Nikon offers a total software solution for image capturing, archiving, and analysis.

Why NIS-Elements?

NIS-Elements is an integrated software imaging platform which delivers comprehensive control of microscopes and peripheral devices, image capturing, documentation, image analysis and data management of up to six dimensions. This system contributes to experiment efficiency with intuitive image analysis features and database building capabilities developed to handle archiving and management of large numbers of multidimensional image files. Unified control of the entire imaging system offers significant benefits to users for cutting-edge research, such as live cell imaging.

Total Imaging Solution

Designed to serve the needs of advanced bioresearch, clinical, industrial and documentation professionals, NIS-Elements provides a totally integrated solution for users of Nikon and other manufacturers’ accessories by delivering automated intelligence to microscopes, cameras, and peripheral components. The software optimizes the imaging process and workflow and provides the critical element of information management for system-based microscopy.

Highest Quality Optical Performance

The world-renowned Nikon CF60 infinity optical system has effectively set a new standard for optical quality by providing longer working distances, higher numerical apertures, and the widest magnification range and documentation field sizes. Nikon’s new objectives and accessories are specifically engineered for digital imaging.

Diverse Line of Powerful Digital Cameras

Nikon offers a full line of digital cameras, addressing the varied needs of users in multiple disciplines. Each Nikon digital camera is designed to work seamlessly with Nikon microscopes, peripherals, and software. With Nikon Digital Sight (DS) series cameras, even novice users can take beautiful and accurate microscopic images. For the advanced researcher, high resolution image capturing and versatile camera control is fast and simple.

Main Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>AR</th>
<th>BR</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Window style</td>
<td>(Multiple Document Interface)</td>
<td>(Multiple Document Interface)</td>
<td>Single Document Interface</td>
</tr>
<tr>
<td>Dark color scheme</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Industrial simple GUI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camera control</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Microscope control</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Nikon-made peripheral control</td>
<td></td>
<td></td>
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<tr>
<td>Non-Nikon peripheral control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Live image capture</td>
<td></td>
<td></td>
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<tr>
<td>Time-lapse image capturing (T)</td>
<td></td>
<td></td>
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<tr>
<td>E-series image capturing (E)</td>
<td></td>
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<tr>
<td>Multichannel image capturing (M)</td>
<td></td>
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<tr>
<td>Multimode image capturing (M)</td>
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<tr>
<td>Multidimensional image capturing</td>
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<tr>
<td>Stimulation experiment</td>
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<tr>
<td>RAW capture</td>
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<tr>
<td>HDR image capture</td>
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<tr>
<td>4K still/image capture</td>
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<tr>
<td>Electron calibration</td>
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<tr>
<td>Capturing data savings (Meta-data)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Image browsing</td>
<td></td>
<td></td>
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<tr>
<td>Browse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LUT (look up table)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Management</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Manual measurement</td>
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<tr>
<td>Auto measurement</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Intensity profile</td>
<td></td>
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<tr>
<td>Intensity surface plot</td>
<td></td>
<td></td>
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<tr>
<td>Time (Intensity) measurement</td>
<td></td>
<td></td>
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<tr>
<td>ROI measurement</td>
<td></td>
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<td>Volume measurement</td>
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<td>Stain</td>
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<tr>
<td>Advanced interpreter</td>
<td></td>
<td></td>
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<tr>
<td>Report generator</td>
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<td></td>
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<tr>
<td>User library</td>
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<td></td>
<td></td>
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<tr>
<td>Volume view</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DFP (Extended depth of focus)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3D software view</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Ratio view</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2D real-time deconvolution</td>
<td></td>
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<td>2D deconvolution</td>
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<tr>
<td>3D deconvolution</td>
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<tr>
<td>4D deconvolution</td>
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<tr>
<td>Image standardizer</td>
<td></td>
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<td>Object standardizer</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2D/3D object tracking</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Camera &amp; ROI</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>General analysis</td>
<td></td>
<td></td>
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<td>NC template</td>
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<tr>
<td>ROI Tracker</td>
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<tr>
<td>IE-SIM analysis</td>
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<td>IE-SIM offline analysis</td>
<td></td>
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<td>IE-STORM analysis</td>
<td></td>
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<tr>
<td>IE-STORM offline analysis*</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Metamorphology analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elimination sequence</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Stage incubator control</td>
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<td></td>
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<tr>
<td>Dual camera support</td>
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*N-STORM analysis is required.

Ar: Full function [ ] Limited function — Not available © Option
Image Acquisition

NIS-Elements offers the most suitable image acquisition for various applications with the integrated control of the camera, motorized microscope and peripheral devices.

Multichannel (multi color)

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

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

Time Lapse

Time lapse imaging in NIS-Elements is easily configurable simply by setting the time interval and duration of capture.

The Perfect Focus System of the motorized inverted microscope Ti-E enables high-accuracy image capture without focus drifting even during extended time-lapse experiments.

Multipoint Experiments

NIS-Elements’ motorized stage control offers automated travel to multiple stage points of the sample of a multi-well plate or dish. Stage points are memorized and can be saved and loaded for future imaging sessions.

Image Stitching (Large image)

Large Image Acquisition generates a single high-magnification wide field-of-view image by automatically stitching multiple adjacent frames from a multipoint acquisition using a motorized stage or from multiple single images captured from a previous session.

Users can easily select image acquisition ranges and areas from low magnification images.

Multidimensional imaging

Z-series

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

ND Acquisition

NIS-Elements captures images in a combination of multiple dimensions such as Time-Lapse, Multichannel, Z-series, and Multipoint. It is also possible to create and manage the acquisition of a multi-dimensional dataset with a thirty-minute time lapse of two wavelengths and a Z series across each well of a multi-well plate.

ND Stimulus

NIS-Elements controls photo stimulation and image acquisition.

ND Simultaneous Stimulation

NIS-Elements enables image acquisition during photo stimulation.

ND Sequential Acquisition

NIS-Elements allows various sequential imaging experiments to be combined with other functions, such as simultaneous photo stimulation and imaging, or multidimensional acquisition.
Optical Configuration

Preset or “Optical Configurations” can be saved for each observation method such as FITC fluorescence and DIC imaging, memorizing the settings of the microscope, camera and peripheral devices. The optical configurations are created through a one click set-up and are displayed as icons in the toolbar for easy access and use.

Movie Capture, Fast Image Capture

NIS-Elements has several options to observe and capture a sample’s change and fast movement.

Fast Time Lapse

Fast Time Lapse is designed for ultra high-speed cameras. The hard disk drive can be used together with PC memory to enable a longer acquisition time.

RAM Capture

RAM Capture allows for acquisition at the fastest possible rate of the camera. A RAM buffer is utilized to enable capture and retrieve a high speed time lapse, which aids in the capture of fleeting events such as calcium sparks, motility and translocation.

AVI Live-Stream Capture

AVI Acquisition automatically captures live data into an easily exportable and viewable AVI format.

Extended Depth of Focus (EDF)

With motorized focusing

The EDF function selects the in-focus area from multiple Z-stack images, and produces one all-in-focus image. The composite image can be viewed and rotated as a virtual 3D image, as it contains Z-axis information.

With manual focusing

An all-in-focus image is created in real-time in synchronization with the rotation of the focus knob. While the focus is manually adjusted, the in-focus areas of the image at different depths are successively captured and combined for the EDF image.

High Speed Device Operation by Triggering

Triggered Acquisition

Triggering external devices directly from the camera enables synchronized control of various devices such as the laser unit without passing through the PC. This allows for the fastest performance of the system components for multi-wavelength excitation in TIRF observation.

Ti-recipe

This function enables the HUB-A controller of the motorized inverted microscope Ti-E to control both image acquisition and the fluorescent shutter by directly connecting the camera and a HUB-A controller without passing through a PC. As a result of optimizing the communication times of all connected devices, acquisition times for multi-dimensional datasets are reduced.

NI-DAQ Control

TTL and analog signal input/output with NI-DAQ Control enables experiments using various triggerable devices. This function enables the HUB-A controller of the motorized inverted microscope Ti-E to control both image acquisition and the fluorescent shutter by directly connecting the camera and a HUB-A controller without passing through a PC. As a result of optimizing the communication times of all connected devices, acquisition times for multi-dimensional datasets are reduced.

Illumination Sequence Option

This module provides an easy-to-use graphical user interface for setting and running advanced real-time (triggered) acquisition experiments. It is a universal interface for camera-to-device triggering. An item drag-drop function makes it easy to create any complex illumination or stimulation procedure in a matter of minutes.

*Some cameras and devices are not compatible with these functions. For more information, please contact Nikon or an authorized representative.
Display and Data Processing

Various methods are available for displaying and processing captured images and datasets.

Multi-dimensional Image Display

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.

Merge Channels

Multiple single-channel images (i.e., two from three-channel acquisition images) can be merged together to create an overlay of full depth separately scalable images. With AR and BR, images can be merged by simply dragging the tab of one image onto another image. With D, images are merged by selecting each image for red, blue, green and brightfield channels.

Image Processing

Image Filtering, Color Adjustment

*Usable functions vary depending on the package. With NIS-Elements image processing tools, it is possible to modify image display and feature extraction using various filters for, for example, sharpness, smoothing and detection. White balance and RGB/HIS balance adjustment are additional available options.

Arithmetic operation (Image arithmetic)

NIS-Elements enables arithmetic operations such as addition, subtraction, multiplication and division on an image or between multiple images. Arithmetic operation between multiple images is also possible.

Arithmetic operation (Image averaging)

NIS-Elements reduces the noise of an image by averaging multiple sequential images such as time-lapse images. Rolling averaging that does not reduce frame rate is available as well.

Deconvolution

3D Deconvolution

Noise and blur of the acquired fluorescence image can be eliminated. By reassigning out-of-focus intensities back to the spatial locations to where they originated, the intensity of the image is kept and allows for quantitative analysis. Algorithms for wide-field fluorescence, point-scanning confocal and spinning-disk confocal images are available.

2D Deconvolution

The 2D deconvolution module can be applied to a live image or an already acquired dataset. The module also allows the elimination of out-of-focus blur from live images and multidimensional images.
Measurement and Analysis

Manual Measurement (Interactive Measurement) and Image Annotation

Interactive 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 an Excel spreadsheet. Annotations such as arrows, circles, squares, text are also available display options.

Histogram/Intensity Line Profile/Intensity Surface Plot

Histogram measurement measures the intensity distribution of pixels across the whole image or a defined region. An intensity line profile measurement shows the intensity distribution on a defined line. The Intensity Surface plot shows the intensity distribution of an image with the height of the z-axis line.

ROI Statistics

ROI or multiple ROIs statistic results for a single image or a multi-dimensional dataset are displayed and easily exported as text or an excel file.

Auto Measurement (Object Counting)

Auto measurement measures the number of area of objects which are extracted from images by the creation of a binary layer through thresholding using RGB/HIS or intensity values. The results can be listed or exported as text or an excel file. It is possible to save and reuse thresholding parameters.

Classifier

Object Classifier

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

Pixel Classifier

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

Time (Intensity) Measurement

Time measurement creates a graph of sequential intensity changes while time-lapse imaging or from captured time-lapse images. Ratio view function* allows the measurement of the ratio of two wavelengths across multiple ROIs and shows the ratio value by pixel. Numeric data and graph images are exportable and the measurements on the graph are available as well. (* Only with AR)

Calcium & FRET

Ca2+ ion concentration calibration of the ratiometric fluorochrome Fura2, for example, is available using an easily configurable wizard. Corrected FRET image and FRET efficiency, reported in percentage is also available using three filter sets (three types of excitation–fluorescent combination: "Donor – Donor," " Acceptor – Acceptor" and "Donor – Acceptor") and two bleed-through factors.

ROI Statistics

*Usable functions vary depending on the package.

Common pixel measurements such as area, maximum or minimum intensity are possible with the user defined ROI (Region Of Interest). ROI or multiple ROIs statistic results for a single image or a multi-dimensional dataset are displayed and easily exported as text or an excel file.

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2D/3D Object Tracking

Tracking of an object utilizes the threshold of objects over time and produces measurements such as velocity, acceleration, and distance from a specified origin. The tracking module offers both automated tracking and manual tracking methods.
GA (General Analysis)

General Analysis streamlines the setup of image analysis combining functions, such as image preprocessing and thresholding, processing of binary images and features, and measurement settings.

- GA creates a new measurement area by combining multiple binary layers, and creates a new measurement parameter by applying these custom measurement settings.
- Each setting can be stored as a recipe that can be run for routine analysis under the same conditions across multiple datasets.

Options

- Image preprocessing
- Setup of multiple analysis tasks
- Output of analyzed results
- Image thresholding
- Processing of binary layers (measurement areas)
- Measurement parameters

Others

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.

Background Compensation

Background correction uses previously captured images to correct uneven background brightness while imaging or of captured images.

Live Image Comparison

Live Compare enables easy image comparison between a sample image and a live image. Live observation side by side with a paused live image is also available in split screen mode.

Database

Using the organizer function, captured images are displayed in thumbnails for easy retrieval of the desired image. By simply clicking on the thumbnail image in this view, the image is easily opened. Sorting and filtering this database of images and datasets using acquisition details such as objective settings, date and author is an easy method for data management as well.

Report Generation

Images captured with NIS-Elements have information such as acquisition details and analysis results, allowing export and PDF conversion of the image and the associated image header and data information.

User Rights/Control

For safe system management, it is possible to individually limit each user authorization using the user account of Windows® (such as the Administrator or Guest) or the user account of NIS-Elements. It limits the authorization and modification of the device settings (microscopes, cameras or others), optical configuration and layout editing.
Results display
Various formats are available for displaying results. Plate view is a centered view that shows acquired images and all associated data. Sample labeling manages image data by linking cells by name, type and quantity of reagent. Heat maps visualize trends in measurement results and analytical values. Graphical displays of analytical values such as histograms, scatter plots and bar graphs are also available.

Experimental setups
The wizard format simplifies settings for each experimental parameter. It also enables sequential operational settings, such as well plate definition, acquisition patterns in a well, wavelengths, autofocus and image analysis.

Define general job parameters
- Z-stack
- Sample labeling
- Autofocus
- Sending task completion by e-mail or SNS

Well plate setting
- Define well plate to use
- Select well plate for image capture
- Define XY image capture pattern inside a well
- Define acquisition pattern for image capture

Define analytical parameters
(Use the custom image analysis utility General Analysis on page 12.)

Experimental setups
General setup wizard

HC Template for the High Content Analysis System
Option ( □ )

The HC Template is a dedicated software module within NIS-Elements.
- It allows fully automated acquisition and analysis of a large number of high-content, multi-dimensional images with integrated control of the high-speed motorized focus and stage of Ti-E motorized inverted microscope, camera and peripheral devices.
- HC Template within NIS-Elements allows for quick experimental setups with several autofocusing options and an immediate view of measurement data well by well during acquisition and via a heat map for trend observation and further analysis.

High Content Analysis System

• The microscope-based High Content Analysis System combined with the Ti-E offers a wide range of interchangeable options, including a full range of camera models, such as high-speed and high-definition cameras, as well as a choice of objectives and fluorescence filters.
• High-speed peripheral devices are optionally available to boost throughput of integrated devices. These include the high-speed piezo Z-objective positioner for fast autofocusing and the automatic plate loader for auto analysis of multiple well plates.

High Content Analysis System

- High-speed Piezo Z-objective Positioner (Option) for fast autofocusing
- Automatic Plate Loader (Option) for automatic imaging with multiple well plates

Sequential HC Template workflow from acquisition to analysis

1. Experimental setups
2. Progress display
3. Results display

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High Content Analysis System
**Industrial Simple GUI**

With D package, the simple GUI mode provides controls for the most common operations such as image capture and simple measurement.

**Dark Color Scheme**

This popular display option mode has a brightness level interface color palette suitable for use in a dark microscopy room.

**Layout Manager**

Layout manager enables customizing layouts of controls, toolbars and menus and application (image acquisition or measurement). Saving custom layouts is possible and accessible through one-click tab access.

**Off-line Package for Analysis**

The NIS-Elements off-line software package offers analysis tools such as intensity measurements and object counting of tiff and multi-dimensional format images captured with Nikon’s microscopes and third-party software.

**Viewer Software**

This is free software for image display of single images and datasets captured using NIS-Elements. Possible views include Tile View, Max/Min Projections and 3D Volume View. Saving multi-dimensional files into TIFF format is available as well. The viewer is downloadable from the Nikon website.

**SUA License**

NIS-Elements can be upgraded for one year from the date of purchase. The Software Upgrade Agreement (SUA) License, which is purchasable in one-year license segments, extends the access to the latest version of NIS-Elements.
Supporting Broad Microscope Imaging

NIS-Elements is a common software platform for Nikon microscope systems, which allows the comprehensive control of wide range of functions for cameras, confocal imaging systems and super resolution microscopes.

**NIS-Elements C**
NIS-Elements C is a free trial version of NIS-Elements C-ER, which provides a user-friendly interface for easy and simple control of Nikon microscopes and peripheral devices. It contains information about the hardware settings and the experiment conditions and settings.

**NIS-Elements C-ER**
NIS-Elements C-ER imaging software enables integrated control of the confocal imaging system, microscope and peripheral devices with a single and intuitive interface. Various reliable analysis functions are also available. Without changing the conventional confocal image acquisition procedure, users can easily achieve enhanced resolution by utilizing unique image processing technology.

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**NIS-Elements Supported Devices** (ver. 4.50 or later)

<table>
<thead>
<tr>
<th>Nikon Cameras</th>
<th>Nikon Microscope Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS-R2, DS-2</td>
<td>Biological Microscope T1 (HIDCUX), HUBUN; T2-LAP System</td>
</tr>
<tr>
<td>DS-U2</td>
<td>Biological Microscope T2000 (Perfect Focus System)</td>
</tr>
<tr>
<td>CQ50</td>
<td>Biological Microscope 90i (160 Fiber Stage)</td>
</tr>
<tr>
<td>CQ51</td>
<td>Biological Microscope 90i (180 Fiber Stage)</td>
</tr>
<tr>
<td>CQ52</td>
<td>Biological Microscope N-L, N-CL, G-L</td>
</tr>
<tr>
<td>CQ53</td>
<td>Fixed-stage Microscope P1; + D-2H-A1*</td>
</tr>
<tr>
<td>C45</td>
<td>Stereo Microscope SMZ1500 (Nikon Modular Microscope MM-4000)*</td>
</tr>
<tr>
<td>C46</td>
<td>Metallographic Microscope MA20D</td>
</tr>
<tr>
<td>C47</td>
<td>Inspection Microscopes L2000/1400</td>
</tr>
<tr>
<td>C48</td>
<td>C-STG/2.5H Flip Illuminator Intensilight</td>
</tr>
<tr>
<td>C49</td>
<td>C-STG1 Epifluo LED Illuminator Laser Module EU-0i Series</td>
</tr>
<tr>
<td>C50</td>
<td>LV-2000 NT V Axiostar controller</td>
</tr>
<tr>
<td>C51</td>
<td>N-SIM-ER</td>
</tr>
<tr>
<td>C52</td>
<td>N-SIM-ER</td>
</tr>
</tbody>
</table>

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**Supported Operation System**

Windows 7 Professional SP1 (32/64-bit version)

*NIS-Elements Ar and C are only compatible with the 32-bit version.

NIS-Elements is compatible with all common file formats, such as JPEG, TIFF, BMP, GIF, PNG, PDF, JP, PDF, PDF, PDF. NIS-2D, JFF, JTF, AVI, ICS/IDS. ND2 is a special format for NIS-Elements; ND2 allows storing sequences of images acquired during EL experiments. It contains information about the hardware settings and the experiment conditions and settings.