Leica ScanStation P20

User Manual

Version 1.1
English

- when it has to be **right**

Leica Geosystems

Introduction

Purchase

Congratulations on the purchase of a ScanStation P20 series instrument.

This manual contains important safety directions as well as instructions for setting up the product and operating it. Refer to "4 Safety Directions" for further information.
Read carefully through the User Manual before you switch on the product.

Product identification

The type and serial number of your product are indicated on the type plate.
Enter the type and serial number in your manual and always refer to this information when you need to contact your agency or Leica Geosystems authorised service workshop.

Type: _____

Serial No.: _____

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 herein.

DANGER, **WARNING**, **CAUTION** and **Notice** are standardized 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 table below 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.

Trademarks

- Windows is a registered trademark of Microsoft Corporation.
- *Bluetooth*® is a registered trademark of Bluetooth SIG, Inc.

All other trademarks are the property of their respective owners.

Table of Contents

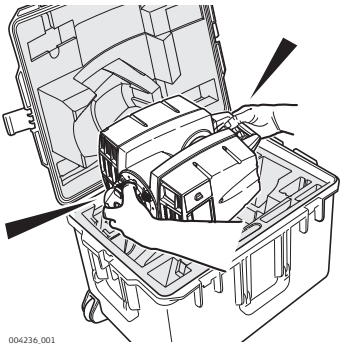
In this manual

1 Description of the System

1.1 Packing / Unpacking the Instrument

Packing and Unpacking

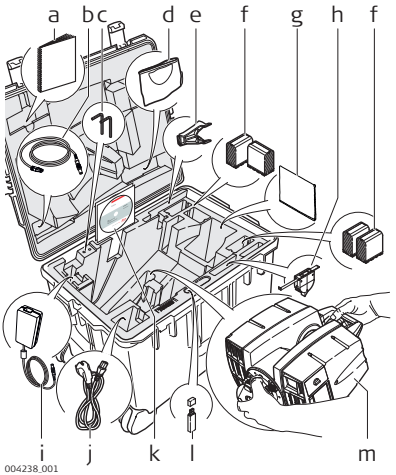
When in its transport container, the ScanStation P20 can sit in either a face-up or face-down position.



To take the instrument out of its container, grasp the handle and the base of the instrument, and lift. Use caution due to the weight of the instrument (12 kg).

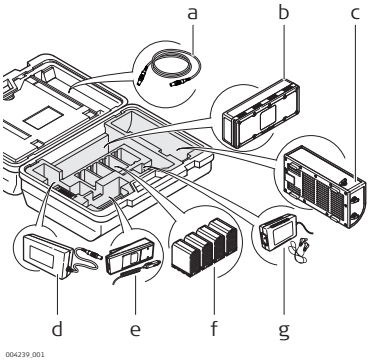
1.2 Container Contents

Transport Container for ScanStation P20



a) ScanStation P20 User Manual
b) GEV228 Ethernet cable
c) Allen keys
d) Protection cover
e) GHT196 distance holder for height meter
f) GEB242 internal batteries
g) Cleaning tissue
h) GHM008 height meter
i) GKL123 AC power supply (not supplied with the system)
j) Power cable, country specific
k) ScanStation P20 System CD-ROM
l) USB memory stick, not supplied with the system
m) ScanStation P20

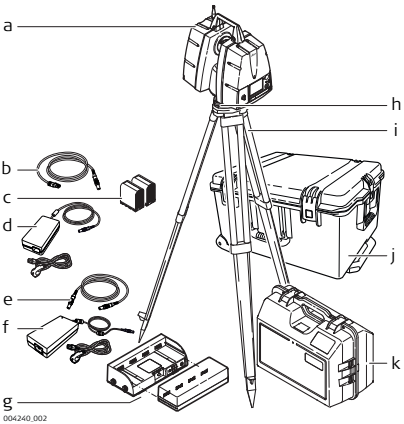
Transport Container for ScanStation P20 accessories



a) GEV259 power cable.
b) GEB271 external battery pack
c) GKL271 charging station
d) GEV225 AC power supply for GKL271 charging station
e) GKL212 basic charger including car adapter cable
f) GEB242 internal batteries
g) AC/DC adapter for basic charger with daisy chain cable

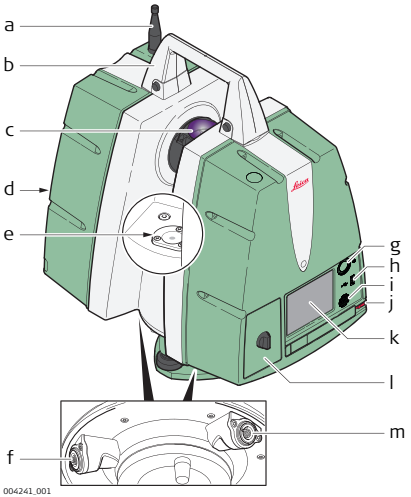
1.3 System Components

System components ScanStation P20



a) ScanStation P20
b) GEV228 Ethernet cable
c) GEB242 internal batteries
d) GKL123 AC power adapter
e) GEV259 power cable
f) GEV225 AC power supply for GKL271
g) GKL271 charging station and GEB271 battery pack
h) Tribrach
i) Tripod
j) Transport container for ScanStation P20
k) Transport container for ScanStation P20 accessories

Components of the ScanStation P20

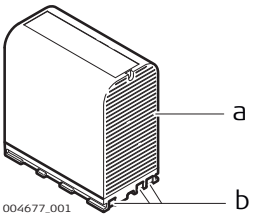


a) Antenna
b) Removable handle
c) Rotating mirror (laser and camera aperture)
d) Battery compartment B
e) Circular level
f) Socket for power supply, 5 pin female with blue bend protection
g) ON/OFF button
h) USB socket
i) Loudspeaker
j) Stylus
k) Touchscreen
l) Battery compartment A
m) Ethernet socket, 8 pin female with grey bend protection

1.4 Power Concept

1.4.1 Batteries

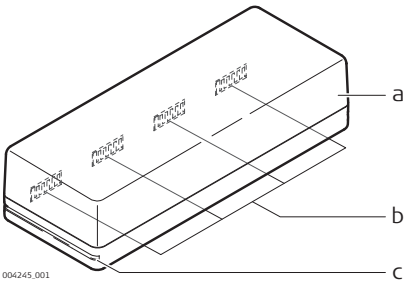
GEB242 Li-Ion internal battery



a) GEB242 internal battery
b) Electrical contacts

GEB271 battery pack

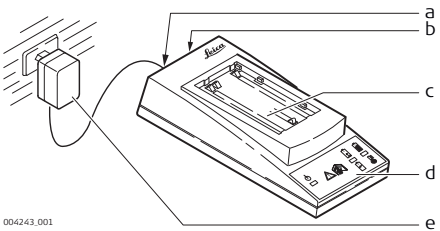
The GEB271 battery pack can only be used together with the GKL271 charging station.



a) Battery pack
b) Battery connector interface, female
c) Guide rail for fitting with charging station

1.4.2 Chargers and Power Supplies

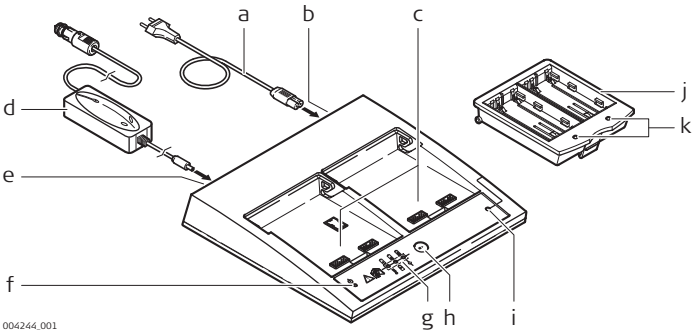
GKL212 basic charger



a) Mains cable socket on the charger
b) Socket for daisy chain cable
c) Charging bay for battery
d) Capacity and error indicators
e) Mains cable, country specific

For more details refer to the GKL212 User Manual.

GKL221 professional charger

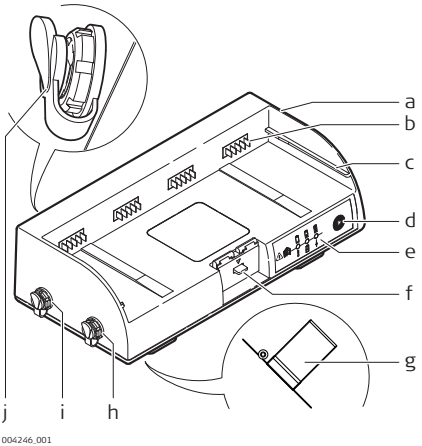


a) Mains cable, country specific
b) Mains cable socket on the charger
c) Adapter bays I and II for the GDI221 battery adapter
d) Vehicle adapter GDC221 - optional
e) Vehicle cable socket on the charger
f) Function indicator
g) Capacity and error indicators
h) Selection button
i) Status indicator for external battery connection
j) GDI221 battery adapter
k) Battery status indicators

☞ For more details refer to the GKL221 User Manual.

GKL271 charging station

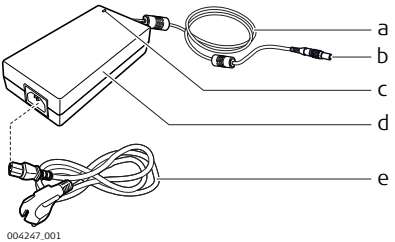
GKL271 charging station for the GEB271 battery pack.



a) Charging station
b) Battery connector interface, male
c) Guide rail for fitting with battery pack
d) Select button
e) Power and error indicators
f) Lock/unlock button
g) Clip for tripod mount
h) Port P2 for power output
i) Port P1 for power output
j) Port P3 for power input

GEV225 AC power supply

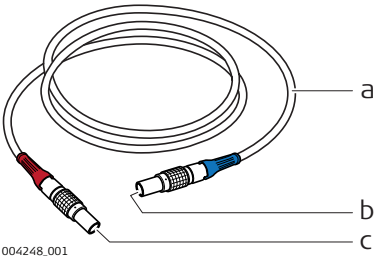
GEV225 AC power supply for the GKL271 charging station.



a) AC power supply cable
b) Connector 3pin, male with blue bend protection
c) Power indicator LED
d) AC power supply
e) Mains power cable, country specific

GEV259 power cable for ScanStation P20

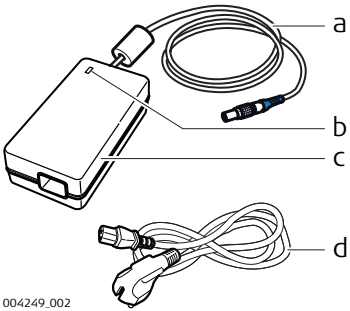
Connects ScanStation P20 to GKL271 charging station.



a) Cable
b) Connector 5-pin, male with blue bend protection
c) Connector 4-pin, male with red bend protection

GKL123 AC power supply

AC power supply for the ScanStation P20.

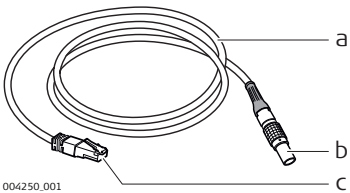


a) Cable and connector 5 pin, male with blue bend protection
b) Power indicator LED
c) GKL123 AC power supply unit
d) Mains power cable, country specific

1.5 Other Components

GEV228 Ethernet cable

Connects the ScanStation P20 to an Ethernet network or directly to a computer.

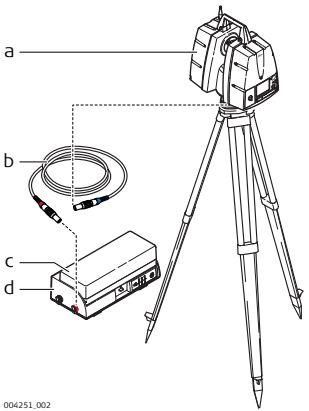


a) Cable
b) Connector 8pin, male with grey bend protection
c) RJ45 Ethernet standard connector

1.6 Cabling

Cabling for ScanStation P20 with GEB271 battery pack

The following illustration shows the correct cabling to connect the ScanStation P20 to a GEB271 battery pack.

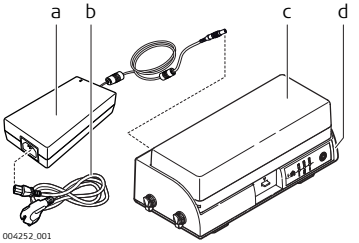


a) ScanStation P20
b) GEV259 power cable
c) GEB271 battery pack
d) GKL271 charging station

Power supply for GKL271 charging station

The following illustration shows the charging station setup.

☞ See "Hazards of Use" for additional safety information.



a) GEV225 AC power supply
b) Mains power cable, country specific
c) GEB271 battery pack
d) GKL271 charging station

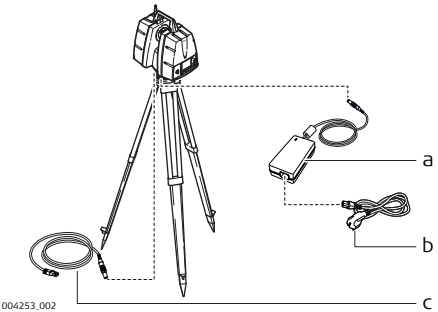
☞ The GEV225 AC power supply cannot be used as an AC power supply for the scanner. It is designed exclusively for powering the charging station and must not be connected to the instrument.

☞ The GEB271 battery pack can only be used together with the GKL271 charging station.

Cabling for ScanStation P20 with GKL123 AC power supply

The following illustration shows the correct cabling to connect the ScanStation P20 to a GKL123 AC power supply.

See "Hazards of Use" for additional safety information.



a) GKL123 AC power supply
b) Mains power cable, country specific
c) GEV228 ethernet cable

The GKL123 AC power supply cannot be used as an AC power supply for the battery charging station. It is designed exclusively for powering the ScanStation P20 and must not be connected to any other device.

1.6.1 About Chargers and Power Supply

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

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

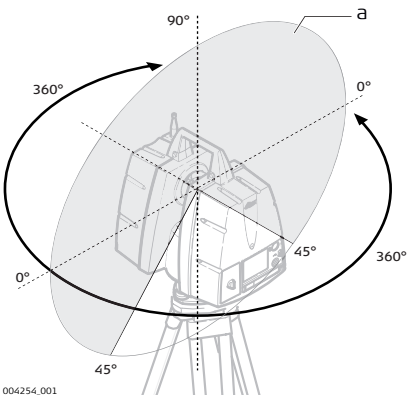
WARNING If unit is not connected to ground, death or serious injury can occur.

Precautions:
To avoid electric shock power cable and power outlet must be grounded.

1.7 Field of View (FoV)

Field of View

The instrument has a rotating scan-head and a rotating mirror that covers a 360° x 270° field of view (FoV).

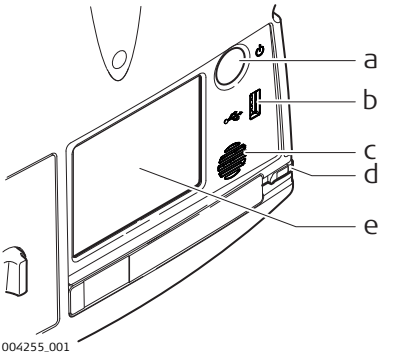


a) Scanning laser beam

1.8 User Interface

1.8.1 Face Plate

Overview of face plate



a) ON/OFF button
b) USB socket
c) Loudspeaker
d) Stylus
e) Touchscreen user interface

1.8.2 Screen

Screen overview

a) Time
b) Caption
c) Title bar
d) Screen area
e) Message bar
f) Status bar
g) Escape button
h) Menu icon
i) SHIFT button
j) Soft keys

Element	Description
Time	The current local time is shown.
Caption	Shows location in menu system.
Title bar	Shows name of current screen.
Screen area	Working area of the screen.
Message bar	Shows messages.

Element	Description
Status bar	Shows current status information of the instrument.
Escape button	Returns to the previous screen.
Menu icon	Selecting menu icons opens submenus.
SHIFT button	Displays the second level of soft keys.
Soft keys	Commands can be executed with the soft keys.

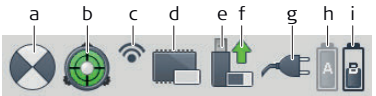
1.8.3 Icons

Status bar icons

Status bar icons display status information of the instrument. Their appearance changes accordingly to the system status.

Overview of status bar icons

Clicking a status icon gives direct access to a detailed status description.



a) Active target type
b) Dual-axis compensator
c) WiFi status
d) Internal hard disc
e) External memory
f) Status of external memory
g) External battery / AC power supply
h) Internal battery **A**
i) Internal battery **B**

Internal battery A indicates the status of the battery in compartment **A** which is located at the same side cover as the touchscreen.

Internal battery B indicates the status of the battery in compartment **B** at the opposite side cover without a screen.

Icon set

Icon		Description
Active target type		HDS black/white target
		HDS sphere target
		User defined target
Dual-axis compensator		On and levelled
		Off
		On but out of range

Icon		Description
WiFi		Onboard WiFi adapter on and connected.
		Onboard WiFi adapter off.
		Onboard WiFi adapter on.
Internal hard disc		Empty
		13% memory used
		25% memory used
		38% memory used

Icon		Description
		50% memory used
		63% memory used
		75% memory used
		88% memory used
		Full
Status of external memory		Ready to be removed.
		Do not remove!

Icon		Description
External memory		Empty
		17% memory used
		33% memory used
		50% memory used
		67% memory used
		83% memory used
		Full

Icon		Description
External battery /AC power supply		External battery connected
		AC power supply connected

Icon		Description
Internal batteries A/B	**Symbols for the currently used battery:**	
		Empty
		20% capacity
		40% capacity
		60% capacity
		80% capacity
		Full

Icon	Description
	Symbols for the currently unused battery:
	Empty
	20% capacity
	40% capacity
	60% capacity
	80% capacity
	Full

1.8.4 Operating Principles

Keyboards on touchscreen

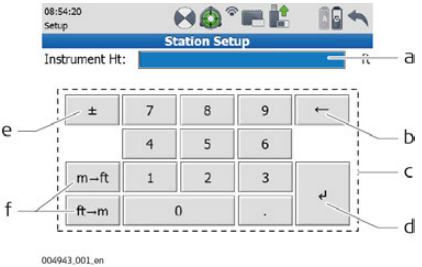
The system offers two different virtual keyboard layouts for user input:

- When an **alphanumeric input field** is selected with the stylus, the keyboard will appear in alphanumeric layout. This layout offers letters, numbers and special characters.
- When an **numeric input field** is selected with the stylus, the keyboard will appear in numeric layout. This layout offers numbers and some special characters.

Keyboard layouts **Alphanumeric layout:**

a) Input field
b) Alphanumeric keypad
c) Backspace
d) Enter
e) Toggle between letters and numbers/special characters
f) Shift - Toggle between lower case and upper case characters

Numeric layout:



a) Input field
b) Backspace
c) Numeric keypad
d) Enter
e) Toggle between positive and negative number
f) Unit calculator (optional when distance units **ft** or **fi** are selected)

2 Operation

2.1 Instrument Setup

2.1.1 General Information

Use the tripod

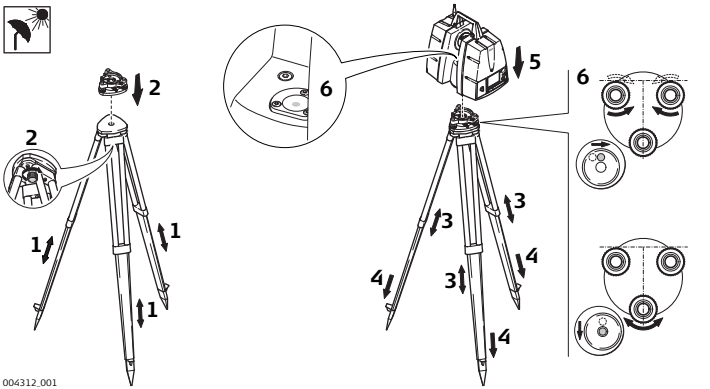
The instrument should always be set up on its tripod. Using the tripod specified for the scanning system guarantees maximum stability during scanning operations.

Always set up the instrument on its tripod. Do not set up the instrument directly on the ground for scanning operations.

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

2.1.2 Tripod Setup

ScanStation setup step-by-step



Shield the instrument from direct sunlight and avoid uneven temperatures around the instrument.

Step	Description
1.	Extend the tripod legs to allow for a comfortable working posture. Tighten the screws at the bottom of the legs.
2.	Place the tribrach on the tripod and secure it with the central fixing screw.
3.	Set up the tripod so that the tripod plate is as horizontal as possible.
4.	Push the tripod legs firmly into the ground.
5.	Place the instrument on the tribrach and secure it with the locking knob of the tribrach.
6.	Level up the instrument using the instrument's circular level. Turn two of the foot screws together in opposite directions. The index finger of your right hand indicates the direction in which the bubble should move. Now use the third foot screw to centre the bubble.

2.1.3 Setup Over a Benchmark with the Internal Laser Plummet

Description

This topic describes an instrument setup over a marked ground point using the laser plummet. Geo-referencing of the ScanStation P20 is established by setting up over a known or assumed control point, with optional reference target measurement to set the azimuth direction, and establishing a local or global coordinate system. The ScanStation P20 allows you to traverse, resect or free-station. Known azimuth or known back sight measurements can be observed.

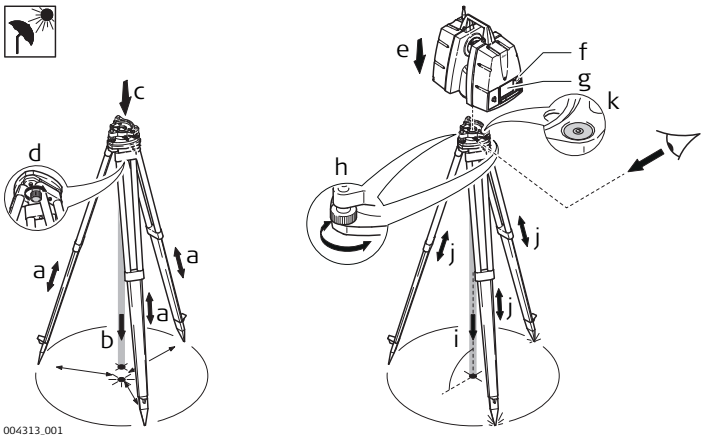
☞ It is always possible to set up the instrument without the need for a marked ground point.

☞ With the dual-axis compensator enabled, the data scanned with ScanStation P20 is corrected automatically.

About the plummet:

- The laser plummet described in this topic is built into the vertical axis of the instrument. It projects a red spot onto the ground, making it much easier to centre the instrument.
- The laser plummet cannot be used in conjunction with a tribrach equipped with an optical plummet.

Setup with Laser Plummet step-by-step

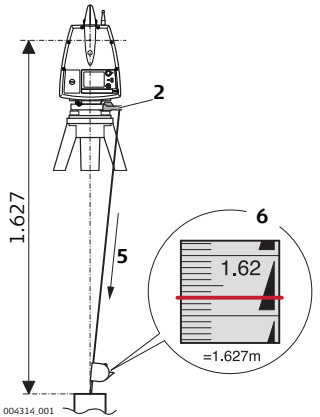


Shield the instrument from direct sunlight and avoid uneven temperatures around the instrument.

Step	Description
1.	Extend the tripod legs to allow for a comfortable working posture (**a**). Position the tripod approximately over the marked ground point, centring it as well as possible (**b**).
2.	Place the tribrach on the tripod (**c**) and secure it with the central fixing screw (**d**).
3.	Place the instrument on the tribrach (**e**) and secure it with the tribrach's locking knob.
4.	Turn on the instrument by pressing the ON/OFF button (**f**). Go to **Status, Level and Laser Plummet, Plummet** and activate the laser plummet (g).
5.	Move the tripod legs (**a**) and use the tribrach footscrews (**h**) to centre the plummet (**i**) over the ground point.
6.	Adjust the tripod legs (**j**) to level the circular level (**k**).
7.	By using the electronic level (**Status, Level and Laser plummet, Level**) turn the tribrach footscrews (**h**) to precisely level the instrument.
8.	Centre the instrument precisely over the ground point (**i**) by shifting the tribrach on the tripod plate.
9.	Repeat steps 7. and 8. until the required accuracy is achieved.

2.1.4 Instrument Height

ScanStation height setup step-by-step



To get an accurate height measurement use the GHM008 instrument height meter in conjunction with the GHT196 distance holder. Both are included with the scanner.

Step	Description
1.	Place tripod centrally over the ground point, level instrument.
2.	Click GHT196 distance holder to tribrach. It must "snap" onto the cover over an adjusting screw.
3.	Unfold measuring tongue, pull out tape measure a little.
4.	Insert GHM008 instrument height meter in the distance holder and attach.
5.	Swivel measure in the direction of the ground point, pull out until the tip of the measuring tongue touches the point on the ground, keep under tension and do not allow to sag, clamp if necessary.
6.	Read height of the instrument (ground - tilt axis) in the reading window at the red marking (in the example 1.627 m).

Note:

- For detailed information about the GHM008 instrument height meter and GHT196 distance holder refer to the GHM008/GHT196 user manual which is delivered with these items.
- The tilt axis height of the ScanStation P20 is 250 mm. Take care to use the GHM008 which has a special scale to measure the height of instruments with a tilt axis height of 250 mm. Do not use a tape with any other scale.

- Alternatively the instrument height can be measured with a common, 1:1 scaled measuring tape from the point on the ground to the little notch under the red Leica logo at both side covers of the scanner. This distance will then be from the ground point to the tilt axis.

2.2 Power Supply

2.2.1 Operating Principles

About the battery pack

As the battery pack contains rechargeable cells it is always recommended to handle the battery and charging station with care.

- Observe the LEDs on the charging station before and after the charging process, as well as during operation. For details please refer to section "About the Charger".
- When port P3 is connected for charging, both ports P1 and P2 cannot be used for operation: no simultaneous charging and discharging.
- When port P1 is connected for operation, port P2 cannot be used for operation and vice versa: no simultaneous operation of two ports.
- The ScanStation P20 can only be powered via P2.

2.2.2 Battery and Charger Safety

General

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

WARNING

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

Precautions:

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

Charging / first-time use

- The battery must be charged prior to using it for the first time because it is delivered with an energy content as low as possible.
- The permissible temperature range for charging is between 0°C 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 if the temperature is too high.
- For new batteries or batteries that have been stored for a long time (> three months), it is effectual to make only one charge/discharge cycle.
- For Li-Ion batteries, a single discharging and charging cycle is sufficient. We recommend carrying out the process when the battery capacity indicated on the charger or on a Leica Geosystems product deviates significantly from the actual battery capacity available.

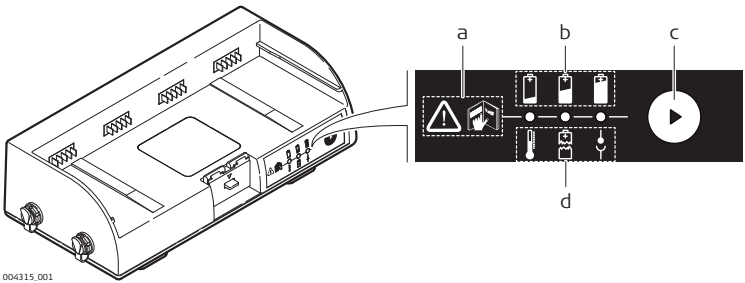
Operation / Discharging

- The batteries can be operated from -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.

2.2.3 Charging Station

About the Charger

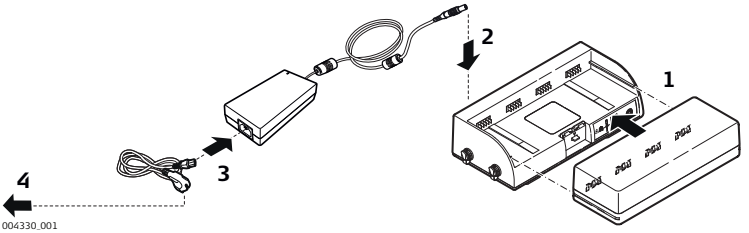
On the charging station's front side are the Select button and LEDs for capacity and error indication.



a) Safety directions to read this manual
b) Capacity indication
c) Select button
d) Error indication

The LEDs show the actual charge/discharge status or indicate an error status. During charging, the LEDs always show the current status.
While discharging or in standby, the status will only be shown for about 10 seconds after pressing the select button.

Charging the battery



1) Slide the battery pack into the charging station. When connected, the three LEDs light up for 1 sec.
2) Plug the AC power supply cable of the AC power supply into port P3 of the charging station.
3) Plug the power cable into the AC port of the AC power supply.
4) Plug the power cable into a socket outlet. The charging process starts automatically when all parts are plugged in. The battery is fully charged when all three LEDs are flashing green.
5) After charging is completed, remove the power cable from the socket outlet.
6) Remove the battery pack from the charging station by moving the lock/unlock-button.

Charger handling advice

- After a maximum of six hours the charging process is terminated.
- Properly remove the wall plug first, before removing the Lemo connector.
- Do not tamper with the power supply or charger during charging or usage.
- Do not put flammable objects near the power supply during charging or usage.

Explanation of the symbols used in this chapter

Symbol	Description
	LED off.
	LED permanently on.
	LED flashing.

Capacity indicators, green LEDs

Symbol	Description
	Battery fully charged.
	Battery capacity > 80%.
	Battery capacity > 50%.
	Battery capacity > 10%.
	Battery capacity < 10%.

Error indicators, red LEDs

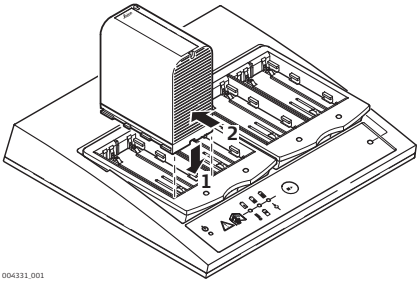
LED	Description	Measure to take
	Charging outside temperature range 0°C to 45°C	Use within specified temperature range only. LED keeps flashing until problem is resolved.
	Discharging outside temperature range -20°C to +55°C	Use within specified temperature range only.
	Battery defect	Disconnect all cables and other equipment, check contacts and reconnect. If problem persists, contact Leica Geosystems or your local agency.
	Charging error	Disconnect all cables and other equipment, check contacts and reconnect. If problem persists, contact Leica Geosystems or your local agency.

Additional status indicators

- When the GEB271 battery pack is inserted into the GKL271 charging station, the three LEDs light green for one second.
- When the GEV225 AC adapter is connected to the GKL271 charging station for charging, the three LEDs light green for one second and then show the actual battery level.

If the charger indicates an error when the battery is connected, try connecting a different battery to find out whether the fault lies with the battery or with the charging station. If the problem persists, contact Leica Geosystems or your local agency.

GKL221 professional battery charger



Insert the battery:

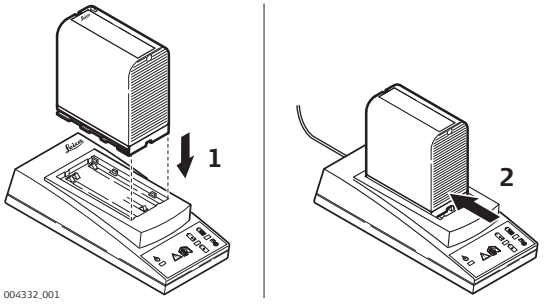
1) Insert the battery flush to the front edge of the GDI221 battery bay.
2) Push the battery to the back. Use only slight pressure to push it into the stop position.

Removing the battery:

- Pull the battery to the front stop and then remove it.

For more details refer to the GKL221 User Manual.

GKL212 basic battery charger



Insert the battery:

1) Insert the battery flush to the front edge of the battery bay.
2) Push the battery to the back with only slight pressure to the stop position.

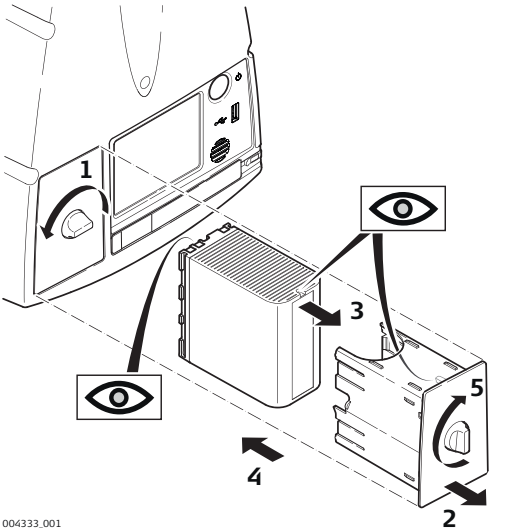
Removing the battery:

- Pull the battery to the front stop and then remove it.

For more details refer to the GKL212 User Manual.

2.2.4 Internal Battery

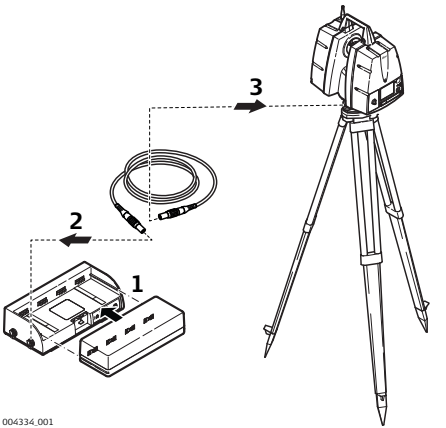
Insert and remove the internal battery step-by-step



Step	Description
1.	Unlock and open the battery compartment.
2.	Remove the battery holder.
3.	Remove the battery from the battery holder. Insert the new battery into the battery holder, ensuring that the contacts are facing outward and that the tip on the holder fits into the slot of the battery. The battery should click into position.
4.	Insert the battery holder back into the battery compartment.
5.	Turn the knob to lock the battery holder in place.
6.	Switch on the instrument to start the boot process.

2.2.5 External Battery

Using the external battery pack GEB271 step-by-step



Step	Description
1.	Slide the battery pack into the charging station. When connected, the three LEDs on the charging station light up for 1 sec.
2.	Connect the GEV259 power cable to port P2 of the charging station. Use the plug with the red bend protection.
3.	Connect the other end of the GEV259 power cable to the power port of the instrument. Use the plug with the blue bend protection.
4.	Press the On/Off button on the instrument to start the boot process.

☞ Check the battery capacity indicator LEDs to ensure that remaining power is enough to operate the instrument and finish the scheduled scan process.

2.3 Scanning

2.3.1 Switching the System On/Off

Switch On procedure

1) Set up the instrument as desired. Refer to chapter "Instrument Setup" for more information.
2) Press and hold the On/Off button for 2 seconds until a beep is audible.
3) The instrument starts with several subsequent beeps and a short melody.
4) The **Leica Geosystems** welcome screen appears.
5) Wait until the **Main Menu** appears on the display.

Switch Off procedures

Shutdown via **Main Menu**:

1) From the current menu return to the **Main Menu**.
2) In the **Main Menu** press the  button.
3) In the popup window confirm the question **Do you want to shutdown?** with **Yes**.
4) Wait for the scanner to shut down.

Shutdown via **On/Off button**:

1) Press and hold the **On/Off button** for 2 seconds until a single beep is audible.
2) Wait for the scanner to shut down.

In case of a system crash (forced shutdown):

1) Press and hold the On/Off button for 6 seconds until a **double beep** is audible.
2) Wait for the scanner to shut down.

2.3.2 Ambient Conditions

Unfavourable surfaces for scanning

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

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

Unfavourable weather conditions for scanning

- Rain, snow or fog cause poor measurements, so it is not possible to survey during these conditions!
- Surfaces that are directly illuminated by the sun cause an increased range noise and therefore a larger measurement uncertainty.
- If some objects are scanned against the sunlight or a bright spotlight, the optical receiver of the instrument can be dazzled so heavily that in this area no measured data is recorded. A "black hole" appears in the reflectance image.

Temperature changes during scanning

If the instrument is brought from a cold environment, for example from storage, into a warm and humid environment, the glass window at the mirror or in extreme cases even the interior optics can condensate. This may cause measurement errors.

☞ Precaution: Avoid rapid temperature changes and give the instrument time to acclimatise.

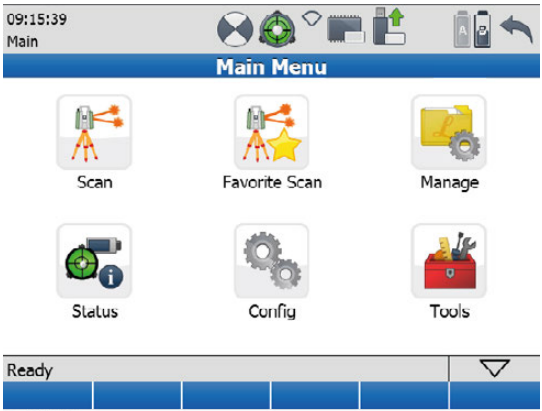
Dirt on the glass pane

Dirt on the glass pane of the mirror such as a layer of dust, condensation or fingerprints may cause considerable measuring errors.

2.3.3 Onboard Controls

About the Main Menu

The **Main Menu** will be displayed after the system boot process. **Ready** in the message bar indicates that the instrument is ready for scanning.



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For a complete description of all menus and commands refer to the Leica ScanStation P20 System Field Manual.

Icon	Function
Scan 	Offers access to all commands for scanner setup and operation control.
Favorite Scan 	Starts scan immediately with pre-defined scan settings.
Manage 	Offers access to all commands for project, target and control point management.
Status 	Offers access to all commands for the scanner's status information.

Icon	Function
Config 	Offers access to all commands for the configuration of the system.
Tools 	Offers access to all commands for disk formatting, data transfer, license management and display calibration.

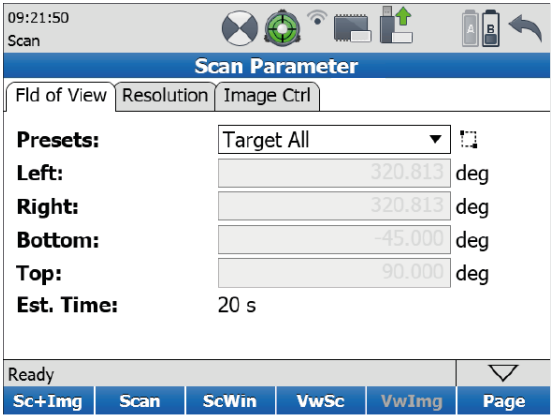
Menu independent commands:

Command	Function
Escape 	Return to previous menu in menu hierarchy.
Shift → Quit 	Return to main menu.
Page 	Switch between pages in a menu.

2.3.4 Scan Menu

About the Scan menu

In the **Scan** menu all commands for the scanner setup and operation control are available.



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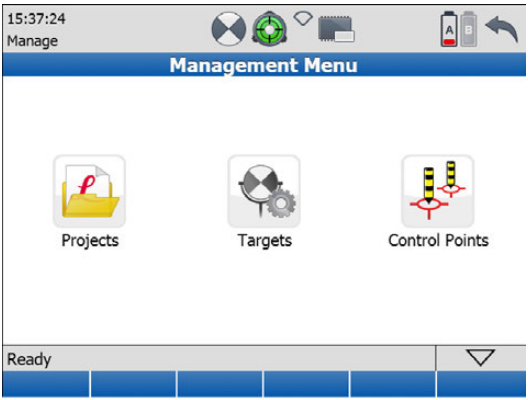
2.3.5 Manage Menu

About the Manage menu

In the **Manage** menu all commands for project, target and control point management on the scanner are available.



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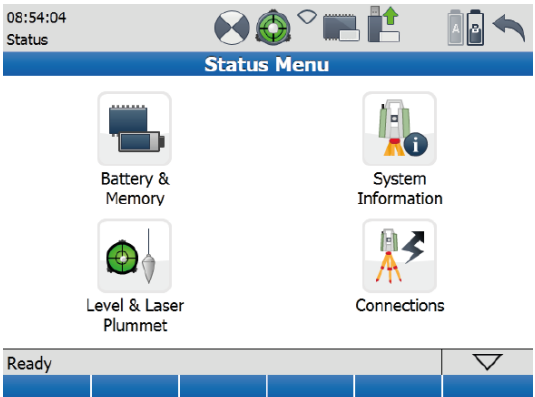
Icon	Function
Projects 	Offers access to all commands for project management.
Targets 	Offers access to all commands for target management.
Control Points 	Offers access to all commands for control points management.

2.3.6 Status Menu

About the Status menu

In the **Status** menu all commands for the scanner's status information are available.



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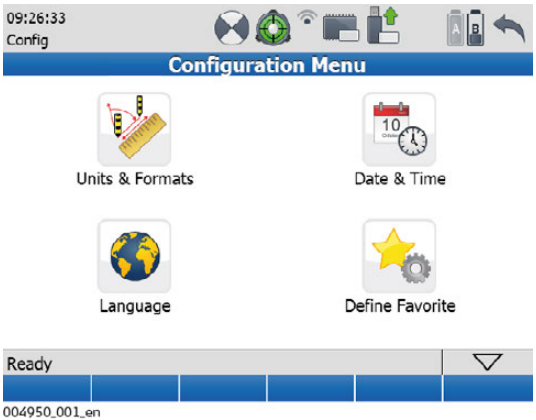
Icon	Command	Function
Battery & Memory 	**Battery**	Status information about internal battery, external battery and AC power supply.
	Memory	Status information about size and free space of internal hard disk's data partition.
System Information 	**Instrument**	Status information about instrument type, serial number, equipment number and system language.
	Firmware	Status information about installed firmware version and firmware maintenance expiry date.

Icon	Command	Function
Level & Ls Plummet 	**Level**	Numerical and graphical display of instrument's tilt.
	Plummet	Switch laser plummet on/off.
	Compensator	Switch dual-axis compensator on/off. Define how scanner should react when compensator goes out of range.
Connections 	**WiFi**	Status information about internal WiFi. Enable/disable the internal WiFi adaptor.

2.3.7 Configuration Menu

About the Configuration menu

In the **Config** menu all commands for the configuration of the system are available.



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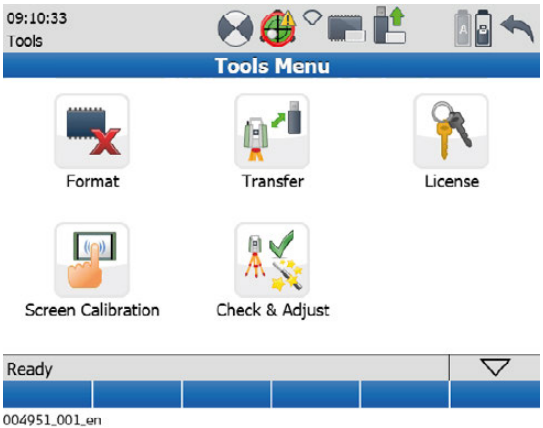
Icon	Command	Function
Units 	**Distance Unit**	Select unit for distances (Metre, Int Ft, Us Ft).
	Distance Dec	Select number of decimal digits for distance display.
Time & Date 	**Local Time**	Set local time.
	Local Date	Set local date.
Language 	**Language**	Select language for the user interface or delete a language from the list.
Define Favorite 	**Fld of View**	Select area of interest and scanner action for **Favorite Scan**.
	Resolution	Define horizontal and vertical point spacing for **Favorite Scan**.
	Image Ctrl	Define parameters of internal camera for **Favorite Scan**.

2.3.8 Tools Menu

About the Tools menu

In the **Tools** menu all commands for disk formatting, data transfer, license management, display and instrument calibration are available.



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Icon	Command	Function
Format 		Format the complete data partition of the internal hard disk. All project data will be erased.
Transfer 	**Projects**	Transfer selected project or all projects to USB memory storage device.
	System Files	Upload new firmware or language file to the instrument.
License 	**Manual**	Enter license key manually.
	Upload	Upload license key file from USB memory storage device.
Display Calibration 		Recalibrate the touchscreen by clicking four points on the display.

Icon	Command	Function
Check & Adjust 		Determine and update angular parameters and tilt compensator, set range offset.

2.3.9 Troubleshooting

Basic troubleshooting

Problem	Possible Cause(s)	Suggested Remedies
Instrument does not boot.		Disconnect from AC power supply or external battery. Disconnect all cables and remove all internal batteries. Wait for 1 minute. Reconnect cables and external power sources, insert all internal batteries and switch on again.
Black gap of missing points in overhead scans.	Handle not removed.	Remove handle and scan area again.
Display elements cannot be hit exactly with the stylus.	Touchscreen not calibrated.	Recalibrate touchscreen via **Tools>Screen Calibration**.
Missing points in scan.	Dust, debris or fingerprints on optics of rotating mirror.	Use glass cleaning tissue to clean the specific areas.

Advanced troubleshooting

Problem	Possible Cause(s)	Suggested Remedies
When switching on the instrument or starting a scan, the system switches off automatically.	Capacity of battery is too low.	Recharge or change battery.
When switching on the instrument or starting a scan, the system switches off automatically even though it was totally recharged.	Battery charger is defective.	Check the function of the battery charger. Please note the charging status displayed on the battery charger.
	Damaged cable.	Examine the cabling and pay attention to damages, which for example can cause loose contacts or short circuits. Defective cables need to be replaced. Only use supplied power cables.
	Internal battery is no longer charging.	At the end of its life time the internal battery has lost most of its capacity.The battery needs to be replaced.
	External battery no longer charging.	At the end of its life time the external battery has lost most of its capacity.The battery needs to be replaced.

Diagnostic procedure

The diagnostic procedure explains how to create log files with the user interface of your ScanStation P20 instrument in case of problems with the scanner. To create log files, follow the steps described below:

1) From the **Main Menu** go to **Tools**, **Transfer**, **Transfer Project**.
2) Connect an external USB memory device to the scanner's USB connector.
3) Press the **Logs** button.
4) In the USB memory devices's main directory a folder named Logs will be created containing log files:
   - P20_1841234_20121019.log: Log file with scanner serial number (e.g. 1841234) and scan date (year, month, day) embedded in the file name,
   - UpgraderLog.txt,
   - POSTLog.txt,
5) Send the content of the Logs folder together with details about scanner type, scanner serial number and a short description of the problem to your local support team.

Troubleshooting - support contacts

If you experience problems with your instrument:

- Email the scanner's log files to your local support:
  - For **America**: us-support@hds.leica-geosystems.com
  - For **Europe**, **Middle East** and **Africa**: euro-support@hds.leica-geosystems.com
  - For **Asia**: asia-support@hds.leica-geosystems.com
- Log files are stored on the USB memory stick in the folder Logs.

3 Care and Transport

3.1 Check & Adjust

Units that are exposed to high mechanical forces, e.g. through frequent transport or rough handling, it is recommended to carry out a check and adjust once a year by the manufacturer respectively just after such a high stress exposure.

3.2 Transport

Transport in the field

When transporting the equipment in the field, always make sure that you
- either carry the product in its original transport container,
- or carry the tripod with its legs splayed across your shoulder, keeping the attached product upright.
- or remove product from tripod and carry it by its handle.

Transport in a road vehicle

Never carry the product loose in a road vehicle, as it can be affected by shock and vibration. Always carry the product in its transport container and secure it.

Shipping

When transporting the product by rail, air or sea, always use the complete original Leica Geosystems packaging, transport container and cardboard box, or its equivalent, to protect against shock and vibration.

Shipping, transport of batteries

When transporting or shipping batteries, the person 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.

3.3 Storage

Product

Respect the temperature limits when storing the equipment, particularly in summer if the equipment is inside a vehicle. Refer to "5 Technical Data" for information about temperature limits.

Field adjustment

After long periods of storage inspect the field adjustment parameters given in this user manual before using the product.

Storing

Long-term battery storage is not recommended. If storage is necessary:

- Refer to "5.5 Environmental Specifications" for information about storage temperature range.
- Remove batteries from the product and the charger before storing.
- After storage recharge batteries before using.
- Protect batteries from damp and wetness. Wet or damp batteries must be dried before storing or use.
- A storage temperature range of 0°C to +30°C/+32°F to 86°F in a dry environment is recommended to minimise self-discharging of the battery.
- At the recommended storage temperature range, batteries containing a 40% to 50% charge can be stored for up to one year. After this storage period the batteries must be recharged.
- Always try to use a ‘first-in first-out’ approach to minimise storage time.

3.4 Cleaning and Drying

Product and accessories

- Blow dust off lenses and prisms.
- Never touch the glass with your fingers.

Cleaning the touchscreen:

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

The touchscreen is covered by a thin, touch resistive foil. This foil can easily be damaged during cleaning e.g. by detergents.

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 completely 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.

3.5 Glass Cleaning Procedure

General cleaning information

The scanning mirror must be kept clean. The instructions must be followed as described in this chapter to clean the scanner mirror.

Before any cleaning procedure, ensure the instrument is switched off.

Dust and debris on optical surfaces

Using a compressed gas duster (e.g., UltraJet® 2000 Gas Duster or UltraJet® Compressed CO2 Duster), remove dust and debris from surface of scanner glass.

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

Cleaning of optical surfaces

Soiling of the glass pane can cause extreme measurement errors and therefore useless data!

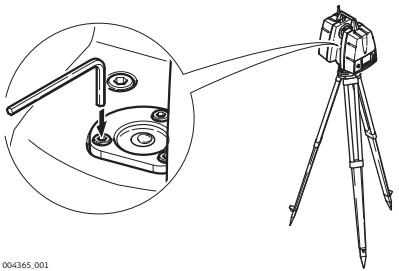
☞ All soiling that is visible on the glass pane has to be removed, except for single small dust particles that adhere inevitably.

Clean the glass pane regularly with the provided cleaning tissue:

- Switch off instrument.
- Washing hands is necessary in order to avoid grease on the cleaning tissue.
- Better, use gloves to avoid finger oil on the glass.
- Then use the lens tissue for wiping circularly from the centre to the edge until there is only a thin film of detergent visible.
- If any smears from cleaning are visible against back light, repeat the procedure.
- Do not use air from the pneumatic power system as this is always slightly oily!

3.6 Checking and Adjusting the Circular Level of the Tribrach

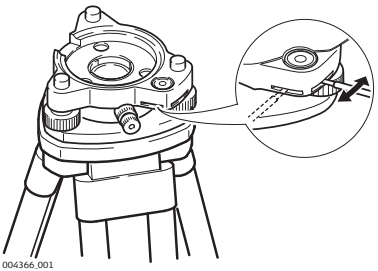
Levelling the instrument step-by-step



1) Level up the instrument in advance with the electronic level, assuming that the instrument is correctly adjusted. In the **Main Menu** go to **Status**, **Level and Laser plummet**, **Level** to access the electronic bubble.
2) The bubble must be centred. If it extends beyond the circle, use an allen key to centre it with the adjustment screws. Turn the instrument slowly 200 gon (180°). Repeat the adjustment procedure if the bubble does not stay centred.

☞ After the adjustment, no screw shall be loose.

Levelling the tribrach step-by-step

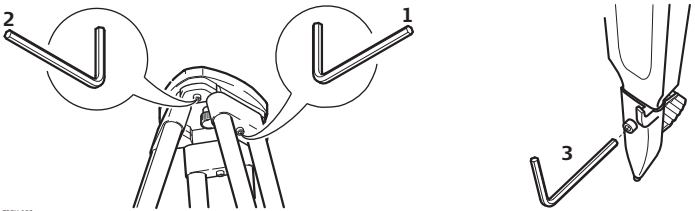


1) Level up the instrument in advance with the electronic level, assuming that the instrument is correctly adjusted. In the **Main Menu** go to **Status**, **Level and Laser plummet**, **Level** to access the electronic bubble.
2) The bubble of the tribrach must be within the centring circle. If the bubble is outside the circle, use the adjusting pin and the two cross-headed adjustment screws to centre it.

☞ After the adjustment, no screw shall be loose.

3.7 Servicing the Tripod

Service the tripod step-by-step



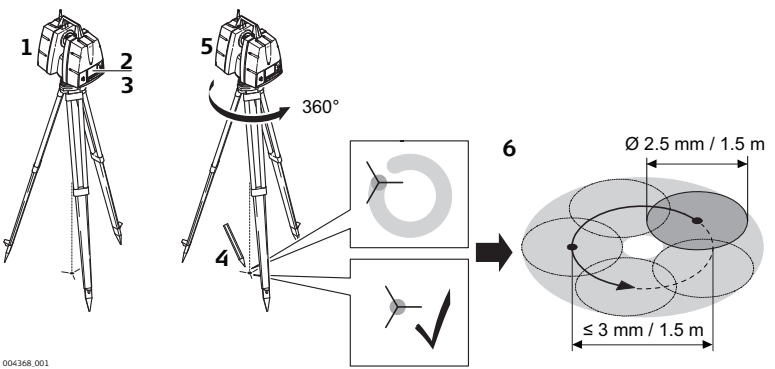
The connections between metal and timber components must always be firm and tight.

1) Tighten the leg cap screws moderately with the allen key supplied.
2) Tighten the articulated joints on the tripod head just enough to keep the tripod legs open when lifting the tripod off the ground.
3) Tighten the screws of the tripod legs.

3.8 Inspecting the Laser Plummet of the Instrument

The laser plummet is located in the vertical axis of the instrument. Under normal conditions of use, the laser plummet does not need adjusting. If an adjustment is necessary due to external influences, return the instrument to any Leica Geosystems authorised service workshop.

Inspecting the laser plummet



The following table explains the most common settings.

Step	Description
1.	Place and secure the instrument into the tribrach and onto a tripod.
2.	Using the tribrach footscrews, level the instrument with the electronic level. In the **Main Menu** go to **Status**, **Level and Laser plummet**, **Level**.
3.	To enter the laser plummet page, press **Page**. Switch on the laser plummet. Inspection of the laser plummet must be carried out on a bright, smooth and horizontal surface, like a sheet of paper.
4.	Mark the centre of the red dot on the ground.
5.	Turn the instrument through 360° slowly, carefully observing the movement of the red laser dot.
☞	The maximum diameter of the circular movement described by the centre of the laser point must not exceed 3 mm at a distance of 1.5 m.
6.	If the centre of the laser dot describes a perceptible circular movement or moves more than 3 mm away from the point which was first marked, an adjustment might be required. Inform your nearest Leica Geosystems authorised service workshop. Depending on brightness and surface, the diameter of the laser dot can vary. At 1.5 m it is about 2.5 mm.

4 Safety Directions

4.1 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.

4.2 Definition of Use

Intended use

- Measuring horizontal and vertical angles.
- Measuring distances.
- Scanning objects.
- Capturing and recording images.
- Recording measurements.
- Computing with software.
- Remote control of product.
- Data communication with external appliances.

Reasonably foreseeable misuse

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

4.3 Limits of Use

Environment

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

⚠ **DANGER**

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

Environmental conditions for indoor chargers

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

4.4 Responsibilities

Manufacturer of the product

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

Person responsible for the product

The person responsible for the product has the following duties:

- To understand the safety instructions on the product and the instructions in the user manual.
- To ensure that it is used in accordance with the instructions.
- To be familiar with local regulations relating to safety and accident prevention.
- To inform Leica Geosystems immediately if the product and the application becomes unsafe.
- To ensure that the national laws, regulations and conditions for the operation of e.g. radio transmitters, lasers are respected.

WARNING

The person responsible for the product must ensure that it is used in accordance with the instructions. This person is also accountable for the training and the deployment of personnel who use the product and for the safety of the equipment in use.

4.5 Hazards of Use

DANGER Because of the risk of electrocution, it is dangerous to use poles 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 If the product is used with accessories, for example masts, staffs, poles, you may increase the risk of being struck by lightning.

Precautions:
Do not use the product in a thunderstorm.

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

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

WARNING Inadequate securing of the working site can lead to dangerous situations, for example in traffic, on building sites, and at industrial installations.

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

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

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

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

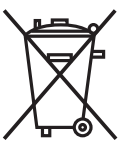
WARNING If battery terminals are short circuited e.g. by coming in contact with jewellery, keys, metalized paper or other metals, the battery can overheat and cause injury or fire, for example by storing or transporting in pockets.

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

WARNING If the product is improperly disposed of, the following can happen:

- If polymer parts are burnt, poisonous gases are produced which may impair health.
- If batteries are damaged or are heated strongly, they can explode and cause poisoning, burning, corrosion or environmental contamination.
- By disposing of the product irresponsibly you may enable unauthorised persons to use it in contravention of the regulations, exposing themselves and third parties to the risk of severe injury and rendering the environment liable to contamination.

Precautions:



The product must not be disposed with household waste.
Dispose of the product appropriately in accordance with the national regulations in force in your country.
Always prevent access to the product by unauthorised personnel.

Product-specific treatment and waste management information can be downloaded from the Leica Geosystems home page at

http://www.leica-geosystems.com/treatment or received from your Leica Geosystems dealer.

CAUTION Watch out for erroneous measurement results if the product has been dropped or has been misused, modified, stored for long periods or transported.

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 and before and after important measurements.

CAUTION During the operation of the product, there is a hazard of squeezing extremities or entanglement of hair and/or clothes by moving parts.

Precautions:
Keep a safe distance of the moving parts.

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

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

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

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

4.5.1 For Power Supplies

WARNING If charged or discharged, batteries not recommended by Leica Geosystems may be damaged. They may burn and explode.

Precautions:
Only charge and discharge batteries recommended by Leica Geosystems.

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.

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

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

4.6 Laser Classification

4.6.1 General

General

The following chapters provide instructions and training information about laser safety according to international standard IEC 60825-1 (2007-03) and technical report IEC TR 60825-14 (2004-02). The information enables the person responsible for the product and the person who actually uses the equipment, to anticipate and avoid operational hazards.

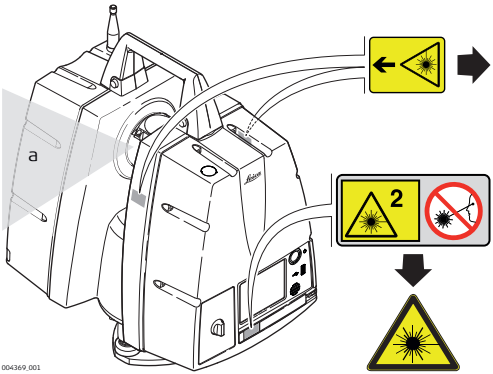
According to IEC TR 60825-14 (2004-02), products classified as laser class 1, class 2 and class 3R do not require:

- laser safety officer involvement,
- protective clothes and eyewear,
- special warning signs in the laser working area

if used and operated as defined in this User Manual due to the low eye hazard level.

National laws and local regulations could impose more stringent instructions for the safe use of lasers than IEC 60825-1 (2007-03) and IEC TR 60825-14 (2004-02).

Labelling ScanStation P20



Laser Radiation
Do not stare into the beam
Class 2 Laser Product
according to IEC 60825-1

$P_{cw} \leq$	0.23 mW
$\lambda =$	650 ... 660 nm
$E_{pulse} =$	9 nJ
$t_{pulse} =$	3 ns
$\lambda =$	800 ... 820 nm

4.6.2 Scanning Laser

General

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

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

- IEC 60825-1 (2007-03): "Safety of laser products"
- EN 60825-1 (2007-10): "Safety of laser products"

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

Visible Laser:

Description	Value
Wavelength	658 nm
Maximum radiant power	0.23 mW
Rotating base speed	32 µHz
Beam divergence (1/e)	0.2 mrad

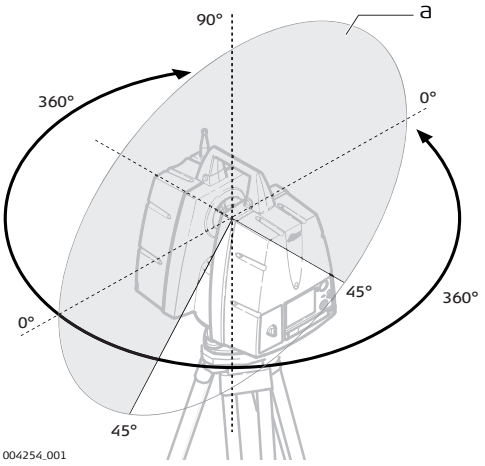
Description	Value
Beam diameter at front window (1/e)	≤ 2.8 mm
Angular subtense	< 1.5 mrad

Invisible Laser:

Description	Value
Wavelength	808 nm
Maximum single pulse energy	8.5 nJ
Pulse duration	3 ns
Pulse repetition frequency, PRF	1 MHz
Rotating base speed	32 µHz
Beam divergence (1/e)	0.2 mrad
Beam diameter at front window (1/e)	≤ 2.8 mm
Angular subtense	< 1.5 mrad

☞ Do not wear red absorbing glasses in the vicinity (< 10 m) of the instrument.

Scanning laser - field of view



a) Scanning laser beam

4.6.3 Laser Plummet

General

The laser incorporated in the product produces a visible red laser beam which emerges from the bottom of the product.

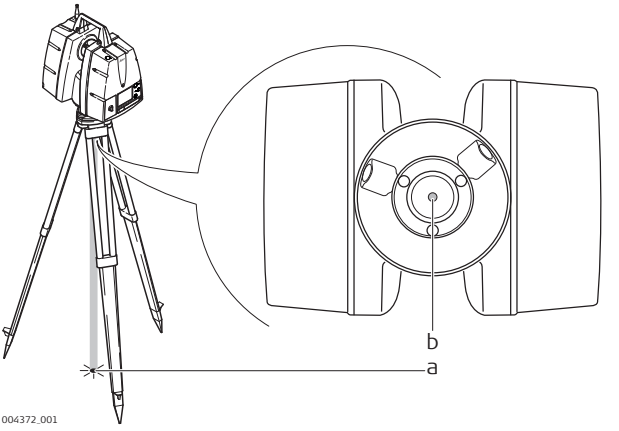
The laser product described in this section, is classified as laser class 1 in accordance with:

- IEC 60825-1 (2007-03): "Safety of laser products".
- EN 60825-1 (2007-10): "Safety of laser products".

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

Description	Value
Maximum average radiant power	0.39 mW
Pulse duration	0 - 100 %
Pulse repetition frequency	1 kHz
Wavelength	620 nm - 690 nm

Laser plummet beam



a) Plummet laser beam
b) Laser exit window

4.7 Electromagnetic Compatibility EMC

Description

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

WARNING

Electromagnetic radiation can cause disturbances in other equipment.

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

Radios or digital cellular phones

Use of product with radio or digital cellular phone devices:

WARNING

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

Precautions:
Although the product meets the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that other equipment can be disturbed or that humans or animals can be affected.

- Do not operate the product with radio or digital cellular phone devices in the vicinity of filling stations or chemical installations, or in other areas where an explosion hazard exists.
- Do not operate the product with radio or digital cellular phone devices near to medical equipment.
- Do not operate the product with radio or digital cellular phone devices in aircraft.

⚠ **CAUTION** There is a risk that disturbances may be caused in other equipment if the product is used with accessories from other manufacturers, for example field computers, personal computers, two-way radios, non-standard cables or external batteries.

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

CAUTION Disturbances caused by electromagnetic radiation can result in erroneous measurements.
Although the product meets the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that the product may be disturbed by intense electromagnetic radiation, for example, near radio transmitters, two-way radios or diesel generators.
Precautions:
Check the plausibility of results obtained under these conditions.

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

4.8 FCC Statement, Applicable in U.S.

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

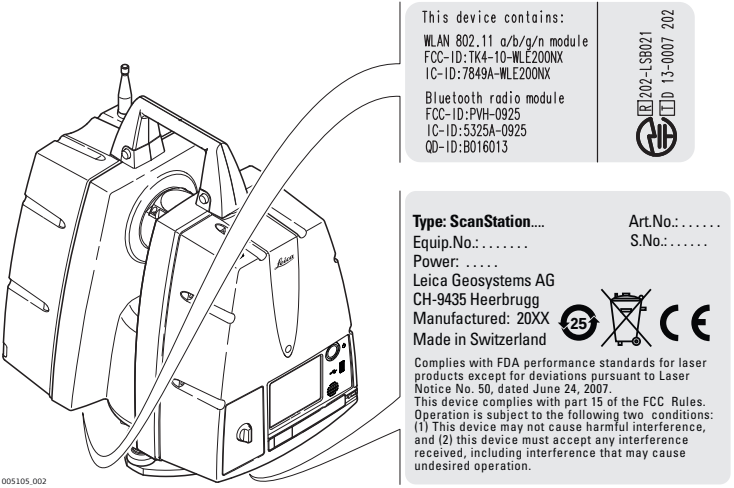
WARNING

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

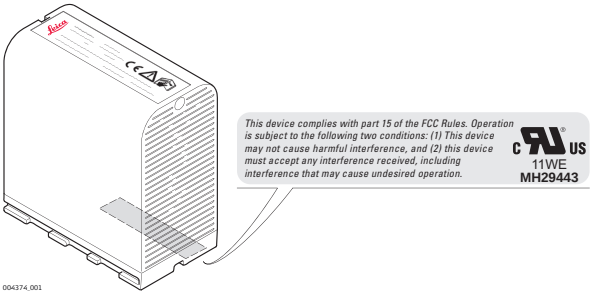
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

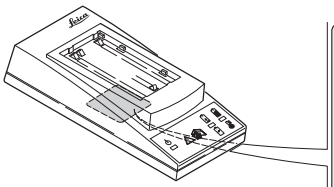
FCC Labelling ScanStation P20



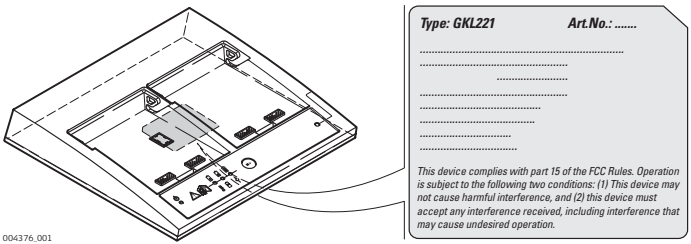
FCC Labelling
GEB242



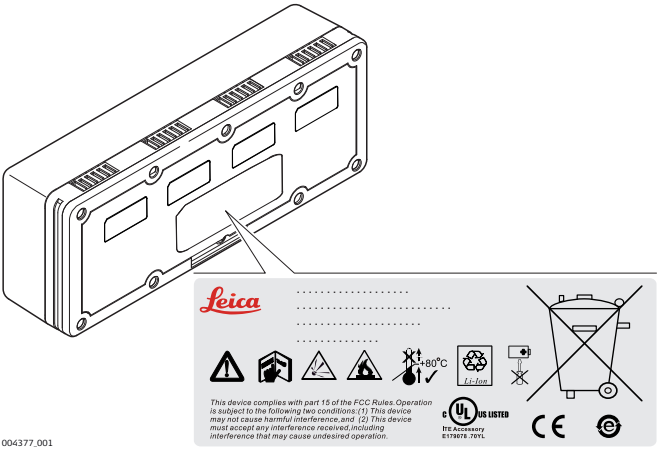
Type Plate Labelling GKL212



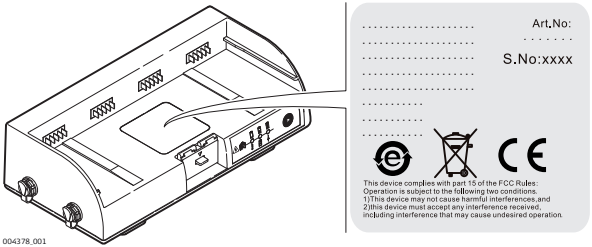
Type Plate Labelling GKL221



FCC Labelling
GEB271



FCC Labelling
GKL271



5 Technical Data

5.1 General Technical Data of the Instrument

Instrument features

The ScanStation P20 has the following features:

- Compact design
- Ultra high-speed laser scanner with pulsed, dual-axis compensated scanning unit
- Survey-grade scanning accuracy
- Long range and wide field of view
- Integrated high-resolution camera
- Built-in laser plummet
- Built-in electronic and external circular bubble for level indication

User interface

Built-in control:

- Touchscreen control with stylus
- Full colour graphic display, VGA (640 x 480 pixels)

Optional external control:

- Notebook
- Tablet PC
- Remote controller

Storage and Communication

Internal Storage:
Integrated 256 GB solid state drive. Additional storage on external USB device or external PC.

Communication:
Gigabit Ethernet or integrated wireless LAN (WLAN).

Camera

The ScanStation P20 has an integrated high-resolution digital camera with zoom video.

Camera data:	Value:
Type	Colour sensor, auto-adjusting, parallax-free integration
Full 360° x 270° dome	Streaming video with zoom, auto-adjusts to ambient lighting
Single 17° x 17° image	1920 x 1920 pixels (4 megapixel)
Full 360° x 270° dome	260 images, automatically spatially rectified

5.2 System Performance

System performance and accuracy

☞ All ± accuracy specifications are one sigma (1σ) unless otherwise noted.

Accuracy of single measurement:	Value:
3D position accuracy	3 mm @ 50 m; 6 mm @ 100 m
Linearity error	< 1 mm
Angle (horizontal/vertical)	8" / 8" (40 µrad / 40 µrad)

Target acquisition[1]:
2 mm standard deviation

Dual-axis compensator:	Value:
Selectable	on/off
Setting accuracy	1.5" / 7.275 µrad, resolution 1", dynamic range ±5'

List of accuracy specifications:

1 Algorithmic fit to planar Black&White HDS targets

5.3 Laser System Performance

Laser scanning system data

The scanning system is an ultra-high speed time-of-flight unit, enhanced by Waveform Digitising (WFD) technology.

Laser unit:

Scanning laser:	Value:
Classification	Laser Class 2
Wavelength	658 nm / 808 nm

Range:

Scanning data:	Value:
Beam divergence (1/e)	0.2 mrad
Beam diameter at front window (1/e)	≤ 2.8 mm
Minimum range	0.4 m
Maximum range	120 m @ 18% albedo

Field-of-View (per scan):

Field-of-View:	Value:
Aiming/Sighting	Parallax-free, integrated zoom video
Horizontal	360° (maximum)
Vertical	270° (maximum)
Scan motors	Direct drive, brushless
Scanning optics	Vertically rotating mirror on horizontally rotating base: • Up to 50 Hz with internal battery. • Up to 100 Hz with external power supply.

Range noise:

Range:	Black (10%):	Gray (28%)	White (100%)
10 m	0.8 mm rms	0.5 mm rms	0.4 mm rms
25 m	1.0 mm rms	0.6 mm rms	0.5 mm rms
50 m	2.8 mm rms	1.1 mm rms	0.7 mm rms
100 m	9.0 mm rms	4.3 mm rms	1.5 mm rms

Scan resolution (7 pre-set point settings):

	Quality level			
mm@10 m	**1**	**2**	**3**	**4**
50	00:20	00:20	00:28	----
25	00:33	00:33	00:53	01:43
12.5	00:58	01:44	03:24	06:46
6.3	01:49	03:25	06:46	13:30
3.1	03:30	06:47	13:30	26:59
1.6	13:33	27:04	54:07	----
0.8	54:07	1:48:13	----	----

Laser Plummet data

Plummet laser:

Plummet:	**Value:**
Classification	Laser Class 1 (visible red)
Location	In standing axis of instrument
Accuracy	1.5 mm at 1.5 m instrument height (deviation from plumb line)

5.4 Electrical Data

ScanStation power supply and consumption

Power ports:

Ports:
Internal: 2, External: 1 (simultaneous use, hot swappable)

Power supply:

Internal:
12 - 16.6V DC; four internal batteries provided with system.

External:
24 - 36V DC

Power consumption:

Instrument:
40 W typical; 95 W max.

External GKL123 AC power supply:

Supply:	Value:
Input voltage	100-240 V AC, 50-60 Hz
Output voltage	24 V, 7.5A max.

GEV225 AC power supply for GKL271

Supply:	Value:
Input voltage	100-240 V AC, 50-60 Hz
Output voltage	24 V

GKL271 charging station

Supply:	Value:
Input voltage	24 V DC (port: P3)
Output voltage	14.4 V DC (port: P1)
	24 V DC / 36 V DC (port: P2)

GEB271 external battery pack

Supply:	Value:
Type	Li-Ion
Voltage	14.4 V
Capacity	19.6 Ah

GEB242 internal battery

Supply:	Value:
Type	Li-Ion
Voltage	14.8 V
Capacity	5.8 Ah

Battery operating and charging times

Internal battery:	Value:
Operating time	>7 hours, typical continuous use (room temperature), using both batteries simultaneously
Charging time	Typical charging time with Professional Charger GKL221 is <3.5 hours at room temperature (2 batteries).

External battery pack:	Value:
Operating time	>8.5 hours, typical continuous use (room temperature)
Charging time	Typical charging time is 3.5 hours at room temperature.

5.5 Environmental Specifications

5.5.1 ScanStation

Environmental specifications ScanStation P20

Temperature range:

Type	Operating temperature [°C]	Storage temperature [°C]
Instrument	-20 to +50	-40 to +70
AC-power supply	0 to +40	-25 to +65

Protection against water, dust and sand:

Type	Protection
Instrument	IP54 (IEC 60529) Dust protected Protection against splashing water from any direction

Humidity:

Type	Protection
Instrument	Max 95 % non condensing

Lighting:

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

Sound emission:

Type	Level
Instrument	≤75 dB(A)

5.5.2 Charger and Batteries

Charger and battery specifications

Temperature range for GEB271, GKL271, GKL123 and GEB242

Operating temperature [°C]	Mode
0 to +45	Charging
-20 to +55	Discharging

Storage temperature [°C]	Mode	Recharging interval
-40 to +70	Standard	6 months

Protection against water, dust and sand

Type	Protection
Instrument	IP54 (IEC 60529) Dust protected Protection against splashing water from any direction

Humidity

Type	Protection
Instrument	Max 95 % non condensing

5.6 Dimensions

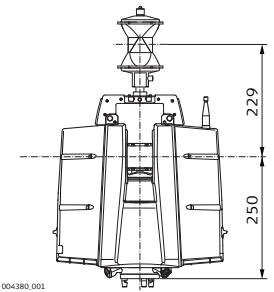
Dimensions

Instrument	Dimensions [mm] (D x W x H)	Dimensions [″] (D x W x H)
ScanStation P20	238 x 358 x 395	9.4 x 14.1 x 15.6
GKL123 power supply for ScanStation P20	85 x 170 x 42 / cable length: 1700	3.4 x 6.7 x 1.7 / cable length: 66
GEV225 AC power supply for charging station GKL271	85 x 170 x 41 / cable length: 1800	3.4 x 6.7 x 1.6 / cable length: 70
GKL271 charging station	127 x 264 x 82	5 x 10.4 x 3.2
GEB271 battery pack	95 x 248 x 60	3.7 x 9.8 x 2.4
GEB242 battery	40 x 72 x 77	1.6 x 2.8 x 3.0
GVP645 transport container	500 x 625 x 366	19.7 x 24.6 x 14.4

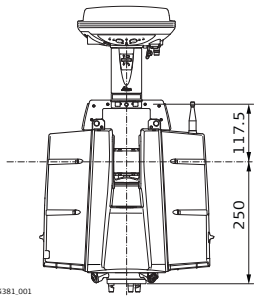
5.7 Height and Offset

Tilt axis height and offset to TPS/GNSS accessories

ScanStation P20 with GRZ122 prism (with handle GAD110 and adapter GAD112)

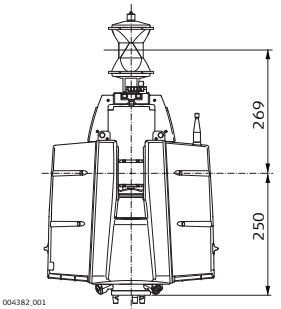


ScanStation P20 with GS15 antenna (with handle GAD110)

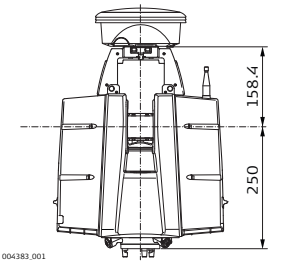


Type	GRZ122 / GAD110 / GAD112	GS15 / GAD110
Tilt axis height	250 mm	250 mm
Offset tilt axis	229 mm to prism centre. Valid for all Leica standard prisms with an height offset of 86 mm.	117.5 mm to GS15 antenna MRP (**M**echanical **R**eference **P**lane).

ScanStation P20 with GRZ122 prism (with handle GAD104 and adapter GAD111)



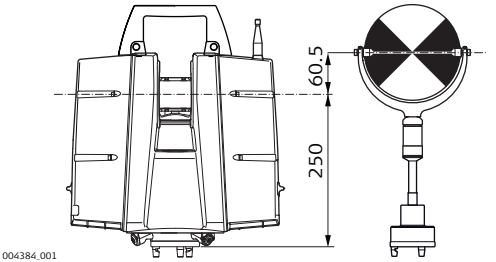
ScanStation P20 with ATX1230+ antenna (with handle GAD104)



Type	**GRZ122 / GAD104**	**ATX1230+ / GAD104**
Tilt axis height	250 mm	250 mm
Offset tilt axis	269 mm to prism centre. Valid for all Leica standard prisms with an height offset of 86 mm.	158.4 mm to ATX1230+ antenna MRP (**M**echanical **R**eference **P**lane).

Tilt axis height and offset to targets

ScanStation P20 with HDS B&W target 6" (with GRZ146 carrier)



Type	HDS B&W target 6" (with GRZ146 carrier)
Tilt axis height	250 mm
Offset tilt axis	60.5 mm to target center.

5.8 Weight

Weight

Instrument	Weight [kg]	Weight [lbs]
ScanStation P20	11.9 nominal	26.2 nominal
GKL123 AC power supply for ScanStation P20	0.9	1.9
GEV225 AC power supply for GKL271	0.860	1.9
GKL271 charging station	1	2.2
GKL271 battery pack	1.9	4.2
GEB242 battery	0.4	0.9
GVP645 ScanStation P20 transport container (without scanner and accessories)	10.4	22.9
GVP645 ScanStation P20 transport container (with scanner and standard accessories)	28	61.7

5.9 Accessories

Scope of delivery

Included standard accessories:
- Transport container for scanner
- Tribrach (Leica Professional Series)
- Internal battery (4x)
- Battery charger with AC power cable, car adapter, daisy chain cable
- Ethernet cable
- Height metre and distance holder for height metre
- Cleaning tissue
- 1 year CCP Basic support agreement

Additional accessories

- B&W scan targets and target accessories
- Range of Customer Care Products (CCP) that include support, hardware & software maintenance and extended warranty
- External battery with charging station, AC power supply and power cable
- Professional charger for internal batteries
- AC power supply for scanner
- Tripod, tripod star, rolling base
- Adapter for upside down mounting

5.10 Conformity to National Regulations

Conformity to national regulations

- FCC Part 15, 22 and 24 (applicable in US)
- Hereby, Leica Geosystems AG, declares that the product ScanStation P20 is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. The declaration of conformity can be consulted at http://www.leica-geosystems.com/ce.

  Class 1 equipment according European Directive 1999/5/EC (R&TTE) can be placed on the market and be put into service without restrictions in any EEA member state.
- The conformity for countries with other national regulations not covered by the FCC part 15, 22 and 24 or European directive 1999/5/EC has to be approved prior to use and operation.
- Japanese Radio Law and Japanese Telecommunications Business Law Compliance.
  - This device is granted pursuant to the Japanese Radio Law and the Japanese Telecommunications Business Law.
  - This device should not be modified (otherwise the granted designation number will become invalid).

5.10.1 Integrated Bluetooth

Frequency band

2402 - 2480 MHz

Output power

Bluetooth:
4 mW max.

Antenna

Antenna:	**Protection:**
Type	Internal PIF antenna
Gain	0 dBi

5.10.2 Integrated WiFi

Frequency band

2412 - 2462 MHz

Output power

WiFi:
63 mW max.

Antenna

Antenna:	Protection:
Type	External Dipole Antenna
Gain	± 2 dBi

6 Software Licence Agreement

Software Licence Agreement

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6.1 End User Licence Agreement EULA

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Index

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Total Quality Management: Our commitment to total customer satisfaction.

Leica Geosystems AG, Heerbrugg, Switzerland, has been certified as being equipped with a quality system which meets the International Standards of Quality Management and Quality Systems (ISO standard 9001) and Environmental Management Systems (ISO standard 14001).

Ask your local Leica Geosystems dealer for more information about our TQM program.

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- when it has to be **right**

Leica Geosystems