



DRONE PILOT GUIDE

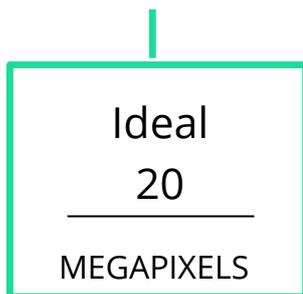
Facade measurement with DJI Fly App

Data collection for the façade

In order to create a façade report, we need image data of the entire façade surface. The flight pattern used depends on the type of building. For example, the flight pattern for a detached house differs from that for a large commercial building. For the best measurement and visualization results, we recommend the following flight parameters.

Requirements for the drone

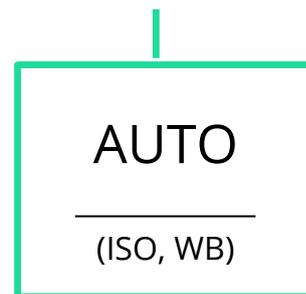
Camera
resolution



Phototype



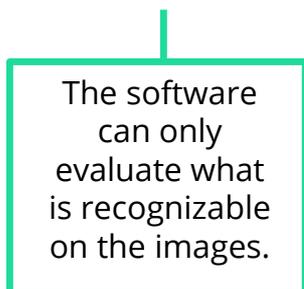
Camera
settings



Requirements for the images

In order for the software to be able to process the drone images, there are 3 basic things to remember:

Image
quality



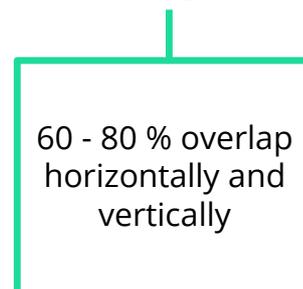
Sections behind trees or
scaffolding cannot be
evaluated.

Distance to
object



So that all details are
clearly visible.

Overlap of
images



Images from all directions
with sufficient overlap.

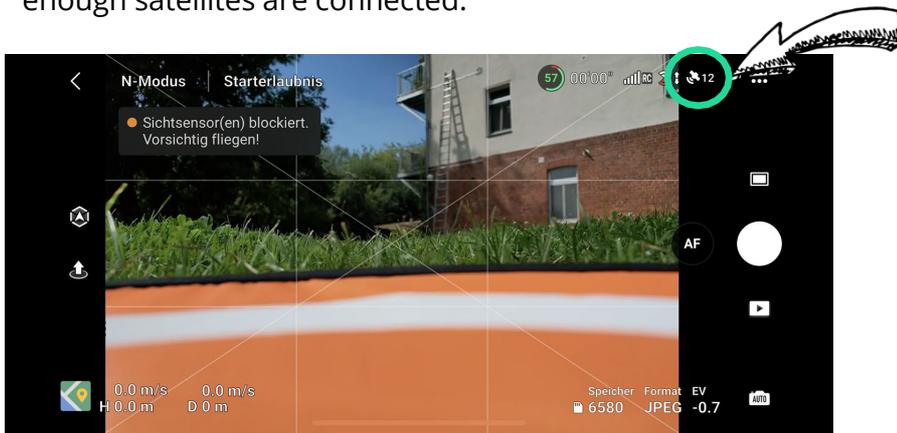
How to start the drone

1. Select take-off point

Choose your take-off point so that you can take off and land safely. Make sure that your take-off point is as open as possible, i.e. don't take off too close to buildings or trees!

2. Satellite connections

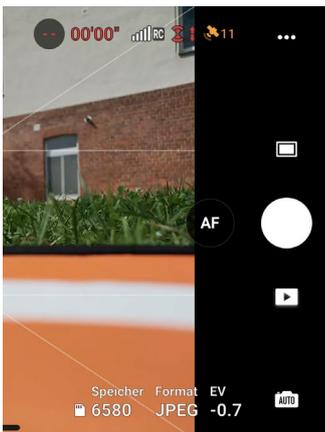
Switch on your drone and wait until the drone has at least 12 satellite connections. The announcement "The home point has been updated, please check it on the map" will sound when enough satellites are connected.



3. Take-off speed

Start the drone at a moderate speed and wait a short moment before positioning yourself to take the picture.

4. Avoid the following sources of error:



GPS-Reception:

Do not take off until the drone has found 12 or more satellites.



Too close to the building:

If the drone is too close to the building, the quality of the satellite connections drops and the drone takes a very long time to find 12 or more satellites.



Wrong underground :

Avoid taking off from a surface with metal (e.g. reinforced concrete), as this interferes with the drone's compass.

Detached house - Manual flight

1. Step - Position the drone

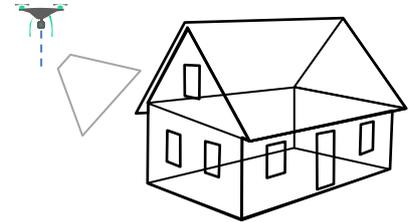
Fly the drone to the ridge height.

2. Step - Aligning the camera

Adjust the camera angle with the rear wheel on the controller so that you have a view of the entire façade, including the plinth, looking downwards. In this case, the camera angle should be approx. 15° - 30° downwards.

If there is not enough space on site or the house is too high to show the entire façade including the base, the house will be circled at several flying heights. (Step 4)

If the plinth does not fit directly into the picture, take as much of it as is possible with the selected camera angle.



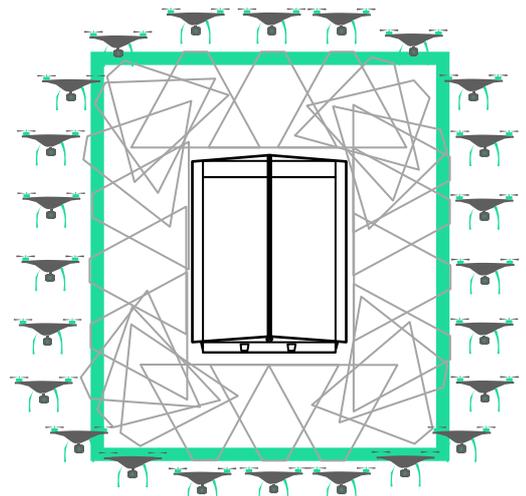
Positioning the drone

3. Step - Circling the house

Once you have positioned yourself, close the first photo. Now you have to steer the drone to the next point and take the next photo. **Please note: Each image of the flight must overlap the previous image by approx. 70%.**

The grid lines in the flight app will help you here! These help you to achieve the ideal overlap by moving the drone so that what was previously visible on the right-hand edge of the image is now visible on the right-hand grid line. This shifts the image by about 30%, so it overlaps by about 70%!

You can then use this trick to fly around the entire house. At the corners of the house, you have to take about 4 pictures and turn the drone sideways so that the camera is facing directly towards the facade.



Perspectives on orbiting

4. Step (optional) - Circling at a further height

Now that you have captured the upper part of the façade, you must use the same procedure to capture the lower part.

Fly the drone downwards until the image content from the lower edge of the image is now at the lower grid line. You are now at the 2nd flight altitude and can start the 2nd orbit. (see 3rd step)

Depending on the height of the object, you may need to repeat the flight several times at different altitudes.

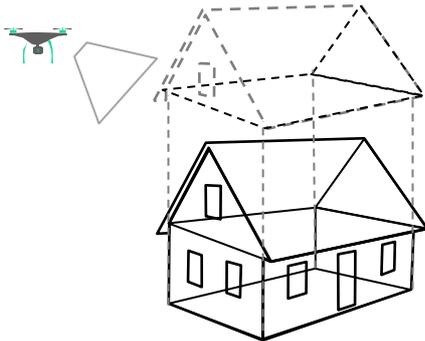
5. Step (optional) - Record concealed façade due to roof overhang

If the roof of your object obscures the upper part of the façade, you can perform a further orbit. Work according to the same principle here but set the camera tilt to 10 - 15° upwards. This allows you to capture the obscured area.

Large building - Manual flight

1. Step - Position the drone

Fly the drone to a corner of a façade surface, e.g. the upper left corner of the façade in front of you. The distance to the façade should be 5 - 10 meters.



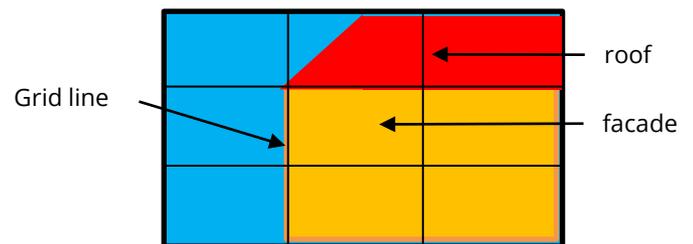
Positioning the drone

2. Step - Align drone & camera

Set the camera tilt to 10 - 15° upwards or downwards! Before you take the first photo, you should have the following view on the display:

- The right 2/3 of the picture show the façade
- The lower 2/3 show the façade

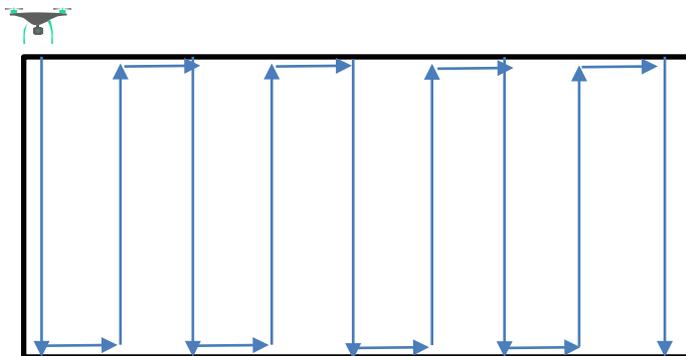
So, we can clearly see the edges!



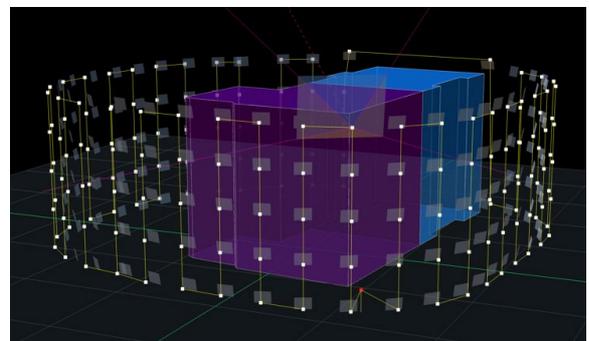
Screen view at the start of the measurement

3. Step - Recording the entire façade

You should use the following flight pattern to measure the façade ideally:



Flight pattern of a facade surface



Flight pattern of the building envelope

After alignment, take the first photo. **Caution: Each image of the flight must overlap the previous image by approx. 70%.** The grid lines in the flight app will help you with this! These will help you to achieve the ideal overlap of the individual images of approx. 70%!

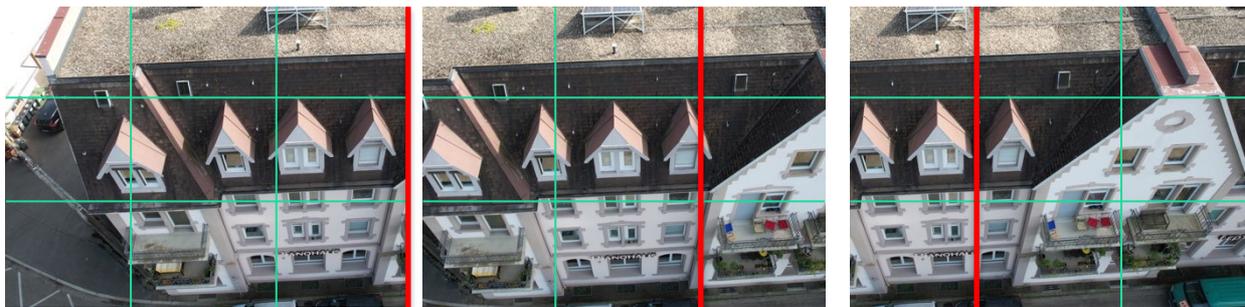
After the first photo, fly down until what was previously visible at the bottom of the image is now visible at the bottom grid line. So, you move the image content by 30% and shoot the 2nd photo. This overlaps 70% with the first photo. Repeat this until you reach the bottom.

Now fly to the side for the first time until your image view shifts by 30%. Take a photo and then fly up/down again! With this trick you can now fly over the entire façade surface! To capture the corners between 2 sides of the façade, fly 2 to 4 vertical paths at the corner so that you create a transition to the next façade surface. This is very important, because our algorithm will only process all facade surfaces when they are well connected at the corners!

Tips for measuring

Tip - Grid lines

If you activate the grid lines in the camera settings, you can easily recognize the structure of the image. The vertical and horizontal lines help you to maintain the overlap of approx. 70%!



The images overlap by approx. 70%

Image width

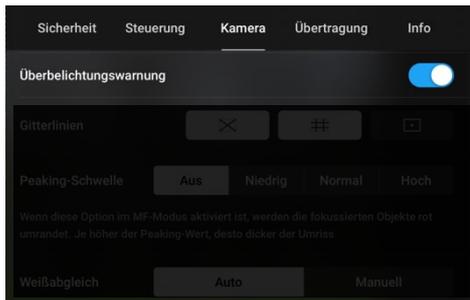


Use of the grid lines:

In the above pictures, the last dormer is at the edge (red line) in the 1st photo. In the 2nd photo it is on the right-hand grid line. This trick makes it very easy to maintain the ideal overlap (70%)!

Tip - Overexposure warning

If the sun is shining strongly and the façade has a very bright color, you should activate the overexposure warning in the camera settings. Areas that are too bright will then be displayed in black and white hatching. You can easily correct the exposure using the EV value.



Exposure compensation EV -0.7

Tips for measuring

Tip - Too close to the facade?

The distance to the facade is not enough and you only get a small part of the object in the picture? Then turn the drone by 10° to 20°! This will give you more image information of the façade in one photo.

If the images are taken too close to the façade, only a very small part of the building will be shown. The information on this image is not sufficient to offset the image with the other images.

If you turn the drone in slightly, you will capture much more image information at the same distance from the façade. You can turn the drones between 10° and 20°!



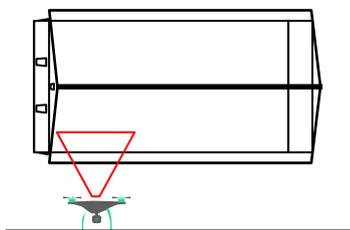
Not enough facade information in the picture



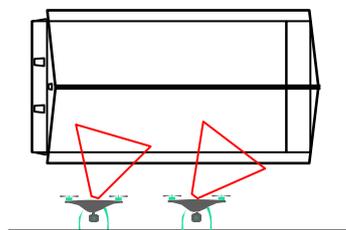
The drone was turned by approx. 10°.



The drone was turned by approx. 20°.



There is not enough space to get enough information on the picture



The more the drone is turned in, the more information you have in the picture.

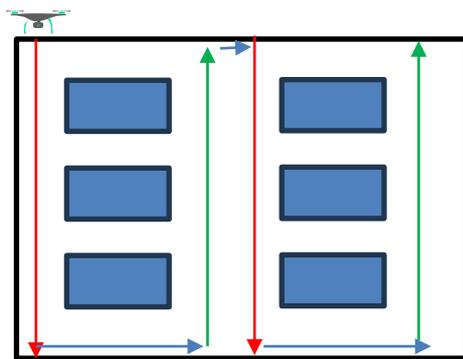
Tips for measuring

Tip - Capture windows completely

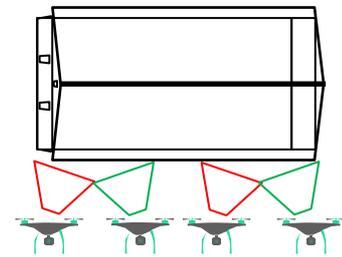
To capture the windows in the highest possible quality, you need to photograph them from several perspectives:

Pick up windows from both sides

You fly along the façade according to the explained pattern. However, you always add an additional path when you capture a window. The drone's line of sight should alternate so that the window pockets are captured from both sides.



Flight pattern for windows



Top view of the viewing direction

Pick up window frame downwards and upwards

To capture the entire window frame, you also fly over the window with a camera tilt of 15° in the opposite direction to the one you selected when measuring the façade. If you flew over the façade with the camera tilted upwards, you now fly over the windows with the camera tilted downwards. If you have flown over the façade with the camera tilted downwards, now set the camera to the same angle upwards and fly over the windows. This gives you all the angles of view of the window and the ideal shot.

This gives you all angles of view of the window and it is ideally captured.

Typical challenges

Obstacles, e.g. trees

During the flight, trees can restrict the flight path. If an obstacle blocks the planned flight direction, you must ensure that the concealed areas are captured from a different perspective. For example, you can turn the drone in further and fly closer to the façade to make the façade behind the tree visible. However, a different camera angle can also help to capture relevant areas despite the obstacle.

Overhang of the roof

If the property has a roof with an overhang, this will cover the uppermost part of the façade during the measurement. In order to capture the concealed area, it must be captured. To do this, use a camera angle of 10 - 15° upwards and fly over the entire top area.

Blurred images

Make sure that the focus of the image is on the facade and not somewhere else. With most drones, you can set or correct the camera focus by tapping on the display. This is necessary during the flight, for example, if you are taking photos from different distances.

Camera angle

If you want to measure the façade efficiently, check that the camera is at the correct angle. For small objects, preferably at an angle of 15 - 30° downwards and for large objects at an angle of 10 - 15° upwards or downwards. If you want to map the area behind a roof overhang, the camera should be tilted upwards by 10-15°. Please note that the angle should not be at 0°!

Distance to the facade

Make sure that all parts of the façade can be seen in the pictures due to the selected distance. A common problem is that the corners of the façade are not fully depicted in the images. If there is not enough space, you can turn the drone sideways by 10 or 20° to capture more image information.

Not enough pictures

We can only measure and model what has been sufficiently depicted on the images of the flight. Sufficient images should therefore be taken for each survey flight. Each image must overlap the previous image by approx. 70%.