

KEYENCE

NEW Ultra High-Speed, Multi-Camera,
High-Performance Image Processing System

Supports Line Scan Cameras

XG-8000 Series



INTERCHANGEABLE CAMERA SYSTEM

MACHINE VISION INSPECTION

SUPPORTS LINE SCAN & AREA CAMERAS

An image processing system with the ultimate camera selection

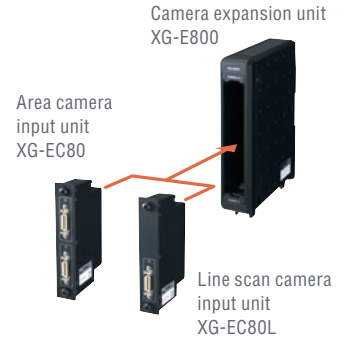
Expansion via camera modules that support area or line scan type cameras

The expansion and interconnection of different cameras is possible through the combination of the camera expansion unit (XG-E800) and the camera input unit (XG-EC80/XG-EC80L). Area and line scan cameras are supported with a single controller allowing the same ease of use for both types of cameras providing the ultimate application flexibility.

CAMERA COMPATIBILITY CHART

Model	AREA CAMERA			LINE SCAN CAMERA			No. of connected camera units	Encoder input	Touch panel support
	300,000 pixels	2,000,000 pixels	5,000,000 pixels	2000 pixels	4000 pixels	8000 pixels			
XG-8502L	○	○	×	○	×	×	Up to 2 units*	○	○
XG-8702L	○	○	○	○	○	○			

*When using line scan cameras only, up to 2 cameras can be connected at once.
When using a mixed connection, up to 2 area cameras and 1 line scan camera can be connected at once.



A user-friendly design that makes it easy to understand the installation condition at a single glance

Ease of use has been emphasized in order to reduce the amount of time, effort and difficulty of implementing a line scan camera, which have traditionally been issues with conventional line scan camera installations. The XG-8000 Series is equipped with an interface that makes it easy to understand and install the line scan camera into the application.



Model	XG-HL02M
Applicable lens	1 in. C-mount
Number of pixels	2048
Max. expanded image size	2048×16384
Scan speed	24μS/line
Pixel clock	100 MHz (8x transfer)



Model	XG-HL04M
Applicable lens	1 in. C-mount
Number of pixels	4096
Max. expanded image size	4096×16384
Scan speed	24μS/line
Pixel clock	200 MHz (16x transfer)



Model	XG-HL08M
Applicable lens	2 in. (M40 P0.75 P0.03*)lens*
Number of pixels	8192
Max. expanded image size	8192×8192
Scan speed	45μS/line
Pixel clock	200 MHz (16x transfer)

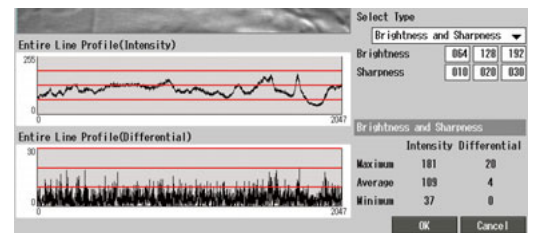
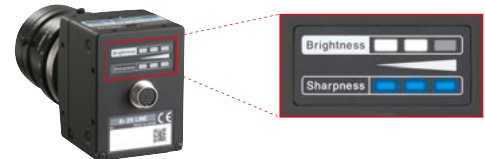
*Supports F-mount conversion adapter

Understand optical axis consistency at a single glance

LED INDICATOR Industry's first

The typically difficult task of obtaining the correct camera mounting is made easy using visual LED indicators right on the camera that show the level of light intensity and sharpness being received. This drastically reduces the amount of time needed for line scan camera installation.

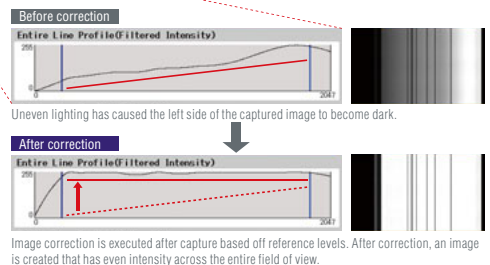
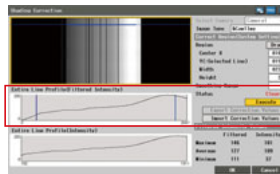
LED indicators on the back of the camera display the focus and intensity information of the image currently being captured using a 3-level indicator. The individual threshold levels can be user specified in order to obtain the best results under the specific application conditions.



Adjust for variations of received light intensity in the camera

WAVEFORM VIEWER

Uneven brightness is typical when performing wide range image capture with line scan cameras. The built-in waveform viewer on the XG-8000 displays the intensity shading information of the image captured by the camera.



The shading correction function of the XG can be used to adjust for an uneven lighting condition across the field of view. The shade correction is performed in the camera before the image transfer so it does not have an effect on the processing time which is very important with high speed production lines.

CA-LHW/CA-LHL/CA-LM SERIES

High-resolution lens for line scan cameras

Provides optimal imaging performance with minimal distortion



SPECIALIZED LENS DESIGNED FOR LINE SCAN CAMERAS

Uses an original optical design to drastically reduce distortion that is easily generated with close-proximity image capture.

PART NUMBER LIST

Part number	CA-LHW8	CA-LHW12	CA-LHW16	CA-LHW25	CA-LHW35	CA-LHW50	CA-LHL16	CA-LHL25	CA-LHL35
Focal point	8 mm 0.32"	12.5 mm 0.49"	16 mm 0.62"	25 mm 0.98"	35 mm 1.38"	50 mm 1.97"	16 mm 0.62"	25 mm 0.98"	35 mm 1.38"
F-stop range (aperture)*1	F1.4 to F16	F1.4 to F16	F1.4 to F16	F1.4 to F16	F1.4 to F16	F1.4 to F16	F2.8 to F32	F2.8 to F32	F2.8 to F32
Minimum WD	0.1 m 0.33"	0.3 m 0.98"	0.3 m 0.98"	0.3 m 0.98"	0.3 m 0.98"	0.5 m 1.64"	0.1 m 0.33"		
Mount	C-mount						Special mount (M40 P0.75 P0.03")		
Filter size	55.0 mm P0.75 2.17" P0.03"	35.5 mm P0.5 1.4" P0.02"	35.5 mm P0.5 1.4" P0.02"	35.5 mm P0.5 1.4" P0.02"	35.5 mm P0.5 1.4" P0.02"	40.5 mm P0.5 1.59" P0.02"	77 mm P0.75 3.03" P0.03"	52 mm P0.75 2.05" P0.03"	46 mm P0.75 1.81" P0.03"
Compatible CCD size	1"						2"		
Distortion*2	-1.2% (-1.6%, -1%)	-1.58% (-1%, -0.6%)	-1.0% (-0.7%, -0.4%)	-1.0% (-0.5%, -0.3%)	-0.5% (-0.3%, -0.1%)	-0.05% (0.05%, 0.02%)	-0.20%	-0.06%	-0.05%
Resolution	120 cycles/mm (center), 60 cycles/mm (periphery)						100 cycles/mm (center), 80 cycles/mm (periphery)		
Ambient temperature/humidity range	0 to 50°C 32 to 122°F, 35% to 80% RH (No condensation)						0 to 50°C 32 to 122°F, 35% to 80% RH (No condensation)		
Weight	Approx.210g	Approx.160g	Approx.150g	Approx.130g	Approx.140g	Approx.210g	Approx.420g	Approx.420g	Approx.330g

*1: When used with a line camera, an aperture of around F 2.8 is recommended. This improves the peripheral resolution.

*2: Indicates specification for compatible CCD size. Value in parenthesis applies to 2/3" or 1/2" CCD size.

Part number	CA-LM0210		CA-LML0210	
Optical magnification	>0.25 to x1.0		>0.25 to x1.0	
Telecentricity	—		—	
WD (mm, at reference magnification)*3	>0.25	238 mm 9.37"	>0.25	238 mm 9.37"
	>0.50	137 mm 5.39"	>0.50	137 mm 5.39"
	>0.75	105 mm 4.13"	>0.75	105 mm 4.13"
	x1.0	88 mm 3.46"	x1.0	88 mm 3.46"
Compatible CCD size	1"		2"	
Field of view (at reference magnification)	2/3"	6.6 × 8.8 mm to 26.4 × 35.2 mm 0.26" × 0.35" to 1.04" × 1.39"	1"	9.6 × 12.8 mm to 38.4 × 51.2 mm 0.38" × 0.50" to 1.51" × 2.01"
	14.3 mm 0.56" line camera	14.3 mm to 57.3 mm 0.56" to 2.26"	28.7 mm 1.13" line camera	28.7 mm to 114.7 mm 1.13" to 4.52"
	1"	9.6 × 12.8 mm to 38.4 × 51.2 mm 0.38" × 0.50" to 1.51" × 2.01"	2"	19.2 × 25.6 mm to 76.8 × 102.4 mm 0.76" × 1.01" to 3.02" × 4.03"
F-stop range (aperture)	F6 to F64 (F-stop: F2.8 to F32)		F6 to F64 (F-stop: F2.8 to F32)	
Depth of field*1	>0.25	5120 μm 201.57 Mil	>0.25	5120 μm 201.57 Mil
	>0.50	2560 μm 100.79 Mil	>0.50	2560 μm 100.79 Mil
	x1.0	1280 μm 50.39 Mil	x1.0	1280 μm 50.39 Mil
TV distortion (Max.)	>0.25	-0.11%	>0.25	-0.10%
	>0.50	0.03%	>0.50	0.10%
	x1.0	0.01%	x1.0	-0.10%
Resolution (μm)*2	>0.25	16.8 μm 0.66 Mil	>0.25	16.8 μm 0.66 Mil
	>0.50	8.4 μm 0.33 Mil	>0.50	8.4 μm 0.33 Mil
	x1.0	4.2 μm 0.17 Mil	x1.0	4.2 μm 0.17 Mil
Mount	C-mount		Special mount (M40 P0.75 P0.03")	
Filter size	46.0 mm P0.75 1.81" P0.03"		46.0 mm P0.75 1.81" P0.03"	
Ambient temperature/humidity range	0 to 50°C 32 to 122°F, 35% to 80% RH (No condensation)			
Weight	Approx.640g		Approx.650g	

*1 Depth of field applies to an F-stop of 32 and will vary depending on F-stop setting. The indicated depth of field is a theoretical value that assumes 1/2" CCD size and a horizontal resolution of 320 lines. (Circle of least confusion is 40 μm 1.57 Mil in the image)

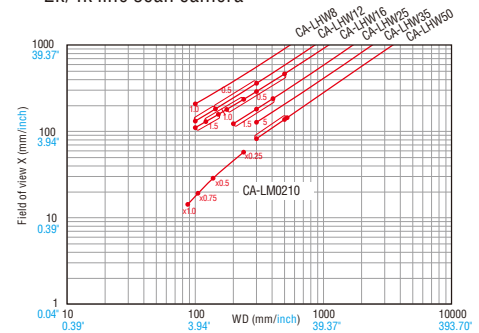
*2 The smallest resolvable feature that can be detected using 550 nm wavelength light.

*3 WD indicates a working distance at reference magnification. WD will vary depending on magnification adjustment.

Note: When installing the macro lens (CA-LMxx) to the line scan camera, make sure to secure the lens unit with the dedicated mounting stand (OP-87337, sold separately) or an equivalent mount.

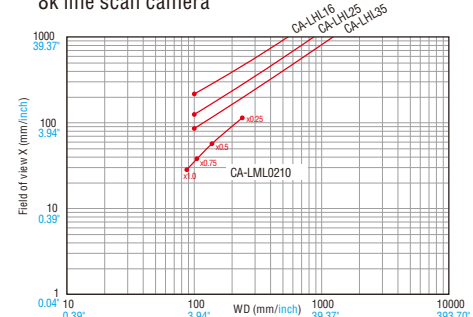
LENS CHART

When using the CA-LHW Series
2k/4k line scan camera



2048 pixels/4096 pixels
(When using the XG-HL02M/XG-HL04M)

When using the CA-LHL Series
8k line scan camera



8192 pixels (When using the XG-HL08M)

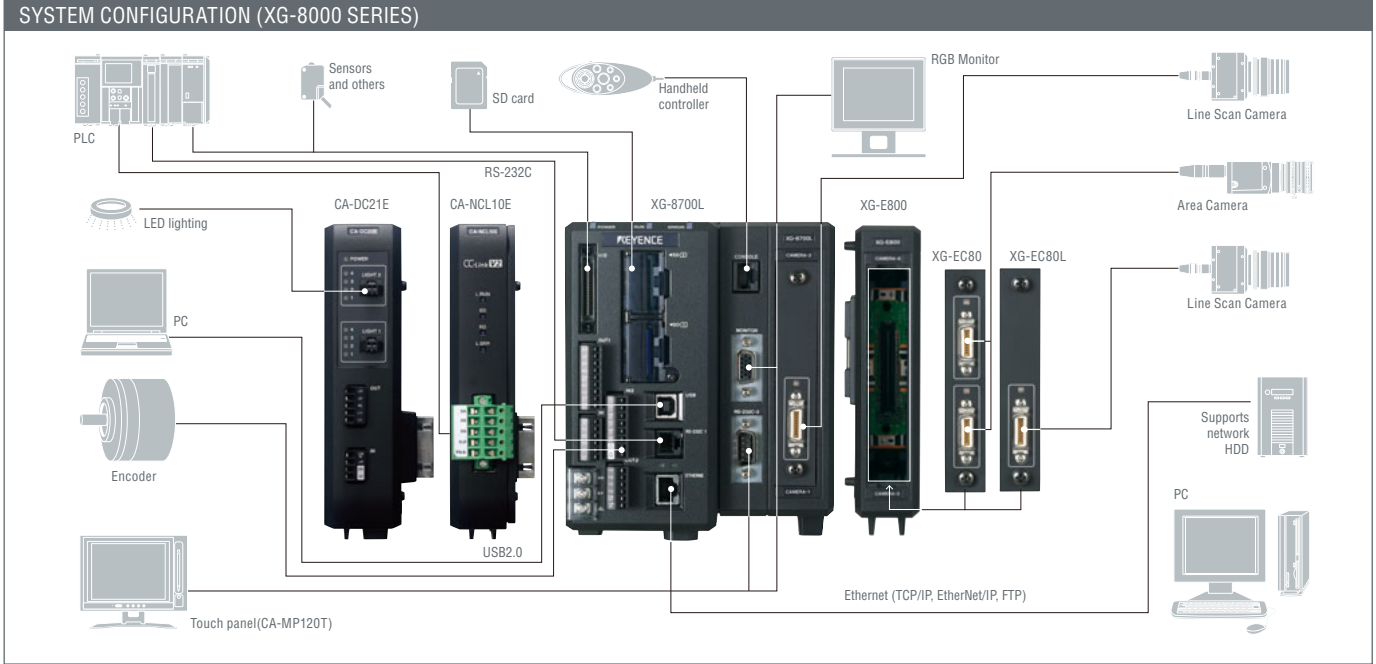
Dedicated mounting stand for the macro lens

Part number	OP-87337
Weight	Approx.980g

F-mount conversion adapter

Part number	OP-87319
Camera side mount	Special mount (M40 P0.75 P0.03")
Lens side mount	Nikon F-mount
Weight	Approx.90g

INTERFACE



PRODUCT LINEUP

Controllers



Supports all cameras up to the 5M pixel area cameras and the 8K pixel line scan camera
XG-8702L

Supports all cameras up to the 2M pixel area cameras and the 2K line scan camera
XG-8502L

Expansion unit



Camera expansion module
XG-E800
 XG-8000 Series only



Line scan camera Input unit
XG-EC80L



Area camera Input unit
XG-EC80



LED light control expansion module
CA-DC21E



CC-Link module
CA-NCL10E

Line scan cameras



8x high-speed, 2048 pixels Line scan camera
XG-HL02M
 (Monochrome)



16x high-speed, 8192 pixels Line scan camera
XG-HL08M
 (Monochrome)

16x high-speed, 4096 pixels Line scan camera
XG-HL04M
 (Monochrome)

Others



Handheld controller
OP-84231
OP-84236(Blank)

Image processing system integration software
XG-H8NE2
 Please see p. 14 for the supported OS.



Dedicated touch panel
CA-MP120T



Optional Accessories

Camera cable



L-type connector

Camera cables

Cable type	Connector shape	Cable length					Extension cable
		1 m 3.3'	3 m 9.8'	5 m 16.4'	10 m 32.8'	17 m 55.8'	
High-speed camera cable	Straight	—	CA-CH3	CA-CH5	CA-CH10	—	—
	L-type	—	CA-CH3L	CA-CH5L	CA-CH10L	—	—
High-speed high flex robot cable	Straight	—	CA-CH3R	CA-CH5R	CA-CH10R	—	—

Amplifier for extension cables

CA-CHX10U
 (for high-speed cameras)



Camera cables may be extended up to 30 m 98.4'.



The dedicated extension cable is necessary in order to connect an amplifier to a camera or between two amplifiers.

Accessories for the CA-MP120T for the XG-8000:

OP-87258 (3 m 9.8' touch panel RS-232C cable)
OP-87259 (10 m 32.8' touch panel RS-232C cable)
 Monitor stand: **OP-87262**

Monitor cable

OP-66842 (3 m 9.8')
OP-87055 (10 m 32.8')



Console junction cable

OP-87260 (3 m 9.8')
OP-87261 (10 m 32.8')

* A RGB monitor cable and touch panel RS-232C cable are required when using the CA-MP120T.

Parallel I/O cable
OP-51657 (3 m 9.8')



Communication cable conversion connector

OP-26486: 9 pins
OP-26485: 25 pins
 For 9-pin SYSMAC: **OP-84384**
 For 9-pin MELSEC: **OP-86930**



Industrial SD card
CA-SD4G: 4GB (SDHC)
CA-SD1G: 1GB
OP-87133: 512MB



Y split cable
CA-D1W (1 m 3.3')



1Gbps Ethernet cable
OP-66843 (3 m 9.8')

USB cable
OP-66844 (2 m 6.6')

Connector to terminal
OP-84457 (1 m 3.3')



RS-232C communication cable
OP-26487 (2.5 m 8.2')

Standard lighting cable
CA-D2 (2 m 6.6')
CA-D5 (5 m 16.4')

High flex lighting cable
CA-D3R (3 m 9.8')
CA-D5R (5 m 16.4')
CA-D10R (10 m 32.8')
CA-D17R (17 m 55.8')

SPECIFICATIONS (SOFTWARE)

Model		XG-H8NE2 (XG VisionEditor)
PC Specifications	Operating Systems	Microsoft Windows XP Home Edition/Professional SP2 or later Microsoft Windows Vista Home Basic, Home Premium, Business, Ultimate, Enterprise Microsoft Windows 7 Home Premium, Professional, Ultimate, Enterprise Supports the 64-bit version of Microsoft Windows 7 only. For all other operating systems, only the 32-bit version is supported.
	PC	- CPU Minimum requirements: Core 2 Duo 1.06 GHz or higher; Recommended: Core 2 Duo 1.80 GHz or higher - RAM: 2 GB or higher - HDD: Minimum 500 MB of free space* Space is required for saving separate image data - Monitor: 1024x768 dots or higher (1280x1024 dots or higher is recommended) - DVD drive: A CD/DVD drive capable of reading the software CD-ROM - USB port: USB 2.0 required. Either an internet connection or means of receiving the activation code license electronically.
Licensing		License required for full activation. Information for receiving a license / activation code includes, company details, user ID and CD serial number.
Additional Software	XG Vision Terminal	License free remote support, data logging (image and data output), and file management PC software for use with up to 8 connected controllers (via Ethernet or USB).
	USB Driver	USB driver (license free) specifically for connecting a XG-8000 controller via USB to either the XG VisionEditor, XG Vision Terminal or XG Simulator+ software. Supplied with XG VisionEditor, Vision Terminal and Simulator+.

The number of possible settings amongst all listed items depends on the main unit memory capacity.

SPECIFICATIONS (CONTROLLER)

Controller (XG-8702L/8502L)

Model	NPN	XG-8702L	XG-8502L	
	PNP	XG-8702LP	XG-8502LP	
Supported Resolution		<ul style="list-style-type: none"> With XG-HL08M connected: Up to 8192 (H) x 8192 (L), approx. 67.11 mega-pixels With XG-HL04M connected: Up to 4096 (H) x 16384 (L), approx. 67.11 mega-pixels With XG-HL02M connected: Up to 2048 (H) x 16384 (L), approx. 33.55 mega-pixels With XG-H500C/H500M connected: 2432 (H) x 2050 (V), approx. 4.99 mega-pixels With XG-200C/S200C/H200C/200M/S200M/H200M connected: 2 mega-pixel mode: 1600 (H) x 1200 (V), 1.92 mega-pixels 1 mega-pixel mode: 1024 (H) x 960 (V), approx. 980,000 pixels With XG-H100C/H100M connected: 1000 (H) x 1000 (V), 1 mega-pixels With XG-035C/S035C/035M/S035M/H035C/H035M connected: 310,000 pixel mode: 640 (H) x 480 (V), approx. 310,000 pixels 240,000 pixel mode: 512 (H) x 480 (V), approx. 240,000 pixels 	<ul style="list-style-type: none"> With XG-HL02M connected: Up to 2048 (H) x 16384 (L), approx. 33.55 mega-pixels With XG-200C/S200C/H200C/200M/S200M/H200M connected: 2 mega-pixel mode: 1600 (H) x 1200 (V), 1.92 mega-pixels 1 mega-pixel mode: 1024 (H) x 960 (V), approx. 980,000 pixels With XG-H100C/H100M connected: 1000 (H) x 1000 (V), 1 mega-pixels With XG-035C/S035C/035M/S035M/H035C/H035M connected: 310,000 pixel mode: 640 (H) x 480 (V), approx. 310,000 pixels 240,000 pixel mode: 512 (H) x 480 (V), approx. 240,000 pixels 	
Camera Connectivity		<p>When mounting the XG-EC80L (included with controller): 1 monochrome line camera (supports: XG-HL02M/HL04M/HL08M)</p> <p>When mounting the XG-EC80: 2 Color/monochrome area cameras (supports: XG-H500C/200C/S200C/H200C/H100C/035C/S035C/H035C/H500M/200M/S200M/H200M/H100M/035M/S035M/H035M)</p> <p>1 line scan camera can be connected to the XG-EC80L. 2 area cameras can be connected to the XG-EC80. Up to 2 line scan cameras or 4 area cameras is possible with the use of the XG-E800. (mixed connection is possible)</p>	<p>When mounting the XG-EC80L (included with controller): 1 monochrome line camera (supports: XG-HL02M)</p> <p>When mounting the XG-EC80: 2 Color/monochrome area cameras (supports: XG-200C/S200C/H200C/H100C/035C/S035C/H035C/200M/S200M/H200M/H100M/035M/S035M/H035M)</p> <p>1 line scan camera can be connected to the XG-EC80L. 2 area cameras can be connected to the XG-EC80. Up to 2 line scan cameras or 4 area cameras is possible with the use of the XG-E800.</p>	
	Trigger input	4-camera simultaneous individual capture can be selected (when XG-E800 is not connected, images from up to two area cameras can be captured at the same time).		
Image Processor		DSP (High-speed)		
Program Memory		SD cards 1 and 2 can each hold 1000 programs (depending on the size of the SD card and the size of the programs), external switching possible.		
Screen Capacity		Maximum 1000 screens for each program (depending on SD card size), image compression (JPEG) also available.		
Editing	Program Editing	Supports the creation, deletion, copying and renaming of programs in edit mode, adding/editing units/flowchart (image acquisition/vision tools/position adjustment/program control/operations/timing/display/commands), variable settings/total judgment settings/Unit total error settings/scaling adjustment settings/camera model settings/statistical settings/image archive settings/FTP output settings / variable changing dialog/registered image batch updating/position adjustment reference position batch updating/defect classification/image snapshot output settings. Supports the creation and editing of custom screens through screen editing.		
	System Settings	Supports the editing of system settings during offline mode, general (controller name/date and time settings/language settings/registered image type/menu opacity/unit execution/startup mode/VT Series touch panel settings, and options during settings creation) basic camera (camera settings/white balance settings/Waveform viewer), I/O settings (external terminals/Ethernet (TCP/IP), Ethernet IP/RS-232C/PLC link/CC-Link EtherNet/IP/VNC), date/time encryption (OCR), and custom command settings, CA Series touch panel correction.		
Retest		Supports retest mode that uses accumulative history images, selected image files, and master images (selected from the image bar) and inspection setting editing (nonstop option selection available). Supports the interlocking function with statistics through batch test. Retest images can reside in the Image Archive, SD card or FTP drive.		
SD Card Specifications		<ul style="list-style-type: none"> 2x SD Card slots (SDHC compatible) Compatible with OP-87133 (512MB), CA-SD1G (1GB; included in SD1 slot), and CA-SD4G (4GB;SDHC) 	<ul style="list-style-type: none"> 2x SD Card slots (SDHC compatible) Compatible with OP-87133 (512MB; included in SD1 slot), CA-SD1G (1GB), and CA-SD4G (4GB;SDHC) 	
Image Capture Settings	Image Processing Area	Specify a 980,000-pixel area (1024 H x 960 V) in any position as the image processing area within 1,920,000 pixels (1,000,000-pixel mode for 2MP camera) Specify a 240,000 pixel area (512 H x 480 V) or 310,000 (640 H x 480 V) pixel area in any position as the processing area with 320,000 pixels.*		
	Scanning method (monochrome cameras only)	Progressive/Interlace		
	CCD start/end function	With a line camera: Can set an arbitrary line number within the maximum line number for each camera. With an area camera: Can set an arbitrary capture start/end line within the image capture range. (The XG-H200C and H200M do not allow less than 100 lines to be specified) The capture start line supports changes for each image capture through variable referencing.		
Image and Processing Correction	Camera gain adjustment	Camera CCD sensitivity, offset and span adjustments. Also supports the changing of the shift and span of the CCD for 16 different levels (including separate RGB elements when using color cameras).		
	White balance adjustment (color camera only)	Manual setting with white target		
	Image Inversion	Supports inverting the image to the left or right/vertical inversion, 180° rotation		
	Scaling	Allows the setting and application of individual scaling values to X, Y and length result data, along with the support for using variables.		
	Shading Correction (Only available on line cameras)	Uses the waveform viewer to set shading correction values for each camera.		
Support Functions	Statistics	<p>Data Points: Maximum of 100,000 points per item, maximum of 256 items (supports exporting to SD card)</p> <p>Results: Maximum, minimum, average value, deviation (3σ), summary of processing, including OK/NG count</p>		
	Image Archive	<p>Enables the storage of archived images (specified below) to the main internal controller memory.</p> <p>With an area camera connected</p> <ul style="list-style-type: none"> Up to 1024 images (monochrome camera, 240,000 pixels) Up to 1024 images (monochrome camera, 310,000 pixels) Up to 1024 images (monochrome camera, 1,000,000 pixels) Up to 829 images (monochrome camera, 2,000,000 pixels) Up to 315 images (monochrome camera, 5,000,000 pixels) Up to 1024 images (color camera, 240,000 pixels) Up to 1024 images (color camera, 310,000 pixels) Up to 1024 images (color camera, 1,000,000 pixels) Up to 819 images (color camera, 2,000,000 pixels) Up to 309 images (color camera, 5,000,000 pixels) 	<p>With a line camera connected</p> <ul style="list-style-type: none"> Up to 85 images (XG-HL02M continuous capture, 2048x8192) Up to 40 images (XG-HL02M individual capture, 2048x16384) Up to 38 images (XG-HL04M continuous capture, 4096x8192) Up to 16 images (XG-HL04M individual capture, 4096x16384) Up to 14 images (XG-HL08M continuous capture, 8192x8192) Up to 16 images (XG-HL08M individual capture, 8192x8192) 	<p>With an area camera connected</p> <ul style="list-style-type: none"> Up to 1024 images (monochrome camera, 240,000 pixels) Up to 1024 images (monochrome camera, 310,000 pixels) Up to 525 images (monochrome camera, 1,000,000 pixels) Up to 270 images (monochrome camera, 2,000,000 pixels) Up to 1024 images (color camera, 240,000 pixels) Up to 1024 images (color camera, 310,000 pixels) Up to 516 images (color camera, 1,000,000 pixels) Up to 264 images (color camera, 2,000,000 pixels)
		Enables the simultaneously running up to 8 image archives that can reference different storage conditions. Supports the overwriting or accumulation of the data modes. Supports result data accumulation to correspond with the images for replaying in the image archive. Supports outputting of the image archive to SD cards, PC applications and FTP servers.		

SPECIFICATIONS (CONTROLLER)

Model		NPN	XG-8702L	XG-8502L
		PNP	XG-8702LP	XG-8502LP
Support Functions	Programming Assistance	Screen Magnification	Gives the ability to magnify the screen from 1% to 2500% during operation, while enabling the control of the display position of via external controls depending on the commands issued (individual magnification settings possible for multiple screen displays)	
		Edge Waveform Display	Enables the display of the edge differential waveform graph and associated numerical data during operation.	
		Profile Display	Enables the display of the detected profile for the trend edge position, graphical display of all detected positions for width is possible.	
		Stability Display	Stain detection (stain level) and shading blobs (shading level) can be graphically displayed during operation.	
		Character Extraction Display	Enables the display of the automatic extraction projection waveform graph of OCR during operation.	
		Defect Waveform Display	Enables the display of the defect level waveform for trend edge defects during operation.	
		Variable Changing Dialog	Enables the verification/changing of selected local variables, global variables, and system variables values (only verification for system variables). Supports grouping setting and specifying display patterns during operation.	
		Waveform Viewer	Waveforms of the total or of a magnified area on a specified line (intensity/differential) can be displayed during operation (Supported with monochrome cameras only).	
	Data Save Functionality	Supports the direct saving of data results, captured images (compression possible), image archive images compression possible, statistical analysis data, RS-232C communication logs, setting details, the direct saving of operation logs during inspections (not including setting details) and the current image from any camera during offline mode.		
	Other	Image capture function, user account switching function, file management function, I/O monitor, RS-232C monitor (including log saving function), encoder monitor.		
Interface	Assignable Input	<ul style="list-style-type: none"> • 20 (including four high speed designed for trigger input) • Input rating 26.4V or lower, 2mA or greater (3mA or greater for high speed input terminal) 		
	Assignable Output	<ul style="list-style-type: none"> • 36 (including four high speed outputs designed for pulse outputting to external device) • NPN type: NPN open collector Maximum 50 mA (30 V or less) PNP type: PNP open collector 50 mA (30 V or less) 		
	Encoder Input	Supports NPN open-collector output that uses the RS-422 line driver output dedicated terminal (5V output included: max. 150 mA) and the control input terminal (Selects each single system or 2 systems for NPN open-collector output)		
	Monitor output	Analog RGB output, XGA (1024 x 768, 24-bit color)/SVGA (800 x 600, 24-bit color) switching (can be specified with inspection settings units)		
	Operation indicators	Power, Error LED display		
	RS-232C	Supports a maximum baud rate of 230,400 bps. 2 ports available that can be switch between control I/O and CA Series touch panel.		
	PLC link	<ul style="list-style-type: none"> • Numerical data output and control input/output enabled via the RS-232C port or Ethernet port (Cannot be used in conjunction with CC-Link or EtherNet/IP) • The following PLCs are supported via link unit:^{*1} KEYENCE: KV-700 Series, KV-1000 Series, KV-3000 Series, KV-5000 Series Mitsubishi Electric: A Series (RS-232C only), Q Series, L Series OMRON: SYSMAC C Series (RS-232C only), CP1/CS1/CJ1/CJ2 Series, YASKAWA Electric Corporation: MP900 Series (only RS-232C available)/MP2000 Series 		
	Ethernet	<ul style="list-style-type: none"> • Numerical data output, and control input/output enabled. • Uploading and downloading program settings, simulations, data, including image data can be sent or received • 1000BASE-T/100BASE-TX/10BASE-T • Compatible with FTP server, VNC server function (Supports remote desktop function), Supports BOOTP function. 		
	USB	<ul style="list-style-type: none"> • Uploading and downloading programs settings, simulations, data, and images when using KEYENCE PC software. • USB2.0 connection required. 		
	CC-Link	<ul style="list-style-type: none"> • By connecting the optional CC-Link expansion module CA-NCL10E, numerical value input/output and control input/output are enabled. Cannot be used in conjunction with PLC-Link or EtherNet/IP. • Compatible to the Ver.1.10 remote device station, and Ver.2.00 remote device station 		
	EtherNet/IP	<ul style="list-style-type: none"> • Numerical value and control input/output using the Ethernet port enabled. <ul style="list-style-type: none"> • Maximum connections: 32. • Cyclic (implicit) communication (max. 1436 bytes) possible. <ul style="list-style-type: none"> • In conformity with conformance test Version.A7 • Cannot be used in conjunction with PLC-link/CC-Link • Explicit message communication possible. 		
	Handheld Controller	<ul style="list-style-type: none"> • By using the optional OP-84231 (OP-84236 blank version) direct interaction with the controller and program settings is possible. • Buttons can be reassigned to user-defined operations. • Buttons can be activated/deactivated based on user groups. 		
	Touch Panel	Programming can be performed via the CA Series touch panel using the RS-232C and analog RGB port.		
Language	Japanese/English/Simplified Chinese/Traditional Chinese			
illumination control	By connecting the optional illumination expansion module CA-DC21E, direct control of LED illumination strobing and intensity can be executed via the programming.			
Rating	Power supply voltage	24 VDC (±10%)		
	Current consumption (Maximum)	Using line scan cameras: 2.8 A (1 camera connected)/3.8 A (2 cameras connected). Using area cameras: 3.6 A (2 cameras connected)/4.6 A (4 cameras connected). For all types, the maximum consumption includes inrush current during start up.		
Environmental resistance	Ambient temperature	0 to 45°C 32 to 113 °F		
	Ambient operating humidity	35 to 85% RH (no condensation)		
Weight	Approx. 1600 g			

*1 When connecting the XG-H035C/H035M camera, the process area cannot be changed when set to 640 H x 480 V mode and only the horizontal area can be changed when set to 512 H x 480 V mode.
*2 PLC models that have a built-in Ethernet port support a direct connection.

SPECIFICATIONS (CAMERA)

Line scan camera (XG-HL02M/HL04M/HL08M)

Model		XG-HL02M*1	XG-HL04M*1	XG-HL08M*1
CCD		14.3 mm 0.56" monochrome CMOS image receiving element, 8x high-speed reading using square-grid (2 outputs), 2048 pixels Unit cell size: 7 μm x 7 μm	14.3 mm 0.56" monochrome CMOS image receiving element, 16x high-speed reading using square-grid (4 outputs), 4096 pixels Unit cell size: 3.5 μm x 3.5 μm	28.7 mm 1.13" monochrome CMOS image receiving element, 16x high-speed reading using square-grid (8 outputs), 8192 pixels Unit cell size: 3.5 μm x 3.5 μm
Resolution	Processing Area (individual)	2048 pixels 2048 (H) x 16384 (V)	4096 pixels 4096 (H) x 16384 (V)	8192 pixels 8192(H) x 8192(V)
	Processing Area (continuous)	2048 (H) x 8192 (V)	4096 (H) x 8192 (V)	8192(H) x 8192(V)
Minimum Scan Time		24 μs (41.7kHz)	24 μs (41.7kHz)	45 μs(22.2kHz)
Pixel transfer frequency		100 MHz (50 MHz x 2ch) 8x high-speed	200MHz (50MHzx4ch) 16x high-speed	200MHz (25MHzx8ch) 16x high-speed
Transfer system		Digital serial transfer		
Electronic shutter		User-defined setting (2 μs to 20,000 μs)*2		
Functions		Shading correction (1 save pattern unit)		
Lens mount		C mount	C mount	Special mount (M40 P0.75 P0.03)*1
Environmental resistance	Ambient temperature	0 to 40°C 32 to 104 °F		
	Relative humidity	35 to 85%RH (No condensation)		
Weight		Approx.340g (not including the lens)	Approx.350g (not including the lens)	Approx.310g (not including the lens)

*1 When using any of the line scan cameras, only the high-speed camera cable (CA-CHxx) can be used.
*2 The maximum shutter time is limited to 3 μs less than the line trigger cycle setting.
*3 F-mount lens adapter is optionally available (OP-87319).