SONY

XCL-CG Series
Digital Video Camera

XCL-CG510 (B/W) / XCL-CG510C (colour)
2/3-type 5.1MP 35fps

Camera Link®

Key Features
Cubic Size
High Compatibility

XCL-SG Series
Digital Video Camera

XCL-SG510 (B/W) / XCL-SG510C (RAW colour)
2/3-type 5.1MP 154fps

Camera Link®

Key Features
High Frame Rate 154 fps
Image Processing Feature

Exmor **Pregius** **Link** **CL**

	XCL-CG510	XCL-CG510C	XCL-SG510	XCL-SG510C
Sensor	Global Shutter CMOS		Global Shutter CMOS	
Number of Output Pixels	5.1 Mega		5.1 Mega	
B/W / Color	B/W	Color	B/W	RAW color
Frame Rate	35 fps (Base, 8 bit, 3 tap, Mono/Raw)		154 fps (80 bit (DECA), 8 bit, 10 tap, Mono/Raw)	
Dimensions (W x H x D)	29 × 29 × 30 mm (13/16 × 13/16 × 1 3/16 inches)		44 × 44 × 30 mm (13/4 × 13/4 × 1 3/16 inches)	
Multi ROI	–		•	
Wide Dynamic Range (Wide-D)	–		•	
Area Exposure	–		•	
Area Gain	•		•	
Frame Accumulation	–		•	
Defect Correction	•		•	
3 x 3 Filter	•		•	
Shading Correction	•		•	
Temperature Readout	•		•	
LUT	•		•	

A new series of PoCL compatible Camera Link interface digital camera equipped with a Global Shutter CMOS Sensor.
With 5.07 million pixel high resolution and 35 fps high frame rate, the XCL-CG Series achieves a compact 29 (W) x 29 (H) x 30 (D) mm size. Easy replacement for the conventional CCD equipped model XCL-C Series.
Selections available based on the high-performance model XCL-SG Series and your application.
Responds to the needs for high reliability, high speed, and high sensitivity that are required for image processing including machine vision, etc.

Features

High Frame Rate

	XCL-SG510	XCL-SG510C
	XCL-CG510	XCL-CG510C

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	29 fps	35 fps
	10	14 fps	29 fps	
	12	14 fps	29 fps	

Multi ROI

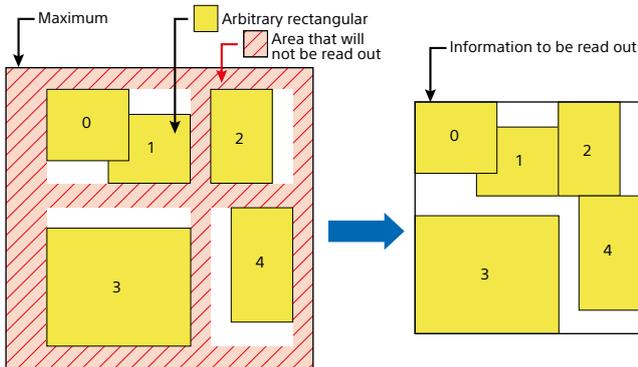|	XCL-SG510	XCL-SG510C
	XCL-CG510	XCL-CG510C

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

- Maximum
- Arbitrary rectangular
- Area that will not be read out
- Information to be read out

Wide Dynamic Range (Wide-D)

	XCL-SG510	XCL-SG510C
	XCL-CG510	XCL-CG510C

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

In the case that overexposure of the image occurs since only 1 light is used or the brightness of lights are changed in 2 steps since the image is too dark for recognition

"Area Gain" and "Area 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.

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

|	Valid cases	Equipped models
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)	XCL-SG510 XCL-SG510C XCL-CG510 XCL-CG510C
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	XCL-SG510 XCL-SG510C XCL-CG510 XCL-CG510C

Area gain

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
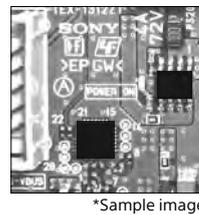
When area gain is ON
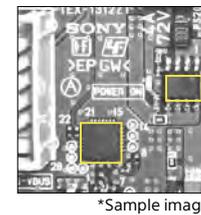
In case setting Gain=2 at Area 0 and Area 1

*Sample image   *Sample image
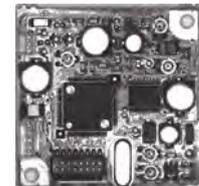
Area exposure

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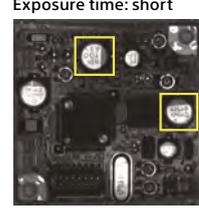Due to optimization through exposure time, there is no S/N deterioration of the image.

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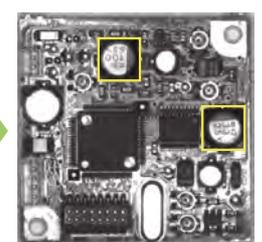
Exposure time: Long

*Sample image

Exposure time: short

Combining Image

When area exposure is ON

*Sample image

*Sample image

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

Burst Trigger

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

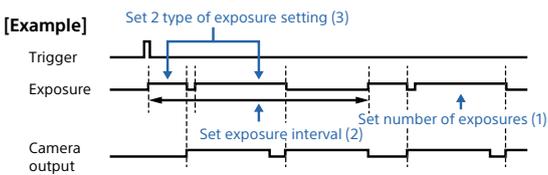Set the number of exposures (1), exposure interval (2), and exposure time (3)
Continuous shooting at the trigger timing

[Example]
Trigger
Exposure
Camera output

Set 1 type of exposure setting (3)
Set exposure interval (2)
Set number of exposures (1)
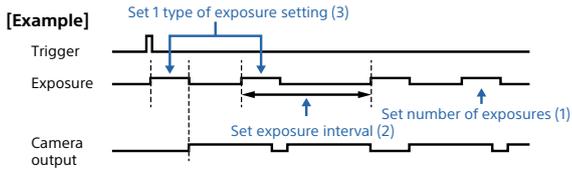
(B) When 2 patterns of exposure times are set

Set the number of exposures (1), exposure interval (2), and exposure time (3)
Continuous shooting at the trigger timing

[Example]
Trigger
Exposure
Camera output

Set 2 type of exposure setting (3)
Set exposure interval (2)
Set number of exposures (1)

Frame Accumulation

XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C

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

Averaging process

*Sample image
*Sample image
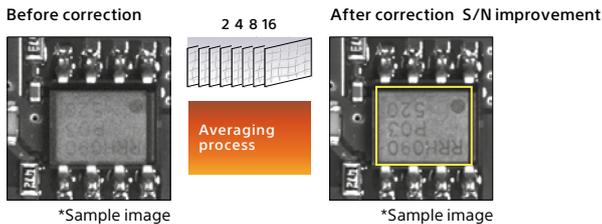
Trigger Range Limitation

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.

Defect Correction

Corrects white defect points and black defect points of the image sensor.
Corrections start from the periphery of the pixel coordinates where defects were detected.
Select between factory default settings and user settings

3 x 3 Filter

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.
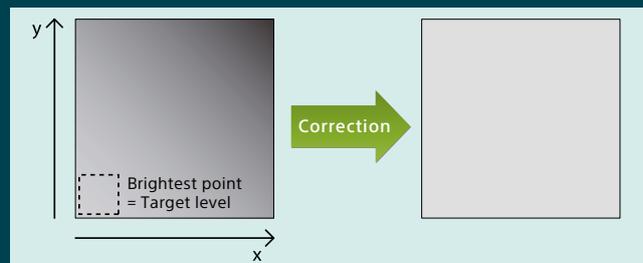
Shading Correction

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-SG510/SG510C: 9 patterns
XCL-CG510/CG510C: 9 patterns

y
x
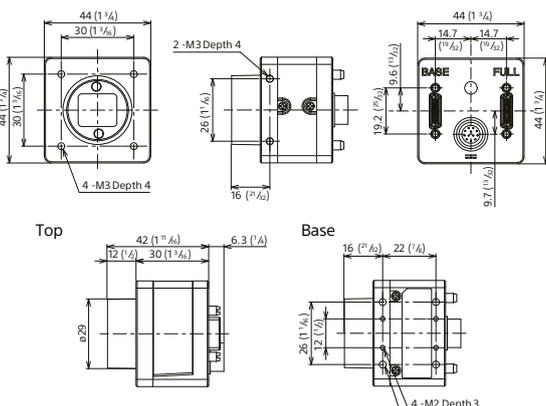Brightest point = Target level
Correction

Image Flip

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

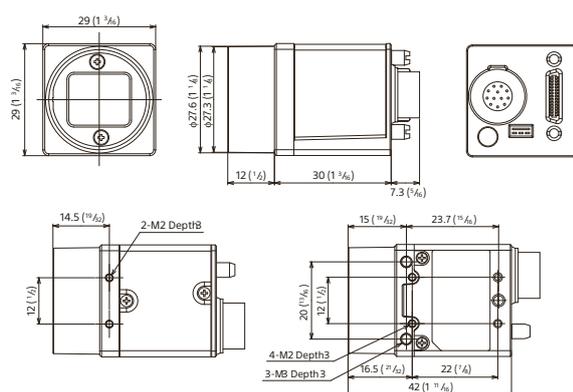|		ReverseX	
		0	1
ReverseY	0	Normal	Horizontal flip
	1	Vertical flip	180° rotation

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-SG510/SG510C

44 (1 ³/₄)
30 (1 ³/₁₆)
2 -M3 Depth 4
44 (1 ³/₄)
44 (1 ³/₄)
30 (1 ³/₁₆)
4 -M3 Depth 4
26 (1 ¹/₁₆)
16 (²¹/₃₂)
14.7 (¹⁹/₃₂)
14.7 (¹⁹/₃₂)
9.6 (³/₈)
19.2 (²⁵/₃₂)
BASE
FULL
44 (1 ³/₄)
9.7 (¹³/₃₂)

Top
42 (1 ¹¹/₁₆)
6.3 (¹/₄)
12 (¹/₂)
30 (1 ³/₁₆)
ø29

Base
16 (²¹/₃₂)
22 (⁷/₈)
26 (1 ¹/₁₆)
12 (¹/₂)
4 -M2 Depth 3

XCL-CG510/CG510C

29 (1 ³/₁₆)
29 (1 ³/₁₆)
ø27.6 (1 ¹/₄)
ø27.3 (1 ¹/₄)
12 (¹/₂)
30 (1 ³/₁₆)
7.3 (⁵/₁₆)

14.5 (⁹/₁₆)
2-M2 Depth8
12 (¹/₂)
15 (¹⁹/₃₂)
23.7 (¹⁵/₁₆)
20 (¹³/₁₆)
12 (¹/₂)
4 -M2 Depth3
3-M3 Depth 3
16.5 (²¹/₃₂)
22 (⁷/₈)
42 (1 ¹¹/₁₆)

Units: mm (inches)

XCL-CG Series - XCL-SG Series- Specifications

Basic Specifications	5.1M Camera Link *		5.1M Camera Link®	
	XCL-SG510	XCL-SG510C	XCL-CG510	XCL-CG510C
B/W / Color	B/W	RAW color	B/W	Color
Image Size	5.1 Mega			
Image Sensor	2/3-type CMOS Image sensors with a global shutter function (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			
Color Filter	–	RGB color mosaic filter	–	RGB color mosaic filter
Frame Rate	16 fps (Base, 8 bit, 1tap, Mono/Raw) 32 fps (Base, 8 bit, 2tap, Mono/Raw) * 48 fps (Base, 8 bit, 3tap, Mono/Raw) 64 fps (Medium, 8 bit, 4tap, Mono/Raw) 124 fps (Full, 8 bit, 8tap, Mono/Raw) 154 fps (80 bit(DECA), 8 bit, 10tap, Mono/Raw) *At the time of shipment		14 fps (Base, 8 bit, 1tap, Mono/Raw) 29 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)	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 (2x1, 1x2, 2x2), Partial Scan (Multi ROI)	Normal, Partial Scan (Multi ROI)	Normal, Binning (1x2, 2x1, 2x2)* 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	32 kbytes + 64 bytes x 16ch		64 bytes x 16ch	
Partial Scan — W (Pixel)	16to2,464			
Partial Scan — H (Line)	4 to2,056			
GPO	EXPOSURE/Strobe/LVAL/FVAL/Sensor lead out/Trigger through/Pulse generation signal/User defined 1, 2, 3 (Output switching)			
Other Features	Wide dynamic range, Frame accumulation, Area exposure, Area gain, Defect correction, Shading correction, Temperature readout, LUT, 3 x 3 filter		Area gain, Defect correction, Shading correction, Temperature readout, LUT, 3 x 3 filter	

Interface

Video Data Output	digital Mono 8, 10, 12, 16 bit (at the time of shipping 8bit)	digital Raw 8, 10, 12, 16 bit (at the time of shipping 8 bit)	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)	85/65/45 MHz switchable		75/45 MHz switchable	
Camera Link Tap	1/2/3/4/8/10 switchable		1/2/3 switchable	
Digital Interface	LVDS			
Camera Specification	Camera Link Version 2.0			
Output Data Clock	85MHz (1, 2, 3, 4, 8, 10tap), 65MHz (1, 2, 3, 4, 8, 10tap), 45MHz (1, 2, 3, 4, 8, 10tap)		75MHz (1,2,3tap), 45MHz (1,2,3tap)	
Digital I/O	ISO IN (x1), ISO OUT (x2), TTL IN (x1), TTL IN/OUT (x2, selectable)		TTL IN (x3), TTL OUT (x3)	

General

Lens Mount	C mount	
Flange Back	17.526 mm	
Power Requirements	DC +12 V (10.5 to 15.0 V), PoCL (10 to 13.0 V)	
Power Consumption	5.0 W max. (DC +12V)*	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 95% (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)	29 × 29 × 30 mm (excluding protrusions) 1 3/16 × 1 3/16 × 1 3/16 inches (excluding protrusion)
Mass	Approx. 96 g (Approx. 3.4 oz)	Approx. 53 g (Approx. 1.9 oz)
MTBF	70,523 hours (Approx. 8.1 years)	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)	

*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.

SONY