The New Standard for Image Inspection
FQ2 Smart Camera

Advanced inspection
In a compact housing.

Expanded
Performance and functionality.

Much more
Camera, communications, software tools.
Introducing the Smart Solution Camera

Flexible inspection capabilities, multiple camera and communication options -- this powerful Smart Camera has it all.

Camera provides all of the best-selling features found in Vision Systems without the need for a separate controller.

Three Advantages for effective Machine Design

1. **Compact Body**
   - All-in-one compact size that is perfect for use in tight spaces or designs requiring small size.
   - Compared to more-advanced Vision Sensors with multiple components, this Sensor boasts a much more efficient hardware design.

2. **Image Sensor, OCR, and Code Reader in One**
   - The OCR function with the “build-in” dictionary and the Code Reading ability to recognize 15 code types, add to the solution and provide a powerful upgrade!

3. **A Lineup That Fits a Wide Range of Equipment**
   - Expanded inspection menu, camera variations, and communication interfaces are offered at the same price level as our previous FQ Series. With a wide range of sensors, be certain that we have a solution for your various applications needs.
All You Need is One Package

All You Need in One

Image Processor
Previous Vision Sensors placed the image processor in a separate Controller, now the processor is built into the camera itself.

High-power Lighting
This Smart Camera includes high-power lighting capable of lighting evenly across a wide field of view. This provides sufficient light even when the polarizing filter is used.

Adjustable Lens
The focus of the lens can be adjusted to take clear images for the required field of view and installation distance.

I/O and Power Supply Connector
The output line for inspection results, the input line for changing the setup along with other I/O lines and the power supply line are all combined into one connector.

Ethernet Connectivity
Commands can be input from a PLC to control the FQ2 via Ethernet. In the same way, inspection and measurement results can be output from the FQ2 to a PLC. What is more, and for traceability purposes, you can also transfer images to a computer.

Compact

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 lights or lenses, they are integral to the Smart Camera. Furthermore, the time required to wire everything is drastically reduced, because you only need two components instead of 7 or more as is the case for a vision system.

Ethernet Connectivity
This Smart Camera includes high-power lighting capable of lighting evenly across a wide field of view. This provides sufficient light even when the polarizing filter is used.

Easy Installation
The camera and lighting are integrated into a single unit, so only the 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. Additionally, since the light and camera are integrated, axis alignment is not required either.

Easy Camera Expansion
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. 32 Cameras can be accessed and set up from a single Touch Finder, so you do not need to worry about adding more monitors when you need more Cameras. So, if an operator has problems or a specific request for any of the sensors on the network, you can quickly and remotely access the required sensor.

Flexible Cables
All cables from the cameras are flexible. This allows the Sensor to be used safely on moving parts.

Smart Click Connectors
Connection is made quick and easy with a clear, definitive click-into-place mechanism.

IP67 Water Resistant
The sensor can be used in wet environments.

All You Need in One Package
Easily Perform Both Inspection and Positioning

You can combine multiple inspection tools to perform inspections, positioning and other tasks, all from a single Sensor.

**External Inspection**

Several external inspections can be completed with a single Sensor as depicted by the figure below checking different points of the IC chip. Furthermore, 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.

**Component Positioning**

The Sensor can measure angles of rotation and other position information, which can be used by a robot to position a part correctly. Counting the number of holes and measuring their diameter can also be performed along with the position information.

**Measurement Flow**

Adjusts the image so that it is easier to inspect

Compensates for the position offset of the chip.

Uses the inspection data for calculations and judgements.

Outputs the judgements of inspections individually.

**Purpose**

Calculates data for external output.

Outputs the position information and inclination.

You can combine multiple inspection tools to perform inspections, positioning and other tasks, all from a single Sensor.

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

**Searching**

- **Shape Search**
  - Detects targets of the registered model at high speed.
  - The target object can be detected precisely even with the background.

- **Sensitive Search**
  - The target object can be detected simultaneously even with differences in light amount.
  - Stable 360° searching is possible even if objects are overlapped or partially hidden.

**Search**

- **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**

- **Area**
  - This inspection item measures the area and center position of the specified label.

- **Color Data**
  - Performs inspections that compare the difference in color between the workpiece and a registered model of a good product. It detects defects and defective colors through the average color value tool.

- **Utility Items**
  - The FQ2-CH/S4 unit version 2.10 or later supports the new functions.

**Image Filters**

- **Background Suppression**
  - Suppression of background interference and backgrounds. Advanced robustness, which is critical in FA sites. High precision and reliable position detection is possible without being affected by light interference and backgrounds.

- **360° Rotational Position Compensation**
  - The correct position of workpieces with inconsistent orientation can be measured. This is done by automatically detecting automatic detection of the offset of the workpiece in relation to a registered standard model.

- **Calibration**
  - If the dimensions or position of a workpiece is difficult to determine by the number of pixels, you can convert these pixels and display actual engineering units.
New OCR Method to Quickly Read Characters without Dictionary Registration

Date Verification

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

Character Recognition and Label Position Inspection

Although previously performed as separate processes, character recognition and inspection tools can now both be performed with a single Sensor. This helps you reduce costs and save space.

Measurement Flow

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Measurement Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusts the image so that it is easier to inspect.</td>
<td>Image Filters</td>
</tr>
<tr>
<td>Compensates for the position of the box.</td>
<td>Position Compensation</td>
</tr>
<tr>
<td>Reads the lot number and date.</td>
<td>OCR</td>
</tr>
<tr>
<td>Searches.</td>
<td>Search</td>
</tr>
<tr>
<td>Label position inspection.</td>
<td>Inspections</td>
</tr>
<tr>
<td>Outputs.</td>
<td>Outputs</td>
</tr>
<tr>
<td>Outputs the judgements of (a) and (b).</td>
<td>Calculations and Outputs</td>
</tr>
<tr>
<td>OCR with Built-in Dictionary</td>
<td></td>
</tr>
<tr>
<td>Verification</td>
<td></td>
</tr>
</tbody>
</table>

OCR with Built-in Dictionary

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 offsets.

Utilities That Make Daily Operation Easier

- **Verification**
  - The character data being read can be verified against the character data registered in the master data. You can register up to 30 character strings in the master data and easily change the current master data with an external device.
  - The FQ2-SPx can also compare against the character strings read from bar codes or 2D codes.

- **Calendar Function**
  - The calendar function eliminates the need to set the date and know before data manually every day. The data read by the sensor can be automatically compared to the internal sensor date. The date within the sensor can be automatically converted to the Teach data and adjusted if the external Teach data is entered.

- **Registration in Model Dictionary**
  - New conventional characters can be added to the dictionary. Special items are difficult to read if written without character contrast or positional offsets.

- **Logging Images and Reading Data**
  - The inspected images and reading results can be temporarily saved in the sensor. Additionally, up to 10,000 images and 10,000 reading results can be saved in a 4-GB SD card. You can select logging both OK and NG results or only NG results to aid in traceability.

- **Boundary Correction**
  - Dark areas around characters, such as bar codes, are removed to achieve stable reading.

*The FQ2-Ch/S4 unit version 2.10 or later supports the new functions.*
### Expanded Functionality: Code Reader

**Read Any of 15 Types of Codes from Paper Labels to Direct Part Marking (DPM)**

### Code and Character Verification

OCR and Code Reading inspection items can be combined to read 1D or 2D codes and verify them against character strings all within the FQ2. No programming of external devices is required.

### Reading Direct Marking Codes

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

### 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.

### 2D Codes

The FQ2 can read all the standard 2D code types. You do not need to use more than one code reader even for processing a combination of different code types.

### Paper Labels

**Barcodes**

- JAN/EAN/UPC
- Codabar (NW-7)
- Codabar (Type 1)
- GS1 Datamark
- GS1-128 Composite Code
- Pharmacode

**2D Codes**

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

### Direct Part 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. But 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.

#### 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.

#### Retry function

Code Readers must be able to read codes even when the quality of printing is poor. The FQ2 retry function can automatically retry reading while changing the exposure time and other reading conditions. Even when the workpiece or environment parameters change, the retry function provides 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.
   - Result: R S S S K

2. **Retrying While External Trigger Is Input**
   - Reading is performed when an external trigger is input.
   - Result: R S S S K

3. **Retrying While Changing the Shutter Speed**
   - Reading is performed for the same scene while changing the exposure time in stages.
   - Result: R S S K S K

4. **Retrying While Changing the Reading Conditions**
   - Reading is performed while changing the reading conditions.
   - Result: R S S S K

#### Combining Filtering

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

- **Erosion**
- **Dilate**

### Types of Code Marking

- **Marking on Resin**
- **Marking on Small Parts**
- **Marking on Metal**
- **Marking on Film or Glass**

#### Types of Code Marking

- **Barcodes**
  - Code39
  - Code93
  - GS1-128 Composite Code
  - Codabar (NW-7)
  - Code128 / GS1-128
  - Pharmacode

- **2D Codes**
  - JAN/EAN/UPC
  - Codabar (NW-7)
  - Codabar (Type 1)
  - GS1 Datamark
  - GS1-128 Composite Code
  - Pharmacode

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  - Pharmacode
A Lineup That Fits a Wide Range of Equipment

Sensor Types Available

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**
- **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.

**Monochrome**
- **Wide View Sensrors — Perfect for Tight Spaces**
  A wide-view/whole-angle camera takes images and performs inspections across a wide area, even if the camera is close to the workpiece. Perfect for mounting 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.

**C-mount Type Sensors**
- **Lighting Examples**
  **Backlighting**
  - External Shape Inspections
  - Defect and Foreign Matter Inspections
- **Low-angle Lighting**

**Range Field of View**
- Long Distance
  - 10 m max.
- Name Field of View
  - 1 m
  - 3 mm min.

*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.

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

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

**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.

**I/O Expansion Units**
Our expansion units enable expansion 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**
This Sensor Data Unit supports standard RS-232C communications.

**Operation Interfaces**

You can choose the operation interface and monitor size to suit your application.

- **Touch Finder**
  - Larger monitor
  - Larger + integrated monitor
- **Touch Finder for PLC**
- **Integrated Machine Monitor (.NET controls)**
  - Customizable user interface
  - Larger monitor
  - Larger + integrated monitor

This touch screen monitor with a durable, rugged design is shock-resistant and portable. It has passed our standard 1.5 m drop test. The language displayed can be selected out nine different choices: English, Traditional Chinese, Simplified Chinese, Korean, Japanese, German, French, Italian, and Spanish.

The Setup Tool provides the same functions as those on the Touch Finder, but on a PC. In addition, offline simulation can be performed without the need of a Sensor. The software can be downloaded for free by any customer with the purchase of a Sensor. Refer to the user manual included with the Sensor for details.

OMRON PLCs: CS, CJ1, CJ2, CP1, and NSJ Series
OMRON Machine Automation Controllers: NJ Series
Mitsubishi Electric PLCs: Q Series

*Custom controls to easily display images and results measured by the FQ2 Series on applications created with Microsoft Visual Studio.

Microsoft®.NET is either a registered trademark or trademark of Microsoft Corporation in the United States and/or other countries.

*EtherNet/IP™ is a trademark of ODVA.

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

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High-speed Image Processor
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.

High-brightness ODR Lighting
Four times the brightness of conventional LEDs can be achieved with ODR lighting (Optical Double Reflection) that uses a complete new optics technology. High-brightness illumination was achieved by increasing light efficiency and heat dissipation, making it possible to input images this sharply for the first time.

Crystal Clear Images Even through Polarizing Filter
Lighting is fundamental for stable image inspection, but shiny surfaces can reflect light, resulting in incorrect judgments. 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 ODR optical system for effective use of LED power. This system provides sufficient lighting for inspection even when the supplied polarizing filter is used.

Megapixel CMOS Sensor
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.

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.

Partial Input with DAP (Dual Axis Partial) Processing
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. This system provides sufficient lighting for inspection even when the supplied polarizing filter is used.

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Useful Onsite Utilities

Simulation Software

Without connecting the FQ2 Sensor, the Touch finder for PC enables offline adjustment of inspection conditions and measurement simulation using logged images. You can verify and adjust the settings using the logged images from a remote location to increase yields in overseas factories.

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.

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.

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.

Inspection History Logging

Displays the most recent 1,000 inspection results in graph form.

Recent Results Logging

Inspecting the previous test results allows for easy parameter adjustment.

Alert Judgments

OK or NG image data can be saved to a different folder. This facilitates OK/NG classification.

OK/NG Image save

OK or NG image can be separated and saved in different folders.

Save and load sensor settings

Load and save sensor settings

Note: When multiple sensors are connected, the most recent NG sensor of 10 sensors selected for display is displayed.

Key Technologies

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.

HDR Sensing

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

Shape Search III (Same functionality included in high-end sensors)

With Shape Search III, you can visualize comparisons between the registered model data the measurement object to easily compare and see even slight changes in color. Visualization of the comparison areas provide the guide for parameter adjustment for acceptable variation.

New OCR Algorithm: Matching with Structural Models

Even special cases where character registration is typically required for image matching, no character registration is required to read the characters. This new OCR algorithm matches the structural characteristic points of each character.
### Ordering Information

**FQ-S2 Series [Standard Type]**

<table>
<thead>
<tr>
<th>Field of view/ Installation distance</th>
<th>Narrow View</th>
<th>Standard View</th>
<th>Wide View (Long-distance)</th>
<th>Wide View (Short-distance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pixels</td>
<td>FQ-S20010F</td>
<td>FQ-S20050F</td>
<td>FQ-S2100F</td>
<td>FQ-S2100N</td>
</tr>
<tr>
<td>Color</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
</tr>
<tr>
<td>Field of view/ Installation distance</td>
<td>Refer to figure 1 on p.20</td>
<td>Refer to figure 2 on p.20</td>
<td>Refer to figure 3 on p.20</td>
<td>Refer to figure 4 on p.20</td>
</tr>
</tbody>
</table>

**FQ-S4 Series [Standard Type]**

<table>
<thead>
<tr>
<th>Field of view/ Installation distance</th>
<th>Narrow View</th>
<th>Standard View</th>
<th>Wide View (Long-distance)</th>
<th>Wide View (Short-distance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pixels</td>
<td>FQ-S40010F</td>
<td>FQ-S40050F</td>
<td>FQ-S4100F</td>
<td>FQ-S4100N</td>
</tr>
<tr>
<td>Color</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
</tr>
<tr>
<td>Field of view/ Installation distance</td>
<td>Refer to figure 5 on p.20</td>
<td>Refer to figure 6 on p.20</td>
<td>Refer to figure 7 on p.20</td>
<td>Refer to figure 8 on p.20</td>
</tr>
</tbody>
</table>

**FQ-CR1 Series [Multi Code Reader]**

<table>
<thead>
<tr>
<th>Field of view/ Installation distance</th>
<th>Narrow View</th>
<th>Standard View</th>
<th>Wide View</th>
<th>Wide View (Long-distance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pixels</td>
<td>FQ-CR10010F</td>
<td>FQ-CR10050F</td>
<td>FQ-CR100F</td>
<td>FQ-CR100N</td>
</tr>
<tr>
<td>Color</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
</tr>
<tr>
<td>Field of view/ Installation distance</td>
<td>Refer to figure 1 on p.20</td>
<td>Refer to figure 2 on p.20</td>
<td>Refer to figure 3 on p.20</td>
<td>Refer to figure 4 on p.20</td>
</tr>
</tbody>
</table>

**FQ-CR2 Series [2D Code Reader]**

<table>
<thead>
<tr>
<th>Field of view/ Installation distance</th>
<th>Narrow View</th>
<th>Standard View</th>
<th>Wide View</th>
<th>Wide View (Long-distance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pixels</td>
<td>FQ-CR20010F</td>
<td>FQ-CR20050F</td>
<td>FQ-CR200F</td>
<td>FQ-CR200N</td>
</tr>
<tr>
<td>Color</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
</tr>
<tr>
<td>Field of view/ Installation distance</td>
<td>Refer to figure 1 on p.20</td>
<td>Refer to figure 2 on p.20</td>
<td>Refer to figure 3 on p.20</td>
<td>Refer to figure 4 on p.20</td>
</tr>
</tbody>
</table>

### Sensor

<table>
<thead>
<tr>
<th>Field of view</th>
<th>Narrow View</th>
<th>Standard View</th>
<th>Wide View</th>
<th>Wide View (Long-distance)</th>
<th>Wide View (Short-distance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pixels</td>
<td>FQ-CR10010F</td>
<td>FQ-CR10050F</td>
<td>FQ-CR100F</td>
<td>FQ-CR100N</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
<td></td>
</tr>
<tr>
<td>Field of view/ Installation distance</td>
<td>Refer to figure 1 on p.20</td>
<td>Refer to figure 2 on p.20</td>
<td>Refer to figure 3 on p.20</td>
<td>Refer to figure 4 on p.20</td>
<td></td>
</tr>
</tbody>
</table>

### ID Model

**FQ2-S2 Series [Standard Type]**

<table>
<thead>
<tr>
<th>Field of view</th>
<th>Narrow View</th>
<th>Standard View</th>
<th>Wide View (Long-distance)</th>
<th>Wide View (Short-distance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pixels</td>
<td>FQ2-S20010F</td>
<td>FQ2-S20050F</td>
<td>FQ2-S2100F</td>
<td>FQ2-S2100N</td>
</tr>
<tr>
<td>Color</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
</tr>
<tr>
<td>Field of view/ Installation distance</td>
<td>Refer to figure 1 on p.20</td>
<td>Refer to figure 2 on p.20</td>
<td>Refer to figure 3 on p.20</td>
<td>Refer to figure 4 on p.20</td>
</tr>
</tbody>
</table>

**FQ2-S4 Series [Standard Type]**

<table>
<thead>
<tr>
<th>Field of view</th>
<th>Narrow View</th>
<th>Standard View</th>
<th>Wide View (Long-distance)</th>
<th>Wide View (Short-distance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pixels</td>
<td>FQ2-S40010F</td>
<td>FQ2-S40050F</td>
<td>FQ2-S4100F</td>
<td>FQ2-S4100N</td>
</tr>
<tr>
<td>Color</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
</tr>
<tr>
<td>Field of view/ Installation distance</td>
<td>Refer to figure 5 on p.20</td>
<td>Refer to figure 6 on p.20</td>
<td>Refer to figure 7 on p.20</td>
<td>Refer to figure 8 on p.20</td>
</tr>
</tbody>
</table>

**FQ2-CH Series [Optical Character Recognition Sensor]**

<table>
<thead>
<tr>
<th>Field of view</th>
<th>Narrow View</th>
<th>Standard View</th>
<th>Wide View</th>
<th>Wide View (Long-distance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pixels</td>
<td>FQ2-CH10010F</td>
<td>FQ2-CH10050F</td>
<td>FQ2-CH100F</td>
<td>FQ2-CH100N</td>
</tr>
<tr>
<td>Color</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
</tr>
<tr>
<td>Field of view/ Installation distance</td>
<td>Refer to figure 1 on p.20</td>
<td>Refer to figure 2 on p.20</td>
<td>Refer to figure 3 on p.20</td>
<td>Refer to figure 4 on p.20</td>
</tr>
</tbody>
</table>

**FQ-CR1 Series [Multi Code Reader]**

<table>
<thead>
<tr>
<th>Field of view</th>
<th>Narrow View</th>
<th>Standard View</th>
<th>Wide View</th>
<th>Wide View (Long-distance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pixels</td>
<td>FQ-CR10010F</td>
<td>FQ-CR10050F</td>
<td>FQ-CR100F</td>
<td>FQ-CR100N</td>
</tr>
<tr>
<td>Color</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
</tr>
<tr>
<td>Field of view/ Installation distance</td>
<td>Refer to figure 5 on p.20</td>
<td>Refer to figure 6 on p.20</td>
<td>Refer to figure 7 on p.20</td>
<td>Refer to figure 8 on p.20</td>
</tr>
</tbody>
</table>

**FQ-CR2 Series [2D Code Reader]**

<table>
<thead>
<tr>
<th>Field of view</th>
<th>Narrow View</th>
<th>Standard View</th>
<th>Wide View</th>
<th>Wide View (Long-distance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pixels</td>
<td>FQ-CR20010F</td>
<td>FQ-CR20050F</td>
<td>FQ-CR200F</td>
<td>FQ-CR200N</td>
</tr>
<tr>
<td>Color</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
<td>PHF</td>
</tr>
<tr>
<td>Field of view/ Installation distance</td>
<td>Refer to figure 5 on p.20</td>
<td>Refer to figure 6 on p.20</td>
<td>Refer to figure 7 on p.20</td>
<td>Refer to figure 8 on p.20</td>
</tr>
</tbody>
</table>

### Lineup ranging from single-function models to full-function models

**Inspection Model**

<table>
<thead>
<tr>
<th>Color</th>
<th>Field of view</th>
<th>Number of pixels</th>
<th>Number of simultaneous measurements</th>
<th>Number of registered scenes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monochrome</td>
<td>Narrow View</td>
<td>FQ2-CH Series [Optical Character Recognition Sensor]</td>
<td>350,000 pixels</td>
<td>Standard Type</td>
</tr>
<tr>
<td>Monochrome</td>
<td>Wide View (Short-distance)</td>
<td>FQ2-CH Series [Optical Character Recognition Sensor]</td>
<td>700,000 pixels</td>
<td>Standard Type</td>
</tr>
<tr>
<td>Color</td>
<td>Wide View (Long-distance)</td>
<td>FQ2-CH Series [Optical Character Recognition Sensor]</td>
<td>1.3 million pixels</td>
<td>Standard Type</td>
</tr>
</tbody>
</table>

**ID Model**

<table>
<thead>
<tr>
<th>Color</th>
<th>Field of view</th>
<th>Number of pixels</th>
<th>Number of simultaneous measurements</th>
<th>Number of registered scenes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monochrome</td>
<td>Narrow View</td>
<td>FQ-CR Series [2D Code Reader]</td>
<td>350,000 pixels</td>
<td>High-resolution Type</td>
</tr>
<tr>
<td>Monochrome</td>
<td>Wide View (Short-distance)</td>
<td>FQ-CR Series [2D Code Reader]</td>
<td>700,000 pixels</td>
<td>High-resolution Type</td>
</tr>
<tr>
<td>Color</td>
<td>Wide View (Long-distance)</td>
<td>FQ-CR Series [2D Code Reader]</td>
<td>1.3 million pixels</td>
<td>High-resolution Type</td>
</tr>
</tbody>
</table>
**Touch Finder**

- **Appearance**
  - 355,000 pixels Type
  - 760,000 pixels Type

**Cables**

<table>
<thead>
<tr>
<th>Type</th>
<th>Appearance</th>
<th>Cable length</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>FQ Ethernet Cables (connect Sensor to Touch Finder, Sensor to PC)</td>
<td></td>
<td></td>
<td>FQ-ES-31 (See note.)</td>
</tr>
<tr>
<td>I/O Cables</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sensor Data Unit** (FQ2-S3/S4/CN only)

<table>
<thead>
<tr>
<th>Type</th>
<th>Appearance</th>
<th>Output type</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallel Interface</td>
<td>NPN</td>
<td>FQ-SDU10</td>
<td></td>
</tr>
<tr>
<td>RS-232C Interface</td>
<td>NPN</td>
<td>FQ-SDU20</td>
<td></td>
</tr>
<tr>
<td>FQ2-DS15</td>
<td></td>
<td>FQ-SDU25</td>
<td></td>
</tr>
</tbody>
</table>

**Cables for Sensor Data Unit**

<table>
<thead>
<tr>
<th>Type</th>
<th>Appearance</th>
<th>Cable length</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor Data Unit Cable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parallel Cable for FQ-SDU1</td>
<td></td>
<td>5m</td>
<td>FQ-WL035</td>
</tr>
<tr>
<td>Parallel Cable for FQ-SDU2</td>
<td></td>
<td>10m</td>
<td>FQ-WL036</td>
</tr>
<tr>
<td>Parallel Cable for FQ-SDU3</td>
<td></td>
<td>20m</td>
<td>FQ-WL037</td>
</tr>
<tr>
<td>Parallel Cable for FQ-SDU4</td>
<td></td>
<td></td>
<td>FQ-P1022</td>
</tr>
<tr>
<td>RS-232C Cable for FQ-SDU2</td>
<td></td>
<td>2m</td>
<td>FQ-WP1010</td>
</tr>
<tr>
<td>RS-232C Cable for FQ-SDU3</td>
<td></td>
<td>2m</td>
<td>FQ-WP2005</td>
</tr>
<tr>
<td>RS-232C Cable for FQ-SDU4</td>
<td></td>
<td>5m</td>
<td>FQ-WP2005-V</td>
</tr>
</tbody>
</table>

**Accessories**

- Mounting Bracket: FQ-XL
- Mounting Bracket for High-precision sensing: FQ-XL2
- Mounting Base for C-mount type: FQ-XL2
- Polarizing Filter Attachment: FQ-XF1
- Panel Mounting Adapter: FQ-3PM
- AC Adapter (for AC/DC/battery model): FQ-AC4
- Battery (* for AC/DC/battery model): FQ-BAT1
- Touch Pen: FQ-XT
- Strap: FQ-KH
- SD Card (4 GB): HMIC-SD001
- SD Card (4 GB): HMIC-SD003

**External Lighting**

- FL Series
- PL Series

**Lenses for C-mount Camera**

- High-resolution, Low-distortion Lenses

**Industrial Switching Hubs (Recommended)**

- FL Series
- PL Series

**Cables**

- 2 Cables are required for all I/O signals.

---

*Note: AC Adapter and Battery are sold separately.*

*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.
5. The Battery uses a lithium ion secondary battery. Confirm any applicable laws and regulations in the destination country if you export the Battery.
6. Enclosed with Touch Finder.*
System Configuration

Up to 32 Sensors can be set up and monitored from a single Touch Finder or Touch Finder for PC. 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.

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

Data Unit

Parallel Interface of the Connection with Standard FQ-CR2

Model compatible with Data Unit

RS-232 Serial Connection

I/O wiring using 2 cables

Connection through a Parallel Interface Sensor Data Unit

I/O specification

Input signals

• Single measurement input (TRIG)
• Control input (I/O to P/N)

Output signals

• READY
• BUSY
• STG (Strobe trigger)
• OR (bit) (judgment) to OR1 (bit) (judgment)
• End of judgment to Exp.31 (judgment)

Environmental conditions

Ambient temperature

Operating: -25 to 65ºC
Storage: -25 to 65ºC

Relative humidity

Operating: 0 to 90% (with no icing or condensation)
Storage: 0 to 90% (with no icing or condensation)

Shock resistance

Operating: 15 g (3 Hz to 200 Hz), 3 impacts
Storage: 150 g (3 Hz to 200 Hz), 3 impacts

Vibration resistance

Operating: 3 g, 5 to 500 Hz (damping ratio: 0.707)
Storage: 3 g, 5 to 500 Hz (damping ratio: 0.707)

Model compatible with communications interface

Compatible

Not compatible

Notes:

1. Ethernet/IP not available for FQ-CR1 and FQ-CR2

2. RJ-45 of the FQ-CR1 is not compatible.
### Sensor [Inspection/ID Model FQ2-S4 Series]

<table>
<thead>
<tr>
<th>Inspect/ID Model</th>
<th>FQ2-S40</th>
<th>FQ2-S45</th>
<th>FQ-CR15-M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply voltage</td>
<td>-M</td>
<td>-FQ2-S45</td>
<td>-FQ-CR15-M</td>
</tr>
</tbody>
</table>

#### Optical Character Recognition Sensor

- FQ2-S40-M
- Multi Code Reader
- FQ2-CH10
- FQ-CR25

#### LED class

- with sensor

#### Weight

- Materials
  - Mounting Bracket: PBT, PC
  - Filter: PBT, PC
  - Resistance: 1KΩ

#### Environmental immunity

- Ambient temperature
  - Storage: -20 to 60°C
- Shock resistance (shock wave)
  - 150 m/s², three times each in 6 directions (up, down, left, right, forward, and backward)

#### Degree of protection

- IP65/52P (except when following Filter/Attachment is mounted or connector cap is removed)

#### Materials

- Mounting Bracket: PBT
- Filter: PBT, PC
- Resistance: 1KΩ

#### Weight

- Approx. 160 g without Filter/Attachment
- Approx. 162 g with Filter/Attachment

#### Accessories included with sensor

- Mounting Bracket (FQ-CR15)
- Filter/Attachment (FQ-CR15-M)
- Instruction Manual, Member Registration Sheet

#### Life cycle

- 5 years

---

**Note:**

1. The types of codes to be read are the same as those of FQ-CR15 Optical Character Recognition Sensor (p.25).
2. The types of codes to be read are the same as those of FQ-CR1 Multi Code Reader (p.25).
3. The types of codes to be read are the same as those of FQ-CR2 2D Code Reader (p.25).
4. The maximum number of selectable frames depends on settings due to restrictions on memory.

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

<table>
<thead>
<tr>
<th>Sensor Model</th>
<th>FQ2-CH</th>
<th>FQ-CR1</th>
<th>FQ-CR2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply voltage</td>
<td>-M</td>
<td>-FQ2-S45</td>
<td>-FQ-CR1/CR2</td>
</tr>
</tbody>
</table>

#### Optical Character Recognition Sensor

- FQ2-S40-M
- Multi Code Reader
- FQ2-CH10
- FQ-CR25

#### LED class

- with sensor

#### Weight

- Materials
  - Mounting Bracket: PBT, PC
  - Filter: PBT, PC
  - Resistance: 1KΩ

#### Environmental immunity

- Ambient temperature
  - Operating and storage: 35% to 85% (with no condensation)
  - No corrosive gas

#### Degree of protection

- IP65/52P (except when following Filter/Attachment is mounted or connector cap is removed)

#### Materials

- Mounting Bracket: PBT, PC
- Filter: PBT, PC
- Resistance: 1KΩ

#### Weight

- Approx. 160 g without Filter/Attachment
- Approx. 162 g with Filter/Attachment

#### Accessories included with sensor

- Mounting Bracket (FQ-CR1/CR2-M)
- Filter/Attachment (FQ-CR1/CR2-M)
- Instruction Manual, Member Registration Sheet

#### Life cycle

- 5 years

---

**Note:**

1. The types of codes to be read are the same as those of FQ-CR15 Optical Character Recognition Sensor (p.25).
2. The types of codes to be read are the same as those of FQ-CR1 Multi Code Reader (p.25).
3. The types of codes to be read are the same as those of FQ-CR2 2D Code Reader (p.25).
4. The maximum number of selectable frames depends on settings due to restrictions on memory.
**Touch Finder**

### Model with DC power supply

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>FQ2-D30</td>
<td>FQ2-D30</td>
</tr>
<tr>
<td>FQ2-D31</td>
<td>FQ2-D31</td>
</tr>
<tr>
<td>FQ2-S30</td>
<td>FQ2-S30</td>
</tr>
<tr>
<td>FQ2-S31</td>
<td>FQ2-S31</td>
</tr>
<tr>
<td>FQ2-S32</td>
<td>FQ2-S32</td>
</tr>
<tr>
<td>FQ2-S33</td>
<td>FQ2-S33</td>
</tr>
<tr>
<td>FQ2-S34</td>
<td>FQ2-S34</td>
</tr>
</tbody>
</table>

### Model with AC/DC/Battery power supply

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>FQ2-TX1</td>
<td>FQ2-TX1</td>
</tr>
<tr>
<td>FQ2-TX2</td>
<td>FQ2-TX2</td>
</tr>
<tr>
<td>FQ2-TX3</td>
<td>FQ2-TX3</td>
</tr>
<tr>
<td>FQ2-TX4</td>
<td>FQ2-TX4</td>
</tr>
<tr>
<td>FQ2-TX5</td>
<td>FQ2-TX5</td>
</tr>
<tr>
<td>FQ2-TX6</td>
<td>FQ2-TX6</td>
</tr>
</tbody>
</table>

### Number of connectable Sensor

- FQ-SDU10
- FQ-SDU25
- FQ-SDU20
- FQ2-D31
- FQ-SDU

### Accessories included with Sensor Data Unit

- Touch Pen (FQ-XT), Instruction Manual

**Main functions**

- LCD
  - Display device: 8.0" TFT color LCD
  - Display colors: 16.7 million
  - Brightness: Adjustable
  - Screen saver: Provided

- Operation interface
  - Touch screen: Resistance film
  - Life expectancy: 1,700,000 touch operations

- External interface
  - SD card: Internal, fixed or higher recommended

### Ratings

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply voltage</td>
<td>DC power connection: 21.6 to 26.4 VDC (including ripple)</td>
</tr>
<tr>
<td>Power consumption</td>
<td>DC power connection: 0.2 A max.</td>
</tr>
</tbody>
</table>

### Environmental immunity

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature range</td>
<td>Operating: 0 to 50ºC, Storage: -20 to 60ºC (with no icing or condensation)</td>
</tr>
<tr>
<td>Ambient humidity range</td>
<td>Operating: 35% to 85% (with no condensation), Storage: 35% to 85% (with no condensation)</td>
</tr>
<tr>
<td>Vibration resistance (destruction)</td>
<td>90 to 100 Hz, single amplitude: 0.35 mm, X/Y/Z directions, 9 min each, 10 times</td>
</tr>
<tr>
<td>Shock resistance (destruction)</td>
<td>150 m/s² 3 times each in 6 directions (up, down, right, left, forward, and backward)</td>
</tr>
</tbody>
</table>

### System Requirements for Touch Finder for PC

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS</td>
<td>Microsoft Windows XP Home Edition/Professional SP2 or higher (32-bit version)</td>
</tr>
<tr>
<td>CPU</td>
<td>Core 2 Duo 1.06 GHz or the equivalent or higher</td>
</tr>
<tr>
<td>RAM</td>
<td>1GB min.</td>
</tr>
<tr>
<td>HDD</td>
<td>500 GB min.</td>
</tr>
<tr>
<td>Monitor</td>
<td>1,024 x 768 dots min.</td>
</tr>
</tbody>
</table>

### Touch Finder Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main functions</td>
<td>LCD: English, German, French, Italian, Spanish, Traditional Chinese, Simplified Chinese, Korean, Japanese</td>
</tr>
<tr>
<td>Menu language</td>
<td>English, German, French, Italian, Spanish, Traditional Chinese, Simplified Chinese, Korean, Japanese</td>
</tr>
<tr>
<td>Indications</td>
<td>Touch Finder</td>
</tr>
<tr>
<td>Accessories included with Sensor Data Unit</td>
<td>Touch Pen (FQ-XT), Instruction Manual</td>
</tr>
</tbody>
</table>

### Battery

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery type</td>
<td>Secondary lithium ion battery</td>
</tr>
<tr>
<td>Nominal capacity</td>
<td>1,800 mAh</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>5 V</td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>Operating: 0 to 40ºC, Storage: -20 to 65ºC (with no icing or condensation)</td>
</tr>
<tr>
<td>Ambient humidity range</td>
<td>Operating and storage: 35% to 85% (with no condensation)</td>
</tr>
<tr>
<td>Charging method</td>
<td>Charged in Touch Finder (FQ2-D31). AC adapter (FG-AL1) is required.</td>
</tr>
<tr>
<td>Charging time</td>
<td>2 h</td>
</tr>
<tr>
<td>Weight</td>
<td>90 g max.</td>
</tr>
</tbody>
</table>

### Notes

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 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.

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

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPN</td>
<td>PNP</td>
</tr>
<tr>
<td>I/O specifications</td>
<td>Parallel I/O</td>
</tr>
<tr>
<td>Qty</td>
<td>16 inputs (DI to DI15)</td>
</tr>
<tr>
<td>Qty</td>
<td>11 inputs (TRIG, RESET, PW 1 to PW7, and CAS)</td>
</tr>
<tr>
<td>Qty</td>
<td>8 outputs (GATE, ACK, RUN, BUSY, OR, ERROR, STGOUT, and SHUTOUT)</td>
</tr>
<tr>
<td>Qty</td>
<td>RS-232C</td>
</tr>
</tbody>
</table>

### Sensor Data Unit

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply voltage</td>
<td>21.6 to 26.4 VDC (including ripple)</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>Between all external terminals and case: 2 MΩ min (at 250 VDC)</td>
</tr>
<tr>
<td>Current consumption</td>
<td>0.5 A max. (FG-SST, FG-SDS, FG-SSM, FG-STD, and FG-SSR)</td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>Operating: 0 to 50ºC, Storage: -20 to 60ºC (with no icing or condensation)</td>
</tr>
<tr>
<td>Ambient humidity range</td>
<td>Operating and storage: 35% to 85% (with no condensation)</td>
</tr>
<tr>
<td>Vibration resistance (destruction)</td>
<td>10 to 150 Hz, single amplitude: 0.35 mm, X/Y/Z directions, 9 min each, 10 times</td>
</tr>
<tr>
<td>Shock resistance (destruction)</td>
<td>150 m/s² 3 times each in 6 directions (up, down, right, left, forward, and backward)</td>
</tr>
</tbody>
</table>

**Other**

* Windows is registered trademark of Microsoft Corporation in the USA and other countries. Other company names and product names in this document are the trademarks or registered trademarks of their respective companies.
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 axes.

Related Manuals

<table>
<thead>
<tr>
<th>Man.No.</th>
<th>Model number</th>
<th>Manual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z327</td>
<td>FQ2-S1/S2/S3/S4CH</td>
<td>Smart Camera FQ2-SCH Series User’s manual</td>
</tr>
<tr>
<td>Z328</td>
<td>FQ2-S1/S2/S3/S4CH</td>
<td>Smart Camera FQ2-SCH Series User’s manual (Communication Settings)</td>
</tr>
<tr>
<td>Z316</td>
<td>FQ-CR2</td>
<td>Fixed Mount 2D Code Reader FQ-CR2 User’s manual</td>
</tr>
</tbody>
</table>
The lineup covers everything from cost-effective Smart Cameras to ultra-high-speed Vision Systems. Choose the best combination for your budget and needs.

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.

Note: Refer to the FH Series Catalog (Cat. No. Q197) for details.