

Vision Sensors for Pick & Place

## FZM1-series

High speed and Precise Positioning



EtherCAT®

- » High-speed Processing
- » Superior Detection Stability
- » Easy Set-up of Connectivity and Quick Startup

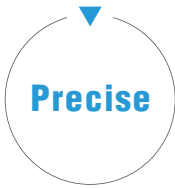
# Vision - tailored for pick & place

The Omron Vision Sensor FZM1 is optimized to detect in high speed and high accuracy the position and orientation of any object inside a machine. This helps to increase the production efficiency.

New generation image processing technologies and an intuitive user interface optimized for positioning applications. High speed communication via EtherCAT or UDP enables an easy interworking with motion components from Omron and other vendors. This increases the overall performance from positioning through control.



EtherCAT®



**Precise**

### **Increased Yield**

Stable inspections under challenging environmental conditions. Increase productivity and don't care about:

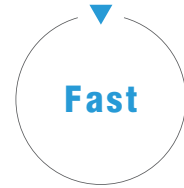
- differences of the work piece
- dust and dirt
- changing ambient environment



**Easy**

### **Reduce the cost of operation**

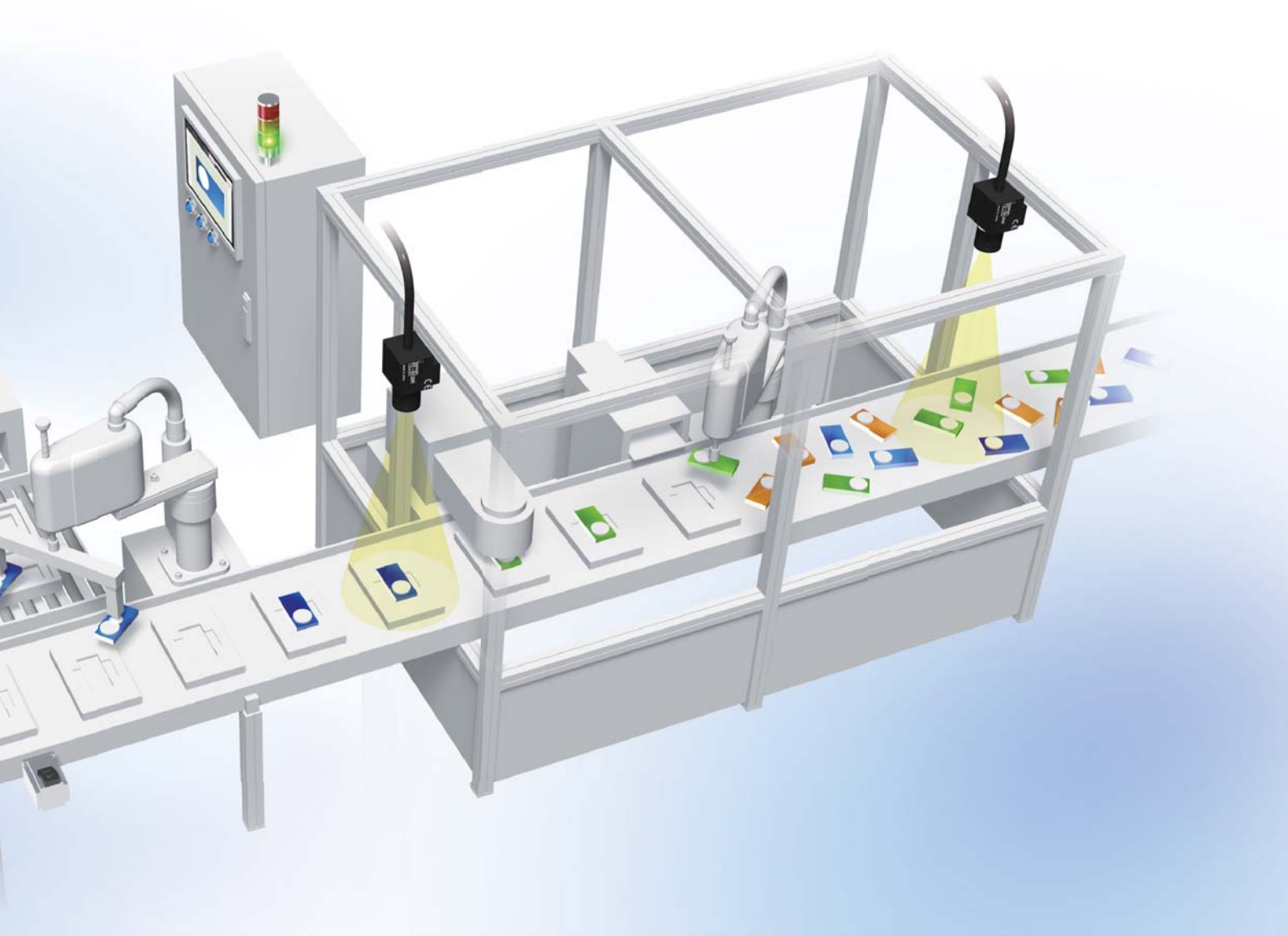
Omron FZM1 does not require troublesome configuration and calculation for positioning. Interactive menus and automatic calculations enable an easy setup for the connection to motion devices.



**Fast**

### **Increased Throughput**

High speed image acquisition and processing optimized for positioning tasks is supported by FZM1. This enables non-stop, undelayed positioning, which means Vision is not limiting anymore, the overall production speed.







# Stable Measurements Under Changing Conditions

More-robust operation means less stopping for detection mistakes and increased yield. This more than meets on-site needs and increases system performance.



[Detecting Alignment Marks with Light Interference]



Previously  
Position incorrectly detected.



FZM1  
Position detected accurately.



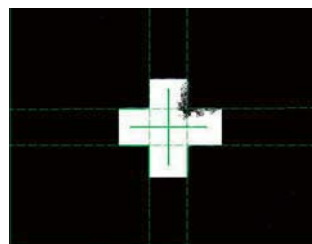
## Highest Detection Performance in the Industry

Optimized processing items for positioning have been included to handle a wide range of measurement objects. Just select the right processing item for the target object to enable stable inspection without complicated calculations and settings.

### Positioning with Alignment Marks

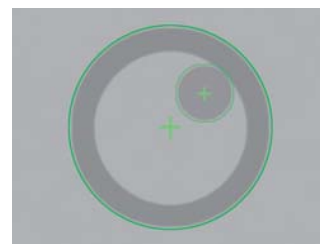
The alignment marks commonly used in manufacturing of LCD panels and PCBs can be precisely detected. Accurate detection is possible even if the marks are dirty or partially hidden.

EC Cross



Dirty

EC Circle

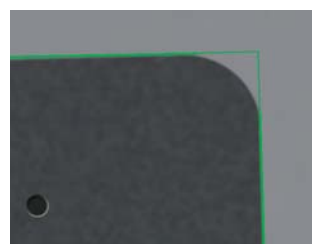


Overlapping

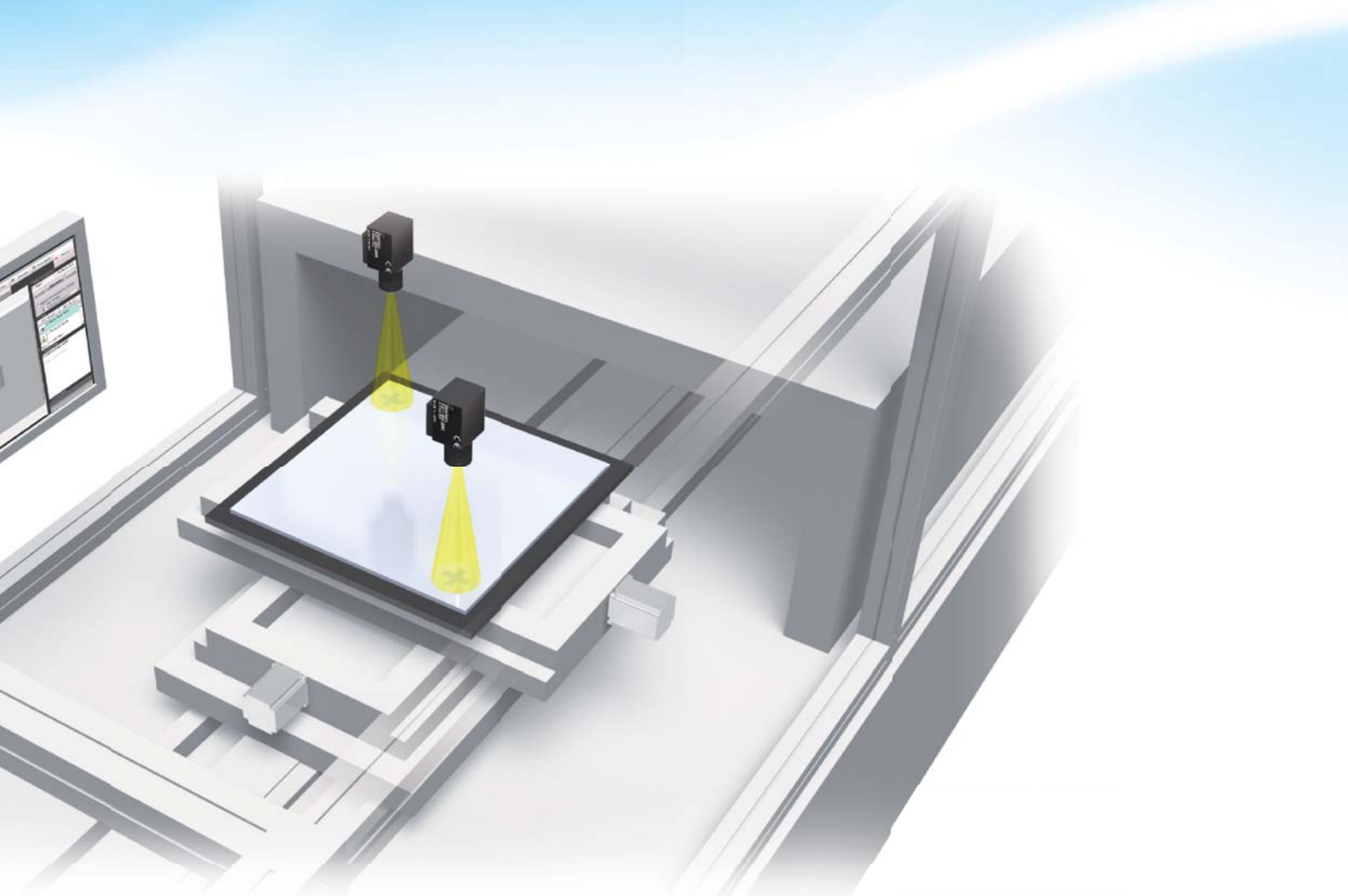
### Positioning with Corner Detection

Positioning can be performed by detecting a corner of the measurement object. Now, stable detection is possible even for rounded corners or when the edge is broken. This is ideal for glass plates, LCDs and other objects on which alignment marks cannot be printed.

EC Corner



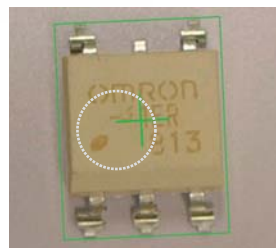
Rounded or Broken Corner



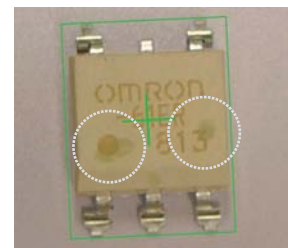
## Positioning by Shape of object

When picking electronic components or food items, unclear printing and dirt can make stable inspections impossible. FZM1 can identify the position and orientation of objects from their shapes. The use of ECM search processing enables precise position and attitude measurements without being affected by surface conditions.

## ECM Search



Printing Mistake



Dirt

## Superior Performance Under Severe Conditions

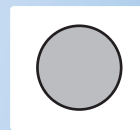
### EC: Edge Code

### Image Processing Technique

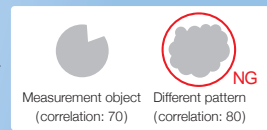
patent number 11-550303

Conventional search processing and pattern matching detect objects based on density differences or feature points registered on model images. This produced unstable detection when the measurement object was changed or the shape was not consistent. With EC image processing, the measurement object is recognized as a geometric shape to minimize offsets in the detection position caused by light interference or dirt. This achieves stable, accurate position detection.

#### Conventional Search Processing

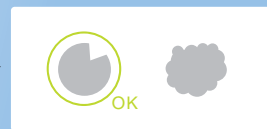
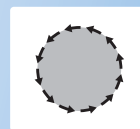


Model



The shape is imperfect, producing a low correlation. Dirt of the same size and color within the measurement region is incorrectly detected.

#### EC Image Processing



Changes in brightness are recognized as an edge code and geometric calculations determine the center of the circle and circumference edge. Even if the circle is broken, it is recognized as a circle, i.e., as the measurement object. Dirt and other abnormalities in the measurement region are differentiated so that they are not falsely detected.

Easy

# Get Relief from the Difficulties of Positioning

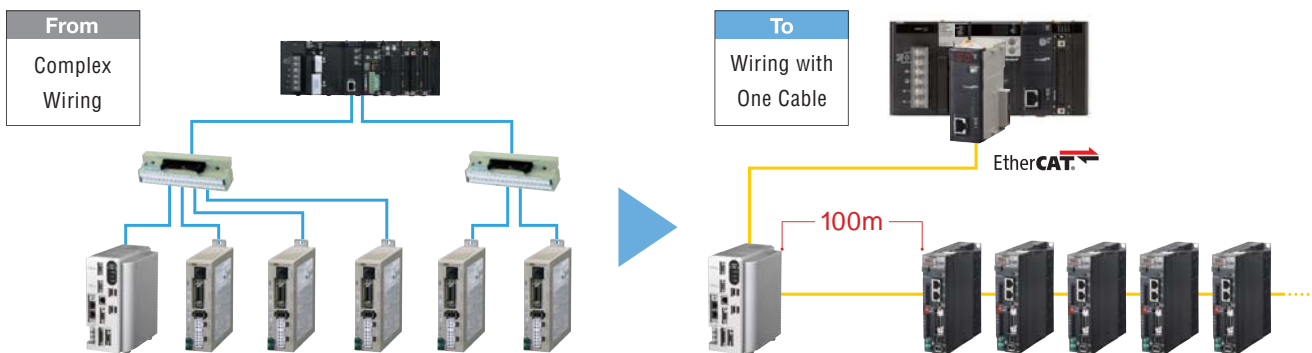
Wiring and Design

## Next-generation High-speed Communications with EtherCAT

Support for the EtherCAT open network enables realtime remote I/O control. Connect to OMRON PLCs or other EtherCAT components through EtherCAT communications to perform high-speed motion control.

### Less Wiring with Ethernet Cables

All trigger inputs and result outputs are performed using only an Ethernet cable. This eliminates wasted wiring work and helps prevent wiring mistakes when launching the system. With EtherCAT you can wire up to 100 m without a repeater to easily connect to Vision Sensors and Servo Drives.



### Reduced Ladder Programming

The PLC Link function communicates using three link areas: the command area, response area, and data output area. The PLC can control communications with the sensor simply by reading and writing words allocated in the I/O memory in the PLC. This greatly reduces the amount of ladder programming required for communications.



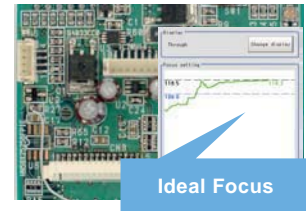
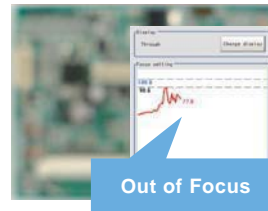
### What is EtherCAT?

EtherCAT is an open network based on Ethernet that enables realtime control. It is ideal for machine-control networks that include motion control. EtherCAT provides the operating principles and architecture required to achieve ultra-high-speed sync control and a bus topology that provides wiring efficiency. It solves the traditional complex wiring problems of Ethernet, which required many hubs and switches. OMRON applies EtherCAT to the high-speed, high-precision machine control networks required in FA sites, and will be releasing more EtherCAT products in the future.

## Camera Adjustments

# Focus and Aperture Adjustments

Focus and brightness, which use to be adjusted based on experience and instinct, have been expressed numerically and displayed in graphs so that you can literally see them. The ideal focus and aperture can be adjusted quickly by essentially anyone. Variations between different operators are eliminated and greater inspection precision can be achieved.



## Coordinate Conversions

# Simple Auto Calibration

The Vision Sensor provides a coordinate conversion function for different stages and robots. Coordinates can be converted for the Vision Sensor and output device without troublesome calculations.

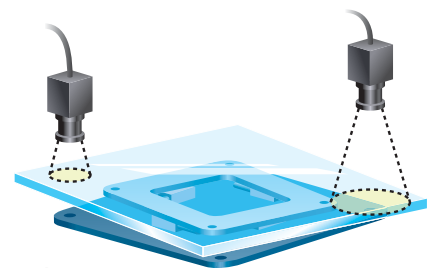
Handles Various Stages and Robots

|               |                         |
|---------------|-------------------------|
| Robot control | <b>XY,XYθ</b>           |
| Stage control | <b>XYθ,θXY,UVW,UVWR</b> |

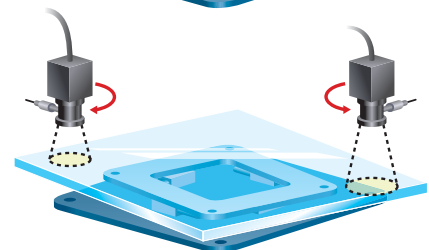
Flexible Camera Mounting

There are no Camera mounting restrictions even with alignment systems that use two Cameras. Differences between Camera angles and fields of vision can be calculated and coordinates converted without performing complex calculations in a PLC or other external device.

Use Different Fields of Vision

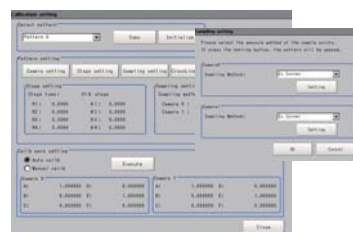


Mount at Any Angle



Easy Setup and configuration by an Application Wizard

Calibration between the Cameras and stage or robot can be easily set up using a wizard. Simply select the type of inspection to easily generate the calibration parameters. Automatically input sampling data from an external device via EtherCAT or UDP to eliminate mistakes that can occur in manual input. Fine-tuning can also be quickly and accurately performed for production changes or adjustments of the setup is required on-site.



Automatically input these with communications.

- STEP 1 Communications Setup
- STEP 2 Camera Setup
- STEP 3 External Device Setup
- STEP 4 Sampling
- STEP 5 Calibration Parameter Creation



Fast

# Faster Image acquisition and Processing



## A Lineup of High-speed Cameras

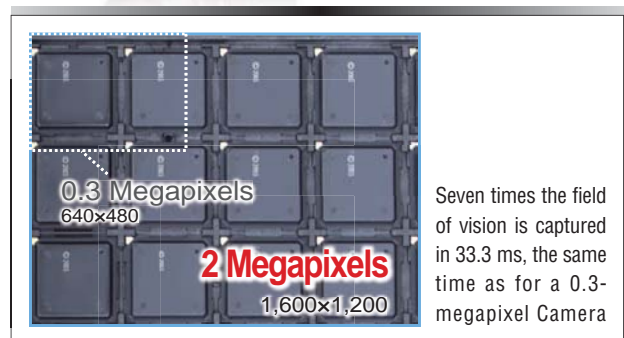
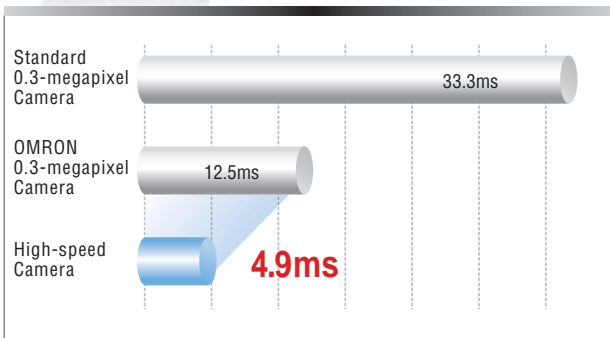
The speed of capturing images by a 0.3-megapixel Camera has been greatly increased. Even with a 2-megapixel Camera, the image capturing speed is equivalent to that of a standard 0.3-megapixel Camera. The difference is most obvious in applications requiring a wide field of vision, high precision, and high speed.



**NEW**  
**High-speed Camera**  
**0.3 Megapixels**



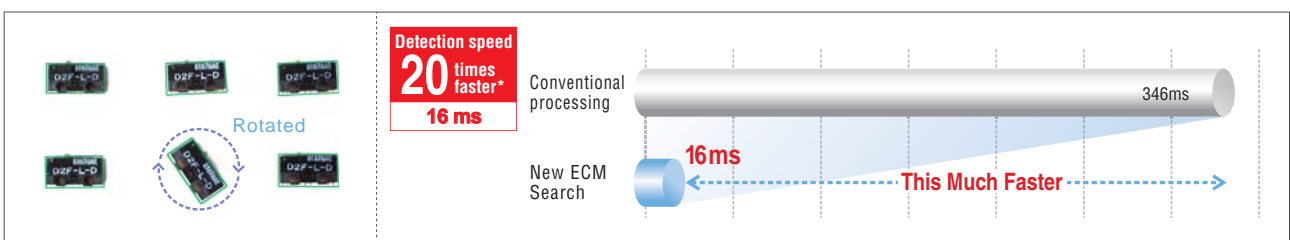
**Camera**  
**2 Megapixels**



## ECM Searches at 20 Times the Speed

The FZM1 provides an advanced version of OMRON's unique high-speed search processing, ECM. High-speed search processing is now possible for multiple measurement objects that are conveyed in different orientations. This enables high speed pick-and-place processing for moving objects.

### [Search Speed for Rotated Objects]



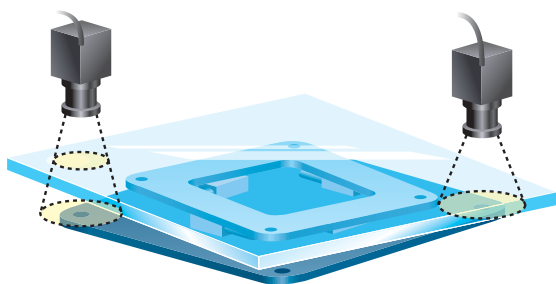
\*Individual workpieces under OMRON test conditions.



# Target Applications

FPD

## LCD Glass Plate Alignment



### Problem

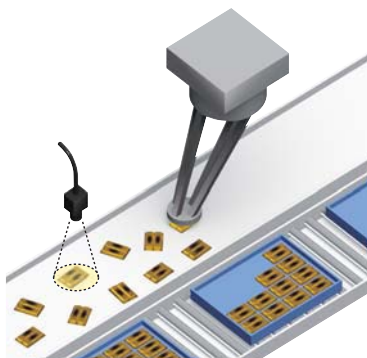
Yield was decreased because alignment marks could not be detected due to dirt and defects. Also, it was necessary to use a PLC to calculate the movement amounts of the stage from the measurement results from two Cameras, and the ladder program design and adjustment processes required excessive time.

### Solution

Alignment mark detection using the EC algorithm suppressed the effects of dirt and defects to enable stable detection. Calibration between the Cameras and stage could be achieved without complex settings or calculations, greatly reducing setup work.

Food and Packaging

## Pick and Place for Shiny Packages

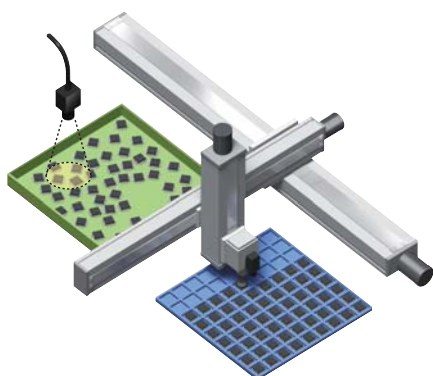


Reflections from the shiny packages made measurements unstable and caused frequent mistakes. To increase stability, precise parameter settings were required, increasing setup work. The increased number of parameters increased the processing time, which reduced throughput.

The new ECM Search, which resists light interference, greatly reduced the time required to set up lighting and adjust the parameters, creating stable, high-speed inspections. System throughput was increased.

Electronic Components

## High-speed Palletizing



The robot was kept waiting because of the long time required from image input to positioning output. This made it impossible to increase system throughput.

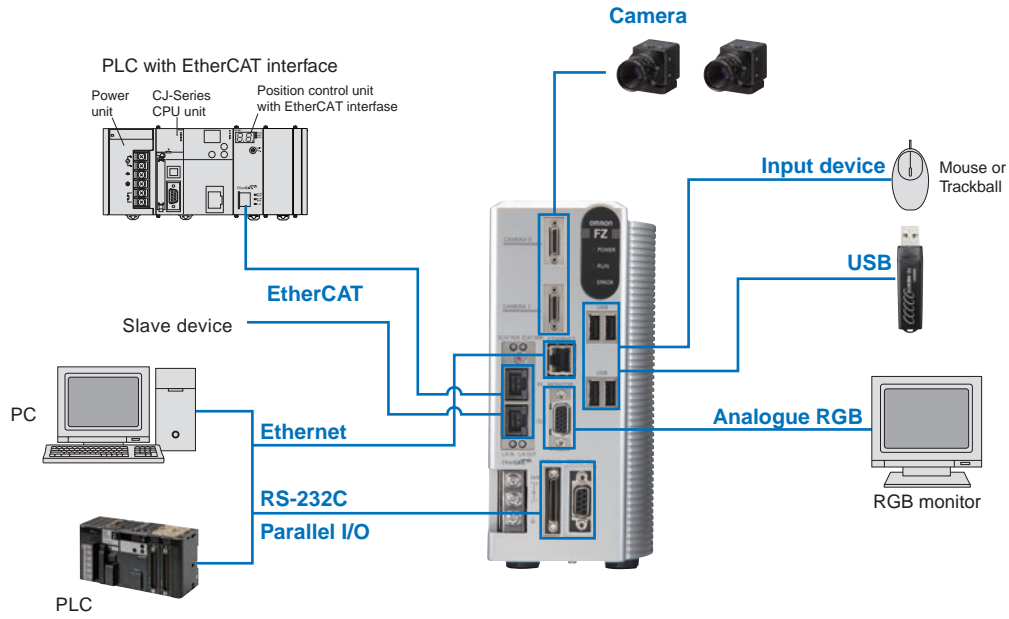
Using a high-speed Camera and faster image processing achieved high-speed processing. By further combining an OMRON Servo Drive and Position Control Unit that support EtherCAT communications, the time from inputting the image to starting the servo was greatly minimized.



# Vision Sensors for Positioning

# FZM1-Series

## System configuration



# FZM1-Series

## Ordering Information










| Item                       |  | Descriptions            |                        |   | Model  | Remarks  |              |
|----------------------------|--|-------------------------|------------------------|---|--|--|--------------|
| Controllers                | Standard Controllers with EtherCAT interface | Box-type Controllers    | Two-camera controllers | NPN   | FZM1-350-ECT   | -  |              |
|                            |  |                         |                        | PNP   | FZM1-355-ECT   |  |              |
| Cameras                    | High-speed Cameras                           | 300,000 Pixels          | Monochrome             |   | FZ-SH  | Lens required  |              |
|                            |  |                         | Color                  |   | FZ-SHC   |  |              |
|                            | Digital cameras                              | 300,000 Pixels          | Monochrome             |   | FZ-S   |  |              |
|                            |  |                         | Color                  |   | FZ-SC  |  |              |
|                            |  | 2 million pixels        | Monochrome             |   | FZ-S2M   |  |              |
|                            |  |                         | Color                  |   | FZ-SC2M  |  |              |
|                            | Small digital cameras                        | 300,000-pixel flat type | Monochrome             |   | FZ-SF  | CCTV lens required                                   |              |
|                            |  |                         | Color                  |   | FZ-SFC   |  |              |
|                            |  | 300,000-pixel pen type  | Monochrome             |   | FZ-SP  |  |              |
|                            | Color  |                         |                        | FZ-SPC  |  |  |              |
|                            | Intelligent cameras                          | Wide field of vision    | Color                  |   | FZ-SLC100  | Camera + Zoom, Autofocus Lens + Intelligent Lighting |              |
|                            |  | Narrow field of vision  |                        |   | FZ-SLC15   |  |              |
| Autofocus cameras          | Wide field of vision                         |                         |                        | FZ-SZC100   | Camera + Zoom, Autofocus Lens  |  |              |
|                            | Narrow field of vision                       |                         |                        | FZ-SZC15  |  |  |              |
| Cameras peripheral devices | Intelligent camera diffusion plate           | Wide field of vision    |                        | FZ-SLC100-DL  | -  |  |              |
|                            |  | Narrow field of vision  |                        | FZ-SLC15-DL   |  |  |              |
|                            | CCTV Lenses                                  |                         |                        | 3Z4S-LE Series  | -  |  |              |
|                            | Extension Tubes                              |                         |                        |   | -  |  |              |
|                            | Low-distortion Lenses                        |                         |                        | 3Z4S-LE SV-0614H/<br>SV-0814H/SV-1214H/<br>SV-1614H/SV-2514H/<br>SV-3514H/SV-5014H/<br>SV-7525H/SV-10028H | Low distortion lens for 2-million pixel cameras  |  |              |
|                            | Lenses for small camera                      |                         |                        | FZ-LES3/LES6/LES16/<br>LES30  | Lenses for 300,000-pixel small cameras   |  |              |
|                            | Extension Tubes for small camera             |                         |                        | FZ-LESR   | Extension Tubes for 300,000-pixel small cameras  |  |              |
| Cables                     | Camera Cable                                 |                         |                        | FZ-VS   | Cable length: 2 m, 5 m, or 10 m (See note 2.)  |  |              |
|                            | Bend resistant Camera Cables                 |                         |                        | FZ-VSB  | Cable length: 2 m, 5 m, or 10 m (See note 3.)  |  |              |
|                            | Right-angle Camera Cable (See note 1.)       |                         |                        | FZ-VSL  | Cable length: 2 m, 5 m, or 10 m (See note 2.)  |  |              |
|                            | Long-distance camera cable                   |                         |                        | FZ-VS2  | Cable length: 15 m (See note 4.)   |  |              |
|                            | Long-distance right-angle camera cable       |                         |                        | FZ-VSL2   | Cable length: 15 m (See note 4.)   |  |              |
|                            | Cable extension unit                         |                         |                        | FZ-VSJ  | Up to two Extension Units and three Cables can be connected.(Maximum cable length: 45 m (See note 5.)) |  |              |
|                            | Monitor cable                                |                         |                        | FZ-VM   | Cable length: 2 m or 5 m   |  |              |
|                            | Parallel cable                               |                         |                        | FZ-VP   | Cable length: 2 m or 5 m   |  |              |
|                            |  |                         | FZ-VPX (See note 6.)   | Cable length: 2 m or 5 m, Connector type  |  |  |              |
| Peripheral devices         | LCD monitor                                  |                         |                        | FZ-M08  | For Box-type Controllers   |  |              |
|                            | USB memory                                   | 2GB                     |                        | FZ-MEM2G  | Capacity: 2 GB   |  |              |
|                            |  | 8GB                     |                        | FZ-MEM8G  | Capacity: 8 GB   |  |              |
| Mouse                      |  |                         |                        | -   | Recommended Products (Optical Mouse)<br>Microsoft Corporation: Compact Optical Mouse, U81 Series       |  |              |
| External Lightings         |  |                         |                        | 3Z4S-LT Series  | -  |  |              |
|                            |  |                         |                        | FZ-LT Series  |  |  |              |
|                            |  |                         |                        | FL Series   |  |  |              |
| Strobe Controllers         | For 3Z4S-LT Series                           |                         |                        | Manufactured by MORITEX Corporation<br>3Z4S-LT MLEK-C100E1TS2   | Required to control external lighting from a Controller  | One channel  |              |
|                            |  | For FZ-LT Series        |                        |   |  | FZ-LTA100  | Two channels |
|                            |  |                         |                        |   |  | FZ-LTA200  |              |
| Lighting Controller        | For FL Series                                |                         |                        | FL-TCC1   | -  |  |              |

- Note:**
- This Cable has an L-shaped connector on the Camera end.
  - The 10-m cable cannot be used for the intelligent camera, autofocus camera and 5 million-pixel camera.
  - The 10-m cable cannot be used for the intelligent camera, autofocus camera 2 million-pixel camera and 5 million-pixel camera.
  - The 15-m cable cannot be used for the intelligent camera, autofocus camera and 5 million-pixel camera.
  - 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 17.
  - Scheduled for release soon.  
Connector-Terminal Block Conversion Units can be connected (Recommended Products: OMRON XW2B-50G4/50G5, XE2D-50G6)












## 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   |  |  |  |  |  |  |  |  |  |
| Focal length | 5mm   | 8mm   | 12mm  | 16mm  | 25mm  | 35mm   | 50mm  | 75mm  | 100mm   |
| 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  | M27.0 P0.5  | M27.0 P0.5  | M27.0 P0.5  | M35.5 P0.5   | M40.5 P0.5  | M34.0 P0.5  | M37.5 P0.5  |

### CCTV Lenses

| Model        | 3Z4S-LE SV-0614V  | 3Z4S-LE SV-0814V  | 3Z4S-LE SV-1214V  | 3Z4S-LE SV-1614V  | 3Z4S-LE SV-2514V  | 3Z4S-LE SV-3518V   | 3Z4S-LE SV-5018V  | 3Z4S-LE SV-7527V  | 3Z4S-LE SV-10035V   |
|--------------|---|---|---|---|---|--|---|---|---|
| Appearance   |  |  |  |  |  |  |  |  |  |
| Focal length | 6mm   | 8mm   | 12mm  | 16mm  | 25mm  | 35mm   | 50mm  | 75mm  | 100mm   |
| Brightness   | F1.4  | F1.3  | F1.4  | F1.4  | F1.4  | F1.8   | F1.8  | F2.7  | F3.5  |
| Filter size  | M27 P0.5  | M25.5 P0.5  | M27 P0.5  | M27 P0.5  | M27 P0.5  | M27 P0.5   | M30.5 P0.5  | M30.5 P0.5  | M30.5 P0.5  |

### Lenses for small camera

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

### 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. |

- Note:**
- 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.

### Extension Tubes for small camera

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

# FZM1-Series

## Ratings and Specifications

### Standard Controllers with EtherCAT interface

| Model                                 | NPN Output  |                        | FZM1-350-ECT   |
|---------------------------------------|---|------------------------|--|
|                                       | PNP Output  |                        | FZM1-355-ECT   |
| Connected Camera                      |   |                        | High-speed Cameras, Digital cameras, Small digital cameras, Intelligent camera, or Autofocus cameras   |
| No. of Cameras                        |   |                        | 2  |
| Processing resolution                 | When connected to a 300,000-pixel camera            |                        | 640 (H) × 480 (V)  |
|                                       | When connected to a 2 million-pixel camera          |                        | 1600 (H) × 1200 (V)  |
| No. of scenes                         |   |                        | 32   |
| Number of logged images (See note 1.) | When connected to a 300,000-pixel camera            | Connected to 1 camera  | Color camera: 250, Monochrome Camera: 252  |
|                                       |   | Connected to 2 cameras | Color camera: 125, Monochrome Camera: 126  |
|                                       | 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  |
| Operation                             |   |                        | Mouse or similar device  |
| Settings                              |   |                        | Create series of processing steps by editing the flowchart (Help messages provided).   |
| Serial communications                 |   |                        | RS-232C/422A: 1CH  |
| Network communications                |   |                        | Ethernet 100BASE-TX/10BASE-T   |
| EtherCAT communications               |   |                        | Protocol only for EtherCAT communication 100BASE-TX  |
| Parallel I/O                          |   |                        | 13 input (RESET, ENCTRG_A, ENCTRG_B, STEP/ENCTRG_Z, DSA, and DI0 to 7)<br>24 output (RUN, BUSY, GATE, OR, READY, ERROR, STGPUT0 to 1, and DO0 to 15) |
| Monitor interface                     |   |                        | Analog RGB video output, 1 channel<br>(Resolution: XGA 1,024 × 768 dots)   |
| USB interface                         |   |                        | 4 channels (supports USB 1.1 and 2.0)  |
| Power supply voltage                  |   |                        | 20.4 to 26.4 VDC   |
| Current consumption (See note 3.)     | When connected to a intelligent or autofocus camera |                        | 5 A max.   |
|                                       | When connected to a 300,000-pixel camera            |                        | 3.7 A max.   |
|                                       | When connected to a 2 million-pixel camera          |                        |  |
| Ambient temperature range             |   |                        | Operating: 0 to 45 °C, 0 to 50 °C (See note 2.), Storage: -20 to 65 °C (with no icing or condensation)   |
| Ambient humidity range                |   |                        | Operating and storage: 35% to 85% (with no condensation)   |
| Weight                                |   |                        | Approx. 1.9 kg   |
| Accessories                           |   |                        | Please Read First, Instruction manual (Setup)  |

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

### High-speed Cameras

| Model                        | 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              | Selecting a lens according to the field of vision and installation distance    |        |
| 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 cameras, autofocus cameras**

| Model                              | FZ-SLC100  | FZ-SLC15                   | FZ-SZC100                    | FZ-SZC15                   |
|------------------------------------|--|----------------------------|------------------------------|----------------------------|
| Image elements                     | Interline transfer reading all pixels, 1/3-inch CCD image elements             |                            |                              |                            |
| Color/Monochrome                   | Color  |                            |                              |                            |
| Effective pixels                   | 640 (H) × 480 (V)  |                            |                              |                            |
| Pixel size                         | 7.4 (μm) × 7.4 (μm)  |                            |                              |                            |
| Shutter function                   | Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s              |                            |                              |                            |
| Partial function                   | 12 to 480 lines  |                            |                              |                            |
| Frame rate (image read time)       | 80 fps (12.5 ms)   |                            |                              |                            |
| Field of vision (See note 2.)      | 13 to 100mm (See note1.)   | 2.9 to 14.9mm (See note1.) | 13 to 100mm (See note1.)     | 2.9 to 14.9mm (See note1.) |
| Installation distance              | 70 to 190mm (See note1.)   | 35 to 55mm (See note1.)    | 77.5 to 197.5mm (See note1.) | 47.5 to 67.5mm             |
| LED class (See note 3.) (lighting) | Class 2  |                            | —                            |                            |
| Ambient temperature range          | Operating: 0 to 50 °C<br>Storage: -25 to 65 °C (with no icing or condensation) |                            |                              |                            |
| Ambient humidity range             | Operating and storage: 35% to 85% (with no condensation)                       |                            |                              |                            |
| Weight                             | Approx. 670 g  | Approx. 700 g              | Approx. 500 g                |                            |
| Accessories                        | Instruction manual and hexagonal wrench  |                            |                              |                            |

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

**Digital cameras**

| Model                                  | FZ-S   | FZ-SC | FZ-S2M   | FZ-SC2M |
|--|--|-------|--|---------|
| Image elements                         | Interline transfer reading all pixels<br>1/3-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 (12.5 ms)   |       | 30 fps (33.3 ms)   |         |
| Field of vision, installation distance | Selecting a lens according to the field of vision and installation distance    |       |  |         |
| Ambient temperature range              | Operating: 0 to 50 °C<br>Storage: -25 to 65 °C (with no icing or condensation) |       | Operating: 0 to 40 °C<br>Storage: -25 to 65 °C (with no icing or condensation) |         |
| 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**

| Model                                  | 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 (12.5 ms)  |        |                    |        |
| 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 |        |

# FZM1-Series

## LCD Monitor

|                           |   |
|---------------------------|---|
| Model                     | <b>FZ-M08</b>   |
| 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 manual and Four mounting brackets                               |

## Cable Extension Unit

|                                    |   |
|------------------------------------|---|
| Model                              | <b>FZ-VSJ</b>   |
| 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 manual and 4 mounting screws                                    |

**Note:** 1. A 12-VDC power supply must be provided to the Cable Extension Unit when connecting the Intelligent camera, the Autofocus camera, 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.

## Camera Cables

| Model                            | FZ-VS (2m)   | FZ-VSB (2m)  | FZ-VSL (2m)  |
|----------------------------------|--|--------------|--------------|
| 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% (with no condensation)               |              |              |
| Ambient atmosphere               | No corrosive gases   |              |              |
| Material                         | Cable sheath, connector: PVC   |              |              |
| Minimum bending radius           | 69 mm  | 69 mm        | 69 mm        |
| Weight                           | approx. 170g   | approx. 220g | approx. 170g |

## Long-distance Camera Cables

| Model                            | FZ-VS2 (15m)   | FZ-VSL2 (15m) |
|----------------------------------|--|---------------|
| 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% (with no condensation)               |               |
| Ambient atmosphere               | No corrosive gases   |               |
| Material                         | Cable sheath, connector: PVC   |               |
| Minimum bending radius           | 93 mm  |               |
| Weight                           | approx. 1600g  |               |

## Monitor Cable

|                           |   |
|---------------------------|---|
| Model                     | <b>FZ-VM</b>  |
| 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% (with no condensation)                    |
| Ambient atmosphere        | No corrosive gases  |
| Material                  | Cable sheath: heat-resistant PVC Connector: PVC                             |
| Minimum bending radius    | 75 mm   |
| Weight                    | approx. 170g  |



**Parallel Cable**

| Model                     | 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% (with no condensation)                    |              |
| Ambient atmosphere        | No corrosive gases  |              |
| Material                  | Cable sheath: heat-resistant PVC Connector: resin                           |              |
| Minimum bending radius    | 75 mm   |              |
| Weight                    | approx. 160g  | approx. 180g |

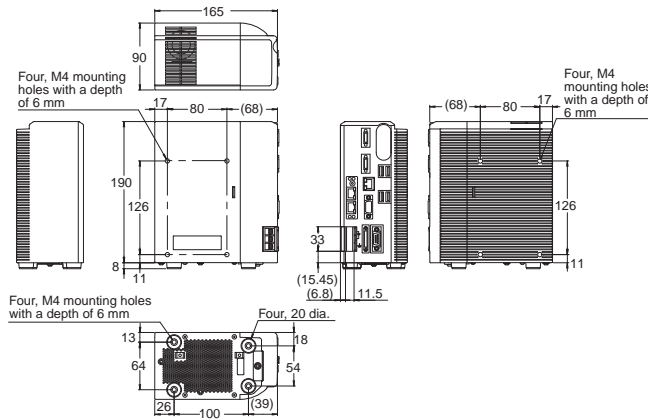
**Connection Table**

**Cameras / Cables Connection Table**

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

Controllers

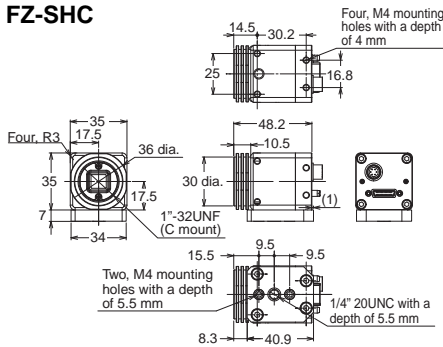
FZM1-35□-ECT



Cameras

•High-speed Cameras

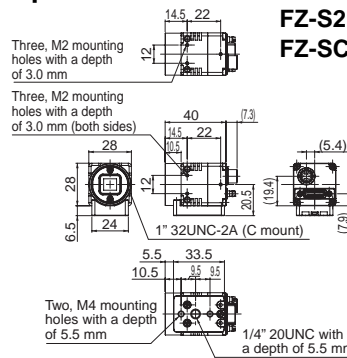
FZ-SH  
FZ-SHC



•Digital cameras

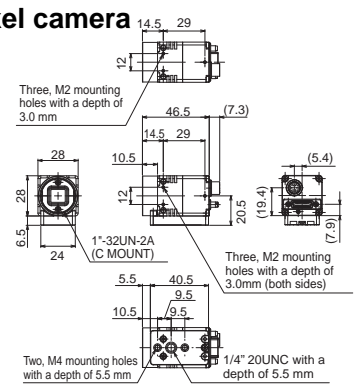
300,000-pixel camera

FZ-S  
FZ-SC



2 million-pixel camera

FZ-S2M  
FZ-SC2M

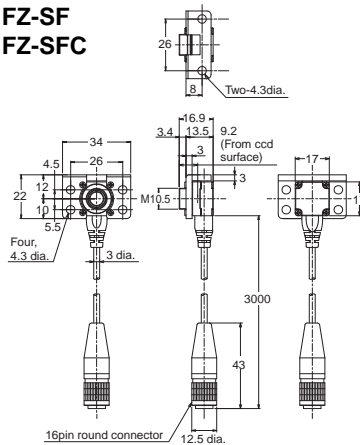


•Small digital cameras

Camera head

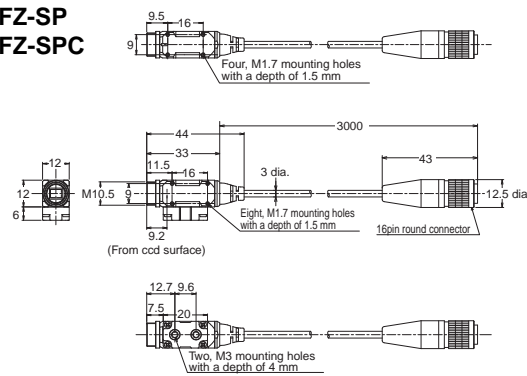
Flat camera

FZ-SF  
FZ-SFC



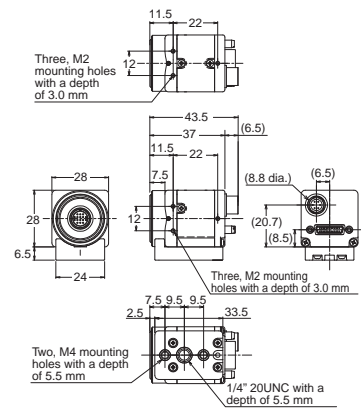
Pen-shaped camera

FZ-SP  
FZ-SPC



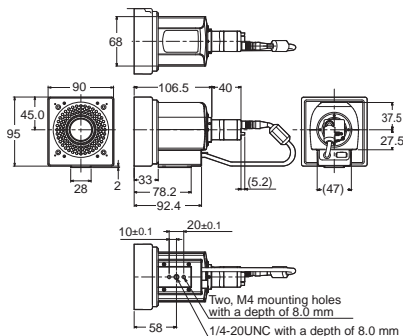
Camera amplifier

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

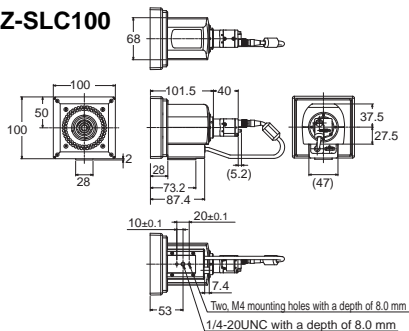


•Intelligent camera

FZ-SLC15

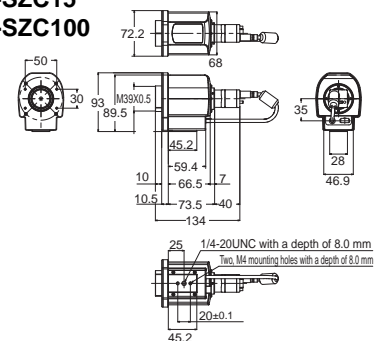


FZ-SLC100



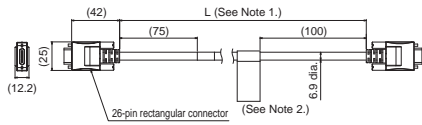
•Auto focus camera

FZ-SZC15  
FZ-SZC100

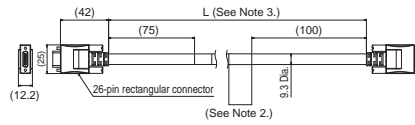


Cable

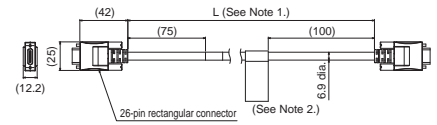
•Camera Cable  
Camera Cable  
FZ-VS



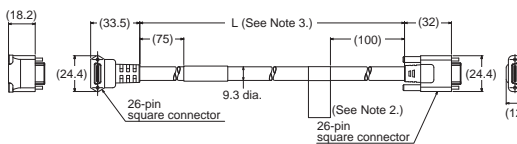
Long-distance Camera Cable  
FZ-VS2



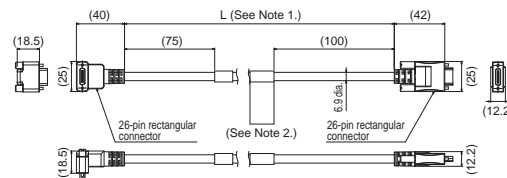
Bend resistant Cable  
FZ-VSB



Long-distance Right-angle Camera Cable  
FZ-VSL2

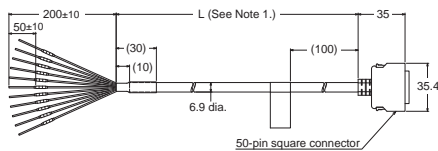


Right-angle Camera Cable  
FZ-VSL



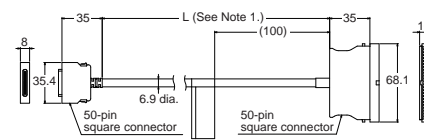
- Note:**
1. Cable is available in 2m/5m/10m. The FZ-VS, FZ-VSB, and FZ-VSL are also available with a cable length of 3.5 m.
  2. Each camera cables has polarity. Please ensure that the name plate side of the cable is connected to the controller.
  3. Cable is available in 15m.

Parallel Cable  
FZ-VP



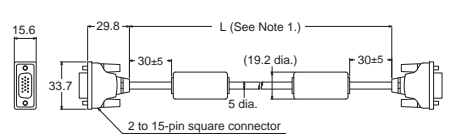
**Note:** 1. cable is available in 2m/5m.

FZ-VPX



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

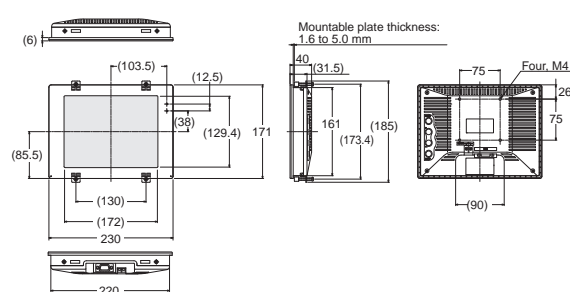
Monitor Cable  
FZ-VM



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

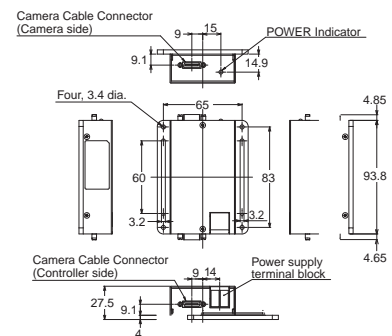
LCD Monitor

FZ-M08



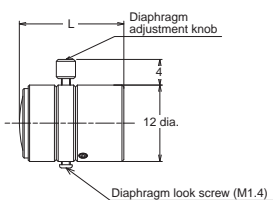
Camera Cable Extension Unit

FZ-VSJ



Lens for small camera

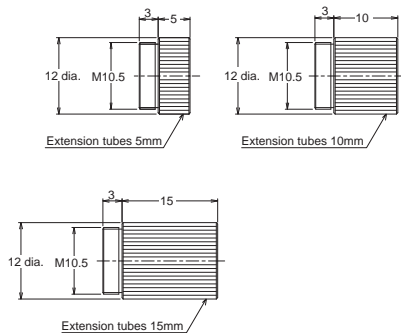
FZ-LES Series



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

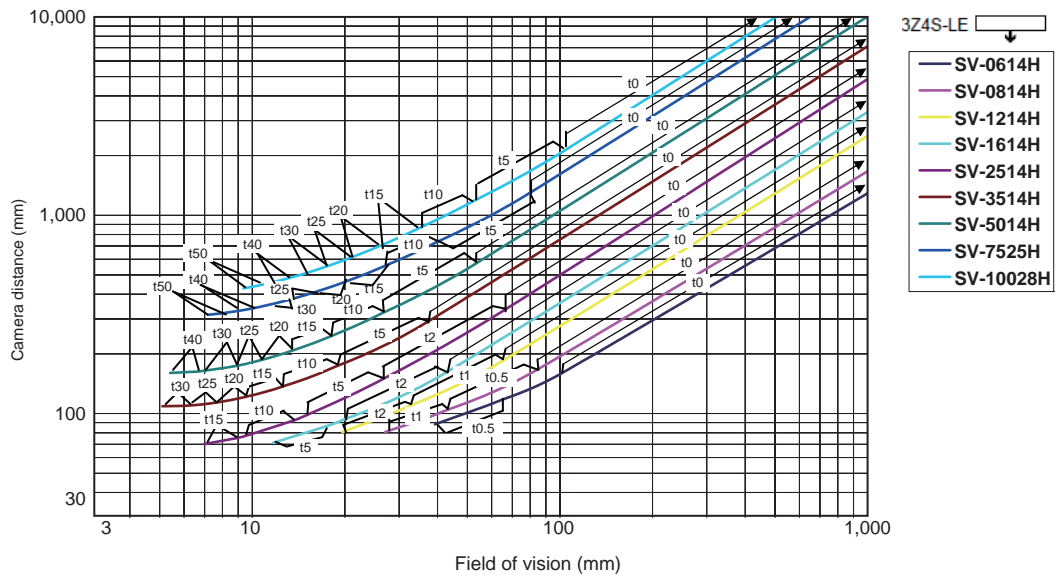
Extension Tubes for small camera

FZ-LESR

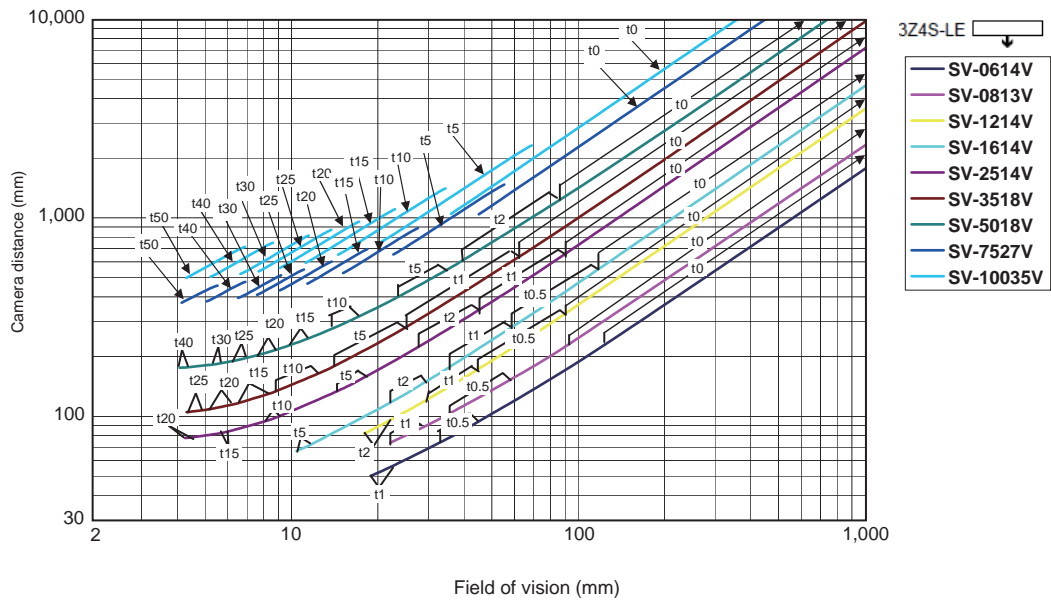


# FZM1-Series Optical Chart

## 2 million-pixel Digital camera FZ-S□2M

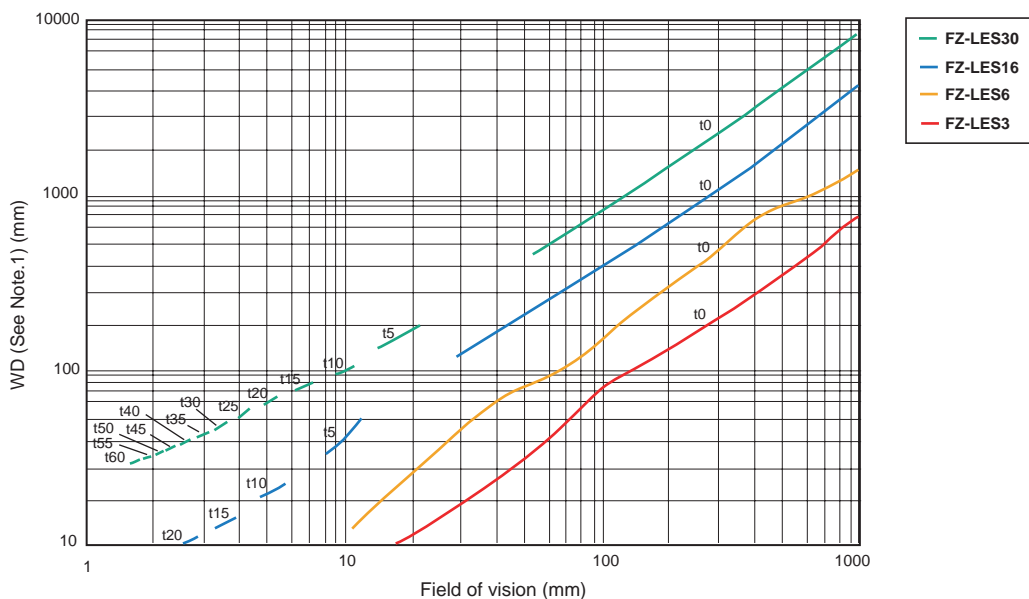


## 300,000-pixel High-speed camera FZ-SH□, and Digital camera FZ-S□





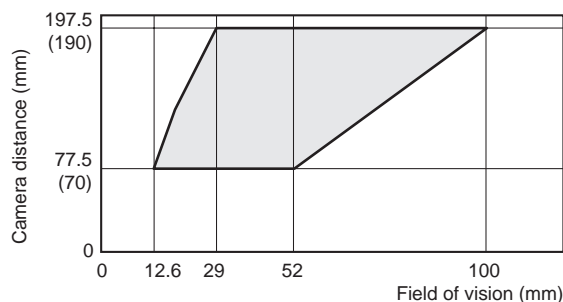
300,000-pixel Small digital cameras FZ-SF□, FZ-SP□



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

Intelligent camera, autofocus camera with wide field of vision

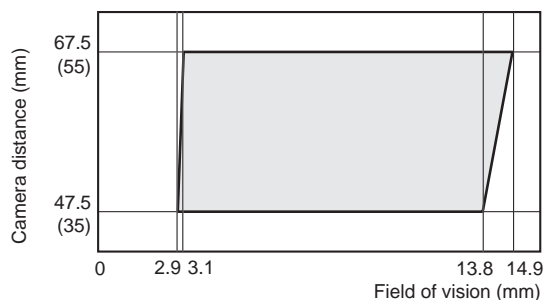
FZ-S□C100



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

with narrow field of vision

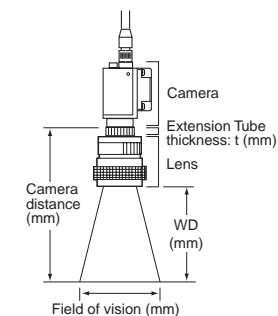
FZ-S□C15



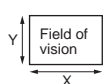
Note: 1. The value in parentheses is for the camera installation distance when using an Intelligent Camera.  
2. Be sure to check the Instruction Sheet packed with the product before using an Intelligent Camera or Autofocus Camera.

•Meaning of Optical Chart

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



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



## Read and Understand this Catalog

Please read and understand this catalog before purchasing the product. Please consult your OMRON representative if you have any questions or comments.

## Warranty and Limitations of Liability

### WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

### LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted. IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

## Application Considerations

### SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of the product in the customer's application or use of the product.

Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used. Know and observe all prohibitions of use applicable to this product.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

### PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

## Disclaimers

### CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons. Consult with your OMRON representative at any time to confirm actual specifications of purchased product.

### DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

### PERFORMANCE DATA

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

## OMRON Corporation Industrial Automation Company

Tokyo, JAPAN

Contact: [www.ia.omron.com](http://www.ia.omron.com)

### Regional Headquarters

#### OMRON EUROPE B.V.

#### Sensor Business Unit

Carl-Benz-Str. 4, D-71154 Nufringen, Germany  
Tel: (49) 7032-811-0/Fax: (49) 7032-811-199

#### OMRON ASIA PACIFIC PTE. LTD.

No. 438A Alexandra Road # 05-05/08 (Lobby 2),  
Alexandra Technopark,  
Singapore 119967  
Tel: (65) 6835-3011/Fax: (65) 6835-2711

#### OMRON ELECTRONICS LLC

One Commerce Drive Schaumburg,  
IL 60173-5302 U.S.A.  
Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

#### OMRON (CHINA) CO., LTD.

Room 2211, Bank of China Tower,  
200 Yin Cheng Zhong Road,  
PuDong New Area, Shanghai, 200120, China  
Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2200

### Authorized Distributor:

© OMRON Corporation 2010 All Rights Reserved.  
In the interest of product improvement,  
specifications are subject to change without notice.

CSM\_6\_1\_0213  
Cat. No. Q177-E1-01

Printed in Japan  
0510 (0510) (w)