Allied Vision

MIPI CSI-2 and USB3 Vision Cameras

Alvium

Features Reference

V2.6.0

FW 00.08.00.6727174b

Allied Vision Technologies GmbH // Taschenweg 2a, 07646 Stadtroda / Germany

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Alvium Features Reference at a glance

Read this document carefully

Learn to avoid damage to your Alvium camera and use it in the most safe and efficient way.

The Alvium Features Reference describes Alvium features, using **Vimba Access** based on GenICam features as seen from the **Vimba Viewer**.

Features and values availability

Features described in this document may not be supported by every Alvium model. Value ranges may differ between models as well.

GenICam for CSI-2 Access is supported for selected camera models, please see the Alvium CSI-2 Cameras User Guide for details.

Further information and feedback

- For more information on Alvium cameras, see www.alliedvision.com/en/support/technical-documentation.html.
- For feedback or technical questions, please visit www.alliedvision.com/en/support.

Vimba and third party software

Vimba is the Allied Vision Software Development Kit (SDK) for camera control and image acquisition, including drivers and other useful data.

Because Vimba SDK is based on the GenICam standard, GenICam-based third-party software automatically connects with **Vimba**'s transport layers. Additionally, Vimba includes the **Cognex Adapter** for **VisionPro**.

Download **Vimba** from:

www.alliedvision.com/en/support/software-downloads

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Website, email

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Contents

Document history and conventions

This chapter includes:

Document history

Version	Date	Document updates
V2.6.0	2022-Mar-21	**Firmware version**: V00.08.00.6727174b Added support for selected Alvium 1800 C models. • Updated diagrams in Features processing order on page 19 for convolution filters. • Added the `CounterAndTimerControl` category. • Added `AcquitisitonFrameRateMode`, `ExposureActiveMode` and `SensorBitDepth`. • Added features to control convolution filters in the `ImageProcessingControl` category. • Added individual options *`UserSet1`* to *`UserSet4`* and descriptions to the `UserSetControl` category. • Added features that are specific to MPI CSI-2, including the subcategories `StreamInformation/Statistics` and `TransportLayerControl/Info`. • Applied editorial changes.
V2.5.0	2021-Dec-07	**Firmware version**: V00.07.00.81db3896 • Updated diagrams in Features processing order on page 19 for new LUT and Sharpness features. • Added descriptions for `Sharpness`, `TriggerDelay`, and LUT features. • Removed descriptions for `ContrastConfigurationMode`. • Added information on using `ExposureMode`.
V2.4.1	2021-Sep-22	• Removed *`FitRange`* option from `IntensityControllerAlgorithm`.
V2.4.0	2021-Aug-04	**Firmware version**: V00.06.00.35992 • Updated Figure 1: Image data flow for Alvium cameras on page 19. • Added feature descriptions for `BinningHorizontal`, `BinningHorizontalMode`, `BinningSelector`, `BinningVertical`, `BinningVerticalMode`, and `DevicePowerSavingMode`. • Applied editorial changes.

Table 1: Document history

Version	Date	Document updates
V2.3.0.	2021-Apr-07	**Firmware version**: V00.04.00.34658 • Added feature descriptions for `DeviceLinkCommandTimeout`, `DeviceTLVersionMajor`, `DeviceTLVersionMinor`, `TimestampLatch`, `TimestampLatchValue`, `TimestampReset`. • Applied editorial changes.
V2.2.0	2020-Nov-13	**Firmware version**: V00.03.00.31919 • Added descriptions in Features processing order on page 19. • Added *`User`* option to `CorrectionSet` and `CorrectionSetDefault` for defect pixel correction. • Applied editorial changes.
V2.1.2	2020-Jun-05	Corrected naming for the `IntensityAutoPrecedence` feature.
V2.1.1	2020-Mar-12	Removed notes for features previously enabled.
V2.1.0	2020-Feb-13	• Added contents for maximum values for contrast features. • Added `ShutterMode` to the feature descriptions.
V2.0.0	2020-Jan-07	**Firmware version**: V00.01.02.28100 • Added descriptions for `Contrast`, `Gamma`, `Hue`, `Saturation` features, and *`ExposureActive`* option for `TriggerSelector`. • Reorganized feature categories. • Added information on related selectors. • Reorganized introduction chapters. • Corrected typographical errors.
V1.0.3	2019-Sep-05	Applied editorial changes.
V1.0.2	2019-Jul-08	Applied editorial changes.
V1.0.1	2019-Jul-05	Applied editorial changes.
V1.0.0	2019-Jul-01	Associated firmware version: V00.01.00.26405 Release version

Table 1: Document history (Continued)

Conventions used in this document

To give this document an easily understandable layout and to emphasize important information, the following typographical styles and symbols are used:

Styles

Style (example)	Function
Emphasis	Some important parts or items of the text are emphasized to make them more visible.
`Features names`	Features names are displayed as monospaced text.
`Features options`	Features options and values that are selectable by the user are displayed as monospaced italicized text.
`Non-standard features options`	Marked with superscript ([1]) are features that complement the features defined in the SFNC.
`InputCommand`	Text or command to type in by the user, selected menu options, or other selectable options.
`SourceCode`	Code words, such as for programs, used in running text. Mainly designated for use in software documentation.
UIElement	Text that is displayed, or output, by the system for the user, like parts of the GUI, dialog boxes, buttons, menus, important information, or windows titles.
WebReference	References to other documents or webpages, like weblinks, hypertext links, or emails.

Table 2: Markup conventions used in this reference

Symbols and notes

Practical tip

Additional information helps to understand or ease handling the camera.

Additional information

Web address or reference to an external source with more information is shown.

Avoiding malfunctions

Precautions are described.

Access

Acronym	Meaning
R/W	Feature is read/write.
R/(W)	Feature is readable, and it may be read/write, depending upon the user privilege level.
R/C	Feature is read-only and constant.
R	Feature is read-only and may change.
ROI	Region of interest
W	Feature is write-only.

Table 3: Abbreviations used in this reference

Standards referred to in this document

The document describes in alphabetical order the basic and advanced camera controls for Allied Vision Alvium cameras as seen from Vimba Viewer.

These features comply with the following standards:

- USB3 Vision Standard V1.0.1
- GenICam Standard Features Naming Convention (SFNC) V2.2
- GenICam Transport Layer Standard Features Naming Convention (GenTL SFNC) V1.0
- AIA Pixel Format Naming Convention (PFNC) V2.0
- GenICam Generic Control Protocol (GenCP) V1.0.

Downloads of applied common standards

For SFNC, GenTL SFNC, and GenCP, see www.genicam.org
For USB3 Vision and PFNC, see www.visiononline.org

Allied Vision custom features

Some features in this document are adapted SFNC features. Some features are custom features adding new functions to the features range defined by the SFNC.

Abbreviation/term	Meaning
GenTL SFNC	GenICam Transport Layer Standard Features Naming Convention V1.0
GenTL SFNC adapted	Features that deviate from the GenTL SFNC definition
SFNC	GenICam Standard Features Naming Convention V2.2
SFNC adapted	Features that deviate from the SFNC definition
Custom	Non-SFNC features that are adding to new functions to the existing SFNC feature definitions

Table 4: Standards used in this reference

Features description scheme

This document describes categories and features as seen from Vimba Viewer and features in alphabetical order for Allied Vision Alvium cameras.

The features in this reference are described according to the formatting scheme described below.

Category name

First-level item, always starting a new page. Short description of category, including individual characteristics, and showing the Feature type as *(Category)*.

Subcategory

Second-level item. Short description of subcategory, including individual characteristics, and showing the Feature type as *(Category)*.

Feature

[Selector]

Second-level or third-level item. Short description of feature, including individual characteristics and possible values, and showing the full Category path.

Features availability

Some features are available for one camera interface only. Other features differ between camera interfaces. `AcquisitionFrameCount` is supported for all interfaces. If a feature is supported for some interfaces only, the supported interfaces are stated.

AcquisitionFrameCount

Controls the number of frames to acquire in *`MultiFrame`* acquisition mode.

Interface support	All
Display name	Acquisition Frame Count
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R/W
Unit	(number)
Affected features	Not applicable
Category	/AcquisitionControl

Selectors

Some features have multiple instances. For these features, Selector features define which instance of the feature is accessed.

Example: the `LineInverter` feature, used to invert internal signal polarity, can be applied to all input and output lines of the camera. The line is selected by the `LineSelector` feature.

The headline for the feature description is `LineInverter[LineSelector]`, according to the C programming language convention for arrays: a pair of brackets follows the feature name, like in `SelectedFeature[Selector]`.

Invalidators

Some features have opposing functions. For example, `Sharpness` enhances edge contrast while `Blur` reduces edge contrast. Therefore, when `Sharpness` is enabled, `Blur` is automatically disabled. Feature descriptions provide an additional row for opposing features, called **Affected features**.

Copyright and trademarks

Feature description

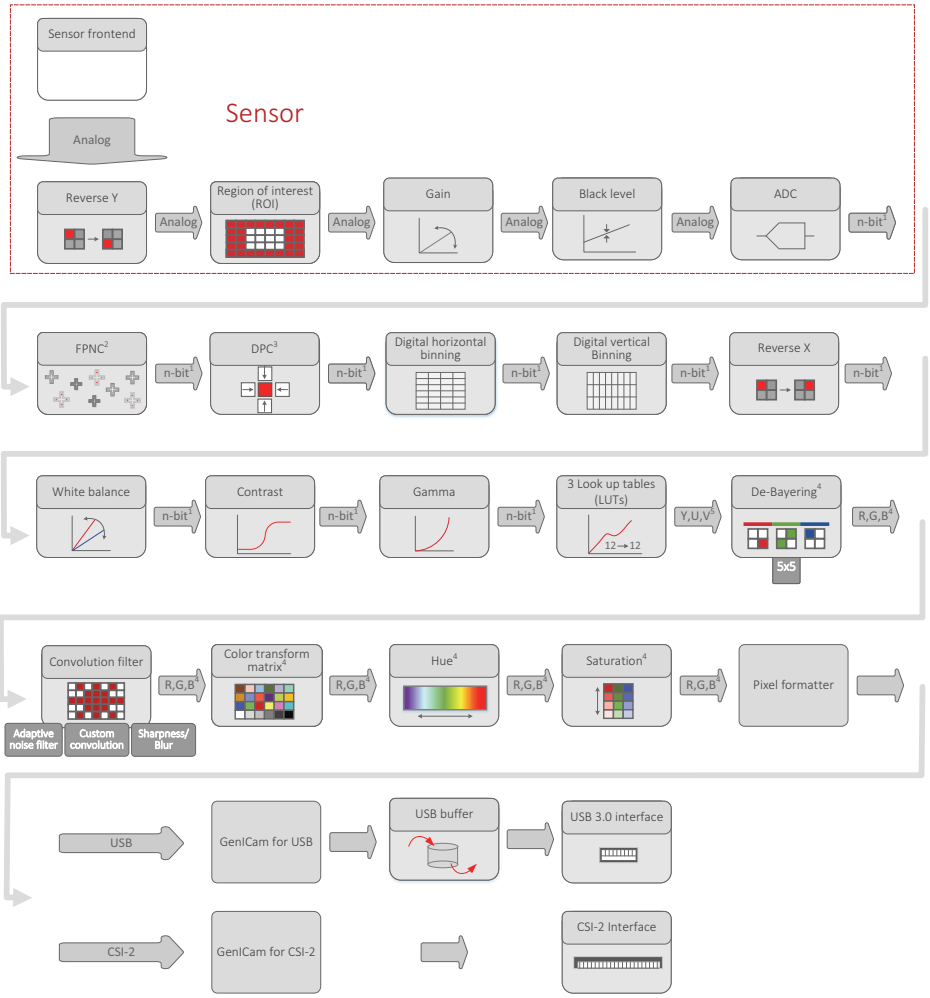
This chapter includes:

Features processing order

To develop your application effectively, note the order in which the features are processed in Alvium cameras.

Image data flow

In the Alvium user guides, the image data flow describes the sequence of image processing steps inside the camera. The shown functionalities represent features or feature groups.



[1] Model dependent: See ADC bit depths in the Specifications chapter of your Alvium camera's user guide.

[2] Factory preset for FPNC = Fixed Pattern Noise Correction
The current firmware version does not support FPNC for Alvium 1800 C/U-2050.

[3] Factory preset for DPC = Defect pixel correction

[4] Color models only

[5] For monochrome models: Y only

Figure 1: Image data flow for Alvium cameras

Feature interdependencies

The conversion between time and clock cycles affects control values. Features for pixel format, bandwidth, ROI, exposure time, and triggering are related to each other. Changing values for one feature can change values for another feature. For example, frame rates can be reduced when `PixelFormat` is changed subsequently. Figure 2 shows the interdependencies.

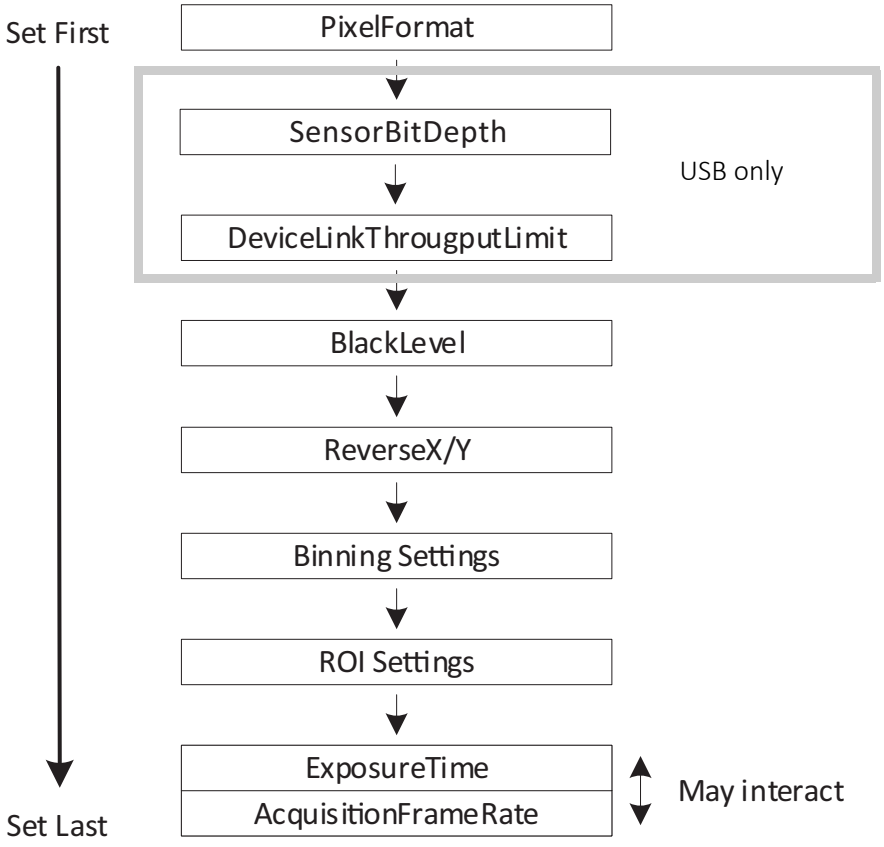


Figure 2: Interdependencies between features

Regions of interest and auto mode regions

Generally, auto mode regions are areas or regions on the image, where measurements are done to be used by various auto-features, for example measurement of the intensity for auto-exposure control.

The features used to define area of regions of interest (ROIs) and auto mode regions are displayed in Figure 3.

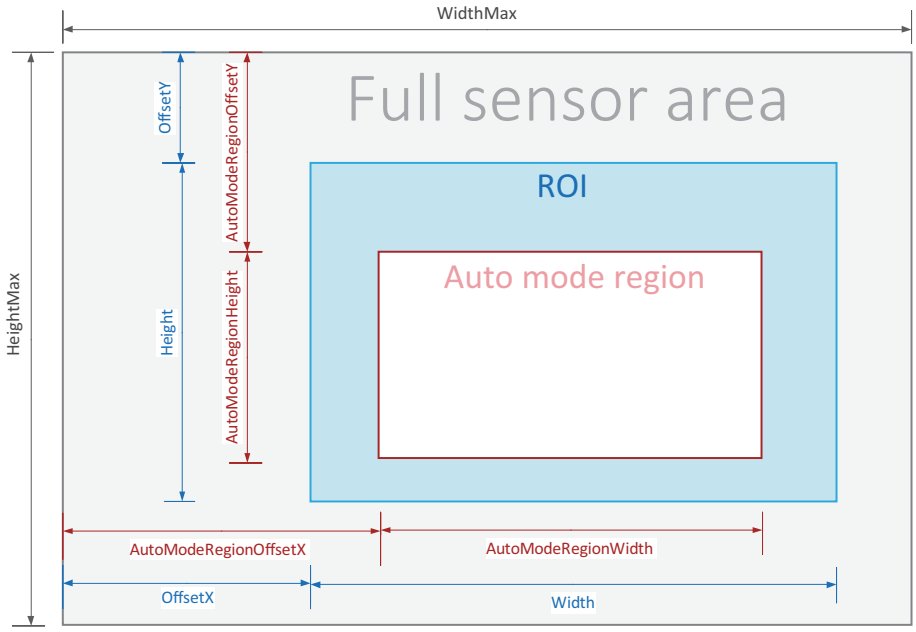


Figure 3: auto mode region and ROI measurement features

It is possible to have multiple auto mode regions. Also, multiple sensor-ROIs are supported that are called DisplayROI in this document. A DisplayROI covers the area that is being transmitted by the camera subsystem.

The interaction of auto mode regions and ROIs would allow for a huge variety of possibilities. However, the actual interaction is limited to a few useful possibilities that practically make sense.

Basic rules

- Auto mode regions must be explicitly enabled by a feature.
- One auto mode region inside a ROI is permitted. This provides a fixed correlation between ROI and auto mode region.
- Auto mode region and ROI coordinates are absolute to the sensor area. If the ROI position is changed, the position of the auto mode region is maintained. The auto mode region represents the content changed by shifting the ROI.

- The auto mode region must be inside the respective ROI.
- If auto mode regions are enabled, the position and size are set to the same position and size of the respective ROI. This means that disabling and re-enabling the auto mode regions resets their positions and sizes.
- If ROI is changed, auto mode region may need to be adjusted. To do so, **set the position before you set the size**.
  Therefore, as long as the origin of the auto mode region remains inside the ROI, the position and size of the auto mode region can be maintained.
  To ensure no part of the auto mode region is outside the ROI, the size of the auto mode region is adjusted until the minimum allowed size is reached.
  Only then the position may be altered.

ROI and auto mode region effects

Auto mode region is always treated as a subset of ROI. The following scenarios show the interaction between ROI and auto mode region and gives recommendations where auto mode region settings can be improved. Vice versa, you can adjust settings for ROI to match an existing auto mode region.

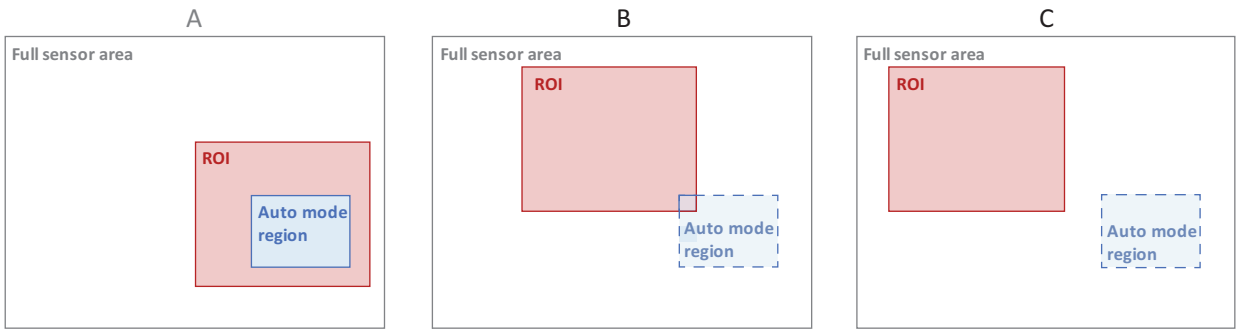


Figure 4: ROI and auto mode region effects

A. **Scenario**: User input creates an auto mode region included by a larger ROI.
   Result: Camera logic applies no changes to the selected auto mode region. The complete auto mode region is effective.
B. **Scenario**: User input creates a common area between ROI and auto mode region is only small.
   Result: Camera logic reduces the effective auto mode region to the common area between auto mode region and ROI.
   Recommendation: Relocate and resize auto mode region to become a subset of or to match ROI.
C. **Scenario**: User input creates ROI and auto mode region that have no common area.
   Result: Camera logic reduces the effective auto mode region to $\emptyset$.
   Recommendation: Relocate and resize auto mode region to become a subset or to match ROI.

Feature descriptions

AcquisitionControl

Display name	Acquisition Control
Standard	SFNC
Origin of feature	Camera
Feature type	(Category)

AcquisitionFrameCount

Controls the number of frames to acquire in ***`MultiFrame`*** acquisition mode.

Interface support	All
Display name	Acquisition Frame Count
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R/W
Unit	(number)
Affected features	Not applicable
Category	/AcquisitionControl

AcquisitionFrameRate

Controls the acquisition rate at which the frames are captured.

Notes

- If `AcquisitionFrameRateEnable` is false, `AcquisitionFrameRate` is read-only.
- If values for exposure time or ROI are changed **after** `AcquisitionFrameRate` has been set, the value may be adjusted. See Feature interdependencies on page 20. In this case the value for `AcquisitionFrameRate` must be re-adjusted by the user.

Interface support	All
Display name	Acquisition Frame Rate
Standard	SFNC
Origin of feature	Camera
Feature type	Float
Access	R/W
Unit	Hertz
Affected features	`ExposureTime`
Category	/AcquisitionControl

AcquisitionFrameRateEnable

Enables or disables `AcquisitionFrameRate`.

Note: Otherwise, the frame rate is implicitly controlled by the combination of other features like `ExposureTime`.

Interface support	All
Display name	Acquisition Frame Rate Enable
Standard	SFNC
Origin of feature	Camera
Feature type	Boolean
Access	R/W
Affected features	`AcquisitionFrameRate`
Category	/AcquisitionControl

Values	Description
True	`AcquisitionFrameRate` feature is writable and used to control the acquisition rate.
False	`AcquisitionFrameRate` is implicitly controlled by the combination of other features like `ExposureTime`. Automatically, the maximum available frame rate is used.

AcquisitionFrameRateMode

Selects the priority between `AcquisitionFrameRate` and `ExposureTime`.

Interface support	All
Display name	Acquisition Frame Rate Mode
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R
Affected features	Not affected
Category	/AcquisitionControl

Values	Description
Basic	`ExposureTime` has the priority over `AcquisitionFrameRate`. If `ExposureTime` gets longer than the inverse of `AcquisitionFrameRate`, the resulting acquisition frame rate is reduced accordingly.

AcquisitionMode

Selects the acquisition mode of the camera. The feature defines mainly the number of frames to capture during an acquisition and the way the acquisition stops.

Interface support	All
Display name	Acquisition Mode
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`LineMode`, `TriggerSource`, `LineInverter`, `LineSource`
Category	/AcquisitionControl

Values	Description
`SingleFrame`	Single images are acquired. Further trigger events will be ignored until acquisition is stopped and restarted.
`MultiFrame`	A number of images is acquired that is specified by `AcquisitionFrameCount`. Further trigger events will be ignored until acquisition is stopped and restarted. In case of *`MultiFrame`*, acquisition can be stopped using `AcquisitionStop` command before it reaches the number of frames specified in `AcquisitionFrameCount`. So, the `AcquisitionStop` trigger event will not be ignored.
`Continuous`	After an `AcquisitionStart` event: Selects continuous image acquisition until acquisition stop is triggered.

AcquisitionStart

Starts the acquisition of the camera.

Note: The number of frames captured is specified by `AcquisitionMode`.

Interface support	All
Display name	Acquisition Start
Standard	SFNC
Origin of feature	Camera
Feature type	Command
Access	W
Affected features	Not applicable
Category	/AcquisitionControl

AcquisitionStatus

[AcquisitionStatusSelector]

Displays the state of the internal acquisition signal selected using `AcquisitionStatusSelector`.

Interface support	All
Display name	Acquisition Status
Standard	SFNC
Origin of feature	Camera
Feature type	Boolean
Access	R
Affected features	Not applicable
Category	/AcquisitionControl

Values	Description
`True`	The camera is performing the selected action.
`False`	The camera is performing the selected action.

AcquisitionStatusSelector

Selects the internal acquisition signal to read using *`AcquisitionStatus`*.

Interface support	All
Display name	Acquisition Status Selector
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	AcquisitionStatus
Category	/AcquisitionControl

Values	Description
`AcquisitionActive`	The camera acquires one or many frames.
`AcquisitionTransfer`	The camera transfers one or many frames to the host.

AcquisitionStop

Stops the acquisition of the camera at the end of the current frame.

Note: This feature is mainly used when `AcquisitionMode` is *`Continuous`*, but it can be used in any acquisition mode.

Interface support	All
Display name	Acquisition Stop
Standard	SFNC
Origin of feature	Camera
Feature type	Command
Access	W
Affected features	Not applicable
Category	/AcquisitionControl

ExposureActiveMode

Selects the mode for the `ExposureActive` signal. You can use this feature for synchronizing strobe lights to compensate for the rolling shutter effect.

Note: Global shutter cameras support only *`FlashWindow`*, other cameras support *`FirstLine`* and *`FlashWindow`*.

Interface support	All
Display name	Exposure Active Mode
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`LineInverter, LineMode, LineSelector, LineSource, LineStatus, LineStatusAll, TimerDelay, TimerDuration, TimerReset, TimerSelector, TimerStatus, TimerTriggerActivation, TimerTriggerSource, TriggerSelector`
Category	/AcquisitionControl

Values	Description
`FirstLine`	Sets the `ExposureActive` signal to high when the first line is exposing.
`FlashWindow`	Sets the `ExposureActive` signal to high when all lines are exposing simultaneously.

ExposureAuto

Selects the auto exposure mode.

Note: The output of the auto exposure function affects the whole image.

Interface support	All
Display name	Exposure Auto
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/AcquisitionControl

Values	Description
Off	Automatic mode is disabled.
Once	Automatic exposure is applied once until the target value of the selected auto control algorithm is achieved, then the value returns to *Off*.
Continuous	The exposure time varies continuously according to the scene illumination.

ExposureMode

Selects the operation mode of the exposure (or shutter).

Notes:

- A delay may occur between the trigger signal and the start of the exposure. For the delay with rolling shutter sensor cameras, see your Alvium camera's user guide.
- For *`TriggerWidth`* and *`TriggerControlled`*, the resulting exposure time is extended, because of an exposure offset after the trigger pulse.

Interface support	All
Display name	Exposure Mode
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/AcquisitionControl

Value	Description
`Timed`	The exposure time is set by `ExposureTime` or `ExposureAuto`.
`TriggerWidth`[1,2]	The width of the current frame trigger signal(s) pulse controls the exposure time.
`TriggerControlled`[2]	One or more trigger signals control the exposure time independently from the current frame triggers.

[1]Controlling the exposure time using *`TriggerWidth`*: We recommend you to follow the workflow shown in Workflow for using TriggerWidth on page 31.

[2]Global shutter sensor cameras only.

Workflow for using TriggerWidth

Follow the workflow shown in Figure 5 to use **`TriggerWidth`**.

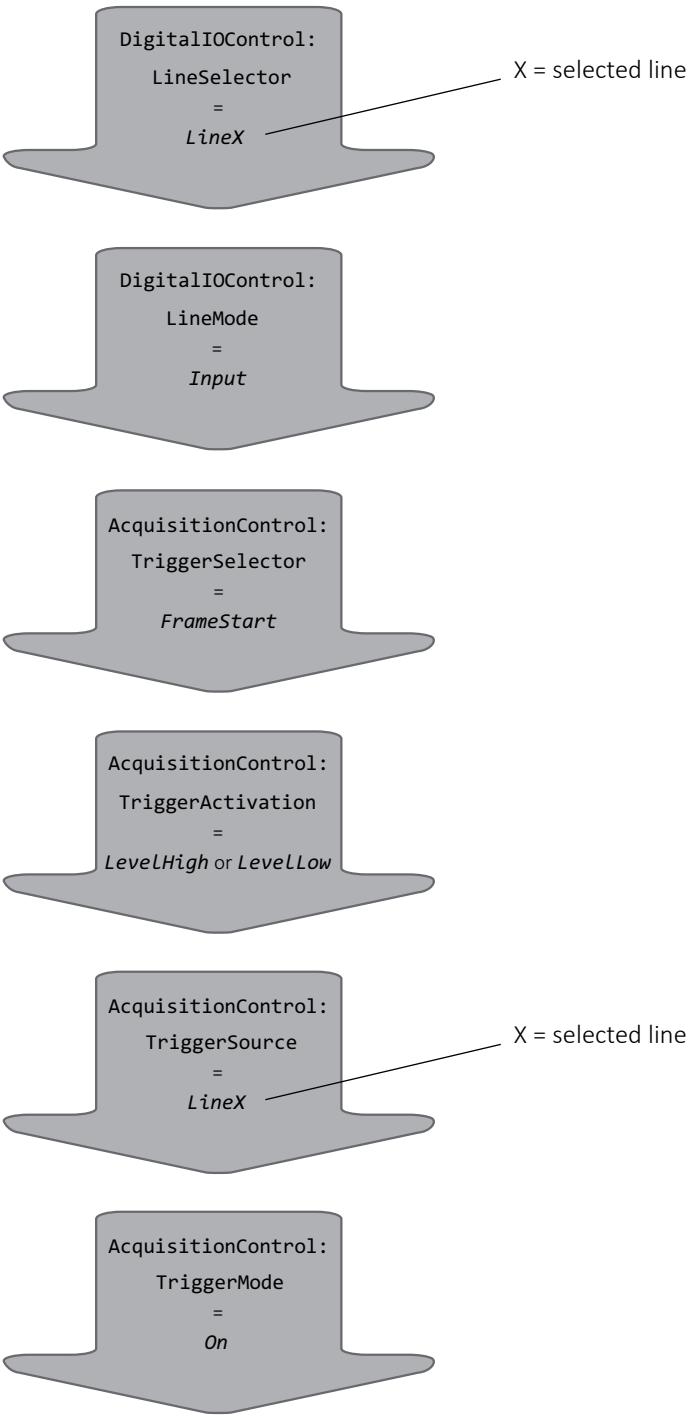


Figure 5: Workflow for using TriggerWidth

ExposureTime

Selects the exposure time when `ExposureMode` is *`Timed`* and `ExposureAuto` is *`Off`*. This controls the duration where the photosensitive cells are exposed to light.

Interface support	All
Display name	Exposure Time
Standard	SFNC
Origin of feature	Camera
Feature type	Float
Access	R/W
Unit	Microseconds [µs]
Affected features	`ExposureAutoMin`, `ExposureAutoMax`, `AcquisitionFrameRate`
Category	/AcquisitionControl

TriggerActivation

[TriggerSelector]

Selects the activation mode of the trigger.

Interface support	All
Display name	Trigger Activation
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/AcquisitionControl

Values	Description
`RisingEdge`	The encoder on the rising edge of the signal is reset.
`FallingEdge`	The encoder on the falling edge of the signal is reset.
`AnyEdge`	The encoder on the falling or rising edge of the signal is reset.
`LevelHigh`	The encoder at a high signal level is reset.
`LevelLow`	The encoder at a low signal level is reset.

TriggerDelay

[TriggerSelector]

Controls the period of time before the camera corresponds after receiving a trigger signal.

Notes:

- Available only when `TriggeSelector` is set to *`FrameStart`* or *`AcquisitionStart`*.
- The value for `TriggerDelay` adds to the sensor related delay between trigger and exposure start. The sensor related delay depends on such as data rate and sensor characteristics.

Interface support	All
Display name	Trigger Delay
Standard	SFNC
Origin of feature	Camera
Feature type	Float
Access	R/W
Unit	Microseconds
Affected features	Not applicable
Category	/AcquisitionControl

Values	Description
`0`	Minimum
`20748634.2705`	Maximum

TriggerMode

[TriggerSelector]

Enables or disables the selected trigger.

Interface support	All
Display name	Trigger Mode
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`LineMode`, `TriggerSource`, `LineInverter`, `LineSource`
Category	/AcquisitionControl

Values	Description
On	Triggering is enabled
Off	Triggering is disabled.

TriggerSelector

Selects the type of trigger to configure.

Interface support	All
Display name	Trigger Selector
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`TriggerMode`, `LineMode`, `TriggerSoftware`, `LineInverter`, `LineSource`, `TriggerSource`, `TriggerActivation`
Category	/AcquisitionControl

Values	Description
`AcquisitionStart`	The selected trigger starts the acquisition process.
`AcquisitionActive`	The selected trigger controls the duration of the acquisition of a single frame or many frames. The acquisition is activated when the trigger signal becomes active and terminated when it goes back to the inactive state.
`AcquisitionEnd`	The trigger terminates the acquisition process.
`FrameStart`	The selected trigger starts the capture of a single frame (when acquisition is running).
*`ExposureStart`**	The selected trigger starts the exposure of a single frame (when acquisition is running).
*`ExposureEnd`**	The selected trigger ends the exposure of a single frame (when acquisition is running).
*`ExposureActive`**	The selected trigger controls the duration of exposure of a single frame (when acquisition is running).

*Not supported by cameras using rolling shutter sensors.

TriggerSoftware

[TriggerSelector]

Generates an internal trigger. `TriggerSource` must be set to *`Software`*.

Interface support	All
Display name	Trigger Software
Standard	SFNC
Origin of feature	Camera
Feature type	Command
Access	W
Affected features	Not applicable
Category	/AcquisitionControl

TriggerSource

[TriggerSelector]

Selects the internal signal or physical input line to use as the trigger source.
Note: The selected trigger must have its `TriggerMode` set to *`On`*.

Interface support	All
Display name	Trigger Source
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/AcquisitionControl

Values for CSI-2	Description
`Software`	Software is used to signal triggers.
`Line0`	Physical Line0 is used to signal triggers.
`Line1`	Physical Line1 is used to signal triggers.

Values for U3V	Description
`Software`	Software is used to signal triggers.
`Line0`	Physical Line0 is used to signal triggers.
`Line1`	Physical Line1 is used to signal triggers.
`Line2`	Physical Line2 is used to signal triggers.
`Line3`	Physical Line3 is used to signal triggers.

AnalogControl

Display name	Analog Control
Standard	SFNC
Origin of feature	Camera
Feature type	(Category)

BalanceRatio

[BalanceRatioSelector]

Controls the ratio of the selected color component to the green color component. This feature is used for white balance.

Interface support	All
Display name	Balance Ratio
Standard	SFNC
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	Not applicable
Category	/AnalogControl

Values	Description
0	Minimum
8	Maximum
0.001	Increment

BalanceRatioSelector

Selects the balance ratio to control.

Interface support	All
Display name	Balance Ratio Selector
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`BalanceRatio`
Category	/AnalogControl

Values	Description
`Red`	The red channel is adjusted.
`Blue`	The blue channel is adjusted.

BalanceWhiteAuto

Selects the auto white balance mode.

Interface support	All
Display name	Balance White Auto
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`BalanceWhiteAutoRate`, `BalanceWhiteAutoTolerance`
Category	/AnalogControl

Values	Description
`Off`	Auto white balance is disabled.
`Once`	Auto white balance is applied once. After adjustments have been done, auto white balance is disabled.
`Continuous`	Auto white balance is applied continuously.

BlackLevel

[BlackLevelSelector]

Controls the analog black level as an absolute physical value. The feature represents a DC offset applied to the video signal.

Interface support	All
Display name	Black Level
Standard	SFNC
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	Not applicable
Category	/AnalogControl

Values	Description
1	Increment

BlackLevelSelector

Selects the black level to be controlled by the various black level features.

Interface support	All
Display name	Black Level Selector
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	BlackLevel
Category	/AnalogControl

Value	Description
All	All black levels are controlled.

Gain

[GainSelector]

Controls the selected gain in decibels [dB] as an absolute physical value. This is an amplification factor applied to the video signal.

Interface support	All
Display name	Gain
Standard	SFNC
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	`GainAutoMin`, `GainAutoMax`
Category	/AnalogControl

Values	Description
`0.1`	Increment

GainAuto

[GainSelector]

Selects the auto gain mode.

Note: The output of the auto gain function affects the whole image.

Interface support	All
Display name	Gain Auto
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/AnalogControl

Values	Description
`Off`	Auto gain is disabled.
`Once`	Auto gain is being applied once. After adjustments have been done, gain is disabled.
`Continuous`	Gain is continuously adjusted to keep the value set for `IntensityControllerTarget`. This is triggered by such as changes in illumination or in object brightness.

GainSelector

Selects the gain to be controlled by the various gain features.

Interface support	All
Display name	Gain Selector
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`Gain`, `GainAuto`, `GainAutoMax`
Category	/AnalogControl

Value	Description
All	All gains are controlled.

Gamma

Controls the gamma correction of pixel intensity.

Interface support	All
Display name	Gamma
Standard	SFNC
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	Not applicable
Category	/AnalogControl

Values	Description
0.4	Minimum
2.4	Maximum
0.5	Increment

AutoModeControl

Display name	Auto Mode Control
Standard	SFNC
Origin of feature	Camera
Feature type	(Category)

AutoModeRegionHeight

[AutoModeRegionSelector]

Controls the height of the region used to measure values for all auto functions.

Interface support	All
Display name	Auto Mode Region Height
Standard	Custom
Origin of feature	Camera
Feature type	Integer
Access	R/W
Unit	Pixel
Affected features	`AutoModeRegionOffsetY`
Category	/AutoModeControl

AutoModeRegionOffsetX

[AutoModeRegionSelector]

Controls the horizontal position of the window used to measure the actual value for the auto function.

Interface support	All
Display name	Auto Mode Region OffsetX
Standard	Custom
Origin of feature	Camera
Feature type	Integer
Access	R/W
Unit	Pixel
Affected features	`AutoModeRegionWidth`
Category	/AutoModeControl

AutoModeRegionOffsetY

[AutoModeRegionSelector]

Controls the vertical position of the window used to measure the actual value for the auto function.

Interface support	All
Display name	Auto Mode Region OffsetY
Standard	Custom
Origin of feature	Camera
Feature type	Integer
Access	R/W
Unit	Pixel
Affected features	`AutoModeRegionHeight`
Category	/AutoModeControl

AutoModeRegionSelector

Selects the auto mode region to configure.

Interface support	All
Display name	Auto Mode Region Selector
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`AutoModeRegionWidth`, `AutoModeRegionOffsetX`, `AutoModeRegionHeight`, `AutoModeRegionOffsetY`
Category	/AutoModeControl

Value	Description
`AutoModeRegion1`	Auto Mode Region 1 is configured.

AutoModeRegionWidth

[AutoModeRegionSelector]

Controls the width of the window used to measure the actual value for the auto function.

Interface support	All
Display name	Auto Mode Region Width
Standard	Custom
Origin of feature	Camera
Feature type	Integer
Access	R/W
Unit	Pixel
Affected features	`AutoModeRegionOffsetX`
Category	/AutoModeControl

BalanceWhiteAutoRate

Controls the rate at which the frequency for adjustments of the white balance.

Interface support	All
Display name	Balance White Auto Rate
Standard	Custom
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	`BalanceWhiteAutoTolerance`
Category	/AutoModeControl

Values	Description
1	Minimum
100	Maximum
1	Increment

BalanceWhiteAutoTolerance

Controls the deviation of the current white balance value from the ideal value at which the white balance is adjusted.

Interface support	All
Display name	Balance White Auto Tolerance
Standard	Custom
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	`BalanceWhiteAutoRate`
Category	/AutoModeControl

Values	Description
0	Minimum
50	Maximum
1	Increment

ExposureAutoMax

Controls the maximum value for auto exposure.

Note: The output of the auto exposure function affects the whole image.

Interface support	All
Display name	Exposure Auto Max
Standard	Custom
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	`ExposureAutoMin`
Category	/AutoModeControl

ExposureAutoMin

Controls the minimum value for auto exposure.

Note: The output of the auto exposure function affects the whole image.

Interface support	All
Display name	Exposure Auto Min
Standard	Custom
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	`ExposureAutoMax`
Category	/AutoModeControl

GainAutoMax

Controls the maximum value for auto gain.

Note: The output of the auto gain function affects the whole image.

Interface support	All
Display name	Gain Auto Max
Standard	Custom
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	`GainAutoMin`
Category	/AutoModeControl

GainAutoMin

Controls the minimum value for auto gain.

Note: The output of the auto gain function affects the whole image.

Interface support	All
Display name	Gain Auto Min
Standard	Custom
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	`GainAutoMax`
Category	/AutoModeControl

IntensityAutoPrecedence

Selects the precedence of intensity controller.

Interface support	All
Display name	Intensity Auto Precedence
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/AutoModeControl

Values	Description
MinimizeNoise	Orders the control loops so that noise is minimized: exposure time first, gain second. Gain increases are avoided if possible.
MinimizeBlur	Orders the control loops so that image blur is minimized: gain first, exposure time second. Long exposure times are avoided if possible.

IntensityControllerAlgorithm

[IntensityControllerSelector]

Selects the algorithm determining how the histogram is used to determine the current intensity value.

Note: The outliers are disregarded.

Interface support	All
Display name	Intensity Controller Algorithm
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/AutoModeControl

Values	Description
Mean	After comparing the arithmetic mean of the current image's histogram to `ExposureAutoTarget`, the exposure time for the next image is adjusted to meet this target. Bright areas are allowed to saturate.

IntensityControllerOutliersBright

[IntensityControllerSelector]

Controls the number of pixels from the top of the distribution to be ignored.

Interface support	All
Display name#	Intensity Controller Outliers Bright
Standard	Custom
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	Not applicable
Category	/AutoModeControl

Values	Description
0	Minimum
10	Maximum
0.01	Increment

IntensityControllerOutliersDark

IntensityControllerSelector]

Controls the number of pixels from the bottom of the distribution to be ignored.

Interface support	All
Display name	Intensity Controller Outliers Dark
Standard	Custom
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	Not applicable
Category	/AutoModeControl

Values	Description
0	Minimum
10	Maximum
0.01	Increment

IntensityControllerRate

Controls the rate at which the controller should compute an intensity value.

Note: This value also defines the period at which the associated auto functions change their control value.

Interface support	All
Display name	Intensity Controller Rate
Standard	Custom
Origin of feature	Camera
Feature type	Integer
Access	R/W
Affected features	Not applicable
Category	/AutoModeControl

Values	Description
1	Minimum
100	Maximum

IntensityControllerRegion

Selects the subregion of the image that the intensity controller operates on.

Interface support	All
Display name	Intensity Controller Region
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/AutoModeControl

Values	Description
FullImage	The intensity controller controls the full sensor area.
AutoModeRegion1	The intensity controller controls Auto Mode Region 1.

IntensityControllerSelector

Selects the intensity controller to configure.

Interface support	All
Display name	Intensity Controller Selector
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`IntensityControllerOutliersDark`, `IntensityControllerOutliersBright`, `IntensityControllerTolerance`, `IntensityControllerAlgorithm`
Category	/AutoModeControl

Value	Description
`IntensityController1`	Intensity Controller 1 is selected to be configured.

IntensityControllerTarget

Controls the target intensity value for auto intensity control as deviation from the mean value in [percent]. The default value for all auto features is 50.

Interface support	All
Display name	Intensity Controller Target
Standard	Custom
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	Not applicable
Category	/AutoModeControl

Values	Description
`10`	Minimum
`89.9`	Maximum
`0.0001`	Increment
`50`	Default

IntensityControllerTolerance

Controls the deviation of the current value from the target value at which the feature is inactive.

Interface support	All
Display name	Intensity Controller Tolerance
Standard	Custom
Origin of feature	Camera
Feature type	Integer
Access	R/W
Affected features	Not applicable
Category	/AutoModeControl

Values	Description
0	Minimum
50	Maximum
1	Increment

BufferHandlingControl

You need experience to use these features

We recommend you to use features in this category only if you are an advanced user.

Display name	Buffer Handling Control
Standard	GenTL SFNC
Origin of feature	Camera
Feature type	(Category)

MaxDriverBuffersCount

Controls the maximum number of driver buffers used by the acquisition engine.

Note: We recommend you to use this feature only if you are an advanced user.

Interface support	All
Display name	Max Driver Buffers Count
Standard	GenTL SFNC
Origin of feature	Transport layer
Feature type	Integer
Access	R/W
Affected features	Not applicable
Category	/BufferHandlingControl

Values	Description
1	Minimum
4096	Maximum
1	Increment

StreamAnnounceBufferMinimum

Displays the minimum number of buffers to announce to enable selected buffer handling mode. Corresponds to the `STREAM_INFO_BUF_ANNOUNCE_MIN` command of `DSGetInfo` function.

Note: We recommend you to use this feature only if you are an advanced user.

Interface support	All
Display name	Stream Announce Buffer Minimum
Standard	GenTL SFNC
Origin of feature	Transport layer
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/BufferHandlingControl

StreamAnnouncedBufferCount

Displays the number of announced (known) buffers on this stream. Corresponds to the `STREAM_INFO_NUM_ANNOUNCED` command of `DSGetInfo` function.

Note: We recommend you to use this feature only if you are an advanced user.

Interface support	All
Display name	Stream Announced Buffer Count
Standard	GenTL SFNC
Origin of feature	Transport layer
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/BufferHandlingControl

Values	Description
0	Minimum
9223372036854775807	Maximum

StreamBufferHandlingMode

Selects the available acquisition modes of the stream.

Note: We recommend you to use this feature only if you are an advanced user.

Interface support	All
Display name	Stream Buffer Handling Mode
Standard	GenTL SFNC
Origin of feature	Transport layer
Feature type	Enumeration
Access	R
Affected features	`StreamAcquisitionModeSelector`
Category	/BufferHandlingControl

Value	Description
`Default`	Default stream buffer handling is available.

ColorTransformationControl

This section describes features related to color transformations in color cameras. The following features are only valid if using on-camera interpolated pixel formats.

The color transformation is a linear operation taking as input the triplet R_{in}, G_{in}, B_{in} for an RGB color pixel. This triplet is multiplied by a 3×3 matrix. This color transformation allows to change the coefficients of the 3×3 matrix.

$$\begin{bmatrix} R_{out} \\ G_{out} \\ B_{out} \end{bmatrix} = \begin{bmatrix} Gain00 & Gain01 & Gain02 \\ Gain10 & Gain11 & Gain12 \\ Gain20 & Gain21 & Gain22 \end{bmatrix} \times \begin{bmatrix} R_{in} \\ G_{in} \\ B_{in} \end{bmatrix}$$

Display name	Color Transformation Control
Standard	SFNC
Origin of feature	Camera
Feature type	(Category)

ColorTransformationEnable

[ColorTransformationSelector]

Enables or disables the selected color transformation module.

Interface support	All
Display name	Color Transformation Enable
Standard	SFNC
Origin of feature	Camera
Feature type	Boolean
Access	R/W
Affected features	`ColorTransformationValue`
Category	/ColorTransformationControl

Values	Description
`True`	The selected color transformation module is enabled.
`False`	The selected color transformation module is disabled.

ColorTransformationSelector

Selects the type of color transformation.

Interface support	All
Display name	Color Transformation Selector
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`ColorTransformationEnable`, `ColorTransformationValue`, `ColorTransformationValueSelector`
Category	/ColorTransformationControl

Value	Description
`RGBtoRGB`	RGB is transformed to RGB.

ColorTransformationValue

ColorTransformationSelector][ColorTransformationValue-Selector]

Selects the gain factor or offset for the selected color transformation.

Interface support	All
Display name	Color Transformation Value
Standard	SFNC
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	Not applicable
Category	/ColorTransformationControl

Values	Description
-4	Minimum
+4	Maximum
1	Default

ColorTransformationValueSelector

[ColorTransformationSelector]

Selects the gain factor or offset of the Transformation matrix for the selected Color Transformation module.

Interface support	All
Display name	Color Transformation Value Selector
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`ColorTransformationValue`
Category	/ColorTransformationControl

For values described in the following table, see ColorTransformationControl on page 55 for the color transformation matrix.

Values	Description
`Gain00`	Gain 00 for the red contribution to the red pixel (multiplicative factor) is selected.
`Gain01`	Gain 01 for the green contribution to the red pixel (multiplicative factor) is selected.
`Gain02`	Gain 02 for the red contribution to the red pixel (multiplicative factor) is selected.
`Gain10`	Gain 10 for the red contribution to the green pixel (multiplicative factor) is selected.
`Gain11`	Gain 11 for the green contribution to the green pixel (multiplicative factor) is selected.
`Gain12`	Gain 12 for the blue contribution to the green pixel (multiplicative factor) is selected.
`Gain20`	Gain 20 for the red contribution to the blue pixel (multiplicative factor) is selected.
`Gain21`	Gain 21 for the green contribution to the blue pixel (multiplicative factor) is selected.
`Gain22`	Gain 22 for the blue contribution to the blue pixel (multiplicative factor) is selected.

Hue

Controls the color tone correction by rotating the chrominance field clockwise with values > 0 and counter clockwise with values < 0 in degrees [°].

Interface support	All
Display name	Hue
Standard	Custom
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	`PixelFormat`, `DeviceLinkThroughputLimit`, `ExposureAutoMin`, `ExposureAutoMax`, `ExposureTime`, `AcquisitionFrameRate`, `Width`, `OffsetX`, `AutoModeRegionWidth`, `AutoModeRegionOffsetX`, `AutoModeRegionHeight`, `AutoModeRegionOffsetY`, `PayloadSize`, `WidthMax`, `Height`, `OffsetY`, `HeightMax`, `PixelSize`, `ContrastEnable`, `ContrastDarkLimit`, `ContrastBrightLimit`, `BlackLevel`, `Saturation`, `ColorTransformationEnable`, `ColorTransformationValue`
Category	/ColorTransformationControl

Values	Description
-4	Minimum (40 degrees)
+4	Maximum (40 degrees)
0	Default

Saturation

Controls the amplification of the chrominance signal in the color space in degrees [°].

Interface support	All
Display name	Saturation
Standard	Custom
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	Not applicable
Category	/ColorTransformationControl

Values	Description
0	Minimum (40 degrees)
+2	Maximum (40 degrees)
0	Default

CorrectionControl

Display name	Correction Control
Standard	SFNC
Origin of feature	Camera
Feature type	(Category)

CorrectionMode

Enables or disables correction features.

Interface support	All
Display name	Correction Mode
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/CorrectionControl

Values	Description
On	Correction features are enabled.
Off	Correction features are disabled.

CorrectionSelector

Selects the type of correction to configure

Interface support	All
Display name	Correction Selector
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`CorrectionMode`, `CorrectionSet`, `CorrectionSetDefault`, `CorrectionDataSize`, `CorrectionEntryType`
Category	/CorrectionControl

Values	Description
*`DefectPixel Correction`**	Defect pixel correction (DPC) is selected.
*`FixedPattern NoiseCorrection`**	Fixed pattern noise correction (FPNC) is selected.

*Availability is camera dependent.

CorrectionSet

[CorrectionSelector]

Selects the currently enabled correction settings.

Interface support	All
Display name	Correction Set
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R/(W)
Affected features	Not applicable
Category	/CorrectionControl

Values	Description
`Preset`	Factory settings are enabled (default).
*`User`**	User settings are enabled.

*Available only if a user correction set has been written to the camera memory.

CorrectionSetDefault

[CorrectionSelector]

Selects the correction set used when the camera is reset.

Interface support	All
Display name	Correction Set Default
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R
Affected features	Not applicable
Category	/CorrectionControl

Values	Description
Preset	Factory settings are used after camera reset.
*User**	User settings are used after camera reset.

*Available only if a user correction set has been written to the camera memory.

CorrectionInfo (subcategory)

This subcategory provides information on the correction type currently used.

Display name	Correction Info
Standard	Custom
Origin of feature	Camera
Feature type	Subcategory
Category	/CorrectionControl

CorrectionDataSize

[CorrectionSelector]

Displays the current size of the correction data that is stored inside the camera.

Interface support	All
Display name	Correction Data Size
Standard	Custom
Origin of feature	Camera
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/CorrectionControl/CorrectionInfo

CorrectionEntryType

Displays the entry type (correction type specific variant).

Interface support	All
Display name	Correction Entry Type
Standard	Custom
Origin of feature	Camera
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/CorrectionControl/CorrectionInfo

CounterAndTimerControl

Display name	Counter And Timer Control
Standard	SFNC
Origin of feature	Camera
Feature type	(Category)

TimerDelay

Controls the duration of the delay at the reception of a trigger before starting the timer.

Interface support	All
Display name	Timer Delay
Standard	SFNC
Origin of feature	Camera
Feature type	Float
Access	R/W
Unit	Microseconds [µs]
Affected features	Not applicable
Category	/CounterAndTimerControl

Values	Description
0	Minimum
429496729.5	Maximum

TimerDuration

Controls the duration of the timer pulse.
When the timer reaches the TimerDuration value:

- For `TimerStatus`, the value is changed from *`TimerActive`* to *`TimerCompleted`*.
- The timer stops counting until the camera receives a new trigger, or until the timer is explicitly reset with `TimerReset`.

Interface support	All
Display name	Timer Duration
Standard	SFNC
Origin of feature	Camera
Feature type	Float
Access	R/W
Unit	Microseconds [µs]
Affected features	Not applicable
Category	/CounterAndTimerControl

Values	Description
`0`	Minimum
`429496729.5`	Maximum

TimerReset

The selected timer is reset by software and restarted.
Note: The timer starts immediately after the reset unless a timer trigger is active.

Interface support	All
Display name	Time Reset
Standard	SFNC
Origin of feature	Camera
Feature type	Command
Access	W
Affected features	`TimerDelay`, `TimerDuration`, `TimerStatus`, `TimerSelector`, `TimerTriggerActivation`, `TimerTriggerSource`
Category	/CounterAndTimerControl

TimerSelector

Selects the timer to be configured.

Interface support	All
Display name	Timer Selector
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`TimerDelay`, `TimerDuration`, `TimerStatus`, `TimerTriggerActivation`, `TimerTriggerSource`
Category	/CounterAndTimerControl

Value	Description
`Timer0`	Timer0 is selected.
`Timer1`	Timer1 is selected.

TimerStatus

Displays the current status of the selected timer.

Interface support	All
Display name	Timer Status
Standard	SFNC (adapted)
Origin of feature	Camera
Feature type	Enumeration
Access	R
Affected features	Not applicable
Category	/CounterAndTimerControl

Value	Description
`TimerActive`	The timer is active.
`TimerCompleted`	The timer has completed.
`TimerDelay`	The timer is delayed by the period of time set for `TimerDelay`.
`TimerTriggerWait`	The timer is waiting for a trigger.

TimerTriggerActivation

Selects the type of trigger signal levels to activate the timer.

Interface support	All
Display name	Timer Trigger Activation
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/CounterAndTimerControl

Value	Description
RisingEdge	The timer is triggered by a signal on the rising edge.
FallingEdge	The timer is triggered by a signal on the falling edge.
AnyEdge	The timer is triggered by a signal on any edge.
LevelHigh	The timer is triggered when signal level turns to high.
LevelLow	The timer is triggered when signal level turns to low.

TimerTriggerSource

Selects the activation mode to start the timer.

Interface support	All
Display name	Timer Trigger Source
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/CounterAndTimerControl

Value	Description
AcquitisionActive	The timer is triggered when the acquisition starts.
ExposureActive	The timer is triggered when the exposure starts.
Line0 ... Line3	The timer is triggered by a signal on the corresponding input line.
Timer0End	Timer0 has ended.
Timer1End	Timer1 has ended.
Off	The time is stopped.

DeviceControl

Display name	Device Control
Standard	SFNC
Origin of feature	Camera
Feature type	(Category)

DeviceFamilyName

Displays the identifier of the product family of the camera.

Interface support	All
Display name	Device Family Name
Standard	SFNC
Origin of feature	Camera
Feature type	String
Access	R
Affected features	Not applicable
Category	/DeviceControl

DeviceFirmwareID

[DeviceFirmwareIDSelector]

Displays one or a list of firmware IDs of the camera.

Interface support	All
Display name	Device Firmware ID
Standard	Custom
Origin of feature	Camera
Feature type	String
Access	R
Affected features	Not applicable
Category	/DeviceControl

DeviceFirmwareIDSelector

Selects the `DeviceFirmwareID` to be read after restarting the camera.

Interface support	All
Display name	Device Firmware ID Selector
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`DeviceFirmwareID`
Category	/DeviceControl

Values	Description
`Current`	The current firmware ID is selected to be read after the next camera restart.
`Supported`	Another than the current firmware ID is selected to be read after the next camera restart.

DeviceFirmwareVersion

[DeviceFirmwareVersionSelector]

Displays the version of the firmware in the camera.

Interface support	All
Display name	Device Firmware Version
Standard	SFNC
Origin of feature	Camera
Feature type	String
Access	R
Affected features	Not applicable
Category	/DeviceControl/DeviceControl

DeviceFirmwareVersionSelector

Selects the `DeviceFirmwareVersion` to be read after restarting the camera.

Interface support	All
Display name	Device Firmware Version Selector
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`DeviceFirmwareVersion`
Category	/DeviceControl

Values	Description
`Current`	The current firmware version is selected to be read after the next camera restart.
`Programmed`	Another than the current firmware version is selected to be read after the next camera restart.

DeviceGenCPVersionMajor

Displays the major version of the GenCP supported by the camera.

Interface support	All
Display name	Device GenCP Version Major
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Affected features	`DeviceGenCPVersionMinor`
Category	/DeviceControl

DeviceGenCPVersionMinor

Displays the minor version of the GenCP supported by the camera.

Interface support	All
Display name	Device GenCP Version Minor
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Affected features	`DeviceGenCPVersionMajor`
Category	/DeviceControl

DeviceIndicatorLuminance

Controls the luminance of the indicators (such as LEDs) showing the status of the camera.

Interface support	All
Display name	Device Indicator Luminance
Standard	Custom
Origin of feature	Camera
Feature type	Integer
Access	R/W
Affected features	Not applicable
Category	/DeviceControl

Values	Description
0	Minimum
10	Maximum

DeviceIndicatorMode

Selects the behavior of the indicators (such as LEDs) showing the status of the camera.

Interface support	All
Display name	Device Indicator Mode
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/DeviceControl

Values	Description
`Inactive`	The indicator is disabled.
`Active`	The indicator is enabled.
`ErrorStatus`	The indicator signals an error status.

DeviceLinkCommandTimeout

Displays the command timeout of the specified link.

Interface support	All
Display name	Device Link Command Timeout
Standard	SFNC
Origin of feature	Camera
Feature type	Float
Access	R
Unit	µs
Affected features	Not applicable
Category	/DeviceControl

Values	Description
`0`	Minimum
`1,000,000,000`	Maximum

DeviceLinkSpeed

Displays the speed of transmission negotiated and represents the total speed of all the connections of the specified link.

Interface support	All
Display name	Device Link Speed
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Unit	Bytes per second
Affected features	Not applicable
Category	/DeviceControl

DeviceLinkThroughputLimit

Controls the maximum bandwidth of the data streamed out by the camera on the selected link. Delays are uniformly inserted between transport layer packets reducing the peak bandwidth.

Note: Use this feature to adjust camera data output to the performance of your host system to avoid lost frames. Additionally, you may reduce the frame rate to reduce bandwidth.

Interface support	USB
Display name	Device Link Throughput Limit
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R/W
Unit	Bytes per second
Affected features	`ExposureTimeMax`, `ExposureTimeMin`, `ExposureAutoMin`, `ExposureAutoMax`, `ExposureTime`, `AcquisitionFrameRate`
Category	/DeviceControl

Values	Description
450000000	Maximum with USB 3.x
200000000	Default with USB 3.x

DeviceLinkThroughputLimitMode

Enable or disables `DeviceLinkThroughputLimit`.

When this feature is disabled, low-level transport layer (TL) specific features are expected to control the throughput.

When this feature is enabled, `DeviceLinkThroughputLimit` controls the overall throughput.

Interface support	USB
Display name	Device Link Throughput Limit Mode
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`ExposureTimeMax`, `ExposureTimeMin`, `ExposureAutoMin`, `ExposureAutoMax`, `ExposureTime`, `AcquisitionFrameRate`
Category	/DeviceControl

Values	Description
On	`DeviceLinkThroughputLimit` is enabled.
Off	`DeviceLinkThroughputLimit` is disabled.

DeviceManufacturerInfo

Displays the manufacturer information about the camera.

Interface support	All
Display name	Device Manufacturer Info
Standard	SFNC
Origin of feature	Camera
Feature type	String
Access	R
Affected features	Not applicable
Category	/DeviceControl

DeviceModelName

Displays the model name of the camera.

Interface support	All
Display name	Device Model Name
Standard	SFNC
Origin of feature	Camera
Feature type	String
Access	R
Affected features	Not applicable
Category	/DeviceControl

DevicePowerSavingMode

Selects between standard power use and various power saving modes.

Interface support	All
Display name	Device Power Saving Mode
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/DeviceControl

Values	Description
`Disabled`	The camera uses standard power (default).
`SuspendMode`	The camera is enabled to go into USB U3 power saving mode.[1]

[1]To apply the selected power saving mode, the host must send a `DevicePowerSave` command or a respective backend command to the camera.

DeviceReset

Resets the camera to its power up state.

Note: After reset, the camera must be rediscovered.

Interface support	USB
Display name	Device Reset
Standard	SFNC
Origin of feature	Camera
Feature type	Command
Access	W
Affected features	Not applicable
Category	/DeviceControl

DeviceSFNCVersionMajor

Displays the major version of the SFNC that was used to create the camera`s GenICam XML.

Interface support	All
Display name	Device SFNC Version Major
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/DeviceControl

DeviceSFNCVersionMinor

Displays the minor version of the SFNC that was used to create the camera’s GenICam XML.

Interface support	All
Display name	Device SFNC Version Minor
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/DeviceControl

DeviceSFNCVersionSubMinor

Displays the sub minor version of the SFNC that was used to create the camera's GenICam XML.

Interface support	All
Display name	Device SFNC Version Sub Minor
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/DeviceControl

DeviceScanType

Displays the scan type of the image sensor.

Interface support	All
Display name	Device Scan Type
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R
Affected features	Not applicable
Category	/DeviceControl

Values	Description
Areascan	2D area readout is selected.

DeviceSerialNumber

Displays the camera's serial number.

Displays the unique identifier of the camera.

Interface support	All
Display name	Device Serial Number
Standard	SFNC
Origin of feature	Camera
Feature type	String
Access	R
Affected features	Not applicable
Category	/DeviceControl

DeviceTemperature

[DeviceTemperatureSelector]

Displays the camera temperature in degrees Celsius [°C], measured at the location selected by `DeviceTemperatureSelector`.

Interface support	All
Display name	Device Temperature
Standard	SFNC
Origin of feature	Camera
Feature type	Float
Access	R
Unit	Degrees Celsius
Affected features	Not applicable
Category	/DeviceControl

DeviceTemperatureSelector

Selects the location in the camera, where the temperature is to be measured.

Interface support	All
Display name	Device Temperature Selector
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`DeviceTemperature`
Category	/DeviceControl

Value	Description
`Mainboard`	The mainboard temperature is measured.

DeviceTLVersionMajor

Displays the major version of the camera's transport layer.

Interface support	All
Display name	Device TL Version Major
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/DeviceControl

Value	Description
`0`	Minimum
`4294967295`	Maximum

DeviceTLVersionMinor

Displays the minor version of the camera transport layer.

Interface support	All
Display name	Device TL Version Minor
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/DeviceControl

Value	Description
0	Minimum
4294967295	Maximum

DeviceUserID

Controls the user-programmable camera identifier.

Note: Maximum 63 characters are allowed.

Interface support	All
Display name	Device user ID
Standard	SFNC
Origin of feature	Camera
Feature type	String
Access	R/W
Affected features	Not applicable
Category	/DeviceControl

DeviceVendorName

Displays the name of the camera manufacturer.

Interface support	All
Display name	Device Vendor Name
Standard	SFNC
Origin of feature	Camera
Feature type	String
Access	R
Affected features	Not applicable
Category	/DeviceControl

DeviceVersion

Displays the camera's product code.

Interface support	All
Display name	Device Version
Standard	SFNC
Origin of feature	Camera
Feature type	String
Access	R
Affected features	Not applicable
Category	/DeviceControl

TimestampLatch

Latches the current timestamp counter into `TimestampLatchValue`.

Interface support	All
Display name	Time Stamp Latch
Standard	SFNC
Origin of feature	Camera
Feature type	Command
Access	W
Affected features	`TimestampLatchValue`
Category	/DeviceControl

TimestampLatchValue

Displays the latched value of the timestamp counter.

Interface support	All
Display name	Timestamp Latch Value
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/DeviceControl

Value	Description
0	Minimum
9223372036854775807	Maximum

TimestampReset

Resets the current value of the timestamp counter.

Note: After executing this command, the timestamp counter restarts automatically.

Interface support	All
Display name	Timestamp Reset
Standard	SFNC
Origin of feature	Camera
Feature type	Command
Access	W
Affected features	`TimestampLatchValue`
Category	/DeviceControl

DigitalIOControl

Display name	Digital IO Control Info
Standard	SFNC
Origin of feature	Camera
Feature type	(Category)

LineInverter

[LineSelector]

Enables or disables the inversion of the signal of the selected input or output line.

Interface support	All
Display name	Line Inverter
Standard	SFNC
Origin of feature	Camera
Feature type	Boolean
Access	R/W
Affected features	Not applicable
Category	/DigitalIOControl

Values	Description
True	Signal of the input or output line is inverted.
False	Signal of the input or output line is not inverted.

LineMode

[LineSelector]

Selects the physical line to be used to input or output a signal.

Interface support	All
Display name	Line Mode
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`TriggerSource`, `LineInverter`, `LineSource`
Category	/DigitalIOControl

Values	Description
`Input`	The physical line is used for signal input.
`Output`	The physical line is used for signal output.

LineSelector

Selects the physical line (or pin) of the external camera connector or the virtual line of the transport layer to configure.

Interface support	All
Display name	Line Selector
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`LineMode`, `LineSource`, `LineInverter`, `LineStatus`, `LineStatusAll`
Category	/DigitalIOControl

Values	Description
`Line0`	Line 0 is selected for configuration.
`Line1`	Line 1 is selected for configuration.
`Line2`	Line 2 is selected for configuration.
`Line3`	Line 3 is selected for configuration.

LineSource

[LineSelector]

Set the output signal for the selected line.

Note: `LineMode` must be set to *`Output`*.

Interface support	All
Display name	Line Source
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/DigitalIOControl

Values	Description
`Off`	No I/O source signal is output.
`AcquisitionActive`	The *`AcquisitionActive`* I/O source signal is output.
`FrameTriggerWait`	The *`FrameTriggerWait`* I/O source signal is output.
*`ExposureActive`**	The *`ExposureActive`* I/O source signal is output.
`Stream0TransferActive`	The *`Stream0TransferActive`* I/O source signal is output.
`Line0Signal`	The *`Line0Signal`* I/O source signal is output.
`Line1Signal`	The *`Line1Signal`* I/O source signal is output.
`Line2Signal`	The *`Line2Signal`* I/O source signal is output.
`Line3Signal`	The *`Line3Signal`* I/O source signal is output.

*Available for cameras with global shutter sensors and with rolling shutter senors if `TriggerMode` is enabled or if `AcquisitionMode` is set to *`Continuous`*.

LineStatus

[LineSelector]

Displays the current status of the selected input or output line.

Interface support	All
Display name	Line Status
Standard	SFNC
Origin of feature	Camera
Feature type	Boolean
Access	R
Affected features	Not applicable
Category	/DigitalIOControl

Values	Description
True	Line status is enabled.
False	Line status is disabled.

LineStatusAll

Displays the current status of every input or output line in a sequence from Line0 to LineN.

Interface support	All
Display name	Line Status All
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/DigitalIOControl

Values	Description
0	Minimum
15	Maximum

FileAccessControl

Display name	File Access Control
Standard	SFNC
Origin of feature	Camera
Feature type	(Category)

FileAccessBuffer

Displays the intermediate access buffer that allows the exchange of data between the camera file storage and the application.

Interface support	All
Display name	File Access Buffer
Standard	SFNC
Origin of feature	Camera
Feature type	Register
Access	R
Affected features	Not applicable
Category	/FileAccessControl

FileAccessLength

Displays the length of the mapping between the camera file storage and `FileAccessBuffer`.

Interface support	All
Display name	File Access Length
Standard	SFNC
Origin of feature	Camera
Feature type	Register
Access	R
Affected features	Not applicable
Category	/FileAccessControl

FileAccessOffset

Displays the offset of the mapping between the camera file storage and the `FileAccessBuffer`.

Interface support	All
Display name	File Access Offset
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/FileAccessControl

FileOpenMode

Selects the access mode in which a file is opened in the camera.

Interface support	All
Display name	File Open Mode
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/FileAccessControl

Values	Description
`Read`	Read access is enabled.
`Write`	Write access is enabled.

FileOperationExecute

Executes the operation selected by `FileOperationSelector` on the selected file.

Interface support	All
Display name	File Operation Execute
Standard	SFNC
Origin of feature	Camera
Feature type	Command
Access	W
Affected features	`FileAccessBuffer`, `FileAccessOffset`, `FileAccessLength`, `FileOperationStatus`, `FileOperationResult`, `FileSize`
Category	/FileAccessControl

FileOperationResult

[FileSelector][FileOperationSelector]

Displays the file operation result. For read or write operations, the number of successfully read or written bytes is returned.

Interface support	All
Display name	File Operation Result
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/FileAccessControl

FileOperationSelector

[FileSelector]

Selects the target operation for the selected file in the camera. This operation is executed when the `FileOperationExecute` feature is called.

Damage to the defect pixel correction data set

If you select *`DefectPixelCorrectionPreset`* for `FileSelector`, you also have write access. This way, the DPC correction data from manufacturing can be overwritten.

Before you write to this data set, read and save the data to an external source for recovery!

Interface support	All
Display name	File Operation Selector
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`FileOperationExecute`, `FileAccessBuffer`, `FileAccessOffset`, `FileAccessLength`, `FileOperationStatus`, `FileOperationResult`, `FileSize`
Category	/FileAccessControl

Values	Description
`Open`	The selected file is opened.
`Close`	The selected file s closed.
`Read`	The selected file is read from.
`Write`	The selected file is written to.
`Delete`	The selected file is deleted.

FileOperationStatus

[FileSelector][FileOperationSelector]

Displays the file operation execution status.

Interface support	All
Display name	File Operation Status
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R
Affected features	Not applicable
Category	/FileAccessControl

Values	Description
Success	File operation was successful (default).
Failure	File operation failed.

FileProcessStatus

[FileSelector]

Displays an additional process status.

Interface support	All
Display name	File Process Status
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R
Affected features	Not applicable
Category	/FileAccessControl

Values	Description
None	No extended status (default).
UpdateNotRequired	No file operation is required, because flash and file content are identical.

FileSelector

Selects the target file in the camera.

Damage to the defect pixel correction data set

If you select *`DefectPixelCorrectionPreset`* for `FileSelector`, you also have write access. This way, the DPC correction data from manufacturing can be overwritten.

Before you write to this data set, read and save the data to an external source for recovery!

Interface support	All
Display name	File Selector
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`FileStatus`, `FileSize`, `FileOpenMode`, `FileOperationSelector`, `FileOperationExecute`, `FileAccessBuffer`, `FileAccessOffset`, `FileAccessLength`, `FileOperationStatus`, `FileOperationResult`
Category	/FileAccessControl

Values	Description
`Firmware`	Firmware is target for file operations.
`UserData`	User data is target for file operations.
`DefectPixel CorrectionPreset`	The preset for defect pixel correction (DPC) is target for file operations.
`DefectPixel CorrectionUser`	User defined defect pixel correction (DPC) is target for file operations.
`FixedPattern NoiseCorrectionPreset`	The preset for fixed pattern noise correction (FPNC) is target for file operations.
`FixedPattern NoiseCorrectionUser`	User defined fixed pattern noise correction (FPNC) user set is target for file operations.

FileSize

[FileSelector]

Displays the size of the selected file in bytes.

Interface support	All
Display name	File Size
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/FileAccessControl

FileStatus

[FileSelector]

Displays the status of the selected file.

Interface support	All
Display name	File Status
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R
Affected features	Not applicable
Category	/FileAccessControl

Values	Description
Open	The selected file is currently open.
Closed	The selected file is currently closed (default).

ImageFormatControl

Display name	Image Format Control
Standard	SFNC
Origin of feature	Camera
Feature type	(Category)

BinningHorizontal

Controls the number of horizontal pixels combined into one. This reduces the horizontal resolution (width) of the image.

Note: For Alvium models ≥12 MP resolution, if `BinningVertical` is used, `BinningHorizontal` is set to 2.

Interface support	All
Display name	Binning Horizontal
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R/W
Unit	Pixel
Affected features	`WidthMax`
Category	/ImageFormatControl

Values	Description
1	Minimum
8	Maximum

BinningHorizontalMode

Determines whether the result of binned pixels is averaged or summed up.

Note: Changing `BinningHorizontalMode` sets `BinningVerticalMode` to the same value.

Interface support	All
Display name	Binning Horizontal Mode
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`AcquisitionFrameRate, BinningHorizontal, BinningVertical, BinningVerticalMode, DeviceLinkThroughputLimit, ExposureAutoMax, ExposureAutoMin, ExposureTime, HeightMax, WidthMax`
Category	/ImageFormatControl

Values	Description
Sum	The charge or gray value of adjacent pixels is summed up.
Average	The charge or gray value of adjacent pixels is averaged.

BinningSelector

Selects which binning engine is controlled by `BinningHorizontal` and `BinningVertical`.

Interface support	All
Display name	Binning Selector
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`AcquisitionFrameRate, BinningHorizontal, BinningHorizontalMode, BinningVertical, BinningVerticalMode, DeviceLinkThroughputLimit, ExposureAutoMax, ExposureAutoMin, ExposureTime, HeightMax, WidthMax`
Category	/ImageFormatControl

Values	Description
Digital	Digital binning is used.

BinningVertical

Controls the number of vertical pixels combined into one. This reduces the vertical resolution (height) of the image.

Interface support	All
Display name	Binning Vertical
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R/W
Unit	Pixel
Affected features	`AcquisitionFrameRate, BinningHorizontal, DeviceLinkThroughputLimit, ExposureAutoMax, ExposureAutoMin, ExposureTime, HeightMax, WidthMax`
Category	/ImageFormatControl

Values	Description
1	Minimum
8	Maximum

BinningVerticalMode

Determines whether the result of binned pixels is averaged or summed up.

Note: Changing `BinningVerticalMode` sets `BinningHorizontalMode` to the same value.

Interface support	All
Display name	Binning Vertical Mode
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`AcquisitionFrameRate`, `BinningHorizontal`, `BinningVertical`, `BinningHorizontalMode`, `DeviceLinkThroughputLimit`, `ExposureAutoMax`, `ExposureAutoMin`, `ExposureTime`, `HeightMax`, `WidthMax`
Category	/ImageFormatControl

Values	Description
Sum	The charge or gray value of adjacent pixels is summed up.
Average	The charge or gray value of adjacent pixels is averaged.

Height

Controls the image height output by the camera.

Interface support	All
Display name	Height
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R/W
Unit	Pixel
Affected features	`OffsetY`, `AutoModeRegionOffsetY`, `AutoModeRegionHeight`, `AcquisitionFrameRate`, `PayloadSize`
Category	/ImageFormatControl

HeightMax

Displays the available maximum image height.

Note: This dimension is calculated after vertical binning or any other function changing the vertical dimension of the image.

Interface support	All
Display name	Height Max
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Unit	Pixel
Affected features	`Height`, `OffsetY`
Category	/ImageFormatControl

OffsetX

Controls the horizontal offset from the origin to the ROI.

Interface support	All
Display name	Offset X
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R/W
Unit	Pixel
Affected features	`AutoModeRegionOffsetX`, `AutoModeRegionWidth`
Category	/ImageFormatControl

Values	Description
0	Minimum

OffsetY

Controls the vertical offset from the origin to the ROI.

Interface support	All
Display name	Offset Y
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R/W
Unit	Pixel
Affected features	`AutoModeRegionOffsetY`, `AutoModeRegionHeight`
Category	/ImageFormatControl

Values	Description
0	Minimum

PixelFormat

Selects the pixel format output by the camera.

Note: The feature represents all the information provided by `PixelCoding`, `PixelSize`, and `PixelColorFilter` combined in a single feature.

Interface support	All
Display name	Pixel Format
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`DeviceLinkThroughputLimit`, `PayloadSize`, `PixelSize`, `BlackLevel`, `ContrastEnable`, `ContrastDarkLimit`, `ContrastBrightLimit`, `BlackLevel`, `Hue`, `Saturation`, `ColorTransformationEnable`, `ColorTransformationValue`, `HeightMax`, `WidthMax`
Category	/ImageFormatControl

PixelSize

Displays the total size of a pixel of the image as Bits per pixel (Bpp).

Interface support	All
Display name	Pixel Size
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R
Unit	Bits
Affected features	Not applicable
Category	/ImageFormatControl

ReverseX

Enables or disables to flip the image horizontally.
Note: The ROI is applied after the flipping.

Interface support	All
Display name	Reverse X
Standard	SFNC
Origin of feature	Camera
Feature type	Boolean
Access	R/W
Affected features	`Width`, `WidthMax` (color cameras)
Category	/ImageFormatControl

Values	Description
`True`	Image is flipped horizontally.
`False`	Image is not flipped horizontally.

ReverseY

Enables or disables to flip the image vertically.
Note: The ROI is applied after the flipping.

Interface support	All
Display name	Reverse Y
Standard	SFNC
Origin of feature	Camera
Feature type	Boolean
Access	R/W
Affected features	`Height`, `HeightMax` (color cameras)
Category	/ImageFormatControl

Values	Description
`True`	Image is flipped vertically.
`False`	Image is not flipped vertically.

SensorBitDepth

Selects the readout mode of the camera sensor.

If you are using pixel formats that do not require 12-bit readout and you want to achieve higher frame rates, you can select between readout modes for 12-bit, 10-bit, and 8-bit.

Notes

- The sensor ADC bit depth is the default value.
- In the *`Adaptive`* mode, the bit depth is switched between 10-bit and 12-bit automatically, depending on the selected pixel format and limitations of sensor and camera.

Interface support	USB
Display name	Sensor Bit Depth
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Unit	Bits
Affected features	`AcquisitionFrameRate`, `DeviceLinkThroughputLimit`, `ExposureActiveMode`, `ExposureAuto`, `ExposureAutoMax`, `ExposureAutoMin`, `ExposureMode`, `ExposureTime`
Category	/ImageFormatControl

Values[1]	**Description**
`Adaptive`	The sensor bit depth is switched automatically between 12-bit and 10-bit readout, depending on the pixel format. (Default value for all camera models.)
`Bpp8`	The sensor bit depth is set to 8-bit, if supported by the sensor.
`Bpp10`	The sensor bit depth is set to 10-bit, if supported by the sensor.
`Bpp12`	The sensor bit depth is set to 12-bit if the camera sensor supports 12-bit readout mode.

[1]Camera model dependent

SensorHeight

Displays the effective sensor height.

Interface support	All
Display name	Sensor Height
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Unit	Pixel
Affected features	`HeightMax`
Category	/ImageFormatControl

SensorWidth

Displays the effective sensor width.

Interface support	All
Display name	Sensor Width
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Unit	Pixel
Affected features	`WidthMax`
Category	/ImageFormatControl

ShutterMode

Selects the shutter type for cameras where the sensor can be operated in different shutter modes.

Interface support	All
Display name	Shutter Mode
Standard	SFNC adapted
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/ImageFormatControl

Values*	Description
`GlobalResetReleaseShutter`	The camera is operated using global reset release shutter (GRS).
`GlobalShutter`	The camera is operated using global shutter (GS).
`RollingShutter`	The camera is operated using rolling shutter (RS).

*Availability depends on the sensor model.

Width

Controls the image width of the image output by the camera.

Interface support	All
Display name	Width
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R/W
Unit	Pixel
Affected features	`OffsetX`, `AutoModeRegionOffsetX`, `AutoModeRegionWidth`, `AcquisitionFrameRate`, `ExposureAutoMin`, `ExposureAutoMax`, `ExposureTime`, `PayloadSize`
Category	/ImageFormatControl

WidthMax

Displays the available maximum image width.

Note: The dimension is calculated after horizontal binning or any other function changing the horizontal dimension of the image.

Interface support	All
Display name	Width Max
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Unit	Pixel
Affected features	`Width`, `OffsetX`
Category	/ImageFormatControl

ImageProcessingControl

Display name	Image Processing Control
Standard	Custom
Origin of feature	Camera
Feature type	(Category)

AdaptiveNoiseSupressionFactor

Controls the amount of the noise suppression.

Interface support	All
Display name	Adaptive Noise Supression Factor
Standard	Custom
Origin of feature	Camera
Feature type	Float
Access	R/W
Affected features	Not applicable
Category	/ImageProcessingControl

Values	Description
0.5	Minimum value
1	The feature is disabled.
2	Maximum value

ColorInterpolation

Selects the `ColorInterpolation` filter.

Note: This feature is available only with color models.

Interface support	All
Display name	Color Interpolation
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/ImageProcessingControl

Values	Description
`Basic2x2`	Basic 2×2 algorithm for debayering is selected.
`Bilinear3x3`	A standard 3×3 algorithm for debayering is selected.
`HighQuality Linear5x5`	A high-quality linear interpolation for debayering is selected (default).

ConvolutionMode

Selects the convolution filter to process the image.

Various filters enable to reduce image noise, emphasize the edges of an image, or to perform individual image processing.

Interface support	All
Display name	Convolution Mode
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`AdaptiveNoiseSuppression`, `CustomConvolutionValue`, `Sharpness`
Category	/ImageProcessingControl

Values	Description
`Off`	The feature is disabled (default).
`AdaptiveNoiseSuppression`	To reduce noise while keeping the edges, the adaptive noise suppression is selected, (controlled by `AdaptiveNoiseSuppressionFactor`).
`CustomConvolution`	Your individual settings defined in `CustomConvolutionValue` are selected.
`Sharpness`	To increase the contrast of edges, the sharpness mode is selected, (controlled by `Sharpness`).

CustomConvolutionValue

[CustomConvolutionValueSelector]

Sets the value for the convolution filter selected by `CustomConvolutionValueSelector`.

Interface support	All
Display name	Custom Convolution Value
Standard	Custom
Origin of feature	Camera
Feature type	Integer
Access	R/W
Affected features	Not applicable
Category	/ImageProcessingControl

Values	Description
0	Minimum value
255	Maximum value

CustomConvolutionValueSelector

Defines the position to read from or write to the selceted *`CustomConvolution`* filter, using `CustomConvolutionValue`.

Interface support	All
Display name	Custom Convolution Value Selector
Standard	Custom
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`AdaptiveNoiseSuppressionFactor`, `CustomConvolutionValue`, `Sharpness`
Category	/ImageProcessingControl

Values	Description
`Coefficient 00...04`	Selects coefficients from 01 to 04.
`Coefficient 10...14`	Selects coefficients from 10 to 14.
`Coefficient 20...24`	Selects coefficients from 20 to 24.
`Coefficient 30...34`	Selects coefficients from 30 to 34.

	0	1	2	3	4
0	00	01	02	03	04
1	10	11	12	13	14
2	20	21	22	23	24
3	30	31	32	33	34
4	40	41	42	43	44

Figure 6: Matrix for coefficient values

ContrastControl (subcategory)

Display name	Contrast Control
Standard	Custom
Origin of feature	Camera
Feature type	Subcategory
Category	/ImageProcessingControl

ContrastBrightLimit

Selects the maximum gray value for the image.

Note: The current **value ranges displayed for 8-bit and 10-bit pixel formats are higher than the calculated values**.

Interface support	All
Display name	Contrast Bright Limit
Standard	Custom
Origin of feature	Camera
Feature type	Integer
Access	R/W
Affected features	`ContrastDarkLimit`
Category	/ImageProcessingControl/ContrastControl

Values	Description
`ContrastDarkLimit + 1`	The minimum value is selected.
`4095`	The maximum value is selected.

Pixel bit depth [bit]	Value range	Calculated value range	Pixel count per increment
8	*`0`* to *`4095`*	*`0`* to *`255`*	$^{1}/_{16}$
10	*`0`* to *`4095`*	*`0`* to *`1023`*	$^{1}/_{4}$
12	*`0`* to *`4095`*		1

ContrastDarkLimit

Selects the minimum gray value for the image.

Note: The current **value ranges displayed for 8-bit and 10-bit pixel formats are higher than the calculated values**. See ContrastBrightLimit on page 111.

Interface support	All
Display name	Contrast Dark Limit
Standard	Custom
Origin of feature	Camera
Feature type	Integer
Access	R/W
Affected features	`ContrastBrightLimit`
Category	/ImageProcessingControl/ContrastControl

Values	Description
`0`	The minimum value is selected.
`ContrastBrightLimit - 1`	The maximum value is selected.

ContrastEnable

Enables or disables the contrast enhancement features.

Interface support	All
Display name	Contrast Enable
Standard	Custom
Origin of feature	Camera
Feature type	Boolean
Access	R/W
Affected features	Not applicable
Category	/ImageProcessingControl/ContrastControl

Values	Description
`True`	The feature is enabled.
`False`	The feature is disabled.

ContrastShape

Controls the sigmoid shape of the transfer curve.

Interface support	All
Display name	Contrast Shape
Standard	Custom
Origin of feature	Camera
Feature type	Integer
Access	R/W
Affected features	Not applicable
Category	/ImageProcessingControl/ContrastControl

Values	Description
1	Minimum value
4	Default value
10	Maximum value
1	Increment

Figure 7 and Figure 8 on page 114 show the transfer curves for different values.

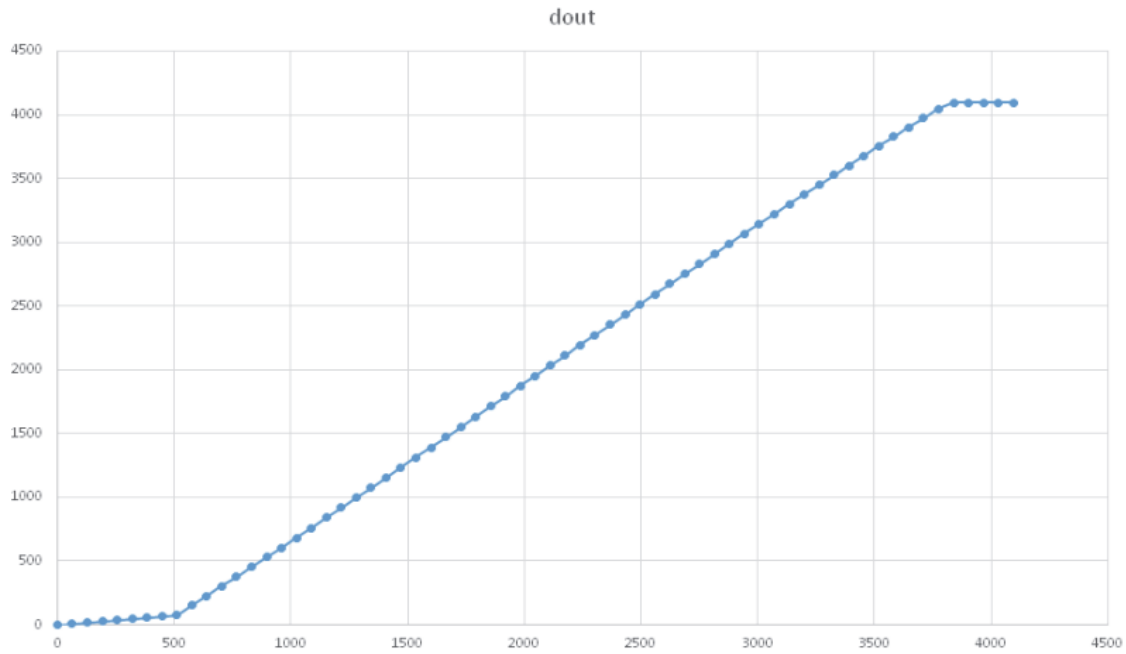


Figure 7: Image transfer for a value of 1.

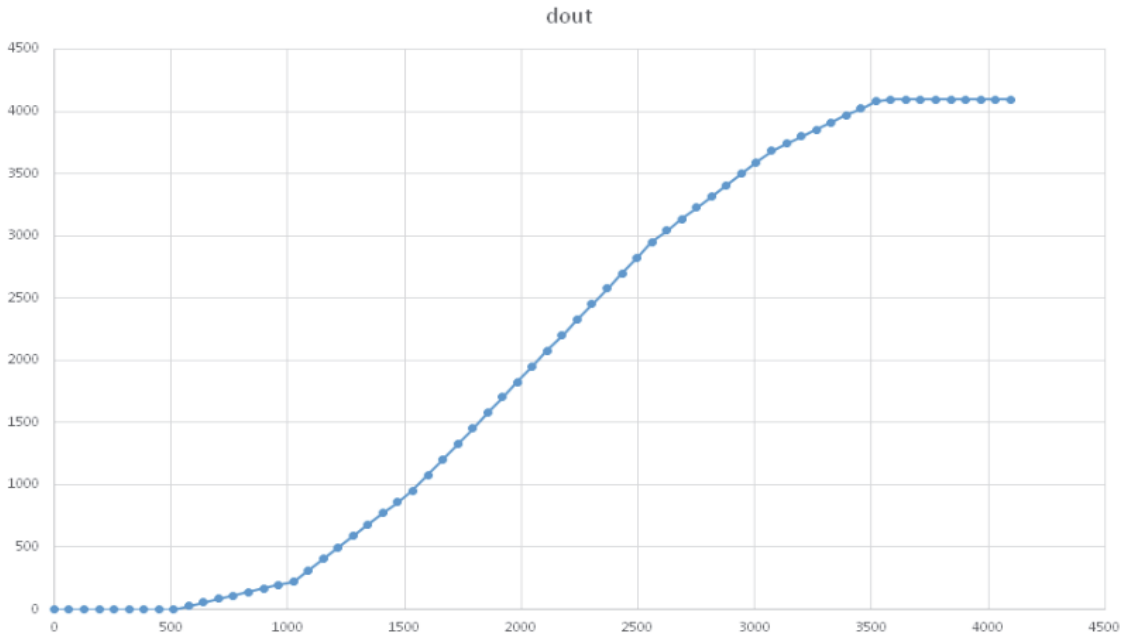


Figure 8: Image transfer for a value of 9.

Sharpness

Selects the degree of sharpness or blurring of the image.

Interface support	All
Display name	Sharpness
Standard	Custom
Origin of feature	Camera
Feature type	Integer
Access	R/W
Affected features	Not applicable
Category	/ImageProcessingControl

Values	Description
-12	Maximum blurring is applied.
0	The image is not affected (default).
12	Maximum sharpness is applied.

LUTControl

Display name	LUT Control
Standard	SFNC
Origin of feature	Camera
Feature type	(Category)

LUTEnable

[LUTSelector]

Enables or disables the selected LUT.

Interface support	All
Display name	LUT Enable
Standard	SFNC
Origin of feature	Camera
Feature type	Boolean
Access	R/W
Affected features	`LUTIndex`, `LUTValue`
Category	/LUTControl

Values	Description
`True`	The selected LUT is enabled.
`False`	The selected LUT is disabled.

LUTIndex

[LUTSelector]

Controls the index (offset) of the coefficient to access in the selected LUT.

Interface support	All
Display name	LUT Index
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R/W
Affected features	`LUTValue`
Category	/LUTControl

Values	Description
0	Minimum
4095	Maximum

LUTSelector

Selects the LUT to be controlled.

Interface support	All
Display name	LUT Selector
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`LUTEnable`, `LUTIndex`, `LUTValue`
Category	/LUTControl

Values	Description
Luminance	The LUT for luminance is selected.
Red	The LUT for red is selected.
Green	The LUT for green is selected.
Blue	The LUT for blue is selected.

LUTValue

[LUTSelector][LUTIndex]

Controls the value for the selected LUT.

Interface support	All
Display name	LUT Value
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R/W
Affected features	Not affected
Category	/LUTControl

Values	Description
0	Minimum
4095	Maximum

StreamInformation

Display name	Stream Information
Standard	GenTL SFNC
Origin of feature	Transport layer
Feature type	(Category)

StreamID

Displays the camera's unique ID for the stream, for instance a GUID.

Interface support	All
Display name	Stream ID
Standard	GenTL SFNC
Origin of feature	Transport layer
Feature type	String
Access	R
Affected features	Not applicable
Category	/StreamInformation

StreamIsGrabbing

Displays the status of the acquisition engine.

Interface support	All
Display name	Stream Is Grabbing
Standard	GenTL SFNC
Origin of feature	Transport layer
Feature type	Boolean
Access	R
Affected features	`MaxDriverBuffersCount`, `StreamPayloadSizeMode`, `StreamPayloadSizeAlignment`, `ManualStreamPayloadSize`
Category	/StreamInformation

Values	Description
`True`	Acquisition engine is started.
`False`	Acquisition engine is not started.

StreamType

Displays the transport layer type of the data stream.

Interface support	All
Display name	Stream Type
Standard	GenTL SFNC (adapted)
Origin of feature	Transport layer
Feature type	Enumeration
Access	R
Affected features	Not applicable
Category	/StreamInformation

Values	Description
CSI-2	The transport layer is MIPI CSI-2 type.
USB3	The transport layer is USB 3.x type.

Statistics (subcategory)

Note: Features in this subcategory are **available for CSI-2 cameras only.**

Interface support	CSI-2
Display name	Statistics
Standard	Custom
Origin of feature	Transport layer
Feature type	Subcategory
Category	/StreamInformation

StatFrameRate

Displays the rate at which the device is sending frames to the host, derived from the frame timestamps.

Interface support	CSI-2
Display name	Stat Frame Rate
Standard	Custom
Origin of feature	Transport layer
Feature type	Float
Access	R
Unit	fps [frames per second]
Affected features	Not applicable
Category	/StreamInformation/Statistics

Values	Description
0	Minimum value
1.79769313486e+308	Maximum value

StatFramesCRCError

Displays the number of frames received with CRC errors.

Interface support	CSI-2
Display name	Stat Frames CRC Error
Standard	Custom
Origin of feature	Transport layer
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/StreamInformation/Statistics

Values	Description
0	Minimum value
9223372036854775807	Maximum value

StatFramesDelivered

Displays the number of frames received without errors.

Interface support	CSI-2
Display name	Stat Frames Delivered
Standard	Custom
Origin of feature	Transport layer
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/StreamInformation/Statistics

Values	Description
0	Minimum value
9223372036854775807	Maximum value

StatFramesIncomplete

Displays the number of incomplete frames received.

Note: Shoved frames are not included.

Interface support	CSI-2
Display name	Stat Frames Incomplete
Standard	Custom
Origin of feature	Transport layer
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/StreamInformation/Statistics

Values	Description
0	Minimum value
9223372036854775807	Maximum value

StatFramesUnderrun

Displays the number of missed frames caused by a missing user supplied buffer (buffer underrun).

Interface support	CSI-2
Display name	Stat Frames Underrun
Standard	Custom
Origin of feature	Transport layer
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/StreamInformation/Statistics

Values	Description
0	Minimum value
9223372036854775807	Maximum value

TestControl

Display name	Test Control
Standard	SFNC
Origin of feature	Camera
Feature type	(Category)

TestPendingAck

Tests the camera's pending acknowledge feature. When this feature is written, the camera waits a time period corresponding to the value of TestPendingAck before acknowledging the write.

Note: If you select a high value, the camera does not correspond for a long time.

Interface support	All
Display name	Test Pending Ack
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R/W
Unit	ms
Affected features	Not applicable
Category	/TestControl

Values	Description
0	Minimum
60000	Maximum

TransportLayerControl

Display name	Transport Layer Control
Standard	SFNC
Origin of feature	Camera
Feature type	(Category)

PayloadSize

Displays the number of bytes transferred for each image or chunk on the stream channel. This includes any end-of-line, end-of-frame statistics, or other stamp data. Therefore, the feature displays the total size of data payload for a data block.

Interface support	All
Display name	Payload Size
Standard	SFNC
Origin of feature	Camera
Feature type	Integer
Access	R
Unit	Bytes
Affected features	Not applicable
Category	/TransportLayerControl

Values	Description
0	Minimum

Info (subcategory)

Note: Features in this sub category are **available for CSI-2 cameras only.**

Interface support	CSI-2
Display name	Info
Standard	Custom
Origin of feature	Transport layer
Feature type	Subcategory
Category	/TransportLayerControl

CSI2ClockFrequency

Displays the MIPI CSI-2 clock frequency.

Interface support	CSI-2
Display name	CSI-2 Clock Frequency
Standard	Custom
Origin of feature	Transport layer
Feature type	Float
Access	R
Unit	Hz [Hertz]
Affected features	Not applicable
Category	/TransportLayerControl/Info

CSI2DriverInterfaceVersion

Displays the version of the MIPI CSI-2 interface.

Interface support	CSI-2
Display name	CSI-2 Driver Interface Version
Standard	Custom
Origin of feature	Transport layer
Feature type	String
Access	R
Affected features	Not applicable
Category	/TransportLayerControl/Info

CSI2LaneCount

Displays the number of used MIPI CSI-2 lanes.

Interface support	CSI-2
Display name	CSI-2 Lane Count
Standard	Custom
Origin of feature	Transport layer
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/TransportLayerControl/Info

LibcsiVersion

Displays the libcsi version.

Interface support	CSI-2
Display name	libcsi Version
Standard	Custom
Origin of feature	Transport layer
Feature type	String
Access	R
Affected features	Not applicable
Category	/TransportLayerControl/Info

CSI2DriverVersion

Displays the version of the MIPI CSI-2 driver.

Interface support	CSI-2
Display name	CSI-2 Driver Version
Standard	Custom
Origin of feature	Transport layer
Feature type	String
Access	R
Affected features	Not applicable
Category	/TransportLayerControl/Info

PacketCount

Displays the number of MIPI CSI-2 packets per frame.

Interface support	CSI-2
Display name	Packet Count
Standard	Custom
Origin of feature	Transport layer
Feature type	Integer
Access	R
Affected features	Not applicable
Category	/TransportLayerControl/Info

Values	Description
0	Minimum
4294967295	Maximum

PacketSize

Displays the size of MIPI CSI-2 packets.

Interface support	CSI-2
Display name	Packet Size
Standard	Custom
Origin of feature	Transport layer
Feature type	Integer
Access	R
Unit	Bytes
Affected features	Not applicable
Category	/TransportLayerControl/Info

Values	Description
0	Minimum
4294967295	Maximum

UserSetControl

`UserSet` features enable to store individual settings on Alvium cameras. These user sets can be loaded by default, without needing to set values by software after every restart of the camera. Or they can be used to switch between different settings, for example, to adjust from daylight to artificial light.

Supported features

User sets on Alvium cameras support all features except for:

- Selectors
- Command features
- Read-only features
- Features that do not apply to the corresponding interface, such as CSI-2 related features on a USB camera
- Features in the `LUTControl` category.

Display name	User Set Control
Standard	SFNC
Origin of feature	Camera
Feature type	(Category)

UserSetDefault

Selects the user set to be loaded by default when the camera is reset.

Interface support	All
Display name	User Set Default
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	Not applicable
Category	/UserSetControl

Value	Description
`Default`	The default user set is loaded at camera reset.
`UserSet1`	Your individual UserSet1 is loaded at camera reset.
`UserSet2`	Your individual UserSet2 is loaded at camera reset.
`UserSet3`	Your individual UserSet3 is loaded at camera reset.
`UserSet4`	Your individual UserSet4 is loaded at camera reset.

UserSetLoad

[UserSetSelector]

Loads the user set specified by `UserSetSelector` to the camera.

Interface support	All
Display name	User Set Load
Standard	SFNC
Origin of feature	Camera
Feature type	Command
Access	W
Affected features	All features that are not excluded from user sets. See your Alvium camera's user guide for exceptions.
Category	/UserSetControl

UserSetSave

[UserSetSelector]

Writes and saves the current setup and state of the camera to the user set specified by `UserSetSelector`.

Interface support	All
Display name	User Set Save
Standard	SFNC
Origin of feature	Camera
Feature type	Command
Access	W
Affected features	Not applicable
Category	/UserSetControl

UserSetSelector

Selects the user set to be loaded or saved.

Interface support	All
Display name	User Set Selector
Standard	SFNC
Origin of feature	Camera
Feature type	Enumeration
Access	R/W
Affected features	`UserSetLoad`, `UserSetSave` All features that are not excluded from user sets. See your Alvium camera's user guide for exceptions.
Category	/UserSetControl

Value	Description
`Default`	The default user set is selected.
`UserSet1`	Your individual UserSet1 set is selected.
`UserSet2`	Your individual UserSet2 set is selected.
`UserSet3`	Your individual UserSet3 set is selected.
`UserSet4`	Your individual UserSet4 set is selected.

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