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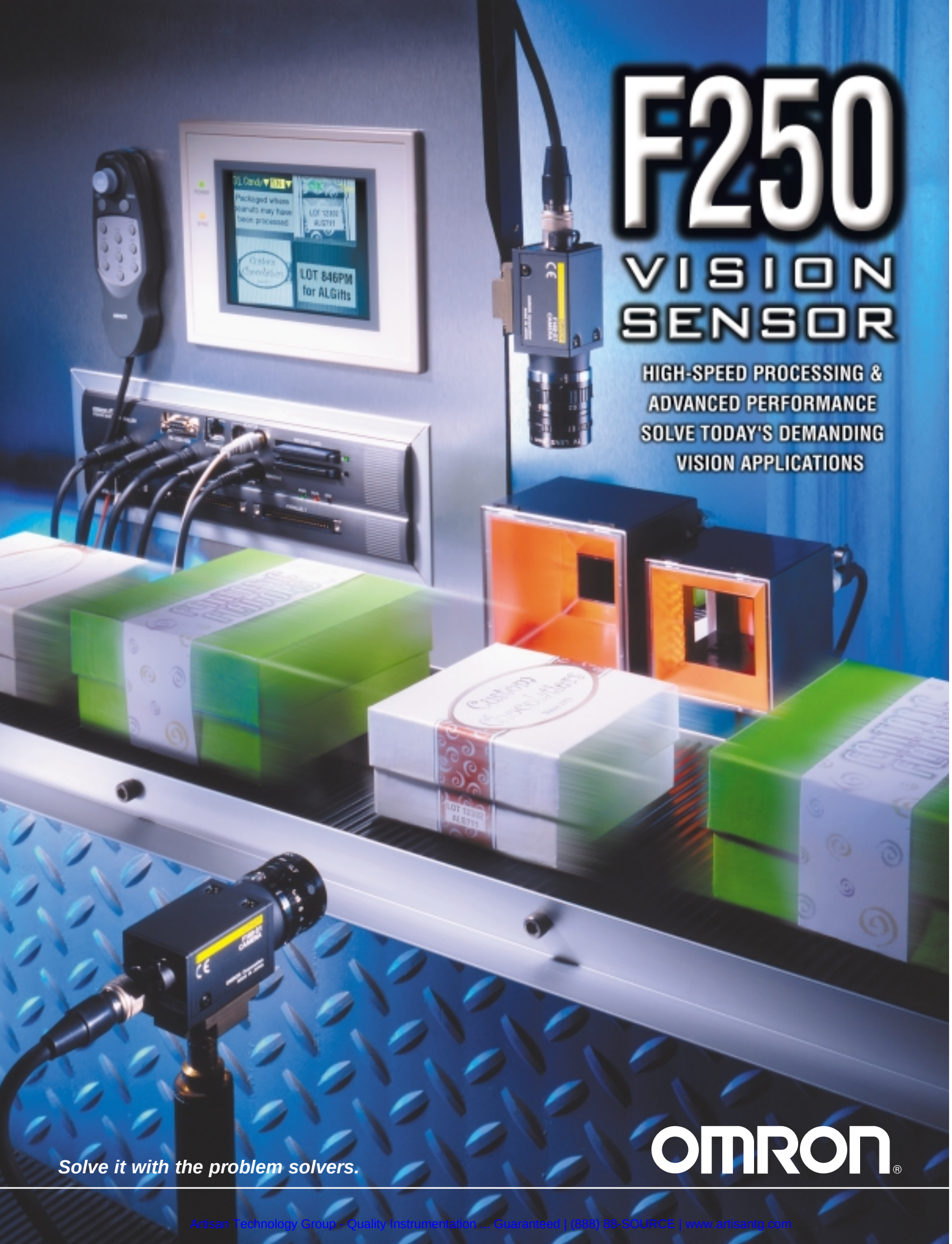
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High-Speed Processing and Advanced Performance Solve Today's Demanding Vision Applications



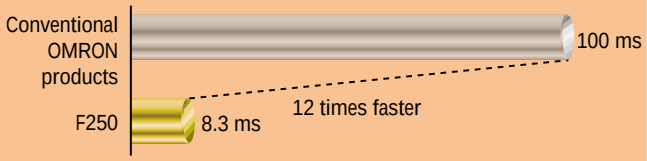
Demanding vision applications require multiple complex inspections with high-speed analysis to maintain top quality in the finished product. Omron meets this need with the F250 vision sensor. It uses up to four cameras on a single controller to deliver high-speed results for ultra-complex inspections. In fact, F250 is the world's first multi-camera vision sensor to perform a high-speed, real-time rotation search for parts or features located at random angles and positions. On a conveyor line for example, other vision systems require slowed conveyor speeds to allow complex inspections, potentially creating a bottleneck in production. With the F250's real-time rotation search, production speeds are maintained.

Here's how Omron's technology and know-how give you the productivity edge:

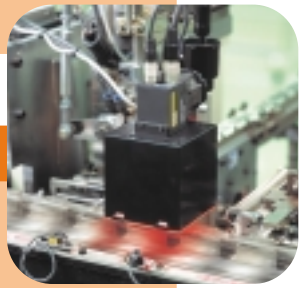
- Edge Code Technology adds enhanced and ultra-precise detection performance to many of the F250's commonly used algorithms. For example, with Edge Code Technology, positioning can be done with high precision and defect inspection can detect fine scratches, dirt and deformities.
- Omron's original QUEST Optical Character Recognition and Verification algorithm enhances the detection of printed alphanumeric characters regardless of their shape or size with no need to teach the F250 any characters. The QUEST OCR/OCV algorithm uses built-in character libraries to discern multiple characters simultaneously.

World's First* Real-time Rotation Search

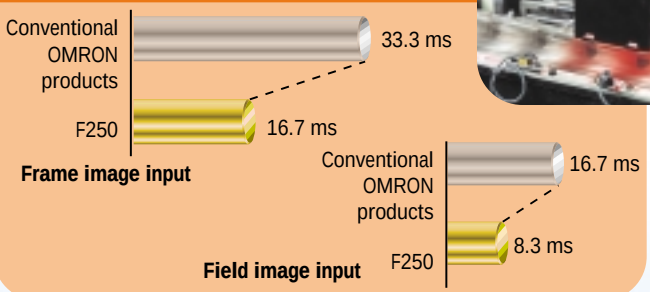
360° Rotation Compensation Speed (in field image mode)



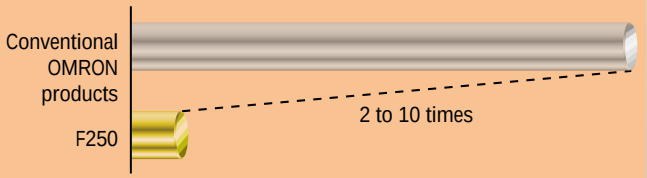
*Based on OMRON test results of 1 August 2001.



Fast Image Input



Fast Image Processing



Advanced Algorithms

Edge Code (EC) Positioning
High-precision positioning and low-contrast workpiece detection



QUEST Character Recognition
Confirm expiration dates and lot numbers using the OCR/OCV algorithm



Edge Code (EC) Defect Inspection
Inspection for fine scratches, dirt, and deformation



Fine Matching
Inspection of characters and graphic patterns for blurring or dirt

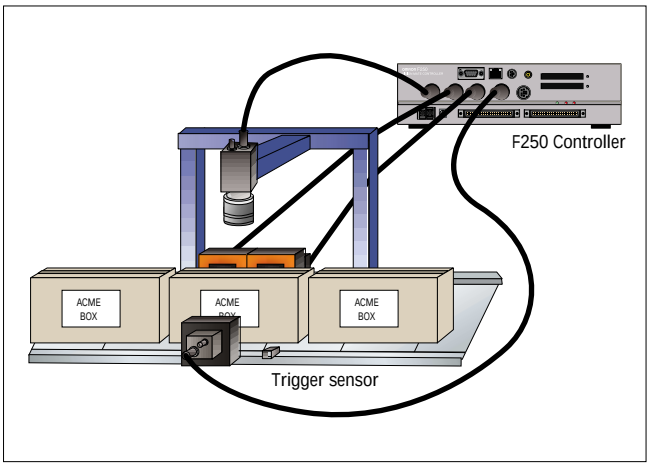


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High-Speed Measurement and Inspection Applications

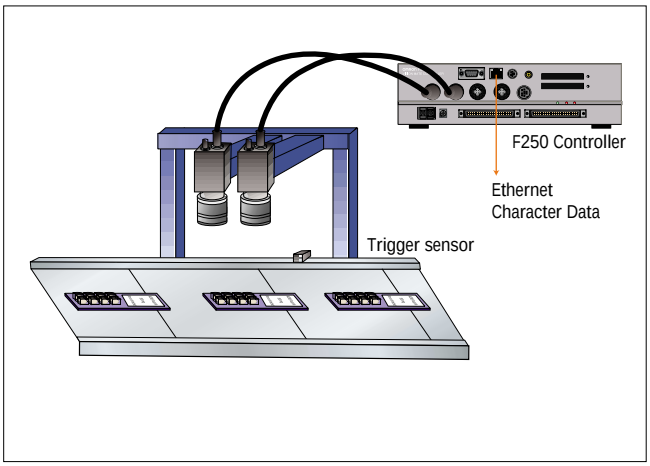
Product Sorting

Sort boxes by size or labels, inspect seams, and verify lot codes.



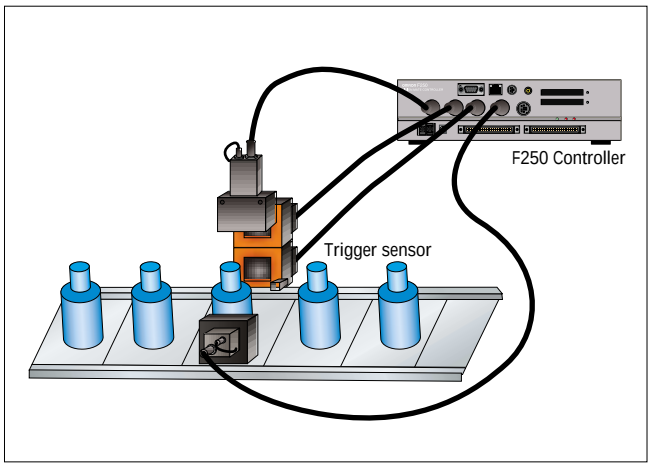
Pharmaceutical Package Inspection

Pill presence/absence and Lot/Date code confirmation on blister packs.



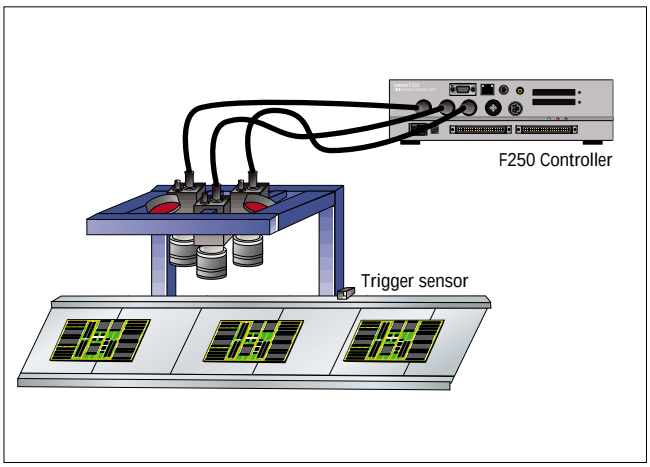
High-Speed Bottle Inspection

Inspect for defects, dimensions, conformance and date code.



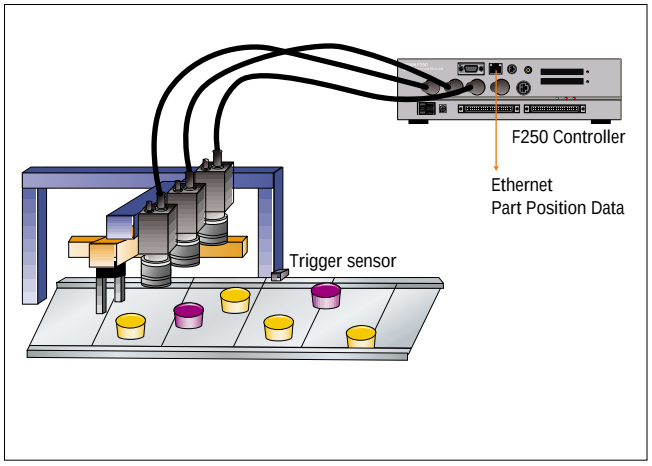
Electronics Inspection

Electronic component presence/absence and position inspection.



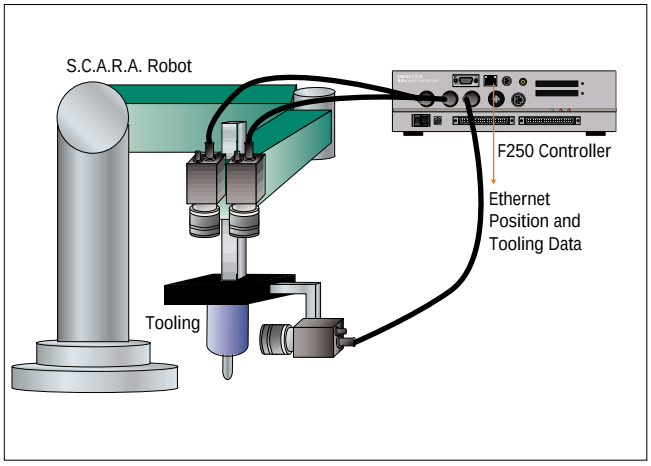
Random Position Reference

Report random, odd-shaped package positioning on a conveyor.



High-Speed Robotic Tool Guidance

Report tool and part alignment and tool wear positioning to robot.



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Advanced Algorithms

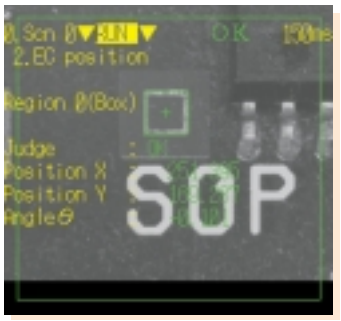
Edge Code (EC) Technology

Edge Code Technology's advanced inspection and positioning algorithms use the direction of changes in brightness and the differences in image brightness to achieve ultra-precise detection. EC technology also enables the detection of low-contrast images and deformed or partly defective parts or features to a degree that was never before possible.

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 PCB's Fiducial Marks

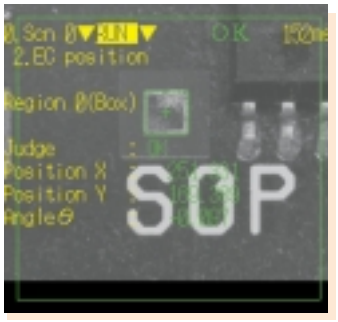




Low-contrast



Rotation



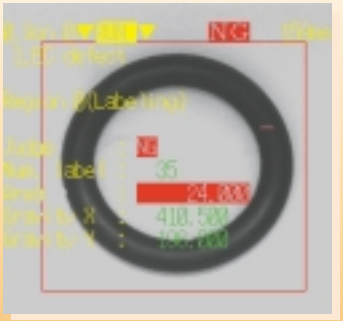
Internal dirt

EC Defect Inspection

Detects scratches on metal surfaces, even with low-contrast images.



Accurately detects fine defects that could not be detected before, even on edges of parts.



Correctly detects distortion or deformation in rubber packing, etc.



Detects scratches on metal surfaces, even with low-contrast images.

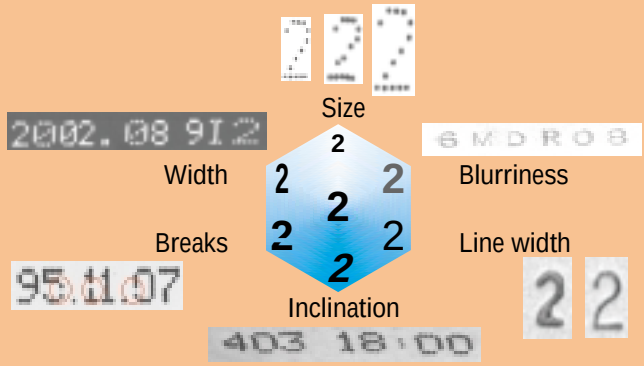
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Advanced Algorithms

QUEST Optical Character Recognition

QUEST technology can recognize characters correctly regardless of their size or shape. Using built-in character libraries makes setup easy with no character teaching required.

Correctly Recognizes Six Different Types of Character Variations

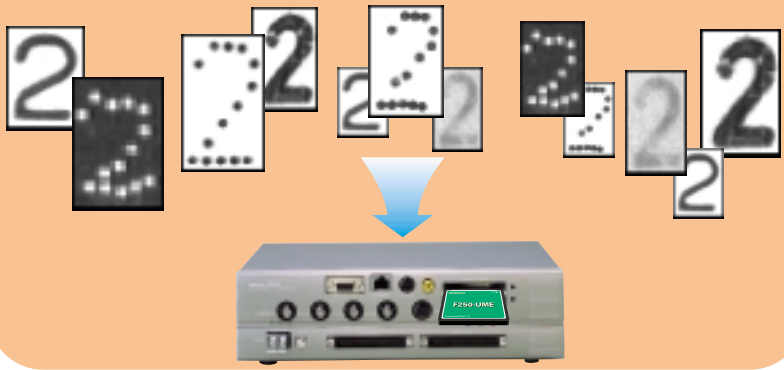




Printed characters such as expiration dates, lot numbers and date codes can vary in shape, size and line width based on the printing method and conditions. The QUEST algorithm ensures that the six most common types of variations are always recognized correctly.

QUEST technology has built-in character libraries of commonly used factory automation fonts stored for ready reference. This eliminates the need to register characters as models, or teach and create font or character libraries to handle most text. Setup time during installation is greatly reduced.

No Need to Register Characters in a Library



Fine Matching

The F250 quickly and accurately detects any differences between the registered model and the image being measured. This dramatically improved model matching algorithm now reveals fine defects on the edges of characters, printed labels and graphic patterns that may have gone undetected in the past using less accurate matching algorithms.



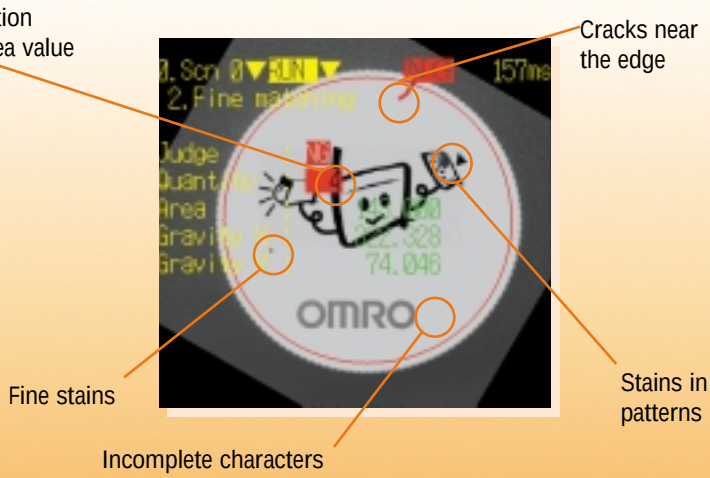
Registered image



Inspected image

Fine Matching

Application example: inspection for soft drink bottle caps

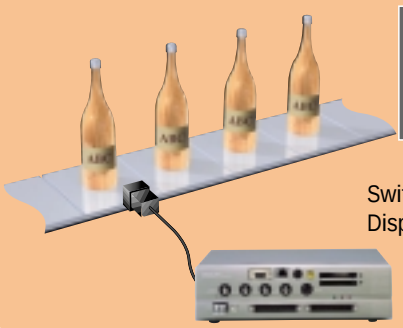


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Reach Full Productivity Quickly

Omron's F250 boosts productivity in every process from installation and setup to maintenance and adjustments with maximum flexibility and usability. An on-screen menu system allows applications to be created using a simple tool insertion method. The application program is then displayed sequentially, in the order of execution. An I/O monitor screen allows easy monitoring of the controller's inputs and outputs for faster setup and troubleshooting. The line brightness meter can be used to show the pixel density (brightness) of any single line of pixels in both horizontal and vertical directions, making setup and troubleshooting for measurements an easier task. The F250 also uses a removable Flash-RAM memory card for storage and backup of controller settings and measurement images.

Trend Monitor Function





Viewing the History of Measurement Values on the Trend Monitor

Switching Displays



Confirming Defects from Past NG Images

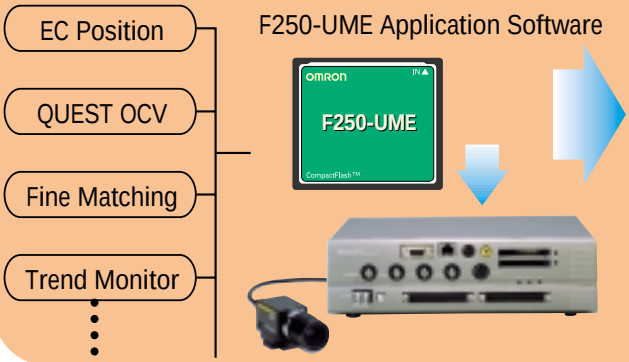
Use the Trend Monitor to view measurement values and judgment results. They can be trended and displayed on the monitor while in operation, allowing easy monitoring of the application during setup, online operation or troubleshooting. The NG Image Save function can be useful for solving the cause of rejects by providing visual confirmation with the NG image when they occur. The Judgment Results Limits can also be adjusted while watching the trend monitor, simplifying setup and adjustment.

Simple, Flexible Configuration Using the Application Software

Easy setup process:

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.

*Branch processing also possible using measurement results and external input.





Processing Item Functions

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

Position Compensation

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

Results Output

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

General Measurement

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

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

Branch Control

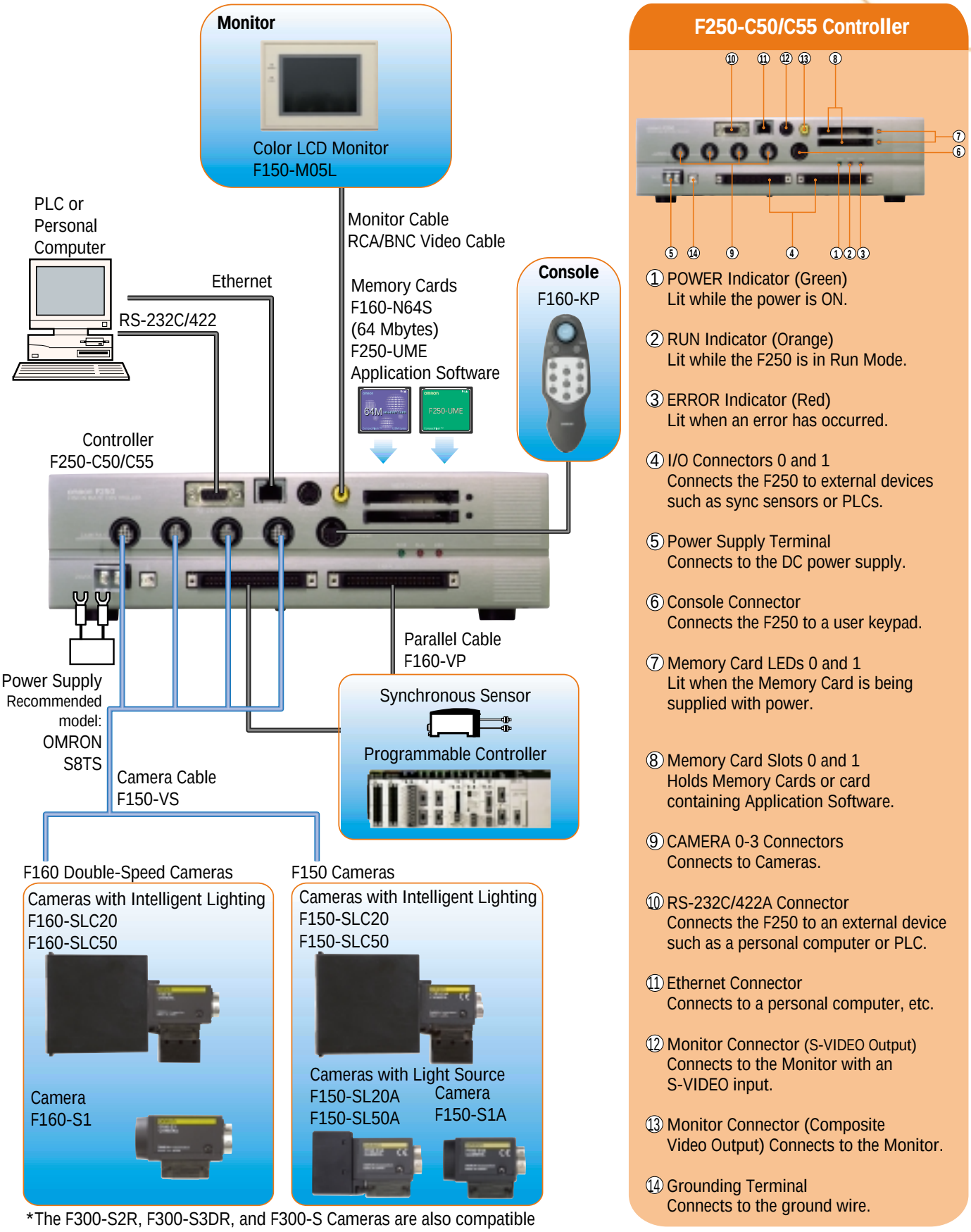
Conditional branch
DI branch
End

Results Display

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

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System Configuration



*The F300-S2R, F300-S3DR, and F300-S Cameras are also compatible

F250-C50/C55 Controller

① POWER Indicator (Green)
Lit while the power is ON.

② RUN Indicator (Orange)
Lit while the F250 is in Run Mode.

③ ERROR Indicator (Red)
Lit when an error has occurred.

④ I/O Connectors 0 and 1
Connects the F250 to external devices such as sync sensors or PLCs.

⑤ Power Supply Terminal
Connects to the DC power supply.

⑥ Console Connector
Connects the F250 to a user keypad.

⑦ Memory Card LEDs 0 and 1
Lit when the Memory Card is being supplied with power.

⑧ Memory Card Slots 0 and 1
Holds Memory Cards or card containing Application Software.

⑨ CAMERA 0-3 Connectors
Connects to Cameras.

⑩ RS-232C/422A Connector
Connects the F250 to an external device such as a personal computer or PLC.

⑪ Ethernet Connector
Connects to a personal computer, etc.

⑫ Monitor Connector (S-VIDEO Output)
Connects to the Monitor with an S-VIDEO input.

⑬ Monitor Connector (Composite Video Output) Connects to the Monitor.

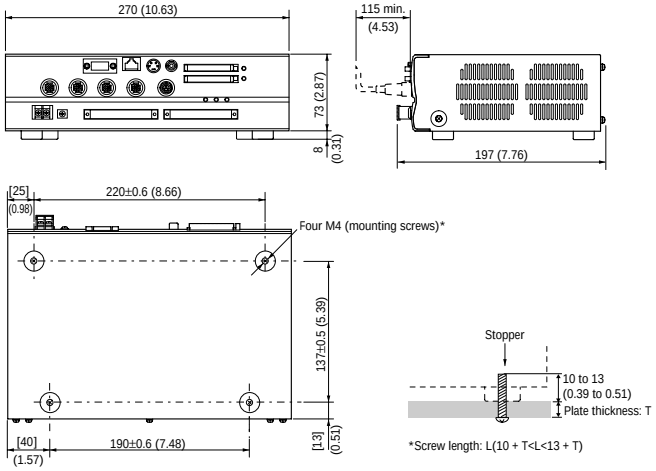
⑭ Grounding Terminal
Connects to the ground wire.

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Dimensions Unit: mm (inches)

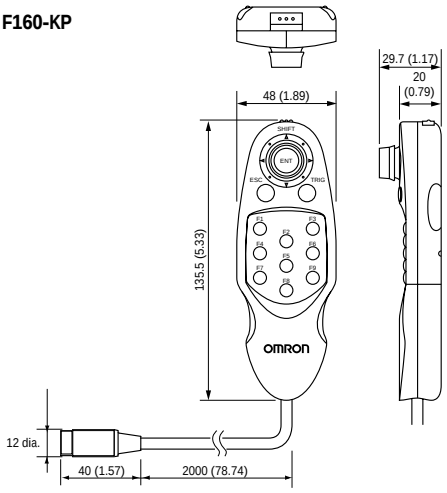
Controller

F250-C50/C55



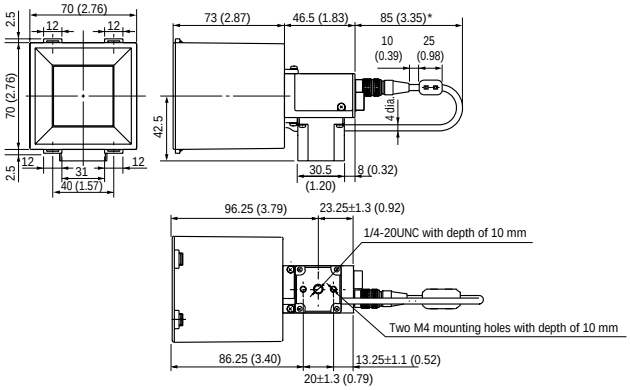
Console

F160-KP

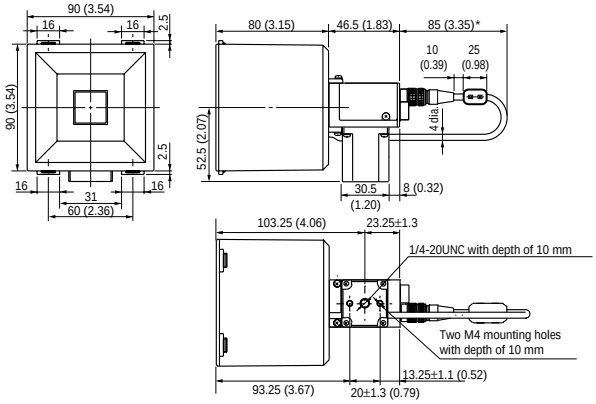


Double-Speed Camera

F160-SLC20

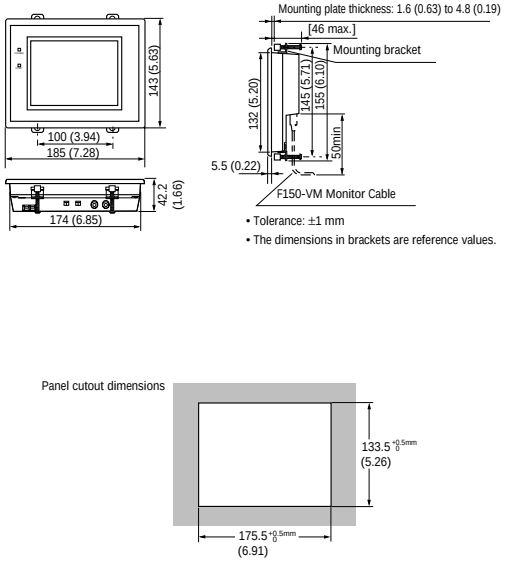


F160-SLC50

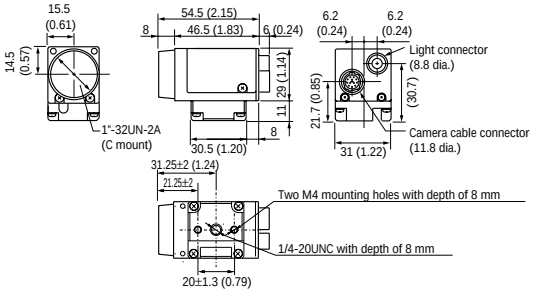


Liquid Crystal Monitor

F150-M05L



F160-S1



Note: Dimensions for F150 cameras are in Omron's F150-3 Vision Sensor brochure SB F1503-1.

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Specifications

Rating/Function

Controller: F250-C50/C55

Item	Specifications
Connectable cameras	F150-S1A/SL20/SL50/SLC20/SLC50, F160-S1/SLC20/SLC50, F300-S2R/S3DR/S
Number of cameras connectable	4
Number of pixels	512 x 484 (H x 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 x 81 x 197 mm (W x H x D)
Weight	Approx. 2.7 kg (Controller only)

Double-Speed Camera : F160-S1

Picture element	1/3" Interline CCD
Effective pixels	659 x 494 (H x 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 x 40 x 54.5 (W x H x D) mm (not including connectors and other protruding parts)
Weight	Approx. 85 g (Camera only)

Note: Specifications for F150 cameras are in Omron's F150-3 Vision Sensor brochure SB F1503-1.

Monitor

Item / Model number / Name	F150-M05L Color LCD Monitor
Size	5.5 inches
Type	Liquid crystal color TFT
Resolution	320 x 240 dots
Input signals	NTSC composite video (1.0 V/75 Ω)
Power supply voltage	20.4 to 26.4 VDC
Current consumption	Approx. 700 mA
Ambient temperature	Operating: 0 to 50°C; Storage: -25 to 65°C (with no icing or condensation)
Ambient humidity	Operating or storage: 35% to 85% (with no condensation)
Weight (monitor only)	Approx. 1 kg
Accessories	Instruction manual and 4 mounting brackets

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F250 Vision Sensor Selection Guide

First: Start by selecting the controller part number with the correct input/output type, NPN or PNP, to meet the applications needs.

Second: Choose cameras for the system. Omron offers three F160 double-speed or five standard speed F150 cameras. Select one to four cameras based on the application. Cameras with built-in Intelligent Light Source are available for 20- or 50-mm fields of vision in both the F150 and F160 series. If a different field of vision and lighting is required, use the F150-S1A or F160-S1 camera without lens and light source. **Important: cameras from the F150, F160 and F300 series CAN NOT be mixed on a single controller.** **Note:** F150 camera distance setting information is in vision sensor brochure SB F1503-1; F160 camera distance setting information is in brochure SB F160-1.

Third: Choose camera cables, Parallel I/O cable, monitor and monitor cable as required. For additional camera cable and parallel I/O cable lengths and monitor options, please consult your Omron vision representative.

Fourth: Select lenses and lighting for the application if F150-S1A or F160-S1 cameras are used. Refer to the Lens Selection Guide (next page). The intelligent lighting interface is available for F150-S1A and F160-S1 cameras to allow the use of controllable external lighting options. Please refer to the back cover of this brochure for additional intelligent lighting information and consult your Omron vision representative for assistance in selecting lenses and lighting.



Ordering Information

Name	Model number	Comments
Controllers	F250-C50	NPN input/output
	F250-C55	PNP input/output
Double-speed cameras		
with intelligent lighting	F160-SLC20	20 mm field of view
	F160-SLC50	50 mm field of view
Camera only	F160-S1	Without lens or light source
Compatible F150 cameras		
with intelligent lighting	F150-SLC20	20 mm field of view
	F150-SLC50	50 mm field of view
with light	F150-SL20	20 mm field of view, red LED light source
	F150-SL50	50 mm field of view, red LED light source
Camera only	F150-S1A	Without lens or light source
Console	F160-KP	Keypad with shortcut buttons
Color LCD monitor	F150-M05L	5.5 inch color LCD
Memory card	F160-N64S	Memory capacity: 64 Mbytes
Application software	F250-UME	
Camera cable	F150-VS	For F160 (double-speed) & F150 cameras; cable length: 3 m
Monitor cable	RCA/BNC Video Cable	Cable length: 2 m
Parallel cable	F160-VP	Loose-wire cable for parallel I/O connectors; cable length: 2 m
Extension tubes	F150-EXT	A set of six extension tubes that are 40, 20, 10, 5, 1, and 0.5 mm in length respectively

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Lens Selection Guide

First: Start by defining the field of view requirements for each camera. Refer to the diagram at bottom left. The field of view is considered to be the area or areas requiring inspection. This does not necessarily include the entire part or object in the field of view.

Second: Determine the camera distance, measured from the object surface to the camera. Refer to the lens setting illustration for additional information about setting distance. This distance can impose limitations on the field of view and lens choice. To get the greatest flexibility in lens selection, keep the camera setting distance as flexible as possible.

Third: Using the field of view and camera setting distance requirements, use the optical graph axis marked "Field of view L (mm)" to find the matching field of view size. Use the optical graph axis marked "Camera distance A (mm)" to find the approximate camera setting distance. Follow the values across the chart until they cross. Refer to the lens part reference on the right at the end of the graph line to find the correct lens size. (If a "t" value other than 0 is indicated, corresponding lens extension tubes will need to be added in between the camera and lens in order to properly focus the image. The "t" value indicates the thickness of the extension tubes required.)
Note: Extension tube length should not exceed 10% of the focal length of the lens. When looking at other manufacturers' lenses not referenced by Omron, please use a 1/3-inch CCD size as a selection value reference.

Fourth: If an appropriate lens cannot be found to satisfy your application, please consult your Omron vision representative for additional assistance in lens selection options.

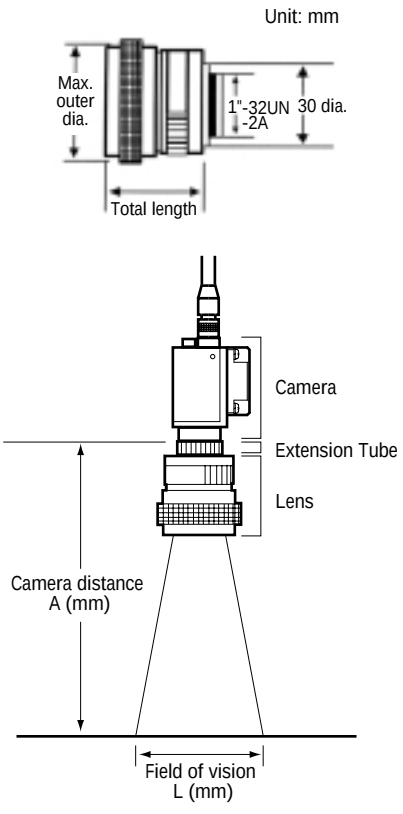
CCTV Lens

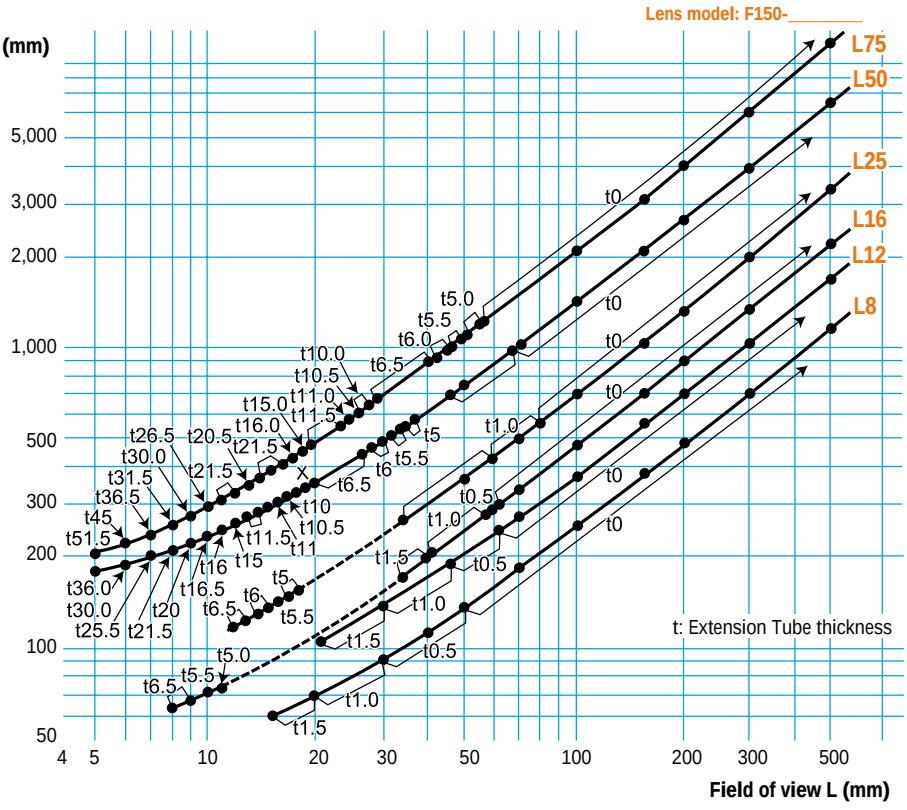
Model	F150-L8	F150-L12	F150-L16	F150-L25	F150-L50	F150-L75
Dimensions	29 dia. x 34.5 L*	30 dia. x 34.5 L*	30 dia. x 24.5 L*	30 dia. x 24.5 L*	32 dia. x 37 L*	32 dia. x 42.5 L*
Focal length	8.0 mm	12.5 mm	16.0 mm	25.0 mm	50.0 mm	75.0 mm
Brightness	F1.3	F1.4	F1.4	F1.4	F1.8	F2.7

* Lens diameter does not include lens ring lock screw height.

Note: Omron reserves the right to change lens suppliers and specifications without notification. Please verify all lenses with sales personnel.

Optical Graph





Note: All values are approximate values. It is recommended that the camera distance be adjusted by sliding the camera forward or backward in actual operation.

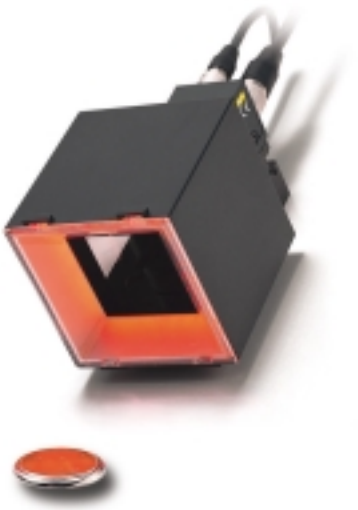
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The Right Lights & Camera For Your Action



Omron's compact shutter camera is perfect for high-speed inspection applications and can be fitted with several different light sources, including those that support the Intelligent Light Source specification, depending on the application.

Unique, Intelligent Light Sources (ILS)



Omron's ILSs and ILS integrated cameras are designed to enhance and simplify your vision applications. The ILSs use a hood shape that reduces external interference, making conditions ideal for highly accurate inspections. The combination of red and green LEDs also enables the F250 to inspect a wide range of objects. One ILS version offers the ability of adjustable coaxial vertical lighting in addition to the adjustable ring light. The adjustable ring light lets the user adjust brightness and light direction based on the application requirements.

Maximize Lighting Control

With an Intelligent Light Source camera, the F250's controller menus take all of the guesswork out of proper lighting. Operators can control the illuminated area and light intensity from the controller menus. The settings are easily changed without direct adjustment to the light source. Lighting positioning is stored with other scene data so operators can change the lighting conditions to match different operating environments. Because the settings are numeric data, it is possible to recreate the lighting conditions from machine to machine.

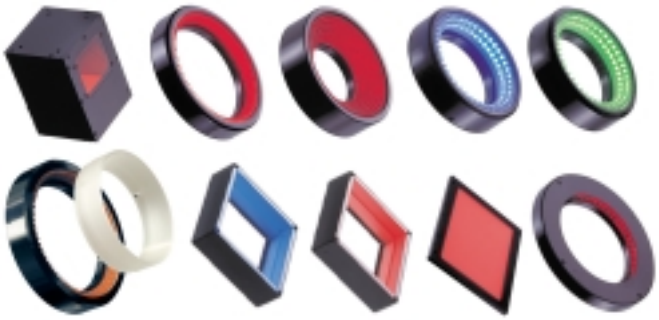


Solve Machine Vision Lighting Problems with Easy-to-Use Intelligent Lighting Control

A Visionary Partnership

Omron and CCS America have partnered to provide the CCS Intelligent Lighting Adapter (ILA), lighting power supplies and wide range of controllable LED lighting for Omron's F-series Vision Sensors. Features include:

- 64 light level steps per light
- Up to 4 controllable lights per camera and power supply
- Set light intensity and angle in controller software
- Settings are saved and repeatable
- Compatible with Omron F150-3, F160 and F250 vision sensors
- Over 200 CCS lighting options to choose from; consult your Omron vision representative for additional information and assistance regarding CCS lighting products



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