IRON

CoaXPress

User Manual

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International Distributors

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1 Figures & Tables

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2 Revision History

Ver	Date	Notes
1.0	06.2019	Initial release
1.1	07.2019	Balance White chapter update
1.2	09.2019	Minor content and tables editing
1.3	03.2020	- Add more descriptive section for File Access Control - Add new parameters for Exposure Auto algorithm - Document restructure for better readability
1.4	03.2021	- Update description of Lens Control chapter - Add support for P-Iris lens control

Table 1 – Revision History

3 Introduction

3.1 Safety Precautions

With your ***Iron*** camera in hand, please take the time to read the precautions listed below in order to prevent preventable and unnecessary injuries and damage to you, other personnel or property. Read these safety instructions carefully prior to your first use of the product, as these precautions contain safety instructions that must be observed. After reading through this manual, be sure to follow it to prevent misuse of product.

⚠ Caution! Read Carefully and do not disregard these instructions.
In the event of a failure, disconnect the power supply Disconnect the power supply immediately and contact our sales personnel for repair. Continuing to use the product in this state may result in a fire or electric shock.
If an unpleasant smell or smoking occurs, disconnect the power supply. Disconnect the power supply immediately! Continuing to use the product in this state may result in a fire or electric shock. After verifying that no smoking is observed, contact our sales personnel for repair.
Do not disassemble, repair or modify the product. This may result in a fire or electric shock due to a circuit shortage or heat generation. Contact our sales personnel prior to inspection, modification or repair.
Do not place the product on unstable surfaces. Otherwise, it may drop or fall, resulting in injury to persons or the camera.
Do not use the product if dropped or damaged. Otherwise, a fire or electric shock may occur.
Do not touch the product with metallic objects. Otherwise, a fire or electric shock may occur.
Do not place the product in dusty or humid environments, nor where water may splash. Otherwise, a fire or electric shock may occur.
Do not wet the product or touch it with wet hands. Otherwise, the product may fail, or it may cause a fire, smoking or electric shock.
Do not touch the gold-plated sections of the connectors on the product. Otherwise, the surface of the connector may be contaminated by sweat or skin-oil, resulting in contact failure of a connector, malfunction, fire or electric shock due to static electricity discharge.
Do not use or place the product in the following locations. ▪ Unventilated areas such as closets or bookshelves. ▪ Near oils, smoke or steam. ▪ Next to heat sources. ▪ A closed (and not running) car where the temperature becomes high. ▪ Static electricity replete locations ▪ Near water or chemicals. Otherwise, a fire, electric shock, accident or deformation may occur due to a short circuit or heat generation.
Do not place heavy objects on the product. Otherwise, the product may be damaged.
Be sure to discharge static electricity from body before touching any sensitive electronic components. The electronic circuits in your computer and the circuits on the ***Iron*** camera and the ***Predator II*** board are sensitive to static electricity and surges. Improper handling may seriously damage the circuits. In addition, do not let your clothing come in contact with the circuit boards or components. Otherwise, the product may be damaged.

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3.2 Disclaimer

This product should only be used for image capturing and processing. KAYA Instruments will assume no responsibility for any damage that may ensue by the use of the camera for any purpose other than intended, as previously stated. Without detracting from what was previously written, please be advised that the company will take no responsibility for any damages caused by:

- Earthquake, thunder strike, natural disasters, fire caused by use beyond our control, wilful and/or accidental misuse and/or use under other abnormal and/or unreasonable conditions.
- Secondary damages caused by the use of this product or its unusable state (business interruption or others).
- Use of this product in any manner that contradicts this manual or malfunctions that may occur due to connection to other devices. Damage to this product that is out of our control or failure due to modification
- Accidents and/or third parties that may be involved.

Additionally, KAYA Instruments assumes no responsibility or liability for:

- Erasure or corruption of data caused by the use of this product.
- Any consequences or other abnormalities following the use of this product

Repairs to this product are carried out by replacing it on a chargeable basis and not by repairing the faulty device. Non-chargeable replacement is offered for initial failure, as long as it is reported no later than two weeks post-delivery of the product.

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4 Overview

This document describes the functionality and features of the *Iron CoaXPress* cameras.

Iron CoaXPress camera is a high-speed, high-quality device for image streaming. Using standard CoaXPress Frame Grabber, connection and streaming can be achieved in few easy steps and requires little configurations.
The camera provides vast variety of image processing algorithms and configurations to adjust the stream output.

Camera control can be achieved using standard GenICam interface, subordinate to the camera's descriptive schema (xml) file.
Configuration features are subject to the active firmware capabilities and a firmware upgrade might be needed to support complete functionality set.

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5 Hardware Reference

5.1 Power over CoaXPress

Iron CoaXPress cameras support PoCXP (Power over CoaXPress), but must never be connected to an external power source whilst receiving power through PoCXP. Powering the camera with an external power source and over CoaXPress simultaneously may cause irreversible damage.

! Never connect an external power supply to CoaXPress cameras when PoCXP is enabled on Frame Grabbers

5.2 Micro BNC Connector

To connect the Micro-BNC cable, first need to align the pin on the male end with the "L" shaped track on the female-connector of the Coaxial cable. Once aligned, the connector should be pushed in place (see figure no. 1). Only mild pressure should be applied to achieve this operation, otherwise it may cause unnecessary damage to the cable or the card.

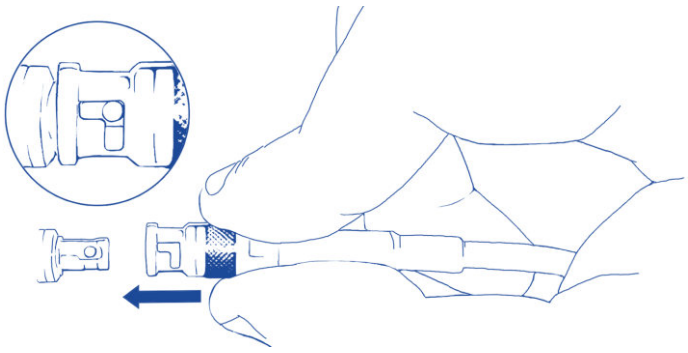

Figure 1 – Pushing the Micro-BNC connector into place

Once pushed all the way through, twist the connector clock-wise. The pin will move in the track locking the connector in position:

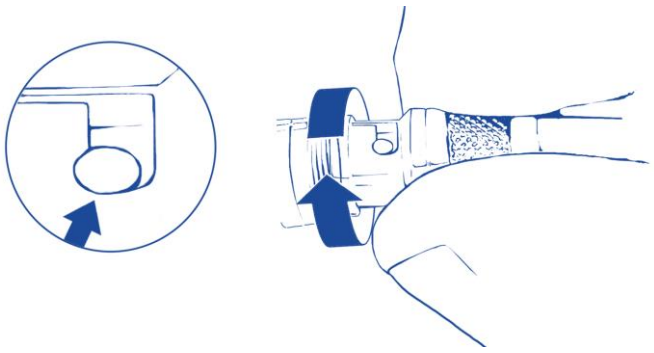

Figure 2 – Twisting the connector and securing it in position

The cable can be removed by reversing the steps: twisting the connector counter-clock-wise and pulling it out.

Do not force the cable out! In case of resistance check for the pin location in relation to the track. Adjust as needed and only then pull the cable out.

5.3 Status LEDs

The bi-color LEDs behave according to definition in section 5.4 of the CoaXPress standard. Color-coded indication along with exact timing for each indicator are described in the following tables:

	LED state	Indication
	Off	Camera is not powered
	Solid orange	Camera is booting
	Solid red	Camera is powered but no active connection
	Fast flash alternate green / orange	Fast flash alternate green / orange - Connection detection in progress
	Solid green	Camera is connected, no data being transferred
	Fast flash green	Camera is connected, data is being transferred
	Slow pulse orange	Camera is connected. Waiting for trigger event

Table 2 – Connector indicator lamp states

	Indication	Timing
	Fast flash	12.5Hz (20ms on, 60ms off)
	Slow flash	0.5Hz (1s on, 1s off)
	Slow pulse	1Hz (200ms on, 800ms off)

Table 3 – Connector indication lamp timings

6 Configuration Interface

6.1 Device Control

The Device Control contains manufacturer parameters describing the currently connected hardware device. The information includes device vendor name, basic manufacturer information details and the currently running firmware version. This information can be used to identify the specific hardware and notify in case a firmware update is needed to support complete functionality set.

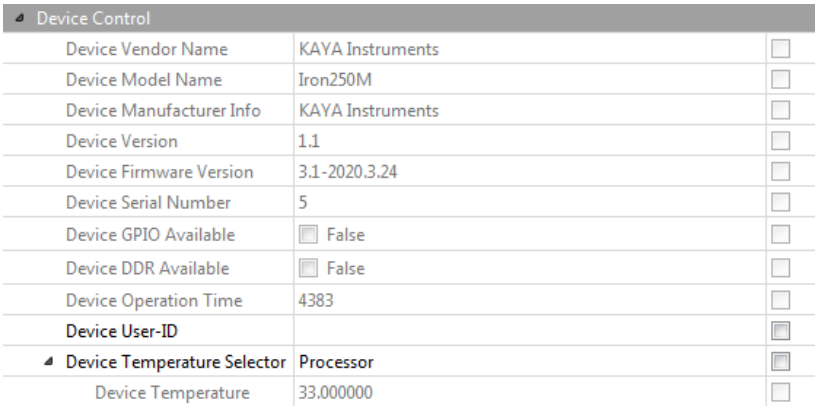

Figure 3 – Device Control category in GenICam Browser

6.1.1 Device Control XML parameters

Parameter	Description	Gen<i>Cam name	Type	Possible values		Remarks
				Value	Gen<i>Cam name	
Gen<i>Cam Category: DeviceControl						
Device Vendor Name	Name of the manufacturer of the device	DeviceVendorName	String			
Device Model Name	The model of the device	DeviceModelName	String			
Device Manufacturer Info	Extended manufacturer information about the device	DeviceManufacturerInfo	String			
Device Version	The version of the device	DeviceVersion	String			
Device Firmware Version	The firmware version of the device	DeviceFirmwareVersion	String			
Device Serial Number	Device's serial number. This string is a unique identifier of the device	DeviceSerialNumber	String			
Device Operation Time	Device operation time since first power up	DeviceOperationTime	Integer			RO in minutes
Device Temperature Selector	Selects the temperature value source	DeviceTemperatureSelector	Enumeration (Selector)	0 1	Processor Sensor	
Device Temperature	Device temperature	DeviceTemperature [DeviceTemperatureSelector]	Float	Max: 120 Min: -60		In °C

Table 4 – Device Control parameters

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6.1.2 Device Operation Timer

Device Operation Timer indicates how much time has the camera been operational in its lifetime. The time value units of the Timer are in minutes. For example: value of 1234 will indicate that camera has been operational (powered-up) for total of 1234 minutes in its lifetime.

This parameter can be found under the “Device Control” section of camera’s XML.

6.2 Image Format Control

The Image Format Control is responsible for defining the output image dimensions and format type. The resolution of the image and output format will influence the maximum frame rate which can be achieved.

Image Format Control		
WidthMin	272	☐
HeightMin	4	☐
WidthMax	2448	☐
HeightMax	2048	☐
Width	2448	☐
Height	2048	☐
OffsetX	0	☐
OffsetY	0	☐
Pixel Format	Mono12	☐
Pixel Adc	Adc12bit	☐
Scan Type	Areascan	☐
Test Pattern	Off	☐
Vertical invert	☐ False	☐
Horizontal invert	☐ False	☐
Binning Selector	Sensor	☐
Binning Vertical	1	☐
Decimation Vertical Mode	Average	☐
Decimation Vertical	1	☐
Decimation Horizontal Mode	Average	☐
Decimation Horizontal	1	☐
TLParamsLocked	0	☐

Figure 4 – Image Format Control category in GenICam Browser

6.2.1 Image Format Control XML Parameters

Parameter	Description	Gen<i>Cam name	Type	Possible values		Remarks
				Value	Gen<i>Cam name	
Gen<i>Cam Category: ExtendedStreamFeatures \ ImageFormatControl						
Width Min	Minimum width of the image	WidthMin	Integer			In pixels *See remark (1)*
Height Min	Minimum height of the image	HeightMin	Integer			In pixels *See remark (1)*
Width Max	Maximum width of the image	WidthMax	Integer			In pixels *See remark (1)*
Height Max	Maximum height of the image	HeightMax	Integer			In pixels *See remark (1)*
Width	Width of the image provided by the device (in pixels)	Width	Integer	≥ 4		
Height	Height of the image provided by the device (in pixels)	Height	Integer	≥ (*)		*Minimum value is dependent on sensor type, pixel bitness and acquisition mode

Offset X	Horizontal offset from the origin to the area of interest (in pixels)	OffsetX	Integer			
Offset Y	Vertical offset from the origin to the area of interest (in pixels)	OffsetY	Integer			
Pixel Format	Indicates the format of the pixel to use during the acquisition	PixelFormat	Enumeration	0x00000101 0x00000102 0x00000103 0x00000311 0x00000312 0x00000313 0x00000321 0x00000322 0x00000323 0x00000331 0x00000332 0x00000333 0x00000341 0x00000342 0x00000343	Mono8 Mono10 Mono12 BayerGR8 BayerGR10 BayerGR12 BayerRG8 BayerRG10 BayerRG12 BayerGB8 BayerGB10 BayerGB12 BayerBG8 BayerBG10 BayerBG12	*See remark (2)*
Pixel Adc	Indicates the pixel analog output bitness during the acquisition	PixelAdc	Enumeration	0 1 2	Adc8bit Adc10bit Adc12bit	
Scan Type	Scan type of the sensor of the device	DeviceScanType	Enumeration	0 1	Areascan Linescan	only “Areascan” is available for now
Test Pattern	Selects the type of test pattern that is generated by the device as image source	TestPattern	Enumeration	0x101 0x102 0x103	Grey Vertical Ramp 1 Grey Vertical Ramp 2 Gradation Pattern	
Vertical invert	Flip image vertically. The ROI will stay as original image.	ReverseY	Boolean	0 1	False True	
Horizontal invert	Flip image horizontally. The ROI will stay as original image.	ReverseX	Boolean	0 1	False True	
Binning Selector	Selects which binning engine is controlled by the BinningHorizontal and BinningVertical features	BinningSelector	Enumeration	0	Sensor	
Binning Vertical	Number of vertical photo-sensitive cells to combine together	BinningVertical	Integer	Min: 1 Max: 2		*See remark (3)*
Binning Horizontal	Number of horizontal photo-sensitive cells to combine together	BinningHorizontal	Integer	Min: 1 Max: 2		*See remark (4)*
Decimation Horizontal Mode	Sets the mode used to reduce the horizontal resolution when DecimationHorizontal is used	DecimationHorizontalMode	Enumeration	0	Average	
Decimation Horizontal	Horizontal sub-sampling of the image	DecimationHorizontal	Integer	Min: 1 Max: 2		*See remark (5)*
Decimation Vertical Mode	Sets the mode used to reduce the Vertical resolution when DecimationVertical is used	DecimationVerticalMode	Enumeration	0	Average	
Decimation Vertical	Vertical sub-sampling of the image	DecimationVertical	Integer	Min: 1 Max: 2		*See remark (6)*

Table 5 – Image Format control parameters

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Remarks:

1. The dimension is calculated after horizontal binning, decimation or any other function changing the horizontal dimension of the image.
2. Conversion in Frame Grabber is possible according to input camera, PixelFormat, resolution and HW capabilities
3. Reduces the vertical resolution (height) of the image. A value of 1 indicates that no vertical binning is performed by the camera.
4. Reduces the horizontal resolution (width) of the image. A value of 1 indicates that no horizontal binning is performed by the camera.
5. Reduces the horizontal resolution (width) of the image by the specified horizontal decimation factor.
6. Reduces the vertical resolution (height) of the image by the specified vertical decimation factor.

6.3 Acquisition Control

The Acquisition stream control section describes settings and state for data generation (commands and stream). Acquisition can also be controlled trough executing the relevant commands from this category

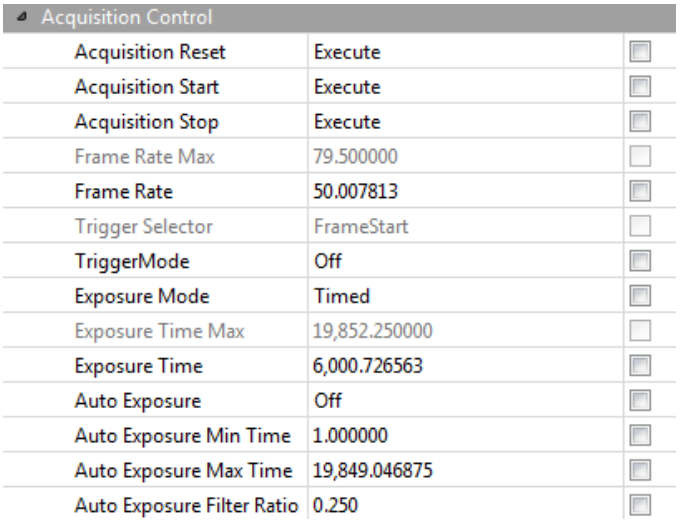

Figure 5 – Acquisition Control category in GenICam Browser

6.3.1 Acquisition Control XML parameters

Parameter	Description	Gen<i>Cam name	Type	Possible values		Remarks
				Value	Gen<i>Cam name	
Gen<i>Cam Category: AcquisitionControl						
Acquisition Reset	Resets the image acquisition logic and counters	AcquisitionReset	Command	1 - Activate		
Acquisition Start	Starts the Acquisition of the device	AcquisitionStart	Command	1 - Activate		
Acquisition Stop	Stops the Acquisition of the device at the end of the current Frame	AcquisitionStop	Command	0 - Activate		
Frame Rate Max	Acquisition rate maximum value	AcquisitionFrameRateMax	Float			In units of Hz
Frame Rate	Controls the acquisition rate at which the frames are captured	AcquisitionFrameRate	Float	≥ 1		In units of Hz
Exposure Mode	Sets the operation mode of the Exposure (or shutter)	ExposureMode	Enumeration	0x00 0x01	Timed TriggerWidth	
Exposure Time Max	Exposure time maximum value	ExposureTimeMax	Float			In units of microseconds (us)
Exposure Time	Sets the Exposure time when ExposureMode is Timed	ExposureTime	Float	≥ 1.0		In units of microseconds (us) *See remark (1)*
Trigger Selector	Selects the type of trigger to configure	TriggerSelector	Enumeration	0	FrameStart	
Trigger Mode	Controls if the selected trigger is active	TriggerSoftware	Enumeration	0x00 0x01	Off On	

Table 6 – Acquisition Control parameters

Remarks:
1. Controls the duration where the photosensitive cells are exposed to light.

6.3.2 Exposure Time

Time in microseconds [µsec] in which sensor is exposed to light. This time is subject to the specified image frame rate:

$$\text{minimum exposure} \cong 6$$
$$\text{maximum exposure} \cong \frac{1{,}000{,}000}{\text{frame rate}}$$

Additional delays might be taken to consideration in calculation of exposure values, like delay between frames, etc.

6.3.3 Auto Exposure & Gain Algorithm

Auto Exposure and Gain features used to control the picture brightness by adjusting Exposure and Gain values in automatic mode in order to reach desired brightness level. The algorithm calculates the average picture intensiveness inside the defined ROI and tries to adjust it to desired brightness level. The brightness is adjusted by increasing/decreasing exposure time and/or analog gain level. Three modes are available for automatic brightness adjustment:

6.3.3.1 Auto Exposure Mode

When operating in this mode, the camera tries to reach the desired brightness level of the picture by adjusting Exposure Time.

Steps to set Auto Exposure Mode:

1. Define Desired Brightness Level

AutoCompensationControl		
Desired Brightness Level Max	255	☐
Desired Brightness Level	128	☐
Average Brightness Level	0	☐
Peak Brightness Level	0	☐
Brightness Level Average Peak Balance	1.000	☐
Auto Exposure Ratio Selector	Red	☐
Auto Exposure Ratio	0.299	☐
AutoCompensation Roi Width	4096	☐
AutoCompensation Roi Height	3000	☐
AutoCompensation Roi Offset X	0	☐
AutoCompensation Roi Offset Y	0	☐

Figure 6 – Brightness level

2. Define Auto Exposure Minimum and Maximum Time. These parameters define the limits for exposure time adjustment. By default, these values will be set to maximum and minimum possible values.

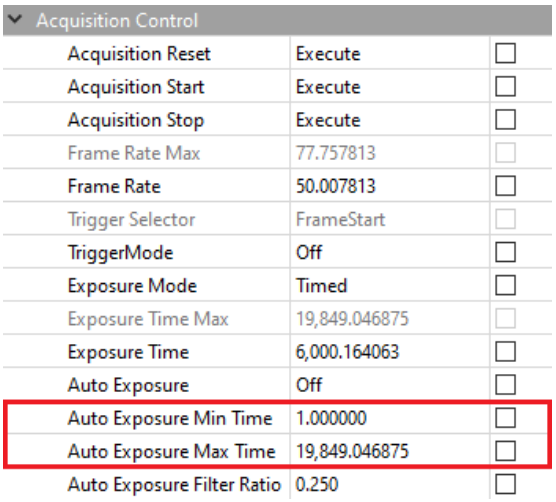

Figure 7 – Auto exposure times

3. Choose one of Auto Exposure modes: “Once” or “Continuous”. Under “Once” mode, the algorithm will adjust the Exposure only once and then the feature will be set to OFF. Respectively under “Continuous” mode, the exposure will be adjusted continuously.

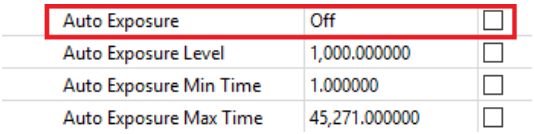

Figure 8 – Exposure mode

The next table specifies the Auto Exposure parameters:

Parameter	Description	Gen<i>Cam name	Type	Possible values		Remarks
				Value	Gen<i>Cam name	
Gen<i>Cam Category: AcquisitionControl						
Exposure Auto	Sets the automatic exposure mode when ExposureMode is Timed	ExposureAuto	Enumeration	0x00 0x01 0x02	Off Continuous Once	
Desired Brightness Level	Image total Brightness Level	DesiredBrightnessLevel	Float	Range: 1 to (2^bitness – 2)		
Exposure Auto Min Time	Sets the Auto Exposure minimal time	ExposureAutoMinTime	Float	Range: 1 to Auto Exposure Max Time		
Exposure Auto Max Time	Sets the Auto Exposure maximum time	ExposureAutoMaxTime	Float	Range: Auto Exposure Min Time to		
Auto Exposure Filter Ratio	Sets the Auto Exposure filter effective ratio	ExposureAutoFilterRatio		Range: 0 to 1		

Table 7 – Exposure Auto control

6.3.3.2 Auto Gain Mode

When operating in this mode, the camera tries to reach the desired brightness level of the picture by adjusting Analog Gain Level. Steps to set Auto Gain Mode:

1. Define Desired Brightness Level

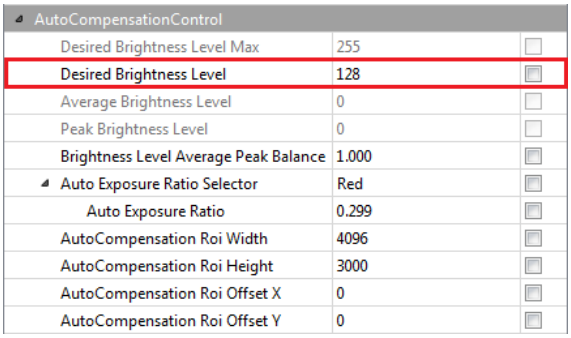

Figure 9 – Brightness Level

2. Define Auto Gain Minimum and Maximum Gain. These parameters define the limits for analog gain adjustment. By default, these values will be set to maximum and minimum possible values.

Figure 10 – Auto Gain values

3. Choose one of Auto Gain modes: “Once” or “Continuous”. Under “Once” mode, the algorithm will adjust the Analog Gain only once, and then the feature will be set to OFF. Respectively under “Continuous” mode, the gain will be adjusted continuously.

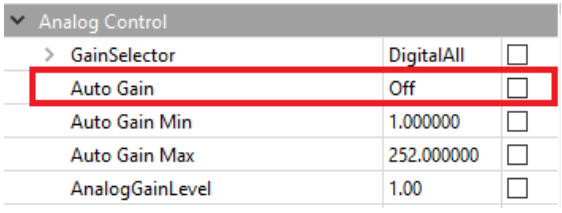

Figure 11 – Auto Gain mode selection

The following tables specifies the auto exposure parameters:

Parameter	Description	Gen<i>Cam name	Type	Possible values		Remarks
				Value	Gen<i>Cam name	
Gen<i>Cam Category: AnalogControl						
Auto Gain	Auto Gain Selector	GainAuto	Enumeration	0x00	Off	
				0x01	Continuous	
				0x02	Once	
Auto Gain Min	Auto Gain Min Value	GainAutoMin	Float	Range: 1 to Auto Gain Max		

Auto Gain Max	Auto Gain Max Value	GainAutoMax	Float	Range: Auto Gain Min to 252
Auto Gain Filter Ratio	Sets the Auto Gain filter effective ratio	GainAutoFilterRatio	Float	Range: 0 to 1

Table 8 – Gain Auto control

6.3.4 Combined Auto Exposure & Auto Gain Mode

When operating in this mode, the camera tries to reach the preferred picture brightness by adjusting both Exposure and Analog Gain values. If the camera's image intensiveness is under desired brightness level, the algorithm first increases exposure value to make the picture brighter. If exposure level is at maximum value, while preferred brightness level is not reached yet, the algorithm starts to modify Gain Level and adjust exposure level accordingly.

This mode is operational only when both Auto Exposure and Auto Gain are set to "Continues" mode.

Steps to set Combined Auto Exposure and Auto Gain Mode:

1. Define the parameters for Auto Exposure; please see the section 6.3.3.1 for detailed instructions.
2. Set Auto Exposure to "Continuous" mode.
3. Define the parameters for Auto Gain; please see related section 6.3.3.2 for detailed instructions.
4. Set Auto Exposure to "Continuous" mode.

6.3.5 Brightness Level

The Desired Brightness Level reflect the average value of all pixels in the defined ROI. The value range of the Desired Brightness Level depends on the output pixel bitness. e.g. for a 10bit output the value should be between 0 and 1023, while for 12bit output the value should be between 0 and 4095.

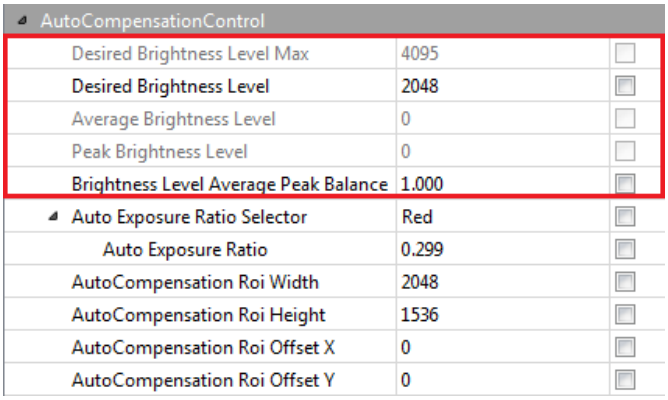

Figure 12 – Brightness level selection

The average value is calculated by the following formulas:

$$avg\_val = \text{ExposureAutoRatio}[\text{red}] * avg\_val[red] + \text{ExposureAutoRatio}[\text{green}] * avg\_val[green] + \text{ExposureAutoRatio}[\text{blue}] * avg\_val[blue]$$

$$\max\_val = \text{ExposureAutoRatio}[\text{red}] * \max\_val[red] + \text{ExposureAutoRatio}[\text{green}] * \max\_val[green] + \text{ExposureAutoRatio}[\text{blue}] * \max\_val[blue]$$

$$roi\_avg = \text{BrightnessLevelAveragePeakBalance} * avg\_val + (1 - \text{BrightnessLevelAveragePeakBalance}) * \max\_val$$

The algorithm strives to make roi_avg value as close as possible to the specified "DesiredBrightnessLevel" by changing Exposure and Analog Gain. Current average value and maximum value can be retrieved using "AverageBrightnessLevel" and "PeakBrightnessLevel" parameters.

Brightness parameters can be seen in the following table:

Parameter	Description	Gen<i>Cam name	Type	Possible values		Remarks
				Value	Gen<i>Cam name	
Gen<i>Cam Category: AnalogControl						
Desired Brightness Level	Desired brightness level for auto compensation algorithm	DesiredBrightnessLevel	Integer	Range: 0 to <max pixel value>		
Average Brightness Level	Current average brightness level result from auto compensation	AverageBrightnessLevel	Integer	Range: 0 to <max pixel value>		
Peak Brightness Level	Current peak brightness level result from auto compensation	PeakBrightnessLevel	Integer	Range: 0 to <max pixel value>		
Brightness Level Average Peak Balance	Sets the effective ratio of Average Brightness Level as complement to Peak Brightness Level	BrightnessLevelAveragePeakBalance	Float	Range: 0 to 1	1 - Complete Average Level and 0 - Complete Peak Level	
Auto Exposure Ratio Selector	Selects which Exposure Auto compensation ratio to control	ExposureAutoRatioSelector	Enumeration	0x00 0x01 0x02	Red Green Blue	
Auto Exposure Ratio	Controls ratio of the selected color component to a reference color component	ExposureAutoRatio	Float	Range: 0 to 1		

Table 9 – Brightness level control

6.3.6 Auto Exposure & Gain ROI Definition

ROI definition refers to Region of Interest which will be used for brightness calculations. The ROI Offset X and Offset Y refer to the distance of the ROI from top left corner of sensor area:

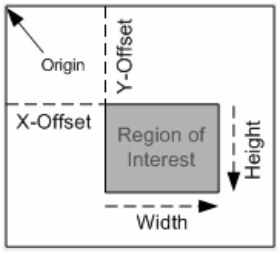

Figure 13 – ROI position in relation to the origin

By default, the ROI is defined to be maximum possible area, i.e. the horizontal and vertical offsets are 0 and the ROI width and height as the sensor dimensions. The ROI settings for brightness calculations could be modified under section Analog Control->AutoCompensationControl:

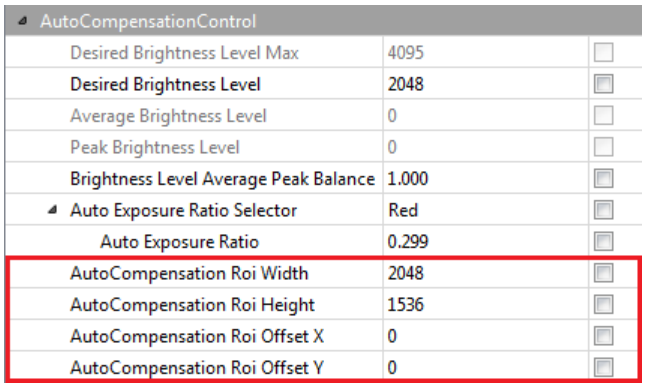

Figure 14 – ROI parameters

Auto Exposure ROI parameters are described in the following table:

Parameter	Description	Gen<i>Cam name	Type	Possible values		Remarks
				Value	Gen<i>Cam name	
Gen<i>Cam Category: AnalogControl/AutoCompensationControl						
Auto Compensation ROI Width	Width of the Auto Compensation calculation ROI	AutoCompensationRoiWidth	Integer			
Auto Compensation ROI Height	Height of the Auto Compensation calculation ROI	AutoCompensationRoiHeight	Integer			
Auto Compensation ROI Offset X	OffsetX of the Auto Compensation calculation ROI	AutoCompensationRoiOffsetX	Integer			
Auto Compensation ROI Offset Y	OffsetY of the Auto Compensation calculation ROI	AutoCompensationRoiOffsetY	Integer			

Table 10 – Auto compensation ROI control

6.4 Analog Control

Analog control parameters describes how to influence the analog sensor features and digital modifiers, such as gain, black level, white balance and voltages, to manipulate image output.

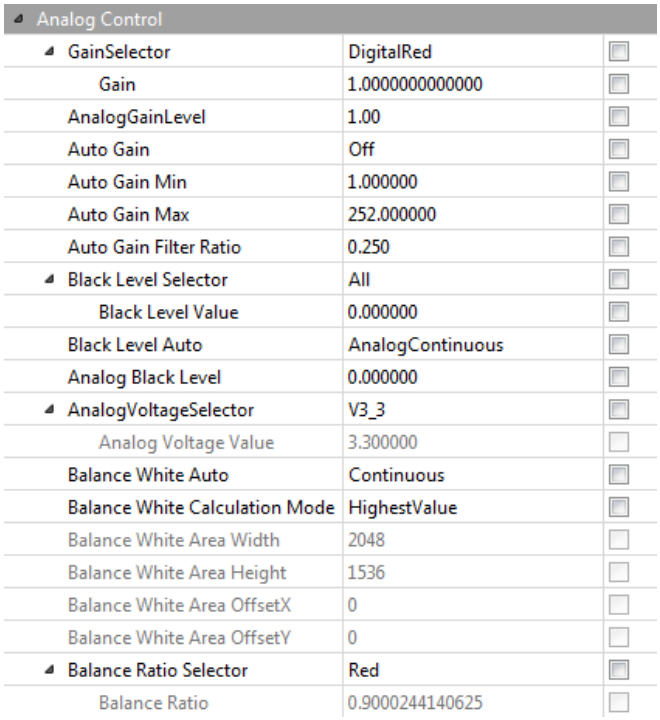

Figure 15 – Analog Control category in GenICam Browser

6.4.1 Analog and Digital Gain and Black Level

Parameter	Description	Gen<i>Cam name	Type	Possible values		Remarks
				Value	Gen<i>Cam	
Gen<i>Cam Category: AnalogControl						
Gain Selector	Selects which Gain is controlled by the various Gain features	GainSelector	Enumeration (Selector)	0 1 2 3	DigitalAll DigitalRed DigitalGreen DigitalBlue	
Gain	Controls the selected gain as an absolute physical value	Gain [GainSelector]	Float	Max. 7.99923		
Analog Gain Level	Controls the analog gaining level	AnalogGainLevel	Float	Min. 1 Max. 252		
Black Level Selector	Selects which Black Level is controlled by the various Black Level features	BlackLevelSelector	Enumeration	0 1 2 3	All Red Green Blue	
Black Level	Controls the digital black level as an absolute physical value	BlackLevel [BlackLevelSelector]	Enumeration	Min. -1023 Max. 1023		
Black Level Auto	Controls the mode for automatic black level adjustment	BlackLevelAuto	Enumeration	0x00 0x03 0x04	Off DigitalOnce DigitalContinuous	

Analog Black Level	Controls the analog black level as an absolute physical value. Represents the applied DC offset	AnalogBlackLevel	Float	Min. -1.2 Max. 1.2		
Analog Voltage Selector	Selects an analog voltage	AnalogVoltageSelector	Enumeration (Selector)	0x04 0x05 0x06 0x07 0x101 0x102 0x104	V3_3 V1_2 V2_5 V1_8 V1_8_Internal V1_05_Internal V2_5_Internal	
Analog Voltage Value	Device analog voltage value in volts	AnalogVoltageValue	Float			In units of Volt (V)

Table 11 – Analog Control parameters

The Analog Control parameters can be used to control and adjust the gain and the black level available features. The correction is performed according to the following equation:

$$\overline{P_{red}} = (\mathrm{P_{red}} + \text{"BlackLevelRed"}) * \text{"GainRed"}$$
$$\overline{P_{green}} = (\mathrm{P_{green}} + \text{"BlackLevelGreen"}) * \text{"GainGreen"}$$
$$\overline{P_{blue}} = (\mathrm{P_{blue}} + \text{"BlackLevelBlue"}) * \text{"GainBlue"}$$

Where P is the pixel that is being corrected, the Black Level is the offset of said pixel and the Gain is the gain of the pixel. Analog Black Level Controls the analog black level as an absolute physical value. Represents the applied DC offset

6.4.2 White Balance

Parameter	Description	Gen<i>Cam name	Type	Possible values		Remarks
				Value	Gen<i>Cam name	
Gen<i>Cam Category: AnalogControl						
Balance White Auto	Controls the mode for automatic white balancing between the color channels. The white balancing ratios are automatically adjusted	BalanceWhiteAuto	Enumeration	0x00 0x01 0x02 0x03	Off Once Continuous Manual	
Balance White Calculation Mode	Controls the mode for calculation algorithm of white balancing compensation	BalanceWhiteCalculationMode	Enumeration	0 1 2 3	HighestValue Red Green Blue	
Balance White Area Width	Width of the area for BalanceWhite calculation, inside the output image ROI	BalanceWhiteAreaWidth	Integer	Max: Image Width		In units of pixels
Balance White Area Height	Height of the area for BalanceWhite calculation, inside the output image ROI	BalanceWhiteAreaHeight	Integer	Max: Image Height		In units of pixels
Balance White Area Offset X	Horizontal offset from the origin to the area of BalanceWhite interest	BalanceWhiteAreaOffsetX	Integer			In units of pixels

Balance White Area Offset Y	Vertical offset from the origin to the area of BalanceWhite interest	BalanceWhiteAreaOffsetY	Integer			In units of pixels
Balance Ratio Selector	Selects which Balance ratio to control	BalanceRatioSelector	Enumeration	0 1 2	Red Green Blue	
Balance Ratio	Ratio of the selected color, compared to a reference color component selected using Balance White Calculation Mode. Used to adjust colors for white balancing	BalanceRatio [BalanceRatioSelector]	Float	Max. 7.999		

Table 12 – White Balance parameters

Automatic white balance adjustment, compensate sensor output colors to true colors. The algorithm works on the assumption that average color of image in selected ROI is gray.

Manual adjustment can also be selected per color, for user configuration coefficients.

The calculation mode can be adjusted to normalize result according to selected color or highest value.

6.5 LUT control

The LUT Control can be used to re-map the camera linear output in different manner. Mostly to compensate for the non-linear scene emission.
LUT configuration typical applications include enhancing gamma or image contrast, brightness changes, gray value spreading, setting individual gradation curves, etc.

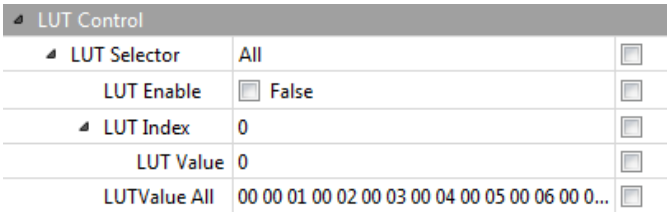

Figure 16 – LUT Control category in GenICam Browser

6.5.1 LUT Control XML Parameters

Parameter	Description	Gen<i>Cam name	Type	Possible values		Remarks
				Value	Gen<i>Cam name	
Gen<i>Cam Category: LUTControl						
LUT Selector	Selects which LUT to control	LUTSelector	Enumeration (Selector)	0 1 2 0xFF	Red Green Blue All	
LUT Enable	Activates the selected LUT	LUTEnable [LUTSelector]	Boolean	0 - false 1 - true		
LUT Index	Control the index (offset) of the coefficient to access in the selected LUT	LUTIndex [LUTSelector]	Integer	Max. 4095		
LUT Value	Returns the Value at entry LUTIndex of the LUT selected by LUTSelector	LUTValue [LUTSelector] [LUTIndex]	Integer	Max. 4095		
LUT Value All	Accesses all the LUT coefficients in a single access without using individual LUTIndex	LUTValueAll [LUTSelector]	IRegister			

Table 13 – LUT Control parameters

6.5.2 LUT pixel re-map algorithm

Each index at the LUT corresponds to the pixel value and the LUT value at this index corresponds to the value that the pixels should be replaced with. The applied valid LUT index and corresponding value will be re-mapped according to selected pixel bitness. i.e For 8 bit the applied indexes will be 0-255, for 10 bit the applied indexes will be 0-1023, for 12 bit the applied indexes will be 0-4095.
Pixel value is replaced according to the following equation:

$$\overline{P_{red}(x,y)} = LUT_{red}[P_{red}(x,y)]$$
$$\overline{P_{green}(x,y)} = LUT_{green}[P_{green}(x,y)]$$
$$\overline{P_{blue}(x,y)} = LUT_{blue}[P_{blue}(x,y)]$$

Where P(x,y) is the pixel at offset X in horizontal and Y in vertical, of specific color.

6.6 Pixel Correction Control

The pixel correction control allow compensating any sensor dead pixel by averaging adjacent pixels.
The Dark and Flat field correction algorithm helps to solve issues with fixed pattern noise, usually originates from the sensor.

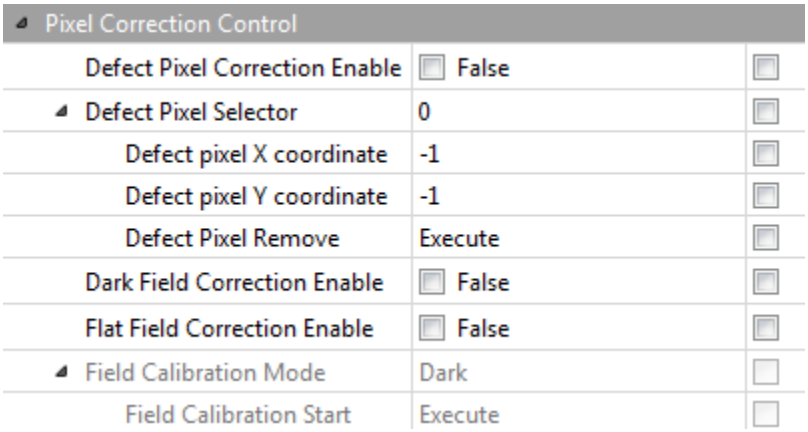

Figure 17 – Pixel Correction Control category in GenICam Browser

6.6.1 Pixel Correction Control XML Parameters

Parameter	Description	Gen<i>Cam name	Type	Possible values		Remarks
				Value	Gen<i>Cam name	
Gen<i>Cam Category: PixelCorrectionControl						
Defect Pixel Correction Enable	Enable the Defect Pixel correction algorithm	DefectPixelCorrectionEnable	Boolean	0 - false 1 - true		
Defect Pixel Selector Max	Total number of defect pixels to be corrected	DefectPixelSelectorMax	Integer			
Defect Pixel Selector	Total number of defect pixels to be corrected	DefectPixelSelector	Integer (Selector)			
Defect pixel X coordinate	Configure defect pixel X coordinate	DefectPixelX [DefectPixelSelector]	Integer	Min: -1 Max: SensorWidth		
Defect pixel Y coordinate	Configure defect pixel Y coordinate	DefectPixelY [DefectPixelSelector]	Integer	Min: -1 Max: SensorHeight		
Defect Pixel Remove	Remove the defect pixel determined by DefectPixelWriteX and DefectPixelWriteY	DefectPixelRemove [DefectPixelSelector]	Command	1 - Activate		
Dark Field Correction Enable	Enable the Dark Field correction algorithm	DarkFieldCorrectionEnable	Boolean	0 - false 1 - true		
Flat Field Correction Enable	Enable the Flat Field correction algorithm	FlatFieldCorrectionEnable	Boolean	0 - false 1 - true		
Field Calibration Mode	Sets the operation Field Calibration mode	FieldCalibrationMode	Enumeration (Selector)	0 1	Dark Flat	
Field Calibration Start	Activates the Field Calibration	FieldCalibrationStart [FieldCalibrationMode]	Command	1 - Activate		

Table 14 – Pixel Correction Control parameters

6.6.2 Defect Pixel Correction

The defected pixel correction will correct up to 32 pixels in the sensor and up to 2 adjacent pixels in a row. The pixel correction coordinates represent pixels of sensor's visible ROI, therefore identifying the correct X and Y coordinate should be done using default, full resolution image.
The algorithm will correct the defect pixel based on the value of existing adjacent pixels. The correction for Mono and Color sensor is slightly different and described as follows:

Mono pixel correction:
The defect pixel $P(x,y)$ value will be the average value of 2 pixels adjacent to pixel $P(x,y)$ from both sides in the same row.

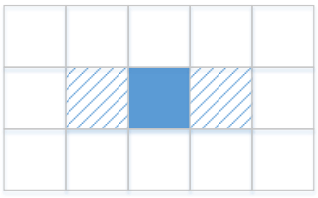

Figure 18 – Defect pixel correction position for Mono image

Color (Bayer) pixel correction:
The defect pixel $P(x,y)$ value will be the average value of two pixels from both sides of pixel $P(x,y)$ in the same row, corresponding to the same Bayer color element.

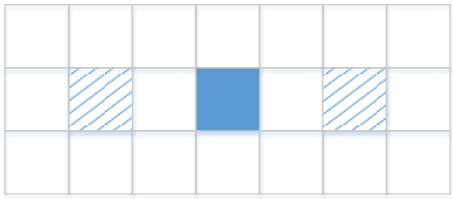

Figure 19 – Defect pixel correction position for Color image

6.6.3 Field Correction

The Flat-field and Dark-field corrections are used to improve the quality of the image by removing the artefacts that are caused by fixed pattern noise and variations in the pixel-to-pixel sensitivity of the detector. To make Dark/Flat field correction, two pictures should be taken. One with lens closed (offset should be boosted) and one with uniform illumination of around 40% .The operator is per pixel and defined according to following formula:

$$\overline{P(x,y)} = Gain(x,y)[P(x,y) - P_{dark}(x,y)]$$

Where P(x,y) is the pixel at offset X in horizontal and Y in vertical. Pdark (x,y) is the offset of the pixel at offset X in horizontal and Y in vertical that was measured during the calibration stage. Gain(x,y) is the gain of the pixel at offset X in horizontal and Y in vertical that was measured during the calibration stage.

This correction is valid for the specific camera settings and conditions (gain, exposure time, temperature etc.) which were selected during the calibration process. Follow these steps to perform calibration process:

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1. Prepare light source for specific calibration:
   a. Dark field calibration: in this case, light should be blocked from the sensor. This can be achieved by covering the sensor with a solid cap.
   b. Flat field calibration: in this case, uniform light should be applied across the sensor. This can be achieved by setting a uniform light source in front of the camera.
2. Select the “Calibration Mode” either “Dark” or “Flat”
3. Start camera’s stream either in free run or by applying an external trigger.
4. Initiate the selected calibration with “Field Calibration Start” command Execute.

Notes:

1. The Flat field calibration should be performed after the Dark field calibration has already be performed for the selected camera settings.
2. The PRNU and DSNU depends on exposure, gain, temperature and number of active fiber links. In case the above conditions might change during camera operation, it is advised to pre calibrate the system on several conditions and save them as different user sets. Load the user set if the conditions have been changed. User set control is described in section. For more information, please refer to “Flat Field correction in JetCam cameras”.
3. “Default” user set will load camera’s factory settings.
4. Firmware update may erase the saved user sets and may change camera’s “Default” settings.

6.7 File Access Control

File Access Control contains parameters related to accessing files stored on the device, including file selection, operation mode (reading and writing) as well as data transfer limitations and information regarding file sizes.

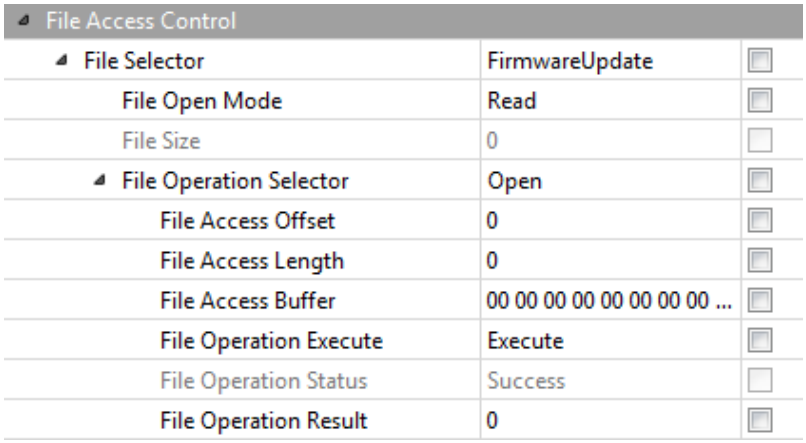

Figure 20 – File Access Control parameter configuration in GenICam Browser

6.7.1 File Access Control XML Parameters

Parameter	Description	Gen<i>Cam name	Type	Possible values		Remarks
				Value	Gen<i>Cam name	
Gen<i>Cam Category: FileAccessControl						
File Selector	Selects the target file in the device	FileSelector	Enumeration (Selector)	0 1	FirmwareUpdate UserMemory	
File Open Mode	Selects the access mode in which a file is opened in the device	FileOpenMode	Enumeration	0 1 2	Read Write ReadWrite	
File Size	Represents the size of the selected file in bytes	FileSize	Integer			
File Operation Selector	Selects the target operation for the selected file in the device. This Operation is executed when the FileOperationExecute feature is called	FileOperationSelector	Enumeration (Selector)	0 1 2 3	Open Close Read Write	
File Access Offset	Controls the Offset of the mapping between the device file storage and the FileAccessBuffer	FileAccessOffset	Integer			
File Access Length	Controls the Length of the mapping between the device file storage and the FileAccessBuffer	FileAccessLength	Integer	Min. 0 Max. 1024		
File Access Buffer	Defines the intermediate access buffer that allows the exchange of data between the device file storage and the application	FileAccessBuffer	IRegister			
File Operation Execute	Executes the operation selected by FileOperationSelector on the selected file	FileOperationExecute	Command	1 - Activate		

File Operation Status	Represents the file operation execution status	FileOperationStatus	Enumeration	0 1	Success Failure
File Operation Result	Represents the file operation result. For Read or Write operations, the number of successfully read/written bytes is returned	FileOperationResult	Integer		

Table 15 – File Access Control parameters

6.7.2 How to Use File Access Control

The purpose of file access control interface is to perform large data transfer with the camera. This can be achieved using the following sequence:

Write operation sequence:

1. Select the file section to access using “FileSelector”
2. Change the “FileOpenMode” to either “Write” or “ReadWrite”
3. Set the “FileOperationSelector” to “Open” in order to open write access to selected file
4. Open the file using “FileOperationExecute” command.
5. Check the operation status in “FileOperationStatus“. On success file will open for writing.
6. Set the “FileOperationSelector” to “Write” in order to select write operation.
7. Fill “FileAccessOffset”, “FileAccessLength” and “FileAccessBuffer” with offset position, length and data for next transection.
8. Perform write operation using “FileOperationExecute” command.
9. Check the operation status in “FileOperationStatus“ and count of transferred bytes in “FileOperationResult”
10. Proceed to next transaction, by performing steps 7-9 until all file is transferred

Read operation sequence:

1. Select the file section to access using “FileSelector”
2. Change the “FileOpenMode” to either “Read” or “ReadWrite”
3. Set the “FileOperationSelector” to “Open” in order to open read access to selected file
4. Open the file using “FileOperationExecute” command.
5. Check the operation status in “FileOperationStatus“. On success file will open for reading.
6. Set the “FileOperationSelector” to “Read” in order to select read operation.
7. Fill “FileAccessOffset”, “FileAccessLength” with offset position and length for next transection.
8. Perform read operation using “FileOperationExecute” command.
9. Check the operation status in “FileOperationStatus“ and count of transferred bytes in “FileOperationResult”
10. On success, read the extracted data from “FileAccessBuffer”.
11. Proceed to next transaction, by performing steps 7-10 until all file is transferred

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6.7.3 Firmware Update

"FirmwareUpdate" is used to upload new firmware to camera: only a dedicated firmware update file should be loaded using this method. The file upload process should not be interrupted and must be completed for successful camera firmware update. After the upload of a new firmware file is finished the camera should be power cycled. Note that although the camera will not have any external indication (i.e. led), power must be applied for at least 30 seconds to complete the update operation

6.7.4 User Memory

"UserMemory" is a dedicated, non-volatile memory space reserved for user usage. Up to 74MB can be filled with user specific data, which can be read back at any time. This memory space will not be erased or modified on camera power-cycle. Notice that the camera does not manage the user memory space nor is it responsible for any initial value.

Write operation remarks:
Writing to any offset which is aligned to 0x10000 (0, 0x10000, 0x20000, 0x30000 …) will erase the complete sector (size of 0x10000 bytes). Writing to any offset which is not aligned to 0x10000 will just perform write operation. Be aware that if a specified offset sector was not erased, new data will be written over existing data and may result in corrupted data.

Remark:
It is advised not to perform memory access operation while stream is running, in order to reduce traffic which might result in error.

6.8 User Set Control

Eight user sets are available for saving different camera parameter configurations. In addition, a "Default" UserSet is available so it will be possible to revert back to default factory settings.

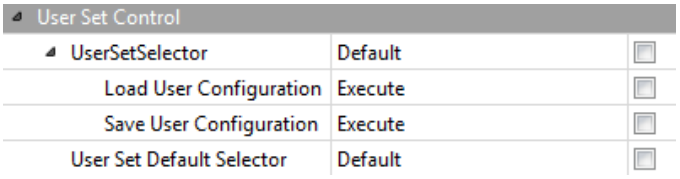

Figure 21 – UserSet Control parameter configuration in GenICam Browser

6.8.1 User Set Control XML Parameters

The User Set Control parameters are summarized in Tables 14 and 15:

Parameter	Description	Gen<i>Cam name	Type	Possible values		Remarks
				Value	Gen<i>Cam name	
Gen<i>Cam Category: UserSetControl						
User Set Selector	Selects the feature User Set to load, save or configure	UserSetSelector	Enumeration (Selector)			
Load User Configuration	Loads the User Set specified by UserSetSelector to the device and makes it active	UserSetLoad [UserSetSelector]	Command	1 - Activate		
Save User Configuration	Save the User Set specified by UserSetSelector to the non-volatile memory of the device	UserSetSave [UserSetSelector]	Command	1 - Activate		
User Set Default Selector	Selects the feature User Set to load and make active when the device is reset	UserSetDefault	Enumeration			

Table 16 – User Set Control parameters

Value	Gen<i>Cam name
0	Default
1	UserSet1
2	UserSet2
3	UserSet3
4	UserSet4
5	UserSet5
6	UserSet6
7	UserSet7
8	UserSet8

Table 17 – User Set Selector parameters

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6.8.2 UserSet operation sequence

The following steps describe the sequence of saving and loading user set camera parameter configurations:

Save User Set:

1. Calibrate the desired camera parameters in “Camera” tab.
2. Open “User Set Control” category
3. Select the desired “UserSetSelector” numeration as UserSetX (X in range of 1-8).
   NOTE: “Default” user set contains factory settings and is not rewritable.
4. Execute “Save User Configuration” command.

Load User Set:

1. Select “UserSetSelector” to the desired UserSetX (X in range of 1-8).
2. Execute “Load User Configuration” command.
3. Press “Refresh” (located in the bottom of the project window).
4. In order to determine the user set configuration with which setting the camera will power up, set the desired user set in “User Set Default Selector” to UserSetX (X in range of 1-8).

Notes:

1. “Default” user set will load camera’s factory settings.
2. Firmware update may erase the saved user sets and may change camera’s “Default” settings.

6.9 CoaXPress Category

The CoaXPress category deals with CoaXPress protocol specific configuration parameters.

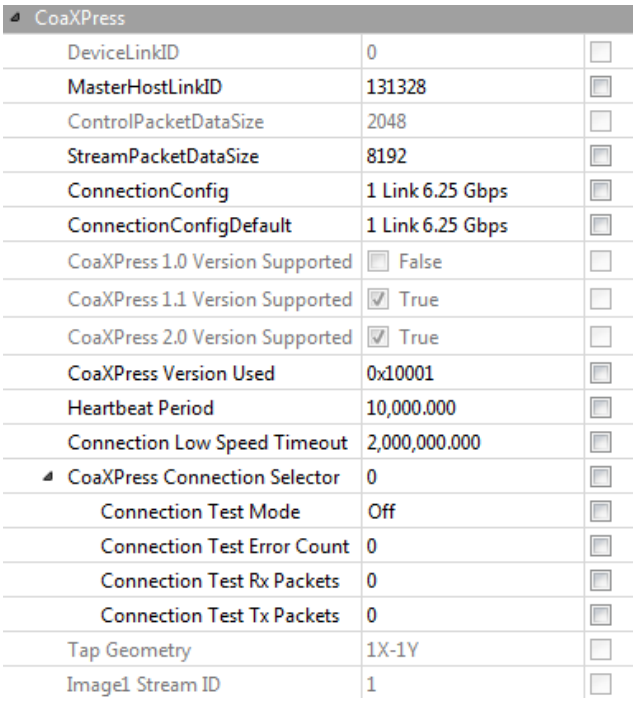

Figure 22 – CoaXPress category in GenICam Browser

6.9.1 CoaXPress XML Parameters

Parameter	Description	Gen<i>Cam name	Type	Possible values		Remarks
				Value	Gen<i>Cam name	
Gen<i>Cam Category: CoaXPress						
Device Link ID	Bootstrap register DeviceLinkID	DeviceLinkID	Integer			
Master Host Link ID	Bootstrap register MasterHostLinkID	MasterHostLinkID	Integer			
Control Packet Data Size	Bootstrap register ControlPacketDataSize	ControlPacketDataSize	Integer			
Stream Packet Data Size	Bootstrap register StreamPacketDataSize	StreamPacketDataSize	Min. 256 Max. 8192			
Connection Config	Bootstrap register ConnectionConfig	ConnectionConfig	Enumeration	0x00010038 0x00010048	x1_CXP_3 x1_CXP_6	1 Link 3.125 Gbps 1 Link 6.25 Gbps
Connection Config Default	Bootstrap register ConnectionConfigDefault	ConnectionConfigDefault	Enumeration	0x00010038 0x00010048 0x00010058	x1_CXP_3 x1_CXP_6 x1_CXP_12	1 Link 3.125 Gbps 1 Link 6.25 Gbps 1 Link 12.5 Gbps
CoaXPress Connection Selector	Selects the CoaXPress physical connection to control	CxpConnectionSelector	Integer	0 – Default		
Connection Test Mode	Test communication errors of the system cabling between devices	CxpConnectionTestMode	Enumeration	0 1	Off Mode1	

Connection Test Error Count	Reports the current connection error count for test packets received by the device on the connection selected by CxpConnectionSelector	CxpConnectionTestErrorCount	Integer		
Connection Test Rx Packets	Reports the current count for test packets received by the device on the connection selected by CxpConnectionSelector	CxpConnectionTestRxPacketCount	Integer		
Connection Test Tx Packets	Reports the current count for test packets sent to the device on the connection selected by CxpConnectionSelector	CxpConnectionTestTxPacketCount	Integer		
Tap Geometry	Vertical multi-tap geometry scanning	TapGeometry	Enumeration	0	X1_1Y
Image1 Stream ID	Gives the Stream ID of the first image stream from the Device	Image1StreamID	Integer		

Table 18 – CoaXPress parameters

6.10 Test Control

Test Control category contain parameters for camera testing and analysis purposes only. These configurations are not required for standard operation of the camera.
Configuration of these parameters might result in unexpected camera behavior if wrong value is input.

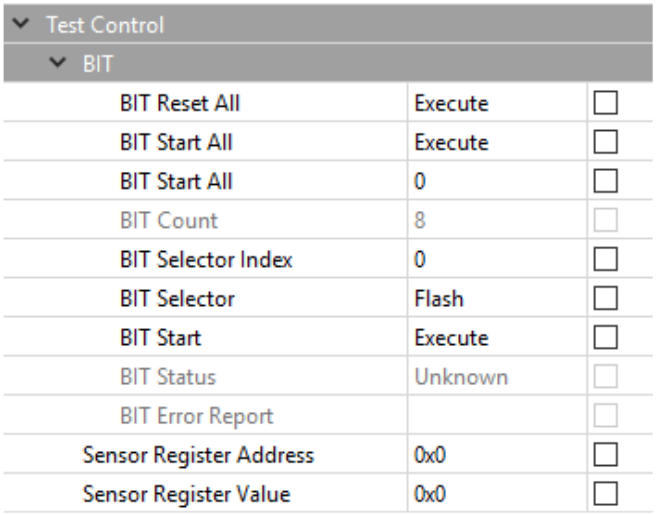

Figure 23 – Test Control parameter configuration in GenICam Browser

6.10.1 Test Control XML Parameters

Parameter	Description	Gen<i>Cam name	Type	Possible values		Remarks
				Value	Gen<i>Cam name	
Gen<i>Cam Category: TestControl						
Sensor Register Address	Sensor Register Address	SensorRegAddress	Integer			
Sensor Register Value	Returns the value of sensor register at SensorRegAddress address	SensorRegValue	Integer			
Gen<i>Cam Category: TestControl/BIT						
BIT Reset All	Reset all BITs	BITResetAll	Command	1 - Activate		
BIT Start All	Start all BITs	BITStartAll	Command	1 - Activate		
BIT Count	Number of available BITs	BITCount	Integer			
BIT Selector Index	Selects BIT configuration	BITSelectorIndex	Integer (Selector)			
BIT Selector	Selects BIT configuration	BITSelector	Enumeration	0	Flash	
				1	Uart	
				2	SensorControl	
				3	SensorLVDS	
				4	Temperature	
				5	Voltages	
				6	MACOM	
				7	GPIO	

BIT Start	Start selected BIT	BITStart	Command	1 - Activate	
BIT Status	BIT current status	BITStatus	Enumeration	0	Unknown
				1	Pass
				2	Fail
				0xFF	Unsupported
BIT Error Report	BIT last error report description	BITErrorReport	String		

Table 19 – Test Control parameters

6.10.2 Build-In-Test

The Build-In-Test (BIT) implements option to check individual camera's interfaces to insure correct behavior in the allowed range.
Each test may result in "Pass", "Fail" or "Unsupported" with appropriate error report, either by starting individual test or all tests together.

Following describe each test functionality:

1. Flash – Test the functionality of flash access.
2. Uart [(1)] – Test the functionality of the UART interface. (Loopback dongle should be mounted to perform this test)
3. SensorControl – Test basic communication with the sensor by reading and comparing with a known default value.
4. SensorLVDS – Test stream interface with the sensor using a known pattern.
5. Temperature – Test the temperature of several components; they must be in acceptable range.
6. Voltages – Test the analog voltages levels; they must be in acceptable range.
7. MACOM [(1)] – Test the speed configuration of the CoaXPress interface.
8. GPIO [(1)] – Test the functionality of the external GPIO interface. (Loopback dongle should be mounted to perform this test)

Remarks:

1. Not all camera models support this configuration.

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6.11 Lens Control

The Lens control allows control over the Focus and Iris and provides general information about the mounted lens. The Lens Controller currently support Birger and P-Iris adaptors;

Please note that a camera must be ordered with the P-Iris option and P-Iris cable assembly in order for the P-Iris lens to operate.

6.11.1 Lens Control Parameters

Parameter	Description	Gen<i>Cam name	Type	Possible values		Remarks
				Value	Gen<i>Cam name	
Gen<i>Cam Category: LensControl						
Lens Selector	Selects lens controller	LensSelector	Enumeration	0	Off	
				1	Birger	
				2	P-Iris	
Lens Communication Source	Source for communication to the lens	LensCommSource	Enumeration	0	RS232_0	
Lens Initiate	Initiates lens controller	LensInit	Command	1 - Activate		
Lens Reset	Reset lens controller	LensReset	Command	1 - Activate		
Lens Present	Indicate if lens is present	LensPresent	Enumeration	0	No	
				1	Yes	
Lens Name	Lens descriptive name	LensName	StringReg			
Lens Identification	Lens type identification	LensId	StringReg			
Lens Serial Number	Serial Number of the lens	LensSerialNumber	StringReg			
Lens Version	Firmware version of the lens	LensVersion	StringReg			
Gen<i>Cam Category: LensFocusControl						
Focus Move Near Full	Move focus to the infinity stop	LensFocusMoveNearFull	Command	1 - Activate		
Focus Move Far Full	Move focus to the zero stop	LensFocusMoveFarFull	Command	1 - Activate		
Focus Move Step	Define focus move step	LensFocusMoveStep	Integer			
Focus Move Near	Move focus to near position	LensFocusMoveNear	Command	1 - Activate		
Focus Move Far	Move focus to far position	LensFocusMoveFar	Command			
Focus Minimum Position	Lens minimum position for focus	LensFocusPositionMin	Float			

Focus Maximum Position	Lens maximum position for focus	LensFocusPositionMax	Float		
Focus Position Increment	Increment step of lens focus position	LensFocusPositionInc	Float	0.001 INC	
Focus Position	Move focus to position	LensFocusPosition	Float		
Focus Position Absolute	Move focus to absolute position	LensFocusPositionAbsolute	Float	Min 0 Max 16383 Inc 1	
Gen<i>Cam Category: LensIrisControl					
Iris Close Full	Move iris to the fully stopped down limit	LensIrisCloseFull	Command	1 - Activate	
Iris Open Full	Move iris to completely open	LensIrisOpenFull	Command	1 - Activate	
Iris Move Step	Define iris move step	LensIrisStep	Integer		
Iris Speed	Defines the aperture speed in microseconds. A lower value will increase the response speed.	LensIrisSpeed	integer		Please note that a value that is too low may result in skipped steps.
Iris Close	Close iris in incremental steps	LensIrisClose	Command	1 - Activate	
Iris Open	Open iris in incremental steps	LensIrisOpen	Command	1 - Activate	
Iris Minimum Position	Lens minimum position for iris	LensIrisPositionMin	Float		For P-Iris, please refer to the lens's manual for minimal step.
Iris Maximum Position	Lens maximum position for iris	LensIrisPositionMax	Float		For P-Iris, please refer to the lens's manual for maximal step.
Iris Position Increment	Increment step of lens iris position	LensIrisPositionInc	Float		
Iris Position	Move iris to absolute position	LensIrisPosition	Float		
Gen<i>Cam Category: LensCommandControl					
Lens Command Request	Lens command request buffer data	LensCommandRequest	Register		
Lens Command Size	Size of command to send	LensCommandSize	Integer		
Lens Command Send	Send 'LensCommandSize' bytes of command in 'LensCommandRequest'	LensCommandSend	Command	1 - Activate	
Lens Command Response	Lens command response buffer data	LensCommandResponse	Register		

Table 20 – Lens Control parameters

6.11.2 P-Iris Setup

Please note that a camera must be ordered with the P-Iris option and P-Iris cable assembly in order for the P-Iris lens to operate.

Figure 24 – Iron CoaXPress with P-Iris

Iron CoaXPress cameras have integrated Gen<i>Cam parameters for controlling P-Iris lenses.

1. Mount the P-Iris lens and connect it to the GPIO while the camera is turned off.
2. Set “LensSelector” as “P-Iris” to select P-Iris control.
3. Initialize the P-Iris using “LensInit” command. The P-Iros will calibrate and move to initial position.
4. After a successful initialization, the “LensIrisControl” category will be available to control the iris motor.
   “LensIrisSpeed” can be used to increase the iris response speed (a value that is too low may result in skipped steps.)
   “LensIrisPositionMin” and “LensIrisPositionMin” can be set to limit step range of the iris motor (refer to the lens’s manual for step range).
5. Recommended: Use the “UserSetSave [UserSetSelector]” command to save this preset and remove the need to initiate the P-Iris in future sessions.

Lens Control		
Lens Selector	PIris	☑
Lens Communication Source	RS232 0	☐
Lens Initiate	Execute	☑
Lens Reset	Execute	☐
Lens Present	Yes	☐
Lens Name		☐
Lens Serial Number		☐
Lens Identification		☐
Lens Version		☐
Lens Focus Control		
Lens Iris Control		
Iris Close Full	Execute	☐
Iris Open Full	Execute	☐
Iris Move Speed	10000	☐
Iris Move Step	1	☐
Iris Close	Execute	☐
Iris Open	Execute	☐
Iris Minimum Position	0.0	☐
Iris Maximum Position	80.0	☐
Iris Position	0.0	☐

Figure 25 – Lens Iris Control parameter configuration in GenICam Browser

6.11.3 Birger Setup

Iron CoaXPress cameras have integrated Gen<i>Cam parameters for controlling Birger lens adapters.

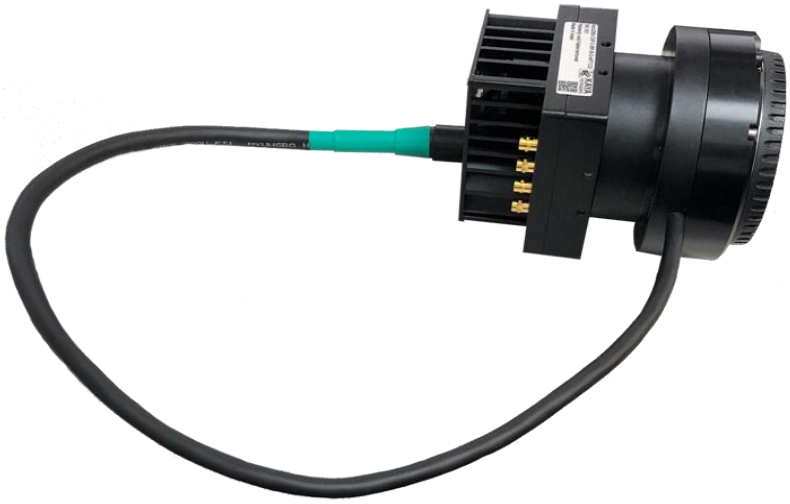

Figure 26 – Iron CoaXPress with Birger

1. Mount the Birger adapter with a lens, and connect it to the GPIO while the camera is turned off.
2. Set “LensSelector” as “Birger” to select Birger adaptor control.
3. Initialize the Birger using “LensInit” command. The Birger will calibrate and move to initial position. Please note that this process might take a few minutes to learn the specific steps of the lens.
4. After a successful initialization, the lens info, “LensFocusControl”, “LensIrisControl” and “LensCommandControl” categories will be available to control the different lens components.
5. Recommended: Use the “UserSetSave [UserSetSelector]” command to save this preset and remove the need to initiate the Birger in future sessions.

Lens Control		
Lens Selector	Birger	☐
Lens Communication Source	RS232 0	☐
Lens Initiate	Execute	☐
Lens Reset	Execute	☐
Lens Present	Yes	☐
Lens Name	Canon 18-55mm	☐
Lens Serial Number	24287	☐
Lens Identification	29mm,f43	☐
Lens Version	s:C2v23	☐
Lens Focus Control		
Focus Move Near Full	Execute	☐
Focus Move Far Full	Execute	☐
Focus Move Step	1	☐
Focus Move Near	Execute	☐
Focus Move Far	Execute	☐
Focus Minimum Position	0.250	☐
Focus Maximum Position	0.250	☐
Focus Position	0.250	☐
Focus Position Absolute	13,311.000000	☐
Lens Focus Control		
Iris Close Full	Execute	☐
Iris Open Full	Execute	☐
Iris Move Step	1	☐
Iris Close	Execute	☐
Iris Open	Execute	☐
Iris Minimum Position	4.3	☐
Iris Maximum Position	26.9	☐
Iris Position	26.9	☐
Lens Command Control		
Lens Command Request	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ...	☐
Lens Command Size	0	☐
Lens Command Send	Execute	☐
Lens Command Response	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ...	☐

Figure 27 Birger mount Control parameter configuration in GenICam Browser