CIS

CoaXPress I/F

5.3M pixels CMOS (B/W) Camera

VCC-5CXP3M

Product Specifications & Operational Manual

CIS Corporation

Table of Contents

1. Handling Precautions

1.1. Camera Handling Precautions

☐ Do not use or store camera in dusty or humid places.

☐ Do not apply excessive force, vibration, or static electricity that could damage camera. Please handle camera with care.

☐ Do not shoot direct images that are extremely bright (e.g., strong light source, sun, etc.). When extremely strong light source is shot, smear or blooming may occur. Put the lens cap on or protect the lens with seal when camera is not in use.

☐ Follow the instructions in Chapter 4. "External Connector Pin Assignment" for connecting camera. Improper connection may cause damages not only to the camera but also to the connected devices.

☐ Confirm mutual ground potential carefully before connecting camera to monitors or computers. Any AC leak from the connected devices may cause damages or destroy the camera.

☐ Do not apply excessive voltage. (Use only the specified voltage.) Unstable or improper power supply voltage may cause damages or malfunction of the camera.

☐ Do not disassemble the camera. Once the camera is disassembled, it will be out of warranty.

☐ Our warranty does not apply to damages or defects caused by irregular and/or abnormal use of the product.

Our warranty does not apply to damages or defects caused by neglecting the instructions and precautions explained in this manual.

1.2. Restrictions on Applications

☐ The camera must not be used for any nuclear equipment or aerospace equipment with which mechanical failure or malfunction could result in serious bodily injury or loss of human life.

☐ The camera must not be used under conditions or environments other than those specified in this manual.

1.3. Disclaimers (Exception Clause)

CIS should not be liable for any damages or losses if;

☐ damages or losses are caused by earthquake, lightning strike, fire, flood, or other acts of God.

☐ damages or losses are caused by deliberate or accidental misuse by user, or failure to observe information and instructions explained in this manual.

☐ damages or losses are caused by repair or modification conducted by user or any unauthorized party.

2. Product Outline

VCC-5CXP3M is a small B/W camera with CoaxPress interface.

Using 1", global shutter type 5M pixels CMOS image sensor, frame rate reaches 85.1fps with CXP-6 (ROI OFF). Complies with CoaXPress Version 1.0 and transfers data up to approx. 100m with CXP-1.

Must have function ready for Machine Vision applications such as trigger shutter, ROI, Gain, sub-sampling, shading correction, sequence control, and defective pixels correction. Suitable for various Machine Vision inspection systems and others.

<Features>

- Dimensions: 29mm(H) x 29mm(W) x 55mm(D)
- Global shutter type CMOS sensor (Monochrome)
- Complies with CoaXPress CXP-1/2/3/5/6 x 1lane
- Maximum frame rate: 85.1fps (with CXP-6, ROI OFF)
- Maximum cable length: Approx. 100m (with CXP-1)
- ROI
- Sub-sampling
- Exposure setting, Gain setting
- External trigger mode (Fixed trigger shutter mode/Pulse width trigger shutter mode)
- Sequence control function
- Shading correction
- Complies with GenICam

3. Specifications

3.1. General Specifications

Image sensor	Sensor type	1", Global shutter type CMOS sensor	
	Effective pixels	2592(H) × 2048(V)	
	Unit cell size	4.8μm(H) × 4.8μm(V)	
Pixel clock frequency	72MHz		
Interface	Complies with CoaXPress 1.0. Supports CXP-1/2/3/5/6 x 1lane		
Video output format	Mono8 / Mono10		
Resolution	2048 TV lines		
Output (Sensor AD)	10bit		
Sensitivity	F2.8 400 lx (Shutter 1/300(s), Gain 0dB)		
Minimum Illumination	F1.4 0.9 lx (Shutter 1/300(s), Gain 18dB)		
Gain variable range	x1~x32 (0dB-30dB)		
Shutter speed	Preset: 1/10000, 1/5000, 1/2500, 1/1200, 1/600, 1/300, 1/150, 1/100 Manual: 100[us] ~ approx. 1/Framerate[us]		
Gamma correction	Fixed to 1.		
Trigger mode	Free run mode (Camera internal trigger) Trigger mode ・ Fixed trigger shutter ・ Pulse width trigger shutter		
Partial scan (ROI)	Preset 8 patterns. ※Including Full resolution (ROI OFF)		
Power requirements	PoCXP		
Power consumption	3.6 W (CXP-6) [Entire pixel, with free run]		
Dimensions	H:29mm W:29mm D:55mm excluding projection.		
Weight	Approx. 75 g		
Lens mount	C mount		
Safety/Quality standard	UL: Complies with UL standard including materials.		
	CE EMC: 2014/30/EU Emission: EN61000-6-4:2007+A1:2011 Immunity: EN61000-6-2:2005		
	RoHS: 2011/65/EU Complies with EN50581(RoHS2)		
Durability	Vibration	Acceleration	98m/s^2 (10G)
		Frequency	20~200 Hz
		Direction	X, Y, and Z 3 directions
		Testing time	120min for each direction
	Shock	No malfunction with 90m/s^2(50G) for ±X, ±Y, and ±Z 6 directions without packaging.	
Operational temperature	-5 ~ +45℃ Humidity: 20 ~ 80%RH with no condensation.		
Storage temperature	-25 ~ +60℃ Humidity: 20 ~ 80%RH with no condensation.		

3.2. Camera Input and Output Specifications

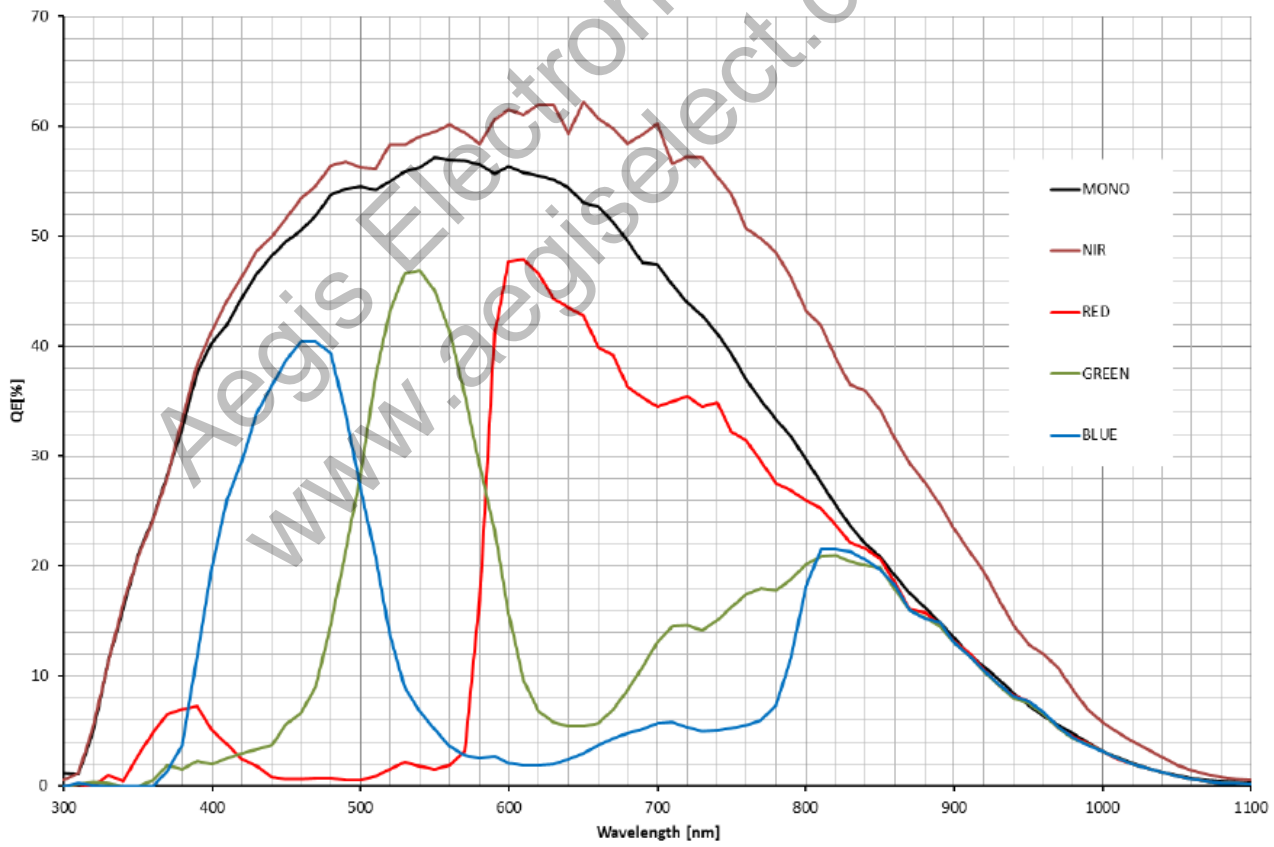
Video output data	Max. effective video output	2592(H) x 2048(V)	
Image signal output	BNC connector LINK 0	PoCXP	Power, Video, and Superimposed control signals
Video output format	Tap Geometry	1X-1Y	
Video signal output level	White clip level	FFh	with 8bit
	Setup level	CXP-1 : 01 -1/+2 CXP-2-6 : 01 ±01	with 8bit and Gain 0dB
	※Setup level will change with gain up. This can be adjusted by BlackOffset.		
External trigger signal input	CoaXPress BNC Connector	Low speed uplink	20.83Mbps
	6pins circular connector No.5 pin	TTL level input	DC5.0V (Max. 5.5V)
General signal output	6pins circular connector No.3 pin	EXPOSURE, FVAL, LVAL, and UplinkTriger (After decoding)	Outputs 1 with register settings. 5V output

3.3. Spectral Response

※Please refer to MONO in the diagram below.

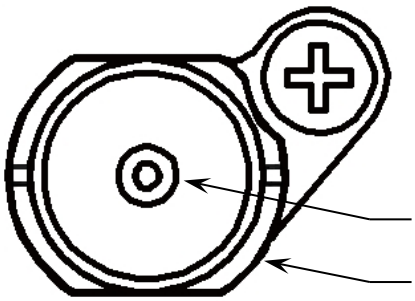
※Excludes characteristics of lens and light source.

Quantum Efficiency



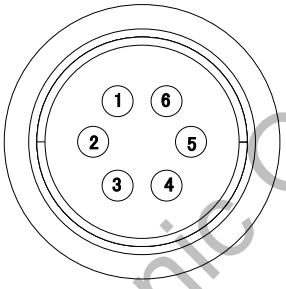
4. External Connector Pin Assignment

4.1. 75ΩBNC Connector



(BCJ-BPLHA: CANARE)

4.2. 6pins Connector Pin Assignment



(SNH-8-6(RPCB): SamWoo Electronics)

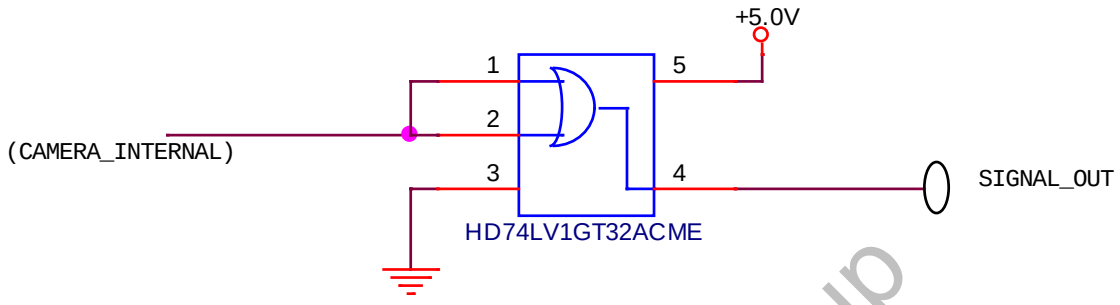
Pin No.	Signals	Note
1	NC	
2	NC	
3	SIGNAL_OUT	Output selected signals.
4	NC	
5	TRIGGER_IN	Trigger input.
6	GND	Ground camera chassis.

※NC=Non-Connection. Do not connect anything to the terminal.

☐ 3pins SIGNAL_OUT Circuit

This is to output timing signals in the camera. Please select signals to output with LineSource of DigitalIOControl. Please refer to Section 7.

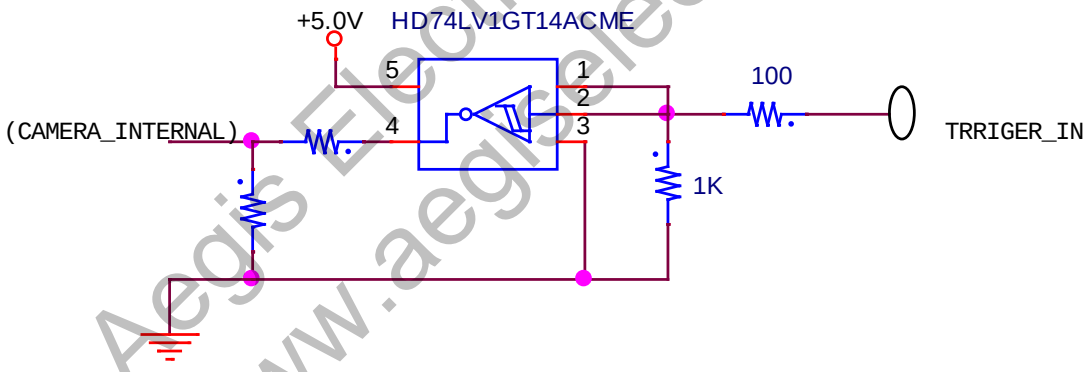
- 5.0V CMOS logic level output
- Output voltage Low: 0.55Vdc (Max.), High: 3.8Vdc (Min.)



☐ 5pins TRIGGER_IN Circuit

This is to input trigger directly from external equipment. Please set TriggerSource of AcquisitionControl to LineIn to use this terminal. Please refer to Section 6.

- 5.0V, 3.3V CMOS level / TTL compatible
- Voltage Low: 0.5Vdc (Min.), High: 2.1Vdc (Max.)



5. How to Save and Initialize Settings

UserSets	
UserSetSave	(Execute)
UserSetDefault	(Execute)

When execute UserSetDefault, it will be factory settings. Execution is only valid when link rate (CxpLinkConfiguration) is CXP-1. Even when executed, it will not be saved unless executing UserSetSave.
If you wish to save settings, execute UserSetSave. Setting values will be saved in camera memory and start with the saved settings next time when power up the camera.

6. Camera Functions

6.1. Link Configuration

Transfer Control	
CxpLinkConfiguration	CXP1_X1 CXP2_ X1 CXP3_ X1 CXP5_ X1 CXP6_ X1

6.2. Pixel Format Settings

ImageFormatControl	
PixelFormat	Mono8 Mono10

6.3. Camera Sync. Mode

Acquisition Control	
TriggerSelectorAndActivation	AquisitionMode FrameStartRisingEdge FrameStartFallingEdge FrameStartLevelHigh FrameStartLevelLow FrameBurstStart
TriggerSource	LinkTrigger0 Line0
TriggerSoftware	(Execute)

・TriggerSelectorAndActivation

AquisitionMode : Internal sync. mode (Free run mode)
FrameStartRisingEdge : External trigger sync. mode (Fixed trigger shutter mode: Rising edge)
FrameStartFallingEdge : External trigger sync. mode (Fixed trigger shutter mode: Falling edge)
FrameStartLevelHigh : External trigger sync. mode (Pulse width trigger shutter mode: High active)
FrameStartLevelLow : External trigger sync. mode (Pulse width trigger shutter mode: Low active)
FrameBurstStart : Internal sync. mode (Burst mode of sequence function)

・TriggerSource

This is to select where to send external triggers.

LinkTrigger0: Use LOW SPEED uplink of CoaXPress, and input triggers via coaxial cable from frame grabber board to use this trigger.

LineIn: This is to use by inputting triggers from No.5 pin of circular connector on the camera rear.

・TriggerSoftware

Camera generates a trigger to capture one frame image by executing this command. Please note that this trigger does not have temporal accuracy like the trigger by TriggerSource above.

Only TriggerSelectorAndActivation --- FrameStartRisingEdge mode is available for Acquisition Control mode.

6.3.1 Internal Trigger Sync. Mode (Free Run Mode)

This is a mode to use internal triggers continuously generated.

・ Set TriggerSelectorAndActivation to AcquisitionMode.

Configuration	Frame rate (fps)	
	8bit	10bit
CXP-1	21.3	16.3
CXP-2	42.6	34.8
CXP-3	42.6	42.6
CXP-5	85.1	69.5
CXP-6	85.1	85.1

6.3.2 External Trigger Sync. Mode

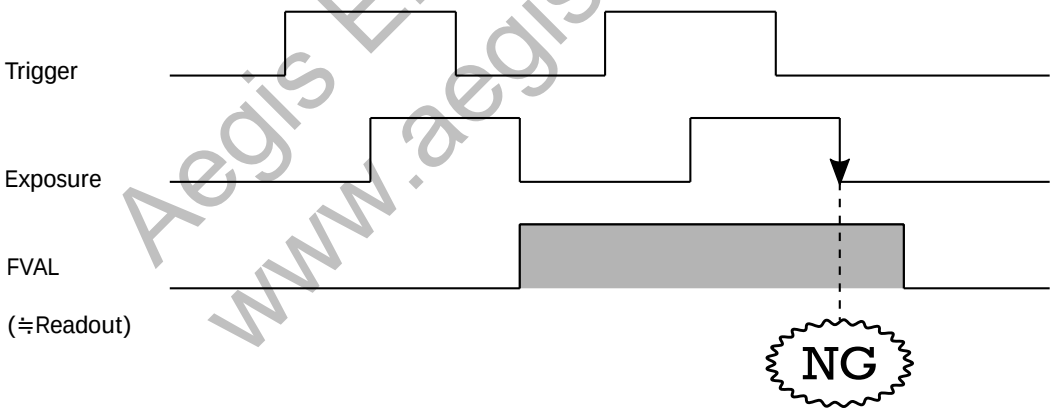
This is a mode to input external trigger signals to capture images by any preferred timings.

Please note that there are some delay from the camera recognizes the edge of trigger signals to actually inputting triggers to image sensor.

Input	Delay time
LinkTrigger0	Approx. 3.4μs
Line0	Approx. 150 ns

[Note]

User can input a trigger for the next frame while camera is reading out signals. However, do not input a trigger pulse to end exposure while camera is reading out signals. In other words, a trigger pulse to start reading out signals for the next frame before completion of reading out signals for the current frame is restricted.



If there is a trigger input with restricted timing explained in the above, or input trigger right after FVAL turns to “L” at the timing of end exposure, camera might stop video output. If the camera stops operating, or cannot output correct images, please stop trigger input and execute “SensorReset” command to start operation.

※If the camera does not start its operation, please reboot the camera.

Device Control	
SensorReset	(Execute)

[Note]
Due to the characteristics of image sensor, the timing from trigger input to actually starts exposure are different with normal readout operation (starts exposure for the next frame after completed readout) and with overlapping operation (starts exposure for the next frame while reading out).

・With full pixels operation (ROI_OFF)

Link rate	CXP1	CXP2	CXP3	CXP5	CXP6
Exposure delay with normal readout [µs] ※Exposure delay time (A) in the timing chart.	4	8	8	4	4
Exposure delay with overlapping [µs] ※Exposure delay time (B) in the timing chart.	26-49	19-31	19-31	9-15	9-15

・With sub-sampling

Link rate	CXP1	CXP2	CXP3	CXP5	CXP6
Exposure delay with normal readout [µs] ※Exposure delay time (A) in the timing chart.	4	8	8	4	4
Exposure delay with overlapping [µs] ※Exposure delay time (B) in the timing chart.	18-34	14-22	14-22	7-11	7-11

※Delay time will depend on frame rate and exposure time. With specific conditions, delay time will not change randomly.

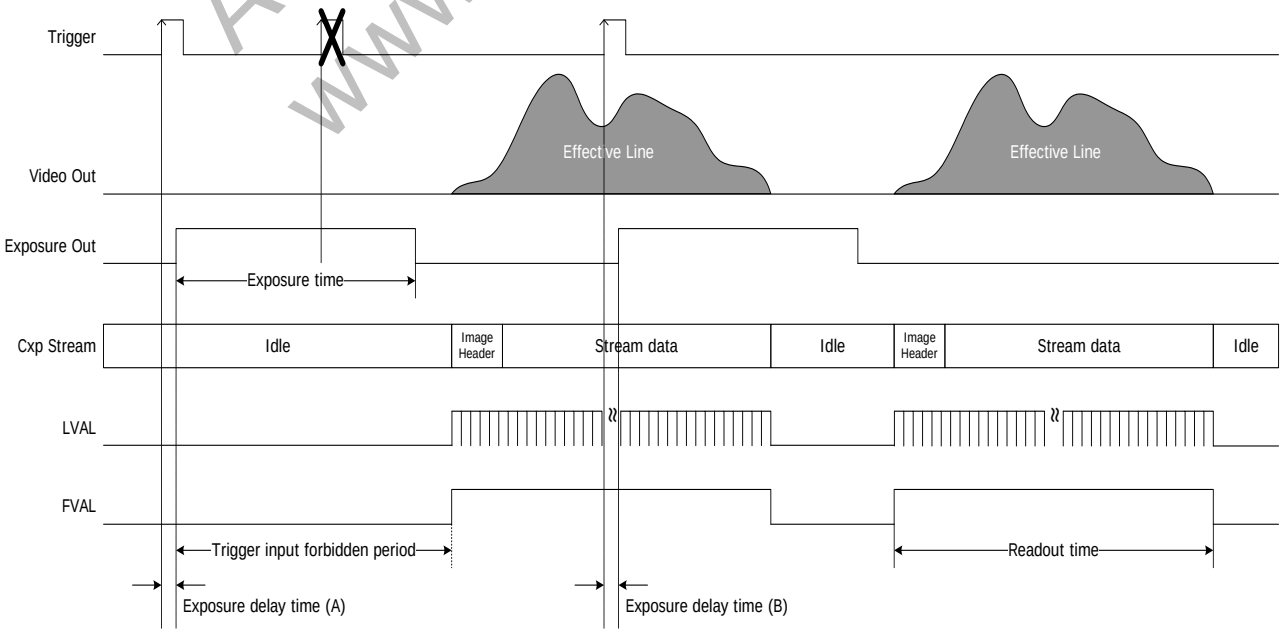
☐ Fixed Trigger Shutter Mode

This is to start exposure with trigger input and set exposure time with preset or manual.

・Set "TriggerSelectorAndActivation" to "FrameStartRisingEdge" or "FrameStartFallingEdge".

・Trigger cycle needs to be longer than FVAL period (≒1/frame rate).

・Trigger cycle needs to be longer than exposure time.
・Trigger operation is CLK sync., H-V sync. reset.
・30us or more of trigger pulse width can be input.
・The maximum exposure time will depends on ROI settings, "PixelFormat", and link rate.



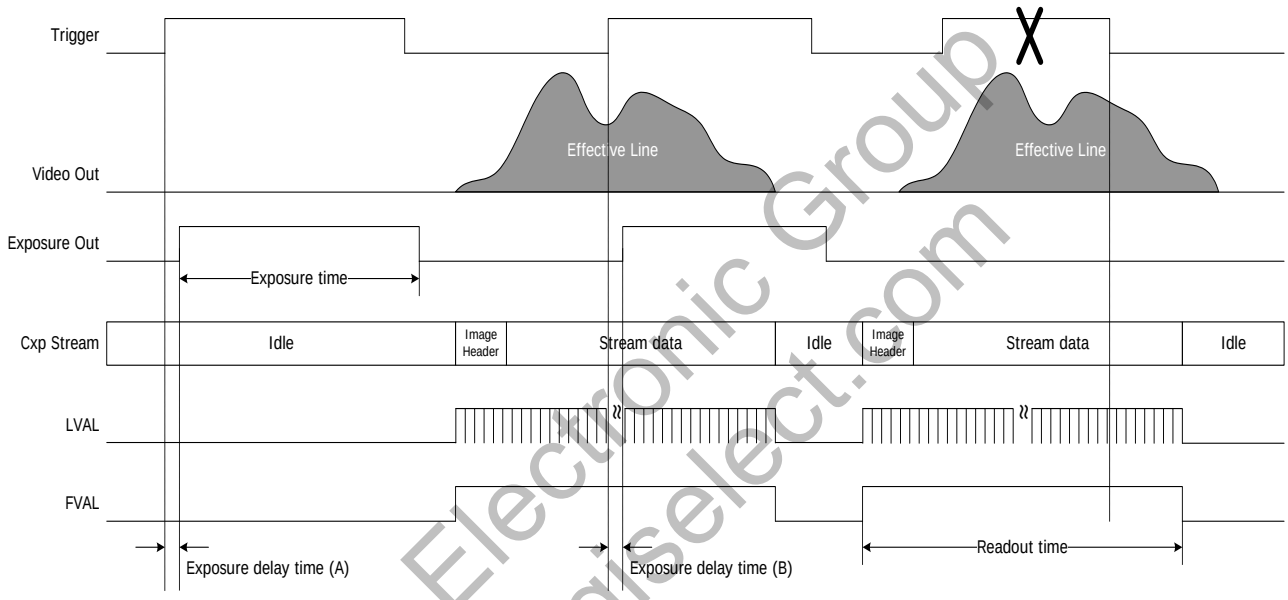
□ Pulse width trigger shutter mode

This is to start exposure with trigger input and set exposure time with trigger pulse width.

・Set "TriggerSelectorAndActivation" to "FrameStartLevelHigh" or "FrameStartLevelLow".

・Trigger cycle needs to be longer than FVAL period (≒1/framerate).

・Trigger operation is CLK sync., H-V sync. reset.
・The shortest trigger width is 30μs.
・Functionally, there is not upper limitation. However, noises, lines, pixel-wise FPN, and shadings may become noticeable with long timer exposure.



7. Camera Functions

7.1. Gain

Video output level can be improved with preset gain or manual gain. Setting values are both powered values. When set preset value, it will be reflected to manual settings.

※User can set gain values up to x32. With high gain settings, noise will increase and image quality deteriorates.

AnalogControl	
PresetGainX	Gain_x1
	Gain_x1_5
	Gain_x2
	Gain_x3
	Gain_x4
	Gain_x6
	Gain_x8
Gain	(Manual)

・PresetGainX: Preset gain

When set preset gain, it will be reflected to Gain of manual settings.

PresetGainX	Magnification	dB corresponding value
Gain_x1	x1	0dB
Gain_x1_5	x1.5	3.5dB
Gain_x2	x2	6dB
Gain_x3	x3	9.5dB
Gain_x4	x4	12dB
Gain_x6	x6	15.6dB
Gain_x8	x8	18dB

・Gain: Manual gain

Any preferred gain can be set per 0.25 from x1 to x32.

7.2. Exposure Time Settings

Exposure time can be set by using preset values or manual values.

Acquisition Control	
PresetShutter1_Xs	Shutter_1_100
	Shutter_1_150
	Shutter_1_300
	Shutter_1_600
	Shutter_1_1200
	Shutter_1_2500
	Shutter_1_5000
	Shutter_1_10000
ExposureTime	(Manual)

・PresetShutter1_Xs: Preset shutter mode

When set preset values, it will be reflected to “ExposureTime” of manual settings. Execution can be controlled by image size (ROI) and frame rate.

PresetShutter_1_Xs	Shutter (s)	Time
Shutter_1_100	1/100	10ms
Shutter_1_150	1/150	6.7 ms
Shutter_1_300	1/300	3.3 ms
Shutter_1_600	1/600	1.7 ms
Shutter_1_1200	1/1200	833 us
Shutter_1_2500	1/2500	400 us
Shutter_1_5000	1/5000	200 us
Shutter_1_10000	1/10000	100 us

・Manual shutter mode (ExposureTime)

The maximum exposure time will depend on video output format, link rate, and ROI settings. Please refer to the table below.

(Unit: us)

ROIQuick Change-	8Bit					10Bit				
	CXP1	CXP2	CXP3	CXP5	CXP6	CXP1	CXP2	CXP3	CXP5	CXP6
Off	46650	23360	23360	11680	11680	57270	28500	23300	14300	11550
Pattern1	39000	19300	19300	9510	9510	45600	22660	19300	11120	9520
Pattern2	21950	10890	10890	5340	5340	25210	12600	10850	6130	5300
Pattern3	19250	9550	9550	4640	4640	21200	10590	9510	5190	4640
Pattern4	14200	6960	6960	3410	3410	14650	7120	6980	3510	3410
Pattern5	12450	6070	6070	2920	2920	12440	6070	6070	2920	2920
Pattern6	6580	3110	3110	1450	1450	6580	3110	3110	1450	1450
Pattern7	4750	2370	2370	1160	1160	4750	2370	2370	1160	1160

	8Bit					10Bit				
	CXP1	CXP2	CXP3	CXP5	CXP6	CXP1	CXP2	CXP3	CXP5	CXP6
Subsampling	14190	7080	7080	3520	3520	14530	7260	7090	3630	3550

7.3. ROI (Region Of Interest)

This is to increase frame rate by vertically cutting and reducing readout area. User can select 1 area out of preset 7 patterns.

ImageFormatControl
ROIQuickChangePattern1 - 7
ROIQuickChangeOff

・This mode is mutually exclusive with sub-sampling mode.

・Please grab the viewer again to acquire images.

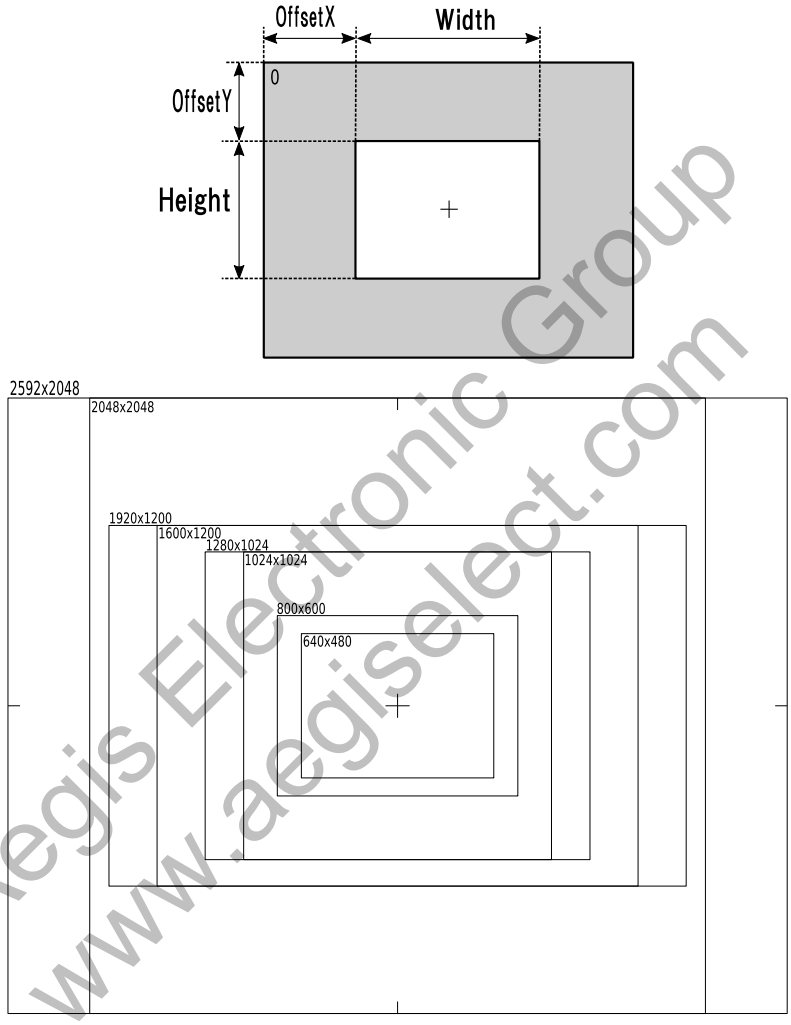
・Exposure end timing of image sensor may appear as pale horizontal line on the image depends on ROI mode and exposure timing.

ROIQuick Change-	Pixel number	Resolution	Frame rate (fps)					
				CXP-1	CXP-2	CXP-3	CXP-5	CXP-6
Off	2592x2048	5.2M	8bit	21.3	42.6	42.6	85.1	85.1
			10bit	16.3	34.8	42.6	69.5	85.1
Pattern1	2048x2048	2K2K(4M)	8bit	21.5	51.0	51.0	101.4	101.4
			10bit	19.2	43.5	51.0	85.8	101.4
Pattern2	1920x1200	WUXGA	8bit	41.7	90.1	90.1	179.4	179.4
			10bit	37.4	77.8	90.1	155.6	179.4
Pattern3	1600x1200	UXGA	8bit	45.8	102.2	102.2	204.4	204.4
			10bit	40.7	92.5	102.2	185.0	204.4
Pattern4	1280x1024	SXGA	8bit	64.9	138.4	138.4	274.7	274.7
			10bit	61.0	135.2	138.4	266.3	274.7
Pattern5	1024x1024	1K1K(1M)	8bit	73.2	158.4	158.4	313.9	313.9
			10bit	64.6	158.4	158.4	313.9	313.9
Pattern6	800x600	SVGA	8bit	137.3	297.9	297.9	585.9	585.9
			10bit	122.1	297.9	297.9	585.9	585.9
Pattern7	640x480	VGA	8bit	199.8	399.5	399.5	799.0	799.0
			10bit	183.1	399.5	399.5	799.0	799.0

・The selected ROI area can readout the following information.

ImageFormatControl
Width
Height
OffsetX
OffsetY

・ROI area is cutout based on the center of image sensor.



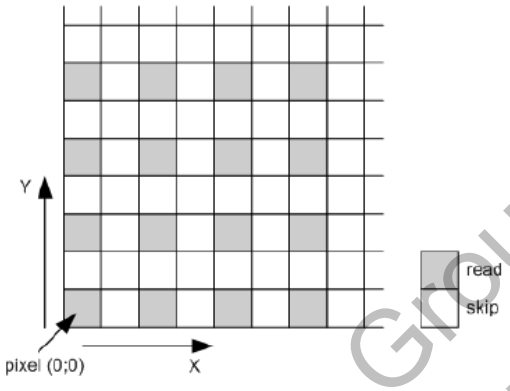
7.4. Sub-sampling

This is the mode to increase its frame rate by reducing the pixel numbers to read out, reducing both horizontal and vertical pixel number in half, that is, 1/4 of the entire pixels. The field angle remains the same as the one for full resolution.

ImageFormatControl	
SubsamplingMode	Subsampling_On
	Subsampling_Off

・This mode is mutually exclusive with ROI mode.
・Please grab the viewer again to acquire images.
・Please refer to the table in the next page for the frame rate when operating sub-sampling with free run mode.

Configuration	Frame rate (fps)	
	8bit	10bit
CXP-1	64.6	57.8
CXP-2	138.6	135.4
CXP-3	138.6	138.6
CXP-5	277.1	270.4
CXP-6	277.1	277.1



7.5. Defective Pixel Correction

CIS compensates the noticeable CMOS pixel defects found at the shipping inspection prior to our shipment.
User can turn off defective pixel correction.

AnalogControl	
DefectivePixelCorrection	True
	False

7.6. Shading Correction

This is a function to correct the peripheral brightness lowering caused by the lens and others.

AnalogControl	
ShaddingCorrection	True
	False
DetectShading	(Execute)

・Detect shading

Shoot a uniform object such as a pattern box, to full screen, then execute DetectShading, to calculate and save the correction data automatically in the camera.

※ When detecting shading, please make sure that ROI, sub-sampling, and shading correction settings are OFF.

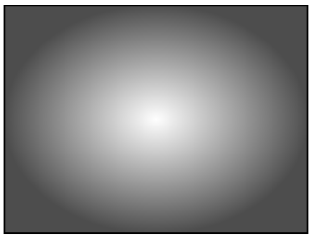
※ If DetectShading is executed with no video output at trigger mode operation, it cannot operate properly.
To execute DetectShading, a trigger signal needs to be input within 200ms after execution.

※ When obtain correction data with trigger shutter mode, the data sometimes becomes unstable. In this case, change the trigger cycle in small measure and obtain correction data again.

・Shading correction

Turn ShadingCorrection On to start shading correction according to the shading correction data prepared by DetectShading function.

◆ Before shading correction



◆ After shading correction

7.7. Black Level Adjustment

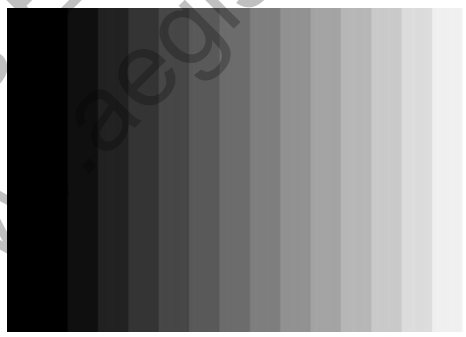
AnalogControl	
BlackOffset	0~255

- The initial setting value is 64.
- Black level is adjustable with relative values. When it is increased by 1, its luminance level changes by approx. 0.25 with 8bit output, and it changes by approx. 1.0 at 10bit output.
- When the lower values than the initial value is set, saturation level will not achieve to the maximum value of output range.

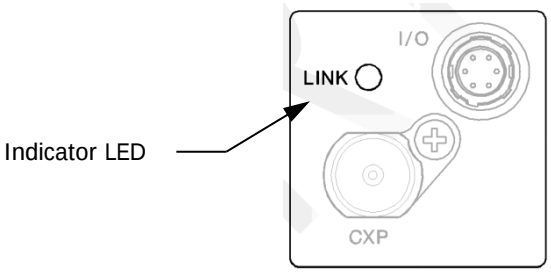
7.8. Test Pattern Indication

ImageFormatControl	
TestImageMode	OFF/ON

Test pattern can be output from the camera. It is useful to check if your system is operating normal.



7.9. LED Indicator



DeviceControl	
DeviceIndicatorMode	Active ErrorStatus Inactive

- Active : Indicate communication status of CoaXPress.
- ErrorStatus : Light only when there was an error in the system.
- Inactive : ALL LED OFF.

Lighting patterns of LED when it is set to active are as follows. It shows the camera status by the way of its lighting.

Lighting status	Camera status
OFF	No PoCXP Supplied
Green Slow Blinking [0.5Hz]	Confirmed connection of the device and the host.
Green Lighting	Transmitting video data.
Orange Slow Blinking [1Hz]	Waiting for a trigger input.
Red Fast Blinking	System error occurred.

※ There might be some cases that LED Red blinks to show system error, even though its operation is normal. The camera will keep indicating error if the camera recognized an error in any occasion such as when a trigger was input at the prohibited timing, and when ROI or sub-sampling was changed with keep grabbing video output. To restore this to normal LED lighting status, reboot the camera or execute Device Control—SensorReset.

7.10. Camera Timing Output

According to the settings of LineSource, the following signals can be output from the 6pins circular connector at the camera rear.

Digital IO Control	
LineSelector	Line1
LineMode	Output
LineSource	OFF ExposureActive FrameActive LineActive TriggerPacketActive

・LineSource

ExposureActive	: Indicate exposure period of image sensor as Hi Active.
FrameActive	: Indicate the effective period of the frame as Hi Active.
LineActive	: Indicate the effective period of the line as Hi Active.
TriggerPacketActive	: Decode and output uplink trigger packet signals from the frame grabber board.

7.11. Device User ID

DeviceControl	
DeviceUserID	[User Definition]

Set a letter string as DeviceUserID with up to 16 characters by executing "UserSetSave" to EEPROM in the camera.
Execute “UserSetDefault” if you wish to restore it to the factory setting.

※ This is a resister area for up to 16byte. English single byte characters are effective.

8. Sequence Control Function

This is the function to select one set of parameter out of the several preset parameter sets per every trigger input, and apply it to the camera.

・ 16 sets of parameter can be preset. Each parameter set can set the following parameter.
Parameters able to be set: shutter, gain

・ Specify operation sequence as ”Index”. Specify the parameter set number to apply for the max. 16 indexes.

・ There are three operation modes for sequence; Trigger mode, Index mode, and Burst mode

・ Please refer to the following table for AcquisitionMode (Camera operating mode) and SequencerActivation (Starting operation) which are able to set and corresponds to each sequence mode.

AcquisitionControl AquisitionMode [TriggerSelectorAndActivation] / 【Sequence operational mode】	FrameStartRisingEdge	FrameStartFallingEdge	FrameStartLevelHigh	FrameStartLevelLow	FrameBurstStart	SequencerControl [SequencerActivation]
Trigger mode	◎	◎	◎	◎		FrameStartPredfined
Index mode	◎	◎	◎	◎		FrameStartIndexselector
Burst mode					◎	FrameBurstStartEdge FrameBurstStartLevel FrameBurstStartSoftware

8.1. Basic Operation

Please set the following operational modes to use sequence control function.

(1) AquisitionControl --- TriggerSelectorAndActivation setting
This is to set camera operational mode.

(2) Sub-sampling and ROI settings
Make sure to turn off Sub-sampling mode. Please set ROI of ImageFormatControl to ROIQuickChangeOff.
This will not operate with sequence control function.

(3) Set the parameter table for sequence (SequencerParameterSetSelector)
Set ExposureTime and Gain for each parameter set.

(4) Set the parameter set for sequence (ParameterIndexNumber), index loop count (IndexLoopCount), whole sequence loop count (SeqencerLoopCount), and index range (ActiveIndexNumber).

(5) SequencerControl --- SequencerActivation setting
This is to set the start operation of sequence. By switching to the preferred [SequencerActivation] from Off, the camera will become trigger waiting status.

(6) This is to start sequence control operation by inputting the trigger to operate sequence.

[Note]

- Please decide link configuration before making each setting.
- The restrictions of trigger input timing with sequence control is the same as the one with normal mode.
- Please make sure to turn off SequencerActivation once to make settings for sequence.
- SequencerMode is not subject to UserSetSave and UserSetDefault. Therefore, please set them after turn on the power. (Other settings for sequence is subject to UserSetSave and UserSetDefault.
- When the trigger is input to the camera, sequence will start when SequencerActivation is set to other than Off. Do not input triggers when switch SequencerActivation.
- Please refer to the Max. exposure time with manual shutter in Section 8.2 for the exposure time to input in each parameter set.
- When sequence control is completed, the screen will stop at the last image of sequence control with burst mode.
- The camera will return to the status before sequence control when turn Off SequencerActivation.

8.2. Operation Outline for Trigger Mode and Burst Mode

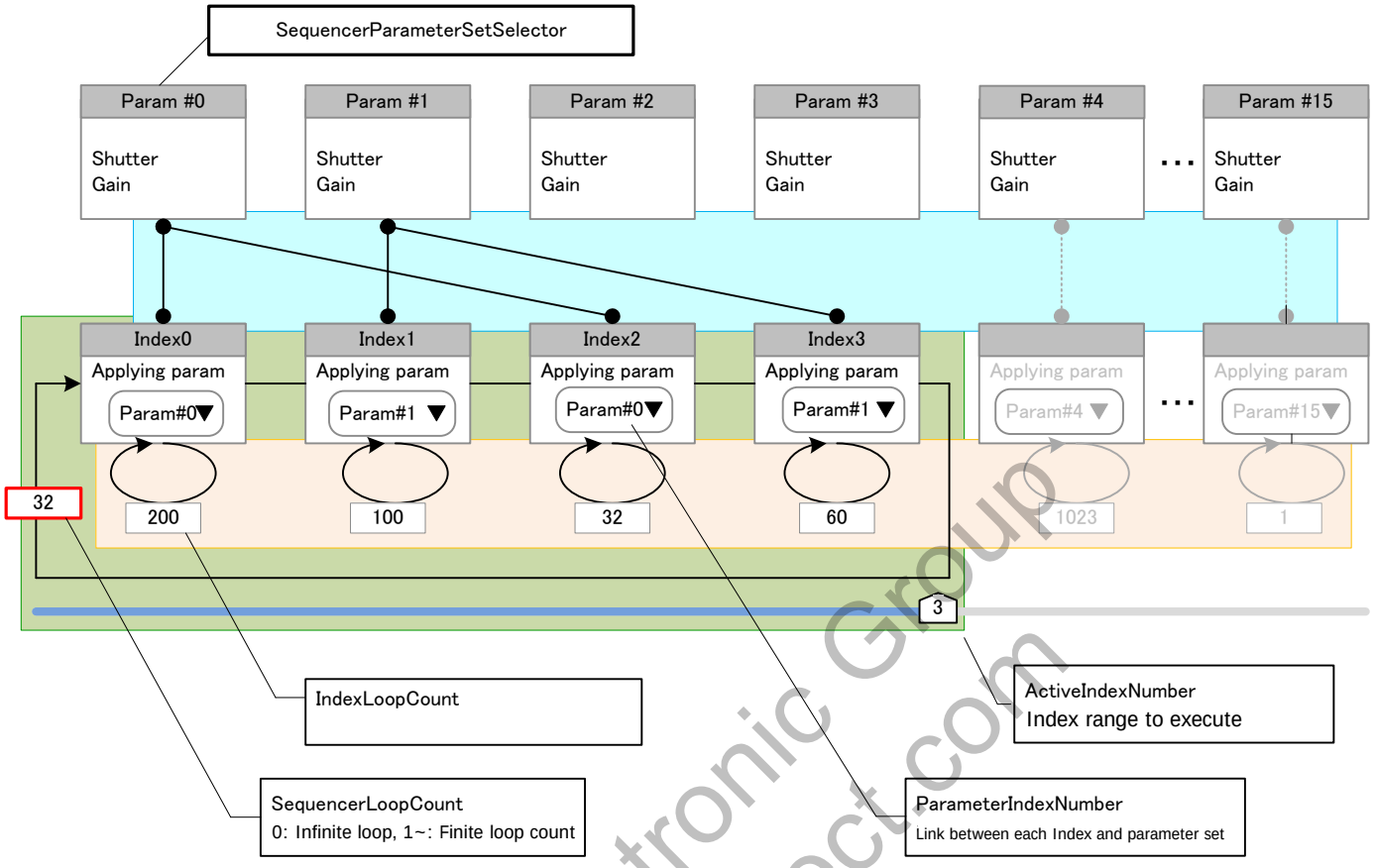
This is to designate Index transition motion in advance, and set repeating count of each Index and Loop count.

・Trigger mode

Index repeat count is increased every time when external trigger is input, and the designated parameter set will be applied to the camera.

・Burst mode

Operation of this mode is equivalent to free run of internal sync mode. Sequence starts with trigger, repeating count of Index will be added automatically with camera internal trigger, and the designated parameter set will be applied to the camera.

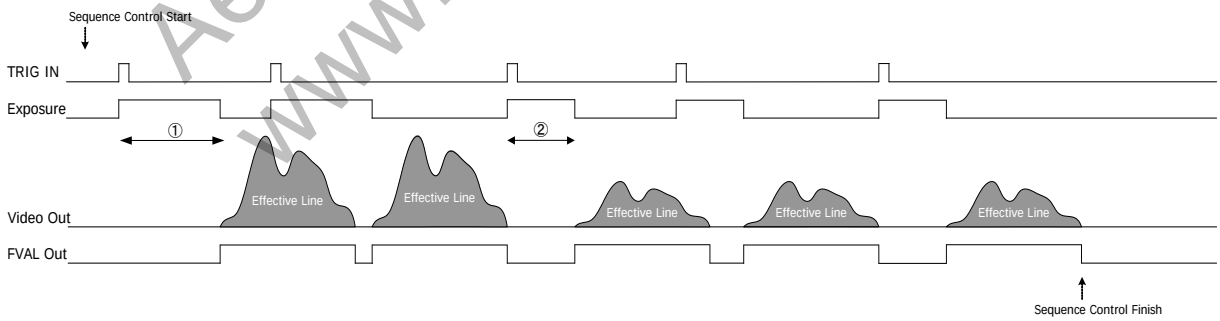


8.3. Trigger Mode

Edge control by using trigger input signals and pulse width control are selectable for sequence operation.

・Set TriggerSelectorAndActivation to either FrameStartRisingEdge/ FrameStartFallingEdge/ FrameStartLevelHigh/ FrameStartLevelLow depends on the way of control.

(1) Edge control

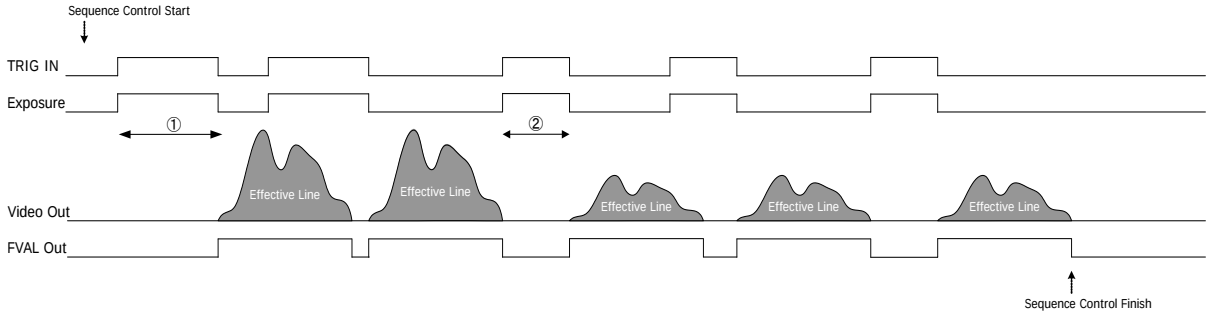


This is to operate trigger by setting TriggerSelectorAndActivation to FrameStartRisingEdge or FrameStartFallingEdge, and inputting trigger.

・Exposure time (① and ②) for each frame will be controlled by the preset sequence parameter set.

・Sequence will end and operation will stop at the timing of when image output for sequence loop count is completed.

(2) Pulse width control



Set TriggerSelectorAndActivation to FrameStartLevelHigh or FrameStartLevelLow, and input trigger to proceed sequence.

・Trigger pulse width is exposure time (① and ②) for each frame.

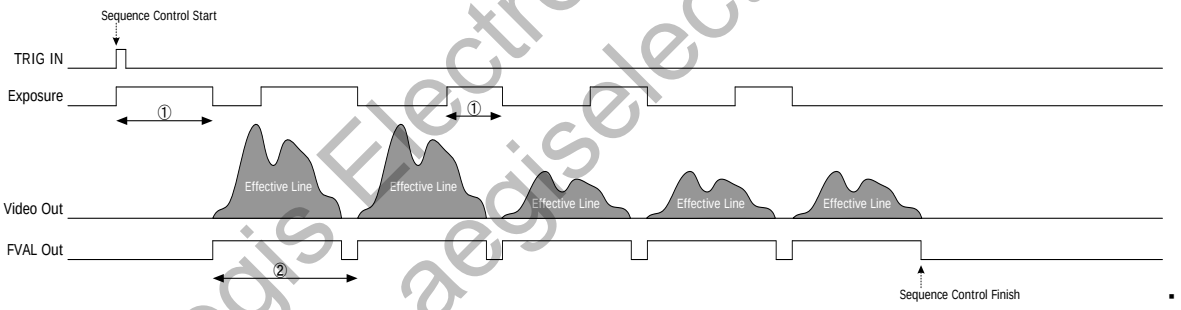
・Sequence will end and operation will stop at the timing of when image output for sequence loop count is completed.

8.4. Burst Mode

Edge control, level control, and register start by using trigger input signal are selectable for start and end of sequence operation.

・Set TriggerSelectorAndActivation to FrameBurstStart.

(1) Edge control

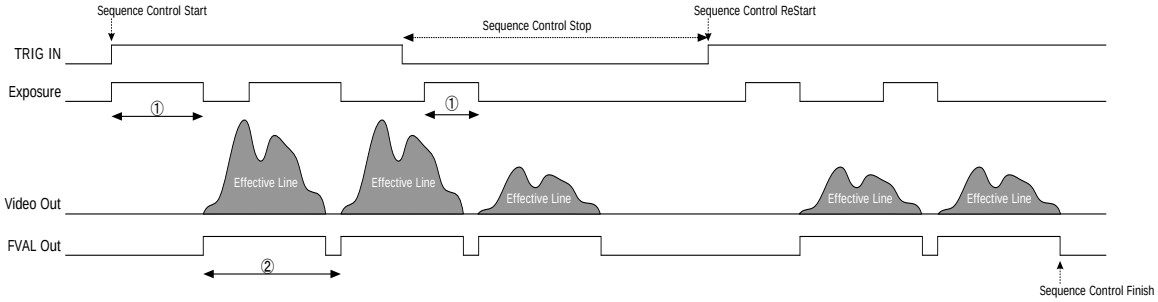


Sequence operation starts by setting SequencerActivation to FrameBurstStartEdge, and inputting trigger.

・Exposure time (①) for each frame and output frame time (②) will be controlled by preset sequence parameter set and image size setting.

・Sequence will end and operation will stop at the timing of when image output for sequence loop count is completed.

(2) High level control



Set SequencerActivation to FrameBurstStartLevel, and perform sequence operation during the period when trigger input is at High level.

・High level control can be stopped in the middle of the operation by setting trigger input to Low level.
(If you wish to exit as it is, turn Off sequence control.)
By setting trigger input to High level, Sequence operation resumes its operation.
・Sequence will end and operation will stop at the timing of when image output for sequence loop count is completed.

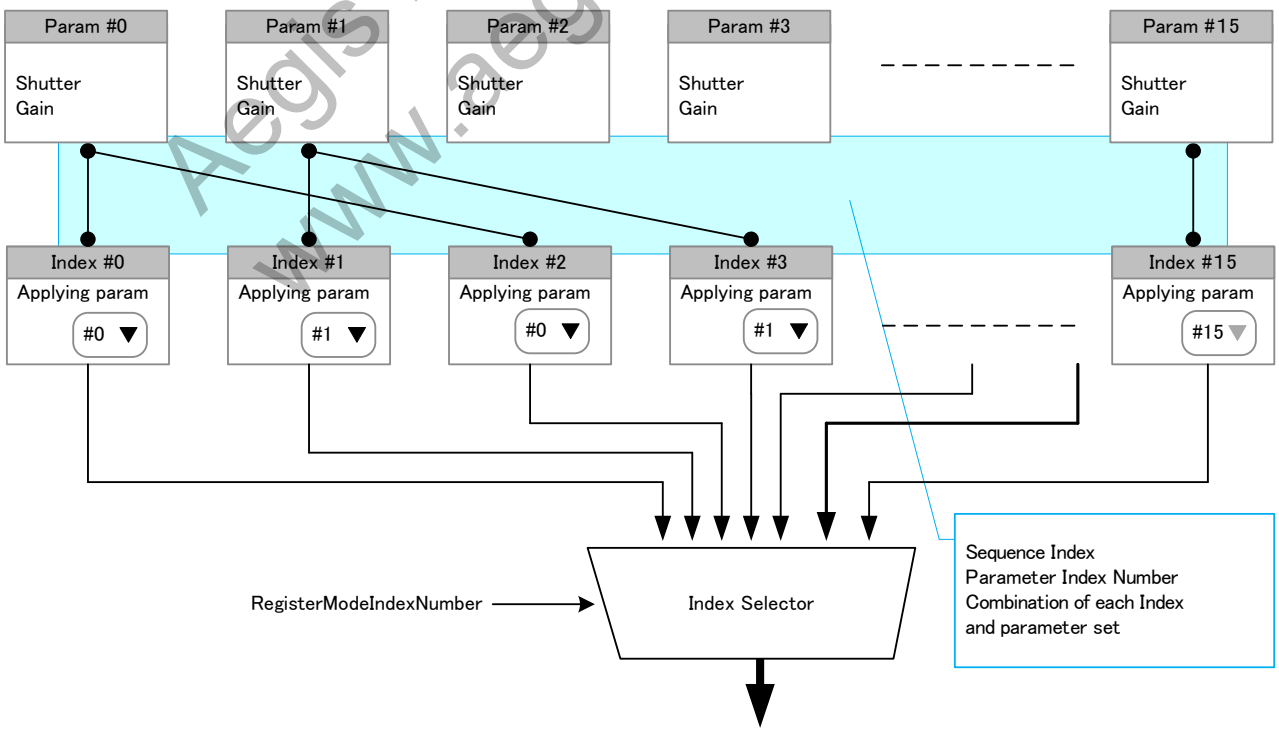
(3) Register start

Sequence operation starts at the timing of when set SequencerActivation from Off to FrameBurstStartSoftware.

8.5. Index Mode

This is a mode to designate Index number to apply directly with IndexSelectorModeIndexNumber.
The Index parameter set designated by IndexSelectorModeIndexNumber will be applied to the camera each time when trigger is input.

Operation schematic diagram



・Set TriggerSelectorAndActivation to either FrameStartRisingEdge/ FrameStartFallingEdge/ FrameStartLevelHigh/ FrameStartLevelLow depends on the way of control.

(1) Edge control
Exposure time for each frame will be controlled by preset parameter set.

(2) Pulse width control
Trigger pulse width is exposure time for each frame. Exposure time of parameter set are not referred.

※ Note for IndexSelectorModeIndexNumber command issuing timing
Input trigger pulse after IndexSelectorModeIndexNumber is issued and ACK is replied in order to reflect designated parameter set at the next frame.

8.6. How to set Sequence control

Execute UserSetSave to save settings. SequencerActivation will always be turned Off at power-on since SequencerActivation will not be saved. Please make settings every time when using sequence mode.

◇How to set sequence control

Acquisition Control	
TriggerSelectorAndActivation	AquisitionMode FrameStartRisingEdge FrameStartFallingEdge FrameStartLevelHigh FrameStartLevelLow FrameBurstStart

・FrameStartRisingEdge : Set sequence control to rising edge of trigger pulse.
・FrameStartFallingEdge : Set sequence control to falling edge of trigger pulse.
・FrameStartLevelHigh : Set sequence control to high level control of trigger pulse.
・FrameStartLevelLow : Set sequence control to low level control of trigger pulse.
・FrameBurstStart : Set when using sequence control with burst mode.

◇Shifting to sequence mode

SequencerControl	
SequencerActivation	Off
	FrameStartPredefined
	FrameStartIndexSelector
	FrameBurstStartEdge
	FrameBurstStartLevel
	FrameBurstStartSoftware

・FrameStartPredefined : Set to start trigger mode and burst mode.
・FrameStartIndexSelector : Set to start index mode.
・FrameBurstStartEdge : Set to start edge control of burst mode.
・FrameBurstStartLevel : Set to start High level control of burst mode.
・FrameBurstStartSoftware : Set to start register start of burst mode.

◇Settings for sequence count and the range

SequencerConfigurationParameter		Setting range
SequencerLoopCount	Loop count for entire sequence	1-1023 0: Infinite
ActiveIndexNumber	The range of Index to execute	0-15
IndexSelectorModeIndexNumber	Index number to use with Index mode.	0-15
ParameterIndexNumber		
Index0-15	Parameter number of Index0-15.	0-15
IndexLoopCount		
IndexCount0-15	Each loop count for Index0-15.	1-1023

◇There are 16 sets of sequence parameter. If the number of SequencerParameterSetSelector is changed, the parameter set will be changed as well. Even when parameter number is changed, setting data will be kept.

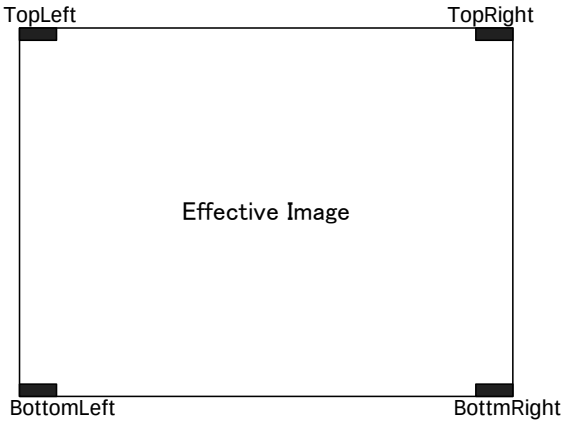
SequencerParameterSetSelector		0~15 Parameter set
SetConfiguration		
	SequencerExposureTime	Exposure time
	(SequencerExposureTimeMAX)	Indicate the maximum exposure time able to be set.
	SequencerGain	Gain
	(SequencerXSize)	X size set with ROI will be set.
	(SequencerYSize)	Y size set with ROI will be set.
	(SequencerXStart)	X coordinate set with ROI will be set.
	(SequencerYStart)	Y coordinate set with ROI will be set.

8.7. Sequence Information Output

This is to indicate the status of sequence control. The status information is embedded in the effective image area to be output.

SequencerStatus		
SequencerInformationLocation		Designate the position to indicate status information.
	Off	Output of status information OFF.
	TopLeft	Upper left output
	TopRight	Upper right output
	BottomLeft	Lower left output
	BottomRight	Lower right output
FrameBurstStatus		Indicate status of sequence burst mode.
IndexNumberStatus		Indicate the Index number in execution.
RepeatNumberStatus		Indicate the repeating count of Index number in execution.
LoopNumberStatus		Indicate the sequence loop count in execution. ※When loop count is set to infinity, indication will be up to 1023 loop count.

The position to indicate the status information can be selected out of four positions as below, and the information will be embedded into 5 pixels.



Pix0	Pix1	Pix2	Pix3	Pix4

Information on Index number, Index repeating count, and Loop count are output to each pixel as follows. With 10bit video output, 2 bit on LSB side will always be “00”.

	MSB			LSB
pix0	“00”	Index Number [3:0]	“0000”	“00”
pix1	“00”	Repeating count [7:0]		“00”
pix2	“00”	“000000”	Repeating count [9:8]	“00”
pix3	“00”	Loop count [7:0]		“00”
pix4	“00”	“000000”	Loop count [9:8]	“00”

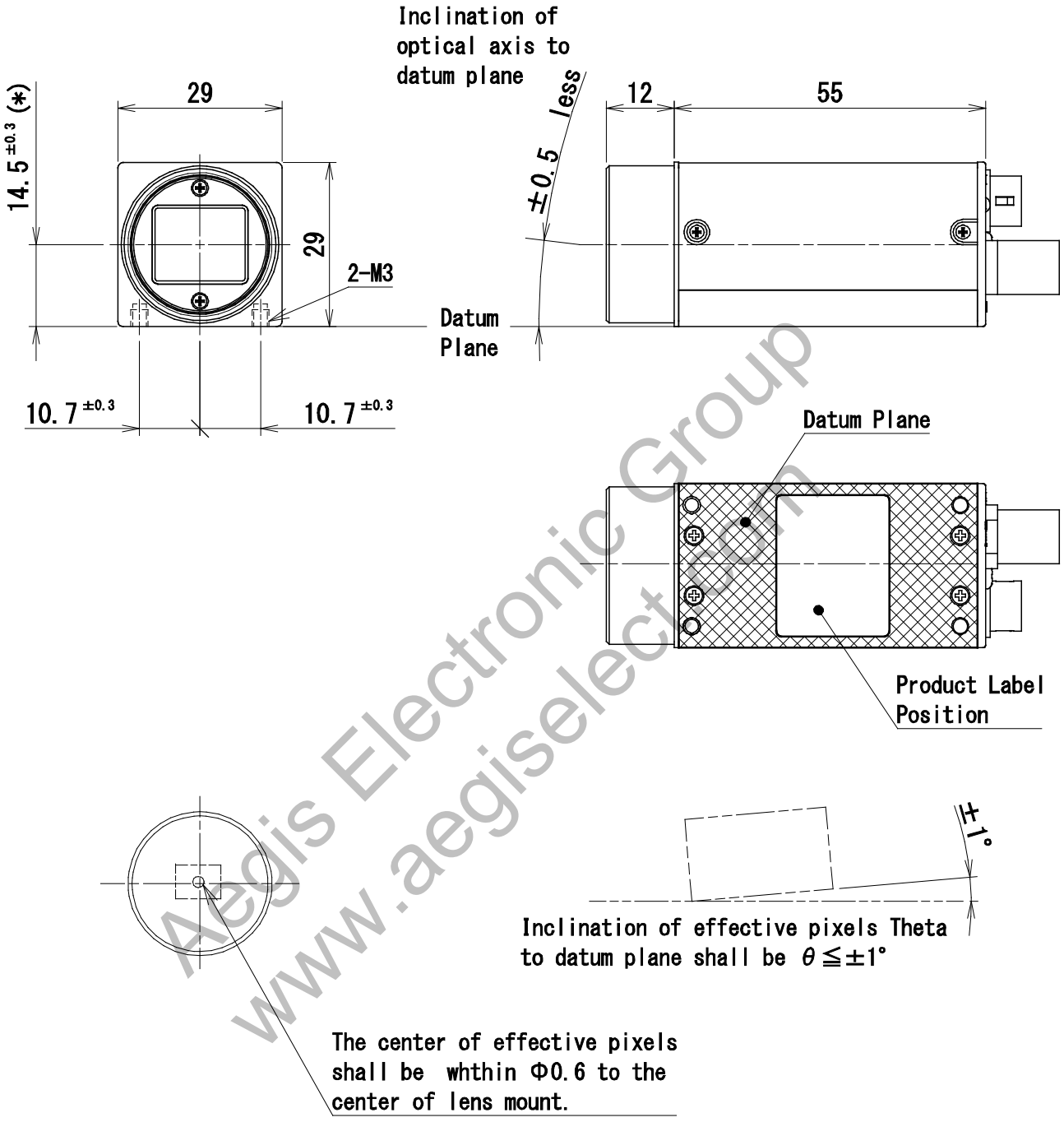
9. Factory Settings

Function	Data	Descriptions
DeviceControl		
DeviceUserID	ID00DevU0000000H	
DeviceIndicatorMode	Active	
ImageFormatControl		
ROIQuickChangeOff	Width : 2592	
	Height : 2048	
	OffsetX : 0	
	OffsetY : 0	
PixelFormat	MONO8	
AquisitionControl		
TriggerSelectorAndActivation	AcquisitionMode	
TriggerSource	LinkTrigger0	
ExposureTime	3333.0	
AnalogControl		
blackOffset	64	
Gain	1.0	
ShadingCorrection	False	
DefectivePixelCorrection	True	
DigitalIOControl		
LineSource	OFF	
SequencerControl		
SequencerActivation	Off	
SequencerInformationLocation	Off	
Index0~Index15	0~15	Same value as Index number
Index0Count~Index15Count	1	All 1
SequencerLoopCount	0	
ActiveIndexModeIndexNumber	0	
SequencerExposureTime	1000.0	(Selector 0-15)
SequencerGain	1.0	(Selector 0-15)
TransportLayer		
CxpLinkConfiguration	CXP_X1	

※ Factory settings are the same values as UserSetDefault commands.

10. Dimensions

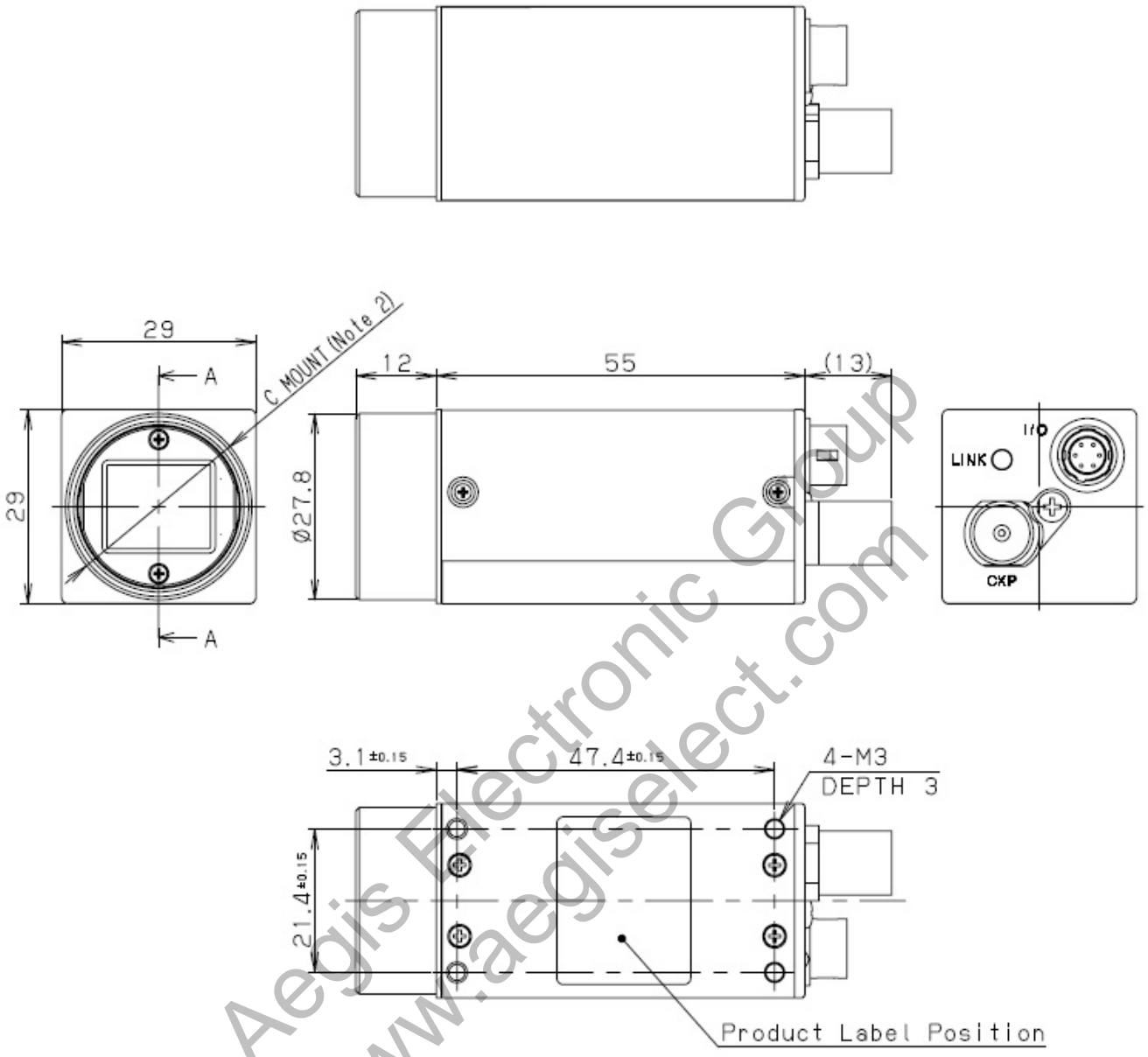
10.1. Optical Axis Accuracy



(*)Dimension from datum plane to the center of lens mount.

937-0012-00
(Unit:mm)

10.2. Camera Dimensions



Note2) C mount screws comply with ANSI/ASME B1.1.1-32UN(2B).
Note1) Screw length from the lens mount surface shall be less than 6 mm. And protruding portion of the C mount lens shall be less than 10 mm.

935-0189-00
(Unit:mm)

11. Case for Indemnity (Limited Warranty)

The term of warranty of this product is within 3 years from the date of shipping out from our factory.
If you use the product properly and discover a defect during the warranty period, and if that was caused by designing or manufacturing, CIS Corporation, at its option, repairs or replaces it at no charge to you. Products out of warranty period will be subject to charge.

CIS should not hold responsible for damages or losses if;

- damages or losses are caused by earthquake, lightning strike, fire, flood or other acts of God.
- damages or losses are caused by deliberate or accidental misuse by user, or failure to observe the information contained in the instructions in this Product Specification and Operational Manual.
- damages or losses are caused by repair or modification conducted by customer or any unauthorized party.

・CMOS Defective Pixels

CIS applies defective pixel correction prior to shipment of the product. However, the number of defective pixels are subject to increase due primarily to the effect of cosmic rays. Due to this nature, CIS should not hold responsible for the natural increase of defective pixels.

12. Product Support

Should you have any problems in function of the product you purchased, and if you need our further analysis and/or repair, please contact your local distributor.