



## Technical Manual

**AVT Cooled CCD Cameras**

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### **Allied Vision Technologies GmbH 08/2013**

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Managing Director: Mr. Frank Grube

Tax ID: DE 184383113

Headquarters:

Taschenweg 2a

D-07646 Stadtroda, Germany

Tel: +49 (0)36428 6770

Fax: +49 (0)36428 677-28

e-mail: [info@alliedvisiontec.com](mailto:info@alliedvisiontec.com)

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# Contacting Allied Vision Technologies

## Info



### Technical information:

<http://www.alliedvisiontec.com>

### Support:

[support@alliedvisiontec.com](mailto:support@alliedvisiontec.com)

### Allied Vision Technologies GmbH (Headquarters)

Taschenweg 2a  
07646 Stadtroda, Germany  
Tel: +49 36428-677-0  
Fax.: +49 36428-677-28  
e-mail: [info@alliedvisiontec.com](mailto:info@alliedvisiontec.com)

### Allied Vision Technologies Canada Inc.

101-3750 North Fraser Way  
Burnaby, BC, V5J 5E9, Canada  
Tel: +1 604-875-8855  
Fax: +1 604-875-8856  
e-mail: [info@alliedvisiontec.com](mailto:info@alliedvisiontec.com)

### Allied Vision Technologies Inc.

38 Washington Street  
Newburyport, MA 01950, USA  
Toll Free number +1 877-USA-1394  
Tel: +1 978-225-2030  
Fax: +1 978-225-2029  
e-mail: [info@alliedvisiontec.com](mailto:info@alliedvisiontec.com)

### Allied Vision Technologies Asia Pte. Ltd.

82 Playfair Road  
#07-02 D'Lithium  
Singapore 368001  
Tel: +65 6634-9027  
Fax: +65 6634-9029  
e-mail: [info@alliedvisiontec.com](mailto:info@alliedvisiontec.com)

### Allied Vision Technologies (Shanghai) Co., Ltd.

2-2109 Hongwell International Plaza  
1602# ZhongShanXi Road  
Shanghai 200235, China  
Tel: +86 (21) 64861133  
Fax: +86 (21) 54233670  
e-mail: [info@alliedvisiontec.com](mailto:info@alliedvisiontec.com)



# Introduction

This **Bigeye G Technical Manual** describes in depth the technical specifications, dimensions, all pixel formats, bandwidth and frame rate related subjects.

For information on hardware installation, safety warnings, pin assignments on I/O connectors and GigE port connectors read the **AVT GigE Installation Manual**.

For information on camera features (camera controls) read the **AVT GigE camera and driver attributes** document.

## Note

**Please read through this manual carefully.**



We assume that you have read already the **AVT GigE Installation Manual** and that you have installed the required hardware and software on your PC or laptop (Gigabit Ethernet network card, cables).

<http://www.alliedvisiontec.com/emea/support/downloads/product-literature/hardware-installation-guide.html>

## Document history

Version	Date	Remarks
V2.0.0	14.09.12	New Manual - COMMERCIAL RELEASE status
V2.1.0	08-July-2013	<ul style="list-style-type: none"> <li>Updated RoHS (2002/95/EC) to RoHS (2011/65/EU)</li> <li>Updated Specifications -&gt; Power requirements (inrush current)</li> <li>Added „Surge“ warning</li> <li>Corrected number of cycles of Bigeye G-629B Cool / Bigeye G-629B NIR Cool shutter</li> <li>Corrections derived from terminology alignment</li> </ul>

Table 1: Document history

## Manual overview

This **manual overview** outlines the contents of each chapter of this manual.

- Chapter [Contacting Allied Vision Technologies](#) on page 5 lists AVT contact data (phone numbers and URLs) for both:
  - Technical information / ordering
  - Commercial information
- Chapter [Introduction](#) on page 7 (this chapter) gives you the document history, a manual overview (short description of each chapter) and conventions used in this manual (styles and symbols). Furthermore, you learn how to get more information on **AVT GigE Installation Manual**, available **AVT software** (incl. documentation) and where to get it.
- Chapter [Bigeye G GigE cameras](#) on page 12 gives you a short introduction to the Bigeye G cameras with their GigE technology. Links are provided to information on **GigE Vision and GenICam** and to data sheets and brochures on AVT website.
- Chapter [Conformity](#) on page 14 gives you information about conformity of AVT cameras (CE, RoHS).
- Chapter [Filters and lenses](#) on page 35 describes the available filters. Suitable camera lenses for different focal lengths are provided for different camera models.
- Chapter [Specifications](#) on page 15 lists camera details and measured spectral sensitivity diagrams for each camera type.
- Chapter [Camera dimensions](#) on page 38 provides CAD drawings of standard housing models.
- Chapter [Camera interfaces](#) on page 41 describes in general the inputs/ outputs of the cameras (incl. trigger features): Gigabit Ethernet port, camera I/O connector pin assignment, schematic input/output block diagrams as well as a general description of trigger (timing diagram, definitions and rules).
- Chapter [Description of the data path](#) on page 48 describes the data path of the Bigeye G cameras in block diagrams as well as available Bigeye G camera controls. For a detailed description of all camera controls see the document: **AVT GigE camera and driver attributes**. Furthermore the image memory, color interpolation is described.
- Chapter [Index](#) on page 57 gives you quick access to all relevant data in this manual.



## Conventions used in this manual

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

### Styles

Style	Function	Example
Bold	Programs, inputs or highlighting important things	<b>bold</b>
Courier	Code listings, camera output etc.	Output
Courier bold	Commands sent to the camera	<b>Command</b>
Upper case	Register	REGISTER
Italics	Modes, fields	<i>Mode</i>

Table 2: Styles

### Symbols

**Note** This symbol highlights important information.



**Caution** This symbol highlights important instructions. You have to follow these instructions to avoid malfunctions.



**www** This symbol highlights URLs for further information. The URL itself is shown in blue.



Example:

<http://www.alliedvisiontec.com>

## More information

For more information on hardware and software read the following:

- **AVT GigE installation manual** describes the hardware installation procedures for the AVT GigE cameras (Manta/Bigeye G). Additionally you get safety instructions and information about camera interfaces (GigE port, I/O connector, inputs and outputs).
- **AVT GigE camera and driver attributes** describes the available camera controls when using AVT's PvAPI GigE SDK.

www



For **downloading the AVT GigE installation manual** and **AVT GigE camera and driver attributes** go to:

<http://www.alliedvisiontec.com/emea/support/downloads/product-literature.html>

www



All **software packages** (including **documentation** and **release notes**) provided by AVT can be downloaded at:

<http://www.alliedvisiontec.com/emea/products/software.html>

## Before operation

**Target group** This **Technical Manual** is the guide to detailed technical information of the camera and **is written for experts**.

**Getting started** For a quick guide how to get started read **AVT GigE installation manual** first.

Note



**Please read through this manual carefully before operating the camera.**

For information on **AVT accessories** and **AVT software** read **AVT GigE installation manual**.

Caution



Before operating any AVT camera read **safety instructions** and **ESD warnings** in **AVT GigE installation manual**.

## Safety warnings

**Caution**

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**Electrostatic discharge**

The camera contains sensitive electronic components that can be destroyed by electrostatic discharge.

Use sufficient grounding to minimize the risk of damage.

# Bigeye G GigE cameras

**Bigeye G** The Bigeye G cameras are cooled cameras equipped with high-quality CCD sensors from SONY (with EXview HAD microlenses) or from Truesense (former KODAK) both providing a high quantum efficiency.

For each of these sensors AVT applies special measures (by using only high-quality components and designing a sophisticated circuitry) to provide an outstanding image quality with low noise.

**Image applications** The Bigeye G camera series is equipped with a GigE Vision compliant AVT GigE module. This series distinguishes from the Bigeye P series (equipped with Pleora GigE module) by providing an extended feature set and AVT software support.

**GigE** GigE is the abbreviation for **Gigabit Ethernet**.

All AVT Bigeye G cameras are GigE Vision compliant cameras with a Gigabit Ethernet interface. AVT Bigeye G cameras work with standard Gigabit Ethernet hardware and cables. AVT Bigeye G cameras support cable lengths up to 100 m, using conventional Cat5e or better network cables.

Gigabit Ethernet has a data rate of 1000 Mbit/s or 1 Gbit/s. Gigabit Ethernet is capable of handling streaming image data and providing reliable transmission of image data.

**GigE Vision** The GigE Vision standard is an **interface standard for high-performance machine vision cameras** that is widely supported in the industrial imaging industry. GigE (Gigabit Ethernet), however, is simply the network structure GigE Vision is built on.

The GigE Vision standard includes both a hardware interface standard (Gigabit Ethernet) and standardized communication with the camera and controlling the camera.

**GenICam** The GigE Vision **camera control registers** are based on a command structure called GenICam that is administered through the **European Machine Vision Association (EMVA)**. GenICam seeks to establish a **common camera control interface**: third-party software can communicate with cameras from various manufacturers without customization. GenICam is incorporated as part of the GigE Vision standard, so any GigE Vision compliant camera also complies with GenICam.

- Key benefits**
- Low-noise CCD cameras with stabilized dual-level Peltier cooling
  - Excellent signal-to-noise ratio
  - Low dark noise
  - Excellent quantum efficiency and low readout noise contribute to the cameras' outstanding performance for low-light applications up to very long exposure times (> 60 minutes)
  - 4 user-configurable input and output ports (no additional I/O cards needed)

- Robust metal housing
- GigE Vision compliant interface enables support for any GigE Vision compliant third-party software solution
- NIR-optimized variants available  
(currently only Bigeye G-132 and Bigeye G-629)

**www**

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For further information on the highlights of Bigeye G types, the Bigeye G family and the whole range of **AVT GigE cameras** read the data sheets and brochures on the website of Allied Vision Technologies:

<http://www.alliedvisiontec.com/emea/products/cameras.html>

## Conformity

Allied Vision Technologies declares under its sole responsibility that all standard cameras of the **AVT Bigeye G** family that this declaration relates to, are in conformity with the following standards or other normative documents:

- CE, following the provisions of 2004/108/EG directive
- RoHS (2011/65/EU)

### **CE**

We declare, under our sole responsibility, that the previously described **AVT Bigeye G** cameras conform to the directives of CE.

# Specifications

## Bigeye G-132B Cool / Bigeye G-132B NIR Cool

**Note**

The warranty becomes void in case of unauthorized tampering or any modifications not approved by the manufacturer.



**Caution**

**Surge**



To avoid damage caused by surge, connect the camera to an AC/DC power supply. Use a certified industrial power supply that complies with common industrial standards. Make sure the polarization of the power supply is correct.

During the camera start-up, inrush currents  $\geq 4$  A can occur for 20 ms. Use a sufficiently dimensioned power supply to avoid damage to the camera.

For the DC signal, use cable lengths less than 30 m. Consider that the voltage drop increases with the cable length.

AVT (or your local dealer) provides suitable power supplies:

<http://www.alliedvisiontec.com/emea/products/accessories.html>



	Feature	Specification
Sensor and lens mount	Sensor	SONY ICX285AL with EXview HAD CCD microlenses
	Max. resolution (HxV)	1280 x 1024 pixels
	Sensor type	CCD progressive
	Sensor size	Type 2/3
	Sensor diagonal	11 mm
	<b>Effective chip size</b>	<b>8.26 mm x 6.6 mm</b>
	Cell size	6.45 μm x 6.45 μm
	Lens mount	C-Mount: 17.526 mm (in air); Ø 24.5 mm (32 tpi) maximum protrusion: 7.5 mm  <b>Note</b> <b>Maximum protrusion</b> means the distance from lens flange to the glass filter in the camera. 
	Shutter type	Electronic global shutter
	Max. frame rate at full resolution	12.5 fps (continuous) 6.25 fps (IOD)  <b>Note</b> IOD mode uses different exposure process for optimizing image quality. In combination with SONY ICX285 this leads to the big differences in frame rates for continuous and IOD mode. 
Max. frame rate with binning at 640 x 512	25 fps (continuous) 12.5 fps (IOD)	
ADC	12 bits	
Output	Bit depth	12 bits
	Pixel format	Mono8, Mono12, Mono12Packed

Table 3: Specification Bigeye G-132B Cool / Bigeye G-132B NIR Cool




	Feature	Specification
Features	Exposure time	80077 $\mu$ s ... 4294.97 s in 1 $\mu$ s increments
	Binning	2x1, 2x2
	Gain	0, +6 dB
	Gamma	0.45, 0.5, 0.7
	ROI	available (Note: decreasing ROI does not increase frame rate)
	Trigger modes	Continuous mode (image acquisition with maximum frame rate) IOD mode (Image on Demand: triggered image acquisition)
	External trigger event	Rising edge, falling edge, any edge, level high, level low
	External trigger delay	0 to 102.26 seconds in 1 $\mu$ s increments 2x2 binning mode: 0 to 204.522 seconds in 1 $\mu$ s increments
	Fixed rate control	0.000233 fps to max. frame rate
	Imaging modes	Free-running, external trigger, fixed rate, software trigger
	Sync Out modes	Trigger ready, trigger input, exposing, readout, imaging, strobe, GPO, CCDTemperatureOK
	Internal image memory	32 MByte, up to 25 frames  <b>Note</b> The number of frames (StreamHoldCapacity) depends on resolution and pixel format. Listed number of frames is typical for full resolution and Mono8. 
Interfaces	Digital interface	IEEE 802.3 1000BASE-T (GigE Vision V1.2 compliant)
	GigE connector	RJ45 (8P8C) with horizontal screw-locks
	I/O port connector	20-pin Mini D Ribbon (MDR) shielded I/O connector with screw-locks
	Camera control interface	GenICam V1.0 compliant
	I/O	4 inputs (3 optocoupled) 4 outputs (3 optocoupled)
Operating conditions	Operating temperature	0 °C to +35 °C ambient temperature (without condensation)
	Stabilized cooling temperature	-20 °C (Peltier cooling) (up to +25 °C ambient temperature)
	Power requirements	+12 V (+5 %), max. 3.0 A (during camera start-up: inrush current $\geq$ 4 A for 20 ms, capacitive load < 2000 $\mu$ F)
	Power consumption	Max. <36 watts Typical <18 watts (@ 12 V DC) (maximal frame rates at full resolution)

Table 3: Specification Bigeye G-132B Cool / Bigeye G-132B NIR Cool

Feature		Specification
Mechanics	Mass (without lens)	<1270 g
	Dimensions (L x W x H)	100.8 mm x 90 mm x 99 mm; incl. connectors, without tripod and lens
	Regulations	CE, RoHS (2011/65/EU)
Options	Optional	NIR variant Bigeye G-132B NIR Cool
	Software packages	AVT VIMBA SDK AVT PvAPI SDK AcquireControl software (V4.0.0 or greater)

Table 3: Specification Bigeye G-132B Cool / Bigeye G-132B NIR Cool

## Bigeye G-283B Cool

### Note



The warranty becomes void in case of unauthorized tampering or any modifications not approved by the manufacturer.

### Caution



#### Surge

To avoid damage caused by surge, connect the camera to an AC/DC power supply. Use a certified industrial power supply that complies with common industrial standards. Make sure the polarization of the power supply is correct.

During the camera start-up, inrush currents  $\geq 4$  A can occur for 20 ms. Use a sufficiently dimensioned power supply to avoid damage to the camera.

For the DC signal, use cable lengths less than 30 m. Consider that the voltage drop increases with the cable length.

AVT (or your local dealer) provides suitable power supplies:

<http://www.alliedvisiontec.com/emea/products/accessories.html>


Feature		Specification
Sensor and lens mount	Sensor	SONY ICX674ALG with EXview HAD CCD II microlenses
	Max. resolution (HxV)	1928 x 1452 pixels
	Sensor type	CCD progressive
	Sensor size	Type 2/3
	Sensor diagonal	10.972 mm
	<b>Effective chip size</b>	<b>10.7 mm x 9.2 mm</b>
	Cell size	4.54 μm x 4.54 μm
	Lens mount	C-Mount: 17.526 mm (in air); Ø 24.5 mm (32 tpi) maximum protrusion: 7.5 mm  <b>Note</b> <b>Maximum protrusion</b> means the distance from lens flange to the glass filter in the camera. 
	Shutter type	Electronic global shutter
	Max. frame rate at full resolution	6.0 fps (continuous) 5.7 fps (IOD)
	Max. frame rate with binning at 964 x762	12 fps (continuous) 10.9 fps (IOD)
ADC	14 bits	
Output	Bit depth	14 bits
	Pixel format	Mono8, Mono12Packed, Mono14

Table 4: Specification Bigeye G-283B Cool

	Feature	Specification
Features	Exposure time	9083 $\mu$ s ... 4294.97 s in 1 $\mu$ s increments
	Binning	2x1, 2x2
	Gain	0, +6 dB
	Gamma	0.45, 0.5, 0.7
	ROI	available (Note: decreasing ROI does not increase frame rate)
	Video-type auto iris	available
	Trigger modes	Continuous mode (image acquisition with maximum frame rate) IOD mode (Image on Demand: triggered image acquisition)
	External trigger event	Rising edge, falling edge, any edge, level high, level low
	External trigger delay	0 to 51.13 seconds in 1 $\mu$ s increments 2x2 binning mode: 0 to 102.26 seconds in 1 $\mu$ s increments
	Fixed rate control	0.000233 fps to max. frame rate
	Imaging modes	Free-running, external trigger, fixed rate, software trigger
	Sync Out modes	Trigger ready, trigger input, exposing, readout, imaging, strobe, GPO, CCDTemperatureOK
	Interfaces	Internal image memory
Digital interface		IEEE 802.3 1000BASE-T (GigE Vision V1.2 compliant)
GigE connector		RJ45 (8P8C) with horizontal screw-locks
I/O port connector		20-pin Mini D Ribbon (MDR) shielded I/O connector with screw-locks
Camera control interface		GenICam V1.0 compliant
Operating conditions	I/O	4 inputs (3 optocoupled) 4 outputs (3 optocoupled)
	Operating temperature	0 °C to +35 °C ambient temperature (without condensation)
	Stabilized cooling temperature	-10 °C (Peltier cooling) (up to +25 °C ambient temperature)
	Power requirements	+12 V (+5 %), max. 3 A (during camera start-up: inrush current $\geq$ 4 A for 20 ms, capacitive load < 2000 $\mu$ F)
	Power consumption	Max. < 36 watts Typical < 18 watts (@ 12 V DC) (maximal frame rates at full resolution)

Table 4: Specification Bigeye G-283B Cool

Feature		Specification
Mechanics	Mass (without lens)	< 1250 g
	Dimensions (L x W x H)	100.8 mm x 90 mm x 99 mm; incl. connectors, without tripod and lens
	Regulations	CE, RoHS (2011/65/EU)
Options	Software packages	AVT VIMBA SDK AVT PvAPI SDK AcquireControl software (V4.0.0 or greater)

Table 4: Specification Bigeye G-283B Cool

## Bigeye G-629B Cool / Bigeye G-629B NIR Cool

### Note

The warranty becomes void in case of unauthorized tampering or any modifications not approved by the manufacturer.



### Caution

#### Surge



To avoid damage caused by surge, connect the camera to an AC/DC power supply. Use a certified industrial power supply that complies with common industrial standards. Make sure the polarization of the power supply is correct.

During the camera start-up, inrush currents  $\geq 4$  A can occur for 20 ms. Use a sufficiently dimensioned power supply to avoid damage to the camera.

For the DC signal, use cable lengths less than 30 m. Consider that the voltage drop increases with the cable length.

AVT (or your local dealer) provides suitable power supplies:

<http://www.alliedvisiontec.com/emea/products/accessories.html>


Feature		Specification
Sensor and lens mount	Sensor	Truesense KAF6303E
	Max. resolution (HxV)	3072 x 2048 pixels
	Sensor type	Full-frame CCD
	Sensor size	Type 35 mm
	Sensor diagonal	33.229 mm
	<b>Effective chip size</b>	<b>27.65 mm x 18.43 mm</b>
	Cell size	9.00 μm x 9.00 μm
	Lens mount	F-Mount: 46.5 mm (in air) maximum protrusion: 26 mm  <b>Note</b> <b>Maximum protrusion</b> means the distance from lens flange to the glass filter in the camera. 
	Shutter type	Built-in electromechanical full-frame shutter (min. 100,000 cycles)
	Max. frame rate at full resolution	0.67 fps (IOD)
	Max. frame rate with binning at 1536x1024	1.9 fps (IOD)
ADC	14 bits	
Output	Bit depth	14 bits
	Pixel format	Mono8, Mono12, Mono12Packed, Mono14

Table 5: Specification Bigeye G-629B Cool / Bigeye G-629B NIR Cool





	Feature	Specification
Features	Exposure time	50688 $\mu$ s ... 4294.97 s in 1 $\mu$ s increments
	Binning	2x1, 2x2
	Gain	0, +6 dB
	Gamma	0.45, 0.5, 0.7
	ROI	available (Note: decreasing ROI does not increase frame rate)
	Video-type auto iris	available
	Trigger modes	IOD mode (Image on Demand: triggered image acquisition)  <b>Note</b> A continuous mode is not supported due to the mechanical shutter. 
	External trigger event	Rising edge, falling edge, any edge, level high, level low
	External trigger delay	0 to 204.52 seconds in 1 $\mu$ s increments
	Fixed rate control	0.000233 fps to max. frame rate
	Imaging modes	Free-running, external trigger, fixed rate, software trigger
	Sync Out modes	Trigger ready, trigger input, exposing, readout, imaging, strobe, GPO, CCDTemperatureOK
Interfaces	Internal image memory	32 MByte, up to 5 frames  <b>Note</b> The number of frames (StreamHoldCapacity) depends on resolution and pixel format. Listed number of frames is typical for full resolution and Mono8. 
	Digital interface	IEEE 802.3 1000BASE-T (GigE Vision V1.2 compliant)
	GigE connector	RJ45 (8P8C) with horizontal screw-locks
	I/O port connector	20-pin Mini D Ribbon (MDR) shielded I/O connector with screw-locks
	Camera control interface	GenICam V1.0 compliant
Operating conditions	I/O	4 inputs (3 optocoupled) 4 outputs (3 optocoupled)
	Operating temperature	0 $^{\circ}$ C to +35 $^{\circ}$ C ambient temperature (without condensation)
	Stabilized cooling temperature	+5 $^{\circ}$ C (Peltier cooling) (up to +25 $^{\circ}$ C ambient temperature)
	Power requirements	+12 V (+5 %), max. 3.1 A (during camera start-up: inrush current $\geq$ 4 A for 20 ms, capacitive load < 2000 $\mu$ F)
	Power consumption	Max. <37.2 watts Typical <18 watts (@ 12 V DC) (maximal frame rates at full resolution)

Table 5: Specification Bigeye G-629B Cool / Bigeye G-629B NIR Cool

Feature		Specification
Mechanics	Mass (without lens)	<1390 g
	Dimensions (L x W x H)	131.55 mm x 90 mm x 109 mm; incl. connectors, without tripod and lens
	Regulations	CE, RoHS (2011/65/EU)
Options	Optional	NIR variant Bigeye G-629B NIR Cool
	Software packages	AVT VIMBA SDK AVT PvAPI SDK AcquireControl software (V4.0.0 or greater)

Table 5: Specification Bigeye G-629B Cool / Bigeye G-629B NIR Cool

## Bigeye G-1 100B Cool

### Note

The warranty becomes void in case of unauthorized tampering or any modifications not approved by the manufacturer.



### Caution

#### Surge



To avoid damage caused by surge, connect the camera to an AC/DC power supply. Use a certified industrial power supply that complies with common industrial standards. Make sure the polarization of the power supply is correct.

During the camera start-up, inrush currents  $\geq 4$  A can occur for 20 ms. Use a sufficiently dimensioned power supply to avoid damage to the camera.

For the DC signal, use cable lengths less than 30 m. Consider that the voltage drop increases with the cable length.

AVT (or your local dealer) provides suitable power supplies:

<http://www.alliedvisiontec.com/emea/products/accessories.html>


Feature		Specification
Sensor and lens mount	Sensor	Truesense KAI11002
	Max. resolution (HxV)	4024 x 2680 pixels
	Sensor type	CCD progressive
	Sensor size	Type 35 mm
	Sensor diagonal	43.5 mm
	<b>Effective chip size</b>	<b>36.22 mm x 24.12 mm</b>
	Cell size	9.00 μm x 9.00 μm
	Lens mount	F-Mount: 46.5 mm (in air) maximum protrusion: 30 mm  <b>Note</b> <b>Maximum protrusion</b> means the distance from lens flange to the glass filter in the camera. 
	Shutter type	Electronic global shutter
	Max. frame rate at full resolution	1.58 fps (continuous) 1.58 fps (IOD)
Max. frame rate with binning at 4024 x 1340	3.15 fps (continuous) 3.15 fps (IOD)	
ADC	14 bits	
Output	Bit depth	12 bits
	Pixel format	Mono8, Mono12, Mono12Packed

Table 6: Specification Bigeye G-1100B Cool


	Feature	Specification
Features	Exposure time	1394 $\mu$ s ... 4294.97 s in 1 $\mu$ s increments
	Binning	1x2, 2x1, 2x2
	Gain	0, +6 dB
	Gamma	0.45, 0.5, 0.7
	ROI	available (Note: decreasing ROI does not increase frame rate)
	Video-type auto iris	available
	Trigger modes	Continuous mode (image acquisition with maximum frame rate) IOD mode (Image on Demand: triggered image acquisition)
	External trigger event	Rising edge, falling edge, any edge, level high, level low
	External trigger delay	0 to 102.26 seconds in 1 $\mu$ s increments
	Fixed rate control	0.000233 fps to max. frame rate
	Imaging modes	Free-running, external trigger, fixed rate, software trigger
	Sync Out modes	Trigger ready, trigger input, exposing, readout, imaging, strobe, GPO, CCDTemperatureOK
	Internal image memory	32 MByte, up to 3 frames  <b>Note</b>  The number of frames (StreamHoldCapacity) depends on resolution and pixel format. Listed number of frames is typical for full resolution and Mono8.
Interfaces	Digital interface	IEEE 802.3 1000BASE-T (GigE Vision V1.2 compliant)
	GigE connector	RJ45 (8P8C) with horizontal screw-locks
	I/O port connector	20-pin Mini D Ribbon (MDR) shielded I/O connector with screw-locks
	Camera control interface	GenICam V1.0 compliant
	I/O	4 inputs (3 optocoupled) 4 outputs (3 optocoupled)
Operating conditions	Operating temperature	0 °C to +35 °C ambient temperature (without condensation)
	Stabilized cooling temperature	0 °C (Peltier cooling) (up to +25 °C ambient temperature)
	Power requirements	+12 V (+5 %), max. 3 A (during camera start-up: inrush current $\geq$ 4 A for 20 ms, capacitive load < 2000 $\mu$ F)
	Power consumption	Max. < 36 watts Typical < 18 watts (@ 12 V DC) (maximal frame rates at full resolution)

Table 6: Specification Bigeye G-1100B Cool

Feature		Specification
Mechanics	Mass (without lens)	< 1320 g
	Dimensions (L x W x H)	132.8 mm x 90 mm x 99 mm; incl. connectors, without tripod and lens
	Regulations	CE, RoHS (2011/65/EU)
Options	Optional	NIR variant
	Software packages	AVT VIMBA SDK AVT PvAPI SDK AcquireControl software (V4.0.0 or greater)

Table 6: Specification Bigeye G-1100B Cool

# Spectral sensitivity

**Note**

All measurements were done without protection glass / without a filter.



The margin of error of the QE values is  $\pm 10\%$ .

This is due to:

- Manufacturing tolerance of the sensor
- Uncertainties in the measuring equipment itself (Ulbricht-Kugel/Ulbricht sphere, optometer, etc.)

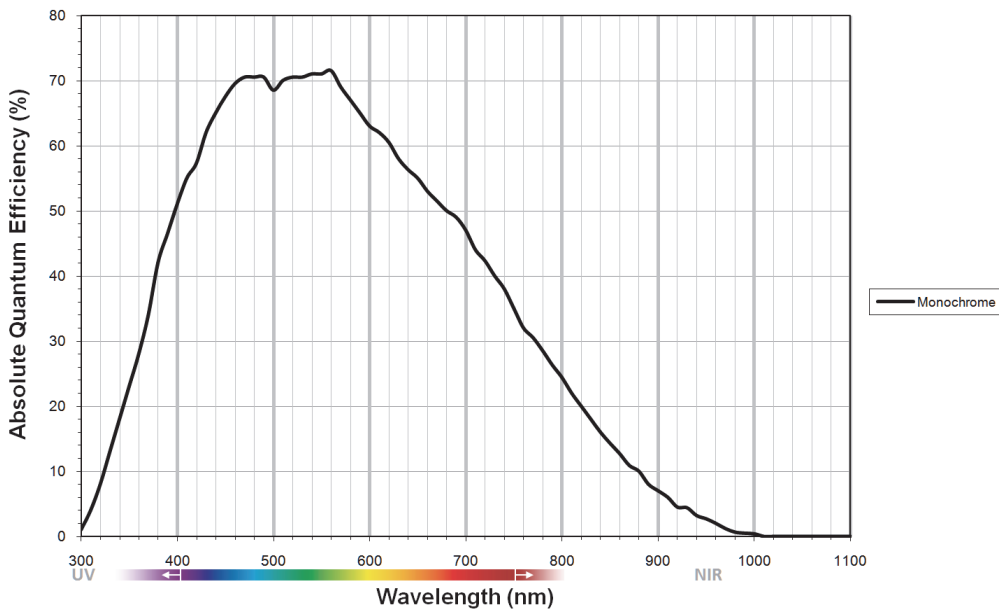


Figure 1: Spectral sensitivity of Bigeye G-132B Cool

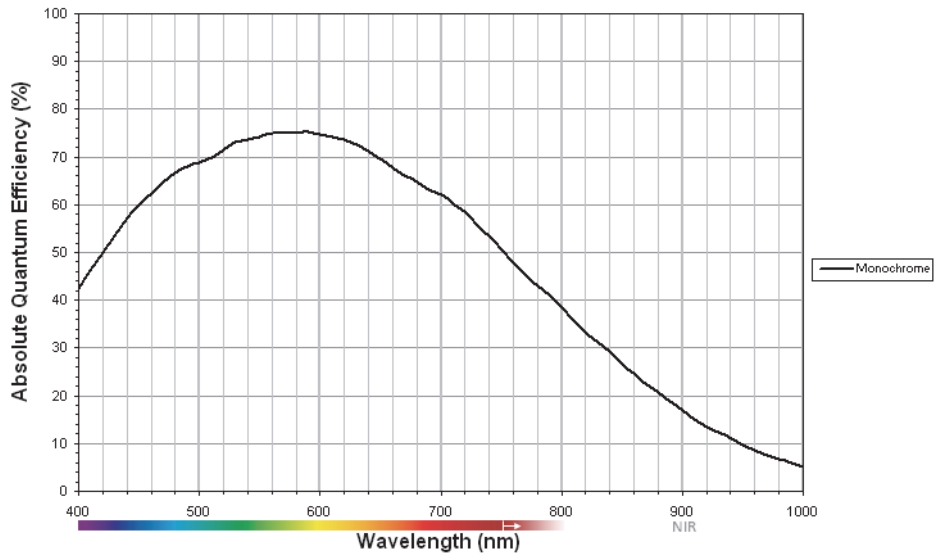


Figure 2: Spectral sensitivity of Bigeye G-283B Cool



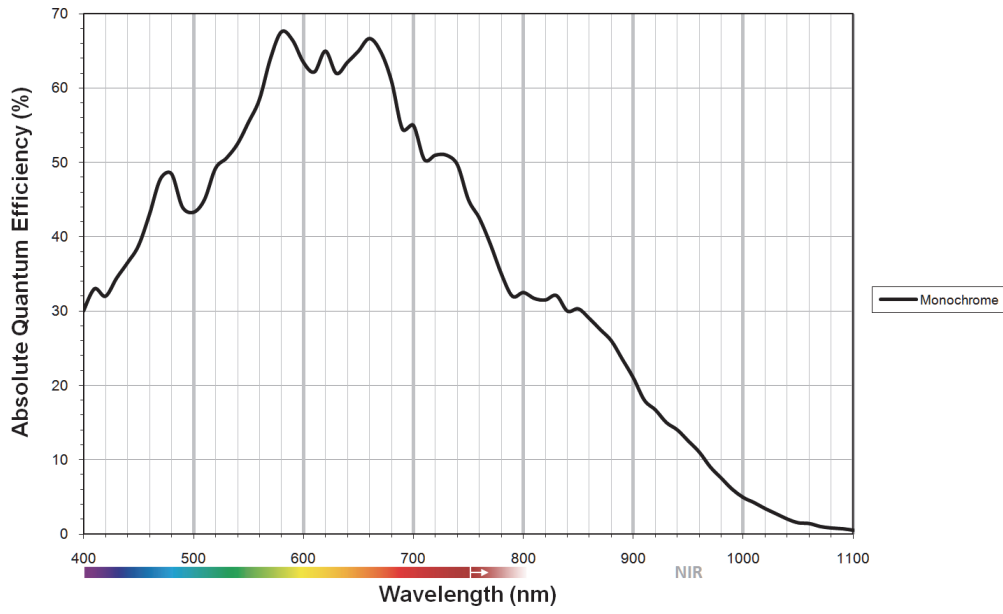


Figure 3: Spectral sensitivity of Bigeye G-629B Cool

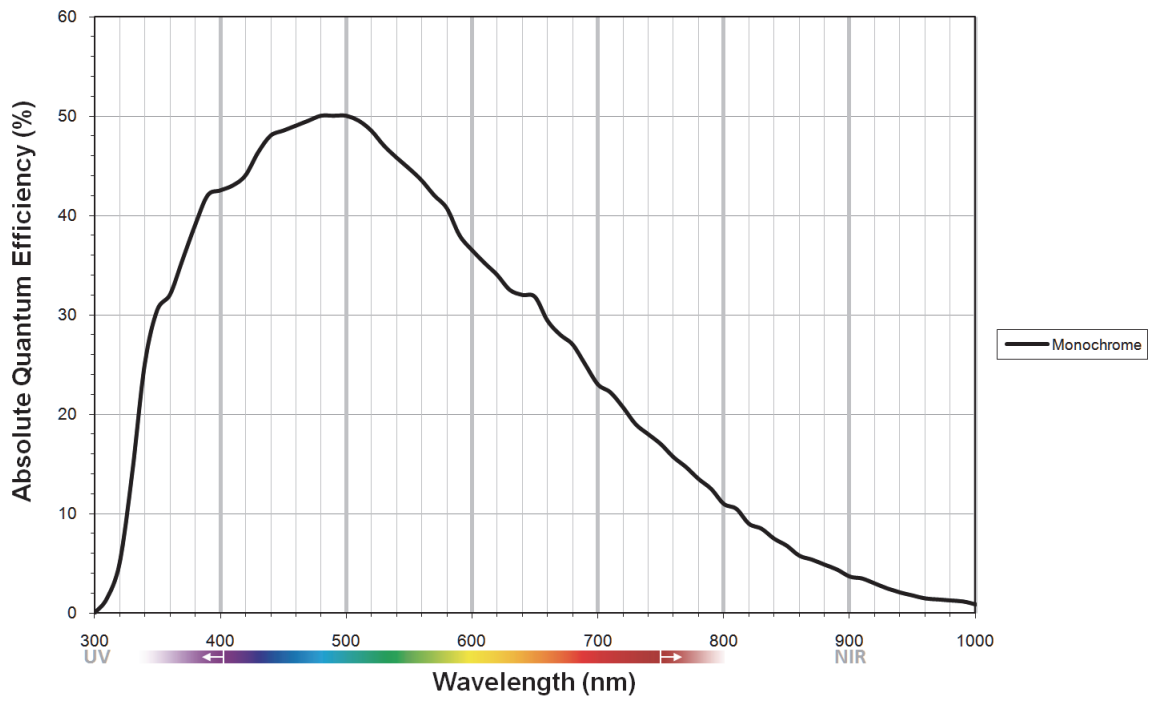


Figure 4: Spectral sensitivity of Bigeye G-1100B Cool

# Filters and lenses

## Filters

- **Monochrome** cameras are equipped with a protection glass (without IR cut filter): Transmission > 99 % between 450 nm and 700 nm. Anti-reflective coating on both sides.
- **NIR cameras:** Bigeye G-132B NIR Cool and Bigeye G-629B NIR Cool cameras are equipped with a protection glass: Transmission > 98 % between 700 nm and 1700 nm. Anti-reflective coating on both sides.

## Camera lenses

AVT offers different lenses from a variety of manufacturers.

**www**

For more information go to:



<http://www.alliedvisiontec.com/emea/products/accessories/lenses.html>

The following tables list selected image formats in **width x height** depending on the camera type, the distance and the focal length of the lens.

**Note**

Lenses with focal lengths < 8 mm may show shading on the edges of the image due to microlenses on the sensor's pixels.



Focal length f / mm for Bigeye G-132	Object at distance = 500 mm Width x Height / mm <sup>2</sup>	Object at distance = 1000 mm Width x Height / mm <sup>2</sup>
4.8	852 x 681	1713 x 1368
6.0	680 x 543	1368 x 1093
6.5	627 x 501	1263 x 1009
8	508 x 406	1024 x 818
10	405 x 323	818 x 653
12	336 x 268	680 x 543
16	250 x 200	508 x 406

Table 7: Focal length vs. field of view (Bigeye G-132)

Focal length f / mm for Bigeye G-132	Object at distance = 500 mm Width x Height / mm <sup>2</sup>	Object at distance = 1000 mm Width x Height / mm <sup>2</sup>
25	157 x 125	322 x 257
35	110 x 88	228 x 182
50	74 x 59	157 x 125
75	47 x 37	102 x 81
90	38 x 30	84 x 67

Table 7: Focal length vs. field of view (Bigeye G-132)

Focal length f / mm for Bigeye G-283	Object at distance = 500 mm Width x Height / mm <sup>2</sup>	Object at distance = 1000 mm Width x Height / mm <sup>2</sup>
4.8	1104 x 949	2218 x 1907
6.0	881 x 757	1773 x 1524
6.5	812 x 698	1635 x 1406
8	658 x 566	1327 x 1141
10	524 x 451	1059 x 911
12	435 x 374	881 x 757
16	324 x 278	658 x 566
25	203 x 175	417 x 359
35	142 x 122	295 x 254
50	96 x 83	203 x 175
75	61 x 52	132 x 113
90	49 x 42	108 x 93

Table 8: Focal length vs. field of view (Bigeye G-283)

Focal length f / mm for Bigeye G-629	Object at distance = 500 mm Width x Height / mm <sup>2</sup>	Object at distance = 1000 mm Width x Height / mm <sup>2</sup>
14	960 x 640	1947 x 1298
18	740 x 494	1508 x 1005
21	631 x 420	1289 x 859
28	466 x 311	960 x 640
35	367 x 245	762 x 508
50	249 x 166	525 x 350
85	135 x 90	298 x 198

Table 9: Focal length vs. field of view (Bigeye G-629)

<b>Focal length f / mm for Bigeye G-629</b>	<b>Object at distance = 500 mm Width x Height / mm<sup>2</sup></b>	<b>Object at distance = 1000 mm Width x Height / mm<sup>2</sup></b>
100	111 x 74	249 x 166
135	75 x 50	177 x 118
180	49 x 33	126 x 84
300	18 x 12	65 x 43
400	7 x 5	41 x 28

Table 9: Focal length vs. field of view (Bigeye G-629)

<b>Focal length f / mm for Bigeye G-1100</b>	<b>Object at distance = 500 mm Width x Height / mm<sup>2</sup></b>	<b>Object at distance = 1000 mm Width x Height / mm<sup>2</sup></b>
14	1257 x 837	2551 x 1699
18	970 x 646	1976 x 1316
21	826 x 550	1689 x 1124
28	611 x 407	1257 x 837
35	481 x 320	999 x 665
50	326 x 217	688 x 458
85	177 x 118	390 x 260
100	145 x 96	326 x 217
135	98 x 65	232 x 155
180	64 x 43	165 x 110
300	24 x 16	85 x 56
400	9 x 6	54 x 36

Table 10: Focal length vs. field of view (Bigeye G-1100)

# Camera dimensions

## Bigeye G-132B Cool / Bigeye G-283B Cool

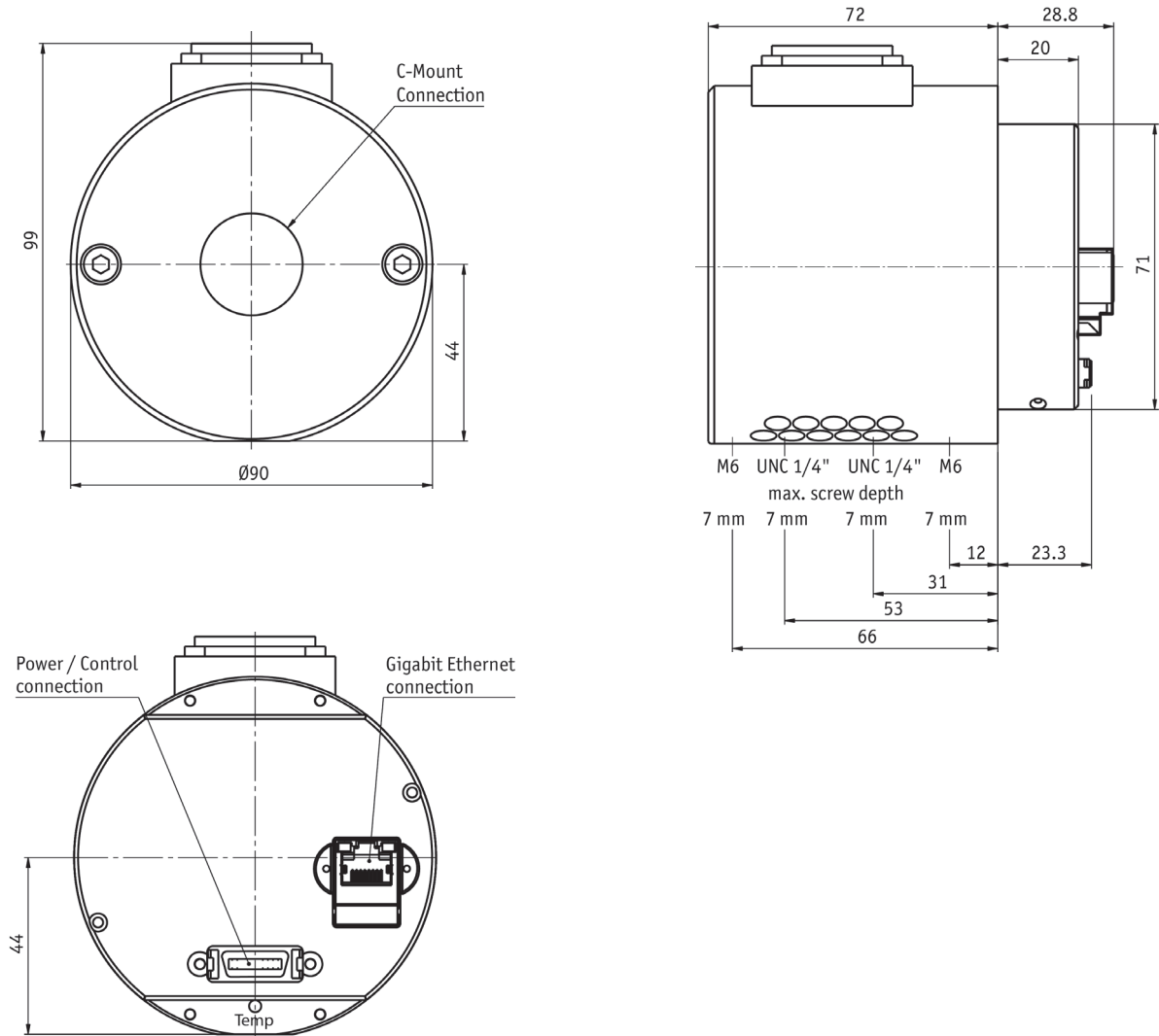


Figure 5: Camera dimensions: Bigeye G-132B Cool / Bigeye G-283B Cool (front/side/back)

# Bigeye G-629B Cool

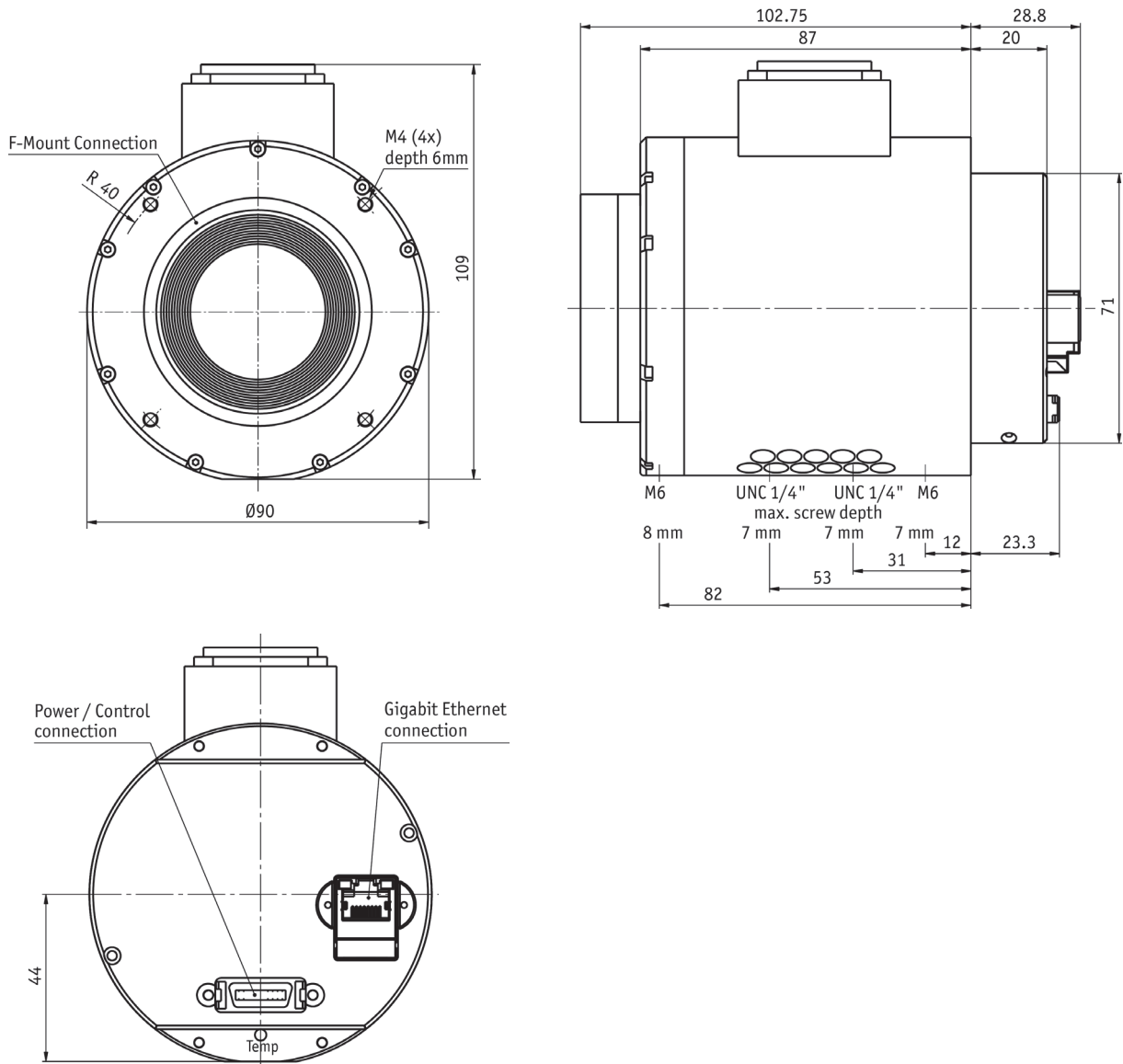


Figure 6: Camera dimensions: Bigeye G-629B Cool (front/side/back)

# Bigeye G-1100B Cool

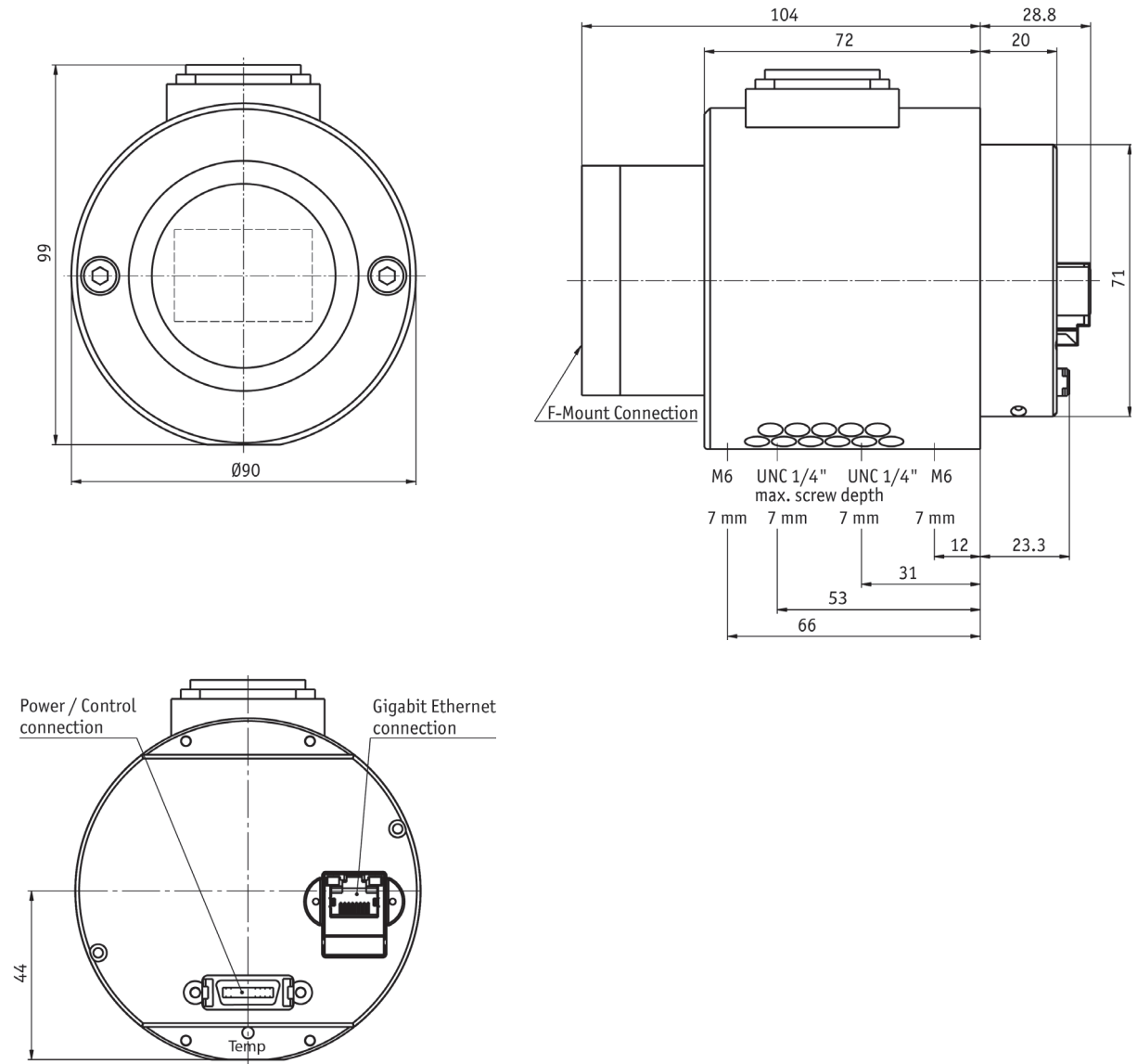


Figure 7: Camera dimensions: Bigeye G-1100B Cool (front/side/back)



## Camera interfaces

This chapter gives you information on Gigabit Ethernet port, inputs and outputs and trigger features.

### Note



For a detailed description of the **camera interfaces (GigE, I/O connector, status LEDs)**, and **operating instructions** see the **Manta/Bigeye G Hardware Installation Guide (How to install a GigE camera: Manta and Bigeye G)**, Chapter **Camera interfaces**.

Read all **Notes** and **Cautions** in the **Manta/Bigeye G Hardware Installation Guide (How to install a GigE camera: Manta and Bigeye G)**, before using any interfaces.

### www



For accessories like cables see:

<http://www.alliedvisiontec.com/emea/products/accessories/gige-accessories.html>

## Gigabit Ethernet port

The Gigabit Ethernet port conforms to the IEEE 802.3 1000BASE-T standard for Gigabit Ethernet over copper. We recommend connecting the Bigeye G using Category 5e or better patch cables and connectors for best performance.

### Note



Cable lengths up to 100 m are supported.

The 8-pin RJ45 (8P8C) connector has the pin assignment according to the Ethernet standard (IEEE 802.3 1000BASE-T).

The GigE port of a Bigeye G camera is screw-lockable.

### Accessories

Cables are available from AVT:

<http://www.alliedvisiontec.com/emea/products/accessories/gige-accessories.html>

Ask your local dealer for more details.

## Camera I/O connector pin assignment

### Note

The I/O port of a Bigeye G camera is different to the one provided with a Bigeye P camera.



Bigeye G cameras have a 20-pin Mini D Ribbon (MDR) shielded I/O connector with screw-locks.

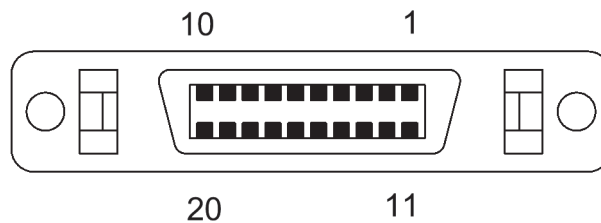


Figure 8: 20-pin Mini D Ribbon (MDR) shielded I/O connector

Pin	Signal	Direction	Level	Description
1	External Power	---	+12 V DC	Power supply
2	External GND	---	GND	External Ground
3	External Power	---	+12 V DC	Power supply
4	External GND	---	GND	External Ground
5	Camera Out 4	Out	3.3 V TTL, active low	Camera Output 4
6	---	---	---	Reserved
7	RxD 1	In	RS232	Terminal Receive Data
8	TxD 1	Out	RS232	Terminal Transmit Data
9	Camera In 3	In	Max. 24.0 V	Camera Input 3 (GP In 3)
10	Camera In GND	In	Common GND for inputs	Camera Common Input Ground (In GND)
11	Camera In 1	In	Max. 24.0 V	Camera Input 1 (GP In 2)
12	Camera Out 3	Out	Open emitter, max. 20 mA	Camera Output 3 (GP Out 3)
13	Camera Out Power	In	Common VCC for outputs max. 30 V DC	External Power for digital outputs (OutVCC)
14	Camera Out 1	Out	Open emitter, max. 20 mA	Camera Output 1 (GP Out 1)

Table 11: Camera I/O connector pin assignment (HD20 Mini D Ribbon)

Pin	Signal	Direction	Level	Description
15	Camera Out 2	Out	Open emitter, max. 20 mA	Camera Output 2 (GP Out 2)
16	Camera In 2	In	Max. 24.0 V	Camera Input 2 (GP In 2)
17	Camera In 4	In	3.3 V TTL	Camera Input 4 (GP In 4)
18	---	---	---	Reserved
19	RxD 2	In	RS232	Terminal Receive Data 2
20	TxD 2	Out	RS232	Terminal Transmit Data 2

Table 11: Camera I/O connector pin assignment (HD20 Mini D Ribbon)

## Control signals

The inputs and outputs of the camera can be configured by software. The different modes are described below.

### Inputs

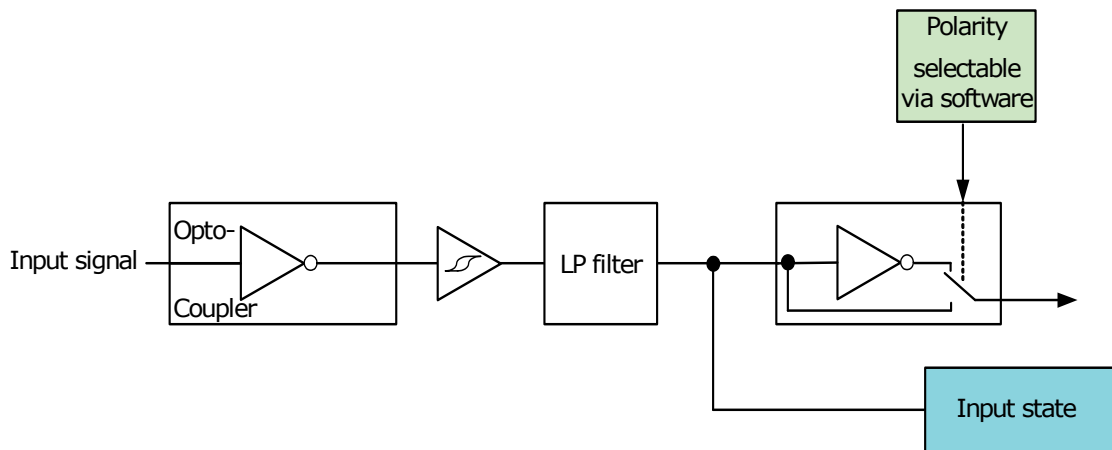


Figure 9: Input block diagram

## Input/output pin control

All input and output signals running over the camera I/O connector are controlled by the I/O strobe commands. See **AVT GigE GenICam Feature Description** and **AVT GigE Vision Cameras**.

## Outputs

**Note** For a general description of the **outputs** and **warnings** see the **AVT GigE Installation Manual**.



Output features are configured by software. Any signal can be placed on any output.

The main features of output signals are described below:

Signal	Description
GPO	Configured to be a general purpose output, control of which is assigned to SyncOutGpoLevels.
AcquisitionTriggerReady	Active once the camera has been recognized by the host PC and is ready to start acquisition.
FrameTriggerReady	Active when the camera is in a state that will accept the next frame trigger.
FrameTrigger	Active when an image has been initiated to start. This is a logic trigger internal to the camera that is initiated by an external trigger or software trigger event.
Exposing	Exposing – active for the duration of sensor exposure.
FrameReadout	Active at during frame readout, i.e. the transferring of image data from the CCD to camera memory.
Imaging	Imaging is high when the camera image sensor is either exposing and/or reading out data.
Acquiring	Active during an acquisition stream.
SyncIn1	Active when there is an external trigger at SyncIn1.
SyncIn2	Active when there is an external trigger at SyncIn2.
SyncIn3	Active when there is an external trigger at SyncIn3.
SyncIn4	Active when there is an external trigger at SyncIn4.
Strobe1	The output signal is controlled according to Strobe1 settings.

Table 12: Output signals

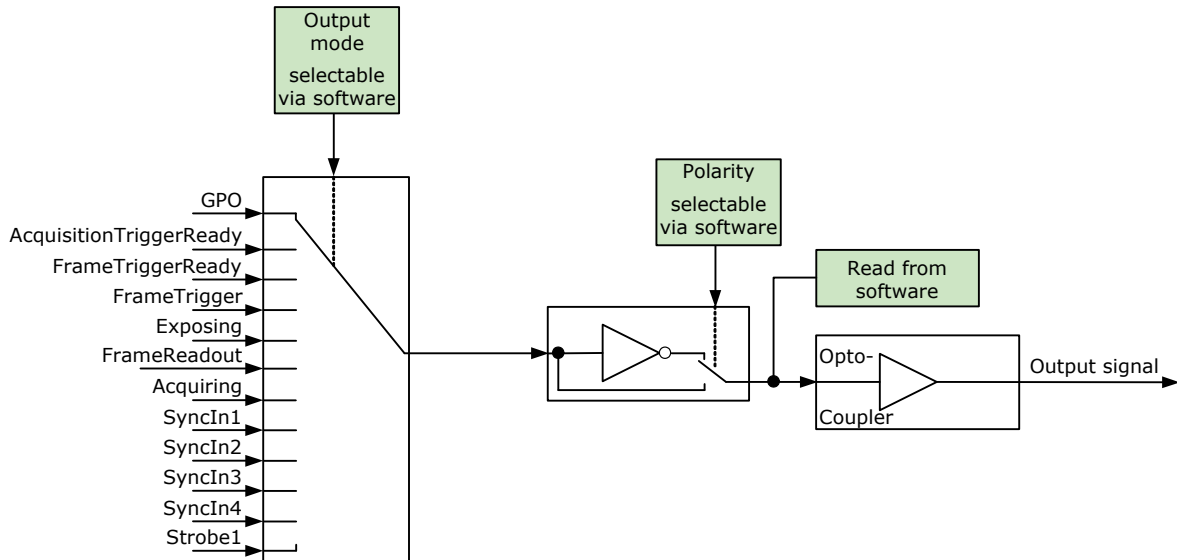


Figure 10: Output block diagram

### Trigger timing diagram

The following diagram explains the trigger concept in general.

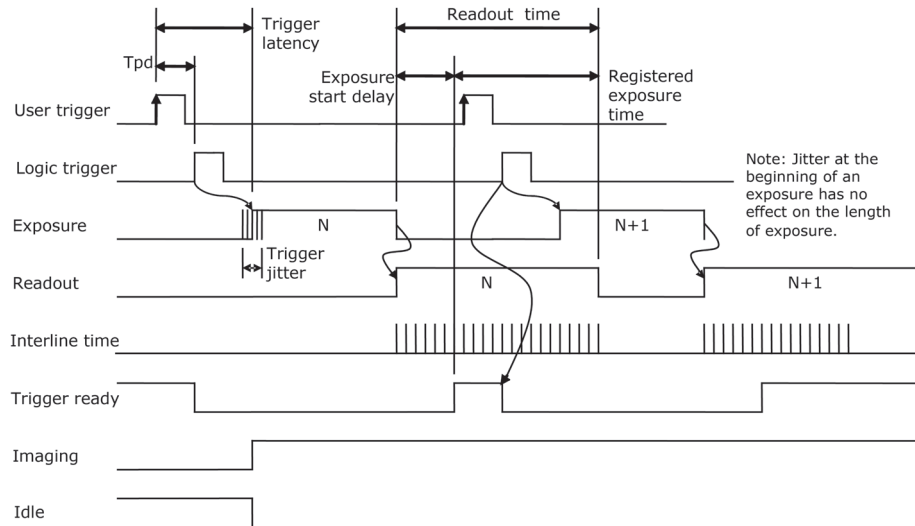


Figure 11: Trigger timing diagram

## Notes on triggering

### Trigger definitions

Term	Definition
User trigger	Trigger signal applied by the user (hardware trigger, software trigger).
Logic trigger	Trigger signal seen by the camera internal logic (not visible to the user).
Tpd	Propagation delay between the user trigger and the logic trigger.
Exposure	High when the camera image sensor is integrating light.
Readout	High when the camera image sensor is reading out data.
Trigger latency	Time delay between the user trigger and the start of exposure.
Trigger jitter	Variability in the trigger latency time.
Trigger ready	Indicates to the user that the camera will accept the next trigger.
Registered exposure time	Exposure time value currently stored in the camera memory.
Exposure start delay	Registered exposure time subtracted from the readout time and indicates when the next exposure cycle can begin such that the exposure will end after the current Readout.
Interline time	Time between sensor row readout cycles.
Imaging	High when the camera image sensor is either exposing and/or reading out data.
Idle	Is high if the camera image sensor is not exposing and/or reading out data.

Table 13: Trigger definitions

### Trigger rules

**Note** The **user trigger pulse width** should be at least three times the width of the trigger latency as indicated in Chapter [Specifications](#) on page 15.



- The **end of exposure** will always trigger the next readout.
- The **end of exposure** must always end after the current readout.

- The **start of exposure** must always correspond with the interline time if Readout is true.
- **Exposure start delay** equals the Readout time minus the registered exposure time.

### **Triggering during the idle state**

For applications requiring the shortest possible trigger latency and the smallest possible trigger jitter the user trigger signal should be applied when Imaging is false and Idle is true.

### **Triggering during the readout state**

For applications requiring the fastest triggering cycle time such that the camera image sensor is exposing and reading out simultaneously:

Take care that the user trigger signal is applied as soon as a valid trigger ready is detected.

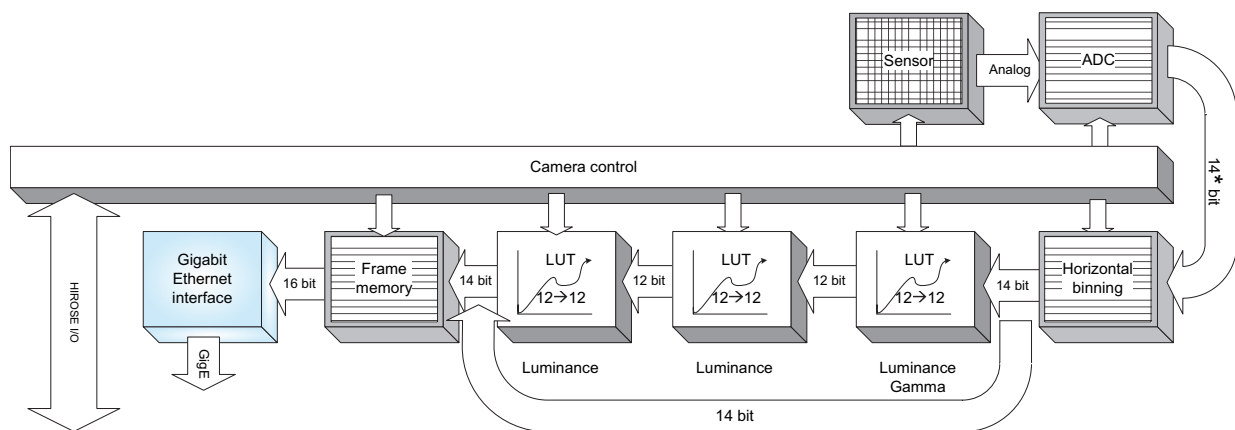
In this case, trigger latency and trigger jitter can be up to 1 line time since exposure must always begin on an interline boundary.

# Description of the data path

## Block diagrams of the cameras

The following diagrams illustrate the data flow and the bit resolution of image data after being read from the CCD sensor chip in the camera. The individual blocks are described in more detail in the following manual: **AVT GigE Camera Controls**. For sensor data see Chapter [Specifications](#) on page 15.

### Monochrome cameras



\* 14-bit models:

LUT input: If LUT is activated, only upper 12 bits are used.

Lower 2 bits are unused.

LUT output: 12 bits are filled up with 2 lower zero bits.

Figure 12: Block diagram monochrome camera



## Available Bigeye G camera controls

The following camera controls are available. The controls are displayed the way they are seen on the GigE Sample Viewer.

Hierarchy level 1	Hierarchy level 2	Hierarchy level 3	Hierarchy level 4	
Info				
	CameraName			
	DeviceFirmwareVersion			
	DeviceModelName			
	DevicePartNumber			
	DeviceScanType			
	DeviceSerialNumber			
	DeviceVendorName			
	Firmware			
			FirmwareVerBuild	
			FirmwareVerMajor	
	Part			
			PartClass	
			PartNumber	
			PartRevision	
			PartVersion	
	Sensor			
			SensorBits	
			SensorHeight	
			SensorType	
	SensorWidth			
UniqueId				
ImageMode				
	BinningX			
	BinningY			

Table 14: Available Bigeye G camera controls

Hierarchy level 1	Hierarchy level 2	Hierarchy level 3	Hierarchy level 4
Acquisition	Trigger	AcqEnd	AcqEndTriggerEvent
			AcqEndTriggerMode
		AcqRec	AcqRecTriggerEvent
			AcqRecTriggerMode
		AcqStart	AcqStartTriggerEvent
			AcqStartTriggerMode
		FrameRate	
		FrameStart	FrameStartTriggerDelay
			FrameStartTriggerEvent
	FrameStartTriggerMode		
	FrameStartTriggerOverlap		
		FrameStartTriggerSoftware	
	AcquisitionAbort		
	AcquisitionFrameCount		
	AcquisitionMode		
	AcquisitionStart		
AcquisitionStop			
RecorderPreEventCount			
ImageFormat	ROI	Height	
		RegionX	
		RegionY	
		Width	
	PixelFormat		
	TotalBytesPerFrame		

Table 14: Available Bigeye G camera controls



Hierarchy level 1	Hierarchy level 2	Hierarchy level 3	Hierarchy level 4		
Controls	DSP	DSPSubregionBottom			
		DSPSubregionLeft			
		DSPSubregionRight			
		DSPSubregionTop			
		Gamma			
	Exposure	ExposureMode			
		ExposureValue			
	Gain	GainValue			
	IODMode				
	Iris	<p><b>Note</b>  This feature is implemented in the firmware, but is not applicable due to missing lenses that may support this feature.</p>	IrisAutoTarget		
			IrisMode		
			IrisVideoLevel		
			IrisVideoLevelMax		
			IrisVideoLevelMin		
	LUTControl	LUTSelector			
		LUTMode			
		LUTEnable			
		LUTIndex			
		LUTValue			
		LUTLoad			
		LUTSave			
		LUTInfo	LUTAddress		
			LUTSizeBytes		
			LUTBitDepthIn		
			LUTBitDepthOut		
	Shutter	<p><b>Note</b>  Only available on Bigeye G-629B</p>			

Table 14: Available Bigeye G camera controls

Hierarchy level 1	Hierarchy level 2	Hierarchy level 3	Hierarchy level 4
EventControls	EventID	EventAcquisitionStart	
		EventAcquisitionEnd	
		EventFrameTrigger	
		EventExposureEnd	
		EventAcquisitionRecordTrigger	
		EventSyncIn1Rise	
		EventSyncIn1Fall	
		EventSyncIn2Rise	
		EventSyncIn2Fall	
		EventSyncIn3Rise	
		EventSyncIn3Fall	
		EventSyncIn4Rise	
		EventSyncIn4Fall	
		EventOverflow	
		EventError	
		EventNotification	
	EventSelector		
	EventsEnable1		
ConfigFile			
	ConfigFileIndex		
	ConfigFileLoad		
	ConfigFilePowerUp		
	ConfigFileSave		

Table 14: Available Bigeye G camera controls

Hierarchy level 1	Hierarchy level 2	Hierarchy level 3	Hierarchy level 4	
GigE				
	BandwidthCtrlMode			
	ChunkModeActive			
	NonImagePayloadSize			
	PayloadSize			
	StreamFrameRateConstrain			
	Ethernet			
		DeviceEthAddress		
		HostEthAddress		
	IP			
		DeviceIPAddress		
		HostIPAddress		
	GvcpRetries			
	Gvsp			
		GvspLookbackWindow		
		GvspResendPercent		
		GvspRetries		
		GvspSocketBuffersCount		
	GvspTimeout			
	HeartbeatInterval			
	HeartbeatTimeout			
	Multicast			
		MulticastEnable		
		MulticastIPAddress		
	PacketSize			
	StreamBytesPerSecond			
	StreamHold			
		StreamHoldCapacity		
		StreamHoldEnable		
	Timestamp			
		TimeStampFrequency		
TimeStampReset				
TimeStampValueHi				
TimeStampValueLatch				
TimeStampValueLo				

Table 14: Available Bigeye G camera controls

Hierarchy level 1	Hierarchy level 2	Hierarchy level 3	Hierarchy level 4
I0	StatusLed1	StatusLedInvert	StatusLedMode
	StatusLedGpoLevels		
	Strobe	1	Strobe1ControlledDuration Strobe1Delay Strobe1Duration Strobe1Mode
	SyncIn1	SyncInGlitchFilter	
	SyncIn2	SyncInGlitchFilter	
	SyncIn3	SyncInGlitchFilter	
	SyncIn4	SyncInGlitchFilter	
	SyncInLevels		
	SyncOut1	SyncOut1Invert SyncOut1Mode	
	SyncOut2	SyncOut2Invert SyncOut2Mode	
	SyncOut3	SyncOut3Invert SyncOut3Mode	
	SyncOut4	SyncOut4Invert SyncOut4Mode	
	SyncOutGpoLevels		

Table 14: Available Bigeye G camera controls


Hierarchy level 1	Hierarchy level 2	Hierarchy level 3	Hierarchy level 4
Stats			
	CCDTemperatureOK		
	StatDriverType		
	StatFilterVersion		
	StatFrameRate		
	StatFramesCompleted		
	StatFramesDropped		
	StatPacketsErroneous		
	StatPacketsMissed		
	StatPacketsReceived		
	StatPacketsRequested		
	StatPacketsResent		

Table 14: Available Bigeye G camera controls

## Frame memory

An image is normally captured and transmitted in consecutive steps. The image is taken, read out from the sensor, digitized and sent over the Gigabit Ethernet network.

Bigeye G cameras are equipped with 32 MByte of RAM. The table below shows how many frames can be stored by each model.

**Note**  The number of frames (StreamHoldCapacity) depends on resolution and pixel format. The listed number of frames is valid for full resolution and Mono8/Bayer8.

The memory operates according to the FIFO (first in, first out) principle. This makes addressing for individual images unnecessary.

Model	Memory size	Pixel format/ resolution
Bigeye G-132B Cool	32 MB memory: 25 frames	Mono8/ full resolution
Bigeye G-283B Cool	32 MB memory: 11 frames	
Bigeye G-629B Cool	32 MB memory: 5 frames	
Bigeye G-1100B Cool	32 MB memory: 3 frames	

Table 15: Image memory size (typical; see note above)



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