

# Vision System FZ5-Series

## A range of processing items for positioning and inspection

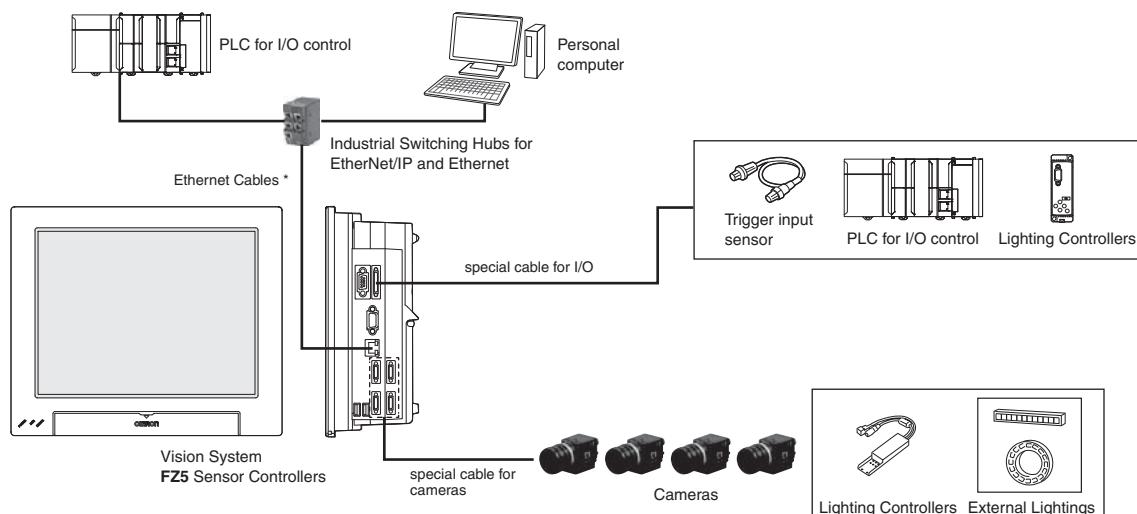
- The High-precision Object Detection Required for Positioning
- Converting Measurement Results to Output User Units
- Easily Integrate Interfaces into the Machine
- Easy Setup with Program Scalability



## System configuration

### EtherNet/IP, No-protocol Ethernet and PLC Link Connections

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



## Ordering Information

### FZ5 Series Sensor Controllers

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

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# FZ5-Series

## Cameras

Item	Descriptions	Color / Monochrome	Image Acquisition Time	Model	
	Digital CCD Cameras (Lens required)	5 million pixels (When connecting FZ5-6□ or FZ5-L35□, up to two cameras can be connected.)	62.5 ms	FZ-SC5M2	
		Monochrome		FZ-S5M2	
		2 million pixels	33.3 ms	FZ-SC2M	
		Monochrome		FZ-S2M	
		300,000 pixels	12.5 ms	FZ-SC	
		Monochrome		FZ-S	
	High-speed CCD Cameras (Lens required)	300,000 pixels	4.9 ms	FZ-SHC	
		Monochrome		FZ-SH	
	Small Digital CCD Cameras (Lenses for small camera required)	300,000-pixel flat type	12.5 ms	FZ-SFC	
		Monochrome		FZ-SF	
		300,000-pixel pen type	12.5 ms	FZ-SPC	
		Monochrome		FZ-SP	
	Intelligent Compact CMOS Cameras (Camera + Manual Focus Lens + High power Lighting)	Narrow view	Color	16.7 ms	FZ-SQ010F
		Standard view	Color		FZ-SQ050F
		Wide View (long-distance)	Color	16.7 ms	FZ-SQ100F
		Wide View (short-distance)	Color		FZ-SQ100N

## Camera Cables

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

\*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".

## Cameras / Cables Connection Table

Type of camera	Model	Cable length	Digital CCD cameras			Small digital CCD cameras Pen type / flat type	High-speed CCD cameras	Intelligent compact CMOS cameras
			300,000-pixel	2 million-pixel	5 million-pixel			
			FZ-S/SC	FZ-S2M/SC2M	FZ-S5M2/SC5M2			
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	Maximum cable length using 1 Camera Cable	Max. number of connectable Extension Units	Using Cable Extension Units FZ-VSJ	
				Max. cable length	Connection configuration
Digital CCD Cameras	FZ-S/SC	15 m (Using FZ-VS4/VSL4)	2	45 m	Camera cable: 15 m × 3 Extension Unit: 2
	FZ-S2M/SC2M	5 m (Using FZ-VS□/VSL□)	2	15 m	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	Camera cable: 15 m × 3 Extension Unit: 2
High-speed CCD Cameras	FZ-SH/SHC	15 m (Using FZ-VS4/VSL4)	2	45 m	Camera cable: 15 m × 3 Extension Unit: 2
Intelligent Compact CMOS Cameras	FZ-SQ□	15 m (Using FZ-VS4/VSL4)	2	45 m	Camera cable: 15 m × 3 Extension Unit: 2

## LED Monitor Cable

Item	Descriptions	Model
	LED Monitor Cable Cable length: 2 m or 5 m	FZ-VM

## Parallel I/O Cable

Item	Descriptions	Model
	Parallel I/O Cable Cable length: 2 m or 5 m	FZ-VP
	Parallel I/O Cable for Connector-terminal Conversion Unit Cable length: 2 m or 5 m Connector-Terminal Block Conversion Units can be connected (Terminal Blocks Recommended Products: OMRON XW2R-J50G-T, XW2R-E50G-T, XW2R-P50G-T)	FZ-VPX

## Recommended EtherNet/IP Communications Cables

Use Straight or cross STP (shielded twisted-pair) cable of category 5 or higher for EtherNet/IP.

Item	Descriptions		Model
—	Wire Gauge and Number of Pairs: AWG24, 4-pair Cable	Cables	Hitachi Metals, Ltd. <b>NETSTAR-C5E SAB 0.5 × 4P *1</b>
—			Kuramo Electric Co. <b>KETH-SB *1</b>
—			SWCC Showa Cable Systems Co. <b>FAE-5004 *1</b>
—		RJ45 Connectors	Panduit Corporation <b>MPS588-C *1</b>
—	Wire Gauge and Number of Pairs: AWG22, 2-pair Cable	Cables	Kuramo Electric Co. <b>KETH-PSB-OMR *2</b>
—			Nihon Electric Wire&Cable Co.,Ltd. <b>PNET/B *2</b>
		RJ45 Assembly Connector	OMRON <b>XS6G-T421-1 *2</b>
—	Wire Gauge and Number of Pairs: 0.5 mm, 4-pair Cable	Cables	Fujikura Ltd. <b>F-LINK-E 0.5mm × 4P *3</b>
—		RJ45 Connectors	Panduit Corporation <b>MPS588 *3</b>

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

\*1 We recommend you to use above cable For EtherNet/IP and RJ45 Connector together.

\*2 We recommend you to use above cable For EtherNet/IP and RJ45 Assembly Connector together.

\*3 We recommend you to use above cable For EtherNet/IP and RJ45 Connectors together.

# FZ5-Series

## Accessories

Item	Descriptions				Model			
	LCD Monitor 8.4 inches For Box-type Controllers				FZ-M08			
	USB Memory		2 GB	FZ-MEM2G				
			8 GB	FZ-MEM8G				
	VESA Attachment For installing the LCD integrated-type controller				FZ-VESA			
	Desktop Controller Stand For installing the LCD integrated-type controller				FZ-DS			
	Display/USB Switcher				FZ-DU			
—	Mouse Recommended Products Driverless wired mouse (A mouse that requires the mouse driver to be installed is not supported.)				—			
	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			
—	External Lighting		—		FLV Series *			
—			—		FL Series *			
	Lighting Controller (Required to control external lighting from a Controller)	For FLV-Series	Camera Mount Lighting Controller					
			Analog Lighting Controller					
		For FL-Series	Camera Mount Lighting Controller					
	For Intelligent Compact Camera	Mounting Bracket						
		Mounting Brackets						
		Polarizing Filter Attachment						
—	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			

\* 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□)

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
<b>Appearance/ Dimensions (mm)</b>	 29.5 dia. → 30.4	 29.5 dia. → 29.5	 29 dia. → 30.0	 28 dia. → 34.0	 29 dia. → 29.5	 29 dia. → 24.0	 29 dia. → 24.5	 29 dia. → 33.5 [WD:∞] to 37.5 [WD:300]	 32 dia. → 37.0 [WD:∞] to 39.4 [WD:1000]	 32 dia. → 42.0 [WD:∞] to 44.4 [WD:1000]	 32 dia. → 43.9 [WD:∞] to 46.3 [WD:1000]
<b>Focal length</b>	3.5 mm	4.5 mm	6 mm	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm	75 mm	100 mm
<b>Aperture (F No.)</b>	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
<b>Filter size</b>	—	—	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
<b>Maximum sensor size</b>	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
<b>Mount</b>	C mount										

## C-mount Lens for 2/3-inch image sensor (Recommend: FZ-S□2M/FZ-S□5M2)

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)	 42 dia. 57.5	 39 dia. 52.5	 30 dia. 51.0	 30 dia. 47.5	 30 dia. 36.0	 44 dia. 45.5	 44 dia. 57.5	 36 dia. 42.0[WD:>] to 54.0[WD:1200]	 39 dia. 66.5[WD:>] to 71.0[WD:2000]
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	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	1 inch	1 inch						
Mount	C mount								

## Lenses for small camera

Model	FZ-LES3	FZ-LES6	FZ-LES16	FZ-LES30
Appearance/ Dimensions (mm)	 12 dia. 16.4	 12 dia. 19.7	 12 dia. 23.1	 12 dia. 25.5
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□)

Model	3Z4S-LE VS-MC15-□□□□□ *1								3Z4S-LE VS-MC20-□□□□□ *1									
	 31 dia. 25.4[0.03x] to 29.5[0.3x]								 31 dia. 23.0[0.04x] to 30.5[0.4x]									
Focal length	15 mm								20 mm									
Filter size	M27.0 P0.5								M27.0 P0.5									
Optical magnification	0.03 x			0.2 x			0.3 x			0.04 x			0.25 x			0.4 x		
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)	 31 dia. 26.5[0.05x] to 38.0[0.5x]								 31 dia. 24.0[0.06x] to 35.7[0.45x]									
Focal length	25 mm								30 mm									
Filter size	M27.0 P0.5								M27.0 P0.5									
Optical magnification	0.05 x			0.25 x			0.5 x			0.06 x			0.15 x			0.45 x		
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)	 31 dia. 32.0[0.26x] to 45.7[0.65x]								 31 dia. 44.5[0.08x] to 63.9[0.48x]									
Focal length	35 mm								50 mm									
Filter size	M27.0 P0.5								M27.0 P0.5									
Optical magnification	0.26 x			0.3 x			0.65 x			0.08 x			0.2 x			0.48 x		
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)	 31 dia. 70.0[14x] to 105.5[0.62x]																	
Focal length	75 mm																	
Filter size	M27.0 P0.5																	
Optical magnification	0.14 x			0.2 x			0.62 x			0.08 x			0.2 x			0.48 x		
Aperture (fixed F No.) *2	3.8	5.6	8	3.8	5.6	8	3.8	5.6	8	2	5.6	8	2	5.6	8	2	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 iris range 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.

## Extension Tubes

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

# FZ5-Series

## Ratings and Specifications (FZ5 Sensor Controllers)

Type			High-speed Controllers		Standard Controllers		Lite Controllers					
Model	NPN	PNP	FZ5-1100	FZ5-1100-10	FZ5-600	FZ5-600-10	FZ5-L350	FZ5-L350-10				
Controller type			Controllers integrated with LCD				Box-type controllers					
No. of Cameras			2	4	2	4	2	4				
Connected Camera			Can be connected to FZ-S series. (Can not be connected to FH-S series.)				Can be connected to FZ-S series. (Can not be connected to FH-S series. When connecting 5 million-pixel cameras, up to two cameras can be connected.)					
Processing resolution	When connected to an intelligent compact camera		752 (H) × 480 (V)									
	When connected to a 300,000-pixel camera		640 (H) × 480 (V)									
	When connected to a 2 million-pixel camera		1600 (H) × 1200 (V)									
	When connected to a 5 million-pixel camera		2448 (H) × 2044 (V)									
No. of scenes			128									
Number of logged images *1	When connected to an intelligent compact camera	Connected to 1 camera	232		214							
		Connected to 2 cameras	116		107							
		Connected to 3 cameras	77		71							
		Connected to 4 cameras	58		53							
	When connected to a 300,000-pixel camera	Connected to 1 camera	Color camera: 270, Monochrome Camera: 272		Color camera: 250, Monochrome Camera: 252							
		Connected to 2 cameras	Color camera: 135, Monochrome Camera: 136		Color camera: 125, Monochrome Camera: 126							
		Connected to 3 cameras	Color camera: 90, Monochrome Camera: 90		Color camera: 83, Monochrome Camera: 84							
		Connected to 4 cameras	Color camera: 67, Monochrome Camera: 68		Color camera: 62, Monochrome Camera: 63							
	When connected to a 2 million-pixel camera	Connected to 1 camera	Color camera: 43, Monochrome Camera: 43		Color camera: 40, Monochrome Camera: 40							
		Connected to 2 cameras	Color camera: 21, Monochrome Camera: 21		Color camera: 20, Monochrome Camera: 20							
		Connected to 3 cameras	Color camera: 14, Monochrome Camera: 14		Color camera: 13, Monochrome Camera: 13							
		Connected to 4 cameras	Color camera: 10, Monochrome Camera: 10		Color camera: 10, Monochrome Camera: 10							
	When connected to a 5 million-pixel camera	Connected to 1 camera	Color camera: 16, Monochrome Camera: 16		Color camera: 11, Monochrome Camera: 11							
		Connected to 2 cameras	Color camera: 8, Monochrome Camera: 8		Color camera: 5, Monochrome Camera: 5							
		Connected to 3 cameras	Color camera: 5, Monochrome Camera: 5		—							
		Connected to 4 cameras	Color camera: 4, Monochrome Camera: 4		—							
Operation			Touch pen, mouse, etc.				Mouse or similar device					
Settings			Create series of processing steps by editing the flowchart (Help messages provided).									
Serial communications			RS-232C/422A : 1 CH				RS-232: 1CH					
EtherNet communications			Ethernet 100BASE-TX/10BASE-T				Ethernet 1000BASE-T/100BASE-TX/ 10BASE-T					
EtherNet/IP communications			Ethernet port baud rate: 100 Mbps (100Base-TX)									
Parallel I/O			(When used in Multi-line random-trigger mode) 17 inputs (RESET, STEP0/ ENCTRIG_Z0, STEP1/ENCTRIG_Z1, DSA0 to 1, ENCTRIG_A0 to 1, ENCTRIG_B0 to 1, D10 to 7), 29 outputs (RUN/BUSY1, BUSY0, GATE0 to 1, OR0 to 1, READY0 to 1, ERROR, STGOUT0 to 3, D00 to 15) (When used in other mode) 13 inputs (RESET, STEP0/ ENCTRIG_Z0, DSA0, ENCTRIG_A0, ENCTRIG_B0, D10 to 7), 26 outputs (RUN, BUSY0, GATE0, OR0, READY0, ERROR, STGOUT0 to 3, D00 to 15) * STGOUT 2 to 3 only for camera 4 ch type									
			13 inputs (RESET, STEP0/ ENCTRIG_Z0, DSA0, ENCTRIG_A0, ENCTRIG_B0, D10 to 7), 26 outputs (RUN, BUSY0, GATE0, OR0, READY0, ERROR, STGOUT0 to 3, D00 to 15) * STGOUT 2 to 3 only for camera 4 ch type				11 inputs (RESET, STEP, DSA, and D1 0 to 7), 26 outputs (RUN, BUSY, GATE, OR, READY, ERROR, STGOUT 0 to 3, and D0 0 to 15) * STGOUT 2 to 3 only for camera 4 ch type					
Monitor interface			Integrated Controller and LCD 12.1 inch TFT color LCD (Resolution: XGA 1,024 × 768 dots)				Analog RGB video output, 1 channel (Resolution: XGA 1,024 × 768 dots)					
USB interface			4 channels (supports USB 1.1 and 2.0)				2CH (supports USB1.1/2.0)					
Power supply voltage *2			20.4 to 26.4 VDC									
Current consumption (at 24.0 VDC) *3	When connected to an intelligent compact camera	5.0 A max.	7.5 A max.	5.0 A max.	7.5 A max.	4.0 A max.	5.5 A max.					
	When connected to a 300,000-pixel camera	3.7 A max.	4.9 A max.	3.7 A max.	4.9 A max.	2.6 A max.	2.9 A max.					
	When connected to a 2 million-pixel camera											
	When connected to a 5 million-pixel camera											
Ambient temperature range			Operating: 0 to 45 °C for low cooling fan speeds, 0 to 50 °C for high cooling fan speeds Storage: -20 to 65 °C (with no icing or condensation)				Operating: 0 to 45 °C, 0 to 50 °C Storage: -20 to 65 °C (with no icing or condensation)					
Ambient humidity range			Operating and storage: 35% to 85% (with no condensation)									
Weight			Approx. 3.2 kg	Approx. 3.4 kg	Approx. 3.2 kg	Approx. 3.4 kg	Approx. 1.8 kg					
Accessories			Touch pen (one, inside the front panel), Instruction Manual, 6 mounting brackets				Instruction Manual					

\*1 The image logging capacity changes when multiple cameras of different types are connected at the same time.

\*2 Do not ground the positive terminal of the 24-VDC power supply to a Lite Controller.

If the positive terminal is grounded, electrical shock may occur when an SG (0-V) part, such as the case of the Controller or Camera, is touched.

\*3 The current consumption when the maximum number of cameras supported by each controller are connected.

If a lighting controller model is connected to a lamp, the current consumption is as high as when an intelligent compact camera is connected.

## Ratings and Specifications (Cameras)

### Digital CCD Cameras

Model	FZ-S	FZ-SC	FZ-S2M	FZ-SC2M	FZ-S5M2	FZ-SC5M2
<b>Image elements</b>	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)			
<b>Color/Monochrome</b>	Monochrome	Color	Monochrome	Color	Monochrome	Color
<b>Effective pixels</b>	640 (H) × 480 (V)		1600 (H) × 1200 (V)		2448 (H) × 2044 (V)	
<b>Imaging area H × V (opposing corner)</b>	4.8 × 3.6 (6.0mm)		7.1 × 5.4 (8.9mm)		8.4 × 7.1 (11mm)	
<b>Pixel size</b>	7.4 (μm) × 7.4 (μm)		4.4 (μm) × 4.4 (μm)		3.45 (μm) × 3.45 (μm)	
<b>Shutter function</b>	Electronic shutter; select shutter speeds from 20 μs to 100 ms					
<b>Partial function</b>	12 to 480 lines		12 to 1200 lines		12 to 2044 lines	
<b>Frame rate (Image Acquisition Time)</b>	80 fps (12.5 ms)		30 fps (33.3 ms)		16 fps (62.5 ms)	
<b>Lens mounting</b>	C mount					
<b>Field of vision, installation distance</b>	Selecting a lens according to the field of vision and installation distance					
<b>Ambient temperature range</b>	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)			
<b>Ambient humidity range</b>	Operating and storage: 35% to 85% (with no condensation)					
<b>Weight</b>	Approx. 55 g		Approx. 76 g		Approx. 140 g	
<b>Accessories</b>	Instruction manual					

### Small CCD Digital Cameras

Model	FZ-SF	FZ-SFC	FZ-SP	FZ-SPC
<b>Image elements</b>	Interline transfer reading all pixels, CCD image elements (1/3-inch equivalent)			
<b>Color/Monochrome</b>	Monochrome	Color	Monochrome	Color
<b>Effective pixels</b>	640 (H) × 480 (V)			
<b>Imaging area H × V (opposing corner)</b>	4.8 × 3.6 (6.0mm)			
<b>Pixel size</b>	7.4 (μm) × 7.4 (μm)			
<b>Shutter function</b>	Electronic shutter; select shutter speeds from 20 μm to 100 ms			
<b>Partial function</b>	12 to 480 lines			
<b>Frame rate (Image Acquisition Time)</b>	80 fps (12.5ms)			
<b>Lens mounting</b>	Special mount (M10.5 P0.5)			
<b>Field of vision, installation distance</b>	Selecting a lens according to the field of vision and installation distance			
<b>Ambient temperature range</b>	Operating: 0 to 50 °C (camera amp) 0 to 45 °C (camera head) Storage: -25 to 65 °C (with no icing or condensation)			
<b>Ambient humidity range</b>	Operating and storage: 35% to 85% (with no condensation)			
<b>Weight</b>	Approx. 150 g			
<b>Accessories</b>	Instruction manual, installation bracket, Four mounting brackets (M2)	Instruction manual		

### High-speed CCD Cameras

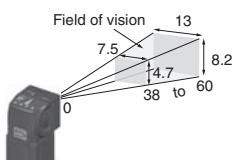
Model	FZ-SH	FZ-SHC
<b>Image elements</b>	Interline transfer reading all pixels, CCD image elements (1/3-inch equivalent)	
<b>Color/Monochrome</b>	Monochrome	Color
<b>Effective pixels</b>	640 (H) × 480 (V)	
<b>Imaging area H × V (opposing corner)</b>	4.8 × 3.6 (6.0mm)	
<b>Pixel size</b>	7.4 (μm) × 7.4 (μm)	
<b>Shutter function</b>	Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s	
<b>Partial function</b>	12 to 480 lines	
<b>Frame rate (Image Acquisition Time)</b>	204 fps (4.9ms)	
<b>Field of vision, installation distance</b>	Selecting a lens according to the field of vision and installation distance	
<b>Ambient temperature range</b>	Operating: 0 to 40 °C Storage: -25 to 65 °C (with no icing or condensation)	
<b>Ambient humidity range</b>	Operating and storage: 35% to 85% (with no condensation)	
<b>Weight</b>	Approx. 105 g	
<b>Accessories</b>	Instruction manual	

## Intelligent Compact CMOS Cameras

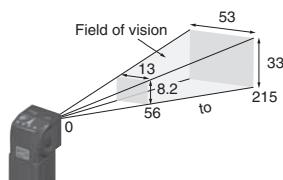
Model	FZ-SQ010F	FZ-SQ050F	FZ-SQ100F	FZ-SQ100N
<b>Image elements</b>	CMOS color image elements (1/3-inch equivalent)			
<b>Color/Monochrome</b>	Color			
<b>Effective pixels</b>	752 (H) × 480 (V)			
<b>Imaging area H × V (opposing corner)</b>	4.51 × 2.88 (5.35mm)			
<b>Pixel size</b>	6.0 (μm) × 6.0 (μm)			
<b>Shutter function</b>	1/250 to 1/32,258			
<b>Partial function</b>	8 to 480 lines			
<b>Frame rate (Image Acquisition Time)</b>	60 fps (16.7 ms)			
<b>Field of vision</b>	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
<b>Installation distance</b>	38 to 60 mm	56 to 215 mm	220 to 970 mm	32 to 380 mm
<b>LED class *</b>	Risk Group2			
<b>Ambient temperature range</b>	Operating: 0 to 50 °C Storage: -25 to 65 °C			
<b>Ambient humidity range</b>	Operating and storage: 35% to 85% (with no condensation)			
<b>Weight</b>	Approx. 150 g		Approx. 140 g	
<b>Accessories</b>	Mounting bracket (FQ-XL), polarizing filter attachment (FQ-XF1), instruction manual and warning label			

\* Applicable standards: IEC62471-2

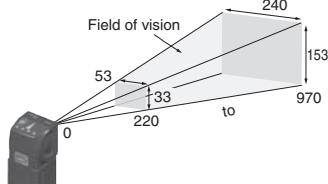
### • Narrow View FZ-SQ010F



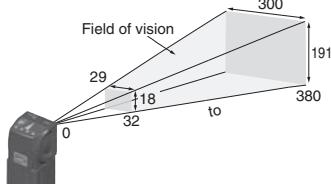
### • Standard FZ-SQ050F



### • Wide View (Long-distance) FZ-SQ100F



### • Wide View (Short-distance) FZ-SQ100N



## Ratings and Specifications (Cable, LCD Monitor)

### Camera Cables

Model	FZ-VS3 (2 m)	FZ-VSB3 (2 m)	FZ-VSL3 (2 m)	FZ-VSLB3 (2 m)
<b>Shock resistiveness (durability)</b>	10 to 150 Hz single amplitude 0.15 mm 3 directions, 8 strokes, 4 times			
<b>Ambient temperature range</b>	Operation and storage: 0 to 65 °C (with no icing or condensation)			
<b>Ambient humidity range</b>	Operation and storage: 40 to 70%RH (with no condensation)			
<b>Ambient atmosphere</b>	No corrosive gases			
<b>Material</b>	Cable sheath, connector: PVC			
<b>Minimum bending radius</b>	69mm	69mm	69mm	69mm
<b>Weight</b>	Approx. 170 g	Approx. 180 g	Approx. 170 g	Approx. 180 g

### Cable Extension Unit

Model	FZ-VSJ
<b>Power supply voltage *1</b>	11.5 to 13.5 VDC
<b>Current consumption *2</b>	1.5 A max.
<b>Ambient temperature range</b>	Operating: 0 to 50 °C; Storage: -25 to 65 °C (with no icing or condensation)
<b>Ambient humidity range</b>	Operating and storage: 35 to 85% (with no condensation)
<b>Weight</b>	Approx. 240 g
<b>Accessories</b>	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.

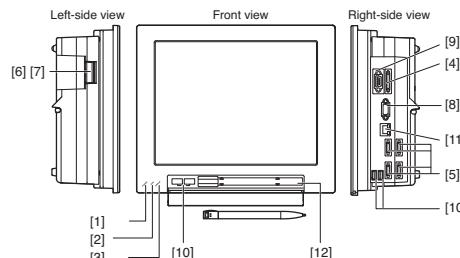
\*2 The current consumption shows when connecting the Cable Extension Unit to an external power supply.

### LCD Monitor

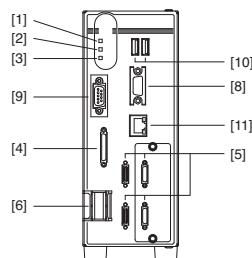
Model	FZ-M08
<b>Size</b>	8.4 inches
<b>Type</b>	Liquid crystal color TFT
<b>Resolution</b>	1,024 × 768 dots
<b>Input signal</b>	Analog RGB video input, 1 channel
<b>Power supply voltage</b>	21.6 to 26.4 VDC
<b>Current consumption</b>	Approx. 0.7 A max.
<b>Ambient temperature range</b>	Operating: 0 to 50 °C; Storage: -25 to 65 °C (with no icing or condensation)
<b>Ambient humidity range</b>	Operating and storage: 35 to 85% (with no condensation)
<b>Weight</b>	Approx. 1.2 kg
<b>Accessories</b>	Instruction Sheet and 4 mounting brackets

### Components and Functions

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



#### Example of the FZ5-Lite Sensor Controllers LCD-integrated type (4-camera type)



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

## Processing Items

Group	Icon	Processing Item
Measurement		Search
		Flexible Search
		Sensitive Search
		ECM Search
		EC Circle Search
		Shape Search II
		Shape Search III
		EC Corner
		Ec Cross
		Classification
		Edge Position
		Edge Pitch
		Scan Edge Position
		Scan Edge Width
		Circular Scan Edge Position
		Circular Scan Edge Width
		Intersection
		Color Data
		Gravity and Area
		Labeling
		Label Data
		Defect
		Precise Defect
		Fine Matching
		Character Inspect
		Date Verification
		Model Dictionary
		2DCode *2
		Barcode *1
		OCR
		OCR User Dictionary
		Circle Angle
		Glue Bead Inspection
Input Image		To input images from cameras. And set up the conditions to input images from cameras. (To FZ5 Sensor Controllers only)
		To input images from cameras. And set up the conditions to input images from cameras. (For FH Sensor Controllers only)

Group	Icon	Processing Item
Input Image		Camera Image Input HDR
		Camera Image Input HDR Lite
		Camera Switch
		Measurement Image Switching
		Position Compensation
		Filtering
		Background Suppression
		Brightness Correct Filter
		Color Gray Filter
		Extract Color Filter
Compensate image		Anti Color Shading
		Stripes Removal Filter II
		Polar Transformation
		Trapezoidal Correction
		Machine Simulator
		Image Subtraction
		Advanced filter
		Panorama
		Unit Macro
		Unit Calculation Macro
Support measurement		Calculation
		Line Regression
		Circle Regression
		Precise Calibration
		User Data
		Set Unit Data
		Get Unit Data
		Set Unit Figure
		Get Unit Figure
		Trend Monitor
Support		Image Logging
		Image Conversion Logging
		Data Logging
		Elapsed Time
		Wait

Group	Icon	Processing Item
Support measurement		Focus setting is supported.
		Focus and aperture setting is supported.
		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.
		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.
		Used when you need to calculate an average of multiple measurement results.
		Calibration data and distortion compensation data held under other processing items can be referenced.
		The specified position angle is calculated from the measured positions.
		Sets and stores data related to stages.
		Sets and stores data related to robots.
		This processing item automatically calculates the entire axis movement amount of the control equipment necessary for calibration.
		Calibration data is created using a communication command from PLC.
		The position angle after the specified axis movement is calculated.
		The axis movement that is required to match the measured position angle to the reference position angle is calculated.
		The axis movements that are required to match the measured position angles to the corresponding reference position angles are calculated.
		Obtains position/angle information by referring to the coordinate values measured with the Measurement Processing Unit.
		By setting the camera calibration, the measurement result can be converted and output as actual dimensions.
		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.
Branch		
	Used where more than two kinds of products on the production line need to be detected separately.	
	This processing item must be set up as the last processing unit of a branch.	
	Same as Processing Item "Branch". But you can change the targets of conditional branching via external inputs.	
	Set the measurement flow processing into the wait state in which the specific no-protocol command can be executed.	
	Set the measurement flow processing into the wait state in which the specific PLC Link command can be executed.	
	Set the measurement flow processing into the wait state in which the specific parallel command can be executed.	
	Set the measurement flow processing into the wait state in which the specific Fieldbus command can be executed.	
	Easily branch to multiple destinations.	
Output results		
	Used when you need to output data to the external devices such as PLC or PC via serial ports.	
	Used when you need to output data to the external devices such as PLC or PC via parallel ports.	
	Used when you need to output judgement results to the external devices such as PLC or PC via parallel ports.	
	Outputs data to an external device, such as a Programmable Controller, through a fieldbus interface.	
Output result		
	Used for displaying the texts or the figures in the camera image.	
	Display selected image file.	
	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

\*3 FZ5-L3□□/-6□□ controllers do not support.

## Dimensions

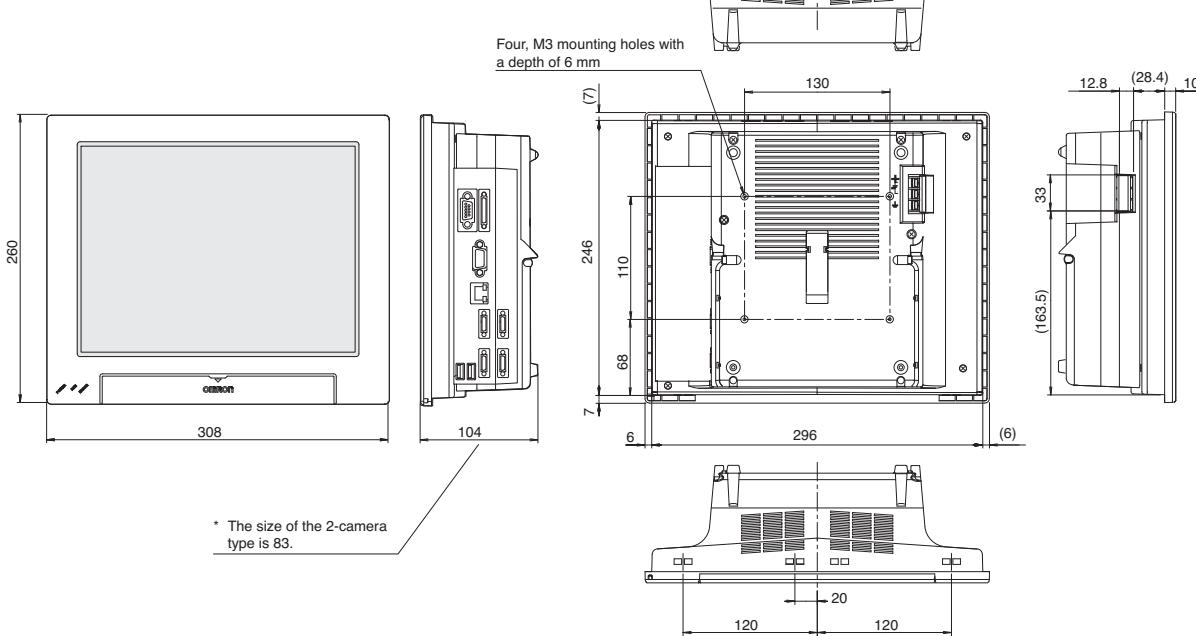
(Unit: mm)

### Sensor Controllers

FZ5-series LCD-integrated type

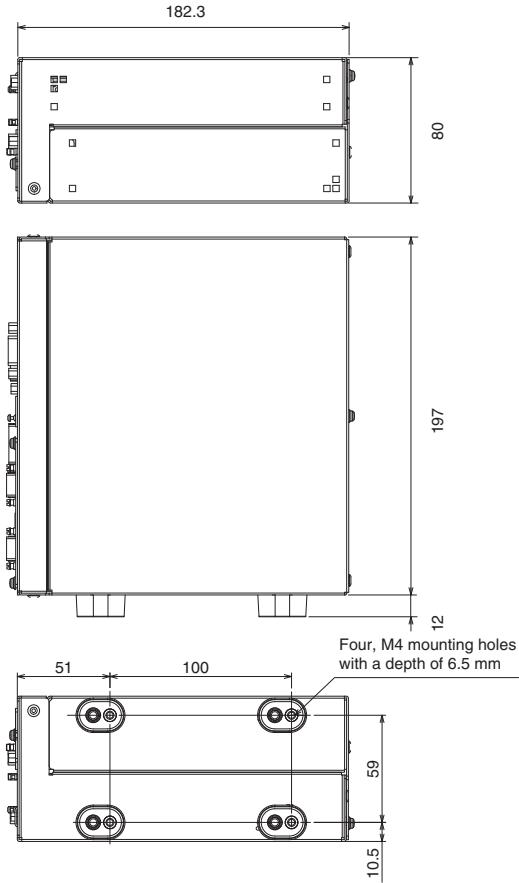
FZ5-1100/-1105/-1100-10/1105-10

FZ5-600/-605/-600-10/-605-10



# FZ5-Series

## FZ5-series Lite Box-type FZ5-L350/-L355/-L350-10/-L355-10

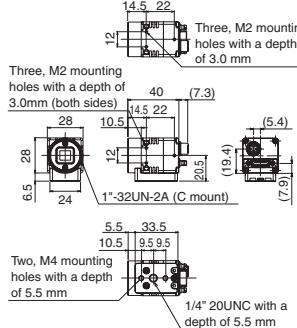


## Cameras

### Digital CCD Cameras

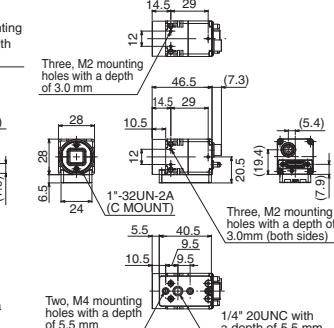
#### 300,000-pixel camera

FZ-S  
FZ-SC



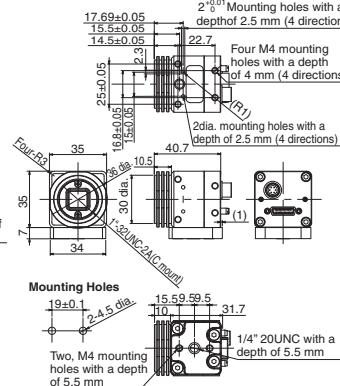
#### 2 million-pixel camera

FZ-S2M  
FZ-SC2M



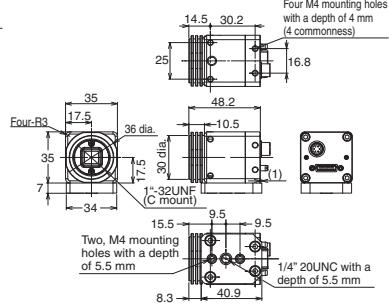
#### 5 million-pixel camera

FZ-S5M2  
FZ-SC5M2



### High-speed CCD Camera

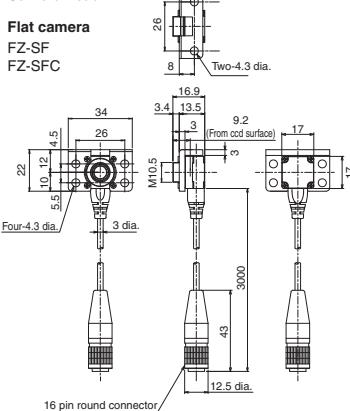
FZ-SH  
FZ-SHC



### Small digital CCD cameras

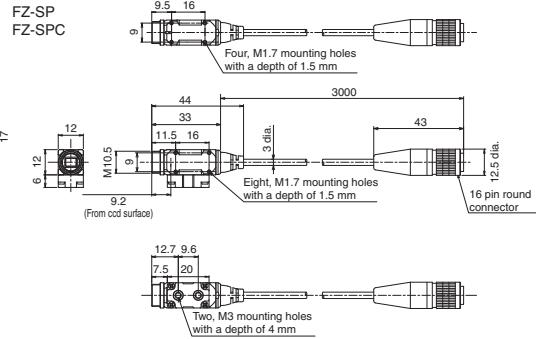
#### Camera head

Flat camera  
FZ-SF  
FZ-SFC



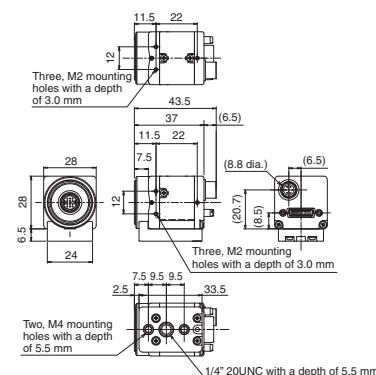
#### Pen-shaped camera

FZ-SP  
FZ-SPC



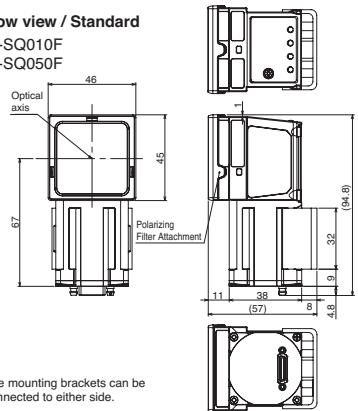
#### Camera amplifier

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

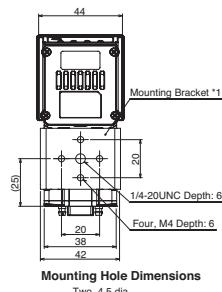


## Intelligent Compact CMOS Cameras

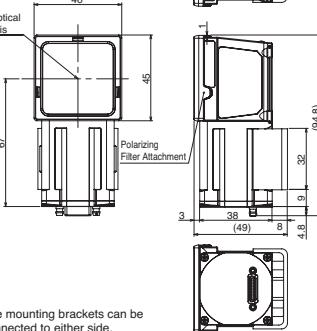
## Narrow view / Standard

FZ-SQ010F  
FZ-SQ050F

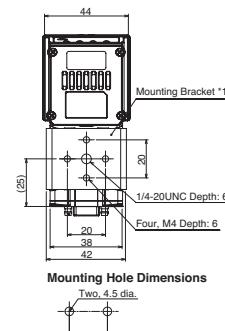
\*1. The mounting brackets can be connected to either side.



## Wide View

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

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



Tightening torque: 1.2 N·m

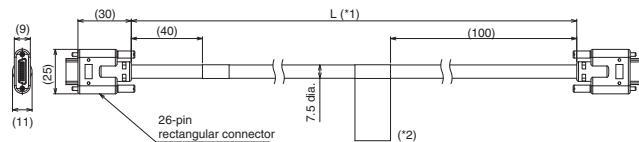
Tightening torque: 1.2 N·m

## Cables

## Camera Cable

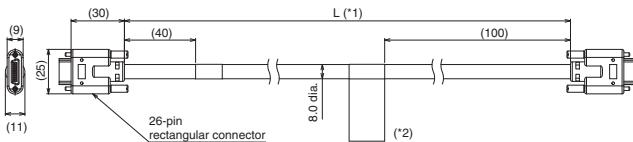
## Camera Cable

FZ-VS3



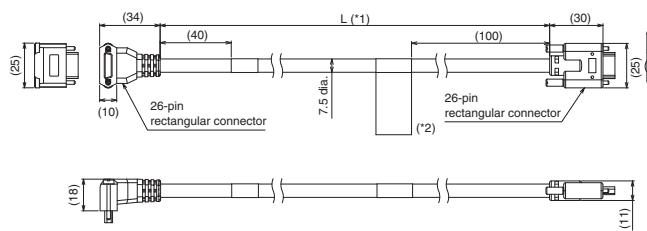
## Bend resistant Camera Cable

FZ-VSB3



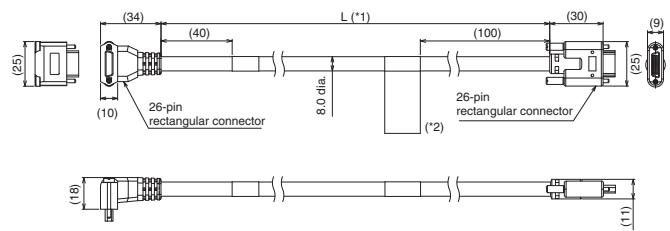
## Right-angle Camera Cable

FZ-VSL3



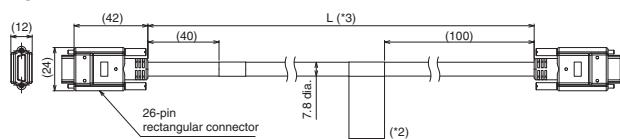
## Bend resistant Right-angle Camera Cable

FZ-VSLB3



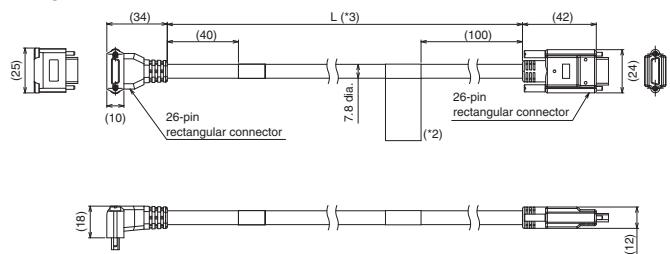
## Long-distance Camera Cable

FZ-VS4



## Long-distance Right-angle Camera Cable

FZ-VSL4



\*1. Cable is available in 2m/3m/5m/10m.

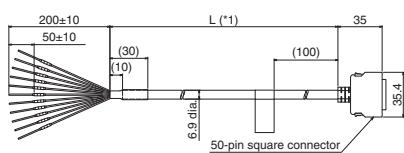
\*2. Each camera cables has polarity.

Please ensure that the name plate side of the cable is connected to the controller.

\*3. Cable is available in 15m.

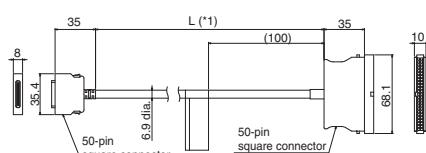
## Parallel Cable

FZ-VP



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

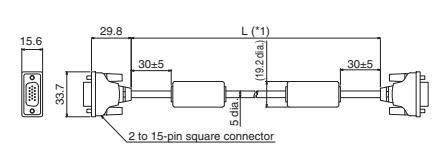
FZ-VPX



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

## LED Monitor Cable

FZ-VM

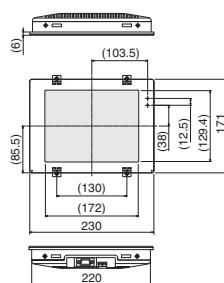


\*1. cable is available in 2m/5m.

# FZ5-Series

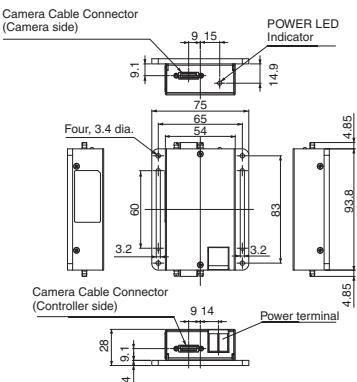
## LCD Monitor

FZ-M08



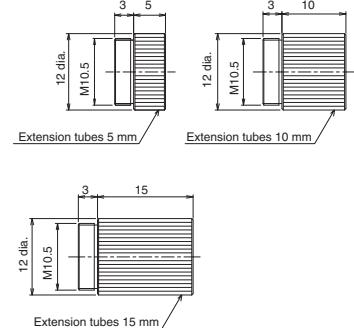
## Camera Cable Extension Unit

FZ-VSJ



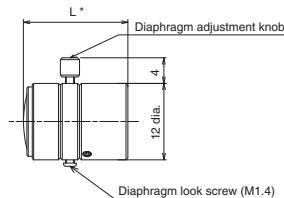
## Extension Tubes for Small Camera

FZ-LESR



## Lens for Small Camera

FZ-LES Series

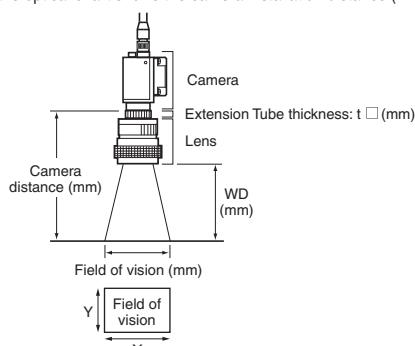


\* Overall length is available in 16.4mm/19.7mm/23.1mm/25.5mm.

## Optical Chart

### Meaning of Optical Chart

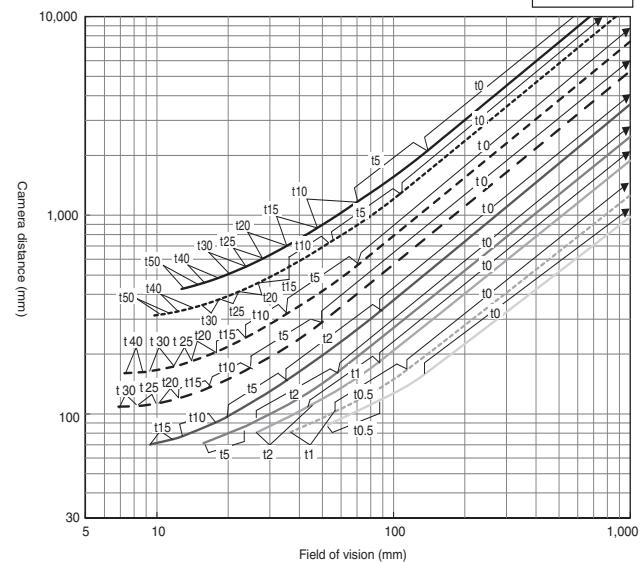
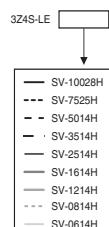
The X axis of the optical chart shows the field of vision (\*1), and the Y axis of the optical chart shows the camera installation distance (mm) (\*2).



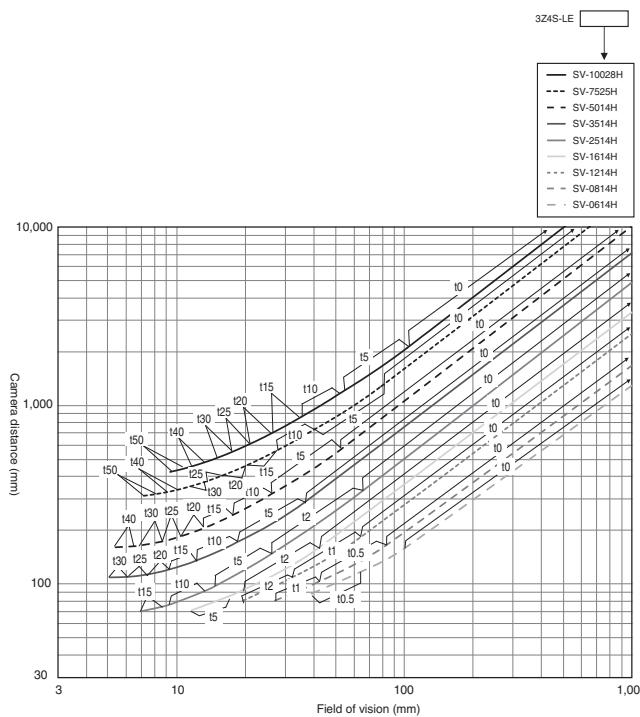
\*1. The lengths of the fields of vision given in the optical charts are the lengths of the Y axis.

\*2. The vertical axis represents WD for small cameras.

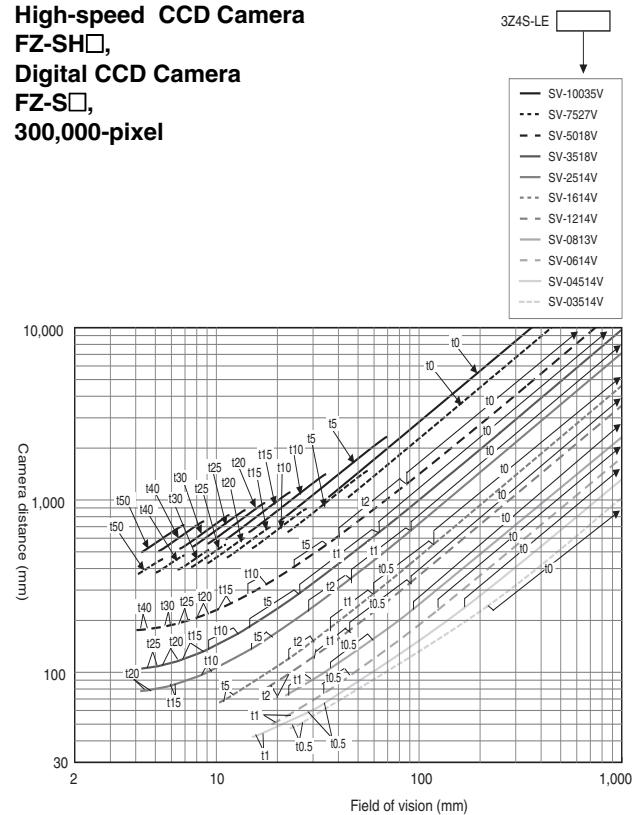
### Digital CCD Camera FZ-S□5M2, 5 million-pixel



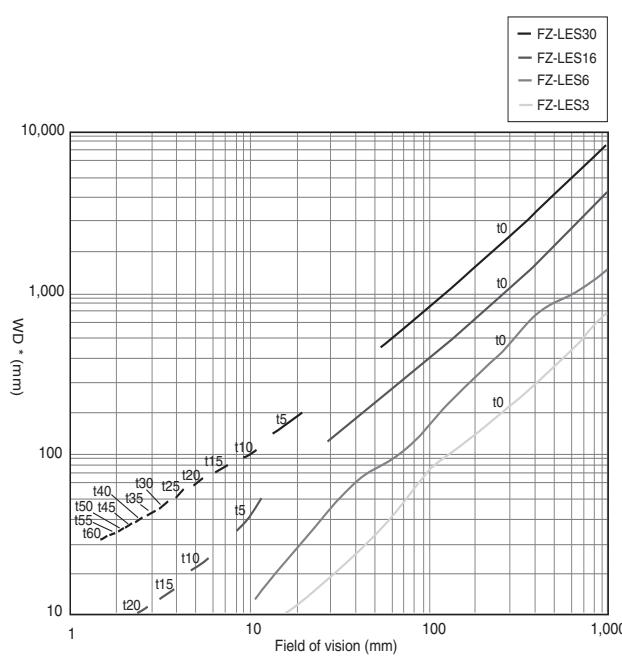
**Digital CCD Camera**  
**FZ-S□2M,**  
**2 million-pixel**



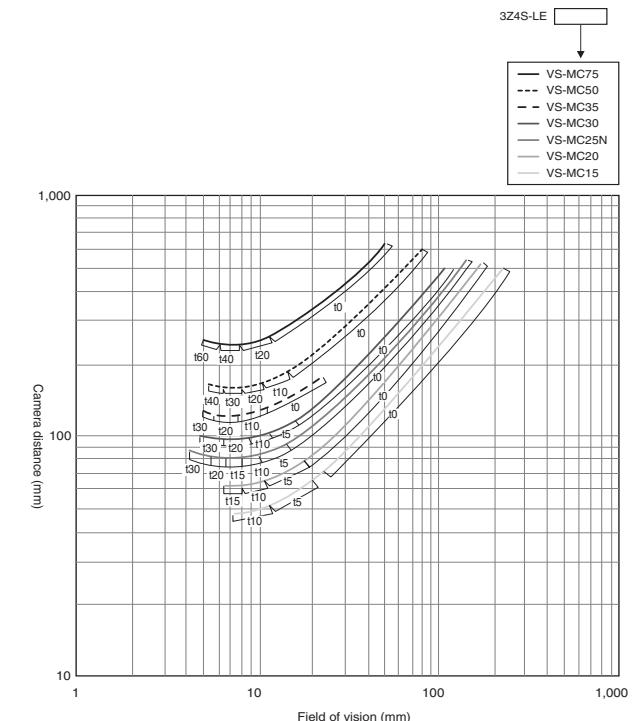
**High-speed CCD Camera**  
**FZ-SH□,**  
**Digital CCD Camera**  
**FZ-S□,**  
**300,000-pixel**



**Small Digital CCD Cameras**  
**FZ-SF□,**  
**FZ-SP□,**  
**300,000-pixel**

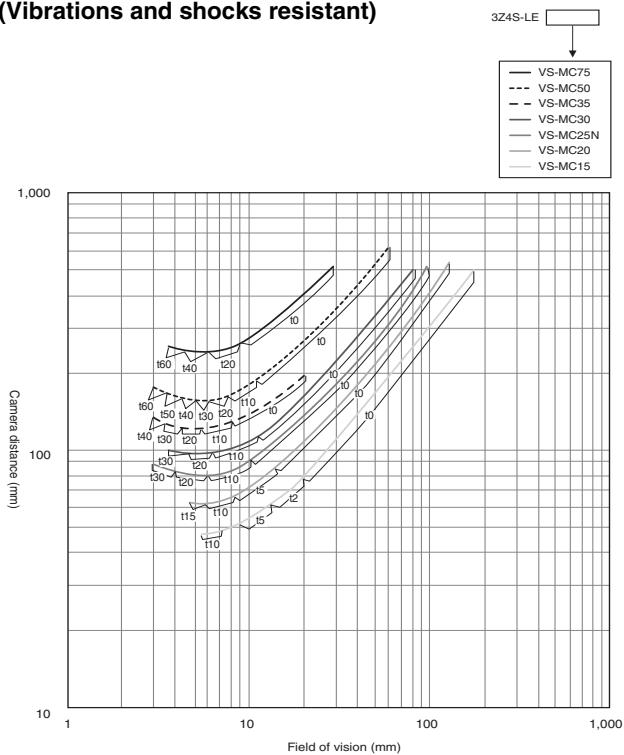


**Digital CCD Camera**  
**FZ-S□5M2,**  
**5 million-pixel**  
**(Vibrations and shocks resistant)**

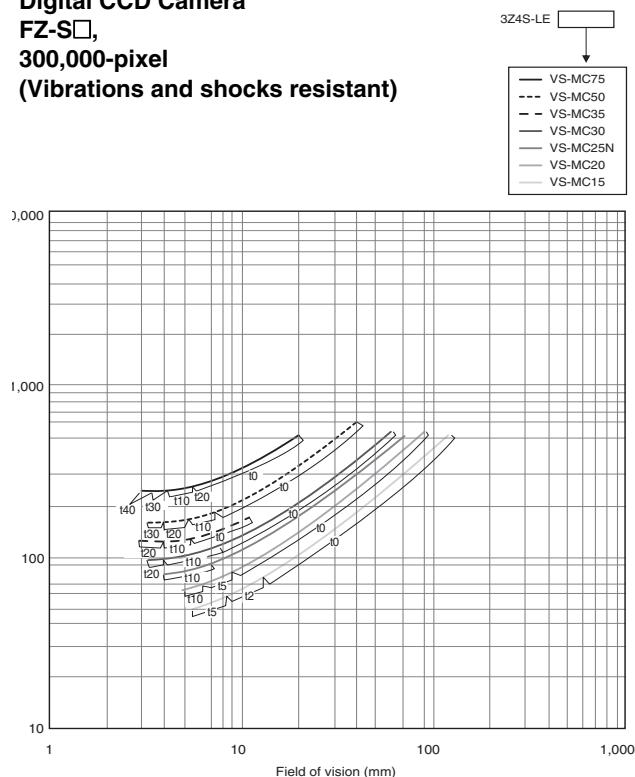


\* The vertical axis represents WD, not installation distance.

**Digital CCD Camera**  
**FZ-S□2M,**  
**2 million-pixel**  
**(Vibrations and shocks resistant)**



**High-speed CCD Camera**  
**FZ-SH□,**  
**Digital CCD Camera**  
**FZ-S□,**  
**300,000-pixel**  
**(Vibrations and shocks resistant)**



## Related Manuals

Man.No.	Model number	Manual
Z340	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

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