



OMRON

Magnificent Performance

The High-performance Vision Sensor

F250

Yes, *eye* I can.
The F250 can.

Yes, *eye* I can.

The F250 can.

When faced with extremely fine variations, can a sensor match the human eye in seeing the difference?

OMRON's answer is, "Yes, I can" with the new F250. The F250 achieves what conventional Vision Sensors cannot. It sees the difference.



The High-performance Vision Sensor

F250



Advanced Algorithms

Inspection of Fine Scratches, Dirt, and Deformation

Confirmation of Expiration Dates and Lot Numbers

EC Defect Inspection



QUEST Character Recognition



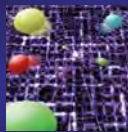
High-precision Positioning and Low-contrast Workpiece Detection

Inspection of Characters and Graphic Patterns for Blurring or Dirt

EC Positioning



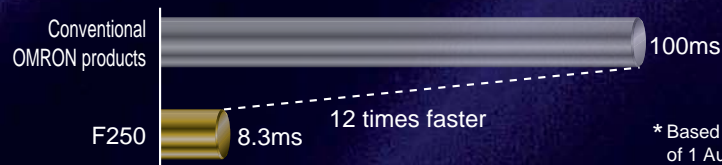
Fine Matching



Very High Speed

World's First* Real-time Rotation Search

360° Rotation Compensation Speed (in field image mode)



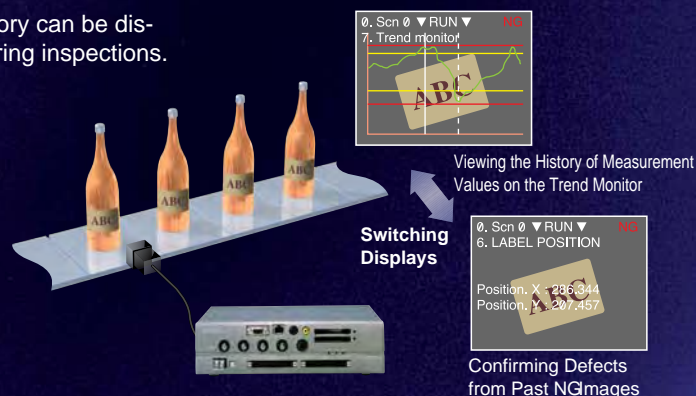
* Based on OMRON test results of 1 August 2001.

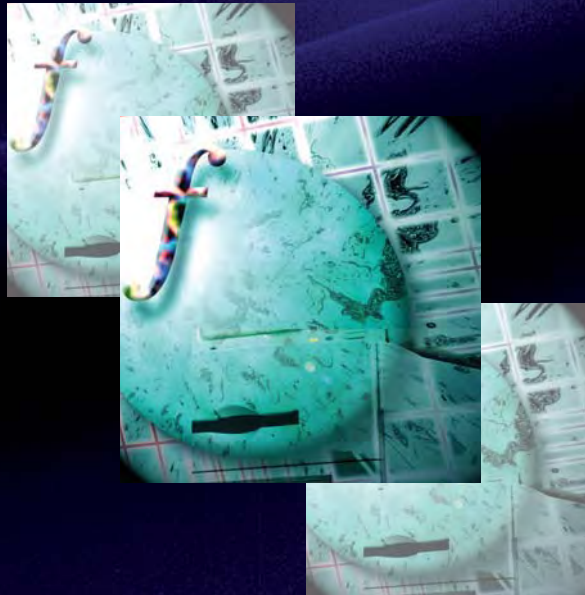


Ultimately Flexible

Simple Adjustment and Maintenance with a Trend Monitor
Trend Monitor Function

The inspection result history can be displayed on the monitor during inspections.





Advanced Algorithms

EC Technology

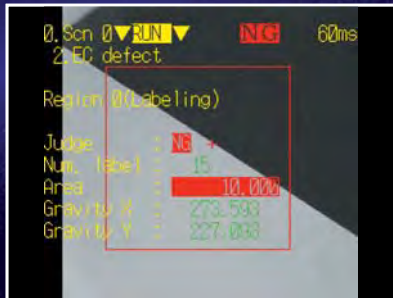
EC technology enables the F250 to detect low-contrast images and deformed or partly defective workpieces to a degree that was never before possible. Its epoch-making inspection/positioning algorithms use the direction of changes in brightness and the difference in image brightness to achieve ultra-precise detection.

The High-performance Vision Sensor

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The F250 Can Accurately and Easily Perform Inspections and Positioning that Were Difficult for Conventional Vision Sensors

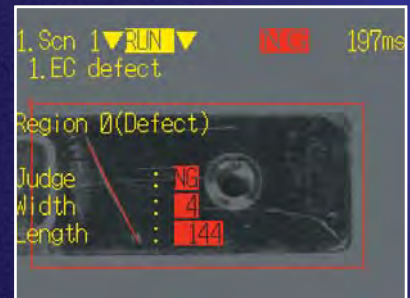
EC Defect Inspection



Accurately detects fine defects that could not be detected before.



Correctly detects distortion or deformation in rubber packing, etc.

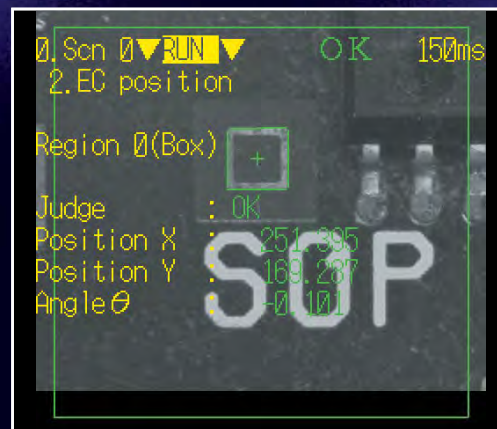


Detects low-contrast scratches on metal surfaces

EC Positioning

The F250 performs positioning and measurement accurately even if the workpiece internally changes or its appearance viewed from the Sensor changes.

● Positioning of PWB's Fiducial Marks



Low Contrast

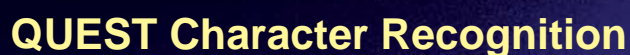


Rotation



Internal dirt



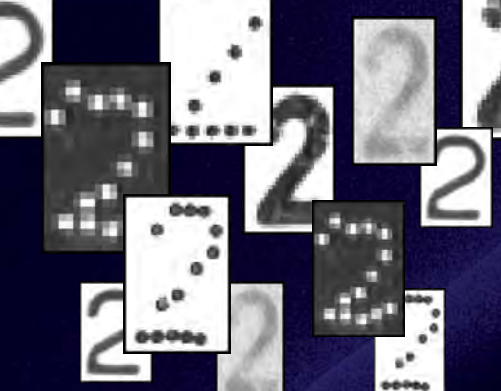


Correctly Recognizes Six Different Types of Character Variations

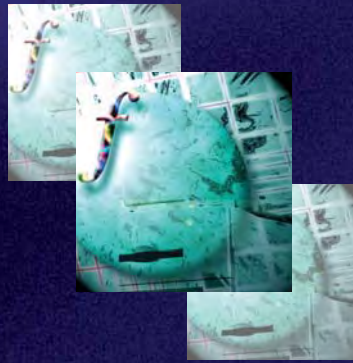
Address: 7C901000
 Data: 70 96 57 84 150 24 77 95 04
 on XC5B-322P



greatly reducing the amount of manual work required during installation.



The image shows a collection of approximately 12 different representations of the digit '2'. These include: a standard black digit on a white background; a pixelated or dithered version; a grayscale image with some noise; a version with a thick, hand-drawn appearance; a version with a thin, sketchy appearance; and several versions that are rotated or skewed. The images are arranged in a somewhat chaotic, overlapping manner, suggesting a diverse set of data points created through augmentation techniques.

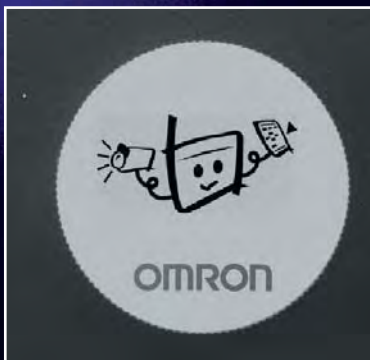


Fine Matching

The F250 quickly and accurately detects any differences from the registered image. Its remarkably improved performance reveals fine defects on the edges of characters and graphic patterns that often went undetected in the past.

Application Example: Inspection for Soft Drink Bottle Caps

Registered image



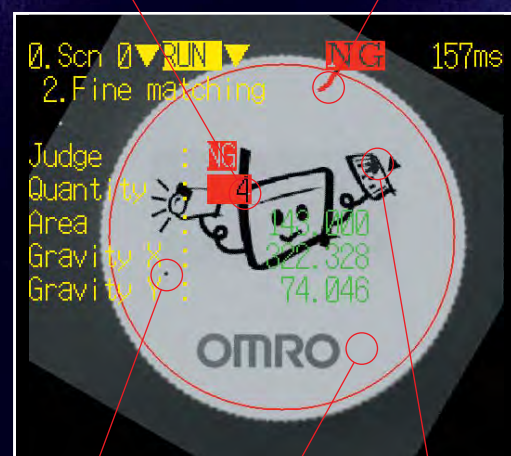
Inspected image



Fine Matching

Displays inspection results as an area value.

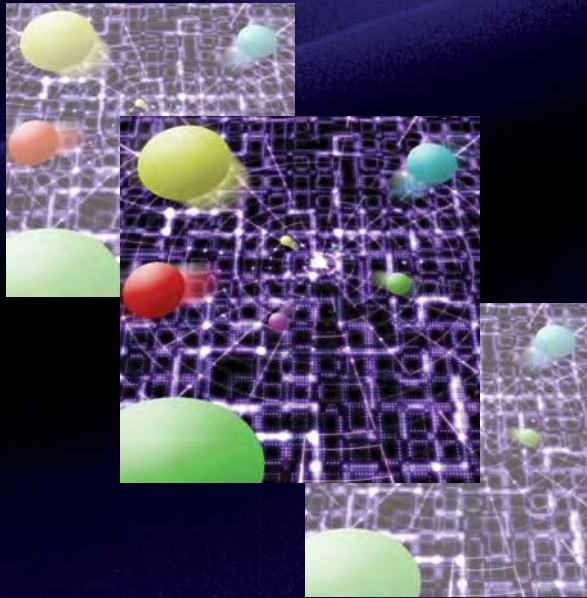
Cracks near the edge



Fine stains

Incomplete characters

Stains in patterns



High-speed Processing

OMRON's unique real-time processing technology
gives the F250 its excellent performance in
ultrahigh-speed production lines.

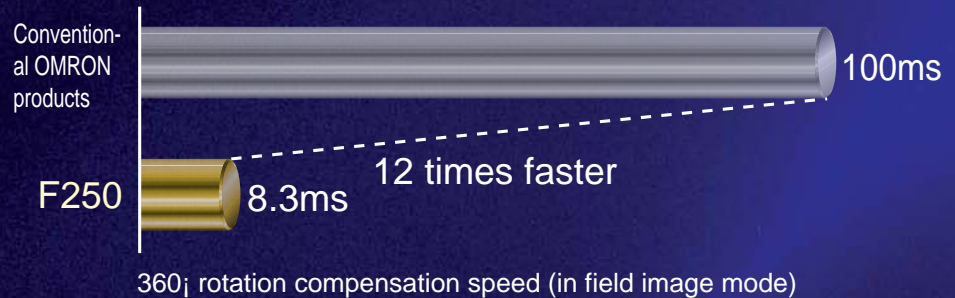
The High-performance Vision Sensor

F250

The F250 Responds to Stricter Quality Requirements and Rapidly Increasing Line Speeds

World's First* Real-time Rotation Search

Executes real-time search for 72 models. Even for workpieces that rotate 360°, position and orientation compensation is completed at the same time as image input.



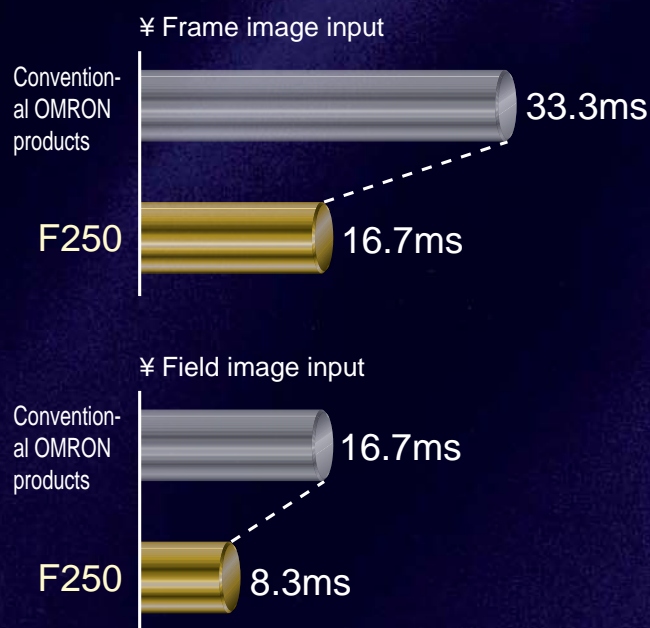
Fast Image Processing

Newly developed parallel processing technology enables the F250 to process images much faster than conventional OMRON products, increasing the inspection speed for Camera-input images up to 10 times.

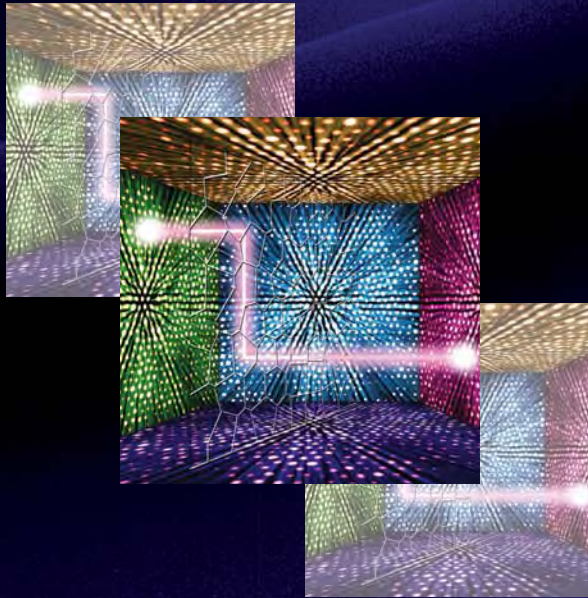


Fast Image Input

The F160-S1 Double-speed Camera takes images at up to 8.3 ms.



* Based on OMRON test results of 1 August 2001.



Superb Flexibility

The F250 boosts productivity in every process -
- installation, maintenance, and adjustment.

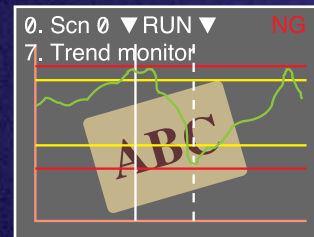
The High-performance Vision Sensor

F250

Simple Adjustment and Maintenance with a Trend Monitor

Trend Monitor Function

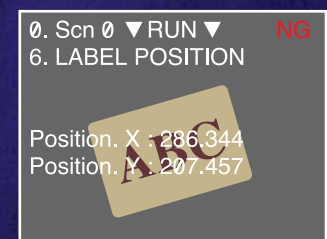
The inspection result history can be displayed on the monitor during inspections to give a clear view of the trends in measurement values and judgement results. The NImage Save function helps to solve the cause of defects by providing visual confirmation of NImages when they occur. Judgement values can also be adjusted while watching the trend monitor, to prevent excessive viewing or



Viewing the History of Measurement Values on the Trend Monitor



Switching Displays



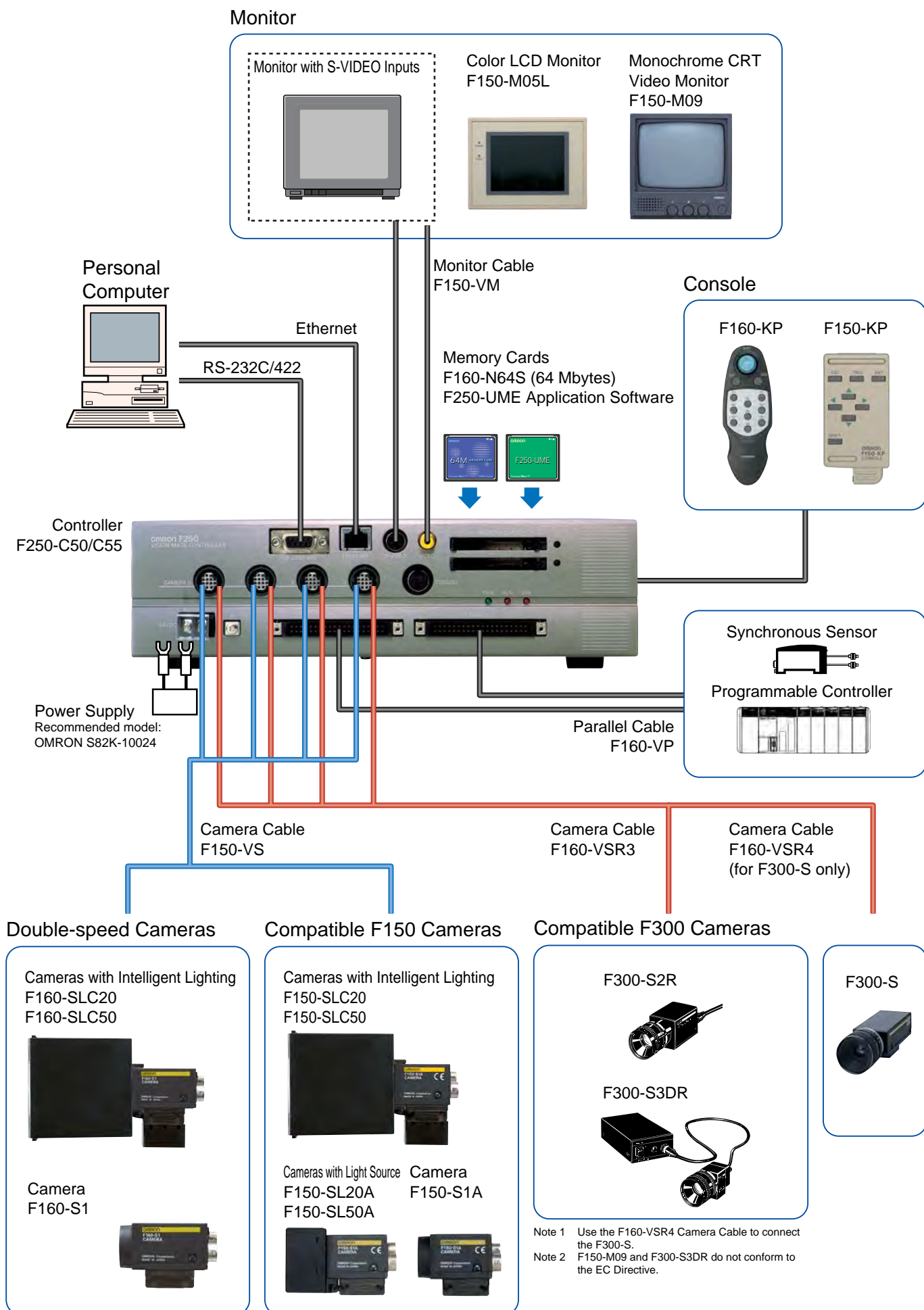
Confirming Defects from Past NG Images

Simple and Flexible Settings Using Application Software

1. Select the necessary inspection functions from the Application Software and install them.
2. Any combination of inspection functions can be selected from the menu.



Batch processing also possible using measurement results and external input.



Name		Model	Remarks
Controllers		F250-C50	NPN input/output
		F250-C55	PNP input/output
Double-speed Cameras	Cameras with Intelligent Lighting	F160-SLC20	
	Camera only	F160-SLC50	
Compatible F150 Cameras	Cameras with Intelligent Lighting	F160-S1	
	Cameras with Light	F150-SLC20	
		F150-SLC50	
		F150-SL20A	
	Camera only	F150-SL50A	
Compatible F300 Cameras	Camera	F150-S1A	
	Shutter Cameras	F300-S	
		F300-S2R	
		F300-S3DR	With separable head.
Consoles		F160-KP	
		F150-KP	
Color LCD Monitor		F150-M05L	
Monochrome CRT Video Monitor		F150-M09	
Memory Card		F160-N64S	Memory capacity: 64 Mbytes
Application Software		F250-UME	
Camera Cables		F150-VS	For Double-speed Camera and compatible F150 Cameras. Cable length: 3 m
		F160-VSR3	For compatible F300 Cameras. Cable length: 3 m
		F160-VSR4	For F300-S only. Cable length: 3 m
Monitor Cable		F150-VM	Cable length: 2 m
Parallel Cable		F160-VP	Loose-wire cable for parallel I/O connectors. Cable length: 2 m

■ Ratings/Functions

● Controller: F250-C50/C55

Item	Specifications
Connectable Cameras	F150-S1A/SL20A/SL50A/SLC20/SLC50, F160-S1/SLC20/SLC50, F300-S2R/S3DR
Number of Cameras connectable	4
Number of pixels	512 × 484 (H × V)
Number of scenes	32 (Expansion possible using Memory Cards)
Image storage function	Maximum of 35 images stored
Filtering	Smoothing (strong, weak), edge enhancement, edge extraction (horizontal, vertical, both), dilation, erosion, median, background suppression
Operations and settings	Installing measurement items using application software, and combining and setting measurement items by menu operations
Operation customization functions	Menu masking, password setting, shortcut keys
Screen customization functions	Display items: Character strings (measurement values, judgement results, times, user-specified characters, measurement region names), figures (lines, boxes, circles, cross cursors) Specified parameters: Display color, position, and size
Trend monitor function	Supported
Memory card slots	2
Monitor interface	Composite video output: 1 channel, S-VIDEO output: 1 channel
Ethernet	10Base-T: 1 channel
Serial communications	RS-232C/422A: 1 channel
Parallel I/O	21 inputs and 46 outputs
Strobe interface	4 channels (included in parallel outputs)
Power supply voltage	20.4 to 26.4 VDC
Current consumption	Approx. 3.7 A (when four F160-SLC50 Cameras connected)
Ambient temperature	Operating: 0 to 50°C, Storage: -25 to +65°C (with no icing or condensation)
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)
External dimensions	270 × 81 × 197 mm (W × H × D)
Weight	Approx. 2.7 kg (Controller only)

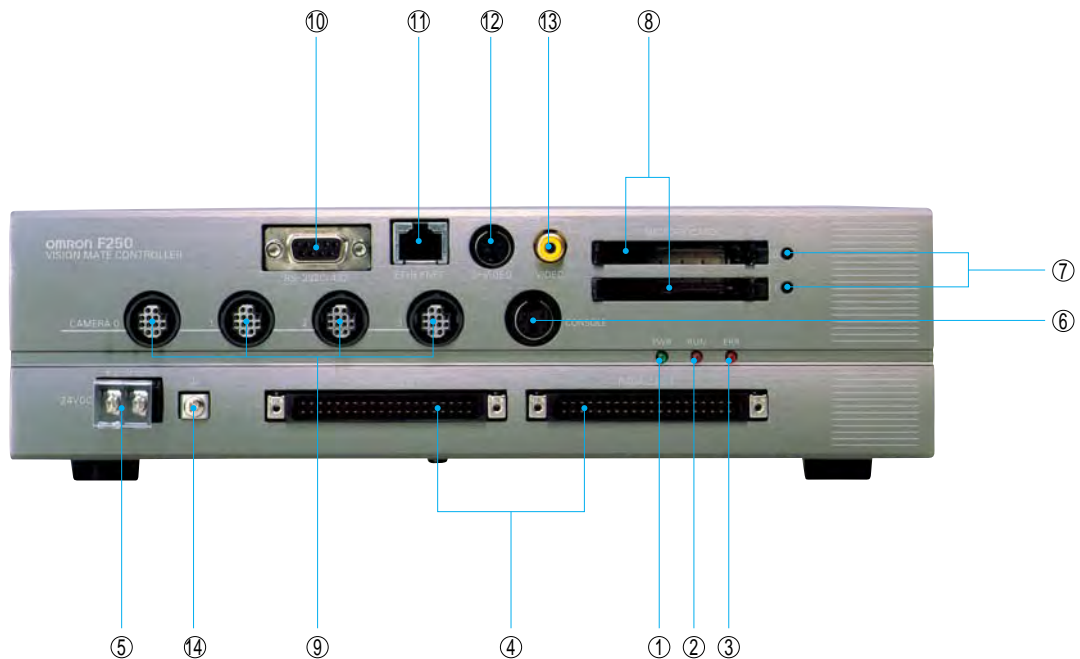
● Double-speed Camera : F160-S1

Picture element	1/3 Interline CCD
Effective pixels	659 × 494 (H × V)
Scanning method	1/60-s non-interlace (frame) mode, 1/120-s 2:1 interlace (field) mode
Shutter	Electronic shutter; select from 8 shutter-speed settings (1/120 to 1/20,000 s) using menu.
Camera with Intelligent Lighting	F160-SLC20 (field of vision: 20 mm), F160-SLC50 (field of vision: 50 mm)
Ambient temperature	Operating: 0 to 50°C, Storage: -25 to +60°C
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)
External dimensions	31 × 40 × 54.5 (W × H × D) mm (not including connectors and other protruding parts)
Weight	Approx. 85 g (Camera only)

● Monitor

Item	Model number Name	F150-M05L Color LCD Monitor	F150-M09 Monochrome CRT Video Monitor
Size		5.5 inches	9 inches
Type		Liquid crystal color TFT	CRT monochrome
Resolution		320 × 240 dots	800 TV lines min. (at center)
Input signals		NTSC composite video (1.0 V/75 %)	
Power supply voltage		20.4 to 26.4 VDC	100 to 240 VAC (-15%, +10%)
Current consumption		Approx. 700 mA	Approx. 200 mA
Ambient temperature		Operating : 0 to 50°C Storage : -25 to 65°C (with no icing or condensation)	Operating : -10 to 50°C Storage : -20 to 65°C (with no icing or condensation)
Ambient humidity		Operating or storage: 35% to 85% (with no condensation)	10% to 90% (with no condensation)
Weight (Monitor only)		Approx. 1 kg	Approx. 4.5 kg
Accessories		Instruction manual and 4 mounting brackets	Instruction manual

● F250-C50/C55 Controller



- | | |
|--|---|
| <p>① POWER Indicator (Green)
Lit while the power is ON.</p> <p>② RUN Indicator (Orange)
Lit while the F250 is in Run Mode.</p> <p>③ ERROR Indicator (Red)
Lit when an error has occurred.</p> <p>④ I/O Connectors 0 and 1
Connects the F250 to external devices such as sync sensors or PLCs.</p> <p>⑤ Power Supply Terminal
Connects to the DC power supply.</p> <p>⑥ Console Connector
Connects the F250 to the Console.</p> <p>⑦ Memory Card LEDs 0 and 1
Lit when the Memory Card is being supplied with power.</p> | <p>⑧ Memory Card Slots 0 and 1
Holds Memory Cards or card containing Application Software.</p> <p>⑨ CAMERA0-3 Connectors
Connects to Cameras.</p> <p>⑩ RS-232C/422A Connector
Connects the F250 to an external device such as a personal computer or PLC.</p> <p>⑪ Ethernet Connector
Connects to a personal computer, etc.</p> <p>⑫ Monitor Connector (S-VIDEO Output)
Connects to the Monitor with an S-VIDEO input.</p> <p>⑬ Monitor Connector (Composite Video Output)
Connects to the Monitor.</p> <p>⑭ Grounding Terminal
Connects to the ground wire.</p> |
|--|---|

● Processing Items

The F250-UME Application Software can be used to install the following measurement items and perform combinations of inspections.

Position Compensation Functions

- Binary position compensation
- EC position compensation
- Edge position compensation
- Model position compensation
- Circle position compensation
- Reset scroll
- Scroll

General Measurement Functions

- Detecting binary defects
- Classification
- Density defects
- EC defect
- EC positioning
- Edge position
- Fine matching
- EC circle count
- Pattern
- QUEST character verification
- Rotation positioning
- ECM search
- Lot number OCV 1
- Labeling
- Label data
- Edge pitch
- Density data

Measurement Support Functions

- Calculation
- Elapsed time
- Get unit data
- Wait
- Set unit data
- Trend monitor

Branch Control Functions

- Conditional branch
- DI branch
- End

Results Output Functions

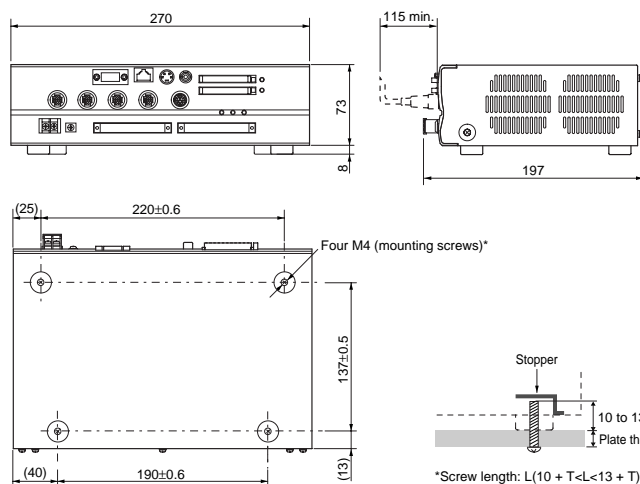
- Memory card data output
- DO data output
- DO judgement output
- Host link data output
- Normal data output

Results Display Functions

- String display
- Measurement display
- Judgement display
- Item display
- Time display
- Figure display
- Line display
- Box display
- Circle display
- Cursor display

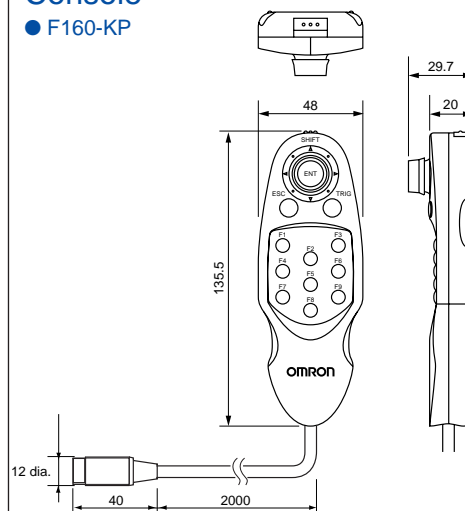
Controller

● F250-C50/C55

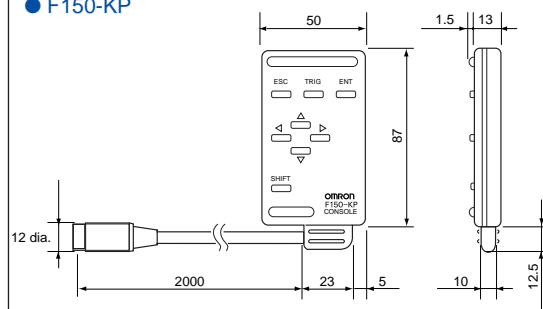


Console

● F160-KP

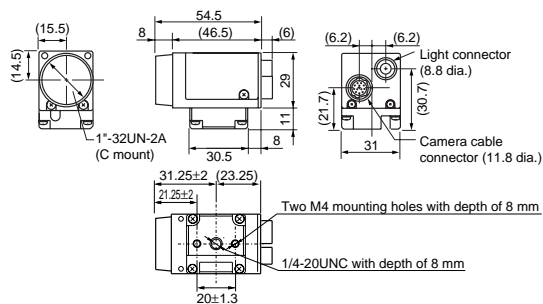


● F150-KP

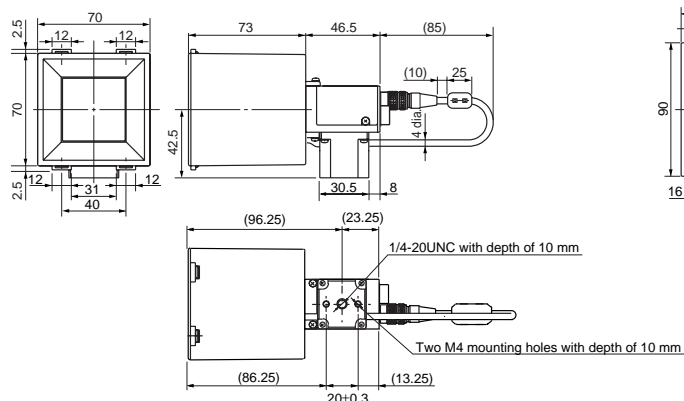


Double-speed Camera

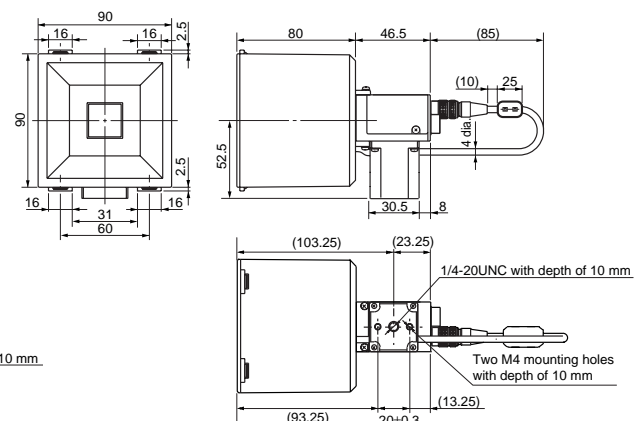
● F160-S1



● F160-SLC20

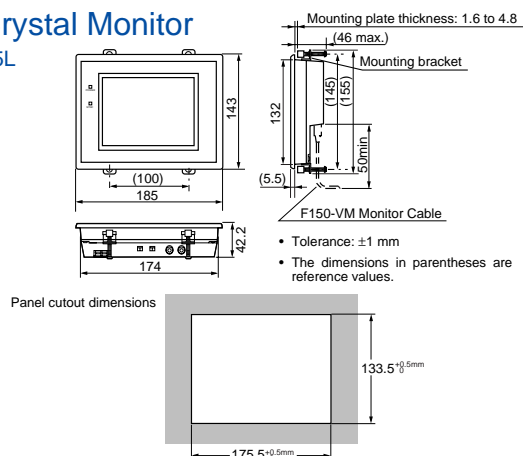


● F160-SLC50



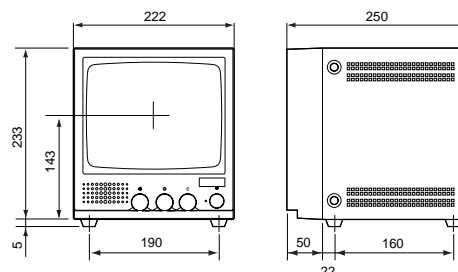
Liquid Crystal Monitor

● F150-M05L



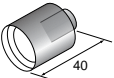
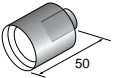
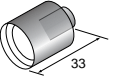
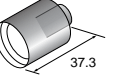
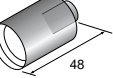
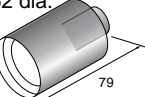
Video Monitor

● F150-M09



- With reference to the optical graph below, select the lens and combination of Extension Tubes that give the required field of vision and camera distance.

CCTV Lens

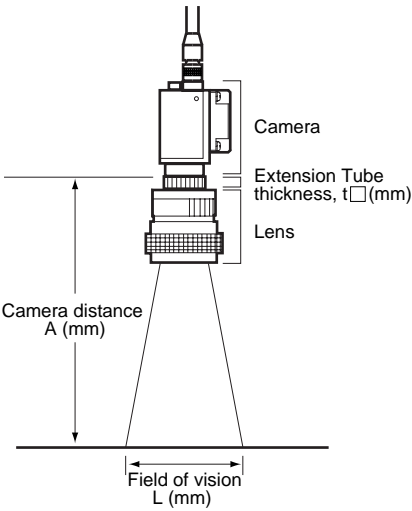
CCTV lens						
Model	3Z4S-LE C815B	3Z4S-LE B1214D-2	3Z4S-LE C1614A	3Z4S-LE B2514D	3Z4S-LE B5014A	3Z4S-LE B7514C
Dimensions	42 dia. 	42 dia. 	30 dia. 	30 dia. 	48 dia. 	62 dia. 
Locking mechanism	Focus locking mechanism					None

Extension Tubes

Model	Content
3Z4S-LE EX-C6	A set of six Extension Tubes of thicknesses 40, 20, 10, 5, 1, and 0.5 mm respectively.

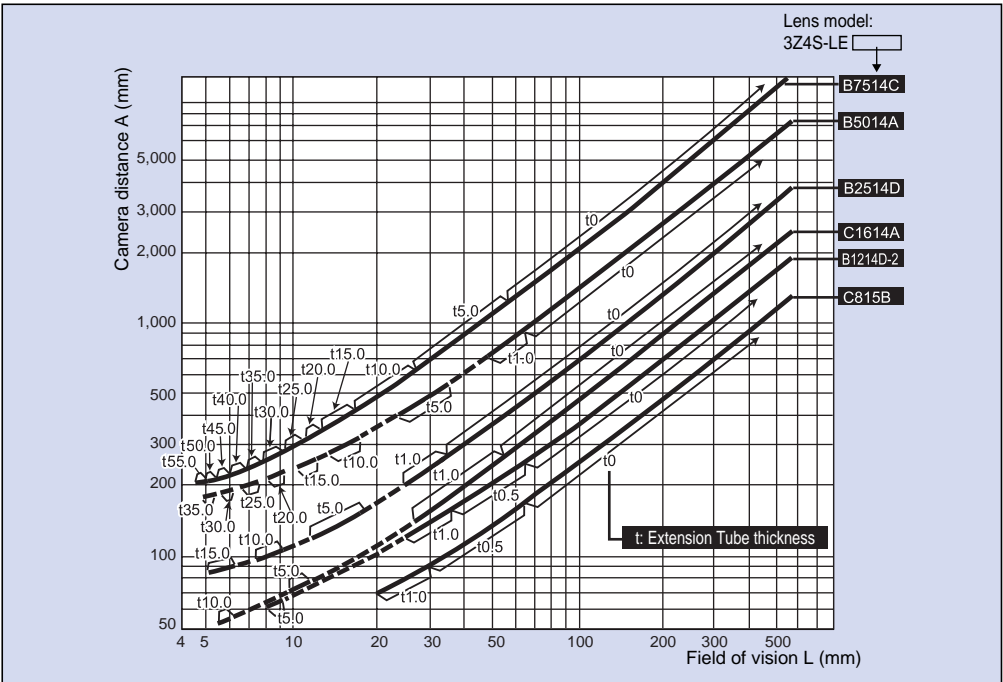
Meaning of Optical Graph

The X axis of the graph shows the field of vision L (mm), and the Y axis shows the camera distance A (mm). The curves on the graph indicate different lenses, and the "t" values indicate the lengths of the Extension Tubes.



Optical Graph

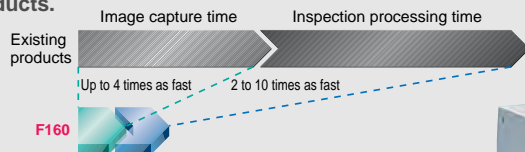
- The values given in the optical graph are only approximate values. It is recommended that the camera distance is adjusted by sliding the Camera forward or backward to get the required field of vision for actual operation.



Faster and more powerful than anything in its class!

Can also be easily introduced to ultra high-speed processing lines.

- Images from the F160-S1 Double-speed Camera are input up to 4 times faster than conventional OMRON products.
- Inspection functions (dark/light searches, detection of scratches, soiling, etc.) are 2 to 10 times faster than conventional OMRON products.



Equipped with a Memory Card

- Allows easy use on multi-product lines by simply increasing the number of scenes.

Customize function allows the F160 to be tailored to specific production needs.

- Shortcut keys
- Password setting
- Screen message customization on measurement screens, color displays, and much more.



F160

Vision Sensor