iQ-FoV Box

User Manual

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CONTENT

1 INTRODUCTION

With the iQ-FoV-Box, you have a chart illumination and positioning system optimized for resolution measurements of high FoV cameras up to 180 degrees. Together with the iQ-Analyzer, it is a complete automatic detection and analysis solution for two different chart setups. In the following manual, you will find a detailed description of how to use this system to get the best measurement performance.

If you assemble your iQ-FoV-Box by yourself, please follow the separate installation manual.

Safety note: If the power supply gets interrupted or there is a power failure, the illumination may execute a reset and start again with 1 % brightness.

2 STARTING THE SYSTEM

2.1 Placement

Place your iQ-FoV-Box in a dry condition and on even ground. Ensure that there is enough space around the box. You need full access to the back door and enough space to adjust the alignment arm on the front side to the full length.

2.2 Starting/Control overview

Connect the box to power and turn it on with the power switch placed on the control panel at the lower left edge of the front wall of the box. On the right side of the control panel are the illuminance intensity knob, the illumination on/off button, and a USB port. This USB port directly connects to the camera mounting inside the box. You do not need to put a control or power cable inside the box.

The box is now ready for starting with camera and chart alignment. The alignment tools and chart setups will be described in the following chapters.

3 CAMERA AND CHART ALIGNMENT

You can choose between two different chart setups when using your iQ-FoV Box. These setups will allow you to analyze your images automatically with the iQ-Analyzer-X. For high performance, it is crucial to align your camera inside the box and position the three different chart types in the correct areas.

Please follow the steps below to correctly arrange your camera’s position and charts. If possible, use the live view mode of your camera. This mode will help you arrange the charts and align your camera. The magnetic rulers (see “image 03”) are an excellent way to align the camera properly, assuming that the camera’s orientation is correct when the horizontal/vertical rulers each show the same distance.

3.1 Camera depth and height

Attach the camera to the mount inside the box so the back door of the box can be opened. If your camera is controllable via USB, you can use the cable already mounted inside the box and connect your control device from outside the box (the control panel at the front). The USB connection is placed right beside the illumination level knob.

Align the camera attachment so the camera's position is centered inside the box and the camera's optical axis is centered. For camera depth and height alignment, use the mechanical positioning of the extension arm from the outside of the box. Depending on your camera's FoV and dimensions, you may have to adjust the depth, height or leveling again when adjusting the chart positions, as described in the following chapters. We suggest starting with chart setup (1) to align the camera depth corresponding to the upper and lower chart in the image. These two charts should be placed inside the box as deep as possible, directly on the border of the back wall.

3.2 Camera pitch and yaw

The pitch and yaw alignment of your camera can be adjusted with the motorized positioner via the IR remote control from outside the box. The IR detector of the motor is positioned on the backside of the motor device on a small pin. You can adjust this pin to use your remote control device from other directions.

3.3 Camera fine leveling

The fine leveling of your camera can be regulated with the leveling tool positioned directly under the camera attachment.

3.4 Chart positioning

Please note that the placement of chart type (A), (B), or (C) in the following description is vital and must not be changed. Otherwise, the automatic detection of the iQ-Analyzer-X will not work. You may also have to optimize your camera position while positioning your charts.

Setup 1:

Place chart (C) in the center of the back wall. The other charts must be positioned on a straight vertical and horizontal line through the image center. The vertical placement has to have one chart (A) on the top using the top wall and one chart (B) at the bottom using the bottom floor wall. The horizontal placement has to be done similarly: place one chart (B) on the left wall and one chart (A) on the right wall. Use folding and rotating for each chart so that its border looks straight-lined in the resulting image:

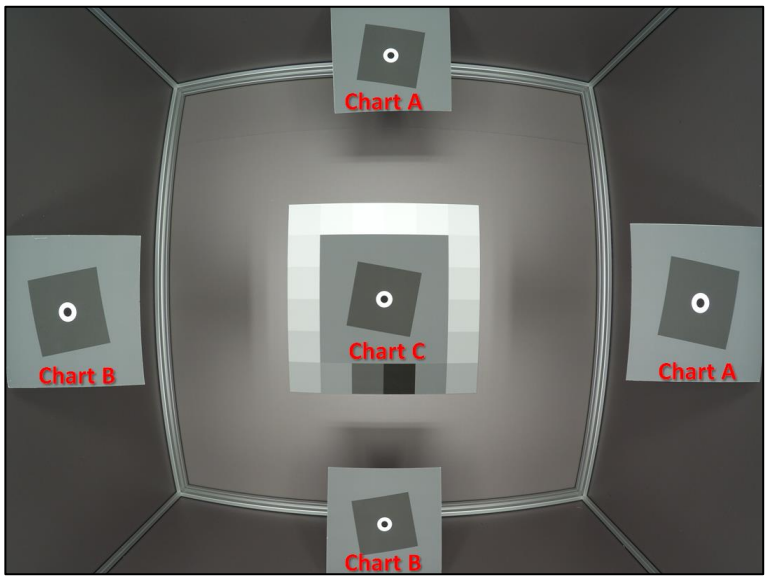

Image 01: Chart positions, Setup 1

Setup 2:

Position chart (C) in the center of the back wall. The other charts must be positioned on a straight diagonal line through the image center to be in the image corners. Use the right wall to attach the top-right chart (B) and bottom-right chart (A). Use the left wall to attach the top-left chart (A) and bottom-left chart (B):

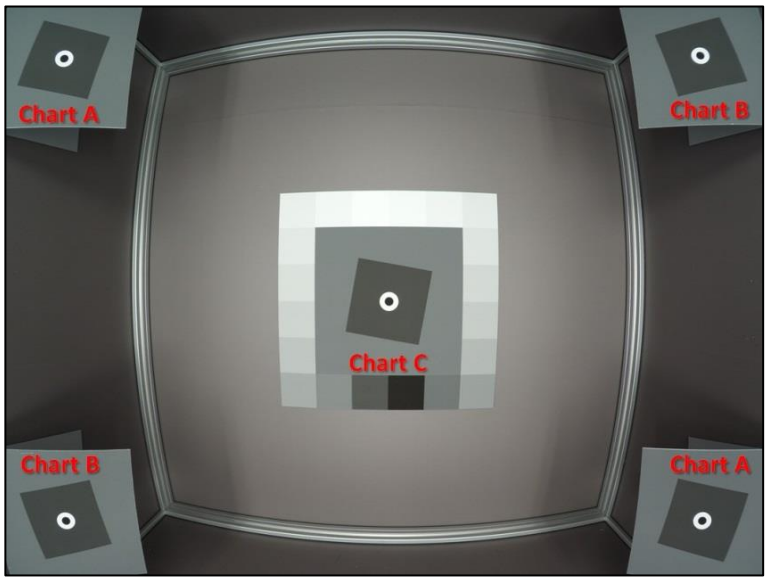

Image 02: Chart positions, Setup 2

4 ILLUMINATION INTENSITY

You can adjust the intensity of the fluorescent tubes inside the box via the illumination level knob outside the device. The intensity panel shows the actual intensity in percent. Turn on/off the tubes via the on/off button.

To get the best performance measure, adjust the intensity so that the brightest area of the OECF grey patch fields around the center chart (C) is on its possible maximum but not saturated.

You can put the density filters over the fluorescent tubes for low-intensity use. The actual intensity could be calculated via the density factor of the installed filters.

Measuring and noting the lux value inside the box on a defined position is recommended.

5 CHART HANDLING

You must be very careful with the test charts. While positioning, please ensure that you will not touch the chart surface.

6 FIELD OF VIEW CALULATION

The iQ-FoV Box offers a simple way to check a camera's angle of view (horizontally/vertically). The iQ-FoV Box is supplied with four magnetic rulers that should be placed as shown in Image 03.

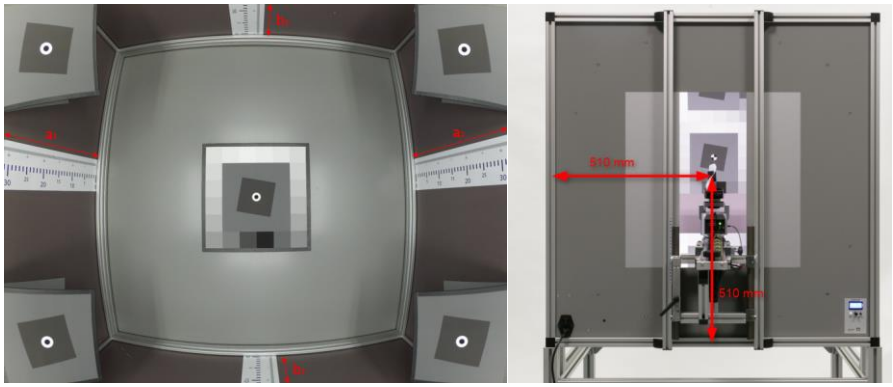

Image 03: horizontal/vertical distances and camera centering

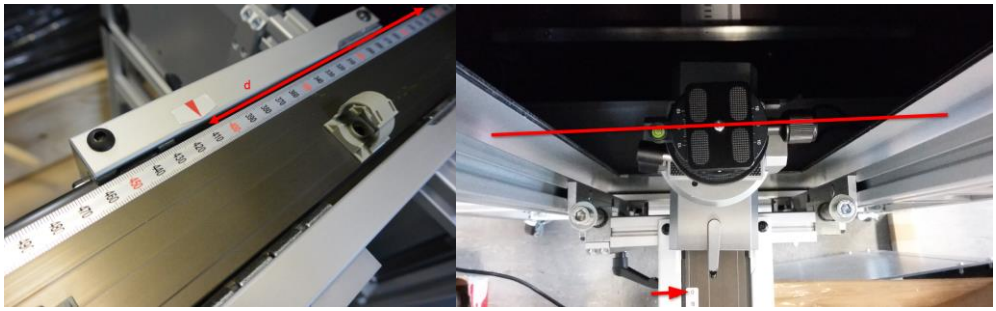

Image 04: camera distance, origin of measure

Use distances $a_{1/2}$, $b_{1/2}$, and d in the following formula to calculate the angle of view:

$$\theta_{hor} = 2 \cdot \left(90° - \tan^{-1}\left(\frac{985\,mm - d - \frac{a_1 + a_2}{2}}{510\,mm}\right)\right)$$

for horizontal angle

$$\theta_{ver} = 2 \cdot \left(90° - \tan^{-1}\left(\frac{985\,mm - d - \frac{b_1 + b_2}{2}}{510\,mm}\right)\right)$$

for vertical angle

d is the distance the camera moved into the iQ-FoV Box measured from the front plate (see the left side of Image 04). The measure's origin is shown in Image 04 on the right side and is located in the center of the front plate.

Please note that it is essential to center the camera for field-of-view calculations. The lens's optical axis has to be orthogonal to the backplane and centered around 510 mm in height and width of the iQ-FoV Box.