Baumer
Passion for Sensors

Operating Manual

VIXG
(Gigabit Ethernet)

EN-US

V1.0 | 8/6/2024 | 11728413

Table of contents

1 About this document

1.1 Purpose

This operating manual (subsequently referred to as manual) allows the safe and efficient handling of the product .

The manual does not provide instructions on operating the machine in which the product is integrated. Information on this is found in the operating manual of the machine.

The manual is a constituent part of the product. It must be kept in the immediate vicinity of the product and must be accessible to personnel at all times.

Personnel must have carefully read and understood this manual before beginning any work. The basic prerequisite for safe working is compliance with all safety instructions and handling instructions given in this manual.

In addition, the local occupational health and safety regulations and general safety regulations apply.

The illustrations in this manual are examples only. Deviations are at the discretion of Baumer at all times.

1.2 Warnings in this manual

Warnings draw attention to potential personal injury or material damage. The warnings in this manual indicate different hazard levels:

Symbol	Warning term	Explanation
	**DANGER**	Indicates an imminent potential danger with high risk of death or serious personal injury if not being avoided.
	WARNING	Indicates potential danger with medium risk of death or (serious) personal injury if not being avoided.
	CAUTION	Indicates a danger with low risk, which could lead to light or medium injury if not avoided.
	NOTE	Indicates a warning of material damage.
	**INFO**	Indicates practical information and tips that enable optimal use of the devices.

1.3 Labels in this manual

Identifier	Usage	Example
Dialog element	Indicates dialog elements.	Click the ***OK*** button.
Unique name	Indicates the names of products, files, etc.	*Internet Explorer* is not supported in any version.
`Code`	Indicates entries.	Enter the following IP address: `192.168.0.250`

1.4 Liability limitation

All information and notes in this manual have been compiled in accordance with the applicable standards and regulations, the state of the art, and our many years of knowledge and experience.

The manufacturer accepts no liability for damage due to the following reasons:

- Non-observance of the manual
- Improper use
- Use of unqualified personnel
- Unauthorized conversions

The obligations agreed in the delivery contract, the general terms and conditions and the delivery conditions of the manufacturer and its suppliers, as well as the legal regulations valid at the time of conclusion of the contract apply.

2 Safety

2.1 Personnel requirements

Certain work with the product may only be carried out by specialized personnel.

Specialized personnel are staff members who can evaluate the tasks assigned to them and recognize potential danger, based on their training and work as well as a reliable understanding of technical safety issues.

Qualified personnel are divided into the following categories:

- **Instructed personnel:**
  A person who has been informed and, if required, trained, by a specialist about the assigned tasks and potential dangers of improper behavior.
- **Specialist:**
  A person who, based on his/her training, experience, and instruction, as well as his/her knowledge of applicable standards, rules, and accident prevention regulations, has been authorized to carry out the respectively required tasks, while recognizing and avoiding potential dangers.
- **Electrical specialist:**
  A person with the appropriate specialist training, knowledge, and experience allowing him/her to recognize and avoid dangers originating from electricity.

2.2 General information

Intended use

This product is a precision device and serves the detection of items, objects, or physical measurement variables and the preparation or provision of measured values as electric variables for the higher-level system.

Unless specifically labeled, this product may not be used in explosive environments.

Commissioning

Assembly, installation, and calibration of this product may only be performed by a specialist.

Installation

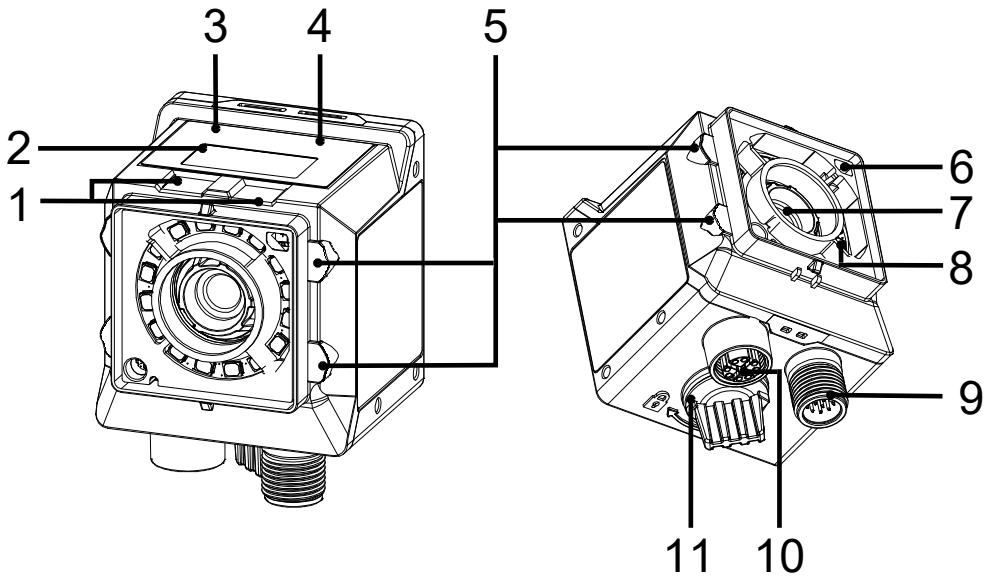
Only use the fasteners and fastener accessories intended for this product for installation. Outputs not in use must not be wired. Unused wires of cable outputs must be insulated. Do not go below the permissible cable bending radii. Disconnect the system from power before the product is electrically connected. Use shielded cables to prevent electro-magnetic interference. If the customer assembles plug connections on shielded cables, then EMC-version plug connections should be used and the cable shield must be connected to the plug housing across a large surface area.

Disposal (environmental protection)

Used electrical and electronic devices may not be disposed of in household waste. The product contains valuable raw materials that can be recycled. Therefore dispose of this product at the appropriate collection point. For additional information visit www.baumer.com.

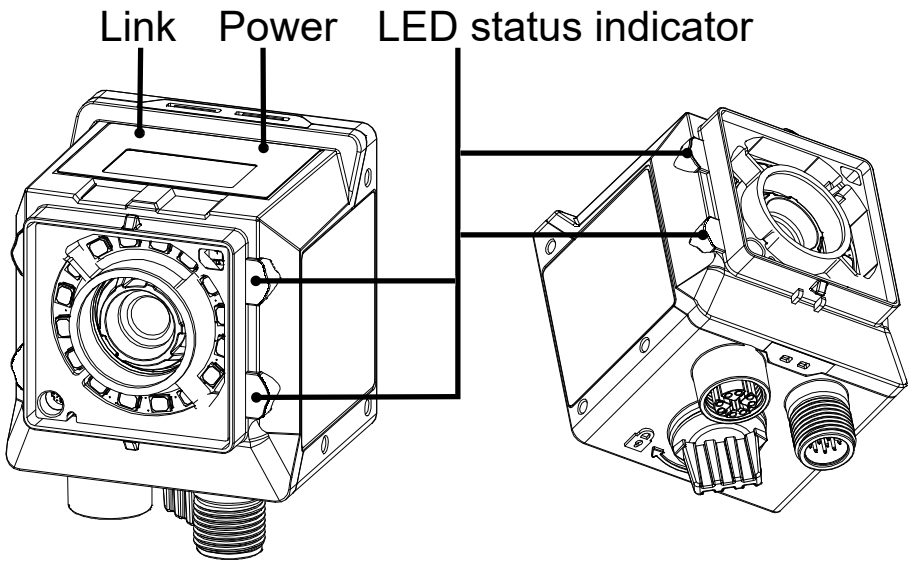
3 Description

3.1 Structure



1	qTeach Buttons	2	Display
3	LED Link	4	LED Power
5	Illuminated ring (4 x RGB LED indicators)	6	Sensor (filter recognition)
7	Camera (with electromechanical focus)	8	Internal illumination (each segment to be switched on individually)
9	Electrical connection; 12-pin M12, A-encoding	10	Ethernet connection (1 GigE); X-encoding
11	Protective plug (USB-C port without function)		

3.2 LED status indicator



Designation	Color	Significance
Link	green	▪ if Ethernet connection present
Power	green	▪ Voltage supply present
LED status indicator	red	▪ Error (e.g. excess temperature)
	green	▪ Image acquisition is running
	blue	▪ Camera ready for image acquisition

3.3 Display

The camera features a display to visualize various parameters.

The following functions are available:

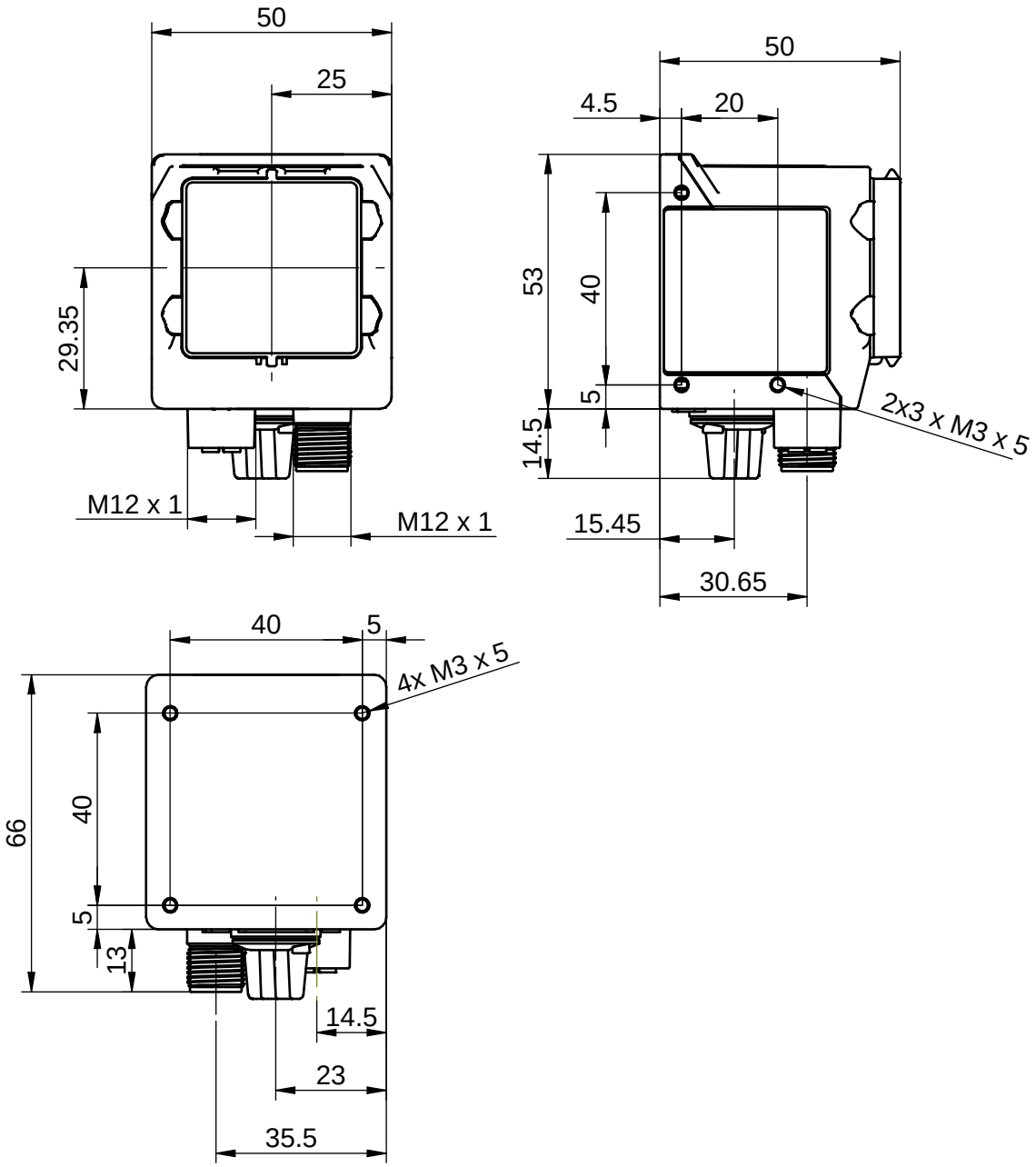
- Indicating the firmware version
- Indicating the camera type at boot up
- Indicating IP address

Display will deactivate after having remained unchanged for 60 minutes. To reactivate, use a 3 mm wide screwdriver and the *qTeach* buttons.

3.4 Camera models

Camera type	Sensor size	Resolution (Width × Height)	Max. FPS
Monochrom			
VIXG-10M.W06	1/4″	1280 × 800	37
VIXG-10M.W08	1/4″	1280 × 800	37

3.5 Dimensional drawing



Ill. 1: Dimensional drawing - VIXG

4 Transport and storage

4.1 Transport

NOTICE

Material damage due to improper transport.

a) Ensure maximum diligence when unloading the delivered packages as well as when transporting them inside the company.

b) Note the information and symbols on the packaging.

c) Only remove packaging immediately before mounting.

4.2 Delivery inspection

Upon receipt immediately inspect the delivery for completeness and transport damage.

Claim any defect as soon as it is detected. Damages can only be claimed within the applicable claims deadlines.

In case of externally visible transport damage, proceed as follows:

Instruction:

a) Do not accept the delivery or only with reservations.

b) Note the scope of the damage on the transport documents or the delivery slip of the carrier.

c) Initiate the claim.

5 Installation

5.1 Environmental requirements

Storage temperature	-10 °C (+14 °F) … +60 °C (+140 °F)
Humidity	0 % ... 85 % non condensing

5.2 Mechanical Tests

Baumer cameras are tested towards the following standards to ensure industrial suitability.

Test environment	Standard	Parameter	
Vibration (sinusoidal)	IEC 60068-2-6:2008	Continuous oscillation	10 - 55 Hz
		Amplitude underneath crossover frequencies	1 mm
		Acceleration	1 g
		Test duration	5 min (axis) 30 min (total)
Shock (semi-sinusoidal)	IEC 60068-2-27:2009	Pulse Time	11 ms
		Acceleration	30 g
		Test duration	6 impacts per axis and direction

5.3 Heat dissipation

NOTICE

Heat accumulation in the device

Heat can damage the device. Ensure adequate heat dissipation. In view of the varied installation options Baumer does not make any recommendation for heat dissipation, but we suggest the following:

a) Any form of convection around device and mounting helps reduce temperature. Prevent any heat accumulation!

b) Mounting combined with forced convection may provide proper heat dissipation.

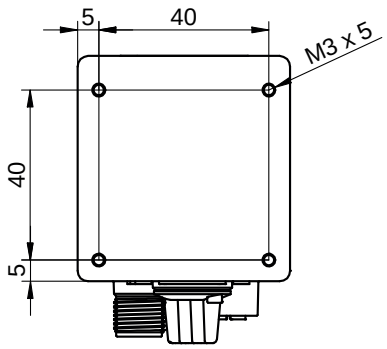
c) Avoid mounting on stainless steel surfaces. The thermal conductivity of stainless steel is about 10 times worse compared to aluminium.

d) To ensure heat dissipation on both sides, do not install the device at the end of a profile (larger surface for increased temperature reduction)!

e) Do not operate other devices close to the camera. Any waste heat might further heat up the camera.

5.4 Mounting the camera

Rear mount (preferred)



Ill. 2: Screwing points - rear mount

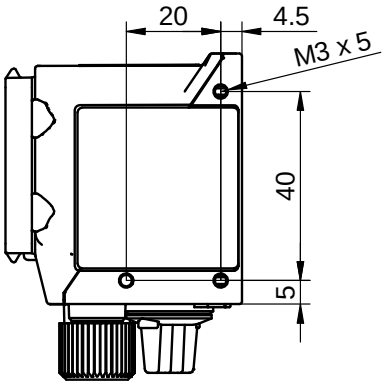
Condition:

⇨ M3 screws × (5 + x) (4 pieces) / x = sheet thickness of screw-on angle

Instruction:

- Screw on the camera.
  Tightening torque: max. 0.8 Nm.

Lateral mount



Ill. 3: Screw-on points - lateral mount

Condition:

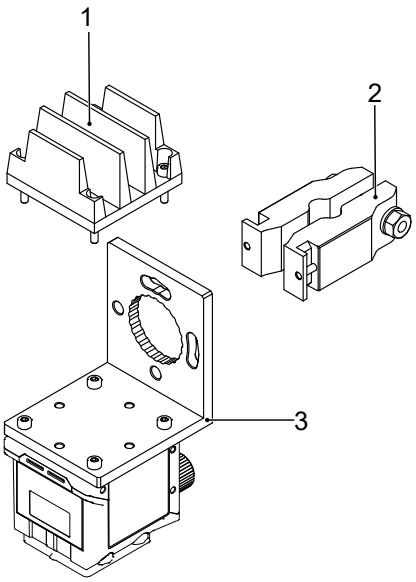
⇨ M3 screws × (5 + x) (3 pieces) / x = sheet thickness of screw-on angle

- Screw on the camera.
  Tightening torque: max. 0.8 Nm.

5.5 Accessories (not included)

Sensor attachment

Special modular *Smart Mounting Kit* is available. It will allow sensor installation even at profiles and rods.

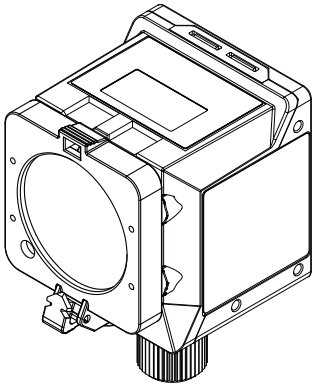


Ill. 4: Smart Mounting Kit A

Number	Designation	Item number
1	Cooling element *Smart Mounting Kit A*	11720395
2	Bar mount *Smart Mounting Kit A*	11720396
3	Angle *Smart Mounting Kit A*	11720397

Polarization filter

Polarization filters may be used for improved inspection on glossy surfaces.



Ill. 5: Snap-on polarization filter 44 mm (article number: 11704588)

INFO

Using a filter will darken the image. Re-parameterization of image acquisition configuration may be required.

For more accessories visit our website at:

https://www.baumer.com

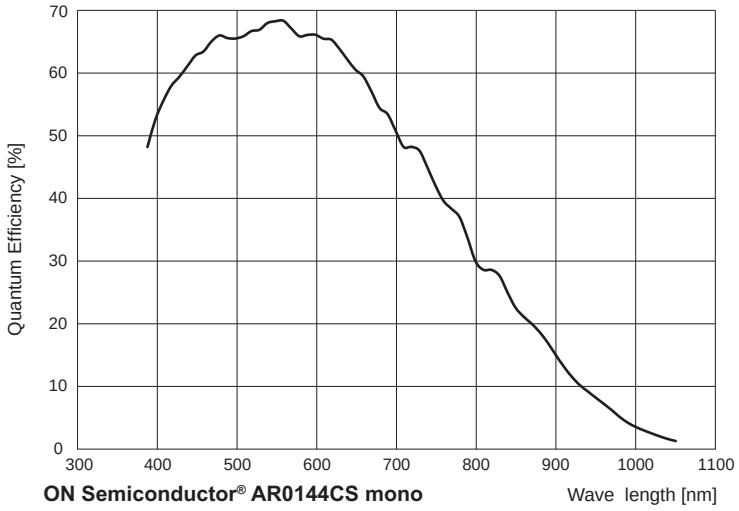
6 Optical specification

6.1 Spectral sensitivity

The following diagrams show the spectral sensitivity characteristics for this camera series. The characteristic curves for the sensors do not take the characteristics of lenses and light sources without filters into consideration.

The values refer to the related data sheets.

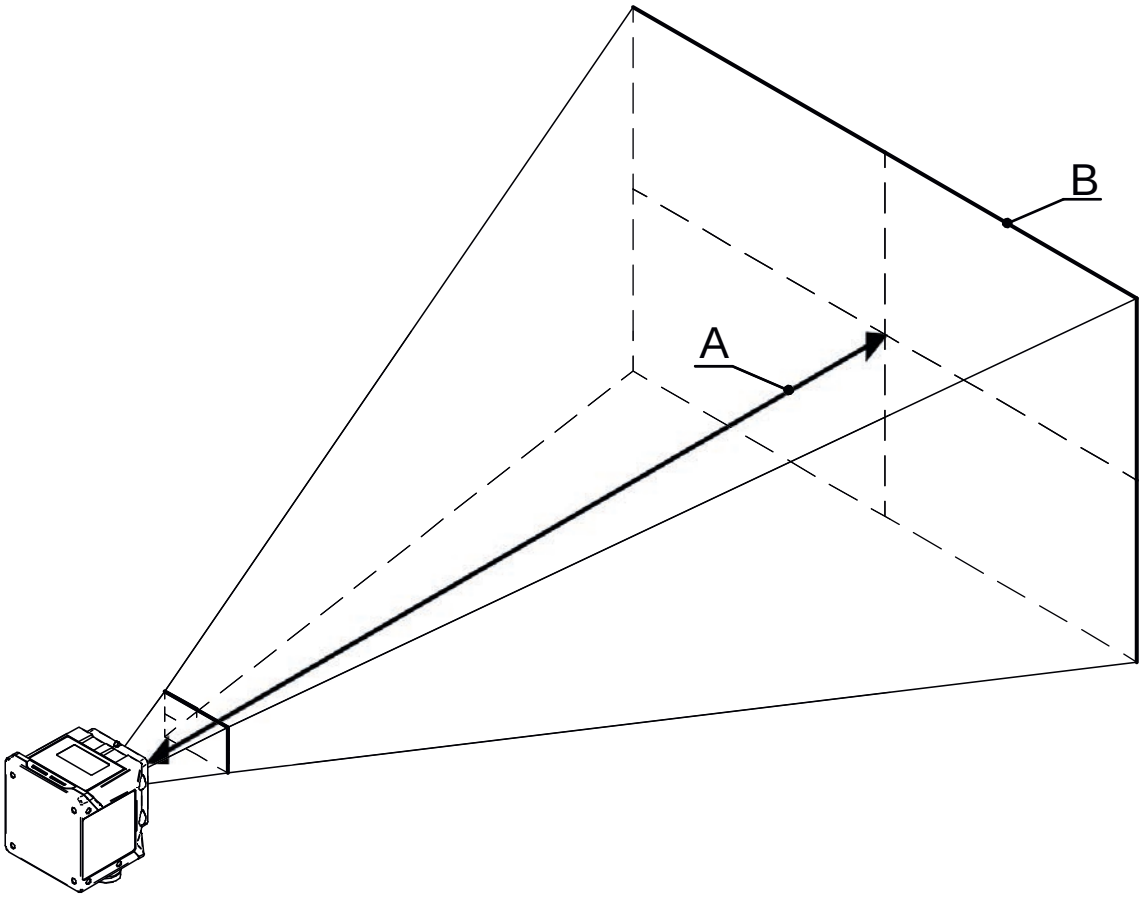
Cameras



Spectral sensitivity VIXG-10M.06 / VIXG-10M.08
(ON Semuconductor® AR0144CS mono)

6.2 Field of view / operating distance

Below you see the minimum and maximum fields of view.



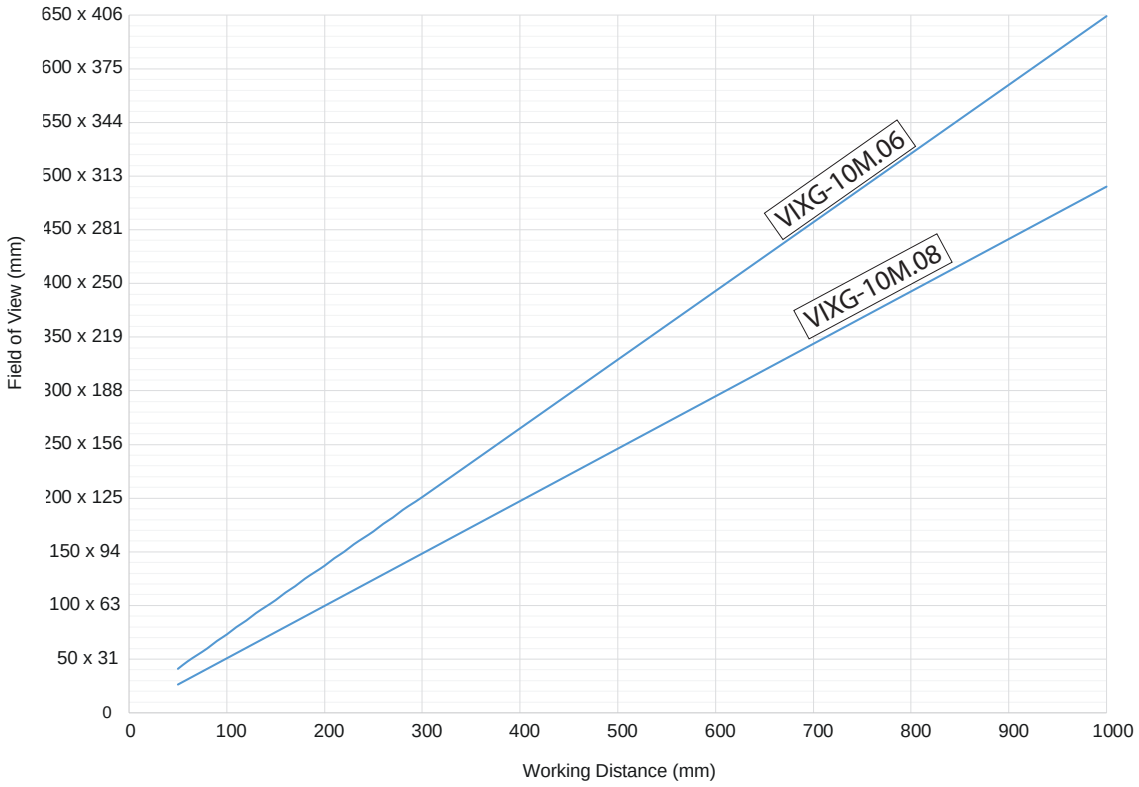
Minimum

	VIXG-10M.06	VIXG-10M.08
A	50 mm	50 mm
B	41 mm x 25 mm	29 mm x 18 mm

Maximum

	VIXG-10M.06	VIXG-10M.08
A	1000 mm	1000 mm
B	649 x 408 mm	485 mm x 303 mm

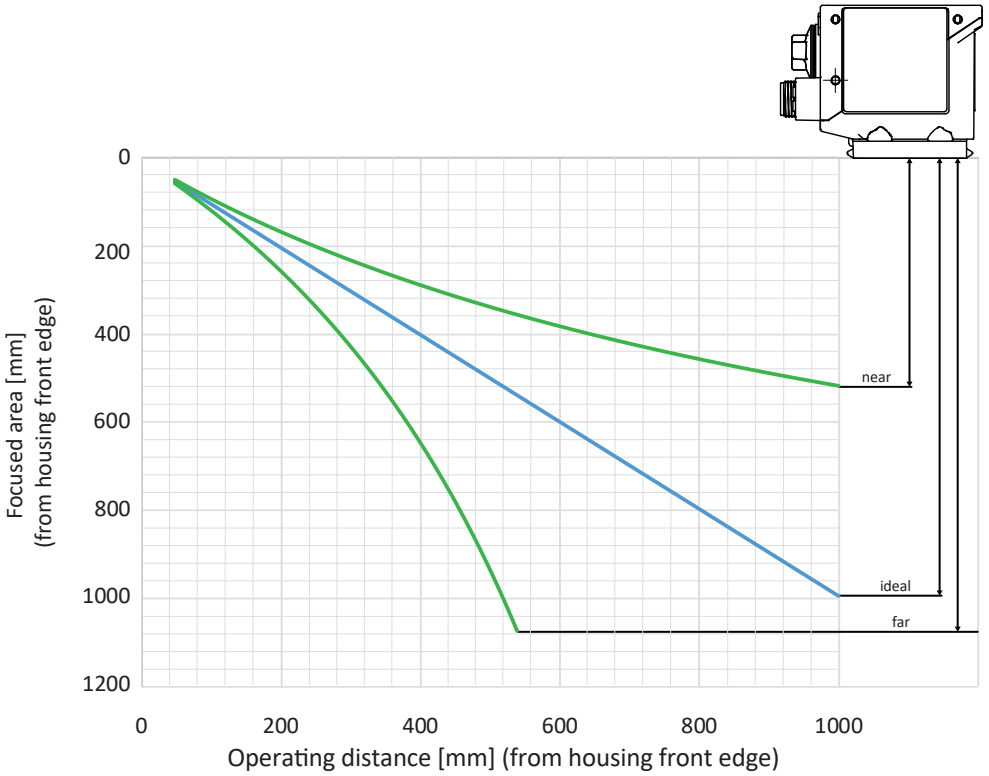
Field of view - operating distance



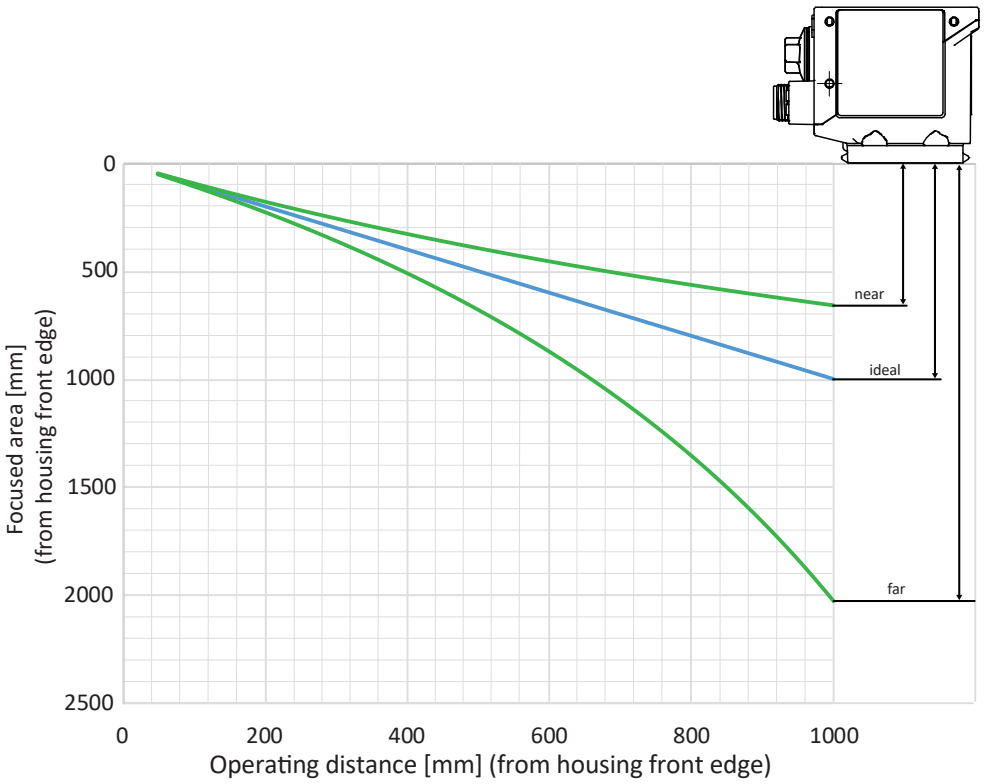
6.3 Depth of field

For information on device-specific depth of field (*near / ideal / far*) please see the following diagrams.

VIXG-10M.W.06 (focal length: 6 mm / aperture: 3.5)



VIXG-10M.W.08 (focal length: 8 mm / aperture: 3.5)



7 Electrical installation

7.1 General instructions for electric installation

NOTICE

Device damage due to faulty power supply.

The device can be damaged due to faulty power supply.

a) Operate the device only with protected low voltage and safe electrical isolation of protection class III.

NOTICE

Device damage or unintended operation due to work on live parts.

Any wiring work on live parts may lead to unintentional operation.

a) Prior to performing any wiring work disconnect power supply.

b) Only connect or disconnect any terminals when not live.

INFO

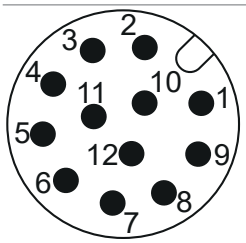
USB port without function

Use a power unit for power supply. The USB interface under the protective plug is without function. Power supply always via the 12-pin M12 connector.

- Prerequisites for IP rating:
  - Connection to power supply and network must be established by cable.
  - Protective plug must be closed. The internal USB port has no function.

7.2 Pin assignment

Power Supply / Digital-IO

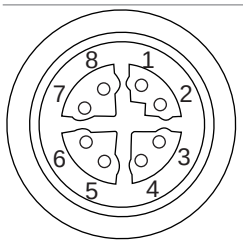


1	Power (19.2 … 28.8 VDC)	2	Ground
3	IN1 (Trigger)	4	IN2
5	IN3	6	OUT1
7	(not used)	8	OUT2
9	OUT3	10	(not used)
11	(not used)	12	(not used)

Wire colors according to DIN IEC 757

1	BN – Brown	2	BU – Blue
3	WH – White	4	GN – Green
5	PK – Pink	6	YE – Yellow
7	BK – Black	8	GY – Gray
9	RD – Red	10	VT – Violet
11	GY-PK – Gray Pink	12	RD-BU – Red Blue

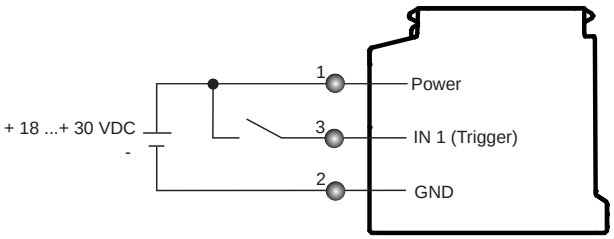
Wire colors according to DIN IEC 757



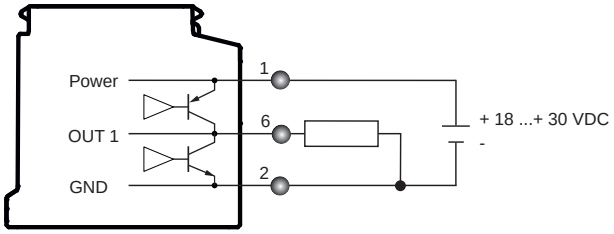
1	RX+	2	RX-
3	TX+	4	TX-
5	-VDC	6	-VDC
7	+VDC	8	+VDC

7.3 Wiring

Input



Output



8 Maintenance

The device is maintenance-free. No special preventive maintenance is required. Regular cleaning and visual inspection of the plug connections are recommended.

8.1 Cleaning the device

Outside cleaning

When cleaning the exterior of the device, make sure to use cleaning agents that will not affect housing surface nor seals.

NOTICE

Material damage due to improper cleaning.

Inappropriate cleaning agents and methods can cause leaks and damage device, seals, or connections.

a) Always check the suitability of the cleaning agent for the surface to be cleaned.

b) Use alcohol-based cleaning agents but never any scouring agents, solvents or other aggressive cleaning agents.

c) Never use a high-pressure cleaner for cleaning.

d) Do not scrape off soiling with sharp-edged items.

e) Only ever use a lens cloth for cleaning the front glass.

Inside cleaning

No interior cleaning required.

9 Troubleshooting

9.1 Support

In case of any questions please contact our Technical & Application Support Center.

Worldwide

Baumer Optronic GmbH

Badstrasse 30

DE - 01454 Radeberg

www.baumer.com

Tel.: +49 (0)3528 4386 845

support.cameras@baumer.com

9.2 Accessories

You can find accessories at the website at:

www.baumer.com

10 Software

10.1 Baumer GAPI

Baumer GAPI stands for Baumer **G**eneric **A**pplication **P**rogramming **I**nterface. With this API Baumer offers an interface for fast and easy integration of Baumer industrial cameras in C++, C and C# (Windows only®). The software interface allows for switchover to other camera models.

The API supports Windows®, Linux® and ARM®-based platforms.

For more information, please visit: https://www.baumer.com/vision/software

10.2 Baumer neoAPI

The neoAPI is a high-performant and user-friendly API for camera integration. Using few code lines only, it enables fast integration of Baumer cameras into C++, C# and Python™.

The API supports Windows®, Linux® and ARM®-based platforms.

For more information, please visit: https://www.baumer.com/neoAPI

10.3 Baumer Camera Explorer

Easy-to-use Baumer *Camera Explorer* allows for camera evaluation and configuration within the least amount of time. It helps get to know and try the diversified functions of the Baumer cameras for configuration to the application.

Baumer *Camera Explorer* supports Windows®, Linux® and ARM®-based platforms.

For more information, please visit: https://www.baumer.com/camera-explorer

10.4 3rd Party Software

Strictly adhering to the GenICam™ standard, Baumer is in a position to offer the 3rd party software for use with this camera series.

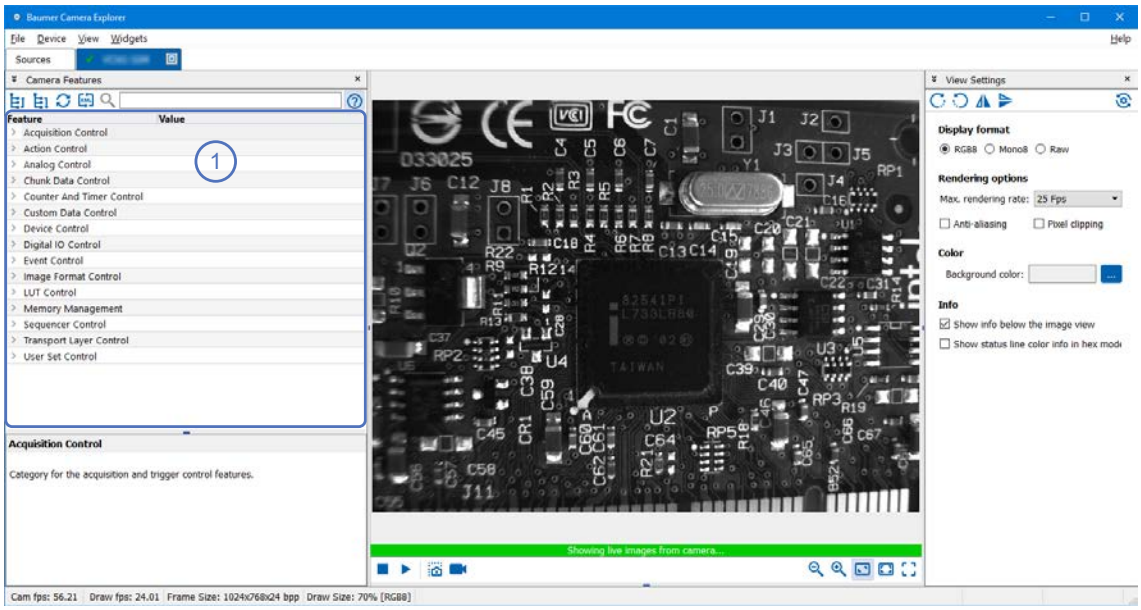
A current listing of 3rd party software that has been successfully tested with Baumer cameras is accessible at: https://www.baumer.com/c/14180.

11 GenICam Camera Features

A GenICam™-compliant XML-description file presents the camera's Features. The following chapter describes all included and accessible functions. Most of the camera's functions are standardized in *GenICam™ SFNC* and must use the name defined in there. Particular Features, which cannot be assigned to an existing *GenICam™ SFNC* name come as vendor-specific in the "Custom" namespace.

The Features are clustered in categories according to their function. The software uses them to present the functions more clearly.

You can see your camera's Features functionalities in *Feature Tree* (1) of the *Camera Explorer*. Please refer to the appropriate documentation.



11.1 Category: AcquisitionControl

This chapter describes all features related to image acquisition, including the trigger and exposure control.

11.1.1 AcquisitionFrameRate

Controls the acquisition rate (in Hertz) at which the frames are captured.

Name	AcquisitionFrameRate
Category	AcquisitionControl
Interface	IFloat
Access	Read / Write
Unit	Hz
Values	depends on camera

11.1.2 AcquisitionFrameRateEnable

Enables the acquisition at the framerate specified by AcquisitionFrameRate.

Name	AcquisitionFrameRateEnable
Category	AcquisitionControl
Interface	IBoolean
Access	Read / Write
Unit	-
Values	true = 1 (On) false = 0 (Off)

11.1.3 AcquisitionMode

Sets the acquisition mode of the device. It defines mainly the number of frames to capture during an acquisition and the way the acquisition stops.

INFO
The camera must be stopped before this feature can be edited.

Name	AcquisitionMode
Category	AcquisitionControl
Interface	IEnumeration
Access	Read / Write
Unit	-
Values	see table(s) below

VIXG

Values	Description
Continuous	Without external events frames are continuously acquired until stop by command *AcquisitionStop*.

11.1.4 AcquisitionStart

Once image acquisition has started, the camera processes the images in three steps:

1. Determining the current set of image parameters
2. Sensor exposure
3. Readout from the sensor

This process is then repeated until the camera is stopped.

Name	AcquisitionStart
Category	AcquisitionControl
Interface	ICommand
Access	Write only
Unit	-
Values	-

11.1.5 AcquisitionStop

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

Name	AcquisitionStop
Category	AcquisitionControl
Interface	ICommand
Access	Write only
Unit	-
Values	-

11.1.6 ExposureAuto

Sets exposure mode to automatic if *ExposureMode* = *Timed*. The exact algorithm used for implementation is device-specific.

Name	ExposureAuto
Category	AcquisitionControl
Interface	IEnumeration
Access	Read / Write
Unit	-
Values	see table(s) below

VIXG

Values [ExposureAuto]	Description
Off	Exposure duration is user controlled using *ExposureTime*.
Once	Exposure time is adapted once. Once it has converged, it returns to the *Off* state.

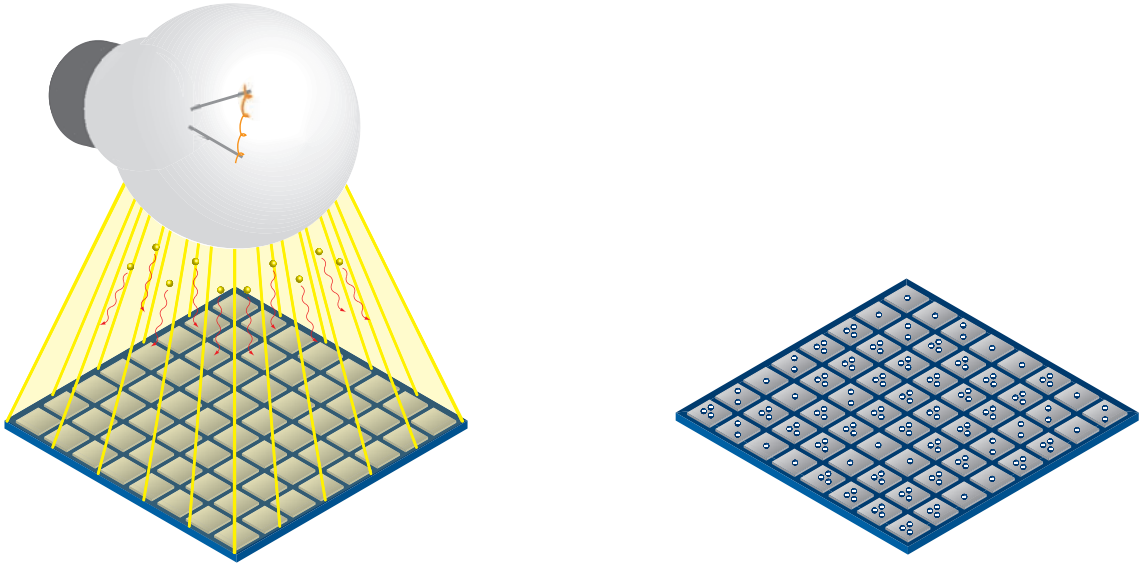
11.1.7 ExposureMode

Sets the operation mode of the Exposure.

Name	ExposureMode	
Category	AcquisitionControl	
Interface	IEnumeration	
Access	Read / Write	
Unit	-	
Values	Timed	Time-controlled exposure. The exposure duration time is set using the *ExposureTime* or *ExposureAuto* features and the exposure starts with the *FrameStart* or *LineStart*.

11.1.8 ExposureTime

On exposure of the sensor, the inclination of photons produces a charge separation on the semiconductors of the pixels. This results in a voltage difference, which is used for signal extraction.



The signal strength is influenced by the incoming amount of photons. It can be increased by increasing the exposure time (texposure).

Name	ExposureTime
Category	AcquisitionControl
Interface	IFloat
Access	Read / Write
Unit	µs
Values	see table(s) below

VIXG

Camera type	texposure min [µsec]	texposure max [µsec]
Monochrome		
VIXG-10M.W06	11	5000
VIXG-10M.W08	11	5000

11.1.9 TriggerActivation

Specifies the trigger activation mode.

Name	TriggerActivation
Category	AcquisitionControl
Interface	IEnumeration
Access	Read / Write
Unit	-
Values	see table(s) below

VIXG

Values [TriggerActivation]	Description
RisingEdge	*Trigger* valid at rising edge of source signal.

INFO

Signal inversion of the selected line is via feature *LineInverter (Category: DigitalIO)*. This way, trigger will also be valid at falling edge of the source signal.

11.1.10 TriggerDelay

Specifies the delay in microseconds (µs) to apply after the trigger reception before activating it.

Name	TriggerDelay
Category	AcquisitionControl
Interface	IEnumeration
Access	Read / Write
Unit	µs
Values	0 - 2,000,000.000000 (Increment: 1.00)

11.1.11 TriggerMode

Controls if the selected *Trigger* is active.

Name	TriggerMode	
Category	AcquisitionControl	
Interface	IEnumeration	
Access	Read / Write	
Unit	-	
Values	Off	Disables selected *Trigger*.
	On	Enables selected *Trigger*.

11.1.12 TriggerSelector

Selects the type of trigger to configure.

Name	TriggerSelector	
Category	AcquisitionControl	
Interface	IEnumeration	
Access	Read / Write	
Unit	-	
Values	Frame Start	Selects the type of trigger to configure.

11.1.13 TriggerSoftware

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

Name	TriggerSoftware
Category	AcquisitionControl
Interface	ICommand
Access	Write only
Unit	-
Values	-

11.1.14 TriggerSource

Specifies the internal signal or physical input Line to use as the trigger source. The selected trigger must have its *TriggerMode* set to *On*.

Name	TriggerSource
Category	AcquisitionControl
Interface	IEnumeration
Access	Read / Write
Unit	-
Values	see table(s) below

TriggerSource	VIXG
All	■
Line0	■
Off	■
Software	■

11.2 Category: AnalogControl

Features in this chapter describe how to influence the analog features of an image, such as *Gain*, *BlackLevel* and *Gamma*.

11.2.1 BlackLevel

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

Name	BlackLevel
Category	AnalogControl
Interface	IFloat
Access	Read / Write
Unit	-
Values	see table(s) below

VIXG

Camera type	BlackLevel
Monochrome	
VIXG-10M.W06	10 ... 10 DN8
VIXG-10M.W08	10 ... 10 DN8

11.2.2 BlackLevelSelector

Selects which Black Level is controlled by the various Black Level features.

Name	BlackLevelSelector	
Category	AnalogControl	
Interface	IEnumeration	
Access	Read / Write	
Unit	-	
Values	All	Black Level will be applied to all channels.

11.2.3 Gain

Motion blur is unacceptable in high quality image acquisition. Exposure times are therefore limited. However, this results in low output signals from the camera and dark images. To solve this issue, the signals can be amplified by a user-defined gain factor within the camera.

INFO

Increasing the *Gain* will increase image noise.

Name	Gain
Category	AnalogControl
Interface	IFloat
Access	Read / Write
Unit	-
Values	see table(s) below

VIXG

Camera type	Gain
Monochrome	
VIXG-10M.W06	1 ... 8
VIXG-10M.W08	1 ... 8

11.2.4 GainAuto

Sets the automatic gain control (AGC) mode. The algorithm used to implement AGC is device-specific.

Name	GainAuto
Category	AnalogControl
Interface	IEnumeration
Access	Read / Write
Unit	-
Values	see table(s) below

VIXG

INFO

With this camera the feature is *Read only*.

Values [GainAuto]	
Off	Gain is User controlled using *Gain*.

11.2.5 GainSelector

Selects which gain is controlled by the various gain feature.

Name	GainAuto
Category	AnalogControl
Interface	IEnumeration
Access	Read / Write
Unit	-
Values	see table(s) below

VIXG

Values [GainSelector]	
All	All Gain values will be applied to all channels.

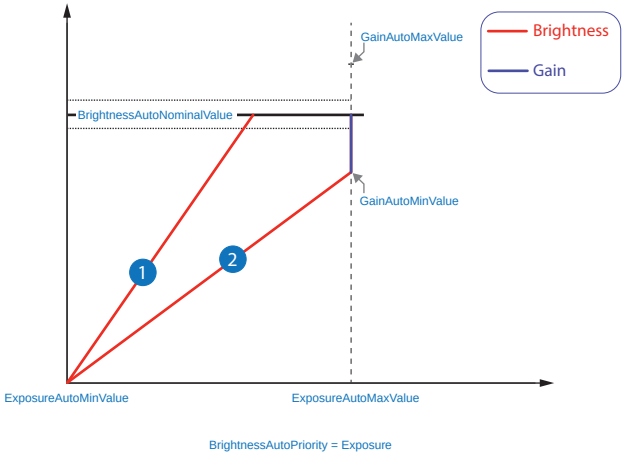
11.3 Category: AutoFeatureControl

Category containing the functions for automatic adjustment.

General Information

Various auto functions are available to automatically adjust image brightness. Two methods are described below.

BrightAutoPriority = ExposureAuto



1

Example 1

For image 1, increasing brightness using *ExposureTime* will suffice to achieve the value in *BrightnessAutoNominalValue*.

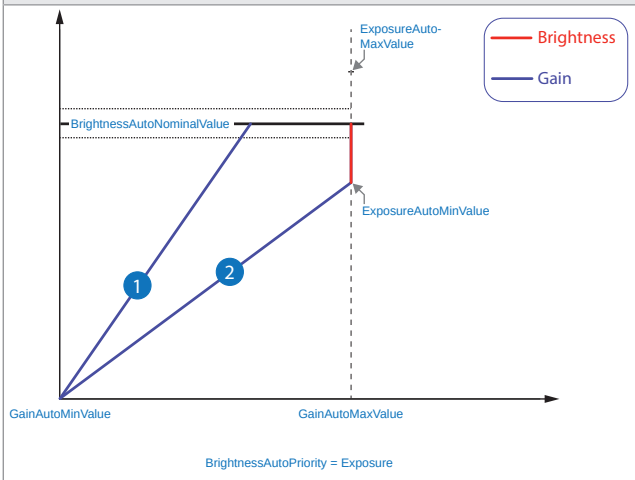
2

Example 2

For image 2, increasing brightness using *ExposureTime* will not sufficient to achieve value in *BrightnessAutoNominalValue*.

Therefore, *Gain* is increased once *ExposureAutoMaxValue* has been achieved.

BrightAutoPriority = GainAuto



1

Example 1

For image 1, increasing brightness using *Gain* will suffice to achieve the value in *BrightnessAutoNominalValue*.

2

Example 2

For image 2, increasing brightness using *Gain* will not sufficient to achieve value in *BrightnessAutoNominalValue*.

Therefore, *ExposureTime* is increased once *ExposureAutoMaxValue* has been achieved.

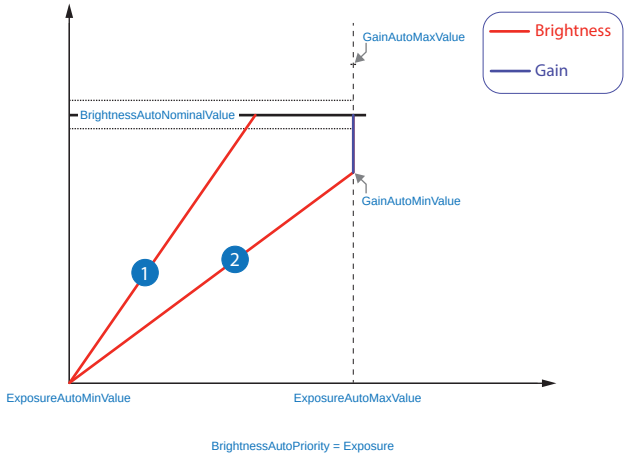
11.3.1 BrightnessAutoPriority

The function set the highest priority auto function to adjust the brightness.

INFO

Provided *BrightnessAutoPriority* is set to *GainAuto*, image brightness can be increased by a higher value in *Gain*. Though this can cause image noise, but the Framerate will not be reduced.

BrightAutoPriority = ExposureAuto



1 Example 1

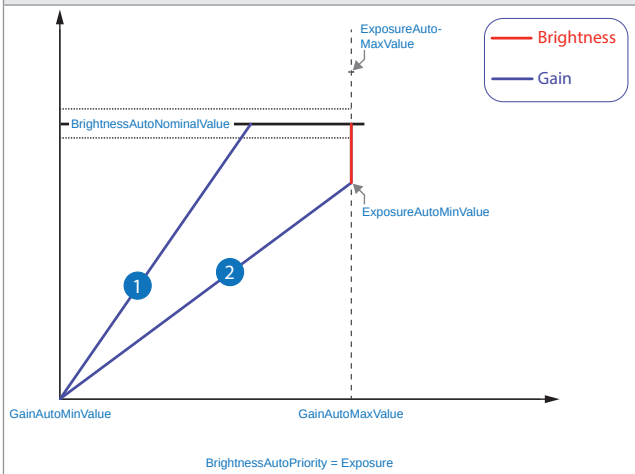
For image 1, increasing brightness using *ExposureTime* will suffice to achieve the value in *BrightnessAutoNominalValue*.

2 Example 2

For image 2, increasing brightness using *ExposureTime* will not sufficient to achieve value in *BrightnessAutoNominalValue*.

Therefore, *Gain* is increased once *ExposureAutoMaxValue* has been achieved.

BrightAutoPriority = GainAuto



1 Example 1

For image 1, increasing brightness using *Gain* will suffice to achieve the value in *BrightnessAutoNominalValue*.

2 Example 2

For image 2, increasing brightness using *Gain* will not sufficient to achieve value in *BrightnessAutoNominalValue*.

Therefore, *ExposureTime* is increased once *ExposureAutoMaxValue* has been achieved.

Name	BrightnessAutoPriority	
Category	AutoFeatureControl	
Interface	IEnumeration	
Access	Read / Write	
Unit	-	
Values	ExposureAuto	*ExposureAuto* has highest priority and will be modified first.
	GainAuto	*GainAuto* has highest priority and will be modified first.

11.4 Category: DeviceControl

Category for device information and control.

11.4.1 DeviceFamilyName

Identifier of the product family of the device.

Name	DeviceFamilyName
Category	DeviceControl
Interface	IString
Access	Read only
Unit	-
Values	device family name

11.4.2 DeviceFirmwareVersion

Version of the firmware in the device.

Name	DeviceFirmwareVersion
Category	DeviceControl
Interface	IString
Access	Read only
Unit	-
Values	e.g. CID:000057/PID:11194280

11.4.3 DeviceLinkHeartbeatMode

Activate or deactivate the Link`s heartbeat.

Name	DeviceLinkHeartbeatMode	
Category	DeviceControl	
Interface	IEnumeration	
Access	Read / Write	
Unit	-	
Values	On	Enables the Link heartbeat.
	Off	Disables the Link heartbeat.

11.4.4 DeviceLinkHeartbeatTimeout

Controls the current heartbeat timeout of the specific Link.

If this time is exceeded without a read access, the camera disconnects itself to be ready for the next connection of another application, or reconnection of the restarted PC application.

The exceedance can be caused, for example, by a crashed software or a CPU overload of the PC.

Name	DeviceLinkHeartbeatTimeout
Category	DeviceControl
Interface	IFloat
Access	Read / Write
Unit	µs
Values	500,000.000000 ... 4,294,967,295,000.000000 (Increment: 1)

11.4.5 DeviceLinkSelector

Selects which Link of the device to control.

Generally, a device has only one Link that can be composed of one or many connections. But if there are many, this selector can be used to target a particular Link of the device with certain functions.

Name	DeviceLinkSelector
Category	DeviceControl
Interface	IInteger
Access	Read / Write
Unit	-
Values	≥ 0

11.4.6 DeviceLinkSpeed

Indicates the speed of transmission negotiated on the specified link.

Name	DeviceLinkSpeed
Category	DeviceControl
Interface	IInteger
Access	Read only
Unit	Bps
Values	≥ 0

11.4.7 DeviceLinkThroughputLimit

Limits the maximum bandwidth of the data that will be streamed out by the device on the selected Link. If necessary, delays will be uniformly inserted between transport layer packets in order to control the peak bandwidth.

Name	DeviceLinkThroughputLimit	
Category	DeviceControl	
Interface	IInteger	
Access	Read / Write	
Unit	-	
Values	GigE:	1.250.000 ... 1.250.000.000 (Increment: 12.500.000)
	5GigE:	1.250.000 ... 6.250.000.000 (Increment: 12.500.000)
	10GigE:	1.250.000 ... 1.250.000.0000 (Increment: 12.500.000)
	USB3:	1.000.000 ... 4.000.000.000 (Increment: 1000000)

11.4.8 DeviceManufacturerInfo

Manufacturer-specific device information.

The content might come as follows:

Firmware (F) / FPGA (C) / BL3-Version (BL)

Name	DeviceManufacturerInfo
Category	DeviceControl
Interface	IString
Access	Read only
Unit	-
Values	e.g.F:00007F9A/C:0180802D/BL3.8:00000081

INFO

The following information is available for VIXG:
BN:XXXXXX/L:X.X.X-XX
(BuildNr = Jenkins Build, L = Linux-Version)

11.4.9 DeviceModelName

Model name of the device.

Name	DeviceModelName
Category	DeviceControl
Interface	IString
Access	Read only
Unit	-
Values	Model name of the device.

11.4.10 DevicePeripheralEnable

Control, element selected with *DevicePeripheralSelector*.

Name	DevicePeripheralEnable	
Category	DeviceControl	
Interface	IEnumeration	
Access	Read / Write	
Unit	-	
Values	On	Enable
	Off	Disable

11.4.11 DevicePeripheralSelector

Select the element to be controlled. Control may use *DevicePeripheralEnable*.

Name	DevicePeripheralSelector
Category	DeviceControl
Interface	IEnumeration
Access	Read / Write
Unit	-
Values	StatusLED
	Aimer
	Display

11.4.12 DeviceReset

Resets the device to its power up state.

INFO
The execution of this feature may take several seconds.

Name	DeviceReset
Category	DeviceControl
Interface	IComand
Access	Write only
Unit	-
Values	-

11.4.13 DeviceSerialNumber

Device`s serial number. This string is a unique identifier of the device.

Name	DeviceSerialNumber
Category	DeviceControl
Interface	IString
Access	Read only
Unit	-
Values	e.g. 1117281217

11.4.14 DeviceSFNCVersionMajor

Primary version of *Standard Features Naming Convention* used to create the device GenICam XML(**X**.x.x).

Name	DeviceSFNCVersionMajor
Category	DeviceControl
Interface	IInteger
Access	Read only
Unit	-
Values	0 ... 9223372036854775807 (Increment: 1)

11.4.15 DeviceSFNCVersionMinor

Minor version of *Standard Features Naming Convention* used to create the device *GenICam XML*(x.**X**.x.).

Name	DeviceSFNCVersionMinor
Category	DeviceControl
Interface	IInteger
Access	Read only
Unit	-
Values	0 ... 9223372036854775807 (Increment: 1)

11.4.16 DeviceSFNCVersionSubMinor

Sub version of *Standard Features Naming Convention*, used to create the device *GenICam XML*(x.x.**X**).

Name	DeviceSFNCVersionSubMinor
Category	DeviceControl
Interface	IInteger
Access	Read only
Unit	-
Values	0 ... 9223372036854775807 (Increment: 1)

11.4.17 DeviceStreamChannelPacketSize

Specifies the stream packet size, in bytes, to send on the selected channel for a Transmitter or specifies the maximum packet size supported by a receiver.

Name	DeviceStreamChannelPacketSize
Category	DeviceControl
Interface	IInteger
Access	Read only
Unit	Byte
Values	576 ... 9000 (Increment: 2)

11.4.18 DeviceTemperature

Device temperature in degrees Celsius (°C). Measured at the location selected by *DeviceTemperatureSelector*.

Name	DeviceTemperature
Category	DeviceControl
Interface	IFloat
Access	Read only
Unit	°C
Values	Device specific (e.g. -127.0 ... 127.0)

11.4.19 DeviceTemperatureSelector

Selects the temperature measuring point.

Name	DeviceTemperatureSelector	
Category	DeviceControl	
Interface	IEnumeration	
Access	Read / Write	
Unit	-	
Values	InHouse	Temperature inside the camera housing.

11.4.20 DeviceVendorName

Name of the manufacturer of the device.

Name	DeviceVendorName
Category	DeviceControl
Interface	IString
Access	Read only
Unit	-
Values	Manufacturer name.

11.4.21 DeviceVersion

Version of the device.

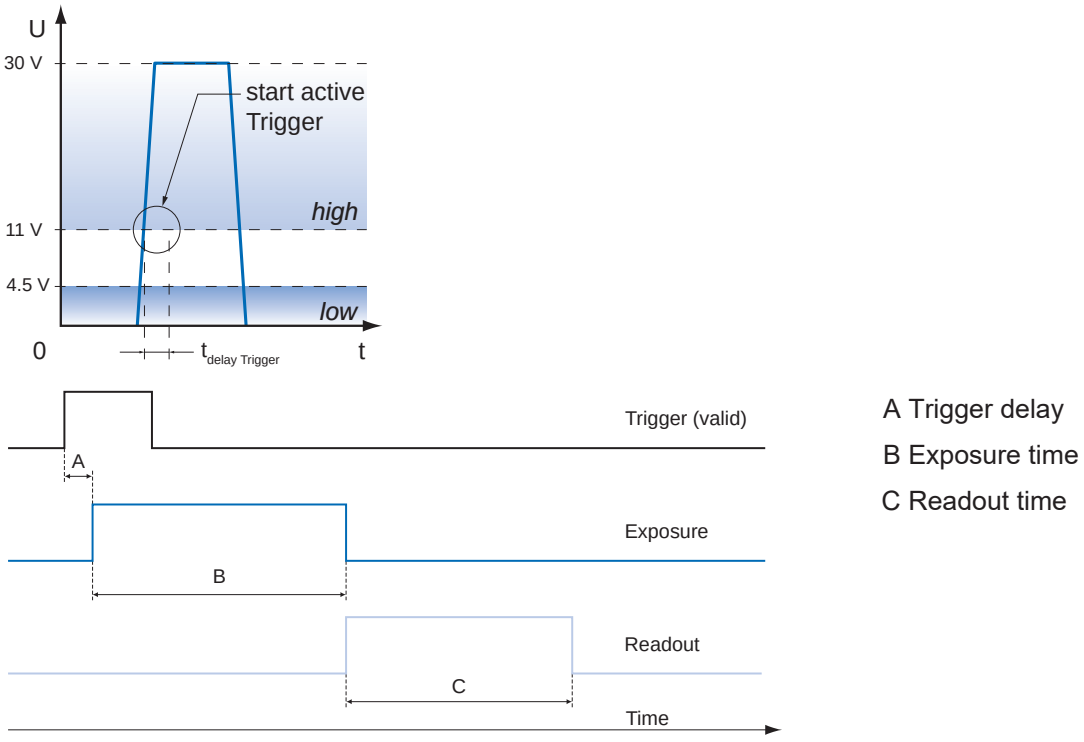
Name	DeviceVersion
Category	DeviceControl
Interface	IString
Access	Read only
Unit	-
Values	e.g. R2.0.0

11.5 Category: DigitalIOControl

Category that contains the digital input and output control functions.

Trigger – General Information

Trigger signals are used to synchronize the camera exposure and a machine cycle or, in case of a software trigger, to take images at predefined time intervals. Different trigger sources can be used here.



A Trigger delay
B Exposure time
C Readout time

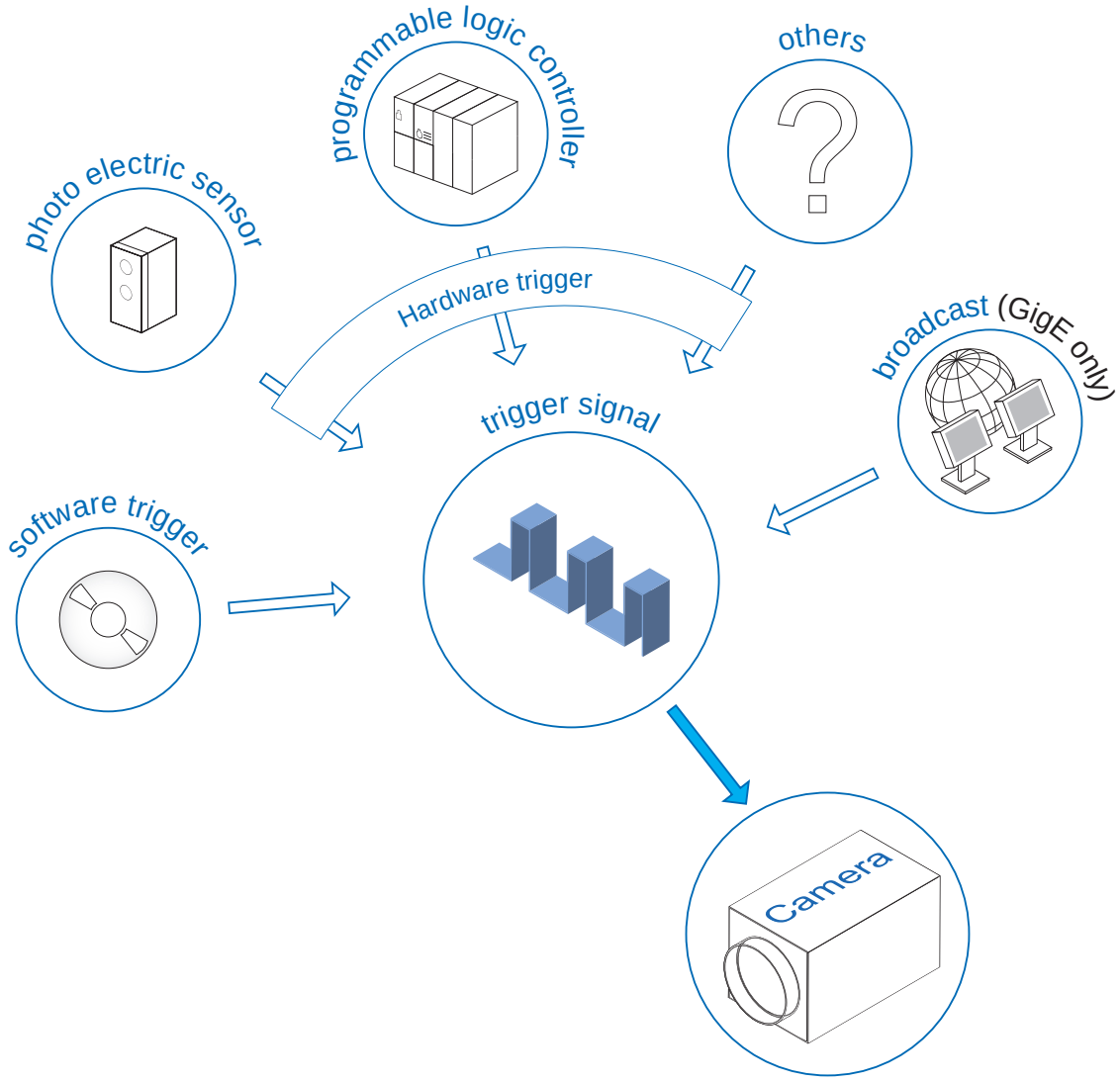
Trigger delay – General Information

Trigger delay (*TriggerDelay*) is a user-defined delay between the given trigger impulse and image acquisition. The delay time can be set between 0 µs and 2.0 s in increments of 1 µs. Where there are multiple triggers during the delay, the triggers will also be stored and delayed. The buffer is able to store up to 512 trigger signals during the delay.

Your benefits:

- No need for an external trigger sensor to be perfectly aligned
- Different objects can be captured without hardware changes

Trigger Source (examples of possible trigger sources)



Each trigger source must be activated separately. When the trigger mode (*TriggerMode*) is activated, the hardware trigger is activated by default.

11.5.1 LineInverter

Controls signal inversion of the selected line *Input* or *Output*.

Name	LineInverter
Category	DigitalIOControl
Interface	IBoolean
Access	Read / Write
Unit	-
Values	true = 1 (On) false = 0 (Off)

11.5.2 LineMode

Controls if the physical Line is used to input or output a signal.

Name	LineMode	
Category	DigitalIOControl	
Interface	IEnumeration	
Access	Read / Write	
Unit	-	
Values	Input	The selected physical line is used to input an electrical signal.
	Output	The selected physical line is used to output an electrical signal.

11.5.3 LineSelector

Selects the physical line (or pin) of the external device connector to configure.

Name	LineSelector
Category	DigitalIOControl
Interface	IInteger
Access	Read / Write
Unit	-
Values	see table(s) below

VIXG

Values [Lineselector]
Line0 (IN1)
Line1 (IN2)
Line2 (IN3)
Line3 (OUT1)
Line4 (OUT2)
Line5 (OUT3)

11.5.4 LineSource

Selects which internal signals are output at the selected *Line*.

Name	LineSource
Category	DigitalIOControl
Interface	IEnumeration
Access	Read / Write
Unit	-
Values	see table(s) below

VIXG

LineSource (Signals)	
Alarm	The device emits an alarm.
DeviceReady	Device is ready operational.
ExposureActive(Line5 only)	A Frame (or Line) is currently being exposed by the device.
Off	Line Output disabled.
TriggerReady	The device is ready for *Trigger*.

11.5.5 LineStatus

Returns the current status of the selected *Input* or *Output*.

Name	LineStatus
Category	DigitalIOControl
Interface	IBoolean
Access	Read only
Unit	-
Values	true = 1 (On) false = 0 (Off)

11.5.6 LineStatusAll

Returns the current status of all available Line signals at time of polling in a single bitfield.

Name	LineStatusAll
Category	DigitalIOControl
Interface	IInteger
Access	Read only
Unit	-
Values	Devices-Specific (HexNumber)

11.6 Category: FileAccessControl

Category including the functions for file access control.

NOTICE

Updating incorrect firmware may cause the camera becoming unusable

We recommend using *Baumer Update Tool* for camera firmware updates. Only update the most recently authorized firmware version. If required, contact customer support before updating the firmware.

Baumer assumes no warranty for updating unauthorized firmware.

11.6.1 FileAccessBuffer

Defines the intermediate access buffer enabling data exchange between the device data memory and the application.

Name	FileAccessBuffer
Category	FileAccessControl
Interface	IRegister
Access	Read / Write
Unit	-
Values	Memory Address: e.g. 0x2000031c (Length: 5360)

11.6.2 FileAccessLength

Controls the amount of data transferred between the device file storage and *FileAccessBuffer* during a file access (e.g. read or write).

Name	FileAccessLength
Category	FileAccessControl
Interface	IInteger
Access	Read / Write
Unit	Byte
Values	≥ 0

11.6.3 FileAccessOffset

Specifies the byte position within a file the read or write access should start at. Useful if only a specific part of a file is to be read or written.

Name	FileAccessOffset
Category	FileAccessControl
Interface	IInteger
Access	Read / Write
Unit	Byte
Values	≥ 0

11.6.4 FileOpenMode

Selects how to open a file when being accessed.

Name	FileOpenMode	
Category	FileAccessControl	
Interface	IEnumeration	
Access	Read / Write	
Unit	-	
Values	Read	Opens the file read only. File cannot be edited.
	Write	Opens the file write only. Existing file contents can be overwritten or deleted.
	ReadWrite	Opens the file both read and write. This allows for retrieving data and for editing or adding data to the file.

11.6.5 FileOperationExecute

Executes the operation selected with *FileOperationSelector* in the selected file.

Name	FileOperationExecute
Category	FileAccessControl
Interface	ICommand
Access	Write only
Unit	-
Values	-

11.6.6 FileOperationResult

Indicates the file operation result. Read or write operations return the number of bytes successfully read/written.

Name	FileOperationResult
Category	FileAccessControl
Interface	IInteger
Access	Read only
Unit	Byte
Values	≥ 0

11.6.7 FileOperationSelector

Selects the operation for the selected device file. This operation is executed by feature *FileOperationExecute*.

Name	FileOperationSelector	
Category	FileAccessControl	
Interface	IEnumeration	
Access	Read / Write	
Unit	-	
Values	Open	Opens the device file selected with *FileSelector*. Feature *FileOpenMode* is to select the access mode when opening the file.
	Close	Closes the device file selected with *FileSelector*.
	Read	Reads the bytes *FileAccessLength* from the device memory at the relative Offset *(FileAccessOffset)* in *FileAccessBuffer*.
	Write	Writes the bytes *FileAccessLength* from *FileAccessBuffer* to the device memory at the relative Offset of the related file *(FileAccessOffset)*.
	Delete	Deletes the file selected with *FileSelector* in the device. Please consider that when deleting a device file, the allocated entry for *FileSelector* should not be deleted to enable file use in future operations.

11.6.8 FileOperationStatus

Provides the execution status of a file operation.

Name	FileOperationStatus	
Category	FileAccessControl	
Interface	IEnumeration	
Access	Read only	
Unit	-	
Values	Success	File operation successful.
	Failure	File operation failed.

11.6.9 FileSelector

Feature *FileSelector* can be used to select a specific file of the camera.

Name	FileSelector
Category	FileAccessControl
Interface	IEnumeration
Access	Read / Write
Unit	-
Values	VPK
	IPK

11.6.10 FileSize

Specifies the size of the selected file in bytes.

Name	FileSize
Category	FileAccessControl
Interface	IInteger
Access	Read only
Unit	Byte
Values	≥ 0

11.7 Category: ImageFormatControl

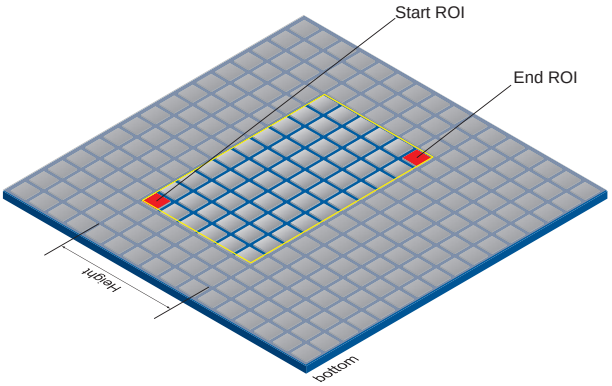
This chapter describes how to influence and determine the image format control features.

11.7.1 Height

Height of the image provided by the device (in pixels). The selected value changes with the change of *Binning*.

INFO

The sum of *OffsetY* and *Height* must be smaller or equal than *HeightMax*.



Name	Height
Category	ImageFormatControl
Interface	IInteger
Access	Read / Write
Unit	-
Values	see table(s) below

Camera type	Values [Pixel]
Monochrome	
VIXG-10M.W06	1 … 800 (Increment: 1)
VIXG-10M.W08	1 … 800 (Increment: 1)

11.7.2 HeightMax

Maximum height of the image (in pixels). This dimension is calculated after *Vertical Binning*, *Decimation* or any other function changing the vertical dimension of the image.

Name	HeightMax
Category	ImageFormatControl
Interface	IInteger
Access	Read only
Unit	-
Values	see table(s) below

Camera type	Values [Pixel]
Monochrome	
VIXG-10M.W06	800
VIXG-10M.W08	800

11.7.3 PixelFormat

PixelFormat - General Information

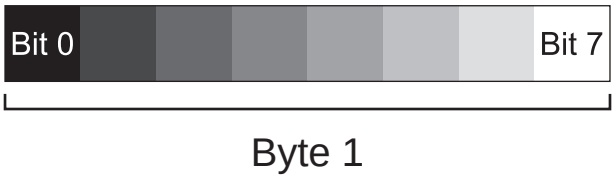
Format of the pixels provided by the device.

Mono Monochrome. The monochrome color range comprises the shades of a single color. Shades of gray as well as black and white are generally considered synonyms for monochrome.

Pixel depth - General Information

In general, pixel depth defines the number of possible different values for each color channel. Typically 8 bits, which means 28 different "colors". Transmission of more than 8 bits per pixel requires two bytes - even if data do not completely fill the second byte.

8 bit 8 bit sequence



INFO
The camera must be stopped before this feature can be edited.

Name	PixelFormat
Category	ImageFormatControl
Interface	IEnumeration
Access	Read / Write
Unit	-
Values	see table(s) below

Camera type	Mono8
Monochrome	
VIXG-10M.W06	■
VIXG-10M.W08	■

11.7.4 SensorHeight

Effective height of the sensor in pixels.

Name	SensorHeight
Category	ImageFormatControl
Interface	IInteger
Access	Read only
Unit	-
Values	0 ... 65535 (Increment: 1)

11.7.5 SensorName

Product name of the imaging sensor.

Name	SensorName
Category	ImageFormatControl
Interface	IString
Access	Read only
Unit	-
Values	e.g. IMX264

11.7.6 SensorPixelHeight

Physical size (pitch) in the y direction of a photo sensitive pixel unit.

Name	SensorPixelHeight
Category	ImageFormatControl
Interface	IFloat
Access	Read only
Unit	µm
Values	0.000000 ... 255.000000 (Increment: 1)

11.7.7 SensorPixelWidth

Physical size (pitch) in the x direction of a photo sensitive pixel unit.

Name	SensorPixelWidth
Category	ImageFormatControl
Interface	IFloat
Access	Read only
Unit	µm
Values	0.000000 ... 255.000000 (Increment: 1)

11.7.8 SensorShutterMode

Sets the sensor shutter mode of the camera. The sensor shutter mode depends on the *Trigger-Mode*.

Name	SensorShutterMode
Category	ImageFormatControl
Interface	IEnumeration
Access	Read / Write
Unit	-
Values	See table(s) below

Values	
Global	The shutter opens and closes at the same time for all pixels. All the pixels are exposed for the same length of time at the same time.

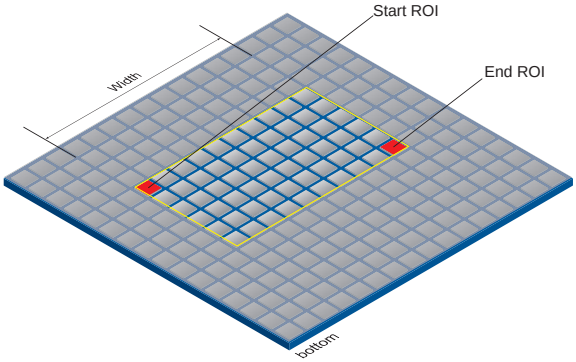
11.7.9 SensorWidth

Effective width of the sensor in pixels.

Name	SensorWidth
Category	ImageFormatControl
Interface	IInteger
Access	Read only
Unit	-
Values	0 ... 65535 (Increment: 1)

11.7.10 Width

Width of the image provided by the device (in pixels).



Name	Width
Category	ImageFormatControl
Interface	IInteger
Access	Read / Write
Unit	-
Values	see table(s) below

Camera type	Values [Pixel]
VIXG-10M.W06	1 … 1280 (Increment: 0)
VIXG-10M.W08	1 … 1280 (Increment: 0)

11.7.11 WidthMax

Maximum width of the image (in pixels). Dimension is calculated after *Horizontal Binning*, *Decimation* or having executed any other function that would change the horizontal image dimension.

Name	WidthMax
Category	ImageFormatControl
Interface	IInteger
Access	Read only
Unit	-
Values	see table(s) below

Camera type	Values [Pixel]
Color	
VIXG-10M.W06	1280
VIXG-10M.W08	1280

11.8 Category: LightControl

Category comprising the features for lighting control.

11.8.1 LightBrightness

Feature to define the lighting brightness selected in *LightControllerSelector*.

INFO

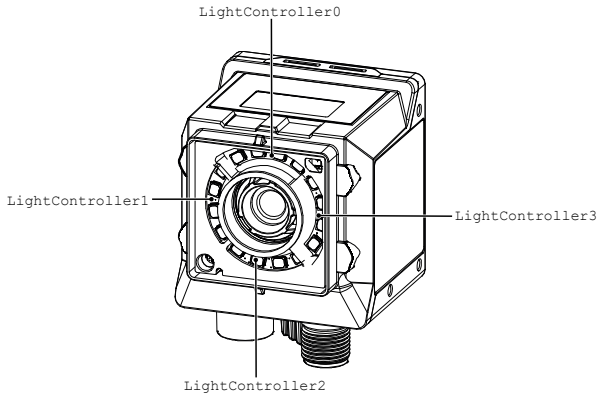
Here is enabling / disabling of the internal lighting segments. Image brightness control is via the feature *ExposureTime*.

Name	LightBrightness
Category	LightControl
Interface	IFloat
Access	Read / Write
Unit	-
Values	0 ... 100 (Increment: 100)

11.8.2 LightControllerSelector

Feature for selecting the lighting element to be controlled.

Name	LightControllerSelector
Category	LightControl
Interface	IEnumeration
Access	Read / Write
Unit	-
Values	See table(s) below



Values
LightController_All
LightController0
LightController1
LightController2
LightController3

11.9 Category: OpticControl

Category including the optics control features (e.g. lens).

11.9.1 FocalLength

Focal length in millimeters.

Name	FocalLength
Category	OpticControl
Interface	IFloat
Access	Read / Write
Unit	mm
Values	> 0 (according to optical system)

11.9.2 FocusAuto

Sets the automatic focus. This function enabled will bring the optical device into an operating mode where the lens automatically identifies the best possible focus.

Name	FocusAuto	
Category	OpticControl	
Interface	IEnumeration	
Access	Read / Write	
Unit	-	
Values	Off	The focus is to be set manually..
	Once	There will be one focusing operation by the camera. Once the focus has been adjusted it will be back to status *Off*.

11.9.3 ObjectSensorDistance

Distance from the image sensor surface to the object in millimeters (mm).

Name	ObjectSensorDistance
Category	OpticControl
Interface	IFloat
Access	Read / Write
Unit	mm
Values	> 0

11.9.4 OpticControllerSelector

Select optical controller to be configured.

Name	OpticControllerSelector
Category	OpticControl
Interface	IEnumeration
Access	Read / Write
Unit	-
Values	e.g.OpticController 0

11.9.5 OpticControllerVendorName

Manufacturer name of optical controller.

Name	OpticControllerVendorName
Category	OpticControl
Interface	IString
Access	Read only
Unit	-
Values	Name

11.10 Category: TransportLayerControl

This chapter provides the *Transport Layer* control functions.

11.10.1 Category: GigEVision

Category that contains the features pertaining to the GigE Vision transport layer of the device.

11.10.1.1 GevCCP

Controls the device access privilege of an application.

Name	GevCCP	
Category	TansportLayerControl → GigEVision	
Interface	IEnumeration	
Access	Read / Write	
Unit	-	
Values	OpenAccess	Open Access.
	ExclusiveAccess	Exclusive Access.
	ControlAccess	Control Access.

11.10.1.2 GevCurrentDefaultGateway

Reports the default gateway IP address to be used on the given logical link.

Name	GevCurrentDefaultGateway
Category	TansportLayerControl → GigEVision
Interface	IInteger
Access	Read only
Unit	-
Values	IP address

11.10.1.3 GevCurrentIPAddress

Reports the IP address for the given logical link.

Name	GevCurrentIPAddress
Category	TansportLayerControl → GigEVision
Interface	IInteger
Access	Read only
Unit	-
Values	IP address

11.10.1.4 GevCurrentIPConfigurationDHCP

Controls whether the DHCP IP configuration scheme is activated on the given logical link.

Name	GevCurrentIPConfigurationDHCP
Category	TansportLayerControl → GigEVision
Interface	IBoolean
Access	Read / Write
Unit	-
Values	true = 1 (On) false = 0 (Off)

11.10.1.5 GevCurrentIPConfigurationLLA

Controls whether the Link Local Address IP configuration scheme is activated on the given logical link.

Name	GevCurrentIPConfigurationLLA
Category	TansportLayerControl → GigEVision
Interface	IBoolean
Access	Read only
Unit	-
Values	true = 1 (On) false = 0 (Off)

11.10.1.6 GevCurrentIPConfigurationPersistentIP

Controls whether the PersistentIP configuration scheme is activated on the given logical link.

Name	GevCurrentIPConfigurationPersistentIP
Category	TansportLayerControl → GigEVision
Interface	IBoolean
Access	Read / Write
Unit	-
Values	true = 1 (On) false = 0 (Off)

11.10.1.7 GevCurrentSubnetMask

Reports the subnet mask of the given logical link.

Name	GevCurrentSubnetMask
Category	TansportLayerControl → GigEVision
Interface	IInteger
Access	Read only
Unit	-
Values	IP address

11.10.1.8 GevPersistentDefaultGateway

Controls the persistent default gateway for this logical link. It is only used when the device boots with the Persistent IP configuration scheme.

Name	GevPersistentDefaultGateway
Category	TansportLayerControl → GigEVision
Interface	IInteger
Access	Read / Write
Unit	-
Values	≥ 0

11.10.1.9 GevPersistentIPAddress

Controls the Persistent IP address for this logical link. It is only used when the device boots with the Persistent IP configuration scheme.

Name	GevPersistentIPAddress
Category	TansportLayerControl → GigEVision
Interface	IInteger
Access	Read / Write
Unit	-
Values	≥ 0

11.10.1.10 GevPersistentSubnetMask

Controls the Persistent subnet mask associated with the Persistent IP address on this logical link. It is only used when the device boots with the Persistent IP configuration scheme.

Name	GevPersistentSubnetMask
Category	TansportLayerControl → GigEVision
Interface	IInteger
Access	Read / Write
Unit	-
Values	≥ 0

11.10.1.11 GevInterfaceSelector

Selects which logical link to control.

Name	GevInterfaceSelector
Category	TansportLayerControl → GigEVision
Interface	IInteger
Access	Read / Write
Unit	-
Values	≥ 0 (Increment: 1)

11.10.1.12 GevIPConfigurationStatus

Reports the current IP configuration status.

Name	GevIPConfigurationStatus	
Category	TansportLayerControl → GigEVision	
Interface	IEnumeration	
Access	Read / Write	
Unit	-	
Values	None	None.
	PersistentIP	Persistent IP.
	DHCP	DHCP.
	LLA	LLA.
	ForceIP	Force IP.

11.10.1.13 GevSCPD

Controls the delay (in timestamp counter unit) to insert between each packet for this stream channel. This can be used as a crude flow-control mechanism if the application or the network infrastructure cannot keep up with the packets coming from the device.

Name	GevSCPD
Category	TansportLayerControl → GigEVision
Interface	IInteger
Access	Read / Write
Unit	-
Values	≥ 0

11.10.1.14 GevSCPSPacketSize

Specifies the stream packet size, in bytes, to send on the selected channel for a GVSP transmitter or specifies the maximum packet size supported by a GVSP receiver.

Name	GevSCPSPacketSize
Category	TansportLayerControl → GigEVision
Interface	IInteger
Access	Read / Write
Unit	Byte
Values	> 0 (Increment: 2)

11.10.2 PayloadSize

Provides the number of bytes transferred for every image or *Chunk* on the Stream Channel with current parameterization. Total size of data payload for a data block.

Name	PayloadSize
Category	TansportLayerControl
Interface	IInteger
Access	Read only
Unit	Byte
Values	0 ... depends on current parameterization (Increment: 1)

12 GigE interface functionality

12.1 Package size and Maximum Transmission Unit (MTU)

Network packets can be of different sizes. The size depends on the network components used. When using GigE Vision® compatible devices, using larger packages is generally recommended. First, there is less overhead per packet and second larger packets reduce CPU load.

The size of UDP packets can vary from 576 bytes to MTU.

MTU describes the maximum packet size which all involved network components can process.

According to the GigE network standard, modern network hardware supports 1500 bytes packet size.

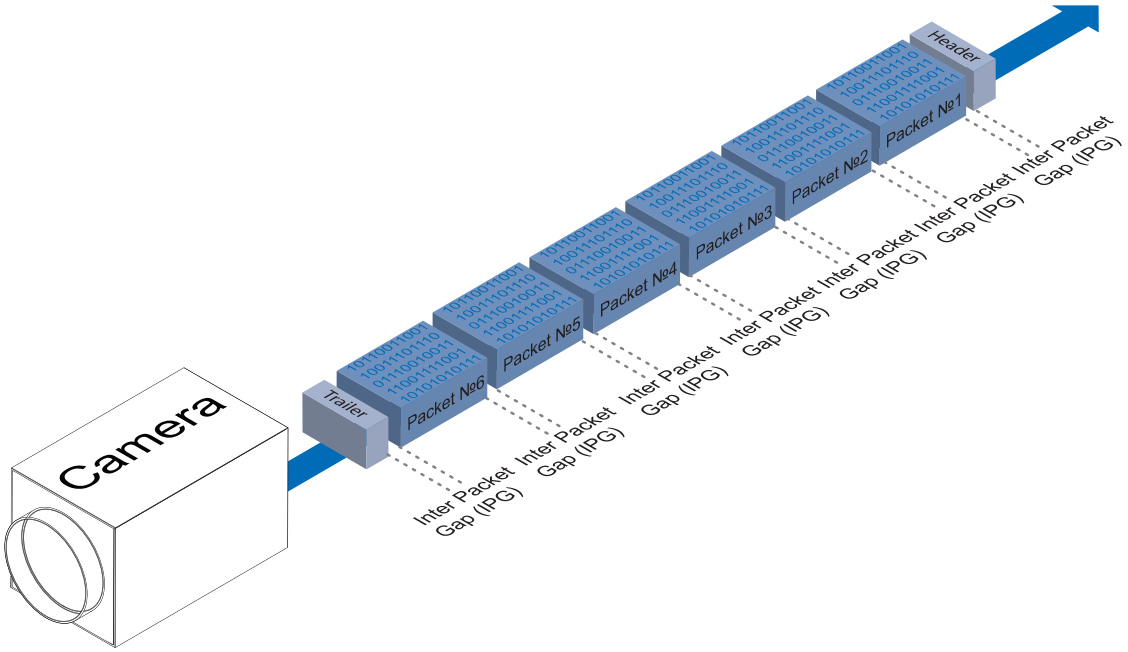
12.2 Inter Packet Gap (IPG)

For optimal results in image transmission, some Ethernet-specific factors must be taken into account.

When starting image transfer at a camera, data packets are transferred with maximum transfer speed. In compliance with the network standard, Baumer cameras operate on a 12-byte minimum distance between every packet. This gap is referred to as *Inter Packet Gap (IPG)*. Further to the minimum *IPG*, The GigE Vision®-standards defines that *IPG* must enable scaling (.i.e. hast to be user-defined).

INFO

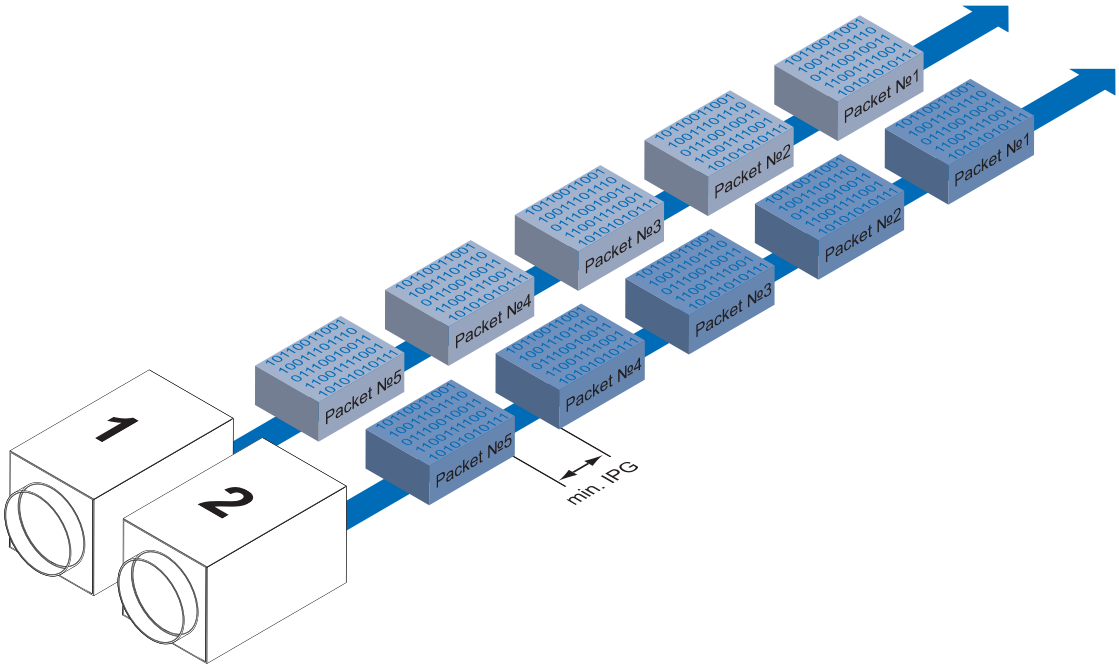
According to the Ethernet standard, the IPG must not be inferior to 12 bytes.



Example 1: Multicamera operation - Minimum IPG

A minimum IPG will have images transmitted at maximum speed. This means full network load, even at a frame rate of 1 fps. Such "bursts" may cause overload to individual network components which results into packet loss. This applies particularly to the use of multiple cameras.

Two cameras transmitting images in parallel can cause such burst at a transmission rate of 2 Gbits/sec. The data must be buffered to the switch for subsequent transfer at a speed of 1 Gbit/s. According to internal buffer switch properties, this would do without any problems with up to n cameras (n ≥ 1). More cameras would cause packet loss. Nevertheless, lost packets can be regained by appropriate Resend mechanism, which however adds load to the network components.



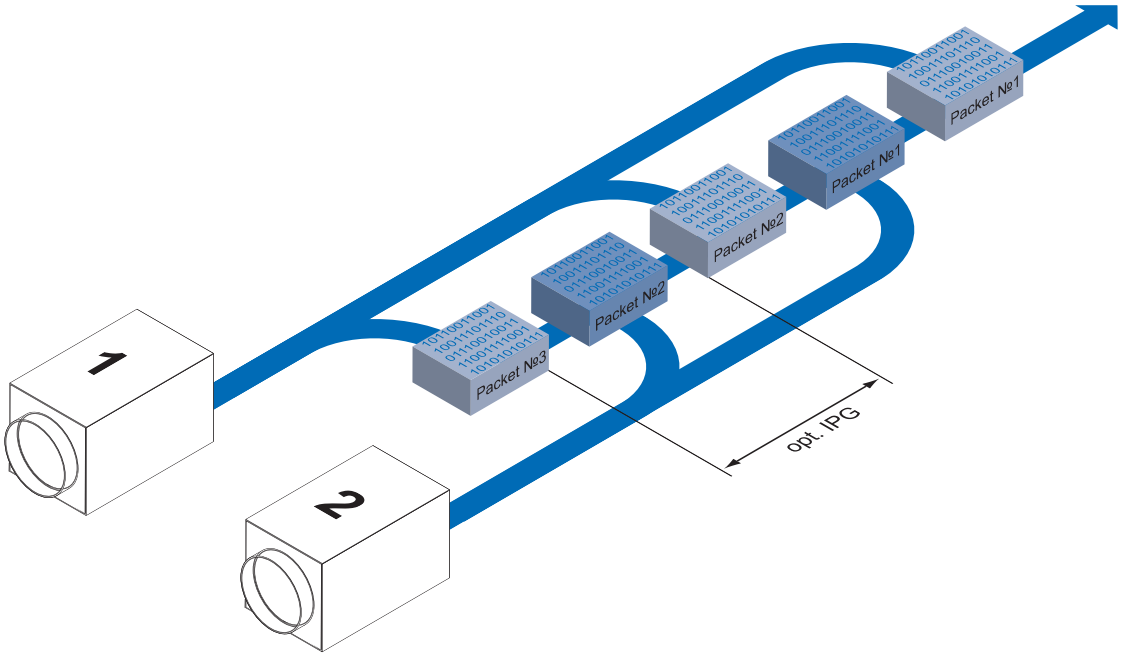
Example 2: Multicamera operation - Optimal IPG (GigE)

Better optimize IPG size.

```
Optimal IPG [byte] = (number of cameras-1)*packet size + 2 × minimum IPG
```

This way, both data packets can be transmitted one after another other (zipper method) without the need for buffering by switch.

The IPG is mapped in the camera using the *GevSCPD* function. Observe the specified unit. Conversion may be required.

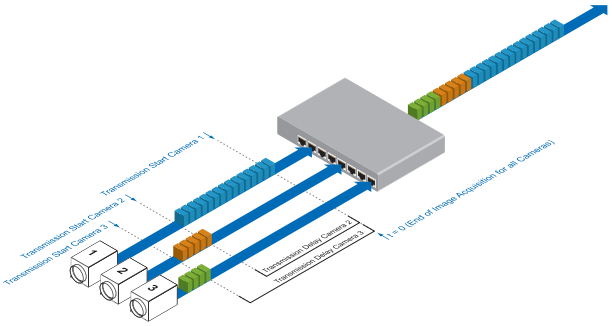


12.3 Frame Transmission Delay

Another approach to packet sorting in multi-camera operation is *Frame Transmission Delay*. Saving the currently acquired image to the camera and starting transfer at the predefined delay allows for transmission to PC of all frames at once.

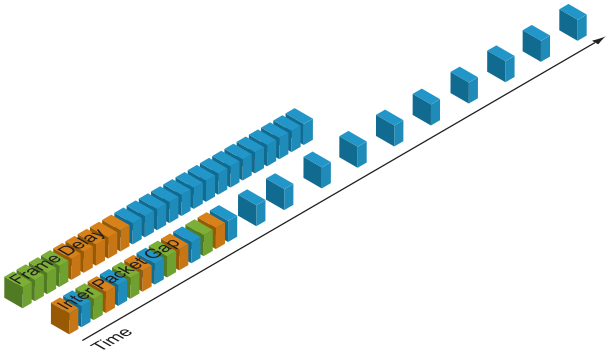
For process-specific reasons, all cameras will stop image acquisition at the same time. Now, the cameras do not transmit their images all at once, but - according to the specified transmission delays - one after the other. In doing so, the first camera immediately starts transmission, i.e. with "0" delay.

The following scenario is an example:



Time savings in multi-camera operation

As already mentioned, feature *Frame Transmission Delay* is particularly intended for multi-camera operation and using different camera models. This would particularly speed up image transmission of individual cameras:



In the above example, using *Inter Packet Gap* results in time savings of approx. 45% (in relation to overall transmission of three images) compared to *Inter Packet Gap*.

Configuration Example (GigE)

The following parameters are known for the three cameras in use:

Camera	Resolution [Pixel]	Pixel depth [bit]	Data volume [bit]	Readout Time [ms]	Transfer Time [ms]
1	1392 x 1040	8	11581440	50	≈ 11.6
2	776 x 582	8	3613056	15.5	≈ 3.6
3	656 x 494	8	2592512	11	≈ 2.6

For resolution and Readout Time (*treadout*) please refer to the related technical data sheet (TDS). The example uses full screen resolution.

All cameras are manually set the same value in Exposure Time (*texposure*).

The resulting data volume is calculated as follows:

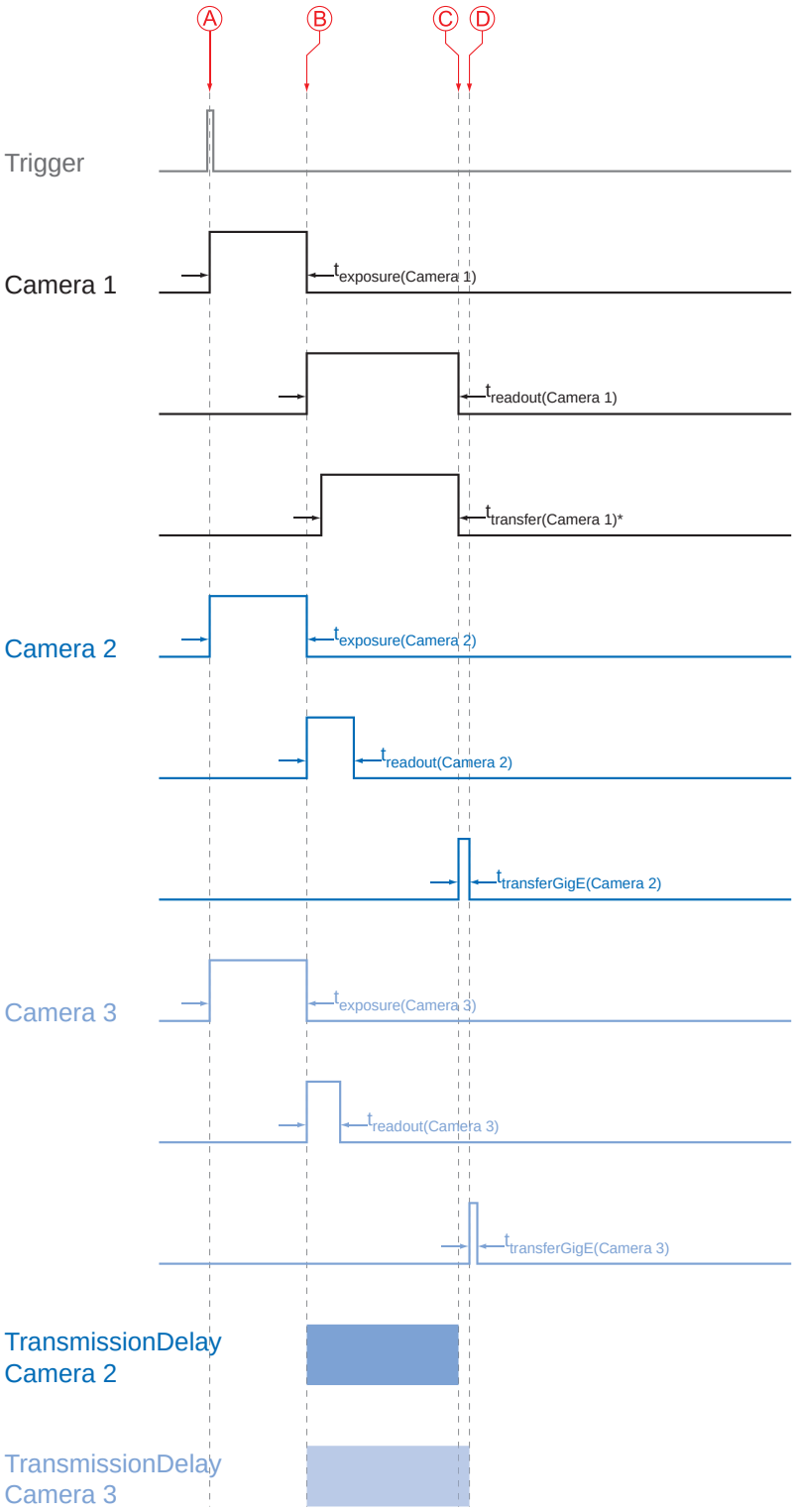
```
Resulting data volume = horizontal pixels × vertical pixels × pixel depth
```

Transfer time (ttransferGigE) is calculated as follows:

```
Transmission time = Resulting data volume / (1000 × 1000) [ms]
```

All cameras are triggered simultaneously.

Transmission delay is implemented in the form of a counter which runs immediately when starting sensor readout.



A	All cameras start exposure	B	all cameras are ready for transmission
C	Camera 2 starting transmission	D	Camera 3 starting transmission

Transmission delay is calculated as follows:

$$t_{TransmissionDelay(Camera\ n)} = t_{exposure(Camera\ 1)} + t_{readout(Camera\ 1)} - t_{exposure(Camera\ n)} + \sum_{n\geq 3}^{n} t_{transferGigE(Camera\ n-1)}$$

Transmission delays of camera 2 and 3 are calculated as follows:

$$tTransmissionDelay_{(Camera\ 2)} = texposure(Camera\ 1) + treadout(Camera\ 1) - texposure(Camera\ 2)$$

$tTransmissionDelay_{(Camera\ 3)} = t_{exposure(Camera\ 1)} + t_{readout(Camera\ 1)} - t_{exposure(Camera\ 3)} + ttransferGige_{(Camera\ 2)}$

Consequently:

$t_{TransmissionDelay(Camera\ 2)}$ = 32 msec + 50 msec - 32 msec = 50 msec

$t_{TransmissionDelay(Camera\ 3)}$ = 32 msec + 50 msec - 32 msec + 2.6 msec = 52.6 msec

12.4 Multicast

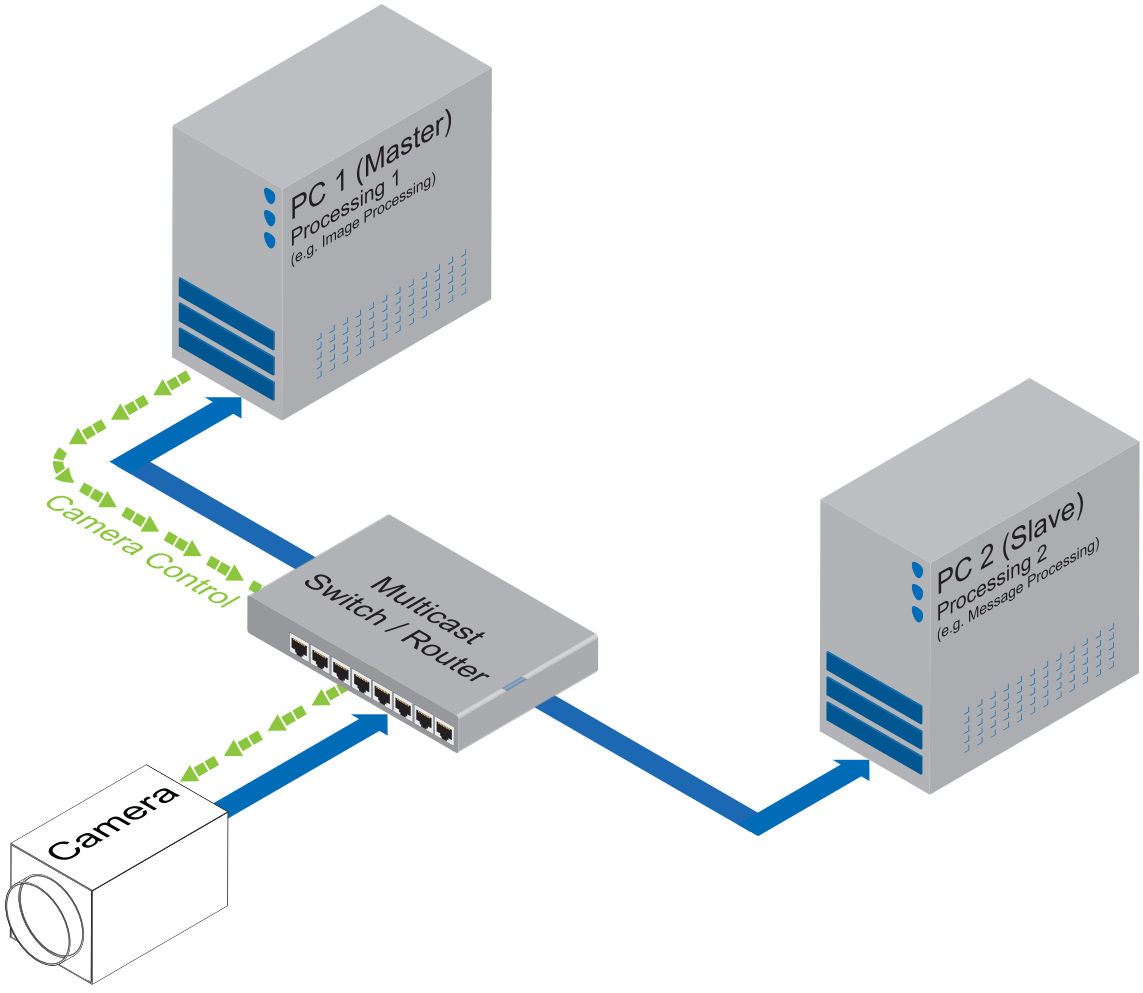
Multicasting allows for transmission of data packets to multiple addresses - without multiplying the bandwidth between camera and multicast device (e.g. router or switch).

The data is sent to an intelligent network node, a IGMP (Internet Group Management Protocol)-enabled switch or router, and distributed to the group of recipients with the specific address range.

In the below example illustration, multicast is used for separate processing of image and message data at two individual PCs.

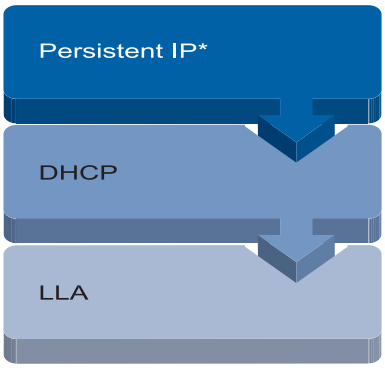
INFO

For multicasting, Baumer suggests an address range from `232.0.1.0` to `232.255.255.255`.



12.5 IP-Konfiguration

The device applies IP address according to the priorities shown.



*) This function (*GevCurrentIPConfigurationPersistentIP*) is deactivated by default.

12.5.1 Persistent IP

A persistent IP is permanently assigned. Validity unlimited. This function is disabled by default. Activate the function via the function *GevCurrentIPConfigurationPersistentIP*.

INFO
Make sure PC and camera are operated in the same subnet.

12.5.2 DHCP (Dynamic Host Configuration Protocol)

DHCP is for automated assignment of network parameters such as IP addresses, subnet masks and gateways.

Once connected to a DHCP-enabled network with DHCP server, the camera will be assigned the appropriate IP configurations.

12.5.3 LLA (Link-Local-Address)

LLA (Link-Local Address) refers to an IP address within the range from `169.254.0.1` to `169.254.254.254` and is used for automated IP address allocation if no other method of IP allocation is available.

The IP address is defined by the host using a pseudo-random number generator operating in the above IP range.

Once an address has been selected, it is broadcast to the network together with an ARP query (Address Resolution Protocol) to verify whether it already exists. Depending on the answer (i.e. does not already exist), the device is assigned the IP address or the process will repeat.

This may take some time - the GigE Vision® standard specifies that establishing connection via LLA should not take longer than 40 seconds, worst case it can take up to several minutes.

12.5.4 Force IP (Static IP)

Faults in operation can lead to connection errors between PC and camera.

In this case,*Force IP (Static IP)* may present a final solution. The Force IP feature will transmit IP address and subnet mask to the camera's MAC address. These settings are sent without verification and immediately applied by the client. They remain valid until camera power off.

List of illustrations

1801439913097511 5

Baumer
Passion for Sensors