See the evolution

The Ni series, the ultimate in upright biological microscope evolution, supports bioscience studies with enhanced basic performance and flexible system expandability. The newly developed CFI Plan Apochromat λ (lambda) series objectives are the key to the series’ optical performance. Nano Crystal Coat, with its ultra low refractive index, is employed for the first time in microscope objectives, providing brighter, high-resolution and high-contrast microscopy images. Nikon’s proprietary stratum structure, used and highly acclaimed for inverted research microscopes, is now incorporated in an upright microscope, allowing a combination of components to be installed. Applications using laser and fluorescent proteins, such as Kaede and PA-GFP, are possible with the addition of a two-tiered fluorescent unit and a photoactivation unit.

The Ni series transcends the concept of conventional upright microscopes and expands the possibilities of advanced research in fields such as bioscience and medicine.

- **System expandability**
  - Nikon’s proprietary stratum structure enables efficient system construction.
  - The numerous accessories can be custom combined depending upon application.

- **Optical performance**
  - CFI Plan Apochromat λ objectives with chromatic aberration correction and high transmission throughout a broad range of wavelengths.
  - Objectives with improved transmission in near IR wavelength range for multiphoton excitation imaging.

- **Design**
  - 3D ergo design combines functionality with sophistication.

- **Operability**
  - Ni-E: Motorized model with automatic change of observation conditions and adjustment of microscope accessories.
  - Ni-U: Manual model with some motorized options.
  - Most microscope controls can be operated with easy-to-reach buttons on the front of the Ni-E.
The Ni series microscopes meet all research demands

These microscopes have three features: expandability of the system due to the stratum structure that enables optical paths in two tiers; superior optical performance, as represented by the Plan Apochromat \( \lambda \) series objectives; and high-speed motorized accessories. The Ni series is designed to meet the needs of all advanced bioscience and medical research.
Expandable system broadens application possibilities

Multi-color fluorescent imaging (Ni-E)
Demand for multi-color fluorescent imaging that uses newly developed fluorescent proteins and fluorescent reagents is constantly increasing. Nikon meets such needs with diverse functions and optical technologies.

- High-speed motorized components
  The higher speeds of the motorized excitation and barrier filter wheel and the motorized shutter enable quick wavelength changes, reducing photobleaching of the specimen. It can be operated via easily accessible control buttons, increasing operation efficiency.

- CFI Plan Apochromat λ series objectives
  Transmission and chromatic aberration correction have been improved throughout the wide range of visible to near-IR wavelengths, allowing use of various fluorescent reagents. They provide bright, high-contrast, high S/N (signal-to-noise) ratio multi-color fluorescence images with almost no focus shift when used with any wavelength.

Photoactivation imaging (Ni-E/Ni-U)
Research into the reactions and changes of stimulated cells has become popular in recent years. Nikon has developed a new photoactivation unit for upright microscopes, a first in microscopy.

- Flexible stratum structure
  This structure allows two-layer mounting of a photoactivation unit with an epi-fluorescence attachment.

- Objectives for long-wavelength laser
  With CFI Plan Apochromat λ objectives, chromatic aberration has been corrected up to 850 nm and transmission improved in the long-wavelength range, increasing accuracy and efficiency of laser excitation at target site.
Simultaneous multichannel imaging (Ni-E/Ni-U)
The Ni's back port and the quadrupolar tilting tube allow the user to acquire simultaneous, two-channel images on separate cameras. This feature is invaluable for applications such as FRET.

Simultaneous imaging with two cameras
The Ni's flexible stratum structure enables incorporation of a back camera port unit, allowing simultaneous image acquisition of two different wavelengths with two different cameras mounted on the back port unit and the quadrupolar tilting tube. This enables the capture of high-resolution images in the entire frame for each wavelength without dividing the CCD chip. The use of individual cameras for acquisition allows the user to tailor acquisition parameters for each channel independently, allowing acquisition of high-sensitivity FRET images.

Multiphoton imaging (Ni-E)
Multiphoton microscopy in which long excitation wavelengths are used to allow less-invasive imaging of ever deeper areas of cells is gaining popularity. The design of the Ni-E model is optimized for multiphoton imaging in both optical and mechanical systems to meet the demands of today.

Objective dedicated to multiphoton imaging
CRF5s Achromat 25xW MP objective features chromatic aberration correction over a broad wavelength range from 405 to 950 nm, high NA (numerical aperture: 1.10) and longer working distance (2.0 mm), and compatibility with water immersion and water dipping.

High-sensitivity multiphoton detector (NDD)
Newly developed episcopic NDD (non-descanned detector) unit incorporates a detector that efficiently senses weak signals from deep areas of live specimen. In combination with a diaiscopic NDD unit, transmitted signals can also be detected.

Retrofittable focusing nosepiece mechanism
Microscopes can be modified by switching the focusing stage and focusing nosepiece, enabling fixed-stage configuration to meet demands of experiments such as in vivo imaging.
Versatile microscopes meet all demands

Manual and motorized models
To meet diverse user demands for operability, system expandability and motorized control, Nikon provides two Ni series models. The Ni-U, which has compatibility with some motorized accessories, is the manual model suitable for high-quality image observation and digital imaging. The Ni-E is a fully motorized model that is efficient for experiments requiring comprehensive control of various devices, such as photoactivation units and confocal systems.

Ni-U (manual model)
- Ergonomic tube and stage handle height adjustment mechanism allow comfortable viewing positions.
- Stratum structure and sturdy design improve expandability.
- Motorized nosepiece, motorized epi-fluorescence cube turret, motorized shutter can be utilized.

Ni-E (motorized model)
- High-precision motorized focusing
- Broad range of motorized accessories that can be used in combination.
- Observation conditions can be changed at a simple push of a button.
- Stratum structure and sturdy design improve expandability.
- Microscope settings in use can be verified on the display.
- Optimized for multiphoton excitation imaging
- Two focusing mechanism options: focusing stage and focusing nosepiece

Ni-E provides fully motorized operations

Automatic adjustment with objective changeover
Condenser, aperture and field diaphragm, and ND filter are automatically set to the optimal position during objective changeover. In addition, stage XYZ travel amount per handle rotation and parfocal distance deviation correction are automatically adjusted. Microscope settings can also be manually adjusted.

Change of observation conditions
Selected observation conditions can be designated to individual buttons, enabling changes to be made at the push of a button. This is particularly convenient when reproducing specific observation conditions.

High-precision motorized focusing
High-precision Z-focus incorporated by the Ni-E provides accurate Z-position information required for use with confocal laser microscopes. Individual coarse and fine focus knobs provide enhanced ease of operation.
Technologies supporting the Ni series

Supreme optical performance

As a light microscope manufacturer, Nikon has cultivated high technical capabilities and confidence. With its advanced technologies extending from optical glass production to lens design, fabrication, coating and processing, Nikon provides unsurpassed optical performance.

High-performance objective lens

- **CFI Plan Apochromat A series**
  
  With remarkably high NA, greatly improved transmission in the long wavelength range thanks to Nikon proprietary Nano Crystal Coat, and chromatic aberration correction over 435 to 850 nm, these objectives are ideally suited not only for brightfield and DIC observations but also for fluorescent observations. These lenses allow acquisition of bright and clear images at any wavelength for near-IR imaging and multi-color fluorescence imaging. Because bright images can be captured even with a weak excitation light, damage to a specimen is minimized.

-Nano Crystal Coat

This anti-reflective coating that consists of nanometer-size particles is based on semiconductor manufacturing technology and is also used for Nikon camera lenses. The coarse structure with particles arranged in a spongy construction with uniform spaces between them enables extremely low refractive indices.

-**Water dipping objective lenses**

  With a long working distance and high NA, these objectives provide excellent transmission in near IR wavelength range. The axial chromatic aberration of 40X and 60X objectives has been corrected to up to 150 nm, allowing high resolution images of minute structures in thick specimens during IR-DIC observation. The 25XW MP and 100X objectives feature high NA (1.11) and a long working distance (2.0 mm). With chromatic aberration corrected in the IR region, these objectives are ideal for multiphoton excitation observation. In addition, by employing a mechanism to compensate for the changes in spherical aberration that occur at different temperatures and depths of observation points, clear images of areas deep within a thick specimen can be captured.

Uniformly bright illumination

The “fly-eye” lens is ideally suited to diascopic illumination optical systems. Uniform and bright illumination up to the viewfield periphery is provided at any magnification.

Fluorescence noise elimination

Nikon’s proprietary noise terminator mechanism is employed in the epi-fluorescence cube turret and filter cubes. The S/N ratio has been dramatically improved by thoroughly eliminating stray light in the filter cubes, allowing images of weak fluorescent signals to be captured with high contrast and brightness.

Excellent image acquisition with all observation methods

Epi-fluorescence observation

DIC (Differential Interference Contrast) observation

Phase contrast observation

Brightfield observation
Digital imaging

The Ni series can be controlled in conjunction with a Digital Sight series digital camera, facilitating effortless digital imaging. Images can be captured with a dedicated button on the microscope body, the touch panel on the camera control unit, or the software GUI on a PC, depending on your preference.

• **Image capture button**

Images can be acquired by simply pressing the image capture button located on the microscope base.

- **Stand-alone control unit DS-L3**

  Stand-alone control unit DS-L3 allows the Digital Sight series digital camera to be set up and operated without a PC connection. It also enables image acquisition from a PC through a network. The DS-L3 is firmware based, and therefore will not compromise your facility’s network.

  - Optimal imaging parameters for each observation method can be selected using icons and simple measurements can be taken.
  - Camera, motorized microscope functions and peripheral devices can be comprehensively controlled.
  - Microscope status data, such as objective lens, fluorescent filter cube and condenser information, is automatically saved along with the captured image when a motorized or intelligent unit is attached.
  - Operations can be controlled with a mouse or a touch panel operated by touch or stylus pen.
  - Required icons can be selected and laid out as desired.

- **Combination of Ni-E and motorized stage enables large-image acquisition.**

Digital Sight series digital cameras

A wide array of models with high sensitivity, high resolution, high speeds and faithful color reproduction are available to meet all research needs and purposes.

- **High-sensitivity cooled monochrome camera head DS-Q1**

  The new CCD drive circuit reduces readout noise. The cooling mechanism reduces heat-induced noise, allowing the capture of weak fluorescence signals. Furthermore, there is a high frame rate of up to 48 fps and a high quantitative linearity within 2%.

- **Ultrahigh-resolution cooled color camera head DS-Ri1**

  Provides the 12.7-megapixel equivalent, 2200 TV line high definition. Smooth live image display at max. 32 fps makes focusing easy. Superior color reproduction capabilities allow recording of accurate specimen colors. The cooling mechanism reduces heat-induced noise in fluorescent images.

- **High-definition cooled color camera head DS-Fi1c**

  Equipped with a 5-megapixel CCD. The cooling mechanism reduces heat-induced noise, making it ideal for fluorescent image acquisition.

- **High-definition color camera head DS-Fi2**

  Equipped with a 5-megapixel CCD. Displays live images at max. 21 fps. Minute structures can be captured in brightfield, phase contrast and DIC observations.

- **Stand-alone control unit DS-L3**

  Stand-alone control unit DS-L3 allows the Digital Sight series digital camera to be set up and operated without a PC connection. It also enables image acquisition from a PC through a network. The DS-L3 is firmware based, and therefore will not compromise your facility’s network.

  - Imaging Software NIS-Elements

    NIS-Elements seamlessly integrates cameras, peripheral devices, and the Ni, serving as a powerful yet easy-to-use interface for complex imaging experiments. Powerful tools for quick processing, measurement and acquired data management provide a one-step solution for acquisition and analysis.
High-resolution confocal imaging systems

Combining the Ni-E’s high-precision Z-focus mechanism with a confocal scanner allows high-resolution, high-S/N-ratio imaging of 3D structures of organs and cells. The Ni-E can be configured with either a focusing stage or a focusing nosepiece, catering to specific imaging requirements. Nikon offers a wide range of confocal systems that can accommodate various needs.

- **Multiphoton confocal microscope A1 MP*/A1R MP**

  A1 MP* enables high-resolution multiphoton imaging (up to 4096 x 4096 pixels). In addition, A1R MP* is capable of high-speed multiphoton imaging of up to 400 fps. The high-performance detectors enable deep imaging of living specimens with high sensitivity. The NDD also enables high-speed, accurate unmixing of GFP and YFP.

- **Confocal microscope C2**

  C2+ features a compact design and high functionality. The C2+ allows users to acquire simultaneous 3-channel and discscopic DIC images and provides powerful imaging modalities, such as large image stitching.

- **Confocal microscope A1**

  A1+ incorporates a high-definition (up to 4096 x 4096 pixels) non-resonant scanner. A1R+ also incorporates a high-speed (up to 420 fps) resonant scanner. In addition to the non-resonant scanner, enabling true simultaneous photoactivation and imaging.

- **Spectral imaging confocal microscope A1si*/A1Rsi*/C2si**

  By incorporating a spectral detector, a wide wavelength spectrum of 320 nm can be acquired with a single scan. Closely overlapping spectra can be unmixed cleanly with minimal crosstalk.

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- **Adult mouse brain stained with anti-proinsulin, anti-beta catenin and anti-KDELR (ER marker)**

  The cell was exposed to ionomycin to raise intracellular calcium and induce FRET. The color change indicates changes in the level of FRET. Time-lapse images were taken with the A1R (resonant scanner). Samples courtesy of: Drs. Diva Jonatan, Matt Kofron and James Wells, Cincinnati Children’s Hospital Medical Center.

- **Bovine brain microvascular endothelial cells labeled with MitoTracker (mitochondria, yellow), phalloidin (actin, blue) and Hoechst (DNA, magenta)**

  (captured with A1)

- **Cryosection of a mouse kidney labeled with phalloidin (actin; red), wheat germ agglutinin (green), and DAPI (DNA; blue)**

  (captured with A1)

- **Mouse fibroblast labeled with tubulin antibodies (blue) and DAPI (DNA; magenta)**

  (captured with A1)

- **E10.5 mouse embryo wholemount stained with anti-Pdx1 (green), anti-Nkx2.1 antibodies (blue) and anti-E-cadherin to reveal the developing pancreatic and lung primordia. Photos courtesy of: Drs. Diva Jonatan, Matt Kofron and James Wells, Cincinnati Children’s Hospital Medical Center.**

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Wide array of accessories finely segmented by function

Motorized quadrangular lifting tube (Ni-E)
- Motorized changeover of optical paths is possible. Eyepiece inclination can be adjusted from 15° to 35°.

Motorized DSC zooming port (Ni-E)
- A digital camera can be mounted on the camera port. A motorized 0.6x–2.0x zoom optical system is incorporated.

Motorized XY stage (Ni-E)
- Effective for applications that require highly accurate positioning, such as photoactivation imaging and FISH.

Motorized universal condenser Dry (Ni-E)
- High-speed motorized changeover of condenser modules for brightfield, phase contrast, DIC and simple darkfield observations is possible.

Photoactivation unit (Ni-E, Ni-U)
- Laser light photoactivation and episcopic illumination are possible. Both the photoactivation unit and the vertical system can be used with a single laser source.

Motorized epi-fluorescence cube turret (Ni-E, Ni-U)
- A digital camera can be mounted on the camera port. Examples of units are motorized 0.6x, 1x, 2x and 2.5x condensers.

Motorized barrier filter wheel (Ni-E)
- Barrier filter positions (7 positions—using 25 mm filters) can be changed at a high speed of 0.2 sec. Between adjacent positions.

Motorized excitation filter wheel (Ni-E)
- Excitation filter positions (8 positions—using 25mm filters) can be changed at a high speed of 0.15 sec. Between adjacent positions.

Motorized ND filter (Ni-E)
- Brightness is automatically optimized with the changeover of the motorized nosepiece. Motorized adjustment of brightness is also possible.

Motorized ND filter (Ni-E)
- Brightness is automatically optimized with the changeover of the motorized nosepiece. Motorized adjustment of brightness is also possible.

Motorized ND filter (Ni-E)
- Brightness is automatically optimized with the changeover of the motorized nosepiece. Motorized adjustment of brightness is also possible.

Motorized shutter (Ni-E, Ni-U)
- High-speed shutter control is possible. The shutter can be attached to diascopic and episcopic illumination systems.

Motorized sextuple DIC nosepiece (Ni-E, Ni-U)
- Objective magnification is automatically saved along with the captured image. Built-in prism/analyzer plate slot.

Simple remote control pad (Ni-U)
- Motorized operation of nosepiece, epi-fluorescence cube turret and shutter is possible.

Ni-E (for use with focusing nosepiece)
- Configured with an Ni photoactivation unit, two-tiered motorized epi-fluorescence cube turret and motorized quadrangular lifting tube.

Ni-U
- Configured with a motorized epi-fluorescence cube turret and quadrangular lifting tube.

Ni-U
- Configured with an ergonomic binocular tube and DSC port.

Dimensional diagram

Unit: mm
System diagram: Ni-E focusing stage type
System diagram: Ni-E focusing nosepiece type
### Specifications

<table>
<thead>
<tr>
<th>Optical system</th>
<th>CF98 infinity optical system</th>
<th>CF168 and CF175 infinity optical systems</th>
<th>CF80 infinity optical system</th>
</tr>
</thead>
</table>

### Eyepieces

- F.O.V. 10x (22) · CF10x
- F.O.V. 10xM Photomask (22) · CF10xM
- F.O.V. 12.5x (16) · CF12.5x

### Controls

- Focus Coarse/Fine focusing
- Coaxial Coarse/Fine focusing
- Motorized escape and refocus mechanism
- Motorized鼻件 septuple DIC鼻件
- NI-N7-E Motorized septuple DIC鼻件
- NI-ND6-E Motorized sextuple DIC鼻件
- NI-ND6-I Intelligent sextuple DIC鼻件

### Transmitted light

- On/Off switch, Intensity control dial with preset function
- ND2 filter (option)
- Built-in NCB11, ND8, ND32 filters (detachable, one additional filter mountable) and diffuser (non-detachable)
- Built-in fly-eye lens

### Eyepiece (I.D.V. mm)

<table>
<thead>
<tr>
<th>CF110 (12)</th>
<th>CF110M Photomask (22)</th>
<th>CF110 (14.5)</th>
<th>CF110M Photomask (25)</th>
</tr>
</thead>
</table>

###subsides

- NI-SS Substage (for Motorized Universal Condenser and Rotatable/Motorized stages)
- NI-SS Substage for Focusing Nonpincase (for LWD condenser and FY1 Standard/Motorized stage)

### Epifluorescence illuminator

- NI-1FL-E Epifluorescence Attachment
- Aperture diaphragm and field diaphragm (Centerable/Detachable), ND filters (ND8, ND16, ND32)
- NI-PAU Ni-Precise (4/m to 6/mm)

### Filter cube turret

- 6 filter cubes mountable, High S/N noise terminator mechanism for all turrets
- NI-FTE-E Motorized Epi-Fuorescence Cube Turret
- NI-FTE-E Intelligent Epi-Fuorescence Cube Turret
- NI-FTE-E Motorized Epi-Fuorescence Cube Turret
- Manual Shutter

### Light distribution device

- NI-KL-E Fibre-Optic Light Guide (with max. halogen lamp intensity)

### Ni-U

- NI-U Motorized Shutter 0.012 sec between open and close state

### Ni-E

- NI-E Motorized Barrier Filter Wheel
- 7 filters mountable, 0.2 mm between adjacent positions

### Option

- NI-BAW-E Motorized Excitation Filter Wheel
- 8 filters mountable, 0.15 mm between adjacent positions

### Epi-illumination light source

- C-HG1/HPGE Hg Premixed Filter Illuminator Intensity (100W)
- Hg Lamphouse and Power Supply (100W)
- Hg Lamphouse and Power Supply (100W)
- Hg Lamphouse and Transformer (100W)*

### Power consumption

- 27W (with max. halogen lamp intensity and full motorized options)
- 16W (with max. halogen lamp intensity and full motorized options)

### Weight (approx.)

- 25kg (Epifluorescent configuration with motorized filter cube turret)
- 42 kg (Focusing arrangement with motorized filter cube turret)

### Stage

- N-SF2 Right Handle Stage with 25 Holder
- N-SF2 Right Handle Ceramic-coated Stage with 15 Holder
- C-SR8 Right Handle Ceramic-coated Stage
- N-C33092 Right Handle Rotatable Ceramic-coated Stage with 25 Holder

### Motorized

- NI-CUD Motorized Universal Condenser Dry for DIC, phase contrast, darkfield observations
- Attachable on N-SM Substage

### Manual

- NI-CUD Universal Condenser Dry
- C-Achro Condenser NA 0.9
- C-Achro Condenser NA 0.9
- Darkfield Condenser Dry
- C-Achro/Darkfield Condenser
- C-Achro Slide-Achro Condenser 2-100x
- C-Achro Slide-Achro Condenser 2-100x
- C-Achro Shutter Slide-Achro Condenser 2-100x
- X U WD Condenser
- D-CLC Dic Condenser Oil

### Substages

- N-SS Substage
- N-SS Substage (for Non-rotatable stages)

### Ports (O.C.A. 11 mm)

- CI-2PS2 FN1 Standard Stage (with max. halogen lamp intensity)

### Condensers

- C-NA Standard Condenser
- C-NK Standard Condenser
- C-NA Standard Condenser with Analyzer Slot
- C-NA Universal Quotientia Nosepiece ESD
- C-NA Universal Quotientia Nosepiece ESD

### N-Area

- NI-CAM Contact Arm (for Motorized/Intelligent options)
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