

Instruction Manual



„TERRATEST 4000 USB“
„TERRATEST 5000 BLU“



Made in Germany



Instruction Manual

Light Weight Deflectometer
for the dynamic plate load test

„TERRATEST 4000 USB“

„TERRATEST 5000 BLU“

with integrated GPS system and Google® Maps interface

Corresponding to

international standard:

**„ASTM E2835-11 Standard Test Method for Measuring
Deflection using a Portable Impulse Plate Load Test Device“**

German standard:

**„Technical Test Code for Soil and Rock Mechanics
in Road Constructions TP BF-StB Part B 8.3“**

Austrian standard:

„RVS 08.03.04

Compaction Tests by means of the Dynamic Plate Load Test“

as well as

„RIL 836 - Deutsche Bahn AG for Track Construction“



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1. Documentation

1.1 Notes on the Documentation

Congratulations on your purchase of your Light Weight Deflectometer from the **TERRATEST** product family. By selecting this innovative test instrument you have chosen a cutting-edge product featuring the latest technology. To be able to make full use of all the advantages and possibilities that this high-tech product offers, and to ensure the proper use of the device according to the manual, please take a little time to read this documentation carefully before use. The chapters contain everything you need to know about the device and give valuable tips and recommendations for the proper use of this product. Reading this documentation carefully will ensure that you will always obtain precise test results, which will give you a clear indication as to the bearing capacity of the soil.

Read the instruction manual carefully and operate the device in accordance with the instructions. TERRATEST GmbH will not be liable for damages caused by failure to observe these instructions.

All details contained in this documentation are subject to change without prior notice. TERRATEST GmbH gives no assurance as to the accuracy of this documentation, and specifically disclaims any implied warranties of merchantability or fitness for a particular purpose.

TERRATEST GmbH cannot be held liable for errors contained in this documentation, or for accidental or sequential damage in connection with the delivery, performance, or use of the material.



PLEASE OBSERVE THE INSTRUCTIONS OF THE GERMAN STANDARD
„**Technical Test Code for Soil and Rock Mechanics in Road Construction TP BF-StB Part B 8.3**“.
Evaluate the test data strictly in accordance with ZTV-E, ZTV-A, RIL 836 and/or RVS 08.03.04.



We would like to point out explicitly that a reliable evaluation of the test data is only possible if a correlation measurement with the static plate load test is performed for every dynamic test with the Light Weight Deflectometer. At least three static plate load tests should be performed for a reliable calibration (see p. 29/30).

1.2 General Safety Information

Please read and understand the following safety guidelines, before starting to use „TERRATEST 4000 USB“ / „TERRATEST 5000 BLU“.



Useful information and instructions



ATTENTION

Indicates processes where incorrect execution could result in physical injury or material damage. Please observe these warnings carefully to ensure a safe operation of the device.



ATTENTION

If the Light Weight Deflectometer is used in a manner not specified by these instructions, the protection provided by this instrument may be impaired.



ATTENTION (Quotation from ZTV E-StB 09)

„The deformation modulus E_{v2} is to be assessed by the static plate load test, in accordance with DIN 18134, and the dynamic deflection module E_{vd} with the dynamic plate load test, in accordance with TP BF-StB Part B 8.3.... The specifications of the building contract should state whether the static or dynamic deflection modulus is to be established. If no such statement is to be found in the contract, the static deformation modulus will need to be established.“



ATTENTION

The evaluation of the measured E_{vd} value depends on the material and the subsoil being tested. It is always necessary to determine correlation values of the static plate load test on a trial basis for the pre-existing ground or the ground intended for backfilling. Homogeneous ground is a prerequisite for properly correlating the two measuring methods. Accordingly, the water content of the soil must not vary widely.



ATTENTION

According to German standard TP BF-StB Part B 8.3, Light Weight Deflectometers must be calibrated at least once a year at a calibration institute accredited by the German Federal Road Research Institute (Bundesanstalt für Straßenbau). Test results of a device that has not been calibrated or of a device with an expired calibration date must not be used for evaluating the bearing capacity of soil or rock. Abide by the mandatory calibration intervals.



CAUTION

Never place the testing computer or load plate of „TERRATEST 5000 BLU“ near any inflammable liquids such as alcohol, thinner etc. There is a risk of fire if such flammable liquids make contact with the electric components in the interior of the device.



CAUTION

Never place or charge the testing computer or load plate of „TERRATEST 5000 BLU“ in areas with excessive humidity, high temperatures, direct sunlight, or close to open flames. Doing so carries the risk of fire or electric shock.



CAUTION

Whenever the loading device is not placed on the metal ball of the sensor dome on the load plate, always store it horizontally or on the magnetic plate, which may be purchased separately. The loading device could fall over and cause injuries otherwise.



CAUTION

Before operating the Light Weight Deflectometer read the instruction manual carefully to ensure correct set-up of the device. When no test is performed, keep the drop weight in its 'rest' position at the bottom of the guide rod. The drop weight could fall down and cause injuries or damage otherwise.

1.3. Safety Precautions during Power Supply



CAUTION

Never place any heavy objects on the measuring or charging cables. Never twist or pull them, and take care that they do not become knotted.



CAUTION

Ensure that the charging and measuring cables are fully inserted into their sockets. A poor connection can lead to equipment damage. Use only the cables provided.

1.3.1. Power Supply



ATTENTION

Only batteries approved by the manufacturer (Panasonic LCR-6V 4.2 P) should be used for the testing computer. Batteries should only be replaced and disposed of by qualified personnel. The plugs of the cable, to which the battery will be connected, are colour-coded. The white wire with the red plug should be connected to the positive (+) pole of the battery (+6 volts). The brown wire with the black plug should be connected to the negative (-) pole of the battery. The cable contains a 2A/32V fuse.



Only the permanently-installed, long-lasting, rechargeable battery pack approved by the manufacturer (type 8904 7.4 V/2.4 Ah) should be used in the Bluetooth® sensor dome („TERRATEST 5000 BLU“ ONLY). This battery pack should only be replaced by the manufacturer.



ATTENTION

The assembly may be destroyed if the leads of the battery are interchanged, or a different type of fuse is inserted.

No tests should be performed while charging the device.

1.3.2. Mains Power Supply



ATTENTION

Only power cables approved by the manufacturer (SA07-15US12R) may be used for the testing computer. When using the power cable to charge the device, take care to do so only in dry, indoors locations. The inner pole is the positive (+) pole.



Only power cables with LEMO-plugs approved by the manufacturer (SYS1308-1809-W2E) should be used for charging the Bluetooth® transmission unit in the Bluetooth® sensor dome („TERRATEST 5000 BLU“ ONLY). When using the power cable to charge the device, take care to do so only in dry, indoors locations. The inner pole is the positive (+) pole.

1.3.3. Car Charger Lead



ATTENTION

Only car chargers approved by the manufacturer may be used. Charging should only be done inside dry rooms (the interior of the vehicle, for example). The inner pole is the positive (+) pole.



ATTENTION

Always hold the plug when disconnecting the charger cable. Wires may be damaged if the cables are pulled directly.

1.3.4. Measuring Cable



ATTENTION

Only the original measuring cable / extension cable supplied by the manufacturer should be used. Cables should not be disassembled or extended. Incorrect test results may occur otherwise.

1.4. Safety Precautions during Operation



ATTENTION

TERRATEST GmbH shall not be liable for any damage, consequential damage, or financial loss that occurs as a result of improper use of the device and / or lack of professional knowledge when evaluating the test data. It is essential to ensure that the calibration of the device is always up to date and that the device is always operated in accordance with the instructions of this document as well as your local standard.



CAUTION

Use the Light Weight Deflectometer only outdoors. Never use it inside any enclosed area. Using the device indoors carries the risk of damage to the building. Never use the device on paving stones, tiles, cobblestones, floor boards, asphalt, cement, industrial flooring, or any other type of flooring; these may be damaged by the impact of the dropping weight.



ATTENTION

Never disassemble or alter the Light Weight Deflectometer, the testing computer, or any other equipment such as the charger cable etc.



ATTENTION

In case of unusual noise, smoke, smell, or excessive heat generation, switch off the device immediately and contact TERRATEST customer support.



ATTENTION

Do not expose the testing computer or load plate of „TERRATEST 5000 BL“ to direct rainfall. If it rains, cover and protect testing computer and load plate of „TERRATEST 5000 BLU“.



ATTENTION

Protect the testing computer and load plate of „TERRATEST 5000 BLU“ from water, liquids, and any flammable substances. There is a risk of fire if flammable liquids enter the device and make contact with the electric components.



CAUTION

Clean surfaces with solvent-free cleaning agents only. Gently wipe surfaces with a soft, dry cloth. If dirt remains, use a cloth moistened with water, well-wrung, and then wipe with a soft, dry cloth to absorb any remaining moisture. Never use flammable substances such as alcohol, benzine or thinner for cleaning. There is a risk of fire if flammable liquids enter the device and make contact with the electric components, or if the cables get damaged. Thus, always take care when connecting or disconnecting the cables.



ATTENTION

Let go of the lid of the testing computer only after it has been fully closed / opened. If the lid falls down it may cause injury to your hands. No objects should be placed on the inspection window.



CAUTION

When placing the load plate on the test ground, and for removing it, kneel down on one knee and grab the load plate with both hands on the handles. Do not let the load plate fall down; doing so may injure your feet, or damage the device.



CAUTION

Always transport the loading device with the drop weight locked; failure to do so carries the risk of personnel injury or damage to the device. Keep the drop weight locked in its 'rest' position at the bottom of the loading device and unlock it only immediately prior to conducting a test. Failure to observe these points may cause the device to be damaged, and there may be a high risk of personnel injury. When latched at the top of the loading device, take care to release the drop weight only immediately prior to conducting a test. Pull up the drop weight, latch it at the top, and release it immediately afterwards.



CAUTION

The transportation lock should be unlocked only immediately prior to conducting a test. Uncontrolled movements of the weight may cause injury, or damage to the device or its surroundings. Regularly check that the



transportation lock of the Light Weight Deflectometer is functioning properly. If you notice signs of wear, stop using the device immediately. Send the device back to TERRATEST for the transportation lock to be repaired or replaced.



Never transport the loading device, or let it stand around, while the drop weight is latched at the top!



ATTENTION

When conducting a test, only the operator should come close to the device. Release the drop weight only when no one else is beneath or near the Light Weight Deflectometer.



CAUTION

Hearing protectors must be worn when operating the Light Weight Deflectometer. since the noise level may rise over 85 dB. ATTENTION: Operating the device without hearing protection may result in permanent hearing impairment.



ATTENTION

If the device will not be used for a longer period of time, ensure that all cables are disconnected. Before transporting the device, ensure that all cables are disconnected. Before moving the device around the construction site, ensure that all cables are disconnected. Damaged cables may cause fire.



No tests should be performed while the apparatus is on charge; this can distort test results!



CAUTION

Never insert the enclosed CD-ROM into a normal CD player; doing so will generate a loud noise.



According to the Waste Electrical and Electronic Equipment Directive (2002/95/EG) the battery, electronics, and especially the electronics of the load plate may not be disposed of with your domestic waste. Comply with your local regulations. In some countries you are required by law to dispose of these products only at the collection points provided. In some countries manufacturers of similar electronic equipment are obliged by law to take back electronic waste. Due to potentially hazardous substances, often contained in electronic waste, incorrect handling of such waste may have negative impacts on the environment and human health. By disposing of electronic parts in an appropriate way you also contribute to an effective use of natural resources.



For more information about collection points for electronic waste please contact your city council, your public waste management authorities, or your garbage disposal service.

TERRATEST GmbH will take back electronic waste free of charge, and dispose of it in a safe and environmentally appropriate manner.

1.5 Packaging



We strongly recommend that you keep the original packaging of the device for transport at a later date (e.g. when sending the device in for calibration). Upon delivery, inspect the device immediately. Make sure that the goods are undamaged and complete. Check in particular that there is no visible external damage to the packaging. If the device or any other item included in the delivery is damaged, immediately record the type of damage and notify the carrier that you may seek compensation. Please also advise TERRATEST GmbH of the damage and the name of the carrier, so that we can also get in contact with the transport company.

2. Contents of Delivery

2.1 Basic Package „TERRATEST 4000 USB“

Light Weight Deflectometer 10 kg
corresponding to German standard TP BF-StB Part B 8.3

„TERRATEST 4000 USB“ with integrated GPS system and Google® Maps interface

consisting of:

- 10 kg loading device with ergonomic weight-catching grip
- Load plate 300 mm
- Testing computer with GPS system,
internal plausibility check and test data comparison,
internal memory for up to 2000 tests, on a rolling basis
backlit graphic display for presentation of settlement curves during test,
thermal printer with paper roll, integrated chip card reader, port for USB flash drive,
integrated rechargeable battery, external control button,
large inspection window enabling operation under adverse weather conditions
- Connection cable with jack plug for testing computer / load plate
- User-friendly „TERRATEST 2.0“ software with statistical analysis
in accordance with German standard TP BF-StB Part B 8.3
- USB stick for test data storage
- Power cable 100 ... 240 V~ / 12 V= 1.25 A
- Car charger lead 12 V/DC
- Detailed instruction manual
- Calibration certificate according to German standard
„TP BF-StB Part B 8.3 for Soil and Rock Mechanics in Road Constructions“

2.2 Optional Equipment „TERRATEST 4000 USB“

- Loading device with 15 kg drop weight and strengthened spring assembly, calibration certificate
- „CARRELLO 4000“, the mobile testing system, for testing without carrying
- Transport box „MILANO“, made of plywood and an aluminium profile,
with integrated handles and wheels
- Transport box „ROMA“, made of plywood and an aluminium profile, with integrated handles and
wheels, for combined transport of 10 kg basic package and 15 kg loading device
- Magnetic plate „TRETMINNE“, for the convenient placement of the loading device on the ground
- Extension cable, load plate / testing computer, for extended range as well as tests in areas that are
difficult to access such as trenches etc.
- Paper rolls for thermal printer

2.3 Basic Package „TERRATEST 5000 BLU“

Light Weight Deflectometer 10 kg
corresponding to German standard TP BF-StB Part B 8.3

„TERRATEST 5000 BLU“ with integrated GPS system and Google® Maps interface

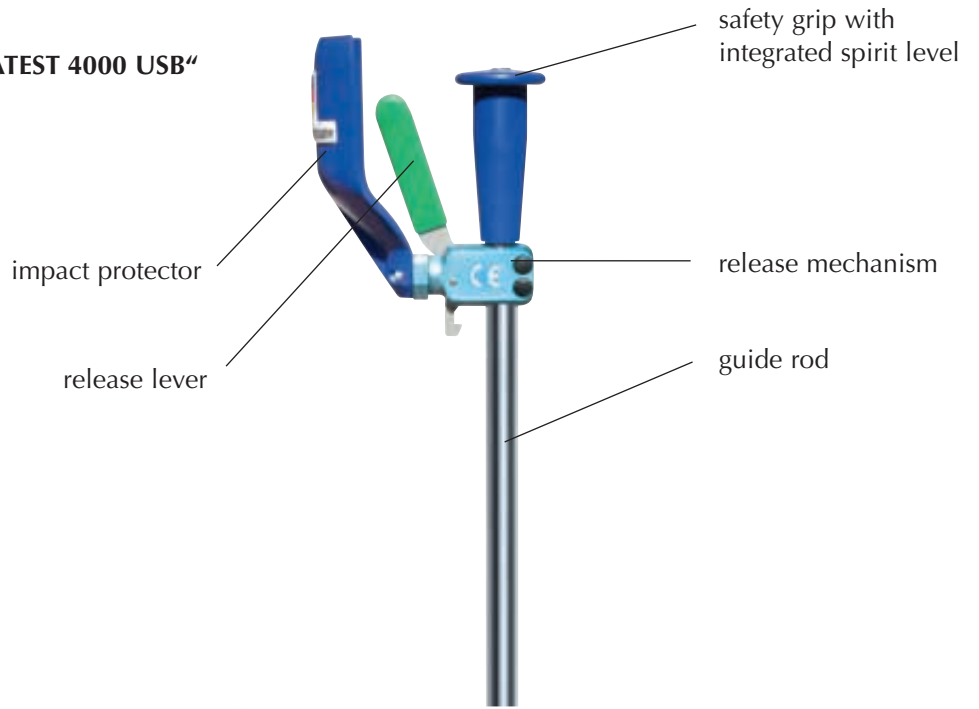
consisting of:

- 10 kg loading device with ergonomic weight-catching grip
- Load plate 300 mm with Bluetooth® transmission electronics in the sensor dome and integrated rechargeable battery pack type 8904 7.4V/2.4Ah
- Testing computer with GPS system, internal plausibility check and test data comparison, „continuous measuring mode“, voice output, internal memory for up to 2000 tests, on a rolling basis, backlit graphic display for presentation of settlement curves during test, thermal printer with paper roll, interface for SD memory cards, integrated rechargeable battery, external control button, large inspection window enabling operation under adverse weather conditions
- Connection cable with high-quality push-pull connectors from LEMO for testing computer / load plate
- User-friendly software „TERRATEST 2.0“ with statistical analysis in accordance with German standard TP BF-StB Part B 8.3
- SD memory card for saving up to 500 tests
- Power cable 100 ... 240 V~ / 12 V= 1.25 A and power cable 100 ... 240 V~ / 9 V= 2 A with plugs from LEMO
- Car charger lead 12 V/DC
- Detailed instruction manual
- Calibration certificate according to German standard „TP BF-StB Part B 8.3 for Soil and Rock Mechanics in Road Constructions“

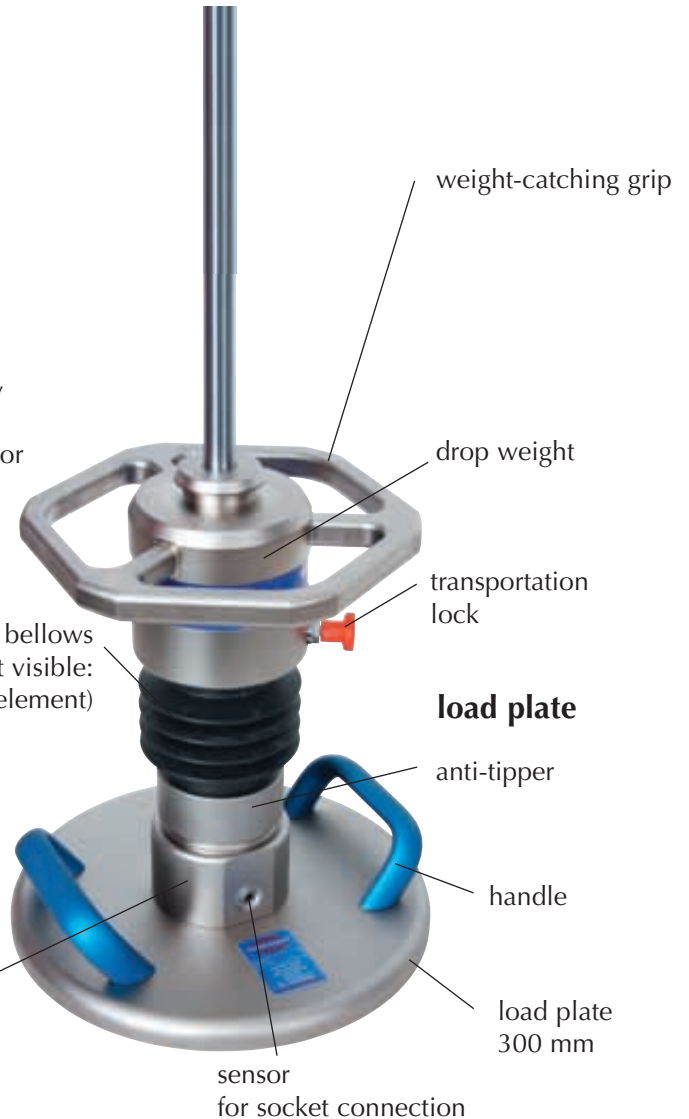
2.4 Optional Equipment „TERRATEST 5000 USB“

- Loading device with 15 kg drop weight and strengthened spring assembly, calibration certificate
- „CARRELLO 5000“, the mobile testing system, for testing without carrying
- Transport box „VERONA“, made of plywood and an aluminium profile, with integrated handles and wheels
- Transport box „TORINO“, made of plywood and an aluminium profile, with integrated handles and wheels, for combined transport of 10 kg basic package and 15 kg loading device
- Magnetic plate „TRETMINÉ“, for convenient placement of the loading device on the ground
- Paper rolls for thermal printer

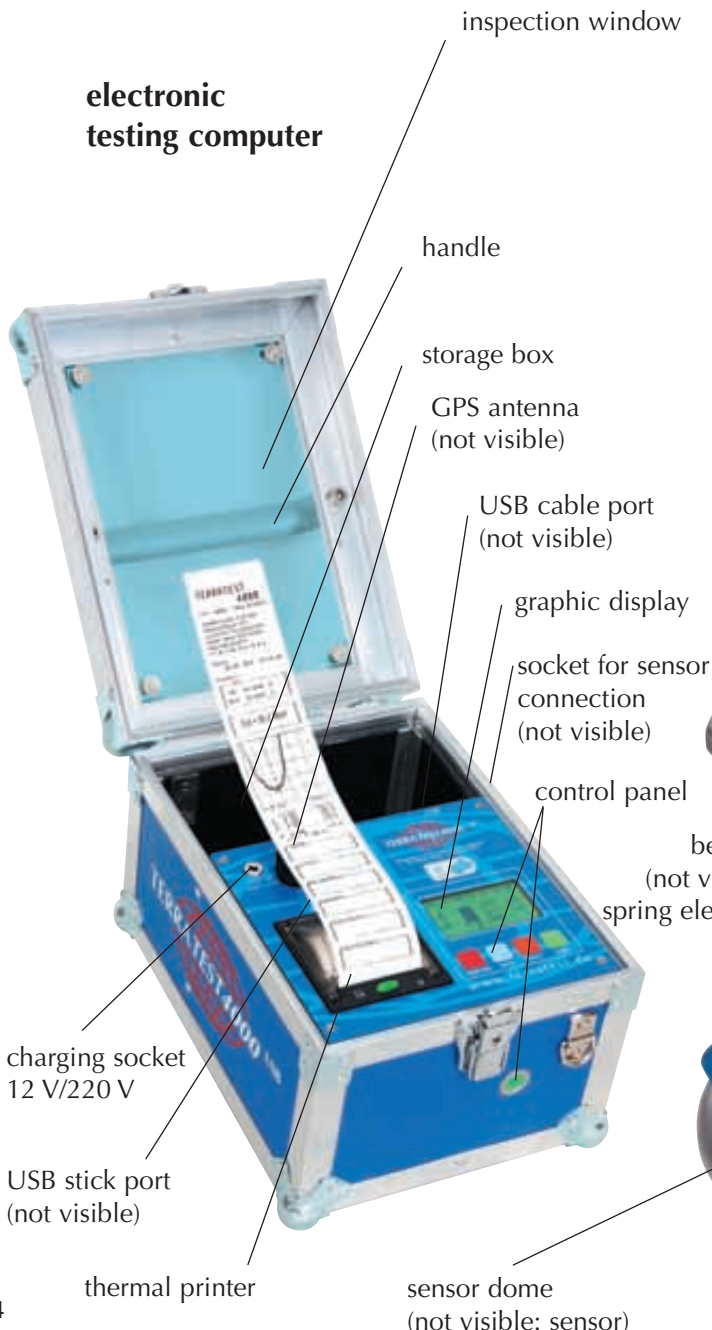
2.5 General View – „TERRATEST 4000 USB“



mechanical loading device



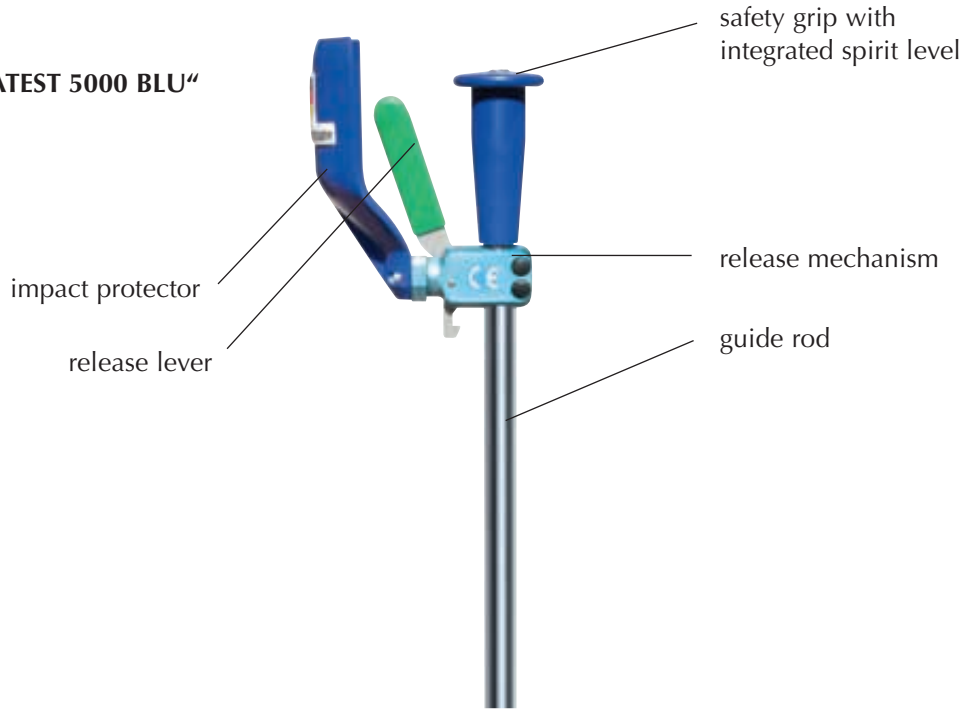
electronic testing computer



2.6 Top View of Control Panel, Testing Computer – „TERRATEST 4000 USB“



2.7 General View – „TERRATEST 5000 BLU“



electronic testing computer

mechanical loading device



2.8 Top View of Control Panel, Testing Computer – „TERRATEST 5000 BLU“



3. Technical Specifications

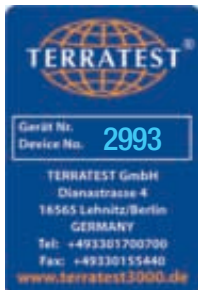
3.1 Device Designation:



„TERRATEST 4000 USB“
with box for testing computer „Robusta“
(box made of air chamber panels
and aluminium profiles,
external button on the front face)

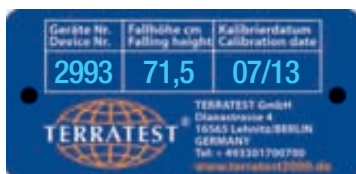


„TERRATEST 5000 BLU“
with box for testing computer „Robusta“
(box made of air chamber panels
and aluminium profiles,
external button on the front face)



3.2 Serial Number:

Load plate, loading device and testing computer form a single unit and have been attuned to one another during calibration of the device. These three components may only be used in conjunction with each other and may not be interchanged with the components of other devices. Accordingly, the single components are identified with particular serial numbers. These serial numbers are identical and located on metal tags, which are attached to each component. Each serial number consists of a four-digit number.



The serial number is located:

On the **load plate**, directly between the handles.

Inside the **testing computer**, on the partition panel in the storage box.

On the drop weight of the **loading device**. Additionally, drop height as well as month and year of last calibration are noted here.

3.3 Load Plate:

Weight of load plate, including sensor dome and handles	15 kg
Diameter of load plate	300 mm
Thickness of load plate	20 mm
Power supply Bluetooth® transmitter	long-lasting, rechargeable
Bluetooth® sensor dome („TERRATEST 5000 BLU“ ONLY)	battery pack type 8904 7.4V/2.4Ah

3.4 Mechanical Loading Device:

	10 kg	15 kg
Impact force	7.07 kN ± 1%	14.14 kN ± 1%
Impact duration	17 ms ± 1,5 ms	17 ms ± 1,5 ms
Weight of drop weight	10 kg	15 kg
Weight of guide rod	5 kg	5,5 kg
Length of guide rod	1140 mm	1140 mm
Total height of device, including load plate	1230 mm	1230 mm
Sound power level	95 dB(A)	95 dB(A)
Sound pressure level	84 dB(A)	84 dB(A)

3.5 Testing Computer

Weight without accessories	4.5 kg
Dimensions	length = 320 mm width = 300 mm height = 180 mm
Measurement range (settlement)	15-70 MN/m ² 70-120 MN/m ²
Power supply	long-lasting, rechargeable 6 Volt PANASONIC-Super-Life lead acid battery
Automatic switch-off	after three minutes
Radio clock, date display	satellite-based, can be configured manually
Precision GPS receiver	less than 20 meters
Maximum voltage variation	+/- 10%
Bluetooth® transmitter / receiver („TERRATEST 5000 BLU“ ONLY)	Type RN-41/RN41-N Class 1 Certifications FCC, ICS, CE, RoHS Frequency range 2,402 ~ 2,480 MHz

3.6 Environmental Conditions

Charge the device only in dry, indoors locations.	
Protection class	IP53
Do not expose the testing computer to direct rain.	
If it rains, cover and protect the testing computer.	
Do not expose Bluetooth® load plate („TERRATEST 5000 BLU“ ONLY) to direct rain.	
If it rains, cover and protect Bluetooth® load plate („TERRATEST 5000 BLU“ ONLY).	
Temperature range	0 - 40 °C
Maximum height for use above sea level	3.000 metres
Maximum relative humidity for use	< 80%, dew must be avoided

3.7 Power Supply

Power consumption while on battery
normally 6V DC/0.5A (when backlight is on)
normally 6V DC/0.4A (when backlight is off)

3.8 Battery Performance

Battery 6V type Panasonic LCR-6V 4,2P (which may be replaced only by Technical Support Service)
Charging time approx. 4-5h, depending on ambient temperature
Fuse in battery cable: blade fuse ATO 2A/32V (31,75x6,35)

A long-lasting, rechargeable 6 Volt, 4.5 Ah built-in battery is located in the testing computer.

The device may be charged via either the supplied power cable or a 12 Volt car battery. The charging socket „12V=~/max 1.25A“ on the control panel, next to the GPS antenna, must be used for this. Both car charger and power cable are included with the contents of delivery (basic package).

A long-lasting, rechargeable, built-in battery pack type 8904 7.4 V/2.4 Ah is located in the sensor dome („TERRATEST 5000 BLU“ ONLY). It should be charged with the supplied power cable 9V DC/2A with plugs from LEMO.

The battery charge of the testing computer will be shown on the display „STATUS REQUEST“ upon switching on the device. Fully charged, the battery holds 6.9 volts. Approximately 300 tests can be performed with a new, fully charged battery. However, the battery performance also depends largely on density of air pressure, ambient temperature, battery lifetime, and other criteria. The device switches off automatically three minutes after last use (automatic switch-off). Shortly before total discharge of the battery, the testing computer also turns off automatically to avoid deep discharge. It can only be activated again after recharging.

The battery charge of the Bluetooth® transmitter in the sensor dome of the Bluetooth® load plate („TERRATEST 5000 BLU“ ONLY) will be shown on the display „STATUS REQUEST“ upon switching on the device. Fully charged, the battery holds 7.4 volts (= 100%). Approximately 300 tests can be performed with a new, fully charged battery. However, the battery performance also depends largely on density of air pressure, ambient temperature, battery lifetime, and other criteria. The device switches off automatically three minutes after last use (automatic switch-off). Shortly before total discharge of the battery, the testing computer also turns off automatically to avoid deep discharge. It can only be activated again after recharging.



The battery should be replaced only by the manufacturer. Never attempt to dismantle the battery. Lead is a highly toxic heavy metal. Please comply with the regulations regarding transport and disposal of lead batteries. Do not dispose of batteries by burning them. Batteries must be kept out of reach of children.



According to the Waste Electrical and Electronic Equipment Directive (2002/95/EG) the battery, electronics, and especially the electronics of the load plate may not be disposed of with your domestic waste. Comply with your local regulations. In some countries you are required by law to dispose of these products only at the collection points provided. In some countries manufacturers of similar electronic equipment are obliged by law to take back electronic waste. Due to potentially hazardous substances, often contained in electronic waste, incorrect handling of such waste may have negative impacts on the environment and human health. By disposing of electronic parts in an appropriate way you also contribute to an effective use of natural resources. For more information about collection points for electronic waste please contact your city council, your public waste management authorities or your garbage disposal service. TERRATEST GmbH will take back electronic waste free of charge, and dispose of it in a safe and environmentally appropriate manner.

3.9 Charging of Testing Computer

Only the charging equipment supplied by the manufacturer should be used for charging the battery. To charge the battery of the testing computer, plug the power cable into the „12 V $\overline{=}$ /max. 1.25 A“ socket on the testing computer. This socket is located on the top left of the control panel, next to the GPS antenna. Depending on ambient temperature, charging time is approximately 4-5 hours, when the battery is empty. The current battery charge will be shown during „STATUS REQUEST“, when switching on the testing computer. The maximum variation in voltage must not exceed 10%. During the charging process place the testing computer inside a dry room and take care that it is possible to disconnect the device from power at any time.

3.10 Charging of Bluetooth® Load Plate („TERRATEST 5000 BLU“ ONLY)

To charge the battery pack in the sensor dome („TERRATEST 5000 BLU“ ONLY), use the supplied charging cable with LEMO-plugs, and plug it into the LEMO-socket on the sensor dome. Depending on ambient temperature, charging time is approximately 8 hours, when the battery pack is empty. The current battery charge will be shown as a percentage below the battery charge of the testing computer during „STATUS REQUEST“, when switching on first the load plate and subsequently the testing computer. The maximum variation in voltage must not exceed 10%. During the charging process, place the load plate inside a dry room and take care that it is possible to disconnect the device from power at any time.

Power Cable, Testing Computer:



Only the power cable supplied by the manufacturer (SA07-15US12R) should be used. Charge the device only in dry, indoors locations. The inner pole is the positive (+) pole.
Type: SA07-15US12R (Touch electronic Co., Ltd.)
Prim: 100-240V AC, 50-60Hz, 0.5A Class II
Sec: 12V/1.25A
IP20

First plug the power cable into the appropriate „12V \equiv / max. 1.25A“ socket of the testing computer, located on the top left of the control panel. Then plug the other end of the cable into the wall socket.



When disconnecting the cable always take hold of the plug. Pulling on the cable may result in damage to the wires.

Power Cable, Bluetooth® Load Plate („TERRATEST 5000 BLU“ ONLY):

Only the power cable supplied by the manufacturer (SYS1308-1809-W2E) with LEMO-plugs should be used for charging the Bluetooth® transmitter in the Bluetooth® sensor dome. Charge the device only in dry, indoors locations. The inner pole is the positive (+) pole.

Type: SYS1308-1809-W2E with LEMO-plugs
Prim: 100-240V AC, 47-63Hz, 1A Class II
Sec: 9V/2A
IP20

First plug the power cable into the socket of the Bluetooth® sensor dome. Then plug the other end of the cable into the wall socket.



When disconnecting the cable always take hold of the plug. Pulling on the cable may result in damage to the wires.

The power cable for the Bluetooth® load plate („TERRATEST 5000 BLU“ ONLY) is equipped with a plug with LEMO „PUSH-PULL“ lock and anti-kink protection. To connect the power cable, first open the hinged lid of the socket on the Bluetooth® sensor dome of the Bluetooth® load plate and insert the plug of the power cable all the way until it stops. The plug will lock itself automatically inside the socket; it can only be disconnected by unlocking the plug. Accordingly, pull only on the plug. Failure to do so may cause damage to the cable or socket.

Car Charger for Testing Computer:



Only the car charger supplied by the manufacturer (ITC W24) should be used. Charge the device only in dry, indoors locations (e.g. inside vehicles). The inner pole is the positive (+) pole.
Type ITC W24

inner pole positive (+)
Fuse F2L32V (fast)

First plug the power cable into the appropriate „12V \equiv / max. 1.25A“ socket of the testing computer, located on the top left of the control panel. Then plug the other end of the car charger into the cigarette lighter socket.





When disconnecting the cable always take hold of the plug.
Pulling on the cable may cause damage to the wires, fire or electric shock.



No tests should be performed while charging the device; doing so may distort test results.

3.11 USB Cable Port

The testing computer is equipped with a USB cable port on the partition panel of the storage box. This USB port provides service access for the manufacturer, and can also be used by the operator to transfer test data from the internal memory to a computer via a standard USB2.0-A/A-m/m cable (see also section 6.4.2 of this manual).

3.12 Measuring Cable

„TERRATEST 4000 USB“: The measuring cable for transferring the sensor signals to the testing computer can be extended to a maximum of 2 meters. It is equipped with two identical 6.35 mm jack plugs.

„TERRATEST 5000 BLU“: The measuring cable for transferring the sensor signals to the testing computer can be extended to a maximum of 2 meters. It is equipped with two identical plugs with LEMO „PUSH-PULL“ lock as well as with an anti-kink protection for each plug. To connect the measuring cable, first open the hinged lid of the socket on the sensor dome of the load plate and insert the plug of the measuring cable all the way until it stops. Then open the hinged lid of the socket on the side of the testing computer and insert the measuring cable all the way until it stops. The plug will lock itself automatically inside the socket; it can be disconnected only by unlocking the plug. Accordingly, pull only on the plug. Failure to do so may cause damage to the cable or socket.



Never pull on the measuring cable to disconnect the plug-socket connection; doing so may cause damage to the cable and/or socket.



Never place any heavy objects on the measuring cable; never twist or pull it. Take care that it does not become knotted. Damaged cables can cause fire or electric shock.



Ensure that the measuring cable is fully inserted into the socket. A poor connection can cause fire or electric shock. Use only the cables provided. Failure to do so may cause fire or electric shock.



When closing the lid of the testing computer, take care not to trap the measuring cable.



Jack plugs
„TERRATEST 4000 USB“



LEMO Push-Pull plugs
„TERRATEST 5000 BLU“

Extension Cable

To expand the reach between the testing computer and load plate (for example, in areas that are difficult to access, such as trenches and shafts), the measuring cable for transferring the sensor signals to the testing computer can be extended up to a total maximum of 4 metres with the aid of an extension cable. This extension cable can be purchased separately. It is equipped with a male jack plug as well as a female jack socket at the other end. To connect the extension cable, disconnect the measuring cable from the testing computer as described above. Open the hinged lid of the socket on the side of the testing computer and insert the plug of the extension cable all the way until it stops. Afterwards, connect the measuring cable and extension cable by sliding the plug of the measuring cable into the socket of the extension cable all the way until it stops. Plugs with LEMO „PUSH-PULL“ lock („TERRATEST 5000 BLU“ ONLY) lock themselves automatically inside the sockets; they can only be disconnected after unlocking. Accordingly, pull only on the plug, never on the cable. Doing so may cause damage to the cable or socket.



Never pull on the measuring cable to disconnect the plug-socket connection; doing so may cause damage to the cable and/or socket.



Never place any heavy objects on the extension cable; never twist or pull it. Take care that it does not become knotted. Damaged cables can cause fire or electric shock.



Ensure that the extension cable is fully inserted into the socket. A poor connection can cause fire or electric shock. Use only the measuring cables provided. Failure to do so may cause fire or electric shock.



When closing the lid of the testing computer, take care not to trap the measuring cable.



„TERRATEST 4000 USB“



Female socket



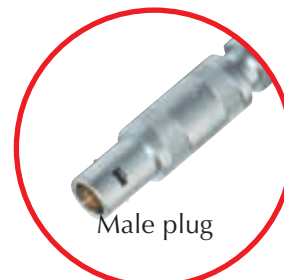
Male plug



„TERRATEST 5000 BLU“



Female socket



Male plug

4. General Overview: Light Weight Deflectometer

4.1 Introduction

The „TERRATEST“ product family combines highly modern microelectronic components with the properties of an ergonomic test instrument, which is extremely suitable for the use on construction sites. Testing with the Light Weight Deflectometer has been brought to perfection and is now more authentic than ever. This is due to the possibility of automatically registering the testing points simultaneously via Global Positioning System (GPS) and a Google® Maps interface. Voice output and Bluetooth® data transfer are unique features, found only on the Light Weight Deflectometer „TERRATEST 5000 BLU“.

The accompanying software „TERRATEST 2.0“ enables a statistical analysis of the test data in accordance with German standard TP BF-StB Part B 8.3. Our focus during its development has been to make it as user-friendly as possible.

4.2 Innovations

All „TERRATEST“ products have such outstanding, innovative features that they have become globally unique testing instruments for measuring bearing capacity:

4.2.1 Mechanical Innovations:

- Ergonomic hexangular weight-catching grip with chamfered edges for a better grip of the drop weight
- Angled handles to facilitate handling of the load plate on the construction site and aid picking-up of the device by means of the mobile testing system „CARRELLO“
- Firmly fixed safety grip with integrated spirit-level

4.2.2 Electronic Innovations:

- Integrated GPS system with Google® Maps interface for immediate positioning
- Voice output to help and support the operator („TERRATEST 5000 BLU“ ONLY)
- Bluetooth® transmitter and receiver unit for tests without cable („TERRATEST 5000 BLU“ ONLY)
- „Continuous measuring mode“ for quick performance of several tests without additional operation of the testing computer, when multiple testing points are close to each other („TERRATEST 5000 BLU“ ONLY)
- Text input function to add notes about material or altitude of the testing point
- USB stick for saving test data
- Internal memory for up to 2000 tests, on a rolling basis, with USB interface
- Automatic plausibility check and result comparison of test data
- Audio signal
- Convenient graphic display with backlight for clear menu guidance, and for showing settlement curves during testing
- Quality connection assemblies featuring high-quality plugs and sockets
- Convenient, user-friendly software „TERRATEST 2.0“, with statistic function for evaluating test data

4.3 Dynamic Plate Load Test

The dynamic plate load test with the Light Weight Deflectometer is a test method during which the ground is subjected to an impact load. This impact load is caused by a weight dropping onto a load plate with a diameter of 30 cm (radius $r = 15$ cm), which generates a maximum force (F_{\max}) of 7.070 kN. During calibration of the device this force is adjusted so that the normal stress (σ_{\max}) under the load plate amounts to 0.1 MN/m² while tests are being performed. The parameter for the deformability of the soil under this defined vertical impact load t_{\max} is the so-called E_{vd} value.

$$E_{vd} = 1,5 r \frac{\sigma_{\max}}{s_{\max}}$$

s_{\max} = mean value of the settlements $\sigma_{4\max}$, $\sigma_{5\max}$, $\sigma_{6\max}$ of 3 tests (after 3 pre-consolidation tests)

r = radius of the load plate (15 cm)

σ_{\max} = normal stress under the load plate (0,1 MN/m²)

4.4 Area of Application

The dynamic plate load test with the Light Weight Deflectometer is suitable for testing the bearing capacity and the compaction of subsoil / soil on the subbase of earthworks and road constructions. „Soil“ shall be understood as including backfill materials, base courses without binding agents, soil improvements, cold recycling layers, mineral sealing layers, asphalt and cement, which has yet to set. The testing method is especially suitable for coarse-grained and mixed soils with a maximum grain size of 63 mm.

The test can be performed in less than two minutes by a single operator, without a load testing vehicle. Thus, it is possible to immediately evaluate the evenness of the bearing capacity within the inspection lot.

In Germany and Austria the dynamic plate load test may be performed as an alternative to the static plate load test according to DIN 18134.



The use of the Light Weight Deflectometer always requires a prior determination of correlation values with the degree of compaction or the deformation modulus. The evaluation of the measured E_{vd} value depends on the material and the subsoil being tested. It is always necessary to determine correlation values of the static plate load test on a trial basis for the pre-existing ground or the ground intended for backfilling. Homogeneous ground is a prerequisite for properly correlating the two measuring methods. Accordingly, the water content of the soil must not vary widely at the different testing points.



ATTENTION (Quotation from ZTV E-StB 09)

„The deformation modulus E_{v2} is to be assessed by the static plate load test in accordance with DIN 18134 and the dynamic deflection module E_{vd} with the dynamic plate load test in accordance with TP BF-StB Part B 8.3.... The specifications of the building contract should state whether the static or dynamic deflection modulus is to be established. If no such statement is to be found in the contract, the static deformation modulus will need to be established.“

One advantage over the static plate load test according to DIN 18134 is the possibility to perform tests in confined areas such as utility trenches or construction backfills.

In accordance with the German standard TP-BF StB Part B 8.3 the measuring range of a Light Weight Deflectometer with 10kg drop weight must be specified as 15 MN/m² to 70 MN/m², since it is only within this measuring range that the device complies fully with the strict rules of the German Federal Road Research Institute (Bundesanstalt für Straßenwesen).

4.5 Calibration

Before delivery „TERRATEST 4000 USB“ and „TERRATEST 5000 BLU“ are calibrated according to German „Technical Test Code for Soil and Rock Mechanics in Road Constructions TP BF-StB Part B 8.3“. During calibration all components of the device, such as the load plate with integrated sensor, the loading device and the electronic testing computer, are attuned specifically to one another. After successful calibration, respective calibration tags with the expiry date of the calibration are affixed to the load plate, the loading device, and the testing computer. These calibration marks also contain the name of the calibration institute and the serial number. Each device is provided with a calibration certificate which meets the requirements of the German standard TP BF-StB Part B 8.3. A precise test result can only be guaranteed if the device is used as a single unit with all its corresponding parts. Identification plates with the same four-digit serial number are located on the load plate, the drop weight and the testing computer for this purpose. This serial number is also recorded on the calibration certificate. On the identification plate of the drop weight the date of the last calibration and the respective drop height of the weight in cm are also noted.

According to German standard TP BF-StB Part B 8.3 the device must be calibrated at least once a year at a calibration institute accredited by the German Federal Research Institute (Bundesanstalt für Straßenwesen).



Test results of a device that has not been calibrated, or of a device with an expired calibration date, must not be used for evaluating the bearing capacity of soil and rock. Abide by the mandatory calibration intervals and ensure that the device is re-calibrated in due time.



4.6 12 Rules for Proper Use



1. Always perform a correlation measurement with the static plate load test. For every static plate load test at least three dynamic tests must be performed.

2. The section examined by the device reaches down to a maximum of 40 cm in depth, depending on backfill materials and subsoil.

3. Remove any loose material from the test area; create a smooth and level surface on which to place the load plate. Ensure full and even contact between the load plate and the ground. In the case of soil irregularities, spread a thin layer of sand on the surface and reduce the thickness of the layer by moving the plate back and forth.

4. Keep the guide rod vertical and make sure that the plate does not move horizontally during the impact.



5. ATTENTION: The transportation lock must be unlocked before each drop. Catch the weight on the side opposite the lock. No warranty for damages caused by improper use.

6. The decline of the test area must not be greater than 6°.

7. Pull on the plugs only, never on the measuring cable!

8. Never change the position of the release handle!

9. Before each test, make sure that the bottom side of the plate is clean and remove any material stuck to it.

10. The grain size of the material to be tested may be a maximum of 63 mm.

11. If the three settlement curves vary widely, re-compaction has occurred caused by the test.

12. Make sure that latching the drop weight into the release mechanism does not trigger an accidental reading of the testing computer.



Test results of a device that has not been calibrated, or of a device with an expired calibration date, must not be used for evaluating the bearing capacity of soil and rock. Abide by the mandatory calibration intervals.



Only transport the loading device when the drop weight is in its „rest“ position at the bottom of the guide rod and the transportation lock is locked. Any other way of transport is prohibited, and carries with it considerable risk of accident due to the movement of the drop weight.

4.7 Proposal for the Correlation of Static / Dynamic Plate Load Test



The static and the dynamic plate load test differ from each other especially in the load speed and the pressure exerted on the ground. Therefore there is **no constant correlation** between the parameters E_{v1} / E_{v2} and E_{vd} .

In order to achieve the most accurate reading possible, we recommend performing site-specific correlation tests for every construction project directly on-site. To determine correlation values for the required backfill material we advise you to adhere to the following procedure: After the first phase of compaction work has been sufficiently completed, perform a static plate load test on the test area. Make sure that the loading vehicle leaves the area very carefully to avoid any ground disturbances. Afterwards, determine the water content of the backfill material. Then, in a circle around this first testing point, carry out eight dynamic plate load tests – four tests 30 cm away from the first testing point, and four 60 cm away, each with a 45 degree distance from the next. Several test sequences must be performed in succession along the centre of the compaction line; the required number depends on the size of the construction site. In all cases, at least three test sequences, at a distance of 20 metres from each other, should be performed.

The procedure must be repeated at other points of the test area. If the water content at the different testing points does not vary widely, compare the mean values of the measured E_{vd} values with the mean values of the E_v values obtained through the static test.

For the calculation of the E_{vd} mean value, ignore the two highest and the two lowest test results and consider only the four test results which show parameters close to each other. After having determined the correlation values E_{vd} / E_v all other tests can be performed with the Light Weight Deflectometer, provided that it is used on the same type of soil. Contractor and client should perform the correlation procedure together, so that they can both agree on the standard test method.

4.8 Interpreting the Test Results

According to German standards ZTV E-StB 09, ZTV A-StB 12 and RIL 836 Deutsche Bahn AG as well as Austrian standard RVS 08.03.04, an inspection with the dynamic plate load test (in accordance with 'TP BF-StB Part 8.3 for Soil and Rock Mechanics in Road Constructions') can be conducted instead of the static plate load test. Please strictly follow the instructions of ZTV-E, ZTV-A and/or RVS 08.03.04 (Austria).

For every static plate load test at least three dynamic tests must be performed. However, these must not be conducted side by side, but can be spread over the entire test area.



The evaluation of the measured E_{vd} value depends on the material and the subsoil being tested. It is always necessary to determine correlation values of the static plate load test on a trial basis for the pre-existing ground or the ground intended for backfilling. Homogeneous ground is a prerequisite for properly correlating the two measuring methods. Accordingly, the water content of the soil must not vary widely.



ATTENTION (Quotation from ZTV E-StB 09)

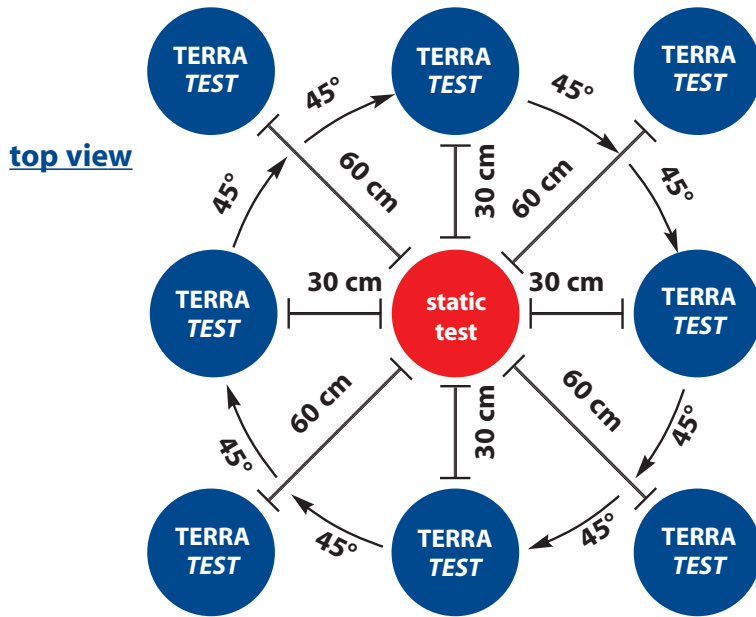
„The deformation modulus E_{v2} is to be assessed by the static plate load test in accordance with DIN 18134 and the dynamic deflection module E_{vd} with the dynamic plate load test in accordance with TP BF-StB Part B 8.3.... The specifications of the building contract should state whether the static or dynamic deflection modulus is to be established. If no such statement is to be found in the contract, the static deformation modulus will need to be established.“



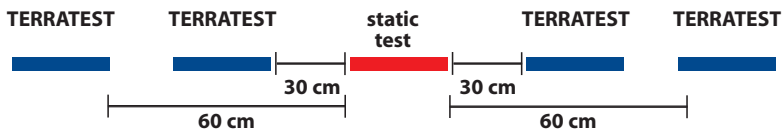
According to German standard TP BF-StB Part B 8.3 Light Weight Deflectometers must be calibrated at least once a year at a calibration institute accredited by the German Federal Road Research Institute (Bundesanstalt für Straßenbau). Send the device back to TERRATEST GmbH for calibration at least once a year, otherwise test results may be imprecise. Test results of a device that has not been calibrated, or of a device with an expired calibration date, must not be used for evaluating the bearing capacity of soil and rock. Abide by the mandatory calibration intervals.



**Schematic Representation – Determination of Correlation Values
Static / Dynamic Plate Load Test**



cut



For general information only! All details are subject to change.



Always perform a correlation measurement with the static plate load test, before evaluating the test results.

The water content at the different testing points must not vary widely.

For every static plate load test at least three dynamic tests must be performed.



TERRATEST GmbH shall not be liable for any damage, consequential damage, or even financial loss that occurs as a result of improper use of the device and / or lack of professional knowledge when evaluating the test data. It is essential to ensure that the calibration of the device is always up to date, and that the device is always operated in accordance with the instructions of this document as well as your local standard.



4.9 Determining the Residual Compaction

If three individual curves are shown on the protocol printout (see Figure 1) and if the Smax value of the individual settlements decreases significantly, re-compaction has occurred caused by the test; further compaction work is usually necessary. In this case we recommend improving the compaction at the same place by performing 15 more impact drops with the Light Weight Deflectometer. Afterwards, repeat the compaction test. If the distance between the individual curves decreases, in the ideal case only one single curve composed of three congruent curves will be shown (see Figure 2), one can conclude that the ground can be further compacted without difficulty, due to residual compaction.

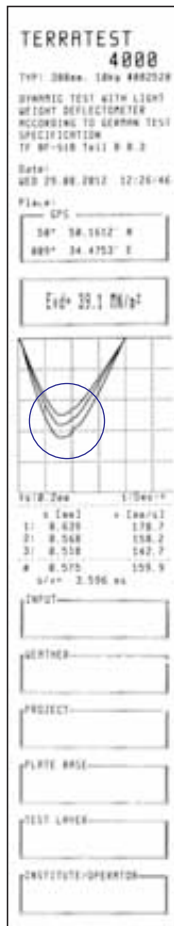


Figure 1: Test performed on relatively soft soil with visible re-compaction by the dynamic plate load test. Three individual curves are shown.

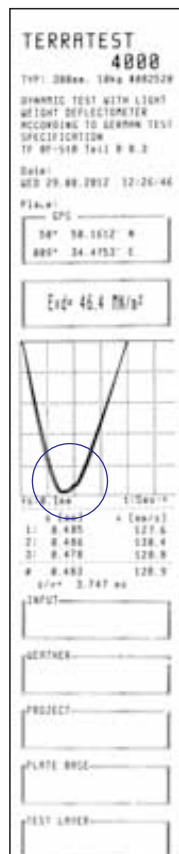


Figure 2:

Test performed after 15 re-compacting impact drops with the Light Weight Deflectometer at the same testing point: The protocol printout shows a single settlement curve composed of three congruent curves. The Evd value, and thus the bearing capacity of the ground, has increased by 20% compared to the first test.

Further compaction work should be considered for this test area.

5. Test Execution „TERRATEST 4000 USB“ (for „TERRATEST 5000 BLU“ see page 38)

5.1 Preparing the Testing Point

Place the load plate on the ground, ensuring full and even contact between the load plate and the ground. Create a smooth and level surface on the area where the load plate will be placed. This can be done by moving the load plate back and forth, or by using appropriate tools (such as a trowel). Remove any loose soil from the area. In case of soil irregularities, spread a thin levelling layer of fine-grained quartz sand. Make sure to add only a few millimetres; it should compensate only for uneven patches under the load plate. Next, place the load plate on top and move it back and forth to reduce the thickness of the sand layer. Full contact between the load plate and the test area is essential.



5.2 Test Execution / Data Input Function

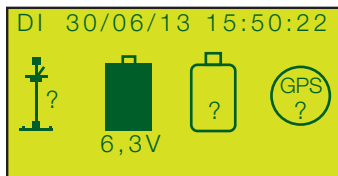
After preparing the testing point and placing the load plate on the ground, place the loading device in the centre of the sensor dome on the load plate.

Connect the sensor dome of the load plate with the testing computer, using the measuring cable.

Press and hold the start button to turn on the testing computer. To activate the backlight of the graphic display, press the start button for approximately three seconds, when turning on the device, until the start screen switches automatically to „STATUS REQUEST“.

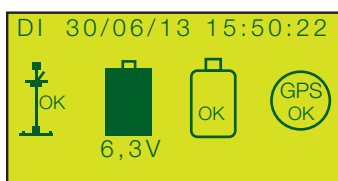


When turning on the testing computer with the backlight off, the start screen will show the „TERRATEST 4000 USB“ logo and the firmware version number for approximately three seconds, before it switches automatically to „STATUS REQUEST“.

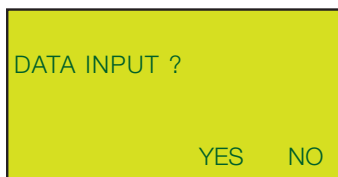


STATUS DISPLAY

During „STATUS REQUEST“ the computer checks the sensor connection, USB stick, GPS, and the current battery charge, and confirms that everything is working correctly by showing „OK“. If one of these features is unavailable, a „?“ will be shown instead. Checking the GPS connection can take 2-3 minutes. If the sensor connection is not established, the computer will not progress to the measuring mode and no test can be performed. The current battery charge is shown as a small battery icon, indicating the current level of charge.



If the USB stick is not recognised, turn the device off, insert the USB stick again and turn the device back on. If the USB stick is still not recognised, check that it has been formatted correctly. The USB stick can be formatted on a PC by choosing „format...“ from the context menu which appears when right-clicking on the drive icon.



DATA INPUT FUNCTION

By pressing the start button again you will be forwarded to the text input function and „DATA INPUT?“ will appear on the screen.

You can now choose to perform the test with or without data input.

If no text input is desired, select „NO“ by pressing the „START“ button. You will automatically be forwarded to the measuring mode.

By pressing the „SELECT“ button you confirm the data input function with „YES“. You can now enter up to 23 characters of text.

Select the desired characters with <= or =>. Confirm each character with „ENTER“ by briefly pressing the „START“ button.

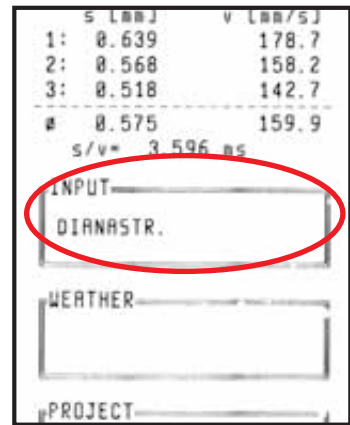
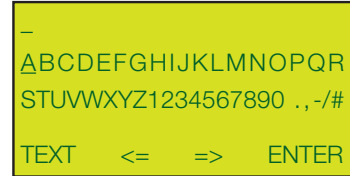
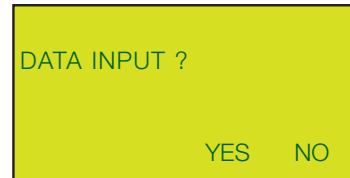
Select and overwrite characters already entered by pressing „TEXT“ (to delete, use space character).

To confirm data input, press and hold down the „START“ button. You will be forwarded directly to the measuring mode. Your data input is saved to both the internal memory and the external media (if in use).

Every entry remains saved, but will only be stored on either the internal memory or external media and printed on the protocol printout if the data input mode is confirmed with „YES“.

If choosing „NO“ by pressing „START“ when asked for „DATA INPUT?“, the last entry will remain in the memory of the data input mode, but will not be saved to either the internal memory or external media, and will not be printed on the protocol.

The confirmed entry will be shown in the „TEXT ENTRY“ field of the protocol printout and in the „Comments“ field of the „TERRATEST 2.0“ software.



If you precede the text entry, e.g. „PROJECT JOE BLOGGS“, with a slash „/“, the test will be saved under this file name, e.g. „PROJECT JOE BLOGGS“, when loading the data to a PC. This facilitates managing and searching of test data. See also chapter „Edit / Save Protocol“ on page 76.



After placing the loading device on the metal ball in the centre of the sensor dome, unlock the transportation lock of the drop weight by pulling the orange knob. The transportation lock should only be unlocked immediately prior to a test being performed, as uncontrolled movements of the weight may cause injury or damage to the device or its surroundings.

Ensure that the transportation lock is unlocked before each drop.



In case of improper use, i.e. if the weight is dropped while the transportation lock is still pushed in, damage to the device may occur. Damage caused by improper use is not covered by the device warranty.





Regularly check that the transportation lock of the drop weight is functioning properly. If you notice signs of wear, stop using the device immediately. Send the device back to TERRATEST for the transportation lock to be repaired or replaced.



Put on hearing protectors before the first drop. **Hearing protectors must be worn when operating the Light Weight Deflectometer, since the noise level may rise over 85 dB during the test. ATTENTION: Operating the device without hearing protection can result in permanent hearing impairment.**



Following the instruction on the display „**10 kg 1. Preload**“, continue with the first pre-consolidation test as follows: Take hold of the blue safety grip at the end of the guide rod; open the release mechanism by pushing the green start lever towards the guide rod and holding it there. With your other hand pull up the unlocked drop weight all the way until it stops. Fix it in place by releasing the green start lever and thus latching the drop weight into the release mechanism. The drop weight is now fastened securely in the release mechanism on top of the device. Open the release mechanism by pushing the green start lever towards the guide rod, and let the drop weight fall freely until it hits the spring assembly. Catch the drop weight immediately after first contact and in the same way as described above, latch it back into the release mechanism. In total, six drops must be performed to complete the test.

After hearing the audio signal and receiving the instruction „**10 kg 2. Preload**“, continue with the second pre-consolidation test in the same way as described above. The testing computer will not register any drops performed before the audio signal.

After hearing the audio signal and receiving the instruction „**10 kg 3. Preload**“, continue with the third pre-consolidation test in the same way as described above.

The device checks the results of the three pre-consolidation tests and then progresses automatically to the main test.

After hearing the audio signal and receiving the instruction „**10 kg 1. Test**“, continue with the first test in the same way as described above.

After performing the first test, the device will show the settlement s_4 in mm, as well as the respective settlement curve.

After hearing the audio signal and receiving the instruction „**2. Test**“, continue with the second test in the same way as described above

After performing the second test, the device will show the settlements of both prior tests, s_4 and s_5 , in mm, as well as the respective settlement curves.

After hearing the audio signal and receiving the instruction „**3. Test**“, continue with the third test in the same way as described above.


After performing the third test, the device will show the settlements s_4 , s_5 and s_6 in mm, as well as the respective settlement curves. Additionally, the final result (the E_{vd} value in MN/m^2 will be shown).


10 Kg
1. Preload


10 Kg
2. Preload

10 Kg
3. Preload

10 Kg
1. Test

 $s_4=0,366mm$
2. Test

 $s_4=0,366mm$
 $s_5=0,364mm$
3. Test

 $s_4=0,366mm$
 $s_5=0,364mm$
 $s_6=0,364mm$
61,8 MN/m²
 $s/v=2,277 ms$
2/127 NEXT

A longer audio signal (a beep lasting one second) announces the end of the test and the recording of measured data on both the internal memory and the USB stick (if in use). All test data including settlement curves, GPS coordinates, date, time, serial number, device type, and the test results themselves, are now saved. The protocol can be printed by pressing the „PRINT“ button. Alternatively, continue with the next test by pressing the „START“ button (NEXT) again.



Keep the safety grip on top of the device tight in your hand during the whole test. When a test is not being performed, never leave the weight latched on top of the loading device, as it could fall over and cause injury or damage. The drop weight should only be latched on top of the device immediately prior to an upcoming test. While in use, only the operator should come close to the device. All other persons should stay at a safe distance to ensure that no one is injured by the dropping weight. After the sixth drop place the drop weight in its 'rest' position on top of the bellows at the bottom of the device and lock it immediately with the transportation lock.



Ensure that the guide rod is kept upright during the impact. Use the spirit level integrated in the safety grip to aid in the vertical positioning of the guide rod. The test is invalid if the load plate moves horizontally during the impact. This risk exists particularly if the test area is inclined. Avoid sideward movements of the load plate on inclined test areas by placing your foot against the side of the plate. Never stand on the plate! Doing so will distort the test results. Every correct impact will be acknowledged by an audio signal (a single beep).

A different signal (a stuttering beep) will announce a possible measuring error. In this event, „Try again“ will be shown on the display. Should this occur, move the load plate and restart the complete test from the first pre-consolidation drop.

If the error message shows again, the soil may be too soft or too hard, so that the measured value is outside the measuring range. In this case, move the load plate to another testing point and repeat the test there.

The sensitivity of the testing computer is set up in such a way that a normal placing of the loading device on the load plate, or a normal latching of the drop weight into the release mechanism will not trigger a measurement.



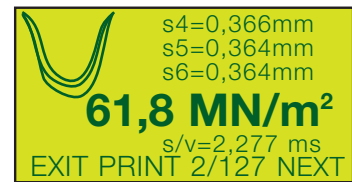
However, abrupt movements when placing the loading device on the load plate, or latching the drop weight into the release mechanism, may trigger an impulse. The electronic plausibility check will recognise the error and the device will restart the complete test. Move the load plate and start the test procedure again from the beginning.

If the settlement is very small, it is advisable to push the loading device onto the metal ball of the sensor dome during impact. Doing so will help to avoid a possible rebound of the guide rod and thus a distortion of the test results.

Try again !

5.3 Printing the Test Protocol

The integrated thermal printer allows printouts of the test protocols to be created conveniently on-site, immediately after the test; protocols can also be printed at any later point in time. The protocol shows all data obtained during the test (see printout on page 37). To print the test protocol, activate the thermal printer by pressing the „PRINT“ button. It is located on the internal control panel. During the printing process the control lamp will show green. When printing is finished, detach the protocol by tearing it against the tear-bar. If the green light is flashing and the thermal printer does not start printing after pressing the „PRINT“ button, this is usually due to the absence of paper. In this case, follow the instructions below to insert a new roll of paper. The button for the paper feed is located on the left of the green control lamp.



5.4 Changing the Paper

A flashing green control lamp signals the absence of paper. To open the paper tray and replace the paper roll, press the button on the green control lamp. Lift the cover and insert the new thermal paper roll (57 mm wide and 25 mm long) with the coated side facing outwards. One roll of paper will print approximately 100 printouts. Unroll approximately 10 cm of the edge of the paper and hold it up, while closing the printer by gently pressing the cover on both sides. Detach the protruding end of the paper by tearing it against the tear-bar. The printer is now ready for use again. An ink ribbon is not necessary for the thermal print method.

Use only thermal paper; the coated, heat-sensitive side must face outwards. Suitable paper rolls can be obtained in most office supply stores, or ordered at TERRATEST GmbH.

Specifications of paper rolls:

Thermal paper roll
 Width 57 mm
 Length 25 metres
 Diameter 47 mm
 Core 12 mm



If you intend to store printouts for an extended period of time, make sure that the thermal paper is not exposed to direct sunlight or temperatures over 30°C. Thermal paper ages relatively quickly, so ensure to make copies on normal paper.



During the printing process the control lamp will show green.



Inserting a new roll of thermal paper

Printout of the Test Protocol

The printout displays the following information:

- Device Name:** TERRATEST
- Serial Number:** 4000
- Device Type:** TYP: 300mm, 10kg #002520
- German Standard:** DYNAMIC TEST WITH LIGHT WEIGHT DEFLECTOMETER ACCORDING TO GERMAN TEST SPECIFICATION TF 8F-StB Teil 8 8.3
- Date and Time:** Date: WED 29.08.2012 12:26:46
- GPS Coordinates:** Plate: GPS, 50° 50.1612' N, 009° 34.4753' E
- Dynamic Deflection Module:** E_{vd} = 39.1 MN/m²
- Settlement Curves:** A graph showing three curves representing the progress of settlement over time. The x-axis is time (t) and the y-axis is settlement (s).
- Settlement Data:**

s [mm]	v [mm/s]
1: 0.639	178.7
2: 0.568	158.2
3: 0.518	142.7
Ø 0.575	159.9
s/v = 3.596 ms	
- Input Fields:** INPUT DIANASTR., WEATHER, PROJECT, PLATE BASE, TEST LAYER, INSTITUTE/OPERATOR.

Annotations on the printout include:

- device name
- serial number
- device type
- German standard
- date of test
- time of test
- GPS coordinates of testing point
- dynamic deflection module
- zero point test area
- progress of settlement with the three settlement curves
- maximum settlement
- maximum speed of immersion
- average maximum settlement
- average maximum speed of immersion
- s/v value: relation between settlement and speed
- display of text input function
- handwritten comments

6. Test Execution „TERRATEST 5000 BLU“ (for „TERRATEST 4000 USB“ see page 32)

6.1 Preparing the Testing Point

Place the load plate on the ground, ensuring full and even contact between the load plate and the ground. Create a smooth and level surface on the area where the load plate will be placed. This can be done by moving the load plate back and forth, or by using appropriate tools (such as a trowel). Remove any loose soil from the area. In case of soil irregularities, spread a thin leveling layer of fine-grained quartz sand. Make sure to add only a few millimetres; it should compensate only for uneven patches under the load plate. Next, place the load plate on top and move it back and forth to reduce the thickness of the sand layer. Full contact between the load plate and the test area is essential.



6.2 Test Execution / Data Input Function

After preparing the testing point and placing the Bluetooth® load plate on the ground, turn on the Bluetooth® sensor dome by pressing the green button on the Bluetooth® sensor dome; „the magic eye“ will show red. Place the loading device in the centre of the Bluetooth® sensor dome on the load plate.

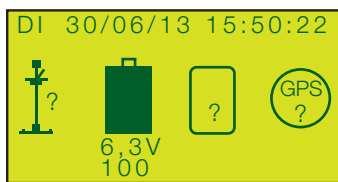


To establish the Bluetooth® connection, ALWAYS turn on the Bluetooth® sensor dome first, before turning on the testing computer. During the test the „magic eye“ (the transparent hemisphere), which protects the antenna of the Bluetooth® transmitter, must always face the testing computer.

Press and hold the „START“ button to turn on the testing computer. To activate the backlight of the graphic display, press the „START“ button for approximately three seconds, when turning on the device, until the start screen switches automatically to „STATUS REQUEST“. An audio sonar signal announces the setup of the Bluetooth® connection to the Bluetooth® load plate. Once established, you will hear the voice instruction: „Bluetooth OK, start test.“ The „magic eye“ on the Bluetooth® sensor dome will show blue.

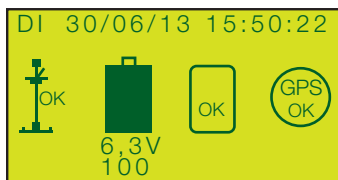


When turning on the testing computer with the backlight off, the start screen will show the „TERRATEST 5000 BLU“ logo as well as the version number of the firmware for approximately three seconds, before progressing automatically to „STATUS REQUEST“.

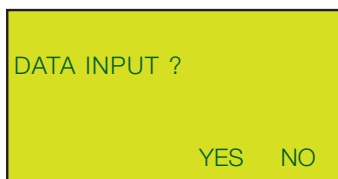


STATUS DISPLAY

During „STATUS REQUEST“ the computer checks the sensor connection, SD card, GPS, and the current battery charge and confirms that everything is working correctly by showing „OK“. If one of these features is unavailable, a „?“ will be shown instead. Checking the GPS connection can take 2-3 minutes. If the sensor connection is not established, the computer will not progress to the measuring mode and no test can be performed. The current battery charge of the Bluetooth® sensor dome will be shown as a percentage below the icon showing the current battery charge of the testing computer.



If the SD card is not recognised, turn the device off and insert the SD card again. If the SD card is still not recognised, check that it has been prepared correctly. The SD card can be prepared for saving the test results by using the „TERRATEST 2.0“ software (see chapter „Prepare media“ – „SD card“, page 63). By pressing the start button again the computer will progress to the text input function and „DATA INPUT?“ will appear on the screen.



DATA INPUT FUNCTION

You can now choose to perform the test with or without data input.

If no text input is desired, select „No“ by pressing the „START“ button. You will automatically be forwarded to the measuring mode.

By pressing the „SELECT“ button you confirm the data input function with „YES“. You can now enter up to 23 characters of text.

Select the desired characters with <= or =>. Confirm each character with „ENTER“ by briefly pressing the „START“ button.

Select and overwrite characters already entered by pressing „TEXT“ (to delete, use space character).

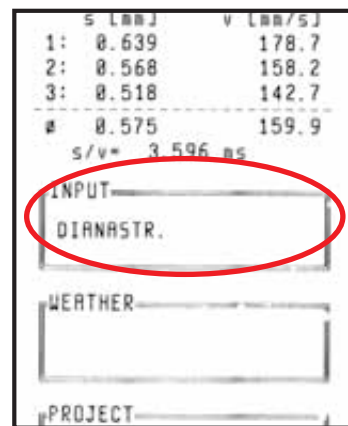
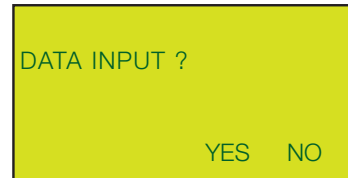
To confirm data input, press and hold down the „START“ button. You will be forwarded directly to the measuring mode. Your data input is saved to both the internal memory and the external media (if in use).

Every entry remains saved, but will only be stored on either the internal memory or external media and printed on the protocol printout if the data input mode is confirmed with „YES“.

If choosing „NO“ by pressing „START“ when asked for „DATA INPUT?“, the last entry will remain in the memory of the data input mode, but will not be saved to either the internal memory or external media, and will not be printed on the protocol.

The confirmed entry will be shown in the „TEXT ENTRY“ field of the protocol printout and in the „Comments“ field of the „TERRATEST 2.0“ software.

If you precede the text entry, e.g. „PROJECT JOE BLOGGS“, with a slash „/“, the test will be saved under this file name, e.g. „PROJECT JOE BLOGGS“, when loading the data to a PC. This facilitates managing and searching of test data. See also chapter „Edit / save protocol“ on page 76.



After placing the loading device on the metal ball in the centre of the Bluetooth® sensor dome, unlock the transportation lock of the drop weight by pulling the orange knob. The transportation lock should only be unlocked immediately prior to a test being performed, as uncontrolled movements of the weight may cause injury or damage to the device or its surroundings.



Ensure that the transportation lock is unlocked before each drop.
In case of improper use, i.e. if the weight is dropped while the transportation lock is still pushed in, damage to the device may occur. Damage caused by improper use is not covered by the device warranty.





Regularly check that the transportation lock of the drop weight is functioning properly. If you notice signs of wear, stop using the device immediately. Send the device back to TERRATEST for the transportation lock to be repaired or replaced.



Put on hearing protectors before the first drop. Hearing protectors must be worn when operating the Light Weight Deflectometer, since the noise level may rise over 85 dB during the test. ATTENTION: Operating the device without hearing protection can result in permanent hearing impairment.



If the status LED on the Bluetooth® sensor dome shows green, the device is ready for transferring data to the testing computer. Following the voice instruction „FIRST PRELOAD“ and the display instruction „10 kg 1. Preload“, continue with the first pre-consolidation test as follows: Take hold of the blue safety grip at the end of the guide rod; open the release mechanism by pushing the green start lever towards the guide rod and holding it there. With your other hand pull up the unlocked drop weight all the way until it stops. Fix it in place by releasing the green start lever and thus latching the drop weight into the release mechanism. The drop weight is now fastened securely in the release mechanism on top of the device. Open the release mechanism by pushing the green start lever towards the guide rod, and let the drop weight fall freely until it hits the spring assembly. Catch the drop weight immediately after first contact and, in the same way as described above, latch it back into the release mechanism. The status LED on the Bluetooth® sensor dome shows blue while transferring the data to the testing computer. The status LED switches back to green, when the device is ready for the next test. In total, six drops must be performed to complete the test.

After hearing the audio signal, receiving the instruction „10 kg 2. Preload“ on the display of the testing computer, and hearing the voice instruction „SECOND PRELOAD“, continue with the second pre-consolidation test in the same way as described above. The testing computer will not register any drops performed before the acoustic signal.

After hearing the audio signal, receiving the instruction „10 kg 3. Preload“ on the display of the testing computer, and hearing the voice instruction „THIRD PRELOAD“, continue with the third pre-consolidation test in the same way as described above.

The device checks the results of the three pre-consolidation tests and then progresses automatically to the main test.

After hearing the audio signal, receiving the instruction „10 kg 1. Test“ on the display of the testing computer, and hearing the voice instruction „FIRST TEST“, continue with the first test in the same way as described above.

After performing the first test, the device will show the settlement s_4 in mm, as well as the respective settlement curve.

After hearing the audio signal, receiving the instruction „2. Test“ on the display of the testing computer, and hearing the voice instruction „SECOND TEST“, continue with the second test in the same way as described above.

After performing the second test, the device will show the settlements of both prior tests, s_4 and s_5 , in mm, as well as the respective settlement curves.

After hearing the audio signal, receiving the instruction „3. Test“ on the display of the testing computer, and hearing the voice instruction „THIRD TEST“ continue with the third test in the same way as described above.



„Magic eye“ GREEN: ready for testing

10 Kg

1. Preload

10 Kg

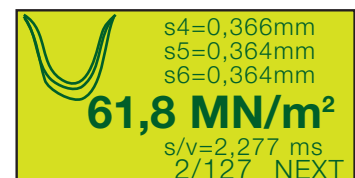
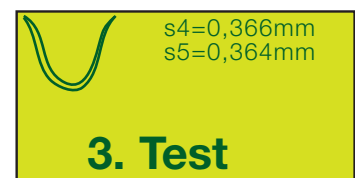
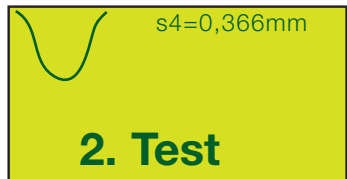
2. Preload

10 Kg

3. Preload

10 Kg

1. Test



After performing the third test, the device will show the settlements s_4 , s_5 and s_6 in mm, as well as the respective settlement curves. Additionally, the final result, the Evd value in MN/m^2 , will be shown and will also be announced, rounded to whole numbers in MN/m^2 , via the voice output.

A longer audio signal (a beep lasting one second) and the voice output „**TEST FINISHED, PLACE WEIGHT BELOW**“ announce the end of the test and the recording of measured data on the internal memory and SD card (if in use). All test data including settlement curves, GPS coordinates, date, time, serial number, device type, and the test results themselves are now saved. The protocol can be printed by pressing the „PRINT“ button. Alternatively, continue with the next test by pressing the „START“ button (NEXT) again.

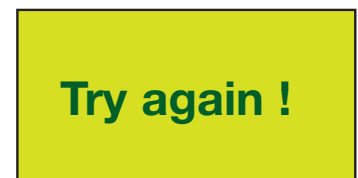


Keep the safety grip on top of the device tight in your hand during the whole test. When a test is not being performed, never leave the weight latched on top of the loading device, as it could fall over and cause injury or damage. The drop weight should only be latched on top of the device immediately prior to an upcoming test. While in use, only the operator should come close to the device. All other persons should stay at a safe distance to ensure that no one is injured by the dropping weight. After the sixth drop place the drop weight in its „rest“ position on top of the bellows at the bottom of the device and lock it immediately with the transportation lock.



Ensure that the guide rod is kept upright during the impact. Use the spirit level integrated in the safety grip to aid in the vertical positioning of the guide rod. The test is invalid if the load plate moves horizontally during the impact. This risk exists particularly if the test area is inclined. Avoid sideward movements of the load plate on inclined test areas by placing your foot right next to the plate. Never stand on the plate! Doing so will distort the test results. Every correct impact will be acknowledged by an audio signal (a single beep).

A different signal (a stuttering beep) will announce a possible measuring error. In this event „Try again“ will be shown on the display and announced by the voice output. Should this occur, move the load plate and restart the complete test from the first pre-consolidation drop.



If the error message shows again, the soil may be too soft or too hard, so that the measured value is outside the measuring range. In this case, move the Bluetooth® load plate to another testing point and repeat the test there.

The sensitivity of the testing computer is set up in such a way that a normal placing of the loading device on the Bluetooth® load plate, or a normal latching of the drop weight into the release mechanism will not trigger a measurement.



However, abrupt movements when placing the loading device on the Bluetooth® load plate, or latching the drop weight into the release mechanism, may trigger an impulse. The electronic plausibility check will recognise the error and the device will restart the complete test. Move the load plate and start the test procedure again from the beginning.

If the settlement is very small, it is advisable to push the loading device onto the metal ball of the sensor dome during impact. Doing so will help to avoid a possible rebound of the guide rod and thus a distortion of the test results.

6.3 Connecting Bluetooth® Load Plate to Testing Computer with the Measuring Cable

If the Bluetooth® connection between Bluetooth® load plate and testing computer is not desired, or not possible, the connection can also be established with the supplied measuring cable.

Turn on the transmission unit of the Bluetooth® sensor dome by pressing the button on the Bluetooth sensor dome. The status LED will show red, indicating that the device is ready for use. Turn on the testing computer and connect the Bluetooth® sensor dome on the Bluetooth® load plate with the testing computer by using the measuring cable. Be careful when opening the hinged lids of the sockets and when inserting the plugs. If the connection has been successful, the status LED will turn blue. You can now start the test.

The high-quality PUSH-PULL plugs from LEMO lock themselves inside the socket automatically and can be unlocked only by gently pulling on the connector housing. Accordingly, never pull the cable. Doing so causes damage to the cable and the device. The plugs of the measuring cable are identical, making an incorrect connection impossible.

6.4 The „Magic Eye“ of the Bluetooth® Sensor Dome

The Bluetooth® transmission unit of the Bluetooth® sensor dome is equipped with a status LED, which indicates three different states. During the test, these are displayed via the „magic eye“ (a transparent hemispherical cover over the transmitter) on the Bluetooth® sensor dome.

„Magic Eye“ RED

After turning on the transmission unit by pressing the button on the Bluetooth® sensor dome, the „magic eye“ will show red, indicating that the device is ready for use. In this state, the Bluetooth® sensor dome is waiting for the connection with the testing computer to be established. If the „magic eye“ switches to red during the test, it indicates that the Bluetooth® connection between the testing computer and the Bluetooth® load plate has been lost. This may be caused by the distance between the Bluetooth® load plate and the testing computer being too great. In this case, testing stops and the voice output of the testing computer will issue a sonar signal, indicating that the testing computer is attempting to re-establish the connection. Reduce the distance between the Bluetooth® load plate and the testing computer. Another possible cause for the failure might be that the automatic switchoff mechanism of the testing computer has turned off the computer after three minutes of inactivity. In this case, turn the testing computer back on and wait for the connection to be re-established. If the Bluetooth® connection has been successful, the voice instruction will announce „BLUETOOTH OK – START TEST“.

„Magic Eye“ BLUE

If the Bluetooth® connection between the testing computer and the Bluetooth® load plate has been successfully established, the „magic eye“ will show blue. The voice output of the testing computer will also indicate the successful connection by announcing „BLUETOOTH OK – START TEST“.

Always ensure that the „magic eye“ faces towards the testing computer, so that there is a line of sight between the two.



Control elements of the Bluetooth® sensor dome



View of the „magic eye“ on Bluetooth® sensor dome



„Magic Eye“ RED: the sensor dome is ready for use and waiting for connection



„Magic Eye“ BLUE: the connection is established

„Magic Eye“ GREEN

Whenever the Bluetooth® sensor dome is ready to start a test, the „magic eye“ will show green. After every drop the test data will be transferred to the testing computer. During data transfer the „magic eye“ will switch to blue. As soon as the data transfer is finished the „magic eye“ will switch back to green, indicating that the device is ready for the next drop.



„Magic Eye“ GREEN:
ready to start a test

6.5 Continuous Measuring Mode

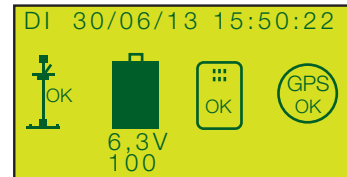
If the test shall be performed on several testing points close to each other, the testing computer can be operated in „CONTINUOUS MEASURING MODE“. In this mode tests can be performed in quick succession, without the need to operate the testing computer between each individual test.

To turn on the „CONTINUOUS MEASURING MODE“, press the „SELECT“ button during „STATUS REQUEST“. In the „MAIN MENU“ press the „SELECT“ button, until the arrow is positioned on the menu entry „CONNECTION“. Then press the „START“ button to select the menu „CONNECTION“. Finally, press the „START“ button again to select the menu „STAND-BY TIME“.

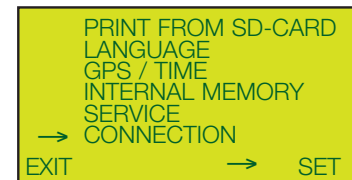
The stand-by time is the time that the testing computer will wait for the next test to start before switching itself off due to timeout. Use the „SELECT“ button to increase the wait time by increments of five minutes, up to a maximum wait of 30 minutes. Confirm the set time with the „EXIT“ button. Continue pressing the „EXIT“ button, until the screen shows „STATUS REQUEST“ again. Then start the first test, as described above. The voice output will confirm if the „CONTINUOUS MEASURING MODE“ is turned on successfully by announcing „CONTINUOUS MEASURING MODE ON“. It will then direct you through the test, as described above. At the end of the test, move to the next testing point. Firmly latch the drop weight back into the release mechanism. This will start the next test without needing to operate the testing computer.

If no new test is started within the set wait time, the testing computer will switch off automatically.

The „STAND-BY TIME“ can be set back to „00 MIN“ by using the „PRINT“ button. The testing computer will then go back to single measuring mode and will operate with the default switch-off after three minutes of inactivity.



STATUS DISPLAY



MAIN MENU

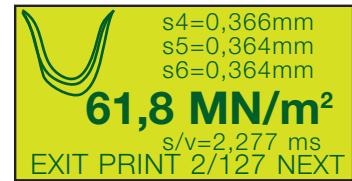


MENU CONNECTION



6.6 Printing the Test Protocol

The integrated thermal printer allows printouts of the test protocols to be created conveniently on-site, immediately after the test; protocols can also be printed at any later point in time. The protocol shows all data obtained during the test (see printout on page 45). To print the test protocol, activate the thermal printer by pressing the „PRINT“ button. It is located on the internal control panel. During the printing process the control lamp will show green. When printing is finished, detach the protocol by tearing it against the tear-bar. If the green light is flashing and the thermal printer does not start printing after pressing the „PRINT“ button, this is usually due to the absence of paper. In this case, follow the instructions below to insert a new roll of paper. The button for the paper feed is located on the left of the green control lamp.



6.7 Changing the Paper

A flashing green control lamp signals the absence of paper. To open the paper tray and replace the paper roll press the button on the green control lamp. Lift the cover and insert the new thermal paper roll (57 mm wide and 25 mm long) with the coated side facing outwards. One roll of paper will print approximately 100 printouts. Unroll approximately 10 cm of the edge of the paper and hold it up, while closing the printer by gently pressing the cover on both sides. Detach the protruding end of the paper by tearing it against the tear-bar. The printer is now ready for use again. An ink ribbon is not necessary for the thermal print method.

Use only thermal paper; the coated, heat-sensitive side must face outwards. Suitable paper rolls can be obtained in most office supply stores, or ordered at TERRATEST GmbH.

Specifications of paper rolls:

Thermal paper roll
Width 57 mm
Length 25 Meter
Diameter 47 mm
Core 12 mm



If you intend to store printouts for an extended period of time, make sure that the thermal paper is not exposed to direct sunlight or temperatures over 30°C. Thermal paper ages relatively quickly, so ensure to make copies on normal paper.



During the printing process the control lamp will show green.



Inserting a new roll of thermal paper

Printout of the Test Protocol

TERRATEST
5000

TYP: 300mm, 10kg #002520

DYNAMIC TEST WITH LIGHT WEIGHT DEFLECTOMETER
ACCORDING TO GERMAN TEST SPECIFICATION
TF 8F-StB Teil 8 8.3

Date:
WED 29.08.2012 12:26:46

Place:
GPS

50° 50.1612' N
009° 34.4753' E

Evd= 39.1 MN/m²

ts: 0.2mm t: 5ms⁻¹

	s [mm]	v [mm/s]
1:	0.639	178.7
2:	0.568	158.2
3:	0.518	142.7
Ø	0.575	159.9
s/v = 3.596 ms		

INPUT

DIANASTR.

WEATHER

PROJECT

PLATE BASE

TEST LAYER

INSTITUTE/OPERATOR

device name

serial number

device type

German standard

date of test

time of test

dynamic deflection module

GPS coordinates of testing point

zero point test area

progress of settlement with the three settlement curves

maximum settlement

maximum speed of immersion

average maximum settlement

average maximum speed of immersion

s/v value: relation between settlement and speed

display of text input function

handwritten comments

7. Menu Guidance

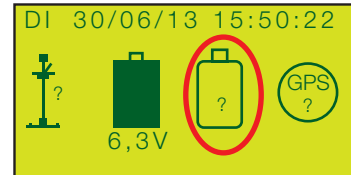
7.1 Menu „USB STICK“ („TERRATEST 4000 USB“ ONLY)

All commercially available USB sticks can be used. However, pay attention to the height of the USB stick; if it has a height over 45 mm, it could cause damage to the testing computer when closing the cover.

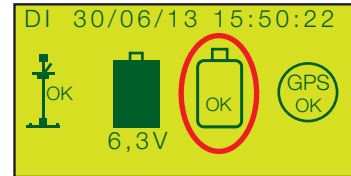
If a USB stick is in use, all test data will be automatically saved to both the USB stick and the internal memory. The supplied USB stick is already formatted. When turning on the device make sure that the display shows an „OK“ on the USB stick icon during „STATUS REQUEST“.

Every test saved to the USB stick receives a consecutive data record number. Tests performed on the same day will be saved in one folder, named after the test date.

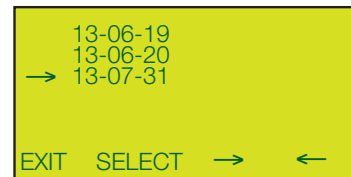
The data on the USB stick can only be deleted by re-formatting the medium on the PC. The USB stick can be used again afterwards. It is only possible to delete ALL data from the USB stick. Deleting single records from the USB stick is not possible.



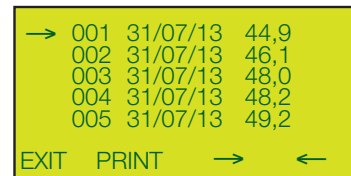
USB STICK NOT AVAILABLE



USB STICK AVAILABLE



FOLDER LIST



TEST DATA LIST

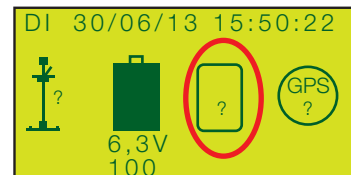
7.2 Menu „SD CARD“ („TERRATEST 5000 BLU“ ONLY)

Only SD cards with a capacity of 2 GB can be used.

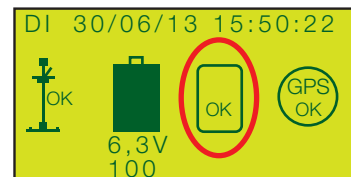
500 tests can be saved on the SD card. If the SD card is in use, all test data will automatically be saved to both the SD card and the internal memory. The SD card is already formatted and prepared for recording the tests. When turning on the device, make sure that the display shows an „OK“ on the SD card icon during „STATUS REQUEST“.

Every test saved on the SD card receives a consecutive data record number.

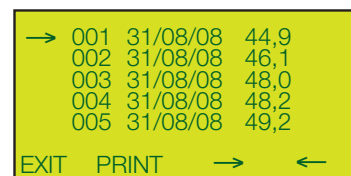
The data on the SD card can only be deleted via the „TERRATEST 2.0“ software. To prepare the medium for new test data, insert it into a PC and use the menu option „Prepare media“ of the „TERRATEST 2.0“ software. The SD card is ready to be used again afterwards. It is only possible to completely delete ALL data from the SD card (see page 63).



SD CARD NOT AVAILABLE



SD CARD AVAILABLE



TEST DATA LIST

7.3 Subsequent Printing of Test Data

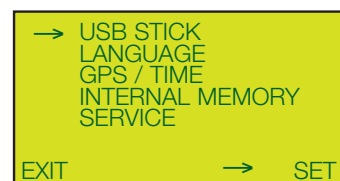
Turn on the device by pressing the „START“ button. Then enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „USB STICK“ („TERRATEST 4000 USB“ ONLY) or „PRINT FROM SD CARD“ („TERRATEST 5000 BLU“ ONLY) from the menu. Press the „START“ button (SET) to enter the test data list. On „TERRATEST 4000 USB“ you will then be forwarded to the folder list, named after the date on which the respective test was performed. Move the arrow with the „START“ and „SELECT“ buttons to the folder of your choice. Open the folder with the „PRINT“ button and enter the test data list.

All tests with their consecutive data record number, date and Evd value will be shown on the display. Move the arrow with the „START“ and „SELECT“ buttons to select the data record which you would like to print. Pressing the „PRINT“ button will print the corresponding test.

Press the „RESET/OFF“ button (EXIT) to return to the „MAIN MENU“. Press the „RESET/OFF“ button (EXIT) again to return to the „STATUS REQUEST“. Pressing the „START“ button will start the test procedure.

If no test data is saved on the medium, „CARD IS EMPTY“ will appear on the screen for a few seconds; the screen will then return automatically to the „MAIN MENU“.

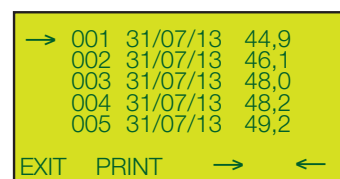
„TERRATEST 4000 USB“



MAIN MENU

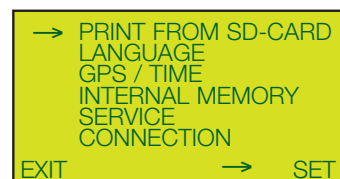


FOLDER LIST

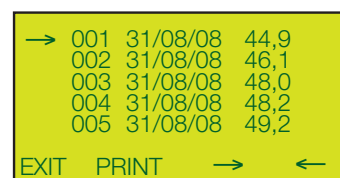


TEST DATA LIST

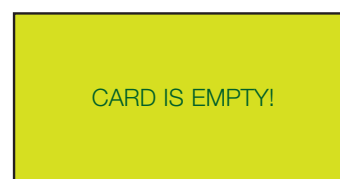
„TERRATEST 5000 BLU“



MAIN MENU



TEST DATA LIST

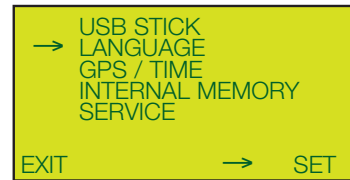


7.4 Language Menu

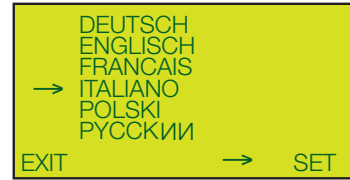
Turn on the device by pressing the „START“ button. Then enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „LANGUAGE“ from the menu. Then press the „START“ button to enter the „LANGUAGE“ menu.

Choose the desired language by pressing the „SELECT“ button. To activate the selected language, press the „START“ button (SET). The „MAIN MENU“ will then appear automatically in your desired language.

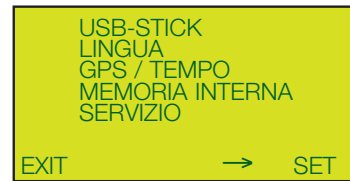
Press the „RESET/OFF“ button (EXIT) to return to the „STATUS REQUEST“. Pressing the „START“ button will start the test procedure.



MAIN MENU



LANGUAGE MENU



MAIN MENU
in new language

7.5 Menu GPS / TIME

7.5.1 GPS Reception

The device is delivered with the status set to „GPS IS ON“.

The GPS reception is automatically activated when turning on the device, unless it has been switched off previously. After turning on the device, wait until the GPS reception has logged in. While searching for satellites a „ ? “ will be shown on the GPS icon. Once the GPS reception is established, the display will show an „OK“ on the GPS icon during „STATUS REQUEST“. This process may take a few minutes.

If a test is started without waiting for GPS reception during „STATUS REQUEST“, the GPS will not log in and all tests will be performed without the GPS function.

If the GPS reception is turned on, the GPS coordinates of the testing point will automatically appear on the test protocol. They will also be saved automatically to both the internal memory and the external media (if in use) for later analysis on a PC and connection to the Google® Maps interface.

7.5.2 Accuracy of GPS Reception

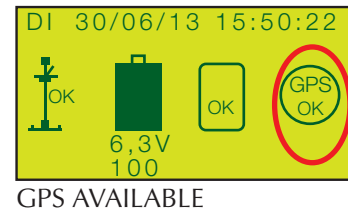
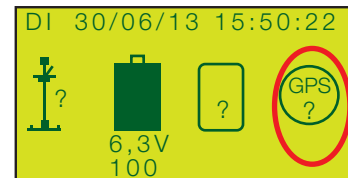
The GPS satellite positioning system was developed by the U.S. Department of Defense at the beginning of the 1970s. 24 satellites were placed in space. Due to the orbits of the satellites and the deployed transmission technology, the accuracy of the determined position is limited.

We would like to briefly explain this further: A GPS receiver calculates its position by analysing the signal of several GPS satellites. The more satellite signals it receives, the more accurate the determined position. If the view of the sky is clear, the signals of up to 12 satellites may be received at the same time. To determine a valid position, the data of at least three satellites is necessary. This works very well in open field. In this case, the accuracy is below 30 metres.

On a moving vehicle, accuracies of one metre and below can be achieved. Unfortunately, construction work is not always conducted in open space. In cities or in a built-up areas, various disturbances occur, shade for example. In this case, one or more satellites are likely to be blocked by high buildings. It is possible that the signals of only western, northern and southern satellites may be received, while all eastern satellites are blocked completely. This may be the case when standing very close to a building, for example.

Reflections are another cause of inaccuracy. The signals sent out by the GPS satellites are radio signals, which spread in wave form and can be reflected, by large metal surfaces (such as aeroplanes) for example. Due to these reflections the GPS module may not receive the signals directly, but after being reflected by another object or surface. The signal propagation delay may change, which may result in a greater divergence than normal (outlier). In a densely built area with high buildings, this may mean errors of tens of metres.

A car navigation system tries to offset the effects of these problems by assuming that the car is moving, and by checking that the position determined by the GPS module makes sense on the current road (a signal which indicates a sharp turn into a nearby field 100 metres before a junction is most likely an error, for example).

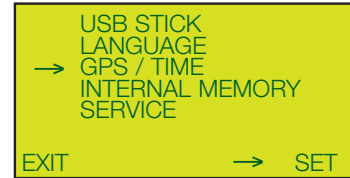


7.5.3 GPS ON / GPS OFF

Turn on the device by pressing the „START“ button. Then enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „GPS / TIME“ from the menu. Press the „START“ button (SET) to enter the „GPS / TIME“ menu.

To deactivate the GPS reception, position the arrow on „GPS IS ON“ and press the „START“ button (SET). „GPS IS OFF“ will then show on the display. If the GPS system is deactivated, the GPS icon will be absent from the „STATUS REQUEST“ screen.

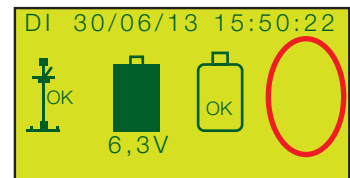
If the GPS reception is switched off, and you would like to re-activate it, proceed as described above. After activating the GPS reception the GPS icon will appear during „STATUS REQUEST“. Press the „RESET/OFF“ button (EXIT) to return to the „MAIN MENU“. Press the „RESET/OFF“ button (EXIT) again to return to the „STATUS REQUEST“. The chosen GPS status will be shown either by the presence or by absence of the GPS icon, depending on whether you have chosen „GPS IS ON“ or „GPS IS OFF“. Pressing the „START“ button will start the test procedure.



MAIN MENU



GPS / TIME MENU



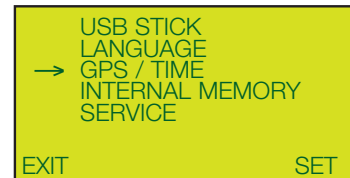
GPS icon is missing: GPS is off

7.5.4 Summer Time Function

Turn on the device by pressing the „START“ button. Then enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „GPS / TIME“ from the menu. Press the „START“ button (SET) to enter the „GPS / TIME“ menu.

To deactivate the summer time, position the arrow on „SUMMER TIME IS ON“ and press the „START“ button (SET). „SUMMER TIME IS OFF“ will then show on the display.

To activate the summer time, position the arrow on „SUMMER TIME IS OFF“ and press the „START“ button (SET). „SUMMER TIME IS ON“ will then show on the display. Press the „RESET/OFF“ button (EXIT) to return to the „MAIN MENU“. Press the „RESET/OFF“ button (EXIT) again to return to the „STATUS REQUEST“. Pressing the „START“ button will start the test procedure.



MAIN MENU



GPS / TIME MENU



7.5.5 Date and Time

The device is delivered with the status set to „TIME IS GPS TIME“. Weekday, date and switch-on time will be shown automatically during „STATUS REQUEST“, when turning on the device. This data is globally imported via satellite; the default setting corresponds to „GMT + 01:00 h“ (GMT = Greenwich Mean Time).

PAY ATTENTION TO YOUR TIME ZONE IN RELATION TO THE GMT IMPORTED BY THE TESTING COMPUTER. ADJUST THE DIFFERENCE IN THE „TIME ZONE“ MENU BEFORE FIRST USE OF THE DEVICE (see time zone set-up).

If the mode „TIME IS GPS TIME“ is switched on, date and time of the test will be automatically added to the test protocol. This data will be also saved automatically to both the internal memory and the external media (if in use) for later analysis on a PC and connection to the Google® Maps interface.

7.5.6 Manual Time

Turn on the device by pressing the „START“ button. Then enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „GPS / TIME“ from the menu. Press the „START“ button (SET) to enter the „GPS / TIME“ menu.

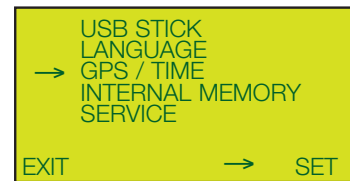
Position the arrow on „TIME IS GPS TIME“ and press „START“ (SET) to deactivate this mode and set the clock manually. „MANUAL TIME“ will then show on the display with the menu option „SET CLOCK“ directly below. Use the „SELECT“ button to move the arrow and select „SET CLOCK“. Press the „START“ button (SET) to enter the „SET CLOCK“ menu.

With the „SELECT“ button you can then choose between date (day / month / year) and time, and set both manually by pressing the „PRINT“ button (+). The modified details must be confirmed by pressing the „START“ button. The corresponding weekday will be adjusted automatically. Simultaneously, the screen will return to the „MANUAL TIME“ menu.

Press the „RESET/OFF“ button (EXIT) to return to the „MAIN MENU“. Press the „RESET/OFF“ button (EXIT) again to return to the „STATUS REQUEST“. Pressing the „START“ button will start the test procedure.

If the GPS time is switched off and you would like to re-activate it, proceed as described above. Position the arrow on „MANUAL TIME“ and press „START“ (SET) to deactivate this mode and switch back to GPS time. „TIME IS GPS TIME“ will then show on the display with the menu option „TIME ZONE“ directly below.

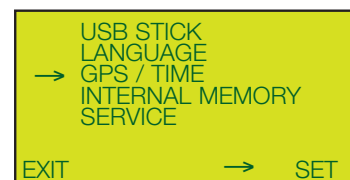
Press the „RESET/OFF“ button (EXIT) to return to the „MAIN MENU“. Press the „RESET/OFF“ button (EXIT) again to return to the „STATUS REQUEST“. Pressing the „START“ button will start the test procedure.



MAIN MENU



GPS / TIME MENU



MAIN MENU



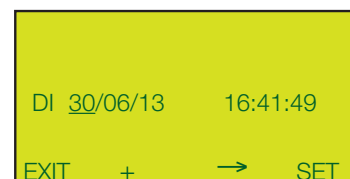
GPS / TIME MENU



MANUAL TIME MENU



MANUAL TIME MENU



SET CLOCK MENU

7.5.7 Time Zones

The testing computer is delivered with the time zone set to „GMT + 01:00 h“ (GMT = Greenwich Mean Time). This setting corresponds to Central European Winter Time, imported via the corresponding satellites by the GPS receiver. Central European Summer Time can be set separately; it corresponds to the time zone set-up „GMT + 02:00 h“.

PAY ATTENTION TO YOUR TIME ZONE IN RELATION TO THE GMT IMPORTED BY THE TESTING COMPUTER. ADJUST THE DIFFERENCE IN THE „TIME ZONE“ MENU BEFORE FIRST USE OF THE DEVICE.

The testing computer will remember the set time zone, even if it is subsequently switched to a manual time setting.

The automatic time zone mode is active only, when the device is set to „TIME IS GPS TIME“.

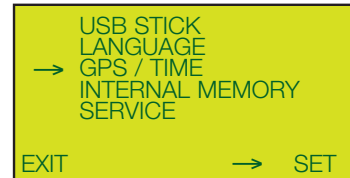
7.5.8 Time Zone Set-up

Turn on the device by pressing the „START“ button. Then enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „GPS / TIME“ from the menu. Press the „START“ button (SET) to enter the „GPS / TIME“ menu.

Use the „SELECT“ button to move the arrow and select „TIME ZONE“ from the menu. Press the „START“ button (SET) to enter the „TIME ZONE“ menu.

Use the „START“ (+) and „SELECT“ (-) buttons to set the desired time zone in relation to Greenwich Mean Time. Confirm the chosen time zone by pressing the „RESET/OFF“ button (EXIT); you will be automatically returned to the „GPS / TIME“ menu.

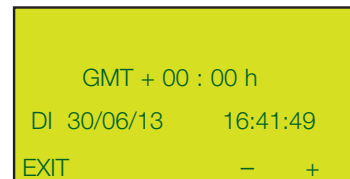
Press the „RESET/OFF“ button (EXIT) to return to the „MAIN MENU“. Press the „RESET/OFF“ button (EXIT) again to return to the „STATUS REQUEST“. Pressing the „START“ button will start the test procedure.



MAIN MENU



GPS / TIME MENU



TIME ZONE MENU

7.6 Internal Memory

The last 2000 tests will automatically be saved in the internal memory of the testing computer, even if the external medium (USB stick / SD card) is not in use. The test data can be transferred from the internal memory to the external medium, if required. If the internal memory is full, the oldest test data will be automatically overwritten (i.e. saving is on a rolling basis).

The USB cable port allows test data to be transferred to a PC for analysis using the USB cable (included in the basic package).

7.6.1 Printing from the Internal Memory

Turn on the device by pressing the „START“ button. Then enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „INTERNAL MEMORY“ from the menu. Press the „START“ button (SET) to enter the „INTERNAL MEMORY“ menu.

Position the arrow on „PRINT OUT“ and press „START“ (SET) to enter the „TEST DATA LIST“ of the internal memory. All test data saved in the internal memory will be shown on the display, including the consecutive data record number, date, and Evd value. Move the arrow with the „START“ and „SELECT“ buttons to select the data record which you would like to print. The corresponding test protocol will be printed, when pressing the „PRINT“ button. If no test data is saved in the internal memory, „MEMORY IS EMPTY“ will appear on the screen for a few seconds. The screen will then return automatically to the „INTERNAL MEMORY“ menu.

Press the „RESET/OFF“ button (EXIT) to return to the „INTERNAL MEMORY“ menu. Press the „RESET/OFF“ button (EXIT) again to return to the „MAIN MENU“. Press the „RESET/OFF“ button (EXIT) again to return to the „STATUS REQUEST“. Pressing the „START“ button will start the test procedure.

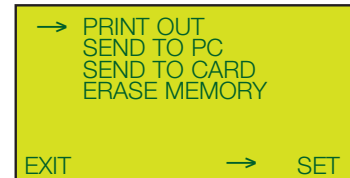
7.6.2 Internal Memory to PC

Turn on the device by pressing the „START“ button. Enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „INTERNAL MEMORY“ from the menu. Press the „START“ button (SET) to enter the „INTERNAL MEMORY“ menu. Position the arrow on „SEND TO PC“ and press the „START“ (SET) button to load the test data directly into the „TERRATEST 2.0“ software. Establish the USB connection between the testing computer and PC by plugging in the USB cable included in the basic package. Upon initial connection of the testing computer to the PC the respective driver will have to be installed from the supplied CD ROM „TERRATEST 2.“. For help, refer to the chapter „Driver installation for the testing computer“ (see page 74). If there is no connection to the PC, the instruction „PLEASE CONNECT TO USB-PORT OF PC“ will appear on the display.

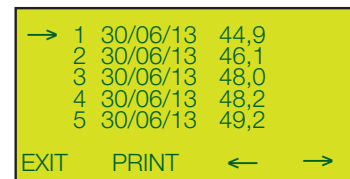
After the USB connection has successfully been established „PC connected“ will appear on the display.



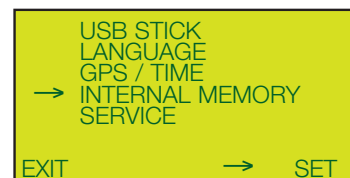
MAIN MENU



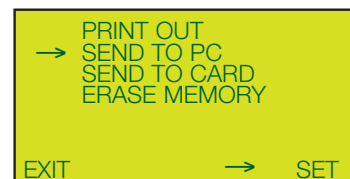
INTERNAL MEMORY MENU



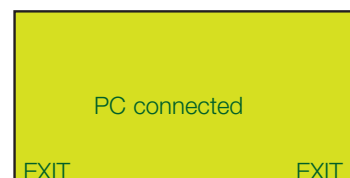
TEST DATA LIST



MAIN MENU



INTERNAL MEMORY MENU

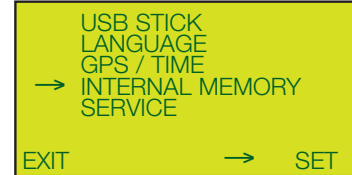


Launch the „TERRATEST 2.0“ software and click on the field „Read testing computer“. All data records saved in the internal memory will then be copied to the PC. You can then undertake an analysis of the test data on your PC. All test data will be retained in the internal memory.

Once all test data has been copied, the testing computer will automatically switch first to the welcome screen and then back to „STATUS REQUEST“.

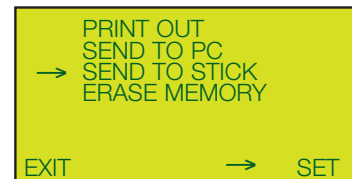
7.6.3 Internal Memory to External Media

Turn on the device by pressing the „START“ button. Enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „INTERNAL MEMORY“ from the menu. Press the „START“ button (SET) to enter the „INTERNAL MEMORY“ menu.



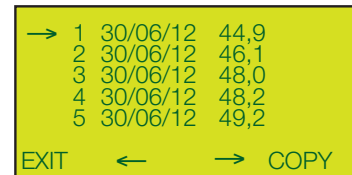
MAIN MENU

Position the arrow on „SEND TO STICK“ („TERRATEST 4000 USB“ ONLY) or „SEND TO CARD“ („TERRATEST 5000 BLU“ ONLY) and press the „START“ (SET) button to enter the „TEST DATA LIST“.



INTERNAL MEMORY MENU

Move the arrow with the „PRINT“ and „SELECT“ buttons to select the data record which you would like to copy to the external media. Then press the „START“ button (COPY).



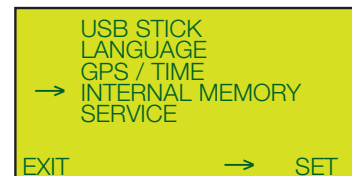
TEST DATA LIST

The testing computer will then copy the selected data record directly to the external media. You can then copy any number of data records, one-by-one, to the external media.

Press the „RESET/OFF“ button (EXIT) to return to the „INTERNAL MEMORY“ menu. Press the „RESET/OFF“ button (EXIT) again to return to the „MAIN MENU“. Press the „RESET/OFF“ button (EXIT) again to return to the „STATUS REQUEST“.

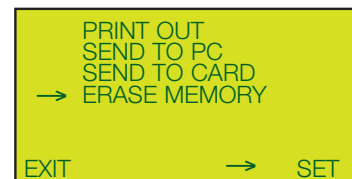
7.6.4 Clear Internal Memory

Turn on the device by pressing the „START“ button. Enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „INTERNAL MEMORY“ from the menu. Press the „START“ button (SET) to enter the „INTERNAL MEMORY“ menu.



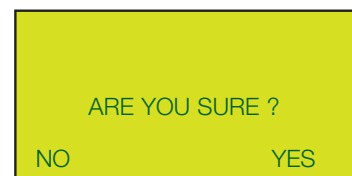
MAIN MENU

Position the arrow on „ERASE MEMORY“ and press the „START“ (SET) button to clear all data records from the internal memory.



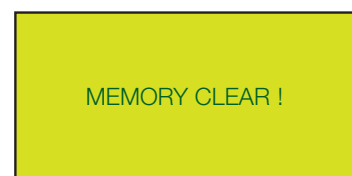
INTERNAL MEMORY MENU

You will be asked „ARE YOU SURE?“. Confirm by pressing the „START“ button (YES). The deletion procedure will be started. Upon completion of the deletion procedure, „MEMORY CLEAR“ will appear on the display. The display will then return automatically to the „INTERNAL MEMORY“ menu.



If you do not want to erase the data, press the „RESET/OFF“ button (NO). The screen will return to the „INTERNAL MEMORY“ menu.

Press the „RESET/OFF“ button (EXIT) again to return to the „MAIN MENU“. Press the „RESET/OFF“ button (EXIT) again to return to the „STATUS REQUEST“. Pressing the „START“ button will start the test procedure.



7.7 Service

7.7.1 Input Test

Turn on the device by pressing the „START“ button. Enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „SERVICE“ from the menu. Press the „START“ button (SET) to enter the „SERVICE“ menu.

Use the „SELECT“ button to move the arrow and select „INPUT TEST“ from the menu.

Press the „START“ button (SET) to enter the „INPUT TEST“ menu.

The „INPUT TEST“ serves to check the functionality of the device and shows important function parameters of the device components.

Press the „RESET/OFF“ button (EXIT) to return to the „SERVICE“ menu. Press the „RESET/OFF“ button (EXIT) again to return to the „MAIN MENU“. Press the „RESET/OFF“ button (EXIT) again to return to the „STATUS REQUEST“. Pressing the „START“ button will start the test procedure.

7.7.2 Version

Turn on the device by pressing the „START“ button. Enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „SERVICE“ from the menu. Press the „START“ button (SET) to enter the „SERVICE“ menu.

Use the „SELECT“ button to move the arrow and select „VERSION“ from the menu.

Press the „START“ button (SET) to enter the „VERSION“ menu, where you will find:

- 12 digit device number
- device type
- last calibration date
- calibration factor
- firmware version
- number of tests performed since last firmware update

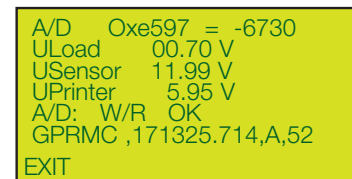
Press the „RESET/OFF“ button (EXIT) to return to the „SERVICE“ menu. Press the „RESET/OFF“ button (EXIT) again to return to the „MAIN MENU“. Press the „RESET/OFF“ button (EXIT) again to return to the „STATUS REQUEST“. Pressing the „START“ button will start the test procedure.



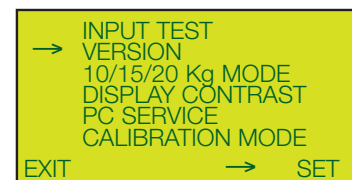
MAIN MENU



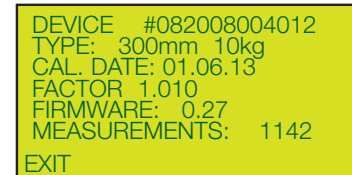
SERVICE MENU



INPUT TEST MENU



SERVICE MENU



VERSION MENU

7.7.3 Device Type 10 / 15 Kg

Turn on the device by pressing the „START“ button. Enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „SERVICE“ from the menu. Press the „START“ button (SET) to enter the „SERVICE“ menu.

Use the „SELECT“ button to move the arrow and select „10 / 15 KG MODE“ from the menu.

Press the „START“ button (SET) to enter the „10 / 15 KG MODE“ menu.

The display will show plate diameter and the currently selected device version with 10 or 15 kg loading device. You can change the device version by pressing the „START“ button (SET). The 20 kg loading device cannot be selected; this is reserved for planned future changes.

Press the „RESET/OFF“ button (EXIT) to return to the „SERVICE“ menu. Press the „RESET/OFF“ button (EXIT) again to return to the „MAIN MENU“. Press the „RESET/OFF“ button (EXIT) again to return to the „STATUS REQUEST“. Pressing the „START“ button will start the test procedure.

7.7.4 Display Contrast

Turn on the device by pressing the „START“ button. Enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „SERVICE“ from the menu. Press the „START“ button (SET) to enter the „SERVICE“ menu.

Use the „SELECT“ button to move the arrow and select „DISPLAY CONTRAST“ from the menu.

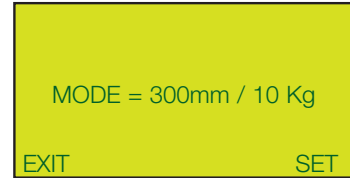
Press the „START“ button (SET) to enter the „CONTRAST“ menu.

The display contrast may be adapted by using the „PRINT“ (-) and „SELECT“ (+) buttons.

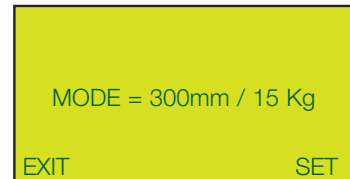
Press the „RESET/OFF“ button (EXIT) to return to the „SERVICE“ menu. Press the „RESET/OFF“ button (EXIT) again to return to the „MAIN MENU“. Press the „RESET/OFF“ button (EXIT) again to return to the „STATUS REQUEST“. Pressing the „START“ button will start the test procedure.



SERVICE MENU



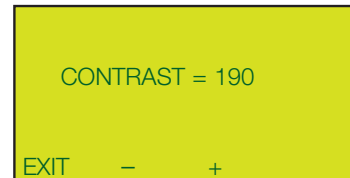
10 / 15 KG MODE MENU



10 / 15 KG MODE MENU



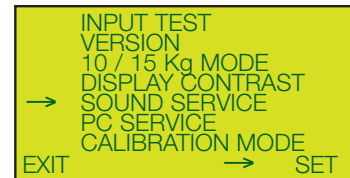
SERVICE MENU



CONTRAST MENU

7.7.5 Voice Output: Sound Service („TERRATEST 5000 BLU“ ONLY)

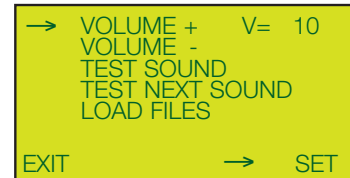
Turn on the device by pressing the „START“ button. Enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „SERVICE“ from the menu. Press the „START“ button (SET) to enter the „SERVICE“ menu.



SERVICE MENU

Use the „SELECT“ button to move the arrow and select „SOUND SERVICE“ from the menu.

Press the „START“ button (SET) to enter the „SOUND SERVICE“ menu.



SOUND SERVICE MENU

You can then adapt the volume level of the voice output. The symbol „V=...“ shows the currently selected volume, minimum 0, maximum 20.

To increase the volume, use the „SELECT“ button to move the arrow and select „VOLUME +“ from the menu. Press the „START“ button (SET), until the desired volume is reached.

To decrease the volume, use the „SELECT“ button to move the arrow and select „VOLUME -“ from the menu. Press the „START“ button (SET), until the desired volume is reached.

To test the selected volume, use the „SELECT“ button to move the arrow and select „TEST SOUND“ or „TEST NEXT SOUND“ from the menu. Press the „START“ button (SET). A voice instruction in the selected volume will follow.

The menu entry „LOAD FILES“ permits TERRATEST GmbH to install other language versions (if available). Only one language per device can be used at a time.

Press the „RESET/OFF“ button (EXIT) to return to the „SERVICE“ menu. Press the „RESET/OFF“ button (EXIT) again to return to the „MAIN MENU“. Press the „RESET/OFF“ button (EXIT) again to return to the „STATUS REQUEST“. Pressing the ‘START’ button will start the test procedure.

7.7.6 PC Service and Calibration Mode

The menu entries „PC SERVICE“ and „CALIBRATION MODE“ are reserved for factory settings and calibration mode. They can be used only by TERRATEST GmbH.

7.7.7 BT Sensor Dome - Connection („TERRATEST 5000 BLU“ ONLY)

7.7.7.1 Stand-by Time

The testing computer can be operated in two measuring modes: „SINGLE MEASURING MODE“ and „CONTINUOUS MEASURING MODE“. If several tests shall be performed in a limited period of time, it is useful to set the testing computer to „CONTINUOUS MEASURING MODE“. If set to „SINGLE MEASURING MODE“ (default setting), the testing computer must be operated between the single tests by pressing the appropriate buttons on the testing computer. If set to „CONTINUOUS MEASURING MODE“, the next test will be started if the drop weight is firmly latched back into the release mechanism on top of the guide rod. (Also see „Continuous Measuring Mode“ on page 43).

Turn on the device by pressing the „START“ button. Enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „CONNECTION“ from the menu. Press the „START“ button (SET) to enter the „CONNECTION“ menu.

Use the „SELECT“ button to move the arrow and select „STAND-BY TIME“ from the menu.

Press the „START“ button (SET) to enter the „STAND-BY TIME“ menu.

The current settings will be displayed.

Using the „SELECT“ button you can increase the stand-by time by 5-minute increments, up to a maximum of 30 minutes. Values greater than zero imply that the testing computer is operating in „CONTINUOUS MEASURING MODE“, and will only switch itself off after an inactivity of the time set.

Using the „PRINT“ button you can decrease the time by 5-minute increments, up to a minimum of 00 minutes. The testing computer will operate in „SINGLE MEASURING MODE“ if the time is set to „00 MIN“.

Press the „RESET/OFF“ button (EXIT) to accept the selected time settings and return to the „SERVICE“ menu. Press the „RESET/OFF“ button (EXIT) again to return to the „MAIN MENU“. Press the „RESET/OFF“ button (EXIT) again to return to the „STATUS REQUEST“. Pressing the „START“ button will start the test procedure. The voice output will confirm if the „CONTINUOUS MEASURING MODE“ is turned on successfully by announcing „CONTINUOUS MEASURING MODE ON“.

7.7.7.2 Bluetooth Pairing

The menu entry „BLUETOOTH PAIRING“ is reserved for factory settings and calibration mode. It can be used only by TERRATEST GmbH.



MAIN MENU



CONNECTION MENU



8. „TERRATEST 2.0“ Software

All Light Weight Deflectometers from TERRATEST GmbH are supplied with a user-friendly software, which can be used to analyse the test data on a PC. This analysis meets the requirements of the German standard TP BF-StB Part B 8.3. The software can be run on MS Windows XP, MS Windows 2000, MS Windows Vista, MS Windows 7 and MS Windows 8.

To ensure full functionality, including the Google® Maps interface, the „TERRATEST 2.0“ software requires an Internet connection and a browser. Ensure that the Internet browser installed on your PC connects to the Internet.

8.1 Uninstalling the „TERRATEST 2.0“ Software

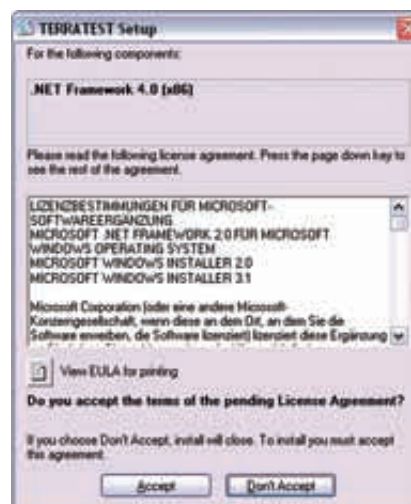
If an older version of „TERRATEST 2.0“ is already installed on your PC, it must be uninstalled before the installation of the current version. The new software cannot be installed otherwise. Use the uninstall routine of the software as follows:

Go to START -> CONTROL PANEL -> SOFTWARE, select the „TERRATEST 2.0“ software and click the „Change / Remove“ button. Your PC will then automatically uninstall the existing version of „TERRATEST 2.0“.

8.2 (Re-) Installing the „TERRATEST 2.0“ Software

Insert the CD „TERRATEST 2.0“ into your PC. The installation of the program will start automatically. If it does not start automatically, go to START -> My Computer -> CD Drive and start the file „Setup.exe“ from the CD.

If „NET Framework 4.0“, a necessary component for the software application, is not already installed on your PC, this will be installed first. Confirm the license agreement by clicking „Accept“.



Once the installation of „NET Framework 4.0“ is complete, the installation wizard will start automatically. This installation program will guide you through the rest of the installation.

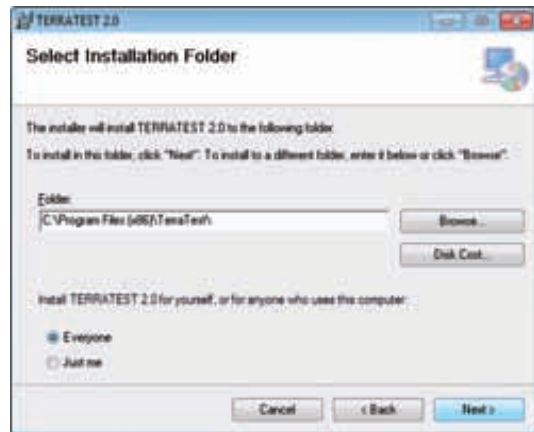
Click „Next“ to start the installation.



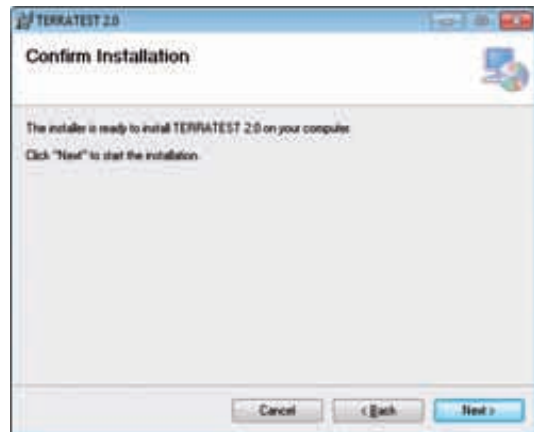
Confirm the installation directory, or select another location for the software data.

Select the user rights by checking the appropriate option field.

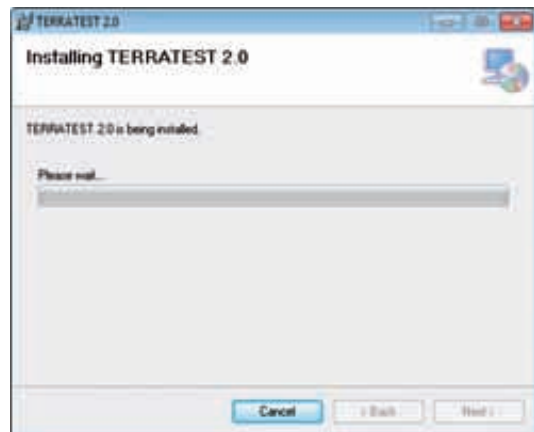
Confirm your selection by clicking „Next“.



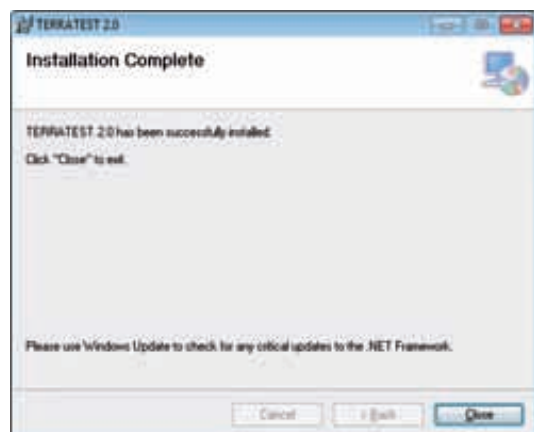
The confirmation screen will open. Confirm by clicking „Next“.



Next, the main installation process of the „TERRATEST 2.0“ software will start. This may take a few minutes.



A new window will open, confirming the successful installation. Click „Close“ to close the application.



8.3 Using the „TERRATEST 2.0“ Software

If the default settings have not been changed during installation, the „TERRATEST 2.0“ software is now stored in the „PROGRAM FILES“ folder. Additionally, a shortcut to start the program will have appeared on your desktop in form of a small TERRATEST logo on a white square.

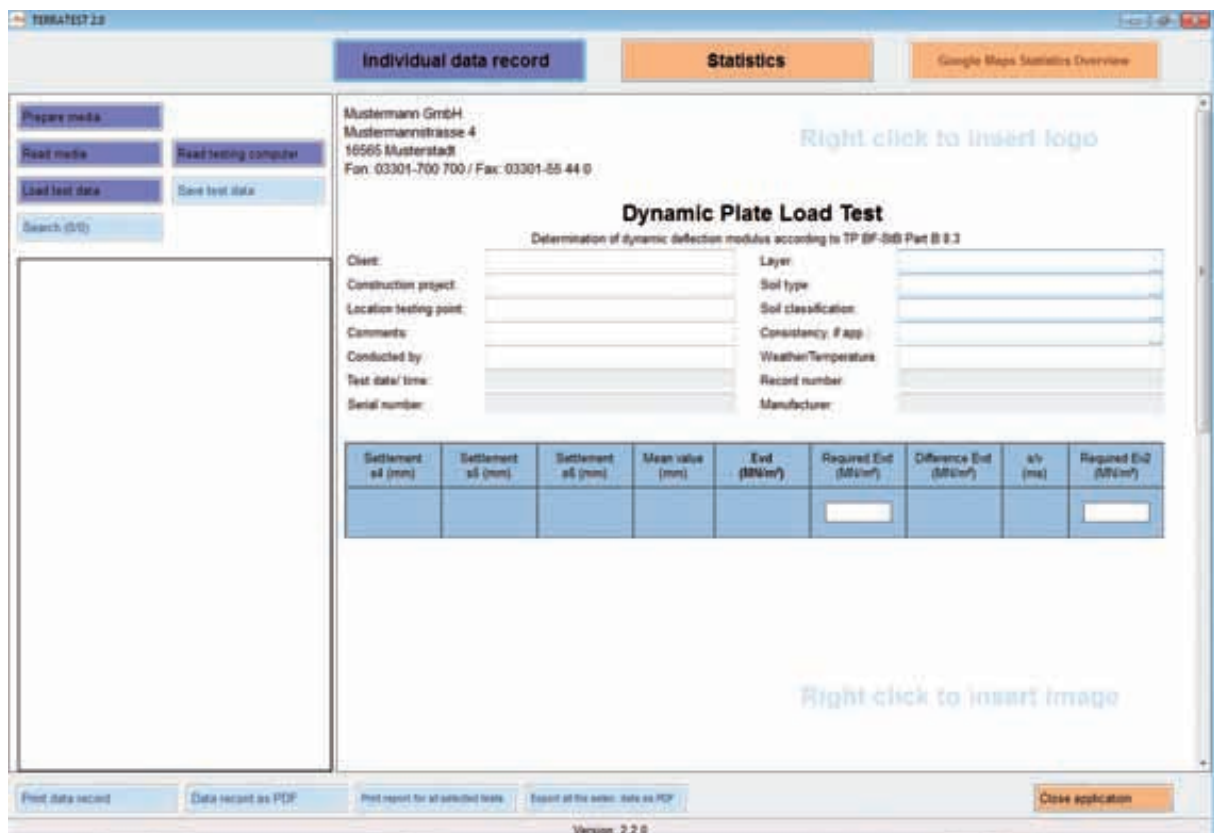
To start the software go to START -> PROGRAMS -> TERRATEST -> TERRATEST 2.0 or simply double-click on the TERRATEST logo on the desktop. The **main screen** of the „TERRATEST 2.0“ software will open automatically.

The screen is divided into four areas: On the left hand side is a utility to load test data (depending on the selection made, either from the chip card, the SD card, the USB stick, the testing computer, or already processed test data from previous tests stored on the PC) and prepare external media for test data storage. To do so, choose the corresponding button. Once the test data has been imported, a summary will be displayed at the top left in the form of a list including data record number, date, time, and Evd value.

On the right hand side is a preview of the test protocol, including the settlement curves, or, if you click on the button „Statistical Analysis“ on top, the chart for the statistical analysis of the test data in accordance with the German standard TP BF-StB Part B 8.3.

There are three buttons on top of the screen: one button to display individual data records, one button for statistical analysis, and one button to call up a Google® Maps overview of all testing points selected for the statistical analysis.

Located on the bottom of the screen are buttons for various printing functions of the individual data records, as well as the „Exit“ button for closing the „TERRATEST 2.0“ software.



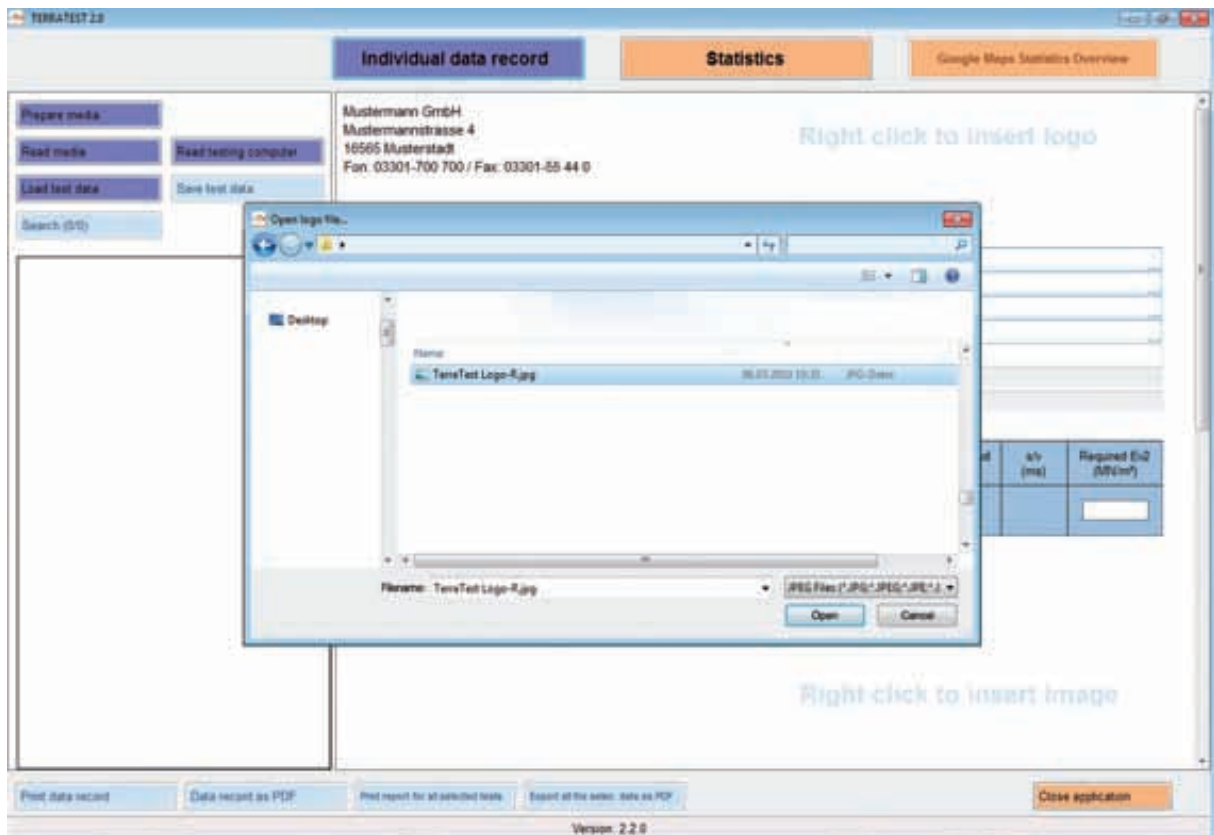
The main screen for processing of test data: on the left, the window for the test data list; on the right, the test protocol for the individual test; on the top, buttons for the different display options; on the bottom, buttons for the printing functions and the „Exit“ button.

8.3.1 Editing Logo and Company Data

Your company logo can be inserted in the top right corner of every report. To change or add a logo, simply right-click on the area in the top right corner of the screen. A selection window will open in which the relevant image file (supported formats: *.bmp, *.jpg, *.gif, *.tif, *.png) may be selected. The logos will be scaled and displayed automatically. To remove a logo, right-click on it, and select „Remove logo“ from the menu.

Additionally, company data can be entered on the top left of the test protocol. Once entered, the logo and company data will automatically be saved, and will subsequently be shown on all protocols.

The fields provided for the printing of company data and logo will remain blank if no data is entered. Any company data and logo will remain saved until replaced.



Importing the company logo by right-clicking on the logo area.

8.3.2 Prepare Media

8.3.2.1 SD Card („TERRATEST 5000 BLU“ ONLY)

The Light Weight Deflectometer „TERRATEST 5000 BLU“ is supplied with an SD card, which is already prepared for recording the test data. Other SD cards need to be prepared for saving the test data by using the „TERRATEST 2.0“ software.

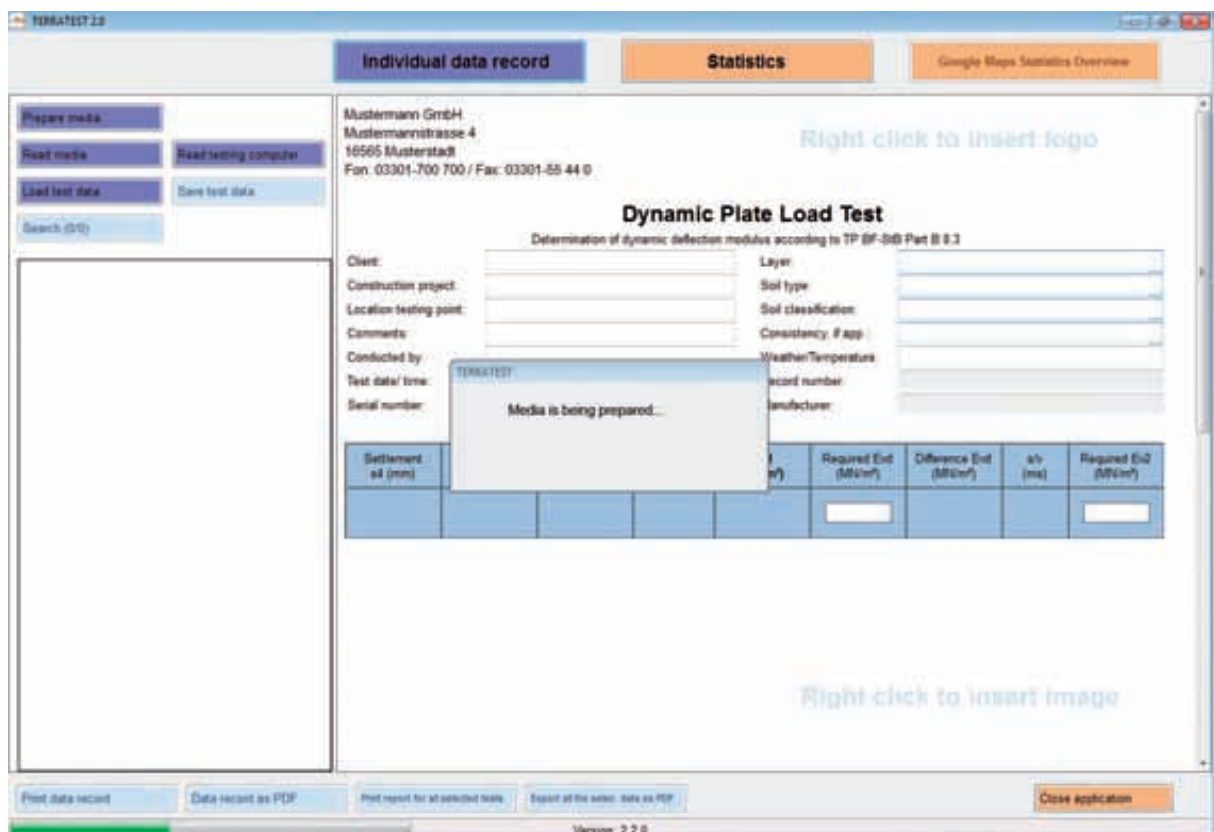
Only SD cards with a capacity of 2 GB can be used.

To prepare an SD card, insert the SD card into the SD card slot of the PC, or in the slot of an SD card reader. Make sure that software and driver of the SD card slot, or the SD card reader, are correctly installed on your PC and that the media is mounted correctly.

Click on the button „PREPARE MEDIA“. A folder pane will open. Select the SD card drive and confirm your selection with „OK“. A warning will appear, advising that all data on the card will be deleted. Ensure that you have selected the correct media and that you want to delete all data saved on the media. Acknowledge the warning with „OK“. A progress bar on the bottom left will indicate the progress of the formatting process. When the process is complete, you will receive the message „Media has successfully been prepared for the testing computer“.

8.3.2.2 USB Stick („TERRATEST 4000 USB“ ONLY)

The Light Weight Deflectometer „TERRATEST 4000 USB“ is supplied with a USB stick, which is already prepared for recording the test data. If you want to use other USB sticks, these must be empty. In order to use a USB stick for saving test data, no files or folders other than those created by the testing computer of the Light Weight Deflectometer during the test should be saved on the stick.



An SD card is being prepared for recording the test data. The bar in the bottom left corner indicates the progress.

8.3.3 „TERRATEST 4000 USB“ – Reading USB Stick

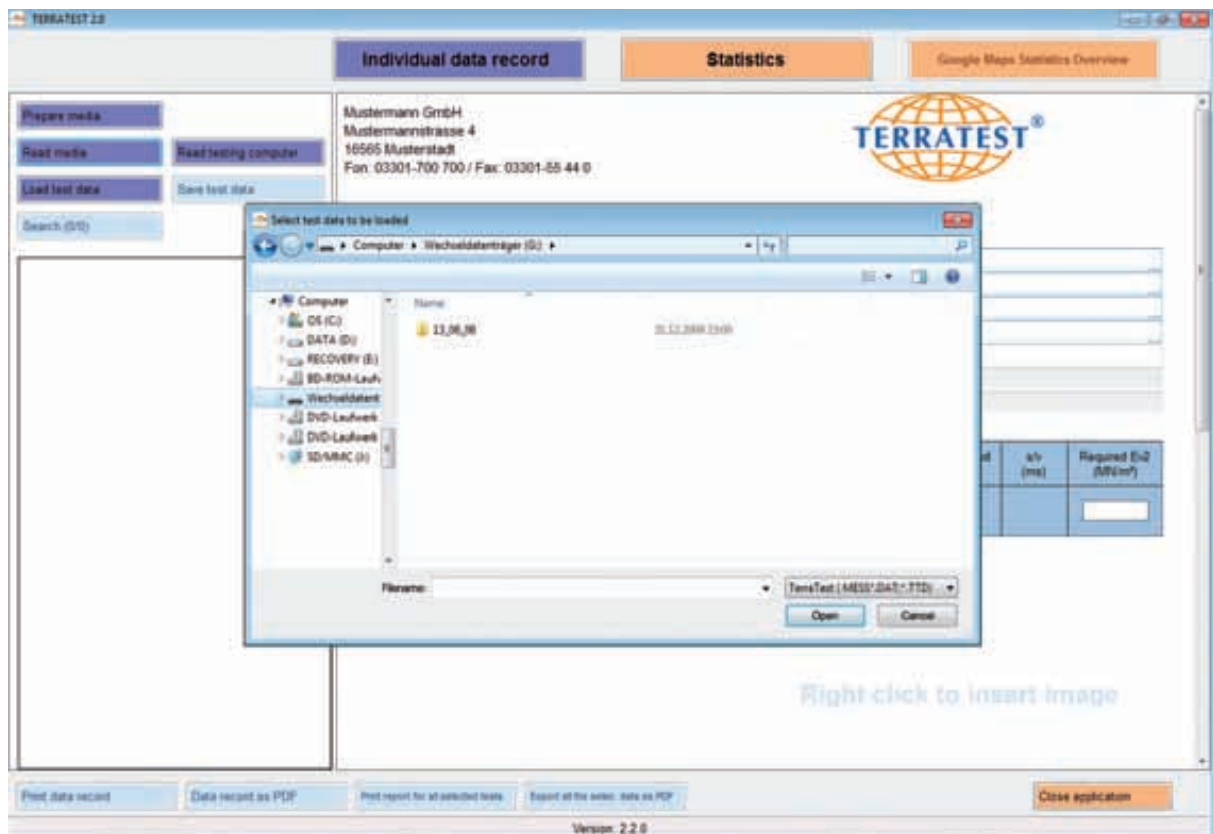
To load data from the USB stick, insert it into the USB port of your PC.

Make sure that the software and driver of the USB stick are correctly installed on your PC, and that the media is mounted correctly.

Click on the button „READ MEDIA“. A file window will open. Select the USB stick, then the folder, showing the date of the test(s) in question. Finally, select the test data to be loaded. Click „OPEN“ to load the test data from the USB stick. A progress bar will indicate the progress of the transfer. Once loading is complete, the test data will appear in the left window as a test data list, including data record number, date, time, and Evd value. The test data is now ready for processing.

If there is no data stored on the USB stick, you will receive the message „NO DATA AVAILABLE“, once reading is complete.

The content of only one folder, one external media device, or the testing computer can be displayed in the test data list at any one time. If you would like to include several test series in one test data list, save all required data records in the same folder. Then, load it into the „TERRATEST 2.0“ software by clicking on the button „LOAD TEST DATA“.



In the folder pane you can select the tests to be loaded. The test data of one working day has been saved in one folder, named accordingly.

8.3.4 „TERRATEST 5000 BLU“ – Reading SD Card

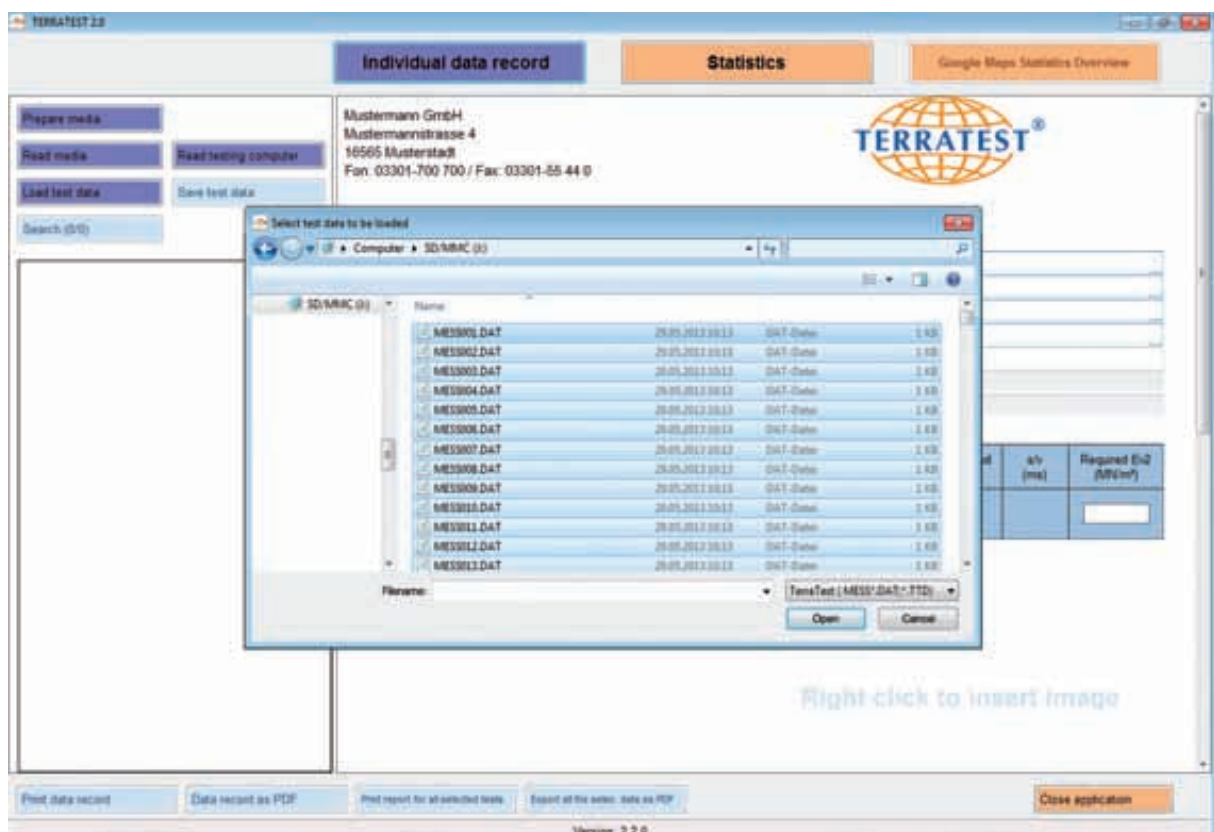
To load data from the SD card, insert the card into the SD card slot of your PC.

Make sure that software and driver of the SD card reader are correctly installed on your PC, and that the media is mounted correctly.

Click on the button „READ MEDIA“. A file window will open. Select the SD drive and then the test data to be loaded. Click „OPEN“ to load the test data from the SD card. A progress bar indicates the progress of the reading process. Once loading is complete, the test data will appear in the left window as a test data list, including data record number, date, time, and Evd value. The test data is now ready for processing.

If there is no data stored on the SD card, you will receive the message „NO DATA AVAILABLE“, once reading is complete.

The content of only one folder, one external media device, or the testing computer can be displayed in the test data list at a any one time. If you would like to include several test series in one test data list, save all required data records in the same folder. Then, load it into the „TERRATEST 2.0“ software by clicking on the button „LOAD TEST DATA“.



In the folder pane you can select the tests to be loaded.

8.3.5 Reading Chip Card („TERRATEST 3000 GPS“ ONLY – no longer available)

To load data from the chip card (the credit card sized media), plug the external chip card reader into the USB cable port of your PC. After the operating system has successfully recognised the card reader, two further buttons will appear in the „TERRATEST 2.0“ software. Insert the chip card, with the memory chip facing downwards, into the slot of the chip card reader.

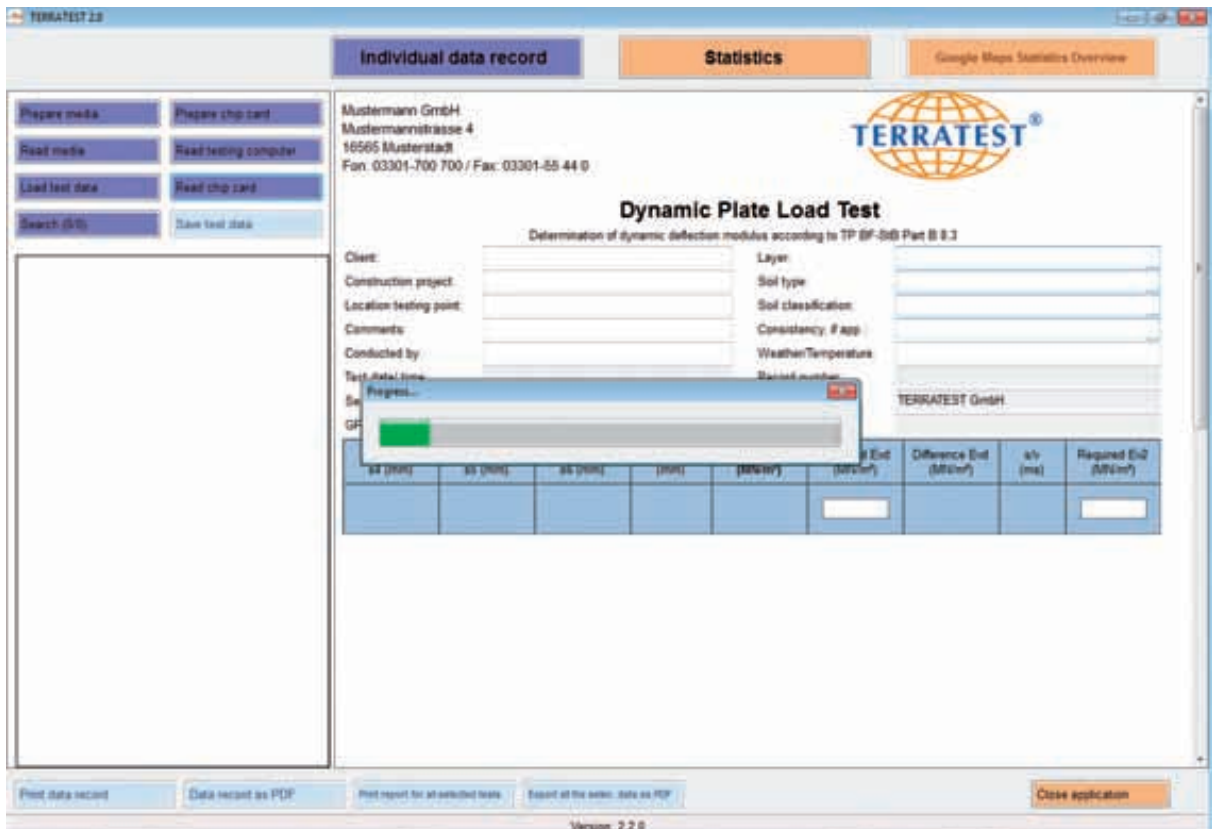
Make sure that software and driver of the chip card reader are correctly installed on your PC; you will receive the error message „NO CARD READER FOUND“ otherwise. In this case, install the software and driver, which can be found on the software CD in the directory „Driver SCR3311“.

Click on the button „READ CHIP CARD“. A progress bar will open, indicating the progress of downloading the test data from the chip card. All test data saved on the chip card will be loaded and displayed as a test data list, including data record number, date, time, and Evd value in the top left window. The test data is now ready for processing.

If there is no data stored on the chip card, you will receive the message „NO DATA AVAILABLE“, once reading is complete.

The content of only one folder, one chip card, or the testing computer can be displayed in the test data list at any one time. If you would like to include several test series in one test data list, save all required data records in the same folder. Then, load it into the „TERRATEST 2.0“ software by clicking on the button „LOAD TEST DATA“.

All data can be deleted from the chip card by clicking on the button „PREPARE CHIP CARD“.



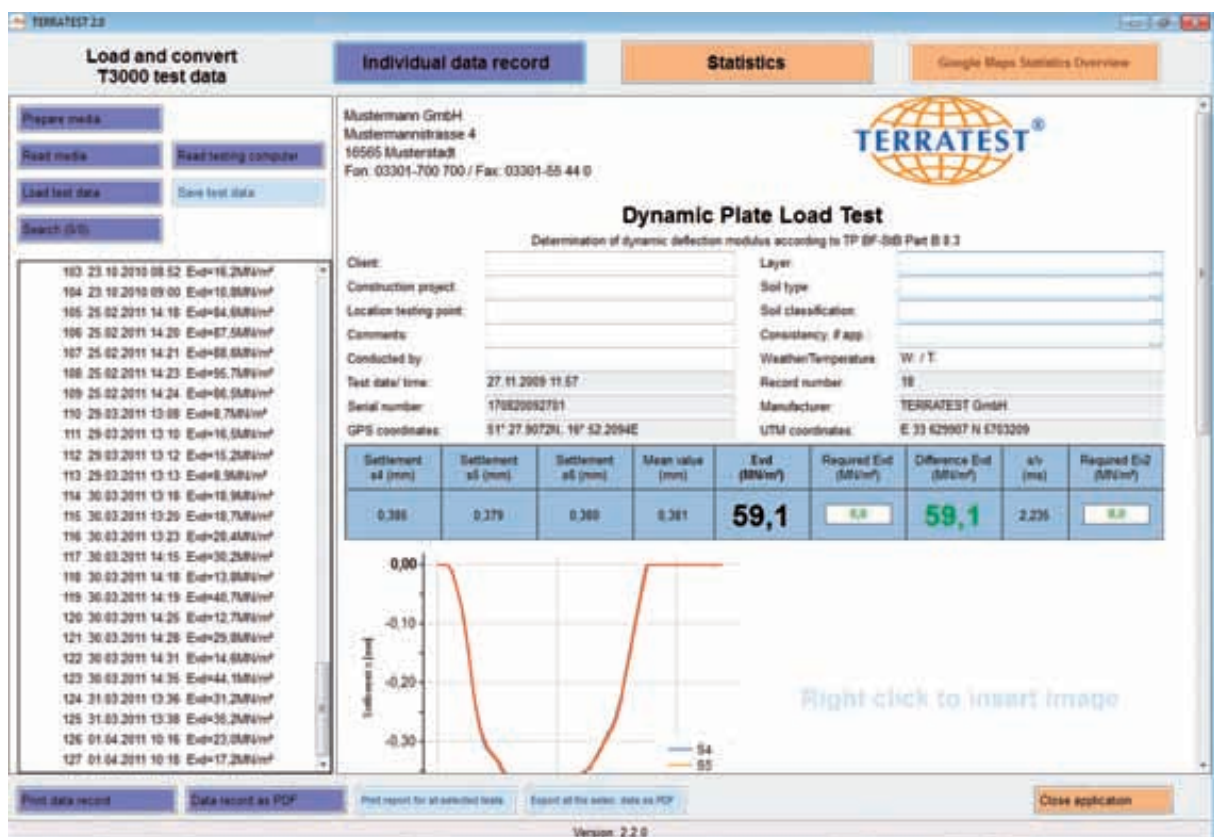
The bar indicates the progress of downloading the test data from the chip card.

8.3.6 Converting Old Test Data

The data format for saving the test data on the PC has been modified, in order to use the new features of the „TERRATEST 2.0“ software. To be able to use older test data stored on the PC using a previous version of the „TERRATEST“ software, this data must first be converted into the new data format. Test data stored on large chip cards (credit card sized external media) will automatically be converted into the new data format, when being loaded with the „TERRATEST 2.0“ software.

Right-click on the button „LOAD TEST DATA“ and select „LOAD AND CONVERT T3000 TEST DATA“. A file window will open. Navigate to the location of your saved test data and then select the test data to be converted. After confirming by clicking „OPEN“ a second file window will appear, asking you to choose a new save location for the newly converted data.

Once the conversion process is complete, the test data will appear as a test data list including data record number, date, time, and Evd value in the left window. The test data is now ready for further processing.



Load and convert T3000 test data

Individual data record

Statistics

Google Maps Statistics Overview

Prepare media
Read media
Load test data
Search (S/F)

Read testing computer
Save test data

Mustermann GmbH
Mustermannstrasse 4
16565 Musterstadt
Fax: 03301-700 700 / Fax: 03301-55 44 0

TERRATEST

Dynamic Plate Load Test
Determination of dynamic deflection modulus according to TP 09-080 Part B 0.3

Client: _____ Layer: _____
Construction project: _____ Soil type: _____
Location testing point: _____ Soil classification: _____
Comments: _____ Consistency / f app: _____
Conducted by: _____ Weather/Temperature: W / T: _____
Test date / time: 27.11.2009 11:57 Record number: 18
Serial number: 170820092701 Manufacturer: TERRATEST GmbH
GPS coordinates: 51° 27' 50.72N, 10° 52' 20.94E UTM coordinates: E 33 62907 N 4703209

Settlement s4 (mm)	Settlement s5 (mm)	Settlement s6 (mm)	Mean value (mm)	Evd (MN/m²)	Required Evd (MN/m²)	Difference Evd (MN/m²)	s4/s5 (ms)	Required Evd (MN/m²)
0.386	0.379	0.380	0.381	59,1	0,0	59,1	2,235	0,0

0,00
-0,10
-0,20
-0,30

Right click to insert image

Print data record
Data record as PDF
Print report for all selected tests
Export all the selected data as PDF
Close application

Version: 2.2.0

A note on top of the left buttons indicates that the data shown is old-format test data converted into the new data format.

8.3.7 Test Protocol of Individual Tests

The test protocol (for an example, see page 70) is divided into four areas:

Protocol heading, with general information about the test and the test instrument

Test result chart, with the recorded test results and the required E_{vd} value

Settlement curves, with a presentation of the course of the three settlement curves, as well as a picture of the testing point, if added

Google® Maps satellite picture of the GPS coordinates (where these exist)

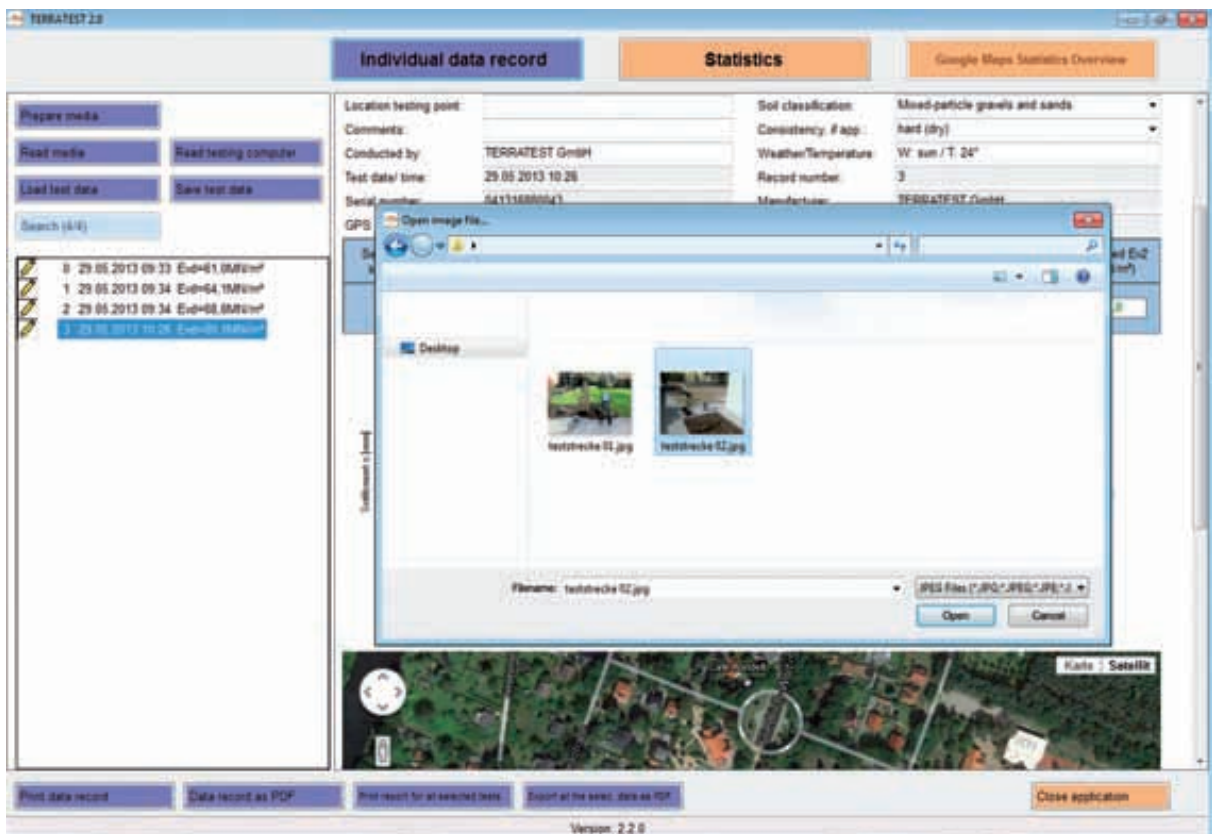
The following data will automatically be entered in the protocol heading for each individual test: device manufacturer, serial number, device type, data medium number, data record number, test date and time, GPS coordinates (if GPS is in use), and comments (where these have been entered via the text input function on the testing computer). Find out how to enter other project-specific data by referring to the chapter „**Edit / Save Protocol**“. **This data cannot be altered / edited.**

In the test result chart are listed the three recorded individual settlements in mm, the mean value of the three individual settlements in mm, the E_{vd} value in MN/m², the discrepancy between this and the required E_{vd} value (entered manually beforehand), the s/v value in ms, and the required E_{v2} value (entered manually beforehand).

On the left hand side, below the test result chart, the three settlement curves are shown in different colours (s₄= red, s₅= green, s₆= blue). From the shape of the settlement curves, the test duration, maximum settlement, and the course of the settlement can be deduced. If the ground has already been compacted, then the three settlement curves should be nearly congruent.

On the right hand side of the test result chart, a picture of the testing point can be uploaded. The picture will be saved upon saving of the test data.

If GPS coordinates are available, and if a connection to the Internet exists, a Google® Maps display of the testing point will be added to the individual data record. It will feature the typical Google® Maps controls, and can thus be switched between satellite and map view, or zoomed in and out, for a better presentation.



A picture of the testing point can be added to every test protocol. It will be saved together with the test data.

TERRATEST 2.8
Individual data record
Statistics
Google Maps Statistics Overview

Prepare media

Read media Read testing computer

Load test data Save test data

Search (4/4)

- 0 29.05.2013 09:33 Evd=61,0MN/m²
- 1 29.05.2013 09:34 Evd=64,1MN/m²
- 2 29.05.2013 09:34 Evd=68,6MN/m²
- 3 29.05.2013 10:26 Evd=80,1MN/m²

Print data record Data record as PDF

Mustermann GmbH
Mustermannstrasse 4
16565 Musterstadt
Fon: 03301-700 700 / Fax: 03301-55 44 0

Dynamic Plate Load Test

Determination of dynamic deflection modulus according to TP 8F-Sd Part B 9.3

Client:

Construction project:

Location testing point:

Comments:

Conducted by:

Test data / time: 29.05.2013 10:26

Serial number: 64131888043

GPS coordinates: 52° 44.8129N, 13° 15.8014E

Layer:

Soil type:

Soil classification:

Consistency, f App:

Weather/Temperature: W / T

Record number: 3

Manufacturer: TERRATEST GmbH

UTM coordinates: E 33 362625 N 5845156

Settlement s4 (mm)	Settlement s5 (mm)	Settlement s6 (mm)	Absen value (mm)	Evd (MN/m²)	Required Evd (MN/m²)	Difference Evd (MN/m²)	s/n (ms)	Required Evd (MN/m²)
0,296	0,282	0,266	0,281	80,1	61,0	15,1	2,295	120,0

The test data list on the left specifies all individual measurements loaded to the PC. A satellite picture of the testing point is displayed on the bottom right for the selected test. On the top right the individual data record with its three settlement curves is shown. In the space next to it, a picture of the testing point can be uploaded, if desired.

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 16565 Musterstadt
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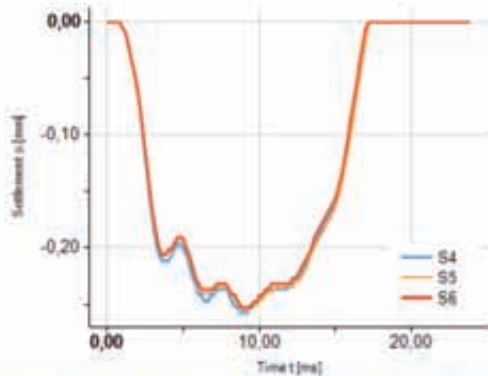


Dynamic Plate Load Test

Determination of dynamic deflection modulus according to TP BF-StB Part B 8.3

Client:	TERRATEST GmbH	Layer:	Naturally grown soil
Construct. project:	ACB AB	Soil type:	Sand
Loc. test. point:		Soil classification:	Mixed-particle gravels and sands
Comments:		Consistency:	hard (dry)
Conducted by:	TERRATEST GmbH	Weather/Temp.:	W: sun / T: 24°C
Test date/ time:	12.06.2013 10:57	Record number:	1
Serial number:	041316880027	Manufacturer:	TERRATEST GmbH
GPS coordinates:	52° 44.6161N, 13° 15.8486E	UTM coordinates:	E 33 382822 N 5845162

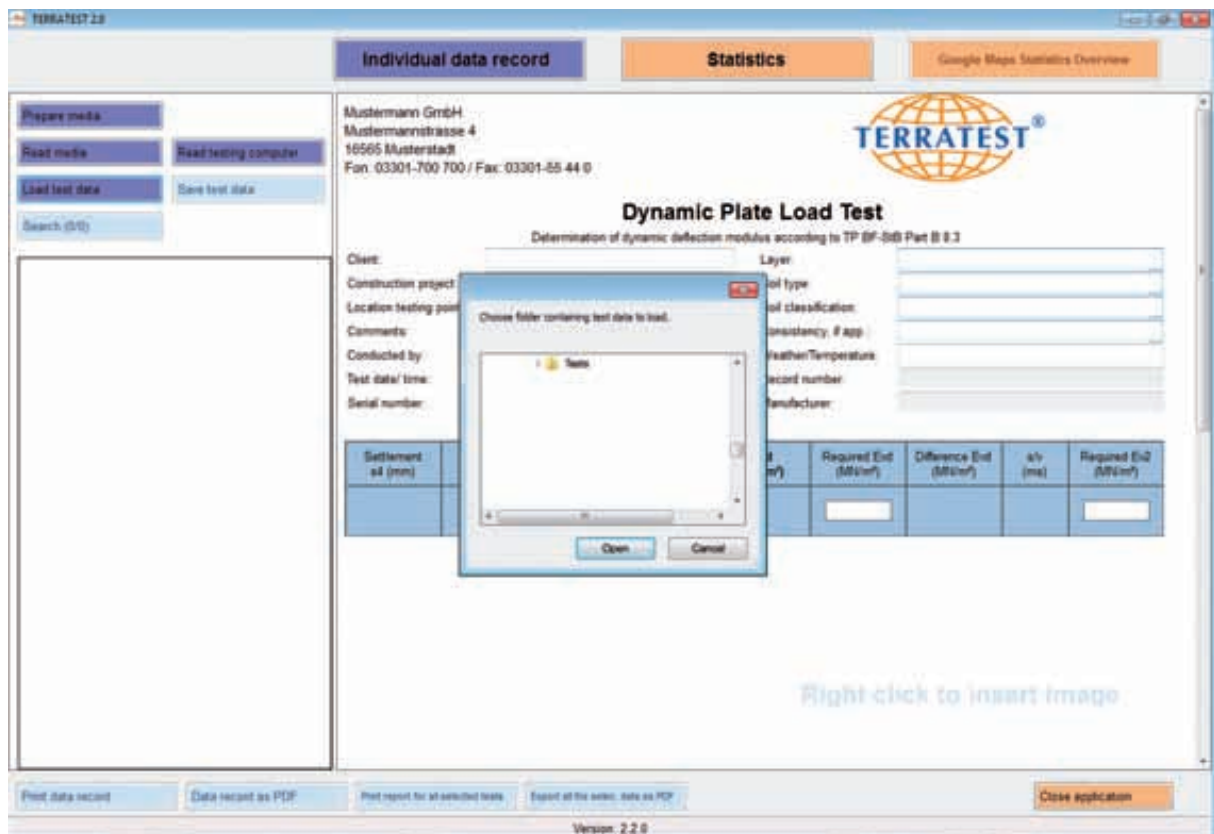
Settlement s4 (mm)	Settlement s5 (mm)	Settlement s6 (mm)	Mean value (mm)	Evd (MN/m ²)	Required Evd (MN/m ²)	Difference Evd (MN/m ²)	s/v (ms)	Required Ev2 (MN/m ²)
0,257	0,255	0,252	0,254	88,6	65,0	23,6	2,077	120,0



8.3.8 Test Data Loading

To load previously stored test data from a media (PC, USB stick, SD card, etc.), click on the button „LOAD TEST DATA“. The file catalogue, in which the last test data has been saved, will open. Select the desired test data and confirm your selection with „OK“. The stored test data will be loaded and displayed as a diagram, with data record number, date, time, and Evd value. The data is now ready for further processing.

The content of only one folder, one external media device, or the testing computer can be displayed in the test data list at any one time. If you would like to include several test series in one test data list, save all required data records in the same folder. Then, load it into the „TERRATEST 2.0“ software by clicking on the button „LOAD TEST DATA“.



To load previously stored data, click on 'LOAD TEST DATA' and select the storage location of the saved data. Confirm with 'OK' and the data will be loaded.

8.3.9 Loading Data from Testing Computer

To load test data from the internal memory of the testing computer, connect the testing computer to the USB cable port of the PC. If no connection was made previously, the message „PLEASE CONNECT TO USB-PORT OF PC“ will appear on the display.

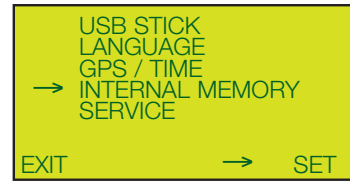
Make sure that the driver of the testing computer is correctly installed on your PC. For information about the installation of the driver, read the chapter „**Driver Installation for Testing Computer**“. The driver can be found on the supplied CD ROM.

To download the test data from the testing computer, turn on the device by pressing the „START“ button. Enter the „MAIN MENU“ by pressing the „SELECT“ button. Use the „SELECT“ button to move the arrow and select „INTERNAL MEMORY“ from the menu. Press the „START“ button (SET) to enter the „INTERNAL MEMORY“ menu.

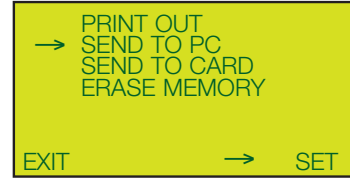
Position the arrow on „MEMORY TO PC“ and press the „START“ button (SET) to load the test data directly to the „TERRATEST 2.0“ software.

Upon establishing a successful USB connection, „PC connected“ will appear on the display. Click on the button „READ TESTING COMPUTER“. A progress bar will open, indicating the downloading progress of the test data. The test data stored on the testing computer will now be loaded and subsequently shown in the left window as a test data list, including data record number, date, time, and Evd value. The test data is now ready for processing.

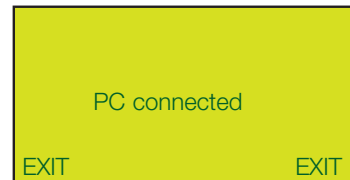
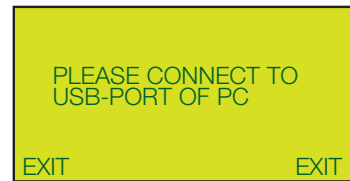
The content of only one folder, one external media device, or the testing computer can be displayed in the test data list at any one time. If you would like to include several test series in one test data list, save all required data records in the same folder. Then, load it into the „TERRATEST 2.0“ software by clicking on the button „LOAD TEST DATA“.

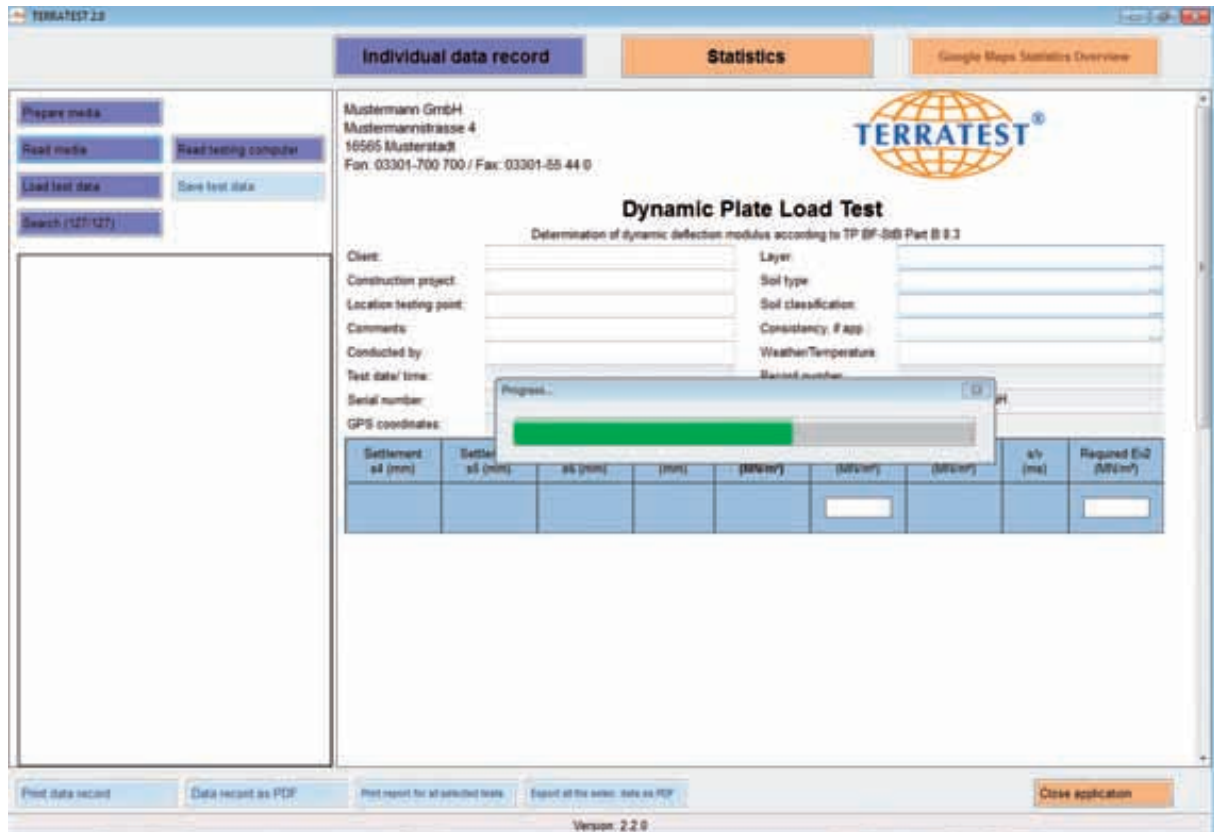


MAIN MENU



INTERNAL MEMORY MENU





To download the test data from the testing computer, connect it to the USB cable port of your computer and establish the connection via the menu of the testing computer.

8.3.10 Driver Installation for Testing Computer

When the testing computer is being connected to the PC for the first time, the corresponding driver will need to be installed from the supplied CD ROM „TERRATEST 2.0“.

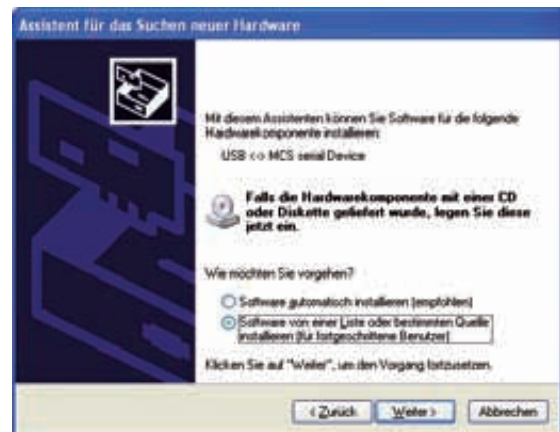
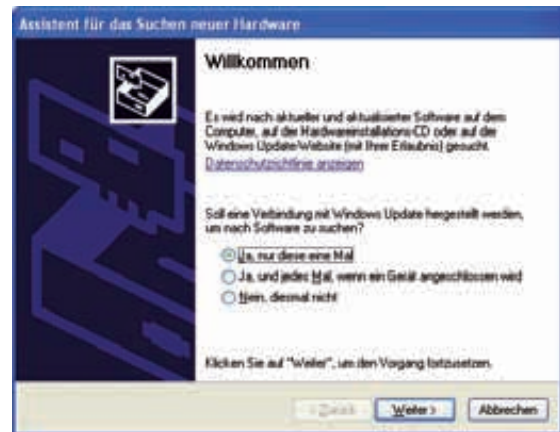
Insert the CD ROM „TERRATEST 2.0“ into the CD drive of your PC.

When connecting the testing computer to your PC you will automatically be informed about the required driver. To install the driver for the testing computer on your PC, check „YES, THIS TIME ONLY“ and then click „CONTINUE“.

In the next window check „INSTALL SOFTWARE FROM A LIST OR A SPECIFIC SOURCE“ and click „CONTINUE“.

In the following window check „BROWSE THESE SOURCES IN SEARCH FOR THE MOST APPROPRIATE DRIVER“ and additionally „BROWSE REMOVABLE MEDIA“. Then click „CONTINUE“.

Your PC will search the „TERRATEST 2.0“ CD ROM for the required driver.



Since the driver has not been certified by Microsoft® for MS Windows®, you will be asked if you would like to continue with the installation. Confirm by clicking „CONTINUE INSTALLATION“.



The driver will then be installed.



To finish, confirm the driver installation with „COMPLETE“.

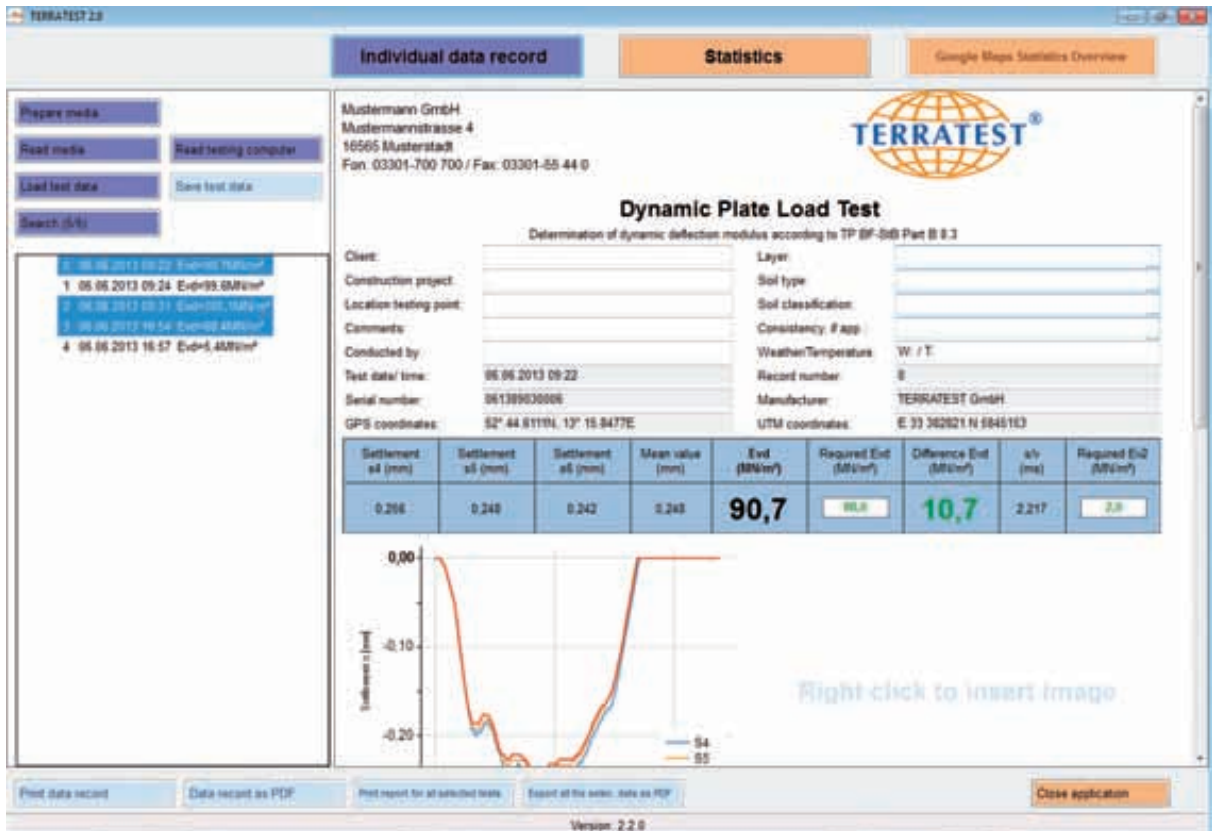
The driver for the testing computer is now installed on your PC.



8.3.11 Edit / Save Protocol

In order to edit the test protocols of individual tests, left-click on the desired individual data record from the test data list in the left window. If you would like to select several successive data records, left-click on the first and the last data record, while holding down the Shift key. All selected data records are highlighted blue and activated for editing.

If you would like to select several data records that do not appear next to each other in the list, left-click on the desired data records while holding down the Ctrl key. All selected data records are highlighted blue and activated for editing.



The screenshot shows the TERRATEST 2.0 software interface. The main window is titled "Individual data record" and displays details for a "Dynamic Plate Load Test". The test details include client information (Mustermann GmbH), test date (06.06.2013 09:22), and test results. A table below the details shows settlement and E_{vd} values for three different settlements (s4, s5, s6).

Settlement s4 (mm)	Settlement s5 (mm)	Settlement s6 (mm)	Mean value (mm)	E _{vd} (MN/m²)	Required E _{vd} (MN/m²)	Difference E _{vd} (MN/m²)	a/v (ms)	Required E _{vd} (MN/m²)
0.268	0.248	0.242	0.243	90,7	90,0	10,7	2.217	2,0

Below the table is a graph showing settlement (mm) versus time (ms) for two different settlements (s4 and s5). The graph shows a sharp initial drop in settlement followed by a gradual increase and then a plateau.

The data records to be edited must be selected by left-click; they will then be highlighted blue.

To enable editing of the selected data records, right-click and select „EDIT“ from the menu. All data records selected for editing will be marked with a pen symbol in front of each respective data record. Select any data record marked with the pen symbol and edit the blank fields of the individual data record by entering site-specific data, including the required E_{vd} value. Your entered data will automatically be copied into all data records selected for editing.

Exempt from this automatic copy are the fields „LOCATION TESTING POINT“ and „COMMENTS“. These may be edited separately for each individual data record. If the data input function of the testing computer has been used at the start of the respective test, the field „COMMENTS“ will contain the data entered from the testing computer. Further comments can be added to this field.

In the field „LOCATION TESTING POINT“, data can be entered manually. If the data record is selected for statistical analysis, the entered data will be applied to the analysis, and will not have to be entered again.

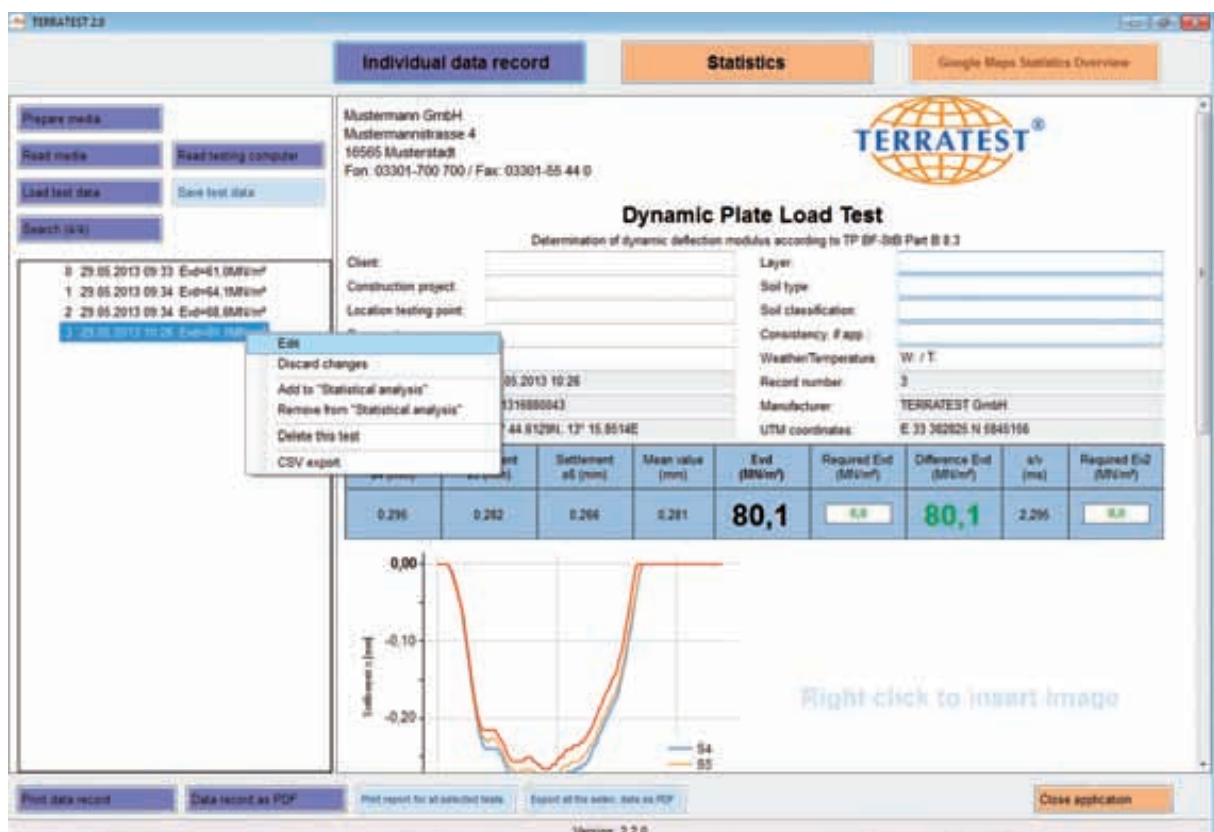
To describe the soil characteristics of the testing point in the individual data record, you can either enter data manually or use the drop-down buttons, which contain a selection of the most common descriptions.

For each individual test the difference between the measured and the required Evd value will be displayed (if the required Evd value has been entered manually). If the measured Evd value is higher than the required Evd value, the discrepancy will be shown in green. If the measured Evd value is lower than the required Evd value, the discrepancy will be shown in red.

If a test data was accidentally selected for editing, or if the data entered on the right is not relevant to one of the selected tests, right-click on the relevant test in the test data list and select „DISCARD CHANGES“. This data record will then be deactivated for editing. The pen symbol in front of the data record will disappear.

Please be aware that imported test data will not be saved automatically; only the data records selected for editing are made available for saving.

Left-click on „SAVE TEST DATA“ to save the selected data records in a directory of your choice. The file name is usually composed of <serial number/medium>_<data record>_<date>_<time>_<nr>.tc5. If comments have been entered with a preceding slash '/' in the text input function before the start of the test, the file name will be composed of <comment>_<date>_<time>_<nr>.tc5. This can be done at a later time in the „TERRATEST 2.0“ software by preceding the text in the field „COMMENTS“ with a slash '/'. If a slash '/' is entered in the text input function on the testing computer, or in the comments field on the PC, the data can subsequently be filtered via the „SEARCH“ function. Please refer to 8.3.17 „Search Function for Individual Tests“ on page 85.



Dynamic Plate Load Test
Determination of dynamic deflection modulus according to TP 89-089 Part B 8.3

Test	Settlement s ₆ (mm)	Mean value (mm)	Evd (MN/m ²)	Required Evd (MN/m ²)	Difference Evd (MN/m ²)	s/v (ms)	Required E _d (MN/m ²)
0.296	0.282	0.266	80,1	6,0	80,1	2,295	6,0

Graph: Settlement s (mm) vs. Load (MN/m²). Curves for S4 and S5 are shown.

Once the data records desired for editing are selected, right-click and select „EDIT“ to enable editing of the test data.

Individual data record | **Statistics** | [Google Maps Statistics Overview](#)

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 16565 Musterstadt
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Dynamic Plate Load Test
 Determination of dynamic deflection modulus according to TP 8F-08B Part B 9.3

Client: Layer:

Construction project: Soil type:

Location testing point: Soil classification:

Comments: Consistency, f app:

Conducted by: Weather/Temperature: W / T

Test date / time: 29.05.2013 10:26 Record number: 3

Serial number: 641318880043 Manufacturer: TERRATEST GmbH

GPS coordinates: 52° 44.8129N, 13° 15.8014E UTM coordinates: E 33 362625 N 6845156

Settlement s4 (mm)	Settlement s5 (mm)	Settlement s6 (mm)	Mean value (mm)	Evd (MN/m²)	Required Evd (MN/m²)	Difference Evd (MN/m²)	s/v (ms)	Required Evd (MN/m²)
0.296	0.262	0.266	0.281	80,1	55,0	15,1	2,06	170,0

Print data record | Data record as PDF | Print report for all selected tests | Export all the saved data as PDF | Close application

Version: 2.2.0

The pen symbol marks the data records ready for editing. Only those featuring the pen symbol will be saved or printed.

Individual data record | **Statistics** | [Google Maps Statistics Overview](#)

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 Mustermannstrasse 4
 16565 Musterstadt
 Fon: 03301-700 700 / Fax: 03301-55 44 0

Dynamic Plate Load Test
 Determination of dynamic deflection modulus according to TP 8F-08B Part B 9.3

Client: TERRATEST GmbH Layer:

Construction project: ACB AC Soil type: Freely editable

Location testing point: Soil classification: Naturally grown soil

Comments: Consistency, f app: Base course

Conducted by: TERRATEST GmbH Weather/Temperature: Gravel base layer

Test date / time: 29.05.2013 09:33 Record number: Frost protection layer

Serial number: 641318880043 Manufacturer: Other

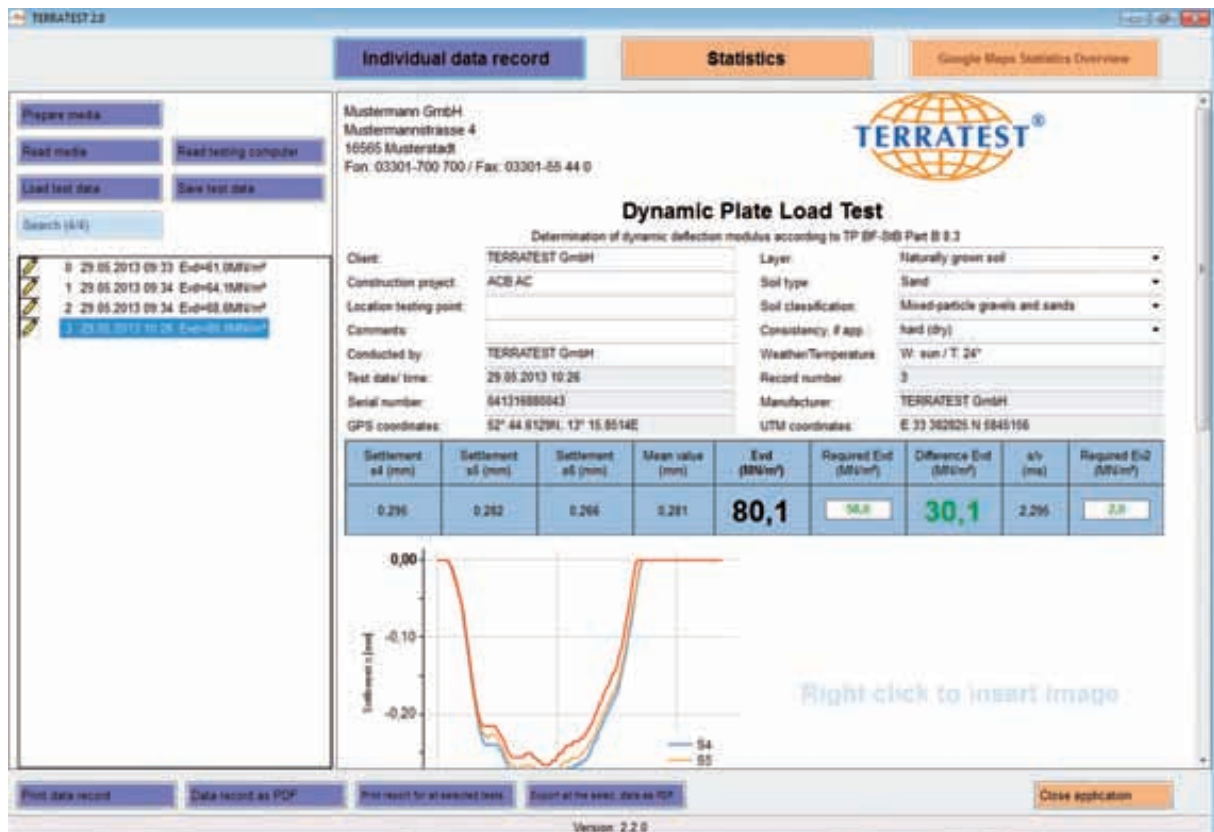
Manufacturer: TERRATEST GmbH

Settlement s4 (mm)	Settlement s5 (mm)	Settlement s6 (mm)	Mean value (mm)	Evd (MN/m²)	Required Evd (MN/m²)	Difference Evd (MN/m²)	s/v (ms)	Required Evd (MN/m²)
0.377	0.369	0.362	0.369	61,0	50,0	11,0	2,005	2,0

Print data record | Data record as PDF | Print report for all selected tests | Export all the saved data as PDF | Close application

Version: 2.2.0

Drop-down menus facilitate the entry of soil characteristics. However, individual descriptions can be entered as well.



Individual data record | **Statistics** | Google Maps Statistics Overview

Mustermann GmbH
 Mustermannstrasse 4
 16565 Musterstadt
 Fax: 03301-700 700 / Fax: 03301-55 44 0

TERRATEST®

Dynamic Plate Load Test
 Determination of dynamic deflection modulus according to TP 8F-Sd8 Part B 9.2

Client: TERRATEST GmbH | Layer: Naturally grown soil
 Construction project: ACB AC | Soil type: Sand
 Location testing point: | Soil classification: Mixed-particle gravels and sands
 Comments: | Consistency: # App: hard (by)
 Conducted by: TERRATEST GmbH | Weather/Temperature: W: sun / T: 24°
 Test date / time: 29.05.2013 10:26 | Record number: 3
 Serial number: 64131888043 | Manufacturer: TERRATEST GmbH
 GPS coordinates: 52° 44.8129N, 13° 15.8514E | UTM coordinates: E 33 362825 N 5845156

Settlement s4 (mm)	Settlement s5 (mm)	Settlement s6 (mm)	Mean value (mm)	Evd (MN/m²)	Required Evd (MN/m²)	Difference Evd (MN/m²)	s/v (ms)	Required Evd (MN/m²)
0.296	0.282	0.266	0.281	80,1	30,0	30,1	2,295	2,0

Settlement s (mm)

Right click to insert image

Print data record | Data record as PDF | Print report for all selected tests | Export all the selected data as PDF | Close application

Version: 2.2.0

Test protocol with manually entered data. All entered data, except „LOCATION TESTING POINT“ and „COMMENTS“, will automatically be applied to all data records marked with a pen symbol. If the required Evd value has been entered manually, the discrepancy between the required and the measured value will be displayed automatically.

8.3.12 Print Protocol / Export as PDF File

The individual protocol for the currently displayed data record can be printed or saved as PDF via the buttons „PRINT DATA RECORD“ and „DATA RECORD AS PDF“. The protocols for all data records marked with a pen symbol can be printed or saved as PDF via the buttons „PRINT ALL DATA RECORDS“ and „ALL DATA RECORDS AS PDF“.

8.3.13 Create Statistical Analysis

For the statistical analysis of various tests, left-click on the individual tests in the test data list on the left hand side. If you would like to select several successive data records, left-click on the first and the last data record, while holding down the Shift key. All marked data records are selected for editing. If you would like to select several data records that do not appear next to each other in the list, left-click on the desired data records while holding down the Ctrl key.

All selected data records are highlighted blue.

To enable a statistical analysis of the selected data records, right-click and select „ADD TO STATISTICAL ANALYSIS“ from the menu. All data records selected for the statistical analysis will be marked with a report symbol in front of each data record. If a data record was accidentally selected for statistical analysis, or if a certain data record shall be removed from the statistical analysis, right-click on the relevant data record and select „REMOVE FROM STATISTICAL ANALYSIS“ from the menu.

Once all data records desired for statistical analysis are selected and marked with the record symbol in front of each data record in the test data list, click on the button „STATISTICS“ on the top right.

A statistical analysis in accordance with the German standard TP-BF-StB Part B 8.3 will be displayed. It contains the previously selected data records.

The data of at least two tests is required for a statistical analysis.

The statistical analysis is divided in four areas:

Protocol heading, with general information about the tests, the construction site, and the test instrument
Test result chart, with the recorded test results, the required Evd value, and the GPS coordinates of the testing points (where these exist)

Statistics, with the required minimum quantile, arithmetic mean, standard deviation, coefficient of variation, quality number and test criterion

Statement, additional comments to the analysis as well as images (such as a signature, for example) can be added here. To add images, right-click and select „LOAD IMAGE“ from the menu.

The statistical analysis is based on the principle „Single sample plan – variable inspection“, although only the dynamic deflection module Evd is analysed.

The device manufacturer and the serial number are automatically shown on the protocol heading. Other project-specific data can be entered individually in the blank fields. If entries regarding the „Location of the testing point“ have been made in the individual data records of the selected test data, this information will also automatically be copied to the statistical analysis.

8.3.14 Print Statistical Analysis / Export as PDF File

To print the statistical analysis, click the button „PRINT ALL DATA RECORDS“ on the bottom right. To save the statistical analysis as a PDF, use the button „ALL DATA RECORDS AS PDF“.



8.3.15 Google® Maps Statistics Overview

In addition to the statistical analysis, a Google® Maps image showing all testing points included in the statistical analysis can be displayed by clicking on the button „Google® Maps Statistics Overview“. The map is equipped with the typical Google® Maps controls and can thus be scaled and switched between satellite and map view. The method of marking each test point can also be alternated between the pin icon and „Evd value, date, time“ by right-clicking on the map. There is also the option to print the map.



Google® Maps representation of all testing points selected for the statistical analysis, including information about the Evd value, and date and time of the test.

TERRATEST 2.8
Individual data record
Statistics
Google Maps Statistics Overview

Prepare media


Road media Road testing computer

Load test data Save test data

Search (4/4)

1	12.06.2013 10:57	Evd=88.5MVi/m²
2	12.06.2013 10:59	Evd=97.9MVi/m²
3	12.06.2013 11:00	Evd=84.6MVi/m²
4	12.06.2013 11:00	Evd=82.1MVi/m²

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Dynamic Plate Load Test, Statistical Analysis

Determination of dynamic deflection modulus
according to TP BF-50B Part B 8.3 and TP BF-50B, Part E1: "Test on a statistical basis - sample testing plans"
Single sample plan - Variable inspection

Client:	TERRATEST GmbH	Layer:	Naturally grown soil
Construction project:	ACB AB	Soil type:	Sand
Comments:		Soil classification:	Mixed-particle gravels and sands
Conducted by:	TERRATEST GmbH	Consistency, if app.:	hard (dry)
Weather/Temperature:	W. sun / T. 24°C	Manufacturer:	TERRATEST GmbH
Serial number:	8411680027		

Corecut Number	Date/Time	Settlement s1 (mm)	Settlement s2 (mm)	Settlement s3 (mm)	Settlement mean value s (mm)	Evd (MVi/m²)	GPS coordinate
0	12.06.2013 10:57	0.257	0.255	0.252	0.254	88.5	52° 44.6161N, 13° 15.8408E
1	12.06.2013 10:59	0.231	0.236	0.229	0.232	97.9	52° 44.6140N, 13° 15.8479E
2	12.06.2013 11:00	0.281	0.280	0.259	0.256	84.6	52° 44.6133N, 13° 15.8481E
3	12.06.2013 11:00	0.285	0.270	0.268	0.274	82.1	52° 44.6133N, 13° 15.8481E

Required minimum quartile: 65.0 MVi/m²

Arithmetic mean of the sample $\bar{x}(Evd)$: 88.067 MVi/m²

Standard deviation $s(Evd)$: 6.613 MVi/m²

Coefficient of variation $V(Evd)$: 0.074 %

Quality number $Q(Evd)$: 3.541

Test criterion $Q(Evd) > 0.88$ is: Fulfilled

Statement:

Statistical analysis including data that was automatically copied from the individual data records.

Mustermann GmbH
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 16565 Musterstadt
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Dynamic Plate Load Test, Statistical Analysis

Determination of dynamic deflection modulus
 according to TP BF-StB Part B 8.3 and TP BF-StB, Part E1: "Test on a statistical basis –
 sample testing plans"

Single sample plan - Variable inspection

Client:	TERRATEST GmbH	Layer:	Naturally grown soil
Construction project:	ACB AB	Soil type:	Sand
Comments:		Soil classification:	Mixed-particle gravels and sands
Conducted by:	TERRATEST GmbH	Consistency, if app.:	hard (dry)
Weather/Temperature:	W: sun / T: 24°C	Manufacturer:	TERRATEST GmbH
Serial number:	041316880027		

Consecut. Number	Date/Time	Settlement s4 [mm]	Settlement s5 [mm]	Settlement s6 [mm]	Settlement mean value s [mm]	Evd [MN/m ²]	GPS coordinates
0	12.06.2013 10:57	0,257	0,255	0,252	0,254	88,6	52° 44.6161N, 13° 15.8486E
1	12.06.2013 10:59	0,231	0,236	0,229	0,232	97,0	52° 44.6148N, 13° 15.8479E
2	12.06.2013 11:00	0,281	0,260	0,259	0,266	84,6	52° 44.6133N, 13° 15.8461E
3	12.06.2013 11:00	0,285	0,270	0,268	0,274	82,1	52° 44.6133N, 13° 15.8461E

Required minimum quantile: 65,0 MN/m²
 Arithmetic mean of the sample $X_m(Evd)$: 88,067 MN/m²
 Standard deviation $s(Evd)$: 6,513 MN/m²
 Coefficient of variation $V(Evd)$: 0,074 %

Quality number $Q(Evd)$: 3,541

Test criterion $Q(Evd) > 0,88$ is: **Fulfilled**

Statement:

Measurements carried out on the measurement plan 2548/K-25489 from 11.06.2013

No special features.

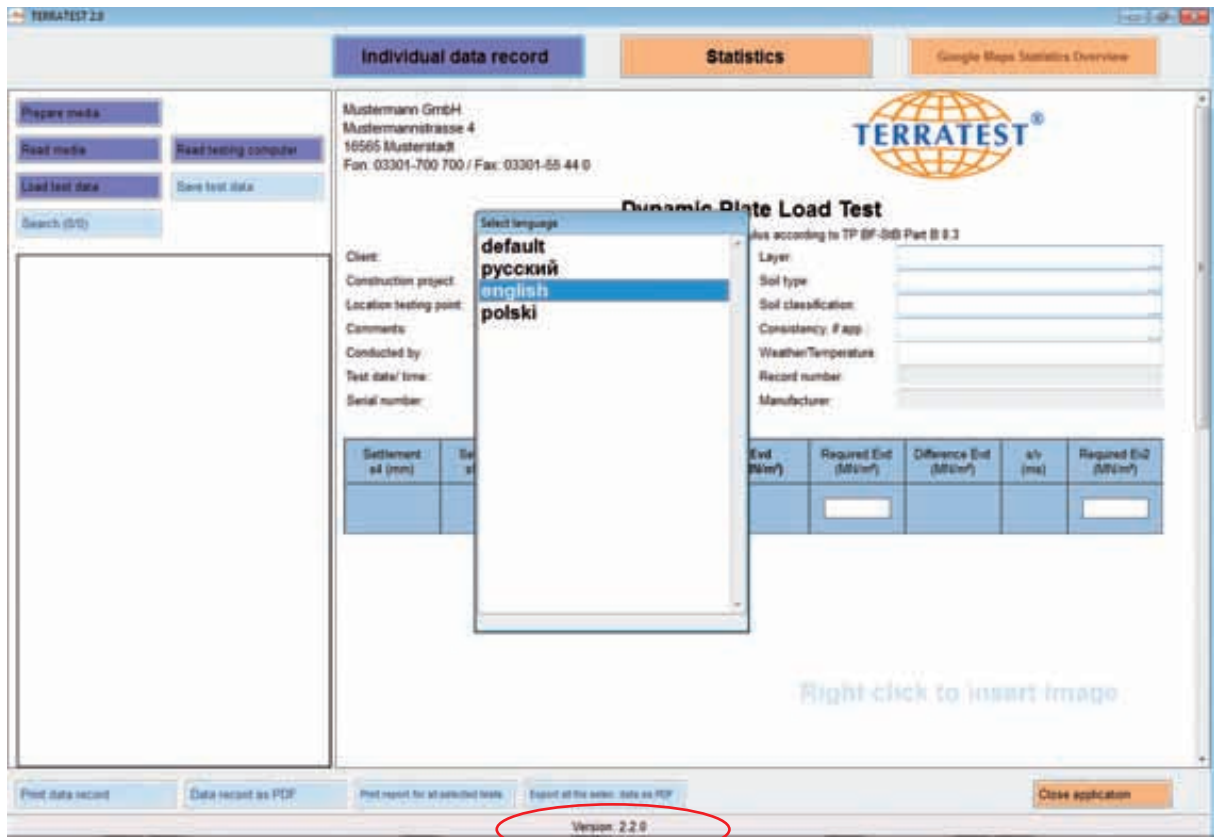
Lehnitz, 12.06.2013



Krone, Sven
 Head of laboratory

8.3.16 Select language

You can select the desired language of the software by double-clicking on the version number.

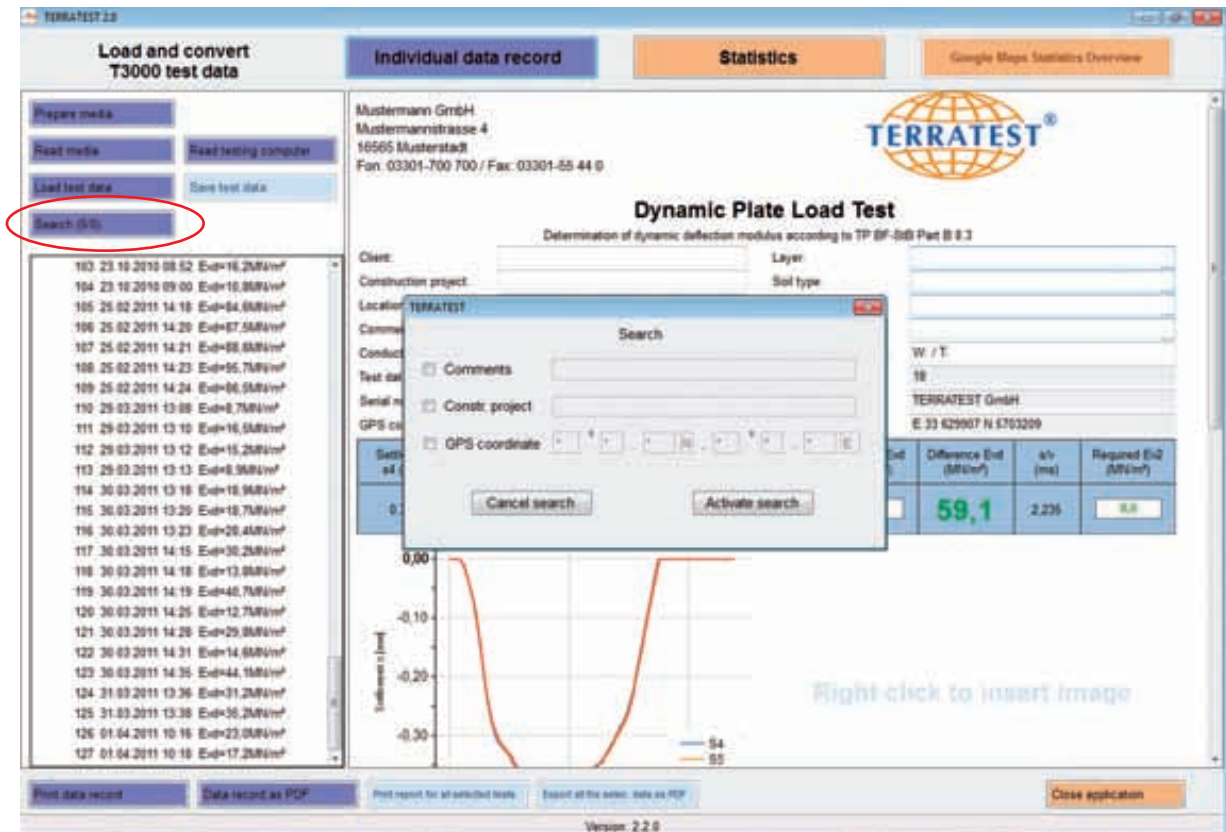


After double-clicking on the version number, the language selection will open.

8.3.17 Search Function for Individual Tests

The search function can be used only if the test data has previously been uploaded to the „TERRATEST 2.0“ program. Activate the search function by clicking on the „SEARCH“ button on top of the list which shows all uploaded tests. A search is possible only for the description fields „CONSTRUCTION PROJECT“, „COMMENTS“ and „GPS COORDINATES“. This function enables locating all tests that have been saved with the exact search term in these fields. For example, this function may be used to list all the tests which have been performed on a certain construction site.

The search can be refined by adding more filters. To do this, check the relevant box in front of the filter category and enter the search term in the description field behind the filter category. Up to three search terms can be combined with each other.



After clicking on the „SEARCH“ button the filter function will open.

As shown above, it is possible to switch the single search terms „COMMENTS“, „CONSTRUCTION PROJECT“, „GPS COORDINATES“ on and off by checking the respective boxes. If more than one search term is selected, only tests that match ALL search criteria will be listed. To activate the filter after entering the search words, click the button „ACTIVATE SEARCH“. All tests that match the search criteria will then be listed. To deactivate the filter, click the button „CANCEL SEARCH“.

The search function is deactivated (greyed out) while tests are marked for editing or added to the statistical analysis.

Keyword Search

If, instead of the list of all available tests, you want to see only those tests which contain a certain keyword in the „COMMENTS“ or „CONSTRUCTION PROJECT“ field, you can activate the relevant filter by checking the box in front of the filter name and entering the keyword in the filter description field. If you enter „MISSISSIPPI“ in the „CONSTRUCTION PROJECT“ field, test data for the construction project „MISSISSIPPI BRIDGE 2A“ and „DOT MISSISSIPPI“ will match the search criteria and will thus remain on the screen.

Searching for GPS Coordinates

Upon checking the search function „GPS COORDINATES“ the formula $*^{\circ} * , *N; *^{\circ} * , *E$ will automatically be entered in the respective description field. This formula can be edited by entering the desired GPS coordinates. Only the placeholders $*$ can be edited. The more numbers are entered, the more exact the search result will be. A number followed by a star refers to all values that start with the entered number. A star followed by a number refers to all values that end with the entered number.

Examples for the „GPS COORDINATES“ search:

- $5^{\circ} * , *N; *^{\circ} * , *E$ (searches for all tests with 50°, 51°, 52°, ... up to 59° northern latitude)
- $52^{\circ} * , *N; *^{\circ} * , *E$ (searches for all tests with 52° northern latitude)
- $*5^{\circ} * , *N; *^{\circ} * , *E$ (searches for all tests with 5° northern latitude)
- $52^{\circ} 27,2153N; 13^{\circ} * , *E$ (searches for all tests with exactly the specified N latitude and 13° eastern longitude)
- $52^{\circ} 27,21*N; 13^{\circ} 23,30*E$ (a search accurate to two decimal places)



In this example, the test data will be filtered for all GPS coordinates placed on 52° northern latitude: 52°27,2107N;13°23,3080E, for example.

If searching for test data from a text location with coordinates in the western or southern hemisphere, replace the default „N“ for „S“ and the default „E“ for „W“.

Be aware that the GPS coordinates of the tests may show deviations for technical reasons. We therefore advice you to not enter exact eight/sixteen-number coordinates when using the „GPS COORDINATES“ search.



9. Warranty

TERRATEST GmbH provides a warranty for this device of one year from date of delivery. This 1-year warranty granted in addition to statutory provisions is subject to the following warranty conditions. Statutory warranty claims shall not be affected by these warranty claims. If a manufacturing or material defect occurs within the warranty period, the device will be repaired or replaced at the expense of TERRATEST GmbH. Any warranty claim presupposes the presentation of sufficient proof, e.g. an accurate invoice. The warranty claim must be raised within the warranty period. The warranty does not cover devices or device parts which are exposed to normal wear and must thus be considered as wear parts.

The warranty will be void, if the device should be damaged and/or not be used and serviced appropriately (for example if the instructions provided in this manual are not followed).

The warranty period expires if the device is not calibrated within a year from date of purchase at a calibration institute accredited by the German Federal Road Research Institute (Bundesanstalt für Straßenbau).

Repairs may be carried out only by TERRATEST GmbH or authorised repair shops.

All instructions mentioned in this manual must be strictly observed for proper use of the device. Strictly avoid any utilisation of the device and any way of operating that this instruction manual advises or warns against.

The warranty period can be extended by additional purchase of a special service package.

1. Scope of Warranty

1.1. With this warranty declaration, TERRATEST GmbH grants you certain rights, restricted by kind and content (see „Exclusions“ and „Limitations“ in section 2). Please read this document carefully. By exercising any rights derived from this warranty you declare concurrently that you have understood and accepted their conditions. Your statutory provisions (warranty) against the party from which you have directly acquired this product persist irrespective of and in addition to this warranty and will not be affected by it.

1.2. TERRATEST GmbH guarantees that under normal circumstances every „system“ (see below) which is sold for the first time by TERRATEST GmbH or one of our dealers in a country of the European Economic Area or Switzerland (our trading area) will be free of defects in material or workmanship for the duration of time noted on the warranty card supplied with the system. „System“ refers to your brand-new product, including all original parts and components (provided that these were offered as options and/or accessories and installed at the time of purchase).

1.3. Software supplied with the system does not fall within the scope of this warranty. TERRATEST GmbH does not guarantee that the software will work faultlessly or without disruptions and neither that it will meet your requirements.

1.4. In case of a warranty claim TERRATEST GmbH will, at reasonable discretion, repair or replace faulty systems or parts covered by this warranty by new or as good as new parts or systems. In cases where TERRATEST GmbH uses parts or systems that are as new, these will be original TERRATEST GmbH products that underwent a general overhaul, so that their characteristics and performance equals brand-new products. All exchanged parts and systems replaced under the terms of this limited warranty become the property of TERRATEST GmbH.

1.5. The warranty period starts at time of delivery. Your invoice stating the purchase date of the system is your proof of purchase.

2. Exclusions and Limitations

This warranty is subject to the following exceptions and limitations:

2.1. Exclusions

This limited warranty does not cover:

2.1.1. Products which were not manufactured by TERRATEST GmbH or which were originally sold to an end user in a county outside the area in which this warranty applies.

2.1.2. Products which were damaged or rendered inoperable by one of the following ways of utilisation or operating:

2.1.2.1. Any use of the product for purposes other than the intended, including but not limited to non-compliance with the instruction manual supplied with the system, or other forms of improper use or neglect of the system;

2.1.2.2. Any modification of the system, for instance, the use or mounting of components which were not manufactured and/or sold by TERRATEST GmbH;

2.1.2.3. Any service or repair carried out by non-authorized third parties, i.e. not by TERRATEST GmbH;

2.1.2.4. Improper transport or packaging when returning the system to TERRATEST GmbH.

2.1.3. Loss or damage of programs, data, or media (except in cases of producer's liability, according to the product liability legislation which will be applied as appropriate to the damage suffered). You are responsible for a backup of all programs, data and/or media. As mentioned above, TERRATEST GmbH reserves the right to replace any systems sent in for repair with new or overhauled products of comparable quality and performance, in which case all data saved on the original system may become permanently inaccessible.

2.1.4. Consumables, i.e. any parts which need to be replaced regularly under normal conditions of use.

2.1.5. Minor defects of LC displays that occur in devices which are equipped with LC display technology.

2.2. Limitations and exclusion of warranty

2.2.1. No rights other than those explicitly granted herein can be derived from this warranty. This applies in particular to all other warranties, whether expressed, implied, or statutory, for which TERRATEST GmbH disclaims any liability. These include, amongst others, any implied warranties of marketability or fitness for a particular purpose. Any compulsory official warranty deriving from the applicable law is limited by the conditions of this warranty.

2.2.2. In no case shall TERRATEST GmbH be liable for damages caused by coincidence, for consequential damages caused by a defect, or for loss of profit, employment opportunities, data or use, irrespective of whether such claims are based on contractual entitlements, assurances concerning the utilisation or performance of the system, or the use of the device in any way prohibited by law or advised against in this documentation, or whether such claims concern the software supplied by TERRATEST GmbH, regardless of whether it was pre-installed or enclosed with the product. This exclusion of liability applies even if TERRATEST GmbH has been informed about the possibility of such damages.

2.2.3. The limitations and exclusions of liability mentioned in section 2.2.2 do not apply if the suffered loss or damage is the direct result of an arbitrary deception or a violation of a legal obligation by TERRATEST GmbH, provided that TERRATEST GmbH has acted with gross negligence. Neither do they apply if their exertion would restrict a valid entitlement against TERRATEST GmbH under the product liability legislation, which applies respectively to the damages suffered by the end-user.

2.3. If you make a claim under the warranty, you acknowledge concurrently that no further entitlements against TERRATEST GmbH regarding the purchase or use of your system exist other than those warranty and compensation benefits described above.

2.4. All entitlements based on this warranty become time-barred, if they are not claimed within one year after emergence.

3. Obtaining warranty service

Please contact TERRATEST GmbH to obtain warranty service, or should you have any cause for complaint.

TERRATEST GmbH
Dianastraße 4
16515 Lehnitz
Germany
Tel: +49 33 01 700 700
Fax: +49 33 01 55 44 0

www.terratest.de
info@terratest.de

10. EC Declaration of Conformity

**in accordance with the EC Low Voltage Directive 2006/95/EC Annex III B;
of 12 December 2006**

We hereby declare that the below mentioned product complies with the fundamental health and safety regulations of the EC Low Voltage Directive, by virtue of its design and construction, as well as its configuration, which was placed on the market by us, TERRATEST GmbH. This declaration shall become null and void should any alterations be made to the product without our prior agreement.

Manufacturer/Representative: TERRATEST GmbH
Dianastraße 4
16565 Lehnitz bei Berlin
GERMANY

of Light Weight Deflectometer

Description of electrical equipment:

Function: Test instrument to determine bearing capacity of soil
Type: TERRATEST 3000 GPS
Serial number: 3001
Year of construction: 2010

We furthermore declare the compliance with the following directives / regulations, which apply to the product:

- EC Low Voltage Directive 2006/95/EC
- EMC Directive (2004/108/EC)

Applied harmonised standards, in particular:

Other applied technical standards and specifications:

- EN ISO 12100-1:2003 Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology
- EN ISO 12100-1:2003/A1:2009 Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology – Amendment 1
- EN ISO 12100-2:2003 Safety of machinery – Basic concepts, general principles for design – Part 2: Technical principles
- EN ISO 12100-2:2003/A1: 2009 Safety of machinery – Basic concepts, general principles for design – Part 2: Technical principles – Amendment 1
- EN ISO 14121-1: 2007 Safety of machinery – Risk assessment – Part 1: Principles
- EN 61010-1: 2001 Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements

Years of CE marking: 10

Place / Date: Lehnitz, 01.07.2012

Personal details / identity of the signatory:



Frank G. Schulz
General Manager



11. Standards

11.1 ZTV-E-StB 09 German Road and Transportation Research Association (Issue 2009)

..... 3.4.7.2 Requirements for deflection modulus

The requirements detailed below are based on the 10% minimum quantile. When constructing roads corresponding to Construction Classes SV, or I to IV on frost-free subsoil or substructure, it is necessary to obtain a deflection modulus of at least $E_{v2} = 120 \text{ MN/m}^2$ or alternatively $E_{vd} = 65 \text{ MN/m}^2$ on the subgrade. For Construction Classes V and VI a deflection modulus of at least $E_{v2} = 100 \text{ MN/m}^2$ or alternatively $E_{vd} = 50 \text{ MN/m}^2$ must be obtained. The deflection modulus E_{v2} is to be verified through the static plate load test, as defined in DIN 18134, and the deflection modulus E_{vd} through the dynamic plate load test, as defined in TP BF-StB Part B 8.3. If these requirements can be met only through compaction of the base courses, which are to be laid on the subgrade, it will be sufficient to prove or assess, by separate examination, a deflection modulus of at least $E_{v2} = 100 \text{ MN/m}^2$ or alternatively $E_{vd} = 50 \text{ MN/m}^2$ on the subgrade for Construction Classes SV, or I to IV, and a deflection modulus of at least $E_{v2} = 80 \text{ MN/m}^2$ or alternatively $E_{vd} = 40 \text{ MN/m}^2$ on the subgrade for Construction Classes V and VI. If the subsoil or substructure is susceptible to frost, a deflection modulus of at least $E_{v2} = 45 \text{ MN/m}^2$ or alternatively $E_{vd} = 25 \text{ MN/m}^2$ is necessary on the subgrade. For the scenarios outlined above, if the specifications of the building contract do not state whether the static or dynamic deflection modulus is to be established, the static deflection modulus should always be used. Alternatively, one can perform a calibration according to TP BF-StB Part E4, using the static deflection modulus to calibrate the dynamic deflection modulus. Afterwards, the dynamic deflection modulus may be used as a requirement. If the deflection modulus required on the subgrade cannot be achieved through compaction, it will be necessary to either

- (1) improve or solidify the subsoil or substructure, or
- (2) increase the thickness of the unbound base courses.

The measures must be listed in the specifications of the building contract.

Benchmarks for the allocation of the static deflection modulus E_{v2} or the dynamic deflection modulus E_{vd} to degree of compaction D_{pr} on coarse-grained soil types			
	Required compaction in different depths (ZTVT-StB 95*) (ZTVE-StB 94)	Based on benchmarks for the allocation to D_{pr} (ZTVE-StB 84 Chart 8)	1) Proposal for the allocation of E_{vd} to E_{v2} (acc. ZTV-E StB, Oct. 09)
Soil Types DIN 18 196	Degree of compaction D_{pr} in %	Deflection modulus E_{v2} in MN/m^2	Deflection modulus E_{vd} in MN/m^2
Gravels and sands with $\leq 7\%$ by weight $<0,063 \text{ mm}$ (gravels with wide or intermittent grain size distribution, gravel-clay and gravel-peat mixtures)	≥ 103	≥ 120	≥ 65
	≥ 100	≥ 100	≥ 50
	≥ 98	≥ 80	≥ 40
	≥ 97	≥ 70	≥ 35
Gravels and sands with narrow grain size distribution, sands with wide or intermittent grain size distribution	≥ 100	≥ 80	≥ 40
	≥ 98	≥ 70	≥ 35
	≥ 97	≥ 60	≥ 32
Mixed gravels and sands with 7-15% by weight $<0,063 \text{ mm}$ (gravel-silt and gravel-clay mixtures, sand-silt and sand-clay mixtures)	≥ 100	≥ 70	≥ 35
	≥ 97	≥ 45	≥ 25
Silty and clayey as well as mixed soils 15-40% by weight $<0,063 \text{ mm}$ (silt, clay, gravel-silt and gravel-clay mixtures, sand-silt and sand-clay mixtures)	≥ 97	≥ 45	≥ 25
	≥ 95	≥ 30	≥ 20

ZTV E
StB 09

ZTV A
StB 12

1) In accordance with ZTV E-StB 09 §14.2.5 and ZTV E-StB 12 client and contractor may agree upon these reference values as benchmarks for verification of the achieved compaction.

To be on the safe side always perform a correlation measurement with the static plate load test in accordance with DIN 18134.

The test must be performed and evaluated according to German standard TP BF StB Part B 8.3.

For general information only! All details are subject to change.

11.2 RIL 836 – German National Railway Company Deutsche Bahn AG

Extract from German standard RIL 836 - Deutsche Bahn AG

836.501 RIL 836- Earthwork structures – design, construction and maintenance
Seite 10 Standard for embankments and cuttings

Requirements for railway track substructure under embankments or cuttings													
1	Type of railway line		Top soil		Protective layer					Subgrade		general assembly	
	Line category ¹⁾	Track ballast	E _{v2} [MN/m ²]	E _{vd} ²⁾	Material mix	D _{pr} (-)	Standard thickness [cm] area affected by frost			E _{v2} [MN/m ²]	E _{vd} ²⁾	acc. attachment 1, figure	
							I	II	III			embankment	cutting
2	3	4	5	6	7	8	9	10	11	12	13	14	
New construction	P 300	Ballast track	120	50	KG 1/2	1,00	70	70	70	80	40/35	A 1.1	A 1.3
		Solid track	120	50	KG 2	1,00	³⁾ 40	³⁾ 40	³⁾ 40	60	35/30	A 1.2	A 1.4
	P 230 M 230	Ballast track	120	50	KG 1/2	1,00	50	60	70	60	40/35	A 1.9	A 1.7
		Solid track	120	50	KG 2	1,00	³⁾ 40	³⁾ 40	³⁾ 40	60	35/30	A 1.6	A 1.8
	P 160, M 160 G 120, R 120	Ballast track	100	45	KG 1/2	1,00	40	50	60	45	35/30	A 1.9	A 1.10
	R 80, G 50 all other lines	Ballast track	80	40	(KG 1/2) ⁴⁾	1,00	30	40	50	45	30/25	A 1.11	A 1.12
Maintenance ⁵⁾ Improvement	P 230 M 230	Ballast track	80	40	KG 1/2	1,00	30	40	50	45	30/25	A 1.13	A 1.13
		Solid track	100	45	KG 2	1,00	³⁾ 40	³⁾ 40	³⁾ 40	45	30/25	A 1.14	A 1.14
	P 160, M 160 G 120, R 120	Ballast track	50	35	KG 1/2	1,00	20	25	30	30	25/20	A 1.15	A 1.15
	R 80, G 50 all other lines	Ballast track	40	30	(KG 1/2) ⁴⁾	0,97	20	20	20	20	25/20	A 1.16	A 1.16

(1) Types of railway lines according to modulus 413.0202

P 300	High-speed traffic	300 km
P 230	Passenger traffic line (upgraded)	230 km
M 230	Mixed traffic line (upgraded)	230 km
P 160	Passenger traffic line (I+II)	160 km
M 160	Mixed traffic line	160 km
G 120	Freight transport line	120 km
R 120	Regional transport line	120 km
G 80	Regional transport line	80 km
G 50	Freight transport line	50 km

(2) Dynamic deflection modulus: For conditions of use see article 6; paragraph 5 for subgrade:

1. Value for coarse-grained soil
2. Value for mixed and fine-grained soil

(3) This thickness assumes a hydraulically bound base course of at least 30 cm under the solid track.

(4) as well as coarse-grained soils, gravels and sands with wide or intermittent grain size distribution; see modulus 836.0503, article 3

(5) when improving lines for high-speed traffic

**The test must be performed and evaluated according to German standard TP BF StB Part B 8.3.
For general information only! All details are subject to change.**



Extract from Austrian standard RVS 08.03.04 – Compaction Tests by means of the Dynamic Plate Load Test; Issue 1st March 2008; Austrian Association for Research on Road · Rail · Transport

8.1 Conversion of Minimum Requirements

A minimum requirement for the deformation modulus E_{v1} of the static plate load test can also be checked with the dynamic plate load test. The conversion of minimum requirements for the deformation modulus of the static plate load test (E_{v1}) to those for the dynamic deflection module of the dynamic plate load test (E_{vd}) is carried out with the following formula for **non-cohesive soils**:

for $E_{v1} \geq 25 \text{ MN/m}^2$ applies: $E_{vd} = 10 + \frac{4}{5} E_{v1}$

for $E_{v1} < 25 \text{ MN/m}^2$ applies: $E_{vd} = \frac{6}{5} E_{v1}$

and for **cohesive soils** with the formula:

$$E_{vd} = 10 + \frac{4}{5} E_{v1}$$

Chart 1 presents the relation.

Note:

Chart 1 helps you to convert requirements (limit values); however it should not be used to convert the test values (E_{vd} - E_{v1}). The influence of the dynamic excess pore water pressure, which occurs with cohesive soils, the dispersion due to the high number of tests as well as the deviations caused by various tests under high rigidity have been considered during the creation of the chart.

Chart 1: Conversion of the Minimum Requirements from E_{v1} to E_{vd}

Static Plate Load Test E_{v1}	Dynamic Plate Load Test E_{vd}	
Deformation Modulus E_{v1} [MN/m ²]	Dynamic Deflection Module E_{vd} [MN/m ²]	
	non-cohesive	cohesive
0	0	10
5	6	14
7,5	9	16
10	12	18
15	18	22
20	24	26
25	30	30
30	34	
35	38	
40	42	
45	46	
50	50	
55	54	
60	58	
65	62	
70	66	
75	70	
80	74	
85	78	
90	82	


The current calibration chart of the LWD in use must be carried along with the device. The test value E_{vd} , which corresponds to the minimum requirement E_{v1} , may be found in this calibration chart and must be verified.

The test must be performed and evaluated according to Austrian standard RVS 08.03.04. For general information only! All details are subject to change.


12. Cable Layout

12.1 LEMO Push-Pull Connection („TERRATEST 5000 BLU“ ONLY)

12.1.1 Female Socket

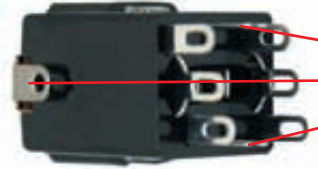
	Codification	Testing Computer	Bluetooth® Sensor Dome
	GND	green	black
	+U	white	red
	OUT	brown	green

12.1.1 Male Plug


	Codification	Wire
	+U	red
	OUT	white
	GND	yellow

12.2 Jack Connection („TERRATEST 4000 USB“ ONLY)

12.2.1 Female Socket

	Codification	Testing Computer	Sensor Dome
	OUT	brown	green
	GND	green	black
	+U	white	red

12.2.1 Male Plug

	Codification	Wire
	OUT	white
	+U	red
	GND	yellow



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