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®

Key Features
Camera Link Base Configuration (1/2/3 tap selectable)
Area gain
Defect correction
Shading correction
Base Clock 45/65/85 MHz selectable

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

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

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

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

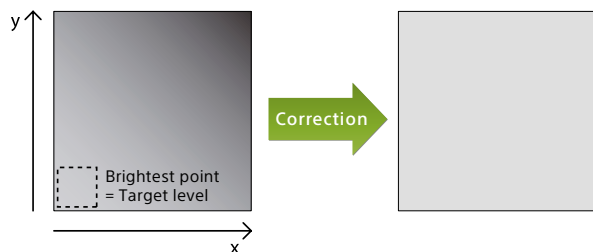|	
XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C

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.
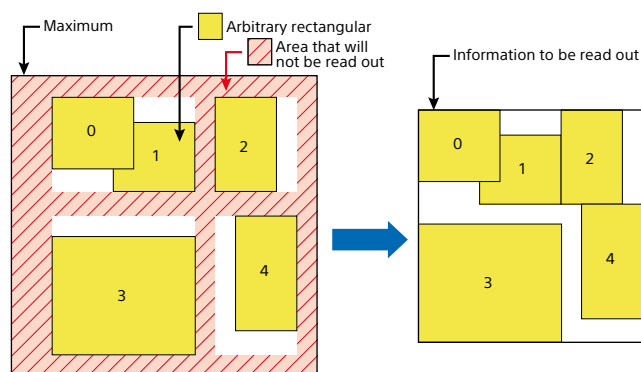

Parcial scan
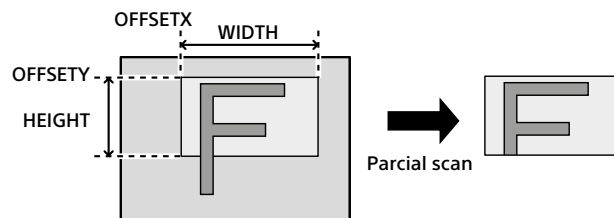
Partial Scan (Multi ROI)

XCL-SG510	XCL-SG510C

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

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.

Combining Image
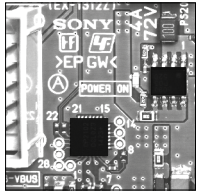
*Sample image

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
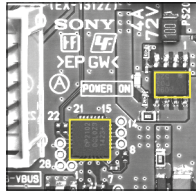
*Sample image
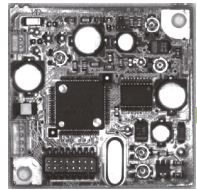
*Sample image

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

Area Exposure

XCL-SG510	XCL-SG510C

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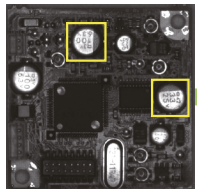
*You may not be able to correctly capture moving subjects since 2 images will be combined.
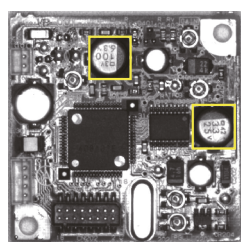
Exposure time: Long

*Sample image

Exposure time: short

*Sample image

Combining Image

When area exposure is ON

*Sample image

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
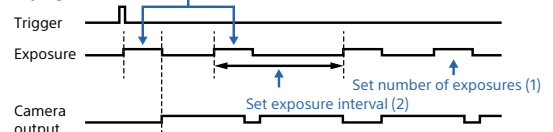- Optimal when 2 exposures are necessary due to the difference in

(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

[Example]

Set 1 type of exposure setting (3)

Trigger

Exposure

Camera output

Set number of exposures (1)
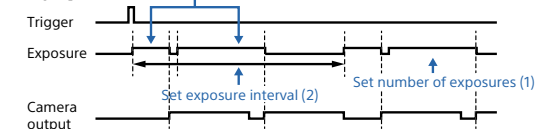
Set exposure interval (2)

(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

[Example]

Set 2 types of exposure settings (3)

Trigger

Exposure

Camera output

Set exposure interval (2)

Set number of exposures (1)

Frame Accumulation

XCL-SG510	XCL-SG510C

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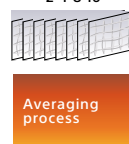Select from 2, 4, 8, or 16 images for the averaging process.

*You may not be able to correctly capture moving subjects since several images will be combined.
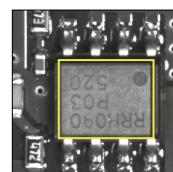
Before correction
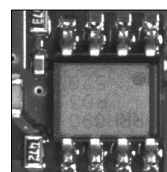
2 4 8 16

Averaging process

After correction S/N improvement

*Sample image

*Sample image

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

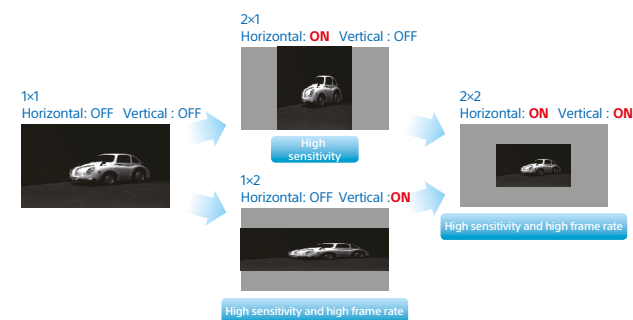|	XCL-SG1240 XCL-SG1240C	XCL-SG510 XCL-SG510C	XCL-CG510 XCL-CG510C
Number of corrections (upper limit)	8184	2040	2047

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.
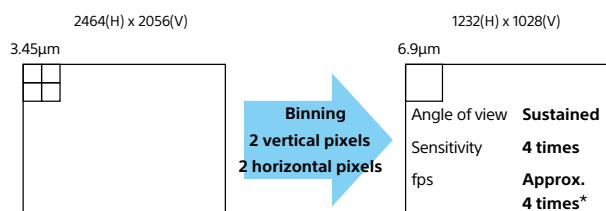
Binning

| 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.

1×1
Horizontal: OFF Vertical : OFF

2×1
Horizontal: **ON** Vertical : OFF

High sensitivity

1×2
Horizontal: OFF Vertical :**ON**

High sensitivity and high frame rate

2×2
Horizontal: **ON** Vertical : **ON**

High sensitivity and high frame rate

■ For XCL-SG510

2464(H) x 2056(V)

3.45µm

Binning
2 vertical pixels
2 horizontal pixels

1232(H) x 1028(V)

6.9µm

Angle of view	**Sustained**
Sensitivity	**4 times**
fps	**Approx. 4 times***

*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.
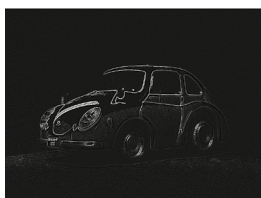
3 x 3 filter: OFF

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

Main Features	B/W	XCL-SG1240	XCL-SG510	XCL-CG510
	Colour	XCL-SG1240C	XCL-SG510C	XCL-CG510C
Image sensor		Global Shutter CMOS		Pregius
Image size		12.4 MP	5.1 MP	
Frame rate (Max.)		20 fps	154 fps	35 fps
Dimensions (W x H x D)		44×44×30 mm		29 × 29 × 30 mm
Shading correction		•	•	•
Partial scan		•	•	•
Partial scan (Multi ROI)		–	•	–
Wide Dynamic Range		–	•	–
Area Gain		•	•	•
Area Exposure		–	•	–
Burst trigger		•	•	•
Bulk trigger		–	•	•
Sequential trigger		–	•	•
Frame accumulation		–	•	–
Binning (only B/W model)*		•	•	•
Trigger range limitation		•	•	•
Defect correction		•	•	•
3 x 3 Filter		•	•	•
LUT		•	•	•
Image flip		•	•	•

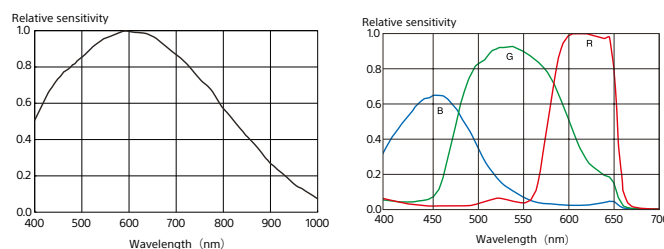* Valid when the exposure time setting is sufficiently short since it is set to exposure time priority.

Spectral Sensitivity Characteristics

*Lens characteristics and light source characteristics excluded.

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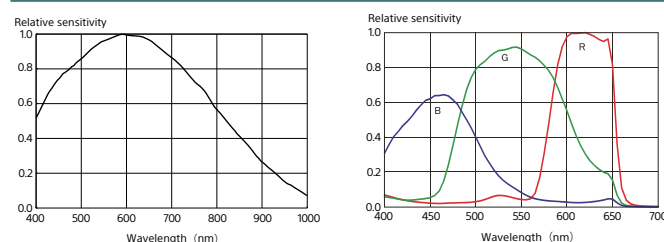
XCL-SG510/SG510C
XCL-CG510/CG510C

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

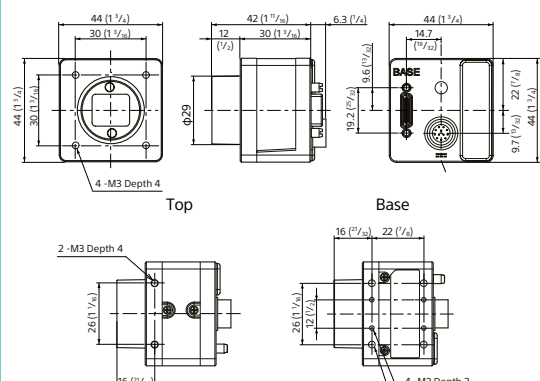| Basic Specifications		12.4M Camera Link®		5.1M Camera Link®	
		XCL-SG1240	XCL-SG1240C	XCL-SG510	XCL-SG510C
B/W / Colour		B/W	Colour	B/W	Colour
Image Size		12.4 Mega		5.1 Mega	
Image Sensor		1.1-type Global Shutter CMOS sensors (Pregius)		2/3-type Global Shutter CMOS sensors (Pregius)	
Number of Effective Pixels (H x V)		4,112 × 3,008		2,464 × 2,056	
Cell Size (H x V)		3.45 μm × 3.45 μm			
Standard Output Pixels (H x V)		4,096 × 3,000		2,448 × 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 8 bit)
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® Version2.0			
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 × 44 × 30 mm (excluding protrusions) 1 3/4 × 1 3/4 × 1 3/16 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, 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)			

*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".
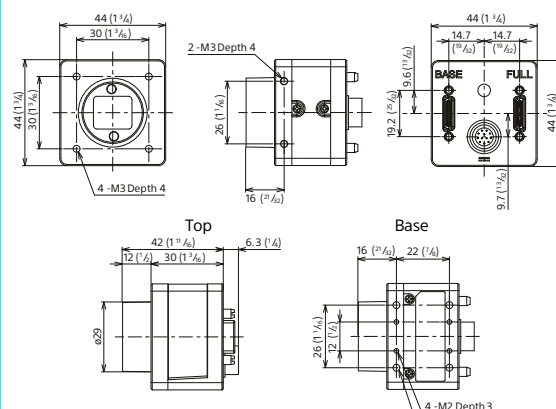
XCL-CG Series- Specifications

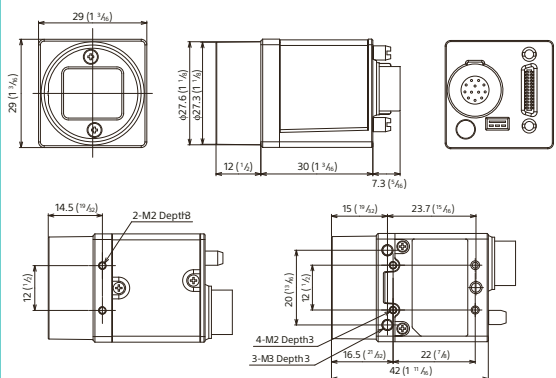| Basic Specifications	5.1M Camera Link®	
	XCL-SG510	**XCL-SG510C**
B/W / Colour	B/W	Colour
Image Size	5.1 Mega	
Image Sensor	2/3-type Global Shutter CMOS sensors (Pregius)	
Number of Effective Pixels (H x V)	2,464 × 2,056	
Cell Size (H x V)	3.45 μm × 3.45 μm	
Standard Output Pixels (H x V)	2,448 × 2,048	
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)	
Userset	16	
User Memory	64 bytes x 16ch	
Partial Scan W (Pixel)	16 to 2,464	
Partial Scan 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® Version2.0	
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) 13/16 × 13/16 × 13/16 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

Top Base

XCL-SG510/SG510C

Top Base

XCL-CG510/CG510C

Units: mm (inches)

SONY