Digital Cameras for Microscopes

DIGITAL SIGHT SERIES

Nikon
Nikon Digital Sight series

Choose the ideal microscope camera to suit every application, including the Digital Sight 10, which makes possible to switch between color and monochrome image capture at very high definition of 23.9 mega-pixels or 6K resolution, Digital Sight 1000, which directly displays microscope images on a full HD display without a PC, and the Digital Sight 50M, a monochrome high-sensitivity model suited to fluorescence photography.

Four camera options covering two computing platforms

**Microscope Camera**

- **Digital Sight 1000**
  - Frame rate: 30 fps (1920×1080)
  - Max recordable pixels: 1920×1080
  - C-Mount

- **Digital Sight 10**
  - Frame rate: 15 fps (2880×2048), 30 fps (1440×1024)
  - Max recordable pixels: 2880×2048
  - C-Mount

- **Digital Sight 50M**
  - Frame rate: 9 fps (6000×3984), 66 fps (1920×1080)
  - Max recordable pixels: 6000×3984
  - F-Mount

**Microscope Camera**

- **DS-Fi3**
  - Frame rate: 6 fps (9552×6336), 225.9 fps (640×480)
  - Max recordable pixels: 9552×6336
  - F-Mount

**Low cost, Full HD Camera**

Equipped with a 2 megapixel CMOS image sensor, it can display, capture, and save full HD microscope images of 1920 x 1080 pixels at 30 frames / second.

**Easy operation on HDMI display**

By connecting the microscope to a camera and HDMI monitor, movie and still images can be created, captured and data can be saved to an SD card. No PC connection is required to display scales and reticles, as well as to conduct simple measurements.
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.

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.

High-resolution images

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

Camera Control

The DS-Fi3 interfaces with PC computers via a USB3.0 interface directly to the camera head, and uses NIS-Elements series software for image acquisition.
Quickly and efficiently search wide fields of view, capture and analyze high-definition images

Monochrome Microscope Camera Digital Sight 50M

9K ultra-high resolution

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.

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.

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.

Adjustable image acquisition modes

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.

During manual operation

Color and Monochrome shooting are both possible with one camera unit

During electronic operation (using the 1x electronic adapter)

Easy motorized filter switching

Easy switching between color and monochrome modes using the imaging software is possible by a motorized, hands-free process.

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

Example of combination with the MA200 inverted metallurgical microscope

During electronic operation (using the 1x electronic adapter)

Switch with a single action in the imaging software

1x electronic adapter

Metallic structure (aluminum) (Objective: TU Plan Fluor 50x)

Color

Monochrome

Example of combination with the LV150NA industrial microscope

Wafer (IC pattern) (Objective: TU Plan Fluor 100x)

Before Digital Sight 10

Digital Sight 10

23.9 megapixel

High-sensitivity

Monochrome

Digital Sight 10 enables unprecedented 6K ultra-high definition, capturing microscopic images at up to 6000 x 3984 pixels (23.9 megapixels).

23.9 megapixel

Color/Monochrome

High-resolution

High-definition observation

Digital Sight 10

High-speed display

Digital Sight 10 is able to output a standard or a user definable Region of Interest (ROI) directly from the sensor area. (Position and size limits on ROI are present in the camera, but images are cropped using the SDK to provide an unrestricted ROI to the user.)

Color and Monochrome shooting are both possible with one camera unit

During manual operation

Color mode

Inserting the color filter optimizes the image from 400 to 680 nm in color live display and capture modes

Monochrome mode

Inserting the IR filter in place of the color filter now extends the IR imaging range from 400 to 850 nm in both live and capture modes.

Electric switching function

Easy motorized filter switching

Easy switching between color and monochrome modes using the imaging software is possible by a motorized, hands-free process.

Photography with the natural colors seen through the microscope

Nikon is a leader in development of algorithms for reproducing color just as the eyes see it

The Digital Sight 10 models’ image processing engine is based on extensive data accumulated over many years of developing microscope color digital cameras, resulting in perfect reproduction of the colors your eyes see in the microscope.

Digital Sight 10 adjusts image size in the vertical direction to enhance the frame rate above that of the DS-Ri2, Qi2, and Fi3 models.

High-speed display

Digital Sight 10

Achieves up to approximately 357 fps

(3x3 binning, 128x128 ROI, exposure time: 100 μs)
Integration with Nikon’s Software Imaging Platform

Nikon’s universal software platform, NIS-Elements combines powerful image acquisition, analysis, visualization and data sharing tools. With fully customizable user interfaces and seamless integration of Nikon microscopes, cameras and a wide variety of peripheral devices, NIS-Elements can serve as a single interface for photo-documentation or power complex, conditional workflows with automated imaging and analysis routines. The NIS-Elements platform features various packages and software modules to meet the needs of even the most challenging applications.

**HDR (High Dynamic Range)**

**Image acquisition**

HDR creates an image with appropriate brightness in both the dark and bright regions in a sample by combining multiple images acquired with different exposure settings. It is also possible to create HDR image using multiple captured images.

**Without HDR**

**With HDR**

**EDF (Extended Depth of Focus)**

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

**Manual measurement and image annotation**

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)**

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

**Grain size analysis**

Detects and measures grains in one and two phase samples according to JIS G0551, ASTM E112-13/E1382-97, BS0643 and GB/T 6394 standards.

**Image stitching (Large Image)**

Stitches together images acquired from multiple fields of view. This can occur from images as they are acquired or from previously captured images.

**Cast iron analysis**

Detects, measures and classifies graphite content as well as ferrite content in graphite-corrected samples according to JIS G5502, ASTM A247-06 and ISO945-1 standards.

**Measuring Software**

**Measurement of distance between two points**

**Measurement of distance from base line**
Intuitive control of microscope cameras from tablet PCs

Easily view images and control image acquisition settings for the Digital Sight 1000/DS-Fi3/Digital Sight 10 camera on a tablet PC using NIS-Elements L.

(Compatible OS: Windows® 10 Pro)  * Nikon provides confirmed compatible tablet PCs with up-to-date specifications. Contact Nikon for details.

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.

Other functions

- Split screen display: 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 displayed image is saved with a new file name.
- Live stream: Easy live streaming to other PCs and mobile devices on the same network or via an Internet streaming services.

Table: Measuring functions

<table>
<thead>
<tr>
<th>Measurement function</th>
<th>Annotate function</th>
<th>Graticule/scale function</th>
</tr>
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<tr>
<td>Line distance</td>
<td>Line</td>
<td>Grid</td>
</tr>
<tr>
<td>Area</td>
<td>Arrow</td>
<td>Horizontal scale</td>
</tr>
<tr>
<td>Circle</td>
<td>Text</td>
<td>Vertical scale</td>
</tr>
<tr>
<td>Circle diameter</td>
<td>Marker</td>
<td></td>
</tr>
<tr>
<td>Pitch distance</td>
<td>Polyline</td>
<td></td>
</tr>
</tbody>
</table>

System Diagram

Digital Sight 1000

- Weight: approx. 450 g
- Dimensions: Width: 91 mm, Height: 69 mm, Depth: 76 mm
- System Diagram:

Digital Sight 10

- Weight: approx. 400 g
- Dimensions: Width: 100 mm, Height: 108 mm, Depth: 69 mm
- System Diagram:

Digital Sight 50M

- Weight: approx. 1,300 g
- Dimensions: Width: 117 mm, Height: 101 mm, Depth: 86 mm
- System Diagram:

Nikon provides confirmed compatible tablet PCs with up-to-date specifications. Contact Nikon for details.

*Only NIS-Elements F is compatible with Digital Sight 1000.
## Specifications

<table>
<thead>
<tr>
<th>Model name</th>
<th>Digital Sight 1000</th>
<th>DS-Fi3</th>
<th>Digital Sight 10</th>
<th>Digital Sight 50M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image sensor</td>
<td>1/2.8 inch Color CMOS image sensor</td>
<td>1/1.8 inch Color CMOS image sensor</td>
<td>Nikon FX-format Color/ Monochrome CMOS image sensor</td>
<td>Nikon FX-format Monochrome CMOS image sensor</td>
</tr>
<tr>
<td>Size</td>
<td>5.27 x 3.13 mm</td>
<td>6.91 x 4.92 mm</td>
<td>Size: 38.5 x 23.8 mm</td>
<td>Size: 38.5 x 23.8 mm</td>
</tr>
<tr>
<td>Recordable pixels</td>
<td>1920 x 1080 pixels All pixels: 2880 x 2048 pixels 2 Vertical and 2 horizontal pixels average: 1440 x 1024</td>
<td>6000 x 3984 pixels</td>
<td>All pixels: 9552 x 6336</td>
<td></td>
</tr>
<tr>
<td>Lens mount</td>
<td>C-mount</td>
<td>F-mount</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling method</td>
<td>—</td>
<td>Electronic cooling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISO sensitivity (recommended exposure index)</td>
<td>Standard: equivalent to ISO 150 (Selectible from ISO 50 to ISO 3200 equivalent)</td>
<td>Equivalent to ISO 200 (color mode) (Selectible from ISO 125 to 8000; in color / ISO 500 to 32000 in mono)</td>
<td>Equivalent to ISO 200</td>
<td></td>
</tr>
<tr>
<td>Quantum efficiency</td>
<td>—</td>
<td>85%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full well Capacity</td>
<td>—</td>
<td>45000e- (typ.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Readout noise</td>
<td>—</td>
<td>6e-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dark current</td>
<td>—</td>
<td>1.0e-/p/s (Ta=25°C) (typ.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Live display mode* (maximum fps)</td>
<td>1920 x 1080 pixels: 30 fps All pixels (2880 x 2048): 15 fps All pixels (6000 x 3984): 9 fps All pixels (9552 x 6336): 6 fps</td>
<td>6 fps (8 bit, 1.9 fps @ 16 bit) 3 x 3 pixels average @ 8 bit (ROI 640 x 480): 225.9 fps ***</td>
<td>6 fps (8 bit, 1.9 fps @ 16 bit) 3 x 3 pixels average @ 8 bit (ROI 640 x 480): 225.9 fps ***</td>
<td></td>
</tr>
<tr>
<td>Exposure time</td>
<td>1 m sec-10 sec</td>
<td>100 μsec-30 sec</td>
<td>100 μsec-120 sec</td>
<td>150 μsec-120 sec</td>
</tr>
<tr>
<td>Photometry mode</td>
<td>Average photometry 1920 x 1080 pixels (all area)</td>
<td>Average photometry: Average intensity within the photometry area</td>
<td>Peak photometry: Maximum intensity within the photometry area</td>
<td></td>
</tr>
<tr>
<td>Exposure control</td>
<td>Automatic exposure, Manual exposure</td>
<td>One-time automatic exposure: Exposure time is adjusted automatically for one-time within the optimum range for the camera</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td>Exposure correction</td>
<td>Available</td>
<td>Average metering: ±1 EV Step:1/6 EV (some restrictions according to tone) Peak hold metering: -1 EV ~ +0 EV</td>
<td>Peak hold metering: -1 EV ~ +1/2 EV</td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td>USB2.0 (connect with PC or USB mouse) x 1, HDMI x 1, SD card slot x1</td>
<td>USB3.0 (connect with PC) x 1, External trigger x 1</td>
<td>USB3.0GEN1,2 (connect with PC) x 1, External trigger x 1</td>
<td>USB3.0GEN1 (connect with PC) x 1, External trigger x 1</td>
</tr>
<tr>
<td>Power supply</td>
<td>AC100-240V 50Hz/60Hz</td>
<td>Power consumption: 3 W 4.8 W 18 W 27 W</td>
<td>Operating environment: 0-40°C, 60% RH max. (without condensation)</td>
<td></td>
</tr>
</tbody>
</table>

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

**Both SD and SDHC memory cards are compatible with the Digital Sight 1000 camera.

***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.

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### WARNING

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

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