



User Manual Version 1.0 English







PDF

### Introduction

Purchase	Congratulations on the purchase of a Leica BLK360 series instrument.			
Ĩ		tains important safety directions as well as instructions for roduct and operating it. Refer to 1 Safety Directions for fur- n.		
	Read carefully t product.	hrough the User Manual before you install and switch on the		
	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 versior	as are available for download at the following Internet address:		
	<u>myWorld@Leica</u>	<u>Geosystems</u> > myProducts.		
Product identification	The model and	serial number of your product are indicated on the type plate.		
		this information when you need to contact your agency or ns authorised service centre.		
Trademarks	<ul> <li>Windows is a registered trademark of Microsoft Corporation in the United States and other countries</li> <li>Bluetooth<sup>®</sup> is a registered trademark of Bluetooth SIG, Inc.</li> <li>Android<sup>™</sup> is a trademark of Google Inc.</li> <li>Apple, iPad, iPad Air, iPad Pro, and iPhone are trademarks of Apple Inc., registered in the U.S. and other countries.</li> <li>Use of the Made for Apple badge means that an accessory has been designed to connect specifically to the Apple product(s) identified in the badge, and has been certified by the developer to meet Apple performance standards. Apple is not responsible for the operation of this device or its compliance with safety and regulatory standards.</li> <li>iOS is a trademark or registered trademark of Cisco in the U.S. and other countries and is used under license.</li> </ul>			
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 <u>http://leica-geosystems.com/contact-us/sales_support</u> .			
Available documentation	Name	Description/Format		
	Leica BLK360 Quick Guide	Provides an overview of the instrument together $\checkmark$ $\checkmark$ with technical data and safety directions. Intended as a quick reference guide		
	LeicaProvides all required instructions to operate the instrument to a basic level. Provides an overviewBLK360of the instrument together with technical data and safety directions.			

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

# Refer to the following resources for all BLK360 documentation/soft-ware:

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

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1	Safety Direction	Safety Directions			
1.1	General Introduction	General Introduction			
Description		enable the person responsible for the product, and uses the equipment, to anticipate and avoid opera-			
	The person responsible these directions and adh	for the product must ensure that all users understand nere to them.			
About warning messages		n essential part of the safety concept of the instru- ever hazards or hazardous situations can occur.			
	Warning messages				
		about direct and indirect hazards concerning the use s of behaviour.			
	strictly observed and fol	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.			
	identifying levels of haza damage. For your safety following table with the	<b>AUTION</b> and <b>NOTICE</b> are standardised signal words for ards and risks related to personal injury and property r, it is important to read and fully understand the different signal words and their definitions! Supple- tion symbols may be placed within a warning message y text.			
	Туре	Description			
	<b>A</b> DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.			
	Awarning	Indicates a potentially hazardous situation or an unintended use which, if not avoided, could result in death or serious injury.			
		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.			

1.2	Definition of Use
Intended use	<ul> <li>Capturing and recording of spatial 3D data</li> <li>Capturing and recording images</li> <li>Computing with software</li> <li>Remote control of product</li> <li>Data communication with external appliances</li> </ul>
Reasonably foresee- able misuse	<ul> <li>Use of the product without instruction</li> <li>Use outside of the intended use and limits</li> <li>Disabling safety systems</li> <li>Removal of hazard notices</li> <li>Opening the product using tools, for example screwdriver, unless this is permitted for certain functions</li> <li>Modification or conversion of the product</li> <li>Use after misappropriation</li> <li>Use of products with recognisable damage or defects</li> <li>Use with accessories from other manufacturers without the prior explicit approval of Leica Geosystems</li> <li>Inadequate safeguards at the working site</li> <li>Deliberate dazzling of third parties</li> </ul>
	A
	<ul> <li>Unauthorised modification of automatic machines and robots by mounting or installing the product</li> <li>This may alter the function and safety of the machine.</li> <li>Precautions: <ul> <li>Follow the instructions of the machine/robot manufacturer.</li> <li>If no appropriate instruction is available, ask machine/robot manufacturer for instructions before mounting or installing the product.</li> </ul> </li> </ul>
1.3	Limits of Use
Environment	Suitable for use in an atmosphere appropriate for permanent human habita- tion. Not suitable for use in aggressive or explosive environments.
	<ul> <li>Working in hazardous areas, or close to electrical installations or similar situations</li> <li>Life Risk.</li> <li>Precautions:</li> <li>Local safety authorities and safety experts must be contacted by the person responsible for the product before working in such conditions.</li> </ul>
	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	<ul> <li>The person responsible for the product has the following duties:</li> <li>To understand the safety instructions on the product and the instructions in the User Manual</li> <li>To ensure that it is used in accordance with the instructions</li> <li>To be familiar with local regulations relating to safety and accident prevention</li> <li>To stop operating the system and inform Leica Geosystems immediately if the product and the application become unsafe</li> <li>To ensure that the national laws, regulations and conditions for the operation of the product are respected</li> </ul>
	Awarning
	Unqualified installation on automatic machines and robots
	This may result in personal and material damage.  Precautions:
	<ul> <li>This product may be installed on automatic machines and robots only by an appropriately trained and qualified specialist.</li> </ul>
1.5	Hazards of Use
	Awarning
	<b>Distraction or loss of attention</b> 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. <b>Precautions:</b>

 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.

#### ACAUTION

#### 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.

#### **A**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.

#### **MWARNING**

#### 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.

F

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#### 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.

#### **A**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.

#### AWARNING

#### 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:

#### **A**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.		
	<ul> <li>According to IEC TR 60825-14 (2004-02), products classified as laser class 1, class 2 and class 3R do not require:</li> <li>laser safety officer involvement,</li> <li>protective clothes and eyewear,</li> <li>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.</li> </ul>		

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.				
	accordance with:	<ul> <li>The laser product described in this section is classified as laser class 1 in accordance with:</li> <li>IEC 60825-1 (2014-05): "Safety of laser products"</li> <li>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.</li> </ul>			
	and are not harmful to the eye				
	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)	S60 <sup>2</sup> 1 <sup>2</sup>			

- 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.

#### **ACAUTION**

# 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.

#### 

#### 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.

#### 

#### 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.

#### AWARNING

#### 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:**

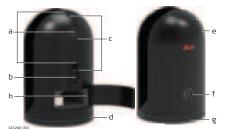
- Although the product meets the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that other equipment can be disturbed or that humans or animals can be affected.
- Do not operate the product with radio or digital cellular 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		
	b — <b>0 0</b>		
	cs	a b c	BLK360 with GEB825 battery BLK transportation case GEB825 battery 2x
		d e f	BLK cleaning cloth GEV278 USB-C cable GKL825 multicharger
		g h i	Mission bag (from BLK2GO) BLK tripod (from BLK360) BLK tripod adapter (from BLK360)
2.2	Container Contents		
Container contents	NEW ILLUSTRATION		
	Ø .		
	f g h	a b c d f	BLK transportation case BLK box GEB825 battery 3x GKL825 multicharger GEV278 USB-C cable BLK cleaning cloth
	b 013446.002	g h i j	BLK GEV821 power adapter BLK Quick Guide BLK USB documentation card

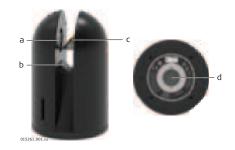
#### **Instrument Components**

Instrument components

#### **NEW ILLUSTRATION**



#### NEW ILLUSTRATION



- HDR and VIS camera а
- Ring-shaped LED Ь
- Scanner 360 ° С
- Power button d
- 360 ° WLAN antenna е
- USB-C port f
- Laser aperture а
- Nadir reference plate Ь
- Rotating prism С
- Quick release mount d

#### Additionally ->

- а
- Battery compartment Cooling channel/grid inlay Ь
- Laser shield С

2.3

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 blink- ing 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 shut-down.

#### 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 ILLUSTRA- TIONS	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	LED status	Instrument status
mode	NEW ILLUSTRA- TIONS	The BLK360 is running a firmware update.
		The firmware update was successful.
		The firmware update failed.
	Refer to process.	the Leica BLK360 website for details about firmware update

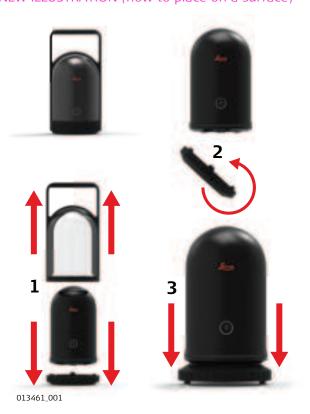
Instrument status

4	Operation	
4.1	Instrument Setup	
4.1.1	General Information	
Use the tripod	specifie • Gu	commended to set up the BLK360 on the tripod. Using the tripod ed for the scanning system: larantees maximum stability during scanning operations, sures 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 sun- light and avoid uneven temperatures around the instrument.
4.1.2	Tripod Setup	
BLK360 setup step- by-step	013458.001	ILLUSTRATION (same mounting)
	1.	Unfold the tripod and extend the tripod legs to allow for a comfort- able 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.

#### Setup on a Surface

BLK360 setup step-by-step

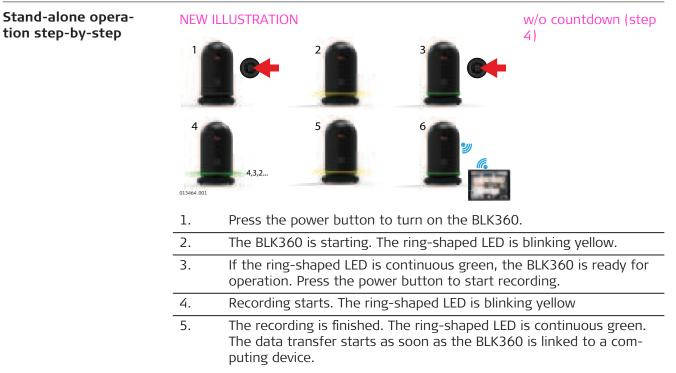
NEW ILLUSTRATION (how to place on a surface)



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

### 4.2

#### **Operation - Getting Started**



#### 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 4 013465.002	
	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.
	E.	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		B connection can be used to transfer data quickly and reliably in the f connected to a computer, for example, PC or laptop.
	powere • Pov • Pov	B-C data transfer works with powered off/no battery inside and ed on BLK360. wered off/no battery inside: The data transfer speed is slower. wered on: The data transfer speed is faster and the battery will be arged.
		It is recommended to have the BLK360 powered on during USB-C data transfer to ensure fastest data throughput.

NEW I	LLUSTRATION	Stand-alone record- ing and afterwards
		data transfer to PC via USB-C
013465_002		
1.	Press the power button to turn on the BLK36	0.
2.	The BLK360 is starting. The ring-shaped LED i	s blinking yellow.
3.	If the ring-shaped LED is continuous green, the operation.	ne BLK360 is ready for
4.	Connect the computing device with the BLK36	60.
5.	Start the recording and simultaneous data tra device. The ring-shaped LED is blinking yellow	1 5
6.	Start the processing of data on the computing	g device.
	If the USB-C cable is plugged in the BLK360 ca	annot capture data.

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

#### NEW ILLUSTRATION



014420\_001

Steps need to be reviewed and adapted. 1. Start the BLK360 and wait until the LED is continuous green. On the computing device select **Settings** and tap **Wi-Fi**. 2. 3. Select the network BLK360-35xxxxx in the Wi-Fi settings to be connected. F The number **35xxxxx** is the serial number of the BLK360. 4. Enter the password. F 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. F

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.

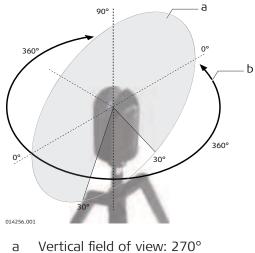
2.	Connect the USB-C cable to the BLK360.
3.	Connect the USB-C cable to the computing device.

4. Start the app and data can be downloaded.

Imaging		
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).		
NEW ILLUSTRATION- 4 cameras		
a 4 cameras		
Ambient Conditions		
<ul> <li>Rain, snow or fog may adversely affect measurement quality. Always use care when collect image data in these conditions.</li> <li>Need input: dark surroundings /night</li> <li>Need input: direct sunlight</li> </ul>		

#### Field of View (FoV)





Ь

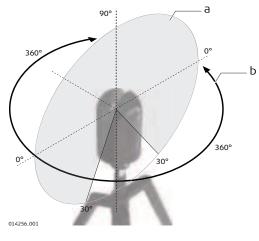
-		
4.4	Scanning	
4.4.1	Ambient Conditions	
Unfavourable sur- faces for scanning	<ul> <li>Highly reflective (polished metal, gloss paint)</li> <li>Highly absorbent (black)</li> <li>Translucent (clear glass)</li> <li>Colour, powder or tape these surfaces before scanning if necessary.</li> </ul>	
Unfavourable weather conditions for scan- ning	<ul> <li>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.</li> <li>Be aware, that rain, snow or fog may adversely affect measurement quality. Always use care when scanning in these conditions.</li> <li>Surfaces that are directly illuminated by the sun cause an increased range noise and therefore a larger measurement uncertainty.</li> <li>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.</li> </ul>	
Temperature changes during scanning	If the instrument is brought from a cold environment, for example from stor- age, 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.	

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

Missing points in scan. Problem When switching on the instrument or starting a scan, the	Dust, debris or finger- prints on the laser shield. Possible cause Capacity of battery is too	Use the BLK cleaning cloth to clean carefully the specific areas. Suggested remedies
When switching on the instrument or		Suggested remedies
the instrument or	Capacity of battery is too	
system switches off automatically.	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	Battery charger is defective.	Check the function of the battery charger. Note the charging status dis- played on the battery charger.
instrument or start- ing a scan.	Battery is no longer charging.	The battery has lost most of its capacity at the end of its life time. Replace the battery.
LED status	Instrument status	
2 NEW ILLUSTRA- TIONS	empty battery. Shut down reboot again. If status does not change,	the instrument and check internal storage
	the instrument and reboot	again. If status does not
	off automatically, even though it was recharged, when switching on the instrument or start- ing a scan. LED status 2 NEW ILLUSTRA-	off automatically, even though it was recharged, when switching on the instrument or start- ing a scan.defective.Battery is no longer charging.LED statusInstrument status2 NEW ILLUSTRA- TIONSSystem warning. For example empty battery. Shut down reboot again. If status does not change, capacity and power status

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

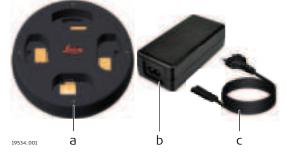
#### **NEW ILLUSTRATION**



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

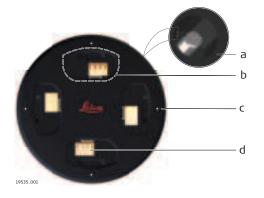
#### 4.4.3

4.6	Power Supply	
4.6.1	Battery and Charger Safety	
General	Use the batteries, chargers and accessories recommended by Leica Geosys- tems to ensure the correct functionality of the instrument.	
First-time use/ charging batteries	<ul> <li>The battery must be charged before using it for the first time because it is delivered with an energy content as low as possible</li> <li>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</li> <li>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</li> <li>For new batteries or batteries that have been stored for a long time (&gt; three months), it is effectual to make only one charge/discharge cycle</li> <li>For Li-lon 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.</li> </ul>	
- Operation/discharging	<ul> <li>The batteries can be operated from -20 °C to +55 °C/-4 °F to +131 °F.</li> <li>Low operating temperatures reduce the capacity that can be drawn; high operating temperatures reduce the service life of the battery.</li> </ul>	
4.6.2	Charging Station	
Description	<ul> <li>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: <ul> <li>Power supply through dedicated AC/DC power adapter</li> <li>LED to indicate the status</li> <li>Four battery positions</li> <li>Charging of one to four battery packs at the same time</li> </ul> </li> <li>The GKL825 can charge one to four batteries at a time depending on requested battery charging current.</li> </ul>	
System components		



- a b
- GKL825 charger AC/DC power adapter AC power cable
- С

#### **Charger components**



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

#### LED indicators

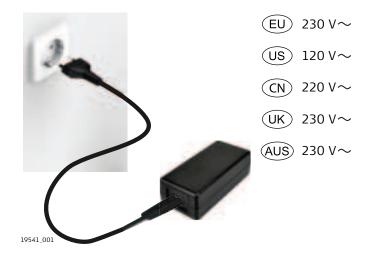


LED indicator	Status	Description
0	Off	No activity.
•	Solid green	The battery is fully charged.
0	Blinking orange	The battery is charging.
•	Solid red	Failure. Refer to Troubleshooting.

**Power supply** 

F

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.



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		ILLUSTRATION ( TIM ID 23589 ) and insert the wing note in step-by-step table	
	6	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.	
_			

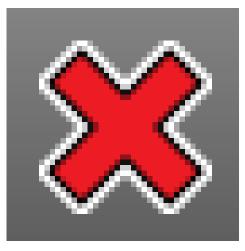
#### NOTICE

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-lon battery	<ul> <li>Refer to Environmental specifications for information about storage temperature range</li> <li>Remove batteries from the product and the charger before storing</li> <li>After storage recharge batteries before using</li> <li>Protect batteries from damp and wetness. Wet or damp batteries must be dried before storing or use</li> <li>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</li> <li>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</li> </ul>		
Charger and docking station	<ul> <li>Keep chargers and docking stations away from excessive dirt, dust and contaminants.</li> <li>After unpacking the product visually inspect the charger for possible damage.</li> <li>Unplug the product from the outlet before attempting any maintenance or cleaning.</li> </ul>		

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 accessor- ies	<ul> <li>Never touch the glass surfaces of the cameras or the laser shield with your fingers.</li> <li>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.</li> </ul>
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 clean- ing 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.
	<ul> <li>If one of the following occurs, a mesh cleaning must be carried out:</li> <li>There is clearly visible dust on the mesh.</li> <li>The BLK360 overheats unusually fast.</li> <li>The fan runs at a constantly high level, which is audible from the fan noise as well as the battery is drained faster.</li> </ul>
- -	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

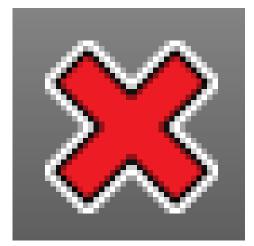
## Cleaning the mesh step-by-step

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.			
	B	Do not use water to clean the mesh.			
	1 B	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.				
		JTION			
		any cleaning procedure, ensure that the instrument is switched off and tery has been removed.			
Dust and debris on	Use the	e BLK cleaning cloth to remove dust and debris from these surfaces.			
optical surfaces		The BLK cleaning cloth must be clean and free from dirt, dust or particles.			
	(A)	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		of the laser shield can cause extreme measurement errors and there- eless data.			
	(J)	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 t cloth:	the laser shield and camera lenses regularly with the BLK cleaning			
	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	3	
6.1	General Technica	al Data of the Product	
Storage and Commu-	Internal storage:		
nication	256 GB		
	Setup	Description	
	Scan resolution xy	xxx setups can be saved	
	Image quality xy	xxx setups can be saved	
	Communication:		
	Туре	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	
	Туре	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	Sensor	Description	
sensors	Visual Inertial System 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 Performa	ance	
System performance and accuracy		y specifications are one sigma (1σ) under Leica Geosys- rd test conditions unless otherwise noted.	
	Accuracy of single measurement Value (at 78% albedo)		
	3D point accuracy	6 mm at 10 m, 8 mm at 20 m	
6.3	Laser System Per	rformance	
Laser scanning sys- tem data		g system is a high speed time-of-flight unit, enhanced b igitising (WFD) technology with a maximum scan rate of nts/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	Power supply:			
and consumption	Internal battery			
	7.4V DC; one intern	al battery provided with system.		
	Power consumptio	n:		
	Instrument			
	10 W typical; 16 W	max.		
	Supply	Value		
	Input voltage	10-32 V DC		
GEB825 internal bat-	Supply	Value		
tery		Li-lon		
	Type	7.4 V		
	Voltage			
	Capacity	2.6 Ah		
Battery operating and	Internal battery	Value		
charging times	Operating time	> 40 setups per battery, typical continu- ous use (room temperature).		
	Charging time	Typical charging time with charger GKL825 is 4-8 hours at room temperat- ure.		
6.5	Environmental S	Specifications		

Environmental specifications	Туре		Operating temperature [°C]	Storage temperature [°C]
	Instru	ment	0 to +40	-25 to +70
	Batter	у	0 to +50	-40 to +70
		er and AC/DC supply	0 to +40	-40 to +70
	- Andrew Contraction of the second se	but place it i	n a shaded area. If the outs	pose it to the direct sunlight, ide temperature is above are full scanning performance.
	Туре		Protection against wate	er, dust and sand
	Instru	ment	IP54 (IEC 60529) upright, correctly	battery inserted and closed

Туре	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	IPX0 (IEC 60529)
power supply	Only operate in dry environments, for example in buildings and vehicles.
Туре	Humidity
Instrument	max. 95% non-condensing
Battery and Charger	max. 95% non-condensing
barrery and charger	
AC/DC power supply	max. 80% non-condensing
AC/DC power supply	max. 80% non-condensing
AC/DC power supply           Type           Instrument and	max. 80% non-condensing  Limits of use Indoor and outdoor use.
AC/DC power supply Type Instrument and battery Charger and AC/DC	max. 80% non-condensing          Limits of use         Indoor and outdoor use.         Working altitude: unlimited         Indoor use only.

6.6

Dimensions

#### Dimensions

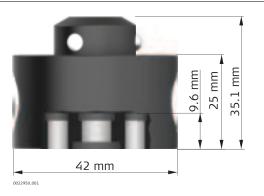
Dimensions [mm] Dimensions ["] Instrument  $(D \times W \times H)$  $(D \times W \times H)$ BLK360 80 x 80 x 155 3.1 x 3.1 x 6.1 GEV821 AC power 85 x 170 x 41 / cable 3.4 x 6.7 x 1.6 / cable supply length: 1800 length: 70 GKL825 multichar-157 x 71 x 38 6.2 x 2.8 x 1.5 ger GEB825 battery 71.5 x 39.5 x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

#### 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	<ul> <li>Included standard accessories:</li> <li>BLK360 hood</li> <li>Battery charger GKL825 with AC power adapter GEV821</li> <li>Battery GEB825 (3x)</li> <li>Quick guide BLK360</li> <li>12 month warranty</li> </ul>		

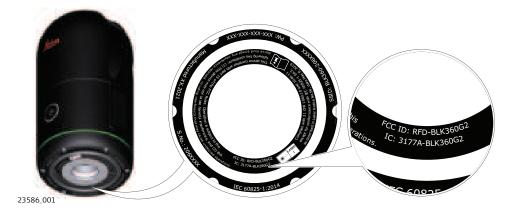
Calibration certificate digital access via online registration

Additional accessor-	•
ies	•

- 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





#### Labelling GEB825



#### Labelling GKL825



#### Labelling GEV821



ULIN

24033\_001

WLAN

Frequency band Output power	Туре	Frequency band [MHz]
	WLAN	2412-2462
	Client mode	5180-5240,
		5260-5320,
		5500-5700
	Tupo	Output power [mW]
output power	Туре	Output power [mW]

#### 100 max. Antenna Antenna Туре Gain WLAN 2x chip antenna MIMO 2.4 Ghz: +1.87 dBi system 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 avail- able at the following Internet address: <u>http://www.leica-geosys- tems.com/ce</u> .	
(J)	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 relev- ant provisions of the applicable European Directives. The full text of the EU declaration of conformity is available at the following Internet address: <u>http://www.leica-geosystems.com/ce</u> .	
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 particu- lar installation. If this equipment does cause harmful interference to radio or television recep- tion, 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:	
	<ul> <li>Reorient or relocate the receiving antenna.</li> <li>Increase the separation between the equipment and the receiver.</li> <li>Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.</li> <li>Consult the dealer or an experienced radio/TV technician for help.</li> </ul>	
	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	

	<ul> <li>Canada Compliance Statement</li> <li>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: <ol> <li>This device may not cause interference</li> <li>This device must accept any interference, including interference that may cause undesired operation of the device</li> </ol> </li> <li>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: <ol> <li>L'appareil ne doit pas produire de brouillage</li> <li>L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement</li> </ol> </li> </ul>	
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 <b>IATA Dangerous Goods Regulations</b> .	
	Leica Geosystems has developed <b>Guidelines</b> 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 ( <u>http://www.leica-geosystems.com/dgr</u> ) 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 This product contains software that is preinstalled on the product is supplied to you on a data carrier medium, or that can be downled by you online according to prior authorisation from Leica Geosyster software is protected by copyright and other laws and its use is d regulated by the Leica Geosystems Software Licence Agreement, we aspects such as, but not limited to, Scope of the Licence, Warrant Property Rights, Limitation of Liability, Exclusion of other Assurance ing Law and Place of Jurisdiction. Please make sure, that at any tir fully comply with the terms and conditions of the Leica Geosystem Licence Agreement.		
	Such agreement is provided together with all products and can also be referred to and downloaded at the Leica Geosystems home page at <u>Hexagon – Legal Documents</u> or collected from your Leica Geosystems distributor.	
	You must not install or use the software unless you have read and accepted the terms and conditions of the Leica Geosystems Software Licence Agree- ment. Installation or use of the software or any part thereof, is deemed to be an acceptance of all the terms and conditions of such Licence Agreement. If you do not agree to all or some of the terms of such Licence Agreement, you must not download, install or use the software and you must return the unused software together with its accompanying documentation and the purchase receipt to the distributor from whom you purchased the product within ten (10) days of purchase to obtain a full refund of the purchase price.	
Open source informa- tion	The software on the product may contain copyright-protected software that is licensed under various open source licences.	
	<ul> <li>Copies of the corresponding licences:</li> <li>are provided together with the product (for example in the About panel of the software).</li> <li>can be downloaded on http://opensource.leica-geosystems.com/blk360.</li> </ul>	
	If foreseen in the corresponding open source licence, you may obtain the corresponding source code and other related data on http://opensource.leica-geosystems.com/blk360. Contact opensource@leica-geosystems.com in case you need additional information.	

### User Manual BLK360 G2

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