SONY

Digital Camera Module
Equipped with a Global Shutter CMOS Sensor

Camera Link®
XCL-SG Series

12.4 MP
5.1 MP
High resolution
High functionality

Camera Link®
XCL-CG Series

5.1 MP
1.6 MP
Compact size

Pregius Exmor CAMERA Link PoCL

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

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

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

XCL-CG160 (B/W)
XCL-CG160C (Colour)
1/2.9-type 1.6MP 127fps

Key Features

- Compact size: 29(W) x 29(H) x 30 (D) mm
- Area gain
- Defect correction
- Shading correction
- Multi ROI *1
- Base Clock 45/75 MHz selectable
- High compatibility with the XCL-C series
  - Identical command specifications/mounting hole positions
- Identical sensor size as XCL-C500 *2

*1 Only XCL-CG160/CG160C
*2 Only XCL-CG510/CG510C

Introducing a series of PoCL compatible Camera Link interface digital cameras equipped with a Global Shutter CMOS Sensor.

This lineup of 8 models ranges from the 12.4 MP and 5.1 MP high resolution, high frame rate models to the 1.6 MP standard models. Each is equipped with a wide array of Sony's original features, offering just the right model to fit your needs. 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-CG160 | XCL-CG160C

XCL-SG1240/SG1240C

Supports Base Configuration 3tap.

Bit length	CameraLink tap (Pixel clock frequency: when 85 MHz)		
	1	2	3
8	6 fps	13 fps	20 fps
10	6 fps	13 fps	
12	6 fps	13 fps	

XCL-SG510/SG510C

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

Bit length	CameraLink tap (Pixel clock frequency: when 85 MHz)					
	1	2	3	4	8	10
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	16 fps*					

*Only when Wide-D

XCL-CG510/CG510C

Supports Base Configuration 3tap.

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

XCL-CG160/CG160C

Supports Base Configuration 3tap.

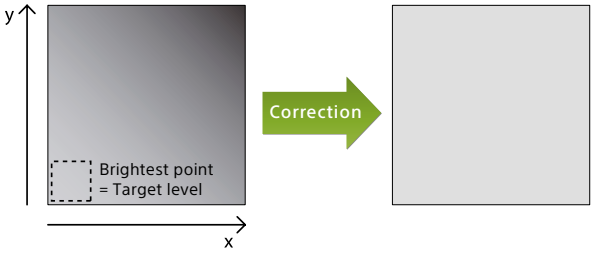
Bit length	CameraLink tap (Pixel clock frequency: when 75 MHz)		
	1	2	3
8	44 fps	90 fps	127 fps
10	44 fps	90 fps	
12	44 fps	90 fps	

Shading Correction

XCL-SG1240 | XCL-SG1240C
XCL-SG510 | XCL-SG510C
XCL-CG510 | XCL-CG510C
XCL-CG160 | XCL-CG160C

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

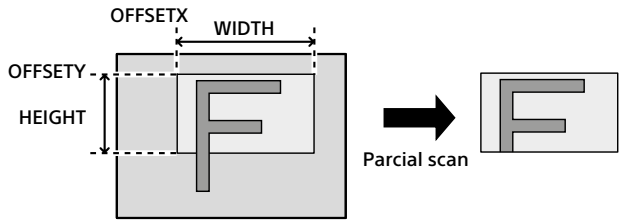
A number of user data can be saved as user settings.
XCL-SG1240/SG1240C: 3 patterns
XCL-SG510/SG510C: 9 patterns
XCL-CG510/CG510C: 9 patterns
XCL-CG160/CG160C: 31 patterns



Partial Scan

XCL-SG1240 | XCL-SG1240C
XCL-SG510 | XCL-SG510C
XCL-CG510 | XCL-CG510C
XCL-CG160 | XCL-CG160C

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.

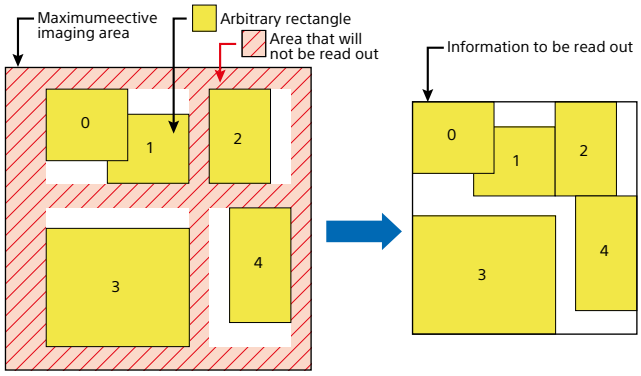


Partial Scan (Multi ROI)

XCL-SG510 | XCL-SG510C
XCL-CG160 | XCL-CG160C

Arbitrarily read out images including arbitrary multiple rectangular areas from the maximum effective imaging area.
With this function you will be capable of limiting read out information, thus accelerating the frame.
XCL-SG510/SG510C 8 areas (max.)
XCL-CG160/CG160C 2 areas (max.)

*When 5 rectangles are selected

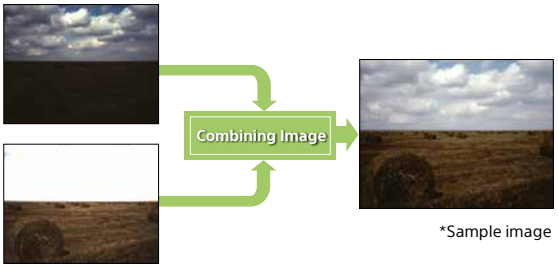


Wide Dynamic Range (Wide-D)

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.



*Sample image

Sample of application

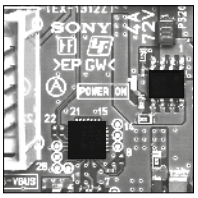
The application case is when the picture is taken with two type of lighting illumination, which is because only one lighting causes overexposure or too dark to recognize.

Area Gain

XCL-SG1240 | XCL-SG1240C
XCL-SG510 | XCL-SG510C
XCL-CG510 | XCL-CG510C
XCL-CG160 | XCL-CG160C

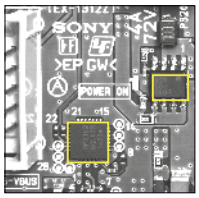
Individually set digital gain (0 to 32 times) to any of the 16 rectangular areas.
If several rectangular areas overlap, the gain value of the rectangular area with a smaller area number is prioritized.
Optimization of images for parts is available during parts inspection, etc.

When area gain is OFF



*Sample image

When area gain is ON



*Sample image

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

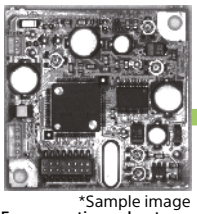
Area Exposure

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.

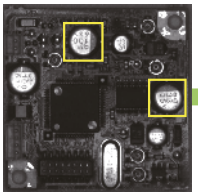
*You may not be able to correctly capture moving subjects since 2 images will be combined.

Exposure time: Long



*Sample image

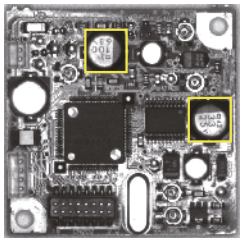
Exposure time: short



*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

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
XCL-CG160 | XCL-CG160C

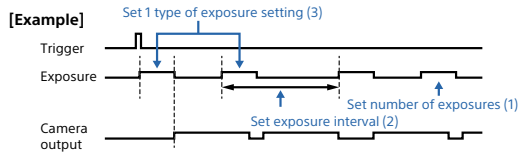
Capable of continuous shooting at the trigger timing and specifying the number of exposures, exposure interval, and exposure time. You can select from the mode that repeats one exposure time or the mode that switches between 2 exposure times repeatedly.
Furthermore, there is another mode that repeats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

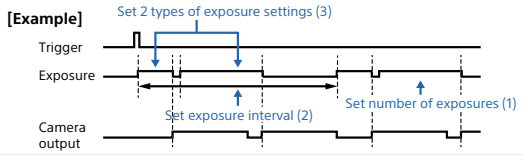
(A) When 1 pattern of exposure time is set

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



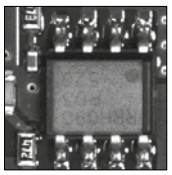
Frame Accumulation

XCL-SG510 | XCL-SG510C

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.

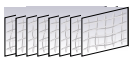
*You may not be able to correctly capture moving subjects since several images will be combined.

Before correction



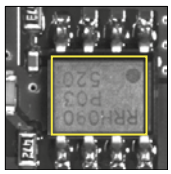
*Sample image

2 4 8 16



Averaging process

After correction S/N improvement



*Sample image

Defect Correction

XCL-SG1240 | XCL-SG1240C
XCL-SG510 | XCL-SG510C
XCL-CG510 | XCL-CG510C
XCL-CG160 | XCL-CG160C

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

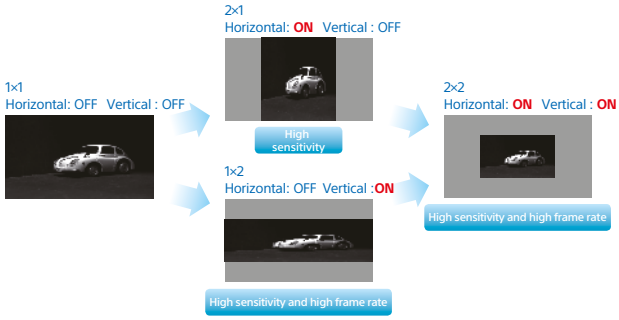
	XCL-SG1240 XCL-SG1240C	XCL-SG510 XCL-SG510C	XCL-CG510 XCL-CG510C	XCL-CG160 XCL-CG160C
Number of corrections (upper limit)	8184	2040	2047	

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.

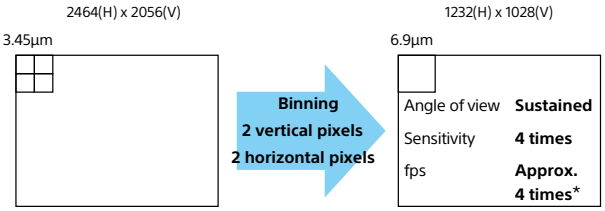
Binning

XCL-SG1240
XCL-SG510
XCL-CG510
XCL-CG160

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
XCL-CG160 XCL-CG160C

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
XCL-CG160 XCL-CG160C

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

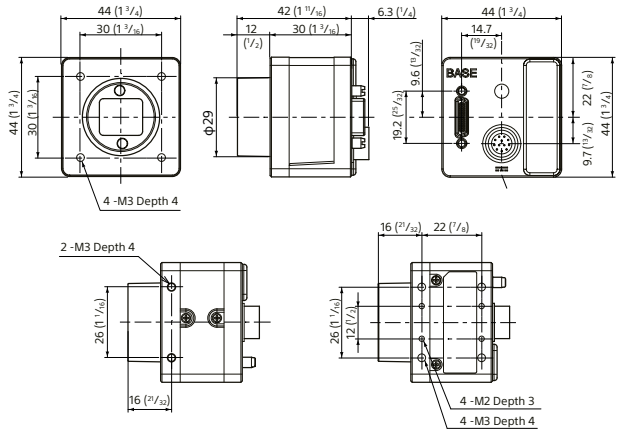
XCL-SG1240 XCL-SG1240C
XCL-SG510 XCL-SG510C
XCL-CG510 XCL-CG510C
XCL-CG160 XCL-CG160C

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

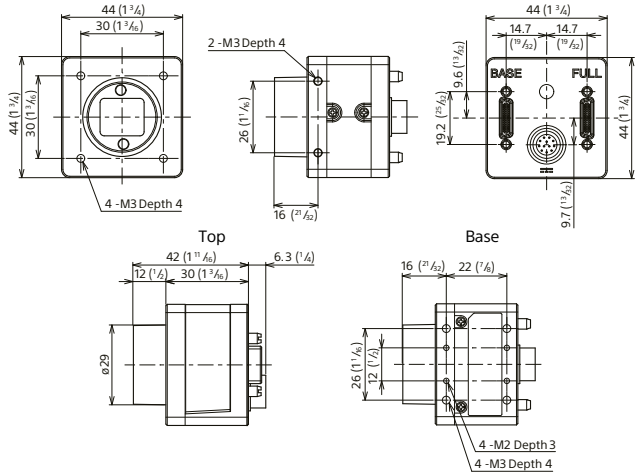
		ReverseX	
		0	1
ReverseY	0	Normal	Horizontal flip
	1	Vertical flip	180° rotation

Dimensions

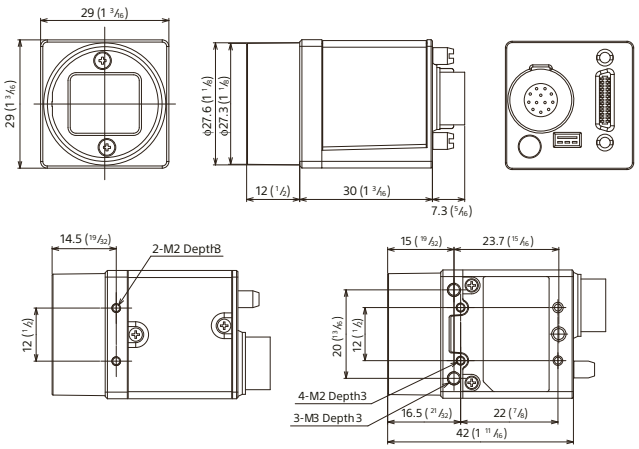
XCL-SG1240/SG1240C



XCL-SG510/SG510C



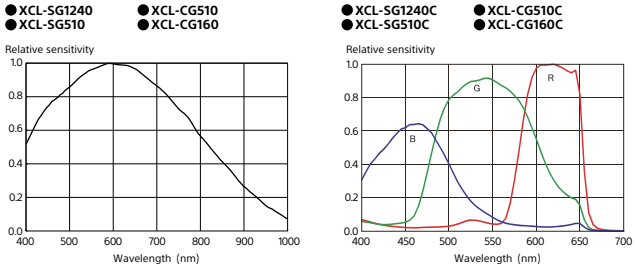
XCL-CG510/CG510C/CG160/CG160C



Units: mm (inches)

Spectral Sensitivity Characteristics

*Lens characteristics and light source characteristics excluded.



XCL-SG Series- Specifications

Basic Specifications		XCL-SG1240	XCL-SG1240C	XCL-SG510	XCL-SG510C
B/W / Colour		B/W	RAW color	B/W	RAW color
Image Size		12.4 Mega		5.1 Mega	
Image Sensor		IMX304: 1.1-type Global Shutter CMOS sensors (Pregius)		IMX250: 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 color mosaic filter	–	RGB color 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 (1x2, 2x1, 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 8 bit)	digital Mono 8, 10, 12, 16*2 bit (at the time of shipping 8 bit)	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)		45 MHz (1, 2, 3, 4, 8, 10 tap) 65 MHz (1, 2, 3, 4, 8, 10 tap) 85 MHz (1, 2, 3, 4, 8, 10 tap)	
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, CU-TR EAC			
Supplied Accessories		Lens mount cap (1), Safety Regulations*4 (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 Notes related to safety. Conventional instruction manual content will be included in the "Technical Manual".

XCL-CG Series- Specifications

Basic Specifications		XCL-CG510	XCL-CG510C	XCL-CG160	XCL-SG160C
B/W / Colour		B/W	Color	B/W	Color
Image Size		5.1 Mega		1.6 Mega	
Image Sensor		IMX264: 2/3-type Global Shutter CMOS sensors (Pregius)		IMX273: 1/2.9-type Global Shutter CMOS sensors (Pregius)	
Number of Effective Pixels (H x V)		2,464 × 2,056		1,456 × 1,088	
Cell Size (H x V)		3.45 µm × 3.45 µm			
Standard Output Pixels (H x V)		2,448 × 2,048		1,440 × 1,080	
Colour Filter		–	RGB color mosaic filter	–	RGB color mosaic filter
Frame Rate		14 fps (Base, 8 bit, 1 tap, Mono/Raw) 28 fps (Base, 8 bit, 2 tap, Mono/Raw)* 35 fps (Base, 8 bit, 3 tap, Mono/Raw) *At the time of shipment		44 fps (Base 8bit 1tap, Mono/Raw) 90 fps (Base 8bit 2tap, Mono/Raw)* 127 fps (Base 8bit 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 (1x2, 2x1, 2x2)*1, Partial scan	Normal, Partial Scan	Normal, Binning (1x2, 2x1, 2x2), Decimation, Partial scan (Multi ROI)	Normal, Decimation, 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), Special trigger (Burst triggerr/Bulk trigger*/Sequential trigger*) *Except XCL-CG160/CG160C			
Userset		16			
User Memory		32 kbytes + 64 bytes x 16ch			
Partial Scan	W (Pixel)	16 to 2,464		16 to 1,456	
	H (Line)	4 to 2,056		8 to 1,088	
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 8 bit)	digital Raw 8, 10, 12 bit (at the time of shipping 8 bit) digital RGB 24 bit	digital Mono 8, 10, 12 bit (at the time of shipping Mono 8 bit)	digital Raw 8, 10, 12 bit (at the time of shipping Raw 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		45 MHz (1,2,3 tap) 75 MHz (1,2,3 tap)			
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) $1\frac{3}{16} \times 1\frac{3}{16} \times 1\frac{3}{16}$ inches (excluding protrusions)			
Mass		Approx. 53 g (Approx. 1.9 oz)			
MTBF		81,562 hours (Approx. 9.3 years)		76,315 hours (Approx. 8.7 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, CU-TR EAC			
Supplied Accessories		Lens mount cap (1), Safety Regulations*2 (1)			

*1 The frame rate does not change.
*2 Notes related to safety. Conventional instruction manual content will be included in the "Technical Manual".

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