# Gigabit Ethernet uEye®

## Your imagination is our challenge

# uEye® – It's so easy

## Features at a glance

- Universal use with PC, notebook, IPC and embedded systems with Gigabit Ethernet interface
- Resolutions from VGA (640x480) to 5 megapixels (2560x1920)
- High-quality CCD and CMOS sensors
- Color depth up to 12/36 bits *
- Up to 100 full frames/sec., over 1000 frames/sec. with AOI
- One universal driver and one SDK for all uEye® camera models
- Firmware upload philosophy ensures identical, up-to-date versions in multi-camera environments
- Straight and 90° angled versions
- Multi I/O interface: 1 trigger, 1 digital out, 2 GPIOs and 1 serial RS232 port
- 6 - 24 V power supply
- Compact, symmetrical housing with C-mount lens connector and adjustable mounting dimensions
- Standard interfaces such as Direct Show (WDM) and interfaces for popular image processing software available: e.g. Common Vision Blox, HALCON, LabView and NeuroCheck
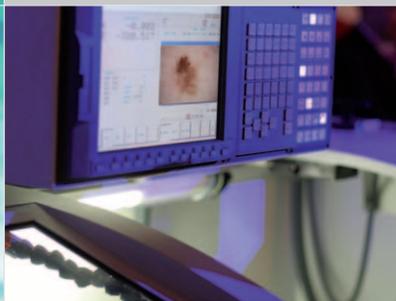- GenICam™ Interface in preparation *

## The Gigabit Ethernet uEye® Series

The GigE uEye® series is not only the logical continuation of the uEye® USB range, but takes it to a higher level with a rich set of additional features. The 12 or 36 bit color depth, the significantly enhanced I/O functionality and the housing design open up new possibilities and introduce a new class of performance. The new interface provides additional advantages: These range from higher frame rates and a higher bandwidth for multi-camera applications to uncompromising cable lengths and proven, highly available periphery, depending on the individual sensors.

## GigE Plug and Play

Our new Camera Manager enables configuring and controlling the GigE uEye® as quickly and as simply as you are familiar with. The GigE and the USB uEye® cameras also employ the same SDK. Using both technologies simultaneously is just as easy to do as migrating from USB to Ethernet, and vice versa. For users who want an even more universal solution, we also offer the GenICam™* interface for all uEye® cameras. It's so easy!

GEN<i>CAM
TRANSPORT LAYER

1288
EMVA Standard Compliant

* Software support available by end of 2008

# uEye® Solutions for...

**Automation
and quality assurance**

**Analysis
and documentation**

**Comparing
and archiving**

**For possible applications of our
products please visit:
www.ids-imaging.com/casestudies**

## ■ Industry

Implement quick and simple solutions in process automation, robotics and quality assurance. Standardized interfaces provide you with flexibility. Migrating from analog or USB to Gigabit Ethernet is simplified by the SDK, which is specially adapted for this purpose or, in the case of USB, even identical.

## ■ Diagnostics

The uEye® cameras are designed around the latest sensor technology making them ideal for applications such as microscopy, microscopic measurement and non industrial imaging. Advanced color depth ensures the dynamics required for accurate calculations. The built-in Ethernet interface makes it possible for the cameras to be accessed via the network.

## ■ Security technology

High-resolution sensors achieve a high level of detail and allow image acquisition in the near-infrared range. A built-in memory enables temporary storage of images in the camera, and extended universal I/O ports are provided, e.g. for controlling lenses, lighting, motorized domes, etc.

iDS:  3

Gigabit Ethernet uEye® camera
with C-mount lens connector

Dimensions:
38 x 38 x 89,5 mm (W x H x D)
Weight: 170 g

## Field removable/ Changeable filter

The new filter design gives the custo-mer the ability to easily remove and/or replace the filter. The dustproof design of the sensor sealing underneath it ensures consistent and reliable pro-tection against contamination.

## Pixel pre-processing

Built-in pre-processing frees up the host CPU by performing shading correction as well as Bayer conversion into multiple color formats.

## Image memory

The integrated 64 MB image memory ensures lossless data transfer and serves as a buffer for multi-camera operation.

## Back focus adjustment

The C-Mount ring can be adjusted beyond the standard range by 50 µm increments. This fine tuning of the flange back dis-tance is ideal for special and borderline telecentric lenses.

## Symmetrical housing

The camera can be mounted at any 90° angle around the optical axis. The front provides identical mounting holes all around, the rear side can be secured with one or two additional screws.

## Smart features

Histogram generation for auto features, text overlay, checksum transmission and image compres-sion can be carried out directly in the camera to reduce load on the host.
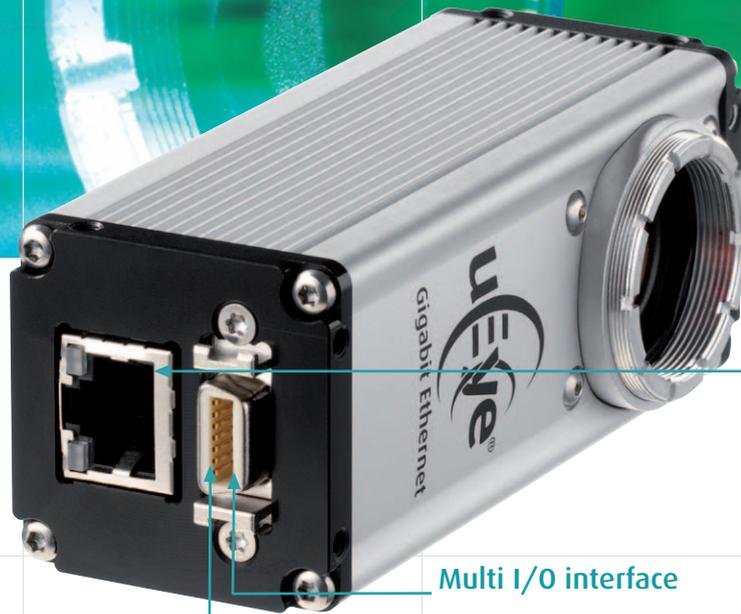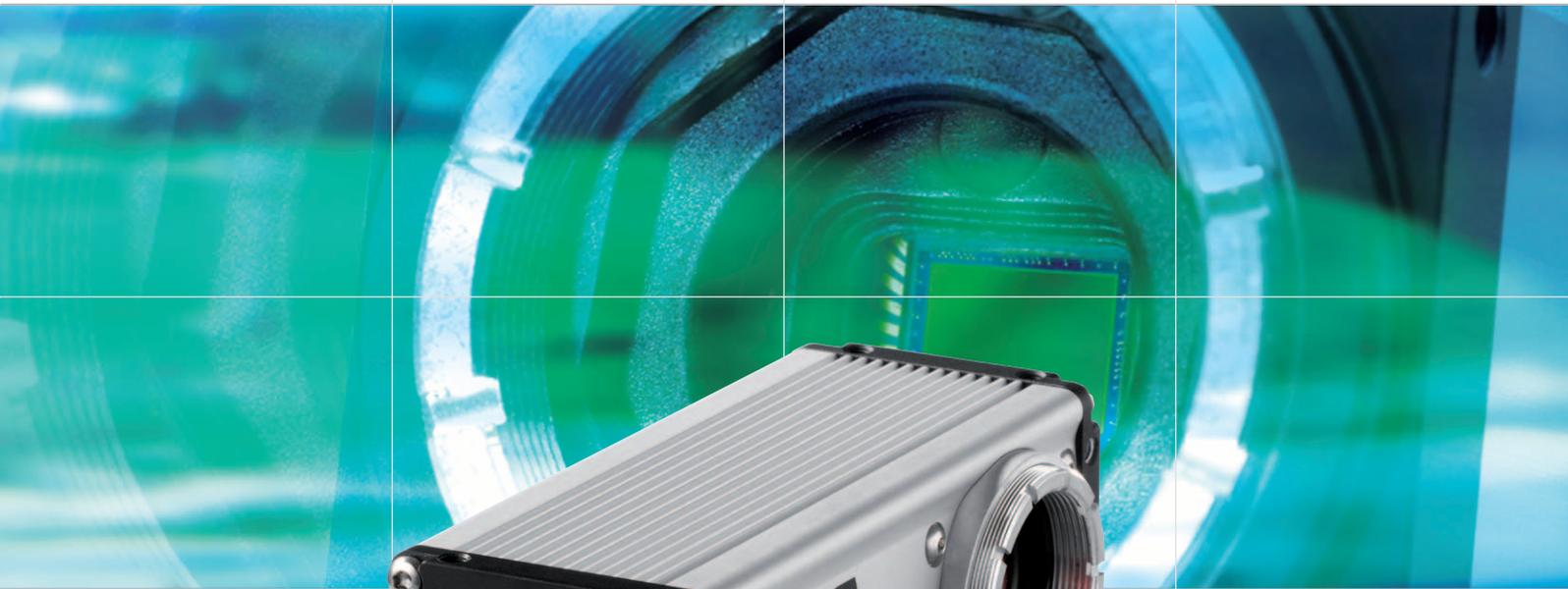
Gigabit Ethernet 90° uEye® camera
with C-mount lens connector

**Dimensions:**
**38 x 97,2 x 38 mm (W x H x D)**
**Weight: 180 g**

## Enhanced image quality

Up to 12 bits (monochrome) and 36 bits (color) per pixel allow for high-fidelity rendering. This offers you significant advantages when working with color-critical applications or processing images in the sub-pixel range.

## Multi I/O interface

The GigE uEye® comprises one trigger and one flash output, which are both optically decoupled. Two general-purpose I/Os (GPIOs) and one serial RS232 port are provided for communication with external peripherals.
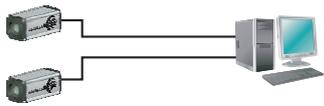
## Gigabit Ethernet

The GigE uEye® reveals its true performance potential on 1000 Mbit networks, but it can also be used on the slower 100 Mbit networks. The integrated cable tester and the two color status LEDs facilitate on-site diagnosis.
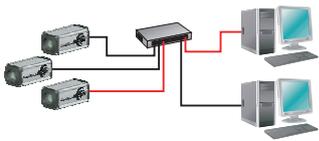
## Dual-core processing

Two separate processors ensure powerful performance so that you can simultaneously send and receive data as well as profit from other configuration-specific features.

## New operating modes

New trigger functions enable you to automatically acquire multiple images. The group trigger has been specially implemented for use in multi-camera applications.

## Flexible power supply

The camera operates with a supply voltage of 6V to 24V. Therefore, neither the typical 24V used in mechanical engineering nor the usual 12V of PC environments need to be converted.

# The Second Half of the Camera



**Direct connection to the PC**



**Connection via switches**



**Simultaneous operation with USB cameras**



All the parameters at a glance:
The uEye® Camera Manager

## One-stop configuration

The uEye® Camera Manager is the central point for managing the uEye® cameras connected to the system. You can choose, for example, whether you want to configure the IPs of the Gigabit Ethernet cameras automatically or manually. You can also set the camera ID and the individual branding. The Expert mode gives you additional details on the connected cameras, e.g. the IP addresses and network adapters that are used, the camera temperature and, with USB uEye® cameras, the USB root hub used. This central tool to helps you avoid bottlenecks and achieve maximum performance.

# Easy Integration
## Thanks to Comprehensive Software

The uEye® SDK offers over 100 functions

Over 20 demos provided in source code facilitate integration

Interface variety gives you good cards for quick integration

## Programming languages and libraries

To make integration as easy as possible and allow use of your familiar development environment, we support the following programming languages: C, C++, C#, Microsoft .NET and Visual Basic. We also provide 3rd party software drivers for Common Vision Blox, HALCON, LabView and NeuroCheck.

---

**Application Level**

Image Processing Libraries

| TWAIN Interface | ActiveX Interface | Direct Show Interface | GenICam™ Interface* | Library Interface |

**uEye® SDK**

**uEye® USB Driver**
Windows 2000/XP/Vista, Linux, Windows CE on request

**uEye® Gigabit Ethernet Driver**
Windows 2000, Windows XP, Windows Vista, Linux*

*Components of the uEye® software package*

\* In preparation

iDS:
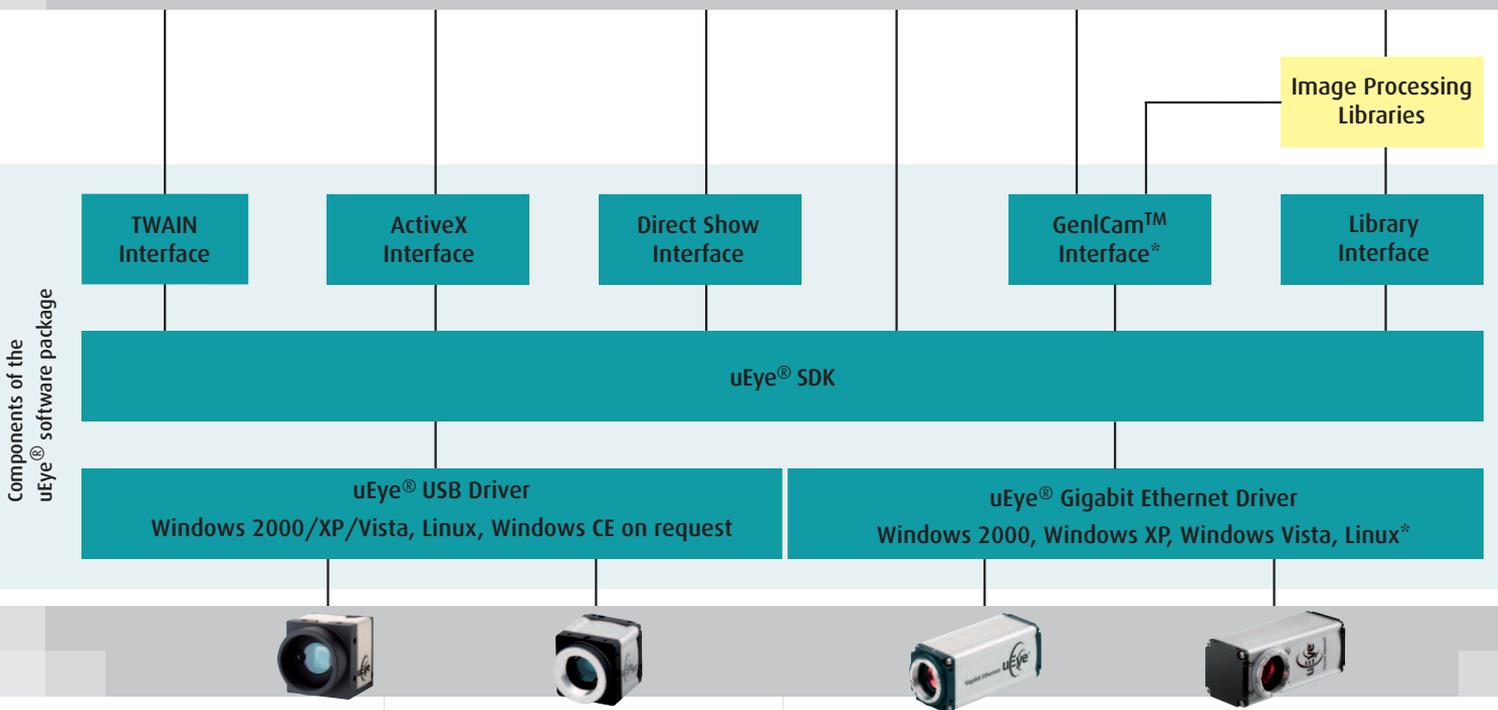
# Software in Detail
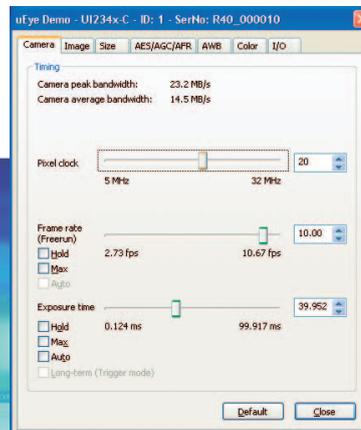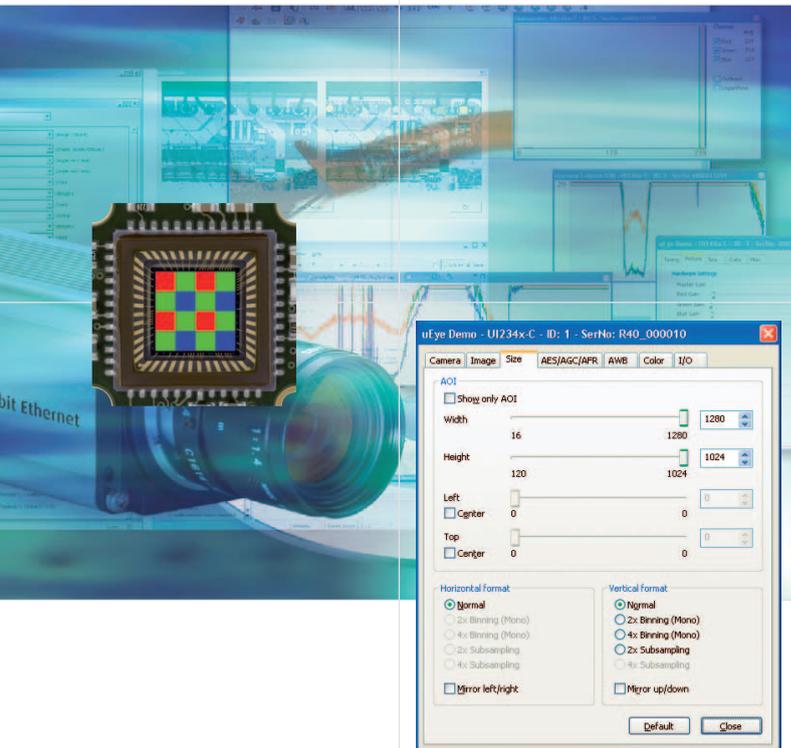
Sample programs and the uEye®
demo program in source code serve
as a programming model and allow
quick integration
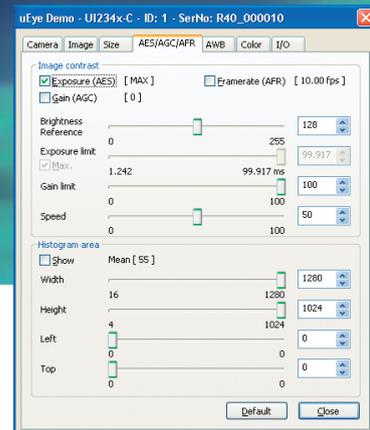
## Uniform Firmware

The firmware upload automatically ensures that all the cameras of a system use the same version. To upgrade the functionality of all connected cameras USB and GigE all you need to do is update the driver in your PC once. You can also freeze a version without problems in this way. Future camera models do not have to be adapted.

The firmware does not have to be changed separately for each camera, which is a major advantage for certified systems. Multi-camera multi-PC systems also support the use of different firmware versions on the individual PCs. The version supplied by the system is used when initializing the camera.

## Image Management

The camera provides a memory capacity of 64 Mbytes exclusively for image data. This memory is managed as a ring buffer. With the new trigger modes you can record e.g. sequences and pre- or post-trigger events. The memory also serves as a buffer for forwarding packets, for example, or for allowing the transmission of pixel data on the slower 100 Mbit networks. When using monochrome cameras, you can correct the shading to compensate for inhomogeneous lighting and lens artifacts.

## Color Rendering

The camera can calculate colors internally and reduce the load on the host CPU. The raw Bayer data are converted at up to 36 bits per pixel, depending on the model. The Gamma and Color Correction features also benefit from the increased bit depth and produce top-quality color images. 12 different transmission formats permit flexible use. Along with the new RGBY format, color cameras also output monochrome information. Last but not least, the planar formats popular in image processing have also been implemented.
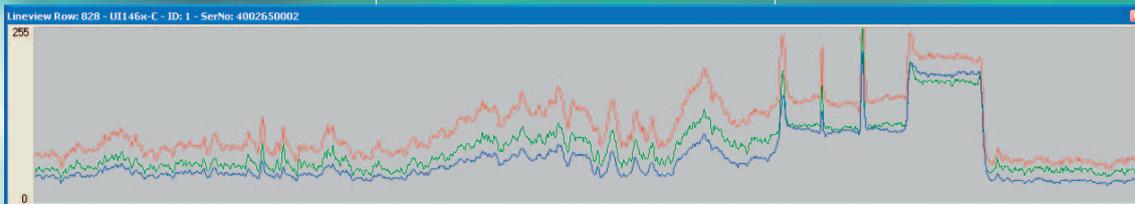
**Finding the right settings and acquiring the first image without a line of code – with the help of the uEye® demo program**

## Flexible Camera Integration

With over 100 functions the uEye® Software Development Kit (SDK) gives you all the possibilities to integrate the camera under C++, C#, Microsoft.NET and Visual Basic. Basic camera functions allow controlling the camera timing, frame size and image representation. More than 20 demo programs, provided in source code, facilitate your first steps in programming.

## uEye® Demo

The supplied uEye® demo program allows you to start acquiring images with your uEye® camera in no time at all. It also allows you to perform image measurement and annotation, in addition to giving you all the tools to configure the camera settings so that it can be optimized for your application.

## Auto Features

To facilitate working with the uEye® camera under changing lighting conditions, the uEye® software offers three automatic image control functions: Auto Exposure, Auto Gain and Auto White Balance. Following selectable control criteria, the camera driver adjusts exposure times and signal amplification on the sensor (hardware gain) and performs the white balance for the relevant color temperature of the light.

## Area of Interest (AOI) Binning and Subsampling

In AOI mode the uEye® camera reads out only a selected part of the sensor area. This increases the possible frame rate of the camera: At half the frame height, e.g., uEye® CCD cameras are 60%-80% faster and uEye® CMOS cameras almost 100% faster!

Depending on the camera model, you can use the binning and/or subsampling functions to decrease the resolution without reducing the sensor's field of view.

# All uEye®-Models at a Glance

| | | | | | | |
|---|---|---|---|---|---|---|
| **Sensor Technology** | CMOS | CMOS | CMOS | CMOS | CMOS | CMOS |
| **Model (Mono)** | UI-5220-M | UI-5540-M | - | - | - | UI-5480-M |
| **Model (Color)** | UI-5220-C | - | UI-5640-C | UI-5550-C | UI-5460-C | UI-5480-C |
| **Resolution (h x v)** | 752 x 480 | 1280 x 1024 | 1280 x 1024 | 1600 x 1200 | 2048 x 1536 | 2560 x 1920 |
| **Resolution Category/Pixel Class** | WVGA | SXGA/1.3 MP | SXGA/1.3 MP | UXGA/2 MP | SUXGA/3.2 MP | QSXGA/5 MP |
| **Sensor Size** | 1/3" | 1/2" | 1/3" | 1/3" | 1/2" | 1/2" |
| **Shutter** | Global | Rolling | Rolling | Rolling | Rolling | Rolling/Global Start |
| **Max. fps in Freerun Mode at full resolution** | 100 fps | 35 fps | 25 fps | 25 fps | 15 fps | 12 fps |
| **Max. fps in SW Trigger Mode at 1 ms exposure** | 75 fps | 33 fps | 23 fps | 23 fps | 14 fps | 11 fps |
| **Exposure Time in Freerun Mode** | 70 µs - 5,5 s | 26 µs - 983 ms | 37 µs - 10 s | 27 µs - 12,8 s | 41 µs - 1750 ms | 37 µs - 2,7 s |
| **Exposure Time in Trigger Mode** | 70 µs - 5,5 s | 26 µs - 983 ms | 37 µs - 10 s | 27 µs - 12,8 s | 41 µs - 750 ms | 37 µs - 2,7 s |
| **AOI-Modes** | H² + V² | H² + V² | H² + V² | H² + V² | H² + V² | H² + V² |
| **Mono: Min./max. width, raster** | 16 - 752, 4 | 32 - 1280, 4 | 32 - 1280, 4 | - | - | - |
| **Color: min./max. width, raster** | 16 - 752, 4 | 32 - 1280, 4 | 32 - 1280, 4 | 16 - 1600, 4 | 16 - 2048, 4 | 32 - 2560, 4 |
| **Mono: min./max. width, raster** | 4 - 480, 2 | 4 - 1024, 2 | 4 - 1024, 2 | - | - | - |
| **Color: min./max. width, raster** | 4 - 480, 2 | 4 - 1024, 2 | 4 - 1024, 2 | 4 - 1200, 2 | 4 - 1536, 2 | 4 - 1920, 2 |
| **AOI Frame Rate Example from the image center** | 640 x 480, 115 fps | 1024 x 768, 54 fps | 1024 x 768, 40 fps | 1280 x 720, 49 fps | 1920 x 1080, 23 fps | 1920 x 1080, 25 fps |
| | 320 x 240, 231 fps | 640 x 480, 115 fps | 640 x 480, 90 fps | 1024 x 768, 56 fps | 1280 x 720, 74 fps | 1024 x 768, 50 fps |
| | 160 x 120, 390 fps | 320 x 240, 320 fps | 320 x 240, 265 fps | 640 x 480, 122 fps | 640 x 480, 112 fps | 640 x 480, 100 fps |
| **Binning-Modes** | H² + V²  (Mono) | - | - | H² + V² | H² + V² | H² + V² |
| **Binning-Method** | H + V: Average | - | - | H: Average V: Average | H: Sum V: Average | H: Sum V: Average |
| **Binning-Factors,** | 2x, 368 x 240, 185 fps | - | - | 2x, 800 x 600, 73 fps | 2x, 1024 x 768, 42 fps | 2x, 1280 x 960, 29 fps |
| **Resolution, fps** | 4x, 176 x 120, 328 fps | - | - | - | 4x, 512 x 384, 72 fps | 4x, 640 x 480, 45 fps |
| **Subsampling-Method** | - | H² + V² (Pairing) | H² + V² | H² + V² | H² + V² | H² + V² |
| **Subsampling-Factors,** | - | 2x, 640 x 512, 110 fps | 2x, 640 x 512, 85 fps | 2x, 800 x 600, 85 fps | 2x, 1024 x 768, 52 fps | 2x, 1280 x 960, 37 fps |
| **Resolution, fps** | | 4x, 320 x 256, 305 fps | 4x, 320 x 256, 254 fps | 4x, 400 x 300, 250 fps | 4x, 512 x 384, 155 fps | 4x, 640 x 480, 103 fps |
| **Mono: Maximum Gain** | 4x | 12x | - | - | - | - |
| **Color: Maximum Gain RGB/Master** | 5x (SW)/4x | - | 3,1x/3x | 3,1x/3,5x | 7,25x/12x | 6,5x/12x |
| **Additional Gain Boost with Factor** | 1,6x | 1,5x | 2x | 2x | 2x | 1,6x |
| **Sensor Model** | MT9V022 | MT9M001 | MT9M131 | MT9D131 | MT9T001 | MT9P031 |
| **Pixel Clock** | 5 - 46 MHz | 5 - 61 MHz | 5 - 40 MHz | 5 - 60 MHz | 5 - 60 MHz | 5 - 82 MHz |
| **Pixel Pitch in µm** | 6,0 µm | 5,2 µm | 3,6 µm | 2,8 µm | 3,2 µm | 2,2 µm |
| **Full Well Capacity** | 30.000 e- | 40.000 e- | | | 20.000 e- | 15.000 e- |
| **Optical Size** | 4,51 x 2,88 mm | 6,66 x 5,32 mm | 4,61 x 3,69 mm | 4,48 x 3,36 mm | 6,55 x 4,92 mm | 5,63 x 4,22 mm |
| **Exact Real Diagonal** | 5,4 mm, 1/3,0" | 8,5 mm, 1/1,9" | 5,9 mm, 1/2,7" | 5,6 mm, 1/2,9" | 8,2 mm, 1/2,0" | 7,0 mm, 1/2,3" |
| **Aspect Ratio** | 14:9 | 5:4 | 5:4 | 4:3 | 4:3 | 4:3 |

² = Use increases frame rate
* = Planned

■ **Delivery includes**

uEye® camera, installation CD with drivers, demo programs, program examples, tools and documentation

■ **System requirements**

PC with 1.5 GHz, 512 MB RAM; operating system: Windows 2000 -SP4, Windows XP -SP2, Windows VISTA, Linux Kernel 2.6˚, Ethernet interface

| CCD<br>UI-6210-M<br>UI-6210-C | CCD<br>UI-6410-M<br>UI-6410-C | CCD<br>UI-6220-M<br>UI-6220-C | CCD<br>UI-6230-M<br>UI-6230-C | CCD<br>UI-6240-M<br>UI-6240-C | CCD<br>UI-6250-M<br>UI-6250-C |
|---|---|---|---|---|---|
| 640 x 480<br>VGA | 640 x 480<br>VGA | 768 x 576<br>CCIR | 1024 x 768<br>XGA | 1280 x 1024<br>SXGA/1.3 MP | 1600 x 1200<br>UXGA/2 MP |
| 1/2"<br>Global | 1/3"<br>Global | 1/2"<br>Global | 1/3"<br>Global | 1/2"<br>Global | 1/1.8"<br>Global |
| 75 fps | 75 fps | 52 fps | 30 fps | 15 fps | 12 fps |
| 66 fps | 66 fps | 47 fps | 27 fps | 14 fps | 12 fps |
| 40 µs - 630 ms<br>40 µs - 10 Min. | 40 µs - 640 ms<br>40 µs - 10 Min. | 50 µs - 770 ms<br>50 µs - 10 Min. | 66 µs - 1 s<br>66 µs - 10 Min. | 83 µs - 1,46 s<br>83 µs - 10 Min. | 94 µs - 1,57 s<br>94 µs - 5 s |
| H + V² | H + V² | H + V² | H + V² | H + V² | H + V² |
| 16 - 640, 1<br>16 - 640, 2<br>120 - 480, 1<br>120 - 480, 2 | 16 - 640, 1<br>16 - 640, 2<br>120 - 480, 1<br>120 - 480, 2 | 16 - 768, 1<br>16 - 768, 2<br>120 - 576, 1<br>120 - 576, 2 | 16 - 1024, 1<br>16 - 1024, 2<br>120 - 768, 1<br>120 - 768, 2 | 16 - 1280, 1<br>16 - 1280, 2<br>120- 1024, 1<br>120 - 1024, 2 | 16 - 1600, 1<br>16 - 1600, 2<br>120 - 1200, 1<br>120 - 1200, 2 |
| 320 x 240, 122 fps | 320 x 240, 111 fps | 640 x 480, 60 fps<br>320 x 240, 97 fps | 800 x 600, 37 fps<br>640 x 480, 45 fps<br>320 x 240, 78 fps | 1024 x 768, 18 fps<br>640 x 480, 26 fps<br>320 x 240, 38 fps | 1024 x 768, 18 fps<br>640 x 480, 28 fps<br>320 x 240, 47 fps |
| V² (Mono)<br>V: Sum<br>2x, 640 x 240, 133 fps<br>4x, 640 x 120, 220 fps | V² (Mono)<br>V: Sum<br>2x, 640 x 240, 133 fps<br>4x, 640 x 120, 215 fps | V² (Mono)<br>V: Sum<br>2x, 768 x 288, 90 fps<br>4x, 768 x 144, 143 fps | V² (Mono)<br>V: Sum<br>2x, 1024 x 384, 53 fps<br>4x, 1024 x 192, 85 fps | V² (Mono)<br>V: Sum<br>2x, 1280 x 512, 23 fps<br>4x, 1280 x 256, 31 fps | V² (Mono)<br>V: Sum<br>2x, 1600 x 600, 24 fps<br>4x, 1600 x 300, 43 fps |
| -<br>-<br>- | -<br>-<br>- | -<br>-<br>- | -<br>-<br>- | -<br>- | V² (Color)<br>2x, 1600 x 600, 24 fps<br>4x, 1600 x 300, 43 fps |
| 20,7x<br>4x/12x<br>2x (Mono) | 18x<br>4x/12x<br>2x (Mono) | 14x<br>4x/8,9x<br>2x (Mono) | 10,4x<br>4x/7,59x<br>2x (Mono) | 13,6x<br>4x/8,9x<br>2x (Mono) | 13,7x<br>4x/8,9x<br>2x (Mono) |
| ICX414<br>5 - 30 MHz | ICX424<br>5 - 30 MHz | ICX415<br>5 - 30 MHz | ICX204<br>5 - 30 MHz | ICX205<br>5 - 30 MHz | ICX274<br>5 - 30 MHz |
| 9,9 µm<br>32.000 e-<br>6,34 x 4,75 mm<br>7,9 mm, 1/2,0"<br>4:3 | 7,4 µm<br>24.000 e-<br>4,74 x 3,55 mm<br>5,9 mm, 1/2,7"<br>4:3 | 8,3 µm<br>25.000 e-<br>6,37 x 4,78 mm<br>8,0 mm, 1/2,0"<br>4:3 | 4,65 µm<br>12.000 e-<br>4,76 x 3,57 mm<br>6,0 mm, 1/2,7"<br>4:3 | 4,65 µm<br>12.000 e-<br>5,95 x 4,79 mm<br>7,6 m, 1/2,1"<br>5:4 | 4,4 µm<br>9.000 e-<br>7,04 x 5,28 mm<br>8,8 mm, 1/1,8"<br>4:3 |