

310-2310-001 EN22



Operating Manual

Sliding Friction Tester GMG-200



Sliding Friction Tester GMG-200 Operating Manual
Document version: 310-2310-001 EN22
– Translation from German –

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Brief Description

The GMG-200 is a mobile device for measuring the coefficient of sliding friction of floor coverings conforming to EN 13893, EN 16165, ANSI NFSI B101.3 and DIN 51131.

The device has a traction cable that allows it to draw itself across the flooring to be tested by an integrated motor. The electronic component of the GMG-200 records the friction and evaluates it.

The scope of delivery includes a foot plate to which the traction cable is attached. The foot plate serves as the anchor point during pulling.

To be able to reproducibly evaluate the frictional forces, the GMG-200 is equipped with sliders that comply with the applicable standards. The sliders are attached to a changeable slider assembly on the bottom of the device. The slider assembly can be changed as needed for the respective type of flooring. A sensor incorporated into the slider assembly enables the GMG-200 to automatically detect the material of the attached sliders and to include it in the evaluation.

All of the measured values and the signal patterns are automatically placed in the device's data memory, which can record up to 90 measurements. The integrated LCD guides the operator and displays relevant information. The intuitive control panel provides direct access to all of the core features.

Integrated batteries supply energy to the device; a power supply (battery charger) is included in the scope of delivery.

A serial data interface in conjunction with the optional Windows software GMG-Vision enables the measured values to be transmitted to a laptop or PC to be evaluated, logged and stored.

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1 About this Manual

1.1 Objective

This manual describes the requirements for proper operation of the Sliding Friction Tester GMG-200.

It is intended to be used only by properly qualified personnel (→ *Chap. 2, For your Safety*).

1.2 Explanation of Symbols

This manual follows a certain structure to make it easy to work with and understand. The following designations are used throughout.

Operational objectives

Operational objectives specify the result to be achieved by following the subsequent instructions. Operational objectives are shown in **bold print**.

Instructions

Instructions are the steps to be taken in order to achieve the previously stated operational objective.

Instructions appear like this:

- Indicates a single instruction
- 1** First of a series of instructions
- 2** Second of a series of instructions
- 3** etc.

Intermediate states

When it is possible to describe intermediate states or events resulting from the instruction steps (e.g. screens, internal function steps, etc.), they are shown like this:

- ▷ Intermediate state

Warnings

The following types of notes are used throughout this manual.



DANGER!

This combination of symbol and signal word indicates an immediately dangerous situation which could lead to death or severe injuries if it is not avoided.



WARNING!

This combination of symbol and signal word indicates a possibly dangerous situation which could lead to death or severe injuries if it is not avoided.



CAUTION!

This combination of symbol and signal word indicates a possibly dangerous situation which could lead to minor injuries if it is not avoided.



NOTICE!

This combination of symbol and signal word indicates a possibly dangerous situation which could lead to property damage if it is not avoided.



TIPS AND RECOMMENDATIONS

This type of note provides information that is directly relevant for the further operation of the device.

1.3 Abbreviations

Abbr.	Meaning
GTE	GTE Industrieelektronik GmbH
GMG	Sliding Friction Tester
F	Force
CF	Friction coefficient
M	Measurement
SC	Scan
N	Newton

1.4 Storing this Manual

Store this manual near the device, in a place where it can easily be accessed when needed for reference.

1.5 Standards and Regulations

The following standards and directives are particularly important when working with the GMG-200:

Regulation	Description
DIN 51131	Testing of floor coverings – Determination of the anti-slip property – Method for measurement of the sliding friction coefficient
EN 13893	Resilient, laminate and textile floor coverings – Measurement of dynamic sliding friction coefficient on dry floor surfaces
EN 16165	Determination of slip resistance of pedestrian surfaces – Methods of evaluation
ANSI NFSI B101.3	Test Method for Measuring the Wet DCOF of Hard Surface Walkways

2 For your Safety



WARNING!

The traction mechanism of the GMG-200 is pulled with increased force during measurement and can cause squashing.

- **Do not touch the traction mechanism during pulling!**
- **Steel strap must move easily!**



WARNING!

The steel strap on the GMG-200 may have sharp edges, thus posing a risk of cuts.

- **Do not touch the steel strap!**



CAUTION!

Operating errors can cause injury as well damage to the device.

- **Read the entire manual and follow the instructions!**
- **Do not open the device!**

2.1 Intended Use

The GMG-200 is used to measure the sliding friction of floor coverings. It is operated by placing the device on the floor with the sliders on the underside, pulling out the strap and attaching it to the foot plate. When the foot plate is braced by a foot and the strap is kept tensed, the GMG-200 moves along the floor and performs measurement.

**CAUTION!**

Unintended use can lead to injuries as well as to damage to the device.

2.2 Qualification Required of Personnel

**WARNING!**

Only properly trained persons may operate the GMG-200.

2.3 Modifications

**WARNING!**

All kinds of unauthorized modifications or additions to the equipment are expressly prohibited!

–Do not open the device!

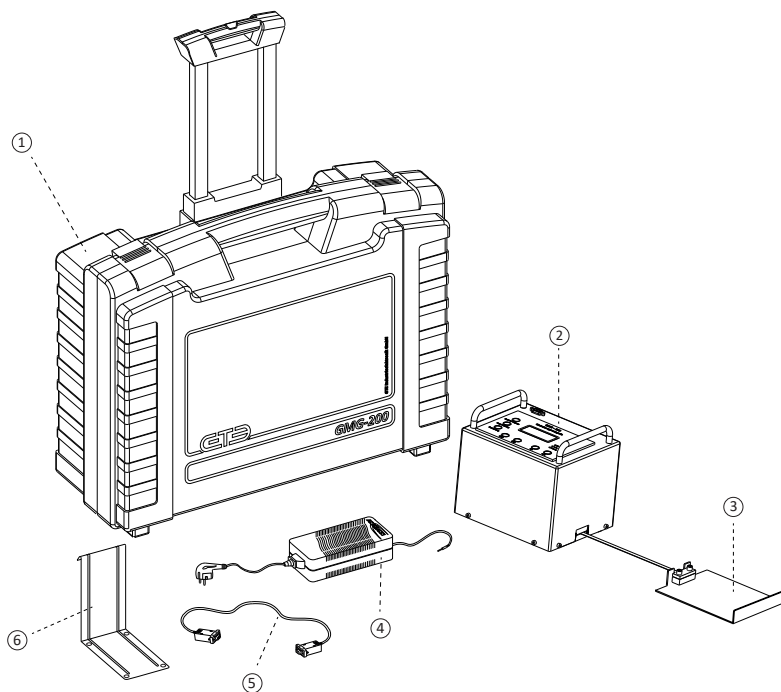
–When in doubt, consult the manufacturer!

**WARNING!**

Only original spare parts and accessories provided by the manufacturer may be used!

3 Scope of Delivery

Delivery of the GMG-200 includes the following components:



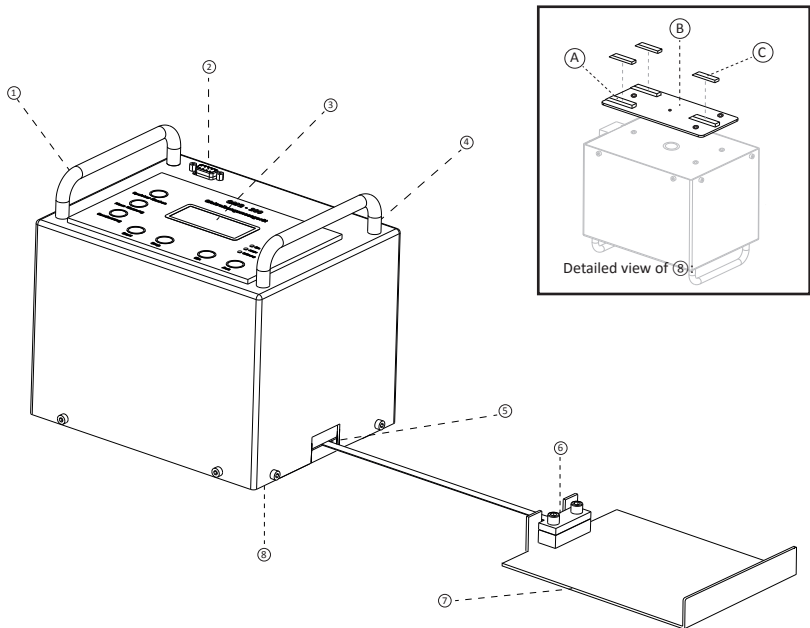
No.	Description
①	Transport case / trolley with foam insert
②	Sliding Friction Tester GMG-200
③	Foot plate
④	Power supply (battery charger)
⑤	Interface cable RS-232 to USB for data transmission
⑥	Removal tool
No illustration	
Allen key for exchanging slider plates	

3.1 Accessories and Spare Parts

The following accessories are available for the GMG-200:

Art. no.	Description
310-2304-001	Evaluation software GMG-Vision
310-2003-020	GMG-200 slider plate SBR rubber EN 16165 with certificate
310-2003-021	GMG-200 slider plate mix (gum/leather) EN 16165 with certificate
310-2303-020	Carrier plate for sandpaper according to EN 1615
310-3000-020	Standard sandpaper B115 SIC120 roll 50 m
310-3000-021	Standard sandpaper B115 SIC320 roll 50 m
310-4304-007	Calibration certificate
90-01-03954	USB-/RS-232 converter

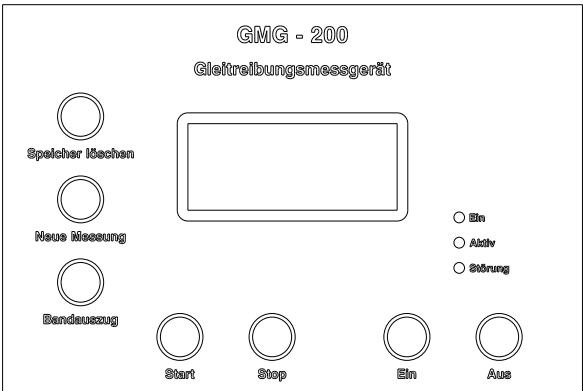
4 Design and Functioning



4.1 Overview

No.	Description
①	Handles
②	Interface RS-232
③	Control panel with LCD and buttons
④	Connection for power supply (on the back / not shown)
⑤	Traction mechanism / strap extraction
⑥	Strap grip
⑦	Foot plate
⑧	A Slider base
	B Slider plate
	C Slider material

4.2 Control Panel



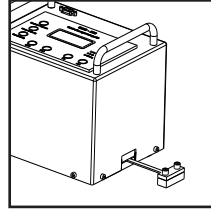
Element	Description
LCD	Plain text display of measured values, memory space, slider material and measuring track
LED indicator "Ein"	Lights up green when the device is switched on to monitor operation and battery charge
LED indicator "Aktiv"	Lights up yellow during measurement process
LED indicator "Störung"	Lights up red when an error occurs
"Ein" button	Switches on device
"Aus" button	Switches off device
"Start" button	Initiates strap retraction and measurement process
"Stop" button	<ul style="list-style-type: none"> - Change language - Stop strap extraction at desired length - Stop measurement process - Retrieve measurement results
"Bandauszug" button	Enables strap extraction to pull the strap out to the required length
"Speicher löschen" button	All saved measurement results are deleted
"Neue Messung" button	Initiates a new measurement consisting of five measuring runs (scans)

4.3 Measurement Mechanism

Traction mechanism

The traction mechanism for strap extraction is located near the floor, on the right side of the device.

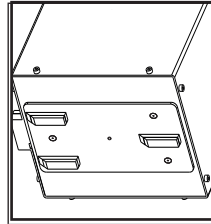
The strap extension is used to determine the length and direction of the measuring track. The strap grip is secured to the foot plate after the strap is extended.



Slider plate

The slider plate on the underside of the device consists of a metal plate with coding contact and three metal skids, to which the changeable slider material is affixed.

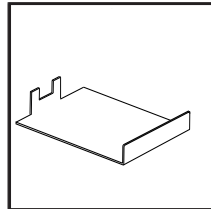
When special materials are to be used as the slider material, slider plate systems can be provided to which the respective material can be attached.



Foot plate

The foot plate serves as the anchor point when pulling the GMG-200 during measurement.

It is fixed to the floor after the strap grip has been attached.



5 Preparing for Operation



TIPS AND RECOMMENDATIONS

Verify that the slider plate is attached properly before every use!

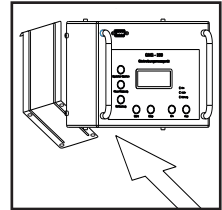


TIPS AND RECOMMENDATIONS

Check the battery charge before starting up the device and charge if necessary!
(→ Chap. 5.1, Charging Battery)

Removing GMG-200

- 1 Brace the removal tool with one hand.
- 2 Grasp the handle with the other hand.
- 3 Carefully lift the device out of the foam insert.

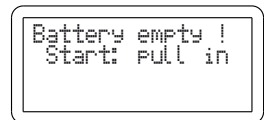


5.1 Charging Battery

The GMG-200 has a built-in battery that allows measurement without a power supply. If the remaining battery charge falls below a limit, "Battery empty" appears in the display.

The remaining charge is enough to:

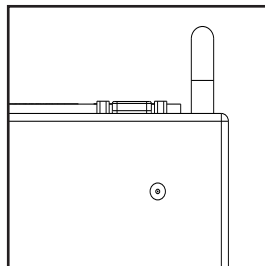
- completely retract the strap
- transmit the data to the computer.



TIPS AND RECOMMENDATIONS

The battery can be recharged at any time. Because of the type of battery used, it can be recharged at any level without any adverse memory effect!

- 1 Switch off the device.
- 2 Connect the power supply to an electrical outlet (100 to 240 V AC).
 - ▷ Power supply LED indicator red: Power supply is ready for use.
- 3 Connect the power supply to the GMG charging socket.
 - ▷ Power supply LED indicator orange: Device begins charging.
 - ▷ Power supply LED indicator green: GMG-200 is partially charged. **It takes 14 hours for the device to be completely charged!**
- 4 Disconnect the power supply.



TIPS AND RECOMMENDATIONS

When the GMG-200 is not in use, change it once a month for at least 10 to 12 hours. Disconnect the power supply when charging is completed!

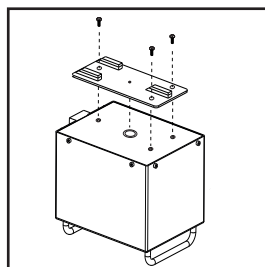


TIPS AND RECOMMENDATIONS

The device has deep discharge protection. After ten minutes of idling or no data transmission, the device switches itself off!

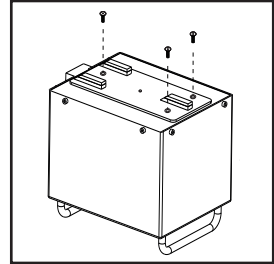
5.2 Attaching Slider Plate

- 1 Turn over the GMG-200 and rest it on the handles.
- 2 Place the desired slider plate on the floor plate of the GMG-200.
- 3 Use an Allen key (size 3.0) and three screws to secure the slider plate.



5.3 Changing Slider Plate

- 1 Turn over the GMG-200 and rest it on the handles.
- 2 Use an Allen screwdriver (3.0) to release the screws.
- 3 Detach the slider plate from the floor plate.
- 4 Place the desired slider plate on the floor plate.
- 5 Use an Allen key and three screws to secure the slider plate.



5.4 Cleaning Sliders



TIPS AND RECOMMENDATIONS

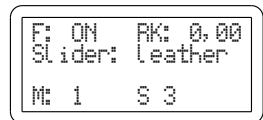
To clean the glider, please proceed as described in EN 16165.

- Clean the sliders with SiC sandpaper with grit 120 (in case of dirt) and grit 320 for standard preparation of the slider surfaces before every use!

5.5 Changing Sliders

A sensor in the slider plate determines the material of the respective slider.

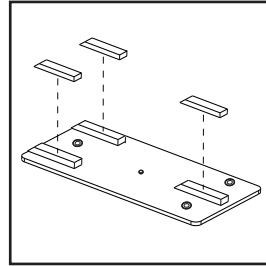
When the slide plate is changed, the device automatically detects the type of material, displays it and saves the information along with the respective measured values.



TIPS AND RECOMMENDATIONS

When changing the sliders, verify that the slider material and slider plate match.

- 1 Turn over the GMG-200 and rest it on the handles.
- 2 Detach the slider plate. (→ Chap. 5.2, *Attaching Slider Plate*)
- 3 Clamp the slider plate in a vise.
- 4 Detach the glued sliders from the slider bases.
- 5 Remove adhesive residue from the slider bases.
- 6 Apply a thin coating of adhesive to the entire surface of the slider bases.
(Use *superglue* for rubber sliders and "*Pattex Alleskleber*" (*Pattex all purpose glue*) for leather sliders!)
- 7 Place the sliders on the runners, align them and press them into place.



TIPS AND RECOMMENDATIONS

Allow the adhesive to dry before use!



TIPS AND RECOMMENDATIONS

Clean the slider before each start-up of the device
(for cleaning procedure, see DIN EN 16165)!

6 Operation



TIPS AND RECOMMENDATIONS

Before beginning operation of the GMG-200:

- **Check the battery charge and recharge if necessary.**
- **Verify that the surface of the attached sliders complies with the standard specification.**
- **Clean the glider (for cleaning procedure, see EN 16165)**

6.1 Preparing Measuring Surface

- 1 Clean the surface to be tested to remove dust and dirt (Refer to EN 16165).
- 2 Spray lubricant on the area to be tested.



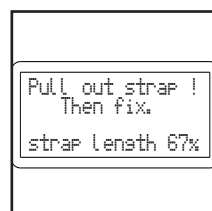
TIPS AND RECOMMENDATIONS

As the lubricant, use pressure-free water pursuant to EN 16165 or use the lubricant to which the flooring is normally subjected and that may cause an accident during everyday use.

6.2 Preparing for Strap Extraction

Strap extraction

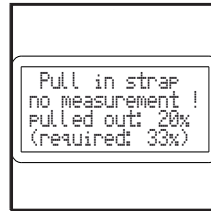
- 1 Grasp the strap grip and draw the traction cable out of the device. How quickly the device releases the strap is a factor of the tensile force applied.
- 2 As the strap is being extracted, its length is shown in the display as a percentage of the total length.
- 3 The strap stops automatically when it is released (tensile force = 0) or when it is completely extracted (100%).
- 4 When completely extracted (100%), the strap is 80 cm long.



Partial extraction

For shorter measuring tracks the strap can be partially extracted, whereby the minimum extraction is 33% of the total length (~ 32 cm).

- When extracting only part of the strap, press "STOP" to end extraction. The measuring run can then begin in the usual manner.



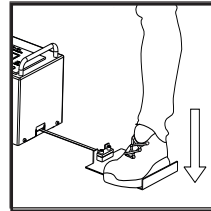
TIPS AND RECOMMENDATIONS

Exception for measuring tracks shorter than the 50 cm specified by the standard (e.g. steps):

Values from shorter measuring tracks that do not comply with lengths specified by the standard are indicated with an asterisk (*)!

Securing strap

- 1 Attach the strap grip to the foot plate and position it properly.
- 2 Position the foot plate to avoid off-track traction.
- 3 Place a foot on the foot plate to secure it.



TIPS AND RECOMMENDATIONS

When the device starts up, force (0 to 100 N, depending on the sliding friction) is applied to the foot plate via the strap.

This is why it is essential to weight down and secure the foot plate with body weight!

6.3 Preparing for Measuring Run



TIPS AND RECOMMENDATIONS

A complete measurement of the sliding friction consists of five measuring runs:

- **Measuring runs 1 and 2 are “adjusting runs” that prepare the friction process between the sliders and the floor.**
- **The measurement results and the mean sliding friction are determined and calculated based on measuring runs 3 to 5.**

- 1 Position the device.
- 2 Press the “Strap extraction” button.
- 3 Draw the traction cable out of the device and secure it with the foot plate.
- 4 Weigh down the foot plate with your foot.

6.4 Starting Measurement Process

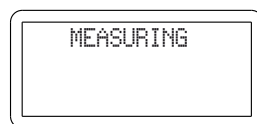
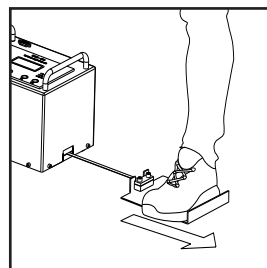


TIPS AND RECOMMENDATIONS

The strap has to be tensed slightly before beginning the measurement process.

To initiate a measuring run with the aid of the foot plate:

- 1 Briefly release tension to the strap (approx. 2 sec.).
 - 2 Tense strap slightly with the foot plate (approx. 3 sec.).
- ▷ The GMG-200 automatically starts a measuring run and moves towards the foot plate weighted down with a foot. The measuring track is defined by the strap extension.
- ▷ The display indicates “Measuring” during an ongoing measurement process.



6.5 Ending Measurement Process

The strap retraction speed decreases about 3 to 5 cm before the end of the measuring run. The strap grip is slowly drawn into the device, where it triggers a limit switch. The device stops automatically.

- The measuring run can be stopped before it is finished by pressing the "Stop" button; the results of the measuring run are then invalid. (→ Chap. 6.8, *Canceled a Measuring Run*)

6.6 Querying Measurement Result

The result of the respective measuring run appears immediately on the display.

- Press the "Bandauszug" button for additional measuring runs.

6.7 Evaluating Measuring Run

Evaluation and display take place after the set point speed has been achieved over a measuring distance of 50 cm.

- ▷ The current sliding friction coefficients of the most recent successful measuring runs are displayed.

M: 4	SC: 1	0,45
M: 4	SC: 2	0,42
M: 4	SC: 3	0,45
M: 4	SC: 4	0,44

- ▷ After five measuring runs have occurred, the measured values of the last three measuring runs are averaged and the value displayed in the last line. (If one of the last three measuring runs was invalid, no average is calculated and the entire measurement must be repeated.)

M: 4	SC: 3	0,43
M: 4	SC: 4	0,44
M: 4	SC: 5	0,42
MW	SCs 3-5	0,45

Data and the measured values can be transmitted to a PC via RS-232.



TIPS AND RECOMMENDATIONS

The special evaluation software GMG-Vision is recommended for further processing of the measurement results. It evaluates the data, archives it and creates logs!



TIPS AND RECOMMENDATIONS

On slightly inclined surfaces, perform two measurements with 5 measurement runs each in opposite directions and calculate the mean value from both measured values!

6.8 Canceling a Measuring Run

If during a measuring run the "Stop" button is pressed or a system error is detected, the measuring run is immediately canceled.

- Press the "Start" button to slowly retract the strap.

Cancel
Key Bandauszug
or
Start: Full in

6.9 New Measuring Run

A new measuring run can be started right after the previous run ends.

- 1 Position the device.
- 2 Press the "Bandauszug" button: Draw out the strap.
- 3 Attach the strap to the foot plate and secure it.
- 4 Press the "Start" button: Start measuring run.



TIPS AND RECOMMENDATIONS

When the device starts up, force (0 to 100 N, depending on the sliding friction) is applied to the foot plate via the strap. This is why it is essential to weight down and secure the foot plate with body weight!

7 Measuring Series

A total of 18 standard measurements – consisting of five measuring runs (scans) each – can be performed.



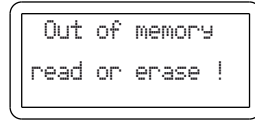
TIPS AND RECOMMENDATIONS

The standard measurement is complete when five measuring runs have occurred. If additional standard measurements are to be performed, press the "Neue Messung" button!

- 1 Press the "Neue Messung" button to initiate a new measuring series.
 - ▷ The number of the measuring run is adjusted automatically in the display.
 - ▷ The number of measuring series increases automatically.
- 2 Prepare for the new measuring run.

8 Measured Value Memory

- ▷ All measured values are saved at the end of each measuring run.
- ▶ Up to 90 measuring runs can be saved. Then the memory has to be cleared!



TIPS AND RECOMMENDATIONS

If there is not enough space left in the memory to save a complete measuring series, the following message appears when the "Start" button is pressed: "Out of memory, read or erase!"

8.1 Reading Out Measured Value Memory

Viewing values in the memory

- ▶ Device idling: Press the "Stop" button once.
Device operating: Press the "Stop" button twice.
- ▷ The view mode "Memory" appears in the display.

Displaying completed measuring runs

- ▶ Press the "Stop" button for each additional measuring run to be displayed.
- ▷ The measured value memory appears in the display, beginning with the highest number and going back.

Exiting display mode and returning to starting screen

- ▶ Hold down the "Stop" button for two seconds.

8.2 Resetting Measured Value Memory

Clearing measured value memory

- Press the "Speicher löschen" button for five seconds.



TIPS AND RECOMMENDATIONS

The memory is completely deleted!

9 Logging

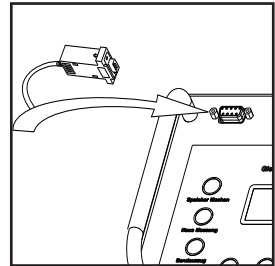
The purpose of the Windows software GMG-Vision is to visualize, archive, and log the measured data recorded with the GMG-200.

Via an interface, the measurement results can be transferred to a PC or notebook at the click of a mouse. The program makes it possible to retrieve the exact curve progression of each individual measurement run and visualize it graphically.

GMG-Vision also allows the creation of larger projects: the underlying standards as a basis for testing, the data of the testers, customer data, soil information, image material and all measurement results can be combined on a project-specific basis.

GMG-Vision generates a report with all data and measurement results stored in the project, including curve progressions and evaluation of the coefficient of sliding friction, in the form of a Word document. Company data and a logo can also be stored. With text marks, the measurement report can be generated individually as a Word document.

- Use the connecting cable to connect the GMG-200 to the serial interface on the computer.



10 Checking Zero Point of Force Measurement

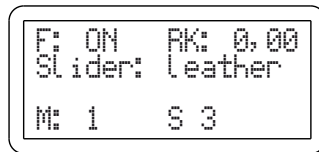
The precision of the measurement of the friction coefficient is a factor of the precision of force measurement at the traction cable.

- ▷ When there is no force applied to the traction cable, the GMG-200's force measuring device should indicate "ON."

Checking

- 1 Extract the strap approx. 5 to 10 cm and then press the "Stop" button.
- 2 Hold down the "Stop" button for about two seconds.

- ▷ The force (N) is indicated in Newton in the first line. The value should be "0".



- ▷ When the strap is extracted and there is no tensile force applied to the strap, the display should indicate "ON."
- ▷ When force is applied to the traction cable (Pull strap to check), the respective tensile force is indicated in the display.

11 Errors




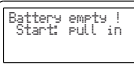
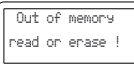
TIPS AND RECOMMENDATIONS

When the strap is completely retracted, the display may indicate a force > 0 since the strap limit switch presses against a buffer spring!

Possible error indications

- Remedy common errors by following the instructions in the display!

Display	Description	Remedy
	Permitted motor current exceeded	Start strap retraction
	Internal traction cable winding error	Extract the strap and then take care that the strap is drawn in straight and evenly when attempting again
	Inconsistency in RAM and/or EEPROM data	Start strap retraction
	Counter reading error: Measurement results are not displayed	Measurement invalid – repeat measuring run
	Blank display – device is in self-discharge protection mode: The device has an automatic shutdown feature to prevent deep discharge. If within ten minutes no functions occur and no data transmitted, the device switches itself off	Press “Start” to switch on the device

Display	Description	Remedy
	Blank display – device cannot be switched on	Check power supply or battery charge; charge battery if necessary
	Self-discharge protection: The device has an automatic shutdown feature to prevent deep discharge	Completely retract the strap.
	The memory is so full that no more complete measuring series can be saved	Press the “Clear memory” button for five seconds

12 Maintenance



CAUTION!

If overload occurs during use of the device, e.g. due to blockage during the measuring run, the measurement mechanism is subjected to extremely high forces.

–It is advisable to have the device inspected at the plant!

12.1 Cleaning

The device is designed such that moisture that penetrates the device via the traction cable does not impair operation. It is advisable to keep the traction cable tensed during measurements to prevent excessive moisture from penetrating the device.

When all measurements are finished, extract the traction cable all the way, wipe it dry with a soft cloth and then retract it again.



Caution!

The steel strap on the GMG-200 may have sharp edges, thus posing a risk of cuts.

–Wear gloves when drying!

12.2 Storage

- Store the GMG-200 in the proper transport case!

The foam insert in the GMG-200 transport case is designed to accommodate all components included in the scope of delivery.

Stowing the GMG-200 in the transport case:

- 1 Release the strap from the foot plate and press the "Stop" button.
- 2 Press "Start" and hold it down: The strap is retracted.
- 3 Press the "Off" button to switch off the device.
- 4 Place the device on the removal tool such that the underside of the device rests on the removal tool.
(Front of device faces forward)
- 5 Use one hand to hold the device to the removal tool. With the other hand, grasp the handle and, with the underside of the device facing the case lid, carefully lower the device into the foam insert.



TIPS AND RECOMMENDATIONS

When it is not in use, charge the GMG-200 once a month!

–**Disconnect the charging cable (power supply) when charging is completed**

12.3 Transport



NOTICE!

To safely transport the device:

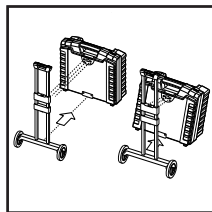
–**Retract the strap all the way!**

- Stow the device in the proper transport case / trolley to transport it.

12.4 Trolley

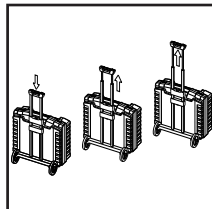
Attaching wheels

- 1 Place the handle upright on the wheels.
- 2 Roll the handle up to the case.
- 3 Hold the case at a slight angle, slide the underside of the handle under the case, then lower the case again.
- 4 Hold the "Push" button, allow the handle to snap into the upper holder on the case, then release the "Push" button.



Extending and retracting handle

- 1 Hold onto the handle and press the button on the top.
- 2 Hold down the button and pull up the handle track by track or press it down.
- 3 Release the button and lock the handle into place at the desired height.



12.5 Calibration



TIPS AND RECOMMENDATIONS

Send the GMG-200 to the plant at least once a year to be calibrated!

13 Disposal

Return the device to the manufacturer when it reaches the end of its serviceable life. The manufacturer will ensure that the components are disposed of properly, in an environmentally friendly manner.



14 Technical Data

General data		
Dimensions of measuring surface:	cm ²	11.25
Dimensions including handle:	mm	160 x 200 x 150 (L x W x H)
Weight:	g	10000 ± 100
Electrical properties		
Power supply:		Lead gel battery
Power supply (battery charger):	V AC	230 +10 % / -15 %, max. 20 VA
Power consumption:	A	At max. motor capacity ≤ 8
Inputs/outputs		
Interface:		RS-232
Power connection:		Socket for power supply (battery charger)
Ambient conditions		
Temperature range:	°C	-10 to +40
Relative humidity:	r. h.	20 ... 90 % (non-condensing)
Degree of protection:		IP20
Measurement process		
Traction speed:	m/s	0.2 ... 0.25 ± 0.02
Pressure on sliders:	N/cm ²	9
Range of friction coefficient;		0.01 ... 1 Resolution: 0.01
Measurement uncertainty of measuring device	of limit	< ± 1% plus errors caused by vertical or horizontal off-track traction and floor coverings that are not horizontal
Admissible vertical off-track traction:	cm	± 1 cm per 1 m
Admissible horizontal off-track traction:	cm	± 1 cm per 1 m
Memory for measuring curves:		90
