OMRON

Vision System
FH-2050-□/-5□50-□ Series

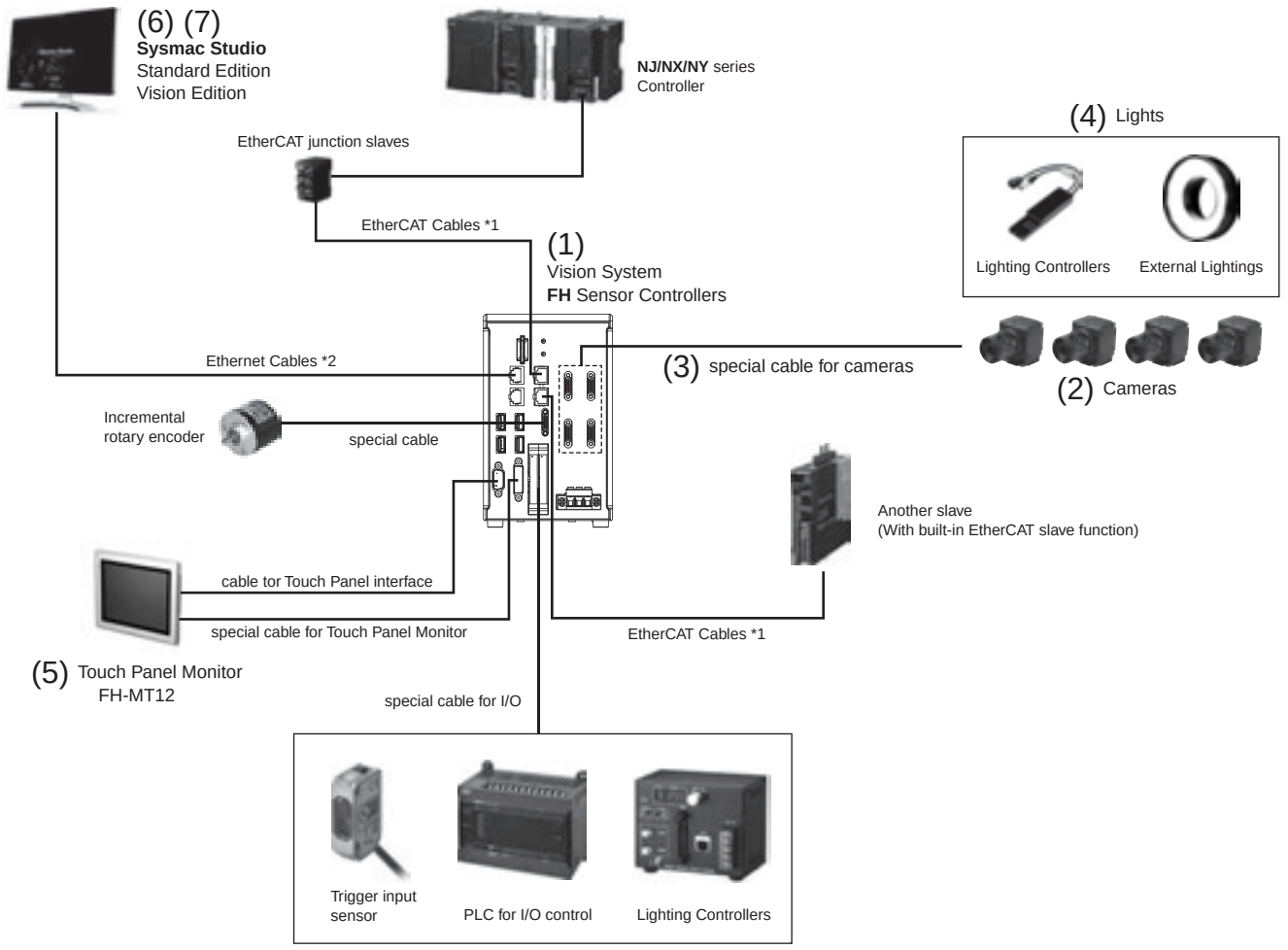
AI-based automated visual inspection

- AI reproduces human sensibility and experience
- Software for flexible automation
- Design interface for quick setup

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.

(1) Controllers

Select a controller based on the required processing speed and network.

	Series	CPU	Performance	Memory	No. of connectable cameras	Fieldbus
High-speed, Large-capacity Controller	FH-5550 Series	Intel® Core™ i7 processor 4 cores	★★★★★	RAM 32 GB, ROM 64 GB	8 max.	PROFINET, EtherNet/IP®, EtherCAT
High-speed Controller	FH-5050 Series	Intel® Core™ i7 processor 4 cores	★★★★★	RAM 8 GB, ROM 32 GB	8 max.	PROFINET, EtherNet/IP®, EtherCAT
Standard Controller	FH-2050 Series	Intel® Celeron® processor 2 cores	★★★	RAM 8 GB, ROM 32 GB	8 max.	PROFINET, EtherNet/IP®, EtherCAT

★: The more stars, the higher the performance.

Optional product (sold separately)	Model
Scratch Detect AI Software Installer*	FH-UMAI1

* This product can be installed on the FH-5□50-series Controller (version 6.40 or later).

(2) Cameras

Choose the right camera to suit your required number of pixels.
Easy-to-use cameras with built-in light are also available.

No. of pixels	High-speed camera	Standard camera	Rolling shutter camera	Camera with built-in light
20.4 Mpix*	---	---	FH-S□21R	---
12 Mpix	FH-S□X12	---	---	---
5 Mpix	FH-S□X05	FZ-S□5M3	FH-S□05R	---
4 Mpix	FH-S□04	---	---	---
3.2 Mpix	FH-S□X03	---	---	---
2 Mpix	FH-S□02	FZ-S□2M	---	---
1.6 Mpix	FH-S□X01	---	---	---
0.4 Mpix/0.3 Mpix	FH-S□X	FZ-S□	---	FZ-SQ□□□□

* 20.4 Mpix Cameras can be used with the FH-5050/2050-series High-speed, Large-capacity Controllers.

(3) Camera cables

The cable line-up includes bend-resistant cables and right-angle cables. Use the FZ-VSJ Cable Extension Unit for cable extensions.

Description	Model
Camera Cable	FZ-VS□ □□M
Bend-resistant Camera Cable	FZ-VSB3 □□M
Super-bend-resistant Camera Cable	FZ-VSBX □□M
Right-angle Camera Cable	FZ-VSL□ □□M
Bend-resistant Right-angle Camera Cable	FZ-VSLB3 □□M
Cable Extension Unit	FZ-VSJ

(4) Lights

Omron offers a complete line-up of lights required for image processing. The use of the camera-mount lighting controller allows you to control lighting conditions from the FH Controller, making system configuration simple.

External lighting controller

Description	LED	High-brightness LED
Camera-mount Lighting Controller	FLV-TCC	FL-TCC
Bar Light	FLV-BR	FL-BR
Direct Ring Light	FLV-DR	FL-DR
Low Angle Ring Light	FLV-DL	---
Coaxial Light	FLV-CL	---
Shadowless Light	FLV-FR/FP/FS/FQ	---
Spot Light	FLV-EP	---
Direct Back/Edge Type Light	FLV-DB/FB	---
Dome Light	FLV-DD	---
Photometric Stereo Light *	---	FL-PS

* The FL-TCC Camera-mount Lighting Controller cannot be used. Use the FL-TCC1PS Lighting Controller for Photometric Stereo Light.

Built-in lighting controller

Description	Model
MDMC Light	FL-MD

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

(5) Touch panel monitor

The touch panel monitor is optimized for the operation of the FH Series.

Description	Model
Touch Panel Monitor 12.1 inches	FH-MT12
DVI-Analog Conversion Cable for Touch Panel Monitor	FH-VMDA □□
USB Cable for Touch Panel Monitor	FH-VUAB □□

* RS-232C cables for long-distance connections are also available. Refer to Ordering Information for details.

(6) Sysmac Studio

The development environment for the Sysmac platform allows you to configure and simulate the FH Series on your PC.

Description	Model
DVD for installation	SYSMAC-SE200D
Software license (Vision Edition)	SYSMAC-VE001L

(7) Application producer

This development environment enables you to customize FH functions. It includes sample codes and wizards that will help you develop your own interfaces and processing items.

Description	Model
DVD for installation	FH-AP1
Software license	FH-AP1L

Ordering Information

FH Series Sensor Controllers

Item		CPU	AI function		No. of cameras	Output	Model
			AI Scratch Detect Filter *	AI FineMatching			
	High-speed, Large-capacity Controller	Intel® Core™ i7 processor 4 cores	Available	Available	2	NPN/PNP	**FH-5550**
					4	NPN/PNP	**FH-5550-10**
					8	NPN/PNP	**FH-5550-20**
	High-speed Controller	Intel® Core™ i7 processor 4 cores	Available	Available	2	NPN/PNP	**FH-5050**
					4	NPN/PNP	**FH-5050-10**
					8	NPN/PNP	**FH-5050-20**
	Standard Controller	Intel® Celeron® processor 2 cores	Not available	Available	2	NPN/PNP	**FH-2050**
					4	NPN/PNP	**FH-2050-10**
					8	NPN/PNP	**FH-2050-20**

* Optional FH-UMAI1 Scratch Detect AI Software Installer is required.

Optional Products (Sold Separately)

Item	Model
Scratch Detect AI Software Installer *	**FH-UMAI1**

* This product can be installed on the FH-5□50-series Controller (version 6.40 or later).

Cameras

Item		Lens mount	Descriptions	Color / Monochrome	Image Acquisition Time *1	Model
	Digital CMOS Cameras (Lens required)	C mount	20.4 million pixels (Supported controller: FH-5□50(-□)/2050(-□) Series) *2	Color	42.6 ms *3	**FH-SC21R**
				Monochrome		**FH-SM21R**
	High-speed Digital CMOS Cameras (Lens required)	C mount	12 million pixels *2	Color	24.9 ms *3	**FH-SCX12**
				Monochrome		**FH-SMX12**
			5 million pixels	Color	10.3 ms *3	**FH-SCX05**
				Monochrome		**FH-SMX05**
			3.2 million pixels	Color	6.6 ms *3	**FH-SCX03**
				Monochrome		**FH-SMX03**
			1.6 million pixels	Color	6.5 ms	**FH-SCX01**
				Monochrome		**FH-SMX01**
			0.4 million pixels	Color	1.9ms	**FH-SCX**
				Monochrome		**FH-SMX**
	High-speed Digital CMOS Cameras (Lens required)	M42 mount	12 million pixels *2	Color	25.7 ms *3	**FH-SC12**
				Monochrome		**FH-SM12**
	High-speed Digital CMOS Cameras (Lens required)	C mount	4 million pixels	Color	8.5 ms *3	**FH-SC04**
				Monochrome		**FH-SM04**
			2 million pixels	Color	4.6 ms *3	**FH-SC02**
				Monochrome		**FH-SM02**
			0.3 million pixels	Color	3.3 ms	**FH-SC**
				Monochrome		**FH-SM**
	Digital CMOS Cameras (Lens required)	C mount	5 million pixels	Color	71.7ms	**FH-SC05R**
				Monochrome		**FH-SM05R**
			5 million pixels	Color	38.2 ms	**FZ-SC5M3**
				Monochrome		**FZ-S5M3**
	Digital CCD Cameras (Lens required)	C mount	2 million pixels	Color	33.3 ms	**FZ-SC2M**
				Monochrome		**FZ-S2M**
			0.3 million pixels	Color	12.5 ms	**FZ-SC**
				Monochrome		**FZ-S**

Item		Lens mount	Descriptions	Color / Monochrome	Image Acquisition Time *1	Model
	Small Digital CCD Cameras (Lens required)	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 Digital CMOS Camera	Built-in lens	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**

*1 The image acquisition time does not include the image conversion processing time of the sensor controller.
The camera image input time varies depending on the sensor controller model, number of cameras, and camera settings. Check before you use the camera.
*2 Up to four cameras of this model can be connected to one controller. Up to eight cameras including other models can be connected to an FH-5550-20, 5050-20 or 2050-20.
*3 Frame rate in high speed mode when the camera is connected using two camera cables. For other conditions, refer to the table on the next page.

Model			FH-SM02	FH-SC02	FH-SM04	FH-SC04	FH-SM12	FH-SC12	FH-SMX	FH-SCX	FH-SMX01	FH-SCX01	FH-SMX03	FH-SCX03	FH-SMX05	FH-SCX05	FH-SMX12	FH-SCX12	FH-SM21R	FH-SC21R
Image Acquisition Time *4	2 Cables *5	High Speed Mode *6	4.6 ms		8.5 ms		25.7 ms		---		---		6.6 ms		10.3 ms		24.9 ms		42.6 ms	
		Standard Mode	9.7 ms		17.9 ms		51.3 ms		---		---		14.1 ms		22.1 ms		53.5 ms		90.1 ms	
	1 Cables	High Speed Mode *6	9.2 ms		17.0 ms		51.3 ms		1.9 ms		6.5 ms		13.2 ms		20.6 ms		50.0 ms		83.3 ms	
		Standard Mode	19.3 ms		35.8 ms		102.0 ms		3.8 ms		14.7 ms		28.2 ms		44.1 ms		106.4 ms		175.4 ms	

*4 The image acquisition time does not include the image conversion processing time of the sensor controller.
*5 Two Camera ports of the controller are used per one camera.
*6 Up to 5 m Camera Cable length.

Camera Cables

Item	Descriptions	Model *3
	Camera Cable Cable length: 2 m, 3 m, 5 m, or 10 m *2	**FZ-VS3 □M**
	Bend resistant Camera Cable Cable length: 2 m, 3 m, 5 m, or 10 m *2	**FZ-VSB3 □M**
	Super Bend resistant Camera Cable Cable length: 5 m or 10 m	**FZ-VSBX □M**
	Right-angle Camera Cable *1 Cable length: 2 m, 3 m, 5 m, or 10 m *2	**FZ-VSL3 □M**
	Bend resistant Right-angle Camera Cable *1 Cable length: 2 m, 3 m, 5 m, or 10 m *2	**FZ-VSLB3 □M**
	Long-distance Camera Cable Cable length: 15 m *2	**FZ-VS4 15M**
	Long-distance Right-angle Camera Cable *1 Cable length: 15 m *2	**FZ-VSL4 15M**
	Cable Extension Unit Up to two Extension Units and three Cables can be connected. (Maximum cable length: 45 m *2)	**FZ-VSJ**

*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, refer to the *Cameras / Cables Connection Table and Maximum Extension Length Using Cable Extension Units FZ-VSJ* table.
When a High-speed Digital CMOS Camera FH-S□02/-S□04/-S□12/-S□X03/-S□X05/-S□X12/-S□21R is used in the high speed mode of transmission speed, two camera cables are required.
*3 Insert the cables length into □ in the model number as follows. 2 m = 2, 3 m = 3, 5 m = 5, 10 m = 10

Cameras / Cables Connection Table

Camera Cables	Model	Cable length	High-speed Digital 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 Bend resistant Right-angle Camera Cable	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
Super Bend resistant Camera Cable	FZ-VSBX	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

Camera Cables	Model	Cable length	High-speed Digital CMOS cameras									
			400,000-pixel		1.6 million-pixel		3.2 million-pixel		5 million-pixel		12 million-pixel	
			FH-SMX/SCX		FH-SMX01/SCX01		FH-SMX03/SCX03		FH-SMX05/SCX05		FH-SMX12/SCX12	
			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	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	Yes	Yes	Yes
		3 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		5 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		10 m	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Bend resistant camera cables Bend resistant Right-angle Camera Cable	FZ-VSB3 FZ-VSLB3	2 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		3 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		5 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		10 m	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Super Bend resistant Camera Cable	FZ-VSBX	5 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		10 m	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Long-distance camera cable Long-distance right-angle camera cable	FZ-VS4 FZ-VSL4	15 m	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Camera Cables	Model	Cable length	Digital CMOS Camera				Digital CCD cameras	
			5 million-pixel	20.4 million-pixel		5 million-pixel	300,000-pixel	2 million-pixel
			FH-SM05R/ SC05R	FH-SM21R/SC21R		FZ-S5M3/ SC5M3	FZ-S/SC	FZ-S2M/SC2M
			–	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
		3 m	Yes	Yes	Yes	Yes	Yes	Yes
		5 m	Yes	Yes	Yes	Yes	Yes	Yes
		10 m	Yes	No	Yes	No	Yes	Yes
Bend resistant camera cables Bend resistant Right-angle Camera Cable	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	No	Yes	No	Yes	Yes
Super Bend resistant Camera Cable	FZ-VSBX	5 m	Yes	Yes	Yes	Yes	Yes	Yes
		10 m	Yes	No	Yes	No	Yes	Yes
Long-distance camera cable Long-distance right-angle camera cable	FZ-VS4 FZ-VSL4	15 m	Yes	No	Yes	No	Yes	Yes

Camera Cables	Model	Cable length	Small digital CCD cameras Pen type / flat type	Intelligent Compact Digital CMOS Camera
			FZ-SF/SFC FZ-SP/SPC	FZ-SQ□
Camera Cables Right-angle camera cables	FZ-VS3 FZ-VSL3	2 m	Yes	Yes
		3 m	Yes	Yes
		5 m	Yes	Yes
		10 m	Yes	Yes
Bend resistant camera cables Bend resistant Right-angle Camera Cable	FZ-VSB3 FZ-VSLB3	2 m	Yes	Yes
		3 m	Yes	Yes
		5 m	Yes	Yes
		10 m	Yes	Yes
Super Bend resistant Camera Cable	FZ-VSBX	5 m	Yes	Yes
		10 m	Yes	Yes
Long-distance camera cable Long-distance right-angle camera cable	FZ-VS4 FZ-VSL4	15 m	Yes	Yes

Maximum Extension Length Using Cable Extension Units FZ-VSJ

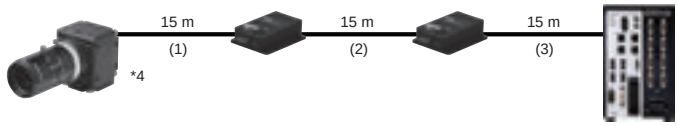
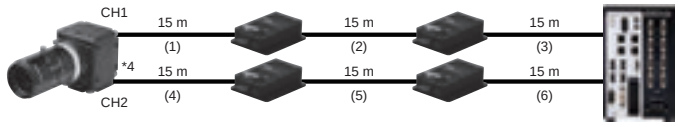
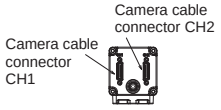
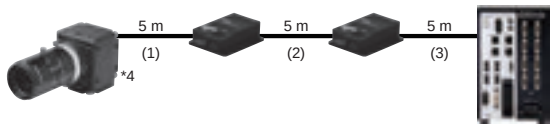
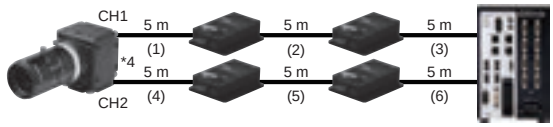
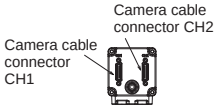
Item	Model	Transmission speed (*1)	No. of CH used for connection (*2)	Maximum cable length using 1 Camera Cable (*1)	Max. number of connectable Extension Units	Using Cable Extension Units FZ-VSJ	
						Max. cable length	Connection configuration
High-speed Digital CMOS Cameras	FH-SM/SC	---	---	15 m (Using FZ-VS4/VSL4)	2	45 m	[Configuration 1] Camera cable: 15 m × 3 Extension Unit: 2
	FH-SMX/SCX FH-SMX01/SCX01	Standard	---	15 m (Using FZ-VS4/VSL4)	2	45 m	[Configuration 1] Camera cable: 15 m × 3 Extension Unit: 2
		High speed	---	5 m (Using FZ-VS□/VSL□)	2	15 m	[Configuration 3] Camera cable: 5 m × 3 Extension Unit: 2
	FH-SM02/SC02 FH-SM04/SC04 FH-SM12/SC12 FH-SMX03/SCX03 FH-SMX05/SCX05 FH-SMX12/SCX12	Standard	1	15 m (Using FZ-VS4/VSL4)	2	45 m	[Configuration 1] Camera cable: 15 m × 3 Extension Unit: 2
			2	15 m (Using FZ-VS4/VSL4)	4 (*3)	45 m	[Configuration 2] Camera cable: 15 m × 6 Extension Unit: 4
		High speed	1	5 m (Using FZ-VS□/VSL□)	2	15 m	[Configuration 3] Camera cable: 5 m × 3 Extension Unit: 2
			2	5 m (Using FZ-VS□/VSL□)	4 (*3)	15 m	[Configuration 4] Camera cable: 5 m × 6 Extension Unit: 4
Digital CMOS Cameras	FH-SM21R/SC21R	Standard	1	15 m (Using FZ-VS4/VSL4)	2	45 m	[Configuration 1] Camera cable: 15 m × 3 Extension Unit: 2
			2	15 m (Using FZ-VS4/VSL4)	4 (*3)	45 m	[Configuration 2] Camera cable: 15 m × 6 Extension Unit: 4
		High speed	1	5 m (Using FZ-VS□/VSL□)	2	15 m	[Configuration 3] Camera cable: 5 m × 3 Extension Unit: 2
			2	5 m (Using FZ-VS□/VSL□)	4 (*3)	15 m	[Configuration 4] Camera cable: 5 m × 6 Extension Unit: 4
	FH-SM05R/SC05R	---	---	15 m (Using FZ-VS□/VSL□)	2	45 m	[Configuration 1] Camera cable: 15 m × 3 Extension Unit: 2
	FZ-S5M3/SC5M3	---	---	5 m (Using FZ-VS□/VSL□)	2	15 m	[Configuration 3] Camera cable: 5 m × 3 Extension Unit: 2
Digital CCD Cameras	FZ-S/SC FZ-S2M/SC2M	---	---	15 m (Using FZ-VS4/VSL4)	2	45 m	[Configuration 1] Camera cable: 15 m × 3 Extension Unit: 2
Small Digital CCD Cameras Flat type/ Pen type	FZ-SF/SFC FZ-SP/SPC	---	---	15 m (Using FZ-VS4/VSL4)	2	45 m	[Configuration 1] Camera cable: 15 m × 3 Extension Unit: 2
Intelligent Compact Digital CMOS Camera	FZ-SQ□	---	---	15 m (Using FZ-VS4/VSL4)	2	45 m	[Configuration 1] Camera cable: 15 m × 3 Extension Unit: 2

*1 The FH-S□□□ enables switching between standard and high speed modes. In high speed mode, images can be transferred approximately two times faster than in standard mode, but the connectable cable length will be shorter.

*2 The FH-S□□□ has two channels to connect Camera Cables. Connection to two channels makes image transfer two times faster than connection to one channel: high speed mode using two channels can transfer approximately four times as many images as standard mode using one channel.

*3 Each channel can be used to connect up to two Cable Extension Units: up to four extension units, two channels x two units, can be connected by using two channels.

Connection Configuration

	Connection configuration using the maximum length of Camera Cables	Remarks
Configuration 1		
Configuration 2		
Configuration 3		
Configuration 4		

*4 Select the Camera Cables between the Controller and Extension Unit, between the Extension Units, and between the Extension Unit and Camera according to the connected Camera.
Different types or lengths of Camera Cables can be used for (1), (2), and (3) as well as for (4), (5), and (6). However, the type and length of Camera Cable (1) must be the same as those of Camera Cable (4), (2) must be the same as (5), and (3) must be the same as (6).

Monitor

Item	Descriptions	Model
	Touch Panel Monitor 12.1 inches For FH Sensor Controllers *	**FH-MT12**
	LCD Monitor 8.4 inches	**FZ-M08**

* FH Series Sensor Controllers version 5.32 or higher is required.

Monitor Cables

Item	Descriptions	Model
	DVI-Analog Conversion Cable for Touch Panel Monitor/LCD Monitor Cable length: 2 m, 5 m or 10 m	**FH-VMDA □M *1**
	RS-232C Cable for Touch Panel Monitor Cable length: 2 m, 5 m or 10 m	**XW2Z-□□□PP-1 *2**
	USB Cable for Touch Panel Monitor Cable length: 2 m or 5 m	**FH-VUAB □M *1**

*1 Insert the cables length into □ in the model number as follows. 2 m = 2, 5 m = 5, 10 m = 10
*2 Insert the cables length into □□□ in the model number as follows. 2 m = 200, 5 m = 500, 10 m = 010.

A video signal cable and an operation signal cable are required to connect the Touch Panel Monitor.

Signal	Cable	2 m	5 m	10 m
Video signal	DVI-Analog Conversion Cable	Yes	Yes	Yes
Touch panel operation signal	USB Cable	Yes	Yes	No
	RS-232C Cable	Yes	Yes	Yes

Parallel I/O Cables/Encoder Cable

Item	Descriptions	Model
	Parallel I/O Cable *1 Cable length: 2m, 5m or 15m	**XW2Z-S013-□** *2
	Parallel I/O Cable for Connector-terminal Conversion Unit *1 Cable length: 0.5 m, 1 m, 1.5 m, 2 m, 3 m, 5 m Connector-Terminal Block Conversion Units can be connected (Terminal Blocks Recommended Products: OMRON XW2K-34G-T)	**XW2Z-□□□EE** *3
	Ultra-Compact Interface Wiring System (General-Purpose)	**XW2K-34G-T** *4
	Encoder Cable for line-driver Cable length: 1.5 m	**FH-VR 1.5M**

*1 2 Cables are required for all I/O signals.
*2 Insert the cables length into □ in the model number as follows. 2 m = 2, 5 m = 5, 15 m = 15
*3 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
*4 Refer to the XW2K Series Datasheet (Cat. No. G152) for details.

Parallel Converter Cable

When you change to connect the F series, FZ5 series, or FZ5-L series to FH series Sensor Controller, you can convert by using the appropriate parallel converter cable of FH-VPX series under the usable condition.

Item	Applicable Model		Usable Condition	Model
	FZ□ series		• Do not use RESET signal. * • Use with COMIN and COMUT are same power source.	**FH-VPX-FZ**
	FZ□-L35x series		• Do not use RESET signal. *	**FH-VPX-FZL**
	F160 series	F160-C10	• Do not use RESET signal. * • Use with COMIN and COMOUT are same power source. • Do not use DI5 and DI6.	**FH-VPX-F160**
	F210 series	F210-C10	• Do not use RESET signal. * • Use with COMIN and COMOUT are same power source. • Do not use DI8 and DI9.	**FH-VPX-F210**
		F210-C10-ETN		
	F500 series	F500-C10		

* Even if RESET signal cannot be use by conversion, conversion is possible to convert satisfying other usable condition.
Note: Cannot be used for the F160-C10CP/-C10CF.

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.

Cable with Connectors

Item	Appearance	Recommended manufacturer	Cable length (m)	Model
Cable with Connectors on Both Ends (RJ45/RJ45) Standard RJ45 plugs type *1 Wire Gauge and Number of Pairs: AWG26, 4-pair Cable Cable Sheath material: PUR Cable color: Yellow *2		OMRON	0.3	**XS6W-6PUR8SS30CM-YF**
			0.5	**XS6W-6PUR8SS50CM-YF**
			1	**XS6W-6PUR8SS100CM-YF**
			2	**XS6W-6PUR8SS200CM-YF**
			3	**XS6W-6PUR8SS300CM-YF**
			5	**XS6W-6PUR8SS500CM-YF**
Cable with Connectors on Both Ends (RJ45/RJ45) Rugged RJ45 plugs type *1 Wire Gauge and Number of Pairs: AWG22, 2-pair Cable Cable color: Light blue		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**
Cable with Connectors on Both Ends (M12 Straight/M12 Straight) Shield Strengthening Connector cable *3 M12/Smartclick Connectors Wire Gauge and Number of Pairs: AWG22, 2-pair Cable Cable color: Black		OMRON	0.5	**XS5W-T421-BM2-SS**
			1	**XS5W-T421-CM2-SS**
			2	**XS5W-T421-DM2-SS**
			3	**XS5W-T421-EM2-SS**
			5	**XS5W-T421-GM2-SS**
			10	**XS5W-T421-JM2-SS**
Cable with Connectors on Both Ends (M12 Straight/RJ45) Shield Strengthening Connector cable *3 M12/Smartclick Connectors Rugged RJ45 plugs type Wire Gauge and Number of Pairs: AWG22, 2-pair Cable Cable color: Black		OMRON	0.5	**XS5W-T421-BMC-SS**
			1	**XS5W-T421-CMC-SS**
			2	**XS5W-T421-DMC-SS**
			3	**XS5W-T421-EMC-SS**
			5	**XS5W-T421-GMC-SS**
			10	**XS5W-T421-JMC-SS**

*1 Cables with standard RJ45 plugs are available in the following lengths: 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.
Cables with rugged RJ45 plugs are available in the following lengths: 0.3 m, 0.5 m, 1 m, 2 m, 3 m, 5 m, 10 m, 15 m.
For details, refer to the Industrial Ethernet Connectors Catalog (Cat. No. G019).
*2 Cables colors are available in yellow, green, and blue.
*3 For details, contact your OMRON representative.

Cables / Connectors

Item		Recommended manufacturer	Model
Products for EtherCAT or EtherNet/IP (1000BASE-T/100BASE-TX) Wire gauge and number of pairs: AWG24, 4-pair cable	Cable	Hitachi Metals, Ltd.	**NETSTAR-C5E SAB 0.5 x 4P CP** *1
		Kuramo Electric Co.	**KETH-SB ✻1**
	RJ45 Connector	Panduit Corporation	**MPS588-C ✻1**
Products for EtherCAT or EtherNet/IP (100BASE-TX/10BASE-T) Wire gauge and number of pairs: AWG22, 2-pair cable	Cable	Kuramo Electric Co.	**KETH-PSB-OMR ✻2**
		JMACS Japan Co., Ltd.	**PNET/B ✻2**
	RJ45 Assembly Connector	OMRON	**XS6G-T421-1 ✻2**

*1 We recommend you to use the above Cable and RJ45 Connector together.
*2 We recommend you to use the above Cable and RJ45 Assembly Connector together.

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.

Item	Specifications	Number of licenses	Media	Model
Sysmac Studio Standard Edition Ver.1.□□	The Sysmac Studio is the software that provides an integrated environment for setting, programming, debugging and maintenance of machine automation controllers including the NJ/NX-series CPU Units, NY-series Industrial PC, EtherCat Slave, and the HMI. This software provides functions of the Vision Edition. Refer to OMRON website for details such as supported models and functions.	-- (Media only)	Sysmac Studio (32bit) DVD *1	**SYSMAC-SE200D**
		-- (Media only)	Sysmac Studio (64bit) DVD *1	**SYSMAC-SE200D-64**
		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 *3	Sysmac Studio Vision Edition is a limited license that provides selected functions required for Vision Sensor FH-series/ Smart Camera FHV7-series/FQ-M-series settings.	1 license	—	**SYSMAC-VE001L**
Sysmac Studio Robot Additional Option *3	Sysmac Studio Robot Additional Option is a license to enable the Vision & Robot integrated simulation.	1 license	—	**SYSMAC-RA401L**

*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.
*3 This product is a license only. You need the Sysmac Studio Standard Edition DVD media to install it.

Development Environment

Please purchase a CD-ROM and licenses the first time you purchase the Application Producer. CD-ROMs and licenses are available individually. The license does not include the CD-ROM.

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 10 (32/64bit) Windows 11 .NET Framework: .NET Framework 3.5 SP1 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® 2008 Professional or Microsoft® Visual Studio® 2010 Professional or Microsoft® Visual Studio® 2012 Professional	— (Media only)	CD-ROM	**FH-AP1**
		1 license	—	**FH-AP1L**

Accessories

Item	Descriptions				Model
	USB Memory		2 GB		**FZ-MEM2G**
			16 GB		**FZ-MEM16G**
	SD Card		2 GB		**HMC-SD293**
			4 GB		**HMC-SD493**
			16 GB		**HMC-SD1A3**
	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	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	5 port		Current consumption: 0.07 A	**W4S1-05D**
–	Calibration Plate				**FZD-CAL**
–	External Lights *1		External lighting controller	LED	**FLV Series**
				High-brightness LED	**FL-BR/DR Series**
				Photometric Stereo Light	**FL-PS Series**
			Built-in lighting controller	MDMC Light	**FL-MD Series**
	For Intelligent Compact Digital CMOS Camera			Mounting Bracket	**FQ-XL**
				Mounting Brackets	**FQ-XL2**
				Polarizing Filter Attachment	**FQ-XF1**
				Cover Attachment (for replacement)	**FQ-XF2**
–	Mounting Bracket for FZ-S□, FH-S□05R, FZ-S□X				**FZ-S-XLC**
	Mounting Bracket for FZ-S□2M				**FZ-S2M-XLC**
	Mounting Bracket for FH-S□, FZ-S□5M□, FH-S□X05, FH-S□X12, FH-S□21R				**FH-SM-XLC**
	Mounting Bracket for FH-S□12				**FH-SM12-XLC**
	M42 - F Mount Conversion Adapter				**FH-ADF/M42-10**

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

Lenses

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

Resolution	Camera Model	Size of image element	Recommended lens		
			Standard Lens	Telecentric Lens	Vibrations and Shocks Resistant Lens
300,000-pixel	FZ-SF/SFC	1/3" equivalent	FZ-LES Series	---	---
	FZ-SP/SPC				
	FZ-S/SC		SV-V Series	VS-TCH Series	VS-MCA Series Non-telecentric Macro VS-MC Series
	FH-SM/SC				
400,000-pixel	FH-SMX/SCX	1/2.9" equivalent			
1.6 million-pixel	FH-SMX01/SCX01		SV-H Series		
2 million-pixel	FZ-S2M/SC2M	1/1.8" equivalent			
	FH-SM02/SC02	2/3" equivalent *1	VS-H1 Series	VS-TEV Series	VS-MCH1 Series
3.2 million-pixel	FH-SMX03/SCX03	1/1.8" equivalent	SV-H Series	VS-TCH Series	VS-MCA Series Non-telecentric Macro VS-MC Series
4 million-pixel	FH-SM04/SC04	1" equivalent	VS-H1 Series	VS-TEV Series	VS-MCH1 Series
5 million-pixel	FH-SM05R/SC05R	1/2.5" equivalent	SV-H Series	VS-TCH Series	VS-MCA Series Non-telecentric Macro VS-MC Series
	FZ-S5M3/SC5M3	2/3" equivalent			
	FH-SMX05/SCX05	2/3" equivalent			
12 million-pixel	FH-SMX12/SCX12	1.1" equivalent	VS-LLD Series VS-HVA Series	VS-TEV Series	---
	FH-SM12/SC12	1.76" equivalent	VS-L/M42-10 Series	---	VS-MCL/M42-10 Series
20.4 million-pixel	FH-SM21R/SC21R	1" equivalent	VS-LLD Series VS-HVA Series	VS-TEV Series	VS-MCH1 Series

*1 A lens recommended for a 1" image element should be used for an image element size equivalent to 2/3". Vignetting may occur with a lens recommended for a 2/3" image element.

FH-2050-□/-5□50-□ Series

Ratings and Specifications (FH Sensor Controllers)

High-speed, Large-capacity Controller

Sensor Controller Series			FH-5550/5050 Series			FH-2050 Series		
Sensor Controller Model			FH-5550/5050	FH-5550/5050-10	FH-5550/5050-20	FH-2050	FH-2050-10	FH-2050-20
Parallel IO			NPN/PNP (common)					
Memory, Storage			FH-5550 series: 32GB RAM, 64GB ROM FH-5050 series: 8GB RAM, 32GB ROM			8GB RAM, 32GB ROM		
Number of cores			4 cores			2 cores		
Main Functions	Operation Mode	Standard	Yes					
		Double Speed Multi-input	Yes					
		Non-stop adjustment mode	Yes					
		Multi-line random-trigger mode	Yes (Maximum 8 lines) *1					
	Parallel Processing		Yes					
	Number of Connectable Camera		2	4	8	2	4	8
	Supported Camera	FH-S series camera	All of the FH-S series cameras are connectable.		All of the FH-S series cameras are connectable. *2	All of the FH-S series cameras are connectable.		All of the FH-S series cameras are connectable. *2
		FZ-S series camera	All of the FZ-S series cameras are connectable.					
	Camera I/F		OMRON I/F					
	Possible Number of Captured Images		Refer to page 13.					
	Possible Number of Logging Images to Sensor Controller		Refer to the *Vision System FH Series User's Manual* (Cat. No. Z365).					
	Possible Number of Scenes		128					
	Operating on UI	USB Mouse	Yes (wired USB and driver is unnecessary type)					
		Touch Panel	Yes (RS-232C/USB connection: FH-MT12)					
	Setup		Create the processing flow using Flow editing.					
	Language		Japanese, English, Simplified Chinese, Traditional Chinese, Korean, German, French, Spanish, Italian, Vietnamese, Polish					
External Interface	Serial Communication		RS-232C × 1					
	Ethernet Communication	Protocol	Non-procedure (TCP/UDP)					
		I/F	1000BASE-T × 2					
	EtherNet/IP Communication		Yes (Target/Ethernet port)					
	PROFINET Communication		• Yes (Slave/Ethernet port) • Conformance class A					
	EtherCAT Communication		Yes (slave) Refer to the *Vision System FH Series Catalog* (Cat. No. Q197) about EtherCAT Communications Specifications.					
	Parallel I/O		• 12 inputs/31 outputs: • Use 1 Line. • Operation mode: Except Multi-line random-trigger mode.					
			• 17 inputs/37 outputs: • Use 2 Lines. • Operation mode: Multi-line random-trigger mode.					
			• 14 inputs/29 outputs: • Use 3 to 4 Lines. • Operation mode: Multi-line random-trigger mode.					
			• 19 inputs/34 outputs: • Use 5 to 8 Lines. • Operation mode: Multi-line random-trigger mode.					
	Encoder Interface		Input voltage: 5 V ± 5% Signal: RS-422A Line Driver Level Phase A/B/Z: 1 MHz					
	Monitor Interface		DVI-I output (Analog RGB & DVI-D single link) × 1					
	USB I/F		USB3.0 host × 2 (BUS Power: Port5 V/0.5 A) USB2.0 host × 4 (BUS Power: Port5 V/0.5 A)					
	SD Card I/F		SDHC × 1					
Indicator Lamps	Main		POWER: Green ERROR: Red RUN: Green ACCESS: Yellow					
	Ethernet		NET RUN1: Green LINK/ACT1: Yellow NET RUN2: Green LINK/ACT2: Yellow					
	SD Card		SD POWER: Green SD BUSY: Yellow					
	EtherCAT		ECAT RUN: Green LINK/ACT IN: Green LINK/ACT OUT: Green ECAT ERR: Red					
Power-supply voltage			20.4 VDC to 26.4 VDC					
Current consumption	When connecting an intelligent compact digital camera • When connecting the following light or lighting controller without an external power supply FLV-TCC1, FLV-TCC4, FLV-TCC3HB FLV-TCC1EP, FL-TCC1 • When connecting the following light or lighting controller FL-TCC1PS, FL-MD□MC		5.6 A max.	7.7 A max.	12.2 A max.	4.6 A max.	6.6 A max.	11.2 A max.
	Other than above		4.5 A max.	5.5 A max.	7.3 A max.	3.5 A max.	4.3 A max.	6.3 A max.
Built-in FAN			Yes					
Usage Environment	Ambient temperature range		Operating: 0°C to +45°C Storage: -20 to +65°C (with no icing or condensation)			Operating: 0°C to +50°C Storage: -20 to +65°C (with no icing or condensation)		
	Ambient humidity range		Operating:35 to 85%RH Storage: 35 to 85%RH (with no condensation)					
	Ambient atmosphere		No corrosive gases					
	Vibration tolerance		Oscillation frequency: 10 to 150 Hz Half amplitude: 0.1 mm Acceleration: 15 m/s^2 Sweep time: 8 minute/count Sweep count: 10 Vibration direction: up and down/front and behind/left and right					
	Shock resistance		Impact force: 150 m/s^2 Test direction: up and down/front and behind/left and right					
	Noise immunity	Fast Transient Burst	• DC power Direct infusion: 2kV, Pulse rising: 5ns, Pulse width: 50ns, Burst continuation time: 15ms/0.75ms, Period: 300ms, Application time: 1 min • I/O line Direct infusion: 1kV, Pulse rising: 5ns, Pulse width: 50ns, Burst continuation time: 15ms/0.75ms, Period: 300ms, Application time: 1 min					
	Grounding		Type D grounding (100 Ω or less grounding resistance) *3					
External Features	Dimensions		190 mm × 115 mm × 182.5 mm Note Height: Including the feet at the base.					
	Weight		Approx. 3.4 kg	Approx. 3.6 kg	Approx. 3.6 kg	Approx. 3.0 kg	Approx. 3.2 kg	Approx. 3.2 kg
	Degree of protection		IEC60529 IP20					
	Case material		Cover: zinc-plated steel plate Side plate: aluminum (A6063)					
Accessories			Instruction Sheet (Japanese and English): 1, Installation Instruction Manual for FH series:1, General Compliance Information and Instructions for EU:1, Member registration sheet: 1, Power source (FH-XCN): 1 (male), Ferrite core for camera cable: 2 (FH-5□50, FH-2050), 4 (FH-5□50-10, FH-2050-10), 8 (FH-5□50-20, FH-2050-20)					

*1 According to the CPU performance, FH-2050 series is recommended to use up to two lines in this mode.
*2 Up to eight cameras can be connected in total including up to four 12 or 20.4 million-pixel cameras.
*3 Existing third class grounding

Maximum Number of Loading Images during Multi-input

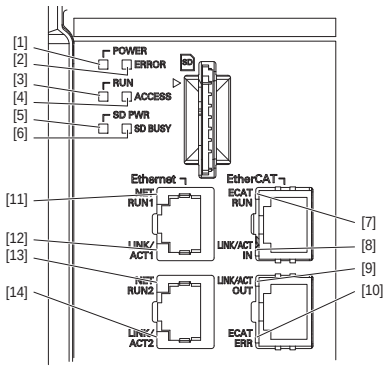
Camera	Model	Max. Number of Loading Images during Multi-input *1
Intelligent Compact Digital CMOS Cameras *2	FZ-SQ010F/-SQ050F/-SQ100F/-SQ100N	256
0.3 million pixels CCD/CMOS Cameras	FZ-S/-SC/-SF/SFC/-SH/-SHC/-SP/-SPC FH-SM/-SC	256
0.4 million pixels CMOS Cameras	FH-SMX/-SCX	256
1.6 million pixels CMOS Cameras	FH-SMX01/-SCX01	64
2 million pixels CCD Cameras	FZ-S2M/-SC2M	64
2 million pixels CMOS Cameras	FH-SM02/-SC02	51
3.2 million pixels CMOS Cameras	FH-SMX03/-SCX03	36
4 million pixels CMOS Cameras	FH-SM04/-SC04	32
5 million pixels CCD/CMOS Cameras	FZ-S5M3/-SC5M3 FH-SMX05/-SCX05/-SM05R/-SC05R	25
12 million pixels CMOS Cameras	FH-SM12/-SC12/-SMX12/-SCX12	10
20.4 million pixels CMOS Cameras	FH-SM21R/-SC21R	6

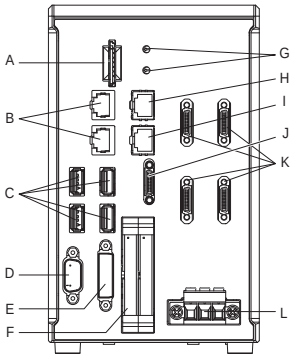
*1 When using two camera cables for connection, the maximum number of loaded images during multi-input is twice the number given in the table.
*2 The multi-input function cannot be used when the built-in light of an intelligent compact digital camera is used.
Refer to the *Vision System FH/FZ5 Series User's Manual* (Cat. No. Z340) for details.

Refer to the *Vision System FH Series Catalog* (Cat. No. Q197) for more information on cameras and other accessories.

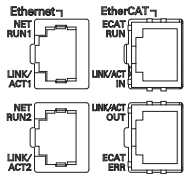
Components and Functions

Sensor Controllers
High-speed,
Large-capacity Controller
Standard Controller
(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 layout turned on output setting is displayed.
[4]	ACCESS LED	Blinks while the internal nonvolatile memory is accessed.
[5]	SD POWER LED	Blinks while power is supplied to the SD memory 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 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 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 memory card during measurement operation. Otherwise measurement time may be affected or data may be destroyed.
B	EtherNet connector	Connect an EtherNet device. **FH-2050 Series/FH-5□50 Series** Upper port: Ethernet port Lower port: Ethernet port, EtherNet/IP port, and PROFINET port are sharing use. 
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.

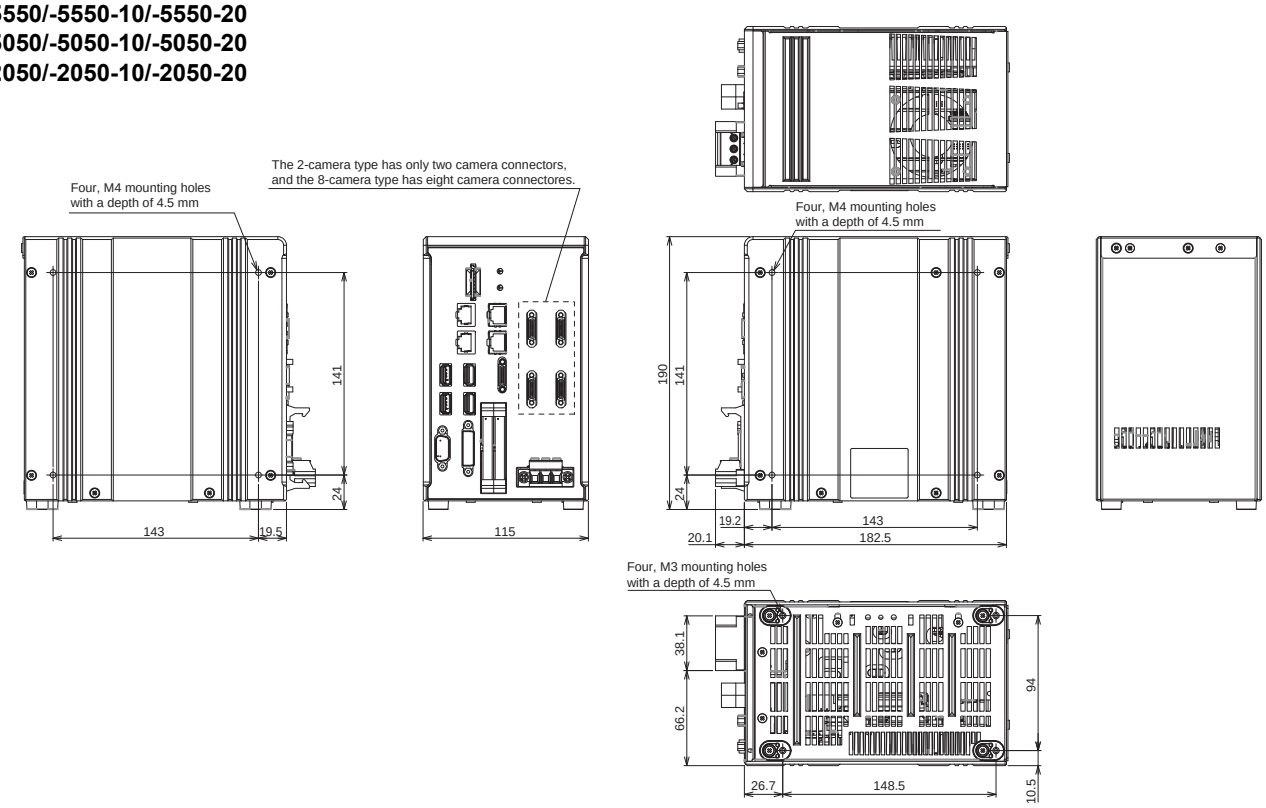
* Use the attachment power terminal connector (male) of FH-XCN series.
For details, refer to 5-3 Sensor Controller Installation on Vision System FH series Hardware Setup Manual (Z366).

Dimensions

(Unit: mm)

Sensor Controllers

High-speed, Large-capacity Controllers/Standard Controllers
FH-5550/-5550-10/-5550-20
FH-5050/-5050-10/-5050-20
FH-2050/-2050-10/-2050-20



Related Manuals

Man.No.	Model number	Manual
Z365	FH/FHV7	Vision System FH/FHV7 Series User's Manual
Z341	FH/FHV7	Vision System FH/FHV7 series Processing Item Function Reference Manual
Z342	FH/FHV7	Vision System FH/FHV7 Series User's Manual for Communications Settings
Z343	FH/FHV7	Vision System FH/FHV7 Series Operation Manual for Sysmac Studio
Z366	FH	Vision System FH series Hardware Setup Manual
Z367	FH	Vision System FH series Macro Customize Functions Programming Manual
Z437	FH-UMAI	FH Application Software FH-UMAI Processing Item Function Reference Manual
Z438	FH-UMAI	FH Application Software FH-UMAI Version Update Tool Operating Manual

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