

Leica CS30



User Manual
Version 2.0
English

- when it has to be **right**

Leica
Geosystems

PART OF
HEXAGON

Introduction

Purchase

Congratulations on the purchase of the Leica CS30.



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.

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.



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

Updated versions are available for download at the following Internet address:
myWorld@Leica_Geosystems > myProducts.

Product Identification

The model and serial number of your product are indicated on the type plate. Always refer to this information when you need to contact your agency or Leica Geosystems authorised service centre.

Trademarks

- Windows[®] is a registered trademark of Microsoft Corporation in the United States and other countries
- SD Logo is a trademark of SD-3C, LLC.
- Bluetooth[®] is a registered trademark of Bluetooth SIG, Inc.
- The terms HDMI, HDMI High-Definition Multimedia Interface, and the HDMI Logo are trademarks or registered trademarks of HDMI Licensing Administrator, Inc.

All other trademarks are the property of their respective owners.

Validity of this manual

This manual applies to the CS30 field controllers. Differences between the various models are marked and described.

Available documentation

Name	Description/Format		
CS30 Quick Guide	Provides an overview of the product together with technical data and safety directions. Intended as a quick reference guide.	✓	✓
CS30 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 CS30 documentation/software:

- the Leica USB documentation card
- myWorld@Leica-Geosystems

Leica Geosystems address book



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

myWorld@Leica-Geosystems 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.

The availability of services depends on the instrument model.

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	Create new support requests for your products that will be answered by your local Leica Geosystems Support team. View the complete history of your support requests and view detailed information on each request in case you want to refer to previous support requests.
myLearning	Welcome to the home of Leica Geosystems on-line learning! There are numerous online courses – available to all customers with products that have valid CCPs (Customer Care Packages).
myTrustedServices	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.

Service	Description
mySmartNet	LeicaGN SmartNet is the GNSS correction service built on the world's largest reference station network, enabling GNSS-capable devices to quickly determine precise positions in the range of one to two centimetre accuracy. The service is provided 24/7 by a highly-available infrastructure and professional support team with more than 10 years of experience reliably delivering the service.
myDownloads	Downloads of software, manuals, tools, training material and news for Leica Geosystems products.

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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 aware 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

**Reasonably
foreseeable misuse**

- Use of the product without instruction
- Use outside of the intended use and limits
- Disabling safety systems
- Removal of hazard notices
- Opening the product using tools, for example screwdriver, unless this is permitted for certain functions
- Modification or conversion of the product
- Use after misappropriation
- Use of products with recognisable damage or defects
- Use with accessories from other manufacturers without the prior explicit approval of Leica Geosystems
- Inadequate safeguards at the working site
- 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.

 WARNING

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

Life Risk

Precautions:

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



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

Environment

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



1.4

Responsibilities

**Manufacturer of the
product**

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

Person responsible for the product

The person responsible for the product has the following duties:

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

Risk of electrocution

Because of the risk of electrocution, it is dangerous to use poles, leveling 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

Distraction/loss of attention

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

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.

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

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.

DANGER

Risk of being struck by lightning

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.

WARNING

Inappropriate mechanical influences to batteries

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

Precautions:

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

WARNING

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

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

Precautions:

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

WARNING

Short circuit of battery terminals

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

For the AC power supply:

WARNING

If unit is not connected to ground, death or serious injury can occur.

Precautions:

- ▶ To avoid electric shock power cable and power outlet must be grounded.



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

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.

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

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.

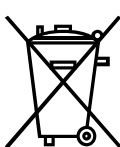
WARNING

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

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.

1.6

Description

Electromagnetic Compatibility (EMC)

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

WARNING

Electromagnetic radiation

Electromagnetic radiation can cause disturbances in other equipment.

Precautions:

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

CAUTION

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

This may cause disturbances in other equipment.

Precautions:

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

CAUTION

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

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

Precautions:

- ▶ Check the plausibility of results obtained under these conditions.

CAUTION

Electromagnetic radiation due to improper connection of cables

If the product is operated with connecting cables attached at only one of their two ends, 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.

 WARNING

Use of product with radio or digital cellular phone devices

Electromagnetic fields can cause disturbances in other equipment, in installations, in medical devices, for example pacemakers or hearing aids and in 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 to 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 Overview

System components

CS30 LTE



0021682_002

CS30 LTE LRBT



The LRBT mode has a long-range Bluetooth module.

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 IS instruments.

2.3 System Concept

2.3.1 Power Concept

General

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

Power options

Power supply

Internally by GLB260 battery, OK

Externally by GLV288 power supply, OK

Externally by CCS02 docking station

If an external power supply is connected and the internal battery is inserted, then the external power is used. The internal battery is charged.

2.3.2 Data Storage Concept

Memory device

Device	Description
microSD card	All field controllers have a microSD card slot fitted as standard. A microSD card can be inserted and removed. Available capacity: 256 GB.
USB stick	All field controllers have an USB type A and type C port fitted as standard.
Internal memory	All field controllers have an internal memory fitted as standard. Available capacity: 64 GB.
	While other microSD cards can be used, Leica Geosystems recommends to only use Leica microSD cards and is not responsible for data loss or any other error that can occur while using a non-Leica card.

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

Transfer data

Data can be transferred in various ways.

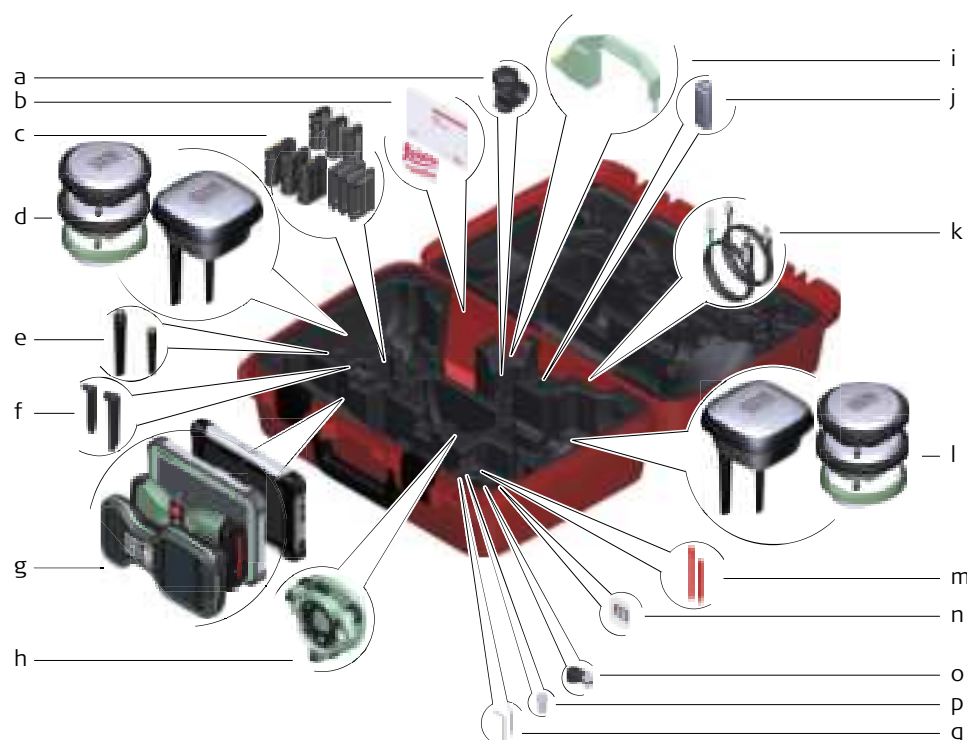


microSD cards can, with the supplied adaptor, also be used in an OMNI drive as supplied by Leica Geosystems. Other PC card drives can require an adaptor.

2.4

Container Contents

Container for GS instrument and accessories 1/2



0021683.002

- a GL 163 clamp
- b Manuals and USB documentation card
- c GEB212, GEB250 (spare battery for GS30) or GEB331 batteries
- d Antenna
- e GA118, GA127 or GA128 mobile antenna
- f GA121, GA125 or GA126 radio antenna
- g Field controller with holder or cap on
- h Tripod
- i Height hook
- j USB stick
- k Cables
- l Antenna
- m Stylus
- n SD cards
- o CAD34 arm 3 cm
- p INC ON-adaptor
- q Allen key and adjustment tool

Container for GS instrument and accessories 2/2



0014961_002

- a GI 136 base for telescopic rod
- b Antenna arm
- c CPU RTK modem
- d CAD32 telescopic rod
- e CA11 or CA12 radio antennas
- f GEB212, GEB260 (same battery for GS30 LTE URBTL or GEB331 batteries)
- g GR1146 or GR1247 carrier
- h GAD33 arm
- i GR1158 tripod bracket for GPU
- j External battery

Container for TS instrument and accessories



0023030_001

- a GA11 or GA12 radio antennas
- b Field controller with holder or tablet
- c Stylus
- d SD card and cover
- e CR24 or CR22 prism
- f CRP15, quick release adaptor for quick mounting and demounting the prism to the pole without screwing
- g USB stick
- h Maintenance and USB documentation card
- i GR1163 pole holder clamp
- j GEB212, GEB250 (spare battery for G530) or GEB331 batteries

Container for GS instrument and accessories



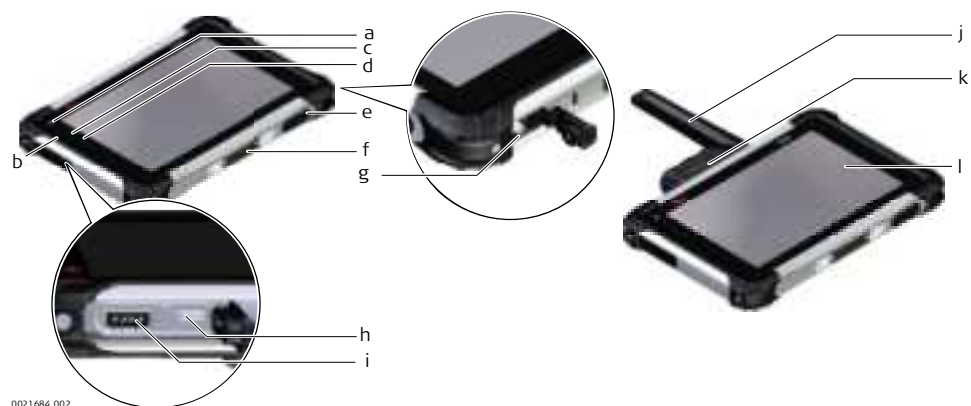
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- a Field controller with holder
- b Antenna
- c CRP15, click release adaptor for quick mounting and demounting the GS18 to the pole without screwing
- d CA125, CA126, CA127 or CA128 antenna
- e Stylus
- f GI 163 clamp
- g USB stick
- h GA11 or GA12 radio antennas
- i Antenna arm
- j microSD card including adapter or SD card
- k Manual & USB documentation card
- l GEB212, GEB260 (spare battery for GS30 LTE LRB-T) or GEB331 batteries

2.5

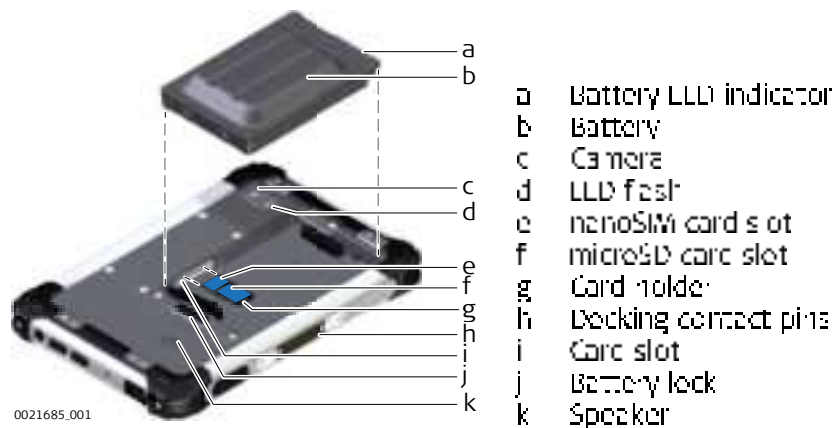
CS Components

Upside



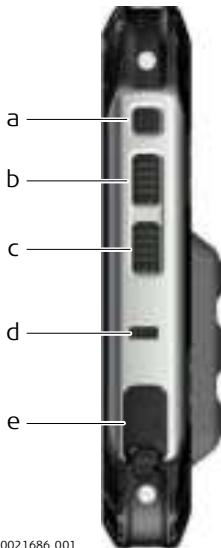
- a Light sensor
 - b Microphone
 - c Power LED
 - d Charging LED
 - e WLAN + GNSS + 4G+ pass-through connectors to external antenna
 - f Docking contact pins
 - g DC jack for power cable
 - h USB type C
 - i USB type A
 - j CAT23 antenna
 - k CSR30, long-range Bluetooth module
 - l CS30 LIL LR01
- * Optional

Underside



- a Battery LED indicator
- b Battery
- c Camera
- d LLD flash
- e nanoSIM card slot
- f microSD card slot
- g Card holder
- h Docking contact pins
- i Card slot
- j Battery lock
- k Speaker

Side



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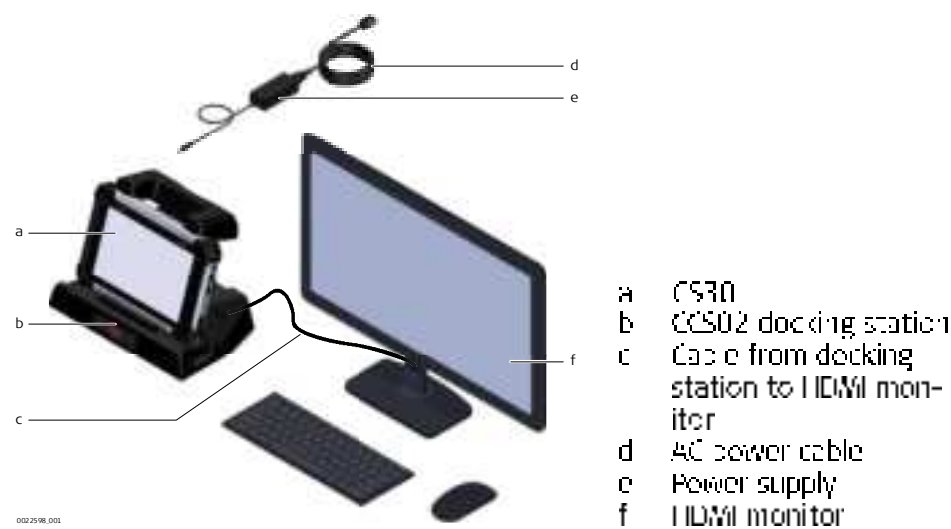
- a Power key
- b P1, function key 1
- c P2, function key 2
- d Kensington lock
- e DC Jack

Keys

Key		Function
Power key		Power on. If the field controller is already on: ▪ Activate sleep mode when held for 2 s. ▪ Turns the field controller off when held for 5 s.
P1, function key 1		Increase the screen brightness. To increase the screen brightness by one level, press the key once. To increase the screen brightness to maximum, press and hold the key
P2, function key 2		Decrease the screen brightness. To decrease the screen brightness by one level, press the key once. To decrease the screen brightness to minimum, press and hold the key

2.6 Docking Station Components

Components for setup of CCS02



Ports on CCS02



AC power cables

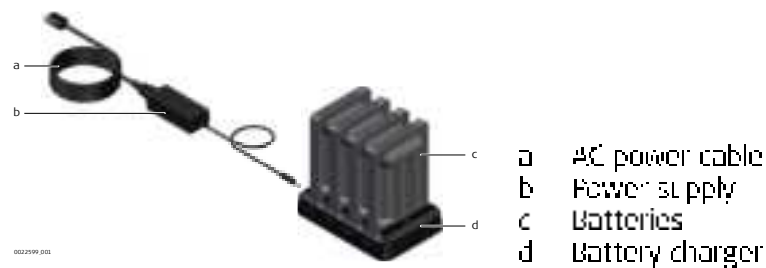
Article number	Description	Country
926054	AC power cable C5 / Type F	USA Canada Japan
926055	AC Power cable C5 / Type F	Europe
926056	AC Power cable C5 / Type G	Great Britain Hongkong
926057	AC Power cable C5 / Type I	Australia New Zealand China

Article number	Description	Country
926056	AC Power cable C5 / Type J	Switzerland

2.7

Battery Charger

Components of the battery charger



AC power cables

Article number	Description	Country
926054	AC power cable C5 / Type B	USA Canada Japan
926055	AC Power cable C5 / Type F	Europe
926056	AC Power cable C5 / Type G	Great Britain Hongkong
926057	AC Power cable C5 / Type I	Australia New Zealand China
926058	AC Power cable C5 / Type J	Switzerland

Windows 10 Setup

Whether you have got a brand-new CS30, reinstalled Windows, or did a full reset on your CS30, this chapter will help you get your CS30 up and running.

When you begin setting up the CS30, you will find an Ease of Access icon which allows you to bring up the narrator, an audio assistant that reads information to you. You can also magnify parts of your screen or the entire screen if you need visual assistance. This is where you can start setting your preferences. If you ever change your mind about a setting or preference, you can always change them later.

Step-by-step**1. Select region**

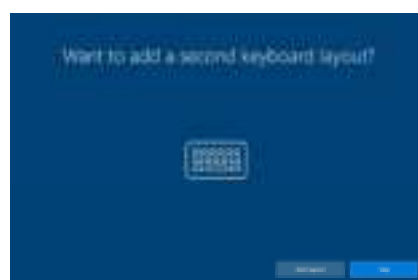
The first thing to set is the region. The selection defines the time and date automatically so that features such as time zones or day and night cycles can work effectively.

**2. Select language keyboard**

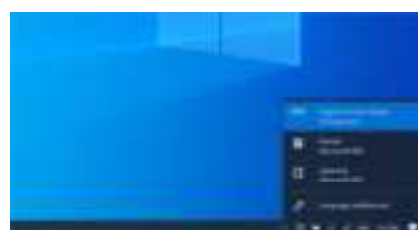
On the next screen, the default and secondary keyboard layouts are defined. Specify what language to use for the keyboard. The selection can be changed at any time.



The secondary keyboard layout might look different on the screen, and not match the physical keyboard for typing on, letters and numbers might not match up.



After setting up the device, the keyboard language can be changed at any time by selecting the language icon on the taskbar.

**3. Select setup preference**

When setting up the Windows 10 Pro edition, a screen appears for setting up for personal or work use. For a work device, work with the IT team to ensure a correct connection to the services of the company.



4. **Sign In with an account**

Having used Microsoft services like Xbox, Skype, Microsoft Office, or OneDrive before, a Microsoft account may exist. Sign in there, or create a new account using any e-mail address.



Activity history allows starting a task on one device and finishing it on another. Example: Work on an Excel spreadsheet on one device could not be finished. Open Timeline on any device to see the spreadsheet and continue working. When sending Microsoft the activity history, which includes the websites visited and the apps used, Timeline shows all the activity on the devices and allows resuming that activity from where it has been left off on a different device.



Cortana is a personal assistant for devices. It can help answer questions, set reminders, and find other information to help plan the day better. To use Cortana, give permission to access relevant data. Denying access prevents Cortana from performing tasks.



Microsoft makes it easy to control who gets access to personal information. On the privacy settings page, control what information you want to share with Microsoft.

For each setting, learn what information is being requested and what it is used for. When setting a toggle, information is provided what that means for the data, but also how it affects what services that data uses. Keep in mind that privacy settings affect how well various apps and services might work. For example, limiting location-based data, maps and weather may not work as well.

Once this final step has been done, the setup process is complete.

Wait a little while the device sets up a few things and downloads language files, if necessary. After that, the desktop is available and the device can be used.



4.1

Operating Principles

Keyboard and touch screen

The user interface is operated by the touch screen with finger or 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 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.
To open the status bar while still working in another app	Swipe from the left edge of the screen toward the centre of the screen
To open the notification bar or to access the settings quickly	Swipe from the right edge of the screen toward the centre of the screen

4.2

Home Screen

Home screen

From the home screen, you can view the device status and access the applications.



At the bottom of the home screen is the status bar, which contains the notification area, the status area and the display area.

The shortcut panel is at the bottom. The shortcut panel can be customized.

Using apps

The main screen shows all included apps. Double-click to open an app.

Fix the app to the start menu/start screen

1. Right-click the application item on the left.
2. See **Fix to start screen** to next.
3. The app icon or tile will appear in the right area.

Fix the application to the taskbar

1. Right-click an app item in the start menu.
2. Select **Pin to taskbar**.
3. More content is displayed in the lower-left corner of the start menu. More folders can be displayed in the lower-left corner of the start menu, including downloads, music, images, etc.

4.3

LED Indicators

LED Indicators on CS30

The field controller has Light-Emitting Diode (LED) indicators. They indicate the basic field controller status.



0021687-001

- a Light sensor
- b Power LED
- c Charging LED



0021688-001

- a Camera
- b Flash LED for camera
- c Battery LEDs

Description of the LEDs

LED	LED Status	Status of Field Controller
Power LED	off	CS30 is shut down or in hibernation mode.
	green	CS30 is powered on.
	flashing green	CS30 is in sleep mode.
Charging LED	off	No battery available or not charging.
	red	Battery is charging.
	flashing every 2 seconds	Battery capacity is below 10%.
	green	Battery is fully charged.
Battery LEDs	4 LEDs on	Battery is fully charged.
	3 LEDs on	The remaining battery power is more than 50%.
	2 LEDs on	The remaining battery power is less than 50%.

LED	LED Status	Status of Field Controller
	1 LED is on	The remaining battery power is very low.
	0 LED is on	Battery is empty
Has 1 LED for rear camera		Supports lightning.
	off	Lightning is off.
	on	Lightning is on.

LED Indicators on CTR30

The CTR30 has Light Emitting Diode (LED) indicators. They indicate the basic status.



- a Power LED
- b Link LED
- c Data transfer LED
- d Mode LED

Description of the LED Indicators

IF the	is	THEN
Power LED 	off	power is off.
	green	power is on.
Link LED 	off	device is not paired.
	blue	paired to another device.
Data transfer LED 	off	no data transfer to/from field controller.
	green (flashing)	data is being transferred.
Mode LED 	off	CTR30 is in data mode.
	red	CTR30 is in configuration mode.

5

Operation

5.1

Equipment Setup

5.1.1

Fixing the Field Controller to a Holder and Pole

Components of the GHT81 holder

The GHT81 holder consists of the following components:



Fixing the field controller to a pole step-by-step

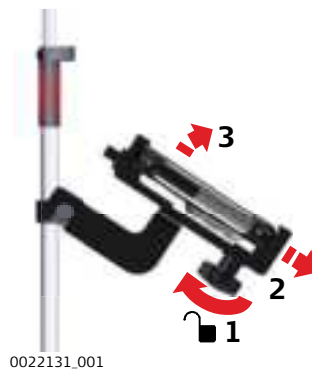
1. For an aluminium pole, fit the plastic sleeve to the pole clamp.
2. Insert the pole into the clamp hole.
3. Attach the holder to the clamp using the clamp bolt.
4. Adjust the angle and the height of the holder on the pole to a comfortable position.
5. Tighten the clamp with the clamp bolt.
6. Hold 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. Tighten the holder with the clamp bolt at the bottom of the unit.



Detaching the field controller from a pole step-by-step

1. Unscrew the bottom clamp bolt.
2. Place your palm over the bottom of the field controller.

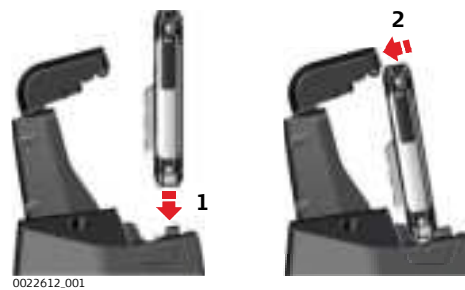
- 7 While in this position, lift the bottom of the field controller from the holder.



5.1.2

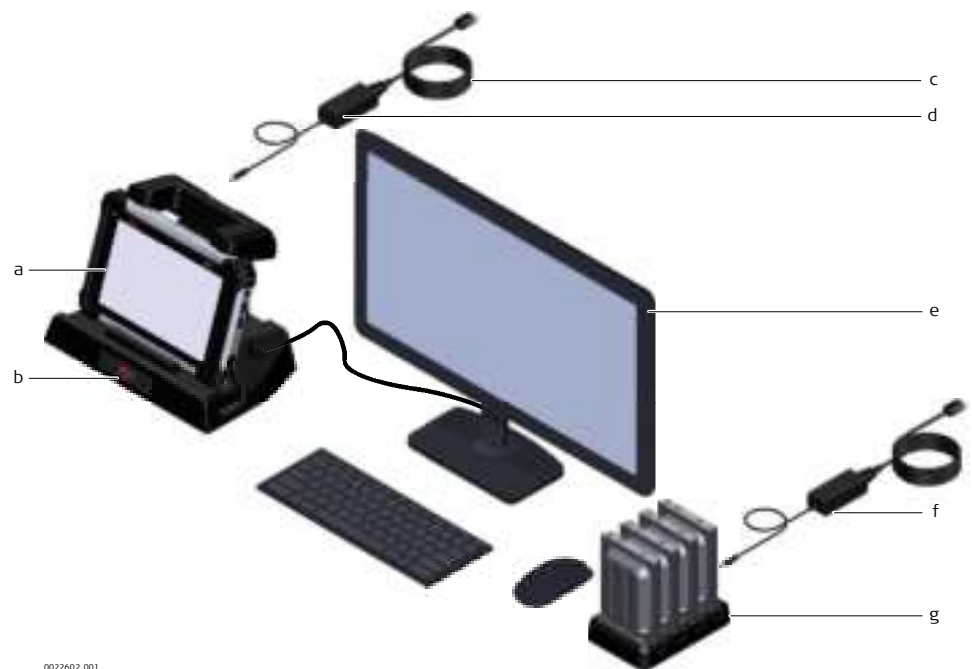
In the Office

Placing the field controller into the docking station



1. Place the bottom side of the field controller onto the pogo-pins.
2. Lift the field controller backwards until it snaps into position underneath the top fixation arm.

Equipment setup



- a CS30
- b CCS02 docking station
- c AC power cable
- d Power supply
- e Monitor
- f Power supply
- g Battery charger

5.1.3

Replacing the Display Foil on the CS

CS30

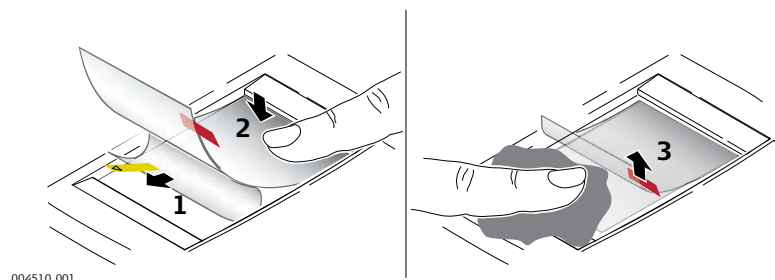
On delivery, the display of the CS is covered by a foil to protect the display against scratches and dirt and to guarantee a trouble-free function of the touchscreen in extreme and humid weather conditions. We strongly recommend to use this display foil and to replace it, if necessary.

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.

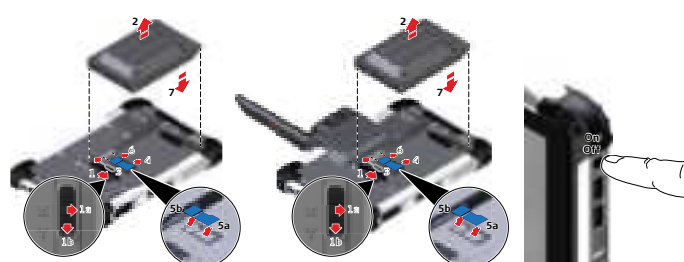


1. Touch the yellow-coloured sticker with two fingers and pull it slowly upwards. The carrier foil is peeling away.
⚠ Do not peel the carrier foil more than 2 cm - 3 cm away.
2. Fix the adhesive underside of the display foil on the display edge. Peel away the carrier foil slowly and smooth it out gently 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.

5.2	Batteries
5.2.1	Operating Principles
First-time use/ charging batteries	- The battery must be charged before using it for the first time because it is delivered with an energy content as low as possible. - The permissible temperature range for charging is from 0 °C to +40 °C / +32 °F to +104 °F. For optimal charging, we recommend charging the batteries at a low ambient temperature of +10 °C to +20 °C / +50 °F to +68 °F if possible. - It is normal for the battery to become warm during charging. Using the charger recommended by Leica Geosystems, it is not possible to charge the battery once the temperature is too high. - For new batteries or batteries that have been stored for a long time (> three months), it is essential 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 -25°C to +55°C / -13°F to +131°F. - Low operating temperatures reduce the capacity that can be drawn; high operating temperatures reduce the service life of the battery.

5.2.2 Changing the Battery

Insert and remove the battery step-by-step

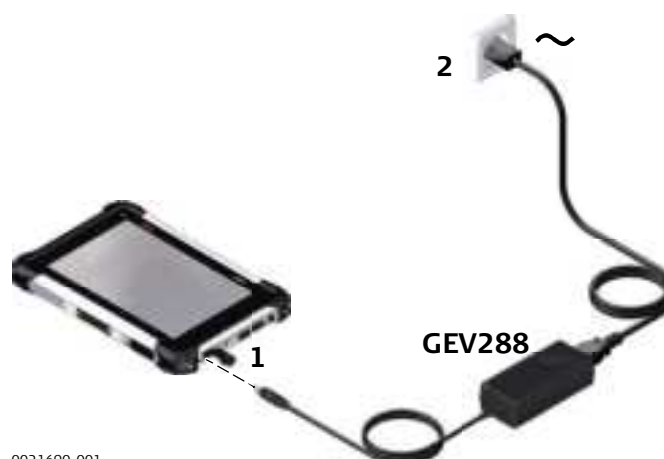


1. Turn off the field controller.
2. Turn over the field controller.
3. Push the horizontal lock to the right.
4. Push the vertical lock downwards.
5. Remove the battery.
6. Insert a fully charged battery.
7. Push the vertical lock upwards.
8. Push the horizontal lock to the left.
9. Turn on the field controller.

5.2.3

Charging the Battery

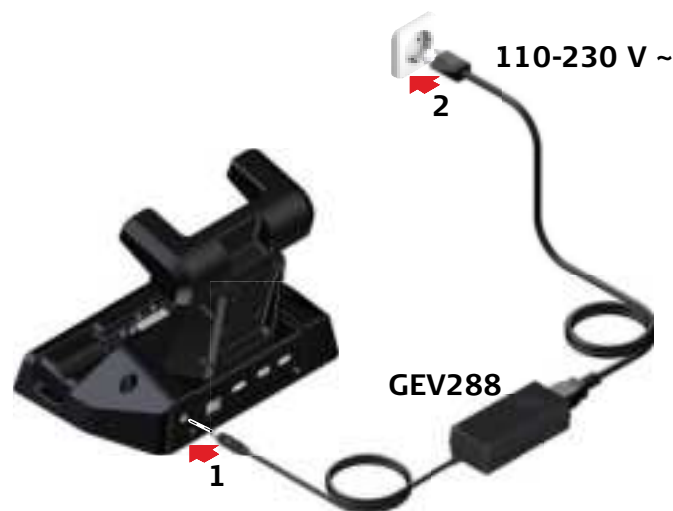
Charging the battery by GEV288 (power supply) step-by-step



0021690_001

1. Connect the GEV288 power adapter with the field controller.
 2. Connect the power adapter to the plug.
 3. The Charging LED on the CS field controller switches on. While charging, the Charging LED is red. When the field controller's battery is fully charged the Charging LED is green.
- ☞ Refer to for detailed information about the Charging LED.

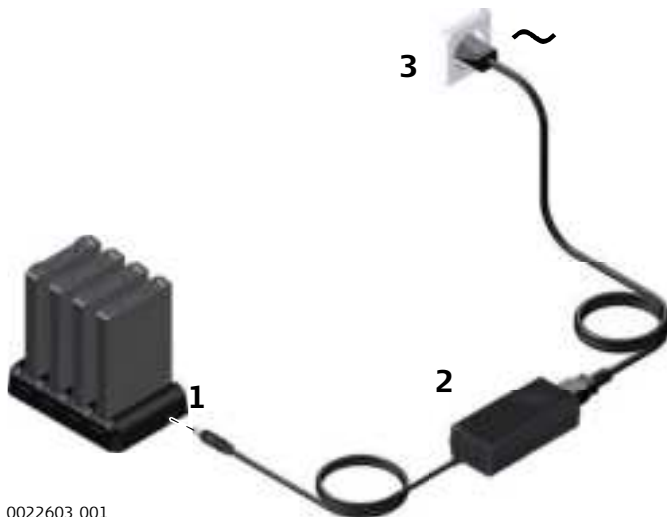
Charging the battery by CCS02 docking sta- tion step-by-step



22605_002

1. Connect the GEV288 power adapter with the docking station.
 2. Connect the power adapter to the plug.
- ☞ Refer to the CCS02 User Manual for detailed information about the charging LED.

Charging the battery
by GKL260 battery
charger step-by-step



0022603_001

1. Connect the provided power supply to the charging cradle.
2. Connect the AC power cable to the power supply.
3. Connect the AC power cable to the plug.
4. The Charging LLD on the CS field controller switches on. While charging, the Charging LLD is red. When the field controller's battery is fully charged the Charging LLD is green.
☞ Refer to 4.3 LLD Indicators on CS30 for detailed information about the Charging LLD.

5.3

Power Functions

Turning field
controller on and off

1. To turn on the device, firmly press and hold the top right power button until the boot screen appears.
2. To turn off the device, click on the bottom left windows icon to display the options menu. Select the Power off option to shut down.
3. With the device turned on, press the power button to turn off the screen and go into sleep mode. Press the power button again to wake the device. Swipe upwards on the screen to unlock.
- ☞ If the device has been idle for a period of time, the screen will automatically turn off and go into sleep mode.

5.4

Working with the Memory Device

5.4.1

Working with the microSD Card and Nano SIM Card

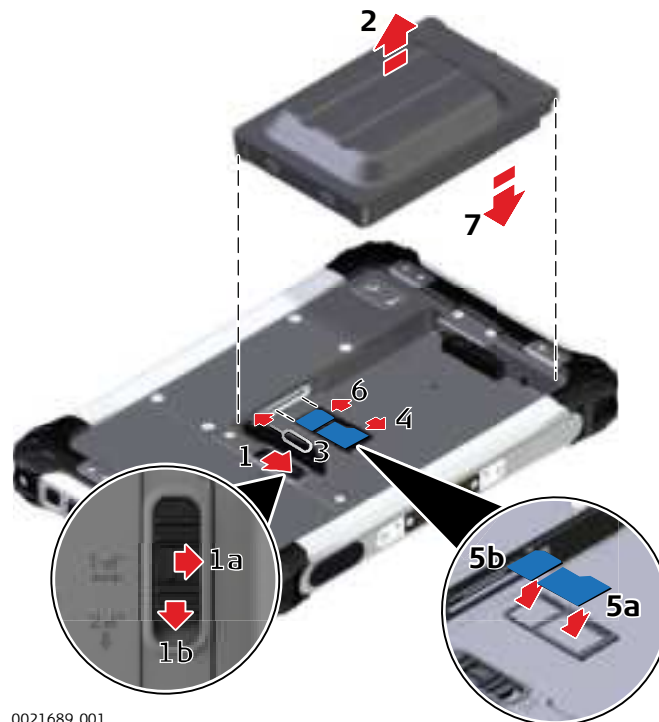
☞

- 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 microSD card and Nano SIM card step-by-step



0021689_001

⚠ Inserting/removing a card while the CS30 is turned on can result in permanent damage to the card. Only insert/remove a card when the CS30 is switched off.

⚠ The microSD card is inserted into a slot inside the battery compartment.

⚠ The Nano SIM and microSD card can be inserted into a slot below the battery.

⚠ Switch off the field controller.

1. Push the side fastener of the battery compartment in the direction of the arrow with the open-lock symbol.

2. Remove the battery from the battery compartment.

3. Pull the SIM and microSD card holder in the direction of the OPEN arrow.

4. Place the card into the card holder, the chip facing the connectors inside the slot - as shown beside the SIM card holder.

5. Press the card holder down and push the card holder in the direction of the LOCK arrow to close.

6. Reinsert the battery.

7. Push the side fastener of the battery compartment in the direction of the arrow with the closed-lock symbol.

**Insert a USB stick
step-by-step**

0021691.001

- 1. The USB stick can be inserted into a slot on the left small side of the controller. Refer to .
- 2. Insert the USB stick into the slot.

6	Care and Transport
6.1	Transport
Transport in a road vehicle	Never carry the product loose in a road vehicle, as it can be affected by shock and vibration. Always carry the product in its container and secure it. For products for which no container is available use the original packaging or its equivalent.
Shipping	When transporting the product by rail, air or sea, always use the complete original Leica Geosystems packaging, container and cardboard box, or its equivalent, to protect against shock and vibration.
Shipping, transport of batteries	When transporting or shipping batteries, the person responsible for the product must ensure that the applicable national and international rules and regulations are observed. Before transportation or shipping, contact your local passenger or freight transport company.
6.2	Storage
Product	Respect the temperature limits when storing the equipment, particularly in summer if the equipment is inside a vehicle. Refer to 7 Technical Data for information about temperature limits.
Li-Ion batteries	• Refer to 7 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.
6.3	Cleaning and Drying
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. 817061.001

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.

7 Technical Data

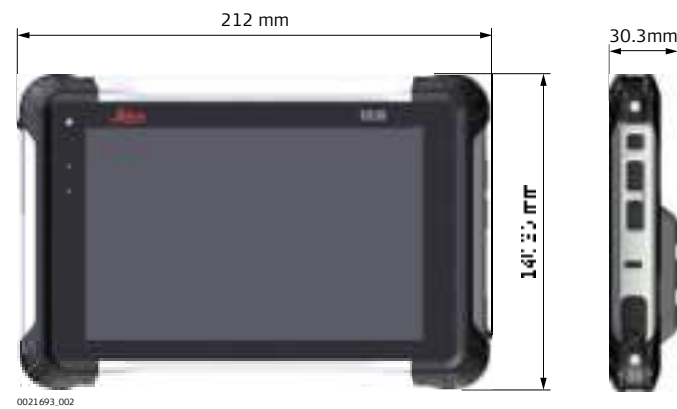
7.1 CS30

Control unit

Type	Description
Display	7" FHD 1280 x 800 sunlight readable 650 NITS multi-capacitive touch screen
Touch technology	Capacitive
Sound	Integrated sealed speaker and microphone
Digital camera	8 MP, fixed focus lens, image capture: JPEG, flash

Dimensions

CS30



CS30 LTE LRBT



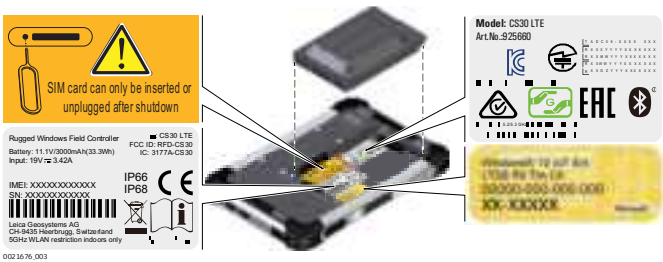
Weight	Type		Weight [kg]							
	CS30 tablet		0.760							
	CTR30 LRBI module		0.067							
	GAT25 antenna		0.030							
Memory devices	Data can be stored on the microSD card, USB stick or in the internal memory.									
Power	Type		Consumption [A]		External supply voltage					
	CS30		2.2		Nominal voltage: 15 V DC (—) Voltage range: 11.1 V DC to 19.0 V DC Minimum voltage for charging: 14 V DC (—)					
Internal battery	Type		Battery		Voltage		Capacity		Operating time, typical*	
	GLB260		Li-Ion		11.1 V		3000 mAh		> 8 h	
					* Operating time depends on use of wireless communication devices and processor drain.					
Environmental specifications	Temperature		Type		Operating temperature [°C]		Storage temperature [°C]			
	CS30		-25 to +55		-40 to +70					
	Protection against water, dust and sand									
	Protection									
CS30		IP65 to IP68 (IEC 60529)			(*) CS30 is in compliance with IP68 only when expansion cover, connector cover and battery cover are closed.					
					IP6x: Dust tight. No ingress of dust. Complete protection against contact. A vacuum must be applied. Test duration of up to 8 h based on air flow.					
					IPx6: Water projected in powerful jets (12.5 mm) against the enclosure from any direction shall have no harmful effects. Tested for 1 min per square meter for at least 3 min. Water volume: 100 l/min. Pressure: 100 kPa at distance of 3 m.					
					IPx8: Protected against continuous immersion in water. Tested for 2 hours in 1.40 m depth.					
Humidity		Protection								
CS30		0 - 95% RH, non-condensing								

Interfaces

Type	USB Host	Bluetooth	RF antenna pass-through	WiFi
CS30	USB Type A v2.0	Class 1 BTv4.2	WWAN GNSS	802.11 n/AC/AX
	USB Type C v3.0		WLAN	12.4 G 5 GHz

7.2 Conformity to National Regulations

Labelling CS30



Labelling GEB260



Europe

- Therefore, Leica Geosystems AG declares that the radio equipment type CS30 I TF / CS30 I TF I RBT is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following Internet address: <http://www.leica-geosystems.com/ce>.



Class 2 equipment according to European Directive 2014/53/EU (RED) for which following EEA Member States apply restrictions on the placing on the market or on the putting into service or require authorisation for use:

- The low band 5.15 - 5.35 GHz is for indoor use only



AT, BE, BG, CH, CY, CZ, DE, DK, EE, FI, ES, FR, GR, HU, IE, IS, IT, LI, LT, LU, LV, MT, NL, PL, PT, RO, SE, SI, SK, TR, UK

US

FCC ID: RFD-CS30, RFD-CS30I RBT

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15, §§ 74, 77.50 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.

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

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

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

Canada

IC: 3177A-CS30, 3177A-CS30I RBT

RSS-332 Issue 3, RSS-333 Issue 6, RSS-139 Issue 3, RSS-109 Issue 3

RSS-130 Issue 1, RSS-195 Issue 2, RSS-140 Issue 1, RSS-102 Issue 5

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

Canada Compliance Statement

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

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

Canada Déclaration de Conformité

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

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

Japan

5.2 GHz / 5.3 GHz band is restricted to indoor use due to the Radio Law.

- This device is granted pursuant to the Japanese Radio Law [電波法], and the Japanese Telecommunications Business Law [電気通信事業法].
- This device should not be modified otherwise the granted designation number will become invalid.

Korea



There is a possibility of radio interference during operation of this radio facility.

Power range

-  Restriction: 5.150 MHz – 5.250 MHz, only for indoor use.
-  Non-European radio frequency bands and/or technologies supported by the equipment were not part of the assessment and are marked in *italics*.

Product characteristics

Hardware version	Software version
PCE V0.4	RFD.00.02.03

UMTS / LTE part

Mode	Characteristics	
Frequency band(s)	WCDMA	[FDD I, II, III, IV, V, VIII, IX, XX]
	LTE	[FDD 1, 2, 3, 4, 5, 7, 8, 9, 12, 13, 14, 17, 18, 19, 20, 21, 25, 26, 28, 29, 30, 32, 66; ITDD 38, 39, 40, 41]
Power class	WCDMA	3
	LTE	

GNSS part

Mode	Operating frequency range	Modulation
GPS	1559 MHz to 1610 MHz	BPSK
GLONASS	1559 MHz to 1610 MHz	BPSK

SAR limits**For CS30 LTE**

Country	SAR	SAR limit
USA & Canada	1.492 W/Kg 1 gram	1.6 W/Kg 1 gram
FII	1.812 W/Kg 10 gram	2.0 W/Kg 10 gram

For CS30 LTE LRBT

Country	SAR	SAR limit
USA & Canada	1.372 W/Kg 1 gram	1.6 W/Kg 1 gram
FII	1.890 W/Kg 10 gram	2.0 W/Kg 10 gram

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Open Source Information

The software on the product may contain copyright-protected software that is licenced under various open source licences.

Copies of the corresponding licences

- are provided together with the product (for example in the About pane 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.



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- when it has to be **right**



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Normal Mode RF Power Range (WCDMA)

Mode	Range(dBm)
WCDMA Band 2 RMC	23.00-24.00
HSDPA Band 2	21.50-22.80
HSUPA Band 2	20.00-23.00
WCDMA Band 4 RMC	22.50-23.80
HSDPA Band 4	21.00-23.50
HSUPA Band 4	19.50-22.80
WCDMA Band 5 RMC	23.40-24.00
HSDPA Band 5	22.00-23.50
HSUPA Band 5	20.20-23.00

Normal Mode RF Power Range (LTE)

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 2	20 MHz	1	QPSK	23.00-24.50
		50		22.30-23.50
		100		22.30-23.50
		1	16QAM	22.50-23.50
		50		21.50-22.50
		100		21.50-22.50
	15 MHz	1	QPSK	23.00-24.50
		36		22.30-23.50
		75		22.30-23.50
		1	16QAM	22.00-23.50
		36		21.50-22.50
		75		21.50-22.50
	10 MHz	1	QPSK	23.00-24.50
		25		22.30-23.50
		50		22.30-23.50
		1	16QAM	22.00-23.50
		25		21.20-22.50
		50		21.20-22.50
	5 MHz	1	QPSK	23.00-24.00

Appendix A

		12		22.00-23.50
		25		22.00-23.50
		1	16QAM	22.00-23.50
		12		21.20-22.50
		25		21.20-22.50
	3 MHz	1	QPSK	23.00-24.00
		8		22.00-23.00
		15		22.00-23.00
		1	16QAM	22.00-23.50
		8		21.20-22.50
		15		21.20-22.50
	1.4 MHz	1	QPSK	23.00-24.00
		3		22.50-23.80
		6		22.00-23.00
		1	16QAM	22.00-23.50
		3		22.00-23.00
		6		21.00-22.00

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 4	20 MHz	1	QPSK	23.50-25.00
		50		22.80-24.00
		100		22.80-23.50
		1	16QAM	23.00-24.00
		50		21.50-22.50
		100		21.50-22.50
	15 MHz	1	QPSK	23.50-24.50
		36		22.50-23.50
		75		22.50-23.50
		1	16QAM	22.50-24.00
		36		21.50-22.50
		75		21.50-22.50
	10 MHz	1	QPSK	23.50-24.50
		25		22.50-23.50
		50		22.50-23.50

Appendix A

		1	16QAM	22.50-24.00
		25		21.50-22.50
		50		21.50-22.50
	5 MHz	1	QPSK	23.20-24.50
		12		22.50-23.50
		25		22.50-23.50
		1	16QAM	22.50-23.50
		12		21.50-22.50
		25		21.50-22.50
	3 MHz	1	QPSK	23.20-24.50
		8		22.50-23.50
		15		22.50-23.50
		1	16QAM	22.50-23.50
		8		21.50-22.50
		15		21.50-22.50
	1.4 MHz	1	QPSK	23.20-24.50
		3		23.00-24.00
		6		22.00-23.50
		1	16QAM	22.50-23.50
		3		22.50-23.30
		6		21.50-22.50

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 5	10 MHz	1	QPSK	23.50-24.50
		25		22.50-23.50
		50		22.50-23.50
		1	16QAM	22.50-23.50
		25		21.50-22.50
		50		21.50-22.50
	5 MHz	1	QPSK	23.50-24.50
		12		22.50-23.50
		25		22.50-23.50
		1	16QAM	23.00-24.00
		12		21.50-22.50

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	3 MHz	25		21.50-22.50
		1	QPSK	23.50-24.20
		8		22.50-23.50
		15		22.50-23.50
		1	16QAM	22.50-23.50
		8		21.50-22.50
		15		21.50-22.50
	1.4 MHz	1	QPSK	23.50-24.50
		3		23.50-24.50
		6		22.50-23.20
		1	16QAM	22.50-23.50
		3		22.50-23.50
		6		21.50-22.50

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 7	20 MHz	1	QPSK	23.50-24.50
		50		22.50-23.50
		100		22.50-23.50
		1	16QAM	23.00-24.00
		50		22.00-22.50
		100		22.00-22.50
	15 MHz	1	QPSK	23.50-24.50
		36		22.50-23.50
		75		22.50-23.50
		1	16QAM	22.50-24.00
		36		21.50-22.50
		75		21.50-22.50
	10 MHz	1	QPSK	23.50-24.50
		25		22.50-23.50
		50		22.50-23.50
		1	16QAM	22.50-23.80
		25		21.50-22.80
		50		21.50-22.90
	5 MHz	1	QPSK	23.50-24.50

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		12		22.50-23.50
		25		22.50-23.50
		1	16QAM	22.50-24.00
		12		21.50-22.80
		25		21.50-22.80

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 12	10 MHz	1	QPSK	23.50-24.50
		25		22.50-23.50
		50		22.50-23.50
		1	16QAM	22.50-23.50
		25		21.50-22.50
		50		21.50-22.50
	5 MHz	1	QPSK	23.50-24.50
		12		22.50-23.50
		25		22.50-23.50
		1	16QAM	22.50-24.00
		12		21.50-22.50
		25		21.50-22.50
	3 MHz	1	QPSK	23.50-24.50
		8		22.50-23.20
		15		22.50-23.20
		1	16QAM	22.50-23.60
		8		21.50-22.50
		15		21.50-22.50
	1.4 MHz	1	QPSK	23.50-24.00
		3		23.50-24.20
		6		22.50-23.00
		1	16QAM	22.50-23.50
		3		22.50-23.50
		6		21.50-22.50

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Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 13	10 MHz	1	QPSK	23.50-24.50
		25		22.50-23.50
		50		22.50-23.50
		1	16QAM	22.50-23.50
		25		21.50-22.50
		50		21.50-22.50
	5 MHz	1	QPSK	23.50-24.50
		12		22.50-23.50
		25		22.50-23.50
		1	16QAM	22.50-24.00
		12		21.50-22.50
		25		21.50-22.50

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 14	10 MHz	1	QPSK	23.50-24.50
		25		22.60-23.50
		50		22.50-23.50
		1	16QAM	22.50-23.50
		25		21.60-22.50
		50		21.80-22.50
	5 MHz	1	QPSK	23.50-24.50
		12		22.50-23.50
		25		22.50-23.50
		1	16QAM	23.00-24.00
		12		22.00-22.60
		25		22.00-22.50

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 17	10 MHz	1	QPSK	23.50-24.50
		25		22.50-23.50
		50		22.50-23.40
		1	16QAM	22.50-23.70
		25		21.50-22.50

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	5 MHz	50	QPSK	21.50-22.50
		1		23.50-24.50
		12		22.50-23.50
		25		22.50-23.50
		1	16QAM	22.50-23.40
		12		21.50-22.50
		25		21.50-22.50

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 25	20 MHz	1	QPSK	23.00-24.50
		50		22.50-23.50
		100		22.50-23.50
		1	16QAM	23.00-24.00
		50		21.30-22.50
		100		21.50-22.50
	15 MHz	1	QPSK	23.50-24.50
		36		22.50-23.30
		75		22.50-23.20
		1	16QAM	22.00-23.80
		36		21.50-22.50
		75		21.50-22.50
	10 MHz	1	QPSK	23.50-24.20
		25		22.50-23.00
		50		22.50-23.00
		1	16QAM	22.30-23.50
		25		21.50-22.50
		50		21.50-22.30
	5 MHz	1	QPSK	23.20-24.20
		12		22.00-23.20
		25		22.20-23.20
		1	16QAM	22.50-23.70
		12		21.50-22.50
		25		21.50-22.50
	3 MHz	1	QPSK	23.00-24.30

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		8		22.20-23.00
		15		22.00-23.00
		1	16QAM	22.00-23.50
		8		21.50-22.50
		15		21.50-22.50
	1.4 MHz	1	QPSK	23.00-24.20
		3		23.00-24.20
		6		22.00-23.20
		1	16QAM	22.00-23.80
		3		22.00-23.50
		6		21.50-22.20

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 26 Part22	15 MHz	1	QPSK	24.00-25.50
		36		23.00-24.00
		75		23.00-24.00
		1	16QAM	23.00-24.80
		36		22.00-23.00
		75		22.00-23.00
	10 MHz	1	QPSK	24.00-25.00
		25		23.00-24.00
		50		23.00-24.00
		1	16QAM	23.00-24.20
		25		22.00-23.00
		50		22.00-23.00
	5 MHz	1	QPSK	24.00-25.00
		12		23.00-24.00
		25		23.00-24.00
		1	16QAM	23.00-24.50
		12		22.00-23.00
		25		22.00-23.00
	3 MHz	1	QPSK	24.00-24.50
		8		23.00-23.60
		15		23.00-23.60

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		1	16QAM	23.00-24.00
		8		22.00-23.00
		15		22.00-23.00
	1.4 MHz	1	QPSK	24.00-24.50
		3		24.00-24.50
		6		23.00-23.60
		1	16QAM	23.00-24.00
		3		23.00-24.00
		6		22.00-22.80

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 26 Part90	10 MHz	1	QPSK	24.00-25.00
		25		23.00-24.00
		50		23.00-23.60
		1	16QAM	22.00-23.60
		25		22.00-23.00
		50		22.00-23.00
	5 MHz	1	QPSK	24.00-25.00
		12		23.00-23.80
		25		23.00-23.80
		1	16QAM	23.00-24.20
		12		22.00-23.00
		25		22.00-23.00
	3 MHz	1	QPSK	24.00-24.60
		8		23.00-23.80
		15		23.00-23.80
		1	16QAM	23.00-24.00
		8		22.00-23.00
		15		22.00-23.00
	1.4 MHz	1	QPSK	24.00-24.50
		3		24.00-24.50
		6		23.00-23.50
		1	16QAM	23.00-24.00
		3		23.00-24.00

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		6		22.00-22.80
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Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 30	10 MHz	1	QPSK	20.80-22.50
		25		20.50-21.50
		50		20.50-21.50
		1	16QAM	20.50-21.40
		25		19.50-20.50
		50		19.50-20.50
	5 MHz	1	QPSK	20.80-22.50
		12		20.60-21.50
		25		20.80-21.50
		1	16QAM	20.80-22.00
		12		19.50-20.50
		25		19.50-20.50

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 38	20 MHz	1	QPSK	23.50-25.00
		50		22.50-24.00
		100		22.50-23.50
		1	16QAM	23.00-24.20
		50		21.50-22.60
		100		21.50-22.50
	15 MHz	1	QPSK	23.50-24.80
		36		22.50-23.50
		75		22.50-23.50
		1	16QAM	23.00-24.00
		36		21.50-22.50
		75		21.50-22.50
	10 MHz	1	QPSK	23.50-24.50
		25		22.60-23.60
		50		22.50-23.60
		1	16QAM	23.00-24.00
		25		21.80-22.80

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	5 MHz	50	QPSK	21.80-22.80
		1		23.50-24.70
		12		22.50-23.80
		25	16QAM	22.50-23.80
		1		23.00-24.00
		12		21.80-22.70
		25		21.80-22.70

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 41	20 MHz	1	QPSK	22.50-24.50
		50		22.50-23.50
		100		22.50-23.50
		1	16QAM	22.00-23.60
		50		21.50-22.50
		100		21.50-22.50
	15 MHz	1	QPSK	23.50-24.50
		36		22.50-23.50
		75		22.60-23.50
		1	16QAM	22.80-24.00
		36		21.50-22.50
		75		21.50-22.50
	10 MHz	1	QPSK	23.50-24.50
		25		22.50-23.50
		50		22.50-23.20
		1	16QAM	22.80-23.80
		25		21.50-22.50
		50		21.50-22.50
	5 MHz	1	QPSK	23.50-24.40
		12		22.50-23.20
		25		22.50-23.20
		1	16QAM	23.00-23.50
		12		21.50-22.50
		25		21.50-22.50

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Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 66	20 MHz	1	QPSK	22.30-25.00
		50		22.50-24.00
		100		22.50-23.60
		1	16QAM	21.50-24.00
		50		21.50-22.80
		100		22.00-22.80
	15 MHz	1	QPSK	22.20-25.00
		36		22.50-23.80
		75		22.50-23.50
		1	16QAM	21.20-24.20
		36		22.00-22.80
		75		21.80-22.60
	10 MHz	1	QPSK	22.20-25.00
		25		22.50-23.50
		50		22.50-23.50
		1	16QAM	21.50-24.00
		25		21.50-22.80
		50		21.80-22.50
	5 MHz	1	QPSK	22.50-24.50
		12		21.50-23.50
		25		21.50-23.50
		1	16QAM	21.50-24.00
		12		20.80-22.80
		25		20.80-22.50
	3M	1	QPSK	22.50-24.50
		8		21.50-23.50
		15		21.50-23.50
		1	16QAM	21.50-24.00
		8		20.50-22.80
		15		20.50-22.50
	1.4M	1	QPSK	22.50-24.50
		3		22.50-24.40
		6		21.50-23.50

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		1	16QAM	21.50-24.00
		3		21.50-23.50
		6		20.50-22.50

Normal Mode RF Power Range (WLAN/Bluetooth)

Band (GHz)	Mode	Range(dBm)
WIFI 2.4G (2.4~2.4835)	802.11b	14.50-16.00
	802.11g	11.80-15.00
	802.11n(HT20)	11.80-15.80
	802.11ac(VHT40)	11.60-15.00

Band (GHz)	Mode	Range(dBm)
WIFI 5.2 G (5.15~5.25)	802.11a	11.50-12.80
	802.11n(HT20)	11.80-13.00
	802.11ac(VHT20)	11.50-12.50
	802.11n(HT40)	9.00-10.50
	802.11ac(VHT40)	8.00-9.50
	802.11ac(VHT80)	7.50-8.00
WIFI 5.8G (5.725~5.850)	802.11a	10.00-12.00
	802.11n(HT20)	9.50-11.50
	802.11ac(VHT20)	10.50-12.50
	802.11n(HT40)	9.00-10.50
	802.11ac(VHT40)	9.80-11.50
	802.11ac(VHT80)	9.50-10.50

Band (GHz)	Mode	Range(dBm)
Bluetooth (2.4~2.4835)	GFSK	3.20-4.00
	Pi/4-DQPSK	0.50-2.00
	8-DPSK	(-0.30)-1.00
	BLE	2.00-3.50

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External Bluetooth Module

Band (GHz)	Mode	Range(dBm)
Bluetooth (2.4~2.4835)	GFSK	5.00-8.00
	Pi/4-DQPSK	4.00-7.00
	8-DPSK	4.00-7.00
	BLE	0.20-4.50

Power Reduction Mode RF Power Range (WCDMA)

Mode	Range(dBm)
WCDMA Band 2 RMC	16.00-17.00
HSDPA Band 2	14.50-16.00
HSUPA Band 2	13.00-16.00
WCDMA Band 4 RMC	17.00-18.00
HSDPA Band 4	15.50-17.40
HSUPA Band 4	14.00-17.00
WCDMA Band 5 RMC	18.00-19.00
HSDPA Band 5	16.50-18.00
HSUPA Band 5	15.00-18.00

Power Reduction Mode RF Power Range (LTE)

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 2	20 MHz	1	QPSK	15.30-16.50
		50		15.30-16.50
		100		15.30-16.50
		1	16QAM	15.30-16.80
		50		15.30-16.50
		100		15.30-16.50
	15 MHz	1	QPSK	15.30-16.50
		36		15.30-16.40
		75		15.30-16.40
		1	16QAM	15.30-16.80
		36		15.30-16.40
		75		15.30-16.30

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	10 MHz	1	QPSK	15.20-16.20
		25		15.20-16.20
		50		15.20-16.20
		1	16QAM	15.20-16.40
		25		15.20-16.40
		50		15.20-16.40
	5 MHz	1	QPSK	15.20-16.50
		12		15.20-16.40
		25		15.20-16.50
		1	16QAM	15.50-16.50
		12		15.50-16.50
		25		15.50-16.50
	3 MHz	1	QPSK	15.00-16.40
		8		15.00-16.40
		15		15.00-16.40
		1	16QAM	15.00-16.50
		8		15.50-16.50
		15		15.50-16.20
	1.4 MHz	1	QPSK	15.00-16.40
		3		15.00-16.40
		6		15.00-16.20
		1	16QAM	15.50-16.40
		3		15.50-16.50
		6		15.00-16.50

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 4	20 MHz	1	QPSK	15.50-16.50
		50		15.50-16.50
		100		15.50-16.50
		1	16QAM	16.00-17.00
		50		15.80-16.50
		100		15.80-16.50
	15 MHz	1	QPSK	15.50-16.40
		36		15.50-16.40

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		75	16QAM	15.50-16.40
		1		15.50-16.80
		36		15.50-16.50
		75		15.50-16.50
	10 MHz	1	QPSK	15.40-16.40
		25		15.50-16.40
		50		15.50-16.40
		1	16QAM	15.50-16.80
		25		15.50-16.40
		50		15.50-16.40
	5 MHz	1	QPSK	15.50-16.40
		12		15.50-16.40
		25		15.50-16.30
		1	16QAM	15.80-16.50
		12		15.50-16.40
		25		15.50-16.40
	3 MHz	1	QPSK	15.50-16.30
		8		15.50-16.30
		15		15.50-16.30
		1	16QAM	15.50-16.50
		8		15.50-16.50
		15		15.50-16.50
	1.4 MHz	1	QPSK	15.50-16.20
		3		15.50-16.40
		6		15.30-16.20
		1	16QAM	15.50-16.50
		3		15.50-16.50
		6		15.50-16.50

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 5	10 MHz	1	QPSK	20.00-21.00
		25		20.00-21.00
		50		20.00-20.80
		1	16QAM	20.00-21.00

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		25		20.00-21.00
		50		20.00-21.00
	5 MHz	1	QPSK	20.00-20.80
		12		20.00-20.80
		25		20.00-20.80
		1	16QAM	20.00-21.20
		12		20.00-21.00
		25		20.00-21.00
	3 MHz	1	QPSK	20.00-20.50
		8		20.00-20.50
		15		20.00-20.50
		1	16QAM	19.80-21.00
		8		20.00-21.00
		15		20.00-21.00
	1.4 MHz	1	QPSK	19.60-20.50
		3		19.60-20.50
		6		19.60-20.50
		1	16QAM	20.00-21.00
		3		20.00-20.80
		6		20.00-20.50

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 7	20 MHz	1	QPSK	15.50-16.50
		50		15.50-16.50
		100		15.50-16.50
		1	16QAM	16.00-16.80
		50		15.50-16.40
		100		15.50-16.40
	15 MHz	1	QPSK	15.50-16.20
		36		15.50-16.20
		75		15.50-16.00
		1	16QAM	15.50-16.50
		36		15.50-16.40
		75		15.50-16.20

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	10 MHz	1	QPSK	15.50-16.20
		25		15.50-16.20
		50		15.50-16.20
		1	16QAM	15.50-16.40
		25		15.50-16.40
		50		15.50-16.40
	5 MHz	1	QPSK	15.50-16.20
		12		15.50-16.20
		25		15.50-16.20
		1	16QAM	15.50-16.50
		12		15.50-16.40
		25		15.50-16.40

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 12	10 MHz	1	QPSK	20.50-21.50
		25		20.50-21.50
		50		20.50-21.50
		1	16QAM	20.50-21.80
		25		20.50-21.50
		50		20.50-21.50
	5 MHz	1	QPSK	20.50-21.50
		12		20.50-21.50
		25		20.50-21.50
		1	16QAM	20.80-22.00
		12		20.80-21.50
		25		20.80-21.50
	3 MHz	1	QPSK	20.60-21.50
		8		20.60-21.50
		15		20.60-21.50
		1	16QAM	20.80-21.80
		8		20.80-21.50
		15		20.80-21.50
	1.4 MHz	1	QPSK	20.50-21.50
		3		20.50-21.50

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		6	16QAM	20.50-21.50
		1		20.60-21.50
		3		20.60-21.50
		6		20.60-21.50

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 13	10 MHz	1	QPSK	20.00-21.00
		25		20.00-21.00
		50		20.00-20.50
		1	16QAM	20.00-20.50
		25		20.00-20.50
		50		20.00-20.50
	5 MHz	1	QPSK	20.00-20.50
		12		20.00-20.50
		25		20.00-20.50
		1	16QAM	20.00-21.00
		12		20.00-20.80
		25		20.00-20.80

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 14	10 MHz	1	QPSK	20.80-21.60
		25		20.80-21.60
		50		20.80-21.60
		1	16QAM	20.80-21.60
		25		20.80-21.60
		50		20.80-21.60
	5 MHz	1	QPSK	20.80-21.50
		12		20.80-21.50
		25		20.80-21.50
		1	16QAM	21.00-22.00
		12		21.00-21.80
		25		21.00-21.80

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Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 25	20 MHz	1	QPSK	16.70-18.00
		50		16.70-18.00
		100		16.70-18.00
		1	16QAM	17.00-18.20
		50		17.00-18.00
		100		17.00-18.00
	15 MHz	1	QPSK	16.50-17.80
		36		16.50-17.80
		75		16.50-17.50
		1	16QAM	17.00-18.00
		36		17.00-18.00
		75		17.00-18.00
	10 MHz	1	QPSK	16.50-17.60
		25		16.60-17.50
		50		16.60-17.50
		1	16QAM	16.80-17.80
		25		16.80-17.80
		50		16.80-17.80
	5 MHz	1	QPSK	16.50-17.50
		12		16.50-17.50
		25		16.50-17.50
		1	16QAM	17.00-18.00
		12		17.00-17.80
		25		17.00-17.80
	3 MHz	1	QPSK	16.50-17.50
		8		16.50-17.50
		15		16.50-17.50
		1	16QAM	16.80-17.80
		8		16.80-17.80
		15		16.80-17.80
	1.4 MHz	1	QPSK	16.80-17.50
		3		16.80-17.50

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		6		16.80-17.50
		1	16QAM	17.00-17.80
		3		17.00-18.00
		6		16.80-17.80

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 26 Part22	15 MHz	1	QPSK	20.00-21.00
		36		20.00-21.00
		75		20.00-20.60
		1	16QAM	20.00-21.50
		36		20.00-21.00
		75		20.00-20.80
	10 MHz	1	QPSK	20.00-20.50
		25		20.00-20.50
		50		20.00-20.50
		1	16QAM	20.00-21.00
		25		20.00-21.00
		50		20.00-20.80
	5 MHz	1	QPSK	20.00-20.50
		12		20.00-20.50
		25		20.00-20.50
		1	16QAM	20.20-21.00
		12		20.00-20.80
		25		20.00-20.60
	3 MHz	1	QPSK	20.00-20.50
		8		20.00-20.50
		15		20.00-20.50
		1	16QAM	20.00-21.00
		8		20.00-20.60
		15		20.00-20.60
	1.4 MHz	1	QPSK	19.80-20.40
		3		20.00-20.50
		6		19.80-20.40
		1	16QAM	20.00-21.00

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		3		20.00-20.80
		6		20.00-20.60

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 26 Part90	10 MHz	1	QPSK	19.80-20.60
		25		19.80-20.60
		50		19.80-20.60
		1	16QAM	20.00-20.50
		25		20.00-20.50
		50		20.00-20.50
	5 MHz	1	QPSK	19.80-20.50
		12		19.80-20.50
		25		19.80-20.50
		1	16QAM	20.00-21.00
		12		20.00-20.80
		25		20.00-20.80
	3 MHz	1	QPSK	19.80-20.50
		8		19.80-20.50
		15		19.80-20.50
		1	16QAM	19.80-21.00
		8		20.00-20.80
		15		20.00-20.80
	1.4 MHz	1	QPSK	19.60-20.50
		3		19.60-20.50
		6		19.60-20.50
		1	16QAM	19.80-20.80
		3		19.80-20.80
		6		19.80-20.60

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 30	10 MHz	1	QPSK	15.00-16.00
		25		15.00-16.00
		50		15.00-15.80
		1	16QAM	15.00-15.80

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		25		15.20-15.80
		50		15.20-15.80
	5 MHz	1	QPSK	15.00-15.80
		12		15.00-15.80
		25		15.00-15.80
		1	16QAM	15.20-16.20
		12		15.20-16.00
		25		15.20-16.00

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 38	20 MHz	1	QPSK	19.30-20.50
		50		19.30-20.50
		100		19.30-20.50
		1	16QAM	19.50-20.50
		50		19.50-20.50
		100		19.50-20.50
	15 MHz	1	QPSK	19.20-20.00
		36		19.20-20.00
		75		19.20-20.00
		1	16QAM	19.50-20.60
		36		19.50-20.60
		75		19.50-20.60
	10 MHz	1	QPSK	19.30-20.20
		25		19.30-20.00
		50		19.30-20.00
		1	16QAM	19.40-20.50
		25		19.40-20.20
		50		19.40-20.20
	5 MHz	1	QPSK	19.30-20.00
		12		19.30-20.00
		25		19.30-20.00
		1	16QAM	19.50-20.50
		12		19.50-20.40
		25		19.50-20.40

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Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 41	20 MHz	1	QPSK	16.50-18.60
		50		17.30-18.50
		100		17.30-18.50
		1	16QAM	16.80-18.50
		50		17.00-18.40
		100		17.00-18.30
	15 MHz	1	QPSK	17.20-18.40
		36		17.20-18.40
		75		17.20-18.20
		1	16QAM	17.50-18.80
		36		17.50-18.50
		75		17.50-18.50
	10 MHz	1	QPSK	17.50-18.30
		25		17.50-18.30
		50		17.50-18.30
		1	16QAM	17.50-18.80
		25		17.50-18.40
		50		17.50-18.40
	5 MHz	1	QPSK	17.30-18.40
		12		17.30-18.40
		25		17.30-18.40
		1	16QAM	17.50-18.60
		12		17.50-18.50
		25		17.50-18.50

Mode	Bandwidth	RB	Modulation	Range(dBm)
LTE Band 66	20 MHz	1	QPSK	17.50-18.50
		50		17.50-18.50
		100		17.50-18.50
		1	16QAM	17.60-18.80
		50		17.60-18.50
		100		17.60-18.50

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	15 MHz	1	QPSK	17.50-18.40
		36		17.50-18.40
		75		17.50-18.40
		1	16QAM	17.60-18.80
		36		17.60-18.50
		75		17.60-18.50
	10 MHz	1	QPSK	17.50-18.40
		25		17.50-18.40
		50		17.50-18.40
		1	16QAM	17.50-18.60
		25		17.60-18.40
		50		17.60-18.40
	5 MHz	1	QPSK	17.50-18.40
		12		17.50-18.40
		25		17.50-18.40
		1	16QAM	17.50-18.80
		12		17.50-18.50
		25		17.50-18.50
	3 MHz	1	QPSK	17.50-18.40
		8		17.50-18.40
		15		17.50-18.40
		1	16QAM	17.50-18.50
		8		17.50-18.50
		15		17.50-18.40
	1.4 MHz	1	QPSK	17.50-18.30
		3		17.50-18.30
		6		17.50-18.30
		1	16QAM	17.50-18.50
		3		17.50-18.40
		6		17.50-18.40