Vision Systems

Smart Sensors (with Ultra-High-Speed CCD Camera)

ZFV Series

NEW

Ordering Information

Sets of Sensor Head and Amplifier Unit

Type	NPN	PNP
Narrow View/Single Function	ZFV-R1010	ZFV-R1015
Narrow View/Standard	ZFV-R1020	ZFV-R1025
Wide View/Single Function	ZFV-R5010	ZFV-R5015
Wide View/Standard	ZFV-R5020	ZFV-R5025

Sensor Heads

Appearance	Type	Working length	Sensing area	Model
	Narrow View	34 to 49 mm (variable)	5 4.6 mm (H V) to 9 8.3 mm (H V)	ZFV-SR10
	Wide View	38 to 194 mm (variable)	10 9.2 mm (H V) to 50 46 mm (H V)	ZFV-SR50

Amplifier Units

Appearance	Type	Power supply	Output type	Model
	Single Function	24 VDC 10%	NPN	ZFV-A10
			PNP	ZFV-A15
	Standard		NPN	ZFV-A20
			PNP	ZFV-A25

Accessories (Order Separately)

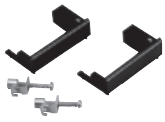
Data Storage Units

Appearance	Power supply	Output type	Model
	24 VDC	NPN	ZS-DSU11
		PNP	ZS-DSU41

Controller Link Unit

Appearance	Model
	ZS-XCN

Panel-mounting Adapter

Appearance	Model	
	ZS-XPM1	First Unit
	ZS-XPM2	Additional Units (for expansion)

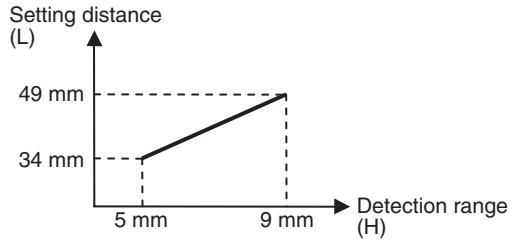
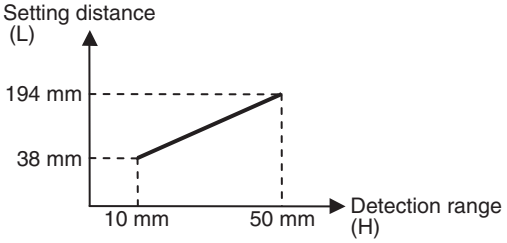
Sensor Head Extension Cable

Cable length	Model	Quantity
3 m	ZFV-XC3B (See note.)	1
8 m	ZFV-XC8B	1

Note: ZFV-XC3BR Robot Cable is also available.

Specifications

Sensor Heads

Item	ZFV-SR10 (Narrow View)	ZFV-SR50 (Wide View)
Setting distance (L)	34 to 49 mm	38 to 194 mm
Detection range (H × V)	5 × 4.6 mm to 9 × 8.3 mm	10 × 9.2 mm to 50 × 46 mm
Relation between setting distance and detection range		
Guide light	Provided (center, sensing area)	
Built-in lens	Focus: f15.65	Focus: f13.47
Object lighting method	Pulse lighting	
Object light source	Eight red LEDs	
Sensing element	1/3-inch CCD, partial scan	
Shutter	Electronic shutter, shutter time: 1/1,000 to 1/4,000	
Power supply voltage	15 VDC (Supplied from Amplifier Unit.)	
Current consumption	Approx. 200 mA	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min	
Vibration resistance (destruction)	10 to 150 Hz, 0.35-mm single amplitude, 10 times each in X, Y, and Z directions for 8 min	
Shock resistance (destruction)	150 m/s^2, three times each in six directions (up/down, left/right, forward/backward)	
Ambient temperature	Operating: 0 to 40 C, Storage: 25 to 65 C (with no icing or condensation)	
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)	
Ambient atmosphere	Must be free of corrosive gas.	
Connection method	Prewired, Standard cable length: 2 m	
Degree of protection	IEC60529, IP65	
Materials	Case: ABS, Mounting bracket: PBT	
Weight	Approx. 200 g (including mounting bracket and cord)	
Accessories	Mounting bracket (1), Ferrite core (1), Instruction sheet	

Amplifier Units

Item		Single-function models		Standard models	
		ZFV-A10	ZFV-A15	ZFV-A20	ZFV-A25
Output method		NPN	PNP	NPN	PNP
Inspection items		Pattern (PTRN), Brightness (BRGT)		Patterns (PTRN), Brightness (BRGT), Area (AREA), Width (WID), Position (POSI), Count (CNT), Characters (CHAR)	
Teaching area		Rectangular, one area			
Teaching area size		Pattern (PTRN), Brightness (BRGT): Any rectangular area (256 × 256 max.) Area (AREA), Width (WID), Position (POSI), Count (CNT), Characters (CHAR): Any rectangular area (full screen max.)			
Sensing area		Full screen			
Resolution		468 432 (H V) max.			
Bank selection		Supported for 8 banks.			
Response time		Pattern (PTRN), Brightness (BRGT): High-speed: 4 ms, Standard: 8 ms, High-precision: 12 ms Area (AREA), Width (WID), Position (POSI), Count (CNT), Characters (CHAR): 128 128: 15 ms max.			
Other functions		Control output switching: ON for OK or ON for NG ON delay/OFF delay, One-shot output, “ECO” mode			
Output signals		(1) Control output (OUTPUT), (2) Enable output (ENABLE), (3) Error output (ERROR)			
Input signals		(1) Simultaneous measurement input (TRIG) or Continuous measurement input (TRIG), Switched by using menu. (2) Bank selection inputs (BANK1 to BANK3) (3) Workpiece still teaching (TEACH) or Workpiece moving teaching (TEACH), Switched by using menu.			
Connecting to ZS-DSU	Image logging trigger	Stores NG images or all images.			
	Sampling rate	ZFV measurement cycle (See note 1.)			
	Number of logged image	Logs up to 128 images in series			
	Number of connected	15 max. (ZFV: 5 Units max., ZS-LDC: 9 Units max., ZS-MDC (See note 2.): 1 Unit max.)			
	External bank function	Amplifier Unit setting data can be saved to the memory card as bank data. Reading bank data enables bank switching.			
Sensor Head interface		Digital interface			
Image display		Compact TFT 1.8-inch LCD (Display dots: 557 234)			
Indicators		Judgement result indicator (OUTPUT) Inspection mode indicator (RUN)			
Operation interface		Cursor keys (up, down, left, right) Setting key (SET) Escape key (ESC) Operating mode switching (slide switch) Menu switching (slide switch) Teaching/Display switching key (TEACH/VIEW)			
Power supply voltage		20.4 to 26.4 VDC (including ripple)			
Current consumption		600 mA max. (with Sensor Head connected)			
Dielectric strength		1,000 VAC, 50/60 Hz for 1 min between leads and Amplifier Unit case			
Noise immunity		1 kV, Pulse rise: 5 ns, Pulse width: 50 ns, Burst duration: 15 ms, Cycle: 300 ms			
Vibration resistance		Destruction: 10 to 150 Hz, 0.1-mm single amplitude, 10 times each in X, Y, and Z directions for 8 min			
Shock resistance		Destruction: 150 m/s^2, three times each in six directions (up/down, left/right, forward/backward)			
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%			
Ambient atmosphere		Must be free of corrosive gas.			
Degree of protection		IEC60529, IP20			
Materials		Polycarbonate			
Weight		Approx. 300 g (including cord)			
Accessories		Ferrite core (1), Instruction sheet			

Note 1. This is the sampling rate when logging images. To log measurement data only, use the ZS-DSU settings.

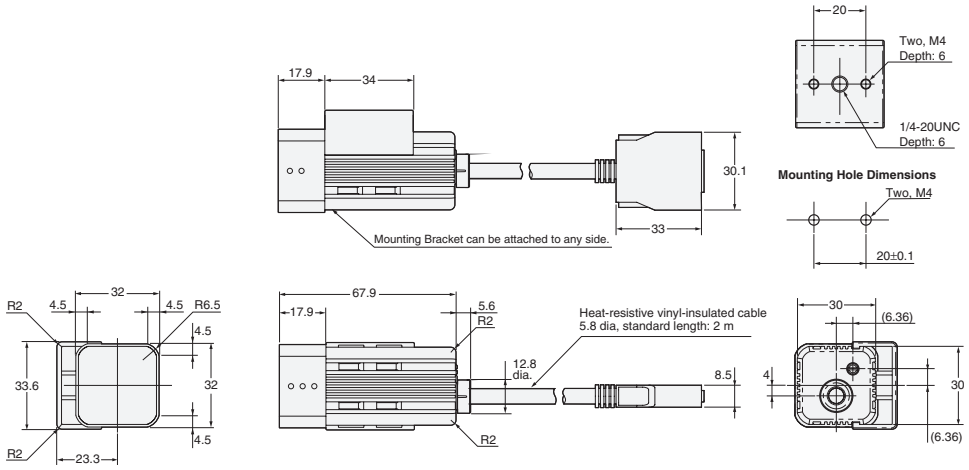
2. Image logging is not possible when the ZS-MDC is connected.

Dimensions

Note: All units are in millimeters unless otherwise indicated.

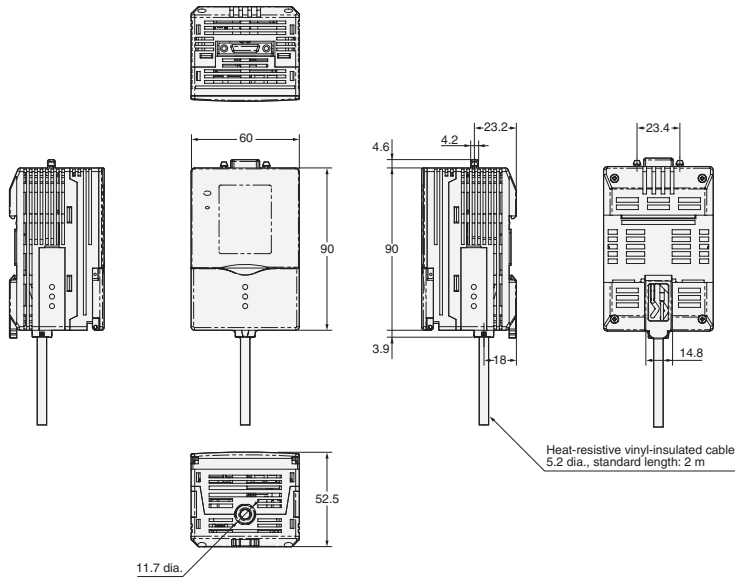
Sensor Heads

ZFV-SR□



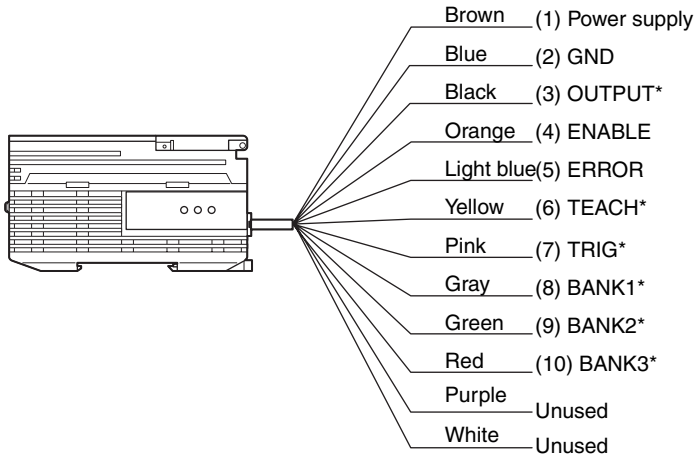
Amplifier Units

ZFV-A□



About the I/O cable

The following shows the leads that comprise the I/O cable.

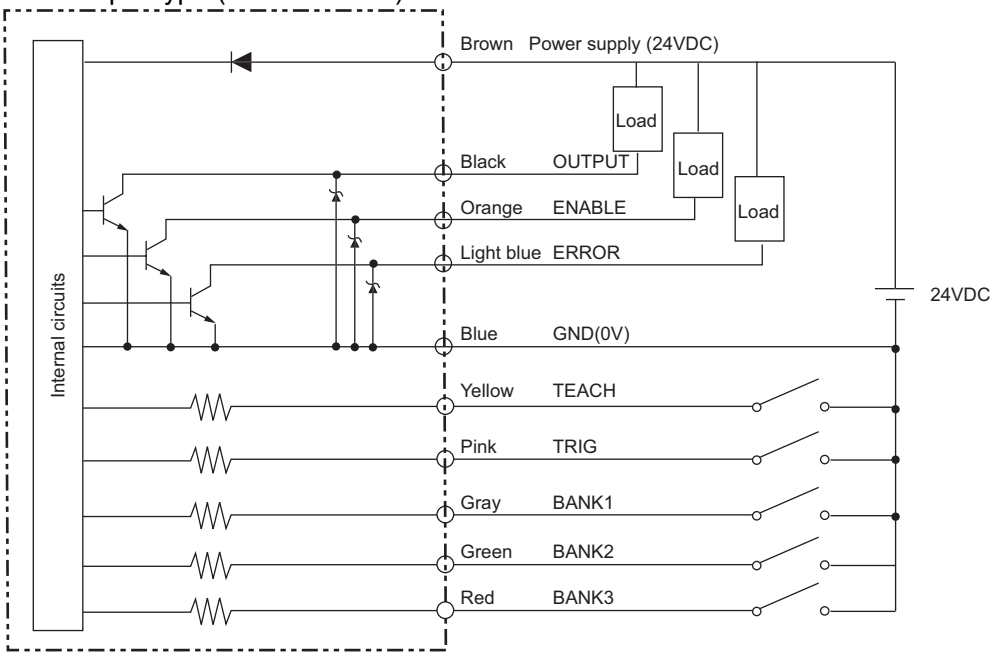


* : Enabled only in the RUN mode

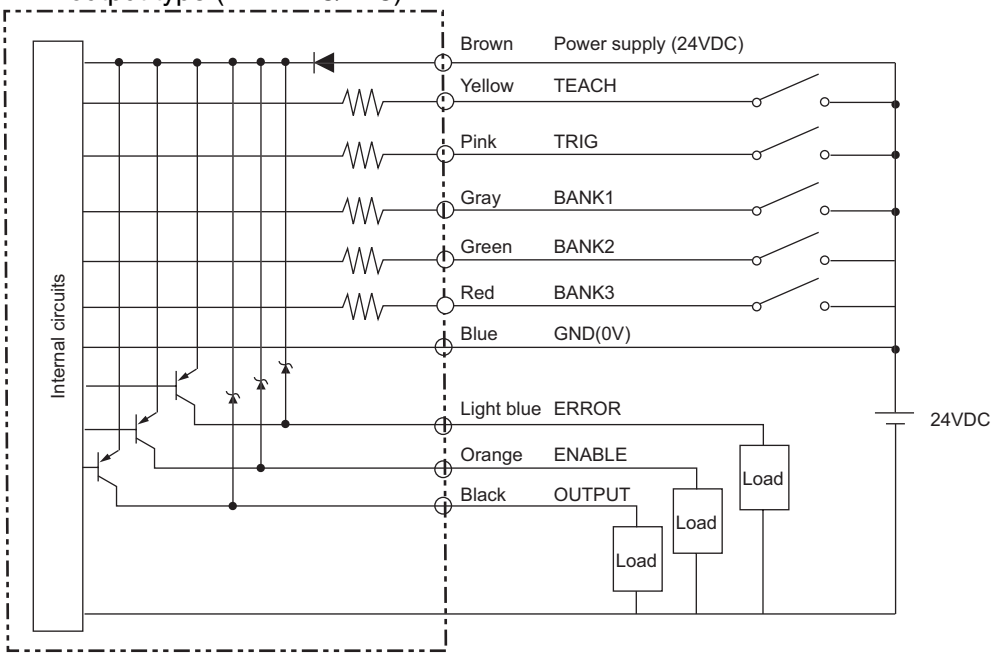
1. Power supply
   This connects the power supply.
   Supply power from a DC power supply unit that has a countermeasure (safety ultra-low voltage circuit) built-in for preventing high voltages from occurring.
   Wire the power supply separately from other devices. Wiring them together or placing them in the same duct may cause induction, resulting in malfunction or damage.
2. GND
3. OUTPUT (control output)
   This outputs judgment results.
   This lead is interlocked with OUTPUT LED.
4. ENABLE (enable output)
5. ERROR (error output)
   This turns ON when an error is generated.
6. TEACH (teaching input)
   There are two teaching modes, workpiece stop teaching and workpiece move teaching. These teaching modes can be selected in the menu.
7. TRIG (measurement trigger input)
   There are two measurement modes, synchronous measurement and continuous measurement. Which mode of measurement is to be performed in is selected in the menu.
8. BANK1 (bank switching input 1)
9. BANK2 (bank switching input 2)
10. BANK3 (bank switching input 3)

I/O Circuit Diagrams

NPN output type (ZFV-A10/A20)



PNP output type (ZFV-A15/A25)



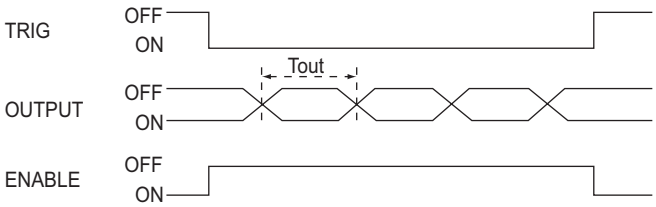
Timing charts

The following shows the timing charts when communication is performed with external devices.

Measurement

Continuous measurement

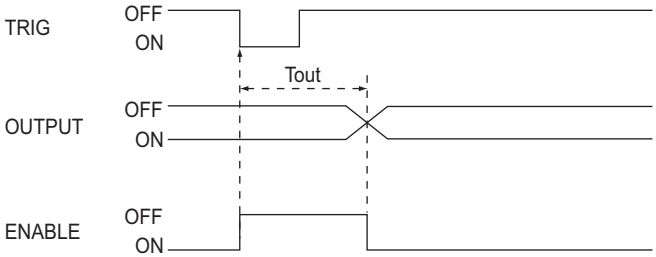
Measurement is performed continuously for the duration that the TRIG signal is ON.
The measurement result is updated, and output to external devices at each measurement cycle.



Tout: Measurement cycle
The measurement cycle changes depending on the setting.

Synchronous measurement

Measurement is performed only once in synchronous with the change in TRIG signal state from OFF to ON, and the result is output.



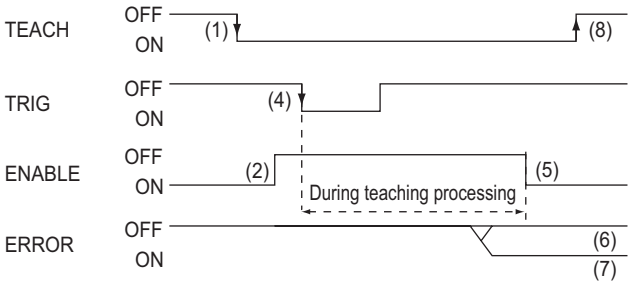
Tout: Measurement time.
The measurement time changes depending on the setting.

- The minimum ON width of the TRIG signal is 1 ms.
- The OUTPUT signal is held until the next measurement result is updated.
  Note, however, that when one-shot output is currently set, the OUTPUT signal is held for the preset time.

Teaching

Workpiece stop teaching

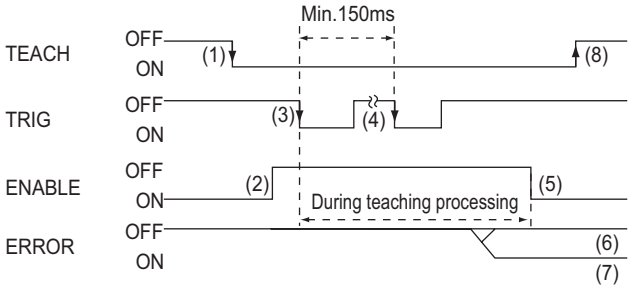
Teaching processing is performed according to TRIG signal input after the TEACH signal is input from the outside.
Measurement is not performed while teaching is being performed. Do not move the workpiece until teaching is completed.



1. Turn the TEACH signal ON.
2. Confirm that the ENABLE signal has turned OFF.
3. Make sure that the workpiece to be taught is in the teaching area.
4. Input the TRIG signal from the outside.
5. The ENABLE signal turns ON after teaching is completed. At this timing, check the state of the ERROR signal.
6. When teaching has been completed successfully, the ERROR signal stays OFF.
7. When teaching fails, the ERROR signal turns ON.
8. Turn the TEACH signal OFF, and end teaching processing.
   When teaching fails, the state before teaching was initiated is returned to. Perform teaching again.
   If the TEACH signal is turned OFF midway, teaching is disabled.

Workpiece move teaching

Use this teaching mode when the object cannot be stopped.
Teaching processing is divided up and performed in synchronous with the TRIG signal input after the TEACH signal is input from the outside.
Teaching must be processed six times.
Measurement is not performed while teaching is being performed.



1. Turn the TEACH signal ON from the outside.
2. Confirm that the ENABLE signal has turned OFF.
3. Input the TRIG signal at the timing for measuring the workpiece to be taught.
4. Repeat the input in step (3) six times. (Trigger inputs from the seventh time onwards are ignored.)
5. The ENABLE signal turns ON after teaching is completed. Check the state of the ERROR signal at this timing.
6. When teaching has been completed successfully, the ERROR signal stays OFF.
7. When teaching fails, the ERROR signal turns ON.
8. Turn the TEACH signal OFF, and end teaching processing.
   When teaching fails, the state before teaching was initiated is returned to. Perform teaching again.
   If the TEACH signal is turned OFF midway, teaching is disabled.

Bank switching

The bank No. can be switched when BANK1o BANK3 are connected as follows.

Bank No.	BANK1	BANK2	BANK3
BANK1	OFF	OFF	OFF
BANK2	ON	OFF	OFF
BANK3	OFF	ON	OFF
BANK4	ON	ON	OFF
BANK5	OFF	OFF	ON
BANK6	ON	OFF	ON
BANK7	OFF	ON	ON
BANK8	ON	ON	ON

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. Z205-E2-02-X In the interest of product improvement, specifications are subject to change without notice.

Vision Sensor

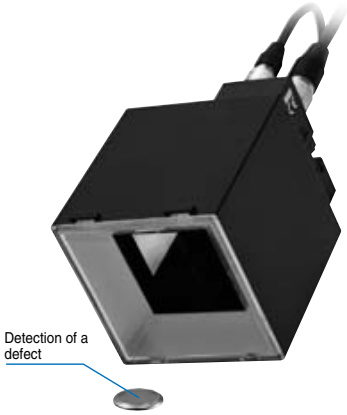
F150-3

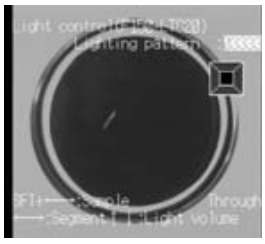
Perform settings in a conversational manner. The dialog menu artist "talks" to you.

Features

Intelligent lighting

Various types of lighting control make it possible to obtain a clear, stable image suitable for the inspection. The dome shape minimizes the effects of external light and permits damage inspection. Red and green light is mixed to allow inspection of a wide range of work.





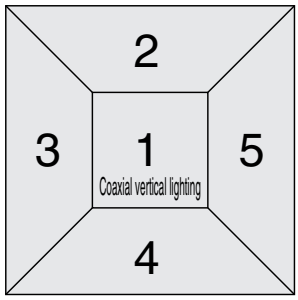
Inspection of button battery defect

Variety of lighting methods

The direction of lighting and the brightness can be changed. Coaxial lighting is also possible with the F150-SLC20. The optimum lighting method for the work can be selected.

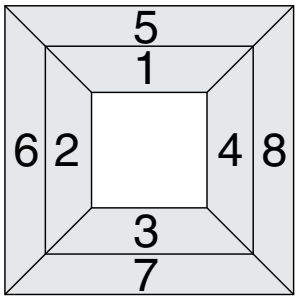
F150-SLC20
(Field of view: 20 mm)

Light intensity can be set separately to one of 8 levels for 5 illuminated areas.



F150-SLC50
(Field of view: 50 mm)

Light intensity can be set separately to one of 8 levels for 8 illuminated areas.



Control lighting from the menu

- The illumination area and light intensity are controlled from the controller menu. Settings can be easily changed without handling the lighting.
- The lighting is also treated as scene data, and thus can be changed along with other conditions when the model is changed.
- The controller manages the lighting setting as a digital value. This increases the reproducibility of the setting.

Features

Integrated camera and lens

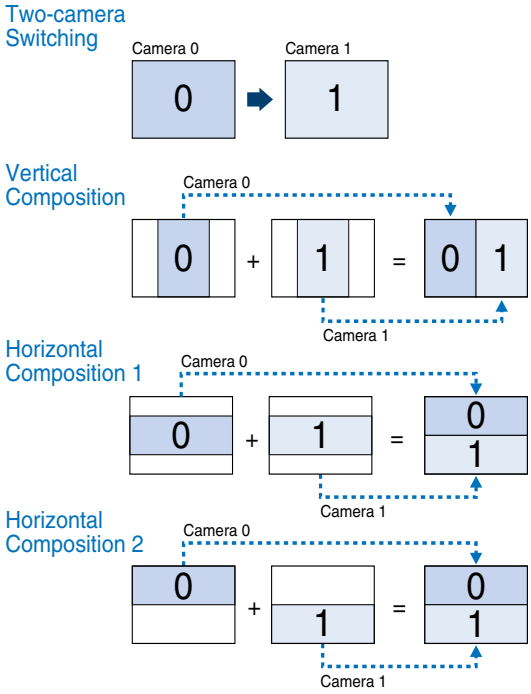
Camera setup is easy because the object-imaging camera is integrated into a single unit with the lighting apparatus and lens.

2-camera unit

We have made bi-directional, 2-line inspection easy and inexpensive.

A variety of image read-in methods

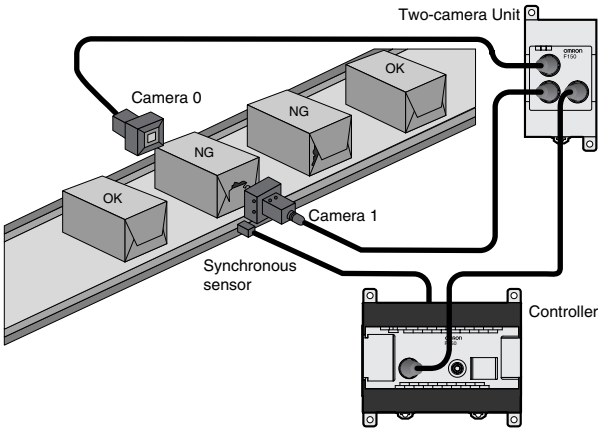
Images from two cameras can be read in at the same time. Read-in methods include successive changeover between the two cameras, and combination of the image from each camera into a single image.



Example of application using two cameras

Inspecting Boxes From Both Side

Simultaneously inspect both sides of a box using two cameras.



PCB Positioning

Determine the coordinates of position marks using two fields of vision.

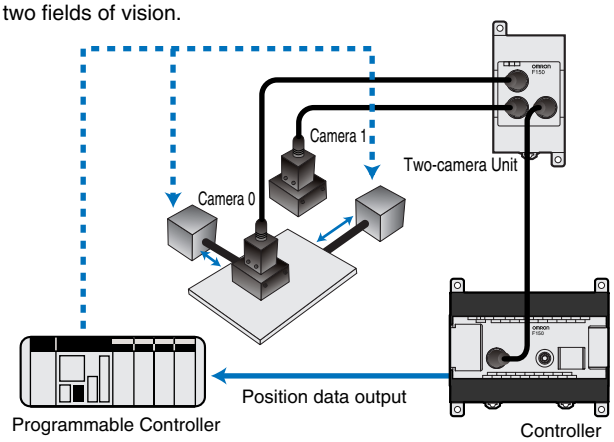


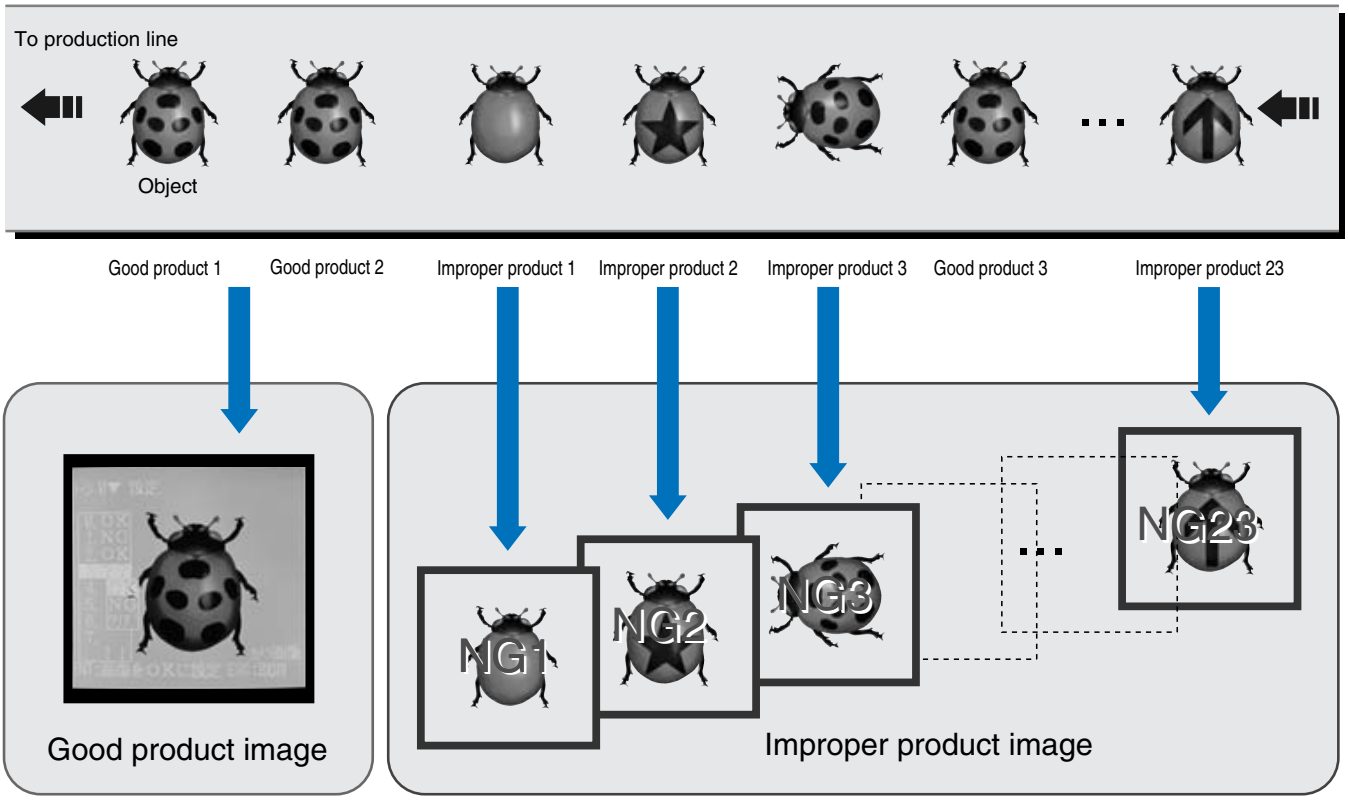
Image memory function

Up to 23 inspected images can be stored*.

You can check the image to see what kind of defect occurred. This serves as an aid to maintaining and improving the production line.

With respect to a stored image, measurement can be repeated and measurement conditions changed. This enables a dramatic reduction in setup time during initial installation.

*Can be stored before power is turned off. Storage of all images, including "good" images, is also possible.



Features

Compact frame shutter camera

- Compact with high resolution.
- An all-pixel reading method and square lattice CCD make it possible to obtain a clear and detailed image suitable for image processing.
- Equipped with an electronic shutter to handle high-speed lines.
- The shutter speed can be adjusted for each scene from the menu. Select the optimum shutter speed for the line speed and work.

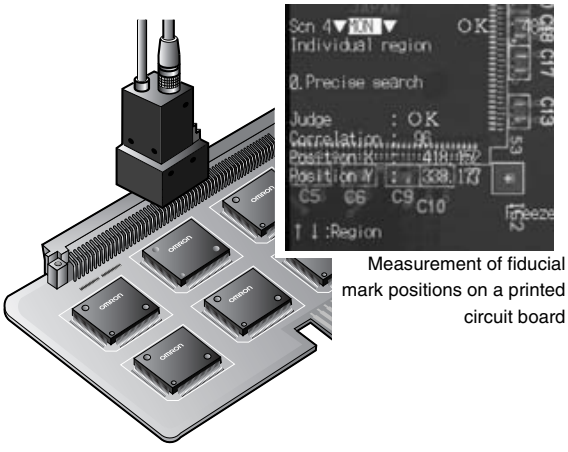
Image pre-processing

- Pre-processing such as smoothing, edge enhancement, edge extraction, and background cut-off allow you to obtain the optimum image for the inspection.
- Pre-processing can be performed in real time (simultaneously with image read-in).

Original image Edge extraction

High-precision gray search

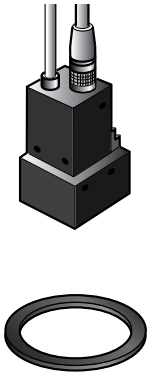
- Position measurement at sub-pixel precision is possible using 256 graduation gray search processing. This feature is ideal for high-precision positioning applications.



Measurement of fiducial mark positions on a printed circuit board

Damage/dirt inspection

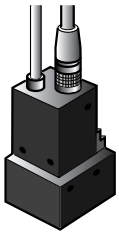
- Omron's proprietary algorithm enables fast and detailed inspection for visual defects such as chips, nicks, burrs, and dirt.
- Linear, circular and rectangular areas can be set, enabling inspection for a variety of defect shapes.

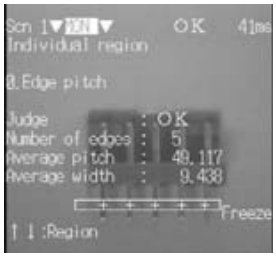


Rubber packing flare inspection

Gray edge measurement

- High-precision (sub-pixel) measurement of work edge position is possible. Ideal for width and dimension inspection.
- Includes edge number and pitch measurement functions for support of IC and connector lead inspection.

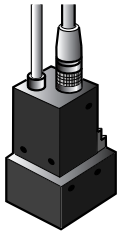




Connector pin-pitch inspection

Output computation functions

- Measurement data computations such as the four arithmetical operations, minimum, maximum, distance between two points, and angle can be set from the menu.
- Up to 24 computations can be set, and decision and data output can be performed based on the computation results.

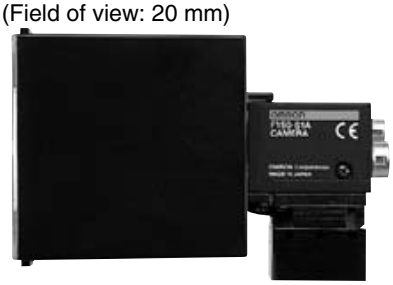


Hole-to-hole distance computation

System configuration

Cameras

Camera with Intelligent Light Source:
F150-SLC20
(Field of view: 20 mm)



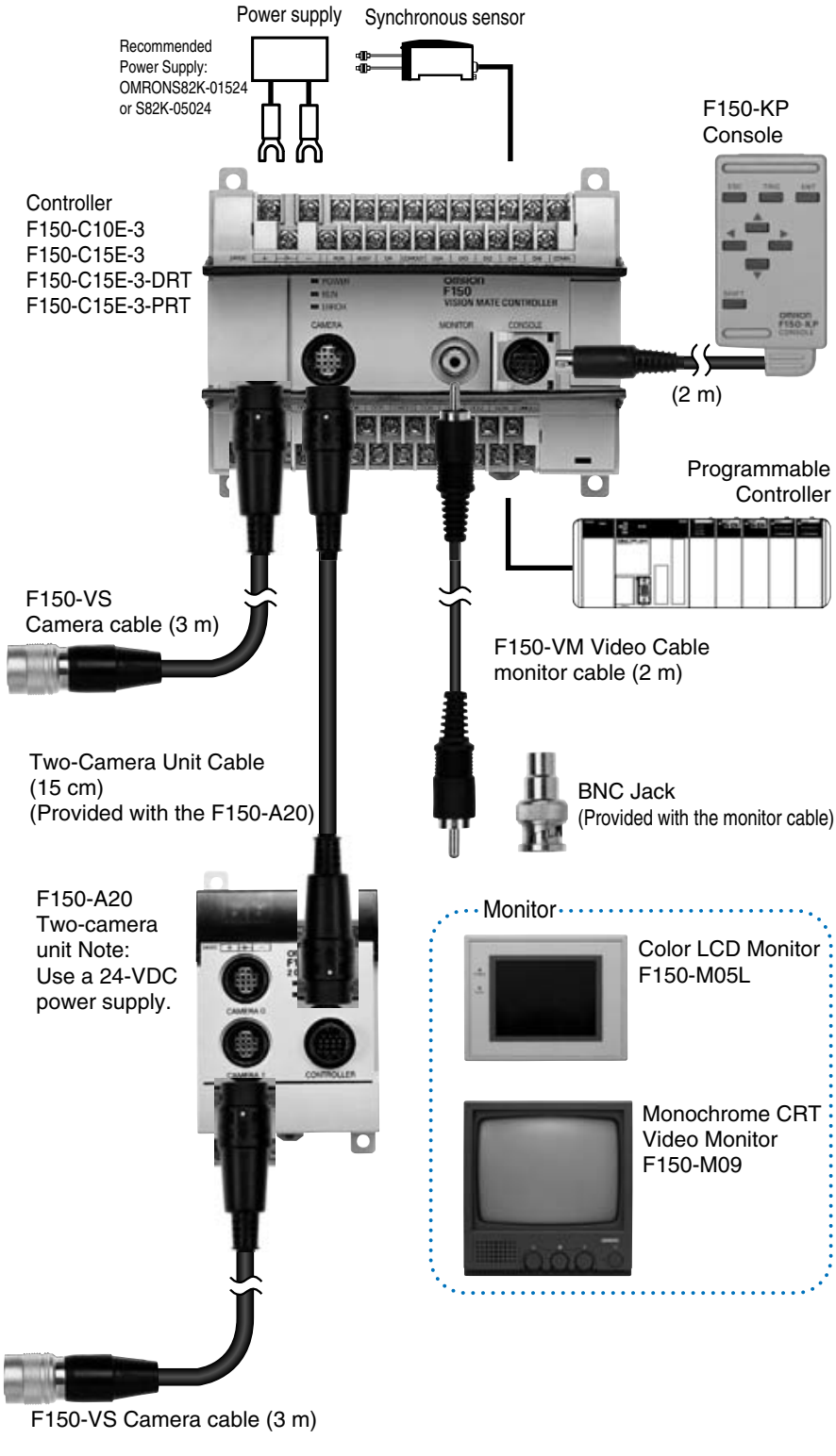
Camera with Intelligent Light Source:
F150-SLC50
(Field of view: 50 mm)

Camera with Light Source:
F150-SL20
(Field of view: 20 mm)
F150-SL50
(Field of view: 50 mm)

F150-S1A
Camera

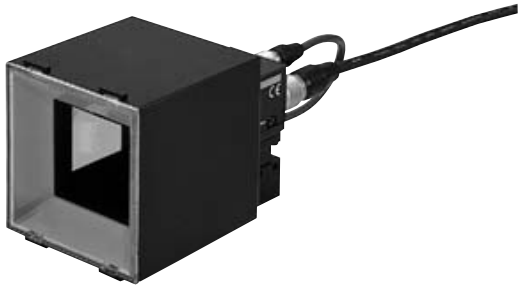
When using this camera, please look at "Cameras, lens, and lighting".

* When the size and view of a measurement item do not suit, please use a general CCTV lens and general lighting.



Camera with lighting

Camera with intelligent lighting



Model

Field of view: 20 mm	F150-SLC20
Field of view: 50 mm	F150-SLC50

*A lens and intelligent lighting are installed on the special camera (F150-S1A) for the F150.

Camera with lighting

Field of view: 20 mm	F150-SL20A
Field of view: 50 mm	F150-SL50A

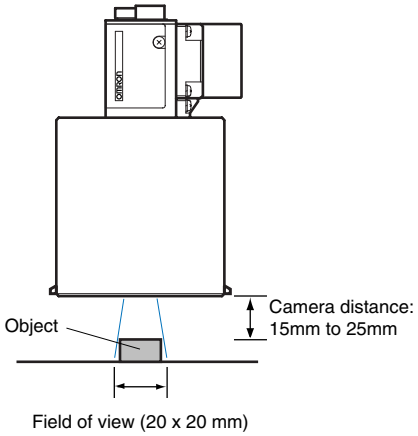
*A lens and lighting are installed on the special camera (F150-S1A) for the F150.

Distance to inspection object and field of view

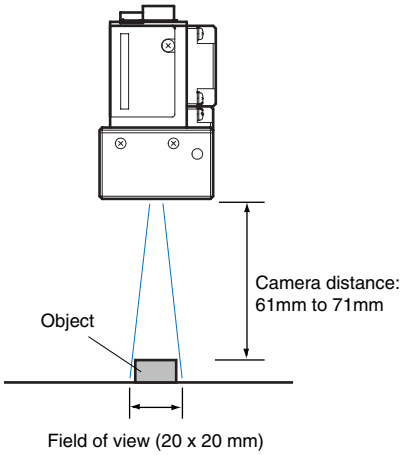
The camera distance is fixed.

Fix the camera at a distance that allows correct imaging of the inspected object.

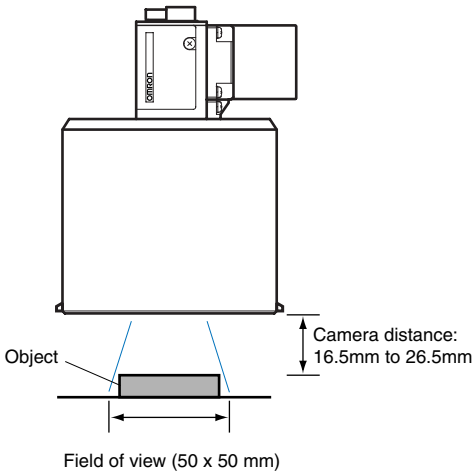
F150-SLC20



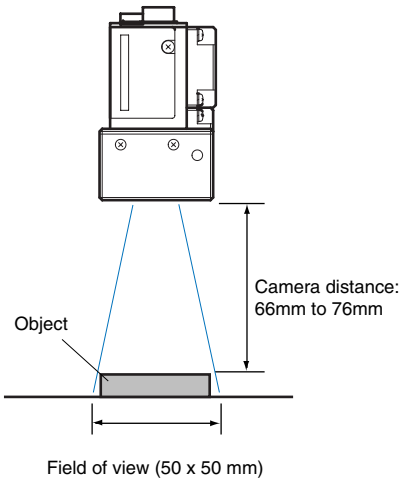
F150-SL20A



F150-SLC50



F150-SL50A



Ordering Information

Name		Model
Controller		F150-C10E-3 (NPN) F150-C15E-3 (PNP)
		F150-C10E-3-DRT (Compo Bus/D) F150-C15E-3-PRT (PROFIBUS)
Camera	Camera with intelligent lighting	F150-SLC20
		F150-SLC50
	Camera with lighting	F150-SL20A
		F150-SL50A
	Camera only	F150-S1A
2-camera unit		F150-A20
Console		F150-KP
LCD monitor		F150-M05L
Video monitor		F150-M09
Camera cable 3 m		F150-VS
Monitor cable 2 m		F150-VM

Rating/Performance

Controller: F150-C10E-3/C15E-3 and F150-C15E-3-PRT/DRT

Item	Specifications
Number of connected cameras	1 unit / 2 units (using the F150-A20)
Processing resolution	512 (H) x 484 (V)
Number of scenes	16 scenes (can be saved to a computer through the RS-232C)
Image memory function	Up to 23 images can be saved
Processing method	Grey Levels (256) / Binary
Image pre-processing	Smoothing, edge enhancement, edge extraction, background cut-off
Binary Levels	256 levels (per measurement area)
Position correction function	Correction directions: X, Y, Detection modes: binary center of gravity / main axis angle, model position: middle point, edge position
Number of measurement areas	16 areas/scene
Measured data	Area center of gravity, main axis angle, dark-light correlation value, dark-light search position, defect degree, edge position, edge number, density average, relative position
Calculation functions	Four arithmetic operations, distance, maximum value / minimum value, absolute value, others
Result output	Overall decision, computation result (decision) per measurement area, measurement/computation data (RS-232C and parallel output possible)
Monitor	1 ch (supports pin jack and over-scan monitor)
RS-232C	1 ch (Dsub 9-pin, female)
CompoBus/D	1 ch (F150-C10E-3-DRT)
PROFIBUS-DP	1 ch (F150-C15E-3-PRT)
Parallel input/output	F150-C10E-3 and F150-C15E-3: Inputs: 11points, outputs: 21 points F150-C10E-3-PRT/DRT: Inputs: 1 point, outputs: 5 points (including control inputs/outputs)
Power supply voltage	20.4 to 26.4 VDC
Current consumption	Approximately 0.5 A
Ambient temperature	Operating: 0 to +50°C, storage: -25 to +65°C (no ice formation or condensation)
Ambient humidity	Operating/storage: 35 to 85% RH (with no condensation)
Weight (Packed state)	Approximately 940 g (controller: 390 g)
Accessories	Three manuals, CompoBus/D connector (DRT type only), PROFIBUS-DP connector (PRT type only)

Camera
Camera with intelligent lighting: F150-SLC20/50
Camera with lighting: F150-SLC20A/50A
Camera: F150-SL20A/50A

Item		Specifications
Camera	Image pick-up	1/3 inch CCD
	Effective pixels	659(H) x 494(V)
	Shutter function	Electronic frame shutter Shutter speed: 1/100, 1/500, 1/2000, 1/10000 sec (can be changed from the menu)
Lens	Installation distance	F150-SLC20: 15 to 25 mm, F150-SLC50: 16.5 to 26.5 mm, F150-SL20A: 61 to 71 mm, F150-SL50A: 66 to 76 mm
	Field of view	F150-SLC20/SL20A:20 mm□, F150-SLC50/SL50A:50 mm□
Lighting unit	Light source	F150-SLC20/50: Red LED - green LED mixed F150-SL20A/50A: Red LED
	Light emission method	Pulse emission (sychronized with camera shutter)
Ambient temperature		Operating: 0 to +50°C, storage: -25 to +60°C (no icing or condensation)
Ambient humidity		Operating/storage: 35 to 85% RH (with no condensation)
Weight * Unit only		F150-SLC20: Approximately 280 g F150-SLC50: Approximately 370 g F150-SL20A/50A: Approximately 135 g F150-S1A: Approximately 80 g
Accessories		Instruction manual

Two-camera unit: F150-A20

Item	Specifications
Number of connected cameras	2 units
Camera mode	Two-camera switching, vertical division composite, horizontal division composite 1/2, one camera single-stand (camera 0/1)
Supply voltage	20.4 to 26.4 VDC
Current consumption	Approximately 0.3 A
Ambient temperature	Operating: 0 to +50°C, storage: -25 to +65°C (no ice formation or condensation)
Ambient humidity	Operating/storage: 35 to 85% RH (with no condensation)
Weight * Unit only	Approx. 220 g
Accessories	Operation manual, camera unit cable (1)

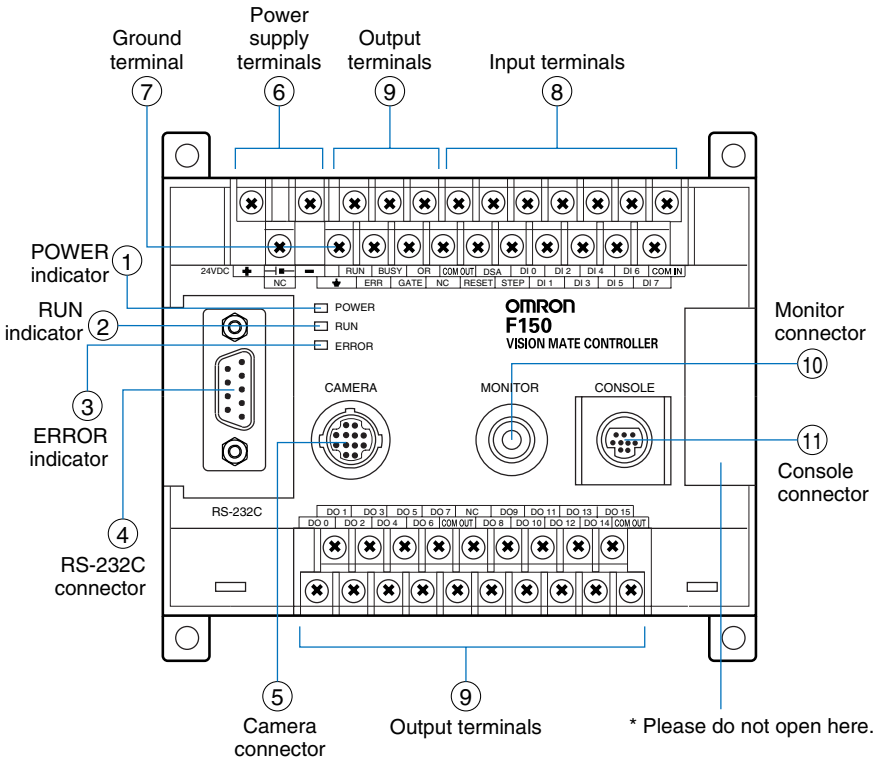
Note: Can be connected to an F150-C10-3 controller.

Monitor

Item / Product name / Model	LCD monitor F150-M05L	Video monitor F150-MON
Size	5.5 type	9 inches
Type	TFT color LCD	CRT monochrome
Resolution	320 x 240 dots	800TV or higher (center)
Input signal	NTSC composite video (1.0 V / 75)	
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 (no ice formation or condensation)	Operating: -10 to +50°C, storage: -20 to +65°C (no ice formation or condensation)
Ambient humidity	Operating/storage: 35 to 85% RH (no ice formation or condensation)	10 to 90–RH (No condensation)
Weight * Unit only	Approx. 1 kg	Approx. 4.5 kg
Accessories	Operation manual, clamps (4)	Instruction manual

Part Names/Functions

F150-C10E-3/F150-C15E-3



① Lit while power is ON.

② Lit while the F150 is in Run Mode.

③ Lit when an error has occurred.

④ Connects the F150 to external devices such as personal computers or programmable controllers.

⑤ Connects the F150 to camera or two-camera unit.

⑥ Connects to the power supply.

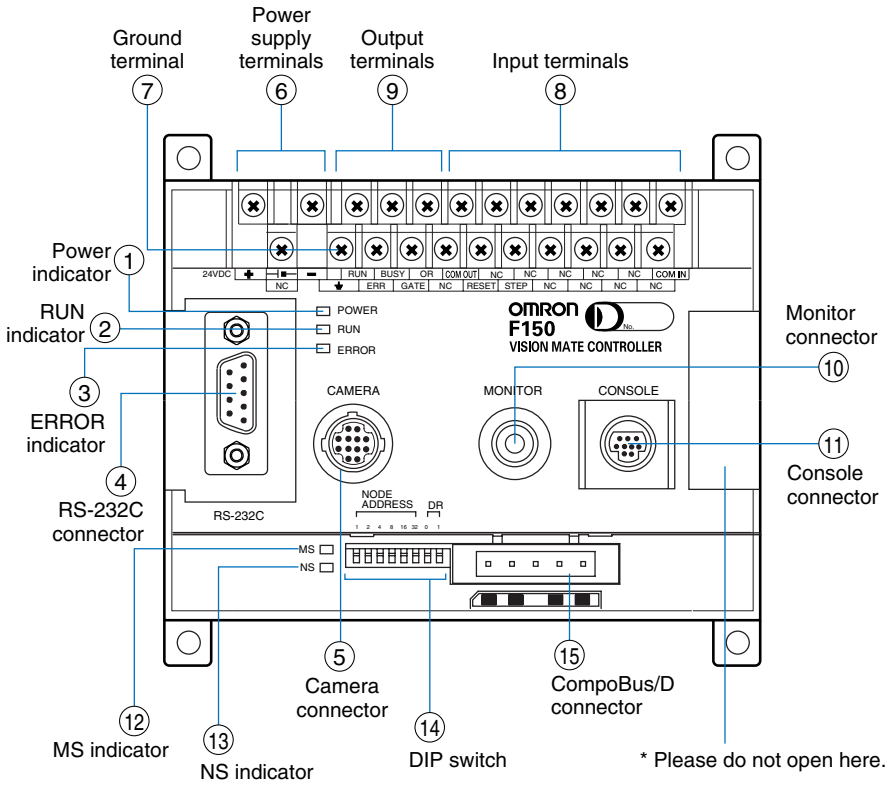
⑦ Connects to the ground wire.

⑧ ⑨ Connects to the F150 to external devices such as synchronous sensors or programmable controllers.

⑩ Connects to the monitor.

⑪ Connects to the console.

F150-C10E-3-DRT (CompoBus/D (DeviceNet) type)



① Lit while power is ON.

② Lit while the F150 is in Run Mode.

③ Lit when an error has occurred.

④ Connects the F150 to external devices such as personal computers or programmable controllers.

⑤ Connects the F150 to camera or two-camera unit.

⑥ Connects to the power supply.

⑦ Connects to the ground wire.

⑧ ⑨ Connects to the F150 to external devices such as synchronous sensors or programmable controllers.

⑩ Connects to the monitor.

⑪ Connects to the console.

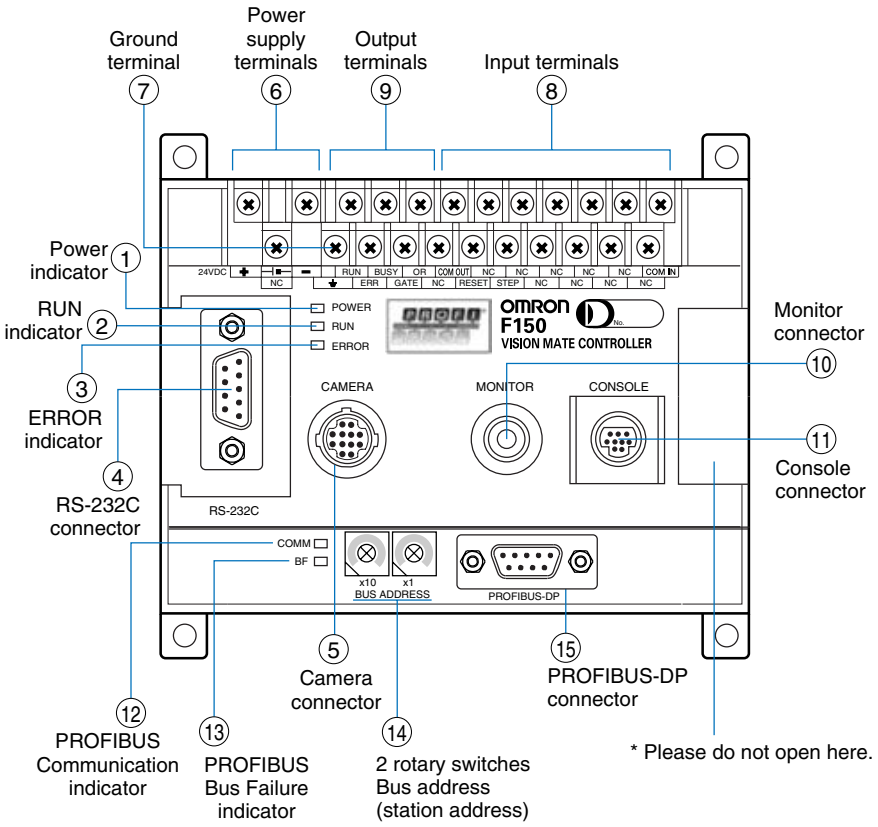
⑫ Indicates the state of F150 in CompoBus/D communication.

⑬ Indicates the state of F150 in CompoBus/D communication.

⑭ Set up the node address and communication speed of CompoBus/D communication.

⑮ Connects to the communication cable of a CompoBus/D network.

F150-C15E-3-PRT (PROFIBUS-DP type)



① Lit while power is ON.

② Lit while the F150 is in Run Mode.

③ Lit when an error has occurred.

④ Connects the F150 to external devices such as personal computers or programmable controllers.

⑤ Connects the F150 to camera or two-camera unit.

⑥ Connects to the power supply.

⑦ Connects to the ground wire.

⑧ ⑨ Connects to the F150 to external devices such as synchronous sensors or programmable controllers.

⑩ Connects to the monitor.

⑪ Connects to the console.

⑫ Indicates the state of F150 in PROFIBUS-DP communication.

⑬ Indicates the state of F150 in PROFIBUS-DP communication.

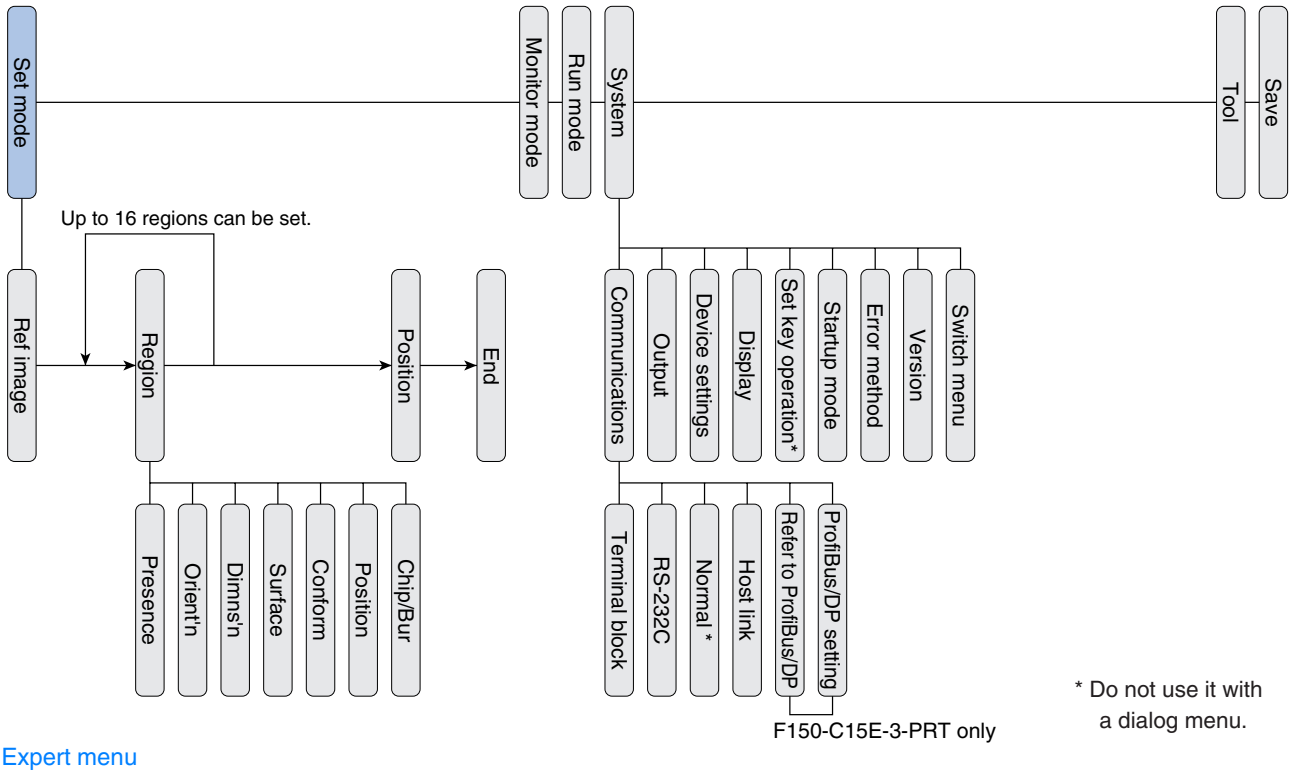
⑭ Set up the node address of PROFIBUS-DP communication.

⑮ Connects to the communication cable of a PROFIBUS-DP network.

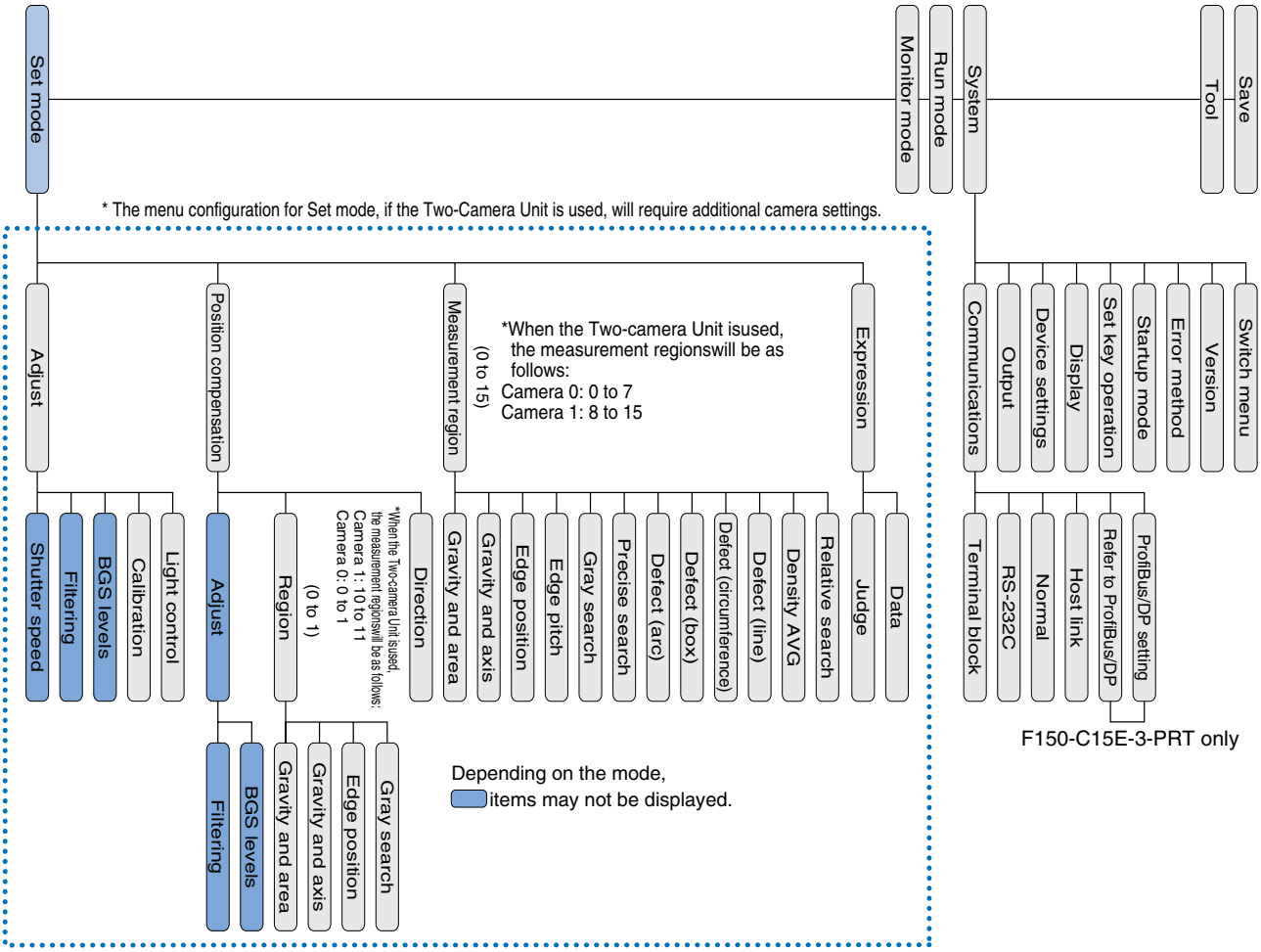
Function menu

Menu structure diagram

Dialog menu



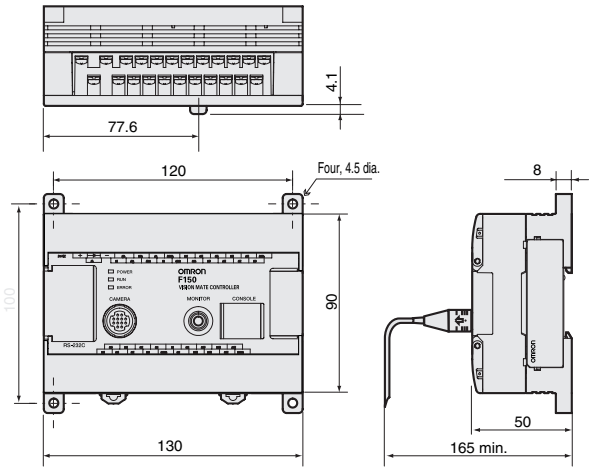
Expert menu



Dimensions (Unit: mm)

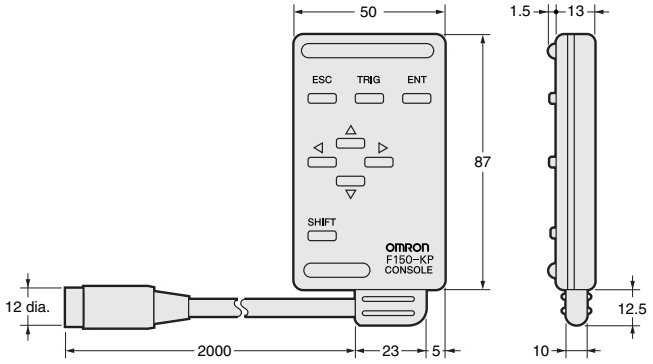
Controller

F150-C10E-3, F150-C50E-3,
F150-C15E-3-PRT,
F150-C10E-3-DRT



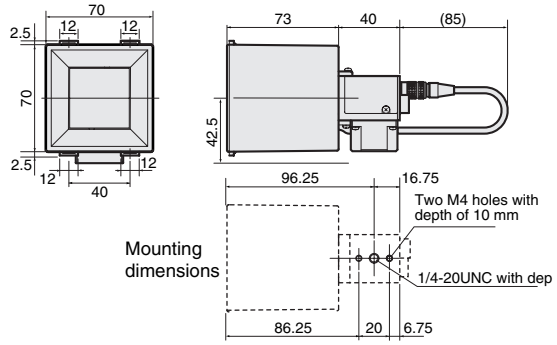
Console

F150-KP

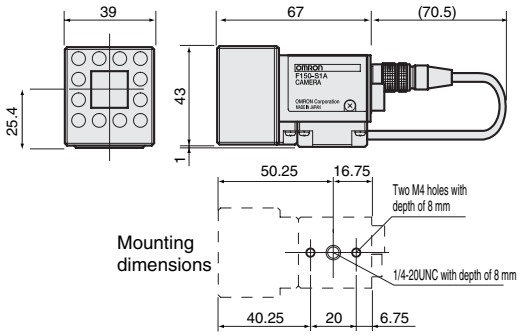


Camera

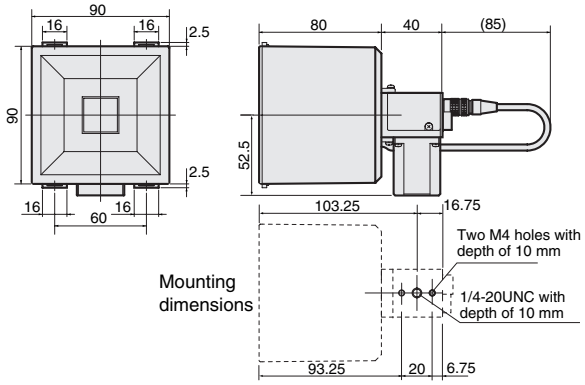
F150-SLC20 (camera with F150-LTC20 intelligent lighting)



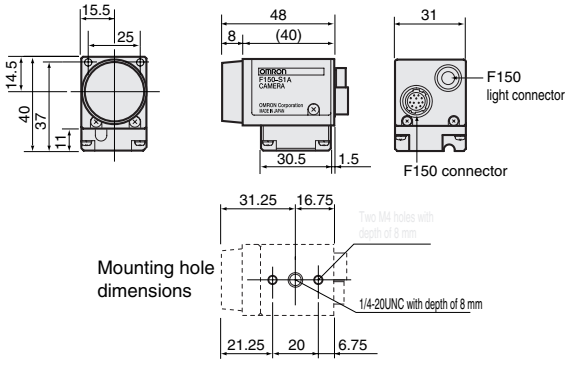
F150-SL20A/SL50A (camera with lighting)



F150-SLC50 (camera with F150-LTC50 intelligent lighting)

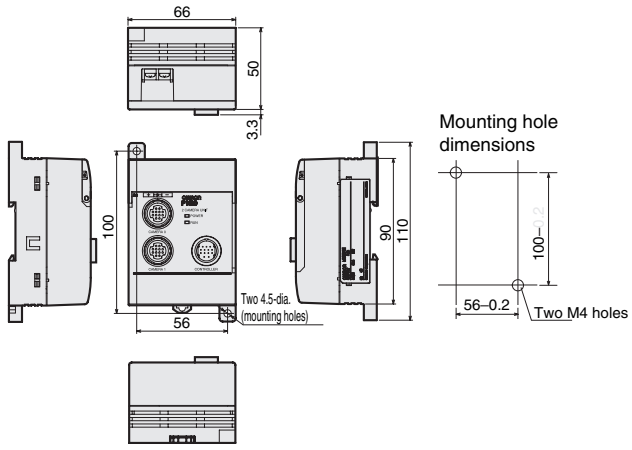


F150-S1A (camera only)



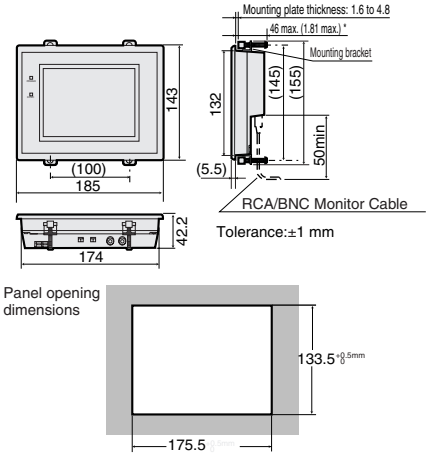
2-camera unit

F150-A20



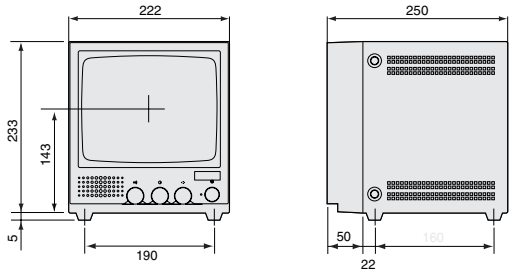
LCD monitor

F150-M05L



CRT monitor

F150-M09



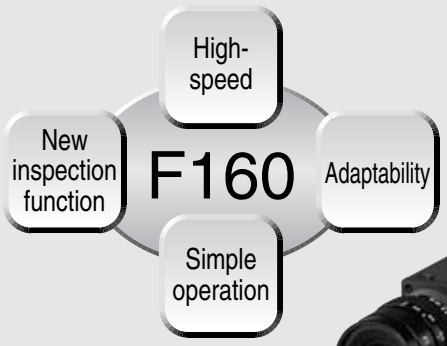
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. Q09E-EN-01

Vision Sensor

F160

Impressive high speed opens up new possibilities

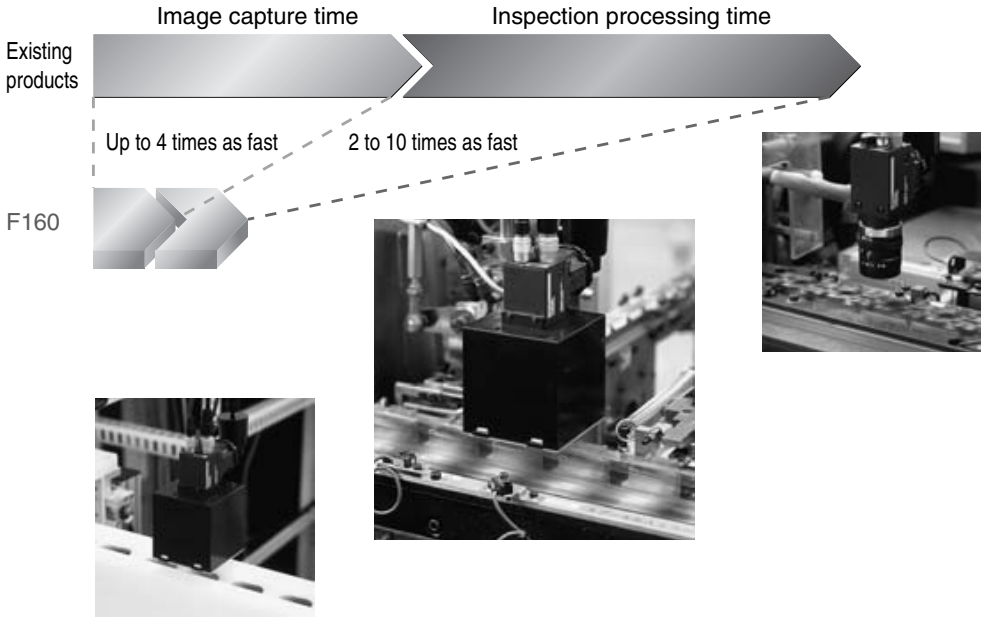


CE

Features

Can be applied to ultra-fast manufacturing lines. Full range of detection features within the required cycle time. Contributes to improved detection quality.

The newly developed double-speed camera makes it possible to read in images as much as 4 times faster than previous speeds, and also achieves an impressive image processing speed 2 to 10 times faster than previous speeds. For example, using dark-light search processing in Figure 1, the camera can be used on ultra high-speed lines handling approximately 5000 pieces per minute. Because each single inspection is fast, multiple inspection tasks can be carried out with minimal increase in time. Inspection tasks that were previously impossible due to insufficient time can also be added for a big contribution to inspection quality.



Example: Gray Search Processing (Picture 1)

Example: More than one inspection item

Features

Equipped with a memory card for low-cost introduction on multi-type lines and a dramatic increase in the number of scenes. Moreover, this is a single-stand system, thus, easily implemented.

The F160 unit is equipped with a memory card slot. The scene number can be easily increased by simply inserting a card. For example, a 128-MB card can store approximately 1000 scenes. (*) No more need to build a scene data communication system using computers.

* The number of scenes that can be stored varies depending on the scene settings.

Enhanced image memory function

Up to 35 measurement images or failure images can be stored. The most recent failure image can be displayed while measurement continues, enabling analysis of the failure without stopping the line.

Good product image

Improper product image

Wide range of camera variations

In addition to the double-speed camera, our F150 camera can also be connected. This lets you select the optimum camera for your speed, cost, and lighting needs.

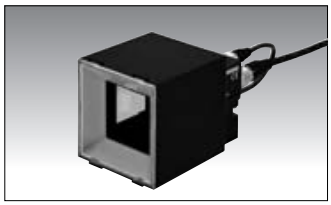
Double-speed camera

F160-S1/S2/SLC20/SLC50

Eight shutter speeds can be selected from the controller. An intelligent-lighting type is also available.

F150 camera

F150-S1AESLC20/SLC50ESL20A/SL50A



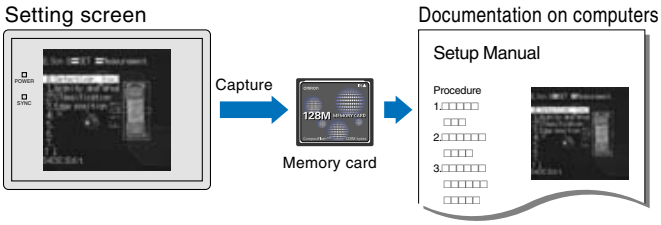
Compact and affordable. Intelligent lighting and small LED lighting types are also available.

I/O monitor

The status of the input/output terminals can be displayed as a list. This is a big help for a wiring check during adjustment.

Screen capture function

Menu setting screens, measurement screens, and failure images can be captured and stored in the memory card. These images can be used in manuals and reports created on a computer.

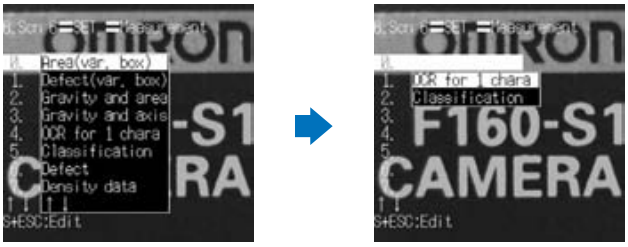


Features

Operation

Menu masking function

Menu items that should not be changed on-site can be hidden to prevent incorrect operation. This also improves operability and saves time when changing menu settings.



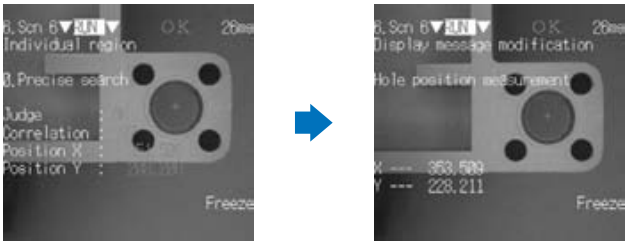
Password function

Operation access can be limited to personnel who have been issued a password. This contributes to increased security.

Screen

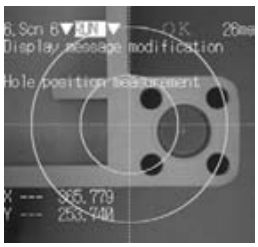
Screen messages

Change to the language used on-site. Can be displayed in any position on the screen.



Graphic drawing function

This allows you to draw straight lines, rectangles, cross-hair cursors, and other graphics. Graphics can be drawn on measurement positions as well.



Output

RS-232C format

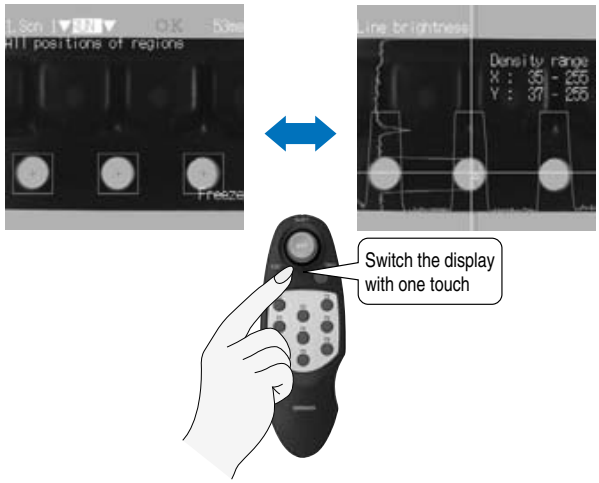
The output format can be changed to meet the specifications of the system.

Short-cut key function

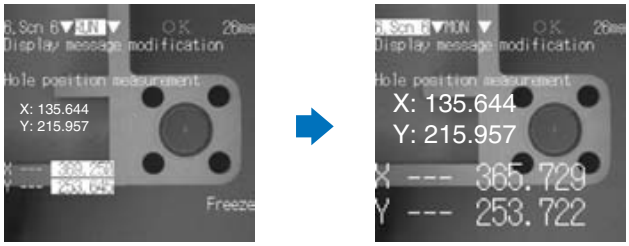
Frequently used operations can be assigned to special keys on the console. Switch menus at the touch of a key.

Measurement image

Line-brightness display

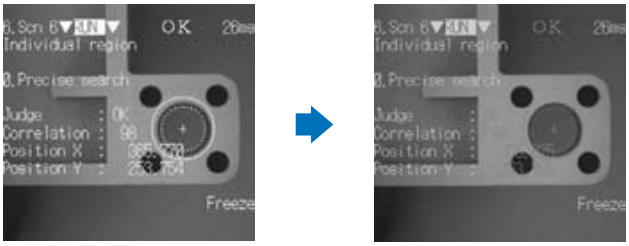


The character size can be selected, and even highlighting is possible.



Color display function

Colors can be added to displayed messages and graphics for easier viewing.



Dialog menu

Dialog-type menus allow even beginners an easy performance of settings.

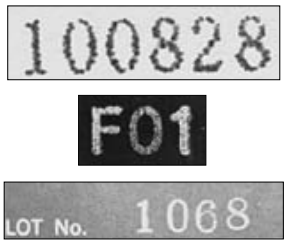
Features

QUEST Character Recognition

F160 uses OMRON's character recognition system - QUEST.
Features

- The user does not have to register characters.
- High discrimination level of similar characters.
- Adapts to fluctuations in shape and size.

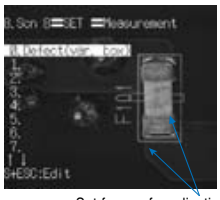
Use for any type of character



"Variable Box" Measurement for Defect Inspection

The measurement area can be set to change automatically when performing inspections for objects with varying sizes, such as electronic chip components. This feature ensures that the optimum measurement areas are always used for inspection.

Setting screen



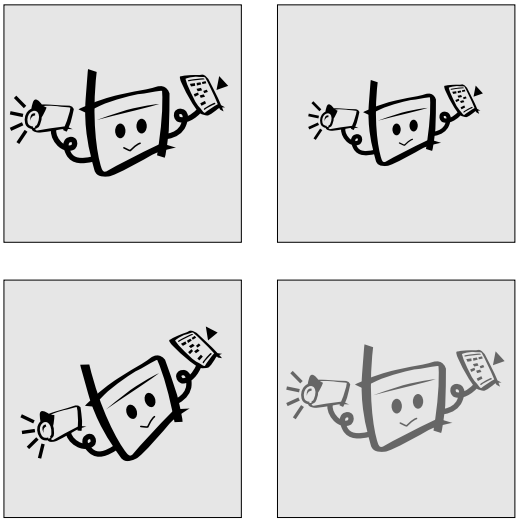
Set frames for adjusting the region size

Measurement screen

The inspection region automatically adapts to the object size.

Flexible Search

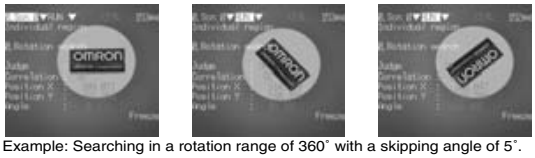
This method performs a matching using more than one reference image and so F160 can perform inspection for objects with varying shapes. This feature helps to reduce incorrect evaluations.



Matching can be performed for products with varying shapes by using more than one reference image.

Rotation search

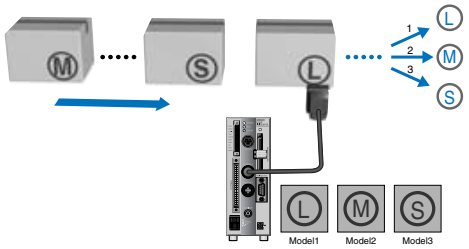
This function rotates the image while searching. Processing speed is 10 times higher than previous models. Angle interpolation enables high-precision angle detection.



Example: Searching in a rotation range of 360˚ with a skipping angle of 5˚.

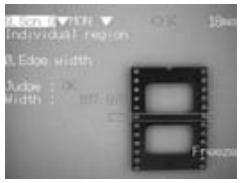
Classification

A search is performed using multiple stored models, and the best-matching model number is output. The flexible search function can also be used for work shapes.
Can handle variations in shape.



Edge width

The positions of both edges of an object are detected with high accuracy, and from this the width of the object is calculated. It is not necessary to set expressions for calculating the width.



Position displacement compensation

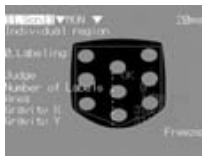
F160 permits compensation using only the outline of the object, 2-stage position compensation, and setting priorities for the compensation direction.

Compensation in the X direction followed by compensation in the Y direction.

Labeling

The number of labels (i.e., objects) inside the measurement area is counted. After they have been sorted according to area or center of gravity, the measurement data for specified labels is output.

Counting gears



Inspecting the position and number of buttons

Expressions

Evaluation and data output based on a maximum of 32 expressions is possible. Up to 32 variables (representing other expressions) can be used, enabling more complex calculations.

Ordering information

Name		Model	Remarks
Controller		F160-C10E-2	NPN Input/Output
Controller		F160-C15E-2	PNP Input/Output
Double-speed camera	Camera with intelligent lighting	F160-SLC20	
		F160-SLC50	
	Camera only	F160-S1	
		F160-S2	With partial scan function.
Compatible F150 cameras	Camera with intelligent lighting	F150-SLC20	
		F150-SLC50	
	Camera with light	F150-SL20A	
		F150-SL50A	
	Camera only	F150-S1A	
Console		F160-KP	
		F150-KP	
Color LCD monitor		F150-M05L	
Monochrome CRT Video monitor		F150-M09	
Memory card		F160-N64S(S)	Memory capacity 64 MB
Camera cable		F150-VS	For Double-speed Camera and compatible F150 Cameras. Cable length: 3 m*1
Monitor cable		F150-VM	Cable length: 2 m*1
Parallel cable		F160-VP	Loose-wire cable for parallel I/O connectors. Cable length: 2 m

*1. Other length on request

Rating/Performance

Controller: F160-C10E-2/F160-C15E-2

Item	Specifications	Conversational Menu Mode	Expert Menu Mode
Connectable cameras		F150-S1A/SL20A/SL50A/SLC20/SLC50, F160-S1/S2/SLC20/SLC50, etc.	
Number of cameras connectable		1	2
Number of pixels		512 x 484 (H x V)	
Number of scenes		32 scenes (Expansion possible using Memory Card)	
Image storage function		Maximum of 35 images stored	
Filtering		---	Smoothing (strong/weak), edge enhancement, edge extraction (horizontal, vertical, both horizontal and vertical), dilation, erosion, median, background suppression
Position displacement compensation		Set either automatically or manually Compensation directions: X, Y, and (360°) directions	Compensation directions: X, Y, and (360°)directions Detection methods: Binary center of gravity, axis angle, labeling, rotation search, gray search, edge position
Number of measurement regions		32 regions per scene	
Applications		7 types available (presence, orientation, dimensions,defects, conformity, position, chips and burs	---
Measurement data		Automatically selected according to the application	Gravity and area, gravity and axis, gray search, precise search, rotation search, flexible search, relative search, defect, area (variable box), defect (variable box), edge position, edge pitch, edge width, density average, labeling, OCR for 1 character, classification
Data operation functions (expressions)		---	Number: 32 expressions can be set for judgements, data, and variables used in other expressions. Operations: Arithmetic operations, square root, absolute value, remainder, distance, angle, maximum, minimum, SIN, COS, ATAN, AND, OR, NOT
Result output		Overall judgements, judgements for each measurement region	Overall judgements, judgements for each measurement region, expression results, measurement/expresion data
Functions for customizing operations		---	Menu masking , password setting, shortcut keys
Functions for customizing screens		---	Display items: Character strings (measured values, judgement results, times, user-specified characters, measurement region names) Specified parameters: Display color, position, size
Number of slots for Memory Cards		1	
Monitor interface		1 channel (color, monochrome)	
Serial communications		RS-232C/422A 1 channel	
Parallel I/O		13 inputs and 22 outputs including control I/O points	
	Input/ Output type: NPN	F160-C10E	
	Input/ Output type: PNP	F160-C15E	
Power supply voltage		20.4 to 26.4 VDC	
Current consumption		Approx. 1.6 A (when two F160-SLC50 Cameras connected)	
Ambient temperature		Operating: 0 to 50°C, Storage: -25 to 65°C (with no ice formation or condensation)	
Ambient humidity		Operating and storage: 35 to 85% (with no condensation)	
Dimensions		56 x 160 x 110 (W x H x D) mm (not including connectors and other protruding parts)	
Weight		Approx. 570 g (Controller only)	

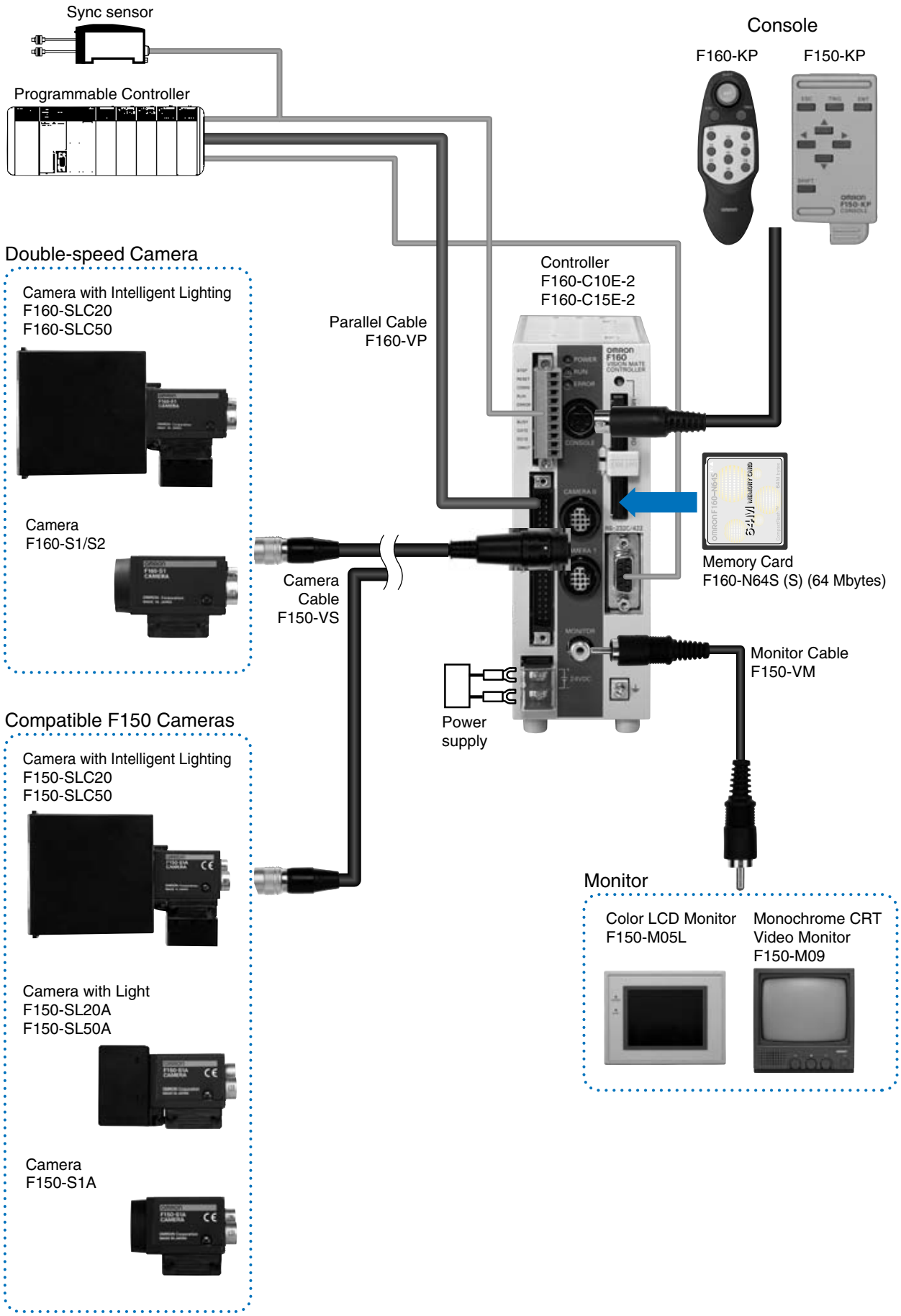
Double-speed camera: F160-S1/S2

Picture element	1/3“ Interline CCD
Effective pixels	659 x 44 (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 (with no icing or condensation)
Ambient humidity	Operating and Storage: 35 to 85% RH (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)

Monitor

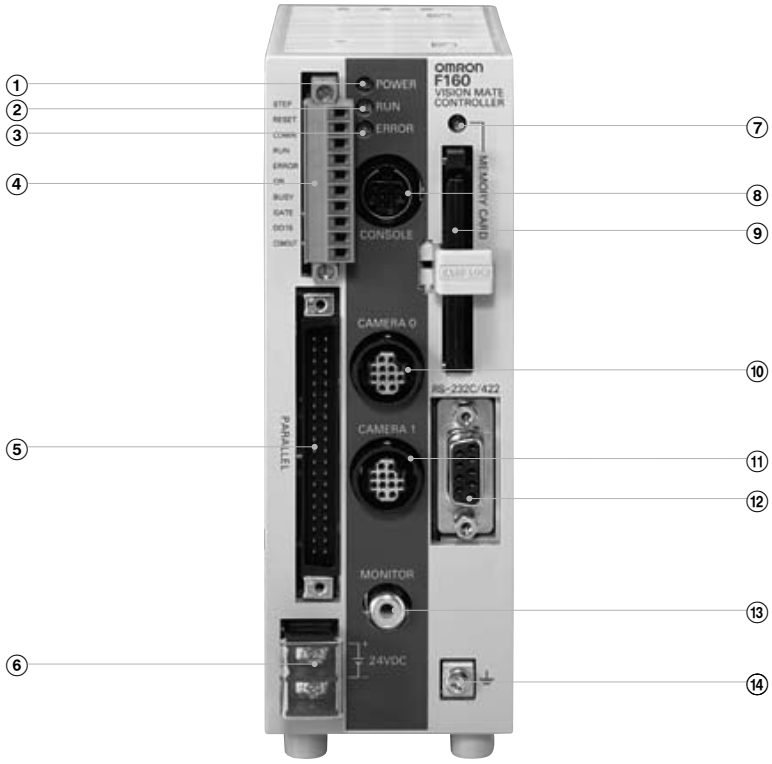
Item / Model number / Name	F150-M05L Color LCD monitor	F150-M09 Monochrome CRT Video Monitor
Size	5.5 inches	9 inches
Type	Liquid crystal color TFT	CRT monochrome
Resolution	320 x 240 dots	800TV or min. (at center)
Input signal	NTSC composite video (1.0 V / 75)	
Power supply voltage	20.4 to 26.4 VDC	100 to 240 VAC (-15%, +10%)
Current consumption	Approx. 700 mA	Approx. 400 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)	Operating or Storage: 10% to 90% (with no condensation)
Weight (Monitor only)	Approx. 610 g	Approx. 4.5 kg
Accessories	Instruction manual and 4 mounting brackets	Instruction manual

System configuration



Name and function of each part

F160-C10E/F160-C15E



① **POWER LED**
Illuminates while the power is on.

② **RUN LED**
Illuminates while the system is in measurement mode.

③ **ERROR LED**
Illuminates when a problem occurs.

④ **Input terminal (control line)**
Connects to a synchronous sensor or programmable controller.

⑤ **Input/output connector (data line)**
Connects to a synchronous sensor or programmable controller.

⑥ **Power terminal**
Connects to the power supply.

⑦ **Memory card LED**
Illuminates during memory access.

⑧ **Console connector**
Connects to the console.

⑨ **Memory card slot**
A memory card inserts into this slot.

⑩ **CAMERA 0 connector**
Connects to a camera.

⑪ **CAMERA 1 connector**
Connects to a camera.

⑫ **RS-232C/422 connector**
Connects to a computer or programmable controller.

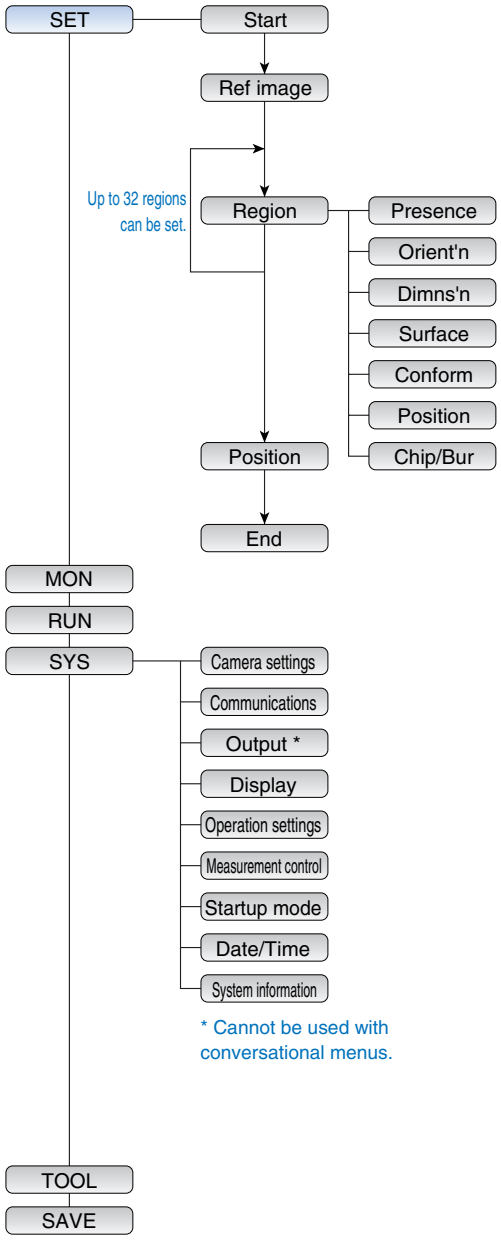
⑬ **Monitor connector**
Connects to a monitor.

⑭ **Ground terminal**
Connect the ground wire to this terminal.

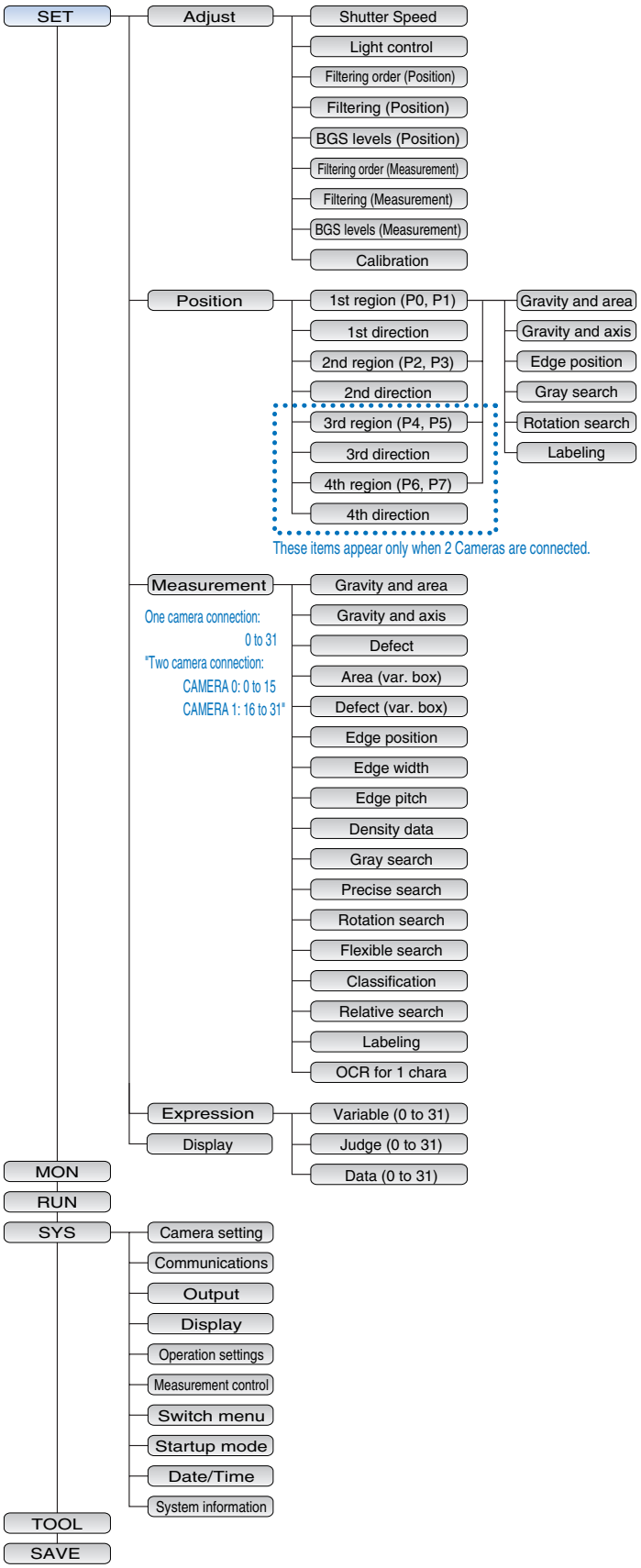
Function menu

Menu structure diagram

Dialog menu



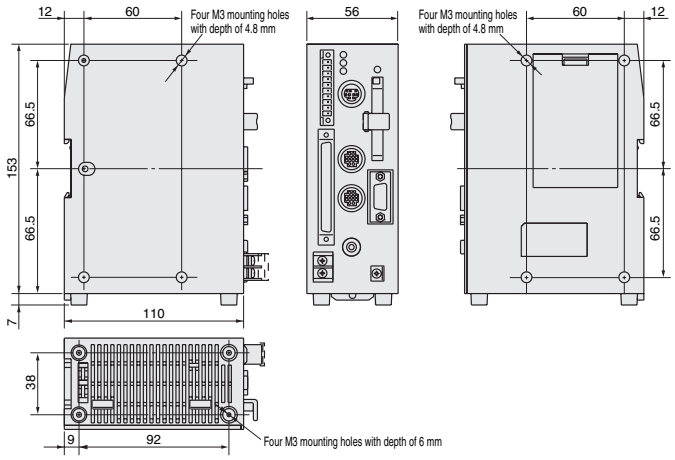
Expert menu



Dimensions (Unit: mm)

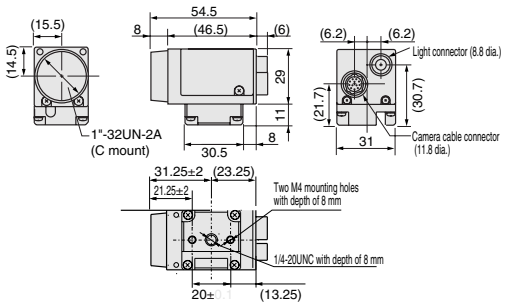
Controller

F160-C10E/F160-C15E

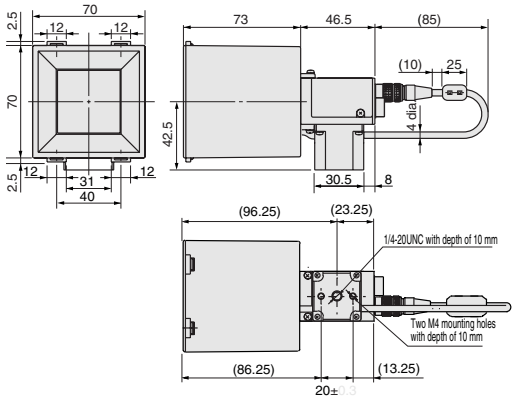


Double-speed camera

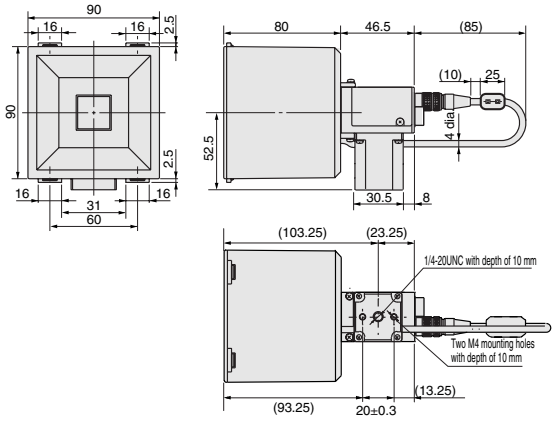
F160-S1/S2



F160-SLC20 (with F150-LTC20 intelligent lighting)

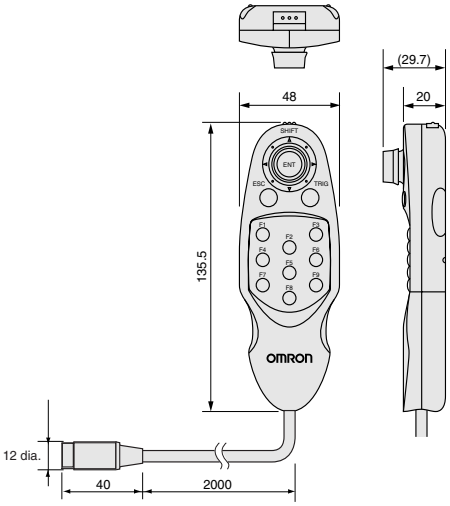


F160-SLC50 (with F150-LTC50 intelligent lighting)

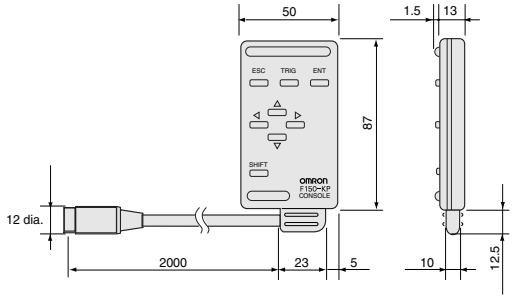


Console

F160-KP

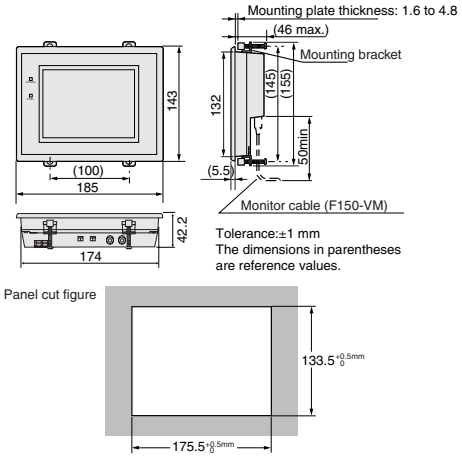


F150-KP



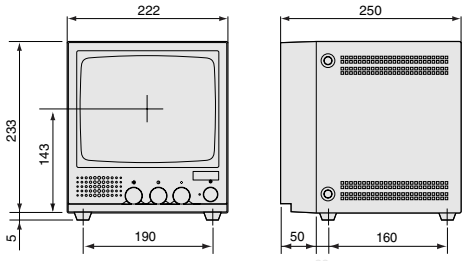
LCD monitor

F150-M05L



Video monitor

F150-M09



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. Q04E-EN-02 In the interest of product improvement, specifications are subject to change without notice.

Vision Sensor

F210

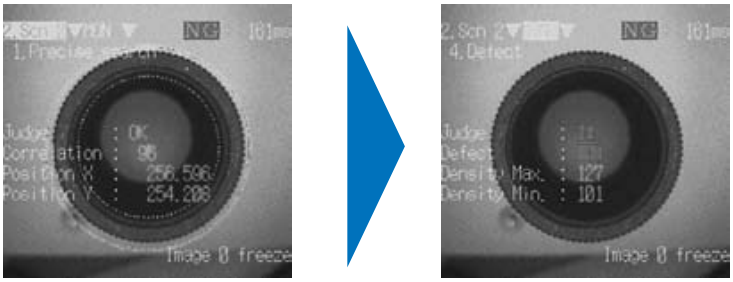
Features

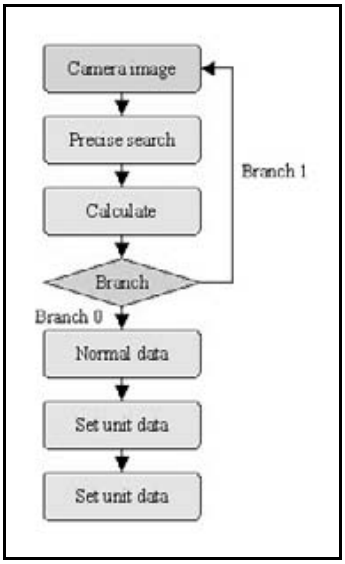
Flow Menus

Flow Menus select the required processing items from the library, combining and linking them for you

Ideal for the following

- Stabilize measurement images by filtering the required number of times.
- Perform measurements according to workpiece tolerance by changing the measurement area baased on measurement results
- Periodically check for data variations by outputting the maximum and minimum values for each 10 measurements,





Features

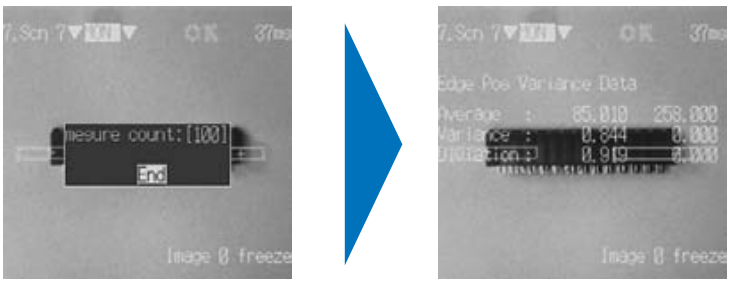
Macros

Augment Flow Menus using a PC text editor. The Software package can be edited using text commands to customize I/O controls, displays, and GUI

Programs can be created using only a text editor, with no need for any special development environment.

Ideal for the following

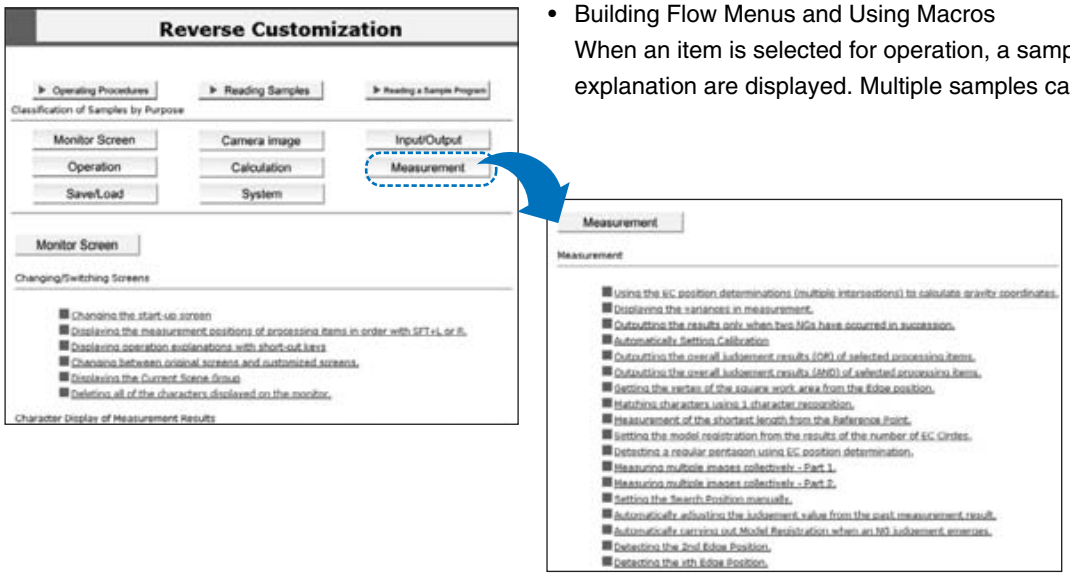
- Creating special menus.
- Displaying and outputting the date and time of NG measurements.
- Automatically saving NG images to a Memory Card.
- Changing the number of registered product types.



Special menus using macros

Customization Manual

The know-how from the past is incorporated in a manual so that Reverse Customization can be used to determine the best method to execute the desired process.



- Building Flow Menus and Using Macros
  When an item is selected for operation, a sample program and explanation are displayed. Multiple samples can be easily combined.

Ordering information

Name		Model	Remarks
Controller		F210-C10	NPN Input/Output
		F210-C15	PNP Input/Output
Double-speed camera	Camera with intelligent lighting	F160-SLC20	
		F160-SLC50	
	Camera only	F160-S1	
		F160-S2	With partial scan function.
Compatible F150 cameras	Camera with intelligent lighting	F150-SLC20	
		F150-SLC50	
	Camera with light	F150-SL20A	
		F150-SL50A	
	Camera only	F150-S1A	
Console		F160-KP	
		F150-KP	
Color LCD monitor		F150-M05L	
Monochrome CRT Video monitor		F150-M09	
Memory card		F160-N64S(S)	Memory capacity 64 MB
Camera cable		F150-VS	For Double-speed Camera and compatible F150 Cameras. Cable length: 3 m*1
Monitor cable		F150-VM	Cable length: 2 m*1
Parallel cable		F160-VP	Loose-wire cable for parallel I/O connectors. Cable length: 2 m

*1. Other length on request.

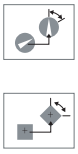
Processing Item Support

The F250-UM3FE (UM3ME) Application Software supports approximately 70 different processing items. These can be freely combined for inspections as needed. Image input, measurement support, branch control, results output, and results display can be used in common for all of the models (F210 and F250).

Image Input Functions

- Inputting Camera Images
- Switching Cameras
- Changing Filtering
- Filtering Again

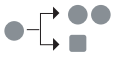
Position Compensation Functions

Compensation	Processing item	Controller		Remarks
		F210	F250	
Position compensation in X, Y, and θ directions 	Binary Position Compensation	YES	YES	---
	Circle Position Compensation	NO	YES	---
	EC Position Compensation	YES	YES	---
	Edge Position Compensation	YES	YES	---
	Model Position Compensation	NO	YES	Enables high-speed processing compared to the model position compensation #.
	Model Position Compensation #	YES	YES	---

General Measurement Functions

Application (measurement)		Processing item	Controller		Remarks
			F210	F250	
Size (area) 		Binary Defect	YES	YES	Up to eight regions can be set per Unit, with results displayed in a list.
		Binary Gravity and Area	YES	YES	Only one region can be set per Unit. Menu levels are simple and easy to understand.
		Binary Area (Variable Box)	YES	YES	Used for inspecting measurement items with varying positions and sizes.
Position	Center-of-gravity detection (Processing time: Low) 	Binary Defect	YES	YES	Up to eight regions can be set per Unit, with results displayed in a list.
		Binary Gravity and Area	YES	YES	Only one region can be set per Unit. Menu levels are simple and easy to understand.
		Binary Area (Variable Box)	YES	YES	Used for inspecting measurement items with varying positions and sizes.
	Coordinate detection (Processing time: High) 	Gray Search	YES	YES	Uses gray models to detect positions in pixel units.
		Precise Search	YES	YES	Uses gray models to detect positions in sub-pixel units.
		Flexible Search	YES	YES	Multiple models are registered to enable searching even when there is variation.
		Pattern	NO	YES	Up to 64 regions can be registered per Unit, and high-speed processing is possible. (See note.)
		ECM Search	YES	YES	Uses edge code models so that processing is not affected by deformation or dirt.
		EC Positioning	YES	YES	No model registration is required. Searches using shape information such as "round" or "angular."
	Coordinate detection (Rotation in measurement item) 	Rotation Positioning	NO	YES	High-speed processing is possible. (See note.)
		Rotation Search	YES	YES	---
	Dimensions measurement 	Gray Edge Position_8	YES	YES	Up to eight regions can be set per Unit, with results displayed in a list.
		Gray Edge Position_1	YES	YES	Only one region can be set per Unit. Menu levels are simple and easy to understand.
		Gray Edge Width	YES	YES	---
	Position deviation detection 	Relative Position	YES	YES	---

Note: These processing items are most effective when set immediately after image input processing item (Camera image input or Camera switching). Depending on conditions, however, high-speed processing may not be possible.

Application (measurement)	Processing item	Controller		Remarks
		F210	F250	
Defect 	Surface Defect	YES	YES	Only one region can be set per Unit. Menu levels are simple and easy to understand.
	Density Defect	NO	YES	Up to eight regions can be set per Unit, with results displayed in a list. The number of Units can be reduced.
	Surface Defect (Variable Box)	YES	YES	Used for inspecting measurement items with varying positions and sizes.
	EC Defect	YES	YES	Uses edge codes for defect inspection so that processing is not affected by deformation or dirt.
	Fine Matching	YES	YES	Accurately detects differences with models.
Characters 	QUEST Character Verification	YES	YES	Used to verify multiple characters.
	Lot Number OCR 1	YES	YES	Handles lot numbers that are changed daily, weekly, monthly, or annually.
	OCR for 1 Character	YES	YES	---
Angle 	Binary Defect	YES	YES	Up to eight regions can be set per Unit, with results displayed in a list. The number of Units can be reduced.
	Binary Gravity and Angle	YES	YES	Only one region can be set per Unit. Menu levels are simple and easy to understand.
	Rotation Positioning	NO	YES	High-speed processing is possible. (See note.)
	Rotation Search	YES	YES	Used when the measurement item rotates.
	Circular Angle	YES	YES	Used only for circular measurement items. Enables higher-speed processing compared to Rotation Search. (See note.)
Quantities 	Labeling	YES	YES	Counts up to 2,500.
	Label Data	YES	YES	Gets label measurement values from other Units.
	Edge Pitch	YES	YES	Gets the number, pitch, and width.
	EC Circle Count	YES	YES	Finds circles using "round" shape information so that processing is not affected even if the circles are deformed or dirty.
Shapes (correlation values) 	Pattern	NO	YES	Up to 64 regions can be registered per Unit, enabling high-speed processing. (See note.)
	Flexible Search	YES	YES	Searching can be performed even if there is variation in model images.
	Fine Matching	YES	YES	Accurately detects differences with models.
Classification 	Classification	NO	YES	Enables higher-speed processing compared to Classification #. (See note.)
	Classification #	YES	YES	---
Brightness 	Density Data	YES	YES	---

Note: These processing items are most effective when set immediately after image input processing item (Camera image input or Camera switching). Depending on conditions, however, high-speed processing may not be possible.

Measurement Support Functions

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

Results Output Functions

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

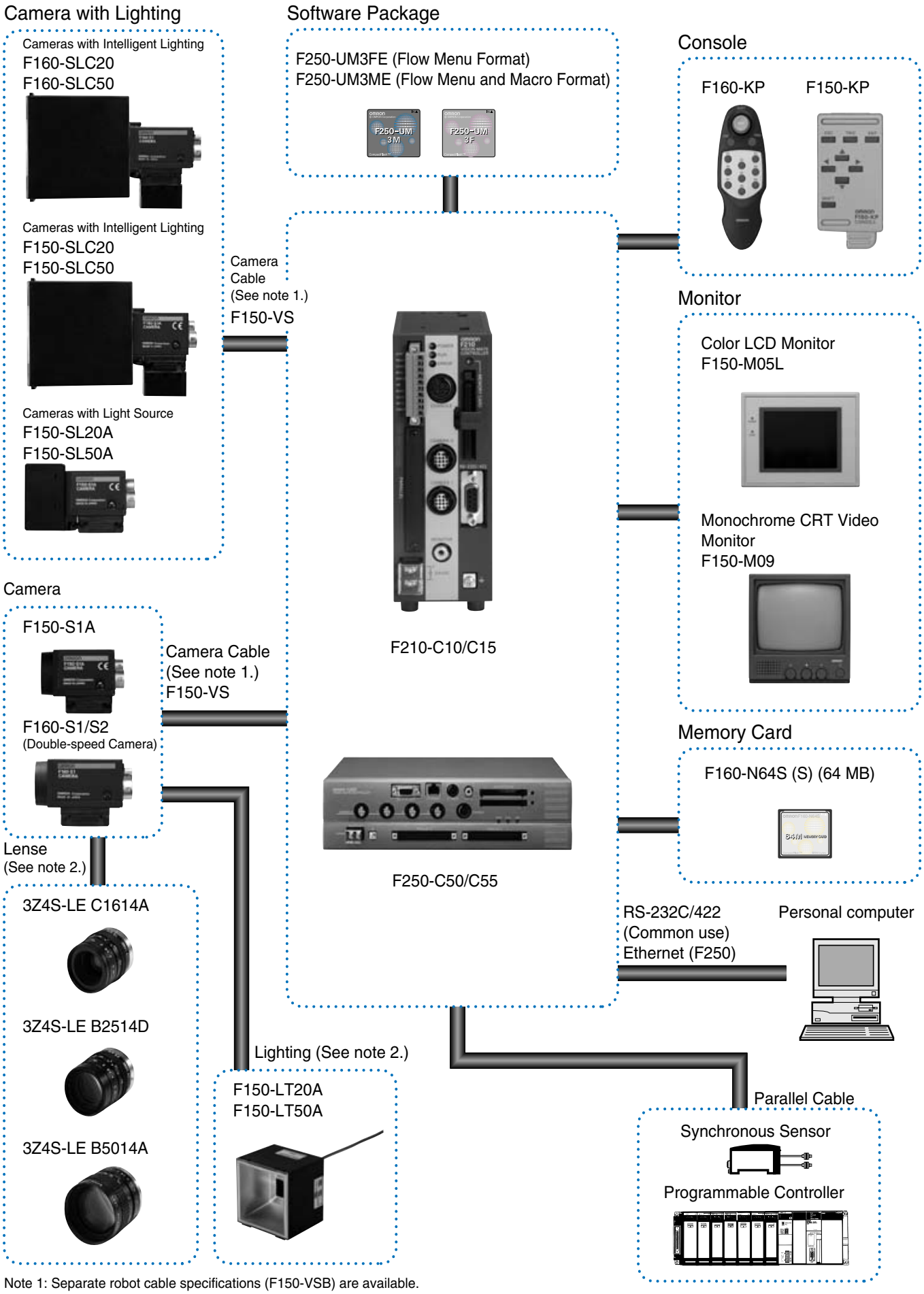
Branch Control Functions

- Conditional branch
- DI branch
- End

Results Display Functions

- String display
- Measurement display
- Judgement display
- Item display
- Time display
- Figure display
- Line results display
- Box display
- Circle display
- Cursor display
- Newest NG image display

System Configuration



Note 1: Separate robot cable specifications (F150-VSB) are available.
Note 2: In addition, lenses and lighting are available.

Rating/Performance

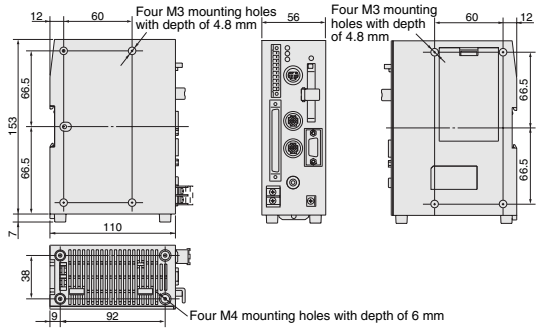
Controller

Item / Specifications	F210-C10/C15	F250-C50/C55
Connectable Cameras	F150-S1A/-SL20A/-SL50A/-SLC20/-SLC50, F160-S1/-S2/-SLC20/-SLC50, F300-S2R/-S3DR, etc.	
Number of Cameras connectable	2	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	
Operation and settings	Installing measurement items using application software, and combining and setting measurement items by menu operations	
Menu language	Japanese or English (Can be switched.)	
Trend monitor function	Supported	
Memory card slots	1	2
Monitor interface	1 channel	Composite video output: 1 channel, S-VIDEO output: 1 channel
Ethernet	Not supported.	10Base-T: 1 channel
Serial communications	RS-232C/422A: 1 channel	
Parallel I/O	13 inputs and 22 outputs	21 inputs and 46 outputs
Strobe interface	2 channels (included in parallel outputs)	4 channels (included in parallel outputs)
Power supply voltage	20.4 to 26.4 VDC	
Current consumption	Approx. 1.6 A (when two F160-SLC50 Cameras are connected)	Approx. 3.7 A (when four F160-SLC50 Cameras are 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	56 × 160 × 110 (W × H × D) mm (not including connectors and other protruding parts)	270 × 81 × 197 (W × H × D) mm
Weight	Approx. 570 g (Controller only)	Approx. 2.7 kg (Controller only)

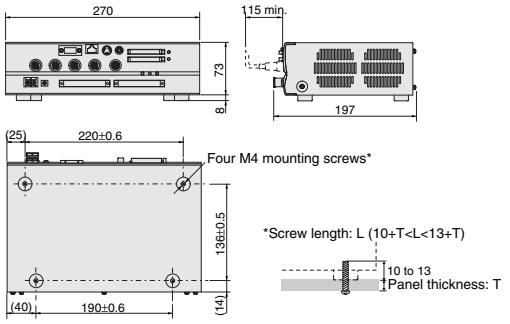
Dimensions

Unit: mm

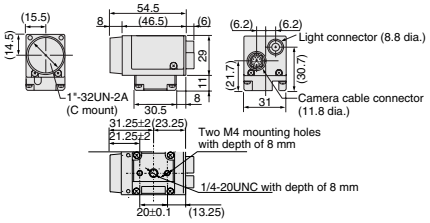
Controller
F210-C10/C15



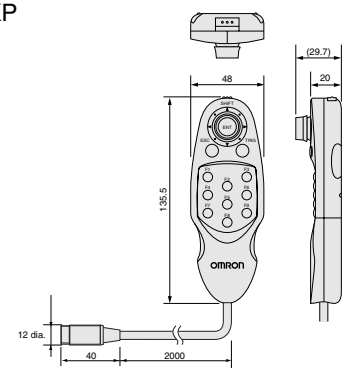
F250-C50/C55



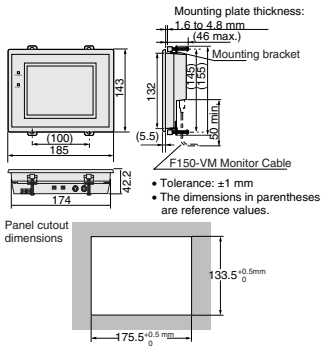
Camera
F160-S1/S2



Console
F160-KP



Liquid Crystal Monitor
F150-M05L



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. Q05E-EN-02

High-performance Vision Sensor

F250

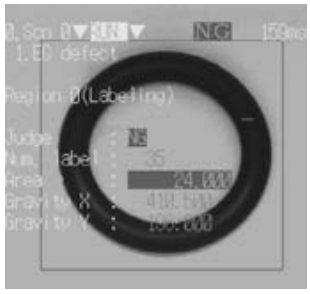
Advanced algorithm enables ultra high speed and maximum flexibility

Features

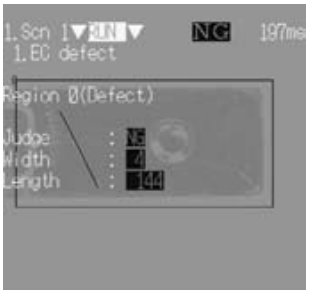
Inspection and positioning that was difficult with previous vision sensors is now surprisingly easy!

ED defect inspection

High-precision detection of minute defects that could not be detected previously .



Certain detection of rubber packing deformities.

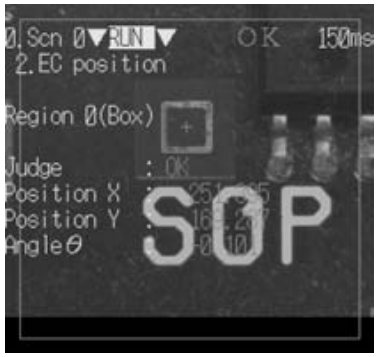


Detection of low-contrast defects on metal surfaces

EC positioning

High-precision position measurement even if the inside of the work changes or the view changes.

● Positioning of PWB fiducial marks



Low contrast

Revolution

Internal dirt

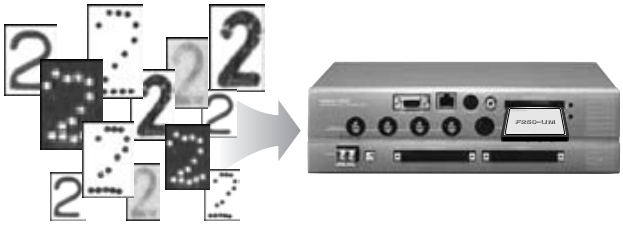
Features

QUEST character checking

Even if the shape or size of a character varies, "QUEST Logic" finds printed characters with certainty. The built-in dictionary makes "simple settings" possible.

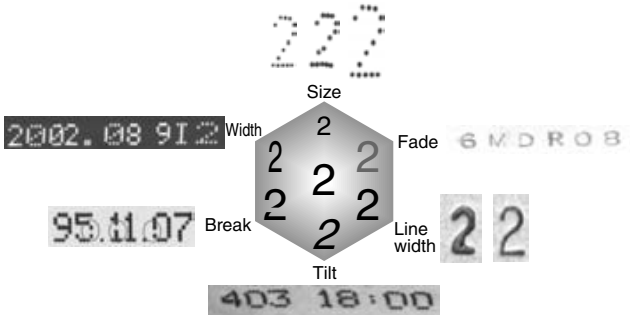
● No need to store a character dictionary

Various character fonts for factory automation have been prestored. This eliminates the need to store a dictionary or model names, and allows a dramatic reduction in man-hours for initial setup.



● The "six character variations" can also be recognized with certitude.

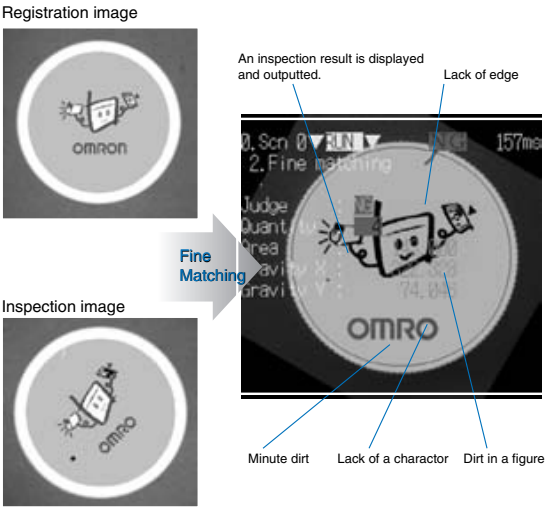
Checks characters printed on the production line such as "Best before" dates and lot numbers. Even if there are deviations in shape, size, or line width, the characters are accurately checked.



Fine matching

Detects differences from the stored "good" image quickly and with high accuracy. Dramatic improvement in ability to inspect characters and patterns with minute border defects.

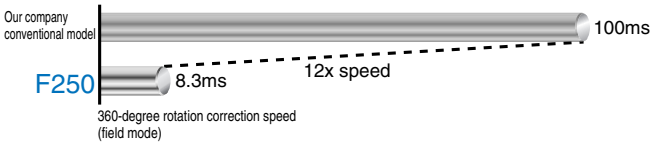
● Example of application to soft drink cap inspection



For fast increasing line speeds and ever stricter quality demands.

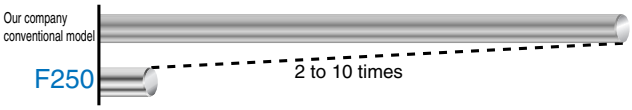
● Real time Revolution Search is amazing

Executes a real time search of 72 models. Even with works that rotate 360°, positioning corrections are completed at the same time as image read-in.



● Fast image processing

Inspection functions following camera image read-in are also up to 10 times faster thanks to a newly developed parallel processing technology.

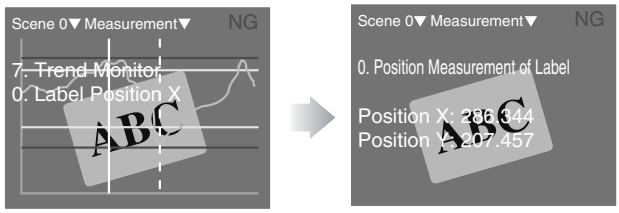


● Fast image read-in

The F160-S1 double-speed camera achieves a maximum image read-in speed of 8.3 ms.

"Non-stop" adjustment without stopping the line

All settings can be adjusted and reset while inspection continues. There is no need to stop the line for adjustments, subsequently, no capacity drops.

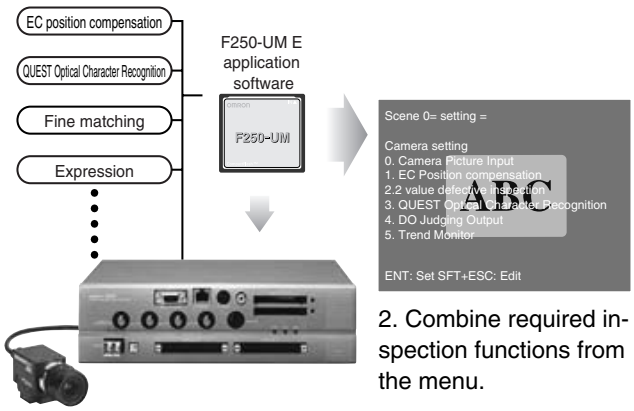


It adjusts checking an inspection history by the trend monitor.

Test measurement is performed as compared with previous NG picture.

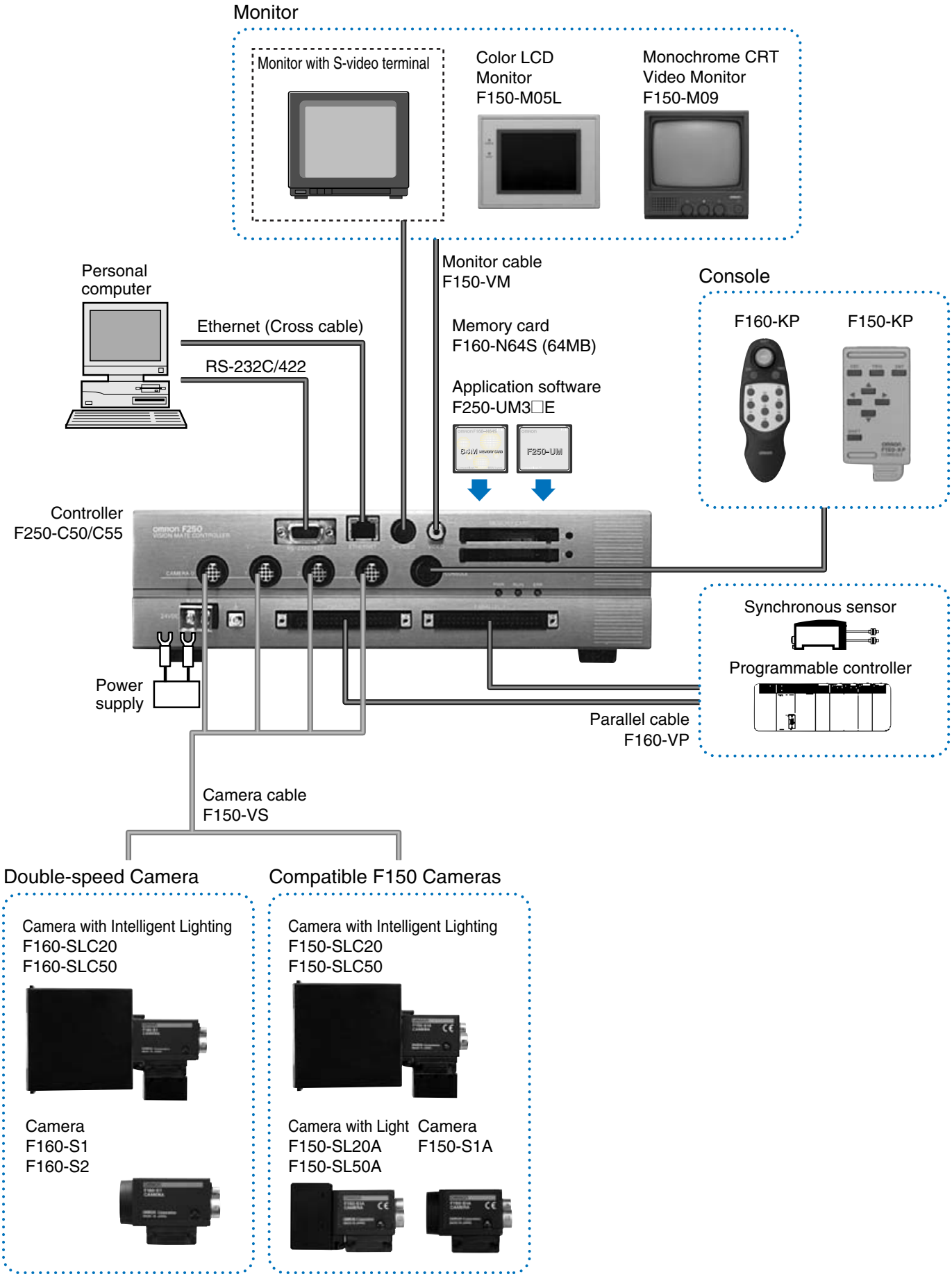
● Easy and flexible settings by means of software application

1. Functions needed for inspection are selected and installed from the software application.



2. Combine required inspection functions from the menu.

System configuration



Ordering Information

Name		Model	Remarks
Controller		F250-C50	NPN Input/Output
		F250-C55	PNP Input/Output
Double-speed camera	Camera with intelligent lighting	F160-SLC20	
		F160-SLC50	
	Camera only	F160-S1	
		F160-S2	Includes Partial Scan functionality
F150 Compatible cameras	Camera with intelligent lighting	F150-SLC20	
		F150-SLC50	
	Camera with lighting	F150-SL20A	
		F150-SL50A	
	Camera only	F150-S1A	
Console		F160-KP	
		F150-KP	
LCD monitor		F150-M05L	
Video monitor		F150-M09	
Memory card		F160-N64S(S)	Memory capacity 64 MB
Application software		F250-UM3ME	with Macro function
		F250-UM3FE	without Macro function
Camera cable		F150-VS	Length of cable for double-speed camera and F150 common camera: 3 m
Monitor cable		F150-VM	Cable length: 2 m
Parallel cable		F160-VP	Length of pigtail cable for parallel input/output connector: 2 m

Rating/Performance

Controller: F250-C50/C55

Connected camera	F150-S1A/SL20A/SL50A/SLC20/SLC50, F160-S1/S2/SLC20/SLC50
Number of connectable cameras	4
Processing resolution	512(H) x 484(V)
Number of scenes	32 scenes (expansion possible using memory card)
Image storage function	Maximum 35 images
Image pre-processing	Smoothing (strong/weak), edge enhancement, edge extraction (horizontal, vertical, both), erosion, dilation, median, background deletion
Operation and Settings	Install measurement routines from a software application, combine and establish settings for measurement routines from menus.
Menu language	Japanese/English (changeable)
Operation customization function	Password function, short-cut key function
Screen customization function	Display items: Character strings (measured values, decisions, time, any character string, measurement area names), graphics (straight lines, rectangles, circles, cross-hair cursors) Parameters specified: display color, postion, size
Non-stop adjustment function	Yes
Trend monitor function	Yes
Memory card slot	2 slots
Monitor	Composite video output: 1 CH, S-video output: 1 CH
Ethernet	10Base-T 1CH
Serial communication	RS-232C/422A 1CH
Parallel input/output	Inputs: 21 points, outputs: 46 points
Strobe	4 CH (included in parallel outputs)
Power supply voltage	20.4 to 26.4 VDC
Current consumption	Approximately 3.7 A (when four F160-SLC50 units are connected)
Ambient temperature	Operating: 0 to +50°C, storage: -25 to +65°C (no ice formation or condensation)
Ambient humidity	Operating/storage: 35 to 85% RH (with no condensation)
Dimensions	270(W) x 81(H) x 197(D)
Weight	Approximately 3.1kg (unit only)

Double-speed camera: F160-S1/S2

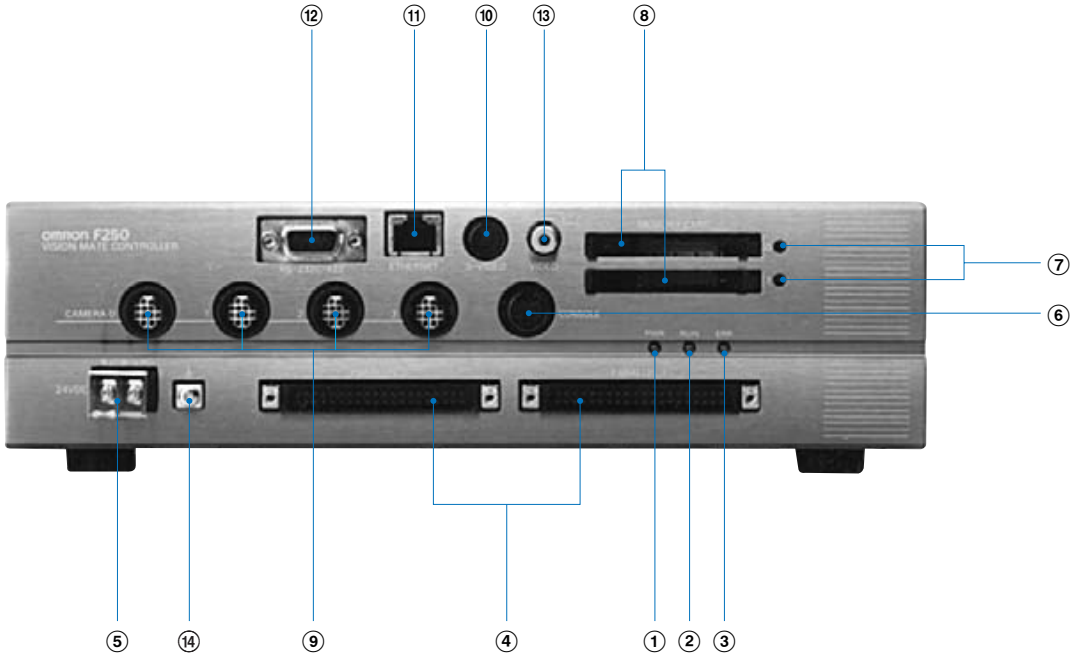
Picture element	1/3“ Interline CCD
Effective pixels	659 x 44 (H x V)
Scanning method	1/60-s non-interlace (frame) mode, 1/120-s 2:1 interlace (field) mode
Shutter	Electronic shutter; select from 8 shutter-speed settings (1/120 to 1/20,000 s) using menu
Camera with Intelligent Lighting	F160-SLC20 (field of vision: 20 mm), F160-SLC50 (field of vision: 50 mm)
Ambient temperature	Operating: 0 to +50°C Storage: -25 to +60°C (with no icing or condensation)
Ambient humidity	Operating and Storage: 35 to 85% RH (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)

Monitor

Model number Item 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 x 240 dots	800TV or min. (at center)
Input signal	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. 400 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)	Operating or Storage: 10% to 90% (with no condensation)
Weight (Monitor only)	Approx. 610 g	Approx. 4.5 kg
Accessories	Instruction manual and 4 mounting brackets	Instruction manual

Name and function of each part

Controller: F250-C50/C55



① **POWER LED (green)**
Illuminates while the power is on.

② **RUN LED (orange)**
Illuminates while the system is in measurement mode.

③ **ERROR LED (red)**
Illuminates when a problem occurs.

④ **Input connectors 0, 1**
Connects to a synchronous sensor or programmable controller.

⑤ **Power terminal**
Connects to a DC power supply.

⑥ **Console connector**
Connects to the console.

⑦ **Memory card LEDs 0, 1**
Illuminates while power is supplied to the memory card.

⑧ **Memory card slots 0, 1**
A memory card or software application is inserted here.

⑨ **CAMERA 0 - 3 connectors**
Connects to a camera.

⑩ **Monitor connector (S-Video output)**
Connects to a monitor with an S-Video input

⑪ **Ethernet connector**
Connects to a computer.

⑫ **RS-232C/422 connector**
Connects to a computer or programmable controller.

⑬ **Monitor connector (composite video output)**
Connects to a monitor.

⑭ **Ground terminal**
Connect the ground wire to this terminal.

Function menu

Processing routine list

The F250-UME application software contains approximately 50 processing routines.

Image input related

- Camera image input
- Camera switch
- Pre-processing change
- Repeat preprocessing

Position compensation related

- Binary position correction
- Model position correction
- Circular work position correction
- Edge position correction
- EC position correction
- Scroll return
- Scroll

General measurement related

- QUEST character checking
- Binary defect inspection
- Density defect inspection
- Fine matching
- Pattern inspection
- Sorting
- EC defect inspection
- EC circular piece count inspection
- Rotation positioning
- Dark-light edge position
- ECM search
- EC positioning
- Lot number checking 1
- Dark-light edge number
- Density average/ deviation
- Labeling
- Label data

Measurement supplement related

- Computing
- Acquire processing unit data
- Set processing unit data
- Wait
- Elapsed time
- Trend monitor

Branch control related

- Condition branch
- DI branch
- End

Result output related

- Memory card data output
- DO data output
- Significant link data output
- Non-protocol data output
- DO decision output

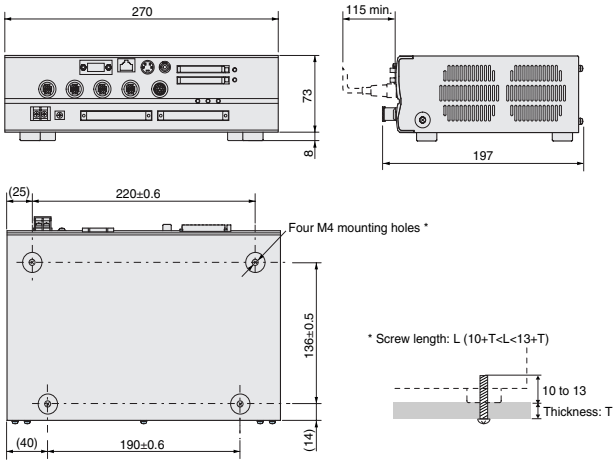
Result display related

- Any character display
- Measured value display
- Decision character display
- Processing task name display
- Measurement time display
- Fixed graphic display
- Straight line result display
- Rectangle result display
- Circle result display
- Cross-hair cursor result display

Dimensions (Unit: mm)

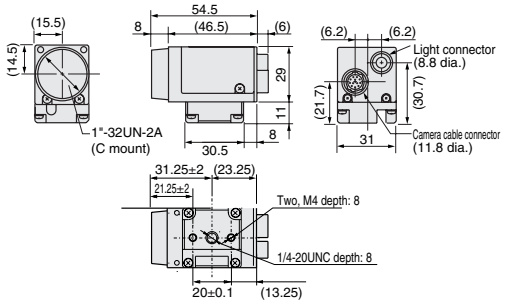
Controller

F250-C50/C55

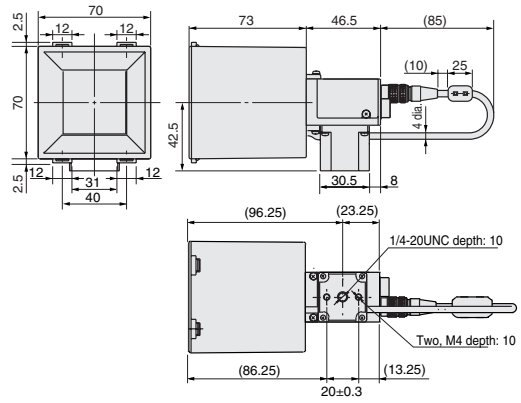


Double-speed camera

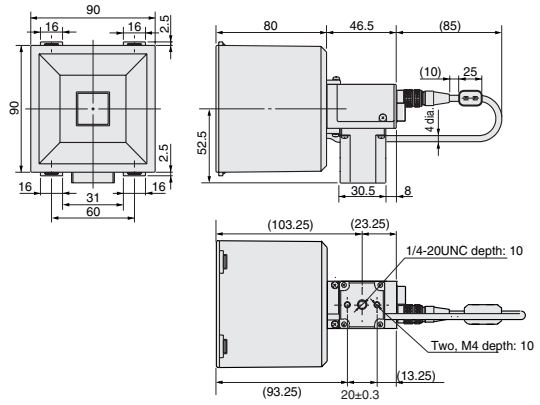
F160-S1/S2



F160-SLC20 (with F150-LTC20 intelligent lighting)

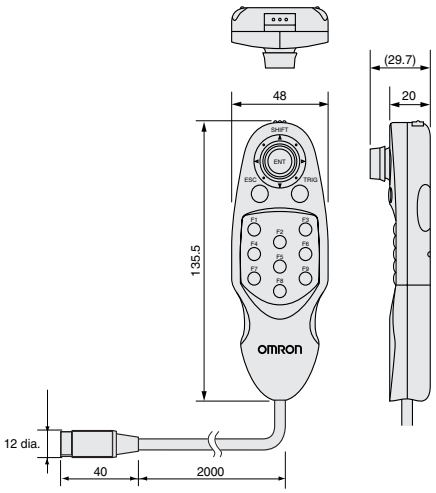


F160-SLC50 (with F150-LTC50 intelligent lighting)

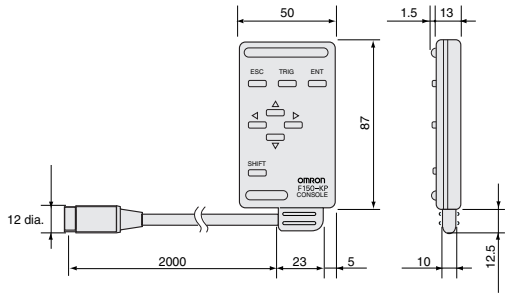


Console

F160-KP

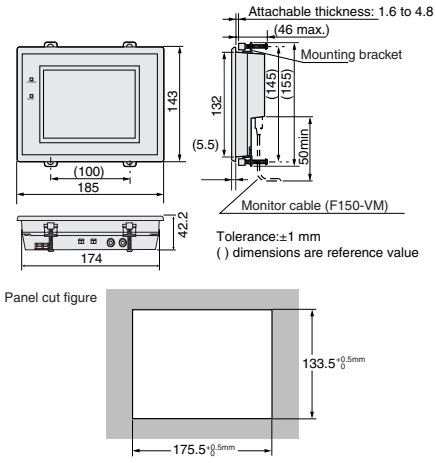


F150-KP



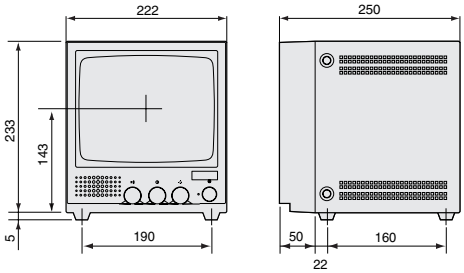
LCD monitor

F150-M05L



Video monitor

F150-M09



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To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. Q11E-EN-01

Vision Sensor

F500

Network-compatible Sensor supports everything from high-precision detection to production and quality control

Features

The F500 enables high-precision inspections and measurements in the factory and then goes further to support easy construction of a production and quality control system for quality traceability.

High-precision Sensing

1-million-pixel Digital Interface Camera

Clear images are obtained by greatly reducing noise in high-resolution video signals.

User Customization for Even Simpler Operation

Various applications are supported through features like flow menus that flexibly handle even complicated applications and macros that enable user programming.

A Wealth of Algorithms to Achieve High-precision Measurements

High-precision measurements are achieved through original algorithms ideal for lowcontrast mark positioning, minute defect detection, and much more.

Applications Software

Build Flexible Applications

The F500 provides OMRON's new menu system called Flow Menus, which enable flexible measurements through menu settings including multiple filtering operations and conditional branches based on measurement results.

Easier to Use, Easy to Program

A Macro programming feature is provided to support measurement functions by enabling screen customization, I/O interface changes, measurement condition changes, and much more. Macros can be easily programmed using a simple text editor.

Storage for Production and Quality Control

Store inspection and measurement data for safe keeping. Provide feedback to quality control data, or analyze the data to improve quality. The stored data can be used in many ways.

Large Storage Capacity

Approximately 200 images minimum can be stored right in the Controller. Measurement images are stored without alteration for future use, such as repeating measurements to check measurement accuracy or attaching images to reports.

Remote Access and Operation across a Network

Network

Easily achieve a production and quality control system using an IT environment that provides easy access to the production site and operating status.

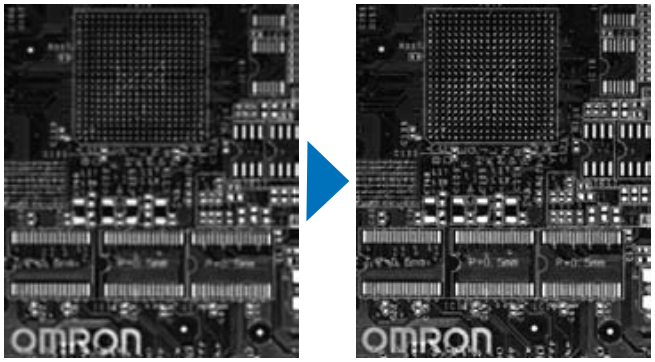
Remote Access and Operation

Data such as the operating status of the Vision Sensor and images resulting from inspections can be remotely accessed. Measurements, storage, and communications can be executed independently so that measurements will not stop even during random remote access.

Flexible User Customization for Any Purpose

Benefits of Increased Resolution

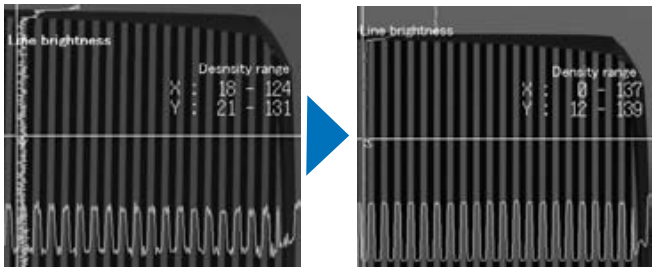
Doubling the horizontal and vertical resolutions increases total resolution by a factor of four, enabling clear images for small or complicated workpieces.



250,000 pixels (previous systems) 1 million pixels

1-million-pixel Camera with Digital Interface

The video signal noise that hurt measurement precision has been greatly reduced to enable inspections of minute foreign matter or damage as well as highprecision positioning.

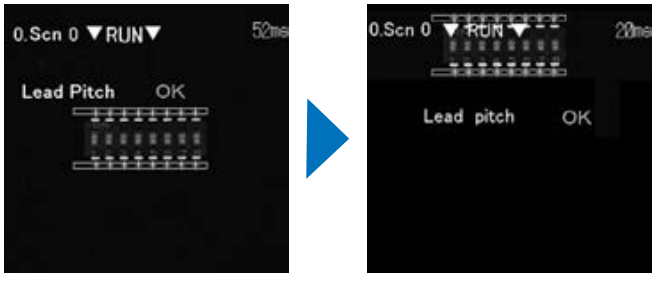


Line Brightness Image from an Analog Interface Camera

Line Brightness Image from a Digital Interface Camera

Partial Scan Function

Partial scans can be used to reduce the image reading time, which is often the bottleneck in measurement processing time.



Full Frame Reading Partial Reading

Number of Pixels read	Reading time
1,024 x 1,024 pixels	48.3 ms
1,024 x 512 pixels	27.6 ms
1,024 x 256 pixels	16.3 ms
1,024 x 128 pixels	10.7 ms

Advanced Algorithms for High-precision Measurements

Positioning

ECM Searches

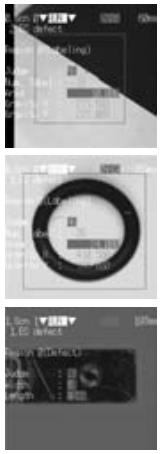
Edge code models are used for pattern searches. ECM searches are not easily affected by deformation and dirt, and can thus be very effective with low-contrast workpieces.

EC Positioning

Model registration is not required for EC positioning. Searching is possible with shape information, such as "circle," "rectangle," or "intersection." This achieves higher precision in measurements than conventional pattern matching methods.

Reference data: Repeatability is within 1/20 pixel (OMRON test data)

Appearance Inspections



EC Defect

Geometric information is used to measure minute defects or lowcontrast scratches in the measurement object at high precision. Stable detection is possible for applications like measuring deformation in O-rings.

EC Circle Count

Circles are searched for based on a circle of a specified size. Stable detection is possible without undue influence by deformation or dirt.

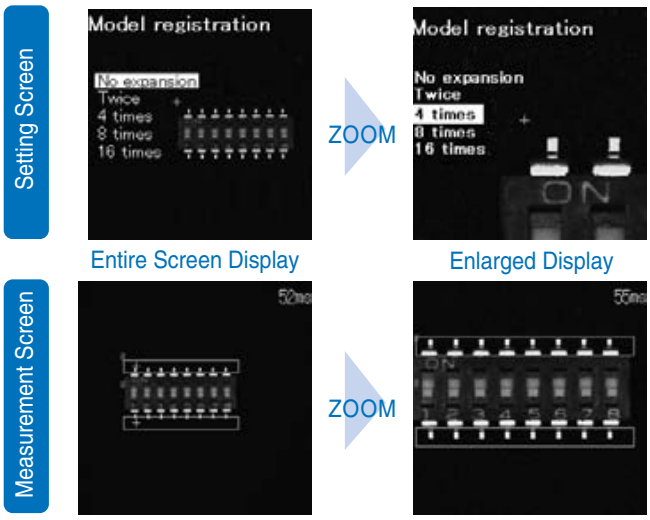
EC Circle Defect

Defects in circles, such as depressions and scorching in molded items, can be easily measured at high precision. The defect in the circle can be extracted even with a patterned background.

Reduced Work with Simple Operations

Zoom Function for 1-million-pixel Images

Zoom in to see detail clearly for easier setting and adjustment (display enlargement supported).



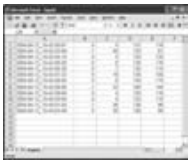
Entire Screen Display Enlarged Display

High-speed Serial USB Interface

A USB interface simplifies high-speed communications between the Vision Sensor and a computer. Communications can be used to handle measurement data, setting data, system data, image data, and more.

Networking to Access, Save, View and Edit Data

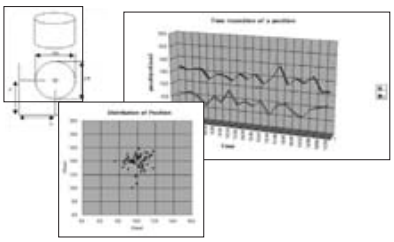
Batched Access and List Viewing of Logged Images[1]



The data stored in the Controller can be displayed in lists.

Access View

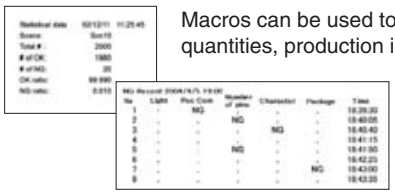
Batched Access and List Viewing of Measurement Data[1]



Links can be created to spreadsheet software to statistically process measurement results or display graphs. All measurement data can be saved for feedback to trend management or to monitor variations in measurement data.

Access View

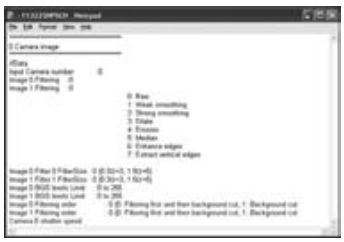
Log Production and Quality Control Information[1]



Macros can be used to total production quantities, production information such as fault rates, or NG products according to the type of inspection.

Access View

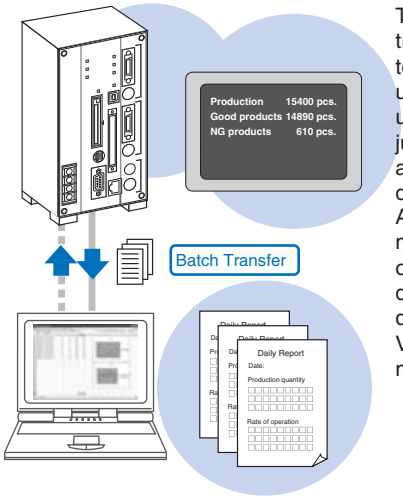
Managing and Transferring Setting Data[1]



Files containing Vision Sensor setting data (such as scenes and system data) can be sent and received.
The software version of the Vision Sensor can also be easily upgraded.

Access Save View

Batch File Uploading[1]



The data saved in the Controller can be transferred to a computer as a batch upload. This function is useful when determining judgement values for initial settings or to back up data.
And because measurements and communications are executed independently, files can be uploaded without affecting the Vision Sensor's measurement operation.

Display and Edit Scene Data[1]

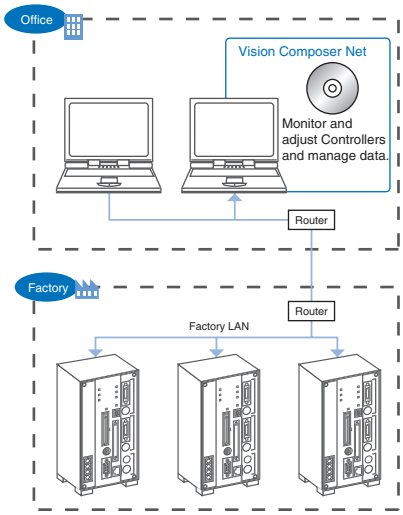
Scene data set in Vision Sensors connected to the network can be viewed and edited. The scene data displayed on the computer can also be printed.

View Save

[1] Scheduled for release soon.

Remote Vision Sensor Operation in a Network Environment[1]

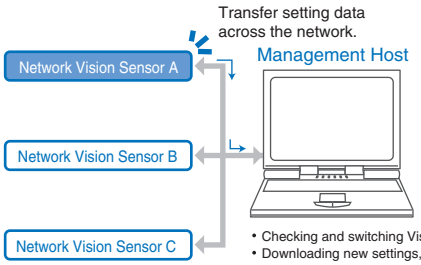
Vision Composer Net[1]



The Vision Composer Net software connects to OMRON Controllers to monitor and control operation, change settings, and perform other tasks.

Controllers can be connected across networks to monitor and adjust Controllers in the factory from an office.

Download Setup Function[1]

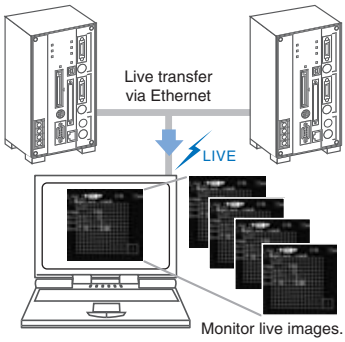


Vision Sensors in different production lines can be easily set up.

Downloading is also useful when changing products or using new programs.

- Checking and switching Vision Sensor settings
- Downloading new settings, and more

Live Monitoring Function



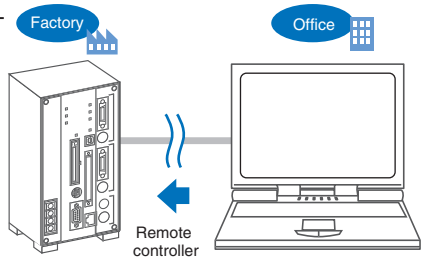
Vision Sensor images can be displayed in realtime on the computer via Ethernet. (See note 1.)
Live inspection images can also be monitored remotely. (See note 2.) And what's more, the images from several Controllers connected via the network can be monitored simultaneously on the computer screen.

Note 1: The transfer speed of live images depends on the network environment.
2: Remote monitoring is not possible through a firewall.

Remote Operations

Vision Sensor measurements can be started and stopped and scene data settings can be specified from a remote computer.

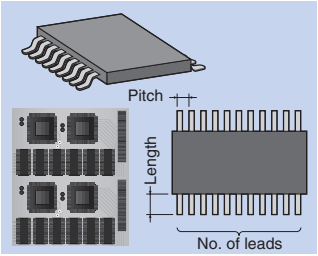
All operations that were previously possible from the Console can be performed remotely from a computer.



[1] Scheduled for release soon.

Applications

Connector and IC Lead Inspections



Sensing

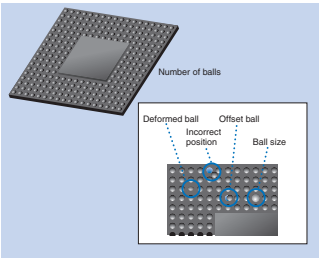
High-resolution inspection over a wide field of view is enabled by using a 1-million-pixel high-resolution camera.

And with macro functions, the statistics on lead pitch data and linear approximations of the lead ends are easily performed.

Storage & Network

Combining networking enables changing inspection devices, managing master data, and uploading statistical data files with macros.

BGA Inspections



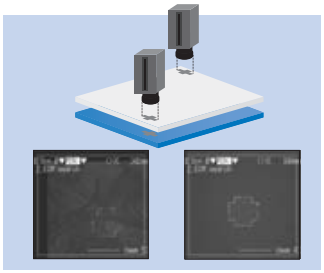
Sensing

High-resolution inspection over a wide field of view is also enabled by using a 1-million-pixel high-resolution camera with BGA inspection software. Variant BGA processing is also possible.

Storage & Network

Quality control data can be used effectively by storing inspection images in relation to lot numbers. Managing all of the product data on the host computer makes frequent changes to settings much smoother.

Positioning Liquid Crystal Boards



Sensing

EC processing, based on an original algorithm from OMRON, enables position inspections of low-contrast alignment marks. And using a Digital Interface Camera enables stable processing.
Macros can also be used to easily achieve original calibration methods, inspection data calculations, and much more.

Storage & Network

Managing productivity is also possible by saving and reviewing inspection images, detection data, and position compensation data.

Printing Defects

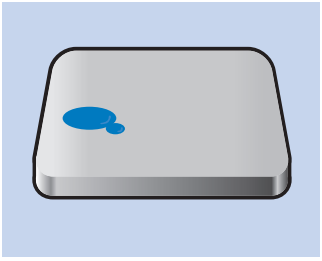
Sensing

Using a 1-million-pixel high-resolution camera provides high-precision inspections over a wide field of view.
Using macros enables saving images and inspection data classified by the type of fault.

Storage & Network

For initial system startup, data to determine judgement values and to troubleshoot problems can be accessed from a remote computer, reducing costs to a minimum.

Molded Product Defect Inspections

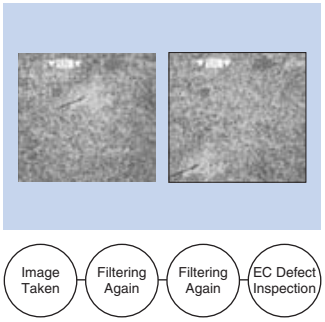


Sensing

Misshapen products, as well as contamination and scorching around molded products, can be detected. Setting is as easy as specifying the circle size to detect (i.e., the size of the defects) on limit samples displayed on the monitor.

With macros, statistics on good products, NG products, and fault rates for the inspections performed each day can be calculated and logged in a Memory Card.

Ceramic Board Defect Inspection

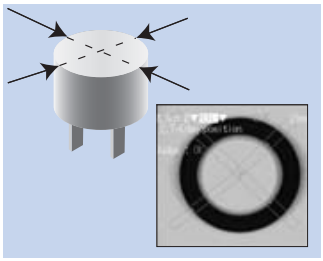


Sensing

Inspect for cracks on the surface of ceramic boards. Even if uneven lighting or rough surfaces show in the images, linear aspects can be consistently detected.

Using the flow menus enables conversion to more stable inspection by repeatedly filtering images.

Inspecting Electrolytic Capacitor Dimensions

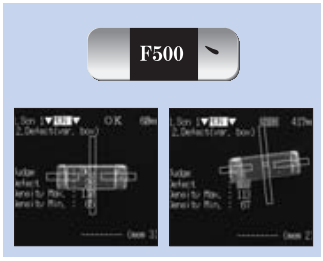


Sensing

The diameter of round workpieces can be measured at multiple points to determine if they are round or not.

With macros, deviations in inspection values can be stored in memory and statistics, such as minimum values, maximum values, and standard deviations, can be calculated.

Chip Capacitor Electrode Defect Inspection



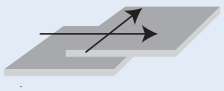
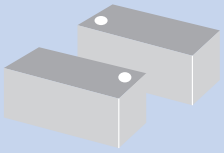
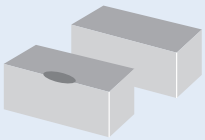
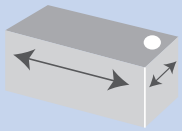
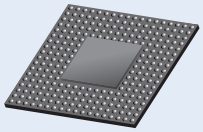
Sensing

Even if the size of the inspection object changes, the size of the inspection area adjusts to the external size to enable measurement. Misshapen products and contamination and scorching around products can be detected.

With macros, production statistics (e.g., number of good products, number of NG products, and fault rates) can be calculated and monitored onscreen.

List of Processing Items

Higher precision

Processing Items	Binary Processing	Gray-scale Processing	EC Processing
Positioning			
	Gravity and Axis	Gray Search (x-y: Pixel Level) Precise Search (x-y: Subpixel Level) Rotation Search (x-y-⊖: Subpixel Level) Circular Angle	ECM Search EC Positioning
Presence and Direction Inspections			
	Gravity and Area Binary Defect Labeling Label Data (counting possible)	Density Data (Average and Deviation) Gray Search (x-y: Pixel Level)	EC Circle Count
Appearance (Defect) Inspections			
	Area (Var. Box)	Density Defect # Defect Defect (Var. Box) Fine Matching Flexible Search	EC Circle Defect EC Defect
Dimensions			
		Edge Position_1 Edge Position_8 (Number of areas drawn differs.) Edge Width (Width between edges measured.) T-Edge Position	
Applications Packages			
		BGA	

The F500-UM Applications Software is used both with the F210 and F250.
Many other measurement functions are also supported by this software. For details, go to http://www.fa.omron.co.jp/sensing/

Complete Image Processing Items

Image Input

The camera image is read synced on an external signal.

Switch Camera
The camera can be selected when two cameras are connected.

Changing Filtering
Filtering can be performed that is different from that performed when the image was read.

Filtering Again
Filtering can be performed many times for the same image.

Position Compensation

Binary Position Compensation
Positioning is compensated based on the center of gravity and axis angle found using binary processing.

EC Position Compensation
EC position compensation is effective for low-contrast marks that vary in size.

Edge Position Compensation
Positioning is compensated based on the outline of the workpiece found through edge processing.

Model Position Compensation
Positioning is compensated based on search points found by matching with registered models.

Scroll
Images read using X,Y coordinates and angle data found with measurement functions can be scrolled.

Reset Scroll
Images that have been scrolled can be reset to their original positions.

Measurement

Positioning
Presence and Direction Inspection
Appearance (Defect) Inspection
Dimension Inspection
Applications Package

Measurement Support

Calculation
Calculations, such as basic arithmetic, tangent, cosine, and distance calculations, can be performed on the measurement data found using measurement functions.

Macros

Elapsed Time
The processing time to a specified point in the process flow can be measured. This can be used for the required processing, such as canceling measurements for time delays.

Wait
The processing flow can be temporarily paused to place processing on standby for a set period of time.

Set Unit Data
Setting data can be overwritten.

Trend Monitor
Measurement time can be displayed on a graph along a time axis.

Branching Control

Conditional Branching
Measurement conditions can be changed based on measurement values and results.

DI Branching
Processing can be branched based on the input status of the parallel interface.

End
End indicates the end of the process flow. (No settings are required.)

Results Output

Memory Card Data
Measurement values can be output to a Memory Card inserted in the Controller.

DO Data
Measurement values can be output as binary or BCD data on the parallel interface.

DO Judgement
The OK/NG judgement results can be output on the parallel interface.

Host Link Data
OMRON's PLC Host Link communications can be used for measurement commands, judgement results, measurement values, and other data without special programming.

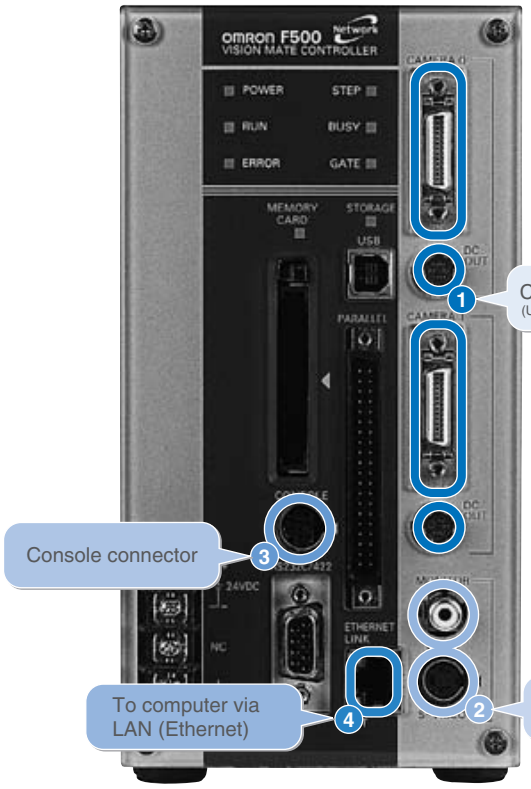
Normal Data
RS-232C communications can be used for measurement commands, judgement results, measurement values, and other data.

Data Logging
Measurement data and images can be stored inside the Controller.

Results Display

Display String
Display Item
Display Line
Display Cursor
Display Measure
Display Time
Display Box
Display Judge
Display Figure
Display Circle

System Configuration



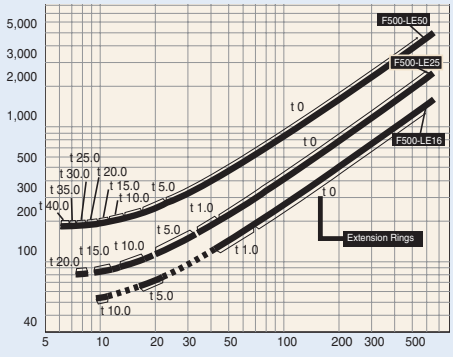
Network-compatible Vision Sensor
F500-C10-ETN/F500-C15-ETN

1

Camera Cable
F500-VS 2M

1-million-pixel Camera with Digital Interface
F500-S1

Optical Chart



High-resolution Lens

2

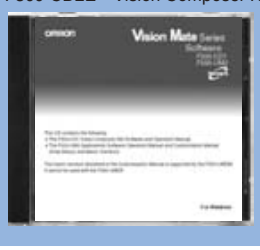
10.4-inch LCD Monitor
F500-M10L

3

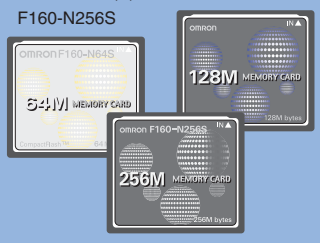
Consoles
F150-KP F160-KP

4

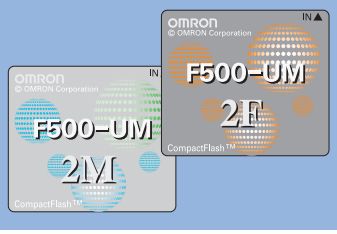
PC Support Software
F500-CD2E Vision Composer Net



Memory Cards
F160-N64S (S) QM300-N128S
F160-N256S



Applications Software
F500-UM2FE/UM2ME



* Scheduled for release soon.

Specifications

F500-C10-ETN / F500-C15-ETN

Connected Camera	F500-S1
No. of connectable Cameras	2
Processing resolution	1,024 (H) x 1,024 (V)
No. of scenes	32 (Can be increased using Memory Cards)
Image memory function	35 images max
Storage	256 MB non-volatile memory
Operation and setting	Measurement items installed using Applications Software. Menu operations used to combine measurement items. Vision Composer Net can be used for operation and settings.
Menu language	Japanese or English (switchable)
Serial communications	USB series B: 1 channel RS-232C/422: 1 channel
Network communications	Ethernet 100Base-TX/10Base-T
Parallel I/O	11 inputs, 22 outputs
Monitor Interface	Composite video output: 1 channel S-VIDEO output: 1 channel
Memory Card interface	Compact Flash card slot, 1 channel
Power supply voltage	20.4 to 26.4 V DC
Current consumption	2.1 A max. (with two F500-S1 Cameras connected)
Ambient temperature	Operating: 0 to 55°C Storage: -25 to 65°C with no icing or condensation
Ambient humidity	Operating / Storage: 35% to 85% with no condensation
Dimensions	100 x 198 x 134 mm (W x H x D) (without connectors and other protrusions)
Weight	Approx. 1.6 kg (Controller only)
Accessories	Ferrite core for console (1), Setup Manual

F500-S1

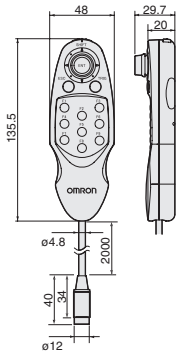
Picture elements	2/3-inch CCD
Pixel size	6.45 µm (H) x 6.45 µm (W)
Shutter	Electronic shutter, 10 shutter speeds (1/24 to 1/10,000 s), changed via menu
Partial function	Four settings
Communication interface	Conforms to Camera Link
Ambient temperature	Operating: 0 to 50°C Storage: -25 to 60°C with no icing or condensation
Ambient humidity	Operating / Storage: 30% to 85% with no condensation
Dimensions	50 x 40 x 90 mm (W x H x D) (without connectors and other protrusions)
Weight	Approx. 270 g
Accessories	Instruction Manual

System Requirements for F500-CD2E Vision Composer Net

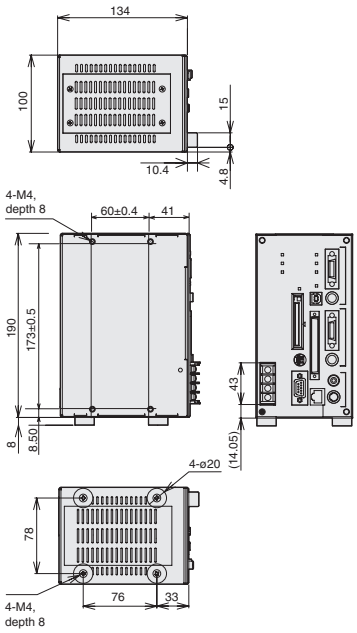
CPU		Pentium III 600 MHz min. (Pentium III 1 GHz min. recommended)
OS		Windows 2000 Professional, Service Pack 3 or higher Windows XP Home Edition, Service Pack 1 or higher Windows XP Professional, Service Pack 1 or higher
Memory		192 MB min. (256 MB min. recommended)
Hard disk		200 MB min. available space
Monitor		Resolution: 1,024 x 768 min. Display colors: High Color (16-bit) min. (True Color (32-bit) min. recommended)
Network		10BaseT-compliant network (100Base-TX recommended)
Vision Sensor	**Controller**	F500-C10-ETN/F500-C15-ETN
	Application Software	F500-UM Version 2.00 or higher

Dimensions

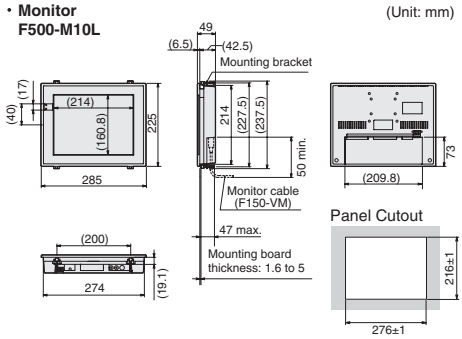
• Console
F160-KP
(Unit: mm)



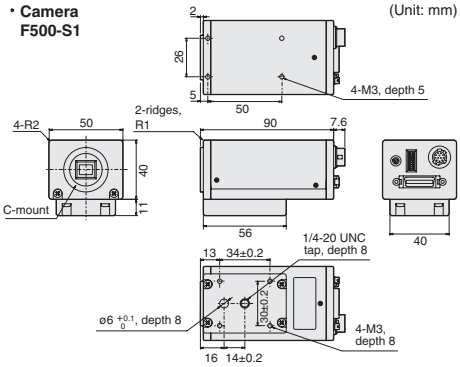
• Controller
F500-C10-ETN
F500-C15-ETN
(Unit: mm)



• Monitor
F500-M10L
(Unit: mm)



• Camera
F500-S1
(Unit: mm)



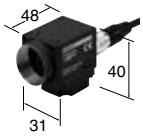
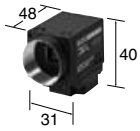
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. Z203-E2-03-X
In the interest of product improvement, specifications are subject to change without notice.

The performance of the visual sensor varies greatly depending on the combination of camera, lens, and lighting. Refer to the following to create a suitable combination for your inspection purpose.

Camera Details

Model

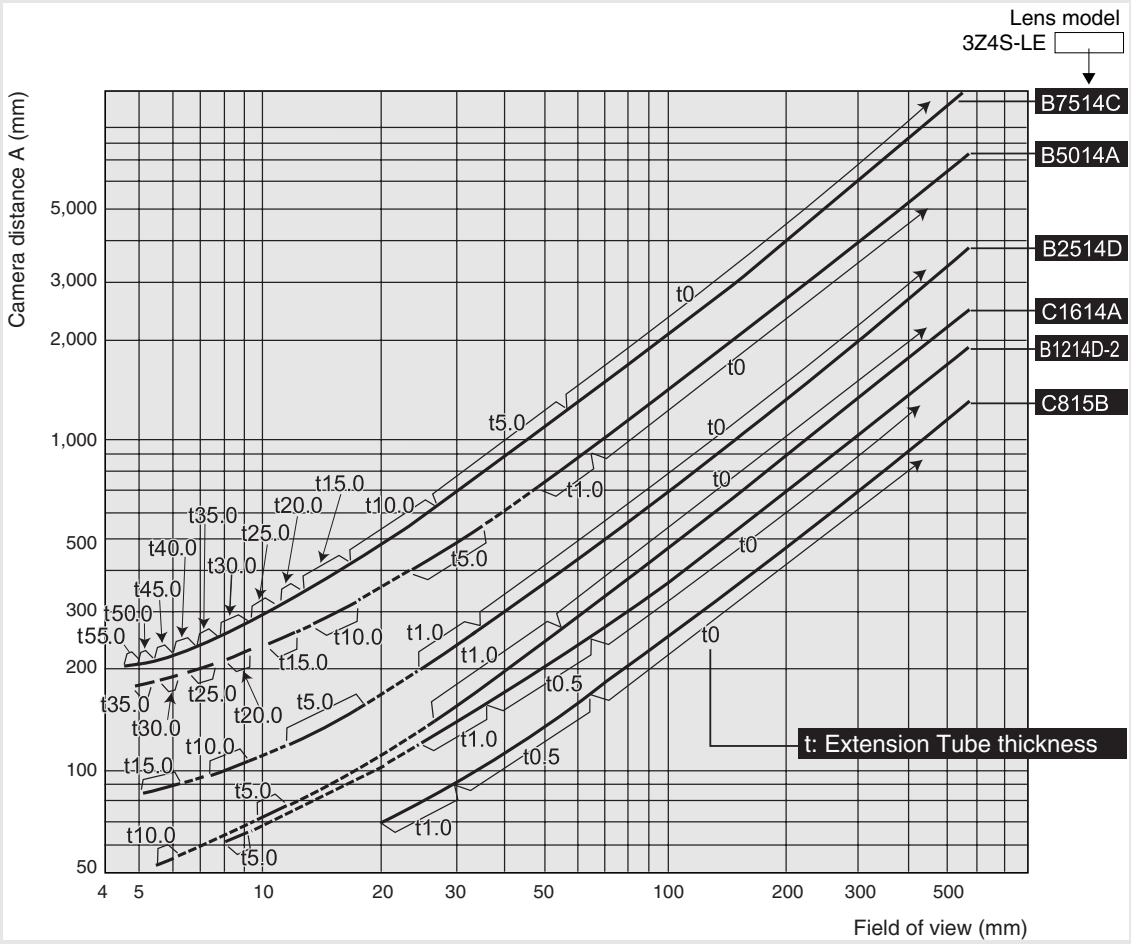
Item \ Model		F150-S1A	F160-S1/S2	F400-S1
Item		Shutter camera		
Visual appearance				
Image pick-up		1/3 inch CCD fixed imaging element	1/3 inch color CCD	
Number of elements		659(H) x 494(V)		
Synchronization method		External synchronization		
Scanning method		Non-interlace method	Non-interlace method Interlace method	Non-interlace method
Lens mount		C mount		
Shutter speed (s)		1/100 1/500 1/2000 1/10000 (factory setting: 1/2000)	8 stages OFF to 1/20000 Changed by menu	1/100 1/500 1/2000 1/10000 (factory setting: 1/2000)
Weight (Unit only)		Approx. 70 g	Approx. 85 g	Approx. 70 g
Applicable camera cable		F150-VS		
Applicable controller	F150	O	X	X
	F160	O	O	X
	F210	O	O	X
	F250	O	O	X
	F400	X	X	O
	V530-R150	O	X	X
	V530-R160	O	X	X

Lens Details

Refer to the following optical graph to select a lens and connecting ring suitable for the field of view and the camera installation distance.

Optical graph

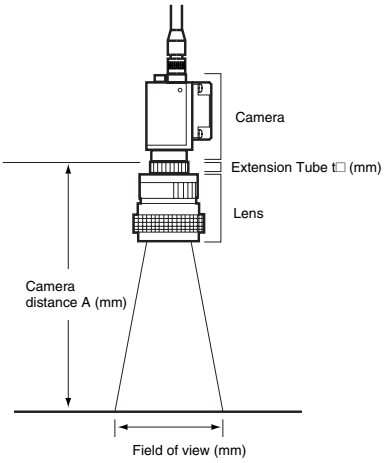
Camera models
F400-S1,
F150-S1A
F160-S1/S2



How to read the optical graphs

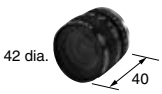
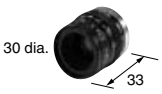
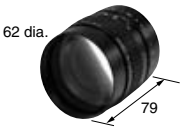
The horizontal axis of each optical graph is the field of view "L" (mm) and the vertical axis is the camera installation distance "A" (mm). Each line represents a lens, and the value "t" is the thickness of the connecting ring.

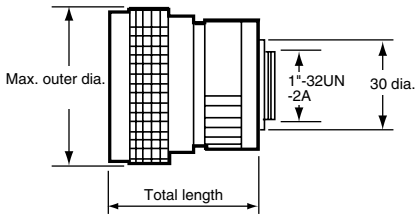
The values given in the optical graph are only approximate values. It is recommended that the camera distance is adjusted by sliding the Camera forward or backward to get the required field of view for actual operation



Ordering Information

Lens

Item \ Model	CCTV lens					
	3Z4S-LE C815B	3Z4S-LE B1214D-2	3Z4S-LE C1614A	3Z4S-LE B2514D	3Z4S-LE B5014A	3Z4S-LE B7514C
Visual appearance						
Focal length	8.5 mm	12.5 mm	16.0 mm	25.0 mm	50.0 mm	75.0 mm
Brightness	F1.5	F1.4				
Filter size	M40.5 x P0.5		M27 x P0.5		M46 x P0.75	M58 x P0.75
Lock mechanism	With focus and aperture lock mechanism					---

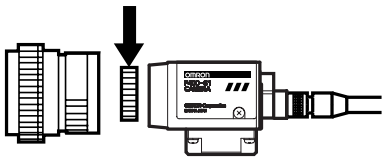


Extension ring

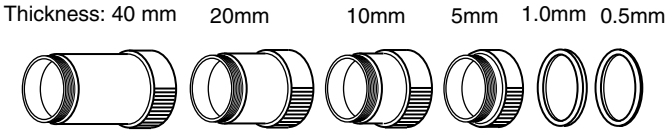
The extension ring is inserted between the lens and camera, and is used to adjust the focus.

Combine 6 sheets for the desired thickness.

Extension Tube



Model	Maximum outer diameter	Thickness
3Z4S-LE EX-C6	31 mm dia.	Six-point set: 0.5 mm, 1 mm, 5 mm, 10 mm, 20 mm, 40 mm



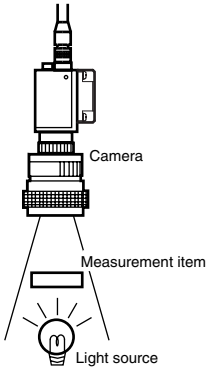
Note 1. Do not use multiple 0.5 mm and/or 1.0 mm extension rings in combination. It will not be possible to tighten the screws sufficiently.
2. Depending on vibration conditions, additional support may be necessary if the extension exceeds 30 mm.

Lighting

For accurate inspection, a stable image must be obtained. Select lighting that is suitable for your purpose and measurement object.

Lighting method

Back lighting



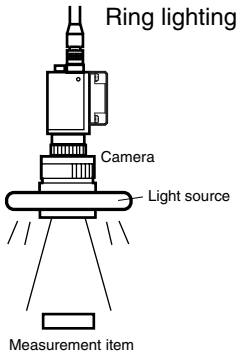
High contrast guarantees a stable image.

Application

Inspection of the shape of the object, positioning inspection, etc.

Reflective lighting

Ring lighting

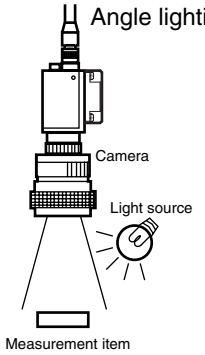


Even illumination is possible.

Application

Inspection of object surface

Angle lighting

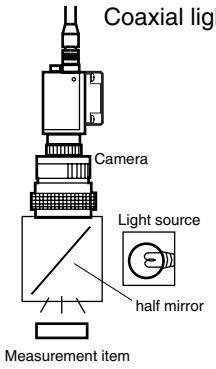


Detection using the difference between regular reflection and diffuse reflection is possible.

Application

Inspection for presence of object surface luster, etc.

Coaxial lighting



There are minimal shadows from bumps and depressions in the measurement object, enabling a stable image to be obtained.

Application

Surface inspection of relatively small objects, positioning, hole inspection, etc.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

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