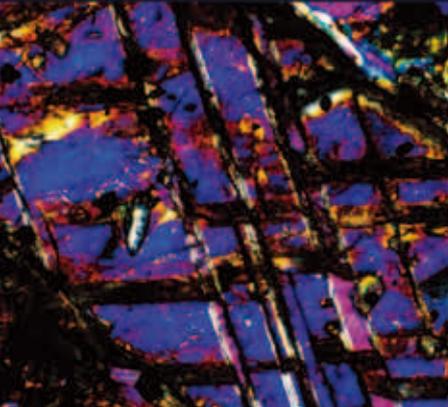
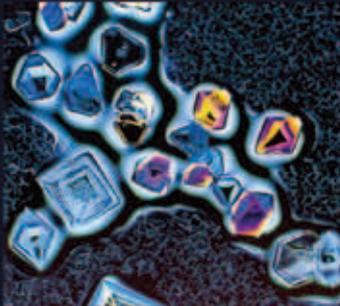
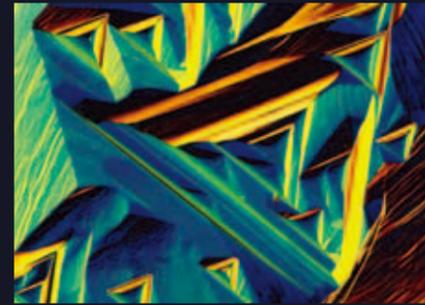


Polarizing Microscopes  
**ECLIPSE**  
**LV100N POL**  
**Ci-POL**



# The highest level of optical quality, operability and stability for polarizing microscopy

- The low-power-consumption 50W light source is brighter than a 100W lamp, and reduces heat-induced focus drift and energy consumption.
- High-precision centerable nosepiece and stage with smooth, accurate movement. (LV100N POL only)
- 30mm long focus stroke accepts tall samples.



1



2

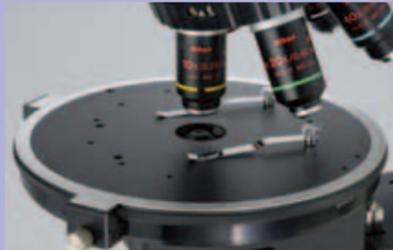


3



Reversed centering quintuple nosepiece

Up to five objectives can be mounted and all objective positions are centerable. The DIN-compliant compensator slot accepts various compensators for qualitative or quantitative measurements.



High-precision rotating stage

The LV100N POL stage is large, pre-adjusted, and click-stops in 45° increments. The smooth stage movement allows stable and easy rotation, providing high operability and high-quality polarized images. The underneath support for the stage table is close to the optical axis. Together with the steel cross roller guides, this provides outstanding stability and durability during regular use.



Intermediate tube

The intermediate tube incorporates a Bertrand lens as standard, enabling both the observation and capture of conoscopic and orthoscopic images. The Bertrand lens is focusable and centerable. The high precision slider-type analyzer can be rotated a full 360° with a precision vernier scale. A P-LC tint plate slider with full and quarter wave plates and an empty space is available.



Conoscopic image of mica / CFI P Achromat 40X



ECLIPSE Ci-POL  
(Diascopic illumination)

ECLIPSE Ci-POL  
(Diascopic/Episcopic illumination)

ECLIPSE LV100N POL  
(Diascopic illumination)

ECLIPSE LV100N POL  
(Diascopic/Episcopic illumination)

## Objective lenses for polarizing observation

### CFI P Achromat objective series (for diascopic illumination)

The unique Nikon CFI60 objectives successfully deliver longer standard working distances and high numerical apertures, offering superb image flatness, contrast and cost performance.



### CFI TU Plan Fluor EPI P objective series (for diascopic/episcopic illumination)

The CFI TU Plan Fluor EPI P series—the newly developed CFI60-2 objectives—produces pin-sharp aberration-free images regardless of magnification.



Nikon CFI optics employ an eco-glass that is manufactured with no harmful substances such as lead and arsenic.

## ECLIPSE LV100N POL Diascopic illumination type

### Outstanding optical performance, perfect for a wide variety of imaging applications and polarizing techniques

Nikon has developed a high-intensity 50W halogen light source (with dedicated lamphouse) that provides greater brightness than a conventional 100W halogen light source. Brightness is increased by approximately 20 to 40% with objective magnifications of 50x and higher. This new light source consumes lower electrical power and generates very little heat, greatly reducing focus drift resulting from light source heat.

- Microscope body is designed to realize high robustness.
- Unique stage mount design ensures exceptional stability.
- Nosepiece comes with a DIN standard compensator slot.
- All five objective positions on the nosepiece are centerable.
- Uses CFI60 optics, realizing both high NA and longer standard working distances.
- A clamp-type upper limit focusing mechanism makes for easy, safe sample exchange, protecting both sample and optics from collision damage.

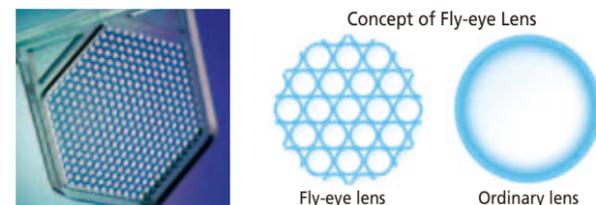
#### Why is 50W brighter than 100W?

Brightness is not determined by wattage. Nikon's unique light source design achieves greater brightness by optimizing the lamp filament size and improving pupil illumination fulfillment. The latter has been achieved by optically expanding the size of the light source with a mirror in the lamphouse. This has resulted in a 50W light source that is brighter than a 100W lamp—about 40% brighter with diascopic illumination\*.

\*With 100x objectives.

#### Uniform brightness with diascopic illumination

Nikon's unique fly-eye lens has been employed in the diascopic illumination optics. This enables high quality digital imaging with no variations in luminescence throughout the view field.



## ECLIPSE LV100N POL Diascopic/Episcopic illumination type ECLIPSE Ci-POL Diascopic/Episcopic illumination type

### Accomplishes advanced polarizing microscopy under both diascopic and episcopic illumination

Both diascopic and episcopic polarizing observations are possible by mounting the LV-UEPI-N Universal Epi-illuminator. Switching the illumination technique is a simple operation\*. The epi-illuminator uses a Nikon 12V50W light source that provides brighter illumination than a 100W lamp. The noise-terminator mechanism provides sharp images with high S/N ratios by eliminating stray light. With the optional universal-type nosepiece and DIC accessories including objectives, episcopic differential interference contrast (DIC) microscopy is also possible.

\* When used with the Ci-POL, LV-UEPI-N requires an external power supply.



ECLIPSE Ci-POL  
(Diascopic/Episcopic illumination type)

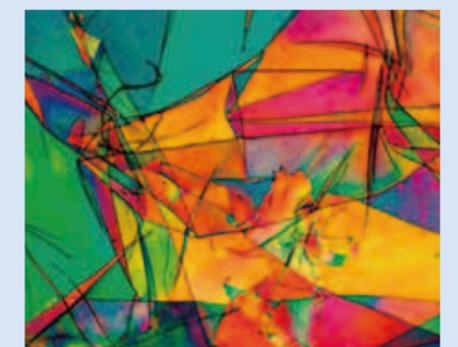
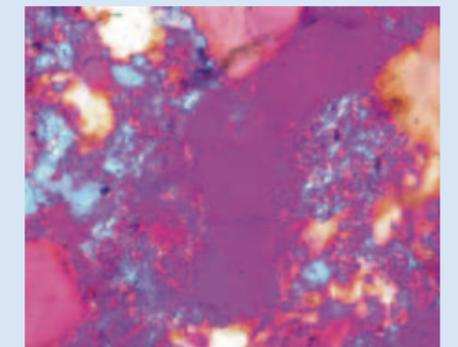
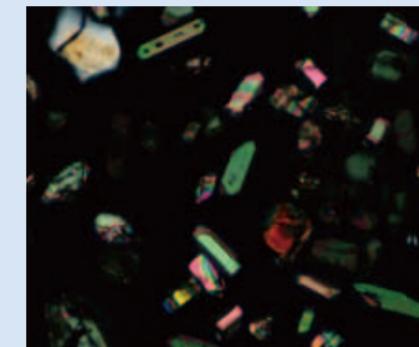
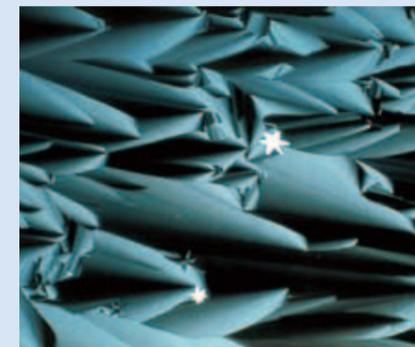


ECLIPSE LV100N POL  
(Diascopic/Episcopic illumination type)

## ECLIPSE Ci-POL Diascopic illumination type

### A compact polarizing microscope that balances optical performance and ease of use

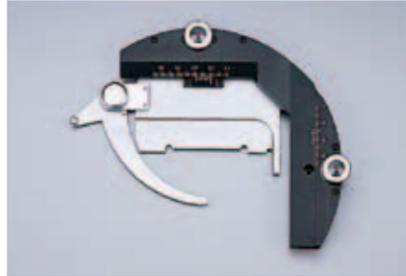
- Slim and compact, an excessively large working area is not necessary.
- Nosepiece uses the same DIN standard compensator slot design as LV100N POL.
- All five objective positions on the nosepiece are centerable.
- Uses CFI60 optics, realizing both high NA and long standard working distances.
- A clamp-type upper limit focusing mechanism makes for easy, safe sample exchange, protecting both sample and optics from collision damage.
- Excellent cost effective and precision manufacturing is balanced with superb basic performance for a polarizing microscope.
- Built-in capture button allows easy imaging with DS series cameras.



## Optional Accessories for Polarizing Observations

### Attachable mechanical stage

To improve microscopy efficiency, an attachable mechanical stage can be mounted on the rotating stage to rigidly hold and move the sample.  
Cross travel: 35 x 25 mm  
Min. increment: 0.1mm on the vernier



### Senarmont compensator

Inserted into the intermediate tube. In addition to the standard use  $1/4 \lambda$  plate and a 546nm ( $1 \lambda$ ) tint plate (1st order red plate), a Senarmont compensator is also available as an option, for retardation measurements from 0 to  $1 \lambda$ .



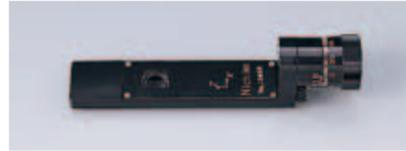
### Quartz wedge compensator

Inserted into the intermediate tube, this compensator permits retardation measurements from 1 to 6  $\lambda$  orders.



### Berek compensator

Inserted into the nosepiece slot, this compensator permits retardation measurements from 0 to 1800 nm. Manufactured by Nichika Corporation.



### IF 546/12 retardation filter

High-precision interference filter with a 546nm central wavelength and 12nm FWHM (full-width at half maximum). Used to increase the precision of retardation measurements.

## Digital camera systems—Digital Sight (DS) series

You can select the most appropriate camera head and control unit to meet your specific documentation needs.

### High-definition color camera head—DS-Fi2

Provides greatly improved video performance in combination with a high-definition 5-megapixel camera. The newly developed CCD control circuit offers the fast frame rate of 21 fps (Display mode: 1280 x 960 pixels). It realizes both high resolution image and clear reproduction of interference color.



### High-definition cooled color camera head—DS-Fi1c

Suited to weak-light polarization samples requiring long term exposure. A built-in cooling mechanism in the 5.0-megapixel color CCD contributes to clear images with minimal heat-induced noise.



### High-speed color camera head—DS-Vi1

Features a high frame rate, 2.0-megapixel color CCD. Displays SXGA live images at 15fps (29fps max.). The DS-Vi1 balances smooth live image movement and excellent reproduction of vivid interference colors.



### Standalone control unit—DS-L3

Standalone control unit with an 8.4-in. large LCD monitor. The camera can be controlled with a mouse or touch panel, eliminating the necessity of a PC connection. Image acquisition settings can be easily selected using scene mode icons according to the observation method, and simple measurement of such as point-to-point distance is also possible. If required, the unit can be connected directly to a PC or to a network via Ethernet.

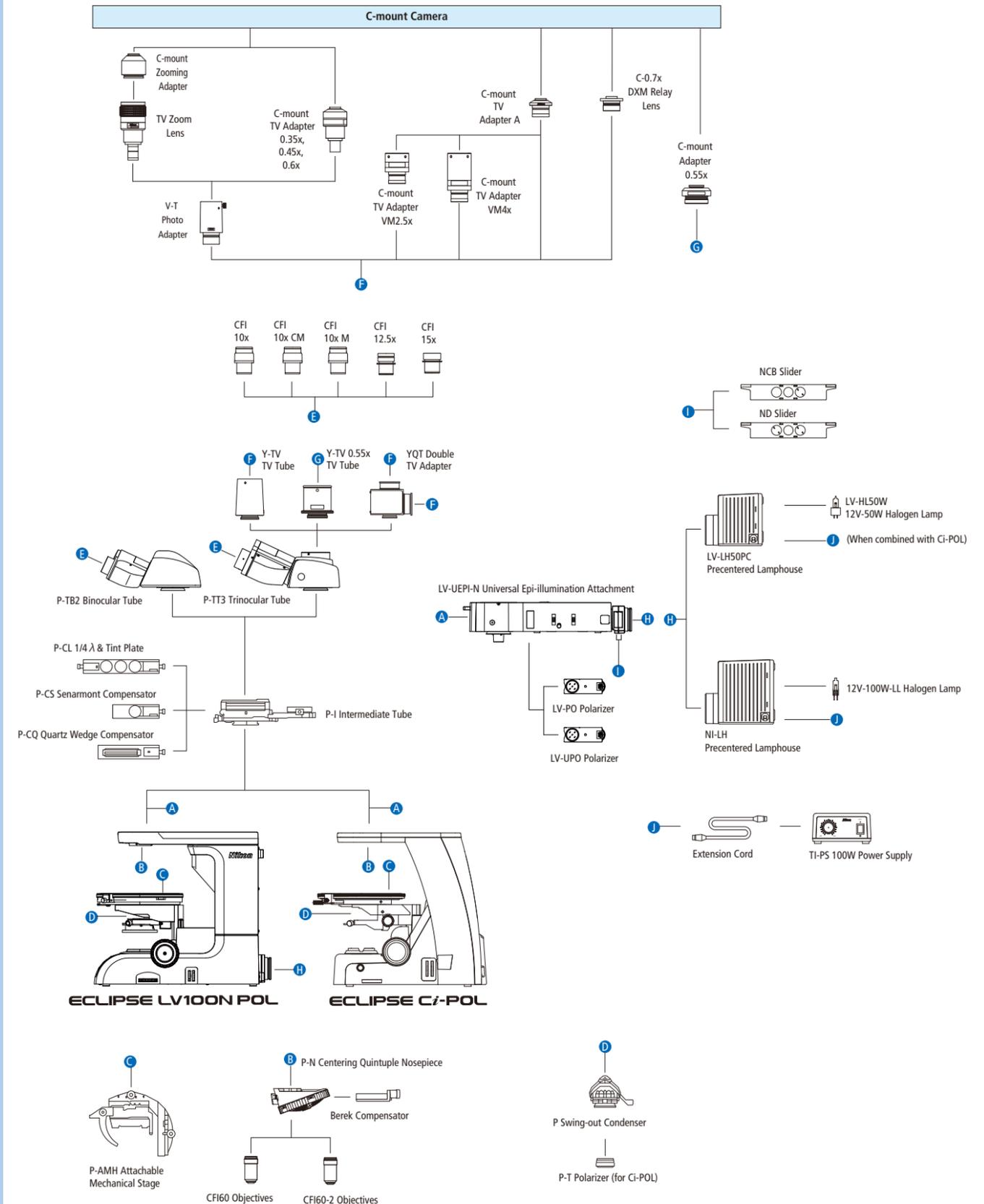


### PC-use control unit—DS-U3

Control unit that allows camera control, image capture, processing, measurement, analysis, data management and report generation on a PC monitor using Nikon's imaging software NIS-Elements. High-speed image transfer to a PC is possible via IEEE1394b interface.



## System Diagram

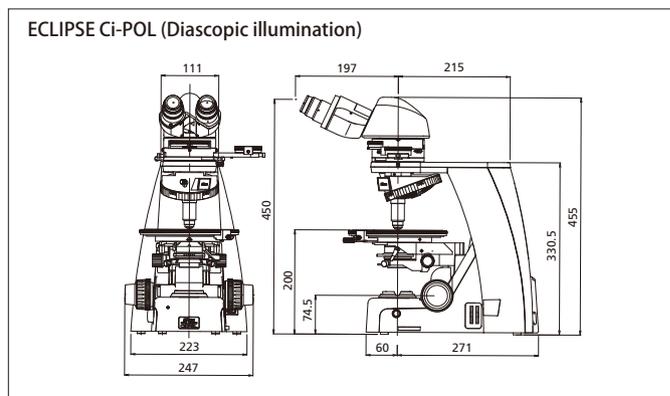
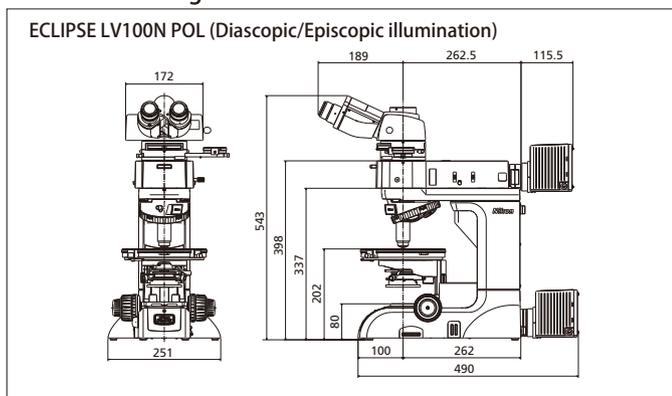


## Specifications

		ECLIPSE LV100N POL	ECLIPSE Ci-POL
Main body	Optical system	CFI60 infinity	
	Illumination	12V-50W halogen lamp; 12V-50W DC transformer built-in; Diascopic/episcopic illumination changeover switch; Fly-eye lens; NCB11, ND8 filters built-in; 12V-100W type optional	6V-30W halogen lamp; 6V-30W transformer built-in; ND8, ND4 filters built-in
	Focusing	Coaxial coarse/fine focus knob; Focus stroke: 30mm; Coarse: 14mm per rotation; Fine: 0.1mm; Minimum reading: in 1µm increments	Coaxial coarse/fine focus knob; Focus stroke: 30mm; Coarse: 9.33mm per rotation; Fine: 0.1mm; Minimum reading: in 1µm increments
Eyepiece		10x (F.O.V. 22mm)	
Eyepiece tube		P-TT3 Trinocular Tube for polarizing microscopy; P-TB2 Binocular Tube for polarizing microscopy	
Intermediate tube		Built-in focusable Bertrand lens removable from optical path; Conoscopic/Orthoscopic observations switchable; Analyzer built-in; Accessory plate/compensator slot	
Analyzer		360° rotary dial; Minimum reading angle 0.1°	
Nosepiece		Centering quintuple nosepiece (detachable); DIN slot	
Stage		Top-grade dedicated circular graduated stage Rotatable 360° horizontally; can be fixed at a specific position; Graduated 360° (in 1° increments); Click stops each 45°; Attachable mechanical stage: 35 x 25 mm travel; vernier 0.1mm	Ball bearing rotary stage; Rotatable 360° horizontally; can be fixed at a specific position; Graduated 360° (in 1° increments); Rotation clamp equipped; Attachable mechanical stage: 35 x 25 mm travel; vernier 0.1mm
Condenser		Dedicated strain-free swing-out type; P Achromat NA 0.9	
Polarizer		Fixed to the bottom of the condenser holder; with scale markings	No scale markings
Objectives (Polarizing sets)		CFI P Achromat 4x, 10x, 20x, 40x, 100x CFI TU Plan Fluor Epi P 5x, 10x, 20x, 50x, 100x	
Episcopic illuminator		LV-UEPI-N Universal Epi-illuminator (The LV100N POL accommodates a 12V-50W illuminator transformer)	LV-UEPI-N Universal Epi-illuminator (The Ci-POL requires an external power supply)
Compensators		P-CL Standard 1/4 λ & tint plate, quartz wedge or Senarmont compensator can be inserted into intermediate tube slot	
Power consumption		1.2A/75W	0.8A/38W
Weight		Approx. 17kg (standard trinocular set)	Approx. 14kg (standard binocular set)

## Dimensional Diagram

Unit: mm



Images courtesy of:

Dr. Kazuhiro Suzuki and Dr. Takenori Kato, Center for Chronological Research, Nagoya University (Front cover upper left and right, ① on page 3, ② on page 5)

Ron Sturm, Construction Technology Laboratories, Inc., U.S.A. (Front cover center and ③ on page 5)

Mike Davidson, Florida State University, U.S.A. (Front cover lower left and right, ④ on page 3, ⑤ on page 5)

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### NIKON CORPORATION

Shin-Yurakucho Bldg., 12-1, Yurakucho 1-chome, Chiyoda-ku, Tokyo 100-8331, Japan  
phone: +81-3-3216-2375 fax: +81-3-3216-2385  
<http://www.nikon.com/instruments/>

### NIKON INSTRUMENTS INC.

1300 Walt Whitman Road, Melville, N.Y. 11747-3064, U.S.A.  
phone: +1-631-547-8500; +1-800-52-NIKON (within the U.S.A. only)  
fax: +1-631-547-0306  
<http://www.nikoninstruments.com/>

### NIKON METROLOGY, INC.

12701 Grand River Avenue, Brighton, MI 48116 U.S.A.  
phone: +1-810-220-4360 fax: +1-810-220-4300  
E-mail: [sales\\_us@nikonmetrology.com](mailto:sales_us@nikonmetrology.com)  
<http://us.nikonmetrology.com/>  
<http://www.nikoninstruments.com/>

### NIKON INSTRUMENTS EUROPE B.V.

Tripolis 100, Burgerweeshuispad 101, 1076 ER Amsterdam, The Netherlands  
phone: +31-20-7099-000 fax: +31-20-7099-298  
<http://www.nikoninstruments.eu/>

### NIKON METROLOGY EUROPE NV

Geldenaaksebaan 329, 3001 Leuven, Belgium  
phone: +32-16-74-01-00 fax: +32-16-74-01-03  
E-mail: [sales\\_europe@nikonmetrology.com](mailto:sales_europe@nikonmetrology.com)  
<http://www.nikonmetrology.com/>

### NIKON INSTRUMENTS (SHANGHAI) CO., LTD.

CHINA phone: +86-21-6841-2050 fax: +86-21-6841-2060  
(Beijing branch) phone: +86-10-5831-2028 fax: +86-10-5831-2026  
(Guangzhou branch) phone: +86-20-3882-0552 fax: +86-20-3882-0580

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### NIKON SINGAPORE PTE LTD

SINGAPORE phone: +65-6559-3618 fax: +65-6559-3668

### NIKON MALAYSIA SDN BHD

MALAYSIA phone: +60-3-7809-3688 fax: +60-3-7809-3633

### NIKON INSTRUMENTS KOREA CO., LTD.

KOREA phone: +82-2-2186-8400 fax: +82-2-555-4415

### NIKON INDIA PRIVATE LIMITED

INDIA phone: +91-124-4688500 fax: +91-124-4688527

### NIKON CANADA INC.

CANADA phone: +1-905-602-9676 fax: +1-905-602-9953

### NIKON INSTRUMENTS S.p.A.

ITALY phone: +39-055-300-96-01 fax: +39-055-30-09-93

### NIKON AG

SWITZERLAND phone: +41-43-277-28-67 fax: +41-43-277-28-61

### NIKON GMBH AUSTRIA

AUSTRIA phone: +43-1-972-6111-00 fax: +43-1-972-6111-40

### NIKON BELUX

BELGIUM phone: +32-2-705-56-65 fax: +32-2-726-66-45

### NIKON UK LTD.

UNITED KINGDOM phone: +44-208-247-1717 fax: +44-208-541-4584

### NIKON METROLOGY UK LTD.

UNITED KINGDOM phone: +44-1332-811-349 fax: +44-1332-639-881

E-mail: [sales\\_uk@nikonmetrology.com](mailto:sales_uk@nikonmetrology.com)



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### NIKON FRANCE S.A.S.

FRANCE phone: +33-1-4516-45-16 fax: +33-1-4516-45-55

### NIKON METROLOGY SARL

FRANCE phone: +33-1-60-86-09-76 fax: +33-1-60-86-57-35

E-mail: [sales\\_france@nikonmetrology.com](mailto:sales_france@nikonmetrology.com)

### NIKON GMBH

GERMANY phone: +49-211-941-42-20 fax: +49-211-941-43-22

### NIKON METROLOGY GMBH

GERMANY phone: +49-6023-91733-0 fax: +49-6023-91733-229

E-mail: [sales\\_germany@nikonmetrology.com](mailto:sales_germany@nikonmetrology.com)

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En



Digital Cameras for Microscopes



DIGITAL CAMERAS FOR MICROSCOPES  
**DIGITAL SIGHT**  
SERIES



# Introducing two new high resolution 16.25 megapixel CMOS cameras to Nikon's lineup of cameras for microscopy

Two Nikon FX-format CMOS sensor cameras join the Digital Sight series of microscope digital cameras: the DS-Ri2 color digital camera and the DS-Qi2 monochrome digital camera.

High pixel density and large field of view coupled with USB3.0 high speed data transfer offer fast frame rates and high resolution images with these new CMOS sensors.



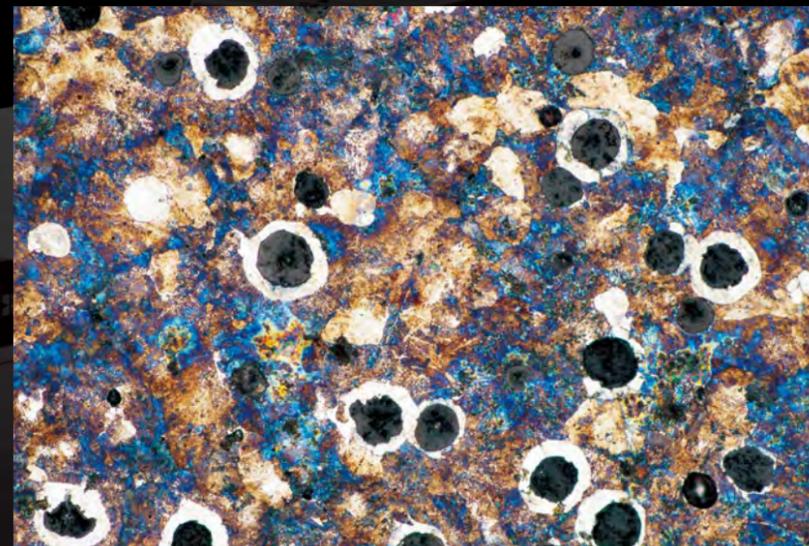
## Large Format CMOS Sensors

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



## DS-Ri2

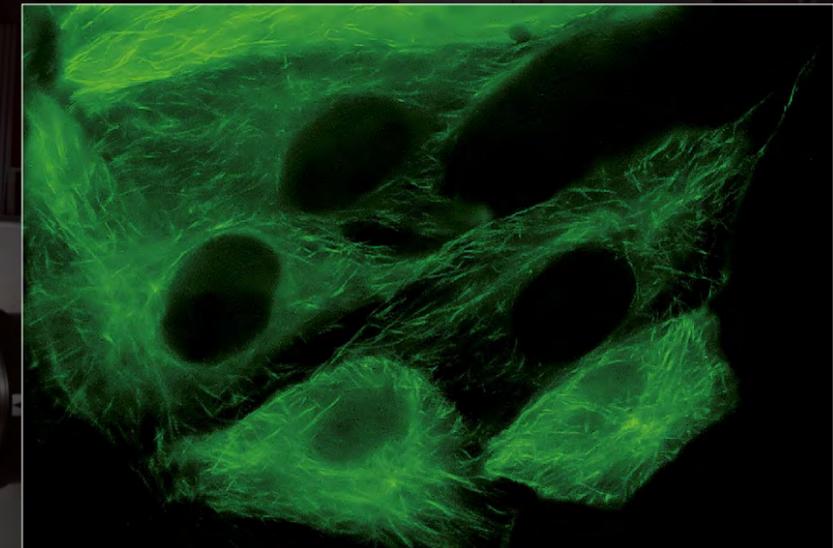
16.25 million pixels (not interpolated) and accurate color rendition are features that make the DS-Ri2 an excellent choice for recreating color images as they eyes see them



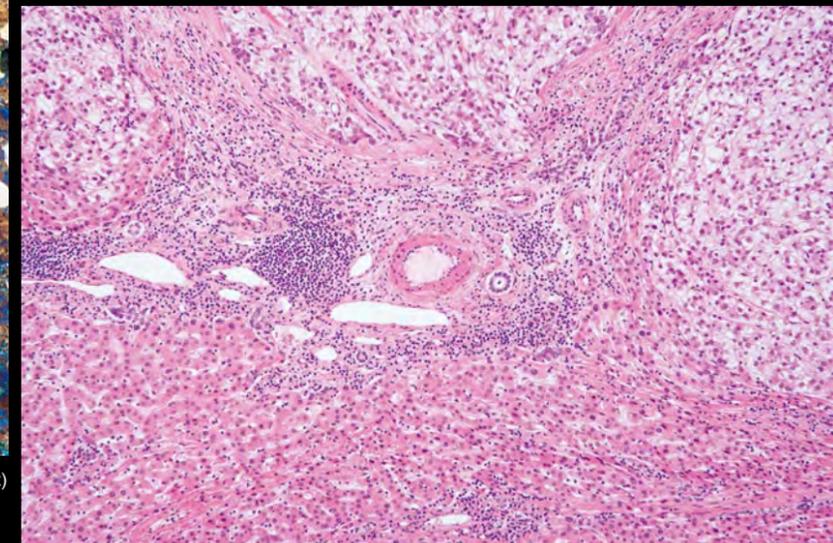
Malleablecastiron (Objective: TU Plan Fluor 20x)

## DS-Qi2

High pixel density, high sensitivity and low noise are key features of the DS-Qi2 monochrome camera



Pig kidney epithelial cells expressing GFP-EB3 tubulin  
Sample courtesy of: Michael Davidson, National High Magnetic Field Laboratory, Florida State University



The tissues of the liver, HE staining (Objective: CFI Plan Apochromat λ 10x)  
Photos courtesy of: Kazuhiro Muraoka, Photography Division, Tokyo Women's Medical University

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

Microscope Camera

## DS-Ri2

16.25-megapixel

Color

High-resolution



Mouse cerebellum sagittal section, hematoxylin and eosin stained  
(Objective: CFI Plan Apochromat  $\lambda$  4x)

### High-resolution images

16.25-megapixel CMOS sensors for astonishing image quality

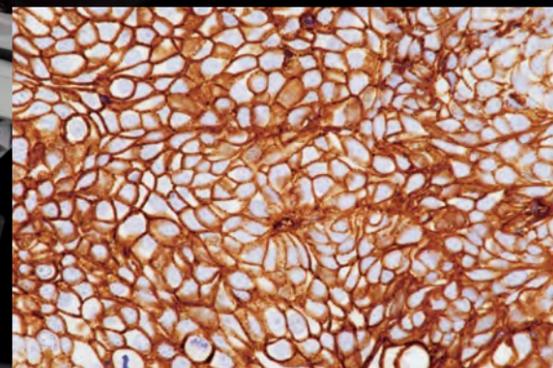
The DS series enables one-shot instantaneous capture and fast storage of images with resolution as high as 4908 x 3264 pixels, without pixel shifting or pixel stepping.

This pixel density is ideally suited for photomicrography of ultra-fine structures or patterns in biological or industrial samples, at low or high magnifications.

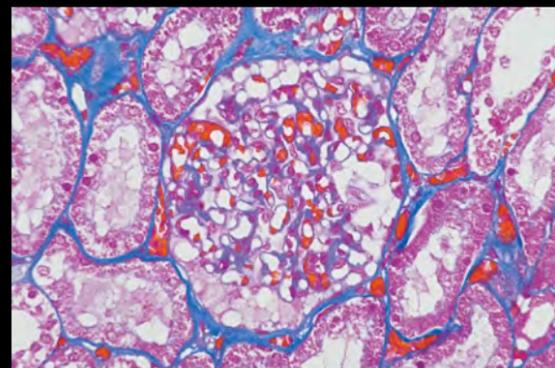
### Photography with the natural colors seen through the microscope

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

The DS models' new 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.

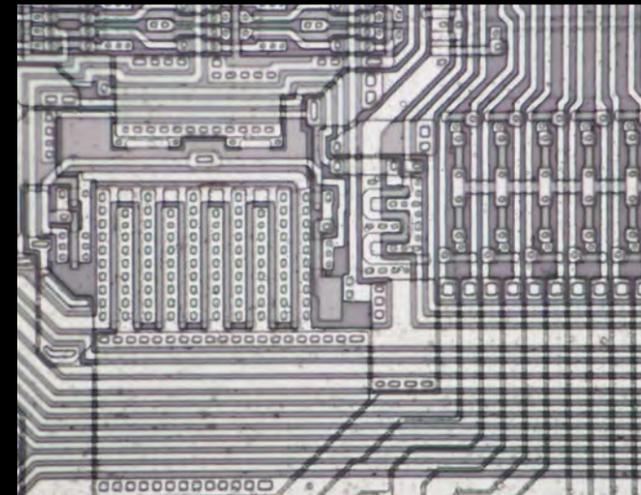


Pancreatic cancer cell, NGFR immunostaining\*1  
(Objective: CFI Plan Apochromat  $\lambda$  40x)

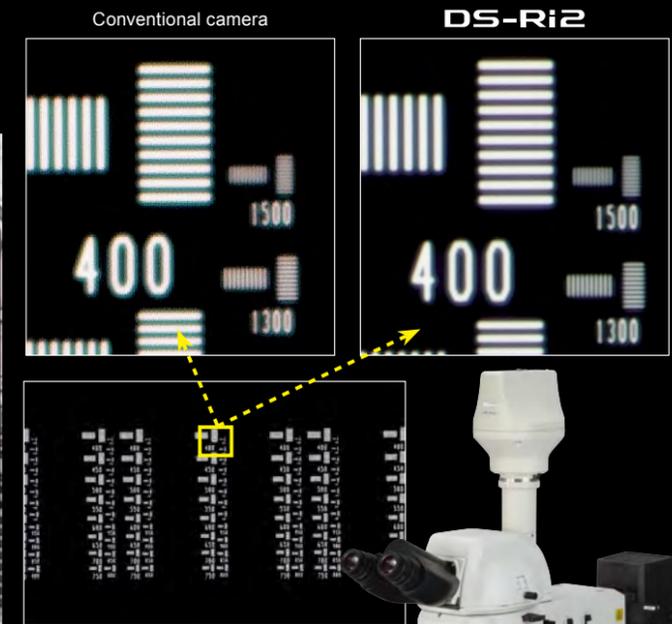


Human glomerulus of kidney, Azan stain\*2  
(Objective: CFI Plan Apochromat  $\lambda$  40x)

\*1, \*2 Photos courtesy of: Dr. Atsushi Furuhashi and Noriyoshi Sueyoshi, Assistant General Manager, Laboratory of morphology and image analysis, BioMedical Research Center, Juntendo University Graduate School of Medicine



Semiconductors (IC wafers)  
(Objective: TU Plan Fluor 20x)



Resolution chart  
(Objective: TU Plan Fluor 20x)

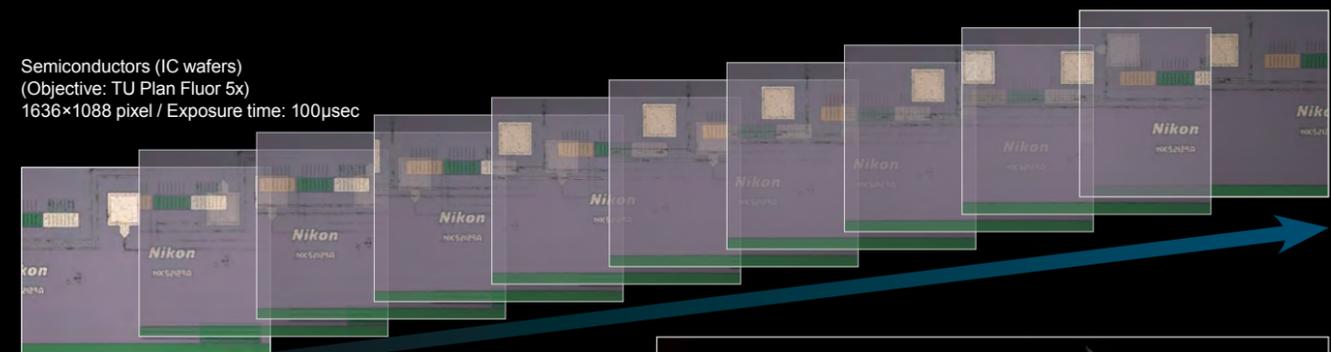
### High-speed live display

High-speed display, even of supra-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 makes fine focusing easy to perform.

Semiconductors (IC wafers)  
(Objective: TU Plan Fluor 5x)  
1636x1088 pixel / Exposure time: 100 $\mu$ sec

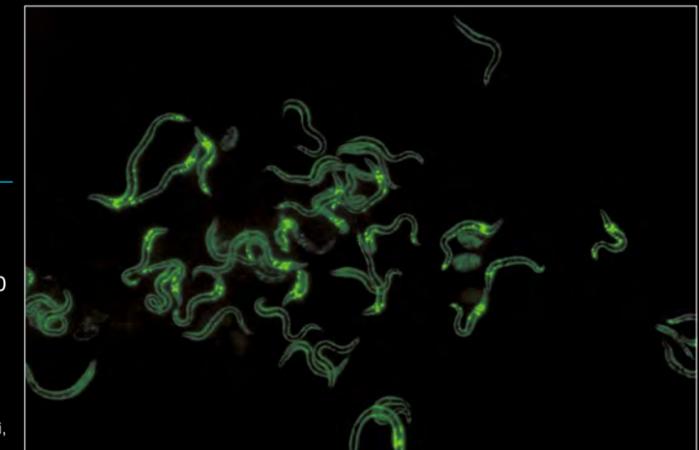


Example of combination with the LV100ND industrial microscope

### High sensitivity, low noise

Fluorescent color image capture with high signal to-noise ratio

Sensitivity settings that span the range from ISO200 to ISO12800 allow the capture of vivid fluorescent color images.



Transgenic *C. elegans* expressing venus in the head neurons and EGFP in the body wall muscles.  
Photos courtesy of: Drs. Keiko Gengyo-Ando and Junichi Nakai, Saitama University Brain Science Institute

# Capture Low light fluorescence and Large Fields of View

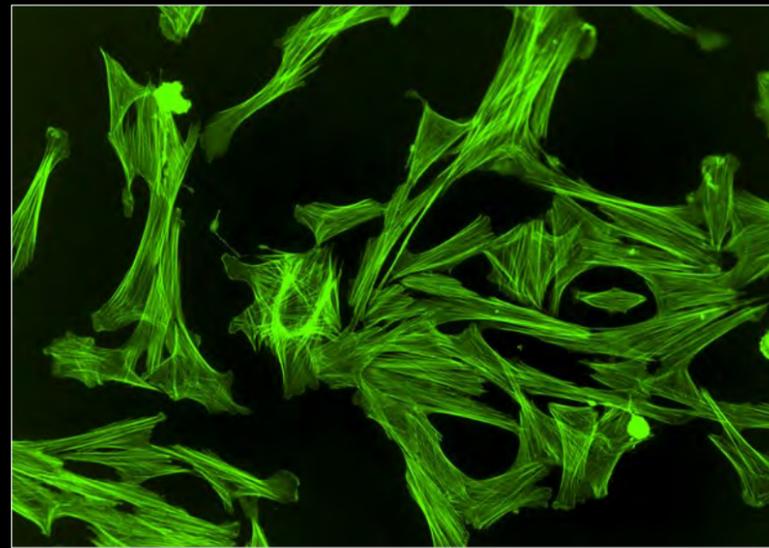
Monochrome Microscope Camera

## DS-Qi2

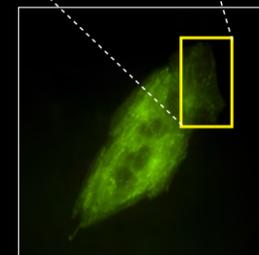
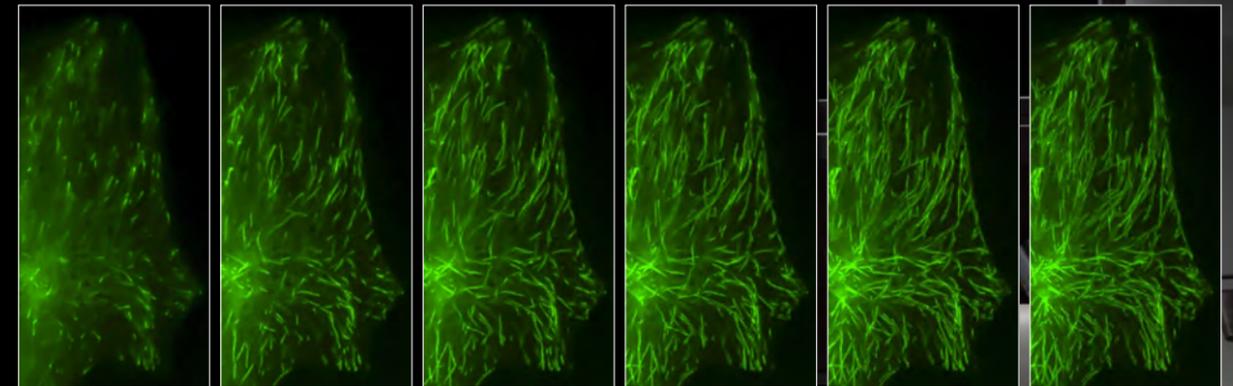
16.25-megapixel

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



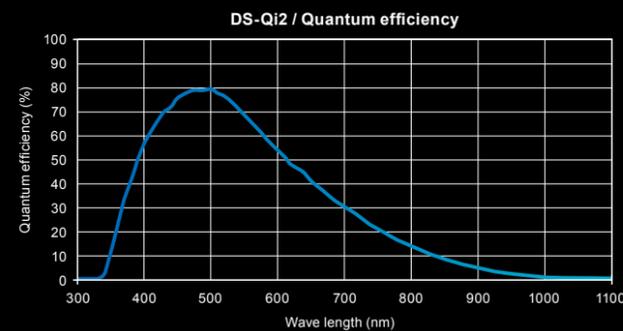
Time-lapse images (every 1 second) of LLC-PK1 cells with GFP-EB3 tubulin. Each image represents the maximum intensity projection of the timelapse, allowing visualization of the end-binding protein located on the microtubule plus-ends, and allowing tracing of the microtubule path.  
DS-Qi2 captures an extremely large field of view, but still represents very fine details as demonstrated in this cropped timelapse sequence from a large FOV image.  
Objective: CFI Plan Achromat  $\lambda$  60x oil / NA: 1.4

Sample courtesy of: Michael Davidson, National High Magnetic Field Laboratory, 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.



## 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.

## High frame rate

Fast focusing, even with fluorescent images

With a high-sensitivity CMOS 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).

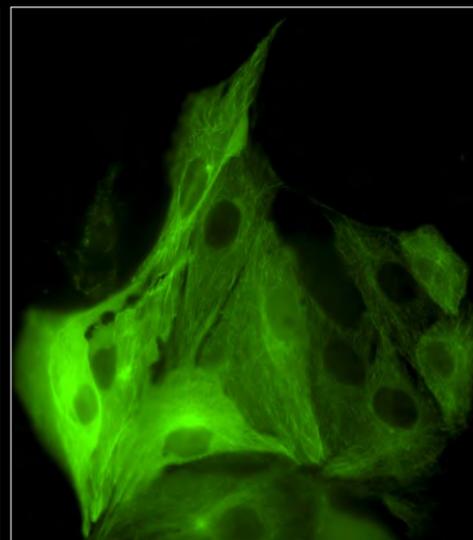
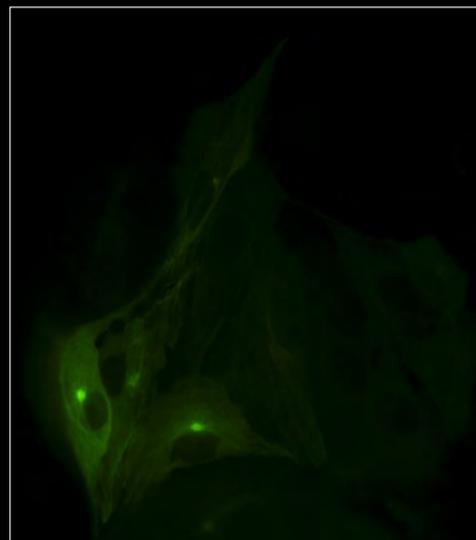
## Low noise

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 fluorescence images with very little noise.

LLC-PK1 cells expressing GFP-EB3 tubulin with low noise. Large linear full well capacity allows acquiring both the brightest and dimmest areas in a single capture.

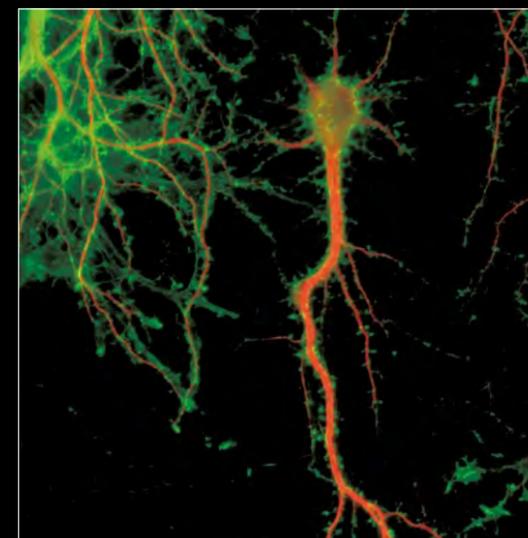
Sample courtesy of: Michael Davidson, National High Magnetic Field Laboratory, Florida State University



## 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 DS-Qi2 is ideal for time-resolved imaging applications.



▲ Rat primary culture neuron  
Dendron labeled with MAP-2(Red) and Actin(cytoskeleton) labeled with Phalloidin (Green)

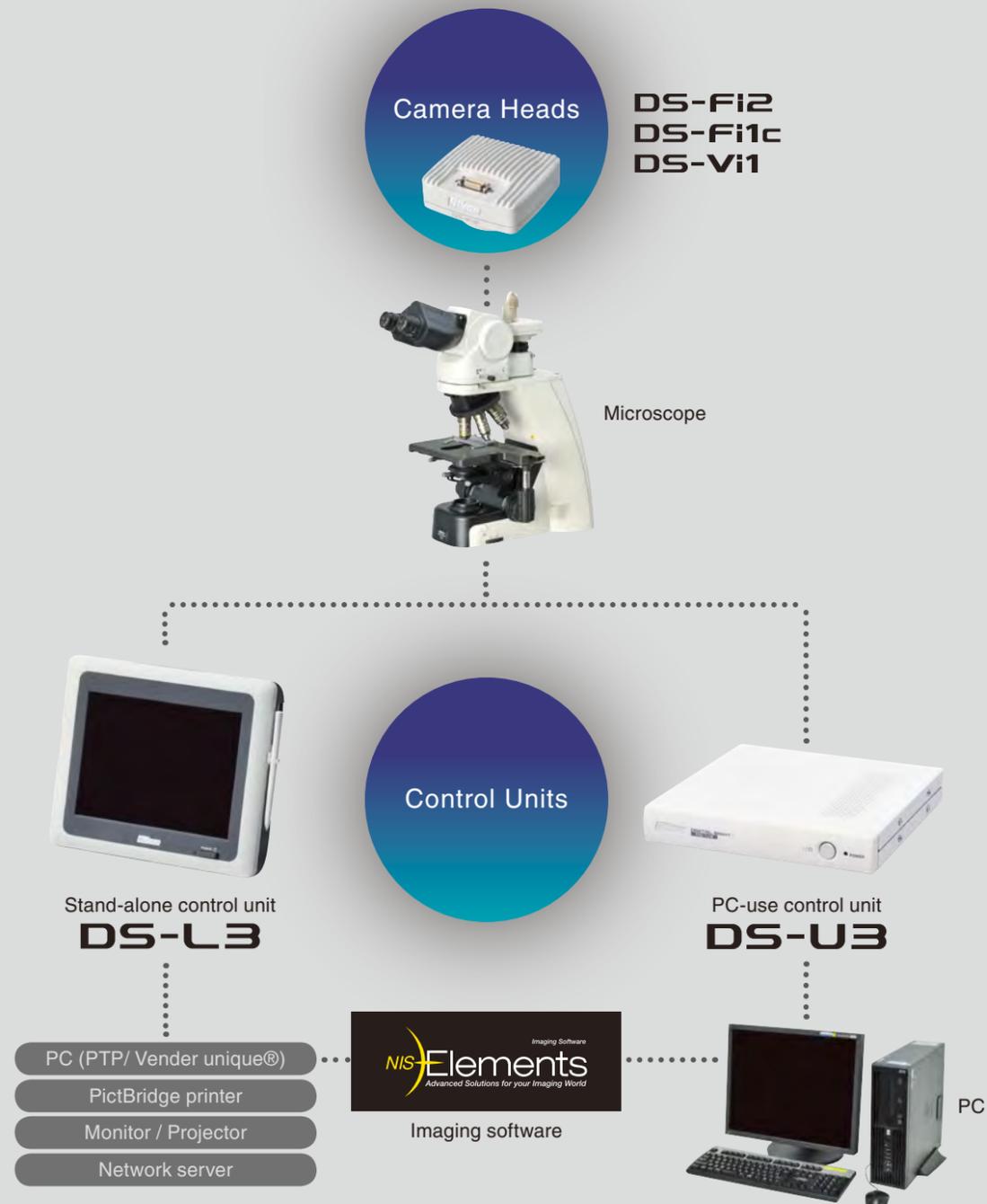
▶ LLC-PK1 cells expressing GFP-EB3 tubulin (green) and H2B-labeled histones (red) illustrating the large field of view of the DS-Qi2 camera.  
Sample courtesy of: Michael Davidson, National High Magnetic Field Laboratory, Florida State University



## A microscope digital camera system with selectable combinations of camera head and controller for every application

Three models of compact color digital cameras for microscopy are available as camera heads. Two models of controller are available: a stand-alone type with built-in monitor for easy image capture, and a PC-use controlled type that enables advanced image processing and analysis via imaging software.

The three camera head models and two controller models can be freely combined to create a system for every purpose.



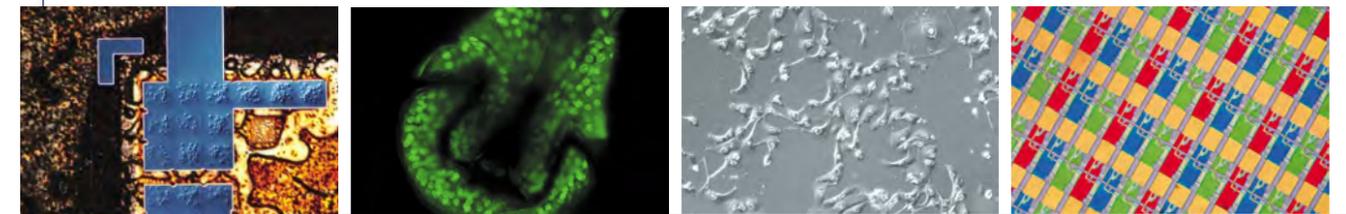
### DS-Fi2 5.0-megapixel Color High-resolution

#### High-definition color camera head

The DS-Fi2 is capable of high-resolution 2560×1920 pixel shooting. In addition to a high-speed frame rate of 21 fps\*, this model expands the range of settings available for exposure time to adapt to a wider variety of samples. Suitable for a wide range of applications including brightfield, phase contrast, and differential interference, the DS-Fi2 achieves high functionality and high cost-performance.

\* When using DS-L3 and FAST mode

Image sensor	2/3" color, 5.0 megapixels, CCD	
Max recordable pixels	2560×1920	
Display speed	DS-U3	4.4 fps (2560×1920), max. 37 fps
	DS-L3	Standalone: 10 fps (2560×1920), max. 37 fps Used with NIS-Elements: 2.0 fps (2560×1920), max. 37 fps
ISO sensitivity	Equivalent to ISO 64	
Features and main applications	High resolution/brightfield, phase contrast, differential interference, etc.	

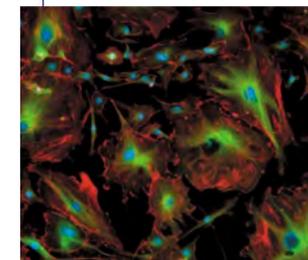


### DS-Fi1c 5.0-megapixel Color Cooled High-resolution

#### High-definition cooled color camera head

The DS-Fi1c is equipped with a 5.0-megapixel color CCD and Peltier element capable of cooling to a -20°C ambient temperature. Even in fluorescent image shooting requiring long exposure times, high-contrast images can be obtained with limited thermal background noise.

Image sensor	2/3" color, 5.0 megapixels, CCD	
Max recordable pixels	2560×1920	
Cooling device	20°C below ambient temperature	
Display speed	DS-U3	4.4 fps (2560×1920), max. 23 fps
	DS-L3	Standalone: 5.9 fps (2560×1920), max. 23 fps Used with NIS-Elements: 2.0 fps (2560×1920), max. 23 fps
ISO sensitivity	Equivalent to ISO 64	
Features and main applications	High-speed live display/brightfield, phase contrast, differential interference, etc.	



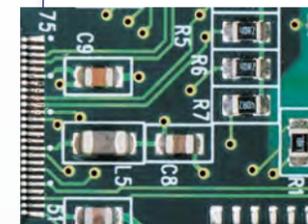
### DS-Vi1 2.0-megapixel Color

#### High-speed color camera head

The DS-Vi1 is equipped with a 2.0-megapixel color CCD that displays SXGA video at a high frame rate of 15 fps\* (maximum 29 fps). This model is suitable for monitoring applications as well, with an excellent balance of smooth movement and clear imaging made possible through its high sensitivity.

\* When using DS-L3 or external monitor output.

Image sensor	1/1.8" color, 2.0 megapixels, CCD	
Max recordable pixels	1600×1200	
Display speed	DS-U3	12 fps (1600×1200), max. 27 fps
	DS-L3	Standalone: 15 fps (1600×1200), max. 29 fps Used with NIS-Elements: 5.0 fps (1600×1200), max. 27 fps
ISO sensitivity	Equivalent to ISO 100	
Features and main applications	High-speed live display/brightfield, phase contrast, differential interference, etc.	



# Stand-alone control unit DS-L3

Equipped with a large touch panel monitor and a rich feature set, the DS-L3's ease of operation enables quick image acquisition even without a PC or computer monitor.



Configuration of ECLIPSE L200ND

## High-definition touch panel monitor

Built-in 8.4" 1024x768 monitor. Easy to see and easy to use, the large touch-panel monitor allows simple setting and operation of the camera head with a touch of a finger or stylus.

## GUI for intuitive operation

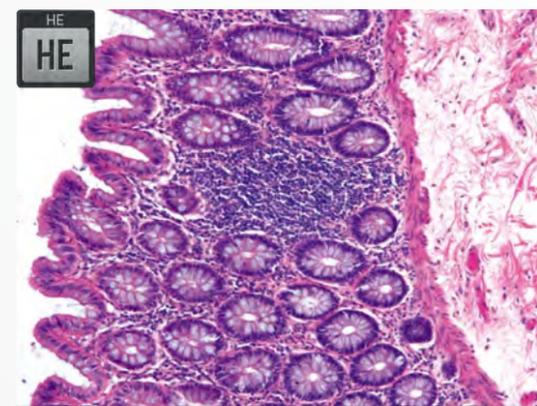
The DS-L3's icon-based menu screens offer excellent recognizability. From image acquisition to setting of shooting parameters, measurement, and export of image data, all operations can be performed easily by touching the screen.



Main menu/Tool menu GUI

## Scene mode

Optimal imaging parameters for each sample type and observation method can easily be set through the icons. A choice of five modes for biological imaging and four modes for industrial imaging are available, and up to seven custom modes with freely configurable shooting parameters can be set.



Biological Scene Mode

Darkfield/Fluorescence Brightfield  
DIC/PH HE ELISA

## Improved image processing performance

The DS-L3 reduces or eliminates diagonal line jaggedness in images and improves color reproduction as well, reducing unevenness in sample colors caused by cameras.



Elimination of jaggedness

## Integration with microscopes

When used with a microscope equipped with motorized units or state detection units, the microscope motor functions and peripheral equipment can be controlled through the DS-L3, with automatic detection of information such as objective lens magnification.



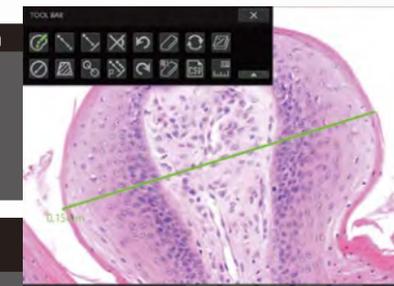
Used with ECLIPSE Ni-E

## A wide variety of tools

The DS-L3 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

- Measurement [2 point distance, Point to line distance, Circle distance, Angle, Circle (Diameter, Radius), Area, Pitch distance]



Measurement (2 point distance)

### Position and size comparison functions

- Scale indication
- Cross-hairs
- Grid
- XY scale
- XY measurement



Count marking

### Drawing functions

- Count marking
- Text input
- Pen drawing (Straight line, Curved line)

## Controllable via PC

The DS-L3 can be controlled via PC using the NIS-Elements software (available separately; see page 12). The DS-L3 can also be used as is for complicated analysis and image processing.

## Saving and printing functions

Saving to a wide range of media (CF cards, USB memory devices, etc.) is possible, as is network transfer. Direct printing to PictBridge printers is a standard feature. Print scaling can be set and adjusted.

## Network functions

Images acquired or under observation can be viewed simultaneously on the DS-L3, a projector, a PC monitor, etc. Through split-screen display, simultaneous comparative observation of an acquired image and a live image is possible, as is upload of shot images to an FTP server.



Split-screen display

## Interface for a full range of peripheral equipment

Interface	Connector, Type	Connected device	Signal format	Features, etc.
CF card	CF card slot	CF card TypeI	FAT16/32 format	Data storage
USB (host)	USB Type A (2 ports)	USB mouse, USB keyboard	2.0/1.1 compatible	Camera operation
		USB bar code reader	2.0/1.1 compatible	Bar code reader (file/directory names)
		USB memory stick	2.0/1.1 compatible, FAT16/32 format	Data storage
USB (device) (mode selection)	USB Type B	Microscope	2.0/1.1 compatible	Microscope state detection/control
		PC	2.0/1.1 compatible, PTP	Data transfer
Network	RJ-45	Printer	2.0/1.1 compatible, Vendor unique	Controlled via NIS-Elements series
		PC, network hub	2.0/1.1 compatible, PictBridge	Printing possible at set magnification ratios (real 10 mode) with direct printing/specified relay lens combination
External monitor output	DVI-I	PC monitor, Projector	10Base-T/100Base-TX compatible IP address automatically acquirable via DHCP	HTTP/FTP/telnet server (data transfer and camera operation), FTP client (data storage)
External sync input/output	ø3.5 stereo pin-jack	External microscope, etc.	Analog RGB/DVI	Image display Resolution SXGA/XGA/720p switchable
			(Input) 4.7 kΩ pull-up (Output) TTI Level	Video syncing with external device



# PC-use control unit DS-U3

From display and shooting of live images to advanced image processing and analysis, the DS-U3 allows the control of all functions from a PC and is flexibly adaptable to a wide range of applications.

## Adaptable to a wide range of applications

Using NIS-Elements imaging software(available separately; see page 12), you can perform image acquisition, processing, and analysis with integrated control of the camera and microscope peripherals.

## Integration with microscopes

The DS-U3 enables the control of a motorized microscope system (turning of nosepiece or filter turret, etc.) and automatic detection of objective magnification using a state detection nosepiece.



Configuration of ECLIPSE Ti

## 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.

\* See the NIS-Elements Catalog for details.

### F Free package

Bundled

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 image acquisition in fields from biomedical to industrial, and is expandable through optional added features such as EDF and databases.

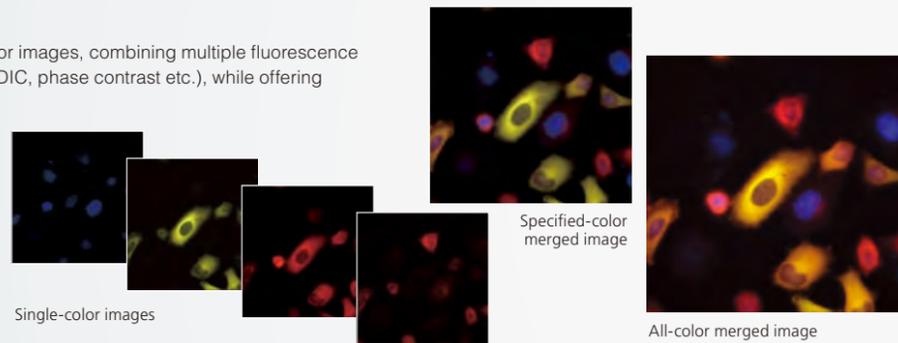
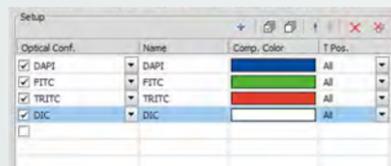
### Br Ar Research package

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® 7 Pro 32/64bit (DS-Ri2 / DS-Qi2 / DS-U3 / DS-L3 vender unique mode) \* Nikon provides confirmed compatible PCs with up-to-date specifications. Contact Nikon for details.

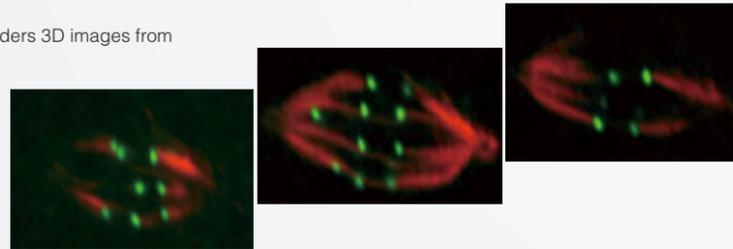
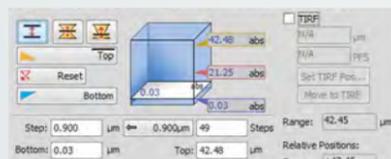
## Multichannel (multi color) Ar Br

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.



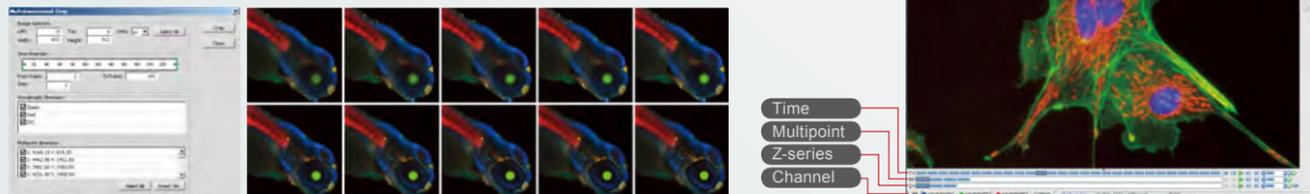
## Z-series Ar Br D

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



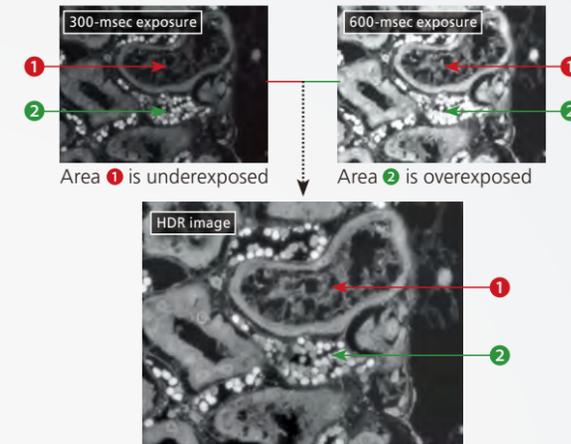
## Multi-dimensional Image Display Ar Br

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.



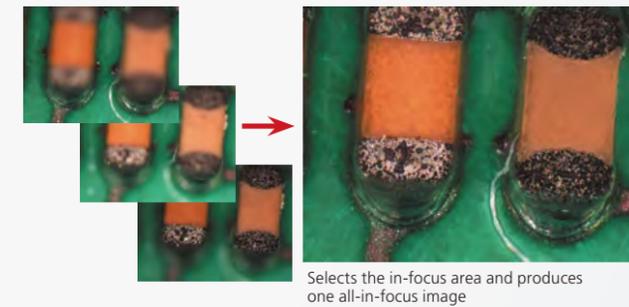
## HDR (High Dynamic Range) image acquisition Ar Option Br D

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.



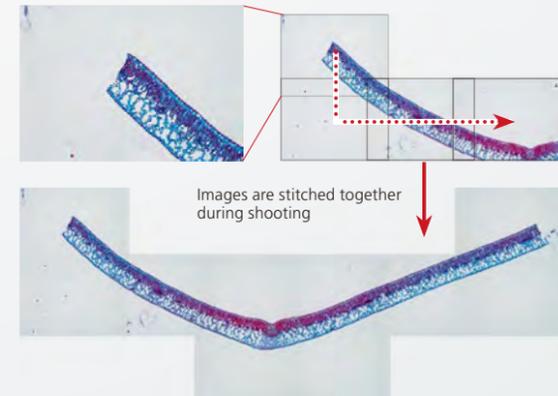
## EDF (Extended Depth of Focus) Option Ar Br D

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



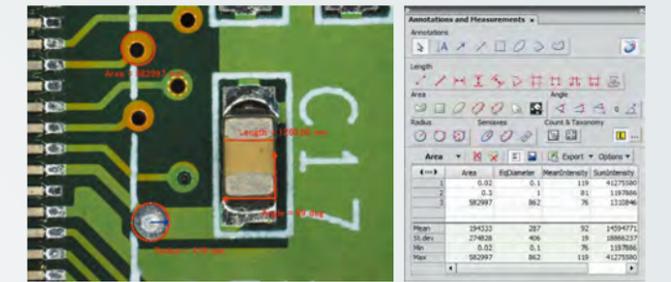
## Image stitching (Large Image) Option Ar Br D

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.



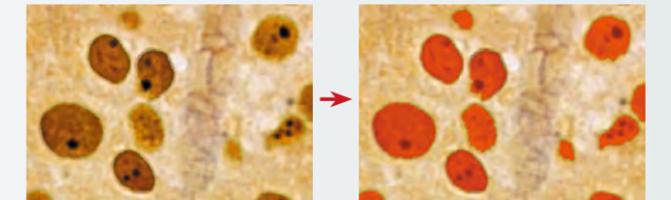
## Manual measurement and image annotation Ar Br D

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.



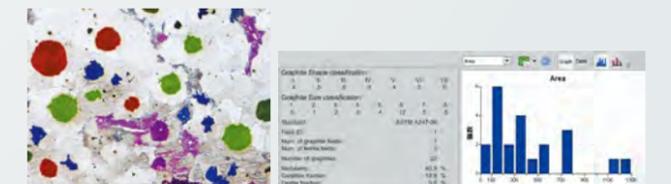
## Grain size analysis Option Ar Br D

Detects and measures grains in one and two phase samples according to JIS G0551 or ASTM E112-96/E1382-97 standards.

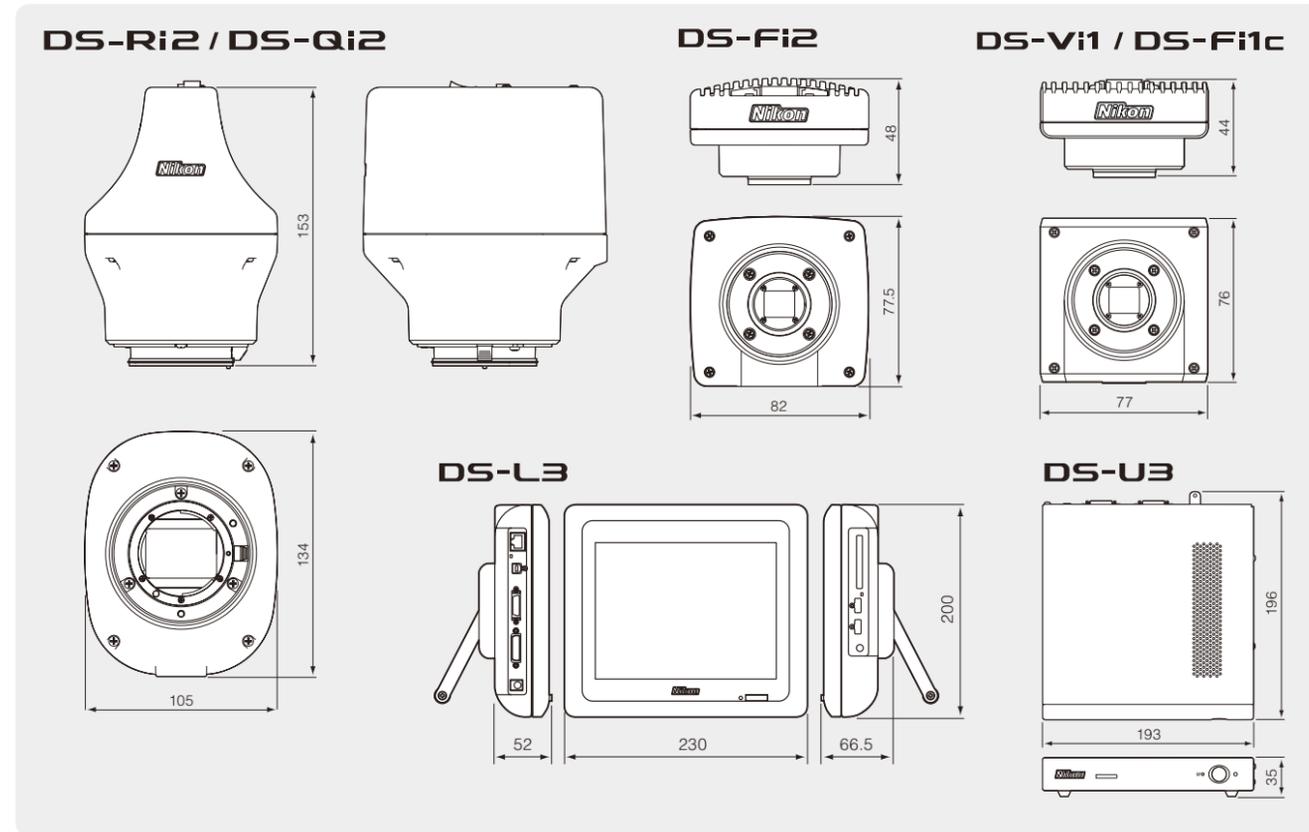


## Cast iron analysis Option Ar Br D

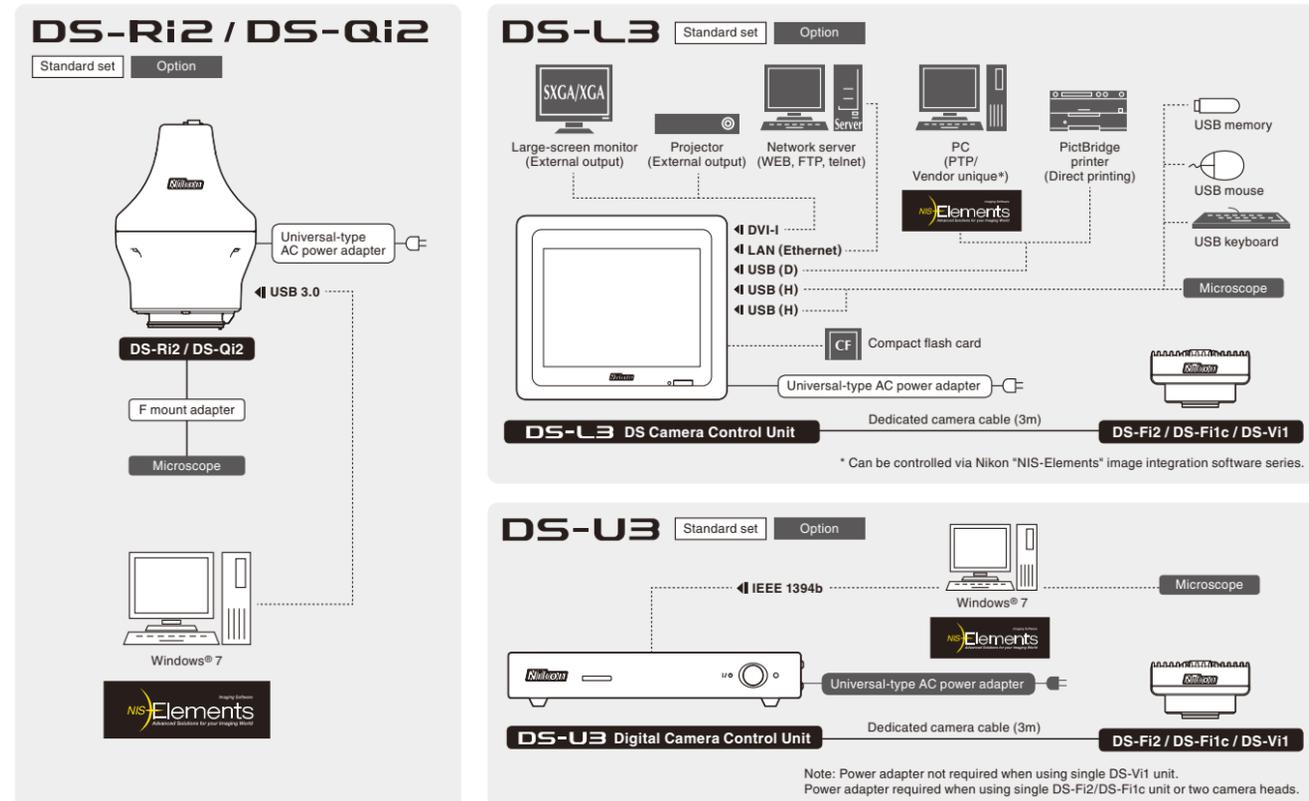
Detects, measures and classifies graphite content as well as ferrite content in graphite-corrected samples according to JIS G5502 or ASTM A247-06 standards.



## Dimensions



## System Diagram



## Specifications

### Camera Type

Digital Camera	DS-Ri2	DS-Qi2
Image sensor	Nikon FX-format, Color CMOS sensor / Size: 36.0x23.9mm Effective 16.25 megapixels	Nikon FX-format, Monochrome CMOS sensor / Size: 36.0x23.9mm
Recordable pixels	4908x3264 pixel (full-pixel), 1636x1088 pixel (3x3 pixel averaging)	
Cooling method	—	Electronic cooling
ISO sensitivity (recommended exposure index)	Standard: equivalent to ISO 200 (Selectable from ISO200 to 12800 equivalent)	Standard: equivalent to ISO 800 (Selectable from ISO800 to 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	Full-pixel 4908x3264 pixel (max 6fps) / 3x3 pixel averaging 1636x1088 (max 45fps)	
Lens mount	F mount	
Exposure time	100 μsec to 60 sec	
Image format	BMP, TIFF, JPEG, etc., selectable in NIS-Elements	
Interface	USB3.0 (computer control connection) x1, External sync input/output x1	
Power supply	AC100-240V 50/60Hz	
Power consumption	13W	24W
Dimensions	105 (W) x 134 (D) x 153 (H) mm	
Weight	1200g	
Operating environment	0-40°C, 60% RH max. (without condensation)	0-30°C, 80% RH max, 30-40°C, 60% RH max. (without condensation)

### System Type (Camera Head + Control Unit)

Camera Head	DS-Fi2	DS-Fi1c	DS-Vi1
Image sensor	2/3 in. high-density CCD; Total number of pixels: 5.24 megapixels (effective 5.07 megapixels)		1/1.8 in. high-density CCD; Total number of pixels: 2.11 megapixels (effective 2.01 megapixels)
Recordable pixels	2560x1920, 1280x960, 640x480		1600x1200, 800x600, 400x300
Cooling method	—	Electronic cooling	—
ISO sensitivity (recommended exposure index)	Standard: equivalent to ISO64 (Selectable from ISO32 to 1250 equivalent)		Standard: equivalent to ISO100 (Selectable from ISO50 to 2000 equivalent)
Live display mode (DS-L3 Standalone mode)	2560x1920 (max. 10 fps), 1280x960 (max. 21 fps), ROI mode (max. 37 fps) *Display reduced or enlarged to SXGA/XGA	2560x1920 (max. 5.9 fps), 1280x960 (max. 12 fps), ROI mode (max. 23 fps) *Display reduced or enlarged to SXGA/XGA	1600x1200 (max. 15 fps), 800x600 (max. 27 fps), 800x560 (max. 29 fps), Center Scan (max. 29 fps) *Display reduced or enlarged to SXGA/XGA
Live display mode (DS-L3/Used with NIS-Elements)	2560x1920 (max. 2.0 fps), 1280x960 (max. 7.8 fps), 640x480 (max. 21 fps), ROI mode (max. 37 fps)	2560x1920 (max. 2.0 fps), 1280x960 (max. 7.8 fps), 640x480 (max. 12 fps), ROI mode (max. 23 fps)	1600x1200 (max. 5.0 fps), 800x600 (max. 27 fps), ROI mode (max. 15 fps)
Live display mode (DS-U3)	2560x1920 (max. 4.4 fps), 1280x960 (max. 18 fps), 640x480 (max. 21 fps), ROI mode (max. 37 fps)	2560x1920 (max. 4.4 fps), 1280x960 (max. 12 fps), 640x480 (max. 12 fps), ROI mode (max. 23 fps)	1600x1200 (max. 12 fps), 800x600 (max. 27 fps), ROI mode (max. 15 fps)
Lens mount	C mount		
Exposure time	130 μsec to 60 sec	1/1000 to 600 sec	1/1000 to 60 sec
Dimensions	82 (W) x 77.5 (D) x 48 (H) mm	77 (W) x 76 (D) x 44 (H) mm	—
Weight	270g	290g	260g
Operating environment	0-40°C, 60% RH max. (without condensation)	0-30°C, 80% RH max, 30-40°C, 60% RH max. (without condensation)	

Control Unit	DS-L3 (Standalone)	DS-L3 (Used with NIS-Elements)	DS-U3
Exposure control	Program AE, Shutter-priority AE, Focus AE, Manual with AE lock function	Auto / Manual	—
Exposure correction	Correction range: ±2.0, Step: 1/3	13 steps	—
Digital zoom	Up to 16x (8 steps)	10 to 1200%	—
Interval shooting	10 sec. - 6 hr. intervals	—	—
Exposure metering	Average metering, Peak hold metering	—	—
Exposure metering range	Position/size adjustable	—	—
White balance	Set method, Color balance adjustable	—	—
Image adjustments	Gamma correction, shading adjustment, black level adjustment, Chroma, hue adjustment, color saturation adjustment		
Recordable image file format	RGB 8 bit	RGB 8 bit	RGB 8 bit/16 bit
Storage format	BMP, TIFF, JPEG (3-step compression)	BMP, TIFF, JPEG, JPEG2000 etc., selectable in NIS-Elements	
Interface	USB device port x 1 (Printer, PTP support, Vendor unique / switching) USB host port x 2 (USB mouse, USB memory stick, USB keyboard, bar code reader, microscope connection), External sync input/output, Camera I/F x 1		IEEE1394b(bilingual) x 1 (computer control connection), External sync input/output, Camera I/F x 2
Power supply	AC100-240V 50/60Hz		
Power consumption	70W	36W	
Dimensions	230 (W) x 66.5 (D) x 200 (H) mm		
Weight	1800g	1400g	
Operating environment	0-40°C, 60% RH max. (without condensation)		
Networking	Ethernet (10/100Base-TX), DHCP compatible, HTTP, TELNET or FTP server, FTP client		
LCD monitor	8.4-in. TFT color LCD XGA (1024x768, 60Hz)		
External monitor output	DVI-I (Digital: Conforms to DVI 1.0/Analog: 0.7 Vpp (75Ω) SXGA/XGA/720p)		
Storage media	USB memory stick, CompactFlash™ card		
Direct printing	PictBridge printer (sold separately)		

Specifications and equipment are subject to change without any notice or obligation on the part of the manufacturer. June 2014 ©2004-2014 NIKON CORPORATION  
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**WARNING** TO ENSURE CORRECT USAGE, READ THE CORRESPONDING MANUALS CAREFULLY BEFORE USING THE EQUIPMENT.



**NIKON CORPORATION**  
 Shin-Yurakucho Bldg., 12-1, Yurakucho 1-chome  
 Chiyoda-ku, Tokyo 100-8331 Japan  
 Bioscience) phone:+81-3-3216-2375 fax:+81-3-3216-2385  
 Industrial Instruments) phone:+81-3-3216-2384 fax:+81-3-3216-2388  
<http://www.nikon.com/instruments/>



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**NIKON INSTRUMENTS INC.**  
 1300 Walt Whitman Road, Melville, N.Y. 11747-3064, U.S.A.  
 phone: +1-631-547-8500; +1-800-52-NIKON (within the U.S.A. only)  
 fax: +1-631-547-0306  
<http://www.nikoninstruments.com/>

**NIKON METROLOGY, INC.**  
 12701 Grand River Avenue, Brighton, MI 48116 U.S.A.  
 phone: +1-810-220-4360 fax: +1-810-220-4300  
 E-mail: [Sales.US.NM@nikon.com](mailto:Sales.US.NM@nikon.com)  
<http://www.nikonmetrology.com/>

**NIKON INSTRUMENTS EUROPE B.V.**  
 Tripolis 100, Burgenweeshuispad 101, 1076 ER Amsterdam, The Netherlands  
 phone: +31-20-7099-0000 fax: +31-20-7099-298  
<http://www.nikoninstruments.eu/>

**NIKON METROLOGY EUROPE NV**  
 Geldenaaksebaan 329, 3001 Leuven, Belgium  
 phone: +32-16-74-01-00 fax: +32-16-74-01-03  
 Email: [Sales.Europe.NM@nikon.com](mailto:Sales.Europe.NM@nikon.com)  
<http://www.nikonmetrology.com/>

**NIKON INSTRUMENTS (SHANGHAI) CO., LTD.**  
 CHINA phone: +86-21-6841-2050 fax: +86-21-6841-2060  
 (Beijing branch) phone: +86-10-5831-2028 fax: +86-10-5831-2026  
 (Guangzhou branch) phone: +86-20-3882-0550 fax: +86-20-3882-0580

**NIKON SINGAPORE PTE LTD.**  
 SINGAPORE phone: +65-6559-3618 fax: +65-6559-3668

**NIKON MALAYSIA SDN. BHD.**  
 MALAYSIA phone: +60-3-7809-3688 fax: +60-3-7809-3633

**NIKON INSTRUMENTS KOREA CO., LTD.**  
 KOREA phone: +82-2-2186-8400 fax: +82-2-555-4415

**NIKON INDIA PRIVATE LIMITED**  
 INDIA phone: +91-124-4688500 fax: +91-124-4688527

**NIKON CANADA INC.**  
 CANADA phone: +1-905-602-9676 fax: +1-905-602-9953

**NIKON INSTRUMENTS S.p.A.**  
 ITALY phone: +39-055-300-96-01 fax: +39-055-30-09-93

**NIKON AG**  
 SWITZERLAND phone: +41-43-277-28-67 fax: +41-43-277-28-61

**NIKON GMBH AUSTRIA**  
 AUSTRIA phone: +43-1-972-6111-00 fax: +43-1-972-6111-40

**NIKON BELUX**  
 BELGIUM phone: +32-2-705-56-65 fax: +32-2-726-66-45

**NIKON UK LTD.**  
 UNITED KINGDOM phone: +44-208-247-1717 fax: +44-208-541-4584

**NIKON METROLOGY UK LTD.**  
 UNITED KINGDOM phone: +44-1332-811-349 fax: +44-1332-639-881  
 E-mail: [Sales.UK.NM@nikon.com](mailto:Sales.UK.NM@nikon.com)

**NIKON FRANCE S.A.S.**  
 FRANCE phone: +33-1-4516-45-16 fax: +33-1-4516-45-55

**NIKON METROLOGY SARL**  
 FRANCE phone: +33-1-60-86-09-76 fax: +33-1-60-86-57-35  
 E-mail: [Sales.France.NM@nikon.com](mailto:Sales.France.NM@nikon.com)

**NIKON GMBH**  
 GERMANY phone: +49-211-941-42-20 fax: +49-211-941-43-22

**NIKON METROLOGY GMBH**  
 GERMANY phone: +49-6023-91733-0 fax: +49-6023-91733-229  
 E-mail: [Sales.Germany.NM@nikon.com](mailto:Sales.Germany.NM@nikon.com)

