

Leica ScanStation C10/C5 User Manual

Version 5.0 English

- when it has to be **right**



Introduction

| Purchase | Congratulations on the purchase of a ScanStation C10/C5 instrument. |
|---------------------------|--|
| | |
| A 🔊 | This manual contains important safety directions as well as instructions for setting up the product and operating it. Refer to "6 Safety Directions" for further information. |
| | Read carefully through the User Manual before you switch on the product. |
| Product identification | The type and the serial number of your product are indicated on the type plate. Enter the model and serial number in your manual and always refer to this informa- tion when you need to contact your agency or Leica Geosystems authorised service workshop. |
| | Туре: |
| | Serial No.: |
| | |

Symbols

The symbols used in this manual have the following meanings:

| Туре | Description |
|----------|--|
| ▲ Danger | Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. |
| Marning | 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 and/or 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 All other trademarks are the property of their respective owners. |
|----------------------------|---|
| Validity of this manual | This manual applies to the ScanStation C10 and C5 instruments. Differences for the C5 model are marked and described. |

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1 Description of the System

1.1 Packing / Unpacking

Unpacking

When in its transport container, the ScanStation C10/C5 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 (13 kg).

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Pack the instrument the same way it is delivered.

1.2 Container Contents





- a) ScanStation C10/C5 User Manual
- b) Ethernet cable
- c) Allen keys
- d) Protection cover
- e) GHT196 distance holder for height meter
- f) GEB241 internal batteries
- g) Cleaning tissue
- h) GHM008 height meter
- i) GEV230 AC power supply (not supplied with system)
- j) Power cable, country specific
- k) Cyclone DVD and C10/C5 System CD-ROM
- USB memory stick, not supplied with system
- m) ScanStation C10/C5



- a) GEB271 external battery pack
- b) GKL271 charging station
- c) GEV225 AC power supply for GKL271 charging station
- d) GKL212 basic charger including car adapter cable
- e) GEB241 internal batteries
- f) AC/DC adapter for basic charger with daisy chain cable

1.3 Instrument Components

Overall system



- a) ScanStation C10/C5
- b) Laptop, not supplied with system
- c) GEV228 ethernet cable
- d) GEB241 internal batteries
- e) GEV230 AC power adapter
- f) GEV97 power cable
- g) GEV225 AC power supply for GKL271
- h) GKL271 charging station and GEB271 battery pack
- i) Tribrach
- j) Tripod
- k) Transport container for ScanStation C10/C5
- Transport container for ScanStation C10/C5 accessories





GKL221 professional charger



- Vehicle cable socket on the charger e)
- Function indicator f)

- Status indicator for external battery
- Battery status indicators k)

For more details refer to the GKI 221 User Manual.

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

ScanStation C10/C5, Description of the System

GKL271 charging GKL271 charging station for the GEB271 battery pack. **station**



- 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 3 pin, male
- c) Control LED; lights when the AC power supply is connected to a power plug.
- d) AC power supply
- e) Mains power cable, country specific

GEV97 ScanStation C10/C5 power cable Connects ScanStation C10/C5 scanner to GKL271 charging station.



a) Cable b) Connector 5 pin, male

ScanStation C10/C5, Description of the System

GEV230 AC power AC power supply for the ScanStation C10/C5 scanner.



-) GEV97 ScanStation C10/C5 power cable
- Cable and connector, 5 pin female
-) Control LED; lights when the AC power supply unit is connected to an AC power supply.
-) GEV230 AC power supply unit
- Mains power cable, country specific







Cabling for GEB271 battery pack with GKL271 charging station



- 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.



For GEV225 AC power supply:

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!





Death or serious injury can occur if unit is not connected to ground. **Precautions**:

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





Batteries not recommended by Leica Geosystems may be damaged if charged or discharged. They may burn and explode.

Precautions:

Only charge and discharge batteries recommended by Leica Geosystems.

Cabling for ScanStation C10/C5 with GEV230 AC power supply



- a) GEV97 power cable
- b) GEV230 AC power supply
- c) Mains power cable, country specific
- d) GEV228 ethernet cable



The GEV230 AC power supply cannot be used as an AC power supply for the battery charging station. It is designed exclusively for powering the scanner and must not be connected to any other device.



For GEV230 AC power supply:

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!





Death or serious injury can occur if unit is not connected to ground. **Precautions:**

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



Laptop

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A dedicated laptop computer is an option with your ScanStation C10/C5 system. This computer must be loaded with proprietary software from Leica Geosystems, and configured to operate with your instrument.

It is recommended that you **do not use your dedicated laptop computer for any purpose other than scanning** with your instrument or other Leica HDS software applications.

Using software, ethernet cards or modems that are not specifically designed to work with your dedicated laptop computer can corrupt the settings in your computer, and can adversely affect system performance.

1.7 Field of View (FoV)

Field of view

The instrument has a rotating scanhead and a rotating mirror that covers a $360^{\circ} \times 270^{\circ}$ field of view (FoV).



1.8 Description of the User Interface



Overview display



| 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 for the instrument. |
| Escape button | Returns to the previous screen. |
| Scroll bar | Scrolls the screen up and down. |
| Menu icon | Selecting menu icons opens submenus. Menu icons will change depending on which menu is displayed. |
| SHIFT button | Displays the second level of softkeys. |
| Softkeys | Commands can be executed with the softkeys. Commands assigned to the softkeys are menu dependent. |

Overview statusThe icons in the status bar display the current status information of the instrument.bar iconsClicking a status icon gives direct access to a detailed status description.



C10_036

- a) Range Filter
- b) Active target type
- c) Dual-axis compensator*
- d) WiFi
- e) External camera
- f) Internal hard disc
- g) Status of external memory
- h) External memory
- i) External battery / AC power supply
- j) Internal battery A
- k) Internal battery B
- * Optional for C5



- 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 | | Status |
|--------------------|------------|-----------------------------------|
| Range Filter | | Range Filter enabled |
| Active target type | 0 | HDS target |
| _ | \bullet | HDS black/white target |
| _ | ٩ | HDS sphere target |
| _ | 9 | Twin target top |
| _ | 9 - | Twin target top with extension |
| _ | ¢ | Twin target bottom |
| | ¢ * | Twin target bottom with extension |
| | User | User defined target |

| Icon | | Status |
|-----------------------|--------|---|
| Dual-axis compensator | ۵ | On and levelled |
| | × | Off |
| | 0 | On but out of range |
| WiFi | ((••)) | WiFi adapter connected to scanner and ready for communication. |
| External camera | íÖ. | External camera connected and selected for image acquisition. |
| | × | External camera connected but not selected for image acquisition. |

| Icon | | Status |
|--------------------|------------|-----------------|
| Internal hard disc | • | Empty |
| | a | 13% memory used |
| | Q | 25% memory used |
| | | 38% memory used |
| | \bigcirc | 50% memory used |
| | | 63% memory used |
| | 9 | 75% memory used |
| | 9 | 88% memory used |
| | 9 | Full |

ScanStation C10/C5, Description of the System

| lcon | | Status |
|------------------------------|--------------|----------------------|
| Status of external memory | 2 | Ready to be removed. |
| | 1 | Do not remove! |
| External memory | 0 | Empty |
| | 0 | 17% memory used |
| | \checkmark | 33% memory used |
| | ~ | 50% memory used |
| | - | 67% memory used |
| | - | 83% memory used |
| | - | Full |

| Icon | | Status |
|---------------------------------------|-------------|-----------------|
| External battery / AC power supply | | Empty |
| | •• | 20% capacity |
| | | 40% capacity |
| | | 60% capacity |
| | | 80% capacity |
| | | Full |
| | * P2 | AC power supply |

| lcon | | Status |
|----------------------|---|-------------------------------------|
| Internal battery A/B | 2 | Empty |
| | 2 | Currently in use - 20% capacity |
| | 9 | Currently in use - 40% capacity |
| - | 3 | Currently in use - 60% capacity |
| | 1 | Currently in use - 80% capacity |
| | 1 | Currently in use - full |
| | 8 | Currently not in use - empty |
| | 2 | Currently not in use - 20% capacity |
| | 2 | Currently not in use - 40% capacity |
| | 8 | Currently not in use - 60% capacity |
| | Î | Currently not in use - 80% capacity |
| | | Currently not in use - full |
Overview user input

The system offers two different virtual keyboards for user input:

1. User input for alphanumeric input fields:

When an alphanumeric input field is selected with the stylus, an alphanumeric keypad opens offering letters, numbers and special characters.



- a) Alphanumeric 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

2. User input for numeric input fields:

When a numeric input field is selected with the stylus, a numeric keypad opens offering numbers and some special characters.



1.9 HDS *Cyclone* Software Suite

General

Leica Geosystems HDS *Cyclone* software modules provide point cloud users with the widest set of work process options for 3D laser scanning projects in engineering, surveying, construction and related applications. The software consist of five packages:

- *Cyclone* SCAN: allows the user to control the Scanner.
- *Cyclone* REGISTER: allows the user to register multiple Scans together or to Geo-reference point clouds.
- *Cyclone* SURVEY:

gives the user basic functionality to extract and measure information from point clouds.

• Cyclone MODEL:

gives the user the full functionality of *Cyclone*. The user is able to extract and measure features and to create a 3D Model from point clouds.

• Cyclone PUBLISHER:

allows the user to publish point cloud data to a panoramic viewing format which can be posted to the web. The user can then view this data using the Internet Explorer plug-in Leica TruView.

| (F | For more information on <i>Cyclone</i> Software Suite, please visit: http://www.leica-geosystems.com/hds <i>Cyclone</i> Software has also online help available which can be accessed by pressing the F1 key on your keyboard. |
|---------------------------------|---|
| General operating principles | Download: <i>Cyclone</i> software, as well as important support documentation, can be downloaded from the Leica Geosystems HDS Website (http://www.leica-geosystems.com/hds/en/27054.htm). The user must create an account before the download section is accessible. Installation: You must use a Windows account with administrator privileges to install or upgrade <i>Cyclone</i>, CloudWorx for AutoCAD, CloudWorx for MicroStation, CloudWorx for PDMS or CloudWorx for Intergraph SmartPlant® Review. Download the <i>Cyclone</i> Installshield from the website shown above. Run the Installation file. Follow the onscreen instructions and select the software you wish to install. Go to the License Request Page. |
| | Language: Cyclone's operating language is English. |
| | |

2 Setting Up the Instrument

2.1 General Information

Use the tripod

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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.

2.2 Scanner Setup on Tripod

Setup step-by-step 5 ത 6 2 4 C10 018



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

- 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 tribrach's locking knob.
- 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.



The instrument must be levelled before it is switched **ON**. If not levelled using the tribrach's or the instrument's circular level, it may not power up properly or scanning accuracy may not be achieved.

2.3 Setup Over a Benchmark with the Internal Laser Plummet

Description

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This topic describes an instrument setup over a marked ground point using the laser plummet. Geo-referencing of the ScanStation C10/C5 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 C10/C5 allows you to traverse, resect or free-station. Known azimuth or known backsight measurements can be observed.

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

The data scanned with ScanStation C10/C5 is corrected by an internal dual-axis compensator*, when the dual-axis compensator is enabled (via onboard control or *Cyclone*).

- * Optional for C5
- 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.

ScanStation C10/C5, Setting Up the Instrument

Setup step-by-step





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

- 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.



Please see also section "Scanning with ScanStation C10/C5" in the *Cyclone* documentation for more information.

2.4 Instrument Height

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



- 1. Place tripod centrally over the ground point, level instrument.
- 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.
- 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.
- Read height of the instrument (ground tilt axis) in the reading window at the red marking (in the example 1.627 m).



- 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 C10/C5 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.

2.5 Power Supply and Charging

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Primary use/charging

- The battery must be charged prior to using 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 +45°C / +32°F to +113°F. For optimal charging we recommend charging the battery 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 or too low.
- 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 battery can be operated from -20°C to +55°C / -4°F to +131°F.
- Low operating temperatures reduce the capacity that can be drawn; very high operating temperatures reduce the service life of the battery.

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 "Indicator panel" on page 52.

- 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.

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



b) Capacity indication

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.

Explanation of the symbols used in this chapter

| Symbol | Meaning |
|--------|---------------------|
| 0 | LED off. |
| | LED permanently on. |
| | LED flashing. |



| LED | Meaning | | | |
|---|------------------------------|--|--|--|
| $ \sum_{\lambda = 0 \\ \lambda = 0 $ | Battery fully charged | | | |
| -☆- <i>☆</i> -☆- | Battery capacity minimum 80% | | | |
| -××- 0 | Battery capacity minimum 50% | | | |
| -×- o o | Battery capacity minimum 10% | | | |
| | Battery capacity < 10% | | | |

Error indicators, red LEDs O O O F O

| LED | Meaning | Measure to take |
|----------------|---|--|
| | Charging outside temperature range 0°C to 45°C | Use within specified tempera- ture range only. LED keeps flashing until problem is resolved. |
| → • • • | Discharging outside tempera- ture range -20°C to +55°C | Use within specified tempera- ture 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. |
|---------------------------------|---|
| (F | 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.

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.
- 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.



For AC power supply:

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!



Period of use, life span of the power supply Operation time for a fully charged external power supply is approximately six hours at room temperature.

- (P
- Before storing the power supply for a long period of time, recharge it to avoid shortening the life span.
 Before storage, remove the battery from the charging station.

ScanStation C10/C5, Setting Up the Instrument

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.

Charging the GEB241 internal battery

Using the GKL221 professional charger:



Inserting:

- Insert the battery flush to the front edge of the GDI221 battery bay.
- 2. Push the battery to the back with only slight pressure to the stop position.

Removing:

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

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For more details refer to the GKL221 User Manual.

Using the GKL212 basic charger:



Inserting:

- 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:

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



For more details refer to the GKI 212 User Manual.



- 1. 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.

ScanStation C10/C5 and external battery pack GEB271



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 GEV97 power cable to port P1 of the charging station.
- 3. Connect the other end of the GEV97 power cable to the power port of the instrument.
- 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.

| 3 | Scanning Switching the System On/Off | | |
|------------------------|--|--|--|
| 3.1 | | | |
| Switch on procedure | 1. Set up the instrument as desired. Refer to chapter "2 Setting Up the Instrument" for more information. | | |
| | 2. Press and hold the ON/OFF button until a beep is audible. | | |
| | 3. The instrument's fan starts. | | |
| | 4. The Leica Geosystems welcome screen starts. | | |
| | 5. Wait until the Main Menu appears on the display and the Idle State message is shown in the message bar. | | |
| | 6. Once in Idle State the scanner is ready for operation. | | |
| Switch off | 1. From the current menu return to the Main Menu. | | |
| procedure | 2. In the Main Menu press the X button. | | |
| | 3. In the popup window confirm the question Do you really want to power down | | |
| | the scanner? with Yes. | | |
| | 4. Wait for the scanner to shut down. | | |

Alternative switch off procedure

3.2

Unfavourable

surfaces for

scanning

- In the event of a system crash follow the alternative switch off procedure:
 - 1. Press and hold the ON/OFF button for a minimum of 6 seconds.
 - 2. After 3 seconds a single beep and after 6 seconds a double beep is audible.
 - 3. After the double beep $\ensuremath{\textbf{release}}$ the ON/OFF button.

survey during these conditions!

4. Wait for the scanner to shut down.

Ambient Conditions

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

(B)

Color or powder these surfaces before scanning if necessary.

Unfavourable weather 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.

Rain, snow or fog cause poor measurements, so it is not possible to

| Temperature changes | 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. |

3.3 Onboard Controls

Description

(B

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



For a complete description of all menus and commands refer to the Leica ScanStation C10/C5 System Field Manual.

| Icon | | Function | |
|---------------|------------------|---|--|
| Scan | | Offers access to all commands for scanner setup and operation control. | |
| Favorite Scan | \triangleright | Starts scan immediately with pre-defined scan settings. | |
| Manage | B | Offers access to all commands for project, target and control point management. | |
| Status | | Offers access to all commands for the scanner's status information. | |
| Config | Ş | Offers access to all commands for the configuration of the system. | |
| Tools | X | Offers access to all commands for disk formatting, data transfer, license management and display calibration. | |

Menu independent commands:

| Command | | Function | |
|---------------|--------|--|--|
| Escape X | | Return to previous menu in menu hierarchy. | |
| Shift -> Quit | ▼ Quit | Return to main menu. | |
| Page | Page | Switch between pages in a menu. | |

3.3.1 Scan

Description

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

| 12:57:08 Scan | X O= | a 3 |
|------------------|------------------|--------------|
| | Scan Parameter | X |
| Fld of View | Resolution Image | Ctrl Filters |
| Presets | : Target All | • |
| Left | : 65.813 | deg |
| Right | : 65.811 | deg |
| Bottom | : -45 | deg |
| Тор | : 90 | deg |
| | | |
| [Idle State] | | T |
| Sc+Img Sc: | an ScWin VwSc | Vwimg Page |

3.3.2 Manage

Description

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



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

3.3.3 Status

Description

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



| Icon | Command | Description |
|-----------------------|------------|---|
| 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. |
| | Options | Status information about installed external camera option and installed set of options on a C5. |
| lcon | Command | Description |
|-----------------------|---------|--|
| Level & Ls Plummet | Level | Numerical and graphical display of instrument's tilt. |
| | Plummet | Switch laser plummet on/off. |
| | Compens | Switch dual-axis compensator* on/off. Define how scanner should react when compensator goes out of range. |
| WiFi | WiFi | Define region code and TX power for external WiFi communication device. The WiFi device should be connected to the scanner before this function is selected. |

* Optional for C5

ScanStation C10/C5, Scanning

3.3.4 Configuration

Description

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



| lcon | | Command | Description |
|-----------------|------------------|---------------|--|
| Units | \times | 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 | a à â ä à æ ă | 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. |
| | V | Resolution | Define horizontal and vertical point spacing for Favorite Scan . |
| | | Image Ctrl | Define parameters of internal camera for Favorite Scan . |
| | | Filters | Define filter parameters for Favorite Scan . |

3.3.5 Tools

Description

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



| lcon | Command | Description |
|------------------------|--------------|---|
| Format | | Format the complete data partition of the internal hard disk. C 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 touch screen by clicking three points on the display. |

3.4 *Cyclone* SCAN

Scanning with *Cyclone* SCAN

In addition to the onboard control the ScanStation C10/C5 can be controlled via the *Cyclone* SCAN interface.

- 1. Connect one end of the ethernet cable to the ScanStation C10/C5 ethernet connector and the other end to a computer which has *Cyclone* SCAN installed.
- 2. Start Cyclone SCAN.
- 3. In the Cyclone Navigator select Configure, Scanners.
- 4. In the **Configure Scanners** window press the **Add** button.
- 5. In the Add Scanner window select ScanStation C10/C5 for the scanner model and add a descriptive scanner name (for example "ScanStation C10/C5 (xxxx)" with xxxx being the scanner's serial number). No IP address is needed for the ScanStation C10/C5.

Close the Add Scanner window to return to the Cyclone Navigator.

- 6. In the *Cyclone* Navigator expand the **Scanners** folder and double click the new scanner name to open the **Scan Control** window.
- 7. The initial **Scan Control** window prompts to select a project folder in the **Select Project** window.
- 8. In the **Select Project** window select an existing project folder or create a new one. Close this window by confirming with the **OK** button.

- 9. In the Scan Control window select Scanner, Connect to connect your computer to the scanner. After connection has been established the Scan Control window will show the status Connected and ready at the bottom of the window. ScanStation C10/C5 and Cyclone are now ready to start a scan.
- Retain enough free disk space on the computer: depending on your project, up to 50% of your hard disk.
- Do not additionally overload the computer with additional tasks and applications while scanning.
- It is not recommended to perform other *Cyclone* tasks while scanning.
- For details about the ScanStation C10/C5 scan operation with Cyclone SCAN refer to the Cyclone help system or your local support team.

න

4 Troubleshooting

ScanStation C10/C5

| 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. | Touch screen not cali- brated. | Recalibrate touch screen via Tools , Calibration . |
| Missing points in scan. | Dust, debris or fingerprints on optics of rotating mirror. | Use glass cleaning kit to clean the specific areas. |

| ScanStation C10/C5 Battery | Problem | Possible Cause(s) | Suggested Remedies |
|-------------------------------|--|------------------------------------|--|
| Battery | 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 defec- tive. | 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 shirt circuits. Defective circuits need to be replaced. Only use supplied power cables. |

ScanStation C10/C5, Troubleshooting

| Problem | Possible Cause(s) | Suggested Remedies |
|---------|--|---|
| | 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

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The diagnostic procedure explains how to create log files with the user interface of your ScanStation C10/C5 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:
 - C10_1234.log: log file of current scan day with 1234 being the last four digits of the scanner serial number,
 - C10_1234.20100829.log: older log file with scanner serial number and scan date embedded in the file name (year, month, day),
 - UpgraderLog.txt,
 - svclog.txt,
 - XenaService.log.
- 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.

For a ScanStation C5 model the diagnostic files are named C5_1234.log and C5_1234.20100829.log with 1234 being the last four digits of the scanner serial number.

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Summary

If you experience problems with your instrument:

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

| 5 C | Care | and | Transport |
|-----|------|-----|-----------|
|-----|------|-----|-----------|

5.1 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.

| 5.2 | 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 equiva- lent, 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. | |

| 5.3 | Storage | | |
|------------------|--|--|--|
| Product | Respect the temperature limits when storing the equipment, particularly in summer if the equipment is inside a vehicle. Refer to "7 Technical Data" for information about temperature limits. | | |
| Field adjustment | After long periods of storage, inspect the field adjustment parameters given in this user manual before using the product. | | |
| Batteries | Refer to "7.5 Environmental" for information about storage temperature range. A storage temperature range of +5°C to +35C / +41°F to +95°F in a dry environment is recommended to minimize self-discharging of the battery. At the recommended storage temperature range, batteries containing a 10% to 50% charge can be stored for up to one year. After this storage period the batteries must be recharged. 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. | | |

5.4 Cleaning and Drying

Windows and targets

- Blow dust off scanner windows.
- Never touch the glass with your fingers.
- Use only a clean, soft, lint-free cloth for cleaning. If necessary, moisten the cloth with water or pure alcohol.
- Do not use other liquids; these may attack the polymer components.
- Charger and touchscreen: Use only a clean, soft, lint-free cloth for cleaning.

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. Do not repack until everything is completely dry.



Cables and plugs

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

| 5.5 | Glass Cleaning Procedure |
|----------------------------|--|
| General | The ScanStation C10/C5 scanning mirror must be kept clean. The instructions must be followed as described in this chapter to clean the scanner mirror. |
| Warning | Direct intrabeam viewing is always hazardous. Precautions: Before cleaning glass, ensure the instrument is switched off. |
| Dust and debris removal | 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. |
| (B) | Never rub off dust or debris as this will scratch the glass and so possibly cause perma- nent damage to the special optical coatings. |

Cleaning of the optics

Caution

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

Precautions:

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

(P)

- 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 center to the edge ٠ 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 oilv!

5.6 Adjustment of the Circular Level

On the instrument step-by-step



- 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.
- The bubble must be centered. If it extends beyond the circle, use an allen key to center it with the adjustment screws. Turn the instrument slowly 200 gon (180°).
 Repeat the adjustment procedure if the bubble does not stay centered.



After the adjustment, no screw shall be loose.

On the tribrach step-by-step



- Level up the instrument with the electronic level, assuming that the instrument is correctly adjusted. Remove the instrument from the tribrach. 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 centered. If it extends beyond the circle, use the adjusting pin in conjunction with the two cross-headed adjustment screws to centre it.



After the adjustment, no screw shall be loose.

5.7 Service of the Tripod

Service tripod step-by-step



The connections between timber and metal must be firm and tight. ŝ

- 1. Moderately tighten the allen screws with the allen key supplied with the tripod.
- 2. Tighten articulated joints just enough to keep the tripod legs open when lifting the tripod off the ground.
- 3. Tighten the allen screws of the tripod legs.

5.8 Adjustment of the Laser Plummet

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, the instrument has to be returned to any Leica Geosystems authorised service workshop.



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**.

Inspecting the laser plummet step-by-step

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- 3. Press **Page** to access the **Laser Plummet** page. Switch on the laser plummet. Inspection of the laser plummet should 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 should 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 may 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.

| Safety Directions |
|---|
| General |
| The following directions should 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. |
| |

6.2 Intended Use

Permitted use

- Measuring horizontal and vertical angles.
- Measuring distances.
- Scanning objects.
- Capturing and recording images.
- Recording measurements.
- Computing by means of software.
- Remote control of product.
- Data communication with external appliances.
- Visualising the aiming direction and vertical axis.

Adverse use

- Use of the product without instruction.
- Use outside of the intended limits.
- Disabling safety systems.
- Removal of hazard notices.
- Opening the product using tools, for example screwdriver, unless this is specifically permitted for certain functions.
- Modification or conversion of the product.
- Use after misappropriation.
- Use of products with obviously recognisable damages or defects.

- Use with accessories from other manufacturers without the prior explicit approval of Leica Geosystems.
- Inadequate safeguards at the surveying site, for example when measuring on roads.
- Deliberate dazzling of third parties.
- Controlling of machines, moving objects or similar monitoring application without additional control- and safety installations.



Adverse use can lead to injury, malfunction and damage.

It is the task of the person responsible for the equipment to inform the user about hazards and how to counteract them. The product is not to be operated until the user has been instructed on how to work with it.

| 6.3 | 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 in close proximity to electrical installations or similar situations by the person in charge of the product.

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

For GEV225 / GEV230

Environment



| 6.4 | Responsibilities |
|--|---|
| Manufacturer of the product | Leica Geosystems AG, CH-9435 Heerbrugg, Switzerland, hereinafter referred to as Leica Geosystems, is responsible for supplying the product, including the user manual and original accessories, in a completely safe condition. |
| Manufacturers of non Leica Geosystems accessories | The manufacturers of non Leica Geosystems accessories for the product are respon- sible for developing, implementing and communicating safety concepts for their products, and are also responsible for the effectiveness of those safety concepts in combination with the Leica Geosystems product. |
| Person in charge of the product | The person in charge of the product has the following duties: To understand the safety instructions on the product and the instructions in the user manual. 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 radio transmitters 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. |

| 6.5 | Hazards of Use |
|---------|---|
| Warning | The absence of instruction, or the inadequate imparting of instruction, can lead to incorrect or adverse use, and can give rise to accidents with far-reaching human, material, financial and environmental consequences. Precautions: |
| | All users must follow the safety directions given by the manufacturer and the directions of the person responsible for the product. |
| 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 hairs and/or clothes by rotating parts. Precautions: Keep a safe distance of the rotating parts. |

Because of the risk of electrocution, it is very 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.



Marning 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.

<u> Marning</u> €

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.

| A Warning | Inadequate securing of the surveying site can lead to dangerous situations, for example in traffic, on building sites, and at industrial installations. Precautions: Always ensure that the survey site is adequately secured. Adhere to the regulations governing safety and accident prevention and road traffic. |
|-----------|--|
| A Warning | If computers intended for use indoors are used in the field there is a danger of elec- tric shock. Precautions: Adhere to the instructions given by the computer manufacturer with regard to field use in conjunction with Leica Geosystems products. |
| 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 may sustain injury. Precautions: When setting-up the product, make sure that the accessories, for example tripod, tribrach, connecting cables, are correctly adapted, fitted, secured, and locked in position. Avoid subjecting the product to mechanical stress. |

ScanStation C10/C5, Safety Directions

| M Warning | Only Leica Geosystems authorised service workshops are entitled to repair these products. |
|------------------|--|
| A Caution | With the remote control of products, it is possible that extraneous targets will be picked out and measured. Precautions: When measuring in remote control mode, always check your results for plausibility. |
| Marning Warning | Using a battery charger not recommended by Leica Geosystems can destroy the batteries. This can cause fire or explosions. Precautions: Only use chargers recommended by Leica Geosystems to charge the batteries. |
| 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. |

| Marning Warning | Short circuited battery terminals can overheat and cause injury or fire, for example by storing or transporting in pockets if battery terminals come in contact with jewel- lery, keys, metallised paper or other metals. Precautions: Make sure that the battery terminals do not come into contact with metallic objects. |
|-----------------|--|
| Caution | During the transport, shipping or disposal of batteries, it is possible for inappropriate mechanical influences to constitute a fire hazard. Precautions: When transporting shipping, or disposing 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. |
| | For Power Supply: |
| A Danger | Death or serious injury can occur if unit is not connected to ground. To avoid electric shock power cable and outlet must be grounded. |

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!



Marning Warning

If you open the product, either of the following actions may cause you to receive an electric shock:

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

Precautions:

Do not open the product. Only Leica Geosystems authorised service workshops are entitled to repair these products.



Batteries not recommended by Leica Geosystems may be damaged if charged or discharged. They may burn and explode.

Precautions:

Only charge and discharge batteries recommended by Leica Geosystems.


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.
- Improper disposal of silicone oil may cause environmental contamination.





The product must not be disposed of 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.

6.6 Laser Classification, Visible Laser

6.6.1 General

General

The following directions (in accordance with the state of the art - international standard IEC 60825-1 (2007-03) and IEC TR 60825-14 (2004-02)) provide instruction and training information to 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.



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.



Products classified as laser class 2 or class 3R may cause dazzle, flashblindness and after-images, particularly under low ambient light conditions.

6.6.2 Distance Laser

General

The laser incorporated into the product produces a visible green laser beam which emerges from the rotating mirror.

The laser product described in this section, is classified as laser class 3R in accordance with:

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

Class 3R laser products:

Direct intrabeam viewing may be hazardous (low-level eye hazard), in particular for deliberate ocular exposure. The risk of injury for laser class 3R products is limited because of:

- a) unintentional exposure would rarely reflect worst case conditions of (e.g.) beam alignment with the pupil, worst case accommodation,
- b) inherent safety margin in the maximum permissible exposure to laser radiation (MPE),
- c) natural aversion behaviour for exposure to bright light for the case of visible radiation.

| Description | Value |
|---|----------------|
| Maximum average radiant power | 1.5 mW |
| Maximum peak radiant power | 120 W |
| Pulse duration | 250 ps |
| Pulse repetition frequency | \leq 50 kHz |
| Beam divergence (full angle) | 0.1 mrad |
| Beam waist location | 20 m |
| Beam waist diameter (1/e) | 2.5 mm |
| NOHD (Nominal Ocular Hazard Distance) @ 0.25s | 6 m / 19.7 ft. |



From a safety perspective class 3R laser products should be treated as potentially hazardous.

Precautions:

Prevent direct eye exposure to the beam. Do not direct the beam at other people.



Potential hazards are not only related to direct beams but also to reflected beams aimed at reflecting surfaces such as prisms, windows, mirrors, metallic surfaces etc. **Precautions:**

Do not aim at areas that are essentially reflective, such as a mirror, or which could emit unwanted reflections. Do not look through or beside the optical sight at prisms or reflecting objects when the laser is switched on, in laserpointer or distance measurement mode.

ScanStation C10/C5, Safety Directions

Labelling







6.6.3 Laser Plummet

General The laser plummet built into 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 2 in accordance with:

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

Class 2 laser products:

These products are safe for momentary exposures but can be hazardous for deliberate staring into the beam.

| Description | Value |
|----------------------------|-----------------|
| Maximum radiant power | 1.00 mW |
| Pulse duration | 0 - 100% |
| Pulse repetition frequency | 1 kHz |
| Wavelength | 620 nm - 690 nm |



From a safety perspective class 2 laser products are not inherently safe for the eyes. **Precautions:**

Avoid staring into the beam or pointing the beam at other people.

Labelling



a) Class 2 laser warning label is not applied because distance laser is of a higher laser class.



6.7 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.

A Caution

There is a risk that disturbances may be caused in other equipment if the product is used in conjunction 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.

ScanStation C10/C5, Safety Directions

| Caution | Disturbances caused by electromagnetic radiation can result in erroneous measure- ments. 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 very intense electromagnetic radiation, for example, near radio transmitters, two-way radios or diesel generators. Precautions: Check the plausibility of results obtained under these conditions. | |
|-----------------|---|--|
| Marning Warning | 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. | |



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 may be disturbed or that humans or animals may 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.

| 6.8 | FCC Statement, Applicable in U.S. The greyed paragraph below is only applicable for products of the ScanStation C10/C5 System without radio, digital cellular phone devices or Bluetooth. | | | |
|---------------|--|--|--|--|
| Applicability | | | | |
| 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. | | | |



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

Labelling ScanStation C10/C5



C10_033











Labelling GKL271



| 7 | Technical Data | | |
|-----------------|--|--|--|
| 7.1 | General Technical Data of the Instrument | | |
| Instrument type | Compact, pulsed, dual-axis compensated, very high-speed laser scanner, with survey- grade accuracy, range, and field of view; integrated camera and laser plummet | | |
| User interface | Onboard control, notebook, Tablet PC or remote controller | | |
| Data storage | Integrated 80 GB solid state drive, external PC or external USB device | | |
| Camera | Auto-adjusting, integrated high-resolution digital camera with zoom video. External SLR camera (optional). | | |

7.2 System Performance

| Accuracy of single measurement | Position ¹ : Distance ¹ : Angle (horizontal/vertical): | 6 mm 4 mm 12" / 12" (60 µrad / 60 µrad) |
|--|--|---|
| Modeled surface precision ² /noise | 2 mm | |
| Target acquisition ³ | 2 mm standard deviation | |
| Dual-axis compensator ⁴ | - Selectable on/off; Setting accuracy: 1.5" / 7.275 μrad, resolution 1", dynamic range ±5' | |
| | All ± accuracy specifications are one sigma (1 σ) unless otherwise noted. At 1 m - 50 m range, 1 σ Subject to modeling methodology for modeled surface Algorithmic fit to planar HDS targets Optional for C5 | |

| 7.3 | Laser Scanning System | | |
|-----------------------------|--------------------------------------|--|---|
| Туре | Pulsed; proprietary microchip | | |
| Color | Green; visible (wavelength = 532 nm) | | |
| Range | | 300 m @ 90%; 134 m @ 18% albedo (minimum range 0.1 m) 35 m @ \geq 5% albedo (upgradeable to full C10 range) | |
| Scan rate | | up to 50'000 points/sec, maximum instantaneous rate 25'000 points/sec (upgradable to full C10 speed) | |
| Scan resolution | Spot size Selectabi Point spa | ility: | \leq 7 mm from 0 - 50 m (based on Gaussian definition) \leq 4.5 mm from 0 -50 m (based on FWHH definition) Independently, fully selectable vertical and horizontal point- to-point measurement spacing Fully selectable horizontal & vertical; through full range |
| Field-of-View (per scan) | Horizont Vertical: Aiming/S | | 360° (maximum) 270° (maximum) Parallax-free, integrated zoom video |

| Scanning Optics | Vertically rotating mirror on horizontally rotating base; Smart X-Mirror™ automatically spins or oscillates for minimum scan time | | |
|---|--|--|--|
| Scan motors | Direct drive, brushless | | |
| Communication | Dynamic Internet Protocol (IP) address via Ethernet or wireless LAN (WLAN) with external adapter | | |
| Integrated digital color camera with zoom video | 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* | | |
| External SLR camera (optional) | * Optional for C5 Canon EOS 60D camera with Sigma 8mm F3.5 EX DG fisheye lense Single image: 3456 x 5184 pixels (18 megapixels) Full 360° x 270° dome: 6 images, automatically spatially rectified | | |
| Onboard display | For details refer to the external camera manual. Touchscreen control with stylus, full color graphic display, QVGA (320 x 240 pixels) | | |

| Level indicator | External bubble, electronic bubble in onboard control and Cyclone software | | |
|-----------------|--|--|--|
| Laser plummet | Type: Location: Accuracy: Diameter of laser point: | Visible red laser class 2 In standing axis of instrument Deviation from plumbline: 1.5 mm at 1.5 m instrument height 2.5 mm at 1.5 m instrument height | |

| 7.4 | Electrical | | |
|---|--|--|--|
| Power supply | 15 V DC, 90 - 260 V AC; Four internal batteries provided with system. | | |
| Power consumption | < 50 W, average | | |
| GEV230 AC power supply for ScanStation C10/C5 | Input voltage: Output voltage: | 100-240 V AC, 50-60 Hz 15 V | |
| Power ports | Internal: 2, External: 1 (simultaneous use, hot swappable) | | |
| GEV225 AC power supply for GKL271 | Input voltage: Output voltage: | 100-240 V AC, 50-60 Hz 24 V | |
| GKL271 charging station | Input voltage: Output voltage: | Port P3: 24 V DC Port P1: 14.4 V DC Port P2: 24 V DC / 36 V DC | |

| ScanStation C10/C5, Technical Data | | |
|------------------------------------|--|--|
| GEB271 battery pack | Type: Voltage: Capacity: | Li-lon 14.4 V 16.8 Ah |
| GEB241 battery | Type: Voltage: Capacity: | Li-Ion 14.8 V 4.8 Ah |
| Operating time | Internal batteries: External battery: | >3.5 hours, typical continuous use (room temperature), using both batteries simultaneously >6 hours, typical continous use (room temperature) |
| Charging time | Internal batteries: External batteries: | Typical charging time with Professional Charger GKL221 is <3.5 h at room temperature (2 batteries). Typical charging time is 3.5 h at room temperature. |

7.5 Environmental

7.5.1 Scanner

Environmental specifications

Lighting

Temperature

| Туре | Operating temperature [°C] | Storage temperature [°C] |
|--------------------|----------------------------|--------------------------|
| ScanStation C10/C5 | 0 to +40 | -25 to +65 |
| A/C power supply | 0 to +40 | -25 to +65 |

Protection against water, dust and sand

IP54 (IEC 60529)

Humidity

Max 95 % non condensing

Fully operational from bright sunlight to complete darkness.

7.5.2 GEB271 / GKL271 / GEB241

Environmental specifications

Temperature

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

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

Protection against water and dust

IP54 (IEC 60529)

Humidity

Max 95% non-condensing



Physical

Dimensions

| | I | I |
|--|-------------------------------------|-------------------------------------|
| Instrument | Dimensions [mm] (D x W x H) | Dimensions ["] (D x W x H) |
| ScanStation C10/C5 | 238 x 358 x 395 | 9.4 x 14.1 x 15.6 |
| GEV230 AC power supply for ScanStation C10/C5 | 76 x 146 x 43 Cable length: 1000 | 3.0 x 5.7 x 1.7 Cable length: 39 |
| GEV225 AC power supply for 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 |
| GEB241 battery | 40 x 72 x 77 | 1.6 x 2.8 x 3.0 |
| GVP645 ScanStation C10/C5 transport container | 500 x 625 x 366 | 19.7 x 24.6 x 14.4 |

Tilt axis height and offset to TPS/GNSS accessories ScanStation C10/C5 with GRZ122 prism (with handle GAD110 and adapter GAD112) ScanStation C10/C5 with GS15 antenna (with handle GAD110)

| Туре | GRZ122 / GAD110 / GAD112 | GS15 / GAD110 |
|------------------|---|---|
| Tilt axis height | 250 mm | 250 mm |
| Offset tilt axis | 229 mm to prism center. 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). |

229

250

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æ

5 50

C10 044





| Type | GREIZE / GADION | AINI2501 / GADIOA |
|------------------|---|---|
| Tilt axis height | 250 mm | 250 mm |
| Offset tilt axis | 269 mm to prism center. 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). |



| | | HDS target 3" (with GRT146 carrier) |
|------------------|---------------------------|--|
| Tilt axis height | 250 mm | 250 mm |
| Offset tilt axis | 60.5 mm to target center. | 37.5 mm to target center. |

Weight

| Instrument | Weight [kg] | Weight [lbs] |
|--|-------------|---------------|
| ScanStation C10/C5 | 13, nominal | 28.7, nominal |
| GEV230 AC power supply for ScanStation C10/C5 | 0.7 | 1.5 |
| GEV225 AC power supply for GKL271 | 0.860 | 1.9 |
| GKL271 charging station | 1 | 2.2 |
| GEB271 battery pack | 1.9 | 4.2 |
| GEB241 battery | 0.4 | 0.9 |
| GVP645 ScanStation C10/C5 transport container (without scanner and accesso- ries) | 10.4 | 22.9 |
| GVP645 ScanStation C10/C5 transport container (with scanner and standard deliverables) | 28 | 61.7 |

| 7.7 | Accessories |
|-------------------------------------|---|
| Standard Accesso- ries, included | 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 meter and distance holder for height meter Cleaning tissue CycloneTM SCAN software 1 year CCP Basic support agreement |
| Additional accessories | HDS scan targets and target accessories Service agreement for Leica ScanStation C10/C5 Extended warranty for Leica ScanStation C10/C5 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, external wireless LAN adapter (third-party) External camera kit with bracket and connection cable to scanner External camera (third-party) |

Notebook PC for scanning

| Component | Minimum requirements |
|--------------------|--|
| Processor | 2 GHz Dual Core processor or better |
| System memory RAM | 2 GB (4 GB for Windows Vista or Windows7) |
| Hard Disk | 40GB or greater, (5'400RPM or faster) |
| Network connection | Ethernet |
| Display | SVGA or OpenGL accelerated graphics card (with latest drivers) |
| Operating system | Microsoft Vista* (32 or 64) Microsoft Windows XP (SP2 or higher) (32 or 64) Microsoft Windows 7 (32 or 64) |
| File System | NTFS |

- * Some systems may not support Windows Vista's Desktop Windows Manager (DWM) with Leica *Cyclone* and must be operated in Windows Classic Look.
- Minimum requirements for modeling operations are different. Please refer to *Cyclone* datasheet for specifications, available at your Leica Geosystems dealer.

8 International Limited Warranty, Software License Agreement

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- when it has to be **right**

