type controllers |                | Controllers integrated with LCD |                | Box-type controllers |                |              |
| High-grade Processing items                           |                                                 |                        | No                                                                                                                                                                                                                                                                 |                |                      |                |                                 | Yes            |                      |                |              |
| No. of Cameras                                        |                                                 |                        | 2                                                                                                                                                                                                                                                                  | 4              | 2                    | 4              | 2                               | 4              | 2                    | 4              |              |
| Connected Camera                                      |                                                 |                        | Can be connected to all cameras.                                                                                                                                                                                                                                   |                |                      |                |                                 |                |                      |                |              |
| Processing resolution                                 | When connected to an intelligent compact camera |                        | 752(H)×480(V)                                                                                                                                                                                                                                                      |                |                      |                |                                 |                |                      |                |              |
|                                                       | 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<br>(See note 1.)              | When connected to an intelligent compact camera | Connected to 1 camera  | 232                                                                                                                                                                                                                                                                |                |                      |                |                                 |                |                      |                |              |
|                                                       |                                                 | Connected to 2 cameras | 116                                                                                                                                                                                                                                                                |                |                      |                |                                 |                |                      |                |              |
|                                                       |                                                 | Connected to 3 cameras | 77                                                                                                                                                                                                                                                                 |                |                      |                |                                 |                |                      |                |              |
|                                                       |                                                 | Connected to 4 cameras | 58                                                                                                                                                                                                                                                                 |                |                      |                |                                 |                |                      |                |              |
|                                                       | When connected to a 300,000-pixel camera        | Connected to 1 camera  | Color camera: 270, Monochrome Camera: 272                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |              |
|                                                       |                                                 | Connected to 2 cameras | Color camera: 135, Monochrome Camera: 136                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |              |
|                                                       |                                                 | Connected to 3 cameras | Color camera: 90, Monochrome Camera: 90                                                                                                                                                                                                                            |                |                      |                |                                 |                |                      |                |              |
|                                                       |                                                 | Connected to 4 cameras | Color camera: 67, Monochrome Camera: 68                                                                                                                                                                                                                            |                |                      |                |                                 |                |                      |                |              |
|                                                       | When connected to a 2 million-pixel camera      | Connected to 1 camera  | Color camera: 43, Monochrome Camera: 43                                                                                                                                                                                                                            |                |                      |                |                                 |                |                      |                |              |
|                                                       |                                                 | Connected to 2 cameras | Color camera: 21, Monochrome Camera: 21                                                                                                                                                                                                                            |                |                      |                |                                 |                |                      |                |              |
|                                                       |                                                 | Connected to 3 cameras | Color camera: 14, Monochrome Camera: 14                                                                                                                                                                                                                            |                |                      |                |                                 |                |                      |                |              |
|                                                       |                                                 | Connected to 4 cameras | Color camera: 10, Monochrome Camera: 10                                                                                                                                                                                                                            |                |                      |                |                                 |                |                      |                |              |
|                                                       | When connected to a 5 million-pixel camera      | Connected to 1 camera  | Color camera: 16, Monochrome Camera: 16                                                                                                                                                                                                                            |                |                      |                |                                 |                |                      |                |              |
|                                                       |                                                 | Connected to 2 cameras | Color camera: 8, Monochrome Camera: 8                                                                                                                                                                                                                              |                |                      |                |                                 |                |                      |                |              |
|                                                       |                                                 | Connected to 3 cameras | Color camera: 5, Monochrome Camera: 5                                                                                                                                                                                                                              |                |                      |                |                                 |                |                      |                |              |
|                                                       |                                                 | Connected to 4 cameras | Color camera: 4, Monochrome Camera: 4                                                                                                                                                                                                                              |                |                      |                |                                 |                |                      |                |              |
| Operation                                             |                                                 |                        | Controllers integrated with LCD: Touch pen, mouse, etc. Box-type controllers: Mouse or similar device                                                                                                                                                              |                |                      |                |                                 |                |                      |                |              |
| Settings                                              |                                                 |                        | Create series of processing steps by editing the flowchart (Help messages provided).                                                                                                                                                                               |                |                      |                |                                 |                |                      |                |              |
| Serial communications                                 |                                                 |                        | RS-232C/422A: 1 CH                                                                                                                                                                                                                                                 |                |                      |                |                                 |                |                      |                |              |
| Network communications                                |                                                 |                        | Ethernet 100BASE-TX/10BASE-T                                                                                                                                                                                                                                       |                |                      |                |                                 |                |                      |                |              |
| EtherNet/IP communications                            |                                                 |                        | Ethernet port baud rate: 100 Mbps (100Base-TX)                                                                                                                                                                                                                     |                |                      |                |                                 |                |                      |                |              |
| Parallel I/O                                          |                                                 |                        | (When used in Multi-line random-trigger mode)<br>17 inputs (RESET, STEP0/ENCTRIG_Z0, STEP1/ENCTRIG_Z1, DSA0 to 1, ENCTRIG_A0 to 1, ENCTRIG_B0 to 1, DI0 to 7),<br>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)<br>13 inputs (RESET, STEP0/ENCTRIG_Z0, DSA0, ENCTRIG_A0, ENCTRIG_B0, DI0 to 7),<br>26 outputs (RUN, BUSY0, GATE0, OR0, READY0, ERROR, STGOUT0 to 3, DO0 to 15)<br>*STGOUT 2 to 3 only for camera 4 ch type                               |                |                      |                |                                 |                |                      |                |              |
|                                                       |                                                 |                        |                                                                                                                                                                                                                                                                    |                |                      |                |                                 |                |                      |                |              |
| Monitor interface                                     |                                                 |                        | Controllers integrated with LCD: Integrated Controller and LCD 12.1 inch TFT color LCD (Resolution: XGA 1,024 × 768 dots)<br>Box-type controllers: 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<br>(at 24.0 VDC)<br>(See note 2.) | When connected to an intelligent compact camera |                        | 5.0 A max.                                                                                                                                                                                                                                                         | 7.5 A max.     | 5.0 A max.           | 7.5 A max.     | 5.0 A max.                      | 7.5 A max.     | 5.0 A max.           | 7.5 A max.     |              |
|                                                       | When connected to a 300,000-pixel camera        |                        |                                                                                                                                                                                                                                                                    |                |                      |                |                                 |                |                      |                |              |
|                                                       | When connected to a 2 million-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 5 million-pixel camera      |                        |                                                                                                                                                                                                                                                                    |                |                      |                |                                 |                |                      |                |              |
| Ambient temperature range                             |                                                 |                        | Operating: 0 to 45°C for low cooling fan speeds, 0 to 50°C for high cooling fan speeds<br>Storage: -20 to 65°C (with no icing or condensation)                                                                                                                     |                |                      |                |                                 |                |                      |                |              |
| Ambient humidity range                                |                                                 |                        | Operating and storage: 35% to 85% (with no condensation)                                                                                                                                                                                                           |                |                      |                |                                 |                |                      |                |              |
| Weight                                                |                                                 |                        | Approx. 3.2 kg                                                                                                                                                                                                                                                     | Approx. 3.4 kg | Approx. 1.8 kg       | Approx. 1.9 kg | Approx. 3.2 kg                  | Approx. 3.4 kg | Approx. 1.8 kg       | Approx. 1.9 kg |              |
| Accessories                                           |                                                 |                        | Controllers integrated with LCD: Touch pen (one, inside the front panel), Instruction Manual, 6 mounting brackets<br>Box-type controllers: Instruction Manual                                                                                                      |                |                      |                |                                 |                |                      |                |              |

Note 1: The image logging capacity changes when multiple cameras of different types are connected at the same time.

Note 2: 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 compact camera is connected.

### FZ4 series High-speed Controllers

| Model                                                 |                                                 |                        | NPN Output                                | FZ4-700                                                                                                                                                                                                                  | FZ4-700-10     | FZ4-750              | FZ4-750-10     | FZ4-H700                        | FZ4-H700-10    | FZ4-H750             | FZ4-H750-10    |
|-------------------------------------------------------|-------------------------------------------------|------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------|----------------|---------------------------------|----------------|----------------------|----------------|
|                                                       |                                                 |                        | PNP Output                                | FZ4-705                                                                                                                                                                                                                  | FZ4-705-10     | FZ4-755              | FZ4-755-10     | FZ4-H705                        | FZ4-H705-10    | FZ4-H755             | FZ4-H755-10    |
| Controller type                                       |                                                 |                        |                                           | Controllers integrated with LCD                                                                                                                                                                                          |                | Box-type controllers |                | Controllers integrated with LCD |                | Box-type controllers |                |
| High-grade Processing items                           |                                                 |                        |                                           | No                                                                                                                                                                                                                       |                |                      |                | Yes                             |                |                      |                |
| No. of Cameras                                        |                                                 |                        |                                           | 2                                                                                                                                                                                                                        | 4              | 2                    | 4              | 2                               | 4              | 2                    | 4              |
| Connected Camera                                      |                                                 |                        |                                           | Can be connected to all cameras. (When connecting 5 million-pixel cameras, up to two cameras can be connected.)                                                                                                          |                |                      |                |                                 |                |                      |                |
| Processing resolution                                 | When connected to an intelligent compact camera |                        |                                           | 752(H)×480(V)                                                                                                                                                                                                            |                |                      |                |                                 |                |                      |                |
|                                                       | 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<br>(See note 1.)              | When connected to an intelligent compact camera | Connected to 1 camera  | 214                                       |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
|                                                       |                                                 | Connected to 2 cameras | 107                                       |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
|                                                       |                                                 | Connected to 3 cameras | 71                                        |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
|                                                       |                                                 | Connected to 4 cameras | 53                                        |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
|                                                       | 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     |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
|                                                       |                                                 | Connected to 3 cameras | —                                         |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
|                                                       |                                                 | Connected to 4 cameras | —                                         |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
| Operation                                             |                                                 |                        |                                           | Controllers integrated with LCD: Touch pen, mouse, etc.<br>Box-type controllers: Mouse or similar device                                                                                                                 |                |                      |                |                                 |                |                      |                |
| Settings                                              |                                                 |                        |                                           | Create series of processing steps by editing the flowchart (Help messages provided).                                                                                                                                     |                |                      |                |                                 |                |                      |                |
| Serial communications                                 |                                                 |                        |                                           | RS-232C/422A: 1 CH                                                                                                                                                                                                       |                |                      |                |                                 |                |                      |                |
| Network communications                                |                                                 |                        |                                           | Ethernet 100BASE-TX/10BASE-T                                                                                                                                                                                             |                |                      |                |                                 |                |                      |                |
| EtherNet/IP communications                            |                                                 |                        |                                           | Ethernet port baud rate: 100 Mbps (100Base-TX)                                                                                                                                                                           |                |                      |                |                                 |                |                      |                |
| Parallel I/O                                          |                                                 |                        |                                           | 13 inputs (RESET, STEP0/ENCTRIG_Z0, DSA0, ENCTRIG_A0, ENCTRIG_B0, DI0 to 7),<br>26 outputs (RUN, BUSY0, GATE0, OR0, READY0, ERROR, STGOUT0 to 3, DO0 to 15)<br>*STGOUT 2 to 3 only for camera 4 ch type                  |                |                      |                |                                 |                |                      |                |
| Monitor interface                                     |                                                 |                        |                                           | Controllers integrated with LCD: Integrated Controller and LCD 12.1 inch TFT color LCD (Resolution: XGA 1,024 × 768 dots)<br>Box-type controllers: 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<br>(at 24.0 VDC)<br>(See note 2.) | When connected to an intelligent compact camera |                        |                                           | 5.0 A max.                                                                                                                                                                                                               | 7.5 A max.     | 5.0 A max.           | 7.5 A max.     | 5.0 A max.                      | 7.5 A max.     | 5.0 A max.           | 7.5A max.      |
|                                                       | When connected to an intelligent camera         |                        |                                           |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
|                                                       | When connected to a 300,000-pixel camera        |                        |                                           |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
|                                                       | When connected to a 2 million-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.           | 4.9A max.      |
|                                                       | When connected to a 5 million-pixel camera      |                        |                                           |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
| Ambient temperature range                             |                                                 |                        |                                           | Operating: 0 to 45°C for low cooling fan speeds, 0 to 50°C for high cooling fan speeds<br>Storage: -20 to 65°C (with no icing or condensation)                                                                           |                |                      |                |                                 |                |                      |                |
| Ambient humidity range                                |                                                 |                        |                                           | Operating and storage: 35% to 85% (with no condensation)                                                                                                                                                                 |                |                      |                |                                 |                |                      |                |
| Weight                                                |                                                 |                        |                                           | Approx. 3.2 kg                                                                                                                                                                                                           | Approx. 3.4 kg | Approx. 1.8 kg       | Approx. 1.9 kg | Approx. 3.2 kg                  | Approx. 3.4 kg | Approx. 1.8 kg       | Approx. 1.9 kg |
| Accessories                                           |                                                 |                        |                                           | Controllers integrated with LCD: Touch pen (one, inside the front panel), Instruction Manual, 6 mounting brackets<br>Box-type controllers: Instruction Manual                                                            |                |                      |                |                                 |                |                      |                |

Note 1: The image logging capacity changes when multiple cameras of different types are connected at the same time.

2: 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.

### FZ4 series Standard Controllers

| Model                                                 |                                                 |                        | NPN Output                                | FZ4-600                                                                                                                                                                                                                  | FZ4-600-10     | FZ4-650              | FZ4-650-10     | FZ4-H600                        | FZ4-H600-10    | FZ4-H650             | FZ4-H650-10    |
|-------------------------------------------------------|-------------------------------------------------|------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------|----------------|---------------------------------|----------------|----------------------|----------------|
|                                                       |                                                 |                        | PNP Output                                | FZ4-605                                                                                                                                                                                                                  | FZ4-605-10     | FZ4-655              | FZ4-655-10     | FZ4-H605                        | FZ4-H605-10    | FZ4-H655             | FZ4-H655-10    |
| Controller type                                       |                                                 |                        |                                           | Controllers integrated with LCD                                                                                                                                                                                          |                | Box-type controllers |                | Controllers integrated with LCD |                | Box-type controllers |                |
| High-grade Processing items                           |                                                 |                        |                                           | No                                                                                                                                                                                                                       |                |                      |                | Yes                             |                |                      |                |
| No. of Cameras                                        |                                                 |                        |                                           | 2                                                                                                                                                                                                                        | 4              | 2                    | 4              | 2                               | 4              | 2                    | 4              |
| Connected Camera                                      |                                                 |                        |                                           | Can be connected to all cameras. (When connecting 5 million-pixel cameras, up to two cameras can be connected.)                                                                                                          |                |                      |                |                                 |                |                      |                |
| Processing resolution                                 | When connected to an intelligent compact camera |                        |                                           | 752(H)×480(V)                                                                                                                                                                                                            |                |                      |                |                                 |                |                      |                |
|                                                       | 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<br>(See note 1.)              | When connected to an intelligent compact camera | Connected to 1 camera  | 214                                       |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
|                                                       |                                                 | Connected to 2 cameras | 107                                       |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
|                                                       |                                                 | Connected to 3 cameras | 71                                        |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
|                                                       |                                                 | Connected to 4 cameras | 53                                        |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
|                                                       | 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     |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
|                                                       |                                                 | Connected to 3 cameras | —                                         |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
|                                                       |                                                 | Connected to 4 cameras | —                                         |                                                                                                                                                                                                                          |                |                      |                |                                 |                |                      |                |
| Operation                                             |                                                 |                        |                                           | Controllers integrated with LCD: Touch pen, mouse, etc.<br>Box-type controllers: Mouse or similar device                                                                                                                 |                |                      |                |                                 |                |                      |                |
| Settings                                              |                                                 |                        |                                           | Create series of processing steps by editing the flowchart (Help messages provided).                                                                                                                                     |                |                      |                |                                 |                |                      |                |
| Serial communications                                 |                                                 |                        |                                           | RS-232C/422A: 1 CH                                                                                                                                                                                                       |                |                      |                |                                 |                |                      |                |
| Network communications                                |                                                 |                        |                                           | Ethernet 100BASE-TX/10BASE-T                                                                                                                                                                                             |                |                      |                |                                 |                |                      |                |
| EtherNet/IP communications                            |                                                 |                        |                                           | Ethernet port baud rate: 100 Mbps (100Base-TX)                                                                                                                                                                           |                |                      |                |                                 |                |                      |                |
| Parallel I/O                                          |                                                 |                        |                                           | 13 inputs (RESET, STEP0/ENCTRIG_Z0, DSA0, ENCTRIG_A0, ENCTRIG_B0, DI0 to 7),<br>26 outputs (RUN, BUSY0, GATE0, OR0, READY0, ERROR, STGOUT0 to 3, DO0 to 15)<br>*STGOUT 2 to 3 only for camera 4 ch type                  |                |                      |                |                                 |                |                      |                |
| Monitor interface                                     |                                                 |                        |                                           | Controllers integrated with LCD: Integrated Controller and LCD 12.1 inch TFT color LCD (Resolution: XGA 1,024 × 768 dots)<br>Box-type controllers: 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<br>(at 24.0 VDC)<br>(See note 2.) | When connected to an intelligent compact camera |                        |                                           | 5.0 A max.                                                                                                                                                                                                               | 7.5 A max.     | 5.0 A max.           | 7.5 A max.     | 5.0 A max.                      | 7.5 A max.     | 5.0 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 for low cooling fan speeds, 0 to 50°C for high cooling fan speeds<br>Storage: -20 to 65°C (with no icing or condensation)                                                                           |                |                      |                |                                 |                |                      |                |
| Ambient humidity range                                |                                                 |                        |                                           | Operating and storage: 35% to 85% (with no condensation)                                                                                                                                                                 |                |                      |                |                                 |                |                      |                |
| Weight                                                |                                                 |                        |                                           | Approx. 3.2 kg                                                                                                                                                                                                           | Approx. 3.4 kg | Approx. 1.8 kg       | Approx. 1.9 kg | Approx. 3.2 kg                  | Approx. 3.4 kg | Approx. 1.8 kg       | Approx. 1.9 kg |
| Accessories                                           |                                                 |                        |                                           | Controllers integrated with LCD: Touch pen (one, inside the front panel), Instruction Manual, 6 mounting brackets<br>Box-type controllers: Instruction Manual                                                            |                |                      |                |                                 |                |                      |                |

Note 1: The image logging capacity changes when multiple cameras of different types are connected at the same time.

2: 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 compact camera is connected.

### FZ4 series Lite Controllers

| Model                                                 |                                                 | NPN Output             | FZ4-L350                                                                                                                                                                  | FZ4-L350-10 |
|-------------------------------------------------------|-------------------------------------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
|                                                       |                                                 | PNP Output             | FZ4-L355                                                                                                                                                                  | FZ4-L355-10 |
| Controller type                                       |                                                 |                        | Box-type controllers                                                                                                                                                      |             |
| High-grade Processing items                           |                                                 |                        | No                                                                                                                                                                        |             |
| No. of Cameras                                        |                                                 |                        | 2                                                                                                                                                                         | 4           |
| Connected Camera                                      |                                                 |                        | Can be connected to all cameras.<br>(When connecting 5 million-pixel cameras, up to two cameras can be connected.)                                                        |             |
| Processing resolution                                 | When connected to an intelligent compact camera |                        | 752(H)×480(V)                                                                                                                                                             |             |
|                                                       | 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<br>(See note 1.)              | When connected to an intelligent compact camera | Connected to 1 camera  | 214                                                                                                                                                                       |             |
|                                                       |                                                 | Connected to 2 cameras | 107                                                                                                                                                                       |             |
|                                                       |                                                 | Connected to 3 cameras | 71                                                                                                                                                                        |             |
|                                                       |                                                 | Connected to 4 cameras | 53                                                                                                                                                                        |             |
|                                                       | 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                                                                                                                                     |             |
|                                                       |                                                 | Connected to 3 cameras | —                                                                                                                                                                         |             |
|                                                       |                                                 | Connected to 4 cameras | —                                                                                                                                                                         |             |
| Operation                                             |                                                 |                        | Mouse or similar device                                                                                                                                                   |             |
| Settings                                              |                                                 |                        | Create series of processing steps by editing the flowchart (Help messages provided).                                                                                      |             |
| Serial communications                                 |                                                 |                        | RS-232C: 1 CH                                                                                                                                                             |             |
| Network communications                                |                                                 |                        | Ethernet 1000BASE-T/100BASE-TX/10BASE-T                                                                                                                                   |             |
| EtherNet/IP communications                            |                                                 |                        | Ethernet port baud rate: 100 Mbps (100Base-TX)                                                                                                                            |             |
| Parallel I/O                                          |                                                 |                        | 11 inputs (RESET, STEP, DSA, and DI 0 to 7),<br>26 outputs (RUN, BUSY, GATE, OR, READY, ERROR, STGOUT 0 to 3, and DO 0 to 15)<br>*STGOUT 2 to 3 only for camera 4 ch type |             |
| Monitor interface                                     |                                                 |                        | Analog RGB video output, 1 channel (Resolution: XGA 1,024 × 768 dots)                                                                                                     |             |
| USB interface                                         |                                                 |                        | 2 channels (supports USB 1.1 and 2.0)                                                                                                                                     |             |
| Power supply voltage (See note 2.)                    |                                                 |                        | 20.4 to 26.4 VDC                                                                                                                                                          |             |
| Current consumption<br>(at 24.0 VDC)<br>(See note 3.) | When connected to an intelligent compact camera |                        | 4.0 A max.                                                                                                                                                                | 5.5 A max.  |
|                                                       | When connected to a 300,000-pixel camera        |                        | 2.6 A max.                                                                                                                                                                | 2.9 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<br>Storage: -20 to 65°C (with no icing or condensation)                                                                                   |             |
| Ambient humidity range                                |                                                 |                        | Operating and storage: 35% to 85% (with no condensation)                                                                                                                  |             |
| Weight                                                |                                                 |                        | Approx. 1.8 kg                                                                                                                                                            |             |
| Accessories                                           |                                                 |                        | Instruction Manual                                                                                                                                                        |             |

Note 1: The image logging capacity changes when multiple cameras of different types are connected at the same time.

2: Do not ground the positive terminal of the 24-VDC power supply to a Lite Controller.

If the positive terminal is grounded, electrical shock may occur when an SG (0-V) part, such as the case of the Controller or Camera, is touched.

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 compact camera is connected.

## Ratings and Specifications (Cameras)

### Digital Cameras

|                                        | FZ-S                                                                            | FZ-SC | FZ-S2M                                                                          | FZ-SC2M |
|----------------------------------------|---------------------------------------------------------------------------------|-------|---------------------------------------------------------------------------------|---------|
| 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            |         |
| Color/Monochrome                       | Monochrome                                                                      | Color | Monochrome                                                                      | Color   |
| Effective pixels                       | 640(H)×480(V)                                                                   |       | 1600(H)×1200(V)                                                                 |         |
| Pixel size                             | 7.4(μm)×7.4(μm)                                                                 |       | 4.4(μm)×4.4(μm)                                                                 |         |
| Shutter function                       | Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s               |       |                                                                                 |         |
| Partial function                       | 12 to 480 lines                                                                 |       | 12 to 1200 lines                                                                |         |
| Frame rate (image read time)           | 80 fps (12.5ms)                                                                 |       | 30 fps (33.3ms)                                                                 |         |
| 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<br>(with no icing or condensation) |       | Operating: 0 to 40°C<br>Storage: -25 to 65°C<br>(with no icing or condensation) |         |
| Ambient humidity range                 | Operating and storage: 35% to 85% (with no condensation)                        |       |                                                                                 |         |
| Weight                                 | Approx. 55 g                                                                    |       | Approx. 76 g                                                                    |         |
| 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)           | 80 fps (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) |        |                    |        |
| Ambient humidity range                 | Operating and storage: 35% to 85% (with no condensation)                                                             |        |                    |        |
| Weight                                 | Approx. 150 g                                                                                                        |        |                    |        |
| Accessories                            | Instruction manual, installation bracket,<br>Four mounting brackets (M2)                                             |        | Instruction manual |        |

### High-speed Cameras

|                                        | FZ-SH                                                                        | FZ-SHC |
|----------------------------------------|------------------------------------------------------------------------------|--------|
| Image elements                         | Interline transfer reading all pixels, 1/3-inch CCD image elements           |        |
| Color/Monochrome                       | 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)           | 204 fps (4.9ms)                                                              |        |
| Field of vision, installation distance | Selecting a lens according to the field of vision and installation distance  |        |
| Ambient temperature range              | 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. 105 g                                                                |        |
| Accessories                            | Instruction manual                                                           |        |

**Intelligent Compact Cameras**

|                              | FZ-SQ010F                                                                                             | FZ-SQ050F          | FZ-SQ100F           | FZ-SQ100N           |
|------------------------------|-------------------------------------------------------------------------------------------------------|--------------------|---------------------|---------------------|
| Image elements               | 1/3-inch CMOS image elements                                                                          |                    |                     |                     |
| Color/Monochrome             | Color                                                                                                 |                    |                     |                     |
| Effective pixels             | 752(H)×480(V)                                                                                         |                    |                     |                     |
| Pixel size                   | 6.0(μm)×6.0(μm)                                                                                       |                    |                     |                     |
| Shutter function             | 1/250 to 1/32,258                                                                                     |                    |                     |                     |
| Partial function             | 8 to 480 lines                                                                                        |                    |                     |                     |
| Frame rate (image read time) | 60 fps                                                                                                |                    |                     |                     |
| Field of vision              | 7.5×4.7 to 13×8.2 mm                                                                                  | 13×8.2 to 53×33 mm | 53×33 to 240×153 mm | 29×18 to 300×191 mm |
| Installation distance        | 38 to 60 mm                                                                                           | 56 to 215 mm       | 220 to 970 mm       | 32 to 380 mm        |
| LED class (See note)         | Class 2                                                                                               |                    |                     |                     |
| Ambient temperature range    | Operating: 0 to 50°C<br>Storage: −25 to 65°C                                                          |                    |                     |                     |
| Ambient humidity range       | Operating and storage: 35% to 85% (with no condensation)                                              |                    |                     |                     |
| Weight                       | Approx. 150 g                                                                                         |                    | Approx. 140 g       |                     |
| Accessories                  | Mounting bracket (FQ-XL), polarizing filter attachment (FQ-XF1), instruction manual and warning label |                    |                     |                     |

Note : Applicable standards: IEC62471-2

## 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-VS3 (2m)                                                            | FZ-VSB3 (2m)   | FZ-VSL3 (2m)  | FZ-VSLB3 (2m)                 |
|----------------------------------|------------------------------------------------------------------------|----------------|---------------|-------------------------------|
| Type                             | Standard                                                               | Bend resistant | Right-angle   | Bend resistant<br>Right-angle |
| Shock resistiveness (durability) | 10 to 150 Hz single amplitude 0.15 mm 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           | 69 mm                                                                  | 69 mm          | 69 mm         | 69 mm                         |
| Weight                           | approx. 170 g                                                          | approx. 180 g  | approx. 170 g | approx. 180 g                 |

### Monitor Cable

|                           | FZ-VM                                                                       |
|---------------------------|-----------------------------------------------------------------------------|
| Vibration resistiveness   | 10 to 150Hz single amplitude 0.15 mm 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    | 75 mm                                                                       |
| Weight                    | approx. 170 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 12-VDC power supply must be provided to the Cable Extension Unit when connecting the Intelligent Compact Camera, the Strobe Controller, or the Lighting Controller.

2: The current consumption shows when connecting the Cable Extension Unit to an external power supply.

### Long-distance Camera Cables

|                                  | FZ-VS4 (15m)                                                           | FZ-VSL4 (15m) |
|----------------------------------|------------------------------------------------------------------------|---------------|
| Type                             | Standard                                                               | Right-angle   |
| Shock resistiveness (durability) | 10 to 150 Hz single amplitude 0.15 mm 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           | 78 mm                                                                  |               |
| Weight                           | approx. 1400 g                                                         |               |

### Parallel Cable

|                           | FZ-VP                                                                      | FZ-VPX        |
|---------------------------|----------------------------------------------------------------------------|---------------|
| Vibration resistiveness   | 10 to 150 Hz single amplitude 0.15 mm 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    | 75 mm                                                                      |               |
| Weight                    | approx. 160 g                                                              | approx. 180 g |

## Connection Table

**Camera Connection Table**

| Type of camera              | Model     | Resolution       | FZ4 series                                            |                                   |                                 |                               |
|-----------------------------|-----------|------------------|-------------------------------------------------------|-----------------------------------|---------------------------------|-------------------------------|
|                             |           |                  | Quad Processing<br>High-speed Controllers<br>FZ4-11 □ | High-speed Controllers<br>FZ4-7 □ | Standard Controllers<br>FZ4-6 □ | Lite Controllers<br>FZ4-L35 □ |
| Digital cameras             | FZ-SC     | 300,000 Pixels   | Yes                                                   | Yes                               | Yes                             | Yes                           |
|                             | FZ-S      | 300,000 Pixels   | Yes                                                   | Yes                               | Yes                             | Yes                           |
|                             | FZ-SC2M   | 2 million pixels | Yes                                                   | Yes                               | Yes                             | Yes                           |
|                             | FZ-S2M    | 2 million pixels | Yes                                                   | Yes                               | Yes                             | Yes                           |
| High-speed cameras          | FZ-SHC    | 300,000 Pixels   | Yes                                                   | Yes                               | Yes                             | Yes                           |
|                             | FZ-SH     | 300,000 Pixels   | Yes                                                   | Yes                               | Yes                             | Yes                           |
| Small digital cameras       | FZ-SFC    | 300,000 Pixels   | Yes                                                   | Yes                               | Yes                             | Yes                           |
|                             | FZ-SF     | 300,000 Pixels   | Yes                                                   | Yes                               | Yes                             | Yes                           |
|                             | FZ-SPC    | 300,000 Pixels   | Yes                                                   | Yes                               | Yes                             | Yes                           |
|                             | FZ-SP     | 300,000 Pixels   | Yes                                                   | Yes                               | Yes                             | Yes                           |
| Intelligent compact cameras | FZ-SQ010F | 360,000 Pixels   | Yes                                                   | Yes                               | Yes                             | Yes                           |
|                             | FZ-SQ050F | 360,000 Pixels   | Yes                                                   | Yes                               | Yes                             | Yes                           |
|                             | FZ-SQ100F | 360,000 Pixels   | Yes                                                   | Yes                               | Yes                             | Yes                           |
|                             | FZ-SQ100N | 360,000 Pixels   | Yes                                                   | Yes                               | Yes                             | Yes                           |

**Cameras / Cables Connection Table**

| Type of camera                                                           | Model               | Cable length | High-speed cameras | Digital cameras |                 |                 | Small digital cameras<br>Pen type / flat type | Intelligent compact cameras |
|--------------------------------------------------------------------------|---------------------|--------------|--------------------|-----------------|-----------------|-----------------|-----------------------------------------------|-----------------------------|
|                                                                          |                     |              |                    | 300,000-pixel   | 2 million-pixel | 5 million-pixel |                                               |                             |
| Camera Cables<br>Right-angle camera cables                               | FZ-VS3<br>FZ-VSL3   | 2m           | Yes                | Yes             | Yes             | Yes             | Yes                                           | Yes                         |
|                                                                          |                     | 3m           | Yes                | Yes             | Yes             | Yes             | Yes                                           | Yes                         |
|                                                                          |                     | 5m           | Yes                | Yes             | Yes             | Yes             | Yes                                           | Yes                         |
|                                                                          |                     | 10m          | Yes                | Yes             | Yes             | No              | Yes                                           | Yes                         |
| Bend resistant camera cables<br>Bend resistant right-angle camera cables | FZ-VSB3<br>FZ-VSLB3 | 2m           | Yes                | Yes             | Yes             | Yes             | Yes                                           | Yes                         |
|                                                                          |                     | 3m           | Yes                | Yes             | Yes             | Yes             | Yes                                           | Yes                         |
|                                                                          |                     | 5m           | Yes                | Yes             | Yes             | Yes             | Yes                                           | Yes                         |
| Long-distance camera cable<br>Long-distance right-angle camera cable     | FZ-VS4<br>FZ-VSL4   | 10m          | Yes                | Yes             | Yes             | No              | Yes                                           | Yes                         |
|                                                                          |                     | 15m          | Yes                | Yes             | Yes             | No              | Yes                                           | Yes                         |

## Processing Items

\* The items in red are High Grade processing items.

| Group                     | Icon | Processing Item                                                                                                                                             | Corresponding Page in the Catalog |
|---------------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Inspections / Measurement |      | Search<br>Used to identify the shapes and calculate the position of measurement objects.                                                                    |                                   |
|                           |      | Flexible Search<br>Recognizing the shapes of workpieces with variation and detecting their positions.                                                       | P20                               |
|                           |      | Sensitive Search<br>Search a small difference by dividing the search model in detail, and calculating the correlation.                                      | P20                               |
|                           |      | ECM Search<br>Used to search the similar part of model form input image. Detect the evaluation value and position.                                          |                                   |
|                           |      | Ec Circle Search<br>Extract circles using "round" shape information and get position, radius and quantity in high preciseness.                              |                                   |
|                           |      | Shape Search+<br>Used to Search the similar part of models from input image. Detect the evaluation value and position.                                      |                                   |
|                           |      | Shape Search II<br>Used to search the similar part of model from input image regardless of environmental changes. Detect the evaluation value and position. | P6                                |
|                           |      | Classification<br>Used when various kinds of products on the assembly line need to be sorted and identified.                                                |                                   |
|                           |      | Edge Position<br>Measure position of measurement objects according to the color change in measurement area.                                                 |                                   |
|                           |      | Edge Pitch<br>Detect edges by color change in measurement area. Used for calculating number of pins of IC and connectors.                                   |                                   |
|                           |      | Scan Edge Position<br>Measure peak/bottom edge position of workpieces according to the color change in separated measurement area.                          |                                   |
|                           |      | Scan Edge Width<br>Measure max/min/average width of workpieces according to the color change in separated measurement area.                                 |                                   |
|                           |      | Circular Scan Edge Position<br>Measure center axis, diameter and radius of circular workpieces.                                                             | P20                               |
|                           |      | Circular Scan Edge Width<br>Measure center axis, width and thickness of ring workpieces.                                                                    | P20                               |
|                           |      | Color Data<br>Used for detecting presence and mixed varieties of products by using color average and deviation.                                             |                                   |
|                           |      | Gravity and Area<br>Used to measure area, center of gravity of workpieces by extracting the color to be measured.                                           |                                   |
|                           |      | Labeling<br>Used to measure number, area and gravity of workpieces by extracting registered color.                                                          |                                   |
|                           |      | Label Data<br>Selecting one region of extracted Labeling, and get that measurement. Area and Gravity position can be got and judged.                        |                                   |
|                           |      | Labeling+<br>Extract objects of registered color, and measure many features such as number and circularity.                                                 |                                   |
|                           |      | Defect<br>Used for appearance measurement of plain-color measurement objects such as defects, stains and burrs.                                             |                                   |
|                           |      | PreciseDefect<br>Check the defect on the object. Parameters for extraction defect can be set precisely.                                                     | P21                               |
|                           |      | Fine Matching<br>Difference can be detected by overlapping and comparing (matching) registered fine images with input images.                               | P21                               |
|                           |      | Character Inspection<br>Recognize character according correlation search with model image registered in [Model Dictionary].                                 |                                   |
|                           |      | Date Verification<br>Reading character string is verified with internal date.                                                                               |                                   |
|                           |      | Model Dictionary<br>Register character pattern as dictionary. The pattern is used in [Character Inspection].                                                |                                   |
|                           |      | Barcode+ *1<br>Recognize barcode, verify and output decoded characters.                                                                                     |                                   |
|                           |      | 2DCode *2<br>Recognize 2D code and display where the code quality is poor.                                                                                  | P21                               |
|                           |      | 2DCode+ *2<br>Recognize 2D code, verify and output decoded characters.                                                                                      |                                   |
|                           |      | Circle Angle<br>Used for calculating angle of inclination of circular measurement objects.                                                                  |                                   |
| Image Capturing           |      | Camera Image Input<br>To input images from cameras. And set up the conditions to input images from cameras.                                                 |                                   |
|                           |      | Camera Image Input HDR<br>Create high-dynamic range images by acquiring several images with different conditions.                                           | P19                               |
|                           |      | Camera Image Input HDR Lite<br>HDR function for FZ-SQ□ Intelligent Compact Cameras.                                                                         |                                   |
|                           |      | Camera Switching<br>To switch the cameras used for measurement. Not input images from cameras again.                                                        |                                   |
|                           |      | Measurement Image Switching<br>To switch the images used for measurement. Not input images from camera again.                                               |                                   |
| Correcting images         |      | Position Compensation<br>Used when positions are differed. Correct measurement is performed by correcting position of input images.                         |                                   |
|                           |      | Trapezoidal Correction+<br>Rectify the trapezoidal deformed image.                                                                                          | P12                               |
|                           |      | Filtering<br>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                   |      | Background Suppression<br>To enhance contrast of images by extracting color in specified brightness.                                      |                                   |
|                                     |      | Brightness Correct Filter<br>Track brightness change of entire screen and remove gradual brightness change such as uneven brightness.     | P15                               |
|                                     |      | Color Gray Filter<br>Color image is converted into monochrome images to emphasize specific color.                                         |                                   |
|                                     |      | Extract Color Filter<br>Convert color image to color extracted image or binary image.                                                     |                                   |
|                                     |      | Anti Color Shading<br>To remove the irregular color/pattern by uniformizing max.2 specified colors.                                       |                                   |
|                                     |      | Stripes Removal Filter+<br>Remove the background pattern of vertical, horizontal and cross stripes.                                       |                                   |
|                                     |      | Stripes Removal Filter II<br>Remove the background pattern of vertical, horizontal and diagonal stripes.                                  | P18                               |
|                                     |      | Halation Cut+<br>Remove halation from input image.                                                                                        |                                   |
|                                     |      | Panorama+<br>Combine multiple image to create one big image.                                                                              |                                   |
|                                     |      | Polar Transformation<br>Rectify the image by polar transformation. Useful for OCR or pattern inspection printed on circle.                |                                   |
|                                     |      | Calculation<br>Used when using the judge results and measured values of Procltem which are registered in processing units.                |                                   |
|                                     |      | Line Regression<br>Used for calculating regression line from plural measurement coordinate.                                               |                                   |
| Assisting inspections / measurement |      | Circle Regression<br>Used for calculating regression circle from plural measurement coordinate.                                           |                                   |
|                                     |      | Calibration+<br>Transform (X,Y) position to the real coordinate system.                                                                   |                                   |
|                                     |      | Precise Calibration<br>Used for calibration corresponding to trapezoidal distortion and lens distortion.                                  | P18                               |
|                                     |      | User Data<br>Used for setting of the data that can be used as common constants and variables in scene group data.                         |                                   |
|                                     |      | Set Unit Data<br>Used to change the Procltem data (setting parameters, etc.) that has been set up in a scene.                             |                                   |
|                                     |      | Get Unit Data<br>Used to get one data (measured results, setting parameters, etc.) of Procltem that has been set up in a scene.           |                                   |
|                                     |      | Set Unit Figure<br>Used for re-setting the figure data (model, measurement area) registered in an unit.                                   |                                   |
|                                     |      | Get Unit Figure<br>Used for get the figure data (model, measurement area) registered in an unit.                                          |                                   |
|                                     |      | Trend Monitor<br>Used for displaying the information about results on the monitor, facilitating to avoid NG and analyze causes.           |                                   |
|                                     |      | Image Logging<br>Used for saving the measurement images to the memory and USB memory.                                                     |                                   |
|                                     |      | Image Conversion Logging<br>Used for saving the measurement images in JPEG and BMP format.                                                | P15                               |
|                                     |      | Data Logging<br>Used for saving the measurement data to the memory and USB memory.                                                        |                                   |
|                                     |      | Elapsed Time<br>Used for calculating the elapsed time since the measurement trigger input.                                                |                                   |
|                                     |      | Wait<br>Processing is stopped only at the set time. The standby time is set by the unit of [ms].                                          |                                   |
|                                     |      | Focus<br>Focus setting is supported.                                                                                                      | P19                               |
|                                     |      | Iris<br>Focus and aperture setting is supported.                                                                                          | P19                               |
| Branching processing                |      | Conditional Branch<br>Used where more than two kinds of products on the production line need to detected separately.                      |                                   |
|                                     |      | End<br>This Procltem must be set up as the last processing unit of a branch.                                                              |                                   |
| Outputting results                  |      | DI Branch<br>Same as Procltem "Branch". But you can change the targets of conditional branching via external inputs.                      |                                   |
|                                     |      | Data Output<br>Used when you need to output data to the external devices such as PLC or PC via serial ports.                              | P19                               |
|                                     |      | Parallel Data Output<br>Used when you need to output data to the external devices such as PLC or PC via parallel ports.                   |                                   |
|                                     |      | Parallel Judgement Output<br>Used when you need to output judgement results to the external devices such as PLC or PC via parallel ports. |                                   |
|                                     |      | Fieldbus Data Output<br>Outputs data to an external device, such as a Programmable Controller, through a fieldbus interface.              |                                   |
| Displaying results on the monitor   |      | Result Display<br>Used for displaying the texts or the figures in the camera image.                                                       |                                   |
|                                     |      | Display Image File<br>Display selected image file.                                                                                        |                                   |
|                                     |      | Display Last NG Image<br>Display the last NG images.                                                                                      | P19                               |

\*1. Bar Codes that can be read : 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), Pharmacode

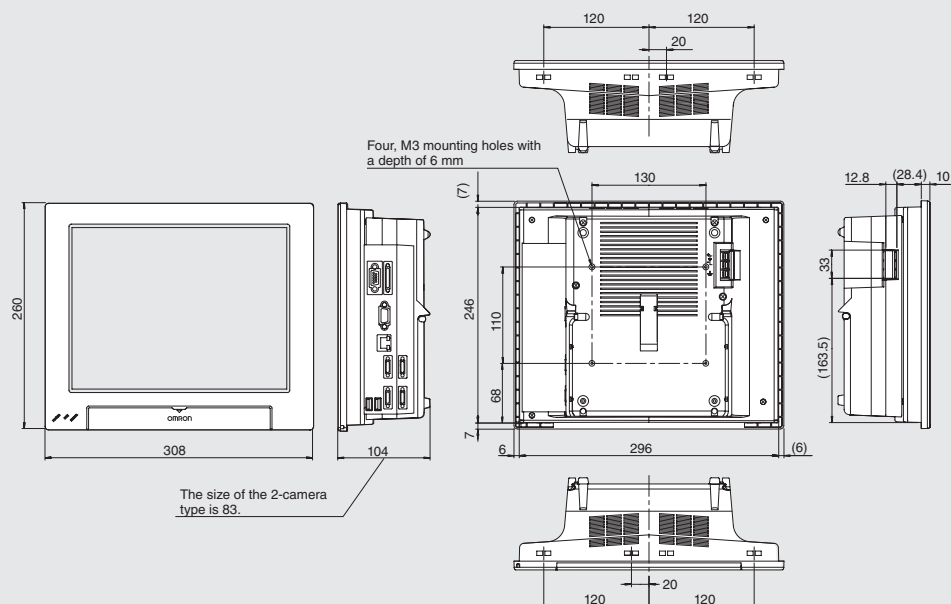
\*2. 2D Codes that can be read : Data Matrix (ECC200), QR Code

## External Dimensions (Unit:mm)

### FZ4-series Controllers

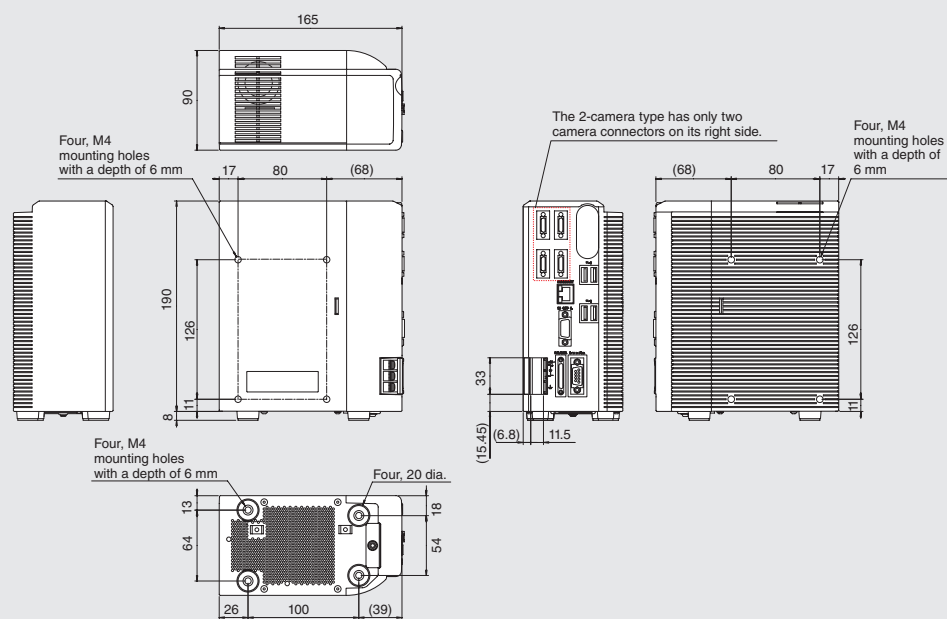
#### ■ LCD-integrated type

FZ4-H110□/-H110□-10  
 FZ4-110□/-110□-10  
 FZ4-H70□/-H70□-10  
 FZ4-70□/-70□-10  
 FZ4-H60□/-H60□-10  
 FZ4-60□/-60□-10

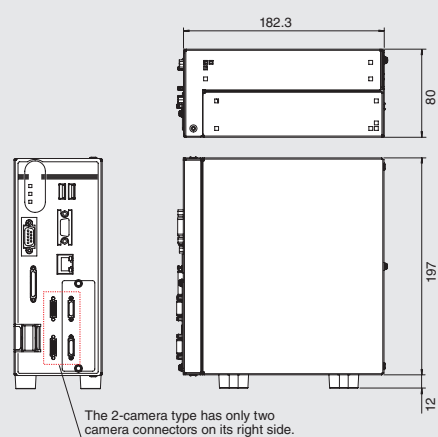


#### ■ Box-type

FZ4-H115□/-H115□-10  
 FZ4-115□/-115□-10  
 FZ4-H75□/-H75□-10  
 FZ4-75□/-75□-10  
 FZ4-H65□/-H65□-10  
 FZ4-65□/-65□-10



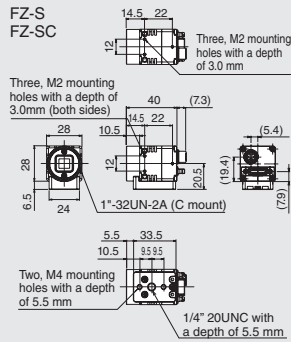
#### FZ4-L35□/-L35□-10



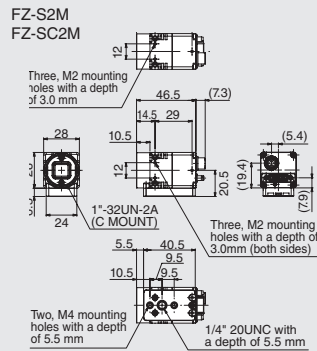
## Cameras

## Digital Cameras

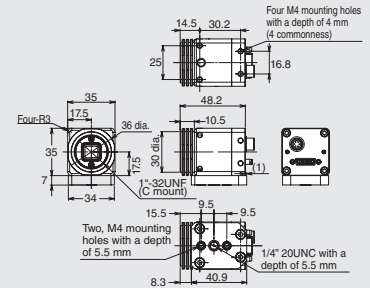
## ■ 300,000-pixel camera

FZ-S  
FZ-SC

## ■ 2 million-pixel camera

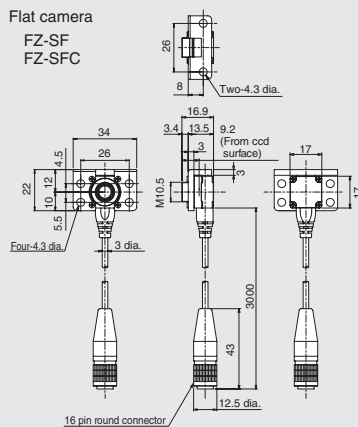
FZ-S2M  
FZ-SC2M

## ■ High-speed Camera

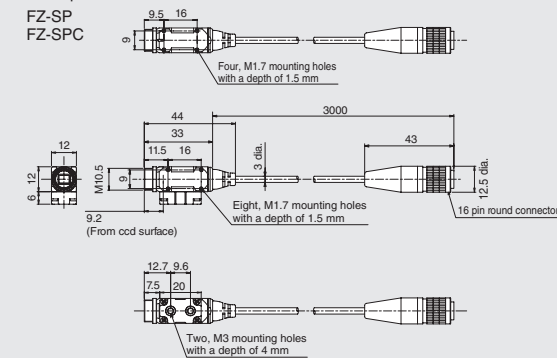
FZ-SH  
FZ-SHC

## Small digital cameras

## ■ Camera head

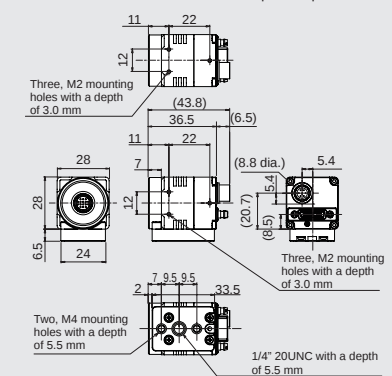
Flat camera  
FZ-SF  
FZ-SFC

## Pen-shaped camera

FZ-SP  
FZ-SPC

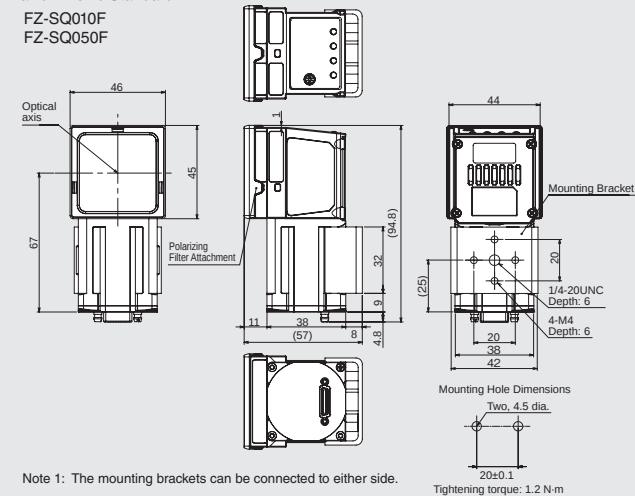
## ■ Camera amplifier

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



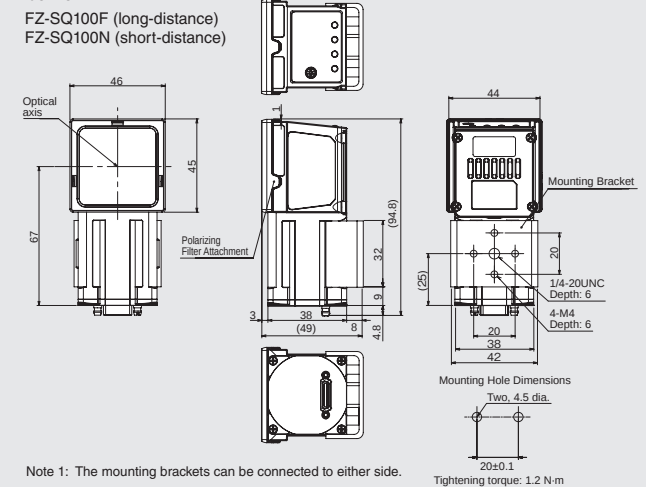
## ■ Intelligent Compact Cameras (Dimensional drawings are provided here only for the products that have undergone design changes as of Dec. 2012.)

## Narrow view / Standard

FZ-SQ10F  
FZ-SQ050F

Note 1: The mounting brackets can be connected to either side.

## Wide View

FZ-SQ100F (long-distance)  
FZ-SQ100N (short-distance)

Note 1: The mounting brackets can be connected to either side.

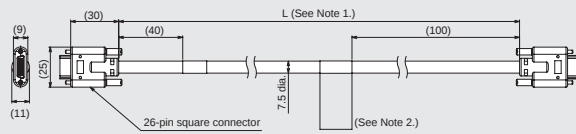
Tightening torque: 1.2 N·m

## Cables

### Camera Cables

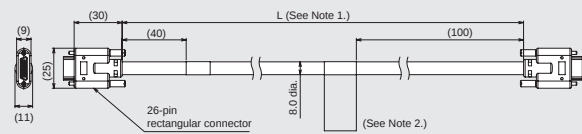
#### ■ Camera Cable

FZ-VS3



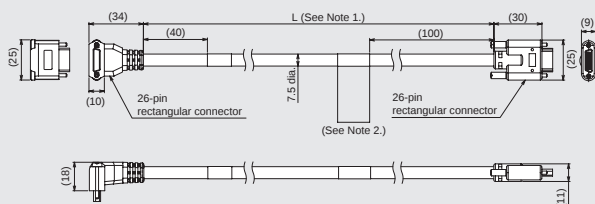
#### ■ Bend resistant Camera Cable

FZ-VSB3



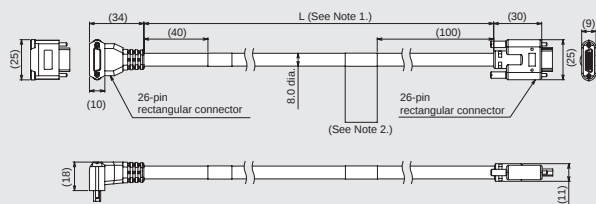
#### ■ Right-angle Camera Cable

FZ-VSL3



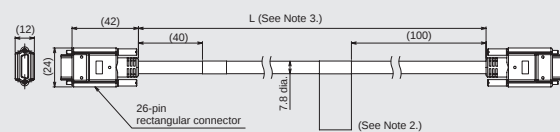
#### ■ Bend resistant Right-angle Camera Cable

FZ-VSLB3



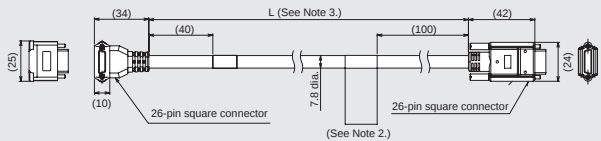
#### ■ Long-distance Camera Cable

FZ-VS4



#### ■ Long-distance Right-angle Camera Cable

FZ-VSL4



Note 1: Cable is available in 2m/3m/5m/10m.

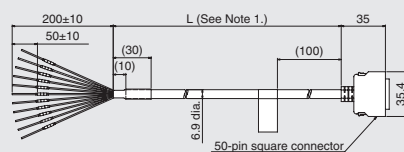
Note 2: Each camera cables has polarity.

Please ensure that the name plate side of the cable is connected to the controller.

Note 3: Cable is available in 15m.

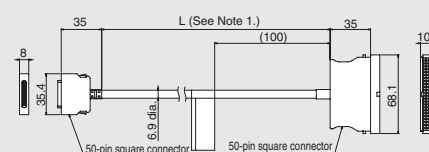
### Parallel Cable

FZ-VP



Note 1: cable is available in 2m/5m.

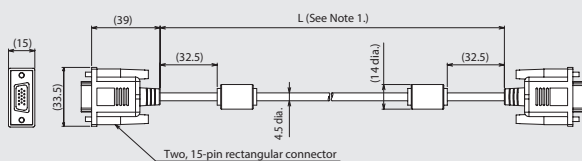
FZ-VPX



Note 1: cable is available in 2m/5m.

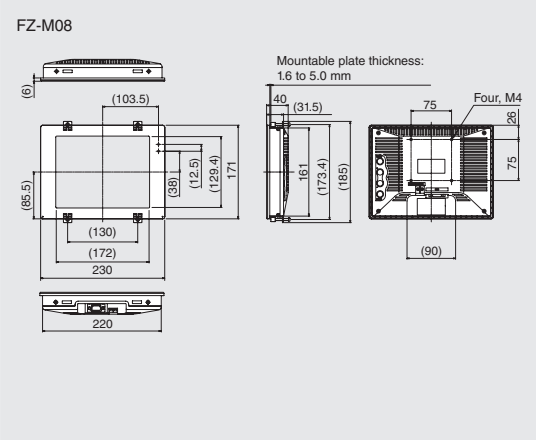
### Monitor Cable

FZ-VM

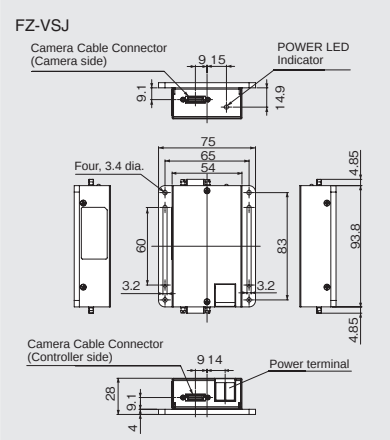


Note 1: Cable is available in 2m/5m.

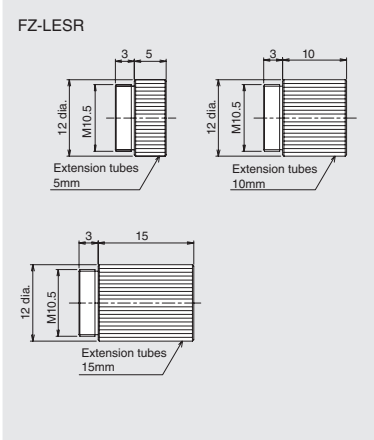
LCD Monitor



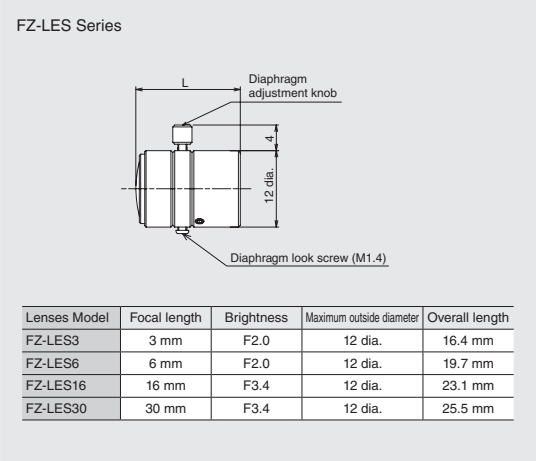
Camera Cable Extension Unit



Extension Tubes for Small Camera

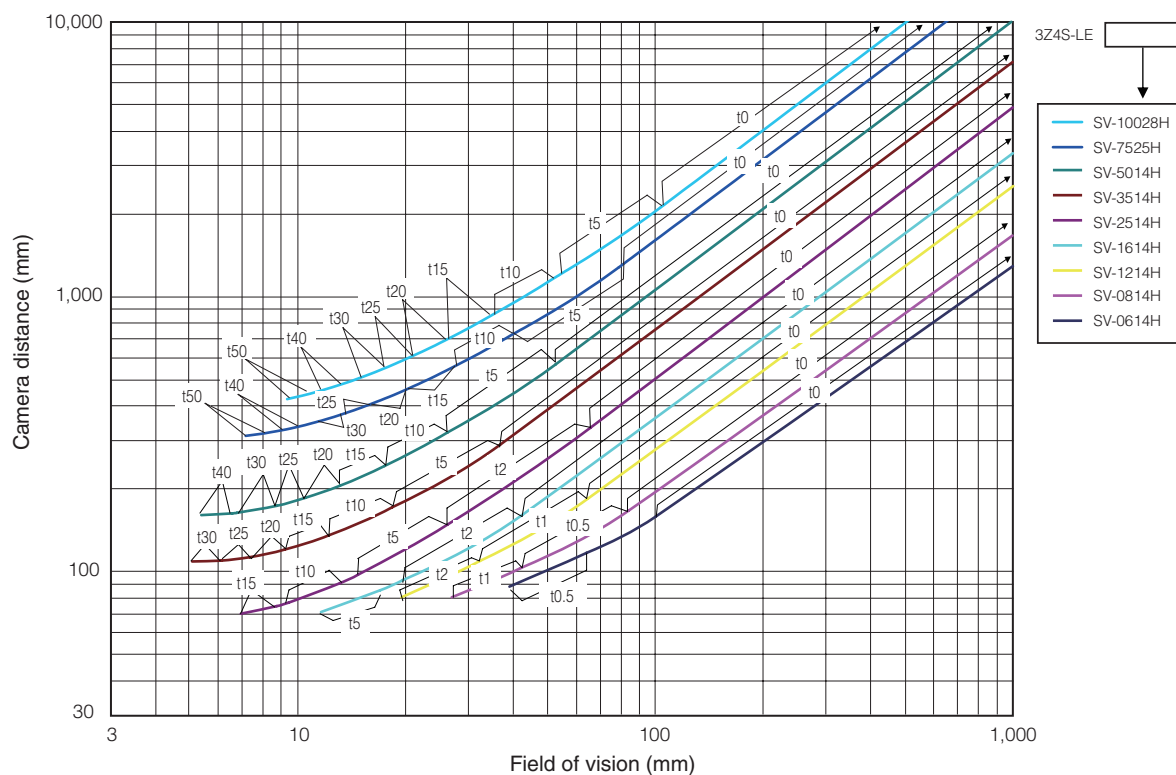


Lens for Small Camera

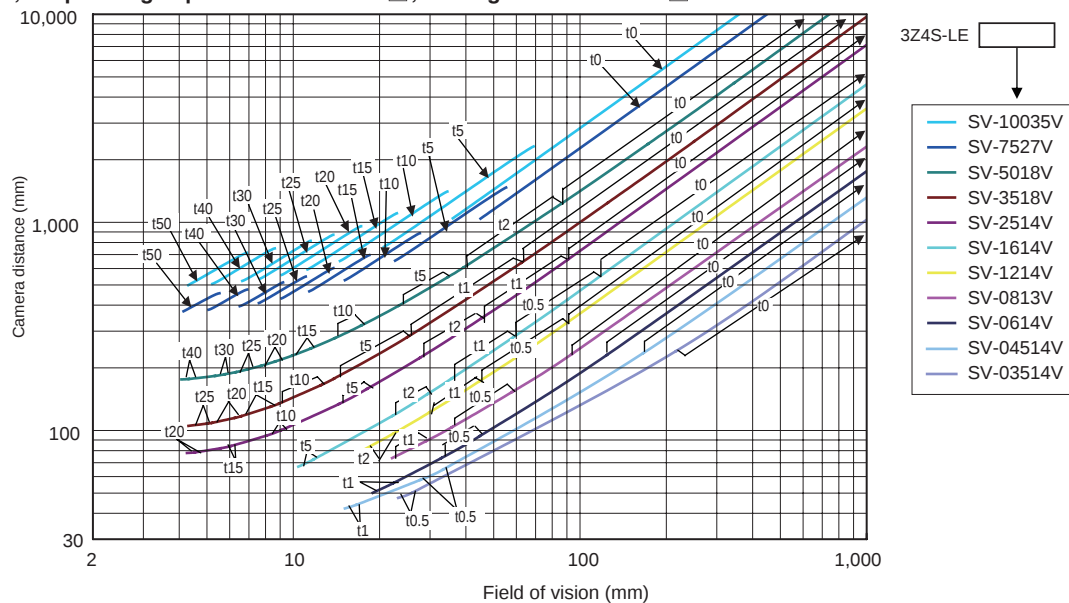


# Optical Chart

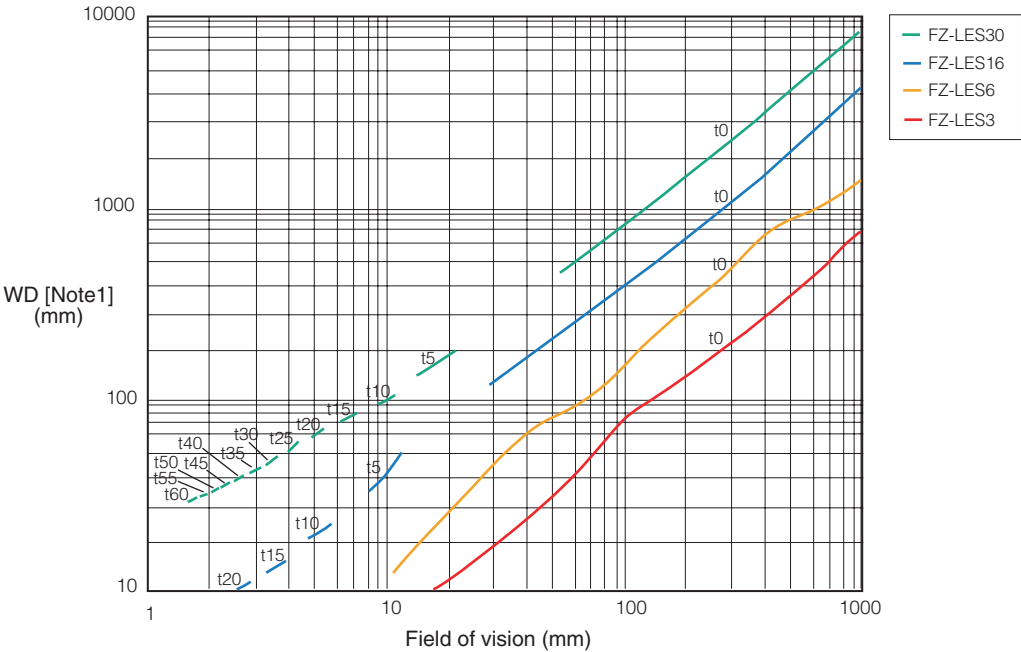
2 million-pixel digital camera FZ-S□2M



300,000-pixel High-speed camera FZ-SH□, and Digital camera FZ-S□



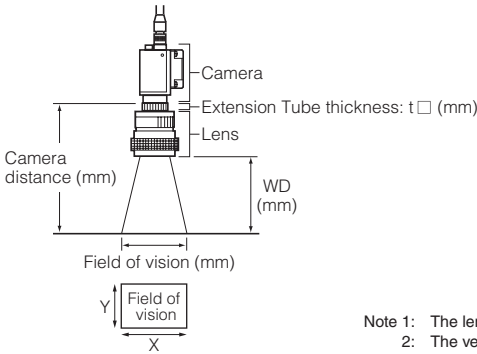
300,000-pixel small digital cameras FZ-SF□, FZ-SP□



Note 1: 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) (See Note 1.), and the Y axis of the optical chart shows the camera installation distance (mm) (See Note 2.).



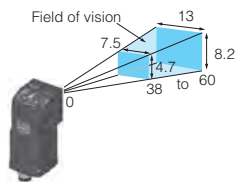
- Note 1: The lengths of the fields of vision given in the optical charts are the lengths of the Y axis.
- Note 2: The vertical axis represents WD for small cameras.

## Intelligent Compact Cameras

(Unit: mm)

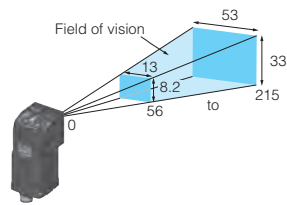
### ■ Narrow View

FZ-SQ010F



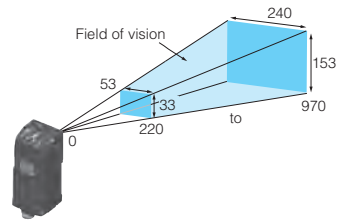
### ■ Standard

FZ-SQ050F



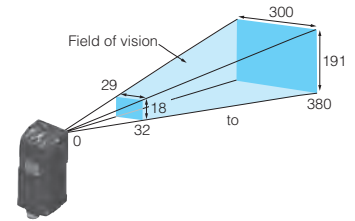
### ■ Wide View (Long-distance)

FZ-SQ100F



### ■ Wide View (Short-distance)

FZ-SQ100N



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