GENERAL CATALOGUE 2004/2005

Sensing & Safety





- Photoelectric Sensors
- Displacement Sensors
- Vision Systems
- Safety Sensors
- Safety Switches
- Safety Relays
- Proximity Sensors
- Rotary Encoders
- Pressure Sensors

Advanced Industrial Automation

Cat.No. F502-EN2-03A SEN

OMRON

Vision Sensors

Pattern matching sensor

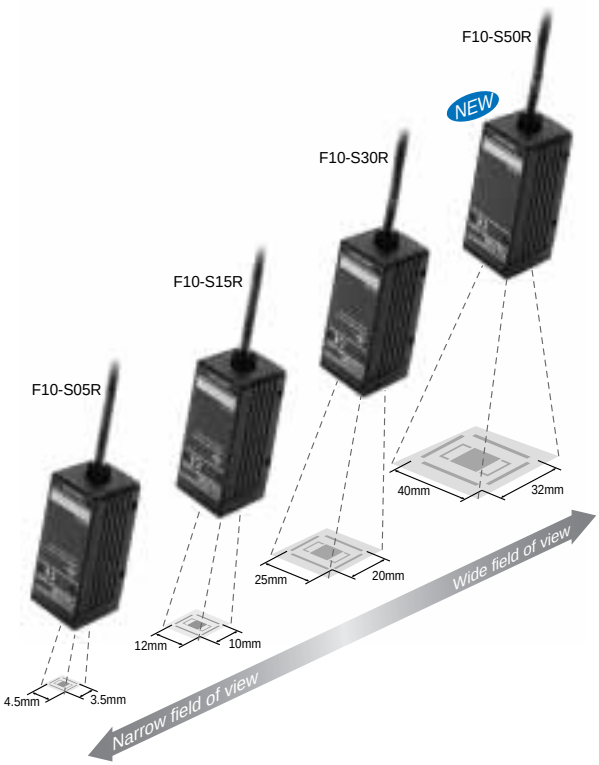
F10

Detect shapes!

Features

New series! Our full line-up of pattern matching sensors meets a wide variety of inspection needs.

Head for each type of work, from narrow to wide field of view.



Amplifier with ample variations

RS-232C and 422I/F Model for Systems

F10-C50/C55

Bank function Model for variety Line

F10-C30/C35

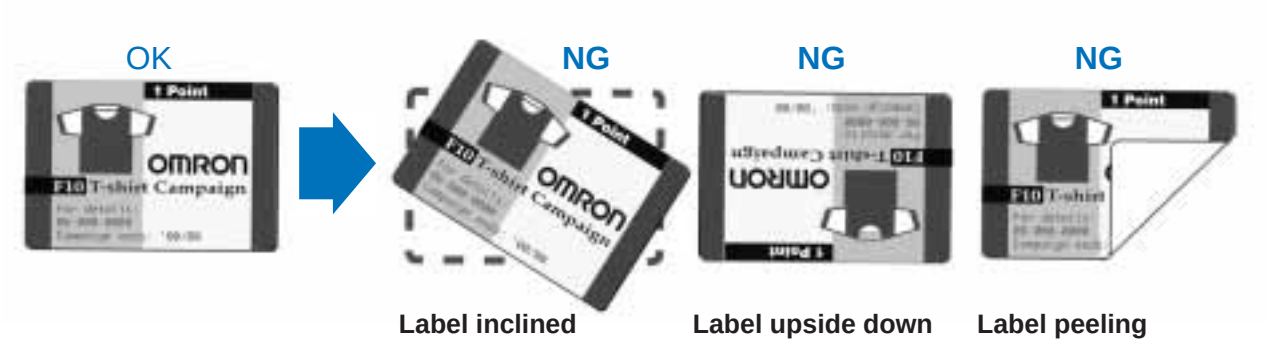
Standard Model for Speed Line

F10-C20/C25

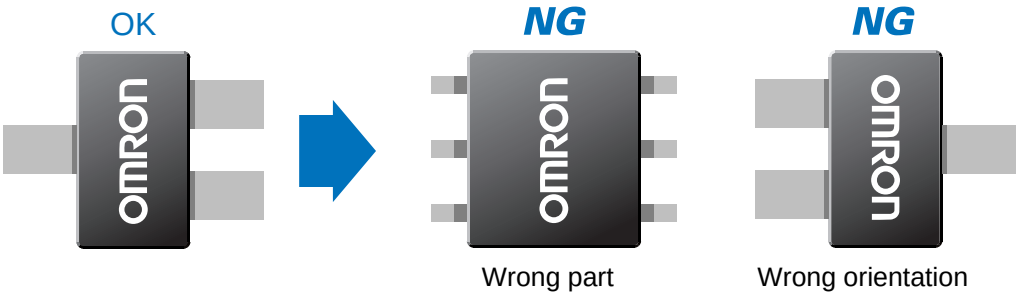
Features

Inspection by pattern enables not only presence inspection but also the following decisions:

Label

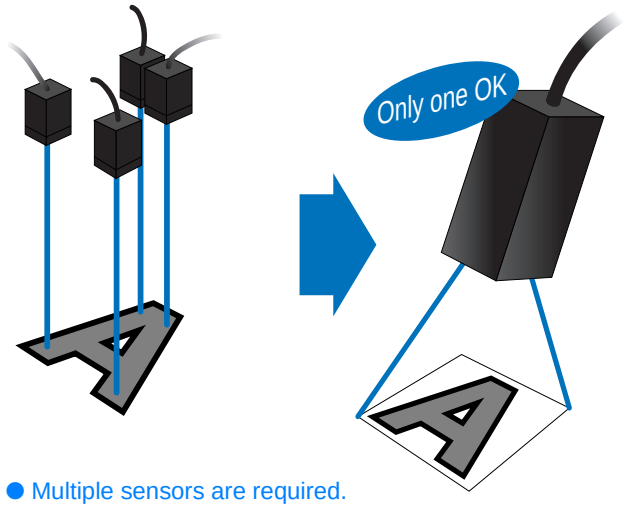


Electronic component



The F10 enables a big reduction in setup cost and man-hours.

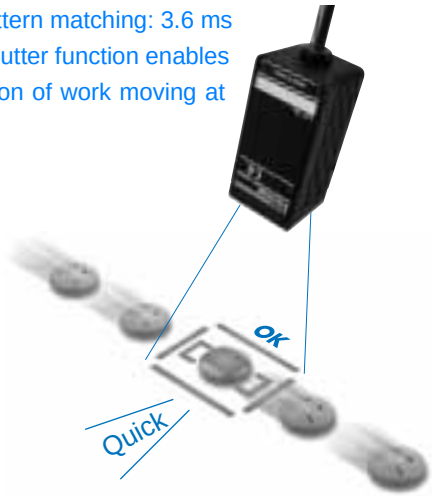
With a photoelectric sensor	With the F10



- Multiple sensors are required.
- Positioning of the conveyor system is required.

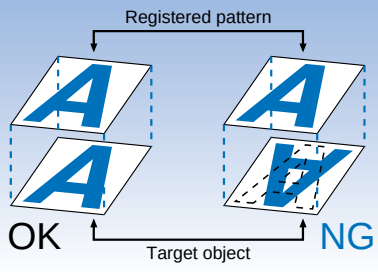
Inspection by face, but fast!

- High-speed pattern matching: 3.6 ms
- The random shutter function enables precise detection of work moving at high-speed.



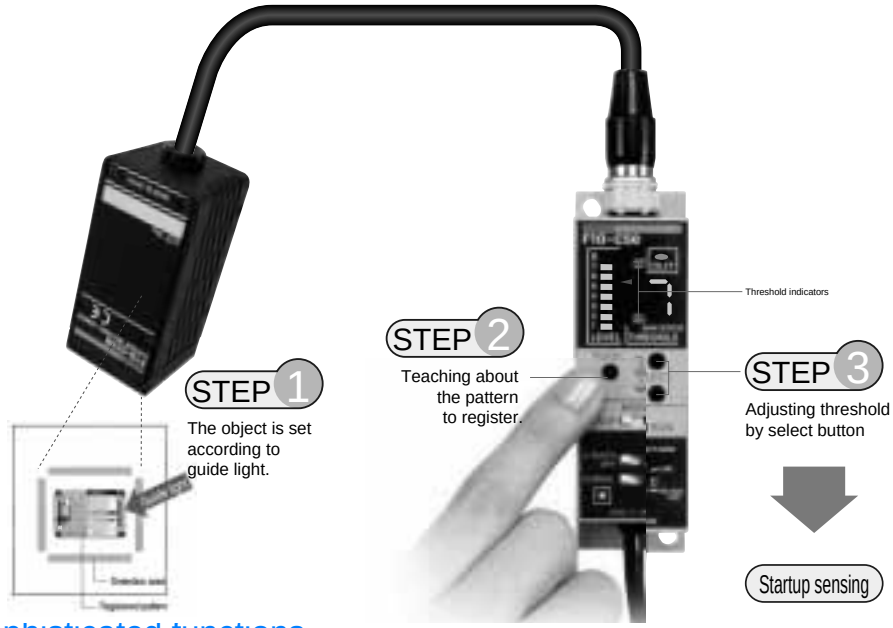
Pattern Measurement F10

Measures the degree with which the pattern and the detected image match to differentiate OK and NG images.



Features

Easy settings with one-push teaching



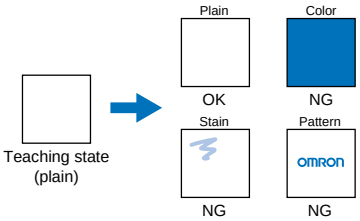
Many other sophisticated functions

Each unit comes standard with plain surface measurement and standard measurement modes.

In addition to pattern measurement, a variety of other inspections are possible, including color shading and dirt.

● Plain-surface measurement is possible

The contrast and average darkness are determined, and a pass/no pass decision is executed. If the same plain surface is identified as during teaching, the result is okay.

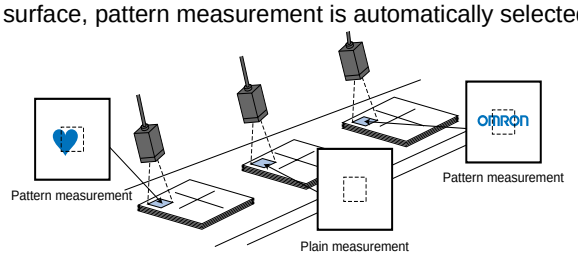


Includes off delay and inverted output functions

Easy connection to a variety of peripheral devices.

● Can be used for missing page inspection.

Missing page inspection is possible by combining plain-surface measurement with pattern measurement. If the teaching model has a plain surface, plain-surface measurement is automatically selected. If the teaching model has a patterned surface, pattern measurement is automatically selected.



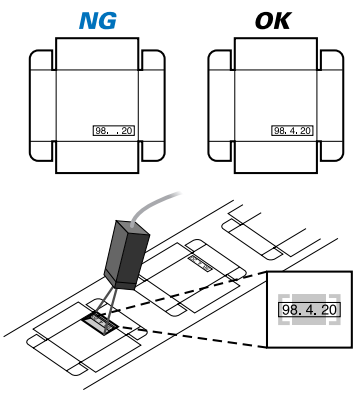
Application

Label count

Character pattern detection makes it possible to count labels.

Printed date presence inspection

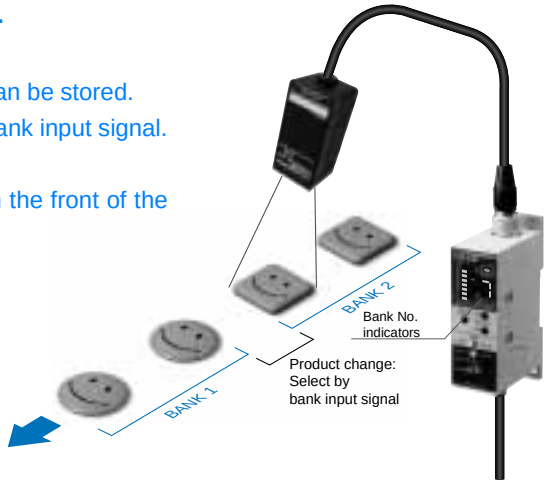
Wide mode is ideal.



Features

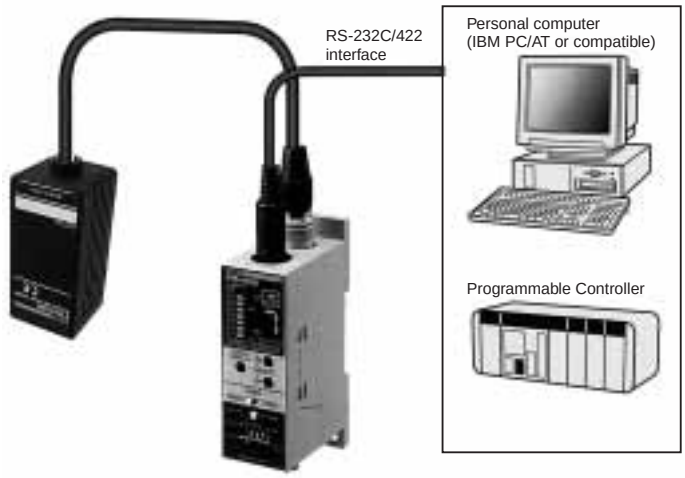
The bank function is ideal for multi-product lines.
*Included on the F10-C30/C35/C50/C55

- Up to eight conditions such as the model and threshold values can be stored. At the time of inspection, these settings can be selected with a bank input signal.
- Supports frequent setup changes.
- The bank number can be easily viewed on the digital display on the front of the amplifier.



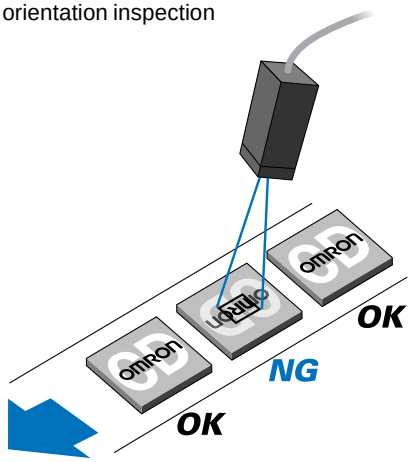
RS-232C/422 interface for system building
*Included on the F10-C50/55.

- Can be connected to a programmable controller or computer to enable uploading and downloading of condition settings and output of measured values and decision values.
- Can be used for sophisticated applications such as support of a high number of products and higher-rank management and use of measured data.

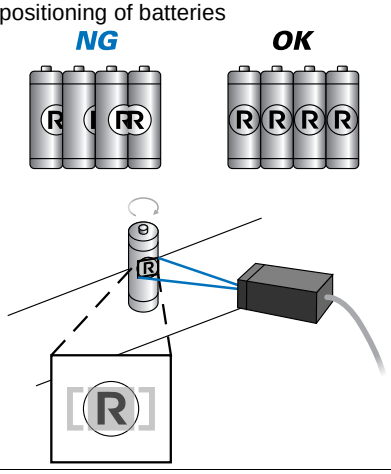


Application

CD jacket orientation inspection



Rotational positioning of batteries



Ordering Information

Head

Red light Green light

Item	Setting distance	Sensing area	Model
Red LED	160±16mm	40 x 32 mm	F10-S50R
Red LED	100±10mm	25 x 20 mm	F10-S30R
Green LED	50±5mm	12 x 10 mm	F10-S15R
Green LED	33±1.5mm	4.5 x 3.5 mm	F10-S05R

Amplifier

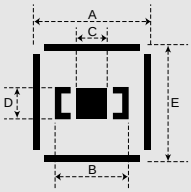
Item	Output system	Number of models stored	Model
Standard	NPN	1	F10-C20
	PNP		F10-C25
Bank function type	NPN	8 (1 model per bank)	F10-C30
	PNP		F10-C35
RS-232C and 422 I/F type	NPN		F10-C50
	PNP		F10-C55

Special cable for amplifier

Item	Model
For RS-232C (cable length: 2 m)	F10-VR2
For RS-422 (cable length: 2 m)	F10-VR4

Rating/Performance

Head

Model	F10-S50R	F10-S30R	F10-S15R	F10-S05R
Installation distance	160±16 mm	100±10 mm	50±5 mm	33±1.5 mm
Sensing area	40mm x 32 mm	25mm x 20 mm	12mm x 10 mm	4.5mm x 3.5 mm
Guide lighting size 	A: 40 mm B: 32 mm C: 13 mm D: 10 mm E: 32 mm (typ.)	A: 25 mm B: 20 mm C: 8 mm D: 6 mm E: 20 mm (typ.)	A: 12 mm B: 10 mm C: 4 mm D: 3 mm E: 10 mm (typ.)	A: 4.5 mm B: 3.5 mm C: 1.5 mm D: 1.0 mm E: 3.5 mm (typ.)
Built-in lens	Focal length: f9.8 (fixed), aperture: F2.8 (fixed)			Focal length: f14.8, aperture: F3.5 (fixed)
Work lighting method	Pulse illumination (pulse width determined by electronic shutter time)			
Light source for work lighting (wavelength of emitted light)	Red light emitting diodes x 8 (680 nm)		Green light emitting diodes x 8 (540 nm)	
Main target color combination	White/black, white/green, white/blue, black/red		White/black, white/red, white/green, white/blue, black/green/, black/blue	
Light source for guide lighting (wavelength of emitted light)	Green light emitting diode x 1 (540 nm)		Blue light emitting diode x 1 (470 nm)	
Guide lighting method	Pulse illumination			
Image pick-up	1/5-inch CCD, 360 (H) x 120 (V)			
Shutter function	Electronic shutter time (1/34722 s to 1/2894 s) (automatically set during teaching)			
Ambient temperature	Operating: 0 to +40°C, storage: -25 to +60°C (no ice formation or condensation)			
Ambient humidity	Operating/storage: 35 to 85% RH (no ice formation or condensation)			
Operating ambient atmosphere	No corrosive gas			
Power supply voltage	16.2 to 19.8 V (supplied from amplifier)			
Current consumption	150 mA or less			
Insulation resistance	20 M Ω min. at 500 VDC			
Dielectric strength	1000 V AC 50/60Hz 1min			
Protective structure	IEC60529 Standard IP64			
Vibration resistance (using clamps)	Vibration frequency: 10 to 150 Hz Maximum half width: 0.75 mm, or maximum acceleration: 100 m/s^2, 32 min each in X, Y, and Z directions			
Shock (durability) (using clamps)	Peak acceleration: 300 m/s^2, 3 times each in X, Y, and Z directions			
Connection method	Pre-wired models (standard length: 2 m)			
Material — Case	Diecast aluminum			
Material — Front cover	Acrylics			
Weight (Packed state)	Approximately 400 g (unit: approximately 300 g (including cable))			
Accessories	Clamps, mounting screws (M4 x 8), operation manual			

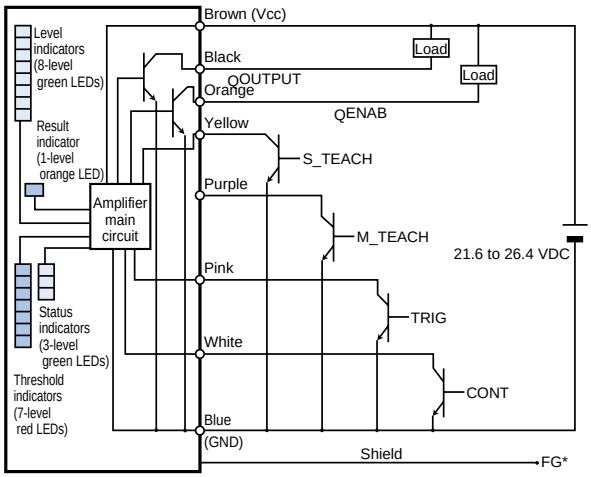
Amplifier

Item \ Model	F10-C20/C30/C50	F10-C25/C35/C55
Output method	NPN	PNP
Measurement item	Pattern measurement / plain surface measurement	
Number of models stored	1 model (C20/C25), 1 model per bank (C30/C35/C50/C55)	
Bank switching	None (C20/C25), 8 banks (C30/C35/C50/C55)	
Automatic teaching function	Yes	
Model size	Normal mode / Wide mode (selector switch)	
Measurement processing time	Normal mode: 3.6 ms, Wide mode: 10.8 ms (during continuous measurement)	
Output signals (2 points)	Control output / enable output: NPN open collector output; load voltage: 30 V or less; load current: 50 mA or less; residual voltage: 1.2 V or less	Control output / enable output: PNP open collector output; load voltage: 30 V or less; load current: 50 mA or less; residual voltage: 2.0 V or less
Output type	Match output: ON when work matches stored model; No-match output: ON when work does not match stored model.	
Input signals C20/C25: 4 points, C30/C35/C50/C55: 7 points	External trigger input (minimum pulse width 1 ms), continuous measurement input, work move teaching input, work stop teaching input When ON: Short-circuit to 0 V (0-V short-circuit current 1 mA or less), or 1.5 V or less When OFF: Open or 5 V or higher (maximum input voltage + 26.4 V DC)	External trigger input (minimum pulse width 1 ms), continuous measurement input, work move teaching input, work stop teaching input When ON: Short-circuit to Vcc, or 9 V or higher (maximum input voltage + 26.4 V DC) When OFF: Open or 5 V or less
Usable heads	F150-S05R/-S15R/-S30R/-S50R	
Indicator lamp	• Decision display (1 orange LED), level display (8 green LEDs), threshold value display (7 red LEDs) • Status indicator lamps (C20/C25: 3 lamps; C30/C35/C50/C55: 7 lamps)	
Operation interface	• Teaching button, selector button (UP/DOWN) • Operation mode selector switch (TEACH/MON/RUN), auto teaching selector switch (OFF/ON) • Model size selector switch (normal/wide), off delay timer switch (timer ON/OFF) • Match/No-match output switching • External input switching (C50/C55 only) LINE: For external input in RUN mode using an input wire; RS-232C/422: For external output in RUN mode using serial communication	
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 (no ice formation or condensation)	
Operating ambient atmosphere	No corrosive gas	
Power supply voltage	21.6 to 26.4 V DC, ripple (p-p) 10% or less	
Current consumption	300 mA or less	
Insulation resistance	20 M Ω min. at 500 VDC	
Dielectric strength	1,000 VAC at 50/60 Hz for 1 minute	
Protective structure	IEC Standard IP40	
Vibration resistance	Vibration frequency: 10 to 150 Hz Maximum half width: 0.75 mm, or maximum acceleration: 100 m/s^2, 32 min each in X, Y, and Z directions	
Shock resistance	Peak acceleration: 300 m/s^2, 3 times each in X, Y, and Z directions	
Connection method	Pre-wired models (standard length: 2 m)	
Material	ABS	
Weight (Packed state)	Approximately 300 g (unit: approximately 200 g (including cable))	
Accessories	Instruction manual	

Input/output stage circuit schematic

NPN-type F10-C20

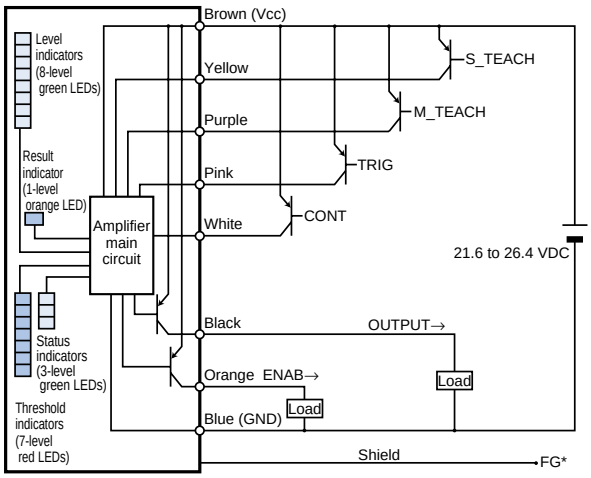
The input line has gray, green, and red wires, however, this model cannot use these wires. Take measures to ensure that they do not short-circuit with other wires.



* The normal shield wire is connected to 0 V or to ground.

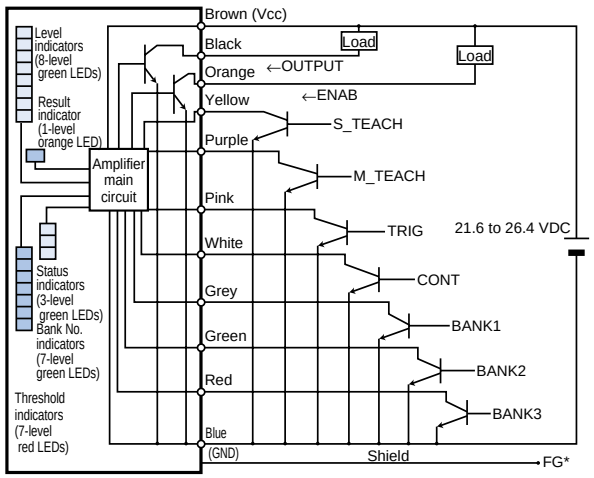
PNP-type F10-C25

The input line has gray, green, and red wires, however, this model cannot use these wires. Take measures to ensure that they do not short-circuit with other wires.



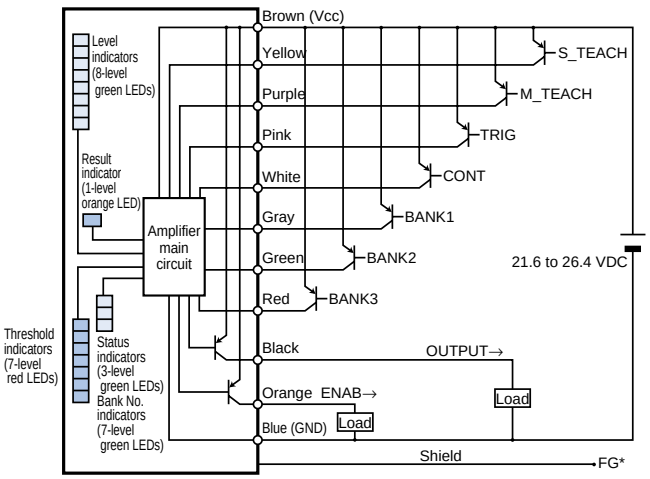
* The normal shield wire is connected to 0 V or to ground.

NPN-type F10-C30/C50



* The normal shield wire is connected to 0 V or to ground.

PNP-type F10-C35/C55



* The normal shield wire is connected to 0 V or to ground.

Input/output signal

Signal	Functions
OUTPUT	Control output
ENAB	Enable output
S_TEACH	Work stop teaching input
M_TEACH	Work move teaching input
TRIG	Measurement trigger input
CONT	Continuous measurement input
BANK1	Bank switch input (F10-C30/C35/C50/C55)
BANK2	
BANK3	

Note: 1 . All input signals are only enabled in RUN mode.
2 . The outer wire (shield) of the shielded wire is not connected to the inside or the case.

Bank switching method (F10-C30/C35/C50/C55)

If BANK1-3 are connected as shown below, the bank number can be switched.

BANK No.	BANK1	BANK2	BANK3
BANK0	OFF	OFF	OFF
Bank 1	ON	OFF	OFF
Bank 2	OFF	ON	OFF
BANK3	ON	ON	OFF
BANK4	OFF	OFF	ON
BANK5	ON	OFF	ON
BANK6	OFF	ON	ON
BANK7	ON	ON	ON

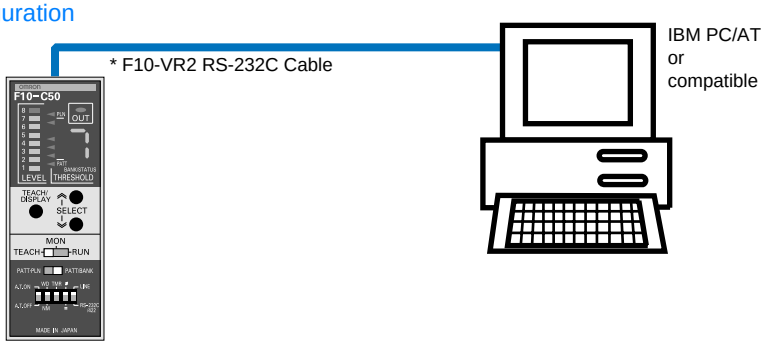
Connection to peripheral devices (F10-C50/C55 only)

The measurement trigger can be input and the measurement result output through the RS-232C port. The set data can also be saved in a computer as a backup. For detailed communication commands, see the operation manual for the product.

Example of 1:1 connection

System configuration

* For parts that are marked, use the special F10 parts.



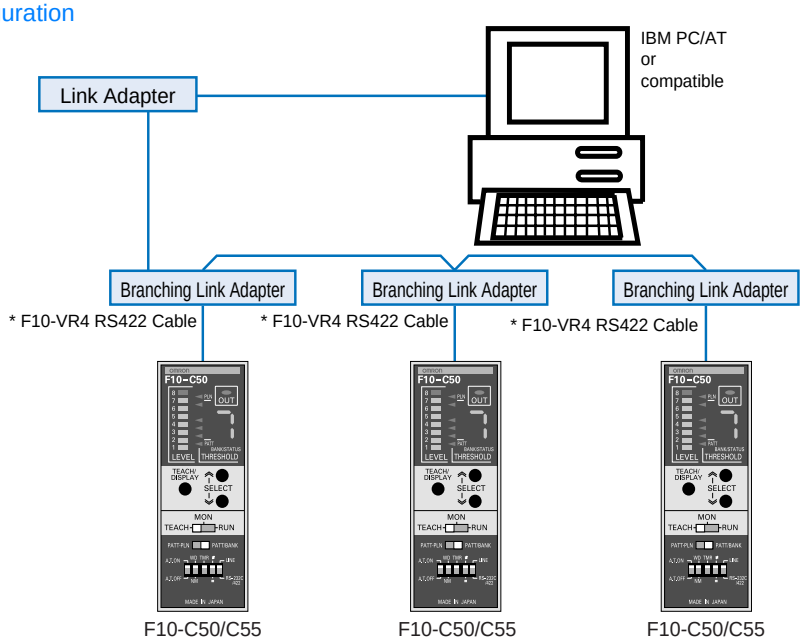
F10-C50/C55

Example of multi-drop connection

An RS232C/RS-422 converter can be connected to communicate with multiple F10-C50/C55 units (up to 31) using one computer.

System configuration

* For parts that are marked, use the special F10 parts.



F10-C50/C55 F10-C50/C55 F10-C50/C55

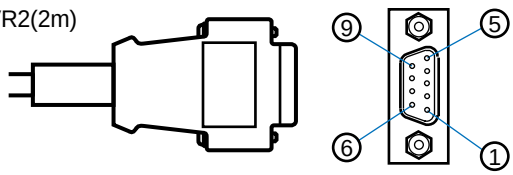
Recommended converter models Manufactured by Omron

Link adapter	B500-AL004
Link adapter distributor	B500-AL001

- When using the B500-AL004 link adapter converter, be sure to set the terminal resistor to "Yes" and terminate the line of the final station as follows: Connect a 220-Ω resistor (1/2 W or higher) between RDA(-) and RDB(+), and connect a 220-Ω resistor (1/2 W or higher) between SDA(-) and SDB(+).

Special RS-232C cable: D sub 9-pin connector side

F10-VR2(2m)

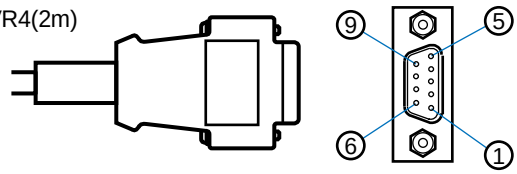


Pin No.	Signal name	Name
2	SD(TXD)	Transmission data
3	RD(RXD)	Received data
5	SG(GND)	Signal ground

* Signal names are as seen from the F10.

Special RS-422 cable: D sub 9-pin connector side

F10-VR4(2m)



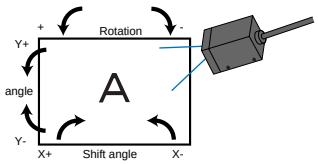
Pin No.	Signal name	Name
1	RDB(+)	Received data (+)
3	SG(GND)	Signal ground
5	SDB(+)	Transmission data (+)
6	RDA(-)	Received data (-)
9	SDA(-)	Transmission data (-)

* Signal names are as seen from the F10.

Note:Secure the connector with a band to ensure that it does not come off.

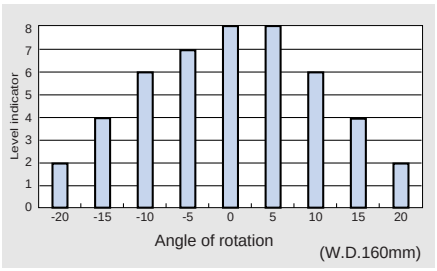
Characteristic data (typical)

F10-S50R

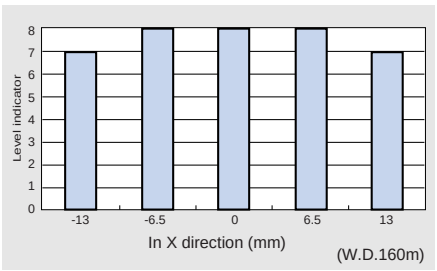


- Measured data using this size of "A" as the object.
- Install the head at an inclination of 15° to the object.

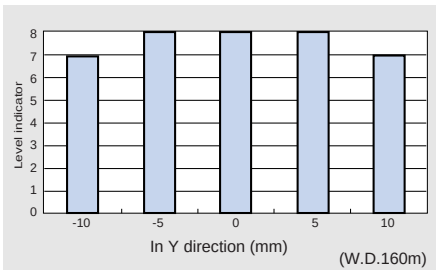
Rotation characteristics



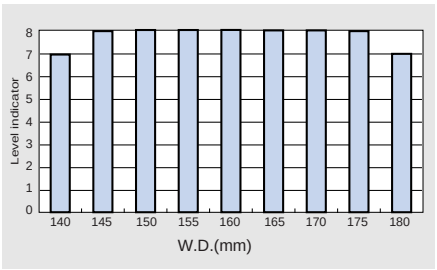
Position characteristics within area (X direction)



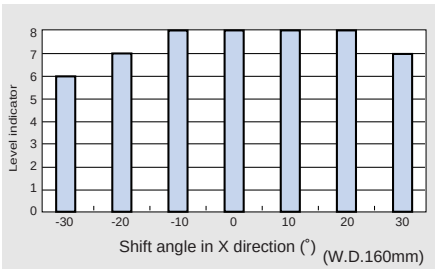
Position characteristics within area (Y direction)



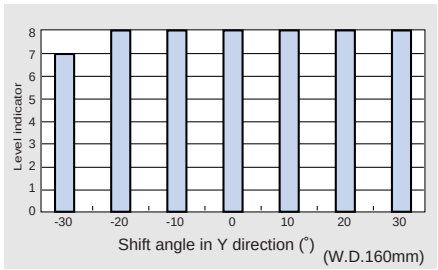
Distance characteristics



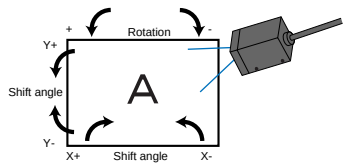
Gate characteristics (X direction)



Gate characteristics (Y direction)

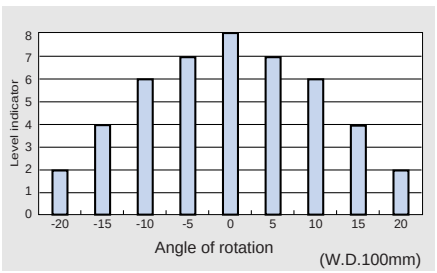


F10-S30R

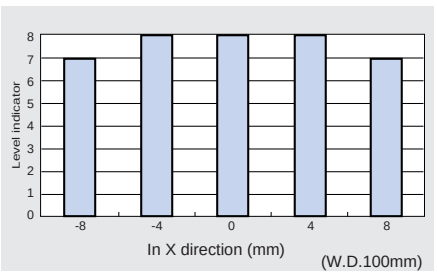


- Measured data using this "A" size as the object.
- Install the head at an inclination of 15° to the object.

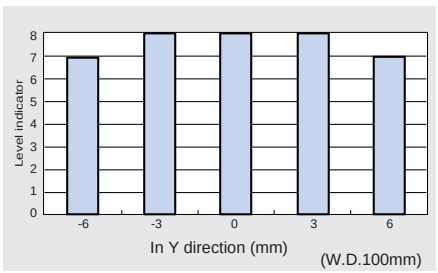
Rotation characteristics



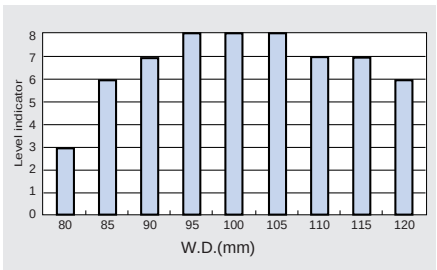
Position characteristics within area (X direction)



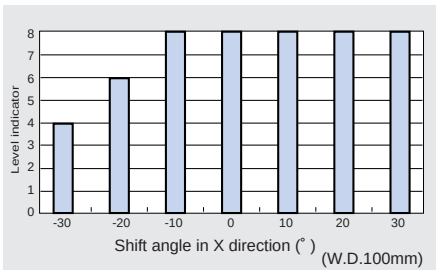
Position characteristics within area (Y direction)



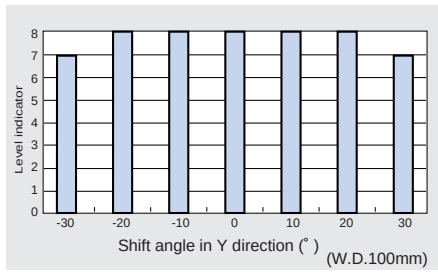
Distance characteristics



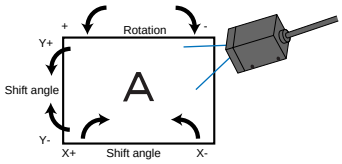
Gate characteristics (X direction)

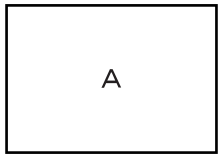


Gate characteristics (Y direction)



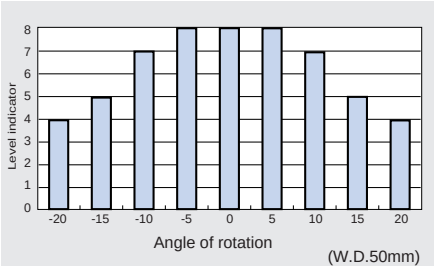
F10-S15R



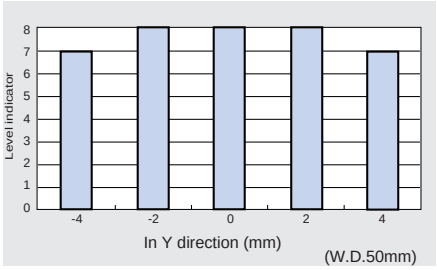


- Measured data using this "A" size as the object.
- Install the head at an inclination of 15° to the object.

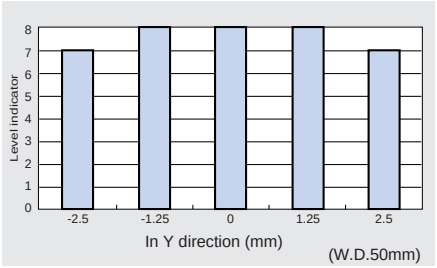
Rotation characteristics



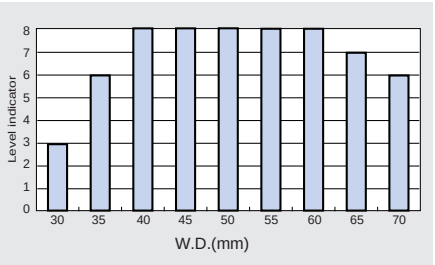
Position characteristics within area (X direction)



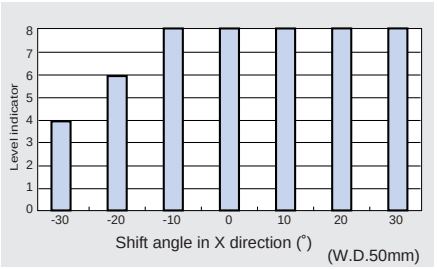
Position characteristics within area (Y direction)



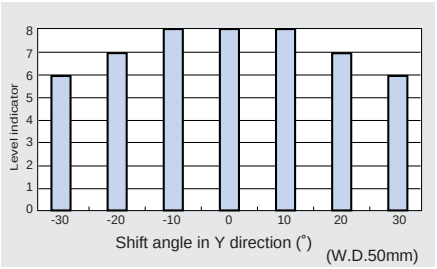
Distance characteristics



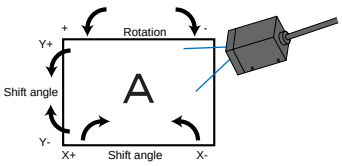
Gate characteristics (X direction)

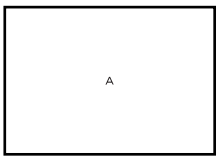


Gate characteristics (Y direction)



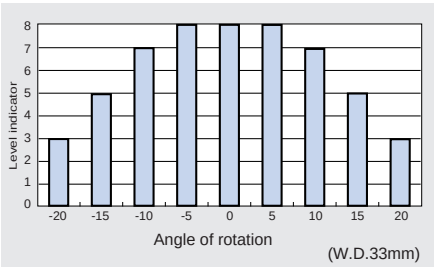
F10-S05R



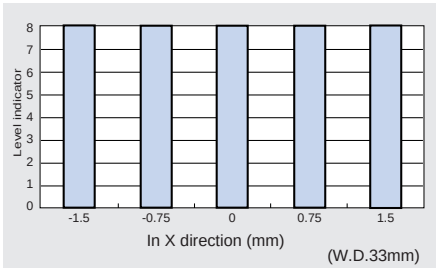


- Measured data using this size of "A" as the object.
- Install the head at an inclination of 15° to the object.

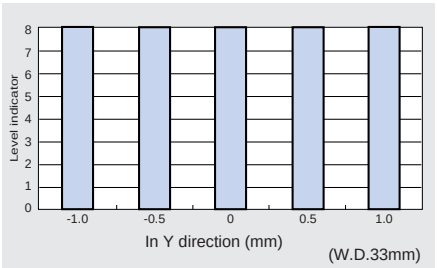
Rotation characteristics



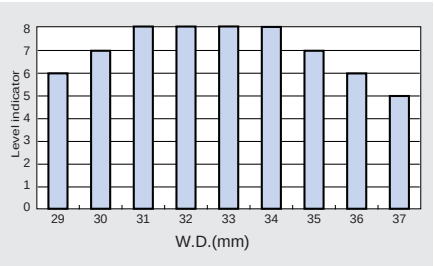
Position characteristics within area (X direction)



Position characteristics within area (Y direction)

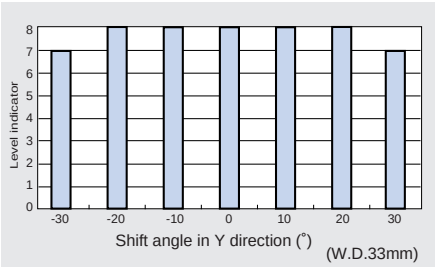


Distance characteristics



Gate characteristics (X direction)

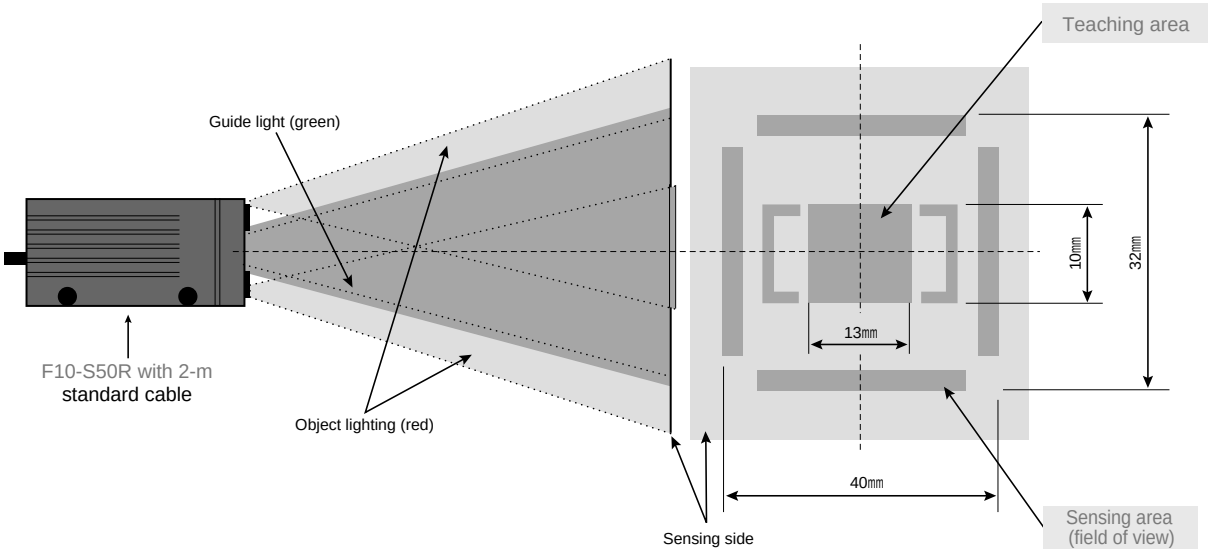
Gate characteristics (Y direction)



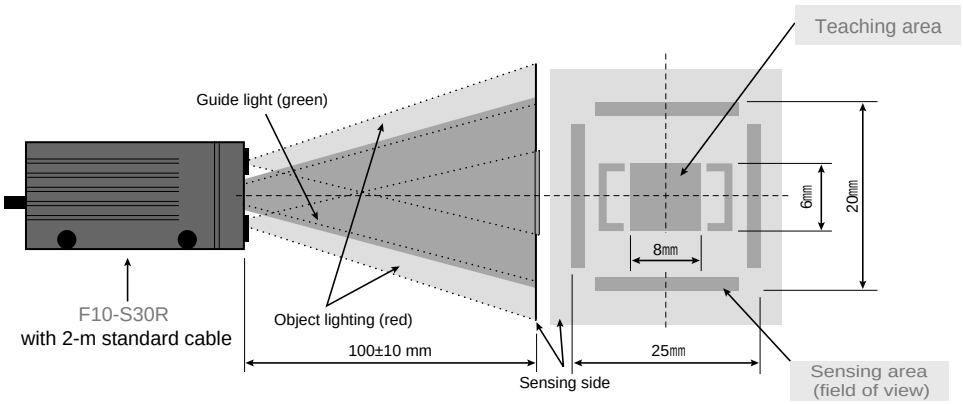
Part names and functions

Head

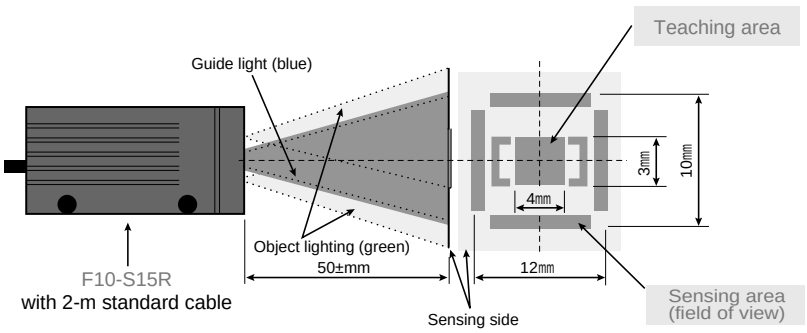
F10-S50R



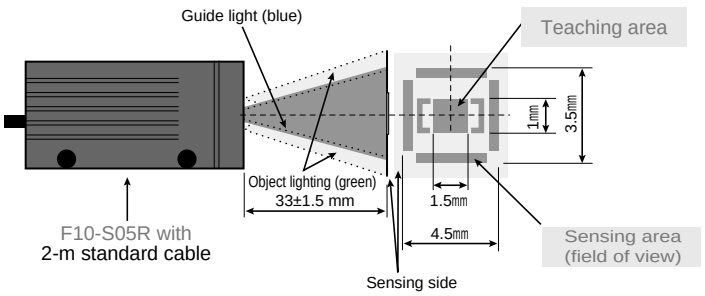
F10-S30R



F10-S15R



F10-S05R



Installation angle

- During installation tilt the head 15°to prevent regular reflected light from entering.
- Use the provided clamps.

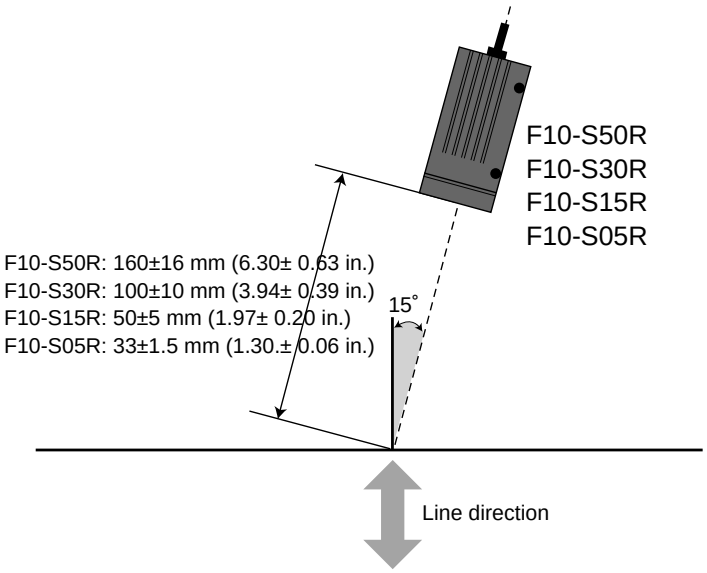
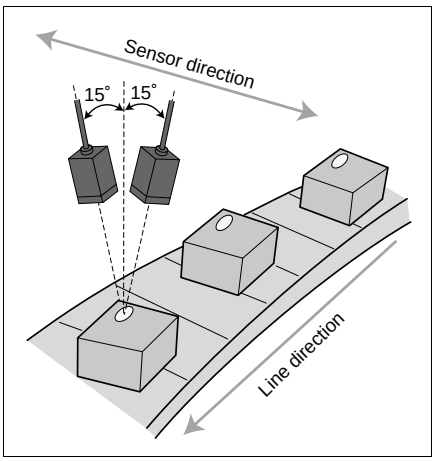


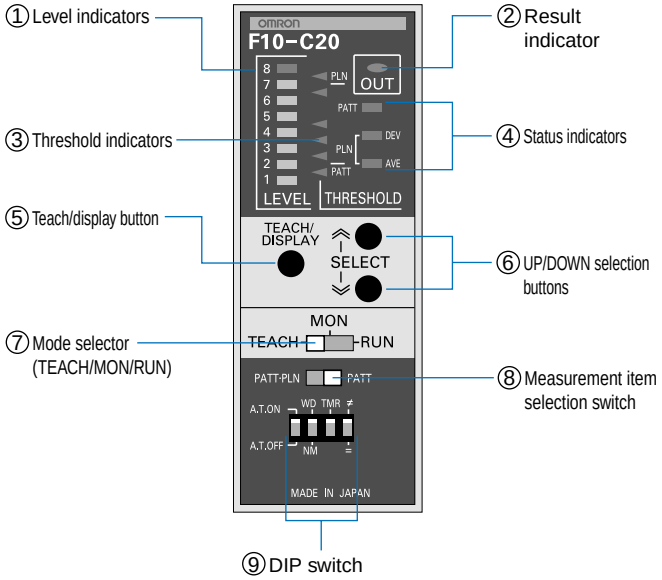
Image diagram



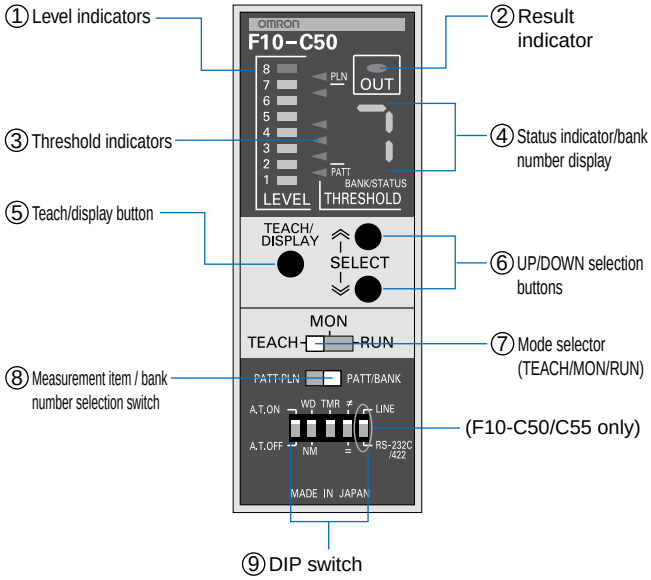
*Incline the sensor vertically with respect to the direction of object movement.

Amplifier

F10-C20/C25



F10-C30/C35/C50/C55



① Indicates the measured value (matching with stored model)

② ON: illuminates, OFF: goes off

③ Indicates the threshold value.

④ Indicates the type of value displayed by the level indicator lamp.

F10-C20/C25

PATT (pattern measurement): Degree of matching with model

PLN (plain-surface measurement) — DEV: Contrast; AVE: Deviation from average darkness

F10-C30/C35/C50/C55

P Pattern measurement: Degree of matching with model

d Plain-surface measurement: Contrast Plain-surface measurement: Deviation from average darkness

A

- Displays the bank number. (F10-C30/C35/C50/C55)

⑤
- Begin teaching.
- Changes the displayed item.

⑥
- Changes the threshold value level.
- Changes the measurement item selection level. (Only for plain-surface measurement)
- Changes the Bank number (F10-C30/C35/C50/C55).

⑦ TEACH: TEACH mode
MON: MONITOR mode
RUN: RUN mode

⑧ Measurement item switching

PATT/PLN — PATT / PATT/BANK

Automatically switches between pattern measurement and plain-surface measurement depending on the teaching object.

PATT/PLN — PATT / PATT/BANK

Only pattern measurement is performed.

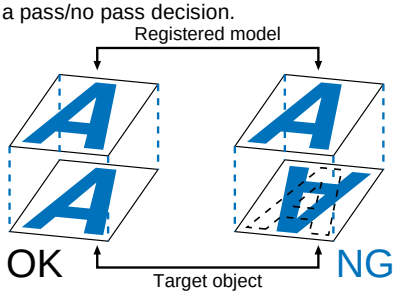
Bank selection mode (F10-C30/C35/C50/C55)

PATT/PLN — PATT/BANK

In TEACH mode, enter the mode for bank selection and setting.

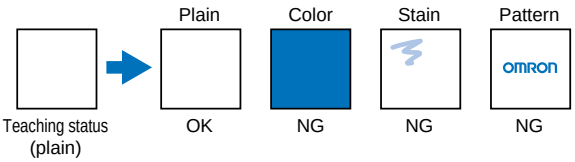
Pattern measurement

Measures the agreement of the object with the pattern and executes a pass/no pass decision.

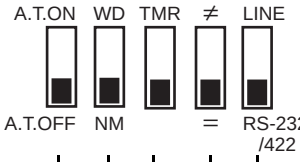


Plain-surface measurement

Executes a pass/no pass decision based on the contrast and average darkness. (Example)



⑨ Dip switches



All set to the lower level at the factory.

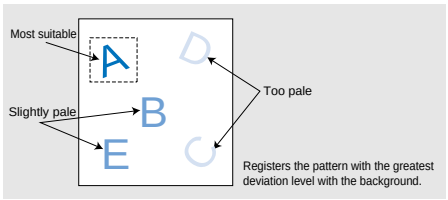
Auto teaching selector switch

A.T. ON: Teaching area automatically selected

A.T. OFF: Teaching area fixed

A.T.ON

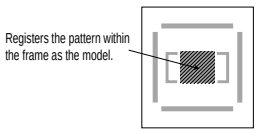
Automatically selects the pattern that is most suitable for the model. Within the detection range, the part where the contrast between the background and the object is greatest is considered to be most suitable.



* Correct teaching may not be possible if the pattern extends out of the detection range or is at the edge. Try to place the pattern as close to the center of the detection range as possible.

A.T.OFF

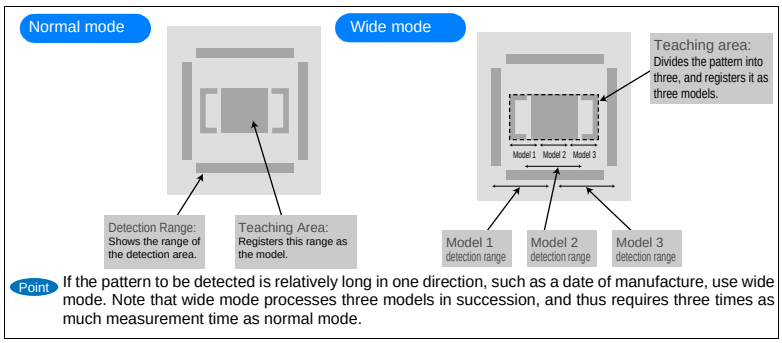
Only the pattern that is inside the teaching area is stored as a model.



Model size selector switch

WD: Wide mode

NM: Normal mode



Point If the pattern to be detected is relatively long in one direction, such as a date of manufacture, use wide mode. Note that wide mode processes three models in succession, and thus requires three times as much measurement time as normal mode.

Off delay timer switch

TMR: Delays the output operation when the control output goes from ON to OFF
(Default value is 40 ms. Refer to the Operation Manual for the Unit for changing procedure).

No Marking: Timer OFF.

Match/no match output selector switch

≠: Output ON when object does not match registered model.

=: Output ON when object matches registered model.

External input selector switch (F10-C50/C55 only)

LINE: Executes external input in RUN mode via input line.

RS-232C/RS-422: Executes external input in RUN mode via serial communications.

Operation procedures

1 TEACH mode: Store reference of decision.

Procedure

① Set the operation mode selector switch to TEACH.

② Set the auto teaching selector switch and the model size selector switch.

→ If you are using the F10-C30/C35/C50/C55, proceed to step ③. If you are using the F10-C20/C24, proceed to step ⑤.

③ Set the measurement item selector switch to PATT/BANK.
The bank number is displayed.

POINT

What is a bank?

F10-C30/C35/C50/C55 has 8 banks, in each of which you can set different models and threshold values.

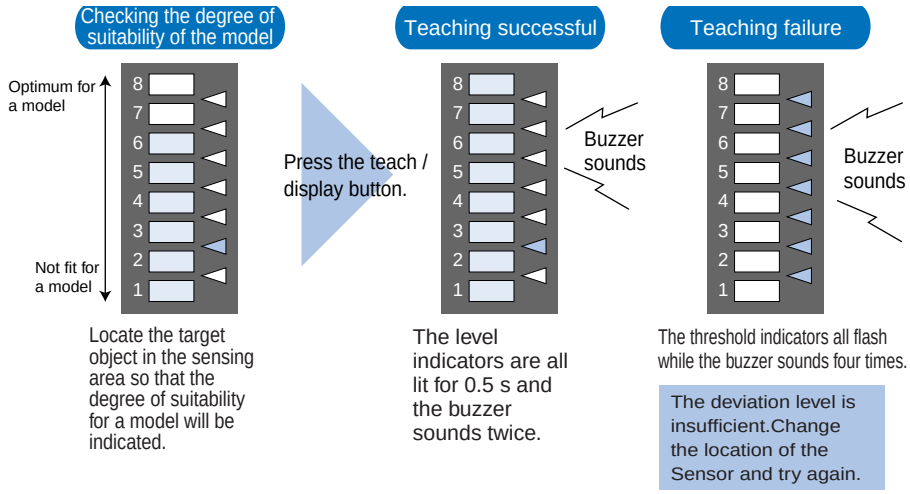
Use this function if you wish to switch between several different conditions while measuring. The setup is changed by simply changing bank numbers.

④ Press the UP/DOWN selector button to select the bank number.

⑤ Set the measurement method with the measurement item selector switch.

⑥ Verify that the object is within the teaching area and press the teaching button.
The status of teaching is displayed as follows.

If the measurement item selector switch is set to PATT/BANK



Locate the target object in the sensing area so that the degree of suitability for a model will be indicated.

The level indicators are all lit for 0.5 s and the buzzer sounds twice.

The threshold indicators all flash while the buzzer sounds four times.

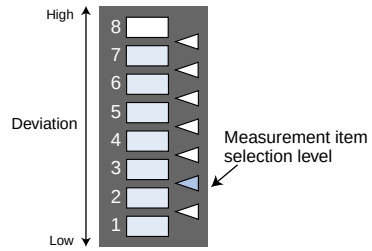
The deviation level is insufficient.Change the location of the Sensor and try again.

*If the measurement item selector switch is set to PATT/PLN

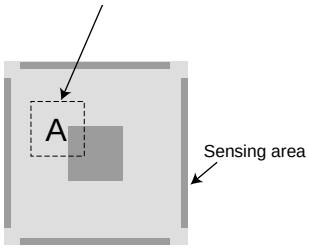
The contrast in the detection range is measured, and the system automatically decides whether to perform plain surface measurement or pattern measurement. When teaching ends, all level indicator lamps illuminate for 0.5 seconds and the alarm beeps twice.

Pattern measurement

Contrast > measurement item selection level: pattern measurement.



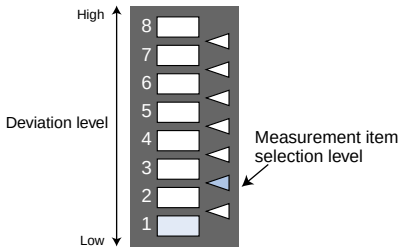
Teaching area
The place with the highest contrast is stored as a model (A.T.ON)



Automatic switching

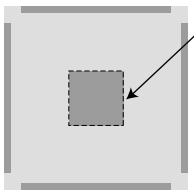
Plain-surface measurement

Contrast < measurement item selection level: plain-surface measurement.



The teaching area and detection range at the time of measurement will vary depending on the setting of the auto teaching selector switch.

• When auto teaching selector switch is at A.T.OFF

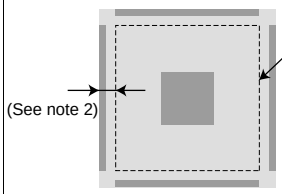


Teaching Area
The deviation and average density in the teaching area are registered in the above example. In other words, the sensing area is restricted so that the pattern close to the edge will not influence the results of object discrimination.

Note 1: The detection range can be increased. For details, see the operation manual for the device.

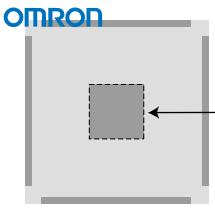
Note 2: F10-S50R: approx. 6.4 mm, -S30R: approx. 4.0 mm, -S15R: approx. 2.0 mm, -S05R: approx. 0.7 mm

• When auto teaching selector switch is at A.T.ON



Teaching Area
The deviation and average density in the area enclosed by teaching areas are registered.

*If the pattern is at the edge of the detection area
The detection range narrows so that the decision is not affected by the pattern.



POINT

The measurement item selection level can be moved up or down with the selector button. The factory setting is between 2 and 3. Adjust as needed depending on the contrast with the background.
Example: There are fine lines and patterns, so pattern measurement is set.
If you wish to use plain-surface measurement, move the measurement item selection level up.

Do not turn off the power before switching to MONITOR mode, or the data will not be saved.

2 MONITOR mode:

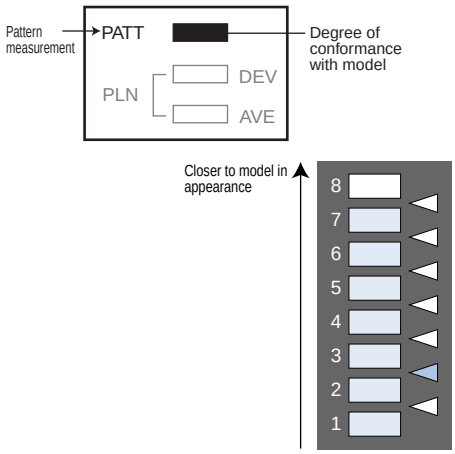
This mode is used to adjust the threshold value for the pass/no pass decision and perfrom table-top sample tests. External output and input does not take place.

Procedure ① Set the operation mode selector switch to MON. While the switch is set to MON, measurement takes place continuously.

In the case of pattern measurement

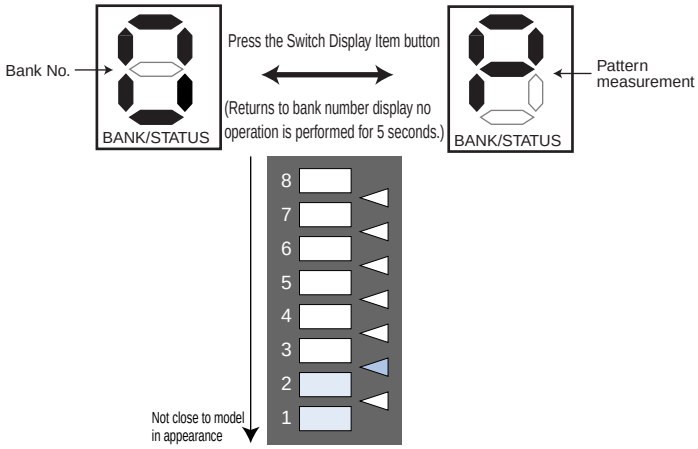
The degree of matching with the model is displayed by the level indicator lamp.

Status indicator lamp (F10-C20/C25)



The closer to the model in appearance, the higher the level.

Status indicator lamp (F10-C30/C35/C50/C55)

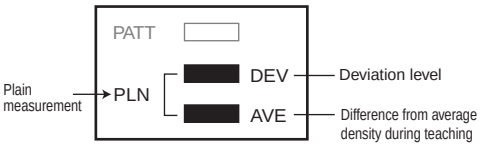


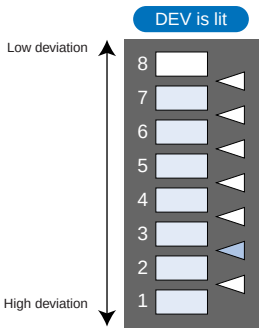
If no target object is within the sensing area or if the target object is greatly different from the model, the level will be lo-

In the case of plain-surface measurement

Press the display selector button to switch between the status indicator lamp types (DEV←→AVE).

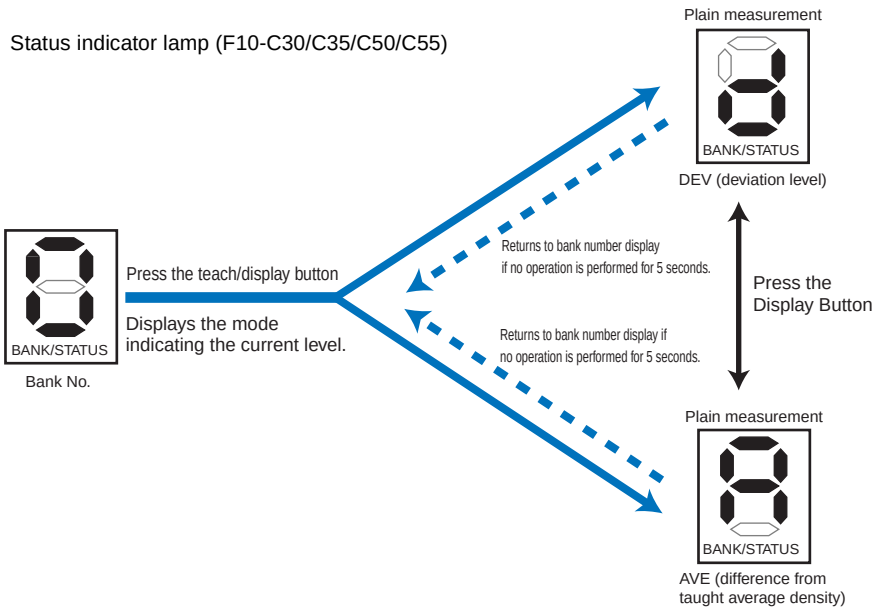
Status indicator lamp (F10-C20/C25)

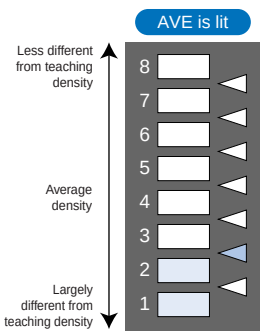




The lower the deviation is, the higher the level indicator reading will be.

Status indicator lamp (F10-C30/C35/C50/C55)





The smaller the difference from the teaching average density is, the higher the level indicator reading will be.

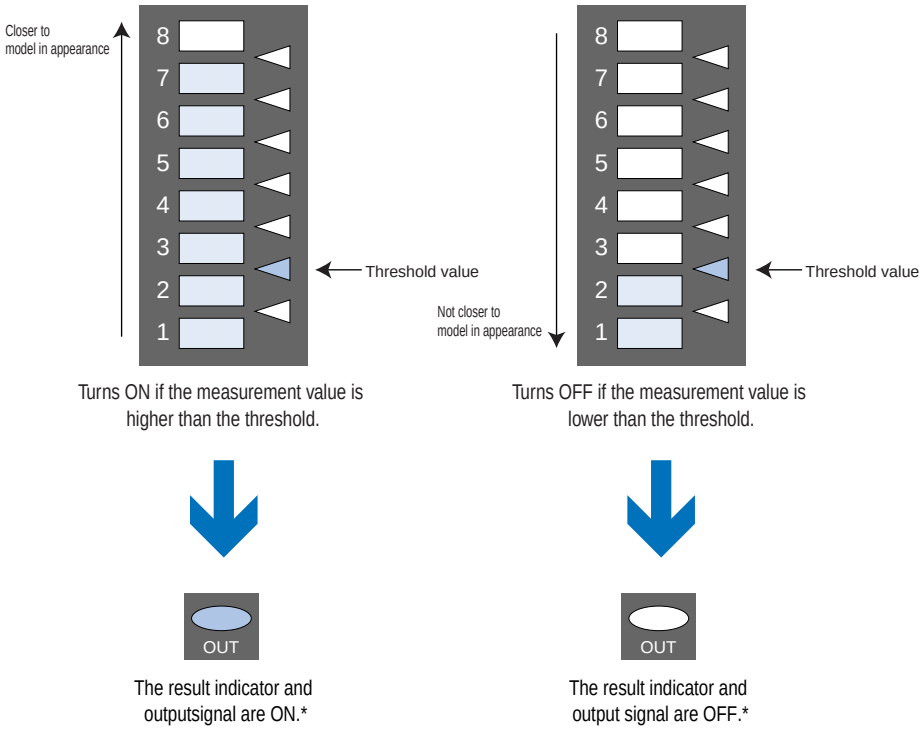
② Press the UP/DOWN selector button to adjust the threshold value. View the level indicator lamps to select the optimum value. The new threshold value will not be saved until the operation mode selector switch is changed to RUN or TEACH.

Pattern measurement

In wide mode, the decision is based on the lowest degree of matching among the three models.

Plain-surface measurement

Set the threshold values for both DEV (contrast) and AVE (average darkness). If either value is lower than the threshold value, the decision will be OFF.



*The OUTPUT signal can be switched ON or OFF with a dip switch. For details, see "Name and function of each part".

3 RUN mode: Measurement is performed based on input of an external signal.

Procedure

① Set the operation mode selector switch to RUN. While the switch is set to RUN, measurement takes place based on input of an external signal.

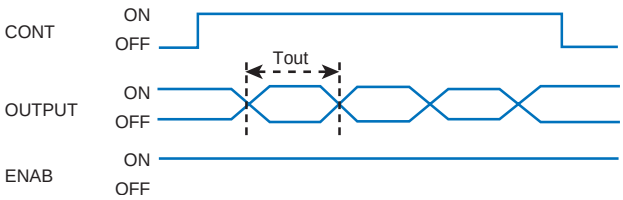
The relation between the operation of the F10 input/ouput terminals and "ON/OFF" in the time chart is as follows.

	Terms in time chart	NPN (F10-C20/C30/C50)	PNP (F10-C25/C35/C55)
Inputs TRIG (pink) CONT (white) S_TEACH (yellow) M_TEACH (purple) BANK1 (gray)* BANK2 (green)* BANK3 (red)*	ON	GND	Vcc
	OFF	OPEN	OPEN
Output OUTPUT (black) ENAB (orange)	ON	GND	Vcc
	OFF	Vcc	GND

*The F10-C20/C25 does not have BANK1- 3.

Continuous measurement mode (CONT)

While the CONT signal is ON, measurement is repeated continuously. The result is updated and output each measurement cycle.

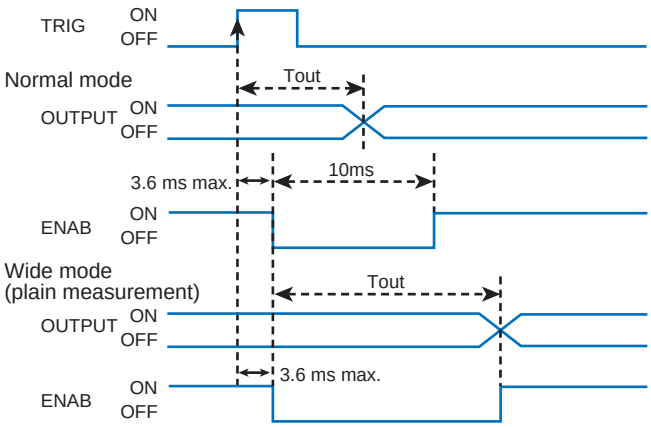


Measurement cycle: Tout

Normal mode: 3.6 ms
Wide mode: 10.8 ms
Plain measurement: 7.2 ms

Synchronous measurement mode (TRIG)

Synchronized to the rising edge (OFF→ON) of the TRIG signal, this performs one measurement and outputs the result.



Measurement cycle: Tout

Normal mode: 7.2 ms max.
Wide mode: 14.4 ms max.
Plain measurement: 10.8 ms max.

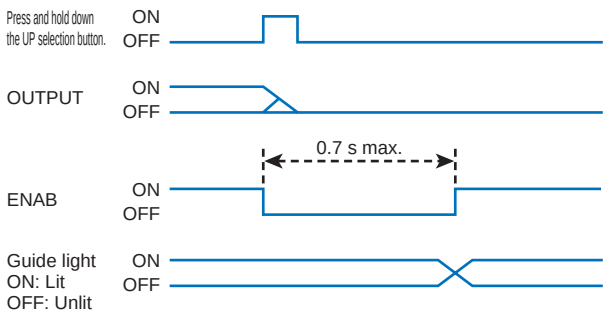
*The minimum ON width of the trigger signal is 1 ms.
*The OUTPUT signal is retained until the next measurement result update.
*ENAB signal
- In normal mode, the OFF width is 10 ms.
- In wide mode•plain-surface measurement, the ENAB signal goes ON at the same time the OUTPUT signal is updated.

POINT

Turning the guide light on or off in synchronous measurement mode

The guide light can be turned off.
Press the UP selector button in RUN mode to control ON/OFF of the guide light.

- During guide light on/off processing, the ENAB signal goes OFF and external input is not accepted.
- At the same time as the UP selector button is pressed, the OUTPUT signal goes OFF.



External teaching in RUN mode

In RUN mode, a model can be stored by input of an external signal. The following two methods can be used for teaching by external signal.

When teaching processing ends, the model data are stored in EEPROM. For this reason, do not turn off the power while processing is in progress. If the power is turned off, an EEPROM data error will occur the next time the power is turned on. In this case, perform teaching again and reset the threshold value.

Work stop teaching (S_TEACH)

Teaching with the object stopped. After input of an external S_TEACH signal, teaching can be performed by input of a TRIG signal or CONT signal. For this reason, do not move the work until teaching ends.

① Input an S_TEACH signal.

② Verify that the ENAB signal is OFF.

③ Verify that the object of teaching is in the teaching area (in the detection range if A.TEACH is ON).

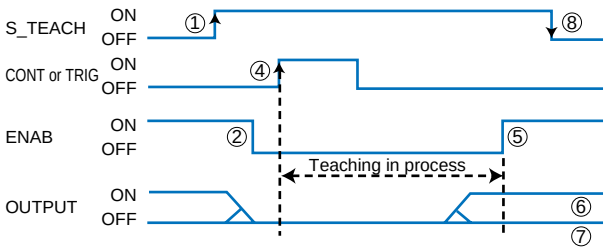
④ Input an external CONT signal or TRIG signal.

⑤ The ENAB signal goes ON when teaching ends, so check the status of the OUTPUT signal at this time.

⑥ If teaching ends normally, the OUTPUT signal will go ON.

⑦ If teaching was not successful, the OUTPUT signal will remain OFF.

⑧ Turn the S_TEACH signal OFF to end teaching. If teaching was unsuccessful, the system returns to the state prior to teaching. Perform teaching once again.



Work move teaching (M_TEACH)

Teaching using multiple objects. Use this procedure when the object cannot be stopped. After input of an external M_TEACH signal, teaching is performed in separate processes synchronized to the input of the external trigger. Six teaching processes are required. During this time, measurement is not performed. (Trigger input is disregarded after the sixth time.)

① Input an external M_TEACH signal.

② Verify that the ENAB signal is OFF.

③ Input a TRIG signal timed to measurement of the object of teaching.

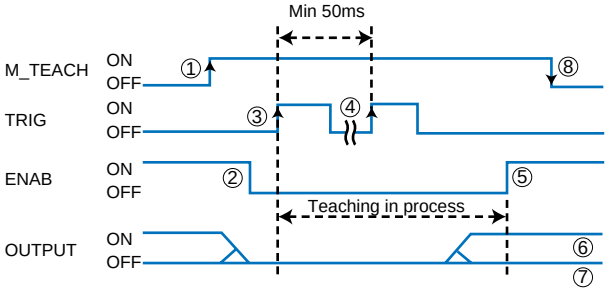
④Repeat the input of Ω six times.

⑤ The ENAB signal goes ON when teaching ends, so check the status of the OUTPUT signal at this time.

⑥ If teaching ends normally, the OUTPUT signal will go ON.

⑦ If teaching was not successful, the OUTPUT signal will remain OFF.

⑧ Turn the S_TEACH signal OFF to end teaching. If teaching was unsuccessful, the system returns to the state prior to teaching. Perform teaching once again. If the M_TEACH signal is turned OFF before teaching ends, teaching will not take effect.



Enable output

'Enable output' goes ON when measurement is possible. For this reason, the 'Enable output' is OFF when the operation mode selector switch is at "TEACH" or "MON".

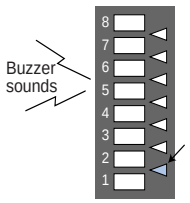
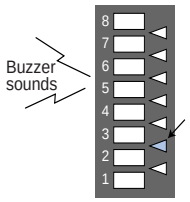
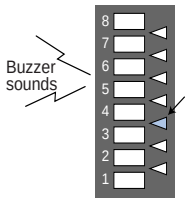
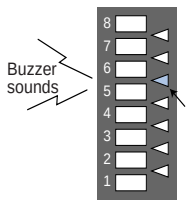
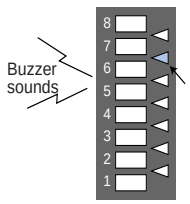
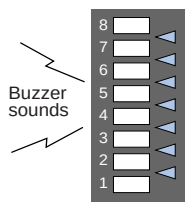
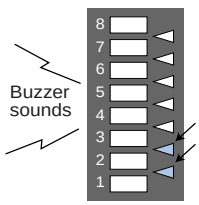
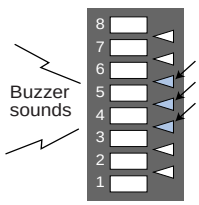
Turns OFF in any of the following cases in RUN mode:

(1) Teaching processing by external trigger input is in progress.
(2) Measurement by TRIG signal is in progress.
(3) Teaching data have not been saved
(4) A hardware problem occurs
(5) During switchover to a different bank
(6) The guide light is being turned on or off

RS-232C/422 command input (F10-C50/C55 only)

Communication with a computer or other external device is possible through the RS-232C or RS-422 port. For details on communication commands, see the product manual.

Troubleshooting

Problems	Cause	Solution
 The indicator lamp for the threshold value of this part will blink and an alarm will sound.	Head not connected error An image signal cannot be obtained because the head is not connected.	After connecting the head, turn on the power again. *If the error still occurs after the head is connected, the head may need service. Please consult an Omron branch or sales office.
 The indicator lamp for the threshold value of this part will blink and an alarm will sound.	Hardware error CPU runaway or other hardware problem has occurred.	Please consult an Omron branch or sales office.
 The indicator lamp for the threshold value of this part will blink and an alarm will sound.	Head data read error ① The EEPROM data in the head cannot be read. ② The data that was read is abnormal.	
 The indicator lamp for the threshold value of this part will blink and an alarm will sound.	Amplifier read error ① The EEPROM data in the amplifier cannot be read. ② The read data are not normal.	Turn off the power and then turn it back on. *It is possible that all of the internal data was cleared. *If an error display still occurs after turning on the power, please consult an Omron branch or sales office
 The indicator lamp for the threshold value of this part will blink and an alarm will sound.	Amplifier data write error ① EEPROM data cannot be written to the amplifier. ② The written data were not normal.	
 All threshold value indicator lamps blink, and the alarm beeps three times.	Teaching data not set error The mode was changed to MONITOR or RUN before teaching was completed..	Execute teaching in TEACH mode.
 The threshold value indicator lamp for this part blinks, and the alarm beeps three times.	Serial buffer overflow error The transmission buffer or reception buffer filled up during communication.	Transmission buffer overflow Change the communication conditions Reception buffer overflow Wait for the response from the F10 before you send the command.
 The threshold value indicator lamp for this part blinks, and the alarm beeps three times.	Plain-surface measurement detection range type error During teaching, the mode was changed to MONITOR or RUN while the plain-surface measurement detection range selection mode was in a state other than the previous mode.	Execute teaching again or change the plain-surface measurement detection range selection mode.
The control output (OUTPUT) and enable output are OFF and do not go ON.	The current in the output transistor exceeded the rated current, causing the current protection circuit to acitivate.	Keep the current below the rated current. * If the outputs do not go ON even after the current is reduced below the rated current, please consult an Omron branch or sales office.

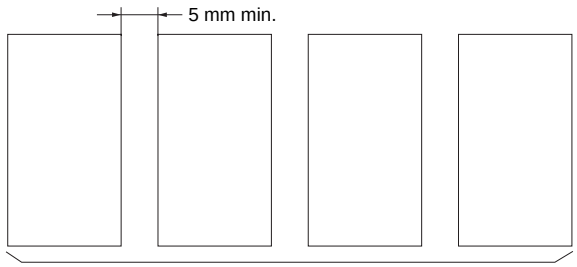
Precautions

Correct Use

Design

Sensor installation

- If you are installing multiple F10-C□ amplifiers in a line, leave a gap of at least 5 mm between each unit to prevent overheating.



- Do not remove or insert the head while the power is on.
- F10-S30R/-S50R cannot detect a red object on a white background. Use an F10-S05R/-S15R.
- F10-S15R cannot detect a green object on a white background. Use an F10-S30R.
- Do not extend the cable more than 20 m from the amplifier.
- The operating ambient temperature of the amplifier is 0 to +50°C. Observe the following rules when installing.
  ① Leave sufficient space for air flow. In particular, if you are installing multiple units in a line, install a fan to dissipate heat.
  ② Do not install close to equipment that emits heat (heaters, transformers, high-capacity resistors, etc.)
  ③ If you are placing a power line (a line with a large current to drive a motor, etc.) close to the amplifier, test the layout well and verify that the wiring conditions are safe.

Connection

- The exposed metal parts of the amplifier connector and the bottom screws are connected to the internal 0 V.

Tightening (both head and amplifier)

- During case installation tighten it to the torque of 1.2 Nm max.

Others

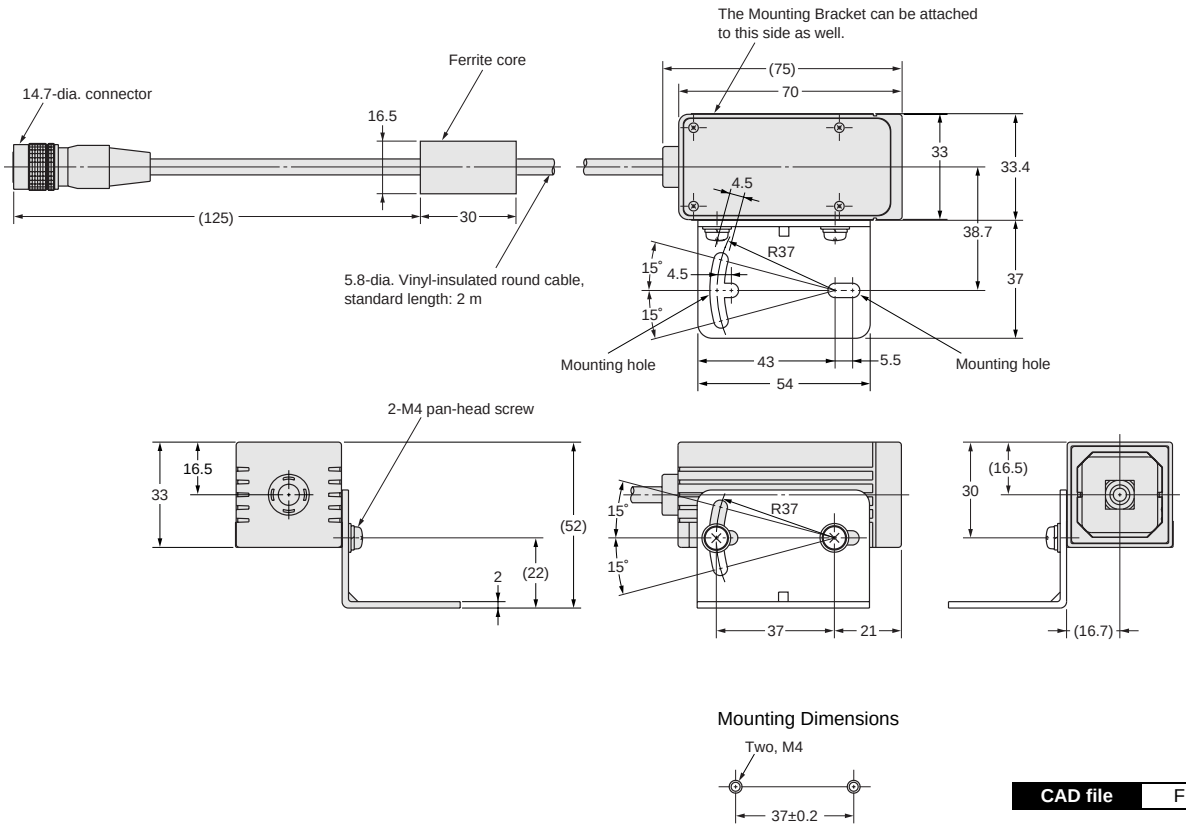
Handing Instructions

- Do not reverse the power polarity or incorrectly wire in any other way. Damage or burns may result.
- Do not exceed the rated voltage range. Exceeding the rated voltage may cause damage or burns.
- Do not short-circuit the load. Damage or burns may result.
- The amplifier case material is ABS, and the transparent plate on the front of the head is acrylic. Take care not to let any organic solvents contact these parts.
- Make sure all locking mechanisms on cables or the unit are securely locked.
- Do not use in environments that exceed the specifications of the protective structure.
- Do not disassemble. A failure may result.

Dimensions (Unit: mm)

Head

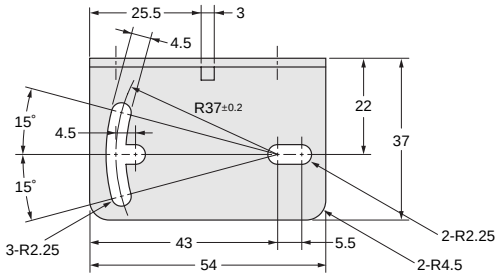
F10-S□R

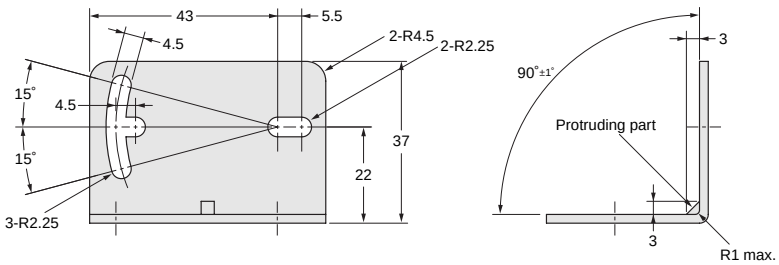


Mounting Dimensions

CAD file: F10_02

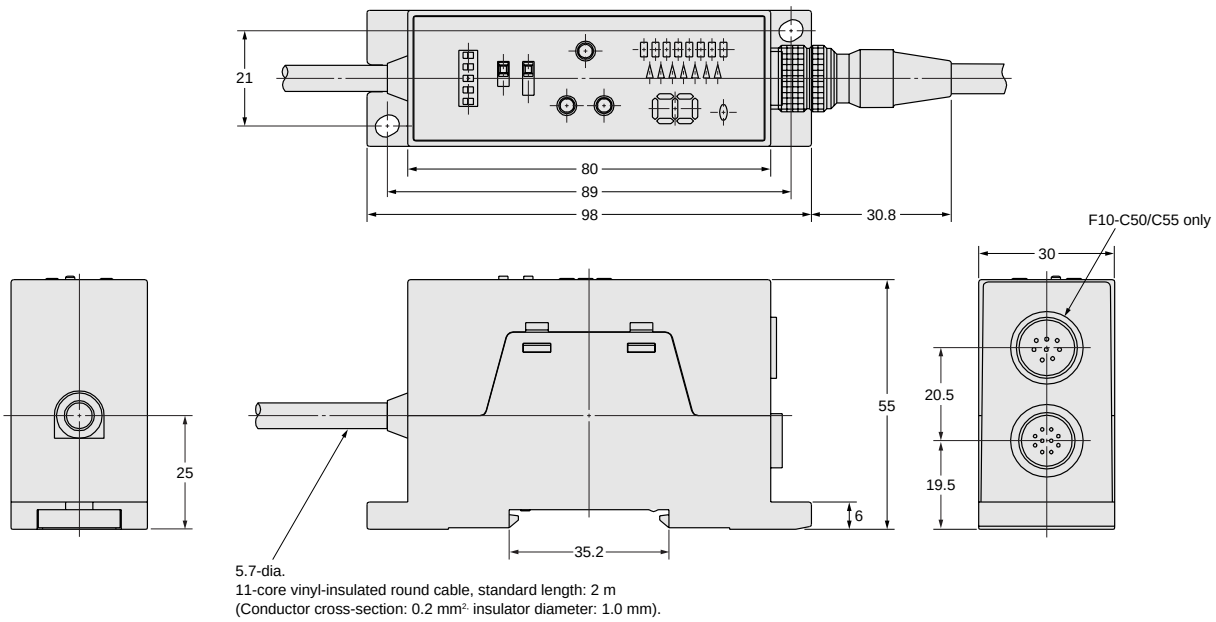
Mounting Brackets



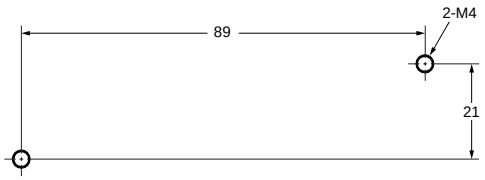


Amplifier

F10-C□



Mounting Dimensions



Model	CAD file
F10-C20/C25	F10_03
F10-C30/C35	F10_04
F10-C50/C55	F10_05

Vision sensor

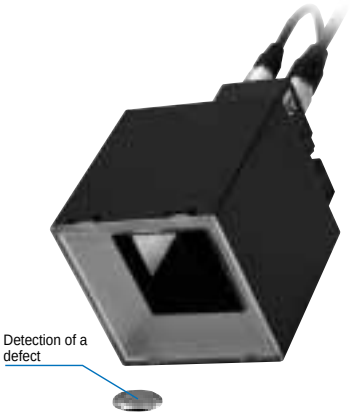
F150-3

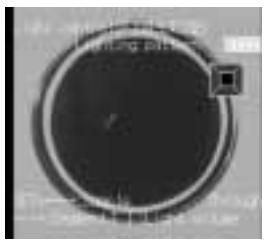
Perform settings in a conversational manner. The dialog menu artist "talks" to you.

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.





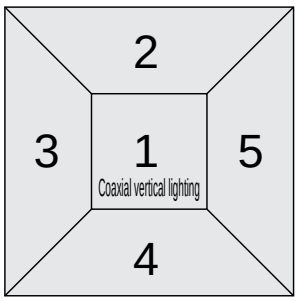
Inspection of button battery defect

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.

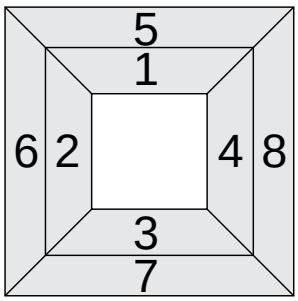
F150-SLC20
(Field of view: 20 mm)

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

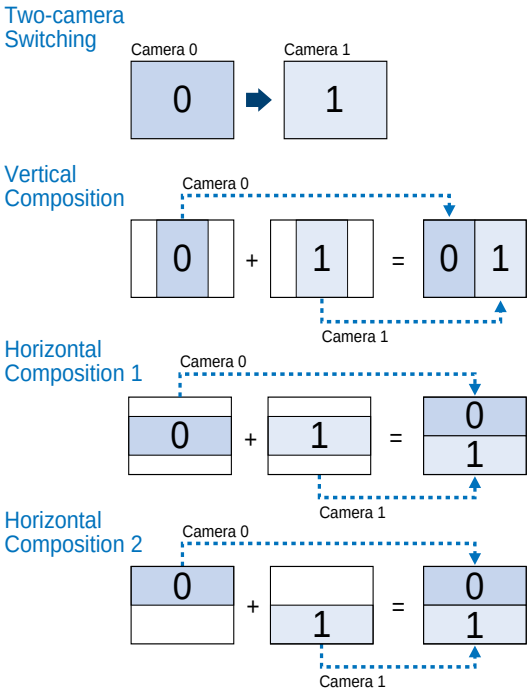
Camera setup is easy because the object-imaging camera is integrated into a single unit with the lighting apparatus and lens.

2-camera unit

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

A variety of image read-in methods

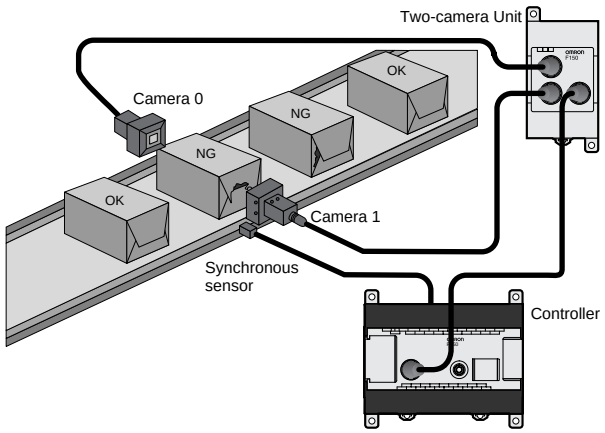
Images from two cameras can be read in at the same time. Read-in methods include successive changeover between the two cameras, and combination of the image from each camera into a single image.



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.

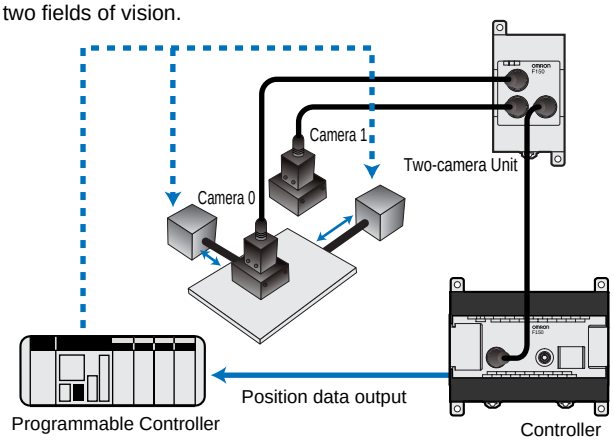


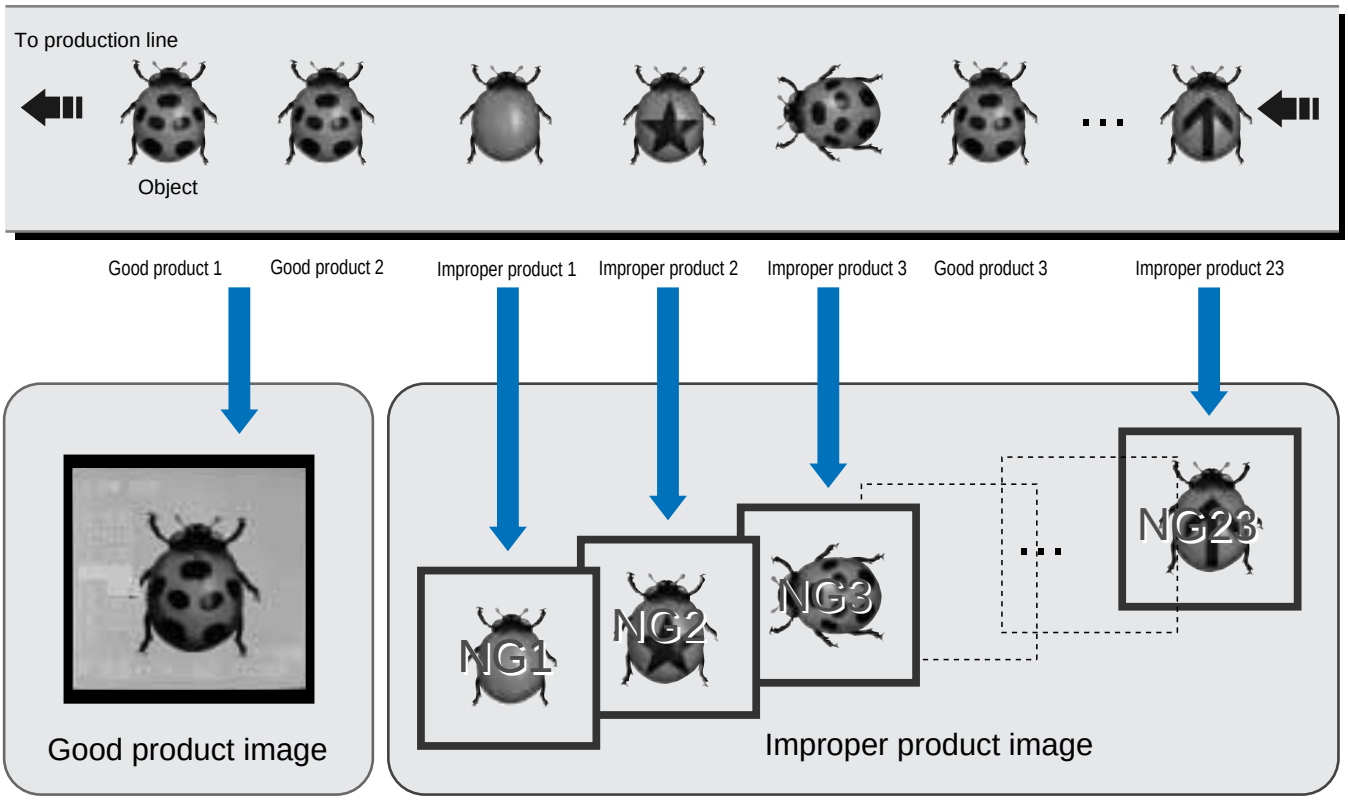
Image memory function

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.

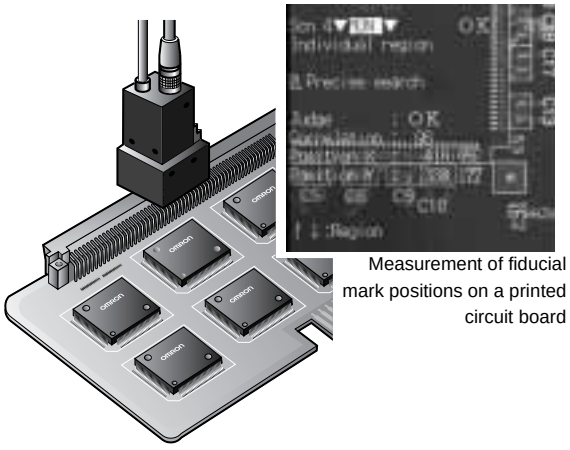
Image pre-processing

- 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

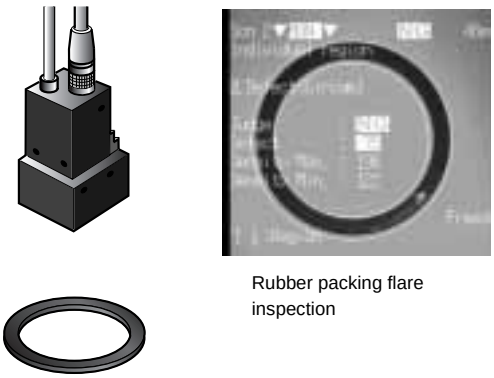
- Position measurement at sub-pixel precision is possible using 256 graduation gray search processing. This feature is ideal for high-precision positioning applications.



Measurement of fiducial mark positions on a printed circuit board

Damage/dirt inspection

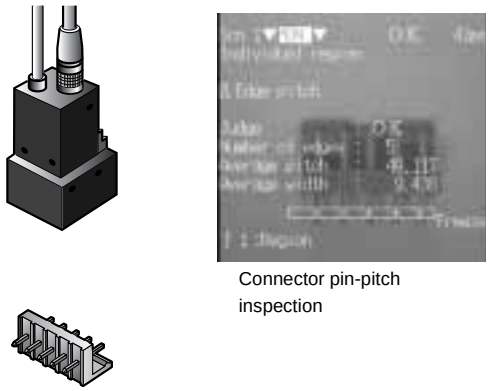
- Omron's proprietary algorithm enables fast and detailed inspection for visual defects such as chips, nicks, burrs, and dirt.
- Linear, circular and rectangular areas can be set, enabling inspection for a variety of defect shapes.



Rubber packing flare inspection

Gray edge measurement

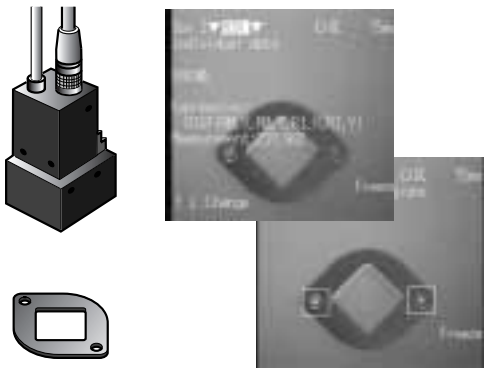
- High-precision (sub-pixel) measurement of work edge position is possible. Ideal for width and dimension inspection.
- Includes edge number and pitch measurement functions for support of IC and connector lead inspection.



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.

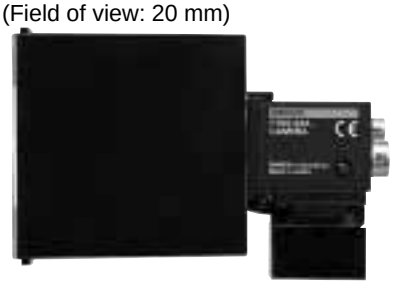


Hole-to-hole distance computation

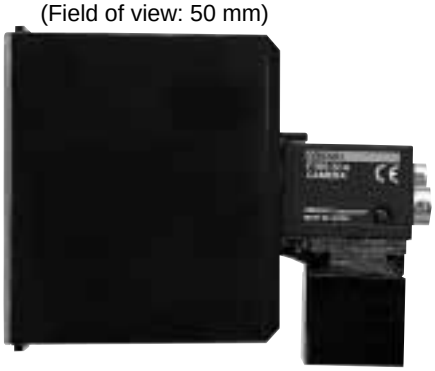
System configuration

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)

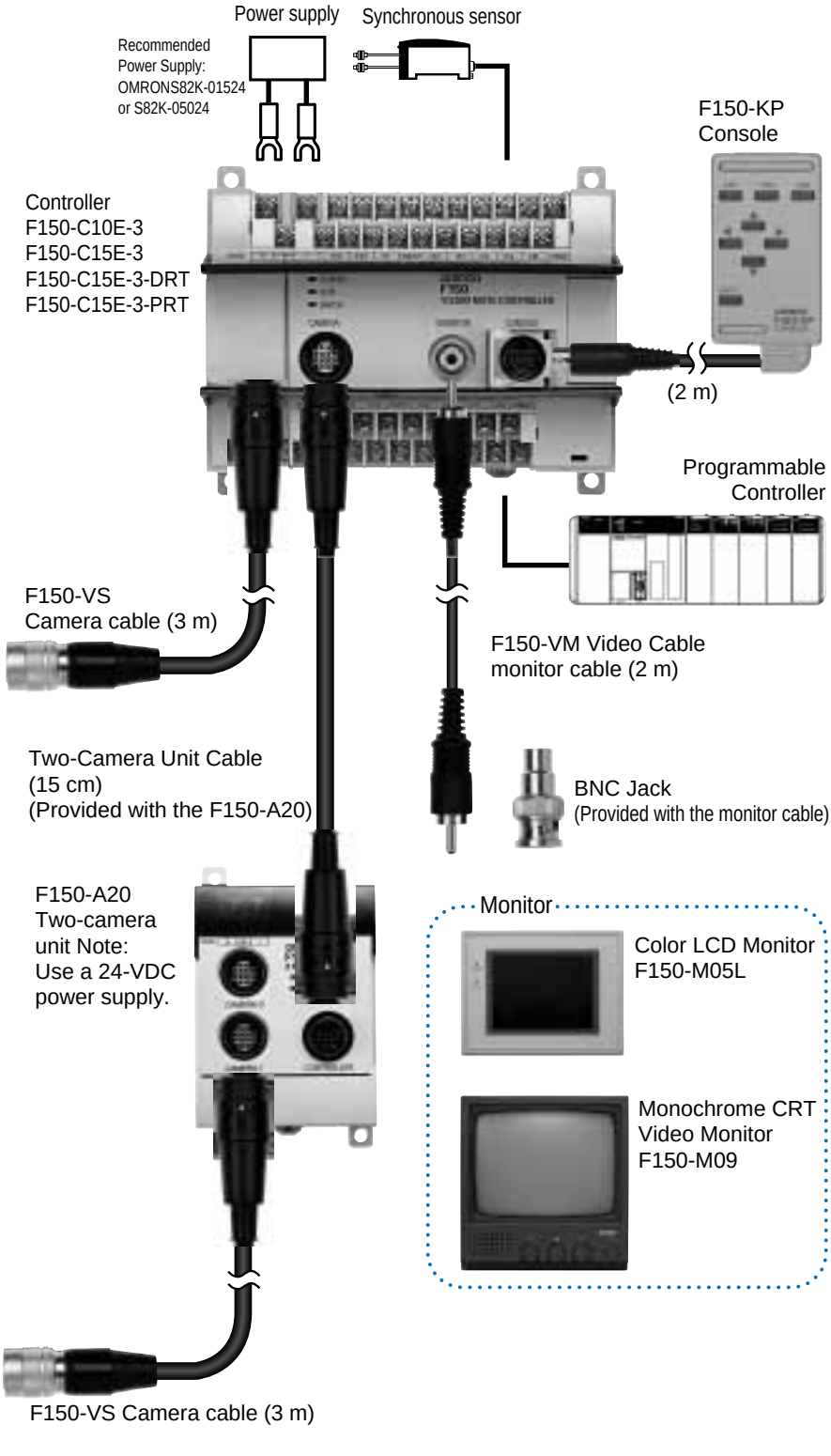


Camera with Light Source:
F150-SL20
(Field of view: 20 mm)
F150-SL50
(Field of view: 50 mm)

F150-S1A
Camera

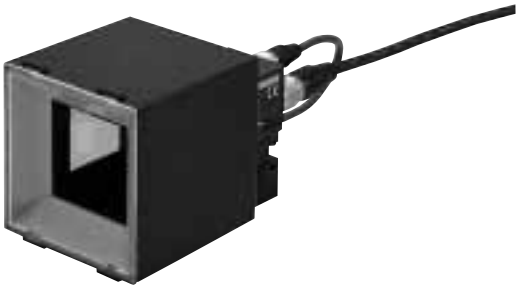
When using this camera, please look at "Cameras, lens, and lighting".

* 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

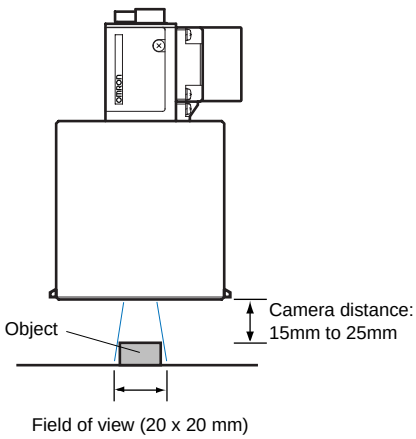
*A lens and lighting are installed on the special camera (F150-S1A) for the F150.

Distance to inspection object and field of view

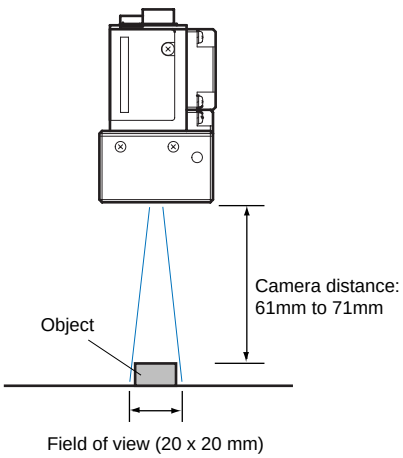
The camera distance is fixed.

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

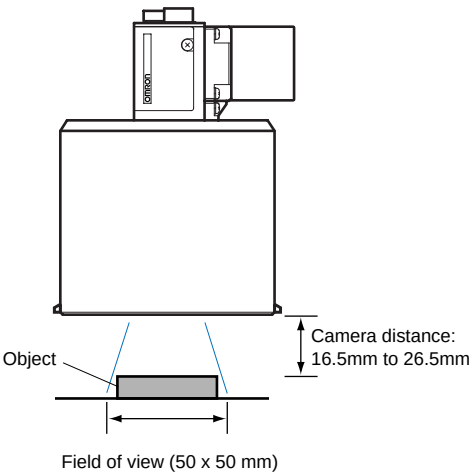
F150-SLC20



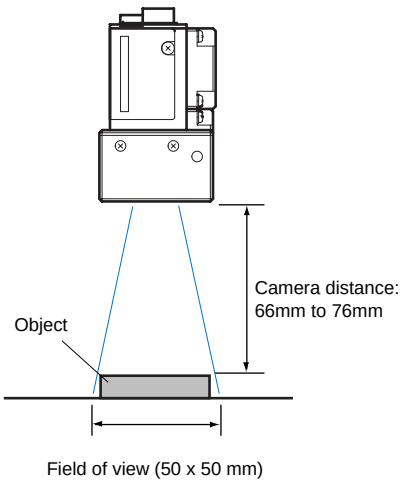
F150-SL20A



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, θ 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)

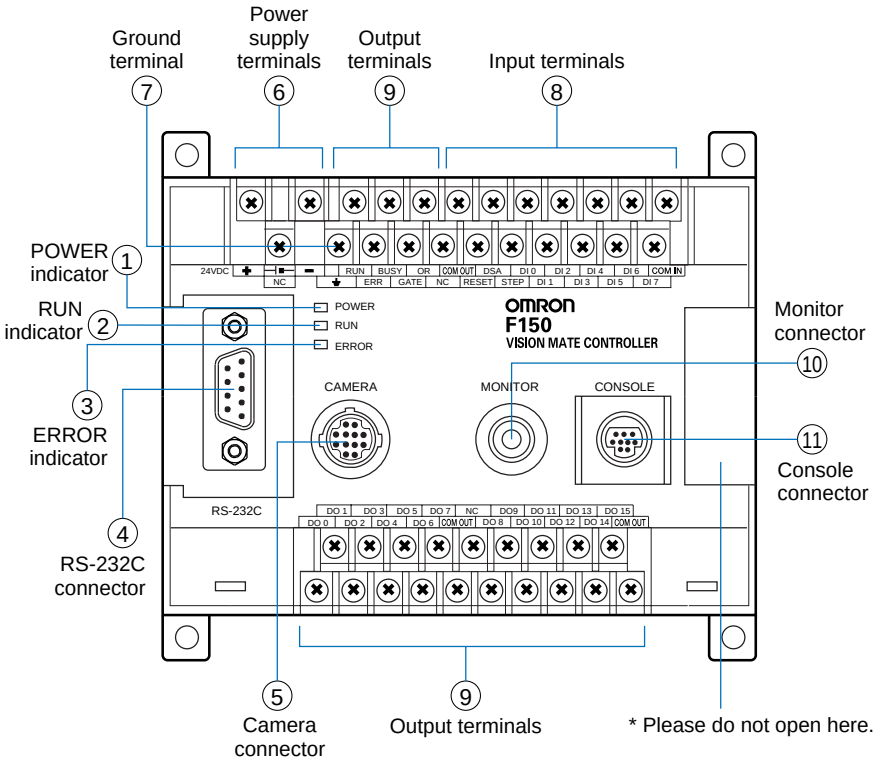
Note: Can be connected to an F150-C10-3 controller.

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 Ω)	
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.

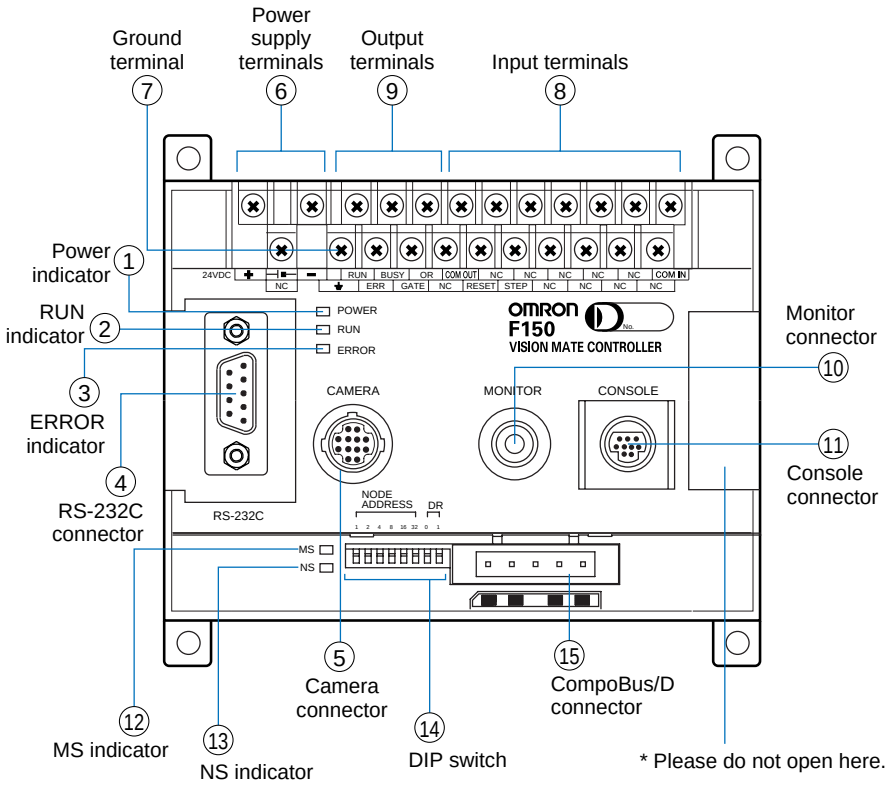
⑦ Connects to the ground wire.

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.

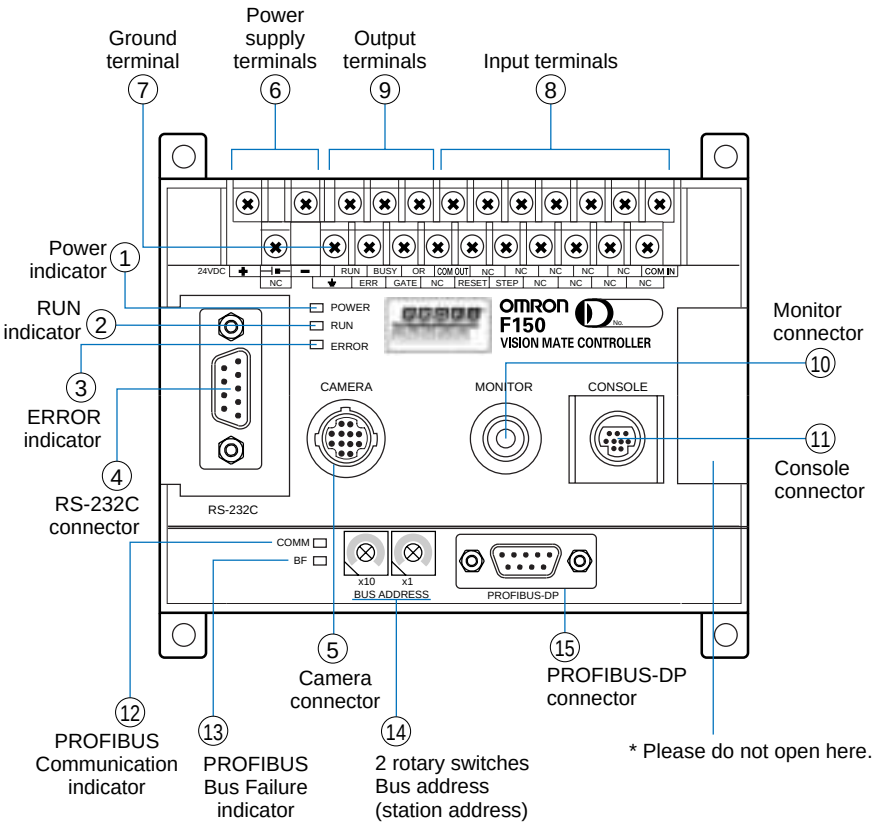
⑫ Indicates the state of F150 in CompoBus/D communication.

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.

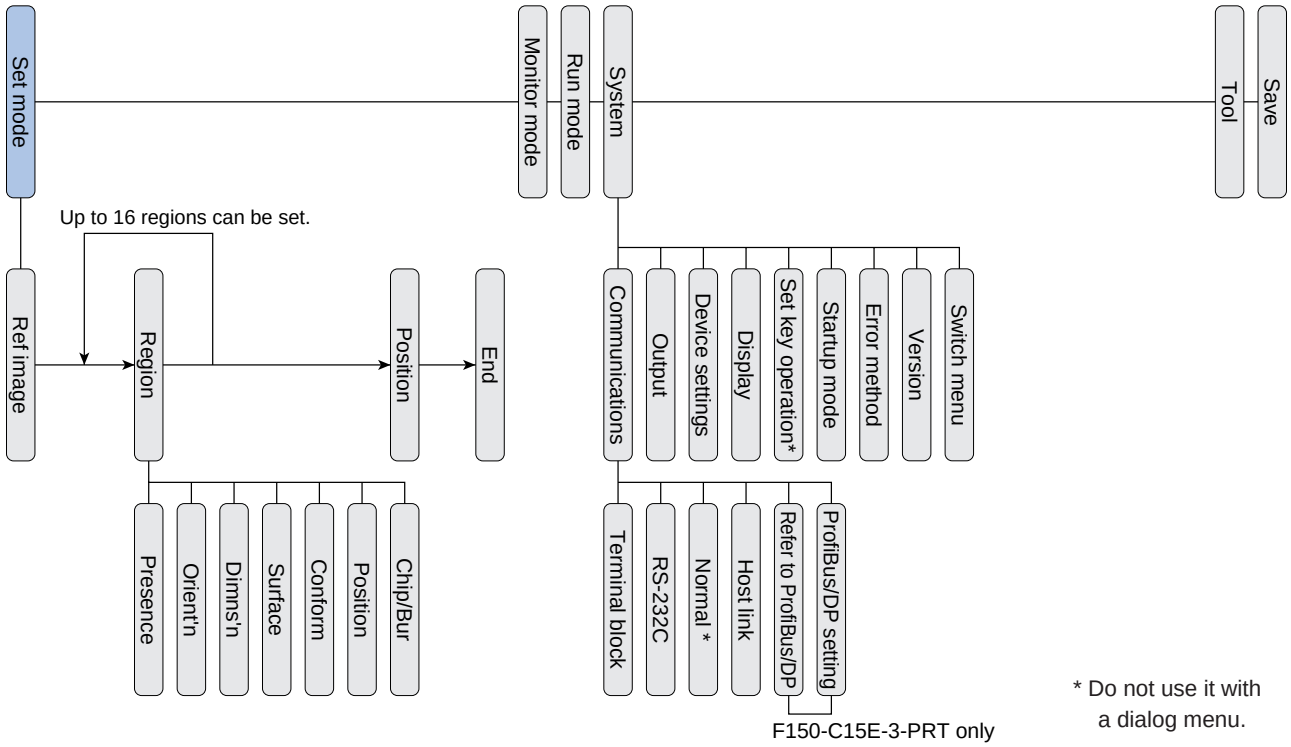
⑭ Set up the node address of PROFIBUS-DP communication.

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

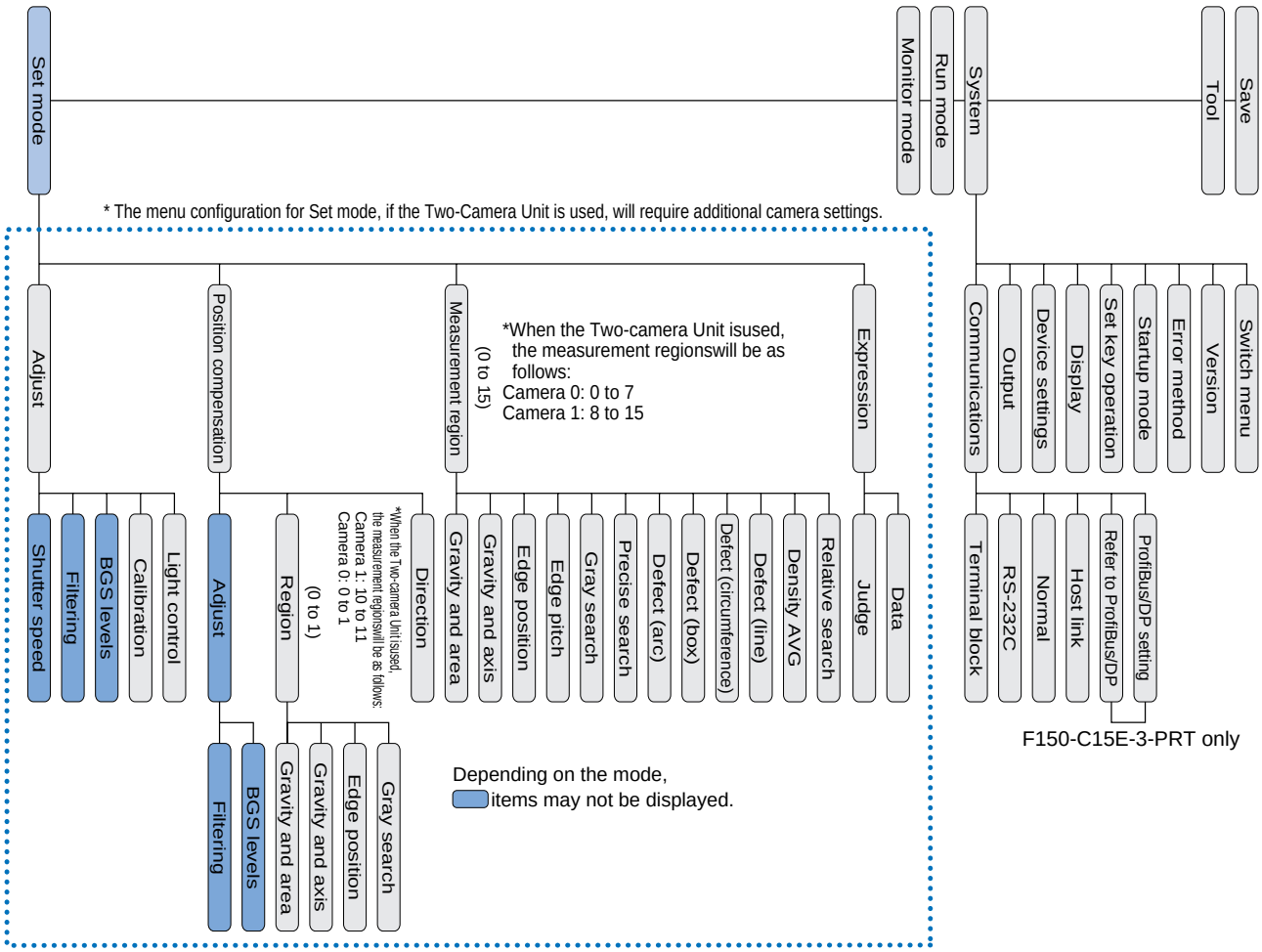
Function menu

Menu structure diagram

Dialog menu



Expert menu

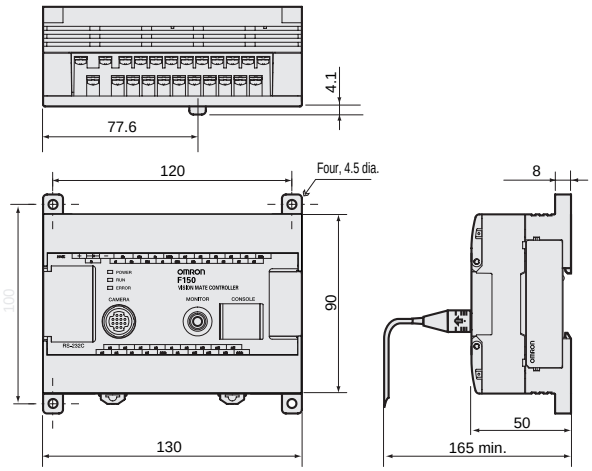


Dimensions (Unit: mm)

Controller

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

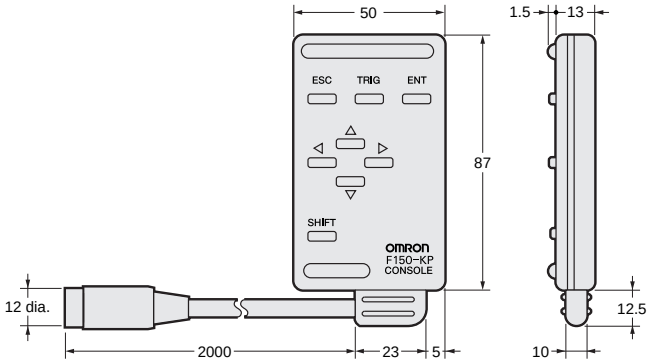
CAD file F150_01



Console

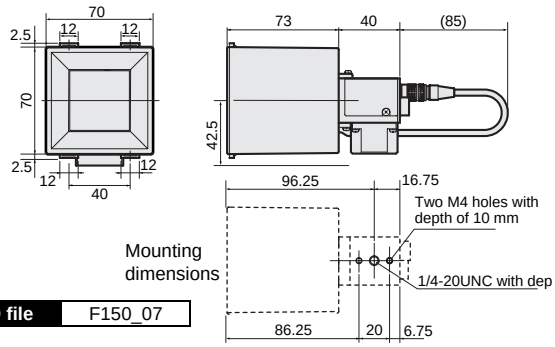
F150-KP

CAD file F150_02



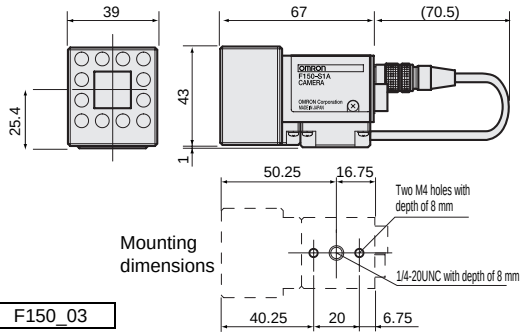
Camera

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



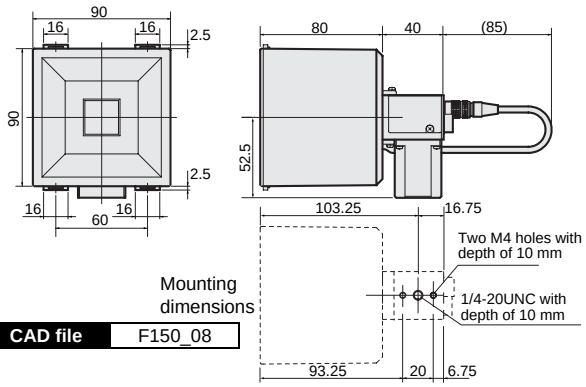
CAD file F150_07

F150-SL20A/SL50A (camera with lighting)



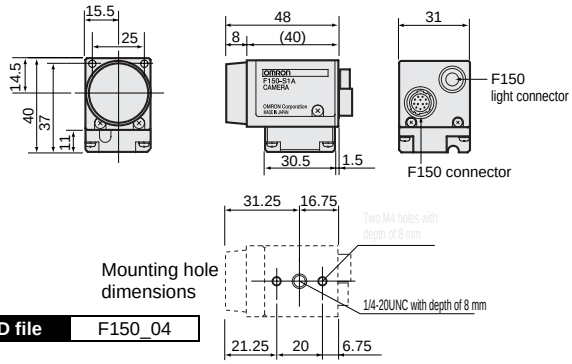
CAD file F150_03

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



CAD file F150_08

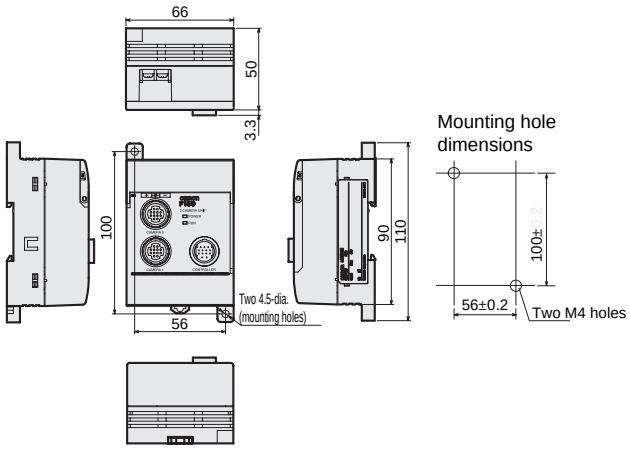
F150-S1A (camera only)



CAD file F150_04

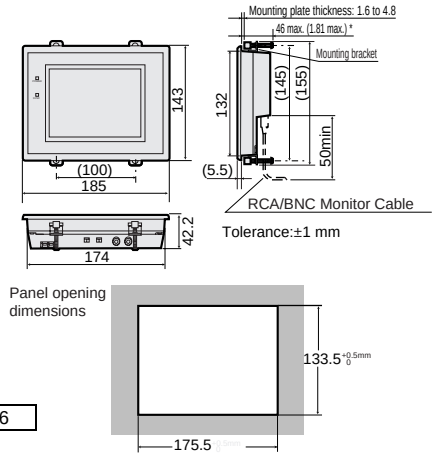
2-camera unit

F150-A20



LCD monitor

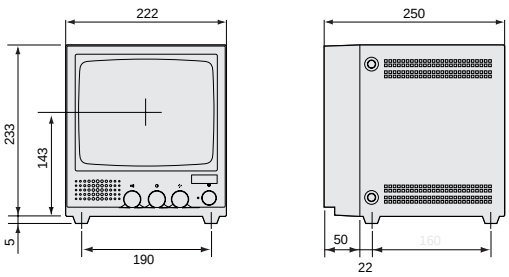
F150-M05L



CAD file F150_06

CRT monitor

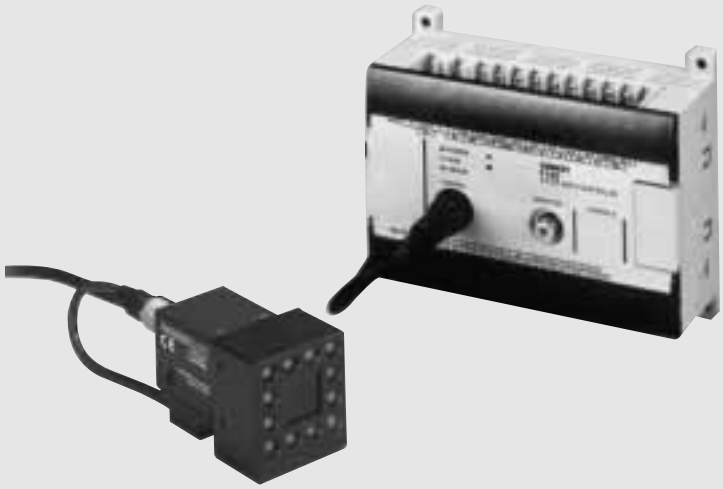
F150-M09



Integrated control software for F150-3

Vision Composer

"Vision Composer" control software makes it easy to achieve the optimum inspection in flowchart format



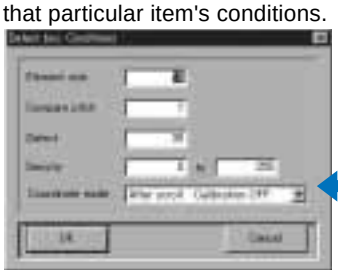
Features

Revolutionizing inspection based on image processing

Although visual sensors can be used based on simple menu settings, they have tended to lack functionality. On the other hand, full-featured advanced image processing devices are capable of a variety of functions, but special programming is necessary. The Vision Conposer makes it easy to achieve the optimum inspection in flowchart format.

a dialog box for item's conditions

Double-click on a box in the flow chart to bring up a dialog box for that particular item's conditions.



Easy operation without a manual

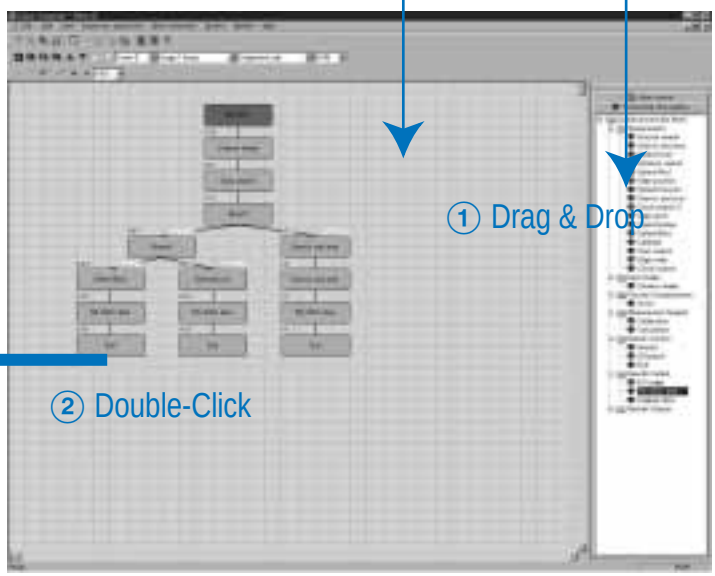
Operation is guided by abundant help/guidance displays. It is not necessary to operate it in manual one hand.

Inspection application edit window

The contents of inspection are displayed by the flow chart. The flow of processing is known at a glance.

Processing item gallery

The list of processing items is displayed. Operators can create flow charts by dragging and dropping items from a library of process items.



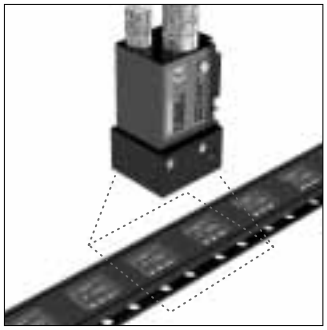
Features

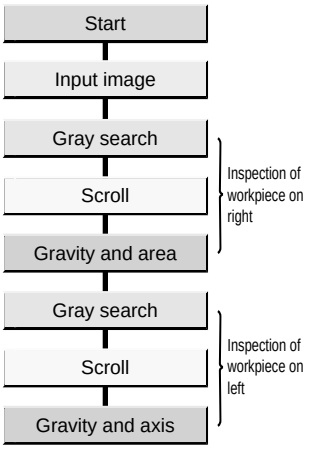
A flexible processing flow can be created in Windows.

Individual position corrections inside each area

Supports individual position corrections inside each inspection area.

● Inpection of chip components inside embossed taping



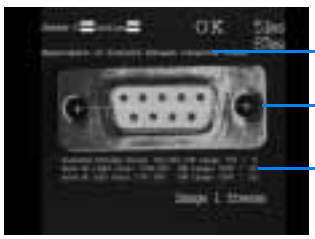


Enhanced screen editing functions increase ease of use.

Editing of scene names

Scene data can be saved using a name that describes the inspection for easy searching and management. Scene data, "no good" images, and other data can be exchanged between the F150 and a computer.

Freely create the measurement screen.



Screen example

Display any character string (measurement description, etc.) in any position

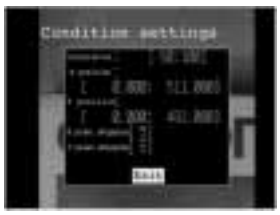
Display a line segment linking holes

Reduced display of measurement results

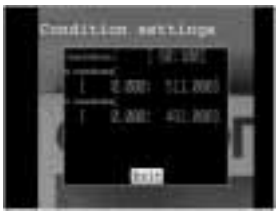
The menu screen can also be edited.

A text editor can be used to change the names and show/hide of menu items.

Before editing



After editing



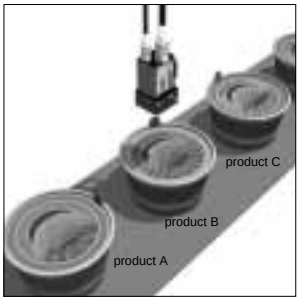
Speed bar

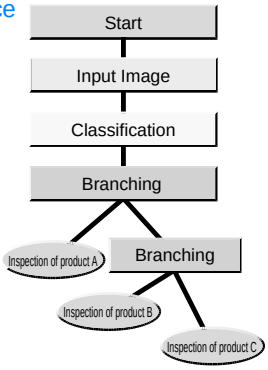
Frequently used processing tasks can be displayed as icons on the toolbar.
Smoother operation.

Branch processing

The type of inspection can be changed by model based on the results of model sorting.

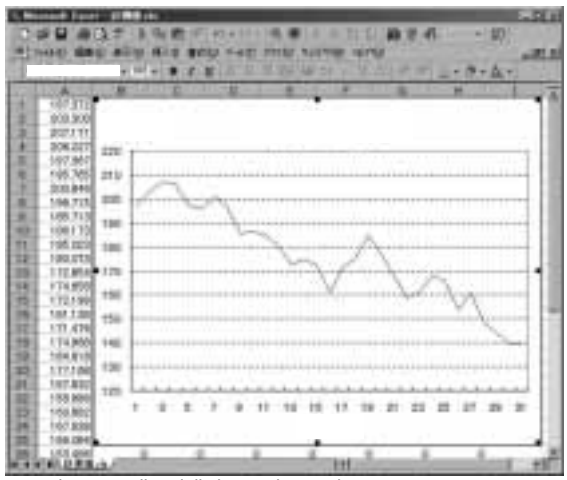
● Inspection of printing on ice cream lids





Manage measurement results on a computer.

Measurement results can be transferred to a computer, making it possible to manage and process data using a spreadsheet or other software program.



Example: Recording daily inspection totals

- Record the date and time of defect occurrences.
- Print out each day's inspection data.
- Transfer inspection data over a network
- Use a spreadsheet or other tool for statistical processing.

Print and output files of flowcharts and processing setting lists.

- Settings can be verified at a glance.
- Import data into a word processor program for easy creation of reports.

Operation procedure

1 Preparation

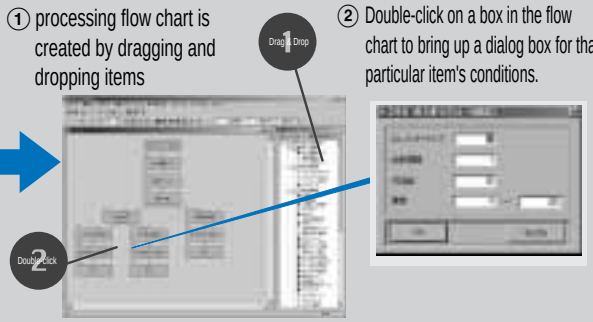
① Insert CD-ROM and install the Software (Vision Composer Ver.2).

② Please connect F150-3 with a personal computer by the RS-232C cable.

2 Set

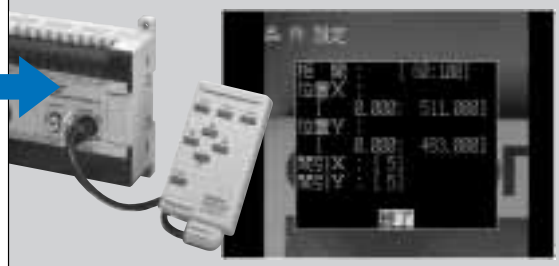
① processing flow chart is created by dragging and dropping items

② Double-click on a box in the flow chart to bring up a dialog box for that particular item's conditions.



3 Operation and adjustment

Even if there is no PC, change/adjustment of conditions can be performed using a console.



Vision Composer Integrated Control Software for the F150-3

List of processing items

Image input related	Camera image input	Input images from the camera
	Memory image input	Input an image from the storage memory to the image memory
	Image transfer	Transfer an image between image memories. Enables multi-stage pre-processing and background cut-off.
Postion correction related	Scrolling	Image scrolling for position correction
	One-unit scrolling	Easy position correction (using one unit)
	Two-unit scrolling Scrolling reset	Easy position correction (using two units) Resets scrolled image memory to original position
General measurement related	Binary area	Obtains only binary area at high speed
	Binary center of gravity and area	Obtains binary center of gravity and area
	Bbinary center of gravity and main axis angle	Obtains binary center of gravity, area, and main axis angle
	Dark-light search	Searches stored model images
	High-precision search	Searches the stored model images and obtains the search coordinates in sub-pixel units.
	Damage and dirt (linear)	Inspects for damage and dirt on a straight line
	Damage and dirt (circular)	Inspects for damage and dirt on a circle
	Damage and dirt (circular arc)	Inspects for damage and dirt on a circular arc
	Damage and dirt (rectangular)	Inspects for damage and dirt inside a rectangular area
	Dark-light edge position	Obtains the edge position by dark-light processing
	Dark-light edge number	Obtains the number of objects by dark-light edge detection processing.
	Dark-light edge width	Obtains the distance between two edges
	Darkness average/deviation	Obtains the average darkness and deviation of a specified area
	Rotation search	Searches objects that are rotated.
	Obtains angle of circular object	Obtains the angle of a circular object at high speed
	Sorting	Sorts up to eight models
	Model dictionary	Used with "Sort 2"; up to 16 types are sorted
	Sort 2	Used with "Model dictionary"; up to 16 types are sorted
	Labeling	Obtains the number of objects by label processing.
	Label sorting	Rearranging based on the label area and center of gravity of each object
	Label data	Obtains the area and center of gravity of each label
	Edge code	Generates an edge code image as a preprocessing step for execution of a circle search or high-precision circle search.
	Circle search	Searches for circular objects
	Stable circle search	Stable circle search without regard to the size of the circle.
	High-precision circle search	Searches for circular objects and obtains the search coordinates on the order of sub-pixels.
Measurement supplement related	Computation	Based on the selected computation equation, computations are carried out using the measurement results of each processing item.
	Calibration	Converts camera coordinates to actual coordinates
	Obtains processing unit data	References parameter settings of processing unit
	Processing unit data settings Elapsed time	The parameter settings of the processing unit can be changed as desired Obtains the elapsed time after input of the measurement trigger.
	Wait	Processing waits during the specified time
Branch control related	Condition-based branching	Processing is divided into branches based on the specified conditions
	DI input branching	Processing is divided into branches based on input from the terminal block
	End	Ends processing
Result output related	DO decision output	Outputs the measurement decision result to the terminal block.
	DO data output	Outputs measurement data to the terminal block
	RS-232C data output	Outputs measurement data to the RS-232C
	RS-232C data output 2	Outputs data in a free format to the RS-232C
	Higher link data output	Outputs data using the higher link protocol
	Data locking output	Outputs data for locking the measurement result in Vision Composer to the RS-232C
Result display related	Value display	Displays any value in any position on the screen (for customization of the measurement screen)
	Value display (small font)	Displays a value in a small font on the screen (for customization of the measurement screen)
	Line display	Displays a line of any length in any position on the screen (for customization of the measurement screen)
	Rectangle display	Displays a rectangle of any size in any position on the screen (for customization of the measurement screen)
	Circle display	Displays a circle of any size in any position on the screen (for customization of the measurement screen)
	Cross-hair cursor display	Displays a cross-hair cursor in any position on the screen (for customization of the measurement screen)

Operating environment

OS	Windows 95/98/NT 4.0 Japanese version (does not operate in Windows 3.1/NT3.5/2000)
WWW browser	Microsoft Internet Explorer 4.0 or higher
CPU	Pentium II 266 MHz or higher
Memory	64 MB or higher (recommended)
Free hard disk space	50 MB or higher
Display image	1024 x 768 dots 256 colors or higher
CD-ROM drive	4 x or higher

Color-graying vision sensor

F400

Detects subtle color differences

Features

In addition to regular color extraction, the F400 color-graying sensor features the world's first color-graying filter. This is a completely new type of sensor that enables easy and inexpensive detection of subtle color differences that could not be discriminated by monochrome processing or color extraction.

Industry's First

Incluses a color-grayed filter

① Good discrimination of subtle color differences (example: inspection for cap damage)

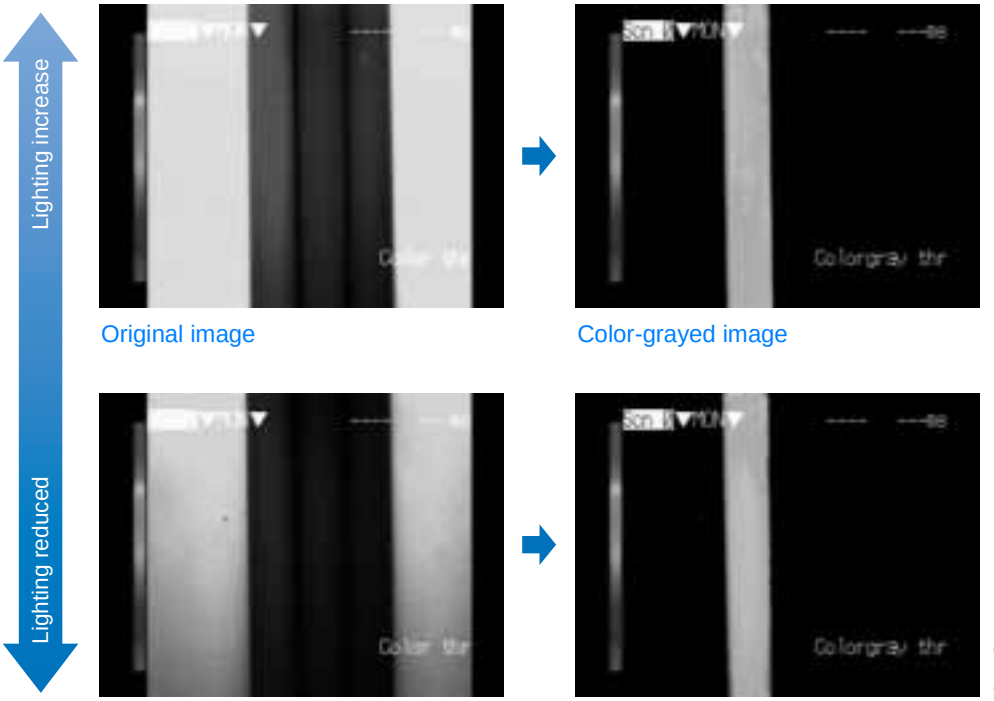
Original image

Color-grayed image
Defects barely visible in the original image stand out clearly.

Monochrome image
The defects are barely visible.

Features

② Handles lighting changes well. (Example: inspection of colored pencil arrangement when the color is set to red)



Original image

Color-grayed image

Original image

Color-grayed image

Even if the illumination is darkened, a stable color-grayed image can be obtained.

Ease-of-Use

① The character color displayed on the screen can be changed.

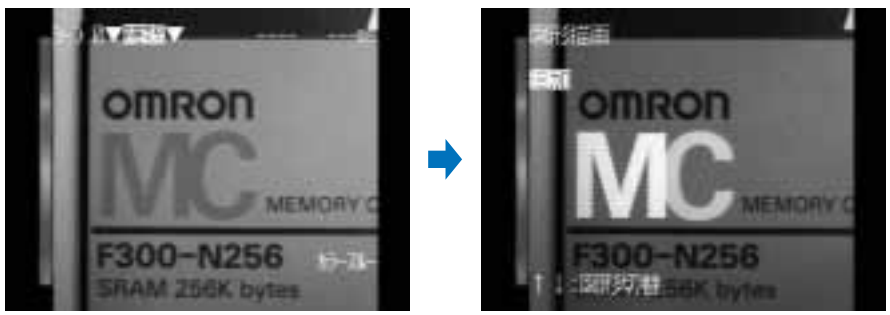
Select the character color that is easiest to see based on the color of the work.

White characters on a white background are difficult to see.

Change the character display to red.

② Enhanced measurement area drawing function.

The optimum measurement area can be selected for complex work shapes.



Measure an orange "M".

Draw an area outlining the character

Features

Other functions

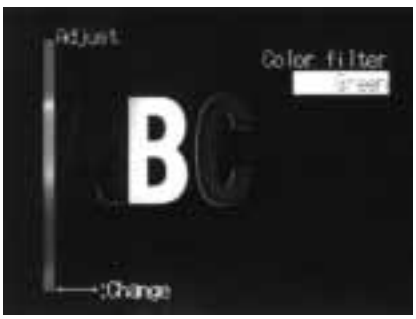
RGB filters

In addition to the color-graying filter, the sensor is equipped with R (red), G (green), and B (blue) filters.

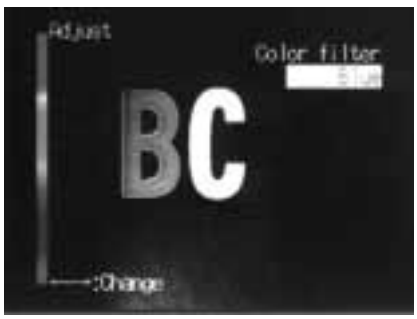
- Use the filter most suitable to the color of the object and the purpose of the inspection.

Color image (original image)

R (red) filter image



G (green) filter image

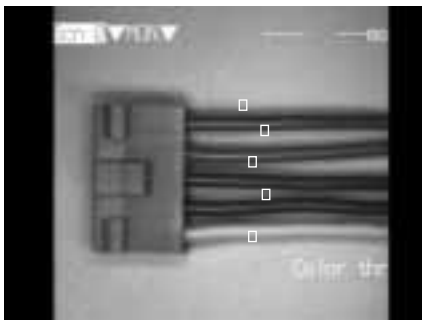


B (blue) filter image

Color extraction function

Up to 8 colors can be simultaneously detected for viewing, and the area, center of gravity, and position deviation can be measured at high speed and high precision.

- Ideal for color sorting, color discrimination, foreign object checking, and a color arrangement check.



Original image

Color-extracted image

Multi-type measurement mode

The highly-acclaimed multi-type measurement algorithm in F150-2 has also been included.

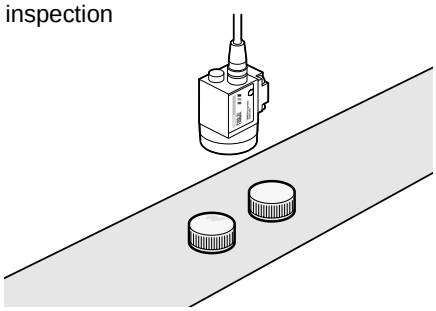
- Binary measurement / dark-light measurement algorithm
- Damage and dirt measurement / edge position measurement algorithm
- "No good" image storage (filter-processed monochrome images)

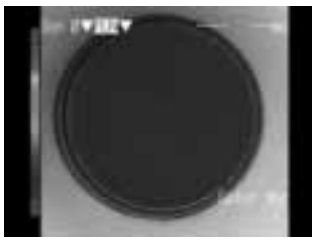
*The actual device image may differ from the catalog photograph.

Application

Color-graying processing

Cap dirt inspection



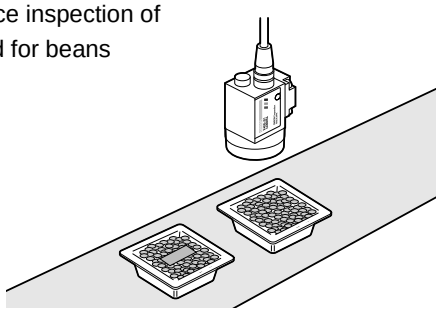


Original image

Filtered image

The contrast between the cap color and dirt can be increased.

Presence inspection of mustard for beans

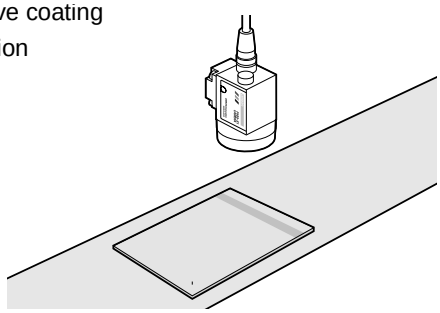


Original image

Filtered image

Presence inspection is possible regardless of the position of the mustard for the beans.

Adhesive coating inspection



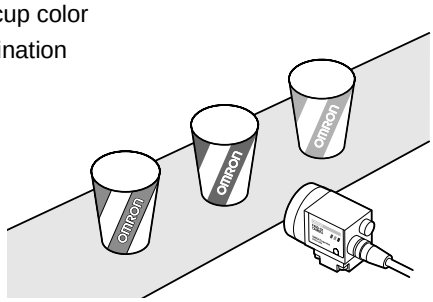
Original image

Filtered image

Using the edge detection function to inspect the quantity (width) of adhesive coating on a copper plate.

Color extraction processing

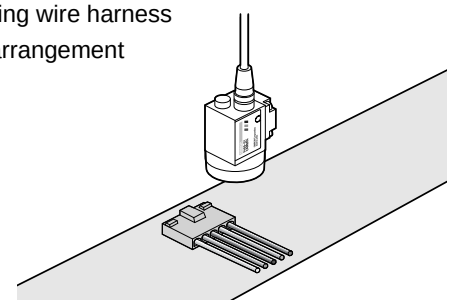
Paper cup color discrimination



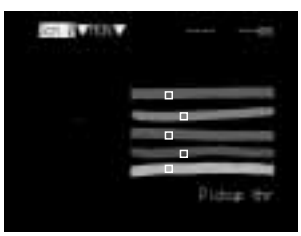
Original image

Color-extracted image

Checking wire harness color arrangement



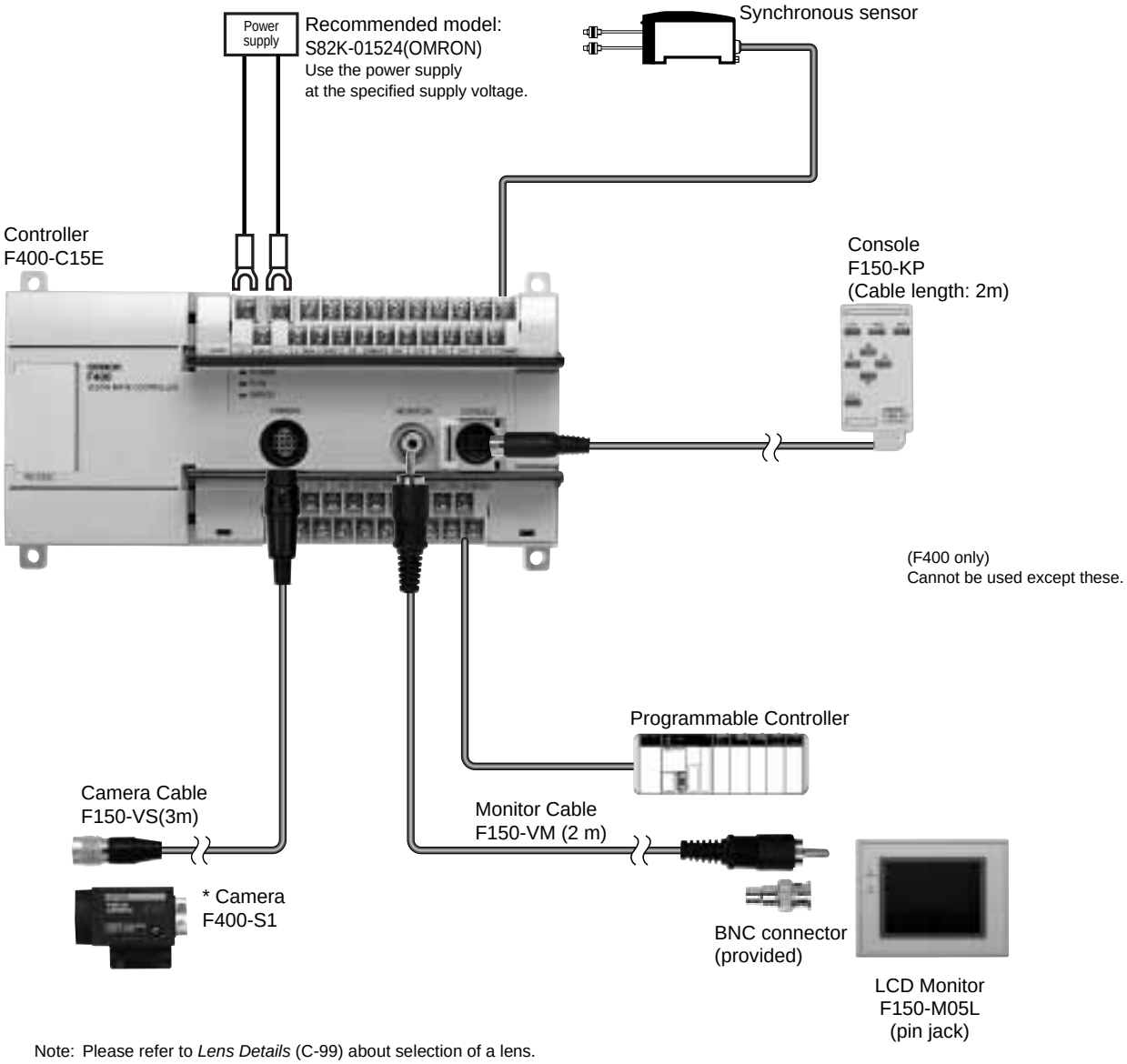
Original image



Color-extracted image

*The actual device image may differ from the catalog photograph.

System configuration



Note: Please refer to *Lens Details* (C-99) about selection of a lens.

Ordering Information

Name	Model
Controller	F400-C15E
Camera	F400-S1
Console	F150-KP
LCD monitor	F150-M05L
Camera cable	F150-VS
Monitor cable	F150-VM
Lens	For details, see option
Lighting	

Rating/Performance

Controller/F400-C15E

Item \ Model	F400-C15-E	
	Color extraction	Color-graying / color filter (R•G•B)
Number of connected cameras	1 unit	
Processing resolution	512(H) x 484(V)	
Number of scenes	16 scenes	
Image memory function	Up to 16 scenes can be stored (only filter-processed monochrome images)	
Operation	Color extraction / selection by color filter	
Processing method	Color extraction: Up to 8 colors	256-shade image (select by color group: gray, red, green, blue)
Image pre-processing	---	Smoothing, edge enhancement, edge extraction, background cut-off
Binary level	---	256 levels (per measurement area)
Position correction function	Correction directions: X, Y, θ Inspection modes: binary center of gravity / main axis angle, search (1 model / 2 models), edge position (1 area / 2 areas)	
Number of measurement areas	16 areas/scene	
Measured data	Binary area, center of gravity, main axis angle, relative value, search position, edge position	Binary area, center of gravity, main axis angle, relative value, search position, edge position, damage/dirt (degree of defect)
Calculation functions	Four arithmetic operations, distance, angle, square root, maximum, minimum	
Result output	Overall decision, computation result decision, by measurement area, measurement/computation data	
Monitor	1 ch (supports pin jack and over-scan monitor)	
RS-232C	1 ch (Dsub, 9 pins, female)	
Parallel input/output	Input: 11 points, output: 21 points (including control inputs/outputs)	
Power supply voltage	20.4 to 26.4 V DC, including ripple (p-p)	
Current consumption	0.6 A or less	
Ambient temperature	Operating: 0 to +50°C, storage: -25 to +65°C (no icing or condensation)	
Ambient humidity	Operating/Storage: 35% to 85% RH (with no condensation)	
Weight (Packed state)	Approximately 1.3 kg (unit: approximately 600 g)	
Accessories	Operation Manuals (3)	

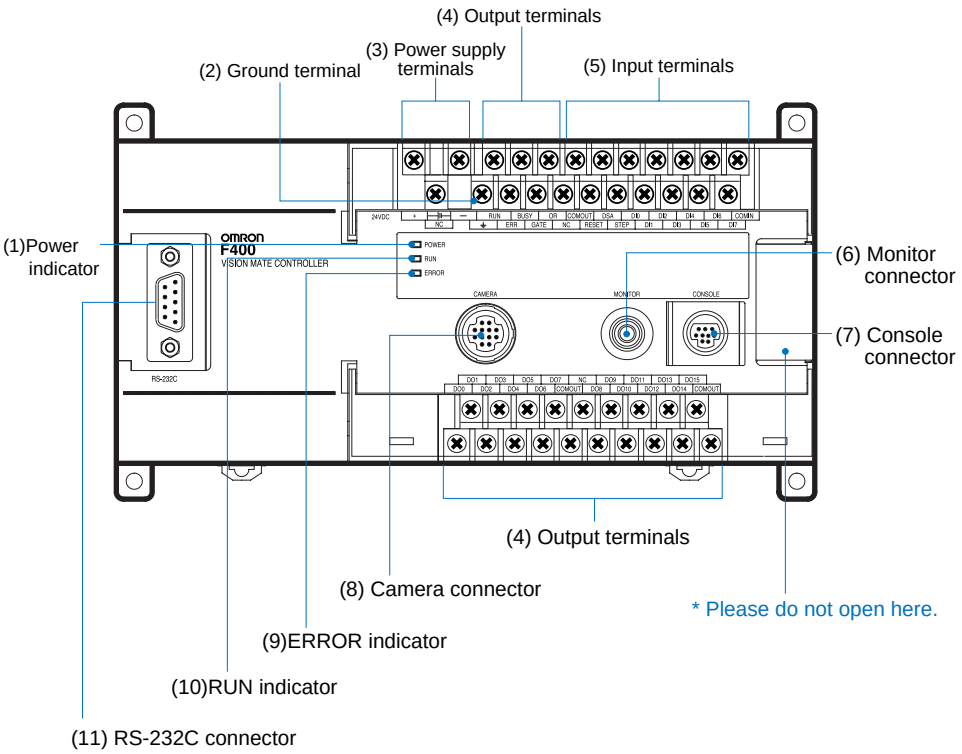
Camera/F400-S1

Item \ Model	F400-S1
Image pick-up	1/3 inch color CCD
Effective pixels	659(H) x 494(V)
Shutter function	Electronic shutter: 1/100 s, 1/500 s, 1/2000 s, 1/10000 s (changed by menu)
Lens mount	C mount
Ambient temperature	Operating: 0 to +50°C, storage: -25 to +65°C (no icing or condensation)
Ambient humidity	Operating/Storage: 35% to 85% RH (with no condensation)
Weight (Packed state)	Approximately 180 g (unit: approximately 80 g)
Accessories	Lens cap, 4-pin connector cover

LCD monitor

Item \ Model	F150-M05L
Size	5.5 inch
Type	TFT color LCD
Resolution	320 x 240 dots
Input signal	NTSC composite video (1.0 V / 75 Ω)
Power supply voltage	20.4 to 26.4 VDC
Current consumption	Approx. 700 mA
Ambient temperature	Operating: 0 to +50°C, storage: -25 to +65°C (no ice formation or condensation)
Ambient humidity	Operating/Storage: 35% to 85% RH (with no condensation)
Weight * Unit only	Approx. 1 kg
Accessories	Operation manual, 4 clamps

Nomenclature:



(1) Lit while power is ON.

(2) Connects to the ground wire.

(3) Connects to the power supply.

(4) (5) Connects to the F400 to external devices such as synchronous sensors or programmable controllers.

(6) Connects to the monitor.

(7) Connects to the console.

(8) Connects to the camera.

(9) Lit when an error has occurred.

(10) Lit while the F400 is in Run Mode.

(11)Connects the F400 to external devices such as personal computers or programmable controllers.

Function menu

Measurement method

Five measurement modes are available. Selections will vary depending on the selected scene mode.

Common to both color extraction and color filter mode.

Search

Select this mode when you wish to focus the inspection on the shape of the object. An image pattern (called a "model") is stored, and measurement is performed using that pattern. The degree of matching with the model (correlation value) and the position where the model was found can be obtained.

Edge

Select this mode when you wish to know the coordinates of the edge of the object. The width of the object can also be obtained by subtracting the coordinates of one edge from the other using a computation equation.

Area and center of gravity

Select this mode if you wish to obtain the size (called the "area") and the position (called the "center of gravity") of the object.

Center of gravity and main axis angle

Select this mode when you wish to obtain the tilt (called the "main axis angle) of the object, in addition to the area and position. A longer processing time is required to obtain the main axis angle. If you only wish to obtain the area and center of gravity, select "Center of gravity and main axis angle".

Color filter mode only

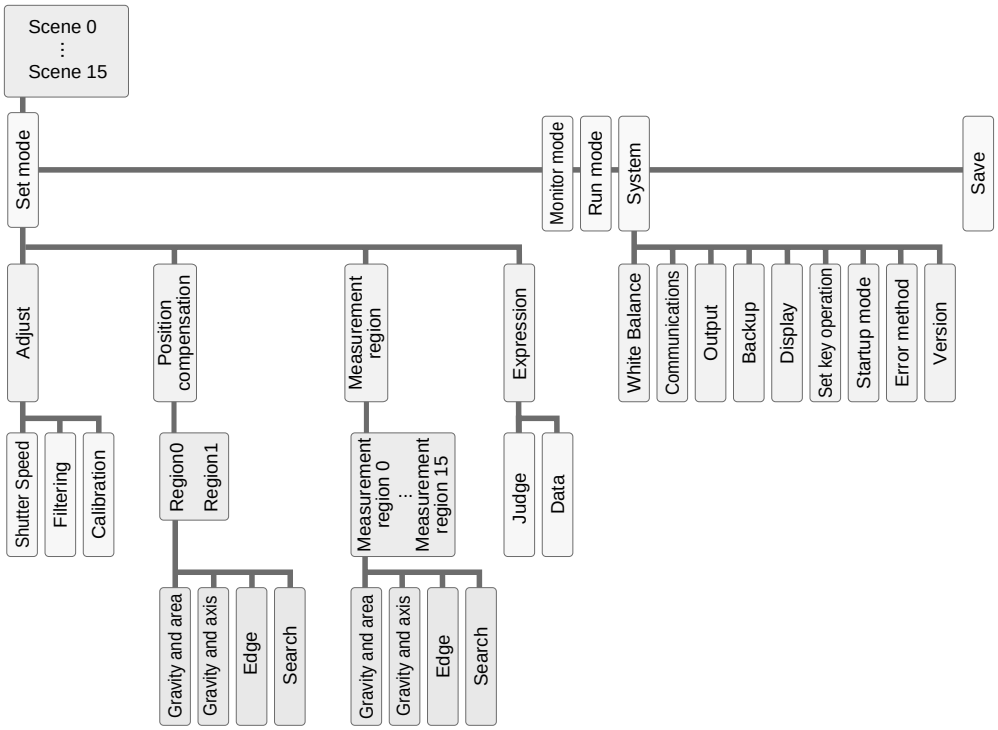
Dirt and damage

Select this mode if you wish to inspect for damage and dirt on the measurement object. Places with large darkness deviations are detected as defective.

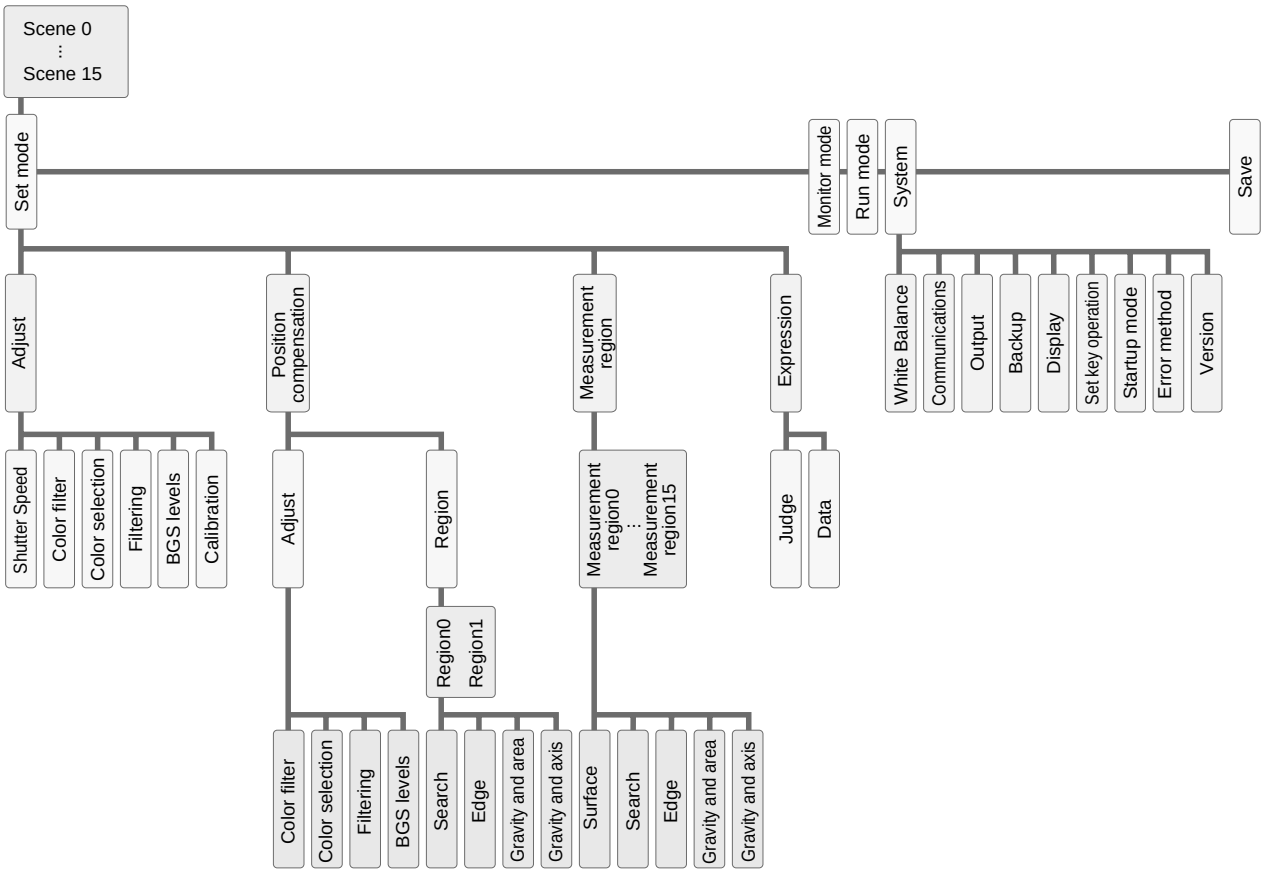
Menu structure diagram

The menu structure differs in color extraction mode and color filter mode. The menu structure for each scene mode is as follows:

Color extraction mode



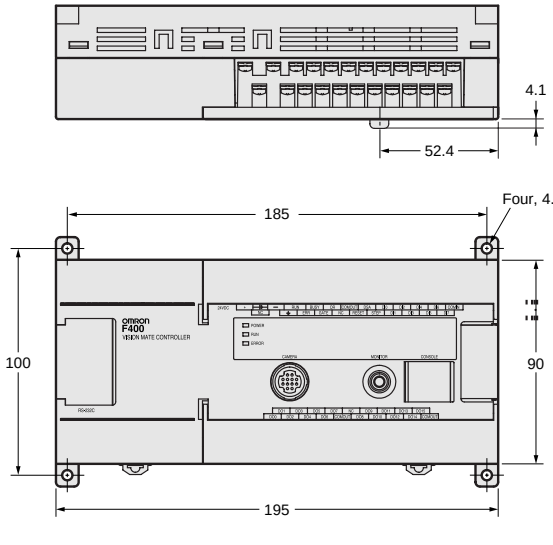
Color filter mode



Dimensions (Unit: mm)

Controller

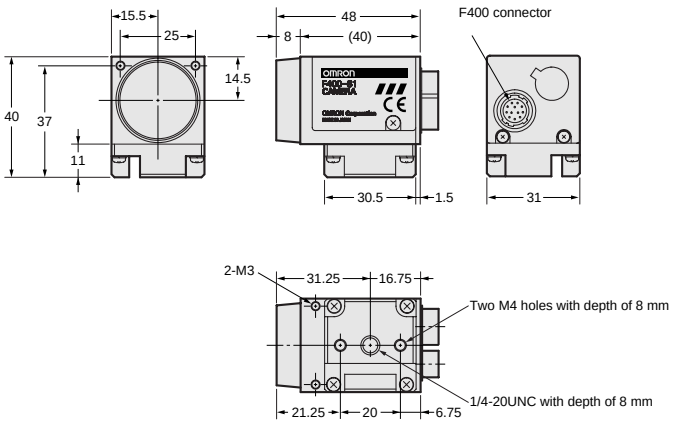
F400-C15E



CAD file F400_01

Camera

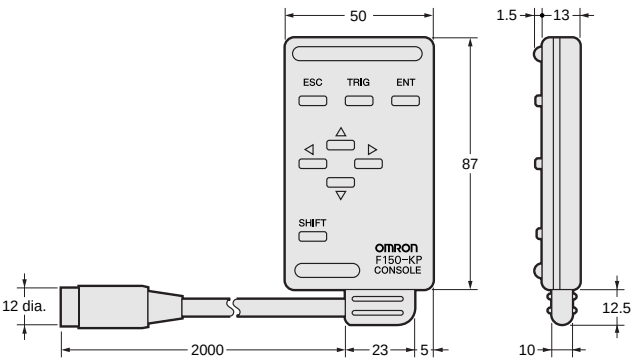
F400-S1



CAD file F400_02

Console

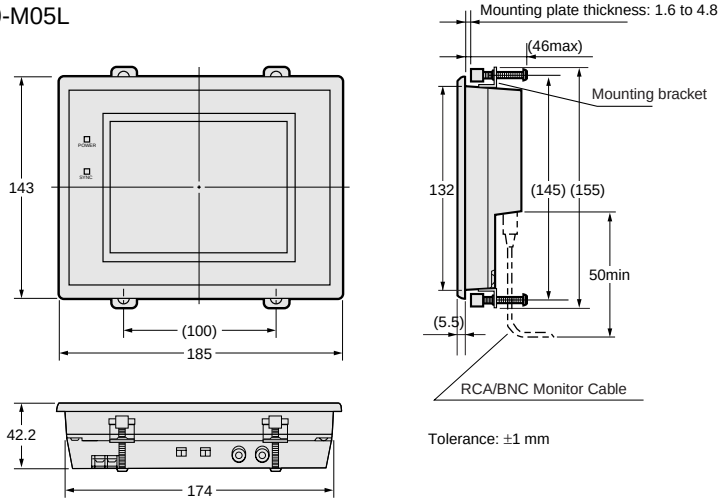
F150-KP



CAD file F150_02

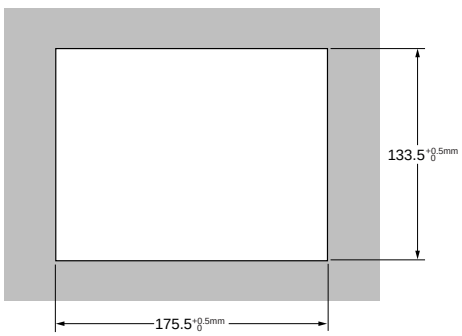
LCD monitor

F150-M05L



Tolerance: ±1 mm

Panel cut diagram



MEMO

Vision sensor

F160

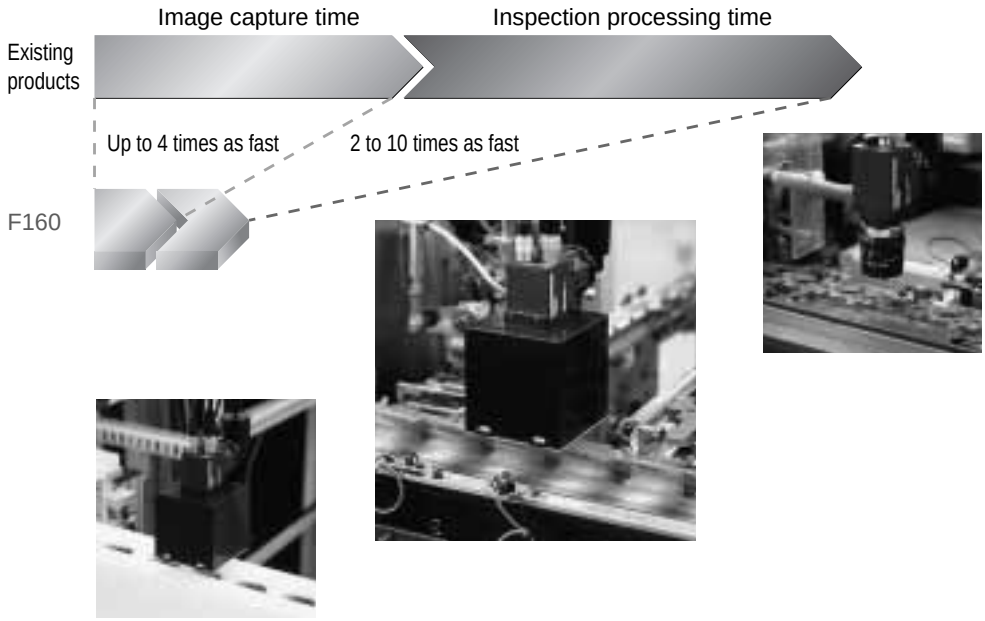
Impressive high speed opens up new possibilities

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.



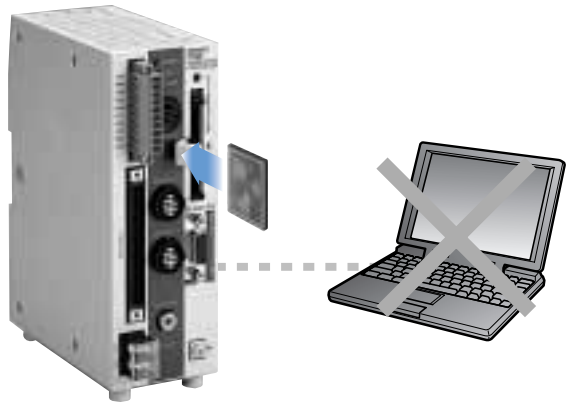
Example: Gray Search Processing (Picture 1)

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.

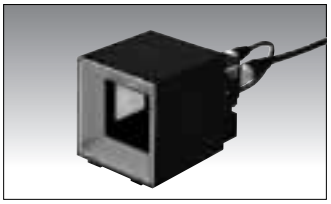
Double-speed camera

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



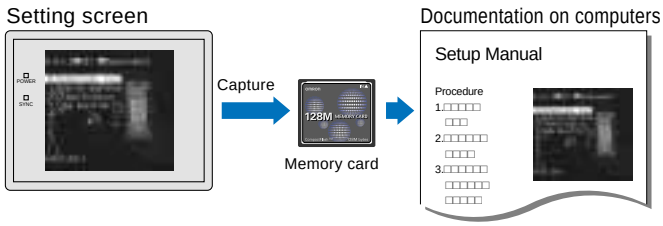
Compact and affordable. Intelligent lighting and small LED lighting types are also available.

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.

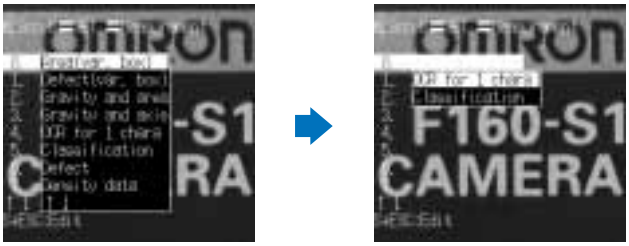


Features

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.



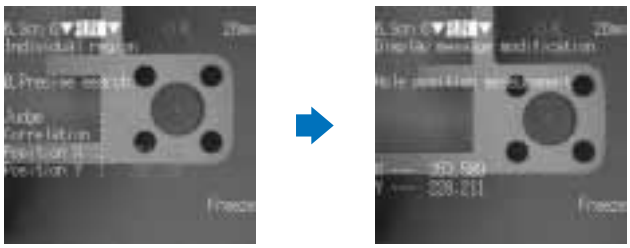
Password function

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

Screen

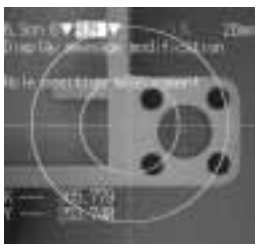
Screen messages

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.



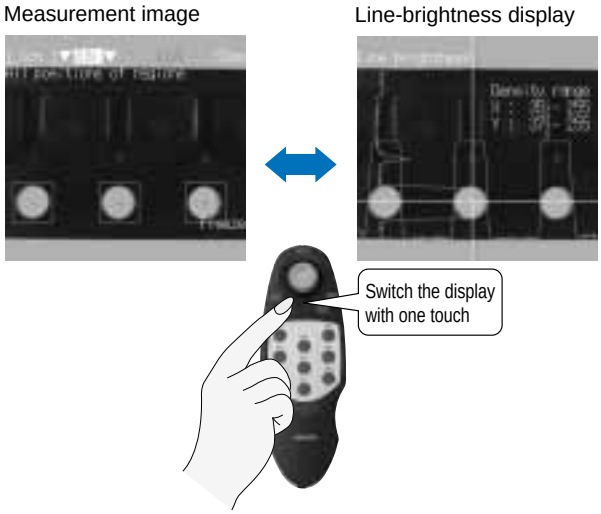
Output

RS-232C format

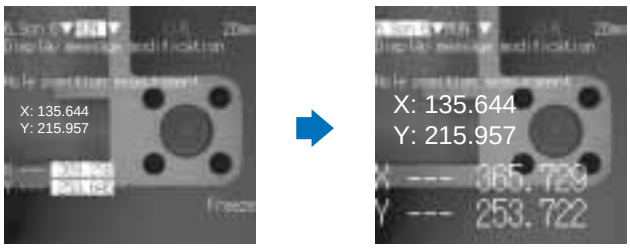
The output format can be changed to meet the specifications of the system.

Short-cut key function

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

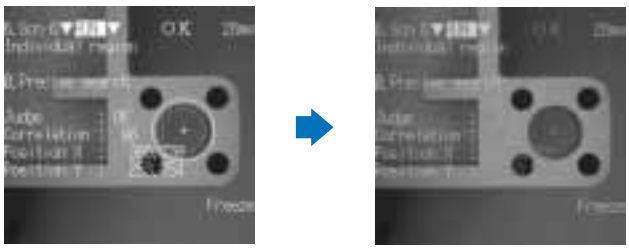


The character size can be selected, and even highlighting is possible.



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.

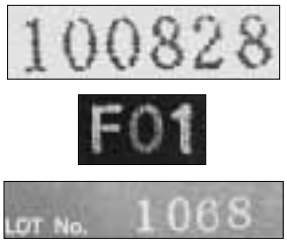
Features

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

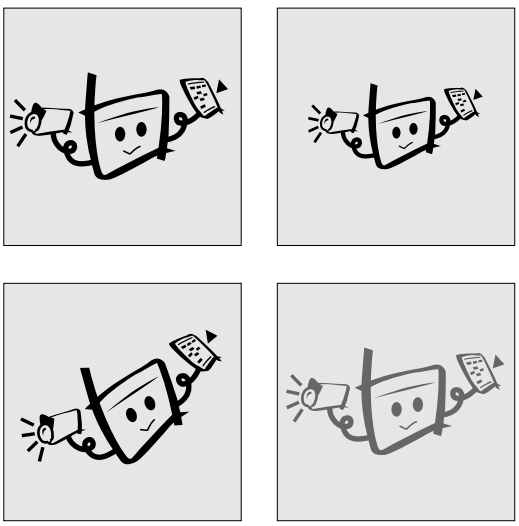
Set frames for adjusting the region size

Measurement screen

The inspection region automatically adapts to the object size.

Flexible Search

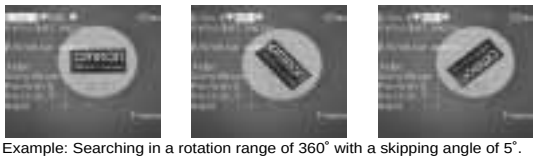
This method performs a matching using more than one reference image and so F160 can perform inspection for objects with varying shapes. This feature helps to reduce incorrect evaluations.



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

Rotation search

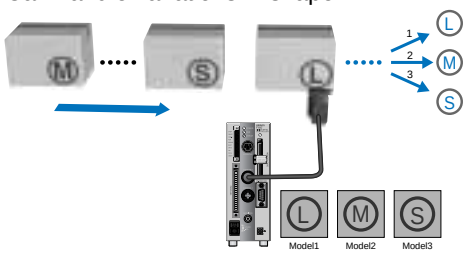
This function rotates the image while searching. Processing speed is 10 times higher than previous models. Angle interpolation enables high-precision angle detection.



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

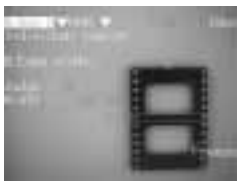
Classification

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

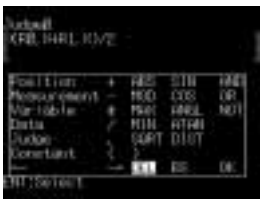
The number of labels (i.e., objects) inside the measurement area is counted. After they have been sorted according to area or center of gravity, the measurement data for specified labels is output.

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 θ (360°) directions	Compensation directions: X, Y, and θ(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	
		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)	

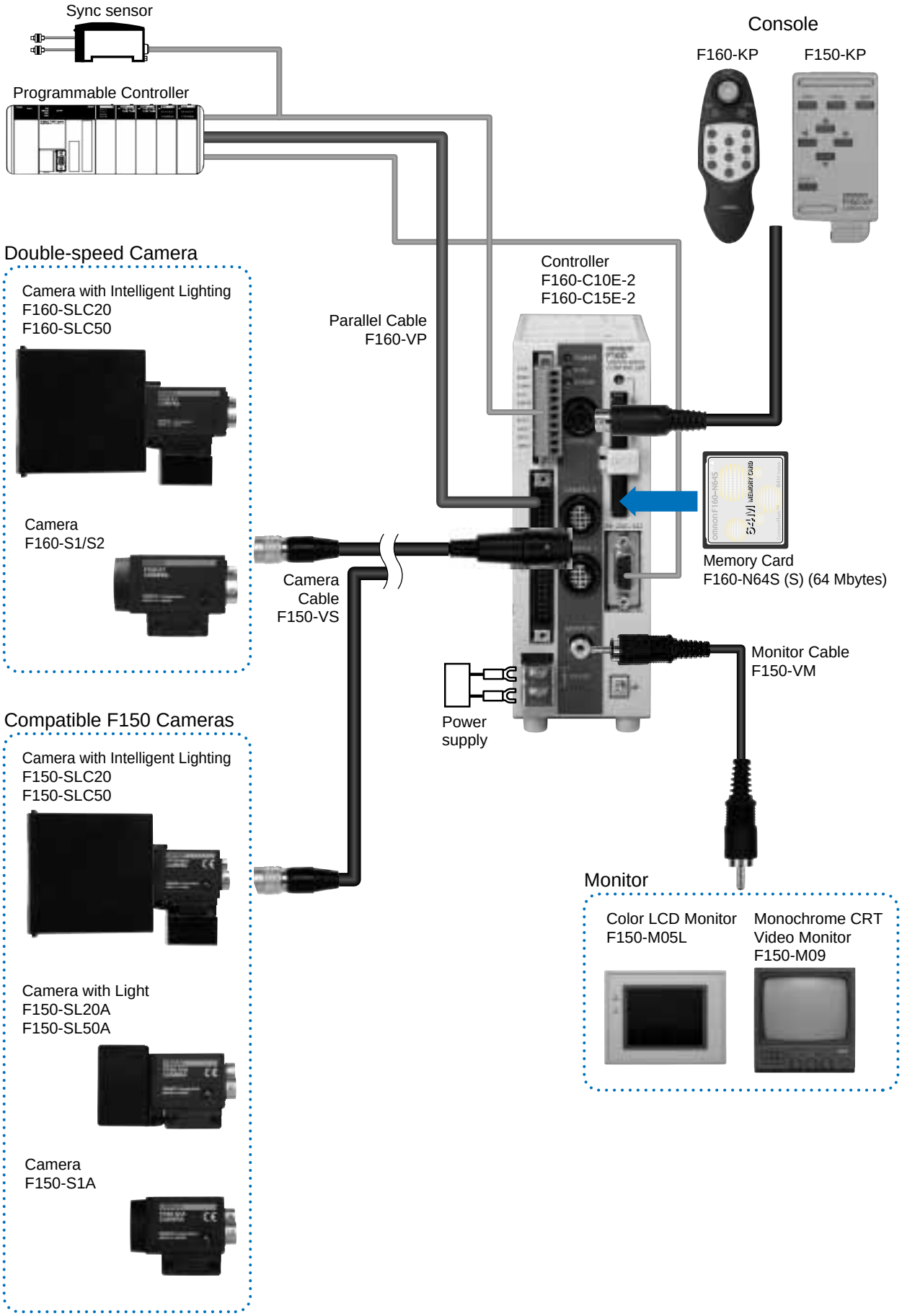
Double-speed camera: F160-S1/S2

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

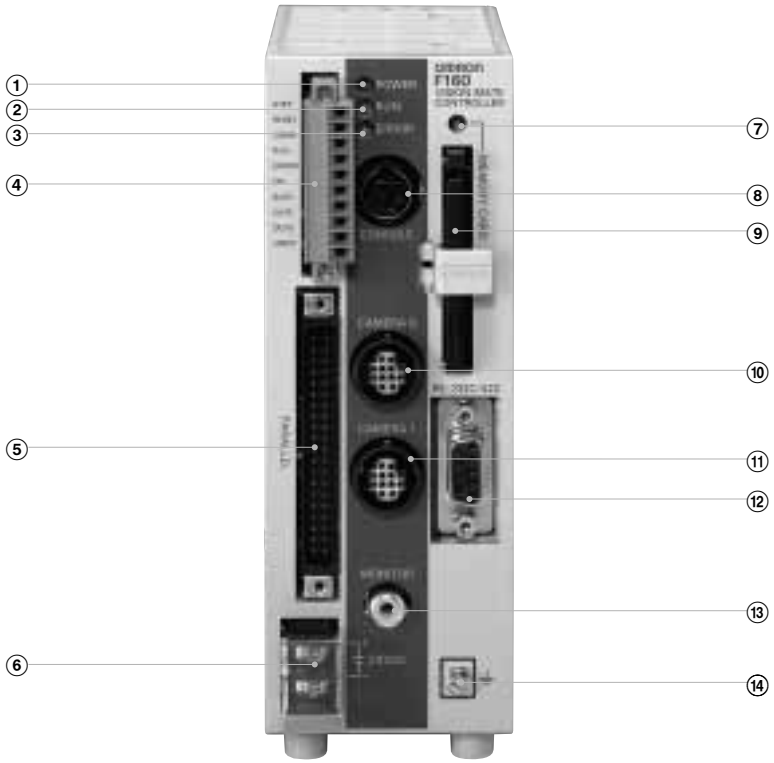
Item / Model number / Name	F150-M05L Color LCD monitor	F150-M09 Monochrome CRT Video Monitor
Size	5.5 inches	9 inches
Type	Liquid crystal color TFT	CRT monochrome
Resolution	320 x 240 dots	800TV or min. (at center)
Input signal	NTSC composite video (1.0 V / 75 Ω)	
Power supply voltage	20.4 to 26.4 VDC	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.

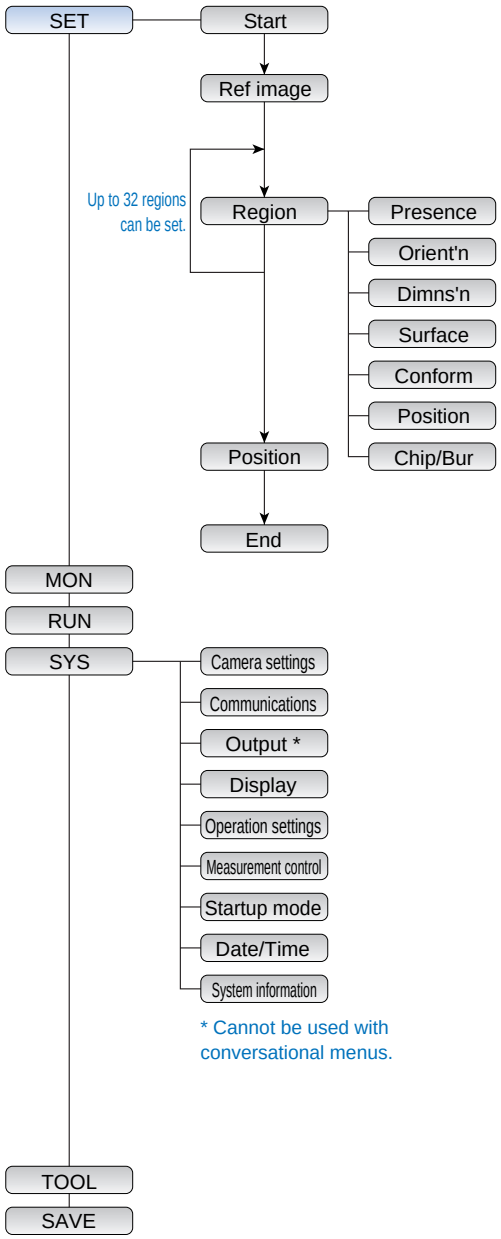
⑬ **Monitor connector**
Connects to a monitor.

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

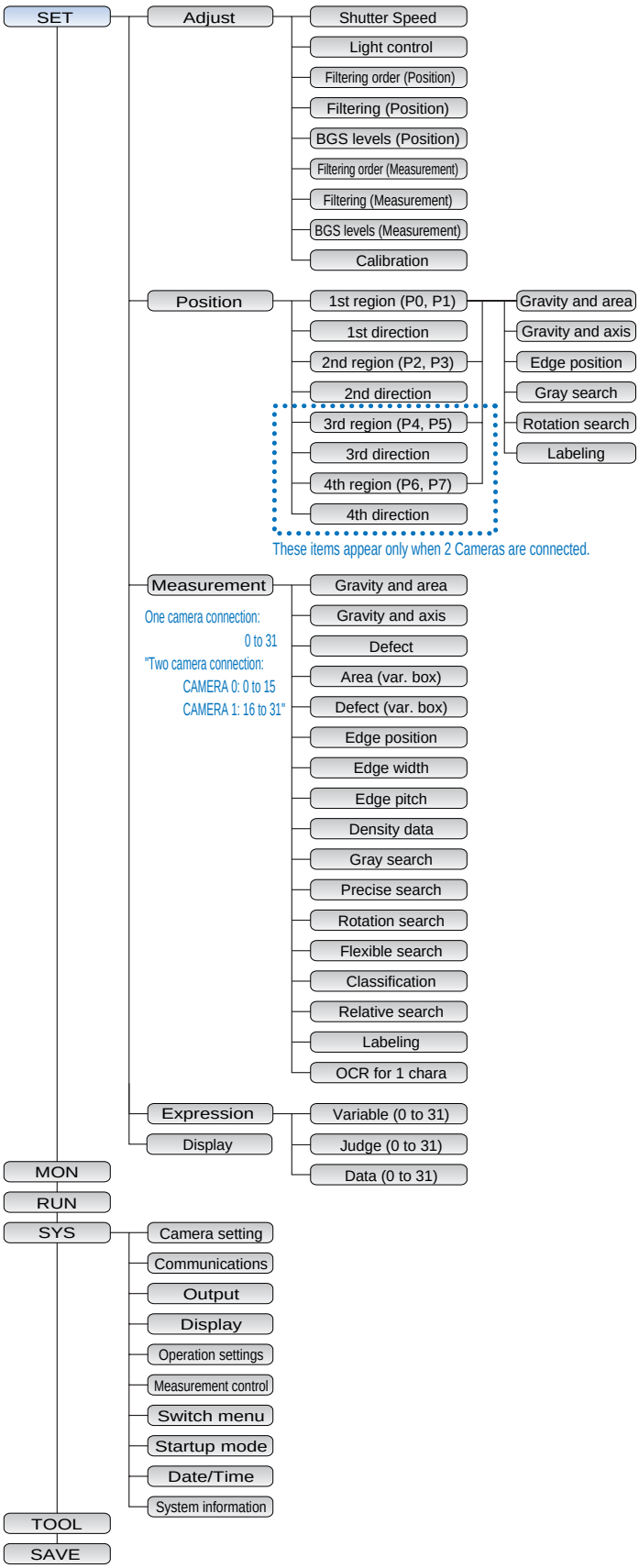
Function menu

Menu structure diagram

Dialog menu



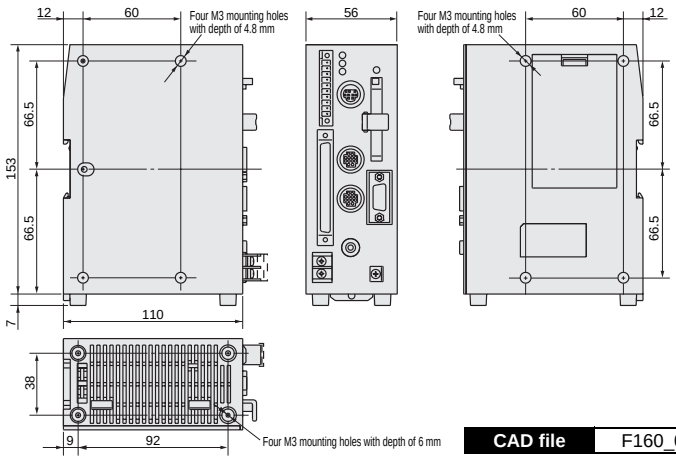
Expert menu



Dimensions (Unit: mm)

Controller

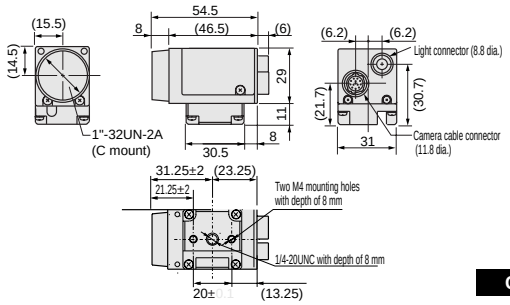
F160-C10E/F160-C15E



CAD file F160_01

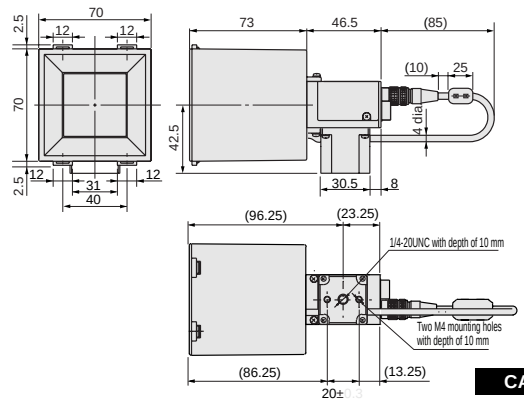
Double-speed camera

F160-S1/S2



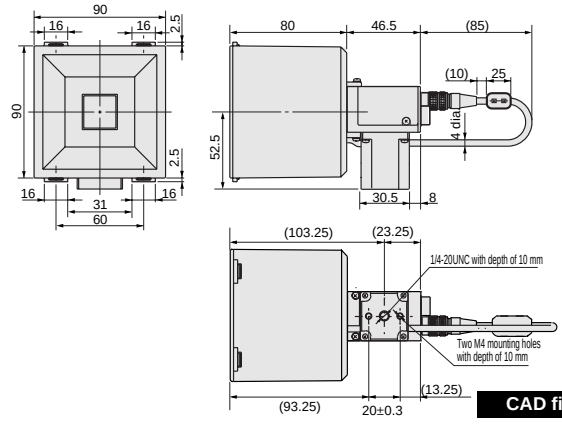
CAD file F160_04

F160-SLC20 (with F150-LTC20 intelligent lighting)



CAD file F160_02

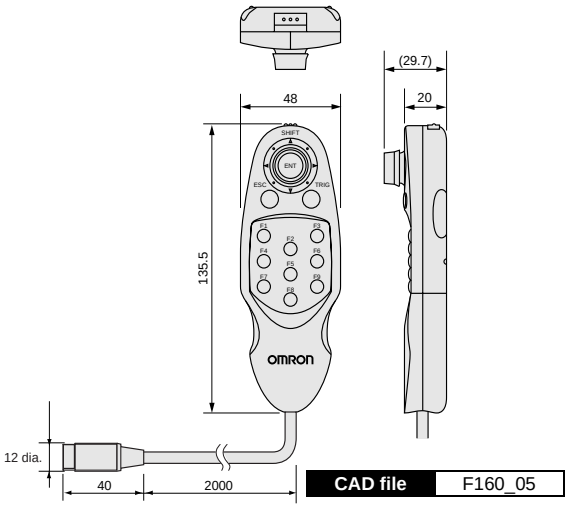
F160-SLC50 (with F150-LTC50 intelligent lighting)



CAD file F160_03

Console

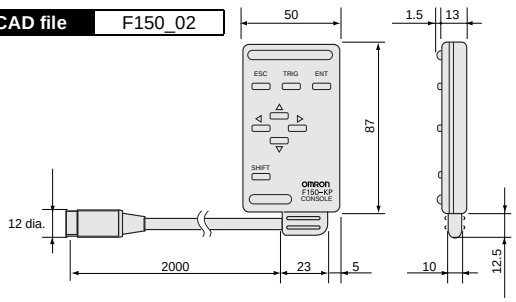
F160-KP



CAD file F160_05

F150-KP

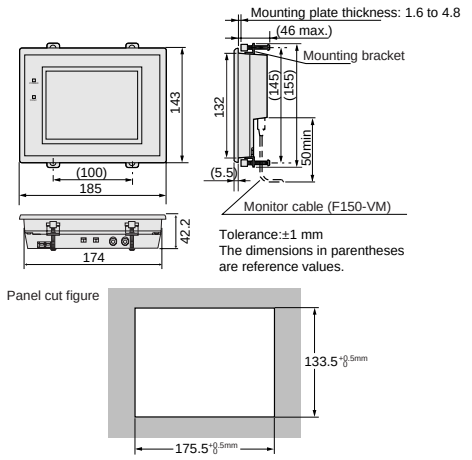
CAD file F150_02



LCD monitor

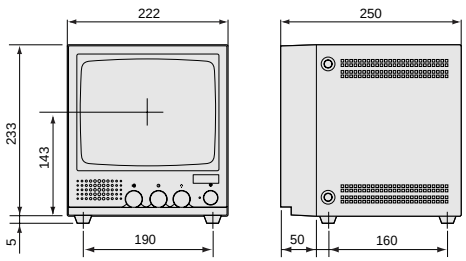
F150-M05L

CAD file F150_06



Video monitor

F150-M09



MEMO

Vision Sensor

F210

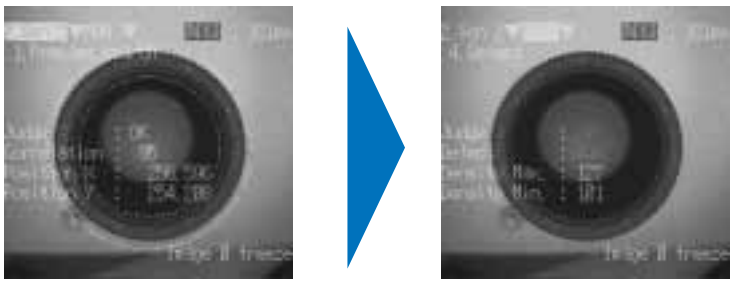
Features

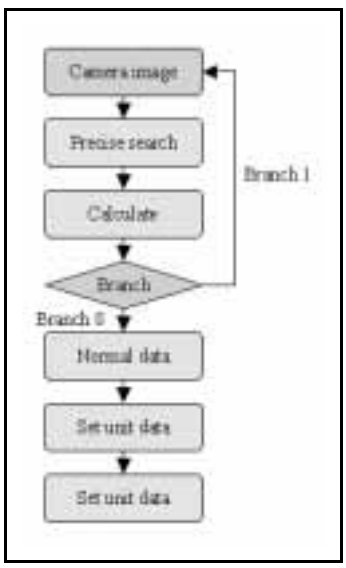
Flow Menus

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

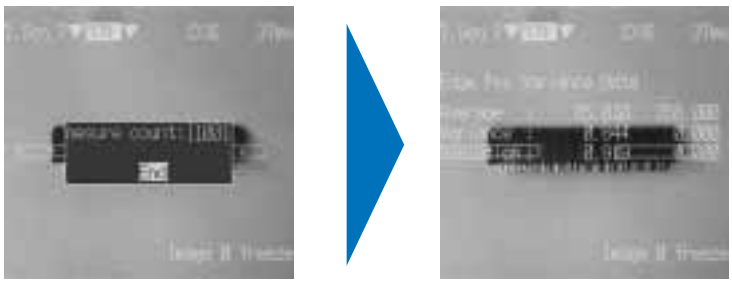
Macros

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

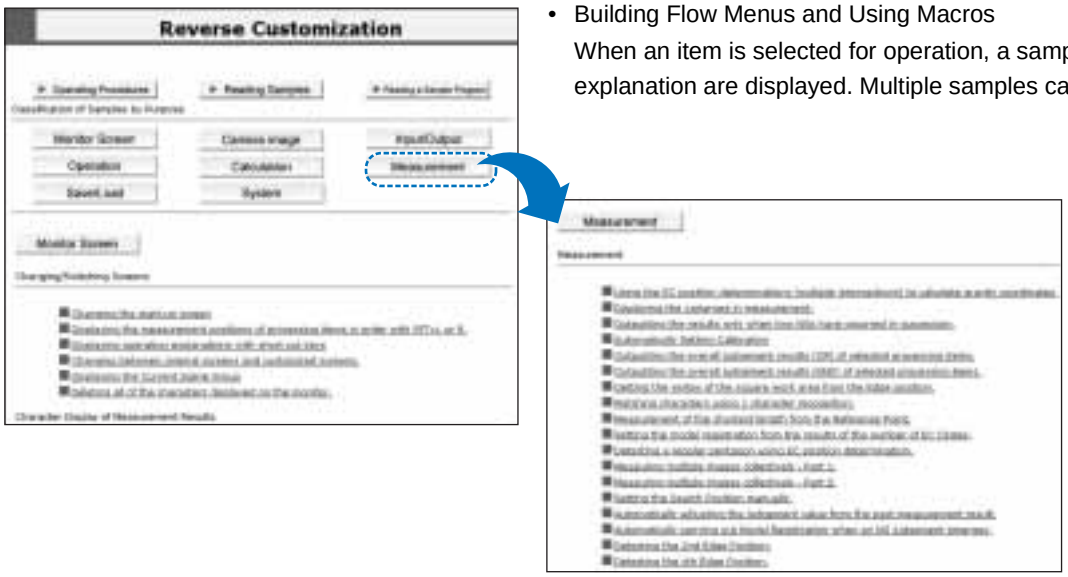
- Creating special menus.
- Displaying and outputting the date and time of NG measurements.
- Automatically saving NG images to a Memory Card.
- Changing the number of registered product types.



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

Camera with Lighting

Cameras with Intelligent Lighting
F160-SLC20
F160-SLC50

Cameras with Intelligent Lighting
F150-SLC20
F150-SLC50

Cameras with Light Source
F150-SL20A
F150-SL50A

Software Package

F250-UM3FE (Flow Menu Format)
F250-UM3ME (Flow Menu and Macro Format)

Console

F160-KP

F150-KP

Camera
Cable
(See note 1.)
F150-VS

F210-C10/C15

Monitor

Color LCD Monitor
F150-M05L

Monochrome CRT Video
Monitor
F150-M09

Camera

F150-S1A

Camera Cable
(See note 1.)
F150-VS

F160-S1/S2
(Double-speed Camera)

F250-C50/C55

Memory Card

F160-N64S (S) (64 MB)

Lense
(See note 2.)

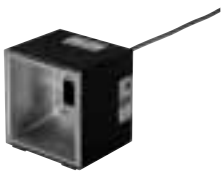
3Z4S-LE C1614A

3Z4S-LE B2514D

3Z4S-LE B5014A

Lighting (See note 2.)

F150-LT20A
F150-LT50A



RS-232C/422
(Common use)
Ethernet (F250)

Personal computer

Parallel Cable

Synchronous Sensor

Programmable Controller

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

Rating/Performance

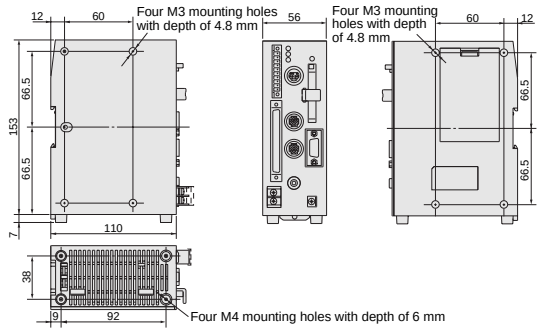
Controller

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)

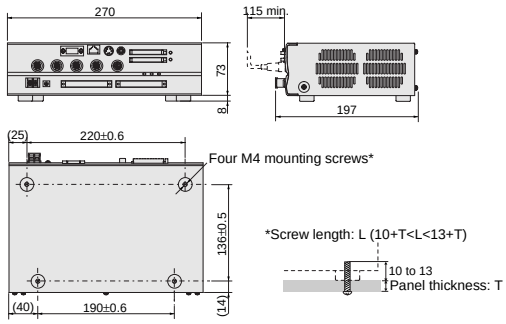
Dimensions

Unit: mm

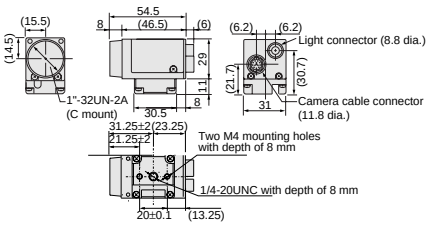
Controller
F210-C10/C15



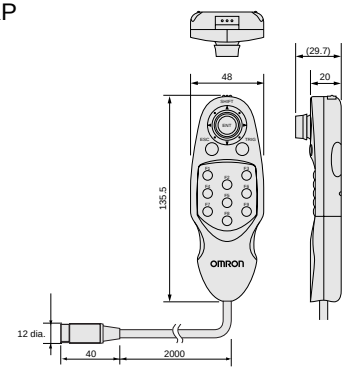
F250-C50/C55



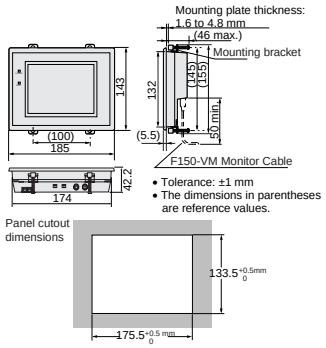
Camera
F160-S1/S2



Console
F160-KP



Liquid Crystal Monitor
F150-M05L



F210

High-performance vision sensor

F250

Advanced algorithm enables ultra high speed and maximum flexibility

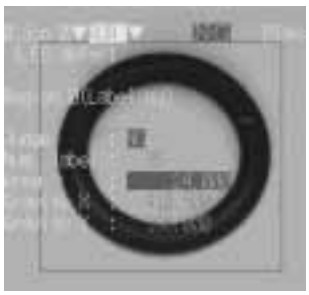
CE

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

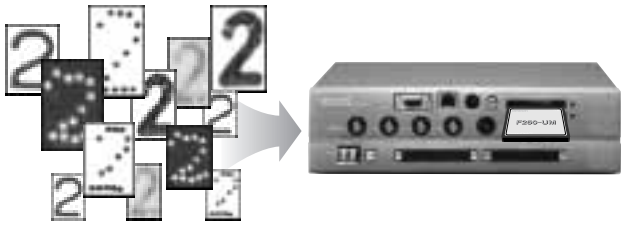
Features

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.

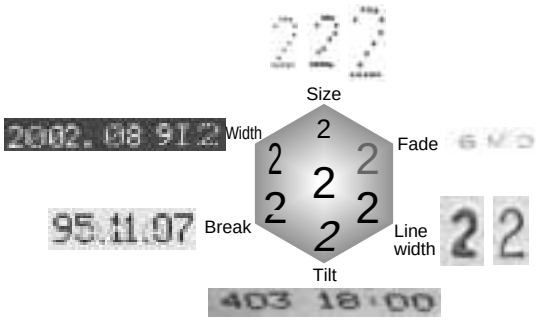
● No need to store a character dictionary

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.

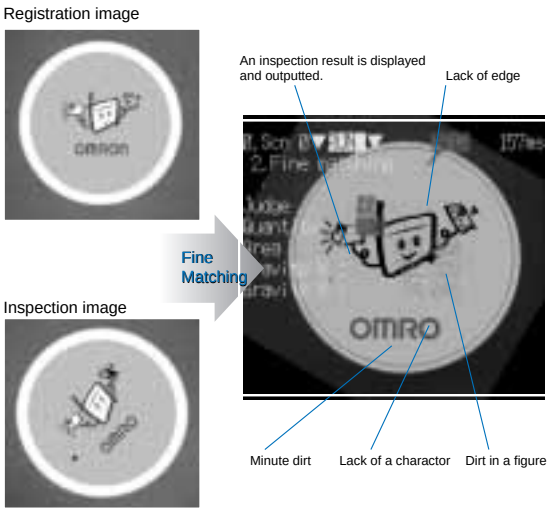
Checks characters printed on the production line such as "Best before" dates and lot numbers. Even if there are deviations in shape, size, or line width, the characters are accurately checked.



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.

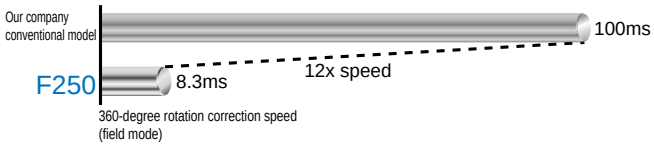
● Example of application to soft drink cap inspection



For fast increasing line speeds and ever stricter quality demands.

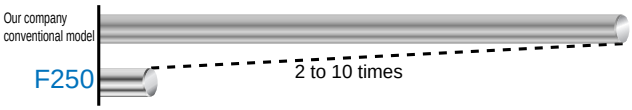
● Real time Revolution Search is amazing

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.

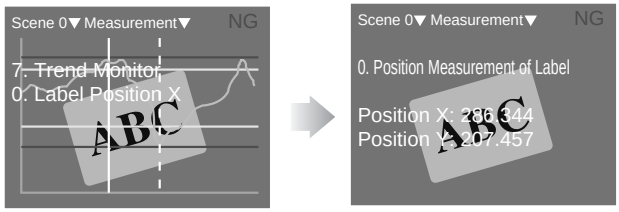


● Fast image read-in

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.

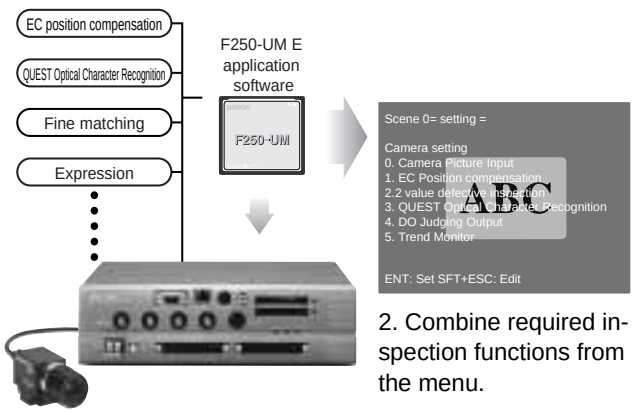


It adjusts checking an inspection history by the trend monitor.

Test measurement is performed as compared with previous NG picture.

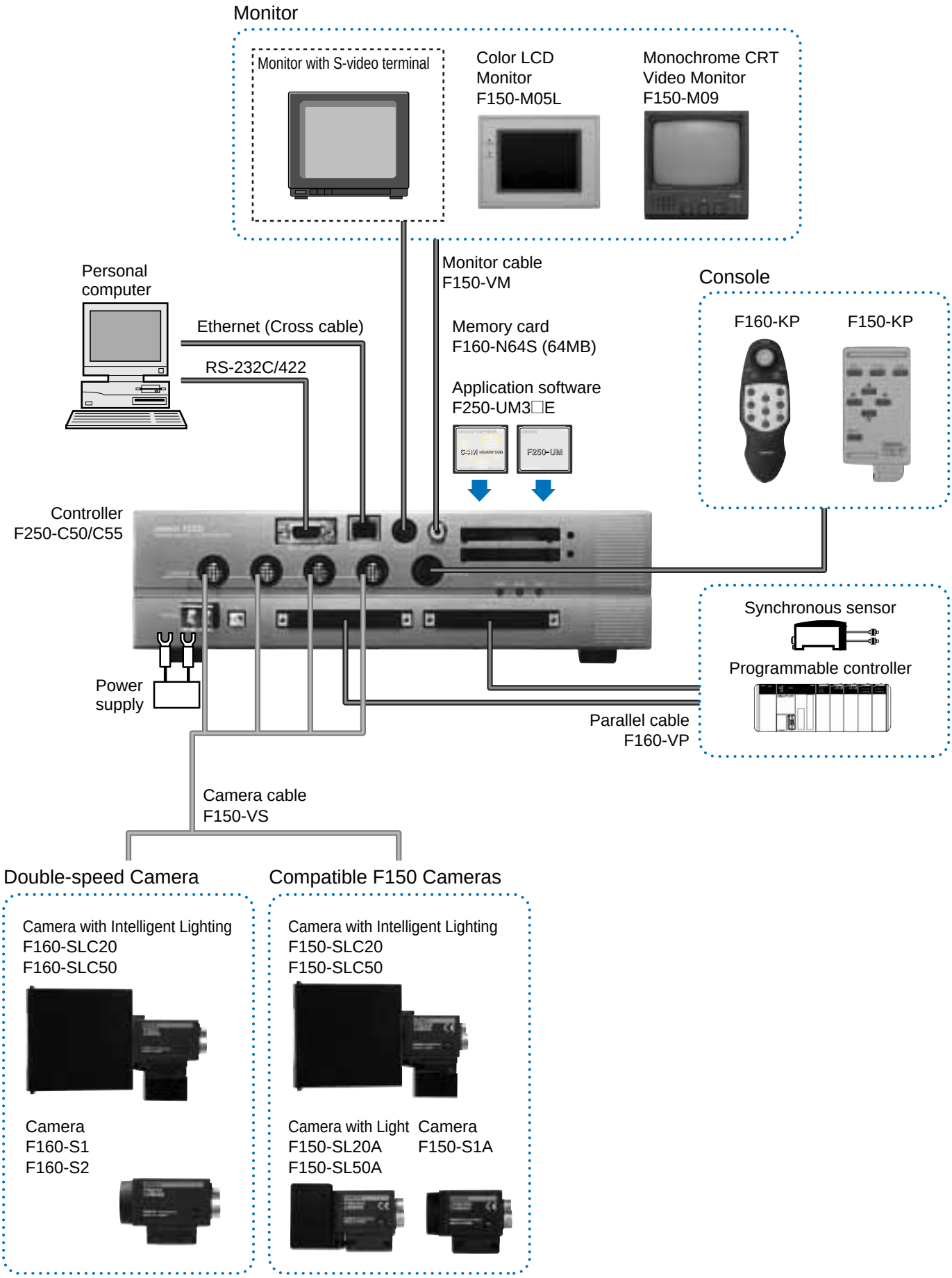
● Easy and flexible settings by means of software application

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

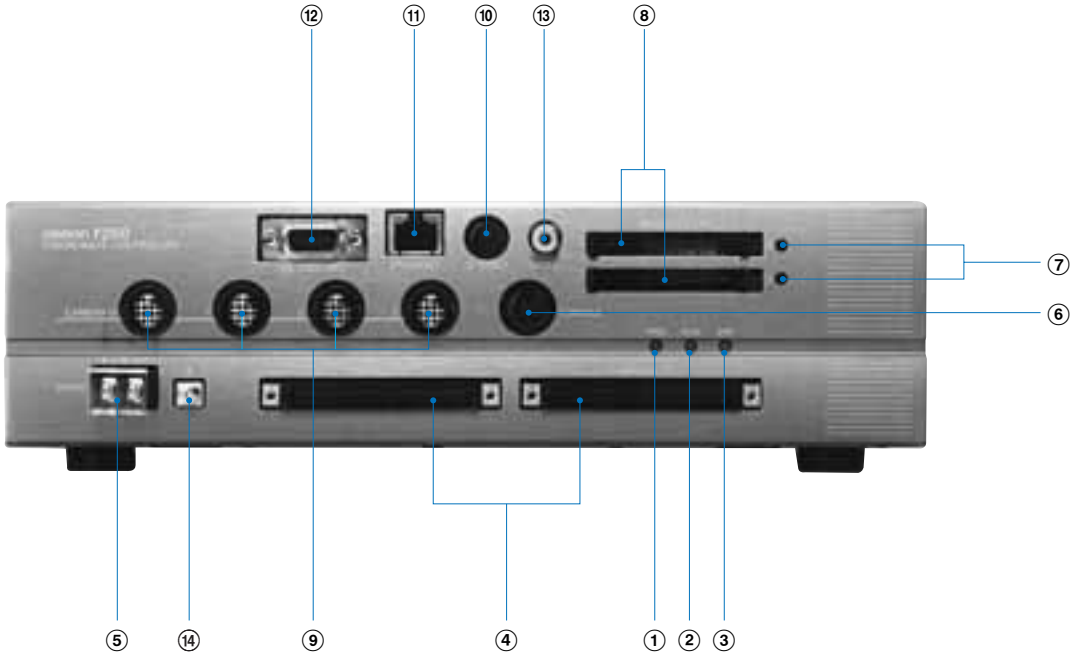
Picture element	1/3“ Interline CCD
Effective pixels	659 x 44 (H x V)
Scanning method	1/60-s non-interlace (frame) mode, 1/120-s 2:1 interlace (field) mode
Shutter	Electronic shutter; select from 8 shutter-speed settings (1/120 to 1/20,000 s) using menu
Camera with Intelligent Light-ing	F160-SLC20 (field 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 Ω)	
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

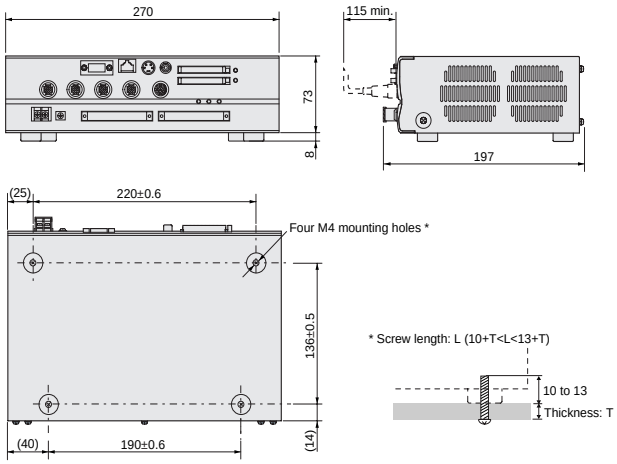
Result display related

- 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)

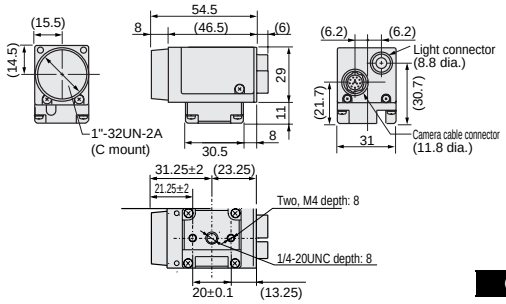
Controller

F250-C50/C55



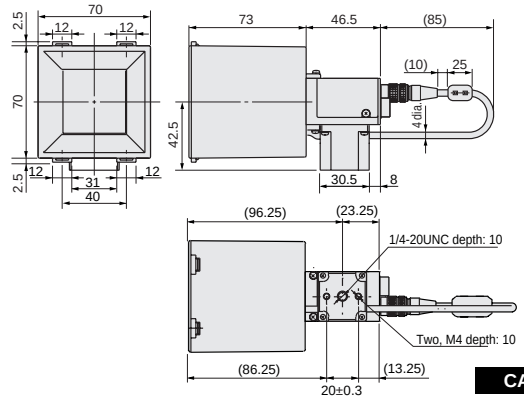
Double-speed camera

F160-S1/S2



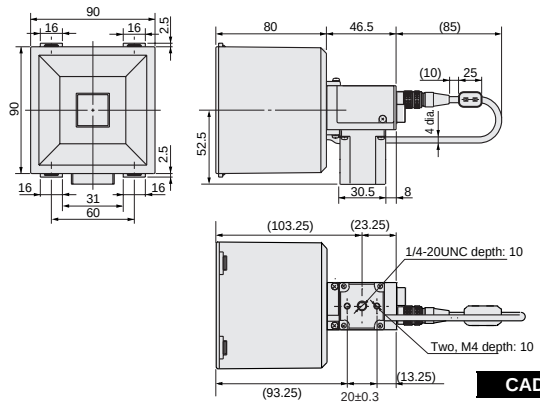
CAD file F160_04

F160-SLC20 (with F150-LTC20 intelligent lighting)



CAD file F160_02

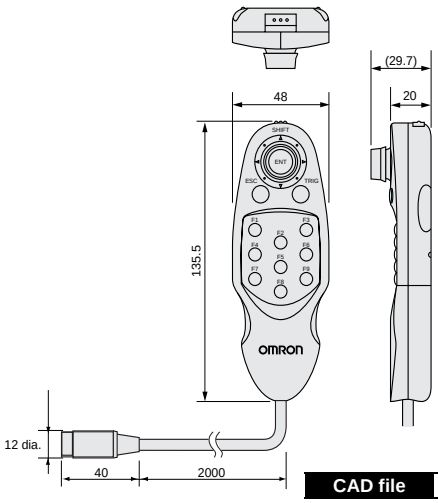
F160-SLC50 (with F150-LTC50 intelligent lighting)



CAD file F160_03

Console

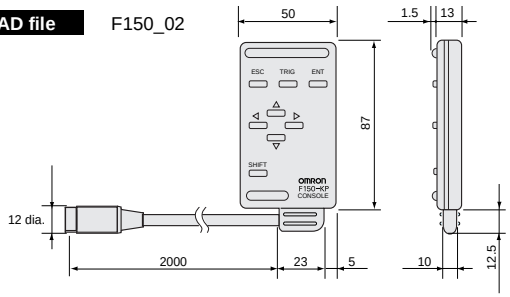
F160-KP



CAD file F160_05

F150-KP

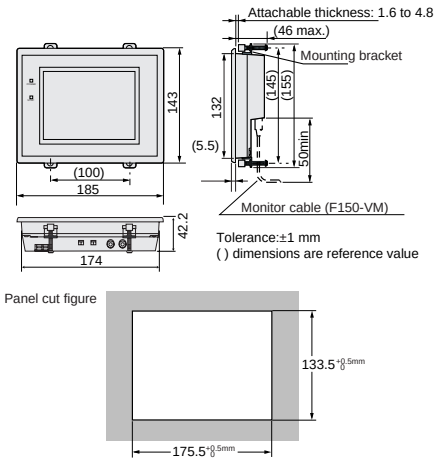
CAD file F150_02



LCD monitor

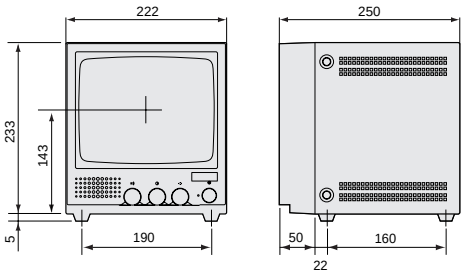
F150-M05L

CAD file F150_06



Video monitor

F150-M09



F250

2-Dimensional Code Reader (Fixed Type)

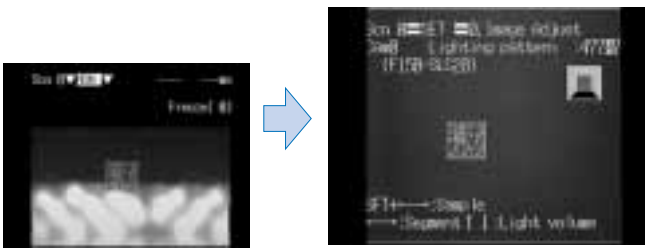
V530-R150E-3, EP-3

Intelligent Light Source and a Two-camera Unit Respond to a Wide Variety of Applications

Features

Intelligent Light Source

Versatile lighting control and a dome shape that minimizes external interference provide stable images for 2-dimensional code reading.



Ring lighting　　Intelligent Light Source

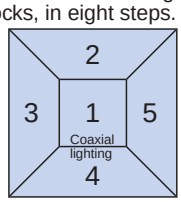
Reduces the background effects of metal processed parts.

A Variety of Lighting Methods

The lighting direction and intensity can be changed. In addition, coaxial lighting is available with the F150-SLC20. Optimal lighting methods can be set for a wide variety of workpieces.

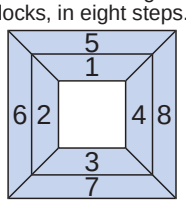
F150-SLC20
(Field of vision: 20 mm)

The light intensity can be set for each of five lighting blocks, in eight steps.



F150-SLC50
(Field of vision: 50 mm)

The light intensity can be set for each of eight lighting blocks, in eight steps.



Lighting Controlled from Menus

- The lighting block and intensity can be controlled from the Controller menu. Settings can be easily changed without having to touch the light itself.
- Because light is handled as scene data, the lighting conditions can be varied to match model changes on mixed-product lines.
- The Controller manages light settings numerically, for accurate reproducibility.

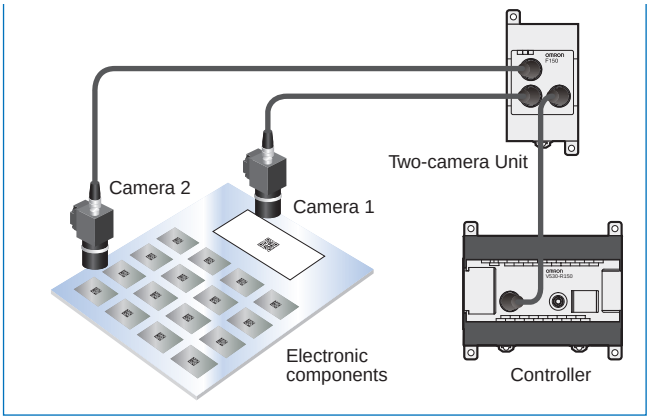
Two-camera Unit

Two cameras can be switched by a single Controller.

Application Example

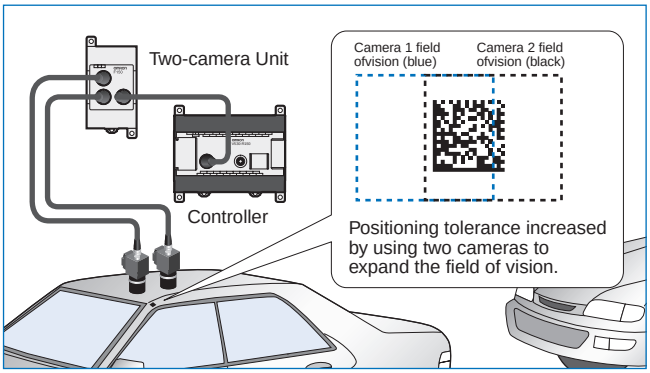
Simultaneous single-product and lot management

Single products and lots can be managed simultaneously.



Greater positioning tolerance

For applications that cannot be covered by the field of view of only one camera.



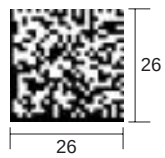
Compatible with Data Matrix Old Version

The V530-R150V3 Controller is also capable of reading the Data Matrix Old Version. (See note.)

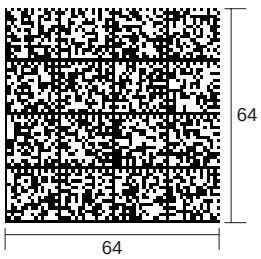
Note: Compatible with ECC000, 050, 080, 100, and 140.

Compatible with Data Matrix ECC200, with Up to 64 × 64 Cells

To enable the use of more information, ECC200 codes with up to 64 × 64 cells (max. of 418 alphanumeric characters) can be read.



Max. of 64 alphanumeric characters.



Max. of 418 alphanumeric characters.

New Guidance Function for the Settings Display

The addition of a guidance function on the display greatly simplifies setting.

Easy-to-Read Analytical Data Format

See the reading status at a glance on the reading information display.
The finder pattern, cell recognition, reading data, etc., can all be viewed on the display.

Finder pattern (cutting symbol)

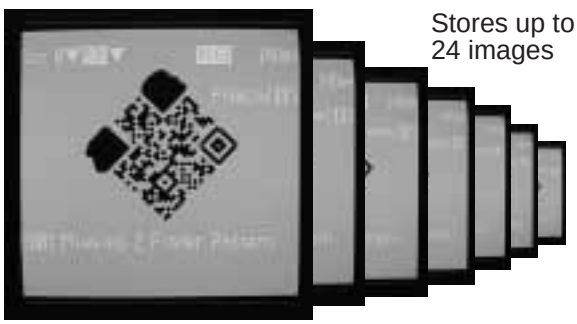
Use this pattern to detect the 2-dimensional code position. The finder pattern is different for each code.

Easy Image Analysis

The image analysis mode helps to detect the cause of marking problems.

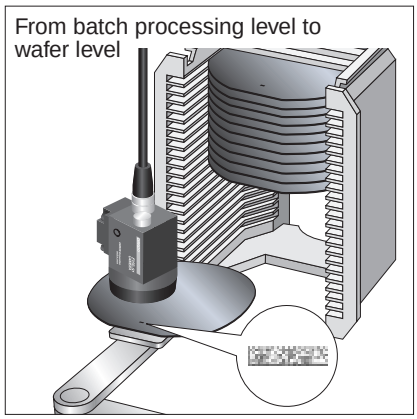
Store up to 24 Defect Images

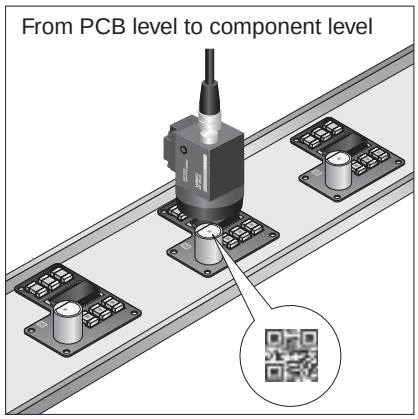
Use the stored images to confirm defect types.

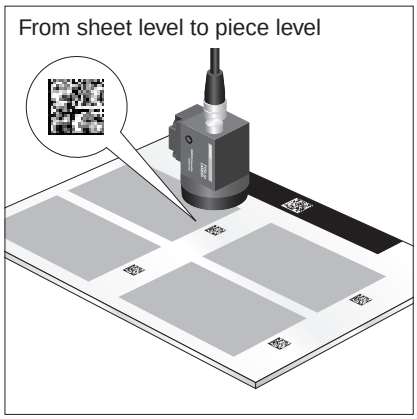


Note: Stored images are kept until the power is turned OFF.

Applications







Ordering Information

List of Models

Name	Model No.
Controller	V530-R150E-3, EP-3
Console	F150-KP
Camera	F150-S1A
Camera Cable (3 m)	F150-VS
Two-camera Unit	F150-A20
Monitor Cable (2 m)	F150-VM
Liquid Crystal Monitor	F150-M05L
Video Monitor	F150-M09

Specifications

Controller

Item	V530-R150E-3, EP-3
Readable codes	Data Matrix ECC200: 10 × 10 to 64 × 64, 8 × 18, 8 × 32,12 × 26, 12 × 36,16 × 36,16 × 48 Data Matrix Old Ver. (ECC000, 050, 080, 100, 140): 9 × 9 to 25 × 25 QR Code (Model 1, 2): 21 × 21 to 41 × 41 (Version 1 to 6)
Readable direction	360°
Number of pixels (resolution)	512 (H) × 484 (V)
Number of connectable cameras	1 (Using F150-A20: 2 max.)
Number of scenes	10
Image memory function	Maximum of 24 images stored.
Operation method	Menu selectable
Processing method	Gray
Monitor interface	1 channel (over scan monitor)
RS-232C I/F	1 channel
Parallel I/O	3 inputs and 9 outputs including control I/O points
Power supply voltage	20.4 to 26.4 VDC
Degree of protection	IEC 60529: IP 20 (panel mounted)
Current consumption	Approx. 0.5 A
Ambient temperature/humidity	0 to 50°C/35% to 85% (with no condensation)
Weight	Approx. 390 g

Camera

Item		F150-S1A
Camera	Picture element	1/3” CCD
	Effective pixels	659 (H) × 494 (V)
	Shutter function	Electronic frame shutter Shutter speed: 1/100, 1/500, 1/2000, or 1/10000 sec (menu selectable)
Lens	Mounting distance	F150-SLC20: 15 to 25 mmF150-SLC50: 16.5 to 26.5 mm F150-SL20A: 61 to 71 mmF150-SL50A: 66 to 76 mm
	Field of view	F150-SLC20/SL20A: 20 × 20 mm, F150-SLC50/SL50A: 50 × 50 mm
Light	Light source	F150-SLC20/50: Red LED/Green LED, F150-SL20A/50A: Red LED
	Lighting method	Pulse (synchronized with camera shutter)
Ambient temperature		Operating: 0 to 50°C, storage: –25 to 60°C (with no icing or condensation)
Ambient humidity		Operating/Storage: 35% to 85% (with no condensation)
Weight (camera only)		F150-ALC20: Approx. 280 g, F150-FLC50: Approx. 370 g, F150-SL20A/50A: Approx. 135 g, F150-S1A: Approx. 80 g

Two-camera Unit

Item	F150-A20
Number of connectable cameras	2
Camera mode	2-camera selectable Single, independent (camera 0/1)
Power supply voltage	20.4 to 26.4 VDC
Current consumption	Approx. 0.3 A
Ambient temperature	Operating: 0 to 50°C storage: –25 to 60°C (with no icing or condensation)
Ambient humidity	Operating/Storage: 35% to 85% (with no condensation)
Weight (2-camera unit only)	Approx. 220 g

Monitor

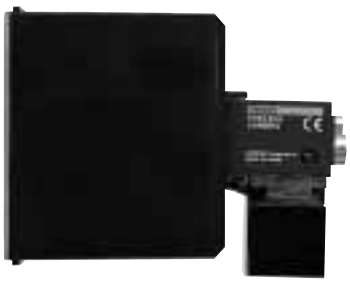
Item	Liquid Crystal Monitor	Video Monitor
	F150-M05L	F150-M09
Size	5.5 inches	9 inches
Type	Liquid crystal color TFT	CRT monochrome
Resolution	320 × 240 dots	800 TV lines min. (at center)
Input signal	NTSC composite video (1.0 V/75 Ω)	
Power supply voltage	20.4 to 26.4 VDC	100 to 240 VAC (–15%, +10%)
Current consumption	Approx. 700 mA	Approx. 200 mA
Ambient temperature	Operating: 0 to 50°C storage: –25 to 60°C (with no icing or condensation)	Operating: –10 to 50°C storage: –20 to 65°C (with no icing or condensation)
Ambient humidity	Operating/Storage: 35% to 85% (with no condensation)	10% to 90% (with no condensation)
Weight (monitor only)	Approx. 1 kg	Approx. 4.5 kg

System Configuration

Cameras

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

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

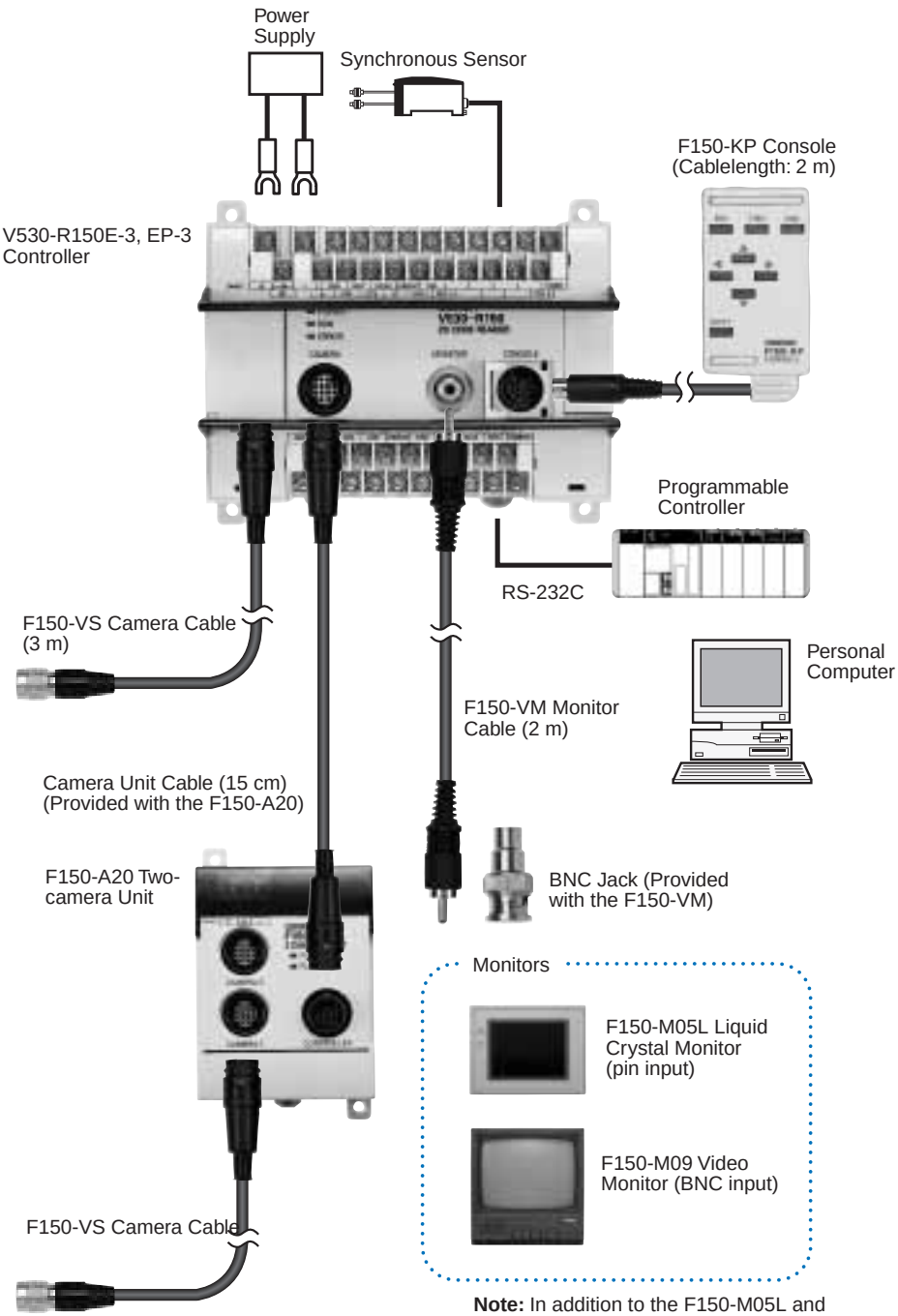


F150-SL20A Camera with Light Source (Field of vision: 20 mm)
F150-SL50A Camera with Light Source (Field of vision: 50 mm)

F150-S1A Camera

Refer to page B-8 concerning the use of this camera.

Note: If the field of vision doesnot match the size of the targetobject you can use an ordinary CCTV lens and lighting.



Note: In addition to the F150-M05L and F150-M09, NTSC monitors with external video input terminals can be used.

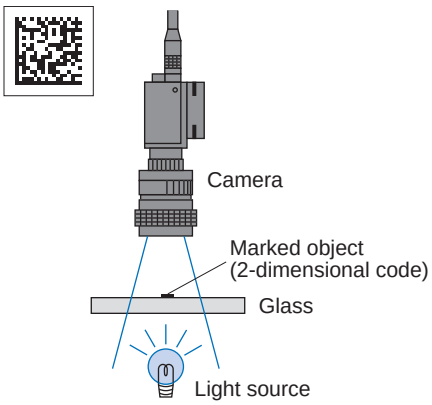
Lighting Methods

Select the appropriate lighting method for the material of the marked object.

Back Lighting

Codes on transparent objects such as glass PCBs can be read by detecting the contrast between transmitted and blocked light.

Applications: Transparent objects such as LCD glass

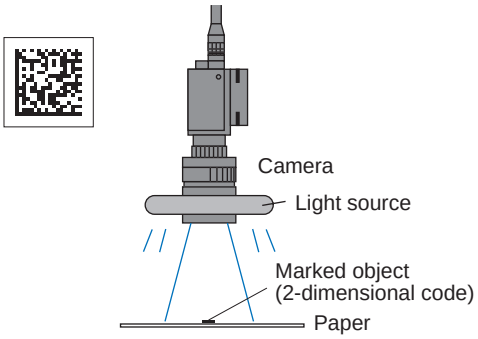


Reflected Lighting

Ring Lighting

For codes printed onto paper or other light-diffusing objects, ring lights can be used to illuminate the marked object. The difference in the reflection factors of the background and the marking enables stable detection.

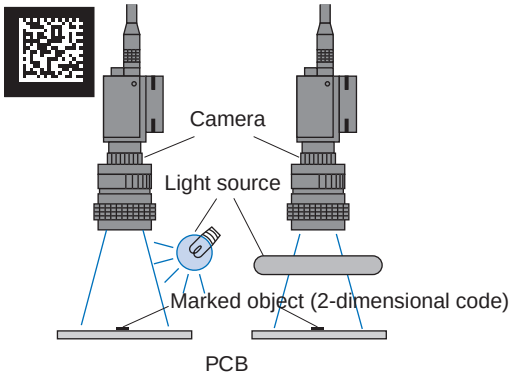
Applications: Paper labels and corrugated cardboard



Oblique Lighting
Ring lighting close to the marked object

For codes inscribed with a laser maker onto PCBs and other relatively glossy surfaces, oblique lighting provides stable detection by distinguishing between regular and diffuse reflected light.

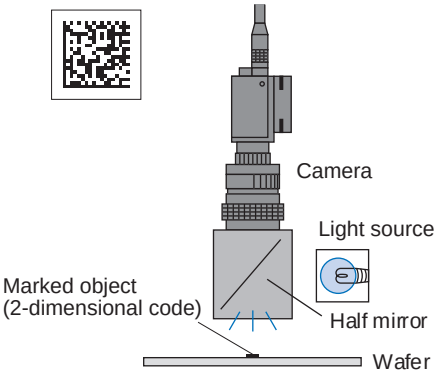
Applications: Direct marking on PCBs and electronic parts



Coaxial Lighting

For codes marked directly onto wafers and other mirror-like surfaces, a stable image with few shadows from surface irregularities can be obtained from the marked object by using coaxial lighting, because it detects only regular reflected light. (The surface of the object must be perpendicular to the optical axis.)

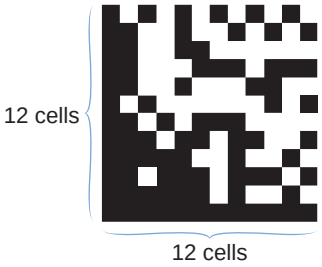
Applications: Mirror-like objects such as wafers



Data Capacity

Data Matrix ECC200

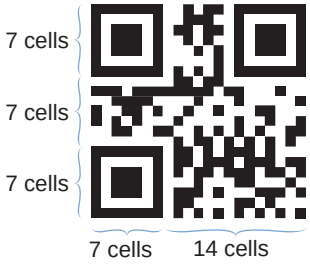
The relation between matrix size (number of cells) and data capacity is shown in the table below. In this example, the matrix size is 12 × 12 cells.



Matrix size	Maximum data capacity				
	Numbers	Alphanumeric characters	Symbols	Japanese Kanji (Shift JIS)	JIS8
10 × 10	6	3	3	---	1
12 × 12	10	6	5	1	3
14 × 14	16	10	9	3	6
16 × 16	24	16	14	5	10
18 × 18	36	25	22	8	16
20 × 20	44	31	28	10	20
22 × 22	60	43	38	14	28
24 × 24	72	52	46	17	34
26 × 26	88	64	57	21	42
32 × 32	124	91	81	30	60
36 × 36	172	127	113	42	84
40 × 40	228	169	150	56	112
44 × 44	288	214	190	71	142
48 × 48	348	259	230	86	172
52 × 52	408	304	270	101	202
64 × 64	560	418	372	139	278
8 × 18	10	6	5	1	3
8 × 32	20	13	12	4	8
12 × 26	32	22	20	7	14
12 × 36	44	31	28	10	20
16 × 36	64	46	41	15	30
16 × 48	98	72	64	23	47

QR Code Model 2

The relation between matrix size (number of cells) and data capacity is shown in the table below. In this example, the matrix size is 21 × 21 cells.



Matrix size (version)	Error correction	Maximum data capacity			
		Numbers	Alphanumeric characters (upper case only)	JIS8	Japanese Kanji (Shift JIS)
21 × 21 (version 1)	L (7%)	41	25	17	10
	M (15%)	34	20	14	8
	Q (25%)	27	16	11	7
	H (30%)	17	10	7	4
25 × 25 (version 2)	L (7%)	77	47	32	20
	M (15%)	63	38	26	16
	Q (25%)	48	29	20	12
	H (30%)	34	20	14	8
29 × 29 (version 3)	L (7%)	127	77	53	32
	M (15%)	101	61	42	26
	Q (25%)	77	47	32	20
	H (30%)	58	35	24	15
33 × 33 (version 4)	L (7%)	187	114	78	48
	M (15%)	149	90	62	38
	Q (25%)	111	67	46	28
	H (30%)	82	50	34	21
37 × 37 (version 5)	L (7%)	255	154	106	65
	M (15%)	202	122	84	52
	Q (25%)	144	87	60	37
	H (30%)	106	64	44	27
41 × 41 (version 6)	L (7%)	322	195	134	82
	M (15%)	255	154	106	65
	Q (25%)	178	108	74	45
	H (30%)	139	84	58	36

Note: **1.** Maximum Data Capacity
The maximum amount of data that can be stored in a code varies with the code size. In other words, if there is a large amount of data to be stored, then the code size must also be large. The maximum data capacity will also vary with the type of characters used. With a QR Code or Data Matrix, the numeric capacity (numbers only) is larger than the alpha numeric capacity (numbers and letters), which is in turn larger than the Japanese Kanji (Shift JIS) capacity. The order and combinations of different characters also affects the data capacity.

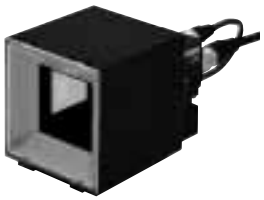
2. The matrix size of a QR Code is indicated by the version. "Version 1" indicates that a QR Code contains (the minimum) 21 cells both horizontally and vertically. The larger the version number, the larger the number of cells per side.

Cameras with Light Source

Cameras with Intelligent Light Source

20-mm field of view	F150-SLC20
50-mm field of view	F150-SLC50

Note: These models consist of an F150-S1A Camera with Lens and Intelligent Light Source.

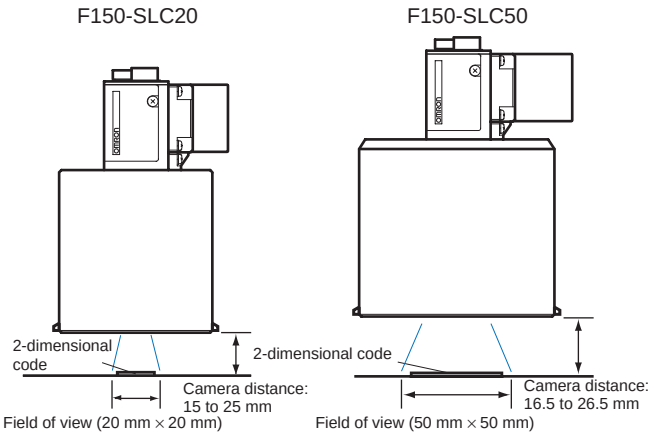


Using the Camera with Intelligent Light Source or Camera with Light Source

- The Lens has a fixed focus. Because there is a certain amount of variation in the field of view and focus of each Lens, the mounting distance must be adjusted each time the Lens or Camera is replaced.
- The camera mounting distance is approximate. Use a mounting method that allows the distance to be adjusted back and forth in the direction of the 2-dimensional code.

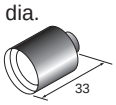
2-Dimensional Code Reader Distance vs. Field of view

Mount the Camera at a distance that will provide accurate imaging of the 2-dimensional codes.



Lenses

CCTV Lenses

CCTV Lenses				
Model	3Z4S-LEB1214D-2	3Z4S-LEC1614A	3Z4S-LEB2514D	3Z4S-LEB5014A
Dimensions	42 dia. 	30 dia. 	30 dia. 	48 dia. 
Locking mechanism	Focus/iris locking mechanism			

Note: Refer to the following optical graph to select the Lens and Extension Tube according to the field of view and camera mounting distance being used.

Extension Tubes

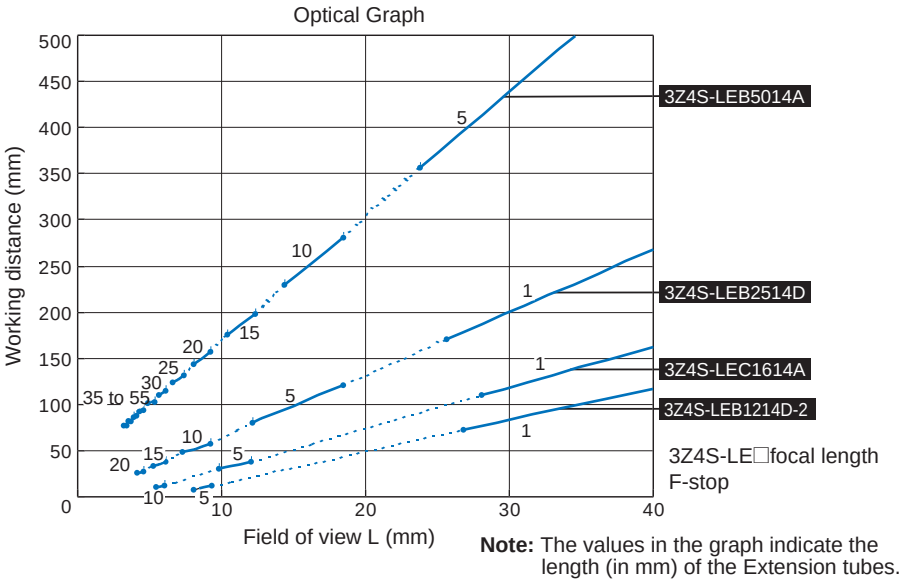
Model	3Z4S-LE EX-C6
Length	A set of six Extension Tubes that are 40, 20, 10, 5, 1, and 0.5 mm in length respectively.

Optical Graph

Point: Based on the necessary field of view and workpiece, select the Lens and Extension Tube to suit the working distance (WD).

Lengthening the Extension Tube lowers the brightness, and increasing distance WD increases the depth of field.

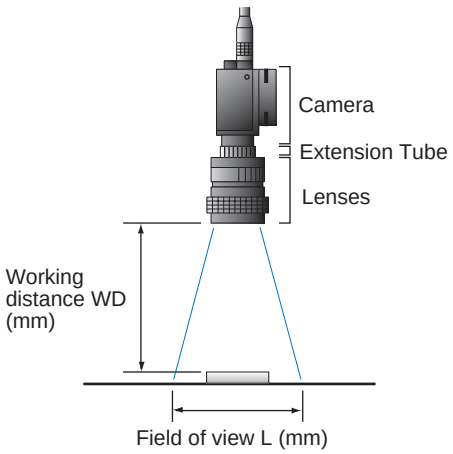
Note: Slight differences exist between cameras. When mounting the Lens, provide a means of adjusting the camera mounting distance. For example, to obtain a camera mounting distance WD of about 30 mm with a field of view of 10 mm, mount a 5-mm Extension Tube to the 3Z4S-LEC1614A.



Note: The values in the graph indicate the length (in mm) of the Extension tubes.

Reading the Optical Graph

The X axis of the graph shows field of view L in millimeters, and the Y axis shows the camera mounting distance A in millimeters. The curves on the graph indicate different Lenses, and the "t" values indicate the lengths of the Extension Tubes.

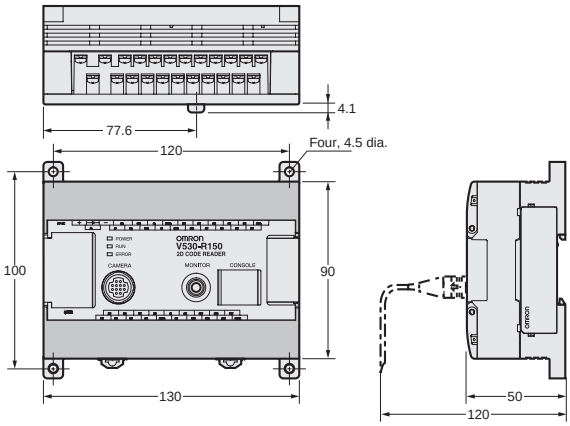


Dimensions

Note: All units are in millimeters unless otherwise indicated.

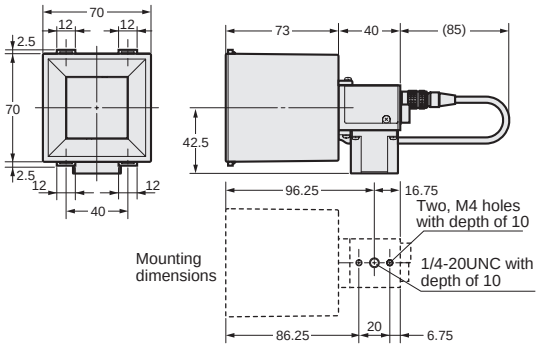
2-Dimensional Code Reader

V530-R150E-3, V530-R150EP-3

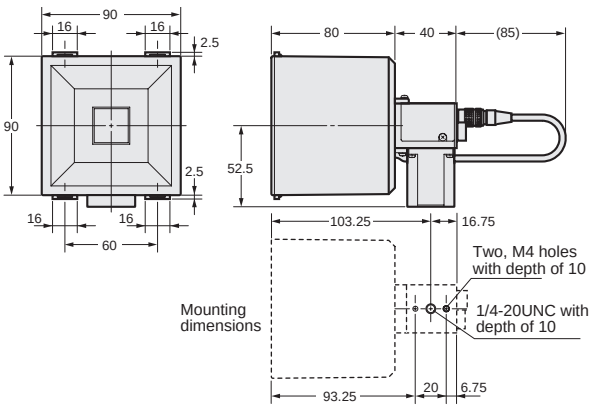


Camera

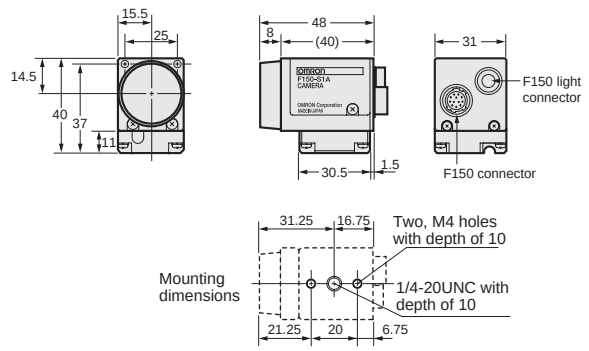
F150-SLC20
(Camera with F150-LTC20 Intelligent Light Source)



F150-SLC50
(Camera with F150-LTC50 Intelligent Light Source)

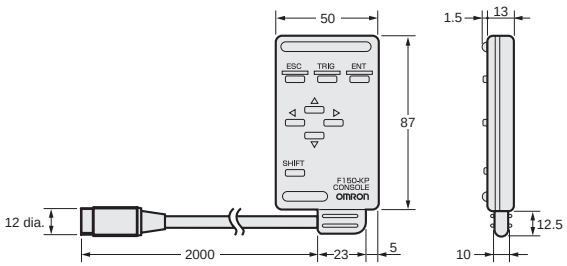


F150-S1A (Camera only)



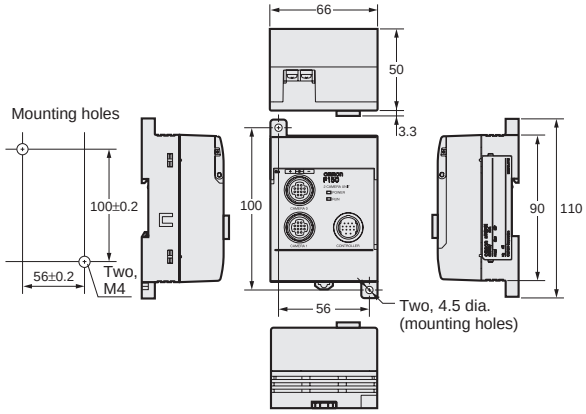
Console

F150-KP



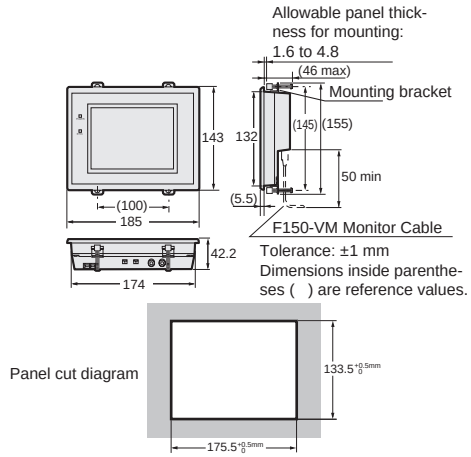
Two-camera Unit

F150-A20



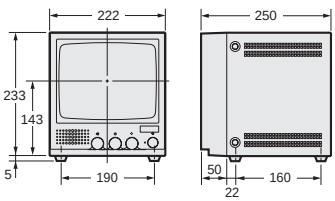
Liquid Crystal Monitor

F150-M05L



Video Monitor

F150-M09



2-Dimensional Code Reader (Fixed Type)

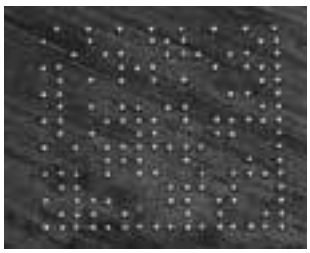
V530-R160E, EP

A code reader that handles pin-stamped markings!

Features

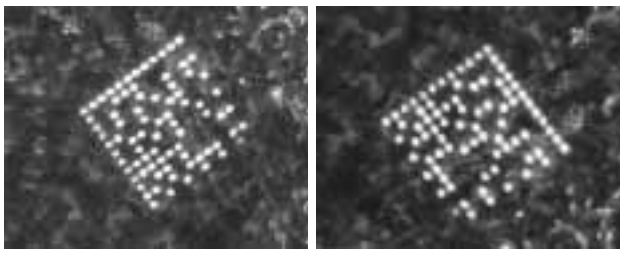
Dependably Read Pin-stamped Markings

- Markings made by pin-stamping machines can be dependably read, providing the user with a wider range of selection of marking devices.
- Stable reading is possible even if the shape of cells changes because of aging in the marking device.
  (Reference: Stamping using a Vector Co. pin-stamping machine)



Dot Codes* Read at Any Angle: 360° Compatibility

- Codes can be read even with rough backgrounds on the casting surface or other locations.
- Dot codes* can be read at any angle through a 360° range.
  * Dot codes are 2-dimensional codes in which dots form the cells.

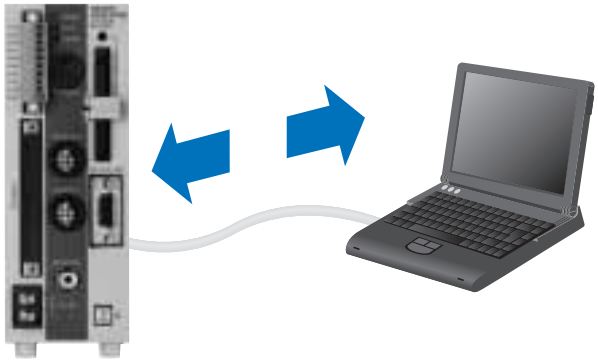


Dependably Read Markings at an Angle

With dependable reading at an angle, installation is possible even on existing facilities with space limitations.

Easy Setup

Setup is easily achieved with a Memory Card (compact flash memory) slot on the V530-R160E and V530-R160EP. Just insert a card to easily copy settings or save images. Carrying a personal computer and cables is no longer required for process switchovers.



Easy Operation and Maintenance

Trends can be monitored to achieve the following:

- Displaying changes in the status (correlation values) of codes or contrast changes on line graphs on a monitor.
- Setting alarm levels while monitoring graphs.
- Outputting external alarms if a value falls below the set value.

Trend monitoring can be used to set guidelines for replacing parts in lighting devices, marking devices, and other equipment.

Easy Analysis

Manage Data Histories

Histories of the number of OK and NG reads can be managed.

Save Images to Memory Cards

Save approx. 200 images in 64 MB and 400 images in 128 MB.

Check and Analyze Troubles

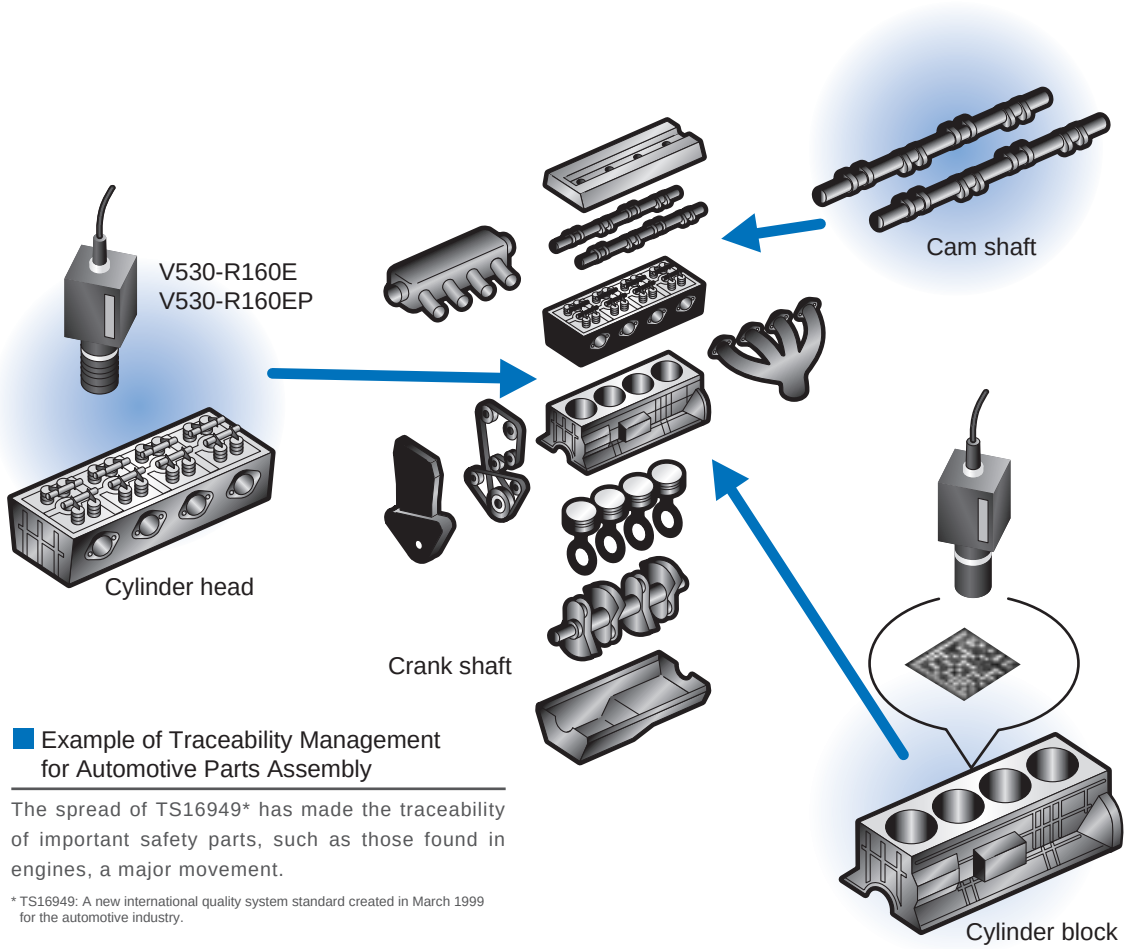
Up to 35 NG images can be saved in internal memory.

Reproduce Images

Saved NG images can be loaded to reproduce a reading.

Using time stamps on NG images with data histories enables more detailed troubleshooting.

Applications



■ Example of Traceability Management for Automotive Parts Assembly

The spread of TS16949* has made the traceability of important safety parts, such as those found in engines, a major movement.

* TS16949: A new international quality system standard created in March 1999 for the automotive industry.

Ordering Information

List of Models

Name	Model No.	Remarks
Controller	V530-R160E, V530-R160EP	
Console	F150-KP	2-m cable
Camera	F150-S1A	
Camera Cable	F150-VS	3-m cable
Monitor Cable	F150-VM	2-m cable
Liquid Crystal Monitor	F150-M05L	
Video Monitor	F150-M09	
Parallel Cable	F160-VP	Cable with loose wires for Parallel I/O Connector (2-m cable)
Memory Card	F160-N64S(S)	Card capacity: 64 MB
RS-232C Cable	XW2Z-200S-V	For IBM PC/AT or compatible computer (2-m cable)
	XW2Z-200T	For SYSMAC PLC (2-m cable)

Specifications

V530-R160E, V530-R160EP Controller

Item	Specifications	
Model	V530-R160E	V530-R160EP
Input/Output type	NPN	PNP
Applicable codes	Data Matrix ECC200: 10 × 10 to 64 × 64, 8 × 18, 8 × 32, 12 × 26, 12 × 36, 16 × 36, 16 × 48 Data Matrix ECC000, ECC050, ECC080, ECC100, ECC140: 9 × 9 to 25 × 25 QR Code (Model 1, 2): 21 × 21 to 41 × 41 (Version 1 to 6)	
Readable direction	360°	
Number of pixels (resolution)	512 (H) × 484 (V)	
Number of connectable cameras	2 max.	
Image memory function	Maximum of 35 images stored (internal memory in Controller).	
Operation method	Selected from menu.	
Processing method	Gray	
Memory Card slot	1	
Monitor interface	1 channel (color/monochrome)	
Serial communications	RS-232C/422A, 1 channel	
Parallel I/O	5 inputs: TRIG-A, TRIG-B, TRIG-C, TRIG-D, and RESET 6 outputs: RUN, ERROR, OK/NG, BUSY, GATE, and ALARM	
Power supply voltage	20.4 to 26.4 VDC	
Current consumption	Approx. 1.6 A max.	
Ambient temperature	Operating: 0 to 50°C, storage: –25 to 65°C (with no icing or condensation)	
Ambient humidity	35% to 85% (with no condensation)	
Weight	Approx. 570 g	

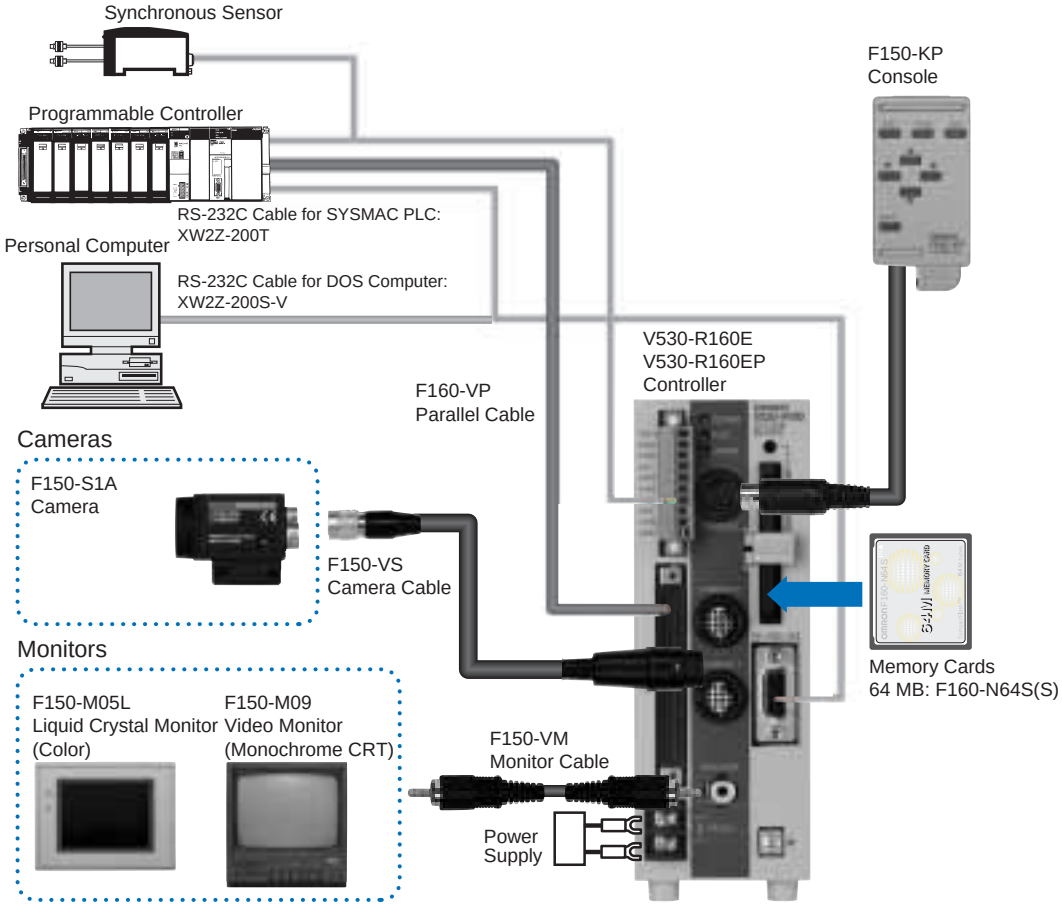
F150-S1A Camera

Item	Specifications
Picture element	1/3-inch CCD
Effective pixels	659 (H) × 494 (V)
Shutter function	Electronic frame shutter Shutter speed: 1/100, 1/500, 1/2000, or 1/10000 s (menu selectable)
Ambient temperature	Operating: 0 to 50°C, storage: –25 to 60°C (with no icing or condensation)
Ambient humidity	35% to 85% (with no condensation)
Weight	Approx. 80 g

Monitor

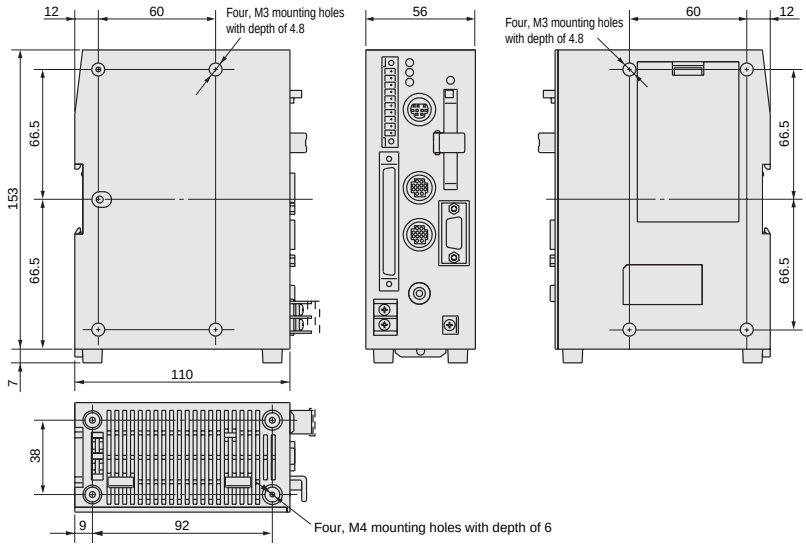
Item / Name / Model No.	Liquid Crystal Monitor F150-M05L	Video Monitor F150-M09
Size	5.5 inches	9 inches
Type	Liquid crystal color TFT	Monochrome CRT
Resolution	320 × 240 dots	800 TV lines min. (at center)
Input signal	NTSC composite video (1.0 V/75 Ω)	
Power supply voltage	20.4 to 26.4 VDC	85 to 264 VAC
Current consumption	Approx. 700 mA	Approx. 200 mA
Ambient temperature	Operating: 0 to 50°C, storage: –25 to 65°C (with no icing or condensation)	Operating: –10 to 50°C, storage: –20 to 65°C (with no icing or condensation)
Ambient humidity	Operating/Storage: 35% to 85% (with no condensation)	Operating/Storage: 10% to 90% (with no condensation)
Weight (Monitor only)	Approx. 1 kg	Approx. 4.5 kg
Accessories	Operation manual, 4 mounting brackets	Operation manual

System Configuration

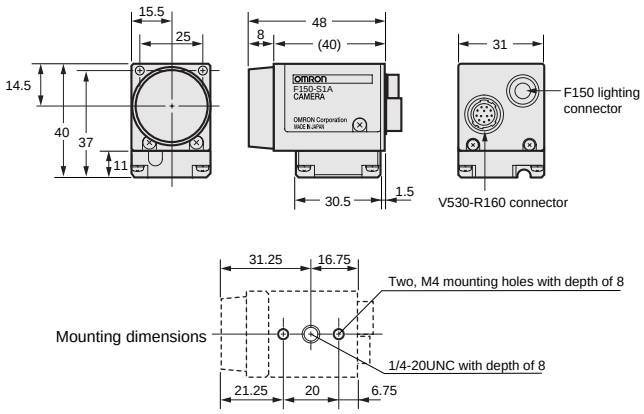


Dimensions

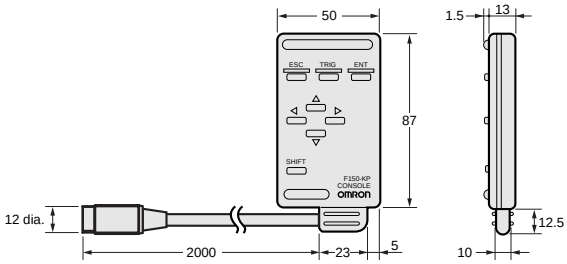
V530-R160E, V530-R160EP Controller



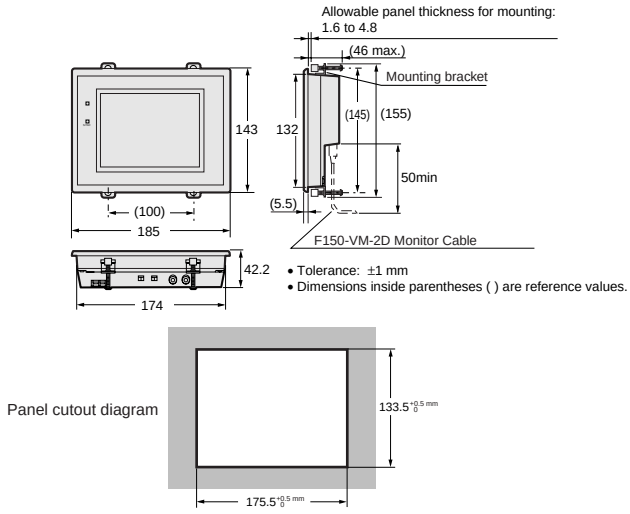
F150-S1A Camera



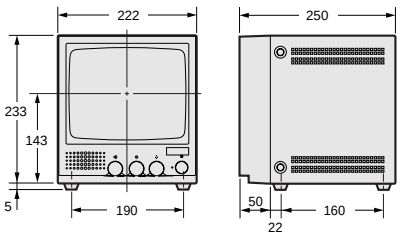
F150-KP Console



F150-M05L Liquid Crystal Monitor



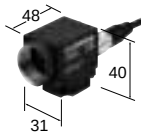
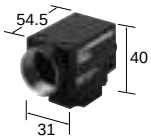
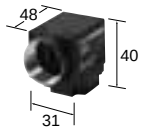
F150-M09 Video Monitor



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

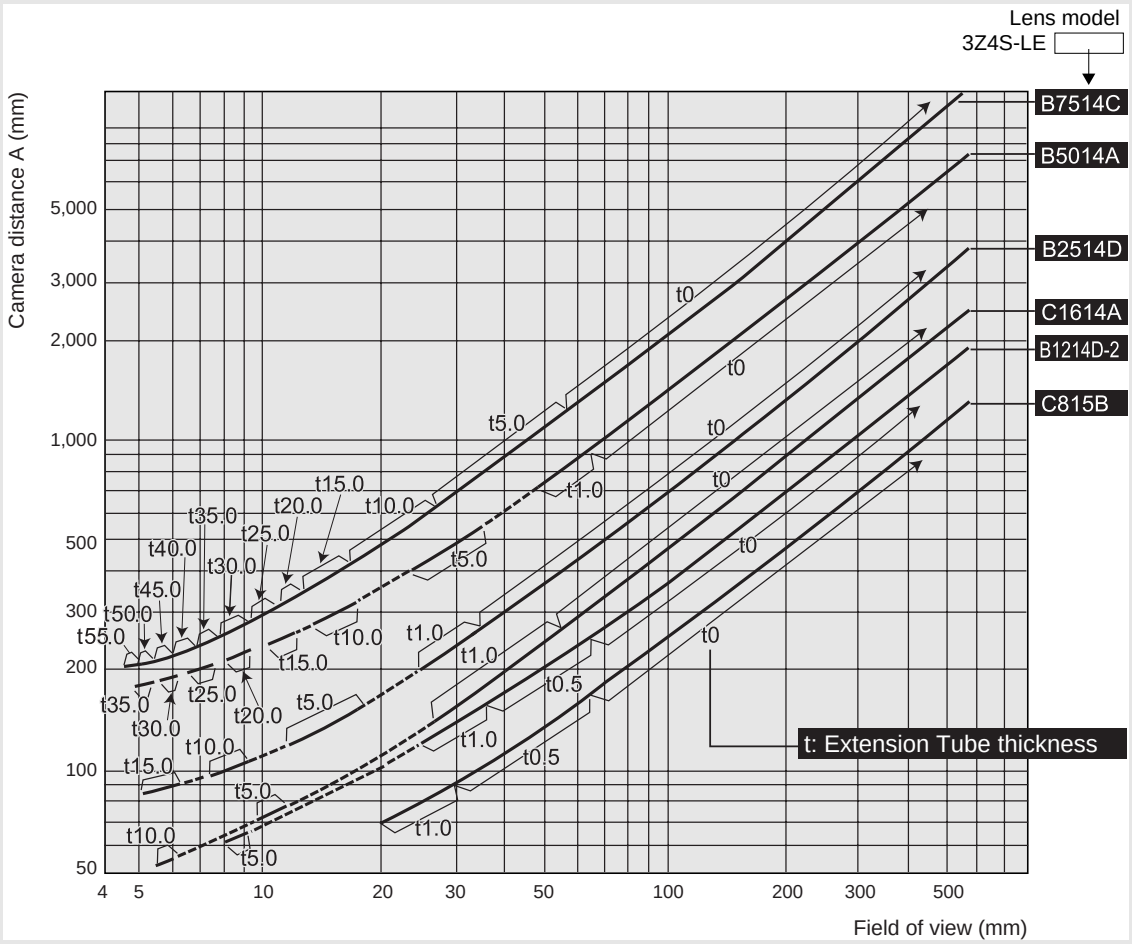
Item \ Model		F150-S1A	F160-S1/S2	F400-S1
Item		Shutter camera		
Visual appearance				
Image pick-up		1/3 inch CCD fixed imaging element	1/3 inch color CCD	
Number of elements		659(H) x 494(V)		
Synchronization method		External synchronization		
Scanning method		Non-interlace method	Non-interlace method 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

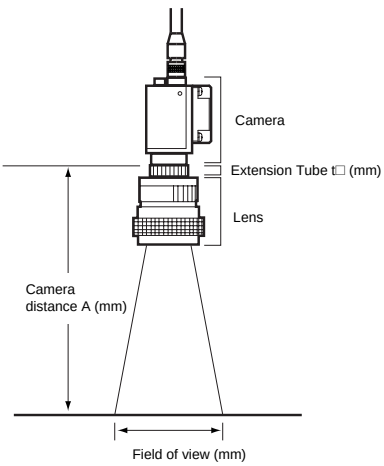
Camera models
F400-S1,
F150-S1A
F160-S1/S2



How to read the optical graphs

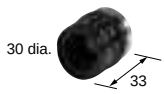
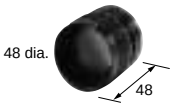
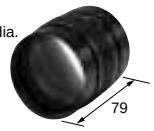
The horizontal axis of each optical graph is the field of view "L" (mm) and the vertical axis is the camera installation distance "A" (mm). Each line represents a lens, and the value "t" is the thickness of the connecting ring.

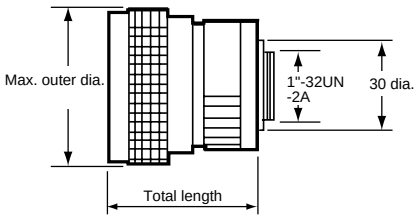
The values given in the optical graph are only approximate values. It is recommended that the camera distance is adjusted by sliding the Camera forward or backward to get the required field of view for actual operation



Ordering Information

Lens

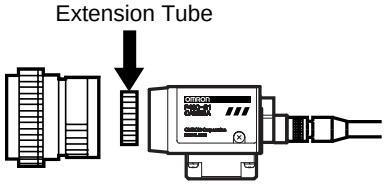
Item \ Model	CCTV lens					
	3Z4S-LE C815B	3Z4S-LE B1214D-2	3Z4S-LE C1614A	3Z4S-LE B2514D	3Z4S-LE B5014A	3Z4S-LE B7514C
Visual appearance						
Focal length	8.5 mm	12.5 mm	16.0 mm	25.0 mm	50.0 mm	75.0 mm
Brightness	F1.5	F1.4				
Filter size	M40.5 x P0.5		M27 x P0.5		M46 x P0.75	M58 x P0.75
Lock mechanism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



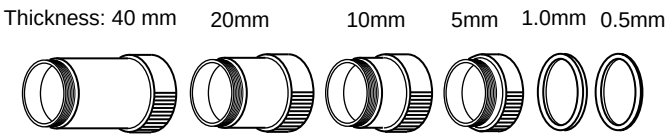
Extension ring

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



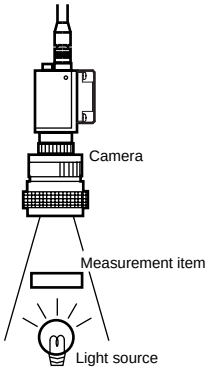
Note 1. Do not use multiple 0.5 mm and/or 1.0 mm extension rings in combination. It will not be possible to tighten the screws sufficiently.
2. Depending on vibration conditions, additional support may be necessary if the extension exceeds 30 mm.

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



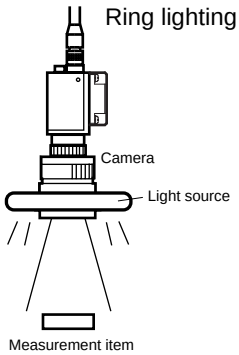
High contrast guarantees a stable image.

Application

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

Reflective lighting

Ring lighting

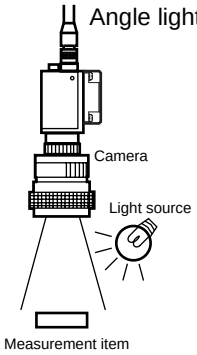


Even illumination is possible.

Application

Inspection of object surface

Angle lighting

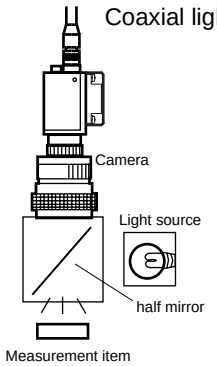


Detection using the difference between regular reflection and diffuse reflection is possible.

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.

MEMO