

SONY

Digital Camera Module Equipped with the Global Shutter CMOS Sensor

XCL-SG Series

XCL-CG Series



Pregius

Exmor

CAMERA
Link

PoCL

XCL-SG1240 (B/W)
XCL-SG1240C (Colour)
1.1-type 12.4 MP 20 fps
Camera Link®

XCL-CG510 (B/W)
XCL-CG510C (Colour)
2/3-type 5.1MP 35fps
Camera Link®

Key Features

Camera Link Base Configuration
(1/2/3 tap selectable)

Area gain

Defect correction

Shading correction

Base Clock 45/65/85 MHz selectable

Key Features

Compact size: 29(W) x 29(H) x 30 (D) mm

Area gain

Defect correction

Shading correction

High compatibility with the XCL-C series

- Identical command specifications/mounting hole positions

Identical sensor size as XCL-C500

XCL-SG510 (B/W)
XCL-SG510C (Colour)
2/3-type 5.1MP 154fps
Camera Link®

Key Features

Camera Link Configuration
(80 bit / Full / Medium / Base selectable)

Frame accumulation

Wide dynamic range

Multi ROI

Defect correction

Shading correction

Base Clock 45/65/85 MHz selectable

Introducing a new series of 12.4 MP and high frame rate XCL-SG1240/SG1240C PoCL compatible Camera Link interface digital cameras equipped with a Global Shutter CMOS Sensor.

The addition of these two new cameras to the existing four 5.1 MP model lineup expand your camera selection options based on your intended use scenario. With its high reliability, the product is capable of fulfilling high speed and high sensitivity needs that are required for image capture and processing in machine vision and other applications.

Features

High Frame Rate	XCL-SG1240	XCL-SG1240C
	XCL-SG510	XCL-SG510C
	XCL-CG510	XCL-CG510C

XCL-SG1240/SG1240C

Supports Base Configuration 3tap.

		CameraLink tap (Pixel clock frequency: when 75 MHz)		
		1	2	3
Bit length	8	6 fps	13 fps	20 fps
	10	6 fps		
	12	6 fps		

XCL-SG510/SG510C

Selects a max. frame rate of 154 fps due to the combination of "Bit length" and "CameraLink tap".

		CameraLink tap (Pixel clock frequency: when 85 MHz)					
		1	2	3	4	8	10
Bit length	8	16 fps	32 fps	48 fps	64 fps	124 fps	154 fps
	10	16 fps	32 fps		64 fps		
	12	16 fps	32 fps		64 fps		
	16	Only when Wide-D					

XCL-CG510/CG510C

Supports Base Configuration 3tap.

		CameraLink tap (Pixel clock frequency: when 75 MHz)		
		1	2	3
Bit length	8	14 fps	28 fps	35 fps
	10	14 fps	28 fps	
	12	14 fps	28 fps	

Shading Correction	XCL-SG1240	XCL-SG1240C
	XCL-SG510	XCL-SG510C
	XCL-CG510	XCL-CG510C

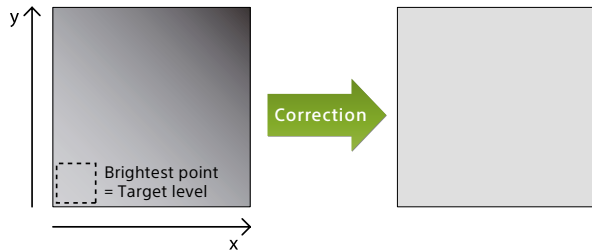
Corrects shading that occurs due to peripheral light falloff, light source irregularity, etc. that are characteristics of the lens.

A number of user data can be saved as user settings.

XCL-SG1240/SG1240C: 3 patterns

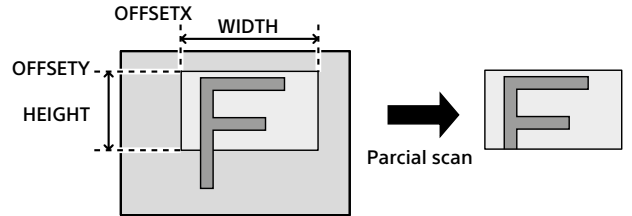
XCL-SG510/SG510C: 9 patterns

XCL-CG510/CG510C: 9 patterns



Partial Scan	XCL-SG1240	XCL-SG1240C
	XCL-SG510	XCL-SG510C
	XCL-CG510	XCL-CG510C

The partial scan function outputs a user-defined region (Area Of Interest) within the overall image area. The cut-out region for partial scan is defined by Offset X and Offset Y (which indicate the start point for cutting), and Width and Height (which indicate the area). Contiguous blocks of minimum areas can be selected to define regions. However, the defined region must be a square or right rectangle. T- and L-shaped regions are invalid.

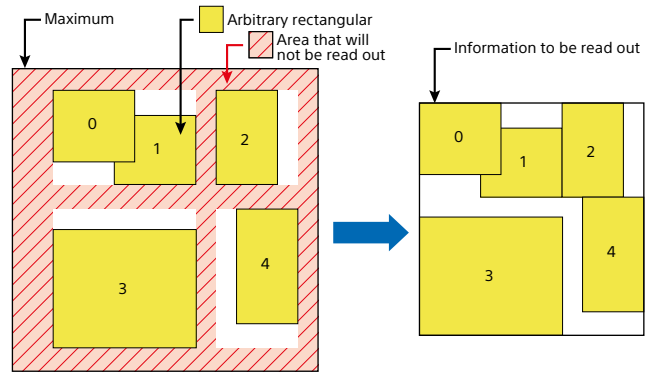


Partial Scan (Multi ROI)	XCL-SG510	XCL-SG510C
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Arbitrarily read out images including any 8 (max.) rectangular area from the maximum effective imaging area.

Due to this, you will be capable of limiting read out information, thus accelerating the frame.

*When 5 rectangles are selected



Wide Dynamic Range (Wide-D)	XCL-SG510	XCL-SG510C
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Restore the gradation for bright and dark areas that have lost the gradation in scenes with strong contrast.

Acquires images with 2 different exposure times and combines images of 16-bit length. When using in 8, 10, 12-bit length, adjusts the gradation using around 17 point LUT. Due to optimization through exposure time, there is no S/N deterioration of the image.

*You may not be able to correctly capture moving subjects since 2 images will be combined.



Sample of application

The application case is when the picture is taken with two type of lighting illumination, which is because only one lighting causes overexposure or too dark to recognize.

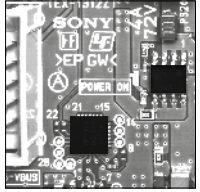
Area Gain

XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C

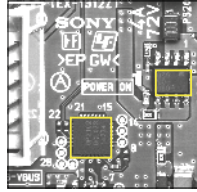
Individually set digital gain (0 to 32 times) to any of the 16 rectangular areas.

If several rectangular areas overlap, the gain value of the rectangular area with a smaller area number is prioritized. Optimization of images for parts is available during parts inspection, etc.

When area gain is OFF



When area gain is ON



In case setting Gain=2 at Area 0 and Area 1

Area Exposure

XCL-SG510	XCL-SG510C
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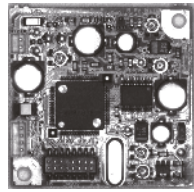
Set 2 types of exposure times for valid pixel areas and 16 arbitrarily selected rectangular areas.

Optimization of images for subjects such as parts inspection, etc. is possible.

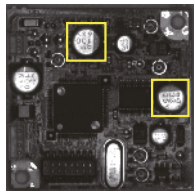
Due to optimization through exposure time, there is no S/N deterioration of the image.

*You may not be able to correctly capture moving subjects since 2 images will be combined.

Exposure time: Long

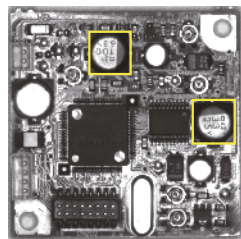


Exposure time: short



Combining Image

When area exposure is ON



The yellow framed "Exposure time: short" areas are optimized when images are combined.

The difference between "Area Gain" and "Area Exposure"

	Valid cases
Area gain	1 - When capturing moving subjects (Processing for single frame) 2 - When you want to make minor adjustments of the brightness for each area (Area gain can be individually set for 16 areas)
Area Exposure	1 - When overexposure occurs with one shot and you want to suppress the exposure amount of that area 2 - When securing S/N by adjusting the exposure

Overview

Since overexposure, etc. may occur in one shot, several shots may be necessary. By using the "Area gain" and "Area exposure" features, you can adjust areas necessary for inspection to optimal levels.

Merits:

Reduction of processing speed Cost reduction

By performing optimizing adjustments on the camera, the processing time on the PC is reduced, the tact time is improved, and high performance PCs won't be necessary, contributing to cost reduction.

Burst Trigger

XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C

Capable of continuous shooting at the trigger timing and specifying the number of exposures, exposure interval, and exposure time. You can select from the mode that repeats one exposure time or the mode that switches between 2 exposure times repeatedly. Furthermore, there is another mode that repeats only while the trigger signal is on.

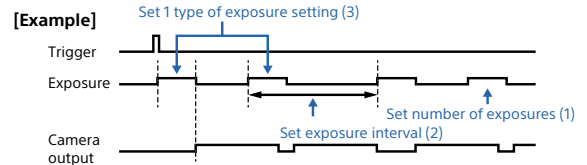
Merits

- Optimal for capturing synchronized images with several cameras
- Optimal when 2 exposures are necessary due to the difference in

(A) When 1 pattern of exposure time is set

Set the number of exposures (1), exposure interval (2), and exposure time (3)

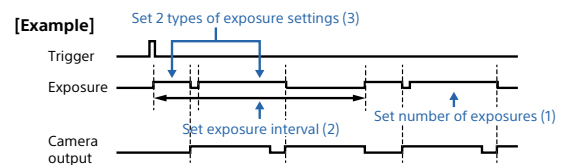
Continuous shooting at the trigger timing



(B) When 2 patterns of exposure times are set

Set the number of exposures (1), exposure interval (2), and exposure time (3)

Continuous shooting at the trigger timing



Frame Accumulation

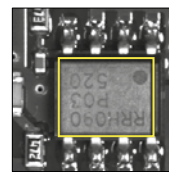
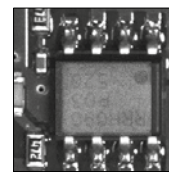
XCL-SG510	XCL-SG510C
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Performs exposure in the specified amount of times and with the averaging process within the camera, outputs 1 image. Optimal for S/N improvement under high gain, canceling of the flicker status during high speed exposure, etc.

Select from 2, 4, 8, or 16 images for the averaging process.

*You may not be able to correctly capture moving subjects since several images will be combined.

Before correction 2 4 8 16 After correction S/N improvement



Defect Correction

XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C

A function optimal for uses that require high resolution.

Corrects white defect and black defect points that occur during image sensor manufacturing.

Furthermore, corrects secondary white and black points that occur after operations due to effects including cosmic rays.

Corrections are applied from the surrounding areas of the coordinate pixel where the defect was detected.

Factory default settings and user settings are selectable.

* During factory default: ON

	XCL-SG1240 XCL-SG1240C	XCL-SG510 XCL-SG510C	XCL-CG510 XCL-CG510C
Number of corrections (upper limit)	8184	2040	2047

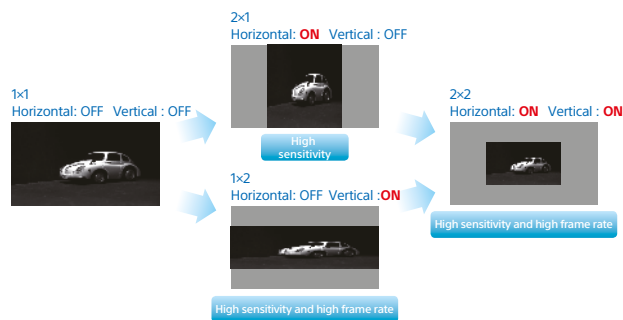
Defects stand out when the gain or temperature is high. Numerous corrections are necessary to perform these corrections.

The XCL series is supplied with sufficient numbers of corrections for defect corrections.

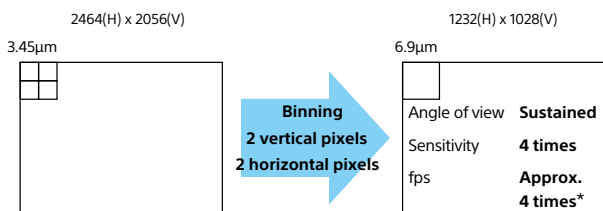
Binning

XCL-SG1240
XCL-SG510
XCL-CG510

Supports binning in vertical and horizontal 2 pixel units and increases frame rate without changing the angle of view as well as enhances the sensitivity.



For XCL-SG510



*However, the frame rate does not change for XCL-SG1240 and XCL-CG510.

Trigger Range Limitation

XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C

You can choose to receive only the signal of the set trigger width as a trigger signal.

It functions as a noise filter that eliminates chattering and disturbance noise of the trigger signal line.

Furthermore, exposure start can be delayed following the set value of the trigger range if a trigger signal is input.

3 x 3 Filter

XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C

Apply various processing to the image through matrix operating in 3 x 3 pixels.

Perform processing including noise reduction, edge emphasizing, and contour extraction with 9 filter factor patterns.

3 x 3 filter: OFF



Laplacian filter



Image Flip

XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C

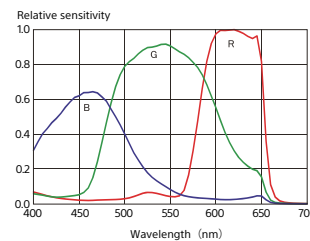
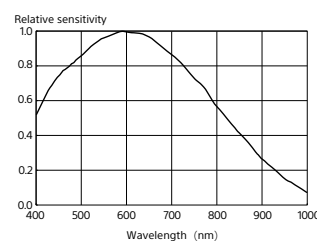
Images can be flipped vertically, horizontally, or 180°.

		ReverseX	
		0	1
ReverseY	0	Normal	Horizontal flip
	1	Vertical flip	180° rotation

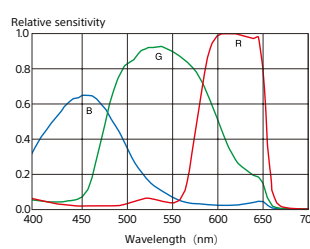
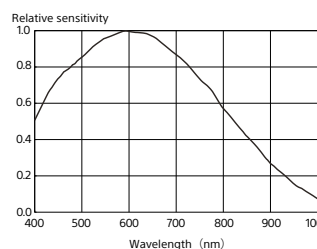
Spectral Sensitivity Characteristics

*Lens characteristics and light source characteristics excluded.

XCL-SG1240/SG1240C



XCL-SG510/SG510C XCL-CG510/CG510C



Pregius

Pregius is a trademark of Sony Corporation. The Pregius is global shutter pixel technology for active pixel-type CMOS image sensors that use Sony's low-noise CCD structure, and realizes high picture quality.

XCL-SG Series- Specifications

Basic Specifications	12.4M Camera Link ^a		5.1M Camera Link ^a	
	XCL-SG1240	XCL-SG1240C	XCL-SG510	XCL-SG510C
B/W / Colour	B/W	Colour	B/W	Colour
Image Size	12.4 Mega		5.1 Mega	
Image Sensor	1.1-type Global Shutter CMOS sensors (Pregius)		2/3-type Global Shutter CMOS sensors (Pregius)	
Number of Effective Pixels (H x V)	4,112 x 3,008		2,464 x 2,056	
Cell Size (H x V)	3.45 μm x 3.45 μm			
Standard Output Pixels (H x V)	4,096 x 3,000		2,448 x 2,048	
Colour Filter	-	RGB colour mosaic filter	-	RGB colour mosaic filter
Frame Rate	6 fps (Base, 8 bit, 1 tap, Mono/Raw) 13 fps (Base, 8 bit, 2 tap, Mono/Raw)* 20 fps (Base, 8 bit, 3 tap, Mono/Raw) *At the time of shipment		16 fps (Base, 8 bit, 1 tap, Mono/Raw) 32 fps (Base, 8 bit, 2 tap, Mono/Raw)* 48 fps (Base, 8 bit, 3 tap, Mono/Raw) 64 fps (Medium, 8 bit, 4 tap, Mono/Raw) 124 fps (Full, 8 bit, 8 tap, Mono/Raw) 154 fps (80 bit(DECA), 8 bit, 10 tap, Mono/Raw) *At the time of shipment	
Minimum Illumination	0.5 lx (Iris: F1.4, Gain: +18 dB, Shutter: 1/30 s)	12 lx (Iris: F1.4, Gain: +18 dB, Shutter: 1/30 s)	0.5 lx (Iris: F1.4, Gain: +18 dB, Shutter: 1/30 s)	12 lx (Iris: F1.4, Gain: +18 dB, Shutter: 1/30 s)
Sensitivity	F5.6 (400 lx, Gain: 0 dB, Shutter: 1/30 s)	F5.6 (2000 lx, Gain: 0 dB, Shutter: 1/30 s)	F5.6 (400 lx, Gain: 0 dB, Shutter: 1/30 s)	F5.6 (2000 lx, Gain: 0 dB, Shutter: 1/30 s)
SNR	More than 50 dB Lens close, Gain: 0 dB, 8 bit)			
Gain	Auto, Manual : 0 to 18 dB			
Shutter Speed	Auto, Manual : 60 to 1/100,000 s			
White Balance	-	Manual, One push	-	Manual, One push
Camera features				
Readout Modes	Normal, Binning (1x2, 2x1, 2x2)*1, Partial Scan	Normal, Partial Scan	Normal, Binning (2x1, 1x2, 2x2), Partial Scan (Multi ROI)	Normal, Partial Scan (Multi ROI)
Readout Features	LUT (Binarization, Gamma (Arbitrary value settable)), Test pattern			
Synchronization	Hardware trigger, Software trigger			
Trigger Modes	OFF (Free run), ON (Edge detection, Trigger width detection), Burst trigger		OFF (Free run), ON (Edge detection, Trigger width detection), Special trigger (Burst trigger/Bulk trigger/Sequential trigger)	
Userset	16			
User Memory	32 kbytes + 64 bytes x 16ch			
Partial Scan	W (Pixel)	16 to 4,112		16 to 2,464
	H (Line)	4 to 3,008		4 to 2,056
GPO	EXPOSURE/Strobe/LVAL/FVAL/Sensor lead out/Trigger through/Pulse generation signal/User defined 1, 2, 3, 4 (Output switching)			
Other Features	Area gain, Defect correction, Shading correction, Temperature readout, LUT, 3 x 3 filter		Wide dynamic range, Frame accumulation, Area exposure, Area gain, Defect correction, Shading correction, Temperature readout, LUT, 3 x 3 filter	
Interface				
Video Data Output	digital Mono 8, 10, 12 bit (at the time of shipping 8bit)	digital Raw 8, 10, 12 bit (at the time of shipping 8bit)	digital Mono 8, 10, 12, 16 ^{**2} bit (at the time of shipping 8bit)	digital Raw 8, 10, 12, 16 ^{**2} bit (at the time of shipping 8bit)
Base Clock (No. of Taps)	45/65/85 MHz switchable			
Camera Link Tap	1/2/3 switchable		1/2/3/4/8/10 switchable	
Digital Interface	LVDS			
Camera Specification	Camera Link ^a Version 2.0			
Output Data Clock	45MHz (1, 2, 3tap), 65MHz (1, 2, 3tap), 85MHz (1, 2, 3tap)		45MHz (1, 2, 3, 4, 8, 10tap), 65MHz (1, 2, 3, 4, 8, 10tap), 85MHz (1, 2, 3, 4, 8, 10tap)	
Digital I/O	ISO IN (x1), ISO OUT (x2), TTL IN (x1), TTL IN/OUT (x2, selectable)			
General				
Lens Mount	C mount			
Flange Back	17.526 mm			
Power Requirements	DC +12 V (10.5 V to 15.0 V), PoCL (10 V to 13.0 V)			
Power Consumption	3.8 W max. (DC +12V)		5.0 W max. (DC +12V)* ³	
Operating Temperature	-5°C to +45°C (23°F to 113°F)			
Performance Guarantee Temperature	0°C to 40°C (32°F to 104°F)			
Storage Temperature	-30°C to +60°C (-22°F to +140°F)			
Operating Humidity	20% to 80% (no condensation)			
Storage Humidity	20% to 80% (no condensation)			
Vibration Resistance	10 G (20 Hz to 200 Hz 20 minutes for each direction -x, y, z)			
Shock Resistance	70 G			
Dimensions (W x H x D)	44 x 44 x 30 mm (excluding protrusions) 13/4 x 13/4 x 13/16 inches (excluding protrusion)			
Mass	Approx. 96 g (Approx. 3.4 oz)			
MTBF	64,461 hours (Approx. 7.4 years)		70,523 hours (Approx. 8.1 years)	
Regulations	UL60950-1, FCC Class A, CSA C22.2-No. 60950-1, IEC Class A Digital Device, CE : EN61326 (Class A), AS EMC : EN61326-1, VCCI Class A, KCC			
Supplied Accessories	Lens mount cap (1), Operating instructions (1)			

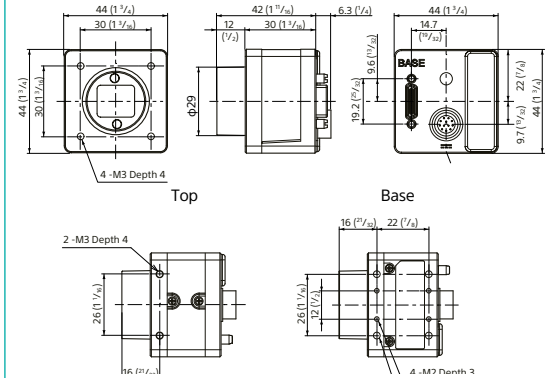
*1 The frame rate does not change. *2 A feature valid when the wide dynamic range feature is ON. *3 When supplying power (PoCL) with 1 camera cable, wide dynamic range, frame accumulation, and area exposure features are not available for use. *4 Safety Regulations: Notes related to safety. Conventional instruction manual content will be included in the "Technical Manual".

XCL-CG Series- Specifications

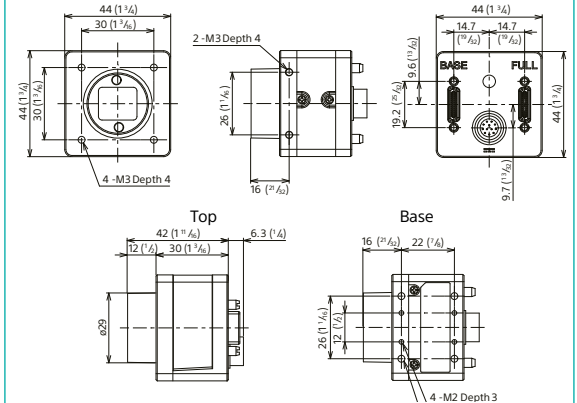
Basic Specifications	5.1M Camera Link [®]	
	XCL-SG510	XCL-SG510C
B/W / Colour	B/W	Colour
Image Size	5.1 Mega	
Image Sensor	2/3-type Global Shutter CMOS sensors (Pregius)	
Number of Effective Pixels (H x V)	2,464 × 2,056	
Cell Size (H x V)	3.45 μm × 3.45 μm	
Standard Output Pixels (H x V)	2,448 × 2,048	
Colour Filter	-	RGB colour mosaic filter
Frame Rate	14 fps (Base, 8 bit, 1tap, Mono/Raw) 28 fps (Base, 8 bit, 2tap, Mono/Raw)* 35 fps (Base, 8 bit, 3tap, Mono/Raw) *At the time of shipment	
Minimum Illumination	0.5 lx (Iris: F1.4, Gain: +18 dB, Shutter: 1/30 s)	12 lx (Iris: F1.4, Gain: +18 dB, Shutter: 1/30 s)
Sensitivity	F5.6 (400 lx, Gain: 0 dB, Shutter: 1/30 s)	F5.6 (2000 lx, Gain: 0 dB, Shutter: 1/30 s)
SNR	More than 50 dB Lens close, Gain: 0 dB, 8 bit)	
Gain	Auto, Manual : 0 to 18 dB	
Shutter Speed	Auto, Manual : 60 to 1/100,000 s	
White Balance	-	Manual, One push
Camera features		
Readout Modes	Normal, Binning (1x2, 2x1, 2x2)* ¹ , Partial scan	Normal, Partial scan
Readout Features	LUT (Binarization, Gamma (Arbitrary value settable)), Test pattern	
Synchronization	Hardware trigger, Software trigger	
Trigger Modes	OFF (Free run), ON (Edge detection, Trigger width detection), Special trigger (Burst trigger/Bulk trigger/Sequential trigger)	
User set	16	
User Memory	64 bytes x 16ch	
Partial Scan	W (Pixel)	16 to 2,464
	H (Line)	4 to 2,056
GPO	EXPOSURE/Strobe/LVAL/FVAL/Sensor lead out/Trigger through/Pulse generation signal/User defined 1, 2, 3 (Output switching)	
Other Features	Area gain, Defect correction, Shading correction, Temperature readout, LUT, 3 x 3 filter	
Interface		
Video Data Output	digital Mono 8, 10, 12 bit (at the time of shipping 8bit)	digital Raw 8, 10, 12 bit (at the time of shipping 8 bit) digital RGB 24 bit
Base Clock (No. of Taps)	45/75 MHz switchable	
Camera Link Tap	1/2/3 switchable	
Digital Interface	LVDS	
Camera Specification	Camera Link [®] Version 2.0	
Output Data Clock	45MHz (1, 2, 3tap), 75MHz (1, 2, 3tap)	
Digital I/O	TTL IN (x3), TTL OUT (x3)	
General		
Lens Mount	C mount	
Flange Back	17.526 mm	
Power Requirements	DC +12 V (10.5 V to 15.0 V), PoCL (10 V to 13.0 V)	
Power Consumption	2.7 W max. (DC +12V)	
Operating Temperature	-5°C to +45°C (23°F to 113°F)	
Performance Guarantee Temperature	0°C to 40°C (32°F to 104°F)	
Storage Temperature	-30°C to +60°C (-22°F to +140°F)	
Operating Humidity	20% to 80% (no condensation)	
Storage Humidity	20% to 80% (no condensation)	
Vibration Resistance	10 G (20 Hz to 200 Hz 20 minutes for each direction -x, y, z)	
Shock Resistance	70 G	
Dimensions (W x H x D)	29 × 29 × 30 mm (excluding protrusions)	
	1 3/16 × 1 3/16 × 1 3/16 inches (excluding protrusions)	
Mass	Approx. 53 g (Approx. 1.9 oz)	
MTBF	81,562 hours (Approx. 9.3 years)	
Regulations	UL60950-1, FCC Class A, CSA C22.2-No. 60950-1, IC Class A Digital Device, CE : EN61326 (Class A), AS EMC: EN61326-1, VCCI Class A, KCC	
Supplied Accessories	Lens mount cap (1), Operating instructions (1)	

Dimensions

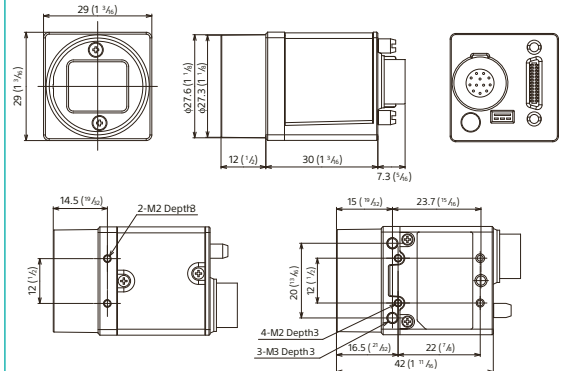
XCL-SG1240/SG1240C



XCL-SG510/SG510C



XCL-CG510/CG510C



Units: mm (inches)

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