



Digital Cameras for Microscopes

Shedding New Light On **MICROSCOPY**

Digital Sight series

Digital Cameras for Microscopes



Nikon Digital Sight Series

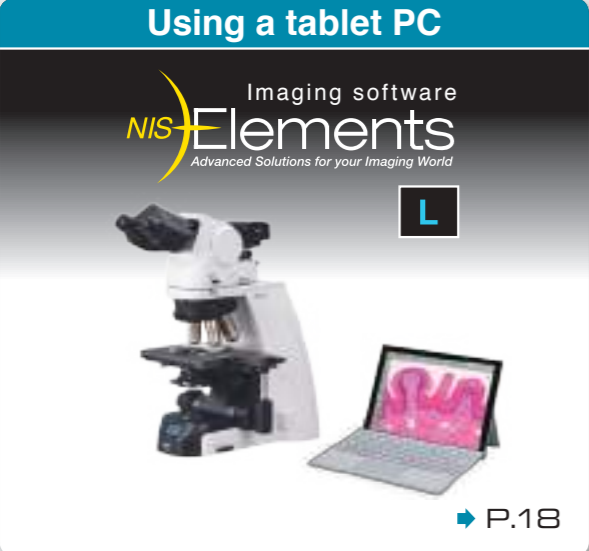
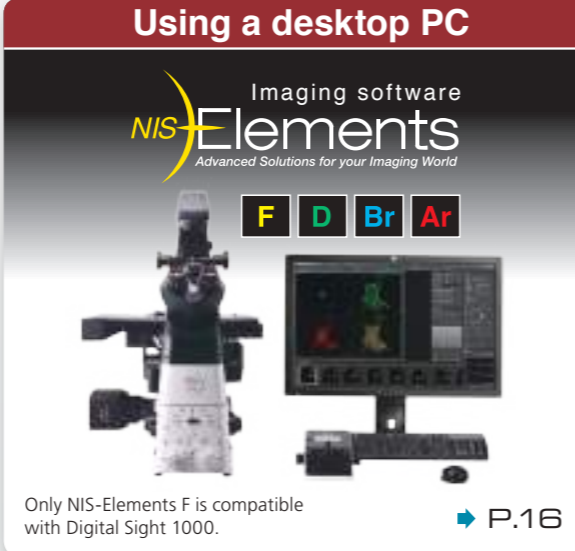
Newly added a model that boasts ultra-high-definition, a wide field of view, and high sensitivity

With various models, including the ultra-high-definition monochrome camera Digital Sight 50M and Digital Sight 10, which can switch between color and monochrome, you can choose the microscope camera for your particular purpose.

Attention: All the examples in this page are images for research. We do not guarantee clinical use.

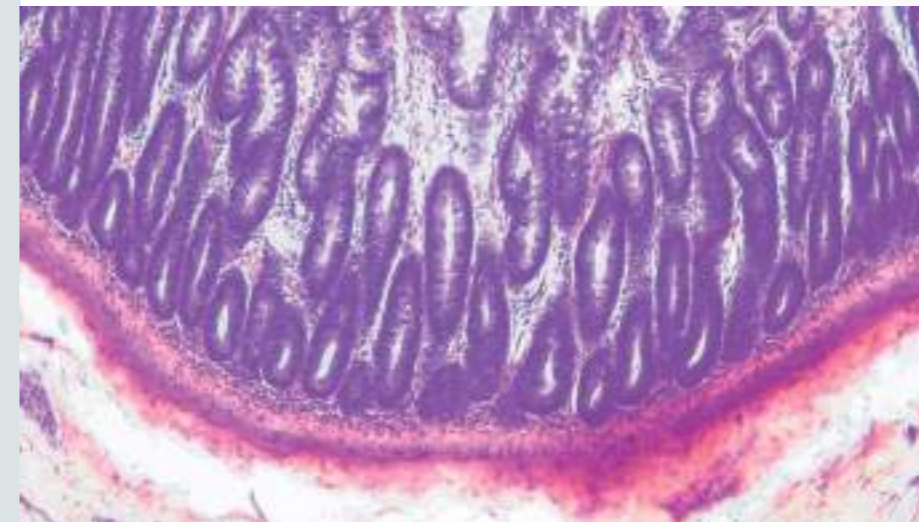
Four camera options covering two computing platforms

| Microscope Camera Digital Sight 1000 | Microscope Camera DS-Fi3 | Microscope Camera Digital Sight 10 | Monochrome Microscope Camera Digital Sight 50M NEW |
|---|---|--|---|
|  |  |  |  |
| → P.3 | → P.4 | → P.8 | → P.12 |
| 2.0 megapixel Color Full HD | 5.9 megapixel Color High-resolution | 23.9 megapixel Color/Mono-chrome High-resolution | 60.0 megapixel Mono-chrome Cooled |
| Frame rate 30 fps (1920×1080) | Frame rate 15 fps (2880×2048), 30 fps (1440×1024) | Frame rate 9 fps (6000×3984), 66 fps (1920×1080) | Frame rate 6 fps (9552×6336), 225.9 fps (640×480) |
| Max recordable pixels 1920×1080 | Max recordable pixels 2880×2048 | Max recordable pixels 6000×3984 | Max recordable pixels 9552×6336 |
| C-Mount | C-Mount | F-Mount | F-Mount |

| Using a tablet PC | Using a desktop PC |
|---|--|
|  <p>Imaging software NIS-Elements Advanced Solutions for your Imaging World</p> <p>→ P.18</p> |  <p>Imaging software NIS-Elements Advanced Solutions for your Imaging World</p> <p>Only NIS-Elements F is compatible with Digital Sight 1000.</p> <p>→ P.16</p> |

Microscope Camera

Digital Sight 1000

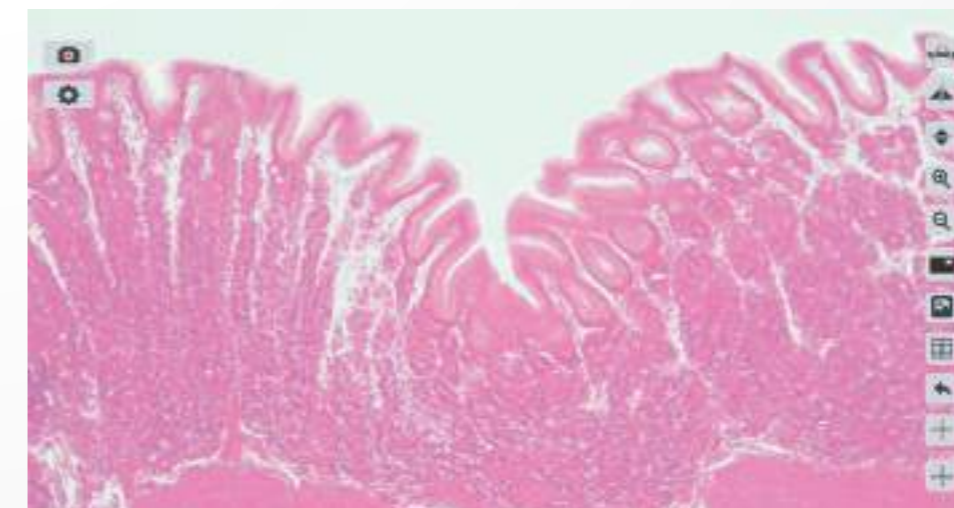


Full HD images

Equipped with a 2 megapixel CMOS image sensor, the Digital Sight 1000 can display, capture and save full HD, 1920x1080 pixel images at 30 frames / second.

Stand-alone mode

By connecting a Full HD display and a mouse, the Digital Sight 1000 can be used without a PC, conserving bench space. Captured images and videos can be saved directly to an SD card which is inserted into the camera. Users can easily display scale bars, measure areas and calculate distances between two points.

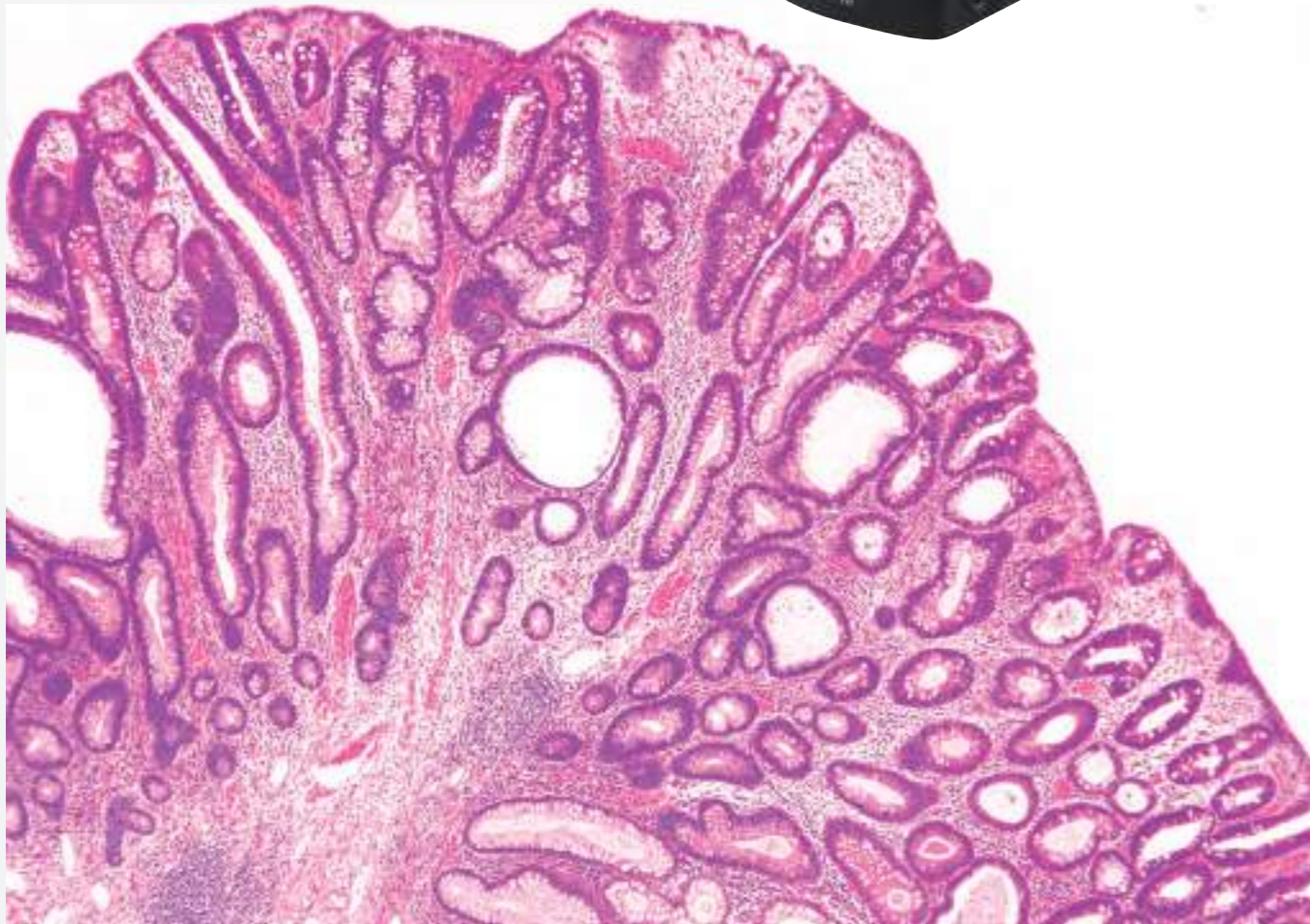


Microscope Camera DS-Fi3



High-resolution images

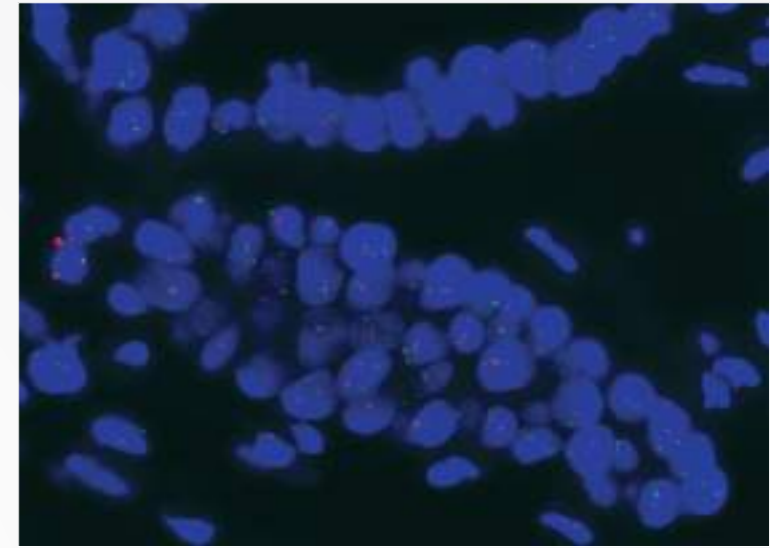
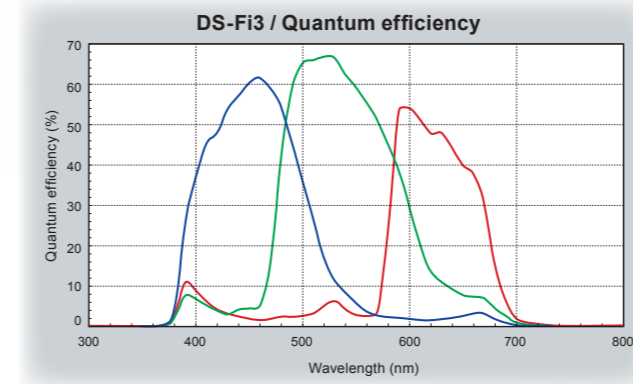
A CMOS high density 5.9 megapixel sensor produces high resolution images. USB3.0 data transfer allows fast focusing at high resolution, and easy capture images in all types of observation methods such as brightfield, differential interference contrast, and phase contrast.



Tubular adenoma, HE staining (Objective: CFI Plan Apochromat Lambda 4X)
Photos courtesy of: Dr. Yasunori Ohta, Department of Pathology, IMSUT Hospital, Institute of Medical Science, The University of Tokyo

High sensitivity, low noise

Quantum efficiency and read noise have been greatly improved, providing better capability for acquisition of fluorescent images with better signal-to-noise ratios than before.



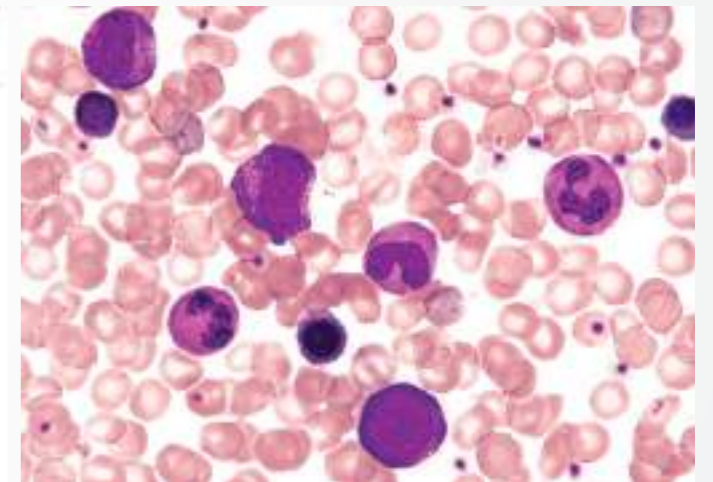
Breast cancer, FISH method (Objective: CFI Plan Apochromat Lambda 100X Oil)
Photos courtesy of: Hironao Kusakari, Diagnostic Pathology, St. Marianna University Hospital

Superior color reproduction

Nikon is well-known for outstanding and lifelike color reproduction, and developing superior algorithms for creating results that look like the actual samples. These algorithms are used in all of the color cameras in the digital sight lineup.



Uterine cervix Pap. Staining
(Objective: CFI Plan Apochromat Lambda 40XC)
Photos courtesy of: Kazuhiro Mita, Department of Pathology, Yokohama City University Hospital



Bone marrow
(Objective: CFI Plan Achromat NCG 40X)
Photos courtesy of: Clinical Laboratory Department, Yokohama City University Hospital

High-speed live display

Fast USB3.0 data transfer means fast, smooth live updating of images for finding samples or focusing, even at full resolution.

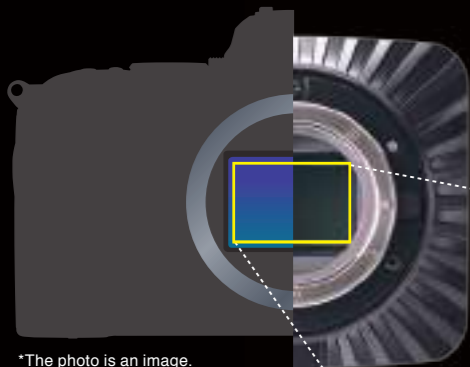
Camera Control

The DS-Fi3 interfaces with PC via a USB3.0 interface directly to the camera head, and uses NIS-Elements series software for image acquisition.

High-definition cameras Digital Sight 10 & 50M Equipped with Nikon FX format CMOS image sensors

In addition to offering the high definition of 6K, the Digital Sight 10 makes it possible to switch between color and monochrome photography. This is a high-performance model that also offers a high frame rate that can quickly focus for high-definition images.

Providing strong cost performance, the Digital Sight 50M is a cooled, monochrome model that combines 9K image quality, FOV25 wide field of view, and a maximum frame rate of 225.9 fps.

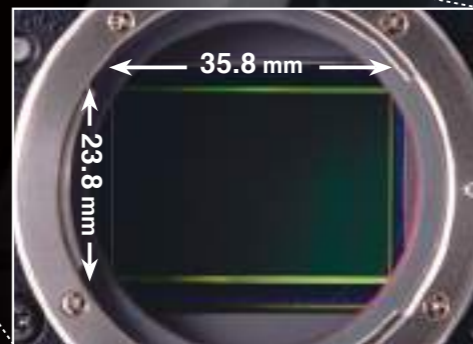


*The photo is an image.
It is different from the actual sensor

Large Format CMOS image sensors

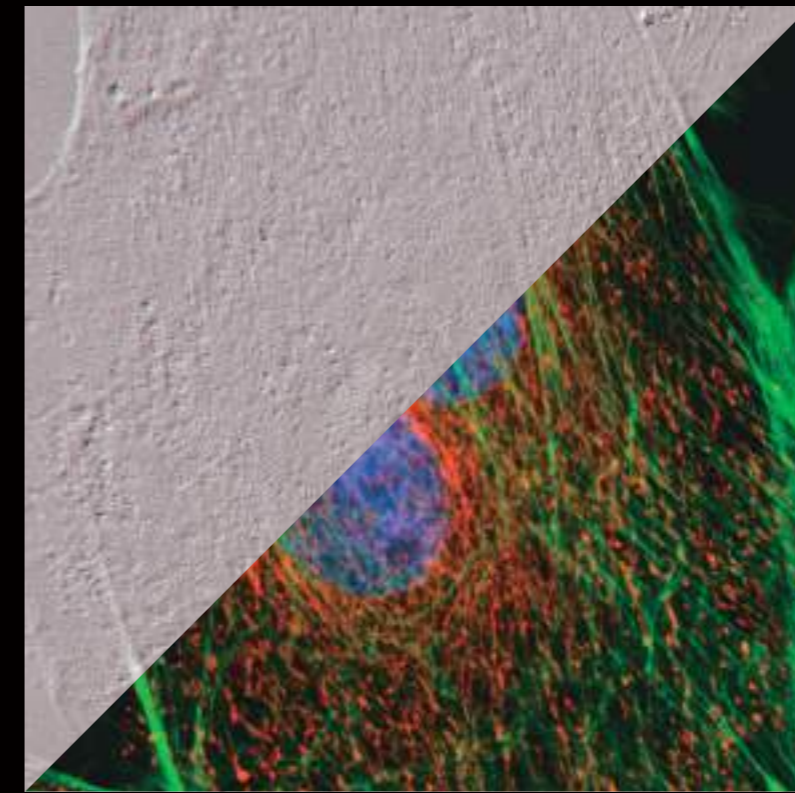
Nikon manufactures CMOS image sensors and imaging technologies for professional DSLR cameras*, and has optimized our sensors for microscopy.

*Digital Sight 10 only



Objective lenses that achieve even higher image quality

Use with the newly developed Plan Apochromat Lambda D series of objective lenses enables the acquisition of even higher quality images.



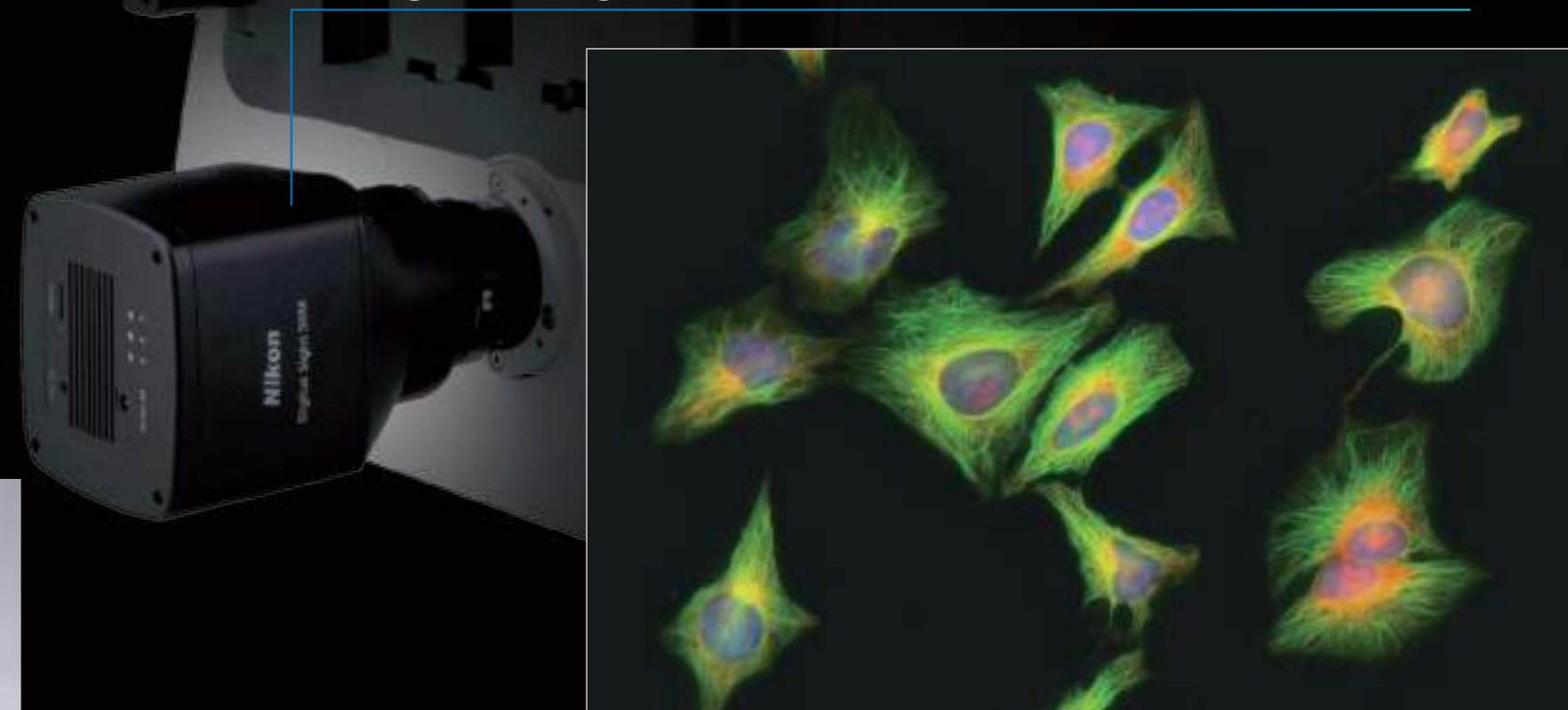
BPAE Fluorescent Stain Specimen Nikon Standard
Sample DIC (left) and fluorescence (right)
Nucleus (DAPI), Actine (FITC),
Mitochondria (MitoTracker RedFM)
Objective: CFI Plan Apochromat Lambda D 100XOil

Digital Sight 10

Freely switch between color and monochrome at 23.9 megapixels

Digital Sight 50M

Seamlessly search, capture images of,
and analyze samples at high speed



Hela cells Nucleus (DAPI), Tubulin(FITC), Cell cytoplasm(CellMask™Red)
Objective: CFI Plan Apochromat Lambda D 60XOil

Covers a wide field of view with 6K ultra-high Definition. Achieves efficient, one-shot image capture.

Microscope Camera

Digital Sight 10



23.9 megapixel

Color/Mono-chrome

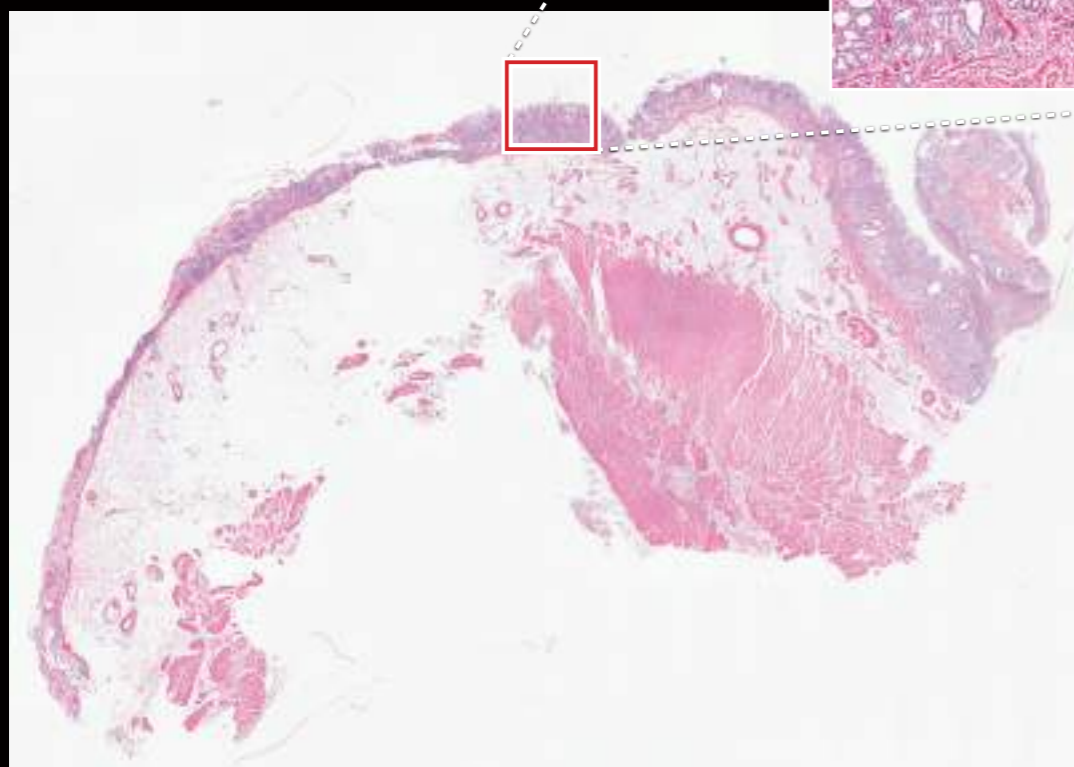
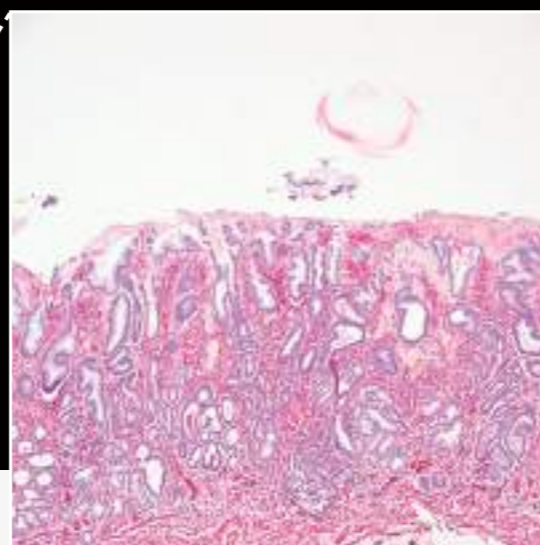
High-resolution

Observation with a wide field of view

A full-frame CMOS image sensor for instantaneous one-shot image capture of wide areas

A 25 mm field of view (FOV), possible in combination with inverted microscopes, and upright microscopes, enabling the capture of images over a wider area in one shot. Tiled images can be created efficiently, cutting the time required for screening.

*Upright microscopes are supported only by the Ni series (brightfield).



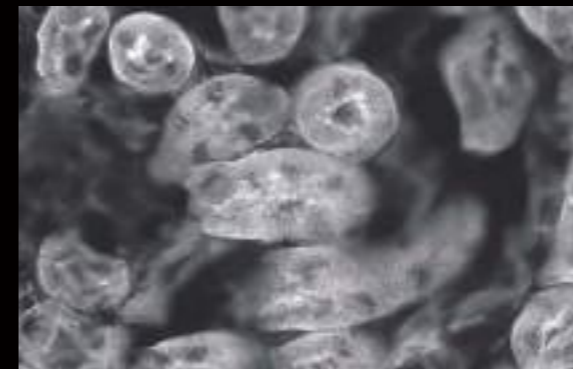
Stomach, SMA staining,
17x12 Tiled images
(Objective: CFI Plan
Apochromat 40XC)
Photo courtesy of :
Nichirei Biosciences Inc.

High-definition observation

Easily capture fine details with 6K pixel resolution and high image quality

Microscopic images can be captured at up to 6000 x 3984 pixels (23.9 megapixels), ideal for image analysis and observation of fine structures.

Digital Sight 10



Conventional model (DS-Ri2)



Kidney tissue
(WGA: 488)
(Objective: CFI Plan
Apochromat VC 20X)

Fast live display

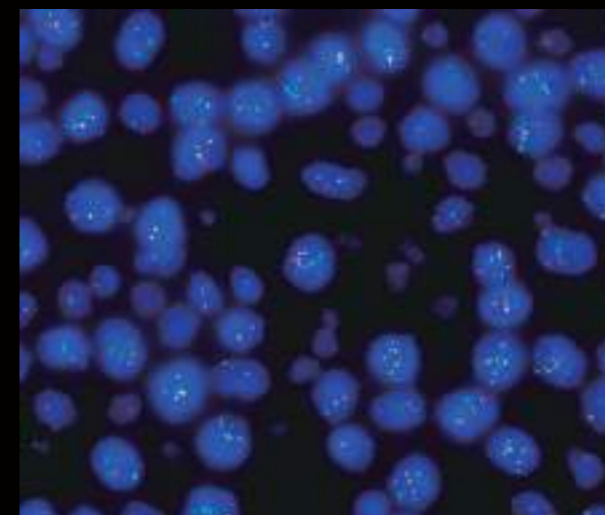
A frame rate that captures moving samples at the perfect instant

Digital Sight 10 is capable of live display of 6000 x 3984 pixel (23.9-megapixel) images at 9 frames/second or 1920 x 1080 pixel (2.1-megapixel) images at 66 frames/second. Fine focusing is easy and stress-free. By using the ROI mode, it is possible to shoot only any place at a higher speed.

High sensitivity and low noise

Ideal for fluorescence observation requiring a wide field of view and high definition

Digital Sight 10 achieves high sensitivity equivalent to ISO 200 in color mode and ISO 800 in monochrome mode. Clear fluorescence observation with a high signal-to-noise ratio is possible in both monochrome and color image acquisition.



Breast cancer, FISH method (Objective: CFI Plan Apochromat Lambda D 100XOil)
Photo courtesy of: St. Marianna University Hospital



High-definition capture in both color and monochrome. Ready for use in a wider range of observation scenarios.

Color shooting and Monochrome shooting are possible with one unit

During manual operation

Color mode



When inserting the color filter
Can shoot 400 to 680 nm in color

Monochrome mode



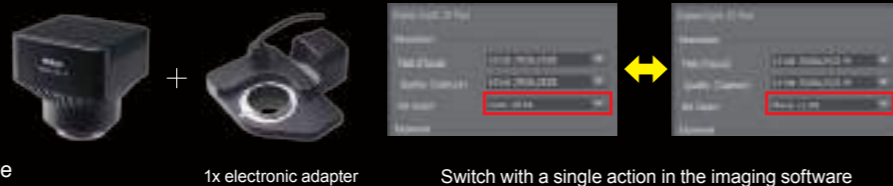
When detaching the color filter
Capable of shooting 400 to 850 nm in Monochrome
*Replace with monochrome IR filter

Electric switching function

During electronic operation (using the 1x electronic adapter)

Easy color mode switching, either manually or electronically

Digital Sight 10 makes it possible to easily switch the color mode either electronically or manually by using specialized imaging software for electronic switching or attaching/detaching filters to the slot at the bottom of the microscope camera for manual switching.



*A 1x electronic adapter and a separate PC equipped with specialized imaging software, NIS-Elements, are required for electronic operation.

Achieves consistent shooting with a single sensor

A convenient all-in-one camera for multiple observation applications

A single sensor captures both color and monochrome images, for consistent appearance even when switching color mode. Easy image acquisition is possible without the hassle of using different cameras.



Zebrafish (Objective: SHR Plan Apo 1X)

A monochrome mode that acquires even near infrared images

Fluorescence observation with little damage to biological samples

Digital Sight 10's monochrome mode supports near-infrared (700 nm-) fluorescence image capture, normally difficult to achieve with conventional color cameras. As fluorescence sensitivity extends to the NIR region, this camera is suited to fluorescence image capture of thick samples and samples with weak phototoxicity.

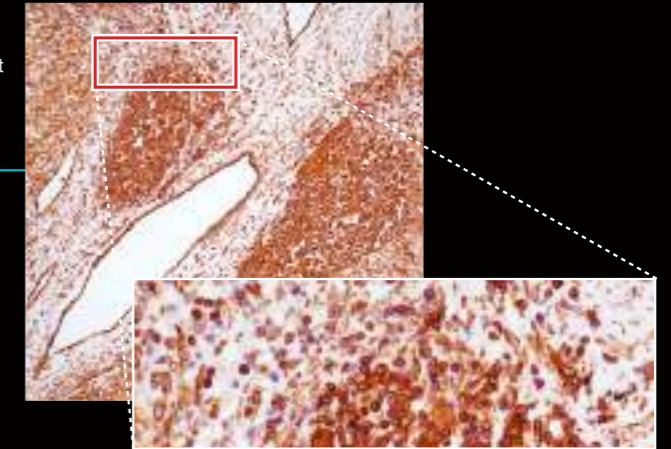
For discriminating fine structures



Kidney cancer, Vimentin staining (Objective: CFI Plan Apochromat Lambda D 20X)
Photo courtesy of: Nichirei Biosciences Inc.

Blurring and color bleeding are low even to the periphery, for images that are clear even when enlarged. ECLIPSE Ni supports everyday observation and inspection of samples with high resolution and high color fidelity.

Upright microscope system **ECLIPSE Ni**
Objective lens for biological microscopes Lambda D



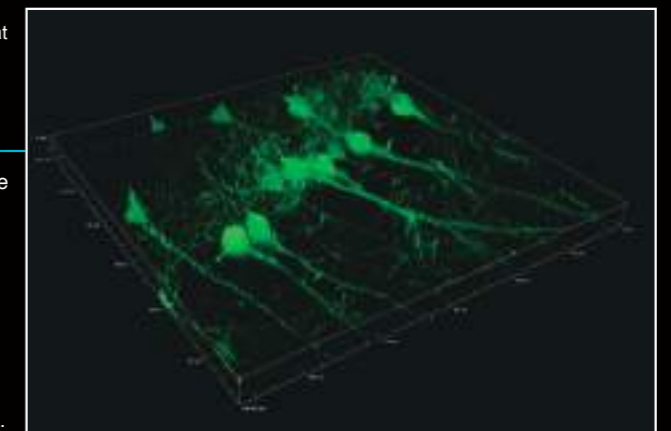
For 3D imaging



Mouse neuron (Objective: CFI Plan Apochromat Lambda D 40XC)
From captured images of 18 μm thickness every 0.2 μm. Image processed with Clarify.ai

ECLIPSE Ti2 takes advantage of a wide field of view (field number 25) to achieve high throughput even when capturing 3D or other large-size data. Combined with image processing, it enables the capture of clear images with a higher signal-to-noise ratio, even deep into subjects.

Inverted microscope system **ECLIPSE Ti2**
Objective lens for biological microscopes Lambda D



For model organisms



Stereoscopic microscope system **SMZ25/18**

Zebrafish larva (brightfield/myocardium GFP) (Objective: SHR Plan Apo 2X)
Photo courtesy of: Dr. Hiroyuki Nakajima, National Cerebral and Cardiovascular Center

SMZ25/18 offers high definition at high frame rates. Capture perfect, bright images without missing high-speed biological reactions. Low noise makes this system ideal for time lapse imaging.



Quickly and efficiently search wide fields of view and capture and analyze high-definition images

Monochrome Microscope Camera Digital Sight 50M

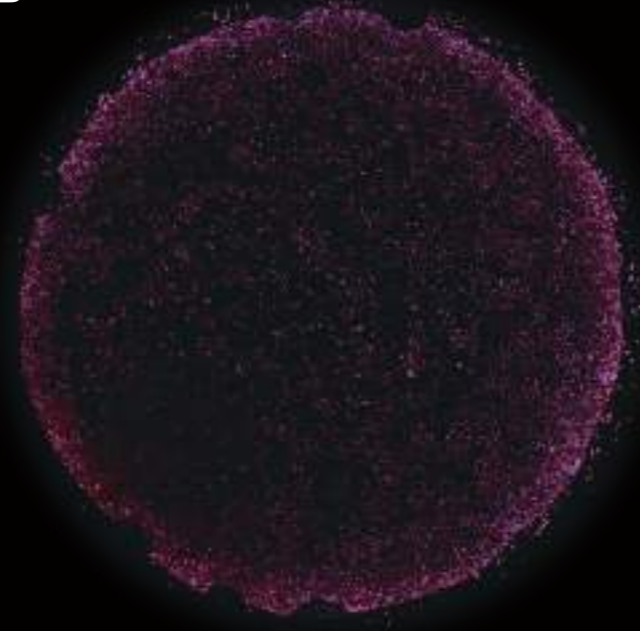


NEW

60.0 megapixel

Mono-chrome

Cooled



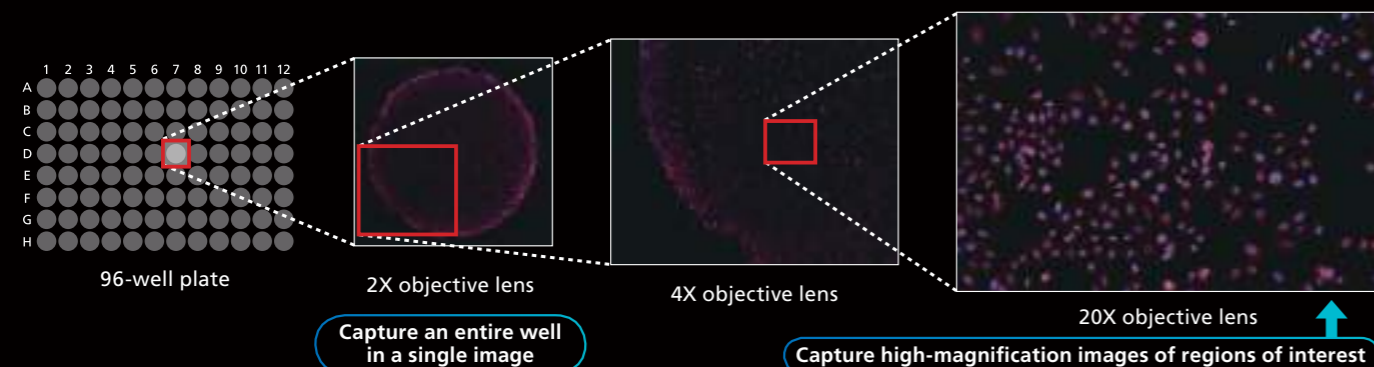
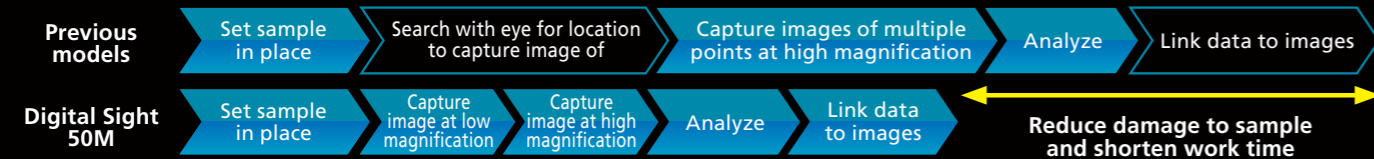
HeLa cells Nucleus(DAPI), Cell cytoplasm(CellMask™DeepRed)
One-shot shooting of 1 well in a 96-well plate: Ti2-E, CFI Plan Apochromat Lambda D 2X

The monochrome digital camera Digital Sight 50M for microscopes is optimized to increase workflow efficiency. In addition to its large number of pixels, number of fields of view, and speed, it comes with dedicated software that makes it effective for screening large volumes of samples. It is perfect for not only academic research but also drug discovery research.

Dramatically improves the workflow for capturing images of and analyzing large volumes of samples

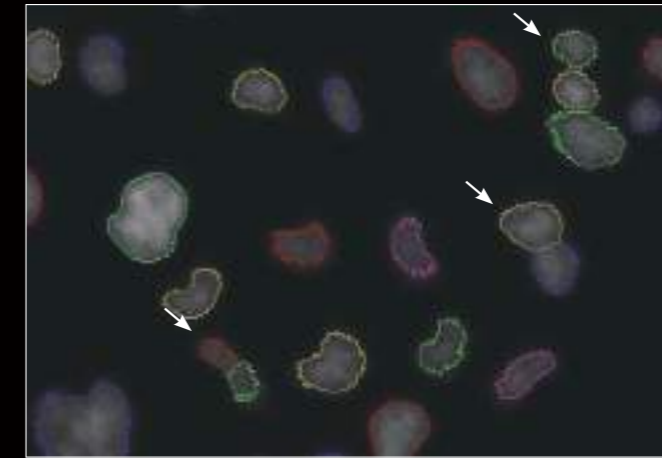
Wide field of view and high resolution for single-shot images of individual wells

With an actual field of view of 7 mm when using a 2X objective lens, it is possible to capture single-shot images of wide areas. You can also quickly check both the overall image of large volumes of samples, such as in well plates, and regions of interest of a sample, which increases reproducibility of experiments.

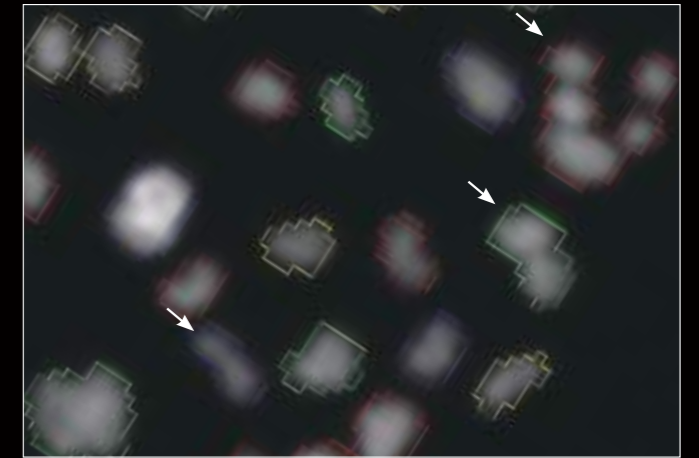


The ultra-high resolution of 9K increases the reliability of quantitative analysis

The improved Digital Sight 50M boasts 3.8 times the number of pixels and 2.5 times the resolution of previous models. Even when using a low-magnification, high-NA objective lens, it fully demonstrates optical capabilities. It is also possible to obtain highly reliable data of small regions when analyzing images.



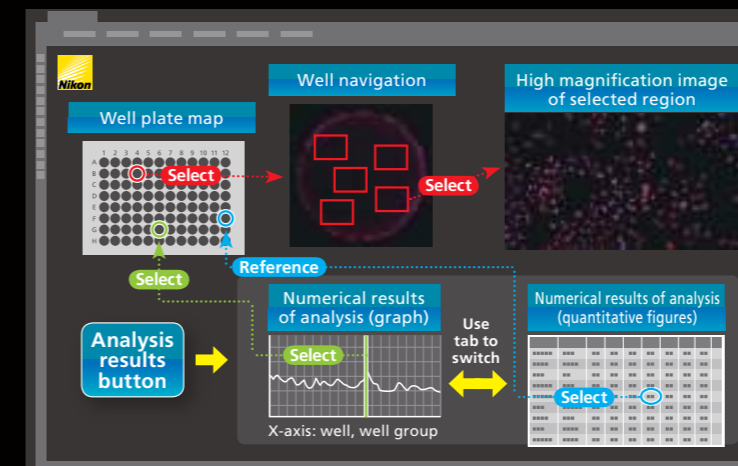
Digital Sight 50M



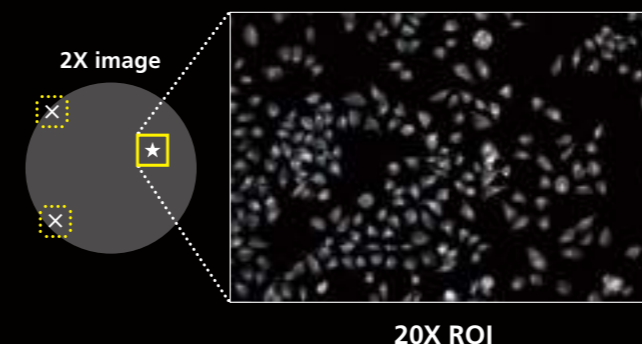
Conventional

Includes software suited to large-volume screening

The Digital Sight 50M comes with NIS-A Bundle JOBS W/RDB optional software so it offers support through post-capture analysis. It is possible to set up a flow from well selection, automatic detection of image ROI, and displaying of analysis results.

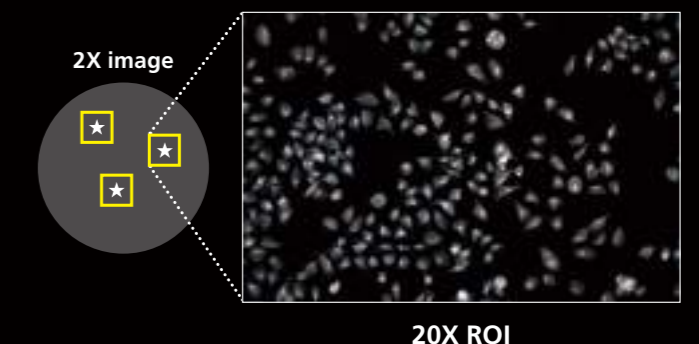


- Plate view
- Heat map
- Sample label
- Binarized image
- Graphs (histogram, scatter plot, bar graph, etc.)



20X ROI

Automatically detect regions with uniform cell density or uniform distribution and then capture image at high-magnification



20X ROI

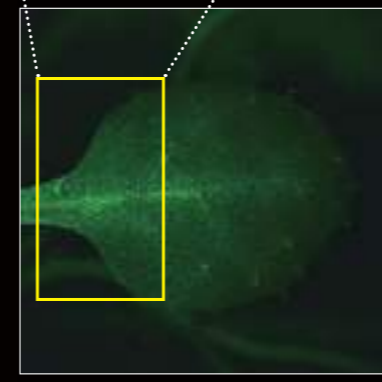
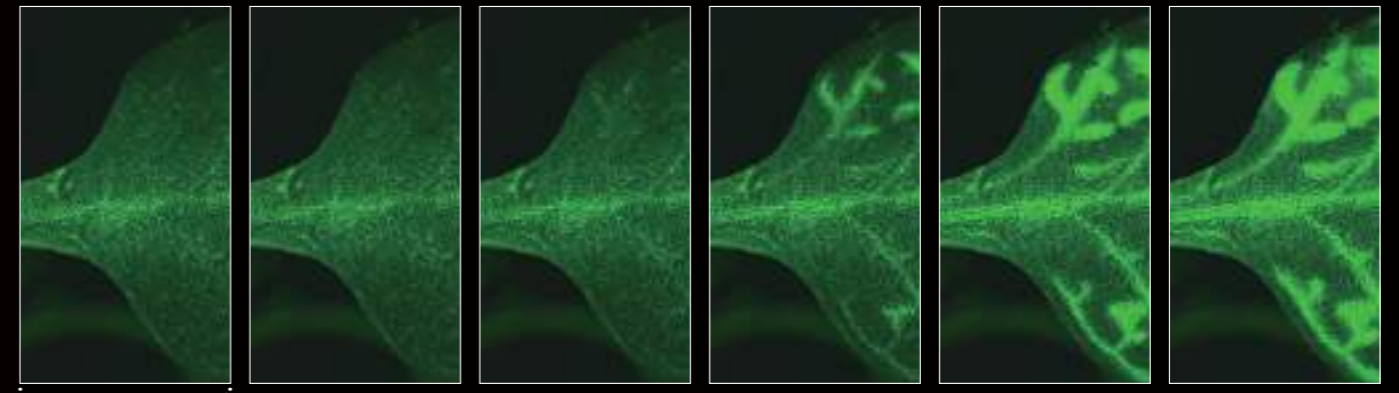
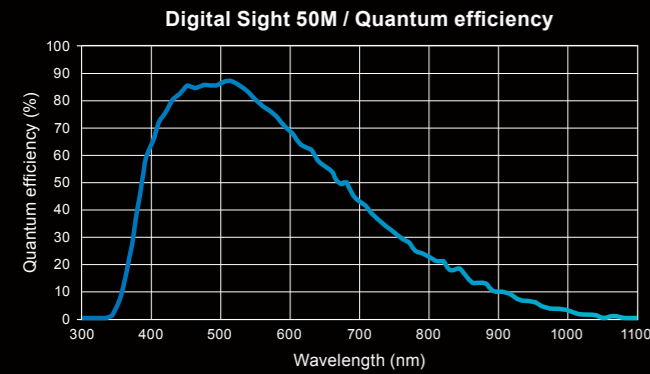
Automatically detect regions that meet conditions input in advance and capture image at high-magnification

More evolved optical capability that can clearly capture fluorescence samples

High sensitivity

Detects even faint fluorescent signals

The Digital Sight 50M achieves quantum efficiency of 85%. Even faint fluorescence signals can be captured by the pixels on account of the broad 3.76 μm pixel pitch and high quantum efficiency.

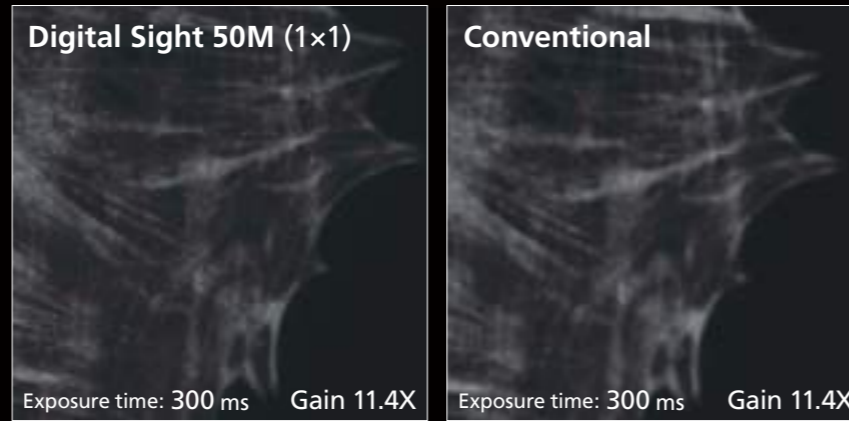


Ca²⁺ transfer images of Arabidopsis thaliana with G-Camp
Interval 1 sec, shooting for 100 sec
Photo courtesy of : Dr. Masatsugu Toyota, Graduate School of Science & Engineering, Saitama University

Low noise

Acquires dim fluorescent signals with ultra-low noise

Both 6e⁻ read noise coupled with a large full-well capacity and 1.0e⁻/p/s dark current allow the acquisition of 14bit fluorescence images with very little noise.



Time-lapse photography

Fluorescent time-lapse imaging through integration with NIS-Elements software

With a large field of view and pixel density, and low noise, the Digital Sight 50M is ideal for time-resolved imaging applications.

Numerous image acquisition modes

Adjustable balance between quality and speed

There are three operation modes, making it possible to select the required speed and quality. Maximum frame rate of 225.9 fps for high-speed photography.

| Mode | ROI size (pixels) | Frame rate | |
|----------|-------------------|------------|-----------|
| | | 8 bits | 16 bits |
| 1x1 mode | 640x480 | 113.0 fps | 23.6 fps |
| 2x2 mode | 640x480 | 114.9 fps | 57.4 fps |
| 3x3 mode | 640x480 | 225.9 fps | 112.9 fps |

Fast live display

Fast focusing, even with fluorescent images

A high-sensitivity CMOS sensor and high-speed data transfer using a general-purpose PC I/F USB 3.2 Gen 1 are combined to achieve 6 fps at the maximum number of pixels (60 megapixels) or a maximum speed of 27 fps (6.7 megapixels). It is also possible to quickly focus on samples.


3 types of camera adapters

Includes 2.5X, 1.8X, and 1X adapters, each for different uses

The Digital Sight 50M offers the large CIS (Nikon FX format) that makes wide field-of-view (FOV25) observations possible.

There are three adapters for different uses: 2.5X and 1.8X adapters for high-resolution single shots of 60 megapixel; and a 1X adapter for samples that require high sensitivity and low noise, such as for image tiling.

For large FOV observations and photography




2.5X

Aspect ratio of about 3:2

ø17.2 mm


1.8X



Aspect ratio of about 3:2

ø24 mm

High sensitivity observations and photography, for tiling



1X

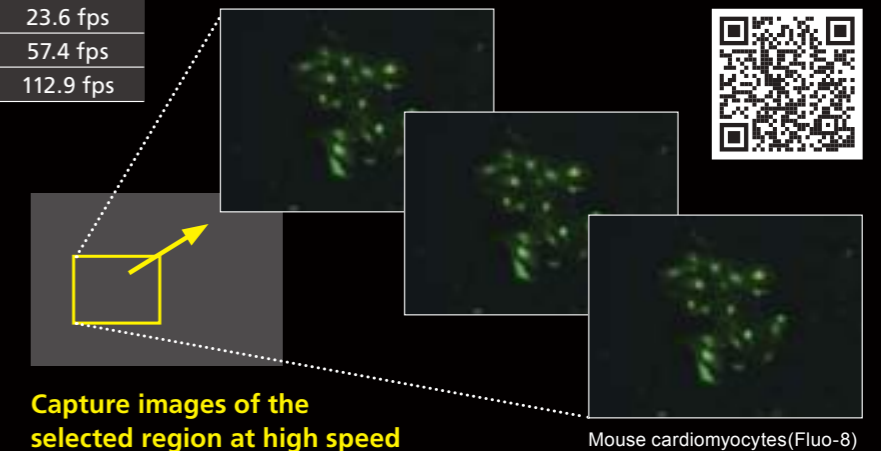
Aspect ratio of about 1:1

ø16,22,25 mm

ROI mode

Capture images of regions of the field of view at high speed and in real time

It is possible to freely designate a region and size within the effective pixel scope and then capture images of that desired region at high speed.



Integration with the comprehensive imaging software series

Nikon uses the NIS-Elements series as control software. NIS-Elements allows functions from basic imaging to control of the microscope and peripheral devices to be performed, as well as the measurement, analysis, and management of acquired images. Four basic packages and a variety of optional modules are available to suit every application and objective.

F Free package

The bundled free package offers functions for the display of scale on live images, full-screen display, and more. The simple operation screen makes shooting easy.

D Documentation package

The documentation package is equipped with measurement and report creation functions. It enables general microscopic image acquisition in fields from biomedical to industrial, and is expandable through optional added features such as EDF and databases.

Br Ar Research package

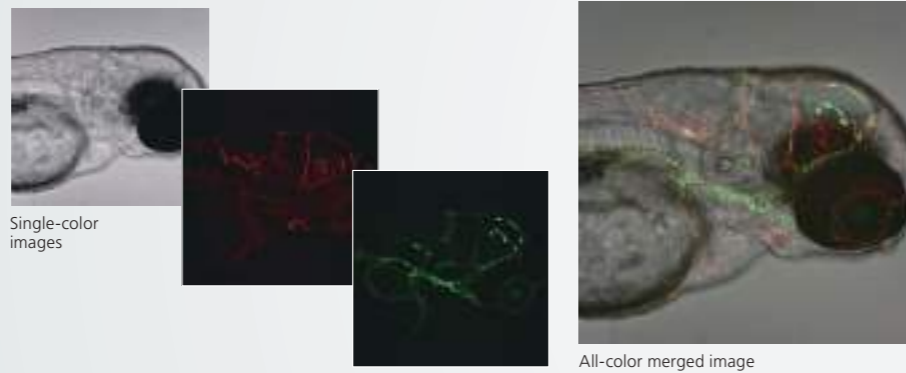
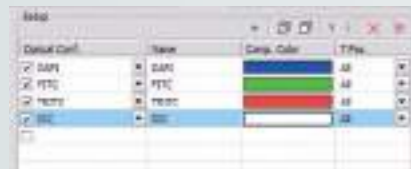
The research package enables the construction of advanced image acquisition systems, including multidimensional imaging (up to 4 dimensions for Br, 6 dimensions for Ar), through integration with systemized microscopes. Sets equipped with a rich range of image processing and analysis functions are available for every application.

Compatible OS: Windows® 10 Pro (64-bit version)

* For information about compatible desktop PCs, contact Nikon.

Multichannel (Multi Color) **Ar Br**

NIS-Elements can acquire full bit depth multi-color images, combining multiple fluorescence wavelengths and different illumination methods (DIC, phase contrast etc.), while offering independently scalable channels.



Z-series **Ar Br D**

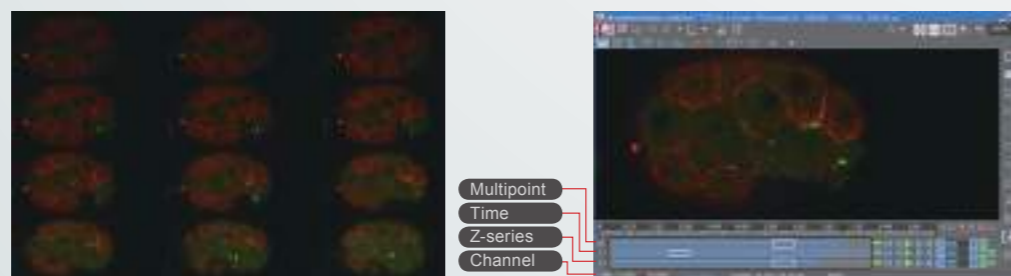
Through motorized focus control, NIS-Elements reconstructs and renders 3D images from multiple Z-axis planes.



Multi-dimensional Image Display

Ar Br

NIS-Elements displays time lapse, multi-channel, multiple X, Y, Z positions in an intuitive layout, which allows for automatic playback and the ability to select subsections of the data to be saved as a new file.



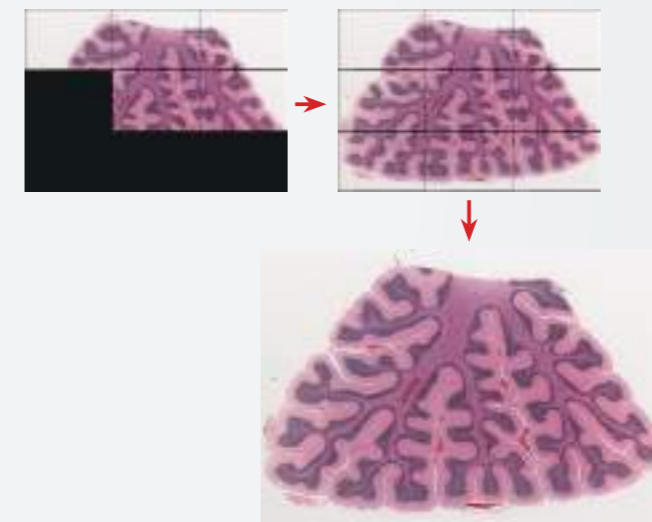
EDF (Extended Depth of Focus) **Option Ar Br D**

Creates a single, all-in-focus image from images of differing focus. Such images can now be created by simply turning the focus knob.



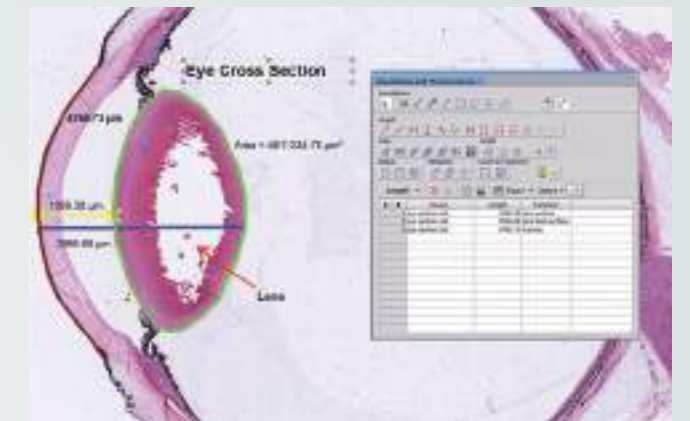
Image stitching (Large Image) **Option Ar Br D**

Stitches together images from multiple fields of view during shooting to create an image with wide field of view. Images already acquired can also be stitched together.



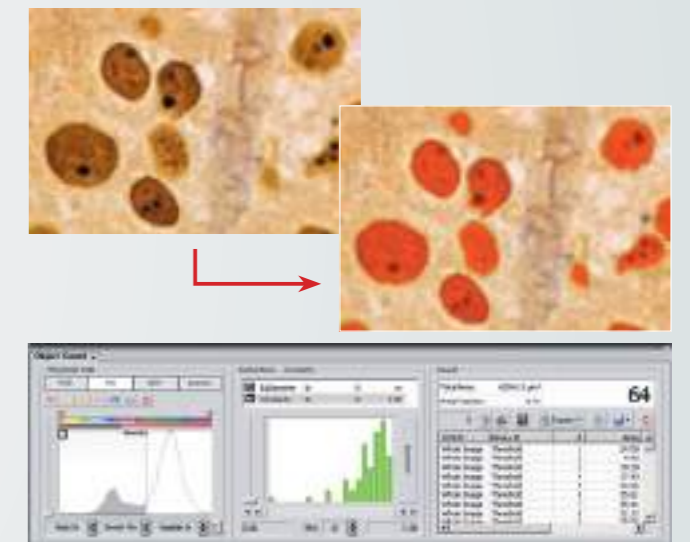
Manual measurement and image annotation **Ar Br D**

Manual Measurement allows easy measurement of length and area by drawing lines or an object directly on the image. The results can be attached to the image, and also exported as text or to an Excel spreadsheet.



Auto measurement (Object Counting) **Ar Br Option D**

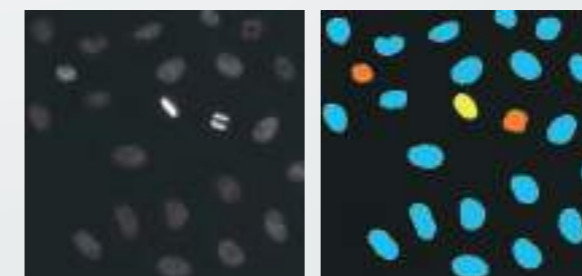
Performs binarization on images using previously set thresholds to measure the number, area, brightness, etc. of identified objects.



Classifier

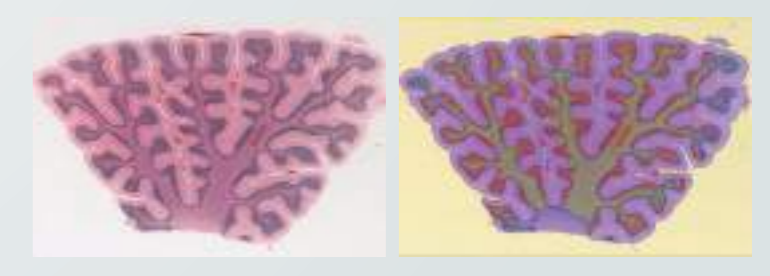
Object Classifier **Option Ar**

Object classifier uses objects identified by thresholding along with additional features such as shape factors, and other statistical methods including nearest neighbor and neural networks for classifying objects into multiple categories. It is also possible to teach the module based on interactive 'picking' of image pixels.



Pixel Classifier **Ar Br Option D**

This function classifies each pixel in the image with RGB/HIS and intensity across the whole image. Results are reported in percentage and it is possible to save and reuse parameters across a large sample of images. Multiple binary layers are also displayed with multiple colors on the image and are available with other analysis tools within the software package.





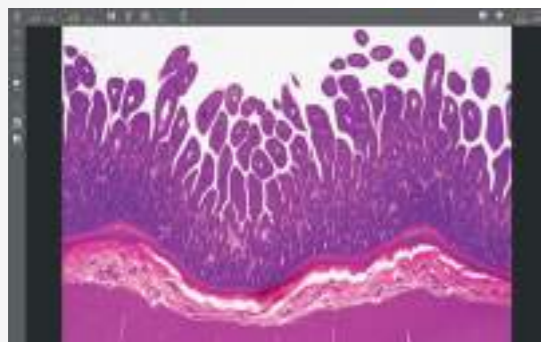
Allows intuitive control of microscope cameras from tablet PCs

Simply installing NIS-Elements L on a tablet PC enables setting and control of DS-Fi3/Digital Sight 10/Digital Sight 1000 microscope cameras, live image display, and image acquisition.

(Compatible OS: Windows® 10 Pro) * For information about compatible tablet PCs, contact Nikon.

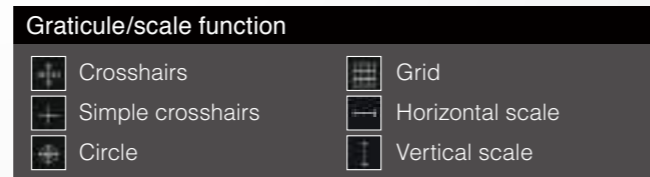
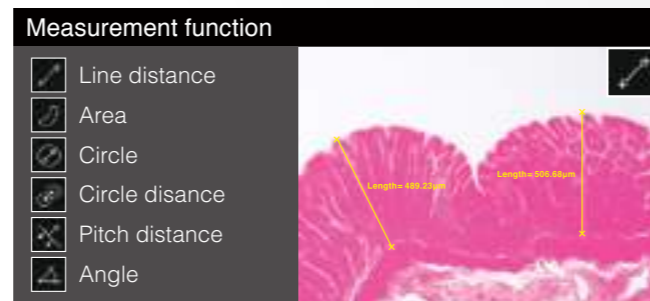
User Interface for naturally simple operation

NIS-Elements L displays various menus for image capture, saving, display, measurement and annotations using intuitive icons. It also supports touch screen operation.



A wide variety of tools

NIS-Elements L enables the conducting of simple measurements on images, with input of lines and comments. These can also be written onto and saved with the image, and measurement data can be output.



Scene mode

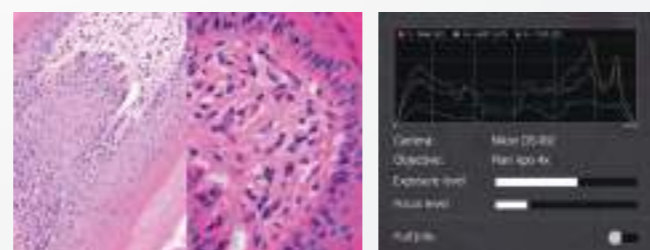
Ten camera setting patterns for optimal color reproduction and contrast for each microscope light source, observation method and type of sample, as well as custom settings, can be selected. (Available with DS-Fi3/Digital Sight 10/Digital Sight 1000 microscope cameras)

Biological Scene Mode

- Brightfield
- HE
- ELISA
- LED-Brightfield
- Asbestos

Other functions

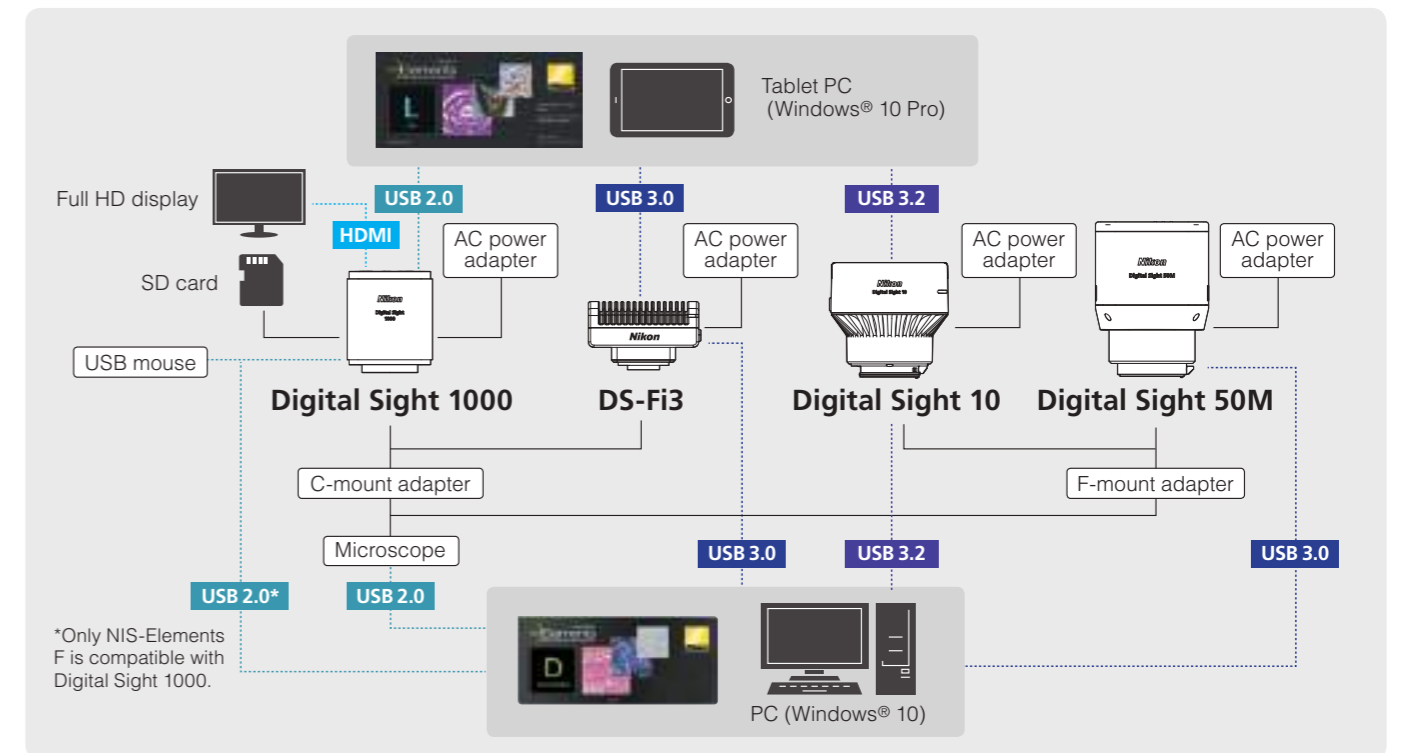
- Split screen display function:** A live image is displayed on the left side of the screen and the saved image is displayed on the right side. When synchronization is activated, synchronized magnification is applied to the both images.
- Camera information:** A histogram and metadata of the image are displayed.
- Full screen:** The image is displayed across the entire screen.
- Saving:** The displayed image is saved with a new file name.



Split screen display function

Camera information

System Diagram



Specifications

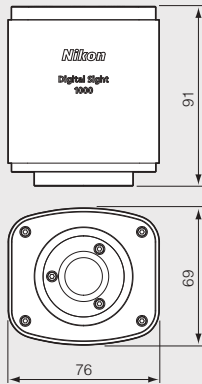
| Model name | Digital Sight 1000 | DS-Fi3 | Digital Sight 10 | Digital Sight 50M |
|--|--|--|--|---|
| Image sensor | 1/2.8 inch Color CMOS image sensor Size: 5.57 × 3.13 mm | 1/1.8 inch Color CMOS image sensor Size: 6.91 × 4.92 mm | Nikon FX-format Color CMOS image sensor Size: 35.8 × 23.8 mm | Nikon FX-format Monochrome CMOS image sensor Size: 35.8 × 23.8 mm |
| Recordable pixels | 1920 × 1080 pixels | All pixels: 2880 × 2048 2 Vertical and 2 horizontal pixels average: 1440 × 1024 | 6000 × 3984 pixels | All pixels: 9552 × 6336 |
| Lens mount | C-mount | | F-mount | |
| Cooling method | | — | | Electronic cooling |
| ISO sensitivity (recommended exposure index) | Standard: equivalent to ISO 150 | Standard: equivalent to ISO 50 (Selectable from ISO 50 to ISO 3200 equivalent) | Equivalent to ISO 200 (color mode) Equivalent to ISO 800 (monochrome mode) (Selectable from ISO 125 to 8000 :in color / ISO 500 to 32000 in mono) | Equivalent to ISO 200 |
| Quantum efficiency | | — | | 85 % |
| Full well Capacity | | — | | 45000e ⁻ (typ.) |
| Readout noise | | — | | 6e ⁻ |
| Dark current | | — | | 1.0e ⁻ /p/s (Ta=25°C)(typ.) |
| Live display mode* (maximum fps) | 1920 × 1080 pixels: 30 fps | All pixels (2880 × 2048): 15 fps 2 Vertical and 2 horizontal pixels average (1440 × 1024): 30 fps | All pixels (6000 × 3984): 9 fps FullHD 3x3 pixels average (1920x1080): 66 fps | All pixels (9552 × 6336): 6 fps@8 bit, 1.9 fps@16 bit 3 × 3 pixels average @ 8 bit (ROI 640 × 480): 225.9 fps*** |
| Exposure time | 1 m sec–10 sec | 100 μsec–30 sec | 100 μsec–120 sec | 150 μsec–120 sec |
| Photometry mode | Average photometry 1920 × 1080 pixels (all area) | Average photometry: Average intensity within the photometry area Peak photometry: Maximum intensity within the photometry area | | |
| Exposure control | Automatic exposure, Manual exposure | One-time automatic exposure: Exposure time is adjusted automatically for one-time within the optimum range for the camera Continuous automatic exposure: Automatic exposure adjustment is performed continuously to keep the exposure within the camera Manual exposure: Exposure time and gain settings are made manually | | |
| Exposure correction | Available | Average metering: ±1EV Step:1/6EV (some restrictions according to tone) Peak hold metering: -1 EV ~ ±0 EV | | Average metering: -1 EV ~ +1/2 EV Peak hold metering: -1 EV ~ ±0 EV |
| Interface | USB2.0 (connect with PC or USB mouse) × 1, HDMI × 1, SD card slot x1** | USB3.0 (connect with PC) × 1, External trigger × 1 | USB3.2GEN1,2 (connect with PC) × 1, External trigger × 1 | USB 3.2GEN1 (connect with PC) × 1, External trigger × 1 |
| Power supply | AC100-240V 50Hz/60Hz | | | |
| Power consumption | 3 W | 4.8 W | 18 W | 27 W |
| Operating environment | 0-40°C, 60% RH max. (without condensation) | | | |

*Maximum frame rate depends on exposure time. **Both SD and SDHC memory cards are available.

***When using NIS-Elements, 16-bit mode can be selected for 1x1 and 2x2 digital binning, and 12-bit mode can be selected for 2x2, 3x3, 4x4 and 6x6. 8-bit mode can be selected in all image size modes.

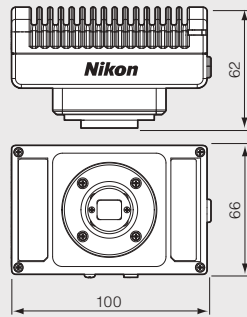
Dimensions

Digital Sight 1000



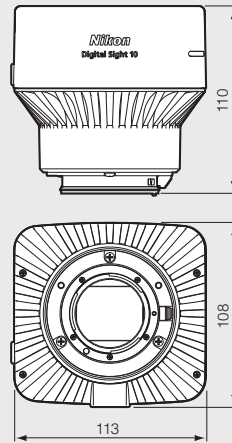
Weight: approx. 450 g

DS-Fi3



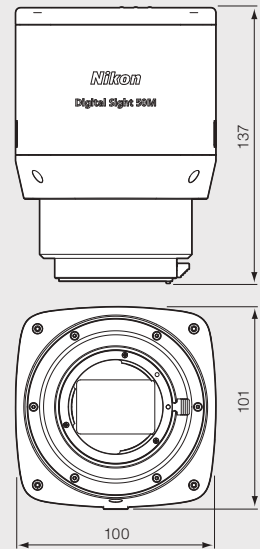
Weight: approx. 400 g

Digital Sight 10



Weight: approx. 1,100 g

Digital Sight 50M



Weight: approx. 1,300 g

Digital Sight 10
Maintenance movie



The digital sight series is not for clinical diagnostic use.

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*Products: Hardware and its technical information (including software)



WARNING

TO ENSURE CORRECT USAGE, READ THE CORRESPONDING MANUALS CAREFULLY BEFORE USING THE EQUIPMENT.



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