OMRON

FQ2 Smart Camera

The New Standard for Image Inspection

New OCR and Code Reader with Built-in Dictionary

» Advanced inspection in a compact housing

» Expanded performance and functionality

» Camera, Communications, Software Tools, and Much More

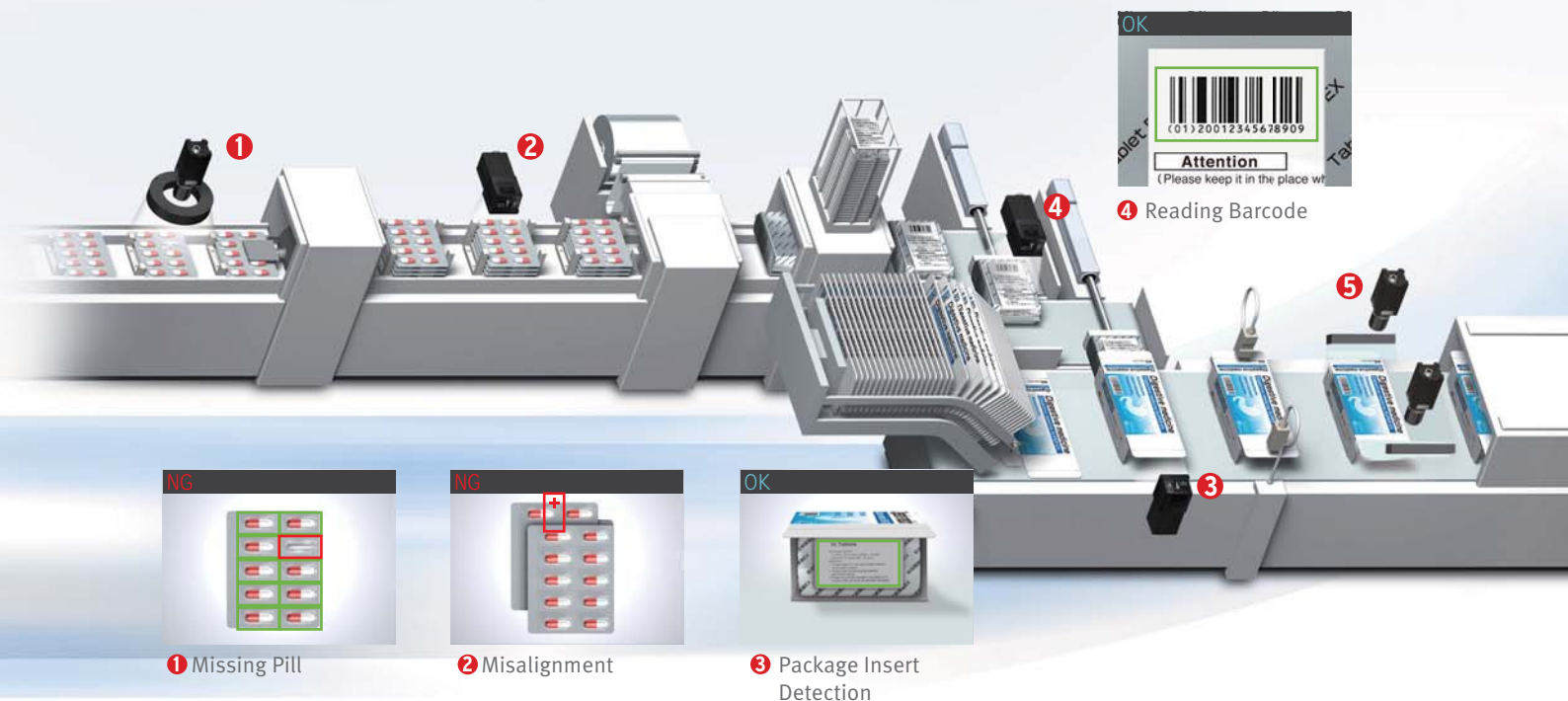realizing

Introducing the Smart Heavyweight

New OCR and Code Reader with Built-in Dictionary

Inspection capabilities, camera options, and communication options -- this powerful heavyweight has it all.

This Vision Sensor provides all of the best-selling features found in high-end models without the need as in vision system for a separate controller. This new Smart Camera was designed to attract potential customers to try the FQ2 Series.

Code Reader	**High-speed** image processor	**Megapixel capacity**	**Real color**	**Monochrome**	**C** -mount	**9** inspection items	**11** image filters	**32** -camera expansion	**360°** position compensation	**Ultra-wide** field of view	**DAP** partial input
OCR	**HDR**	**Sub-pixel processing**	**High-power lighting**	**IP67**	**E-IP**	**PLC** Link	**FINS**	**34 I/O** points	**RS-232C**	**Password**	**Image inversion**

④ Reading Barcode

❶ Missing Pill

❷ Misalignment

❸ Package Insert Detection

Three Improvements for an effective Machine Design

Compact Body

All in one Vision Sensor

All-in-one compact size that is perfect for use in tight spaces or as an aftermarket option.
Compared to more-advanced Vision Sensors with multiple components, this Sensor boasts a much more efficient hardware design.
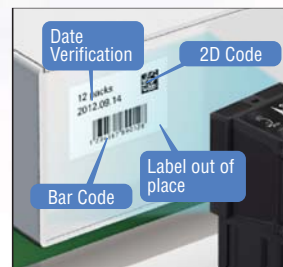
Extended Functions

Image Sensor, OCR, and Code Reader in One

The OCR function, with a "build-in" dictionary and the Code Reading, ability to recognize 15 codes types add to the solution and provide a powerful upgrade !

Date Verification
2D Code
12 packs
2012.08 14
Label out of place
Bar Code

Diverse Lineup

### A Lineup That Fits a Wide Range of Equipment

Expanded inspection menu, camera variations, and communication interfaces with the same pricing level as our previous FQ Series.
With a wide range of sensors, an option for every application now becomes a standard option.

OK

Capsules

❺ Hot-melt Detection

OK

Expiration date 2012.06
Lot No. A12345

❻ Date Verification and Tape Detection

OK

❼ Reading Barcode

❻

❼
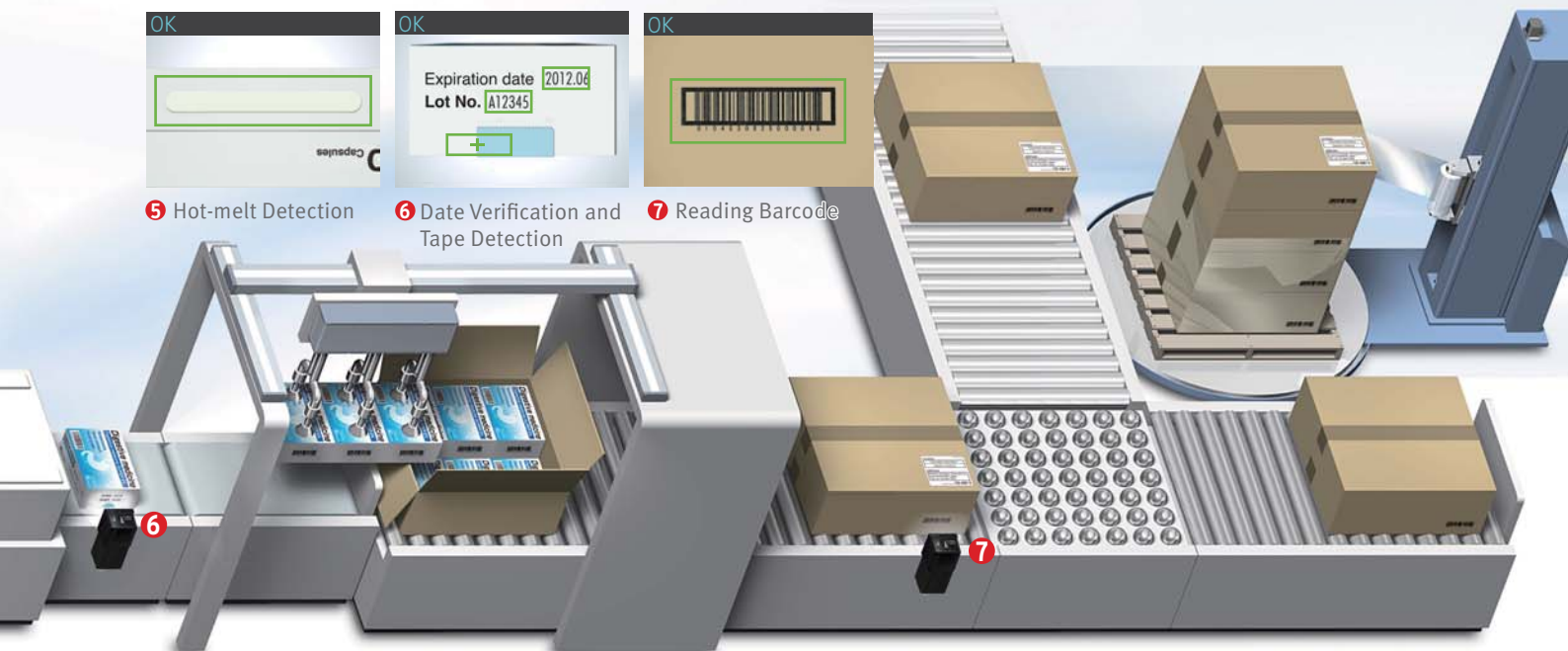
All You Need is One

## All You Need in One Package

Image Processor

Although previous Vision Sensors placed the image processor in a separate Controller, now we have built the processor into the camera unit.

High-power Lighting

The Sensor includes high-power lighting capable of evenly lighting across a wide field of view.
This provides sufficient lighting even when the enclosed polarizing filter is used.

Adjustable lens

The focus of the lens can be adjusted to take clear images for the specific field of view and installation distance you need.

Focus adjustment screw
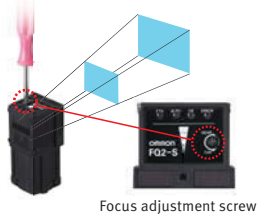
I/O Power Supply Connector

The external output line for inspection results, the input line for changing the setup, and the power supply line are all combined into one connector.

Ethernet Connector

Commands can be input from a PLC to control the FQ2, and inspection results and measurement results can be output from the FQ2 to a PLC.
You can also transfer images to a computer.

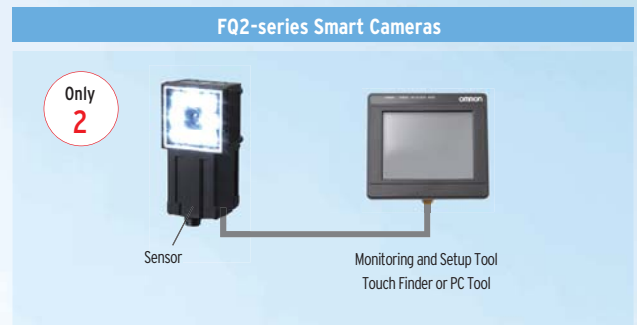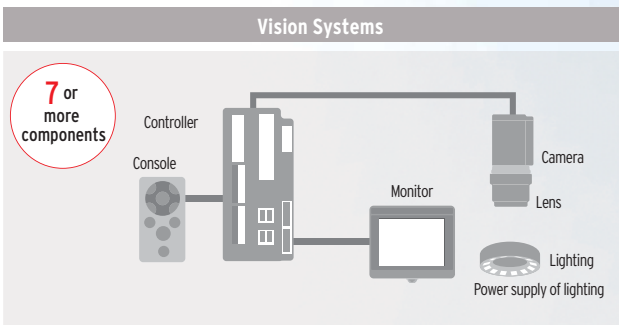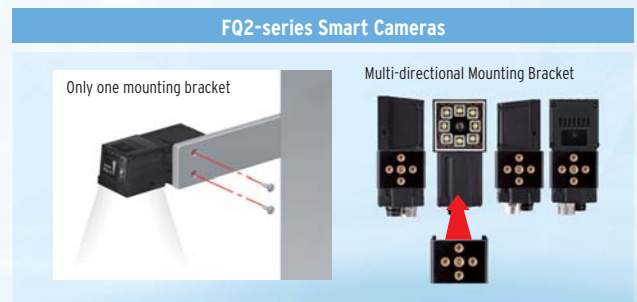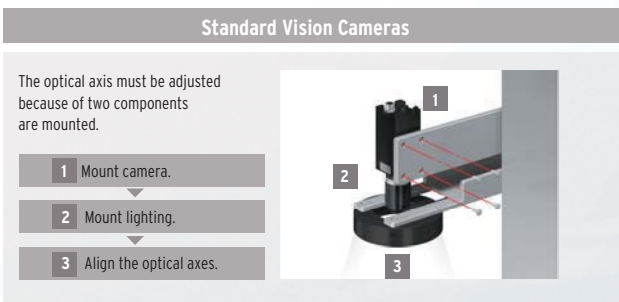| IP67 Water Resistance	Flexible Cables	Smart Click Connectors
The sensor can be used in wet environments.	All cables from the camera are flexible. This allows the Sensor to be used safely on moving parts.	Connection is made quick and easy with a clear, definitive click-into-place mechanism.

Quick and Easy Design and Installation

Easy Product Selection

All you need to do is select the camera based on the field of view and installation distance that you require. There is no need to select and purchase additional lighting or lenses. Furthermore, the time required to wire everything has been drastically reduced due to the low number of components.

Vision Systems	FQ2-series Smart Cameras

7 or more components

Controller

Console

Monitor

Camera

Lens

Lighting
Power supply of lighting

Only 2

Sensor

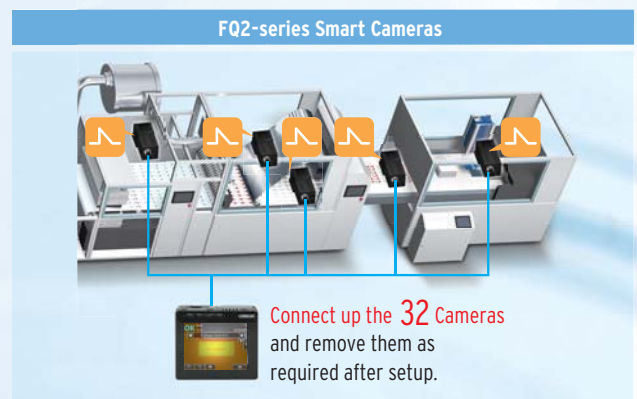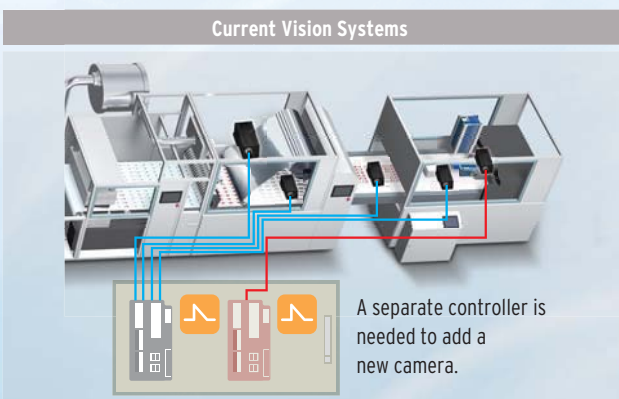Monitoring and Setup Tool
Touch Finder or PC Tool

Easy Installation

The camera and lighting have been integrated into a single unit, so only one camera mounting bracket is required. The Sensor comes with a multi-directional mounting bracket that can be attached on any of the four sides of the Camera. Axis alignment is also not required because the lighting and the camera are integrated into a single unit.

Standard Vision Cameras	FQ2-series Smart Cameras

The optical axis must be adjusted because of two components are mounted.

1 Mount camera.

2 Mount lighting.

3 Align the optical axes.

Only one mounting bracket

Multi-directional Mounting Bracket

Easy Expansion   Up to 32 Cameras

Just install the Cameras where you need them. No control panels are required to house the controllers. Triggers can be input for each Camera, so new Cameras can be added whenever required without having to worry about timing input design. Up to 32 Cameras can be set up from a single Touch Finder, so you do not need to worry about adding new monitors when you need more Cameras. This also allows you to smoothly respond to user requests for additional features.
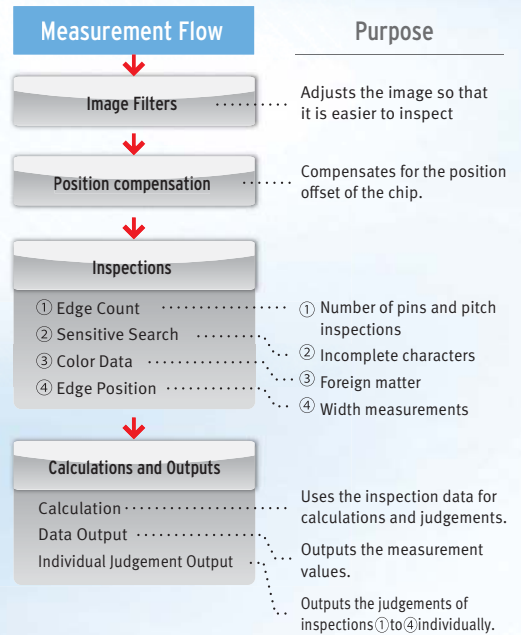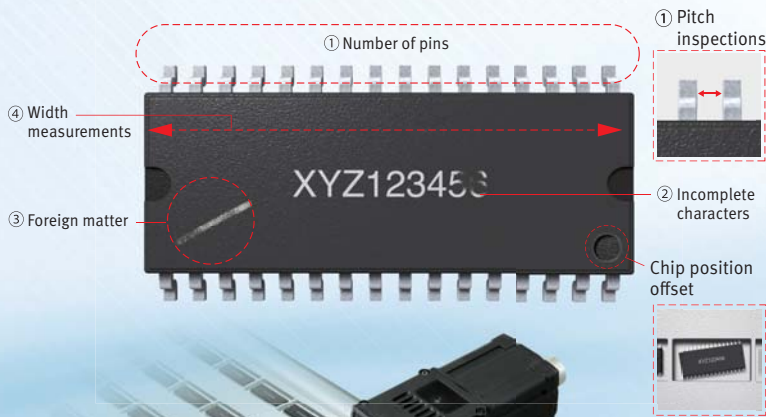
Current Vision Systems	FQ2-series Smart Cameras

A separate controller is needed to add a new camera.

Connect up the 32 Cameras and remove them as required after setup.

Triggers

Easily Perform Both Inspection and Positioning

You can combine multiple inspection items to perform external inspections, positioning, and other tasks all from a single Sensor.
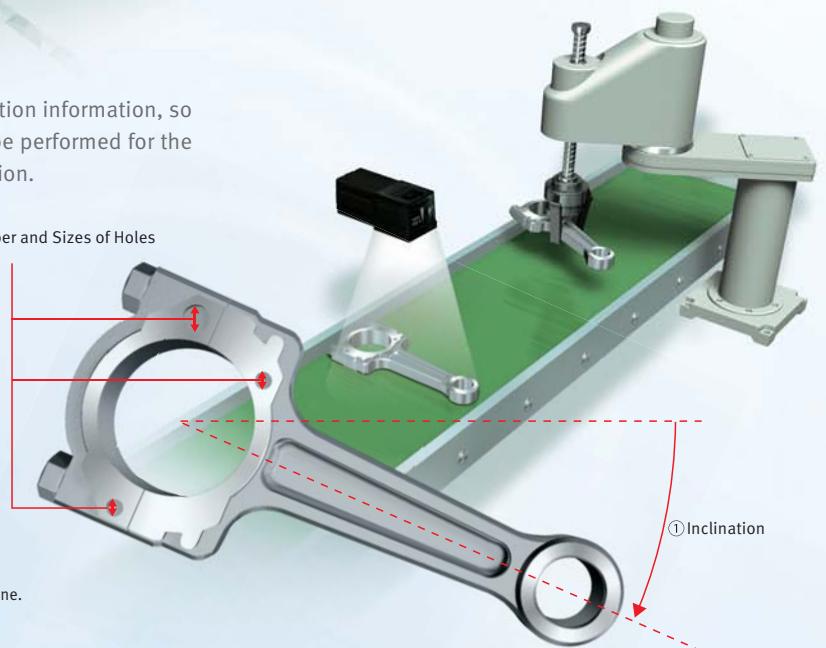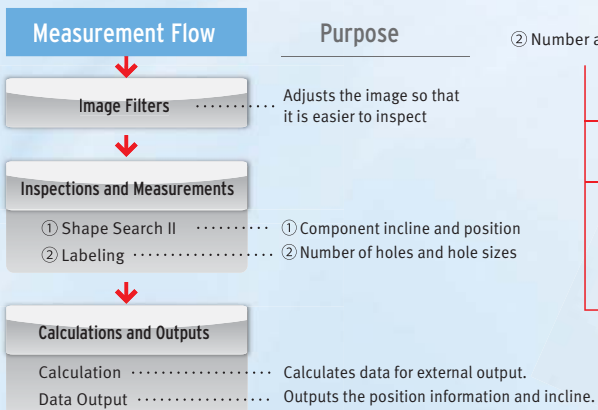
External Inspection

External inspection of ICs can be completed with a single Sensor. The position offset of the entire pallet before inspection can be adjusted on the image itself, which reduces the amount of work required to increase mechanical positioning accuracy.

① Number of pins

① Pitch inspections

④ Width measurements

XYZ123456

③ Foreign matter

② Incomplete characters

Chip position offset

Measurement Flow   **Purpose**

Image Filters · · · · · · · · · Adjusts the image so that it is easier to inspect

Position compensation · · · · · · · Compensates for the position offset of the chip.

Inspections
① Edge Count · · · · · · · · · · · · · · ① Number of pins and pitch inspections
② Sensitive Search · · · · · · · · ② Incomplete characters
③ Color Data · · · · · · · · · · · · · · ③ Foreign matter
④ Edge Position · · · · · · · · · · · · ④ Width measurements

Calculations and Outputs
Calculation · · · · · · · · · · · · · · · · · · Uses the inspection data for calculations and judgements.
Data Output · · · · · · · · · · · · · · · Outputs the measurement values.
Individual Judgement Output · · · · Outputs the judgements of inspections①to④individually.

Component Positioning

The Sensor can measure angles of rotation and other position information, so it can also be used for positioning. Inspections can also be performed for the number and size of holes along with the position information.

Measurement Flow   **Purpose**

Image Filters · · · · · · · · · · Adjusts the image so that it is easier to inspect

Inspections and Measurements
① Shape Search II · · · · · · · · · ① Component incline and position
② Labeling · · · · · · · · · · · · · · · · ② Number of holes and hole sizes

Calculations and Outputs
Calculation · · · · · · · · · · · · · · · · Calculates data for external output.
Data Output · · · · · · · · · · · · · · · Outputs the position information and incline.

② Number and Sizes of Holes

① Inclination

Incorporating the Best-selling Inspection Items from High-end Vision Systems
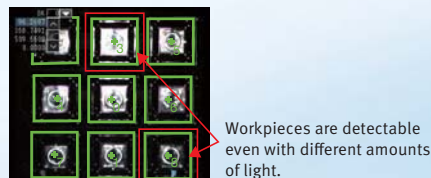
Searching

Shape Search II   Ten Times Faster Than Previous Searching

General searches have a difficult time with overlap or 360° rotation, but this Sensor achieves high-speed, stable searching of any shapes that match the model.

Workpieces are detectable even if they are rotated up to 360°

Workpieces are detectable even if there is overlapping.

Deformed, faulty products are judged as NG.

Multiple searches can be performed simultaneously, which enables the inspection of the number of items in a pallet or picking applications.

Workpieces are detectable even with different amounts of light.

Sensitive Search

Through automatic division and matching of the model image, tiny differences that cannot be detected with a normal search can be detected with large numerical differences.

OK 011. 10/B9 6.

One character is missing.

NG 2011. 0/B9 6.
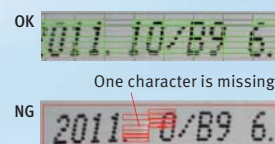
Searching

Search

This is a standard search inspection item. This type of search is used to detect items like labels, identify shapes, or positions.

OK   NG

Detection of Promotional Stickers

Edge Measurements

Edge Pitch

The number of edges in a region can be counted.
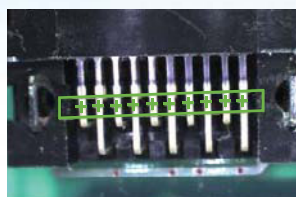
Edge Position

This inspection item detects edges and measures their positions.

Edge Width

This inspection item measures the width between edges.

Area Measurements, Color Measurements, and Defect & Foreign Matter Detection

Labeling

This inspection item counts how many labels there are of the specified color and size and measures the area or center position of the specified label.
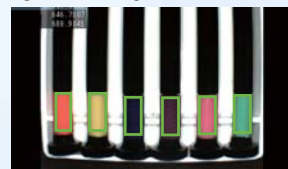
Area

This inspection item measures the area and center position of the specified color.

Color Data

Inspections can be performed that compare the difference in color between the workpiece and a registered image of a good product to detect objects and foreign matter.(average color value)

You can also inspect for defects and foreign matter by looking at the color deviation.(color deviation)

OUTPUT

RUN

Utility Items

360° Rotational Position Compensation

The correct position of workpieces with an inconsistent orientation can be measured through automatic detection of the offset of the workpiece in relation to a registered standard model.
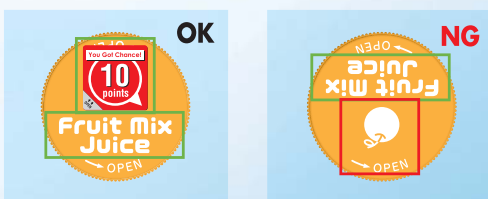
OK   NG

Image Filters

A total of 11 different image filters are provided, including background suppression to help eliminate patterns that can result in unstable measurements, as well as dilation and erosion.

With Background Suppression   Without Background Suppression

OMRON

Calibration

If the dimensions or position of a workpiece is difficult to determine in a pixel display, you can convert the display unit so that it is easier to see.
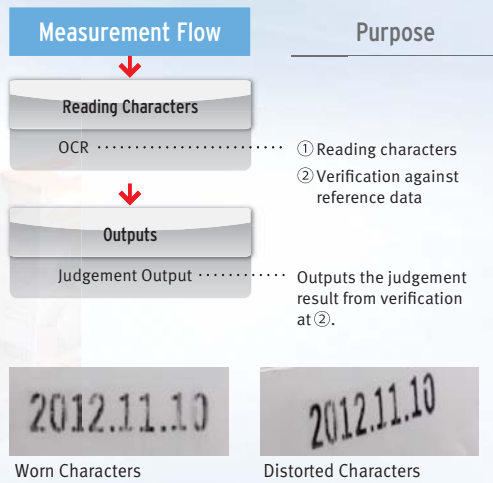
150 pixels   8 mm
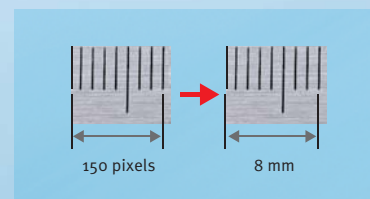
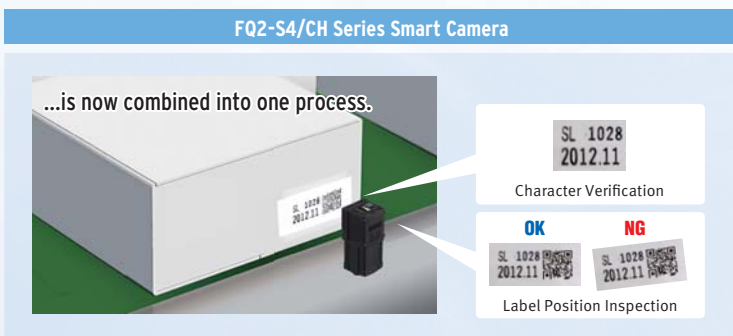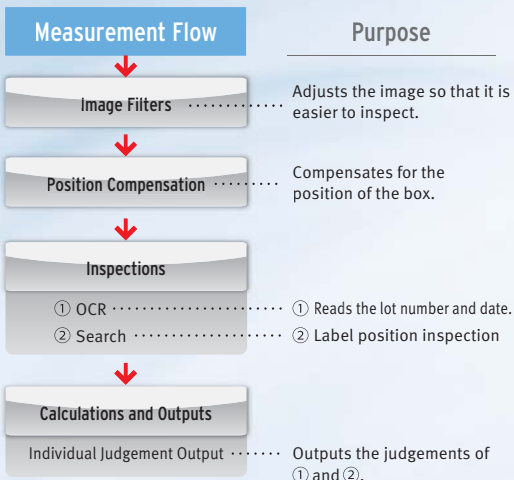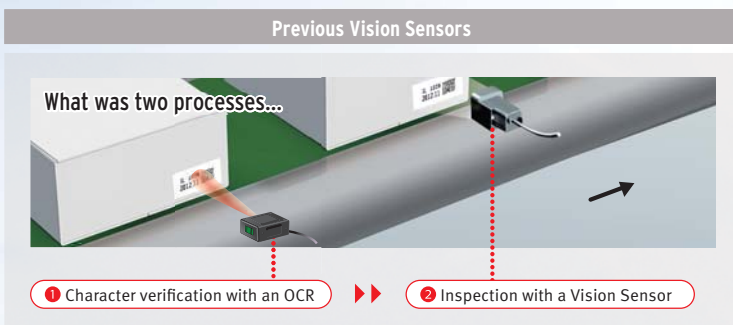# New OCR Method to Quickly Read Characters without Dictionary Registration

Date Verification

Even if printing is distorted or unclear due to conveyor line conditions, a unique reading method with a built-in dictionary enables stable reading of characters.

Measurement Flow

Purpose

Reading Characters

OCR ·················· ① Reading characters
② Verification against reference data

Outputs

Judgement Output ·········· Outputs the judgement result from verification at ②.

2012.11.10

Worn Characters

2012.11.10

Distorted Characters

Character Verification and Label Position Inspection

Although previously performed as separate processes, character verification and inspections can now both be performed with one FQ2 Sensor.
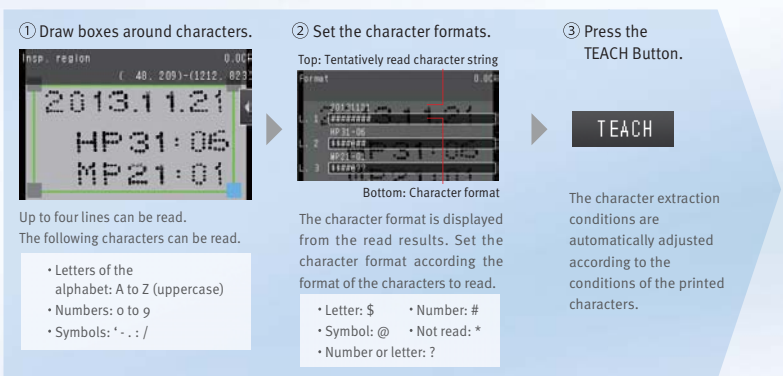This helps you reduce costs and save space.

Measurement Flow

Purpose

Image Filters ············· Adjusts the image so that it is easier to inspect.

Position Compensation ·········· Compensates for the position of the box.

Inspections

① OCR ····················· ① Reads the lot number and date.
② Search ·················· ② Label position inspection

Calculations and Outputs

Individual Judgement Output ········· Outputs the judgements of ① and ②.

Previous Vision Sensors

What was two processes...

❶ Character verification with an OCR ▶▶ ❷ Inspection with a Vision Sensor

FQ2-S4/CH Series Smart Camera

...is now combined into one process.

SL 1028
2012.11

Character Verification

OK   NG

SL 1028   SL 1028
2012.11   2012.11

Label Position Inspection

OCR with Built-in Dictionary

OCR

The large amount of data in the built-in dictionary contains approximately 80 different fonts that are used on FA sites.Variations for worn characters, blurring, distortion, different backgrounds, and size changes have been included to enable stable and highly accurate reading with the built-in dictionary even for some variations in the characters.It is not necessary to set parameters to compensate for character contrast or positional offsetting.

Conventional OCR

Time is required for character registration in the dictionary.

① Draw boxes around characters.

Up to four lines can be read.
The following characters can be read.

- Letters of the alphabet: A to Z (uppercase)
- Numbers: 0 to 9
- Symbols: ' · . : /

② Set the character formats.

Top: Tentatively read character string

Bottom: Character format

The character format is displayed from the read results. Set the character format according to the format of the characters to read.

- Letter: $ · Number: #
- Symbol: @ · Not read: *
- Number or letter: ?

③ Press the TEACH Button.

TEACH

The character extraction conditions are automatically adjusted according to the conditions of the printed characters.

Reading is started.

Different printers use different printing devices.

Characters from most printers can be read, including dot and impact printers. Handles Approx. 80 Fonts

Hot Printer
SL 1028
2012.11.10

Inkjet Printer
208:102
1980 08 19

Thermal Printer
12.8.23
2 Y

Laser Marker
)20012345678

Worn and inclined characters cannot be read.

Unique recognition technology enables stable recognition of worn or distorted characters.

Worn Characters
SL 1028
2012.11.10

Inclined Characters
SL 1028
2012.11.10

Small Characters
SL 1028
2012.11.10
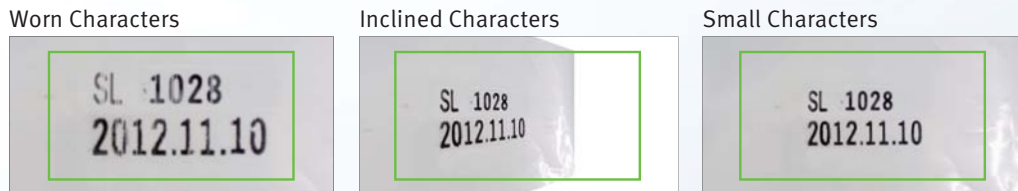
New OCR Algorithm: Matching with Structural Models

Even in cases like the following one, where character registration is required for image matching methods, no character registration is required to read the characters with this new method, which matches structural models of characteristic points.

Structural models record the characteristics of each character in approximately 80 fonts.
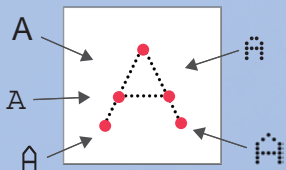
The position and structure of characteristic points are used to recognize characters.
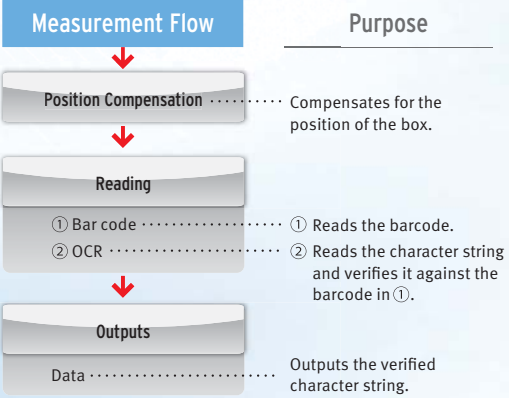
Background Changes

Size and Font Changes

Worn Characters   Inclined Characters
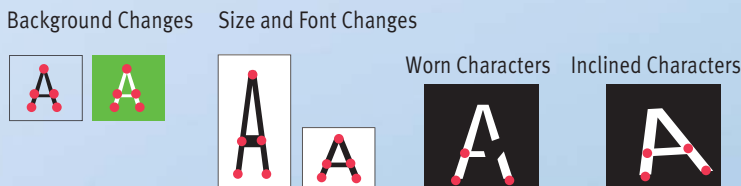
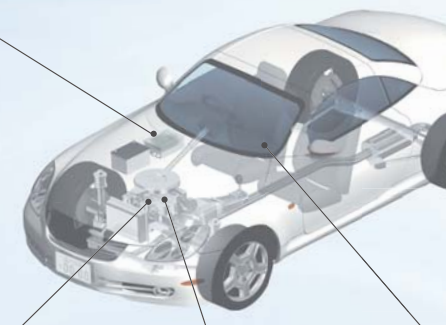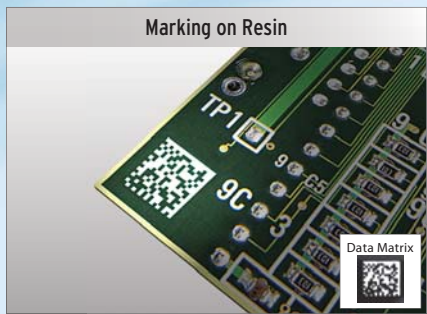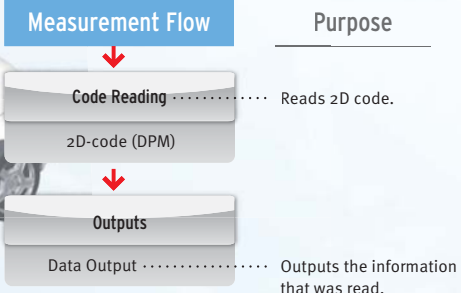# Read Any of 15 Types of Codes from Paper Labels to Direct Marking

Code and Character Verification

OCR and Code Reading inspection items can be combined to read codes and verify them against character strings all within the FQ2. No programming of external devices is required.

Measurement Flow	Purpose
Position Compensation	Compensates for the position of the box.
Reading	
① Bar code	① Reads the barcode.
② OCR	② Reads the character string and verifies it against the barcode in ①.
Outputs	
Data	Outputs the verified character string.

Reading Direct Marking Codes

It has become common to manage information by directly marking codes on products. However, differences in materials often causes instability when reading the printed characters. The FQ2 achieves stable reading with unique functionality designed just for DPM.

Measurement Flow	Purpose
Code Reading	Reads 2D code.
2D-code (DPM)	
Outputs	
Data Output	Outputs the information that was read.

Marking on Resin
Data Matrix

Marking on Small Parts
Data Matrix

Marking on Metal
Data Matrix

Marking on Film or Glass
Data Matrix

Paper Labels

Barcodes

The FQ2 can read the main nine types of barcodes.You can therefore reliably use the FQ2 in pharmaceuticals, where verification of barcodes and characters is required.

JAN/EAN/UPC	Code39	Codabar (NW-7)
ITF (Interleaved 2 of 5)	Code93	Code128 / GS1-128
GS1-DataBar	GS1-128 Composite Code	Pharmacode

2D Codes

The FQ2 can read the main six types of 2D codes.You do not need to use more than one code reader even for processing that combines different types of codes.

| Data Matrix | QR Code | Micro QR Code |
| PDF417 | Micro PDF417 | GS1-DataMatrix |

Direct Marking

2D DPM Codes

When 2D codes are printed on metal, substrates, glass, or many other materials, the printed conditions of the 2D codes can be unstable.Even with these difficult-to-read codes, the FQ2 is equipped with filters and retry processing designed just for DPM to allow you to easily and stably read the codes.

| Data Matrix(EC200) | QR Code |

• Types of Filtering

You can apply up to three of the four unique filters developed by OMRON in the desired order to remove printing irregularities and noise, in order to achieve a stable reading.

Smooth	Smooths the image.
Dilate	For white codes, increases the cell size. Effective for reading codes with cell spreading.
Erosion	For white codes, reduces the cell size. Effective for reading separated dot codes.
Median	Removes noise.

Combining Filtering

Erosion and dilation can be combined to connect dots without changing the dot thickness.

Dilate → Erosion

• Retry function

Code Readers must be able to read codes even for poor printing conditions. You can automatically retry reading while changing the exposure time and other reading conditions, even for changing workpieces or environments, to enable a stable reading.

1 Retrying the Specified Number of Times with the Same Conditions

Reading is performed for the specified number of times for the same scene.

N G — N G — OK

3 Retrying While Changing the Shutter Speed

Reading is performed for the same scene while changing the exposure time in stages.

N G — N G — N G — OK
1ms — 1.3ms — 0.7ms — 1.6ms
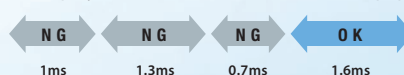
2 Retrying While External Trigger Is Input

Reading is performed until successful, as long as an external level trigger is input.

During level trigger input

N G — N G — OK
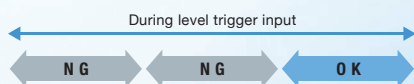
4 Retrying While Changing the Reading Conditions

When reading DPM codes, inconsistencies in printing conditions can result in NGs if reading is performed with only one set of reading settings. The FQ2 allows you to register up to 32 sets of reading conditions as scenes and retry reading while changing the scenes in order. The system automatically determines the scenes with the highest usage rates and changes the order to start with them to flexibly handle changes in reading conditions. Of course you can specify a fixed order if required.

N G — N G — OK
Scene 1 — Scene 2 — Scene 3

Register 32 sets of reading conditions.
Rapidly switch to the optimum reading conditions.

Scene 2 Scene 4 Scene 6 Scene 8 Scene 32
Scene 1 Scene 3 Scene 5 Scene 7 Scene 31
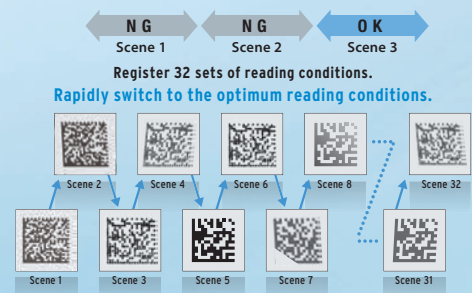
· QR code is the registered trademark of DENSO WAVE.
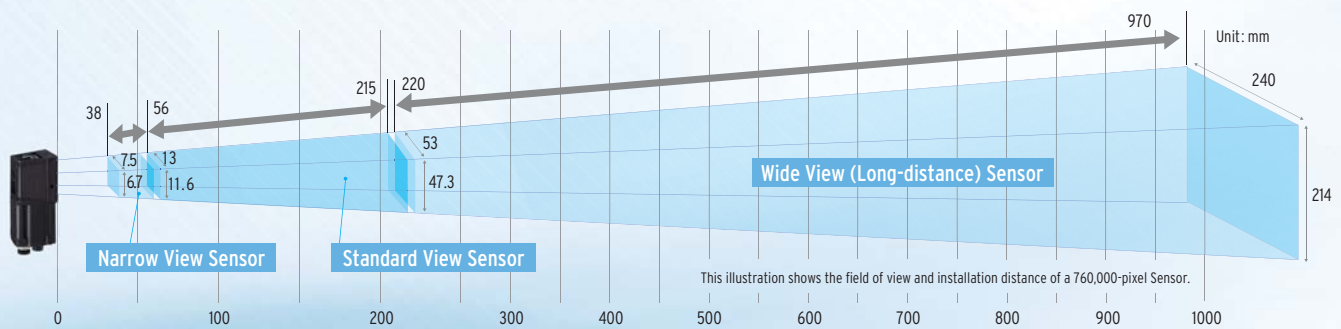
A Lineup That Fits a Wide Range of Equipment

Sensor

We offer a diverse lineup of Sensors so that you can choose the one with the perfect field of view and installation distance for your needs.

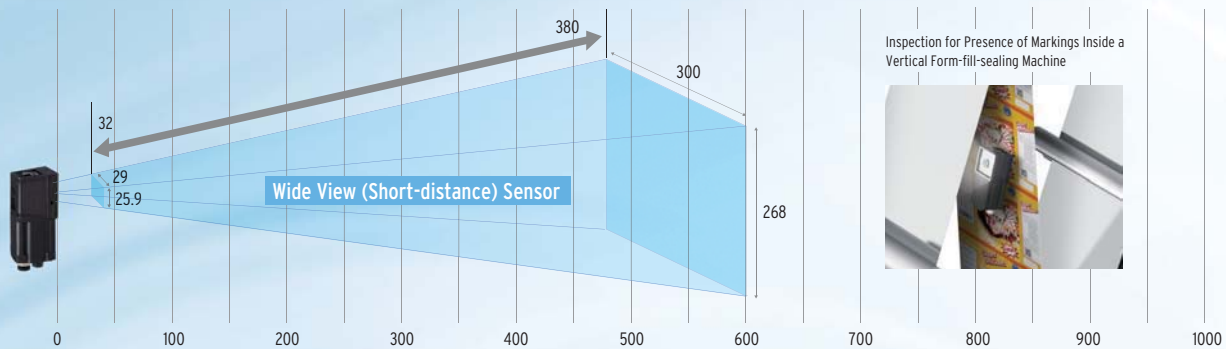### Integrated Sensor · Color · Monochrome

• Seamless Field of View Variations

All-in-one Sensors tend to be limited in field of view variations, but we offer a lineup ranging from 7.5 mm up to 240 mm to meet your needs.

Unit: mm

970
240
215 220
56
53
38
47.3
214
7.5 13
6.7 11.6

Wide View (Long-distance) Sensor

Narrow View Sensor

Standard View Sensor

This illustration shows the field of view and installation distance of a 760,000-pixel Sensor.

0 100 200 300 400 500 600 700 800 900 1000

• Wide View Sensors -- Perfect for Tight Spaces

A side-view wide-angle camera takes images and performs inspections across a wide area, even if the camera is close to the workpiece. Perfect for mounting the sensor in locations with limited space. This also enables the Sensor to be installed alongside an assembly line without protruding in order to perform inspections from the side of the conveyor belt.

380
300
32
29
25.9
268

Wide View (Short-distance) Sensor

Inspection for Presence of Markings Inside a Vertical Form-fill-sealing Machine

0 100 200 300 400 500 600 700 800 900 1000

Sensors with C-mount lens · Color · Monochrome

The Sensors with C-mount lens enable freedom of lens selection for long distances over 1 m and narrow fields of view under 1 mm that are not covered by our integrated Sensors.This type of Sensor is also useful when you want to use external illumination.

Lighting Examples

Backlighting

Low-angle Lighting

Long Distance

1m

10 m max.

External Shape Inspections
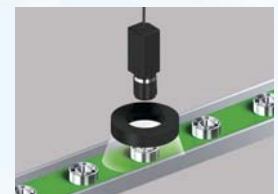
Defect and Foreign Matter Inspections

Narrow Field of View

1 mm min.

65mm

Note: A commercially available telecentric lens is required for narrow field of view applications.

Communication Interfaces

The Sensor includes communication interfaces for compatibility with a wide range of host devices. This helps reduce the design work required for data communications between the Sensor and a PLC.

Note: The type of communications interface depends on the model of the Sensor. Refer to page 22 for details.
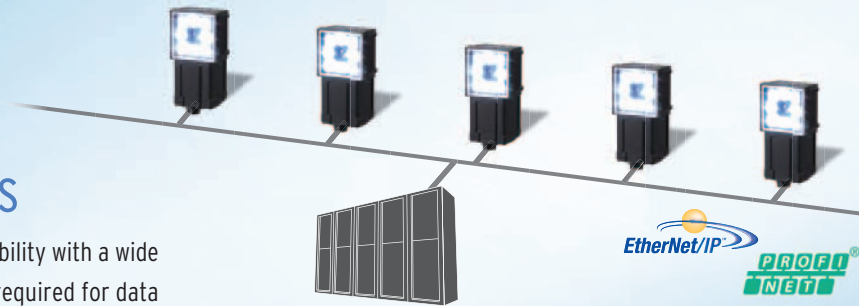
PLC Link

PLC link greatly reduces the amount of time and work that is required to create ladder programs.

Compatible Models	OMRON PLCs: CS, CJ1, CJ2, CP1 and NSJ Series Mitsubishi Electric PLCs: Q Series

FINS

OMRON's exclusive FINS/TCP communications interface can be used to connect to low-cost OMRON PLCs. With this communications interface, no communications controls are required to process the sending and receiving of complex TCP packets. You get faster, simpler connections to OMRON PLCs.

Compatible Models	OMRON PLCs: CS, CJ1, CJ2, CP1 and NSJ Series

EtherNet/IP™

EtherNet/IP™ communications, a standard widely used in communications systems in factories around the world, is also supported. This communication interface enables simple and easy connections to a wide range of EtherNet/IP™ devices, including OMRON PLCs.

Compatible Models	OMRON Machine Automation Controllers: NJ Series OMRON PLCs: CS, CJ1 and CJ2 Series

Inputs: 7
Outputs: 3

Inputs: 11
Outputs: 24

FQ-WU Sensor Data Unit Cable

FQ-SDU1FQ I/O Sensor Data Unit

I/O Expansion Units

Our expansion units enable expansion to up to three times the number of I/O connections. This enables the output of individual judgement results for each inspection, a feature that has been highly requested.
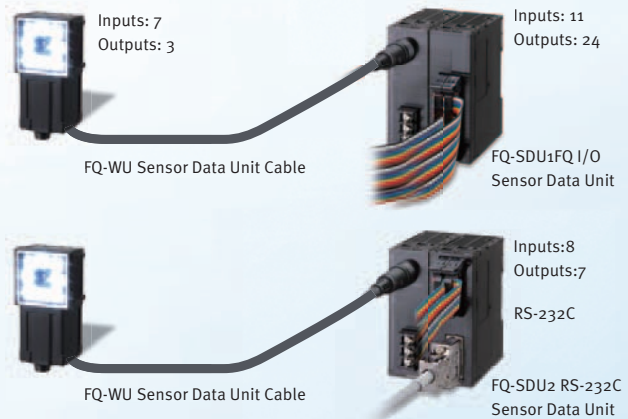
RS-232C Communications Unit

This Sensor Data Unit supports standard RS-232C communications.

Inputs:8
Outputs:7

RS-232C

FQ-WU Sensor Data Unit Cable

FQ-SDU2 RS-232C Sensor Data Unit

Setup Tools

We provide two tools for configuration and monitoring of inspection images: the Touch Finder, which can be used onsite to change settings and which can be installed on a control panel, and the PC Setup Tool which can be used from a computer.

Touch Finder

This is a small monitor with a touch panel. It's durable, rugged design is shock-resistant and portable. It has passed our standard 1.3 m drop test.

PC Tool

The Setup Tool provides the same functions as those on the Touch Finder, but on a PC. The software can be downloaded for free by any customer with the purchase of a Sensor. Refer to the member registration sheet that is enclosed with the sensor for details.

On-screen Messages in Nine Languages

- English
- Traditional Chinese
- Simplified Chinese
- Korean
- Japanese
- German
- French
- Italian
- Spanish

EtherNet/IP™ is the trademark of ODVA.

Hardware Advancements

High-speed Image Processor

3X Faster than Previous Models

20 Inspection Items per Second Processing Time

With our new high-speed image processor we are able to achieve a processing time of 50 ms or less for all primary inspection items.

* Processing may take longer than 50 ms depending on the settings.

Search Inspection Speed Comparison

110 ms		
	1/3 1/5	
	30 ms	22 ms
FQ-S Color Image	FQ2-S Color Image	FQ2-S Monochrome Image

100ms, 80ms, 60ms, 40ms, 20ms
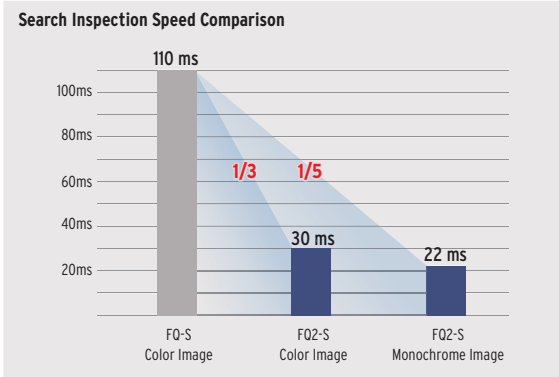
Note: This comparison was conducted with a 752 × 480 pixel image, with no rotational compensation.

Partial Input with DAP (Dual Axis Partial) Processing

Processing time can be further reduced by limiting the camera input to only the area that is required for inspection. Previous models allowed trimming only in the Y direction, but now you can specify a range across both the X and Y axes for trimming. Keep a wide field of view and trim to only the sections that are required for inspection in each scene to reduce processing time.

[Problems with a Standard Digital Zoom]
Camera input is performed for all images and only a portion is shown enlarged, so this does not decrease the amount of time required for camera input.

Note: DAP processing is provided only on 760,000-pixel and 1,300,000-pixel Sensors.

High-speed Image Processor

Partial Input
Partial input allows you to input only the portion of an image that is required for inspection by changing scenes, without having to change the field of view.

Enlarged Display
You can enlarge the display of the partial input image.

Partial Input Y

Workpiece A

Field of View Y

Partial Input X

Field of View X

Workpiece B
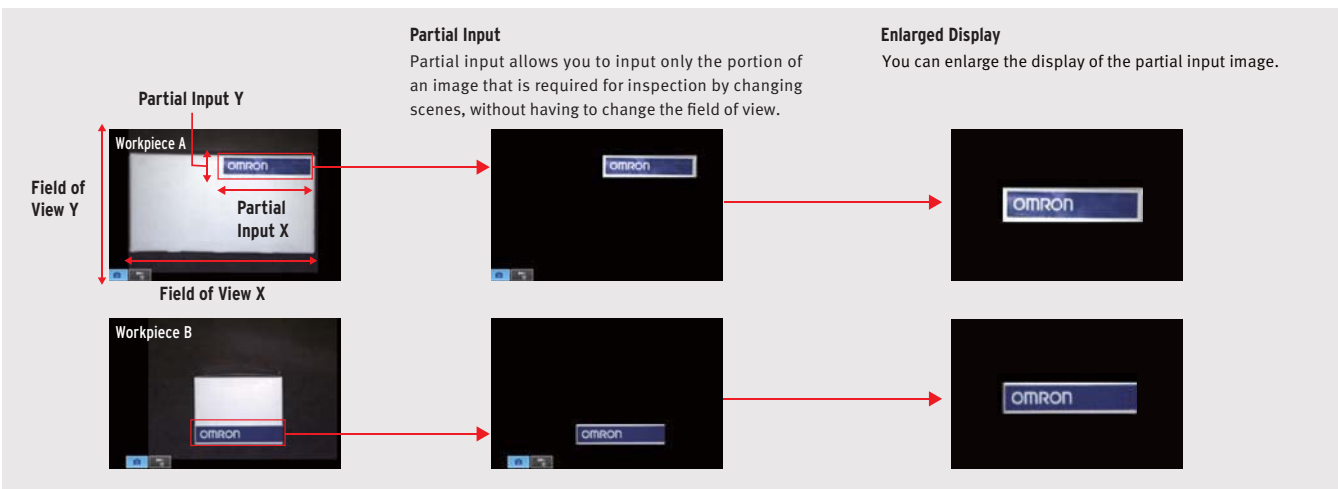
Megapixel CMOS Sensor

4 Times the Pixels $\times$ **1,000 Times** the Display Resolution

(Comparisons to previous OMRON models)

Precision 1.3 Megapixel Camera

Would you like a little more positioning accuracy?
Do you need a wider field of view?
We hear you, and that is why we have greatly improved the resolution of our camera.
The 1.3 megapixels maintain precision and accuracy while also enabling a wider field of view.
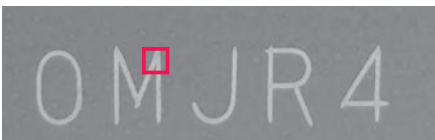
350,000 pixels　　　　**1.3 megapixels**

Megapixel CMOS Sensor

1.3 Megapixels	
Color	Monochrome

Sensor with C-mount
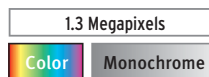
760,000 Pixels		*
Color	Monochrome	
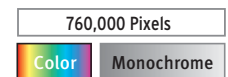
Integrated Sensor

*.350,000 pixels types are also available.

Sub-pixel Processing
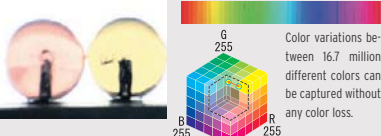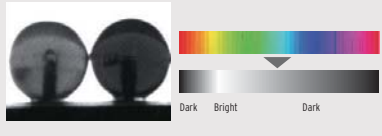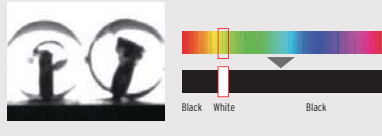
Previously, position information could only be output on a per-pixel basis, but now you can output at a resolution even higher than the number of available pixels. This provides finer measurement values for travel distances and helps to improve positioning accuracy.

Typical Problem	Sub-pixel Processing
1-pixel increments	0.001-pixel increments

1,000x improvement

The position of the edge cannot be detected accurately.

The position of the edge is detected with greater accuracy.
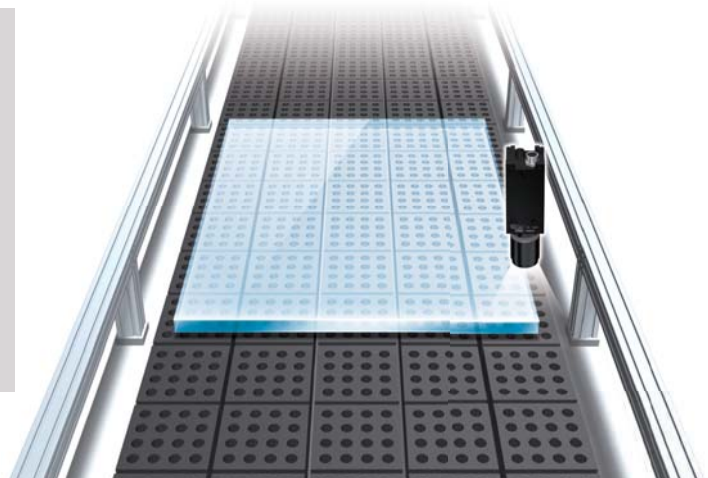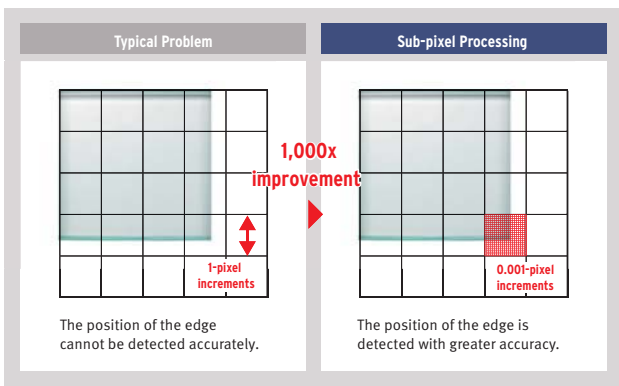
Three Key Technologies for Crystal Clear Images
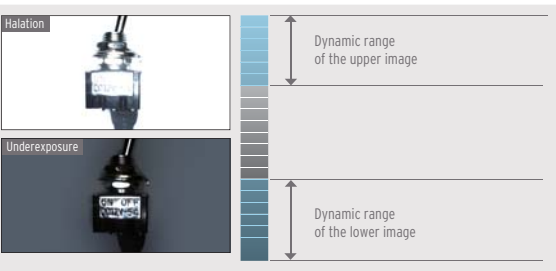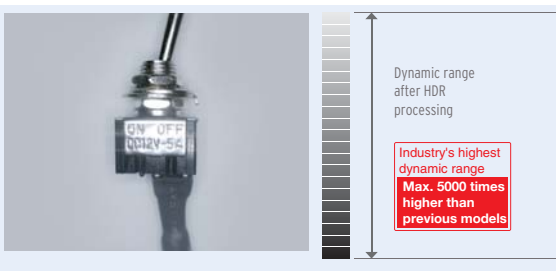
Real-color Sensing

Real-color processing is an image processing technology that performs high-speed processing of full-color images with a total of 16.7 million colors (256 tones per RGB channel). This means that image processing can be performed with the same color information that is visible to the human eye, and stable measurements can be performed under lighting that closely resembles natural light.

Real color image processing

G
255

B
255

R
255

Color variations between 16.7 million different colors can be captured without any color loss.

The camera image is processed as-is without any loss of quality.
This enables even the slightest of color differences to be captured with high accuracy.

Color Image Processing

Dark   Bright   Dark

Captured images are converted to a 256-shade monochrome image and processed. This enables more stable inspection compared to binary level processing, but slight changes in color cannot be detected with this method.

Binary image processing

Black   White   Black

Captured images are converted to a black and white two-color image and processed. This reduces the amount of data and enables high-speed processing.

Previous Image Processing

OMRON FQ2 Series
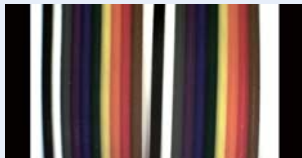
HDR Sensing

High dynamic range minimizes the effects of lighting such as halation and allows highly precise inspections.

Conventional images

Halation

Dynamic range
of the upper image

Underexposure

Dynamic range
of the lower image

Defects Undetectable Due to Overexposure or Underexposure
Any spot outside the dynamic range is blurred by halation or shadow.

HDR image

Dynamic range
after HDR
processing

Industry's highest dynamic range
Max. 5000 times higher than previous models

Defects Detectable Even on Reflective or Shadowy Surfaces
The surface of the workpiece is accurately reproduced and detected even with overexposure or underexposure.

Polarizing Filter + High-power Lighting

Lighting is required for stable image inspection, but shiny surfaces can reflect light, resulting in incorrect judgements. You can use a polarizing filter to reduce specular reflection, but the entire image will be darker, which can result in insufficient image contrast. The FQ2 Series is equipped with OMRON's own high-power lighting DR optical system for effective use of LED power. This system provides sufficient lighting for inspection even when the enclosed polarizing filter is used.

Standard Lighting
Light is reflected.

Standard Lighting + Polarizing Filter
The overall image is dark;
inspection becomes unstable.

High-power Lighting + Polarizing Filter
Overall image contrast is maintained,
and only reflections are eliminated.
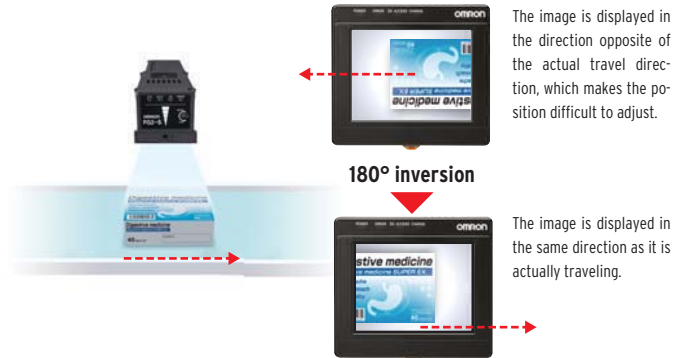
Useful Onsite Utilities

Real-time Threshold Adjustment

The FQ2 smart camera allows fast and easy real-time parameter adjustment. Eliminating the need to stop the machine for fine tuning and optimisation of settings, resulting in zero machine downtime.

Continuous inspection

Updated

Judgement conditions can be adjusted on the Touch Finder.
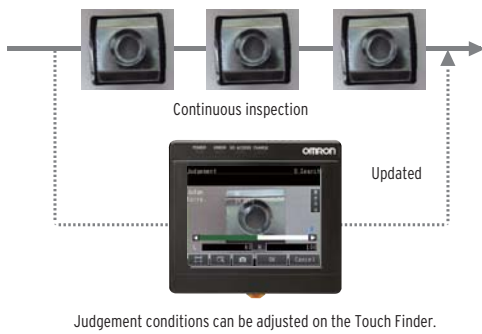
180° Inverted Image Display

Invert images by 180° when an image can only be taken in the incorrect orientation due to the position that the Sensor was mounted in.

The image is displayed in the direction opposite of the actual travel direction, which makes the position difficult to adjust.

180° inversion

The image is displayed in the same direction as it is actually traveling.

Inspection History Logging

Historical results logging is very useful for testing a new line. Samples are fed down the line and inspection results are logged. The logged data can be checked on a time scale in graph form and used to adjust judgement conditions. File Logging is convenient during operation. Large inspection history can be saved on SD cards and used later for traceability.

Recent Results Logging

File Logging

Displays the most recent 1,000 inspection results in graph form.
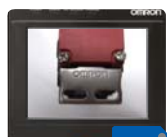
SD card
Up to 10 million measurement values or more
(for a 4-GB SD card)
Up to 10,000 images or more
(for a 4-GB SD card)

SD card

Password Protection

A password can be set to prevent changes to settings during operation by restricting the ability to change from Run Mode to Setup Mode.

Auto Detection

When multiple sensors are connected to the touch finder, the display automatically switches to the image of the sensor which has produced an NG result. This allows dynamic visualisation of reject conditions.

Automatically NG sensor image is displayed !
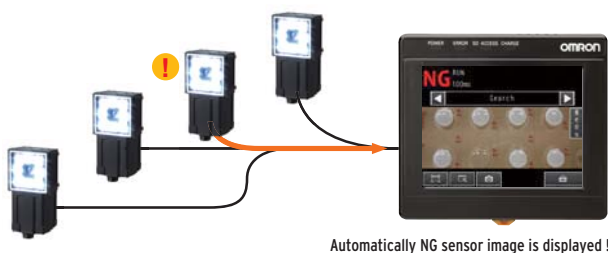
Note. When 32 sensors are connected,
the most recent NG sensor of 8 sensors selected for display is displayed.

Shortcuts

Shortcuts to Setup Menu items that are changed frequently can be added to the Run Mode display.
This enables the user to quickly perform adjustments when a problem occurs during operation.

Directly access frequently used functions.
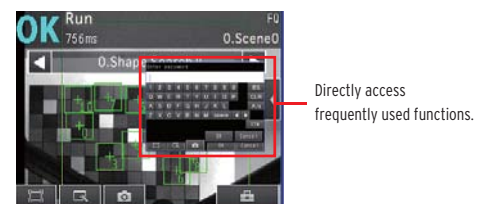
Lineup ranging from single-function models to full-function models

Inspection Model

		FQ2-S1 Series Single-function Type	FQ2-S2 Series Standard Type	FQ2-S3 Series High-resolution Type	
		Integrated Sensor	Integrated Sensor	Integrated Sensor	C-mount
Number of pixels		350,000 pixels	350,000 pixels	760,000 pixels	1.3 million pixels
Color		Real color	Real color	Real color/Monochrome	Real color/Monochrome
Number of simultaneous measurements		1	32	32	32
Number of registered scenes		8	32	32	32
Inspection	Shape search II	•	•	•	•
	Search	•	•	•	•
	Sensitive search	•	•	•	•
	Edge position	•	•	•	•
	Edge width	•	•	•	•
	Edge pitch	•	•	•	•
	Area	•	•	•	•
	Color data	•	•	•	•
	Labeling	•	•	•	•
ID	Bar code	–	–	–	–
	2D code				
	2D code (DPM)*				
	OCR				
I/O specifications	Communications (Ethernet TCP no-protocol, Ethernet UDP no-protocol, Ethernet FINS/TCP no-protocol, EtherNet/IP, PLC Link , or PROFINET)	•	•	•	•
	Sensor Data Units (I/O)	–	–	•	•
	Sensor Data Units (RS-232C)	–	–	•	•

Inspection/ID Model

		FQ2-S4 Series		
		Integrated Sensor	Integrated Sensor	C-mount
Number of pixels		350,000 pixels	760,000 pixels	1.3 million pixels
Color		Real color/Monochrome	Real color/Monochrome	Real color/Monochrome
Number of simultaneous measurements		32	32	32
Number of registered scenes		32	32	32
Inspection	Shape search II	•	•	•
	Search	•	•	•
	Sensitive search	•	•	•
	Edge position	•	•	•
	Edge width	•	•	•
	Edge pitch	•	•	•
	Area	•	•	•
	Color data	•	•	•
	Labeling	•	•	•
ID	Bar code	•	•	•
	2D code	•	•	•
	2D code (DPM)*	•	•	•
	OCR	•	•	•
I/O specifications	Communications (Ethernet TCP no-protocol, Ethernet UDP no-protocol, Ethernet FINS/TCP no-protocol, EtherNet/IP, PLC Link , or PROFINET)	•	•	•
	Sensor Data Units (I/O)	•	•	•
	Sensor Data Units (RS-232C)	•	•	•

ID Model

		FQ2-CH Series Optical Character Recognition Sensor	FQ-CR1 Series Multi Code Reader	FQ-CR2 Series 2D Code Reader
		Integrated Sensor	Integrated Sensor	Integrated Sensor
Number of pixels		350,000 pixels	350,000 pixels	350,000 pixels
Color		Monochrome	Monochrome	Monochrome
Number of simultaneous measurements		32	32	32
Number of registered scenes		32	32	32
Inspection	Shape search II			
	Search			
	Sensitive search			
	Edge position	–	–	–
	Edge width			
	Edge pitch			
	Area			
	Color data			
	Labeling			
ID	Bar code	–	•	–
	2D code	–	•	–
	2D code (DPM)*	–	–	•
	OCR	•	–	–
I/O specifications	Communications (Ethernet TCP no-protocol)	•	•	•
	Communications (Ethernet UDP no-protocol, Ethernet FINS/TCP no-protocol, EtherNet/IP, PLC Link, or PROFINET)	•	–	–
	Sensor Data Units (I/O)	•	–	–
	Sensor Data Units (RS-232C)	•	–	–

* Inspection item for directly marked 2D codes.

Ordering Information

Sensor

Inspection Model

FQ2-S1 Series [Single-function Type]

Field of view		Narrow View	Standard View	Wide View (Long-distance)	Wide View (Short-distance)
Number of pixels		350,000 pixels			
Color	NPN	FQ2-S10010F	FQ2-S10050F	FQ2-S10100F	FQ2-S10100N
	PNP	FQ2-S15010F	FQ2-S15050F	FQ2-S15100F	FQ2-S15100N
Field of view/ Installation distance		Refer to figure 1 on p.20	Refer to figure 2 on p.20	Refer to figure 3 on p.20	Refer to figure 4 on p.20

FQ2-S2 Series [Standard Type]

Field of view		Narrow View	Standard View	Wide View (Long-distance)	Wide View (Short-distance)
Number of pixels		350,000 pixels			
Color	NPN	FQ2-S20010F	FQ2-S20050F	FQ2-S20100F	FQ2-S20100N
	PNP	FQ2-S25010F	FQ2-S25050F	FQ2-S25100F	FQ2-S25100N
Field of view/ Installation distance		Refer to figure 1 on p.20	Refer to figure 2 on p.20	Refer to figure 3 on p.20	Refer to figure 4 on p.20

FQ2-S3 Series [High-resolution Type]

Field of view		Narrow View	Standard View	Wide View (Long-distance)	Wide View (Short-distance)	C-mount
Number of pixels		760,000 pixels				1.3 million pixels
Color	NPN	FQ2-S30010F-08	FQ2-S30050F-08	FQ2-S30100F-08	FQ2-S30100N-08	FQ2-S30-13
	PNP	FQ2-S35010F-08	FQ2-S35050F-08	FQ2-S350100F-08	FQ2-S35100N-08	FQ2-S35-13
Monochrome	NPN	FQ2-S30010F-08M	FQ2-S30050F-08M	FQ2-S30100F-08M	FQ2-S30100N-08M	FQ2-S30-13M
	PNP	FQ2-S35010F-08M	FQ2-S35050F-08M	FQ2-S35100F-08M	FQ2-S35100N-08M	FQ2-S35-13M
Field of view/ Installation distance		Refer to figure 5 on p.20	Refer to figure 6 on p.20	Refer to figure 7 on p.20	Refer to figure 8 on p.20	Refer to optical chart on p.30.

Inspection / ID Model

FQ2-S4 Series [Standard Type]

Field of view		Narrow View	Standard View	Wide View (Long-distance)	Wide View (Short-distance)
Number of pixels		350,000 pixels			
Color	NPN	FQ2-S40010F	FQ2-S40050F	FQ2-S40100F	FQ2-S40100N
	PNP	FQ2-S45010F	FQ2-S45050F	FQ2-S45100F	FQ2-S45100N
Monochrome	NPN	FQ2-S40010F-M	FQ2-S40050F-M	FQ2-S40100F-M	FQ2-S40100N-M
	PNP	FQ2-S45010F-M	FQ2-S45050F-M	FQ2-S45100F-M	FQ2-S45100N-M
Field of view/ Installation distance		Refer to figure 1 on p.20	Refer to figure 2 on p.20	Refer to figure 3 on p.20	Refer to figure 4 on p.20

[High-resolution Type]

Field of view		Narrow View	Standard View	Wide View (Long-distance)	Wide View (Short-distance)	C-mount
Number of pixels		760,000 pixels				1.3 million pixels
Color	NPN	FQ2-S40010F-08	FQ2-S40050F-08	FQ2-S40100F-08	FQ2-S40100N-08	FQ2-S40-13
	PNP	FQ2-S45010F-08	FQ2-S45050F-08	FQ2-S45100F-08	FQ2-S45100N-08	FQ2-S45-13
Monochrome	NPN	FQ2-S40010F-08M	FQ2-S40050F-08M	FQ2-S40100F-08M	FQ2-S40100N-08M	FQ2-S40-13M
	PNP	FQ2-S45010F-08M	FQ2-S45050F-08M	FQ2-S45100F-08M	FQ2-S45100N-08M	FQ2-S45-13M
Field of view/ Installation distance		Refer to figure 5 on p.20	Refer to figure 6 on p.20	Refer to figure 7 on p.20	Refer to figure 8 on p.20	Refer to optical chart on p.30.

ID Model

FQ2-CH Series [Optical Character Recognition Sensor]

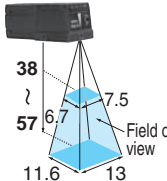| Field of view		Narrow View	Standard View	Wide View (Long-distance)	Wide View (Short-distance)
Number of pixels		350,000 pixels			
Monochrome	NPN	FQ2-CH10010F-M	FQ2-CH10050F-M	FQ2-CH10100F-M	FQ2-CH10100N-M
	PNP	FQ2-CH15010F-M	FQ2-CH15050F-M	FQ2-CH15100F-M	FQ2-CH15100N-M
Field of view/ Installation distance		Refer to figure 1 on p.20	Refer to figure 2 on p.20	Refer to figure 3 on p.20	Refer to figure 4 on p.20

FQ-CR1 Series [Multi Code Reader]
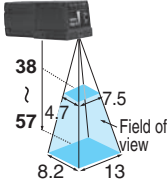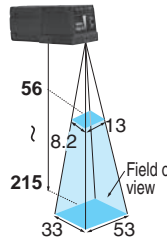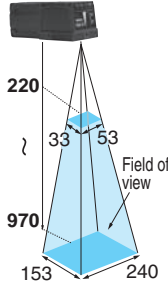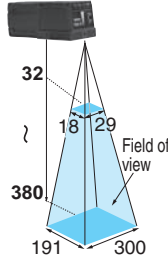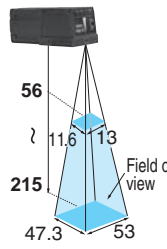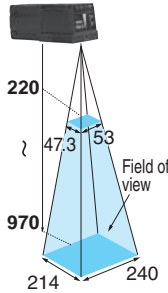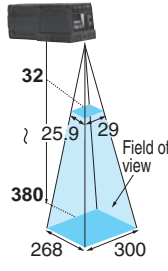
Field of view		Narrow View	Standard View	Wide View (Long-distance)	Wide View (Short-distance)
Number of pixels		350,000 pixels			
Monochrome	NPN	FQ-CR10010F-M	FQ-CR10050F-M	FQ-CR10100F-M	FQ-CR10100N-M
	PNP	FQ-CR15010F-M	FQ-CR15050F-M	FQ-CR15100F-M	FQ-CR15100N-M
Field of view/ Installation distance		Refer to figure 1 on p.20	Refer to figure 2 on p.20	Refer to figure 3 on p.20	Refer to figure 4 on p.20

FQ-CR2 Series [2D Code Reader]

Field of view		Narrow View	Standard View	Wide View (Long-distance)	Wide View (Short-distance)
Number of pixels		350,000 pixels			
Monochrome	NPN	FQ-CR20010F-M	FQ-CR20050F-M	FQ-CR20100F-M	FQ-CR20100N-M
	PNP	FQ-CR25010F-M	FQ-CR25050F-M	FQ-CR25100F-M	FQ-CR25100N-M
Field of view/ Installation distance		Refer to figure 1 on p.20	Refer to figure 2 on p.20	Refer to figure 3 on p.20	Refer to figure 4 on p.20

Field of view/Installation distance

(Unit: mm)

Field of view	Narrow View	Standard View	Wide View (Long-distance)	Wide View (Short-distance)
Appearance				
350,000 pixels Type	Figure **1** 38 ~ 57, 4.7, 7.5, 8.2, 13 Field of view	Figure **2** 56 ~ 215, 8.2, 13, 33, 53 Field of view	Figure **3** 220 ~ 970, 33, 53, 153, 240 Field of view	Figure **4** 32 ~ 380, 18, 29, 191, 300 Field of view
760,000 pixels Type	Figure **5** 38 ~ 57, 6.7, 7.5, 11.6, 13 Field of view	Figure **6** 56 ~ 215, 11.6, 13, 47.3, 53 Field of view	Figure **7** 220 ~ 970, 47.3, 53, 214, 240 Field of view	Figure **8** 32 ~ 380, 25.9, 29, 268, 300 Field of view

Touch Finder

Type	Appearance	Model
DC power supply		FQ2-D30
AC/DC/battery		FQ2-D31
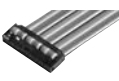
Cables

Type	Appearance	Cable length	Model
FQ Ethernet Cables (connect Sensor to Touch Finder, Sensor to PC)	Robotic cable	2m	FQ-WN002
		5m	FQ-WN005
		10m	FQ-WN010
		20m	FQ-WN020
I/O Cables	Robotic cable	2m	FQ-WD002
		5m	FQ-WD005
		10m	FQ-WD010
		20m	FQ-WD020

Sensor Data Unit (FQ2-S3/S4/CH only)

Type	Appearance	Output type	Model
Parallel Interface		NPN	FQ-SDU10
		PNP	FQ-SDU15
RS-232C Interface		NPN	FQ-SDU20
		PNP	FQ-SDU25

Cables for Sensor Data Unit

Type	Appearance	Cable length	Model
Sensor Data Unit Cable	Robotic cable	2m	FQ-WU002
		5m	FQ-WU005
		10m	FQ-WU010
		20m	FQ-WU020
Parallel Cable for FQ-SDU1*		2m	FQ-VP1002
		5m	FQ-VP1005
		10m	FQ-VP1010
Parallel Cable for FQ-SDU2*		2m	FQ-VP2002
		5m	FQ-VP2005
		10m	FQ-VP2010
RS-232C Cable for FQ-SDU2		2m	XW2Z-200S-V
		5m	XW2Z-500S-V

* When using FQ-SDU□□ , 2 Cables are required for all I/O signals.

Accessories

Application	Appearance	Name	Model
For Sensor		Mounting Bracket *1	FQ-XL
		Mounting Bracket for high-precision sensing *2	FQ-XL2
		Mounting Base for C-mount type *3	FQ-XLC
		Polarizing Filter Attachment *1	FQ-XF1
For Touch Finder		Panel Mounting Adapter	FQ-XPM
		AC Adapter (for AC/DC/battery model) *4	FQ-A□
		Battery (for AC/DC/battery model)	FQ-BAT1
		Touch Pen *5	FQ-XT
		Strap	FQ-XH
		SD Card (2 GB)	HMC-SD291
		SD Card (4 GB)	HMC-SD491

Industrial Switching Hubs (Recommended)

Appearance	Number of ports	Failure detection	Current consumption	Model
	3	None	0.08 A	W4S1-03B
	5	None	0.12 A	W4S1-05B
		Supported		W4S1-05C

External Lighting

Type	Model
3Z4S-LT Series	Refer to 3Z4S-LT/LE Series Catalog (Q164)
FL Series	Refer to FL Series Catalog (Q181)

*1. Included with Integrated Sensor.
*2. A mounting Bracket with improved resistance to vibrations and other external stresses that cause displacement of the optical axis and field of view.
*3. Included with Sensor with C-mount.
*4. AC Adapters for Touch Finder with DC / AC / Battery Power Supply.Select the model for the country in which the Touch Finder will be used.

Plug Type	Voltage	Certified standards	Model
A	125 V max.	PSE	FQ-AC1
		UL/CSA	FQ-AC2
	250 V max.	CCC mark	FQ-AC3
C	250 V max.	---	FQ-AC4
BF	250 V max.	---	FQ-AC5
C	250 V max.	---	FQ-AC6

*5. Enclosed with Touch Finder.

Lenses for C-mount Camera Refer to optical chart on p.30 for selection of a lens.
High-resolution, Low-distortion Lenses

Model	3Z4S-LE SV-0614H	3Z4S-LE SV-0814H	3Z4S-LE SV-1214H	3Z4S-LE SV-1614H	3Z4S-LE SV-2514H	3Z4S-LE SV-3514H	3Z4S-LE SV-5014H	3Z4S-LE SV-7525H	3Z4S-LE SV-10028H
Appearance/ Dimensions (mm)	42 dia. 57.5	39 dia. 52.5	30 dia. 51.0	30 dia. 47.5	30 dia. 36.0	44 dia. 45.5	44 dia. 57.5	36 dia. 42.0[WD:∞] to 54.6[WD:1200]	39 dia. 66.5[WD:∞] to 71.6[WD:2000]
Focal length	6mm	8mm	12mm	16mm	25mm	35mm	50mm	75mm	100mm
Brightness	F1.4	F1.4	F1.4	F1.4	F1.4	F1.4	F1.4	F2.5	F2.8
Filter size	M40.5 P0.5	M35.5 P0.5	M27 P0.5	M27 P0.5	M27 P0.5	M35.5 P0.5	M40.5 P0.5	M34.0 P0.5	M37.5 P0.5

Extension Tubes

Model	3Z4S-LE SV-EXR
Contents	Set of 7 tubes (40 mm, 20 mm,10 mm, 5 mm, 2.0 mm,1.0 mm, and 0.5 mm) Maximum outer diameter: 30 mm dia.

✽ Do not use the 0.5-mm, 1.0-mm, and 2.0-mm Extension Tubes attached to each other. Since these ExtensionTubes are placed over the threaded section of the Lens or other Extension Tube, the connection may loosen when more than one 0.5-mm, 1.0- mm or 2.0-mm Extension Tube are used together.
✽ Reinforcement is required to protect against vibration when Extension Tubes exceeding 30 mm are used.

System Configuration

Up to 32 Sensors can be set up and monitored from a single Touch Finder or PC Tool.
Various types of Sensors can be used at the same time.
However, I/O type and wiring method vary depending on the Sensor, so select the necessary devices.

Touch Finder **FQ2-D** or PC Tool

Switching Hub **W4S1**

Sensors (32 max.)*
FQ2-S1/S2/S3/S4/CH,FQ-CR1/CR2

Standard Ethernet Cable RJ-45 of the FCC regulations

Special Ethernet Cable **FQ-WN**

*The Setup Tool can connect to up to 32 Sensors and it can display up to eight Sensors at the same time.
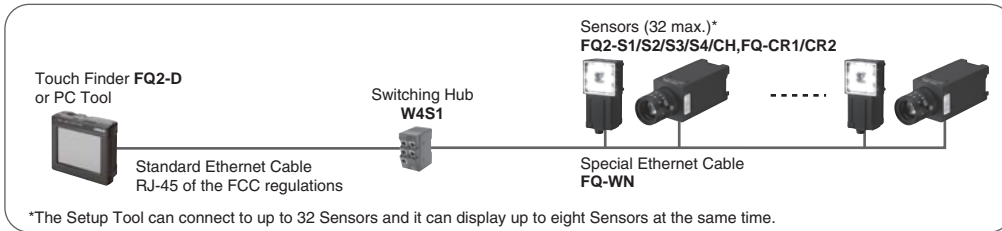
Note: Note: If you register as a member after purchasing a Sensor, you can download free setup software that runs on a PC and can be used in place of Touch Finder. Refer to the member registration sheet for details.

Ethernet (EtherNet/IP, No-protocol, or PLC Link) Connection

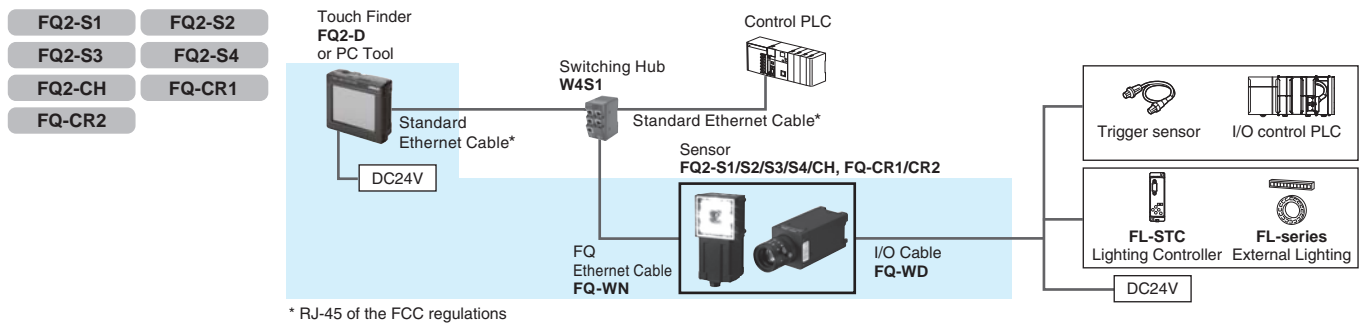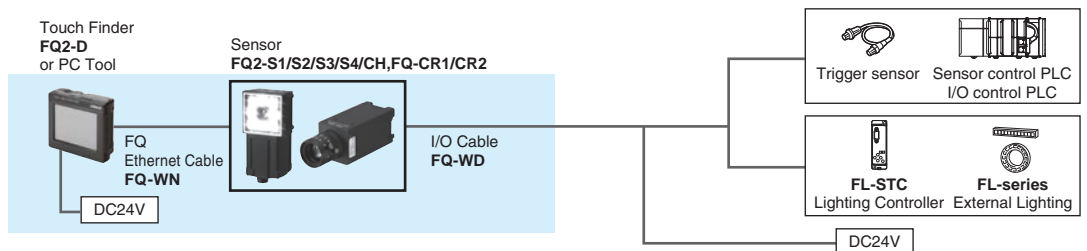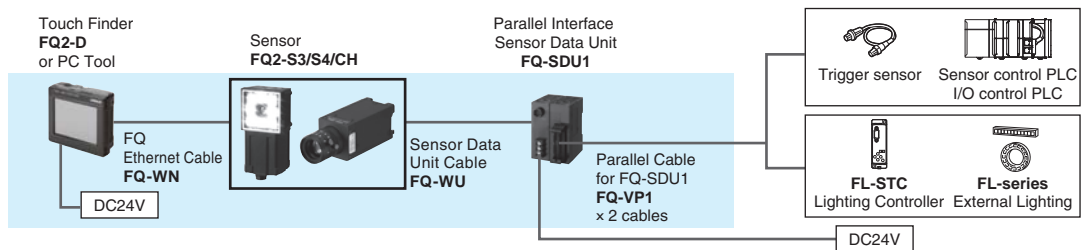| FQ2-S1	FQ2-S2
FQ2-S3	FQ2-S4
FQ2-CH	FQ-CR1
FQ-CR2	

Touch Finder **FQ2-D** or PC Tool

Switching Hub **W4S1**

Control PLC

Standard Ethernet Cable*

Standard Ethernet Cable*

DC24V

Sensor **FQ2-S1/S2/S3/S4/CH, FQ-CR1/CR2**

Trigger sensor   I/O control PLC

FQ Ethernet Cable **FQ-WN**

I/O Cable **FQ-WD**

FL-STC Lighting Controller   **FL-series** External Lighting

DC24V

* RJ-45 of the FCC regulations

Parallel Interface Connection

■ Connection with Standard Parallel Interface of the Sensor

FQ2-S1	FQ2-S2
FQ2-S3	FQ2-S4
FQ2-CH	FQ-CR1
FQ-CR2	

Touch Finder **FQ2-D** or PC Tool

Sensor **FQ2-S1/S2/S3/S4/CH,FQ-CR1/CR2**

FQ Ethernet Cable **FQ-WN**

DC24V

I/O Cable **FQ-WD**

Trigger sensor   Sensor control PLC I/O control PLC

FL-STC Lighting Controller   **FL-series** External Lighting

DC24V

■ Connection through a Parallel Interface Sensor Data Unit

FQ2-S1	FQ2-S2
FQ2-S3	FQ2-S4
FQ2-CH	FQ-CR1
FQ-CR2	

Touch Finder **FQ2-D** or PC Tool

Sensor **FQ2-S3/S4/CH**

Parallel Interface Sensor Data Unit **FQ-SDU1**

FQ Ethernet Cable **FQ-WN**

DC24V

Sensor Data Unit Cable **FQ-WU**

Parallel Cable for FQ-SDU1 **FQ-VP1** × 2 cables

Trigger sensor   Sensor control PLC I/O control PLC

FL-STC Lighting Controller   **FL-series** External Lighting

DC24V

RS-232C Serial Connection

FQ2-S1	FQ2-S2
FQ2-S3	FQ2-S4
FQ2-CH	FQ-CR1
FQ-CR2	

Touch Finder **FQ2-D** or PC Tool

Sensor **FQ2-S3/S4/CH**

RS-232C Interface Sensor Data Unit **FQ-SDU2**

FQ Ethernet Cable **FQ-WN**

DC24V

Sensor Data Unit Cable **FQ-WU**

Parallel Cable for FQ-SDU2 **FQ-VP2** × 2 cables

RS-232C Cable XW2Z-□00S-V

Trigger sensor   Sensor control PLC I/O control PLC

FL-STC Lighting Controller   **FL-series** External Lighting

Sensor control PLC

DC24V
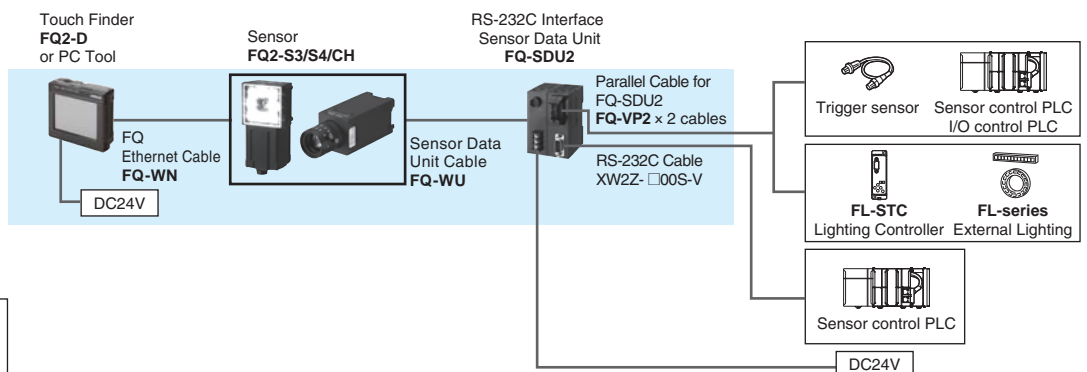
Model compatible with communications interface

	Compatible
	Not compatible

Sensor [Inspection Model FQ2-S1/S2/S3 Series]

Item		Single-function type	Standard type	High-resolution type					
Model	NPN	FQ2-S10□□□□	FQ2-S20□□□□	FQ2-S30□□□□-08	FQ2-S30□□□□-08M	FQ2-S30-13		FQ2-S30-13M	
	PNP	FQ2-S15□□□□	FQ2-S25□□□□	FQ2-S35□□□□-08	FQ2-S35□□□□-08M	FQ2-S35-13		FQ2-S35-13M	
Field of view		Refer to Ordering Information on p.19. (Tolerance (field of view): ±10% max.)				Select a lens according to the field of view and installation distance. Refer to the optical chart on p.30.			
Installation distance									
Main functions	Inspection items	Search, shape search II, sensitive search, area, color data, edge position, edge pitch, edge width, and labeling							
	Number of simultaneous measurements	1	32						
	Position compensation	Supported (360º Model position compensation, Edge position compensation)							
	Number of registered scenes	8 *	32 *						
	Calibration	Supported							
Image input	Image processing method	Real color			Monochrome	Real color		Monochrome	
	Image filter	High dynamic range (HDR), image adjustment (Color Gray Filter, Weak smoothing, Strong smoothing, Dilate, Erosion, Median, Extract edges, Extract horizontal edges, Extract vertical edges, Enhance edges, Background suppression), polarizing filter (attachment), and white balance (Sensors with Color Cameras only)							
	Image elements	1/3-inch color CMOS		1/2-inch color CMOS	1/2-inch Monochrome CMOS	1/2-inch color CMOS		1/2-inch Monochrome CMOS	
	Shutter	Built-in lighting ON: 1/250 to 1/50,000s Built-in lighting OFF: 1/1 to 1/50,000s		Built-in lighting ON: 1/250 to 1/60,000s Built-in lighting OFF: 1/1 to 1/4155s		1/1 to 1/4155s			
	Processing resolution	752 × 480		928 × 828		1280 × 1024			
	Partial input function	Supported horizontally only.		Supported horizontally and vertically					
	Lens mounts	---				C-mount			
Lighting	Lighting method	Pulse				---			
	Lighting color	White				---			
Data logging	Measurement data	In Sensor: 1,000 items (If a Touch Finder is used, results can be saved up to the capacity of an SD card.)							
	Images	In Sensor: 20 images (If a Touch Finder is used, images can be saved up to the capacity of an SD card.)							
Auxiliary function		Math (arithmetic, calculation functions, trigonometric functions, and logic functions)							
Measurement trigger		External trigger (single or continuous) Communications trigger (Ethernet TCP no-protocol, Ethernet UDP no-protocol, Ethernet FINS/TCP no-protocol, EtherNet/IP, PLC Link , or PROFINET)							
I/O specifications	Input signals	7 signals • Single measurement input (TRIG) • Control command input (IN0 to IN5)							
	Output signals	3 signals • Control output (BUSY) • Overall judgement output (OR) • Error output (ERROR) **Note:** The assignments of the three output signals (OUT0 to OUT2) can be changed to the individual judgements of the inspection items, the image input ready output (READY), or the external lighting timing output (STGOUT).							
	Ethernet specifications	100Base-TX/10Base-T							
	Communications	Ethernet TCP no-protocol, Ethernet UDP no-protocol, Ethernet FINS/TCP no-protocol, EtherNet/IP, PLC Link , or PROFINET							
	I/O expansion	---	---	Possible by connecting FQ-SDU1_ Sensor Data Unit. 11 inputs and 24 outputs					
	RS-232C	---	---	Possible by connecting FQ-SDU2_ Sensor Data Unit. 8 inputs and 7 outputs					
Ratings	Power supply voltage	21.6 to 26.4 VDC (including ripple)							
	Current consumption	2.4 A max.				0.3 A max.			
Environmental immunity	Ambient temperature range	Operating: 0 to 50ºC Storage: -25 to 65ºC (with no icing or condensation)		Operating: 0 to 40ºC Storage: -25 to 65ºC (with no icing or condensation)					
	Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)							
	Ambient atmosphere	No corrosive gas							
	Vibration resistance (destruction)	10 to 150 Hz, single amplitude: 0.35 mm, X/Y/Z directions 8 min each, 10 times							
	Shock resistance (destruction)	150 m/s^2 3 times each in 6 direction (up, down, right, left, forward, and backward)							
	Degree of protection	IEC 60529 IP67 (Except when Polarizing Filter Attachment is mounted or connector cap is removed.)				IEC 60529 IP40			
Materials		Sensor: PBT, PC, SUS Mounting Bracket: PBT Polarizing Filter Attachment: PBT, PC Ethernet connector: Oil-resistance vinyl compound I/O connector: Lead-free heat-resistant PVC				Cover: Zinc-plated steel, Thickness: 0.6 mm Case: Aluminum diecast alloy (ADC-12) Mounting base: Polycarbonate ABS			
Weight		Narrow View/Standard View:Approx.160 g Wide View:Approx.150 g				Approx. 160 g without base, Approx. 185 g with base			
Accessories included with sensor		Mounting Bracket (FQ-XL) (1) Polarizing Filter Attachment (FQ-XF1) (1) Instruction Manual , Member Registration Sheet				Mounting Base (FQ-XLC) (1) Mounting Screw (M3 × 8mm) (4) Instruction Manual, Member Registration Sheet			
LED class		Risk Group 2 (IEC62471)				---			
Applicable standards		EN standard EN 61326 and EC Directive No.2004/104/EC	EN 61326-1:2006 and IEC 61010-1						

* The maximum number of registerable scenes depends on settings due to restrictions on memory.

Sensor [Inspection/ID Model FQ2-S4 Series]

Item		Inspection/ID Model					
Model	NPN	FQ2-S40□□□□	FQ2-S40□□□□-M	FQ2-S40□□□□-08	FQ2-S40□□□□-08M	FQ2-S40□□□□-13	FQ2-S40□□□□-13M
	PNP	FQ2-S45□□□□	FQ2-S45□□□□-M	FQ2-S45□□□□-08	FQ2-S45□□□□-08M	FQ2-S45□□□□-13	FQ2-S45□□□□-13M
Field of view		Refer to Ordering Information on p.19. (Tolerance (field of view): ±10% max.)				Select a lens according to the field of view and installation distance. Refer to the optical chart on p.30.	
Installation distance							
Main functions	Inspection items	Search, shape search II, sensitive search, area, color data, edge position, edge pitch, edge width, labeling, OCR *1, Bar code *2, 2D-code *2, 2D-code (DMP) *3, and Model dictionary					
	Number of simultaneous measurements	32					
	Position compensation	Supported (360º Model position compensation, Edge position compensation)					
	Number of registered scenes	32 *4					
	Calibration	Supported					
	Retry function	Normal retry, Exposure retry, Scene retry, Trigger retry					
Image input	Image processing method	Real color	Monochrome	Real color	Monochrome	Real color	Monochrome
	Image filter	High dynamic range (HDR), image adjustment (Color Gray Filter, Weak smoothing, Strong smoothing, Dilate, Erosion, Median, Extract edges, Extract horizontal edges, Extract vertical edges, Enhance edges, Background suppression), polarizing filter (attachment), and white balance (Sensors with Color Cameras only)					
	Image elements	1/3-inch color CMOS	1/3-inch Monochrome CMOS	1/2-inch color CMOS	1/2-inch Monochrome CMOS	1/2-inch color CMOS	1/2-inch Monochrome CMOS
	Shutter	Built-in lighting ON: 1/250 to 1/50,000s Built-in lighting OFF: 1/1 to 1/50,000s		Built-in lighting ON: 1/250 to 1/60,000s Built-in lighting OFF: 1/1 to 1/4155s		1/1 to 1/4155s	
	Processing resolution	752 × 480		928 × 828		1280 × 1024	
	Partial input function	Supported horizontally only.		Supported horizontally and vertically			
	Lens mounts	---				C-mount	
Lighting	Lighting method	Pulse				---	
	Lighting color	White				---	
Data logging	Measurement data	In Sensor: 1,000 items (If a Touch Finder is used, results can be saved up to the capacity of an SD card.)					
	Images	In Sensor: 20 images (If a Touch Finder is used, images can be saved up to the capacity of an SD card.)					
Auxiliary function		Math (arithmetic, calculation functions, trigonometric functions, and logic functions)					
Measurement trigger		External trigger (single or continuous) Communications trigger (Ethernet TCP no-protocol, Ethernet UDP no-protocol, Ethernet FINS/TCP no-protocol, EtherNet/IP, PLC Link , or PROFINET)					
I/O specifications	Input signals	7 signals • Single measurement input (TRIG) • Control command input (IN0 to IN5)					
	Output signals	3 signals • Control output (BUSY) • Overall judgement output (OR) • Error output (ERROR) **Note:** The assignments of the three output signals (OUT0 to OUT2) can be changed to the individual judgements of the inspection items, the image input ready output (READY), or the external lighting timing output (STGOUT).					
	Ethernet specifications	100Base-TX/10Base-T					
	Communications	Ethernet TCP no-protocol, Ethernet UDP no-protocol, Ethernet FINS/TCP no-protocol, EtherNet/IP, PLC Link , or PROFINET					
	I/O expansion	Possible by connecting FQ-SDU1_ Sensor Data Unit. 11 inputs and 24 outputs					
	RS-232C	Possible by connecting FQ-SDU2_ Sensor Data Unit. 8 inputs and 7 outputs					
Ratings	Power supply voltage	21.6 to 26.4 VDC (including ripple)					
	Current consumption	2.4 A max.				0.3 A max.	
Environmental immunity	Ambient temperature range	Operating: 0 to 40ºC Storage: -25 to 65ºC (with no icing or condensation)					
	Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)					
	Ambient atmosphere	No corrosive gas					
	Vibration resistance (destruction)	10 to 150 Hz, single amplitude: 0.35 mm, X/Y/Z directions 8 min each, 10 times					
	Shock resistance (destruction)	150 m/s² 3 times each in 6 direction (up, down, right, left, forward, and backward)					
	Degree of protection	IEC 60529 IP67 (Except when Polarizing Filter Attachment is mounted or connector cap is removed.)				IEC 60529 IP40	
Materials		Sensor: PBT, PC, SUS Mounting Bracket: PBT Polarizing Filter Attachment: PBT, PC Ethernet connector: Oil-resistance vinyl compound I/O connector: Lead-free heat-resistant PVC				Cover: Zinc-plated steel, Thickness: 0.6 mm Case: Aluminum diecast alloy (ADC-12) Mounting base: Polycarbonate ABS	
Weight		Narrow View/Standard View:Approx.160 g Wide View:Approx.150 g				Approx. 160 g without base, Approx. 185 g with base	
Accessories included with sensor		Mounting Bracket (FQ-XL) (1) Polarizing Filter Attachment (FQ-XF1) (1) Instruction Manual, Member Registration Sheet				Mounting Base (FQ-XLC) (1) Mounting Screw (M3 × 8mm) (4) Instruction Manual, Member Registration Sheet	
LED class		Risk Group 2 (IEC62471)				---	
Applicable standards		EN 61326-1:2006 and IEC 61010-1					

*1.   The types of characters to be read are the same as those of FQ2-CH Optical Character Recognition Sensor (p.25).
*2.   The types of cedes to be read are the same as those of FQ-CR1 Multi Code Reader (p.25).
*3.   The types of cedes to be read are the same as those of FQ-CR2 2D Code Reader (p.25).
*4.   The maximum number of registerable scenes depends on settings due to restrictions on memory.

Sensor [ID Model FQ2-CH, FQ-CR1/CR2 Series]

Item		Optical Character Recognition Sensor	Multi Code Reader	2D Code Reader
Model	NPN	FQ2-CH10□□□□-M	FQ-CR10□□□□-M	FQ-CR20□□□□-M
	PNP	FQ2-CH15□□□□-M	FQ-CR15□□□□-M	FQ-CR25□□□□-M
Field of view		Refer to Ordering Information on p.19. (Tolerance (field of view): ±10% max.)		
Installation distance				
Main functions	Inspection items	OCR · Alphabet A to Z · Number 0 to 9 · Symbol ' - . : / Model dictionary	2D Code (Data Matrix (EC200), QR Code, MicroQR Code, PDF417, MicroPDF417, GS1-DataMatrix) Bar Code (JAN/EAN/UPC, Code39, Codabar (NW-7), ITF (Interleaved 2 of 5), Code 93, Code128/GS1-128, GS1 DataBar* (Truncated,Stacked, Omni-directional, Stacked Omnidirectional,Limited, Expanded, Expanded Stacked), Pharmacode, GS1-128 Composite Code (CC-A, CC-B, CC-C))	2D Code (Data Matrix (EC200), QR Code)
	Image filter	Weak smoothing, Strong smoothing, Dilate, Erosion, Median, Extract edges, Extract horizontal edges, Extract vertical edges, Enhance edges, Background suppression	None	Filter function (Smooth, Dilate, Erosion, Median), Code Error Correction Position Display
	Verification function	Supported	Supported	None
	Retry function	Normal retry, Exposure retry, Scene retry, Trigger retry		
	Number of simultaneous measurements	32		
	Position compensation	Supported (360º Model position compensation, Edge position compensation)	None	
	Number of registered scenes	32		
Image input	Image processing method	Monochrome		
	Image filter	High dynamic range (HDR) and polarizing filter (attachment)		
	Image elements	1/3-inch Monochrome CMOS		
	Shutter	Built-in lighting ON: 1/250 to 1/50,000s Built-in lighting OFF: 1/1 to 1/50,000s	1/250 to 1/30,000s	1/250 to 1/32,258s
	Processing resolution	752 × 480		
	Partial input function	Supported horizontally only.		
Lighting	Lighting method	Pulse		
	Lighting color	White		
Data logging	Measurement data	In Sensor: 1,000 items (If a Touch Finder is used, results can be saved up to the capacity of an SD card.)		
	Images	In Sensor: 20 images (If a Touch Finder is used, images can be saved up to the capacity of an SD card.)		
Auxiliary function		Math (arithmetic, calculation functions, trigonometric functions, and logic functions)	---	
Measurement trigger		External trigger (single or continuous) Communications trigger (Ethernet TCP no-protocol, Ethernet UDP no-protocol, Ethernet FINS/TCP no-protocol, EtherNet/IP, PLC Link, or PROFINET)	External trigger (single or continuous) Communications trigger (Ethernet TCP no-protocol)	
I/O specifications	Input signals	7 signals • Single measurement input (TRIG) • Control command input (IN0 to IN5)		
	Output signals	3 signals • Control output (BUSY) • Overall judgement output (OR) • Error output (ERROR) **Note:** The assignments of the three output signals (OUT0 to OUT2) can be changed to the individual judgements of the inspection items, the image input ready output (READY), or the external lighting timing output (STGOUT).	3 signals • Control output (BUSY) • Overall judgement output (OR) • Error output (ERROR) **Note:** Note:The three output signals can be allocated for the judgements of individual inspection items.	
	Ethernet specifications	100Base-TX/10Base-T		
	Communications	Ethernet TCP no-protocol, Ethernet UDP no-protocol, Ethernet FINS/TCP no-protocol, EtherNet/IP, PLC Link, or PROFINET	Ethernet TCP no-protocol	
	I/O expansion	Possible by connecting FQ-SDU1_ Sensor Data Unit. 11 inputs and 24 outputs	---	
	RS-232C	Possible by connecting FQ-SDU2_ Sensor Data Unit. 8 inputs and 7 outputs	---	
Ratings	Power supply voltage	21.6 to 26.4 VDC (including ripple)		
	Current consumption	2.4 A max.		
Environmental immunity	Ambient temperature range	Operating: 0 to 40ºC, Storage: -25 to 65ºC (with no icing or condensation)	Operating: 0 to 50ºC, Storage: -25 to 65ºC (with no icing or condensation)	
	Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)		
	Ambient atmosphere	No corrosive gas		
	Vibration resistance (destruction)	10 to 150 Hz, single amplitude: 0.35 mm, X/Y/Z directions 8 min each, 10 times		
	Shock resistance (destruction)	150 m/s^2 3 times each in 6 direction (up, down, right, left, forward, and backward)		
	Degree of protection	IEC 60529 IP67 (Except when Polarizing Filter Attachment is mounted or connector cap is removed.)		
Materials		Sensor: PBT, PC, SUS, Mounting Bracket: PBT, Polarizing Filter Attachment: PBT, PC Ethernet connector: Oil-resistance vinyl compound, I/O connector: Lead-free heat-resistant PVC		
Weight		Narrow View/Standard View:Approx.160 g Wide View:Approx.150 g		
Accessories included with sensor		Mounting Bracket (FQ-XL) (1), Polarizing Filter Attachment (FQ-XF1) (1), Instruction Manual, Member Registration Sheet		
LED class		Risk Group 2 (IEC62471)		
Applicable standards		EN 61326-1:2006 and IEC61010-1		

Touch Finder

	Type	Model with DC power supply	Model with AC/DC/battery power supply
Item	**Model**	**FQ2-D30**	**FQ2-D31**
Number of connectable Sensor		Number of sensors that can be recognized (switched): 32 max. number or sensor that can displayed on monitor: 8 max.	
Main functions	Types of measurement displays	Last result display, Last NG display, trend monitor, histograms	
	Types of display images	Through, frozen, zoom-in, and zoom-out images	
	Data logging	Measurement results, measured images	
	Menu language	English, German, French, Italian, Spanish, Traditional Chinese, Simplified Chinese, Korean, Japanese	
Indications	LCD — Display device	3.5-inch TFT color LCD	
	LCD — Pixels	320×240	
	LCD — Display colors	16.7 million	
	Backlight — Life expectancy *1	50,000 hours at 25ºC	
	Backlight — Brightness adjustment	Provided	
	Backlight — Screen saver	Provided	
Operation interface	Touch screen — Method	Resistance film	
	Touch screen — Life expectancy *2	1,000,000 touch operations	
External interface	Ethernet	100BASE-TX/10BASE-T	
	SD card	SDHC-compliant, Class 4 or higher recommended	
Ratings	Power supply voltage	DC power connection:21.6 to 26.4 VDC (including ripple)	DC power connection: 21.6 to 26.4 VDC (including ripple) AC adapter (manufactured by Sino-American Japan Co., Ltd) connection: 100 to 240 VAC, 50/60 Hz Battery connection: FQ-BAT1 Battery (1cell, 3.7 V)
	Continuous operation on Battery *3	---	1.5 h
	Power consumption	DC power connection: 0.2 A max.	DC power connection: 0.2 A max. Charging battery: 0.4 A max.
Environmental immunity	Ambient temperature range	Operating: 0 to 50ºC Storage: −25 to 65ºC (with no icing or condensation)	Operating: 0 to 50ºC when mounted to DIN Track or panel Operation on Battery: 0 to 40ºC Storage: −25 to 65ºC (with no icing or condensation)
	Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)	
	Ambient atmosphere	No corrosive gas	
	Vibration resistance (destruction)	10 to 150 Hz, single amplitude: 0.35 mm, X/Y/Z directions 8 min each, 10 times	
	Shock resistance (destruction)	150 m/s^2 3 times each in 6 direction (up, down, right, left, forward, and backward)	
	Degree of protection	IEC 60529 IP20 (when SD card cover, connector cap, or harness is attached)	
Weight		Approx. 270 g (without Battery and hand strap attached)	
Materials		Case: ABS	
Accessories included with Touch Finder		Touch Pen (FQ-XT), Instruction Manual	

*1. This is a guideline for the time required for the brightness to diminish to half the initial brightness at room temperature and humidity. The life of the backlight is greatly affected by the ambient temperature and humidity and will be shorter at lower or higher temperatures.
*2. This value is only a guideline. No guarantee is implied. The value will be affected by operating conditions.
*3. This value is only a guideline. No guarantee is implied. The value will be affected by the operating environment and operating conditions.

Sensor Data Units (FQ2-S3/S4/CH only)

Item			**Parallel Interface**	**RS-232C Interface**
Model	NPN		FQ-SDU10	FQ-SDU20
	PNP		FQ-SDU15	FQ-SDU25
I/O specifications	Parallel I/O	Connector 1	16 outputs (D0 to D15)	6 inputs (IN0 to IN5)
		Connector 2	11 inputs (TRIG, RESET, IN0 to IN7, and DSA) 8 outputs (GATE, ACK, RUN, BUSY, OR, ERROR, STGOUT, and SHTOUT)	2 inputs (TRIG and RESET) 7 outputs (ACK, RUN, BUSY, OR, ERROR, STGOUT, and SHTOUT)
	RS-232C		---	1 channel, 115,200 bps max.
	Sensor interface		FQ2-S3 connected with FQ-WU☐☐☐ : OMRON interface *Number of connected Sensors: 1	
Ratings	Power supply voltage		21.6 to 26.4 VDC (including ripple)	
	Insulation resistance		Between all DC external terminals and case: 0.5 MΩ min (at 250 VDC)	
	Current consumption		2.5 A max. : FQ2-S☐☐☐☐☐-☐☐☐ and FQ-SDU☐☐, FQ2-CH1☐☐☐☐-M and FQ-SDU☐☐ 0.4 A max. : FQ2-S☐☐-☐☐☐ and FQ-SDU☐☐ 0.1 A max. : FQ-SDU☐☐ only	
Environmental immunity	Ambient temperature range		Operating: 0 to 50ºC, Storage: -20 to 65ºC (with no icing or condensation)	
	Ambient humidity range		Operating and storage: 35% to 85% (with no condensation)	
	Ambient atmosphere		No corrosive gas	
	Vibration resistance (destruction)		10 to 150 Hz, single amplitude: 0.35 mm, X/Y/Z directions, 8 min each, 10 times	
	Shock resistance (destruction)		150 m/s^2 3 times each in 6 directions (up, down, right, left, forward, and backward)	
	Degree of protection		IEC 60529 IP20	
Materials			Case: PC + ABS, PC	
Weight			Approx. 150 g	
Accessories included with Sensor Data Unit			Instruction Manual	

Battery

Item Model	FQ-BAT1
Battery type	Secondary lithium ion battery
Nominal capacity	1,800 mAh
Rated voltage	3.7 V
Ambient temperature range	Operating: 0 to 40ºC Storage: −25 to 65ºC (with no icing or condensation)
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)
Charging method	Charged in Touch Finder (FQ2-D31). AC adapter (FQ-AC□) is required.
Charging time *1	2 h
Usage time *1	1.5 h
Battery backup life (See note 2.)	300 charging cycles
Weight	50 g max.

*1. This value is only a guideline. No guarantee is implied. The value will be affected by operating conditions
*2. This is a guideline for the time required for the capacity of the Battery to be reduced to 60% of the initial capacity. No guarantee is implied. The value will be affected
     by the operating environment and operating conditions.

System Requirements for PC tool for FQ

The following Personal Computer system is required to use the software.

OS	Microsoft Windows XP Home Edition/Professional SP2 or higher (32-bit version) Microsoft Windows 7 Home Premium or higher (32-bit/64-bit version)
CPU	Core 2 Duo 1.06 GHz or the equivalent or higher
RAM	1GB min.
HDD	500 MB min. available space *
Monitor	1,024 × 768 dots min.

*. Available space is also required separately for data logging.

Dimensions

Sensor

Integrated Sensor

Narrow View
FQ2-S□□□10F-□□□
FQ2-CH□□□10F-M
FQ-CR□□□10F-M

Standard View
FQ2-S□□□50F-□□□
FQ2-CH□□□50F-M
FQ-CR□□□50F-M

Wide View
FQ2-S□□100□-□□□
FQ2-CH□□100□-M
FQ-CR□□100□-M

The mounting bracket FQ-XL(included with Sensor)

Optical axis

4-M4 Depth: 6

1/4-20UNC Depth: 6

Mounting hole dimensions
Two, 4.5 dia.

20±0.1

Tightening torque: 1.2 N·m

Optical axis

4-M4 Depth: 6

1/4-20UNC Depth: 6

Mounting hole dimensions
Two, 4.5 dia.

20±0.1

Tightening torque: 1.2 N·m

C-mount
FQ2-S3□-13□
FQ2-S4□-13□

4-M3 Depth: 4   Mounting hole dimensions

Four, 3.4 dia.

26±0.1

69.5±0.1

Mounting screw recommended
tightening torque:0.54N·m

Optical axis

4-M3 Depth: 4 *

6-M3 Depth: 4

* The shape of opposite side similar.
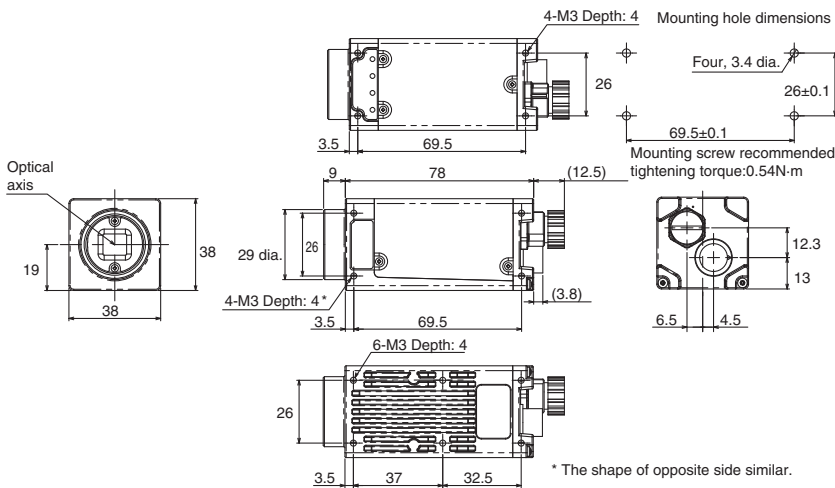
Mounting Base FQ-XLC (included with Sensor)

1/4-20UNC Depth: 4
2-M3 Depth: 4
4-M4 Depth: 4

Mounting hole dimensions
Two, 3.4 dia.
Four, 4.5 dia.

16.3±0.1
20.2±0.1
18±0.1
57.8±0.1
20±0.1

Mounting screw recommended tightening
torque:0.54N·m
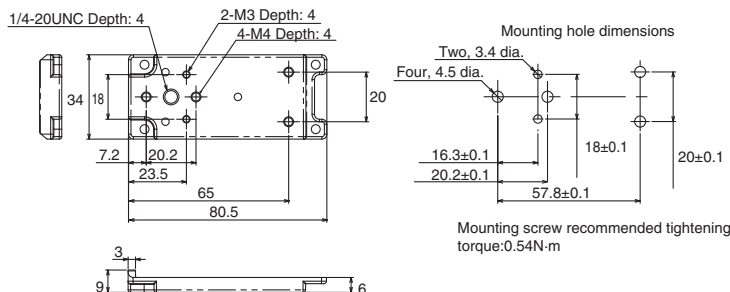
(Unit: mm)

Touch Finder

FQ2-D30/-D31
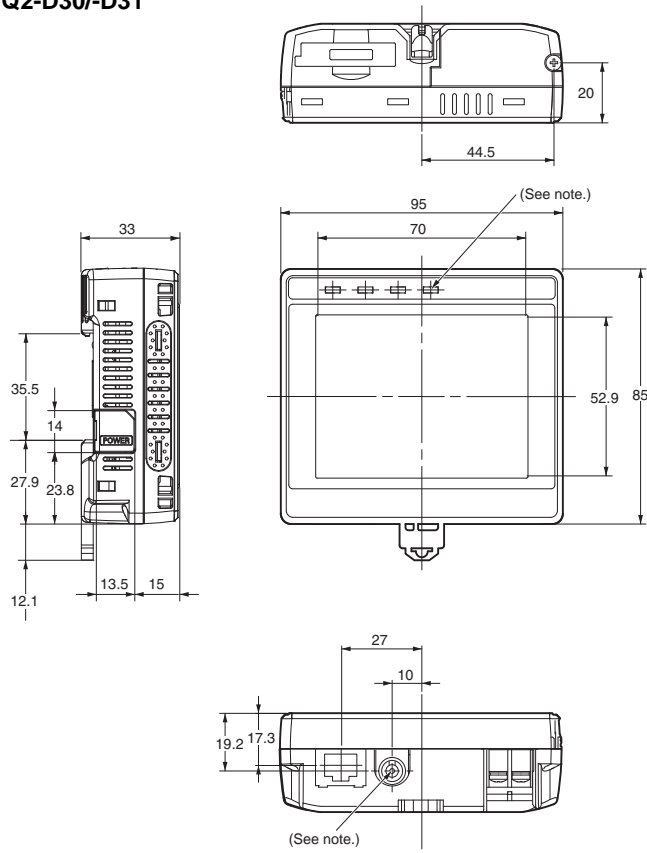
Panel Mounting Adapter FQ-XPM
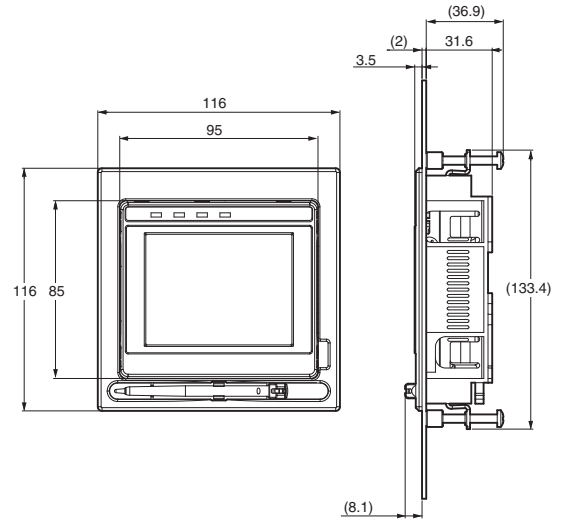
Panel Cutout Dimensions
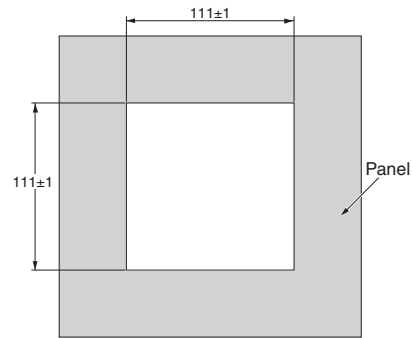
Note: Provided with FQ2-D31 only.

Sensor Data Unit

FQ-SDU10/-SDU15
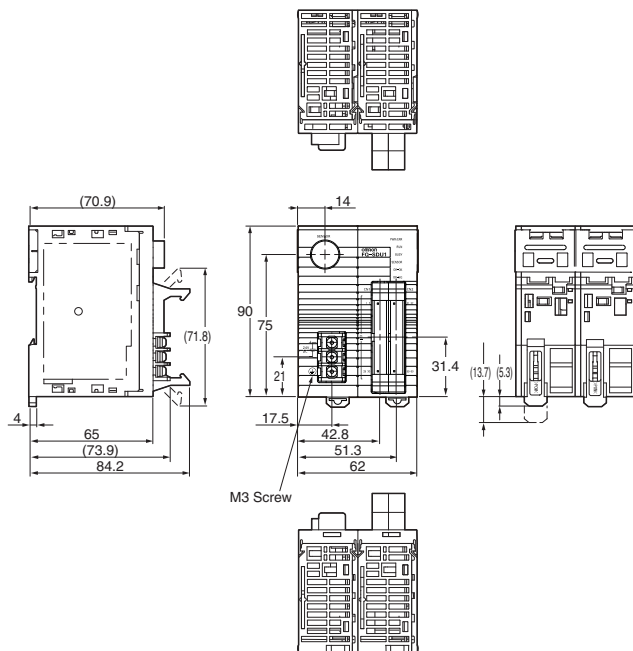
FQ-SDU20/-SDU25
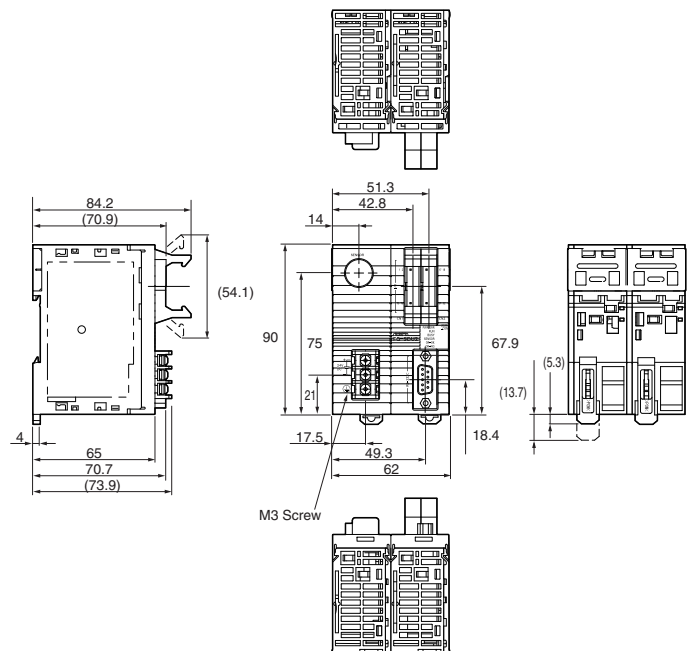
Optical Chart for C-mount Camera FQ2-S3□-13□/-S4□-13□

High-resolution, Low-distortion Lenses 3Z4S-LE SV-□□□□H

3Z4S-LE

— SV-0614H
— SV-0814H
— SV-1214H
— SV-1614H
— SV-2514H
— SV-3514H
— SV-5014H
— SV-7525H
— SV-10028H

Extension tube

Examples
t0: Extension tube is not required.
t5: A 5-mm
    extension tube is required.
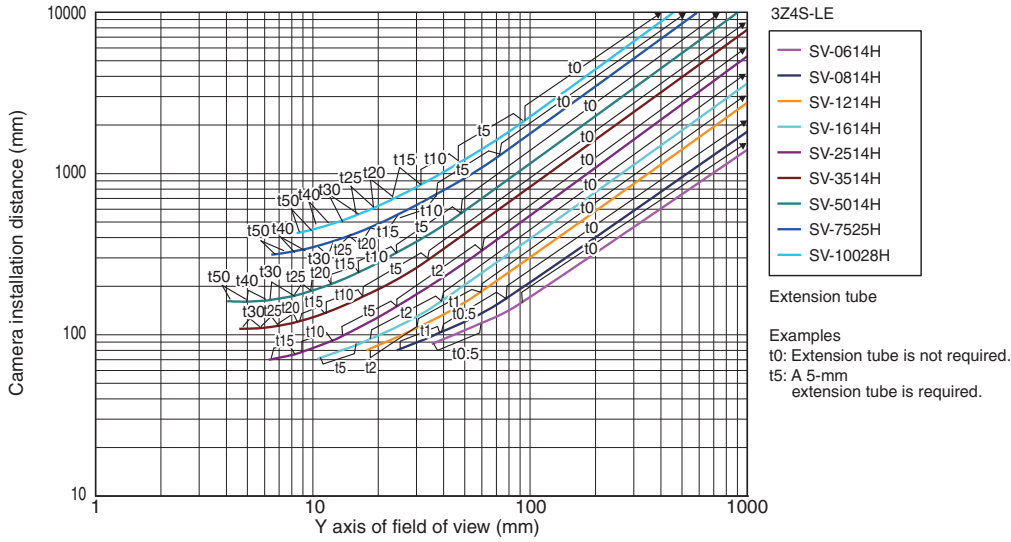
Meaning of Optical Chart
The X axis of the optical chart shows the field of view (mm) (See Note.),
and the Y axis of the optical chart shows the camera installation distance (mm).

Note: The lengths of the fields of view given in the optical charts are the lengths
of the Y axis.
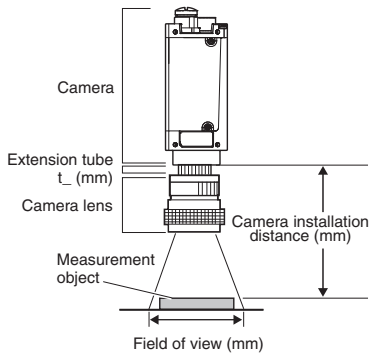
Related Manuals

Man.No.	Model number	Manual
Z337	FQ2-S1/S2/S3/S4/CH	Smart Camera FQ2-S/CH Series User's manual
Z338	FQ2-S1/S2/S3/S4/CH	Smart Camera FQ2-S/CH Series User's manual (Communication Settings)
Z329	FQ-CR1-M	Fixed Mount Multi Code Reader FQ-CR1-M User's manual
Z316	FQ-CR2	Fixed Mount 2D Code Reader FQ-CR2 User's manual

Vision Series Lineup

The lineup covers everything from low-cost
Smart Cameras to highly customizable PC-based image processing systems.
Choose the best combination for your budget and needs.

Cost

FJ Series

FH Series

FQ2 Series

-Inspection model
-ID model
-Inspection/ID model

Functionality and processing speed

Smart Camera

These integrated cameras provide a cost effective solution for a wide range of vision applications.

Vision System

This package-type Vision System provides both high-end inspection capabilities and excellent processing speed.

PC Vision System

An easily customizable, PC-based image processing system.

Note: Do not use this document to operate the Unit.

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