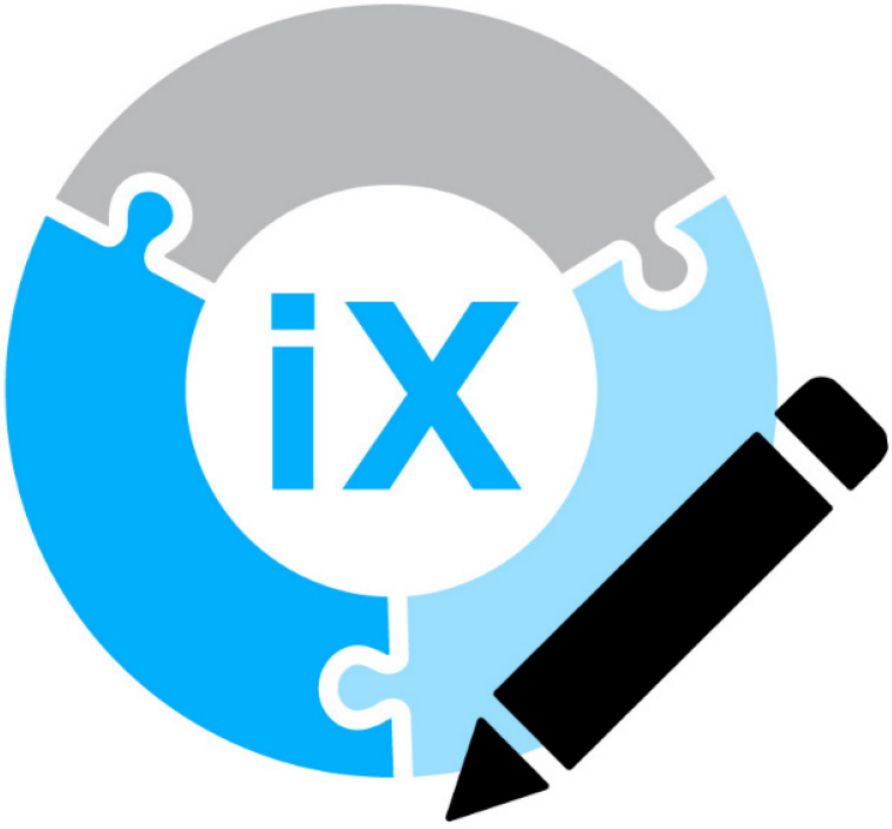
iX Plan 2024

Operation Guide



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https://support.phaseone.com/

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iX Plan 2024 Operation Guide 11/06/2025

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1. Introduction

1.1. Scope

This manual describes how to use the iX Plan 2024 software as follows:

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- Section 6 - Configuring the sensors
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1.2. Applicable documents

Item	Manual
Phase One iX Flight Pro	iX Flight Pro Operation Guide

2. Product Overview

Phase One iX Plan 2024 is an application for generating aerial photogrammetry and mapping flight plans. It allows you to easily generate flight plans for importing into Phase One iX Flight Pro. It enables fast import of digital terrain models (DTM), base maps, project shapes and ground control points, and includes a database of Phase One sensors.

You can easily add flight lines, edit existing ones, and enable automatic planning.

iX Plan 2024 shows existing ground control points and supports the identification and positioning of new ones.

2.1. Viewing the Changelog

To view new features and fixes for iX Plan 2024 versions, click the following link:

https://app.topoflight.com/changelog/missionplanner/vendor/phaseone

3. Getting Started

3.1. Requirements

- RAM: 16 GB recommended, 4 GB minimum
- Windows 10 64-bit or higher
- Valid iX Plan 2024 license (hardware or software license)

3.2. Installation

iX Plan 2024 may be installed on any computer.

The iX Plan 2024 license dongle must be inserted in a USB port of the PC running iX Plan 2024 or the software license must be installed on a local machine or on a company license server.

> **Note**
> The latest version of iX Plan 2024 is available here.
>
> For licensing information, contact Phase One Technical Support .

To install iX Plan 2024:

1. Run the setup file provided by Phase One and follow the instructions in the setup wizard.
2. Insert the iX Plan 2024 license USB dongle into a USB port or activate your software license.
3. Run iX Plan 2024.
4. When you first run iX Plan 2024, you are prompted to select a path for storing the elevation data. You can change the location of this directory later in the Section 10.1.3 - Elevation data.

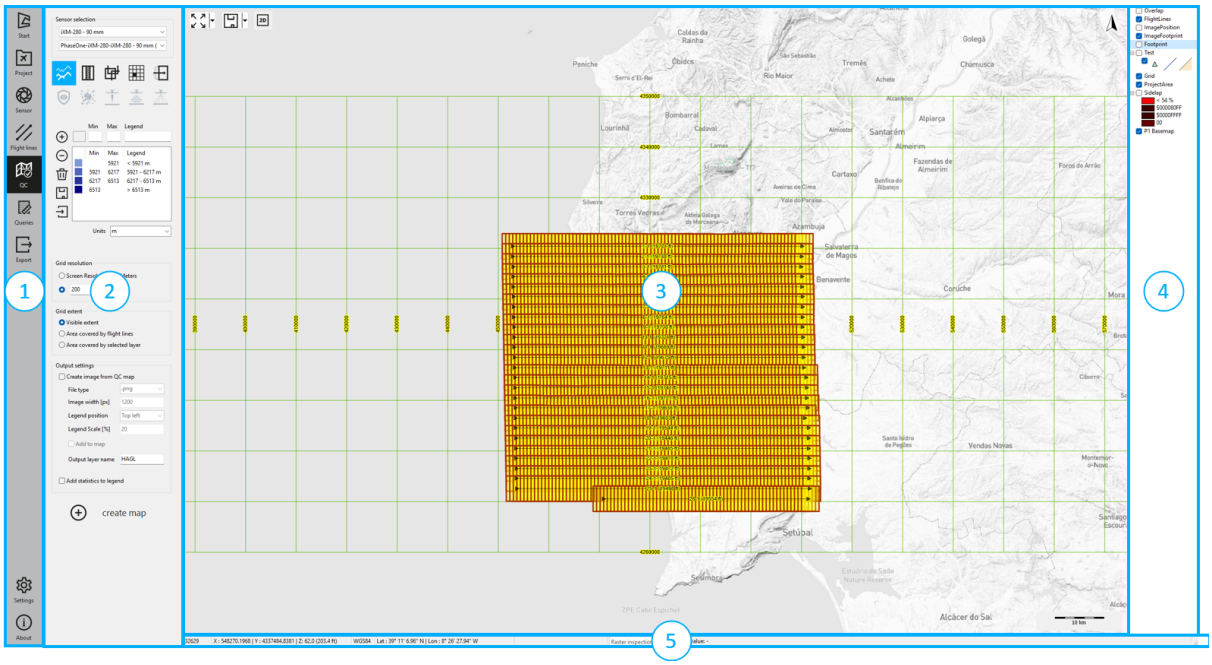
> **Note**
> If your machine does not recognize the license, contact Phase One Technical Support .

4. Getting to know the interface

This section describes the iX Plan 2024 interface as follows:

4.1. General

The iX Plan 2024 user interface is divided into the following main elements:



Item	Element	Description
1	Navigation bar	Contains links to iX Plan 2024's main pages.
2	Secondary sidebar	Contains links to the page's related content, settings, or additional features.
3	Workspace	The main area where you perform most actions related to creating and modifying your flight plan.
4	Layers panel	Displays the map layers and allows you to manage them.
5	Status bar	Displays coordinates and terrain altitude for the current mouse position.

4.2. Navigation bar

The Navigation bar contains the following links to iX Plan 2024's main pages:

- Start
  Includes commands for creating new projects or opening existing ones. The last opened projects are available via tiles with a thumbnail image.

- Project
  Includes settings that you can configure for the currently open project. Here you can also draw the area of interest (AOI) and ground control points (GCP).

- Sensor
  Includes options for selecting and configuring the camera or system that is used in your project.

- Flight lines
  Contains parameters for configuring basic metrics, calculating altitude and creating/managing flight lines.

- QC (Quality Control)
  Contains tools to assist you in evaluating if your flight plan meets the project requirements.

- Queries
  Contains tools for extracting information from your flight plan according to different parameters.

- Export
  Contains options for exporting your flight plan to other formats.

- Settings
  Contains options for configuring iX Plan 2024 options such as display settings, flight lines and elevation data.

- About
  Displays information on the current iX Plan 2024 version (including new features and bug fixes).

  Online documentation

  Latest release - direct download of the latest software installer (.exe)

  Online reference of the software program

4.3. Secondary sidebar

The secondary sidebar appears for the following Navigation bar items:

- Project
- Sensor
- Flight lines
- QC
- Queries
- Export

4.4. Workspace

The workspace is the main area where you perform most actions related to creating and modifying your flight plan. You can interact with the workspace through the Secondary sidebar and Layers panel.

It offers quick access to different viewing options, such as the 3D view mode and to Map scale settings for your project.

4.5. Layers panel

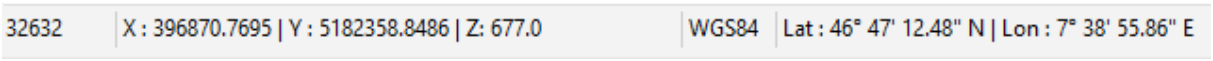
Displays the map layers and allows you to toggle specific layers on or off. Right-click any layer to view additional functions you can perform on the layer, such as Customizing layers.

> **Note**
> To change the stacking order of the layers between front and back, drag each layer up or down as required.

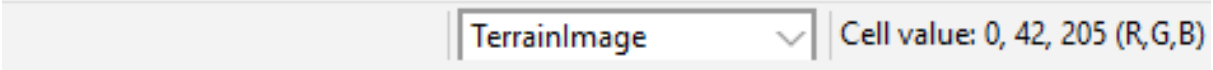
4.6. Status bar

The Status bar displays the following information:

- EPSG Code of the map coordinate system
- mouse position X, Y and Z coordinates/terrain altitude [ft]
- coordinate reference system (CRS)
- latitude and longitude of the current mouse position



- In addition, a layer can be selected from the available pixel layers. In the last field, the cell value on the mouse position is displayed.



4.7. Keyboard shortcuts

Shortcut	Action
Ctrl+S	Save the project.
Ctrl+Shift+S	Save the project with a new name.
Ctrl+L	Open the log.
Ctrl+D	Download the SRTM for current location.
Ctrl+P	Repaint map canvas.
Ctrl+U	Clear (unselect) everything.
Ctrl+mouse wheel	Use smoother zoom.
Esc	Terminate the current action/function.
Backspace	The last drawn marking (such as flight line or AOI) is deleted.
F1	Open the online documentation.
F2	Activate the visibility of all layers.
F3	Hide all vector layers.
F4	Hide all raster layers.
F5	Keep the following layers visible while hiding all other vector layers: • flight lines • image positions • project area
F6	Keep the following layers visible while hiding all other vector layers: • footprints • overlaps
F7	Keep the following layers visible while hiding all other vector layers: • terrain

5. Creating and configuring projects

This section describes how to create and configure projects in iX Plan 2024 as follows:

5.1. General

Optimal flight plans are based on three datasets:

- a base map covering the area to be photographed (2D)
- a digital terrain model (DTM) for elevation data
- an area of interest

In iX Plan 2024, all three datasets can easily be selected, imported and/or customized when creating a new project.

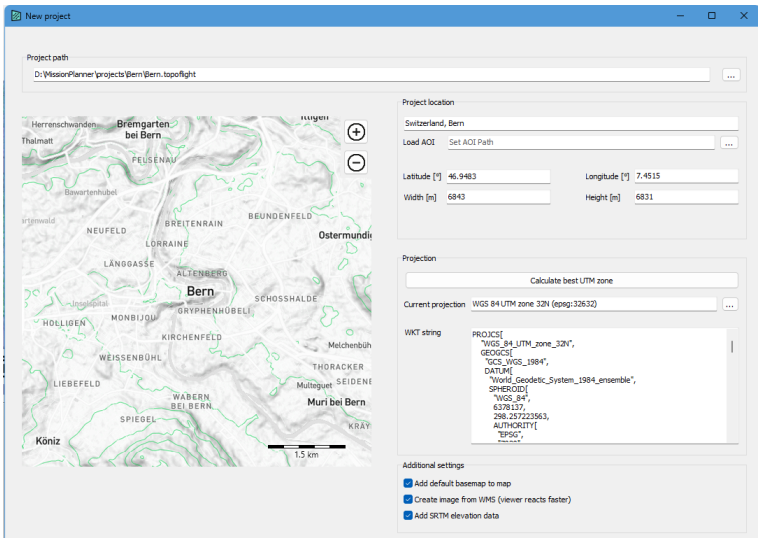
> **Note**
> In the absence of a DTM, the software defaults to a flat terrain assumption with an elevation of Z=0.

5.2. Creating a new project

To create a project:

1. In the Navigation bar, click Start.
2. Click New project.

3. In **Project path**, click ... and navigate to the folder where you want to save the project files. Create a new folder if required.
4. In File name type a name for your project.
5. Click **Save**.
6. Select the project location using any of the following methods:
   - online - in **Project location** type the name (city/country) or adjust the map zoom to encompass your specific area of interest
   - offline - in **Load AOI**, click ... and navigate to the required file.



7. Set the required projection using either of the following options:
   - Click **Calculate best UTM zone** for the default UTM WGS84 projected system.

     Note
     This is the recommended option as the most suitable UTM zone for the designated area is automatically selected.

   - In **Current projection** click ... and select one of the following:
     - **Projected system** (for experienced users only) - you can select regional or national systems that you are familiar with .
     - **Geographic systems** (not recommended) - you can select geographic systems in degrees.
     - **Turn off** - do not use a coordinate system

Note
Select the projection thoughtfully - for more information see Modifying the coordinate reference system.

6. Configure **Additional settings** as required:
   - **Add default base map to map** - default: selected
   - **Create image from WMS** (recommended) - the base map is available offline and the viewer reacts faster as it does not stream the data for each zoom level.
   - **Add SRTM elevation data** - default: selected.

Note
To configure the SRTM elevation data, see Elevation data.

7. Click **OK**. The new project opens under **Project** in the Navigation bar.

> **Note**
> For easy access, the six most recently used projects are listed in the Start window.

5.3. Modifying the coordinate reference system

A flight plan is created only when the following coordinate reference system requirements are met:

- a projected coordinate system is selected
- the axes are orthogonal
- the map unit is in meters [m]

The default base map provided when the project is created uses the commonly used Mercator web map projection.

To select a different coordinate reference systems for the map (Map CRS) and the flight plan (Flight CRS):

1. In the Navigation bar, click Project.
2. In the secondary sidebar, under **COORDINATE SYSTEMS**, select the required **Map CRS** and/or **Flight CRS**.
   The Workspace viewer automatically converts any imported maps to match the selected Map CRS. After making changes, new flight line layers are also saved in the selected Map CRS.

> **Note**
> Base maps and associated data must be available on a computer in the local network.

> **Caution**
> Refrain from making excessive adjustments to these settings. If required, modify the Map CRS before creating flight lines.

5.4. Adding base maps and reference data

The Phase One base map is the default map included when you create a project.

To select other base maps and add them to the project:

1. In the Project secondary sidebar, under **BASEMAP**, click the **Base map** list and select the required base map.

> **Note**
> If you select **Open WMS/WMTS Layer**, a window appears prompting you to specify the server URL and layer name.

Base maps and related reference data can have the following file formats:

- AutoCAD DXF files (*.dxf)
- GEOTIFF
- Google Earth (*.kml)
- Microstation DGN
- MrSID (*.sid). Up to the versions 3.7, MrSID files cannot exceed a certain size (ca. 150 MB)
- Shapefiles (*.shp)
- TIFF with TFW header

Any maps you add are visible in the Layers panel.

> **Note**
> To modify a layer (see Customizing layers), in the layers panel double-click or right-click the layer name.

5.5. Drawing a grid

To modify grid settings:

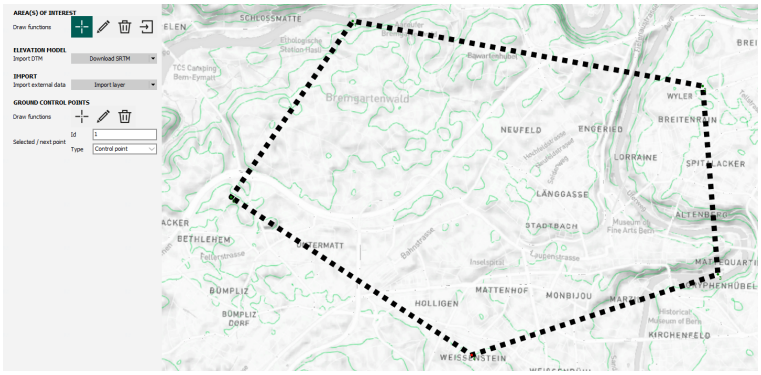
1. In the Project secondary sidebar, under **BASEMAP**, click the **Draw grid** box.
2. Configure the **Grid settings** (see Grid settings).

5.6. Defining the AOI (Area of Interest)

Under **AREA(S) OF INTEREST**, use the icons to perform the following tasks:

Drawing an AOI:

1. Click ⊹ to draw the AOI.
2. In the Workspace, left-click the map to designate each AOI vertex.
3. Right-click or press Esc.



Modifying an AOI:

1. Click  to edit the area of interest.
    a. Move vertices - left click an existing perimeter point. The point changes to red. Drag-and-drop the point to the required location.
    b. Add vertices - a new vertex is added between two points by left-clicking the point with the lower index number (the point changes to red) and then clicking the required position of the new vertex on the map.
2. Right-click or press Esc.

Deleting an AOI:

1. Click  .
2. Left-click the AOI to delete.

Importing an existing AOI file:

- Click  and navigate to the required file.

OR

- Drag and drop an AOI file directly into the workspace.

> **Note**
> Google Earth KML files, as well as a variety of other file formats, are fully supported.

Saving an AOI as KML file:

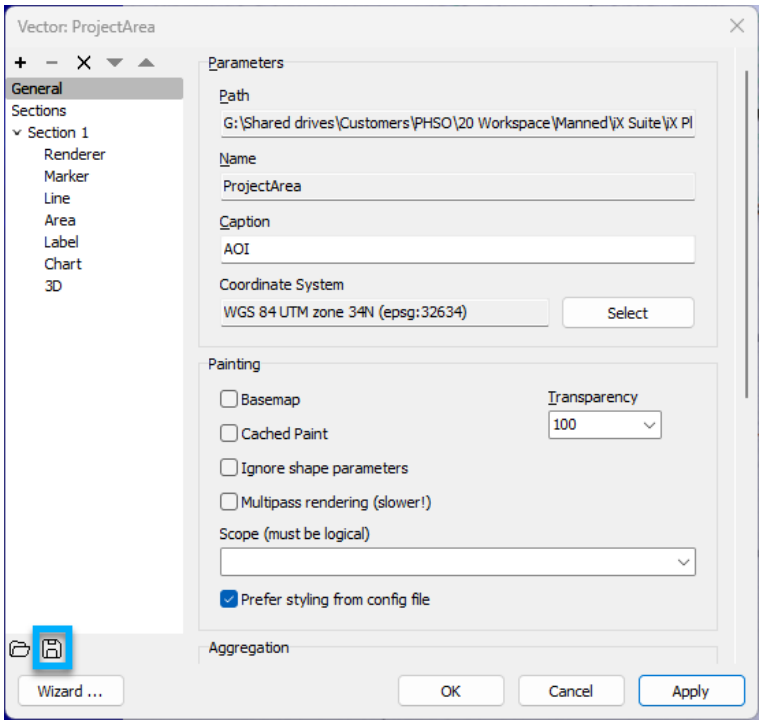
1. In the Navigation bar, click  .
2. In the Export Project window, in the left sidebar, click **KML**.
3. Select the **ProjectArea** checkbox.
4. Click **Set path** configure the folder and filename for the KML file and click **Save**.
5. Click **Export**.

Saving an AOI as GEOJSON file:

> **Note**
> All AOIs created in iX Plan 2024 are automatically saved as GEOJSON files (with the extension geojson.ttkstyle) in the project folder.

To manually save a GEOJSON file:

1. Double-click the **ProjectArea** layer (see Customizing layers).
2. Select a path and name for the AOI layer.
3. Click .



5.7. Updating the elevation model (DTMs)

When you create a project, SRTM data for the initially selected map section is automatically downloaded (unless **Add SRTM elevation data** was not selected when creating the project).

> **Note**
> To validate that elevation data exists, on the Status bar check that Z coordinate displays a numerical value.

Importing an SRTM for a larger area of coverage:

1. In the Workspace, adjust the map view as required.
2. In the Project secondary sidebar, under **ELEVATION MODEL**, click **Download SRTM**. Any previous SRTM layers are replaced with the updated map data for the current workspace view.

> **Note**
> To import other DTMs such as USGS DEMs or TIFF DEM files, click the **Download SRTM** list.

5.8. Importing external data

iX Plan 2024 supports numerous common geodata formats. You can easily incorporate external data, such as flight lines or image centers, with a simple drag-and-drop into the Workspace. For more information, see Import options.

> **Note**
> Before importing external data, a sensor must be configured (see Configuring the sensors

For iX Plan 2024 to consider imported data (such as flight lines or image positions) as if it had been planned in iX Plan 2024, the external data must be imported as a CSV file. Another option is to manually create the GEOJSON file.

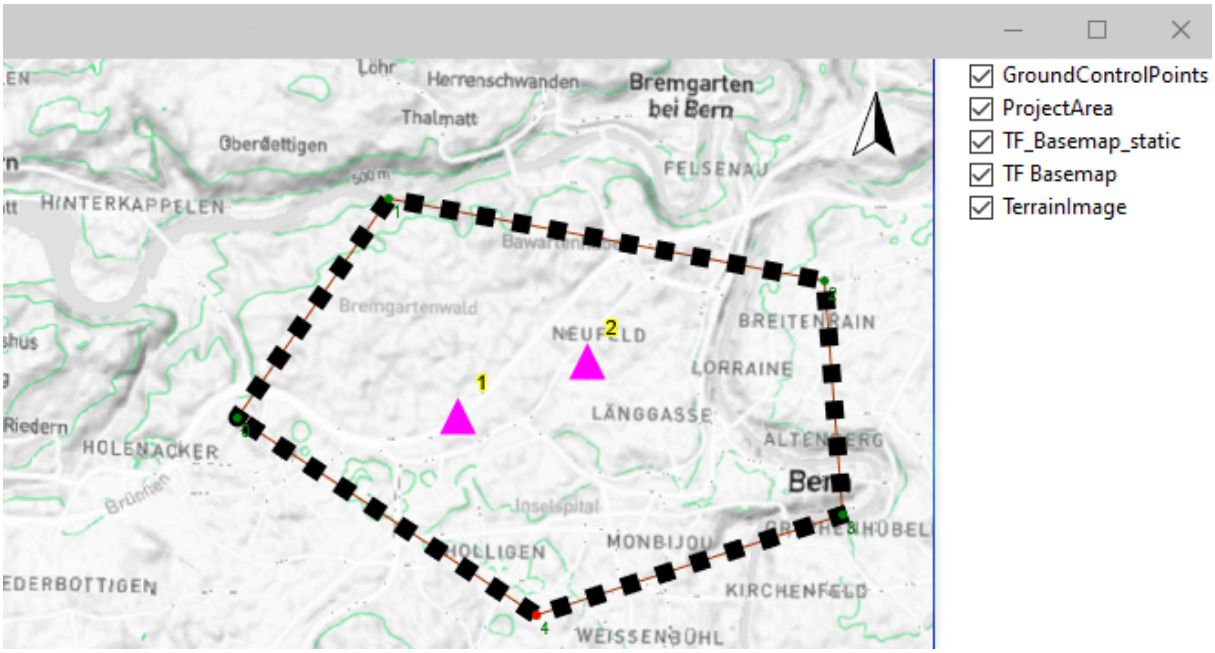
5.9. Defining Ground Control Points (GCPs)

You can use the GCP tools to place approximate GCP positions on the map for determination by a ground surveyor. The map can be printed and given to field surveyors. The surveyors know the approximate location where the photogrammetrists have specified a GCP. A surveyor can go to the location to signalize the points and measure its coordinates.

Under **GROUND CONTROL POINTS**, use the icons to perform the following tasks:

Adding a GCP:

1. In ID, enter the value of the next GCP you are adding.
2. In Type, select the type of GCP: **Control point** or **Check point**.
3. Click ⊹.
4. In the Workspace, click where you want the GCP to appear.
5. After defining the initial GCP, a new map layer appears in the layers panel.



> **Note**
> Refer to Customizing layers for details on configuring the display of GCPs.

Modifying a GCP:

1. Click  to edit a GCP.
2. Click an existing GCP and modify the **ID** value and **Type** as required.

Deleting a GCP:

1. Click  .
2. Click the GCP to delete.
3. Refresh the workspace by clearing the Ground Control Points checkbox, then selecting it again.

5.10. Saving a project

Projects are automatically saved when a sensor is added to the project. Any other time, you can manually click the  button on the top left in the workspace.

Additionally, you can save the project under a different name by clicking the down arrow next to the  button. The original project remains unchanged.

5.11. Deleting a project

To delete a project from the Start page:

1. In the Navigation bar, click  **Start**.
2. On the pane of the project you want to delete, click  .

> **Note**
> To delete the files from your PC, use Windows Explorer to navigate to the project folder and delete it.

6. Configuring the sensors

This section describes how to configure the sensors as follows:

6.1. General

iX Plan 2024 uses sensor parameters to calculate flight lines and trigger points.

After you create a project, you need to select a sensor frame or sensor system. You can also select multiple sensors.

To select sensors:

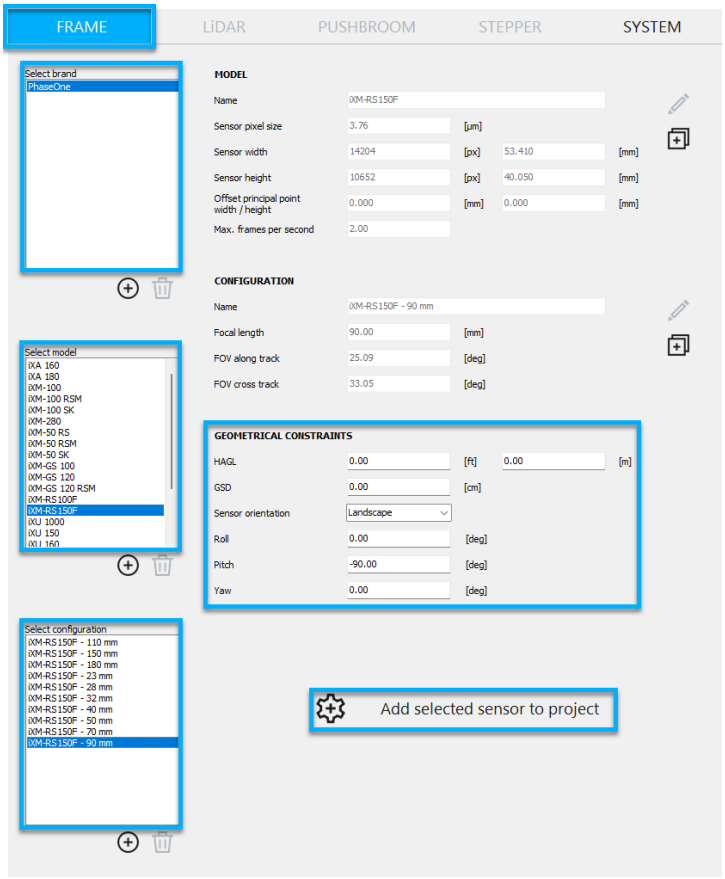
1. In the Navigation bar, click  .

> **Note**
> At the bottom of the secondary sidebar, click **Update database** to fetch all available sensors from Phase One's online resources.

2. In the workspace, click **FRAME** or **SYSTEM** according to the sensor(s) you will be using for the project.

6.2. Configuring Frame Sensors

1. Click **FRAME**.
2. In the **Select brand** box, click PhaseOne.
3. In the **Select model** box, click the required sensor model.
4. In the **Select configuration** box, click the required configuration, which corresponds to the focal length. On the right, the model and configuration parameters are automatically populated with the corresponding values.
5. Under **GEOMETRICAL CONSTRAINTS**, enter the required GSD (the GSD describes the spatial resolution or pixel size of an image on the ground). The HAGL is automatically calculated and the airplane height and sensor footprint are visualized on the right side of the workspace (see Section 6.4 - Visualization of sensor settings).
6. If necessary, adjust the Sensor orientation, Roll, Pitch and Yaw parameter values. The depiction of the footprint changes accordingly.



Note

- The GSD is directly related to the HAGL and depends on the focal length of the selected camera.
- The HAGL selected here is stored as default value for the project.

7. Click **Add selected sensor to project**. The sensor now is listed in the secondary sidebar.

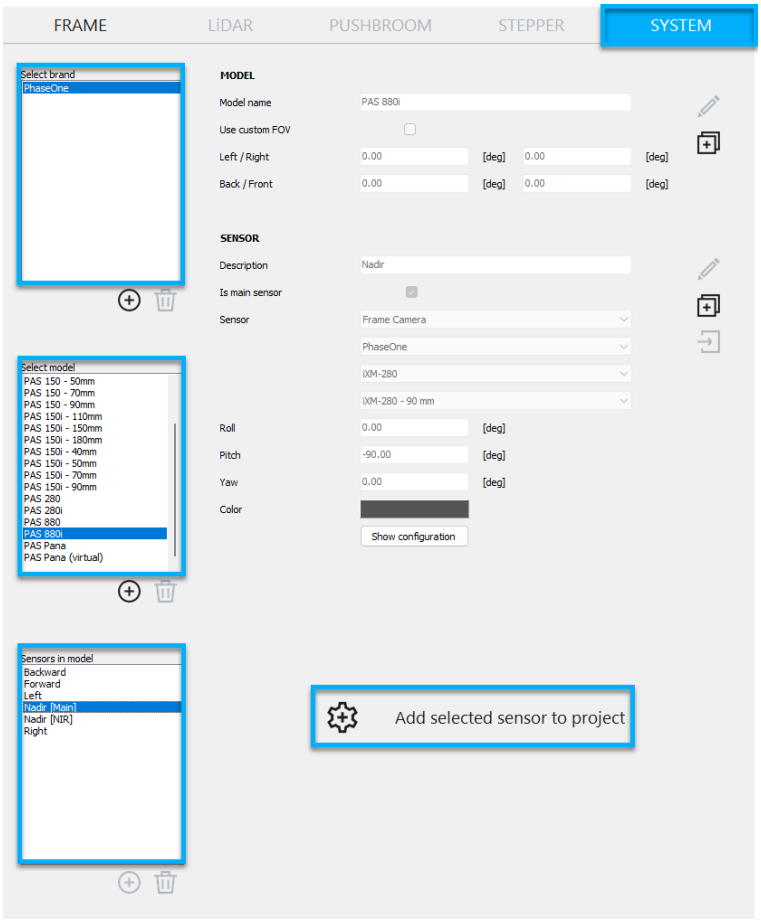
Note

To include frequently used sensors in your preferred selection:

1. In the secondary sidebar, under **FAVORITE SENSORS** list, click ⊕.
   The **FAVORITE SENSORS** list is displayed across all projects.

6.3. Configuring System Sensors

1. Click **SYSTEM**.
2. In the **Select brand** box, click PhaseOne.
3. In the **Select model** box, click the required sensor model. The airplane height and sensor footprint are visualized on the right side of the workspace (see Section 6.4 - Visualization of sensor settings)
4. In the **Sensors in model** box, clicking each sensor displays its parameters on the right. These values cannot be modified here.



> **Note**
> To view a sensor's details, click **Show configuration**. The **FRAME** page is displayed with the sensor's parameters.

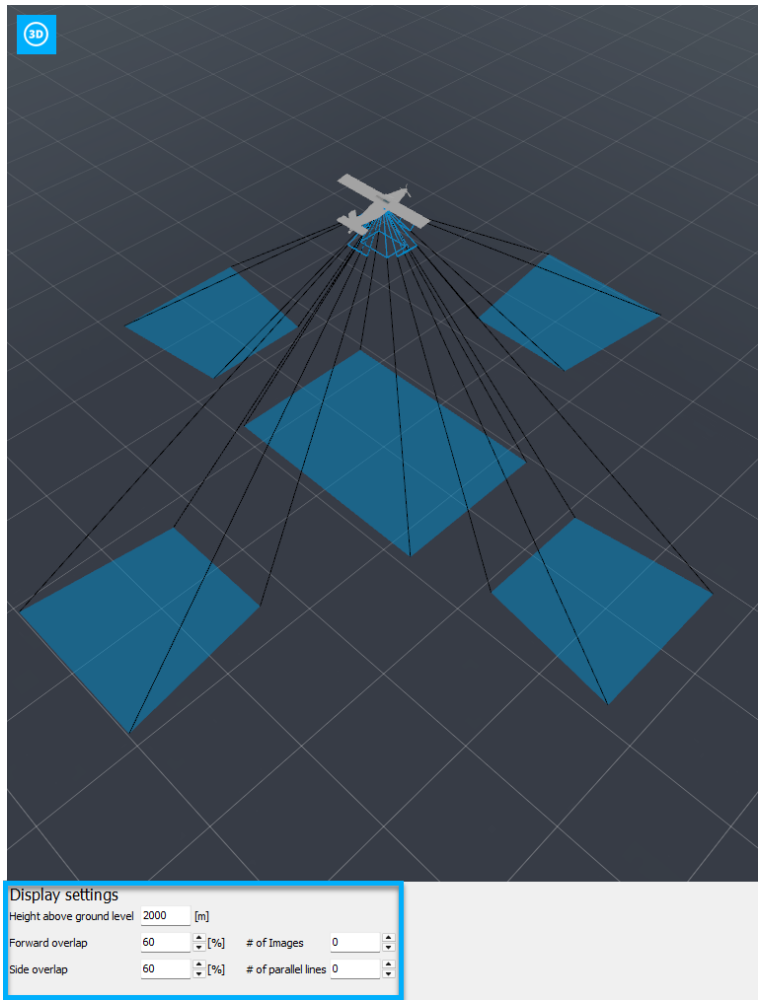
7. Click **Add selected sensor to project**. The sensor now is listed in the secondary sidebar.

> **Note**
> To include frequently used sensors in your preferred selection:
>
> 1. In the secondary sidebar, under **FAVORITE SENSORS** list, click ⊕.
>   The **FAVORITE SENSORS** list is displayed across all projects.

6.4. Visualization of sensor settings

The right side of the Sensor workspace provides a visual overview of the sensor settings footprint on flat terrain.

1. Under the image, in Display settings, configure the various parameters as required.



Note
Changes to the HAGL are transferred to the corresponding geometrical constraints in the camera settings.

In addition to the HAGL, you can adjust the forward and side overlap percentages. The effects of these changes are displayed in the visual overview above the **Display settings**. This is especially useful for sensor systems, enabling a comparison of overlap between nadir and oblique cameras.

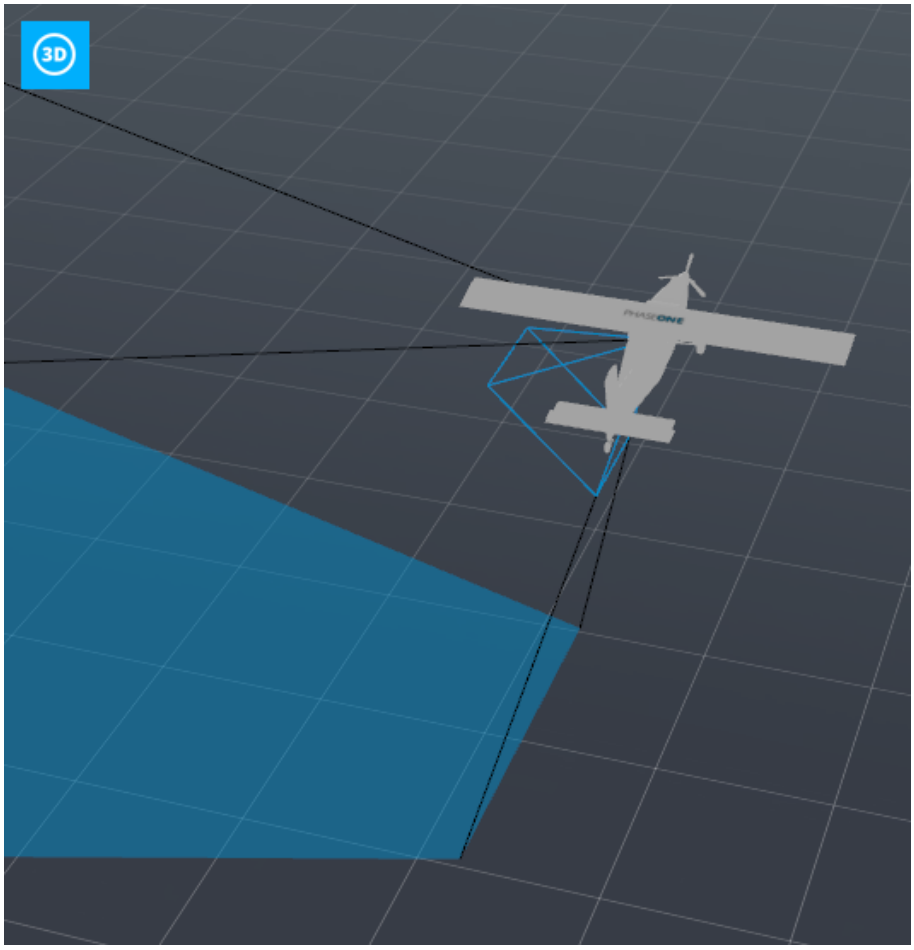
Note
Overlap estimation is only computed for almost parallel lines. You can define the maximum intermediate angle for which overlaps are calculated in Settings (see Overlap calculation).

6.4.1 Example - Effect of Changes to Roll, Pitch and Yaw Angle on Visual Overview

Adjust the Roll, Pitch, and Yaw angles and observe their impact on the visual overview:

1. Set the **Sensor orientation** to:
   a. Landscape (roll=0°)
   b. Portrait (roll=90°).
2. Adjust the pitch value, which ranges between:
   a. pitch=0° (pointing to the horizon)
   b. pitch=-90° (pointing to nadir).
3. Enter the heading that defines the system's direction:
   - yaw=0° (front)
   - yaw=90° (right)
   - yaw=180° (back)
   - yaw=270° (left)

The following image shows a frame using roll=90° (portrait), pitch=-45° (oblique sensor) and yaw=270° (left):



6.5. Adding sensors to database

6.5.1 Adding a frame sensor

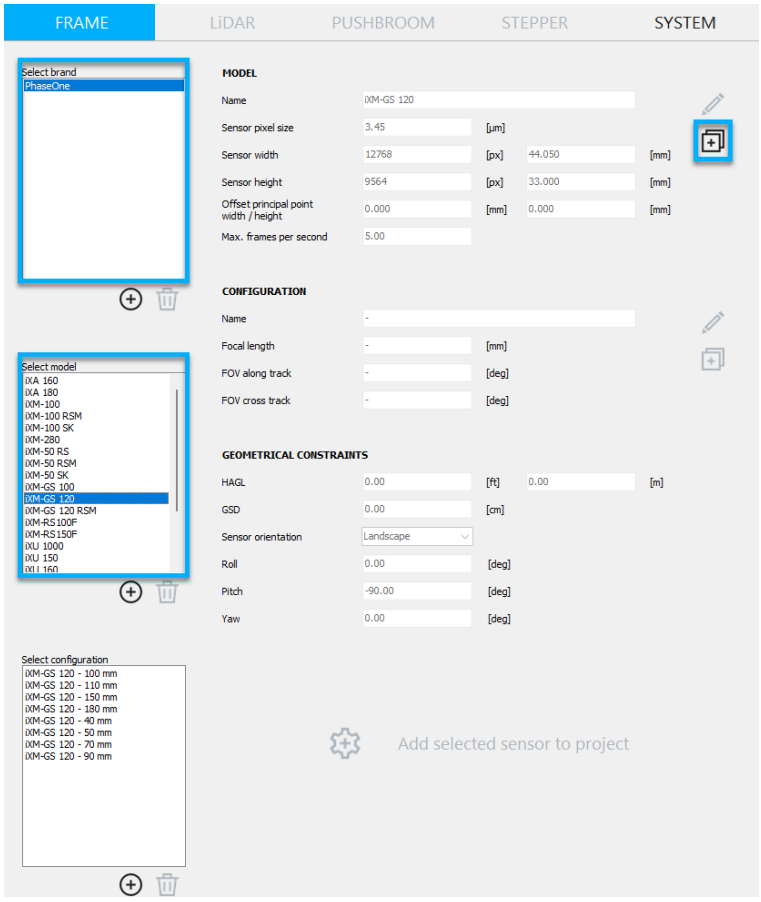
You can add a new sensor by defining a new model and its configuration (focal length).

6.5.1.1 Adding a new model for a frame sensor

To add a new model for a frame sensor:

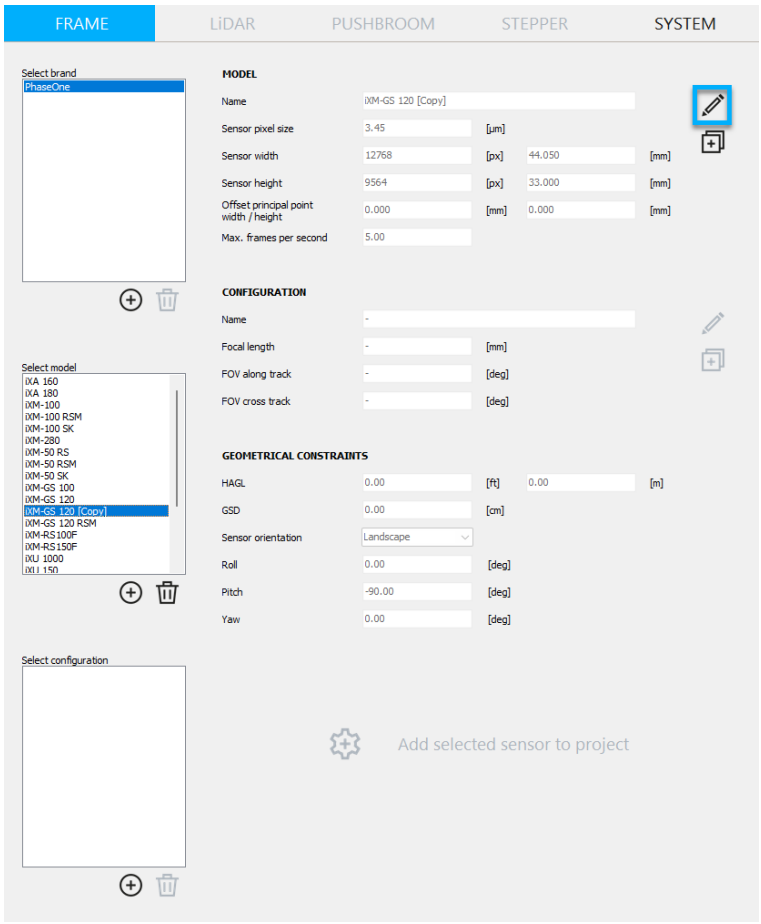
1. In the Navigation bar, click and select **FRAME**.
2. Perform one of the following options:

- To add a new frame model based on an existing model:
  a. In the **Select brand** box, click PhaseOne.
  b. In the **Select model** box, click a model to copy.
  c. Next to the **MODEL** parameters, click .

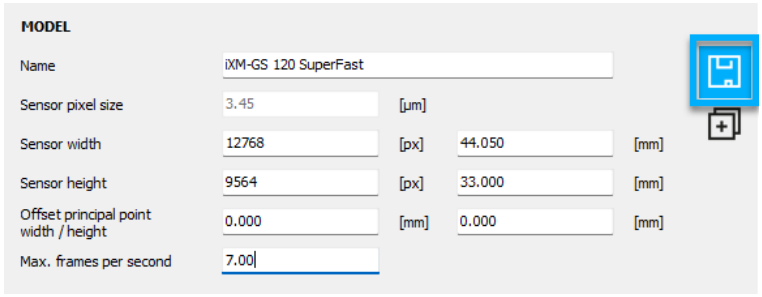


d. In the **Select model** box, click the _____ **(Copy)** you created.

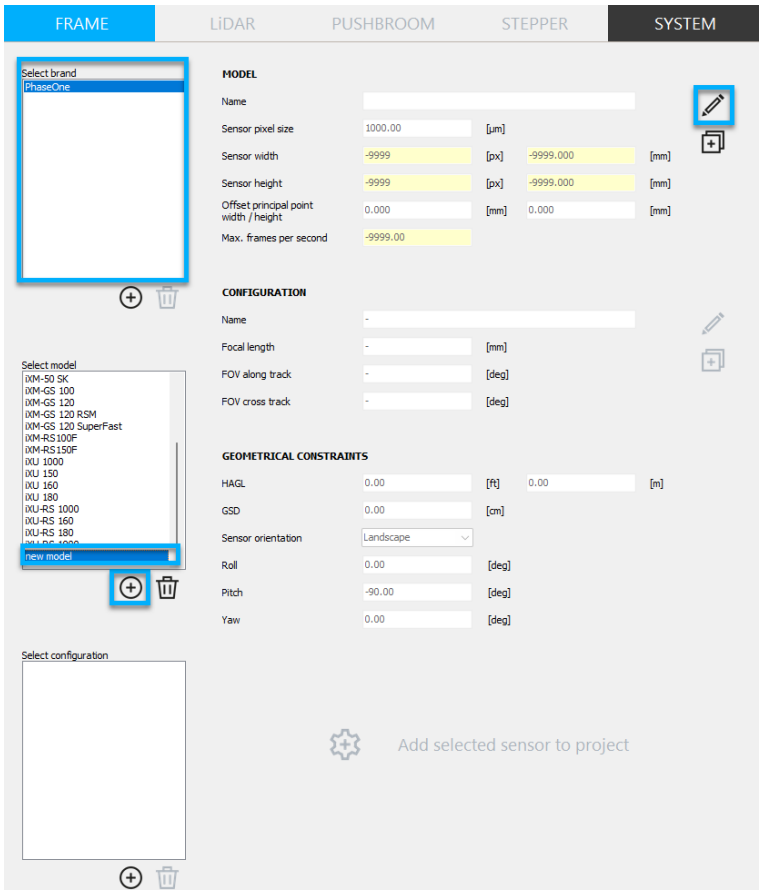
e. Next to the **MODEL** parameters, click ✎ and edit the copied **MODEL** parameters as required.



f. Click 💾.

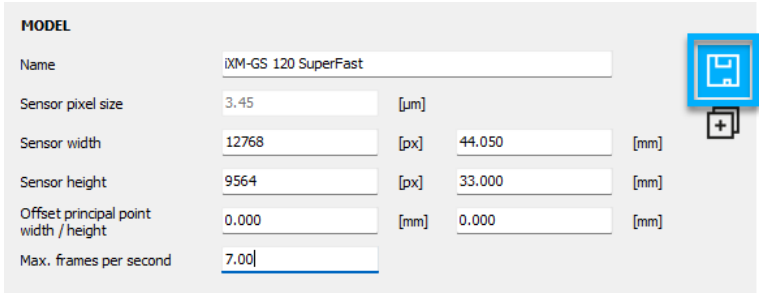


- To create a new frame model from scratch:
  a. In the **Select brand** box, click PhaseOne.
  b. Below the **Select model** box, click ⊕.
  c. In the **Select model** box, click **new model**.
  d. Next to the **MODEL** parameters, click ✎ and edit the parameters as required.



> **Note**
> Yellow fields are mandatory.
> **Sensor pixel size** is calculated automatically after you have entered values for all mandatory fields.

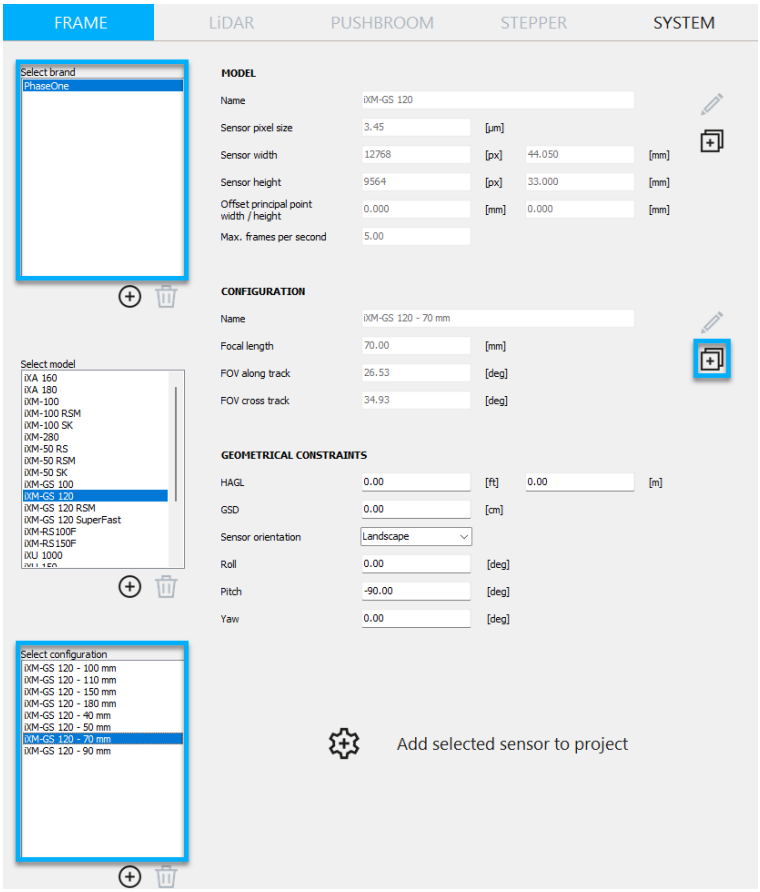
  e. After you enter all required parameters, click 💾. The model you created is added to the list.



6.5.1.2 Adding a new configuration for a frame model

To add a new frame configuration:

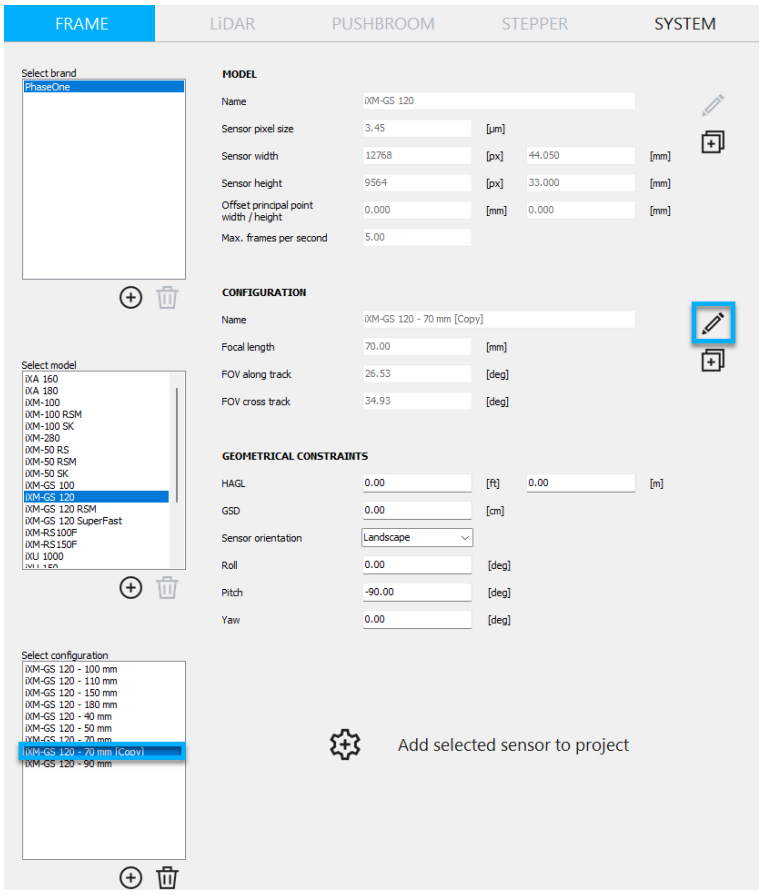
1. Select the model for which you want to add a configuration.
2. Perform one of the following options:
   - To add a new frame configuration based on a model's existing configuration:
     a. In the **Select brand** box, click PhaseOne.
     b. In the **Select model** box, click the required model.
     c. In the **Select configuration** box, click a configuration to copy.
     d. Next to the **CONFIGURATION** parameters, click  .



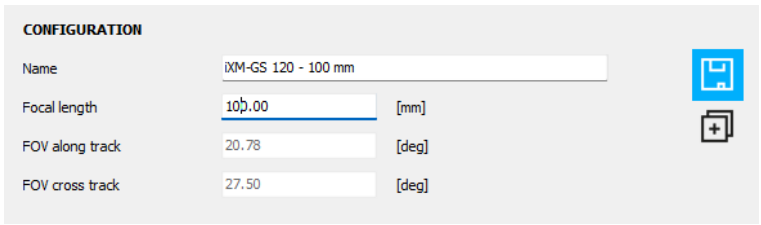
e. In the **Select configuration** box, click the _____ **(Copy)** you created.

f. Next to the **CONFIGURATION** parameters, click ✎.

g. Edit the copied **CONFIGURATION** parameters.



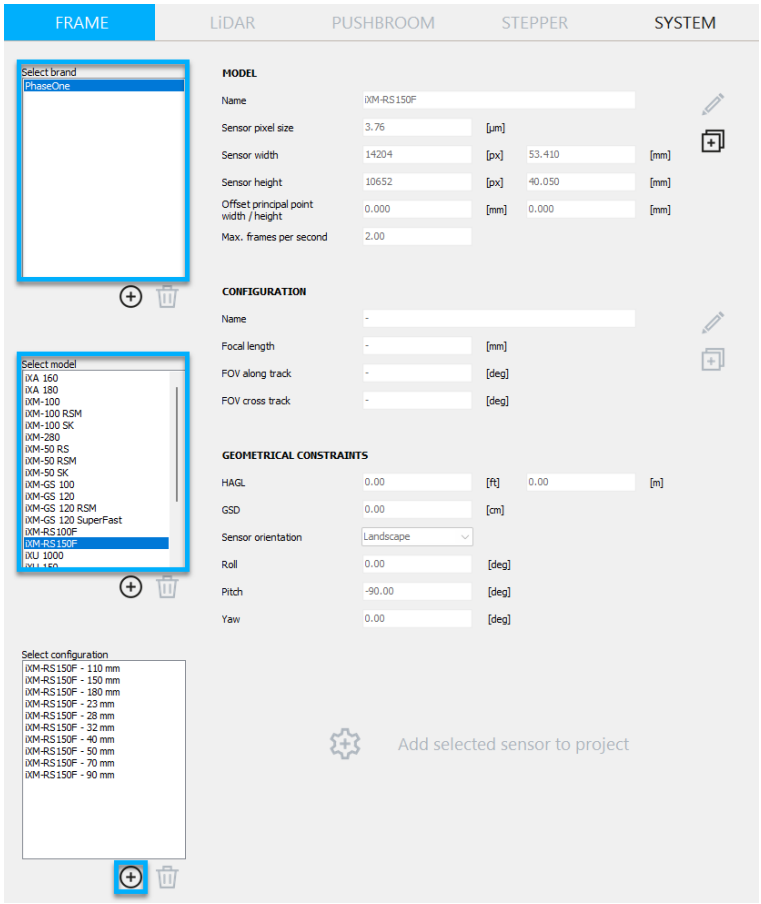
h. Click 🖫.



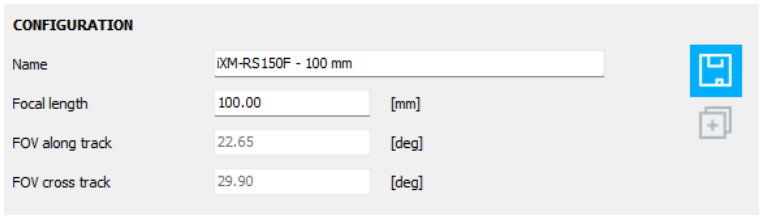
- To create a new frame configuration from scratch:

  a. In the **Select brand** box, click PhaseOne.

  b. Below the **Select model** box, click ⊕.



  c. Under **CONFIGURATION**, define the **Name** and **Focal length**.



  d. Click 💾. The configuration you created is added to the list.

> **Note**
> Sensor information is always stored in the active project. If the project is shared across multiple iX Plan 2024 installations, the software verifies the availability of sensor information in the database; if not found, it generates it.

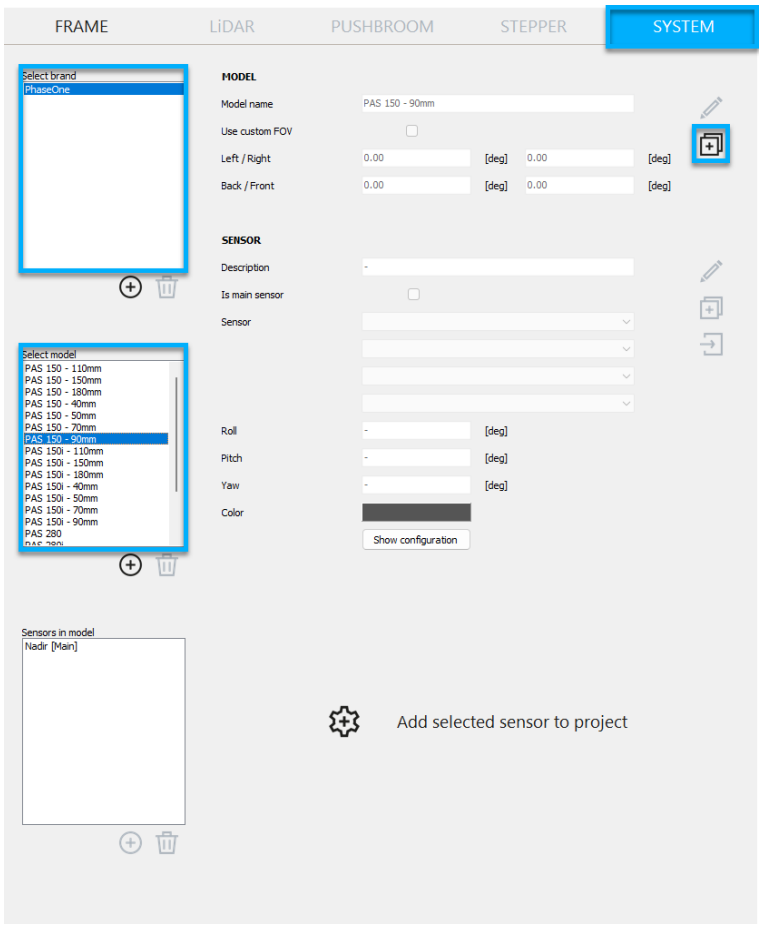
6.5.2 Adding a system sensor

You can add a new sensor by defining a new model and its associated sensors.

6.5.2.1 Adding a new model for a system sensor

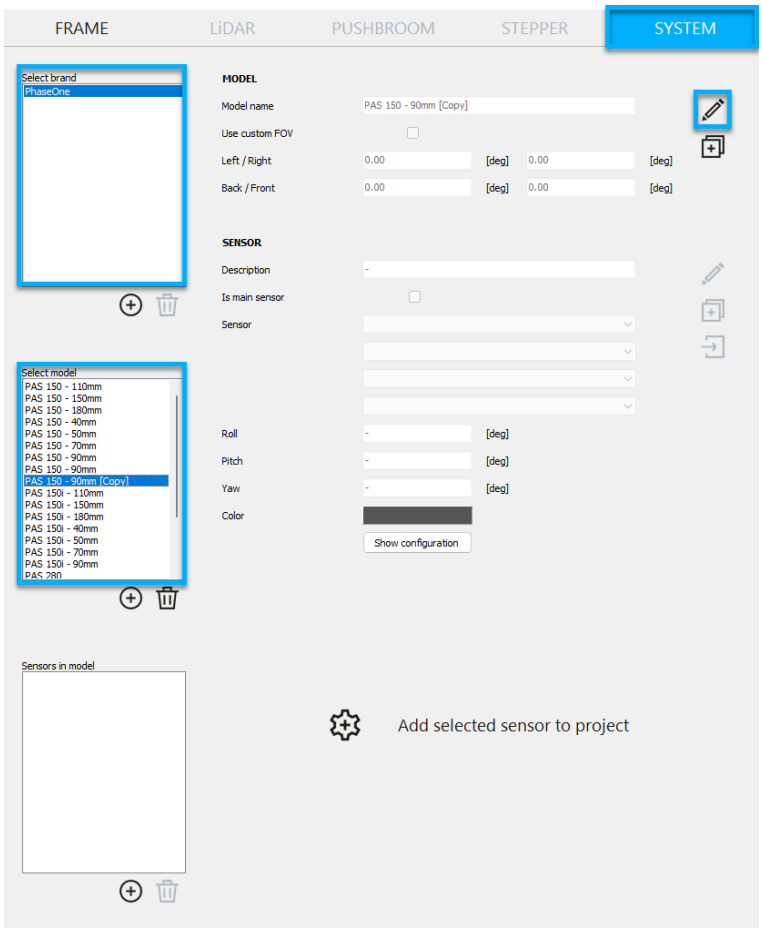
1. In the Navigation bar, click and select **SYSTEM**.
2. Perform one of the following options:

- **To add a new system model based on an existing model:**
  a. In the **Select brand** box, click PhaseOne.
  b. In the **Select model** box, click a model to copy.
  c. Next to the **MODEL** parameters, click .



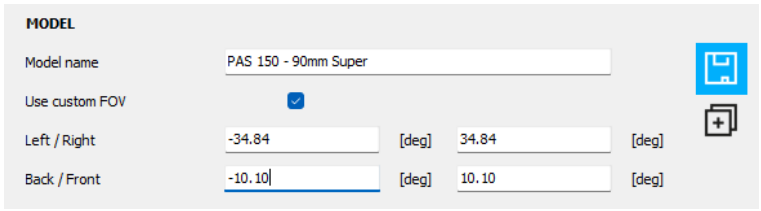
d. In the **Select model** box, click the _____ **(Copy)** you created.

e. Next to the **MODEL** parameters, click  and edit the copied **MODEL** parameters as required.

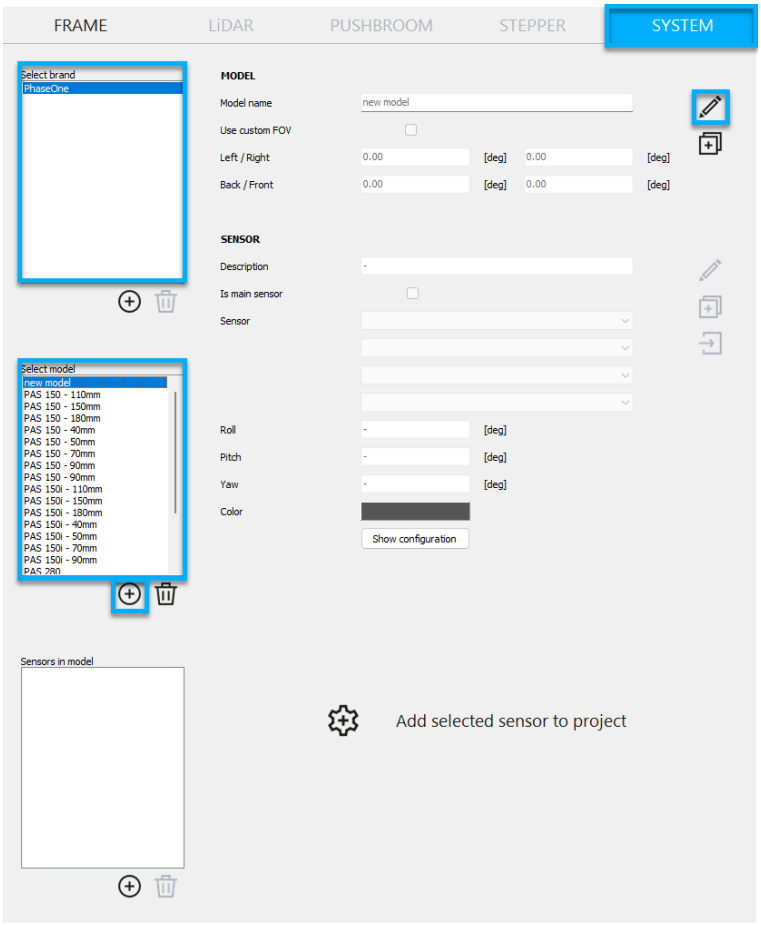


> **Note**
> To modify the FOV values, select the **Use custom FOV** checkbox.

f. Click  .

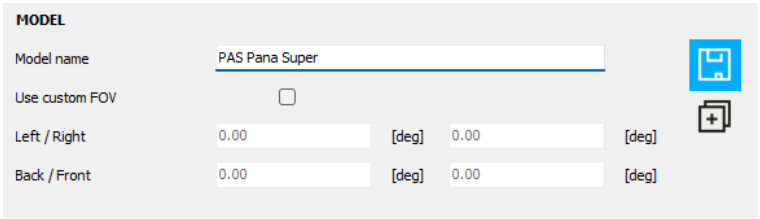


- To create a new system model from scratch:
  a. In the **Select brand** box, click PhaseOne.
  b. Below the **Select model** box, click ⊕.
  c. In the **Select model** box, click **new model**.
  d. Next to the **MODEL** parameters, click ✎ and edit the parameters as required.



> **Note**
> To modify the FOV values, select the **Use custom FOV** checkbox.

  e. After you enter all required parameters, click 🖫. The model you created is added to the list.



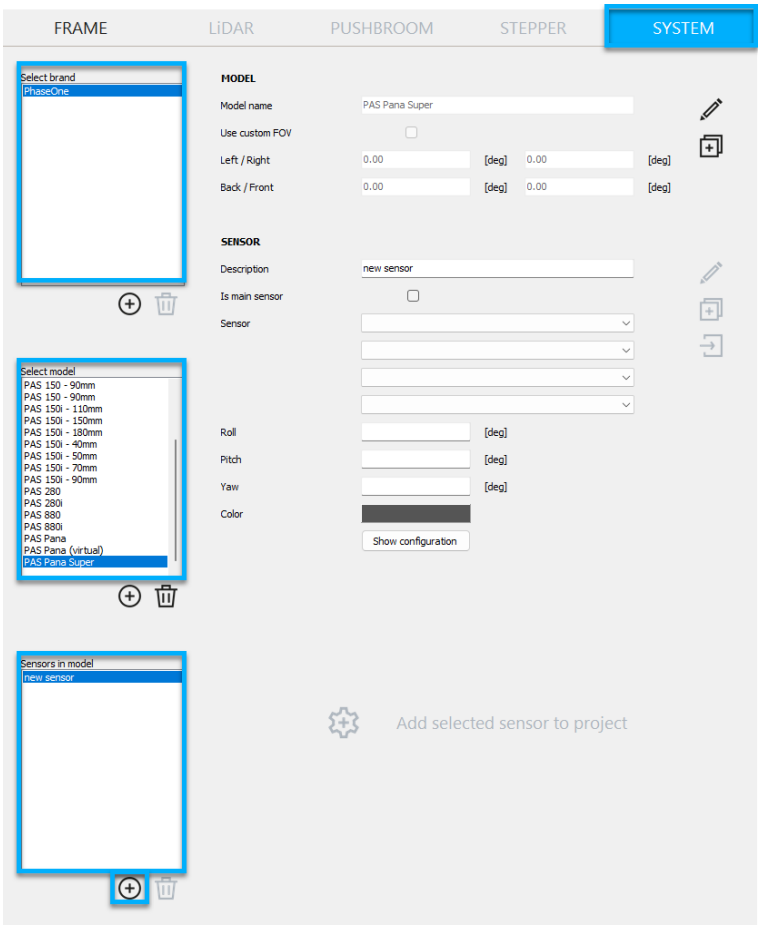
6.5.2.2 Adding a sensor to a model

Note

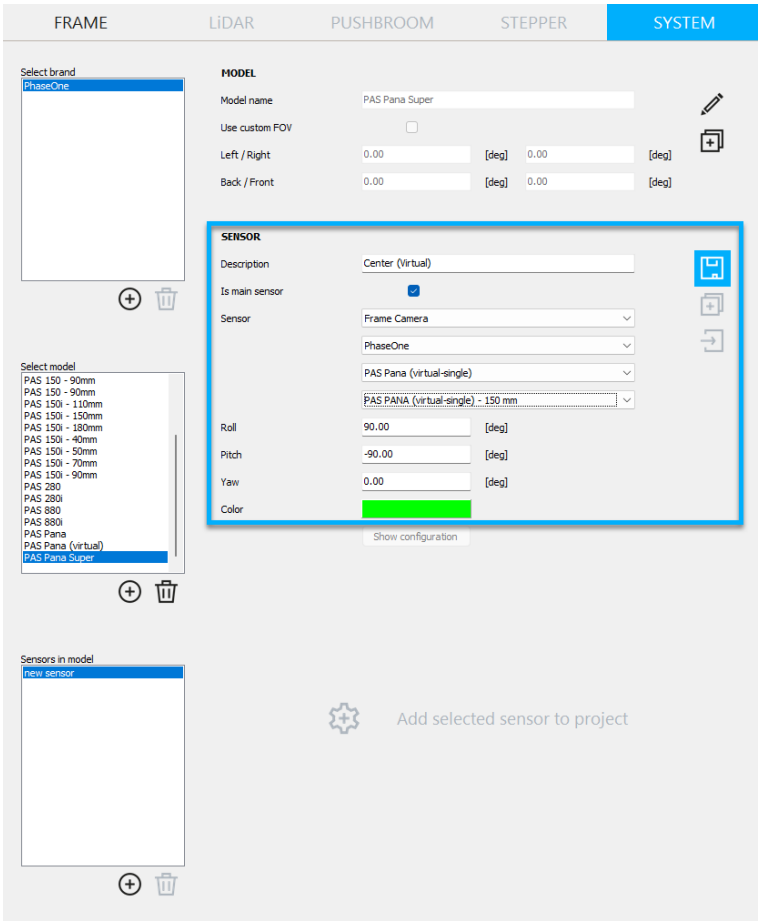
- The sensors for a system model are based on the models and their related configurations (focal length) listed in the FRAME page.
  Therefore, before you define a new system (model and sensors in the model), make sure the model and its configurations are defined in the Sensor **FRAME** page.
  If necessary, add there a new model and configurations as described in Section 6.5.1 - Adding a frame sensor.
- This option is only available for models and configurations that you created.

To add a sensor to a model:

1. In the **Select brand** box, click PhaseOne.
2. In the **Select model** box, click one of the models that you added.
3. Below the **Sensors in model** box, click ⊕ .



4. Under **SENSOR**:
    a. In **Description**, enter a name for the sensor.
    b. Select the **Is main sensor** checkbox as required.
    c. In the **Sensor** list, select **Frame Camera**.
    d. In the next 3 list boxes, select the parameters you require for brand, model and configuration.
    e. In the next 3 fields, define the **Roll**, **Pitch** and **Yaw**.
    f. Select the color to use for the model sensor in the visual overview.
5. Click 



6.6. Deleting sensors from database

> **Note**
> This option is only available for models and configurations that you created.

To delete a frame sensor model or configuration or a system model or sensor in model:

1. In the **Select model** or **Select configuration** or **Sensors in model** box, select the item to delete.
2. Under the box, click  .

7. Defining flight lines

This section describes how to use the basic features required for creating a simple flight plan as follows:

7.1. Accessing the Flight Lines Settings

To access and configure general flight line settings:

1. In the Navigation bar, click  .
2. If you added multiple sensors to the project: in the secondary sidebar, under **Sensor**, select the sensor you will use to plan the flight. The **Distance between flight lines** parameter under **Basic metrics** is updated accordingly.

> **Note**
> iX Plan 2024 uses the parameters of the sensor you select to calculate flight lines and trigger points.

7.2. Configuring flight line basic metrics

> **Note**
> Any parameters you modify under **Basic metrics** are also modified in the Configuring the sensors.

To configure flight line basic metrics:

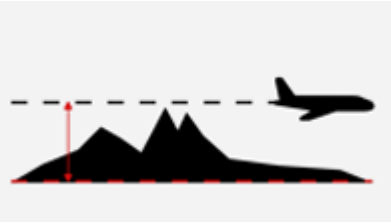
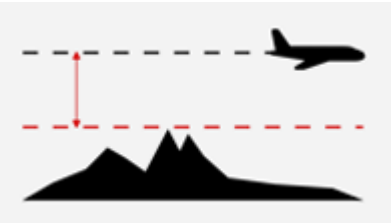
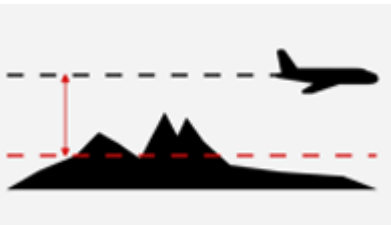
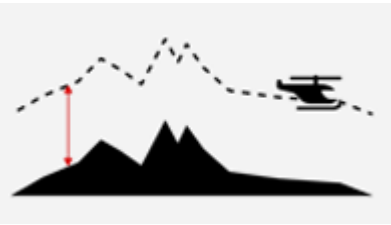
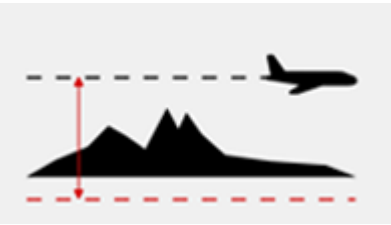
1. In the secondary sidebar, under **Basic metrics**, configure the following parameters:

Parameter	Description
GSD	Ground Sample Distance - the distance on the ground that each pixel in an image represents (the physical size of one pixel in the real world). Modifying the GSD adjusts the HAGL accordingly.
HAGL	Height Above Ground Level - the difference between the flight altitude and the terrain height. Modifying the HAGL adjusts the GSD accordingly.
Forward [min]	The minimal forward overlap between one image and the next along the flight line. Use this value to ensure the image sequence time is met, i.e. the camera has enough time (depending on the distance/flying speed) to capture each image in regard to its hardware capabilities. **Note** • The first parameter is the minimal forward overlap as a percentage. • The second parameter is the minimal distance in meters between 2 image locations. In mountainous regions, you need a low minimal distance to ensure that large variations in terrain over a small distance are captured.
Sidelap [mean/min]	The mean overlap between two flight lines. **Note** • The first parameter is the mean sidelap as a percentage. • The second parameter is the minimal sidelap as a percentage. Modifying the sidelap adjusts the Distance between flight lines accordingly.
Distance between flight lines	Use a specified portion of the stereoscopic area to calculate the distance to the next flight line. Modifying the Distance between flight lines adjusts the sidelap accordingly.

7.3. Calculating altitude settings

To configure the parameters for the flying altitude and altitude rounding:

1. In the secondary sidebar, under **Calculate altitude from**, select one of the following options:

Min. terrain Lowest terrain elevation	
Max. terrain Highest terrain elevation	
Mean terrain Recommended in most scenarios	
Terrain following Constant height above ground	
Fixed altitude Enter value in [m] or [ft].	

Note
These settings (and additional altitude settings) can also be configured in General settings.

7.3.1 Altitude rounding

In the secondary sidebar, under **Calculate altitude from**, select the **Rounding** checkbox and define the parameters as follows:

[rounding increment]	The step size used to round the altitude.
[unit]	Specifies whether altitude is measured in feet (ft) or meters (m).
up	Rounds altitude up to the next multiple of the rounding increment. **Example**: 4711 ft -> 4800 ft for a rounding increment of 100 ft.
down	Rounds altitude down to the previous multiple of the rounding increment. **Example**: 4711 ft -> 4700 ft for a rounding increment of 100 ft.
closest	Rounds altitude up or down to the nearest multiple of the rounding increment. **Example**: 4749 ft -> 4700 ft and 4750-> 4800 ft for a rounding increment of 100 ft.

7.4. Drawing a flight line

Note

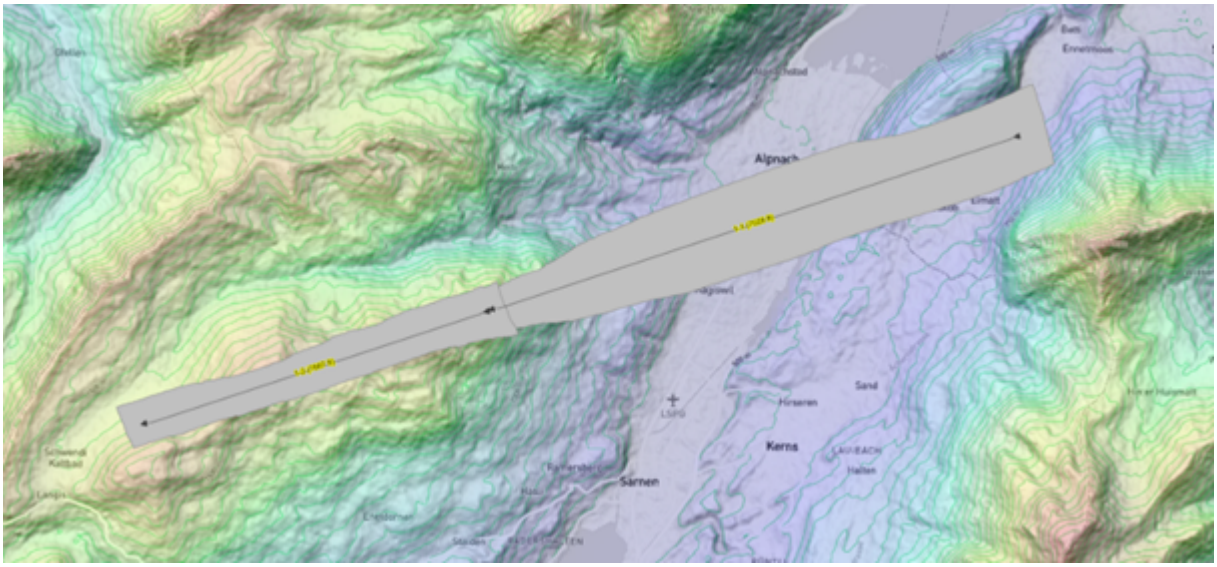
- Flight line segments are not currently supported by iX Flight Pro.
- Flight lines can only be drawn in areas for which elevation data has been downloaded. In the layers panel, make sure the layer containing elevation data encompasses your area of interest. If it doesn't, navigate to  and Updating the elevation model (DTMs).

To draw a single flight line:

1. Before drawing a line, in the secondary sidebar under Calculate altitude from, select and/or check the following constraints:
   - Min. terrain
   - "Max. terrain" on the previous page
   - Mean terrain
   - Terrain following
   - Fixed altitude
   - Altitude rounding

Note

In areas with significant terrain variations it can be useful to have multiple flight line segments, each with a different elevation. Go to ⚙, select **Flight lines** and select the **Allow line stepping** checkbox. Specify above which difference in height iX Plan 2024 may apply line stepping automatically.



2. Click ⊹.
3. In the workspace, click the location where the flight line begins.
4. Move the mouse to the location where the flight line ends and click again.
5. To continue drawing a new segment of the flight line, move the mouse as described in the above steps. Otherwise, right-click the map.

Note

If a buffer was added to the AOI, the flight line extends to the buffer perimeters.

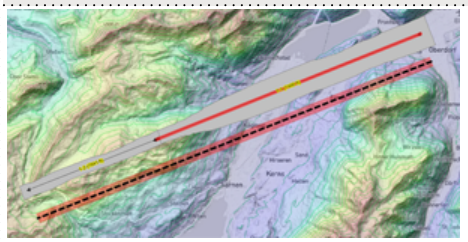
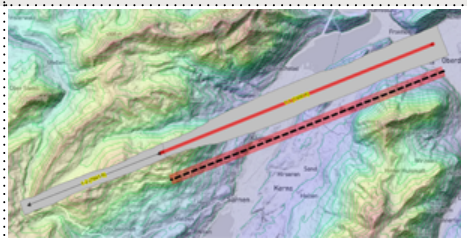
Flight line identification is based on two integer numbers (example: 35-2). The first represents the flight line and the second the segment (or part) of the flight line. It is possible to Setting the IDs of flight line(s).

For wide area planning, all lines with a common first number are on a straight line.

Note

For various flight line modifications described in the following chapters, you can opt to alter either the entire line (comprising all segments) or a single segment.

Example

Copy line:	Copy segment:
	

7.5. Editing flight line(s) and segments

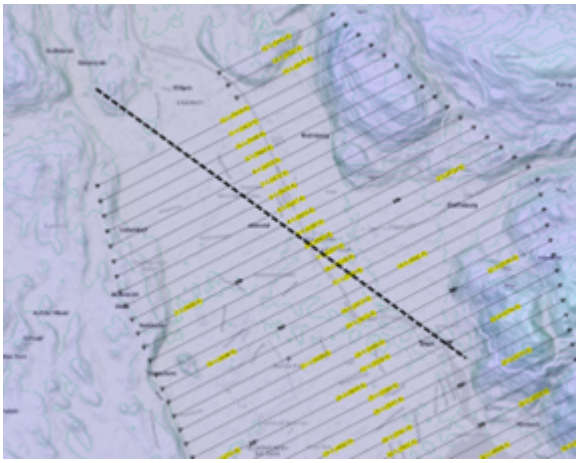
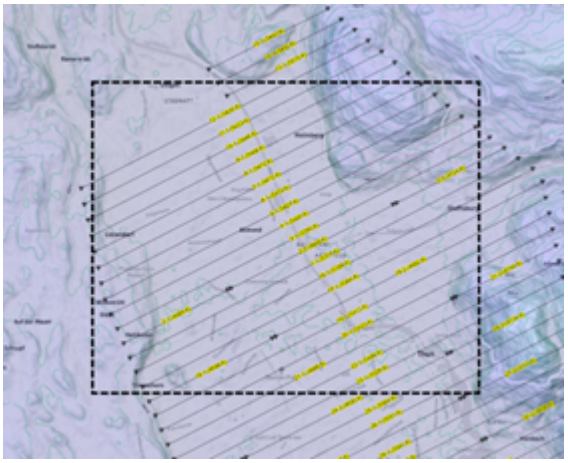
Note

Flight line segments are not currently supported by iX Flight Pro.

To edit a flight line:

1. Click  .
2. Select the required option from Select options.
   - **Edit vertices of a single line** and **Move line parallel** enable the modifications Fix azimuth and Fix height options under **Modify options**.
   - **Single segment**, Multiple segments and All segments enable all options but **Fix azimuth** and **Fix height**.
3. Select the Type by choosing For various flight line modifications described in the following chapters, you can opt to alter either the entire line (comprising all segments) or a single segment. .
4. Select the required unit **m** or **ft**.
5. Adjust the **Modify options** as required.
6. Apply the options that you modified as follows:
   - **Edit vertices of a single line**: left-click the line you want to edit.
   - **Move line parallel**: left-click the line and drag it parallel, then left-click again to finalize its placement.
   - **Single line**: left-click the line you want to edit.

- Multiple lines

default	SHIFT-pressed
Left-click and drag the mouse across the lines you want to select for modification.	Left-click and drag the mouse to open a rectangle for the selection of lines.
	

- All lines: click the workspace and in the message that appears, confirm that you want to continue.

7.6. Deleting flight lines

To delete flight lines:

1. Click .
2. Select the required option from Select options.
   - Single line: left-click the line you want to delete.
   - Multiple lines: left-click and drag the mouse across the lines you want to edit. Use the default to employ the rectangle tool. When you release the mouse button, the lines are deleted.
   - All lines: click the workspace and in the message that appears, confirm that you want to continue.

7.7. Setting a buffer around an AOI

It is recommended to add a good buffer around the AOI (minimally the surrounding flight altitude length), especially when planning an oblique mission.

To set a buffer around the AOI:

> **Note**
> While the AOI is selected
> - it is not possible to draw lines outside the perimeter.
> - every new flight line inside the AOI is extended to the border of the AOI.

1. Click  .
2. Enter the required buffer in meters.
3. Click the AOI that will be buffered.

A new border (default color: yellow) appears around the AOI.

7.7.1 Extending flight lines beyond the AOI

When adding flight lines, you can specify if and by how much the added flight lines extend beyond the AOI. The option you select applies to both to parallel added flight lines as well as flight lines that you draw manually.

To extend added flight lines beyond the AOI:

1. Click  .
2. Select the AOI.
3. Select the **Extend lines beyond AOI** checkbox.
4. Configure the required extension options as follows:
   - **In line direction** - select the checkbox and enter the maximum distance beyond the AOI in which the added line can extend in the same direction as the copied line.
   - **Parallel to lines** - select the checkbox and enter the maximum distance beyond the AOI in which the added line can extend in parallel to the copied line.
   - **Sensor Footprint based on HAGL** - lines that you add extend beyond the AOI according to the sensor footprint. This option automatically selects the above two checkboxes and adjusts the line extension distance accordingly.

7.8. Adding flight lines automatically

> **Note**
> - Flight line segments are not currently supported by iX Flight Pro.
> - At least one flight line must be present before you can add additional lines automatically.

7.8.1 Copying a flight line

> **Note**
> You can specify if and by how much the added parallel flight lines extend beyond the selected AOI (see Section 7.7.1 - Extending flight lines beyond the AOI).

To copy a flight line:

1. Click  .
2. Select For various flight line modifications described in the following chapters, you can opt to alter either the entire line (comprising all segments) or a single segment. .
3. Click **Copy flight line**.
4. Click **Parallel copy**.
5. Scroll down and select the **Use altitude from the reference flight line** checkbox to apply the flight altitude (not HAGL!) of the source line to the target line.
6. Click the source flight line.
7. Move the mouse up or down to the target location and click the map to create the target line.

To copy a flight line to a fixed distance from the source line:

1. Click  .
2. Select For various flight line modifications described in the following chapters, you can opt to alter either the entire line (comprising all segments) or a single segment. .
3. Click **Copy flight line**.
4. Click **Parallel copy** and enter the distance in meters that the new line will be from the source line.
5. Scroll down and select the **Use altitude from the reference flight line** checkbox to apply the flight altitude (not HAGL) of the source line to the target line.
6. Click the source flight line.
7. Move the mouse up or down to the target location (fixed distance) and click the map to create the target line.

To copy a flight line in line with the original line:

1. Click  .
2. Select For various flight line modifications described in the following chapters, you can opt to alter either the entire line (comprising all segments) or a single segment. .
3. Click **Copy flight line**.
4. Click **In line copy**.
5. Scroll down and select the **Use altitude from the reference flight line** checkbox to apply the flight altitude (not HAGL!) of the source line to the target line.
6. Click the source flight line.
7. Move the mouse right or left to the target location and click the map to create the target line.

7.8.2 Filling a shape with parallel lines

> **Note**
> You can specify if and by how much the added parallel flight lines will Extending flight lines beyond the AOI.

To fill all of a selected shape with parallel lines:

1. Select the shape you want to fill.

   > **Note**
   > At least one flight line must be present in the selected shape.

2. Click  .
3. Click **Parallel lines**.
4. Click **Fill whole selected shape**.
5. Scroll down and select the **Use altitude from the reference flight line** checkbox to apply the flight altitude (not HAGL!) of the source line to the target lines.
6. Click the flight line you want to copy (original). The selected shape is filled with lines that are parallel to the line you selected.

To fill the selected shape to the left or right of an existing flight line:

1. Select the shape you want to fill.

   > **Note**
   > At least one flight line must be present in the selected shape.

2. Click  .
3. Click **Parallel lines**.
4. Click either **Fill selected shape left of the line** or **Fill selected shape right of the line**.
5. Scroll down and select the **Use altitude from the reference flight line** checkbox to apply the flight altitude (not HAGL!) of the source line to the target lines.
6. Click the flight line you want to copy (original). The "left" or "right" side of the selected shape is filled with lines that are parallel to the line you selected.

To add a fixed number of flight lines in the selected shape to the left or right of an existing flight line:

1. Select the shape you want to fill.

   > **Note**
   > At least one flight line must be present in the selected shape.

2. Click  .
3. Click **Parallel lines**.
4. Click **Add lines** and enter the number of lines you want to add in the Left and/or Right boxes.

5. Scroll down and select the **Use altitude from the reference flight line** checkbox to apply the flight altitude (not HAGL!) of the source line to the target lines.
6. Click the flight line you want to copy (original). The "left" or "right" side of the selected shape is filled with the number of lines you specified up till the AOI perimeter.

7.9. Breaking a flight line

Flight lines can be broken when it is necessary to change the image scale due to terrain. After a line is broken, each section is recomputed and gets its own flight height.

To break a flight line into two sections:

1. Click  .
2. Set the required overlapping constraints (distance or images).
3. Click the flight line at the location where you want it to be slit into two lines.

7.10. Modifying the altitude of flight line(s)

To modify the altitude of flight lines:

1. Click  .
2. Select the required option from **Select options**.
   - **Single line** - left-click the line you want to modify.
   - **Multiple lines** - left-click and drag the mouse across the lines you want to modify. Use the default to employ the rectangle tool. When you release the mouse button, the lines are modified.
   - **All lines** - click the workspace and in the message that appears, confirm that you want to continue.
3. Select the altitude units display to **m** or **ft**.
4. Select the update method:
   - **Fixed altitude** - sets the altitude to the value you enter.
   - **Round altitude** - rounds the current altitude to the nearest value you enter.

7.11. Modifying the direction of flight line(s)

To modify the direction of flight lines:

1. Click  .
2. Select the required option from **Select options**.
   - **Single line** - left-click the line you want to modify.
   - **Multiple lines** - left-click and drag the mouse across the lines you want to edit. Use the default to employ the rectangle tool. When you release the mouse button, the lines direction are modified.
   - **All lines** - click the workspace and in the message that appears, confirm that you want to continue.

7.12. Setting the IDs of flight line(s)

To set the IDs of flight lines:

1. Click .
2. Select the required option from Select options.
   - Single line - enter the value of the new ID and left-click the required line.
   - Multiple lines - enter the values for the first new line ID and the increment by which to increase the ID of the other lines, then left-click and drag the mouse across the lines you want to renumber. Use the default to employ the rectangle tool. When you release the mouse button, the lines are renumbered.

7.13. Recalculating flight line(s)

The recalculation methods use the current Basic metrics displayed in the secondary sidebar.

To recalculate flight lines:

1. Click .
2. Select the recalculation method:
   - Single line - left-click the line you want to recalculate.
   - Multiple lines - left-click and drag the mouse across the lines you want to recalculate. Use the default to employ the rectangle tool. When you release the mouse button, the lines are recalculated.
   - All lines - click the workspace and in the message that appears, confirm that you want to continue.
3. Select the required recalculation method:
   - Recalculate whole flight line - only start and end points from the existing flight line are used to freshly calculate the flight line based on the current settings for:
     - Sensor
     - HAGL/GSD
     - Forward overlap
   - Recalculate image positions - flight line geometry remains the same. Only image positions are recalculated based on the current settings for:
     - Forward overlap
   - Recalculate footprints - only footprints between flight lines are recalculated.
   - Recalculate overlaps - only overlaps are recalculated.

> **Note**
> This function is a powerful tool if you want to make partial changes to the flight plan.
>
> Example for adjusting the forward overlap of a single line:
>
> 1. Create all flight lines using parallel copy and the standard configuration.
> 2. Under Basic metrics, enter a new forward overlap value.
> 3. Recalculate image positions for one or more lines as described above.

8. Performing Quality Control

This section describes how to add layers with color-coded maps for quality control checks of generated flight lines as follows:

8.1. Critical reasons for QC checks

iX Plan 2024 enables you to perform several quality control (QC) checks to assist you in evaluating if your flight plan meets the project requirements. These checks appear as an overlay over the map in the layers panel.

QC maps are georeferenced TIFF files stored in the project folder and serve the following functions:

- **During the planning** - if you are planning a flight over difficult terrain with highly restricted project requirements (such as small tolerances for minimal and maximal GSD, or low tolerance for point density variation), you can create a QC-map over a portion of the area to check whether you fulfill the project criteria or if you must add extra lines locally.
- **Final proof of the flight plan** - QC maps are frequently used as an important part in a project proposal or quote to show the customer that the flight plan fulfills all project requirements.

> **Note**
> QC maps give a far better understanding of the flight plan quality than statistical values. For example, the flight line statistics show that the GSD exceeds the maximal allowable GSD. But the QC maps shows that the portion of the flight line where the GSD is too high is where the line crosses a valley and adding another flight line along the valley will compensate for the high GSD. For this reason, it is recommended to present QC maps instead of statistics on single flight lines.

8.2. Types of QC maps

Quality control maps can be generated for:

- **HAGL** (Height above ground level) - used especially in mountainous areas for low height flights to check if flight lines are not too close to mountain ridges or if the airplane has enough space in deep valleys to turn into the next line.
- **Sidelap** - the lateral overlap of terrain by two or more flight lines. Click **Units** and click **Forward overlap [%]** for the resulting map to contain the best ratio of two adjacent image footprints on the same flight line.
- **Amount of overlaps** - number of lateral overlaps. Click **Units** and select whether to compute the number for **Lines** or **Images**.
- **GSD (Ground sample distance)** - shows the GSD in different colors for each location.

- Radial object displacement - the wider the lens angle, the greater the resulting image displacement (building lean) in an image. A camera with a wide-angle lens requires much more lateral overlap between flight lines than a camera with a narrow FOV. Therefore, modern project requirements do not define a minimal lateral and longitudinal overlap anymore. Instead, the requirements specify a maximal building lean value (for example, a maximal allowable building lean of 20% means that a building of 10 m height shall not cover more than 2 m of the underlying terrain). The image displacement QC map shows if the overlap is correctly set to remain under the given maximal value.

8.3. Creating QC maps

For each QC check, you can define how the check results are displayed in the map panel, such as color thresholds, units of value legend placement and grid resolution.

How to create a QC map

1. In the Navigation bar, click  .
2. In the secondary sidebar, under Sensor selection, select the sensor for which you wish to perform a quality check.

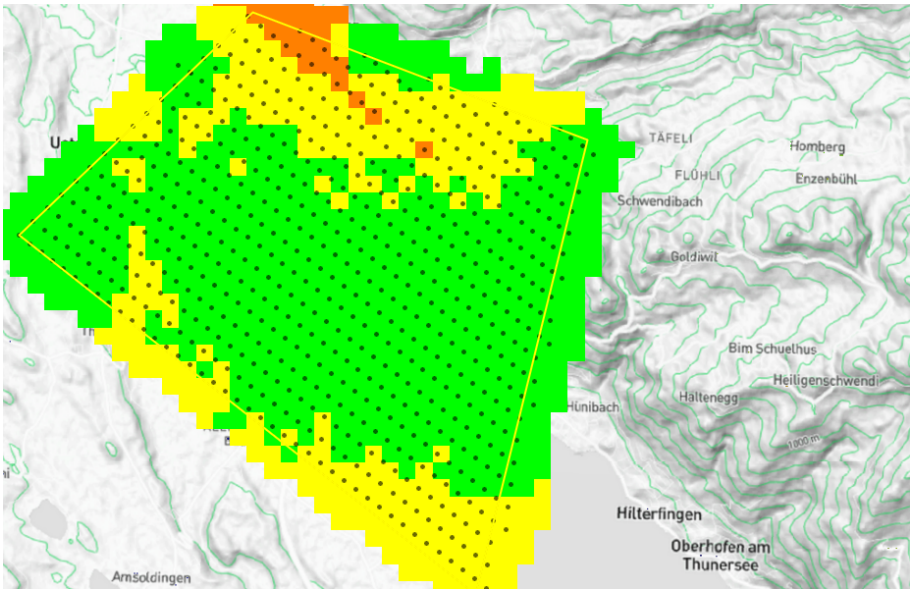
> **Note**
> - In projects with only one sensor, it is selected by default.
> - If you selected a system sensor, in the second list you can also select one or more individual sensors of the system.

3. Select the type of QC map as follows:
   -  Height above ground level (HAGL)
   -  Sidelap
   -  Amount of overlaps
   -  Ground sample distance (GSD)
   -  Radial object displacement
4. For each QC map type, a configurable legend appears with suggested colors and corresponding value ranges.
   To modify individual ranges, click a row, update the minimum, maximum, and optionally, the legend, and then click the + symbol to the left of the box.

> **Note**
> For GSD maps, all areas below the GSD selected in the Flight lines settings are colored green. It is recommended to adjust the value range so that areas with a marginally larger GSD are included in this range as well.

5. In the Units list, select the required unit of measurement.

6. Scroll down and click **Create map**.

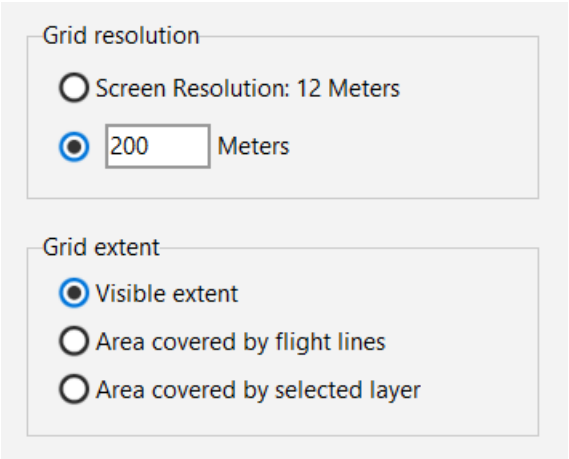


7. In the layers panel, click the new map layer and drag it to the top so that it will be displayed in the foreground.

> **Note**
> Modify the color map transparency value to enhance background base map visibility. Simply double-click the layer and adjust the transparency value.

8.4. Adjusting the grid

In the secondary sidebar, you can adjust the grid resolution and grid extent.



8.4.1 Grid resolution

1. Under **Grid resolution**, adjust the resolution of the QC map.

> **Note**
> - The screen resolution depends on the current zoom level in the workspace.
> - For an initial impression, a resolution of 200 m is recommended. A higher resolution requires more computing time.

8.4.2 Grid Extent

To select the grid extent:

1. Select one of the following options as required:
   - the visible extent
   - the area covered by flight lines
   - the area covered by layer selected in the layers panel

8.5. Displaying individual raster element values

In the status bar, you can change the default selection from Terrain to a QC map that was generated, such as GSD. The **Cell value** will then reflect the GSD value of the raster element that the mouse is hovering over.

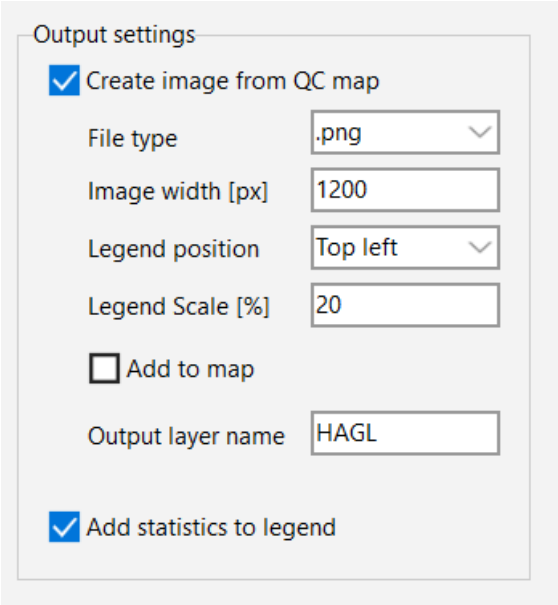
8.6. Creating an image file

QC maps are generated as raster maps, not images.

To configure the QC map output settings:

1. Under **Output settings**, select the required settings.

> **Note**
> You can also right-click the QC map layer in the layers panel and click **Save Layer as Image** to open a window with the output settings.



2. To display the image in your workspace, select the **Add to map** checkbox. A new layer with the ending **_export** will be added in the layers panel.

> **Note**
> - The georeferenced image is automatically saved in the project folder.
> - The data for the image file is rendered and is not in the raw, original layer format.

To enhance your legend by adding statistics regarding the percentage of area within each value range:

1. Under **Output settings**, click the **Add statistics to legend** checkbox.

9. Performing Queries

This section describes how to gain a deeper understanding of your flight plan by using the tools available in the **Queries** page as follows:

To access the Queries tools:

1. In the Navigation bar, click Queries.
2. At the top of the Queries sidebar, click the tool you require (from left to right):
   - Measure distances and areas
   - Image position queries
   - Flight line queries
   - Sun elevation queries

9.1. Measuring distances and areas

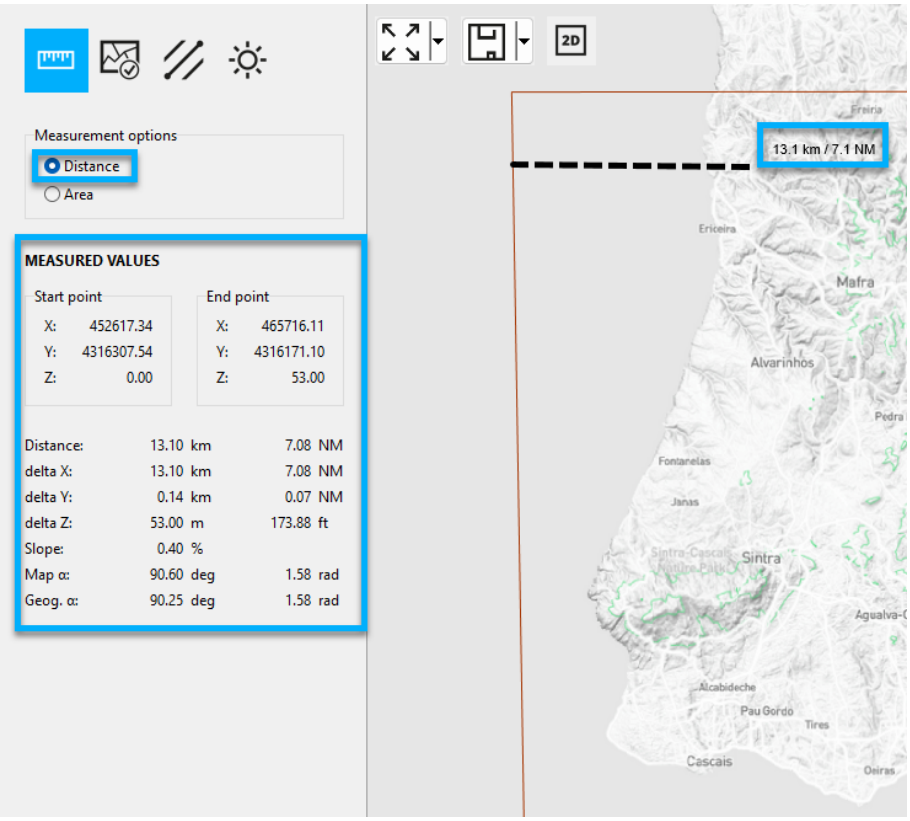
9.1.1 Measuring distances

Determine the distance between two points on the map using the built-in measurement function. Use this feature to precisely measure distances and to gain insights into height differentials and azimuth values for your planning and analysis requirements.

To measure distances:

1. At the top of the secondary sidebar, click .
2. Click **Distance**.
3. On the map, click the measurement starting point.

4. Move your mouse cursor across the map to the required endpoint. As you progress, the distance measured is displayed near the cursor and the MEASURED VALUES in the secondary sidebar are updated.



5. Right-click the map to end the measurement.

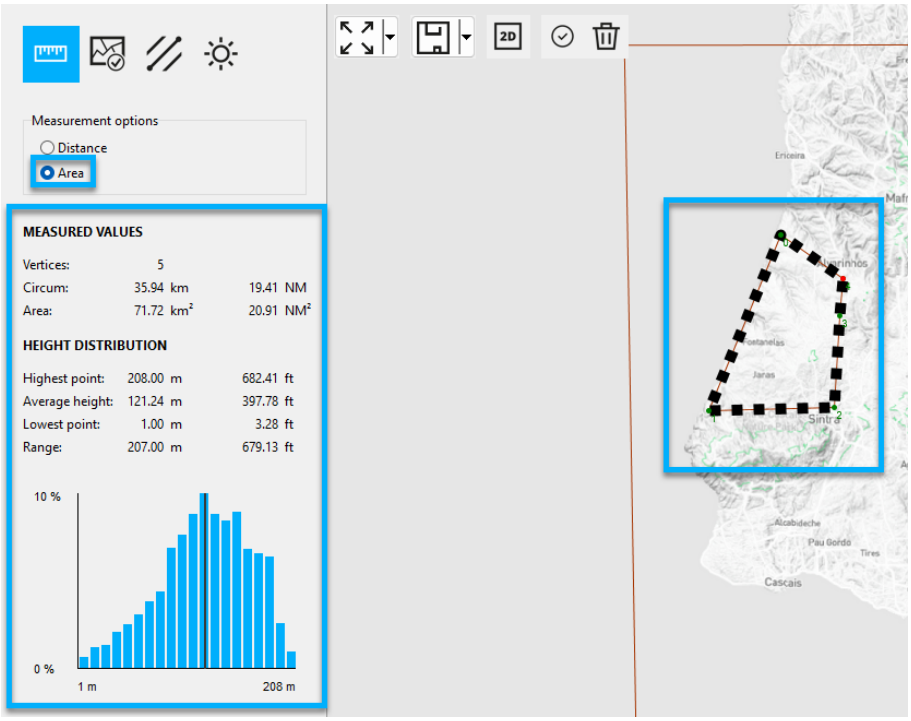
9.1.2 Measuring areas

iX Plan 2024 provides a useful tool to measure the extent of areas.

To measure areas:

1. At the top of the secondary sidebar, click .
2. Click Area.
3. On the map, click the first point of the area. A first vertex for the polygon becomes visible.

4. Click all the positions to form your required polygon. Once your polygon comprises more than two vertices, measurement values for the area appear in the secondary sidebar. Additionally, a histogram showing the height distribution within the specified area is presented, with a vertical line indicating the average terrain height.



Note

To adjust the polygon, move the vertices as follows:

- Click the vertex you want to move. The vertex will become red.
- Drag the vertex to its new destination.
- The polygon with the dashed line and the measurement values are updated.

5. Right-click the map to end the measurement.

9.2. Performing image position queries

Image sequence queries menu offers different methods for selecting image positions.

> **Note**
> The correct layer must be at the top of the layer panel for this feature to operate properly.

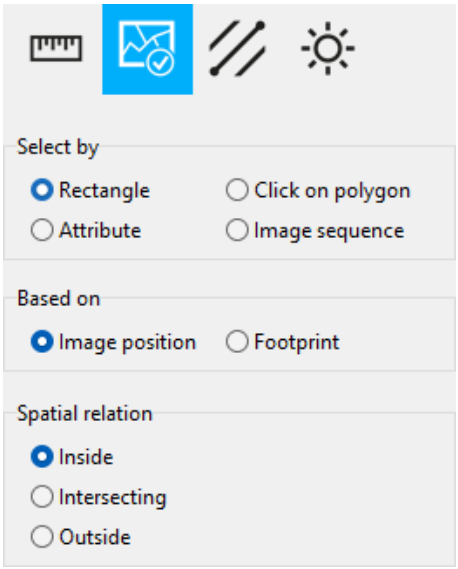
You can perform different image position queries based on the following main types:

- Spatial - based on an area you select (either rectangle or polygon).
- Attribute - based on criteria you select related to image parameters.
- Image sequence - based on the criteria you select related to image capture parameters.

> **Note**
> After performing the query, use the selection to modify your flight plan (see Section 9.2.4 - Selection Actions).

9.2.1 Image position queries - spatial type

To perform queries based on an area you select on the map (Rectangle or Click polygon):

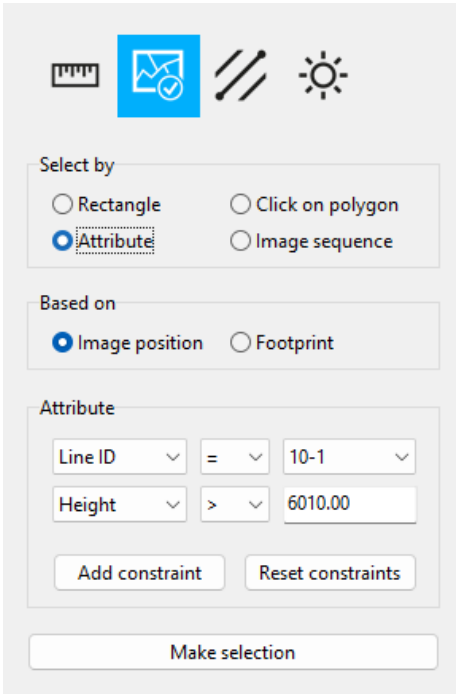


1. At the top of the secondary sidebar, click .
2. Under **Select by**, click the required option for specifying how to perform the selection for the spatial query:
   - **Rectangle** - drag the mouse on the map to select an area.
   - **Click on polygon** - click an existing defined area on the map.
3. Under **Based on**, select whether the function should be based on the **Image position** or its **Footprint**.
4. Select one of the following geographical context options:
   - **Inside:** All image positions/footprints will be selected if the point or footprint is entirely inside the reference area. The shape will not be selected if it touches the reference area.
   - **Intersecting:** Image positions/footprints that fall within or touch the reference area will be selected.
   - **Outside:** Image positions/footprints that fall outside of or do not touch the reference area will be selected.
5. Run the query as follows:
   - **Rectangle** - drag the mouse to select an area.
   - **Click polygon** - click an area that is already defined.

   All image positions matching the query are selected and highlighted on the map. and the total appears under **SELECTION STATISTIC** in the secondary sidebar.

9.2.2 Image position queries - attribute type

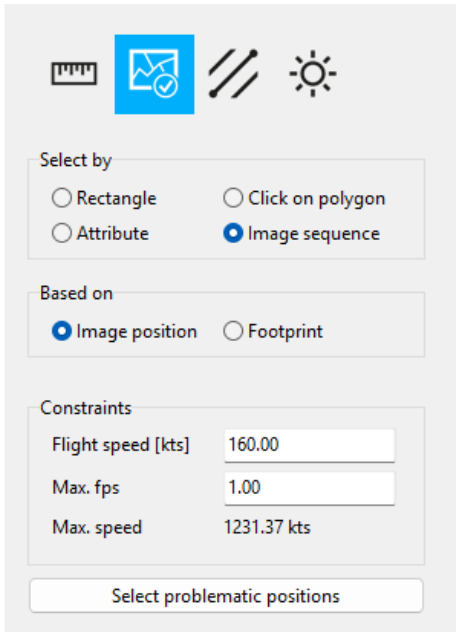
To perform queries using equations based on the area properties:



1. At the top of the secondary sidebar, click .
2. Under **Select by**, click **Attribute**.
3. Under **Based on**, select whether the function should be based on the **Image position** or its **Footprint**.
4. Under **Attribute**:
   a. Click the left list and click an attribute.
   b. Click the middle list and click an operator.
   c. Depending on the attribute you selected in the left list, either enter a value (for numeric fields, e.g. height) or click a list (for enumerated fields, e.g. Line ID).
5. Click **Add constraint** to add an additional row or rows. Define the new constraint as described in the previous step.
6. To run the query, click **Make selection**. All image positions matching the query are selected and highlighted on the map. and the total appears under **SELECTION STATISTIC** in the secondary sidebar.
7. To reset the query, click **Reset constraints**.

9.2.3 Image position queries - image sequence type

To perform queries that check the space between two image trigger points on the same flight line to ensure it adequately aligns with the camera capture rate limitation:



1. At the top of the secondary sidebar, click .
2. Under **Select by**, click **Image sequence**.
3. Under **Based on**, select whether the function should be based on the **Image position** or its **Footprint**.
4. Under **Constraints**, enter values for the **Flight speed [kts]** and **Max. fps** according to the airplane and camera, respectively. The system calculates and displays the **Max. speed** that can be flown based.
5. To run the query, click **Select problematic positions**. All image positions matching the query are selected and highlighted on the map. and the total appears under **SELECTION STATISTIC** in the secondary sidebar.

9.2.4 Selection Actions

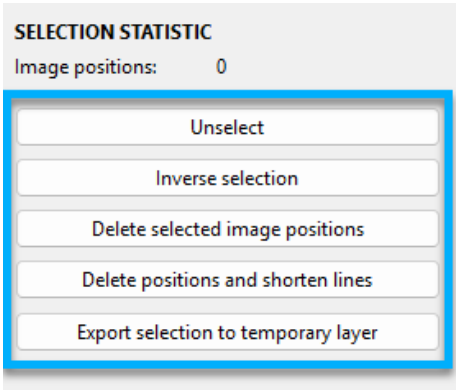
You can use the query results (point selections) to:

- Delete areas with unwanted image points, e.g. where no pictures may be taken.

- Shorten flight lines.
- Modify flight lines in areas where image points do not meet your requirements.

To perform actions based on the query result:

1. Click the buttons below SELECTION STATISTIC as required:
   - Unselect points
   - make an inverse selection
   - delete selected image positions
   - delete positions and shorten lines
   - export the selection to a temporary layer which will appear in the layers panel.



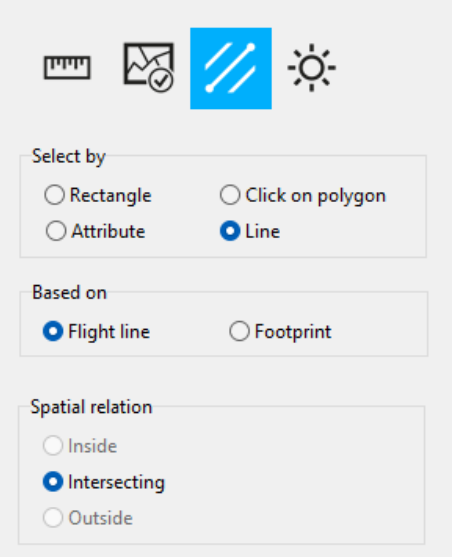
Caution

- Data point deletion cannot be undone! Click **Delete selected items** only if you are certain that your selection is accurate.
  If uncertain, use the Save as option and save the project under a different name before deleting items.
- Automatic flight line recalculation (see Section 7.13 - Recalculating flight line(s)) can be performed for accidentally deleted image points. However, you will need to manually fix shortened flight lines.

9.3. Flight line queries

Running flight line queries is similar to running image position queries except:

- **Line**type replaces **Image sequence**type. Select specific lines by clicking and then dragging the mouse (spatial relation is not available).
- **Flight line** replaces Image position.
- The **Attribute** list is larger.



To perform flight line queries:

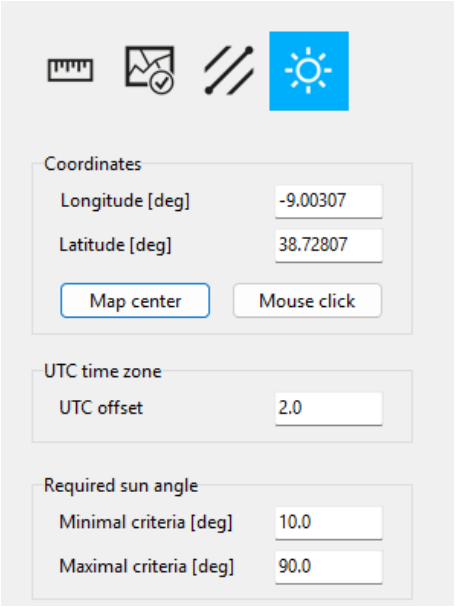
1. At the top of the secondary sidebar, click .
2. Use the same methodology described in Section 9.2 - Performing image position queries),

9.4. Sun elevation queries - knowing when to fly

The sun's elevation angle dictates the time window for the flight, spanning from sunrise to sunset. In addition, it is also a crucial determinant for capturing high-quality images. During low sun angle degrees shadows become excessively long and thus reduce the image quality. Large sun angle degrees during mid-day can cause reflections (particularly from water bodies) that become overly intense, leading to potential issues like cross-fade. Therefore, knowing the optimal time window for the flight is essential for obtaining the best outcome.

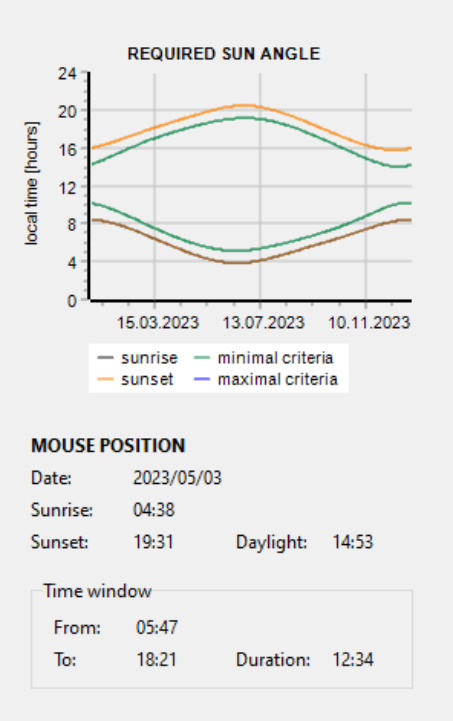
To determine optimal flight times:

1. At the top of the secondary sidebar, click .
2. Click either **Map center** or **Mouse click** to automatically fill out the coordinates.
   You can also enter the coordinates into the respective windows above the buttons.
3. If required, modify the UTM time zone by entering a value in **UTC offset**. The **REQUIRED SUN ANGLE** graph below will update accordingly.
4. Under **Required sun angle**, enter your minimum and maximum criteria in degrees.



The **REQUIRED SUN ANGLE** graph, illustrating sunrise, sunset, and the minimum and maximum sun angle criteria throughout the entire year, is updated.

5. To obtain a larger image that can be copied to the clipboard, click the graph.
6. Move the mouse over the diagram to show the flight time window for individual days of the year. If sun angle requirements exclude mid-day times, two time window boxes are shown.



10. Configuring Settings

This section describes how to configure various general settings in the Settings page as follows:

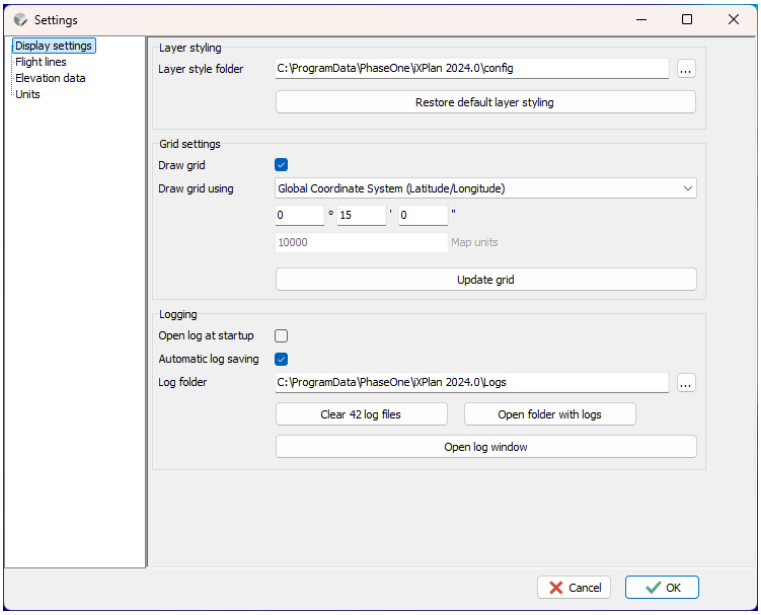
Note

You can also modify many settings iX Plan 2024 display and flight line settings in the various secondary sidebar menus and in the layers panel.

10.1. General settings

To access Settings:

1. In the Navigation bar, click **Settings**. The **Settings** window appears.



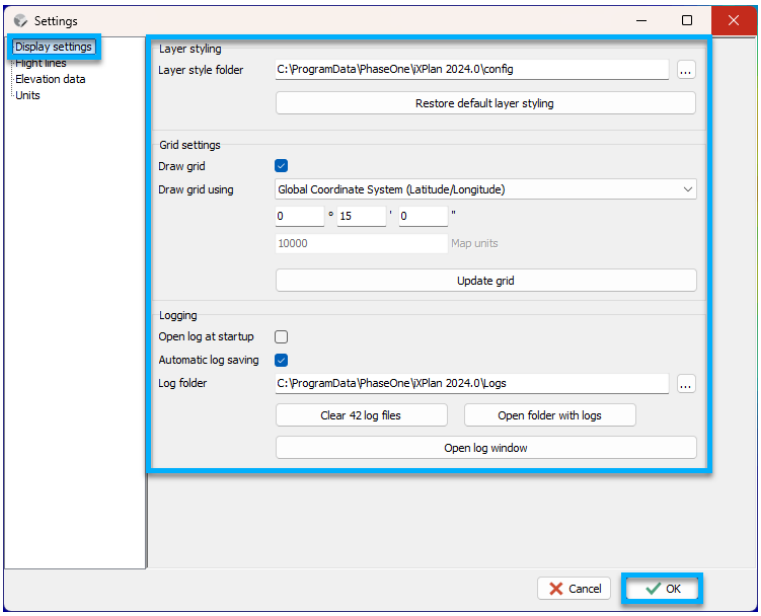
The Settings window has a navigation panel with the options below described in this section:

- Display settings
- Flight lines
- Elevation Data
- Units - (reserved for future use)

10.1.1 Display settings

To access the Display settings:

1. In the **Settings** window navigation panel , click **Display settings**.
2. Configure the settings as described below.
3. Click **OK**.



10.1.1.1 Layer styling

Under **Layer styling**, you can:

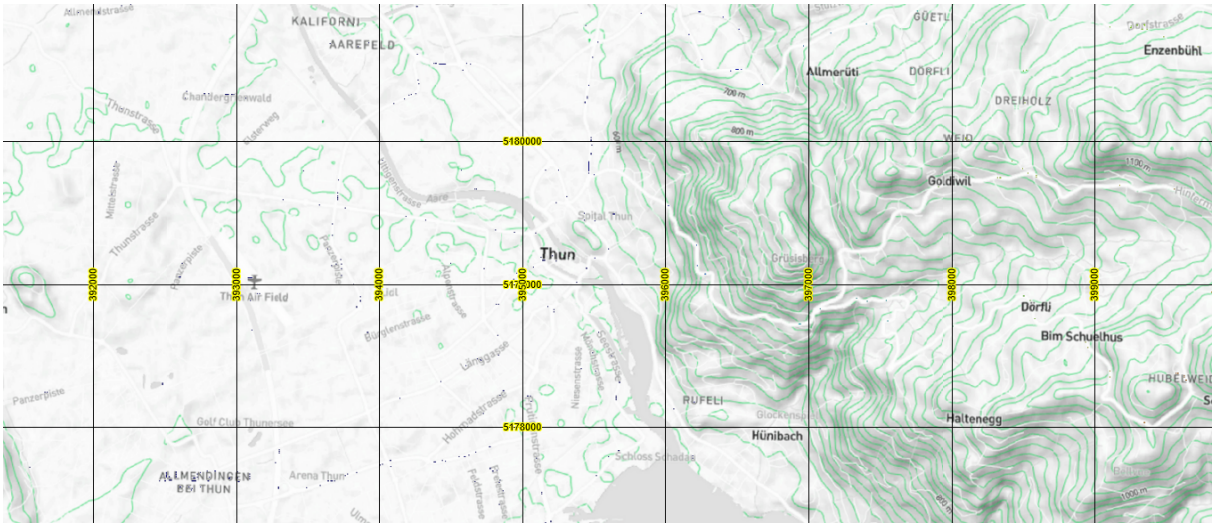
- Configure the path to the directory with your personalized layer styling (see Section 10.2 - Customizing layers).
- Click **Restore default layer styling** to revert to the default styling.

10.1.1.2 Grid settings

To change grid display parameters:

1. Under **Display settings**, select the **Draw grid** checkbox.
2. Configure the coordinate system and the grid spacing options.
3. Click **Update grid**.

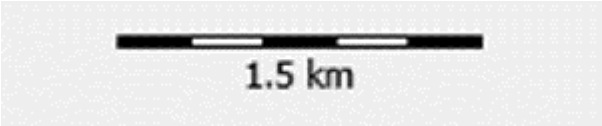
4. Click **OK**.



Map scale

To define the scale of a map:

1. In the workspace, click the scale at the bottom-right corner.
2. In the Input window, define the map scale (for example: 1:50000).



10.1.1.3 Logging

Under **Logging**, you can:

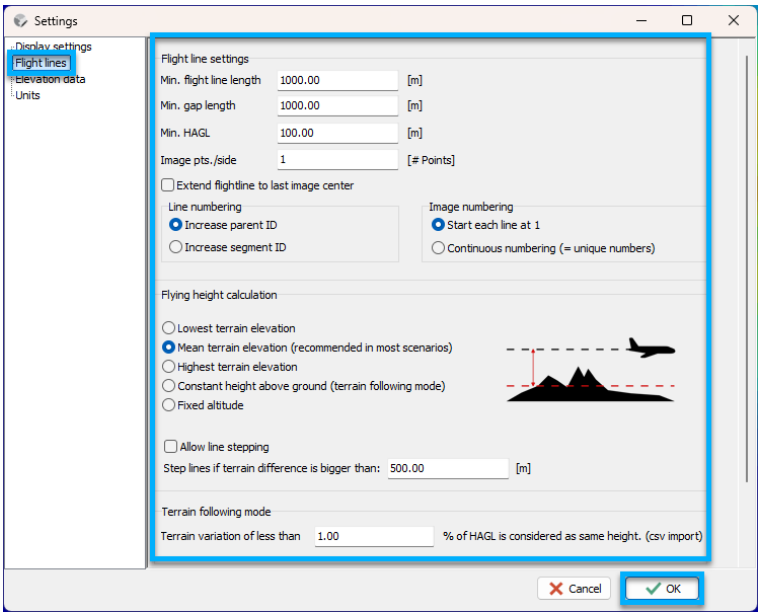
- Toggle the **Open log at startup** checkbox.
- Toggle the **Automatic log saving** checkbox.
- Define the **Log folder** location.
- Click **Clear XX log files** to delete log files.
- Click **Open folder with logs** to access the log files.
- Click **Open log window** to display the latest log messages and perform the following actions:
  - Click **Save logfile** to save these messages to a file.
  - Click **Clear logfile** to delete the displayed messages.
  - Click **Logging level** to filter the shown messages by severity (**Error** / **Warning** / **Info** / **Debug**).

> **Note**
> Some log messages can be used for flight line and point editing.

10.1.2 Flight lines

To access the Flight lines settings:

1. In the **Settings** window navigation panel , click **Flight lines**.
2. Configure the settings as described in the sections below.
3. Click **OK**.



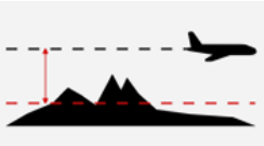
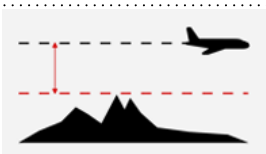
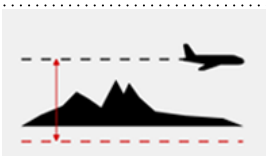
10.1.2.1 Flight line settings

The main flight line settings are described following:

Flight line setting	Description
Min. flight line length [m]	All flight lines will be at least this long. Use this setting to make sure all calculated flight lines are long enough for reasonable flight maneuvering.
Min. gap length [m]	The gap between two flight lines will be at least this wide.
Min. HAGL [m]	All calculated flight lines will be at least this high above the ground level. This ensures that the averaged flight line heights will be at least the specified height of meters above, for example, any mountain peaks. **Caution** This parameter overwrites the HAGL set in the sensor configuration (see Section 6 - Configuring the sensors).
Image pts/side	Determines how many points are calculated between the footprint corner points. Recommended setting: 1. Increasing this number will increase the computation time.
Extend flight line to the last image center	Select to maintain the required image overlap even for the last point of the flight line.
Line numbering	Set to **Increase parent ID**.
Image numbering	Select whether the image identifiers should commence at 1 for each line or have continuous numbering for the entire project.

10.1.2.2 Flying height calculation

- Flying height lines are calculated according to the method you select (displayed on the right) as follows:

Flying height calculation Method	Image displayed
Lowest terrain elevation Min. terrain.	
Mean terrain elevation Recommended in most scenarios.	
Highest terrain elevation Max. terrain.	
Constant height above ground Terrain following mode.	
Fixed altitude	

- To enable steps in height in an individual flight line, select the **Allow line stepping** checkbox and configure the value for **Step lines if terrain difference threshold is bigger than:** . This can be useful when there are large differences in height along a flight line and the mean terrain elevation becomes unsuitable.

> **Caution**
> Use **Line stepping** with caution since it interferes with the minimum HAGL.

10.1.2.3 Terrain following mode

When image positions are imported via CSV, iX Plan 2024 automatically generates flight lines. iX Plan 2024 requires clarification whether the positions are at the same flying altitude or were planned in terrain following mode.

Set the percentage of HAGL to manage the threshold.

> **Note**
> On CSV imports, specify the threshold (% of HAGL) iX Plan 2024 uses to identify terrain variations.

10.1.2.4 Overlap calculation

You can define the maximum intermediate angle between flight lines for which overlaps will be calculated in order to include or exclude adjacent flight lines.

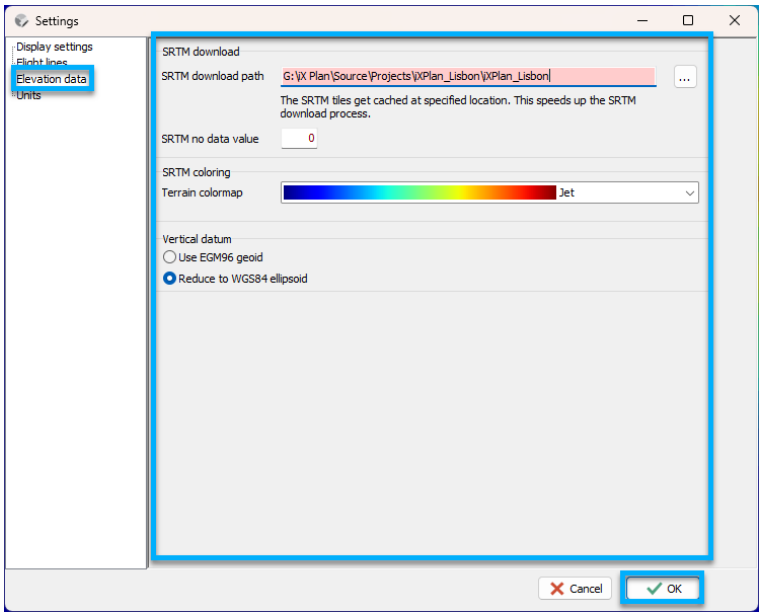
To adjust the intermediate angle for overlap calculation:

1. Adjust the value of the angle in degrees. A low value includes only nearly parallel lines, while a higher value also considers lines that are less parallel.
2. Click **OK**.
3. Recalculate the overlaps with the updated settings (see Section 7.13 - Recalculating flight line(s))

10.1.3 Elevation data

To access the Elevation data settings:

1. In the **Settings** window navigation panel , click **Elevation data**.
2. Configure the settings as described below.
3. Click **OK**.



10.1.3.1 SRTM Download

Set the following elevation data properties:

- **SRTM Download Path** - specifies the folder where SRTM files that you download for your projects are saved. You can modify the folder location.

> **Caution**
> Do not specify a folder that you cannot always access, such as on a server.

- **SRTM no data value** - specifies the value in meters to use when SRTM data is not available, such as above an ocean. Default value: 0

10.1.3.2 SRTM Coloring

Set the color scheme for differentiating between different altitudes in the SRTM data.

> **Note**
> The terrain color map you select will come into effect only after you redownloaded the SRTM elevation model.

10.1.3.3 Vertical Datum

- **Use EGM96 Geoid** (recommended) - the height reference system of the SRTM tiles and most other elevation data.
- **Reduce to WGS84 ellipsoid** - reduces SRTM data from EGM96 Geoid to WGS84 ellipsoid.

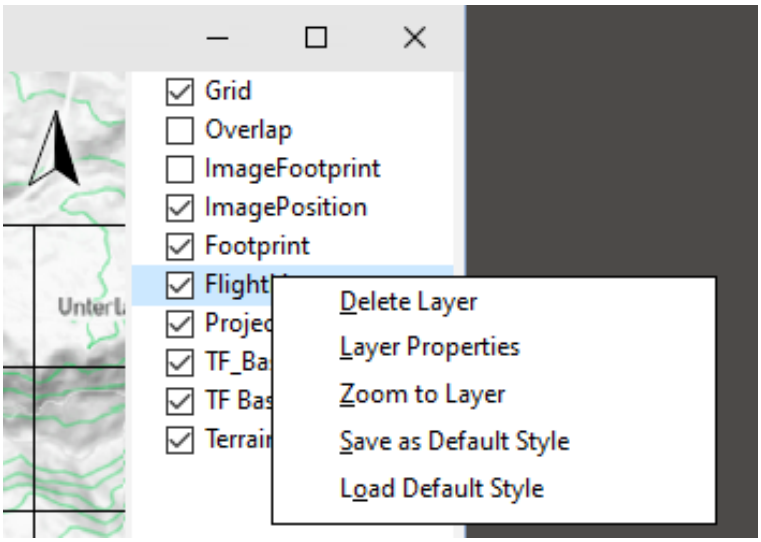
> **Caution**
> Your flight plan altitude values will be based on the WGS84 ellipsoid. Verify that your GPS/IMU settings are configured accordingly.

10.2. Customizing layers

To access various layer options such as the name of the layer or its transparency, in the layers panel either:

- double-click a layer.
- right-click a layer and click **Layer properties**.

> **Note**
> To change the front-back stacking order of layers, drag each layer up or down as required.



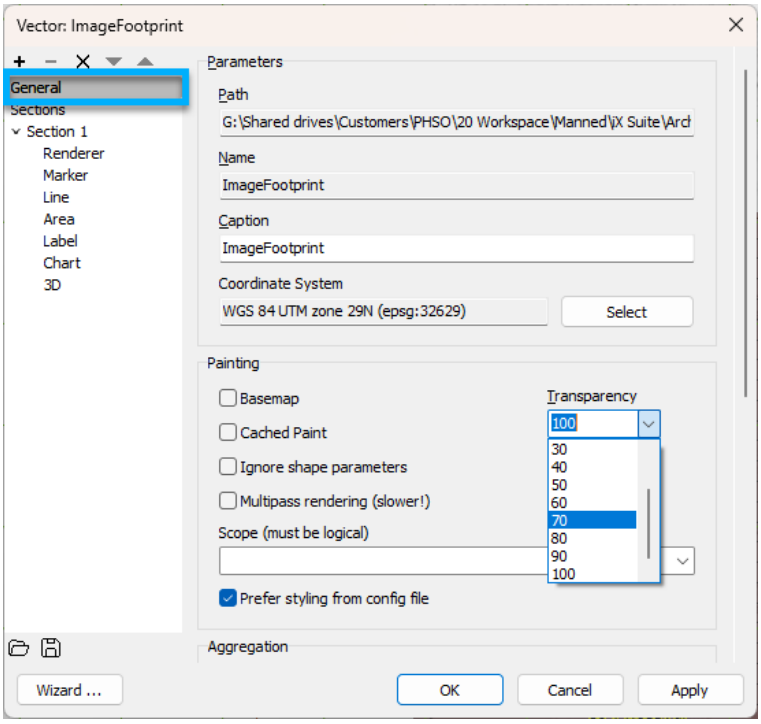
10.2.1 Customizing layer properties

You can define and save the properties of symbols, lines and other elements used in the individual layers.

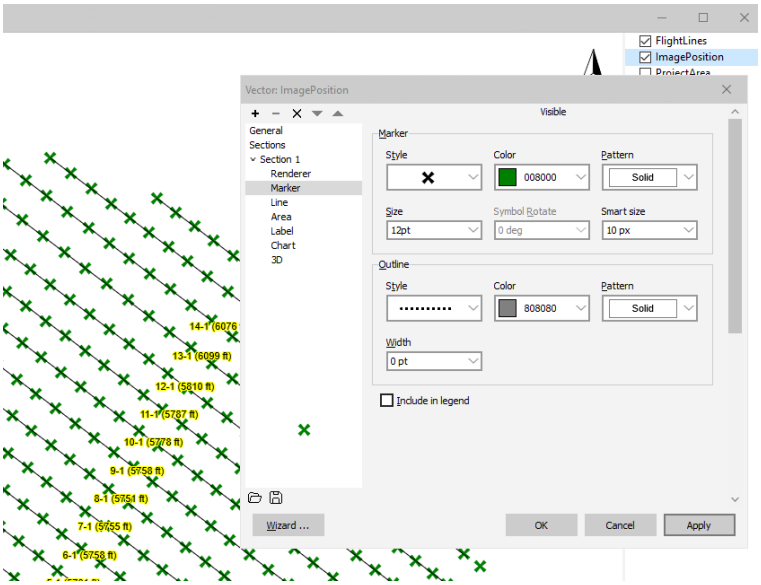
10.2.1.1 Personalizing markers

To personalize markers:

1. Open the required layer properties window.
2. Click **General** to select and modify the various parameters as required, such as the name of the layer or its transparency.



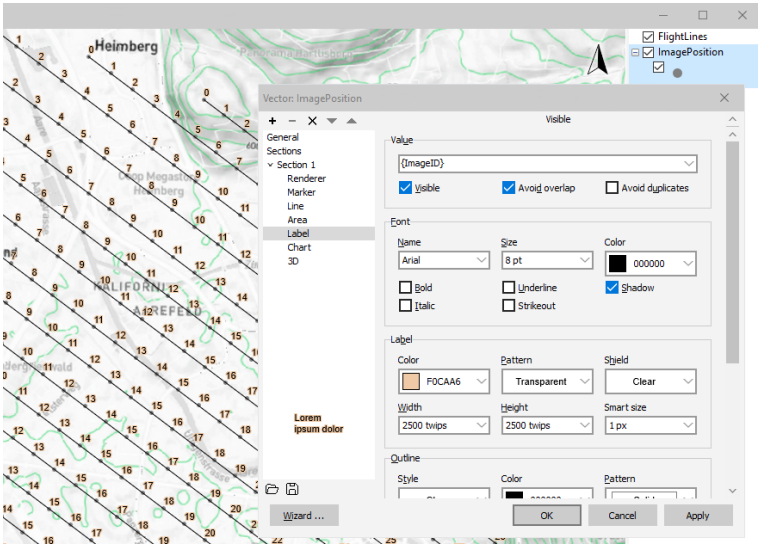
3. Click **Section** to customize items such as the color and style of markers, areas and lines. The example at right shows customized image position markers.



10.2.1.2 Personalizing labels

To personalize labels:

1. Toggle the **Visible** checkbox in the respective item to hide or display its label on the map. The example at right shows customized labels.
2. In the layers panel, right-click the layer name and click **Save as default style** to apply your style to any subsequent markers, areas or lines.



10.2.2 Saving layer styles

Saving layer styles:

1. In a Layer properties window, in the bottom left corner, click .
2. Enter a name for your layer style and click **Save** to save it as a TatukGIS layer Style file (*.ttkstyle).

10.2.3 Loading layer styles

Loading saved layer styles:

1. In a Layer properties window, in the bottom left corner, click the folder icon.
2. Select the path and name of the layer style file.
3. Click Open.
4. Click **OK** or **Apply**.

10.2.4 Deleting layers

Before deleting a layer, a message appears asking whether to delete the entire file from the project folder (**Yes**) or just remove the layer from the layers panel (**No**).

10.2.5 Zooming to layers

To fill the workspace to the extent of a layer:

- Right-click a layer name and click **Zoom to layer**.

> **Note**
> - Avoid zooming to the base map layer, as it will zoom out to the map view of the entire Earth.

To reset the project extent:

1. In the workspace, adjust the view by zooming in or out to capture the required project extent.
2. In the Navigation bar, click Project.
3. In the secondary sidebar, under PROJECT SETTINGS, click Set project extent.
4. is now reset to the selected area.

10.3. 3D view mode

You can get a more comprehensive perspective of your flight plan through 3D visualization.

> **Note**
> Prior to switching to the 3D mode, configure the current 2D view to display the content you wish to observe in the 3D mode, such as clicking for displaying the entire project extent.

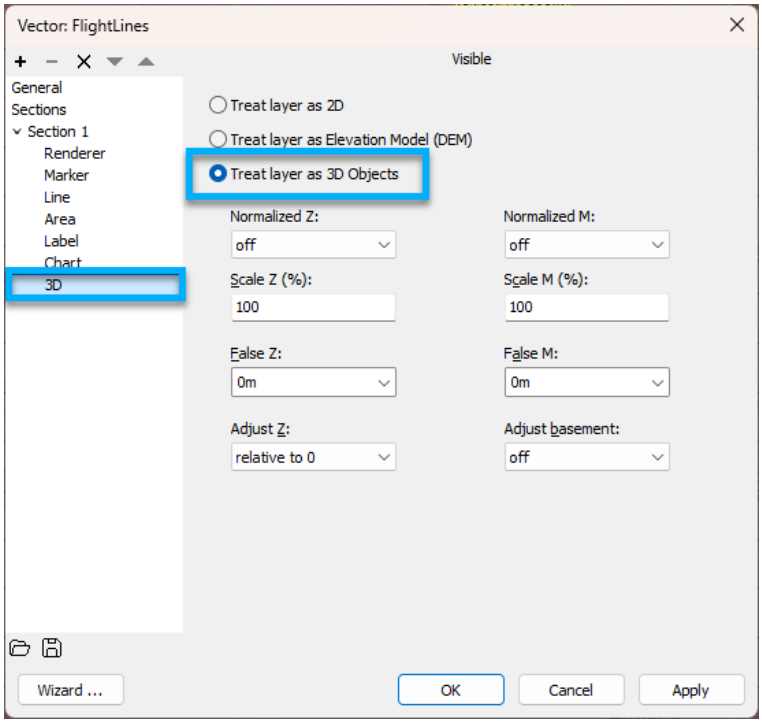
To activate 3D view:

1. In the workspace top left corner, click 3D
2. Click and hold the left mouse button to manipulate and rotate the perspective.

> **Note**
> The 3D view is only applied to layers for which it has been activated.

To activate the 3D view for individual layers:

1. In the layers panel, double-click the required layer (such as ImagePosition or FlightLines).
2. Under Sections, click 3D.
3. Click Treat layer as 3D Object.
4. Click Apply then click OK.



11. Import options

You can import a variety of data into iX Plan 2024, such as external flight lines, image data from a flight and FAA Charts.

To import files:

- Select Project in the Navigation bar. Use the IMPORT section of the secondary sidebar and select the required file.

OR

- simply drag-and-drop the file directly into your Workspace. A variety of file formats are fully supported.

> **Note**
> Before importing, Configuring the sensors!

11.1. Importing images

You can import image data from a flight into iX Plan 2024. For each image, the data includes its number and position coordinates. The raw GPS coordinates can then be used to check the planned vs actual image center positions.

Another use for imported image data is to check the entire geometry of the actual flight using the measured GPS coordinates of the image positions.

To perform post flight QC, copy the flight plan directory from the flight computer to the computer where you will perform QC. During flight, the flight plan directory stores data for use in this process.

11.2. Importing FAA Charts

Download and import FAA Charts:

1. Go to FAA.
2. Download the GEO-TIFF file for the required region.
3. Drag-and-drop the files into the workspace.

12. Exporting Projects

This section describes how to prepare an iX Plan 2024 project for importing by iX Flight Pro, and how to export iX Plan 2024 project data to the most commonly-used formats as follows:

12.1. Preparing an iX Plan 2024 Project for iX Flight Pro

To prepare an iX Plan 2024 Project for importing into iX Flight Pro:

1. In the layers panel, right-click the P1 Basemap.
2. Click **Save Layer as Image**.
3. Click  .
4. Navigate to the project folder, provide a file name and in the **Save as type** list, click **TIFF**.
5. Click **OK**.

12.2. Exporting data as an ESRI Shapefile

To export data to an ESRI Shapefile:

1. In the Navigation bar, click **Export**.
2. Click **ESRI Shapefile**.
3. Select the required attribute checkboxes or click **Select all**.
4. Change the path and file name, if necessary.
5. Click **Export**.

12.3. Exporting to Excel

> **Note**
> To enable iX Plan 2024 to export a file to Microsoft Excel, the following are required on your PC:
>
> - Microsoft Excel 2002 (v10.0) or higher.
> - In the Microsoft Excel Trust Center (or equivalent location in your version of Microsoft Excel), enable Trust Access to VBA project object model.
>
> It is recommended to export the data to a template that has predefined fields for e.g. line number, coordinates, focal length and overlap.

To export data to Microsoft Excel using an existing Microsoft Excel report:

1. In the Navigation bar, click Export.
2. Click **Excel**.
3. In the main window template list, select a template.
4. Under **Sensor selection**, select your sensors.
5. Change the path and file name, if necessary.
6. Click **Export**.

12.3.1 Creating a customized Excel template

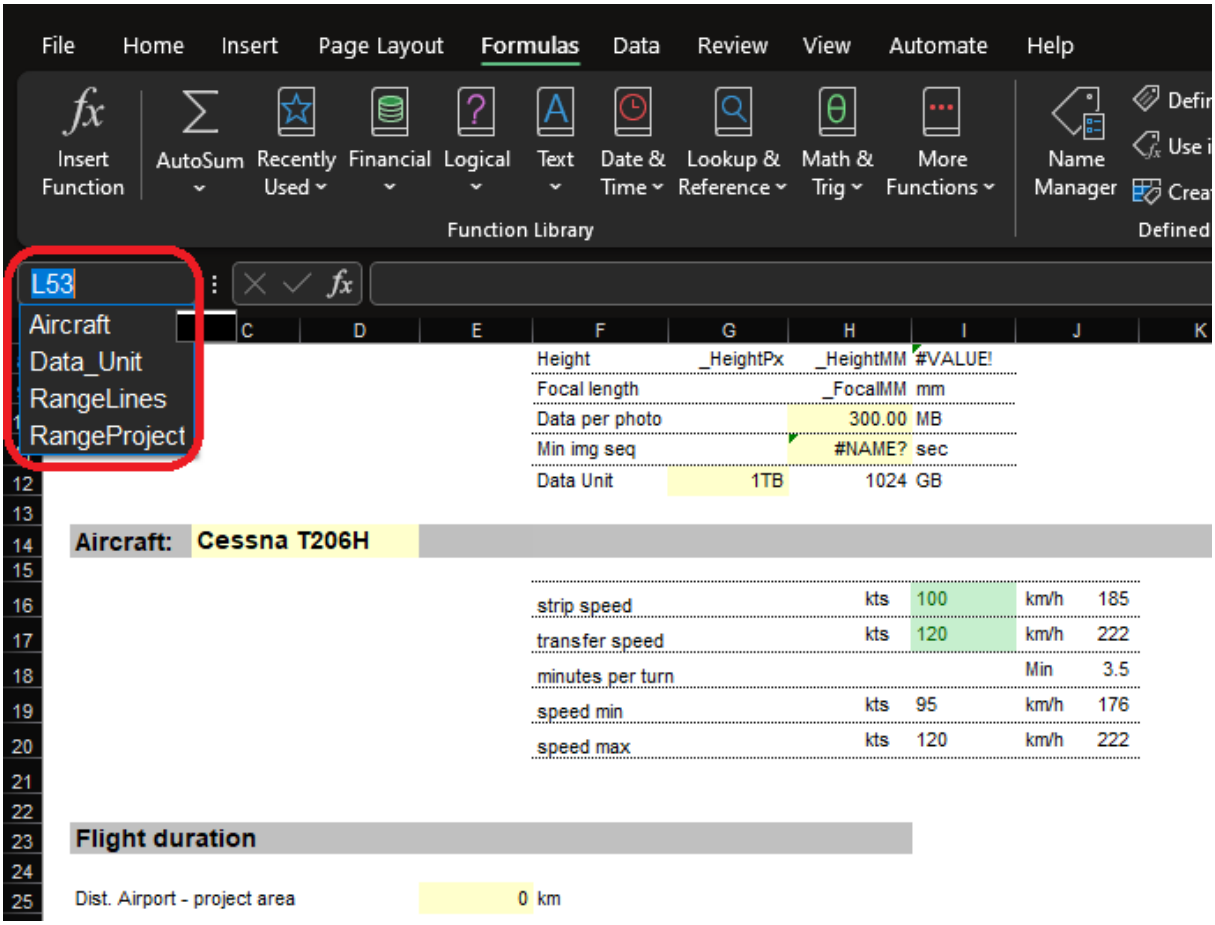
12.3.1.1 Basic principle

iX Plan 2024 uses Excel templates and substitutes the variables found within the template with the corresponding values set in the active project. For the export of flight lines iX Plan 2024 creates a table that then is copied into the template. The Excel spreadsheet is fully customizable and supports adding images.

> **Note**
> It is recommended to use an existing template and customize it to your specific requirements as explained below.

12.3.1.2 Defined sections

Not all template variables are populated during Excel export. Specify a designated area within the template where these variables can be located. The available areas are listed here:

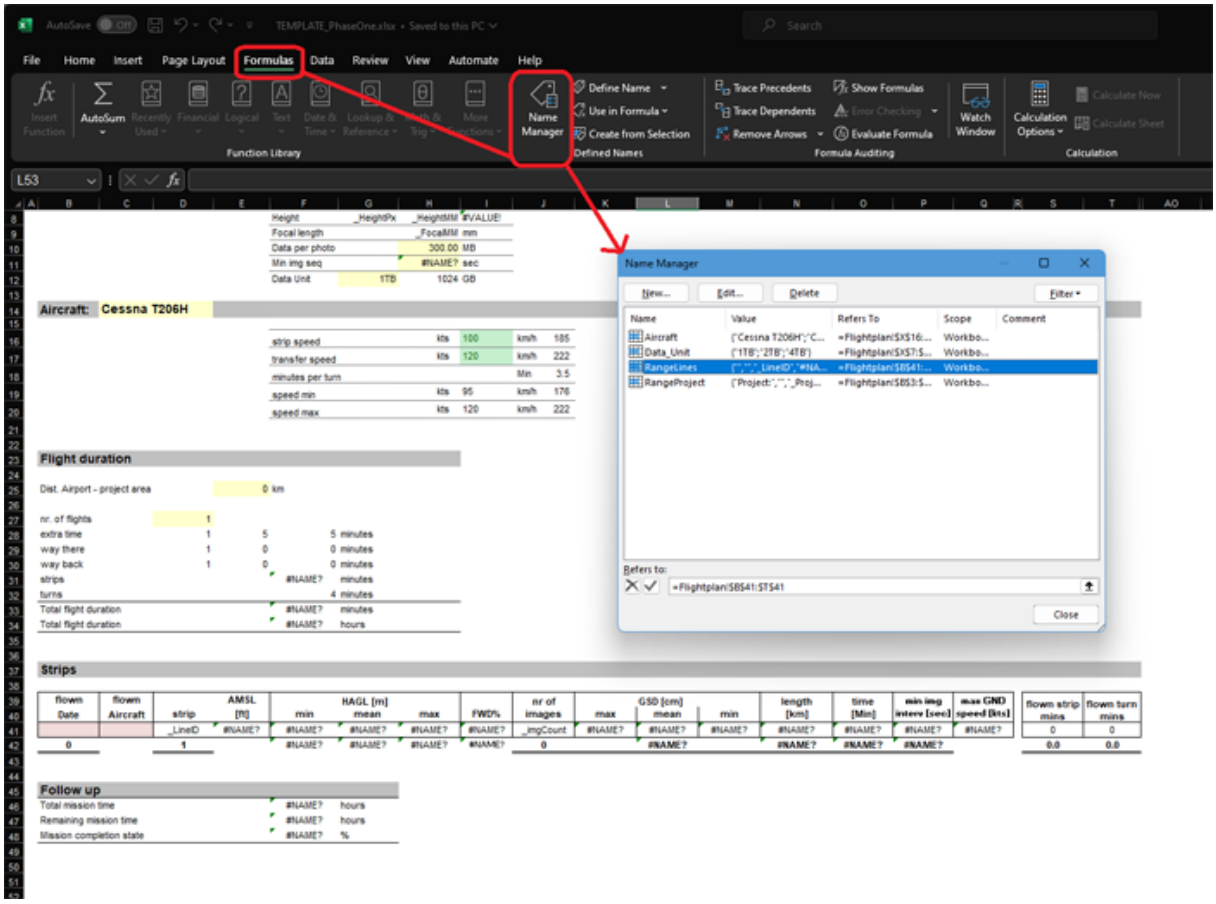


Two areas can be created:

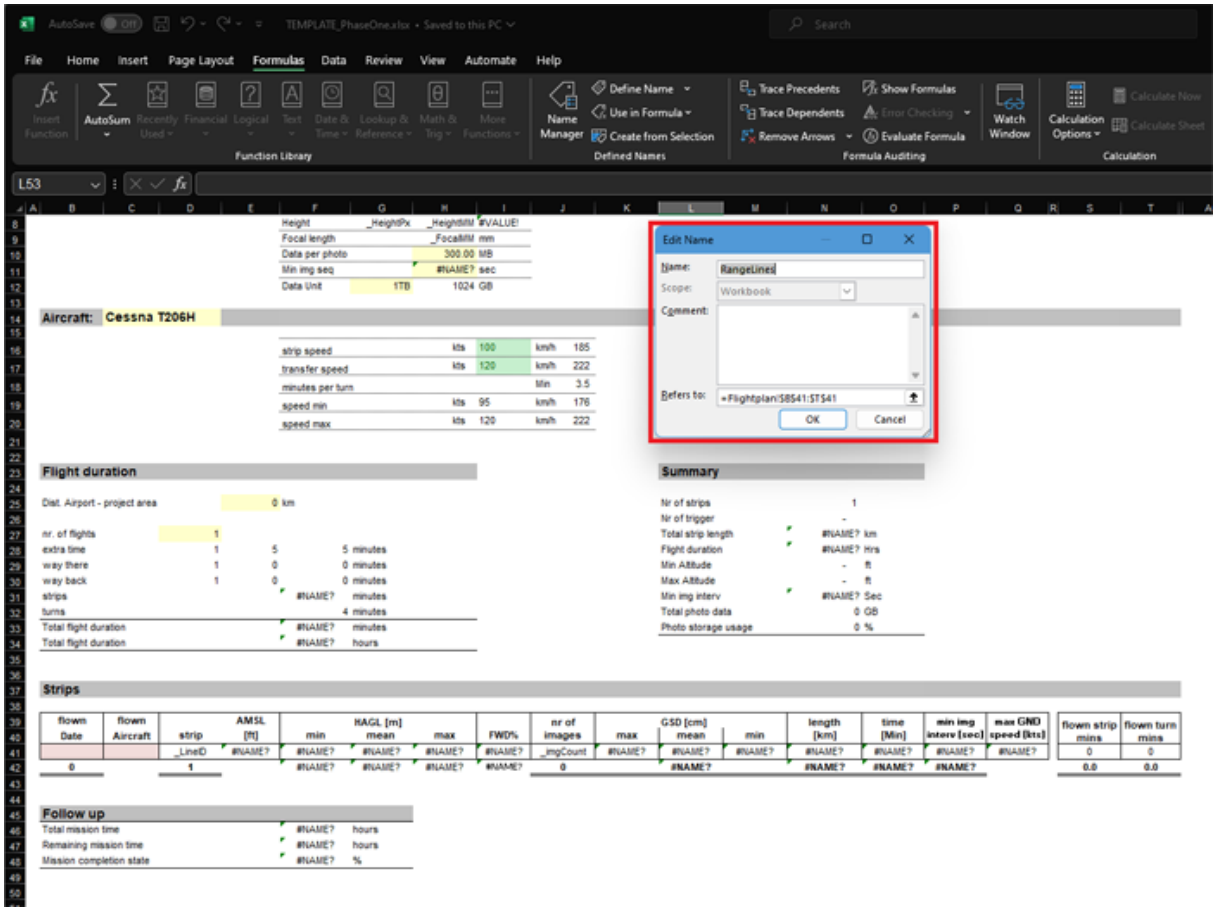
- RangeProject - Area containing all project information
- RangeLines - Area containing all information on one flight line. For each flight line new rows are added and a table is created.

To add, delete or edit sections using Excel's Name Manager:

1. Click **Formulas** > and click **Name Manager**.



3. Double-click a variable name to edit the respective section.



12.3.1.3 Variables

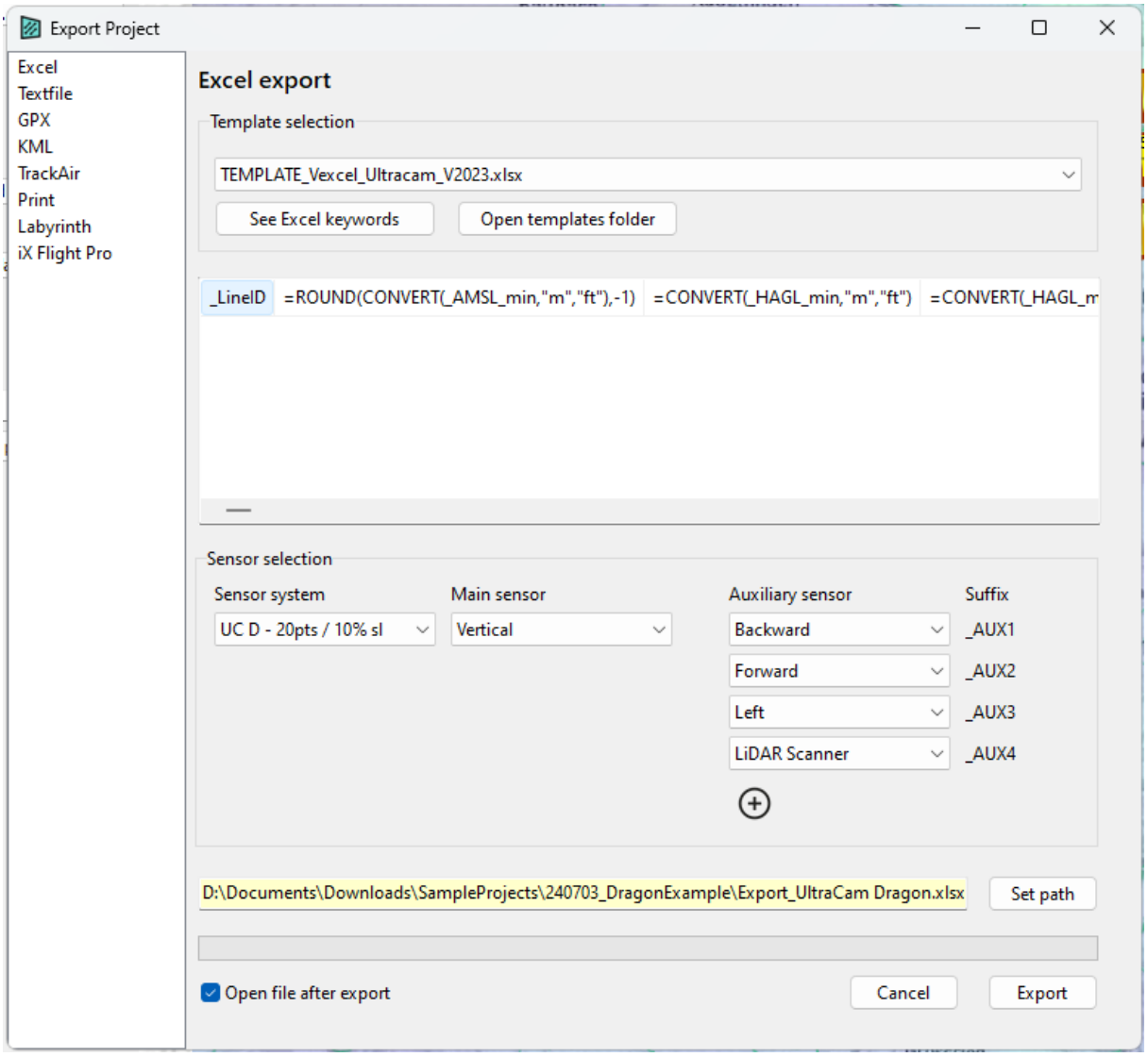
The variable names are predefined. Each variable begins with an underscore (_) so that it can easily be distinguished from other text in the document. Variables can either exist independently within a cell or be integrated into an equation.

Often, a project is planned using only the main sensor, despite the availability of other sensors, such additional NIR sensor(s).

These secondary sensors usually do not have the same properties as the main sensor. Key information about the secondary sensors can also be exported into an Excel template.

Adding additional sensors with own keywords:

1. In the Navigation bar, click Export.
2. Click **Excel**.
3. Under **Sensor selection**, select the required sensor information.
4. Information on the auxiliary sensors is provided by appending e.g. the suffix _AUX1 to the keyword as shown below for the backward camera.



4. Click ⊕ to add additional sensors of a sensor system.

> **Note**
> The main sensor does not require a suffix.

12.3.1.4 Special cases

In order to compute a sum, mean, minimum or maximum value over all flight lines, the equations must reference the specific sections.

Examples:

Operation	German	English
Count	=ANZAHLA(INDEX(RangeLines;;1)	=COUNTA(INDEX(RangeLines;;1)
Min	=MIN(INDEX(RangeLines;;3)	=MIN(INDEX(RangeLines;;3)
Max	=MAX(INDEX(RangeLines;;4)	=MAX(INDEX(RangeLines;;4)
Average	=MITTELWERT(INDEX(RangeLines;;4)	=AVERAGE(INDEX(RangeLines;;4))
Sum	=SUMME(INDEX(RangeLines;;7)	=SUM(INDEX(RangeLines;;7)

The number at the end of the equation corresponds to the column of the section, e.g. column number 1 = 1 .

12.3.1.5 Saving the template

The template must be saved in the ProgramData folder:

%ProgramData%\PhaseOne\{{program version}}\Templates

12.3.1.6 Variables List

Range: RangeProject

General	
_SensorName	sensor name as displayed in iX Plan 2024
_SensorType	display name of the sensor type (Frame, Stepper, Pushbroom, SensorSystem, undefined)
_SenorBrand	brand of the sensor
_SensorModel	model of the sensor
_SensorLabel	sensor's display name within a sensor system (if it is not part of a system, the configuration name is displayed)
_ProjName	name of the project
_FOVWidth	sensor FOV (field of view) width [degrees]
_FOVHeight	sensor FOV (field of view) height [degrees]
_SpeedKn	airplane speed [knots]
_SpeedMs	airplane speed [m/s]
_SpeedKmh	speed [kmh]
_ConfigHAGLFt	flying height above ground level as defined in the sensor configuration [ft]
Frame	
_WidthPx	sensor width in pixel
_HeightPx	sensor height in pixel
_WidthMM	sensor width in mm
_HeightMM	sensor height in mm
_PixSize	pixel size in mm
_FocalMM	focal length in mm
_MaxFPS	maximum supported frame rate per second

Range: RangeLines

General	
_LineID	line ID
_ParentLineID	flight line number (integer)

General	
_SegmentLineID	segment number of a flight line (integer) **Note** Flight line segments are not currently supported by iX Flight Pro.
_Sensor	sensor name
_SensorLabel	sensor label
_AMSL_min	minimum absolute altitude
_AMSL_max	maximum absolute altitude
_AMSL_mean	mean absolute altitude
_HAGL_min	minimum height above ground
_HAGL_max	maximum height above ground
_HAGL_mean	mean height above ground
_Start_X	starting point easting
_Start_Y	starting point northing
_End_X	end point easting
_End_Y	end point northing
_Start_Lon	starting point longitude
_Start_Lat	starting point latitude
_End_Lon	end point longitude
_End_Lat	end point latitude
_Length	length [map units]
_DistanceToNext	shortest distance to the next flight line [map units]
_DistanceToPrevious	shortest distance to the previous flight line [map units]
_SideOverlap_min	minimum side overlap
_SideOverlap_max	maximum side overlap
_SideOverlap_mean	mean side overlap
_Azimuth	azimuth [degrees]
_AzimuthBack	backward azimuth [degrees]
_Azimuth_WGS84	geographic azimuth [degrees]
_AzimuthBack_WGS84	geographic backward azimuth [degrees]
Frame Cameras	
_imgCount	number of images
_GSD_min	minimum ground sampling distance
_GSD_max	maximum ground sampling distance
_GSD_mean	mean ground sampling distance
_FWDOverlap_min	minimum forward overlap
_FWDOverlap_max	maximum forward overlap
_FWDOverlap_mean	mean forward overlap
_ImgBase_min	minimum base between image positions
_ImgBase_max	maximum base between image positions
_ImgBase_mean	mean base between image positions

12.4. Exporting data as KML

To export data to a KML file:

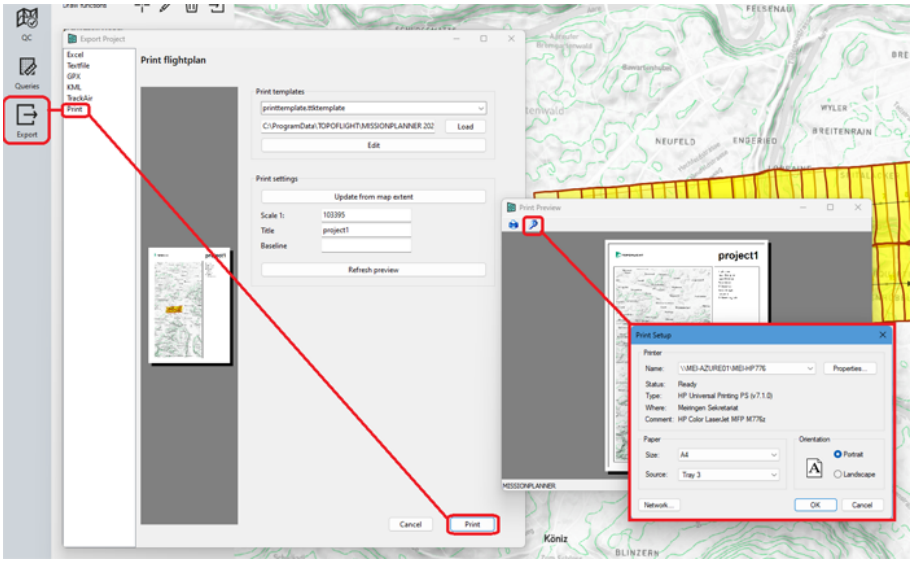
1. In the Navigation bar, click Export.
2. Click KML.
3. Select the required attribute checkboxes.
4. Change the path and file name, if necessary.
5. Configure the style options as required.
6. Click Export.

12.5. Printing a flight plan (PDFs)

> **Note**
> The templates are compatible with printing on various paper sizes. You can edit the format of PDF templates before printing by clicking Edit in the window that opens when selecting and Print. However, these settings are not saved in the file.

To adjust and save the template print size:

1. In the Navigation bar, click Export.
2. In the left sidebar, click Print.
3. Click Print.
4. At the top left of the window, click the Printer setup icon.
5. Adjust the page size and orientation as required.



6. At the top left window, click the Print icon.

12.6. Exporting data as text file

To export data to a text file:

1. In the Navigation bar, click Export.
2. Click **Textfile**.
3. Select the **Flight lines** and/or **Image positions** checkboxes as required.
4. In their respective panes, select the required flight line and/ or image position attributes.
5. Configure the Export settings (delimiter , header, output path/file name as required.
6. Click **Export**.

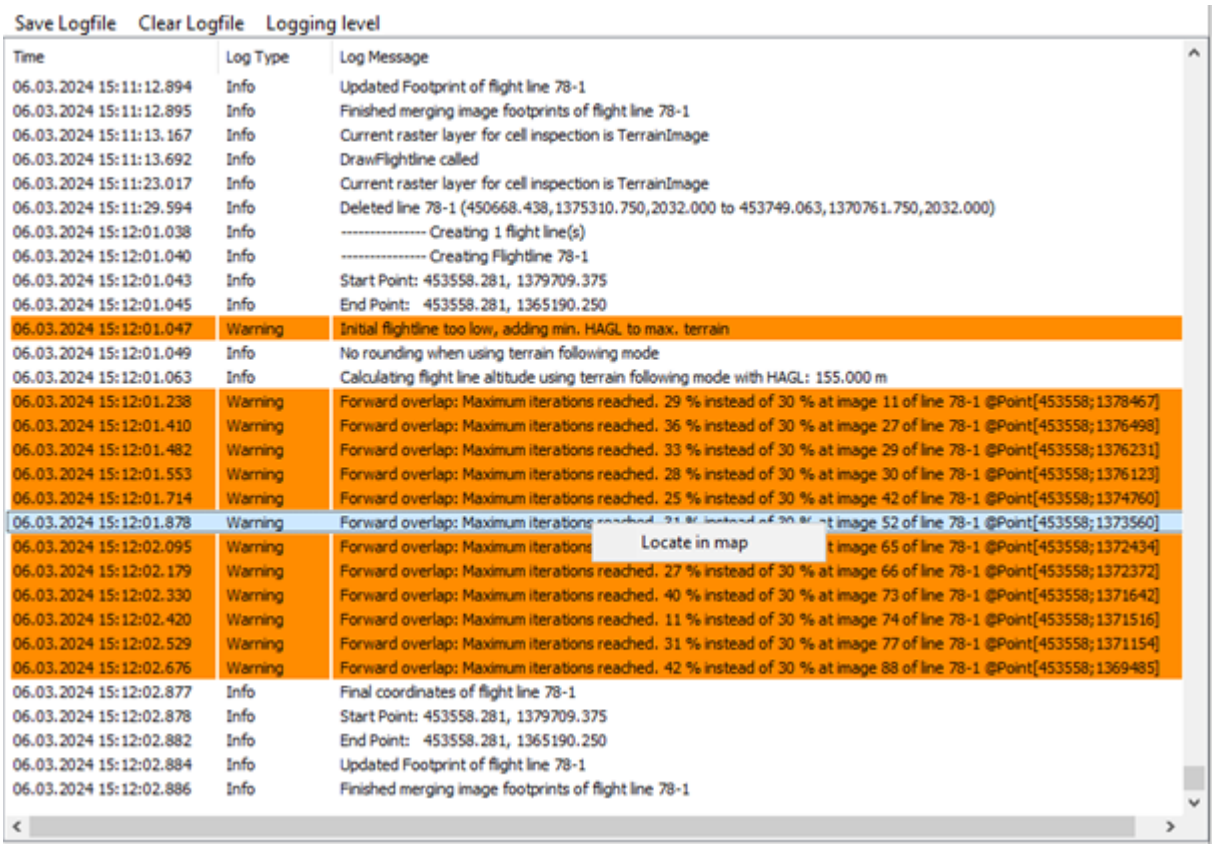
13. Troubleshooting

This section provides several troubleshooting tips as follows:

13.1. Logfile

The logfile displays debug messages that may assist you to troubleshoot problems.

The logfile appears automatically when an error or warning occurs.



> **Note**
> For information on configuring log settings, see Section 10.1.1.3 - Logging

To display the logfile manually, perform either of the following:

- On your keyboard, press Ctrl + L.
- In the Navigation bar, click Settings and click **Display Settings**.
  Under **Logging**, click **Open log window**.

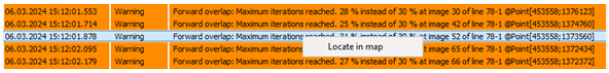
13.2. Using log files

To restore deleted flight lines:

1. Open the log file.
2. Right-click the log message containing the deleted flight lines.
3. Click **Recreate flight line**.

To use @Point or @Area messages:

1. Open the log.
2. Right-click the log message containing the @Point or @Area message.
3. Click the message **Locate in map** to locate the area or point in the map and/or zoom to it.



To save log files:

1. Open the log.
2. Click **Save logfile**.
3. Provide a path and filename for saving the log file.