Vision System

FH-Series

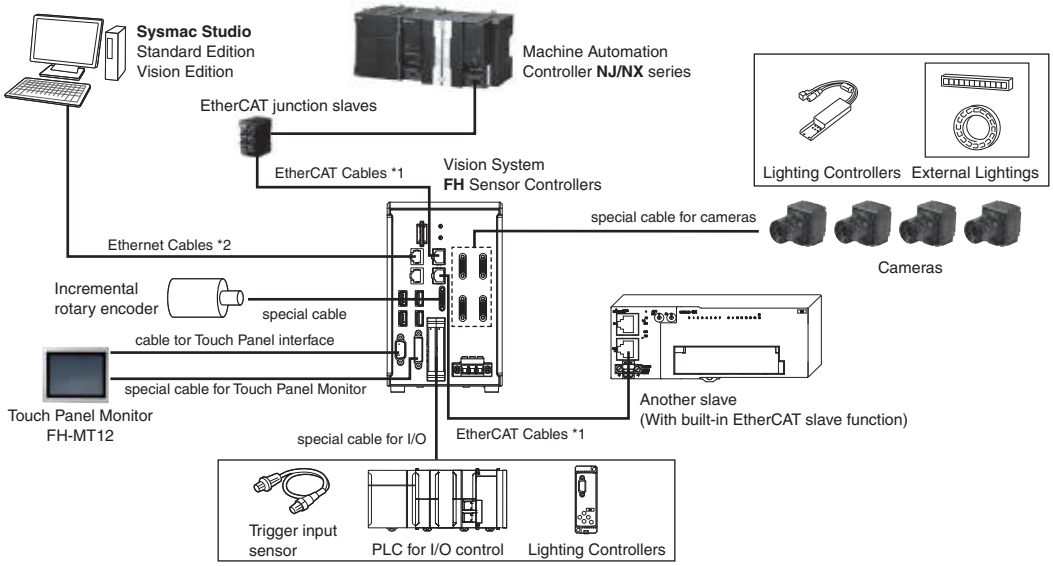
Like or even more than the human eye

- A complete line-up of cameras for various applications
- Powerful controllers for fast and precise inspection and measurement
- Software for easy setting of various measurements

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.

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**
	Box-type controllers	Lite Controllers (2 core)	2	NPN/PNP	**FH-L550**
			4	NPN/PNP	**FH-L550-10**

Cameras

Item		Descriptions	Color / Monochrome	Image Acquisition Time *1	Model
	High-speed Digital CMOS Cameras (Lens required)	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 *2	**FH-SC12**
			Monochrome		**FH-SM12**
	High-speed Digital CMOS Cameras (Lens required)	4 million pixels	Color	8.5 ms *2	**FH-SC04**
			Monochrome		**FH-SM04**
		2 million pixels	Color	4.6 ms *2	**FH-SC02**
			Monochrome		**FH-SM02**
		300,000 pixels	Color	3.3 ms	**FH-SC**
			Monochrome		**FH-SM**
	Digital CMOS Cameras (Lens required)	5 million pixels	Color	71.7ms	**FH-SC05R**
			Monochrome		**FH-SM05R**
	Digital CCD Cameras (Lens required)	5 million pixels	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 Digital 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 Digital CMOS Camera (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**

*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 Frame rate in high speed mode when the camera is connected using two camera cables. For other conditions, please refer to the chart below.

Model			FH-SM02	FH-SC02	FH-SM04	FH-SC04	FH-SM12	FH-SC12
Image Acquisition Time	2 Cables *1	High Speed Mode *2	4.6ms		8.5ms		25.7ms	
		Standard Mode	9.7ms		17.9ms		51.3ms	
	1 Cables	High Speed Mode *2	9.2ms		17.0ms		51.3ms	
		Standard Mode	19.3ms		35.8ms		102.0ms	

*1 Two Camera ports of the controller are used per one camera.
*2 Up to 5 m Camera Cable lengh.

Camera Cables

Item	Descriptions	Model *3
	Camera Cable Cable length: 2 m, 3 m, 5m, or 10 m *2	**FZ-VS3 □M**
	Bend resistant Camera Cable Cable length: 2 m, 3 m, 5m, or 10 m *2	**FZ-VSB3 □M**
	Right-angle Camera Cable *1 Cable length: 2 m, 3 m, 5m, 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,please 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 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

Type of camera	Model	Cable length	High-speed Digital CMOS cameras							Digital CMOS Camera
			300,000-pixel	2 million-pixel		4 million-pixel		12 million-pixel		5 megapixel camera
			FH-SM/SC	FH-SM02/SC02		FH-SM04/SC04		FH-SM12/SC12		FH-SC05R/SM05R
			—	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
		3 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		5 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		10 m	Yes	No	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	Yes	Yes
		3 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		5 m	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		10 m	Yes	No	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	No	Yes	Yes

Type of camera	Model	Cable length	Digital CCD cameras			Small digital CCD cameras Pen type / flat type	High-speed Digital CCD cameras	Intelligent Compact Digital CMOS Camera
			300,000-pixel	2 million-pixel	5 million-pixel	FZ-SF/SFC FZ-SP/SPC	FZ-SH/SHC	FZ-SQ□
			FZ-S/SC	FZ-S2M/SC2M	FZ-S5M2/SC5M2			
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 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	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

Maximum Extension Length Using Cable Extension Units FZ-VSJ

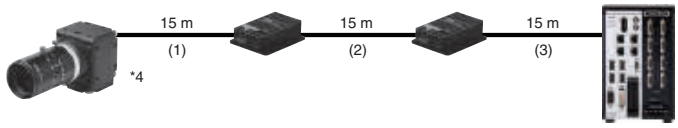
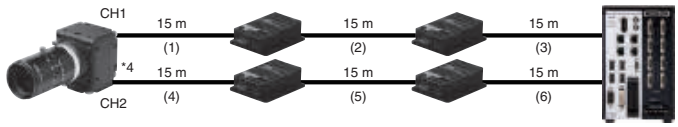
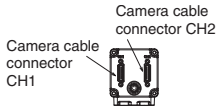
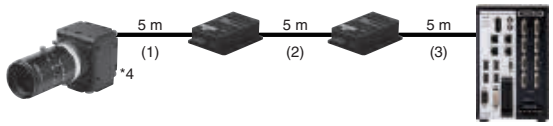
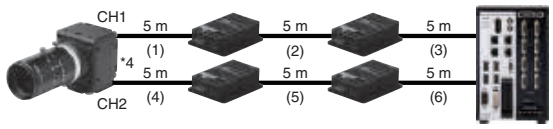
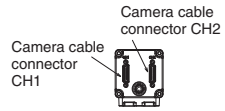
Item	Model	Transmission speed (*1)	No. of CH used for connection (*2)	Maximum cable length using 1 Camera Cable (*1)	Max. number of connectable Extension Units	Using Cable Extension Units FZ-VSJ	
						Max. cable length	Connection configuration
High-speed Digital CMOS Cameras	FH-SM/SC	---	---	15 m (Using FZ-VS4/VSL4)	2	45 m	[Configuration 1] Camera cable: 15 m × 3 Extension Unit: 2
	FH-SM02/SC02 FH-SM04/SC04 FH-SM12/SC12	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-SC05R FH-SM05R	---	---	15m (Using FZ-VS4/VSL4)	2	45 m	[Configuration 1] Camera cable: 15 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
	FZ-S5M2/SC5M2	---	---	5 m (Using FZ-VS□/VSL□)	2	15 m	[Configuration 3] Camera cable: 5 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
High-speed Digital CCD Cameras	FZ-SH/SHC	---	---	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).

Touch Panel Monitor

Item	Descriptions	Model
	Touch Panel Monitor 12.1 inches For FH Sensor Controllers *	**FH-MT12**

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

Touch Panel Monitor Cables

Item	Descriptions	Model
	DVI-Analog Conversion Cable for Touch Panel 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 XW2R-□34G-T)	**XW2Z-□□□EE** *3
	Connector-Terminal Block Conversion Units, General-purpose devices	**XW2R-□34GD-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 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.

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.

Item	Descriptions				Model
	For EtherCAT	Standard type Cable with Connectors on Both Ends (RJ45/RJ45) Wire Gauge and Number of Pairs: AWG27, 4-pair Cable, Cable Sheath material: LSZH *1, 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** *2
		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** *2
		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** *2
		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** *2
--	For EtherCAT and EtherNet/IP	Wire Gauge and Number of Pairs: AWG24, 4-pair Cable	Cables	Hitachi Metals, Ltd.	**NETSTAR-C5E SAB 0.5 × 4P** *3
--				Kuramo Electric Co.	**KETH-SB** *3
--				SWCC Showa Cable Systems Co.	**FAE-5004** *3
--			RJ45 Connectors	Panduit Corporation	**MPS588-C** *3
--		Wire Gauge and Number of Pairs: AWG22, 2-pair Cable	Cables	Kuramo Electric Co.	**KETH-PSB-OMR** *4
--				JMACS Japan Co.,Ltd.	**PNET/B** *4
			RJ45 Assembly Connector	OMRON	**XS6G-T421-1** *4
--	For EtherNet/IP	Wire Gauge and Number of Pairs: 0.5 mm, 4-pair Cable	Cables	Fujikura Ltd.	**F-LINK-E 0.5mm × 4P** *5
--			RJ45 Connectors	Panduit Corporation	**MPS588** *5

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 lineup features Low Smoke Zero Halogen cables for in-cabinet use and PUR cables for out-of-cabinet use.
*2 For details, refer to Cat.No.G019.
*3 We recommend you to use above cable for EtherCAT and EtherNet/IP, and RJ45 Connector together.
*4 We recommend you to use above cable for EtherCAT and EtherNet/IP, and RJ45 Assembly Connector together.
*5 We recommend you to use above cable For EtherNet/IP and RJ45 Connectors 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, EtherCat Slave, and the HMI. Sysmac Studio runs on the following OS. Windows XP (Service Pack 3 or higher, 32-bit version) / Windows Vista (32-bit version) / Windows 7 (32-bit/64-bit version) / Windows 8 (32-bit/64-bit version) / Windows 8.1 (32-bit/64-bit version) / Windows 10 (32bit/64bit 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 *3	Sysmac Studio Vision Edition is a limited license that provides selected functions required for FH-serise/ FQ-M-series Vision Sensor 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**

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 FH-L550/-L550-10.

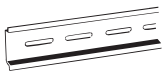
*1 The same media is used for both the Standard Edition and the Vision Edition.
*2 With the Vision Edition, you can use only the setup functions for FH-series/FQ-M-series Vision Sensors.
*3 This product is a license only. You need the Sysmac Studio Standard Edition DVD media to install it.

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 7 Professional (32/64bit) or Enterprise(32/64bit) or Ultimate (32/64bit), Windows 8 Pro(32/64bit) or Enterprise(32/64bit), Windows 8.1 Pro(32/64bit) or Enterprise(32/64bit) • .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 or Microsoft® Visual Studio® 2012 Professional	— (Media only)	CD-ROM	**FH-AP1**
		1 license	—	**FH-AP1L**

Accessories

Item	Descriptions				Model
	LCD Monitor 8.4 inches				**FZ-M08**
	LCD Monitor Cable 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.			2 m	**FZ-VM 2M**
				5 m	**FZ-VM 5M**
	DVI-I -RGB Conversion Connector				**FH-VMRGB**
	USB Memory		2 GB		**FZ-MEM2G**
			8 GB		**FZ-MEM8G**
	SD Card		2 GB		**HMC-SD291**
			4 GB		**HMC-SD491**
	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	3 port	Failure detection: None	Current consumption: 0.08 A	**W4S1-03B**
		5 port	Failure detection: None	Current consumption: 0.12 A	**W4S1-05B**
		5 port	Failure detection: Supported		**W4S1-05C**
–	Calibration Plate				**FZD-CAL**
	Common items related to DIN rail (for FH-L550/-L550-10)	DIN rail mounting bracket			**FH-XDM-L**
		DIN 35mm rail	PHOENIX CONTACT	• Length: 75.5/95.5/115.5/200 cm • Height: 7.5mm • Material: Iron • Surface: Conductive	**NS 35/7,5 PERF**
				• Length:75.5/95.5/115.5/200 cm • Height: 15mm • Material: Iron • Surface: Conductive	**NS 35/15 PERF**
		End plate	PHOENIX CONTACT	Need 2 pieces each Sensor Controller	**CLIPFIX 35**
–	External Lighting			–	**FLV Series ***
					FL Series *
	Lighting Controller (Required to control external lighting from a Controller)		For FLV-Series	Camera Mount Lighting Controller	**FLV-TCC Series ***
				Analog Lighting Controller	**FLV-ATC Series ***
			For FL-Series	Camera Mount Lighting Controller	**FL-TCC Series ***
	For Intelligent Compact Digital CMOS 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.

Lenses

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

Model	3Z4S-LE SV-03514V	3Z4S-LE SV-04514V	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	3.5 mm	4.5 mm	6 mm	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm	75 mm	100 mm
Aperture (F No.)	1.4 to Close	1.4 to Close	1.4 to Close	1.3 to Close	1.4 to Close	1.4 to Close	1.4 to Close	1.8 to Close	1.8 to Close	2.7 to Close	3.5 to Close
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	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□05R)
(3Z4S-LE SV-7525H and 3Z4S-LE SV-10028H can also be used for FH-S□02 and 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
Aperture (F No.)	1.4 to 16	1.4 to 16	1.4 to 16	1.4 to 16	1.4 to 16	1.4 to 16	1.4 to 16	2.5 to Close	2.8 to Close
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)

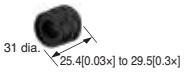
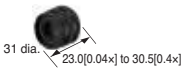
Model	3Z4S-LE VS-L1828/M42-10	3Z4S-LE VS-L2526/M42-10	3Z4S-LE VS-L3528/M42-10	3Z4S-LE VS-L5028/M42-10	3Z4S-LE VS-L8540/M42-10	3Z4S-LE VS-L10028/M42-10
Appearance/ Dimensions (mm)						
Focal length	18 mm	25 mm	35 mm	50 mm	85 mm	100 mm
Aperture (F No.)	2.8 to 16	2.6 to 16	2.8 to 16	2.8 to 16	4.0 to 16	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					

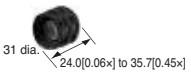
Lenses for small camera

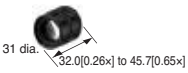
Model	FZ-LES3	FZ-LES6	FZ-LES16	FZ-LES30
Appearance/ Dimensions (mm)				
Focal length	3 mm	6 mm	16 mm	30 mm
Aperture (F No.)	2.0 to 16	2.0 to 16	3.4 to 16	3.4 to 16

Vibrations and Shocks Resistant C-mount Lens for 2/3-inch image sensor (Recommend: FZ-S□/FZ-S□2M/FZ-S□5M2/FZ-SH□/FH-S□)

(Vibrations and Shocks Resistant Lenses for 1-inch image sensors and for large image sensors are also available. Ask your OMRON representative for details.)

Model	3Z4S-LE VS-MC15-□□□□□ *1									3Z4S-LE VS-MC20-□□□□□ *1								
Appearance/ Dimensions (mm)																		
Focal length	15 mm									20 mm								
Filter size	M27.0 P0.5									M27.0 P0.5								
Optical magnification	0.03 ×			0.2 ×			0.3 ×			0.04 ×			0.25 ×			0.4 ×		
Aperture (fixed F No.) *2	2	5.6	8	2	5.6	8	2	5.6	8	2	5.6	8	2	5.6	8	2	5.6	8
Depth of field (mm) *3	183.1	512.7	732.4	4.8	13.4	19.2	2.3	6.5	9.2	110.8	291.2	416.0	3.4	9.0	12.8	1.5	3.9	5.6
Maximum sensor size	2/3 inch																	
Mount	C Mount																	

Model	3Z4S-LE VS-MC25N-□□□□□ *1									3Z4S-LE VS-MC30□□□□□ *1								
Appearance/ Dimensions (mm)																		
Focal length	25 mm									30 mm								
Filter size	M27.0 P0.5									M27.0 P0.5								
Optical magnification	0.05 ×			0.25 ×			0.5 ×			0.06 ×			0.15 ×			0.45 ×		
Aperture (fixed F No.) *2	2	5.6	8	2	5.6	8	2	5.6	8	2	5.6	8	2	5.6	8	2	5.6	8
Depth of field (mm) *3	67.2	188.2	268.8	3.2	9.0	12.8	1.0	2.7	3.8	47.1	131.9	188.4	8.2	22.9	32.7	1.1	3.2	4.6
Maximum sensor size	2/3 inch																	
Mount	C Mount																	

Model	3Z4S-LE VS-MC35-□□□□□ *1									3Z4S-LE VS-MC50-□□□□□ *1								
Appearance/ Dimensions (mm)																		
Focal length	35 mm									50 mm								
Filter size	M27.0 P0.5									M27.0 P0.5								
Optical magnification	0.26 ×			0.3 ×			0.65 ×			0.08 ×			0.2 ×			0.48 ×		
Aperture (fixed F No.) *2	1.9	5.6	8	1.9	5.6	8	1.9	5.6	8	2	5.6	8	2	5.6	8	2	5.6	8
Depth of field (mm) *3	2.8	8.4	11.9	2.2	6.5	9.2	0.6	1.7	2.5	33.8	75.6	108.0	6.0	13.4	19.2	1.3	2.9	4.1
Maximum sensor size	2/3 inch																	
Mount	C Mount																	

Model	3Z4S-LE VS-MC75-□□□□□ *1								
Appearance/ Dimensions (mm)									
Focal length	75 mm								
Filter size	M27.0 P0.5								
Optical magnification	0.14 ×			0.2 ×			0.62 ×		
Aperture (fixed F No.) *2	3.8	5.6	8	3.8	5.6	8	3.8	5.6	8
Depth of field (mm) *3	17.7	26.1	37.2	9.1	13.4	19.2	1.3	1.9	2.7
Maximum sensor size	2/3 inch								
Mount	C Mount								

*1 Insert the aperture into □□□□□ in the model number as follows.
F=1.9 to 3.8: blank
F=5.6: FN056
F=8: FN080

*2 F-number can be selected from maximum aperture, 5.6, and 8.0.

*3 When circle of least confusion is 40 μm.

High-resolution Telecentric Lens for C-mount Lens for 2/3-inch image sensor(Recommend:FZ-S□/FZ-SH□/FZ-S□2M/FZ-S□5M2/FH-S□)

Model *1			3Z4S-LE VS-TCH05 -65□□□□	3Z4S-LE VS-TCH05 -110□□□□	3Z4S-LE VS-TCH1 -65□□□□	3Z4S-LE VS-TCH1 -110□□□□	3Z4S-LE VS-TCH1.5 -65□□□□	3Z4S-LE VS-TCH1.5 -110□□□□	3Z4S-LE VS-TCH2 -65□□□□	3Z4S-LE VS-TCH2 -110□□□□	3Z4S-LE VS-TCH4 -65□□□□	3Z4S-LE VS-TCH4 -110□□□□
Optical magnification (±5%)			0.5x		1.0x		1.5x		2.0x		4.0x	
Field of view (±5%) (VxH) (mm)	FH-SC/-SM	1/3 inch equivalent	9.6×7.2		4.8×3.6		3.2×2.4		2.4×1.8		1.2×0.9	
	FH-SC2M /-SM2M	2/3 inch equivalent	22.4×12		11.2×6.0		7.5×4.0		5.6×3.0		2.8×3.0	
	FZ-SC/-S	1/3 inch equivalent	9.6×7.2		4.8×3.6		3.2×2.4		2.4×1.8		1.2×0.9	
	FZ-SC2M /-S2M	1/1.8 inch equivalent	14.0×10.6		7.0×5.3		4.7×3.5		3.5×2.7		1.8×1.3	
	FZ-SC5M□ /-S5M□	2/3 inch equivalent	16.8×14.2		8.4×7.1		5.6×4.7		4.2×3.6		2.1×1.8	
WD(mm) *2			75.3	110.8	68.8	110.3	65	110.8	65	110.8	65	110.8
Effective FNO			9.42	9.49	9.94	10.49	11.8	11.97	13.6	13.5	17.91	22.2
Depth of field (mm) *3			3	3.04	0.8	0.84	0.4	0.43	0.3	0.27	0.09	0.11
Resolution *4			12.43	12.9	6.71	6.99	5.24	5.33	4.53	4.53	3	3.73
TV distortion			0.02%	0.02%	0.01%	0.02%	0.01%	0.02%	0.03%	0.03%	0.02%	0.03%
Maximum sensor size			2/3 inch		2/3 inch		2/3 inch		2/3 inch		2/3 inch	

*1 Insert the shape into □□□□ in the model number as follows.
Straight : -O
Coaxial : CO-O
*2 The working distance is the distance from the end of the lens to the sensor.
*3 The depth of field is calculated using a permissible circle of confusion diameter of 0.04 mm.
*4 The resolution is calculated using a wavelength of 550 nm.

Note: 1. Fixing the lens or other reinforcement may be required depending on the installation angle or operating environment (vibration/shock). When fixing the lens, insulate the lens from the fixture.
2. The above specifications are values calculated from the optical design and can vary depending on installation conditions.

Extension Tubes

Lenses	For M42 mount Lenses *	For C mount Lenses *	For Small Digital CCD Cameras
Model	**3Z4S-LE VS-EXR/M42**	**3Z4S-LE SV-EXR**	**FZ-LESR**
Contents	Set of 5 tubes (20 mm, 10 mm, 8 mm, 2 mm, and 1 mm) Maximum outer diameter: 47.5 mm dia.	Set of 7 tubes (40 mm, 20 mm,10 mm, 5 mm, 2.0 mm, 1.0 mm, and 0.5 mm) Maximum outer diameter: 30 mm dia.	Set of 3 tubes (15 mm,10 mm, 5 mm) Maximum outer diameter: 12 mm dia.

* Do not use the 0.5-mm, 1.0-mm, and 2.0-mm Extension Tubes attached to each other. Since these Extension Tubes are placed over the threaded section of the Lens or other Extension Tube, the connection may loosen when more than one 0.5-mm, 1.0-mm or 2.0-mm Extension Tube are used together.
Reinforcement is required to protect against vibration when Extension Tubes exceeding 30 mm are used.
When using the Extension Tube, check it on the actual device before using it.

FH-Series

Ratings and Specifications (FH Sensor Controllers)

High-speed Controllers/Standard Controllers

Sensor Controller Series			FH-3000 series			FH-1000 series		
Type			High-speed Controller (4 cores)			Standard Controller (2 cores)		
Sensor Controller Model			FH-3050	FH-3050-10	FH-3050-20	FH-1050	FH-1050-10	FH-1050-20
Controller Type			BOX type					
Parallel IO			NPN/PNP (common)					
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)					
	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. *1	All of the FH-S series cameras are connectable.		All of the FH-S series cameras are connectable. *1
		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 36.					
	Possible Number of Logging Images to Sensor Controller							
	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					
External Interface	Serial Communication		RS-232C × 1					
	Ethernet Communication	Protocol	Non-procedure (TCP/UDP)					
		I/F	1000BASE-T × 1	1000BASE-T × 2		1000BASE-T × 1	1000BASE-T × 2	
	EtherNet/IP Communication		Ethernet port (transmission rate: 1Gbps)					
	EtherCAT Communication		Yes (slave)					
	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 LineDriver Level Phase A/B/Z: 1 MHz					
	Monitor Interface		DVI-I output (Analog RGB & DVI-D single link) × 1					
	USB I/F		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 RUN: Green NET LINK ACT: Yellow	NET RUN1: Green NET LINK ACK1: Yellow NET RUN2: Green NET LINK ACK2: Yellow		NET RUN: Green NET LINK ACT: Yellow	NET RUN1: Green NET LINK ACK1: Yellow NET RUN2: Green NET LINK ACK2: Yellow	
	SD Card		SD POWER: Green SD BUSY: Yellow					
	EtherCAT		EtherCAT RUN LED: Green EtherCAT LINK/ACT IN LED: Green EtherCAT LINK/ACT OUT LED: Green EtherCAT ERR LED: Red					
Power-supply voltage			20.4 VDC to 26.4 VDC					
Current consumption	When connected to a Controller	Connected to 2 cameras	5.0 A max.	5.4 A max.	6.4 A max.	4.7 A max.	5.0 A max.	5.9 A max.
		Connected to 4 cameras	---	7.0 A max.	8.1 A max.	---	6.5 A max.	7.5 A max.
		Connected to 8 cameras	---	---	11.5 A max.	---	---	10.9 A max.
	When not connected to Controller	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.
Built-in FAN			Yes					
Usage Environment	Ambient temperature range		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) *2					
External Features	Dimensions		190 mm × 115 mm × 182.5 mm Note Height: Including the rubber feet at the base.					
	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
	Degree of protection		IEC60529 IP20					
	Case material		Cover: zinc-plated steel plate Side plate: aluminum (A6063)					
Accessories			Instruction Sheet (Japanese and English): 1, Instruction Installation Manual for FH series:1, General Compliance Information and Instructions for EU:1, Power source(FH-XCN): 1 (male), Ferrite core for camera cable: 2(FH-3050, FH-1050), 4(FH-3050-10, FH-1050-10), 8(FH-3050-20, FH-1050-20)					

*1 When the 12 megapixels camera: Max. 4 cameras are connectable. When use except 12 megapixels cameras: Max. 8 cameras are connectable.
*2 Existing third class grounding

Lite Controllers

Sensor Controller Series			FH-L series	
Type			Lite Controller	
Sensor Controller Model			FH-L550	FH-L550-10
Controller Type			BOX type	
Parallel IO			NPN/PNP (common)	
Main Functions	Operation Mode	Standard	Yes	
		Double Speed Multi-input	Yes	
		Non-stop adjustment mode	Yes	
		Multi-line random-trigger mode	No	
	Parallel Processing		NPN/PNP (common)	
	Number of Connectable Camera		2	4
	Supported Camera	FH-S series camera	All of the FH-S series cameras are connectable	
		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 36.	
	Possible Number of Logging Images to Sensor Controller			
	Possible Number of Scenes		128	
	UI Operations	USB Mouse	Yes (wired USB driver-less 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	
External Interface	Serial Communication		RS-232C × 1	
	Ethernet Communication	Protocol	Non-procedure (TCP/UDP)	
		I/F	1000BASE-T × 1	
	EtherNet/IP Communication		Ethernet port (transmission rate: 1 Gbps)	
	EtherCAT Communication		No	
	Parallel I/O		• High-speed input: 1 • Normal speed: 9 • High-speed output: 4 • Normal speed: 23	
	Encoder Interface		None	
	Monitor Interface		DVI-I output (Analog RGB & DVI-D single link) × 1	
	USB I/F		USB2.0 host × 1: BUS Power: Port 5 V/0.5 A USB3.0 × 1: BUS Power: Port 5 V/0.5 A	
	SD Card I/F		SDHC × 1	
Indicator Lamps	Main		POWER: Green ERROR: Red RUN: Green ACCESS: Yellow	
	Ethernet		NET RUN: Green NET LINK ACT: Yellow	
	SD Card		SD POWER: Green SD BUSY: Yellow	
	EtherCAT		None	
Power-supply voltage			20.4 VDC to 26.4 VDC	
Current consumption	When connected to a Controller	Connected to 2 cameras	3.5 A max.	3.7 A max.
		Connected to 4 cameras	---	5.9 A max.
		Connected to 8 cameras	---	---
	When not connected to Controller	Connected to 2 cameras	1.5 A max.	1.7 A max.
		Connected to 4 cameras	---	2.0 A max.
		Connected to 8 cameras	---	---
Built-in FAN			No	
Usage Environment	Ambient temperature range		Operating: 0°C to 55°C Storage: -25 to +70°C	
	Ambient humidity range		Operating and Storage: 10 to 90%RH (with no condensation)	
	Ambient atmosphere		No corrosive gases	
	Vibration tolerance		5 to 8.4 Hz with 3.5 mm amplitude, 8.4 to 150 Hz, acceleration of 9.8 m/s² 100 min each in X, Y, and Z directions (10 sweeps of 10 min each = 100 min total)	
	Shock resistance		Impact force: 150 m/s² 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) *	
External Features	Dimensions		200 mm × 80 mm × 130 mm	
	Weight		Approx. 1.5 kg	Approx. 1.5 kg
	Degree of protection		IEC60529 IP20	
	Case materials		PC	
Accessories			Instruction Sheet (Japanese and English): 1, Instruction Installation Manual for FH-L series:1, General Compliance Information and Instructions for EU:1, Power source(FH-XCN-L):1 (male)	

* Existing third class grounding

Number of logged images/Max. Number of Loading Images during Multi-input

Cameras	Color/ Monochrome	Model	Number of logged images *1								Max. Number of Loading Images during Multi-input *2
			Connected to 1 camera	Connected to 2 camera	Connected to 3 camera	Connected to 4 camera	Connected to 5 camera	Connected to 6 camera	Connected to 7 camera	Connected to 8 camera	
Intelligent Compact Digital CMOS Cameras *3	Color	FZ-SQ010F/-SQ050F/ -SQ100F/-SQ100N	232	116	77	58	46	38	33	29	256
300,000 pixels CCD Cameras	Monochrome	FZ-S/-SF/-SH/-SP	272	136	90	68	54	45	38	34	
	Color	FZ-SC/-SFC/-SHC/ -SPC	270	135	90	67	54	45	38	33	
300,000 pixels CMOS Cameras	Monochrome	FH-SM	272	136	90	68	54	45	38	34	256
	Color	FH-SC	270	135	90	67	54	45	38	33	
2 million pixels CMOS Cameras	Color/ Monochrome	FH-SC02/-SM02	37	18	12	9	7	6	5	4	51
2 million pixels CCD Cameras	Color/ Monochrome	FZ-SC2M/-S2M	43	21	14	10	8	7	6	5	64
4 million pixels CMOS Cameras	Color/ Monochrome	FH-SC04/-SM04	20	10	6	5	4	3	2	2	32
5 million pixels CCD Cameras	Color/ Monochrome	FZ-SC5M2/-S5M2	16	8	5	4	3	2	2	2	25
5 million pixels Digital CMOS Cameras	Color/ Monochrome	FH-SC05R/-SM05R	16	8	5	4	3	2	2	2	25
12 million pixels CMOS Cameras	Color/Mono-chrome	FH-SC12/-SM12	6	3	2	2	---	---	---	---	10

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

Ratings and Specifications (Cameras)

High-speed Digital 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 Acquisition 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 CMOS Cameras

Model	FH-SM05R	FH-SC05R
Image Elements	CMOS image elements (1/2.5-inch equivalent)	
Color/Monochrome	Monochrome	Color
Effective Pixels	2592 (H) × 1944 (V)	
Imaging area H × V (opposing corner)	5.70 × 4.28 (7.13 mm)	
Pixel Size	2.2 (μm) × 2.2 (μm)	
Scan Type	Progressive	
Shutter Method	Rolling shutter	
Shutter Function	Electronic shutter; Shutter speeds can be set from 500 to 10000 ms in multiples of 50 μs	
Frame Rate (Image Acquisition Time)	14 fps (71.7 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 +40°C Storage: -30 to 65°C (with no icing or condensation)	
Ambient humidity range	Operating: 35 to 85%RH Storage: 35 to 85%RH (with no condensation)	
Weight	Approx. 52 g	
Accessories	Instruction Sheet	

Digital CCD Cameras

Model	FZ-S	FZ-SC	FZ-S2M	FZ-SC2M	FZ-S5M2	FZ-SC5M2
Image elements	Interline transfer reading all pixels, CCD image elements (1/3-inch equivalent)		Interline transfer reading all pixels, CCD image elements (1/1.8-inch equivalent)		Interline transfer reading all pixels, CCD image elements (2/3-inch equivalent)	
Color/Monochrome	Monochrome	Color	Monochrome	Color	Monochrome	Color
Effective pixels	640 (H) × 480 (V)		1600 (H) × 1200 (V)		2448 (H) × 2044 (V)	
Imaging area H x V (opposing corner)	4.8 × 3.6 (6.0mm)		7.1 × 5.4 (8.9mm)		8.4 × 7.1 (11mm)	
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 Acquisition 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, CCD image elements (1/3-inch equivalent)			
Color/Monochrome	Monochrome	Color	Monochrome	Color
Effective pixels	640 (H) × 480 (V)			
Imaging area H x V (opposing corner)	4.8 × 3.6 (6.0mm)			
Pixel size	7.4 (μm) × 7.4 (μm)			
Shutter function	Electronic shutter; select shutter speeds from 20 μm to 100 ms			
Partial function	12 to 480 lines			
Frame rate (Image Acquisition 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 Digital CCD Cameras

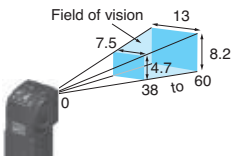
Model	FZ-SH	FZ-SHC
Image elements	Interline transfer reading all pixels, CCD image elements (1/3-inch equivalent)	
Color/Monochrome	Monochrome	Color
Effective pixels	640 (H) × 480 (V)	
Imaging area H x V (opposing corner)	4.8 × 3.6 (6.0mm)	
Pixel size	7.4 (μm) × 7.4 (μm)	
Shutter function	Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s	
Partial function	12 to 480 lines	
Frame rate (Image Acquisition 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 Digital CMOS Cameras

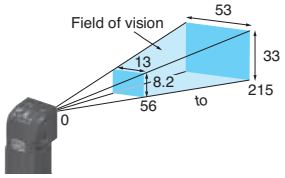
Model	FZ-SQ010F	FZ-SQ050F	FZ-SQ100F	FZ-SQ100N
Image elements	CMOS color image elements (1/3-inch equivalent)			
Color/Monochrome	Color			
Effective pixels	752 (H) × 480 (V)			
Imaging area H x V (opposing corner)	4.51 × 2.88 (5.35mm)			
Pixel size	6.0 (μm) × 6.0 (μm)			
Shutter function	1/250 to 1/32,258			
Partial function	8 to 480 lines			
Frame rate (Image Acquisition Time)	60 fps (16.7 ms)			
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 *	Risk Group2			
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

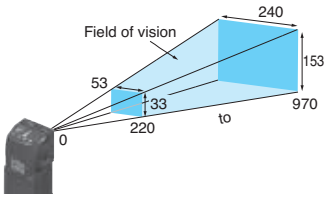
- **Narrow View**
  FZ-SQ010F



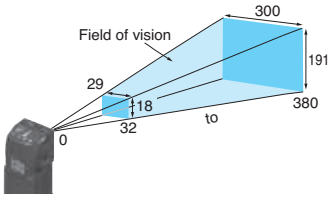
- **Standard**
  FZ-SQ050F



- **Wide View (Long-distance)**
  FZ-SQ100F



- **Wide View (Short-distance)**
  FZ-SQ100N



Ratings and Specifications (Cable, Monitor)

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

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)
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 Compact Camera, 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	

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

Touch Panel Monitor

Model		FH-MT12
Major Function	Display area	12.1 inch
	Resolution	1024 (V) × 768 (H)
	Number of color	16,700,000 colors (8 bit/color)
	Brightness	500cd/m ^{2} (Typ)
	Contrast Ratio	600:1 (Typ)
	Viewing angle	Left and right: each 80°, upward: 80°, downward: 60°
	Backlight Unit	LED, edge-light
	Backlight lifetime	About 100,000hour
	Touch panel	4wire resistive touch screen
External interface	Video input	analog RGB
	Touch panel signal	USB
		RS-232C
Ratings	Power supply voltage	24 VDC (21.6 to 26.4 VDC)
	Current consumption	0.5A
	Insulation resistance	Between DC power supply and Touch Panel Monitor FG: 20 MΩ or higher (rated voltage 250 V)
Operating environment	Ambient temperature range	Operating: 0 to 50°C, Storage: -20 to +65°C (with no icing or condensation)
	Ambient humidity range	Operating and Storage: 20 to 85 %RH (with no icing or condensation)
	Ambient environment	No corrosive gas
	Vibration resistance	10 to 150 Hz, one-side amplitude 0.1 mm (Max. acceleration 15 m/s^2) 10 times for 8 minutes for each three direction
	Degree of protection	Panel mounting: IP65 on the front
Operation		Touch pen
Structure	Mounting	Panel mounting, VESA mounting
	Weight	Approx.2.6 kg
	Material	Front panel: PC/PBT, Front Sheet: PET, Rear case: SUS

Note: FH Series Sensor Controllers version 5.32 or higher is required.

Touch Panel Monitor Cables

Model	FH-VMDA (2 m)	FH-VUAB (2 m)	XW2Z-200PP-1 (2 m)
Cable type	DVI-Analog Conversion Cable	USB Cable	RS-232C Cable
Vibration resistance	10 to 150 Hz, one-side amplitude 0.1 mm, 10 times for 8 minutes for each three direction		
Ambient Temperature	Operating Condition: 0 to 50°C, Storage Condition: -10 to 60°C (with no icing or condensation)		
Ambient Humidity	Operating Condition: 35 to 85%RH, Storage Condition: 35 to 85%RH (with no icing or condensation)		
Ambient environment	No corrosive gases		
Material	Cable outer sheath, Connector: PVC		Cable outer sheath: PVC, Connector: ABS/Ni Plating
Minimum bend radius	36 mm	25 mm	59 mm
Weight	Approx.220 g	Approx.75 g	Approx.162 g

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

LCD 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

Note: 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.

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

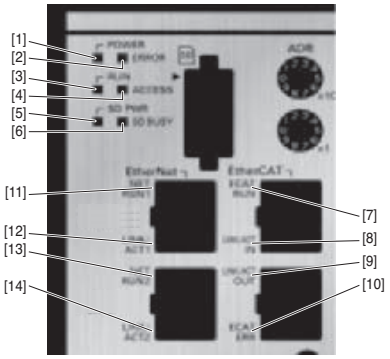
FH Series and Programming Devices

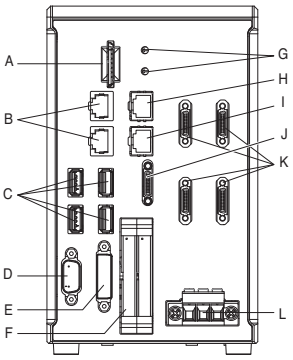
Use the latest version of Sysmac Studio Standard Edition/Vision Edition.

FH Series	Version of FH Series	Corresponding version of Sysmac Studio Standard Edition/Vision Edition
FH-3050 (-□) FH-1050 (-□)	Version 5.60	Supported by version 1.15 or higher.
	Version 5.50	Supported by version 1.14.89 or higher.
	Version 5.30	Supported by version 1.10.80 or higher.
	Version 5.20	Supported by version 1.10 or higher.
	Version 5.10	Supported by version 1.07.43 or higher.
	Version 5.00	Supported by version 1.07 or higher. Not supported by version 1.06 or lower.

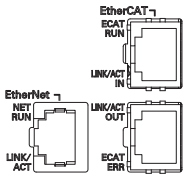
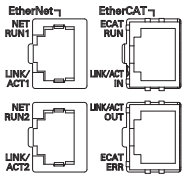
Components and Functions

Sensor Controllers
High-speed Controllers/
Standard Controllers
BOX type
(4-camera type)



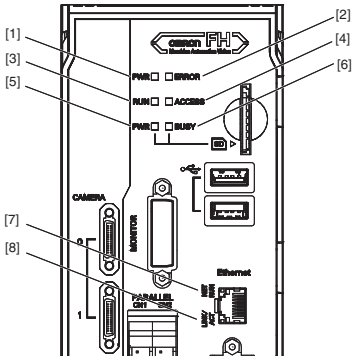


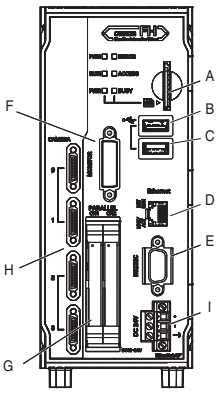
	Name	Description
[1]	POWER LED	Lit while power is ON.
[2]	ERROR LED	Lit when an error has occurred.
[3]	RUN LED	Lit while the layout turned on output setting is displayed.
[4]	ACCESS LED	Blinks while the internal nonvolatile memory is accessed.
[5]	SD POWER LED	Blinks while power is supplied to the SD 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 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 memory card during measurement operation. Otherwise measurement time may be affected or data may be destroyed.
B	EtherNet connector	Connect an EtherNet device. **Camera 2ch type**: Ethernet port and EtherNet/IP port are sharing use.  **Camera 4ch/8ch type**: Upper port : Ethernet port Lower port : Ethernet port and EtherNet/IP 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/FZ5 series Hardware Setup Manual (Z366).

Lite Controllers
BOX type
(4-camera type)





	LED name	Description
[1]	PWR 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 PWR LED	Lit while power is supplied to the SD memory card and the card is usable.
[6]	SD BUSY LED	Lit when access to the SD memory card.
[7]	Ethernet NET RUN LED	Lit while Ethernet communications are usable.
[8]	Ethernet NET LINK/ACT LED	Blinks when connected with an Ethernet device, and blinks while performing communications.

	Connector 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	USB 2.0 connector	Connects to USB 2.0. Do not insert or remove during loading or writing of measurement or data. The measurement time can be longer or data can be damaged.
C	USB 3.0 connector	Connects to USB 3.0. Do not insert or remove during loading or writing of measurement or data. The measurement time can be longer or data can be damaged. USB 3.0 has a high ability to supply the bus power. Use the Sensor Controller by combining USB 3.0, faster transport can be realized.
D	Ethernet connector	Connect an Ethernet device. Shared Ethernet port and EtherNet/IP port.
E	RS-232C connector	Connect an external device such as a programmable controller.
F	Monitor connector	Connect a monitor.
G	Parallel connector (control lines, data lines)	Connect the controller to external devices such as a sync sensor.
H	Camera connector	Connect a camera.
I	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 FH Sensor Controller alone.

* Use the attachment power terminal connector (male) of FH-XCN-L series.
For details, refer to 5-3 Sensor Controller Installation on Vision System FH/FZ5 series Hardware Setup Manual(Z366).

Processing Items

Group	Icon	Processing Item		Corresponding Page in the Catalog
Measurement		Search	Used to identify the shapes and calculate the position of measurement objects.	P16
		Flexible Search	Recognizing the shapes of workpieces with variation and detecting their positions.	P16
		Sensitive Search	Search a small difference by dividing the search model in detail, and calculating the correlation.	P16
		ECM Search	Used to search the similar part of model form input image. Detect the evaluation value and position.	
		EC Circle Search	Extract circles using "round " shape information and get position, radius and quantity in high preciseness.	
		Shape Search Ⅱ	Used to search the similar part of model from input image regardless of environmental changes. Detect the evaluation value and position.	P16
		Shape Search Ⅲ	Robust detection of positions is possible at high-speed and with high precision incorporating environmental fluctuations, such as differences in individual shapes of the workpieces, pose fluctuations, noise superimposition and shielding.	P16
		EC Corner	This processing item measures a corner position (corner) of a workpiece.	
		Ec Cross	The center position of a crosshair shape is measured using the lines created by the edge information on each side of the crosshair.	
		Classification	Used when various kinds of products on the assembly line need to be sorted and identified.	P16
		Edge Position	Measure position of measurement objects according to the color change in measurement area.	P16
		Edge Pitch	Detect edges by color change in measurement area. Used for calculating number of pins of IC and connectors.	P16
		Scan Edge Position	Measure peak/bottom edge position of workpieces according to the color change in separated measurement area.	P16
		Scan Edge Width	Measure max/min/average width of workpieces according to the color change in separated measurement area.	P16
		Circular Scan Edge Position	Measure center axis, diameter and radius of circular workpieces.	P16
		Circular Scan Edge Width	Measure center axis, width and thickness of ring workpieces.	P16
		Intersection	Calculate approximate lines from the edge information on two sides of a square workpiece to measure the angle formed at the intersection of the two lines.	P16
		Color Data	Used for detecting presence and mixed varieties of products by using color average and deviation.	
		Gravity and Area	Used to measure area, center of gravity of workpices by extracting the color to be measured.	
		Labeling	Used to measure number, area and gravity of workpieces by extracting registered color.	
		Label Data	Selecting one region of extracted Labeling, and get that measurement. Area and Gravity position can be got and judged.	
		Defect	Used for appearance measurement of plain-color measurement objects such as defects, stains and burrs.	P16
		Precise Defect	Check the defect on the object. Parameters for extraction defect can be set precisely.	P16
		Fine Matching	Difference can be detected by overlapping and comparing (matching) registered fine images with input images.	P16
		Character Inspect	Recognize character according correlation search with model image registered in [Model Dictionary].	P17
		Date Verification	Reading character string is verified with internal date.	P17
		Model Dictionary	Register character pattern as dictionary. The pattern is used in [Character Inspection].	
		2DCode *2	Recognize 2D code and display where the code quality is poor.	P17
		Barcode *1	Recognize barcode, verify and output decoded characters.	P17
		OCR	Recognize and read characters in images as character information.	P17
		OCR User Dictionary	Register dictionary data to use for OCR.	P17
		Circle Angle	Used for calculating angle of inclination of circular measurement objects.	
		Glue Bead Inspection	You can inspect coating of a specified color for gaps or runoffs along the coating path.	P17
Input Image		Camera Image Input FH	To input images from cameras. And set up the conditions to input images from camer-as. (For FH Sensor Controllers only)	
		Camera Image Input HDR	Create high-dynamic range images by acquiring several images with different conditions.	

Group	Icon	Processing Item		Corresponding Page in the Catalog
Input Image		Camera Image Input HDRLite	HDR function for FZ-SQ□ Intelligent Compact Cameras.	
		Camera Switch	To switch the cameras used for measurement. Not input images from cameras again.	
		Measurement Image Switching	To switch the images used for measurement. Not input images from camera again.	
Compensate image		Position Compensation	Used when positions are differed. Correct measurement is performed by correcting position of input images.	P18
		Filtering	Used for processing images input from cameras in order to make them easier to be measured.	P18
		Backgrond Suppression	To enhance contrast of images by extracting color in specified brightness.	P18
		Brightness Correct Filter	Track brightness change of entire screen and remove gradual brightness change such as uneven brightness.	P18
		Color Gray Filter	Color image is converted into monochrome images to emphasize specific color.	P18
		Extract Color Filter	Convert color image to color extracted image or binary image.	P18
		Anti Color Shading	To remove the irregular color/pattern by uniformizing max.2 specified colors.	P18
		Stripes Removal Filter Ⅱ	Remove the background pattern of vertical, horizontal and diagonal stripes.	P19
		Polar Transformation	Rectify the image by polar transformation. Useful for OCR or pattern inspection printed on circle.	P18
		Trapezoidal Correction	Rectify the trapezoidal deformed image.	P18
		Machine Simulator	How the alignment marks would move on the image when each stage or robot axis is controlled can be checked.	
		Image Subtraction	The registered model image and measurement image are compared and only the different pixels are extracted and converted to an image.	
		Advanced filter	Process the images acquired from cameras in order to make them easier to measure. This processing item consolidates existing image conversion filtering into one processing item and adds extra functions.	P18
		Panorama	Combine multiple image to create one big image.	P18
Support measurement		Unit Macro	Advanced arithmetic processing can be easily incorporated into workflow as Unit Macro processing items.	P20
		Unit Calculation Macro	This function is convenient when the user wants to calculate a value using an original calculation formula or change the set value or system data of a processing item.	P20
		Calculation	Used when using the judge results and measured values of ProcItem which are registered in processing units.	
		Line Regression	Used for calculating regression line from plural measurement coodinate.	
		Circle Regression	Used for calculating regression circle from plural measurement coordinate.	
		Precise Calibration	Used for calibration corresponding to trapezoidal distortion and lens distortion.	P15
		User Data	Used for setting of the data that can be used as common constants and variables in scene group data.	P21
		Set Unit Data	Used to change the ProcItem data (setting parameters,etc.) that has been set up in a scene.	
		Get Unit Data	Used to get one data (measured results, setting parameters,etc.) of ProcItem that has been set up in a scene.	
		Set Unit Figure	Used for re-setting the figure data (model, measurement area) registered in an unit.	
		Get Unit Figure	Used for get the figure data (model, measurement area) registered in an unit.	
		Trend Monitor	Used for displaying the information about results on the monitor, facilitating to avoid NG and analyze causes.	P21
		Image Logging	Used for saving the measurement images to the memory and USB memory.	
		Image Conversion Logging	Used for saving the measurement images in JPEG and BMP format.	
		Data Logging	Used for saving the measurement data to the memory and USB memory.	
		Elapsed Time	Used for calculating the elapsed time since the measurement trigger input.	
		Wait	Processing is stopped only at the set time. The standby time is set by the unit of [ms].	
		Focus	Focus setting is supported.	P15

Group	Icon	Processing Item		Corresponding Page in the Catalog
Support measurement		Iris	Focus and aperture setting is supported.	P15
		Parallelize	A part of the measurement flow is divided into two or more tasks and processed in parallel to shorten the measurement time. This processing item is placed at the top of processing to be performed in parallel.	
		Parallelize Task	A part of the measurement flow is divided into two or more tasks and processed in parallel to shorten the measurement time. This processing item is placed immediately before processing to be performed in parallel between Parallelize and Parallelize End.	
		Statistics	Used when you need to calculate an average of multiple measurement results.	
		Referrence Calib Data	Calibration data and distortion compensation data held under other processing items can be referenced.	
		Position Data Calculation	The specified position angle is calculated from the measured positions.	P14
		Stage Data	Sets and stores data related to stages.	
		Robot Data	Sets and stores data related to robots.	
		Vision Master Calibration	This processing item automatically calculates the entire axis movement amount of the control equipment necessary for calibration.	P15
		PLC Mastoer Calibration	Calibration data is created using a communication command from PLC.	P15
		Convert Position Data	The position angle after the specified axis movement is calculated.	P14
		Movement Single Position	The axis movement that is required to match the measured position angle to the reference position angle is calculated.	P14
		Movement Multi Points	The axis movements that are required to match the measured position angles to the corresponding reference position angles are calculated.	P14
		Detection Point	Obtains position/angle information by r eferring to the coordinate values measured with the Measurement Processing Unit.	
		Camera Calibration	By setting the camera calibration, the measurement result can be converted and output as actual dimensions.	P15
		Data Save	The set data can be saved in the controller main unit or as scene data. The data is held even after the FH/FZ power is turned off.	

Group	Icon	Processing Item		Corresponding Page in the Catalog
Branch		Conditional Branch	Used where more than two kinds of products on the production line need to detected separately.	
		End	This ProcItem must be set up as the last processing unit of a branch.	
		DI Branch	Same as ProcItem "Branch". But you can change the targets of conditional branching via external inputs.	
		Control Flow Normal	Set the measurement flow processing into the wait state in which the specific no-protocol command can be executed.	
		Control Flow PLC Link	Set the measurement flow processing into the wait state in which the specific PLC Link command can be executed.	
		Control Flow Parallel	Set the measurement flow processing into the wait state in which the specific parallel command can be executed.	
		Control Flow Fieldbus	Set the measurement flow processing into the wait state in which the specific Fieldbus command can be executed.	
		Selective Branch	Easily branch to multiple destinations.	
Output results		Data Output	Used when you need to output data to the external devices such as PLC or PC via serial ports.	
		Parallel Data Output	Used when you need to output data to the external devices such as PLC or PC via parallel ports.	
		Parallel Judgement Output	Used when you need to output judgement results to the external devices such as PLC or PC via parallel ports.	
		Fieldbus Data Output	Outputs data to an external device, such as a Programmable Controller, through a fieldbus interface.	
Output result		Result Display	Used for displaying the texts or the figures in the camera image.	
		Display Image File	Display selected image file.	
		Display Last NG Image	Display the last NG images.	

*1 Bar Codes that can be read : JAN/EAN/UPC (including add-on codes), Code 39, Codabar (NW-7), ITF (Interleaved 2 of 5), Code 93, Code 128, GS1-128, GS1 DataBar (RSS-14 / RSS Limited / RSS Expanded), Pharmacode

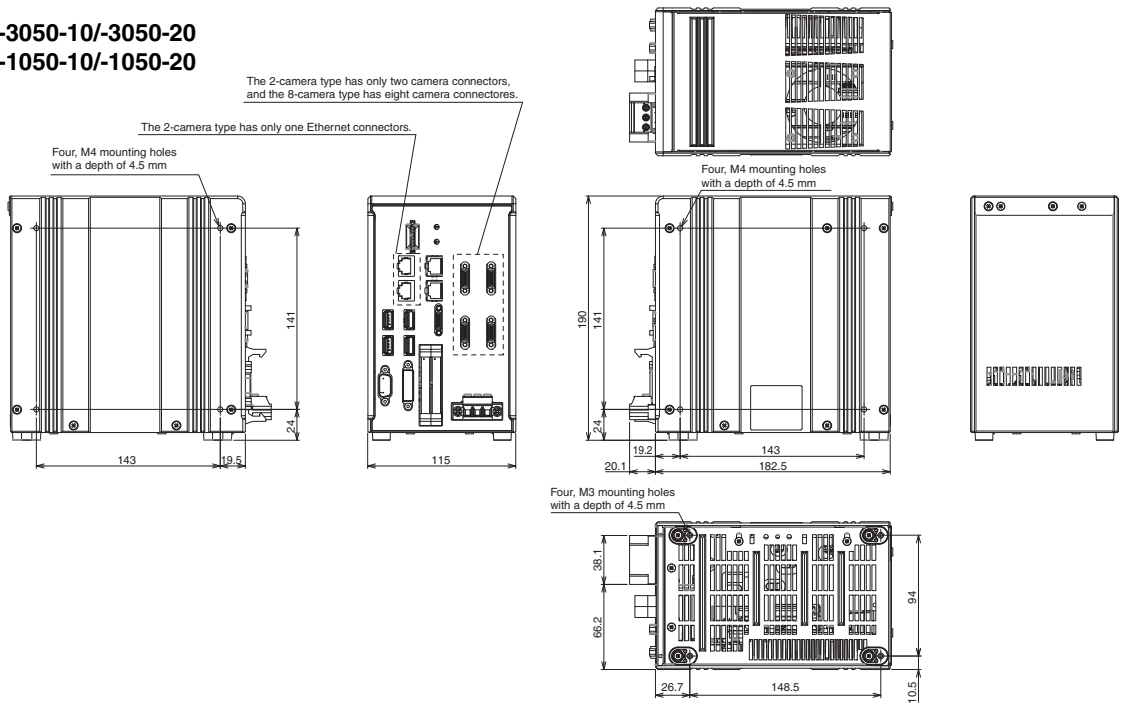
*2 2D Codes that can be read : Data Matrix (ECC200), QR Code

Dimensions

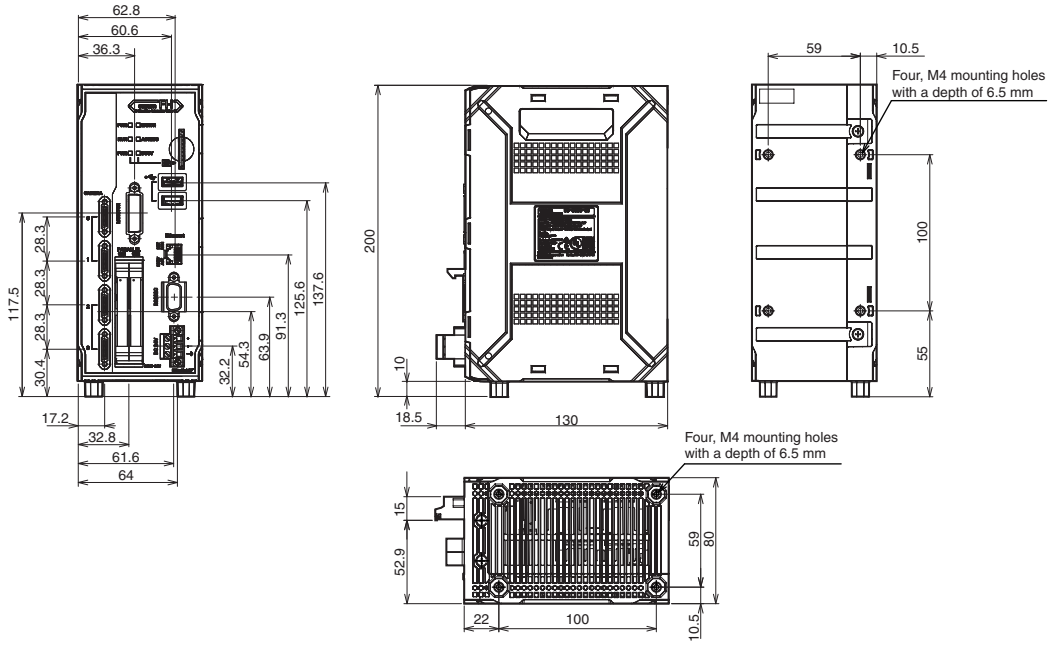
(Unit: mm)

Sensor Controllers

High-speed Controllers/Standard Controllers
Box-type
FH-3050/-3050-10/-3050-20
FH-1050/-1050-10/-1050-20



Lite Controllers
BOX type
FH-L550/-L550-10



Cameras

High-speed Digital CMOS Camera

300,000-pixel camera

FH-SC
FH-SM

2 million-pixel camera

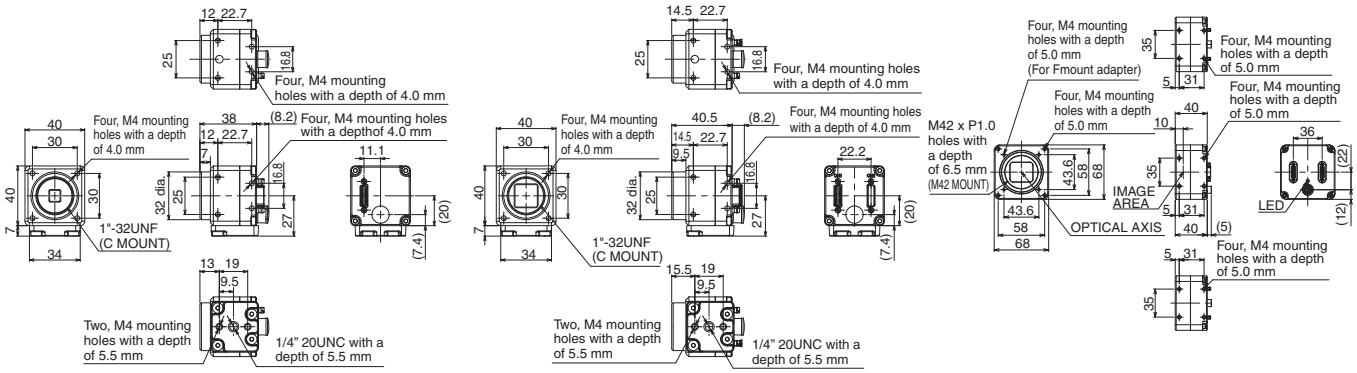
FH-SC02
FH-SM02

4 million-pixel camera

FH-SC04
FH-SM04

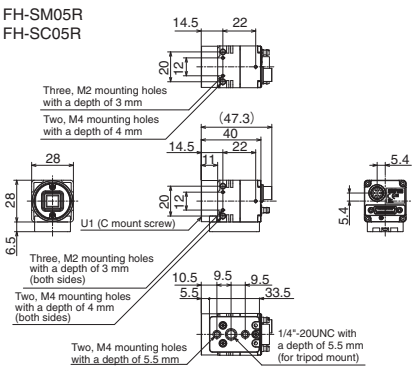
12 million-pixel camera

FH-SC12
FH-SM12



Digital CMOS Cameras

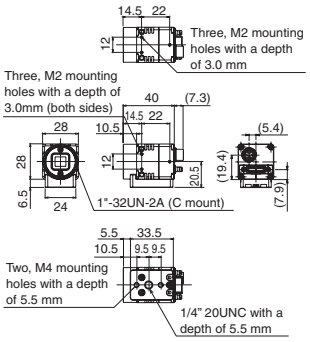
FH-SM05R
FH-SC05R



Digital CCD Cameras

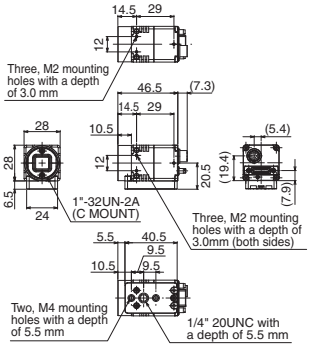
300,000-pixel camera

FZ-S
FZ-SC



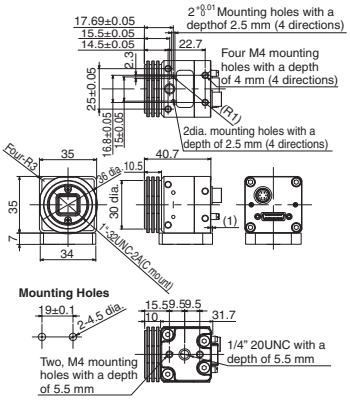
2 million-pixel camera

FZ-S2M
FZ-SC2M



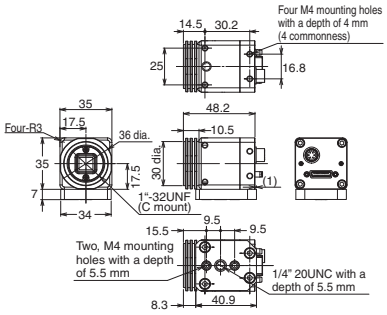
5 million-pixel camera

FZ-S5M2
FZ-SC5M2



High-speed CCD Camera

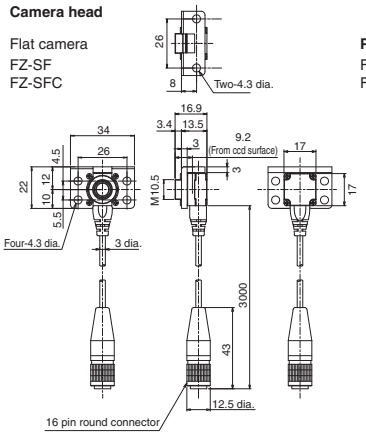
FZ-SH
FZ-SHC



Small digital CCD cameras

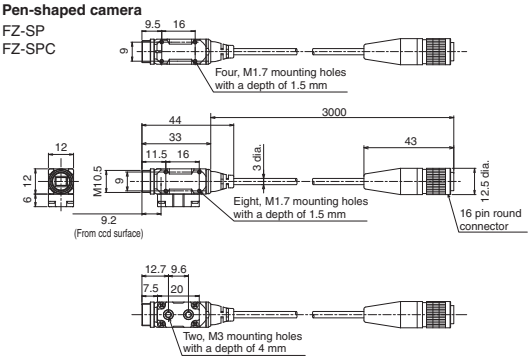
Camera head

Flat camera
FZ-SF
FZ-SFC



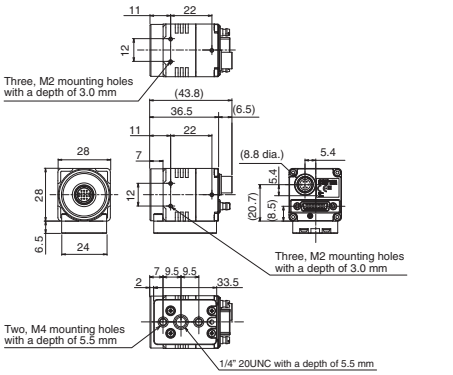
Pen-shaped camera

FZ-SP
FZ-SPC



Camera amplifier

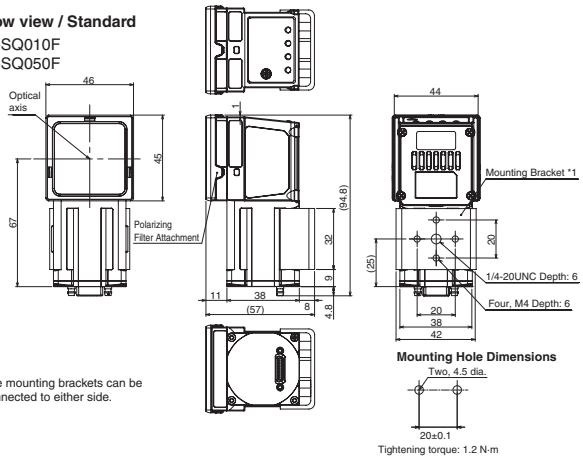
Can be used for both flat cameras and pen-shaped cameras



Intelligent Compact Digital CMOS Cameras

Narrow view / Standard

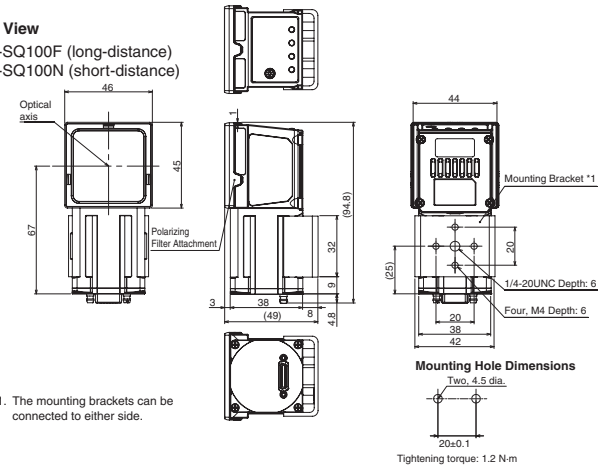
FZ-SQ010F
FZ-SQ050F



*1. The mounting brackets can be connected to either side.

Wide View

FZ-SQ100F (long-distance)
FZ-SQ100N (short-distance)



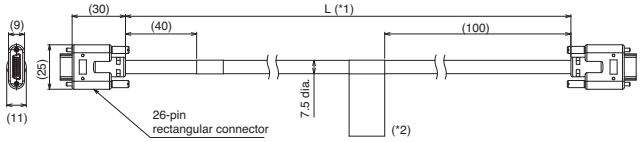
*1. The mounting brackets can be connected to either side.

Cables

Camera Cable

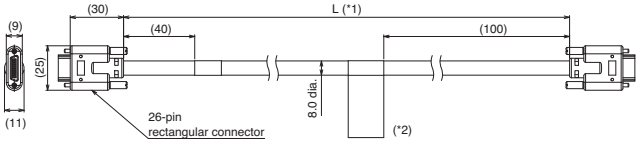
Camera Cable

FZ-VS3



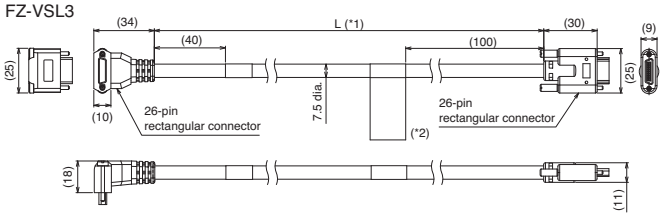
Bend resistant Camera Cable

FZ-VSB3



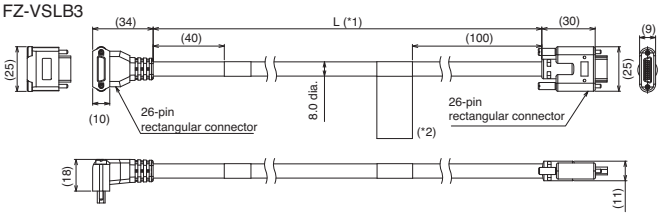
Right-angle Camera Cable

FZ-VSL3



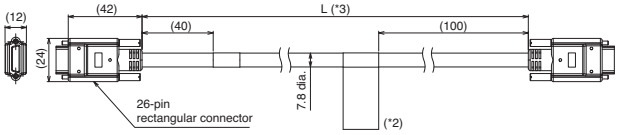
Bend resistant Right-angle Camera Cable

FZ-VSLB3



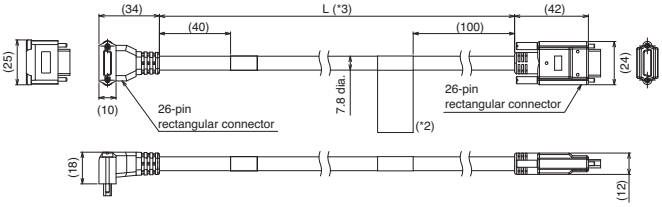
Long-distance Camera Cable

FZ-VS4



Long-distance Right-angle Camera Cable

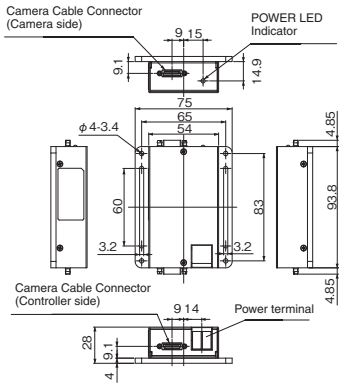
FZ-VSL4



*1. Cable is available in 2m/3m/5m/10m.
*2. Each camera cables has polarity.
Please ensure that the name plate side of the cable is connected to the controller.
*3. Cable is available in 15m.

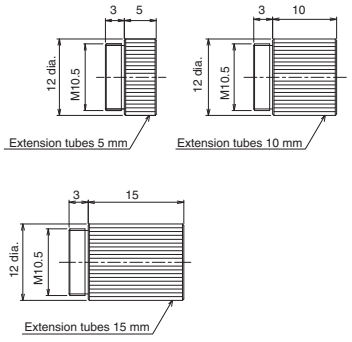
Camera Cable Extension Unit

FZ-VSJ



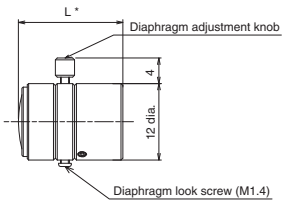
Extension Tubes for Small Camera

FZ-LESR



Lens for Small Camera

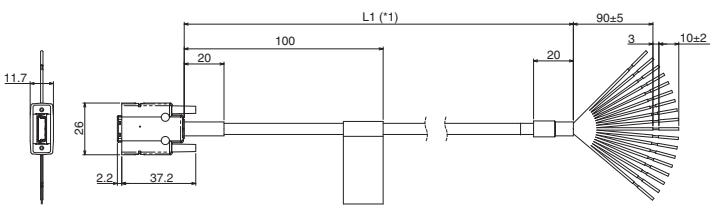
FZ-LES Series



* Overall length is available in 16.4mm/19.7mm/23.1mm/25.5mm.

Encoder Cable

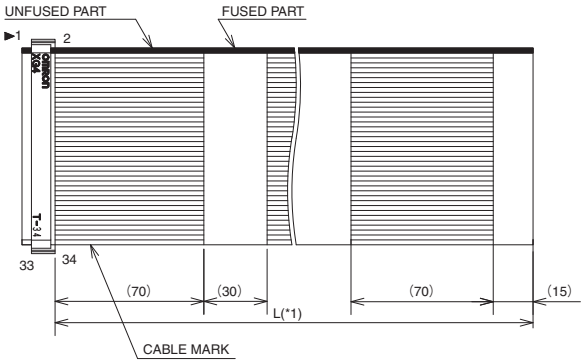
FH-VR



*1. Cable is available in 1.5 m.

Parallel I/O Cable

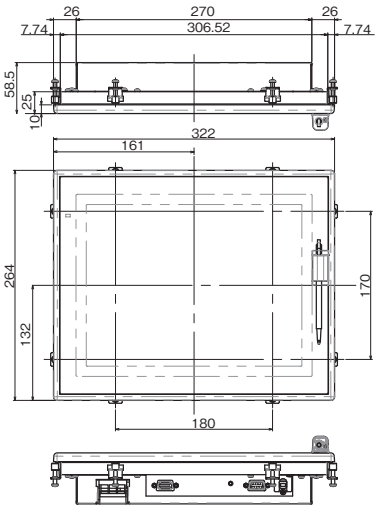
XW2Z-S013-□

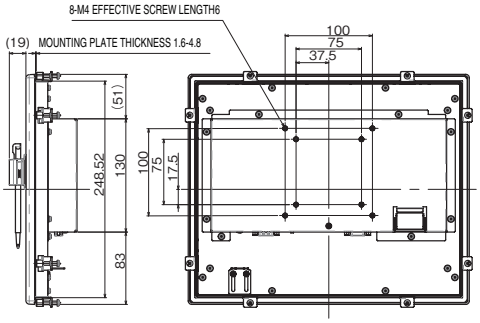


*1. Cable is available in 2m/5m.

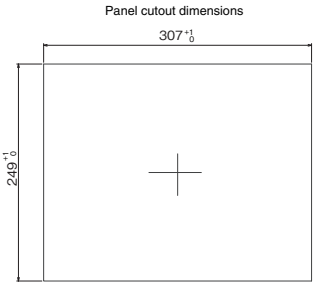
Touch Panel Monitor

FH-MT12





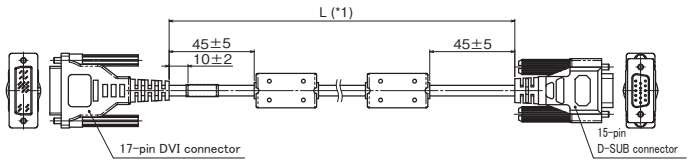
Panel cutout dimensions



Note:1. Panel thickness : 1.6 to 4.8 mm
2. No burr allowed

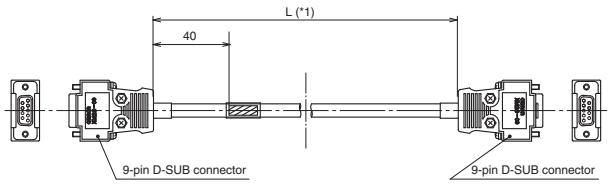
DVI-Analog Conversion Cable for Touch Panel Monitor

FH-VMDA



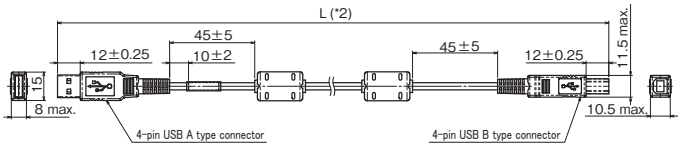
RS-232C Cable for Touch Panel Monitor

XW2Z-□□□PP-1



USB Cable for Touch Panel Monitor

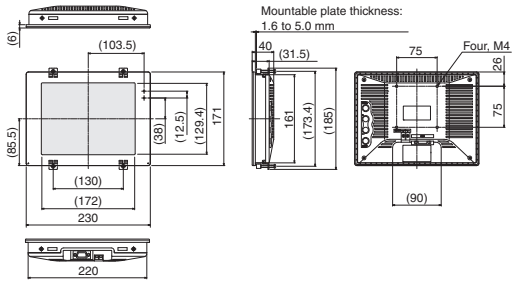
FH-VUAB



*1. Cable is available in 2m/5m/10m.
*2. Cable is available in 2m/5m.

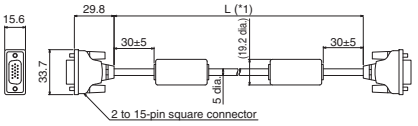
LCD Monitor

FZ-M08



LCD Monitor Cable

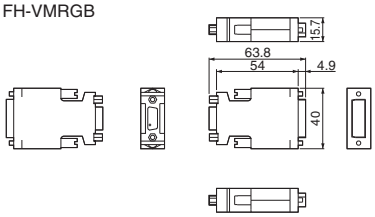
FZ-VM



*1. cable is available in 2m/5m.

DVI-I -RGB Conversion Connector

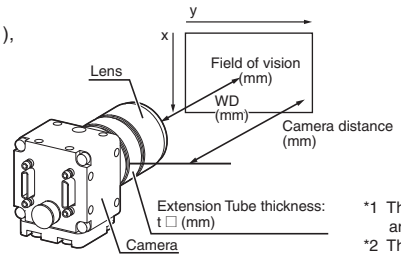
FH-VMRGB



Optical Chart

Meaning of Optical Chart

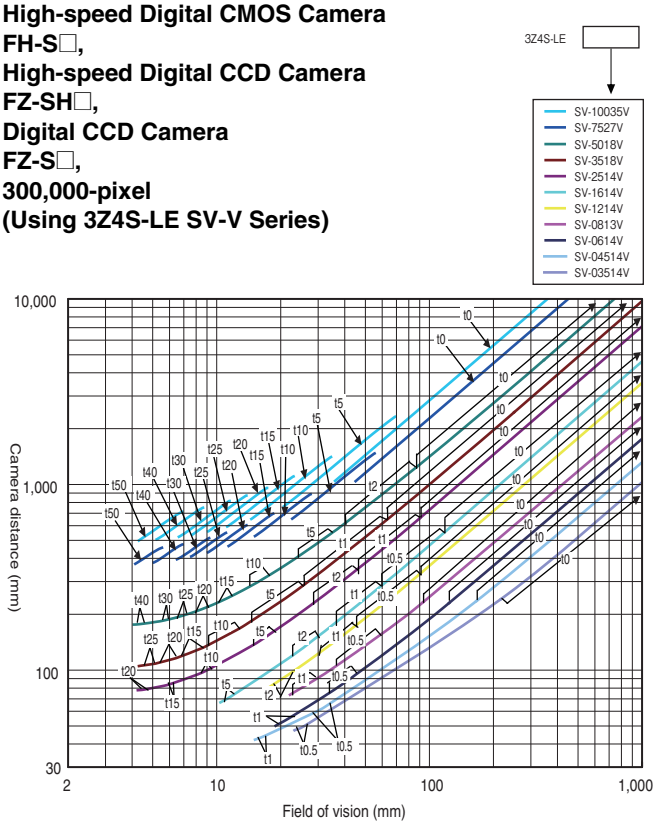
The X axis of the optical chart shows the field of vision (mm) (*1), and the Y axis of the optical chart shows the camera installation distance (mm) (*2).



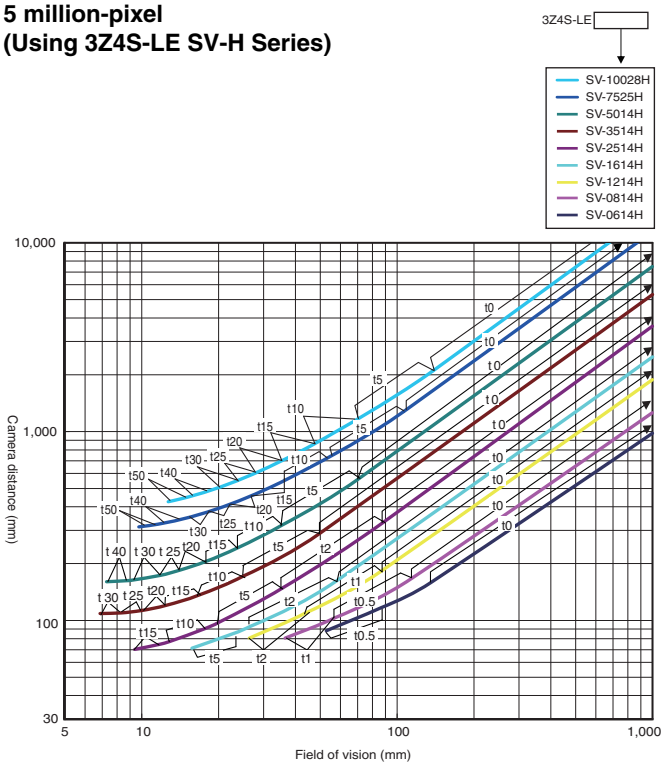
*1 The lengths of the fields of vision given in the optical charts are the lengths of the Y axis.
*2 The vertical axis represents WD for small cameras.

Normal Lenses

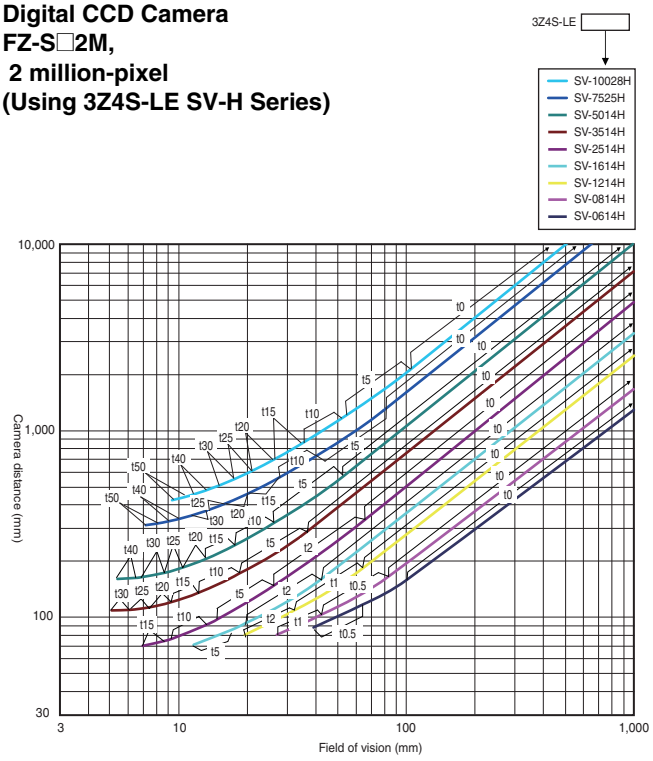
High-speed Digital CMOS Camera FH-S□, High-speed Digital CCD Camera FZ-SH□, Digital CCD Camera FZ-S□, 300,000-pixel (Using 3Z4S-LE SV-V Series)



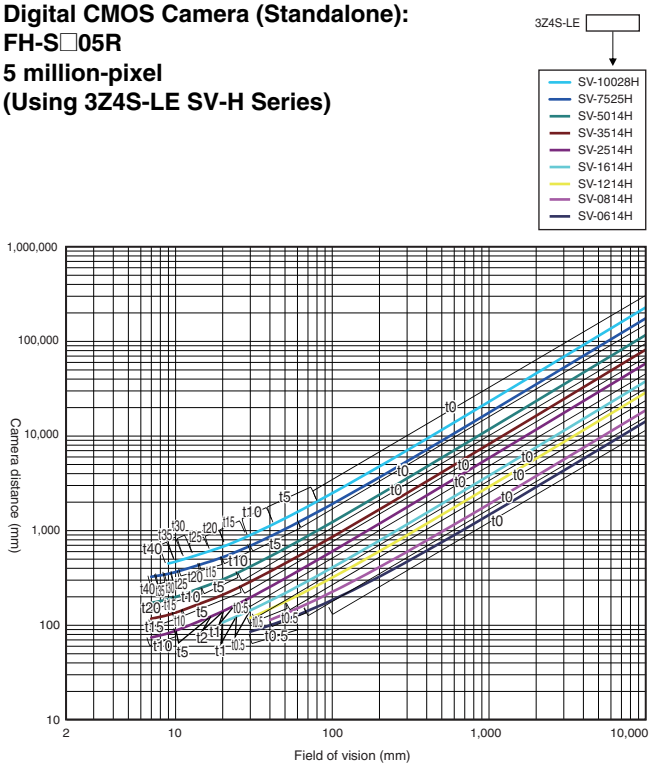
Digital CCD Camera FZ-S□5M2, 5 million-pixel (Using 3Z4S-LE SV-H Series)



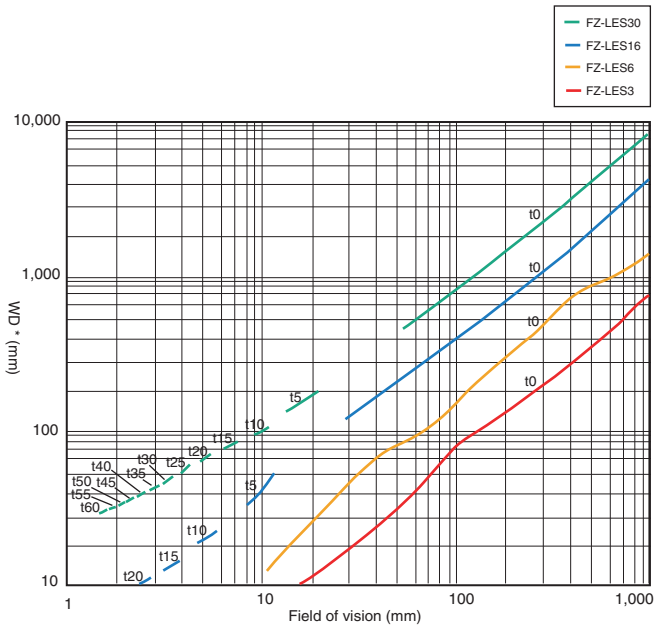
Digital CCD Camera FZ-S□2M, 2 million-pixel (Using 3Z4S-LE SV-H Series)



Digital CMOS Camera (Standalone): FH-S□05R 5 million-pixel (Using 3Z4S-LE SV-H Series)

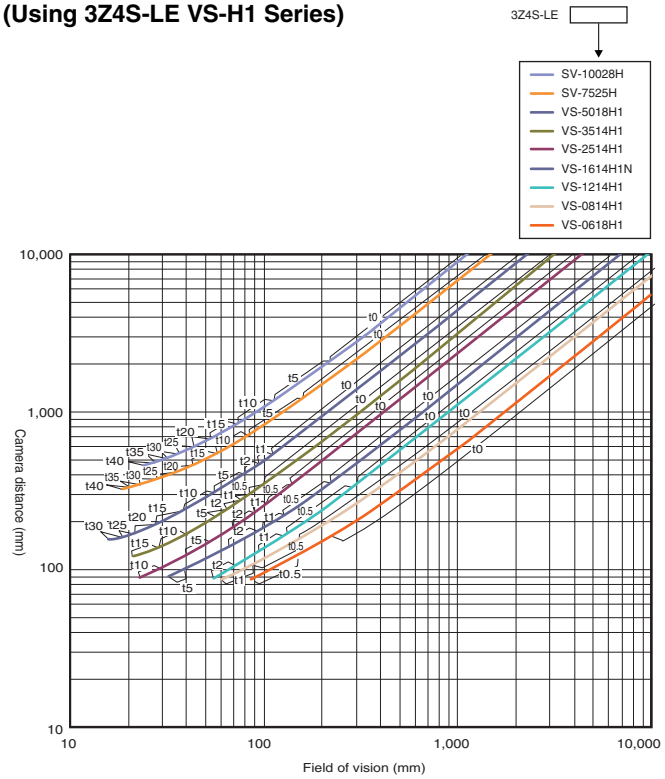


Small Digital CCD Cameras
FZ-SF□,
FZ-SP□,
300,000-pixel
(Using FZ-LES Series)

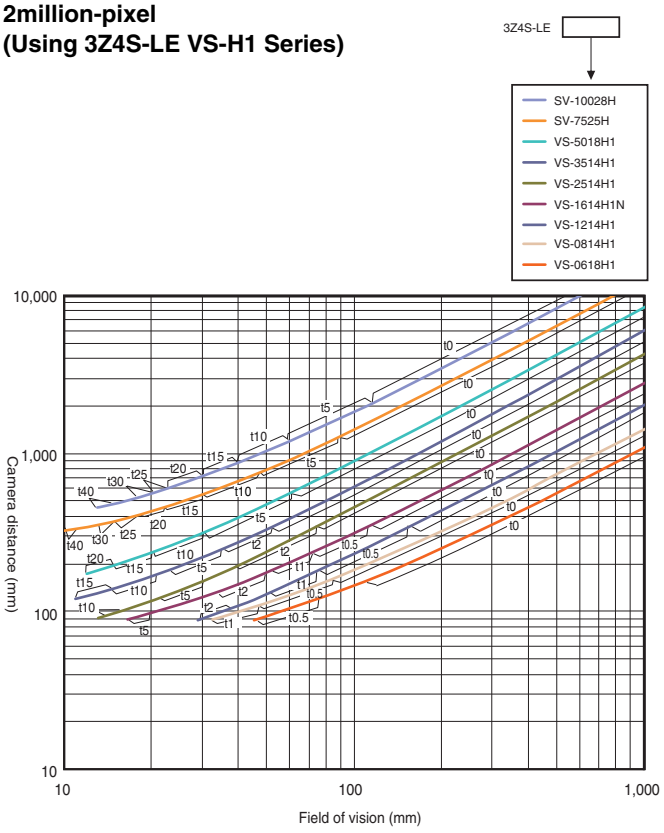


* The vertical axis represents WD, not installation distance.

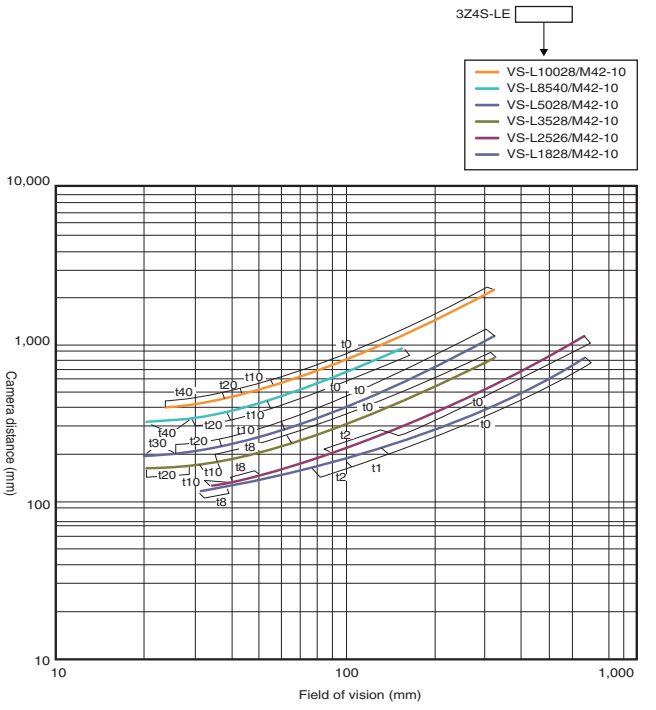
High-speed Digital CMOS Camera
FH-S□04,
4 million-pixel
(Using 3Z4S-LE VS-H1 Series)



High-speed Digital CMOS Camera
FH-S□02,
2million-pixel
(Using 3Z4S-LE VS-H1 Series)

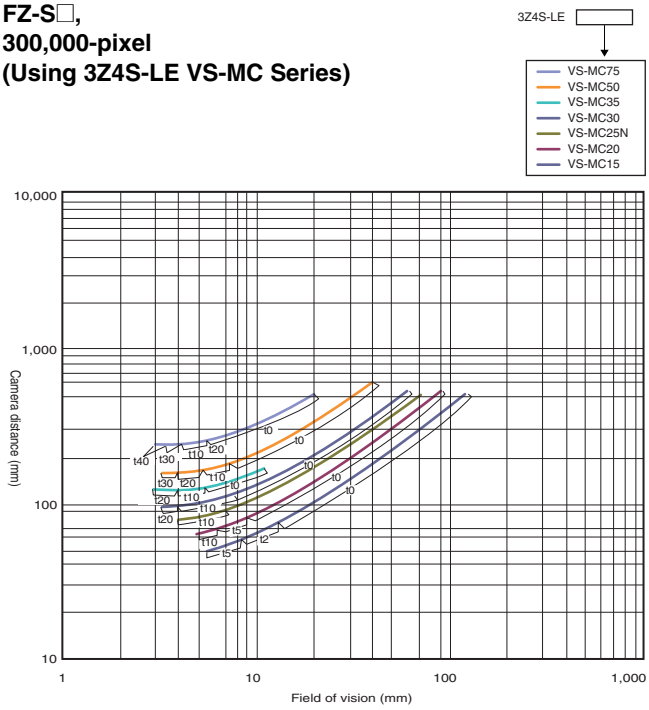


High-speed Digital CMOS Camera
FH-S□12,
12 million-pixel
(Using 3Z4S-LE VS-L/M42 Series)

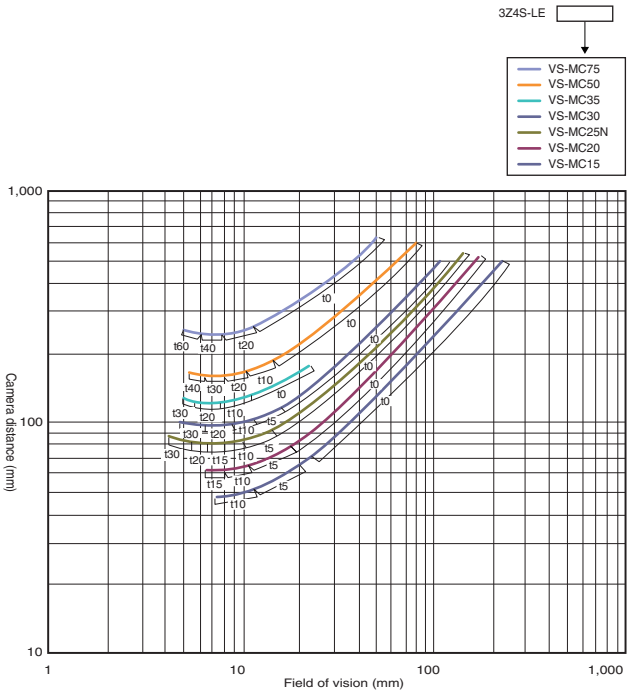


Vibration/Shock-resistance Lens

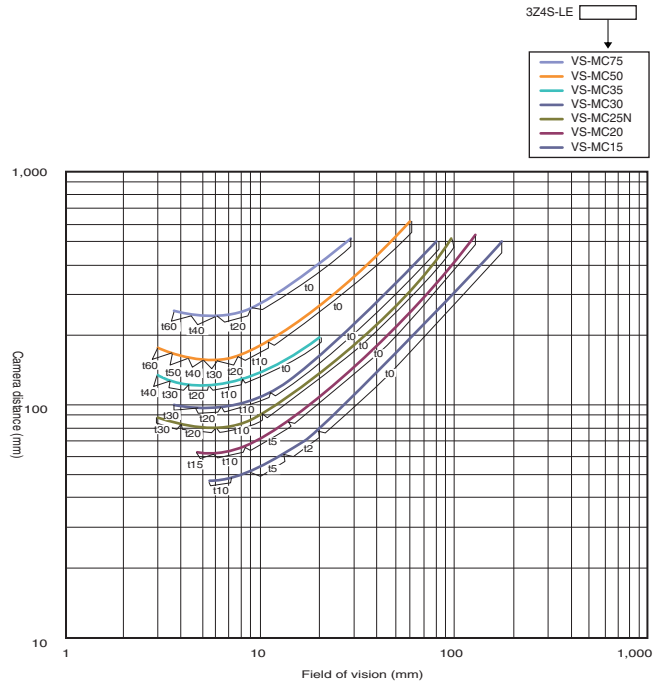
High-speed Digital CMOS Camera FH-S□, High-speed Digital CCD Camera FZ-SH□, Digital CCD Camera FZ-S□, 300,000-pixel (Using 3Z4S-LE VS-MC Series)



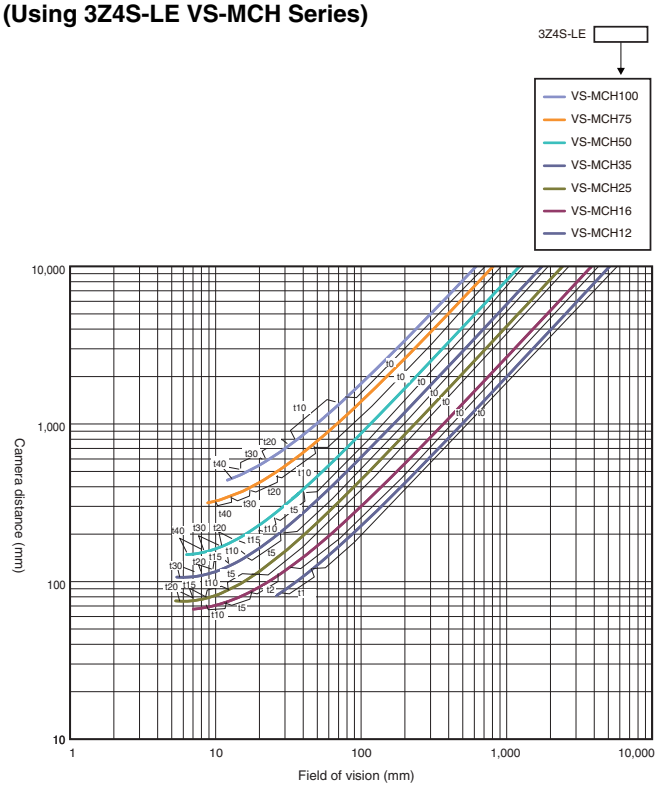
Digital CCD Camera FZ-S□5M2, 5 million-pixel (Using 3Z4S-LE VS-MC Series)



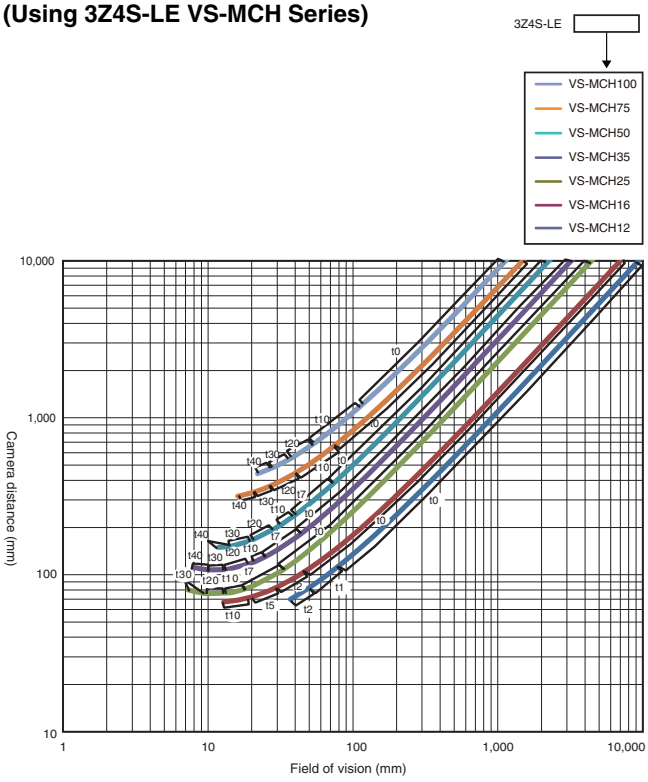
Digital CCD Camera FZ-S□2M, 2 million-pixel (Using 3Z4S-LE VS-MC Series)



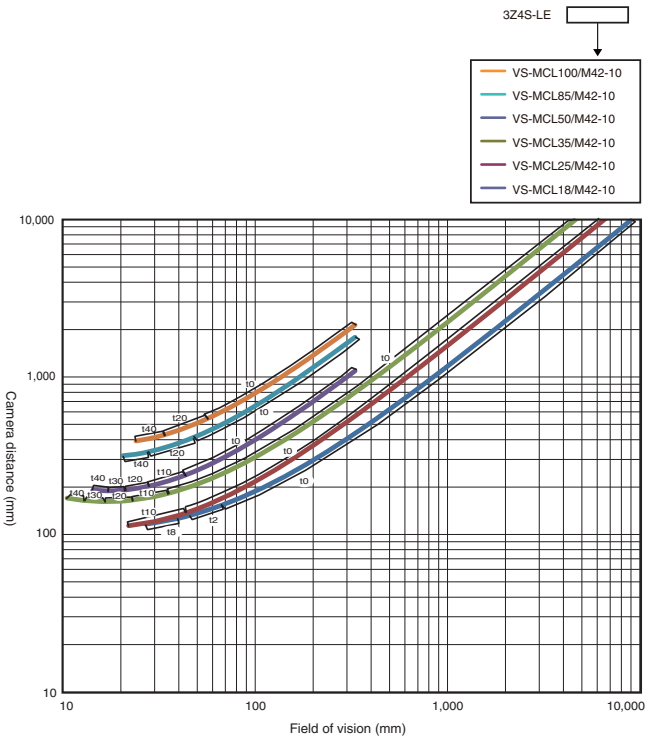
High-speed Digital CMOS Camera (Standalone) FH-S□02 2 million-pixel (Using 3Z4S-LE VS-MCH Series)



High-speed Digital CMOS Camera (Standalone)
FH-S□04
4 million-pixel
(Using 3Z4S-LE VS-MCH Series)



High-speed Digital CMOS Camera (Standalone)
FH-S□12
12 million-pixel
(Using 3Z4S-LE VS-MCL/M42 Series)



Related Manuals

Man.No.	Model number	Manual
Z365	FH/FZ5	Vision System FH/FZ5 Series User's Manual
Z341	FH/FZ5	Vision System FH/FZ5 series Processing Item Function Reference Manual
Z342	FH/FZ5	Vision System FH/FZ5 Series User's Manual for Communications Settings
Z343	FH	Vision System FH Series Operation Manual for Sysmac Studio
Z366	FH/FZ5	Vision System FH/FZ5 series Hardware Setup Manual
Z367	FH/FZ5	Vision System FH/FZ5 series Macro Customize Functions Programming Manual

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