Leica CS20 & GS Sensors
User Manual

Captivate

Version 2.0
English

- when it has to be **right**

Leica Geosystems

Introduction

Purchase

Congratulations on the purchase of a Leica CS20.

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 switch on the product.

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 workshop.

Trademarks

- Windows is a registered trademark of Microsoft Corporation in the United States and other countries
- SD Logo is a trademark of SD-3C, LLC.
- *Bluetooth*® is a registered trademark of Bluetooth SIG, Inc.

All other trademarks are the property of their respective owners.

Validity of this manual

This manual applies to the CS20 field controller, the GS08plus and the CTR20 expansion pack. Differences between the various models are marked and described.

Available documentation

Name	Description/Format		
CS20 Quick Guide	Provides an overview of the product together with technical data and safety directions. Intended as a quick reference guide.	✓	✓
CS20 User Manual	All instructions required in order to operate the product to a basic level are contained in the User Manual. Provides an overview of the product together with technical data and safety directions.	-	✓

Name	Description/Format		
Leica Captivate Technical Reference Manual	Overall comprehensive guide to the product and apps. Included are detailed descriptions of special software/hardware settings and software/hardware functions intended for technical specialists.	-	✓

Refer to the following resources for all CS20 documentation/software:

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

myWorld@Leica Geosystems (**https://myworld.leica-geosystems.com**) offers a wide range of services, information and training material.
With direct access to myWorld, you are able to access all relevant services whenever it is convenient for you, 24 hours a day, 7 days per week. This increases your efficiency and keeps you and your equipment instantly updated with the latest information from Leica Geosystems.

Service	Description
myProducts	Add all products that you and your company own and explore your world of Leica Geosystems: View detailed information on your products and update your products with the latest software and keep up-to-date with the latest documentation.
myService	View the current service status and full service history of your products in Leica Geosystems service centres. Access detailed information on the services performed and download your latest calibration certificates and service reports.
mySupport	View the current service status and full service history of your products in Leica Geosystems service centres. Access detailed information on the services performed and download your latest calibration certificates and service reports.
myTraining	Enhance your product knowledge with Leica Geosystems Campus - Information, Knowledge, Training. Study the latest online training material on your products and register for seminars or courses in your country.
myTrusted Services	Add your subscriptions and manage users for Leica Geosystems Trusted Services, the secure software services, that assist you to optimise your workflow and increase your efficiency.

Table of Contents

In this manual

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

- Remote control of product.
- Data communication with external appliances.
- Recording measurements.
- Computing with software.
- Carrying out measurement tasks using various GNSS measuring techniques.
- Recording GNSS and point related data.
- Measuring raw data and computing coordinates using carrier phase and code signal from GNSS satellites.

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 obvious damages or defects.
- Use with accessories from other manufacturers without the prior explicit approval of Leica Geosystems.
- Inadequate safeguards at the working site.
- Controlling of machines, moving objects or similar monitoring application without additional control and safety installations.

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.

DANGER

Local safety authorities and safety experts must be contacted before working in hazardous areas, or close to electrical installations or similar situations by the person in charge of the product.

The following advice is only valid for battery charger, power adapter and car adapter.

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 inform Leica Geosystems immediately if the product and the application becomes unsafe.
- To ensure that the national laws, regulations and conditions for the operation of e.g. radio transmitters or lasers are respected.
- To ensure that the radio modem is not operated without the permission of the local authorities on frequencies and/or output power levels other than those specifically reserved and intended for use without a specific permit.
  The internal and external radio modems have been designed to operate on frequency ranges and output power ranges, the exact use of which differs from one region and/or country to another.

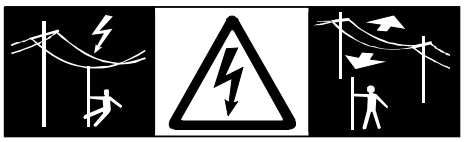
1.5 Hazards of Use

DANGER

Because of the risk of electrocution, it is dangerous to use poles, levelling staffs and extensions in the vicinity of electrical installations such as power cables or electrical railways.

Precautions:

Keep at a safe distance from electrical installations. If it is essential to work in this environment, first contact the safety authorities responsible for the electrical installations and follow their instructions.



WARNING

During dynamic applications, for example stakeout procedures 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 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.

CAUTION

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

Incorrect fastening of the external antenna to vehicles or transporters poses the risk of the equipment being broken by mechanical influence, vibration or airstream. This may result in accident and physical injury.

Precautions:

Attach the external antenna professionally. The external antenna must be secured additionally, for example by use of a safety cord. Ensure that the mounting device is correctly mounted and able to carry the weight of the external antenna (>1 kg) safely.

WARNING

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.

DANGER

If the product is used with accessories, for example on masts, staffs, poles, you may increase the risk of being struck by lightning. Danger from high voltages also exists near power lines. Lightning, voltage peaks, or the touching of power lines can cause damage, injury and death.

Precautions:

- Do not use the product in a thunderstorm as you can increase the risk of being struck by lightning.
- Be sure to remain at a safe distance from electrical installations. Do not use the product directly under or close to power lines. If it is essential to work in such an environment contact the safety authorities responsible for electrical installations and follow their instructions.
- If the product has to be permanently mounted in an exposed location, it is advisable to provide a lightning conductor system. A suggestion on how to design a lightning conductor for the product is given below. Always follow the regulations in force in your country regarding grounding antennas and masts. These installations must be carried out by an authorised specialist.
- To prevent damages due to indirect lightning strikes (voltage spikes) cables, for example for antenna, power source or modem should be protected with appropriate protection elements, like a lightning arrester. These installations must be carried out by an authorised specialist.
- If there is a risk of a thunderstorm, or if the equipment is to remain unused and unattended for a long period, protect your product additionally by unplugging all systems components and disconnecting all connecting cables and supply cables, for example, instrument - antenna.

CAUTION

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 of it, discharge the batteries by running 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

High mechanical stress, high ambient temperatures or immersion into fluids can cause leakage, fire or explosions of the batteries.

Precautions:

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

WARNING

If battery terminals are short circuited e.g. by coming in contact with jewellery, keys, metalized 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.

☞ The following advice is only valid for power adapter and car adapter.

WARNING

If you open 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 workshops are entitled to repair these products.

☞ The following advice is only valid for power adapter and car adapter.

WARNING

The product is not designed for use under wet and severe conditions. If unit becomes wet it may cause you to receive an electric shock.

Precautions:

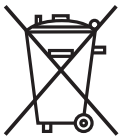
Use the product only in dry environments, for example in buildings or vehicles. Protect the product against humidity. If the product becomes humid, it must not be used!

WARNING

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 downloaded from the Leica Geosystems home page at http://www.leica-geosystems.com/treatment or received from your Leica Geosystems distributor.

WARNING

Only Leica Geosystems authorised service workshops are entitled to repair these products.

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 DISTO

General

The DISTO module built into the product produces a visible red laser beam which emerges from the window at the top of the product.

The laser product described in this section is classified as laser class 2 in accordance with:

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

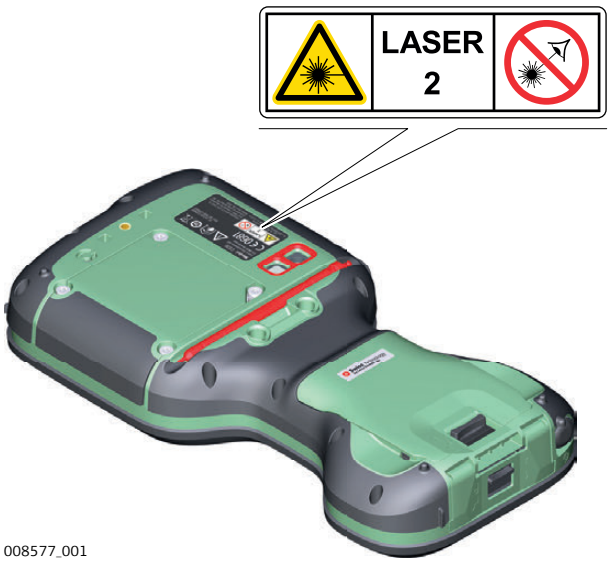
These products are safe for momentary exposures but can be hazardous for deliberate staring into the beam. The beam may cause dazzle, flash-blindness and after-images, particularly under low ambient light conditions.

Description	Value
Wavelength	620 nm - 690 nm
Maximum average radiant power	0.95 mW
Pulse duration	> 400 ps
Pulse repetition frequency (PRF)	320 MHz
Beam divergance	0.16 mrad x 0.6 mrad

⚠ **CAUTION**

From a safety perspective, class 2 laser products are not inherently safe for the eyes.
Precautions:
1) Avoid staring into the beam or viewing it through optical instruments.
2) Avoid pointing the beam at other people or at animals.

Labelling and Location of Laser Aperture



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a) Laser beam

Laser Radiation
Do not stare into the beam.
Class 2 Laser Product according to
IEC 60825-1 (2014 - 05)

Po ≤ 0.95 mW

λ = 620 nm - 690 nm

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 can cause disturbances in other equipment.
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

There is a risk that disturbances may be caused in other equipment if the product is used with accessories from other manufacturers, for example field computers, personal computers or other electronic equipment, non-standard cables or external batteries.
Precautions:
Use only the equipment and accessories recommended by Leica Geosystems. When combined with the product, they meet the strict requirements stipulated by the guidelines and standards. When using computers or other electronic equipment, pay attention to the information about electromagnetic compatibility provided by the manufacturer.

CAUTION

Disturbances caused by electromagnetic radiation can result in erroneous measurements.
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 product may be disturbed by intense electromagnetic radiation, for example, near radio transmitters, two-way radios or diesel generators.
Precautions:
Check the plausibility of results obtained under these conditions.

CAUTION

If the product is operated with connecting cables attached at only one of their two ends, for example external supply cables, interface cables, the permitted level of electromagnetic radiation may be exceeded and the correct functioning of other products may be impaired.
Precautions:
While the product is in use, connecting cables, for example product to external battery, product to computer, must be connected at both ends.

Radios or Digital Cellular Phones

Use of product with radio or digital cellular phone devices:

WARNING

Electromagnetic fields can cause disturbances in other equipment, in installations, in medical devices, for example pacemakers or hearing aids and in aircraft. It 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 to medical equipment.
- Do not operate the product with radio or digital cellular phone devices in aircraft.

1.8 FCC Statement, Applicable in U.S.

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

WARNING

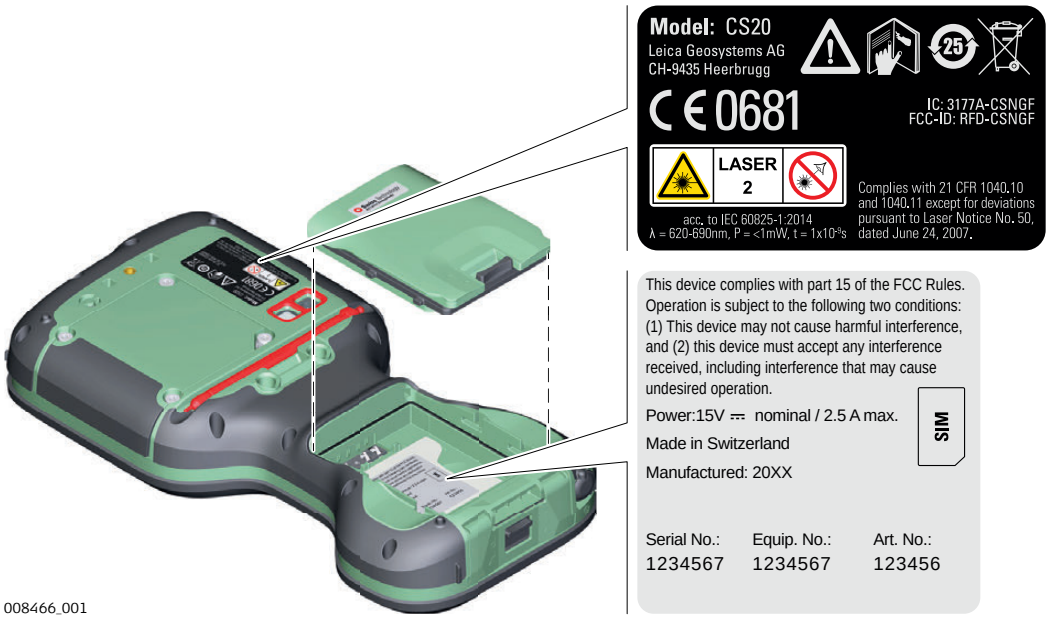
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules.
These limits are designed to provide reasonable protection against harmful interference in a residential installation.
This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.
If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

WARNING

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

Labelling CS20



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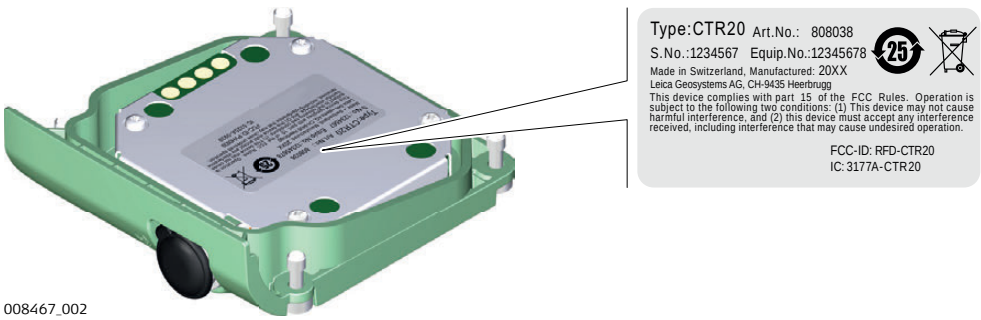
Labelling CTR20



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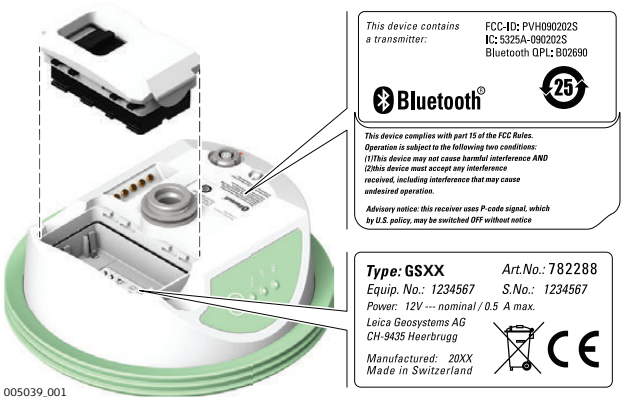
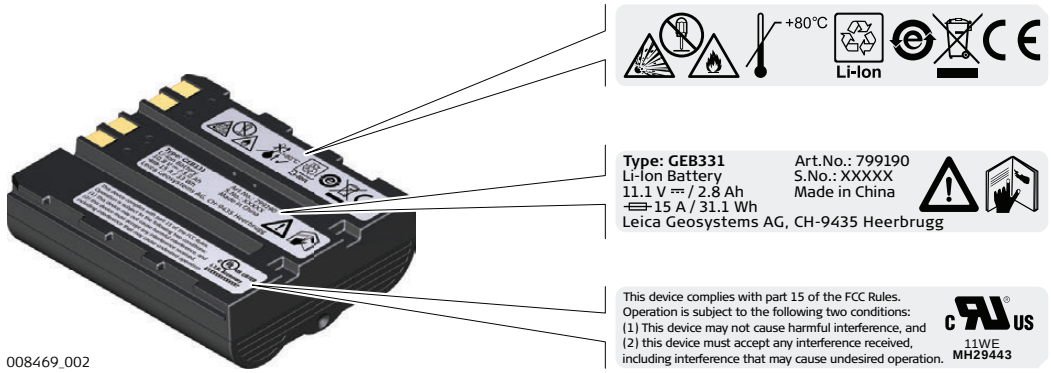
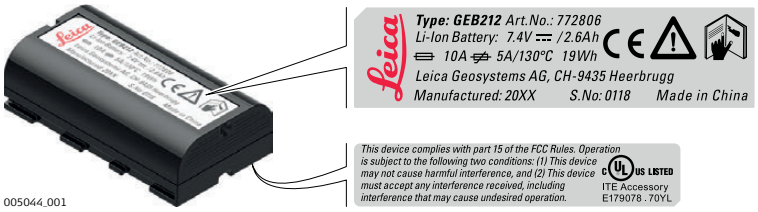
Labelling GS08plus



Labelling Internal Battery GEB331



Labelling internal battery GEB212



Exposure to radio frequency (RF) signals

The wireless device is a radio transmitter and receiver. It is designed and manufactured not to exceed the emission limit for exposure to radio frequency (RF) energy set by the OET Bulletin 65 Supplement C / Ministry of Health (Canada), Safety Code 6. These limits are part of comprehensive guidelines and established permitted levels of RF energy for the general population. These guidelines are based on the safety standards previously set by international standard bodies. These standards include a substantial safety margin designed to assure the safety of all persons, regardless of age and health.
This device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter.
This device has been shown to be capable of compliance for localised specific absorption rate (SAR) for uncontrolled environment / general public exposure limits specific in ANSI/IEEE C95.1-1992 and had been tested in accordance with the measurement procedures specified in IEEE Std. 1528-2003.

⚠ WARNING

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

2 Description of the System

2.1 Overview

System components

2.2 Terminology

CS general description

CS is a collective term describing the various models of the multi-purpose field controller which is used with GNSS and TS instruments.

Available Models

Model	CS20 (823 164)	CS20 3.75G (823 165)	CS20 3.75G DISTO (823 169)	CS20 CDMA DISTO (823 167)
Touch screen	✓	✓	✓	✓
Colour display	✓	✓	✓	✓
Internal long-range TS communication radio	-	✓	✓	✓
Internal 3.75G modem	-	✓	✓	✓
Internal CDMA modem	-	-	-	✓
Internal battery[1]	✓	✓	✓	✓
DISTO	-	-	✓	✓
SD card	✓	✓	✓	✓
Bluetooth	✓	✓	✓	✓
External long-range TS communication radio (CTR20)	-	As expansion pack CTR20		
Wireless LAN 802.11b/g/n	✓	✓	✓	✓
Windows EC 7	✓	✓	✓	✓
Camera with flash	✓	✓	✓	✓
Camera in DISTO	-	-	✓	✓

[1] removable

CS Available Radios **Radios for remote control (RCS) are available in the following variations:**

Type	Description
CS20	Radio unavailable
CS20 with internal long-range TS communication radio	Field controller with an integrated long-range TS communication radio.
CS20 with expansion pack	Field controller with an integrated long-range TS communication radio. A high-performance wireless data transfer device (CTR20) can be attached.

Software

Software type	Description
CS firmware (CS_xx.fw)	This software includes: • The multi- language-specific version of Windows EC 7. • The necessary functionality of the instrument, including Leica Captivate. • The main applications and languages are integrated into the firmware. Languages cannot be deleted.

Software for the GS08plus

Software type	Description
ME firmware (ME_xx.fw)	This software includes: - The firmware for the measurement engine.

Software upload

☞ Uploading firmware can take some time. Ensure that the battery is at least 75% full before beginning the upload, and do not remove the battery during the upload process.

Software for	Description
All CS models	The software is stored in the flash RAM of the field controller. **Firmware update instructions** • Download the most recent firmware file from https://myworld.leica-geosystems.com. • Copy the firmware file into the \SYSTEM folder on the Leica SD card. ☞ Ensure that the Leica SD card is inserted into the field controller before starting the upload. • Start Leica Captivate. To open the Update Software panel, select **Settings** › **Tools** › **Update software** • Select the firmware file to upload and start the update process. When the update process is finished, the new version of Leica Captivate is started.
GS08plus	The software is stored in the flash RAM of the GS08plus. **ME firmware update instructions** • Download the most recent ME firmware file from https://myworld.leica-geosystems.com. • Connect the CS field controller to your PC. • Copy ME firmware file into the /SYSTEM directory of the Leica SD card or Leica CompactFlash card. • Connect the GS08plus with the GEV234/GEV237 cable to the CS field controller and establish a connection between the GS08plus and the CS field controller. Refer to the Leica Leica Captivate Technical Reference Manual. • Start the upload. • A message will appear when the upload is complete.

2.3.2 Power Concept

General

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

Power options

Model	Power supply
all CS models	Internally by GEB331 battery, OR Externally by GEV276 cable, OR Externally by GEV219 cable, OR If an external power supply is connected and the internal battery is inserted, then the external power is used. The internal battery is charged. Please note: Charging functionality is not available for CS20 field controller (823 164).
CTR20	Externally by the field controller. Please note: Expansion pack support is not available for CS20 field controller (823 164).
GS08plus	Internally by GEB212 battery, OR Externally by GEV219 cable If an external power supply is connected and the internal battery is inserted, then the external power is used.

2.3.3 Data Storage Concept

Description

Data is stored on a memory device. The memory device can be an SD card, USB stick or internal memory.

Memory device

SD card: All field controllers have an SD card slot fitted as standard. An SD card can be inserted and removed. Available capacity: 1 GB, 8 GB.

USB stick: All field controllers have a USB port fitted as standard.

Internal memory: All field controllers have an internal memory fitted as standard. Available capacity: 2 GB.

☞ While other SD cards can be used, Leica Geosystems recommends to only use Leica SD cards and is not responsible for data loss or any other error that can occur while using a non-Leica card.

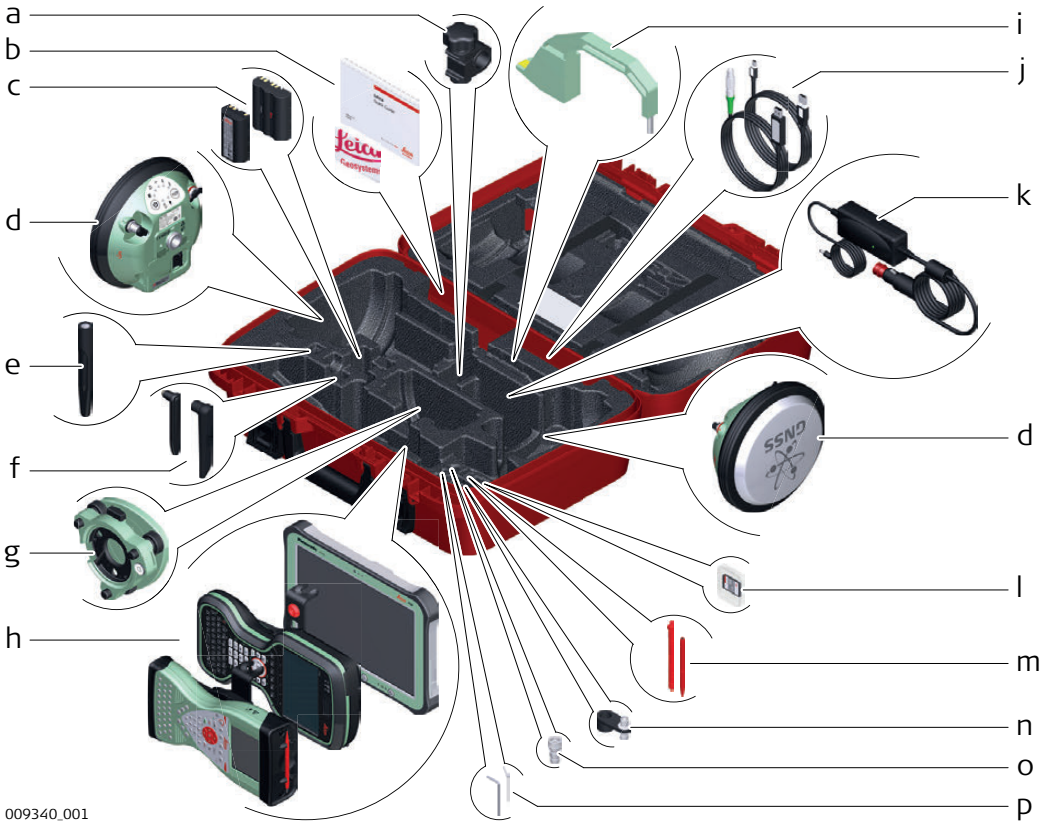
☞ Removing the SD card or USB stick while the field controller is turned on can cause loss of data. Only remove the SD card or USB stick or unplug connecting cables when the field controller is switched off.

Transfer Data

Data can be transferred in various ways. Refer to "4.1.8 Connecting to a Personal Computer".

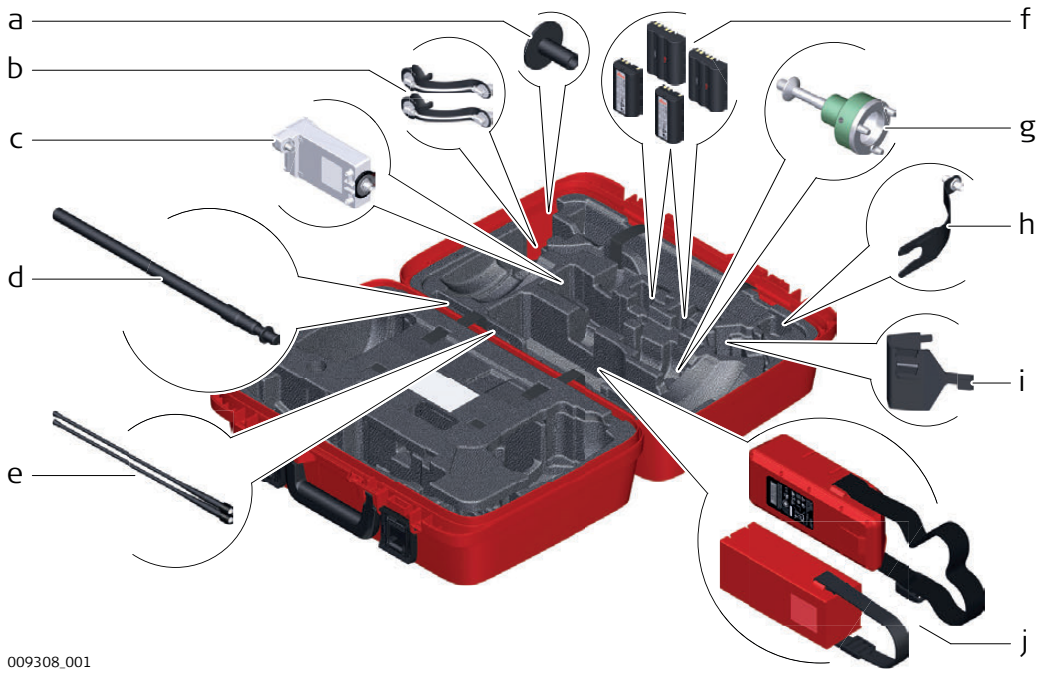
☞ SD cards can directly be used in an OMNI drive as supplied by Leica Geosystems. Other PC card drives can require an adaptor.

Container for GS instrument and accessories 1/2



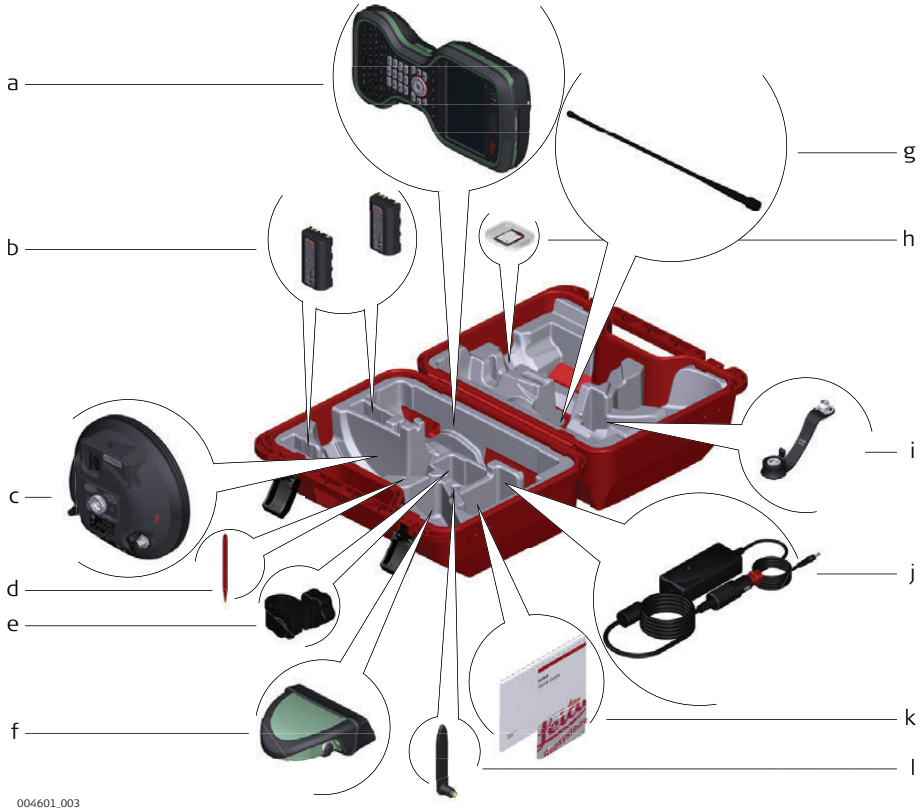
a) GHT63 clamp
b) Manuals and USB documentation card
c) GEB212 or GEB311 batteries
d) Antenna
e) GAT18 mobile antenna
f) GAT21, GAT25 or GAT26 radio antenna
g) Tribrach
h) CS15 field controller with GHT62 holder or CS20 field controller with GHT66 holder or CS35 tablet
i) Height hook
j) Cables
k) GDC221 car adapter
l) SD cards
m) Stylus
n) GAD34 arm 3 cm
o) TNC QN-adapter
p) Allen key and adjustment tool

Container for GS instrument and accessories 2/2



a) GHT36 base for telescopic rod
b) GAD108 arm
c) GFU RTK modem
d) GAD32 telescopic rod
e) GAT1 or GAT2 radio antennas
f) GEB212 or GEB311 batteries
g) GRT146 carrier
h) GAD33 arm
i) GHT58 tripod bracket for GFU
j) External battery

Container for GS instrument and accessories

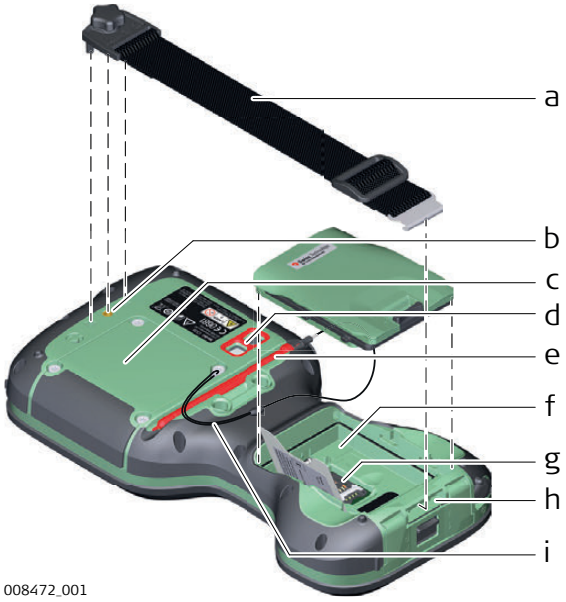


a) Field controller
b) GEB212 batteries
c) Antenna
d) Stylus
e) GHT63 car adapter
f) CGR radio
g) GAT21 antenna for CGR radio
h) microSD card including adapter or SD card
i) GAD108 arm
j) Car adapter
k) Manual & USB documentation card
l) Radio antenna

Upside of CS20

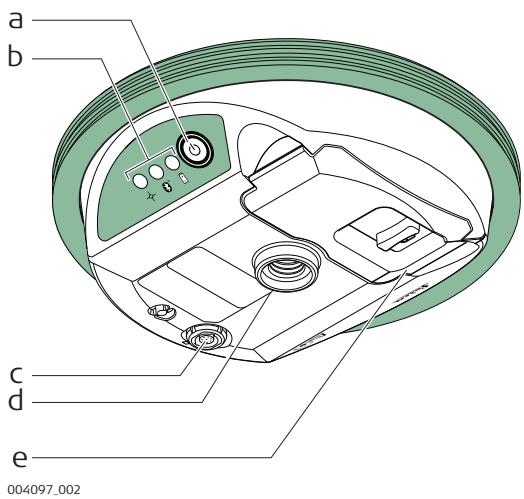
a) DISTO with camera
b) Screen
c) Keyboard
d) Connector cover
e) Power socket
f) SD card slot
g) USB A host port
h) LEMO port (USB and serial)

Underside of CS20



a) Hand strap
b) Thread for screwing on hand strap or utility hook
c) Expansion cover
d) Digital camera with flash
e) Stylus
f) Battery compartment
g) SIM card slot under the battery
h) Socket for fastening clip of the hand strap
i) Tether for the stylus

GS08plus components

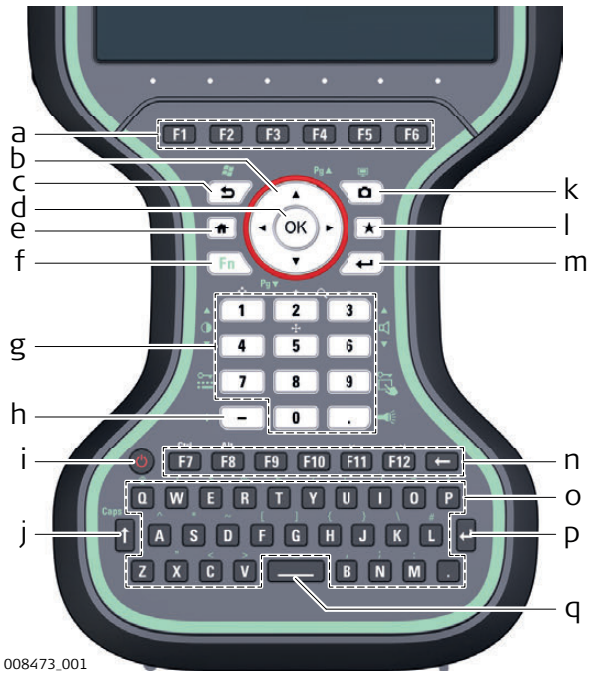


a) ON/OFF button
b) LEDs
c) LEMO port including USB port
d) Mechanical Reference Plane (MRP)
e) Battery compartment

3 User Interface

3.1 Keyboard

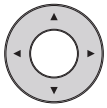
Keyboard Display



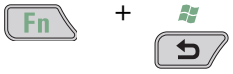
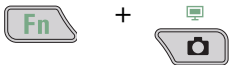
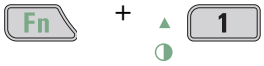
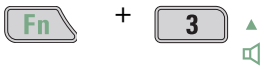
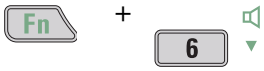
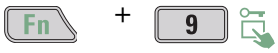
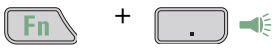
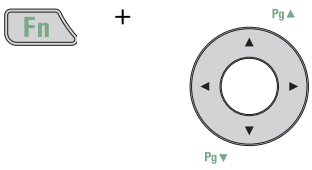
a) Function keys **F1** - **F6**
b) Arrow keys
c) ESC
d) OK
e) Home
f) **Fn**
g) Numeric keys
h) ± key
i) ON/OFF
j) CAPS Lock
k) Cameras
l) Favourites
m) ENTER
n) Function keys **F7** - **F12**; Backspace
o) Alpha keys
p) ENTER
q) SPACE

Keys

Key	Function
Function keys **F1**-**F6**	Correspond to six softkeys that appear on the bottom of the screen when the screen is activated.
Function keys **F7**-**F12**	User definable keys to execute chosen commands or access chosen screens.
Alpha keys	To type letters.
Numeric keys	To type numbers.
Caps Lock	Switches between upper case and lower case letters.
Backspace	Clears all entry at the beginning of user input. Clears the last character during user input.
Esc	Leaves the current screen without storing any changes.
Fn	Switches between the first and second level of function keys.
Space	Enters a blank.
Enter	Selects the highlighted line and leads to the next logical menu/ dialog. Starts the edit mode for editable fields. Opens a selectable list.
ON/OFF	If the field controller is already off: Turns the field controller on when held for 2 s. If the field controller is already on: • Turns to Power Options menu when held for 2 s. • Turns the field controller off when held for 5 s.

Key	Function
Favourites 	Opens the “Favourites” pop-up bubble within Leica Captivate.
Home 	Switches to the Windows EC7 Start Menu.
Cameras 	Access the cameras.
Arrow keys 	Move the focus on the screen.
OK 	Selects the highlighted line and leads to the next logical menu/ dialog. Starts the edit mode for editable fields. Opens a selectable list.

Key combinations

Key	Function
	Hold **Fn** while pressing  . Switch to Windows.
	Hold **Fn** while pressing  . Take a screenshot of the current screen.
	Hold **Fn** while pressing  . Increase the screen brightness.
	Hold **Fn** while pressing  . Decrease the screen brightness.
	Hold **Fn** while pressing  . Increase the volume for acoustic warning signals, beeps and keypresses on the field controller.
	Hold **Fn** while pressing  . Decrease the volume for acoustic warning signals, beeps and keypresses on the field controller.
	Hold **Fn** while pressing  . Lock/unlock the keyboard.
	Hold **Fn** while pressing  . Lock/unlock the touch screen.
	Hold **Fn** while pressing  . Turn the torch on/off.
	Hold **Fn** while pressing ▲ or ▼. Switch to the previous/next page.

Keyboard and touch screen

The user interface is operated either by the keyboard or by the touch screen with supplied stylus. The workflow is the same for keyboard and touch screen entry, the only difference lies in the way information is selected and entered.

Operation by keyboard

Information is selected and entered using the keys. Refer to "3.1 Keyboard" for a detailed description of the keys on the keyboard and their function.

Operation by touch screen

Information is selected and entered on the screen using the supplied stylus.

Operation	Description
To select an item	Tap on the item.
To start the edit mode in editable fields	Tap on the editable field.
To highlight an item or parts of it for editing	Drag the supplied stylus from the left to the right.
To accept data entered into an editable field and exit the edit mode	Tap on the screen outside of the editable field.
To open a context-sensitive menu	Tap on the item and hold for 2 s.

LED Indicators

The field controller has **L**ight **E**mitting **D**iode indicators. They indicate the basic field controller status.

a) Power LED
b) Bluetooth LED
c) Long range TS LED - not available for CS20 field controller (823 164)

Description of the LEDs

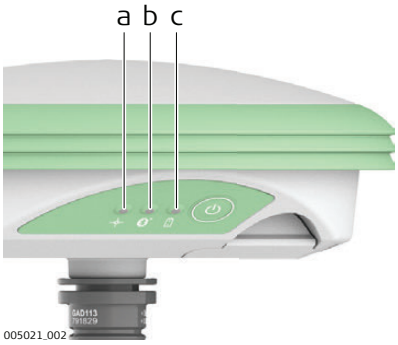
LED	LED Status	Status of Field Controller
Power LED	off	Power is off.
	green	Power is okay.
	flashing green	Power is okay. The battery is being charged.
	red	Power is low. The remaining time for which enough power is available depends on the use of wireless modules, the temperature and the age of the battery.
	flashing red	Power is low. The remaining time for which enough power is available depends on the use of wireless modules, the temperature and the age of the battery. The battery is being charged.
	fast flashing red	Power is very low. The battery must be charged.
Bluetooth LED and Long range TS LED	green	Bluetooth is not connected.
	blue	Bluetooth is connected.

LED indicators

Description

The GS08plus instrument has **L**ight **E**mitting **D**iode indicators. They indicate the basic instrument status.

Diagram



a) Tracking LED (TRK)
b) Bluetooth LED (BT)
c) Power LED (PWR)

Description of the LEDs

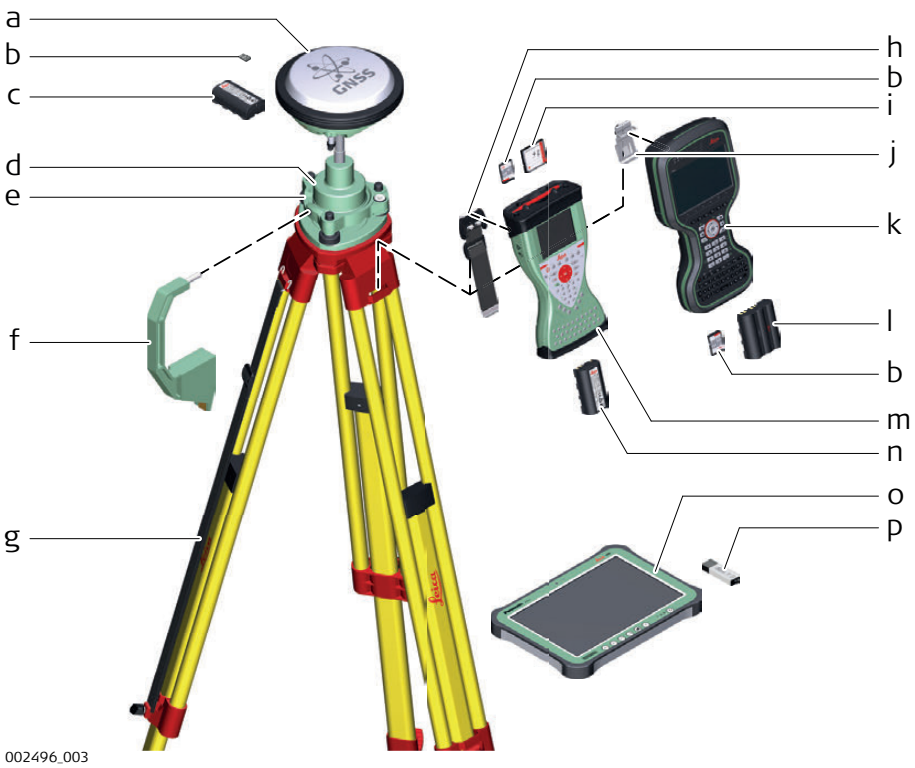
IF the	is	THEN
TRK LED	off	No satellites are tracked.
	flashing green	Less than four satellites are tracked, a position is not yet available.
	green	Enough satellites are tracked to compute a position.
	red	GS08plus instrument is initialising.
BT LED	green	Bluetooth is in data mode and ready for connecting.
	purple	Bluetooth is connecting.
	blue	Bluetooth has connected.
	flashing blue	Data is being transferred.
GS08plus PWR LED	off	Power is off.
	green	Power is 100% - 20%.
	red	Power is 20% - 5%.
	flashing red	Power is low (< 5%). The remaining time for which enough power is available depends on the type of survey, the temperature and the age of the battery.

4 Operation

4.1 Equipment Setup

4.1.1 Setting up as a Post-Processing Base

Use	The equipment setup described is used for static operations over markers.
Description	The instrument can be programmed with the field controller before use which can then be omitted from the setup.
☞	• The antenna is mounted directly using screw fitting. If using stub and adapter, procedures can vary slightly. • When using the adapter and carrier, ensure that the antenna and the adapter assembly slide down the full length of the carrier stub. An incorrectly mounted antenna will have a direct effect on the results.
☞	If the instrument is left in the container during use in high temperatures, the lid should be left open. Refer to the User Manual for operating and storage temperatures.
☞	Use an external battery such as GEB371 to ensure operation for a full day.



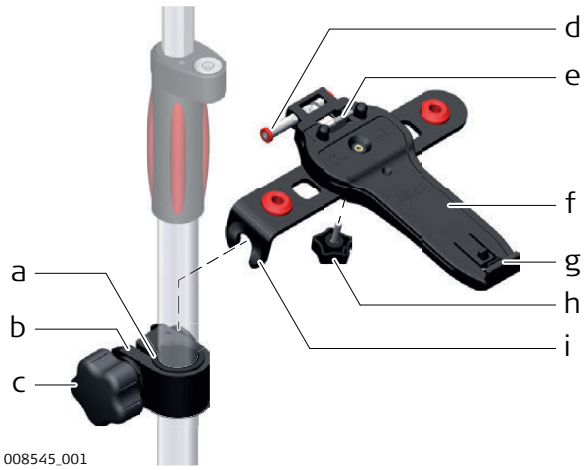
a) GS instrument
b) (micro)SD card
c) GEB212 battery
d) GRT146 carrier
e) Tribrach
f) Height hook
g) Tripod
h) GHT61 hand strap
i) CompactFlash card
j) Utility hook
k) CS20 field controller
l) GEB331 battery
m) CS20 field controller
n) GEB212 battery
o) CS35 tablet
p) USB stick

Equipment setup step-by-step

Step	Description
1.	Set up the tripod.
2.	Mount and level the tribrach on the tripod.
3.	Ensure that the tribrach is over the marker.
4.	Place and lock the carrier in the tribrach.
5.	Insert the data storage device and the batteries into the GS.
6.	Screw the GS onto the carrier.
7.	Check that the tribrach is still level.
8.	Insert the data storage device and the battery into the field controller.
9.	Switch on the field controller and connect it to the instrument if necessary.
10.	To hang the field controller on the tripod leg, use the hook on the hand strap or use the utility hook. Refer to the User Manual of the field controller.
11.	Insert the height hook into the carrier.
12.	Measure the antenna height using the height hook.
13.	Press the ON/OFF button on the instrument for at least 2 s to switch on the instrument.

Components of the GHT66 Holder

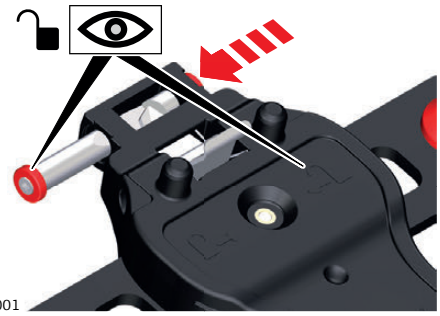
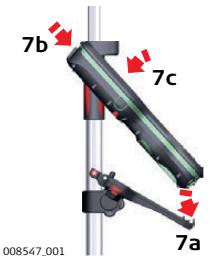
The GHT66 holder consists of the following components:

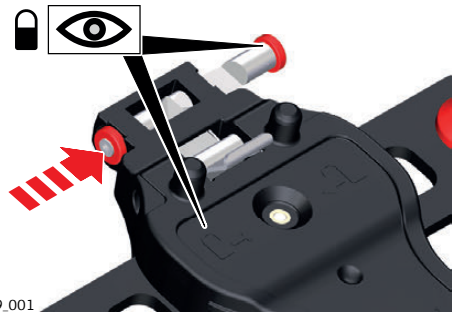


GHT63 clamp
a) Plastic sleeve
b) Pole clamp
c) Clamp bolt

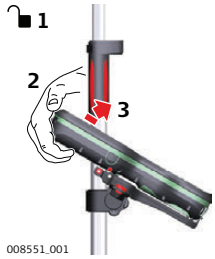
GHT66 holder
d) Locking pin
e) Top clip
f) Mounting plate
g) Bottom clip
h) Tightening screw
i) Mounting arm

Fixing the Field Controller and GHT66 to a Pole Step-by-step

Step	Description
☞	For an aluminium pole, fit the plastic sleeve to the pole clamp.
1.	Insert the pole into the clamp hole.
2.	Attach the holder to the clamp using the clamp bolt.
3.	Adjust the angle and the height of the holder on the pole to a comfortable position.
4.	Tighten the clamp with the clamp bolt.
5.	Before placing the CS field controller onto the mounting plate, ensure that the locking pin is put into the unlocked position. To unlock the locking pin, push the locking pin to the left.  008546_001
6.	Hold the CS field controller above the holder and lower the end of the CS field controller into the mounting plate.
7.	Apply slight pressure in a downward direction and then lower the top part of the CS field controller until the unit is clicked into the holder. The guides of the mounting plate aid in this action. 

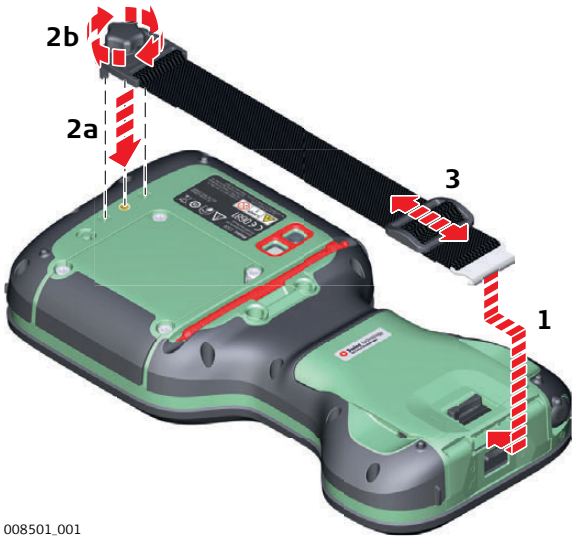
Step	Description
8.	After the CS field controller is placed onto the mounting plate, ensure that the locking pin is put into the locked position. To lock the locking pin, push the locking pin to the right. 

Detaching the Field Controller from a Pole Step-by-step

Step	Description
1.	Unlock the locking pin by pushing the locking pin to the left of the mounting plate.
2.	Place your palm over the top of the field controller.
3.	While in this position, lift the top of the field controller from the holder. 

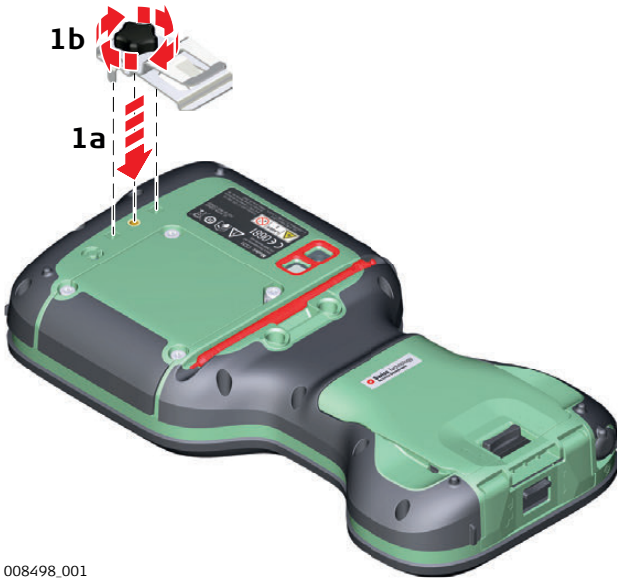
4.1.3 Fixing a Hand Strap to the CS

Fixing the Hand Strap (GHT67) Step-by-step



Step	Description
☞	Turn over the field controller.
1.	Take the end of the hand strap and clip it to the socket at the bottom of the field controller.
2.	Place the screw of the main hook into the thread at the top of the field controller and fasten it.
3.	Adjust the length of the hand strap.

Fixing the Utility Hook (GHT68) Step-by-step



008498_001

Step	Description
☞	If the hand strap is already attached to field controller, you need to detach it before you can fix the utility hook.
☞	Turn over the field controller.
1.	Place the screw of the utility hook into the thread at the top of the field controller and fasten it.

4.1.5 Replacing the Display Foil on the CS

On delivery, the display of the CS is covered by a foil to protect the display against scratches and dirt and to guarantee a trouble-free function of the touchscreen in extreme and humid weather conditions. We strongly recommend to use this display foil and to replace it, if necessary.

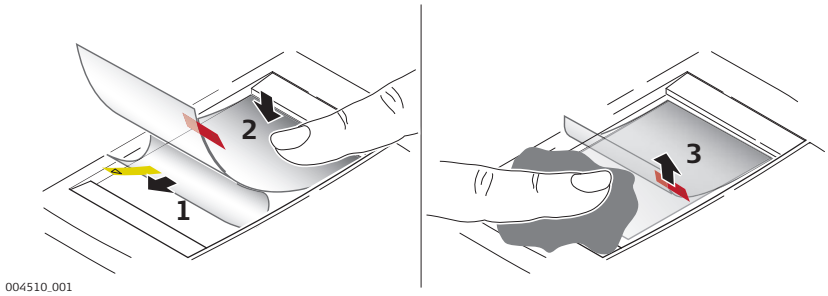
Preparation

- Remove the old display foil.
- Ensure that the display is free of dust and grease.
- Use the provided microfibre cloth to clean the display.
- Look for a dust free and dry atmosphere surrounding while fixing the display foil. The recommended conditions are:

Temperature:	approx. 21°C
Humidity:	< 55%

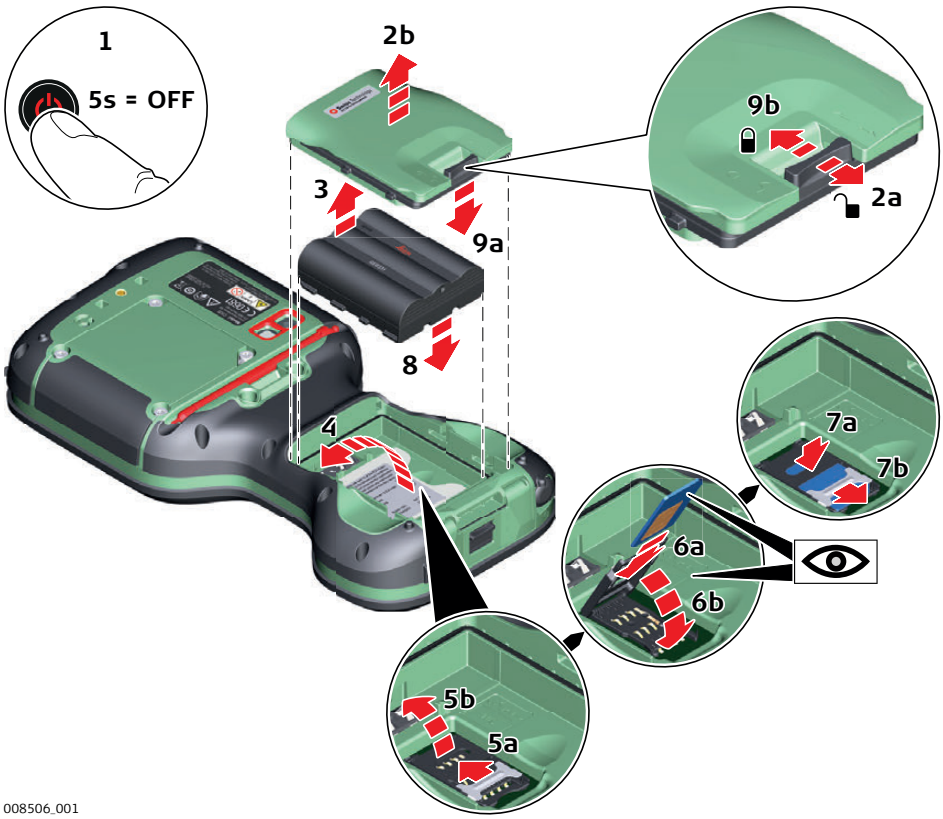
Fixing the display foil step-by-step

The display foil lies between two thin carrier foils. The display foil has a silver-coloured sticker to peel away the carrier foil from the actual display foil.



Step	Description
1.	Touch the yellow-coloured sticker with two fingers and pull it slowly upwards. The carrier foil is peeling away. Do not peel the carrier foil more than 2 cm - 3 cm away.
2.	Fix the adhesive underside of the display foil on the display edge. Peel away the carrier foil slowly and smooth it out gently onto the display.
3.	Remove the additional layer foil which has a red-coloured sticker.
4.	Potential air bubbles between display and display foil have to be smoothed out using the included microfibre cloth. Do not use sharp objects!
5.	In case of remaining dust or grease under the display foil or the need to replace the display foil, lift it again with some adhesive tape.

Insert and Remove a SIM Card Step-by-step



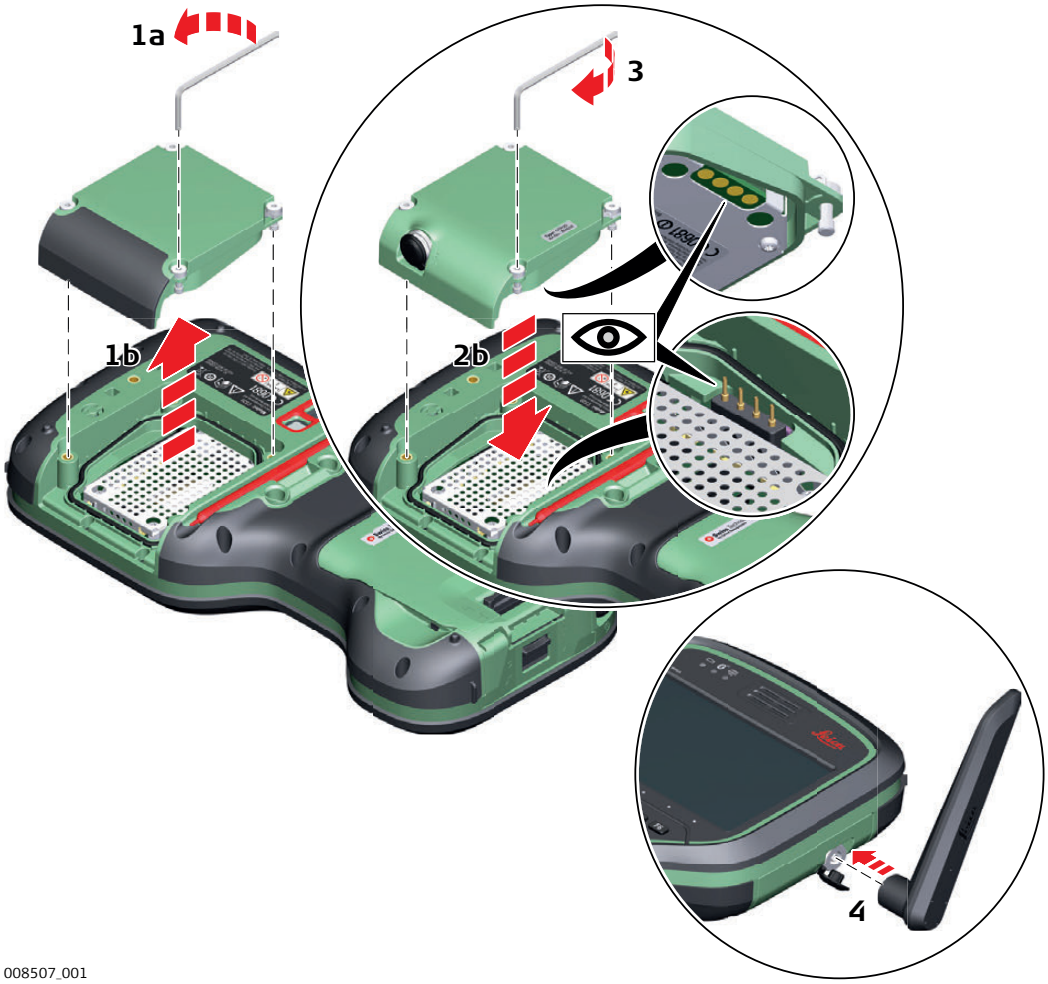
008506_001

Step	Description
☞	Inserting/removing the SIM card while the CS20 is turned on can result in permanent damage to the card. Only insert/remove the SIM card when the CS20 is switched off.
☞	The SIM card is inserted into a slot inside the battery compartment.
1.	Switch off the field controller.
2.	Push the slide fastener of the battery compartment in the direction of the arrow with the open-lock symbol. Remove the cover from the battery compartment.
3.	Remove the battery from the battery compartment.
4.	Bend up the flap that covers the SIM card holder.
5.	Push the SIM card holder in the direction of the OPEN arrow and flip it up.
6.	Place the SIM card into the SIM card holder, the chip facing the connectors inside the slot - as shown beside the SIM card holder.
7.	Press the SIM card holder down and push the SIM card holder in the direction of the LOCK arrow to close.
8.	Bend down the flap again and reinsert the battery.
9.	Attach the cover of the battery compartment. Push the slide fastener of the battery compartment in the direction of the arrow with the closed-lock symbol.

Attaching the extension pack step-by-step

This section does only apply to the models CS20 3.75G, CS20 3.75G DISTO and CS20 CDMA DISTO.

☞ The CTR20 is not available in EU countries due to the directions of EN 300 328 V.1.8.1!



008507_001

☞ When the expansion cover or expansion pack are detached from the field controller, the IP68 protection does not apply! Look for a dry and dust free atmosphere when detaching the expansion cover or the expansion pack.

Step	Description
1.	Loosen the screws of the expansion cover and detach the cover from the field controller.
2.	☞ Check the position of the contacts in the inner surface of the field controller. Attach the expansion pack to the field controller.
3.	Tighten the screws of the expansion pack with the supplied allen key.
4.	Attach the antenna to the expansion pack. ☞ Using a rotating movement makes it easier to attach the antenna, especially at low temperatures.

Description

Windows **M**obile **D**evice **C**enter for PCs with Windows 7/Windows 8/Windows 10 operating system is the synchronization software for Windows mobile-based pocket PCs. WMDC enables a PC and a Windows mobile-based pocket PC to communicate.

Leica USB drivers support Windows 7, Windows 8 (8.1) and Windows 10 operating systems.

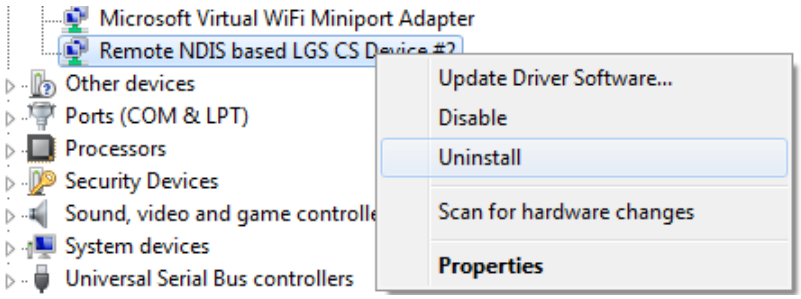
Cables

Leica USB drivers support:

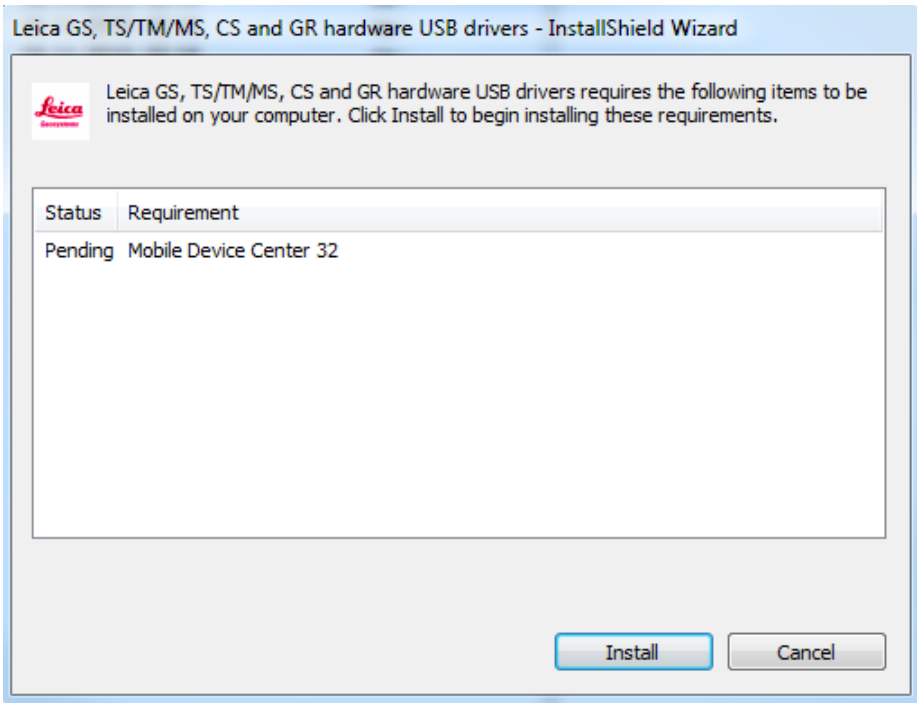
Name	Description
GEV223	USB data cable, 1.8 m, connects instrument to Mini-USB to USB
GEV234	USB data cable, 1.65 m, connects CS to GS or CS to PC (USB)
GEV261	Y-cable, 1.8 m, connects instrument to PC – battery

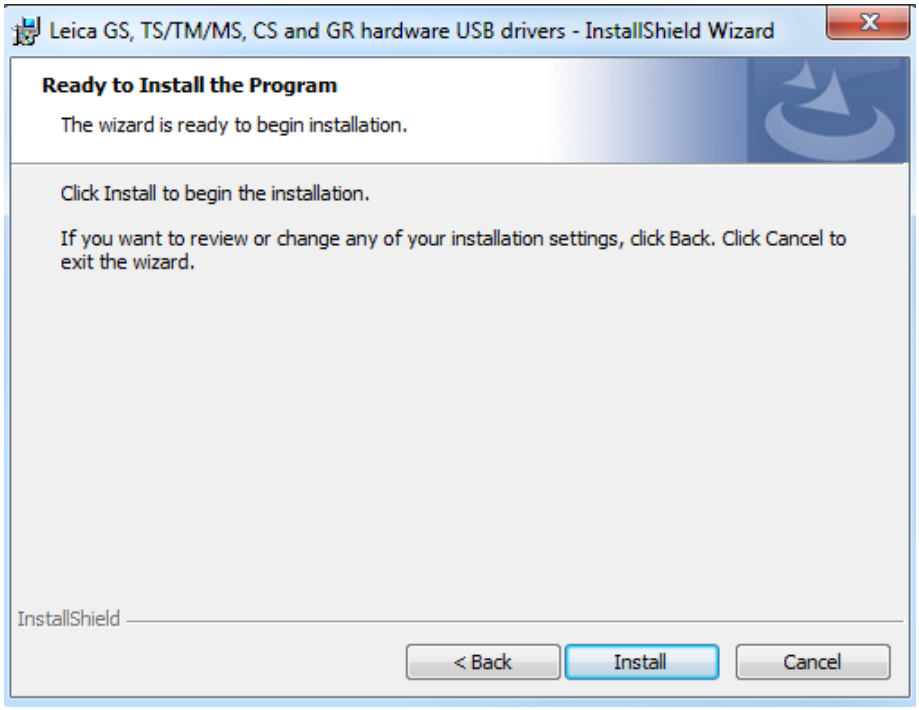
Uninstalling the previous drivers

☞ Skip the following steps if you have never installed Leica USB drivers before. If older drivers were previously installed on the PC, follow the instructions to un-install the drivers prior the installation of the new drivers.

Step	Description
1.	Connect your instrument to the PC via cable.
2.	On your PC, select to **Control Panel** › **Device Manager**.
3.	In **Network Adapters**, right-click on **Remote NDIS based LGS...**.
4.	Click on **Uninstall**. 
5.	Set **Delete the driver...** as checked. Press **OK**. 

Install Leica USB drivers

Step	Description
1.	Start the PC.
2.	Run the **Setup_Leica_USB_XXbit.exe** to install the drivers necessary for Leica devices. Depending on the version (32bit or 64bit) of the operating system on your PC, you have to select between the three setup files following: • Setup_Leica_USB_32bit.exe • Setup_Leica_USB_64bit.exe • Setup_Leica_USB_64bit_itanium.exe ☞ To check the version of your operating system, go to **Control Panel** › **System** › **System type**. ☞ The setup requires administrative privileges. ☞ The setup has to be run only once for all Leicadevices. ☞ For PCs with Windows Vista/Windows 7/Windows 8/Windows 10 operating system: If not already installed, WMDC will be installed additionally otherwise this panel would not appear. Click **Install** to continue or **Cancel** to exit installation. 
3.	The **Welcome to InstallShield Wizard for Leica GS, TS/TM/MS, CS and GR USB drivers** window appears. ☞ Ensure that all Leica devices are disconnected from your PC before you continue!

Step	Description
	
4.	**Next›**.
5.	The **Ready to Install the Program** window appears. 
6.	**Install**. The drivers will be installed on your PC.
7.	The **InstallShield Wizard Completed** window appears.
8.	Click **Finish** to exit the wizard.

Connect to PC via USB cable step-by-step

Step	Description
1.	Start the PC.
2.	Plug the cable into the instrument.
3.	Turn on the instrument.
4.	Plug the cable into the USB port of the PC. ☞ Windows Device Manager cannot be used with CS20/TS16/TS60/MS60.
5.	Press the Windows Start button at the bottom left corner of the screen.
6.	Type the IP address of the device into the search field. • \\192.168.254.1\ for field controller • \\192.168.254.3\ for other instruments
7.	Press **Enter**. A file browser opens. You can now browse within the folders on the instrument.

4.1.9 Enabling WLAN in Windows EC7

Enabling WLAN Step-by-step

Step	Description
☞	By default, the WLAN module is disabled to save battery power.
1.	In order to minimise Leica Captivate, press Fn and **Home**.
2.	Select **Start\Settings\Network and Dial-Up Connections**.
3.	In the **Network Connections** window: Tap the **TIWLNAPI1** icon and select **File\Enable**. OR Hold the stylus on the **TIWLNAPI1** icon. Select **Enable** from the context menu.

4.2 Batteries

4.2.1 Operating Principles

First-time Use / Charging Batteries

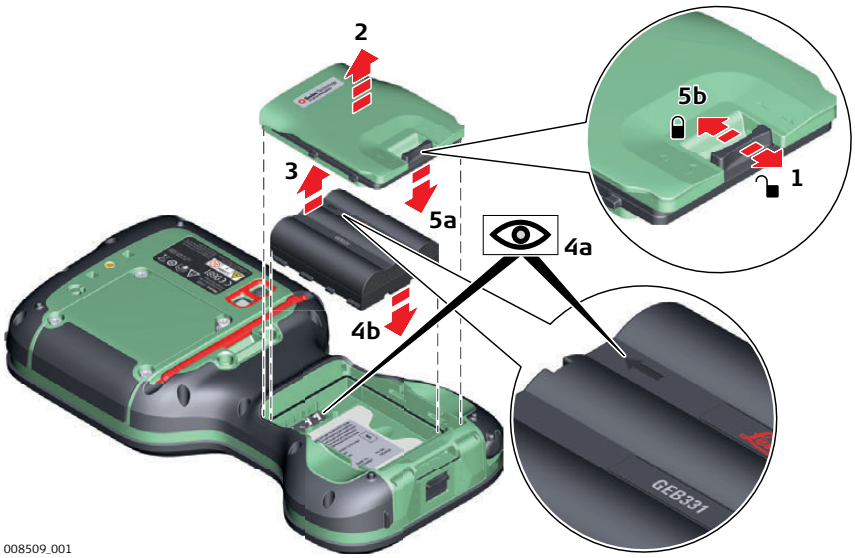
- The battery must be charged prior to using it for the first time because it is delivered with an energy content as low as possible.
- The permissible temperature range for charging is between 0°C and +40°C/+32°F and +104°F. For optimal charging, we recommend charging the batteries at a low ambient 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 if 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 -30°C to +60°C/-22°F to +140°F.
- Low operating temperatures reduce the capacity that can be drawn; high operating temperatures reduce the service life of the battery.

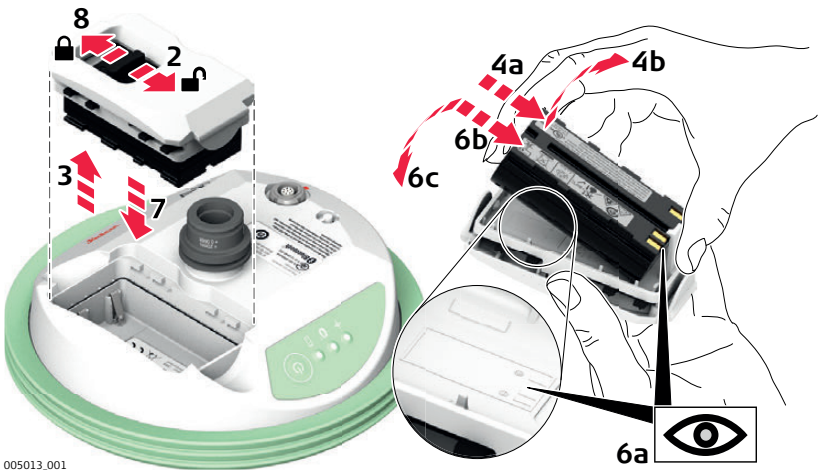
4.2.2 Changing the Battery

Insert and remove the battery step-by-step



Step	Description
☞	Turn over the field controller.
1.	Push the slide fastener in the direction of the arrow with the open-lock symbol.
2.	Remove the cover from the battery compartment. ☞ Ensure that no water enters the battery compartment. IP68 applies only with the battery compartment closed.
3.	Pull the battery from the battery compartment.
4.	Place the battery into the battery compartment with the arrow facing to the top.
5.	Attach the cover of the battery compartment. Push the slide fastener of the battery compartment in the direction of the arrow with the closed-lock symbol.

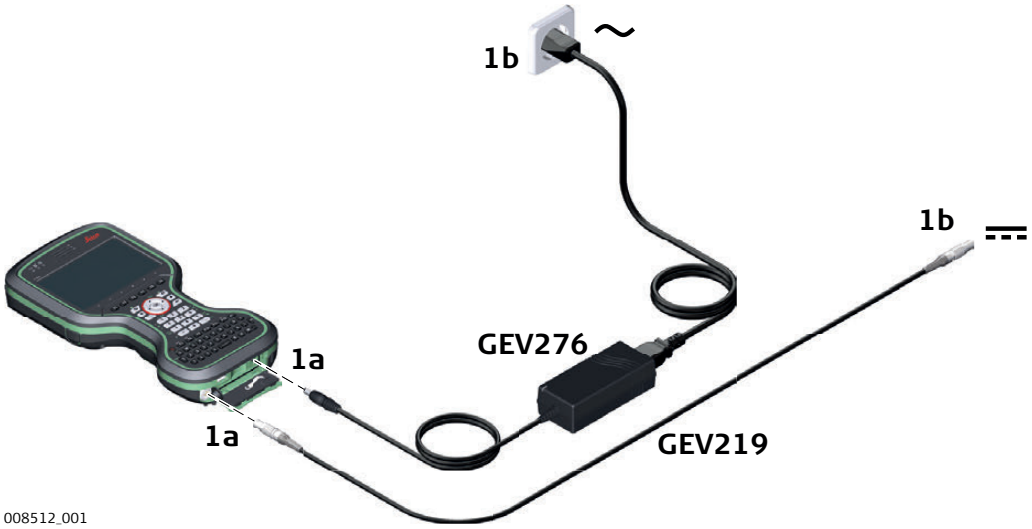
Insert and remove the battery on the GS08plus step-by-step



Step	Description
1.	Turn GS08plus over to gain access to the battery compartment.
2.	Open the battery compartment by pushing the slide fastener in the direction of the arrow with the open-lock symbol.
3.	Pull out the battery housing. The battery is attached to the housing.
4.	Hold the battery housing and pull the battery from the battery housing.
5.	A polarity of the battery is displayed inside the battery housing. This is a visual aid to assist in placing the battery correctly.
6.	Place the battery onto the battery housing, ensuring that the contacts are facing outward. Click the battery into position.
7.	Close the battery compartment by pushing the slide fastener in the direction of the arrow with the close-lock symbol.

Charge the Battery inside the CS20: Step-by-step

Please note: Charging functionality is not available for CS20 field controller (823 164).



Step	Description
1.	Connect the GEV276 power adapter or GEV219 with the field controller.
2.	The power LED on the CS field controller switches on. While charging, the power LED flashes. When the field controller's battery is fully charged the Power LED is green. Refer to **LED Indicators** for detailed information about the power LED.

Charge battery for GS08plus

To charge the batteries for GS08plus, use the Leica Geosystems chargers GKL311 or GKL341. Refer to the GKL311 or GKL341 User Manual for further information.

Turning field controller on

Press and hold power key ( ) for 2 s.
☞ The field controller must have a power supply.

Turning field controller off

Press and hold power key ( ) for 5 s.
☞ The field controller must be on.

Menu "Power Down Options"

Press and hold power key ( ) for 2 s to open **Power Down Options** menu.
☞ The field controller must be on.

Option	Description
Power down and turn off	To turn the field controller off.
Put into stand-by	To put the field controller into stand-by mode.
Reset hardware	Perform one of the following options: • **Restart hardware** The device powers down and restarts. • **Reset Windows EC7** The device powers down and restarts. Any Bluetooth pairings are deleted. • **Reset Leica Captivate** The device powers down and restarts. All working styles, dial-up lists and server lists are deleted. Jobs, code lists, coordinate systems etc. are not deleted. • **Reset Windows EC7 and Leica Captivate** The device powers down and restarts. Bluetooth pairings, working styles, dial-up lists and server lists are deleted.

Turn on GS08plus

To turn on the instrument press and hold the ON/OFF button for 2 s.

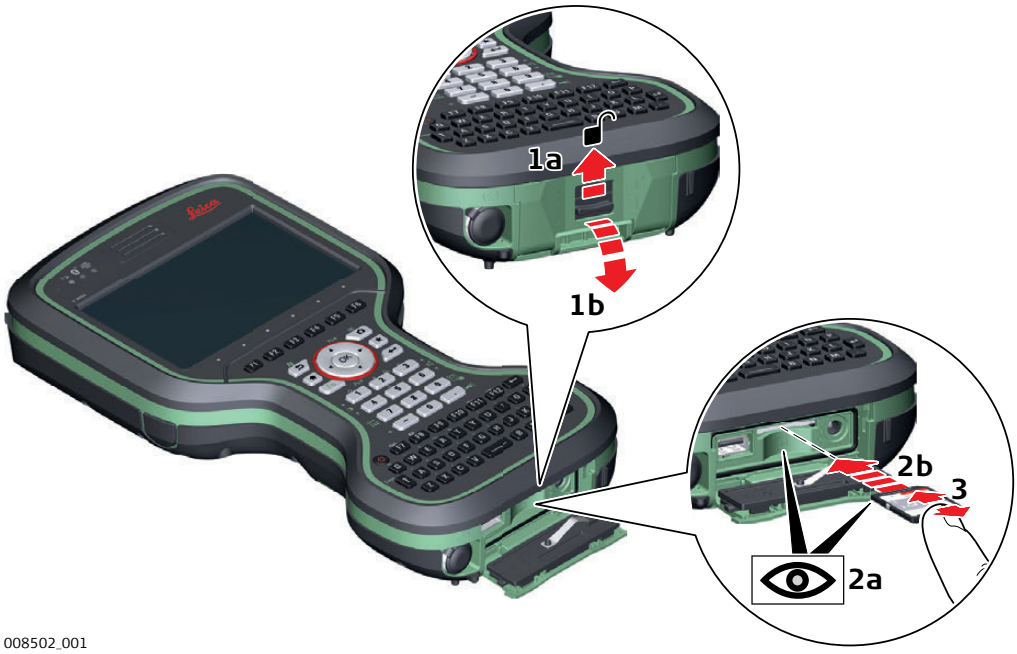
Turn off GS08plus

To turn off the instrument press and hold the ON/OFF button for 2 s.

- Keep the card dry.
- Use it only within the specified temperature range.
- Do not bend the card.
- Protect the card from direct impacts.

Failure to follow these instructions could result in data loss and/or permanent damage to the card.

Insert and Remove the SD Card Step-by-step



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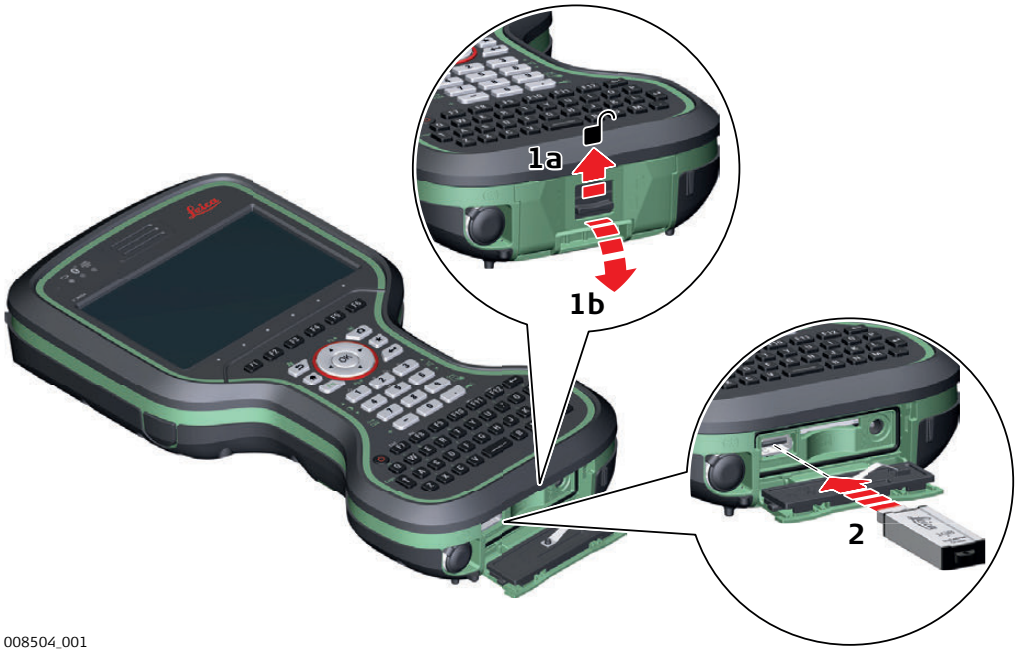
Step	Description
	The SD card can be inserted into a slot behind the connector cover.
1.	Push the slide fastener of the connector cover in the direction of the arrow with the open-lock symbol. Open the connector cover.
2.	Hold the card with the contacts facing the slot. Slide the card firmly into the slot until it clicks into position. Do not force the card into the slot.
3.	To release the card from the slot, gently press the top of the card. The card pops out and you can remove it from the slot.
4.	Close the connector cover. Push the slide fastener of the battery compartment in the direction of the arrow with the closed-lock symbol.

Insert a USB Stick
Step-by-step



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Step	Description
☞	The USB stick can be inserted into a slot behind the connector cover.
1.	Push the slide fastener of the connector cover in the direction of the arrow with the open-lock symbol. Open the connector cover.
2.	Insert the USB stick into the USB A host port.

4.5 Using the Digital Camera

Overview

The field controller is equipped with a digital camera and a flash light, both located at the underside. Mounting a hand strap or pole holder plate does not limit the camera view.
You can start the camera application from within Leica Captivate.

Taking a Picture Step-by-step

Step	Description
☞	To be able to start the camera application, Leica Captivate has to be open.
1.	Press the Camera key. The screen **Capture Image** is displayed.
2.	Aim the camera to the desired target.
3.	Check the view at the display.
4.	Press the **OK** key or click **Capture** to take a picture. *The picture is displayed in the **Image Viewer**.* ☞ **Capture** changes to **Store**.
5.	Press **OK** again or click **Store** to store the picture. *An info screen is displayed where you can choose to save the picture with a link to a point, line or area.*
6.	Press **F2** or **F3** to store the picture with a link. Follow the instructions on the screen. Press **F4** to store the picture without a link. Press **F6** to return to the **Image Viewer** without storing the picture.
	*After storing the picture, the **Capture Image** screen is displayed again.*

4.6 Using the Camera Flash Light as Torch

Using the Flash Light as Torch

You can use the flash light of the camera as torch.
To put the flash light on/off, hold Fn and press .

5 Care and Transport

5.1 Transport

Transport in a road vehicle	Never carry the product loose in a road vehicle, as it can be affected by shock and vibration. Always carry the product in its transport container, original packaging or equivalent and secure it.
Shipping	When transporting the product by rail, air or sea, always use the complete original Leica Geosystems packaging, transport 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.

5.2 Storage

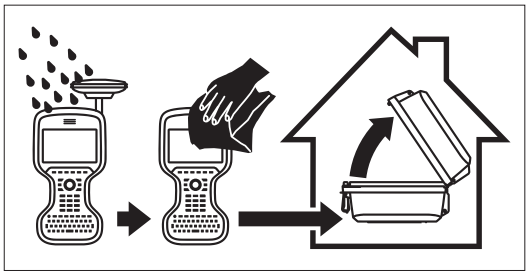
Product	Respect the temperature limits when storing the equipment, particularly in summer if the equipment is inside a vehicle. Refer to "6 Technical Data" for information about temperature limits.
Li-Ion batteries	• Refer to "Technical Data" for information about storage temperature range. • Remove batteries from the product and the charger before storing. • After storage recharge batteries before using. • Protect batteries from damp and wetness. Wet or damp batteries must be dried before storing or use. • A storage temperature range of 0°C to +30°C / +32°F to +86°F in a dry environment is recommended to minimize self-discharging of the battery. • At the recommended storage temperature range, batteries containing a 40% to 50% charge can be stored for up to one year. After this storage period the batteries must be recharged.

Product and accessories

- Use only a clean, soft, lint-free cloth for cleaning. If necessary, moisten the cloth with water or pure alcohol. Do not use other liquids; these may attack the polymer components.

Damp products

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



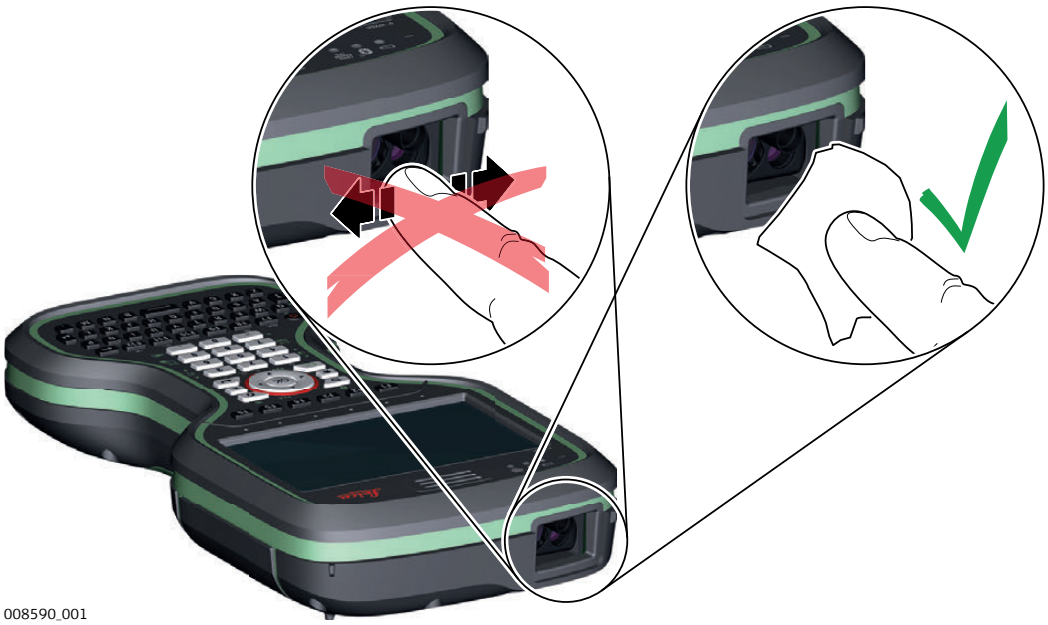
Cables and plugs

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

Connectors with dust caps

Wet connectors must be dry before attaching the dust cap.

DISTO Window



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6 Technical Data

6.1 CS20

Design

Polymer housing with optional integrated battery and radio modem.

Control Unit

Display:	5", WVGA (800 x 480 pixels), graphics capable LCD, illumination, touch screen, colour
Keyboard:	67 keys including 12 function keys
Touch technology:	Resistive
Sound:	Integrated sealed speaker and microphone
Digital camera:	Resolution: 2592 x 1944 pixels, 5 MP, fixed focus lens, image capture: JPEG, flash
DISTO:	Range: 150 m Accuracy: ±1 mm + 0.2 mm/m Resolution of view finder camera: 1600 x 1200 pixels, 2 MP

Dimensions

Weight

Type	Weight [kg]/[lbs]
CS20	1.095/2.414
CS20 3.75G	1.175/2.590
CS20 3.75G/CDMA DISTO	1.215/2.678

Memory Devices

Data can be stored on the SD card, USB stick or in the internal memory.

Power

Type	Consumption [A]	External supply voltage
CS20	2.5	Nominal voltage: 15 V DC (⎓) Voltage range: 10.5 V DC to 18.0 V DC Minimum voltage for charging: 14 V DC (⎓)

Internal Battery

Type	Battery	Voltage	Capacity	Operating time, typical*
CS20	Li-Ion	11.1 V	GEB331: 2.8 Ah	8 h

* Operating time depends on use of wireless communication devices.

Environmental specifications

Temperature

Type	Operating temperature [°C]	Storage temperature [°C]
CS20	-30 to +60	-40 to +80
Internal battery	-30 to +60	-40 to +70

Protection against water, dust and sand

Type	Protection
CS20	IP68 (IEC60529) Dust tight Protected against continuous immersion in water (tested for 2 hours in 1.40 m depth). ☞ CS20 is in compliance with IP68 only when expansion cover, connector cover and battery cover are closed.

Humidity

Type	Protection
CS20	Up to 95 % The effects of condensation are to be effectively counteracted by periodically drying out CS20.

Interfaces

Type	RS232	USB Host	USB Client	Bluetooth	WLAN
CS20	LEMO port	USB2.0 Host (A)	LEMO USB client (high-speed)	Class 1	802.11b/g/n

Data format for RS232

The default values are:

Baud rate:	115200
Parity:	None
Terminator:	CR/LF
Data bits:	8
Stop bits:	1

Ports

Type	8 pin LEMO-1	USB2.0 Host (A)	LEMO USB client (high-speed)
CS20	For power and/or communication	For communication	

6.2 GS08plus

6.2.1 Tracking Characteristics

Satellite reception

Dual frequency

Instrument channels

☞ Depending on the satellite systems and signals configured, a maximum number of 120 channels is allocated.

Supported signals

System	Signal
GPS	L1 C/A, L2P, L2C
GLONASS	L1 C/A, L2C, L2P

☞ Carrier phase and code measurements on L1, L2 and L5 (GPS) are fully independent with AS on or off.

6.2.2 Accuracy

☞ Accuracy is dependent upon various factors including the number of satellites tracked, constellation geometry, observation time, ephemeris accuracy, ionospheric disturbance, multipath and resolved ambiguities.

The following accuracies, given as **r**oot **m**ean **s**quare, are based on measurements processed using LGO and on real-time measurements.

The use of multiple GNSS systems can increase accuracy by up to 30% relative to GPS only.

Differential code

The baseline precision of a differential code solution for static and kinematic surveys is 25 cm.

☞ The measurement of accuracy is compliant with ISO 17123-8.

Differential phase in post-processing

Type	Horizontal	Vertical
Static and rapid static	3 mm + 0.5 ppm	5 mm + 0.5 ppm
Kinematic	10 mm + 1 ppm 8 mm + 1 ppm	20 mm + 1 ppm 15 mm + 1 ppm
Static with long observations	3 mm + 0.5 ppm 3 mm + 0.1 ppm	6 mm + 0.5 ppm 3.5 mm + 0.4 ppm

Differential phase in real-time

Type	Horizontal	Vertical
Single Baseline (< 30 km)	8 mm + 1 ppm	15 mm + 1 ppm
Network RTK	8 mm + 0.5 ppm	15 mm + 0.5 ppm

6.2.3 Technical Data

Description and use

The table gives a description and the intended use of the GS08plus.

Description	Use
L1, L2 GPS, GLONASS SmartTrack antenna	With CS20 field controller

Dimensions

Type	Height	Diameter
GS08plus	0.071 m	0.186 m

Connector

8 pin LEMO-1

Mounting

5/8" Whitworth

Weight

0.8 kg including internal battery

Power

Power consumption:	2.0 W typically
External supply voltage:	Nominal 12 V DC (⎓), voltage range 10.5 V-28 V

Battery internal

Type:	Li-Ion
Voltage:	7.4 V
Capacity:	GEB212: 2.6 Ah
Typical operating time:	7 h The given operating times are valid for • one fully charged GEB212 battery. • 25°C. Operating times will be shorter when working in cold weather.

Electrical data

Type	GS08plus
Voltage	-
Current	-
Frequency	
GPS L1 1575.42 MHz	✓
GPS L2 1227.60 MHz	✓
GPS L5 1176.45 MHz	-
GLONASS L1 1602.5625-1611.5 MHz	✓
GLONASS L2 1246.4375-1254.3 MHz	✓
Galileo E1 1575.42 MHz	-
Galileo E5a 1176.45 MHz	-
Galileo E5b 1207.14 MHz	-
Galileo AltBOC 1191.795 MHz	-
BeiDou B1 1561.098 MHz	-
BeiDou B2 1207.14 MHz	-
Gain	Typically 37 dBi
Noise Figure	Typically < 3 dBi

Environmental specifications

Temperature

Operating temperature [°C]	Storage temperature [°C]
-40 to +65 Bluetooth: -30 to +65	-40 to +80

Protection against water, dust and sand

Protection
IP68 (IEC 60529) Dusttight Protected against water jets Protected against continuous immersion in water Tested for 2 h in 1.40 m depth

Humidity

Protection
Up to 100 % The effects of condensation are to be effectively counteracted by periodically drying out the antenna.

6.3 Conformity to National Regulations

Conformity to National Regulations

For products which do not fall under R&TTE directive:

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 declaration of conformity can be consulted at http://www.leica-geosystems.com/ce.

- Japanese Radio Law and Japanese Telecommunications Business Law Compliance.
  - This device is granted pursuant to the Japanese Radio Law and the Japanese Telecommunications Business Law.
  - This device should not be modified (otherwise the granted designation number will become invalid).

6.3.1 CS20

Conformity to national regulations

- FCC Part 15, 22, 24 (applicable in US)
- Hereby, Leica Geosystems AG, declares that the products CS20, CTR20, GS08plus, AS05 and AS10 are in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC and other applicable European Directives. The declaration of conformity can be consulted at http://www.leica-geosystems.com/ce.

Class 1 equipment according European Directive 1999/5/EC (R&TTE) can be placed on the market and be put into service without restrictions in any EEA member state.

- The conformity for countries with other national regulations not covered by the FCC part 15 or European directive 1999/5/EC has to be approved prior to use and operation.
- Japanese Radio Law and Japanese Telecommunications Business Law Compliance.
  - This device is granted pursuant to the Japanese Radio Law and the Japanese Telecommunications Business Law.
  - This device should not be modified (otherwise the granted designation number will become invalid).

Frequency band

Type	Frequency band [MHz]
CS20, Bluetooth	2402 - 2480
CS20, RCS	2402 - 2480
CS20, GSM (2G)/UMTS (3G)	UMTS 800 / 850 / 900 / 1900 / 2100 GSM 850 / 900 / 1800 / 1900 HSPA Download: 7.2 Mbit/s HSPA Upload: 5.76 Mbit/s
CS20, WLAN	2400 - 2484
CS20, 3.75G GSM/UMTS/CDMA	Quad-Band GSM & Penta-Band UMTS & Tri-Band CDMA 800 / 1900

Output power

Type	Output power [mW]
CS20, Bluetooth	10
CS20	< 20
CS20, GSM (2G)/UMTS (3G) EGSM850/900	2000
CS20, GSM (2G)/UMTS (3G) GSM1800/1900	1000
CS20, GSM (2G)/UMTS (3G) UMTS2100	250
CS20, GSM (2G)/UMTS (3G) EDGE850/900	500
CS20, GSM (2G)/UMTS (3G) EDGE1800/1900	400
CS20, WLAN (802.11b) - 11 Mbit/s	100
CS20, WLAN (802.11g) - 54 Mbit/s	80
CS20, WLAN (802.11n) - 65 Mbit/s	80
CS20,, CDMA BC0 & BC10 (800)/BC1 (1900)	250

Antenna

Type	Antenna	Gain [dBi]	Connector	Frequency band [MHz]
CS20, Bluetooth	Integrated antenna	2	-	2400-2480
CS20, RCS	Integrated antenna	1	-	2400-2480
CS20, GSM (2G)/UMTS (3G)	Integrated antenna	-	-	-
CS20, WLAN	Integrated antenna	1	-	2400-2480
CS20, GSM/UMTS/CDMA	Integrated antenna	0 max. @ 800 / 850 / 900 3 max. @ 1800 / 1900 / 2100	- -	- -

6.3.2 CTR20

Conformity to national regulations

- FCC Part 15 (applicable in US)
- Hereby, Leica Geosystems AG, declares that the product CGR20 is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC and other applicable European Directives. The declaration of conformity can be consulted at http://www.leica-geosystems.com/ce.

Class 2 equipment according European Directive 1999/5/EC (R&TTE)

- The conformity for countries with other national regulations not covered by the FCC part 15 or European directive 1999/5/EC has to be approved prior to use and operation.
- Japanese Radio Law and Japanese Telecommunications Business Law Compliance (applicable for Japan).
  - This device is granted pursuant to the Japanese Radio Law and the Japanese Telecommunications Business Law.
  - This device should not be modified (otherwise the granted designation number will become invalid).

Frequency band

CTR20:	2402 - 2480 MHz

Output power

< 100 mW (e. i. r. p.)

Antenna

Type:	λ/2 antenna
Gain:	2 dBi maximal
Connector:	SMB (internal)

Conformity to national regulations

- FCC Part 15, 22 and 24 (applicable in US)
- Hereby, Leica Geosystems AG, declares that the product GS08plus is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC and other applicable European Directives. The declaration of conformity can be consulted at http://www.leica-geosystems.com/ce.

Class 1 equipment according European Directive 1999/5/EC (R&TTE) can be placed on the market and be put into service without restrictions in any EEA member state.

- The conformity for countries with other national regulations not covered by the FCC part 15, 22 and 24 or European directive 1999/5/EC has to be approved prior to use and operation.
- Japanese Radio Law and Japanese Telecommunications Business Law Compliance.
  - This device is granted pursuant to the Japanese Radio Law and the Japanese Telecommunications Business Law.
  - This device should not be modified (otherwise the granted designation number will become invalid).

Frequency band

Type	Frequency band [MHz]
GS08plus	1227.60 1575.42 1246.4375 - 1254.3 1602.4375 - 1611.5
Bluetooth	2402 - 2480

Output power

Type	Output power [mW]
GNSS	Receive only
Bluetooth	5 (Class 1)

Antenna

GNSS Bluetooth	Internal GNSS antenna element (receive only) Type: Internal Microstrip antenna Gain: 1.0 dBi

7 Software Licence Agreement

Software Licence Agreement

This product contains software that is preinstalled on the product, or that is supplied to you on a data carrier medium, or that can be downloaded by you online according to prior authorisation from Leica Geosystems. Such software is protected by copyright and other laws and its use is defined and regulated by the Leica Geosystems Software Licence Agreement, which covers aspects such as, but not limited to, Scope of the Licence, Warranty, Intellectual Property Rights, Limitation of Liability, Exclusion of other Assurances, Governing Law and Place of Jurisdiction. Please make sure, that at any time you fully comply with the terms and conditions of the Leica Geosystems Software Licence Agreement.

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Open Source Information

The software on the product may contain copyright-protected software that is licensed under various open source licences.
Copies of the corresponding licences

- are provided together with the product (for example in the About panel of the software)
- can be downloaded on http://opensource.leica-geosystems.com

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.
Contact opensource@leica-geosystems.com in case you need additional information.

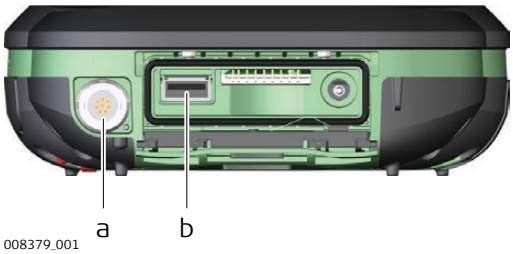
Appendix A Pin Assignments and Sockets

A.1 CS20

Description

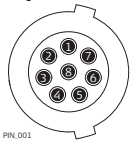
Some applications require knowledge of the pin assignments for the instrument ports. In this chapter, the pin assignments and sockets for the instrument ports are explained.

Ports at the instrument bottom panel - LEMO connector



a) LEMO port (USB and serial)
b) USB A Host port

Pin assignments for 8 pin LEMO-1



Pin	Signal Name	Function	Direction
1	USB_D+	USB data line	In or out
2	USB_D-	USB data line	In or out
3	GND	Signal ground	-
4	RxD	RS232, receive data	In
5	TxD	RS232, transmit data	Out
6	ID	Identification pin	In or out
7	PWR	Power input, 10.5 V-18 V	In
8	GPIO	RS232, general purpose signal	In or out

Sockets

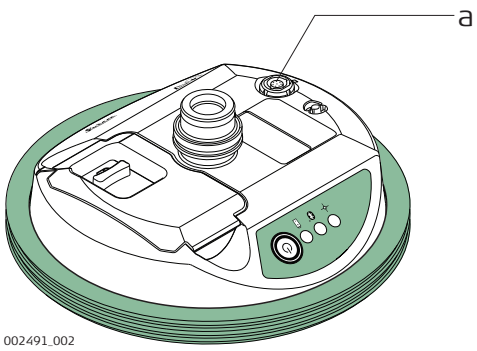
8 pin LEMO-1: LEMO-1, 8 pin, LEMO EGI.1B.308.CLN

A.2 GS08plus

Description

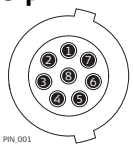
Some applications require knowledge of the pin assignments for the instrument ports. In this chapter, the pin assignments and sockets for the instrument ports are explained.

Ports at the instrument underside



a) Lemo port (USB and serial)

Pin assignments for 8 pin LEMO-1



Pin	Signal Name	Function	Direction
1	USB_D+	USB data line	In or out
2	USB_D-	USB data line	In or out
3	GND	Signal ground	-
4	RxD	RS232, receive data	In
5	TxD	RS232, transmit data	Out
6	ID	Identification pin	In or out
7	PWR	Power input, 10.5 V-28 V	In
8	TRM_ON/USB_ID	RS232, general purpose signal	In or out

819151-2.0.0en
Original text
Printed in Switzerland

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- when it has to be **right**

Leica Geosystems