Leica BLK3D

User Manual
Version 2.2
English

- when it has to be **right**

Leica Geosystems

PART OF HEXAGON

Introduction

Purchase

Congratulations on the purchase of the Leica BLK3D.

Symbols

The symbols used in this manual have the following meanings:

Type	Description
☞	Important paragraphs which must be adhered to in practice as they enable the product to be used in a technically correct and efficient manner.

This manual contains important safety directions as well as instructions for setting up the product and operating it. Refer to 20 Safety Directions for further information.

Read carefully through the User Manual before you switch on the product.

☞

The content of this document is subject to change without prior notice. Ensure that the product is used in accordance with the latest version of this document.

Updated versions are available for download at the following Internet address:

https://myworld.leica-geosystems.com > **myDownloads**.

Product identification

The model and serial number of your product are indicated on the type plate.

Always refer to this information when you need to contact your agency or Leica Geosystems authorised service centre.

Validity of this manual

This manual applies to the Leica Geosystems AG BLK3D.

Leica Geosystems address book

On the last page of this manual, you can find the address of Leica Geosystems headquarters. For a list of regional contacts, please visit **http://leica-geosystems.com/contact-us/sales_support**.

Table of Contents

1 Instrument Components 5

2 Home Screen 6

3 Batteries 7

3.1 Operating Principles 7
3.2 Charging the Battery 7
3.2.1 Charging the Battery by USB Port on Device 7
3.2.2 Charging the Battery by USB Charger (Optional) 8

4 Power Functions 10

5 Update 11

6 Using the touchscreen 12

7 Activation 13

8 Settings 15

9 Measurement Principle 17

10 Reality Capture 22

10.1 Take a Picture 22
10.2 Measure Distances in Picture 23
10.3 Measure Areas in Picture 25
10.4 Accuracy Feedback 26

11 Laser 27

11.1 Distance 27
11.2 Smart Horizontal 28
11.3 Tracking 29
11.4 Area 29
11.5 Volume 30

12 Sketch & Document (Optional) 31

12.1 Import Plan (Optional) 31
12.2 Sketch Plan (Optional) 34
12.3 Smart Room (Optional) 37
12.4 Measure Plan (Optional) 38
12.5 Measure Facade (Optional) 40

13 BIM 360 (Optional) 42

14 Publisher (Optional) 46

15 Organiser 48

16 Check & Adjust 50

17 Care and Transport 53

17.1 Transport 53
17.2 Storage 53
17.3 Cleaning and Drying 54

18 Technical Data 55

18.1 Conformity to National Regulations 55
18.1.1 BLK3D 55
18.1.2 Dangerous Goods Regulations 55
18.2 General Technical Data of the Product 55

19 Warranty 59

20 Safety Directions 60
20.1 General 60
20.2 Definition of Use 61
20.3 Limits of Use 61
20.4 Responsibilities 62
20.5 Hazards of Use 62
20.6 Laser Classification 64
20.6.1 General 64
20.6.2 BLK3D 64
20.7 Electromagnetic Compatibility (EMC) 65
20.8 FCC Statement, Applicable in U.S. 66
20.9 ISED Statements (EN/FR), Applicable in Canada 68

1 Instrument Components

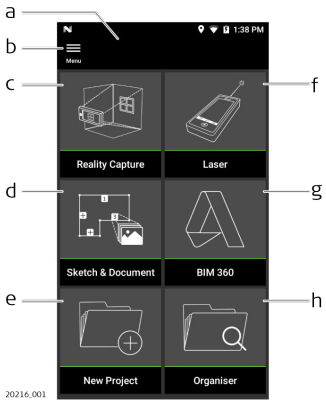
Instrument components

The Leica BLK3D Imager is a real-time, in picture 3D measurement solution. See chapter Technical Data for scope of use.

a Touch screen
b Laser/Photo capture
c Back
d Home
e Laser/Photo capture
f Recents
g Photo capture
h USB port protection lid
i USB port
j Power Functions

2 Home Screen

Home screen



a Status bar
b Side menu
c Reality Capture
d Sketch & Document (Optional)
e New Project
f Laser
g BIM 360 (Optional)
h Organiser

3 Batteries

3.1 Operating Principles

First-time use/ charging batteries

- The battery must be charged before using it for the first time because it is delivered with an energy content as low as possible.
- The permissible temperature range for charging is from 0 °C to +40 °C/+32 °F to +104 °F. For optimal charging, we recommend charging the batteries at a low ambient temperature of +10 °C to +20 °C/+50 °F to +68 °F if possible.
- It is normal for the battery to become warm during charging. Using the chargers recommended by Leica Geosystems, it is not possible to charge the battery once the temperature is too high.
- For new batteries or batteries that have been stored for a long time (> three months), it is effectual to make only one charge/discharge cycle.
- For Li-Ion batteries, a single discharging and charging cycle is sufficient. We recommend carrying out the process when the battery capacity indicated on the charger or on a Leica Geosystems product deviates significantly from the actual battery capacity available.

Operation/discharging

- The batteries can be operated from −20 °C to +55 °C/−4 °F to +131 °F.
- Low operating temperatures reduce the capacity that can be drawn; high operating temperatures reduce the service life of the battery.

⚠CAUTION

Connecting the charger improperly may cause serious damage to the device. Any damage caused by misuse is not covered by the warranty. Use only Leica-approved chargers, batteries, and cables. Unapproved chargers or cables can cause the battery to explode or damage the device.

3.2 Charging the Battery

3.2.1 Charging the Battery by USB Port on Device

Charging the battery by USB-C port on device

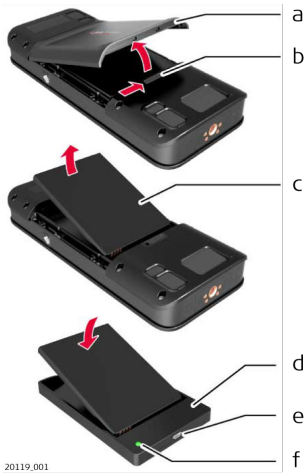
☞ Charge the battery when the battery icon in the status bar is flashing or before the first use.

1. Open the lid (a) and plug the cable into the port of the device (b).
2. Plug the end of the USB-C cable into one of the provided adaptors. Select the appropriate adapter for your country.

☞ The device can also be charged connecting the USB-C cable to the computer, but takes more time. If the device is connected to the computer through USB cable, you can download and upload data.

3.2.2 Charging the Battery by USB Charger (Optional)

Charging with battery charger



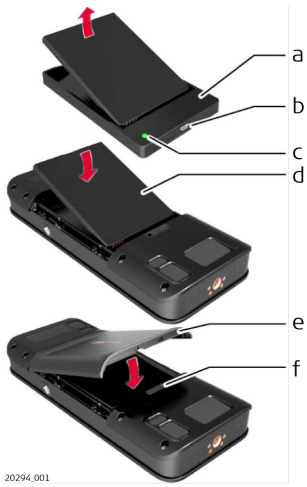
1. Move the slider (b) from left to right and remove the battery cover (a).
2. Pull the plastic strip and remove the battery (c).

☞ Do not remove the plastic strip from the battery (c).

3. Place the battery (c) in the charger (d).
4. Plug the USB cable into the port (e) of the charger (d).
5. Plug the USB cable into a power source.

☞ Charging is finished when the indicator light (f) turns green.

Install battery back in device



1. Remove the battery (d) from the charger (a).
2. Place the battery (d), bottom first in the BLK3D.

☞ Make sure that the battery (d) and the plastic strip are in the correct position.

3. Install the battery cover (e) top first on the BLK3D.

☞ Make sure that the battery cover (e) and the slider (f) are in the correct position.

Switching ON/OFF

Switching ON
Press the **ON/OFF** button (a) to switch the device on.

Switching OFF
Press and hold the **ON/OFF** button (a) for at least two seconds to switch the device off.

5 Update

Update

20215_001

BLK3D searches for updates when starting the app.

6 Using the touchscreen

Using the touch screen

☞ It is recommended to use fingers on the touch screen. To avoid damage to the touch screen, do not apply excessive pressure or tap the touch screen with anything sharp.

☞ Do not allow the touch screen to come into contact with other electrical devices. Electrostatic discharge can cause the touch screen to malfunction.

☞ Do not allow the touch screen to come into contact with water. The touch screen may malfunction in humid conditions or when exposed to water.

Tap
Tap on the display to open an application or to make a selection.

Drag
Touch and hold the object and drag it to the target position.

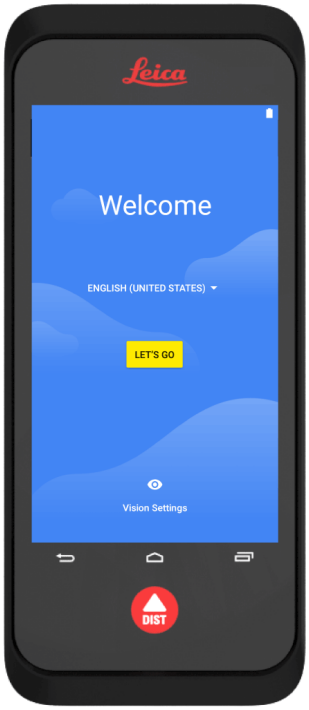
Double tap
Double tap on image to zoom it. Double tap again to return.

Spread and pinch
Spread two fingers apart on image to zoom. Pinch to zoom out.

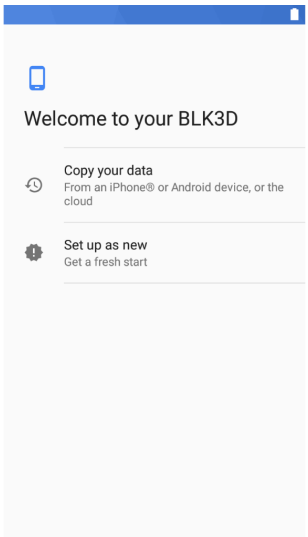
Swipe
Swipe from left to right on the screen to scroll side Menu. Swipe downwards to scroll through options.

Activation

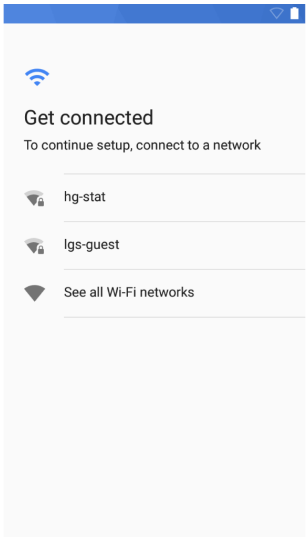
1. Select a language for the operating system.



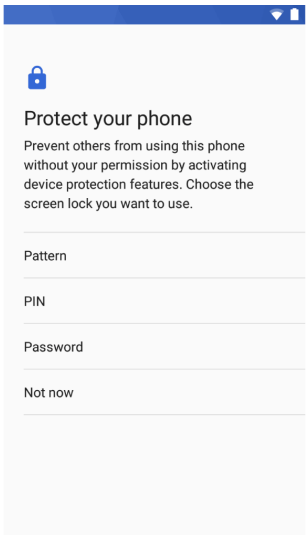
2. **Copy your data** from another device or **Set up as new**.



3. Connect to a Wi-Fi network.

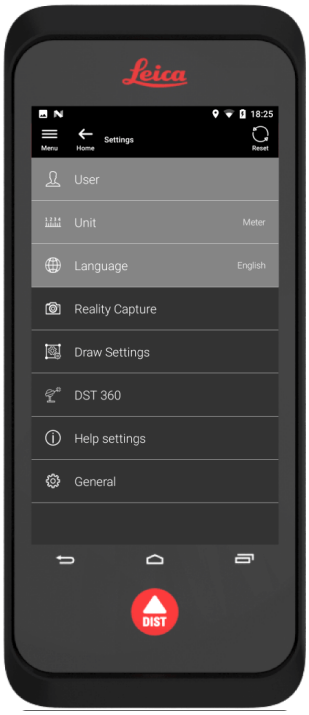


4. Protect your device with a **PIN** or a **Password** (optional).

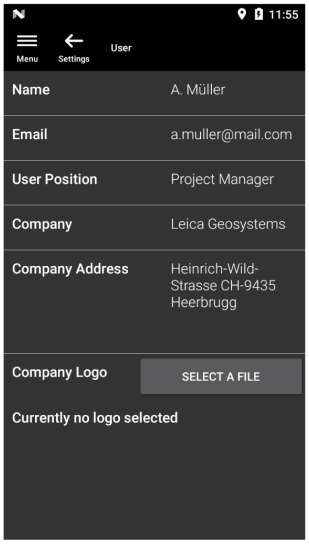


Settings

1. Select the **Settings** menu.

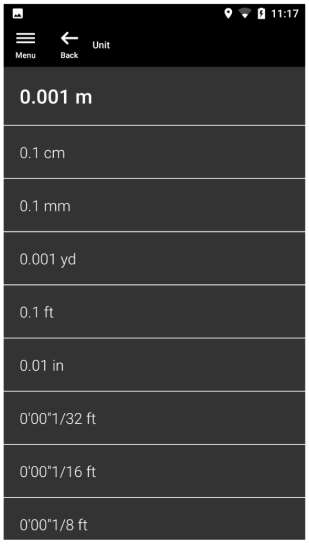


2. Enter the user data.

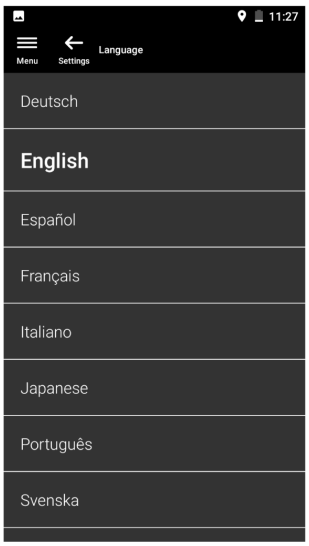


☞ The entered data is stored in your projects and is automatically used to fill in the header of an exported PDF report.

3. Select the measurement unit.



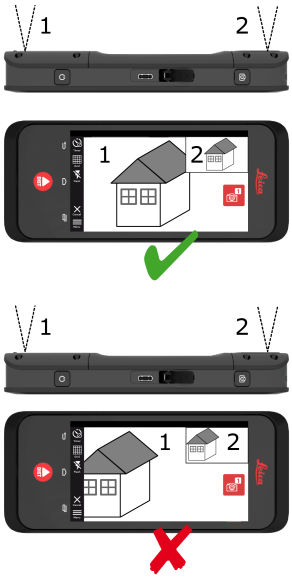
4. Select the language.



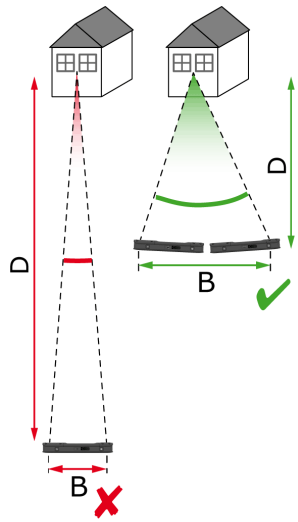
Measurement principle

1. The BLK3D Imager has a calibrated stereo camera, which takes two simultaneous 3D Images of the same scene from two different positions. This is analogue to the left and right eye in human 3D stereo vision.
   - **Reality Capture:** Picture capture process using the BLK3D Imager.
   - **Single-Shot:** Capture of a single stereo picture.
   - **Multi-Shot:** Capture of multiple stereo pictures of the same 3D Image from slightly different positions.
   - **Baseline:** Maximum distance between the cameras during Reality Capture. This distance can be increased by using Multi-Shot from slightly different positions.

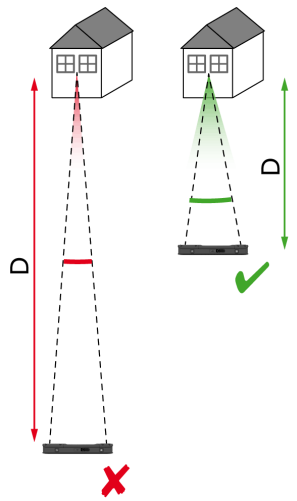
2. The pictures from the two cameras are displayed on the BLK3D screen. Only points which are visible in both pictures can be measured.



3. The intersection angle between the two lines of sight from the two cameras is key for good 3D accuracy. The angle is affected with the distance (D) to the object and the baseline length (B).

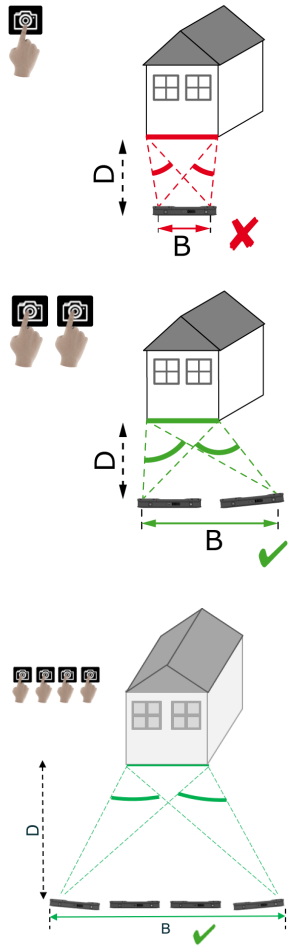


4. To increase the accuracy, take the picture from a short distance (D) to the object.



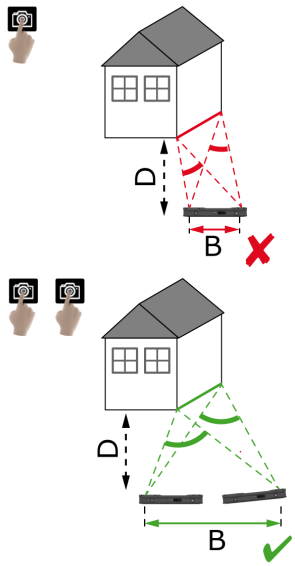
☞ Shorter distance (D) => Better results

5. To increase the baseline length (B), take up to four shots from slightly different positions.



☞ Longer baseline (B) => Better results

6. Multi-Shot is required for 3D measurements and 3D Images which should be used for 3D modelling. To increase the accuracy, take up to four shots.

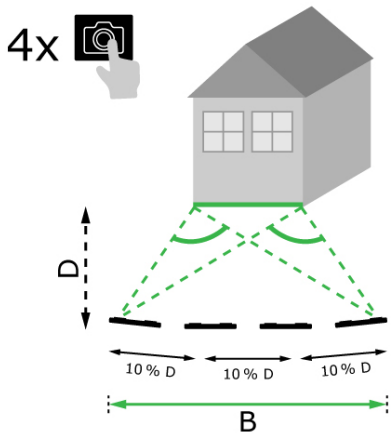


Recommended baseline length

The recommended baseline length between two shots is 10% of the distance from the imager to the object.

Example:

If the target is 5 m/16.4 ft away from the imager, use a baseline of 0.5 m/ 1.6 ft between the first and the second shot. Use the same distance between the second and third, as well as the third and fourth shot.



D - Distance
B - Baseline

Tip: The recommended distance between two shots is displayed on-screen while capturing. To display the recommendation, activate **Laser assisted capture**.

Recommended number of shots

Single-shot

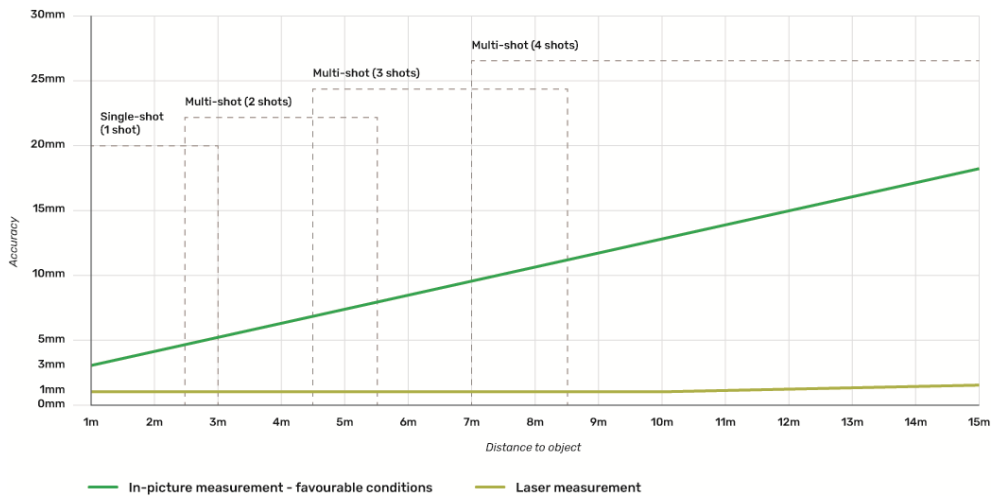
Single-shot is recommended for distances up to 2.5 m/8.2 ft between the imager and the target.

Multi-shot

For 2D measurements with a distance of more than 2.5 m/8.2 ft and for all 3D measurements, use the Multi-Shot function.

- Take **2 shots** for distances between 2.5 m/8.2 ft and 5.5 m/18.0 ft.
- Take **3 shots** for distances between 4.5 m/14.8 ft and 8.5 m/27.9 ft, and whenever high accuracy is needed.
- Take ***4 shots*** for long capture distances of 7 m/23.0 ft and longer, and whenever highest accuracy is needed.

Accuracy in Relation to the Number of Shots and the Distance from the Target



- Tolerances apply to 2D measurements up to 3 m/9.8 ft in length (<20° depth).
- For measurements longer than 3 m/9.8 ft and for 3D depth measurements (> 20° depth), the maximum tolerance may deteriorate up to 0.5%.

☞ For best results, use the Multi-shot function. Keep the recommended baseline length between all shots, which is 10% of the distance to the target object. Refer to Recommended baseline length.

10 Reality Capture

10.1 Take a Picture

Take a picture

1. Select the **Reality Capture** function.

2. Choose between different settings:
   - **Timer:** Set a time delay for the picture acquisition.
   - **Grid:** Show the grid lines on the display for better orientation.
   - **Flash:** Set the flash to ON/OFF or auto.
   - **Cancel:** Go back to the home screen.
   - **Menu:** Show menu for main navigation.

☞ Hold the BLK3D correctly. Make sure that your fingers do not cover the cameras.

3. Ensure that the object you want to measure is visible in all pictures. Only points which are visible in at least two pictures can be measured. Press **Photo** to capture. You can also use the **Photo capture** button.

4. To increase measurement accuracy take another picture from a slightly different perspective.

5. Review pictures. Press **Remove** to delete unwanted pictures and **Done** to exit **Review** mode.

6. Go to **Measure** mode, (see Measure Distances in Picture).
   - **New:** Capture the next **Reality Capture** 3D image without going to measure.

10.2 Measure Distances in Picture

Measure distances in picture

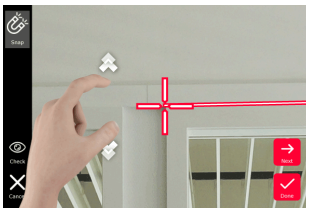
1. Select **Distance**, then zoom into the object you want to measure using gestures.

2. Tap the first point on the picture to start the measuring process.
   - **Snap:** Automatic snap to edges in picture (active by default).
   - **Delete:** Delete selected measured point/line.
   - **Undo:** Undo last operation.

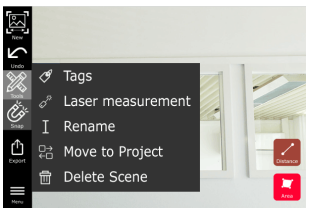
3. Tap the second point. The measured distance is automatically shown above the line.

4. Tap on any measured point again to activate **Precise** mode.

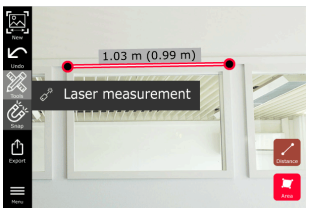
5. Drag and spread to precisely centre of the point you want to measure in the crosshairs.
   - **Done:** Confirm point position.
   - **Next:** Jump to the next point for **Precise** mode selection.



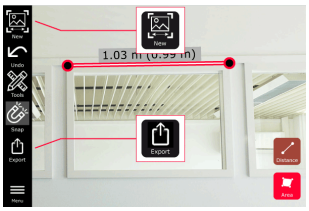
6. Select **Tools** to add **Tags**, **Rename** or delete the 3D image (**Delete Scene**), move 3D image to a project (**Move to Project**), (see Organiser) and measure distances with laser (**Laser measurement**), (see Laser).



7. Select a line and measure the distance with the laser to crosscheck the distance. The laser value is shown in brackets, (see Laser).



8. Choose different options:
   - **New:** Exits **measure** mode to take a new picture.
   - **Export:** Export the 3D image in JPG or PDF format.

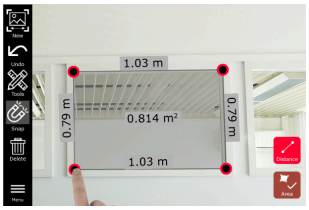


Measure areas in picture

1. Select **Area**, then zoom into the object you want to measure using gestures.

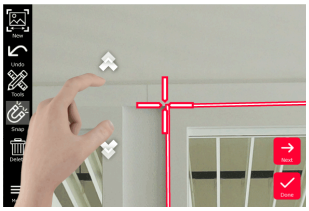
2. Tap the first point on the picture to start the measuring process.
   - **Snap:** Automatic snap to edges in picture (active by default).
   - **Delete:** Delete selected measured point/line.
   - **Undo:** Undo last operation.

3. Tap other points on picture to define the area. Tap **Area** button again to finish defining the area.

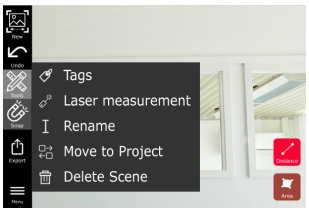


4. Tap on any measured point to activate **Precise** mode.

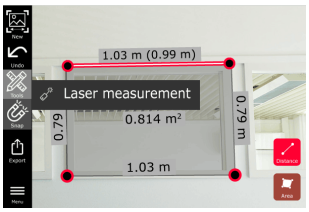
5. Drag and spread to precisely centre of the point you want to measure in the crosshairs.
   - **Done:** Confirm point position.
   - **Next:** Jump to the next point for **Precise** mode selection.



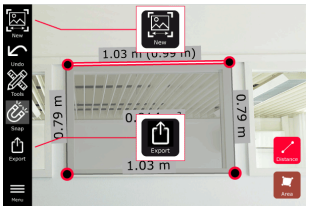
6. Select **Tools** to add **Tags**, **Rename** or delete the 3D image (**Delete Scene**), move 3D image to a project (**Move to Project**), (see Organiser) and measure distances with laser (**Laser measurement**), (see Laser).



7. Select a line and measure the distance with the laser to crosscheck the distance. The laser value is shown in brackets, (see Laser).



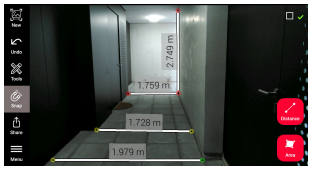
8. Choose different options:
   - **New:** Exits **Measure** mode to take a new picture.
   - **Export:** Export the 3D image in JPG or PDF format.



10.4 Accuracy Feedback

Accuracy feedback

After a point is measured, the point colour indicates the achieved accuracy:



- Green point: accuracy is at the highest level.
- Yellow point: accuracy is reduced.
- Red point: accuracy might be low, especially for 3D distances.

Possible reasons for reduced or low accuracy:

- The point is too far away from the imager.
  - Go closer to the target.
  - Increase the baseline length. Refer to Recommended baseline length.
- The point is too close to the edge of the image.
  - Make sure that the point is at the centre of the scene and capture again.
- The point is not visible in all captured shots.

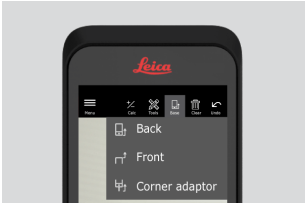
11 Laser

11.1 Distance

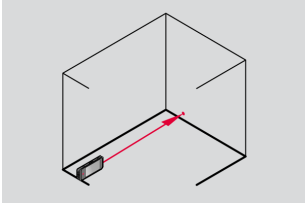
Distance

1. Select the **Laser** function.

2. Adjust the measuring reference (base):
   - **Back:** Distance is measured from the bottom of the device (default setting).
   - **Front:** Distance is measured from the top of the device.
   - **Corner adaptor:** Distance is measured from the Corner adaptor (optional).



3. Select **Distance** from **Tools**. Point the laser at the target.

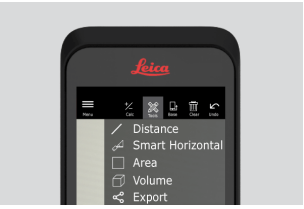


4. Press **Laser** button, (see Instrument Components).

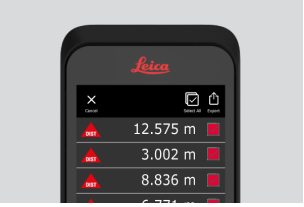
☞ Measured distance is shown at the bottom of the screen.

5. Select **Calc** and choose between **Add** and **Subtract**. Take another distance measurement to add/subtract to/from the previous one.

6. Select **Tools** to choose between different measurements (**Distance**, Smart Horizontal, Area and Volume) and export measurement into a PDF report.



7. Select **Export** and select the measurement to be printed in a PDF report.

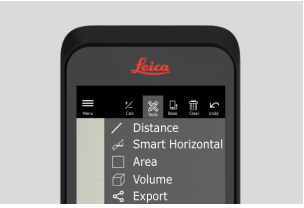


8. Swipe right to left to delete a single measurement, or select **Clear** to delete all measurements from the measurement list.

11.2 Smart Horizontal

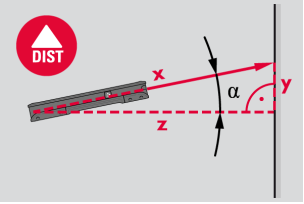
Smart Horizontal

1. Select **Smart Horizontal** from **Tools**.

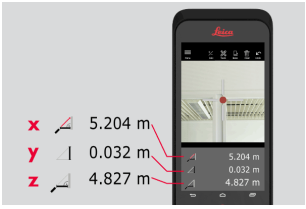


☞ Adjust measure reference if needed.

2. Point the active laser at the target. Measure with the **Laser** button.



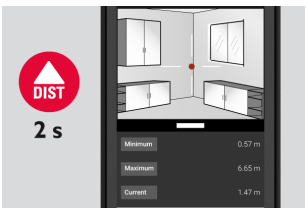
3. Vertical and horizontal distances are calculated.



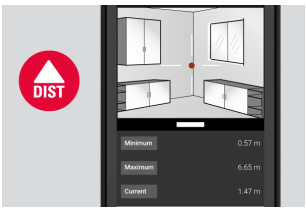
11.3 Tracking

Tracking

1. Press the **Laser** button for two seconds to activate **Tracking** mode.



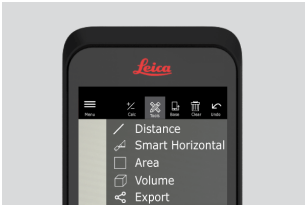
2. Press the **Laser** button again to finish the measurement.



11.4 Area

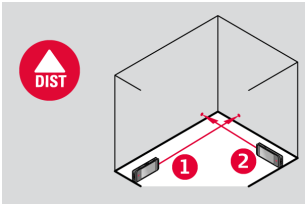
Area

1. Select **Area** from **Tools**.

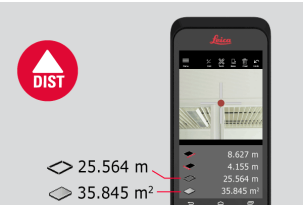


☞ Adjust measure reference if needed.

2. Measure two distances (length and width) with the **Laser** button.



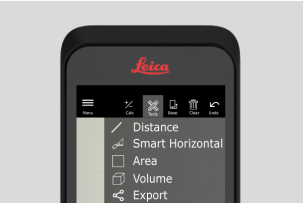
3. Circumference and area are automatically calculated.



11.5 Volume

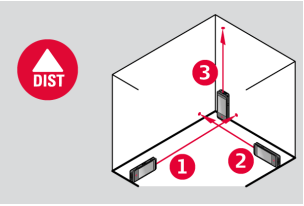
Volume

1. Select **Volume** from **Tools**.

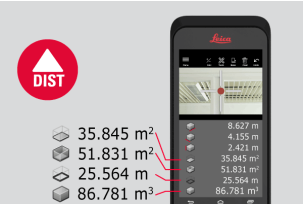


☞ Adjust measure reference if needed.

2. Measure three distances (length, width and height) with the **Laser** button.



3. Area, wall area, circumference and volume are automatically calculated.

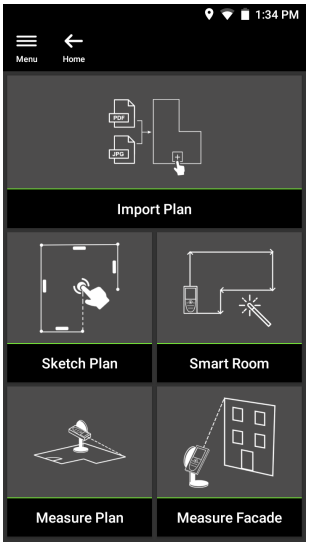


12 Sketch & Document (Optional)

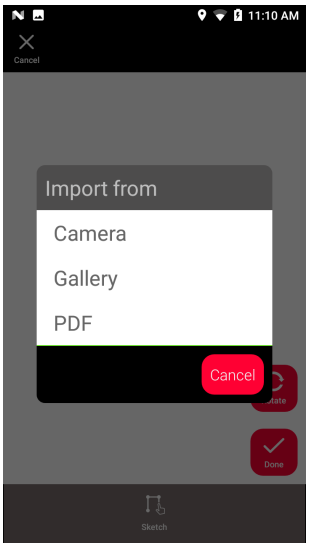
12.1 Import Plan (Optional)

Import Plan (optional)

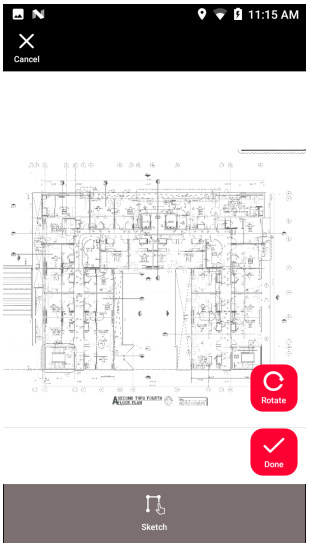
1. Select the **Import Plan** function from the **Sketch & Document** menu.



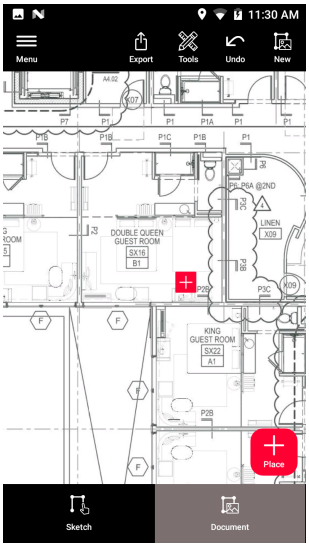
2. Select one of the following options:
   - **Camera:** Take a picture with the device camera.
   - **Gallery:** Import an image from the picture gallery.
   - **PDF:** Import a PDF file.



3. Use the **Rotate** function to change the orientation of the image. Tap **Done** to confirm.

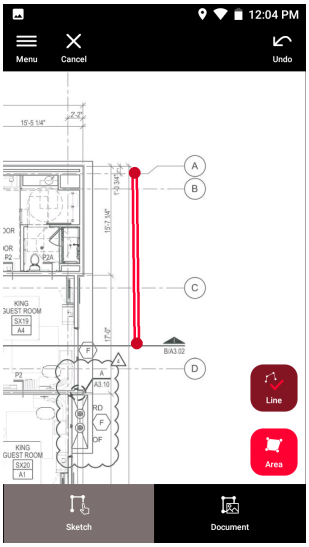


4. **Document** mode is automatically enabled. Tap **Place** and then tap the screen to insert a new place.



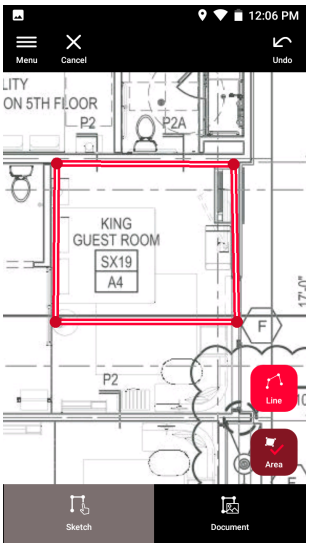
☞ To add 3D images to the place, select the place (see Sketch Plan (Optional)).

5. Switch to **Sketch** mode. Tap **Line** and draw by dragging or tapping. Tap **Line** again to finish the line.

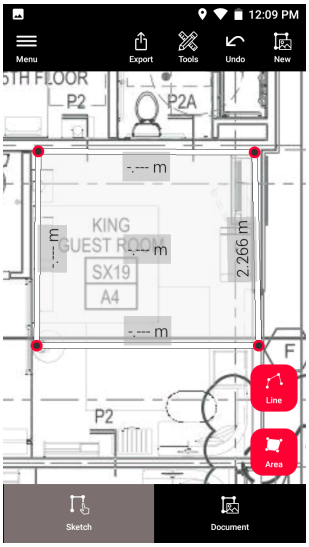


☞ The line finishes automatically when connecting it to the start point.

6. Tap **Area** and draw by dragging or tapping. To create an area, tap at least three points on the screen. Tap **Area** again to finish defining the area.



7. Select a line and press **Laser** to measure the length. Alternatively select a line and press **Enter** to add length.

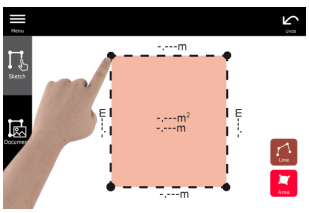


12.2 Sketch Plan (Optional)

Sketch Plan (optional)

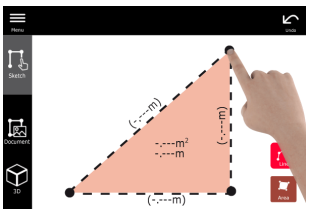
1. Select the **Sketch Plan** function from the **Sketch & Document** menu.

2. Select **Line** button and draw by dragging or tapping. Press again the button to finish the line.

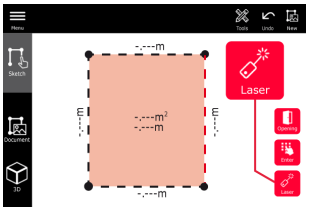


☞ Line finishes automatically when connecting it to the start point.

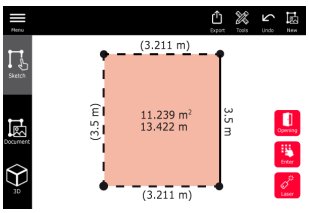
3. Select **Area** button and draw by dragging or tapping. To create an area, tap at least three points on the screen. Tap **Area** button again to finish defining the area.



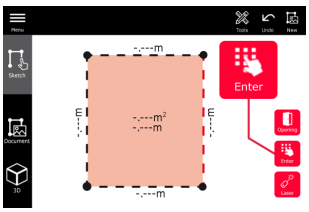
4. Select a line and press **Laser** to measure the length.



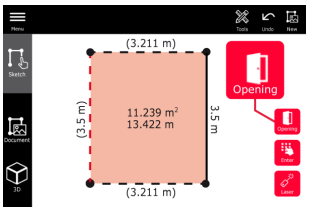
5. The sketch is automatically scaled. Calculated values are in brackets. Area and circumference are automatically printed on sketch.



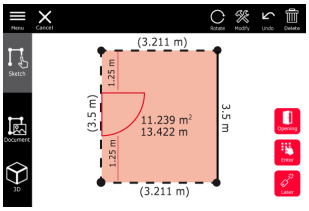
6. Alternatively select a line and press **Enter** to add length.



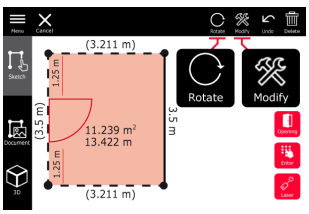
7. Select a line and press **Opening** to add doors or windows.



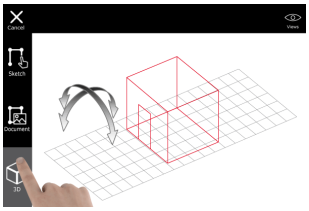
8. Drag the opening to move it or select the distance from the wall and measure it.



9. Select opening and press **Modify** to change type and enter width and height. Use the **Rotate** button to change the opening orientation.

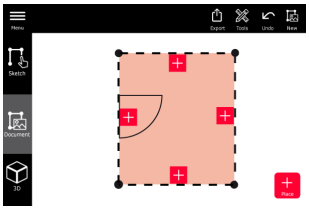


10. Switch to **3D** mode.

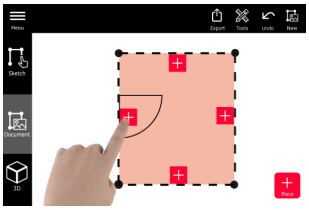


☞ A room height can be entered.

11. Switch to **Document**. A place is automatically assigned to each line. Drag a place to move it. Press the **Place** button and tap the screen to add a new place.

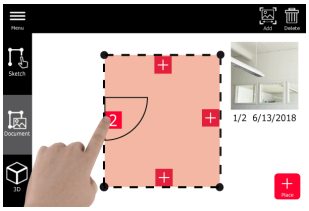


12. Select an empty place to add a 3D image.

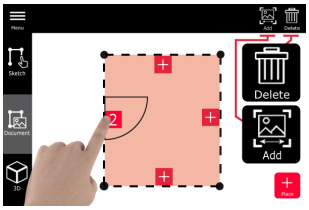


☞ It is possible to take a new picture or browse for existing pictures. A plan can store up to 500 3D images.

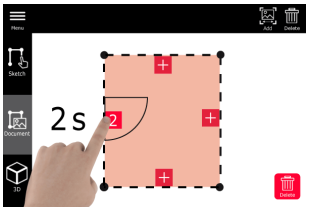
13. Select a place to review the 3D images. Press the image preview to open it and add more measurements.



14. Select a place to **Delete** or **Add** a 3D image. The place counter is updated.



15. To delete a place, press it for 2 seconds and press **Delete**. All the stored 3D images are deleted.

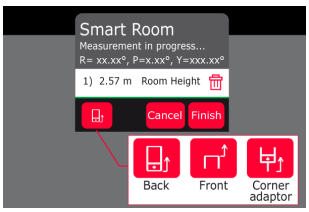


12.3 Smart Room (Optional)

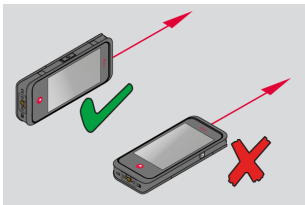
Smart Room (optional)

1. Select the **Smart Room** function from the **Sketch & Document** menu.

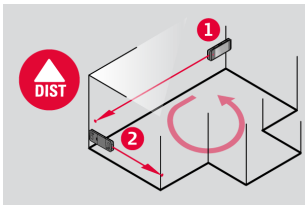
2. Adjust measuring reference:
   - **Back:** Distance is measured from the bottom of the device (default setting).
   - **Front:** Distance is measured from the top of the device.
   - **Corner adaptor:** Distance is measured from the Corner adaptor (optional).



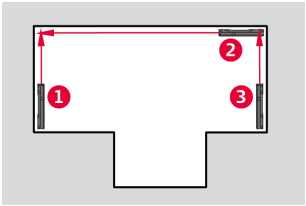
3. Keep the screen oriented away from the wall while measuring.



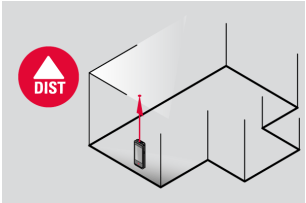
4. Measure the room clockwise/anti-clockwise using the **Laser** button. Up to 20 measurements are supported for one **Smart Room**.



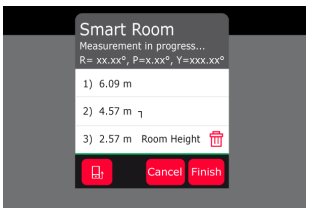
5. Reverse measurements can be done when needed.



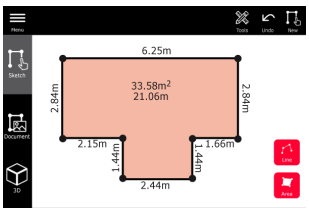
6. **Room Height** can be measured anytime.



7. All measured values are displayed. After the last measurement press **Finish**.



8. The floorplan can be modified in **Sketch** mode, (see Sketch Plan (Optional)).



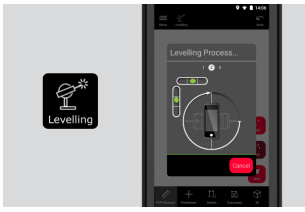
12.4 Measure Plan (Optional)

Measure Plan (optional)

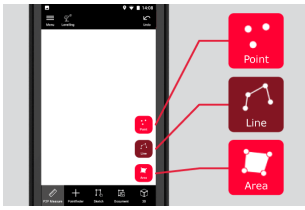
1. Connect the BLK3D to the Leica DST 360 adapter.

2. Select the **Measure Plan** function from the **Sketch & Document** menu.

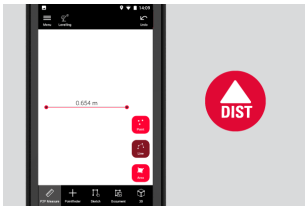
3. Level the instrument before starting to measure. Follow the on screen instructions.



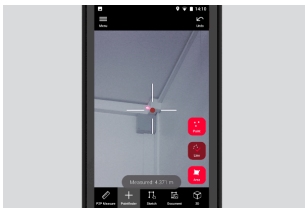
4. Select **Point**, **Line** or **Area** in the **P2P Measure** Tab.



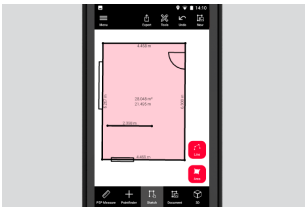
5. Point the laser at the target and measure with the **Measure** button. Measured points are projected onto the floorplan and are automatically shown on screen.



6. Activate **Pointfinder** to use the front camera to find the target point and measure with the **Measure** button.



7. The plan can be modified in **Sketch** mode, (see Sketch Plan (Optional)) or visualised in 3D.



12.5 Measure Facade (Optional)

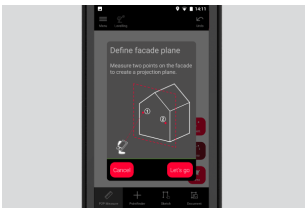
Measure Facade (optional)

1. Connect the BLK3D to the Leica DST 360 adapter.

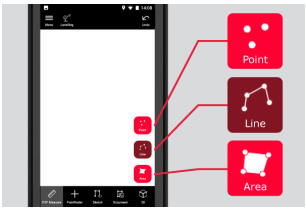
2. Select the **Measure Facade** function from the **Sketch & Document** menu.

3. Level the instrument before starting to measure. Follow the on screen instructions.

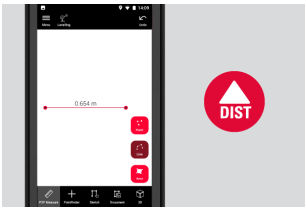
4. Define facade plane to create a projection plane. Follow the on screen instructions.



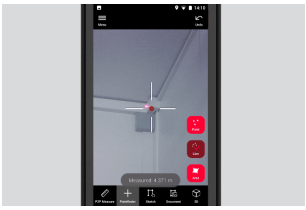
5. After the facade plan has been defined, select **Point**, **Line** or **Area** in the **P2P Measure** Tab.



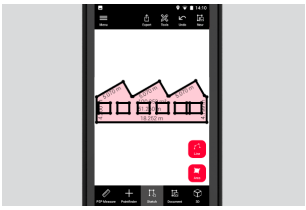
6. Point the laser at the target and measure with the **Measure** button. Measured points are projected onto the floorplan and are automatically shown on screen.



7. Activate **Pointfinder** to use the front camera to find the target point and measure with the **Measure** button.



8. The plan can be modified in **Sketch** mode, (see Sketch Plan (Optional)).



☞ 3D view is not available for facades.

BIM 360 (optional)

Overview

Autodesk BIM 360 Docs integration with BLK3D, allows the sharing of 3D images into the BIM 360 environment.

☞ 3D images captured with the BLK3D can be stored in Autodesk BIM 360 issues.

☞ 3D images stored in BIM 360 issues can be viewed and measured on the BLK3D Web.

Connect the BIM 360 account.

In order to start using files from BIM 360 Docs, you first must establish a connection between the BLK3D and your Autodesk BIM 360 account.

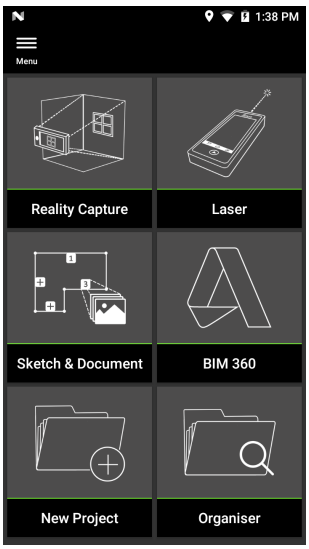
1. Log in to your BIM 360 account.
2. Go to **Account Admin**.
3. Select the **Apps** Tab.
4. Find the BLK3D app and select it.
5. Click **Add to BIM 360**.

☞ If you do not yet have access to an Autodesk account, ask an admin to add you as a member.

☞ After any members are added to the account by the account admin, they can be added to different projects.

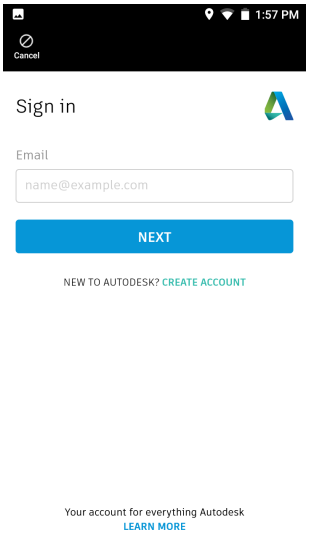
Workflow

1. Select the **BIM 360** function.



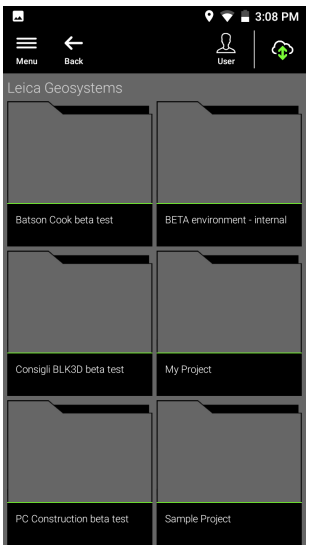
☞ Make sure that you are connected to the Internet.

2. Sign in with a valid Autodesk account.



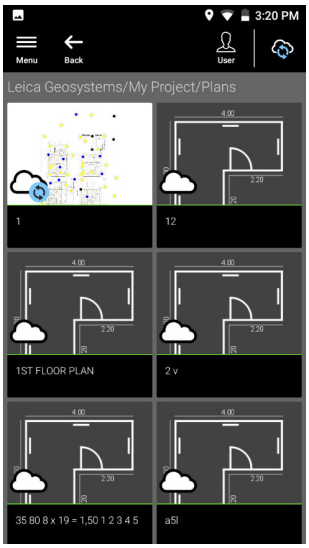
☞ Make sure that your Autodesk account is activated in Autodesk BIM 360 Docs.

3. All the BIM 360 data is automatically synced to the BLK3D after sign-in.
The icon in the top toolbar indicates the status of the syncing progress:
- - Syncing in progress.
- - Syncing successful.
- - Syncing failed.

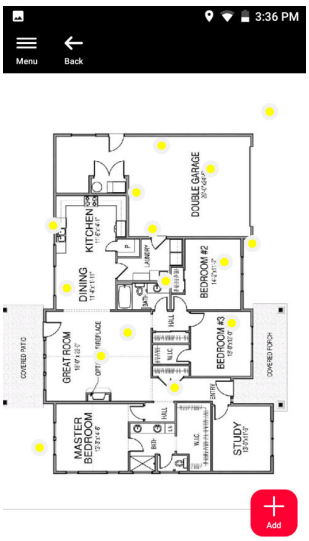


4. Each file has a sync Status icon:
   - - Syncing in progress.
   - - Syncing successful.
   - - Syncing failed.
   - - Syncing not started.

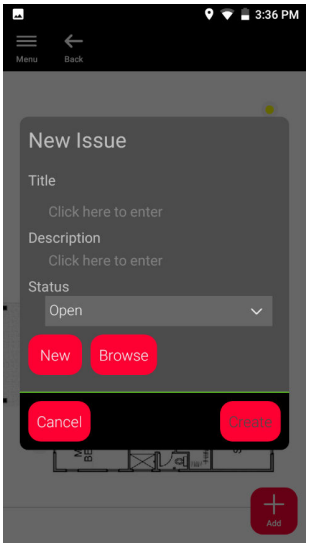
   Tap a file to open it.



5. Tap **Add** to create a new issue. Tap on the screen to place the issue.



6.
- Enter the **New Issue**, **Title** and **Description**.
- Set issue **Status** to **Open** or **Draft**.
- Tap **New** to capture a new 3D image and add it to the issue.
- Alternatively, tap **Browse** and select a 3D image, then add it to the issue.
- Tap **Create** to confirm.



Publisher (optional)

Overview

Select a 3D Image and use the **Publish** function to save the 3D Image into the cloud.

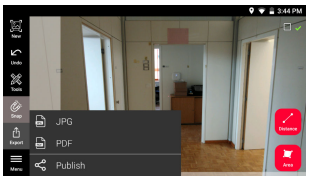
☞ Internet connection is required to publish a link.

☞ The published 3D Image is available to be viewed and measured by anyone on **BLK3D Web**.

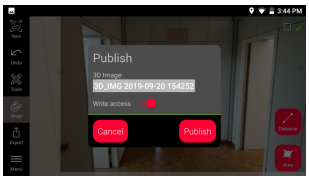
☞ Any changes done later on the original 3D Image are not merged to the file in the cloud.

Workflow

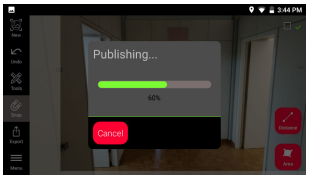
1. A 3D Image can be Published from the Measure function. Select **Share** and then select **Publish**.



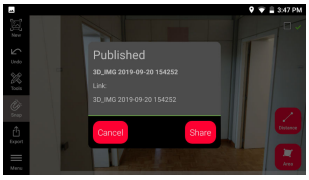
2. It is possible to change the 3D Image name before starting the publishing process.



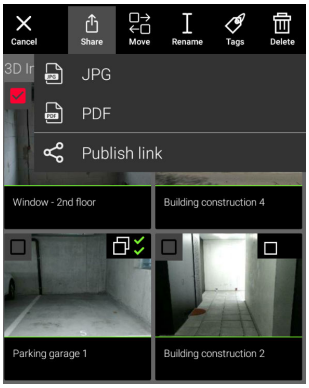
3. Publishing a link uploads the 3D Image to the cloud where it is accessible for 90 days.



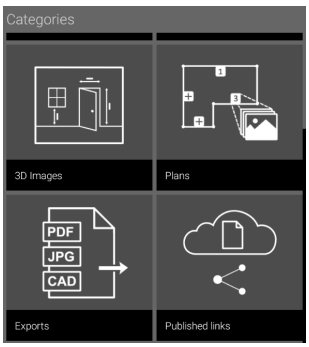
4. A link is automatically created. To select an app for sharing the link, tap **Share**. This link can be used to open the 3D Image in **BLK3D Web**.



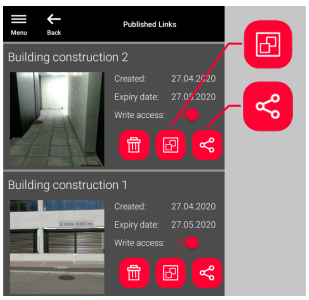
5. As an option, it is possible to publish a 3D Image from the **Organiser**. Select a 3D Image, select **Share** and then select **Publish**.



6. To access the list of published links, open the category **Published Links** in **Organiser**.



7. To copy the published link, tap the **Copy** button.
To attach the published link to an email, tap the **Share** button.



You can also delete a link, or enable or disable write access.

☞ When a link is deleted, the 3D Image is removed from the cloud and cannot be opened anymore on **BLK3D Web**.

Organiser

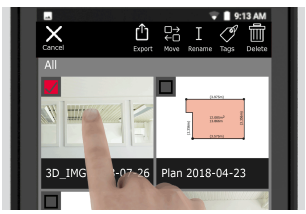
1. Select the **Organiser** function.

2. All the plans and 3D images are stored in five categories:
   1. **All**.
   2. **Projects**.
   3. **3D Images**.
   4. **Plans**.
   5. **Exports**.

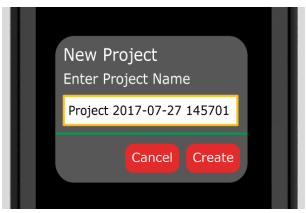
3. Open the category **All**.

☞ All the plans, 3D images and projects are stored.

4. Use the **Select** option to select an item. Different actions are available: **Export**, **Move**, **Rename**, **Tag** and **Delete**.



5. Open the category **Projects**, then select the **Project** button to create a new project folder.



☞ Plans and 3D images can be moved into project folders.

6. Open the category **3D Images**. Press the **RC** button to switch to Reality Capture to take new 3D images.

☞ All the Reality Capture 3D images are stored.

7. Open the category **Plans**.

☞ All plans, including plans with attached 3D images, are stored.

8. Press the **S&D** button to add a new plan.
9. Open the category **Exports**.

☞ All exported files in PDF, JPG and CAD format, are stored.

16 Check & Adjust

Check & adjust

The check and adjustment of the BLK3D is possible thanks to the **Check & Adjust** function.

Check - Is the process of verifying the accuracy of the device with the Initial Accuracy Test.

☞ Can be done hand-held.

☞ Requires the BLK3D calibration plate.

☞ Is recommended after a fall.

Adjust - Is the process of adjusting the accuracy of the device.

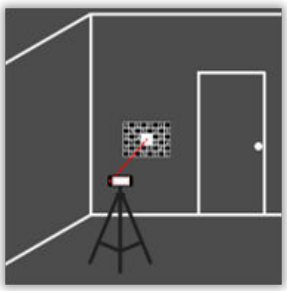
☞ Requires the BLK3D calibration plate, tripod and tripod adapter.

From the menu it is possible to:

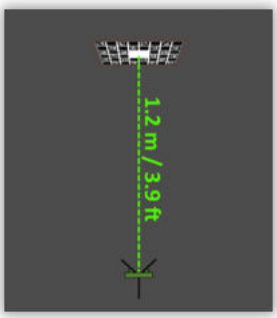
- See when the last check was done.
- See when the last adjustment was done.
- Check the accuracy.
- Reset the adjustment status back to default settings.

To perform the Initial Accuracy Check

1. Place the BLK3D calibration plate on the floor or against the wall and point the laser at the centre of the calibration plate.

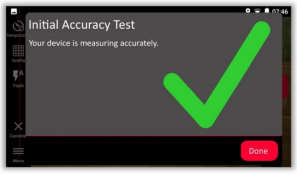


2. Fit the calibration plate into the red frame shown on screen. Use the guidelines on the screen to adjust the distance of the camera from the calibration plate (1.2 m/3.9 ft). Trigger the picture using the **Photo** button on screen.

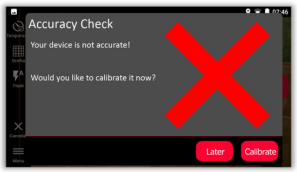


3. After the check is complete, feedback is provided to the user:

Device is calibrated. No need to adjust. Select **Done** to finish.



The check failed. Device is not calibrated. Select **Calibrate** to start adjustment process. Select **Later** to postpone.

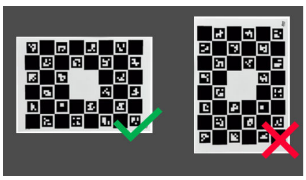


To perform the adjustment

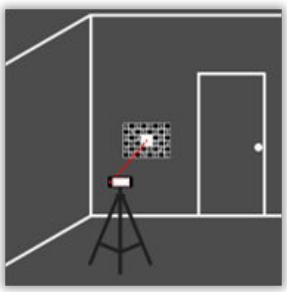
1. Mount the BLK3D horizontally on the tripod.

☞ Adjustment is not possible without the tripod.

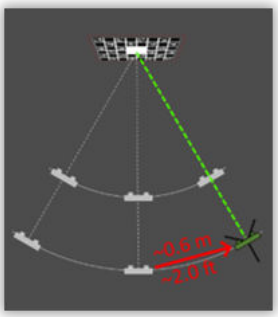
2. Place or hang the calibration plate on the wall.

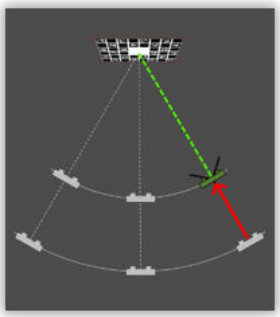


3. Use the laser to adjust the tripod height to the centre of the calibration plate.



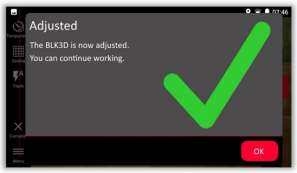
4. The adjustment process is done in the following steps:
   1. Adjust the distance of the camera from the calibration target.
   2. Move left or right following the on screen instructions.
   3. Fit the calibration target into the red frame shown on screen.
   4. Trigger the picture using the on screen Laser/Photo capture option.
   5. Follow the on screen instructions to complete the procedure.



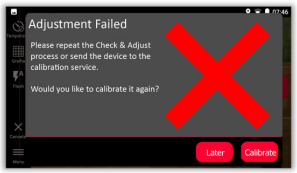


5. After the adjustment process is complete, feedback is provided to the user:

   Device is calibrated. Select **OK** to finish.



   The adjustment failed. Device is not calibrated. Select **Calibrate** to start the adjustment process again. Select **Later** to postpone.



17 Care and Transport

Care

- Clean the device with a damp, soft cloth. Handle with care.
- Never immerse the device in water.
- Never use aggressive cleaning agents or solvents.
- Back up your data regularly. Leica Geosystems AG is not liable for data loss.
- BLK3D Imager is a highly accurate optical measurement device.
- Do not drop. Use the neck strap to prevent dropping. The product may malfunction if subject to strong shocks or vibration. Check the camera calibration after a drop.
- Device can get hot during extensive use. This is normal and not a failure.

17.1 Transport

Transport in a road vehicle

Never carry the product loose in a road vehicle, as it can be affected by shock and vibration. Always carry the product in its container and secure it.

For products for which no container is available use the original packaging or its equivalent.

Shipping

When transporting the product by rail, air or sea, always use the complete original Leica Geosystems packaging, container and cardboard box, or its equivalent, to protect against shock and vibration.

Shipping, transport of batteries

When transporting or shipping batteries, the person responsible for the product must ensure that the applicable national and international rules and regulations are observed. Before transportation or shipping, contact your local passenger or freight transport company.

Field adjustment

Exposing the product to high mechanical forces, for example through frequent transport or rough handling, or storing the product for a long time may cause deviations and a decrease in the measurement accuracy. Periodically carry out test measurements and perform the field adjustments indicated in the User Manual before using the product.

17.2 Storage

Product

Respect the temperature limits when storing the equipment, particularly in summer if the equipment is inside a vehicle. Refer to 18 Technical Data for information about temperature limits.

Li-Ion batteries

- Refer to 18 Technical Data for information about storage temperature range.
- Remove batteries from the product and the charger before storing.
- After storage recharge batteries before using.
- Protect batteries from damp and wetness. Wet or damp batteries must be dried before storing or use.
- A storage temperature range of 0 °C to +30 °C / +32 °F to +86 °F in a dry environment is recommended to minimize self-discharging of the battery.
- At the recommended storage temperature range, batteries containing a 40% to 50% charge can be stored for up to one year. After this storage period the batteries must be recharged.

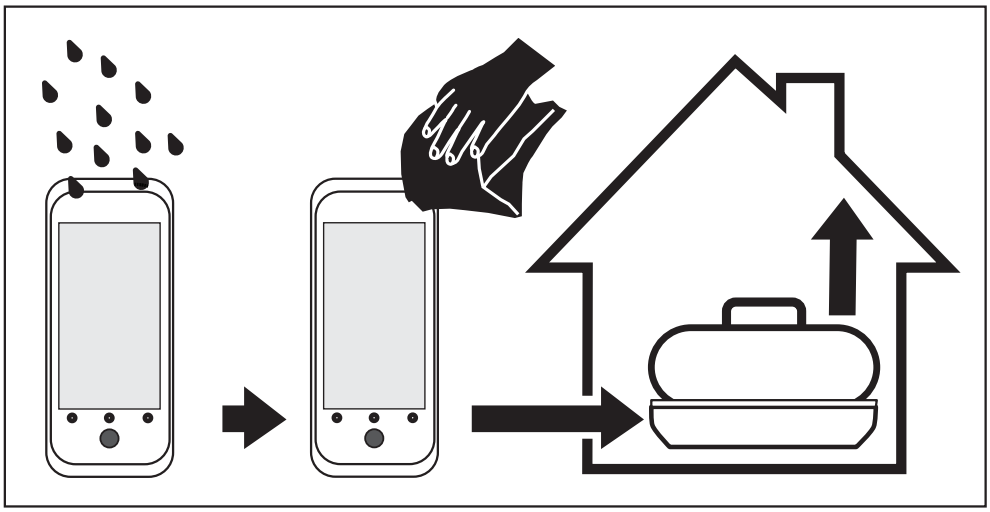
17.3 Cleaning and Drying

Product and accessories

- Blow dust off lenses and prisms.
- Never touch the glass with your fingers.
- Use only a clean, soft, lint-free cloth for cleaning. If necessary, moisten the cloth with water or pure alcohol. Do not use other liquids; these may attack the polymer components.

Damp products

As applicable dry the device and the accessories at a temperature not greater than 40 °C/104 °F. Remove the battery cover and dry the battery compartment.



Cables and plugs

Keep plugs clean and dry. Blow away any dirt lodged in the plugs of the connecting cables.

18 Technical Data

18.1 Conformity to National Regulations

Regulatory information

Regulatory information, certification, and compliance marks are available on the BLK3D. Go to **Android Settings** > **About phone** > **Regulatory labels**.

18.1.1 BLK3D

Conformity to national regulations

- FCC Part 15 (applicable in US)
- Hereby, Leica Geosystems AG declares that the radio equipment type BLK3D is in compliance with Directive 2014/53/EU and other applicable European Directives.
  The full text of the EU declaration of conformity is available at the following Internet address: http://www.leica-geosystems.com/ce.

  CE Class 1 equipment according to European Directive 2014/53/EU (RED) can be placed on the market and be put into service without restrictions in any EEA member state.
- The conformity for countries with other national regulations not covered by the FCC part 15 or European Directive 2014/53/EU has to be approved prior to use and operation.
- Japanese Radio Law and Japanese Telecommunications Business Law Compliance.
  - This device is granted pursuant to the Japanese Radio Law (電波法) and the Japanese Telecommunications Business Law (電気通信事業法).
  - This device should not be modified (otherwise the granted designation number will become invalid).

18.1.2 Dangerous Goods Regulations

Dangerous Goods Regulations

Many products of Leica Geosystems are powered by Lithium batteries.

Lithium batteries can be dangerous under certain conditions and can pose a safety hazard. In certain conditions, Lithium batteries can overheat and ignite.

☞ When carrying or shipping your Leica product with Lithium batteries onboard a commercial aircraft, you must do so in accordance with the **IATA Dangerous Goods Regulations**.

☞ Leica Geosystems has developed **Guidelines** on "How to carry Leica products" and "How to ship Leica products" with Lithium batteries. Before any transportation of a Leica product, we ask you to consult these guidelines on our web page (http://www.leica-geosystems.com/dgr) to ensure that you are in accordance with the IATA Dangerous Goods Regulations and that the Leica products can be transported correctly.

☞ Damaged or defective batteries are prohibited from being carried or transported onboard any aircraft. Therefore, ensure that the condition of any battery is safe for transportation.

18.2 General Technical Data of the Product

Laser distance measurement (ISO 163331-1)

Type	Value	
Accuracy with favourable conditions[1]	±1.0 mm[3]	±0.04 in[3]

Type	Value	
Accuracy with unfavourable conditions[2]	±2.0 mm[3]	±0.08 in[3]
Range with favourable conditions[1]	250 m	820 ft
Range with unfavourable conditions[2]	120 m	394 ft
Smallest unit displayed	0.1 mm	1/32 in
X-Range Power Technology™	Yes	
Ø laser point at distances	6 mm at 10 m 30 mm at 50 m 60 mm at 100 m	

1 Applies to 100% target reflectivity (white painted wall), low background illumination, 25 °C

2 Applies to 10 to 100% target reflectivity, high background illumination, −10 °C to +50 °C.

3 Tolerances apply to ranges from 0.05 m to 10 m with a confidence level of 95%.
The maximum tolerance may deteriorate to 0.1 mm/m between 10 m to 30 m, to 0.20 mm/m between 30 m to 100 m and to 0.30 mm/m for distances above 100 m.

Tilt measurement

Type	Value
Measuring tolerance of laser beam[1]	±0.2°
Measuring tolerance to housing[1]	±0.2°
Range	360°

1 After user calibration.
Additional angle related deviation of ±0.01° per degree up to ±45° in each quadrant.

P2P measurement with DST 360 (optional)

Type	Value
Working range vertical sensor	−64° to >90°
Accuracy vertical sensor up to	±0.1°
Working range horizontal sensor	360°
Accuracy horizontal sensor up to	±0.1°
Tolerance P2P function at distances approximately (combination of sensors and distance measuring)	±2 mm at 2 m ±5 mm at 5 m ±10 mm at 10 m
Levelling range	±5.0°

General

Type	Value	
Dimensions (height x width x length)	180.6 x 77.6 x 27.1 mm	7.11 x 3.06 x 1.07 in
Weight (with rechargeable battery)	480 g	17 oz
Temperature range		

Type	Value	
Storage	−25 to 60°C	−13 to 140°F
Operation	−10 to 50°C	14 to 122°F
Charging	0 to 40°C	32 to 104°F
Tripod adapter	Supports 1/4-20 UNC screw adapters	

Technology

Type	Value
Operating System	Android 7 (Nougat)
Processor	Snapdragon 820E QuadCore (2.35 GHz)
RAM memory	4 GB
Real-time processor	STM32F446
Screen	5.0" IPS, HD 720 x 1280 LCD capacitive multi-touch screen, chemically strengthened, brightness: 450 cd/m^2
Stereo camera	
Pixels	2 x 10 MP (15.8 cm diagonal base line)
Field of view	80°
Focal length	4.0 mm (22 mm in 35 mm equivalent in 1:1)
Aperture	F3.0
Laser EDM camera	
Pixels	2 MP
Field of view	14°
I/O	USB Type-C 1.0 for data transfer and charging (water-resistant), integrated speaker and microphone
Keyboard	Three physical buttons (Power, Laser/Photo capture, Photo capture) Four touch buttons (Back, Home, Recents, Laser/Photo capture)
Additional sensors	Compass, 3D accelerometer and 3D gyroscope
Laser class	2
Laser type	655 nm, 0.95 mW

Storage

Type	Value
Internal storage	64 GB
Single-shots	14000 3D Images
Multi-shots	5000 3D Images (2 shots)

Communication

Type	Value
Bluetooth® Smart	

Type	Value
Bluetooth	v4.1 and v2.1
Radiated power (BLE)	1.78 mW
Radiated power (BT classic)	10.00 mW
Frequency	2402 - 2480 MHz

Type	Value
WLAN	
Standard	802.11 b/g/n
Radiated power	6.31 mW
Frequency	2412 - 2462 MHz
GPS	A-GPS and GLONASS

Power management

Type	Value
Battery	Rechargeable battery pack Li-Ion (3.80 V, 3880 mAh, 14.7 Wh) (included)
Power Management	AC adaptor (input: 100 - 240 V AC) (included) External charger (input: 100 - 240 V AC) (optional)
Charging time	<3.5 h (with AC adaptor) <5 h (with optional external charger)
Operating time	
Typical capture[1]	4 h for 220 multi-shot captures
Continuous capture[1]	2.5 h for 1000 single-shot captures
Laser measurements	6.5 h for 9500 laser measurements
Auto power off	After 3 h

1 Wi-Fi®, Bluetooth® off, flash off, screen brightness 50%

19 Warranty

Description

The Leica BLK3D comes with a one year warranty from Leica Geosystems AG.

More detailed information about the International Limited Warranty can be found on the internet at:

https://leica-geosystems.com/-/media/files/leicageosystems/about_us/legal%20document/internationallimitedwarranty_english_2013.ashx?la=en

20 Safety Directions

20.1 General

Description

The following directions enable the person responsible for the product, and the person who actually uses the equipment, to anticipate and avoid operational hazards.

The person responsible for the product must ensure that all users understand these directions and adhere to them.

About warning messages

Warning messages are an essential part of the safety concept of the instrument. They appear wherever hazards or hazardous situations can occur.

Warning messages...

- make the user alert about direct and indirect hazards concerning the use of the product.
- contain general rules of behaviour.

For the users' safety, all safety instructions and safety messages shall be strictly observed and followed! Therefore, the manual must always be available to all persons performing any tasks described here.

DANGER, **WARNING**, **CAUTION** and **NOTICE** are standardised signal words for identifying levels of hazards and risks related to personal injury and property damage. For your safety, it is important to read and fully understand the following table with the different signal words and their definitions! Supplementary safety information symbols may be placed within a warning message as well as supplementary text.

Type	Description
⚠ **DANGER**	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ **WARNING**	Indicates a potentially hazardous situation or an unintended use which, if not avoided, could result in death or serious injury.
⚠ **CAUTION**	Indicates a potentially hazardous situation or an unintended use which, if not avoided, may result in minor or moderate injury.
NOTICE	Indicates a potentially hazardous situation or an unintended use which, if not avoided, may result in appreciable material, financial and environmental damage.
☞	Important paragraphs which must be adhered to in practice as they enable the product to be used in a technically correct and efficient manner.

20.2 Definition of Use

Intended use

- Capturing 3D images
- Measuring in 3D images
- Measuring distances
- Tilt measurement
- Point to point measurement
- Data transfer with Bluetooth®/WLAN
- 2D/3D CAD export

Reasonably forseeable misuse

- Use of the product without instruction
- Use outside of the intended use and limits
- Disabling safety systems
- Removal of hazard notices
- Opening the product using tools, for example screwdriver, unless this is permitted for certain functions
- Modification or conversion of the product
- Use after misappropriation
- Use of products with recognisable damage or defects
- Use with accessories from other manufacturers without the prior explicit approval of Leica Geosystems
- Deliberate dazzling of third parties
- Controlling of machines, moving objects or similar monitoring application without additional control and safety installations
- Aiming directly into the sun
- Inadequate safeguards at the working site

⚠WARNING

Reasonably foreseeable misuse can lead to injury, malfunction and damage

It is the task of the person responsible for the equipment to inform the user about hazards and how to counteract them.

- ▸ The product is not to be operated until the user has been instructed on how to work with it.

20.3 Limits of Use

Environment

Suitable for use in an atmosphere appropriate for permanent human habitation. Not suitable for use in aggressive or explosive environments.

⚠WARNING

Working in hazardous areas, or close to electrical installations or similar situations

Life Risk.

Precautions:

- ▸ Local safety authorities and safety experts must be contacted by the person responsible for the product before working in such conditions.

20.4 Responsibilities

Manufacturer of the product

Leica Geosystems AG, CH-9435 Heerbrugg, hereinafter referred to as Leica Geosystems, is responsible for supplying the product, including the User Manual and original accessories, in a safe condition.

Person responsible for the product

The person responsible for the product has the following duties:

- To understand the safety instructions on the product and the instructions in the User Manual
- To ensure that it is used in accordance with the instructions
- To be familiar with local regulations relating to safety and accident prevention
- To inform Leica Geosystems immediately if the product and the application become unsafe
- To ensure that the national laws, regulations and conditions for the operation of the product are respected

20.5 Hazards of Use

NOTICE

Dropping, misusing, modifying, storing the product for long periods or transporting the product

Watch out for erroneous measurement results.

Precautions:

- Periodically carry out test measurements and perform the field adjustments indicated in the User Manual, particularly after the product has been subjected to abnormal use as well as before and after important measurements.

☞ We recommend using the **Check & Adjust** function with the BLK3D calibration target plate to check the accuracy.

⚠WARNING

Inappropriate mechanical influences to batteries

During the transport, shipping or disposal of batteries it is possible for inappropriate mechanical influences to constitute a fire hazard.

Precautions:

- Before shipping the product or disposing it, discharge the batteries by the product until they are flat.
- When transporting or shipping batteries, the person in charge of the product must ensure that the applicable national and international rules and regulations are observed.
- Before transportation or shipping, contact your local passenger or freight transport company.

⚠WARNING

Exposure of batteries to high mechanical stress, high ambient temperatures or immersion into fluids

This can cause leakage, fire or explosion of the batteries.

Precautions:

- Protect the batteries from mechanical influences and high ambient temperatures. Do not drop or immerse batteries into fluids.

⚠WARNING

Short circuit of battery terminals

If battery terminals are short circuited e.g. by coming in contact with jewellery, keys, metallised paper or other metals, the battery can overheat and cause injury or fire, for example by storing or transporting in pockets.

Precautions:

- Make sure that the battery terminals do not come into contact with metallic objects.

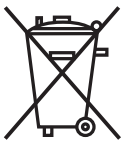
⚠WARNING

Improperly dispose of product

If the product is improperly disposed of, the following can happen:

- If polymer parts are burnt, poisonous gases are produced which may impair health.
- If batteries are damaged or are heated strongly, they can explode and cause poisoning, burning, corrosion or environmental contamination.
- By disposing of the product irresponsibly you may enable unauthorised persons to use it in contravention of the regulations, exposing themselves and third parties to the risk of severe injury and rendering the environment liable to contamination.

Precautions:

- 

  The product must not be disposed with household waste. Dispose of the product appropriately in accordance with the national regulations in force in your country. Always prevent access to the product by unauthorised personnel.

⚠WARNING

Improperly repaired equipment

Risk of injuries to users and equipment destruction due to lack of repair knowledge.

Precautions:

- Only authorised Leica Geosystems Service Centres are entitled to repair these products.

⚠CAUTION

Changes or modifications not expressly approved by Leica Geosystems for compliance could void the user's authority to operate the equipment.

⚠CAUTION

Only use chargers recommended by the manufacturer to charge the batteries.

20.6 Laser Classification

20.6.1 General

General

The following chapters provide instructions and training information about laser safety according to international standard IEC 60825-1 (2014-05) and technical report IEC TR 60825-14 (2004-02). The information enables the person responsible for the product and the person who actually uses the equipment, to anticipate and avoid operational hazards.

☞ According to IEC TR 60825-14 (2004-02), products classified as laser class 1, class 2 and class 3R do not require:
- laser safety officer involvement,
- protective clothes and eyewear,
- special warning signs in the laser working area

if used and operated as defined in this User Manual due to the low eye hazard level.

☞ National laws and local regulations could impose more stringent instructions for the safe use of lasers than IEC 60825-1 (2014-05) and IEC TR 60825-14 (2004-02).

20.6.2 BLK3D

General

The laser product built into the product produces a visible red laser beam which emerges from the front of the product.

The laser product described in this section is classified as laser class 2 in accordance with:
- IEC 60825-1 (2014-05): “Safety of laser products”

These products are safe for momentary exposures but can be hazardous for deliberate staring into the beam. The beam may cause dazzle, flash-blindness and after-images, particularly under low ambient light conditions.

Description	Value
Wavelength	655 nm
Maximum radiant power	0.95 mW
Pulse duration	>400 ps
Pulse repetition frequency (PRF)	320 MHz
Beam divergence	0.16 x 0.6 mrad

⚠CAUTION

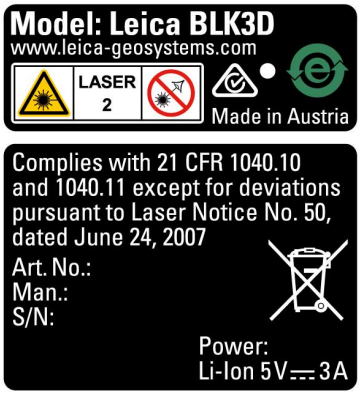
Class 2 laser product

From a safety perspective, class 2 laser products are not inherently safe for the eyes.

Precautions:

- Avoid staring into the beam or viewing it through optical instruments.
- Avoid pointing the beam at other people or at animals.

Labelling



20.7 Electromagnetic Compatibility (EMC)

Description

The term Electromagnetic Compatibility is taken to mean the capability of the product to function smoothly in an environment where electromagnetic radiation and electrostatic discharges are present, and without causing electromagnetic disturbances to other equipment.

⚠WARNING

Electromagnetic radiation

Electromagnetic radiation can cause disturbances in other equipment.

Precautions:

- Although the product meets the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that other equipment may be disturbed.

⚠CAUTION

Use of the product with accessories from other manufacturers. For example field computers, personal computers or other electronic equipment, non-standard cables or external batteries

This may cause disturbances in other equipment.

Precautions:

- Use only the equipment and accessories recommended by Leica Geosystems.
- When combined with the product, they meet the strict requirements stipulated by the guidelines and standards.
- When using computers, two-way radios or other electronic equipment, pay attention to the information about electromagnetic compatibility provided by the manufacturer.

⚠CAUTION

Intense electromagnetic radiation. For example, near radio transmitters, transponders, two-way radios or diesel generators

Although the product meets the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that function of the product may be disturbed in such an electromagnetic environment.

Precautions:

- Check the plausibility of results obtained under these conditions.

20.8 FCC Statement, Applicable in U.S.

☞ The greyed paragraph below is only applicable for products without radio.

⚠WARNING

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

⚠CAUTION

Changes or modifications not expressly approved by Leica Geosystems for compliance could void the user's authority to operate the equipment.

FCC Radiation Exposure Statement

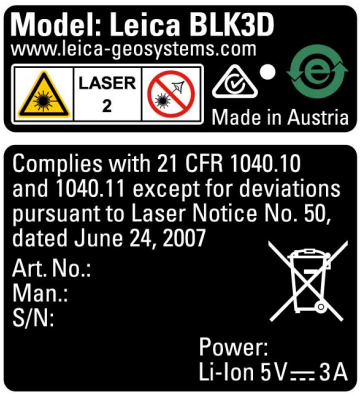
The radiated output power of the instrument is far below the FCC radio frequency exposure limits. Nevertheless, the instrument should be used in such a manner that the potential for human contact during normal operation is minimised. To avoid the possibility of exceeding the FCC radio frequency exposure limits, keep a distance of at least 20 cm between you (or any other person in the vicinity) and theantenna that is built into the instrument.

☞

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

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

Labelling



20.9 ISED Statements (EN/FR), Applicable in Canada

⚠WARNING

This Class (B) digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe (B) est conforme à la norme NMB-003 du Canada.

Canada Compliance Statement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Canada Déclaration de Conformité

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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PART OF HEXAGON

- when it has to be **right**