Camera Calibration: Lens Calibration

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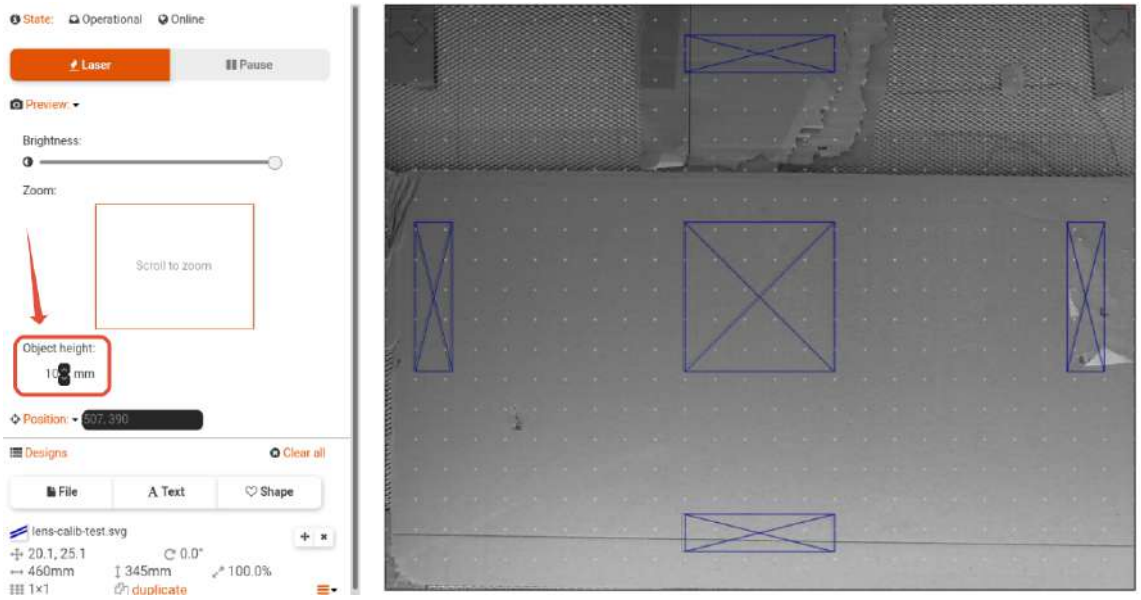
If you have done a **corner calibration** (https://support.mr-beam.org/a/solutions/articles/43000065908?lang=en), and the arrows you engraved for the corner calibration line up perfectly with the edge of the picture, but you still have **bad precision in the centre or edges** (misalignment of **more than 5mm**) of the frame, you can try to correct it with a lens calibration. In some cases you might get a warning message, asking you to do a corner calibration prior to the lens calibration.

The lens calibration is made to remove the fish-eye effect from your camera picture. Only do this if you think that your camera precision is bad, specially in the centre.

How do I test the quality of my lens calibration?

If you don't know how precise your design engraving is compared to the camera, then we suggest to laser several patterns in different places of the work area. You can download **this file** (https://www.mr-beam.org/wp-content/uploads/2020/10/lens-calib-test.zip) for testing. Make sure that the pink markers are still visible to the camera when you put in your test material - otherwise you won't have the best result!

In this example, the height of the cardboard surface used is 10mm. Therefore, we have to set it in the "Object height" parameter to 10 mm in the Preview tab.



The blue boxes on the left and bottom are misaligned by 1 to 3 mm. Be aware that this is already pretty good. **You might not be able to achieve a better precision than 1 mm** after performing your own calibration of the camera.

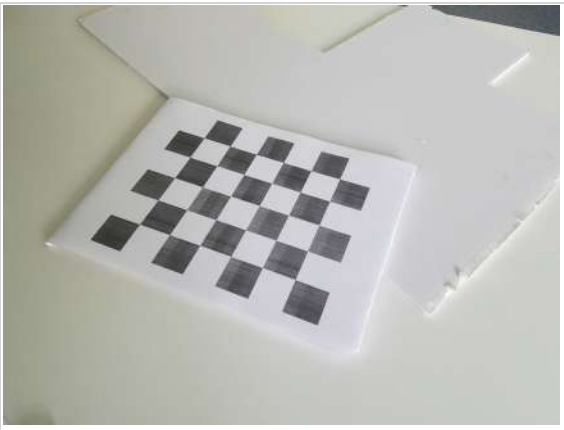
If the misalignment is bigger **- around 5 mm or more** - or if you really want to achieve the best possible precision in case you are engraving thin objects (pencils, kitchen utensils ...) then we suggest that you take some time to perform an extra lens calibration.

How do I calibrate my camera lens?

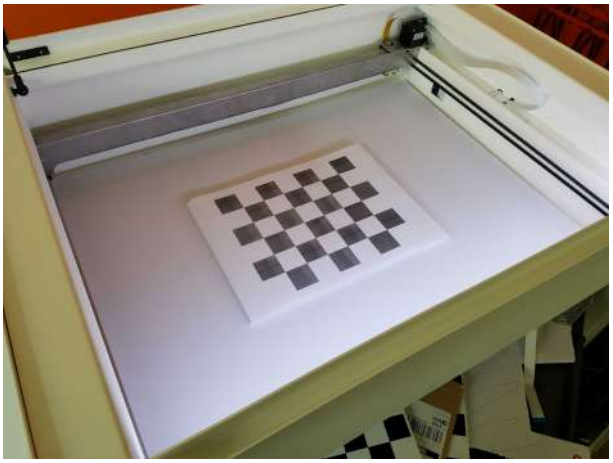
Steps

1. Download and print this chessboard (https://www.mr-beam.org/wp-content/uploads/2020/09/calibration_chessboard_pattern.pdf). Take care to print it in portrait mode - vertically.

If you print it on a regular sheet of paper, then please make sure to keep it flat against another surface (e.g. stick it to a flat piece of wood or thin foam board).

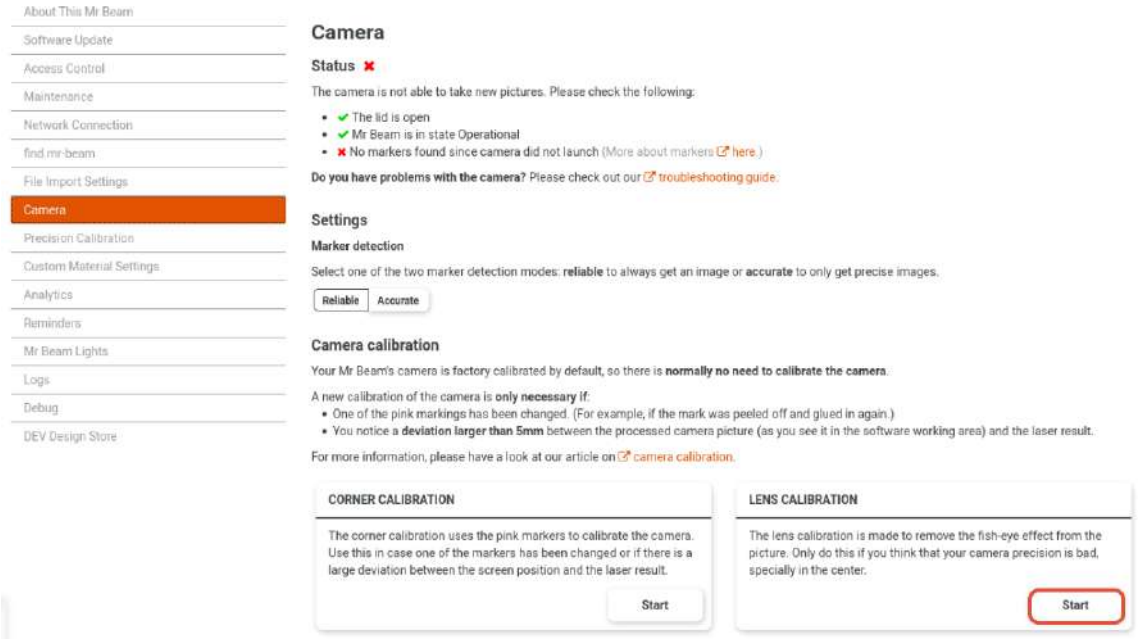


2. Place it inside your Mr Beam, horizontally.

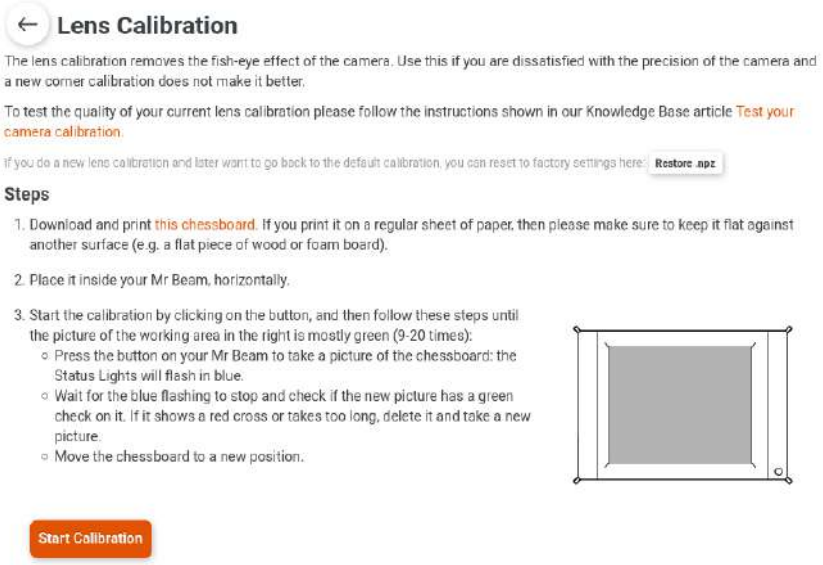


3. Go to the Camera settings and select the "Start" button of the Lens Calibration.

> *We do not need to detect the markers for the following steps, so don't worry about the red cross. They are only needed when you wish to test your calibration.*



4. Start the calibration by clicking on the "Start Calibration" button

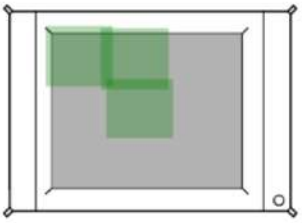


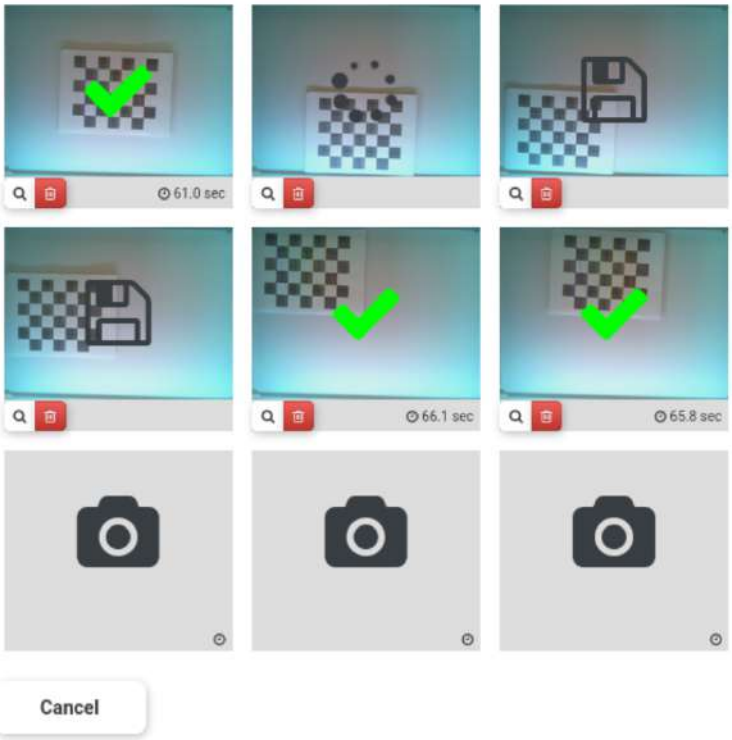
5. Follow these steps until the picture of the working area on the right is mostly green (9-20 times):

- Press the button on your Mr Beam for a short time to take a picture of the chessboard: the Status Lights will flash in blue.
- Wait for the blue flashing to stop.
- Move the chessboard to a new position and take another picture.
- Meanwhile, you can check if the previous pictures have a green check on them. If they show a red cross or takes too long, delete it and take a new picture. 3 minutes should be more than enough for the system to detect the chess-board.

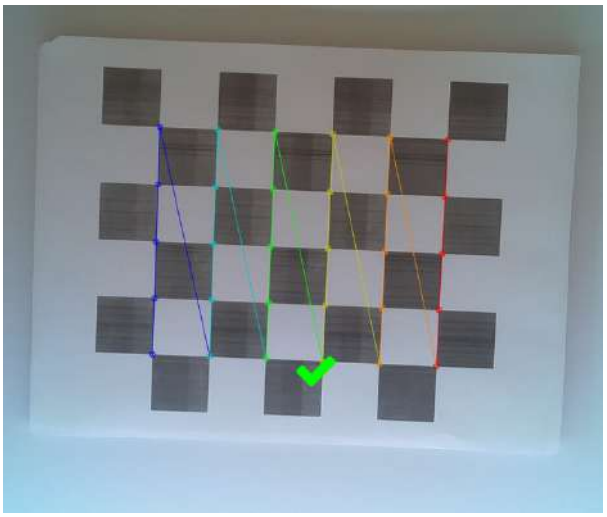
> *While the software is processing a picture, you can already proceed with taking all the pictures you need - as long as you wait for the blue flash to stop between each shot.*

3. Start the calibration by clicking on the button, and then follow these steps until the picture of the working area in the right is mostly green (9-20 times):
   - Press the button on your Mr Beam to take a picture of the chessboard: the Status Lights will flash in blue.
   - Wait for the blue flashing to stop and check if the new picture has a green check on it. If it shows a red cross or takes too long, delete it and take a new picture.
   - Move the chessboard to a new position.



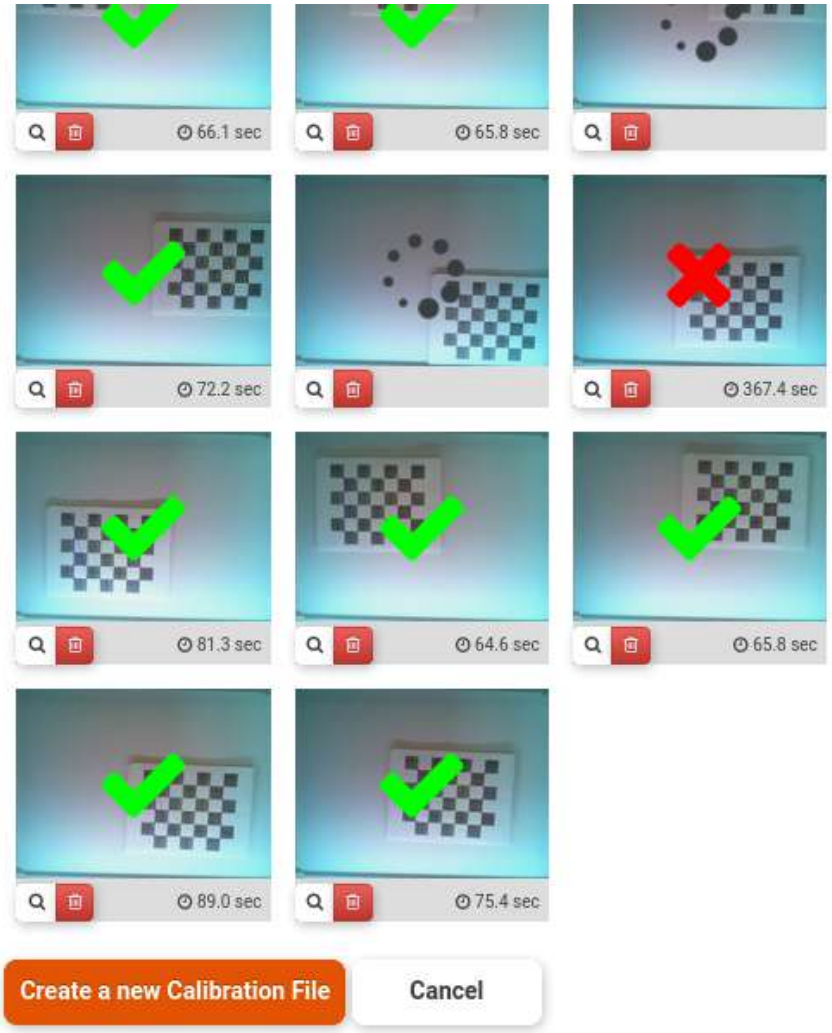


When one of the pictures shows a green check mark, it means that the chessboard was detected. To double check if it is correct, you should see a coloured pattern with circles at each intersection between white and black squares. To magnify the image, press the zoom button on the desired picture.



You can cancel the procedure at any time by pressing the corresponding button, or by going anywhere else in the settings or the work area. **Your progress will not be saved until you have created your first calibration result.**

6. When you have at least 9 pictures with a detected chessboard, you will have the possibility to run the calibration with the given result. The lights will blink then stay green when the calibration is done.



Each new calibration will overwrite your previous one. You will always be able to revert back to the factory calibration of the lens

Tip: If it's taking too long to detect the chess-board, try the following:
We have laid a white foam board on top of the work area. This will greatly increase the speed at which our system is able to identify the calibration checker-pattern, but it is **not strictly necessary!**

7. You can now test if the quality of your lens calibration is sufficient by following the steps described in the first part of this tutorial.