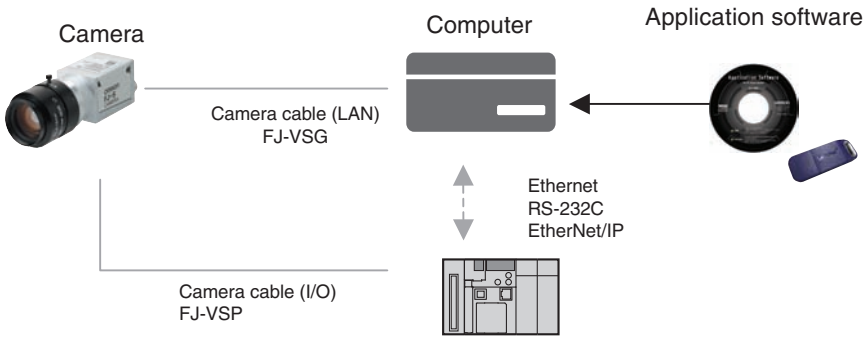
PC Vision System FJ Series

Camera & Software Vision Package

- Built-in high-quality image processing in a PC system
- Resolving a variety of applications with highly robust and advanced measurement algorithm
- Gigabit Ethernet camera that can be readily connected to the FJ application software (the connectivity tested and verified)
- Building an ideal machine vision using a customized sample in no time

System Configuration



Ordering Information

Type				Model	Operating environment
Camera & Software Vision Package • Application software × 1 license • Camera × 1 unit		300,000 pixels	Monochrome	**FJ-SG-S**	• 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 • Camera interface: Ethernet 1000BASE-T • Display: XGA (1024 × 768), True Color (32-bit) or higher • Optical drive: CD/DVD drive
		300,000 pixels	Color	**FJ-SCG-S**	
		2 million pixels	Monochrome	**FJ-S2MG-S**	
		2 million pixels	Color	**FJ-SC2MG-S**	
		5 million pixels	Monochrome	**FJ-S5MG-S**	
		5 million pixels	Color	**FJ-SC5MG-S**	
Camera (Single unit)		300,000 pixels	Monochrome	**FJ-SG**	–
		300,000 pixels	Color	**FJ-SCG**	
		2 million pixels	Monochrome	**FJ-S2MG**	
		2 million pixels	Color	**FJ-SC2MG**	
		5 million pixels	Monochrome	**FJ-S5MG**	
		5 million pixels	Color	**FJ-SC5MG**	
Camera cable (LAN)		Cable length: 3 m, 5 m, 10 m, 20 m, 40 m		**FJ-VSG □M** *2	
Camera cable (Power, I/O)		Cable length: 3 m, 5 m, 10 m *1		**FJ-VSP □M** *2	
Development environment Application Producer	Media only	CD-ROM		**FH-AP1**	• 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 operating environment is required to use the camera FJ-S□□□G. Camera interface: Ethernet 1000BASE-T • 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
	1 license	–		**FH-AP1L**	

*1. 10-m cable can be used with 300,000-pixel cameras FJ-SCG/SG and 2-million pixel cameras FJ-SC2MG/S2MG.
*2. The boxes in the model numbers are replaced by the cable length: 3 m = 3, 5 m = 5, 10 m = 10, 20 m = 20 and 40 m = 40

Lenses

High-resolution, Low-distortion Lenses

Model	3Z4S-LE SV-0614H	3Z4S-LE SV-0814H	3Z4S-LE SV-1214H	3Z4S-LE SV-1614H	3Z4S-LE SV-2514H	3Z4S-LE SV-3514H	3Z4S-LE SV-5014H	3Z4S-LE SV-7525H	3Z4S-LE SV-10028H
Appearance/ Dimensions (mm)									
Focal length	6mm	8mm	12mm	16mm	25mm	35mm	50mm	75mm	100mm
Brightness	F1.4	F1.4	F1.4	F1.4	F1.4	F1.4	F1.4	F2.5	F2.8
Filter size	M40.5 P0.5	M35.5 P0.5	M27 P0.5	M27 P0.5	M27 P0.5	M35.5 P0.5	M40.5 P0.5	M34.0 P0.5	M37.5 P0.5

CCTV Lenses

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	3.5mm	4.5mm	6mm	8mm	12mm	16mm	25mm	35mm	50mm	75mm	100mm
Brightness	F1.4	F1.4	F1.4	F1.3	F1.4	F1.4	F1.4	F1.8	F1.8	F2.7	F3.5
Filter size	—	—	M27 P0.5	M25.5 P0.5	M27 P0.5	M27 P0.5	M27 P0.5	M27 P0.5	M30.5 P0.5	M30.5 P0.5	M30.5 P0.5

Extension Tubes

Model	3Z4S-LE SV-EXR
Contents	Set of 7 tubes(40 mm, 20 mm, 10 mm, 5 mm, 2.0 mm, 1.0 mm, and 0.5 mm) Maximum outer diameter: 30 mm dia.

- 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.

Ratings and Performance

		FJ-SCG/SG	FJ-SC2MG/S2MG	FJ-SC5MG/S5MG
Imaging element		Progressive scan 1/3-inch CCD	Progressive scan 1/1.8-inch CCD	Progressive scan 2/3-inch CCD
Effective pixels		656 (H) × 492 (V): Color	1616 (H) × 1234 (V): Color	2448 (H) × 2056 (V): Color
		656 (H) × 494 (V): Monochrome	1616 (H) × 1236 (V): Monochrome	2448 (H) × 2058 (V): Monochrome
Pixel size		7.4 (μm) × 7.4 (μm)	4.4 (μm) × 4.4 (μm)	3.45 (μm) × 3.45 (μm)
Synchronous system		Internal synchronous		
Frame rate		90fps	20fps	17fps
Number of uptake lines		Min 2 line to Effective pixels (V) (2 lines interval)		
Gain		0dB to +25dB	0dB to +18dB	0dB to +14dB
Shutter speed		17 μs to 1 s	25 μs to 1 s	29 μs to 10 s
Video output		Digital 8 bit		
Trigger input		External trigger / Software trigger (Ethernet)		
External output		Strobe trigger / Trigger READY		
I/F		Gigabit Ethernet (1 Gbit/s)		
Lens mount		C mount		
Power voltage		PoE/12VDC±10%		11.3 to 13.2VDC
Pick-up voltage when camera cable FJ-VSP is used	3 m	11.3 to 13.2VDC		11.8 to 13.8VDC
	5 m			
	10 m			Cannot be used.
Power consumption		PoE supply: 3.6 W	PoE supply: 3.8 W	Power and I/O connector supply: 6.4 W
		Power and I/O connector supply: 3.1 W	Power and I/O connector supply: 3.2 W	
Vibration resistance		10 to 150 Hz, Half amplitude 0.35 mm (Acceleration: Max. 50 m/s^2), 3 directions (X/Y/Z) 8 minutes each, 10 times		
Impact resistance		150 m/s^2, 6 directions (Up and Down, Right and Left, Back and Forth) 3 times each		
Ambient temperature		In operation: 0 to 40°C (Chassis surface temperature should be 55°C or lower.)		
		In storage: -25 to +65°C (no freezing or condensation)		
Ambient humidity		In operation and storage: 35 to 85% RH each (no condensation)		
Ambient environment		No corrosive gas		
Protective structure		IEC60529 standard IP30		
Weight		Approx. 90 g		Approx. 220 g

Processing Items

Group	Icon	Processing Item	
Measurement		Search	Used to identify the shapes and calculate the position of measurement objects.
		Flexible Search	Recognizing the shapes of workpieces with variation and detecting their positions.
		Sensitive Search	Search a small difference by dividing the search model in detail, and calculating the correlation.
		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.
		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.
		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.
		Edge Position	Measure position of measurement objects according to the color change in measurement area.
		Edge Pitch	Detect edges by color change in measurement area. Used for calculating number of pins of IC and connectors.
		Scan Edge Position	Measure peak/bottom edge position of workpieces according to the color change in separated measurement area.
		Scan Edge Width	Measure max/min/average width of workpieces according to the color change in separated measurement area.
		Circular Scan Edge Position	Measure center axis, diameter and radius of circular workpieces.
		Circular Scan Edge Width	Measure center axis, width and thickness of ring workpieces.
		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.
		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.
		Precise Defect	Check the defect on the object. Parameters for extraction defect can be set precisely.
		Fine Matching	Difference can be detected by overlapping and comparing (matching) registered fine images with input images.
		Character Inspect	Recognize character according correlation search with model image registered in [Model Dictionary].
		Date Verification	Reading character string is verified with internal date.
		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.
		Barcode *1	Recognize barcode, verify and output decoded characters.
		OCR	Recognize and read characters in images as character information.
		OCR User Dictionary	Register dictionary data to use for OCR.
		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.
Input Image		Camera image input GigE	Capture images from a GigE camera.
		Camera Image Input HDR	Create high-dynamic range images by acquiring several images with different conditions.
		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.

Group	Icon	Processing Item	
Compensate image		Position Compensation	Used when positions are differed. Correct measurement is performed by correcting position of input images.
		Filtering	Used for processing images input from cameras in order to make them easier to be measured.
		Backgrond Suppression	To enhance contrast of images by extracting color in specified brightness.
		Brightness Correct Filter	Track brightness change of entire screen and remove gradual brightness change such as uneven brightness.
		Color Gray Filter	Color image is converted into monochrome images to emphasize specific color.
		Extract Color Filter	Convert color image to color extracted image or binary image.
		Anti Color Shading	To remove the irregular color/pattern by uniformizing max.2 specified colors.
		Stripes Removal Filter Ⅱ	Remove the background pattern of vertical, horizontal and diagonal stripes.
		Polar Transformation	Rectify the image by polar transformation. Useful for OCR or pattern inspection printed on circle.
		Trapezoidal Correction	Rectify the trapezoidal deformed image.
		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.
		Panorama	Combine multiple image to create one big image.
Support measurement		Unit Macro	Advanced arithmetic processing can be easily incorporated into workflow as Unit Macro processing items.
		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.
		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.
		User Data	Used for setting of the data that can be used as common constants and variables in scene group data.
		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.
		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.
		Iris	Focus and aperture setting is supported.
		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.

Group	Icon	Processing Item	
Support measurement		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.
		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.
		PLC Mastoer Calibration	Calibration data is created using a communication command from PLC.
		Convert Position Data	The position angle after the specified axis movement is calculated.
		Movement Single Position	The axis movement that is required to match the measured position angle to the reference position angle is calculated.
		Movement Multi Points	The axis movements that are required to match the measured position angles to the corresponding reference position angles are calculated.
		Detection Point	Obtains position/angle information by referring 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.
		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.
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.

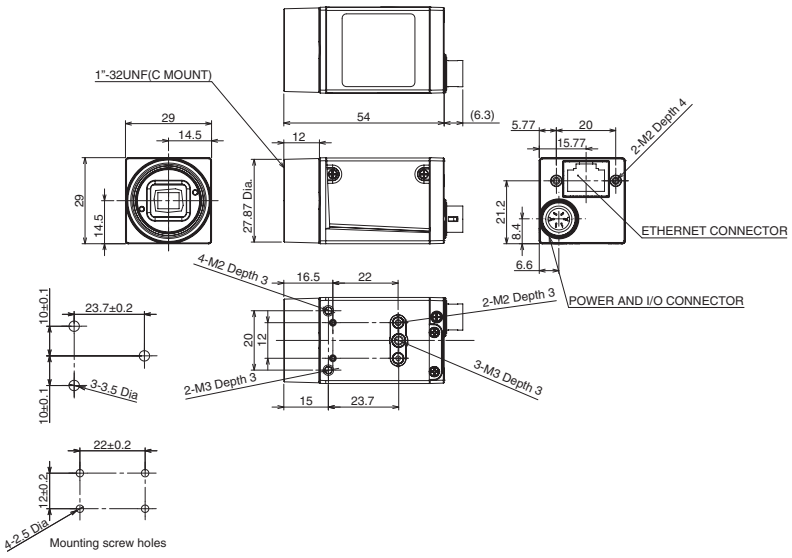
*1 Bar Codes that can be read : JAN/EAN/UPC (including add-on codes), Code 39, Codabar (NW-7), ITF (Interleaved 2 of 5), Code 93, Code 128, GS1-128, GS1 DataBar (RSS-14 / RSS Limited / RSS Expanded), Pharmacode

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

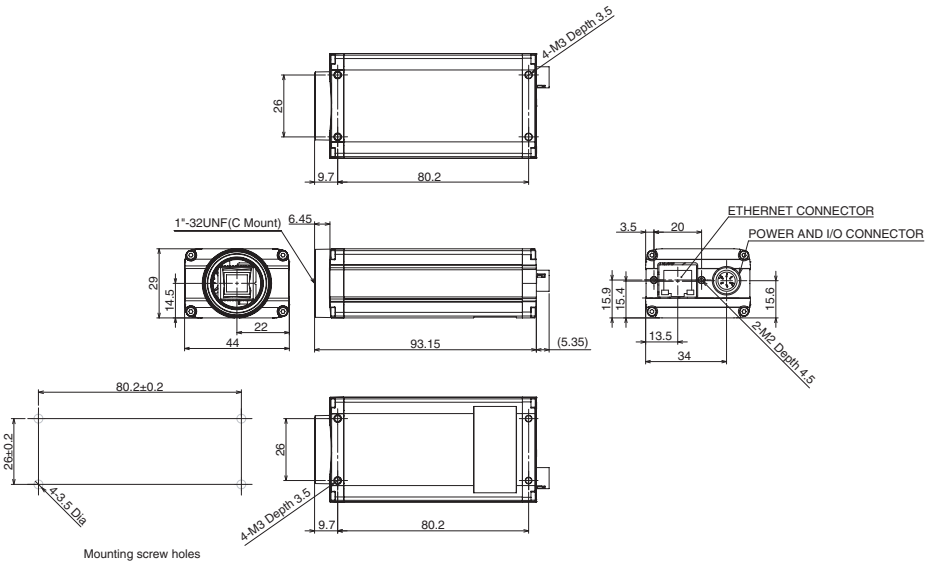
External Dimensions

(Unit: mm)

FJ-SCG/SG/SC2MG/S2MG

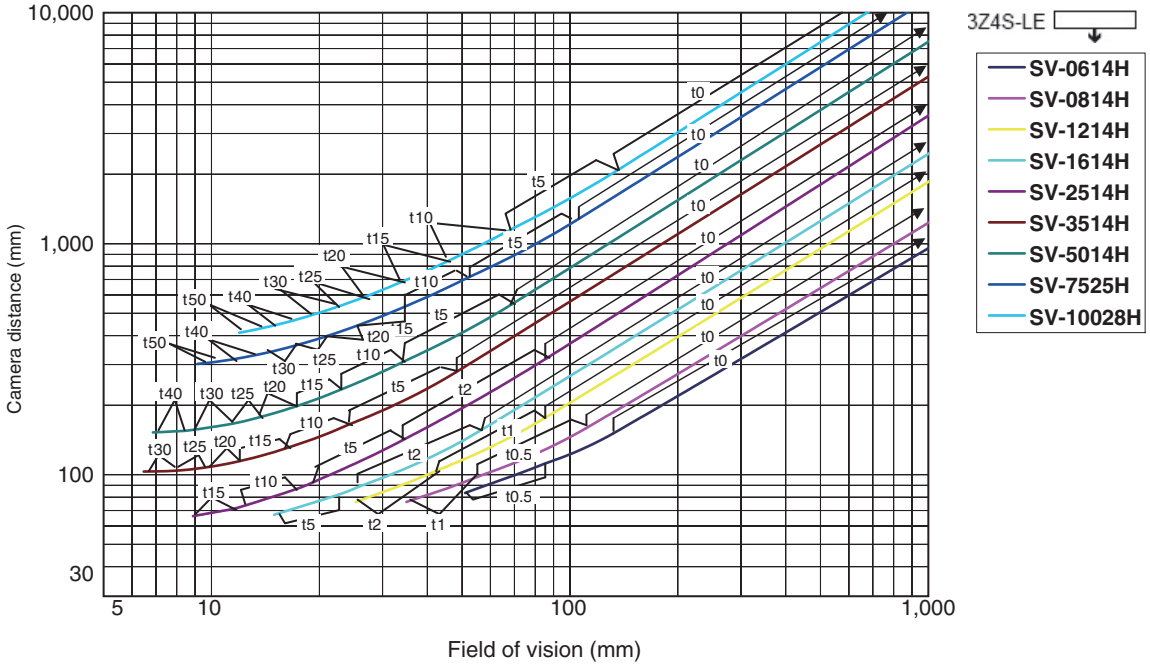


FJ-SC5MG/S5MG

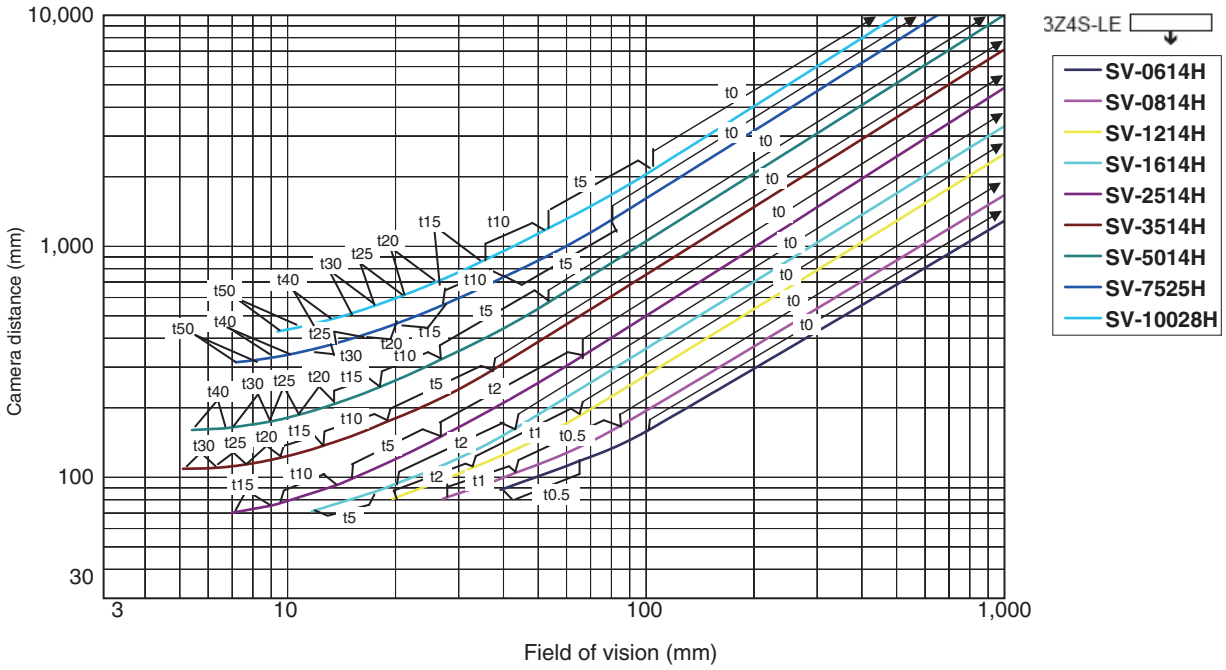


Optical Chart

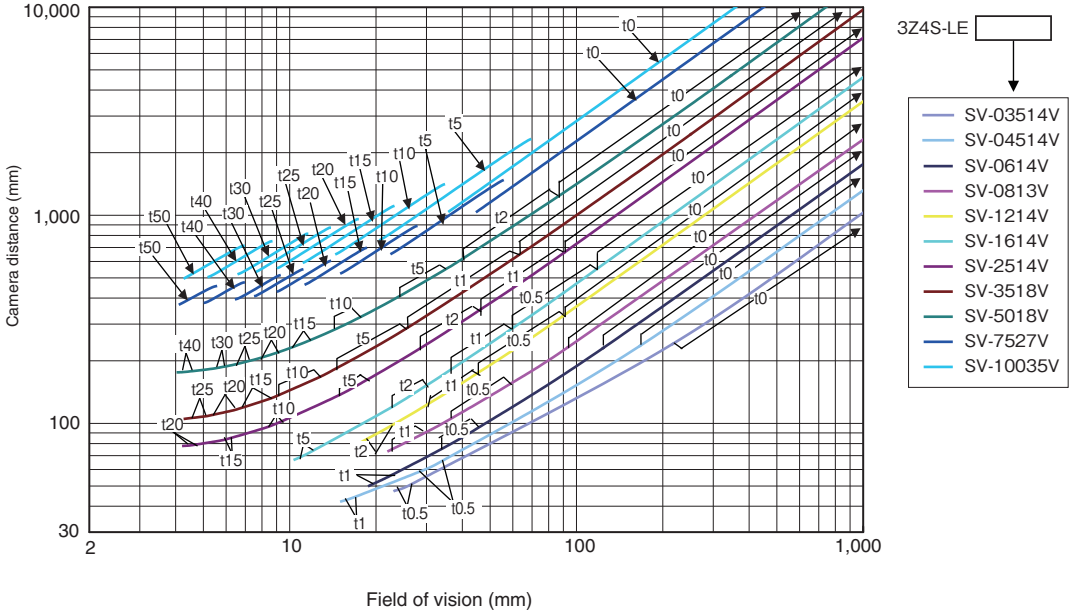
5 million-pixel digital camera FJ-SC5MG/S5MG



2 million-pixel digital camera FJ-SC2MG/S2MG

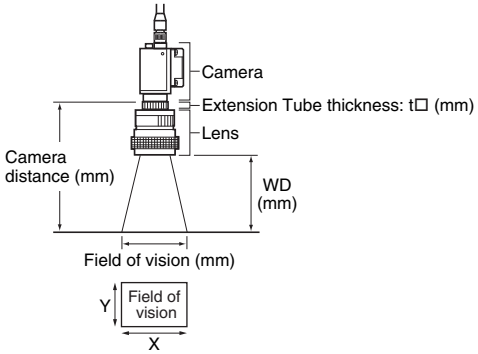


300,000-pixel digital camera FJ-SCG/SG



■ Meaning of Optical Chart

The X axis of the optical chart shows the field of vision (mm)(Note1),
and the Y axis of the optical chart shows the camera installation distance (mm)(Note2).



Note: 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.

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