

MC 200 Depthmaster



User Manual

Version 1.1

English

Leica
Geosystems

Introduction

Purchase

Congratulations on the purchase of a MC 200 Depthmaster.



This manual contains important safety directions as well as instructions for setting up the product and operating it. Refer to "5 Safety Directions" for further information. Read carefully through the User Manual before you switch on the product.

To ensure safety when using the system, please also observe the directions and instructions contained in the User Manual and Safety Handbook issued by the:

- Machine manufacturer,
- Controller manufacturer and
- Sensor manufacturer.

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 information when you need to contact your agency or Leica Geosystems authorized service workshop.

Type: _____

Serial No.: _____

Symbols

The symbols used in this manual have the following meanings:

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 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.



It is recommended to set-up the unit while reading through this manual.

Index

The index is at the back of the manual.

Table of Contents

In this manual

Chapter	Page
1 Description of the System	1-1
2 Buttons	2-1
3 Operation	3-1
4 Care and Transport	4-1
5 Safety Directions	5-1
6 Technical Data	6-1

1 Description of the System

 **Warning**

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

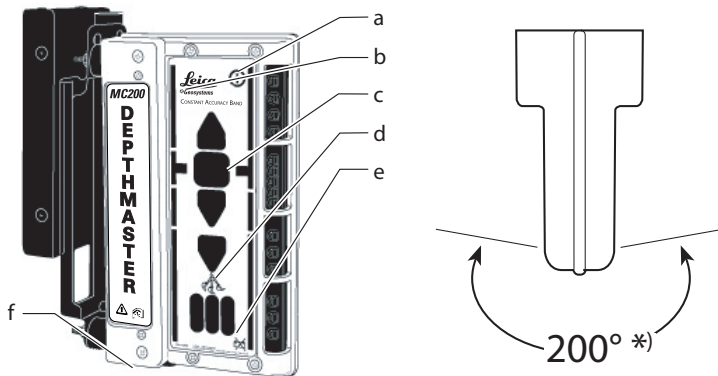
 **Warning**

Unauthorized modification of machines by mounting the product may alter the function and safety of the machine.

Precautions:

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

Features and main components



*) Reception Area (Top View)

a) Power Button

Press the button on the side you will be viewing to activate the indicators for that side, or press both at start-up to activate both sides. The Power Button only function when the battery pack powers the laser sensor. Otherwise, a control panel switch or connecting to an external battery activates the laser sensor.

b) Hidden Switch

See "3.4 Optional Functions" on page 3-8.

c) Grade Position Indicators

Blink rapidly to indicate the position of the machine's cutting edge relative to grade (See below.)

d) Plumb Indicators

Blink rapidly to show the vertical position of the machine's arm. (See below.)

e) Low Battery Indicators

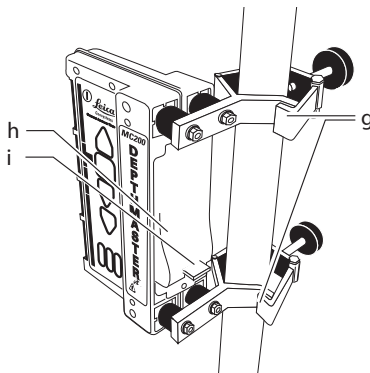
Become lit when the battery pack has less than 6 hours of operating charge.

f) Cable Connector

Provides a connection to a control panel or to a 12 or 24 Volt DC battery. Use sensor battery cable to connect to a battery: the black wire to negative; the white wire to positive.

Shake-to-Wake:

After 5 minutes of no movement, the laser sensor goes into "stand-by" to conserve power. Move the laser sensor to activate it (after 90 minutes of no movement, it shuts completely off).



g) Mounting Clamps

Allow you to easily attach the laser sensor to square and round mounting poles without having to lift the laser sensor over the top of the pole. The laser sensor includes shock isolators to absorb and dampen vibrations from the machine.

Magnetic Mount:

Allows the sensor to be attached to the arm of the machine.
Remove by pulling sharply from a lower corner of the magnet.

h) Battery Pack

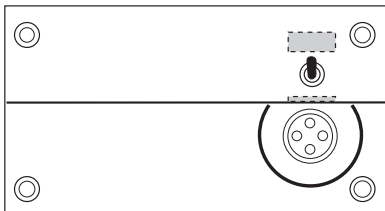
The rechargeable batteries provide power to the laser sensor for over 48 hours on a single charge.

Recharge the battery pack by connecting a 778855 Charger, 100-240 VAC to the charger connector.

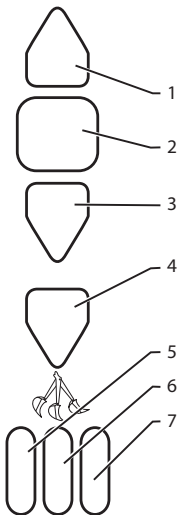
Plug the DC power cable into the battery pack before plugging it into the mains socket.

i) Narrow/Wide Switch

Remove the battery pack before activating the wide/narrow switch. The wide channel is for wide band operation and the narrow channel is for narrow band operation.



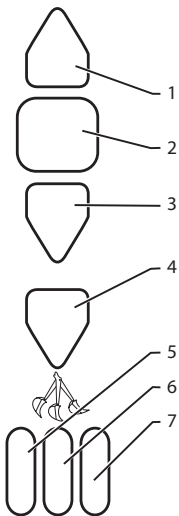
2 Buttons



Button	Machine Control Operation
1	Off-Grade, Low ^{*)} -0.5 to -3.0 in. (-12 to -75 mm)
1+2	Near On-Grade, Low -0.16 to -0.5 in. (-4 to -12 mm)
2	On-Grade ±0.16 in. (±4 mm)
2+3	Near On-Grade, High +0.16 to +0.5 in. (+4 to +12 mm)
3	Off-Grade, High ^{*)} +0.5 to +5.3 in. (+12 to +135 mm)
4, 5, 6, 7	There is no indication in Machine Control Mode. Connect a control panel to enable Machine Control Mode.

^{*)} **Memory Feature**

When the laser sensor goes from within the rotating laser signal to above or below it, the last indicator to detect the laser light blinks slowly.



Button	Excavator/Backhoe Operation
1	Below Grade*) -0.5 to -3.0 in. (-12 to -75 mm)
1+2	Below Grade (Narrow only) -0.16 to -0.5 in. (-4 to -12 mm)
2	On-Grade Wide: ± 0.5 in. (± 12 mm) Nar: ± 0.16 in. (± 4 mm)
2+3	Above Grade (Narrow only) +0.16 to +0.5 in. (+4 to +12 mm)
3	Above Grade +0.5 to +1.7 in. (+12 to +43 mm)
4	Above Grade*) +1.7 to +5.3 in. (+43 to +135 mm)

*) **Memory Feature**

When the laser sensor goes from within the rotating laser signal to above or below it, the last indicator to detect the laser light blinks slowly.

3 Operation

In this chapter

	Topic	Page
3.1	Battery	3-2
3.2	Excavator/Backhoe Operation	3-3
3.3	Machine Control Operation	3-6
3.4	Optional Functions	3-8

3.1 Battery



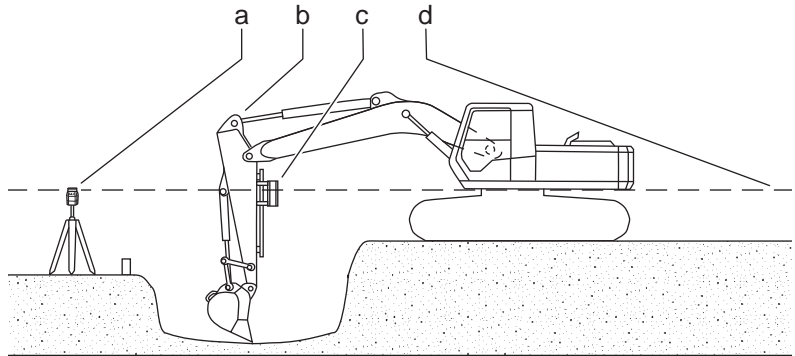
First-time use/charging

- The battery must be charged prior to using it for the first time because it is delivered with an energy content as low as possible.
- For new batteries or batteries that have been stored for a long time (> three months), it is effectual to make 3-5 charge/discharge cycles.
- The permissible temperature range for charging is between 0°C to +35°C/+32°F to +95°F. For optimal charging we recommend charging the batteries at a low ambient temperature of +10°C to +20°C/+50°F to +68°F if possible.
- It is normal for the battery to become warm during charging. Using the chargers recommended by Leica Geosystems, it is not possible to charge the battery if the temperature is too high.

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; very high operating temperatures reduce the service life of the battery.
-

3.2 Excavator/Backhoe Operation



- a) Rotating Laser
- b) Arm
- c) Laser Sensor
- d) Plane of Laser Light

Procedure

1. Set up and level the Rotating Laser in a convenient location.

Make sure there will be a clear path between the rotating laser and laser sensor at all times and that the laser signal will be within the 200° range of the laser sensor.

2. Activate the laser sensor.

- If in “stand-by,” move the arm to shake the laser sensor and start it. Otherwise, press the Power Button for the side(s) you will be viewing.
- If connected to the machine’s battery, it is on.
- If connected to a Control Panel, put **the Control Panel’s Power Switch** to ON.

3. Begin digging and stop when the excavation is at the required depth.

Position the bucket and set it down at the finished elevation.

The bucket can be in any position, but it must be in the same position each time you make a grade check.

4. Plumb the laser sensor.

Adjust the machine’s arm so the center Plumb Indicator is blinking.

5. Loosen the laser sensor’s Mounting Clamps and slide it up or down until the “On-Grade” Grade Position Indicator is blinking.

When using the Laser sensor with magnetic mounts, place the laser sensor in the bracket and set it at the correct height on the arm of the machine before

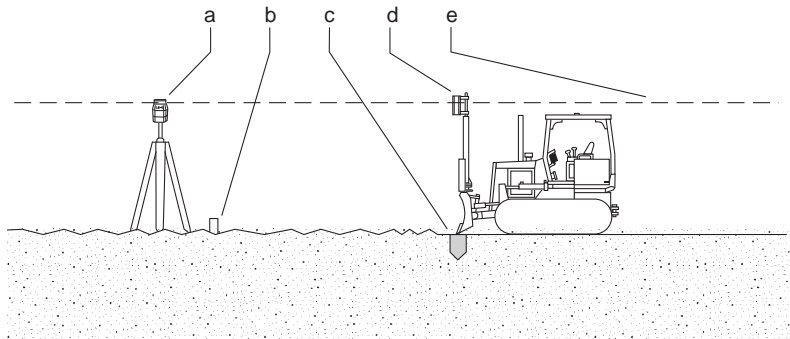


attaching it. When using mounting clamps, tighten the laser sensor at the correct height.

6. Continue digging until a grade check is normally required and take a grade check.

- Move the bucket to the same position as it was in Step 3 and lower it almost to the cut.
 - Plumb the laser sensor by moving the machine's arm in or out until a center Plumb Indicator is blinking.
 - Set the bucket on the cut and read the elevation next to the blinking Grade Position Indicator.
-

3.3 Machine Control Operation



- a) Rotating Laser
- b) Hub Stake
- c) Blue Top
- d) Laser Sensor
- e) Plane of Laser Light

Procedure**1. Set up and level the Rotating Laser in a convenient location.**

Make sure there is a clear path between the Rotating Laser and the MC 200 Depthmaster laser sensor.

2. Move the machine to the area to be graded and set the blade to a position that is at finished grade, such as a Hub Stake or a "Blue Top."**3. Set the Control Panel's Auto/Manual Switch to "MANUAL" and set the Power Switch to "ON".****4. Loosen the laser sensor's Mounting Clamps and slide it up or down until the "On-Grade" Grade Position Indicator is blinking**

(It may be necessary to raise or lower the Rotating Laser). Tighten the Mounting Clamps.

5. Operate the machine:

- Manual Mode. Begin moving the machine forward while observing the Grade Position Indicators on the laser sensor or Control Panel.

Use the machine's controls to keep the "On-Grade" Grade Position Indicator blinking.



3.4 Optional Functions

Switching to Machine Control Mode

The MC 200 Depthmaster can be made to operate as an excavator sensor or as a machine control sensor. To switch between these modes - turn on the sensor, then press the marked switch left of the Leica Logo.



In machine control mode, only the top three lights will function and the sensor will be in narrow band.

Disabling Sleep Mode

The MC 200 Depthmaster will go into a “sleep mode” if no movement is seen in the plumb indicator lights after five minutes. In certain applications (ie: dozers, trenchers) it is desirable to disable this function.

To disable the sleep mode - Turn off the sensor.

Press and hold the marked switch left of the Leica Logo, then turn on the sensor. The sensor will go through it's normal power-up sequence, then the two outer plumb lights will flash to indicate the sleep mode has been disabled. Now let go of the "hidden switch" and sleep-mode is disabled, the laser sensor is set to permanent operations. The sleep mode must be disabled each time the sensor is turned on.

4 Care and Transport

In this chapter

	Topic	Page
4.1	Transport	4-2
4.2	Storage	4-3
4.3	Cleaning and Drying	4-4

4.1 Transport

Transport in the field

When transporting the equipment in the field, always make sure that you carry the product in its original transport container.

Transport in a road vehicle

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

Shipping

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

Shipping, transport of batteries

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

Field adjustment

After transport, inspect the field adjustment parameters given in this user manual before using the product.

4.2 Storage

Product

Respect the temperature limits when storing the equipment, particularly in summer if the equipment is inside a vehicle. Refer to "6 Technical Data" for information about temperature limits.

Field adjustment

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

Batteries

- Refer to "6 Technical Data" for information about storage temperature range.
 - Remove batteries from the product and the charger before storing.
 - After storage recharge batteries before using.
 - Protect batteries from damp and wetness. Wet or damp batteries must be dried before storing or use.
 - Respect a storage temperature range of 0°C to +20°C/+32°F to +68°F in a dry environment to minimise self-discharging of the batteries.
 - At the recommended storage temperature range, batteries containing a 50% to 100% charge can be stored for up to 180 days. After this storage period, recharge the batteries.
-

4.3 Cleaning and Drying

Product

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 liquids may attack the polymer components.

Damp products

Dry the product, the transport container, the foam inserts and the accessories at a temperature not greater than 40°C / 108°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 Safety Directions

In this chapter	Topic	Page
5.1	General	5-2
5.2	Intended Use	5-3
5.3	Limits of Use	5-5
5.4	Responsibilities	5-6
5.5	International Warranty	5-7
5.6	Hazards of Use	5-8
5.7	Electromagnetic Compatibility EMC	5-13
5.8	FCC Statement, Applicable in U.S.	5-15

5.1 General

Description

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.

5.2 Intended Use

Permitted use

- Detection and display of a desired reference height and/or slope by laser beam detection
 - Detection and display of vertical orientation (plumb) by internal level sensing
-

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

 **Warning**

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.

5.3 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.

5.4 Responsibilities

Manufacturer of the product	Leica Geosystems AG, CH-9435 Heerbrugg, hereinafter referred to as Leica Geosystems, is responsible for supplying the product, including the user manual and original accessories, in a completely safe condition.
Manufacturers of non Leica Geosystems accessories	The manufacturers of non Leica Geosystems accessories for the product are responsible 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	<p>The person in charge of the product has the following duties:</p> <ul style="list-style-type: none">• 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.
 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.

5.5 International Warranty

The International Warranty can be downloaded from the Leica Geosystems home page at <http://www.leica-geosystems.com/internationalwarranty> or received from your Leica Geosystems dealer.

5.6 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.

Warning

Unauthorized modification of machines by mounting the product may alter the function and safety of the machine.

Precautions:


Follow the instructions of the machine manufacturer. If no appropriate instruction is available, ask machine manufacturer for instructions before mounting 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**

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.

 **Caution**

Installing near mechanically moving machine components may damage the product.

Precautions:

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





 **Warning**

While steering or navigating the machine accidents may occur due to

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

Precautions:

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

-
-  **Warning** By surveying during a thunderstorm you are at risk from lightning.
Precautions:
Do not carry out field surveys during thunderstorms.
-
-  **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.
-
-  **Warning** Only Leica Geosystems authorized service workshops are entitled to repair these products.
-
-  **Caution** During the transport, shipping or disposal of batteries it is possible for inappropriate mechanical influences to constitute a fire hazard.
Precautions:
Before shipping the product or disposing of it, discharge the batteries by running the product until they are flat.
When transporting or shipping batteries, the person in charge of the product must ensure that the applicable national and international rules and regulations are observed. Before transportation or shipping contact your local passenger or freight transport company.

 **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.

 **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 jewelry, keys, metallized paper or other metals.

Precautions:

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

 **Warning**

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

- If polymer parts are burnt, poisonous gas 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 unauthorized 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:

Dispose of the product appropriately in accordance with the regulations in force in your country.

Always prevent access to the product by unauthorized personnel.

5.7 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.

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.

 **Caution**

Disturbances caused by electromagnetic radiation can result in erroneous measurements.

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

 **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.

5.8 FCC Statement, Applicable in U.S.

Warning

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

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

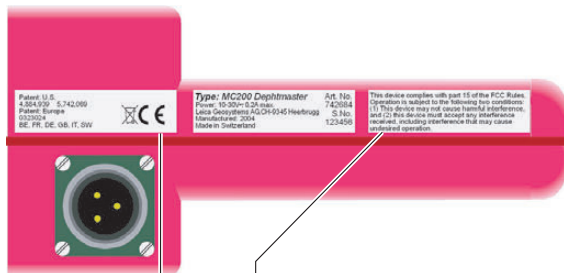
This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

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

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

Warning

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

Labelling
MC200

This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(1) This device may not cause harmful interference,
and (2) this device must accept any interference
received, including interference that may cause
undesired operation.

Patent: U.S.
4.884.939 5.742.069
Patent: Europe
0323024
BE, FR, DE, GB, IT, SW



6 Technical Data

Accuracy for Excavator/Backhoe Operation - using Wide Band	±1/2 in. (±12 mm) "On-Grade"
Accuracy for Excavator/Backhoe Operation - using Narrow Band	±1/6 in. (±4 mm) "On-Grade"
Accuracy for Machine Control Operation - using Narrow or Wide Band	±1/6 in. (±4 mm) "On-Grade"
	±1/2 in. (±12 mm) "Near On-Grade"

Sensor Reception Area	200° Horizontal
	8.3 in. (210 mm) Vertical
Power Input Options	Rechargeable Battery pack or external 11 to 30 Volts DC (Reverse Voltage Protected) with Battery Cable/ System Cable.
Rechargeable Battery - Operation	Battery Pack - 48 Hours

Battery Features	"Shake-to-Wake" Stand-By - 5 Minutes of No Movement
	Auto Shut-Off - 90 Minutes of No Movement
Laser Requirement	All Rotating Lasers (HeNe or Diode) in wavelength range of 635 nm - 785 nm
Verticality Sensing (Factory Setting)	$\pm 0.75^\circ$ to 1.25°
Operating Temperatures	0° to 115°F (-18° to 46°C)
Storage Temperatures	-10° to 150°F (-23° to 65°C)
Storage Temperatures - Battery	-10°F to 131°F (-23°C to 55°C)
Weight	6 lb. (2.7 kg)
Dimensions	10 x 5.7 x 3 in. (254 x 145 x 76 mm)
Construction	Completely Waterproof, Shock Protected
Mounting Bracket	1.5 to 2 in. (38 to 50 mm) Dia. Round
	or 1.5 in. (38 mm) Square
Magnet (optional)	Permanent magnet

Traction Force	450 lbs. (220 kg)
-----------------------	-------------------

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

742679-1.1.0en

Printed in Switzerland - Copyright Leica Geosystems AG, Heerbrugg,
Switzerland 2005
Original text



Leica Geosystems AG
CH-9435 Heerbrugg
(Switzerland)
Phone +41 71 727 31 31
Fax +41 71 727 46 73
www.leica-geosystems.com