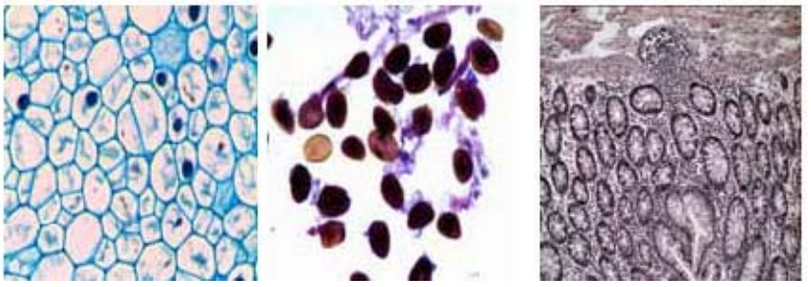
Infinity X Digital Camera for Microscopes



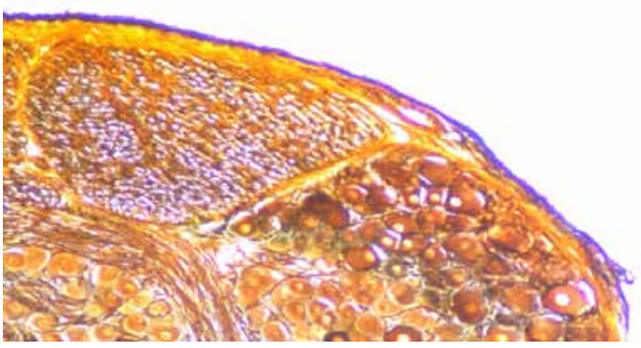
21 Million Pixels and Streaming Video

Infinity X is the ideal digital camera for an exceptionally wide-ranging spectrum of applications with-in light microscopy. It offers an outstanding resolution for still images as well as exceptional faststreaming video at a very high resolution.

The impressive image quality and revolutionary resolution is achievedby the integration of the DeltaVu technology invented by DeltaPix.

Through a process of capturing multiple images with the sensorshifted a fraction of the length of a pixel, the DeltaVu technology allows calculation of details much smaller than the size of a pixel.

Infinity X has standard C-mount interface for flexible attachment to a microscope and has a single USB 2.0 cable for attachment to the PC for power and data communication.



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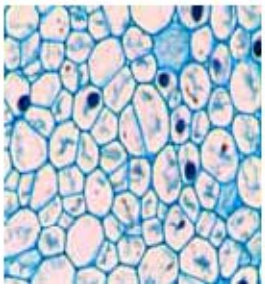
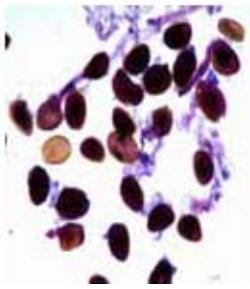




The Infinity X is designed to satisfy the unique and varied demands of digital microscopy. It offers exceptional fast streaming video at an incredibly high-resolution on the computer monitor as well as outstanding resolutions on still images.

A ground-breaking resolution of up to 21 million pixels in precise color puts the Infinity X in a class all by its own. By integrating DeltaVu™, a highly successful, patent pending technology invented by DeltaPix, these incredible resolutions are achieved.

DeltaVu™

DeltaVu™ is a revolutionary new technology designed to dramatically increase the image resolution of a digital camera. The Infinity X has a 1.3 million pixels sensor with Red, Green and Blue color filters placed in standard Bayer pattern.

Through a process of combining precise position information of the sensor, and capturing additional images, by moving the sensor only fractions of the length of a pixel, the DeltaVu™ technology allows calculation of finer details than the size of a pixel.

This process also includes the same detailed reproduction at all pixel locations in each of the three color planes, Red Green or Blue. The result is an impressive image file, where 63 million pixels have captured the information, 21 million pixels for each of the 3 colors (precise color).

Easy-to-use

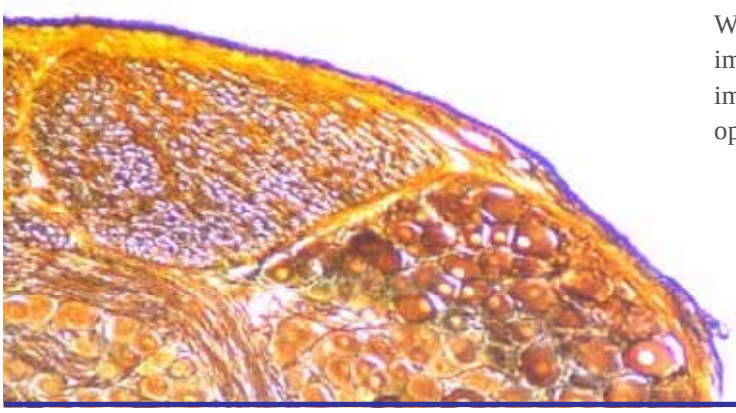
The Infinity X is a small and compact digital camera with a standard C-mount interface for flexible attachment to microscopes.

Installation of the electronic connection is also very simple by connecting a single standard USB 2.0 cable between the camera and the computer. The Infinity X uses the USB 2.0 cable for power, control information and the transmission of data. The very low power consumption of the Infinity X has made it possible only to use a single cable.

Fast video

The use of the 480 Mbits/s high-speed architecture of the USB 2.0 standard has allowed the Infinity X to deliver fast streaming color video in high-resolution on the monitor of the connected computer.

With a rate of 60 frames per second the microscopy image appears on the monitor without delay. The fast live image makes the process of focusing and interactively optimizing the image very easy.



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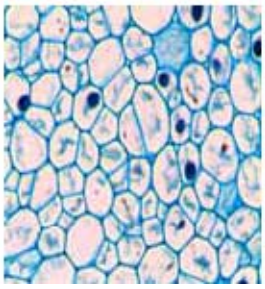
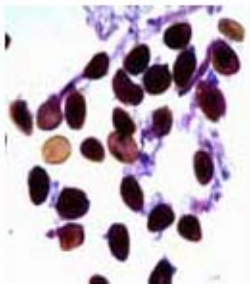




Features:

-Outstanding performance of a small and compact digital camera for microscopy with extremely high-resolution and exceptional fast live images

-Ideal camera for documentation and analyses for an exceptionally wide-ranging spectrum of applications

-Streaming live video on computer monitor through the high-speed USB 2.0 bus at 480 Mbits/s -Fast streaming color video images in high resolution with 60 fps at 640 x 480 pixels resolution

-Selectable video resolution in 4 steps from 1,280 x 1,024 pixels

-Perfect image and color quality with the finest detail

-Resolution up to the extreme of 21 million pixels in precise color

-Selectable resolution between 1.3 and 5.2, 12 and 21 million pixels in DeltaVu™ color

-Automatic and manual exposure and sensitivity control

-Superior anti-blooming (overexposure) behavior

-Easy and flexible daily use with dynamic insertion and removal of the camera to PC and notebook through a single standard USB 2.0 high-speed interface

-Small compact microscopy camera with optical C-mount for easy attachment to a microscope

-Tripod receptable for mounting on stands for macro photography

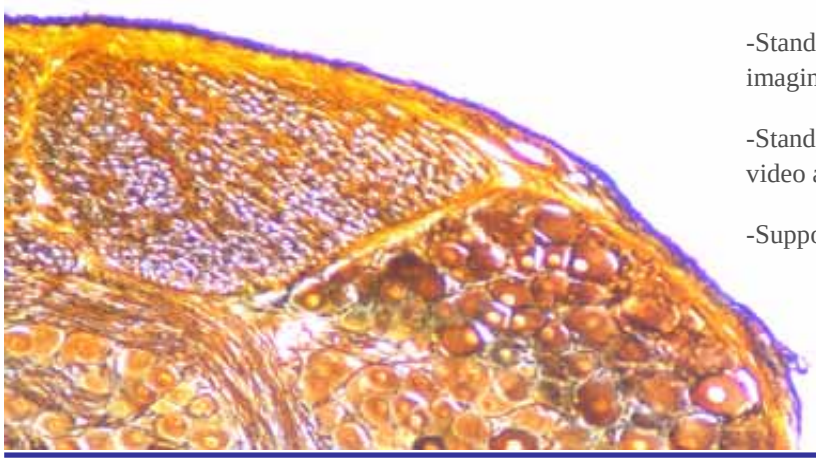
-Silent operation without noisy fan due to very low power consumption

-Intuitive user interface with powerful and easy-to-use image capture and processing functions

-Standard TWAIN driver for integration to 3rd party imaging application and software

-Standard DirectX driver for integration to 3rd party video application and software

-Support for the Dicom file standard



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DeltaVu™
A Revolution in Resolution

DeltaVu™, a revolutionary new technology invented by DeltaPix in Denmark (patent pending), represents a breakthrough in sub-pixel shifting technology resulting in increased image resolution and precise color. The only practical limitation on the resolving power of digital cameras using DeltaVu™ technology is the limitation of the optics being used. In theory, DeltaVu™ technology can resolve infinite detail.

The first product featuring this pioneering technology is the Infinity X™ high resolution USB microscope camera. 21 million pixel resolution is achieved through shifting the 1,280 x 1,024 pixel array of a 1/2" color sensor. Users will have the flexibility of choosing between 1.3, 5, 12 and 21-million pixel resolution taking full advantage of their research microscope optics to capture precise detail. With DeltaVu™ technology each pixel is calculated for all three primary colors (Red, Green & Blue) for precise color reproduction.

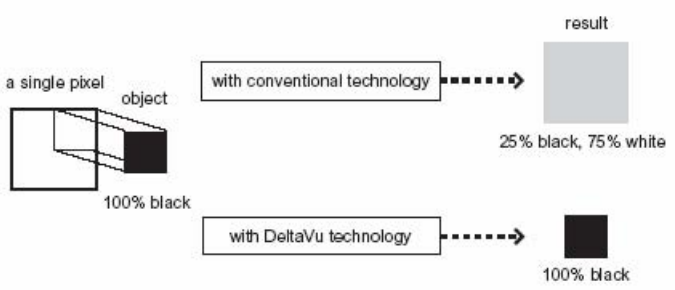
Traditional Pixel Shifting Technology

Traditional pixel shifting technology enhances resolution by moving the image sensor typically half of a pixel between each image capture, sampling the object at more locations and simply using these extra captured pixels directly as image data. The increase in resolution of this technique is limited to the point where the active area of a given pixel begins to overlap with the pixel in the previous position. As the active area increases, the object starts to become over sampled and moving the sensor captures no new spatial information. Improvements in sensor technology have resulted in the active area of a pixel increasing to the point where it covers almost the entire pixel. With this higher "fill factor" traditional pixel shifting is a waste of time.

Most color digital cameras use a color filter array with a different primary color filter associated with each active pixel (e.g. Bayer mosaic). These cameras can take advantage of the traditional technology to help eliminate the artifacts associated with demosaicing the color array as a result of the required color interpolation. This is achieved by moving the pixels in whole pixel steps to capture images where every pixel location on the object is captured by pixels having each of the different color filters. Typically 4 images and 4 movements of the sensor are required to capture these images. The result is an image with every primary color captured by each pixel. Digital cameras using this method are often described as providing "true color" or "real color", because all pixels contain captured color information with no color interpolation being required.

The DeltaVu™ Difference

DeltaVu™ technology is designed to work around the limitation caused by the increased fill factor of newer generation image sensors while at the same time providing even more correct color than "real color". Through its ability to capture and interpret details, which are much smaller than the size of a single pixel, DeltaVu™ dramatically increases both spatial resolution and color quality.



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The way this is achieved is by moving the sensor a fraction of a pixel between each image capture. The result is a large amount of overlap between neighboring pixels for each image captured. Knowing the precise location of each sub-pixel shift and using patent-pending software algorithms, which intelligently calculate the differences between pixels, images containing astonishing detail and enhanced color clarity are achieved. With this technique, objects much smaller than the size of an individual pixel can be resolved with no interpolation artifacts. In theory, by adjusting the amount of pixel overlap, the resolving power can be increased without limit. In practice, however, the resolution is restricted by the resolving power of the optical system.

The theory behind DeltaVu™ technology

This section provides a simplified illustration of how the DeltaVu™ unique image processing technology is implemented.

In the figure below, the 4 x 4 matrix represents the digital camera's image sensor with high fill factor pixels. The object is a black dot, 25% of the size of one of the image sensor's pixels, against a white background. All required optics, illumination, etc. have been omitted for the sake of clarity. The matrix below labeled pixels) is a fl at view representation of the same 4 x 4 cells of the digital camera.

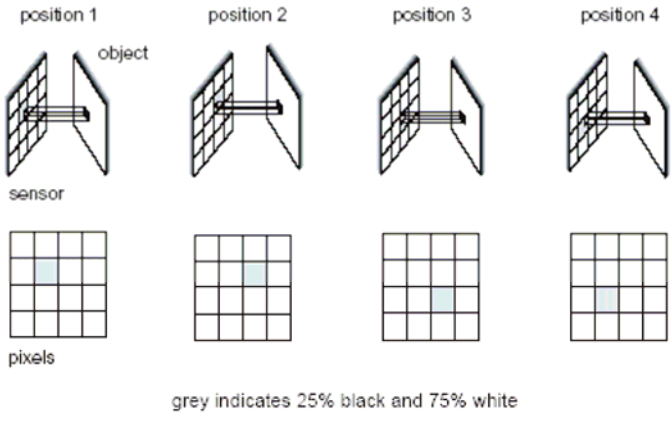
The 1st image is captured with the sensor in position 1. The 2nd image is captured after moving the sensor to the left by 50% of a pixel, to position 2. The 3rd image is captured after moving the sensor up by 50% of a pixel to position 3.

Finally, the 4th image is captured after moving the sensor to the right by 50% of a pixel to position 4.

Because the black dot is only 25% of the size of the pixel detecting it, the pixel will see it as a light gray color, a mixture of 25% black and 75% white.

Traditional method of combining multiple images

Combining the 4 images captured with traditional technology will result in an over sampled image with 4 times the number of pixels. However it will not contain more spatial detail. The first image captured already contained as much resolution as the final combined image because the object is much smaller than the size of a pixel However, as previously mentioned, for color cameras, this method does have the ability to improve the color quality



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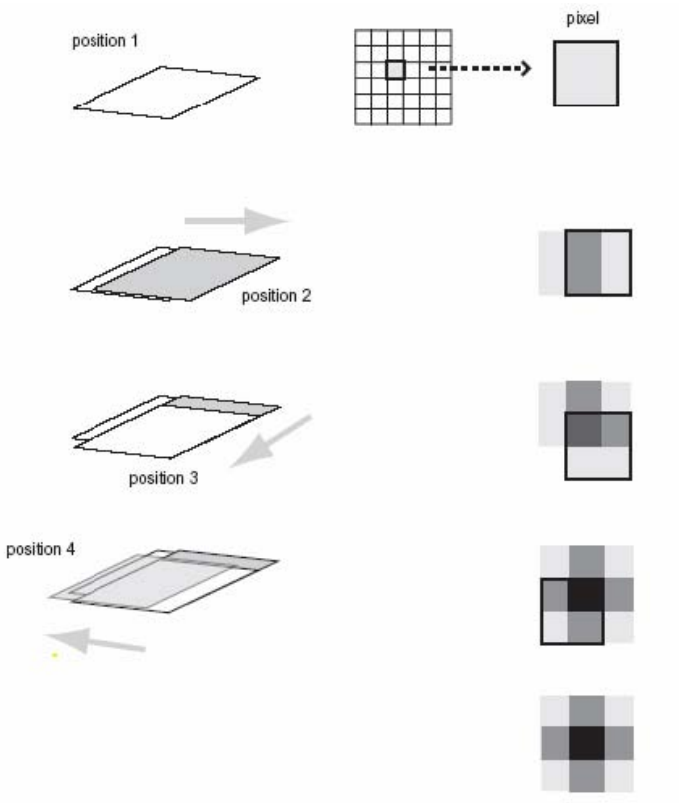
DeltaVu™ method of combining multiple images

The DeltaVu™ method of interpreting and combining the information from multiple images is illustrated below.

The image captured in position 2 is placed on top of the image captured in position 1 and then shifted half a pixel to the left. Then, imagining that the pixels have some transparency, the result is a darker area (pixel), where the gray pixels overlap each other.

A similar process is repeated for the images captured in positions 3 and 4 where one image is placed on top of the other and shifted half a pixel. This will also result in a combined image with one darker pixel, where the 2 gray pixels overlap each other.



Next, the two combined images are placed on top of each other and shifted down by half a pixel. The combination of all 4 images will have one black pixel, where the 4 gray pixels in the 4 original images captured overlap each other, 4 dark gray pixels, where only 2 gray pixels from the original images overlap each other and 4 light gray pixels, where no pixels overlap from the original images.

Further processing by the DeltaVu™ image processing method results in the single black pixel being isolated.

In this case with 4 movements, the final image has a resolution 4 times higher than the number of active pixels in the sensor and the digital camera can capture details down to 25% of the size of a pixel.

The resolution can be significantly increased through additional sub-pixel movements of the sensor until the limitation of the resolving power of the optics are reached.

In order to move the sensor quickly and very reliably, DeltaVu™ utilizes a newly developed electromechanical solution. Unlike the common piezo technology for moving the sensor, the new electromechanical solution is not sensitive to temperature, humidity, or aging and is free from internal friction. Also the need for a special voltage to drive the movement system is eliminated, which enables the digital camera to be fully powered directly from the USB cable, without the need for an external power supply.

The result is a compact digital camera with outstanding reliability and calibration free operation.

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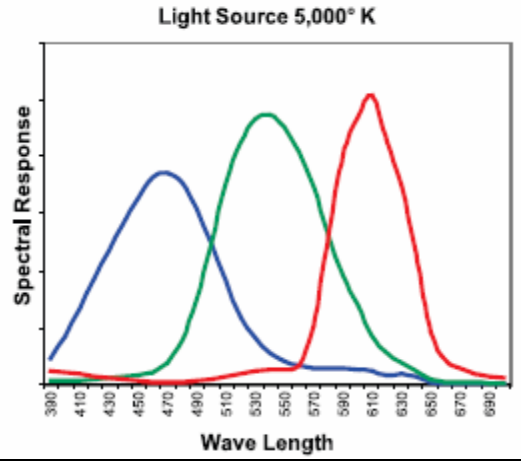
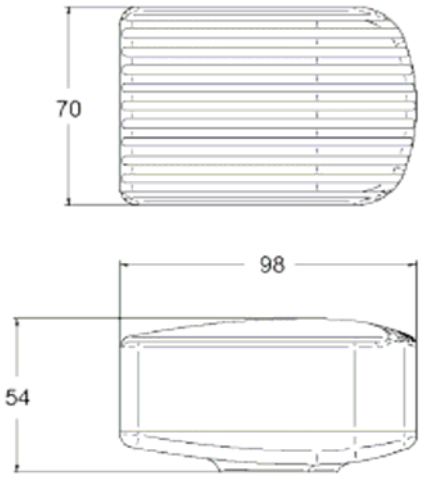
Imager

Effective size:	1/2” format 6.7mm x 5.3mm
Color filter	Red, Green, and Blue in Bayer pattern
Effective pixels	1,280 x 1,024 pixels(1.3 million)
Pixel size	5.2 x 5.2 microns
Dynamic range	>60 dB
Dark current noise:	20 electrons/pixel/second
Exposure time:	0.1 milliseconds to 6 seconds
Exposure sensitivity:	Adjustable from 1 times to 3.7 times
Exposure mode:	Automatic, manual or converging
Color balance:	Color balance:
Shutter:	Electronic rolling shutter



Physical data

Optical mount:	Standard C-mount
Mechanical mount:	Tripod receptable for macro photography
Housing:	Aluminum with cooling fins
Height:	54mm
Width:	70mm
Depth:	98mm
Weight:	425g
Compliance:	CE, FCC Class B



Digital still image

Single exposure:	
	1,280 x 1,024 pixels (1.3 million pixels) 24 bit RGB: 3.8MB 30 bit RGB: 7.6MB
Multiple exposures:	
	2,560 x 2,048 pixels (5.2 million real pixels) 24 bit RGB: 15MB 30 bit RGB: 30MB
	3,840 x 3,072 pixels (11.8 million real pixels) 24 bit RGB: 34MB 30 bit RGB: 68M
	5,120 x 4,096 pixels (21.0 million real pixels) 24 bit RGB: 60MB 30 bit RGB: 120MB

Data format & compression

Digital output:	
	24 bit uncompressed, TIFF-RGB (8 bits per color)
	30 bit uncompressed, TIFF-RGB (10 bits per color)
	24 bit loss-less compressed, JPEG2000 (8 bits per color)
	24 bit compressed, JPEG (8 bits per color)
	24 bit uncompressed, DICOM (8 bits per color)
	24 bit uncompressed, video in AVI format (8 bits per color)

Digital Video:

Resolution:	
	1,280 x 1,024 pixels 15 frames per second
	1,024 x 768 pixels 24 frames per second
	800 x 600 pixels 37 frames per second
	640 x 480 pixels 60 frames per second

Product includes:

-Infinity X digital camera for USB2.0 -CD-ROM with - standard user application - TWAIN driver - DirectX driver - Documentation -USB 2.0 cable (1.8m)

Minimum Computer platform

Pentium III, 1.3 GHz or similar 256MB RAM 5 GB free harddisk space USB 2.0 Port Windows XP, Windows 2000

Computer & software

Data interface:	480 Mb/s high-speed USB 2.0 architecture
Cable:	Standard USB 2.0 cable with series “B” connector
Power:	Direct powered from the USB 2.0 bus
Application interface:	Intuitive, easy-to-use user application
Application support:	TWAIN driver for integration to 3rd party imaging applications
	DirectX driver for integration to 3rd party video applications

Operational requirements

Temperature	0˚C to +40˚C
Humidity:	15 to 80% RH (non-condensing)

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