



User Manual

Geomax Zoom45 Series

English

Version 1.0

Introduction

Purchase

Congratulations on the purchase of a GeoMax Zoom instrument.



This manual contains important safety directions as well as instructions for setting up the product and operating it. Refer to [1 Safety Directions](#) for further information. Read carefully through the User Manual before you switch on the product.



The content of this document is subject to change without prior notice. Ensure that the product is used in accordance with the latest version of this document. Updated versions are available for download at the following Internet address: <https://geomax-positioning.com/partner-area>

Product Identification

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

Trademarks

- *Bluetooth®* is a registered trademark of Bluetooth SIG, Inc. All other trademarks are the property of their respective owners.



Available Documentation

Name	Description/Format	Word	PDF	HTML
Zoom45 Quick Guide	Provides an overview of the product together with technical data and safety directions. Intended as a quick reference guide.	✓	✓	-
Zoom45 User Manual	All instructions required in order to operate the product to a basic level are contained in the User Manual. Provides an overview of the product together with technical data and safety directions.	-	✓	✓

Refer to the following resources for all Zoom45 documentation:

- https://partners.geomax-positioning.com/downloads_v2.htm

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1.1**General****Description**

The following directions enable the person responsible for the product, and the person who actually uses the equipment, to anticipate and avoid operational hazards.

The person responsible for the product must ensure that all users understand these directions and adhere to them.

About warning messages

Warning messages are an essential part of the safety concept of the instrument. They appear wherever hazards or hazardous situations can occur.

Warning messages...

- make the user alert about direct and indirect hazards concerning the use of the product.
- contain general rules of behaviour.

For the users' safety, all safety instructions and safety messages shall be strictly observed and followed! Therefore, the manual must always be available to all persons performing any tasks described here.

DANGER, WARNING, CAUTION and **NOTICE** are standardised signal words for identifying levels of hazards and risks related to personal injury and property damage. For your safety, it is important to read and fully understand the following table with the different signal words and their definitions! Supplementary safety information symbols may be placed within a warning message as well as supplementary text.

Type	Description
 DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	Indicates a potentially hazardous situation or an unintended use which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a potentially hazardous situation or an unintended use which, if not avoided, may result in minor or moderate injury.
 NOTICE	Indicates a potentially hazardous situation or an unintended use which, if not avoided, may result in appreciable material, financial and environmental damage.
	Important paragraphs which must be adhered to in practice as they enable the product to be used in a technically correct and efficient manner.

1.2**Definition of Use****Intended Use**

- Computing with software
- Data communication with external appliances
- Measuring distances
- Measuring horizontal and vertical angles
- Recording measurements

Foreseeable misuse

- Use of the product without instructions
- Use outside of the intended use and limits
- Disabling of safety systems
- Removal of hazard notices
- Inadequate safeguards at the working site
- Modification or conversion of the product
- Opening the product using tools, for example a screwdriver, unless this is permitted for certain functions
- Use after misappropriation
- Use of products with recognisable damage or defects
- Use with accessories from other manufacturers without the prior written explicit approval of GeoMax
- Aiming directly into the sun
- Controlling of machines, moving objects or similar monitoring applications without additional control and safety installations
- Deliberate dazzling of third parties

1.3

Limits of Use

Environment

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

WARNING

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

Life Risk.

Precautions:

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



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

Environment

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



1.4

Responsibilities

Manufacturer of the product

GeoMax AG, CH-9443 Widnau, hereinafter referred to as GeoMax, 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 the product is used in accordance with the instructions
- To be familiar with local regulations relating to safety and accident prevention
- To stop operating the system and inform GeoMax immediately if the product and the application become unsafe
- To ensure that the national laws, regulations and conditions for the operation of the products are respected

CAUTION

Safe and correct use of system

For the safe and correct use of the system, it is essential that:

- The system is only operated by personnel that have successfully completed the appropriate training. It is therefore strongly recommended that all personnel complete any training advised by GeoMax before use.
- GeoMax is not liable for any damages caused by untrained personnel and/or system misuse.

⚠️ WARNING**Distraction or loss of attention**

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

Precautions:

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

⚠️ WARNING**Inadequate securing of the working site**

This can lead to dangerous situations, for example in traffic, on building sites and at industrial installations.

Precautions:

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

⚠️ WARNING**Lightning strike**

If the product is used with accessories, for example masts, staffs, poles, you may increase the risk of being struck by lightning.

Precautions:

- Do not use the product in a thunderstorm.

⚠️ CAUTION**Dropping the product**

When being dropped, the product can cause personal injury and/or mechanical damage.

Precautions:

- Secure the product when operating it.

⚠️ CAUTION**Not properly secured accessories**

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

Precautions:

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

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

Watch out for erroneous measurement results.

Precautions:

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

DANGER

Risk of electrocution

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

Precautions:

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



CAUTION

Damage to instrument

Cleaning the instrument while the device is switched on can damage the instrument or the battery.

Precautions:

- Before cleaning, switch off the instrument and remove the battery.

WARNING

Improperly repaired equipment

Risk of injuries to users and equipment destruction due to lack of repair knowledge.

Precautions:

- Only authorised GeoMax Service Centres are entitled to repair these products.

WARNING

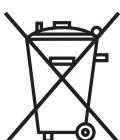
Improper disposal

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

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

Precautions:

-



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

Product-specific treatment and waste management information can be received from your GeoMax distributor.

CAUTION

Pointing product toward the sun

Be careful when pointing the product toward the sun, because the telescope functions as a magnifying glass and can injure your eyes and/or cause damage inside the product.

Precautions:

- Do not point the product directly at the sun.

WARNING

Inappropriate mechanical influences to batteries

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

Precautions:

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

WARNING

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

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

Precautions:

- Protect the batteries from mechanical influences and high ambient temperatures.
- Consider the product's IP class restrictions in chapter [6 Technical Data](#).
- Do not drop or immerse the product into fluids.

WARNING

Short circuit of battery terminals

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

Precautions:

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

WARNING

Damaged battery

If batteries are damaged or are heated strongly, they can explode and cause poisoning, burning, corrosion or environmental contamination.

Precautions:

- Protect the battery against mechanical damages.

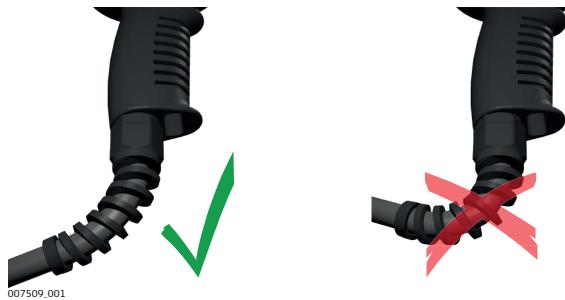
NOTICE

Too much strain on the cable when bending it for a prolonged time

This may damage the cable.

Precautions:

- Ensure that the bending radius is not less than 8 cm when bending the cable for a prolonged time.



1.6

Laser Classification

1.6.1

General

General

The following chapters provide instructions and training information about laser safety according to international standard IEC 60825-1 (2014-05) and technical report IEC TR 60825-14 (2004-02). The information enables the person responsible for the product and the person who actually uses the equipment, to anticipate and avoid operational hazards.



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

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

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



National laws and local regulations could impose more stringent instructions for the safe use of lasers than IEC 60825-1 (2014-05) and IEC TR 60825-14 (2004-02).

1.6.2

Distancer, Measurements with Reflectors

General

The EDM module built into the product produces a visible laser beam which emerges from the telescope objective.

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

- IEC 60825-1 (2014-05): "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
Wavelength	685 nm
Pulse duration	5000 ps
Pulse repetition frequency	100 MHz
Maximum average radiant power	0.34 mW
Beam divergance	1.5 mrad x 3 mrad

1.6.3

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 (2014-05): "Safety of laser products"

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

Description	Value
Wavelength	635 nm
Maximum average radiant power	0.95 mW
Pulse duration	0.7 ms - cw
Pulse repetition frequency (PRF)	1 kHz
Beam divergence	<1.5 mrad

⚠ CAUTION

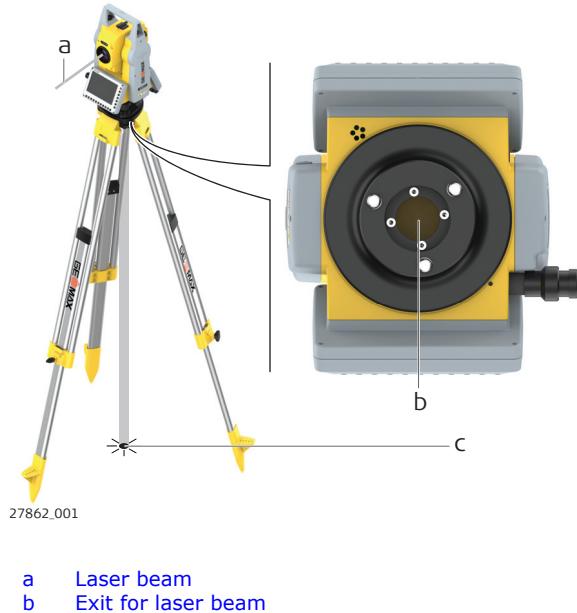
Class 2 laser product

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

Precautions:

- Avoid staring into the beam or viewing it through optical instruments.
- Avoid pointing the beam at other people or at animals.

Labelling



1.6.4

Distancer, Measurements without Reflectors (Reflectorless mode)

General

The EDM module built into the product produces a visible laser beam which emerges from the telescope objective.

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

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

Direct intrabeam viewing may be hazardous (low eye hazard level), in particular for deliberate ocular exposure. The beam may cause dazzle, flash-blindness and after-images, particularly

under low ambient light conditions. The risk of injury for laser class 3R products is limited because of:

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

Description	Value
Wavelength	685 nm
Maximum average radiant power	4.8 mW
Pulse duration	5000 ps
Pulse repetition frequency	100 MHz
Beam divergence	0.2 mrad x 0.3 mrad
NOHD (Nominal Ocular Hazard Distance) @ 0.25s	44 m

⚠ CAUTION

Class 3R laser products

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.

⚠ CAUTION

Reflected beams aimed at reflecting surfaces

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 laser pointer or distance measurement mode. Aiming at prisms is only permitted when looking through the telescope.

Labelling



General

The EDM module built into the product produces a visible laser beam which emerges from the telescope objective.

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

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

Direct intrabeam viewing may be hazardous (low eye hazard level), in particular for deliberate ocular exposure. The beam may cause dazzle, flash-blindness and after-images, particularly under low ambient light conditions. 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
Wavelength	685 nm
Maximum average radiant power	4.8 mW
Pulse duration	5000 ps
Pulse repetition frequency	100 MHz
Beam divergence	0.2 mrad x 0.3 mrad
NOHD (Nominal Ocular Hazard Distance) @ 0.25s	44 m

 **CAUTION**

Class 3R laser products

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.

 **CAUTION**

Reflected beams aimed at reflecting surfaces

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 laser pointer or distance measurement mode. Aiming at prisms is only permitted when looking through the telescope.

Labelling



1.7

Electromagnetic Compatibility (EMC)

Description

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

WARNING

Electromagnetic radiation

Electromagnetic radiation can cause disturbances in other equipment.

Precautions:

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

CAUTION

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

This may cause disturbances in other equipment.

Precautions:

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

CAUTION

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

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

Precautions:

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

CAUTION

Electromagnetic radiation due to improper connection of cables

If the product is operated with connecting cables, attached at only one of their two ends, the permitted level of electromagnetic radiation may be exceeded and the correct functioning of other products may be impaired. For example, external supply cables or interface cables.

Precautions:

- ▶ While the product is in use, connecting cables, for example product to external battery or product to computer, must be connected at both ends.

WARNING

Use of product with radio or digital cellular phone devices

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

Precautions:

- ▶ Although the product meets the strict regulations and standards which are in force in this respect, GeoMax 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 medical equipment.
- ▶ Do not operate the product with radio or digital cellular phone devices in aircrafts.
- ▶ Do not operate the product with radio or digital cellular phone devices for long periods with the product immediately next to your body.

1.8

USA

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:

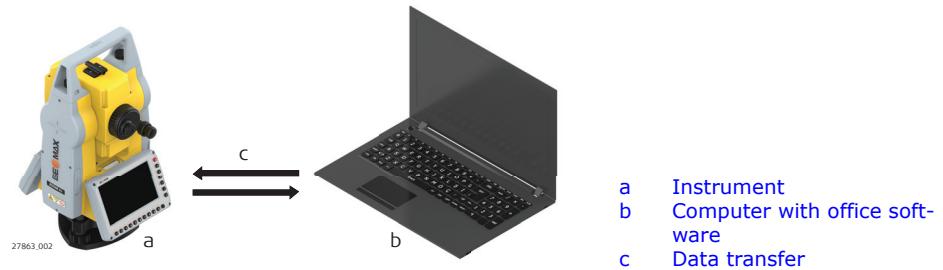
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

2.1

System Components

Main components

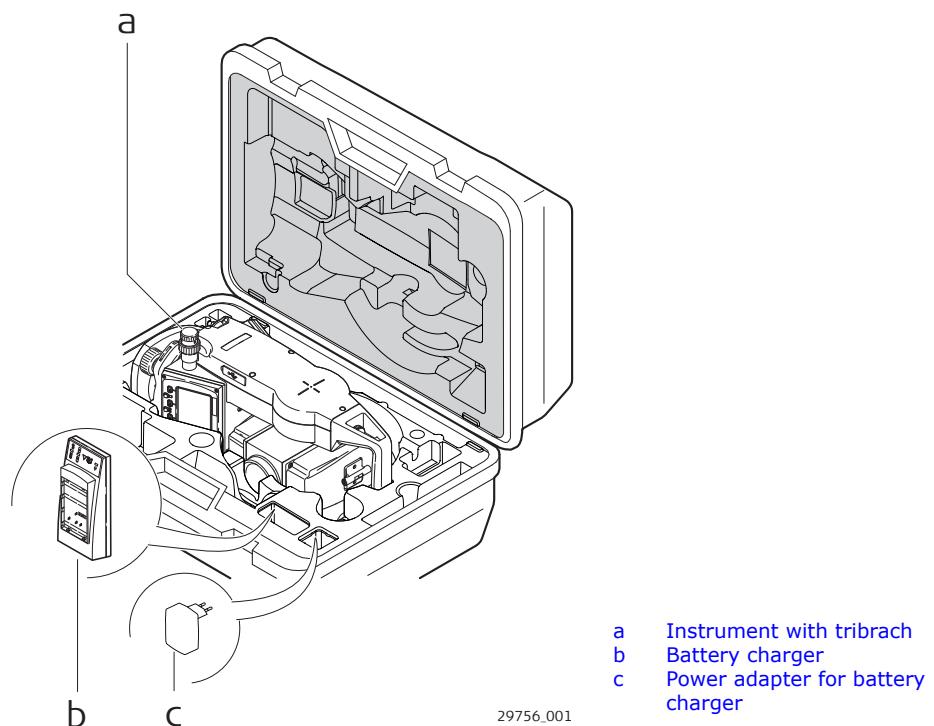


Component	Description
Instrument	An instrument for measuring, calculating and capturing data. Ideally suited for tasks from simple measurements to complex applications. The various lines have a range of accuracy classes and support different features. All lines can be connected with the GeoMax Fusion office software to view, exchange and manage data.
Firmware	The firmware package installed on the instrument. Consists of an operating system, loadable applications and other software components.
Office software	An office software consisting of a suite of standard and extended programs for the viewing, exchanging, managing and post-processing of data.
Data transfer	Data can be always transferred between an instrument and a computer by a USB memory stick, WiFi or Bluetooth.

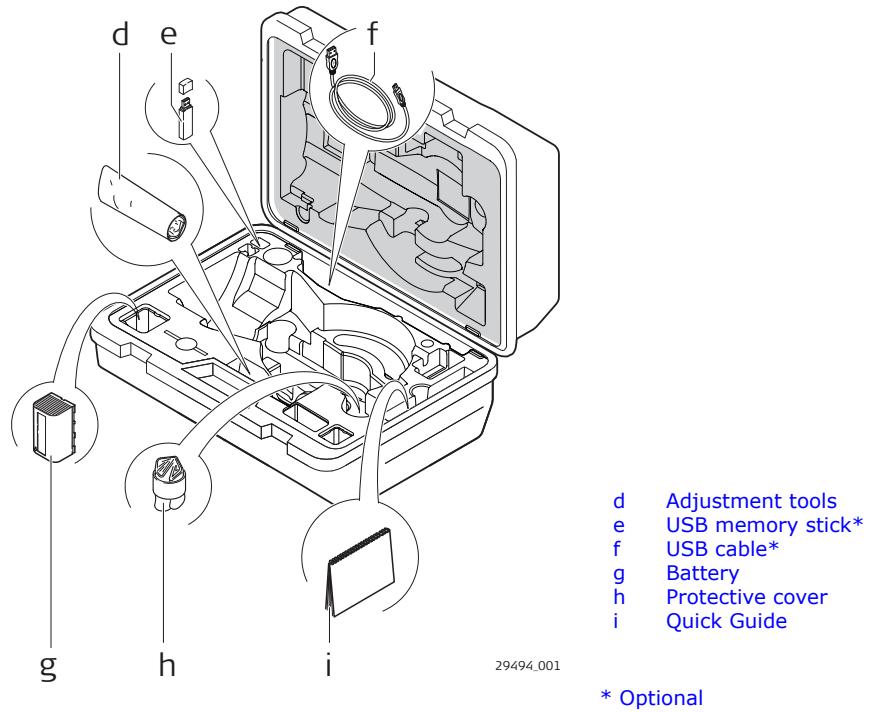
2.2

Container Contents

Container contents part 1 of 2



Container contents part 2 of 2



Instrument components
part 1 of 2



- a Detachable carrying handle
- b Optical sight
- c Objective with integrated Electronic Distance Measurement (EDM). Exit for EDM laser beam
- d Second keyboard*
- e Battery cover
- f Tribrach
- g Horizontal drive
- h Tribrach securing screw

* Optional

Instrument components
part 2 of 2



- i Focusing telescope image
- j Eyepiece; focusing graticule
- k Vertical drive
- l USB ports (A and Mini-B)
- m Level
- n Display
- o Keyboard

3.1

Keyboard

Keyboard



27871_002

- a ON/OFF key
- b Overview
- c Home key/Brightness +
- d Back key/Brightness -
- e Backspace key/Open level panel
- f Function key
- g Enter key
- h . key/Minus (-)
- i Numeric keypad

Function keys F1-F10:



+ 0-9

Second level functions:



+ Home key, Back key, Backspace key or . key

Keys

Key	Description	Function	Key combination
	ON/OFF key.		
	OVERVIEW key.		
	HOME key. Switches to the Home Menu.	Increase brightness:	+
	BACK key. Quits a screen or edit mode without saving changes. Returns to next higher level.	Decrease brightness:	+
	Backspace key.	1) Level:	+
	FUNCTION key.		
	ENTER key. Confirms an entry and continues to the next field.		
	. key.	Minus (-):	+

1) access to level only in particular software screens possible

Key	Description	Function	Key combination
1	Numeric keys (0 ~ 9).	F1 - F10:	

3.2

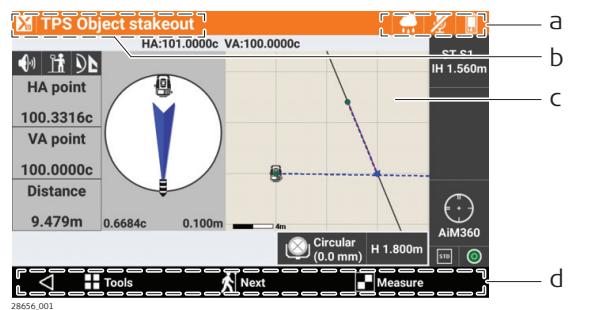
Screen

Screen

The instrument is available with Color&Touch display.

 All shown screens are examples.

Color&Touch screen:



- a Status panel
- b Title of screen
- c Fields
- d Commands

 Tap on an icon or field to run a function.

3.3

Operating Principles

Turn instrument on/off

Use the On/Off key.

Numeric keypad

The numerical keypad is used to enter characters directly into editable fields.

- **Numeric fields:** Can only contain numerical values. By pressing a key of the keypad the number will be displayed.
- Alphanumeric entries via touch or stylus²⁾ possible.

Edit fields



Backspace key. Deletes any change and restores the previous value.

2) optional, not offered by GeoMax

4.1

Instrument Setup

Description

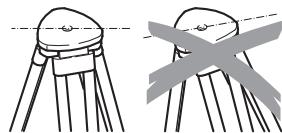
This topic describes an instrument setup over a marked ground point using the laser plummet. It is always possible to set up the instrument without the need for a marked ground point.



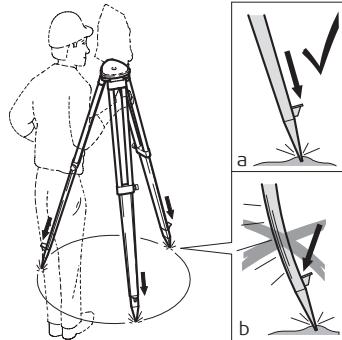
Important features

- It is always recommended to shield the instrument from direct sunlight and avoid uneven temperatures around the instrument.
- 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 appreciably easier to centre the instrument.
- The laser plummet cannot be used with a tribrach equipped with an optical plummet.

Tripod

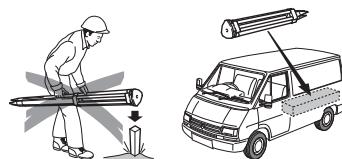


When setting up the tripod pay attention to ensuring a horizontal position of the tripod plate. Slight corrections of inclination can be made with the foot screws of the tribrach. Larger corrections must be done with the tripod legs.



Loosen the clamping screws on the tripod legs, pull out to the required length and tighten the clamps.

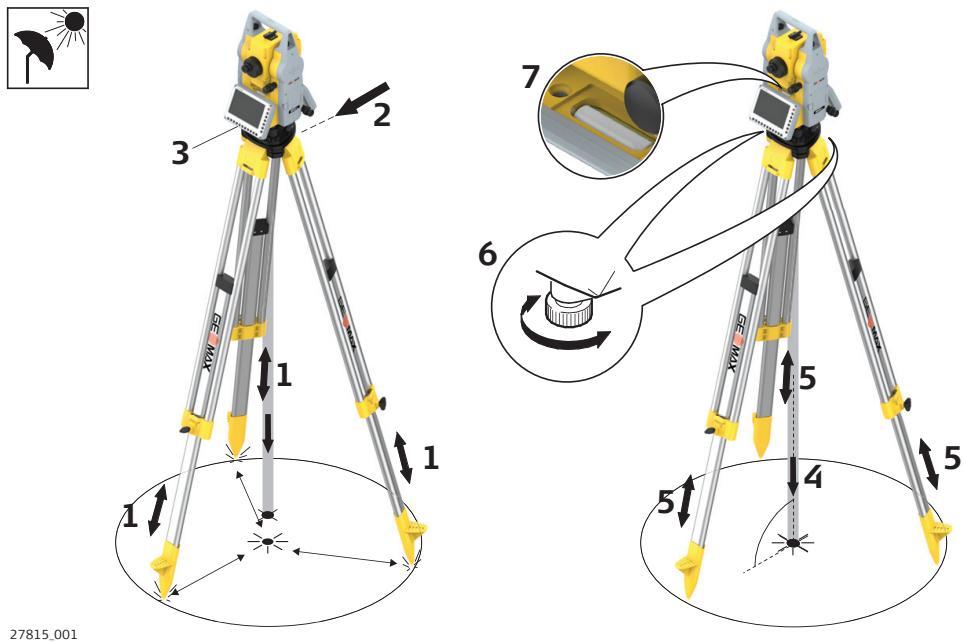
- a In order to guarantee a firm foothold sufficiently press the tripod legs into the ground.
- b When pressing the legs into the ground note that the force must be applied along the legs.



Careful handling of tripod.

- Check all screws and bolts for correct fit.
- During transport always use the cover supplied.
- Use the tripod only for surveying tasks.

Setup step-by-step



1. Extend the tripod legs to allow for a comfortable working posture. Position the tripod over the marked ground point, centring it as best as possible.
2. Fasten the tribrach and instrument onto the tripod.
3. Turn on the instrument, by selecting **Tilt Compensation** in the settings bar of the Toolkit the Level up screen will appear.
4. Move the tripod legs (1) and use the tribrach footscrews (6) to center the plummet (4) over the ground point.
5. Adjust the tripod legs (5) to level the tubular vial (7) or the electronic level.
 If only tubular vial is used, the user would need to do the pre-adjustment with the tubular in two directions.
6. By using the electronic level, turn the tribrach footscrews (6) to precisely level the instrument. Refer to [Level up with the electronic level step-by-step](#).
7. Center the instrument precisely over the ground point by shifting the tribrach on the tripod plate (2).
8. Repeat steps **6.** and **7.** until the required accuracy is achieved.

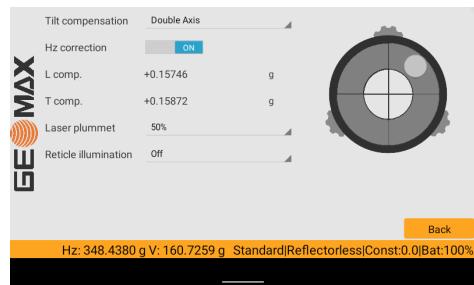
Level up with the electronic level step-by-step

The electronic level can be used to precisely level up the instrument using the footscrews of the tribrach.

1. Turn the instrument until it is parallel to two footscrews.
2. Center the circular level approximately by turning the footscrews of the tribrach.
3. Turn on the instrument, by selecting **Tilt Compensation**  in the **Settings** tab of the **GeoMax Toolkit** the **Level up** screen will appear.

 The bubble of the electronic level appears if the instrument tilt is inside a certain levelling range.

1. Center the electronic level of the first axis by turning the two footscrews.



2. Center the electronic level for the second axis by turning the last footscrew.



3. When the electronic level is centered and both axes are within the tolerance limit, the instrument has been levelled up.



4. Accept with **OK**.

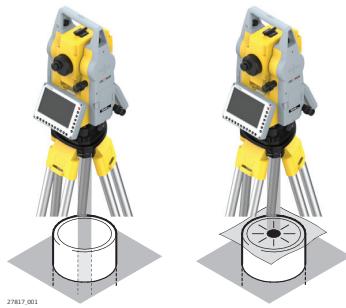
Change the intensity of the laser plummet

External influences and the surface conditions may require the adjustment of the intensity of the laser plummet.

In the **Level Up** screen, adjust the intensity of the laser plummet using the navigation key. The laser can be adjusted in 25% steps as required.



Position over pipes or holes



Under some circumstances the laser dot is not visible, for example over pipes. In this case, using a transparent plate enables the laser dot to be seen and then easily aligned to the center of the pipe.

4.2

Working with the Battery

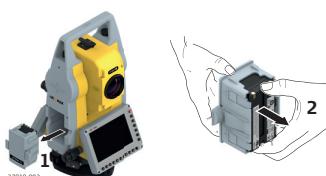
Charging / first-time use

- The battery must be charged before using it the first time, because it is delivered with an energy content as low as possible or might be in sleep mode.
- Charging the battery with external charger ZCH201.
 - Permissible temperature range: 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 GeoMax, it is not possible to charge the battery once the temperature is too high.
- For new batteries or batteries that have been stored for a long time (> three months), it is effectual to make a discharge/charge cycle
- For Li-Ion batteries, a single discharge/charge cycle is sufficient. We recommend carrying out the process when the battery capacity indicated on the charger or on a GeoMax product deviates significantly from the actual battery capacity available.

Operation/discharging

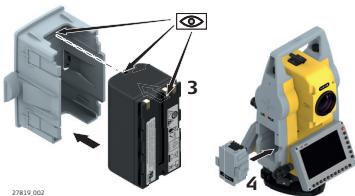
- The batteries can be operated from -20 °C to +55 °C/-4 °F to +131 °F
- Low operating temperatures reduce the capacity that can be drawn; high operating temperatures reduce the service life of the battery

Change the battery step-by-step



Open the battery compartment (1) and remove the battery holder.

Remove the battery from the battery holder (2).



Insert the new battery into the battery holder (3), ensuring that the contacts are facing outward. The battery should click into position.

Insert the battery holder back into the battery compartment (4).



The battery holder is into position if both sides of the compartment are clicked in.



The polarity of the battery is displayed inside the battery housing.

4.3

Data Storage

Description

An internal memory is included in all instruments. Data can then be transferred to a computer.

For Zoom45 instruments, data can also be transferred from the internal memory to a computer or other device via the transfer option (Xpad).



Refer to the USB stick for further information on data management and data transfer.

4.4

GeoMax Toolkit

Description

The instrument comes with a pre-installed application called GeoMax Toolkit.

The main purpose of this application is to perform instrument calibrations, set environmental settings and to perform basic measurements.

Access

From the **HOME** screen press the GeoMax logo icon.

Alternatively, swipe upwards to reach the application drawer. From there, select GeoMax Toolkit.

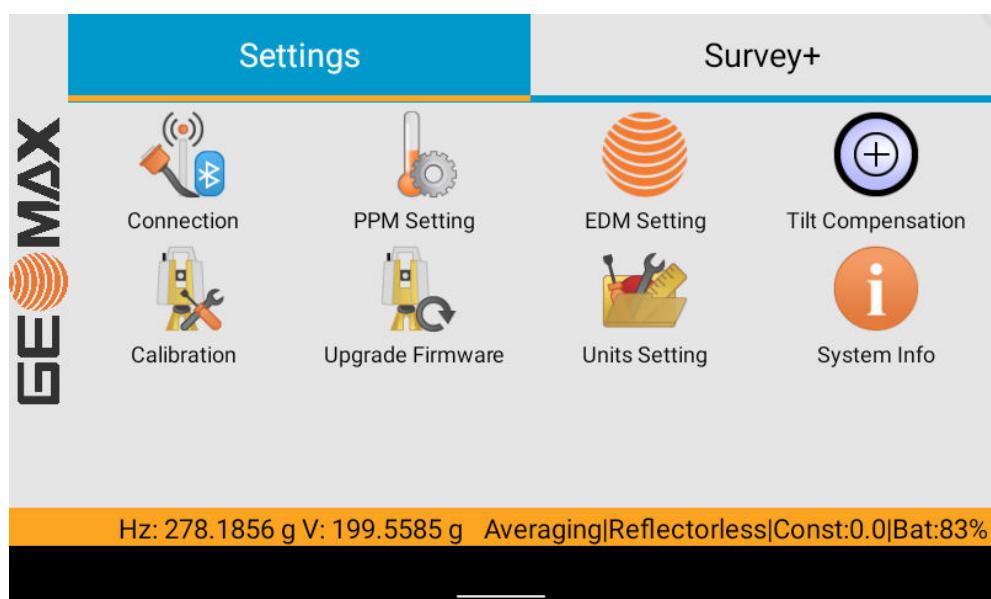
GeoMax Toolkit



4.4.1

Settings Tab

Settings



4.4.1.1

Connection

- The instrument can communicate with external devices via a Bluetooth or Wi-Fi connection.
- The instrument Bluetooth or Wi-Fi is a slave only.
- The Bluetooth or Wi-Fi of the external devices will be the master and therefore will control the connection and any data transfer.
- Bluetooth and Wi-Fi communication settings and connection establishment are done in Android operating system.

Description

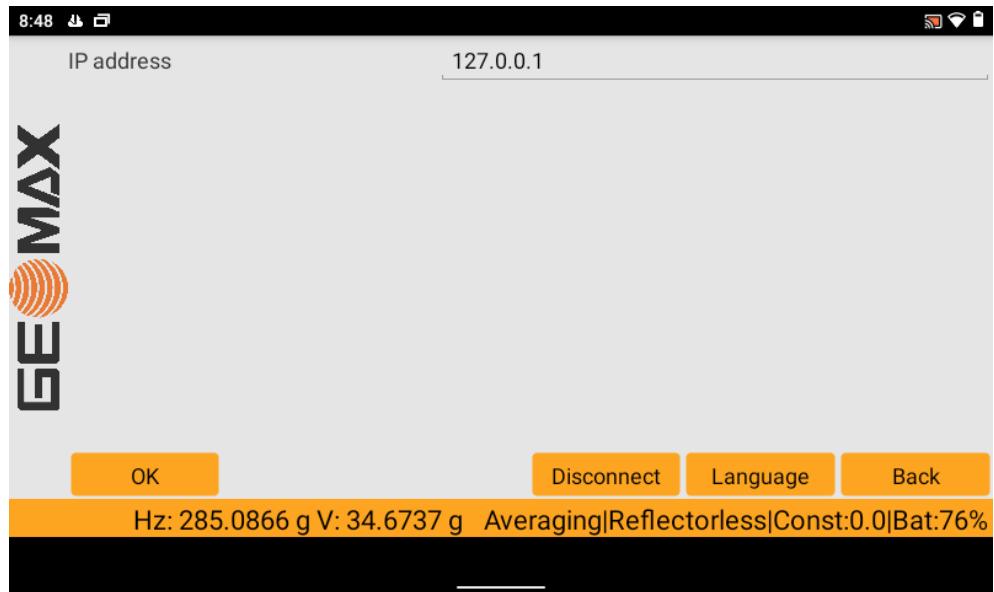
The Connection app is used to connect or disconnect GeoMax Toolkit software from Hardware components of the instrument.

Access



1. Select **Settings** tab
2. Select **Connection** in Settings tab

Connection



IP Address

Set the IP address of the controller when connecting to the device via Wi-Fi.

4.4.1.2

PPM Settings

Description

To calculate proper PPM correction values, the atmospheric conditions can be entered or calculated based on elevation.

Access



1. Select **Settings** tab
2. Select **PPM Setting** in Settings tab

PPM Setting



Atmos PPM	0 PPM
Temperature	12.0 °C
Pressure	1013.00 hPa
Elevation	0.0000 m
Refraction	0.13
PPM constant	0.00
Zoom factor	1.000000

OK Reset Back

Hz: 285.0864 g V: 34.6740 g Averaging|Reflectorless|Const:0.0|Bat:76%

Field	Description
Atmos PPM	The atmospheric ppm is calculated from the values in the previous fields.
Temperature	Sets the temperature.
Pressure	Sets the pressure.
Elevation	Sets the elevation above mean sea level.
Refraction	Refraction coefficient to be used for calculation.
PPM constant	Sets the atmospheric PPM.
Zoom factor	Sets the zoom factor.



Reset to set all values to factory default.

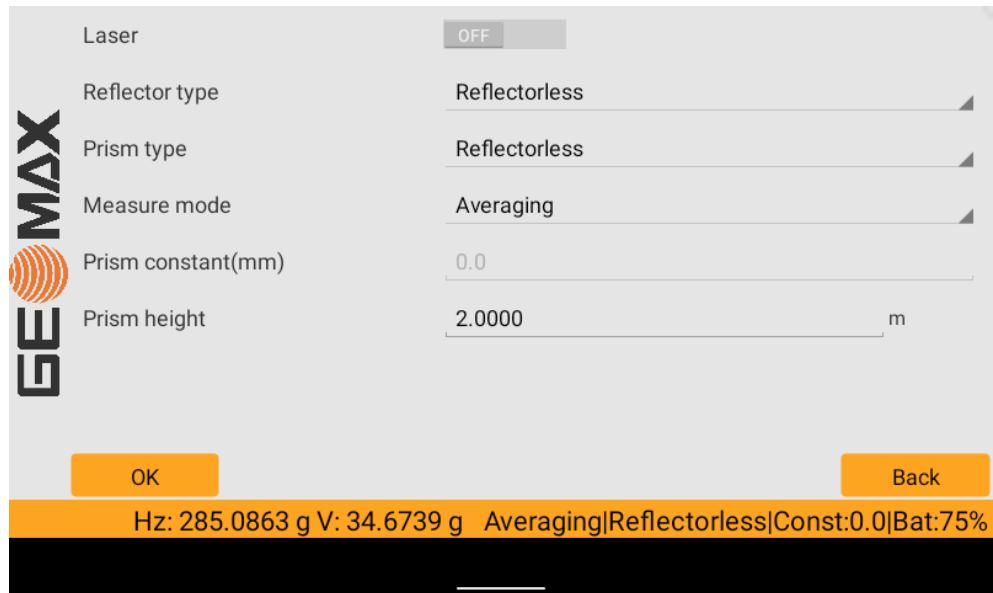
4.4.1.3 EDM Setting

Description	The settings on this screen defines the active EDM values, Electronic Distance Measurement . Different settings for measurements are available with Reflectorless (RL) and Prism (IR) EDM modes.
-------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Access



1. Select **Settings** tab
2. Select **EDM Setting** in Settings tab



Field	Option	Description
Laser	OFF	Visible laser beam is deactivated.
	ON	Visible laser beam for visualising the target point is activated.
Reflector type	Prism	For distance measurements using prism
	Reflector Tape	For distance measurements using Retro reflective targets.
	Reflectorless	For distance measurements without prisms.
Prism type	User Prism	User defined Absolute constant
	Circle Prism	ZPR100 Absolute constant -34.4 mm
	Mini Prism	ZMP101 Absolute constant -16.9 mm
	JP Mini Prism	ZMP100 Absolute constant -0.0 mm
	360 Prism	ZPR1 Absolute constant -11.3 mm
	360 Mini Prism	GRZ101 Absolute constant -4.4 mm
Measure mode	User Reflector	User defined Absolute constant
	Reflector Tape	ZTM100 Absolute constant -0.0 mm
	Reflectorless	RL modes Absolute constant -0.0 mm
	Standard	Fine measuring mode for high precision measurements.
	Fast	Quick measuring mode with prisms, with higher measuring speed and reduced accuracy.
	Tracking	For continuous distance measurements.

Field	Option	Description
	Repeated	For continuous distance measurements with higher frequency of measurements.
	Averaging	Instrument will take 3 readings which will then be averaged.
Prism constant (mm)	This field displays the absolute prism constant for the selected Type. When Type is User Prism or User Reflector this field becomes editable to set a user defined constant. Input can only be made in mm. Limit value: -999.9 mm to +999.9 mm.	
Prism height	For entering the prism height.	

4.4.1.4

Tilt Compensation

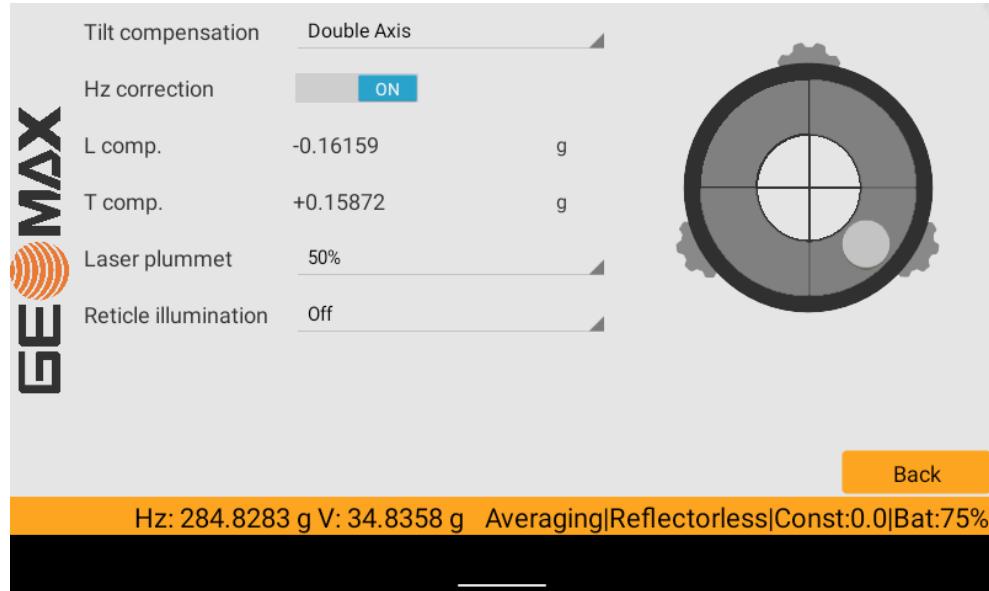
Description The **Tilt Compensation** contains tools for levelling up the instrument, determining if tilt corrections will be included in angular measurements and setting up the reticle illumination.

Access

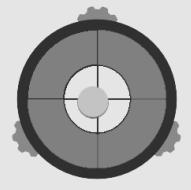


1. Select **Settings** tab
2. Select **Tilt Compensation** in Settings tab

Tilt Compensation



Field	Option	Description
Tilt compensation	OFF	
	Single Axis	
	Double Axis	
Hz correction	OFF	Tilt corrections values are included in angular measurements.
	ON	Tilt corrections values are not included in angular measurements.
Reticle illumination	Off to 100%	Sets the illumination level of the crosshairs in 20% steps.

Field	Option	Description
	<p>Tilt compensation Hz correction L comp. T comp. Laser plummet Reticle illumination</p> <p>Off 20% 40% 50%</p>	

Back

Hz: 340.9808 g V: 160.8862 g Standard|Reflectorless|Const:0.0|Bat:100%



For more information regarding the tools for levelling up the instruments refer to [Level up with the electronic level step-by-step](#)

4.4.1.5

Calibration

Description

The **Calibration** menu contains tools to be used for the electronic calibration of the instrument. Using these tools helps to maintain the measuring accuracy of the instrument.

Access



1. Select **Settings** tab
2. Select **Calibration** in **Settings** tab
3. Select a calibration option from the **Calibration mode** screen

Calibration mode

Calibration mode			
	 Hz Collimation	 V Index, Tilt Index	 View correction

Back

Hz: 284.8288 g V: 34.8352 g Averaging|Reflectorless|Const:0.0|Bat:75%

In the **Calibration mode** screen there are several calibration options.

Calibration option	Description
Hz Collimation	Refer to Line-of-sight error
V Index, Tilt Index	Refer to Vertical index error Refer to Compensator index error

Calibration option	Description
View correction	Displays the current calibration values that have been set for Hz-Collimation and V-index.

4.4.1.5.1

Description

Overview

GeoMax instruments are manufactured, assembled and adjusted to a high quality. Quick temperature changes, shock or stress can cause deviations and decrease the instrument accuracy. It is therefore recommended to calibrate the instrument from time to time. This can be done in the field by running through specific measurement procedures. The procedures are guided and have to be followed carefully and precisely as described in the following chapters. Some other instrument errors and mechanical parts can be adjusted mechanically.

Electronic calibration

The following instrument errors can be checked and calibrated electronically:

- Horizontal collimation error, also called line-of-sight error.
- Vertical index error, and simultaneously the electronic level.
- Compensator longitudinal and transversal index errors.



For determining these errors, it is necessary to measure in both faces, but the procedure can be started in any face.

Mechanical calibration

The following instrument parts can be calibrated mechanically:

- Circular level on the instrument and tribrach.
- Laser plummet.
- Screws on the tripod.



During the manufacturing process, the instrument errors are carefully determined and set to zero. As mentioned, these errors can change and it is highly recommended to redetermine them in the following situations:

- Before the instrument is used for the first time.
- Before every high precision survey.
- After rough or long periods of transport.
- After long periods of work or storage.
- If the temperature difference between current environment and the temperature at the last calibration is more than 10°C (18°F).

4.4.1.5.2

Preparation



Before determining the instrument errors, level-up the instrument using the electronic level. The **Level & Plumbet** is the first screen to appear after turning on the instrument. The tribrach, the tripod and the ground should be very stable and secure from vibrations or other disturbances.



The instrument should be protected from direct sunlight in order to avoid thermal expansion on one side only.



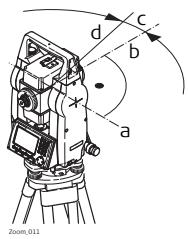
Before starting to work, the instrument has to become acclimatised to the ambient temperature. Take at least 15 minutes into account or approximately 2 minutes per °C of temperature difference from storage to working environment.

4.4.1.5.3

Calibrating Hz Collimation, Vertical Index Error and Tilt Index Error

Line-of-sight error

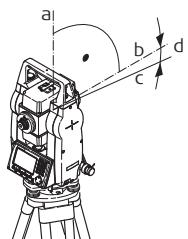
The line-of-sight error, or horizontal collimation error is the deviation from the perpendicular between the tilting axis and the line of sight. The effect of the line-of-sight error to the horizontal direction increases with the vertical angle.



- a Tilting axis
- b Line perpendicular to tilting axis
- c Horizontal collimation, or line-of-sight, error
- d Line-of-sight

Vertical index error

The vertical circle should read exactly 90° (100 gon) when the line of sight is horizontal. Any deviation from this figure is termed vertical index error. This is a constant error that affects all vertical angle readings.



- a Mechanical vertical axis of the instrument, also called standing axis
- b Axis perpendicular to the vertical axis. True 90°
- c Vertical angle is reading 90°
- d Vertical index error



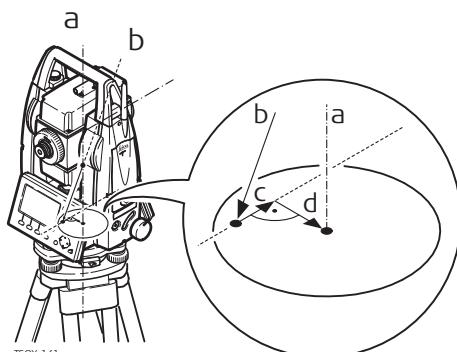
By determining the vertical index error the electronic level is adjusted automatically

Access



1. Select **Settings** tab
2. Select **Calibration** in **Settings** tab
3. Select **Hx Collimation** or **V Index** on the Calibration mode screen.

Compensator index error



- a Mechanical vertical axis of the instrument, also called standing axis
- b Plumb line
- c Longitudinal component (l) of the compensator index error
- d Transversal component (t) of the compensator index error

The compensator index errors (l, t) occur, if the vertical axis of the instrument and the plumb line are parallel but the zero points of the compensator and the circular level do not coincide. The calibration procedure electronically adjusts the zero point of the compensator.

A longitudinal component in direction of the telescope and a transversal component perpendicular to the telescope define the plane of the dual axis compensator of the instrument.

The longitudinal compensator index error (l) has a similar effect as the vertical index error and effects all vertical angle readings.

The transversal compensator index error (t) is similar to the tilting axis error. The effect of this error to the horizontal angle readings is 0 at the horizon and increases with steep sightings.

Access



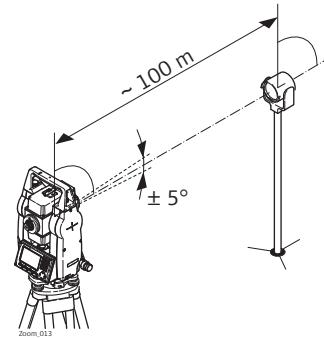
1. Select **Settings** tab
2. Select **Calibration** in Settings tab
3. Select **V Index** on the Calibration mode screen.

Check and adjust step-by-step

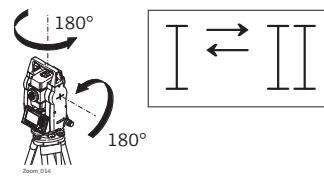
Step	Description
1.	Level the instrument with the electronic level. Refer to - Level up with the electronic level step-by-step.
2.	Press OK to measure the first face. No target has to be aimed at.
3.	Press OK to release the measurement in the other face.
	 If one or more errors are bigger than the predefined limits, the procedure must be repeated. All measurements of the current run are rejected and are not averaged with the results from previous runs.
4.	Measure the target. The standard deviations of the determined adjustment errors can be calculated from the second run onwards.

Calibration step-by-step

1. Level the instrument with the electronic level.
Refer to [Level up with the electronic level step-by-step](#).
2. Aim at a point approximately 100 m from the instrument which is within 5° of the horizontal.



3. Press **OK** to sight the target point.
4. Change face and aim at the target point again



-
-
-  For checking the horizontal aim, the difference in HA and VA are displayed.

5. Press **OK** to sight the target point.

-
-
-  The old and new calculated values are displayed.

6. Either:
 - Press **OK** to save the new calibration data, or
 - Press **BACK** to exit without saving the new calibration data.

Messages

The following are important messages or warnings that may appear.

Messages	Description
V is invalid to calibrate	The vertical angle deviates from the required horizontal/line-of-sight, or in face II the vertical angle deviates by more than 5° from the target point. Aim at the target point with an accuracy of min. 5°.
Ha is invalid to calibrate	Horizontal angle in face II deviates by more than 5° from the target point. Aim on the target point with an accuracy of min. 5°.

4.4.1.6

Upgrade Firmware

Description The Mainboard and ED Firmware can be loaded via a USB or over the air. This process is described below.

For the GeoMax Toolkit Update, please refer to [System Information](#)

Access

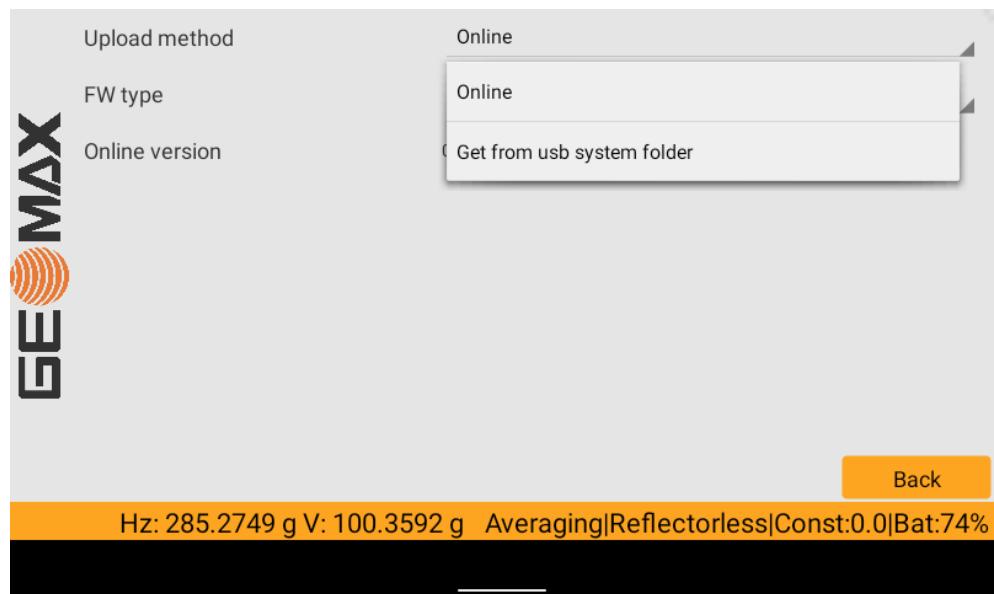


1. Select **Settings** tab
2. Select **Upgrade Firmware** in Settings tab



Never disconnect power supply during data transfer. Battery capacity must be at least 75% capacity before commencing the upload .

Upgrade Firmware



Android: Update happens over the air.

4.4.1.7

Units Setting

Access



1. Select **Settings** tab
2. Select **Units Setting** in Settings tab

Units Setting

Units Setting	Field	Description
Unit of angle Sets the units shown for all angular fields.	Unit of angle Unit of distance Unit of temperature Unit of pressure	gon(400 g) Degree(360°) DMS(360° '') gon(400 g) mil(6400 mil)

OK Back
Hz: 285.2749 g V: 100.3591 g Averaging|Reflectorless|Const:0.0|Bat:73%

Degree (360°) Degree decimal
Possible angle values: 0° to 359.999°

DMS (360° '') Degree sexagesimal
Possible angle values: 0° to 359°59'59"

Gon (400 g) Gon. Possible angle values: 0 gon to 399.999 gon

Mil (6400 mil) Mil. Possible angle values: 0 to 6399.99 mil

Unit of distance

Sets the units shown for all distance and coordinate related fields.

Unit of angle	gon(400 g)
Unit of distance	Meter(m)
Unit of temperature	Meter(m)
Unit of pressure	US-ft(ft)
	Int-ft(fi)

OK Back
Hz: 285.2749 g V: 100.3591 g Averaging|Reflectorless|Const:0.0|Bat:73%

Meter (m) Meters [m]

US-ft (ft) US feet [ft]

Int-ft (fi) International feet [fi]

Unit of temperature

Sets the units shown for all temperature fields.

Unit of angle	gon(400 g)
Unit of distance	Meter(m)
Unit of temperature	°C
Unit of pressure	°C °F

OK Back
Hz: 285.2748 g V: 100.3589 g Averaging|Reflectorless|Const:0.0|Bat:73%

°C Degree Celsius

Units Setting	Field	Description
	°F	Degree Fahrenheit
Unit of pressure Sets the units shown for all pressure fields.		
	Unit of angle	gon(400 g)
	Unit of distance	Meter(m)
	Unit of temperature	°C
	Unit of pressure	hpa
		hpa
		mbar
		mmHg
		inHg
	OK	Back
Hz: 285.2753 g V: 100.3591 g Averaging Reflectorless Const:0.0 Bat:73%		

hpa	Hecto Pascal
mbar	Millibar
mmHg	Millimeter mercury
inHg	Inch mercury

4.4.1.8

System Information

Description	The System Info screen displays instrument, system and firmware information.
Access	 1. Select Settings tab 2. Select System Info in Settings tab
Update GeoMax Toolkit	Press Update online on the System Info screen.

System Info

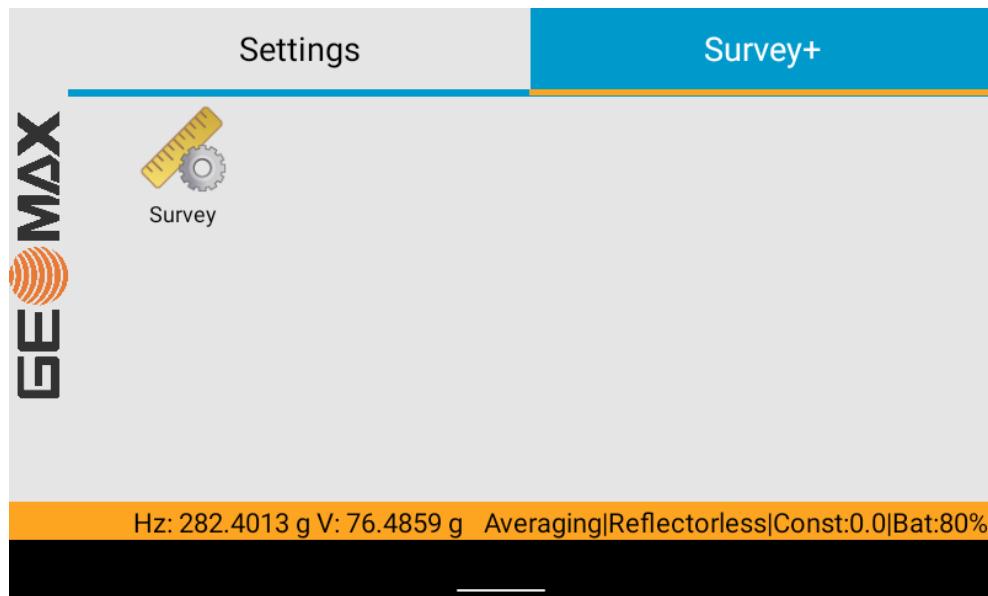
Instrument type	ZOOM45
Serial Number	2174388
FW version toolkit	1.0.32
FW version Main board	0.0.19
FW version EDM	0.17.0
BootLoader version	0.3.0
	Update online
OK	Checking for latest version
Hz: 285.2751 g V: 100.3591 g Averaging Reflectorless Const:0.0 Bat:73%	

Field	Description
Instrument type	Displays the type name of the instrument.
Serial Number	Displays the serial number of the instrument.
FW version toolkit	Displays the Toolkit firmware version.
FW version Main board	Displays the mainboard firmware version.
FW version EDM	Displays the EDM firmware version.
BootLoader version	Displays the BootLoader version.

4.4.2

Survey+ Tab

Survey+



4.4.2.1

GeoMax Survey+ Application

Description

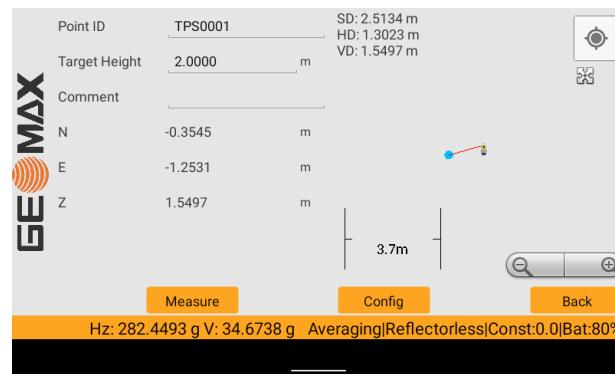
Survey+ is a basic application for taking measurements and is part of the GeoMax Toolkit.

Access



1. Select **Survey+** tab
2. Select **Survey** in Survey+ tab

SURVEY



>>> MEASURE

Take a measurement.

>>> CONFIG

Select what should be shown on the measurement screen.

>>> BACK

Return to the Survey+ tab.

4.5

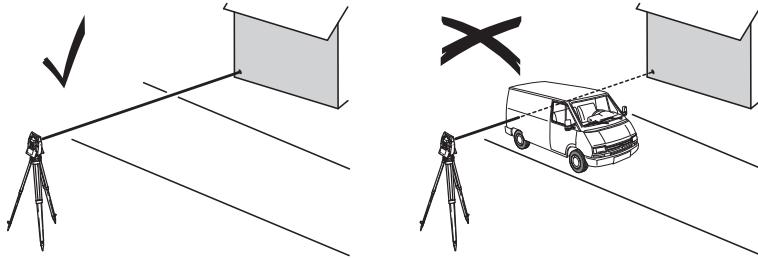
Distance Measurements - Guidelines for Correct Results

Description

A laser distancer (EDM) is incorporated into the instruments. In all versions, the distance can be determined by using a visible red laser beam which emerges coaxially from the telescope objective. There are two EDM modes:

- Prism measurements (P)
- Reflectorless measurements (NP)

Non-prism measurements



- When a distance measurement is triggered, the EDM measures to the object which is in the beam path at that moment. If a temporary obstruction, for example a passing vehicle, heavy rain, fog or snow is between the instrument and the point to be measured, the EDM may measure to the obstruction.
- Be sure that the laser beam is not reflected by anything close to the line of sight, for example highly reflective objects.
- Avoid interrupting the measuring beam while taking reflectorless measurements or measurements using reflective foils.
- Do not measure with two instruments to the same target simultaneously.

Prism measurements

- Accurate measurements to prisms should be made in IR-Default mode.
- Measurements to strongly reflecting targets such as traffic lights in Prism mode without a prism should be avoided. The measured distances may be wrong or inaccurate.
- When a distance measurement is triggered, the EDM measures to the object which is in the beam path at that moment. If for example people, cars, animals, or swaying branches cross the laser beam while a measurement is being taken, a fraction of the laser beam is reflected from these objects and may lead to incorrect distance values.
- Measurements to prisms are only critical if an object crosses the measuring beam at a distance of 0 to 30 m and the distance to be measured is more than 300 m.
- In practice, because the measuring time is very short, the user can always find a way of avoiding unwanted objects from interfering in the beam path.

WARNING

Due to laser safety regulations and measuring accuracy, using the Long Range Reflectorless EDM is only allowed to prisms that are more than 1000m (3300ft) away.

5.1

Transport

Transport in the field

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

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

Transport in a road vehicle

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

Shipping

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

Shipping, transport of batteries

When transporting or shipping batteries, the person responsible for the product must ensure that the applicable national and international rules and regulations are observed. Before transportation or shipping, contact your local passenger or freight transport company.

Field adjustment

Exposing the product to high mechanical forces, for example through frequent transport or rough handling, or storing the product for a long time may cause deviations and a decrease in the measurement accuracy. Periodically carry out test measurements and perform the field adjustments indicated in the User Manual before using the product.

5.2

Storage

Product

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

Li-Ion batteries

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

5.3

Cleaning and Drying

Product and accessories

- Blow dust off lenses and prisms.
- 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.

Fogging of prisms

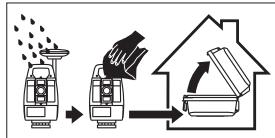
Prisms that are cooler than the ambient temperature tend to fog. It is not enough simply to wipe them. Keep them for some time inside your jacket or in the vehicle to allow them to adjust to the ambient temperature.

Cables and plugs

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

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.



5.4

Maintenance



For units that are exposed to high mechanical forces, for example through frequent transport or rough handling, it is recommended to carry out test measurements periodically.

Service Intervals

The periodicity of service intervals is dependent on the conditions of use. We recommend a service contract with a yearly maintenance of the equipment. Please contact your local GeoMax representative or distributor for details.

Repairs

In case of visible damage, system failure or errors, contact your local GeoMax representative.

6

Technical Data

6.1

Angle Measurement

Accuracy

Available angular accuracies	Standard deviation HA, VA, ISO 17123-3	Display resolution				
		["]	[mgon]	["]	[°]	[mgon]
2	0.6	1	0.0001	0.1	0.01	
5	1.5	1	0.0001	0.1	0.01	

Characteristics

Absolute, continuous, diametric.

6.2

Distance Measurement with Reflectors

Range

Reflector	[m]*	[ft]*
Standard prism (ZPR100)	up to 5000	10000
Reflector tape (ZTM100) 60 mm x 60 mm	800	2300
Mini prism (ZMP101)	1200	4000

* The distance range can vary depending on the conditions and can be above or below the specified value. The specified range value is referring to non-extreme conditions, visibility about 20 km, moderate sunlight.

Accuracy

Accuracy refers to measurements to standard reflectors.

Distance measuring mode	std. dev. ISO 17123-4, standard prism	Measurement time, typical [s]
Standard	2 mm + 2 ppm	1.4
Quick	-	1.1

Beam interruptions, severe heat shimmer and moving objects within the beam path can result in deviations of the specified accuracy.

Shortest measuring distance: 0.30 m

Display unambiguous: up to 6000 m

Characteristics

Type	Description
Principle	Phase measurement
Type	Coaxial, visible red laser
Carrier wave	685 nm
Measuring system	Phase surveying about 100 MHz (99.902567 MHz)

6.3

Distancer, Measurements without Reflectors (Reflectorless mode)

Range

Kodak Gray Card	[m]*	[ft]*
White side 90% reflective	500	1640
Grey side 18% reflective	200	820

* The distance range can vary depending on the conditions and can be above or below the specified value. The specified range value is referring to non-extreme conditions, visibility about 20 km, moderate sunlight.

Accuracy

	ISO17123-4	Measure time, typical [s]
Standard measuring	3 mm + 2 ppm	1.1 in Quick mode 1.3 in Standard mode
>200m	5 mm + 3 ppm	-

Beam interruptions, severe heat shimmer and moving objects within the beam path can result in deviations of the specified accuracy and measurement time.

Shortest measuring distance: 0.30 m

Display unambiguous: up to 500 m

Characteristics

Type	Description
Principle	Phase measurement
Type	Coaxial, visible red laser
Carrier wave	685 nm
Measuring system	Phase surveying about 100 MHz (99.902567 MHz)

Laser dot size

Distance [m]	Laser dot size, approximately [mm]
at 50	12 x 24

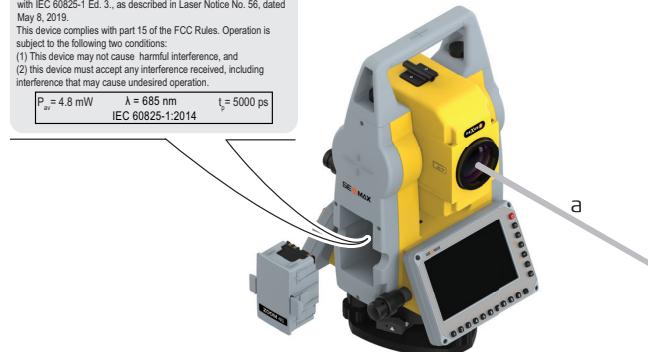
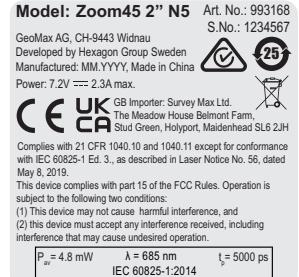
6.4

Conformity to National Regulations

6.4.1

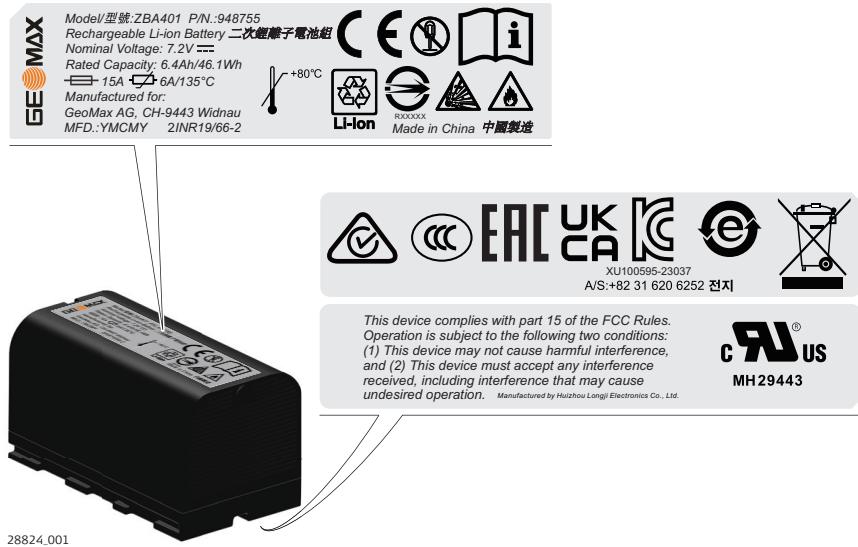
Labelling

Labelling Zoom45



a Laser beam

Labelling internal battery ZBA401



Antennas

Type	Antenna	Gain [dBi]
WLAN	Flexible Planar Inverted F Antenna (FlexPIFA)	2
Bluetooth	Flexible Planar Inverted F Antenna (FlexPIFA)	2

Frequency band

Type	Frequency band [MHz]
Bluetooth	2.402–2.48
WLAN	2.412–2.472 for Europe
	2.412–2.462 for USA
	5.18–5.24 (FCC UNII - low band) for USA and Europe
	5.26–5.32 (FCC UNII - middle band) for USA and Europe
	5.50–5.72 for USA and Europe
	5.745–5.825 (FCC UNII - high band) for USA

Output power

Type	Output power	Country
Bluetooth	13.7 mW	US
	9.43 dBm	Europe
WLAN 2.4 GHz	163.7 mW	US
	19.34 dBm	Europe
WLAN 5 GHz	23.8 mW	US
	22.17 dBm	Europe

Radiation Exposure Statement

The radiated output power of the instrument is below the radio frequency exposure limits. Nevertheless, the instrument should be used in such a manner that the potential for human contact during normal operation is minimised.

SAR values

Country	Body and Head	Extremity
EU	1.3 W/Kg, 10-gram (0.5 cm Gap)	2.93 W/Kg, 10-gram (0 cm Gap)
USA	0.95 W/Kg, 1-gram (1 cm Gap)	2.14 W/Kg, 10-gram (0 cm Gap)

EU

Hereby, GeoMax AG declares that the radio equipment type Zoom45 is in compliance with Directive 2014/53/EU and other applicable European Directives. The full text of the EU declaration of conformity is available at the following Internet address: <https://geomax-positioning.com/partner-area>.

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



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

UKCA

Hereby, GeoMax AG declares that the radio equipment type Zoom45 is following the provisions of the applicable relevant statutory requirement S.I. 2012 No. 3032 The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012, S.I. 2017 No. 1206 Radio Equipment Regulations 2017.

FCC SAR Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End user must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. The portable device is designed to meet the requirements for exposure to radio waves established by the Federal Communications Commission (USA).

These requirements set a SAR limit of 4 W/kg averaged over ten gram of tissue. The highest SAR value reported under this standard during product certification for use when properly worn on the limbs.

The SAR limit of USA is 1.6 W/kg averaged over one gram of tissue. This device has also been tested against this SAR limit. The highest SAR value reported under this standard during product certification for use in held-to-face and when properly worn on the body.

To maintain compliance with RF exposure requirements, use accessories that maintain a 10 mm separation distance between the user's body and radiated construction. The use of accessories that do not satisfy these requirements may not comply with RF exposure requirements and should be avoided.

To maintain compliance with RF exposure requirements, at least maintain a 10 mm separation distance when held-to-face.

SAR Statement France

N'utilisez pas l'appareil dans un hôpital, un avion ou un équipement automobile en raison des radiofréquences qui peuvent produire des interférences.

Maintenez une distance minimale de 15 cm entre votre appareil et un stimulateur cardiaque pour éviter toute interférence.

Eloigner les équipements radioélectriques du ventre des femmes enceintes.

Eloigner les équipements radioélectriques du bas-ventre des adolescents.

Le débit d'absorption spécifique (DAS) local quantifie l'exposition de l'utilisateur aux ondes électromagnétiques de l'équipement concerné.

Le DAS maximal autorisé est de 2 W/ kg pour la tête et le tronc et de 4 W/ kg pour les membres.

La ou les valeurs du débit d'absorption spécifique des RX5: DAS membres: 2.93 W/ kg.

USA

FCC ID: 2AUW9-ZOOM45
FCC Part 15

Others

The conformity for countries with other national regulations has to be approved prior to use and operation.

Environmental specifications

Temperature

Type	Operating temperature [°C]	Storage temperature [°C]
Zoom45	-20 to +50	-30 to +55
Battery	-20 to +55	-40 to +70

Protection against water, dust and sand

Type	IP class
All instruments	IP55 (IEC 60529)

Humidity

Type	Protection
All instruments	Max 95% non-condensing. The effects of condensation are to be effectively counteracted by periodically drying out the instrument.

6.4.2

Dangerous Goods Regulations

Dangerous Goods Regulations

The products of GeoMax are powered by Lithium batteries.

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



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



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



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

6.5

General Technical Data of the Product

Telescope

Type	Value
All-around rotation	
Magnification	28 x
Objective diameter	44 mm
Focusing range	1.60 m/5.25 ft to infinity
Field of view	1°30'/1.60 gon
Field width at 100 m	2.8 m

Compensation

Compensator range: ±8'

Level

Type	Value
Longitudinal level sensitivity	2'/2 mm

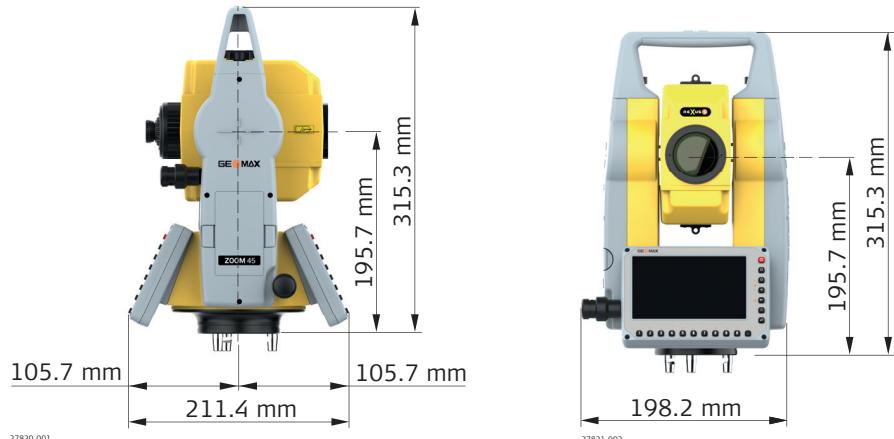
Keyboard display unit

Type	Description
Display	5" WVGA (800 x 480 pixels), colour, graphics Capable LCD, illumination, capacitive touch screen
Keyboard	18 keys Including 10 numeric/function keys
Angle display	360°"/", 360° decimal, 400 gon, 6400 mil, V %
Distance display	m, US-ft, Int-ft
Position	Face I: Standard Face II: Optional

Instrument Ports

Name	Description
USB (mini B)	for communication.
USB host port	USB memory stick port for data transfer.
Bluetooth	Bluetooth connections for communication and data transfer.
WLAN	for internet access.

Instrument dimensions



Weight

Type	Value
Instrument	5.12 kg
Instrument with battery and tri-brach	6.13 kg

Tilting axis height

Type	Description
Without tribrach	196 mm
With tribrach (GDF301)	237 mm ± 5 mm

Recording

Memory Type	Capacity [GB]
RAM	4
Data storage	32

Operating system

Type	Version
Android	11

Laser plummet

Type	Description
Type	Visible red laser class 2
Location	In standing axis of instrument
Accuracy	Deviation from plumb line 1.5 mm at 1.5 m instrument height
Diameter of laser point	2.5 mm at 1.5 m instrument height

Battery

Type	ZBA401
Type	Li-Ion
Voltage	Nominal voltage 7.4 V
Capacity	6.4 Ah
Operating time	up to 8 hours
Based on using a new battery, continuous angle measurement, one display, at 25 °C	

Automatic corrections

The following automatic corrections are made:

- Line of sight error
- Tilting axis error
- Earth curvature
- Standing axis tilt
- Vertical index error
- Refraction
- Compensator index error
- Circle eccentricity

6.6**Scale Correction****Use of scale correction**

By entering a scale correction, reductions proportional to distance can be taken into account.

- Atmospheric correction.
- Reduction to mean sea level.
- Projection distortion.

Atmospheric correction

The slope distance displayed is correct if the scale correction in ppm, mm/km, which has been entered corresponds to the atmospheric conditions prevailing at the time of the measurement.

The atmospheric correction includes:

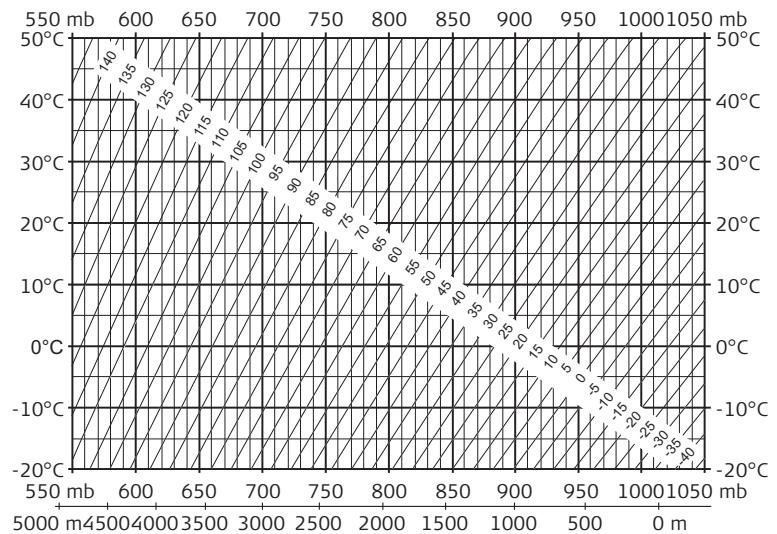
- Adjustments for air pressure
- Air temperature

For highest precision distance measurements, the atmospheric correction should be determined with:

- An accuracy of 1 ppm
- Air temperature to 1 °C
- Air pressure to 3 mbar

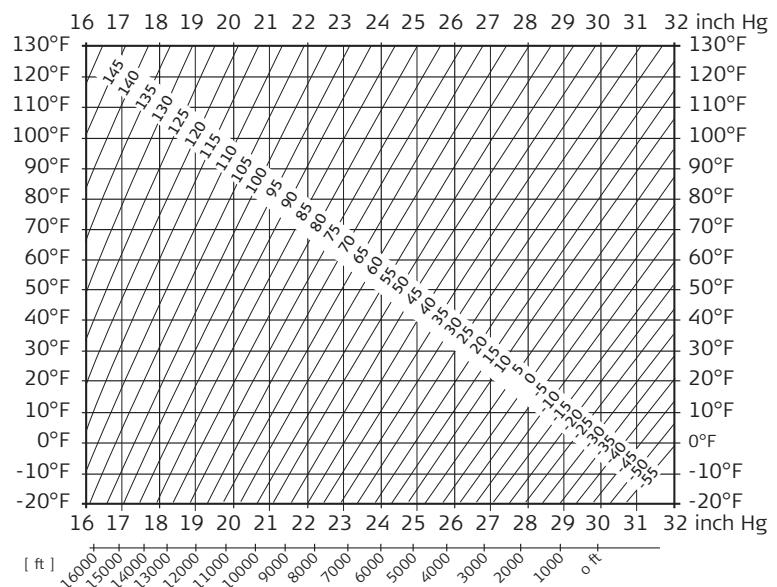
**Atmospheric corrections
°C**

Atmospheric corrections in ppm with temperature [°C], air pressure [mb] and height [m] at 60 % relative humidity.

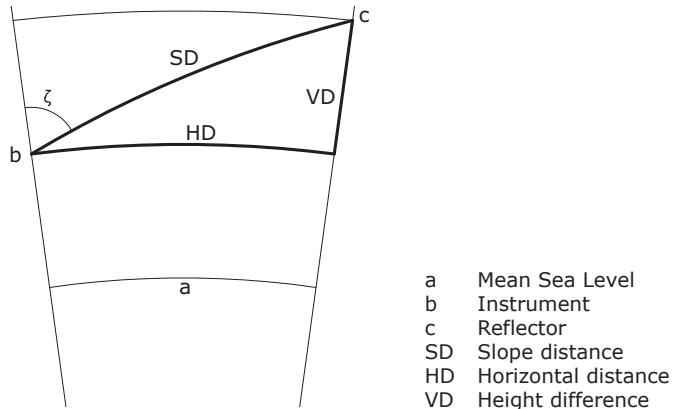


Atmospheric correction °F

Atmospheric corrections in ppm with temperature [°F], air pressure [inch Hg] and height [ft] at 60 % relative humidity.



Formulas



a Mean Sea Level
 b Instrument
 c Reflector
 SD Slope distance
 HD Horizontal distance
 VD Height difference

The instrument calculates the slope distance, horizontal distance, and height difference in accordance with the following formulas. Earth curvature (1/R) and mean refraction coefficient ($k = 0.13$) are automatically taken into account when calculating the horizontal distance and height difference. The calculated horizontal distance relates to the station height and not to the reflector height.

Slope distance

$$SD = D_0 \cdot (1 + ppm \cdot 10^{-6}) + p$$

SD Displayed slope distance [m]

D0 Uncorrected distance [m]

ppm Atmospheric scale correction [mm/km]

p prism constant [m]

Horizontal distance

$$HD = Y - A \cdot X \cdot Y$$

HD Horizontal distance [m]

Y $SD \cdot |\sin \zeta|$

X $SD \cdot \cos \zeta$

A $(1 - k/2)/R = 1.47 \cdot 10^{-7} \text{ [m}^{-1}\text{]}$

ζ = Vertical circle reading

$k = 0.13$ (mean refraction coefficient)

$R = 6.378 \cdot 10^6 \text{ m}$ (radius of the earth)

Height difference

$$VD = X + B \cdot Y^2$$

VD Height difference [m]

Y $SD \cdot |\sin \zeta|$

X $SD \cdot \cos \zeta$

$$B \quad (1 - k)/2R = 6.83 * 10^{-8} \text{ [m}^{-1}\text{]}$$

ζ = Vertical circle reading

$k = 0.13$ (mean refraction coefficient)

$R = 6.378 * 10^6 \text{m}$ (radius of the earth)

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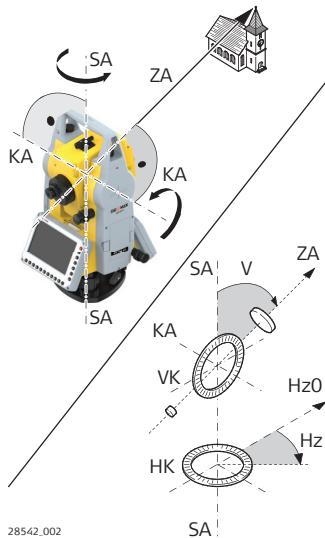
Open Source Information

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

Copies of the corresponding licences

- are provided together with the product (for example in the About panel of the software)
- can be downloaded on <http://www.geomax-positioning.com>.

If foreseen in the corresponding open source licence, you may obtain the corresponding source code and other related data on <http://www.geomax-positioning.com>.

Instrument axis

ZA = **Line of sight / collimation axis**

Telescope axis = line from the cross hairs to the center of the objective.

SA = **Standing axis**

Vertical rotation axis of the telescope.

KA = **Tilting axis**

Horizontal rotation axis of the telescope. Also known as the Trunion axis.

V = **Vertical angle / zenith angle**

VK = **Vertical circle**

With coded circular division for reading the vertical angle.

Hz = **Horizontal direction**

HK = **Horizontal circle**

With coded circular division for reading the horizontal angle.

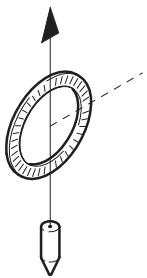
Plumb line / compensator

Direction of gravity. The compensator defines the plumb line within the instrument.

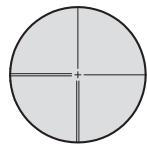
Standing axis inclination

Angle between plumb line and standing axis.

Standing axis tilt is not an instrument error and is not eliminated by measuring in both faces. Any possible influence it may have on the horizontal direction or vertical angle is eliminated by the dual axis compensator.

Zenith

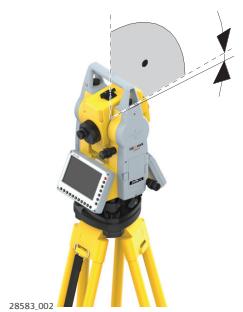
Point on the plumb line above the observer.

Crosshairs

Glass plate within the telescope with reticle.

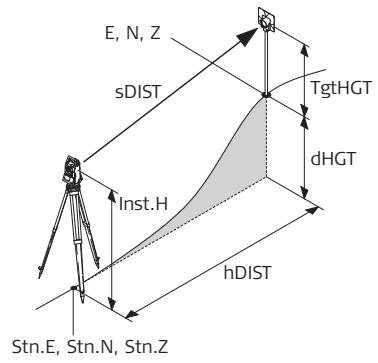
Line-of-sight error (horizontal collimation)

The line-of-sight error (c) is the deviation from the perpendicular between the tilting axis and line of sight. This could be eliminated by measuring in both faces.

Vertical index error

With a horizontal line of sight the vertical circle reading should be exactly 90° (100 gon). The deviation from this value is termed the Vertical index error (i).

Explanation of displayed data



sDIST	Indicated meteorological corrected slope distance between instrument tilting axis and center of prism/laser dot
hDIST	Indicated meteorological corrected horizontal distance
dHGT	Height difference between station and target point
TgtHGT	Reflector height above ground
Inst.H	Instrument height above ground
Stn.E, Stn.N, Stn.Z	Easting, Northing and Height coordinates of station
E, N, Z	Easting, Northing and Height coordinates of target point



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