

XPECTIA FH VISION SYSTEM

Fastest ever industrial compact vision system



» Easy to integrate

» Faster machine speed

» High-precision machine operation

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

EtherCAT

EtherNet/IP

Think & See

HDR

Real Color



Shorter machine cycle

Faster machine speed

High-speed image processing

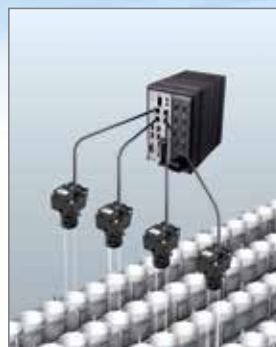
A high-speed image bus and 4-core processing increases speed at every step, from image input to data output.

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.



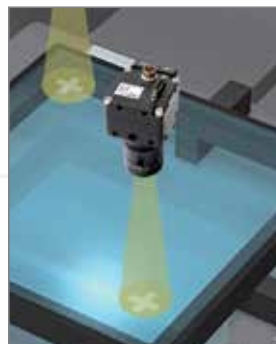
High-precision operation

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.



Logic
control



Positioning



times

Process higher-resolution images without increasing machine cycle time



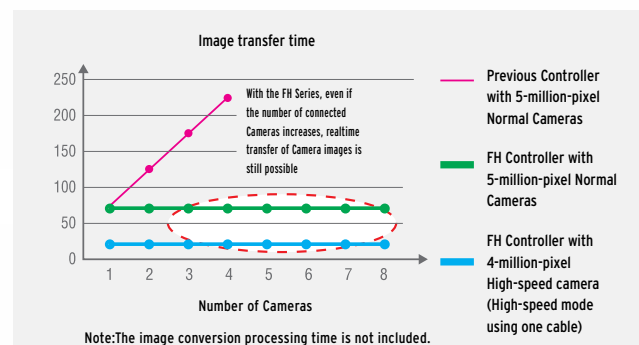
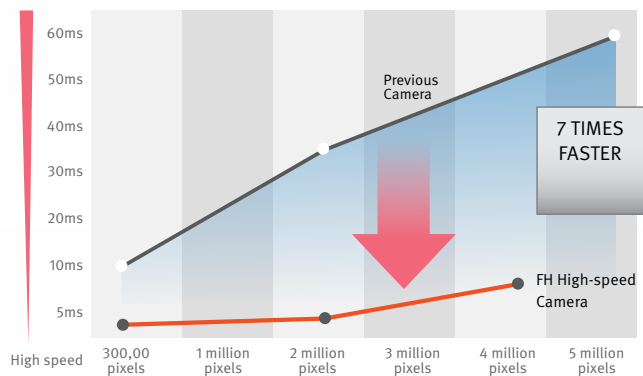
Fastest: 330 μ s

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

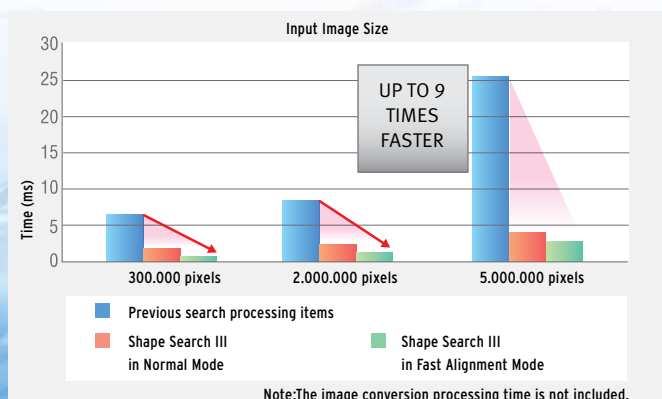
High-resolution cameras capture large amounts of data, which can cause transfer- and input-bottlenecks. That's why the FH Series Controller provides a faster, multi-line image bus to enable real-time transfer of large amounts of image data even for multiple cameras. Now you don't need to sacrifice precision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



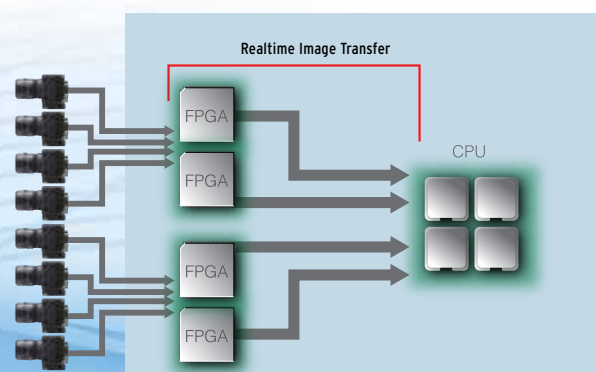
Shape Search III

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



Four-core CPU* for high-speed demands on different machines

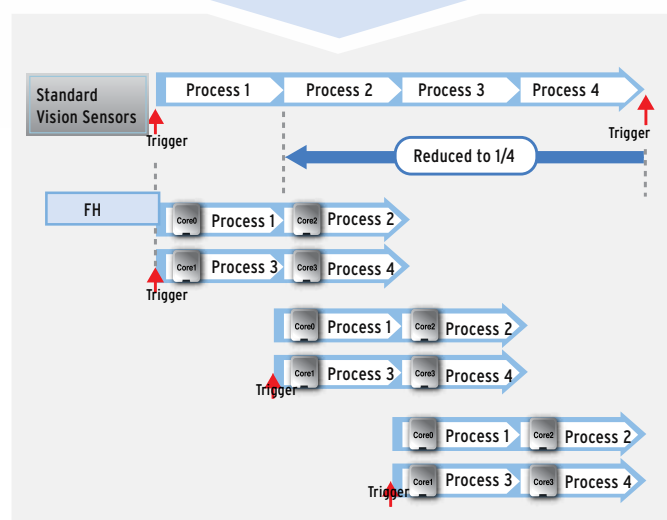
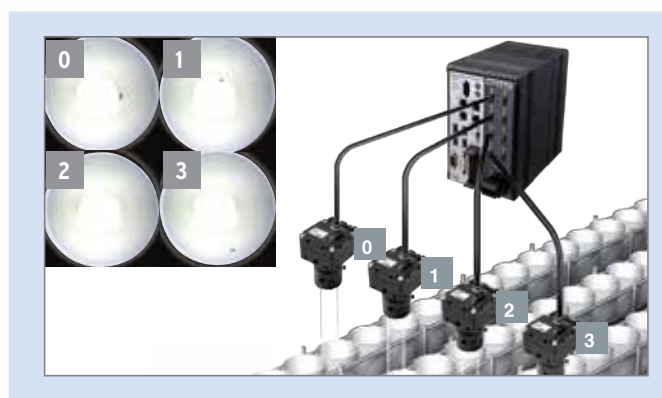
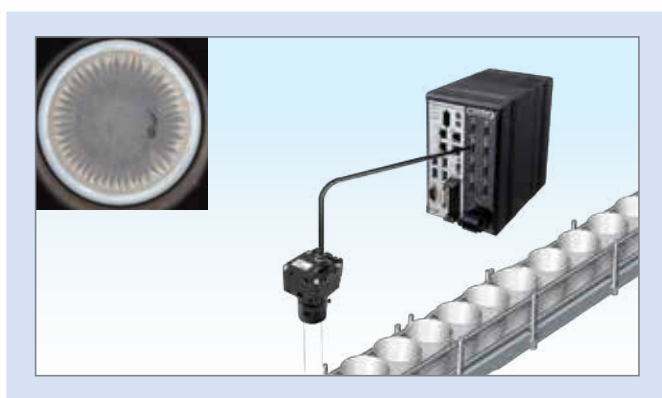
Machine cycle time reduced by 75%**

Four core process triggers, so the trigger interval can be 1/4 of previous models (in-house comparison).

Process multiple lines without waiting

Four controllers are compressed into one without increasing the line cycle time. You can greatly reduce costs for processes that involve many lines.

*for high-speed controllers only

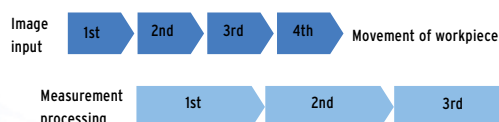
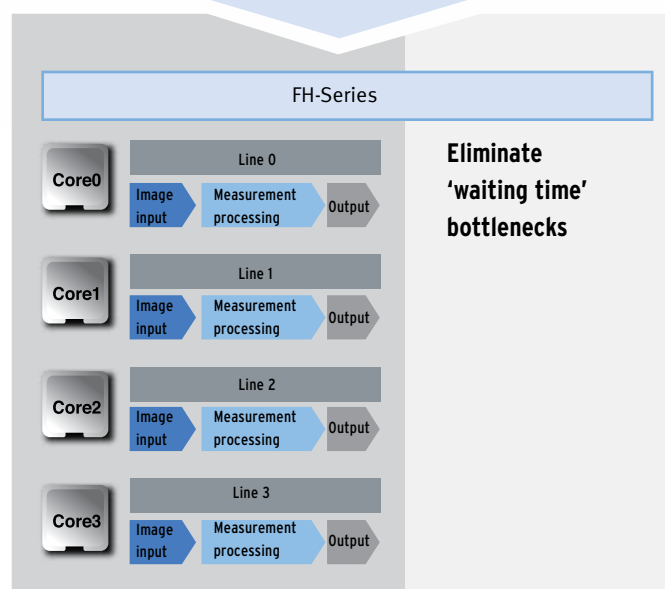


Multi-input function

Continuous high-speed image capture

Higher speed from advanced image capture and parallel measurements

Each camera has its own image buffer for storing image data. This is separate from the main memory that is used for measurement processing. This allows for up to 256 frames of continuous high-speed image capture even when the main memory is processing measurement data.



**The number of images that can be captured depends on the controller and the camera that is connected to it. Refer to the user's manual for details.

Fast output of measurement results reduces machine cycle time

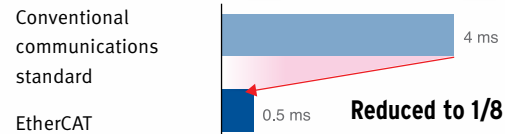
EtherCAT machine control network

EtherCAT is a high-speed open network that is ideal for machine control. You can use it to connect NJ Series machine automation controllers and motion control G5 Series Servomotors and Servo Drives to increase the control speed of everyday communications protocols from workpiece detection to starting axis motion.

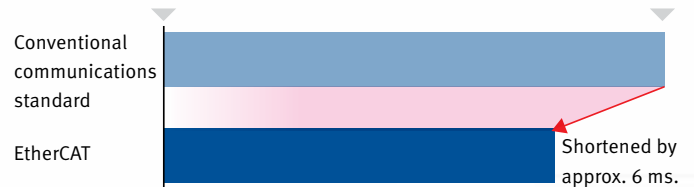
Features

- Communications cycle as low as 500 μ s
- Motion control that's synchronized with the communications cycle

Communications cycle



Time from trigger input to producing measurement results

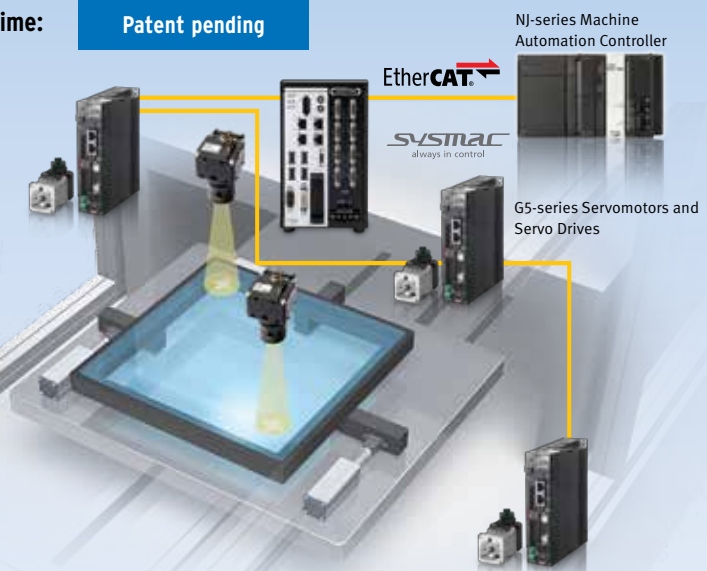


Note: The times given above are typical times. They depend on parameter settings.

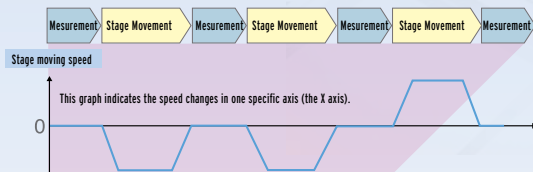
Positioning solution that eliminates workpiece dwell time:

Patent pending

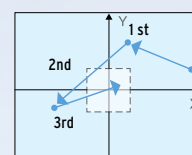
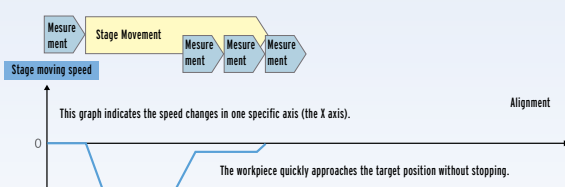
For a machine that requires micron precision, one alignment is not always enough to obtain the desired precision – multiple alignments are often necessary. But these extend the processing time. That's why Omron provides control methods that eliminate workpiece dwell time, which is the main cause of increased processing time. Our Sysmac Automation Platform achieves high-speed, high-precision control that continuously detects workpiece positions and successively updates the travel distance to quickly approach the target position.



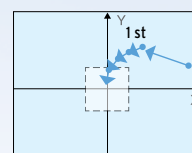
Previous Vision Sensors



Sysmac



The dotted box indicates the target precision range.



The dotted box indicates the target precision range.

Note: Please ask your OMRON representative for details.

High-precision image processing required for positioning

Shape Search III

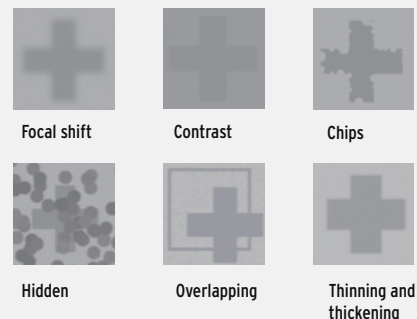
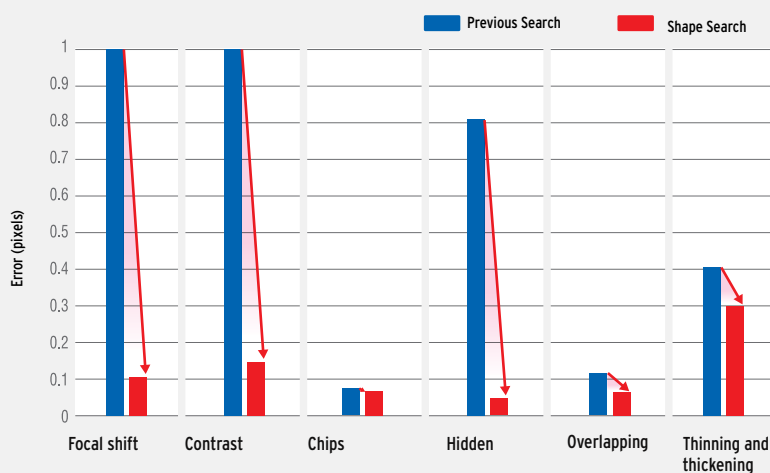


Low-error position detection even with blurry images

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.

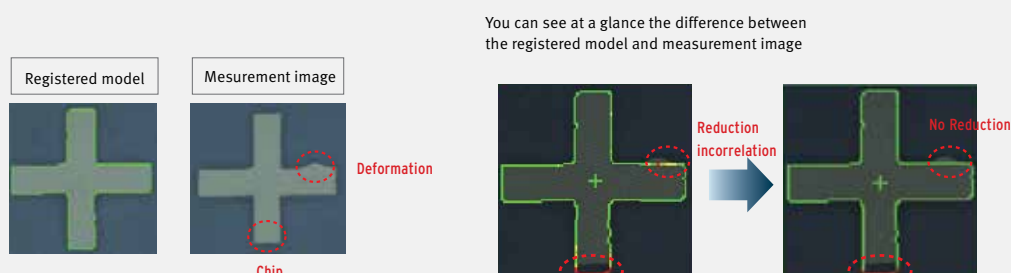


Visualization of comparisons enables easy setup of high-precision searching

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.



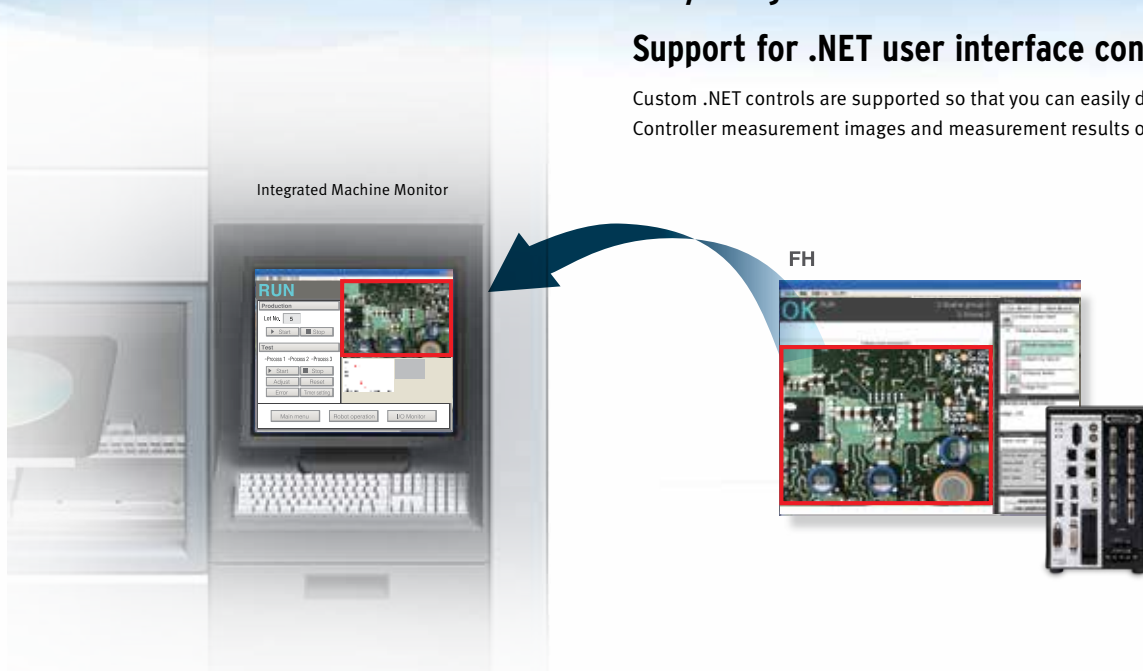
You can adjust a parameter called the Acceptable Distortion Level to enable measurements without reducing the correlation even if there is distortion. You can easily adjust this parameter while monitoring the comparison.

Easily connect the components that configure the machine

Easy integration into a machine monitor

Support for .NET user interface controls

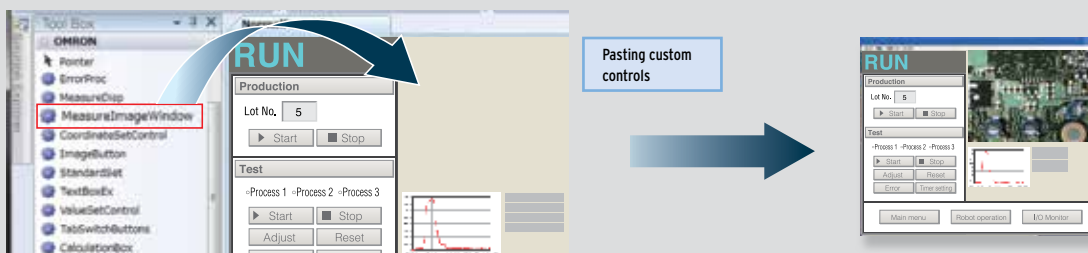
Custom .NET controls are supported so that you can easily display FH Controller measurement images and measurement results on a PC.



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.



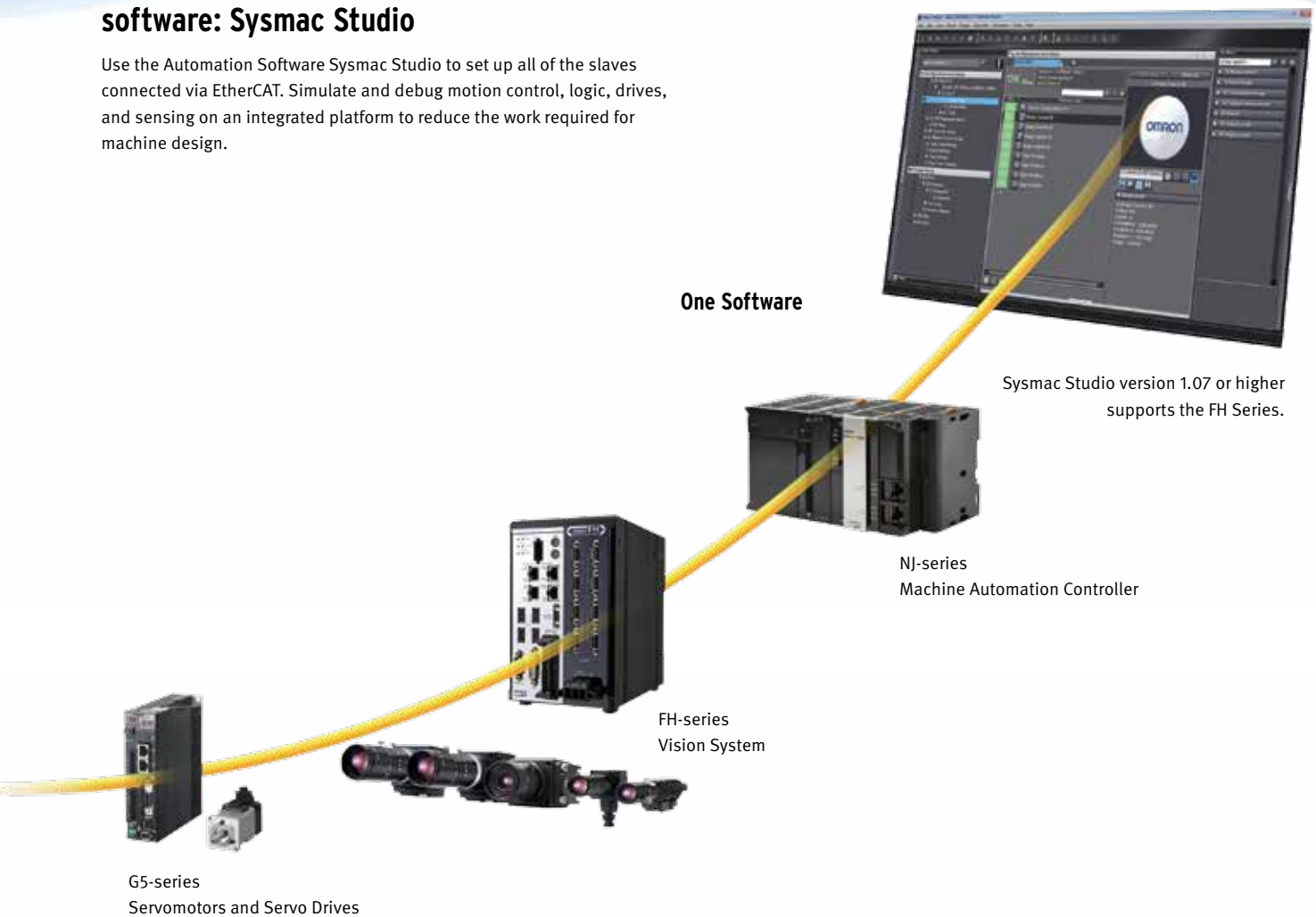
Output to HMI or high-resolution monitor



Design components with one software

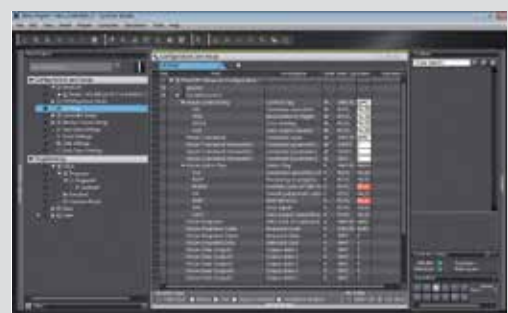
Develop machine control programs with one software: Sysmac Studio

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 & 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

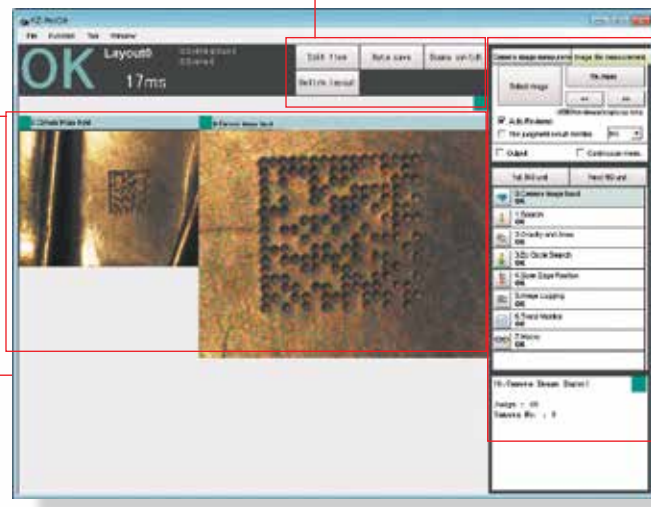
Choose from our library of buttons and position them on screen to best support your daily operation, without “screen clutter”.

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.

Eight screen layout

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



Move windows freely

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

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.

Freely Lay Out Dialog Box Contents



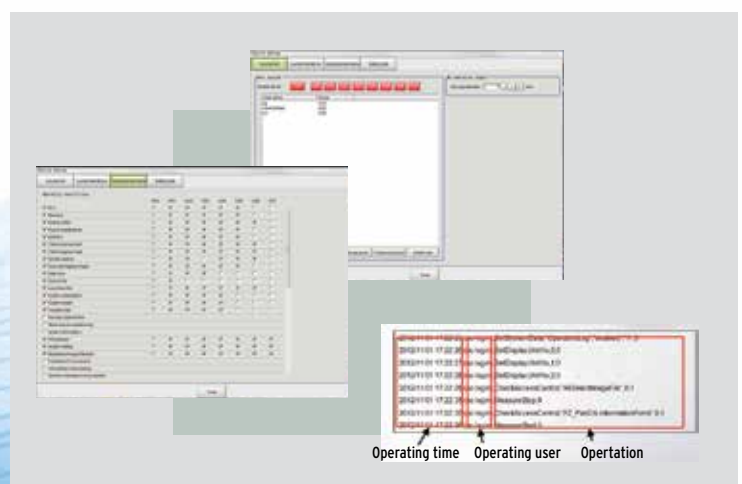
Completed



Only a parameter required for daily operation can be displayed.

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.

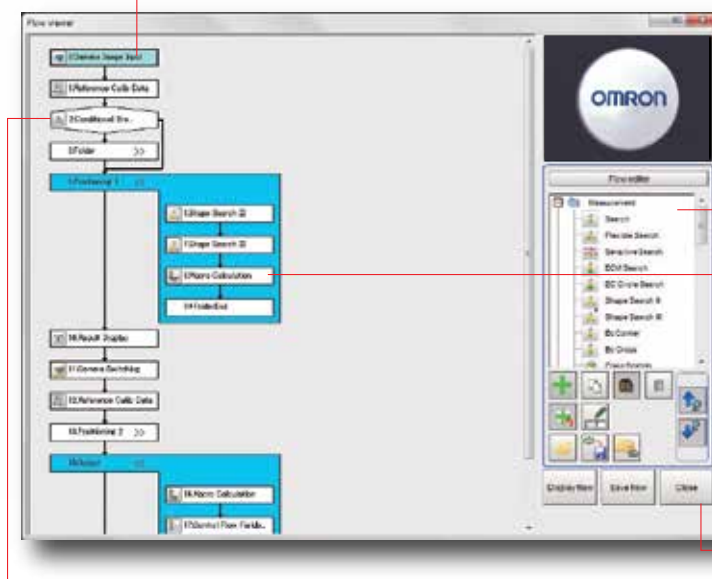


Build measurement process with flowchart programming

Just add any of the large variety of processing items to the measurement flow to build the basic program for image processing. All processing items have menus for easy setup and adjustment. This enables you to easily build the best imaging processing for each application and to smoothly complete testing and adjustments without programming.

Flowchart

Just add processing items from the processing item list to visually edit the flow.



Processing Item List

Folders

You can group processing units into named folders. By managing related processing together and hiding lower levels, you can display even long measurement flows in a way that easily shows the overall flow.

Flowchart Output

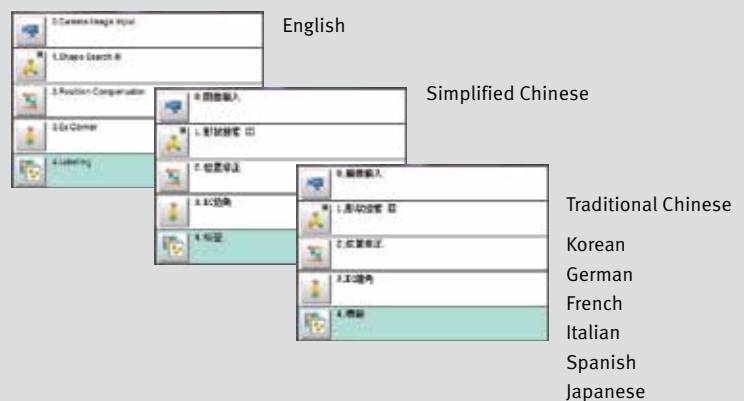
You can save the flowchart as an image file.

Branching

You can use conditional branching to branch according to the execution results of the previous processing units or you can use branching controls with external commands through parallel I/O, PLC Links, or no-protocol communications.

Easy multi-language support: Choose any of nine languages

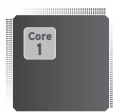
Display the best language for the user for applications in other countries. You can change display messages between nine different languages: English, Chinese (traditional or simplified), German, French, Italian, Spanish, Korean, and Japanese.



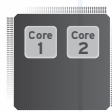
Vision systems line up



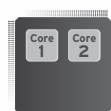
FZ5 Lite
controller



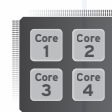
FZ5 standard
controller



FZ5 High-speed
controller



FH standard
controller



FH Ultra-high-speed
controller

up to **4** cameras

up to **8** cameras

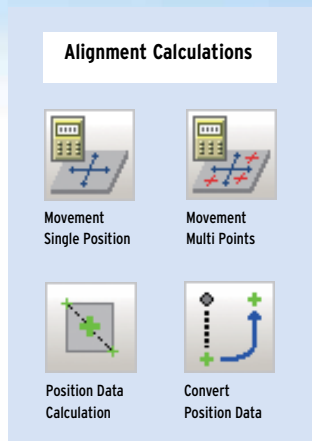
EtherCAT

SYSMAC
always in control

Encoder input

High-precision alignment library

Four specialized types of alignment calculations are provided. You can combine these to easily execute alignment calculations on the FH Series Vision System that require complex calculations on previous sensor models or computers.



Movement single position

The axis movement that is required to match the measured position angle to the reference position angle is calculated.

Movement multi points

The axis movements that are required to match the measured position angles to the corresponding reference position angles are calculated.

Convert position data

The position angle after the specified axis movement is calculated.

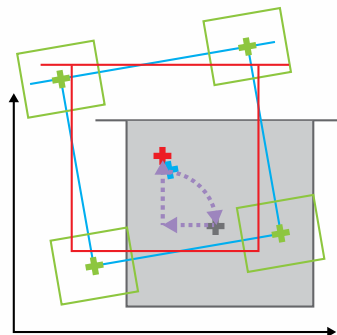
Position data calculation

The specified position angle is calculated from the measured position.

Available alignment methods

Position angle alignment

Offsets are suitable for aligning the positions of workpieces with different sizes. Position angle alignment allows the use of offsets to achieve flexible positioning.



- 1 The Position Data Calculation processing item is used to calculate the position and angle to use in the axis movement based on measurement results (shown in green).
- 2 The rotational movement on the θ axis is calculated as the reference angle minus the measured angle.
- 3 The measurement position is rotated by the rotational movement for the θ axis (grey).
- 4 The reference positions X and Y minus the measured positions X and Y after rotation are used as the X-axis movement and Y-axis movement.

Corresponding point alignment

The axis movements from the measured positions to the reference positions are calculated based on relational position information. This method is suitable for aligning all points within certain distances so that small deviations in the distances do not result in continuity failures, such as they can when aligning electronic substrates.

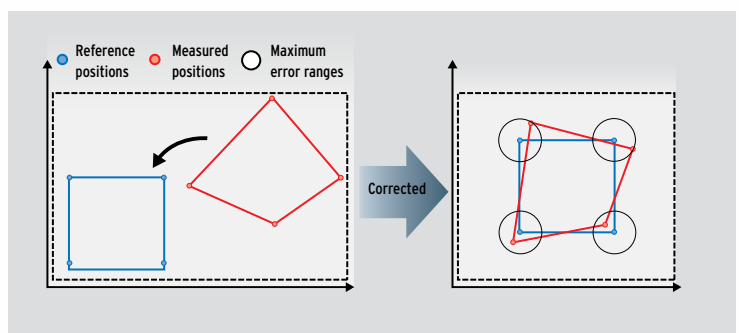
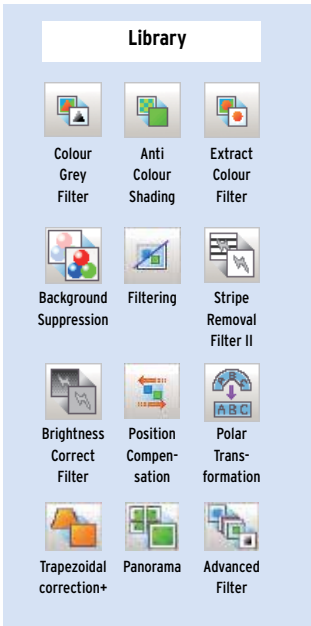


Image filter library

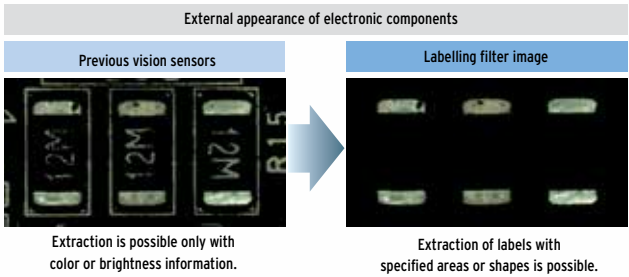
Calculations between images

You can perform arithmetic operations, bit operations, averaging, or maximum/minimum operations between two images.



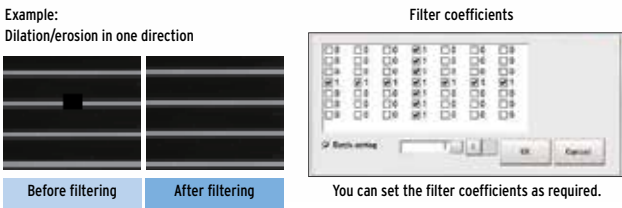
Labelling filter

This filter uses label processing to output an extracted image that contains only the specified characteristic labels.



Custom filter

You can set the mask coefficients as required for these filters. The mask size can be up to 21 x 21. You can more flexibly set image smoothing, edge extractions, dilation, and erosion.

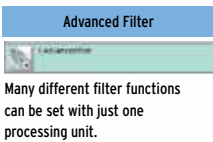


Advanced filter

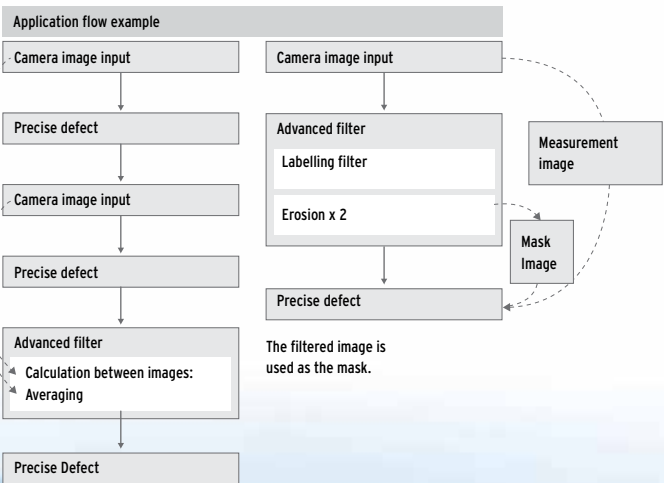
The image filter library has been condensed into one processing item. This allows you to easily set complex filtering as required for external inspections.



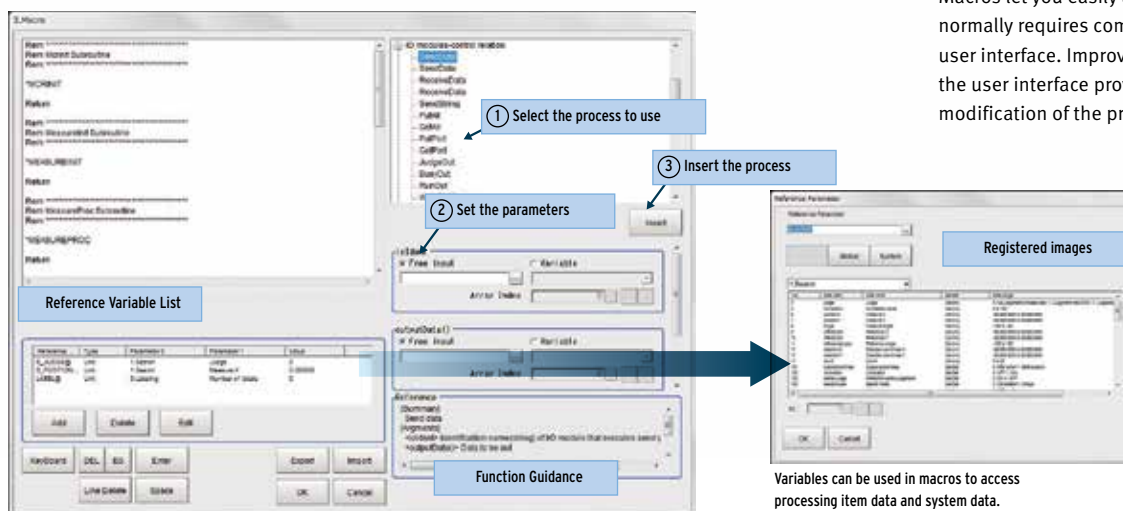
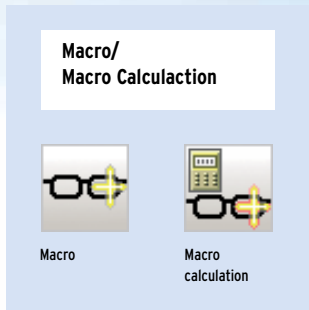
You set up to 16 of the 24 different filters.



The average image is obtained from multiple images.



Utility library

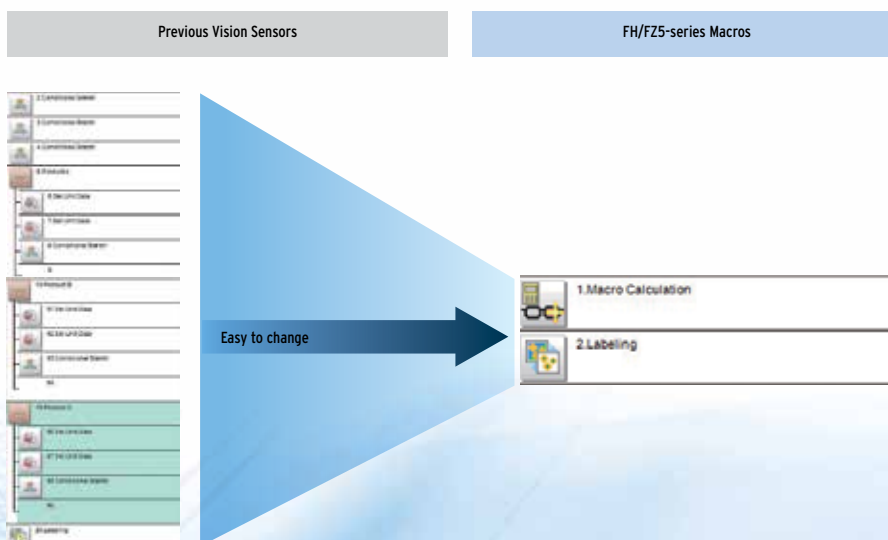


The macros

Macros let you easily achieve flow control that normally requires complex programming from the user interface. Improvements to the setup from the user interface provides ease of selection and modification of the programming process.

Variables can be used in macros to access processing item data and system data.

For example, it would previously have been long and complicated to change the set parameters of a processing item for each product model. With a Macro Calculation processing item, the flow is shorter and setting changes are easy to achieve.



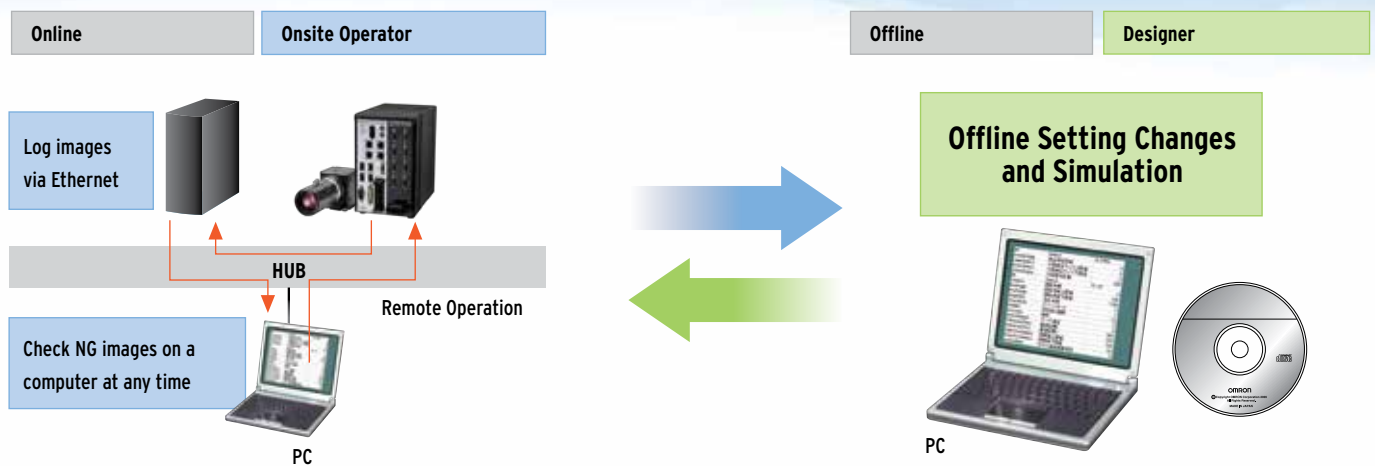
Just enter the values of the variables to update the parameters.

Branching for each product model
 Select INDEX@
 Case 0
 ExtCond0@ = 1 , Area
 ExtParam0@ = 0
 ExtParam1@ = 10000
 Case 1
 ExtCond0@ = 4 , Elliptic major axis
 ExtParam0@ = 0
 ExtParam1@ = 100
 Case 2
 ExtCond0@ = 7 , Rectangle width
 ExtParam0@ = 0
 ExtParam1@ = 200
 End Select

Operation and analysis

Optimum operation both online and offline

Connections to a network hard disk drive or network computer enables a wide range of operation possibilities. You can log measurement images long-term, or you can perform verifications and adjustments on a computer without stopping the FH Series.



Ask your OMRON representative about obtaining simulation software.

New Operation Schemes through Network applications

1 Daily monitoring

You can store NG image in a network HDD to check the NG images every day on a computer without reducing measurement performance. Or you can start simulation software on your computer to remeasure and analyse NG images.

2 Periodic adjustments and inspection adjustments

The non-stop adjustment function lets you change Controller settings without stopping the production line. With remote operation, you can perform operations without going onsite.

3 Handling unstable inspections or measurement failure

The user sends the programmer the image data, setting data, and parameter settings. The programmer can use the simulation software on the computer to check the process and change the settings with the simulation software. The altered scene data can be returned to the user and loaded to the system to complete the adjustments. This enables modifications without requiring the programmer to be on site.

4 Adding inspections or making changes for new models

Based on the images to be inspected, settings are made on the simulation software on a PC running simulation software. The scene data is sent to the user to easily add the new settings.

Ideal for history management

CSV files allow you to easily understand the parameter settings. Also, you can easily change any of the settings.

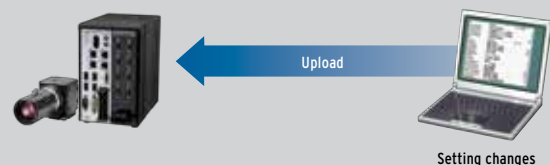
1 Comparisons

If you save the basic settings, you can easily extract any differences in settings caused by changes made incorrectly.

Standard settings	Current parameter settings

2 Remote adjustment

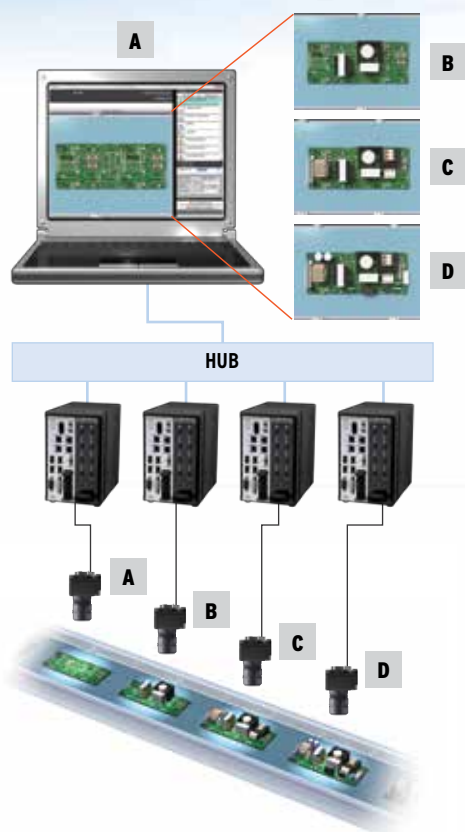
You can attach CSV files to email and upload settings to the FH Series Vision System to easily make adjustments from remote locations when problems occur.



Remote operation centralizes monitoring and adjustment of scattered sensors

You can check the status and adjust the settings of many FH on one computer.

This enables efficient adjustment of Camera images when commissioning a system and application of test adjustment results.



Operating several FHs from one location

Application example 1

1

When commissioning a line, from one location you can adjust the camera images from all of the FHs located along the line. There's no need to go to and from remote controllers, and you can compare camera images under various conditions to adjust them.

2

If setting changes are necessary to add a new model, you can do all the required work at the same time without making trips to all of the controllers.

3

You can easily balance the thresholds between controllers when increasing inspection stability through testing at the production line.

Displaying images from many FHs on one monitor

Application example 2

1

Space savings with a single monitor installation.

2

Single location programming for multiple controllers facilitates adjustments and reduces programmer movement.

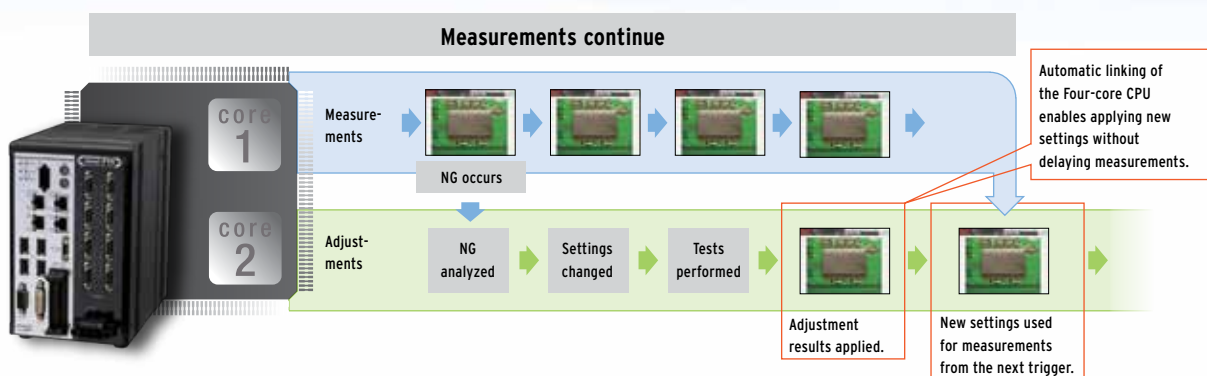
Note: Ask your Omron representative about obtaining simulation software.

Utilities that don't stop your machines

Making confirmations and adjustments without stopping production

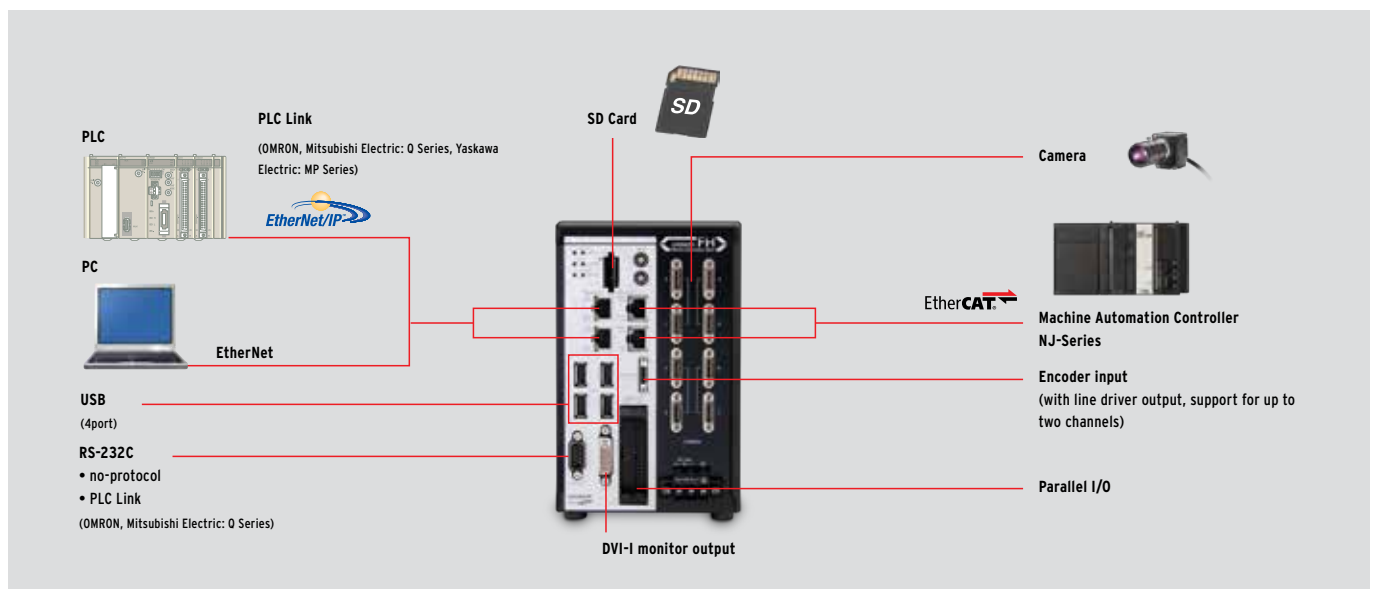
Parallel processing on Four-core CPU not only speeds up measurements, but it enables parallel processing of measurements and adjustments. Automatic distributed processing means that measurements are not delayed when adjustments are applied.

Non-stop adjustment



Seamless communications with peripheral devices

Complete interfaces for all connected devices

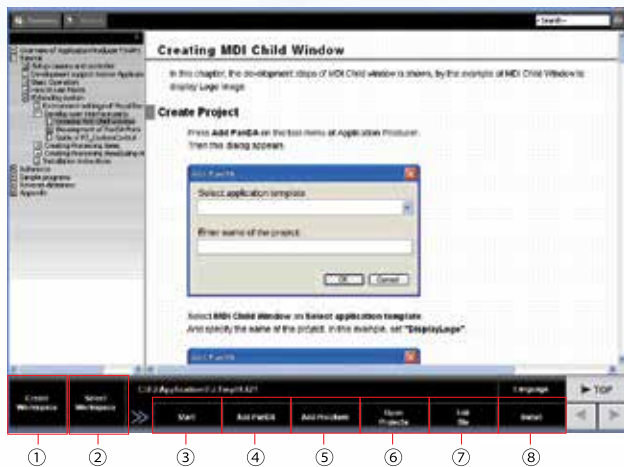


Options for more power customization

Application producer development environment to build and simulate applications

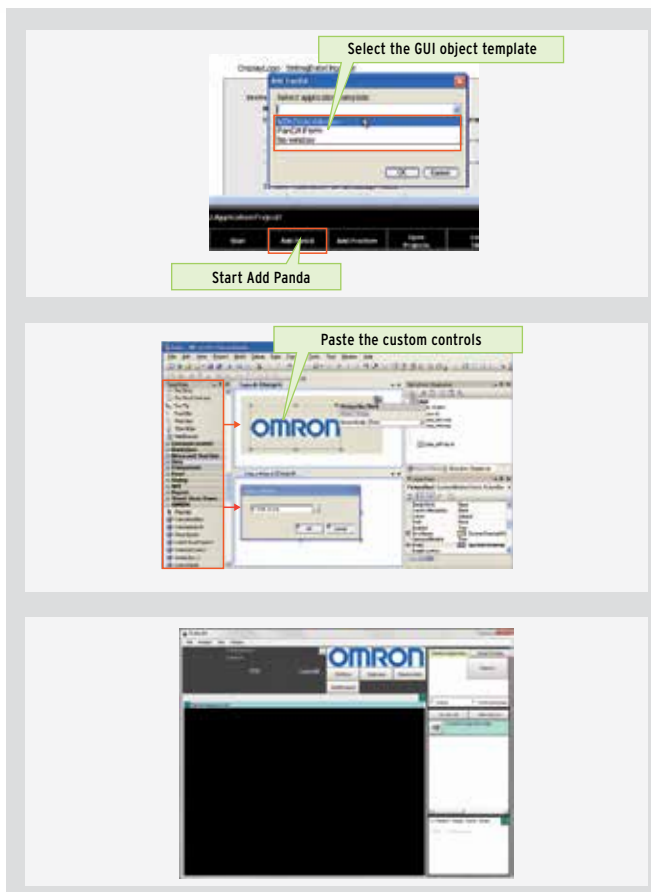
The Application Producer provides a development environment that lets you further customize the standard controller features of the FH Series Vision System. It includes custom control units that you can use to develop original interfaces with Microsoft® Visual Studio®, a command reference to help you create original processing items, and more.

Application Producer Main Window



- ① Create workspaces
- ② Select and change between workspaces.
- ③ Start the program in the selected workspace.
- ④ Create and add GUI objects.
- ⑤ Create and add processing items.
- ⑥ Open Microsoft® Visual Studio® projects.
- ⑦ Open setup files.
- ⑧ Create installation files.

Customization Example: GUI Customization



Start Add Panda and select the template that will serve as a base for customization. Selecting an interface template as a base first greatly reduces the work that is required compared with programming interfaces from scratch.



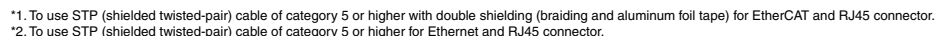
The Application Producer will automatically generate a project file from the selected template so that you can open it in Microsoft® Visual Studio.® You can develop interfaces just by dragging FH Series custom controls and Windows-based controls.



Instead of writing the program code from scratch to build an interface, you can easily build the interface simply by pasting custom controls. You can immediately check and debug the operation of the GUI objects that you add.

System configuration

Example of the FH Sensor Controllers (4-camera type)



Example of the FZ5 Sensor Controllers (4-camera type)



Ordering Information

FH Series Sensor Controllers

Item		CPU	No. of cameras	Output	Model
	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	Model
	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	Color / Monochrome	Image read time	Model	
	High-speed CMOS Cameras (Lens required) For FH Sensor Controllers only	12 million pixels (Up to four cameras can be connected to one Controller. Up to eight cameras other than 12 million-pixel cameras can be connected to a FH-3050-20 or a FH-1050-20.)	Color	25.7 ms*	FH-SC12	
			Monochrome		FH-SM12	
	High-speed CMOS Cameras (Lens required) For FH Sensor Controllers only	4 million pixels	Color	8.5 ms*	FH-SC04	
			Monochrome		FH-SM04	
		2 million pixels	Color	4.6 ms*	FH-SC02	
			Monochrome		FH-SM02	
		300,000 pixels	Color	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.)	Color	62.5 ms	FZ-SC5M2	
			Monochrome		FZ-S5M2	
2 million pixels		Color	33.3 ms	FZ-SC2M		
		Monochrome		FZ-S2M		
300,000 pixels		Color	12.5 ms	FZ-SC		
		Monochrome		FZ-S		
		High-speed CCD Cameras (Lens required)	300,000 pixels	Color	4.9 ms	FZ-SHC
				Monochrome		FZ-SH
	Small Digital CCD Cameras (Lenses for small camera required)	300,000-pixel flat type	Color	12.5 ms	FZ-SFC	
			Monochrome		FZ-SF	
300,000-pixel pen type		Color	12.5 ms	FZ-SPC		
		Monochrome		FZ-SP		
 	Intelligent Compact CMOS Cameras (Camera + Manual Focus Lens + High power Lighting)	Narrow view	Color	16.7 ms	FZ-SQ010F	
		Standard view	Color		FZ-SQ050F	
		Wide View (long-distance)	Color		FZ-SQ100F	
		Wide View (short-distance)	Color		FZ-SQ100N	

* When connected using two camera cables.

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								

C-mount Lens for 1-inch image sensor (Recommend: FH-S□02/FH-S□04) (3Z4S-LE SV-7525H with focal length of 75 mm and 3Z4S-LE SV-10028H with focal length of 100 mm are also available.)

Model	3Z4S-LE VS-0618H1	3Z4S-LE VS-0814H1	3Z4S-LE VS-1214H1	3Z4S-LE VS-1614H1N	3Z4S-LE VS-2514H1	3Z4S-LE VS-3514H1	3Z4S-LE VS-5018H1
Appearance/Dimensions (mm)							
Focal length	6 mm	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm
Aperture (F No.)	1.8 to 16	1.4 to 16	1.4 to 16	1.4 to 16	1.4 to 16	1.4 to 16	1.8 to 16
Filter size	Can not be used a filter	M55.0 P0.75	M35.5 P0.5	M30.5 P0.5	M30.5 P0.5	M30.5 P0.5	M40.5 P0.5
Maximum sensor size	1 inch	1 inch	1 inch	1 inch	1 inch	1 inch	1 inch
Mount	C mount						

M42-mount Lens for large image sensor (Recommend: FH-S□12)

Model	3Z4S-LE VS-L1828/M42-10	3Z4S-LE VS-L2526/M42-10	3Z4S-LE VS-L3528/M42-10	3Z4S-LE VS-L5028/M42-10	3Z4S-LE VS-L8540/M42-10	3Z4S-LE VS-L10028/M42-10
Appearance/Dimensions (mm)						
Focal length	18 mm	25 mm	35 mm	50 mm	85 mm	100 mm
Aperture (F No.)	2.8 to 16	2.6 to 16	2.8 to 16	2.8 to 16	4.0 to 16	2.8 to 16
Filter size	M55.0 P0.75	M55.0 P0.75	M62.0 P0.75	M62.0 P0.75	M52.0 P0.75	M52.0 P0.75
Maximum sensor size	1.8 inch					
Mount	M42 mount					

Camera Accessories

Item	Descriptions		Model
—	External Lighting	—	FLV Series*
			FL Series*
	Lighting Controller (Required to control external lighting from a Controller)	For FLV-Series	Camera Mount Lighting Controller (One channel) FLV-TCC1*
			Camera Mount Lighting Controller (Four channels) FLV-TCC4*
			Analog Lighting Controller FLV-ATC Series*
		For FL-Series	Camera Mount Lighting Controller FL-TCC1*
	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-SH□		FZ-SH-XLC
	Mounting Bracket for FH-S□, FZ-S□5M2		FH-SM-XLC
	Mounting Bracket for FH-S□12		FH-SM12-XLC

* Refer to the Vision Accessory Catalog (Cat. No. Q198) for details.

Cables

Item	Descriptions	Model
	Camera Cable Cable length: 2 m, 3 m, 5m, or 10 m*2	FZ-VS3
	Bend resistant Camera Cable Cable length: 2 m, 3 m, 5m, or 10 m*2	FZ-VSB3
	Right-angle Camera Cable*1 Cable length: 2 m, 3 m, 5m, or 10 m*2	FZ-VSL3
	Bend resistant Right-angle Camera Cable*1 Cable length: 2 m, 3 m, 5 m, or 10 m*2	FZ-VSLB3
	Long-distance Camera Cable Cable length: 15 m*2	FZ-VS4
	Long-distance Right-angle Camera Cable*1 Cable length: 15 m*2	FZ-VSL4
	Cable Extension Unit Up to two Extension Units and three Cables can be connected. (Maximum cable length: 45 m*2)	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 Sensor Controllers only	FH-VMRGB
	Parallel I/O Cable Cable length: 2 m or 5 m, For FZ Sensor Controllers only	FZ-VP
	Parallel I/O Cable for Connector-terminal Conversion Unit Cable length: 2 m or 5 m, For FZ Sensor Controllers 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 Sensor Controllers only	XW2Z-S013-□*4
	Parallel I/O Cable for Connector-terminal Conversion Unit*3 Cable length: 0.5 m, 1 m, 1.5 m, 2 m, 3 m, 5 m, For FH Sensor Controllers only Connector-Terminal Block Conversion Units can be connected (Terminal Blocks Recommended Products: OMRON XW2R-□34G-T)	XW2Z-□□□EE*5
	Connector-Terminal Block Conversion Units, General-purpose devices	XW2R-□34G-T*6
	Encoder Cable for line-driver Cable length: 1.5 m, For FH Sensor Controllers only	FH-VR

*1 This Cable has an L-shaped connector on the Camera end.

*2 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/-S□12 is used in the high speed mode of transmission speed, two camera cables are required.

*3 2 Cables are required for all I/O signals.

*4 Insert the cables length into □ in the model number as follows. 2 m = 2, 5 m = 5

*5 Insert the cables length into □□□ in the model number as follows. 0.5 m = 050, 1 m = 100, 1.5 m = 150, 2 m = 200, 3 m = 300, 5 m = 500

*6 Insert the wiring method into □ in the model number as follows. Phillips screw = J, Slotted screw (rise up) = E, Push-in spring = P

Refer to the XW2R Series catalog (Cat. No. G077) for details.

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				Model
	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 color: Blue, Yellow, or Green, Cables length: 0.2m, 0.3m, 0.5m, 1m, 1.5m, 2m, 3m, 5m, 7.5m, 10m, 15m, 20m			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: 0.3m, 0.5m, 1m, 2m, 3m, 5m, 10m, 15m			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: 0.3m, 0.5m, 1m, 2m, 3m, 5m, 10m, 15m			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: 0.3m, 0.5m, 1m, 2m, 3m, 5m, 10m, 15m			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
--		Wire Gauge and Number of Pairs: AWG22, 2-pair Cable	RJ45 Connectors	Panduit Corporation	MPS588-C*4
--			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

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.

*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.

Peripheral Devices

Item	Descriptions				Model
	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	Number of Model Standards licenses	Media	Model
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

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.

*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.

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	Number of Model Standards licenses	Media	Model
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 Color (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 (Sensor Controllers)

FH Sensor Controllers

Type				High-speed Controllers (4 core)			Standard Controllers (2 core)		
Model		NPN	PNP	FH-3050	FH-3050-10	FH-3050-20	FH-1050	FH-1050-10	FH-1050-20
Main functions	Controller type			Box-type controllers					
	No. of Cameras			2	4	8	2	4	8
	Connected Camera			Can be connected to all cameras. (FZ-S series/FH-S series)		Can be connected to all cameras. (FZ-S series/ FH-S series) (Can be connect- ed to up to four 12 million-pixel cam- eras or up to eight cameras other than 12 million- pixel cameras.)	Can be connected to all cameras. (FZ-S series/FH-S series)		Can be connected to all cameras. (FZ-S series/ FH-S series) (Can be connect- ed to up to four 12 million-pixel cam- eras or up to eight cameras other than 12 million- pixel cameras.)
	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)					
		When connected to a 12 million-pixel camera		4084 (H) × 3072 (V)					
	No. of scenes			128					
	Number of logged images*1	When connected to a intelligent compact camera		Connected to 1 camera(Color): 232, Connected to 2 camera(Color): 116 Connected to 3 camera(Color): 77, Connected to 4 camera(Color): 58 Connected to 5 camera(Color): 46, Connected to 6 camera(Color): 38 Connected to 7 camera(Color): 33, Connected to 8 camera(Color): 29					
		When connected to a 300,000-pixel camera (FZ-S/FH-S)		Connected to 1 camera(Color): 270, Connected to 1 camera(Monochrome): 272 Connected to 2 camera(Color): 135, Connected to 2 camera(Monochrome): 136 Connected to 3 camera(Color/Monochrome): 90 Connected to 4 camera(Color): 67, Connected to 4 camera(Monochrome): 68 Connected to 5 camera(Color/Monochrome): 54 Connected to 6 camera(Color/Monochrome): 45 Connected to 7 camera(Color/Monochrome): 38 Connected to 8 camera(Color): 33, Connected to 8 camera(Monochrome): 34					
		When connected to a 2 million-pixel camera (FH-S)		Connected to 1 camera(Color/Monochrome): 37, Connected to 2 camera(Color/Monochrome): 18 Connected to 3 camera(Color/Monochrome): 12, Connected to 4 camera(Color/Monochrome): 9 Connected to 5 camera(Color/Monochrome): 7, Connected to 6 camera(Color/Monochrome): 6 Connected to 7 camera(Color/Monochrome): 5, Connected to 8 camera(Color/Monochrome): 4					
		When connected to a 2 million-pixel camera (FZ-S)		Connected to 1 camera(Color/Monochrome): 43, Connected to 2 camera(Color/Monochrome): 21 Connected to 3 camera(Color/Monochrome): 14, Connected to 4 camera(Color/Monochrome): 10 Connected to 5 camera(Color/Monochrome): 8, Connected to 6 camera(Color/Monochrome): 7 Connected to 7 camera(Color/Monochrome): 6, Connected to 8 camera(Color/Monochrome): 5					
		When connected to a 4 million-pixel camera (FH-S)		Connected to 1 camera(Color/Monochrome): 20, Connected to 2 camera(Color/Monochrome): 10 Connected to 3 camera(Color/Monochrome): 6, Connected to 4 camera(Color/Monochrome): 5 Connected to 5 camera(Color/Monochrome): 4, Connected to 6 camera(Color/Monochrome): 3 Connected to 7 camera(Color/Monochrome): 2, Connected to 8 camera(Color/Monochrome): 2					
		When connected to a 5 million-pixel camera (FZ-S)		Connected to 1 camera(Color/Monochrome): 16, Connected to 2 camera(Color/Monochrome): 8 Connected to 3 camera(Color/Monochrome): 5, Connected to 4 camera(Color/Monochrome): 4 Connected to 5 camera(Color/Monochrome): 3, Connected to 6 camera(Color/Monochrome): 2 Connected to 7 camera(Color/Monochrome): 2, Connected to 8 camera(Color/Monochrome): 2					
		When connected to a 12 million-pixel camera (FH-S)		Connected to 1 camera(Color/Monochrome): 6, Connected to 2 camera(Color/Monochrome): 3 Connected to 3 camera(Color/Monochrome): 2, Connected to 4 camera(Color/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					
	EtherNet/IP communications			1 port	2 port	2 port	1 port	2port	2port
	EtherCAT 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(Single Link) 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	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.
		When connected to a 300,000-pixel camera, 2 million-pixel camera, 4 million-pixel camera, 5 million-pixel camera or 12 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.
Operation Environment	Insulation resistance			Between DC power supply and controller FG: 20 MΩ or higher (rated voltage 250 V)					
	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					
				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					
Dimensions	Degree of protection			IEC60529 IP20					
	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 lighting controller model is connected to a lamp, the current consumption is as high as when an intelligent compact 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	Color camera: 270, Monochrome Camera: 272		Color camera: 250, Monochrome Camera: 252				
		Connected to 2 cameras	Color camera: 135, Monochrome Camera: 136		Color camera: 125, Monochrome Camera: 126				
		Connected to 3 cameras	Color camera: 90, Monochrome Camera: 90		Color camera: 83, Monochrome Camera: 84				
		Connected to 4 cameras	Color camera: 67, Monochrome Camera: 68		Color camera: 62, Monochrome Camera: 63				
	When connected to a 2 million-pixel camera	Connected to 1 camera	Color camera: 43, Monochrome Camera: 43		Color camera: 40, Monochrome Camera: 40				
		Connected to 2 cameras	Color camera: 21, Monochrome Camera: 21		Color camera: 20, Monochrome Camera: 20				
		Connected to 3 cameras	Color camera: 14, Monochrome Camera: 14		Color camera: 13, Monochrome Camera: 13				
		Connected to 4 cameras	Color camera: 10, Monochrome Camera: 10		Color camera: 10, Monochrome Camera: 10				
	When connected to a 5 million-pixel camera	Connected to 1 camera	Color camera: 16, Monochrome Camera: 16		Color camera: 11, Monochrome Camera: 11				
		Connected to 2 cameras	Color camera: 8, Monochrome Camera: 8		Color camera: 5, Monochrome Camera: 5				
		Connected to 3 cameras	Color camera: 5, Monochrome Camera: 5		—				
		Connected to 4 cameras	Color 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 color 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								
	When connected to a 2 million-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 5 million-pixel camera								
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.

Ratings and Specifications (Cameras)

High-speed CMOS cameras

Model	FH-SM		FH-SC	FH-SM02		FH-SC02	FH-SM04		FH-SC04	FH-SM12		FH-SC12	
Image elements	CMOS image elements (1/3-inch equivalent)			CMOS image elements (2/3-inch equivalent)			CMOS image elements (1-inch equivalent)			CMOS image elements (1.76-inch equivalent)			
Color/Monochrome	Monochrome		Color	Monochrome		Color	Monochrome		Color	Monochrome		Color	
Effective pixels	640 (H) × 480 (V)			2040 (H) × 1088 (V)			2040 (H) × 2048 (V)			4084 (H) × 3072 (V)			
Imaging area H x V (opposing corner)	4.8 × 3.6 (6.0 mm)			11.26 × 5.98 (12.76 mm)			11.26 × 11.26 (15.93 mm)			22.5 × 16.9 (28.14 mm)			
Pixel size	7.4 (μm) × 7.4 (μm)			5.5 (μm) × 5.5 (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.						Electronic shutter; Shutter speeds can be set from 60 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	4 to 3072 lines (4-line increments)			
Frame rate (image read time)	308 fps (3.3 ms)			219 fps (4.6 ms)*			118 fps (8.5 ms)*			38.9 fps (25.7 ms)*			
Lens mounting	C mount									M42 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									Approx.320 g
Accessories	Instruction manual												

* Frame rate in high speed mode when the camera is connected using two camera cables.

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	
Color/Monochrome	Monochrome	Color	Monochrome	Color	Monochrome	Color
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			
Color/Monochrome	Monochrome	Color	Monochrome	Color
Effective pixels	640 (H) × 480 (V)			
Pixel size	7.4 (μm) × 7.4 (μm)			
Shutter function	Electronic shutter; select shutter speeds from 20 μs to 100 ms			
Partial function	12 to 480 lines			
Frame rate (image read time)	80 fps (12.5ms)			
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	
Color/Monochrome	Monochrome	Color
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				
Color/Monochrome	Color				
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*	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				

* Applicable standards: IEC62471-2

Ratings and Specifications (LCD Monitor, Cable)

LCD Monitor

Model	FZ-M08
Size	8.4 inches
Type	Liquid crystal color 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-VS3 (2 m)	FZ-VSB3 (2 m)	FZ-VSL3 (2 m)	FZ-VSLB3 (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	69mm	69mm	69mm	69mm
Weight	Approx. 170 g	Approx. 180 g	Approx. 170 g	Approx. 180 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)
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-VS4 (15 m)	FZ-VSL4 (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	78 mm	
Weight	Approx. 1400 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

FH-Series

Cameras / Cables Connection Table

Type of camera	Model	Cable length	High-speed CMOS cameras*						
			300,000-pixel	2 million-pixel		4 million-pixel		12 million-pixel	
			FH-SM/SC	FH-SM02/SC02		FH-SM04/SC04		FH-SM12/SC12	
			—	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	High speed mode of transmission speed select	Standard mode of transmission speed select
Camera Cables Right-angle camera cables	FZ-VS3 FZ-VSL3	2 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		3 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		5 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		10 m	Yes	No	Yes	No	Yes	No	Yes
Bend resistant camera cables	FZ-VSB3 FZ-VSLB3	2 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		3 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		5 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		10 m	Yes	No	Yes	No	Yes	No	Yes
Long-distance camera cable Long-distance right-angle camera cable	FZ-VS4 FZ-VSL4	15 m	Yes	No	Yes	No	Yes	No	Yes

* 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
			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□
Camera Cables Right-angle camera cables	FZ-VS3 FZ-VSL3	2 m	Yes	Yes	Yes	Yes	Yes	Yes
		3 m	Yes	Yes	Yes	Yes	Yes	Yes
		5 m	Yes	Yes	Yes	Yes	Yes	Yes
		10 m	Yes	Yes	No	Yes	Yes	Yes
Bend resistant camera cables	FZ-VSB3 FZ-VSLB3	2 m	Yes	Yes	Yes	Yes	Yes	Yes
		3 m	Yes	Yes	Yes	Yes	Yes	Yes
		5 m	Yes	Yes	Yes	Yes	Yes	Yes
		10 m	Yes	Yes	No	Yes	Yes	Yes
Long-distance camera cable Long-distance right-angle camera cable	FZ-VS4 FZ-VSL4	15 m	Yes	Yes	No	Yes	Yes	Yes

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.*
	Output	28 bytes/line (including output data and unused areas) Up to 8 lines can be set.*
Mailbox data size	Input	512 bytes
	Output	512 bytes
Mailbox	Emergency messages, SDO requests, and SDO information	
Refreshing methods	I/O-synchronized refreshing (DC)	

* This depends on the upper limit of the master.

Version Information

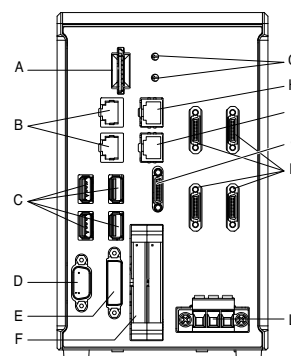
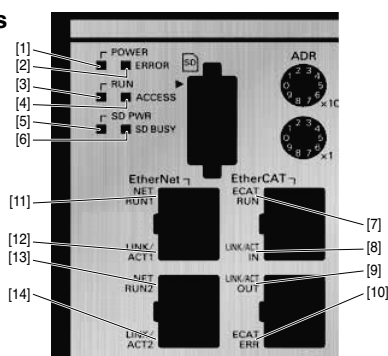
FH Series and Programming Devices

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

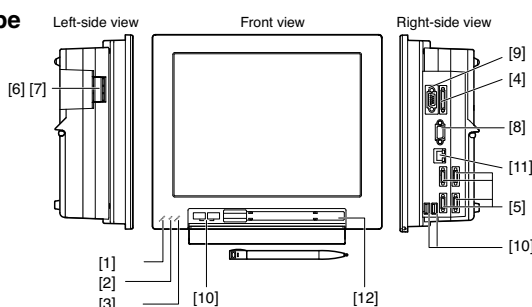
Example of the FH Sensor Controllers BOX type (4-camera type)



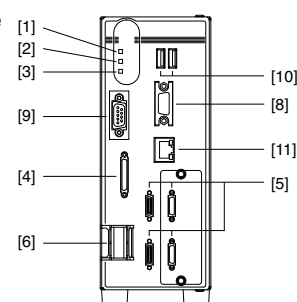
	Name	Description
[1]	POWER LED	Lit while power is ON.
[2]	ERROR LED	Lit when an error has occurred.
[3]	RUN LED	Lit while the controller is in Measurement Mode.
[4]	ACCESS LED	Lit while the memory is accessed.
[5]	SD POWER LED	Lit while power is supplied to the SD card and the card is usable.
[6]	SD 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)

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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