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NEW ELECTRONIC TECHNOLOGY

iCube

iCube SERIES

iCube Series User Operational Manual

User Operation Manual

For USB2.0 Cameras NSxxxx/KSxxxx Models

VERSION 2.0.0.6   Released February 2010

Legal Notice.

For Customers in U.S.A.

This equipment has been tested and found to comply with the limits for a Class B 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. 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. 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. 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 J of Part 15 of FCC Rules.

For customers in Europe

This apparatus has been certified to meet or exceed the standards for CE compliance per the Council Directives. Pertinent testing documentation is available for verification.

For customers in Canada

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

Pour utilisateurs au Canada

Cet appareil est conforme aux normes Classe B pour bruits radioélectriques, spécifiées dans le Règlement sur le brouillage radioélectrique.

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. NET customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify NET for any damages resulting from such improper use or sale.

Before You Start

This manual should help you in installation and setting of the camera and we recommend you to carefully follow the instruction described.
To ensure that your warranty remains valid, read the manual carefully before using the camera.
DO NOT disassemble, modify or repair the camera since there is no user serviceable part inside and may void warranty. For prevention of fire or electric shock DO NOT remove screws or cover from the camera.
Operation in wet environment is NOT recommended and camera SHOULD NOT be exposed to rain or moisture. For long life and use of camera's CCD, do not point the camera directly to the sun or strong spotlight which may result CCD blooming and permanent damage. DO NOT operate camera beyond operation temperature range stated and AVOID usage in conditions exceeding 90% humidity.
DO NOT use unregulated power supply source to prevent camera's circuit damage.
Use soft materials such as lens tissue or cotton tipped applicator with ethanol for CCD faceplate cleaning ONLY when necessary and AVOID contact with fingers or any hard object. Do not use solvent, abrasives or detergent in case of cleaning camera body.
Warranty shall be voided for improper usage or fault caused by user or damage caused by other equipments due to negligence

Warranty

NET GMBH warrants the original components free of defects for one year from purchase date. This warranty covers failures and damage due to defect which may occur during normal use. It does not cover damages or failure resulting from mishandling, abuse, misuse or modification. For every repair or replacement, RMA numbers must be obtained in advance.

Disclaimer

The information in this document has been carefully checked and is believed to be reliable. However, no responsibility is assumed for inaccuracies, nor is any responsibility assumed by NET GMBH. There is no legal obligation to documenting internal relationships in any functional module of its products, which is realized in either hardware or software.

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iCube Operation Manual

0. License

0.1 Limited License for Evaluation Version

Evaluation version of the NET GmbH Camera API(*iCube*SDK Library) is only compliant with cameras manufactured by NET GmbH and my not be operable with other cameras.
User may purchase the license by contacting our sales department or your local distributor for unlimited use of the API and it's function. Please refer to the standard EULA documents for details concerned with API License.

0.2 Note

NET GmbH Camera API(*iCube*SDK Library) only supports NET GmbH hardware and strictly forbidden to use or build Application for cameras or hardware from other venders with this API. The EVALUATION VERSION SOFTWARE is provided to you "AS IS" without warranty. The entire risk of the quality and performance of the software is with its users. We would appreciate feedback bug report of any kind, however, we can not guarantee satisfactory response.

0.3 Legal Notice

By installing, copying or otherwise using the SOFTWARE, you agree to be bound by the terms of the End User License Agreements (EULA). The SOFTWARE includes NET GmbH and NET GmbH suppliers' intellectual property.

Please read NET GmbH and NET GmbH suppliers' EULA before installing the SOFTWARE. If you do not accept the terms of the license agreements, please do not install copy or use this SOFTWARE.

1.0 Introduction

1.1 Overview
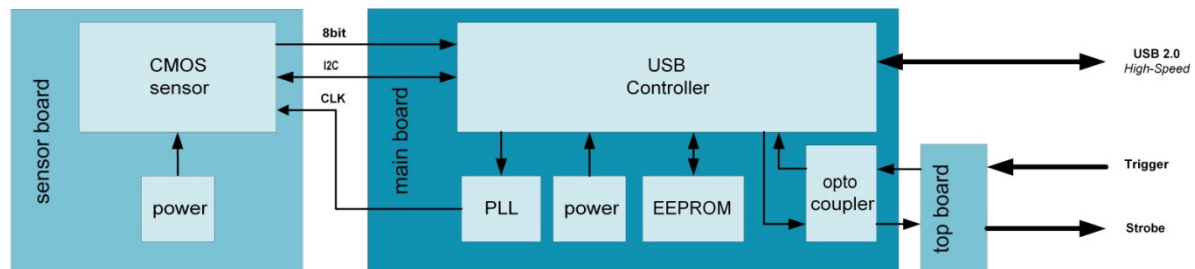
Model	type	size	pixel	resolution	H	V	system	ID	Firmware
NS1044BU KS1044BU	industry OEM	1/3"	0.36MP	WVGA	752	480	M	6	x.3.xx
NS1044CU KS1044CU	industry OEM	1/3"	0.36MP	WVGA	752	480	C	5	x.3.xx
NS1130BU KS1130BU	industry OEM	1/2"	1.3MP	SXGA	1280	1024	M	4	x.1.xx
NS1130CU KS1130CU	industry OEM	1/3"	1.3MP	SXGA	1280	1024	C	3	x.2.xx
NS1201CU KS1201CU	industry OEM	1/3"	2MP	UXGA	1600	1200	C	7	x.5.xx
NS1300CU KS1300CU	industry OEM	1/2"	3.2MP	QXGA	2048	1536	C	2	x.1.xx
NS1500BU KS1500BU	industry OEM	1/2.5"	5.0MP	QSXGA	2592	1944	M	8	x.4.xx
NS1500CU KS1500CU	industry OEM	1/2.5"	5.0MP	QSXGA	2592	1944	C	1	x.4.xx

1.2 Scope of Delivery

Components in our package

The package contains the following components:

NS-Version (housing)

iCube USB 2.0 housing camera

Opticl filter for color models

Trigger / Strobe cable

iCube CD-ROM includes:

Manuals

Driver

Viewer Software

SDK

Data sheets

KS- Version (OEM)

iCube USB 2.0 OEM camera

12mm lens holder

Trigger / Strobe cable

iCube CD-ROM includes:

Manuals

Driver

Viewer Software

SDK

Data sheets

1.3 Optional Accessories

Maschine Vision CCD Lens

Standard USB cable

Special USB cables with screw lock

Standard trigger / strobe cable

2.0 System Requirements

2.1 Hardware requirements

The *iCube* cameras need the following system requirements:

- USB 2.0 on board Interface

- Pentium IV processor with a clock frequency of at least 1.5 GHz or higher

Supported Interface	Host Controller	Comment
✔ USB 2.0	EHCI	*full support*
USB 1.1	OHCI/UHCI	*no support*
USB 1.0	OHCI/UHCI	no support

Application Notes:

- we prefer PCs with USB 2.0 on board. PCI or PCMCIA USB 2.0 adapters may have a lower performance
- the *iCube* need a "full powered" USB 2.0 interface (with 500mA)
- use only USB 2.0 cables for "high speed"

2.2 Software requirements

The following software is required to use NET GmbH Camera API;

> *iCube* Camera Device Driver
>
> Compiler : Microsoft Visual C ++ 6.0, C++ Builder 6.0
>
> Microsoft DirectX 9.0b or higher

The following software are required to use Cognex VisionPro software

> *iCube* Camera Device Driver
>
> *iCube* Cognex AIK Setup

2.3 Supported Plattforms

	Supported Plattforms	Service Packs	Comment
✔	Windows 7	-	*on request*
✔	Windows Vista	-	*on request*
✔	Windows XP	SP2 and higher	
✔	Windows XP embedded	SP1	with module "Device: image"
✔	Linux	Kernel 2.6.xx and higher	with USB Device filesystem (usbfs)

2.4 Enviroment Requirements

The following enviromental conditions are required:

Ambient temperature:	0°C …. 45°C	(32°F …. 113°F)
Storage temperature:	-20°C …. 60°C	(-4°F …. 140°F)

Do not subject the *iCube* camera to direct sunlight and moisture.

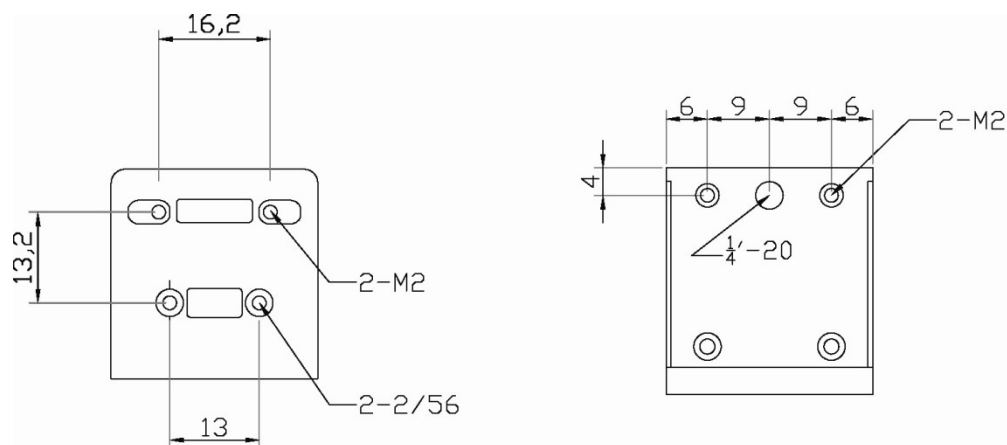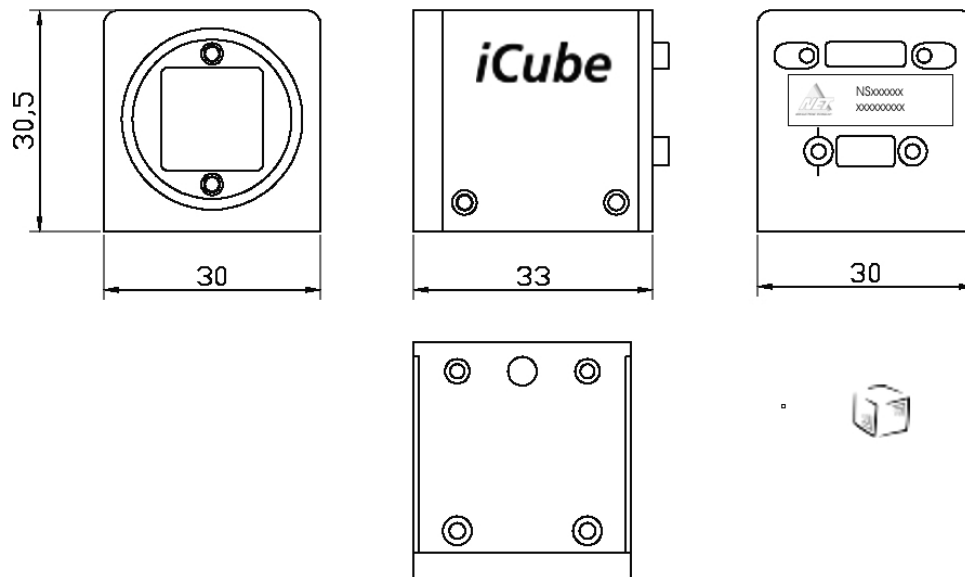The conditions for shock and vibrations are *on request* by NET.

3.0 Camera Specifications

3.1 Dimension and Description

NS-Version (housing)

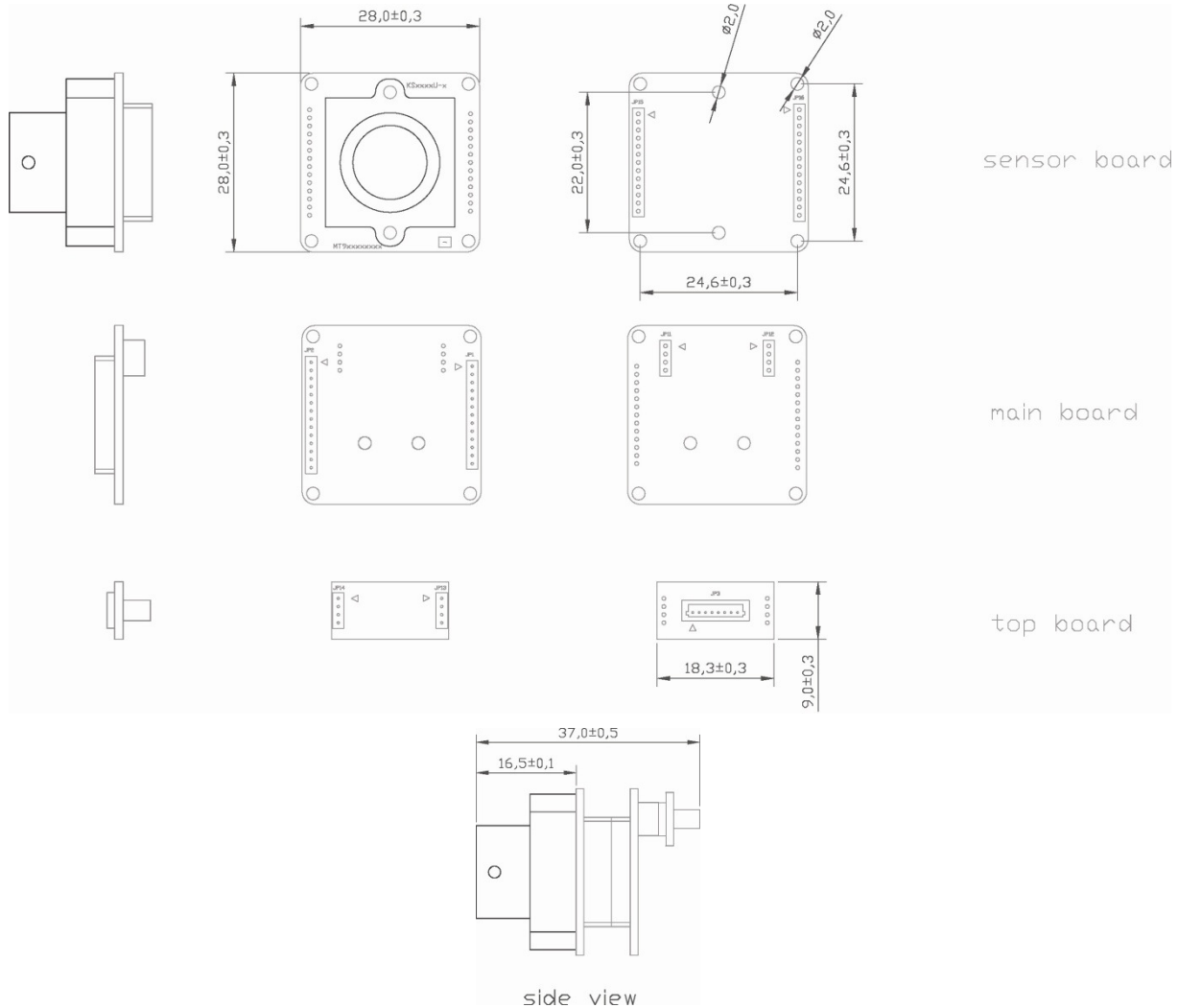Camera Body Size : 30(W) x 30.5 (H) x 33 (D) mm (without C-mount ring)

Camera Body Weight : 44g

KS- Version (OEM)

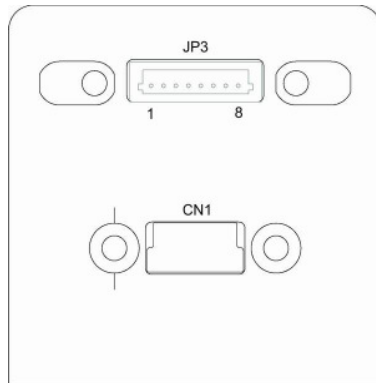PCA size   :   28 x 28 x 22 mm (without S-mount holder)

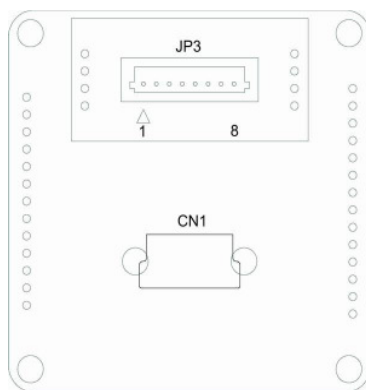Camera Body Weight   :   12g

3.2 Camera Interface

iCube series cameras interfaces are located on the back of the camera (assuming lens mount is front) as per the follows.

NS-Version (housing)

KS- Version (OEM)

JP3   **Trigger / Strobe**

JST   BM08B-SRSS-TB   *(compatible plug JST 08SR-3S)*

CN1   **USB 2.0 High Speed**

Mini USB Type B

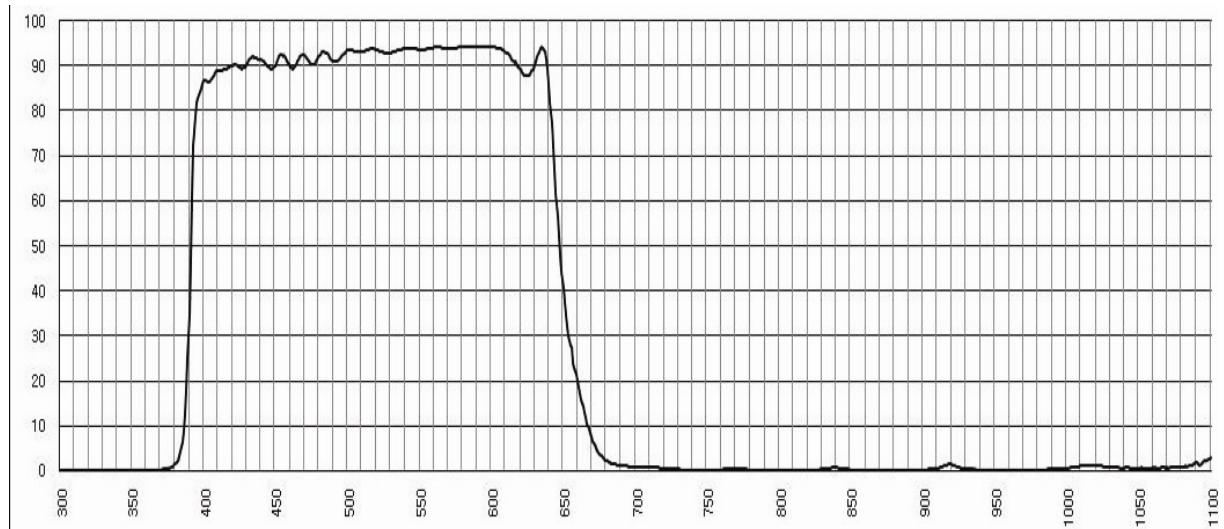## 3.3 Optical Filter

IR Cut Filter (only for color version NSxxxxCU)

Optical specification:

(1) Tave. ≥ 92% @ 420 ~ 620 nm

(2) Tmin. ≥ 88% @ 420 ~ 620 nm

(3) T=50%　　@ 650 ± 10 nm

(4) Tave. ≤ 5%　@ 690 ~ 1,100 nm

Transmittance Scan Trace:

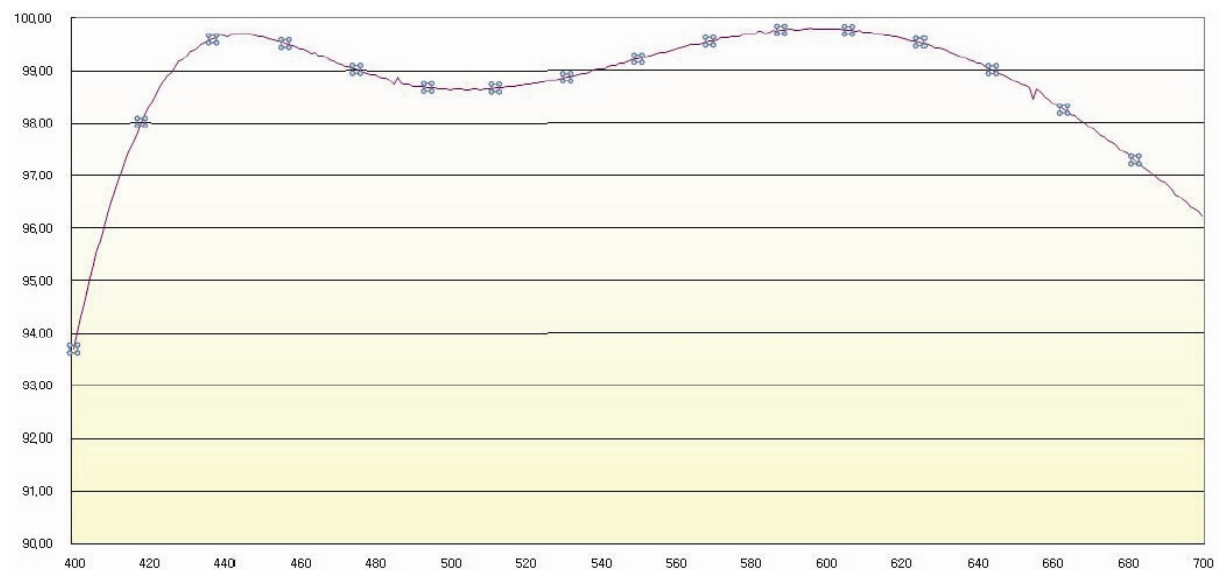**AR Filter** (only for B/W version NSxxxxBU)

Optical specification:

(1) Tave. ≥ 97% @ 420 ~ 680 nm

(2) Tabs ≥ 92%　@ 420 ~ 680 nm

Transmittance Scan Trace:

4.0 Software

4.1 Software CD

The software CD include following directories:

WINDOWS

00_Documentation
    iCube Operation Manual

    iCube SDI API Manual

03_Driver
    iCube Camera Device Driver 32bit

    iCube Camera Device Driver 64bit

    iCube Cognex AIK Setup

04_Viewer SW

    iControl viewer Software

05_Interfaces

    DShow

    SDK

        - C++
        - C++Builder

        - VB.NET

06_Misc

    dxRegistration

LINUX

    Full software package

Visit our website for the latest drivers and documentations about our software
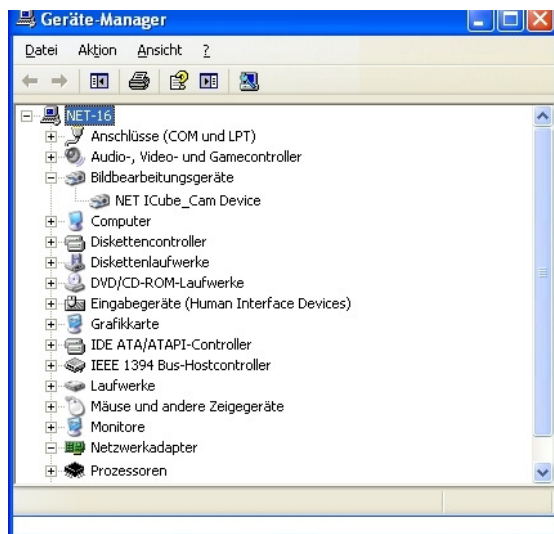
www.net-gmbh.com

4.2 Software Installation

**Administrator rights are necessary for installing a driver**

1. Copy the CD-Rom to your PC directory.

2. Plug in the USB 2.0 cable into your USB 2.0 port and the *iCube*.

3. Windows plug and play manager recognizes the new hardware.

4. Follow the instruction of the windows plug and play manager.

5. After the *iCube* driver was installed, you can see on the device Manager / imaging devices the recognized *iCube* camera.

→ NET *Icube*_Cam Device

Windows (german version)   Windows (english version)
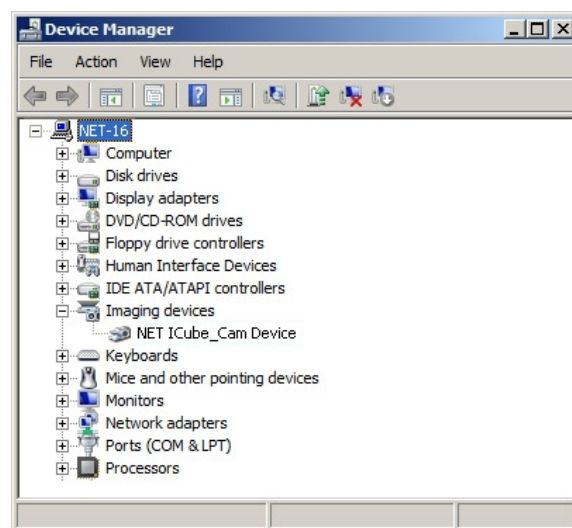
4.3 Software and Driver update

The latest drivers and documentations about our software are available on our homepage

www.net-gmbh.com

The software package includes following files:

- iControl viewer software

- USB driver

- API

- *iCube* Cognex AIK Setup

Please install the full package (iControl and USB driver) to get the right function.

After you have installed the full software package, you have to update the camera driver!

If an *iCube* camera is connected to the PC, please update the camera-driver (new .inf file) on the device manager (imaging devices) and select the driver manually.

4.4 Problems

NET GmbH Camera API (iCubeSDK Library) is the library consisting functions for the controlling the cameras produced by NET GmbH.

Due to heavy real-time data transfer and processing is involved, system performance especially CPU perform crucial for smooth operation. The API is may function smoothly under systems equipped with Pentium IV 1.5 Ghz or higher and possible performance degradation such as actual frame rate drop may occur for system with lower performance.

 "Camera peak bandwith. The maximum of the bandwith is defind by the USB chip set and the internal PC hardware.

If you can see following effects, please reduce the pixelclock of the iCube camera.
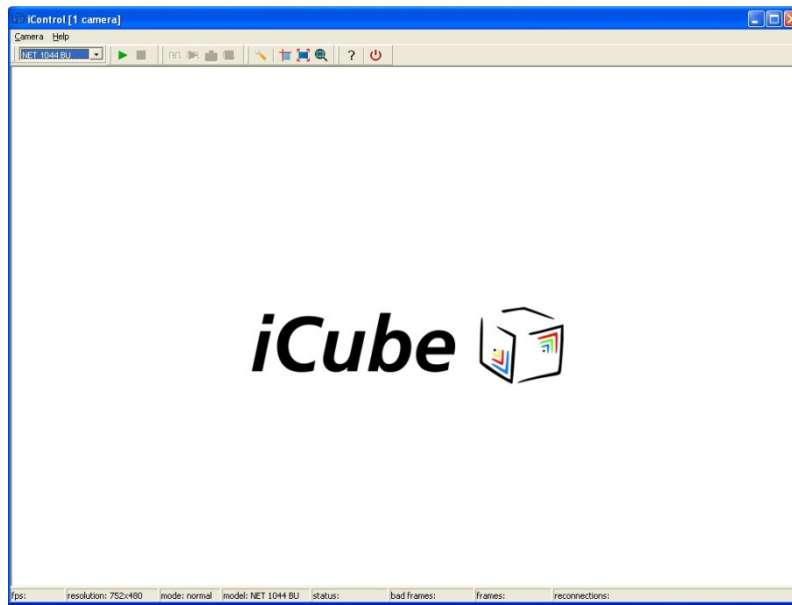
Effects:

Black image

Bad frames

Surge image

No maximal framerate

4.5 Applications

4.5.1   *iCube* iControl viewer software

The iControl software allows you to test the functionalities of the *iCube* camera on your own application. Apart from controlling the *iCube* camera, you can grab images and save them as jpg, bmp and tif files.

4.5.2   *iCube* dx-Registration

The *iCube* dx-Registartion software is to register more than one device as dx-capture filter

The *iCube* dx-Registartion software can be accessed as follows:

Connect all *iCube* cameras to PC.

1) Choose device to register.

You will see the connected camera with serial numbers in the ComboBox.

The selection of the dx-capture filter in 2) will change automatically,

when changing the device.

2)   Register the selected device.

The name in the square brackets is the dx-friendly-name,

which will appear in amcap for example.

4.5.3 *iCube* SDK sample

The *iCube* SDK samples show you how you can develop or integrate the *iCube* on your own application software.

On the CD-Rom you can find examples for following development software:

C++
C++Builder

VB.NET
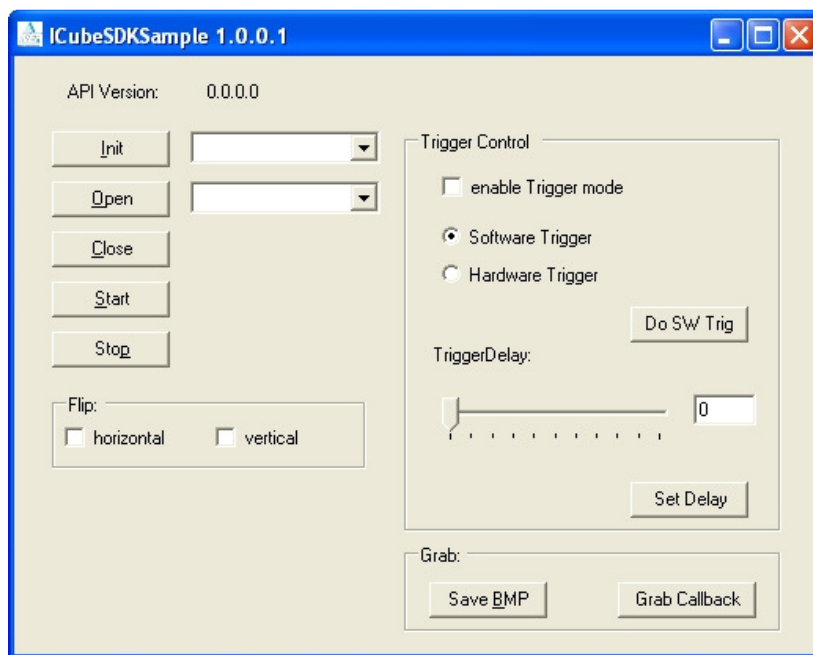
5.0 Camera specifications

5.1 Overview

INDUSTRIAL	NS1044BU	NS1044CU	NS1130BU	NS1130CU	NS1201CU	NS1300CU	NS1500BU	NS1500CU
OEM	KS1044BU	KS1044CU	KS1130BU	KS1130CU	KS1201CU	KS1300CU	KS1500BU	KS1500CU
Image Sensor	1/3" CMOS MT9V032		1/2" CMOS MT9M001	1/3" CMOS MT9M131	1/3" CMOS MT9D131	1/2" CMOS MT9T001	1/2.5" CMOS MT9P031/MT9P001	
Active Pixels	0.36MP, WVGA 752(H) x 480(V		1.3 MP, SXGA 1280(H) x 1024(V)	1.3 MP, SXGA 1280(H) x 1024(V)	2 MP, UXGA 1600(H) x 1200(V)	3.2 MP, QXGA 2048(H) x 1536(V)	5.0 MP, QSXGA 2592(H) x 1944(V)	
Pixel Size	6.00 x 6.00 µm		5.2 x 5.2 µm	3.6 x 3.6 µm	2.8 x 2.8 µm	3.2 x 3.2 µm	2.2 x 2.2 µm	
Image Area	4.51 x 2.88 mm		6.66 x 5.32 mm	4.6 x 3.7 mm	4.73 x 3.52 mm	6.55 x 4.92 mm	5.70 x 4.28 mm	
Frame Rate	86fps		25 fps	25 fps	15 fps	12 fps	6 fps	
Exposure Time (Freerun & Trigger) Shutter	0,024 - 763ms		0,035 - 572ms	0,039 - 630ms	0,053 - 860ms	0,056ms- 50s	0,074ms - 77s	0,075ms - 50s
Dynamic Range	>55dB		68.2dB	71dB	71 dB	61 dB	70.1 dB	67,4 dB
Binning	2x2/4x4		-		2x2	2x2/4x4	2x2/4x4	
Sub-Sampling Modes (Binning or Skipping)	320 x 192/ 128 x 64		640 x 512		768 x 576 / 384 x 256	1024 x 768 / 512 x 384	1280 x 960 / 640 x 448	
Shutter	Global Shutter		Rolling Shutter		Rolling Shutter	Rolling Shutter with Global Reset	Rolling Shutter with Global Reset	
Aspect Ratio	14 : 9		5 : 4		4 : 3	4 : 3	4 : 3	
Exact Real Diagonal	5,35mm		8,5 mm	5,9 mm	5,9 mm	8,2 mm	7,13 mm	
Power Consumption	<1.0W		<1.0W		<1.5W	<1.5W	<1.5W	
Gain	12dB		23,5 dB	24 dB	24 dB	18 dB	18 dB	
Lens Mount	C- / CS- mount, optional S-mount							
Scanning System	Progressive Scan							
Trigger	External Trigger / Software Trigger							
Strobe	Yes							
GPIO	1x							
Interface/Transfer Rate	USB2.0 Interface / 480 Mbits/sec							
Dimension	Cased: 30 (W) x 30.5 (H) x 33 (D) m, 44g Board: 28 x 28 x 22 mm, 12g							
USB Connection	Mini - B USB Connector							
Digital I/O Connection	8 pin lockable							

5.2 Specification

NET 1044 CU/BU

NET 1044 CU/BU		
	resolution	fps
WVGA	753x480	83
VGA	640x480	93
	320x240	170

Shutter Time: you can get the right exposure time [ms] with ***iCubeSDK_GetExposure()*** (SDK API Manual)

Binning Modes: 2nd Pixel, 4th Pixel *(only pixelclock > 15MHz)*

Skipping Modes: none

1044CU/BU: Nominal Gain Range: 1-8

Nominal Range	Increments:	Setting values:
1.000 - 1.9375	0.0625	0x10-0x1f
4.00 - 8.00	0.125	0x20-0x40

NET 1130 CU/BU

NET 1130 CU/BU		
	resolution	fps
SXGA	1280x1024	25
XGA	1024x768	39
SVGA	800x600	65
VGA	640x480	83

Shutter Time: you can get the right exposure time [ms] with ***iCubeSDK_GetExposure()*** (SDK API Manual)

Binning Modes: none

Skipping Modes: 2nd Pixel

1130BU: Nominal Gain Range: 1-15

Nominal Range	Increments:	Setting values:
1.000 - 4.000	0.125	0x08-0x20
4.25 - 8.00	0.25	0x51-0x60
9 -15	1	0x61-0x67

1130CU: Nominal Gain Range: 1-21.875

Nominal Range	Increments:	Setting values:
1.000 - 3.96875	0.03125	0x20-0x7f
4 - 7.9375	0.0625	0x80-0xbf
8 - 21.875	0.125	0x81-0xf0

NET 1300 CU

NET 1300 CU		
	resolution	fps
QXGA	2048x1536	12
UXGA	1600x1200	18
SXGA	1280x1024	27
XGA	1024x768	32
SVGA	800x600	46
VGA	640x480	65

Shutter Time: you can get the right exposure time [ms] with *iCubeSDK_GetExposure()* (SDK API Manual)

Binning Modes: 2nd Pixel, 4th Pixel

Skipping Modes: 2nd Pixel, 4th Pixel

1300CU: Nominal Gain Range: 1-128

Nominal Range	Increments:	Setting values:
1.000 - 4.000	0.125	0x0008 - 0x0020
4.25 - 8.00	0.25	0x0051 - 0x0060
9 - 128	1	0x0160 - 0x7860

NET 1500 CU/BU

NET 1500 CU/BU		
	resolution	fps
Q5XGA	2592x1944	6
QXGA	2048x1536	12
UXGA	1600x1200	18
SXGA	1280x1024	27
XGA	1024x768	32
SVGA	800x600	46
VGA	640x480	65

Shutter Time: you can get the right exposure time [ms] with ***iCubeSDK_GetExposure()*** (SDK API Manual)

Binning Modes: 2nd Pixel, 4th Pixel

Skipping Modes: 2nd Pixel, 4th Pixel

1500CU/BU: Nominal Gain Range: 1-8.00

Nominal Range	Increments:	Analog Multipler	Setting values:
1.000 – 4.00	0.125	0	0x08 - 0x20
4.24 - 8.00	0.25	1	0x11 - 0x20

5.3 Spectral Sensivity

NET 1044 BU
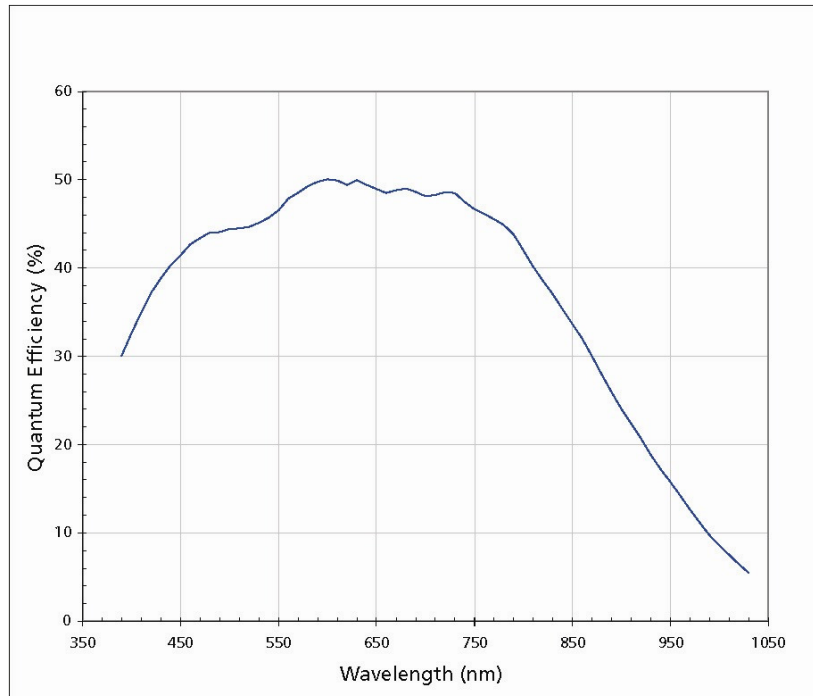
NET 1044 CU
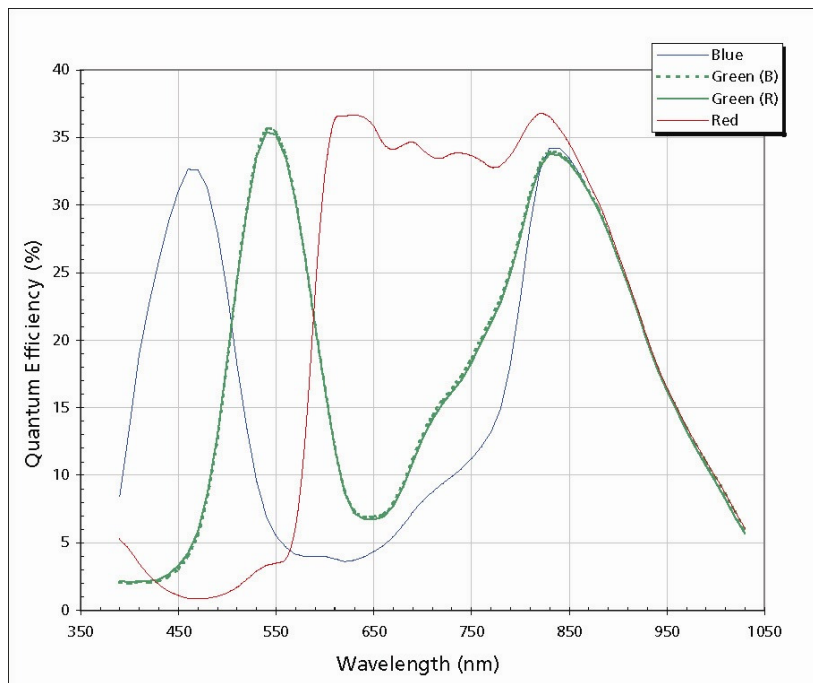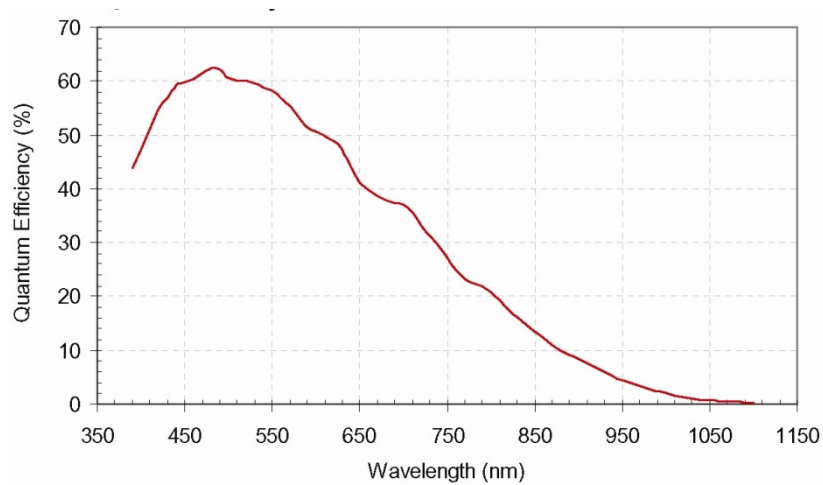
NET 1130 BU
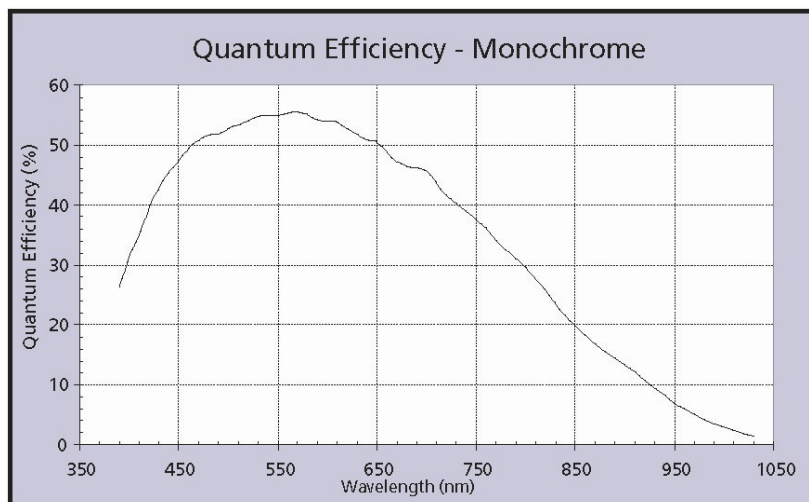
NET 1130 CU
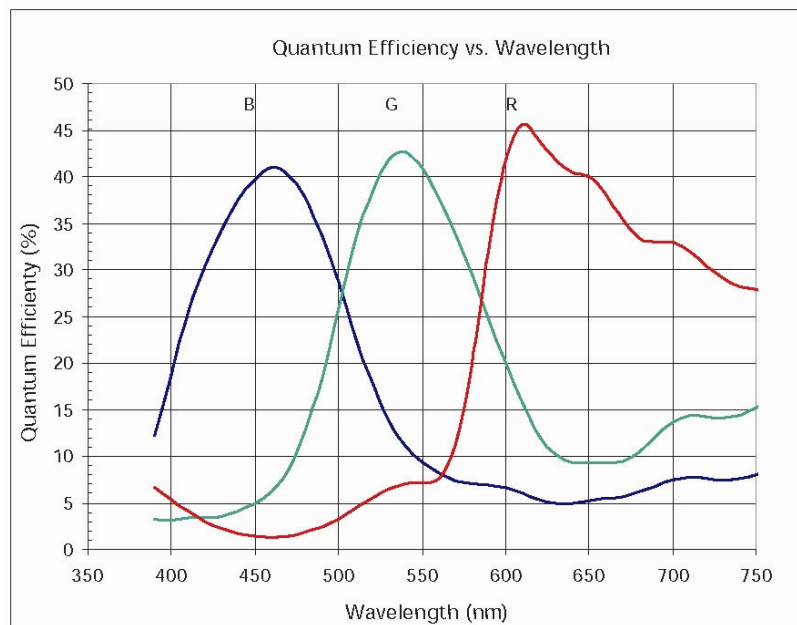
NET 1201 CU
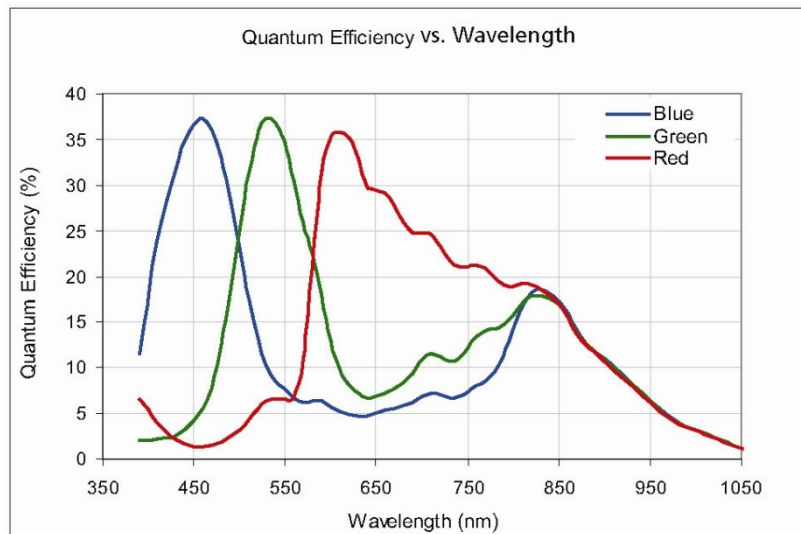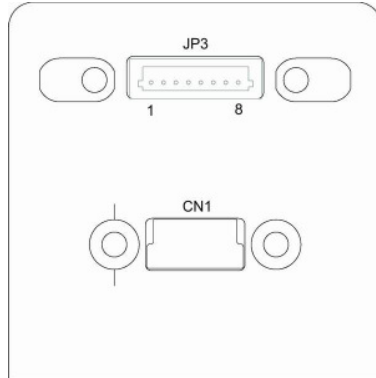

NET 1300 CU
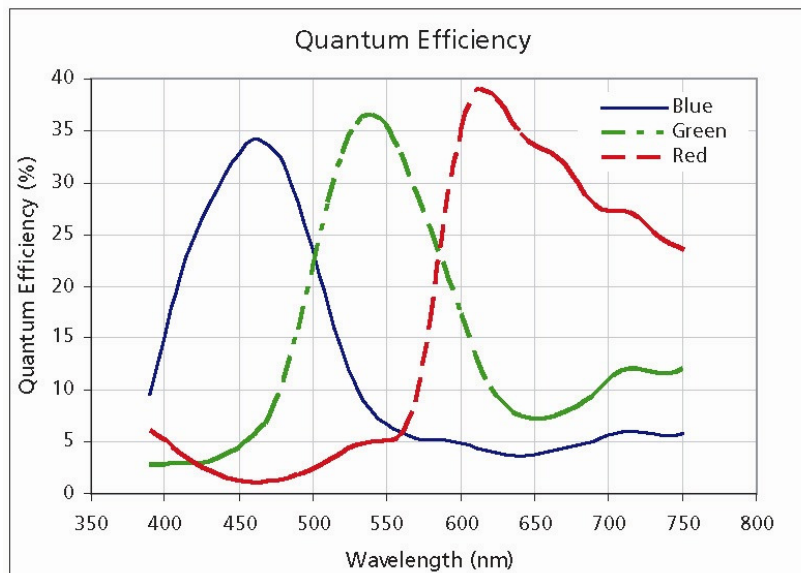
NET 1500 CU
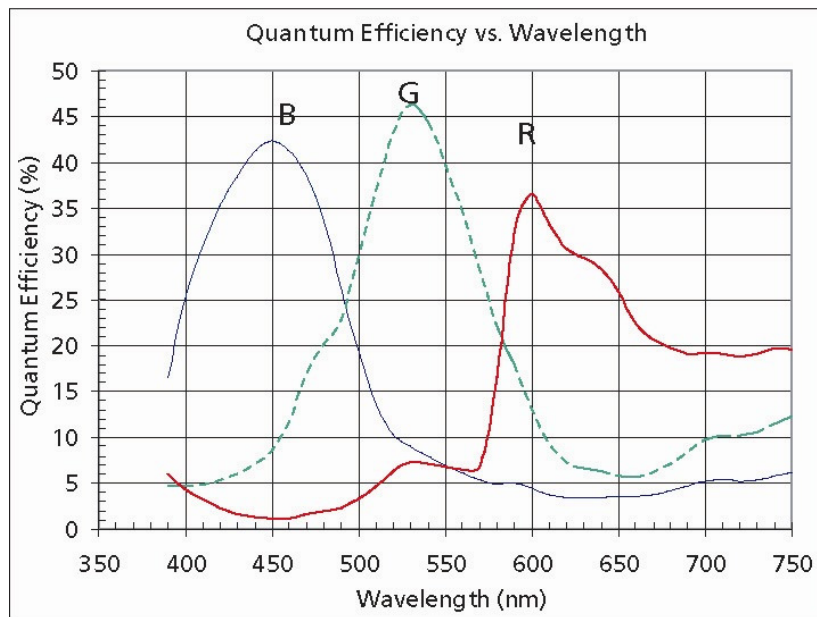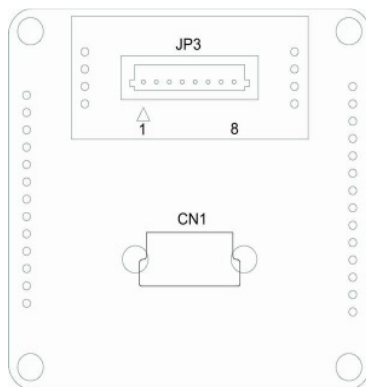

NET 1500 BU

6.0 Trigger / Strobe

6.1 Pinout

NS-Version (housing)

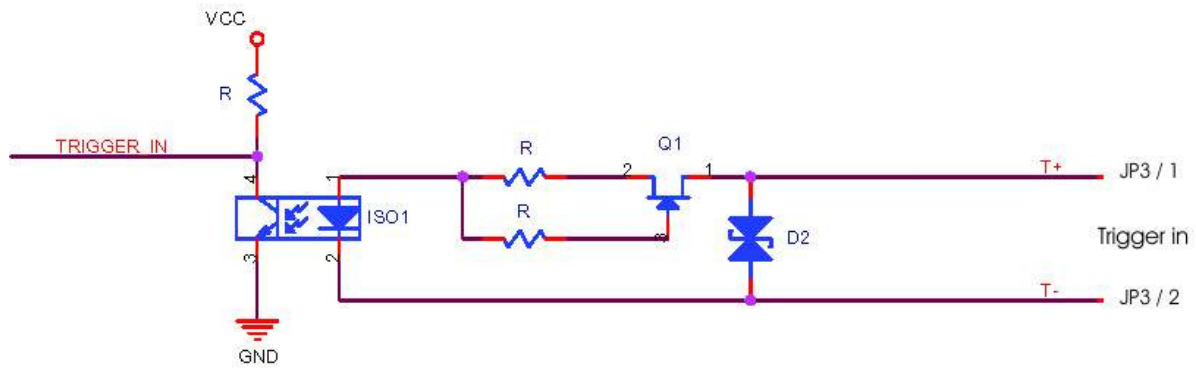*KS- Version (OEM)*

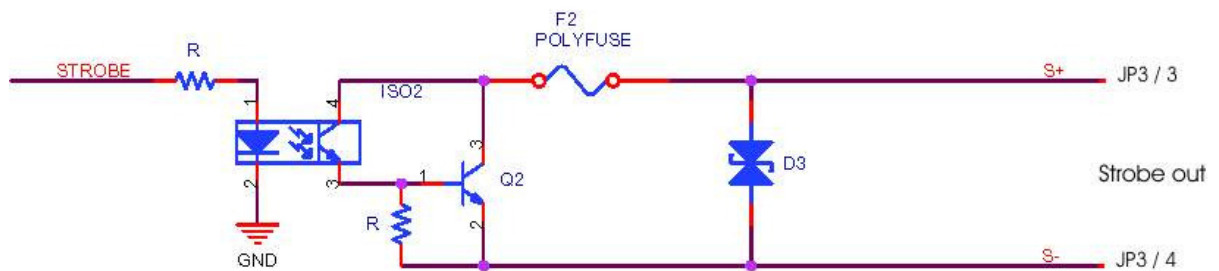<u>**JP3**</u>

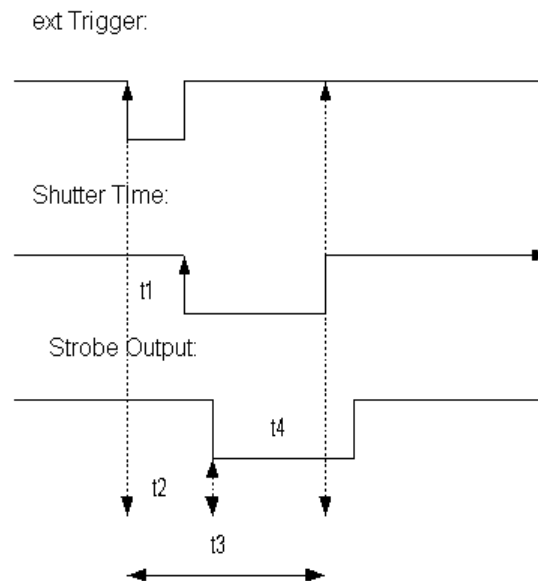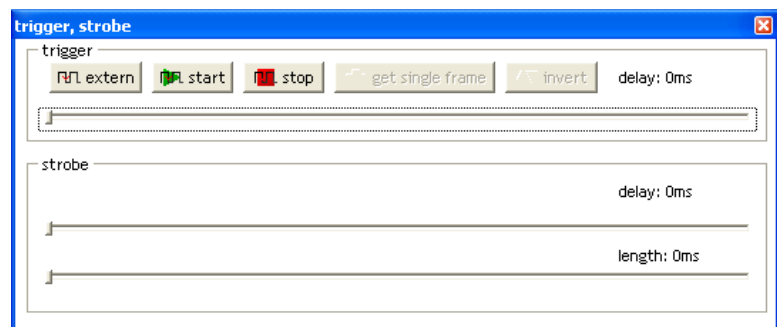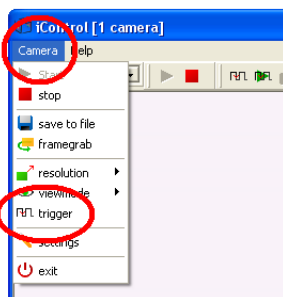|		
1	T+	(Trigger)
2	T-	(Trigger)
3	S+	(Strobe)
4	S-	(Strobe)
5	PD2	(Service)
6	PD3	(Service)
7	PD4	(Service)
8	GND	

6.2 Trigger Input

6.3 Strobe output

6.4 Trigger timing:

t1:   ext. Trigger Delay Time (min 70μsec.)

t2:   Strobe Delay Time (min 70μsec.)

t3:   ext. Trigger prohibited zone

t4:   Strobe Length (min 140μsec.)

The strobe output can be adjust via the iControl software

Note: adjust strobe length > 0ms

NET 1130BU

With this camera you can use the software trigger.
In this case you get a signal on the strobe output.
This function works as free run (shutter).
You also can adjust the exposure time (250us to 1ms) and on the next frame the exposure time is set.

Technical Support

NET ensures the conformity of our product to be reliable and free from defects during manufacturing by testing all the cameras before release. However, unexpected problems and technical issues may come up due to the complexity of the product. In case you require technical support; contact the agent near you or contact NET directly at the following locations:

Europe	http://www.net-gmbh.com
USA	http://www.net-usa-inc.com
Asia	http://www.net-japan.com

Support Team Email :

Europe	info@net-gmbh.com
USA	info@net-usa-inc.com
Asia	info@net-japan.com

Support Team Phone :

Europe	+49 8806 92 34-0
USA	+1 219 934 9042
Asia	

Support Team Fax :

Europe	+49 8806 92 34-77
USA	+1 219 934 9047
Asia	+81 45 476 2423

In case of an RMA, you must first contact NET and obtain an RMA Number before sending the product to us. We are not responsible for any problems caused by not following the RMA procedure.