OMRON

Quality Control & Inspection Guide 2014

For production

that Never Fails!

realizing

Applications examples

Downloads

How it works

Benefits

never-fail.info

Do you know Jack?

Jack is our smart inspector telling you more, to be prepared for today's and tomorrow's inspection challenges. He is facing increasing demands for higher throughput and improved quality. So, if you get stressed about defects in your production process, learn more from Jack about our products. Jack knows the best sensors for machines that never fail.

Test yourself and us. Play with Jack our game and catch the errors. Experience that by using Omron's smart sensors your machine will never fail. Find the perfect solution for your requirements.

Download the latest information

Refer to our website for extended product information with performance charts, dimension drawings, installation and usage instructions, extended specifications, application examples and find information on our complete sensing and accessory portfolio.

Find information fast!

Quick Links shortens your search

Quick Links are unique codes assigned to Omron products listed in this guide. Enter Quick Link codes in the search box on **industrial.omron.eu** to access detailed information on products in this guide.

Zero defect for production that Never Fails!

Customer satisfaction highly depends on the quality of the finished goods or the performance of the machine in use. Zero defects in production is a key criterion for success. The speed of production lines is getting increasingly faster. On the other hand the machines should never fail. But can you trust the result?

The necessity for quality inspection and control in any production process is no longer a discussion point. The cost of non quality is much higher than the investment, which pays for itself within a short time. In order to further reduce the number and cost of defective goods, there is a clear trend from having just one inspection at the end of the process towards several quality checks within or even at the beginning of the process. This effect further increases the demand for accurate, reliable and fast inspection systems.

Omron offers a complete portfolio of measurement and inspection systems using different technologies and principles, but following the same guideline: keep it simple for the user.

Choose the technology that fits best for the application:

- Machine Vision systems
- Ident systems (Code Readers & RFID)
- Measurement Sensors (laser, inductive, tactile)

Content

SELECTED INDUSTRY APPLICATIONS

SPECIAL INSPECTIONS

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Inspection & Ident systems

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Vision system

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Industry Vision Solution

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Ident systems

Code readers and verifiers

FQ-CR

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V400

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RFID

V680

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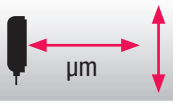
Measurement

Displacement/distance

ZX, ZW, ZS

Profile



ZG2

Position/diameter/width

ZX-GT

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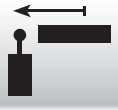
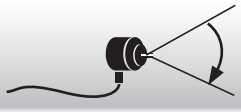
Position detection

Machine part detection



Standard

Rotation



Area monitoring

For more information refer to INDUSTRIAL SENSING GUIDE

INSPECTION IN MATERIAL HANDLING & LOGISTICS

For distribution systems that Never Fail

Versatile inspections have to be performed in logistic processes to ensure content and packaging.

- Avoid wrong content in packages
- Check for proper closure
- Ensure a correct sorting
- Inspection of labels

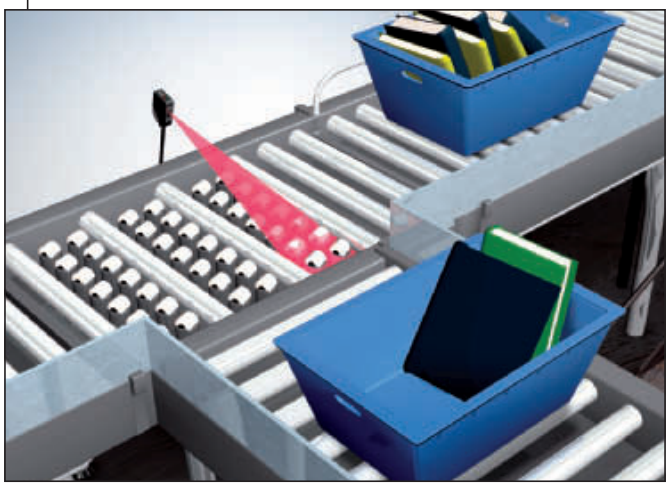
OBJECT DETECTION

The photoelectric sensors provide accurate detection of passing objects with long operational stability even with changing backgrounds or objects and environmental influences like ambient light, electromagnetic noise or dirt.

TRACKING OF PROCESSES

Trace the material flow within the manufacturing process by V680 RFID system.

- Easy installation
- Diagnostic functions for maintenance



More on photoelectric sensors in the INDUSTRIAL SENSING GUIDE

More on V680 RFID system page 122

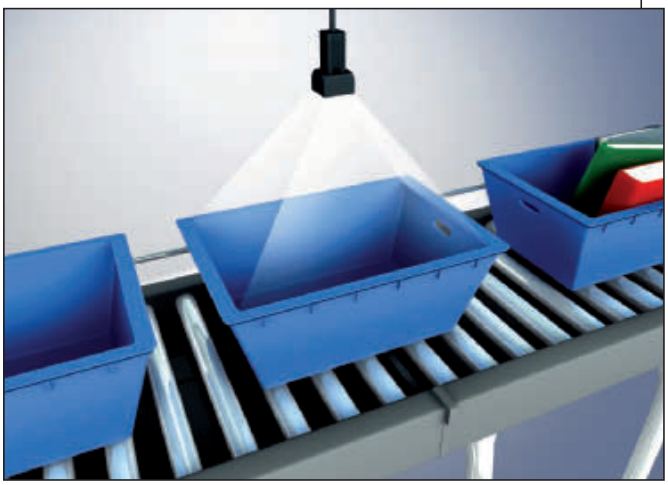
LABEL INSPECTION AND IDENTIFICATION

Inspect the packages for sorting and the correctness of labels
- Read and verify 1D/2D codes
- Character and position inspection

More on Inspection & Ident systems page 30

INSPECTION OF CONTENT

Check the content of boxes with a Vision system.
- Material is complete
- Box is empty



More on FQ2 Easy vision sensors page 32

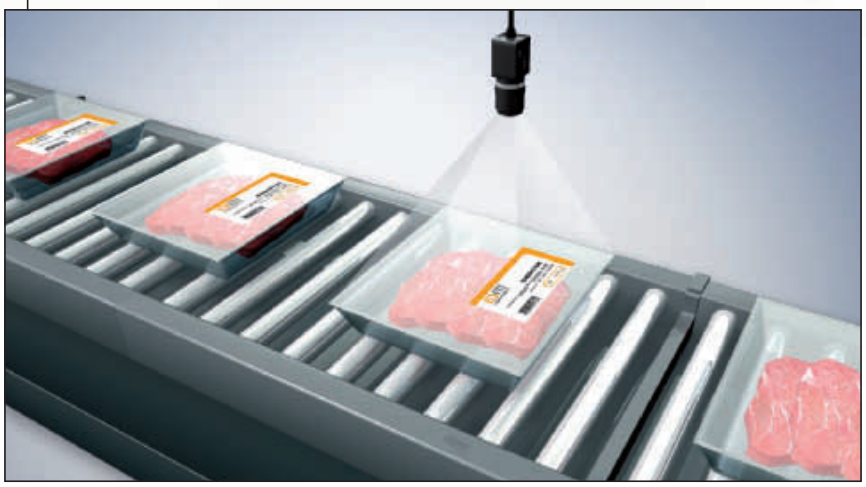
INSPECTION IN FOOD PACKAGING

Reliable inspection for flexible machines

Accurate packaging is a key indicator for quality in the food industry. This requires the inspection of seals, caps, labels, dates and patterns. Flexibility in quality control is important to handle different materials, shapes and colours of packages in the process. Platforms offering this flexibility in a user oriented way are mandatory.

LABEL INSPECTION

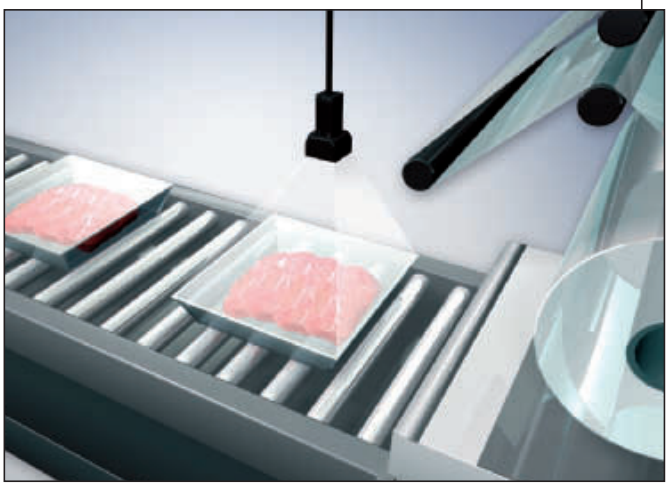
Correctly applied labels are mandatory in the food industry. Check with a vision system the label for position, pattern or it is folded. The important information printed on the label needs to be verified. Vision systems or code readers, can check for the presence of the date of expiry or read a code completely.



More on Xpectia lite vision system page 68

INSPECTION OF SEALS

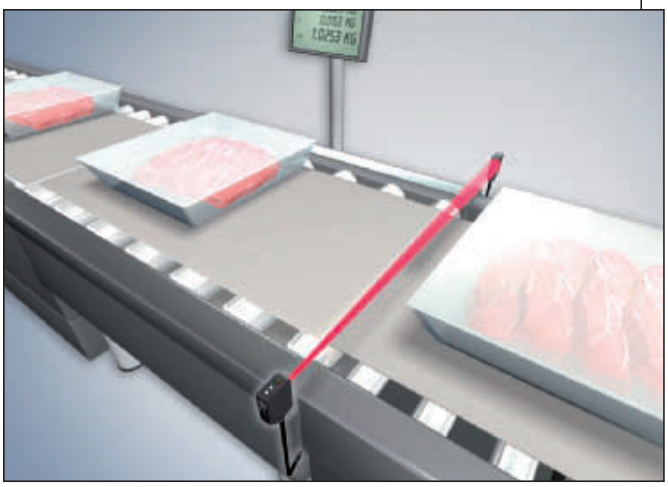
Ensure a proper sealing with Xpectia. One product platform can be used to check a large variety of packaging materials, no matter whether it is transparent, shiny, uneven or is using of different colours and shapes.



More on Xpectia FH vision system page 70

OBJECT DETECTION

The E3 photoelectric sensors provide accurate detection of passing objects for a wide range of different packaging materials, sizes and shapes and provide longest sensor lifetime even in frequently cleaned environments.



More on photoelectric sensors in the INDUSTRIAL SENSING GUIDE

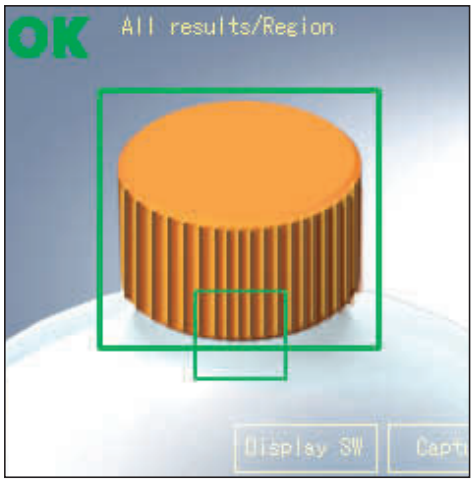
INSPECTION IN THE BEVERAGE INDUSTRY

For flexible production that Never Fails

For beverages and pharmaceuticals the shapes and sizes of containers – especially of PET bottles – are very diverse. Many inspections are necessary along the process to supervise the individual steps. Filling, capping, labeling, palletizing - inspect and monitor the processes with one flexible vision platform, which can be used for all steps, no matter of the diversity.

CAP INSPECTION

Is the right cap on the bottle, or is the cap properly closed? Check from 1 or 2 sides by using FQ2 or Xpectia lite. The simplicity in use for setup and maintenance reduces operational costs – Touch, Connect & Go



More on FQ2 Easy vision sensors page 32
For simple cap presence detection see photoelectric sensors in INDUSTRIAL SENSING GUIDE

LABEL INSPECTION

Is the label damaged, folded or not correctly positioned? Several inspections can be performed at the same time. The intuitive user guidance of Omron vision sensors ensures, that no expert knowledge is required anymore for setup & control. Triggered by the E3Z photoelectric sensors highest detection reliability can be guaranteed also for transparent bottles with varying shapes.

More on Xpectia lite vision system page 68
More on transparent object sensors in INDUSTRIAL SENSING GUIDE

INSPECTION IN THE AUTOMOTIVE INDUSTRY

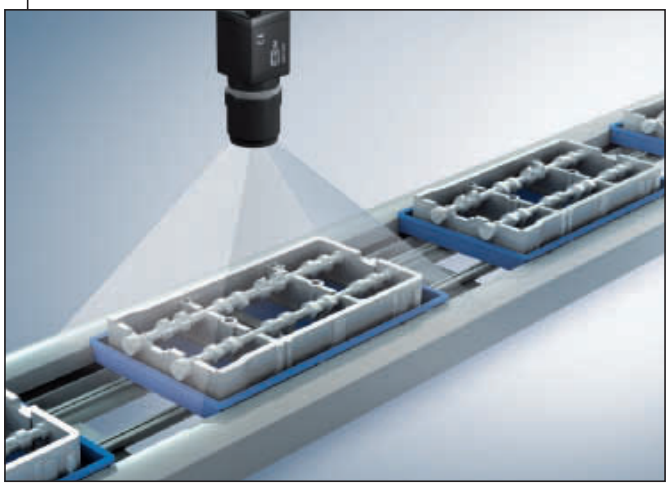
Zero defect production

Producing high quality parts to order for the automotive industry requires quality control within the process, not only at the end. Error-free identification and inspection assures that all parts are within tolerance requirements.

INSPECTION OF LARGE OBJECTS

Check the presence of oil on the cylinder head or the cam shaft. The size of the object requires a high resolution inspection. Xpectia offers:

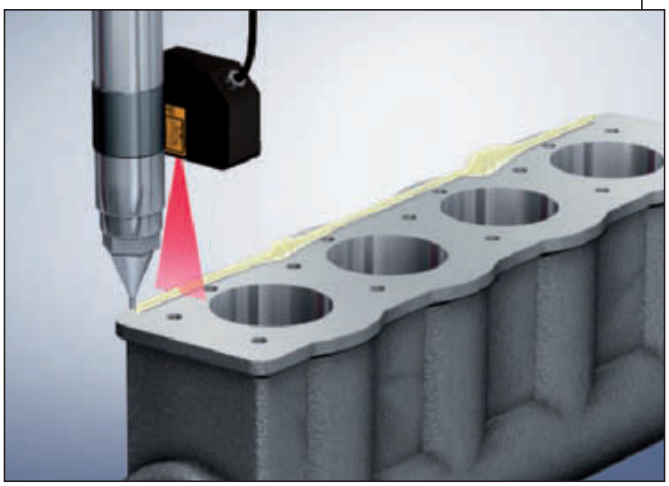
- 4 Mpixel resolution
- Detect minute defects due to real colour sensing



More on Xpectia FH vision system page 70

EASY PROFILE MEASUREMENT

3D glue bead inspection with ZG2 profile sensor. High accuracy combined with ease of use.

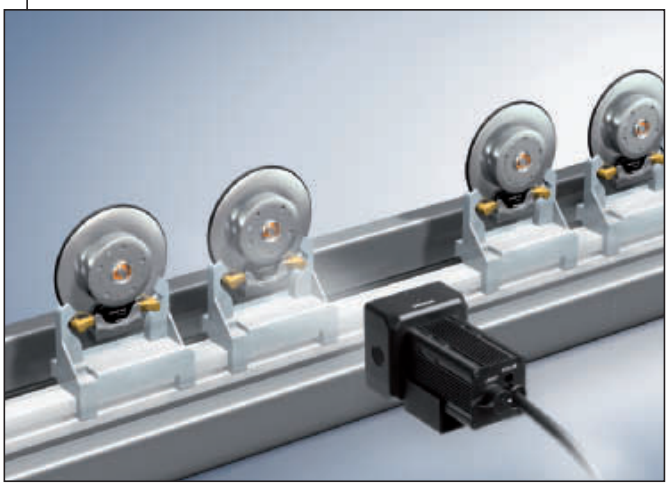


More on ZG2 profile measurement page 146

PART IDENTIFICATION

Verify the correct type of an automotive part, e.g. brakes, to be used in the process.

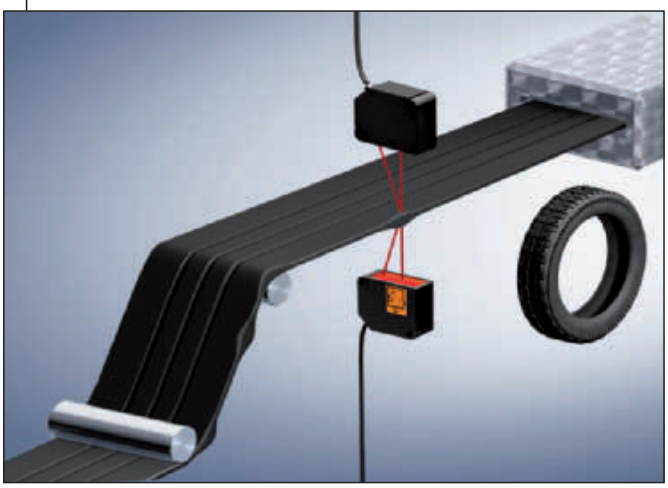
- Characteristic points have to be inspected
- Part colours have to be identified.



More on Xpectia lite vision system page 68
For simple colour identification see E3X-DAC-S in INDUSTRIAL SENSING GUIDE

INSPECTION ON CHALLENGING SURFACES

Thickness measurement on black rubber with the scalable ZS displacement sensor. One sensor for any material.

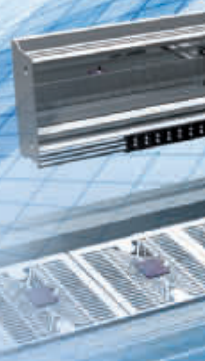


More on ZS displacement measurement page 144

INSPECTION IN THE SEMICONDUCTOR, PHOTOVOLTAIC & ELECTRONICS INDUSTRY

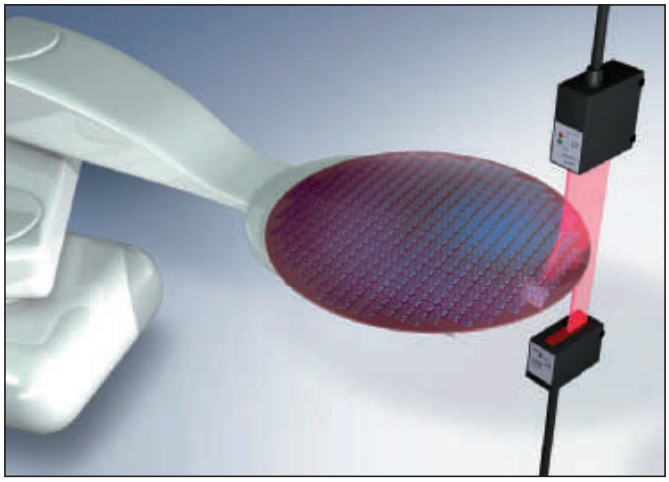
Highest accuracy in production processes

Continuous miniaturisation and higher performance of electronic components and the continuous pressure to increase productivity, requires demanding quality controls.



HIGH ACCURACY MEASUREMENT

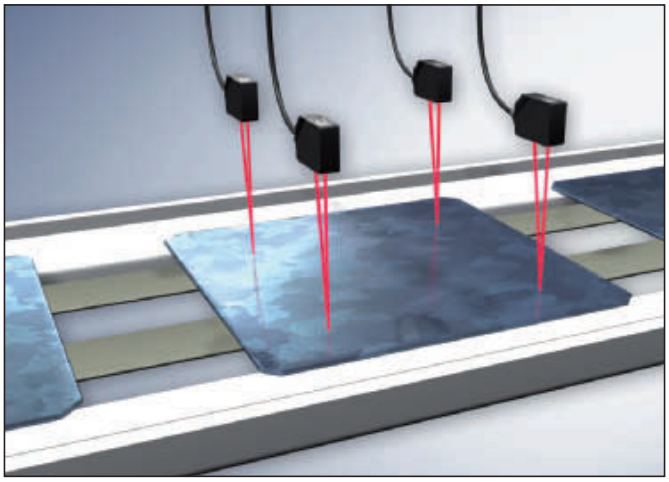
Ensure the quality of a wafer: measure the eccentricity with a laser micrometer. Minute differences can be inspected by using CCD technology.



More on ZX-GT laser micrometer page 148
For accurate wafer detection see fiber optic sensors in INDUSTRIAL SENSING GUIDE

PHOTOVOLTAIC SURFACE MEASUREMENT

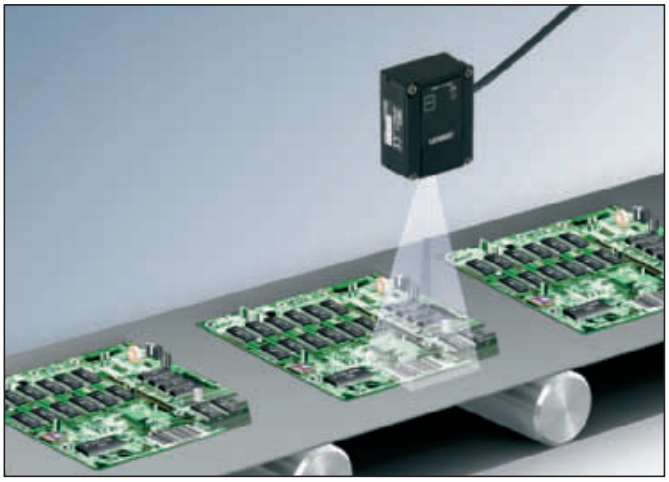
In the production of solar-wafers several inspections have to be made:
- Accurate warpage measurement of the surface using scalable displacement sensors
- Inspect the structure of wafer surfaces with high resolution vision systems



More on ZS high accuracy displacement measurement page 144

PCB INSPECTION AND IDENTIFICATION

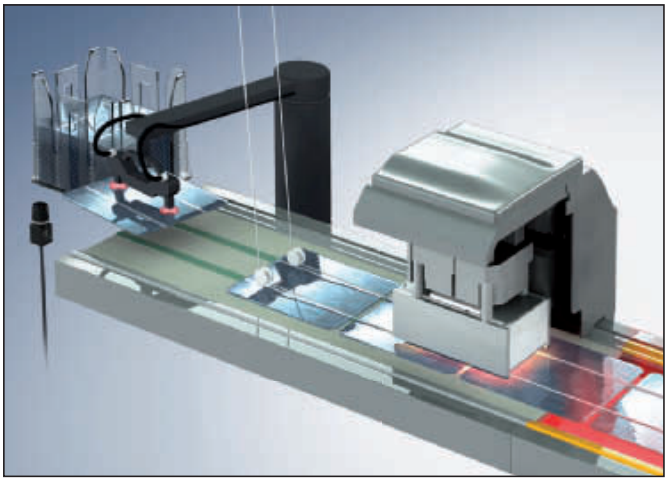
The production of PCBs require the type identification of boards via barcode or datamatrix code. The completeness of the components on the PCB needs to be controlled with a vision system.



More on Inspection and Ident systems page 30
For detection of PCBs see wide beam E3S-LS3 in INDUSTRIAL SENSING GUIDE

PV WAFER INSPECTION

Each step in the production of PV wafers requires:
- Alignment of the wafer
- Inspection for chips and cracks
- Edge breakage



More on FlexXpect-PV on page 92

INSPECTION IN THE PHARMACEUTICAL & HEALTHCARE INDUSTRY

Verification, validation & in-process traceability

The stringent legal requirements in the pharmaceutical industry lead to detailed quality control on drugs and verification of the information printed on the packages. Validation and integrity of process related data is mandatory. Flexible inspection solutions to trace the product and its ingredients in the entire process are the answer to the existing and future legal aspects. Omron's quality inspection systems support:

- FDA CFR21 Part 11
- Track & Trace
- CIP 13 (French coding)
- GMP/GAMP

QUALITY CONTROL FOR MEDICINE

Failure free production requires the verification of different product variants. This includes

- Colour inspection of cans
- Closure control of caps
- Shape and size of containers
- Characteristics on labels
- Control of filling levels

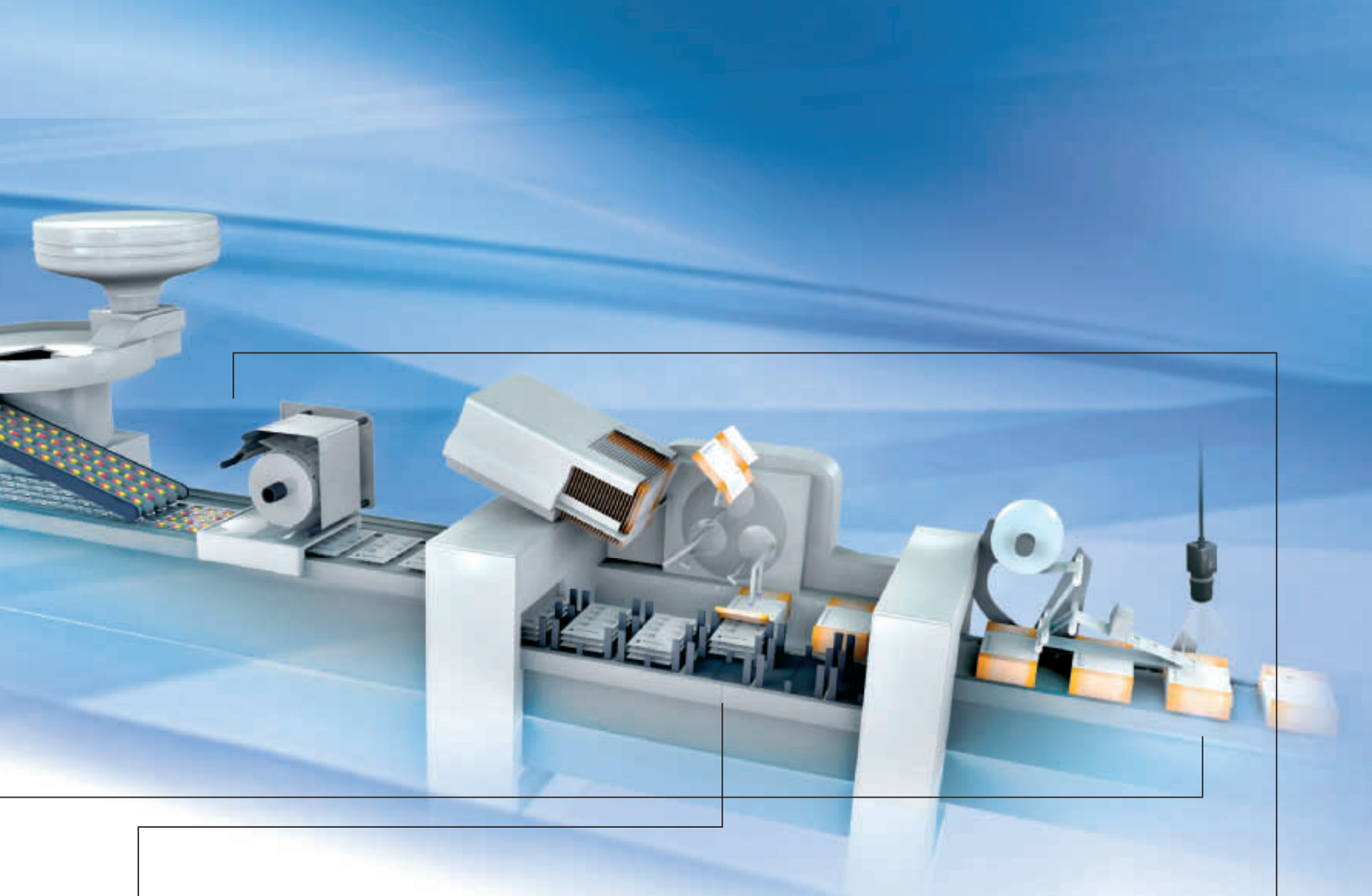
FQ is an easy vision sensor targeting for such inspections

DATE & LOT CODE VALIDATION

The correctness of information on pharmaceutical products is a crucial topic. The verification and validation of 1D/2D codes as well as Date and Batch codes (OCR/OCV) are legally required. Select only one system to inspect both, the quality of the product and the correctness of the codes.

More on FQ2 easy vision sensor page 32

More on Xpectia FH vision system page 70



FLEXIBLE AND FUTURE-PROOF

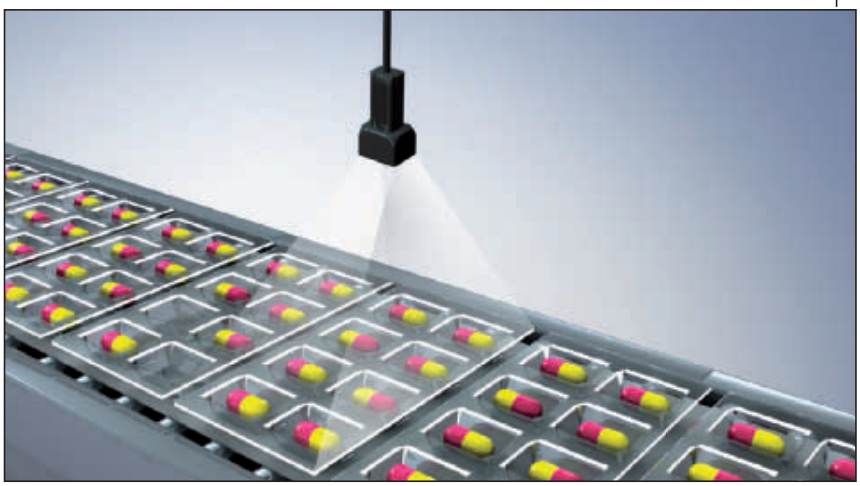
The Pharma industry permanently faces new legal requirements. A future-proof solution, able to integrate new functions (e.g. braille inspection) and applications, ensures to protect the investments. The flexibility of the Omron solution allows to inspect changing models, different country versions, etc. on the same line. This reduces the overall investments and helps to solve any kind of application:

- Packaging inspection
- Blister pack inspection
- Defects and completeness of materials
- Code verifications

CONFORMANCE & APPROVALS

In order to comply to regulations and standards in the Pharma industry and to get system approval it is mandatory to have:

- User administration including different access levels
- Traceability of any user action (Audit trail) with time stamp
- Revision history of program modifications
- Generate readable/printable configuration documents



More on Xpectia FH vision system page 70
More on FQ2 easy vision sensor page 32

More on Xpectia lite vision system page 68

INSPECTION OF SURFACES

Different tasks – several solutions

Surface inspections can be versatile, requiring different measurement principles or technologies:

- Check the presence of patterns or characters
- Inspect the structure and shape
- Ensure presence of parts
- Defect detection
- Position of objects

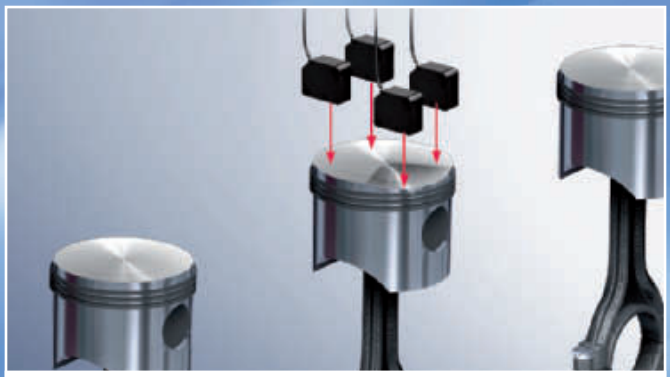
PATTERN RECOGNITION

Search for patterns or characters on the objects in the packaging process. This can require the identification of colour and size of the pattern. The FQ2 vision sensor can be re-configured easily, without expert knowledge, just Teach & Go.

More on FQ2 easy vision sensor page 32

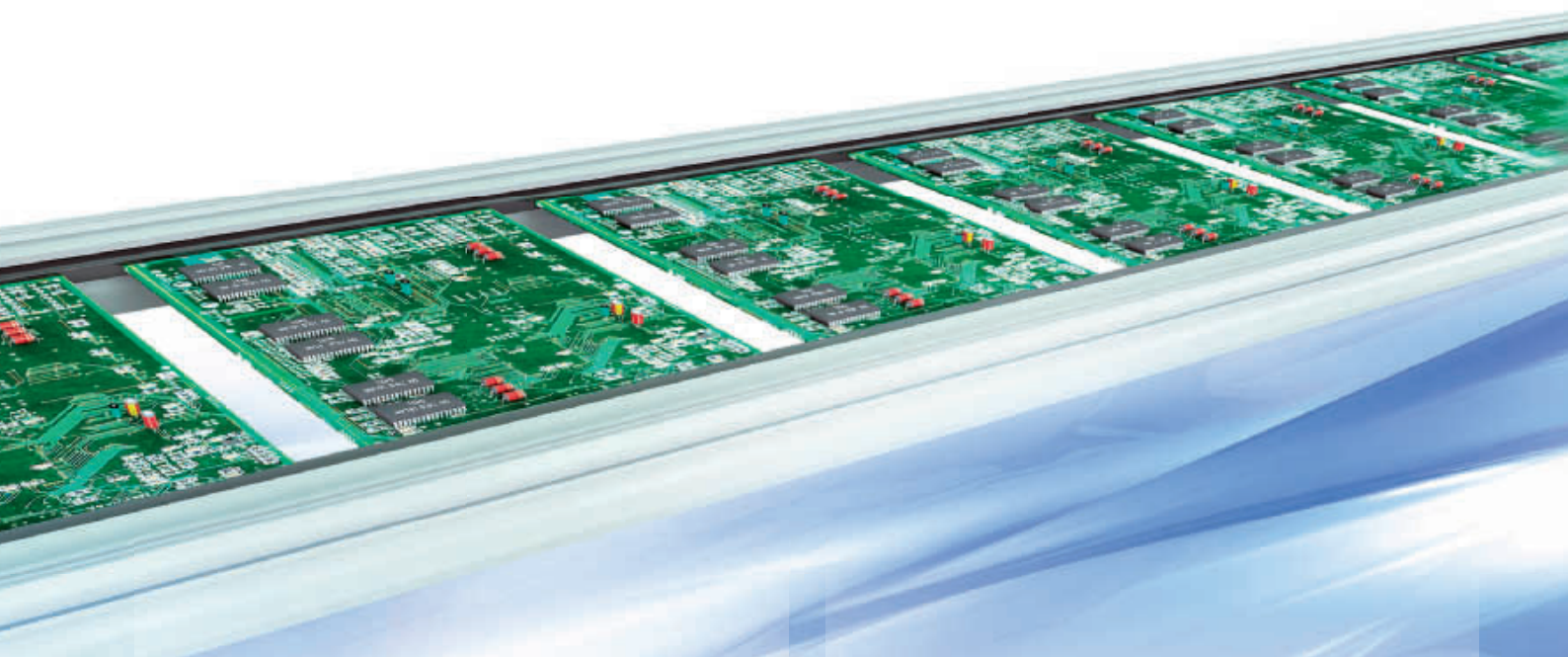
WARPAGE INSPECTION

Measure the warpage of any challenging surface, with a scalable displacement sensor. Flexibility is required in the number of sensors and the measurement distance.



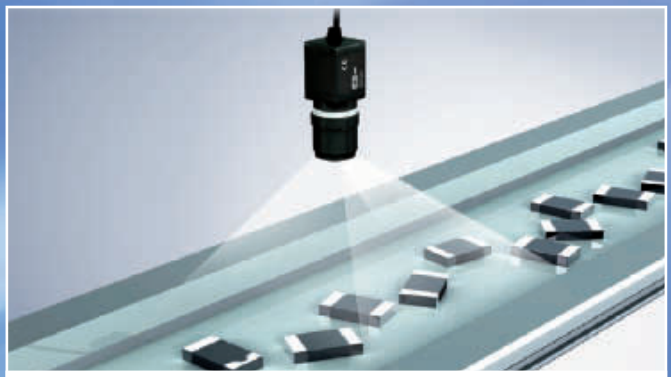
More on ZS laser displacement measurement page 144

surface | transparent | edges | profile/3D | position | characters | colour



DEFECT DETECTION

Investigate a surface on defects, which do not correlate with the surroundings. The vision systems can identify minute differences or scratches on the surface. The colour functionality increases the stability of the detection.



More on FQ2 Easy vision sensors page 32
More on Xpectia lite vision system page 68

PRESENCE OF PARTS

Investigate a surface for the completeness of parts. A vision system is a cost effective solution for the correct placement inspection of components on PCBs.

More on Xpectia lite vision system page 68
More on Xpectia FH vision system page 70

INSPECTION OF TRANSPARENT OBJECTS & GLASS

High performance on challenging surfaces

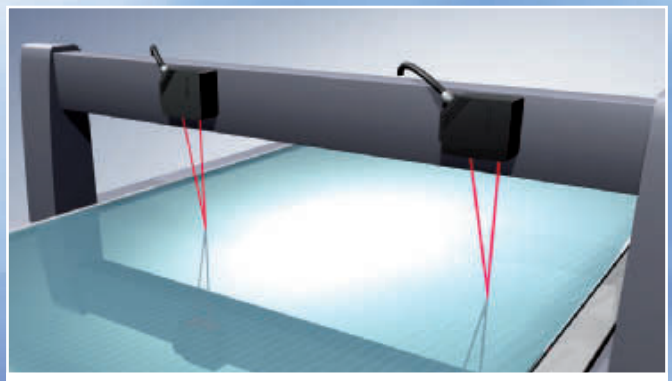
Many quality inspections are necessary in the glass manufacturing process:
- Thickness of glass
- Measurement of layers and coatings
- Detection of defects

The measurement on transparent objects, especially on glass, requires highest performance of the inspection devices.

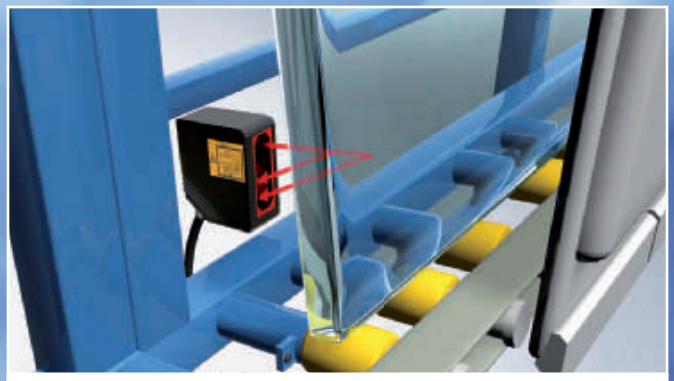
THICKNESS MEASUREMENT OF GLASS

In the flat glass manufacturing process, the thickness has to be checked in many points, to ensure the evenness of the plates.
- Inspect thickness of individual layers
- Check that coatings are equally distributed on the plate

The ZS displacement laser sensor delivers high accuracy on glass and other challenging surfaces. Multiple sensors can be connected to inspect the surface in several points and to calculate the results.
The triangulation reflects the light for each surface (or layer). There is one reflection for the top and one for the bottom surface, which allows to calculate the thickness.

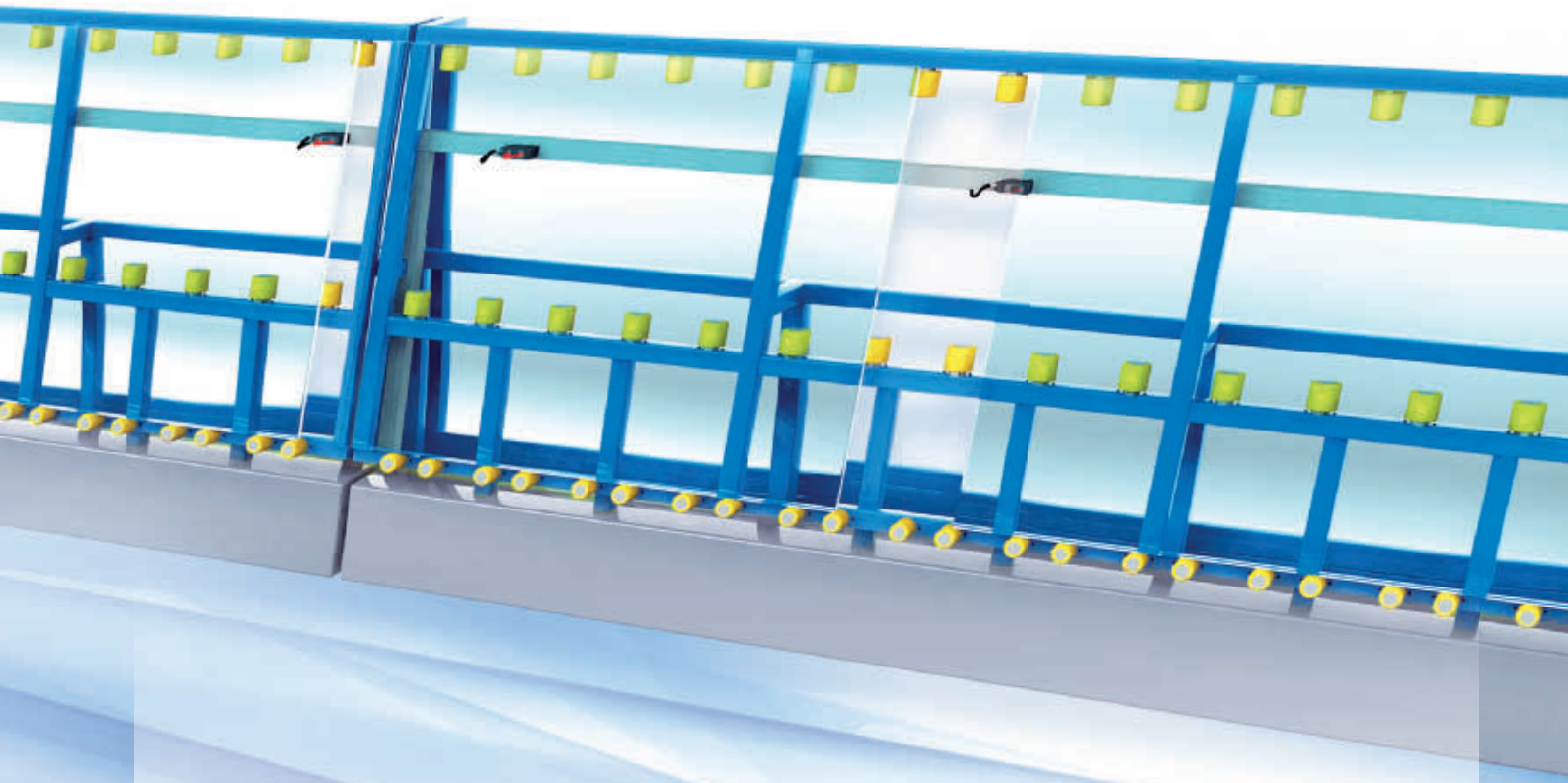


More on high accuracy displacement measurement ZS page 144



More on high accuracy displacement measurement ZS page 144

surface | transparent | edges | profile/3D | position | characters | colour



INSPECT DEFECTS ON BOTTLES

In the beverage or pharmaceutical industry, bottles and bins have to be inspected for defects at the beginning of the process. Xpectia FH can perform multiple checks, to ensure that the bottle is not defect.

Contour based inspections and fine matching functions allow to detect minute defects on the neck of a bottle or particles on the bottom.

More on Xpectia FH vision system page 70
For presence detection of bottles see 'transparent object detection' in INDUSTRIAL SENSING GUIDE

INSPECTION OF EDGES

Position and count

The detection and measurement of edges is an important function for quality inspection systems. It can be used to find the position and rotation of objects, or to count for the correct number of edges as a quality criteria. Edge functions are used by vision and measurement systems. They are technical alternatives depending on the application.

INSPECT THE WANDER OF CONTINUOUS MATERIAL

Edge detection is used to monitor the drift of paper rolls or other material in a production line. Depending on the required accuracy several solutions can be realized:

- Simple detection with E3 photoelectric sensors: check whether a defined position on both sides of the paper is crossed
- Precise measurement of the drift: use a profile sensor or laser micrometer to measure with high accuracy the trend of the drift

More on ZG2 profile measurement page 146
More on E3 photoelectric sensors in INDUSTRIAL SENSING GUIDE

CHECK THE CLOSURE OF COSMETIC BINS

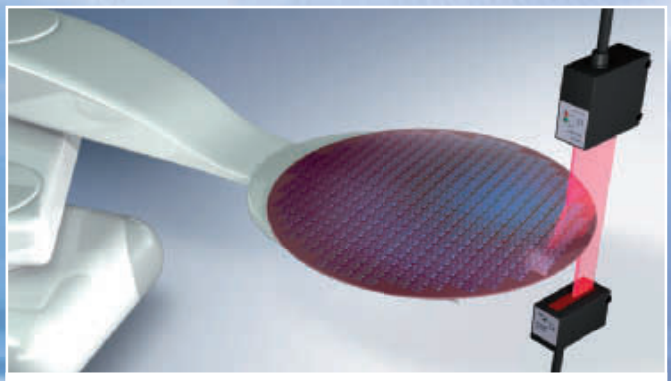
A vision system uses edge tools to inspect whether the cap is properly connected or the closure is locked correctly. FQ2 fulfills this task and is easy to setup and operate. Changing products on the line, can be easily configured.

More on FQ2 Easy Vision sensor on page 32

surface | transparent | **edges** | profile/3D | position | characters | colour

ECCENTRICITY OF A WAFER

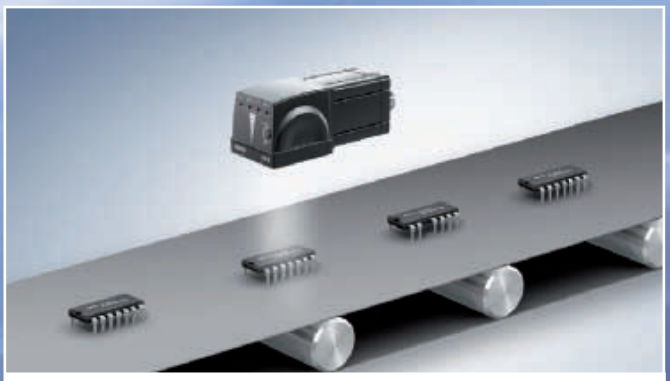
The laser micrometer ZX-GT detects the edge of the wafer. The eccentricity can be measured with high accuracy.



More on ZX-GT laser micrometer page 148
More on fiber optic wafer mapping sensors in INDUSTRIAL SENSING GUIDE

PRESENCE OF PARTS

Verify the number of pins on an IC. An edge tool is used to realize the quality inspection and to identify missing pins with a vision sensor. For simple detections, high precision fiber optic sensors can be used.



More on FQ2 Easy Vision sensor on page 32
More on E32 fiber optic sensors in INDUSTRIAL SENSING GUIDE

PROFILE AND 3D INSPECTION

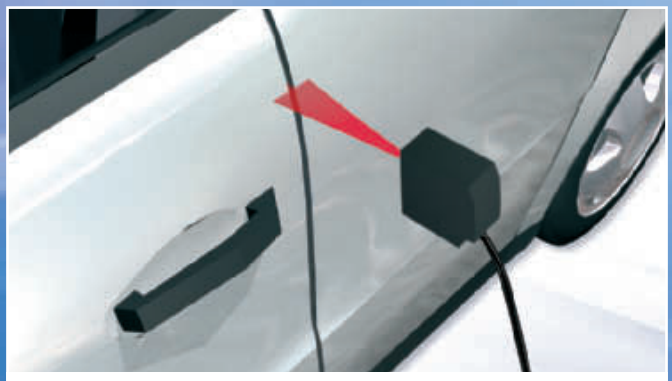
Take the quality into the next dimension

The trend for inspection systems is moving from 2 dimensional to 3 dimensional inspections.
This increases the quality and stability of the measurement. Important applications are 3D inspections of cars or automotive parts, as well as robot guidance for pick & place.

INSPECTION OF THE CAR BODY

Measurement of gaps and bumps on the car body requires profile or 3D information. Choose the right solution, depending from the required resolution or the number of measurement points in the same area.

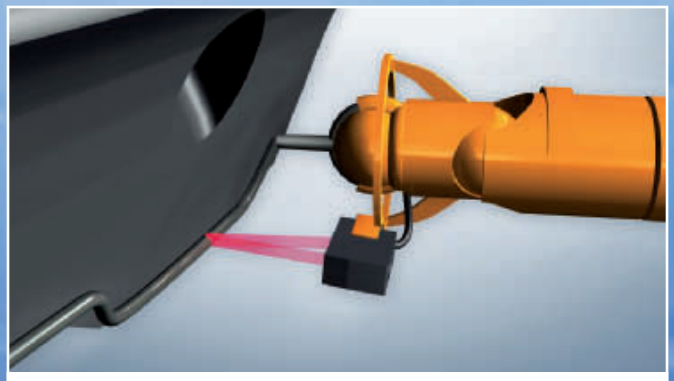
- Profile sensor: highest accuracy on a single measurement point. By moving the car or the sensor the measurement can check multiple points or be continuous.
- 3D Vision system: multiple measurements in the whole field of view, without any movements.



More information on ZG2 profile sensor on page 146
More on Xpectia FH vision system on page 70

GLUE BEAD INSPECTION

Track the proper position and profile of the glue with a profile sensor mounted on the robot.



More information on ZG2 profile sensor on page 146

surface | transparent | edges | **profile/3D** | position | characters | colour

PICKING OF AUTOMOTIVE PARTS

Identify the precise orientation of hanging parts in the press shop, to ensure the correct picking of the part by a robot. Xpectia-FZD analyses the 3D position and orientation.

More on Xpectia FH vision system page 70

INSPECTION OF A CYLINDER HEAD

In the engine highest accuracy is necessary. 2D inspections of the surface can be combined with 3D inspections to further increase the quality of the parts. Xpectia-FZD combines 2D and 3D in a single platform.

More on Xpectia FH vision system page 70

DETERMINATION OF POSITION

Pick & place combined with inspection

In many packaging applications it is mandatory to identify the precise position and orientation of a work piece and to communicate this information to the robot, for a proper pick-up. In addition quality inspection of the work piece or on the package is required.

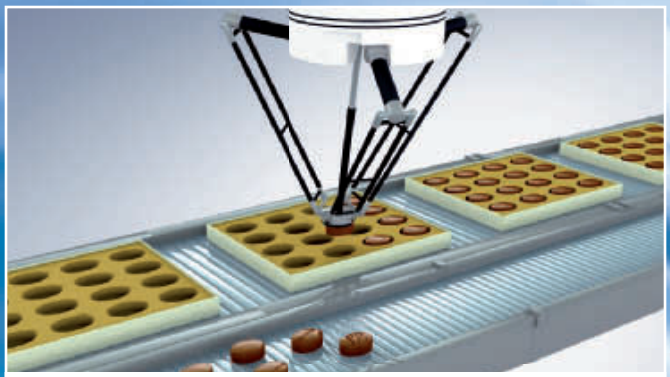
STANDARD PICKING REQUIREMENTS

In many industries, e.g. food packaging the parts on the conveyor can arrive in any position and orientation. The inspection system needs to guide the 'picker' and feed back the coordinates and angle. Multiple parts inside the same image can appear and need to be localised.

More on Pick & place FQ-M page 50
More on Pick & place Xpectia FH page 70

FILLING OF BLISTERS

A vision system identifies the position of pralines on the conveyor and places them into blisters. After detecting the position, the information has to be communicated to the robot or motion controller. High speed inspection is required to keep pace with the maximum picking speed, which depends on the robot and the food.



More on Pick & place FQ-M page 50
More on Pick & place Xpectia FH page 70

surface | transparent | edges | profile/3D | **position** | characters | colour

INSPECT AND PICK

A vision system inspects the parts before or after the picking into blisters or boxes.

- Defect or wrong parts are sorted out before picking
- Inspect for completeness and correct parts after picking

Depending on the performance required, inspection and positioning can be performed by one vision sensor. 100% quality can be achieved on naturals and/or on the package.

More on Pick & place FQ-M page 50
More on Pick & place Xpectia FH page 70

MOTION MEETS VISION

Advanced machine automation requires the integration of many components. Vision represents a key component for pick & place and will become an integrated part of packaging solutions. The benefits are:

- Easy set-up & calibration
- Integrated communication
- Combine positioning and inspection in one system

More on Pick & place FQ-M page 50
More on Pick & place Xpectia FH page 70

CHARACTER RECOGNITION

High end OCR/OCV inspection

The inspection or recognition of characters is a standard method in production processes to verify that information printed on labels or parts directly are correct. Depending on the material, background or font, advanced image processing is required for stable and reliable recognitions.

DATE AND LOT CODES ON LABELS

Ensure the correctness of dates, lot codes and other important product information. Especially in Food or Pharma industry, expiration and productions dates on labels and packages are critical for the business and need to be guaranteed.

More on Xpectia FH vision system page 70

PERSONALIZATION OF CHIP CARDS

The production of credit cards, passports or any other kind of chip card typically contains personalized data. The sensitivity of these products demands 100% failure free printing of all personal information on the cards, as well as highest speed and surface inspection.

More on Xpectia FH vision system page 70

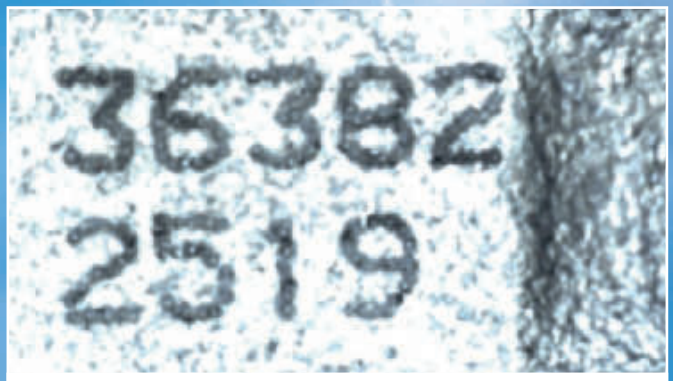
surface | transparent | edges | profile/3D | position | characters | colour

RECOGNITION OF DIRECT MARKED CHARACTERS

In automotive or glass industry characters are often marked directly on the part. Stable and reliable inspections on transparent or shiny materials can be realized by Omron Vision Systems, thanks to advanced filtering options.

MASTER ANY CHALLENGE IN RECOGNITION

Characters can be printed or marked in many different ways, fonts, shapes and orientations. The combination of powerful algorithms, filters and real colour processing together with strong OCR/OCV tools achieves highest quality and reliability for character recognition.



More on Xpectia FH vision system page 70

More on FlexXpect-Pharma/-Labelling page 94/page 96

COLOUR INSPECTION AND DETECTION

Colour enables to enter new applications and is another parameter to make conventional quality inspections more stable and robust. Real colour functionality allows vision systems to see like or even more than the human eye.

Omron offers a complete line-up of vision sensors and systems for colour applications, starting from simple colour identification up to real colour inspections to distinguish minute differences in colour. The line-up is complemented by Omron's colour mark sensors for simple, but reliable colour detections.

REAL COLOUR SENSING

Verify the characters printed on coloured pencils. Real colour sensing allows to inspect all pencils, by using a single inspection tool with highest stability. Beside the capability to distinguish minute differences in the colour, it also allows to ignore colour, where it is not of interest or disturbing the verification.

Real colour sensing simplifies the setup & operation, as in many applications images don't need to be filtered anymore and there is no need to setup multiple inspection tools.
Conventional colour vision sensors convert the colour into a filtered grey scale image for processing, which delivers 256 different colours, Omron real colour sensing provides up to 16 million colours to detect minute variations of coloured objects.

More on Xpectia FH vision system page 70

Standard colour system: Low contrast, internal processing using a filtered monochrome image. Xpectia: High contrast, stable inspections using real-colour sensing

surface | transparent | edges | profile/3D | position | characters | colour

COLOUR IDENTIFICATION

Identify wrong caps on cosmetic bins, by verification of the colour. Bins with wrong caps can be easily sorted out, eaven even if they are very similar. The FQ vision sensor is the ideal solution for simple colour applications.

- Easy setup
- Real colour sensing
- Simultaneous inspection of further quality criteria

EASY COLOUR AND COLOUR MARK DETECTIONS OR VERIFICATION

For best value for money for the detection or verification of colours or coloured marks. OMRON's colour and colour mark sensors provide a reliable, easy-to-use and flexible portfolio to match your application requirements....just choose the performance you need.

- Scalable colour verification solution (choose the nr of channels you need)
- Full flexibility for your mounting requirements

More on FQ2 easy vision sensor page 32

More on E3X-DAC colour sensor in INDUSTRIAL SENSING GUIDE

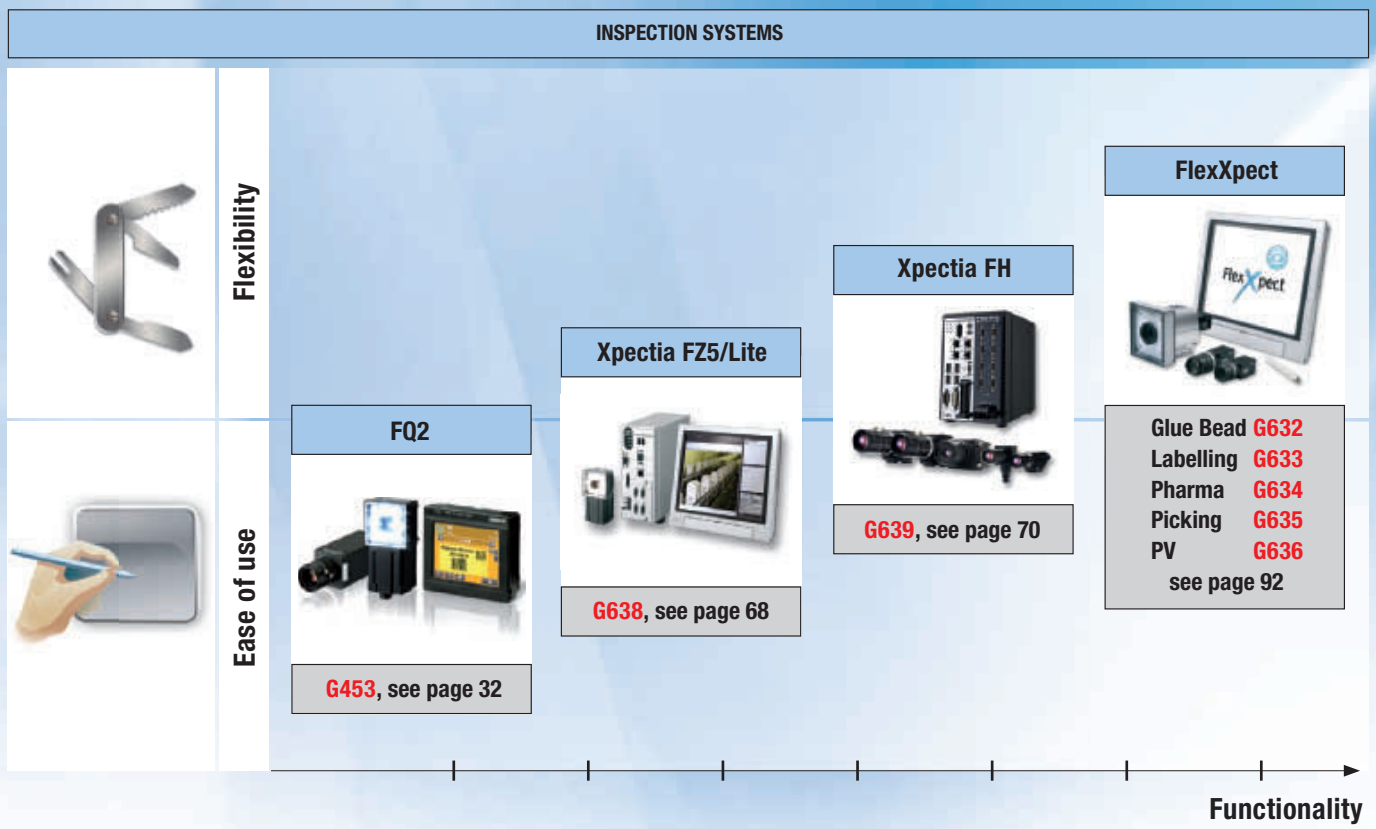
Simplicity and intuitive user guidance

The demand

The necessity for quality inspection and control in any production process is no longer a discussion point. The cost of non quality is much higher than the investment, which pays for itself within a short time. In order to further reduce the number and cost of defective goods, there is a clear trend from having just one inspection at the end of the process towards several quality checks within or even at the beginning of the process. The key technology that fills most inspection requirements is 'Machine Vision', but do all companies have the required know-how for vision applications in-house?

The approach

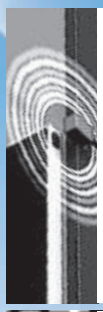
Omron offers a complete portfolio of vision products that solve this problem. Ranging from application-specific vision sensors up to PC-based vision systems, the portfolio has one common design rule: keep it simple.The built in monitors or touch screens are easy to use and avoid an additional PC for setting up while delivering immediate feedback on results. Moreover, users are shielded from the complexity of a vision application by intuitive user guidance that navigates them through the application without the need for expert knowledge on lighting, optics, filtering, etc..



The solution

Furthermore, Omron's platform concept with controllers and cameras allows you to select the best configuration for your application in an easy and flexible way. Choose from the easy vision sensor FQ2, which offers an intuitive teach & go procedure. The new mid-range Xpectia lite for advanced applications requiring features such as multiple inspections, position correction, intelligent image filtering and Ethernet communication. For even more challenging applications the high-end Xpectia FH combines the benefits of a compact system with the flexibility of a PC based platform. For code-reading look no further than the FQ-CR and FQ2-S4.

IDENT SYSTEMS (RFID/CODE READER)



RFID

V680

see page 122

2D

FQ-CR2

G462, see page 108

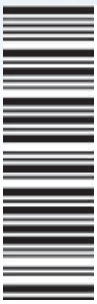
V400-H

D322, see page 120

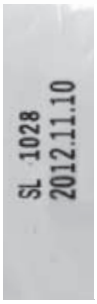
FQ2-S4

FQ-CR1

G524, see page 105



1D



Code verification

G464, see page 115

FQ2-CH

G463, see page 111

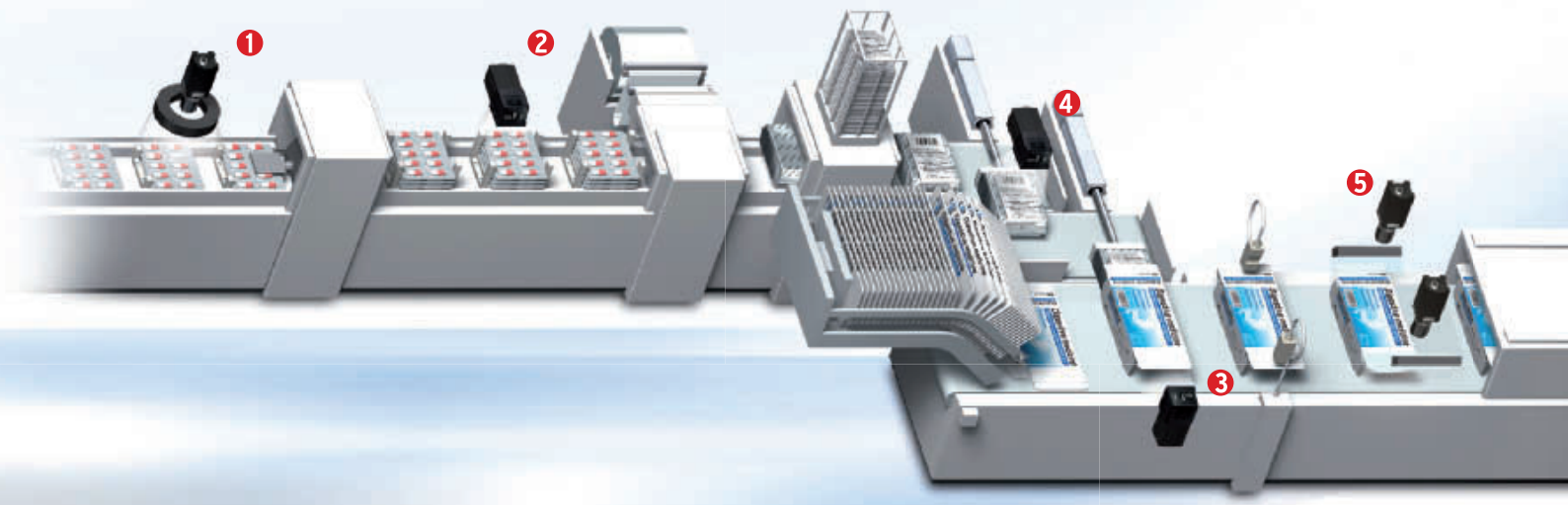
Fixed

Portable

INTRODUCING THE FQ2 VISION SENSOR FAMILY

The FQ2 vision sensor family is set to redefine the vision sensor market, providing advanced inspection, code reading and verification only previously available in higher end vision systems. With over 100 camera options, the FQ2 provides users with the ultimate flexibility to solve applications, whether you need high resolution, code reading, integrated lighting, or a cost effective solution to solve a simple application, there is an FQ2 which fits your needs.

Code Reader	Highspeed image processor	Megapixel capacity	Real colour	Mono-chrome	C-mount	9 inspection items	11 image filters	32 camera expansion	360° position compensation	Ultrawide 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



1 Missing Pill

2 Misalignment

3 Package insert detection

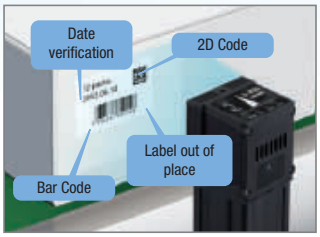
4 Reading barcode

All-in-one-housing

The compact design of the FQ2 means that it fits easily into confined spaces. Furthermore, unlike conventional vision sensors with multiple components, it comes in a single, all-in-one package.

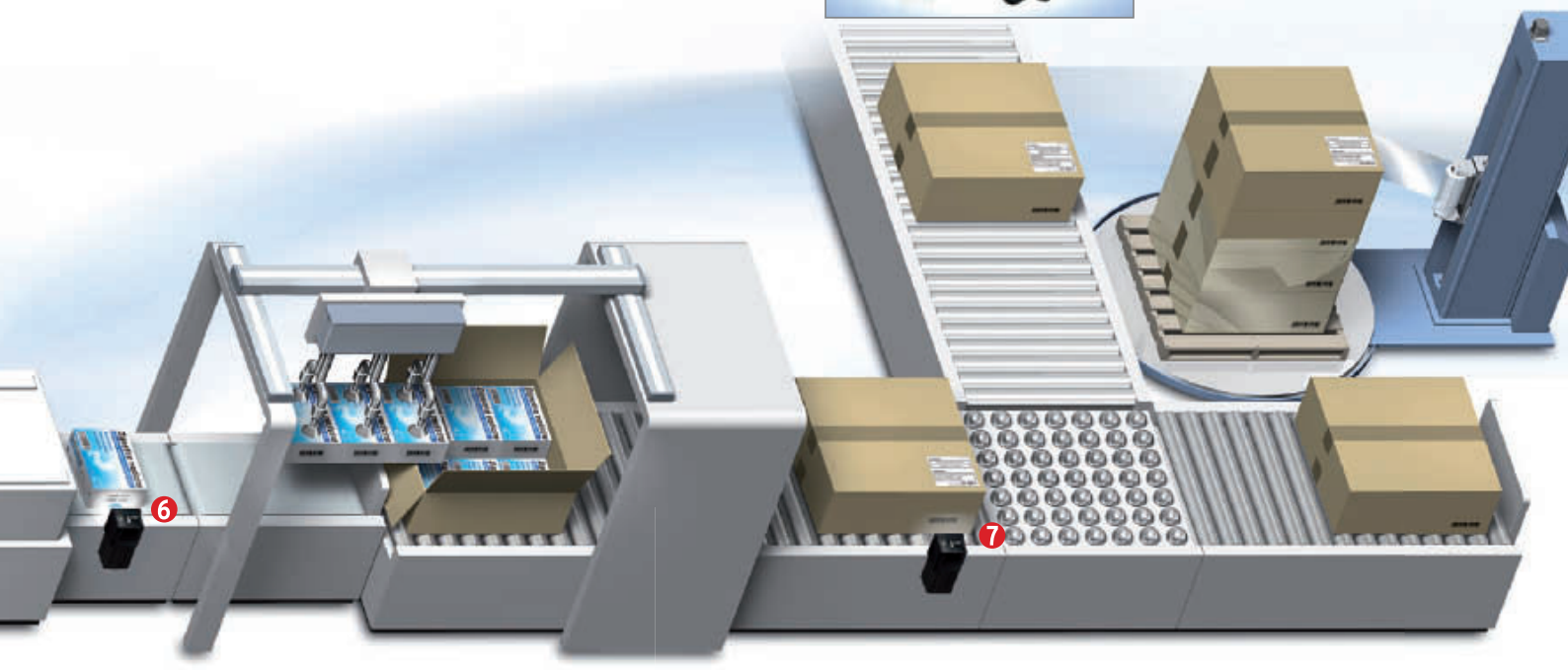
Advanced Inspection

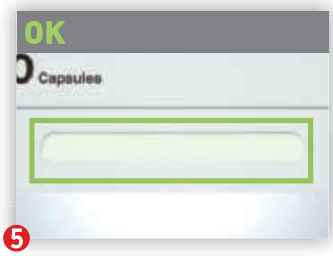
The FQ2 supports a diverse range of inspection items, including shape search, colour inspection, OCR, code reading and verification.



Versatile line-up

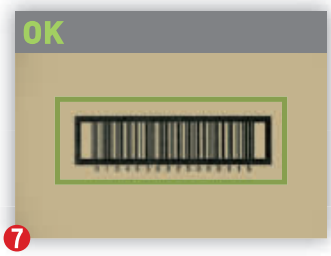
Whatever your application, there is an FQ2 to match your requirements, choose the functionality you need, no more and no less!





Hot-melt detection

Date verification and tape detection



Reading barcode

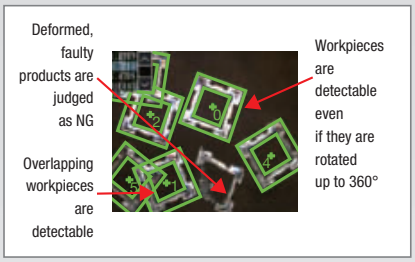
EASY SEARCHING WITH SHAPE SEARCH II

Searches are carried out to detect items such as labels and identify shapes or posi-tions. Shape searches generally run into difficulties when it comes to an overlap or 360° rotation. However, the FQ2 achieves high-speed (up to 10 times faster), stable searching of any shapes that match the model. Multiple searches can be performed simultaneously, which enables the inspection of a group of items, e.g. in a tray, or picking applications.

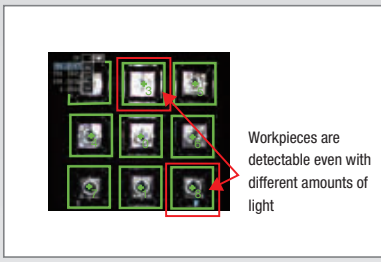
Sensitive searches can also be carried out through automatic division and matching of the model image. This reveals tiny differences that cannot be detected with a normal search.

SEARCHING

Shape search II

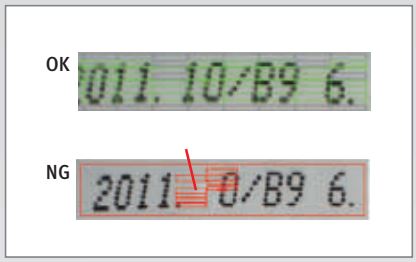


General searches have a difficult time with overlap or 360° rotation, but this Sensor achieves high-speed, stable searching of any shapes that match the model.



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

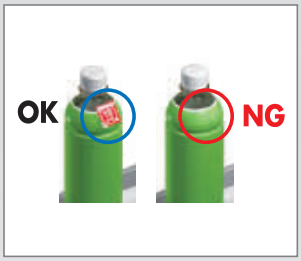
Sensitive search



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.

SEARCHING

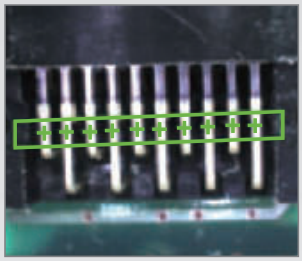
Search



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

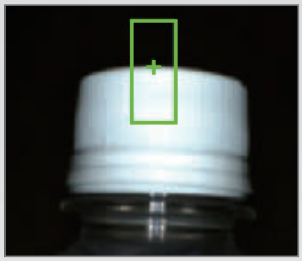
EDGE MEASUREMENTS

Edge pitch



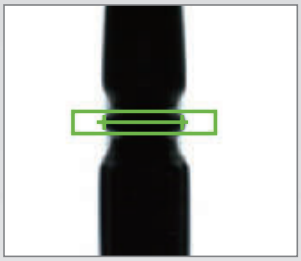
The number of edges in a region can be counted.

Edge position



This inspection item detects edges and measures their positions.

Edge width



This inspection item measures the width between edges.

Stable measurements

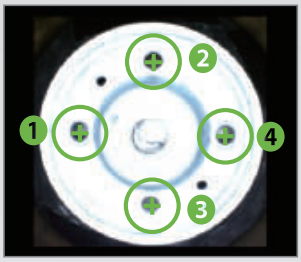
A total of 11 different image filters, including background suppression, are provided to stabilize measurements and maximize inspection results. If the dimensions of a workpiece are difficult to determine in a pixel display, the display units can be converted for easier viewing.

Other measurements possible include:

- Position, width and pitch of edges
- Number, colour, size, area and position of labels
- Colour differences in workpieces
- Inclusion of foreign objects and matter
- Rotational orientation of workpieces

AREA MEASUREMENTS, COLOUR MEASUREMENTS, AND DEFECT AND FOREIGN MATTER DETECTION

Labeling

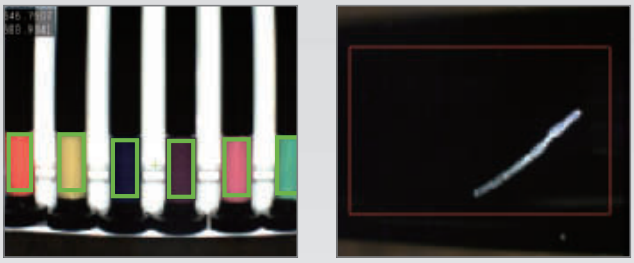


This inspection item counts how many labels there are of the specified colour and size and measures the area or center position of the specified label.

Area

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

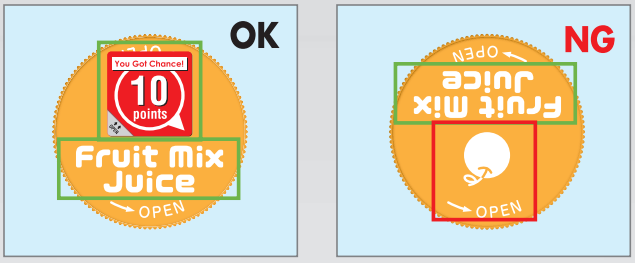
Colour Data



Inspections can be performed that compare the difference in colour between the workpiece and a registered image of a good product to detect objects and foreign matter (average colour value).
You can also inspect for defects and foreign matter by looking at the colour deviation (colour deviation).

UTILITY ITEMS

360° Rotational position compensation

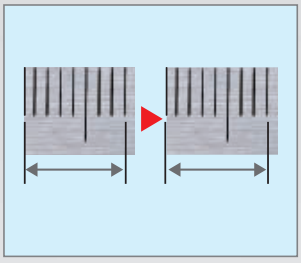


The correct position of workpieces with an inconsistent orientation can be measured through automatic detection of the offset of the workpiece in relation to a registered standard model.

Image filters

One of 11 different image filters is background suppression to help eliminate patterns that can result in unstable measurements, dilation and erosion.

Calibration



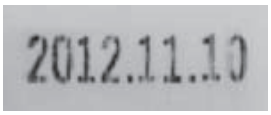
If the dimensions or position of a workpiece is difficult to determine in a pixel display, you can convert the display unit so that it is easier to see.

POSITION INSPECTION AND CHARACTER VERIFICATION

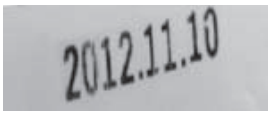
Stable character reading and verification

Distorted or unclear printing, e.g. due to conveyor-line conditions, is no problem for the FQ2. Stable and fast character reading is assured thanks to the new OCR method and the built-in dictionary. Furthermore, character verification and label-position inspection can both be performed using one FQ2 sensor. This reduces your costs and saves you space.

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



Worn Characters



Distorted Characters

Measurement Flow	Purpose
Image filters	Adjusts the image so that it is easier to inspect
Position compensation	Compensates for the position offset 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

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

Previous Vision Sensors

Character Verification

OK NG

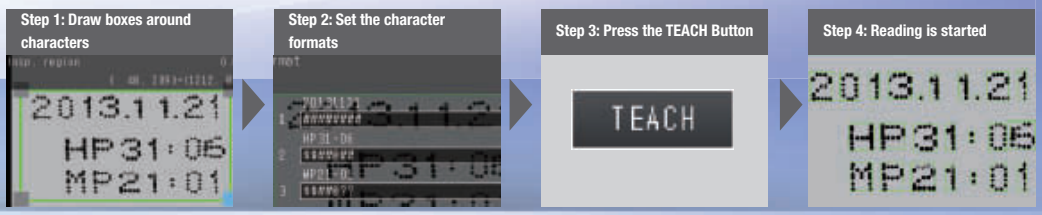

Label Position Inspection

UNIQUE OCR TECHNOLOGY CHARACTER VERIFICATION

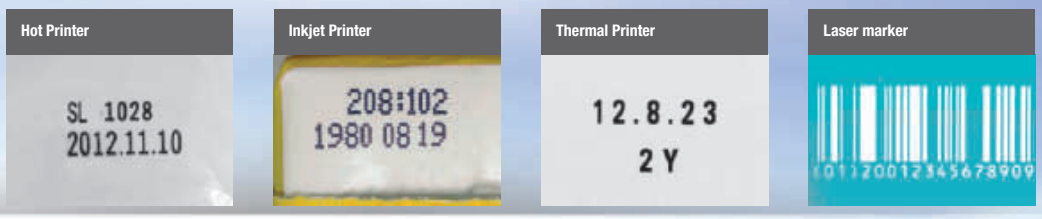
With conventional OCR methods:

Character registration in the dictionary requires time, characters printed by different printing devices lead to reading errors, and worn or inclined characters simply can not be read.

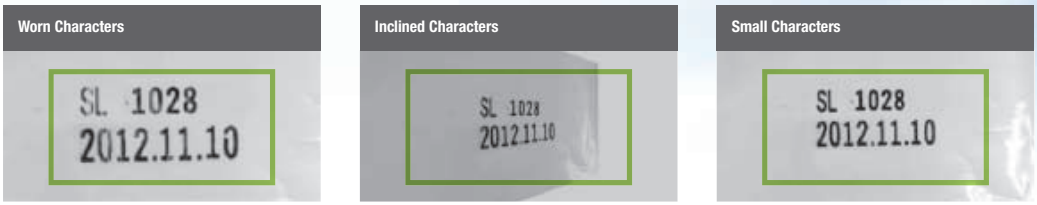
Time is required for character registration in the dictionary



Character variations by printing technology



Worn and inclined characters can not be read

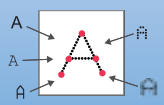


With Omron's unique recognition technology:

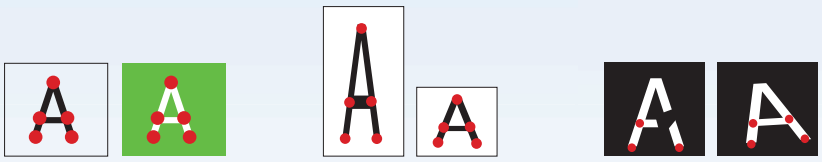
All of these problems have been overcome with the FQ2. A large, built-in dictionary with approximately 80 different fonts, including worn, blurred and distorted character variations, as well as size and background variations, enables characters from most printers to be read accurately, including inkjet and thermal printers.

Omron's unique recognition technology enables stable recognition of worn or distorted characters and requires no setting of parameters to compensate for character contrast or positional offsetting. No character registration is required because Omron's new OCR algorithm matches the characteristics of each character with structural models.

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 and inclined characters

CODE READING AND CHARACTER VERIFICATION

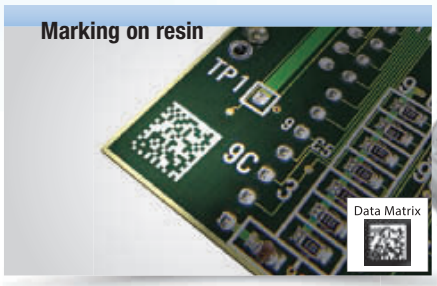
Code and character verification/reading made easy

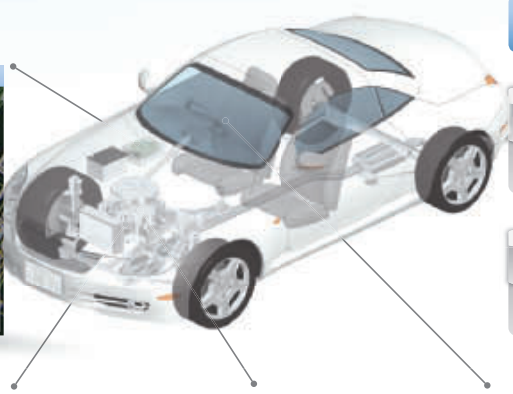
OCR and code reading inspection items can be combined within the FQ2 to read codes and verify them against character strings without any programming of external devices. Due to differences in the various materials involved, codes directly marked on products can cause instability when being read by conventional OCR methods.

The FQ2's unique functionality, designed specifically for DPM, overcomes these differences and achieves stable reading.

Measurement Flow	Purpose
Position compensation	Compensates for the position of the box
Reading	Compensates for the position offset of the box
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

Marking on resin

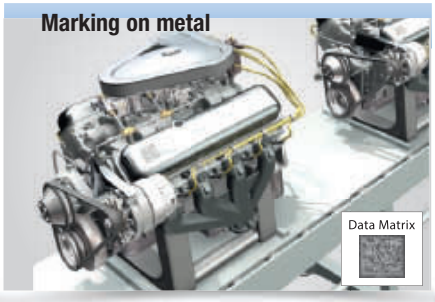




Measurement Flow	Purpose
Code Reading	Reads 2D code
2D-code (DPM)	
	Compensates for the position offset of the box
Outputs	
Data output	Outputs the information that was read

Marking on small parts

Marking on metal



Marking on film or glass

Paper labels

Where reliable verification of barcodes and characters is required on paper labels, e.g. in the pharmaceuticals industry, the FQ2 is the perfect choice. All commonly used types of barcodes and 2D barcodes can be handled. And only one code reader is required, even when different types of code have to be processed.

Direct Part Marked (DPM)

2D codes printed directly onto many materials, including metals, substrates, glass, can be difficult to read with good stability.
No problem for the FQ2, which is equipped with filters designed specifically for DPM and allow easy and stable reading. Unique, Omron-developed filters also remove printing irregularities and noise, while erosion and dilation can be combined to connect dots on 2D codes without changing the dot thickness.

Types of filtering	
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

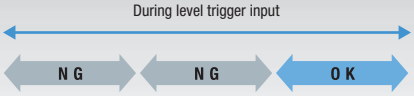
Retry function

Code readers must be able to read codes even with poor printing conditions. The FQ2 enables you to retry reading while changing the exposure time and other reading conditions (even for changing workpieces and environments) to achieve 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

2 – Retrying while external trigger is input



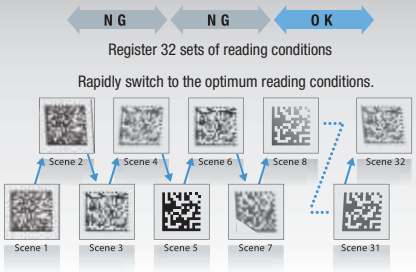
Reading is performed until successful, as long as an external level trigger is input

3 – Retrying while changing the shutter speed

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

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.



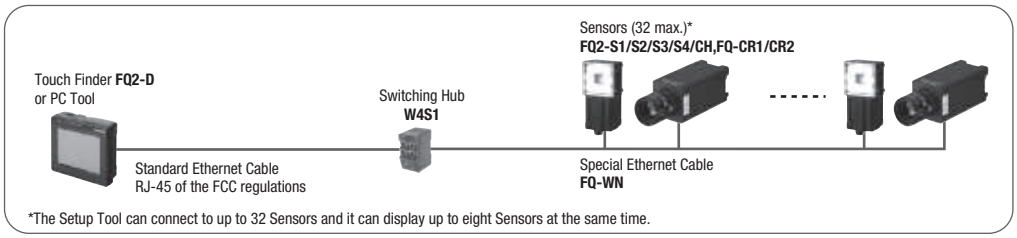
The new standard in image inspection and code verification

The FQ2 vision sensor family is set to redefine the vision sensor market, providing advanced inspection, code reading and verification only previously available in higher end vision systems. With over 100 camera options, the FQ2 provides users with the ultimate flexibility to solve applications, whether you need high resolution, code reading, integrated lighting, or a cost effective solution to solve a simple application, there is an FQ2 which fits your needs.

- Powerful functionality with versatile line-up
- All-in-one-housing
- Easy searching with Shape Search II
- Direct Part Marked (DPM)
- Unique OCR technology
- Code verification

System Configuration

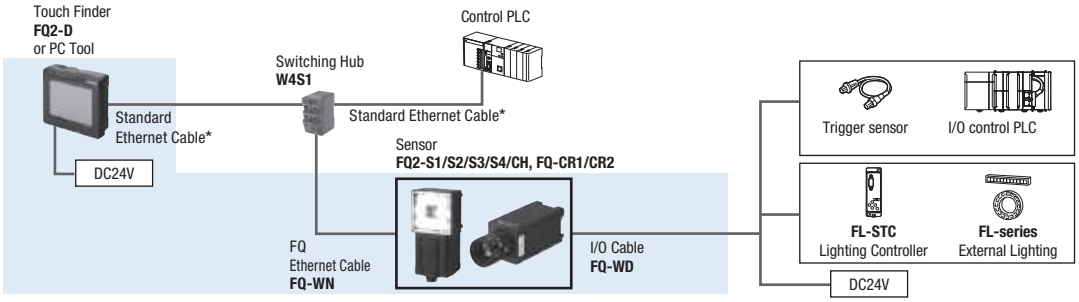
Up to 32 Sensors can be set up and monitored from a single Touch Finder or PC Tool.
Various types of Sensors can be used at the same time.
However, I/O type and wiring method vary depending on the Sensor, so select the necessary devices.



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

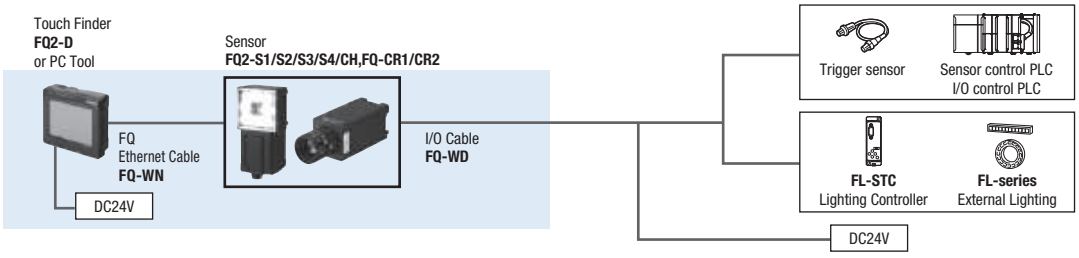


* RJ-45 of the FCC regulations

Parallel Interface Connection

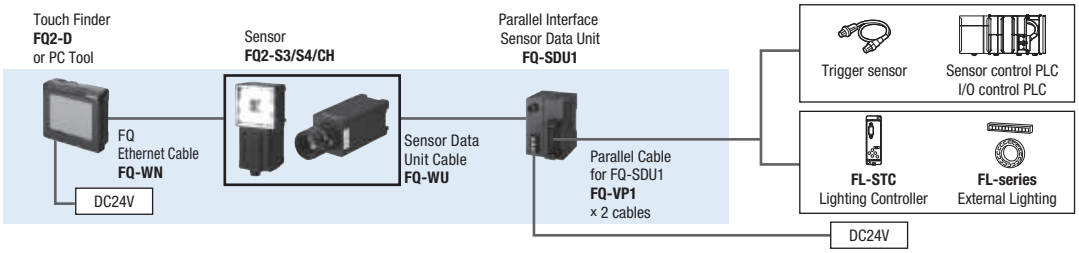
Connection with Standard Parallel Interface of the Sensor

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



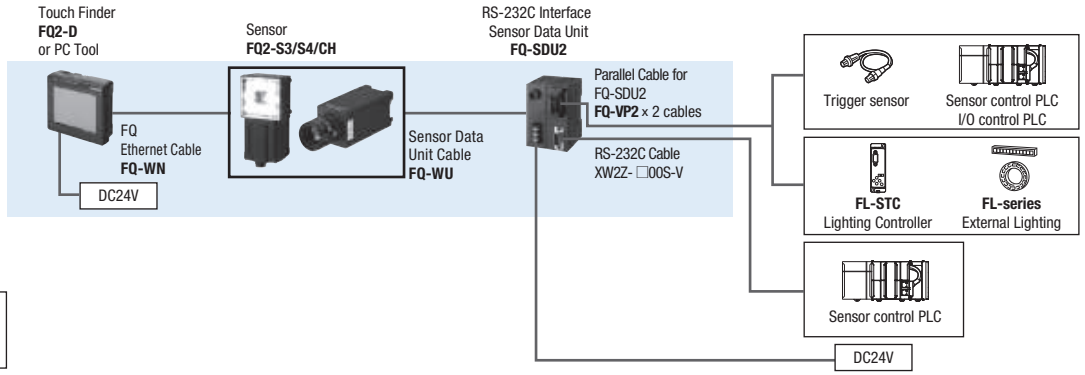
Connection through a Parallel Interface Sensor Data Unit

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



RS-232C Serial Connection

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



Model compatible with communications interface

Compatible
Not compatible

Ordering Information

Sensor

Inspection model

FQ2-S1 Series [Single-function Type]

Field of vision		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 vision/Installation distance		Refer to figure 1 on page 42.	Refer to figure 2 on page 42.	Refer to figure 3 on page 42.	Refer to figure 4 on page 42.

FQ2-S2 Series [Standard Type]

Field of vision		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 vision/Installation distance		Refer to figure 1 on page 42.	Refer to figure 2 on page 42.	Refer to figure 3 on page 42.	Refer to figure 4 on page 42.

FQ2-S3 Series [High-resolution Type]

Field of vision		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 vision/Installation distance		Refer to figure 5 on page 42.	Refer to figure 6 on page 42.	Refer to figure 7 on page 42.	Refer to figure 8 on page 42.	Refer to optical chart on p. 43

Inspection / ID model

FQ2-S4 Series [Standard Type]

Field of vision		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 vision/Installation distance		Refer to figure 1 on page 42.	Refer to figure 2 on page 42.	Refer to figure 3 on page 42.	Refer to figure 4 on page 42.

[High-resolution Type]

Field of vision		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 vision/Installation distance		Refer to figure 5 on page 42.	Refer to figure 6 on page 42.	Refer to figure 7 on page 42.	Refer to figure 8 on page 42.	Refer to optical chart on p. 43

ID Model

FQ2-CH Series [Optical Character Recognition Sensor]

Field of vision		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 vision/Installation distance		Refer to figure 1 on page 42.	Refer to figure 2 on page 42.	Refer to figure 3 on page 42.	Refer to figure 4 on page 42.

FQ-CR1 Series [Multi Code Reader]

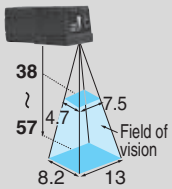
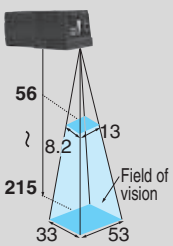
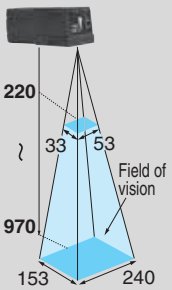
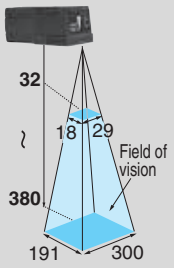
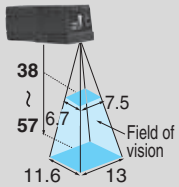
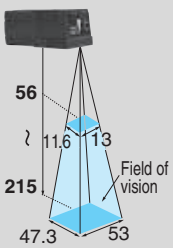
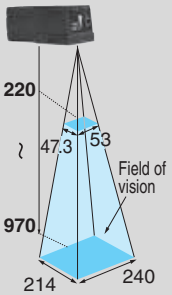
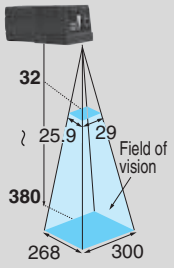
Field of vision		Narrow View	Standard View	Wide View (Long-distance)	Wide View (Short-distance)
Number of pixels		350,000 pixels			
Monochrome	NPN	FQ-CR10010F-M	FQ-CR10050F-M	FQ-CR10100F-M	FQ-CR10100N-M
	PNP	FQ-CR15010F-M	FQ-CR15050F-M	FQ-CR15100F-M	FQ-CR15100N-M
Field of vision/Installation distance		Refer to figure 1 on page 42.	Refer to figure 2 on page 42.	Refer to figure 3 on page 42.	Refer to figure 4 on page 42.

FQ-CR2 Series [2D Code Reader]

Field of vision		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 vision/Installation distance		Refer to figure 1 on page 42.	Refer to figure 2 on page 42.	Refer to figure 3 on page 42.	Refer to figure 4 on page 42.

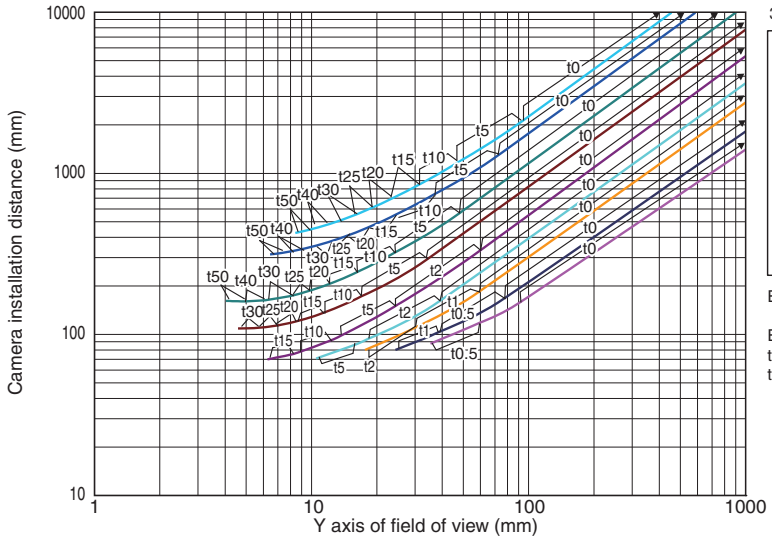
Field of vision/Installation distance

(Unit: mm)

Field of vision	Narrow View	Standard View	Wide View (Long-distance)	Wide View (Short-distance)
Appearance				
350,000 pixels type	Figure 1 	Figure 2 	Figure 3 	Figure 4 
760,000 pixels type	Figure 5 	Figure 6 	Figure 7 	Figure 8 

Optical Chart for C-mount Camera FQ2-S3□-13□/-S4□-13□

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



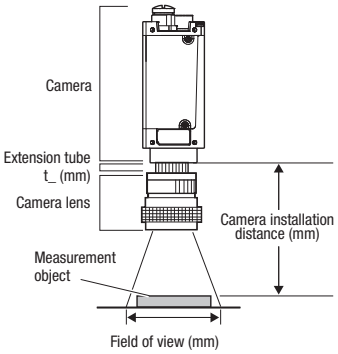
3Z4S-LE
- SV-0614H
- SV-0814H
- SV-1214H
- SV-1614H
- SV-2514H
- SV-3514H
- SV-5014H
- SV-7525H
- SV-10028H

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 vision (mm) (See Note.), and the Y axis of the optical chart shows the camera installation distance (mm).

Note: The lengths of the fields of vision given in the optical charts are the lengths of the Y axis.



Touch Finder

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

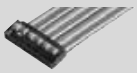
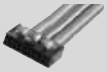
Cables

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*1		2m	FQ-VP1002
		5m	FQ-VP1005
		10m	FQ-VP1010
Parallel Cable for FQ-SDU2*1		2m	FQ-VP2002
		5m	FQ-VP2005
		10m	FQ-VP2010
RS-232C Cable for FQ-SDU2*1		2m	XW2Z-200S-V
		5m	XW2Z-500S-V

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

External Lighting

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

Accessories

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

*1 Included with Integrated Sensor.
*2 Included with Sensor with C-mount.
*3. 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

*4. Enclosed with Touch Finder.

Industrial Switching Hubs (Recommended)

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

Lenses for C-mount Camera. Refer to optical chart on p. 43 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									
Focal length	6 mm	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm	75 mm	100 mm
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.

Note: Do not use the 0.5-mm, 1.0-mm, and 2.0-mm Extension Tubes attached to each other. Since these Extension Tubes 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.

Note: Reinforcement is required to protect against vibration when Extension Tubes exceeding 30 mm are used.

Ratings and Performance

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 vision): ±10% max.)				Select a lens according to the field of vision and installation distance. Refer to optical chart on p. 43.	
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 (360° 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 1/50,000 Built-in lighting OFF: 1/1 to 1/50,000		Built-in lighting ON: 1/250 to 1/60,000 Built-in lighting OFF: 1/1 to 1/60,000		1/1 to 1/60,000	
	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 FINS/TCP no-protocol, EtherNet/IP, or PLC Link)					

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
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) 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 FINS/TCP no-protocol, EtherNet/IP, or PLC Link					
	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, Quick Startup Guide Member Registration Sheet, Warning Label				Mounting Base (FQ-XLC) (1) Mounting Screw (M3 × 8mm) (4) Instruction Manual, Quick Startup Guide Member Registration Sheet	
LED class		Class 2(Applicable standards: IEC 60825-1:1993 +A1:1997 +A2:2001, EN 60825-1:1994 +A1:2002 +A2:2001, and JIS C 6802:2005)				–	
Applicable standards		EN standard EN 61326 and EC Directive No.2004/104/EC		EN 61326-1:2006 and IEC 61010-1			

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 vision): ±10% max.)				Select a lens according to the field of vision and installation distance. Refer to optical chart on p. 43.	
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					
	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 1/50,000 Built-in lighting OFF: 1/1 to 1/50,000		Built-in lighting ON: 1/250 to 1/60,000 Built-in lighting OFF: 1/1 to 1/60,000		1/1 to 1/60,000	
	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				–	

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
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 FINS/TCP no-protocol, EtherNet/IP, or PLC Link)					
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) 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 FINS/TCP no-protocol, EtherNet/IP, or PLC Link					
	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/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, Quick Startup Guide Member Registration Sheet, Warning Label				Mounting Base (FQ-XLC) (1) Mounting Screw (M3 × 8mm)(4) Instruction Manual, Quick Startup Guide Member Registration Sheet	
LED class		Class 2(Applicable standards: IEC 60825-1:1993 +A1:1997 +A2:2001, EN 60825-1:1994 +A1:2002 +A2:2001, and JIS C 6802:2005)				–	
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.
*2 The types of codes to be read are the same as those of FQ-CR1 Multi Code Reader.
*3 The types of codes to be read are the same as those of FQ-CR2 2D Code Reader.

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 page 41. (Tolerance (field of vision): ±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-Data Matrix)	2D Code (Data Matrix(EC200), QR Code)
			Bar Code (JAN/EAN/UPC, Code39, Codabar (NW-7), ITF (Interleaved 2 of 5), Code 93, Code128/ GS1-128, GS1 DataBar* (Truncated, Stacked, Omnidirectional, Stacked Omnidirectional, Limited, Expanded, Expanded Stacked), Pharmacode, GS1-128 Composite Code (CC-A, CC-B, CC-C)	
	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 1/50,000 Built-in lighting OFF: 1/1 to 1/50,000	1/250 to 1/30,000	1/250 to 1/32,258
	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 FINS/TCP no-protocol, EtherNet/IP, or PLC Link)	External trigger (single or continuous)	
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) 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: 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 FINS/TCP no-protocol, EtherNet/IP, or PLC Link	–	
	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.)		

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
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, Quick Startup Guide, Member Registration Sheet, Warning Label		
LED class		Class 2(Applicable standards: IEC 60825-1:1993 +A1:1997 +A2:2001,EN 60825-1:1994 +A1:2002 +A2:2001, and JIS C 6802:2005)		
Applicable standards		EN 61326-1:2006 and IEC61010-1		

Touch Finder

Item			Type	Model with DC power supply	Model with AC/DC/battery power supply
			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	
		Pixels		320 × 240	
		Display colors		16.7 million	
	Backlight	Life expectancy*1		50,000 hours at 25ºC	
		Brightness adjustment		Provided	
		Screen saver		Provided	
Operation interface	Touch screen	Method		Resistance film	
		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:–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□□ 0.4 A max.: FQ2-S3□-□□□ and FQ-SDU□□ 0.1 A max.: FQ-SDU□□ only	
Environmental immunity	Ambient temperature range		Operating: 0 to 50°C, Storage: –20 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	
	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 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 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 (FQ2-D31). AC adapter (FQ-AC□) is required.
Charging time*1	2 h
Usage time*1	1.5 h
Battery backup life*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*1
Monitor	1,024 × 768 dots min.

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

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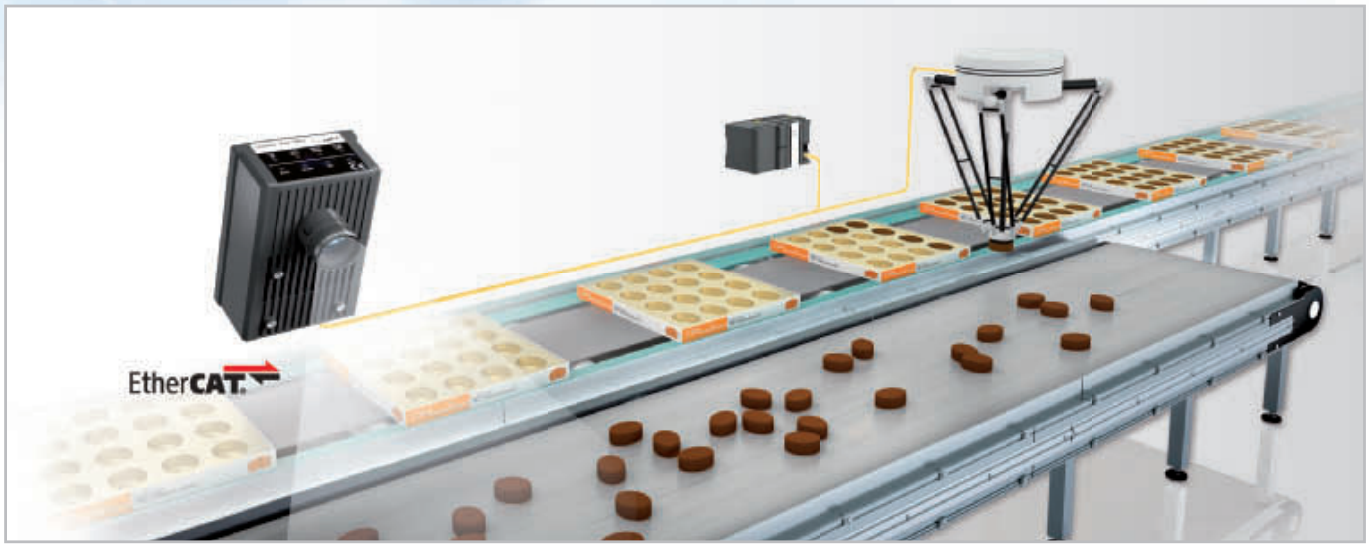
FQ-M VISION SENSOR

Smart camera to guide your robot

The new FQ-M series is a vision sensor designed specifically for Pick & Place applications. It comes with EtherCAT embedded and can be integrated easily into any environment. The FQ-M is compact, fast and includes an incremental encoder input for easy tracking calibration. Omron's Sysmac Studio software is the perfect tool for configuring the FQ-M and is complemented by the TouchFinder console for on-site monitoring.



Easy set-up & integration

With intelligent wizards for calibration and communication integration into your machine is easier than ever.
The FQ-M communicates with all devices via EtherCAT, or standard Ethernet. The communication wizard lets you easily configure any robot protocol both as a server or as a client without complex programming.

Fast detection & high stability

The FQ-M can detect up to 32 pieces at once and more than 5000 pieces per minute. The new contour based search algorithm ensures the highest reliability.

„On-the-fly" tracking

Synchronized control is even easier, because the FQ-M vision sensor has an in-built encoder input for accurate conveyor tracking and easy calibration. The FQ-M is able to output position coordinates and the correlative encoder values and is able to manage the object queue, so that no object's coordinates are duplicated.

YOUR BENEFITS

- Made specifically for pick & place applications
- Encoder input for conveyor tracking and calibration
- Shape based object detection
- Smart calibration wizard
- Sysmac Studio software for vision system operation and setting

FQ-M VISION SENSOR

Easy set-up & integration with motion

Machine control

Programable out put format for your pick & place robot

Configuration as a server or as a client without complex programming.

Ethernet

Sysmac Studio for fast configuration

The Vision Editor of the Sysmac Studio software will help you to program the optimum vision setting. Intuitive and icon driven set-up and configuration.

TouchFinder for monitoring on-site

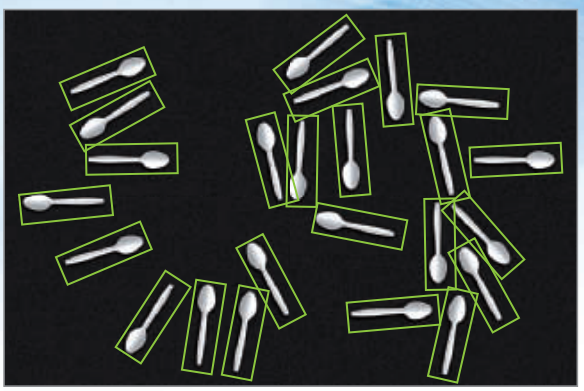
With the intuitive TouchFinder console – which fits in the palm of your hand – you can access all functions and settings quickly and easily.

FQ-M VISION SENSOR

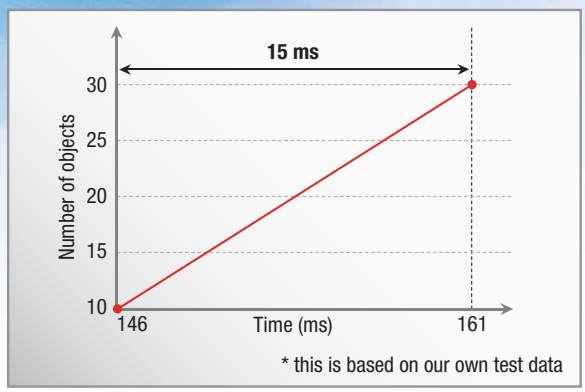
Fast detection and high stability

The new contour based search algorithm offers unique performance for pick & place applications. Changing lighting conditions, reflection, object inclination or partially hidden objects are no longer a problem. The FQ-M delivers a stable result even at high speed, no matter how many objects have to be detected at the same time.

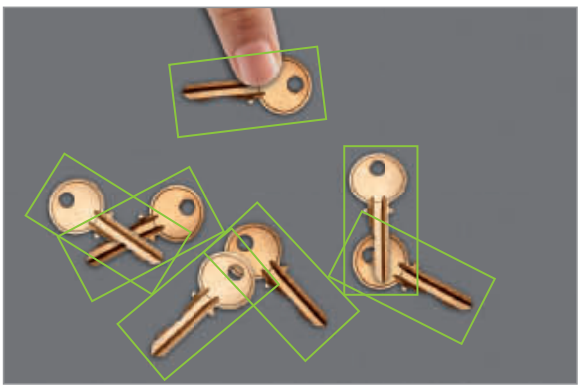
Best in class performance



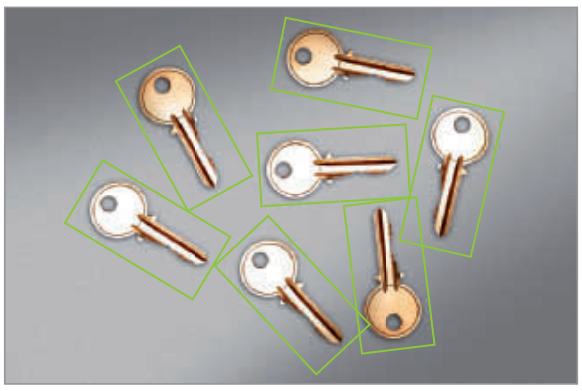
High-speed processing
5000 pcs/min with 360° detection.



Only 15 ms time difference, detecting 10 objects or 30 objects at once.

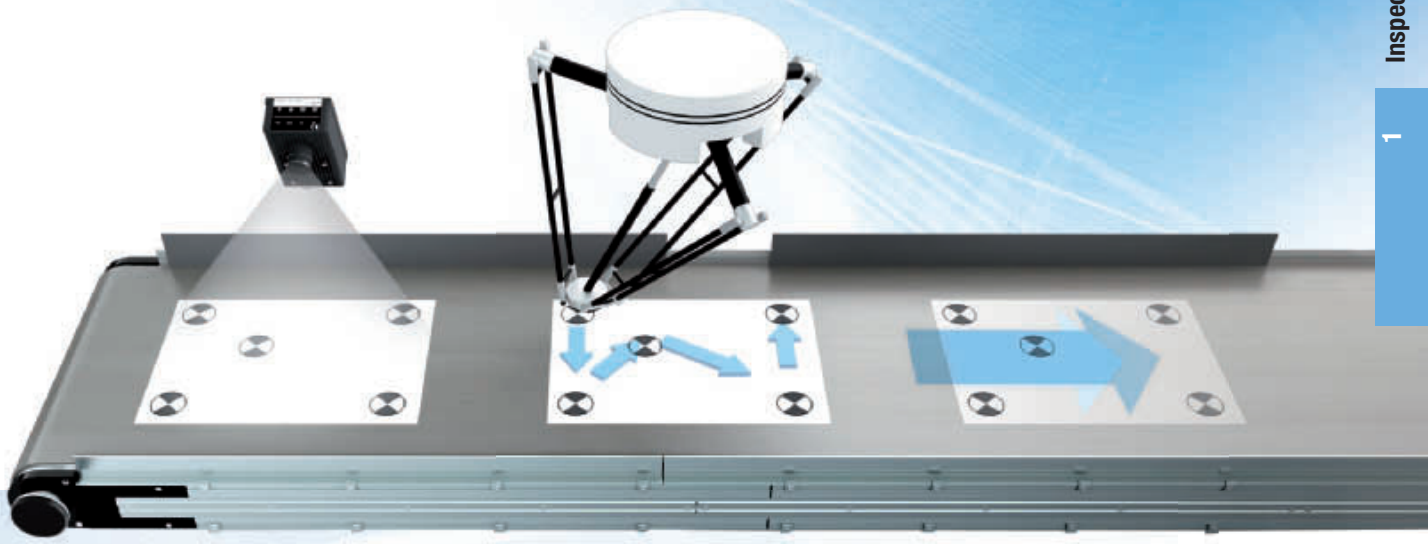


Stable and reliable detection, even if objects are overlapped or partially hidden.



Changing light conditions have no influence on the position accuracy.

Encoder input for simplified calibration & tracking



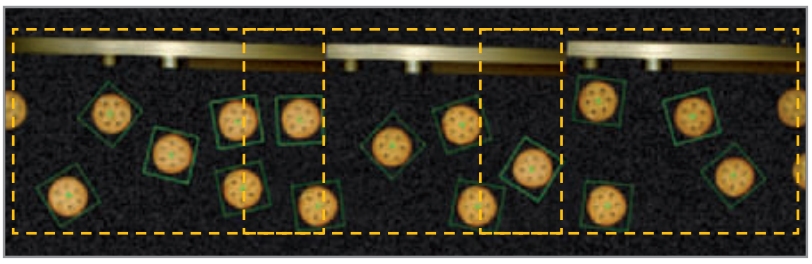
Step 1 – camera
Camera detects all calibration marks.

Step 2 – robot
Robot moves to the calibration marks. The offset to the camera is registered through the encoder value.

Step 3 – system
Camera, conveyor, robot and encoder are automatically aligned.

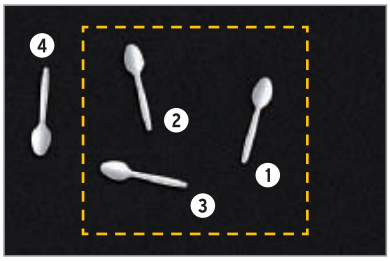
Panorama view – Parameter setting for ideal object detection

A panoramic view can be created from 3 different images, allowing easy parameter optimisation.

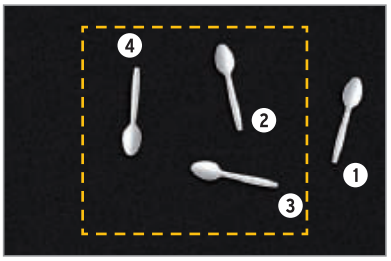


First shot Second shot Third shot

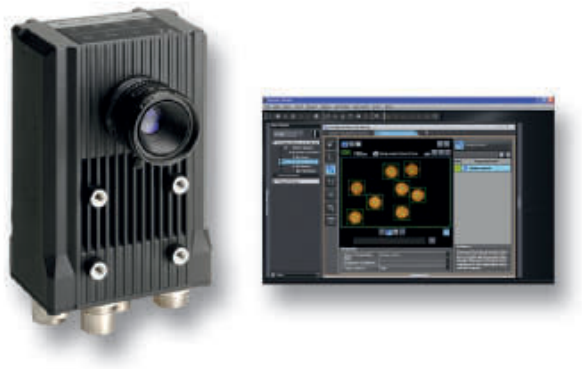
Objects that overlap within more than one field of view are segregated and only inserted in the picking queue once.



First shot
The position and orientation of objects 1, 2 and 3 is detected and added to the picking queue.



Next shot
Object 2, 3 and 4 are detected, but only the data of object 4 is evaluated. Position and orientation of objects 2 and 3 is ignored because they were already added to the queue with the shot before.



FQ-M Vision sensor

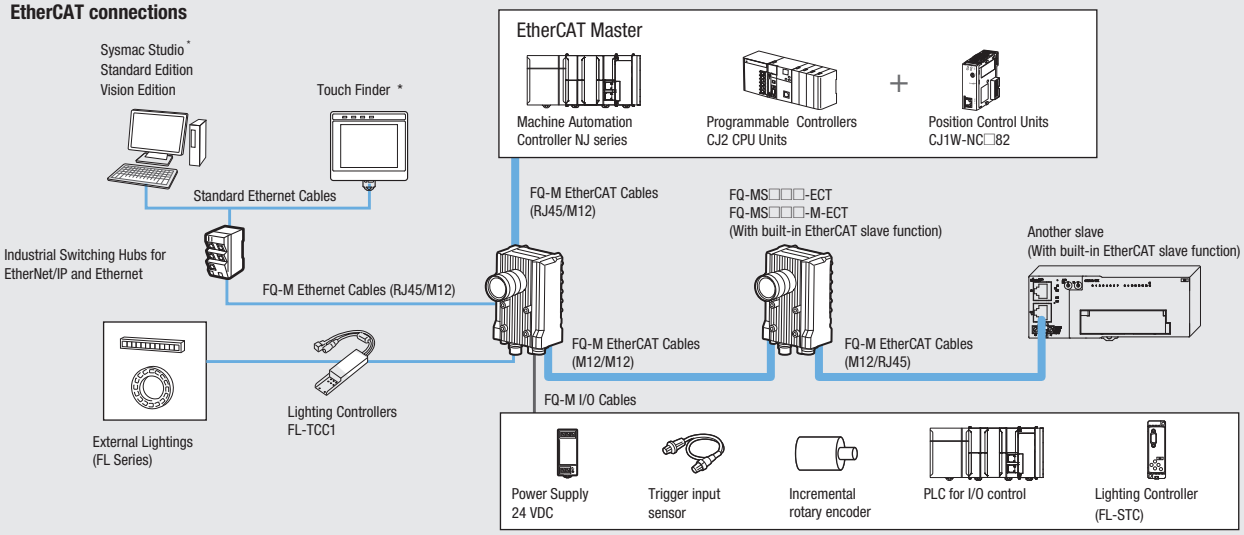
The new FQ-M series is a vision sensor designed specifically for Pick & Place applications. It comes with EtherCAT embedded and can be integrated easily into any environment. The FQ-M is compact, fast and includes an incremental encoder input for easy tracking calibration. Omron's Sysmac Studio software is the perfect tool for configuring the FQ-M and is complemented by the TouchFinder console for on-site monitoring.

Designed for motion tracking

- Made specifically for pick & place applications
- Connectivity with EtherCAT/Ethernet
- Encoder input for conveyor tracking and calibration
- Shape based object detection
- Smart calibration wizard
- Sysmac Studio software for vision system operation and setting

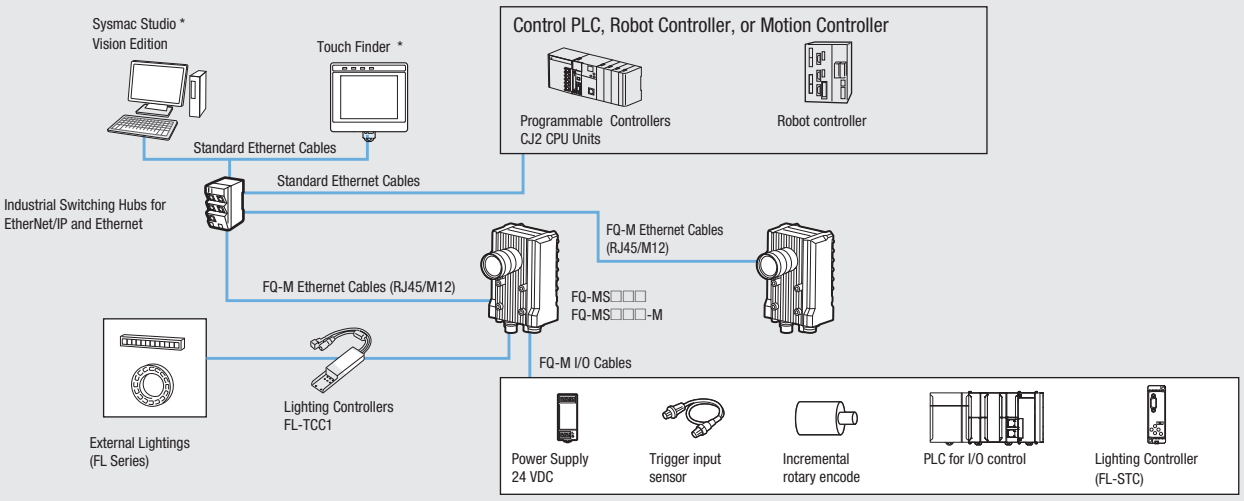
System configuration

EtherCAT connections



* Sysmac Studio and Touch Finder can not be used together. When both are connected, Sysmac Studio will have a priority.
When you use the Sysmac Studio Standard Edition and connect the FQ series and the Machine Automation Controller NJ-series, connect them with a general-purpose Ethernet cable or a USB cable.

No-protocol Ethernet and PLC Link Connections



* Sysmac Studio and Touch Finder can not be used together.
When both are connected, Sysmac Studio will have a priority.

Note: 1. EtherCAT and Ethernet (PLC Link) can not be used simultaneously.
2. It is not possible to configure and adjust the FQ-M via an NJ-series controller, when they are connected via an EtherCAT network. For configuration and adjustment of FQ-M, connect the FQ-M and a computer or a Touch Finder via an Ethernet network.

Sysmac is a trademark or registered trademark of OMRON Corporation in Japan and other countries for OMRON factory automation products.
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EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.
Other company names and product names in this document are the trademarks or registered trademarks of their respective companies.

Ordering Information

Sensors

Appearance	Type			Model
	Color	NPN	EtherCAT communication function not provided	FQ-MS120
		PNP		FQ-MS125
	Monochrome	NPN		FQ-MS120-M
		PNP		FQ-MS125-M
	Color	NPN	EtherCAT communication function provided	FQ-MS120-ECT
		PNP		FQ-MS125-ECT
	Monochrome	NPN		FQ-MS120-M-ECT
		PNP		FQ-MS125-M-ECT

Automation Software Sysmac Studio

Please purchase a DVD and required number of licenses the first time you purchase the Sysmac Studio. DVDs and licenses are available individually. Each model of licenses does not include any DVD.

Product name	Specifications	Number of licenses	Media	Model	Standards
Sysmac Studio Standard Edition Ver.1.□□[*1]	The Sysmac Studio provides an integrated development environment to set up, program, debug, and maintain NJ-series Controllers and other Machine Automation Controllers, as well as EtherCAT slaves. Sysmac Studio runs on the following OS. Windows XP (Service Pack 3 or higher, 32-bit version) / Vista (32-bit version)/7 (32-bit/64-bit version) The Sysmac Studio Standard Edition DVD includes Support Software to set up EtherNet/IP Units, DeviceNet slaves, Serial Communications Units, and Support Software for creating screens on HMIs (CX-Designer). For details, refer to the Sysmac Integrated Catalogue (P072).	– (Media only)	DVD	**SYSMAC-SE200D**	–
		1 license[*2]	–	**SYSMAC-SE201L**	–
Sysmac Studio Vision Edition Ver.1.□□	Sysmac Studio Vision Edition is a limited license that provides selected functions required for Vision Sensor FQ-M settings. Because this product is a license only, you need the Sysmac Studio Standard Edition DVD media to install it.	1 license	–	**SYSMAC-VE001L**	–

[*1] The FQ-M series is supported by Sysmac Studio version 1.01 or higher.
[*2] Multi licenses are available for the Sysmac Studio (3, 10, 30, or 50 licenses).

Touch Finder

Appearance	Type	Model
	DC power supply	FQ-MD30
	AC/DC/battery[*1]	FQ-MD31

[*1] AC Adapter and Battery are sold separately.

Bend resistant Cables for FQ-M Series

Appearance	Type			Model
	For EtherCAT and Ethernet cable Angle: M12/ Straight: RJ45		Cable length: 5 m	FQ-MWNL005
			Cable length: 10 m	FQ-MWNL010
	For EtherCAT and Ethernet cable Straight type (M12/RJ45)		Cable length: 5m	FQ-WN005-E
			Cable length: 10 m	FQ-WN010-E
	For EtherCAT cable Angle type (M12/M12)		Cable length: 5 m	FQ-MWNEL005
			Cable length: 10 m	FQ-MWNEL010
	For EtherCAT cable Straight type (M12/M12)		Cable length: 5m	FQ-MWNE005
			Cable length: 10 m	FQ-MWNE010
	I/O Cables	Angle type	Cable length: 5 m	FQ-MWDL005
			Cable length: 10 m	FQ-MWDL010
		Straight type	Cable length: 5 m	FQ-MWD005
			Cable length: 10 m	FQ-MWD010

Accessories

Appearance	Type		Model
	For Touch Finder	Panel Mounting Adapter	FQ-XPM
		AC Adapter (for models for DC/AC/Battery)	FQ-AC□*1
		Battery (for models for DC/AC/Battery)	FQ-BAT1
		Touch Pen (enclosed with Touch Finder)	FQ-XT
		Strap	FQ-XH
		SD Card (2 GB)	HMC-SD291

*1 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
O	250 V max.	–	FQ-AC6

Industrial Switching Hubs for EtherNet/IP and Ethernet

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

Note: Industrial switching hubs are cannot be used for EtherCAT.

EtherCAT junction slaves

Appearance	Number of ports	Power supply voltage	Current consumption	Model
	3	20.4 to 28.8 VDC (24 VDC -15 to 20%)	0.08 A	GX-JC03
	6		0.17 A	GX-JC06

Note: 1. Please do not connect EtherCAT junction slave with OMRON position control unit, Model CJ1W-NC□81/□82.
2. EtherCAT junction slaves cannot be used for EtherNet/IP and Ethernet.

Cameras peripheral devices

Type		Model
Cameras peripheral devices	CCTV Lenses	3Z4S-LE Series
External Lightings		FL Series
Lighting Controllers	For FL Series	FL-TCC1

Specifications

Sensors

Item	Type	EtherCAT communication function not provided		EtherCAT communication function provided	
		Color	Monochrome	Color	Monochrome
Model	NPN	FQ-MS120	FQ-MS120-M	FQ-MS120-ECT	FQ-MS120-M-ECT
	PNP	FQ-MS125	FQ-MS125-M	FQ-MS125-ECT	FQ-MS125-M-ECT
Field of vision, Installation distance		Selecting a lens according to the field of vision and installation distance.			
Main functions	Inspection items	Shape search, Search, Labeling, Edge position			
	Number of simultaneous inspections	32			
	Number of registered scenes	32			
Image input	Image processing method	Real color	Monochrome	Real color	Monochrome
	Image elements	1/3-inch color CMOS	1/3-inch monochrome CMOS	1/3-inch color CMOS	1/3-inch monochrome CMOS
	Image filter	High dynamic range (HDR) and white balance	High dynamic range (HDR)	High dynamic range (HDR) and white balance	High dynamic range (HDR)
	Shutter	Electronic shutter; select shutter speeds from 1/10 to 1/30000 (sec)			
	Processing resolution	752 (H) × 480 (V)			
	Pixel size	6.0 (m) × 6.0 (m)			
	Frame rate (image read time)	60 fps (16.7 ms)			
External Lightings	Connecting method	Connection via a strobe light controller			
	Connectable lighting	FL series			
Data logging	Measurement data	In Sensor: Max. 32000 items*1			
	Images	In Sensor: 20 images*1			
Measurement trigger		I/O trigger, Encoder trigger, Communications trigger (Ethernet No-protocol, PLC Link, or EtherCAT)			
I/O specifications	Input signals	9 signals Single measurement input (TRIG) Error clear input (IN0) Encoder counter reset input (IN1) Encoder input (A±, B±, Z±)*2			
	Output signals	5 signals*3 OUT0 Overall judgement output (OR) OUT1 Control output (BUSY) OUT2 Error output (ERROR) OUT3 (Shutter output: SHTOUT) OUT4 (Strobe trigger output: STGOUT)			
	Ethernet specifications	100BASE-TX/10BASE-TX			
	EtherCAT specifications	–		Dedicated protocol for EtherCAT 100BASE-TX	
	Connection method	Special connector cables Power supply and I/O: 1 special connector I/O cable Touch Finder, Computer and Ethernet: 1 Ethernet cable EtherCAT: 2 EtherCAT cable			
LED display		OR: Judgment result indicator ERR: Error indicator BUSY: BUSY indicator ETN: Ethernet communications indicator			
	EtherCAT display	–		L/A IN (Link/Activity IN) × 1 L/A OUT (Link/Activity OUT) × 1 RUN × 1 ERR × 1	
Ratings	Power supply voltage	21.6 to 26.4 VDC (including ripple)			
	Insulation resistance	Between all lead wires and case: 0.5 M (at 250 V)			
	Current consumption	450mA max. (When the FL-series Strobe controller and lighting are used.) 250mA max. (When external lighting is not used.)			
Environmental immunity	Ambient temperature range	Operating: 0 to 50 °C, Storage: -20 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			
	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	IEC60529 IP40			
Materials		Case: alminium die casting, Rear cover: alminium plate			
Weight		Approx. 390 g (Sensor only)		Approx. 480 g (Sensor only)	
Accessories		Instruction Manual			

*1 If a Touch Finder is used, results can be saved up to the capacity of an SD card.
*2 Encoder input specifications.
*3 The five output signals can be allocated for the judgements of individual inspection items.

Pulse input Specifications (When an open collector type encoder is used.)

Item		Specification		
Input voltage		24 VDC ±10%	12 VDC ±10%	5 VDC ±5%
Input current		4.8 mA (at 24 VDC, typical value)	2.4 mA (at 12 VDC, typical value)	1.0 mA (at 5 VDC, typical value)
NPN	ON voltage*1	4.8 V max.	2.4 V max.	1.0 V max.
	OFF voltage*2	19.2 V min.	9.6 V min.	4.0 V min.
PNP	ON voltage*1	19.2 V min.	9.6 V min.	4.0 V min.
	OFF voltage*2	4.8 V max.	2.4 V max.	1.0 V max.
Maximum response frequency*3		50 kHz (I/O cable: when the FQ-MWD005 or FQ-MWDL005 cables is used.) 20 kHz (I/O cable: when the FQ-MWD010 or FQ-MWDL010 cables is used.)		
Input impedance		5.1 k		

*1 ON voltage: Voltage to change from OFF to ON state. The ON voltage is the difference of voltages between the GND terminal of the encoder power terminals and each input terminal.
*2 OFF voltage: Voltage to change from ON to OFF state. The ON voltage is the difference of voltages between the GND terminal of the encoder power terminals and each input terminal.
*3 Select maximum response frequency depending on length of the encoder cable and response frequency of the encoder.

Pulse input Specifications (When a line-driver output type encoder is used.)

Item	Specification
Input voltage	EIA standard RS-422-A line driver level
Input impedance*1	120 ±5%
Differential input voltage	0.2 V min.
Hysteresis voltage	50 mV
Maximum response frequency*2	200 kHz (I/O cable: when the FQ-MWD005, FQ-MWDL005, FQ-MWD010, or FQ-MWDL010 cables is used.)

*1 When terminating resistance function is used.
*2 Select maximum response frequency depending on length of the encoder cable and response frequency of the encoder.

Touch Finder

Item		Type	Model with DC power supply	Model with AC/DC/battery power supply
Model			FQ-MD30	FQ-MD31
Number of connectable Sensors			2 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, Japanese	
Indications	LCD	Display device	3.5-inch TFT color LCD	
		Pixels	320 × 240	
		Display colors	16,777,216	
	Backlight	Life expectancy*1	50,000 hours at 25°C	
		Brightness adjustment	Provided	
		Screen saver	Provided	
	Indicators	Power indicator (color: green)	POWER	
		Error indicator (color: red)	ERROR	
		SD card access indicator (color: yellow)	SD ACCESS	
		Charge indicator (color: orange)	–	CHARGE
Operation interface	Touch screen	Method	Resistance film	
		Life expectancy*2	1,000,000 operations	
External interface	Ethernet		100 BASE-TX/10 BASE-T	
	SD card		Omron SD card (Model: HMC-SD291) or a SDHC card of Class4 or higher rating is recommended.	
Ratings	Power supply voltage	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 (1 cell, 3.7 V)
	Continuous operation on Battery*3		–	1.5 h
	Current consumption		DC power connection: 0.2 A	
	Insulation resistance		Between all lead wires and case: 0.5 M (at 250 V)	
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 0 to 40°C when operated on a Battery Storage: -25 to 65°C (with no icing or condensation)
	Ambient humidity range		Operating and storage: 35% to 85% (with no condensation)	
Environmental immunity	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	
Dimensions			95 × 85 × 33 mm	
Materials			Case: ABS	
Weight			Approx. 270 g (without Battery and hand strap)	
Accessories			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. No guarantee is implied. The life of the backlight is greatly affected by the ambient temperature and humidity. It 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	1800 mAh
Rated voltage	3.7 V
Dimensions	35.3 × 53.1 × 11.4 mm
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-MD31). AC adapter (FQ-AC□) is required.
Charging time*1	2.0 h
Battery backup life*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.

Sysmac Studio

Item	Requirement
Operating system (OS)*1, *2 Japanese or English system	Windows XP (Service Pack 3 or higher, 32-bit version) /Vista (32-bit version) / 7 (32-bit/64-bit version)
CPU	Windows computers with Celeron 540 (1.8 GHz) or faster CPU. Core i5 M520 (2.4 GHz) or equivalent or faster recommended
Main memory	2GB min.
Hard disk	At least 1.6 GB of available space*3
Display	XGA 1024 × 768, 1600 million colors. WXGA 1280 × 800 min. recommended
Disk drive	DVD-ROM drive
Communications ports	USB port corresponded to USB 2.0, or Ethernet port

*1 Sysmac Studio Operating System Precaution:
System requirements and hard disk space may vary with the system environment.
*2 The following restrictions apply when Sysmac Studio is used with Microsoft Windows Vista or Windows 7.
Some Help files cannot be accessed.
The Help files can be accessed if the Help program distributed by Microsoft for Windows (WinHlp32.exe) is installed. Refer to the Microsoft homepage listed below or contact Microsoft for details on installing the file. (The download page is automatically displayed if the Help files are opened while the user is connected to the Internet.)
http://support.microsoft.com/kb/917607/en-us
*3 To use the file logging function, additional memory area to save the logging data is necessary.

FQ-M Series EtherCAT Communications Specifications

Item	Specifications
Communications standard	IEC 61158 Type12
Physical layer	100BASE-TX (IEEE802.3)
Connector	M12 × 2 E-CAT IN: EtherCAT (IN) E-CAT OUT: EtherCAT (OUT)
Communications media	Use the cables for FQ-MWN□□, or FQ-WN□□ series.
Communications distance	Use the communication cable within the length of FQ-MWN□□ or FQ-WN□□ series cables.
Process data	Variable PDO Mapping
Mailbox (CoE)	Emergency messages, SDO requests, SDO responses, and SDO information
Distributed clock	Synchronization with DC mode 1
LED display	L/A IN (Link/Activity IN) × 1, L/A OUT (Link/Activity OUT) × 1, RUN × 1, ERR × 1

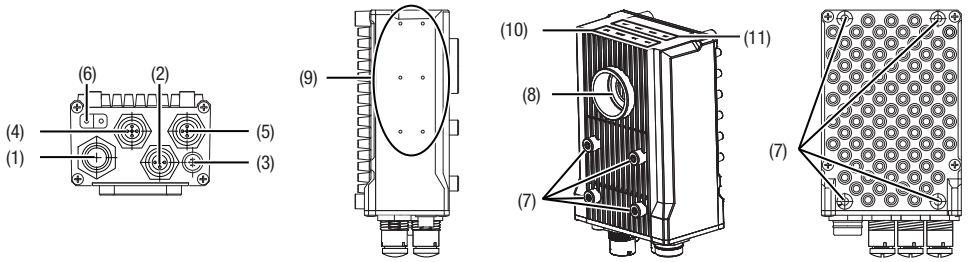
Version Information

FQ-M Series and Programming Devices

FQ-M Series	Required Programming Device	
	Sysmac Studio Standard Edition/Vision Edition	
	Ver.1.00	Ver.1.01 or higher
FQ-MS□□□(-M) FQ-MS□□□(-M)-ECT	Not supported	Supported

Components and Functions

Sensor

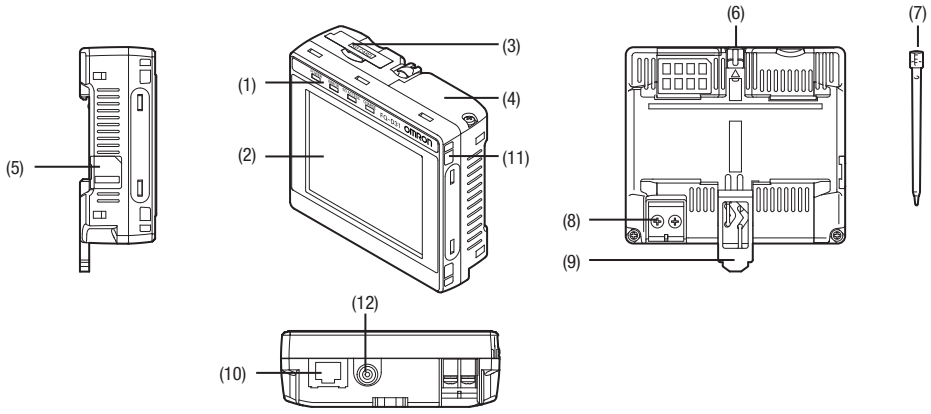


No.	Name	Description
(1)	I/O Cable connector	An I/O Cable is used to connect the Sensor to the power supply and external I/O.
(2)	Ethernet connector	An Ethernet cable is used to connect the Sensor to external devices such as PLCs, the Touch Finder, or computers.
(3)	Lighting connector	Connect an external lighting (strobe controller).
(4)	EtherCAT connector (IN)*1	Connect an EtherCAT compatible device.
(5)	EtherCAT connector (OUT)*1	Connect an EtherCAT compatible device.
(6)	Node address switch*1	Set the node address for EtherCAT communications.
(7)	Installation holes	Holes to install and secure the camera.
(8)	C-mount lens connection part	Install the C-mount lens in this part. Determine the field of view depending on the measurement target and select a suitable CCTV lens (C-mounting lens).

No.	Name		Description
(9)	Strobe controller connection holes		Install the strobe controller in this part. FL-TCC1 can be mounted.
(10)	Measurement process Operation indicators	OR	Lit in orange while OR signal is ON.
		ETN	Lit in orange while in Ethernet communications.
		ERROR	Lit in red when an error occurs.
		BUSY	Lit in green while the sensor is processing.
(11)	EtherCAT Operation indicators	L/A IN	Lit in green when Link with EtherCAT device is established and flickers in green when communicating (data IN).
		L/A OUT	Lit in green when Link with EtherCAT device is established and flickers in green when communicating (data OUT).
		ECAT RUN	Lit in green when EtherCAT communication is available.
		ECAT ERROR	Lit in red when an EtherCAT communications error occurs.

*1 FQ-MS□□□-ECT and FQ-MS□□□-M-ECT only.

Touch Finder



No.	Name		Description
(1)	Operation indicators	POWER	Lights green when the Touch Finder is turned ON.
		ERROR	Lights red when an error occurs.
		SD ACCESS	Lights yellow when an SD card is inserted. Flashes yellow when the SD card is being accessed.
		CHARGE*1	Lights orange when the Battery is charging.
(2)	LCD/touch panel		Displays the setting menu, measurement results, and images input by the camera.
(3)	SD card slot		An SD card can be inserted.
(4)	Battery cover*		The Battery is inserted behind this cover. Remove the cover when mounting or removing the Battery.
(5)	Power supply switch		The Battery is inserted behind this cover. Remove the cover when mounting or removing the Battery.

*1 Applicable to the FQ-MD31 only.

No.	Name	Description
(6)	Touch pen holder	The touch pen can be stored here when it is not being used.
(7)	Touch pen	Used to operate the touch panel.
(8)	DC power supply connector	Used to connect a DC power supply.
(9)	Slider	Used to mount the Touch Finder to a DIN Track.
(10)	Ethernet port	Used when connecting the Touch Finder to the Sensor with an Ethernet cable. Insert the connector until it locks in place.
(11)	Strap holder	This is a holder for attaching the strap.
(12)	AC power supply connector*1	Used to connect the AC adapter.

*1 Applicable to the FQ-MD31 only.

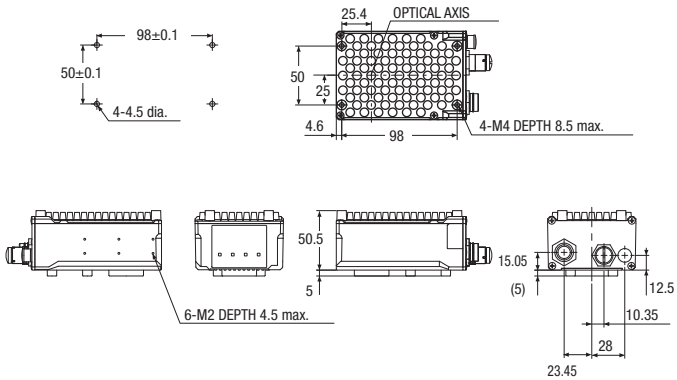
Dimensions

(Unit: mm)

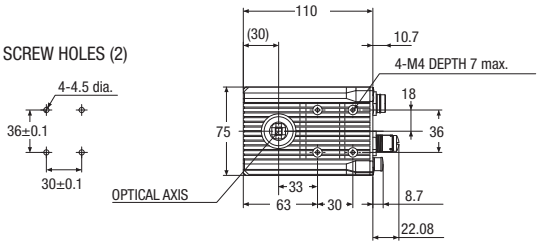
Sensor

FQ-MS120/MS120-M
FQ-MS125/MS125-M

MOUNTING SCREW HOLES (1)

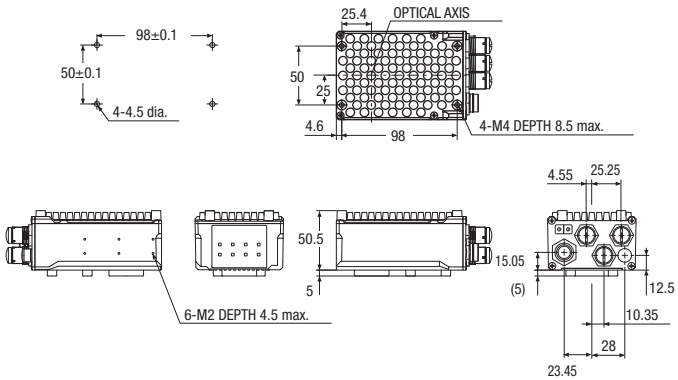


MOUNTING SCREW HOLES (2)

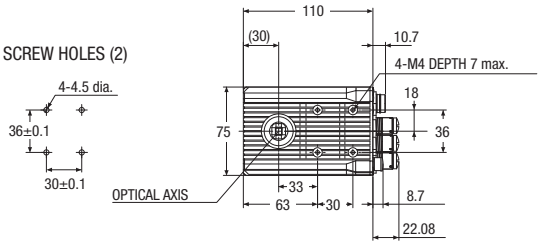


FQ-MS120-ECT/MS120-M-ECT
FQ-MS125-ECT/MS125-M-ECT

MOUNTING SCREW HOLES (1)

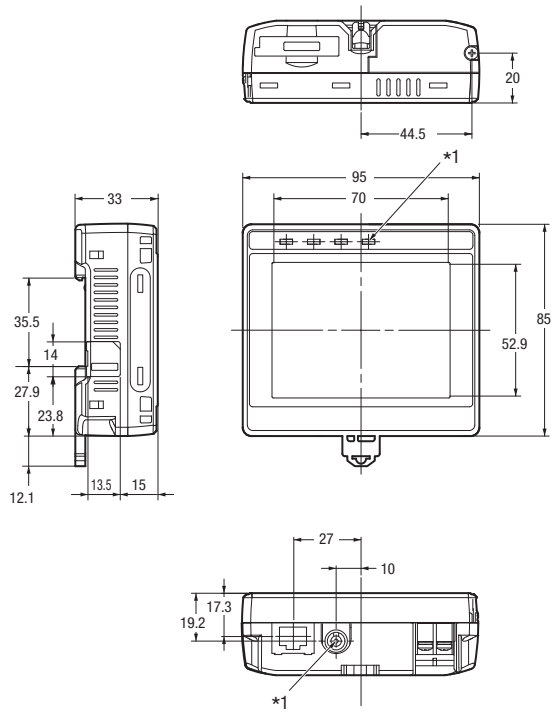


MOUNTING SCREW HOLES (2)

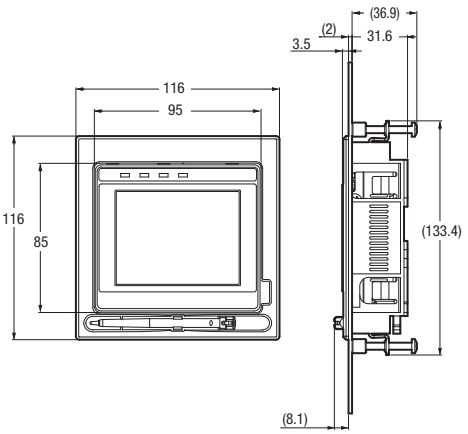


Touch Finder

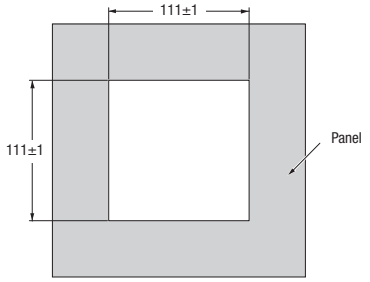
FQ-MD30/MD31



Panel Mounting Adapter*2



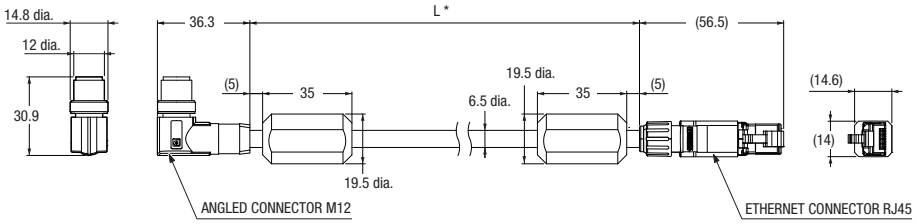
Panel Cutout Dimensions



*1 Provided with FQ-MD31 only.
*2 The dimension of the panel mounting adapter does not include that of a FQ-MD□□.

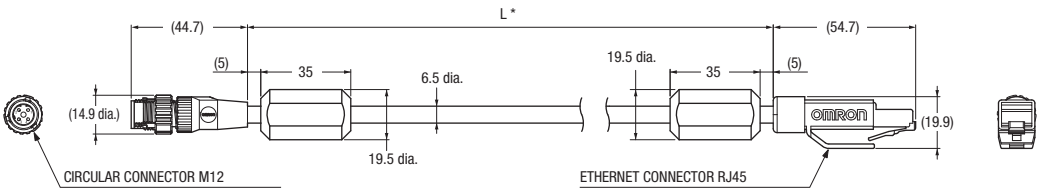
Cables

● **For EtherCAT and Ethernet cable**
Angle:M12/ Straight:RJ45
FQ-MWNL005/010



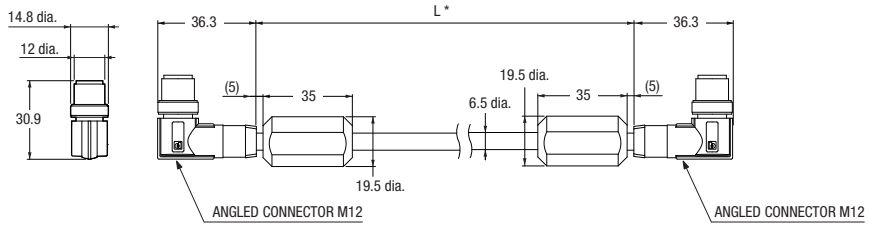
* Cable is available in 5 m/10 m.

Straight type (M12/RJ45)
FQ-WN005/010-E



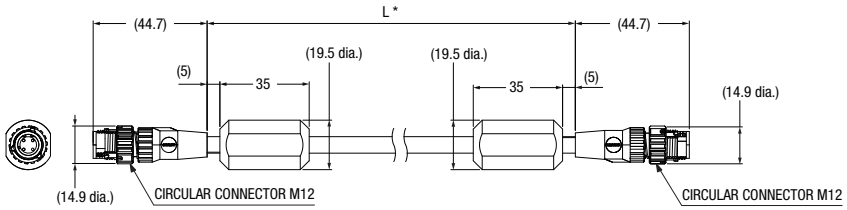
* Cable is available in 5 m/10 m.

● **For EtherCAT cable**
Angle type (M12/M12)
FQ-MWNEL005/010



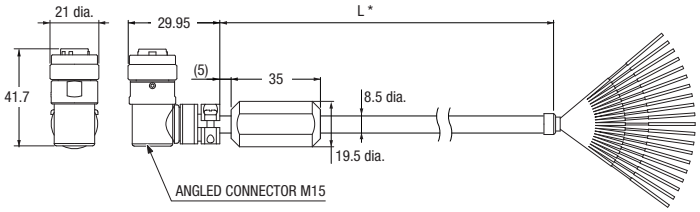
* Cable is available in 5 m/10 m.

Straight type (M12/M12)
FQ-MWNE005/010



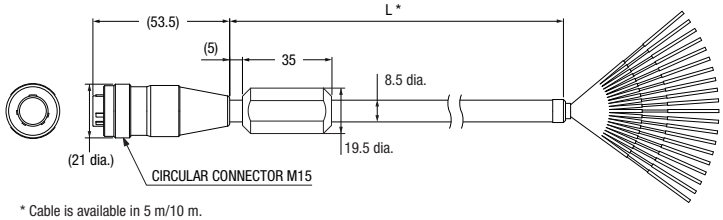
* Cable is available in 5 m/10 m.

● **I/O Cables**
Angle type
FQ-MWDL005/010



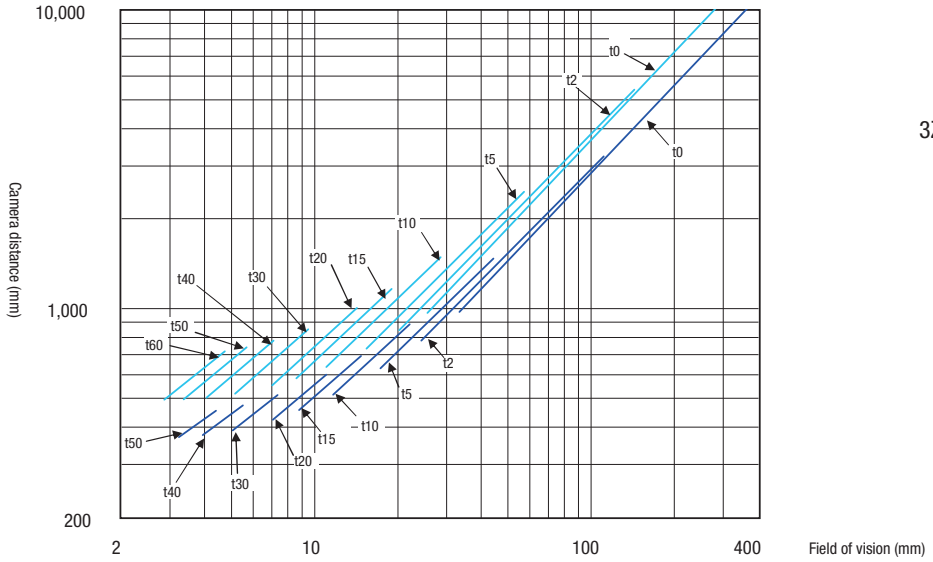
* Cable is available in 5 m/10 m.

Straight type
FQ-MWD005/010



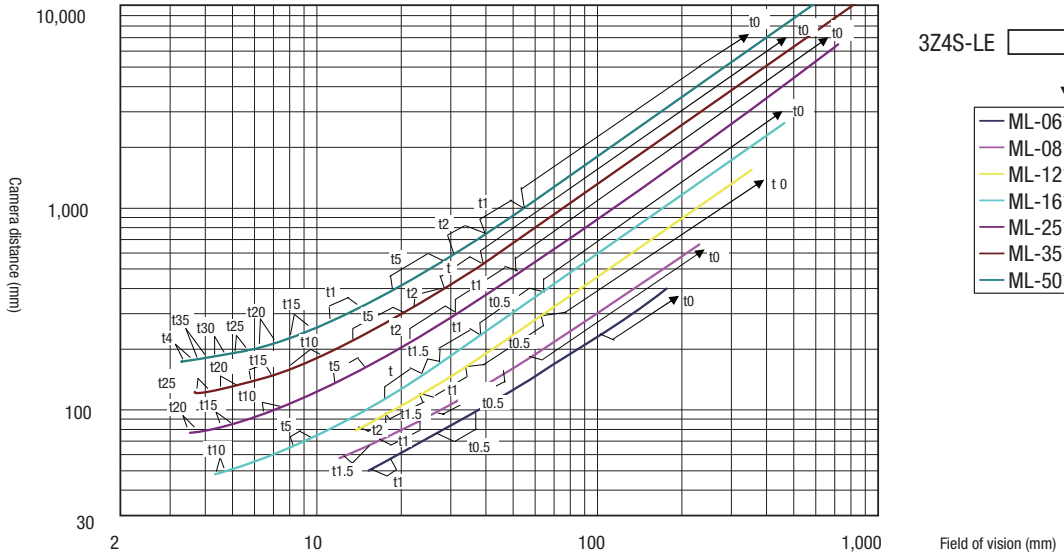
* Cable is available in 5 m/10 m.

Optical Chart



3Z4S-LE

- ML-7527
- ML-10035

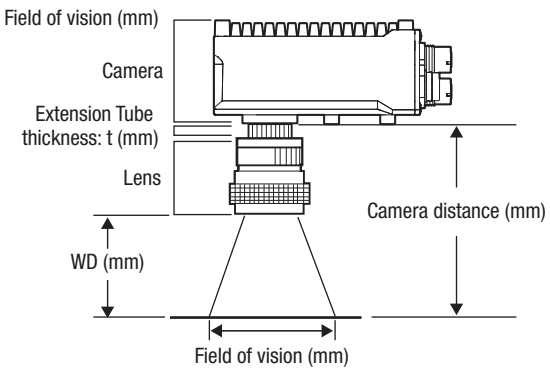


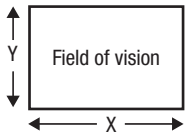
3Z4S-LE

- ML-0614
- ML-0813
- ML-1214
- ML-1614
- ML-2514
- ML-3519
- ML-5018

Meaning of Optical Chart

The X axis of the optical chart shows the field of vision (mm) *1, and the Y axis of the optical chart shows the camera installation distance (mm).*2





*1. The lengths of the fields of vision given in the optical charts are the lengths of the Y axis.
*2. The vertical axis represents WD for small cameras.

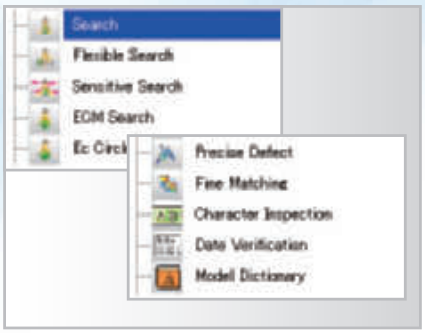
Related Manuals

Cat. No.	Model number	Manual
Z314	FQ-MS□□□(-M) FQ-MS□□□(-M)-ECT	Specialized Vision Sensor for Positioning FQ-M-Series User's Manual
W504	SYSMAC-□□□□□□	Sysmac Studio OPERATION MANUAL

XPETICA LITE VISION SYSTEM

Simple, flexible & crystal clear

The new Xpectia lite integrates the benefits of a msmart camera and a powerful vision system in a single platform. The unique image clarity achieved by using an intelligent camera enables simple setup, fast installation and enhanced optical performance. In combination with the powerful Xpectia lite controller it takes you into a new dimension of image processing. Highest performance, simplicity and unique flexibility are defining a new standard for compact vision sensors.



Flexible Flow Configuration

Xpectia lite supports the smart camera technology from the FQ-series sensors. This allows fast and easy installation of the camera on the machine, without further optics and illumination. Crystal clear images can be easily captured using high-power lighting and a polarizing filter that eliminates glare.

Simple Operation

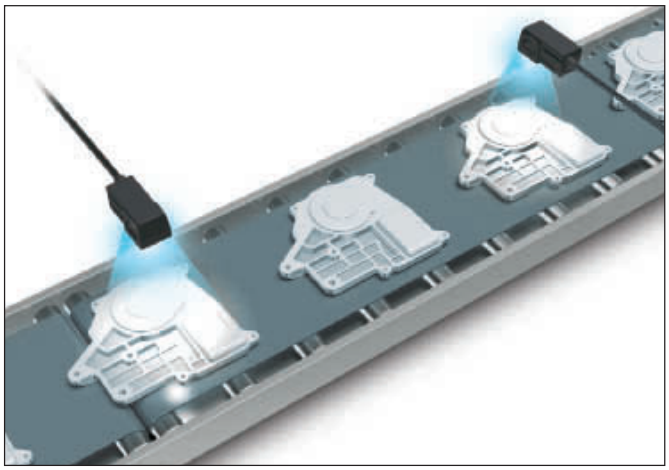
More than 20 processing items are provided by Xpectia lite, such as dimension measurements, various search items (pattern, contour), defects, edge and count tools. These processing items, can be combined in a flow program, offering branches or loops. This offers a new dimension of flexibility for compact vision sensors.

Open Network

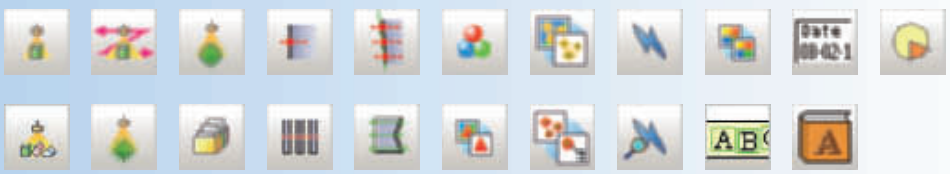
EtherNet/IP, a global standard for factory automation data networking, is supported for seamless integration into a production line or machine. This allows users to easily connect to any EtherNet/IP enabled devices from any manufacturer. Further communication is possible via TCP/IP, serial and parallel interfaces.

YOUR BENEFITS

- Crystal-clear image quality
- Real colour processing (16 million colours)
- C-mount and smart cameras
- EtherNet/IP & TCP/IP communication
- Simple and guided set-up
- Reliable results on any surface
- One platform for any application



21 Inspection and Measurement Items



XPECTIA FH VISION SYSTEM

FASTEST* EVER INDUSTRIAL COMPACT VISION SYSTEM

Designed for use in all types of object inspection, position/orientation and measurement operations, this compact camera and controller system is easily integrated into almost any machine or robot. The system is uniquely capable of providing faster, more precise work throughput – to give you more efficiency, less cost, and more competitive advantage.

A key feature of the system is its advanced new vision algorithm: Shape Search III. This advanced, intuitive program gives you higher-speed and greater precision measurement even with difficult imaging conditions such as poor lighting, out-of-focus and rotated/randomly positioned/overlapping target objects.

Specifically intended for seamless integration with PLCs, motion controllers, and robotics the FH Vision System meets the diverse needs of builders of high-speed manufacturing machinery. The system also offers the flexibility of a PC-based vision system for easy customization and HMI integration.

* Based on Omron investigation in May 2013.

FH Series

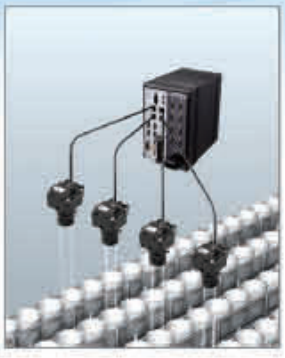
Shorter machine cycle times

Faster machine speed

High-speed image processing
A high-speed image bus and 4-core processing increases speed at every step, from image input to data output.

Multiple camera inspections
Calculations are quick and easy for four parallel tasks to provide total judgement results.

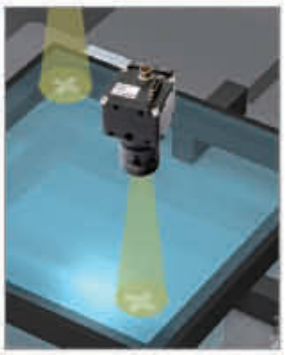
Fast output to PLC
You can output results to an NJ Series machine automation controller on an EtherCAT communications cycle in just 500µs.



High-precision operation

Measure out-of-focus or rotated images
The new Shape Search III processing item provides superior stability.

Assured calibration accuracy
No worker dependent calibration, vision master calibration is provided.

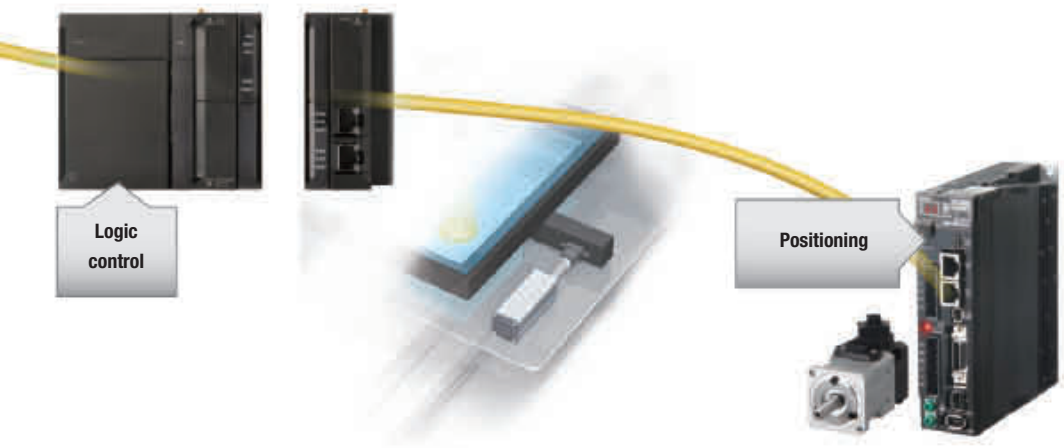


Easy to integrate

Shared machine interface
Supports Microsoft®.NET

Simplified interface
Customizable user interface means only your required menu commands appear on the operation interface.

Fast support for additional needs
For additional measurement needs, complete processing item libraries are provided.

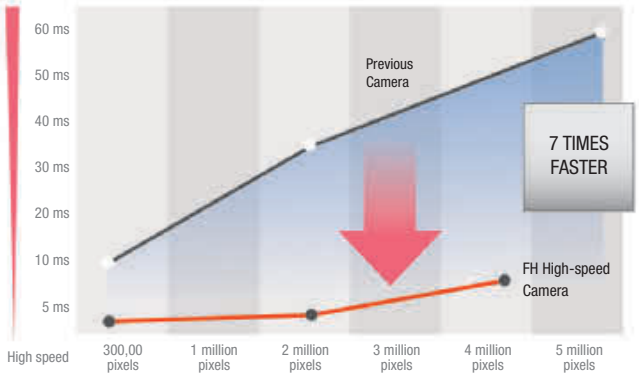


PROCESS HIGHER-RESOLUTION IMAGES WITHOUT INCREASING MACHINE CYCLE TIME

Fastest: 330 µs

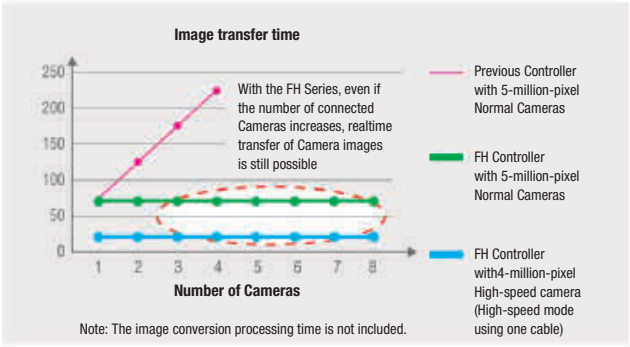
High-speed image input

Camera resolution continues to increase. That's why Omron has greatly reduced the input and transfer times of high-resolution images - to provide high-speed processing that matches the speed of your machine. Even with more cameras and higher resolution, high-speed image input will help increase throughput.



Real-time image transfer

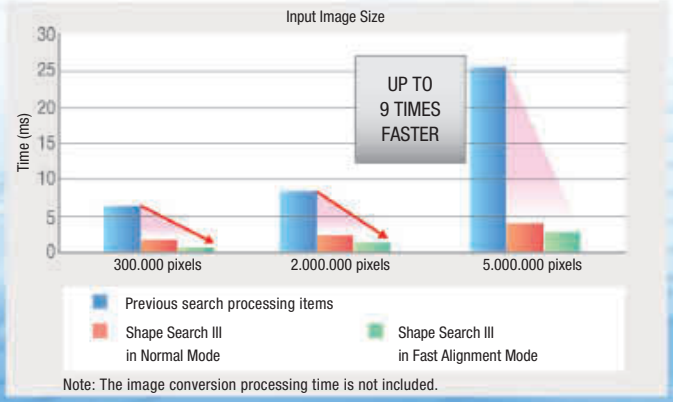
High-resolution cameras capture large amounts of data, which can cause transfer- and input-bottlenecks. That's why the FH Series Controller provides a faster, multi-line image bus to enable real-time transfer of large amounts of image data even for multiple cameras. Now you don't need to sacrifice precision to enable faster machine speed.



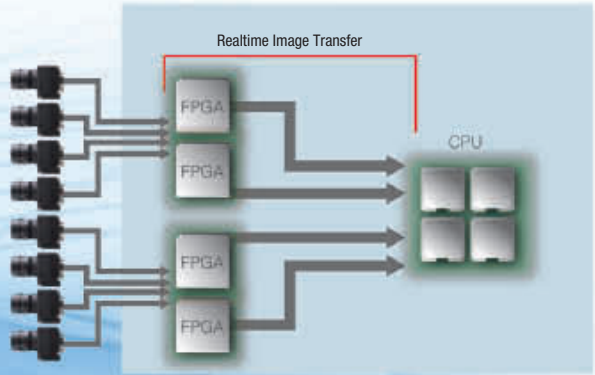
Shape Search III

Ultra-high-speed Searching

New technology makes search algorithms up to nine times faster than before. Even for unstable image conditions (including light interference, overlapping shapes, gloss, and incomplete images), stable searching is now possible without reducing speed.

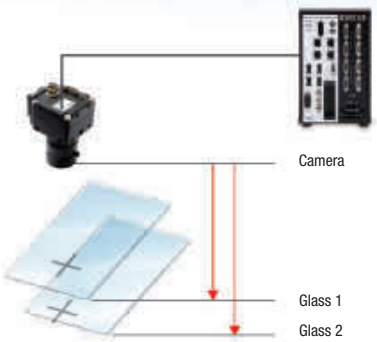


FH-Series



HIGH-PRECISION IMAGE PROCESSING REQUIRED FOR POSITIONING

Shape Search III

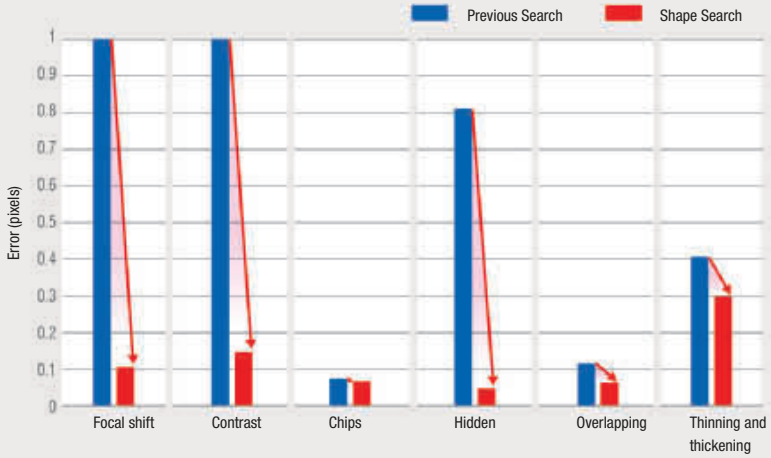


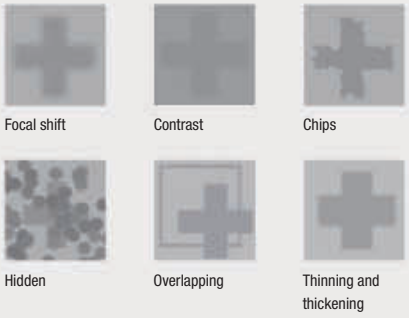
Low-error position detection even with blurry images

Over many years, Omron has perfected techniques to search for and match templates at high speed. This experience and expertise enables us to develop the Shape Search III vision algorithm, which provides advanced robustness and is critical on FA sites. When measuring lamination of glass or other processes where the distance to the workpiece from the camera varies, size differences and focal shifts can occur. Even in cases like this, the new Shape Search III algorithm detects positions with limited error.

Stable searching with limited error even under adverse conditions

Stable searching is possible even under the following adverse conditions, which occur far too often in actual measurement applications.

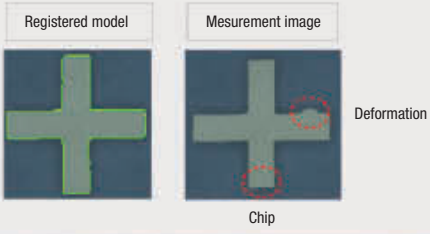




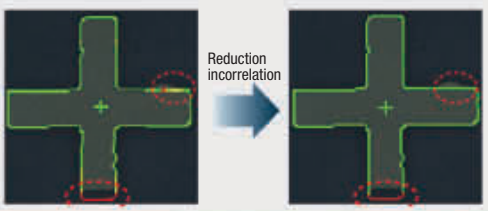
Visualization of comparisons enables easy setup of high-precision searching

Patent pending

Advanced searching is accompanied by many parameters that must be tuned to match the application. However, it is difficult for the person making the settings to see the internal process. Normally, a lot of time and effort is required to maximize tool performance. But with Shape Search III, you can visualize comparisons between the model data and a part of the measurement object to easily see when comparisons are not optimally matched. Visualization of the comparison level allows for parameters to be adjusted to quickly obtain the best performance.



You can see at a glance the difference between the registered model and measurement image

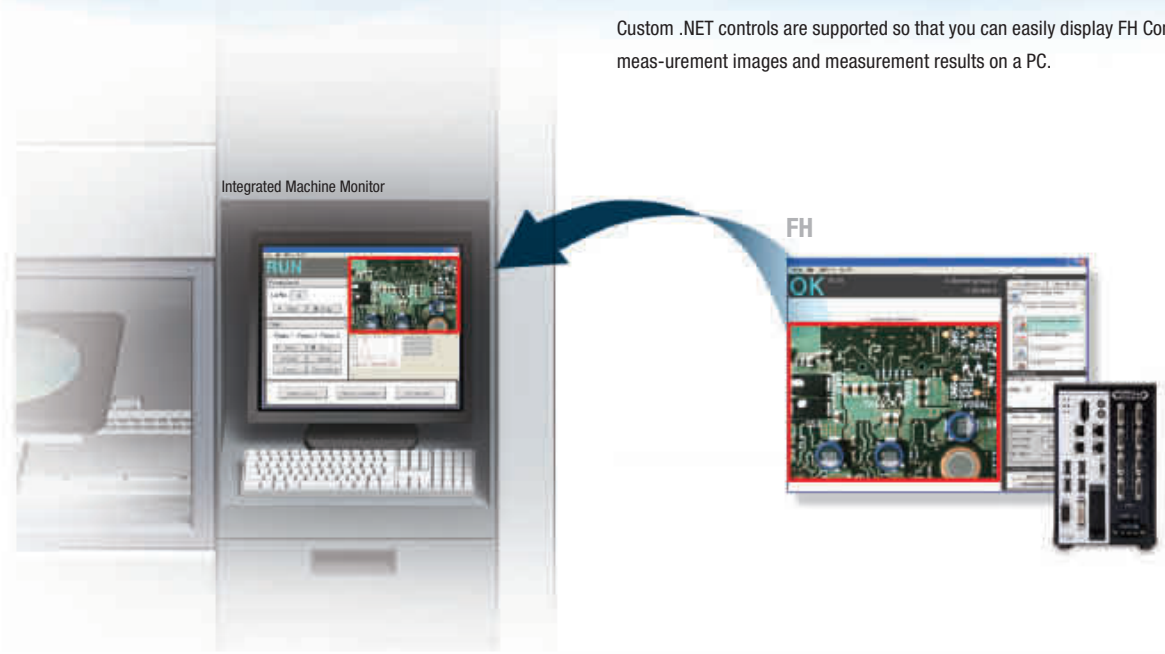


You can adjust a parameter called the Acceptable Distortion Level to enable measurements without reducing the correlation even if there is distortion. You can easily adjust this parameter while monitoring the comparison.

EASILY CONNECT THE COMPONENTS THAT CONFIGURE THE MACHINE

Easy integration into a machine monitor
Support for .NET user interface controls

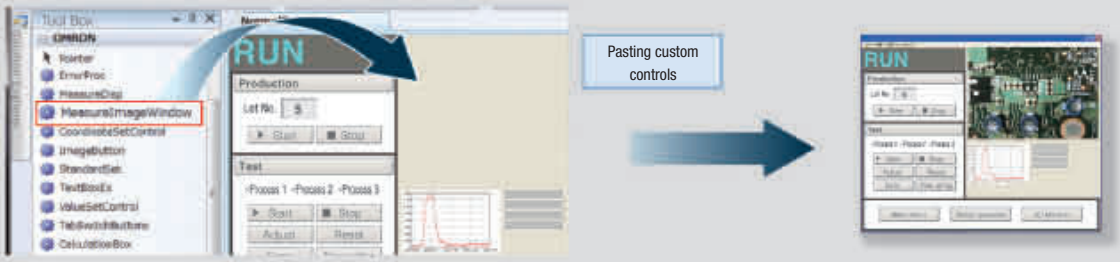
Custom .NET controls are supported so that you can easily display FH Controller meas-urement images and measurement results on a PC.



Easy customization

① Custom controls for FH measurement images and measurement results are laid out on Microsoft Visual Studio®.

② Instead of writing the program code from scratch to build interfaces, you can easily build the interfaces simply by pasting custom controls.



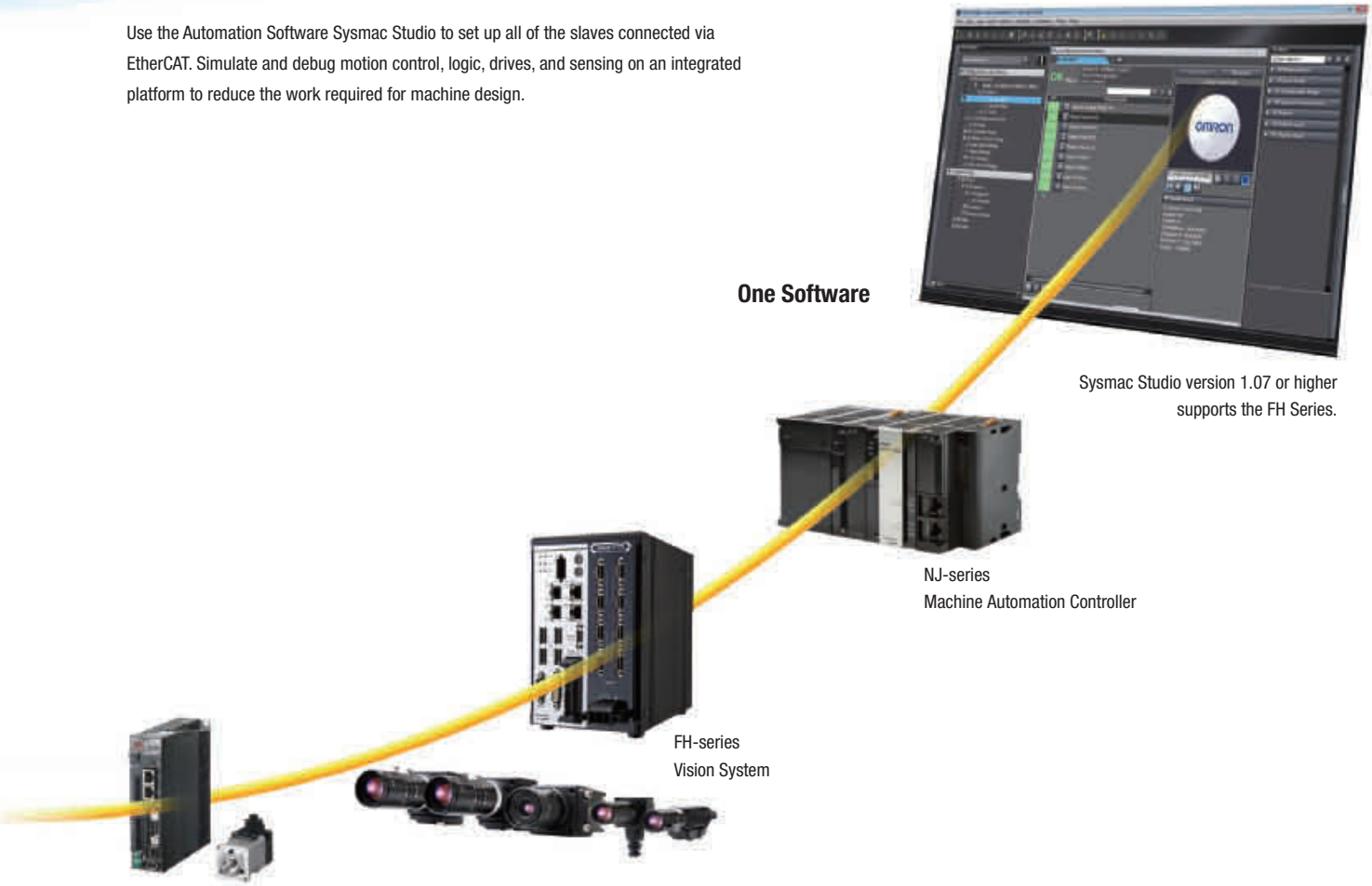
Output to HMI or high-resolution monitor

Microsoft® Visual Studio® is a registered trademark of Microsoft Corporation.

DESIGN COMPONENTS WITH ONE SOFTWARE

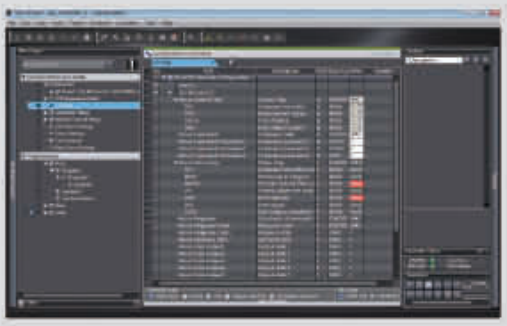
Develop machine control programs with one software: Sysmac Studio

Use the Automation Software Sysmac Studio to set up all of the slaves connected via EtherCAT. Simulate and debug motion control, logic, drives, and sensing on an integrated platform to reduce the work required for machine design.



Minimized commissioning and adjustment

Integrated simulations linked to an NJ Series Machine Automation Controller let you verify the NJ Series program logic. You can directly edit the EtherCAT I/O map to send measurement commands to FH Series Vision Sensors.



EASY SETUP WITH PROGRAM SCALABILITY

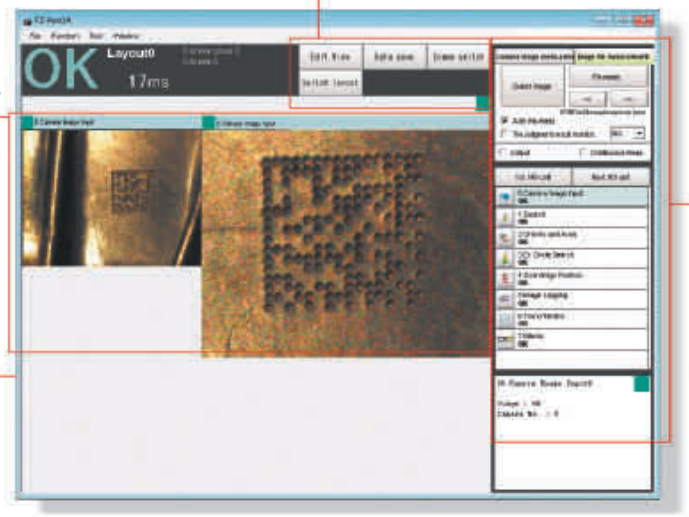
Customize original operation interfaces

Show only the buttons you need

Choose from our library of buttons and position them on screen to best support your daily operation, without “screen clutter”.

Arrange the interface elements flexibly

You can flexibly change the image display composition to display entire image, enlarge part of an image, or display images from different cameras.



Move windows freely

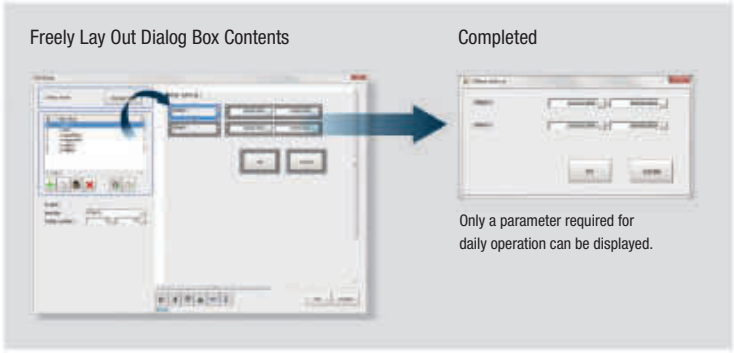
Drag and drop windows where you want. You can also change the box size and delete.

Eight screen layout

Up to 8 screens can be stored depending on the application or user classification.

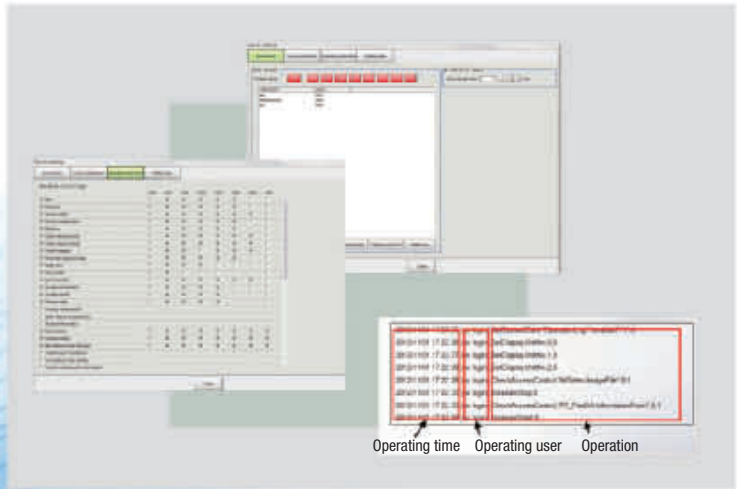
Hide unnecessary adjustment commands

With only menu operations on the controller, you can customize the setting displays in dialog boxes for processing items. For example, you can set up the interface to hide any parameters from the user.



Completely different operation interfaces for designer and operator

Accounts can be used to keep completely different operation interfaces for the designer and operator. You can set up to eight levels of security for up to 50 items for each account. You can record operation logs for each account to enable smoothly isolating problems when troubleshooting.



VISION SYSTEMS LINE UP

FZ5 Lite
controller

FZ5 standard
controller

FZ5 High-speed
controller

up to 4 cameras

FH standard
controller

FH Ultra-high-speed
controller

up to 8 cameras

EtherCAT SYSMAC **Encoder input**

Faster machine speed and high-precision operation

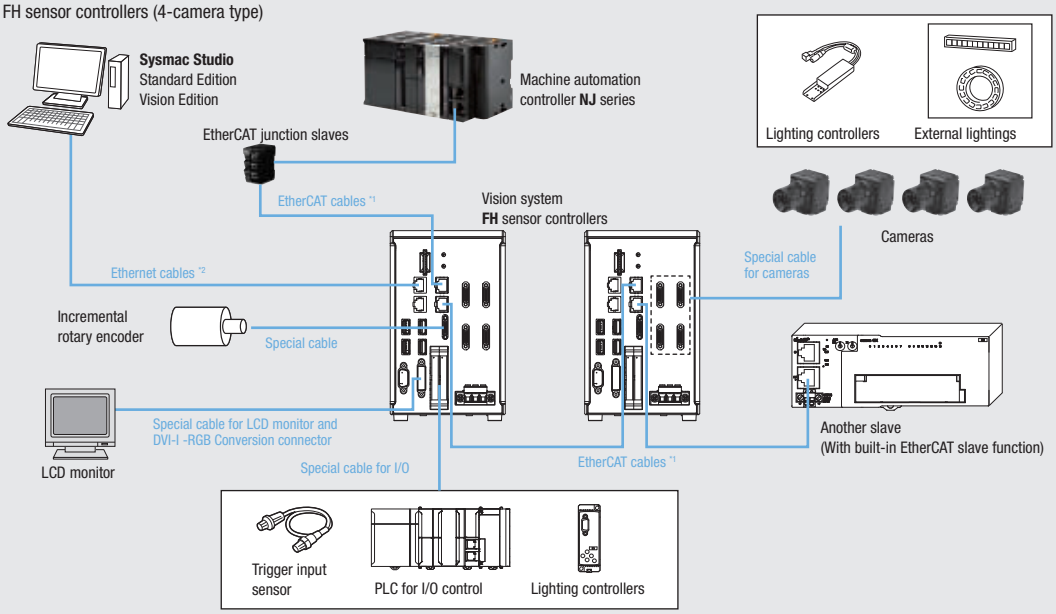
The new FH vision systems are specifically intended for seamless integration with PLCs, motion controllers and robotic control systems, and are ideally suited for applications in high-speed manufacturing machines of all types. FH vision systems featuring a new and exceptionally efficient vision algorithm, high-speed image bus, four-core processing and fast EtherCAT communications. A further benefit is that FH Vision Systems are fully compatible with the Sysmac Studio Automation software.

- Four-core image processing
- Fast EtherCAT communications
- Innovative Shape Search III
- Up to 8 high resolution cameras
- Supports Microsoft® .NET
- Compatible with Sysmac Studio Automation software

System configuration

EtherCAT connections for FH series

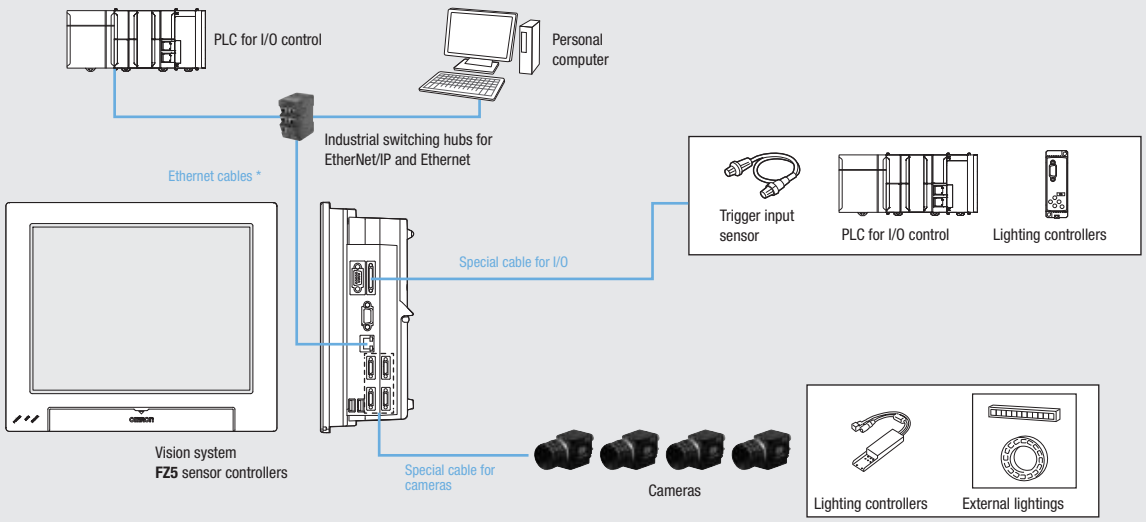
Example of the FH sensor controllers (4-camera type)



*1. To use STP (shielded twisted-pair) cable of category 5 or higher with double shielding (braiding and aluminum foil tape) for EtherCAT and RJ45 connector.
*2. To use STP (shielded twisted-pair) cable of category 5 or higher for Ethernet and RJ45 connector.

EtherNet/IP, No-protocol Ethernet and PLC Link connections for FZ5 series

Example of the FZ5 sensor controllers (4-camera type)



* To use Straight or cross STP (shielded twisted-pair) cable of category 5 or higher for Ethernet and RJ45 connector.

Ordering information

FH series sensor controllers

Item		CPU	No. of cameras	Output	Order code
	Box-type controllers	High-speed controllers (4 core)	2	NPN/PNP	FH-3050
			4	NPN/PNP	FH-3050-10
			8	NPN/PNP	FH-3050-20
		Standard controllers (2 core)	2	NPN/PNP	FH-1050
			4	NPN/PNP	FH-1050-10
			8	NPN/PNP	FH-1050-20

FZ5 series sensor controllers

Item		CPU	No. of cameras	Output	Order code
	Controllers integrated with LCD	High-speed controllers	2	NPN	FZ5-1100
				PNP	FZ5-1105
			4	NPN	FZ5-1100-10
				PNP	FZ5-1105-10
		Standard controllers	2	NPN	FZ5-600
				PNP	FZ5-605
			4	NPN	FZ5-600-10
				PNP	FZ5-605-10
	Box-type controllers	Lite controllers	2	NPN	FZ5-L350
				PNP	FZ5-L355
			4	NPN	FZ5-L350-10
				PNP	FZ5-L355-10

Cameras

Item		Descriptions	Colour/ Monochrome	Image read time	Order code
	High-speed CMOS cameras (Lens required) For **FH series only**	4 million pixels	Colour	8.5 ms	FH-SC04
			Monochrome		FH-SM04
		2 million pixels	Colour	4.6 ms	FH-SC02
			Monochrome		FH-SM02
		300,000 pixels	Colour	3.3 ms	FH-SC
			Monochrome		FH-SM
	Digital CCD cameras (Lens required)	5 million pixels (When connecting FZ5-6□ or FZ5-L35□, up to two cameras can be connected.)	Colour	62.5 ms	FZ-SC5M2
			Monochrome		FZ-S5M2
		2 million pixels	Colour	33.3 ms	FZ-SC2M
			Monochrome		FZ-S2M
		300,000 pixels	Colour	12.5 ms	FZ-SC
			Monochrome		FZ-S
	High-speed CCD cameras (Lens required)	300,000 pixels	Colour	4.9 ms	FZ-SHC
			Monochrome		FZ-SH
	Small digital CCD cameras (Lenses for small camera required)	300,000-pixel flat type	Colour	12.5 ms	FZ-SFC
			Monochrome		FZ-SF
		300,000-pixel pen type	Colour	12.5 ms	FZ-SPC
			Monochrome		FZ-SP
	Intelligent Compact CMOS cameras (Camera + Manual focus lens + High power lighting)	Narrow view	Colour	16.7 ms	FZ-SQ010F
		Standard view	Colour		FZ-SQ050F
		Wide view (long-distance)	Colour		FZ-SQ100F
		Wide view (short-distance)	Colour		FZ-SQ100N
	Intelligent CCD cameras (Camera + Zoom, Autofocus lens + Intelligent lighting)	Wide view	Colour	12.5 ms	FZ-SLC100
		Narrow view	Colour		FZ-SLC15
	Autofocus CCD Cameras (Camera + Zoom, Autofocus lens)	Wide view	Colour	12.5 ms	FZ-SZC100
		Narrow view	Colour		FZ-SZC15

Lenses

C-mount Lens for 1/3-inch image sensor (Recommend: FZ-S□/FZ-SH□/FH-S□)

Model	3Z4S-LE SV-0614V	3Z4S-LE SV-0813V	3Z4S-LE SV-1214V	3Z4S-LE SV-1614V	3Z4S-LE SV-2514V	3Z4S-LE SV-3518V	3Z4S-LE SV-5018V	3Z4S-LE SV-7527V	3Z4S-LE SV-10035V
Appearance/ Dimensions (mm)									
Focal length	6 mm	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm	75 mm	100 mm
Brightness	F1.4	F1.3	F1.4	F1.4	F1.4	F1.8	F1.8	F2.7	F3.5
Filter size	M27.0 P0.5	M25.5 P0.5	M27.0 P0.5	M27.0 P0.5	M27.0 P0.5	M27.0 P0.5	M30.5 P0.5	M30.5 P0.5	M30.5 P0.5
Maximum sensor size	1/3 inch	1/3 inch	1/3 inch	1/3 inch	1/3 inch	1/3 inch	1/3 inch	1/3 inch	1/3 inch
Mount	C-mount								

C-mount Lens for 2/3-inch image sensor (Recommend: FZ-S□2M/FZ-S□5M2/FH-S□02)
(3Z4S-LE SV-7525H and 3Z4S-LE SV-10028H can also be used for FH-S□04)

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)									
Focal length	6 mm	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm	75 mm	100 mm
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	M27.0 P0.5	M27.0 P0.5	M27.0 P0.5	M35.5 P0.5	M40.5 P0.5	M34.0 P0.5	M37.5 P0.5
Maximum sensor size	2/3 inch	2/3 inch	2/3 inch	2/3 inch	2/3 inch	2/3 inch	2/3 inch	1 inch	1 inch
Mount	C-mount								

Cameras peripheral devices

Item	Descriptions			Order code
–	External lighting		–	FL Series
	Lighting controller (Required to control external lighting from a controller)	For FL-series	Lighting controller	FL-TCC1
	Intelligent camera diffusion plate		Wide field of vision	FZ-SLC100-DL
			Narrow field of vision	FZ-SLC15-DL
	For intelligent compact camera		Mounting bracket	FQ-XL
			Mounting brackets	FQ-XL2
			Polarizing filter attachment	FQ-XF1
–	Mounting bracket for FZ-S_			FZ-S-XLC
	Mounting bracket for FZ-S_2M			FZ-S2M-XLC
	Mounting bracket for FZ-S5M_2			FZ-S5M-XLC
	Mounting bracket for FZ-SH_			FZ-SH-XLC

Cables

Item	Descriptions	Order code
	Camera cable Cable length: 2 m, 5 m, or 10 m *1	FZ-VS
	Bend resistant camera cable Cable length: 2 m, 5 m, or 10 m *1	FZ-VSB
	Right-angle camera cable *2 Cable length: 2 m, 5 m, or 10 m *1	FZ-VSL
	Long-distance camera cable Cable length: 15 m *1	FZ-VS2
	Long-distance right-angle camera cable Cable length: 15 m *1	FZ-VSL2
	Cable extension unit Up to two extension units and three cables can be connected. (Maximum cable length: 45 m *1)	FZ-VSJ
	Monitor cable Cable length: 2 m or 5 m (When you connect a LCD monitor FZ-M08 to FH sensor controller, please use it in combination with a DVI-I-RGB conversion connector FH-VMRGB.)	FZ-VM
	DVI-I -RGB conversion connector For **FH series only**	FH-VMRGB
	Parallel I/O cable Cable length: 2 m or 5 m, For **FZ series only**	FZ-VP
	Parallel I/O cable for connector-terminal conversion unit Cable length: 2 m or 5 m, For **FZ series only** Connector-terminal block conversion units can be connected (Terminal blocks recommended products: OMRON XW2R-J50G-T, XW2R-E50G-T, XW2R-P50G-T)	FZ-VPX
	Parallel I/O cable *3 Cable length: 2 m or 5 m, For **FH series only**	XW2Z-S013-2/-S013-5
	Encoder cable for line-driver Cable length: 1.5 m, For **FH series only**	FH-VR

*1 The maximum cable length depends on the camera being connected, and the model and length of the cable being used. For further information please refer to the "Cameras/Cables" table. When a high-speed CMOS camera FH-S_02/-S_04 is used in the high speed mode of transmission speed, two camera cables are required.
*2 This cable has an L-shaped connector on the camera end.
*3 2 Cables are required for all I/O signals.

Recommended EtherCAT and EtherNet/IP communications cables

Use Straight STP (shielded twisted-pair) cable of category 5 or higher with double shielding (braiding and aluminum foil tape) for EtherCAT.
Use Straight or cross STP (shielded twisted-pair) cable of category 5 or higher for EtherNet/IP.

Item	Descriptions				Order code
	For EtherCAT *1	Standard type cable with connectors on both ends (RJ45/RJ45) Wire gauge and number of pairs: AWG27, 4-pair cable, cable sheath material: LSZH *2, Cable colour: Blue, Yellow, or Green, Cables length: 0.2 m, 0.3 m, 0.5 m, 1 m, 1.5 m, 2 m, 3 m, 5 m, 7.5 m, 10 m, 15 m, 20 m			XS6W-6LSZH8SS□CM-Y *3
		Rugged type cable with connectors on both ends (RJ45/RJ45) Wire gauge and number of pairs: AWG22, 2-pair cable Cables length: 0.3 m, 0.5 m, 1 m, 2 m, 3 m, 5 m, 10 m, 15 m			XS5W-T421-□MD-K *3
		Rugged type cable with connectors on both ends (M12/RJ45) Wire gauge and number of Pairs: AWG22, 2-pair cable Cables length: 0.3 m, 0.5 m, 1 m, 2 m, 3 m, 5 m, 10 m, 15 m			XS5W-T421-□MC-K *3
		Rugged type cable with connectors on both ends (M12 L/RJ45) Wire gauge and number of pairs: AWG22, 2-pair cable Cables length: 0.3 m, 0.5 m, 1 m, 2 m, 3 m, 5 m, 10 m, 15 m			XS5W-T422-□MC-K *3
–	For EtherCAT *1 and EtherNet/IP	Wire gauge and number of pairs: AWG24, 4-pair cable	Cables	Hitachi Cable, Ltd.	NETSTAR-C5E SAB 0.5 × 4P *4
–				Kuramo Electric Co.	KETH-SB *4
–				SWCC Showa Cable Systems Co.	FAE-5004 *4
–			RJ45 connectors	Panduit Corporation	MPS588-C *4
–		Wire gauge and number of pairs: AWG22, 2-pair cable	Cables	Kuramo Electric Co.	KETH-PSB-OMR *5
–				Nihon Electric Wire&Cable Co.,Ltd.	PNET/B *5
			RJ45 assembly connector	OMRON	XS6G-T421-1 *5
–	For EtherNet/IP	Wire gauge and number of pairs: 0.5 mm, 4-pair cable	Cables	Fujikura Ltd.	F-LINK-E 0.5mm × 4P *6
–			RJ45 connectors	Panduit Corporation	MPS588 *6

*1 The FH series supports the EtherCAT communication. It cannot be used in FZ series.
*2 The lineup features Low Smoke Zero Halogen cables for in-cabinet use and PUR cables for out-of-cabinet use.
*3 For details, refer to Cat.No.G019.
*4 We recommend you to use above cable for EtherCAT and EtherNet/IP, and RJ45 connector together.
*5 We recommend you to use above cable for EtherCAT and EtherNet/IP, and RJ45 assembly connector together.
*6 We recommend you to use above cable For EtherNet/IP and RJ45 connectors together.

Note: Please be careful while cable processing, for EtherCAT, connectors on both ends should be shield connected and for EtherNet/IP, connectors on only one end should be shield connected.

Peripheral devices

Item	Descriptions				Order code
	LCD monitor For Box-type controllers				FZ-M08
	USB memory	2 GB			FZ-MEM2G
		8 GB			FZ-MEM8G
	SD card **For FH Controller only**	2 GB			HMC-SD291
		4 GB			HMC-SD491
	VESA attachment For installing the LCD integrated-type controller				FZ-VESA
	Desktop controller stand For installing the LCD integrated-type controller				FZ-DS
	Display/USB switcher				FZ-DU
–	Mouse recommended products Driverless wired mouse (A mouse that requires the mouse driver to be installed is not supported.)				–
	EtherCAT junction slaves **For FH series**	3 port	Power supply voltage: 20.4 to 28.8 VDC (24 VDC –15 to 20%)	Current consumption: 0.08 A	GX-JC03
		6 port		Current consumption: 0.17 A	GX-JC06
	Industrial Switching Hubs for EtherNet/IP and Ethernet	3 port	Failure detection: None	Current consumption: 0.22 A	W4S1-03B
		5 port	Failure detection: None		W4S1-05B
		5 port	Failure detection: Supported		W4S1-05C

Automation software Sysmac Studio

Please purchase a DVD and licenses the first time you purchase the Sysmac Studio. DVDs and licenses are available individually. The license does not include the DVD.

Product	Specifications			Order code
		Number of model standards licenses	Media	
Sysmac Studio Standard Edition Ver.1.□□	The Sysmac Studio provides an integrated development environment to set up, program, debug, and maintain NJ-series controllers and other Machine Automation controllers, as well as EtherCAT slaves. Sysmac Studio runs on the following OS. Windows XP (Service Pack 3 or higher, 32-bit version) / Vista (32-bit version) / 7 (32-bit/64-bit version)	– (Media only)	DVD *1	SYSMAC-SE200D
		1 license	–	SYSMAC-SE201L
		3 license	–	SYSMAC-SE203L
		10 license	–	SYSMAC-SE210L
		30 license	–	SYSMAC-SE230L
		50 license	–	SYSMAC-SE250L
Sysmac Studio Vision Edition Ver.1.□□ *2	Sysmac Studio Vision Edition is a limited license that provides selected functions required for FH-series/FQ-M-series vision sensor settings.	1 license	–	SYSMAC-VE001L

*1 The same media is used for both the Standard Edition and the Vision Edition.
*2 With the Vision Edition, you can use only the setup functions for FH-series/FQ-M-series vision sensors.

Note: **1.** Site licenses are available for users who will run Sysmac Studio on multiple computers. Ask your OMRON sales representative for details.
2. Sysmac Studio version 1.07 or higher supports the FH series. Sysmac Studio does not support the FZ5 series.

Development Environment

Please purchase a DVD and licenses the first time you purchase the Sysmac Studio. DVDs and licenses are available individually. The license does not include the DVD.

Product	Specifications			Order code
		Number of model standards licenses	Media	
Application Producer	Software components that provide a development environment to further customize the standard controller features of the FH series. System requirements: • CPU: Intel Pentium Processor (SSE2 or higher) • OS: Windows 7 Professional (32bit) or Enterprise (32bit) or Ultimate (32bit) • .NET Framework: .NET Framework 3.5 or higher • Memory: At least 2 GB RAM Available disk space: At least 2 GB • Browser: Microsoft® Internet Explorer 6.0 or later • Display: XGA (1024 × 768), True Colour (32-bit) or higher • Optical drive: CD/DVD drive The following software is required to customize the software: Microsoft® Visual Studio® 2010 Professional or Microsoft® Visual Studio® 2008 Professional	–(Media only)	CD	FH-AP1
		1 license	–	FH-AP1L

Ratings and Specifications

Controllers

FH sensor controllers

Type				High-speed controllers (4 core)			Standard controllers (2 core)		
Model			NPN	FH-3050	FH-3050-10	FH-3050-20	FH-1050	FH-1050-10	FH-1050-20
			PNP						
Main functions	Controller type			Box-type controllers					
	High-grade processing items			No					
	No. of cameras			2	4	8	2	4	8
	Connected camera			Can be connected to all cameras. (FZ-S series/FH-S series)					
	Processing resolution (FZ-S)	When connected to a intelligent compact camera		752 (H) × 480 (V)					
		When connected to a 300,000-pixel camera		640 (H) × 480 (V)					
		When connected to a 2 million-pixel camera		1600 (H) × 1200 (V)					
		When connected to a 5 million-pixel camera		2448 (H) × 2044 (V)					
	Processing resolution (FH-S)	When connected to a 300,000-pixel camera		640 (H) × 480 (V)					
		When connected to a 2 million-pixel camera		2040 (H) × 1088 (V)					
		When connected to a 4 million-pixel camera		2040 (H) × 2048 (V)					
	No. of scenes			128					
	Number of logged images *1	When connected to a intelligent compact camera		Connected to 1 camera (Colour): 232, Connected to 2 camera (Colour): 116 Connected to 3 camera (Colour): 77, Connected to 4 camera (Colour): 58 Connected to 5 camera (Colour): 46, Connected to 6 camera (Colour): 38 Connected to 7 camera (Colour): 33, Connected to 8 camera (Colour): 29					
		When connected to a 300,000-pixel camera (FZ-S/FH-S)		Connected to 1 camera (Colour): 270, Connected to 1 camera (Monochrome): 272 Connected to 2 camera (Colour): 135, Connected to 2 camera (Monochrome): 136 Connected to 3 camera (Colour/Monochrome): 90 Connected to 4 camera (Colour): 67, Connected to 4 camera (Monochrome): 68 Connected to 5 camera (Colour/Monochrome): 54 Connected to 6 camera (Colour/Monochrome): 45 Connected to 7 camera (Colour/Monochrome): 38 Connected to 8 camera (Colour): 33, Connected to 8 camera (Monochrome): 34					
		When connected to a 2 million-pixel camera (FH-S)		Connected to 1 camera (Colour/Monochrome): 37, Connected to 2 camera (Colour/Monochrome): 18 Connected to 3 camera (Colour/Monochrome): 12, Connected to 4 camera (Colour/Monochrome): 9 Connected to 5 camera (Colour/Monochrome): 7, Connected to 6 camera (Colour/Monochrome): 6 Connected to 7 camera (Colour/Monochrome): 5, Connected to 8 camera (Colour/Monochrome): 4					
		When connected to a 2 million-pixel camera (FZ-S)		Connected to 1 camera (Colour/Monochrome): 43, Connected to 2 camera (Colour/Monochrome): 21 Connected to 3 camera (Colour/Monochrome): 14, Connected to 4 camera (Colour/Monochrome): 10 Connected to 5 camera (Colour/Monochrome): 8, Connected to 6 camera (Colour/Monochrome): 7 Connected to 7 camera (Colour/Monochrome): 6, Connected to 8 camera (Colour/Monochrome): 5					
		When connected to a 4 million-pixel camera (FH-S)		Connected to 1 camera (Colour/Monochrome): 20, Connected to 2 camera (Colour/Monochrome): 10 Connected to 3 camera (Colour/Monochrome): 6, Connected to 4 camera (Colour/Monochrome): 5 Connected to 5 camera (Colour/Monochrome): 4, Connected to 6 camera (Colour/Monochrome): 3 Connected to 7 camera (Colour/Monochrome): 2, Connected to 8 camera (Colour/Monochrome): 2					
		When connected to a 5 million-pixel camera (FZ-S)		Connected to 1 camera (Colour/Monochrome): 16, Connected to 2 camera (Colour/Monochrome): 8 Connected to 3 camera (Colour/Monochrome): 5, Connected to 4 camera (Colour/Monochrome): 4 Connected to 5 camera (Colour/Monochrome): 3, Connected to 6 camera (Colour/Monochrome): 2 Connected to 7 camera (Colour/Monochrome): 2, Connected to 8 camera (Colour/Monochrome): 2					
	Operation			Mouse or similar device					
	Settings			Create series of processing steps by editing the flowchart (Help messages provided).					
External interface	Serial communications			RS-232C: 1 CH					
	EtherNet communications			No-protocol (TCP/UDP) 1000BASE-T					
				1 port	2 port	2 port	1 port	2port	2port
	EtherNet/IP communications			Ethernet port baud rate: 1 Gbps (1000 BASE-T)					
	EtherCAT communications			EtherCAT protocol (100BASE-TX)					
	Parallel I/O			(In the 2-line random trigger mode) 17 inputs (STEP0/ENCTRIG_Z0, STEP1/ENCTRIG_Z1, ENCTRIG_A0 to 1, ENCTRIG_B0 to 1, DSA0 to 1, DI0 to 7, DI_LINE0) 37 outputs (RUN0 to 1, READY0 to 1, BUSY0 to 1, OR0 to 1, ERROR0 to 1, GATE0 to 1, STGOUT0/SHTOUT0, STGOUT1/SHTOUT1, STGOUT2 to 7, DO0 to 15, ACK) (In the 5-line to 8-line random trigger mode) 19 inputs, STEP0 to 7, DI_LINE0 to 2, DI0 to 7) 34 outputs (READY0 to 7, BUSY0 to 7, OR0 to 7, ACK, ERROR, STGOUT/SHTOUT0 to 7)					
	Encoder interface			RS422-A line driver level. Phase A/B: single-phase 4MHz (multiplying phase difference of 1MHz by 4 times), Phase Z: 1MHz					
	Monitor interface			DVI-I output IF × 1ch					
	USB interface			4 channels (supports USB 1.1 and 2.0)					
	SD card interface			SDHC card of Class4 or higher rating is recommended.					
Ratings	Power supply voltage			20.4 to 26.4 VDC					
	Current consumption (at 24.0 VDC) *2	When connected to a intelligent compact camera, intelligent or autofocus camera	Connected to 2 cameras	5.0 A max.	5.4 A max.	6.4 A max.	4.7 A max.	5.0 A max.	5.9 A max.
			Connected to 4 cameras	–	7.0 A max.	8.1 A max.	–	6.5 A max.	7.5 A max.
			Connected to 8 cameras	–	–	11.5 A max.	–	–	10.9 A max.
		When connected to a 300,000-pixel camera, 2 million-pixel camera, 4 million-pixel camera or 5 million-pixel camera	Connected to 2 cameras	4.1 A max.	4.2 A max.	5.2 A max.	3.6 A max.	3.7 A max.	4.5 A max.
			Connected to 4 cameras	–	4.8 A max.	5.6 A max.	–	4.3 A max.	5.0 A max.
			Connected to 8 cameras	–	–	6.8 A max.	–	–	6.2 A max.
	Insulation resistance			Between DC power supply and controller FG: 20 MΩ or higher (rated voltage 250 V)					

Type				High-speed controllers (4 core)			Standard controllers (2 core)		
Model			NPN	FH-3050	FH-3050-10	FH-3050-20	FH-1050	FH-1050-10	FH-1050-20
			PNP						
Operation Environment	Noise Immunity	Fast transient burst	DC power supply	Direct infusion: 2 KV Pulse rising: 5 ns Pulse width: 50 ns Burst continuation time: 15 ms/0.75 ms Period: 300 ms Application time: 1 min					
			I/O line	Cramp: 1 KV Pulse rising: 5 ns Pulse width: 50 ns Burst continuation time: 15 ms/0.75 ms Period: 300 ms Application time: 1 min					
	Ambient temperature range			Operating: 0 to 50°C Storage: –20 to 65°C (with no icing or condensation)					
	Ambient humidity range			Operating and storage: 35% to 85% (with no condensation)					
	Ambient atmosphere			No corrosive gases					
	Grounding			Type D grounding (100Ω or less grounding resistance) Conventional type 3 grounding					
	Degree of protection			IEC60529 IP20					
Dimensions	Dimensions			190 × 115 × 182.5 mm					
	Weight			Approx. 3.2 kg	Approx. 3.4 kg	Approx. 3.4 kg	Approx. 3.2 kg	Approx. 3.4 kg	Approx. 3.4 kg
	Case materials			Cover: zinc-plated steel plate, side plate: aluminum (A6063)					
Accessories				Controller (1) / user manual (one Japanese and one English versions) / Instruction Installation Manual (1) / Power supply terminal block connector (1) / Ferrite core (2, FH-3050 and FH-1050), 4 (FH-3050-10 and FH-1050-10), and 8 (FH-3050-20 and FH-1050-20)					

*1 The image logging capacity changes when multiple cameras of different types are connected at the same time.
*2 The current consumption when the maximum number of cameras supported by each controller are connected. If a strobe controller model is connected to a lamp, the current consumption is as high as when an intelligent camera is connected.

FZ5 sensor controllers

Type			High-speed controllers		Standard controllers		Lite controllers	
Model		NPN	FZ5-1100	FZ5-1100-10	FZ5-600	FZ5-600-10	FZ5-L350	FZ5-L350-10
		PNP	FZ5-1105	FZ5-1105-10	FZ5-605	FZ5-605-10	FZ5-L355	FZ5-L355-10
Controller type			Controllers integrated with LCD				Box-type controllers	
High-grade processing items			No					
No. of cameras			2	4	2	4	2	4
Connected camera			Can be connected to FZ-S series. (Can not be connected to FH-S series.)		Can be connected to FZ-S series. (Can not be connected to FH-S series. When connecting 5 million-pixel cameras, up to two cameras can be connected.)			
Processing resolution	When connected to a intelligent compact camera		752 (H) × 480 (V)					
	When connected to a 300,000-pixel camera		640 (H) × 480 (V)					
	When connected to a 2 million-pixel camera		1600 (H) × 1200 (V)					
	When connected to a 5 million-pixel camera		2448 (H) × 2044 (V)					
No. of scenes			32					
Number of logged images *1	When connected to a intelligent compact camera	Connected to 1 camera	232		214			
		Connected to 2 cameras	116		107			
		Connected to 3 cameras	77		71			
		Connected to 4 cameras	58		53			
	When connected to a 300,000-pixel camera	Connected to 1 camera	Colour camera: 270, Monochrome Camera: 272		Colour camera: 250, Monochrome Camera: 252			
		Connected to 2 cameras	Colour camera: 135, Monochrome Camera: 136		Colour camera: 125, Monochrome Camera: 126			
		Connected to 3 cameras	Colour camera: 90, Monochrome Camera: 90		Colour camera: 83, Monochrome Camera: 84			
		Connected to 4 cameras	Colour camera: 67, Monochrome Camera: 68		Colour camera: 62, Monochrome Camera: 63			
	When connected to a 2 million-pixel camera	Connected to 1 camera	Colour camera: 43, Monochrome Camera: 43		Colour camera: 40, Monochrome Camera: 40			
		Connected to 2 cameras	Colour camera: 21, Monochrome Camera: 21		Colour camera: 20, Monochrome Camera: 20			
		Connected to 3 cameras	Colour camera: 14, Monochrome Camera: 14		Colour camera: 13, Monochrome Camera: 13			
		Connected to 4 cameras	Colour camera: 10, Monochrome Camera: 10		Colour camera: 10, Monochrome Camera: 10			
	When connected to a 5 million-pixel camera	Connected to 1 camera	Colour camera: 16, Monochrome Camera: 16		Colour camera: 11, Monochrome Camera: 11			
		Connected to 2 cameras	Colour camera: 8, Monochrome Camera: 8		Colour camera: 5, Monochrome Camera: 5			
		Connected to 3 cameras	Colour camera: 5, Monochrome Camera: 5		–			
		Connected to 4 cameras	Colour camera: 4, Monochrome Camera: 4		–			
Operation			Touch pen, mouse, etc.				Mouse or similar device	
Settings			Create series of processing steps by editing the flowchart (Help messages provided).					
Serial communications			RS-232C/422A: 1 CH				RS-232: 1CH	
EtherNet communications			Ethernet 100BASE-TX/10BASE-T				Ethernet 1000BASE-T/100BASE-TX/10BASE-T	
EtherNet/IP communications			Ethernet port baud rate: 100 Mbps (100Base-TX)					
Parallel I/O			(When used in Multi-line random-trigger mode) 17 inputs (RESET, STEP0/ ENCTRIG_Z0, STEP1/ENCTRIG_Z1, DSA0 to 1, ENCTRIG_A0 to 1, ENCTRIG_B0 to 1, DI0 to 7), 29 outputs (RUN/BUSY1, BUSY0, GATE0 to 1, OR0 to 1, READY0 to 1, ERROR, STGOUT0 to 3, DO0 to 15) (When used in other mode) 13 inputs (RESET, STEP0/ ENCTRIG_Z0, DSA0, ENCTRIG_A0, ENCTRIG_B0, DI0 to 7), 26 outputs (RUN, BUSY0, GATE0, OR0, READY0, ERROR, STGOUT0 to 3, DO0 to 15) STGOUT 2 to 3 only for camera 4 ch type		13 inputs (RESET, STEP0/ ENCTRIG_Z0, DSA0, ENCTRIG_A0, ENCTRIG_B0, DI0 to 7), 26 outputs (RUN, BUSY0, GATE0, OR0, READY0, ERROR, STGOUT0 to 3, DO0 to 15) STGOUT 2 to 3 only for camera 4 ch type		11 inputs (RESET, STEP, DSA, and DI 0 to 7), 26 outputs (RUN, BUSY, GATE, OR, READY, ERROR, STGOUT 0 to 3, and DO 0 to 15) STGOUT 2 to 3 only for camera 4 ch type	
Monitor interface			Integrated controller and LCD 12.1 inch TFT colour LCD (Resolution: XGA 1,024 × 768 dots)				Analog RGB video output, 1 channel (Resolution: XGA 1,024 × 768 dots)	
USB interface			4 channels (supports USB 1.1 and 2.0)				2CH (supports USB1.1/2.0)	
Power supply voltage *2			20.4 to 26.4 VDC					
Current consumption (at 24.0 VDC) *3	When connected to a intelligent compact camera		5.0 A max.	7.5 A max.	5.0 A max.	7.5 A max.	4.0 A max.	5.5 A max.
	When connected to a intelligent or autofocus camera							
	When connected to a 300,000-pixel camera		3.7 A max.	4.9 A max.	3.7 A max.	4.9 A max.	2.6 A max.	2.9 A max.
	When connected to a 2 million-pixel camera							
	When connected to a 5 million-pixel camera							

Type		High-speed controllers		Standard controllers		Lite controllers	
Model	NPN	FZ5-1100	FZ5-1100-10	FZ5-600	FZ5-600-10	FZ5-L350	FZ5-L350-10
	PNP	FZ5-1105	FZ5-1105-10	FZ5-605	FZ5-605-10	FZ5-L355	FZ5-L355-10
Ambient temperature range		Operating: 0 to 45°C for low cooling fan speeds, 0 to 50°C for high cooling fan speeds Storage: –20 to 65°C (with no icing or condensation)				Operating: 0 to 45°C, 0 to 50°C Storage: –20 to 65°C (with no icing or condensation)	
Ambient humidity range		Operating and storage: 35% to 85% (with no condensation)					
Weight		Approx. 3.2 kg	Approx. 3.4 kg	Approx. 3.2 kg	Approx. 3.4 kg	Approx. 1.8 kg	
Accessories		Touch pen (one, inside the front panel), Instruction manual, 6 mounting brackets				Instruction manual	

*1 The image logging capacity changes when multiple cameras of different types are connected at the same time.
*2 Do not ground the positive terminal of the 24-VDC power supply to a Lite controller.
If the positive terminal is grounded, electrical shock may occur when an SG (0-V) part, such as the case of the controller or camera, is touched.
*3 The current consumption when the maximum number of cameras supported by each controller are connected.
If a strobe controller model is connected to a lamp, the current consumption is as high as when an intelligent camera is connected.

Cameras

High-speed CMOS cameras

Model	FH-SM	FH-SC	FH-SM02	FH-SC02	FH-SM04	FH-SC04
Image elements	1/3-inch CMOS image elements		2/3-inch CMOS image elements		1-inch CMOS image elements	
Colour/Monochrome	Monochrome	Colour	Monochrome	Colour	Monochrome	Colour
Effective pixels	640 (H) × 480 (V)		2040 (H) × 1088 (V)		2040 (H) × 2048 (V)	
Pixel size	7.4 (μm) × 7.4 (μm)		5.5 (μm) × 5.5 (μm)		5.5 (μm) × 5.5 (μm)	
Shutter function	Electronic shutter; Shutter speeds can be set from 20 μs to 100 ms.		Electronic shutter; Shutter speeds can be set from 25 μs to 100 ms.			
Partial function	1 to 480 lines	2 to 480 lines	1 to 1088 lines	2 to 1088 lines	1 to 2048 lines	2 to 2048 lines
Frame rate (image read time)	308 fps (3.3 ms)		219 fps (4.6 ms) *1		118 fps (8.5 ms) *1	
Lens mounting	C-mount					
Field of vision, installation distance	Selecting a lens according to the field of vision and installation distance					
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)					
Weight	Approx. 105 g		Approx. 110 g			
Accessories	Instruction manual					

*1 For high speed frame rate, 2 pieces of FZ-VS-_M cables are required.

Digital CCD Cameras

Model	FZ-S	FZ-SC	FZ-S2M	FZ-SC2M	FZ-S5M2	FZ-SC5M2
Image elements	Interline transfer reading all pixels, 1/3-inch CCD image elements		Interline transfer reading all pixels, 1/1.8-inch CCD image elements		Interline transfer reading all pixels, 2/3-inch CCD image elements	
Colour/Monochrome	Monochrome	Colour	Monochrome	Colour	Monochrome	Colour
Effective pixels	640 (H) × 480 (V)		1600 (H) × 1200 (V)		2448 (H) × 2044 (V)	
Pixel size	7.4 (μm) × 7.4 (μm)		4.4 (μm) × 4.4 (μm)		3.45 (μm) × 3.45 (μm)	
Shutter function	Electronic shutter; select shutter speeds from 20 μs to 100 ms					
Partial function	12 to 480 lines		12 to 1200 lines		12 to 2044 lines	
Frame rate (image read time)	80 fps (12.5 ms)		30 fps (33.3 ms)		16 fps (62.5 ms)	
Lens mounting	C-mount					
Field of vision, installation distance	Selecting a lens according to the field of vision and installation distance					
Ambient temperature range	Operating: 0 to 50°C Storage: –25 to 65°C (with no icing or condensation)		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)					
Weight	Approx. 55 g		Approx. 76 g		Approx.140 g	
Accessories	Instruction manual					

Small CCD Digital Cameras

Model	FZ-SF	FZ-SFC	FZ-SP	FZ-SPC
Image elements	Interline transfer reading all pixels, 1/3-inch CCD image elements			
Colour/Monochrome	Monochrome	Colour	Monochrome	Colour
Effective pixels	640 (H) × 480 (V)			
Pixel size	7.4 (μm) × 7.4 (μm)			
Shutter function	Electronic shutter; select shutter speeds from 20 μm to 100 ms			
Partial function	12 to 480 lines			
Frame rate (image read time)	80 fps (12.5 ms)			
Lens mounting	Special mount (M10.5 P0.5)			
Field of vision, installation distance	Selecting a lens according to the field of vision and installation distance			
Ambient temperature range	Operating: 0 to 50°C (camera amp) 0 to 45°C (camera head) Storage: –25 to 65°C (with no icing or condensation)			
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)			
Weight	Approx. 150 g			
Accessories	Instruction manual, installation bracket, Four mounting brackets (M2)		Instruction manual	

High-speed CCD Cameras

Model	FZ-SH	FZ-SHC
Image elements	Interline transfer reading all pixels, 1/3-inch CCD image elements	
Colour/Monochrome	Monochrome	Colour
Effective pixels	640 (H) × 480 (V)	
Pixel size	7.4 (μm) × 7.4 (μm)	
Shutter function	Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s	
Partial function	12 to 480 lines	
Frame rate (image read time)	204 fps (4.9ms)	
Field of vision, installation distance	Selecting a lens according to the field of vision and installation distance	
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)	
Weight	Approx. 105 g	
Accessories	Instruction manual	

Intelligent Compact CMOS Cameras

Model	FZ-SQ010F	FZ-SQ050F	FZ-SQ100F	FZ-SQ100N
Image elements	1/3-inch CMOS image elements			
Colour/Monochrome	Colour			
Effective pixels	752 (H) × 480 (V)			
Pixel size	6.0 (μm) × 6.0 (μm)			
Shutter function	1/250 to 1/32,258			
Partial function	8 to 752 lines			
Frame rate (image read time)	60 fps			
Field of vision	7.5 × 4.7 to 13 × 8.2 mm	13 × 8.2 to 53 × 33 mm	53 × 33 to 240 × 153 mm	29 × 18 to 300 × 191 mm
Installation distance	38 to 60 mm	56 to 215 mm	220 to 970 mm	32 to 380 mm
LED class *1	Class 2			
Ambient temperature range	Operating: 0 to 50°C Storage: –25 to 65°C			
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)			
Weight	Approx. 150 g		Approx. 140 g	
Accessories	Mounting bracket (FQ-XL), polarizing filter attachment (FQ-XF1), instruction manual and warning label			

*1 Applicable standards: IEC62471-2

Intelligent CCD cameras, Autofocus CCD cameras

Model	FZ-SLC100	FZ-SLC15	FZ-SZC100	FZ-SZC15
Image elements	Interline transfer reading all pixels, 1/3-inch CCD image elements			
Colour/Monochrome	Colour			
Effective pixels	640 (H) × 480 (V)			
Pixel size	7.4 (μm) × 7.4 (μm)			
Shutter function	Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s			
Partial function	12 to 480 lines			
Frame rate (image read time)	80 fps (12.5 ms)			
Field of vision *1	13 to 100 mm *2	2.9 to 14.9 mm *2	13 to 100 mm *2	2.9 to 14.9 mm *2
Installation distance	70 to 190 mm *2	35 to 55 mm *2	77.5 to 197.5 mm *2	47.5 to 67.5 mm
LED class *3 (lighting)	Class 2		–	
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)			
Weight	Approx. 670 g	Approx. 700 g	Approx. 500 g	
Accessories	Instruction sheet and hexagonal wrench			

*1 The length of the visual field is the lengths along the Y axis.
*2 Tolerance: ±5% max.
*3 Applicable standards: IEC62471-2

LCD Monitor

Model	FZ-M08
Size	8.4 inches
Type	Liquid crystal Colour TFT
Resolution	1,024 × 768 dots
Input signal	Analog RGB video input, 1 channel
Power supply voltage	21.6 to 26.4 VDC
Current consumption	Approx. 0.7 A max.
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)
Weight	Approx. 1.2 kg
Accessories	Instruction sheet and 4 mounting brackets

Camera cables

Model	FZ-VS (2 m)	FZ-VSB (2 m)	FZ-VSL (2 m)
Shock resistiveness (durability)	10 to 150 Hz single amplitude 0.15 mm 3 directions, 8 strokes, 4 times		
Ambient temperature range	Operation and storage: 0 to 65°C (with no icing or condensation)		
Ambient humidity range	Operation and storage: 40 to 70%RH (with no condensation)		
Ambient atmosphere	No corrosive gases		
Material	Cable sheath, connector: PVC		
Minimum bending radius	69 mm	69 mm	69 mm
Weight	Approx. 170 g	Approx. 220 g	Approx. 170 g

Monitor cable

Model	FZ-VM
Vibration resistiveness	10 to 150 Hz single amplitude 0.15 mm 3 directions, 8 strokes, 4 times
Ambient temperature range	Operation: 0 to 50°C; Storage: –20 to 65°C (with no icing or condensation)
Ambient humidity range	Operation and storage: 35 to 85%RH (with no condensation)
Ambient atmosphere	No corrosive gases
Material	Cable sheath: heat-resistant PVC, connector: PVC
Minimum bending radius	75 mm
Weight	Approx. 170 g

Cable extension unit

Model	FZ-VSJ
Power supply voltage *1	11.5 to 13.5 VDC
Current consumption *2	1.5 A max.
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)
Model	FZ-VSJ
Maximum units connectable	2 Units per camera
Weight	Approx. 240 g
Accessories	Instruction sheet and 4 mounting screws

*1 A 12-VDC power supply must be provided to the cable extension unit when connecting the Intelligent camera, the Autofocus camera, the Intelligent compact camera, the Strobe controller, or the Lighting controller.
*2 The current consumption shows when connecting the cable extension unit to an external power supply.

Long-distance camera cables

Model	FZ-VS2 (15 m)	FZ-VSL2 (15 m)
Shock resistiveness (durability)	10 to 150 Hz single amplitude 0.15 mm 3 directions, 8 strokes, 4 times	
Ambient temperature range	Operation and storage: 0 to 65°C (with no icing or condensation)	
Ambient humidity range	Operation and storage: 40 to 70%RH (with no condensation)	
Ambient atmosphere	No corrosive gases	
Material	Cable sheath, connector: PVC	
Minimum bending radius	93 mm	
Weight	Approx. 1600 g	

Parallel cable

Model	FZ-VP	FZ-VPX
Vibration resistiveness	10 to 150 Hz single amplitude 0.15 mm 3 directions, 8 strokes, 4 times	
Ambient temperature range	Operation: 0 to 50°C; Storage: –20 to 65°C (with no icing or condensation)	
Ambient humidity range	Operation and storage: 35 to 85%RH (with no condensation)	
Ambient atmosphere	No corrosive gases	
Material	Cable sheath: heat-resistant PVC, Connector: resin	
Minimum bending radius	75 mm	
Weight	Approx. 160 g	Approx. 180 g

Note: FZ-VP/FZ-VPX is only for the FZ series. The FH series can use XW2Z-S013-2/-S013-5.

Encoder Cable

Model	FH-VR
Vibration resistiveness	10 to 150 Hz single amplitude 0.1 mm 3 directions, 8 strokes, 10 times
Ambient temperature range	Operation: 0 to 50°C; Storage: –10 to 60°C (with no icing or condensation)
Ambient humidity range	Operation and storage: 35 to 85%RH (with no condensation)
Ambient atmosphere	No corrosive gases
Material	Cable Jacket: Heat, oil and flame resistant PVC Connector: polycarbonate resin
Minimum bending radius	65 mm
Weight	Approx. 104 g

Cameras/Cables connection table

Type of camera	Model	Cable length	High-speed CMOS cameras *1				
			300,000-pixel	2 million-pixel		4 million-pixel	
			FH-SM/SC	FH-SM02/SC02		FH-SM04/SC04	
			–	High speed mode of transmission speed select	Standard mode of transmission speed select	High speed mode of transmission speed select	Standard mode of transmission speed select
Camera cables Right-angle camera cables	FZ-VS FZ-VSL	2 m	Yes	Yes	Yes	Yes	Yes
		5 m	Yes	Yes	Yes	Yes	Yes
		10 m	Yes	No	Yes	No	Yes
Bend resistant camera cables	FZ-VSB	2 m	Yes	Yes	Yes	Yes	Yes
		5 m	Yes	Yes	Yes	Yes	Yes
		10 m	Yes	No	Yes	No	Yes
Long-distance camera cable Long-distance right-angle camera cable	FZ-VS2 FZVSL2	15 m	Yes	No	Yes	No	Yes

*1 High-speed CMOS camera is only for the FH series.

Type of camera	Model	Cable length	Digital CCD cameras			Small digital CCD cameras Pen type / flat type	High-speed CCD cameras	Intelligent compact CMOS cameras	Intelligent CCD cameras Autofocus CCD cameras
			300,000-pixel	2 million-pixel	5 million-pixel				
			FZ-S/SC	FZ-S2M/SC2M	FZ-S5M2/SC5M2	FZ-SF/SFC FZ-SP/SPC	FZ-SH/SHC	FZ-SQ□	FZ-SLC□ FZ-SZC□
Camera cables Right-angle camera cables	FZ-VS FZ-VSL	2 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		5 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		10 m	Yes	Yes	No	Yes	Yes	Yes	No
Bend resistant camera cables	FZ-VSB	2 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		5 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		10 m	Yes	Yes	No	Yes	Yes	Yes	No
Long-distance camera cable Long-distance right-angle camera cable	FZ-VS2 FZVSL2	15 m	Yes	Yes	No	Yes	Yes	Yes	No

EtherCAT communications specifications

Item		Specifications
Communications standard		IEC61158 Type 12
Physical layer		100 BASE-TX (IEEE802.3)
Modulation		Base band
Baud rate		100 Mbps
Topology		Depends on the specifications of the EtherCAT master.
Transmission media		Twisted-pair cable of category 5 or higher (double-shielded straight cable with aluminum tape and braiding)
Transmission distance		Distance between nodes: 100 m or less
Node address setting		00 to 9
External connection terminals		RJ45 × 2 (shielded) IN: EtherCAT input data, OUT: EtherCAT output data
Send/receive PDO data sizes	Input	56 to 280 bytes/line (including input data, status, and unused areas) Up to 8 lines can be set. *1
	Output	28 bytes/line (including output data and unused areas) Up to 8 lines can be set. *1
Mailbox data size	Input	512 bytes
	Output	512 bytes
Mailbox		Emergency messages, SDO requests, and SDO information
Refreshing methods		I/O-synchronized refreshing (DC)

*1 This depends on the upper limit of the master.

Version information

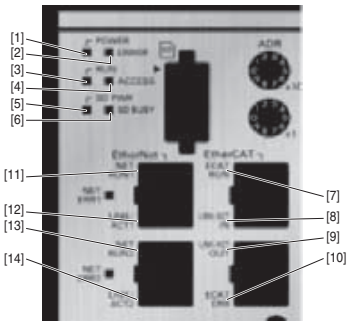
FH Series and programming devices

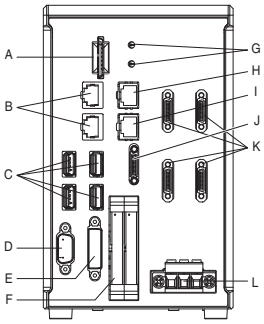
FH series	Required programming device	
	Sysmac Studio Standard Edition/Vision Edition	
	Ver.1.06	Ver.1.07 or higher
FH-3050 (-_) FH-1050 (-_)	Not supported	Supported

Note: **1.** The auto-update to Sysmac Studio version 1.07 will be available soon.
2. Sysmac Studio does not support the FZ5 series.

Components and functions

Example of the FH sensor controllers BOX type (4-camera type)

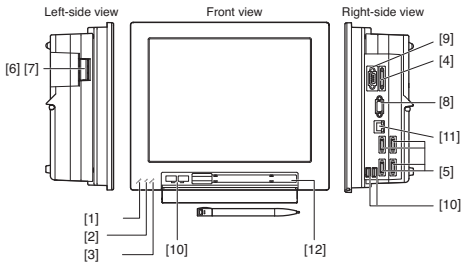




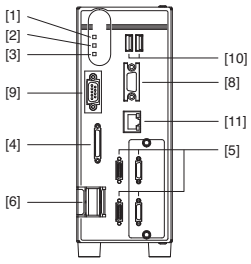
	Name	Description
[1]	POWER LED	Lit while power is ON.
[2]	ERROR LED	Lit when an error has occurred.
[3]	RUN LED	Lit while the controller is in Measurement Mode.
[4]	ACCESS LED	Lit while the memory is accessed.
[5]	SD POWER LED	Lit while power is supplied to the SD card and the card is usable.
[6]	SD BUSY LED	Blinks while the SD memory card is accessed.
[7]	EtherCAT RUN LED	Lit while EtherCAT communications are usable.
[8]	EtherCAT LINK/ACT IN LED	Lit when connected with an EtherCAT device, and blinks while performing communications.
[9]	EtherCAT LINK/ACT OUT LED	Lit when connected with an EtherCAT device, and blinks while performing communications.
[10]	EtherCAT ERR LED	Lit when EtherCAT communications have become abnormal.
[11]	EtherNet NET RUN1 LED	Lit while EtherNet communications are usable.
[12]	EtherNet NET LINK/ACK1 LED	Lit when connected with an EtherNet device, and blinks while performing communications.
[13]	EtherNet NET RUN2 LED	Lit when EtherNet communications are usable.
[14]	EtherNet NET LINK/ACK2 LED	Lit when connected with an EtherNet device, and blinks while performing communications.

	Name	Description
A	SD memory card installation connector	Install the SD memory card. Do not plug or unplug the SD card during measurement operation. Otherwise measurement time may be affected or data may be destroyed.
B	EtherNet connector	Connect an EtherNet device.
C	USB connector	Connect a USB device. Do not plug or unplug it during measurement operation. Otherwise measurement time may be affected or data may be destroyed.
D	RS-232C connector	Connect an external device such as a programmable controller.
E	DVI-I connector	Connect a monitor.
F	I/O connector (control lines, data lines)	Connect the controller to external devices such as a sync sensor and PLC.
G	EtherCAT address setup volume	Used to set a node address (00 to 99) as an EtherCAT communication device.
H	EtherCAT communication connector (IN)	Connect the opposed EtherCAT device.
I	EtherCAT communication connector (OUT)	Connect the opposed EtherCAT device.
J	Encoder connector	Connect an encoder.
K	Camera connector	Connect cameras.
L	Power supply terminal connector	Connect a DC power supply. Wire the controller independently on other devices. Wire the ground line. Be sure to ground the controller alone. Perform wiring using the attached power supply connector.

Example of the FZ5 sensor controllers LCD-integrated type (4-camera type)



Example of the FZ5-Lite sensor controllers LCD-integrated type (4-camera type)



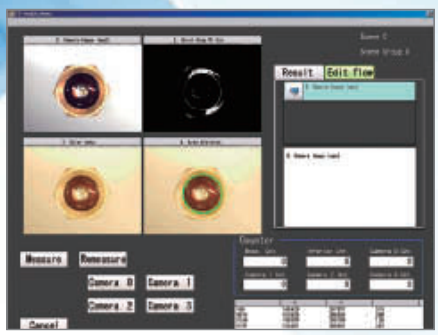
	Name	Description
[1]	POWER LED	Lit while power is ON.
[2]	RUN LED	Lit while the controller is in Run Mode.
[3]	ERROR LED	Lit when an error has occurred.
[4]	I/O connector (control lines, data lines)	Connect the controller to external devices such as a sync sensor and PLC.
[5]	Camera connector	Connect cameras.
[6]	Power	Connect a DC power supply. Wire the power supply unit independently of other devices. After wiring, replace the terminal cover.
[7]	Ground terminal	Connect the ground wire. Make sure that the controller is grounded with a separate ground wire.
[8]	Monitor connector (analog RGB)	Connect a monitor. (Provided with Lite controller type only)
[9]	RS-232C/RS-422 connector	Connect an external device such as a personal computer or PLC.
[10]	USB connector	Connect a track ball, mouse and USB memory. A total of four USB ports are provided and any of them can be used. However, when connecting two or more USB memories, do not connect them to adjacent ports. Doing so may cause the USB memories to come into contact, resulting in malfunction or damage.
[11]	EtherNet connector	Connect the controller to a personal computer.
[12]	Touch pen (holder)	A touch pen is stored. (Provided with the LCD integrated type only)

VISION – TAILORED AND FIT FOR INDUSTRY

FlexXpect vision platform

FlexXpect is a modular Vision platform featuring industry specific functionality. In combination with the powerful Xpectia-hardware, the FlexXpect software modules take you into a new dimension of specialisation. FlexXpect is simple to use and can be customised easily, to focus on your individual needs. The combination of Xpectia's real colour sensing, high resolution and intuitive user guidance combined with the FlexXpect value added tools represents an unbeatable duo.

Depending on industry, different requirements and regulations are in place for quality inspection. Premium class add-on functionality, tailored for industry, is delivered by FlexXpect.



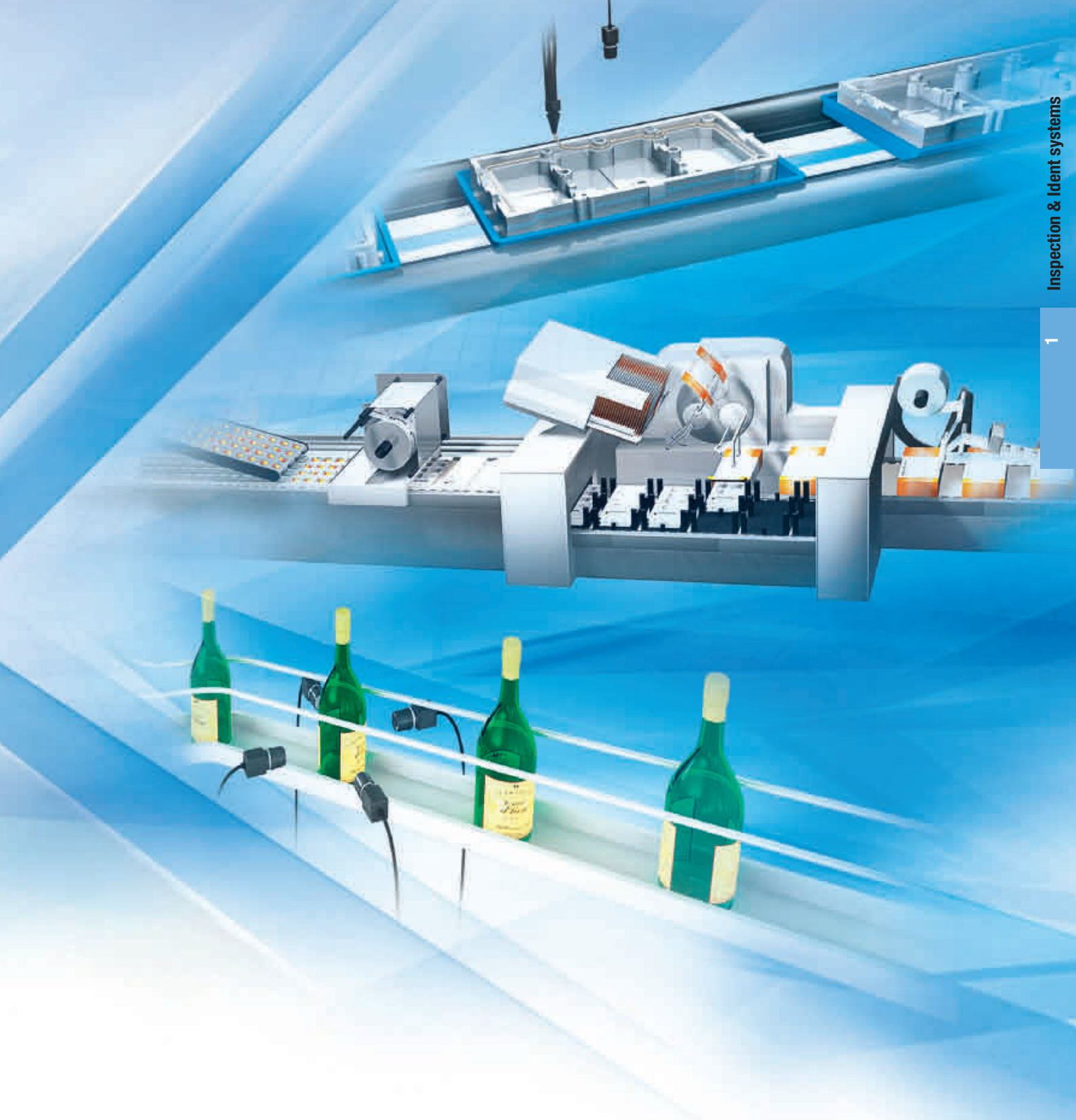
Simplicity – easy to use

FlexXpect features an easy and intuitive user interface, which allows inspection solutions to be set-up quickly and efficiently. With a built in touch screen interface and icon based menu structure, the complexity of programming the system is kept to a minimum. The Flow-Menu is an ideal tool to re-built the process sequences inside the vision platform.

Customised to your needs

The FlexXpect platform can be further customized to the needs of the individual application. Different levels of product modifications are supported. Based on the skill of the user and required functionality it offers:

- Flow programming
- GUI modifications
- Processing items & communication



YOUR BENEFITS

- FlexXpect-Glue Bead: Automatic one shot seal inspection
- FlexXpect-Pharma: 21 CFR Part 11 compliant
- FlexXpect-Labelling: 360° bottle inspection
- FlexXpect-PV: alignment & inspection of wafers

VISION – TAILORED AND FIT FOR INDUSTRY

FlexXpect Pharma

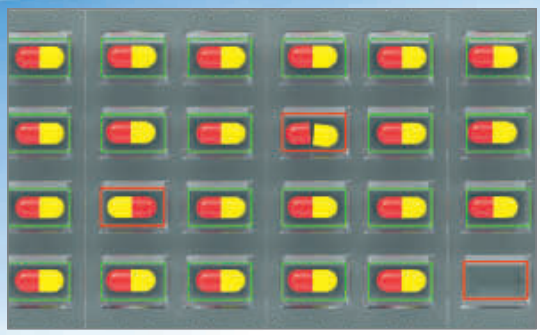
FlexXpect is a modular Vision platform. In combination with the powerful Xpectia-hardware, it takes you into a new dimension of specialisation. The FlexXpect-Pharma is targeting challenging inspections in the Pharmaceutical industry. It offers powerful inspection tools and all functions, necessary for the validation under the FDA 21 CFR Part 11. With the powerful code verification and OCR features, FlexXpect-Pharma is the ideal solution for Track & Trace applications.

Inspect any applications in Pharma:

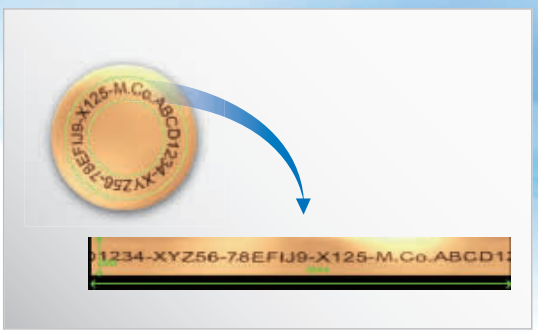
- Blister pack
- Vials
- Syringes
- Label inspection

FlexXpect Pharma

Inspect any applications in Pharma

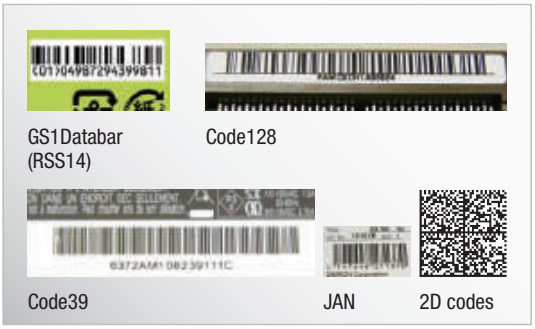


Pill inspection in blisters

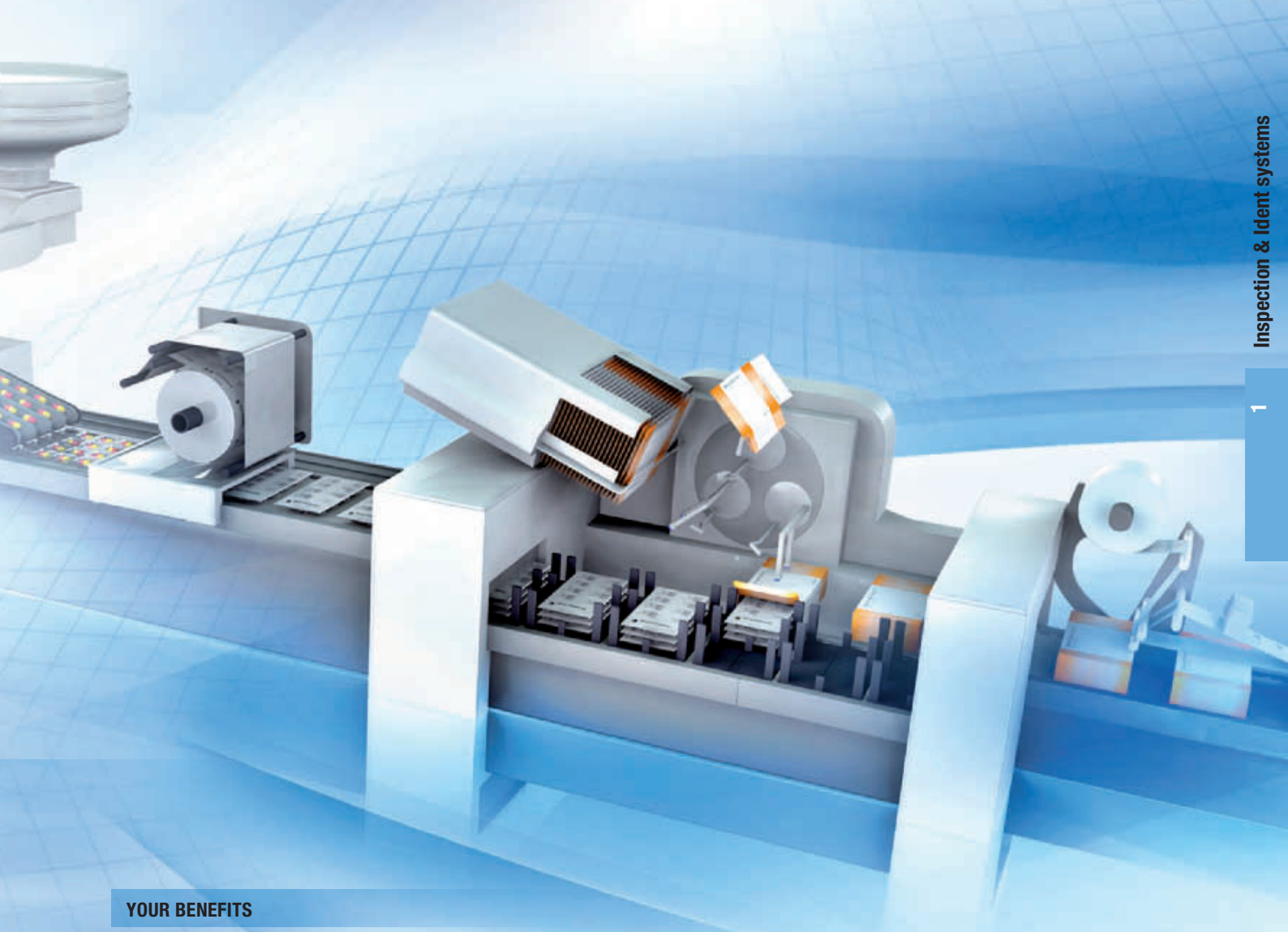


Polar transformation of round strings

Date/Batch code verification (OCR/OCV)



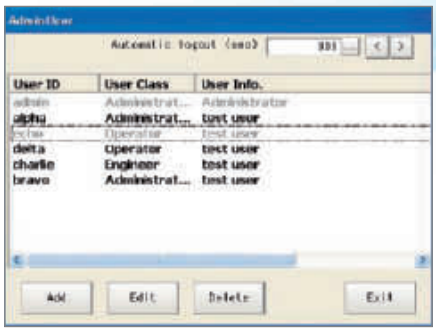
High speed code reading



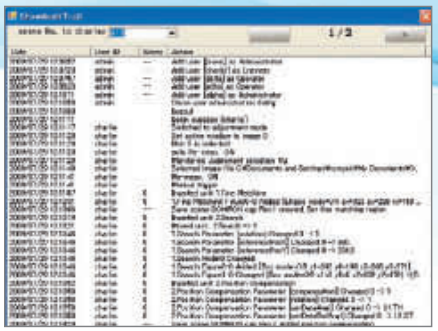
YOUR BENEFITS

- Strong OCR/OCV (any font & print type)
- Barcode/Datamatrix
- Braille
- Pattern and edge tools
- Real colour inspection
- High resolution to detect minute defects

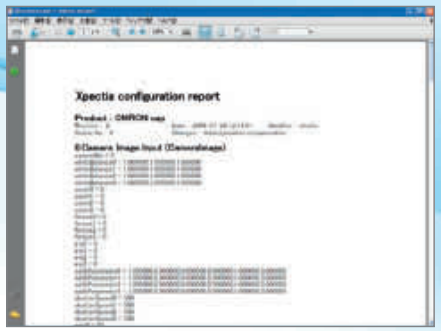
Optimize your set-up with a click



User access administration



Audit trail



Generate and export configuration data

FlexXpect-Pharma software module	FLEXXPECT-PHARMA

Note: FlexXpect software modules require Xpectia/FZW hardware. This is not part of the item and needs to be ordered independently.

VISION – TAILORED AND FIT FOR INDUSTRY

FlexXpect Labelling

FlexXpect is a modular Vision platform. In combination with the powerful Xpectia-hardware, it takes you into a new dimension of specialisation. FlexXpect-Labelling has been designed to deliver tailored functionality for inspection of labels and packages.

Powerful image processing tools for labelling:

- OCR/OCV
- Barcode/Datamatrix
- Pattern and edge tools
- Real colour inspection
- High resolution to detect minute defects

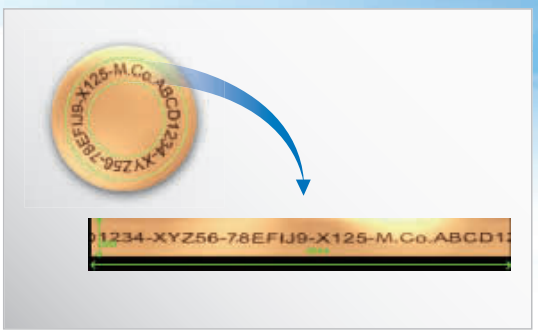
Label unwrapping from bottles for inspection of premium beverages:

- Acquire images from up to 4x cameras
- Compensate the distortion
- Identify the overlapping areas
- Stitch the images together

FlexXpect Labelling

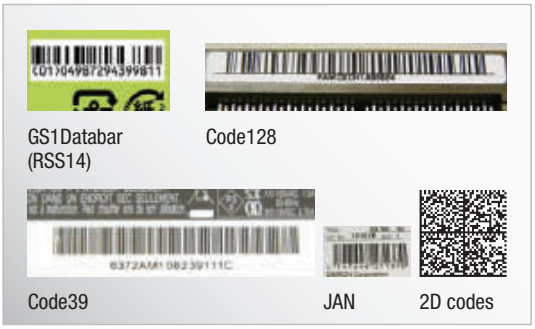
Powerful image processing tools for labelling

Strong OCR/OCV



Polar transformation of round strings

Date/Batch code verification (OCR/OCV)



High speed code reading

Position and defect inspection

Produce aesthetically perfect products is a key point. FlexXpect-Labelling offers a suite of image processing tools to inspect the label for position and defects.

Reading different codes at a time

Two or more different codes in the same field of view can be read by utilizing a high resolution camera.This function helps to reduce the inspection time.

YOUR BENEFITS

- Strong OCR/OCV
- Code reading (Barcode, Datamatrix)
- 360° inspections of bottles
- Real colour processing items
- High resolution
- Easy & intuitive configuration

FlexXpect-Labelling software module	FLEXXPECT-LABELLING

Note: FlexXpect software modules require Xpectia/FZW hardware. This is not part of the item and needs to be ordered independently.

VISION – TAILORED AND FIT FOR INDUSTRY

FlexXpect Glue Bead

FlexXpect is a modular Vision platform. In combination with the powerful Xpectia-hardware, it takes you into a new dimension of specialisation. The FlexXpect-Glue Bead inspects the complete sealing of automotive parts in one shot. Driven by the real colour functionality, any sealing can be identified and checked, independent how visible it is. Featuring a simple set-up procedure and automatic calculation of the path, it represents a powerful and straight forward solution for any glue application.

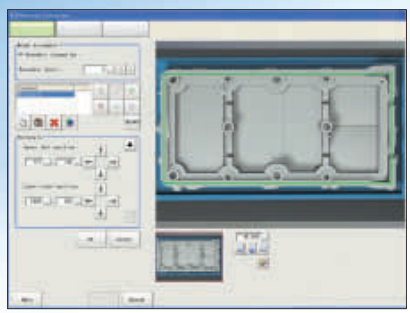
Glue Bead inspection:

- Correct path
- Thickness
- Interrupt

FlexXpect Glue Bead

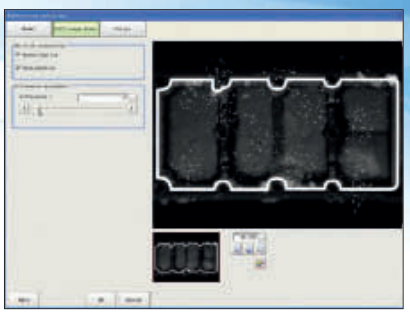
Inspect any applications in Pharma

FlexXpect-Glue Bead features an intuitive and easy set-up procedure. No expert knowledge of the user is required.



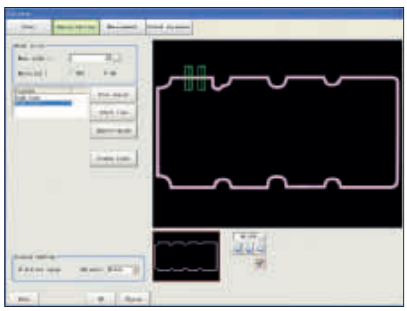
Step 1

Define inspection area.



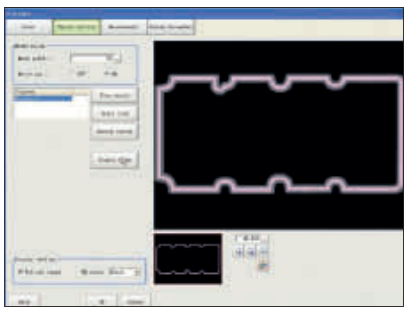
Step 2

Teach the glue.



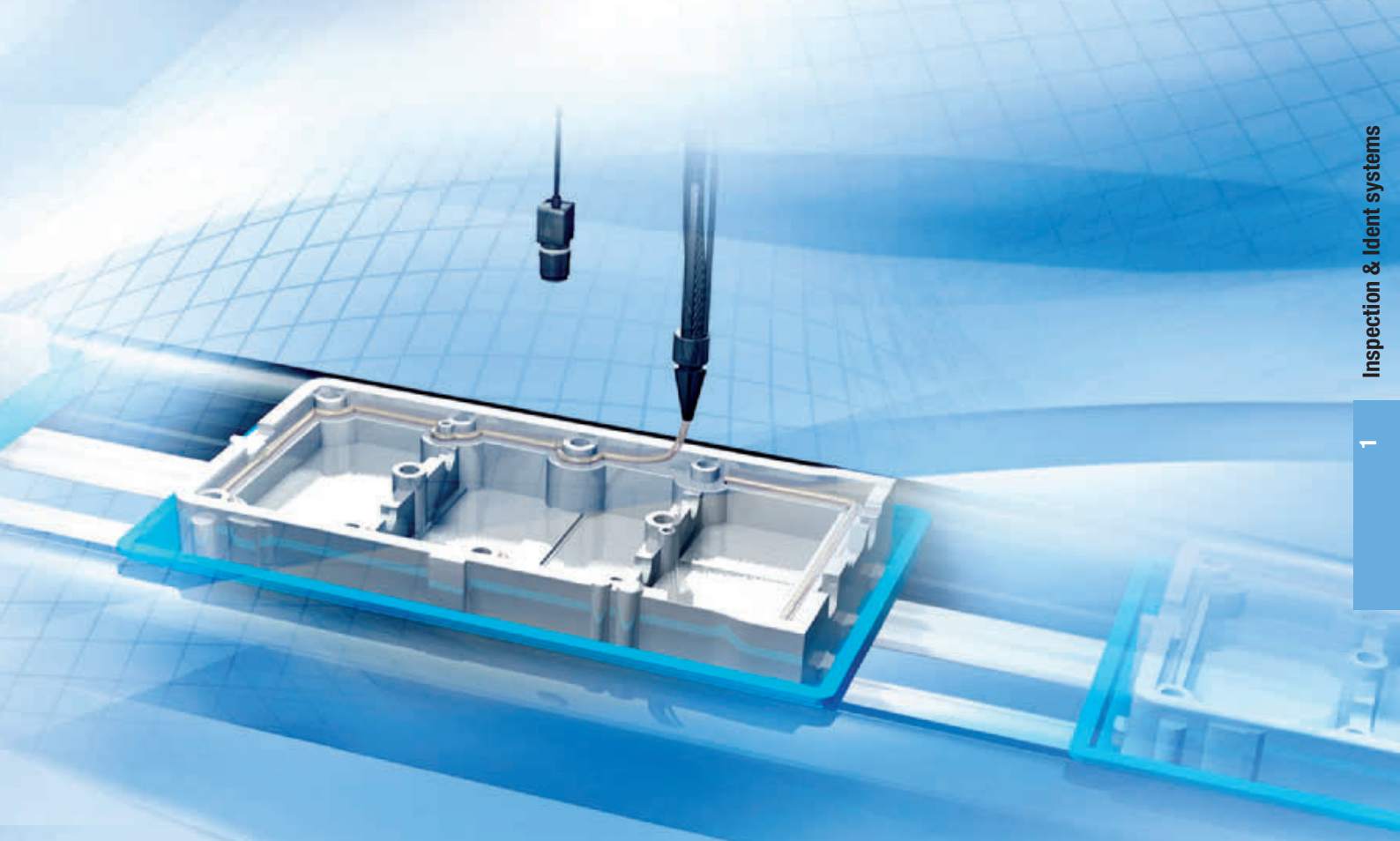
Step 3

Define start & end point of the glue.



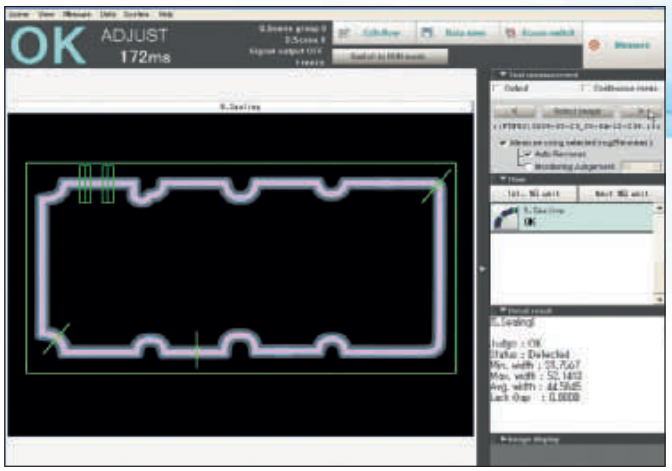
Step 4

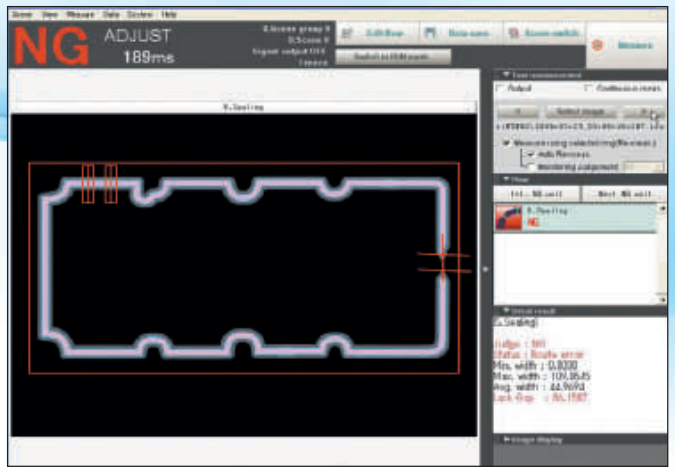
Automatic calculation of the path of the Glue Bead.



YOUR BENEFITS

- One shot inspection of the complete path
- Easy set-up
- Automatic path calculation
- Real colour glue extraction





FlexXpect-Glue Bead software module	FLEXXPECT-GLUE BEAD

Note: FlexXpect software modules require Xpectia/FZW hardware. This is not part of the item and needs to be ordered independently.

VISION – TAILORED AND FIT FOR INDUSTRY

FlexXpect PV

FlexXpect is a modular Vision platform. In combination with the powerful Xpectia hardware, it takes you into a new dimension of specialisation. FlexXpect-PV delivers tailored functionality for alignment and the inspection of wafers for chips and cracks.

Feautures of FlexXpect-PV:

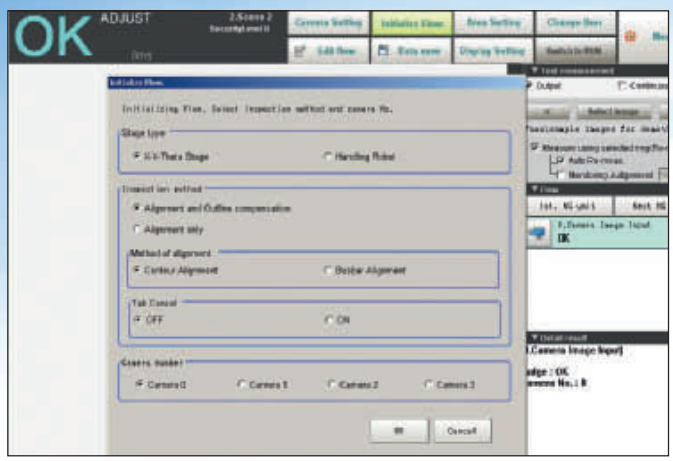
- Easy and intuitive set-up
- Automatic extraction and teaching of the PV wafer
- Precise inspections with high resolution cameras
- Automatic robot calibration
- Fade-out strings and conveyor belts

Supported PV inspections:

- Precise wafer and string alignment
- Accurate chamfer chip inspection
- Detection of minute edge cracks
- Bus bar alignment on the wafer

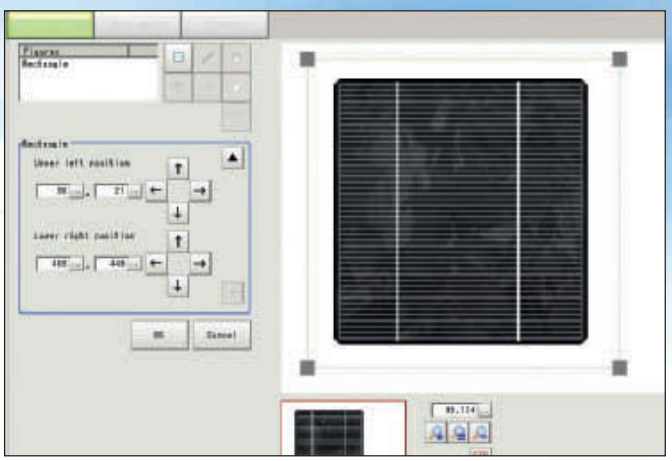
FlexXpect PV

Quick set-up in simple steps:



Step 1:

Select the inspection function



Step 2:

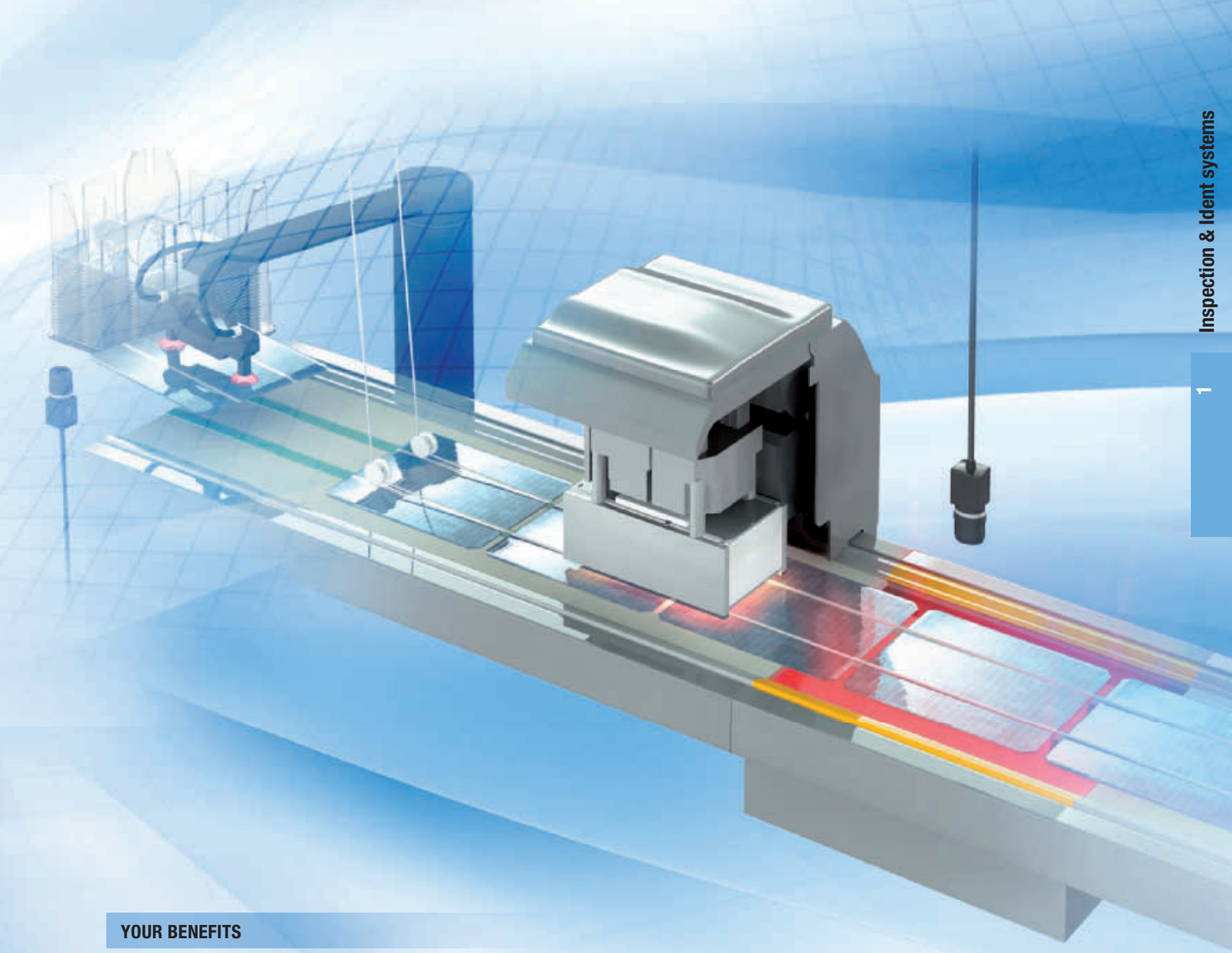
Draw a rectangle around the wafer

Step 3:

One step deletion of bus bars and conveyor belts (optional)

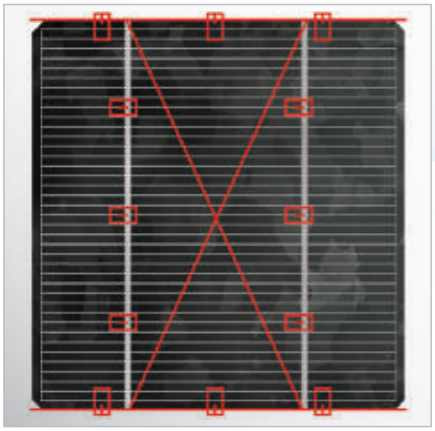
Step 4:

Start the inspection
Accurate chamfer chip inspection (0.1 mm)

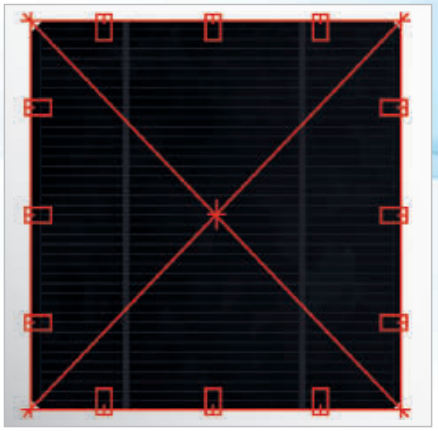


YOUR BENEFITS

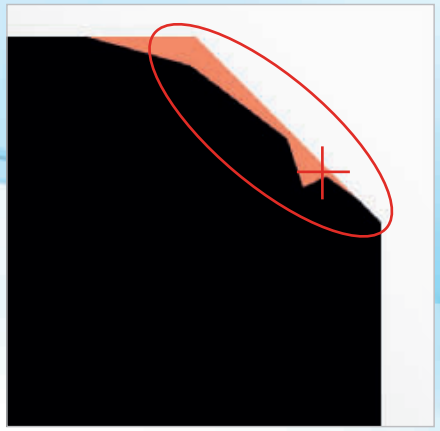
- One shot inspection of the complete path
- Easy set-up
- Automatic path calculation
- Real colour glue extraction



Bus bar alignment



Outline adge alignment



Precise detection of edge breakage

FlexXpect-PV software module	FLEXXPECT-PV

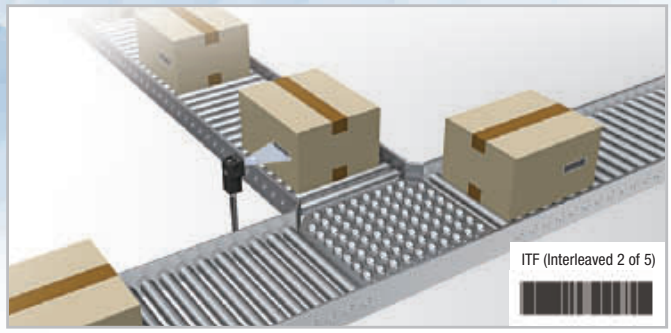
Note: FlexXpect software modules require Xpectia/FZW hardware. This is not part of the item and needs to be ordered independently.

CODE READERS AND VERIFIERS

All codes with one touch

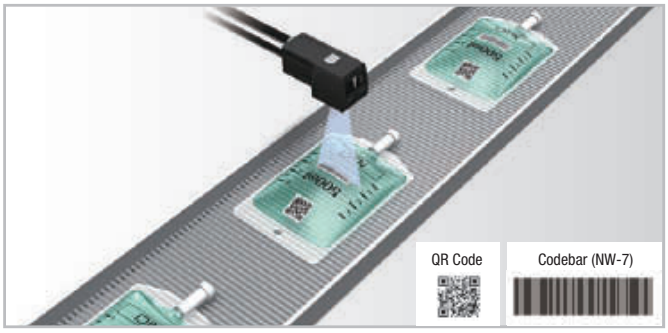
The new compact FQ-CR code reader from Omron enables accurate, reliable and easy reading of barcodes and 2D codes, thanks to superior crystal clear imaging technology, which it shares with the other products in Omron's highly regarded FQ2 family of vision sensors.

Paper or Cardboard

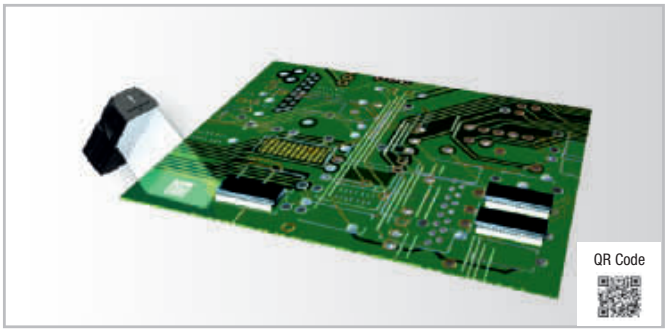


PET Bottles

Medical Packs



PCB Boards



Compact and robust

Designed specifically for reading codes printed on paper or labels, the FQ-CR1 features integrated high power LED lighting and HDR imaging technology, enabling it to provide dependable code reading even in challenging applications. It also automatically recognizes nine different barcode formats and eight different 2D code formats without the need for setting, making it exceptionally versatile and simple to configure.

YOUR BENEFITS

- 1D code reader
- 2D code reader
- Crystal-clear image quality
- One-touch control via simple, icon-driven menu

Guided by simplicity

Setting up the new FQ-CR1 can be carried out using a PC-based software package or by using the optional handheld Touchfinder screen. Ideal for making set up changes on site, the Touchfinder screen features a convenient and intuitive “teaching” system – the user simply places a sample code in the field of view of the reader, confirms it using the Touchfinder screen, and the code reader automatically adjusts itself for optimum performance.

All codes with one touch

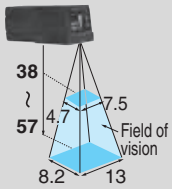
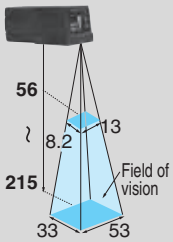
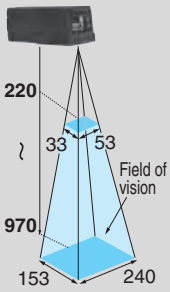
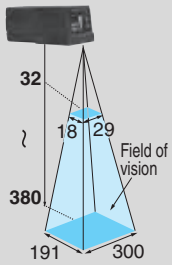
The new compact FQ-CR1 code reader enables accurate, reliable and easy reading of barcodes and 2D codes, thanks to superior crystal clear imaging technology, which it shares with the other products in our highly regarded FQ family of vision sensors.

- 1D code reader
- 2D code reader
- Crystal-clear image quality
- One-touch control via simple, icon-driven menu

Ordering information

Field of vision		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 vision/Installation distance		Refer to figure 1.	Refer to figure 2.	Refer to figure 3.	Refer to figure 4.

Field of vision/Installation distance **(Unit: mm)**

Field of vision	Narrow View	Standard View	Wide View (Long-distance)	Wide View (Short-distance)
Appearance				
350,000 pixels type	Figure 1 	Figure 2 	Figure 3 	Figure 4 

Specifications

Item		Multi Code Reader
Model	NPN	FQ-CR10□□□□-M
	PNP	FQ-CR15□□□□-M
Field of view		Refer to ordering information on page 105. (Tolerance (field of vision): ±10% max.)
Installation distance		
Main functions	Inspection items	2D Code (Data Matrix(EC200), QR Code, MicroQR Code, PDF417, MicroPDF417, GS1-Data Matrix)
		Bar Code (JAN/EAN/UPC, Code39, Codabar (NW-7), ITF (Interleaved 2 of 5), Code 93, Code128/GS1-128, GS1 DataBar* (Truncated, Stacked, Omnidirectional, Stacked Omnidirectional, Limited, Expanded, Expanded Stacked), Pharmacode, GS1-128 Composite Code (CC-A, CC-B, CC-C)
	Image filter	None
	Verification function	Supported
	Retry function	Normal retry, Exposure retry, Scene retry, Trigger retry
	Number of simultaneous measurements	32
	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	1/250 to 1/30,000
	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)
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 three output signals can be allocated for the judgements of individual inspection items.
	Ethernet specifications	100Base-TX/10Base-T
	Communications	–
	I/O expansion	–
	RS-232C	–
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 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, Quick Startup Guide, Member Registration Sheet, Warning Label
LED class		Class 2(Applicable standards: IEC 60825-1:1993 +A1:1997 +A2:2001,EN 60825-1:1994 +A1:2002 +A2:2001, and JIS C 6802:2005)
Applicable standards		EN 61326-1:2006 and IEC61010-1

Touch Finder

Item			Type	Model with DC power supply	Model with AC/DC/battery power supply
			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	
		Pixels		320 × 240	
		Display colors		16.7 million	
	Backlight	Life expectancy*1		50,000 hours at 25ºC	
		Brightness adjustment		Provided	
		Screen saver		Provided	
Operation interface	Touch screen	Method		Resistance film	
		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:–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.

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*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*1
Monitor	1,024 × 768 dots min.

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

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Barcode & 2D code reader for challenging imprinted and molded codes

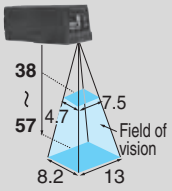
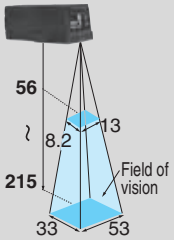
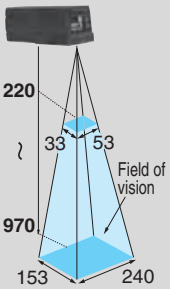
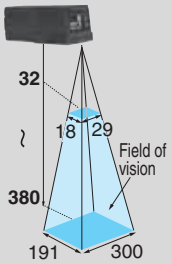
The FQ-CR2 allows the stable reading of codes that are molded or impressed into objects used e.g. in the automotive or electronic industry. The automatic adaption of settings ensures identifying the inspection conditions under which even challenging codes can be read.

- Optimized for imprinted or molded codes in metal, glass, PCB boards, etc.
- Automatic setting modification for finding best reading condition
- IP67

Ordering information

Field of vision		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 vision/Installation distance		Refer to figure 1.	Refer to figure 2.	Refer to figure 3.	Refer to figure 4.

Field of vision/Installation distance **(Unit: mm)**

Field of vision	Narrow View	Standard View	Wide View (Long-distance)	Wide View (Short-distance)
Appearance				
350,000 pixels type	Figure 1 	Figure 2 	Figure 3 	Figure 4 

Specifications

ID Model FQ-CR2 Series

Item		2D Code Reader
Model	NPN	FQ-CR20□□□□-M
	PNP	FQ-CR25□□□□-M
Field of view		Refer to ordering information on page 108. (Tolerance (field of vision): ±10% max.)
Installation distance		
Main functions	Inspection items	2D Code (Data Matrix(EC200), QR Code)
	Image filter	Filter function (Smooth, Dilate, Erosion, Median), Code Error Correction Position Display
	Verification function	None
	Retry function	Normal retry, Exposure retry, Scene retry, Trigger retry
	Number of simultaneous measurements	32
	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	1/250 to 1/32,258
	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)
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 three output signals can be allocated for the judgements of individual inspection items.
	Ethernet specifications	100Base-TX/10Base-T
	Communications	–
	I/O expansion	–
	RS-232C	–
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 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
	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, Quick Startup Guide, Member Registration Sheet, Warning Label
LED class		Class 2(Applicable standards: IEC 60825-1:1993 +A1:1997 +A2:2001,EN 60825-1:1994 +A1:2002 +A2:2001, and JIS C 6802:2005)
Applicable standards		EN 61326-1:2006 and IEC61010-1

Touch Finder

Item			Type	Model with DC power supply	Model with AC/DC/battery power supply
			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	
		Pixels		320 × 240	
		Display colors		16.7 million	
	Backlight	Life expectancy*1		50,000 hours at 25ºC	
		Brightness adjustment		Provided	
		Screen saver		Provided	
Operation interface	Touch screen	Method		Resistance film	
		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:–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.

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*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*1
Monitor	1,024 × 768 dots min.

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

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Date & lot code verifier

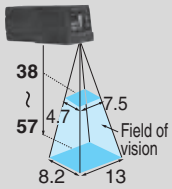
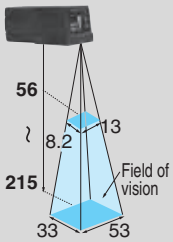
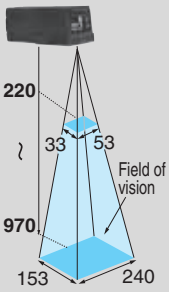
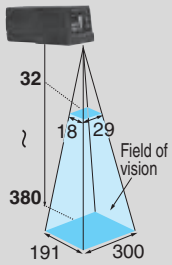
The FQ2-CH is the ideal solution for date & lot code verifications in packaging lines. With double speed and recognition even of angled or difficult to read texts, the sensor helps you avoid costly product returns or the installation of costly vision systems.

- Optimized for date & lot code verification in packaging lines
- Double speed
- Position compensation for angled prints
- IP67

Ordering information

Field of vision		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 vision/Installation distance		Refer to figure 1.	Refer to figure 2.	Refer to figure 3.	Refer to figure 4.

Field of vision/Installation distance **(Unit: mm)**

Field of vision	Narrow View	Standard View	Wide View (Long-distance)	Wide View (Short-distance)
Appearance				
350,000 pixels type	Figure 1 	Figure 2 	Figure 3 	Figure 4 

Specifications

ID Model FQ2-CH Series

Item		Optical Character Recognition Sensor
Model	NPN	FQ2-CH10□□□□-M
	PNP	FQ2-CH15□□□□-M
Field of view		Refer to ordering information on page 111. (Tolerance (field of vision): ±10% max.)
Installation distance		
Main functions	Inspection items	OCR · Alphabet A to Z · Number 0 to 9 · Symbol ' - . : / Model dictionary
	Image filter	Weak smoothing, Strong smoothing, Dilate, Erosion, Median, Extract edges, Extract horizontal edges, Extract vertical edges, Enhance edges, Background suppression
	Verification function	Supported
	Retry function	Normal retry, Exposure retry, Scene retry, Trigger retry
	Number of simultaneous measurements	32
	Position compensation	Supported (360° Model position compensation, Edge position compensation)
	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 1/50,000 Built-in lighting OFF: 1/1 to 1/50,000
	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 FINS/TCP no-protocol, EtherNet/IP, or PLC Link)
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) 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 FINS/TCP no-protocol, EtherNet/IP, or PLC Link
	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 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
	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, Quick Startup Guide, Member Registration Sheet, Warning Label
LED class		Class 2(Applicable standards: IEC 60825-1:1993 +A1:1997 +A2:2001,EN 60825-1:1994 +A1:2002 +A2:2001, and JIS C 6802:2005)
Applicable standards		EN 61326-1:2006 and IEC61010-1

Touch Finder

Item			Type	Model with DC power supply	Model with AC/DC/battery power supply
			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	
		Pixels		320 × 240	
		Display colors		16.7 million	
	Backlight	Life expectancy*1		50,000 hours at 25ºC	
		Brightness adjustment		Provided	
		Screen saver		Provided	
Operation interface	Touch screen	Method		Resistance film	
		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:–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□□ 0.4 A max.: FQ2-S3□-□□□ 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*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*1
Monitor	1,024 × 768 dots min.

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

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All-In-One (barcode, 2D code, text, quality inspection, positioning)

For the combination of code reading or verification tasks with quality inspection and/or positioning tasks, the FQ2-S4 is the ideal solution for all required functionalities in one compact housing. Up to 32 individual inspection tasks can be set up with the easy-to-use and detachable programming devices.

- All-in-one solution for up to 32 code reading & verification, text, quality inspection and positioning tasks
- Easy-to-use and detachable programming devices
- IP67

Ordering information

Standard Type

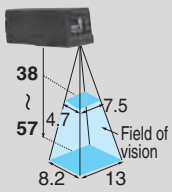
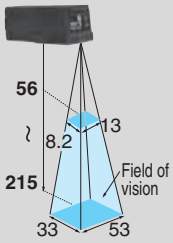
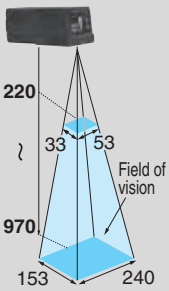
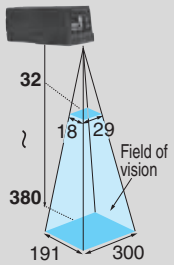
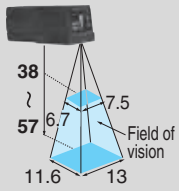
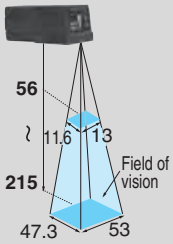
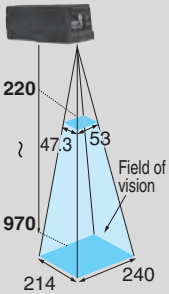
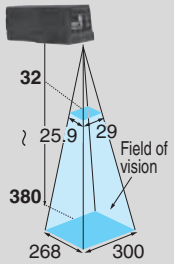
Field of vision		Narrow View	Standard View	Wide View (Long-distance)	Wide View (Short-distance)
Number of pixels		350,000 pixels			
Color	NPN	FQ2-S40010F	FQ2-S40050F	FQ2-S40100F	FQ2-S40100N
	PNP	FQ2-S45010F	FQ2-S45050F	FQ2-S45100F	FQ2-S45100N
Monochrome	NPN	FQ2-S40010F-M	FQ2-S40050F-M	FQ2-S40100F-M	FQ2-S40100N-M
	PNP	FQ2-S45010F-M	FQ2-S45050F-M	FQ2-S45100F-M	FQ2-S45100N-M
Field of vision/Installation distance		Refer to figure 1 on page 115.	Refer to figure 2 on page 115.	Refer to figure 3 on page 115.	Refer to figure 4 on page 115.

High-resolution Type

Field of vision		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 vision/Installation distance		Refer to figure 5 on page 115.	Refer to figure 6 on page 115.	Refer to figure 7 on page 115.	Refer to figure 8 on page 115.	Refer to optical chart on p. 116

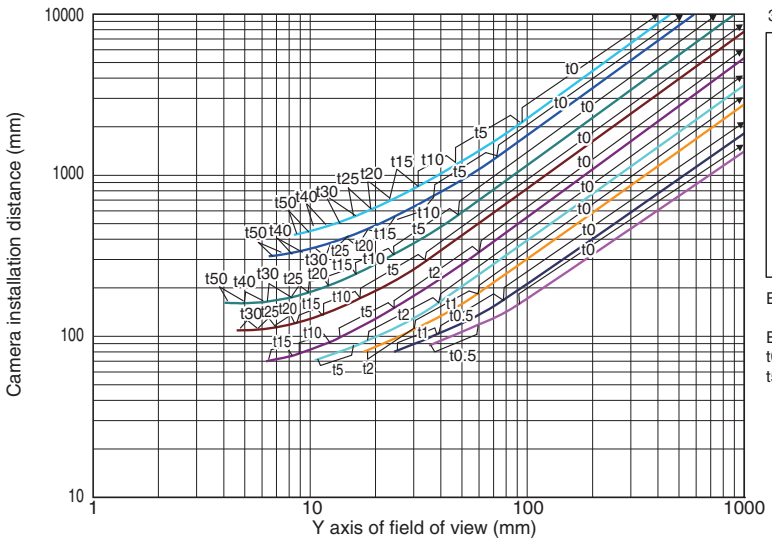
Field of vision/Installation distance

(Unit: mm)

Field of vision	Narrow View	Standard View	Wide View (Long-distance)	Wide View (Short-distance)
Appearance				
350,000 pixels type	Figure 1 	Figure 2 	Figure 3 	Figure 4 
760,000 pixels type	Figure 5 	Figure 6 	Figure 7 	Figure 8 

Optical Chart for C-mount Camera FQ2-S3□-13□/-S4□-13□

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



3Z4S-LE

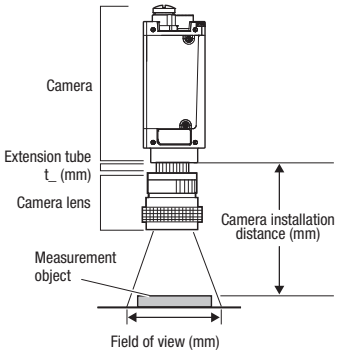
- SV-0614H
- SV-0814H
- SV-1214H
- SV-1614H
- SV-2514H
- SV-3514H
- SV-5014H
- SV-7525H
- SV-10028H

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 vision (mm) (See Note.), and the Y axis of the optical chart shows the camera installation distance (mm).

Note: The lengths of the fields of vision given in the optical charts are the lengths of the Y axis.



Specifications

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 page 115. (Tolerance (field of vision): ±10% max.)				Select a lens according to the field of vision and installation distance. Refer to optical chart on p. 116.	
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 (360° Model position compensation, Edge position compensation)					
	Number of registered scenes	32					
	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 1/50,000 Built-in lighting OFF: 1/1 to 1/50,000		Built-in lighting ON: 1/250 to 1/60,000 Built-in lighting OFF: 1/1 to 1/60,000		1/1 to 1/60,000	
	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 FINS/TCP no-protocol, EtherNet/IP, or PLC Link)					

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
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) 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 FINS/TCP no-protocol, EtherNet/IP, or PLC Link					
	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 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					
	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, Quick Startup Guide Member Registration Sheet, Warning Label				Mounting Base (FQ-XLC) (1) Mounting Screw (M3 × 8mm)(4) Instruction Manual, Quick Startup Guide Member Registration Sheet	
LED class		Class 2(Applicable standards: IEC 60825-1:1993 +A1:1997 +A2:2001, EN 60825-1:1994 +A1:2002 +A2:2001, and JIS C 6802:2005)				–	
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.
*2 The types of codes to be read are the same as those of FQ-CR1 Multi Code Reader.
*3 The types of codes to be read are the same as those of FQ-CR2 2D Code Reader.

Touch Finder

Item			Type	Model with DC power supply	Model with AC/DC/battery power supply
			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	
		Pixels		320 × 240	
		Display colors		16.7 million	
	Backlight	Life expectancy*1		50,000 hours at 25ºC	
		Brightness adjustment		Provided	
		Screen saver		Provided	
Operation interface	Touch screen	Method		Resistance film	
		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:–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□□ 0.4 A max.: FQ2-S3□-□□□ 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 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 (FQ2-D31). AC adapter (FQ-AC□) is required.
Charging time*1	2 h
Usage time*1	1.5 h
Battery backup life*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*1
Monitor	1,024 × 768 dots min.

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

Windows is registered trademarks 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.

Target, “touch&go”

- Easy to use – target, “touch&go”
- Build-in LCD monitor for immediate display of results
- Accurate – reading of direct print marks
- Variable field of view

Ordering information

Main unit

Name	Communications interface	Field of vision	Remarks	Order code
2D code reader	RS-232C	5x5 to 10x10 mm	–	V400-H111
	RS-232C	15x15 to 30x30 mm	–	V400-H211

Accessories

Name	Cable length	Remarks	Order code
Contactor	–	Contactor for positioning (detachable)	V400-AC2
Communications cable	2 m	For SYSMAC series connection (with power cord)	V400-W20-2M
	5 m		V400-W20-5M
	2 m	For PC-compatible connection (with power cord)	V400-W21-2M
	5 m		V400-W21-5M
	2 m	For PC-compatible connection (when using AC adaptor)	V400-W22-2M
	5 m		V400-W22-5M
AC adaptor	–	–	V600-A22

Ratings and specifications

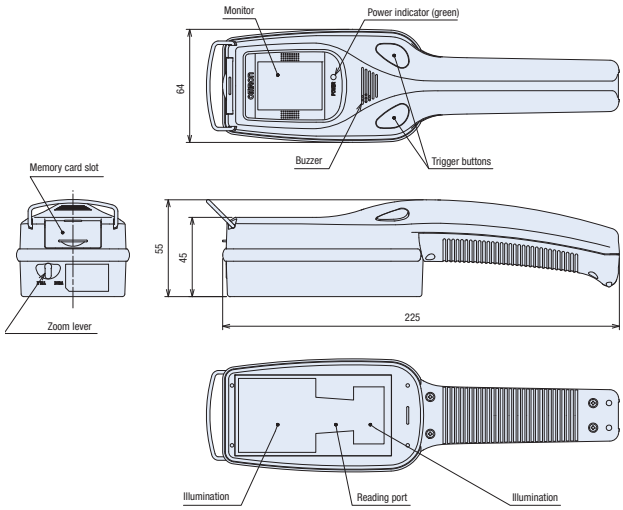
Item	V400-H111	V400-H211
Field of vision	5x5 to 10x10 mm	15x15 to 30x30 mm
Working distance	40 mm (flush when contactor is mounted)	
Power supply	5 VDC ±10%	
Current consumption	1.0 A max.	
Serial interface	RS-232C	
Applicable codes	Data matrix, ECC200, 10x10 to 64x64, 8x18 to 16x48, QR code (models 1, 2), 21x21 to 57x57 (versions 1 to 10)	
Operation method	Pressing the trigger button	
Settings	Make settings by using the manual setting window, uploading from an SD memory card, or by using support software.	
Memory card	SD memory card	
Monitor	1.8 inch TFT LCD, displaying images and read data	
Display illumination	Operation display, memory card access	
Ambient temperature	Operation: 0 to 40°C, storage: -25 to 60°C	
Ambient humidity	35 to 85% (with no condensation)	
Ambient conditions	No corrosive gases	
Vibration resistance	10 to 150 Hz, single amplitude 0.35 mm (50 m^2/s max. acceleration)	
Shock resistance	150 m^2/s in ±X, Y, and Z directions, 3 times	
Weight	Approx. 230 g	
Degree of protection	IEC 60529 IP64	
Materials	Case: ABS; optical surface: PC; display surface: PMMA	

Dimensions

(Unit: mm)

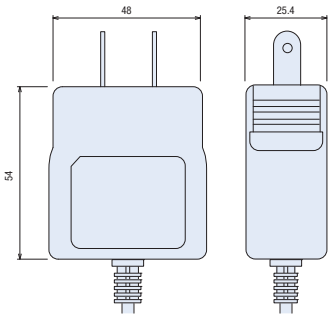
Main unit

V400-H111/V400-H211



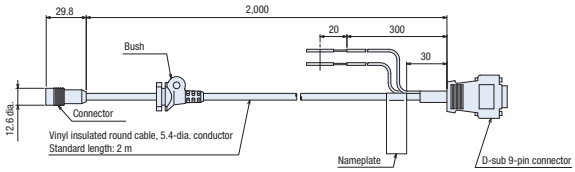
AC Adaptor

V600-A22

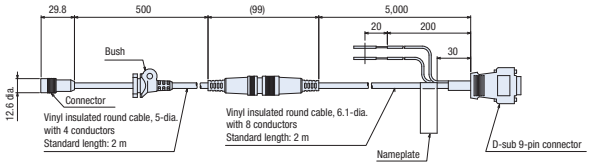


Communication cable

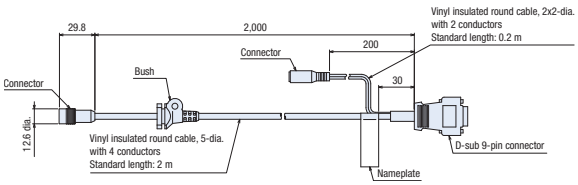
V400-W20-2M/V400-W21-2M



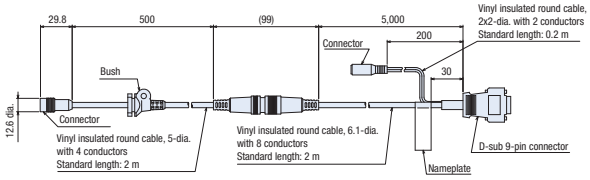
V400-W20-5M/V400-W21-5M



V400-W22-2M

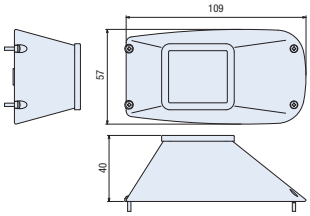


V400-W22-5M



Contactor

V400-AC2

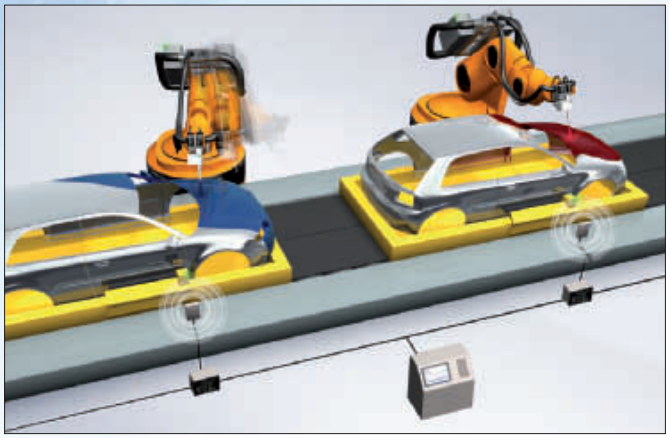


V680 RFID SYSTEM

One for all

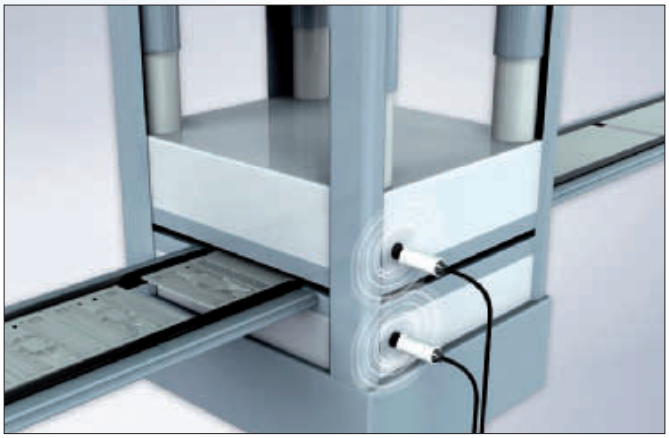
Whenever you need to have full transparency of your production process or logistic application V680 is helping you to manage your data most comfortably and reliably.

- Diagnostic functions for maintenance
- One for all: modular platform concept
- Flexible installation: long reach antennas
- Fit for speed: high turn around time
- Save time & costs: easy setup & maintenance



Production ID system for the paint shop

A RFID system is used to store the process parameters needed for the production of the car throughout the process. Harsh conditions through chemicals and high temperatures occur during the production steps. RFID is ideal for this application as it features high resistance tags for harsh conditions.

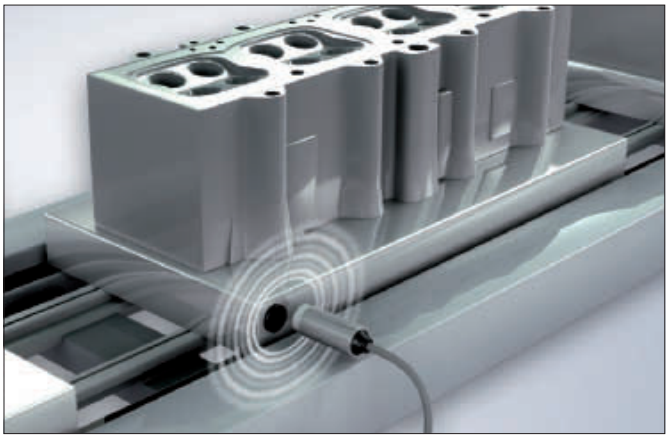


Monitoring of the moulding history

Process and maintenance related information of a moulding press can be stored by using RFID. The information can be read out permanently or on demand from a remote location and can be used to control the process.

YOUR BENEFITS

- High speed air communication
- Standardized protocol (ISO 15693)
- Large memory (up to 32kByte) and very compact tags
- Long life time of tags (FERAM variants)
- All protocols for PLC communication



Traceability of automotive parts

Track the parts in the production process. Process related information can be stored to guarantee high quality production.

Carrier Management

For the administration and traceability of transport carriers along the hole process RFID represents a smart solution. V680 is working on the standardized universal frequency of 13.56MHz. The flexible platform with its versatile and compact design can be easily integrated into any point in the production process.

V680 RFID Platform overview

Mobile transponder (FeRAM + EEPROM)

Please refer to the datasheet for the recommended antennas

V680-D1KP52MT, 1 kByte (metal mounting)
V680-D2KF52M, 2 kByte (metal mounting)

V680-D1KP66T, 2 kBytes
V680-D1KP66MT, 1 kBytes (metal mounting)

V680-D2KF67, 2 kBytes
V680-D2KF67M, 2 kBytes (metal mounting)
V680-D8KF67, 8 kBytes
V680-D8KF67M, 8 kBytes (metal mounting)

V680-D1KP66T-SP, 1 kByte
(PFA enclosure / chemical resistant)

V680-D8KF68, 8 kBytes
V680-D32KF68, 32 kBytes

Wireless data acquisition

Antenna/Interrogator*

V680-HS51/M12

V680-HS52/M22

V680-HS63, rectangular

V680-HS65, rectangular

Amplifier*

V680-HA63A, 1kByte
V680-HA63B, >1kByte

Amplifier with noice measurement function (for use of serial controller or PLC unit)

V680-H01-V2, rectangular
(with integrated amplifier)

Handheld reader/writer

Handheld reader
USB for PC/IPC use
V680 CHUD (V680-CH1D / RS232 / 5V DC connector)

Handheld reader
RS-232C for handheld terminal
V680-CH1D-PSI
5V AC adapter for V680-CH1D: E3X-MC11-S-PS3 BYOMG

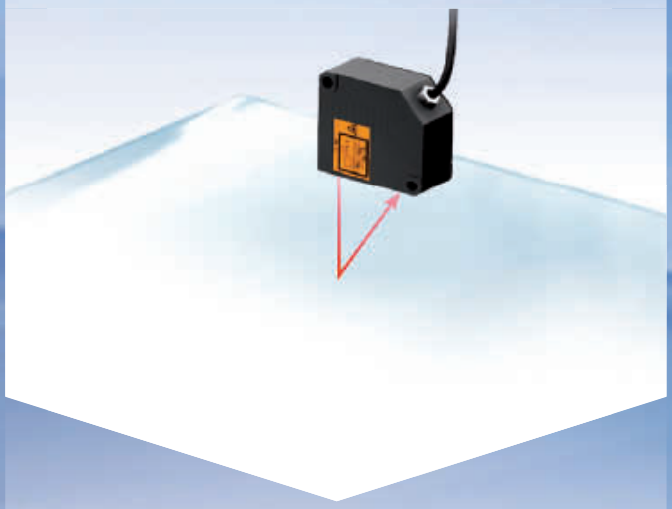
Controlling device	Feature and benefits	Communication and system integration
Easy to maintain 1/2 controller for long wired serial communication V680-CA5D01-V2 (1 channel) V680-CA5D02-V2 (2 channels) 	High speed communication system noise and distance measurement for self diagnosis and preventive maintenance. Protocol analyzer function comfortable software for quick start-up and operation.	**Serial communication for long wiring (<500 m)**
Modular multi functional RFID communication system CJ1W-V680-C11 (1 channnel) CJ1W-V680-C12 (2 channels) CS1W-V680-C11 (1 channnel) CS1W-V680-C12 (2 channels) 	Future-proofed RFID system with enhanced connectivity and additional functionality. Up to 160 antennas can be cascaded Multi-functional intelligent controller for multi-purpose use. V680-C#-SYS can be operated as multi-tasking stand-alone system beside of existing PLC setups CX-One Software allows easy integration using function blocks.	**Advanced modular RFID communication system:** **- Ethernet IP** **- DeviceNet** **- PROFIBUS-DP** **- CAN** **- CompoBus/S**
V680-HAM81 PNP ID Flag Sensor V680-HAM91 NPN ID Flag Sensor 	Cost effective DeviceNet slave controller with integrated amplifier for direct connection to any DeviceNet nodes.	**DeviceNet fieldbus high speed communication (integrated amplifier)**
ID Flag Sensor (PNP/NPN) V680-HAM81/HAM91 	Easy to setup ID flag system addressing up to 64.000 ID's.	**ID flag sensor communication**
Handheld Terminal V680-A-7527S-G2-EG-S 	Wireless handheld to R/W data at any time in production process or logistics. Further possibility to communicate on PC/IPC platform via USB. Demosoftware is pre-installed.	**Handheld/PLC/PC communication**

MEASUREMENT SENSORS

Never fail in measurement

Customer satisfaction highly depends on the quality of the finished goods or the performance of the machine in use. Zero defects in production is a key criterion for success. The speed of production lines is getting increasingly faster. On the other hand the machines should never fail. But can you trust the result?

To ensure highest inspection performance these smart measurement sensors offer accurate, reliable and fast measure-ment. Various inspection principles and techno-logies always provide the best solution for your application.



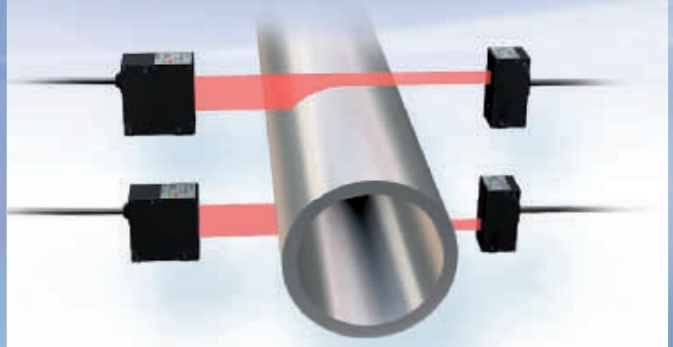
DISPLACEMENT/DISTANCE

Accurate measurement of distances can be done by laser triangulation, inductive or tactile principles.
The Smart sensors ZX and ZS represent a powerful platform matching the accuracy and technology, which is required for this application.

ZX	ZW	ZS
		
C437, C436, see page 128	C438, see page 136	C425, see page 144

DISPLACEMENT / DISTANCE

Scan the profile of an object with a laser beam.
Depending of the height, the laser beam is reflected differently and creates the profile information. By moving the sensor or the object, the complete surface can be inspected. The Smart profile sensors ZG provides an easy to use solution.



POSITION / DIAMETER / WIDTH

Determine accurately the position or diameter of an object. The object interrupts the laser beam, which allows the edges of an object to be determined. The smart laser micrometer ZX-GT is the perfect choice for this task.
For large area monitoring and height measurements up to 2 m with cm accuracy see F3EM measuring light curtains in INDUSTRIAL SENSING GUIDE.

ZG2	ZX-GT	F3EM
		
C422, see page 146	C435, see page 148	B633

ZX-Series – smart sensing in different technologies

The ZX displacement sensor platform offers a variety of interchangeable sensor heads, including laser, inductive and contact types. They can be easily connected to a standard amplifier.

Simply select the sensor head that fits your application based on material and accuracy. The easy exchange of sensor heads reduces installation time and saves maintenance costs.

The modular platform enables different sensing technologies to be combined in one platform. The easy set-up of ZX can be done with the amplifier or by the intuitive Smart Monitor PC software.

SENSOR HEADS ZX

ZX-L – smart laser displacement

- Sensing range from 2 mm – 500 mm
- High resolution
- Fast response time
- Surfaces: plastic, metal, paper, rubber, etc.

C426

ZX-E – smart inductive displacement

- High resolution of 1 µm
- Sensing range from 0.5 mm – 7 mm
- High linearity for any metal
- Mutual interference prevention
- Thickness, evenness, warpage measurement

C427

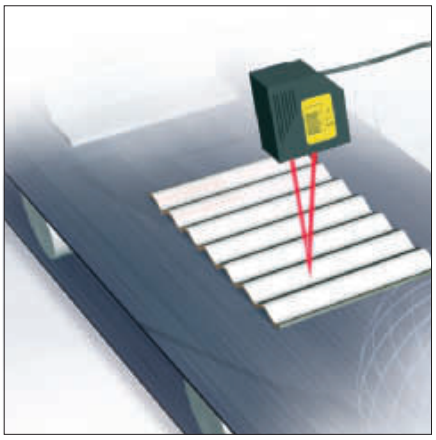
ZX-T – Smart contact measurement

- Wide range of heads and contact tips
- Long life ball bearing structure
- High resolution of 0.1 µm
- Pressing force alarm to prevent malfunctions

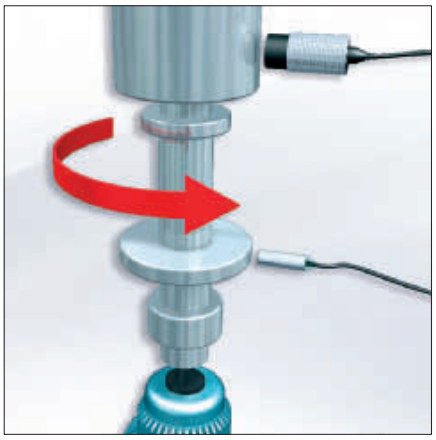
C428

YOUR BENEFITS

- Modular platform
- Combine tactile, inductive and laser sensors
- Plug and play – interchangeable sensor heads
- Multi-point measurements
- Calculate and communicate
- Digital I/Os and analogue outputs



Measurement of structured surfaces



Eccentricity control of a rotating shaft

Thickness measurement

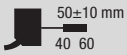
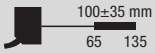
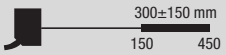
Highest performance for optimized productivity

Highest performance is now available in matchbox size. We are defining a new class of measurement sensors using an advanced HSDR-CMOS (High Speed and Dynamic Range) camera chip.

- Stable measurement for objects with any surface
- Best in class performance for accuracy and speed
- Compact size for quick mounting
- Increased measurement range
- Simple configuration by one-button, Smart Tuning
- Reliable measurement in harsh environments
- Integrated display

Ordering information

Sensors

Appearance	Connection method	Cable length	Sensing distance	Order code	
				NPN output	PNP output
	Pre-wired	2 m		ZX1-LD50A61 2M	ZX1-LD50A81 2M
		5 m		ZX1-LD50A61 5M	ZX1-LD50A81 5M
	Pre-wired connector	0.5 m		ZX1-LD50A66 0.5M	ZX1-LD50A86 0.5M
	Pre-wired	2 m		ZX1-LD100A61 2M	ZX1-LD100A81 2M
		5 m		ZX1-LD100A61 5M	ZX1-LD100A81 5M
	Pre-wired connector	0.5 m		ZX1-LD100A66 0.5M	ZX1-LD100A86 0.5M
	Pre-wired	2 m		ZX1-LD300A61 2M	ZX1-LD300A81 2M
		5 m		ZX1-LD300A61 5M	ZX1-LD300A81 5M
	Pre-wired connector	0.5 m		ZX1-LD300A66 0.5M	ZX1-LD300A86 0.5M
	Pre-wired	2 m		ZX1-LD600A61 2M	ZX1-LD600A81 2M
		5 m		ZX1-LD600A61 5M	ZX1-LD600A81 5M
	Pre-wired connector	0.5 m		ZX1-LD600A66 0.5M	ZX1-LD600A86 0.5M

Accessories (sold separately)

Extension cables for pre-wired connector models

An Extension cable is not provided with the sensor. Order an extension cable separately.

Cable length	Order code
10 m	ZX0-XC10R
20 m	ZX0-XC20R

Specifications

Model	NPN output	ZX1-LD50A61 ZX1-LD50A66	ZX1-LD100A61 ZX1-LD100A66	ZX1-LD300A61 ZX1-LD300A66	ZX1-LD600A61 ZX1-LD600A66
Item	PNP output	ZX1-LD50A81 ZX1-LD50A86	ZX1-LD100A81 ZX1-LD100A86	ZX1-LD300A81 ZX1-LD300A86	ZX1-LD600A81 ZX1-LD600A86
Measurement range		50±10 mm	100±35 mm	300±150 mm	600±400 mm
Light source (wave length)		Visible-light semiconductor laser (wavelength: 660 nm, 1 mW max., IEC/EN Class 2, FDA Class II *1)			
Spot diameter (typical) (Defined at the measurement center distance) *2		0.17 mm dia.	0.33 mm dia.	0.52 mm dia.	0.56 mm dia.
Power supply voltage		10 to 30 VDC, including 10% ripple (p-p)			
Current consumption		250 mA max. (at power supply voltage 10 VDC)			
Control output		Load power supply voltage: 30 VDC max., Load current: 100 mA max. (Residual voltage: 1 V max. (load current 10 mA or less), 2 V max. (load current of 10 to 100 mA))			
Analog output		Current output: 4 to 20 mA, maximum load resistance: 300 Ω			
Indicators		Digital display (red), output indicator (OUT1, OUT2) (orange), zero reset indicator (orange), menu indicator (orange), laser ON indicator (green), and smart tuning indicator (blue)			
Response time	Judgment output	Super-high-speed (SHS) Mode: 1 ms High-speed (HS) Mode: 10 ms Standard (Stnd) Mode: 100 ms			
	Laser OFF input	200 ms max.			
	Zero reset input	200 ms max.			
Temperature characteristic *3		0.03% F.S./°C			0.04% F.S./°C
Linearity *4		±0.15% F.S.		±0.25% F.S.	±0.25% F.S. (200 to 600 mm) ±0.5% F.S. (entire range)
Resolution *5		2 µm	7 µm	30 µm	80 µm
Ambient illumination		Illumination on received light surface: 7,500 lx or less (incandescent light)		Illumination on received light surface: 5,000 lx or less (incandescent light)	
Ambient temperature		Operating: -10 to +55°C, Storage: -15 to +70°C (with no icing or condensation)			
Ambient humidity		Operating and storage: 35% to 85% (with no condensation)			
Dielectric strength		1,000 VAC, 50/60 Hz, 1 minute3			
Vibration resistance (destruction)		10 to 55 Hz, 1.5-mm double amplitude, 2 hours each in X, Y, and Z directions			
Shock resistance (destruction)		500 m/s^2 3 times each in X, Y, and Z directions			
Degree of protection *6		IEC 60529, IP67			
Connection method		Pre-wired model (Standard cable length: 2 m, 5 m) Pre-wired connector model (Standard cable length: 0.5 m)			
Weight (packed state/ sensor only)	Pre-wired models (2 m)	Approx. 240 g / Approx. 180 g		Approx. 270 g / Approx. 210 g	
	Pre-wired models (5 m)	Approx. 450 g / Approx. 330 g		Approx. 480 g / Approx. 360 g	
	Pre-wired connector models (0.5 m)	Approx. 170 g / Approx. 110 g		Approx. 200 g / Approx. 140 g	
Materials		Case and cover: PBT (polybutylene terephthalate), Optical window: Glass, Cable: PVC, Mounting hole part: SUS303			
Accessories		Instruction sheet and Laser warning label (English)			

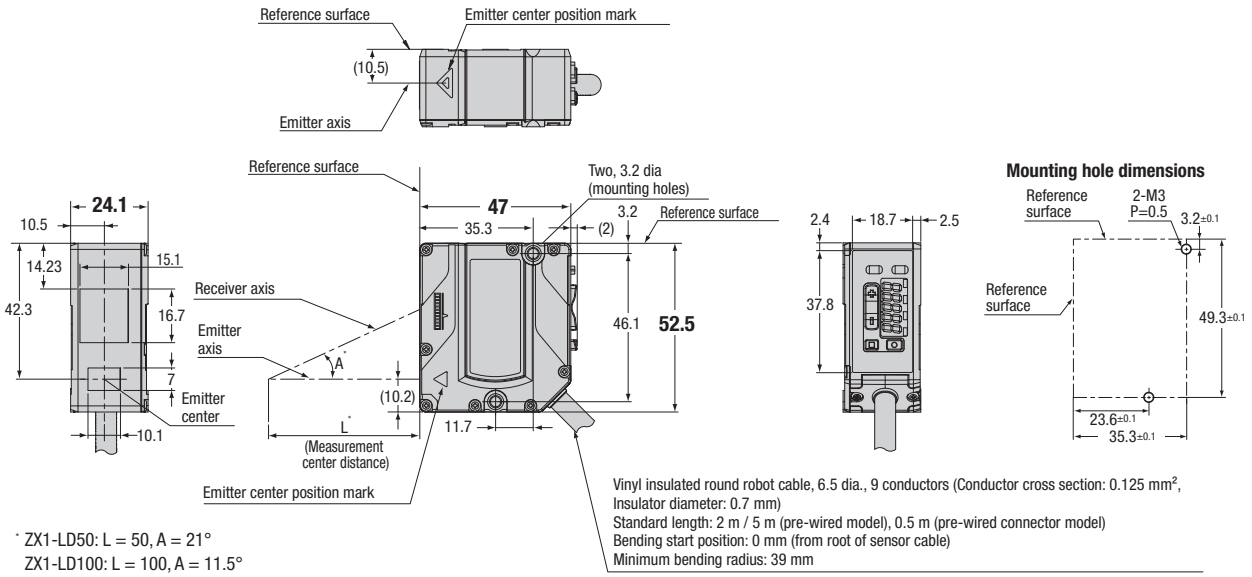
*1 Classified as Class 2 by EN60825-1 criteria in accordance with the FDA standard previsions of Laser Notice No. 50. Notification to CDRH planned. (Center for Devices and Radiological Health)
*2 Spot diameter: Defined as 1/e^2 (13.5%) of the central intensity at the measurement center distance.
False detections can occur in the case there is light leakage outside the defined region and the surroundings of the target object have a high reflectance in comparison to the target object.
Accurate measurements may not be possible for workpieces that are smaller than the spot diameter.
*3 Temperature characteristic: Value for the case the space between the sensor and Omron's standard target object is secured by an aluminum jig. (Measured at the measurement center distance)
*4 Linearity: Indicates the error with respect to the ideal straight line of the displacement output in the case of measuring Omron's standard target object (white ceramic) at a temperature of 25°C.
Linearity and measured value may vary depending on target object.
*5 Resolution: Defined in Standard Mode for Omron's standard target object (white ceramic) after executing Smart Tuning.
The resolution indicates the repetition accuracy for a still workpiece. Not an indication of the distance accuracy.
Resolution performance may not be satisfied in a strong electromagnetic field.
*6 IP67 protection applies to the connector on pre-wired connector models if an extension cable is connected.

Note: False detection outside the measurement range can occur in the case of an object with high reflectance.

Dimensions

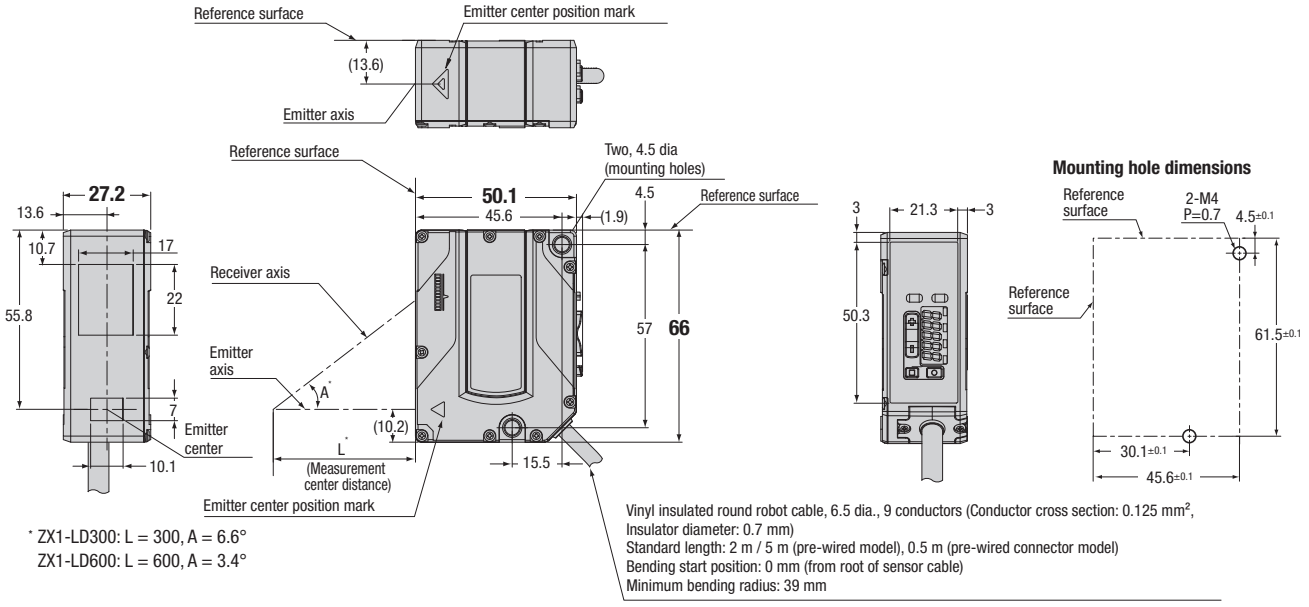
Sensors

Pre-wired models ZX1-LD50A_1/ZX1-LD100A_1
Pre-wired connector models ZX1-LD50A_6/ZX1-LD100A



* ZX1-LD50: L = 50, A = 21°
ZX1-LD100: L = 100, A = 11.5°

Pre-wired models ZX1-LD300A_1/ZX1-LD600A_1
Pre-wired connector models ZX1-LD300A_6/ZX1-LD600A_6



* ZX1-LD300: L = 300, A = 6.6°
ZX1-LD600: L = 600, A = 3.4°

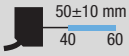
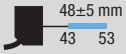
Stable, easy & affordable laser measurement sensor

High accuracy and measurement stability, at an affordable price. The new ZX2 laser sensor offers best in class performance for accuracy and speed for all linear displacement applications. Utilising an advanced HSDR-CMOS image sensor, high measurement stability is achieved, even on the most challenging of surfaces.

- One touch setup
- Accurate: 1.5–5 µm
- Any surface
- High speed: 30 µs

Ordering information

Sensor heads

Optical system	Beam shape	Sensing distance	Resolution	Order code
Diffuse-reflective	Line beam		1.5 µm	ZX2-LD50L
	Spot beam			ZX2-LD50
	Line beam		5 µm	ZX2-LD100L
	Spot beam			ZX2-LD100
Regular reflective	Spot beam		1.5 µm	ZX2-LD50V

Amplifier units

Power supply	Output type	Order code
DC	NPN	ZX2-LDA11
	PNP	ZX2-LDA41

Accessories (order separately)

These are not included with the Sensor Head or Amplifier Unit.
Please order as necessary.

Calculating unit

	Order code
Calculating unit	ZX2-CAL

Sensor head extension cables*1

Cable length	Order code
1 m	ZX2-XC1R
4 m	ZX2-XC4R
9 m	ZX2-XC9R
20 m	ZX2-XC20R

*1. Extension cables cannot be coupled and used together.

Mounting brackets

Applicable Sensor Heads	Appearance	Contents	Order code
ZX2-LD50V ZX2-LD50L ZX2-LD50		Mounting Bracket: 1 Nut plate: 1 Phillips screws (M3×30): 2	E39-L178
ZX2-LD100L ZX2-LD100			E39-L179

Specifications

Diffuse reflective Sensor Heads

Item Model	ZX2-LD50L	ZX2-LD50	ZX2-LD100L	ZX2-LD100
Optical system	Diffuse reflective			
Light source (wave length)	Visible-light semiconductor laser with a wavelength of 660 nm and an output of 1 mW max.			
	EN class 2,FDA class II*5			
Measurement center point	50 mm		100 mm	
Measurement range	±10 mm		±35 mm	
Beam shape	Line	Spot	Line	Spot
Beam size*1	Approx. 60 µm×2.6 mm	Approx. 60 µm dia.	Approx.110 µm×2.7 mm	Approx.110 µm dia.
Resolution*2	1.5 µm		5 µm	
Linearity*3	±0.05% F.S. (40 to 50 mm)	±0.1% F.S. (40 to 50 mm)	±0.05%F.S. (65 to 100 mm)	±0.1%F.S. (65 to 100 mm)
	±0.1% F.S. (entire range)	±0.15% F.S. (entire range)	±0.1% F.S. (entire range)	±0.15% F.S. (entire range)
Temperature characteristic*4	0.02% F.S./°C			
Ambient illumination	Incandescent lamp: 10,000 lx max. (on light receiving side)			
Ambient temperature	Operating: 0 to +50°C, Storage: -15 to +70°C (with no icing or condensation)			
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)			
Dielectric strength	1,000 VAC, 50/60 Hz for 1 minute.			
Vibration resistance (destruction)	10 to 150 Hz, 0.7-mm double amplitude, 80 minutes. each in X,Y,and Z directions			
Shock resistance (destruction)	300 m/s^2 3 times each in six directions (up/down,left/right,forward/backward)			
Degree of protection	IEC60529, IP67			
Connection method	Connector connection (standard cable length: 500 mm)			
Weight (packed state)	Approx.160 g (Sensor Head only: Approx.75 g)			
Materials	Case and cover: PBT (polybutylene terephtahalate), Optical window: Glass, Cable: PVC			
Accessories	Instruction sheet, Ferrite core, Laser warning label (English), FDA certification label			

Regular-reflective Sensor Heads

Item Model	ZX2-LD50V
Optical system	Regular reflective
Light source (wave length)	Visible-light semiconductor laser with a wavelength of 660 nm and an output of 0.24 mW max. EN class 1, FDA class I
Measurement center point	48 mm
Measurement range	±5 mm
Beam shape	Spot
Beam size*1	Approx. 60 µm dia.
Resolution*2	1.5 µm
Linearity*3	±0.3% F.S. (entire range)
Temperature characteristic*4	0.06% F.S./°C
Ambient illumination	Incandescent lamp: 10,000 lx max. (on light receiving side)
Ambient temperature	Operating: 0 to +50°C, Storage: -15 to +70°C (with no icing or condensation)
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 minute.
Vibration resistance (destruction)	10 to 150 Hz, 0.7-mm double amplitude, 80 minutes. each in X,Y,and Z directions
Shock resistance (destruction)	300 m/s^2 3 times each in six directions (up/down,left/right,forward/backward)
Degree of protection	IEC 60529, IP67
Connection method	Connector connection (standard cable length: 500 mm)
Weight (packed state)	Approx.160 g (Sensor Head only: Approx.75 g)
Materials	Case and cover: PBT (polybutylene terephtahalate), Optical window: Glass, Cable: PVC
Accessories	Instruction sheet, Ferrite core, Laser warning label (English)

*1 Beam size: Defined as 1/e^2 (13.5%) of the central intensity at the smallest value of diameter for the measurement range (typical value) False detections can occur in the case there is light leakage outside the defined region and the surroundings of the target object have a high reflectance in comparison to the target object.

*2 Resolution: indicates the degree of fluctuation (±3σ) of analog output when connected to the ZX2-LDA. (The measured value is given for the center distance for OMRON's standard target object (diffuse-reflective models: white ceramic object, regular-reflective models: 1/4 λ flat mirror) when the response time of the ZX2-LDA is set to 128 ms.)
Indicates the repetition accuracy for when the workpiece is in a state of rest. Not an indication of distance accuracy. Resolution performance may not be satisfied in a strong electromagnetic field.

*3 Linearity: indicates the error with respect to the ideal straight line of the displacement output in the case of measuring Omron' s standard target object. Linearity and measured value may vary depending on target object. F.S. indicates the full scope of the measurement range. (ZX2-LD50 (L): 20mm)

*4 Temperature characteristic: Value for the case the space between the sensor head and Omron's standard target object is secured by an aluminum jig. (Measured at the measurement center distance)

*5 These Sensors are classified as Class 2 laser devices for diffuse-reflective models and Class 1 for regular-reflective models under EN 606825-1 and the regulations of Laser Notice No. 50 for FDA certification. CDRH registration has been completed for diffuse-reflective models and is scheduled for regular-reflective models.

Note: False detection outside the measurement range can occur in the case of an object with high reflectance.

Amplifier units

Item	ZX2-LDA11	ZX2-LDA41
Measurement period*1	Min 30 μs	
Response time	60 μs, 120 μs, 240 μs, 500 μs, 1 ms, 2 ms, 4 ms, 8 ms, 12 ms, 20 ms, 36 ms, 66 ms, 128 ms, 250 ms, 500 ms	
Analog output*2	4 to 20 mA, Max. load resistance: 300Ω, ±5VDC or 1 to 5 VDC, Output impedance: 100Ω	
Judgement outputs (HIGH/PASS/LOW: 3 outputs), error output	NPN open-collector outputs, 30 VDC, 50 mA max.(residual voltage: 1 V max. for load current 10 mA max.,2 V max. for load current above 10 mA)	PNP open-collector outputs, 30 VDC, 50 mA max.(residual voltage: 1 V max. for load current 10 mA max., 2 V max. for load current above 10 mA)
Laser OFF input, zero reset input, timing input, reset input, bank input	ON: Short-circuited with 0-V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)	ON: Supply voltage short-circuited or supply voltage within 1.5 V OFF: Open (leakage current: 0.1 mA max.)
Functions	Smart tuning, scaling, sample hold, peak hold, bottom hold, peak-to-peak hold, self-peak hold, self-bottom hold, average hold, zero reset, On-delay timer, OFF-delay timer, keep/clamp switch, (A-B)calculations*3, thickness calculation*3, mutual interference prevention*3, laser deterioration detection, bank function (4 banks)	
Indications	Judgement indicators: HIGH (orange), PASS (green), LOW (orange), 11-segment main display (red), 11-segmentsub-display (orange), laser ON (green), zero reset (green), enable (green), menu (green), HIGH threshold (orange), LOW threshold (orange)	
Power supply voltage	10 to 30 VDC, including 10% ripple(p-p)	
Power consumption	3,000 mW max. with power supply voltage of 30 VDC and power supply current of 100 mA (with Sensor connected)	
Ambient temperature	Operating: 0 to +50°C, Storage: -15 to +70°C (with no icing or condensation)	
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min.	
Vibration resistance (destruction)	10 to 150 Hz, 0.7-mm double amplitude, 80 min. each in X,Y,and Z directions	
Shock resistance (destruction)	300 m/s^2 3 times each in six directions (up/down,left/right,forward/backward)	
Degree of protection	IEC60529, IP40P	
Connection method	Prewired (standard cable length: 2 m)	
Weight (packed state)	Approx. 200 g (unit only: Approx.135 g)	
Materials	Case: PBT(polybutylene terephtahalate), Cover: Polycarbonate, Display: Acrylic resin, Button: Polyacetal, Cable: PVC	
Accessories	Instruction sheet	

*1 In the case of Omron's standard target object (white ceramic)
*2 Configure current output (4 to 20mA) and voltage output (±5V or 1 to 5V) by MENU mode.
*3 Calculating unit (ZX2-CAL) is necessary.

Calculating unit

Item	ZX2-CAL
Applicable amplifier units	ZX2-LDA11/ZX2-LDA41
Current consumption	12 mA max. (supplied from the smart sensor amplifier unit)
Ambient temperature	Operating: 0 to +50°C, storage: -15 to +70°C (with no icing or condensation)
Ambient humidity	Operating and storage: 35 to 85% RH (with no condensation)
Connection method	Connector
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min
Insulation resistance	100 MΩ (at 500 VDC)
Vibration resistance (destructive)	10 to 150 Hz, 0.7-mm double amplitude 80 min each in X, Y, and Z directions
Shock resistance (destructive)	300 m/s^2 3 times each in six directions (up/down, left/right, forward/backward)
Materials	Case: PBT (polybutylene terephthalate), Display: Acrylic resin
Weight (packed state)	Approx. 50 g
Accessories	Instruction sheet

CONFOCAL FIBER DISPLACEMENT SENSOR ZW SERIES

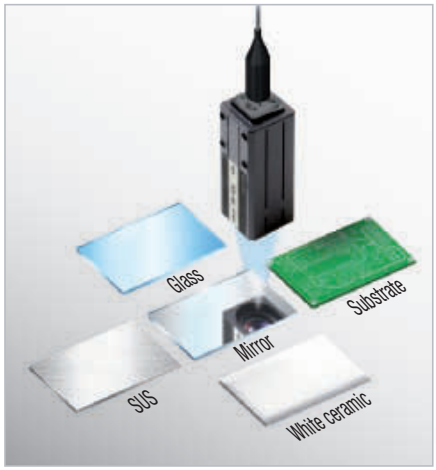
White light confocal principle for high-resolution measurement

Displacement Sensors are indispensable in non-contact measurement of heights, thicknesses, and other dimensions in machine operation control. However, building them into the system has always presented problems. The Confocal Fiber Displacement ZW Series Sensor solves these problems in ways that were not possible with traditional triangulation.
The ZW-series Sensors provide the compact size, light weight, immunity to electrical/magnetic noise, and other features to make them ideal for solving installation space problems.
And OMRON's new confocal principle provides the measurement resolution that is needed for operation control.
The ZW Series solves the problems that came with laser triangulation, such as deviations between different materials and inclination tolerance.

Ultra-compact and Ultra-lightweight

The slim design measures only 24 × 24 mm. It weighs only 105 g. This incredibly compact size could not be achieved with traditional triangulation. Any objects can be measured with the Sensor mounted perpendicular to them to save even more space.

Stable Measurements for any Material



You can measure objects of any material or color at the same position. A wide angle characteristic of ±8° enables high-resolution measurement of the position even for large objects with mirror-like surfaces without being affected by warping.

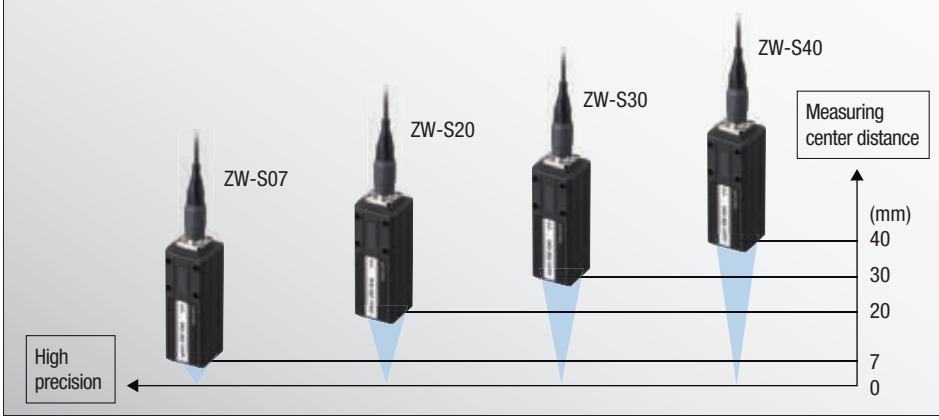
Robust Sensor Head Structure

The sensor head design maintains reliable operation in installations with electronic and magnetic noise. Devices in close proximity will not be affected by noise or heat from the sensor head or fiber cables d to their advanced design.

YOUR BENEFITS

- Ultra-compact and Ultra-lightweight
- Stable Measurements for any Material
- Robust Sensor Head Structure
- No electromagnetic noise - You can therefore use them reliably together with other devices
- Generate no heat and therefore do not affect nearby equipment. You can also install many Sensor Heads side by side and still be sure of reliable operation.

A WIDER SELECTION OF MODELS WITH THE SAME HEAD SIZE



Expanded Communications

- Standard-feature EtherCAT
- Standard-feature EtherNet/IP ™

-EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.
-EtherNet/IP™ are the trademarks of ODVA.

Ultra-compact, lightweight sensor measures any material

The ZW confocal fiber displacement sensor delivers stable, non-contact, in-line measurement of heights, thicknesses and other dimensions. It solves the problems of traditional laser triangulation sensors: deviation between different material and inclination tolerance. The compact sensing head has no electronic parts to eliminate problems of installation space and mutual interference, electrical/magnetic noise, temperature rise and mechanical positioning.

- Minimum resolution: 0.01 µm
- Ultra-compact sensing head: 24 × 24 mm; weighs only 105 g
- High flexibility robotic cable from sensor to controller, extends 32 m
- Mount sensing head one time: no need to re-tune for changing materials
- Separate amplifier provides white LED light source, spectroscope and processor to convert reflected color light to distance
- Automation Software Sysmac Studio simplifies system operation and setting

Ordering information

Sensor heads

Measuring range	Spot diameter	Static resolution	Order code*1
7±0.3 mm	18 µm dia.	0.01 µm*2/0.25 µm	ZW-S07
20±1 mm	40 µm dia.	0.02 µm*2/0.25 µm	ZW-S20
30±3 mm	60 µm dia.	0.06 µm*2/0.25 µm	ZW-S30
40±6 mm	80 µm dia.	0.08 µm*2/0.25 µm	ZW-S40

*1 When ordering, specify the cable length (0.3 m, 2.0 m).
*2 The high resolution types are subject to the export control restrictions

Controller with EtherCAT

Power supply	Output type	Order code
24 VDC	NPN	ZW-CE10T/ZW-C10*1
	PNP	ZW-CE15T/ZW-C15*1

*1 The high resolution types are subject to the export control restrictions

Note: Controllers with binary outputs are also available (ZW-C10T/-C15T). Please contact your OMRON sales representative for details.

Cable

Item	Cable length	Order code
Sensor Head - Controller Extension Fiber Cable (flexible cable) (Fiber Adapter ZW-XFC provided)	2 m	ZW-XF02R
	5 m	ZW-XF05R
	10 m	ZW-XF10R
	20 m	ZW-XF20R
	30 m	ZW-XF30R
Fiber Adapter (between Sensor Head pre-wired cable and Extension Fiber Cable)	–	ZW-XFC
Parallel cable for ZW-CE1□ 32-pole*1	2 m	ZW-XCP2E
RS-232C Cable for personal computer	2 m	ZW-XRS2
RS-232C Cable for PLC/programmable terminal	2 m	ZW-XPT2

*1 A parallel cable for Controllers with binary outputs is also available (ZW-XCP2). Please contact your OMRON sales representative for details.

Automation Software Sysmac Studio

Please purchase a DVD and required number of licenses the first time you purchase the Sysmac Studio. DVDs and licenses are available individually. Each model of licenses does not include any DVD.

Product name	Specifications	Number of licenses	Media	Standards	Order code
Sysmac Studio Standard Edition Ver.1.□□ *1	The Sysmac Studio provides an integrated development environment to set up, program, debug, and maintain NJ-series controllers and other machine automation controllers, as well as EtherCAT slaves. Sysmac Studio runs on the following OS. Windows XP (Service Pack 3 or higher, 32-bit version)/Vista(32-bit version)/7(32-bit/64-bit version) This software provides functions of the Measurement Sensor Edition. Refer to Sysmac Catalog (P072) for details such as supported models and functions.	– (Media only)	DVD	–	SYSMAC-SE200D
		1 license *2	–	–	SYSMAC-SE201L
Sysmac Studio Measurement Sensor Edition Ver.1.□□ *3	Sysmac Studio Measurement Sensor Edition is a limited license that provides selected functions required for ZW-series Displacement Sensor settings. Because this product is a license only, you need the Sysmac Standard Edition DVD media to install it.	1 license	–	–	SYSMAC-ME001L
		3 licenses	–	–	SYSMAC-ME003L

*1 ZW-series is supported by Sysmac Studio version 1.05 or higher.
*2 Multi licenses are available for the Sysmac Studio (3, 10, 30, or 50 licenses).
*3 Setting Software Smart Monitor ZW is also available (ZW-SW101). Please contact your OMRON representative for details.

Setting software

Item	Order code
Smart Monitor ZW	ZW-SW101

Accessories

Item	Order code
Fiber Connector Cleaner	ZW-XCL

Recommended EtherCAT communications cables

Use Straight STP (shielded twisted-pair) cable of category 5 or higher with double shielding (braiding and aluminum foil tape) for EtherCAT.

Cable with connectors

Item	Recommended manufacturer	Cable length (m)*1	Order code
Standard type Cable with connectors on both ends (RJ45/RJ45) Wire gauge and number of pairs: AWG27, 4-pair Cable Cable Sheath material: LSZH *2 Cable color: Yellow *3	OMRON	0.3	XS6W-6LSZH8SS30CM-Y
		0.5	XS6W-6LSZH8SS50CM-Y
		1	XS6W-6LSZH8SS100CM-Y
		2	XS6W-6LSZH8SS200CM-Y
		3	XS6W-6LSZH8SS300CM-Y
		5	XS6W-6LSZH8SS500CM-Y
Rugged type Cable with connectors on both ends (RJ45/RJ45) Wire gauge and number of pairs: AWG22, 2-pair cable	OMRON	0.3	XS5W-T421-AMD-K
		0.5	XS5W-T421-BMD-K
		1	XS5W-T421-CMD-K
		2	XS5W-T421-DMD-K
		5	XS5W-T421-GMD-K
		10	XS5W-T421-JMD-K
Rugged type Cable with connectors on both ends (M12 Straight/RJ45) Wire gauge and number of pairs: AWG22, 2-pair cable	OMRON	0.3	XS5W-T421-AMC-K
		0.5	XS5W-T421-BMC-K
		1	XS5W-T421-CMC-K
		2	XS5W-T421-DMC-K
		5	XS5W-T421-GMC-K
		10	XS5W-T421-JMC-K
Rugged type Cable with connectors on both ends (M12 Right-angle/RJ45) Wire gauge and number of pairs: AWG22, 2-pair cable	OMRON	0.3	XS5W-T422-AMC-K
		0.5	XS5W-T422-BMC-K
		1	XS5W-T422-CMC-K
		2	XS5W-T422-DMC-K
		5	XS5W-T422-GMC-K
		10	XS5W-T422-JMC-K

*1 Standard type cables length 0.2, 0.3, 0.5, 1, 1.5, 2, 3, 5, 7.5, 10, 15 and 20m are available.
Rugged type cables length 0.3, 0.5, 1, 2, 3, 5, 10 and 15m are available.
*2 The lineup features Low Smoke Zero Halogen cables for in-cabinet use and PUR cables for out-of-cabinet use.
*3 Cables colors are available in blue, yellow, or Green

Note: For details, refer to Cat.No.G019.

Cables/connectors

Wire gauge and number of pairs: AWG24, 4-pair cable

Item	Recommended manufacturer	Order code
Cables	Hitachi Cable, Ltd.	NETSTAR-C5E SAB 0.5 × 4P*1
	Kuramo Electric Co.	KETH-SB*1
	SWCC Showa Cable Systems Co.	FAE-5004*1
RJ45 connectors	Panduit Corporation	MPS588-C*1

*1 We recommend you to use above cable and connector together.

Wire gauge and number of pairs: AWG22, 2-pair cable

Item	Recommended manufacturer	Order code
Cables	Kuramo Electric Co.	KETH-PSB-OMR*1
	Nihon Electric Wire&Cable Co.,Ltd.	PNET/B*1
RJ45 Assembly connector	OMRON	XS6G-T421-1*1

*1 We recommend you to use above cable and connector together.

Note: Connect both ends of cable shielded wires to the connector hoods.

Industrial switching hubs for Ethernet

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

Note: Industrial switching hubs are cannot be used for EtherCAT.

EtherCAT junction slaves

Number of ports	Power supply voltage	Current consumption	Order code
3	20.4 to 28.8 VDC (24 VDC –15 to 20%)	0.08 A	GX-JC03
6		0.17 A	GX-JC06

Note: **1** Please do not connect EtherCAT junction slave with OMRON position control unit, Model CJ1W-NC_81/_82.
2 EtherCAT junction slaves cannot be used for EtherNet/IP™ and Ethernet.

Specifications

Sensor head

Item		ZW-S07	ZW-S20	ZW-S30	ZW-S40
Measuring center distance		7 mm	20 mm	30 mm	40 mm
Measuring range		±0.3 mm	±1 mm	±3 mm	±6 mm
Static resolution *1		0.25 µm	0.25 µm	0.25 µm	0.25 µm
Linearity *2		±0.8 µm	±1.2 µm	±4.5 µm	±7.0 µm
Spot diameter *3	Near	20 µm dia.	45 µm dia.	70 µm dia.	90 µm dia.
	Center	18 µm dia.	40 µm dia.	60 µm dia.	80 µm dia
	Far	20 µm dia.	45 µm dia.	70 µm dia.	90 µm dia
Measuring cycle		500 µs to 10 ms			
Operating ambient illumination		Illumination on object surface 10,000 lx or less: incandescent light			
Ambient temperature range		Operating: 0 to 50°C, Storage: –15 to 60°C (with no icing or condensation)			
Ambient humidity range		Operating and storage: 35% to 85% (with no condensation)			
Degree of protection		IP40 (IEC60529)			
Vibration resistance (destructive)		10 to 150 Hz, 0.35 mm single amplitude, 80 min each in X, Y, and Z directions			
Shock resistance (destructive)		150 m/s^2 3 times each in six directions (up/down, left/right, forward/backward)			
Temperature characteristic *4		0.6 µm/°C	1.5 µm/°C	2.8 µm/°C	4.8 µm/°C
Materials		Case: Fiber cable sheat: Calibration ROM:	aluminum die-cast PVC PC		
Fiber cable length		0.3 m, 2 m (Flex-resistant cable)			
Fiber cable minimum bending radius		20 mm			
Insulation resistance (Calibration ROM)		Between case and all terminals: 20 MΩ (by 250 V megger)			
Dielectric strength (Calibration ROM)		Between case and all terminals: 1,000 VAC, 50/60 Hz, 1 min			
Weight		Approx. 105 g (Chassis, fiber cable total)			
Accessories included with sensor head		Instruction sheet, Fixing screw (M2) for Calibration ROM, Precautions for correct use			

*1. Capacity value when Omron standard mirror surface target is measured at the measurement center distance as the average of 4,096 times.
*2. Material setting for the Omron standard mirror surface target: Error from an ideal straight line when measuring on mirror surface.
The reference values for linearity when targets to measure other than the above are as in the table below

Item	ZW-S07	ZW-S20	ZW-S30	ZW-S40
Glass	±1.0 µm	±1.2 µm	±4.5 µm	±7.0 µm
SUS BA	±1.2 µm	±1.4 µm	±5.5 µm	±8.5 µm
White ceramic	±1.6 µm	±1.7 µm	±6.4 µm	±9.5 µm

*3. Capacity value defined by 1/e^2 (13.5%) of the center optical intensity in the measured area.
*4. Temperature characteristic at the measurement center distance when fastened with an aluminum jig between the Sensor Head and the target and the Sensor Head and the controller are set in the same temperature environment.

Automation software Sysmac Studio

System requirements

Item	Condition
Operating system (OS)*1,*2	Windows XP (Service Pack 3 or higher, 32-bit version)/Vista(32-bit version)/7(32-bit/64-bit version)
CPU	Windows computers with Celeron 540 (1.8 GHz) or faster CPU. Core i5 M520 (2.4 GHz) or equivalent or faster recommended
Main memory	2 GB min.
Recommended video memory/video card for using 3D motion trace	Video memory: 512 MB min. Video card: Either of the following video cards: • NVIDIA GeForce 200 Series or higher • ATI RadeonHD5000 Series or higher
Hard disk	At least 1.6 GB of available space
Display	XGA 1024 × 768, 16 million colors. WXGA 1280 × 800 min. recommended
Disk drive	DVD-ROM drive
Communication ports	USB port corresponded to USB 2.0, or Ethernet port*3
Supported languages	Japanese, English, German, French, Italian, Spanish, simplified Chinese, traditional Chinese, Korean

*1 Sysmac Studio operating system precaution: System requirements and hard disk space may vary with the system environment.
*2 The following restrictions apply when Sysmac Studio is used with Microsoft Windows Vista or Windows 7.
Some Help files cannot be accessed.
The Help files can be accessed if the Help program distributed by Microsoft for Windows (WinHlp32.exe) is installed. Refer to the Microsoft homepage listed below or contact Microsoft for details on installing the file. (The download page is automatically displayed if the Help files are opened while the user is connected to the Internet.)
http://support.microsoft.com/kb/917607/en-us
*3 Refer to the hardware manual for your Controller for hardware connection methods and cables to connect the computer and Controller.

Setting software Smart Monitor ZW ZW-SW101

System requirements

Item	Condition
Operating System(OS)	Windows 7 (32 or 64-bit version) Windows XP (Service Pack3 or more, 32-bit version)
CPU	Intel Pentium III, 850 MHz or more (2 GHz or more is recommended.)
Main memory	1 GB or more
Hard disk	50 MB or more
Display	1024 × 768 dots or more, 16 million colors or more
Supported languages	Japanese/English
Communication port	Ethernet port

Controller

Item				ZW-CE10T	ZW-CE15T
Input/Output type				NPN	PNP
Number of connected sensor heads				1 per Controller	
Sensor head compatibility				Available	
Light source for measurement				White LED	
Segment display	Main display			11-segment red display, 6 digits	
	Sub-display			11-segment green display, 6 digits	
LED display	Status indicators			HIGH (orange), PASS (green), LOW (orange), STABILITY (green), ZERO (green), ENABLE (green), THRESHOLD-H (orange), THRESHOLD-L (orange), RUN (green)	
	EtherCAT indicators			L/A IN (Link Activity IN) (green), L/O OUT (Link Activity OUT) (green), ECAT RUN (green), ECAT ERR (red)	
External interface	Ethernet			100BASE-TX, 10BASE-T, No-protocol communications (TCP/UDP), EtherNet/IP™	
	EtherCAT			EtherCAT-specific protocol 100BASE-TX	
	RS-232C			115,200 bps max.	
	Analog output terminal block	Analog voltage output (OUT1V)		–10 V to +10 V, output impedance: 100 Ω	
		Analog current output (OUT1A)		4 mA to 20 mA, maximum load resistance: 300 Ω	
	32-pole extension connector	Judgment output (HIGH1/PASS1/LOW1)		Transistor output system Output voltage: 21.6 to 30 VDC Load current: 50 mA or less Residual voltage when turning ON: 1.2 V or less Leakage voltage when turning OFF: 0.1 mA or les	
		BUSY output (BUSY1)			
		ALARM output (ALARM1)			
		ENABLE output (ENABLE)			
		LED OFF input (LED OFF1)		DC input system Input voltage: 24 VDC –10% (21.6 to 26.4 VDC) Input current: 7 mA Typ. (24 VDC) Voltage/Current when turning ON: 19 V/3 mA or more Voltage/Current when turning OFF: 5 V/1 mA or less	
		ZERO RESET input (ZERO)			
		TIMING output (TIMING1)			
		RESET output (RESET1)			
		Bank	Selected bank output (BANK_OUT 1 to 3)	Transistor output system Output voltage: 21.6 to 30 VDC Load current: 50 mA or less Residual voltage when turning ON: 1.2 V or less Leakage voltage when turning OFF: 0.1 mA or less	
			Selected bank input (BANK_SEL 1 to 3)	DC input system Input voltage: 21.6 to 26 VDC Input current: 7 mA Typ. (24 VDC) Voltage/Current when turning ON: 19 V/3 mA or more Voltage/Current when turning OFF: 5 V/1 mA or less	
Main functions	Exposure time			Auto/Manual	
	Measuring cycle			500 µs to 10 ms	
	Material setting			Standard/Mirror/Diffusion surfaces	
	Measurement Item			Height/Thickness/Calculation	
	Filtering			Median/Average/Differentiation/High pass/Low pass/Band pass	
	Outputs			Scaling/Different holds/Zero reset/Logging for a measured value	
	Display			Measured value/Threshold value/Analog output voltage or current value/Judgment result/Resolution/Exposure time	
	Number of configurable banks			Max. 8 banks	
	Task process			Multi-task (up to 4 tasks per bank)	
	System			Save/Initialization/Display measurement information/Communication settings/Sensor Head calibration/Key-lock/ Trigger-key input	
Ratings	Power supply voltage			21.6 to 26.4 VDC (including ripple)	
	Current consumption			600 mA max.	
	Insulation resistance			Across all lead wires and controller case: 20 MΩ (by 250 V megger)	
	Dialectic strength			Across all lead wires and controller case: 1,000 VAC, 50/60 Hz, 1 min.	
Environmental	Degree of protection			IP20 (IEC60529)	
	Vibration resistance (destructive)			10 to 55 Hz, 0.35-mm single amplitude, 50 min each in X, Y, and Z directions	
	Shock resistance (destructive)			150 m/s^2, 3 times each in six directions (up/down, left/right, forward/backward)	
	Ambient temperature			Operating: 0 to 40°C Storage: –15 to 60°C (with no icing or condensation)	
	Ambient humidity			Operating and storage: 35% to 85% (with no condensation)	
Grounding				D-type grounding (Grounding resistance of 100 Ω or less) Note: For conventional Class D grounding	
Materials				Case: PC	

Item	ZW-CE10T	ZW-CE15T
Weight	Approx. 750 g (main unit only), approx. 150 g (Parallel cable)	
Accessories included with controller	Instruction sheet, Member registration sheet, Parallel cable ZW-XCP2E	

Note: Controllers with binary outputs are also available (ZW-C10T/-C15T). Please contact your OMRON sales representative for details.

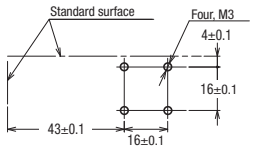
ZW series EtherCAT communications specifications

Item	Specification
Communications standard	IEC61158 Type12
Physical layer	100BASE-TX (IEEE802.3)
Connectors	RJ45 × 2 ECAT IN: EtherCAT input ECAT OUT: EtherCAT output
Communications media	Category 5 or higher (cable with double, aluminum tape and braided shielding) is recommended.
Communications distance	Distance between nodes: 100 m max.
Process data	Variable PDO mapping
Mailbox (CoE)	Emergency messages, SDO requests, SDO responses, and SDO information
Distributed clock	Synchronization in DC mode.
LED display	L/A IN (Link/Activity IN) × 1, AL/A OUT (Link/Activity OUT) × 1, AECAT RUN × 1, AECAT ERR × 1

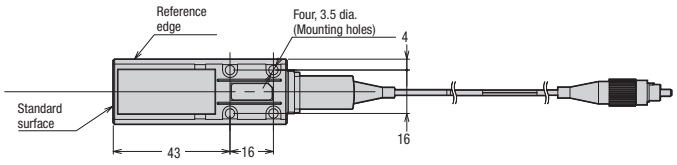
Dimensions

Sensor heads

ZW-S07/-S20/-S30/-S40

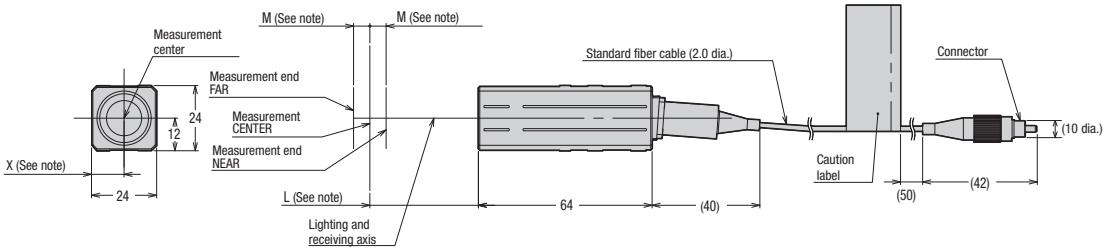


Mounting hole dimensions



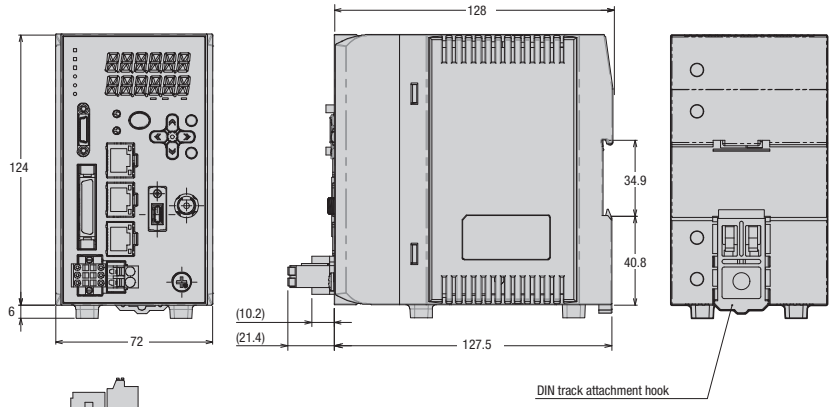
Note:

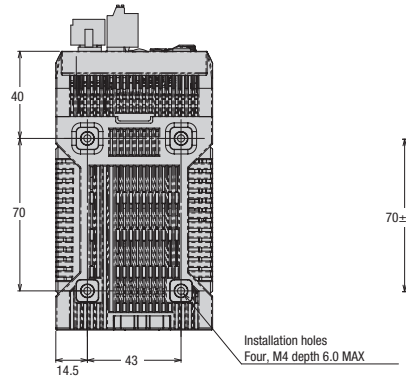
Model	L	M	X
ZW-S07	7	0.3	12
ZW-S20	20	1	11.8
ZW-S30	30	3	11.7
ZW-S40	40	6	11.7

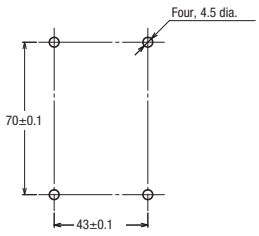


Controller

ZW-CE10T/-CE15T



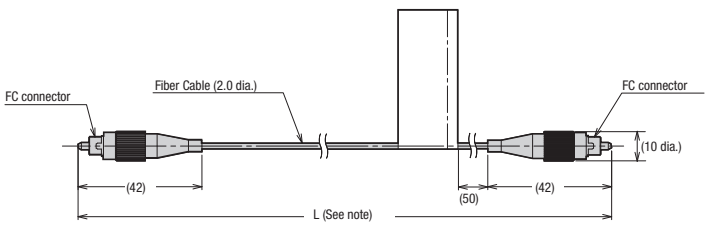




Mounting hole dimensions

Extension fiber cable

ZW-XF02R/-XF05R/-XF10R/-XF20R/-XF30R



Note: The following table lists cable lengths per models.

Model	Cable length	L
ZW-XF02R	2 m	2,000±20
ZW-XF05R	5 m	5,000±50
ZW-XF10R	10 m	10,000±100
`ZW-XF20R	20 m	20,000±200
ZW-XF30R	30 m	30,000±300

DISPLACEMENT/DISTANCE MEASUREMENT

ZS-Series – All in one – Smart, accurate and scalable

The ZS laser sensor family provides outstanding measurement performance on all kind of materials. Its huge range of sensor heads and scalable concept makes it a versatile platform for all high precision sensing applications. The ZS-series features an unique sensor head for glass inspections, which simplifies mounting and allows measurements even on round glass.

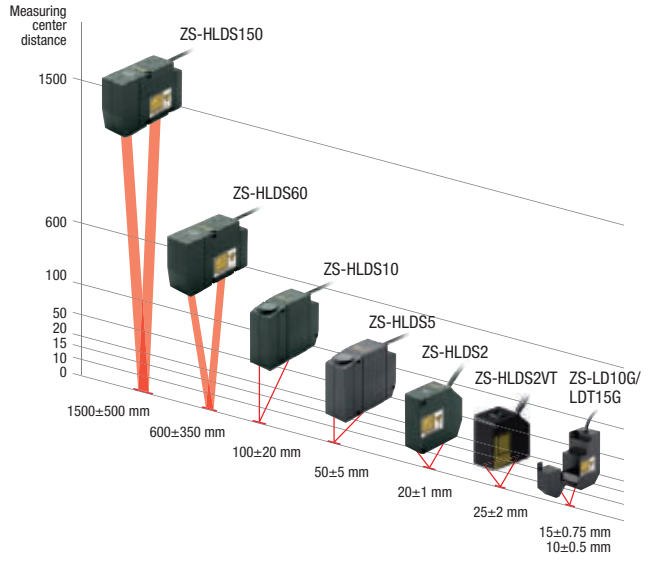
Powerful controller:

- LCD display for setup and immediate result display
- Fast sampling time: 110 µs
- Multi-tasking enabled by a single controller
- Scalability of up to 9 controllers (heads)
- Multi-controller unit (MDC)
- Remote control via communication interfaces and PC software

14 x sensor heads for any purpose:

- Flexible sensing distance: from 10 mm to 1.500 mm
- High accuracy: 0,25 – 5 µm
- Difficult surfaces: glass, shiny metal, black rubber, etc.
- Measure multiple surfaces of transparent objects
- CMOS technology

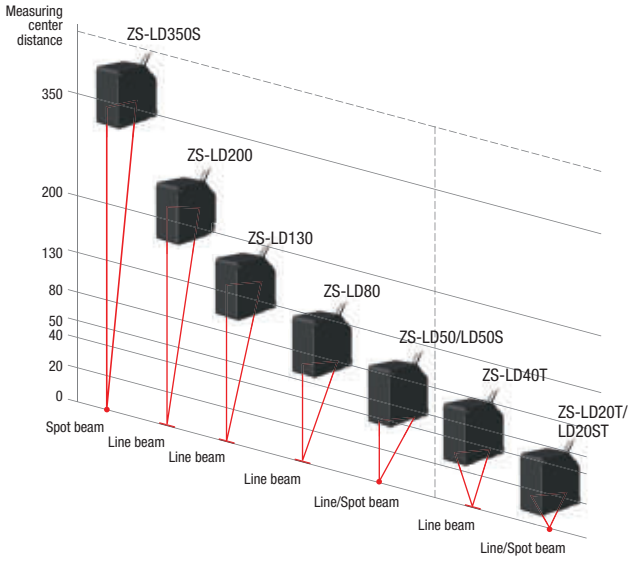
SENSOR HEADS ZS



ZS-HLDS sensor heads

Diffuse Reflective Sensors	Regular Reflective Sensors

C425



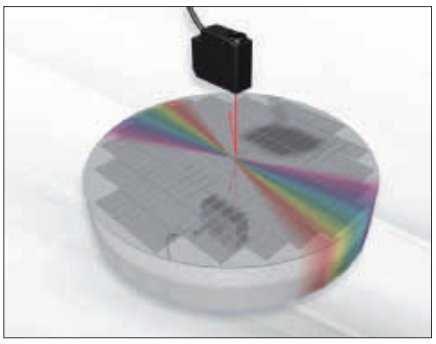
ZS-LD sensor heads

Diffuse Reflective Sensors	Regular Reflective Sensors

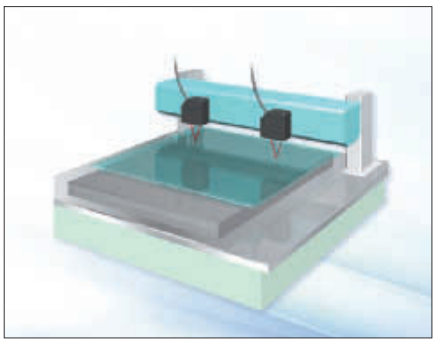
C425

YOUR BENEFITS

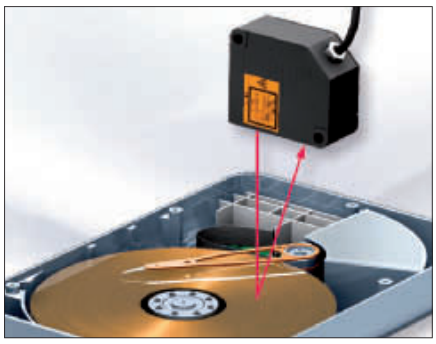
- One sensor – any surface and distance
- One controller – multi-tasking
- One software – remote control
- One solution – any application



Wafer thickness and warping inspection



Glass evenness inspection



Disk surface inspection

PROFILE MEASUREMENT

ZG2-Series – Easy profile measurement

The new ZG2 smart sensor demonstrates that profile measurement with easy operation is no longer impossible. The built-in LCD monitor for an easy and intuitive user interface supports efficient installation and setup. Immediate live feedback of the measurement result is provided in real time.

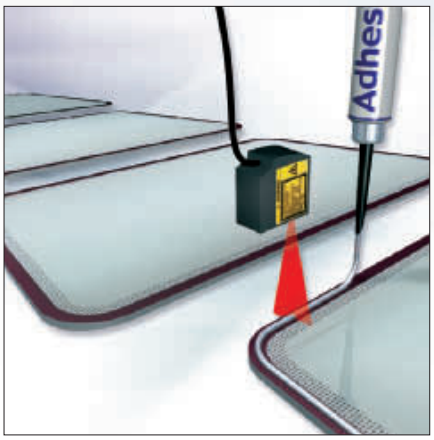
Advanced measurement tasks can be configured within 3 steps to save operation and setting-up time. The fine tuning of the settings can be achieved in seconds.

1 **Adjust sensor head**
Check on LCD display

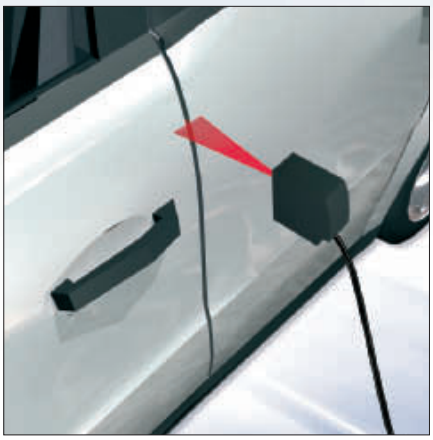
2 **Select function**
Simple ICON menu

3 **Select range**
Automatic calculation

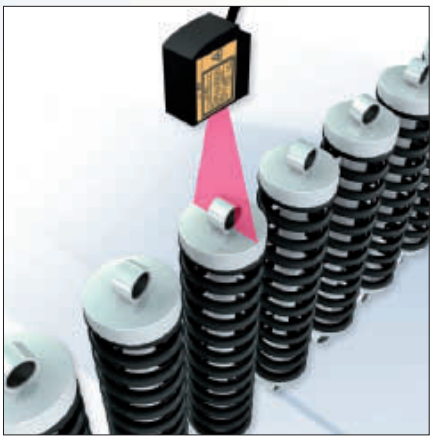
3 STEP SETTING UP OF MEASUREMENT VIA BUILT-IN LCD DISPLAY



Glue seam inspection



Precise gap measurement in automotive industry

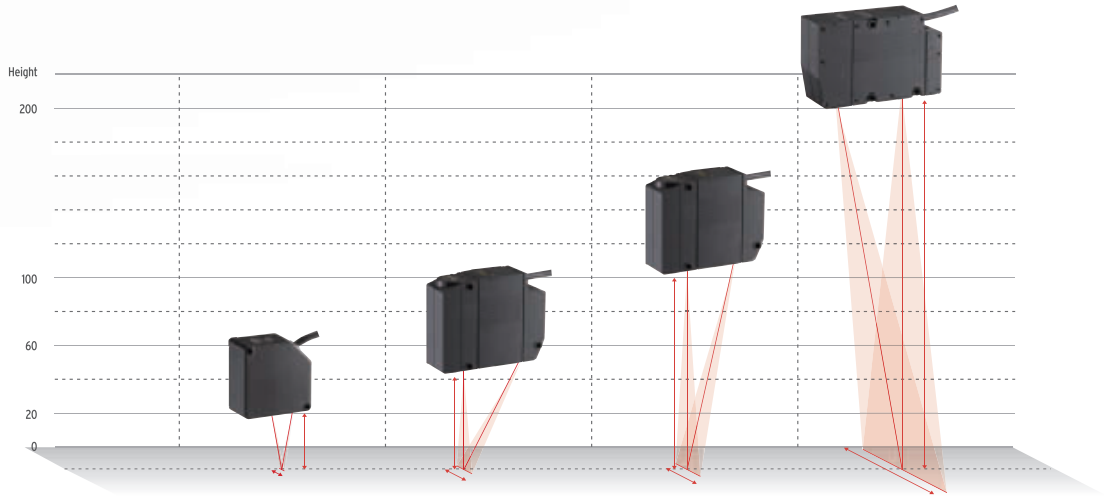


Checking the shape of vehicle structural parts. The wide beam allows the measurment in a single operation.

YOUR BENEFITS

- Intuitive – easy to use
- Live – LCD monitor for display and setup
- Versatile – 18 tools
- Accurate – 5 µm resolution
- Wide profiles – up to 70 mm
- Stable measurements on challenging surfaces

SENSOR HEADS ZG2



PRODUCT NAME	ZG2-WDS3VT	ZG2-WDS8T	ZG2-WDS22	ZG2-WDS70
Height (resolution)	22,3±0,5 mm (0,2 µm)	50±3 mm (1 µm)	100±12 mm (3 µm)	210±48 mm (10 µm)
Width (resolution)	3 mm/631 pixels	8 mm/631 pixels	22 mm/631 pixels	70 mm/631 pixels
Linearity	±0.5% F.S.	±0.5% F.S.	±0.5% F.S.	±0.5% F.S.

C422

POSITION / DIAMETER / WIDTH MEASUREMENT

ZX-GT smart laser micrometer: Accurate and fast on all surfaces

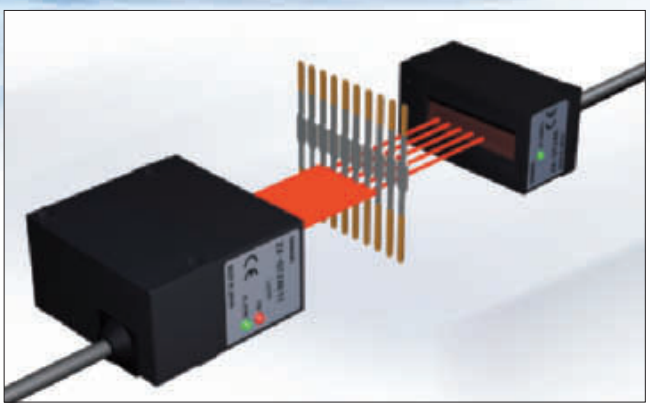
The new ZX-GT smart laser micrometer complements Omron's Smart Laser Measurement platform. ZX-GT is able to detect edges, measure diameters of objects and calculate precisely the position on all kind of materials. Based on CCD technology ZX-GT achieves high accuracy and speed under difficult environmental conditions.

Transparent objects, reflective surfaces or different positions do not have an influence on the result. The PC Smart Monitor software helps to easily setup and configure the laser micrometer.

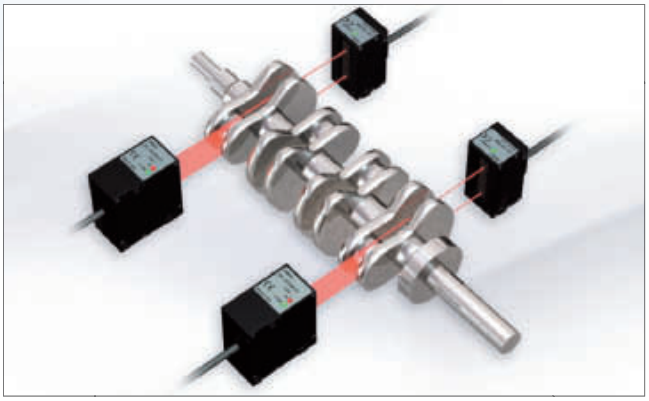
YOUR BENEFITS

- High accuracy: 10 µm
- All surfaces
- Long sensing distance: < 500 mm
- Line width up to 28 mm
- Calculation unit for multiple heads

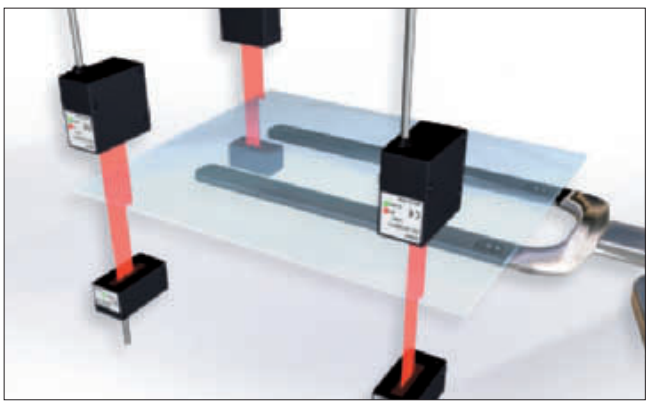
Note: For sensing distances up to 15m, area width up to 2m and cm accuracy, refer to F3EM measuring light curtains in INDUSTRIAL SENSING GUIDE



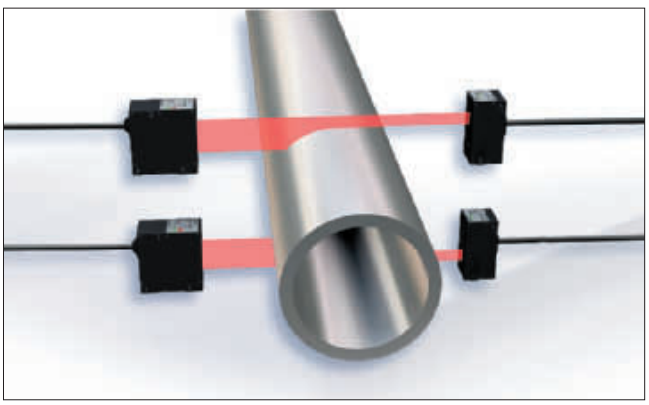
Electronic components – lead-pitch and diameter measurement



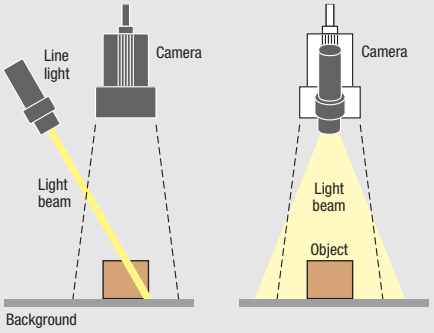
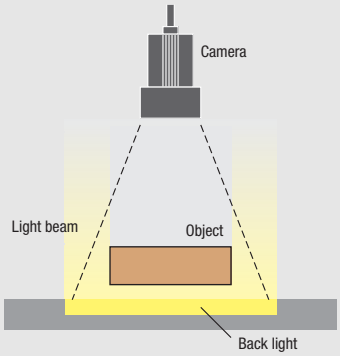
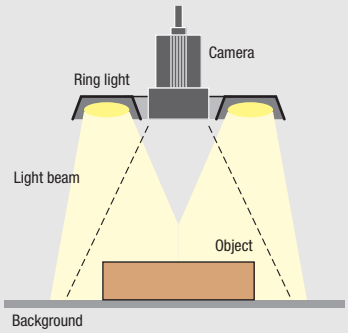
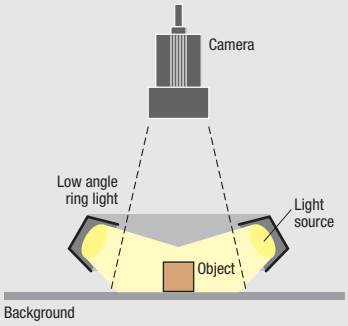
Automotive – diameter inspection of large tubes

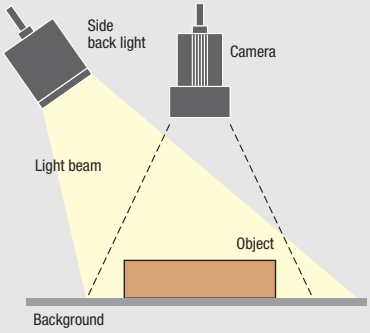
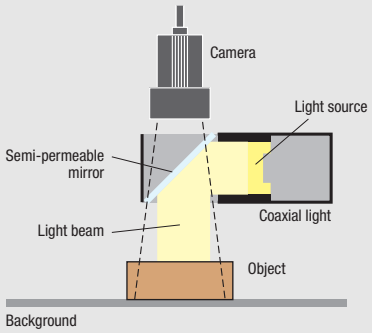
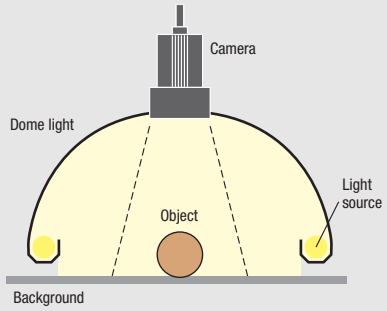
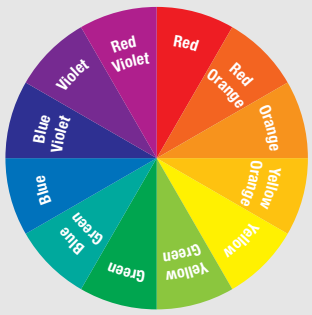


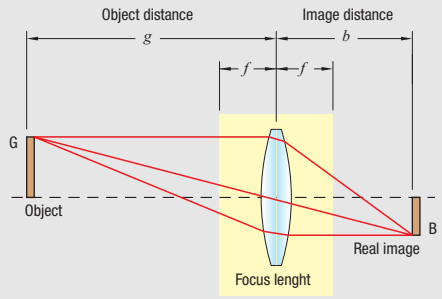
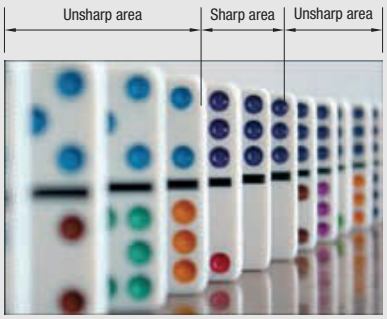
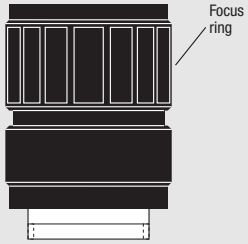
LCD – glass-edge measurement

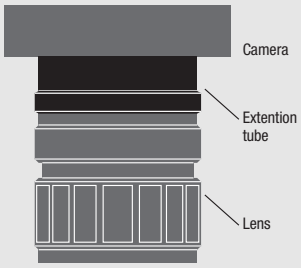
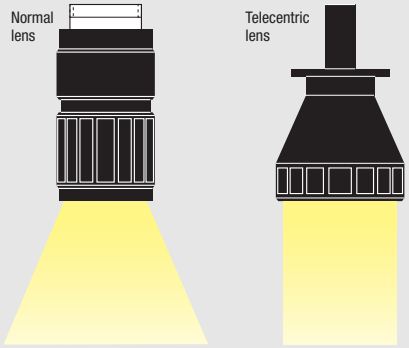


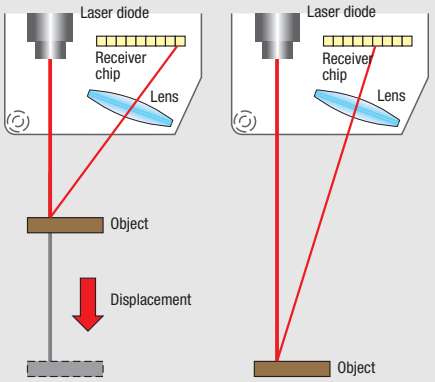
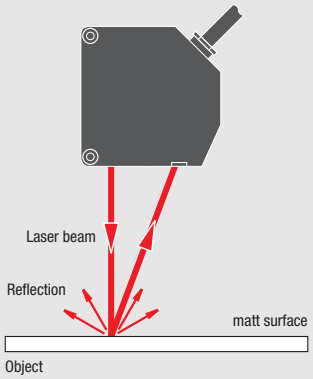
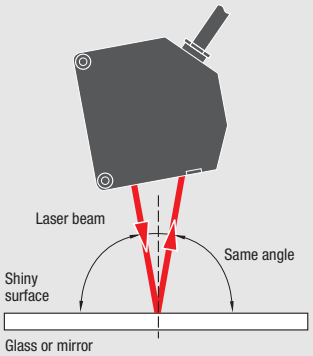
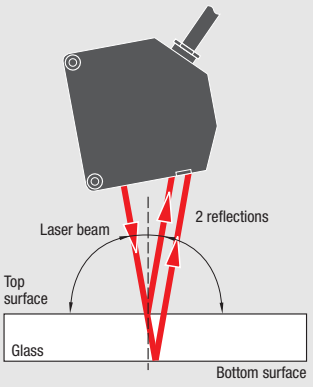
Automotive – diameter measurement of large-scale pipe

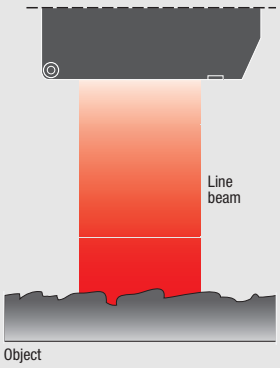
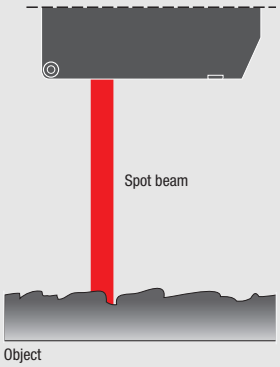
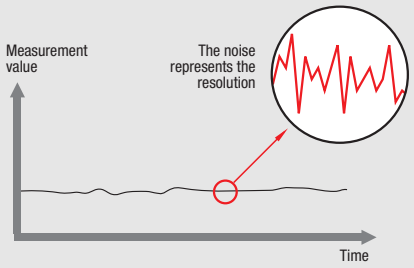
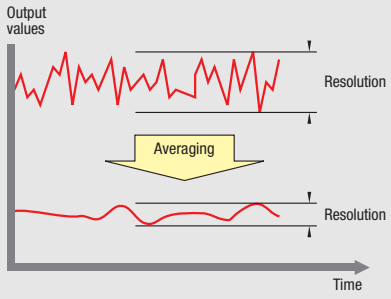
Item	Explanatory diagram	Meaning
Line light		With a line light a straight line is projected on the object. This allows to inspect the height of an object. Applications: • Width/length measurement of parts • Height measurement of parts • Light section method in large parts
Back light		The backlight is placed behind the object into the direction towards the camera. The main purpose is to highlight the edges of an object for contour inspections. Applications: • Width measurement • Counting • Contour searching
Ring light		A ring light is a direct light and creates an equal light on the whole surface of the object (bright field). It is used with the direction towards the object. Applications: • Universal light source for light • Uniform illumination of the checking field • High illuminance, so suited for fast processes
Low angle ring light		The low angle ring light is not lighting directly into the lens, but from the side. The lighted field appears dark, distortions appear bright. Applications: • Visualisation of surface structures (contours, scratches, cracks). • Highlighting striking structures on the object. • Highlighting contour parts without software-filtering (optical image processing).

Item	Explanatory diagram	Meaning
Side back light		Light comes from the observation direction down to the object or to the side to avoid reflection. Applications: • Highlight edges and scratches. • Uniform illumination diffuse reflective surfaces. • Check completeness, presence control, read codes or signs, defect inspection
Coaxial light		The lighting comes from the observation direction down to the level of the object. Coaxial light comes from the observation direction requires vertical arrangement of the lens to the observed surface. Applications: • Uniform illumination from diffuse reflective up to shiny surfaces.
Dome light		The dome light is an indirect light, where the dome is reflecting the light to the object from every angle. This leads to a more homogeneous illumination on the surface of the object. Illumination comes from the observation direction down to the level of the object. Applications: • Highly structured parts, surface, texture, crack-control, safety-related parts, code and character recognition, etc. • Uniform illumination of diffuse reflective surfaces.
What are complementary colours?		The complementary colours are in the colour circle exactly on the opposite side. Important: An object appears dark, when the light colour is its complementary colour, and it appears bright, if the light is a similar colour of its own.

Item		Explanatory diagram	Meaning
General about lenses	Focal lenght		Important terms: • object distance • image distance • focal length Lenses with different focal length generate different image sizes, by having the same distance to the object
	Depth of focus		If the depth of focus is high, the sharp area is becoming larger.
	Focus ring		The focus ring is increasing the distance between the lens and CCD chip. This decreases the minimum distance of the camera to the object, where you still receive a sharp image.
	Aperture	 Lens with a opened aperture Eg 1.4  Lens with a medium aperture Eg 7  Lens with a closed aperture Eg 11	The aperture defines the opening of the lens, which can be increased or decreased. The size controls the amount of light that is received on the CCD chip. Small aperture numbers (such as 1.4 or 2.8) = wide opened lens. Large aperture numbers (for example, 11 or 16) = low opened lens.

Item		Explanatory diagram	Meaning
Extension tube			An extension tube is a ring between camera and lens. So the distance between the lens and CCD chip will be increased. There are extension tube in different sizes, multiple rings can be combined.
Lens selection	Focal length calculation	Characteristics which you need for selecting the correct focal length. b = width of CCD- Chips B = width of object f = focal length D = working distance c = conversion factor chip size $f = \frac{b \times D}{B} \times c$ Example: The width of a 1/3"-chip is 4.8 mm, working distance = 300 mm, image field = 85 mm. $f = \frac{b \times D}{B} \times 0.72 = \frac{4.8\ \text{mm} \times 300\ \text{mm}}{85\ \text{mm}} \times 0.72 = 12.2\ \text{mm} \approx 12\ \text{mm}$	
Special lenses	Telecentric lenses		By using telecentric lens, objects can be captured without perspective distortion. Another advantage is that the size of the object, independent from the distance to the lens or the position in the field of view. These lenses are therefore excellent for measurement of objects.

Item	Explanatory diagram	Meaning
Displacement measurement by laser triangulation		Triangulation means calculation of distance resp. displacement by measuring one angle of a triangle. The reflected light is focussed on a semiconductor receiver element and the position is a representation of the angle. From this angle the sensor can calculate the distance to the object.
Diffuse reflection		Matt surfaces reflect light in all directions. The sensor can “see” the spot on the surface. For diffuse reflection the mounting angle of the sensor head is not critical.
Regular reflection		Shiny surfaces reflect light in only 1 direction. Sensor head must be mounted accurately in regular reflection position, to “see” the spot on the surface. Incidence and reflection angle are equal.
Glass measurement		Transparent materials create reflections for each crossing of different optical density. This results in a reflection for the top surface and the bottom surface of glass. The thickness can be calculated out of these reflections.

Item		Explanatory diagram	Meaning
Line/spot beam	Line beam		The line is averaging the surface shape of the object.
	Spot beam		The spot is focussing the light which leads to higher intensity. This is beneficial for surfaces absorbing a lot of light.
Resolution			The "noise" of the measurement represents the resolution. It is the minimum difference in the measurement, which can be detected. The resolution depends on: • Material (colour, surface, etc.) • Static or moving condition (moving is e.g. 10 to 100 times worse) • Sensor characteristic (optical + electrical noise)
Average			This function is used to get a more stable and representative result. The average of several measurement values is calculated and given as the result. The number of measurements for this calculation is variable. The averaging has 2 effects: • Improvement of the resolution • Increase the response time
Accuracy/precision			Accuracy is the degree of how close the result is to the real value. Precision is the degree of reproducibility.

Refer to the other guides and the DVD

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