



INSIGHT CMOS Camera



Hardware Guide

For both 5MP and 12MP camera models



IMAGING™
Take a closer look

INSIGHT CMOS CAMERA USER GUIDE

CONTENTS:

WHAT'S IN THE BOX	1
MINIMUM SYSTEM REQUIREMENTS	1
REGULATORY AND COMPLIANCE NOTES	2
SAFETY INSTRUCTIONS	3
CONNECTING TO A MICROSCOPE.....	4
CONNECTING THE CAMERA TO A COMPUTER.....	5
CAMERA SPECIFICATIONS	6-7
TROUBLESHOOTING GUIDE.....	8
PART NUMBERS.....	9
A WORD ON LONGER USB3 CABLES	10

WHAT'S IN THE BOX

- Camera (with C-mount dust cap)
- USB 3.0 Cable, Type-A to micro-B (locking), 2m
- This Hardware Guide
- SPOT Basic Software installer CD with installation guide and license activation code
- New Auto Exposure Operation amendment guide
- 2 year Warranty card

Minimum system required for operating this camera

- An Intel-based computer running Microsoft Windows 7 (or later) or Apple OS X 10.8 (or later).
- One available USB 3.0 (SuperSpeed) port that supports the full USB 3.0 power output of 900ma at 5V.
- An Intel Core i3, i5 or i7 processor (4core i5 or above preferred)
- 4 GB RAM (8 GB preferred)
- A monitor with resolution of 1024 x 768 (1920 x 1080 or higher preferred)

REGULATORY AND COMPLIANCE NOTES



This equipment complies 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 commercial environment.

The 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.

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 his own expense.



This product is in conformity with the

- EMC Directive (EMC) 2014/30/EU,
- Low Voltage Directive (LVD) 2014/35/EU, and the
- Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU and carries the CE mark accordingly.



This product has been assessed and determined compliant with the following standards:

EMC: EN 55022:2010/AC:2011, EN 55024:2010

LVD: EN 60950-1:2006/A11:2009/A1:2010/A12:2011/A2:2013

NOTE: this product is exempt from the Low Voltage Equipment Directive due to the fact that its operating voltage is below the minimum applicable input voltage range described in 2014/35/EU, Article 1.

RoHS: EN 50581:2012

This camera is designed for research and industrial imaging applications including the imaging of macroscopic and microscopic specimens. It is the responsibility of the user to qualify that this product meets the requirements for their application. In no event and under no circumstances shall the manufacturer be liable to an individual or entity for any indirect, special, consequential or incidental losses or damages, including without limitation, lost profits.

WEEE – Disposal of Electronic Equipment



This symbol on the camera indicates that it shall not be treated as household waste. To ensure that this electronic equipment will be treated properly, hand over the camera at end-of-life to the applicable collection point for the recycling of electrical or electronic equipment.

For more detailed information about recycling of this product, please contact your local Civic Office, your household waste disposal service or the dealer where you purchased this product.

SAFETY INSTRUCTIONS

- Read these instructions
 - Save these instructions
 - Follow these instructions
-
- Install in accordance with the manufacturer's instructions.
 - Only use the attachments/accessories specified by the manufacturer.
 - Do not attempt to use this product in any manner not specified by the manufacturer, as manufacturer will not be held responsible.
 - Do not remove the camera covers, as this will void the warranty.
 - This product is designed for indoor use only. Do not expose to rain or excessive moisture.
 - Do not expose the camera to dripping or splashing. Do not place objects filled with liquids such as vases, cups, etc. on or over the camera (e.g. on shelves above the unit).
 - Do not install the camera near heat sources such as radiators, heat registers, stoves, or other apparatus that produce heat.
 - Do not cover the camera with cloth or other materials like plastic while plugged in.
 - Do not install in excessively dusty places.
 - Avoid impact shock or excessive vibration.
 - Be sure there is proper and adequate ventilation where the camera is installed to minimize the risk of fire when using flammable liquids.
 - If you smell smoke or other odors coming from the camera or hear strange sounds, unplug the USB cable and contact customer service.
 - Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such when liquid has been spilled into the camera, the camera has been exposed to rain or excessive moisture, has been dropped, or does not operate normally.
 - There are no consumable materials associated with the camera.

CONNECTING THE CAMERA TO A MICROSCOPE

1. Select the correct C-mount optical adapter (sold separately) to fit the photo port on your microscope.
2. Unscrew the C-mount dust cap from the camera.
3. Screw the C-mount optical adapter into the camera. BE GENTLE! When started correctly, the adapter should easily thread into the camera.
4. Insert the optical adapter (with the camera attached) into the photo port of the microscope and tighten into place using the locking screw on the photo port.



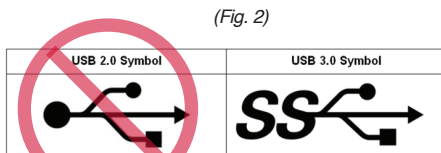
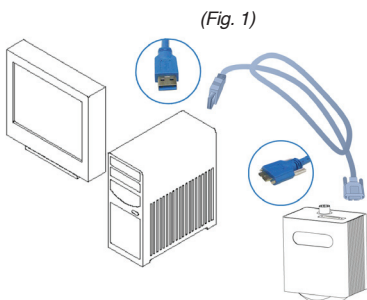
CONNECTING THE CAMERA TO A COMPUTER

1. Install SPOT Software before connecting the camera to a computer.

2. A USB 3.0 Type-A-to-micro B (locking) cable is supplied to connect the camera to your computer. (Fig. 1)

- a. One end of the cable has a micro-B connector with two thumb screws for locking the cable to the camera.
- b. The other end of the cable has a type-A connector for connection to your computer.

3. Plug the type-A connector into a USB 3.0 port on your computer. Do NOT plug the cable into a USB 2.0 port! The camera will NOT function when plugged into a USB 2.0 port.



(Fig. 3)

- a. Windows PC users: Your computer will have a mixture of USB 2.0 and USB 3.0 ports. The correct port will be identified by the USB 3.0 “SuperSpeed” Symbol. (Fig. 2) or a blue tongue (Fig. 3)
- b. Mac users: Apple does not use the USB 3.0 “SuperSpeed” Symbol or blue tongue connectors on their Mac computers that have USB 3.0 ports. They continue to use the older USB 2.0 Symbol even on USB 3.0 ports. To determine if the USB ports on your Mac computer are USB 3.0 go to Apple Menu > About This Mac > Overview > System Report > Hardware > USB > USB Device Tree and see if you have a “USB 3.0 Bus”. If so, all of your USB ports will be USB 3.0.
- c. The camera is powered by your computer through the USB cable. The camera is on when your computer is on and off when your computer is off.
- d. The USB ports on tablet computers and some laptop computers may not be able to supply enough power to run the camera. In this case you will have to use the optional power supply or connect the camera to a “powered” USB 3.0 hub.

4. Plug the micro-B connector into the camera and tighten the two thumbscrews.

SPECIFICATIONS

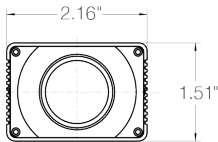
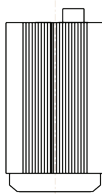
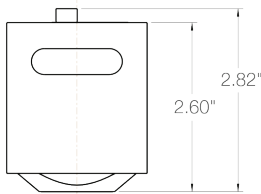
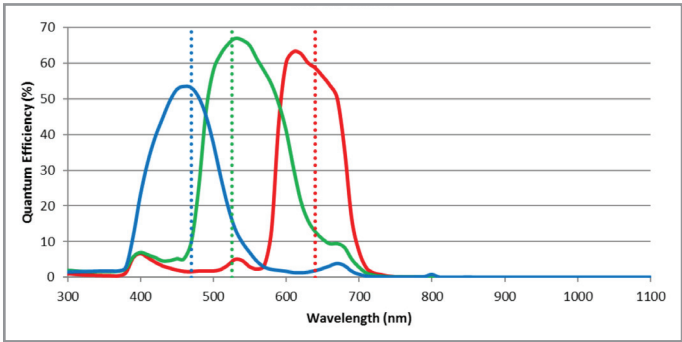
SPOT Insight CMOS camera

Sensor Specs		
Captured Image Resolution	5.1MP	12.3MP
Model	IN41C5IR	IN42C12IR
Sensor type	Color (Bayer Mosaic)	Color (Bayer Mosaic)
Live Image Resolution, no decimation	1.3MP	3.1MP
Live Image Frame Rate, no decimation		
(Typical frame rate on a brightfield microscope with a computer using an Intel Core i5 CPU with 4 physical cores. CPUs with only 2 physical cores will be slower. SPOT Correct Color Technology was ON for this test.)	26 f/s	11 f/s
Live Image Resolution, 2x2 decimation	0.32MP	1.54MP
Live Image Frame Rate, 2x2 decimation	120 f/s	49 f/s
Sensor	Sony Pregius™ CMOS, Back Illuminated, Enhanced Near-IR, 6th Generation	Sony Pregius™ CMOS, Back Illuminated, Enhanced Near-IR, 6th Generation
Sensor P/N	Sony IMX250	Sony IMX253
H x V, pixels	2456 x 2048	4096 x 3000
H x V, mm	8.47mm x 7.07mm	14.13mm x 10.35mm
Pixel Size	3.45 µm	3.45 µm
Aspect Ratio	6:5	4:3
CCD Diagonal	11.0mm	17.6mm
Optical Format	2/3"	1.1"
Shutter Type	Global Shutter	Global Shutter
Peak QE, color	66% at 525nm	66% at 525nm
Fixed Pattern Noise	Negligible	Negligible
Camera Specs		
Lens Mount	C-mount	C-mount
Computer Interface	USB 3.0	USB 3.0
Full Well	10,300 e	10,300 e
Read Noise	2.4 e	2.4 e
Dynamic Range	73 dB	73 dB
A-D Bit Depth	12-bit	12-bit
Analog Gain	1, 2, 4, 8, 16, 32, 64, 128, 251	1, 2, 4, 8, 16, 32, 64, 128, 251
Exposure Time Range	10µs to 3.9 sec	10µs to 3.9 sec
ROI	Yes	Yes
Exposure while Downloading	Yes	Yes
Trigger I/O (OEM models only)	Trigger In* Synch1 Out* I/O/TX, I/O/RX * (Optically isolated, requires external power supply)	Trigger In* Synch1 Out* I/O/TX, I/O/RX * (Optically isolated, requires external power supply)

SPECIFICATIONS *Continued*

Trigger I/O Connector	Hirose HR25-7TR-8A	Hirose HR25-7TR-8A
Power Required	5V supplied via USB3 Interface	5V supplied via USB3 Interface
ON-OFF Switch	No	No
Tripod Mount	Optional	Optional
Power Supply	Optional	Optional
USB Connector	USB 3.0 micro-B (locking)	USB 3.0 micro-B (locking)
Regulatory	CE, FCC Class A, RoHS	CE, FCC Class A, RoHS
SPOT Software Application	Windows Mac	Windows Mac
SDK support	Windows Mac Linux	Windows Mac Linux

Color Mosaic + IR Filter QE



The suggested applications for this camera include:

- Brightfield
- Darkfield
- Bright Light Fluorescence
- Live Cell Imaging
- Histology, Pathology, Cytology
- Semiconductor Inspection
- Metrology
- Whole Slide Imaging

TROUBLESHOOTING GUIDE

If you run into problems using the SPOT CMOS Insight camera:

Issue	Possible Cause	Suggested Remedy
Upon launching the SPOT software application, “Image Too Dim” message appears	Microscope light may be directed to eyepieces instead of photo port	Position microscope beam splitter to direct light to photo port instead of eyepieces (refer to your microscope hardware guide)
	Microscope Neutral Density filters may be blocking too much light	Experiment with different level ND filters that may allow more light to reach the camera
	Specimen may be very dim	<ul style="list-style-type: none"> • Increase microscope light to the specimen, or • Increase the gain setting
Black live image window (no message appears)	Light may be directed to the eyepieces instead of the photo port	Position microscope beam splitter to direct light to photo port (refer to your microscope hardware guide)
	Objective may be out of position	Be sure objective turret is in proper position to allow light to pass through
During imaging session, “No Cameras or Interface Card Found” message appears	USB3 camera cable may have become unplugged from the computer port	Reseat the Insight CMOS camera USB3 cable at both ends (camera and computer)
	Using a USB 3.0 cable other than the one tested and approved by SPOT Imaging	Try using the tested and approved USB3 cable included in the SPOT camera box
	A USB 3.0 cable more than 2 meters in length that has not been tested and approved by SPOT Imaging	A tested and approved USB 3.0 hub is available from SPOT Imaging for driving cables longer than 2 meters

PART NUMBERS

Insight CMOS Camera, 5MP	IN41C5IR
Insight CMOS Camera, 12MP	IN42C12IR
2m (6 ft) USB 3.0 Cable, Type-A to micro-B (locking) (Included with camera).....	USB3AMB2M

OPTIONAL ACCESSORIES

3m (9 ft) USB 3.0 Cable, Type A to micro-B (locking) *USB3AMB3M
5m (16 ft) USB 3.0 Cable, Type-A to micro-B (locking) *USB3AMB5M
Hub, 4-port, (with power supply) USB 3.0**	USB3HUB4PWPS
Hub, 4-port, (without power supply) USB 3.0**	USB3HUB4PNPS
Power Supply for Insight CMOS cameras (5MP and 12MP)	INCMOSPS
Tripod Mount	QUARTER20IN
USB 3.0 Computer Interface Card for PCIe slot	USB3PCIE

*** A Note on Longer USB3 Cables and the Operation of USB3 Hubs**

The USB3 ports on computers serve two functions. They communicate at very high speed with the camera. They also provide a DC voltage to power the camera. Both the high-speed communication and the DC voltage travel through the USB3 cable to the camera.

It has been our experience that some ports on some computers are not robust enough to push the high-speed signal through cables longer than 2 meters. This is the reason that we supply a 2m USB3 cable as standard equipment with our cameras. The problem with longer cables is NOT the ability to supply adequate power to the camera. The problem with longer cables is signal integrity.

The solution to a weak USB3 port is to replace it with a robust USB3 port. We do this by plugging a USB3 hub into the weak USB3 port. The hub connects to the computer with a short (0.2-meter) tethered USB3 cable and has its own robust internal USB3 electronic circuitry to drive its USB3 ports. The USB3 ports on the hub are able to easily drive 3-meter and 5-meter USB3 cables with great reliability.

It should be noted that the USB3 ports on many computers are very robust and can reliably drive longer cables. Some ports are not robust and require hubs.

**** When the Hub Needs an External Power Supply**

The hub does not need an external power supply if only the camera is connected to the hub. The hub receives its power through the USB3 cable from the USB3 port on the computer. The computer can easily supply enough power to run both the hub and the camera.

An external power supply may be necessary if other USB3 devices in addition to the camera are connected to the hub. It may be also necessary when the hub is connected to some tablet and laptop computers.

The unauthorized duplication or distribution of this software or documentation is an infringement of Diagnostic Instruments, Inc. rights to the software and may be subject to criminal and/or civil penalties.



6540 Burroughs Avenue • Sterling Heights • MI • 48314-2133
Toll free: 866.604.SPOT • Phone: 586.731.6000 • Fax: 586.731.6469
www.spotimaging.com