AIMsight Optical Monitoring Station Manual

Installation and operation through the local web interface

September 2026 AIMsight Team Revision 1.5

ABSTRACT

This document describes the operation of the AIMsight video-based monitoring station. It covers installation, configuration, standalone operation with the optional local software licence, secure remote access to the station interface, and use with the optional AIMsight Cloud service.

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Demo Kit Contents

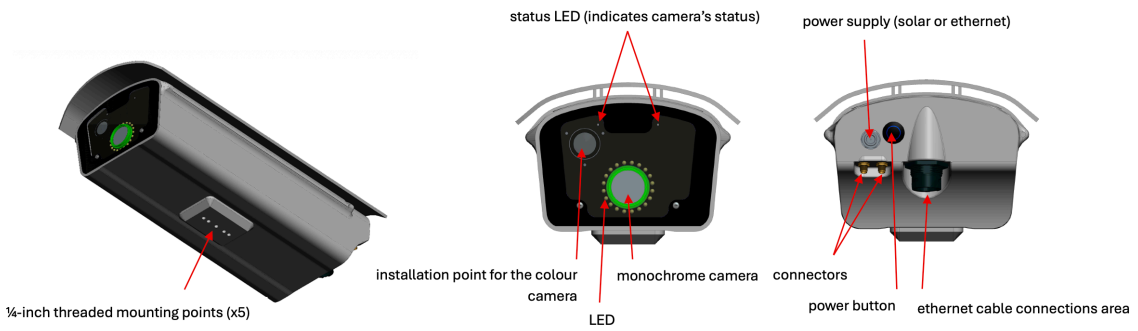




1. Monitoring Station
2. Monitoring prisms (for long-distance measurements, typically from 20 m to more than 100 m)
3. Adhesive reflectors (for measurements in the 1 m to 20 m range)
4. Power supply

Monitoring Station

The AIMsight monitoring station is housed in a rugged enclosure designed for field deployment and flexible mounting. The bottom of the enclosure includes five 1/4 in tapped mounting holes, compatible with standard camera-support equipment. On the front face, the station features two status LEDs, the main near-infrared camera, the installation location for the optional color camera, and the IR LED illumination system. On the rear face, the enclosure provides the power-supply barrel connector for mains or solar operation, the antenna connectors, and the Ethernet RJ45 connector with a lockable IP67 connector system. For optimal protection, either screw the protective cap in place or use compatible lockable cables. The rear panel also includes the power button, with a blue LED indicating that the system is powered on.



From left to right: bottom view showing the mounting interface, front view showing the optical window and status indicators, and rear view showing the power, antenna, and Ethernet connections.

Camera Operation

Turn the camera on by pressing the power button on the back of the camera. Once the system is running, the power button lights up blue.

Access Modes

The AIMsight station provides three complementary access modes:

- **Local access to the station:** when the station includes a standalone local software licence, a computer connected directly to the station by Ethernet, or connected to the same local network, can access the web interface hosted on the station. This mode does not require an Internet connection or an AIMsight Cloud subscription. Acquisition, image processing, and local data storage remain fully autonomous.

  To connect directly, use the supplied Ethernet cable and open the station interface in a web browser. The system has been tested with Mozilla Firefox, Microsoft Edge, and Google Chrome. By default, the station uses the static IP address `192.168.1.2`. Enter this address in the browser address bar. If the station cannot be reached, refer to the **Network Settings** section (see page 21).
- **Remote access to the station interface:** when the station has an Internet connection and the remote-access service is enabled, AIMsight can provide secure remote access to the station's local web interface. The user sees the same interface and functions as when connected locally and can, for example, check the station status, adjust its configuration, or review data stored on the station.

  The station establishes an encrypted connection to a secure gateway managed by AIMsight. This normally avoids the need for a public IP address or for incoming ports to be opened on the customer's network. Because this remains a direct connection to the station, the station must be powered on and connected to the Internet. This service does not by itself create a Cloud archive: the information being viewed remains stored on the station.
- **AIMsight Cloud:** when this optional service is enabled, the station transfers its measurements and, depending on the configuration, associated images and quality metrics to the AIMsight platform. Authorized users can then access the project data through a web browser without connecting directly to the station.

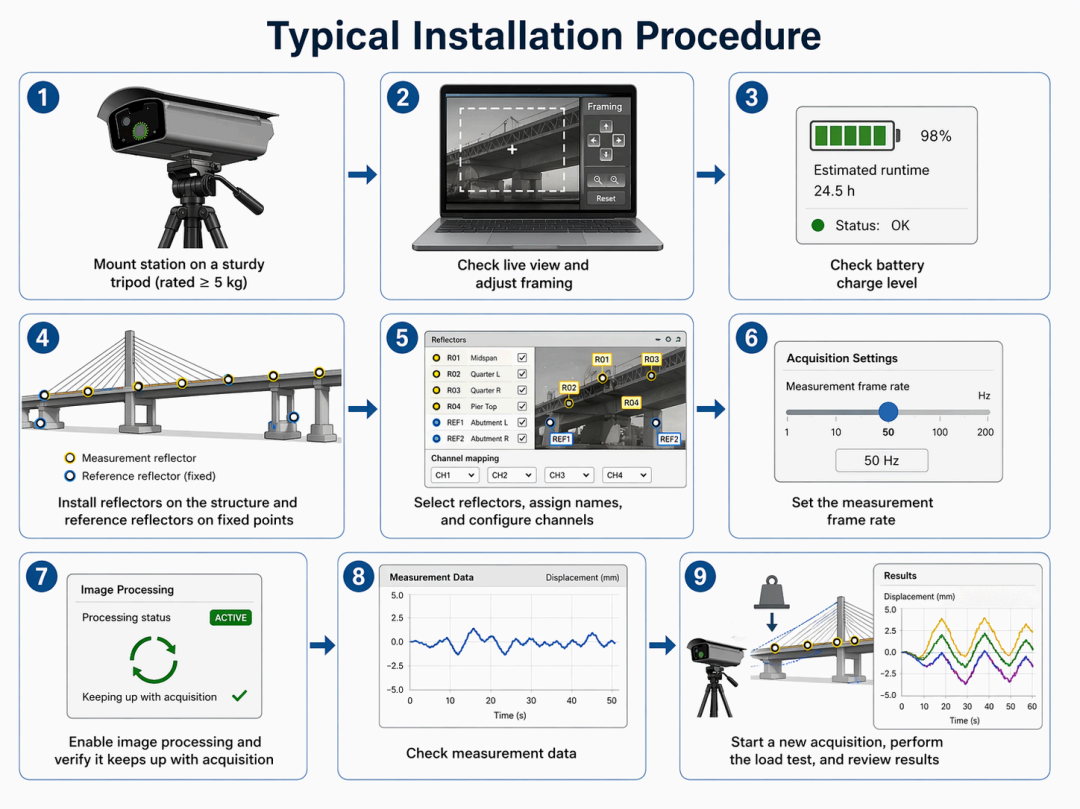
  AIMsight Cloud can centralize and archive measurements, provide access to their history and associated images, display target-recognition quality metrics, and provide alarm, visualization, and post-processing tools. Data that have already been transferred remain accessible if the station is temporarily offline. AIMsight Cloud is typically provided as a subscription service.

NOTE
Standalone operation requires a local software licence. The station can also be supplied without this licence; in that configuration, its operation depends on an active AIMsight Cloud subscription. The applicable licensing model and the functions available without a Cloud connection are specified in the project quotation or agreement.

Typical Installation Procedure

- Mount the camera on a sturdy tripod rated for at least 5 kg.
- Check the live view and adjust the framing (**Live View Page**, see page 6).
- Check the battery charge level (**Camera Management Panel**, see page 10).
- Install the reflectors on the structure and place reference reflectors on points considered fixed.
- Select the reflectors in the image, assign names to them, and configure the channel parameters (**Pattern Creation Page**, see page 7).
- Set the measurement frame rate (**Camera Management Panel**, see page 10).

- Enable image processing and verify that it keeps up with image acquisition (**Camera Management Panel**, see page 10).
- Check the measurement data (**Data Exploration Page**, see page 12).
- Start a new acquisition, perform the load test, and review the results (**Data Exploration Page**, see page 12).



Charging

CAUTION

The system tolerates a maximum input voltage of **26 V** on both the power-supply connector and the optional passive PoE input. **Never connect a standard IEEE PoE source** (802.3af, 802.3at or 802.3bt), as the standard PoE voltages of 48 V and above may damage the charge controller.

CAUTION

The centre pin of the barrel connector is positive. If you are not using an AIMsight-supplied power solution, always verify the connector polarity before connection, especially when using third-party adapters such solar panels with MC4 connectors or adapters.

For mains-powered operation, connect the supplied power supply to an electrical outlet, then connect it to the camera. This operating mode is recommended for charging the battery between mobile deployments or when power is available at the monitoring site. In this configuration, the battery remains connected and acts as an internal backup power source (UPS) in case of a temporary power interruption.

For autonomous field operation, the camera can be connected to a solar panel. We recommend using a standard **12 V solar panel**; in most cases, a generic 100 W panel provides sufficient charging capacity. Install the panel in a location with good sun exposure and orient it appropriately for the site conditions.

The battery charges automatically whenever a suitable external power source is connected. Charging performance depends on the available input power, battery state of charge, and

ambient conditions. For reliable operation, ensure that the external power source remains within the specified voltage range and is capable of supplying adequate current.

NOTE
After a deep discharge (battery voltage below 12 V), the camera may not restart immediately. To prevent repeated restart attempts caused by an insufficient charge level, the system remains off until the battery voltage reaches approximately 12.6 V before powering up again. While charging, verify that the charge-status LED is red. Once the battery has recovered to the required voltage, the system will start automatically, provided that it is switched on.

4G Connectivity Setup

Quick Start — Cellular Monitoring Installation

Use this checklist to bring a monitoring station online through the cellular network:

1. With the system powered off, install an activated **3FF / Micro SIM** card with a suitable mobile-data plan.
2. Connect the supplied cellular antenna using the supplied SMA cable(s).
3. Connect the power supply.
4. Turn the system on and wait for it to boot.
5. Connect locally to the web interface, normally at `192.168.1.2`, using the supplied Ethernet cable.
6. Open **Settings / Network Settings**.
7. Enter the APN provided by the SIM-card operator in the **Cellular Network** section.
8. Click **Apply Network Settings**.
9. Wait for the modem to register on the network. The **Link** status in the **Cellular Network** section should change to **Up**.

When the link status is **Up**, the station is connected through the cellular network and can be reached remotely according to the SIM subscription, network routing, and monitoring-platform configuration.

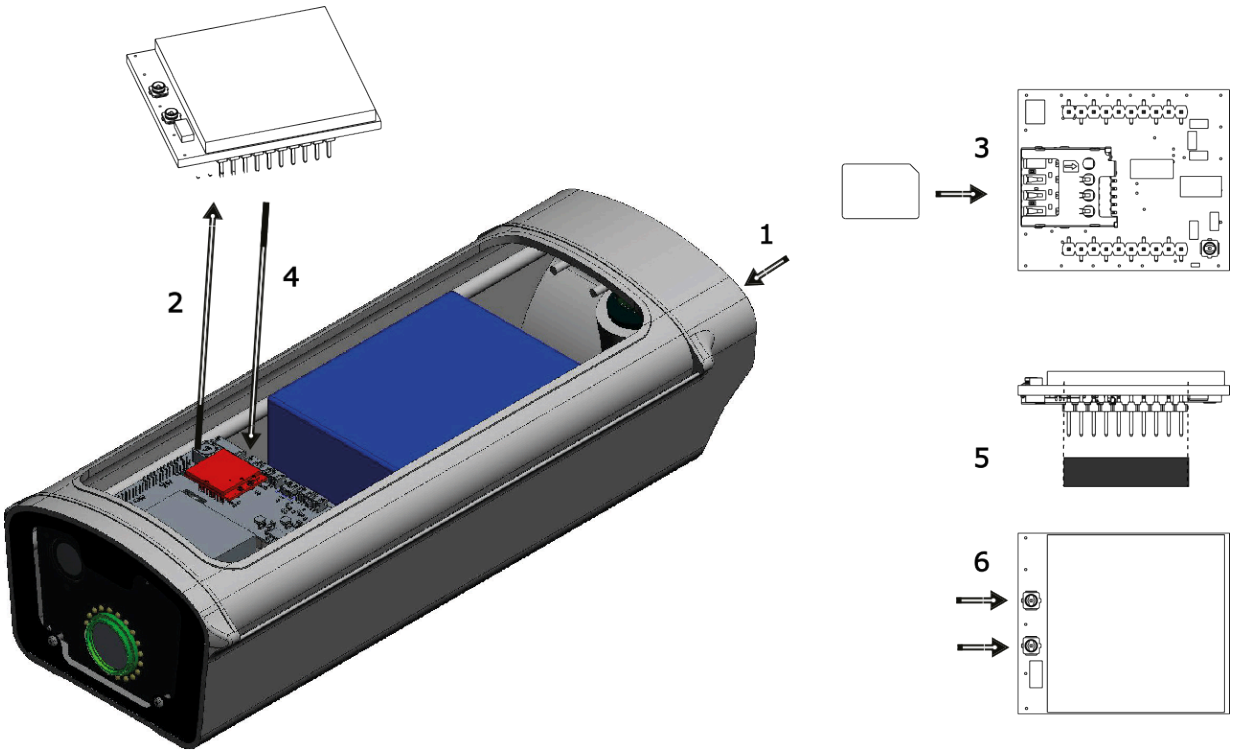
The cellular module uses a **3FF / Micro SIM** card. The SIM card must be activated and configured with a mobile data plan suitable for the intended use. A static IP address is not required.

CAUTION
Make sure that the SIM card data allowance is high enough for the planned operation. If raw, full-quality images or videos are transmitted over the 4G connection, the data volume can quickly become very large.

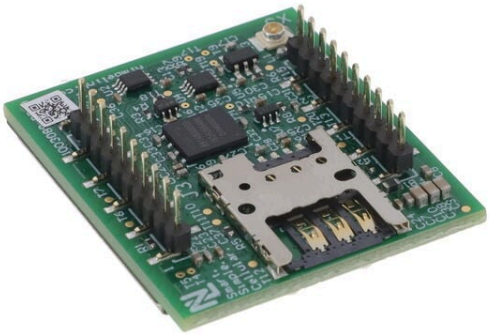
1. Power **OFF** the system and wait until the modem is completely off.
2. Carefully access and lift the modem module. If a SIM card is already installed, remove it from the SIM card slot.
3. Insert the Micro SIM card into the SIM card slot in the correct orientation. Make sure the SIM card is fully seated.
4. Reinstall the modem module onto the AIMsight board. **Before powering the product back on, carefully check that the modem pins are correctly aligned with the AIMsight board connection pins. Do not power on the product if the modem is offset, tilted, only partially inserted, or misaligned. Incorrect alignment may prevent normal operation and may damage the modem or the AIMsight board.**
5. Check that the internal antenna connectors are installed and connected correctly.
6. Connect the supplied cellular antenna to the station using the supplied SMA cable(s).
7. Mount the cellular antenna in a clear location with good sky exposure whenever possible, away from metallic structures, metal surfaces, metal enclosures, other obstructions, other transmitting antennas, and radio equipment, to reduce signal degradation and improve reception.

8. Ensure that the antenna is installed for operation at least **20 cm** away from the operator and other persons during normal use.
9. Power the system on again and wait for the modem to start.
10. Go to the **System / Network Configuration** page, set the correct **APN** for your SIM card/ operator, and check the cellular connection status in **System Settings** (see page 18).

After entering or changing the APN, click **Apply Network Settings**. Allow time for network registration, then verify that the **Link** status under **Cellular Network** changes to **Up**.



SIM card installation or replacement procedure: 1. power the system off; 2. access and lift the modem module to reach the SIM card slot underneath; 3. insert the SIM card in the correct orientation; 4., 5. reinstall the modem module, ensuring that the modem pins are correctly aligned with the AIMsight board connection pins; 6. check that the antenna connections are properly installed.





CAUTION
Use only the supplied or approved antenna and cable assembly. Changes to the antenna, cable, connector, or mounting arrangement may reduce performance and can affect regulatory compliance.

CAUTION
Do not install or operate the cellular antenna close to the body. The antenna is intended for fixed or mobile installation only and must be used with a minimum separation distance of **20 cm** from any person during normal operation.

Navigation Bar

The navigation bar at the top of the screen allows you to navigate between pages and panels and to control image acquisition and processing.

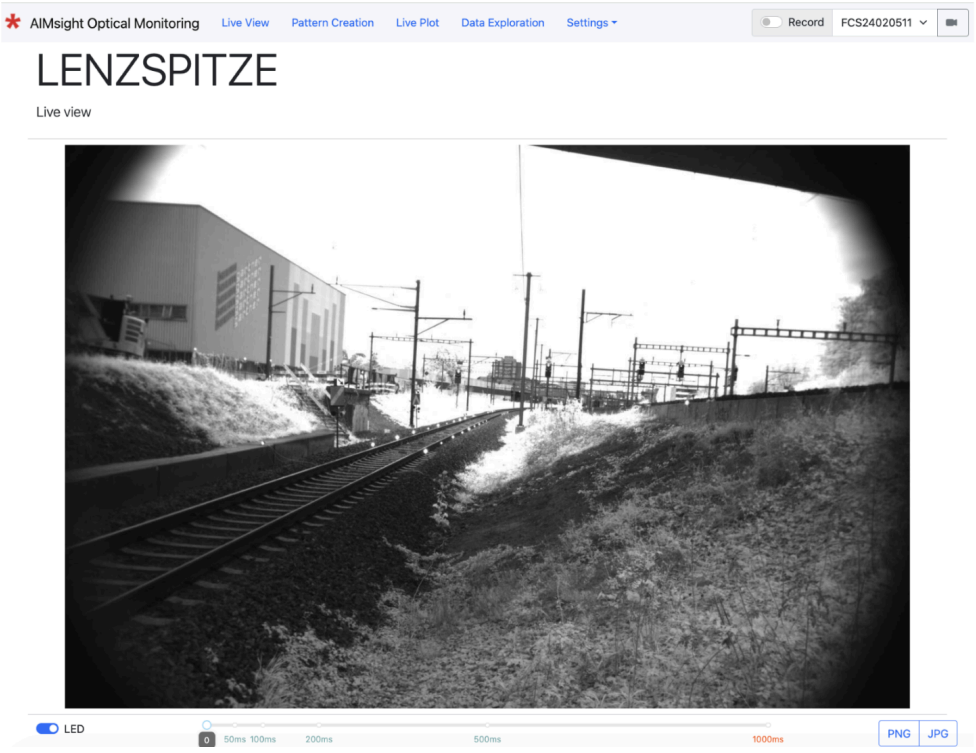
- Clicking **“Live View”** or the AIMsight Optical Monitoring logo opens the **Live View** page.
- The **“Pattern Creation”** page allows you to define measurement channels by selecting areas in the image. See **Pattern Creation Page** (page page 7).
- The **“Live Plot”** toggle enables or disables live image processing.
- **“Data Exploration”** allows you to access, view, and download all measurements stored in the local measurement database (see page 12).
- Clicking the camera icon displays the **Camera Management** panel (see page 10).
- The current camera ID is displayed in the drop-down menu.

Live View Page

Use the **Live View** page to adjust the camera framing.

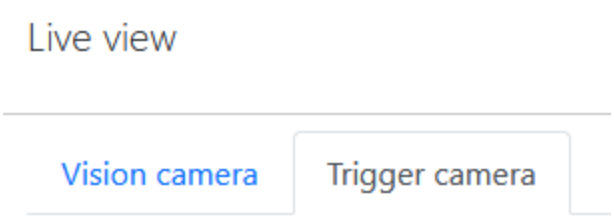
- **LED toggle:** turns the IR LED light on and off. If the LED option is disabled, the reflective strips will not be illuminated and will therefore be harder to identify.
- **Exposure time slider:** sets the exposure time manually, or move it fully left to enable **“auto-exposure”** mode.
- **PNG** / **JPG** buttons: download the current camera image in full resolution.

Auto-exposure is useful for checking the framing, but the images used for displacement monitoring should generally be darker. See the marker-configuration guidance below.



Live View page

On this page you can also view the color image captured by the camera by selecting **Trigger camera** on the right-hand side of the **Vision camera** section.



Live View page

Pattern Creation Page

This page allows you to configure image acquisition parameters and image processing, including the definition of the markers tracked by the camera.

The **Preset** bar at the top of the page allows several target configurations, each with its own acquisition settings and processing zones, to be stored in addition to the main or default configuration.

Defining a target establishes the **reference pattern** that the system searches for in each subsequent image to calculate target motion. In the local web interface, the reference pattern is extracted from the image currently displayed when **Save Configuration** is clicked. That image defines the zero position from which all subsequent relative or differential displacements are calculated. The corresponding date and time are recorded as the **Reference date** in the measurement-channel definition.

Before saving, verify that the displayed image is representative, that all targets are clearly visible, and that no temporary object obscures a tracking zone. Saving the configuration again extracts new reference patterns from the currently displayed image and therefore redefines the displacement zero.

Exposure and Image Preparation

- **Exposure:** Aim for high contrast in the marker or reflector regions. Ideally, the reflector images should be bright, with brightness values above about 200 when hovering over them, and surrounded by a dark background. This is usually achieved with short exposure times, typically in the 0.1 ms to 10 ms range. When in doubt, use a shorter exposure time.
- **Plot brightness slider:** adjusts only the display brightness of the image plot to help you assess exposure. It does not change the actual camera exposure time.
- **Recapture:** clicking **“Recapture”** triggers a new image acquisition using the latest settings and updates the displayed image-processing zones and their names.
- **Image Type:** for dynamic acquisitions using reflective targets as position markers, select **“Single with infrared light”**. The other options are mainly intended to optimize image acquisition in quasi-static monitoring scenarios. The differential image shows a contrast-enhanced view of the reflectors in the scene and is used by the displacement-measurement algorithms by default.

“Single with infrared light” captures one infrared-illuminated image per measurement and is best suited to dynamic measurements. **“Differential”** combines several images to increase target contrast and improve quasi-static tracking. In difficult lighting conditions or with targets that are not sufficiently reflective, use **Differential** mode with a higher **Stacking** value, typically between `20` and `40`. Higher stacking improves detection range but reduces the effective measurement rate.

Marker Configuration Process

Select the **Draw rectangle** tool in the graph toolbar, then click and drag in the image to draw a tracking zone around the target or reflector. The selected area should fully encompass the marker and include a margin larger than the expected range of motion. Each rectangle creates a corresponding measurement-channel row in the configuration table below the image.

If another graph-interaction mode is active, such as **Zoom** or **Pan**, select **Draw rectangle** again before creating a new target. Existing zones can be selected by clicking precisely on their colored border, then moved or resized.

Larger image-processing areas allow tracking over greater motion ranges, but they also slow down image processing.

Image Display and Reflector Identification

Depending on the selected image type and the installed software version, the target-configuration graph may display the current monochrome image together with a contrast-enhanced representation of reflective areas. This overlay helps identify and position tracking zones around reflective tape, stickers, or prisms. It is a visual aid only: changing the overlay does not change the geometry of the tracking zone or the reference pattern that is saved.

Contrast-enhanced Overlay Adjustment

A brightness-range slider below the image controls which pixels of the contrast-enhanced layer remain visible:

- moving the slider to the left retains more pixels and can reveal relatively weak reflectors;
- moving it to the right progressively retains only the brightest pixels, helping isolate the strongest reflectors. At the extreme setting, only a very small fraction of the brightest pixels may remain visible.

Adjustment may be necessary because apparent reflector brightness depends on target type, orientation, distance, and lighting conditions. The setting affects display only and has no effect on target definition or processing.

Working with Conventional Image Features

When reflectors are unavailable or difficult to install, sufficiently contrasted and stable visual features may also be tracked. If the installed software provides the **Work on IRON images** option, enable it to work with conventional images rather than the contrast-enhanced reflector representation. Verify that the selected texture remains visible and stable under all expected measurement conditions.

Once a zone has been drawn, a new row appears in the **“Marker Configuration”** table.

Define the marker parameters in the **“Marker Configuration”** table:

- **Name:** name of the position marker, that is, the name of the measurement channel
- **Type:** assigns the marker to a group or type. Reference targets are considered fixed points, while markers in **“Target Group(s)”** are tracked. Proper selection of reference targets is essential because they are used to compensate for camera motion.
- **Global reference:** a point considered fixed in the monitored scene. Global-reference points are used to estimate and compensate for movement of the monitoring station itself.
- **Local reference:** identifies a measurement point as belonging to the local-reference group. This designation is used for classification and display purposes only. Unlike a **Global reference**, a local reference is not treated as a fixed point and is not used to compensate for movements of the monitoring station. No additional processing is applied; local references are handled in the same way as other measurement-point groups.
- **Error Threshold (optional):** threshold above which a measurement is considered invalid. This is used to detect obstructions, for example when a marker is hidden by a vehicle or vegetation. By default, the error threshold is `0.7`.
- **Pattern Size:** adjusts the size of the image-processing area around the marker
- **Resolution (optional):** processing resolution, expressed as a fraction of a pixel. The default value is `100`, corresponding to one hundredth of a pixel. Lower values reduce processing time.
- **Distance:** straight-line distance in millimeters between the front of the camera and the marker. This is used to calculate the correct pixel-to-distance conversion factor.

An error in the entered distance produces a proportional scale error. For example, a coarse distance error of `1%`—such as entering `99 m` or `101 m` instead of `100 m`—produces an error of approximately `0.1 mm` on a measured displacement of `10 mm`.

- **Reference date:** records the time at which the reference pattern defining the zero position was set

To adjust the position of the marker area, first select it by clicking its border. You can then drag its corners to reshape it or drag inside the area to move it. It is generally best to keep the marker centered within the target region.

The **“Recapture”** button allows you to take a new image and verify that the marker zones are correctly defined.

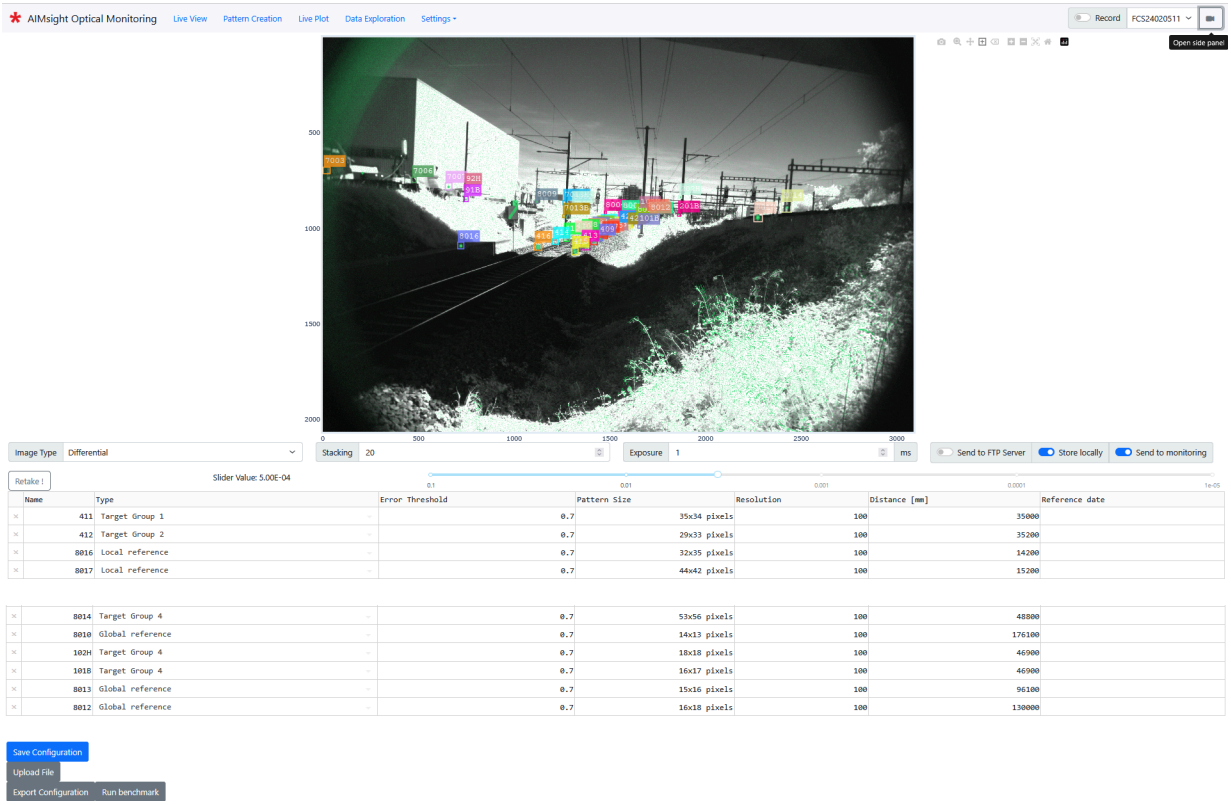
Once the settings have been established, save the pattern configuration by clicking **“Save Configuration”**. The reference patterns are then extracted from the image currently displayed. This image becomes the zero for each channel, and subsequent displacements are calculated relative to the positions saved at that moment. To redefine the zero, display or recapture an appropriate new image, verify all zones and parameters, and save the configuration again.

The **“Store Locally”** toggle must be enabled if the system is to keep measurements in onboard memory.

If the system has internet access through either Ethernet or the onboard 4G module, it can also be configured to forward measurements to the AIMsight database by enabling **“Send to Server”**.

The **“Send to Monitoring”** option must be enabled to transmit measurements in real time to the monitoring platform. When activated, the system continuously sends data to the remote supervision interface, allowing live tracking and analysis.

The **“Send to FTP Server”** option must be enabled to upload the measurements automatically to an external FTP server. This allows the data to be archived and accessed later for analysis or backup purposes.



Target Configuration

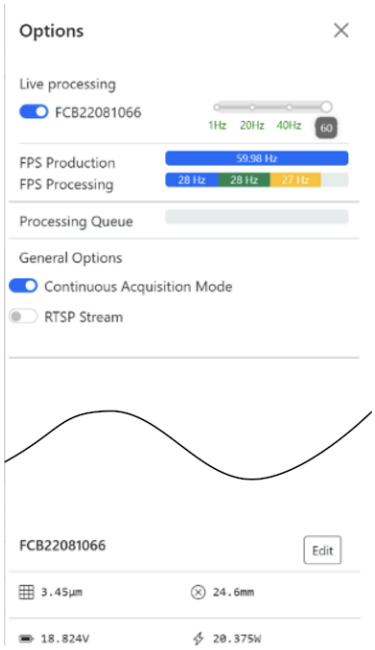
Camera Management Panel

You can display the **“Camera Management”** side panel from any page by clicking the camera icon in the top-right corner of the interface.

The camera button and the top navigation bar change color to indicate the acquisition status:

- grey when idle
- green during an acquisition

Live View images are not considered an acquisition.



1. **Live processing toggle:** enables image acquisition at the specified frame rate and the processing of the raw images into displacement measurements
2. **Framerate slider:** sets the camera acquisition frame rate
3. **FPS Production:** displays the current image-acquisition rate
4. **FPS Processing:** displays the processing rate in each thread. For continuous monitoring, verify that processing is fast enough to keep up with image capture.
5. **Processing Queue:** displays the number of image blocks waiting to be processed. For continuous monitoring, the frame rate should be kept low enough for the queue to remain close to empty.
6. **Continuous acquisition mode:** can be enabled for maximum frame-rate stability, at the expense of battery life
7. **RTSP Stream:** streams the live video feed on port 8554

> **NOTE**
> For short burst-mode measurements, the system can capture data at a much higher frame rate than the real-time processing rate. In such cases, the maximum measurement duration without data loss is limited by the queue size and is typically on the order of 60 seconds. The actual duration should always be verified with the final settings.

Navigation Within the Plots

The same graph-interaction interface is used for time-series plots and for the pattern-configuration graph, where the displayed image—optionally a composite image—is overlaid with the defined processing zones. A navigation toolbar appears when you hover over a graph.



From left to right, the available tools generally allow you to:

- download the current plot;
- zoom to a region by clicking and dragging;
- pan across the graph;
- draw a rectangle to create a new marker;
- delete a selected marker;
- zoom in or out;
- autoscale the view;
- return to the initial view using the **Home** icon.

Trace Selection and Visibility

When several measurement channels are displayed, use the legend on the right side of the graph to control their visibility:

- single-click a legend entry to show or hide that trace;
- double-click a legend entry to isolate that trace and hide the others.

Exporting Graphs

Click the download or disk icon on the left side of the toolbar to save the current graph as a PNG image.

Zooming and Scaling

- In **Zoom** mode, represented by the magnifying-glass icon, click and drag to enlarge a region.
- Double-click inside the graph to reset the view and autoscale both axes.
- To zoom one axis only, click and drag near that axis.
- To act on both axes simultaneously, begin the drag near the point where the axes meet.

Panning and Resetting

- In **Pan** mode, represented by the arrows icon, click and drag to move the view.
- Double-click inside the graph to reset the pan.
- To pan along one axis only, click and drag from the central part of that axis.
- Double-click an individual axis to autoscale that axis only.

Interaction During Target Creation

To create a processing zone, select **Draw rectangle** and draw a rectangle around the target. **Zoom** is useful for inspecting the image but must not be confused with the zone-drawing tool. After creation, click the colored border of a zone to select, move, or resize it.

Live Plot

The **Live Plot** tab allows you to view data acquisition in real time by clicking the record button in the upper-right corner.

The following graph types are available:

- **Relative Horizontal:** relative horizontal displacement of the marker, converted into millimeters
- **Relative Vertical:** relative vertical displacement of the marker, converted into millimeters
- **Raw Horizontal:** raw horizontal position of the target in the image, in pixels
- **Raw Vertical:** raw vertical position of the target in the image, in pixels
- **Error value:** error metric comparing the current image of the target to the reference image in order to detect obstructions

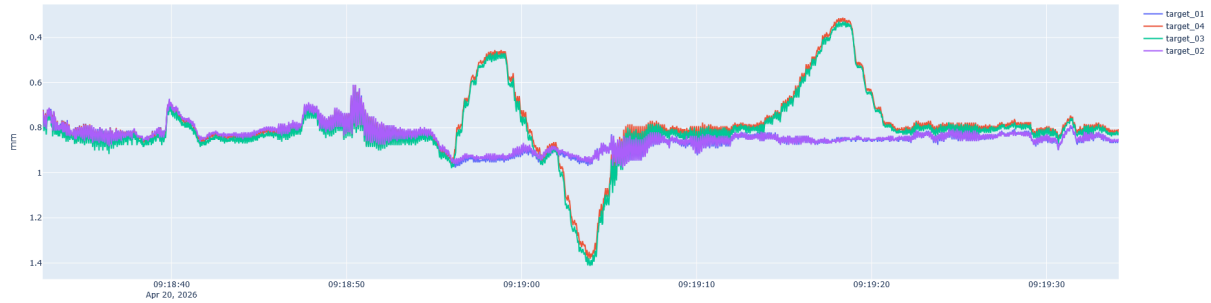
The **“Time Range”** setting determines the time window queried and displayed in the chart. Although it can be changed during an acquisition, it is generally better to set it at the beginning.

In the upper-left corner, the plot-options menu gives access to three groups of settings:

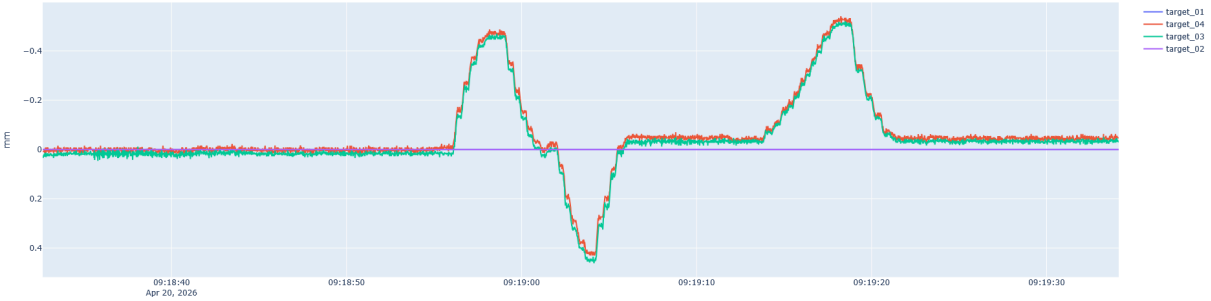
- plot updates
- plot scale

- obstruction handling

These options allow you to override the error threshold and use features such as **auto period**, **lock y**, and **highlight + filter/hide** to visualize or suppress high-error periods.



Example of a real-time acquisition showing target signals together with station motion



Example of the same acquisition after compensation for station motion

These figures show a live acquisition. The first plot includes both target signals and camera motion, which can distort the actual measurements. The second plot displays only the corrected target movements, with camera motion removed. This option can be configured in **Data Exploration** (see page 12)

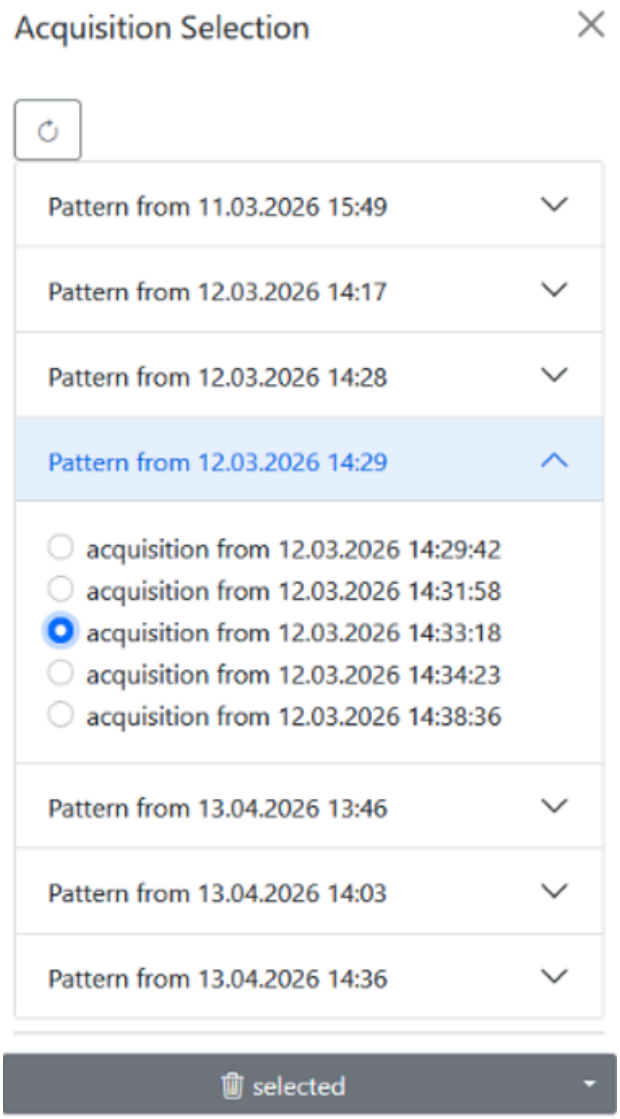
Data Exploration Page

This page is used to display and review stored measurements. The table lists the measurement databases available in the camera's local storage.

In addition to the principal displacement signals, **Data Exploration** provides access to diagnostic metrics describing target visibility, image quality, registration quality, and camera movement. Together with the corresponding camera images, these signals provide powerful tools for understanding abnormal measurements and assessing measurement reliability.

Select Acquisition: choose the acquisition you want to review. Each acquisition is organized chronologically, from oldest to most recent, based on the recording date and time.

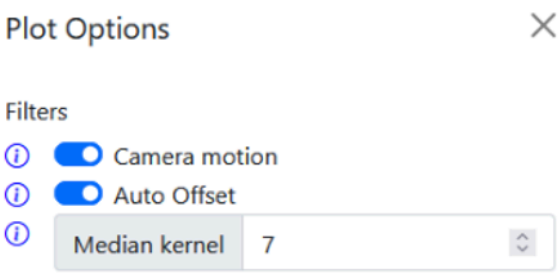
To retrieve acquisitions from a specific day and around the same period, expand the drop-down menu. The collapsible panel displays all acquisitions performed during that session and provides access to the full list of recordings for more precise selection and review.

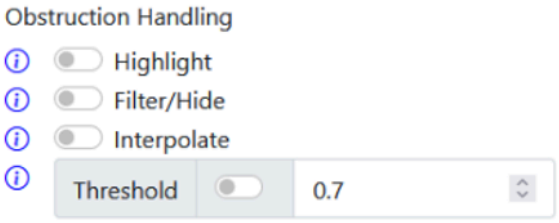


Example of selecting an acquisition

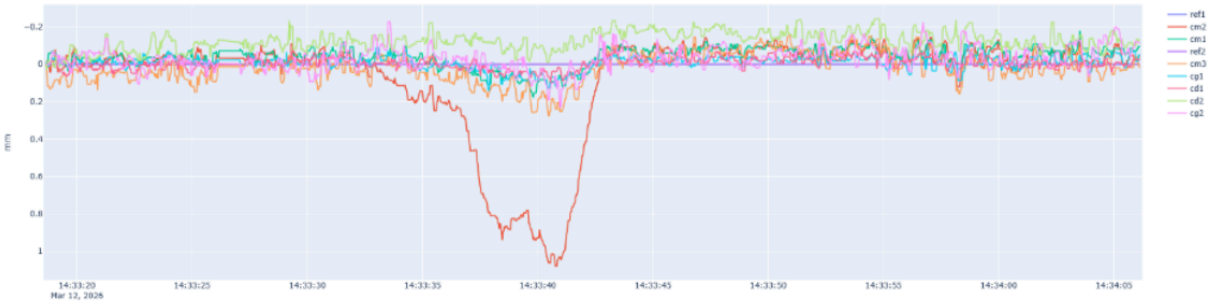
The **plot options** section has two categories:

- **Filters:** remove camera motion from the measurement, remove the offset from the data points, or apply a rolling median
- **Obstruction handling:** highlight areas where the error value is too high, hide data points whose error value exceeds the threshold, replace hidden data points with interpolated values, and override the error threshold with a user-defined value





Selected Plot Options



Measurement results for the acquisition dated 12.03.2026

The **“Update !”** button queries the selected database and displays the latest data. This can be automated by enabling the **“Auto Update”** switch.

When **“Auto Update”** is enabled, the latest measurement data is queried and plotted periodically. The refresh period is defined by the **“Interval”** setting, in seconds.

The **“Time Range”** setting determines the time window queried and displayed in the chart.

Available Signals and Diagnostic Metrics

The **Data Exploration** page provides access to the measured displacements together with the complete set of diagnostic signals that can be computed by the station. These signals describe image quality, target visibility, registration reliability, and estimated camera movement.

The information button next to the signal selector provides a short description of each available signal.

The advanced metrics can also be exported by scheduled acquisitions when the **HDF5** format is selected. Other export formats are intentionally simplified and contain either displacement results only or a reduced set of quality metrics.

The following sections provide additional guidance on the practical interpretation of each signal.

> **NOTE**
> The diagnostic metrics are most useful when interpreted as trends and in combination with the corresponding camera images. A change in one metric does not necessarily indicate a measurement failure, but several concurrent changes can help identify the likely cause of an abnormal measurement.

When the optional AIMsight Cloud service and image archiving are enabled, the image corresponding to a selected point or period in the measurement history can be opened directly from the visualization interface. This makes it possible to compare displacement signals, quality metrics, and the actual visual conditions at the time of the measurement.

Position

Relative Horizontal / Vertical [mm]

“Relative Horizontal” and **“Relative Vertical”** represent the horizontal and vertical displacement of the tracked target relative to its reference position, expressed in millimetres.

When camera-motion correction is enabled, the estimated global movement of the camera is removed from these values.

Practical use: These are the principal displacement values used for structural monitoring and interpretation. They represent target movement after applying the configured image calibration and, when enabled, camera-motion compensation.

Raw Horizontal / Vertical [px]

“Raw Horizontal” and **“Raw Vertical”** represent the horizontal and vertical position of the tracked target in the image, expressed in pixels.

These values are provided before conversion to millimetres and before camera-motion correction.

Practical use: Raw position is mainly useful for diagnostics. It allows the underlying image-based measurement to be inspected independently of the distance calibration and camera-motion correction.

Comparing raw and corrected values can help determine whether an observed variation originates from the tracked target, from movement of the camera, or from the applied geometric conversion.

Target Image Quality and Pattern-Matching Metrics

These metrics are calculated independently for each processed target image. They describe how clearly the target is visible, how stable its image appearance remains, and how reliably the current target image can be matched with its reference pattern.

They are primarily diagnostic indicators intended to explain changes in measurement quality and help identify their likely cause. Most metrics should be interpreted as trends over time and in combination with the corresponding image and other available indicators, rather than as standalone pass/fail criteria.

The **Error Value** is a specific exception: when an **Error Threshold** is configured, it is also used to identify and reject measurements for which pattern matching is considered unreliable.

Error Value

The **“Error Value”** measures how well the current image of the tracked target matches its reference image after compensating for the measured displacement.

Values close to `0` indicate good agreement with the reference. Increasing values indicate that the current target image differs increasingly from the image used as its reference.

Practical use: This is the main general-purpose registration-quality indicator. An increase can be caused by:

- partial or complete obstruction of the target;
- poor target visibility;
- blur or atmospheric disturbance;
- changes in illumination or target appearance;
- loss of the target; or
- incorrect image registration.

Because several different phenomena can increase the **Error Value**, the other image-quality statistics are useful for identifying the likely cause.

The obstruction filters use this indicator to reject measurements exceeding the configured **“Error Threshold”**.

Sharpness

“Sharpness” indicates how concentrated the target image is. A well-focused, compact target generally produces a higher value, while a more diffuse target produces a lower value.

Practical use: A decreasing **Sharpness** trend can indicate deterioration of image quality caused by:

- defocus;
- atmospheric turbulence or heat shimmer;
- vibration; or
- changes in the appearance of the target.

Sharpness is most useful as a relative indicator over time for a given target. It should not be interpreted as an absolute optical measurement or used for direct comparison between different camera, lens, exposure, or target configurations.

FWHM [px]

“FWHM” provides an estimate of the apparent width of the target image, expressed in pixels.

A compact, well-focused reflector generally has a smaller apparent width. A blurred or spread target produces a larger value.

Practical use: An increasing **FWHM** trend can indicate:

- progressive defocus;
- atmospheric turbulence;
- motion blur;
- vibration; or
- another form of optical degradation.

FWHM complements **Sharpness** by providing a more intuitive measure of image spreading in pixel units. It is particularly useful for following gradual changes in focus or atmospheric image quality.

Because the width is estimated within the target processing region, it should primarily be interpreted as a trend rather than as an exact physical measurement of the optical point-spread function.

Dominance

“Dominance” indicates whether the tracked reflector remains clearly brighter than the other bright features present in its processing region.

Values close to `0` indicate that the tracked target is clearly dominant. Values approaching `1` indicate that another bright feature is becoming comparable with the tracked target.

Practical use: A rising **Dominance** value can indicate:

- another reflector entering the tracking region;
- a reflection or another bright feature becoming significant;
- the tracked target becoming weaker relative to an existing secondary feature; or
- an increased risk of the registration algorithm selecting the wrong image feature.

Dominance should therefore be interpreted as an indication of potential competition between image features rather than simply as the brightness of a second object.

It is particularly useful when interpreted together with the **Error Value** and **SNR**. A high Dominance value accompanied by increasing registration error or decreasing SNR indicates increasingly difficult tracking conditions.

Peak Intensity

“Peak Intensity” is the maximum pixel value measured in the target image.

Practical use: It provides a simple indication of major changes in illumination or target response.

A decreasing value can indicate:

- insufficient illumination;
- partial obstruction;
- contamination or reduced reflector response; or
- a missed or weakened illumination flash.

Very high values, particularly when they repeatedly reach the maximum available image intensity, can indicate clipping or saturation.

Because Peak Intensity depends on a single pixel, it is sensitive to local variations and should preferably be interpreted together with **Flux** and **SNR**.

Flux

"Flux" represents the total target signal measured within the target region after compensating for the estimated image background.

Unlike **Peak Intensity**, Flux uses information from multiple pixels and is therefore less sensitive to variations affecting only the brightest pixel.

Practical use: Flux is useful for following gradual changes in the amount of light received from the target.

A decreasing trend can be caused by:

- weaker illumination;
- contamination of the reflector or optical path;
- gradual reflector degradation;
- partial obstruction;
- target misalignment; or
- reduced target visibility.

Flux can therefore reveal progressive changes before they become severe enough to cause registration failure.

It should nevertheless be interpreted as a target-signal indicator rather than as a direct measurement of reflector reflectivity, since illumination and acquisition conditions also influence it.

SNR

"SNR" compares the target peak above the local background with the variations measured in that background.

A high value indicates that the target is clearly distinguishable from its surroundings. A decreasing value means that the target is becoming less distinct relative to background variations.

Practical use: A low or decreasing SNR can indicate:

- insufficient target illumination;
- increased image or background noise;
- adverse visibility conditions;
- obstruction;
- reduced target response; or
- interfering image structures around the target.

SNR complements **Peak Intensity** because it accounts for the actual background conditions. A target can retain relatively high absolute brightness while becoming more difficult to distinguish if the surrounding image becomes brighter or more variable.

Camera

Camera Movement

"Camera Movement" represents the estimated global movement of the camera obtained from the reference targets.

The reference network is used to identify movement common to the observed scene, such as apparent translation, rotation, or scale change caused by movement of the camera or its support.

When camera-motion correction is enabled, this common movement is removed from the reported relative target displacements.

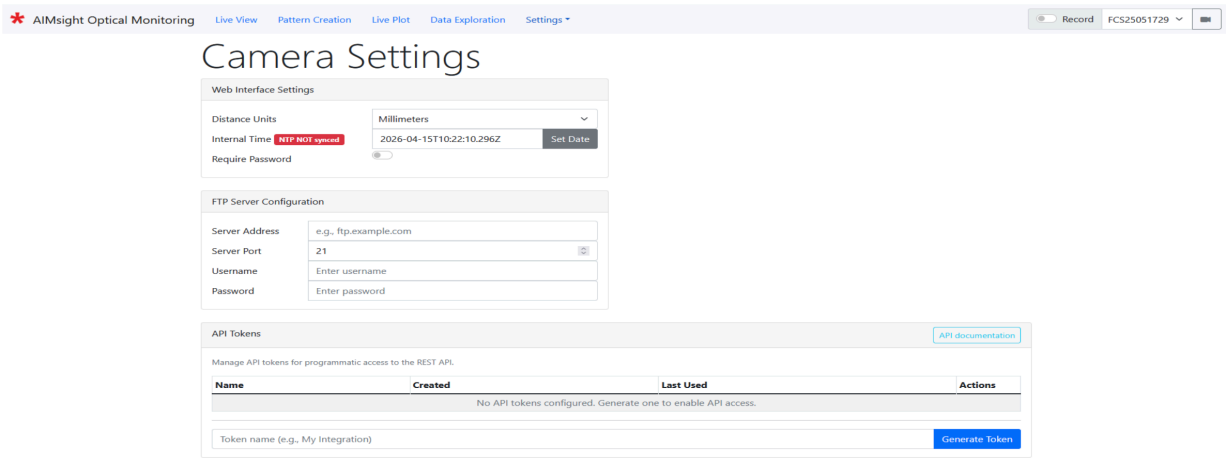
Practical use: Camera Movement helps distinguish actual structural displacement from apparent displacement caused by movement of the monitoring station itself.

It is also useful for identifying:

- movement or instability of the camera support;
- disturbances affecting the complete field of view;
- significant thermal or mechanical changes in the mounting system; and
- situations where camera-motion correction contributes substantially to the final displacement result.

The reliability of this correction depends on the number, distribution, visibility, and measurement quality of the available reference targets. Camera Movement should therefore be interpreted together with the individual target-quality metrics.

System Settings Page



The **System Settings** section of the AIMsight Monitoring interface allows configuration of display options, time synchronization, and external data export.

This section is divided into three main blocks:

- **Web Interface Settings**
- **FTP Server Configuration**
- **API Tokens**

The first block defines display preferences and access-control settings.

- **Distance units:** defines the units used for measurements in the software
- **Internal time:** shows the internal system clock
- **“NTP NOT synced”** indicates that the device is not currently synchronized with an external NTP server
- **Set Date:** allows manual adjustment of the system time when NTP synchronization is unavailable

The FTP server configuration section allows automatic export of recorded data to a remote server using the FTP protocol. When configured, the system automatically uploads measurement data or images to a central server at defined intervals or upon specific events.

Acquisition Schedules

The **Schedules** page allows acquisitions to be triggered automatically without operator intervention. Each schedule defines when an acquisition starts, which acquisition and camera parameters are used, which target preset is processed, and where the resulting data is stored or transmitted.

Saved schedules run automatically while the station is powered and the required resources, such as storage capacity and network connectivity, are available.

Creating a Schedule

Click **New Schedule** and configure the following fields:

- **Schedule Name:** a descriptive name, for example `Hourly Monitoring`.
- **Trigger Type:** the rule that determines when the acquisition starts.
- **Acquisition Type:** the type of acquisition to perform.
- **Parameter Mode:** the method used to define acquisition length and sample count.
- **Image Type:** the image-acquisition mode.
- **Pattern Preset:** the target configuration to process.
- **Camera Parameters:** the optical and acquisition parameters applied by the schedule.
- **Output Options:** the storage and transmission destinations.

Click **Save Schedule** after completing the configuration.

Trigger Definition

Periodic Interval

Periodic Interval starts an acquisition at a regular interval selected in the **Interval** field, for example every 15 minutes, every hour, or once per day. Use this mode for monitoring that requires measurements at a constant repetition interval. Custom intervals can also be defined using the syntax described in the page reached when clicking the information button.

Acquisition Type

- **Time Series:** records a sequence of measurements for a defined duration or number of samples. Use this mode to track displacement over time.
- **Single Image:** captures one image at each trigger. Use this mode for periodic visual documentation or image-based inspection.

Acquisition Length

For **Time Series** acquisitions, **Parameter Mode** provides two configuration methods.

FPS + Duration

- **FPS:** requested acquisition frequency in images or measurements per second.
- **Duration (seconds):** total acquisition duration in seconds.

For example, `10 FPS` for `5` seconds requests approximately 50 images or measurement samples. The actual rate must remain compatible with the processing capacity of the station. For recurring schedules, verify that processing does not accumulate and that an acquisition can finish before the next trigger.

Interval + Count

- **Interval:** time between two images or measurements.
- **Count:** total number of images or measurements to acquire.

Use this mode when an exact sample count is more important than the overall acquisition duration.

Image Mode and Target Preset

- **Single with infrared light:** captures one infrared-illuminated image per measurement and is generally suited to dynamic measurements requiring a higher acquisition rate.
- **Differential:** combines multiple images to improve the contrast of reflective targets and is generally suited to quasi-static monitoring or difficult detection conditions.

Pattern Preset selects the target configuration used to calculate displacement. When **(use active preset)** is selected, the schedule uses the preset active at execution time. A later change to the active preset may therefore change which targets the schedule processes. Select a named preset when the schedule must always use a fixed target configuration.

> **CAUTION**
> Before enabling an automatic schedule, verify that the reference patterns have been saved correctly and that the reference image represents the required displacement zero.

Camera Parameters

- **Exposure (us):** exposure time in microseconds; for example, `1000` corresponds to `1 ms`.
- **Stacking:** number of images combined to produce one result, particularly in **Differential** mode. Increasing stacking can improve contrast and detection range, but increases the time required for each measurement and reduces the effective measurement rate.
- **Gain (dB):** electronic amplification of the camera signal. Higher gain can brighten low-light images but also increases image noise.
- **Continuous Mode:** activated by switching “keep LEDs on during acquisition” on. Enable this mode for maximum frame-rate and frame-rate stability, at the expense of battery life / increased power consumption. It is not compatible with differential imaging.

Scheduled parameters may temporarily override parameters used for manual acquisition or live viewing.

Output Options

Output destinations are independent. Enable each required destination explicitly.

When the **HDF5** (`.h5`) format is selected, scheduled acquisitions can include the complete set of advanced diagnostic signals described in page 14. Other export formats are intentionally simplified and contain either displacement results only or a reduced set of quality metrics.

Disk

Enable **Disk** to retain the acquisition in the station’s internal storage. Monitor available capacity, especially for frequent schedules, long time series, or image-heavy acquisitions.

FTP

Enable **FTP** to upload results automatically to the FTP or SFTP server configured in **System Settings**. Upload requires a valid server configuration and an active network connection.

Monitoring

Enable **Monitoring** to transmit results to the AIMsight monitoring platform. Depending on the installed software version, the following options may be available:

- **Send measurement to monitoring:** sends the acquisition result to the platform.
- **Parquet:** sends or stores the measurements as a structured Parquet file.
- **Send datapoints to monitoring:** sends individual measurement points.
- **Aggregated:** sends aggregated data instead of all raw points.
- **Send trigger camera photo to monitoring:** sends a context-camera photograph captured at the trigger time.

The precise behavior and interaction of **Parquet**, **Send datapoints to monitoring**, and **Aggregated** depend on the installed software version and should be verified with the embedded API or interface documentation.

Saving and Verifying a Schedule

After clicking **Save Schedule**, verify:

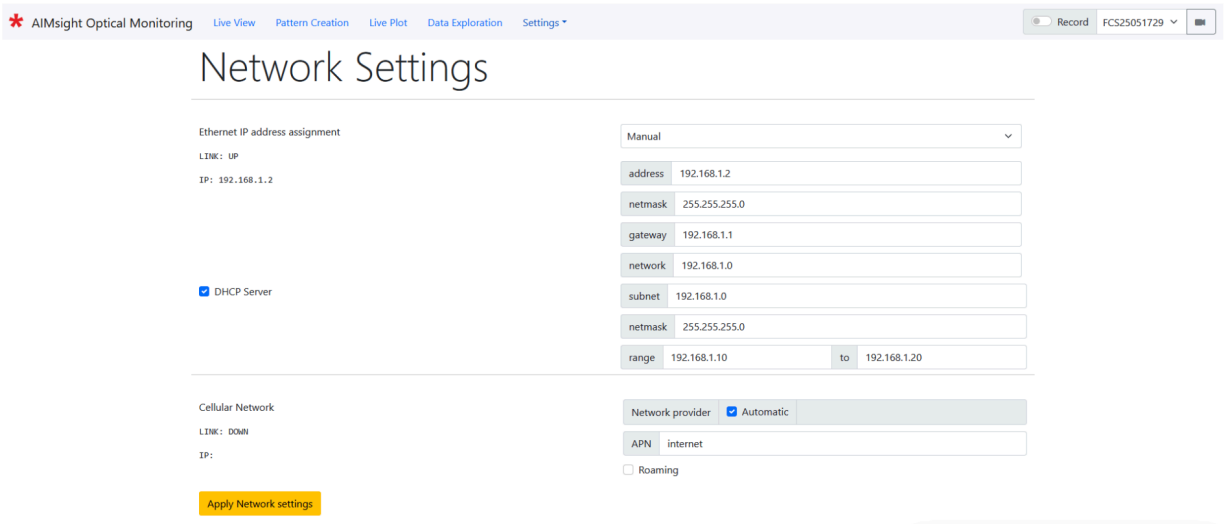
- the schedule name and enabled state;
- the next planned trigger time;
- the acquisition type, length, and requested rate;
- the selected target preset;
- exposure, stacking, and gain;
- the enabled output destinations;
- available internal storage;
- network availability when **FTP** or **Monitoring** is enabled.

Run a test acquisition with the same settings before leaving the schedule unattended. Confirm that the measurements are valid and appear at every selected destination.

REST API Documentation

REST API functionality has been added to the station software. Because the available options are numerous and may evolve in response to customer requirements, the current API documentation is embedded directly in the web interface rather than duplicated in this manual. Open **Settings / System Settings**, locate the **API Tokens** row, and click the **API Documentation** button.

Network Settings



This section describes the **Network Settings** interface of the AIMsight Monitoring software. It allows configuration of how the device communicates with external systems and local networks.

The interface is divided into two main sections:

- **Ethernet (wired network)**
- **Cellular network (mobile connection)**

The Ethernet section manages the physical connection through an Ethernet cable. Two configuration modes are available:

- **automatic (DHCP)**
- **manual (static IP)**

Automatic configuration is recommended whenever possible.

- **Automatic configuration (DHCP):** by default, the camera is configured as a DHCP server and automatically assigns an IP address to the connected computer. The computer must be configured to obtain an IP address automatically, and no external network infrastructure is required.
- **Manual configuration:** the IP address is configured manually.

Recommended manual configuration:

- **IP address:** `192.168.1.10`
- **Subnet mask:** `255.255.255.0`

> **CAUTION**
> The PC must be configured within the same network range as the camera (`192.168.1.X`) and must use a unique IP address to prevent IP conflicts.

Cellular APN Configuration

The APN is supplied by the mobile-network operator or SIM-card provider; it is not specific to the AIMsight station. Enter the operator's APN in the **Cellular Network** section and click **Apply Network Settings**. If the APN is unknown, request it directly from the operator. After applying the settings, wait for the **Link** status to change to **Up**.

Field Notes

Status LEDs

The front status LEDs are disabled by default because visible illumination may be undesirable in monitoring applications and can draw attention to the station. On systems equipped with the optional color camera, the front LEDs should also remain disabled to preserve night-image quality. The blue LED integrated in the rear power button indicates that the system is powered on.

Measurement Range and Optical Options

With 25 mm prisms, differential-mode measurements are possible at distances of up to approximately **200 m**, subject to alignment, atmospheric conditions, background, target reflectivity, and exposure settings.

Narrower-field-of-view lenses are available. They provide improved angular resolution and therefore better displacement precision at long range, at the cost of a smaller field of view and more demanding alignment. Refer to the applicable lens data sheet for the exact focal length, field of view, and expected precision.

Reflective Targets in Bright Sunlight

Detection range depends strongly on target type, target size, orientation, sunlight, background, and acquisition settings. Pieces of reflective tape larger than approximately **25 mm × 25 mm** can typically be detected up to about **40 m** under suitable conditions. Small circular adhesive reflectors generally have a shorter useful range.

For greater distances, difficult lighting, or poorly reflecting targets, use 25 mm surveying prisms where practical. Differential acquisition with a higher **Stacking** value, typically `20` to `40`, can also improve target contrast and detection range for quasi-static measurements.

Choosing Between Single and Differential Acquisition

Use **Single with infrared light** for dynamic measurements where acquisition speed is important. Use **Differential** for quasi-static monitoring when increased contrast and robustness are more important than measurement rate. Differential acquisition combines multiple images; increasing **Stacking** generally improves contrast and range but lowers the effective acquisition frequency.

Troubleshooting

If the system is not operating as expected, first verify the basic connections and settings:

- power supply
- Ethernet connection
- network configuration

Ensure that the camera is properly powered on and that the computer or network device is correctly configured.

If the issue persists:

- check the camera IP configuration
- confirm that the device is within the same network range as the host system
- restart the camera and the software to clear temporary communication issues

For remote-access problems, ensure that the internet connection is active and that the project has been correctly defined on the AIMsight monitoring platform.

If the problem continues after these checks, contact support.

Safety and Regulatory Information

General Safety

CAUTION

Read and follow all installation instructions before operating the system.

- Install the system only in suitable locations and on stable supports or mounting structures.
- Disconnect power before opening, servicing, or modifying the hardware installation.
- Use only the supplied or approved power accessories, antennas, and cables.
- Do not operate the equipment if the enclosure, connectors, or cables are damaged.

Optical and LED Safety

CAUTION
Do not stare directly into the LED lights on the front of the camera.

The front LEDs can emit intense light, including infrared illumination that may not always be perceived as bright by the human eye. Avoid direct eye exposure at short distance.

Cellular and RF Safety

This equipment is intended for fixed or mobile installation only.

CAUTION
Maintain a minimum separation distance of at least **20 cm** between the cellular antenna and any person during normal operation.

- Use only the supplied or approved antenna and cable assembly.
- Mount the cellular antenna away from metallic structures and other obstructions to reduce signal degradation.
- Do not install or operate the antenna in direct contact with the body.
- The antenna must not be co-located or operated together with another antenna or transmitter unless the final product configuration has been separately evaluated and approved.

Approved Radio Module

If fitted with the optional cellular module, this product contains the following pre-approved radio module:

- Device Uses Approved Radio: `NL-SW-LTE-TC4WWG`
- Contains FCC ID: `RI7LE910CXWWX`
- Contains IC: `5131A-LE910CXWWX`

This device complies with Part 15 of the FCC Rules and with Innovation, Science and Economic Development Canada (ISED) licence-exempt RSS standards. Operation is subject to the following two conditions:

1. this device may not cause harmful interference; and
2. this device must accept any interference received, including interference that may cause undesired operation.

Antenna and Installation Conditions

This product is intended for use with an external LTE antenna system meeting the certification conditions of the approved radio module.

In order to maintain FCC and ISED RF exposure limits for an uncontrolled environment, and to remain within carrier-specific certification conditions, the antenna gain shall not exceed the following values:

Band	Frequency	Maximum Antenna Gain
B2	1900 MHz	9.01 dBi
B4	1700 MHz	6.00 dBi
B5	850 MHz	10.41 dBi

B7	2600 MHz	9.01 dBi
B8	900 MHz	10.79 dBi
B12	700 MHz	9.70 dBi
B13	700 MHz	10.17 dBi
B14	700 MHz	10.23 dBi
B25	1900 MHz	9.01 dBi
B26	850 MHz	10.36 dBi

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