

XCL-SG510 (B/W)

XCL-SG510C (RAW Color)

CL Output	Progressive Scan	2/3 Type GS CMOS	Square Pixels	C Lens Mount	5.1 MP Output	Area Gain	Area Exposure
Wide-D	Frame Calculus	Image Flip	Long Exposure	Normal Shutter	External Trigger Shutter	Auto Shutter	Bulk Trigger
Sequential Trigger	Burst Trigger	Trigger range	Partial Scan Multi ROI	Shading Correction	Temperature Readout	Defect Correction	One-Push White Balance
Manual White Balance	LUT	B/W	RAW Color	Near-IR Sensitivity	Camera setting P42		

*1 : XCL-SG510C

*2 : XCL-SG510

Connection Diagram P5B



Outline

The XCL-SG510 and XCL-SG510C are the latest digital cameras from Sony to incorporate Global Shutter CMOS sensor technology. The cameras provide image processing capabilities that satisfy the requirements of high reliability, high speed, and high sensitivity in applications such as machine vision.

Features

High frame rate

You can select a frame rate of up to 154 fps based on the combination of output bit length and camera link tap settings.

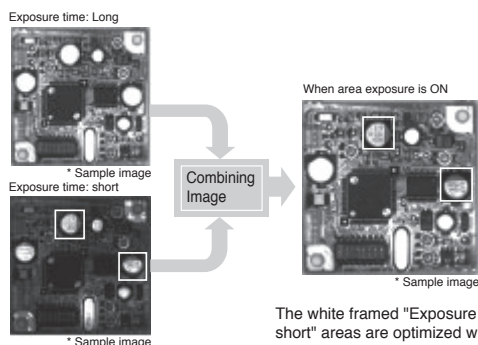
		Camera Link tap (Pixel clock frequency : 85 MHz)					
		1	2	3	4	8	10
Bit length	8	16 fps	32 fps	48 fps	64 fps	124 fps	154 fps
	10	16 fps	32 fps		64 fps		
	12	16 fps	32 fps		64 fps		
	16	Wide dynamic range : ON					

Area Gain → See page 10

You can set the individual digital gain (0 to 32times) to 16 optional rectangular areas. In the case that multiple rectangular areas overlap, the gain value with the smaller area number will have priority. The image can be optimized to suit the subject (part), in applications such as part inspection.

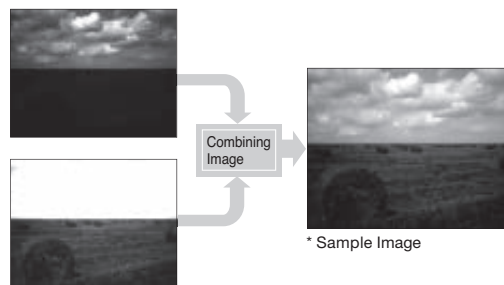
Area Exposure → See page 10

Two types of exposure times can be set to the valid pixel area and 16 optional rectangular areas.



Wide Dynamic Range (Wide-D)

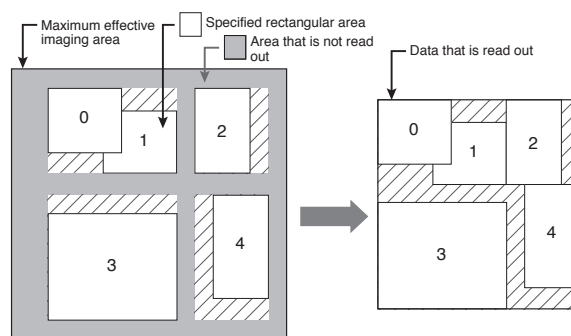
Enables tone restoration in bright and dark parts without the tone in scenes with strong contrast. Two images are captured with different exposure times, and combined into a 16-bit image. When using 8-, 10-, or 12-bit output, a 17-point recent LUT is used to adjust the tone. Signal-to-noise degradation is eliminated by performing optimization based on the exposure time.



Multi ROI → See page 14

Optional 8 rectangular areas from the effective pixel area can be read out. Reading out only the necessary part shortens the time to read out.

* When 5 rectangular areas are selected



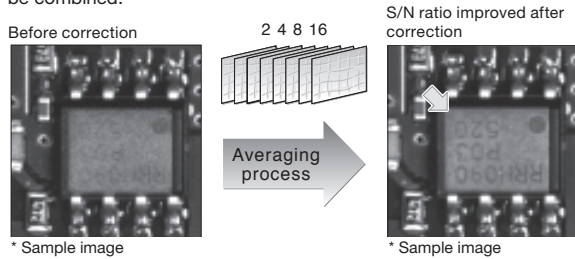
■ Frame Accumulation

Exposure is performed the specified number of times, and an averaging process is performed in the camera to output a single image.

This effectively improves factors such as the signal-to-noise ratio when using high gain settings, and it cancels any flickering that may occur when using high-speed exposure settings.

You can select whether to use 2, 4, 8, or 16 images for the averaging process.

* Moving objects may not be shot properly as multiple image data will be combined.



■ Image Flip

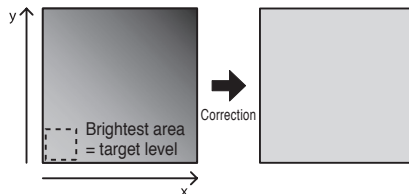
You can flip the image vertically or horizontally, or rotate it 180 degrees.

		ReverseX	
		0	1
ReverseY	0	Normal	Flip horizontally
	1	Flip vertically	Rotate 180 degrees

■ Shading Correction → See page 11

Depending on the characteristic of the lens, shadings caused by a drop in the amount of light around the lens, or light source variation, are corrected.

XCL-SG510/SG510C : 9 Patterns



■ Defect Correction → See page 11

This function is useful for applications that require high resolution.

It corrects clear defect points and opaque defect points of the image sensor.

It can also correct any white or black flecks that may appear in the image due to factors such as cosmic rays. From the peripheral pixels, correction is performed on coordinate pixels in which defects are detected.

Factory setting and user setting can be selected.

* Factory setting :ON

■ 3 x 3 filter → See page 12

Utilizing the 3 x 3 filter, you can obtain images in various processing conditions.

Depending on the patterns of parameters, you can reduce noise, apply edge enhancement and extract the contour.

3 x 3 filter: OFF



Laplacian filter



■ Temperature Readout

■ LUT (Look up Table)

■ Trigger Range Limit

■ Special Trigger modes

(Bulk trigger/Sequential trigger/Burst trigger)

■ Camera Link (PoCL*)

*PoCL: Power over Camera Link

■ Dimensions 44 (W) x 44 (H) x 30 (D) mm (excluding protrusions)

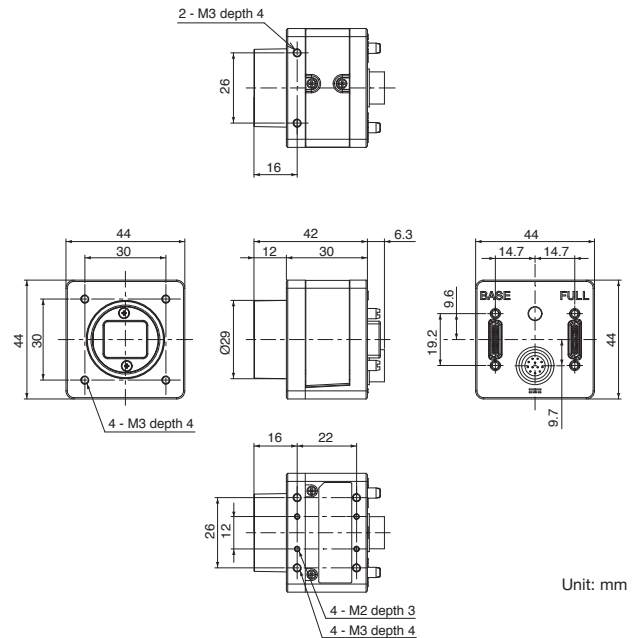
■ Mass: 96 g

Accessories

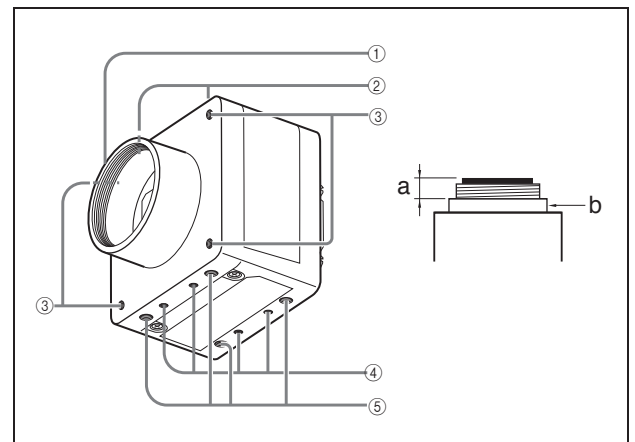
■ Compact camera adaptor DC-700/700CE

■ Tripod adaptor VCT-333I

Dimensions



Location and Function of Parts and Controls



① Lens mount (C-mount)

Attach any C-mount lens or other optical equipment.

Note

Use a C-mount lens with a protrusion (a) extending from the lens mount face (b) of 10mm or less.

② Guide screw holes (Top)

③ LED light guide screw holes (Front)

Screw hole to guide LED light.

Prepare appropriate adaptor according to the LED light to guide.

④ Guide screw holes / Tripod screw holes (Bottom)

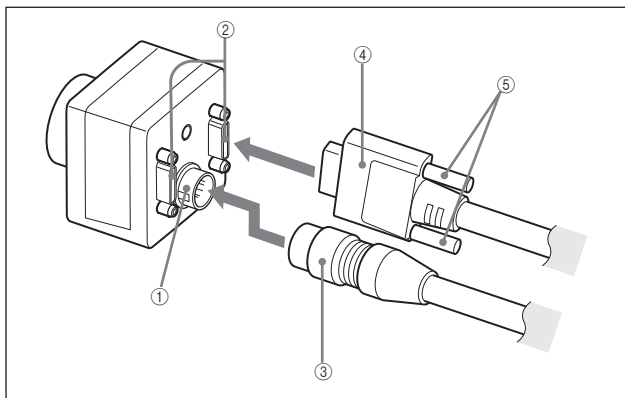
When using a tripod, use these four screw holes to attach a VCT-333I tripod adaptor.

⑤ Reference screw holes (Bottom)

These precision screw holes are for locking the camera module.

Locking the camera module into these holes secures the optical axis alignment.

Connecting the Cables



Connect the camera cable to the DC IN connector and the Camera Link cable to the DIGITAL IF connector respectively.

If you use a camera module interface board with support for PoCL, you can operate the camera even if you do not connect the camera cable to the DC IN connector.

When you connect the Camera Link cable, turn the two fastening screws on the connector to secure the cable tightly.

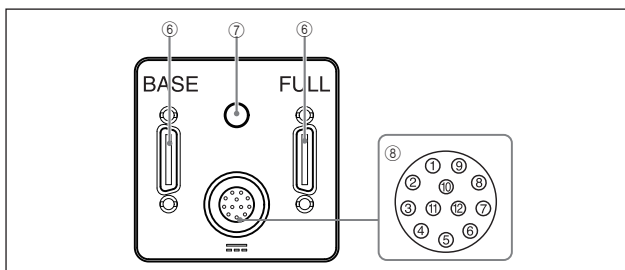
Connect the other end of the camera cable to the DC-700/700CE and the other end of the Camera Link cable to the camera module interface board.

When using the Camera link configuration in Base mode, connect the Camera Link cable to BASE of the DIGITAL IF connector.

Connect cables to the BASE and FULL terminals when you use the camera link configuration in Medium, Full, or 80 bit.

- ① DC IN connector
- ② DIGITAL IF connector
- ③ Camera cable
- ④ Camera Link cable
- ⑤ Fastening screws

Rear Panel/Pin Assignments



⑥ DIGITAL IF (Interface) connector (26-pin) (Connector shape : SDR)

You can connect a Camera Link cable to this connector to control a camera module from a host device utilizing the serial communication protocol while outputting a video signal from the camera module. If you use a camera module interface board with support for PoCL, you can also supply power from this connector. The camera module can also be actuated in external trigger mode by an inputting external trigger signal from this DIGITAL IF terminal.

⑦ Status LED (Green)

This button turns off when power is being supplied to the camera. It can be lit all the time or based on the output specifications set to the GPOX terminal.

⑧ DC IN (DC power input) connector (12-pin)

You can connect a CCXC-12P05N camera cable to input the +12 V DC power supply.

If you use a camera module interface board with support for PoCL, you can operate the camera without using this connector. The pin configuration of this connector is as follows.

Pin No.	Signal	Pin No.	Signal
1	Ground	7	GPI3 /GPO3
2	DC+12V	8	GPI4 (ISO -)
3	GPO4 (ISO -)	9	GPO4 (ISO +)
4	GPI1 / GPO1	10	GPI4 (ISO +)
5	GPO2 (ISO -)	11	GPI2
6	GPO2 (ISO +)	12	GPO4 (ISO -)

Power input

Pin 1 (Ground) and pin 2 (DC +12V) are used.

Signal input

Pins 4, 7, 10 and 11 (GPO1/3/4/2) are used for GPI input or trigger input.

When using 1 system for GPI (ISO):

– GPI4 (ISO+) (pin 10) and GPI4 (ISO-) (pin 8) are used.

When using 2 systems for GPI:

– GPI1 (pin 4*) and Ground (pin 1) are used.

– GPI3 (pin 7*) and Ground (pin 1) are used.

Signal output

Pins 4, 6, 7 and 9 (GPI1/2/3/4) allow you to select GPO from the exposure signal, strobe control signal, Hi/Low fixed value, etc.

When using 2 systems for GPO (ISO):

– GPO4 (ISO+) (pin 9) and GPO4 (ISO-) (pins 3 and 12) are used.

– GPO2 (ISO+) (pin 6) and GPO2 (ISO-) (pin 5) are used.

When using 2 systems for GPO:

– GPO1 (pin 4*) and Ground (pin 1) are used.

– GPO3 (pin 7*) and Ground (pin 1) are used.

* The initial value of pins 4 and 7 is GPI. Switch to GPO output by external command.

Controlling the Camera From the Host Device

Control functions	Description	
Operating mode	Free run/Trigger	
Shutter speed	Free run	1/100,000 s to 60 s
	Trigger edge detection	1/100,000 s to 60 s
	Trigger pulse width detection	Setting by trigger pulse width
Gain	0 dB to 18 dB	
Partial Scan	Variable, 4-line increments	
LUT (Look Up Table)	OFF/ON (Mode: 5 types)	
External trigger input	DIGITAL IF connector/DC IN connector	
Video output switch	Monochrome model: Mono 8/10/12/16-bit Color model: Raw 8/10/12/16-bit, RGB 24-bit	
Binning (Monochrome camera only)	2 × 1, 1 × 2, 2 × 2	
Defect correction	OFF/ON	
Shading correction	OFF/ON	
Image flip	OFF/ON	
Area gain	OFF/ON	
Frame accumulation	OFF/ON	
Aria exposure	OFF/ON	
Wide dynamic range	OFF/ON	

Trigger Signal Input

Trigger signals can be input via the 4th/7th/10th/11th pins of the DC IN connector, the CC1, CC2, CC3, CC4 pins of the Digital IF connector, or the software command. Switchover of the trigger signal can be changed via the TRG-SRC command.

command	param	Trigger signal assigned pin
TRG-SRC	4	DC IN connector 4th pin*
	7	DC IN connector 7th pin*
	10	DC IN connector 10th pin
	11	DC IN connector 11th pin
	101	Digital IF connector 22nd [+]/9th [-] (CC1)
	102	Digital IF connector 10th [+]/23th [-] (CC2)
	103	Digital IF connector 24th [+]/11th [-] (CC3)
	104	Digital IF connector 12nd [+]/25th [-] (CC4)
	0	Software command (TRG-SOFT)
	20	OR of DC IN connector 4th/7th/10th/11th pin

* DC IN connector 4th pin and 7th pin are available only when the GPIO input/output setting is switched to input.

GPIO

GPI

The value can be checked by detecting the signals input to the DC IN connector 4th, 7th, 10th, and 11th using the GPI command. Since all pins are pulled up, 1 (Hi level) is returned if they are opened.

GPO

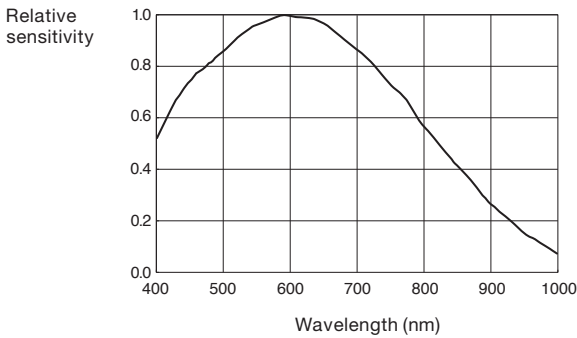
GPO1, GPO2, GPO3 and GPO4 outputs can be transmitted from the DC IN connector 4th, 6th, 7th, and 9th pins, respectively. After selecting a signal, the output polarity should be determined by GPO-INVERTER. The strobe control signal can be set separately for GPO1, GPO2, GPO3, and GPO4.

Spectral Sensitivity Characteristics

B/W model

• XCL-SG510

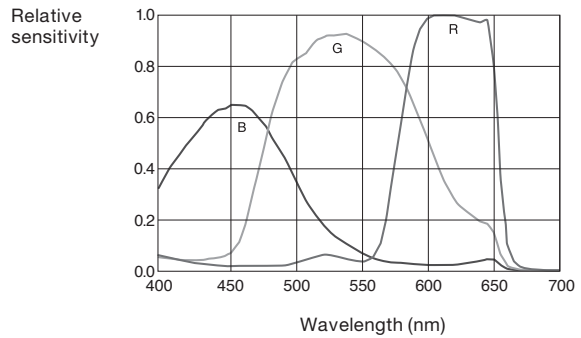
(Lens characteristics and light source characteristics excluded.)



Color model

• XCL-SG510C

(Lens characteristics and light source characteristics excluded.)



Specifications

	XCL-SG510	XCL-SG510C
Basic specifications		
Image type	B/W	RAW Color
Image size	5.1 MP	
Image sensor	IMX 250 : 2/3-type Global Shutter CMOS Sensor (Pregius)	
Number of effective pixels (H x V)	2,464 x 2,056	
Cell size (H x V)	3.45 μm x 3.45 μm	
Standard output pixels (H x V)	2,448 x 2,048	
Color filter	—	RGB color moxaic filter
Frame rate	16 fps (Base 8 bit 1tap Mono/Raw), 32 fps (Base 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 (80bit (DECA), 8 bit 10tap Mono/Raw) *default setting	
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 bits)	
Gain	Auto, Manual : 0 dB to 18 dB	
Shutter speed	Auto, Manual : 60 to 1/100,000 s	
White balance	—	Manual, One push
Camera Features		
Readout modes	Normal, Binning (2x1, 1x2, 2x2), Partial scan, (Multi ROI)	Normal, Partial scan, (Multi ROI)
Readout features	LUT (Binarization, Gamma (arbitrary setting), Test pattern	
Synchronization	Hardware trigger, Software trigger	
Trigger modes	OFF (Free run), ON (Trigger edge detection, Trigger width detection), Special trigger (Burst trigger / Bulk trigger / Sequential trigger)	
User Set/Memory Channel	16 channels	
User memory	32 kbytes + 64 bytes x 16ch	
Partial scan	W (Pixel)	16 to 2464
	H (Line)	4 to 2056
GPO	EXPOSURE/Strobe/LVAL/FVAL/Sensor readout/Trigger through/Pulse generation signal/User definition 1, 2, 3, 4 (Selectable)	
Other features	Wide dynamic range, Frame accumulation, Area exposure, Area gain, Shading correction, Defect correction, Temperature readout, LUT, 3 x 3 filter	
Interface		
Video data output	digital Mono 8, 10, 12, 16 ¹ bit (default setting 8 bits)	digital Raw 8, 10, 12, 16 ¹ bit (default setting Raw 8 bits)
Base Clock	85/65/45 MHz switchable	
Camera Link Tap	1/2/3/4/8/10 switchable	
Digital interface	LVDS	
Camera specification	Camera Link® Version2.0 (Connector shape : SDR)	
Output data clock	85MHz (1, 2, 3, 4, 8, 10tap), 65MHz (1, 2, 3, 4, 8, 10tap), 45MHz (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 focal length	17.526 mm	
Power requirements	DC +12V (10.5 V to 15.0 V), PoCL (10V to 13.0V)	
Power consumption	5.0 W (max.), DC(+12V) ²	
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 (1 3/4 x 1 3/4 x 1 3/16 inches) (excluding protrusions)	
Mass	Approx. 96 g (3 oz)	
MTBF	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), Safety Regulations ³ (1)	

¹ This is an effective setting when the wide dynamic range function is activated.

² Wide dynamic range, frame accumulation and area exposure functions cannot be used when power is supplied (PoCL) using a camera link cable.

³ Safety Regulations : It describes the safety precaution. Those contents which had described in Operation Manual are aggregated in the Technical Manual.