

FQ VISION SENSOR

Beyond simplicity



» One-touch operation

» Crystal-clear imaging

» Flexible platform

Simply guided & crystal clear

Omron defines a new era of simplicity and performance with the new FQ vision sensor range. Now you can benefit from state-of-the-art technology without complex operation instructions or technical know-how. With one-touch control via PC or the intuitive TouchFinder console, you can access all functions and settings quickly and easily.

Excellent image quality is achieved from even the most challenging surfaces, with advanced processing tools. And because the FQ Vision Sensor is available in a wide range of models, you won't have to compromise with a choice that has too many or too few features for your needs. So you can be sure of a best-fit solution for your particular application.

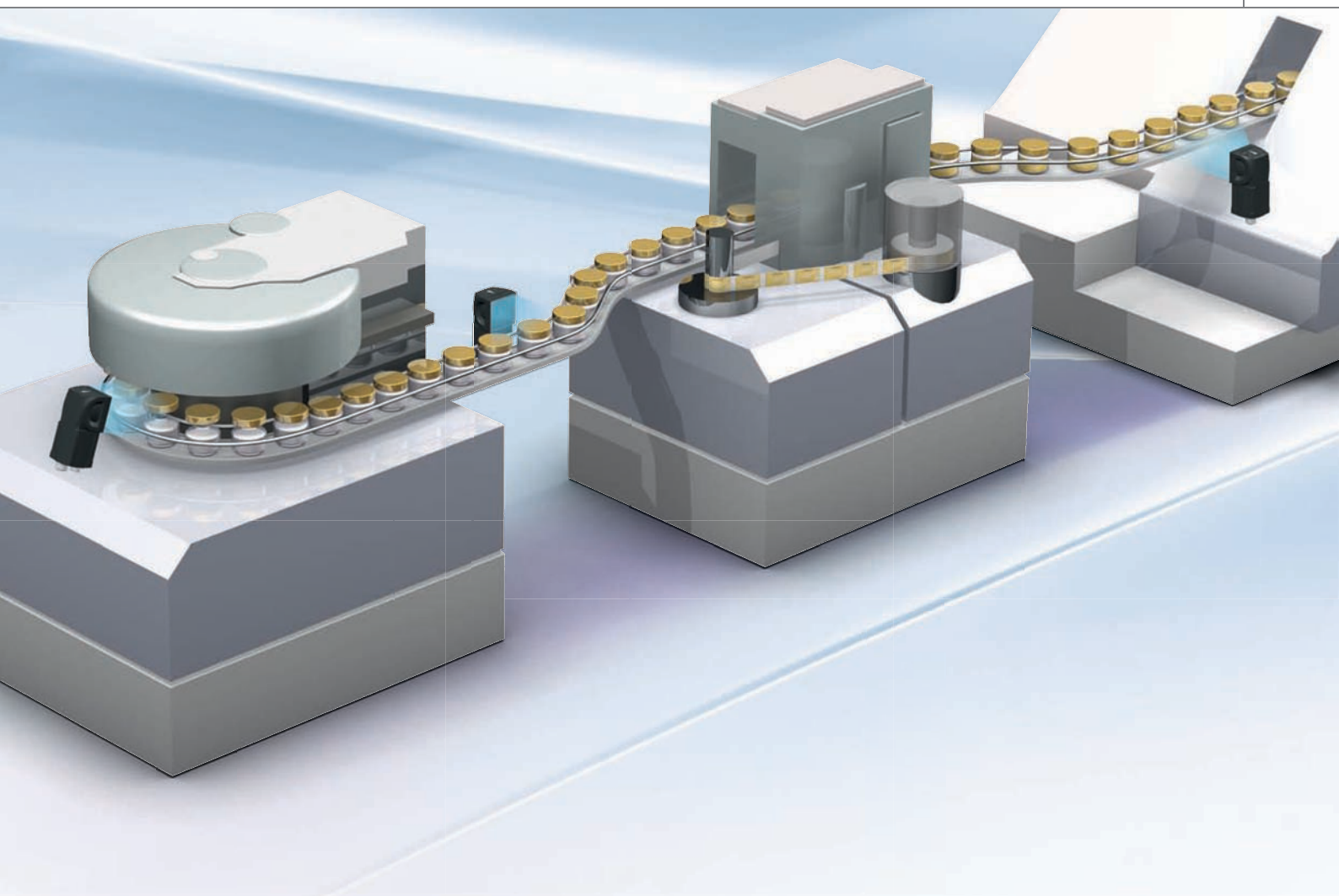
Features

- One-touch control via simple, icon-driven menu
- Crystal-clear image quality
- Real Color Processing (16 million colors)
- Operation via PC or handy TouchFinder screen

Benefits

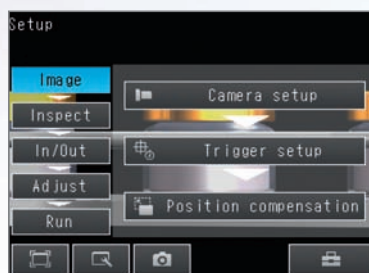
- Simple and guided set-up
- Reliable results on any surface
- Remarkable flexibility – always a perfect match and not a compromise for your application





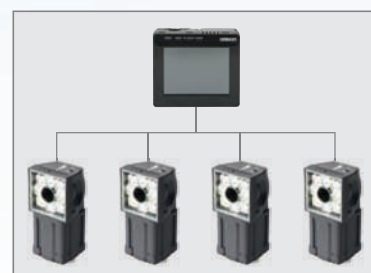
Make it sharp

High performance LEDs and powerful filtering deliver clear images on even the most difficult surfaces.



Simple guided

Always know where you are in operation with the simple navigation menu.



Flexible platform

Select the vision sensor that best fits your application and decide how you want to operate it.

Compact and robust

The FQ Vision Sensor is the most compact solution combining a camera and an image processor within one housing. No need for costly and space-consuming external lighting, thanks to the built-in lens and high performance LED. The IP67 protection class enables the FQ to be used even in harsh environments.

Compact size and robust housing – fits into any machine

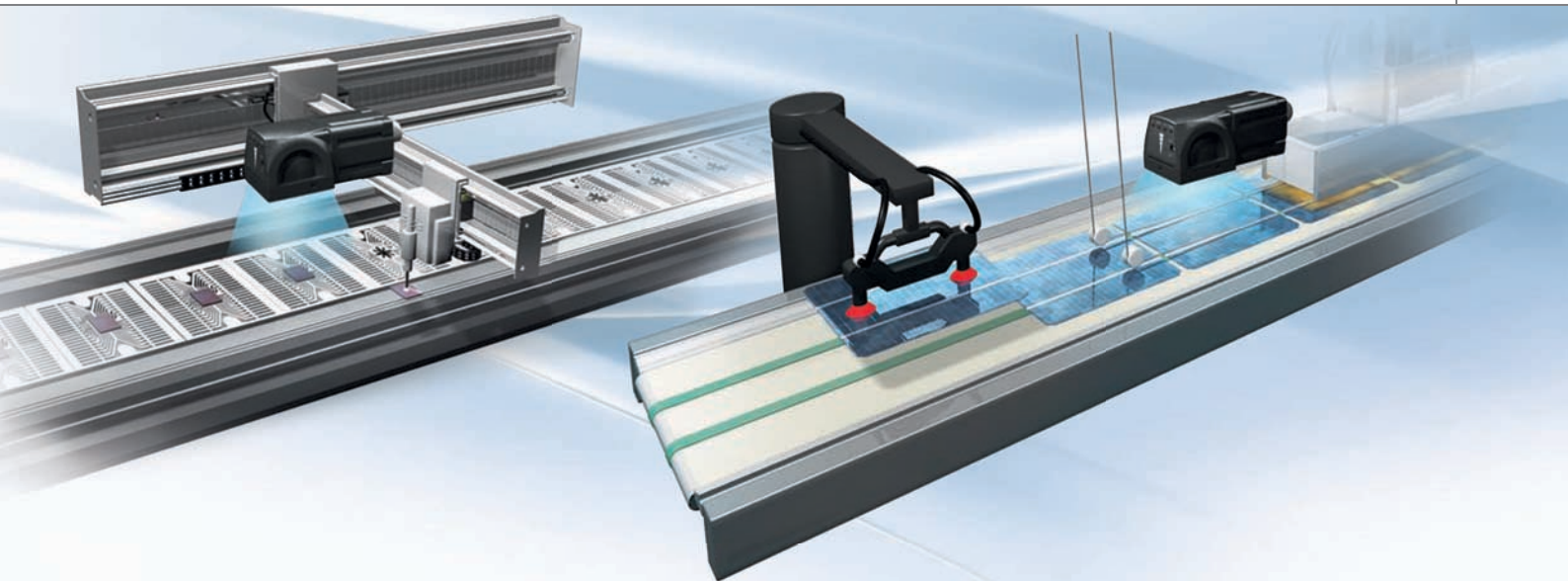
High power LEDs – unique in its class

Built-in lens – simple fine tuning of camera focus

Powerful image processor: high speed inspection, outstanding filtering

Industry grade connectors for trigger and I/O, Ethernet and power.





A new benchmark in image clarity

As well as being a landmark in simplicity, the Omron FQ Vision Sensor also gives you the very best in image quality and clarity. For the first time in this class you can now benefit from a range of advanced image capture and processing features. Power LEDs, HDR, polarization and halation filters enable stable inspections on surfaces where conventional vision sensors see nothing.

The clear image enables a simple installation, as the angle of view is not critical anymore.

Print industry: multicolor objects



Real color sensing

All RGB gradations (16+ million) are processed directly. No grayscale conversion or color filtering required.

Electrical parts: lowest contrast



High power lighting

Contrast was once a major issue in image processing. With the FQ Vision Sensor however, every image is bright and clear, with perfect contrast for reliable results.

Automotive: shiny and reflective



HDR sensing

Variations in lighting conditions can cause unwanted glare or halation. HDR minimizes these effects, maximizing the stability of inspection results, even countering piece-to-piece variation or misalignment.

Simply the most flexible product of its type

Flexibility meets simplicity in the Omron FQ Vision Sensor, in design, functionality and ease of use. Suitable for all types of processing and packaging applications, it can be tailored to meet even the most demanding requirements, and any operational concept.

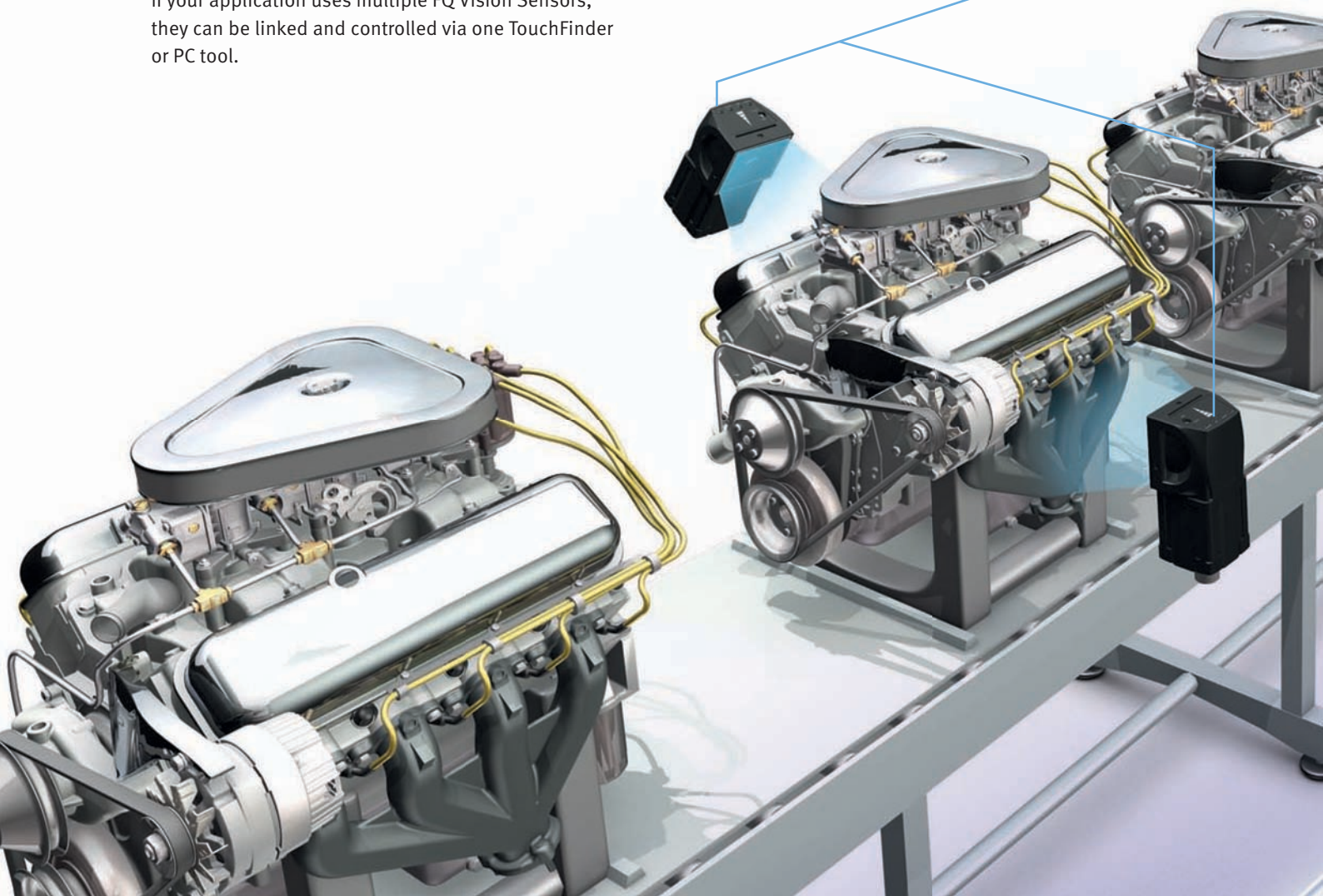
You decide how to set-up and configure

- PC or standalone
- Local or remote
- Portable or fixed
- Permanent or temporary

You have full control over the Omron FQ Vision Sensor, including a live image feed. Only connect the Touch Finder console or PC tool when necessary. Choose permanent installation with DIN rails, or the portable version, with rechargeable battery for full freedom of use.

Multi-control - one for all

If your application uses multiple FQ Vision Sensors, they can be linked and controlled via one TouchFinder or PC tool.

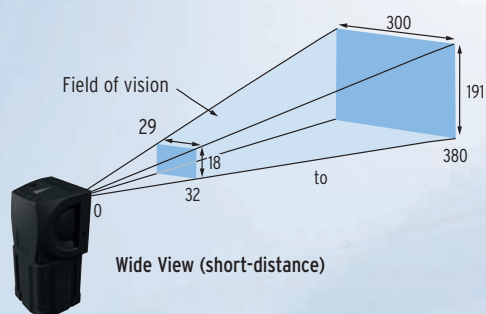
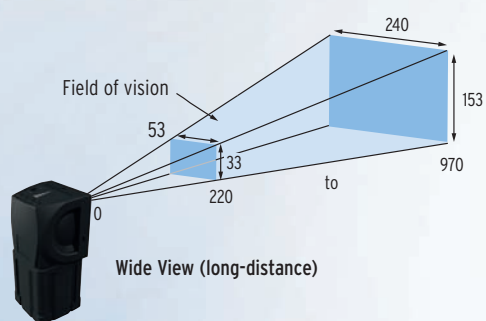
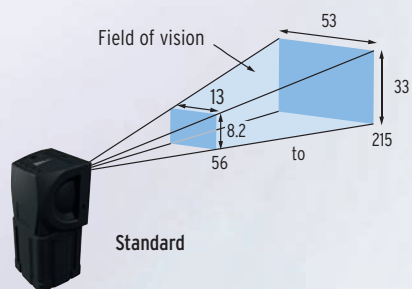
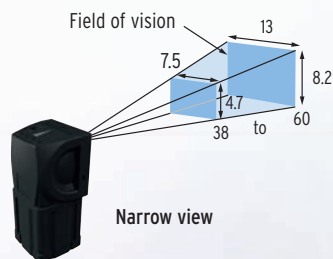


Match your field of view

No matter whether you handle large or small workpieces, the range of Omron FQ Vision Sensors offers a perfect match. Select the FQ model with the appropriate range and adjust the field of view to your application. Focusing is quick and easy too, enabling you to use the sensor for a variety of applications.



Extensive range: field of view from 7.5 - 300mm.

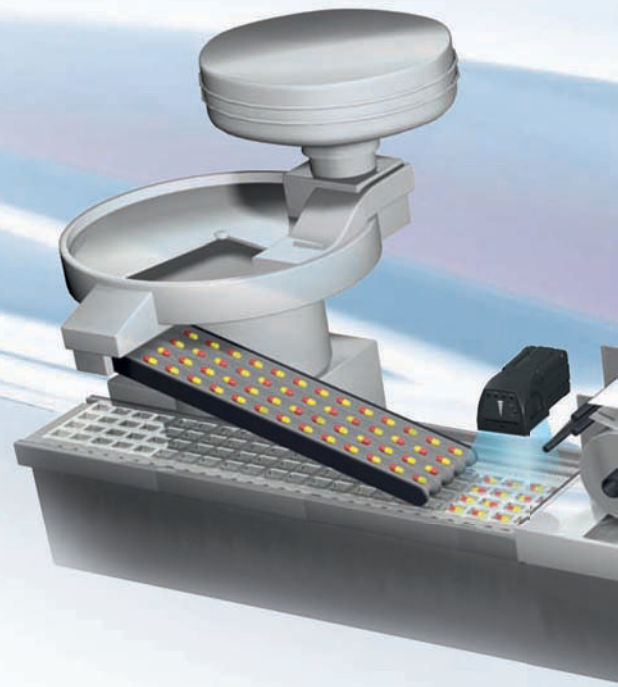


Guided by simplicity

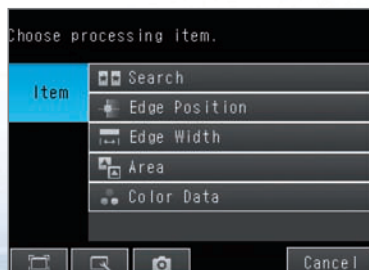
The FQ Vision Sensor takes you into a new dimension of simplicity and intuitive user guidance. Always know where you are thanks to the innovative navigation menu. You are guided step by step, and will quickly learn how to navigate directly to any set-up item.

Use the powerful auto-functions of the FQ to find the ideal settings. Let the FQ support you through the initial set up and any fine tuning or configuration changes. Users do not need to be experts in image sensors, since the processing intelligence is incorporated in the unit itself.

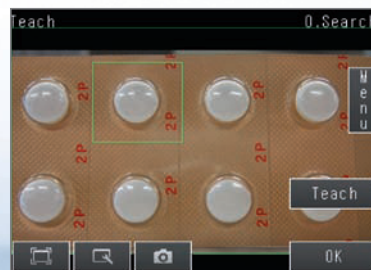
Various inspection result views are available: overview, detail, trend or distribution. The FQ display options give you the results you need to make informed decisions about your production.



Touch & start – inspection setup



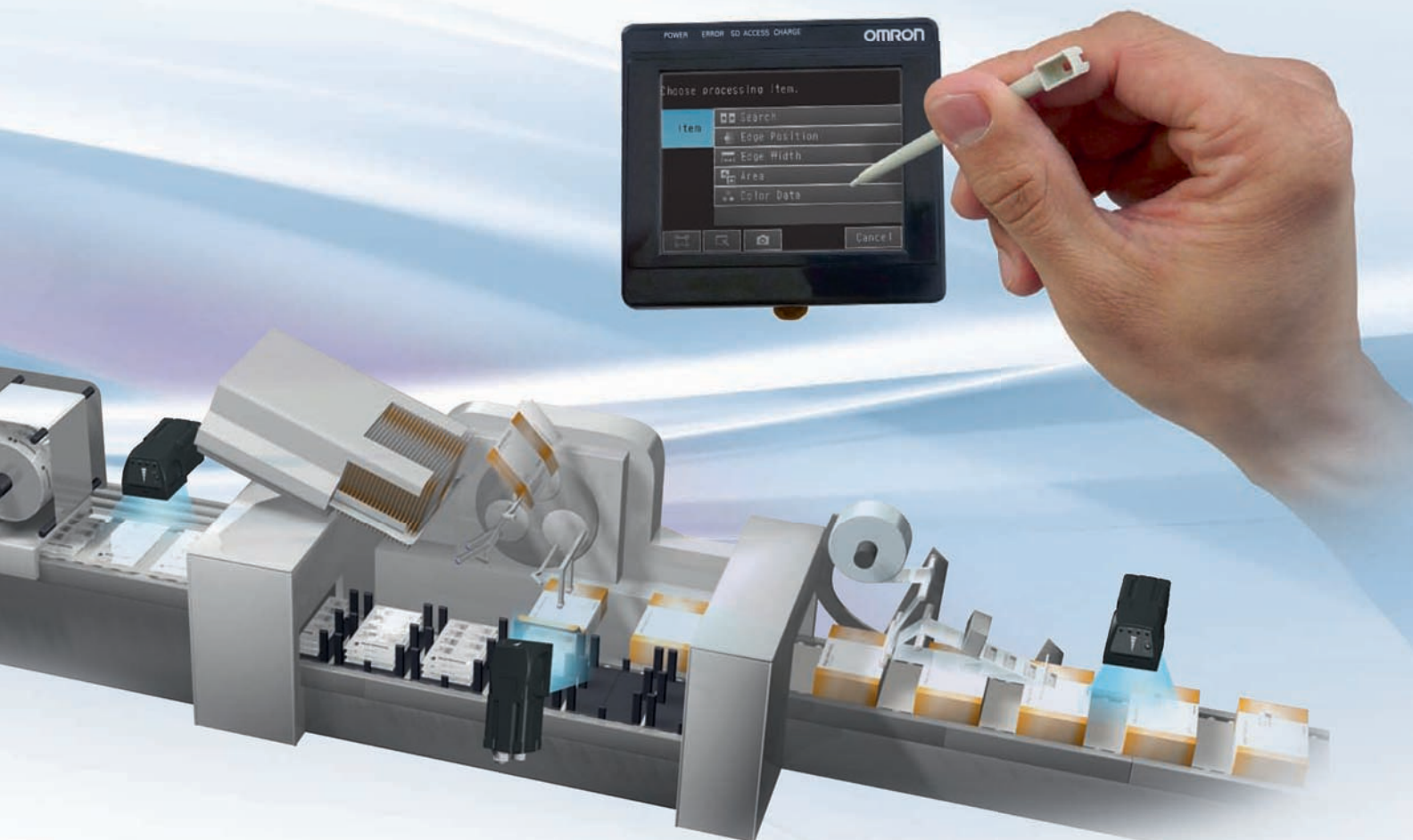
1. Select the inspection item



2. Teach the model



3. Set the thresholds

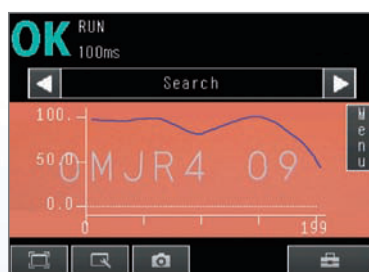


Get the right results every time, in any format



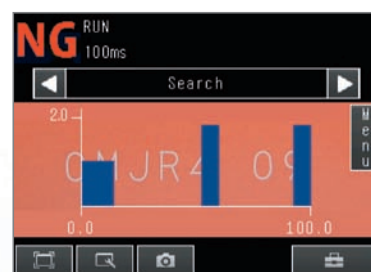
Overview of results

Display the results of all inspection items in one view. Navigate directly to each result with one touch to see the details.



Trend monitor

See the history of inspection results over time. The trend of the production quality can be easily monitored. Countermeasures can be implemented immediately if quality goes down.

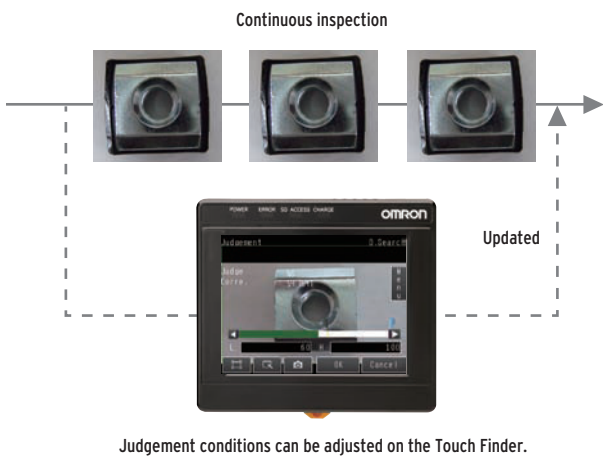


Histogram

Show the distribution of all measurement results, giving you instant overview of overall production quality.

Real-time Threshold Adjustment

The FQ vision sensor 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.



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 histories can be saved in SD cards and used later for traceability.

Recent Results Logging



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

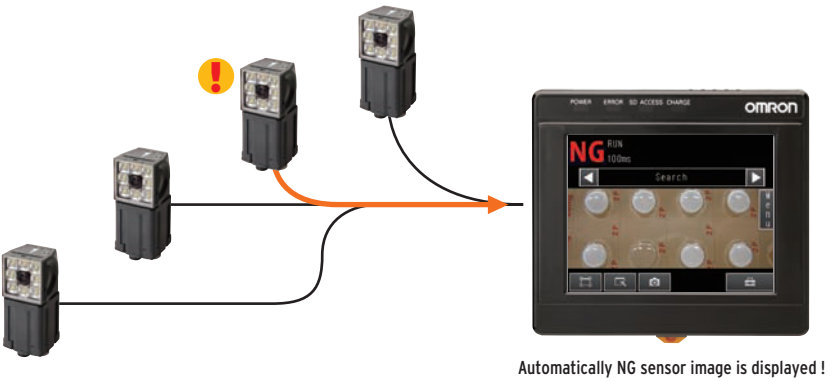
File Logging



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)

Auto Detection

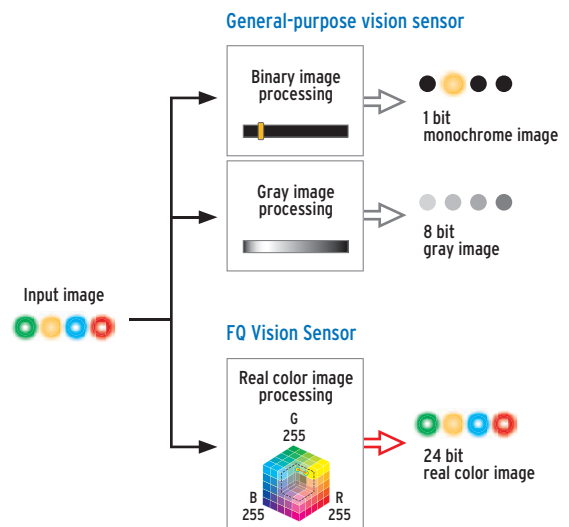
When multiple sensors are connected to the touch finder, the display automatically switches to the image of the sensor which has produced an NG result. This allows dynamic visualisation of reject conditions.



Real Color Sensing

Most vision sensors on the market operate using greyscale image processing, due to the high demand of processing color images. However, many applications may be unsuitable or unstable using greyscale processing due to the requirement of color inspection or poor image contrast.

In order to offer solutions for such issues, the FQ vision sensor combines a high power processor unit and real-color processing technology which enables fast inspections using color images. The same technology is used in Omron's flagship model of vision sensors and is widely utilised throughout industry.



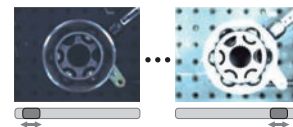
HDR Sensing

Glossy & highly reflective surfaces can often result in "halation" or uneven brightness across an image, coupled with inconsistent workpiece placement inspections can become unstable and unreliable. Such halation is a result of the narrow dynamic range of standard vision sensors.

The FQ vision sensor uses Omron's High Dynamic Range (HDR) processing technology, which increases the dynamic range of the system up to 16 times that of conventional vision sensors. The result is stable detection of objects which are highly reflective, even if workpiece placement is not consistent.

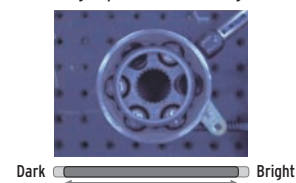
General-purpose vision sensor

image by narrow dynamic range



FQ Vision Sensor

image by wide dynamic range



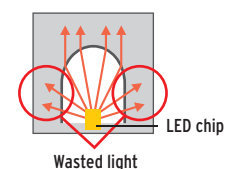
High Power Lighting

Providing suitable illumination for inspections can often be the deciding factor between application success or failure. Especially when inspecting large field of views, even and consistent lighting can be difficult to achieve.

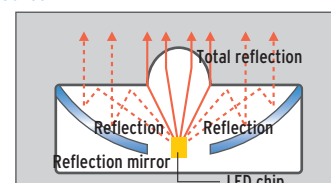
In order to handle such issues, a new DR optical system has been developed for the FQ vision sensor. This system effectively uses all of the LED light to maintain consistent brightness across the field of view at four times the brightness of previous models. The FQ vision sensor also has a polarisation filter, to cut off the specular reflection light which can result from highly reflective objects, resulting in reliable and consistent inspections.

DR optical system : Double-reflection optical system

General-purpose vision sensor



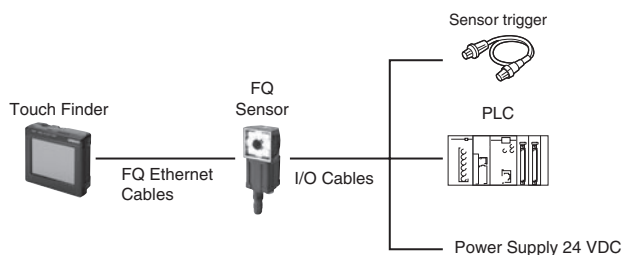
FQ Vision Sensor



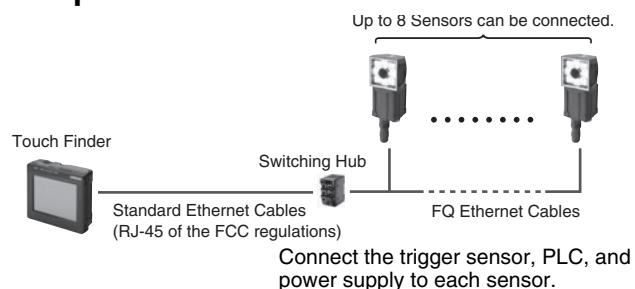
The new DR optical system effectively uses all of the light to achieve four times the brightness of previous models.

System Configuration

Standard Configuration



Multiple Connection

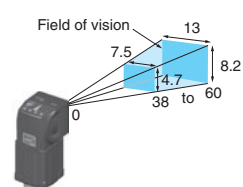


Note: If you register as a member after purchasing a Sensor, you can download free setup software that runs on a PC and can be used in place of the Touch Finder. Refer to the member registration sheet for details.

Ordering Information

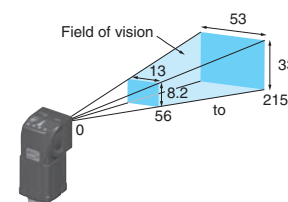
Sensor

Narrow View



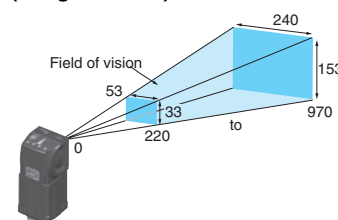
	Single-function models	Standard models
NPN	FQ-S10010F	FQ-S20010F
PNP	FQ-S15010F	FQ-S25010F

Standard



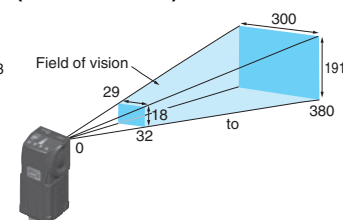
	Single-function models	Standard models
NPN	FQ-S10050F	FQ-S20050F
PNP	FQ-S15050F	FQ-S25050F

Wide View (Long-distance)



	Single-function models	Standard models
NPN	FQ-S10100F	FQ-S20100F
PNP	FQ-S15100F	FQ-S25100F

(Short-distance)



	Single-function models	Standard models
NPN	FQ-S10100N	FQ-S20100N
PNP	FQ-S15100N	FQ-S25100N

Note: Tolerance (field of vision): $\pm 10\%$ max.

Touch Finder

Type	Model
DC power supply	FQ-D30
AC/DC/battery	FQ-D31 (See note.)

Note: AC Adapter and Battery are sold separately.

Cables (Robot cable)

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

Industrial Switching Hubs (Recommended)

Appearance	Number of ports	Failure detection	Current consumption	Model
	3	None	0.22A	W4S1-03B
	5	None	0.22A	W4S1-05B
		Supported		W4S1-05C

Accessories

Application	Appearance	Name	Model
For Sensor		Mounting Bracket (enclosed with Sensor)	FQ-XL
		Polarizing Filter Attachment (enclosed with Sensor)	FQ-XF1
For Touch Finder		Panel Mounting Adapter	FQ-XPM
		AC Adapter (for models for DC/AC/Battery)	FQ-AC□ *
		Battery (for models for DC/AC/Battery)	FQ-BAT1
		Touch Pen (enclosed with Touch Finder)	FQ-XT
		Strap	FQ-XH

* 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
	250 V max.	UL/CSA	FQ-AC2
C	250 V max.	CCC mark	FQ-AC3
BF	250 V max.	---	FQ-AC4
O	250 V max.	---	FQ-AC5
			FQ-AC6

Sensor

Item		Type	Single-function models		Standard models	
Model	NPN		FQ-S10□□□□		FQ-S20□□□□	
	PNP		FQ-S15□□□□		FQ-S25□□□□	
Field of vision			Refer to the table below.			
Installation distance			Refer to the table below.			
Main functions	Inspection items		Search, area, average color, edge position, and edge width			
	Number of simultaneous inspections		1		32	
	Position compensation		None		Supported	
	Number of registered scenes		8		32	
Image input	Image processing method		Real color			
	Image filter		High dynamic range (HDR), polarizing filter (attachment), and white balance			
	Image elements		1/3-inch color CMOS			
	Shutter		1/250 to 1/30,000			
	Processing resolution		752 x 480			
Lighting	Lighting method		Pulse			
	Lighting color		White			
	LED class (See note 1.)		Class 2			
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.)			
Measurement trigger			External trigger (single or continuous)			
I/O specifications	Input signals		7 signals • Single measurement input (TRIG) • Command input (IN0 to IN5)			
	Output signals		3 signals • Control output (BUSY) • Overall judgement output (OR) • Error output (ERROR) Note: The three output signals can be allocated for the judgements of individual inspection items.			
	Ethernet specification		100BASE-TX/10BASE-T			
	Connection method		Special connector cables • Power supply and I/O: 1 cable (FQ-WD□□□□) • Touch Finder and computer: 1 cable (FQ-WN□□□□)			
Ratings	Power supply voltage		20.4 to 26.4 VDC (including ripple)			
	Current consumption		2.4 A max.			
Environmental immunity	Ambient temperature range		Operating: 0 to 50°C Storage: -25 to 65°C (with no icing or condensation)			
	Ambient humidity range		Operating and storage: 35% to 85% (with no condensation)			
	Ambient atmosphere		No corrosive gas			
	Degree of protection		IEC 60529 IP67 (with polarizing filter attachment mounted.)			
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			Depends on field of vision and installation distance. Refer to the table below.			
Accessories			• Mounting Bracket (FQ-XL) (1) • Polarizing Filter Attachment (FQ-XF1) (1) • Instruction Manual • Quick Startup Guide • Member registration sheet • Warning Label			

Single-function models		Standard models		Field of view (See note 2.) (Horizontal × Vertical)	Installation distance	Weight
NPN	PNP	NPN	PNP			
FQ-S10010F	FQ-S15010F	FQ-S20010F	FQ-S25010F	7.5 × 4.7 to 13 × 8.2 mm	38 to 60 mm	Approx. 160 g
FQ-S10050F	FQ-S15050F	FQ-S20050F	FQ-S25050F	13 × 8.2 to 53 × 33 mm	56 to 215 mm	Approx. 160 g
FQ-S10100F	FQ-S15100F	FQ-S20100F	FQ-S25100F	53 × 33 to 240 × 153 mm	Long-distance model: 220 to 970 mm	Approx. 150 g
FQ-S10100N	FQ-S15100N	FQ-S20100N	FQ-S25100N	29 × 18 to 300 × 191 mm	Short-distance model: 32 to 380 mm	Approx. 150 g

Note: 1. Applicable standards: IEC 60825-1:1993 +A1:1997 +A2:2001, EN 60825-1:1994 +A1:2002 +A2:2001, and JIS C 6802:2005
2. Tolerance: ±10% max.

Touch Finder

Item		Type Model	Model with DC power supply	Model with AC/DC/battery power supply
			FQ-D30	FQ-D31
Number of connectable Sensors			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	
		Pixels	320 x 240	
		Display colors	16,777,216	
	Backlight	Life expectancy (See note 1.)	50,000 hours at 25°C	
		Brightness adjustment	Provided	
		Screen saver	Provided	
Operation interface	Touch screen	Method	Resistance film	
		Life expectancy (See note 2.)	1,000,000	
External interface	Ethernet		100BASE-TX/10BASE-T	
	SD card		SDHC-compliant, Class 4 or higher recommended	
Ratings	Power supply voltage		DC power connection:20.4 to 26.4 VDC (including ripple)	DC power connection: 20.4 to 26.4 VDC (including ripple) AC adapter connection: 100 to 240 VAC, 50/60 Hz Battery connection: FQ-BAT1 Battery
	Continuous operation on Battery (See note 3.)		---	1.5 h
	Power consumption		DC power connection: 0.2 A	DC power connection: 0.2 A, Charging battery: 0.4 A
Environmental immunity	Ambient temperature range		Operating: 0 to 50°C Storage: -25 to 65°C (with no icing or condensation)	Operating: 0 to 50°C when mounted to DIN Track or panel Operation on Battery: 0 to 40°C Storage: -25 to 65°C (with no icing or condensation)
	Ambient humidity range		Operating and storage: 35% to 85% (with no condensation)	
	Ambient atmosphere		No corrosive gas	
	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			Touch Pen (FQ-XT), Instruction Manual	

Note: 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.

Battery Specifications

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

Note: 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.

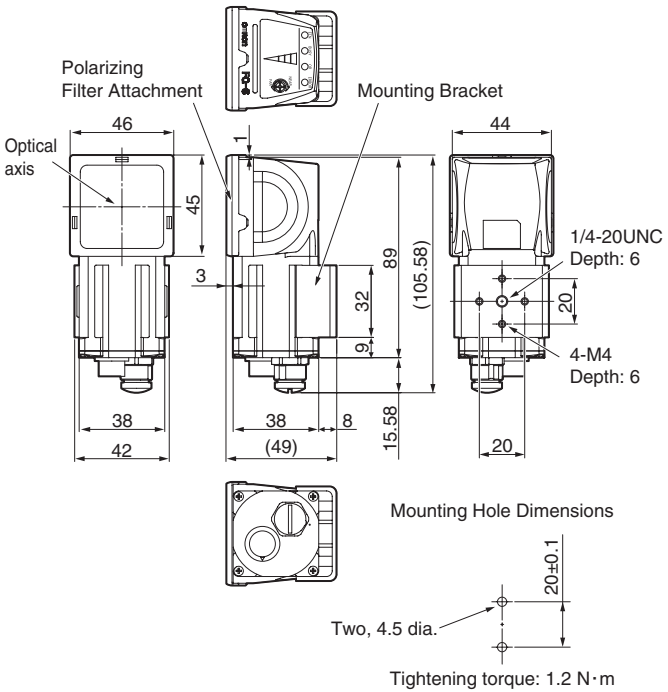
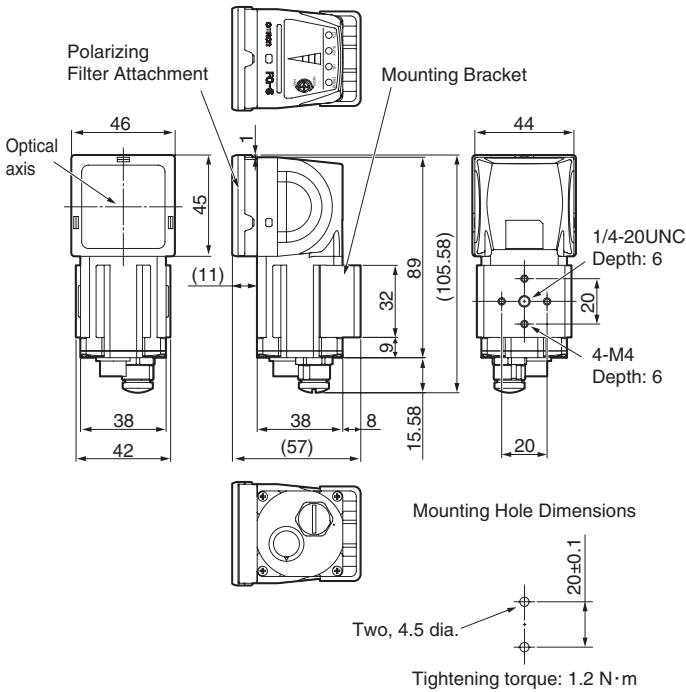
OS	Microsoft Windows XP Home Edition/Professional SP2 or higher (See note 1.) Microsoft Windows 7 Home Premium or higher (See note 1.)
CPU	Core 2 Duo 1.06 GHz or the equivalent or higher
RAM	1GB min.
HDD	500 MB min. available space (See note 2.)
Monitor	1,024 x 768 dots min.

Note: 1. The Japanese and English versions support only 32-bit OS versions.
2. Available space is also required separately for data logging.

Sensor

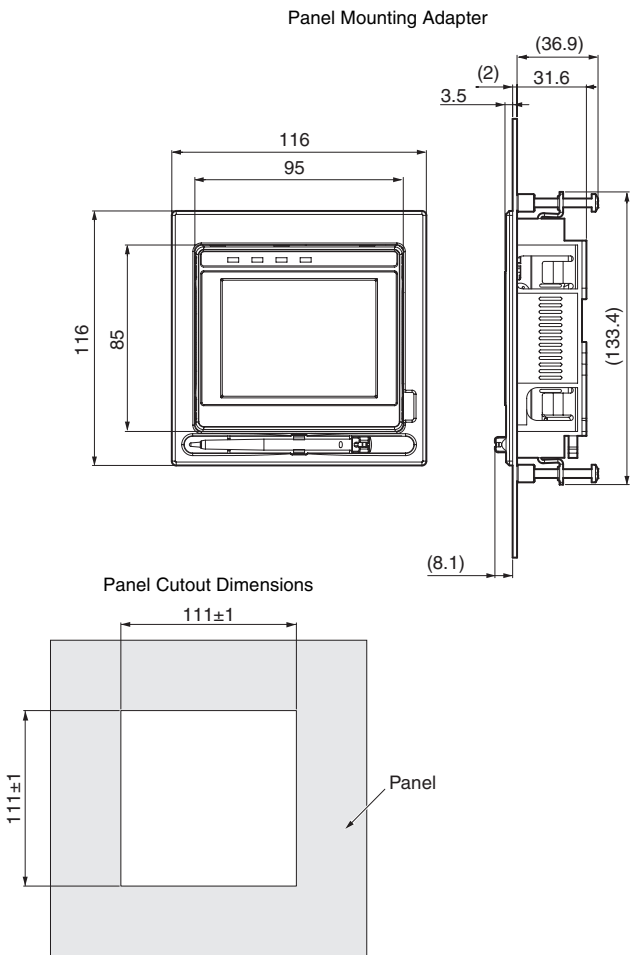
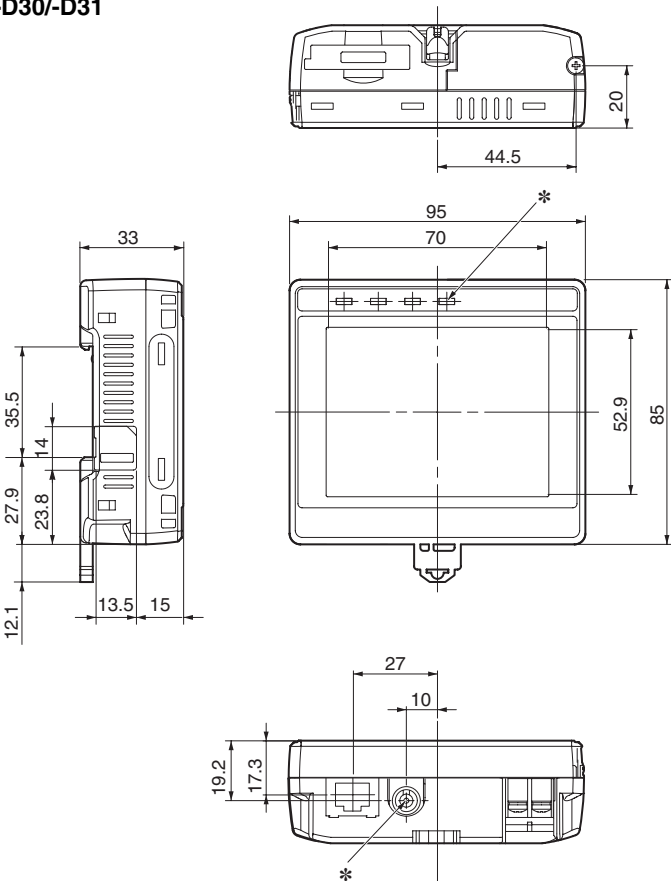
FQ-S10010F/-S10050F
FQ-S15010F/-S15050F
FQ-S20010F/-S20050F
FQ-S25010F/-S25050F

FQ-S10100F/-S10100N/-S20100N
FQ-S15100F/-S15100N/-S25100N
FQ-S20100F
FQ-S25100F



Touch Finder

FQ-D30/-D31



* Provided with FQ-D31 only.

Terms and Conditions of Sale

1. **Offer; Acceptance.** These terms and conditions (these "Terms") are deemed part of all quotes, agreements, purchase orders, acknowledgments, price lists, catalogs, manuals, brochures and other documents, whether electronic or in writing, relating to the sale of products or services (collectively, the "Products") by Omron Electronics LLC and its subsidiary companies ("Omron"). Omron objects to any terms or conditions proposed in Buyer's purchase order or other documents which are inconsistent with, or in addition to, these Terms.
2. **Prices; Payment Terms.** All prices stated are current, subject to change without notice by Omron. Omron reserves the right to increase or decrease prices on any unshipped portions of outstanding orders. Payments for Products are due net 30 days unless otherwise stated in the invoice.
3. **Discounts.** Cash discounts, if any, will apply only on the net amount of invoices sent to Buyer after deducting transportation charges, taxes and duties, and will be allowed only if (i) the invoice is paid according to Omron's payment terms and (ii) Buyer has no past due amounts.
4. **Interest.** Omron, at its option, may charge Buyer 1-1/2% interest per month or the maximum legal rate, whichever is less, on any balance not paid within the stated terms.
5. **Orders.** Omron will accept no order less than \$200 net billing.
6. **Governmental Approvals.** Buyer shall be responsible for, and shall bear all costs involved in, obtaining any government approvals required for the importation or sale of the Products.
7. **Taxes.** All taxes, duties and other governmental charges (other than general real property and income taxes), including any interest or penalties thereon, imposed directly or indirectly on Omron or required to be collected directly or indirectly by Omron for the manufacture, production, sale, delivery, importation, consumption or use of the Products sold hereunder (including customs duties and sales, excise, use, turnover and license taxes) shall be charged to and remitted by Buyer to Omron.
8. **Financial.** If the financial position of Buyer at any time becomes unsatisfactory to Omron, Omron reserves the right to stop shipments or require satisfactory security or payment in advance. If Buyer fails to make payment or otherwise comply with these Terms or any related agreement, Omron may (without liability and in addition to other remedies) cancel any unshipped portion of Products sold hereunder and stop any Products in transit until Buyer pays all amounts, including amounts payable hereunder, whether or not then due, which are owing to it by Buyer. Buyer shall in any event remain liable for all unpaid accounts.
9. **Cancellation; Etc.** Orders are not subject to rescheduling or cancellation unless Buyer indemnifies Omron against all related costs or expenses.
10. **Force Majeure.** Omron shall not be liable for any delay or failure in delivery resulting from causes beyond its control, including earthquakes, fires, floods, strikes or other labor disputes, shortage of labor or materials, accidents to machinery, acts of sabotage, riots, delay in or lack of transportation or the requirements of any government authority.
11. **Shipping; Delivery.** Unless otherwise expressly agreed in writing by Omron:
 - a. Shipments shall be by a carrier selected by Omron; Omron will not drop ship except in "break down" situations.
 - b. Such carrier shall act as the agent of Buyer and delivery to such carrier shall constitute delivery to Buyer;
 - c. All sales and shipments of Products shall be FOB shipping point (unless otherwise stated in writing by Omron), at which point title and risk of loss shall pass from Omron to Buyer; provided that Omron shall retain a security interest in the Products until the full purchase price is paid;
 - d. Delivery and shipping dates are estimates only; and
 - e. Omron will package Products as it deems proper for protection against normal handling and extra charges apply to special conditions.
12. **Claims.** Any claim by Buyer against Omron for shortage or damage to the Products occurring before delivery to the carrier must be presented in writing to Omron within 30 days of receipt of shipment and include the original transportation bill signed by the carrier noting that the carrier received the Products from Omron in the condition claimed.
13. **Warranties.** (a) **Exclusive Warranty.** Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied. (b) **Limitations.** OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right. (c) **Buyer Remedy.** Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty. See <http://www.omron247.com> or contact your Omron representative for published information.
14. **Limitation on Liability; Etc.** OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY. Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.
15. **Indemnities.** Buyer shall indemnify and hold harmless Omron Companies and their employees from and against all liabilities, losses, claims, costs and expenses (including attorney's fees and expenses) related to any claim, investigation, litigation or proceeding (whether or not Omron is a party) which arises or is alleged to arise from Buyer's acts or omissions under these Terms or in any way with respect to the Products. Without limiting the foregoing, Buyer (at its own expense) shall indemnify and hold harmless Omron and defend or settle any action brought against such Companies to the extent based on a claim that any Product made to Buyer specifications infringed intellectual property rights of another party.
16. **Property; Confidentiality.** Any intellectual property in the Products is the exclusive property of Omron Companies and Buyer shall not attempt to duplicate it in any way without the written permission of Omron. Notwithstanding any charges to Buyer for engineering or tooling, all engineering and tooling shall remain the exclusive property of Omron. All information and materials supplied by Omron to Buyer relating to the Products are confidential and proprietary, and Buyer shall limit distribution thereof to its trusted employees and strictly prevent disclosure to any third party.
17. **Export Controls.** Buyer shall comply with all applicable laws, regulations and licenses regarding (i) export of products or information; (ii) sale of products to "forbidden" or other proscribed persons; and (iii) disclosure to non-citizens of regulated technology or information.
18. **Miscellaneous.** (a) **Waiver.** No failure or delay by Omron in exercising any right and no course of dealing between Buyer and Omron shall operate as a waiver of rights by Omron. (b) **Assignment.** Buyer may not assign its rights hereunder without Omron's written consent. (c) **Law.** These Terms are governed by the law of the jurisdiction of the home office of the Omron company from which Buyer is purchasing the Products (without regard to conflict of law principles). (d) **Amendment.** These Terms constitute the entire agreement between Buyer and Omron relating to the Products, and no provision may be changed or waived unless in writing signed by the parties. (e) **Severability.** If any provision hereof is rendered ineffective or invalid, such provision shall not invalidate any other provision. (f) **Setoff.** Buyer shall have no right to set off any amounts against the amount owing in respect of this invoice. (g) **Definitions.** As used herein, "including" means "including without limitation"; and "Omron Companies" (or similar words) mean Omron Corporation and any direct or indirect subsidiary or affiliate thereof.

Certain Precautions on Specifications and Use

1. **Suitability of Use.** Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases but the following is a non-exhaustive list of applications for which particular attention must be given:
 - (i) Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
 - (ii) Use in consumer products or any use in significant quantities.
 - (iii) Energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
 - (iv) Systems, machines and equipment that could present a risk to life or property. Please know and observe all prohibitions of use applicable to this Product.
 NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON'S PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.
2. **Programmable Products.** Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.
3. **Performance Data.** Data presented in Omron Company websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Omron's test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.
4. **Change in Specifications.** Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.
5. **Errors and Omissions.** Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.



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