



NIKON INSTRUMENTS INC.

NIS-Elements NIS.API Module

Reference Guide

Document Type: NIS.API Reference Guide | Version: NIS-Elements 7.01.00+

| 1 | Overview

Nikon Instruments has been serving research applications across life sciences, neuroscience, drug discovery, cell biology, immunology, and high-content screening. These applications are enabled by Nikon's fully automated microscopy systems and **NIS-Elements**, Nikon's universal software platform that combines powerful image acquisition, analysis, visualization, and data sharing tools.

NIS.API is a REST HTTP interface designed for third-party developers familiar with laboratory automation systems (e.g., robotics, incubators, liquid handlers). It enables programmatic control and orchestration of NIS-Elements workflows and connected microscopy hardware.

NIS.API runs as a local HTTP service on port 8444 (by default) on the NIS-Elements workstation. Any HTTP-capable client on the same local area network can issue requests.

Compatibility Notes

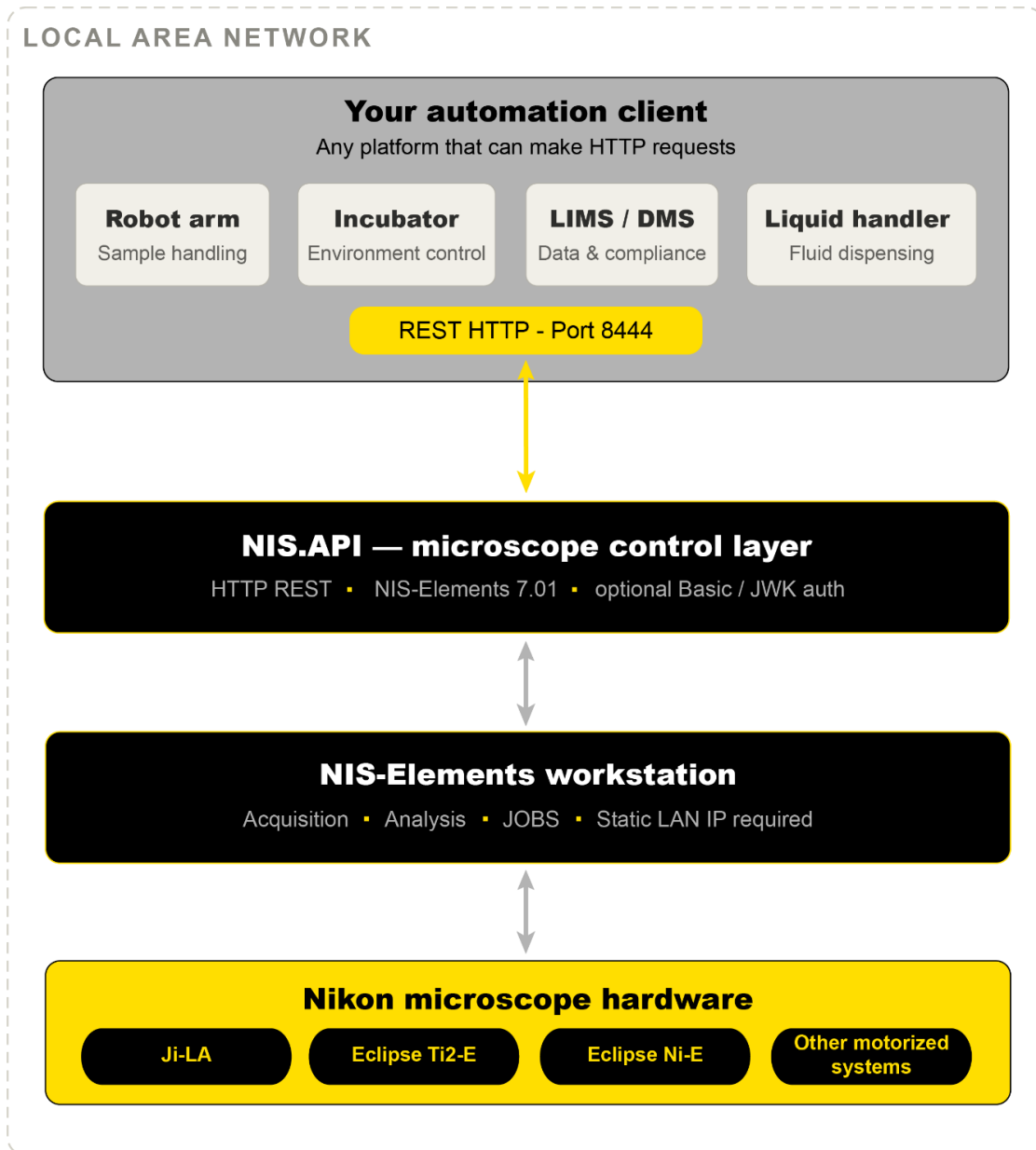
- ✓ NIS.API is available in NIS-Elements version 7.01.00 build 2222 or later.
- ✓ The NIS-Elements workstation must be running Windows 11 Professional.
- ✓ The "Scheduler API module" must be selected during NIS-Elements installation.
- ✓ NIS.API requires AR + 6D + JOBS or C + JOBS or the HC package (includes JOBS).
- ✓ If analysis output will be performed the GA3 module is also required.

| 2 | System Architecture

NIS.API follows a client-server model on a local area network and runs as a Windows service on the NIS-Elements workstation. The workstation hosts the API service, while third-party automation software connect as HTTP clients, issuing requests to drive and orchestrate imaging workflows.

Third-party automation systems (such as robot arms, incubators, LIMS/DMS, and liquid handlers) send REST HTTP requests (port 8444) to the NIS.API, which acts as a control layer. NIS.API communicates with the NIS-Elements workstation, enabling acquisition, analysis, and job execution, which in turn controls the underlying Nikon microscope hardware.

The diagram summarizes how automation clients on a local network interact with Nikon microscopy systems through NIS.API:



NIS.API System Architecture Overview

Network Requirements

- ✓ The API client (e.g., scheduling software) must be on the same local network (LAN), domain, and subnet as the NIS-Elements workstation.
- ✓ A static IP address for the workstation is recommended.



| 3 | Terminology

The following definitions should provide context to the concepts discussed in this reference document:

NIS-Elements	Nikon Instruments' universal microscopy software platform that combines powerful image acquisition, analysis, visualization, and data sharing tools, with fully customizable interfaces and modules capable of supporting everything from simple photo-documentation to complex automated imaging workflows.
2HWConfig (Hardware Configuration)	NIS-Elements can be configured to use many Nikon and supported 3 rd party hardware devices. These devices can be configured together for specific applications or microscope modalities. NIS-Elements allows users to create multiples hardware configurations.
Station	The NIS.API Windows Service responsible for handling the communications between the client program (e.g. Scheduler) and NIS-Elements. The service is also responsible for starting and stopping the NIS-Elements application based on endpoint calls from the client.
NIS-E Process	The NIS-Elements running process in the Windows operating system.
JOBs	NIS-Elements module used to create and perform automated imaging acquisition and analysis tasks.
JOB Run	A single run of a JOBs acquisition session.
Output Folder	The storage location on the local drive or shared network where acquired images are saved during a JOBs run.
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Sample	Typically, a well plate that transferred between a robotic handler and the Nikon microscope stage for an image acquisition (JOBs) session.
Motorized Incubator Lid	The stage top incubator that has a motorized lid feature to allow access to the microscope during transfer of the sample between the robotic handler and the Nikon system.
Loading Position	The X,Y location where the microscope stage will be moved for transferring the sample between the robotic handler and the Nikon microscope system.
Acquisition Position	The optional X,Y location that the microscope stage will be moved to start the JOBs run.



| 4 | Authentication & Connection

4a. Base URL

All API requests are directed to the NIS-Elements workstation at port 8444 by default. Use localhost when calling from the same machine, or the workstation's LAN IP for remote calls.

```
# Local:      http://localhost:8444
# Remote:     http://<workstation-static-ip>:8444
```

4b. Authentication

By default, NIS.API does not require HTTP authentication. If HTTP Basic authentication is configured on the server, include the Authorization header with each request. A 401 response indicates missing or incorrect credentials or a missing API license.

4c. JWK Authentication

Most NIS.API endpoints support single-use JWK (JSON Web Key) token authentication for encrypted sessions. Request a JWK token via the dedicated endpoint for these encrypted sessions.

- GET /v2/nis-e_process/jwk — Issues a single-use JWK key for NIS-E process routes.
- GET /v2/processing/jwk — Issues a single-use JWK key for processing routes.

4d. Request Format

All requests must use JSON bodies where required. The Content-Type header is not strictly enforced by NIS.API, but application/json is recommended for all POST and PATCH requests.

| 5 | V2 API Endpoint Reference

V2 is the primary and recommended API version. All new integrations target V2 endpoints.

5a. Station

Method	Endpoint	Description	Auth
GET	/v2/station	Retrieve current station status for the managed NIS-Elements environment, including hardware configuration details.	Optional



5b. NIS-E Process

Method	Endpoint	Description	Auth
GET	/v2/nis-e_process	Get managed NIS-Elements process status	Optional
POST	/v2/nis-e_process	Start the managed NIS-Elements process. Body: { hwconfig_guid: string }. The hwconfig guid specifies which hardware configuration to use on NIS-Elements startup.	Optional
DELETE	/v2/nis-e_process	Stop all managed NIS-Elements processes.	Optional
GET	/v2/nis-e_process/jwk	Request a single-use JWK authentication key for NIS-E process routes.	None

Response: POST /v2/nis-e_process

```
{ "nis_process_status": "running", "hw_configs": [{ "name": "...", "guid": "..."} ] }
```

5c. Job Runs (V2)

Method	Endpoint	Description	Auth
GET	/nis/v2/job_run	List all JOB runs and their current statuses.	Optional
POST	/nis/v2/job_run	Start a JOB run. Body: { job_definition: base64, barcode: string, output_folder: string, blocking: bool }.	Optional
GET	/nis/v2/job_run/{id}	Fetch status and full details for a specific JOB run by ID.	Optional

Sample Request: POST /nis/v2/job_run

```
{ "job_definition": "<base64_encoded_bin>", "barcode": "PLATE-2024-001",  
  "output_folder": "C:\\Data\\Run1", "blocking": true }
```

5d. Stage Positions (V2)

Method	Endpoint	Description	Auth
GET	/nis/v2/loading_position	Check whether the microscope stage is currently at the loading position.	Optional
POST	/nis/v2/loading_position	Move microscope stage to loading position or open motorized incubator lid.	Optional
GET	/nis/v2/acquisition_position	Check whether the microscope stage is at the acquisition position.	Optional
POST	/nis/v2/acquisition_position	Move microscope stage to acquisition position or close motorized incubator lid.	Optional
GET	/nis/v2/sample	Detect whether a sample is present on the microscope stage.	Optional



5e. Messages (V2)

The Messages endpoints allow automation clients to handle NIS-Elements operator prompts programmatically, enabling fully unattended workflows.

Method	Endpoint	Description	Auth
GET	/nis/v2/message	Retrieve list of pending messages or prompts from NIS-Elements.	Optional
GET	/nis/v2/message/{id}	Fetch a specific message by ID.	Optional
PATCH	/nis/v2/message/{id}	Respond to a specific NIS-Elements message or prompt. Body: response payload.	Optional

5f. Processing Tasks (V2)

Method	Endpoint	Description	Auth
GET	/v2/processing	List all processing tasks and their statuses.	Optional
GET	/v2/processing/{id}	Fetch status and details for a specific processing task.	Optional
POST	/v2/processing/concatenation	Start ND2 concatenation task to create a single time-course files from individual scheduled job runs of the same well plate.. Body: { input_paths: [...], output_path: string }.	Optional
POST	/v2/processing/gaexecutor	Execute a GA pipeline script. Body: { input, output, ga3_bin, params }.	Optional
GET	/v2/processing/jwk	Request single-use JWK key for processing routes.	None

5g. Support Utilities (V2)

Method	Endpoint	Description	Auth
POST	/v2/support/generate_well_selection	Generate well selection JSON for a plate type and selected areas. Body: { plate_type, select_areas }.	Optional
POST	/v2/support/convert_json_to_string	Convert JSON payload to string-encoded format for use in job definitions.	Optional
POST	/v2/support/convert_bin_file_to_base64	Upload a .bin hardware config file; receive its base64 representation.	Optional



| 6 | V1 API Endpoint Reference

The full API interface also contains V1 Endpoints. However, this set of endpoints are only available for existing client implementations and have been deprecated in the current version.

| 7 | Error Handling

All successful responses return HTTP status code 200. Error responses return a 4xx or 5xx code with a JSON body containing an `error_message` field: `{ "error_message": "<description>" }`.

HTTP Code	Status	Meaning	Common Cause
200	OK	Request succeeded. Response body contains result data.	—
401	Unauthorized	License not found or HTTP Basic auth credentials missing or incorrect.	Missing license; incorrect auth header
404	Not Found	Requested ID or resource does not exist, or NIS-E instance is not connected.	Invalid job_run ID; NIS-E not running
409	Conflict	A blocking operation is already running. Only one may run at a time.	Submitting a job while another is active
422	Unprocessable Entity	Input/output data failed validation. Check parameter types, required fields, and formatting.	Malformed body; invalid plate type
423	Locked	File read or write operation failed. Output file may already exist.	File conflict; disk permission issue
424	Failed Dependency	Low-level NIS-Elements API call returned an error.	Hardware failure; NIS-E internal error
500	Internal Server Error	Undefined API service error. Contact Nikon support if persistent.	Unexpected API state

Error Handling Best Practice

Always check status code before reading the response body.

On 409 responses, poll GET `/nis/v2/job_run` to confirm the running job has completed before retrying.

On 423 responses, check whether the output file already exists and either delete it or use a unique output path.

Log the full `error_message` field for all 4xx/5xx responses to aid in debugging.



| 8 | Additional Resources

The following NIS.API content is available to better help understand how the API works with NIS-Elements as well as provide developers additional resources to aid in the integration of the API into their own software solutions:



NIS.API General information

Access general information about Nikon's NIS.API, including features, capabilities, and usage context on [Nikon's healthcare website](#).



NIS.API Client Demo Application

Demonstrates how a third-party automation scheduling software interacts with NIS-Elements using the NIS.API. This demo tool can be downloaded from [Nikon's healthcare website](#).



NIS.API Sample Test Application Package

Designed for developers beginning NIS.API integration. Includes a sample program covering all individual endpoints and common workflows, Python source code, and complete documentation. To obtain this package, contact your local Nikon Sales representative.