



Technical Manual

ISG LightWise IQ
GigE Vision Cameras
Version 1.0.3

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Contacting Imaging Solutions Group

Note



- **Technical information:**
<http://www.ISGCameras.com>
- **Support:**
support@isgcameras.com

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Introduction

About the Imaging Solutions Group:

ISG is a contract engineering services firm in the field of digital imaging and we provide OEM product delivery. In essence, we design custom digital cameras and video systems, manufacture them and sell them to OEM customers who either rebrand them for resale or integrate them into a larger product or system.

We also have a line of intelligent camera products called the **LightWise** Series.

ISG LightWise OEM smart cameras are low-cost and highly functional. ISG Offers both Line Scan and Area cameras. ISG Cameras follow industry standards such as, GigE Vision™, CameraLink™, FireWire™, CoaXPress™ and USB3 Vision™.

This **ISG LightWise IQ Technical Manual** describes in depth the technical specifications of this camera family including dimensions, feature overview, I/O definition, trigger timing waveforms, frame rate performance, etc.

For information on software installation read the **ISG LightWise IQ Software Installation Manual**.
[ISG_LWIQ_Software_Installation_Manual.pdf](#)

www _____ ISG LightWise IQ literature:



<http://www.ISGCameras.com>

Info _____



Please read through this manual carefully.

Document History

Version	Date	Remarks
V1.0.0	08/07/2013	New Manual

Symbols used in this manual

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.ISGCameras.com>

Warranty

Caution



Imaging Solutions Group provides a 1 year warranty which covers the replacement and repair of all ISG LIGHTWISE IQ parts which are found to be defective in the normal use of this product. ISG LIGHTWISE IQ will not warranty parts which have been damaged through the obvious misuse of this product.

Precautions

Caution



DO NOT OPEN THE CAMERA. WARRANTY IS VOID IF CAMERA IS OPENED.

This camera contains sensitive components which can be damaged if handled incorrectly.

Caution



KEEP SHIPPING MATERIAL.

Poor packaging of this product can cause damage during shipping.

Caution



VERIFY ALL EXTERNAL CONNECTIONS.

Verify all external connections in terms of voltage levels, power requirements, voltage polarity, and signal integrity prior to powering this device.

Caution



CLEANING:

This product can be damaged by some volatile cleaning agents. Avoid cleaning the image sensor unless absolutely necessary. Please see instructions on sensor cleaning in this document.

DO NOT EXCEED ENVIRONMENTAL SPECIFICATIONS.

Caution



See environmental specifications limits in the Specifications section of this document. Special care is required to maintain a reasonable operating temperature. If the camera is to be operated in a warm environment, it is suggested that the camera be mounted on a heat sink such as a metal bracket and that there is sufficient air flow.

Cleaning the sensor

Caution



DO NOT CONTACT CLEAN SENSOR UNLESS ABSOLUTELY NECESSARY

Identifying Debris

Debris on the image sensor or optical components will appear as a darkened area or smudge on the image that does not move as the camera is moved. Do not confuse this with a pixel defect which will appear as a distinct point.

Locating Debris

Before attempting to clean the image sensor, it is important to first determine that the problem is due to debris on the sensor window. To do this you should be viewing a uniform image, such as a piece of paper, with the camera. Debris will appear as a dark spot or dark region that does not move as the camera is moved. To determine that the debris is not on the camera lens, rotate the lens independent of the camera. If the spot moves as the lens moves, then the object is on the lens -not on the image sensor- and therefore cleaning is not required. If the camera has an IR filter, then rotate the IR filter. If the object moves then the particle is on the IR filter not the sensor. If this is the case remove the IR filter carefully using a small flat head screw driver. Clean both sides of the IR filter using the same techniques as explained below for the sensor window.

**DO NOT TOUCH ANY OPTICS WITH FINGERS.
OIL FROM FINGERS CAN DAMAGE FRAGILE OPTICAL COATINGS.**

Cleaning with Air

If it is determined that debris is on the sensor window, then remove the camera lens, and blow the sensor window directly with clean compressed air. If canned air is used, do not shake or tilt the can prior to blowing the sensor. View a live image with the camera after blowing. If the debris is still there, repeat this process. Repeat the process a number of times with increased intensity until it is determined that the particulate cannot be dislodged. If this is the case then proceed to the contact cleaning technique.

Contact Cleaning

Only use this method as a last resort. Use 99% laboratory quality isopropyl alcohol and clean cotton swabs. Dampen the swab in the alcohol and gently wipe the sensor in a single stroke. Do not reuse the same swab. Do not wipe the sensor if the sensor and swab are both dry. You must wipe the sensor quickly after immersion in the alcohol, or glue from the swab will contaminate the sensor window. Repeat this process until the debris is gone. If this process fails to remove the debris, then contact ISG.

Conformity

Imaging Solutions Group declares under its sole responsibility that all standard product cameras of the **ISG LightWise IQ** family to which this declaration relates are in conformity with the following standard(s) or other normative document(s):

- CE, following the provisions of 2004/108/EG directive
- FCC Part 15 Class A
- RoHS (2002/95/EC)



We declare, under our sole responsibility, that the previously described **ISG LightWise IQ Cameras** conform to the directives of the CE.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense. You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment.

Legal notice

For customers in the USA

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However there is no guarantee that interferences will not occur in a particular installation. If the equipment does cause harmful interference to radio or television reception, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the distance between the equipment and the receiver.
- Use a different line outlet for the receiver.
- Consult a radio or TV technician for help.

You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment. The shielded interface cable recommended in this manual must be used with this equipment in order to comply with the limits for a computing device pursuant to Subpart A of Part 15 of FCC Rules.

For customers in Canada

This apparatus complies with the Class A limits for radio noise emissions set out in the Radio Interference Regulations.

Life support applications

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Imaging Solutions Group customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify ISG for any damages resulting from such improper use or sale.

Trademarks

Unless stated otherwise, all trademarks appearing in this document of Imaging Solutions Group are brands protected by law.

Warranty

The information provided by Imaging Solutions Group is supplied without any guarantees or warranty whatsoever, be it specific or implicit. Also excluded are all implicit warranties concerning the negotiability, the suitability for specific applications or the non-breaking of laws and patents. Even if we assume that the information supplied to us is accurate, errors and inaccuracy may still occur.

Copyright

All texts, pictures and graphics are protected by copyright and other laws protecting intellectual property. It is not permitted to copy or modify them for trade use or transfer, nor may they be used on web sites.

Preliminary Specifications

LightWise™ IQ Camera Family

Specifications			
Camera Model Number	LW-IQ-08050-C or -M	LW-IQ-16070-C or -M	LW-IQ-29050-C or -M
Image Sensor Type	Truesense Imaging	Interline Transfer	CCD Family
Image Sensor Model	KAI-08050 35mm format	KAI-16070 35mm format	KAI-29050 35mm format
Max Res and Max Frame Rate	3296 x 2472 at 12 FPS	4864 x 3232 at 5 FPS	6576 x 4384 at 3 FPS
Pixel Size	5.5 x 5.5 μm	7.4 x 7.4 μm	5.5 x 5.5 μm

Analog-to-Digital Converter	Analog Devices 14-bit ADC
Video Data Output	8, 12, 16 and 24-bit digital data
Image Data Formats	Mono8, Mono12, Mono16, Raw16 (all models) RGB, YUV422, YUV444, Raw8, Raw12, Raw16 (color models)
Digital Interface	Dual Gigabit Ethernet (2000 Mbps) & CPU Network GigE Port (256Mbps)
Partial Image Modes	Binning is supported via FPGA implementation. Sensor based binning is available. * Additional partial/ROI image modes available *
General Purpose I/O Ports	2 Programmable Opto-Isolated Trigger Inputs 2 Programmable Opto-Isolated Strobe Outputs
Gain Control	Digital Gain (1X to 8X): automatic / manual / one-push gain modes, programmable via software, Analog Gain: Analog gain can be modified to customer requirements. *
White Balance	Red, Blue, Green-Redline, Green-Blueline Channels, One-Push, Auto (optional)
Shutter Speed (Exposure)	Automatic / Manual / One-push modes, programmable via software, 0.03ms to 1S Longer exposure (integration) times can be supported if needed. auto exposure table
Synchronization	via external trigger
External Trigger Modes	External hardware or software trigger Rising Edge, Falling Edge, Trigger Delay, Burst Trigger
Power / Voltage	16W / 24V
Dimensions (W x H x L)	115 mm Wide x 115 mm Tall x 165mm Long (back from front of mount to last BNC connector)
Mass	1406 grams, 1.406 kg (without optics)
Memory	CPU Flash 512Mb NOR CPU DDR2 256 MB 320MB SDRAM Image Buffer #1 System Configuration Serial-EEPROM 64Kb 128MB DDR2 Image Buffer #2
Camera Specification	GigE Vision™ Specification v1.2 Future CoaXPress™ option built-in.
Lens Mount	F-mount (Canon) with full aperture and focus control
Emissions Compliance	CE, FCC, RoHS

Operating Temperature	0° to 45°C
Storage Temperature	-30° to 60°C
Vibration Resistance	10 G (14 Hz to 200 Hz)
Status Monitoring	3 Programmable LED indicators.
Ports	Dual GigE Vision Ports CPU Network GigE Port (256Mbps) RJ45 – Triggers & Strobes 2 USB 2.0 ports Composite video BNC input Triple programmable Diagnostic LED's Network IP Address Reset Switch DC input Option for CoaXPress™
Power Supply	24Vdc in at 3A & 12Vdc in at 300ma & Ground

Table: ISG LightWise IQ Camera Family Specification

Sensor Attributes Highlights

Truesense KAI-16070 shown below.

The KAI-08050 & KAI-29050 information can be found on the Truesense Imaging CCD Datasheets.

QUANTUM EFFICIENCY

Monochrome with Microlens

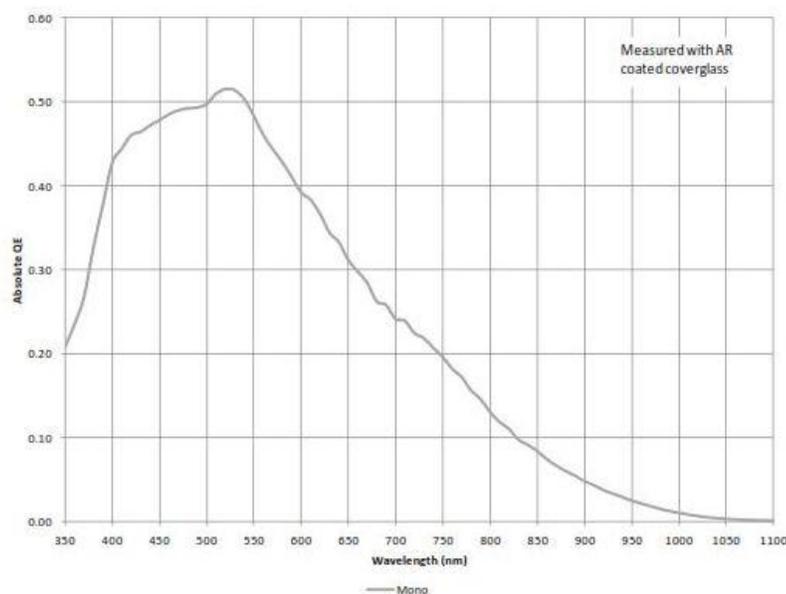


Figure – ISG LightWise IQ monochrome spectral response
Based upon the Truesense Imaging KAI-16070.
Other sensor data can be found on Truesense Imaging
Sensor Datasheets.

Color (Bayer RGB) with Microlens

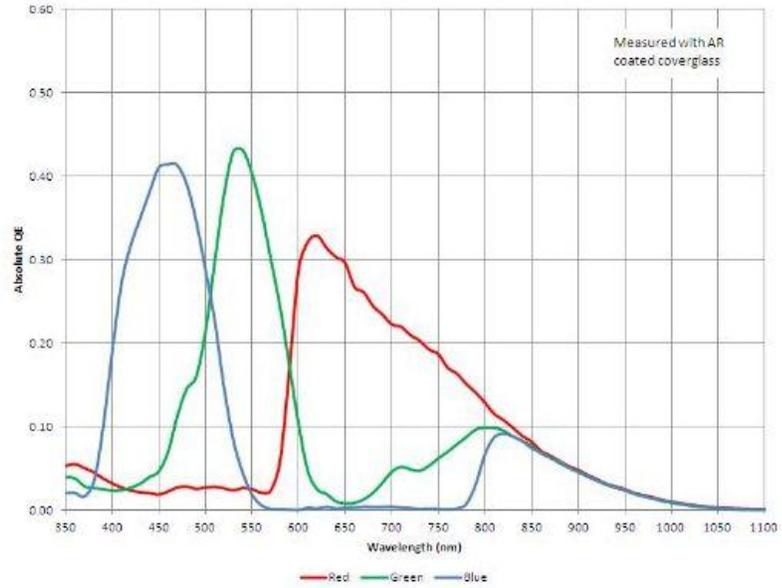


Figure – ISG LightWise IQ color spectral response
Based upon the Truesense Imaging KAI-16070.
Other sensor data can be found on Truesense Imaging Sensor Datasheets.

Color (TRUESENSE Sparse CFA) with Microlens

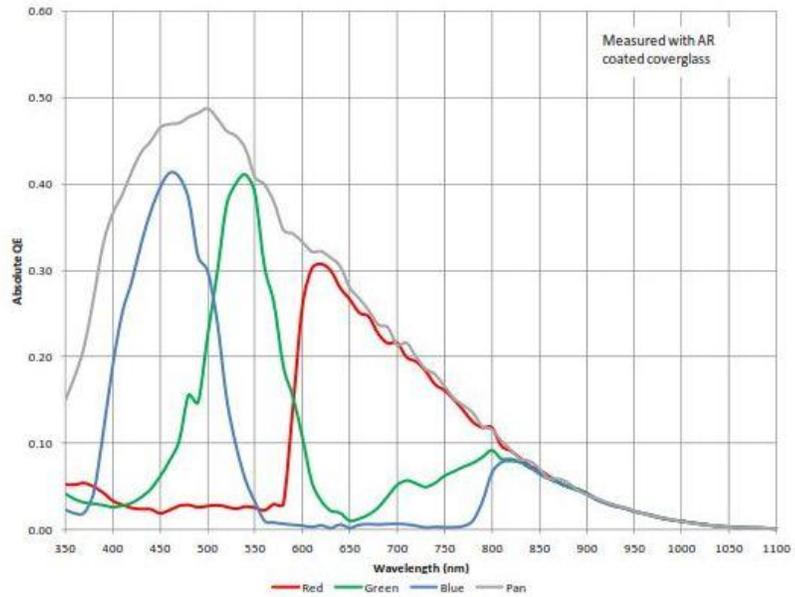


Figure – ISG LightWise IQ color spectral response
Based upon the Truesense Imaging KAI-16070.
Other sensor data can be found on Truesense Imaging sensor Datasheets.

Frame Rates

Additional information can be found on the Truesense Imaging CCD Datasheets. The ISG LightWise IQ Camera Family currently operates at a maximum HCCD Frequency of 30 MHz. ISG supports the 4 output (Quad) implementation.

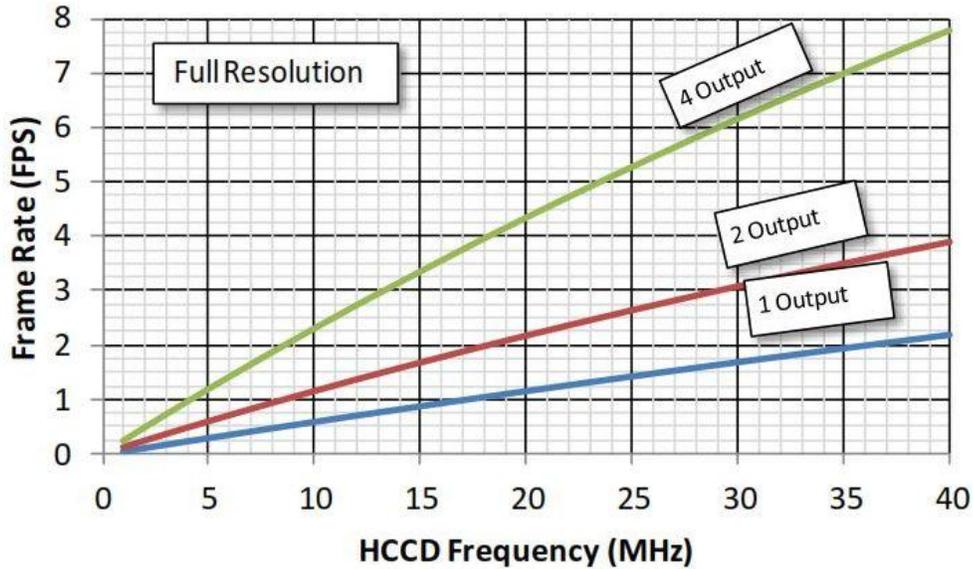


Figure - Truesense Imaging KAI-16070

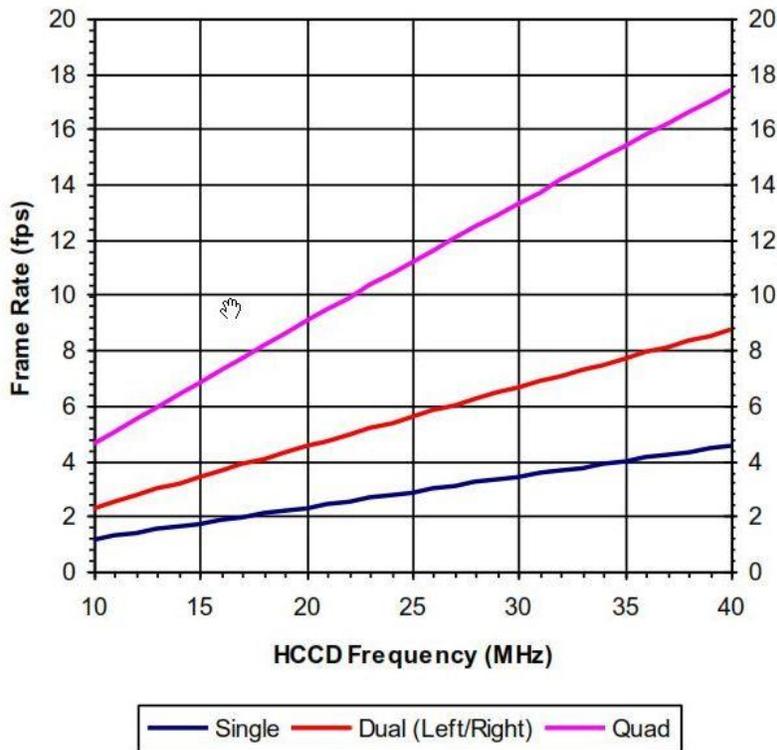


Figure - Truesense Imaging KAI-08050

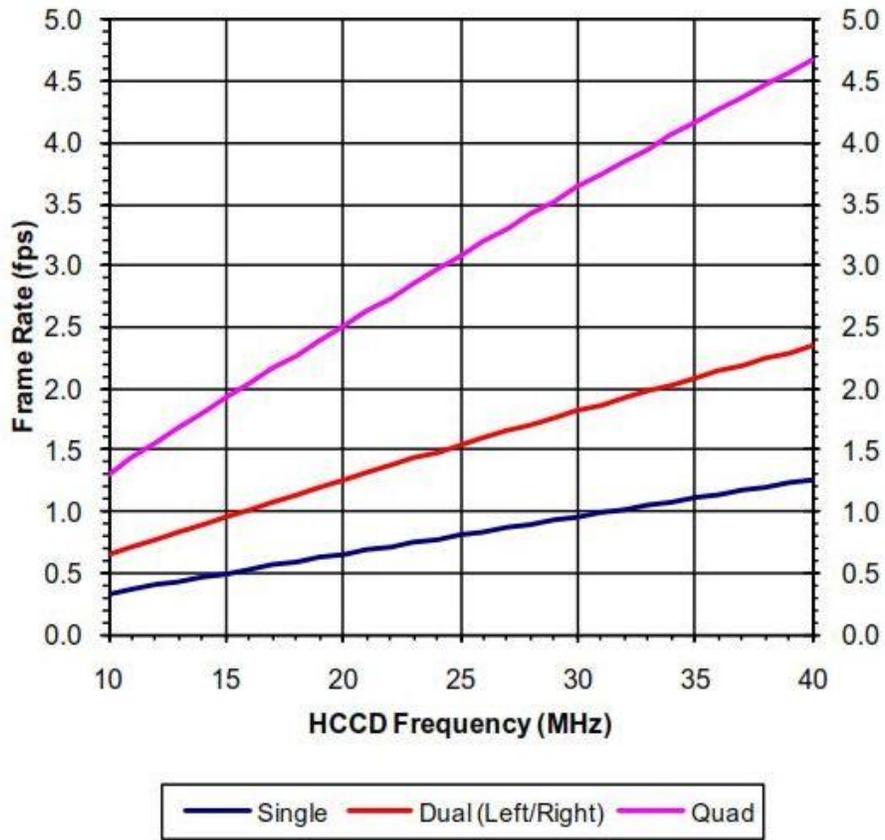


Figure - Truesense Imaging KAI-29050

IR cut filter: spectral transmission

Note



All ISG LightWise™ IQ color models are **not** equipped with an infrared block filter (IR filter). A filter can be employed to stop infrared wavelength photons from passing to the imaging device. Without an IR Cut Filter images will be dominated by red and cannot be properly color balanced. ISG advises the user to install such a filter on the outside of their lens.

Monochrome ISG LightWise IQ cameras do not employ an IR filter.

The figure below shows the filter transmission response for the Midwest Optics SP660-67 IR Cut filter. This filter is recommended by ISG. ISG sells this filter to customers who request it.

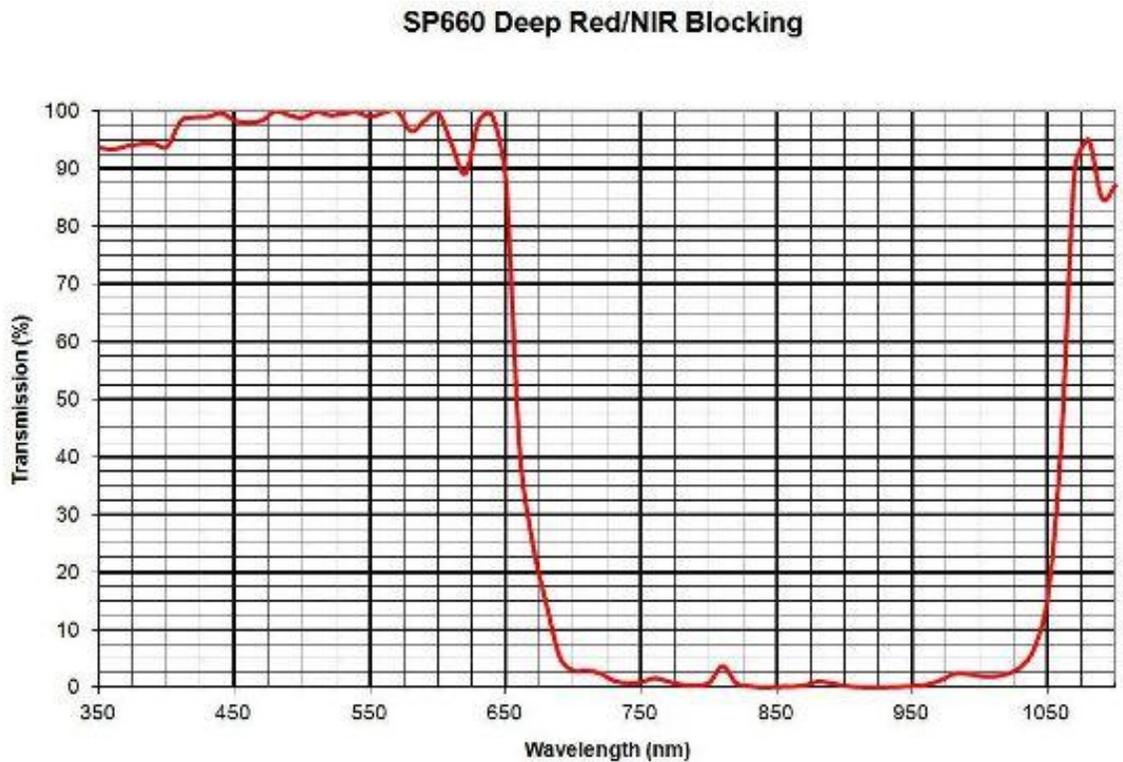
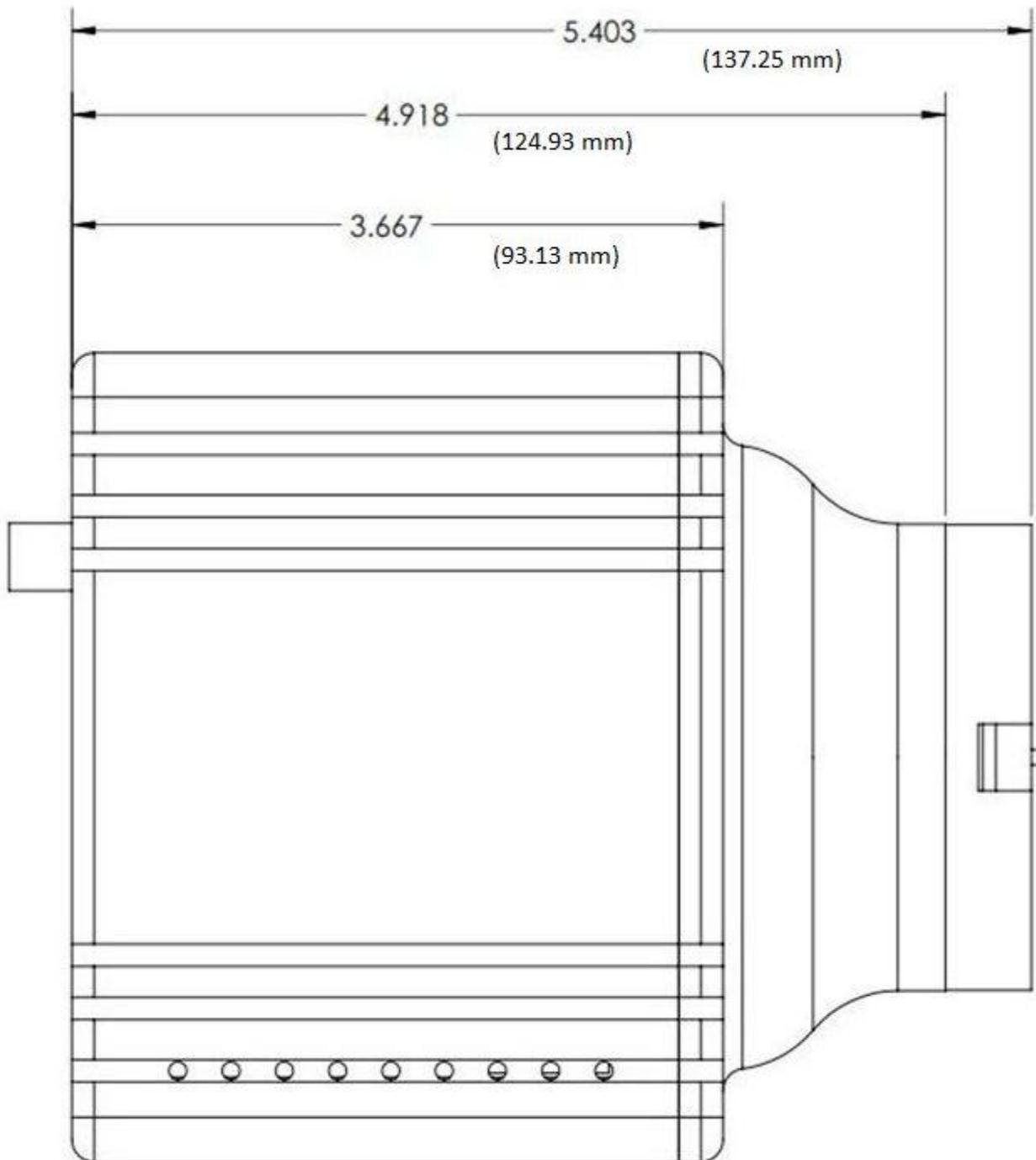
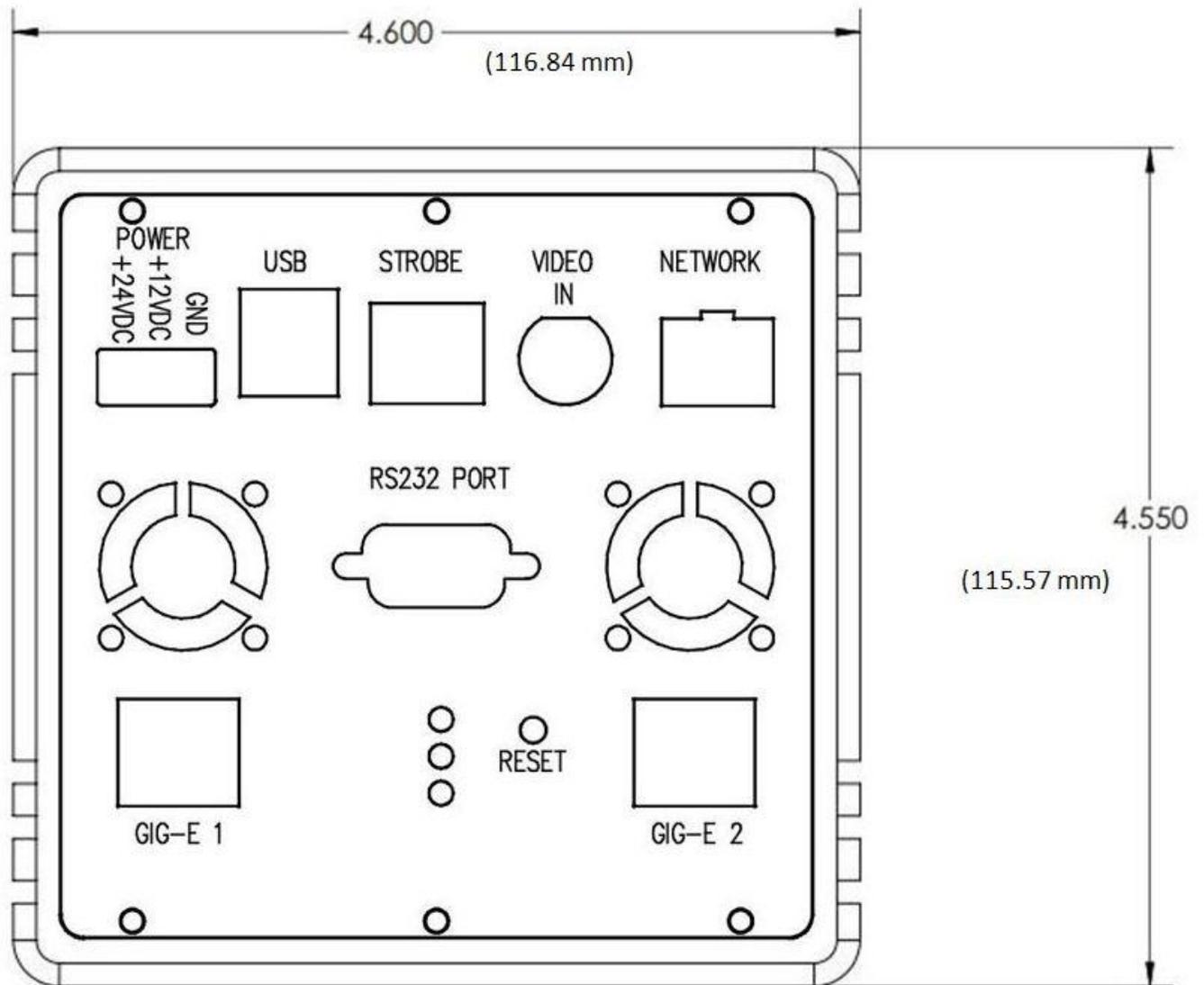


Figure: Midwest Optics SP660 filter transmission values

Camera dimensions (in inches & mm)

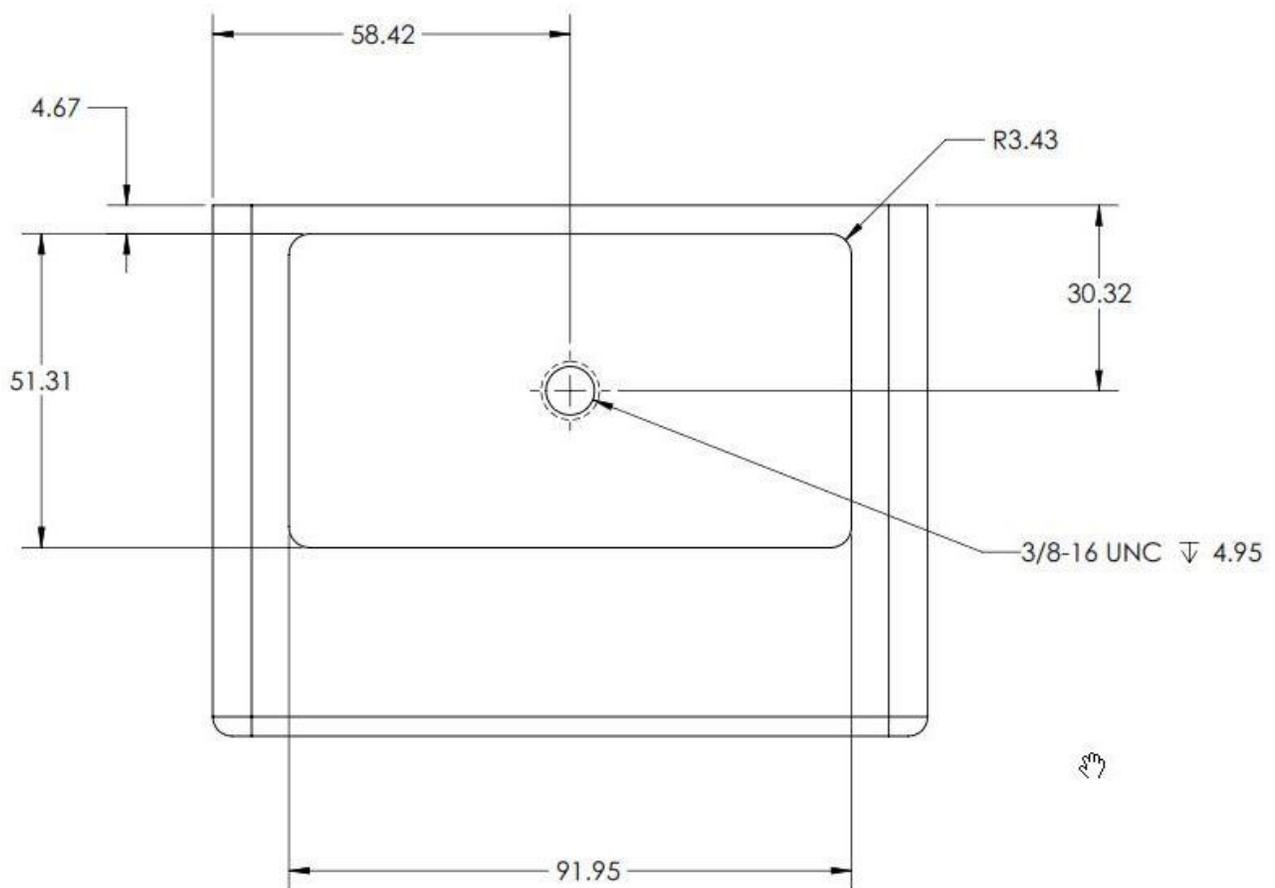




Tripod Adapter

(dimensions in mm)

An ISG LightWise IQ camera can be mounted on a camera tripod by using the mounting holes found on the camera body.



ISG LightWise IQ (EF-Mount)

Canon Compatible EF Lens Mount



The EF-mount is adjusted at the factory and should not require adjusting.
An EF-mount will support EF lenses and F-mount lenses (manual).

Attach EF-mount compatible lens to utilize the programmable lens control.

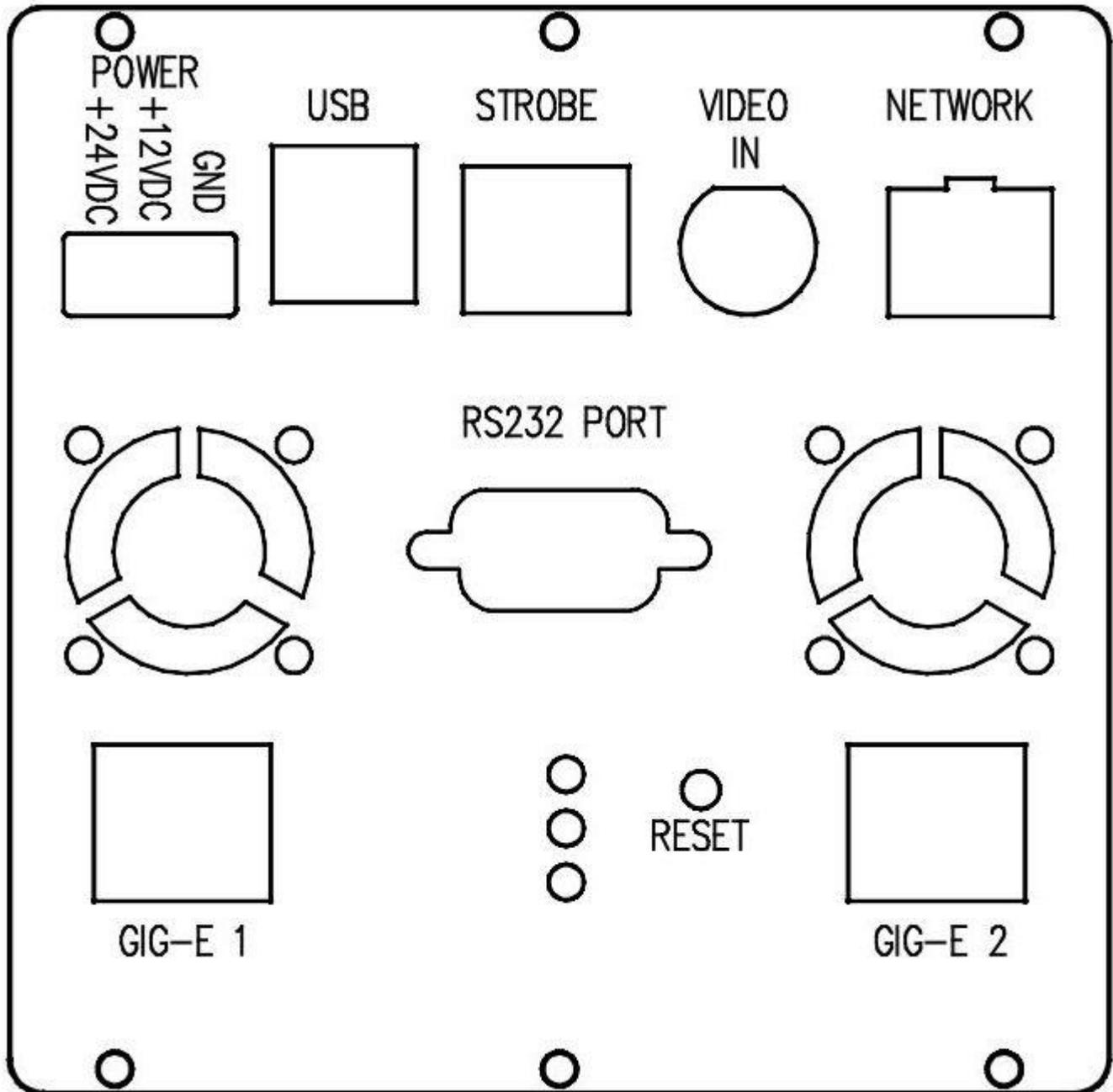
There are many Canon EF compatible lenses. ISG recommends the following:
Tamron SP AF Aspherical XR Di LD (IF) 28-75mm 1:2.8 Macro with 67mm ring
Canon EF 24-105mm f/4L IS USM with 77 mm ring

F-mount manual lenses should work properly. These are manual and the programmable lens control will not operate with manual lenses.

Use an F-mount or EF-Mount compatible lens that allows an infinity focus. Attach the lens to the camera using a counter-clockwise rotation of about a quarter turn. The lens should snap into place and the circumference. Lens flange and camera flange should mate over the full

ISG LightWise IQ cameras are shipped with an EF-mount. The camera can also be shipped as a board set on request.

Camera interfaces



Camera Trigger & Strobe I/O connector pin assignment

The General Purpose I/O port uses a standard RJ45 connector on the camera back.

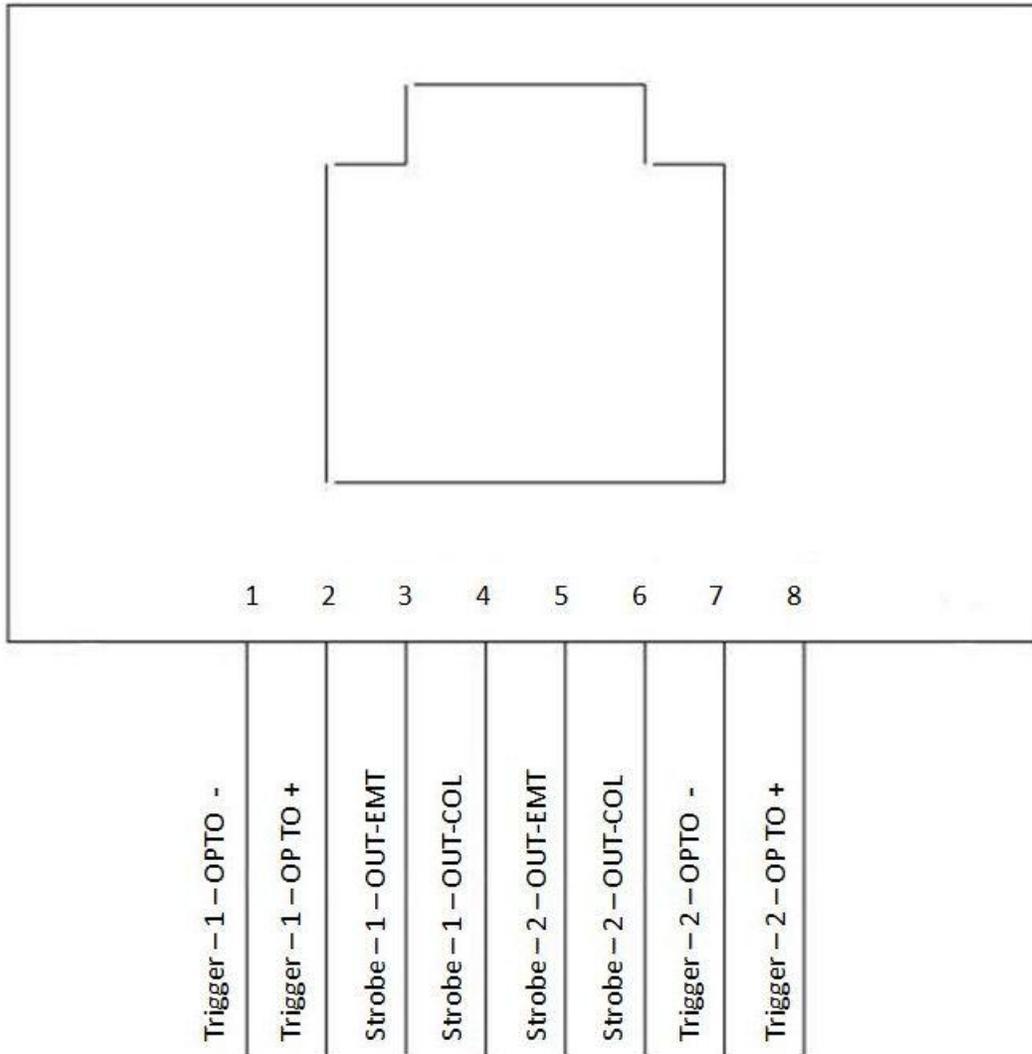


Table: ISG LightWise IQ Trigger & Strobe I/O connector definition

Pin # 1	Trigger - 1 - OPTO -
Pin # 2	Trigger - 1 - OPTO +
Pin # 3	Strobe - 1 - OUT - EMT
Pin # 4	Strobe - 1 - OUT - COL
Pin # 5	Strobe - 2 - OUT - EMT
Pin # 6	Strobe - 2 - OUT - COL
Pin # 7	Trigger - 2 - OPTO -
Pin # 8	Trigger - 2 - OPTO +

Camera Trigger Details:

The external interface consists of two isolated programmable Trigger Inputs and two isolated programmable Strobe outputs. The functions of each trigger are programmable through the Genicam Interface (please see Genicam SFNC 2.0 Spec for more details).

Trigger modes: are programmed by the FPGA for active-high, active-low, falling-edge or rising-edge. There are 2 hardware trigger sources and a software trigger source. Each trigger is programmable and may be used in parallel. In general, the user must set AcquisitionMode to SingleFrame to put the camera in trigger mode (vs. Continuous mode). Then TriggerSelector is used to select the trigger source. TriggerMode is used to turn on/off the selected trigger. TriggerActivation will set the desired edge. TriggerDelay will set the number of microseconds to delay from the source to the sensor trigger.

There is also a Multiframe acquisition mode available. In this mode, one external trigger event will generate AcquisitionBurstFrameCount internal sensor trigger events. The user can control the time between the individual internal triggers within the burst through the TriggerInterval register.

Software Trigger:

The following is a basic example using the ISG User Interface (ISGUI) application. Selections are made in the window "Camera Feature Control" on the ISGUI. The process is similar for Line1/2 hardware trigger control. Adjustments can also be made to TriggerDelay, TriggerActivation, and other controls before enabling the trigger.

In order to put the camera in Trigger mode:

- select "SINGLE FRAME" under Root->Acquisition Control->AcquisitionMode

To select the trigger source (Software, Line1, Line2):

- select "SOFTWARE" under Root->Acquisition Control->TriggerSource

To enable (disable) this particular trigger source:

- select "ON" ("OFF") under Root->Acquisition Control->TriggerMode

To enable the camera to send images:

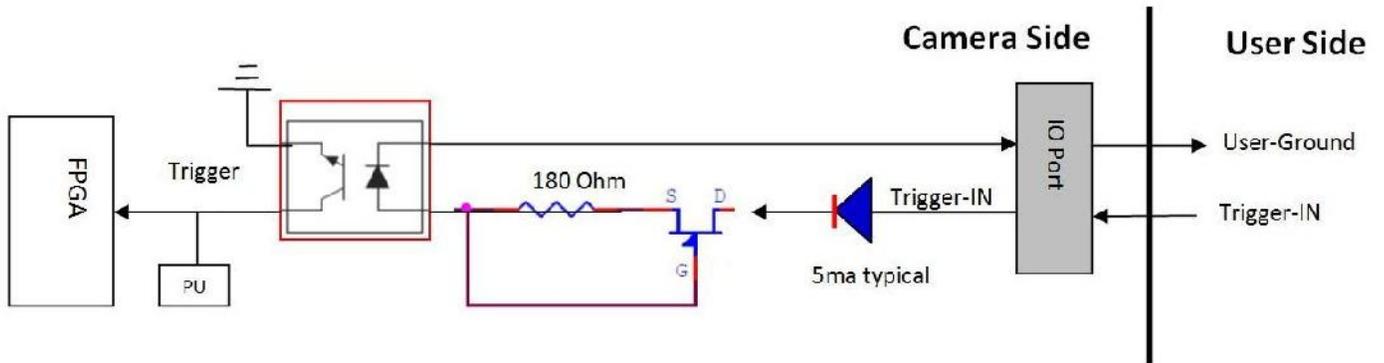
- select "Execute Command" under Root->Acquisition Control->AcquisitionStart

To activate the software trigger:

- select "Execute Command" under Root->Acquisition Control->TriggerSoftware

An image will be sent with every software trigger.

Trigger inputs: The camera receives two optically isolated trigger inputs. The interface consists of 2 wires a) Trigger In (signal) and, b) User-Ground (signal return). The trigger amplitude should be between 5V to 24V. The interface supports the Trigger frequency of up to 1MHz at 50% duty cycle. The camera interface circuit limits the input current to around 5ma. The design provides reverse polarity protection. The drawing below shows the camera's Trigger Interface circuit.



Camera Strobe Details:

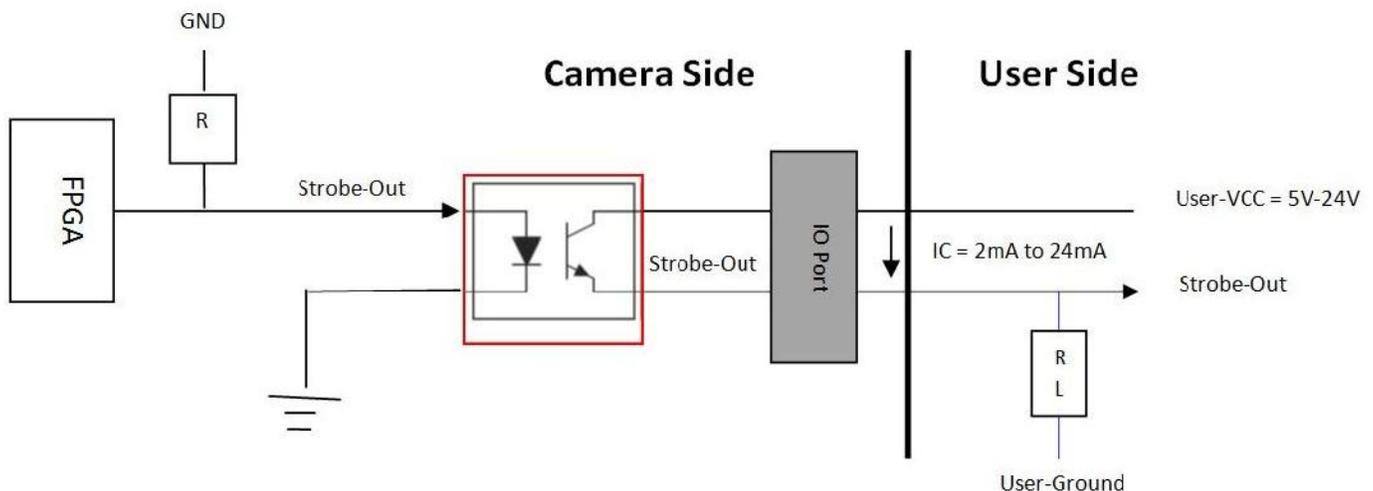
Strobe outputs: The camera provides two optically isolated Strobe outputs (npn transistor). The output modes (level high or level low and pulse duration) are programmed and controlled by the FPGA. The functions of each strobe are programmable through the Genicam Interface (please see Genicam SFNC 2.0 Spec for more details).

Strobe 1 can be driven by either of two sources. The source of this strobe is set in LineSource. ExposureActive is the automatically generated strobe and UserOutput0 is the software generated source described in the next paragraph. The first mode uses as its source an automatically produced strobe generated at the start of sensor integration time. LineStrobeDelay is the time to wait from the start of sensor integration. If LineStrobeDuration is set to 0, the strobe duration will be the sensor integration time. Otherwise, LineStrobeDuration is the width of the strobe pulse in microseconds. The register LineInverter will invert the output.

Strobe 2 can only be used as a Digital IO. To control either strobe in this mode, the user would set the UserOutputSelector to the desired strobe output. The driven value on the selected strobe will be set in UserOutputValue.

The following diagram shows the interface circuit for each of the Strobe outputs.

Note: the amount of current flow, I_C , is the function of User-resistor- Load and User-VCC. It is recommended the I_C be kept at 2mA to 24mA range when Saturation voltage, V_{CE} , is at 0.5V max.



The table below shows some suggested resistor-load value based on various User-VCC at IC value of 10mA

Load Resistor	IC mA	VC	Comment
2.4K	10	24V	VCE = 0.3
1.2K	10	12V	VCE = 0.3
500-ohm	10	5V	VCE = 0.3

Camera Status LEDs

The three (3) Status LED's on the back of the camera are fully programmable.

The default programmed settings are as follows:

Location	Color	Default Setting
TOP	Green	CPU Heartbeat, Camera Busy
Middle	Yellow	Frame Transfer Rate
Bottom	Red	Error Condition



Green LED

When booting the camera, this LED will start with long even blinks to signify the camera is busy loading configuration and correction data. When the blink becomes a “heartbeat” (2 fast blinks and a pause), the camera is ready for connection to the Host and normal operation.

This LED will also signify various busy states with rapid evenly spaced blinks. These states include sending upgrade files to the camera, calibration, and long duration events that the user does not access.

Yellow LED

This LED will change state with every frame that is transferred to the host, therefore representing the current frame rate. This is not the rate at which the sensor is capturing images.

Red LED

On boot, the camera flashes this LED for testing. If this LED remains lit, this signals an error on the camera. Normally, this indicates a serious error affecting the operation of the camera. The user should never see this case. Reasons for this state include:

- Sensor Temperature exceeds the maximum temperature before failure (Fan failure)
- Missing configuration files (installed during manufacturing)
- Unable to access internal hardware modules
- Lens controller error
- Sensor communications failure

If the user is updating the camera, this LED is used to indicate the camera is busy saving files to non-volatile memory. This will happen on the reboot after an upgrade file is sent to the camera. It is important that the user does not remove power while this LED is lit during the upgrade process. The camera will reboot automatically when complete and the LED will go off. For more details on this process, please see the “LightWise-IQ_UpgradeProcedure” document.

Rapid blinking lasting a few seconds indicates a warning. Reasons for this include:

- Sensor Temperature is exceeding recommended values for image quality
- Lens removal
- Unsupported Lens
- The LED is lit due to a previous error and a second error or warning occurs.

Camera Reset Button

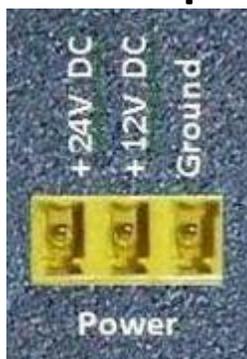


The Reset button on the back of the camera is programmable.
The default settings are as follows:

One short push of the Reset Button will conduct an IP Address Reset.

One Long push of the Reset Button will conduct a Total Camera Reset similar to a power down and up cycle.

Camera power



The ISG LightWise IQ camera family supports a wide input power voltage range. The camera will not power in reverse polarity. Exceeding the voltage range specified below will damage the camera.

Connection for 12V & 24V Inputs are provided.

An ISG Approved power supply can be ordered from ISG LIGHTWISE IQ: P/N LW-IQ-Power-Supply

Gigabit Ethernet ports



The Gigabit Ethernet port conforms to the IEEE 802.3 1000BASE-T standard for Gigabit Ethernet over copper. We recommend using Category 5e or Category 6 compatible cabling and connectors for best performance.

- The 8-pin RJ-45 jack has the pin assignment according to the Ethernet standard (IEEE 802.3 1000BASE-T).

USB 2 ports



The USB2 ports conform to the USB 2.0 standard. These ports are usually used for USB2 Flash Drives but are also sometimes used for a keyboard and mouse.

- Standard USB2 Cable lengths are supported.

NTSC/PAL port



The NTSC/PAL port provides an external camera video signal input that can be synchronized with the higher resolutions LightWise™ IQ camera video stream. This is used to provide context between the higher resolution images and the NTSC/PAL Video Stream running at a higher frame rate (25 fps or 30 fps).

- Standard Coaxial Cable lengths are supported.

RS232 port



The RS232 port provides support for software development and debug.

- Standard RS232 Cables are supported.

Firmware update

Firmware updates are carried out via the CPU Gigabit Ethernet connection. ISG LIGHTWISE IQ provides an application for all GigE cameras which loads firmware to the camera using a simple interface. For more details on this process, please see the “LightWise-IQ_UpgradeProcedure” document.

New feature introductions and product improvements motivate new firmware releases. All users are encouraged to use the newest firmware available and complete the firmware update if necessary.

Download the latest GigE firmware loader from the ISG LIGHTWISE IQ website:

<http://www.ISGCameras.com>

To determine the current firmware version loaded onto the camera, read the camera’s Device Firmware attribute using **GigE Sample Viewer** or third party applications like MVTec’s Halcon and Activision Tools.

Additional references

ISG LightWise™ IQ webpage

Imaging Solutions Group
1387 Fairport Road, Suite 890
Fairport, NY 14450 USA
585-388-5220 x101

<http://www.ISGCameras.com>

ISG LightWise™ IQ webpage

<http://www.isgcameras.com/gigE-CoaXpress-cameras.php>

ISG LightWise™ IQ Documentation

<http://www.isgcameras.com/support.php>

This manual can be downloaded from this webpage.

ISG GigE API SDK

Application Programming Interface and Software Development Kit

<http://www.isgcameras.com/SDKs-APIs.php>

ISG LightWise™ Firmware

<http://www.isgcameras.com/support.php>

Firmware updates will be provided from this webpage.

GigE Vision®



This industry standard is managed by the Automated Imaging Association (AIA) at:

<http://www.visiononline.org/vision-standards-details.cfm?id=36&type=5>

GigE Vision® is a global camera interface standard developed using the Gigabit Ethernet communication protocol. GigE Vision allows for fast image transfer using low cost standard cables over very long lengths. With GigE Vision, hardware and software from different vendors can interoperate seamlessly over GigE connections

The GigE Vision specification relies on GenICam™ to describe the features supported by the camera. This description takes the form of an XML device description file respecting the syntax defined by the GenApi module of the GenICam specification. GenICam is a generic programming interface for all kinds of cameras. For more information visit:

www.genicam.org

The GenICam™ standard group is hosted by the European Machine Vision Association (EMVA).

GenICam™ overview

Today's digital cameras are packed with much more functionality than just delivering an image. Processing the image and appending the results to the image data stream, controlling external hardware, and doing the real-time part of the application have become common tasks for machine vision cameras. As a result, the programming interface for cameras has become more and more complex.

The goal of GenICam™ is to provide a generic programming interface for all kinds of cameras. No matter what interface technology (GigE Vision, Camera Link, 1394 DCAM, USB3 Vision, etc.) they are using or what features they are implementing, the application programming interface (API) should be always the same.

The GenICam™ standard consists of multiple modules according to the main tasks to be solved:

- GenApi: configuring the camera **(GenICam_Standard_v2_0.pdf)**
- Standard Feature Naming Convention (SFNC): recommended names and types for common camera features **(GenICam_SFNC_2_0_0.pdf)**
- GenTL: transport layer interface, grabbing images
- CLProtocol: GenICam™ for Camera Link
- GenCP: generic control protocol
- GenTL SFNC: recommended names and types for transport layer interface

The GenICam™ group also provides GenICam™ reference implementation. The reference implementation (not part of the standard) comes with a BSD-like license and can be freely used by associated members of the GenICam™ group.

GenICam™ Documentation:

<http://www.emva.org/cms/index.php?idcatart=76&client=1&lang=1>

GenICam™ GenApi Standard Document 2.0 GenICam_Standard_v2_0.pdf

GenICam™ Standard Features Naming Convention 2.0 GenICam_SFNC_2_0_0.pdf

Official GenICam™ Flyer GENiCAM_Flyer.pdf

GenICam™, generic interface for cameras: interconnection made easy

GenICam™ Introduction genicam_introduction.pdf
Brief introduction to GenICam™ standard

GenICam™ for Developer's genicam_for_developers.pdf
More detailed presentation designed for developers and other technically oriented audience

These documents can be found on our CD or from the GenICam Website.

GigE Vision Documentation:

GigE Vision Standard Specification **GigE_Vision_Specification_2-0-02.pdf**

Automated Imaging Association **AIA_Pixel_Format_Naming_Convention_1-1-00.pdf**

These documents can be found on our CD or from the AIA Website.

ISG GigeVision Host Application Interface Developer's Guide:

ISG GigeVision Host Application Interface Developer's Guide

ISG_Genapi_Interface.pdf

The purpose of this document is to describe the way in which a user can create a Windows application to control and acquire video from an ISG GigeVision™ camera.

This document is found below and on the CD shipped with the camera and on our website.

ISG GigeVision Host Application Interface Developer's Guide

The purpose of this document is to describe the way in which a user can create a Windows application to control and acquire video from an ISG GigeVision™ camera. Two independent libraries are used for this purpose. The first is the GenICam™ library which is a reference implementation that is supplied by the EMVA standards organization. This provides an interface to the full feature set of the camera. A suite of header files which are installed in the Program Files\GenICam_ver_xx include path provide all of the class and type definitions that are required. A pair of GenICam™ standard documents have been included within the ISG software disk that provides details on the GenICam interface. The first one is the GenICam_Standard_vxx.pdf document. Among other things, it provides a description of the interfaces that are available for each data type defined by the specification (see section 2.9). The second GenICam™ standard document in the software packet is the GenICam_SFNC_xx.pdf file. This document defines all of the features that are common to a digital video camera, and therefore most cameras such as the ISG device, conform to these functions, along with some additional custom controls.

Here is the quick start guide to a set of commands that can be used to control an ISG GigeVision™ camera via the GenICam/GigeVisionLib library interface.

The ISG sample GUI is referenced as a source code example of these operations.

1) Discovery and Connection to the camera

In order to find a camera on the host network, a CDeviceDiscovery object is created, and a discovery operation is started. This is shown in the "OnBnClickedButtonDiscovery" button in the GUI. When a device is discovered, it is added to the device list (m_pDeviceList variable), and its MAC address is displayed in the discovery list box.

The discovery response from the camera is stored to a GigEDevice variable called m_pCurrentDevice in the GUI, which is copied to the active device called m_pDevice. This is the variable that is used to connect to the camera device port. The statically compiled GigeVision.lib library, which provides the software API to the camera, defines a CControlChannel object in order to create a linkage between the GigEDevice and the camera.

The device is “connected” to the camera as shown in the “OnBnClickedButtonConnect” function of the GUI. Once this path has been established, the CControlChannel can then be used to access resources in the camera. As defined in the GigeVision™ specification, the XML data file of the camera can be located by reading first URL data at address 0x200. This is shown in the GetXmlFileData function. As shown there, a generically named “HostXMLFile.xml” is generated. This file is then used in order to attach the GenApi defined CNodeMapRef object to the camera’s supported resources via a LoadXMLFromFile member function.

Refer to the GenICam™ standard document for a description of the variable type categories that are defined which allow the full functionality of the camera to be controlled. Also reference the GenICam SFNC (standard function naming convention) document for a complete listing of all of the common features that are available for control via the GenApi. Note that subsets of these, as listed in the XML file of the camera, are available in the ISG device.

2) Using the control interface of the GenApi to set camera features

The ISG GUI provides the complete list of features that are supported in the camera via a CTreeCtrl variable as defined by the Microsoft Foundation Class (MFC) library. The DumpFeatures function of the GUI allows a user to traverse the entire list of features, which always begin at the “Root” node of a camera. When the root node is opened, the top level feature categories are then displayed. As a subsequent control set is opened, the next level of feature detail becomes available. Eventually the user will be given a set of selections that map to register control of the camera.

Each of these controls has a specific, GenICam™ defined, data type associated with it. Examples of these data types include IInteger, IFloat, IString, and ICommand, each of which provides their own specific methods of getting and setting data. There are also some common member functions among the various data types. For instance, most provide both a SetValue and GetValue method for writing integer or floating point data to the camera. Other functionality such as “execute”, is specific to a single data type, in this case the ICommand type.

Following the CTreeCtrl model of the GUI provides a very convenient way to display the data types associated for each of the camera features automatically. It also enables a user to interact with all of the control data as shown in the edit boxes, drop list boxes and command buttons on the right hand side of the Camera Feature Control group box.

3) Camera video setup routines and data interfacing

The previous section described the way in which an application writer can display and interface to the entire camera feature set. There are also examples in the GUI of setting up a minimal number of features that will allow a custom image frame size to be delivered. The OnBnClickedButtonStartCamera function can be referenced for this purpose. In that function, the height and width resources of the camera are accessed in order to read their state. This access is available using the GetValue method, via an integer pointer variable which was assigned using the GetNode and the respective resource name. In the same way, the SetValue method could have instead been used in order to setup a desired custom frame. The

StartCamera function then proceeds to go through the process of setting up for video transmission. This is done by opening and starting a data stream via the GigeVision.lib API (OpenStreamChannel, StartStream methods) and then executing the “AcquisitionStart” command. The ViewThreadMethod process is kicked off in the GUI in order to receive the video data. Inside this thread, the “WaitForBuffer” function will block until the image becomes available within the data buffer pointer.