

Features of Digital Video Cameras with Global Shutter CMOS sensor

IEEE1588

XCG-CP510/CL • CP510

XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C
XCL-CG160	XCL-CG160C
XCG-CG510	XCG-CG510C
XCG-CG240	XCG-CG240C
XCG-CG160	XCG-CG160C
XCG-CG40	
XCU-CG160	XCU-CG160C

Overview, Principle and Technology

What is IEEE1588?

IEEE1588 is a protocol stipulated by the Precision Time Protocol (PTP) in effect for equipment connected together by an Ethernet. Used for time synchronization of multiple cameras in GigE Vision version 2.0.

① Time Stamp

This synchronizes the time at extremely high levels of precision in cameras that are connected via an Ethernet cable to the Grand Master, which is the standard time clock.

Reducing the cycle interval with the Grand Master improves precision even further.

	Camera supporting IEEE1588	Conventional camera
Result	Synchronization between the camera's time stamp and Grand Master	The time stamps in each camera also gradually go out of synchronization as time passes owing to discrepancies in the clocks' frequencies.
Process	Exchange synchronized messages with the Grand Master at predetermined cycles, and the internal counter is adjusted in accordance with the time stamp information at the time of sending and receiving.	The clocks built into cameras are reset when the power is switched on, and the time stamps asynchronously commence a count-up.

The IEEE1588 time stamp

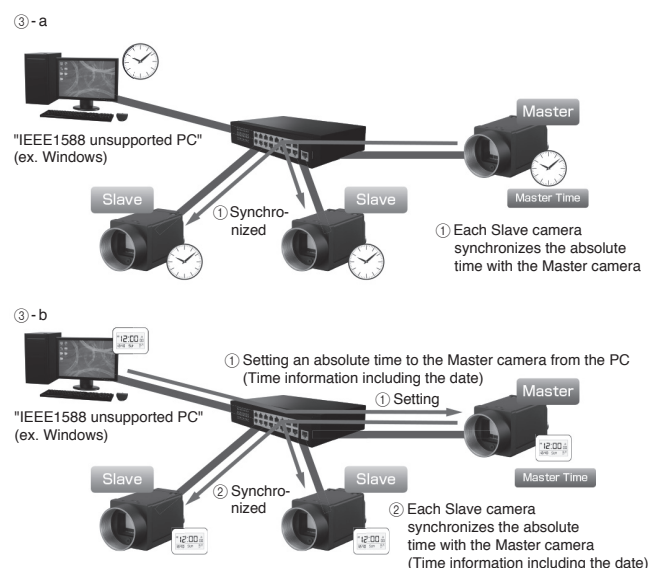
- An epoch time counter with 00:00 January 01 1970 set as [0]
- Provides a resolution of 1 ns (1 GHz)

② Camera as the Master (PTP Master Feature)

When using the IEEE1588 feature, a grand master and slave composition is required.

Operating 1 camera as a master in environments where a grand master cannot be prepared allows synchronization between cameras. (③-a)

Also, arbitrary time information including the date can be set via PC. (③-b)

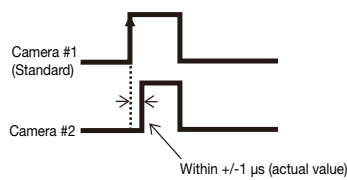


③ Trigger / GPO Links

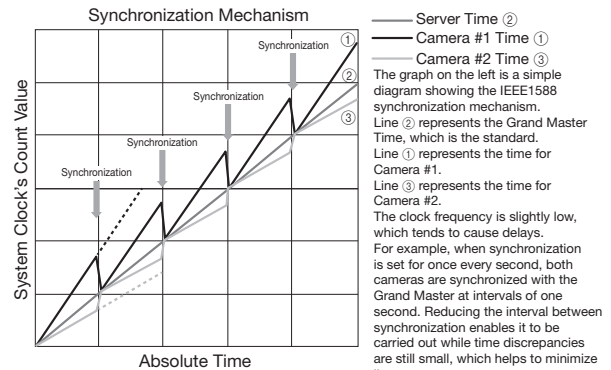
The XCG-CG Series has been equipped with a function that begins exposure in synchronization with this absolute time.

GigE Vision Ver. 2.0	GigE Vision Ver. 1.2
Scheduled Action Command * Implemented for the XCG-CG Series	Action Command
A combination of IEEE1588 and the Action Command enabled each individual camera to specify a time for executing actions.	Action commands that were designed to operate simultaneously with a single command for multiple cameras.

Timing for Starting Exposure with Each Camera



With regards to free-running, the timing for starting camera exposure is aligned with the time that has been synchronized with the Grand Master. Although this is affected by the network environment, it is ideally possible for exposure synchronous control to be performed within 1μs.

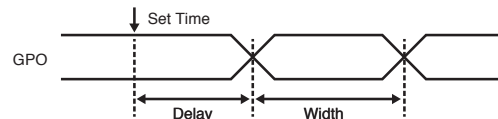


④ Scheduled action command

This is a function that allows you to specify an operation time. The following 2 settings are available.

- Software Trigger (runs the trigger operation)
- GPO Control (controls output signals)

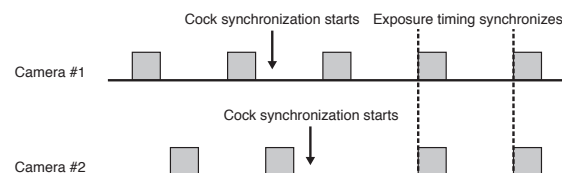
GPO Control



⑤ Simultaneous exposure

A function that automatically synchronizes the exposure timing when time synchronization is established.

PTP Trigger Interval: IEEE1588 Frame cycle when synchronized [msed]



Usage Scenarios and Advantages

① Simplification of Post-Event Analysis

Usage Scenarios ITS (Intelligent Transport Systems)

The time stamps obtained from two different points will allow decisions as to whether vehicles are exceeding the speed limit or not to be made, and accurate times of images obtained from both points will simplify high-precision speed analysis.

Advantages Detect vehicles in violation of the speed limit

Usage Scenarios Industrial assembly and inspection robots as well as devices

Adding absolute times to images showing inspection processing and results will enable the items in question to be easily identified.

Advantages Enables the items in question to be easily identified

② Curtailment of Tact Time

Usage Scenarios Industrial assembly and inspection robots as well as devices

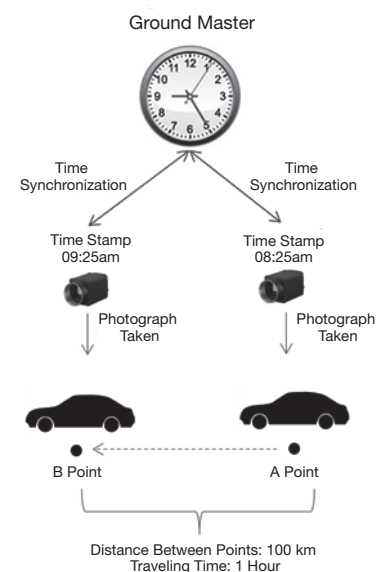
GPO (General Purpose Output) in the future. This will enable peripheral equipment that does not support IEEE1588 to be operated based on time synchronicity.

Connecting the camera's GPO to robots during the period from the camera capturing images to the robot performing work picking operations will enable the image capturing and robot operations to be synchronized.

In addition to this, bottle inspection devices that require multiple cameras to be synchronized and for which inspection samples are conveyed at a predetermined speed will have an extremely good affinity with systems that use the high-precision time synchronization capabilities of IEEE1588.

Advantages Shortening total tact time

Example of ITS use case



⇒ The use of absolute time improves the reliability of a speed of 100 kmh

Area Gain and Area Exposure

Overview, Principle and Technology

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.

Advantages

• 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)	XCG-CP510/CL・CP510	
		XCL-SG1240	XCL-SG1240C
		XCL-SG510	XCL-SG510C
		XCL-CG510	XCL-CG510C
		XCL-CG160	XCL-CG160C
		XCG-CG510	XCG-CG510C
		XCG-CG240	XCG-CG240C
		XCG-CG160	XCG-CG160C
		XCG-CG40	
		XCU-CG160	XCU-CG160C
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

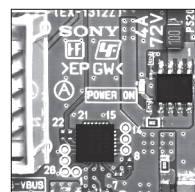
Area Gain

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.

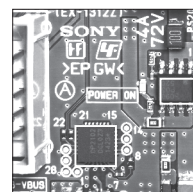
XCG-CP510/CL · CP510	
XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C
XCL-CG160	XCL-CG160C
XCG-CG510	XCG-CG510C
XCG-CG240	XCG-CG240C
XCG-CG160	XCG-CG160C
XCG-CG40	
XCU-CG160	XCU-CG160C

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

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

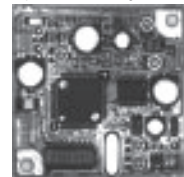
Optimization of images for subjects such as parts inspection, etc. is possible.

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.

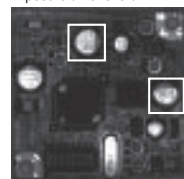
XCG-CP510/CL · CP510	
XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C
XCL-CG160	XCL-CG160C
XCG-CG510	XCG-CG510C
XCG-CG240	XCG-CG240C
XCG-CG160	XCG-CG160C
XCG-CG40	
XCU-CG160	XCU-CG160C

Exposure time: Long



* Sample image

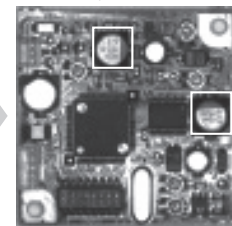
Exposure time: short



* Sample image

Combining Image

When area exposure is ON



* Sample image

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

Shading Correction

Overview, Principle and Technology

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.

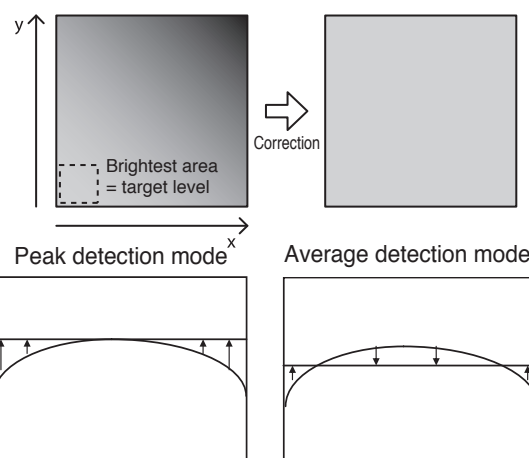
A number of user data can be saved as user settings.

XCG-CP510/CL - CP510		9 patterns
XCL-SG1240	XCL-SG1240C	3 patterns
XCL-SG510	XCL-SG510C	9 patterns
XCL-CG510	XCL-CG510C	9 patterns
XCL-CG160	XCL-CG160C	31 patterns
XCG-CG510	XCG-CG510C	9 patterns
XCG-CG240	XCG-CG240C	20 patterns
XCG-CG160	XCG-CG160C	31 patterns
XCG-CG40		
XCU-CG160	XCU-CG160C	31 patterns

The shading correction pattern can be switched within the span of one frame.

Usage Scenarios

- Part inspection



Advantages

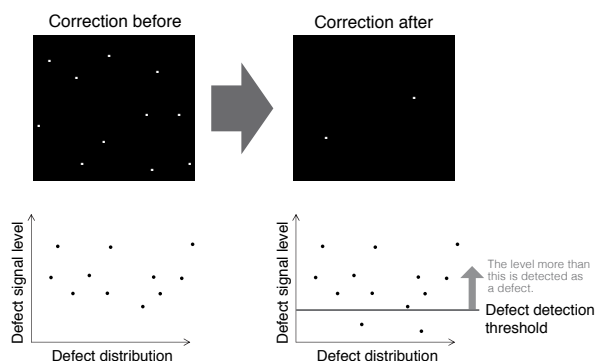
- Improve recognition accuracy/Improve processing speed/Reduce costs
- Multiple setting values adjusted to the light source can be stored

Defect Correction

Overview, Principle and Technology

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.

Example of clear defect correction



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

Advantages

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

If the defect detection threshold is lowered, more defects can be corrected and image quality can be maintained. The XCL series, the XCG series and the XCU series are supplied with sufficient numbers of corrections for defect corrections.

XCG-CP510/CL - CP510	
XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C
XCL-CG160	XCL-CG160C
XCG-CG510	XCG-CG510C
XCG-CG240	XCG-CG240C
XCG-CG160	XCG-CG160C
XCG-CG40	
XCU-CG160	XCU-CG160C

	Polarization Camera (GigE)	Camera Link			GigE Vision	USB3 Vision
	XCG-CP510/CL XCG-CP510	XCL-SG1240 XCL-SG1240C	XCL-SG510 XCL-SG510C	XCL-CG510/CG510C/ CG160/CG160C	CG-CG510/CG510C/CG240/CG240C/ CG160/CG160C/CG40	XCU-CG160 XCU-CG160C
Number of corrections (upper limit)	2047	8184	2040	2047	2047	2047

Effectiveness of 3 x 3 filter

XCG-CP510/CL · CP510	
XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C
XCL-CG160	XCL-CG160C
XCG-CG510	XCG-CG510C
XCG-CG240	XCG-CG240C
XCG-CG160	XCG-CG160C
XCG-CG40	
XCU-CG160	XCU-CG160C

Overview, Principle and Technology

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

Extract the contour when you want to recognize the shape.

Sharpness setting examples

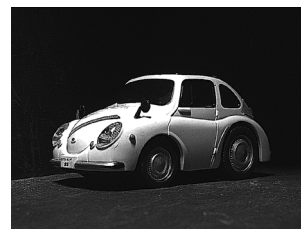
Softening



3 x 3 filter: OFF



Sharpening



Usage Scenarios

- PCB inspection
- Positioning

Advantages

- Easier image recognition in recognizing the shape during measurements

Trigger control

XCG-CP510/CL · CP510	
XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C
XCL-CG160	XCL-CG160C
XCG-CG510	XCG-CG510C
XCG-CG240	XCG-CG240C
XCG-CG160	XCG-CG160C
XCG-CG40	
XCU-CG160	XCU-CG160C

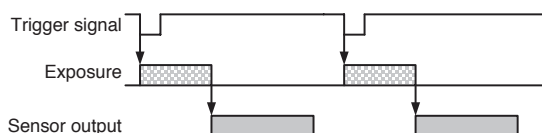
Free Run

Overview, Principle and Technology

The camera operates without a trigger signal and performs the video output operation continuously after the shutter (exposure) is finished. The horizontal and vertical timing signals are generated within the camera. During the free-run operation, image pickup timing cannot be controlled. In the free-run operation, the adjustment is made automatically to achieve the maximum frame rate according to the shutter setting.

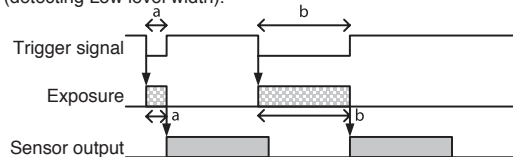
Trigger edge detection (Polarity: positive)

The figure shows the trigger signal negative polarity (detecting the drop edge).



Trigger edge detection (Polarity: positive)

The figure shows the trigger signal negative polarity (detecting Low level width).



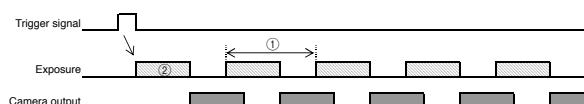
Burst Trigger

Overview, Principle and Technology

This is a feature capable of continuous shooting at the trigger timing and specifying the number of exposures, exposure interval, and exposure time. 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.

(A) When 1 pattern of exposure time is set

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

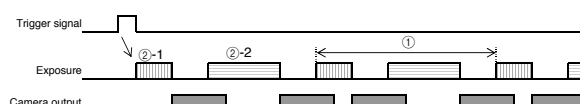


Advantages

- Optimal for capturing synchronized images with several cameras

(B) When 2 patterns of exposure times are set

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



Advantages

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

Free Set Sequence

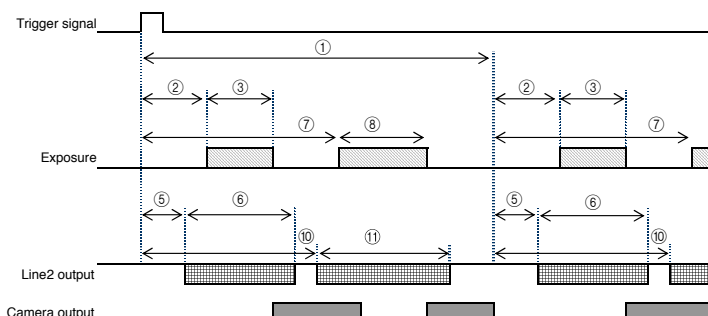
Overview, Principle and Technology

You can perform multiple (maximum 10 patterns) exposure and GPO output with 1 trigger signal. The start time and length as well as the gain of exposure and GPO output can be set to any value. The set sequence of exposure and GPO output is established as 1 cycle, and this cycle can be repeated.

When 2 patterns of exposure times are set

Exposure start (2), exposure time (3), Gain setting (4), GPO output (start (5), length (6)) are specified for exposure 1 and exposure start (7), exposure time (8), Gain setting (9), GPO output (start (10), length (11)) are specified for exposure 2.

If continuously filming in interval (1) with 2 exposures as 1 set



Advantages

- Different lighting, exposure, and gain can be set, and inspection for each different detected target can be performed.

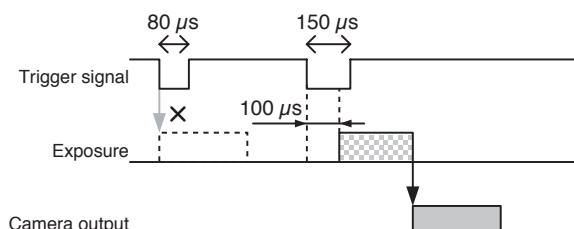
Trigger Range Limitation

Overview, Principle and Technology

Only signals in the set trigger width can be accepted as the trigger signal. This functions as a noise filter, which removes chattering or disturbance noise in the trigger signal line. When the trigger signal is input, exposure is started with the time lag of the trigger range setting values.

Trigger range operation example

ExposureTime = 300, Trigger Acceptance RangeLower Limit = 100 in the figure.



XCG-CP510/CL · CP510	
XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C
XCL-CG160	XCL-CG160C
XCG-CG510	XCG-CG510C
XCG-CG240	XCG-CG240C
XCG-CG160	XCG-CG160C
XCG-CG40	
XCU-CG160	XCU-CG160C

XCG-CP510/CL · CP510	
XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C
XCL-CG160	XCL-CG160C
XCG-CG510	XCG-CG510C
XCG-CG240	XCG-CG240C
XCG-CG160	XCG-CG160C
XCG-CG40	
XCU-CG160	XCU-CG160C

XCG-CP510/CL · CP510	
XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C
XCL-CG160	XCL-CG160C
XCG-CG510	XCG-CG510C
XCG-CG240	XCG-CG240C
XCG-CG160	XCG-CG160C
XCG-CG40	
XCU-CG160	XCU-CG160C

Multi ROI

Overview, Principle and Technology

The following arrangements are made for the specification for readout areas of multi ROI.

XCG-CP510/CL - CP510	
XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C
XCL-CG160	XCL-CG160C
XCG-CG510	XCG-CG510C
XCG-CG240	XCG-CG240C
XCG-CG160	XCG-CG160C
XCG-CG40	
XCU-CG160	XCU-CG160C

The readout setting area from the CMOS image sensor is displayed in a belt-shaped pattern vertically and horizontally as seen in Diagram A. In this case, users must perform calculations for each position coordinate in order to specify the area they require. Therefore, as specified in Diagram B, selections of necessary areas can easily be made with the rectangular box. Based on that area, calculations are made automatically within the camera so that the readout area becomes filled in a belt-shaped pattern vertically and horizontally.

Furthermore, when selecting areas, a highlight function that darkens areas that haven't been selected while making the selected area visible, is available.

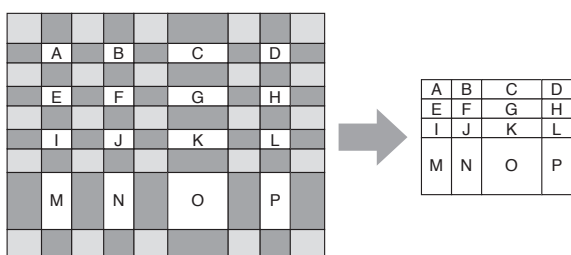


Diagram A Image sensor area setting

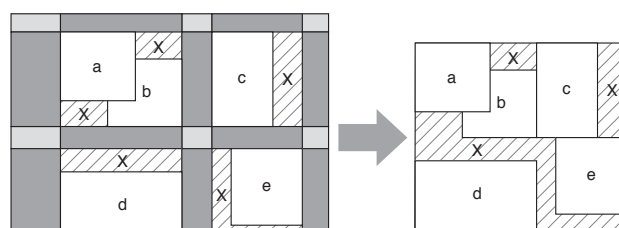


Diagram B User designated area setting :
Readout area : +

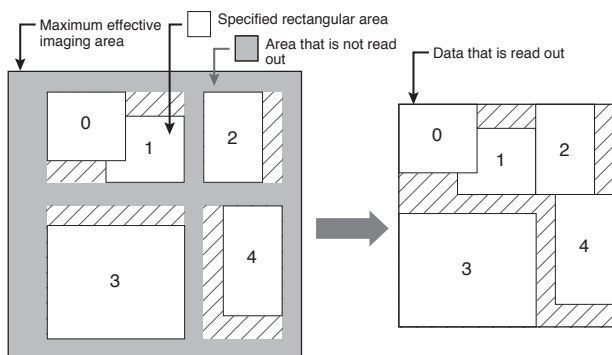
XCL-SG510

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



XCL-CG160

XCL-CG160C

XCG-CG160

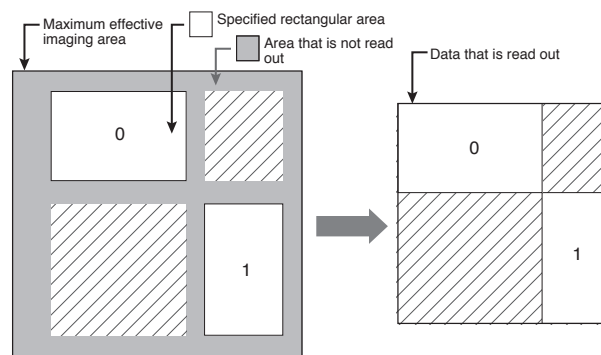
XCG-CG160C

XCU-CG160

XCU-CG160C

Arbitrarily read out images including any 2 (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.



Advantages

- Acceleration of the frame rate by reducing tact time is possible since the readout information can be limited

Bandwidth Control Feature

Advantages

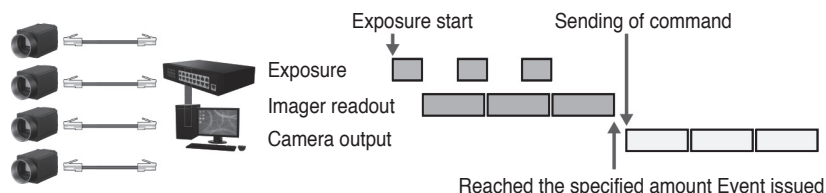
- Exposure of several cameras are performed simultaneously and the PC processing capability is exceeded
When data is sent, the output from the camera can be shifted to disperse the load
- By suppressing the cable load from the camera to the PC, the number of cables can be reduced
Also, since the load on the PC can be reduced, a moderately priced PC can be selected

XCG-CP510/CL - CP510	
XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C
XCL-CG160	XCL-CG160C
XCG-CG510	XCG-CG510C
XCG-CG240	XCG-CG240C
XCG-CG160	XCG-CG160C
XCG-CG40	
XCU-CG160	XCU-CG160C

① Memory shot (when shooting continuously)

Overview, Principle and Technology

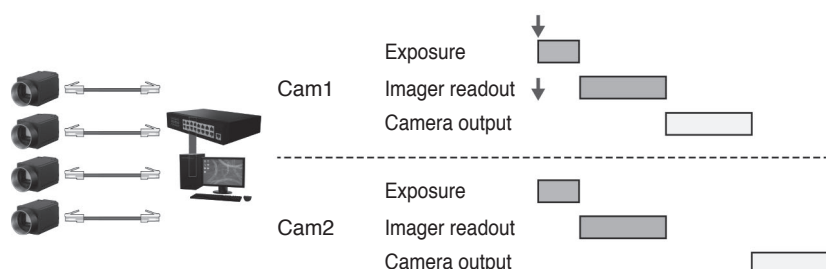
This feature allows you to save a specified amount of camera images to the camera and perform image output at your desired timing.
Optimal when requiring simultaneous exposure, but there are several cameras connected to the same network and the configuration makes the bandwidth exceed 1Gbps when operated simultaneously.
Optimal when shooting several shots.



② Output timing control (when shooting 1 shot with 1 trigger)

Overview, Principle and Technology

Normally, images are sequentially output when exposure ends, but the image output start timing can be delayed.
Optimal when requiring simultaneous exposure, but there are several cameras connected to the same network and the configuration makes the bandwidth exceed 1Gbps when operated simultaneously.
Optimal when shooting 1 shot with single frame or trigger.



Binning·Decimation·Quarter mode

These pixel binning modes reduce the output size and increases frame rates (fps) without changing the angle of view. The sensitivity and frame rate of each function are shown in the table below.

Binning · Decimation · Quarter mode

Function differences

	Angle of view	Sensitivity	fps	Installed models
Binning (2x2)	Sustained	4 times	Approx. 4 times	All monochrome models except XCG-CG40 and XCG-CP510
Decimation	Sustained	Sustained	Approx. 2 times	XCL-CG160/CG160C
Quarter mode	Sustained	Sustained	Sustained	XCG-CG color models XCU-CG160C

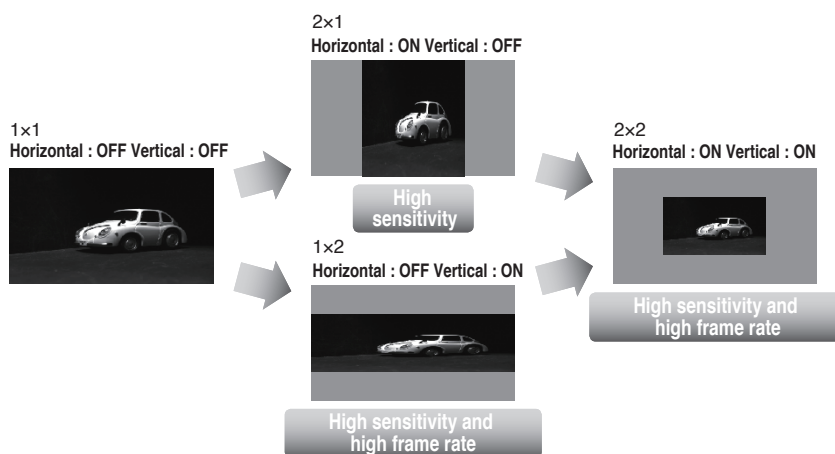
Binning

Overview, Principle and Technology

Pixel binning combines groups of pixels in vertical and horizontal 2 pixel units and increases frame rate without changing the angle of view as well as enhancing the sensitivity.

* In XCL-SG1240/CG510, XCG-CG510/CG240, the frame rate does not become faster using this function.

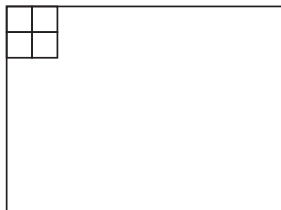
XCG-CP510/CL · CP510	
XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C
XCL-CG160	XCL-CG160C
XCG-CG510	XCG-CG510C
XCG-CG240	XCG-CG240C
XCG-CG160	XCG-CG160C
XCG-CG40	
XCU-CG160	XCU-CG160C



■ 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

Usage Scenarios

- For positioning and inspection, this mode increases efficiency with a high frame rate.
- For observation of animals, microorganisms, etc. under low illumination, this mode provides high sensitivity.

Advantages

Used to increase the sensitivity or frame rate or to decrease the amount of data without changing the angle of view.

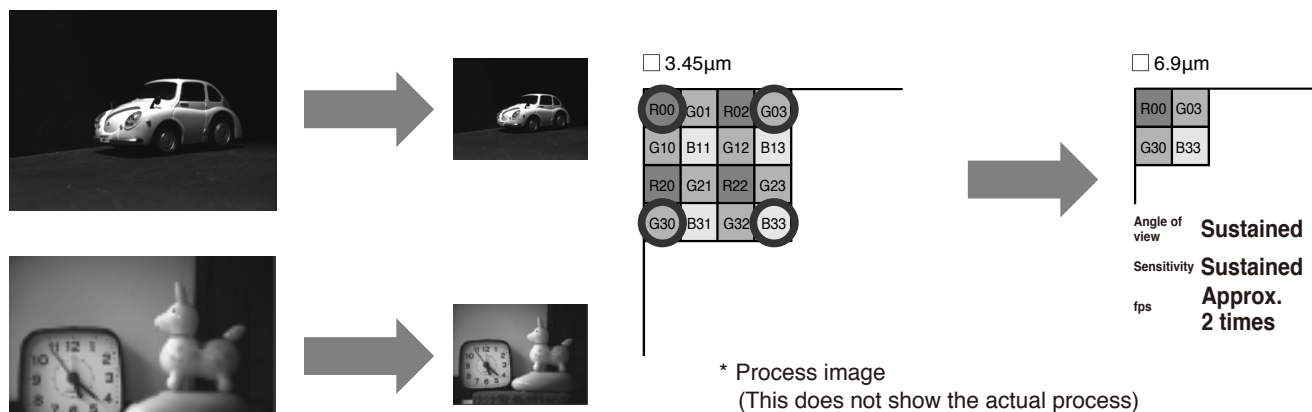
Decimation

Overview, Principle and Technology

Reading alternative pixels in vertical and horizontal directions achieves higher frame rate.

- ✓ Mode reads an alternative pixels in vertical and horizontal directions
- ✓ Mode keeps the angle of view and achieves the higher frame rate

XCG-CP510/CL - CP510	
XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C
XCL-CG160	XCL-CG160C
XCG-CG510	XCG-CG510C
XCG-CG240	XCG-CG240C
XCG-CG160	XCG-CG160C
XCG-CG40	
XCU-CG160	XCU-CG160C



Usage Scenarios

- For positioning and inspection, this mode increases efficiency with a high frame rate.

Advantages

Used to increase the sensitivity or frame rate or to decrease the amount of data without changing the angle of view.

Quarter mode

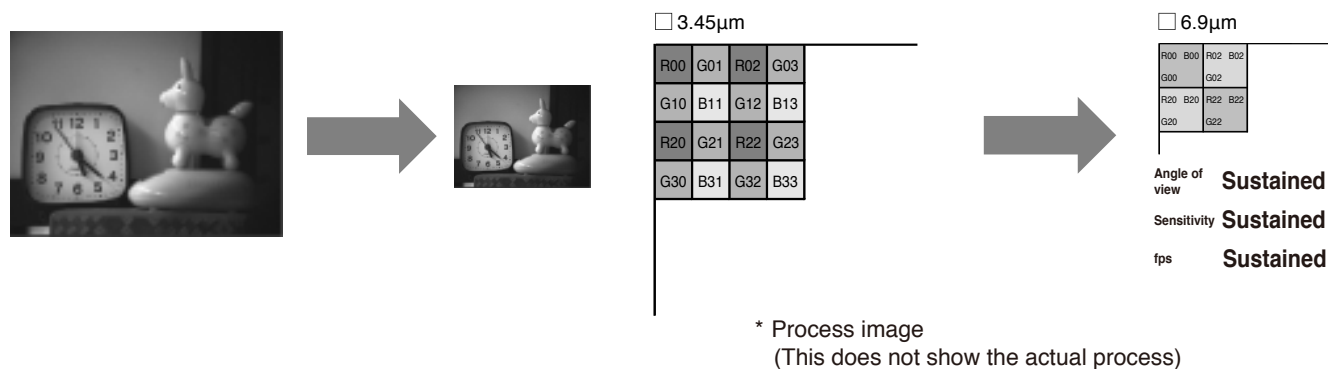
Overview, Principle and Technology

Using this function outputs an image by reducing the output size to the 1/4 area without changing the angle of view.

* Sensitivity and frame rate do not change.

- ✓ Mode converts an bayer array to RGB data
- ✓ Mode keeps the angle of view and reduces the data size
- ✓ Output format is RGB format only

XCG-CP510/CL - CP510	
XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C
XCL-CG160	XCL-CG160C
XCG-CG510	XCG-CG510C
XCG-CG240	XCG-CG240C
XCG-CG160	XCG-CG160C
XCG-CG40	
XCU-CG160	XCU-CG160C



Advantages

Used to decrease the amount of data without changing the angle of view.

Image comparison at near-infrared domains

The feature of the camera supporting much sensitivity in near-infrared domains

Advantages

- The one which is difficult to be seen in the visible wavelength becomes able to be seen by changing a light source. For example, if using the camera which has sensitivity of the infrared wavelength, in the machine vision, you can see the inside of the substrate. Also in case of using security, you can see a thing under the night-vision.

XCG-CP510/CL・CP510	
XCL-SG1240	XCL-SG1240C
XCL-SG510	XCL-SG510C
XCL-CG510	XCL-CG510C
XCL-CG160	XCL-CG160C
XCG-CG510	XCG-CG510C
XCG-CG240	XCG-CG240C
XCG-CG160	XCG-CG160C
XCG-CG40	
XCU-CG160	XCU-CG160C

Camera for good performance at visible wavelengths

Conventional model (XCL-C500)
2/3-type CCD 5 Megapixels
Image acquisition condition: F4,
Shutter 1/30 sec, Gain 0 dB
(Light source: Infrared light (800 to 850 nm))

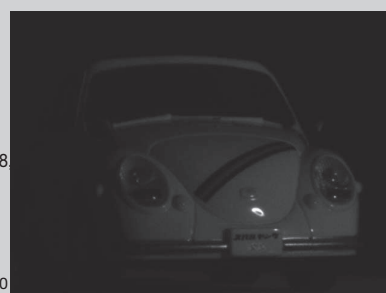
Image taken by XCL-C500



Camera for good performance at near-infrared wavelength

CameraLink: XCL-SG510
2/3-type GS CMOS 5.1 Megapixels
Image acquisition condition: F8
Shutter 1/30 sec, Gain 0 dB
Light source: Infrared light (800 to 850 nm)

Image taken by XCL-SG510



Digital video camera equipped with the GS CMOS sensor supporting much sensitivity in near-infrared domains

CameraLink XCL-SG1240

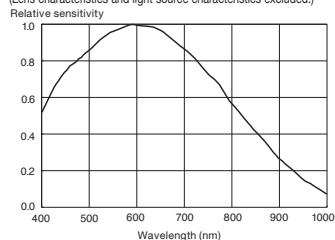
- Exmor™
- 1.1-type GS CMOS
- 12.4 MP : 20 fps



Spectral Sensitivity Characteristics

•XCL-SG1240

(Lens characteristics and light source characteristics excluded.)



CameraLink XCL-SG510

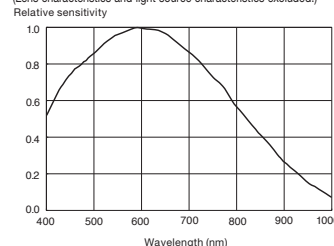
- Exmor™
- 2/3-type GS CMOS
- 5.1 MP : 154 fps



Spectral Sensitivity Characteristics

•XCL-SG510

(Lens characteristics and light source characteristics excluded.)



CameraLink XCL-CG510

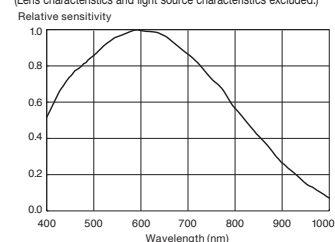
- Exmor™
- 2/3-type GS CMOS
- 5.1 MP : 35 fps



Spectral Sensitivity Characteristics

•XCL-CG510

(Lens characteristics and light source characteristics excluded.)



CameraLink XCL-CG160

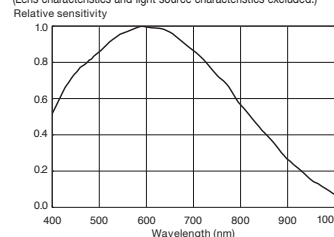
- Exmor™
- 2/2.9-type GS CMOS
- 1.6 MP : 127 fps



Spectral Sensitivity Characteristics

•XCL-CG160

(Lens characteristics and light source characteristics excluded.)



GigE Vision XCG-CP510/CL XCG-CG510

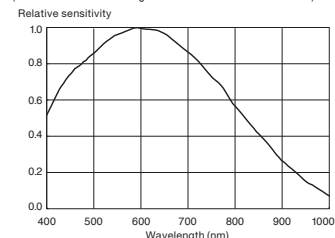
- Exmor™
- 2/3-type GS CMOS
- 5.1 MP : 23 fps



Spectral Sensitivity Characteristics

•XCG-CP510/CL •XCG-CG510

(Lens characteristics and light source characteristics excluded.)



GigE Vision XCG-CG510

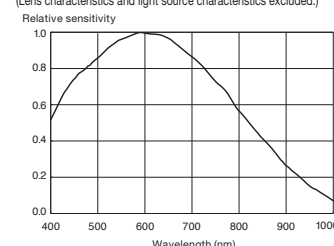
- Exmor™
- 2/3-type GS CMOS
- 5.1 MP : 23 fps



Spectral Sensitivity Characteristics

•XCG-CG510

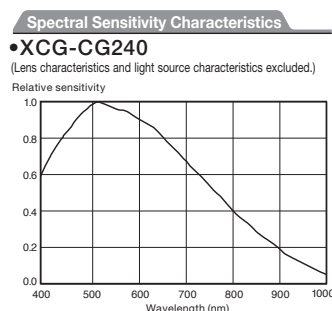
(Lens characteristics and light source characteristics excluded.)



Digital video camera equipped with the GS CMOS sensor supporting much sensitivity in near-infrared domains

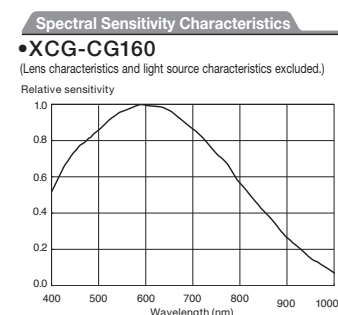
GigE Vision XCG-CG240

- Exmor™
- 1/1.2-type GS CMOS
- 2.4 MP : 41 fps



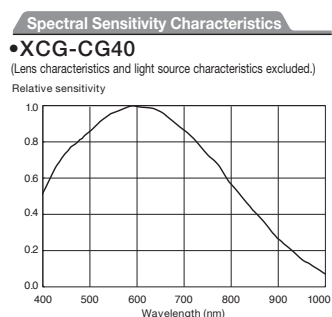
GigE Vision XCG-CG160

- Exmor™
- 1/2.9-type GS CMOS
- 1.6 MP : 75 fps



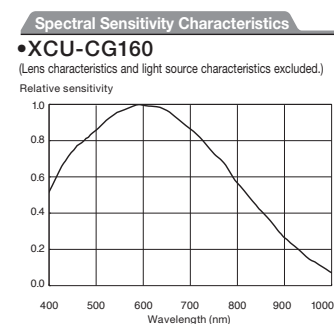
GigE Vision XCG-CG40

- Exmor™
- 1/2.9-type GS CMOS
- 0.4 MP : 300 fps



USB3 Vision XCU-CG160

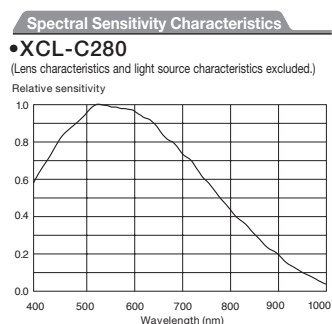
- Exmor™
- 1/2.9-type GS CMOS
- 1.6 MP : 100 fps



Digital video camera equipped with the CCD sensor supporting much sensitivity in near-infrared domains

CameraLink XCL-C280

- EXview HAD CCD II™
- 1/1.8-type CCD
- Full HD, 2.8 MP : 26 fps



CameraLink XCL-C130

- EXview HAD CCD®
- 1/3-type CCD
- SXGA 1.3 MP : 31 fps

