Leica BLK360

User Manual
Version 1.0
English

- when it has to be **right**

Leica Geosystems

PART OF HEXAGON

Introduction

Purchase

Congratulations on the purchase of a Leica BLK360 series instrument.

This manual contains important safety directions as well as instructions for setting up the product and operating it. Refer to 1 Safety Directions for further information.

Read carefully through the User Manual before you install and 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:

myWorld@Leica Geosystems > myProducts.

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.

Trademarks

- Windows is a registered trademark of Microsoft Corporation in the United States and other countries
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- Android™ is a trademark of Google Inc.
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- iOS is a trademark or registered trademark of Cisco in the U.S. and other countries and is used under license.

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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.

Available documentation

Name	Description/Format		
Leica BLK360 Quick Guide	Provides an overview of the instrument together with technical data and safety directions. Intended as a quick reference guide	✓	✓
Leica BLK360 User Manual	Provides all required instructions to operate the instrument to a basic level. Provides an overview of the instrument together with technical data and safety directions.	-	✓

Name	Description/Format		
Leica BLK360 Tutorial videos	Tutorial videos explaining the basic workflow and including assembly instructions.	-	-

Refer to the following resources for all BLK360 documentation/software:

- the Leica USB documentation card
- https://myworld.leica-geosystems.com

Table of Contents

1 Safety Directions 6
- 1.1 General Introduction 6
- 1.2 Definition of Use 7
- 1.3 Limits of Use 7
- 1.4 Responsibilities 8
- 1.5 Hazards of Use 8
- 1.6 Laser Classification 11
  - 1.6.1 General 11
  - 1.6.2 Scanning Laser 12
- 1.7 Electromagnetic Compatibility (EMC) 12

2 Description of the System 15
- 2.1 System Components 15
- 2.2 Container Contents 15
- 2.3 Instrument Components 16

3 User Interface 17
- 3.1 Power Button 17
- 3.2 Instrument Status 17

4 Operation 19
- 4.1 Instrument Setup 19
  - 4.1.1 General Information 19
  - 4.1.2 Tripod Setup 19
  - 4.1.3 Setup on a Surface 20
- 4.2 Operation - Getting Started 20
- 4.3 Imaging 23
  - 4.3.1 Ambient Conditions 23
  - 4.3.2 Field of View (FoV) 24
- 4.4 Scanning 24
  - 4.4.1 Ambient Conditions 24
  - 4.4.2 Troubleshooting 25
  - 4.4.3 Field of View (FoV) 26
- 4.5 Data Transfer 26
- 4.6 Power Supply 27
  - 4.6.1 Battery and Charger Safety 27
  - 4.6.2 Charging Station 27
  - 4.6.3 Internal Battery 29

5 Care and Transport 30
- 5.1 Maintenance 30
- 5.2 Transport 30
- 5.3 Storage 30
- 5.4 Cleaning and Drying 31
  - 5.4.1 Air Inlet Cleaning Procedure 31
- 5.5 Laser Shield and Camera Lenses Cleaning Procedure 33

6 Technical Data 34
- 6.1 General Technical Data of the Product 34
- 6.2 System Performance 34
- 6.3 Laser System Performance 34
- 6.4 Electrical Data 37
- 6.5 Environmental Specifications 37
- 6.6 Dimensions 38
- 6.7 Weight 39
- 6.8 Accessories 39

6.9 Conformity to National Regulations 40
6.9.1 BLK360 40
6.9.2 Dangerous Goods Regulations 43
7 Software Licence Agreement/Warranty *44*

1 Safety Directions

1.1 General Introduction

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.

1.2 Definition of Use

Intended use

- Capturing and recording of spatial 3D data
- Capturing and recording images
- Computing with software
- Remote control of product
- Data communication with external appliances

Reasonably foreseeable 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
- Inadequate safeguards at the working site
- Deliberate dazzling of third parties

⚠WARNING

Unauthorised modification of automatic machines and robots by mounting or installing the product

This may alter the function and safety of the machine.

Precautions:

- ▸ Follow the instructions of the machine/robot manufacturer.
- ▸ If no appropriate instruction is available, ask machine/robot manufacturer for instructions before mounting or installing the product.

1.3 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.

☞ The following advice is only valid for the AC/DC power supply and the battery charger.

Environment

Suitable for use in dry environments only and not under adverse conditions.

1.4 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 stop operating the system and 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

⚠WARNING

Unqualified installation on automatic machines and robots

This may result in personal and material damage.

Precautions:

- ▸ This product may be installed on automatic machines and robots only by an appropriately trained and qualified specialist.

1.5 Hazards of Use

⚠WARNING

Distraction or loss of attention

During dynamic applications there is a danger of accidents occurring if the user does not pay attention to the environmental conditions around, for example obstacles, excavations or traffic.

Precautions:

- ▸ The person responsible for the product must make all users fully aware of the existing dangers.

⚠WARNING

Inadequate securing of the working site

This can lead to dangerous situations, for example in traffic, on building sites and at industrial installations.

Precautions:

- ▸ Always ensure that the working site is adequately secured.
- ▸ Adhere to the regulations governing safety, accident prevention and road traffic.

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, particularly after the product has been subjected to abnormal use and before and after important measurements.

⚠**CAUTION**

Moving parts at the product during operation

Risk of squeezing extremities or entanglement of hair and/or clothes.

Precautions:

- Keep a safe distance to the moving parts.

☞ If the instrument moves unexpectedly during operation, stop the instrument via user interface (display, key) or alternatively remove the battery or main power source to prevent further movements.

⚠**CAUTION**

Not properly secured accessories

If the accessories used with the product are not properly secured and the product is subjected to mechanical shock, for example blows or falling, the product may be damaged or people can sustain injury.

Precautions:

- When setting up the product, make sure that the accessories are correctly adapted, fitted, secured, and locked in position.
- Avoid subjecting the product to mechanical stress.

⚠**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

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.

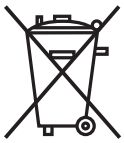
⚠WARNING

Improper disposal

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.

  Product-specific treatment and waste management information can be received from your Leica Geosystems distributor.

⚠WARNING

Lightning strike

If the product is used with accessories, for example masts, staffs, poles, you may increase the risk of being struck by lightning.

Precautions:

- ▸ Do not use the product in a thunderstorm.

⚠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.

For the AC/DC power supply and the battery charger:

⚠WARNING

Unauthorised opening of the product

Either of the following actions may cause you to receive an electric shock:

- Touching live components
- Using the product after incorrect attempts were made to carry out repairs.

Precautions:

- ▸ Do not open the product!
- ▸ Only Leica Geosystems authorised service centres are entitled to repair these products.

For the AC/DC power supply and the battery charger:

⚠WARNING

Electric shock due to use under wet and severe conditions

If unit becomes wet, it may cause you to receive an electric shock.

Precautions:

- ▸ If the product becomes humid, it must not be used!
- ▸ Use the product only in dry environments, for example in buildings or vehicles.

- ▸ Protect the product against humidity.

1.6 Laser Classification

1.6.1 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).

1.6.2 Scanning Laser

General

The laser incorporated in the product produces an invisible beam which emerges from the rotating mirror.

The laser product described in this section is classified as laser class 1 in accordance with:

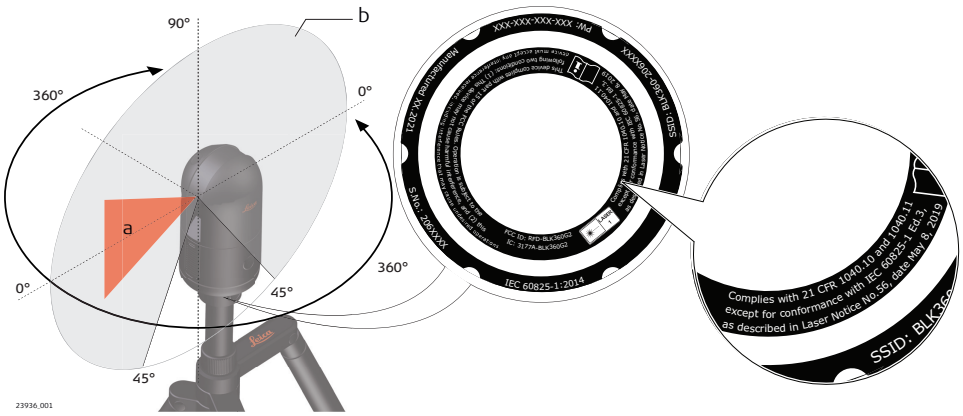
- IEC 60825-1 (2014-05): "Safety of laser products"

These products are safe under reasonably foreseeable conditions of operation and are not harmful to the eyes provided that the products are used and maintained in accordance with this User Manual.

Description	Value
Wavelength	830 nm
Maximum pulse energy	10 nJ
Maximum pulse duration	3 ns
Pulse repetition frequency (PRF)	2.7 MHz
Beam divergence (FWHM, full angle)	0.4 mrad
Mirror rotation	67.9 Hz
Base rotation	6.8 mHz

Labelling

Class 1 Laser Product
according to IEC 60825-1
(2014-05)



a Laser beam
b Scanning laser beam

1.7 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, other accessories must 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 the function of the product may be disturbed in such an electromagnetic environment.

Precautions:

- Check the plausibility of results obtained under these conditions.

⚠CAUTION

Electromagnetic radiation due to improper connection of cables

If the product is operated with connecting cables, attached at only one of their two ends, the permitted level of electromagnetic radiation may be exceeded and the correct functioning of other products may be impaired. For example, external supply cables or interface cables.

Precautions:

- While the product is in use, connecting cables, for example product to external battery or product to computer, must be connected at both ends.

⚠WARNING

Use of product with radio or digital cellular phone devices

Electromagnetic fields can cause disturbances in other equipment, installations, medical devices, for example pacemakers or hearing aids, and aircrafts. Electromagnetic fields can also affect humans and animals.

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 can be disturbed or that humans or animals can be affected.
- Do not operate the product with radio or digital cellular phone devices in the vicinity of filling stations or chemical installations, or in other areas where an explosion hazard exists.
- Do not operate the product with radio or digital cellular phone devices near medical equipment.
- Do not operate the product with radio or digital cellular phone devices in aircrafts.
- Do not operate the product with radio or digital cellular phone devices for long periods with the product immediately next to your body.

2 Description of the System

2.1 System Components

System components BLK360

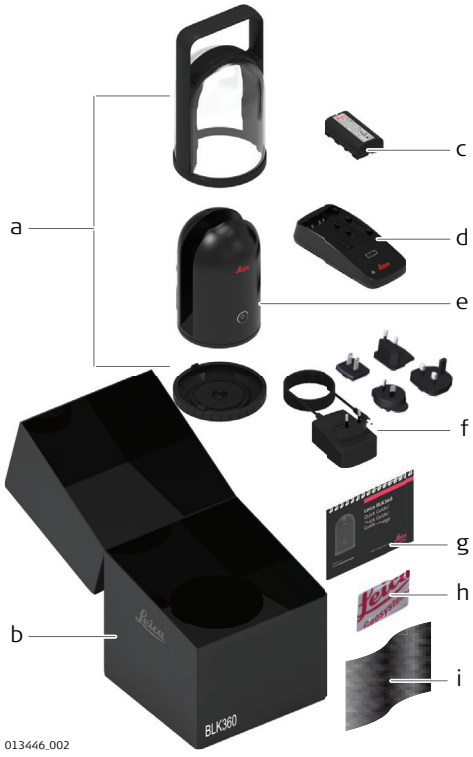
NEW ILLUSTRATION

a BLK360 with GEB825 battery
b BLK transportation case
c GEB825 battery 2x
d BLK cleaning cloth
e GEV278 USB-C cable
f GKL825 multicharger
g Mission bag (from BLK2GO)
h BLK tripod (from BLK360)
i BLK tripod adapter (from BLK360)

2.2 Container Contents

Container contents

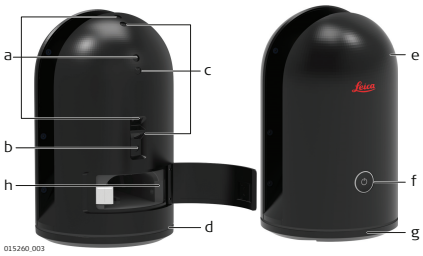
NEW ILLUSTRATION



a BLK transportation case
b BLK box
c GEB825 battery 3x
d GKL825 multicharger
e GEV278 USB-C cable
f BLK cleaning cloth
g BLK
h GEV821 power adapter
i BLK Quick Guide
j BLK USB documentation card

Instrument components

NEW ILLUSTRATION



a HDR and VIS camera
b Ring-shaped LED
c Scanner 360 °
d Power button
e 360 ° WLAN antenna
f USB-C port

NEW ILLUSTRATION

a Laser aperture
b Nadir reference plate
c Rotating prism
d Quick release mount

Additionally ->

a Battery compartment
b Cooling channel/grid inlay
c Laser shield

3 User Interface

3.1 Power Button

Power button

NEW ILLUSTRATION

a Power button

Power button	when the BLK360 is	THEN
Press and hold the button <0.5 sec.	off.	The BLK360 switches on and the LED starts blinking yellow.
Press and hold the button <0.5 sec.	on and ready. The LED is continuous green.	The BLK360 starts recording and the LED starts blinking yellow.
Press and hold the button >2 sec.	on and ready. The LED is continuous green.	The LED starts blinking yellow and the BLK360 switches off.
Press and hold the button > 5 sec.	on.	The BLK360 switches off immediately. Hard shutdown.

NOTICE

It is mandatory to follow always this procedure to shut down the instrument. Do not remove the battery from a running instrument!

3.2 Instrument Status

Device status

The ring-shaped LED lights up green, yellow or red in different intervals to show the operation states of the BLK360.

NEW ILLUSTRATION

a Ring-shaped LED continuous
b Ring-shaped LED blinking
c Ring-shaped LED alternating

Operation mode

LED status	Instrument status
NEW ILLUSTRATIONS 	The BLK360 is off.
	The BLK360 is starting, recording or switching off.
	The BLK360 is ready. Bright green: Battery capacity > 20%. Dark green: Battery capacity < 20%. In case of low battery, refer to Insert and remove the internal battery.

Firmware update mode

LED status	Instrument status
NEW ILLUSTRATIONS 	The BLK360 is running a firmware update.
	The firmware update was successful.
	The firmware update failed.
☞	Refer to the Leica BLK360 website for details about firmware update process.

4 Operation

4.1 Instrument Setup

4.1.1 General Information

Use the tripod

It is recommended to set up the BLK360 on the tripod. Using the tripod specified for the scanning system:

- Guarantees maximum stability during scanning operations,
- Ensures a better airflow and prevents the BLK360 from heating up.

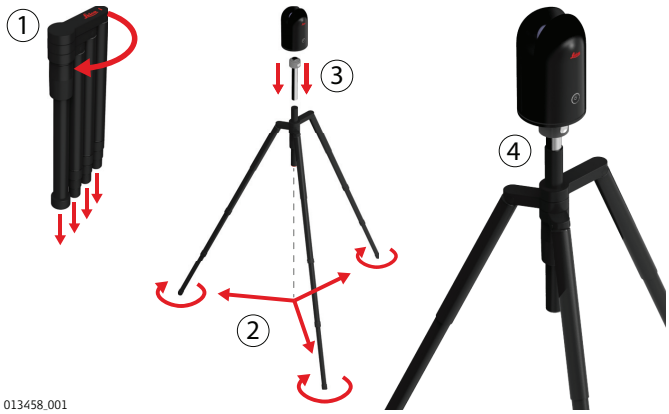
☞ If you set up the BLK360 directly on a surface without the tripod connected, ensure that it is a horizontal and flat surface.

☞ It is always recommended to shield the instrument from direct sunlight and avoid uneven temperatures around the instrument.

4.1.2 Tripod Setup

BLK360 setup step-by-step

NEW ILLUSTRATION (same mounting)



1.	Unfold the tripod and extend the tripod legs to allow for a comfortable working posture.
2.	Tighten the screws of the legs and expand the legs for a stable tripod position.
3.	Place the tripod adapter on the tripod and secure it.
4.	Place the instrument on the tripod adapter and secure it.

4.1.3 Setup on a Surface

BLK360 setup step-by-step

NEW ILLUSTRATION (how to place on a surface)

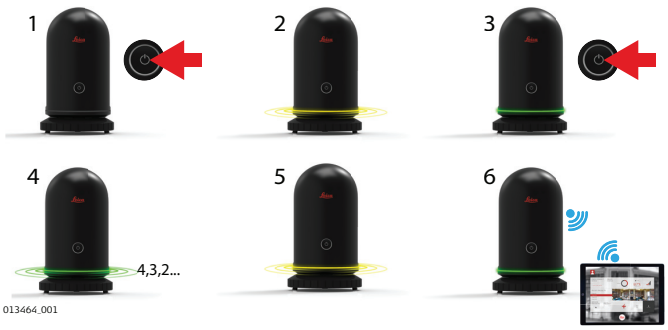
horizontal, flat, no direct sunlight, e.g. a table

4.2 Operation - Getting Started

Stand-alone operation step-by-step

NEW ILLUSTRATION

w/o countdown (step 4)



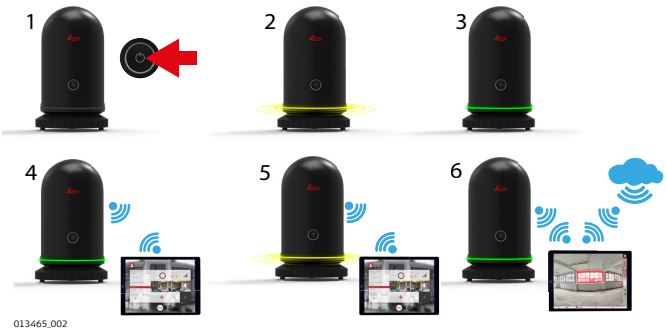
1.	Press the power button to turn on the BLK360.
2.	The BLK360 is starting. The ring-shaped LED is blinking yellow.
3.	If the ring-shaped LED is continuous green, the BLK360 is ready for operation. Press the power button to start recording.
4.	Recording starts. The ring-shaped LED is blinking yellow
5.	The recording is finished. The ring-shaped LED is continuous green. The data transfer starts as soon as the BLK360 is linked to a computing device.

☞ Do not touch or move the BLK360 while the system is recording.

Operation with Wi-Fi connection step-by-step

The operation with Wi-Fi connection can be used to operate freely in the field if connected to a mobile device, for example, a tablet or smartphone.

NEW ILLUSTRATION



1.	Press the power button to turn on the BLK360.
2.	The BLK360 is starting. The ring-shaped LED is blinking yellow.
3.	If the ring-shaped LED is continuous green, the BLK360 is ready for operation.
4.	Establish a Wi-Fi connection between the BLK360 and a computing device.
☞	The best data transfer rate can be ensured if the computing device is close by. Ensure to be close to the BLK360 in the direct line of sight and less than 10 m distance. Greater distances and/or objects blocking the direct line of sight between BLK360 and computing device leads to a slower data transfer.
5.	Start the recording and simultaneous data transfer via computing device. The ring-shaped LED is blinking yellow.
6.	Start the processing of data on the computing device.

Operation with USB connection step-by-step

The USB connection can be used to transfer data quickly and reliably in the office if connected to a computer, for example, PC or laptop.

The USB-C data transfer works with powered off/no battery inside and powered on BLK360.

- Powered off/no battery inside: The data transfer speed is slower.
- Powered on: The data transfer speed is faster and the battery will be charged.

☞ It is recommended to have the BLK360 powered on during USB-C data transfer to ensure fastest data throughput.

NEW ILLUSTRATION

Stand-alone recording and afterwards data transfer to PC via USB-C

1.	Press the power button to turn on the BLK360.
2.	The BLK360 is starting. The ring-shaped LED is blinking yellow.
3.	If the ring-shaped LED is continuous green, the BLK360 is ready for operation.
4.	Connect the computing device with the BLK360.
5.	Start the recording and simultaneous data transfer via computing device. The ring-shaped LED is blinking yellow.
6.	Start the processing of data on the computing device.
☞	If the USB-C cable is plugged in the BLK360 cannot capture data.

Connecting to a computing device using Wi-Fi step-by-step

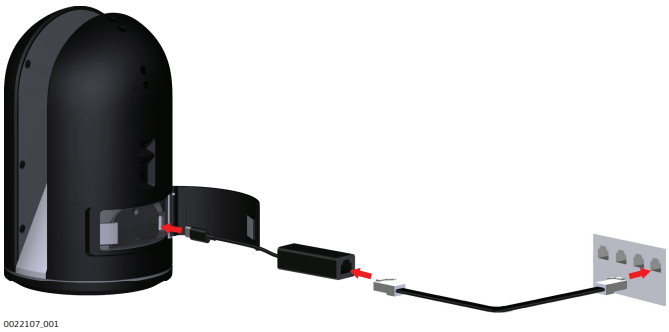
NEW ILLUSTRATION

1.	Steps need to be reviewed and adapted. Start the BLK360 and wait until the LED is continuous green.
2.	On the computing device select **Settings** and tap **Wi-Fi**.
3.	Select the network **BLK360-35xxxxx** in the **Wi-Fi** settings to be connected. ☞ The number **35xxxxx** is the serial number of the BLK360.
4.	Enter the password. ☞ The instrument specific password is printed on the label in the battery compartment (e.g. COL-123-456-789)
5.	Start the app and connect the instrument.
☞	For further information, refer to the help menu in the app.

Connecting to a computing device using USB-C step-by-step

For data download, connect the BLK360 to a computing device using USB-C.

NEW ILLUSTRATION



1.	Steps need to be reviewed and adapted. Start the BLK360.
2.	Connect the USB-C cable to the BLK360.
3.	Connect the USB-C cable to the computing device.
4.	Start the app and data can be downloaded.

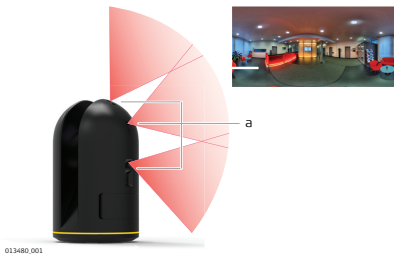
4.3 Imaging

Description

The BLK360 has 4 calibrated RGB cameras to collect LDR and HDR panoramic, 360° spheric images. The 4 cameras are also used for the Visual Inertial System (VIS).

Imaging

NEW ILLUSTRATION- 4 cameras



a 4 cameras

4.3.1 Ambient Conditions

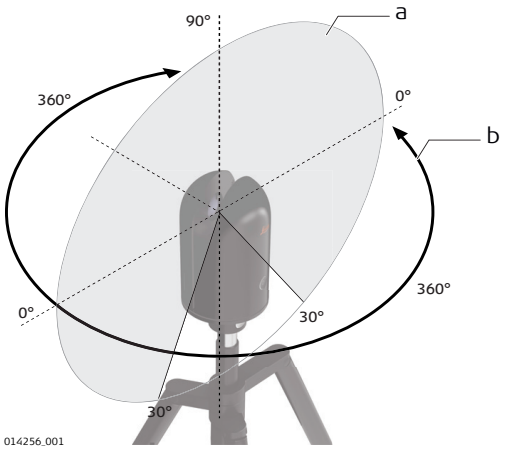
Ambient conditions for imaging

- Rain, snow or fog may adversely affect measurement quality. Always use care when collect image data in these conditions.
- Need input: dark surroundings /night
- Need input: direct sunlight

4.3.2 Field of View (FoV)

Imaging - field of view

NEW ILLUSTRATION



a Vertical field of view: 270°
b Horizontal field of view: 360°

4.4 Scanning

4.4.1 Ambient Conditions

Unfavourable surfaces for scanning

- Highly reflective (polished metal, gloss paint)
- Highly absorbent (black)
- Translucent (clear glass)

☞ Colour, powder or tape these surfaces before scanning if necessary.

Unfavourable weather conditions for scanning

- It is not possible to scan if the laser shield is exposed to rain, snow or fog. To scan in these conditions, position the scanner, for example, under a roof.
- Be aware, that rain, snow or fog may adversely affect measurement quality. Always use care when scanning in these conditions.
- Surfaces that are directly illuminated by the sun cause an increased range noise and therefore a larger measurement uncertainty.
- If some objects are scanned against the sunlight or a bright spotlight, the optical receiver of the instrument can be dazzled so heavily that in this area no measured data is recorded.

Temperature changes during scanning

If the instrument is brought from a cold environment, for example from storage, into a warm and humid environment, the interior optics can condense. This may cause measurement errors.

☞ Avoid rapid temperature changes and give the instrument 15 to 20 minutes time to acclimatise.

Dirt or dust on the laser shield

The scan mirror is protected against direct contact with a laser shield. Dirt on the laser shield such as a layer of dust, condensation or fingerprints may cause considerable measuring errors. Refer to Cleaning and Drying.

4.4.2 Troubleshooting

Basic troubleshooting

Problem	Possible Cause(s)	Suggested Remedies
Missing points in scan.	Dust, debris or finger-prints on the laser shield.	Use the BLK cleaning cloth to clean carefully the specific areas.

Advanced troubleshooting

Problem	Possible cause	Suggested remedies
When switching on the instrument or starting a scan, the system switches off automatically.	Capacity of battery is too low. Battery not properly charged.	Recharge or change bat-tery. Check the battery status as described in Power Supply.
The system switches off automatically, even though it was recharged, when switching on the instrument or start-ing a scan.	Battery charger is defective.	Check the function of the battery charger. Note the charging status dis-played on the battery charger.
	Battery is no longer charging.	The battery has lost most of its capacity at the end of its life time. Replace the battery.

Troubleshooting-operation mode

LED status	Instrument status
2 NEW ILLUSTRA-TIONS 	System warning. For example, full storage device, empty battery. Shut down the instrument and reboot again. If status does not change, check internal storage capacity and power status of battery. Delete data and/or exchange battery.
	An unrecoverable system error occurred. Shut down the instrument and reboot again. If status does not change, contact the Leica support.

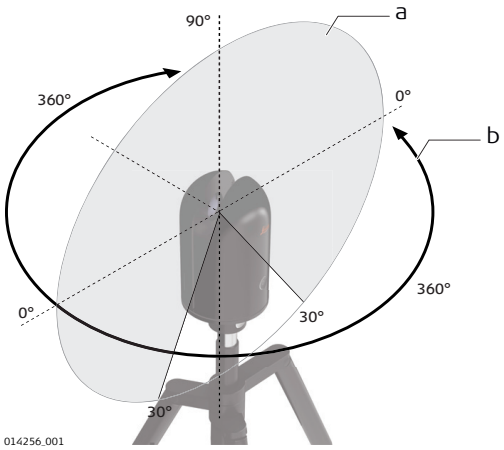
Troubleshooting - support contacts

If you experience problems with your instrument, check the BLK360 web page at INSERT WEB PAGE HERE for support information and contacts.

4.4.3 Field of View (FoV)

Scanning laser - field of view

NEW ILLUSTRATION (vertical cut-out = 45°)



a Vertical field of view: 270°
b Horizontal field of view: 360°

4.5 Data Transfer

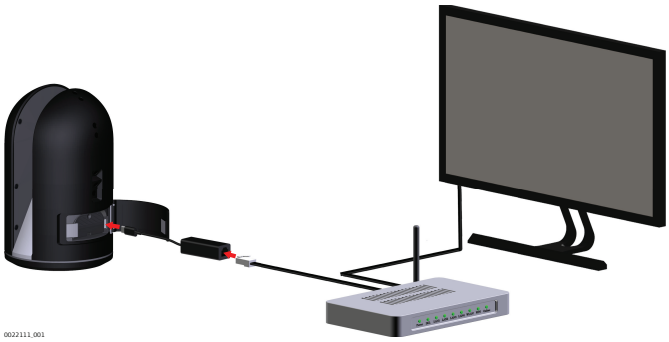
Data transfer from BLK360 to computing device using Wi-Fi

NEW ILLUSTRATION

a Raw data transfer from BLK360 to computing device. Refer to Connecting to a computing device using Wi-Fi step-by-step.

Data transfer from BLK360 to computing device using USB-C

NEW ILLUSTRATION



Refer to Connecting to a computing device using USB-C step-by-step for a detailed description for setting up a connection.

4.6 Power Supply

4.6.1 Battery and Charger Safety

General

Use the batteries, chargers and accessories recommended by Leica Geosystems to ensure the correct functionality of the instrument.

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.

4.6.2 Charging Station

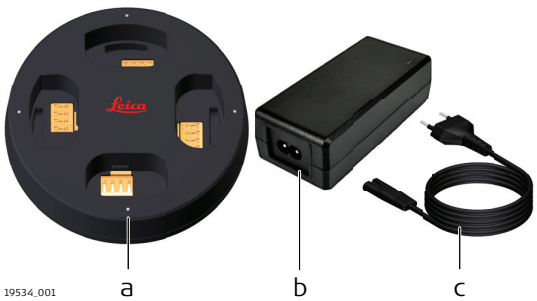
Description

The Charger GKL825 is a multi-charger for indoor-use with four battery bays. The charger is used for battery packs which are used in reality capturing equipment. In these applications, and thus for the charger, high reliability and safe operation over the expected product lifetime are of highest importance. The GKL825 offers the following functions:

- Power supply through dedicated AC/DC power adapter
- LED to indicate the status
- Four battery positions
- Charging of one to four battery packs at the same time

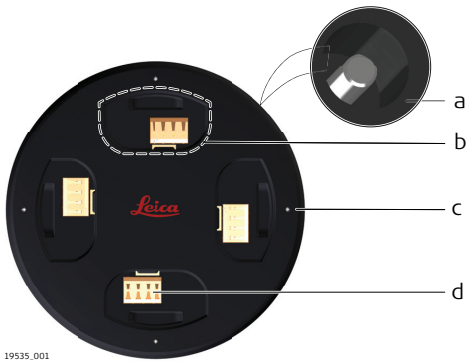
☞ The GKL825 can charge one to four batteries at a time depending on requested battery charging current.

System components



a GKL825 charger
b AC/DC power adapter
c AC power cable

Charger components



a DC input
b Battery bay with charging function
c Battery status LED
d Battery connector

LED indicators

LED indicator	Status	Description
	Off	No activity.
	Solid green	The battery is fully charged.
	Blinking orange	The battery is charging.
	Solid red	Failure. Refer to Troubleshooting.

Power supply

The charger GKL825 is only allowed to be operated with its own AC/DC power adapter. The AC/DC power adapter is part of the delivered package.

EU 230 V~
US 120 V~
CN 220 V~
UK 230 V~
AUS 230 V~

Input voltage: 100-240 V AC

Troubleshooting

If an error occurs, the LED indicator of the related battery bay lights constantly red.

Remove and insert the battery again. Make sure that the battery is correctly positioned in the battery bay. Disconnect from AC power and reconnect. If the failure persists or reappears from time to time, the charger must be sent to a Leica Geosystems authorised service centre.

4.6.3 Internal Battery

Insert and remove the internal battery

NEW ILLUSTRATION (TIM ID 23589) and insert the following note in step-by-step table

☞ The switch on the battery needs to be pressed inwards and downwards/upwards.

1.	Unlock the battery.
2.	Remove the battery.
3.	Insert the new battery and lock it.
4.	Turn on the BLK360 to start the boot process.

NOTICE

Always shut down the instrument before removing the battery.

5 Care and Transport

5.1 Maintenance

☞ For units that are exposed to high mechanical forces, for example through frequent transport or rough handling, it is recommended to carry out test measurements periodically.

5.2 Transport

Transport in the field

When transporting the equipment in the field, always make sure that you carry the product in its original transport container or carry the tripod upright with the product fastened and secured onto the tripod.

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.

5.3 Storage

BLK360

Respect the temperature limits when storing the equipment, particularly in summer if the equipment is inside a vehicle. Refer to 6 Technical Data for information about temperature limits.

Li-Ion battery

- Refer to Environmental specifications 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 minimise 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

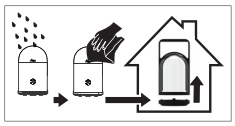
Charger and docking station

- Keep chargers and docking stations away from excessive dirt, dust and contaminants.
- After unpacking the product visually inspect the charger for possible damage.
- Unplug the product from the outlet before attempting any maintenance or cleaning.

5.4 Cleaning and Drying

Damp products

Dry the product, the mission bag, the foam inserts and the accessories at a temperature not greater than 40°C /104°F and clean them carefully. Remove the battery and dry the battery compartment. Do not repack until everything is completely dry. Always close the mission bag when using in the field.



Housing parts of product and accessories

- Never touch the glass surfaces of the cameras or the laser shield with your fingers.
- Only use a clean, soft, lint-free cloth for cleaning. It is recommended to use the BLK cleaning cloth. If necessary, moisten the cloth with water or pure alcohol. Do not use other liquids; other liquids may attack the polymer components.

Charger and AC/DC power supply

Use only a clean, soft, lint-free cloth for cleaning.

Cables and plugs

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

5.4.1 Air Inlet Cleaning Procedure

General

The mesh of the air inlet prevents dust and particles from being drawn into the BLK360.

The mesh must be cleaned regularly, biannually at least. How often the cleaning procedure has to be done depends on the usage of the instrument and the surroundings, where it is used.

For example, using the instrument once a week in a clean environment needs a less often cleaning than using the instrument daily in a dusty environment.

If one of the following occurs, a mesh cleaning must be carried out:

- There is clearly visible dust on the mesh.
- The BLK360 overheats unusually fast.
- The fan runs at a constantly high level, which is audible from the fan noise as well as the battery is drained faster.

☞

Not cleaning the mesh of air inlet regularly might cause performance issues due to a not correctly working air channel.

Position

The air inlet is positioned on the same side of the BLK360 like the USB-C port.

NEW ILLUSTRATION with postion of the air inlet (a) and port (B)

a Air inlet with mesh
b USB-C port

Cleaning the mesh step-by-step

Is is recommended to clean the mesh of the air inlet in a contactless way by using a bellows. The bellows generates a concentrated airflow with moderate air pressure, which gently removes dust from the sensitive mesh.

Alternatively, you can us fresh clean compressed air, for example, with a compressed gas duster. Do not use air from the pneumatic power system as it is always slightly oily.

☞ Make sure that the cleaning procedure is carried out carefully.

☞ Before any cleaning procedure, ensure that the BLK360 is switched off and the battery has been removed.

NEW ILLUSTRATION, step-by-step cleaning the mesh with a bellows

1.	Switch off the BLK360 and remove the battery.
2.	Hold the bellows at a distance of about 1 cm from the mesh and slightly tilted to the mesh.
3.	Generate a concentrated air flow by squeezing the bellows to remove the dust from the mesh.

4. Rotate the bellows 90° three times and repeat step **3.** each time to clean the mesh properly from each side.

☞ If some particles of dust are clearly stuck inside the mesh fibers, do not try to remove them. It may force the particles to move further in and damage the mesh.

☞ Do not use water to clean the mesh.

☞ Do not touch the mesh with your hands or tools, as it can damage the mesh.

☞ The mesh of the air outlet does not require any cleaning.

5.5 Laser Shield and Camera Lenses Cleaning Procedure

General cleaning information

The laser shield and camera lenses must be kept clean. The instructions must be followed as described in this chapter to clean these surfaces.

⚠CAUTION

Before any cleaning procedure, ensure that the instrument is switched off and the battery has been removed.

Dust and debris on optical surfaces

Use the BLK cleaning cloth to remove dust and debris from these surfaces.

☞ The BLK cleaning cloth must be clean and free from dirt, dust or particles.

☞ Never rub off dust or debris as this will scratch the surface and so possibly cause permanent damage to the special optical coatings.

Cleaning of optical surfaces

Soiling of the laser shield can cause extreme measurement errors and therefore useless data.

☞ All soiling that is visible on the laser shield has to be removed, except for single small dust particles that adhere inevitably.

For the cleaning procedure, the BLK cleaning cloth is recommended.

Clean the laser shield and camera lenses regularly with the BLK cleaning cloth:

1. Switch off the BLK360 and remove the battery.
2. Washing hands is necessary in order to avoid grease on the cleaning cloth.
3. Use gloves to avoid finger oil on the glass.
4. Use the BLK cleaning cloth and gently clean the laser shield without putting a lot of force.
5. If any smears from cleaning are visible against back light, repeat the procedure.

☞ Do not use air from the pneumatic power system as this is always slightly oily.

6 Technical Data

6.1 General Technical Data of the Product

Storage and Communication

Internal storage:

256 GB

Setup	Description
Scan resolution xy	xxx setups can be saved
Image quality xy	xxx setups can be saved

Communication:

Type	Description
WLAN	Integrated 802.11 b/g/n WLAN with MIMO
USB-C	Input for USB-C is needed

Internal HDR cameras

The BLK360 has four integrated HDR digital cameras.

Camera data	Value
Type	Colour sensor, fixed focal length
Single image	4224 x 3136 pixels, 105° x 133° (V x Hz)
Full dome	8 images, automatically spatially rectified, 104 Mpx, 360° x 270°
White balancing	Automatic
HDR	Automatic
Minimum range	0.5 m

Additional internal sensors

Sensor	Description
Visual **I**nertial **S**ystem **VIS**	Video enhanced inertial measuring system to track movement of the scanner position relative to the previous setup in real-time. ☞ VIS cannot be used in complete darkness.

6.2 System Performance

System performance and accuracy

☞ All ± accuracy specifications are one sigma (1σ) under Leica Geosystems standard test conditions unless otherwise noted.

Accuracy of single measurement (at 78% albedo)	Value
3D point accuracy	6 mm at 10 m, 8 mm at 20 m

6.3 Laser System Performance

Laser scanning system data

☞ The scanning system is a high speed time-of-flight unit, enhanced by Waveform Digitising (WFD) technology with a maximum scan rate of 680.000 points/second.

Laser unit:

Scanning laser	Value
Classification	Laser Class 1 (in accordance with IEC 60825-1 (2014-05))
Wavelength	830 nm (invisible)

Range:

Scanning data	Value
Beam divergence	0.4 mrad (FWHM, full angle)
Beam diameter at front window	2.25 mm (FWHM)
Minimum range	0.5 m @ 78% albedo
Maximum range	50 m @ 78% albedo

Field-of-View (per scan):

Field-of-View	Value
Selection	Always full dome
Horizontal	360°
Vertical	270°
Scanning optics	Vertically rotating mirror on horizontally rotating base protected by a laser shield.

Scan duration for 4 settings:

Point density mode	Resolution [mm @ 10m]	Estimated scan duration [MM:SS] for a full dome scan
Fast+	50	00:07
Fast	25	00:13
Dense	12	00:30
Dense+	6	01:15

Image capturing time:

Image type	Estimated image duration [MM:SS]
LDR	00:06
HDR	00:15

Scan size for 4 settings:

Point density mode	Approx. scan size [mio points]
Fast+	0.6
Fast	2.3
Dense	9.4
Dense+	37.5

VIS accuracy:

VIS	Accuracy in % of trajectory length
Indoor	xx
Outdoor	xx

6.4 Electrical Data

BLK360 power supply and consumption

Power supply:

Internal battery
7.4V DC; one internal battery provided with system.

Power consumption:

Instrument
10 W typical; 16 W max.

GKL825 Multicharger

Supply	Value
Input voltage	10-32 V DC

GEB825 internal battery

Supply	Value
Type	Li-Ion
Voltage	7.4 V
Capacity	2.6 Ah

Battery operating and charging times

Internal battery	Value
Operating time	> 40 setups per battery, typical continuous use (room temperature).
Charging time	Typical charging time with charger GKL825 is 4-8 hours at room temperature.

6.5 Environmental Specifications

Environmental specifications

Type	Operating temperature [°C]	Storage temperature [°C]
Instrument	0 to +40	−25 to +70
Battery	0 to +50	−40 to +70
Charger and AC/DC power supply	0 to +40	−40 to +70

☞ If the BLK360 is not scanning, do not expose it to the direct sunlight, but place it in a shaded area. If the outside temperature is above 30° C, the unit should be cooled to ensure full scanning performance.

Type	Protection against water, dust and sand
Instrument	IP54 (IEC 60529) upright, battery inserted and closed correctly

Type	Protection against water, dust and sand
	Dust protected Betamesh BM90 – filtration level 69 µm Betamesh BM20 – filtration level 20 µm Protection against splashing water from any direction.
Battery	IP54 (IEC 60529) Dust protected Protection against splashing water from any direction.
Charger and AC/DC power supply	IPX0 (IEC 60529) Only operate in dry environments, for example in buildings and vehicles.

Type	Humidity
Instrument	max. 95% non-condensing
Battery and Charger	max. 95% non-condensing
AC/DC power supply	max. 80% non-condensing

Type	Limits of use
Instrument and battery	Indoor and outdoor use. Working altitude: unlimited
Charger and AC/DC power supply	Indoor use only. Working altitude: ≤ 2000 m

Type	Lighting
Instrument	Fully operational from bright sunlight to complete darkness.

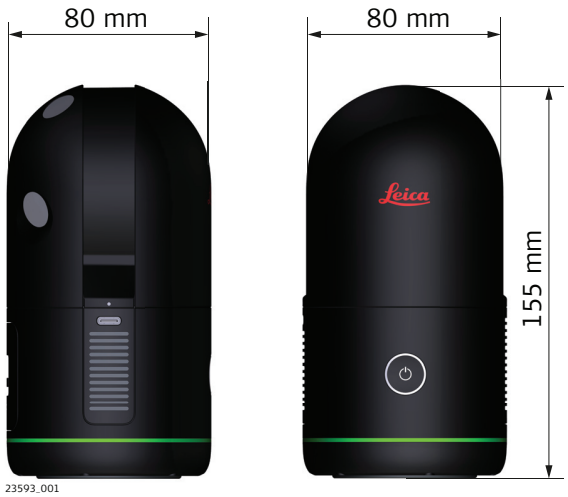
6.6 Dimensions

Dimensions

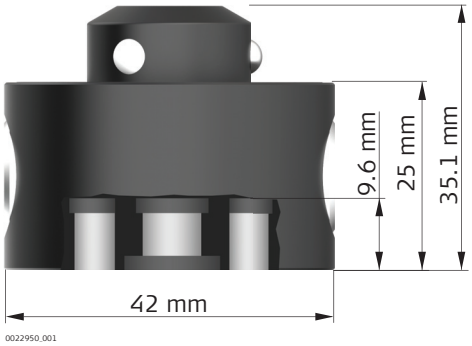
Instrument	Dimensions [mm] (D x W x H)	Dimensions [″] (D x W x H)
BLK360	80 x 80 x 155	3.1 x 3.1 x 6.1
GEV821 AC power supply	85 x 170 x 41 / cable length: 1800	3.4 x 6.7 x 1.6 / cable length: 70
GKL825 multicharger	157 x 71 x 38	6.2 x 2.8 x 1.5
GEB825 battery	71.5 x 39.5 x 21.2	2.8 x 1.6 x 0.8
GAD123 tripod adapter	42 x 42 x 35.1	1.65 x 1.65 x 3.1
Transport container	195.5 x 195.5 x 258.6	7.7 x 7.7 x 10.2

Dimensions

BLK360



Dimensions of tripod adapter



6.7 Weight

Weight

Instrument	Weight [kg]	Weight [lbs]
BLK360	1.0 nominal	2.2 nominal
GEV821 AC power supply	0.1	0.3
GKL825 multicharger	0.1	0.3
GEB825 battery	0.1	0.3
BLK360 transport container (without scanner and accessories)	1.0	2.3
BLK360 transport container (with scanner and standard accessories)	3.0	6.7

6.8 Accessories

Scope of delivery

Included standard accessories:

- BLK360 hood
- Battery charger GKL825 with AC power adapter GEV821
- Battery GEB825 (3x)
- Quick guide BLK360
- 12 month warranty
- Calibration certificate digital access via online registration

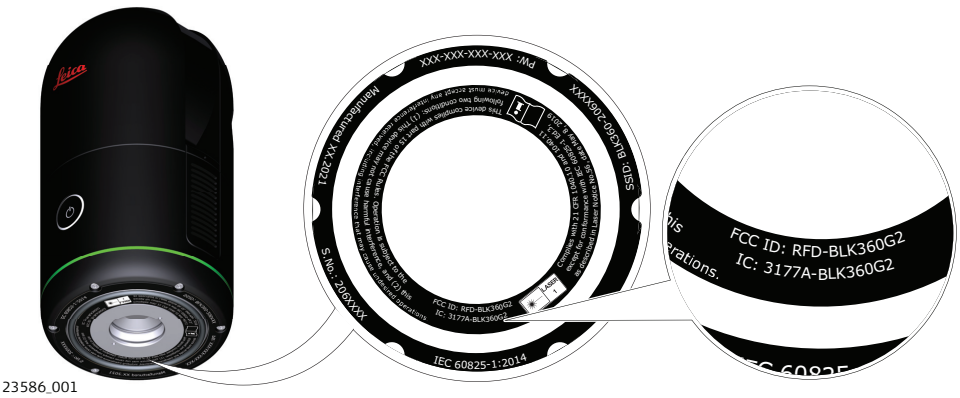
Additional accessories

- additional batteries GEB825
- BLK360 tripod
- BLK360 tripod adapter
- BLK360 mission bag
- BLK360 tribrach adapter

6.9 Conformity to National Regulations

6.9.1 BLK360

Labelling BLK360



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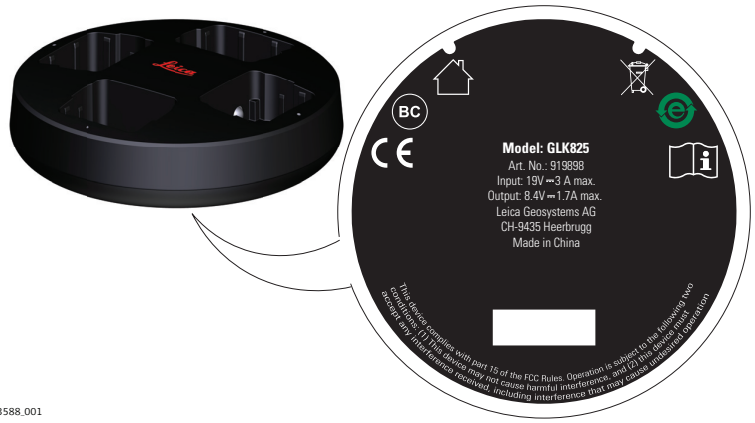
Labelling GEB825

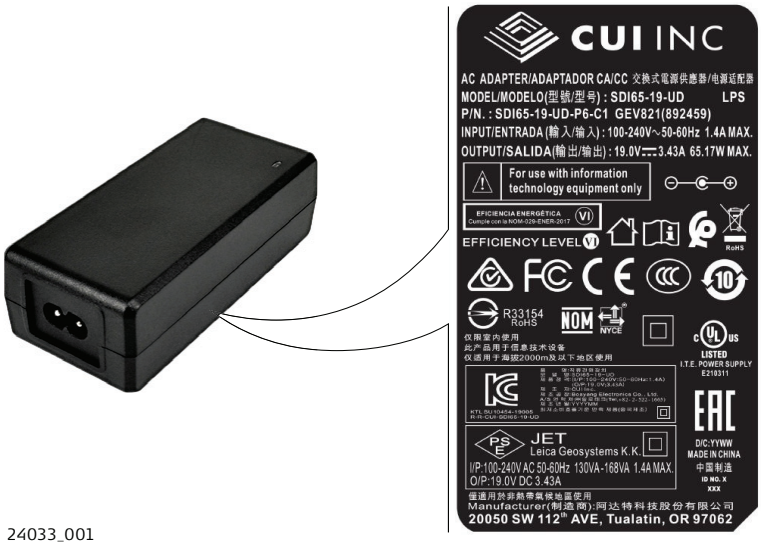
23587_001

Labelling GKL825



23588_001

Labelling GEV821



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Frequency band

Type	Frequency band [MHz]
WLAN	2412-2462
Client mode	5180-5240, 5260-5320, 5500-5700

Output power

Type	Output power [mW]
WLAN	100 max.

Antenna

Type	Antenna	Gain
WLAN	2x chip antenna MIMO system	2.4 Ghz: +1.87 dBi 5 Ghz: +4.42 dBi

EU

Hereby, Leica Geosystems AG declares that the radio equipment type BLK360 G2 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.

☞ The following advice is only valid for battery and charger.

EU

Hereby, Leica Geosystems AG declares that the product/s is/are in compliance with the essential requirements and other relevant provisions of the 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.

USA

FCC ID: RFD-BLK360G2

Part 15 B/C/E

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

☞ The following advice is only valid for battery and charger.

USA

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. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications.

However, there is no guarantee that interference does 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.

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

Canada

CAN ICES-003 (Class B) / NMB-003 (Class B)

IC ID: 3177A-BLK360G2

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

Others

The conformity for countries with other national regulations has to be approved prior to use and operation.

6.9.2 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.

7 Software Licence Agreement/Warranty

Software Licence Agreement

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