



DIGITAL SIGHT SERIES

Digital Cameras for  
Microscopes

# The Digital Sight Camera series

## Introducing a new model with excellent cost performance.

The new Digital Sight 1000 is an economical color camera solution that can directly display high-definition microscope images on a full HD display without using a PC. A built in SD card slot allows direct image capture as well. As with the DS-Fi3 and DS-Ri2, it can also be connected to a tablet PC to save space and easily acquire images.

Four camera options covering two computing platforms

<p>Microscope Camera <b>Digital Sight 1000</b> <b>NEW</b></p>  <p>→ P.3</p> <p>2.0 megapixel Color Full HD</p> <p>Frame rate 30 fps (1920x1080)</p> <p>Max recordable pixels 1920x1080</p> <p>C-Mount</p>	<p>Microscope Camera <b>DS-Fi3</b></p>  <p>→ P.4</p> <p>5.9 megapixel Color High-resolution</p> <p>Frame rate 15 fps (2880x2048), 30 fps (1440x1024)</p> <p>Max recordable pixels 2880x2048</p> <p>C-Mount</p>	<p>Microscope Camera <b>DS-Ri2</b></p>  <p>→ P.6</p> <p>16.25 megapixel Color High-resolution</p> <p>Frame rate 6 fps (4908x3264), 45 fps (1636x1088)</p> <p>Max recordable pixels 4908x3264</p> <p>F-Mount</p>	<p>Monochrome Microscope Camera <b>DS-Qi2</b></p>  <p>→ P.7</p> <p>16.25 megapixel Monochrome Cooled</p> <p>Frame rate 6 fps (4908x3264), 45 fps (1636x1088)</p> <p>Max recordable pixels 4908x3264</p> <p>F-Mount</p>
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Using a tablet PC



→ P.10

Using a desktop PC



→ P.8

Only NIS-Elements L and F are compatible with Digital Sight 1000

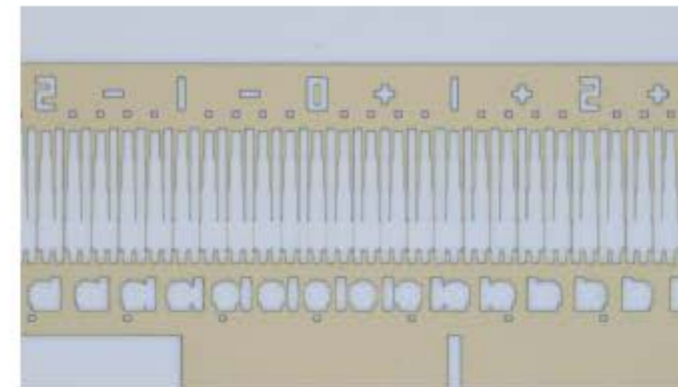
Microscope Camera

**NEW**

# Digital Sight 1000



2.0 megapixel Color Full HD



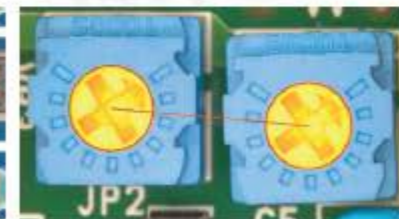
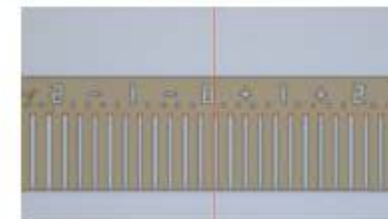
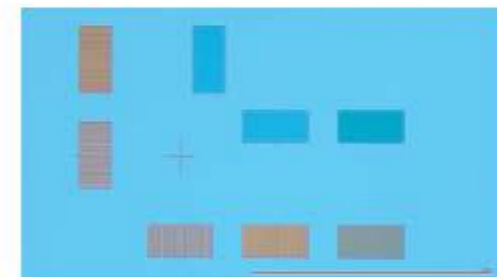
Semiconductor (IC wafer)  
(Objective: TU Plan Fluor 20x on Nikon Eclipse microscope)

## 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.



Cross Line (Line Display)

Perpendicular Distance Measurement

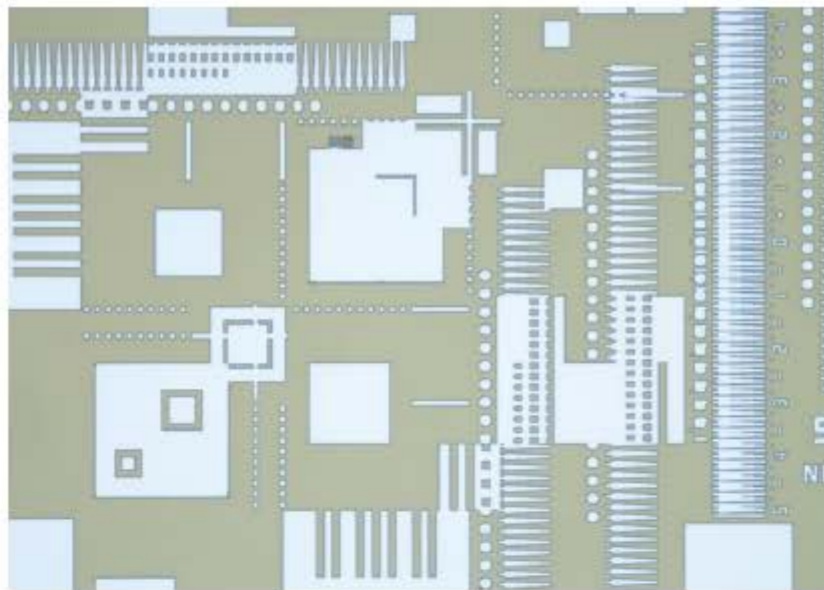
Circle Distance Measurement

### Main Features

- Image Comparison
- Circle Distance Measurement
- Parallel Line Measurement
- Polygon Display
- Measurement Calibration
- Scale Bar Display
- Reticle Display
- Angle Measurement
- Concentric Circles Measurement
- Freehand Line Display
- Rectangle Display
- Coordinate Display
- Scale Reticle Display
- Saving Measurement Result
- Perpendicular Distance Measurement
- Circle Display
- Line Display



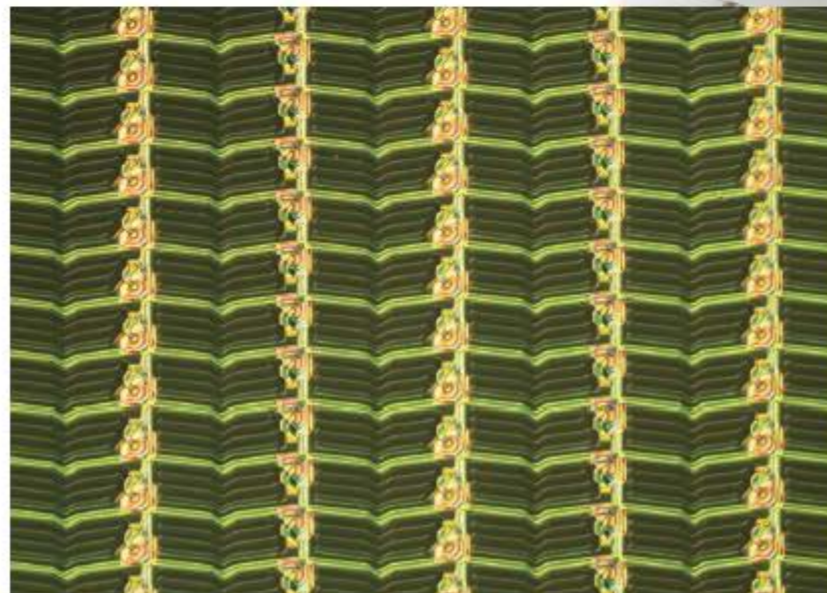
## Microscope Camera DS-Fi3



Semiconductor (IC wafer)  
(Objective: TU Plan Fluor BD 20x on Nikon Eclipse microscope)

## High-resolution images

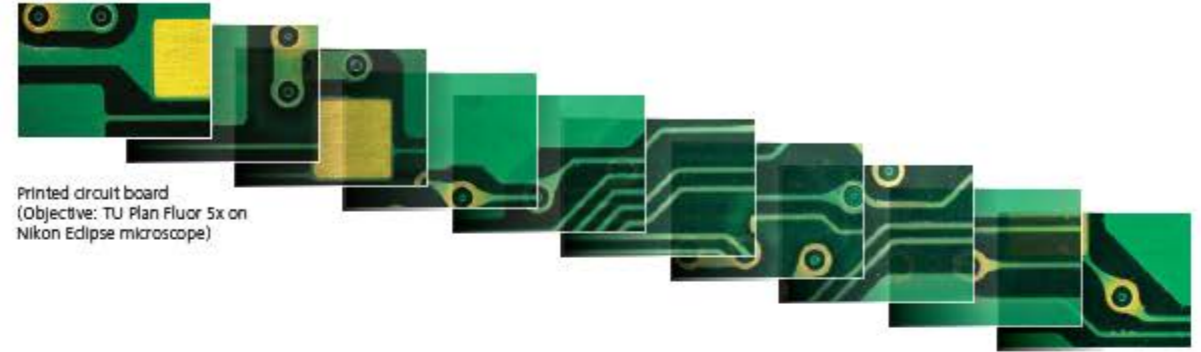
A CMOS high density 5.9 megapixel sensor produces high resolution images. The USB3.0 data transfer allows fast focusing with high resolution, and easy image capture in all types of observation contrast methods such as brightfield, darkfield, differential interference contrast, and phase contrast.



Liquid crystal panel  
(Objective: TU Plan Fluor 10x on Nikon Eclipse microscope)

## 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.



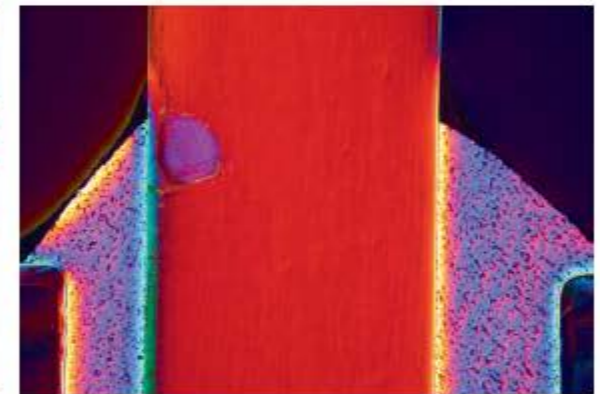
Printed circuit board  
(Objective: TU Plan Fluor 5x on Nikon Eclipse microscope)

## Superior color reproduction

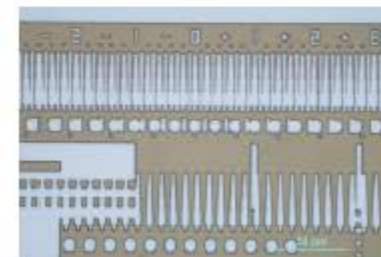
Nikon is well-known for outstanding and lifelike color reproduction, and developing superior algorithms for creating results that look like the actual samples. These algorithms are used in all of the color cameras in the digital sight lineup.



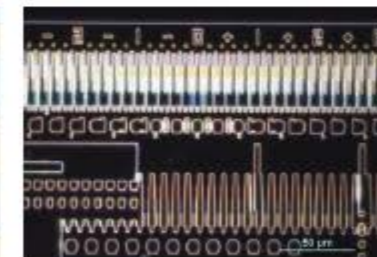
Printed circuit board  
(Stereo microscope + LED ring lights)



Printed circuit board (Connector)  
(Objective: TU Plan Fluor BD 10x on Nikon Eclipse microscope)



Semiconductor (IC wafer)  
(Objective: TU Plan Fluor BD 50x on Nikon Eclipse microscope)



Semiconductor (IC wafer)  
(Objective: TU Plan Fluor BD 50x on Nikon Eclipse microscope)



Semiconductor (IC wafer)  
(Objective: TU Plan Fluor BD 50x on Nikon Eclipse microscope)

## 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.



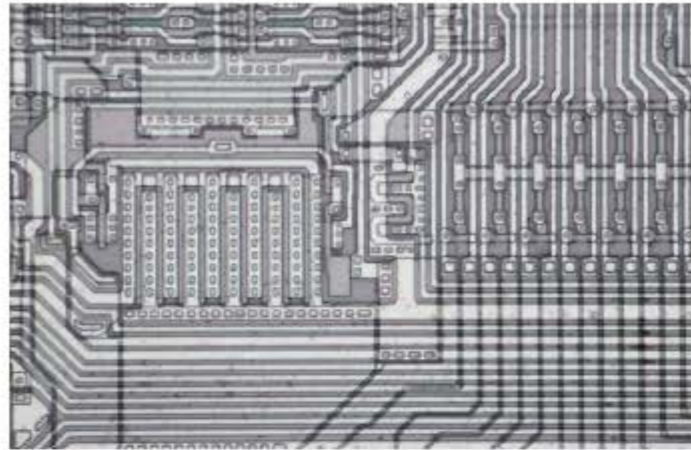
Fast, one-shot capture of ultra-high resolution color images.

## Microscope Camera DS-Ri2

16.25 megapixel

Color

High-resolution



Semiconductor (IC wafer)  
(Objective: TU Plan Fluor 20x on Nikon Eclipse microscope)

## High-resolution images

16.25-megapixel CMOS image sensors for astonishing image quality

The DS-Ri2 enables one-shot instantaneous capture and fast storage of images with resolution as high as 4908x3264 pixels, without pixel shifting or pixel stepping. This pixel density is ideally suited for photomicrography of ultra-fine structures or patterns in biological or industrial samples, at low or high magnifications.



Resolution chart  
(Objective: TU Plan Fluor BD 50x on Nikon Eclipse microscope)



Conventional camera



DS-Ri2



Example of combination with the LV100ND industrial microscope

## 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 DS-Ri2 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.



Left Image: Semiconductor (IC wafer)  
(Objective: TU Plan Fluor BD 50x on Nikon Eclipse microscope)

Right Image: Semiconductors (IC wafer)  
(Objective: TU Plan Fluor BD 20x on Nikon Eclipse microscope)

## High-speed live display

High-speed display, even of super-HDTV-class live images

The DS-Ri2 can display 4908x3264 pixel (full-pixel) images at 6 fps, or 1636x1088 pixel (3x3 pixel averaging) images at 45 fps.

This fast-live frame rate allows easy and fine focusing.



Semiconductor (IC wafer)  
(Objective: TU Plan Fluor 5x on Nikon Eclipse microscope)  
1636x1088 pixel / Exposure time: 100  $\mu$ sec

## Capture Low light fluorescence and Large Fields of View

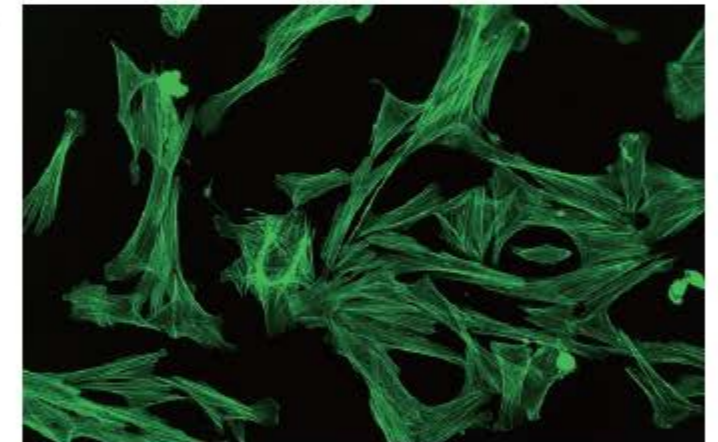
### Monochrome Microscope Camera

## DS-Qi2

16.25 megapixel

Monochrome

Cooled



Indian Muntjac Deer Skin Fibroblast Cells, Cytoskeletal F-actin labeled with Alexa Fluor 488  
Sample courtesy of: Michael Davidson and Florida State University

## High sensitivity

Detects even faint fluorescent signals

7.3  $\mu$ m pixels, high quantum efficiency, and very low read noise allow the DS-Qi2 to read in even faint fluorescent signals.

## High frame rate

Fast focusing, even with fluorescent images

With a high-sensitivity CMOS image sensor and USB 3.0-based data transfer, the DS-Qi2 enables high-speed live imaging and image capture at up to 45 fps (1636x1088 pixels).

## Excellent linearity

Reliable quantitative analysis made possible

With a linearity error of  $\pm 1\%$ , the DS-Qi2 is a superb tool for measuring intensities in fluorescence samples, including time-based intensity measurement and ratiometric measurement.

## Low noise

Acquires dim fluorescent signals with ultra-low noise

Both 2.2 electrons read noise coupled with a large full-well capacity and 0.6 electrons dark current allow the acquisition of 14 bit fluorescence images with very little noise.

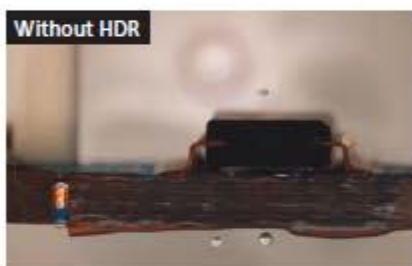


## Integration with Nikon's Software Imaging Platform

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 simple 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.

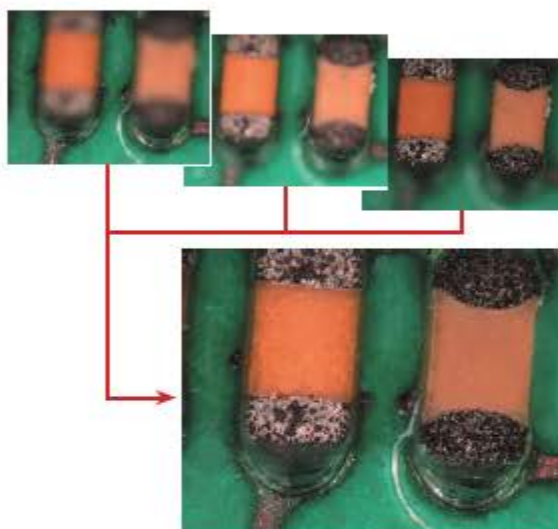
### HDR (High Dynamic Range) image acquisition

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.



### EDF (Extended Depth of Focus)

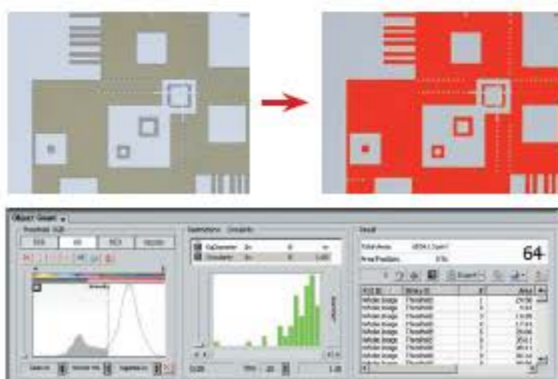
Creates a single, all-in-focus image from images of differing focus. Such images can now be created by simply turning the focus knob.



Selects the in-focus area and produces one all-in-focus image

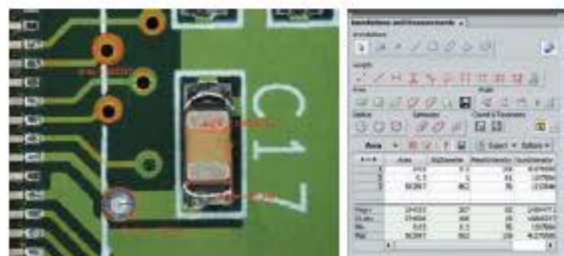
### Auto measurement (Object Counting)

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



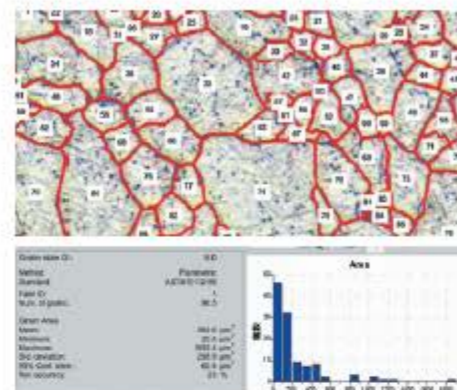
### Manual measurement and image annotation

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.



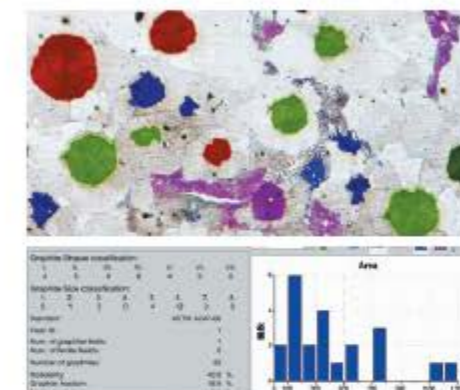
### Grain size analysis

Detects and measures grains in one and two phase samples according to JIS G0551, ASTM E112-13/E1382-97, ISO643 and GB/T 6394 standards.



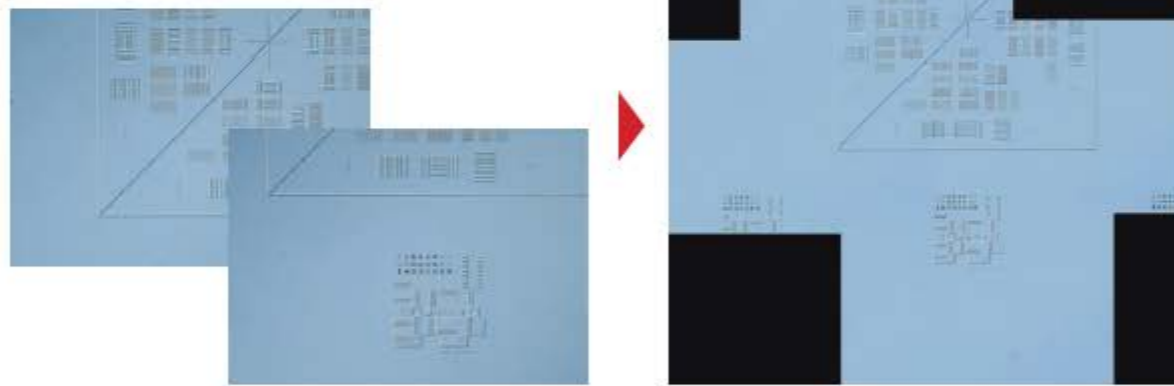
### Cast iron analysis

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.

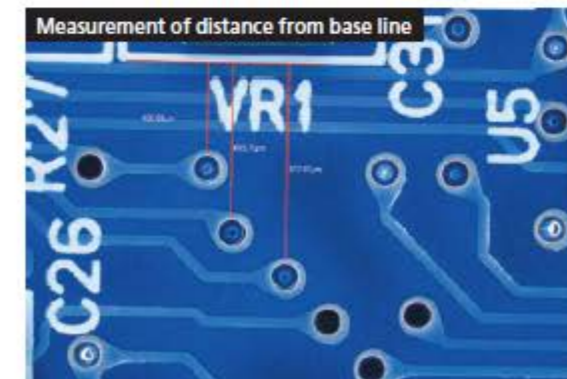
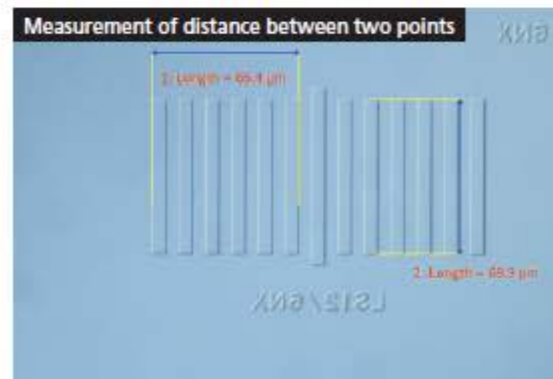


### Image stitching (Large Image)

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



### Measuring Software





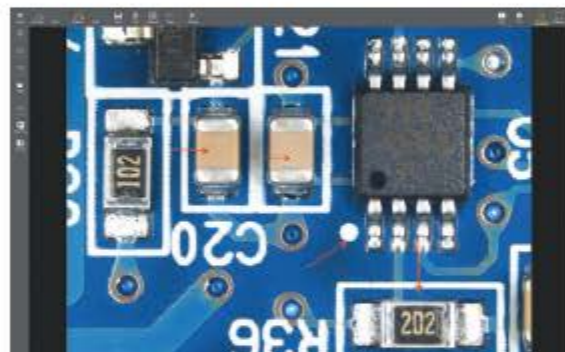
## Intuitive control of microscope cameras from tablet PCs

Easily view images and control image acquisition settings for the Digital Sight 1000/DS-Fi3/DS-Ri2 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.

Measurement function	
<input checked="" type="checkbox"/>	Line distance
<input checked="" type="checkbox"/>	Area
<input checked="" type="checkbox"/>	Circle
<input checked="" type="checkbox"/>	Circle distance
<input checked="" type="checkbox"/>	Pitch distance
<input checked="" type="checkbox"/>	Angle

Annotate function	
<input checked="" type="checkbox"/>	Line
<input checked="" type="checkbox"/>	Arrow
<input checked="" type="checkbox"/>	Text
<input checked="" type="checkbox"/>	Marker
<input checked="" type="checkbox"/>	Polyline

Graticule/scale function	
<input checked="" type="checkbox"/>	Crosshairs
<input checked="" type="checkbox"/>	Simple crosshairs
<input checked="" type="checkbox"/>	Circle
<input checked="" type="checkbox"/>	Grid
<input checked="" type="checkbox"/>	Horizontal scale
<input checked="" type="checkbox"/>	Vertical scale

### Scene mode

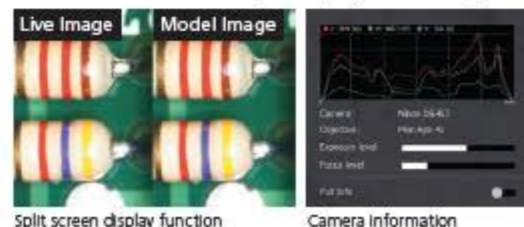
Ten camera setting patterns for optimal color reproduction and contrast for each microscope light source, observation method and type of sample, as well as custom settings, can be selected.

#### Industrial Scene Mode

- Wafer/IC
- Metal
- Circuit board
- Flat Panel Display

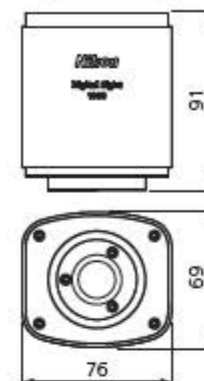
### Other functions

- **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 image is displayed across the entire screen.
- **Saving:** 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.



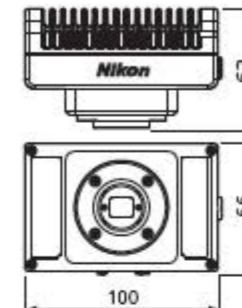
## Dimensions

### Digital Sight 1000



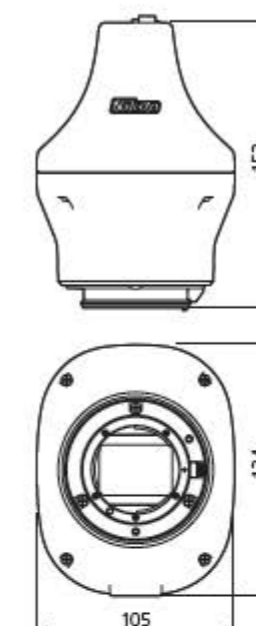
Weight: approx. 450 g

### DS-Fi3



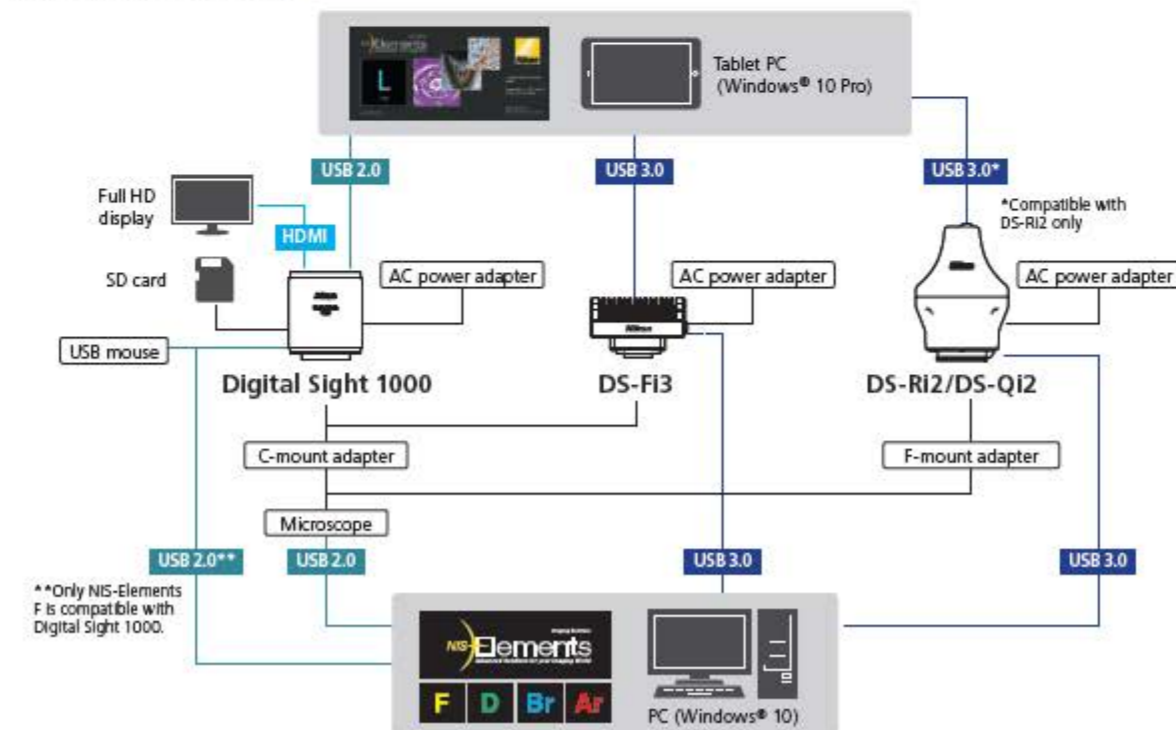
Weight: approx. 400 g

### DS-Ri2/DS-Qi2



Weight: approx. 1,200 g

## System Diagram



# Specifications

Model name	Digital Sight 1000	DS-F13	DS-R12	DS-Q12
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: 36.0 × 23.9 mm	Nikon FX-format Monochrome CMOS Image sensor Size: 36.0 × 23.9 mm
Recordable pixels	1920 × 1080 pixels	All pixels: 2880 × 2048 2 Vertical and 2 horizontal pixels average: 1440 × 1024	All pixels: 4908 × 3264 3 × 3 pixels average: 1636 × 1088	
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)	Standard: equivalent to ISO 200 (Selectable from ISO 200 to ISO 12800 equivalent)	Standard: equivalent to ISO 800 (Selectable from ISO 800 to ISO 51200 equivalent)
Quantum efficiency	—		77%	
Full well Capacity	—		60000e (- typ.)	
Readout noise	—		2.2e (- typ.)	
Dark current	—		0.6e-/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 (4908 × 3264): 6 fps 3 × 3 pixels average (1636 × 1088): 45 fps	
Exposure time	1/30 sec – 10 sec	100 μsec – 30 sec	100 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	±1EV Step:1/6EV	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		USB 3.0 (connect with PC) × 1, External trigger × 1
Power supply	AC100-240V 50Hz/60Hz			
Power consumption	3 W	4.8 W	13 W	24 W
Operating environment	0-40°C, 60% RH max. (without condensation)		0-30 °C, 80% RH max. 30-40°C, 60% RH max. (without condensation)	

\*Maximum frame rate depends on exposure time. \*\*Both SD and SDHC memory cards are compatible with the Digital Sight 1000 camera.

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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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