CIS

CoaXPress I/F
12M CMOS B/W Camera

VCC-12CXP4M

Product Specifications & Operational Manual

CIS Corporation

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1. Handling Precautions

1.1. Camera Handling Precautions

- ☐ Do not use or store the camera in the extremely dusty or humid places.
- ☐ Do not apply excessive force or static electricity that could damage the camera. Handle the camera with care.
- ☐ Do not shoot direct images that are extremely bright (e.g., strong light source, sun, etc.). When strong light such as spot light was shot, blooming or smear may occur. Put the lens cap on when camera is not in use.
- ☐ Follow the instructions in Chapter 3.3, "External Connector Pin Assignment" for connecting the camera module. Improper connection may cause damages not only to the camera module but also to the connected devices.
- ☐ Confirm the mutual ground potential carefully before connecting the camera to monitors or computers. Any AC leaks or coupling noises 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 assembly.
- ☐ Our warranty does not apply to damages or defects caused by irregular and/or abnormal use of the product.

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 specified in this manual.

1.3. Disclaimers (Exception Clause)

CIS shall be exempted from taking responsibility and held harmless for damages or losses incurred by the following cases.

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

[About Heat Dissipation]
CIS basically recommends you to use M42 mount or F mount lenses with VCC-12CXP4M camera. Lens mount conversion rings are prepared.
Using 4pcs of M4 screws at the front and fixing the camera on a metal frame also helps to dissipate heat effectively.

2. Product Outline

☐ VCC-12CXP4M is a CoaXPress interfaced and 12M resolution B/W camera module. 12M pixels, 1.1 type B/W CMOS sensor is utilized.

2.1. Features

- ☐ Small footprint: 55mm(H) x 55mm(W) x 30mm(D)
- ☐ Global Shutter type CMOS sensor
- ☐ CoaXPress CXP-3, CXP-6 are supported.
- ☐ 2lanes or 1lane
- ☐ Exposure and Gain Settings
- ☐ External trigger mode (Fixed trigger shutter mode / Pulse width trigger shutter mode)
- ☐ GenICam complied
- ☐ M42 lens mount

2.2. System Configuration

- ☐ Camera
  - ・ Camera VCC-12CXP4M
- ☐ Optional Accessories (sold separately)
  - ・ M42-F Lens Mount Conversion Ring
  - ・ M42-C Lens Mount Conversion Ring
- ☐ Packaging
  - ・ Individual Carton
  - ・ Master Carton (20 pcs/carton)

    Note) Master carton may vary depends on the quantity to be shipped.

3. Specifications

3.1. General Specifications

Electrical Specifications			
Pick up device	Device type	1.1 type Global shutter CMOS	
	Effective pixel number	4096(H) × 3000(V)	
	Unit cell size	3.45μm(H) × 3.45μm(V)	
Video output mode		Ver,1.1.1 complied, CXP6 / CXP3 x2, x1 complied	
Pixel clock frequency		74.25MHz	
Video output format (MONO ver.)		Mono 8 / Mono 10	
Frame rate	CXP3 8bit/10bit 1lane	16.2fps	
	CXP3 8bit/10bit 2lanes	32.3fps	
	CXP6 8bit/10bit 1lane	32.3fps	
	CXP6 8bit/10bit 2lanes	64.7fps	
Sync. system		Internal sync. system	
Resolution (The maximum pixel size)		4096 (H) × 3000(V)	
Video signals (Gain 0dB)	White clip level	255dig	At 8bit output
	Set up level	2±2dig	At 8bit output
	Dark shading	Under 4dig for both horizontal and vertical	At 8bit output
Sensitivity		F5.6 400lx (Shutter speed 1/27s, Gain 0dB)	
Minimum illumination		F1.4 0.3 lx (Gain +36dB, Shutter speed 1/27s, level=50%)	
Gain variable range		x1~x64 (0dB~+36dB) [Warranty coverage]	
Shutter speed		Manual settings	
Trigger mode		Free run mode (Camera internal trigger) Trigger mode (Host, External terminal) ・Fixed trigger shutter mode ・Pulse width trigger mode	
Partial scan		Vertical 8 areas can be set.	
Power requirements		PoCXP : 18.5~26V	
Power consumption (typ)		4.3W (CXP-6) [At free run]	
Mechanical Specifications			
Dimensions		H:55mm W:55mm D:30mm (Without protruding portion)	
Weight		Approx. 120g	
Lens mount		M42 mount	
Environmental Specifications			
Safety/Quality standard T.B.D		UL: Conform to UL for all materials. CE: EMC 2014/30/EU EN61000-6-4:2007+A1:2011 for Emission EN61000-6-2:2005 for Immunity	
		RoHS: 2015/863/EU EN50581 (RoHS2)	
Durability	Vibration T.B.D	Acceleration	: 98m/s^2 (10G)
		Frequency	: 20 ~ 200Hz
		Direction	: X, Y, and Z 3 directions
		Testing time	: 120min for each direction
	Shock T.B.D	No malfunction shall be occurred with 980m/s^2(100G) for ±X,±Y, and ±Z, 6 directions without packaging.	

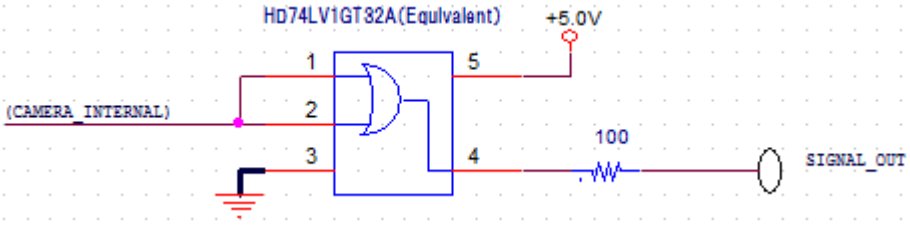
Operation gGuaranteed tTemperature	0 ~ +45°C Humidity 20 ~ 80%RH with no condensation
Storage tTemperature	-30 ~ +60°C Humidity 20 ~ 80%RH with no condensation

3.2. Camera Input and Output Signals Specifications

☐ 3pins SIGNAL_OUT Circuit

This is to output camera internal timing signal. Please set the signal to be output by LineSource of DigitalIO Control.

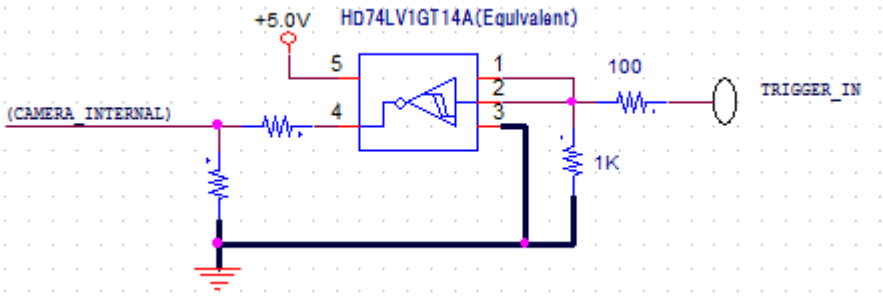
- 5.0V Logic level output
- Output voltage Low: 0.55Vdc (Max.), High: 3.8Vdc (Min.)



☐ 5pins TRIGGER_IN Circuit

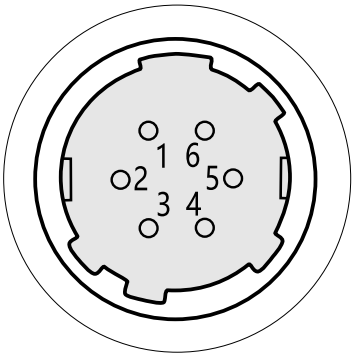
This is to input trigger directly from external device. Please set TriggerSource of AcquisitionControl to Line0 when use this terminal.

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



3.3. External Connector Pin Assignment

3.3.1 6pins Circular Connector (I/O)



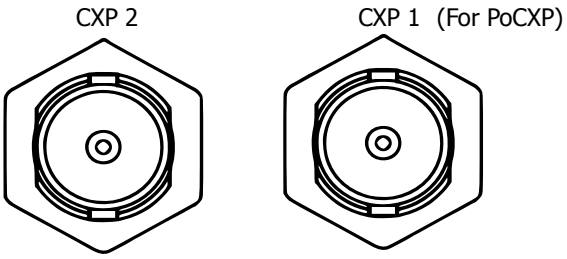
Equivalent to HR10A-7R-6PB (Hirose)

Pin No.	Signals	Description
1	NC	
2	NC	
3	SIGNAL_OUT	Exposure/FVAL/LVAL/LinkTrigger Output
4	NC	
5	TRIGGER_IN	Trigger input
6	GND	Conduction with camera module

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

3.3.2 75ΩBNC Connector

- ☐ CoaXPress video output signals.
- ☐ CXP 1 is the connector for PoCXP.



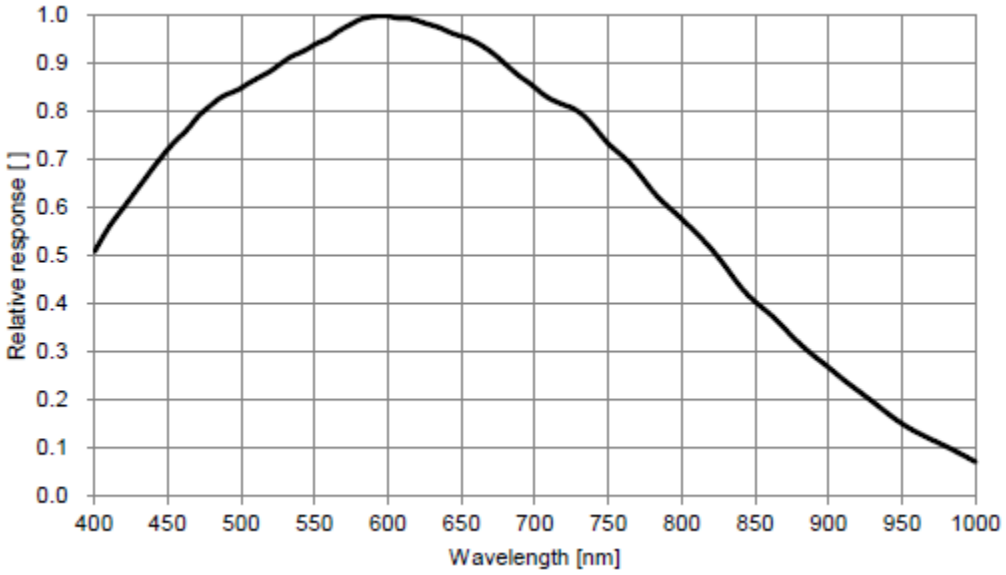
3.3.3 LED Indicator

- ☐ When the LED indicator is set to Active, lighting patterns of LED shows the camera status by the way of its lighting.

OFF	No Power supplied
Green/Orange Fast Blinking [12.5Hz]	1 cable line is not connected.
Green Lighting	Confirmed connection of the device and the host.
Green Fast Blinking [12.5Hz]	Transmitting video data.
Orange Slow Blinking [1Hz]	Waiting for the trigger input.
Red Fast Blinking [12.5Hz]	System error occurred.

3.4. Spectral Response

※The lens characteristics, the optical glass characteristics, and the illuminant characteristics are excluded.



< B/W Model >

4. Camera Operational Function

4.1. Control System

☐ Complies with CoaXPress standard.

4.2. How to Save and Initialize the Settings

UserSetControl	
UserSetSelector	Default UserSet0
UserSetLoad	Execute
UserSetSave	Execute

☐ If you wish to save the setting values, execute "UserSetSave" by selecting UserSet0 (User save area) of UserSetSelector. Doing so, the setting values shall be saved in the camera non-volatile memory.

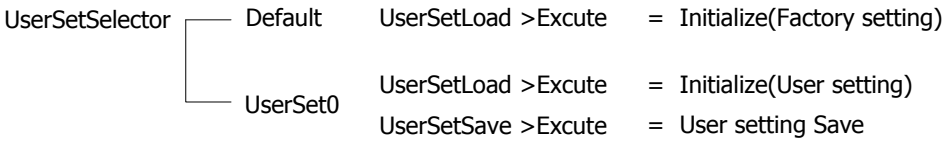
- Since Default (Factory settings) is a defined value, it cannot be saved.
- The value of UserSetSelector cannot be saved even by UserSetSave. It shall always return to Default when the camera is turned on.
- Please reset the values when execute UserSetLoad / UserSetSave.

☐ Default (Factory settings) selected by UserSetSelector or UserSet0 (User save area) can be loaded by UserSetLoad.

※ Please do not execute UserSetLoad when grabbing (acquiring image).

☐ Shading correction value, defective pixels correction value, and UserID are to be saved when UserSetLoad of Default is executed.

☐ Even executing UserSetLoad, ConnectionConfig and PixelFormat shall maintain the settings of when executing. Please set the values by command.



4.3. Link Speed and Link Count

Transfer Control	
ConnectionConfig	CXP3_X1 CXP3_X2 CXP6_X1 CXP6_X2

CXP3 : Link speed=3.125Gbps, Link count=1 or 2
CXP6 : Link speed=6.250Gbps, Link count=1 or 2

※ Please do not change ConnectionConfig while grabbing (acquiring image).

4.4. Pixel Format (B/W Model)

ImageFormatControl	
PixelFormat	MONO8 MONO10

MONO8 : Transfer image data with black and white 8 bit data format.
MONO10 : Transfer image data with black and white 10 bit data format.

※ Please do not change PixelFormat while grabbing (acquiring image).

4.5. Flip

ImageFormatControl	
ReverseX	True/False
ReverseY	True/False

ReverseX : Flip the images of X direction.
ReverseY : Flip the images of Y direction.

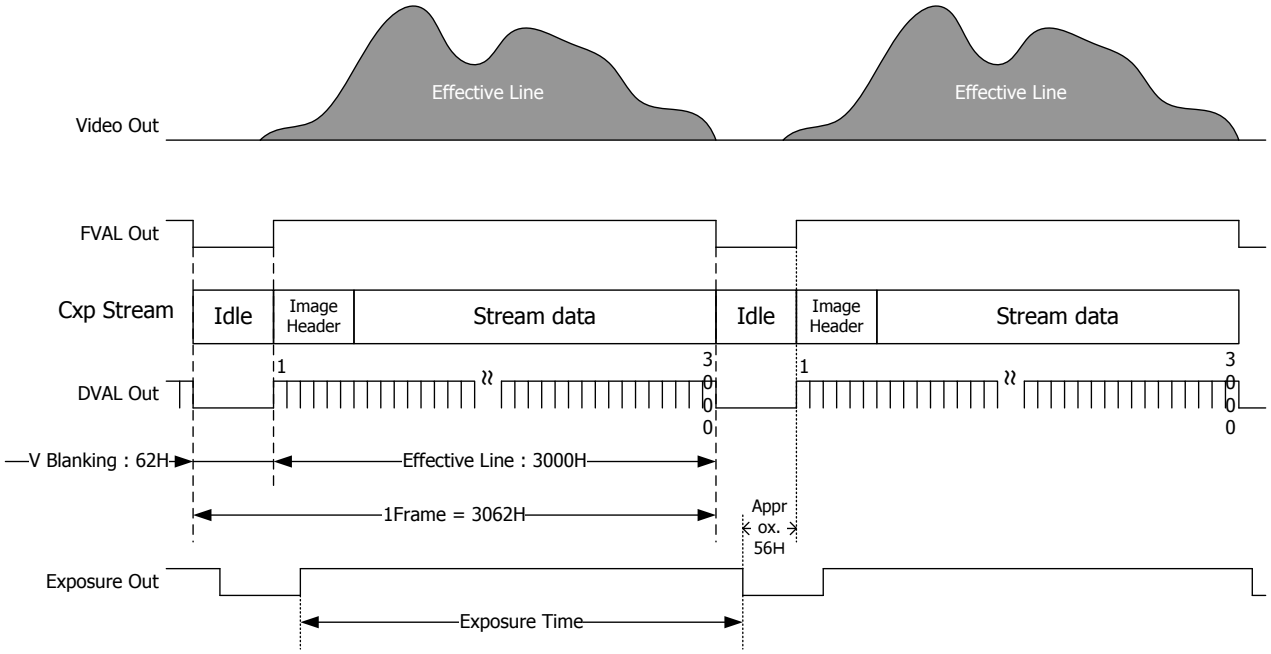
※ Please do not change Flip while grabbing (acquiring image).

4.6. Internal Sync. Mode (Free Run Mode)

☐ This is the mode to use triggers continuously made in the camera. No external trigger is used.

☐ TriggerMode Off = Please set TriggerSelector to AcquisitionStart.

※ This mode cannot be set when TriggerSyncMode is at ClockSync. Please set it after changed to LineSync.



Vertical sync. timing (at free run) TriggerMode=Off

4.7. External Trigger Mode

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

Acquisition Control	
TriggerMode	Off/On
TriggerSelector	AcquisitionStart FrameStart
TriggerSyncMode	LineSync ClockSync
TriggerSource	LinkTrigger0 Line0 Software
TriggerSoftware	Execute
TriggerActivation	RisingEdge FallingEdge LevelHigh LevelLow

☐ TriggerMode : Trigger mode (Links to TriggerSelector)

Off : Free run mode (TriggerSelector = AcquisitionStart)

On : External trigger mode (TriggerSelector = FrameStart)

※ Please do not change TriggerMode while grabbing (acquiring image).

☐ TriggerSelector : Trigger Selector (Links to TriggerMode)

AcquisitionStart : Free run mode (TriggerMode = Off)

FrameStart : External trigger mode (TriggerMode = On)

※ Please do not change TriggerSelector while grabbing (acquiring image).

☐ TriggerSyncMode : Trigger Sync. Mode

LineSync : H sync. trigger mode (Exposure time shall be controlled per line.)

Fixed/Pulse width trigger shutter mode

※ Overlapping operation (Exposure while outputting image) is valid.

ClockSync : CLK Sync. Trigger Mode (Exposure time shall be controlled per sensor clock)

FAST fixed/FAST pulse width trigger shutter mode

※ Overlapping operation (Exposure while outputting image) is invalid.

※ Please set to Line Sync mode to return to free run mode.

☐ TriggerSource : Trigger Source (This is to select where to input the external trigger.)

LinkTrigger0 : External trigger input from the CoaXPress Host Device

Please refer to the specification manuals of the Host Device such as frame grabber board to know how to generate triggers.

Line0 : External trigger input from the 6pins circular connector.

Software : TriggerSoftware

※ Please turn On TriggerMode, and set any of these settings above.

☐ TriggerSoftware : Software Trigger

A trigger is generated in the camera and capture images for 1 frame when this command is executed. This command is valid when TriggerSource is at Software.

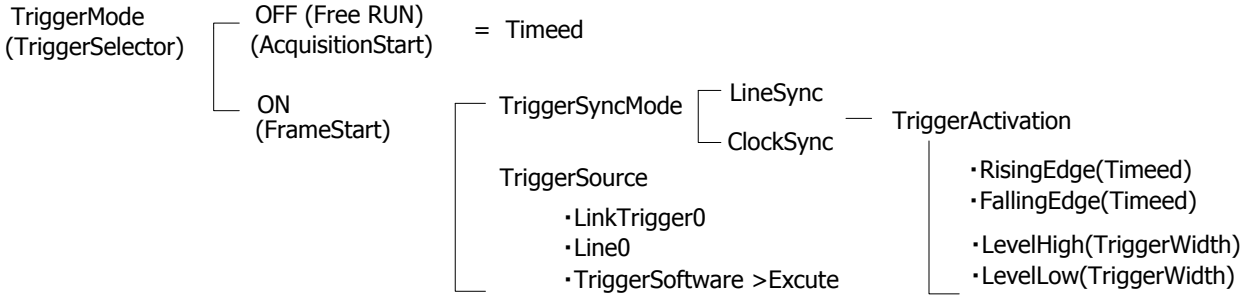
☐ TriggerActivation : Trigger Activation (This is to select trigger type and polarity out of the followings)

RisingEdge : Fixed trigger shutter mode: Rising edge (Timeed)

FallingEdge : Fixed trigger shutter mode: Falling edge (Timeed)

LevelHigh : Pulse width trigger shutter mode: High active (TriggerWidth)

LevelLow : Pulse width trigger shutter mode: Low active (TriggerWidth)



4.8. Trigger Sync. Mode and Delay Time to Start Exposure

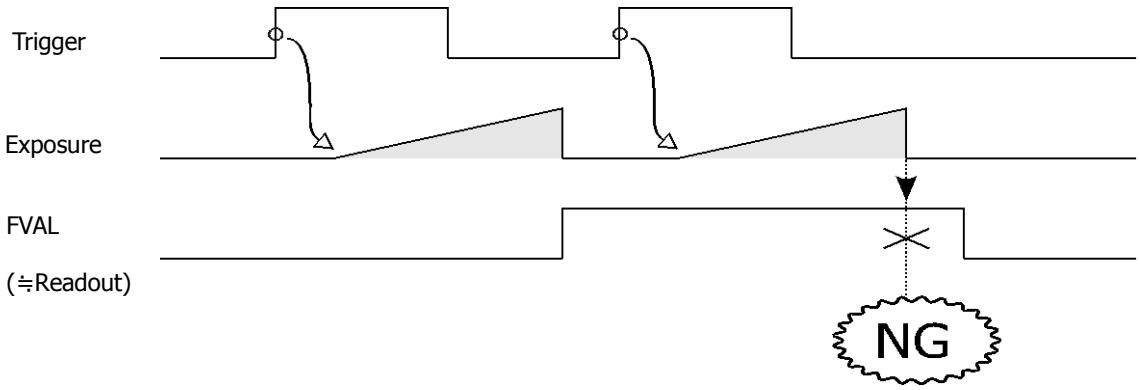
☐ H sync. trigger mode (LineSync): 1H of jitter may occur from inputting trigger to exposure. (Overlapping operation is valid.)

☐ CLK sync. trigger mode (ClockSync): Less delay time from trigger input, and the precise trigger operation is valid. (Overlapping operation is invalid.)

Delay Time to Start Exposure	CXP6_X2	CXP6_X1	CXP3_X2	CXP3_X1
At H sync. trigger (LineSync)	Approx. 2H~3H	Approx. 2H~3H	Approx. 2H~3H	Approx. 2H~3H
At CLK sync. trigger (ClockSync)	Approx. 0.05us	Approx. 0.05us	Approx. 0.05us	Approx. 0.05us

4.9. Restrictions on Trigger Pulse Input Timing

☐ The next trigger pulse can be input while reading out signals. However, please do not input a trigger pulse which ends its exposure while reading out the prior signals. In other words, a trigger pulse, while reading out signals for the prior frame and starts reading out signals for the next frame, cannot be input.



☐ When a trigger is input with the restricted timing explained the above, "IllegalTriggerFlag" shall be "1".

Acquisition Control	
IllegalTriggerFlag	0 or 1

Since Overlapping is invalid at CLK sync. trigger mode, the trigger of this timing shall be masked and "IllegalTriggerFlag" shall not become "1".

Device Control	
ErrorFlagReset	Execute

This is to reset IllegalTriggerFlag to "0".

4.10. Fixed Trigger Shutter Mode (LineSync) H Sync. Trigger

(TriggerMode=On, TriggerSyncMode=LineSync, TriggerActivation= RisingEdge)

☐ This is the mode to start exposure with external input trigger signals, and execute exposure for set period.

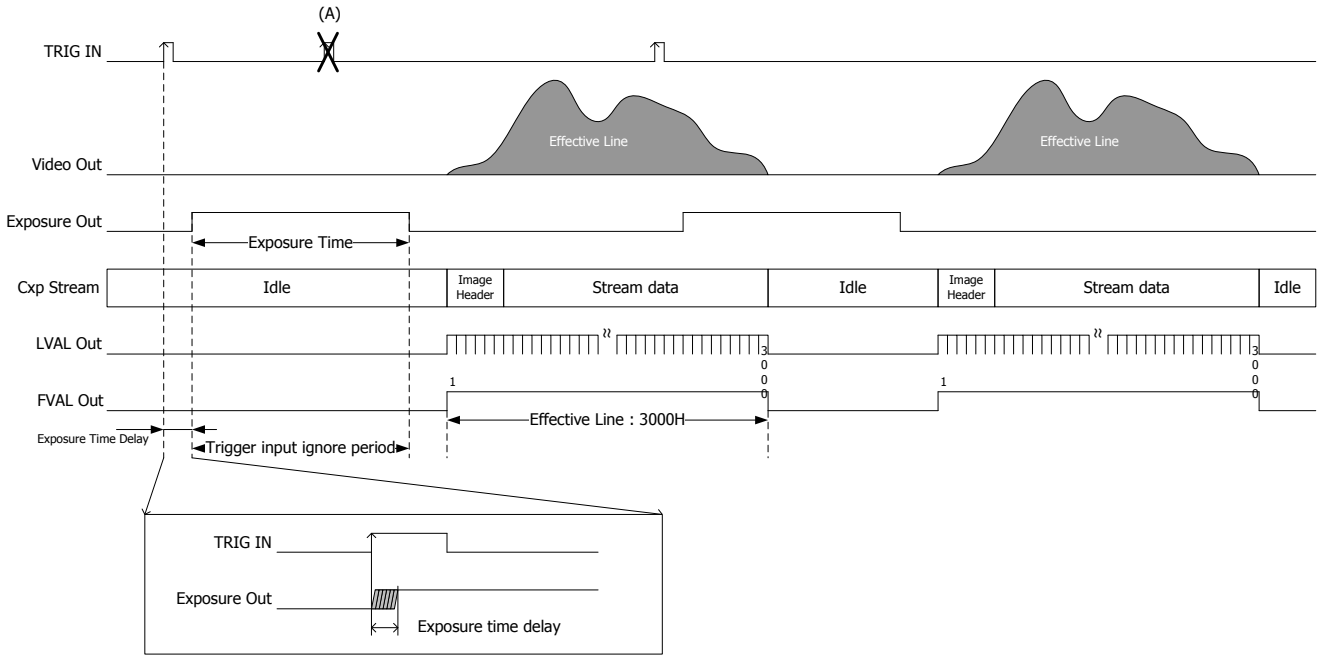
☐ Trigger operation is H Sync, and V-sync Reset system. The delay time (Exposure Time Delay) from detecting trigger edge in the camera to actually starting ExposureActive is 2H ~ 3H.
Since the external trigger signals synchronize with camera internal H signals, 1H jitter occurs to Exposure Time Delay. The trigger pulse with the minimum 1H and more shall be input (Please refer to the table below for the details of 1 line width).

Camera Mode	Time for 1 line
CXP-6 2 lanes	5.05μs
CXP-6 1 lane	10.10μs
CXP-3 2 lanes	10.10μs
CXP-3 1 lane	20.20μs

☐ There is an exposure time period for approx. **14.26μs** at the edge right after ExposureActive.

☐ Triggers can be accepted while outputting video output images. However, please be noted that a trigger signal to start the next video outputting should not be input before completion of outputting the prior images.

☐ Trigger input during exposure time shall be ignored in the camera. (Refer to (A) in the drawing below).
Please note that a trigger shorter than 1 frame cycle shall not be used.



4.11. FAST Fixed Trigger Shutter Mode (ClockSync) CLK Sync. Trigger

(TriggerMode=On, TriggerSyncMode=ClockSync, TriggerActivation= RisingEdge)

☐ This is the mode to start exposure with external input trigger signals, and execute exposure for set period.

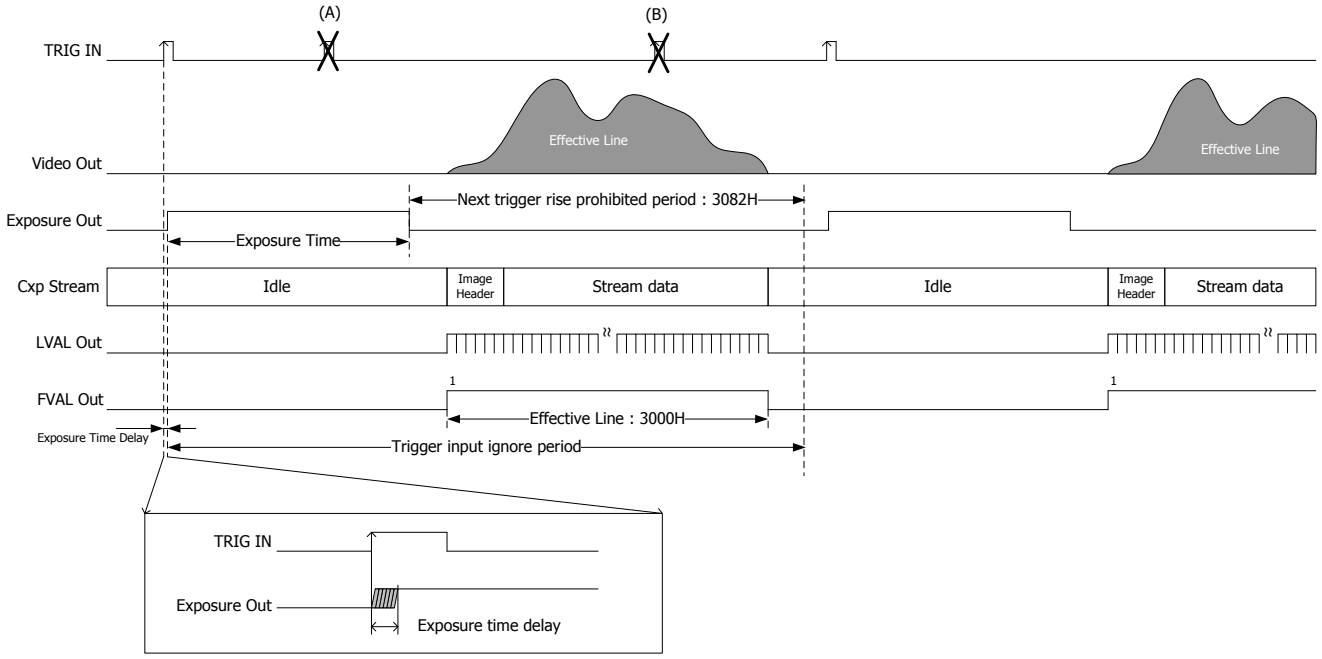
☐ Trigger operation is CLK Sync, and V-sync Restart system.

The delay time (Exposure Time Delay) from detecting trigger edge in the camera to actually starting ExposureActive is approx. 0.05μs. Input more than 1μs width pulse as a trigger.

☐ There is an exposure time period for approx. **14.26μs** at the edge right after exposure output.

☐ Trigger input while outputting images cannot be accepted.

Trigger input during exposure time and video outputting shall be ignored in the camera. (Please refer to (A) and (B) in the drawing below).



4.12. Pulse Width Trigger Shutter Mode (LineSync) H Sync. Trigger

(TriggerMode=On, TriggerSyncMode=LineSync, TriggerActivation=LevelHigh)

☐ This is the mode to start exposure with external input trigger signals, and set the exposure time with pulse width of the trigger signals.

☐ Trigger operation is H Cycle, and V-sync Restart system.

The delay time (Exposure Time Delay①) from detecting trigger edge in the camera to actually starting ExposureActive is 2H~3H. The delay time (Exposure Time Delay②) from detecting trigger edge in the camera to end of ExposureActive is **2H ~ 3H**.

☐ Since the external trigger signals synchronize with camera internal H signals, approx. 1H jitter occurs to Exposure Time Delay ① and ②. In case of pulse width trigger mode, jitters may occur at both start and end edges of exposure. At this time, exposure time would change so that flicker might be noticeable in the image, especially when high-speed shutter is set. This flicker sometimes can be eliminated when fixed trigger shutter mode is used. However, this problem can be solved by inputting a trigger pulse with synchronizing it to the camera internal H cycle (LVAL).

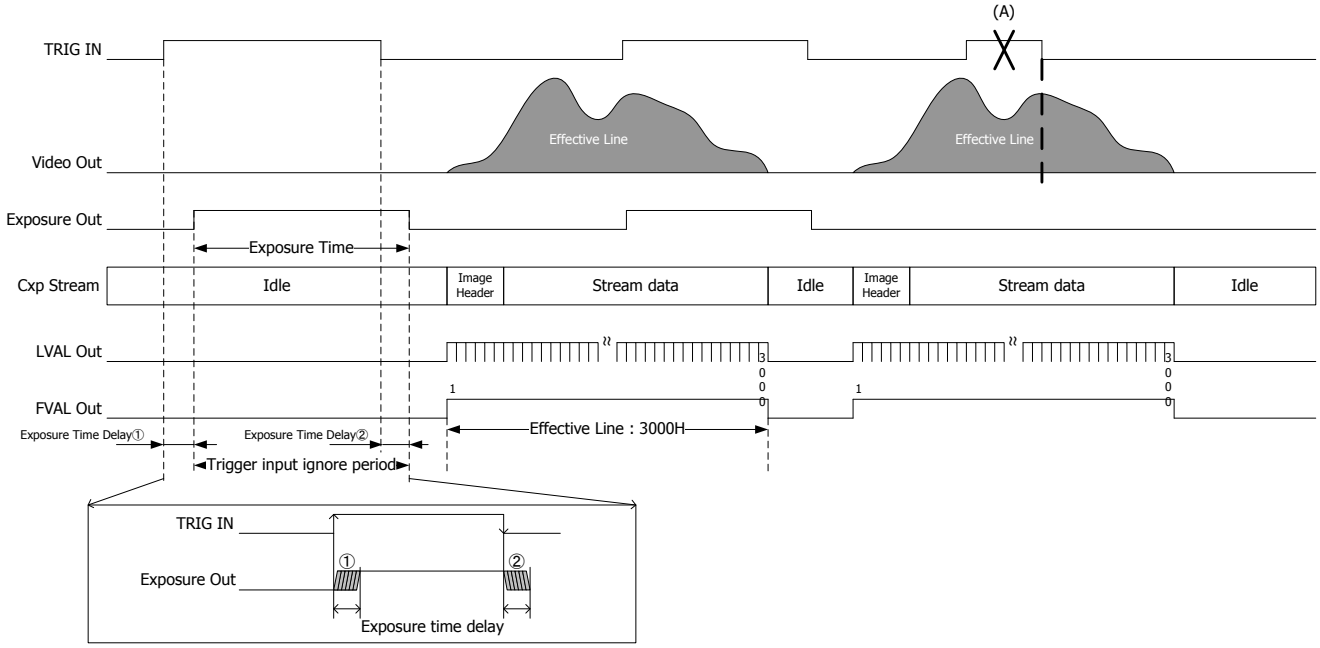
☐ Pulse width 1H(Min.) ~ Approx. 2 frames

Functionally, there is no upper limitation, but noises such as dark noises shadings may be noticeable at long time exposure.

☐ There is an exposure time period for approx. 14.26μs at the edge right after ExposureActive.

☐ Trigger input during exposure time shall be ignored in the camera. However, a trigger shorter than 1 frame cycle should not be used.

☐ Triggers can be accepted while outputting video output images. However, please be noted that a trigger signal to start the next video outputting should not be input before completion of outputting the prior images. (Please refer to (A) in the drawing below).



4.13. FAST Pulse Width Trigger Shutter Mode (ClockSync) CLK Sync. Trigger

(TriggerMode=On, TriggerSyncMode=ClockSync, TriggerActivation=LevelHigh)

☐ This is the mode to start exposure with external input trigger signals, and set the exposure time with pulse width of the trigger signals.

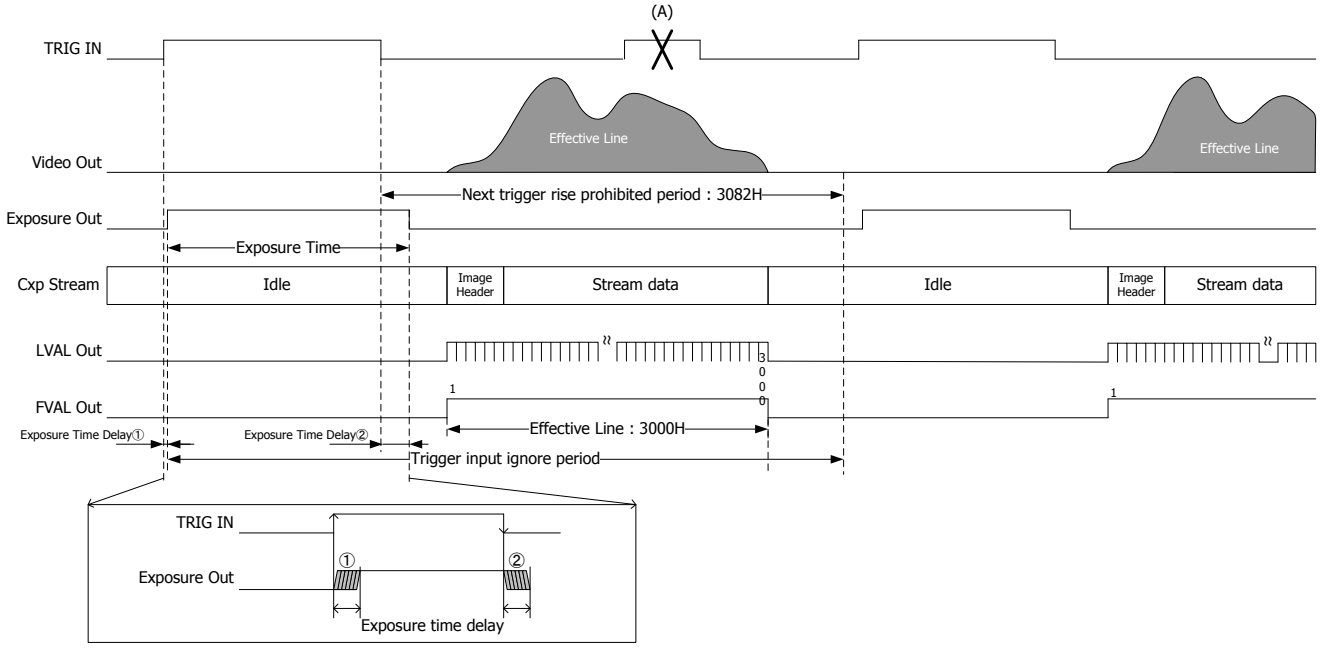
☐ Trigger operation is CLK Sync, and V-sync Restart system.
The delay time (Exposure Time Delay①) from detecting trigger edge in the camera to actually starting exposure is **approx. 0.05µs**. The delay time (Exposure Time Delay②) from detecting trigger edge in the camera to end exposure is **approx. 0.05µs**.

☐ Pulse width **0.74µs** (Min.) ~ Approx. 2 frames

☐ Functionally, there is no upper limitation, but noises such as dark noises shadings may be noticeable at long time exposure.

☐ There is an exposure time period for **approx. 14.26µs** at the edge right after ExposureActive.

☐ Trigger input during readout time shall be ignored in the camera. (Please refer to (A) in the drawing below).



4.14. Exposure Time

Acquisition Control	
ExposureMode	Timed TriggerWidth
ExposureTime (us)	15us~Max. Exposure time
ExposureTimeMax	(ReadOnly)

ExposureMode : This is to check if the current mode is at Timed or TriggerWidth (PWC).

ExposureTime : Exposure time (Valid when ExposureMode is at Timed)

- Please set per 1H at H sync trigger. It shall return the value (us) rounded by 1H per Min. 1H mode.
- It can be set per approx. 1us at CLK sync trigger.

ExposureTimeMax : Max. exposure time

- Please set the smaller value than ExposureTimeMax at internal sync mode. It shall depends on partial scan (ROI) settings, "PixelFormat", and link rate.
- H sync. trigger mode shall be clipped with effective line count.
- CLK sync trigger mode (LineSync) can be set from 15us ~ 200ms. It shall not be clipped with effective line count.

4.15. Formula to Calculate Manual Shutter Values with H Sync Mode

The values shall be corrected correspond to the formula below.

☐ Formula : Exposure Time = Time for 1 line (Please refer to the table below) x Exposure line count +**14.26µs**

Camera mode	Time for 1line
CXP-6 2lanes	5.05µs
CXP-6 1lane	10.10µs
CXP-3 2lanes	10.10µs
CXP-3 1lane	20.20µs

※ The min. value shall be clipped with 1, and the max. value shall be clipped with 3000 or with the total line count at partial mode.

4.16. Manual Shutter Settings with CLK Sync Mode (FAST Trigger Mode)

☐ Min. setting value: **15µs (**Approximate value)

☐ Max. setting value:**200ms** (Approximate value)

※Unlike H sync. mode, clipping shall not be executed by total line count, etc.

※Bright point may be noticeable at long time exposure.

☐ Setting unit : 1µs (Approximate value) ※Slight differences may occur since it is generated by 74.25MHz clock.

4.17. Gain

AnalogControl	
Gain	Manual

x1.00 to x256.00 preferred Gain can be set.

Functionally, up to 256 times of the value can be set. However, image degradation cannot be avoided when gain higher than 64 times of the value is set. We recommend you to evaluate it first.

4.18. Gamma Correction

☐ This is to execute gamma correction.

AnalogControl	
Gamma	Settings for the coefficient of 0.10~1.80

Gamma: This is to set the gamma correction value per 0.01step.

[Note] Gamma table shall be updated at image output timing. It shall be applied at image output after the completion of rewriting the gamma table (Approx. 20ms: Command ACK is the rough standard.) at continuous operation mode. In case the trigger coefficient is changed while waiting trigger to be input, the gamma updated image shall be output with the trigger after the completion of rewriting the table.

4.19. Black Level Adjustment

☐ This is the function to adjust black level of image sensor.

AnalogControl	
BlackOffset	0~100

[Note] This function is not the function to set the absolute value of black level.
This function can change the black level settings of the image sensor relatively.
Settings can be changed while capturing images. However, image may be distorted.

4.20. Partial Scan (ROI)

☐ This is to increase its frame rate by cutting out and reducing the read out area.

☐ This function cannot be used with 2×2 Binning mode (B/W only).

☐ It shall be Idle output in case the RegionMode of Region 1~8 is all off.

ImageFormatControl	
RegionSelector	EffectiveRegion , Region1~8
RegionMode	On/Off
RegionDestination	Stream0
Width	4096 (Fixed)
Height	4~3000 (Multiples of 4)
OffsetX	0 (Fixed)
OffsetY	0~2996 (Multiples of 4)

☐ RegionSelector: This is to select the region to be set.
8 partial areas can be set with Region1~8.
Width and Height of the effective partial area can be checked by selecting EffectiveRegion.

※Please do select EffectiveRegion to start acquiring images.
※Please do select EffectiveRegion when selecting 2×2 binning mode (B/W only).
※Please do select EffectiveRegion when StillView is selected at SourceSelector.

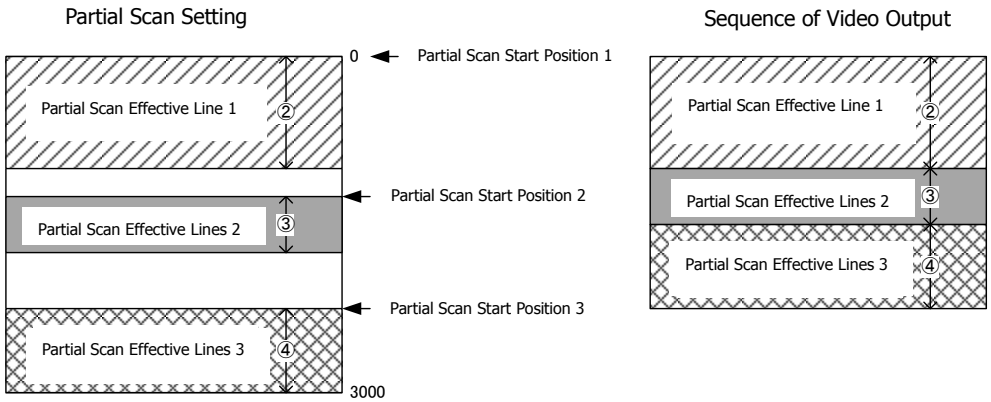
☐ RegionMode: This is to set valid/invalid of selected Region.
Valid can be set to each Region with Region1~8.
Effective Region can be checked by EffectiveRegion.
※This function cannot be turned ON in case Width, Height, OffsetX, and OffsetY are not set to effective settings.
※This function cannot be changed in case shading correction is ON.

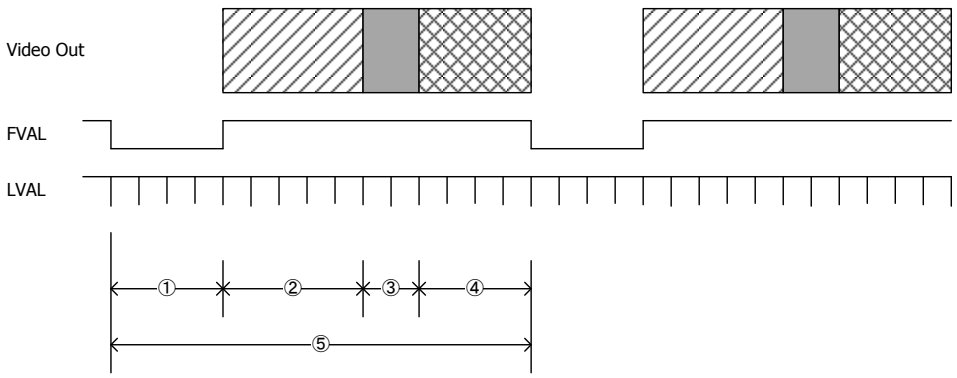
☐ RegionDestination: This is to select the Stream to be output. This model VCC-12CXP4M is fixed to Stream0.

☐ Width: This is to set the width of Region. This model VCC-12CXP4M is fixed to 4096.
☐ Height: This is to set the height of Region.
☐ OffsetX: This is to set the Offset settings for X direction of the Region. This model VCC-12CXP4M is fixed to 0.
☐ OffsetY: This is to set the Offset settings for Y direction of the Region.
※Please make sure to set Height and OffsetY not to overlap with other Region.

☐ Maximum 8 partial areas can be set by serial commands.

Example: 3 partial areas to be set.





① : V blanking line
② : Partial area 1
③ : Partial area 2
④ : Partial area 3
⑤ : frame total line count

☐ When setting several partial scan areas, please set the start position and effective lines trying not to overlap the areas.

☐ Total line count per frame = V blanking lines +
Partial effective line 1 + Partial effective lines 2 + ・・・ + Partial effective lines 8
Please note that sum total of partial effective line numbers from 1~8 (except V blanking lines) has to be less than 3000.
V blanking lines at partial mode is 62H.

☐ Frame rate = 1 / (Total line count per frame × Time for 1 line)

Time for 1 line

Camera mode	Time for 1 line
CXP-6 2 lanes	5.05μs
CXP-6 1 lane	10.10μs
CXP-3 2 lanes	10.10μs
CXP-3 1 lane	20.20μs

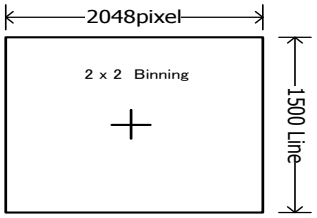
Setting Examples

	Number of active lines	Frame rate (total number of lines of frame)											
		CXP6 X2				CXP6 X1,CXP3 X2				CXP3 X1			
4 (minimum)	4	3000.3	fps	66	(H)	1500.2	fps	66	(H)	750.1	fps	66	(H)
Equivalent to vertical VGA	480	365.4	fps	542	(H)	182.7	fps	542	(H)	91.3	fps	542	(H)
Equivalent to vertical XGA	768	238.6	fps	830	(H)	119.3	fps	830	(H)	59.6	fps	830	(H)
Equivalent to vertical SXGA	1024	182.3	fps	1086	(H)	91.2	fps	1086	(H)	45.6	fps	1086	(H)
Equivalent to vertical UXGA	1200	156.9	fps	1262	(H)	78.5	fps	1262	(H)	39.2	fps	1262	(H)
3000 (maximum)	3000	64.7	fps	3062	(H)	32.3	fps	3062	(H)	16.2	fps	3062	(H)

☐ The line numbers at partial scan setting can be set from 4 lines. Only multiple numbers of 4 can be set.
☐ The effective line numbers of the manual shutter setting value at partial scan setting become the maximum (except at ClkSync trigger).
☐ When you switch between Full Frame Scan Mode and Partial Scan Mode or when you change Partial scan settings, the first one frame right after the changes shall be invalid.
***Especially at fixed trigger shutter mode and pulse width trigger shutter mode, input a dummy trigger first, and use the next trigger as an actual video signal.**

4.21. 2×2 Binning Mode (B/W model only)

ImageFormatControl	
BinningHorizontalMode	Sum
BinningHorizontal	1~2
BinningVerticalMode	Sum
BinningVertical	1~2



☐ Since the settings for Horizontal and Vertical are linked, 2x2 binning mode is executed when either is set to 2.

※This cannot be set unless DefectPixelCorrection is OFF. Defective pixel correction shall be invalid at this mode.

※BinningHorizontal and BinningVertical cannot be changed unless RegionSelector is at EffectiveRegion.

☐ 4 pixels of horizontal and vertical shall be mixed and output as 1pixel. The sensitivity shall be 4 times higher. This is fixed to simple addition (Sum).

☐ Frame rate can be increased with the field angle at full resolution since the vertical line shall be 1/2.

☐ This mode cannot be used with partial scan (ROI) function.

Frame rate at Binning mode [fps]

2x2Binning mode (Number of pixels)	PixelFormat	Link rate (fps)			
		CXP6_X2	CXP6_X1	CXP3_X2	CXP3_X1
(2048x1500)	mono8	127.1	63.5	63.5	31.8
	mono10	127.1	63.5	63.5	31.8

4.22. Shading Correction

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

AnalogControl	
ShadingCorrectionDataSelector	Off/Table1/Table2/Table3
DetectShading	Execute

ShadingCorrectionDataSelector : This is to select the shading correction data.

Shading correction ON/OFF, Shading correction data to be used, and the destination to save the shading detection can be selected.

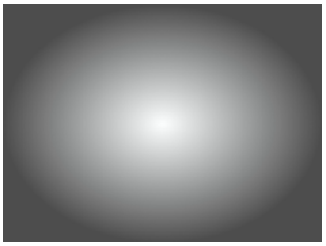
Shading correction shall be invalid at Off.

Table1- In case Table3 is selected, correction function shall be ON with each correction values.

Table1- In case DetectShading is executed while selecting Table3, correction data can be acquired to the specified Table.

※This cannot be executed in case more than 2 partial areas are set.

Before shading correction



After shading correction

DetectShading: Shading detection

Shoot a uniform object such as a pattern box, to full screen, then execute DetectShading, to calculate the correction data of selected table automatically.

[Note]

- When detecting shading, make sure to turn OFF partial scan mode and binning.
  The image size shall be set to 4096x3000.
- When changing the ReverseY, please re-execute shading detection.
- Please acquire correction data only when the camera is in operation.
  (Shading correction data cannot be acquired if the camera is not outputting anything.)
- Please execute UserSetSave to save the correction data of Table1~Table3 in non-volatile memory at the same time.
- Even when executing Default at UserSetLoad, correction data shall be saved.

4.23. Defective Pixels Correction

☐ This is the function to detect and correct the pixel defects in the data output from the sensor.

☐ Data are categorized into two types and controlled.

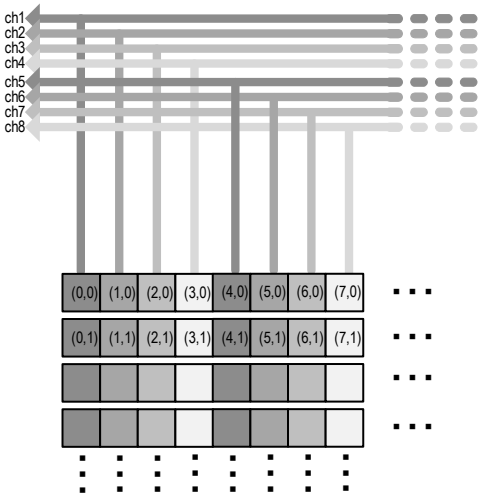
- Data at Ex-Factory
  The detected data of white pixel defects and black pixel defects at Ex-Factory are saved.
  Basically, these data cannot be erased.

- Data registered by users
  Data increased after shipment or the one registered by users.
  These data can be entirely erased anytime by DefectPixelDefault.

☐ Defective pixels correction information is held separately at normal mode and horizontal flip.
(The position and the number of defective pixels are different at normal mode and at horizontal flip.)

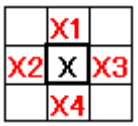
☐ The number of data registerable by users is 256 points. (Note: Up to 32 points per CH.)

[CH(Channel)] Images are processed by 8 CH interleave in the camera.



☐ Defective pixels correction control — This is to select ON/OFF of defective pixels correction processing.
Data at Ex-factory and data registered by users are both controlled at the same time.

☐ Defective pixels registered by users — This is to add the specified X and Y coordinate.
Any preferred pixels can be registered and deleted as defective pixels by specifying coordinate.



※In case of B/W model
X pixel value shall be calculated by referring pixel values of X1, X2, X3, and X4 as the left drawing. When X1, X2, X3, and X4 are already registered as defected pixels, X can be added to be registered but it cannot be corrected.

AnalogControl	
DefectPixelCorrection	On/Off
DefectPixelAdd	(Execute)
DefectPixelAddOffsetY	0~2999
DefectPixelAddOffsetX	0~4095
DefectPixelDelete	(Execute)

- DefectPixelCorrection: This is to select valid/invalid of defective pixels correction
- DefectPixelAddOffsetY: This is to specify the Y coordinate.
- DefectPixelAddOffsetX This is to specify the X coordinate.
- Please execute DefectPixelAdd to register the specified coordinate as a defective pixel correction point.
- Please execute DefectPixelDelete to delete the specified coordinate as a defective pixel correction point.

  ✧ Defective pixels correction cannot not be valid while binning.
  ✧ In case the coordinate same as the defective data at ex-factory is specified, it shall be ignored.
  ✧ Only the added pixels by "Defective pixels detection registered by user" or "Defective pixels added by user" can be deleted.
  ✧ Data at ex-factory cannot be deleted by this command.

☐ Defective Pixels Detection Registered by User

This is to detect and register the correction data of white defect caused by the image sensor.

AnalogControl	
DefectDetectionThesholdValue	0~1023
DefectDetection	(Execute)
DefectDetectionStatus	(ReadOnly)
DefectPixelDefault	(Execute)
DefectCorrectMode	Reacquire/Add

- DefectDetectionThesholdValue: This is to set the threshold value (0~1023: 10bit equivalent) of defective pixels detection registered by user.
  The data with luminance level more than the specified level here shall be registered.
  ※ 4times more value of the image signal level shall be specified as the threshold value with 8 bit images.

- DefectDetection: This is to detect the defective pixels registered by user.
  This is the function to register the pixels automatically if a pixel exceeds the level specified at DefectDetectionThresholdValue. Please be noted that no lights should be in the sensor surface to use this function.
  The defective pixels correction registered by user shall be reflected right after the execution.
  In case UserSetSave is executed after defective pixels detection registered by user, the data will be saved in non-volatile memory.
- DefectDetectionStatus: This is to indicate the result of the defective pixels correction detection registered by user.

0	None defective pixels correction data registered by user
Value (256 or less)	Detected number of defective pixels registered by user
0x000e0001(917505)	Data exceeds the maximum number (32 points) registerable in one CH.
0x000e0002(917506)	Data exceeds the maximum number (256 points) registerable.
	※Error indication may appear in decimal depends on the frame grabber board to use.

If the 256 points or more is indicated, please check the threshold value (DefectDetectionThesholdValue) of defective pixels detection registered by user is correct.
Also, please execute Reacquire at DefectCorrectMode or execute DefectPixelDelete, and change the detect condition then execute again. Please make sure that the lens is closed while executing again.

- DefectPixelDefault: This is to delete entire defective pixels correction data registered by user.
- DefectCorrectMode: This is to set the detection mode of defective pixels.
  In case Reacquire is selected, other than defective pixel added by one point addition shall be deleted, and reacquire the defective point again.
  In case Add is selected, the defect point is additionally acquired for the current defect point.

[Note]

- Correction data shall be acquired only when the camera is in operation. When camera is not outputting anything, white defect detection cannot be performed.
- When detecting white defects, partial scan, binning mode, and shading shall be OFF. (Size shall be set to 4096x3000)
- When changing the threshold value of DefectDetectionThresholdValue and acquiring the defective pixels correction data, please execute DefectPixelDefault and delete the defective pixels correction data registered by user to reacquire it.
- The registerable number of pixel defects and the correctable number of pixel defects may not be always the same because of the following reasons.

(1) With white defects detection, if one of the strip reed reached the maximum number, correction could not be performed. In such case, the data up to that point are registered, error is output, and operation ends.
(2) If no effective pixel exists up next, down next, right next, or left next to the pixel to be corrected, this pixel can be registered but cannot be corrected.

☐ Defective Pixels Indication

This is to indicate the coordinate of defect registered by user.

AnalogControl	
RegisteredDefectSelector	UserState/InitialState
DefectPixelNumber	1~256/1~768
DefectPixelOffsetY	(ReadOnly)
DefectPixelOffsetX	(ReadOnly)
DefectPixelType	(ReadOnly)

- RegisteredDefectSelector: This is to select the type of defect.
- DefectPixelNumber : This is to set the number to the registered defect.
  The table number of the defect data at ex-factory and the defect registered by user shall be specified.
- DefectPixelOffsetY : This is to indicate the Y coordinate of the defect specified at DefectPixelNumber.
  65535 shall be indicated for the number of the table which does not have defect data.

- DefectPixelOffsetX : This is to indicate the X coordinate of the defect specified at DefectPixelNumber. 65535 shall be indicated for the number of the table which does not have defect data.

- DefectPixelType : This is to indicate the defect type specified at DefectPixelNumber.
  1: White defect at ex-factory
  2: Black defect at ex-factory
  6: Defect registered by user
  7: Defect additionally registered by user
  65535: The Table which does not have defect data

AnalogControl	
ChannelNumber	1~8
DefectPixelChannelCount	(ReadOnly)

- ChannelNumber : This is to specify the channel number of defect processing.
- DefectPixelChannelCount : This is to indicate the number of defects of channel number specified at ChannelNumber.
  The specified number of the defect of the channel number is the sum total of the defects at ex-factory and the number of defects registered by user.

4.24. Test Pattern Indication

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

ImageFormatControl	
TestPattern	Off GrayHorizontalRamp (B/W model only)

※ This function cannot be set when cursor indication is ON.

4.25. Cursor Indication

☐ This is to indicate the cursor on the screen.

ImageFormatControl	
CursorPattern	Off
CursorOffsetX	X coordinate
CursorOffsetY	Y coordinate
CursorColor	White/Black

CursorPattern : Specify if the cursor shall be indicated or not. (This function cannot be set when test pattern indication is ON.)
CursorOffsetX : This is to specify the X coordinate of vertical cursor.
CursorOffsetY : This is to specify the Y coordinate of horizontal cursor.
CursorColor : This is to specify the color of the cursor. (White/Black)

4.26. LED Control

☐ When it is ON, lighting patterns of LED shows the camera status by the way of its lighting.

DeviceControl	
DeviceIndicatorMode	Active ErrorStatus Inactive

Active : This is to indicate the communication status of CoaXPress.
ErrorStatus : Light only when there was an error in the communication status of CoaxPress.
Inactive : ALL LED OFF.

4.27. Camera Timing Output

☐ The signals below can be output from 3pin of 6pins circular connecter by LineSource settings.

Digital IO Control	
LineSelector	Line0
LineMode	Output
LineSource	OFF ExposureActive FrameActive LineActive TriggerPacketActive

ExposureActive : This is to indicate exposure period of image sensor by Hi Active.
FrameActive : This is to indicate effective period of frame by Hi Active.
LineActive : This is to indicate effective period of line by Hi Active.
TriggerPacketActive : This is to output uplink trigger packet signal from frame grabber by decoding.

4.28. User ID Save

DeviceControl	
DeviceUserID	Manual

☐ This is the function to set data with up to 16 letters. (Including NUL character (□0)) By executing "UserSetSave", data shall be saved in the non-volatile memory. This item shall maintain the set value even execute "UserSetLoad" at "Default".

4.29. Temperature Indication

☐ This is to indicate the temperature of the image sensor. (Indicate by ℃)

DeviceControl	
DeviceTemperature	ReadOnly

[Note] This value shall not be calibrated. Please regard this value as an approximate value.

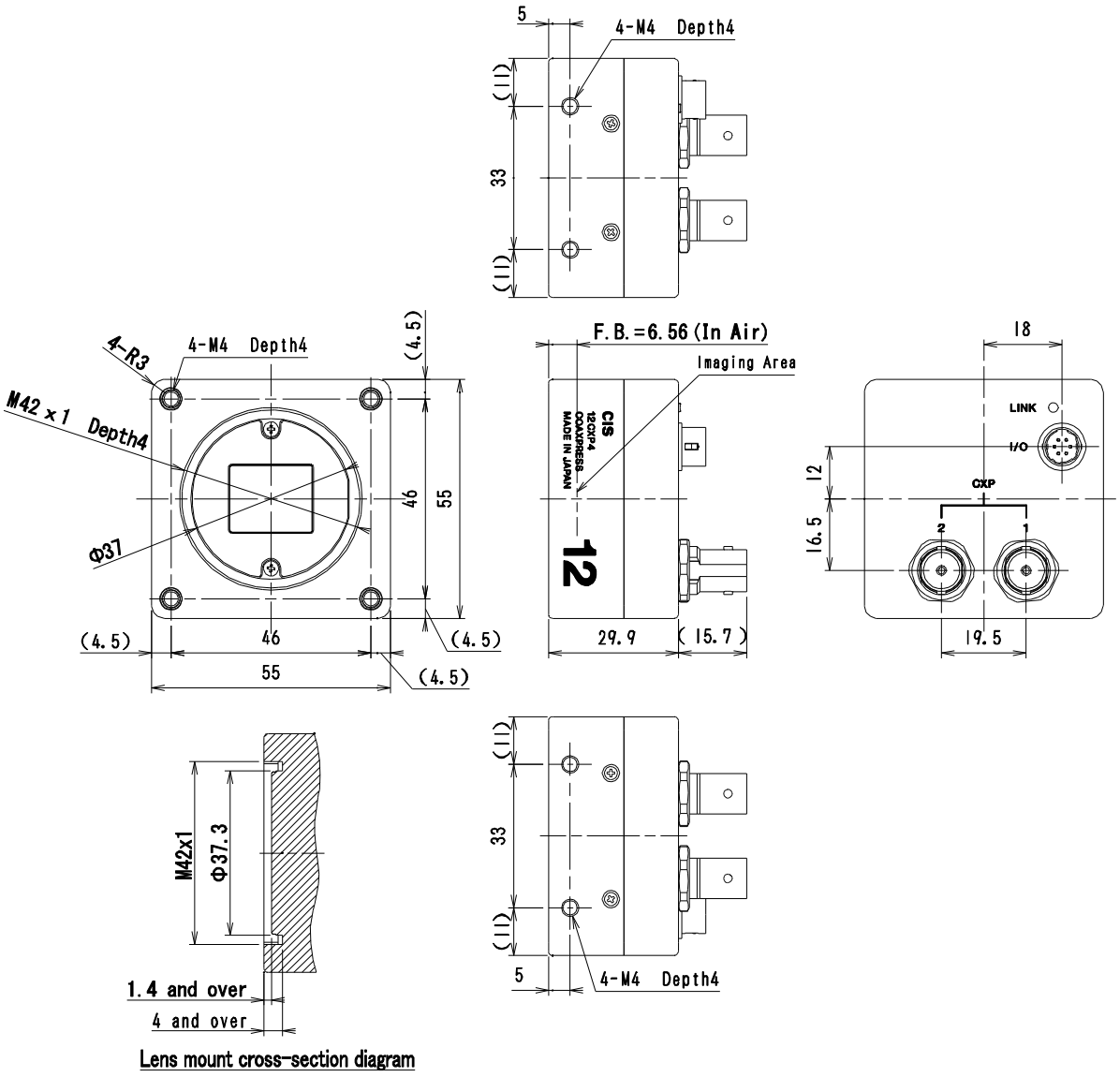
5. Factory Settings

Function	Data	Description
TriggerSelector	AcquisitionStart	Equivalent to TriggerMode=Off
TriggerMode	Off	Link to TriggerSelector
TriggerSyncMode	LineSync	Horizontal sync. mode
TriggerSource	LinkTrigger0	CXP UPLink trigger
TriggerActivation	RisingEdge	Rising edge
ExposureTime	9999.0	≒10ms (1/100s)
Gain	1.00	x1.00
Gamma	1.00	Gamma coefficient=1.00
DefectPixelCorrection	On	Defective pixels correction On
DefectPixelAddOffsetX	0	This is to specify X coordinate.
DefectPixelAddOffsetY	0	This is to specify Y coordinate.
DefectDetectionThesholdValue	50	Defective pixels detection threshold value
ShadingCorrectionDataSelector	Off	Shading correction table
BlackOffset	8	Black level initial value
PixelFormat	Mono8	B/W model
ConnectionConfig	CXP6_X2	CxpLinkConfiguration
TestMode	NomalOperation	Use at Link test mode "NomalOperation"
RegionSelector	EffectiveRegion	This is to specify the Partial area (ROI) (Region1~8)
RegionMode	On	Partial area (ROI) On/Off
Height	3000	Partial area (ROI) Specify height.
OffsetY	0	Partial area (ROI) Specify the start position.
ReverseX	FALSE	Horizontal flip OFF
ReverseY	FALSE	Vertical flip OFF
TestPattern	Off	Cursor indication and Test pattern cannot be ON at the same time.
CursorPattern	Off	Test pattern and Cursor pattern cannot be ON at the same time.
CursorOffsetX	2048	This is to specify the color and the position of cursor X.
CursorOffsetY	1500	This is to specify the color and the position of cursor Y.
CursorColor	White	Cursor color White/Black
BiningHorizontal	1	Only B/W model
BiningVertical	1	Only B/W model
DeviceIndicatorMode	Active	Indicate LED indicator
LineSource	Off	Circular 6P-3pin output settings
SourceSelector	Source0	Normal operation

※ ConnectionConfig and PixelFormat are excluded from UserSetLoad operation.

6. Dimensions

6.1. Camera Dimensions

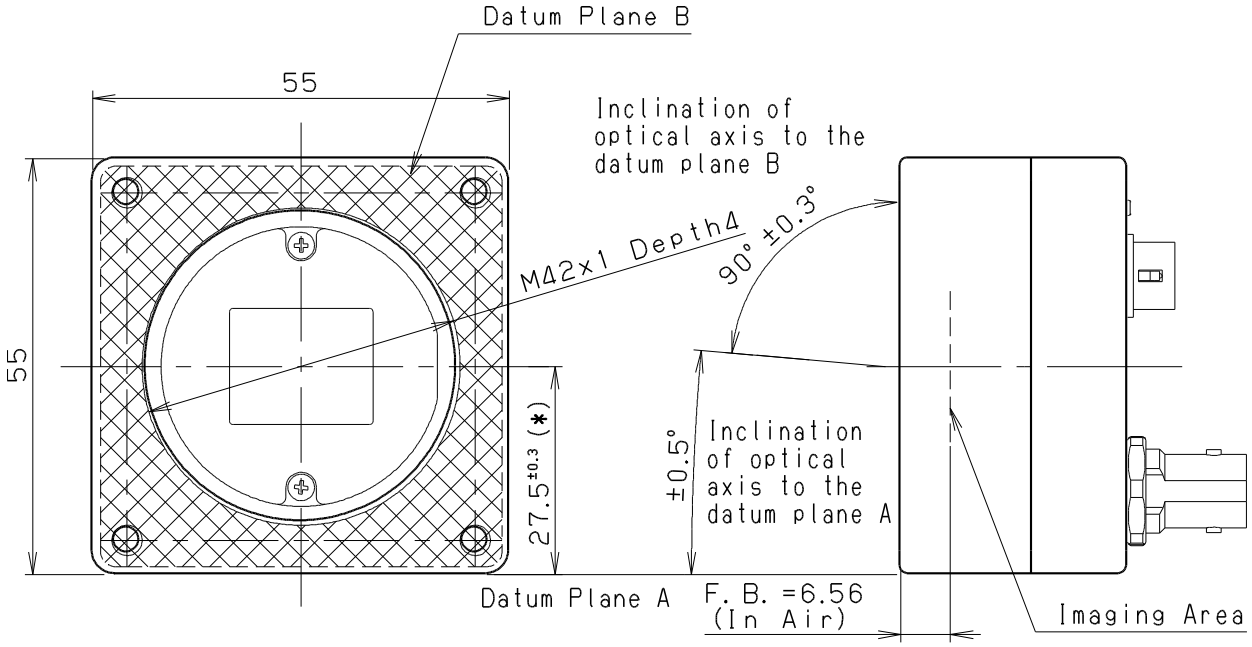


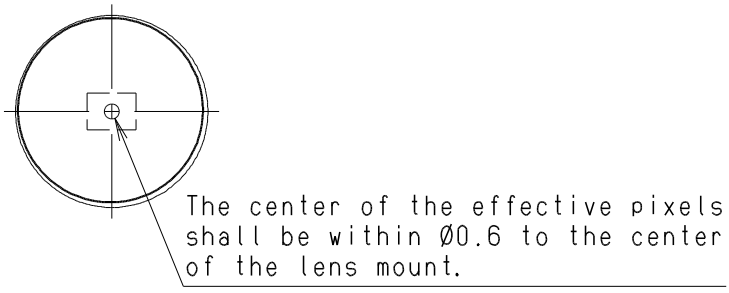
Note 2) Lens mount screw complies with M42x1.0-6H. Please refer to ISO 68-1,965-1 (or JIS B0205-1,B0209-1).

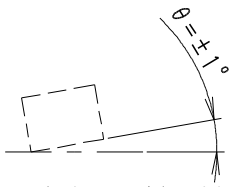
Note 1) Please make sure the protrusion portion does not interfere with the lens selected. Refer to the Lens mount cross-section diagram for the details.

935-0130-00
(Unit : mm)

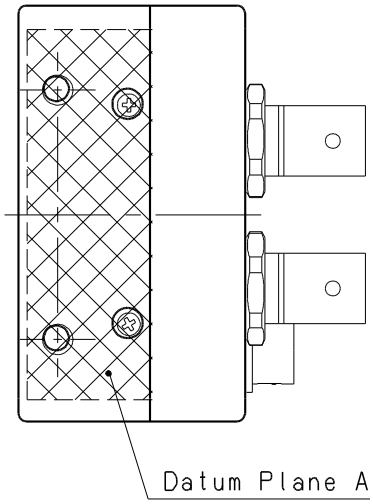
6.2. Optical Axis Accuracy







Inclination of the effective pixels θ to the datum plane is θ≦±1°.



*) Dimensions from the datum plane A to the center of the lens Mount

937-0024-00
(Unit:mm)

7. 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 repairs the products as long as it is repairable.

CIS shall be exempted from taking responsibility and held harmless for damages or losses incurred by the following cases.

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

7.1. CMOS Pixel Defect

CIS compensates the noticeable CMOS pixel defects found at the shipping inspection prior to our shipment. On very rare occasions, however, CMOS pixel defects might be noted with time of usage of the products. Cause of the CMOS pixel defect is the characteristic phenomenon of CMOS sensor itself and CIS is exempted from taking any responsibilities for them. Should you have any questions on CMOS pixel defects compensation please contact us.

7.2. 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 the dealer you purchased it from.