Leica iCON gps 70

User Manual
Version 1.0
English

- when it has to be **right**

Leica Geosystems

Introduction

Purchase

Congratulations on the purchase of the Leica iCON gps 70.

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 centre.

Trademarks

- *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 all models of the Leica iCON gps 70 GNSS instrument. Where there are differences between the various instruments they are clearly described.

Available documentation

Name	Description/Format		
iCON gps 70 Quick Guide	Provides an overview of the product together with technical data and safety directions. Intended as a quick reference guide.	✓	✓
iCON gps 70 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.	-	✓

Refer to the following resources for documentation/software:

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

myWorld

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.

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.

Service	Description
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.
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.
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.

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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 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

- Computing with software.
- Recording measurements.
- Carrying out measurement tasks using various GNSS measuring techniques.
- Recording GNSS and point related data.
- Remote control of product.
- Data communication with external appliances.
- 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 recognizable 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.

⚠WARNING

Altered function and safety of the machine

Unauthorised modification of building and constructions machines by mounting or installing the product may alter the function and safety of the machine.

Precautions:

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

Environment

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

For the Power Supply:

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

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.

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 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.

⚠WARNING

This product must be installed on building and construction machinery only by an appropriately trained and qualified specialist.

⚠CAUTION

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

Watch out for erroneous measurement results.

Precautions:

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

⚠ DANGER

Risk of electrocution

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

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.

⚠CAUTION

Unsuitable installation location

Installing near mechanically moving machine components may damage the product.

Precautions:

- Deflect the mechanically moving machine components as far as possible and define a safe installation zone.

⚠CAUTION

Inadequate steering if machine is defective

Beware of inadequate steering if machine is defective like after a crash or other damaging events or alterations to the machine.

Precautions:

- Periodically perform control measurements and field adjustments on the machine as specified in the User Manual. While working, construction and grading should be checked by appropriate means, for example spirit level, tachymeter, before and after important measuring tasks.

⚠ 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

Missing attention of operators or malfunctions

While steering or navigating the machine accidents may occur due to:

- The operator not paying attention to the surroundings (persons, ditches, traffic, etc.), or
- Malfunctions (...of a system component, interference, etc).

Precautions:

- ▸ The operator assures that the machine is operated, guided and monitored by a qualified user (e.g. driver).
- ▸ The user has to be able to take emergency measures, for example an emergency stop.

⚠ WARNING

Incorrect fastening of the external antenna

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:

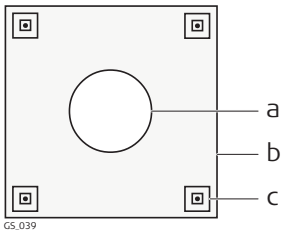
- ▸ Attach the external antenna professionally. The external antenna must be secured additionally, for example by use of a safety cord. Ensure that the mounting device is correctly mounted and able to carry the weight of the external antenna (>1 kg) safely.

Lightning conductors

Suggestion for design of a lightning conductor for a GNSS system:

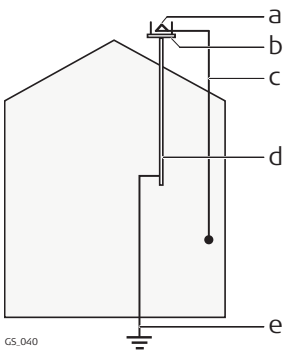
1. On non-metallic structures
   Protection by air terminals is recommended. An air terminal is a pointed solid or tubular rod of conducting material with proper mounting and connection to a conductor. The position of four air terminals can be uniformly distributed around the antenna at a distance equal to the height of the air terminal.
   The air terminal diameter should be 12 mm for copper or 15 mm for aluminium. The height of the air terminals should be 25 cm to 50 cm. All air terminals should be connected to the down conductors. The diameter of the air terminal should be kept to a minimum to reduce GNSS signal shading.
2. On metallic structures
   Protection is as described for non-metallic structures, but the air terminals can be connected directly to the conducting structure without the need for down conductors.

Air terminal arrangement, plan view



a Antenna
b Support structure
c Air terminal

Grounding the instrument/antenna



a Antenna
b Lightning conductor array
c Antenna/instrument connection
d Metallic mast
e Connection to earth

⚠CAUTION

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 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

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

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

Precautions:

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

⚠WARNING

Short circuit of battery terminals

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

Precautions:

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

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.

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

⚠WARNING

Electric shock due to use under wet and severe conditions

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

Precautions:

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

- Protect the product against humidity.

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

⚠WARNING

Unauthorised opening of the product

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

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

Precautions:

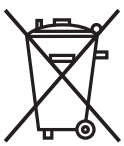
- ▸ Do not open the product!
- ▸ Only Leica Geosystems authorised service centres are entitled to repair these products.

⚠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.
- The product includes parts of Beryllium inside. Any modification of some internal parts can release dust or fragments, creating health hazard.

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 Leica Geosystems authorised service centres are entitled to repair these products.

NOTICE

Magnetic fields or objects which might influence the magnetic field can affect the product and lead to measuring errors.

Precautions:

- ▸ When working near magnetic fields or objects which might influence the magnetic field, check results for plausibility.

1.6 Electromagnetic Compatibility EMC

Description

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

⚠WARNING

Electromagnetic radiation

Electromagnetic radiation can cause disturbances in other equipment. 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 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.

1.7 FCC Statement, Applicable in U.S.

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

⚠WARNING

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

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

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

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

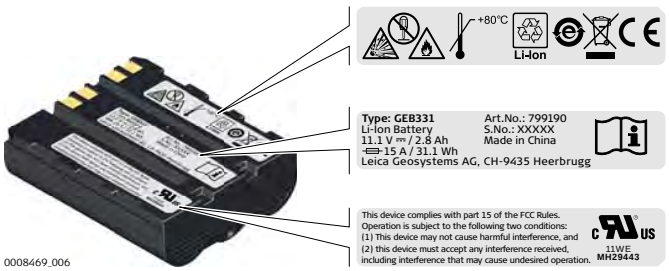
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

⚠CAUTION

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

Labelling iCON gps 70

Labelling GEB331



⚠WARNING

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

Canada Compliance Statement

This device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions:

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

Canada Déclaration de Conformité

Le présent appareil est conforme aux CNR d'Industrie 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.

2 Description of the System

2.1 System Components

Main components

Component	Description
Instrument	To calculate a position from the computed ranges to all visible GNSS (Global Navigation Satellite System) satellites. To estimate a tilt compensated pole tip position by combining the GNSS position with attitude information from an Inertial Measurement Unit (IMU).
Antenna	To receive the satellite signals from the GNSS satellites.

Instrument

Instrument	Description
iCON gps 70	GPS, GLONASS, BeiDou and Galileo GNSS receiver, multi-frequency, code and phase, real-time capable, integrated Inertial Measurement Unit.

2.2 System Concept

2.2.1 Software Concept

Description

All instruments use the same software concept.

Software for all iCON gps 70 instruments

Software type	Description
iCON gps 70 firmware (iCG_xx.fw)	This software covers all functions of the instrument. The English language is integrated into the firmware and cannot be deleted.

Software upload

☞ Uploading iCON gps 70 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 iCON gps 70 models	☞ Ensure that a Leica SD card is inserted into the iCON gps 70 instrument before starting the upload. Refer to " Equipment setup".

2.2.2 Power Concept

General

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

Power options

Power for the instrument can be supplied either internally or externally.

Model	Power supply
Internally	One battery (GEB331) fits into the instrument.
Externally	GEB371 battery connected via a cable, or Car battery connected via a converter cable supplied by Leica Geosystems, or

Model	Power supply
	10.5 V-28 V DC power supply via a converter cable supplied by Leica Geosystems, or 110 V/240 V AC to 12 V DC power supply unit, supplied by Leica Geosystems.

☞ For permanent operations use **U**ninterruptible **P**ower **S**upply units as a back-up in a main power failure.

2.2.3 Data Storage Concept

Description

A special debug.def file is needed to record Leica GNSS raw data on the SD card. Recording Leica GNSS raw data by a controller is not supported.

Memory device

SD card: The iCON gps 70 GNSS instrument has an SD card slot fitted as standard. An SD card can be inserted and removed.
Available capacity: 1 GB, 8 GB.

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

☞ Unplugging connecting cables, removing the data storage device or interrupting the power supply during the measurement can cause loss of data. Only remove the data storage device, unplug connecting cables or interrupt the power supply when the iCON gps 70 instrument is switched off.

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

2.3 Base Station Container

CTC8 container upper shell

The large-size CTC8 container comprises all items for the Base Station setup. The content of the upper shell is the same for all available container configuration.

a GSZ4-1 Height hook
b Cable*
c GRT146 Carrier

* optional

CTC8 container lower shell - iCON CC80

Large-size CTC8 container configuration with iCON CC80 Field Controller.

0015905_002

a	Tribrach	h	iCON gps 70 SmartAntenna
b	GEB331 battery	i	Spare stylus for CC80 Field Controller
c	Antenna GAT27 or GAT28	j	Spare battery for CC80 Field Controller
d	SD card	k	CC80 Field Controller
e	CA41		
f	USB memory stick		
g	Manuals & USB documentation card		

2.4 Rover Setup Container

CTC8 container - iCON gps 70 SmartAntenna

The CTC8 container comprises the iCON gps 70 SmartAntenna and its accessories.

☞ The container can additionally hold a iCON CC80 Field Controller with accessories.

Lower shell

0016095_003

a GEB331 battery
b Antenna GAT27 or GAT28
c SD card
d CAR70*
e CA41*
f USB memory stick
g Manuals & USB documentation card
h iCON gps 70 SmartAntenna
i Spare stylus for CC80 Field Controller
j Spare battery for CC80 Field Controller
k CC80 Field Controller

* optional accessory

Upper shell

016096_002

a Cable*

* optional accessory

CTC6 container Rover only - iCON gps 70 SmartAntenna

The CTC6 container comprises the iCON gps 70 SmartAntenna and its accessories.

☞ The container can additionally hold a iCON CC80 Field Controller with accessories.

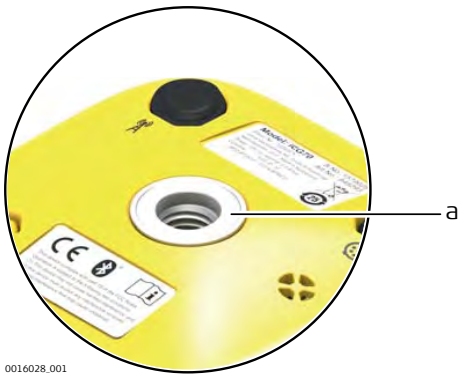
a Antenna GAT27 or GAT28
b iCON gps 70 SmartAntenna
c SD card
d CAR70*
e USB memory stick
f Radio antenna
g Manuals & USB documentation card
h CC80 Field Controller
i CA41*
j Spare battery for CC80 Field Controller*
k GEB331 battery

* optional accessory

iCON gps 70 components

a LEDs, ON/OFF button and Function button
b LEMO port, serial, USB and external power
c SMB-connector for external UHF antenna, only for models with UHF radio
d Battery compartment with SD card slot
e Antenna Reference Plane (ARP)

iCON gps 70



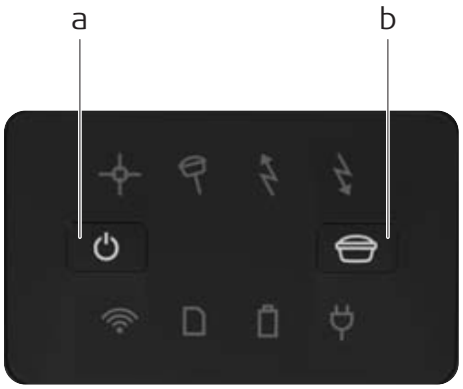
a Antenna Reference Plane (ARP)

☞ A Bluetooth port is included inside all iCON gps 70 instruments enabling connectivity to the field controller.

3 User Interface

3.1 Keyboard

Keyboard iCON gps 70



a ON/OFF button
b Function button

ON/OFF button

Button		Function
ON/OFF		If iCON gps 70 already off: Turns on iCON gps 70 when held for 2 s. ☞ While the iCON gps 70 is booting the Connectivity and Storage LED are flashing green. The Battery and or Power LEDs shine green or red depending on the power source and the battery status.
		If iCON gps 70 already on: Turns off iCON gps 70 when held for 2 s. ☞ The Position LED shines orange. The Tilt and the Storage LEDs shine red. RTK Base and RTK Rover LEDs shine green. The Connectivity LED shines blue or green, depending on the connectivity. The Battery and Power LEDs shine green or red depending on the battery status.

Function button

☞ All functions following described assume the iCON gps 70 is already on.

Button		Function
Function		Press and hold button for < 1 s. If the iCON gps 70 is in: • base mode: The iCON gps 70 switches to be in rover mode. • rover mode and in static mode: No action. • rover mode and in kinematic mode: The iCON gps 70 switches to be in base mode.

Button combinations

Button		Function
ON/OFF		Press and hold both buttons, release after 1 s.
Function		The current almanacs stored on the GNSS instrument are deleted and new almanacs are downloaded. The Position LED flashes orange quickly three times.
		Press and hold buttons for 5 s.
		The Memory LED flashes red quickly three times. If inserted, the SD card of the GNSS instrument is formatted. The Memory LED continues to flash red as the SD card is formatted.
		Press and hold buttons for 10 s.
		The System RAM on the GNSS instrument is formatted. Settings of all installed software will be deleted. After the formatting the System RAM, the GNSS instrument is turned off. Following LEDs flash simultaneously three times: • Position LED: Orange • Tilt LED: Red • RTK Base and RTK Rover LEDs: Green
		Press and hold buttons for 15 s.
		The System RAM on the GNSS instrument is formatted. Settings of all installed software will be deleted. The registry of the GNSS instrument is deleted. Windows CE and communication settings will be reset to factory defaults. After deleting the registry, the GNSS instrument is turned off. Following LEDs flash simultaneously three times: • Position LED: Orange • Tilt and Storage LED: Red • Connectivity LED: Blue • All other LEDs: Green
		Press and hold buttons for >15 s.
		The GNSS instrument switches back to last operation mode.

3.2 Operating Principles

Operating the instrument

The iCON gps 70 GNSS instrument is operated either by pressing its buttons (ON/OFF button, function button) or by the field controller.

Operation by buttons

The iCON gps 70 GNSS instrument is operated by pressing its buttons. Refer to "3.1 Keyboard" for a detailed description of the buttons and their function.

Operation by field controller

The iCON gps 70 GNSS instrument is operated by the field controller using the iCONstruct Field software. Refer to the User Manual of the field controller for a detailed description of the keys and their function.

Turn on iCON gps 70

To turn on the instrument press and hold the Power button for 2 s.

Turn off iCON gps 70

To turn off the instrument:

- press and hold the ON/OFF button for 2 s
- confirm to power down the instrument when exiting the software on the field controller

4 Operation

4.1 Equipment Setup

4.1.1 Raw data logging Setup

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.

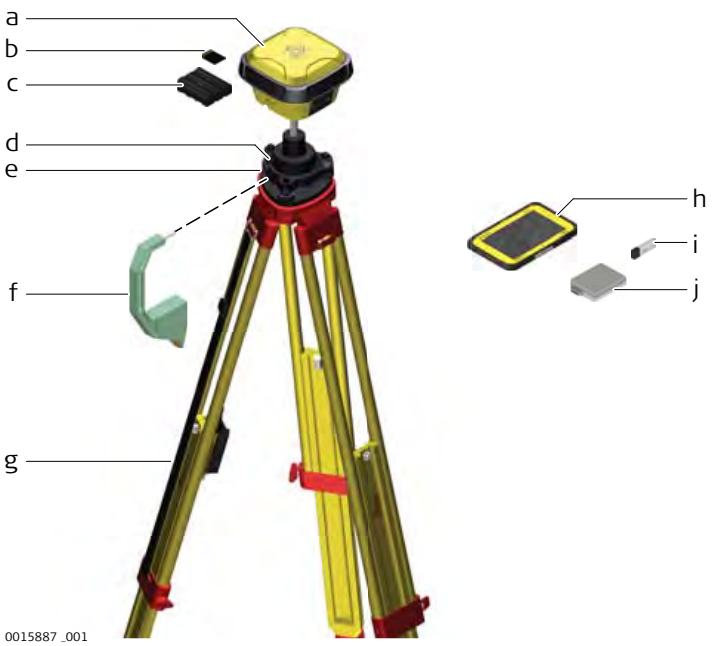
☞

- 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.

☞

Use an external battery such as GEB371 to ensure operation for a full day.

Equipment setup



a iCON gps 70 instrument
b SD card
c GEB331 battery
d GRT146 carrier
e Tribrach
f Height hook
g Tripod
h CC80 field controller
i USB Memory device
j CAB2 battery for CC80 Field Controller

Equipment setup step-by-step

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 iCON gps 70.
6.	Screw the iCON gps 70 onto the carrier.
7.	Check that the tribrach is still levelled.
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.

4.1.2 Setting up as a Real-Time Base

Use

The equipment setup described is used for real-time base stations with the need of optimal radio coverage. Raw observation data can also be collected for post-processing.

Description

The iCON gps 70 instrument can be programmed with the field controller before use which can then be omitted from the setup.

The connection between iCON gps 70 and the field controller is made via Bluetooth.

The radio antenna (GAT27 or GAT28) is directly mounted downwards facing at the antenna. Alternatively, the radio antenna can be mounted on the antenna arm (CA41) which clips to the GNSS antenna.

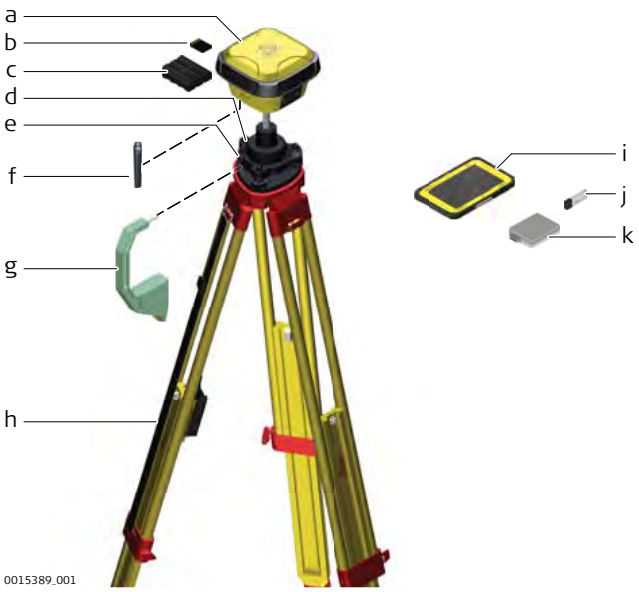
☞

- The GNSS 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.
- Standard radio is used throughout the instructions. Digital cellular phones can also be used but the setup can differ slightly.

☞

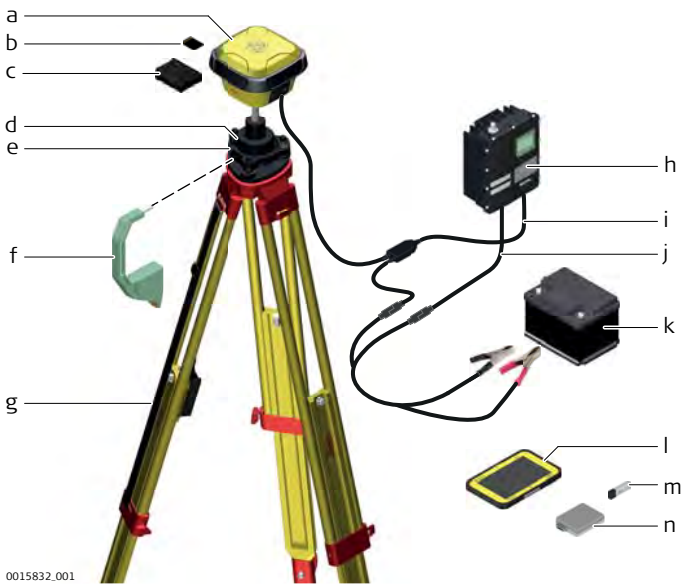
Use an external battery such as GEB371 to ensure operation for a full day.

Equipment setup - iCON gps 70 UHF



a	iCON gps 70 instrument with UHF modem	g	Height hook
b	SD card	h	Tripod
c	GEB331 battery	i	CC80 Field Controller
d	GRT146 carrier	j	USB Memory device
e	Tribrach	k	CBA2 battery for CC80 Field Controller
f	GAT27 (400 Mhz) or GAT28 (900 MHz) radio antenna, for UHF use only		

Equipment setup iCON gps 70 high power radio



a	iCON gps 70 instrument	i	GEV274 cable
b	SD card	j	Power cable delivered with the Satel high power radio
c	GEB331 battery	k	Car battery
d	GRT146 carrier	l	CC80 field controller
e	Tribrach	m	USB Memory device
f	Height hook	n	CBA2 battery for CC80 Field Controller
g	Tripod		
h	Satel high power radio		

Equipment setup step-by-step

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 battery into the iCON gps 70.
6.	Screw the iCON gps 70 onto the carrier.
7.	Check that the tribrach is still levelled.
8.	Connect the power cable to Satel high power radio and car battery.*
9.	Connect the GEV274 cable to the iCON gps 70, to the power cable connecting to the car battery and to the Satel high power radio.*
10.	Insert the data storage device and battery into the field controller.
11.	Connect the field controller to the instrument if necessary.
12.	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.
13.	Insert the height hook into the carrier.
14.	Measure the antenna height using the height hook.
15.	Press the ON/OFF button on the instrument for at least 2 s to switch on the instrument.
	* applicable only when using high power radio

4.1.3 Setting up as a Real-Time Rover

Use

The equipment setup is used for real-time rover with extended periods of use in the field.

Description

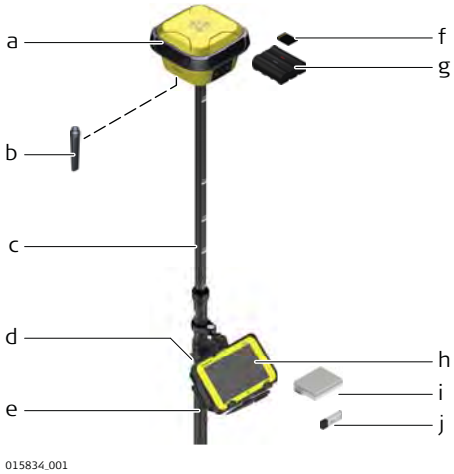
Connections are made to the GNSS antenna, radio antenna and field controller.

The field controller is fixed to the pole with the GHT63. Connection between the iCON gps 70 instrument and the field controller is made through Bluetooth.

☞

- The antenna is mounted directly using screw fitting. If using stub and adapter, procedures can vary slightly.
- When using the pole with stub, ensure that the antenna and the screw-to-stub adapter slide down the full length of the stub before tightening the locking ring. An incorrectly mounted antenna will have a direct effect on the results.
- Carbon fibre poles are used since they are recommended for automatic tilt compensated measurements. For applications without tilt compensation, they can be replaced with their aluminium equivalent without any changes to these instructions.
- Standard radio is used throughout the instructions. Digital cellular phones can also be used but the setup can differ slightly.

Real-time rover setup with iCON CC80



a	iCON gps 70 instrument
b	Radio antenna*
c	Pole
d	Pole clamp
e	Holder for Field Controller
f	SD card
g	Battery for the iCON gps 70
h	CC80 Field Controller
i	Battery for Field Controller
j	USB Memory device

* Radio antenna only used if UHF radio available

☞

Cellular modem available on the CC80 Field controller.

Real-time rover setup step-by-step

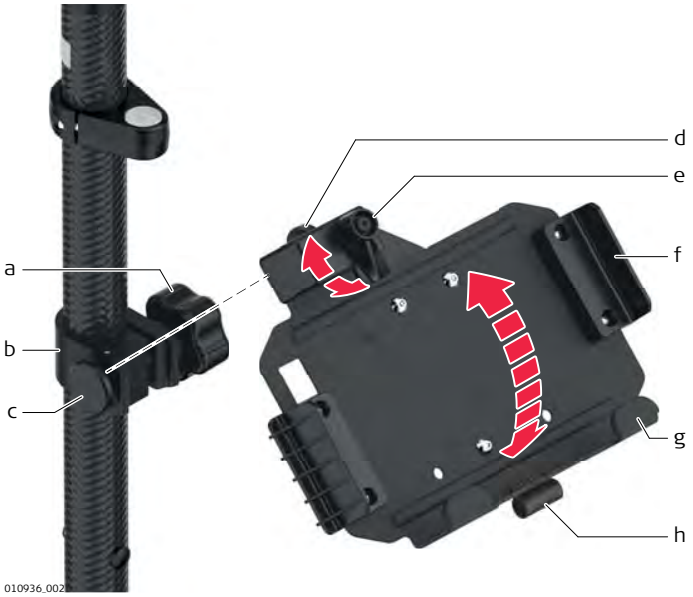
Setting Up the Equipment

1.	Insert the battery into the iCON gps 70 SmartAntenna.
2.	Screw iCON gps 70 SmartAntenna onto the top of the telescopic pole.
3.	Ensure that the compression lock is not clamped.
4.	Extend the telescopic pole and ensure that the snap-lock clicks into its position. The snap-lock ensures that there is no slipping of the telescopic pole.

5.	Clamp the compression lock. The compression lock maintains straightness.
6.	Fix the holder to the clamp with the tightening screw. Before tightening, ensure that the holder is at a comfortable working height and angle. This can be achieved by sliding the clamp along the pole and rotating the holder about the clamp. Tighten the tightening screw.
7.	Insert the battery into the field controller.
8.	Clip the field controller onto the holder and lock into position.
9.	Turn on the antenna and the controller.
10.	Run the data collection or stake-out application of the iCONstruct Field software
☞	Refer to the iCONstruct Field software manual for further information.

4.1.4 Holder and Clamp for Field Controller

Holder for iCON CC80



Clamp

- a Tightening screw
- b Pole clamp
- c Clamping bolt

Holder

- d Mounting arm
- e Locking lever
- f Mounting brackets (side)
- g Mounting brackets (bottom)
- h Holder for stylus

4.2 Batteries

4.2.1 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 chargers recommended by Leica Geosystems, it is not possible to charge the battery once the temperature is too high.
- For new batteries or batteries that have been stored for a long time (> three months), it is effectual to make only one charge/discharge cycle.
- For Li-Ion batteries, a single discharging and charging cycle is sufficient. We recommend carrying out the process when the battery capacity indicated on the charger or on a Leica Geosystems product deviates significantly from the actual battery capacity available.

Operation/ discharging

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

4.2.2 Battery for iCON gps 70

Change battery step-by-step

1.	Push the slide fastener of the battery compartment in the direction of the arrow with the open-lock symbol. Remove the cover.
2.	To remove the battery, push the retaining clip upwards. This releases the battery from its fixed position.
3.	Remove the battery.
4.	To insert the battery, slide the battery into the battery compartment with the battery contacts facing downwards. Push the battery into the compartment so that it locks into position.
5.	Insert the cover of the battery compartment into the compartment.
6.	Push the slide fastener in the direction of the arrow with the close-lock symbol.

4.3 Working with the Tilt Compensation

Description

The pole can be held in a slanting position over the point to be measured without checking the circular bubble on the pole.

Measurements are reliable and accurate even if the pole is not levelled as the tilt values are calculated by an Inertial Measurement Unit. Tilt values contain information about the 3D position of the pole.

The measurements are immune to magnetic disturbances as there is no magnetometer used.

Tilt compensation also works with Navigated and Code solutions. High accuracy positions are recommended to speed up the tilt compensation initialization.

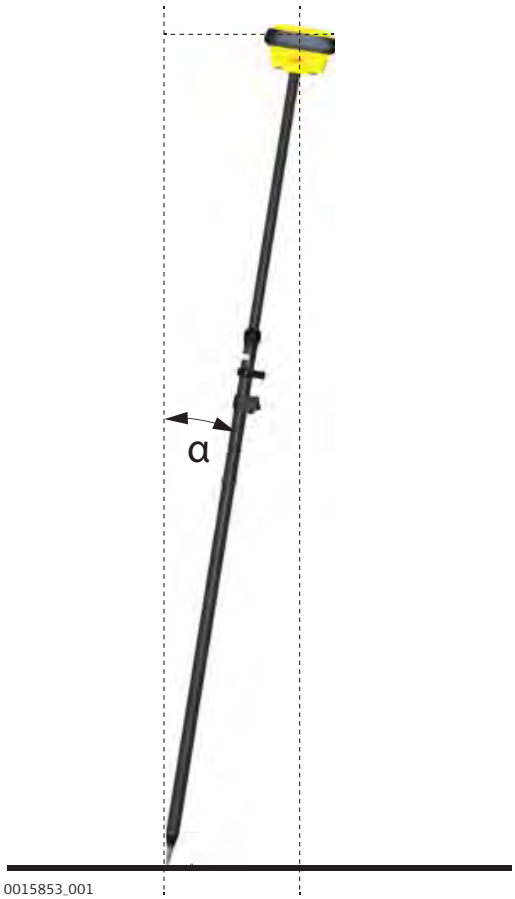
Tilt compensation is turned off when RINEX logging is on.

When measuring a point, the pole tip must be stable on the point while the pole should be in slight movement. Tilt compensation is indicated by an icon and the Tilt LED and is maintained by natural pole movement, for example while moving to the next point to be measured.

Advantages:

- No need to level the pole
- Faster surveying procedure

Diagram



α **Tilt**

Tilt compensation step-by-step

☞ An iCON gps 70 must be configured as real-time rover and connected to a CC80.

☞ Tilt can be configured either:
- in the profile,
- in edit profile mode, or
- in the status bar within each measurement application.

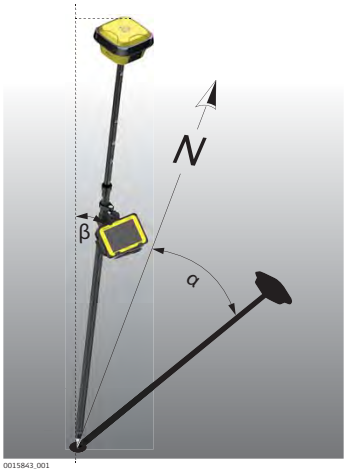
☞ Move the antenna for initialisation. Walking to the survey mark is sufficient. An icon indicates that the tilt compensation is being applied.

☞ The LEDs on the iCON gps 70 and the green background of the position icon indicate when a tilt compensated measurement is possible. Refer to "4.4 LED Indicators on iCON gps 70".

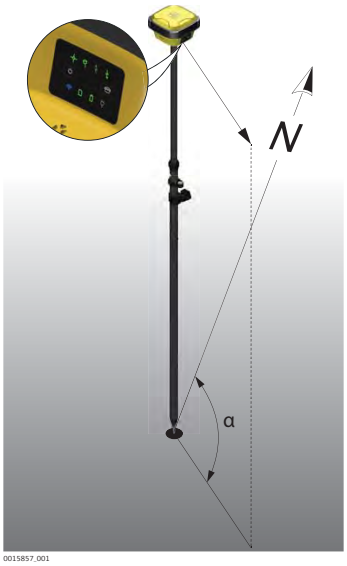
For an overview of the current position in the survey area

1. Within the measurement application click on the position icon in the status bar.

2. **Current antenna position**, **Tiltpage**
The fields are updated according to the setting for **antenna position update rate** in **Screen, Audio & Text Input**.



α Direction of tilt
β Tilt

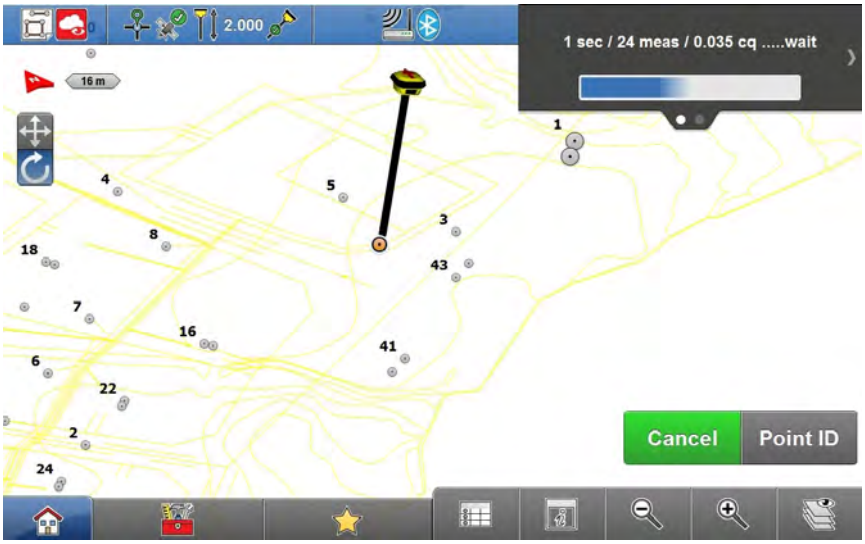


α Heading

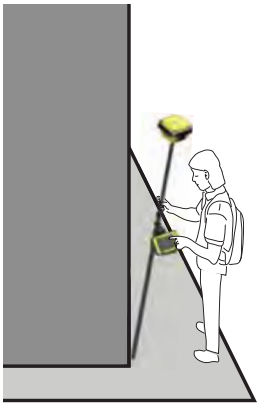
3. Use the 2D or 3D viewer with dxf data or a background image:

Measure points

1. **Leica iCONstruct Field - Home: Measure**:
The position of the tilted iCON gps 70 is shown in both, 2D and 3D. The measure method can be defined from the status bar in both cases.



Application example:



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Stake points

1. **Leica iCONstruct Field - Home**: **Stake points**
   The position of the tilted iCON gps 70 is shown in both, 2D and 3D view.

2. Stake out the point. The values are valid for the tip of the pole.

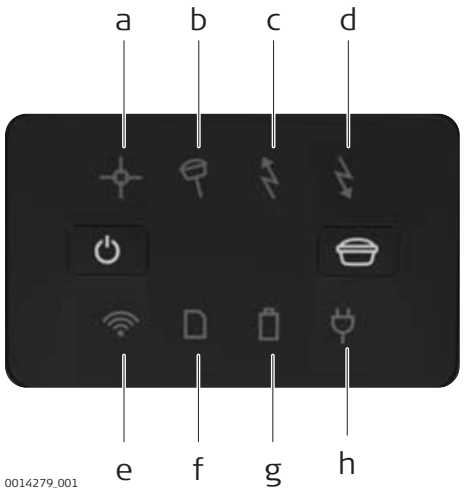
4.4 LED Indicators on iCON gps 70

LED indicators

Description

The iCON gps 70 instrument has **L**ight **E**mitting **D**iode indicators. They indicate the basic instrument status.

Diagram



a Position LED
b Tilt LED
c RTK Base LED
d RTK Rover LED
e Connectivity LED
f Storage LED
g Battery LED
h Power LED

☞ For the non tilt variant the tilt LED b) will always be turned off.

Description of the LEDs

LED	LED Status	Status of the Instrument
Position LED	off	No satellites are tracked or iCON gps 70 is switched off.
	flashing orange	Satellites are tracked, a position is not yet available.
	orange	A navigated position is available.
	flashing green	A code-only position is available. SmartLink is converging. SBAS correction is used.
	green	A fixed RTK position is available, including xRTK. SmartLink has converged.
Tilt LED	off	iCON gps 70 is not powered. Tilt functionality is unavailable or switched off.
	green	Tilt compensation is activated, compensation values are stored. Tilt compensation is being applied.
	red	Tilt compensation is activated, but currently not being applied
	flashing red	Undefined problem with tilt compensation
RTK Base LED	off	iCON gps 70 is in RTK rover mode or iCON gps 70 is switched off.
	green	iCON gps 70 is in base mode, no RTK data is transmitted

LED	LED Status	Status of the Instrument
	flashing green	iCON gps 70 is in base mode, RTK data is transmitted to the selected port. Rate according to RTK base setting.
RTK Rover LED	off	iCON gps 70 is in RTK base mode or iCON gps 70 is switched off.
	green	iCON gps 70 is in rover mode, no RTK data is received via selected port.
	flashing green	iCON gps 70 is in rover mode, RTK data is received via selected port. Rate according to received correction data.
Connectivity LED	off	iCON gps 70 is not powered or module is not ready.
	green	Bluetooth is in data mode and ready for connecting.
	blue	Bluetooth has connected.
Storage LED	off	No SD card is inserted or iCON gps 70 is switched off.
	green	SD card is inserted but no raw data is being logged.
	flashing green	Raw data is being logged. More than 50 MB of memory space is available on the SD card.
	red	Less than 50 MB of memory space is available on the SD card.
	flashing red	Raw data is being logged but less than 50 MB of memory space left on the SD card.
	fast flashing red	SD card is full or no SD card is inserted while raw data logging is configured. No raw data can be logged.
Battery LED	off	Battery is not connected, flat or iCON gps 70 is switched off.
	green	Power is 21% - 100%.
	flashing green	Battery is inserted. External power is connected.
	red	Power is 20% - 11%. The remaining time for which enough power is available depends on the type of survey, the temperature and the age of the battery.
	flashing red	Battery is inserted with less than 20% power remaining. External power is connected.
	fast flashing red	Power is low (<10%).
Power LED	off	External battery is not connected or flat or no external power supply is connected or iCON gps 70 is switched off.
	green	External power is 21% - 100%.
	red	External power is 20% - 11%.

LED	LED Status	Status of the Instrument
	flashing red	External power is low (< 10%).

4.5 Guidelines for Correct Results with GNSS Surveys

Undisturbed satellite signal reception

Successful GNSS surveys require undisturbed satellite signal reception, especially at the instrument which serves as a base. Set up the instrument in locations which are free of obstructions such as trees, buildings or mountains.

Steady instrument for static surveys

For static surveys, the instrument must be kept perfectly steady throughout the whole occupation of a point. Place the instrument on a tripod or pillar.

Centred and levelled instrument

Centre and level the instrument precisely over the marker.

Tilt compensation for kinematic surveys

For stakeout and surveys with instantaneous point measurement, auto points or point measurements with short occupation time, tilt compensation is applied. The pole tip can be placed on the marker, while the antenna does not have to remain level and steady. The status of the tilt compensation is indicated by an icon and the Tilt LED.

5 Care and Transport

5.1 Transport

Transport in the field

When transporting the equipment in the field, always make sure that you

- either carry the product in its original container,
- or carry the tripod with its legs splayed across your shoulder, keeping the attached product upright.

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, 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, 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 "6 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.

5.3 Cleaning and Drying

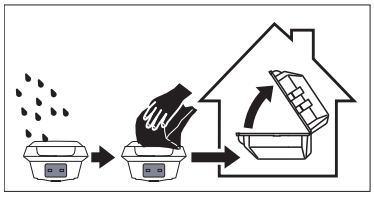
Product and Accessories

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

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.

6 Technical Data

6.1 iCON gps 70 Technical Data

6.1.1 Tracking Characteristics

Satellite reception

Multi-frequency

Instrument channels

☞ Depending on the satellite systems and signals configured, a maximum number of 555 channels is allocated.

Supported signals

System	Signal
GPS	L1, L2, L2C, L5
GLONASS	L1, L2, L3*
Galileo	E1, E5a, E5b, AltBOC, E6*
BeiDou	B1, B2, B3*

* Believe to comply, but subject to availability of BeiDou **I**nterface **C**ontrol **D**ocument and Galileo commercial service definition.

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

6.1.2 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 Leica Infinity 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.

Differential phase in post-processing

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

Tilt

Tilt compensated in real-time

Additional Hz pole tip uncertainty:

Typically 5 mm + 1.5 mm/° for topographic points (not for static control points)

6.1.3 Technical Data

Dimensions [mm]

L = 176.2, W = 176.2, H = 108.8

Weight [kg]

1.240*

* Instrument weight without battery and SD card

Recording

Data (Leica GNSS raw data and RINEX data) can be recorded on the SD card.

1 GB is sufficient for over 1 year of raw data logging based on logging every 15 s from an average of 15 satellites.

Power

Power consumption:	Radio excluded: 3.5 W typically, 300 mA (with external battery), 320 mA (with internal battery)
External supply voltage:	Nominal 12 V DC (⎓, GEV71 car battery cable to a 12 V car battery), voltage range 12 V-24 V DC

Internal battery

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

* Operating time depends on use of wireless communication devices.

External battery

Type	Battery	Voltage	Capacity
GEB371	Li-Ion	13 V	16.8 Ah

Operating times

The given operating times are valid for

- iCON gps 70: instrument; one fully charged GEB331 battery.
- Room temperature; operating times will be shorter when working in cold weather.

Type		Operating time
Static		8 h continuously
Rover	with cellular modem*	6 h continuously
	with radio modem	7 h continuously
Base	with cellular modem*	6 h continuously
	with radio modem 1 W output power	5 h continuously

* Cellular modem only available on the controller

Electrical data

Type	iCON gps 70
Voltage	-
Current	-
Frequency	

Type	iCON gps 70
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 (LNA)	Typically 22 dB
Noise Figure	Typically < 2 dB

Environmental specifications

Temperature

Type	Operating temperature [°C]	Storage temperature [°C]
Instrument	–40 to +65	–40 to +85
Leica SD cards	–40 to +85	–40 to +100
GEB331	–20 to +60	–40 to +70

Protection against water, dust and sand

Type	Protection
Instrument	IP66 & IP68 (IEC 60529), dust tight
	Protected against continuous immersion in water Tested for 2 hours in 1.40 m depth
GEB331	IP54 (IEC60529), dust protected
	Protection against splashing water from any direction. Humidity max. 95% non condensing.

Humidity

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

Vibration/Shock

Type	iCON gps 70 SmartAntenna
Vibration	MIL Std. 810G CHG1, Figure 514.7 C-4, IEC 60068-2-6, 5g, 5–500 Hz
Shock	40 g - 6 msec; compliance IEC 60068-2-27, no loss of lock to satellite signal when used on a pole set-up and submitted to pole bumps up to 150 mm

Type	iCON gps 70 SmartAntenna
Drops Withstands	1.2 m drop onto hard surfaces
Topple over Withstands	Topple over from a 2 m pole onto hard surfaces

6.2 Conformity to National Regulations

6.2.1 iCON gps 70

Conformity to national regulations

- FCC Part 15 (applicable in US)
- Hereby, Leica Geosystems AG, declares that the radio equipment type iCON gps 70 is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EC and other applicable European Directives. The declaration of conformity can be consulted at http://www.leica-geosystems.com/ce.
- This Class 2 equipment may be operated in: AT, BE, BG, CA, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PL, PT, RU, RO, SE, SI, SK, US.

CE Class 2 equipment according European Directive 2014/53/EC (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:
  - France
  - Italy
  - Norway (if used in the geographical area within a radius of 20 km from the centre of Ny-Ålesund)

- The conformity for countries with other national regulations not covered by the FCC part 15 or European directive 2014/53/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 (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).

Frequency band

Type	Frequency band [MHz]
iCON gps 70	1227.60 1246.4375–1254.3 1575.42 1602.5625–1611.5
iCON gps 70, Bluetooth	2402–2480
iCON gps 70, Radio	403–473 (TR4)/902–928 (TR9)

Output power

Type	Output power [mW]
GNSS	Receive only
Bluetooth	5

Type	Output power [mW]
Radio	1000

Antenna

Type	Antenna	Gain [dBi]
GNSS	Internal GNSS antenna element (receive only)	-
Bluetooth	Internal Microstrip antenna	2 max.
UHF	External antenna	0

6.2.2 Dangerous Goods Regulations

Dangerous Goods Regulations

Many products of Leica Geosystems are powered by Lithium batteries.

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

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

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

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

7 Software Licence Agreement

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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Appendix A Pin Assignments and Sockets

Description

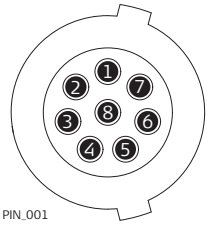
Some applications require knowledge of the pin assignments for the instrument ports.

In this chapter, the pin assignments and sockets for the instrument ports are explained.

Instruments ports at the underside

a SMB-connector for external UHF antenna, only for models with UHF radio
b Port 1 (Power, USB and serial)

Pin assignments for port P1



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	GPIO	RS232, general-purpose signal	In or out

869778-1.0.0en

Original text (869778-1.0.0en)
Published in Switzerland

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- when it has to be **right**

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