



Ground Grid Testers **GGT series**

Manual



Manual Version: M-GGTM00-309-EN

This Manual refers to the GGT200 & GGT300 models with optional GGT-M module

Firmware versions: 2.xx & 3.xx

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1 Introduction

The purpose of this Manual is to provide helpful instructions on how to use **GGT200 and GGT300** instruments with GGT-M module safely, properly, and efficiently.

The following instructions will help the user avoid unsafe situations, reduce maintenance costs, and will ensure the reliability and durability of the GGT instruments.

The GGT must be used in accordance with all existing safety requirements and regulations based on national/local standards for accident prevention and environmental protection. In addition, the relevant international standards are listed in the “Technical Data” section of this document.

1.1 Safety Instructions

Safety is the responsibility of the user. Before operating the GGT, please read the following safety instructions carefully.

It is not recommended the GGT being used (or even turned on) without careful observation of the instructions listed in this Manual. The GGT should only be operated by trained and authorized personnel.

1.1.1 Safety Terms and Symbols

Terms in this Manual

These terms may appear in the Manual:

WARNING: Warning statements identify conditions or practices that could result in an injury or a loss of life.

CAUTION: Caution statements identify conditions or practices that could result in a damage to this product or to the other property.

Terms on the Device

The following warning terms used in this document may appear on the device:

WARNING: indicates that a potential hazard may occur.

CAUTION: indicates that a potential damage may occur to the instrument or to the test object connected to the instrument.

Symbols on the Device

The following symbols may appear on the device:



Refer to Manual



Protective Earth Terminal

1.1.2 Terms of Use

- The GGT shall be used only if it is in a good technical condition. Its use shall be in accordance with local safety and industrial regulations. Adequate precautions must be taken to avoid any risks related to high voltages associated with this equipment and nearby objects.
- The GGT shall be used only for the application purposes described in the " **Intended Use** " section. The manufacturer and distributors are not liable for a damage resulting from the wrong usage. The user bears responsibility for not following the instructions defined in this document.
- Do not remove the protective casing of the GGT.
- All service and maintenance work must be performed by qualified personnel only and approved by DV Power personnel.

1.1.3 Orderly Practices and Procedures

- The Manual shall always be available on the site where the GGT is used.
- Before using the GGT, all personnel (even personnel who only occasionally, or less frequently, work with the GGT) assigned to operate the GGT should read the operation Manual.
- Do not make any modifications, extensions, or adaptations to the GGT.
- Use the GGT only with the original accessories provided by the manufacturer.
- Use the GGT and its original accessories for the device's intended use only.

1.1.4 Instrument maintenance

Device should be kept in a clean condition to prevent excessive dust or other contaminants affecting its operation. It should be cleaned with water/isopropyl alcohol after noticing any dirt/contaminants on its surfaces.

1.1.5 Operator Qualifications

- Testing with the GGT should only be carried out by authorized and qualified personnel.
- While receiving training, instruction, or education on the GGT device personnel should remain under the constant supervision of an experienced operator while working with the test set and the test object.

1.1.6 Safe Operating Procedures

- Hazardous voltages of up to 400 V can occur inside the GGT. Therefore, it is not permitted to remove the protective casing of the GGT.
- Before putting the GGT into operation, check the test set for any visible damage.
- Do not operate the GGT under wet or moist conditions (condensation).
- Do not operate the GGT if explosive gas or vapors are present.
- Only the external devices which meet the requirements for SELV equipment according to EN 60950 or IEC 60950 should be connected to the GGT through the serial interface.
- Removing the GGT protective casing will void the warranty. Any work inside the instrument without prior authorization from DV Power will also void the warranty.

- If the GGT seems to be malfunctioning, please contact the DV Power Support Team (refer to the “Manufacturer Contact Information” section) after previously checking the “Error Messages” section.
- Do not use the GGT without the extra protective ground cables supplied with the GGT. It must never be operated in a non-grounded configuration as this may result in an electrical shock to the user or damage the GGT. Always establish this connection first before establishing any other connections and remove this connection as the very last one.
- Cables between the GGT and any other equipment should be connected and disconnected from the GGT only while the instrument is switched off.

1.1.7 Disposal

DV Power instruments and its accessories are intended for professional use and are not intended for household use. As such they should not be disposed of with waste that was intended for household use.



For customers inside of the EU/EEA member states area

DV Power instruments and accessories are subject to the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE). When disposing DV Power instruments and accessories please use your local WEEE collection systems. Instruments and accessories can be returned to DV Power for disposition and treatment of WEEE.

For customers outside of the EU/EEA member states area

It is important to follow guidelines that are prescribed for disposal of WEEE in the according country. Dispose of DV Power instruments and accessories according to local legal requirements.

1.2 Power Supply

- Supply the GGT only from a power outlet which is equipped with the protective ground.
- Besides being supplied from phase – neutral (L1-N, A-N), it may also be supplied from phase to phase (e.g., L1-L2; A-B). However, the voltage must not exceed 264 V AC. Please refer to the section “Technical Data”.
- The GGT should be positioned in such a way that it is possible to safely disconnect it from the power supply at any moment.

WARNING / AVERTISSEMENT

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Il s'agit d'un produit de classe A. Dans un environnement domestique, ce produit peut provoquer des interférences radio, auquel cas l'utilisateur peut être amené à prendre des mesures adéquates.

1.3 Measurement Category

GGT is intended to be used for measurements in Measurement Category I (CAT I) for voltages to 20 V. Device is also designed to withstand occasional transient overvoltage up to 1000 Vpk.

WARNING / AVERTISSEMENT

This equipment is classified as measurement category I, and must not be used within measurement category II, III and IV.

Cet équipement est classée dans la catégorie de mesure I, et ne doit pas être utilisé dans les catégories de mesure II ,III et IV.

1.4 Intended Use

The Ground Grid Testers GGT series are designed for inspecting of the substation ground grid, as well as for measuring contact resistances of non-inductive test objects used in the electric power industry or similar branches. It is employed for the resistance measurement during manufacturing, commissioning, and maintenance testing of:

- Ground grids integrity (as per IEEE 80)
- High and medium voltage Switchgears and Circuit Breakers (as per IEC 62271-100 standards)
- High and medium voltage Disconnecting Switches (as per IEC 62271-100 standards)
- Bas-bar joints,
- Cable splices,
- Welded joints,
- Bonding of Lighting conductors
- Railway joints, lines, and conductor rails



CAUTION: Any use of the GGT other than mentioned above is being considered improper and will void the warranty and exempt the manufacturer from its liability for repair or exchange.

2 Description

2.1 Front Panel Components for GGT200 and GGT300 devices

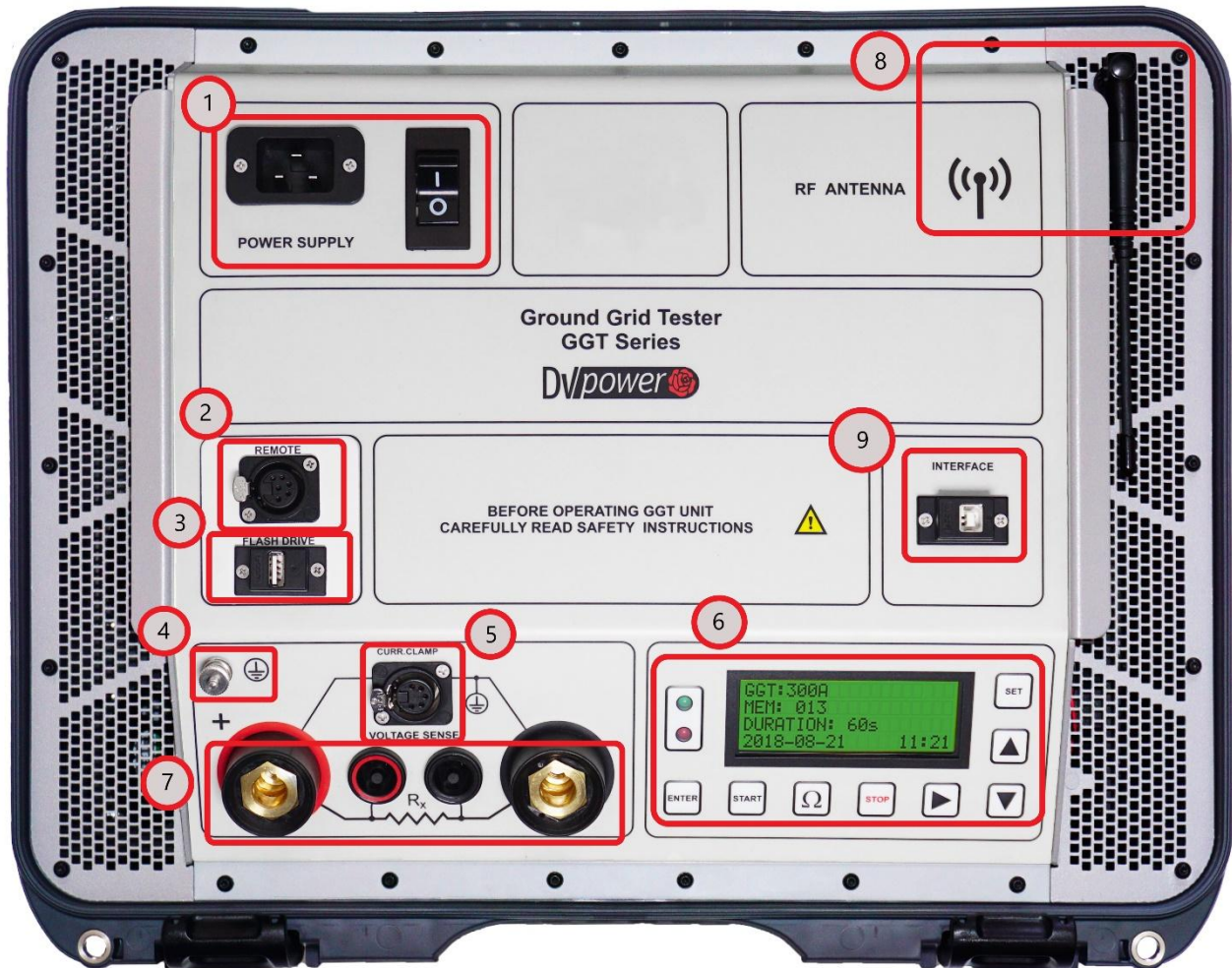


Figure 2-1: Front panel components

1 – Mains power supply input

90 V – 264 V AC; 50 Hz – 60 Hz

2 – Remote control (optional)

Used for remote testing (safety feature)

3 – USB Flash Drive for easier results downloading from the GGT device

4 – Protective Earth Connector

Used for protection against parasitic currents or voltages

5 – Current clamp connector

Used for Both Sides Grounded measurement

6 – Operator control

Display (LCD 20 characters, 40 lines) and Keyboard

7 – Main current and sense connectors

Used for contact resistance measurement

8 – RF Antenna for wireless communication with GGT-M module

9 – USB Interface

Used for PC communication (RS 232 communication interface optional)

Mains power supply input

Mains power connector

Connects the GGT device to the mains power supply with a power cord.

Power switch – Double pole switch

- **I** In this position, the GGT is connected to the mains power supply.
- **0** In this position, the GGT is separated from the mains power supply.



USB Interface

USB Interface

The GGT contains a USB serial interface to connect to an external computer if required. The RS232 communication port is also available as an option instead of USB interface.

Bluetooth communication (optional)

The Bluetooth communication module is optional accessories for GGT devices. In case of this module ordering, RS232 port is implemented instead of USB interface. After connecting the Bluetooth adapters to the device (RS232 port) and to the PC (USB port), the device is automatically ready for the Bluetooth communication with the DV-Win software.

Remote control (optional)

The GGT Remote Control Unit is an optional control unit for GGT, and it can be used to start and stop tests from a remote location, away from the actual GGT position.

Very often the same test current is fed through the test object for a series of tests. To simplify this and speed up the process, multiple measurements can be carried out with the GGT Remote Control Unit.

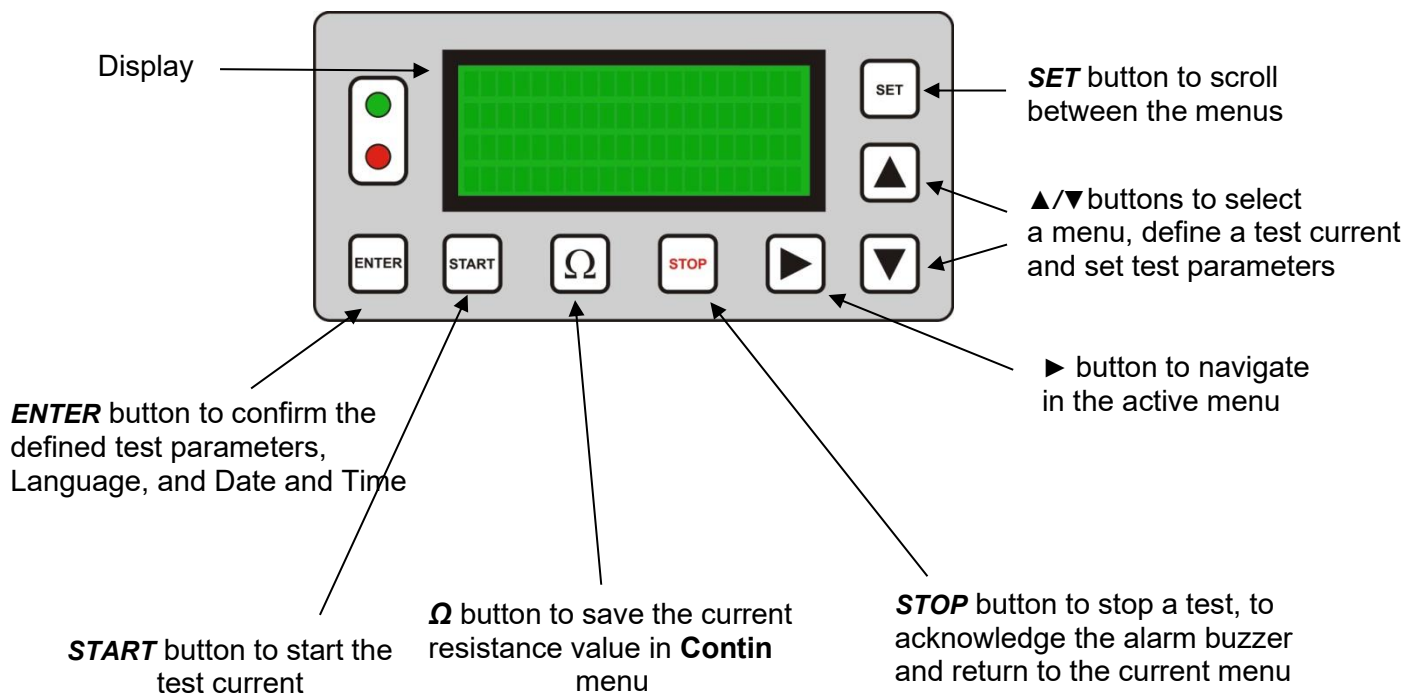
Protective Earth Connector

For protection against parasitic currents or voltages, always connect the GGT protective earth connector to the protective ground (PE). Use only the originally supplied cable.



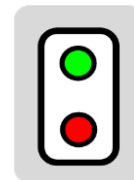
For safety reasons, always establish earth/ground connection as the first step before establishing any other connections and disconnect it as the very last one.

Operator Control for GGT200 and GGT300 devices



Green LED

- Lights continuously when GGT is turned on.
- Flashes when a test can be started.
- Flashes alternately with the red LED during a test.



Red LED

- Lights continuously in case of operational error.
- Flashes alternately with the green LED during a test.
- Lights when assigned maximum value in **Rmax** menu is exceeded (or equaled)

Current clamps connectors

When connecting the current clamp meter please pay attention the current circuit through the current clamp meter is positioned far away from the rest of the current circuits. This will prevent an electromagnetic interference. A distance between the current cables must be more than 10 cm (4 ").

Current and sense connectors

Current connector marked red is the current output connector.
 Current connector marked black is the current returning connector.

RF Antenna for wireless communication with GGT-M module

Allows wireless communication with the specially designed GGT-M module, which is recommended during the substation ground grid integrity test. Designed for extended reach, the GGT-M module facilitates seamless remote control of the device across the substation.

USB Flash Drive for easier results downloading from the GGT device

Data from the GGT internal memory can be exported to a USB flash drive using this connector for additional analysis on a PC if needed.

2.2 Front Panel Components for GGT-M module

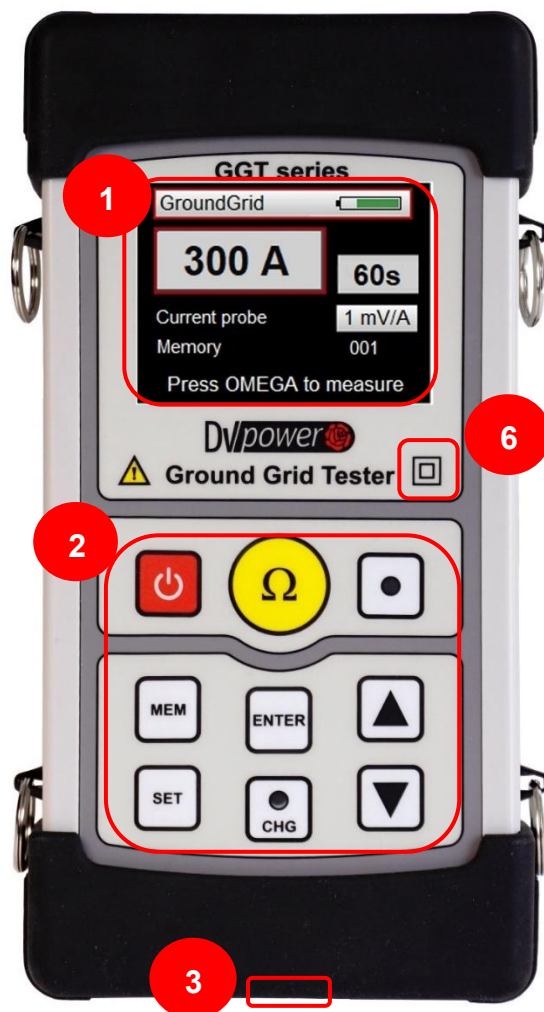


Figure 2-2: Front panel components

1 – LCD Display

TFT LCD 2.8 in (43,2 mm x 57,6 mm / 1.8 in x 2.3 in)
Displays the settings as well as the measured values during and after a test operation

2 – Keyboard

Used to control the device

3 – Charger Connector

4 – Connectors for the current clamps

5 – Connectors for the voltage sense probes

(+) Standard banana connector (red)

(-) Standard banana connector (black)

6 – A Class II or double insulated electrical appliance is one which has been built in such a way that it does not require a connection to electrical earth (ground).



Figure 2-3:
 Voltage sense and
 remote-control connectors

Keyboard

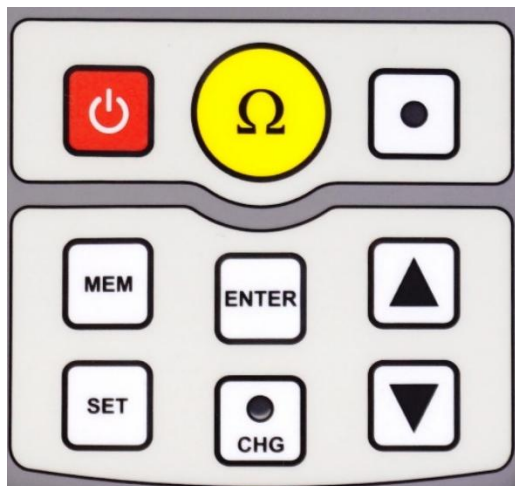


Figure 2-4: Keyboard



Use this button to turn on/off the device.

Use the **Ω** button to start the test.

Use the **ENTER** button to confirm the defined test parameters, language, time, date, and limits.

Use the **UP/DOWN** buttons to navigate through active menu.

Use the **MEM** button to go to Memory Menu.

Use the **SET** button to go to Settings Menu.

3 Getting Started

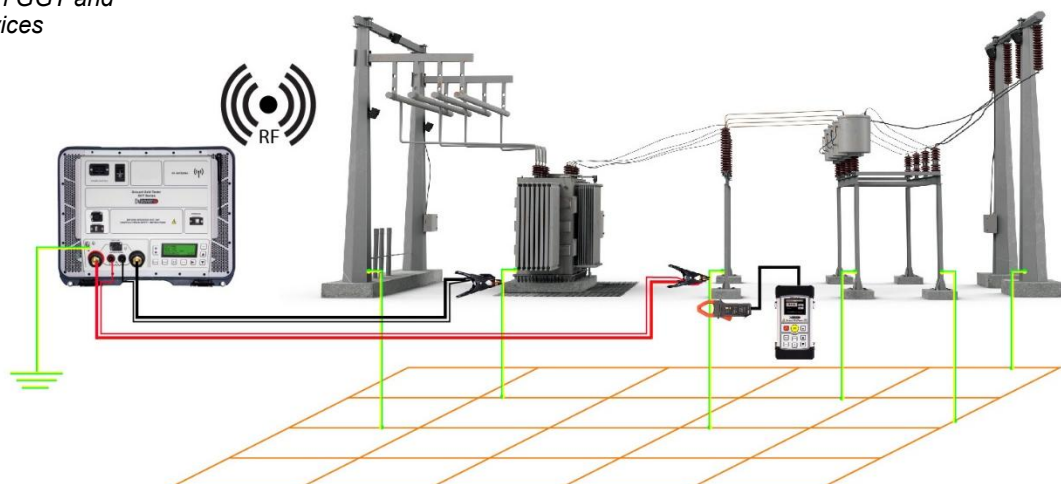
3.1 Ground Grid Integrity testing – connection diagram and procedure

The ground grid integrity test is the most relevant test method / technique for measuring the electrical characteristics of the substation grounding system. The test is described in international standards – IEEE Guide for Safety in AC Substation Grounding IEEE Std. 80-2013 (Revision of IEEE Std. 80-1986).

This section gives detailed description of the substation ground grid integrity testing with GGT200 & GGT300 devices and GGT-M module. The test is controlled remotely by the battery-operated GGT-M module that has wireless communication with GGT main unit.

The test setup of GGT200 / GGT300 devices with GGT-M module and the cable connection diagram is illustrated in the Figure 3-1:

*Figure 3-1:
Testing ground grid
integrity with GGT and
GGT-M devices*



Before connecting the GGT to a ground grid, make sure that instrument is properly grounded. To do so, connect the grounding screw of the GGT to a PE using only original grounding cable.



Cables between the GGT and other equipment should be connected and removed ONLY when the GGT is switched off.

Always connect the measuring cables to the GGT first and then to the test object; and when disconnecting always disconnect the cables from the test object first and after that from the GGT. The grounding wire PE should be disconnected last. Failure to do this may result in a serious injury or even a loss of life.

The GGT test set is provided with set of current carrying cables, black color marked cable 33 ft. (10 m) long and the red color marked cable 165 ft. (50 m) long. The black color marked cable should be connected to a good reference ground point (e.g., usually near the center of the substation and at major piece of apparatus like a transformer or breaker that has multiple ground connections). The red color marked cable is sequentially connected to exposed ground leads in the substation that needs to be inspected.

An operator takes GGT-M module along with the red color marked cable to control the testing remotely (away from the GGT main unit).

The test procedure consists of the following steps:

1. Connect the current cables to the GGT device (GGT200/GGT300).
2. Make a proper grounding of the GGT (e.g., connect the grounding screw of the GGT to a PE using only the manufacturer provided grounding cable).
3. Connect the current clamp to the GGT-M module.
4. Turn ON the GGT200/GGT300 device.
5. Connect the “black” current cable to the reference ground point.
6. Turn ON the GGT-M module and the current clamp.
7. Take the GGT-M module (with connected current clamp) and the “red” current cable to the inspected grounding point.
8. Connect the “red” current cable to inspected ground point.
9. Connect the cable connector of the current clamp to the GGT-M.
10. Open the current clamp jaws and connect it on the tested grounding (between the “red” clamps and the ground surface).
11. Set the test current and duration on the GGT-M module and start testing by pressing **Ω** button.
12. The measured test parameters will be displayed on the GGT-M and GGT200/GGT300 devices and automatically saved in the device’s internal memory.
13. Continue the testing of the next grounding by repeating the steps 6 – 11.

During test, GGT generates preselected DC current (e.g., up to 300 A for GGT300 model) between the reference and the tested grounding points. The current will be generated during pre-selected test duration (e.g., 60 s) and the operator can stop the test after few seconds if the results are satisfactory.

The typical time required for testing one grounding is approximately 2 minutes (including the cable connections). This time refers to the steps 6 – 11.

If the distances are too large for full substation testing, the reference lead (“black” current cable) can be connected to another allegedly good reference point. The first test in this case should be done with the “red” current cable connected back to the original reference point to verify a pass.

3.2 Best Accuracy for Voltage Drop Measurement

As the sense leads are permanently connected to the supplied cable clamps, some minor voltage drop is unavoidable when 300 A is being injected, and this value is also included in the displayed measured voltage drop. The additional voltage drop caused by the clamps can be avoided in two ways. One way is to perform the clamp-to-clamp test by selecting the desired test current, measuring the voltage drop (resistance), and subtracting that value from the final results. Another way is to use the additionally provided (Sense cables 2 x 1 m with alligator clamps A2 – S2-01-02BPA2). Four clamps will be used totally in this way. Two current clamps and two voltage sense clamps.

3.3 Resistance measurement - Connecting the GGT to Test Object

Before connecting the GGT to a circuit breaker, make sure that:

- the breaker is disconnected or separated from its circuit on both sides of the breaker in accordance with the national safety regulations; **always comply with local safety regulations when using the GGT,**
- the breaker is properly grounded to a protective ground (PE),
- the GGT itself is properly grounded. To do so, connect the grounding screw of the GGT to a PE using only original grounding cable.

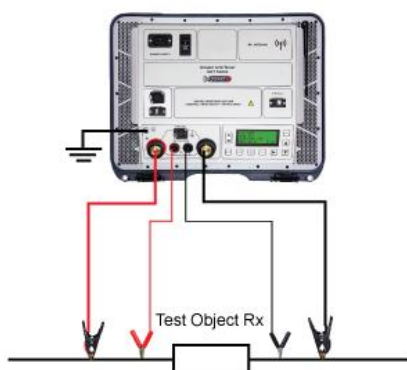
With the GGT turned off, connect it to the circuit breaker with its appropriate cables.

Cables between the GGT and other equipment should be connected and removed ONLY when the GGT is switched off.



Always connect the measuring cables to the GGT first and then to the test object; and when disconnecting always disconnect the cables from the test object first and after that from the GGT. The grounding wire PE should be disconnected last. Failure to do this may result in a serious injury or even a loss of life.

Figure 3-2:
Connecting
GGT to test
object



With GGT turned off, connect GGT to the test object (R_x) in such a way that the measuring cables from the "Voltage Sense" input sockets are attached as close as possible to the test object R_x , and closer to R_x than the connection points of the current feeding cables. That way, resistance of both, cables and clamps is almost completely excluded from the resistance measurement.

To maximize accuracy and measurement repeatability make sure that all clamps have a good connection to the test object and avoid any connection between Sense and Current clamps.

Please pay attention to the polarity while connecting the measuring cables otherwise the measurement results will be incorrect.

3.4 Connecting GGT to Dead Tank circuit breaker

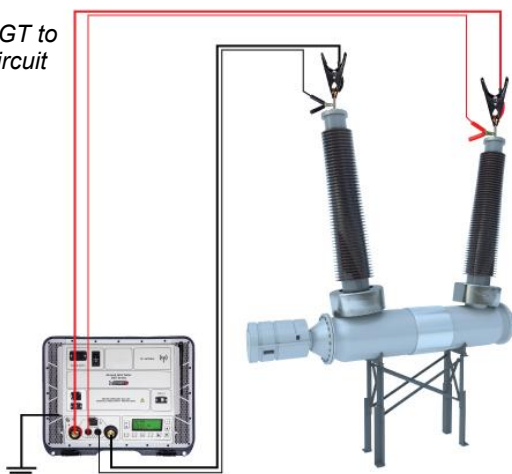
The contact resistance measurement of dead tank circuit breakers requires a different approach compared to the live tank circuit breakers due to their design. A DC current used for this measurement flows directly through the current transformers mounted in the bushings. Presence of current transformers (CT) on this type of circuit breakers may introduce errors during a test due to CT magnetizing process.

It is necessary to saturate a CT prior to measurement. This can be achieved in DTRtest menu, specially designed for dead tank circuit breakers.

Calculations for detecting the saturated condition of a CT are done by an internal algorithm. The process of setting the measurement parameters and testing in this mode is very simple and does not differ much from live tank circuit breaker testing (in SINGLE / CONTIN test modes).

The connecting diagram and the test parameters setup are the same as for the live tank circuit breakers testing, as presented in the figure below:

Figure 3-3:
Connecting GGT to
a dead-tank circuit
breaker



As explained in the previous section, the measuring cables from the "Voltage Sense" input sockets should be attached as close as possible to the tested dead-tank circuit breaker, and closer than the connection points of the current feeding cables.

Please pay attention to the polarity while connecting the measuring cables otherwise the measurement results will be incorrect.

3.5 Connecting GGT to Both Sides Grounded circuit breaker

Grounding circuit breakers from both sides provide increased safety for testing personnel compared with only the one-side grounding method. The GGT device will measure the current through the ground circuit connection (using the current clamp) and increase the selected test current through the circuit breaker contacts by this value.

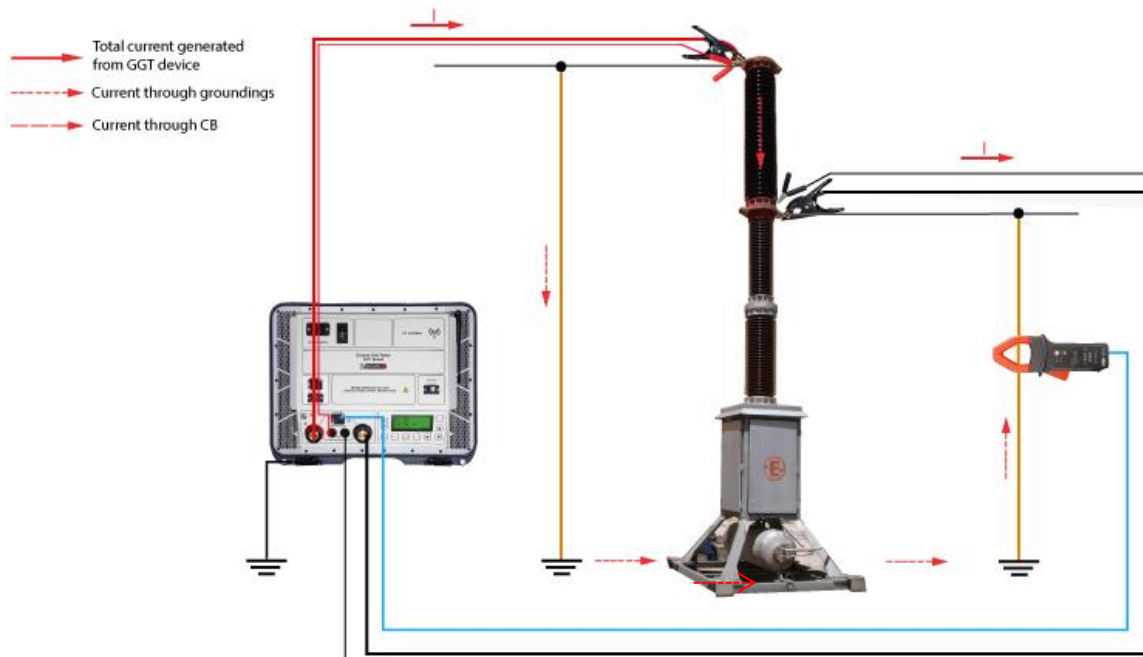


Figure 3-4: GGT cable connection during BSG testing

The BSG test mode within GGT allows contact resistance measurement of the CBs while grounded from both sides. The test setup is very simple (same as for the SINGLE test), and all calculations are made automatically by the device's internal algorithm.

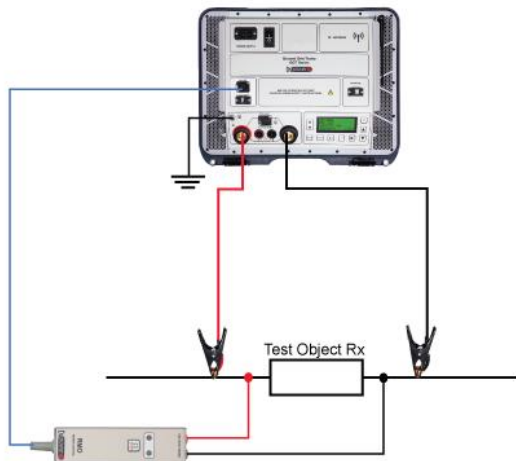


The connection diagram for BSG testing is the same as for one side grounded circuit breaker testing, with only one addition – the current clamps should be connected to the one grounding cable.

Please connect the current clamp-meter cables to the appropriate input terminals of the GGT device. By pressing the side button open the current clamp-meter's jaws and clamp one conductor only. The jaw must be firmly closed around the conductor. Make sure conductor is passed through the middle of the clamp- meter jaw opening. Make sure the angle is 90 degrees between the central axis of a conductor and a plane of the opening of the clamp-meter. The continuous red LED light indicates the clamp-meter works correctly. In the case the red LED is blinking it is necessary to change the battery.

3.6 Connecting the Remote-Control Unit to GGT and Test Object

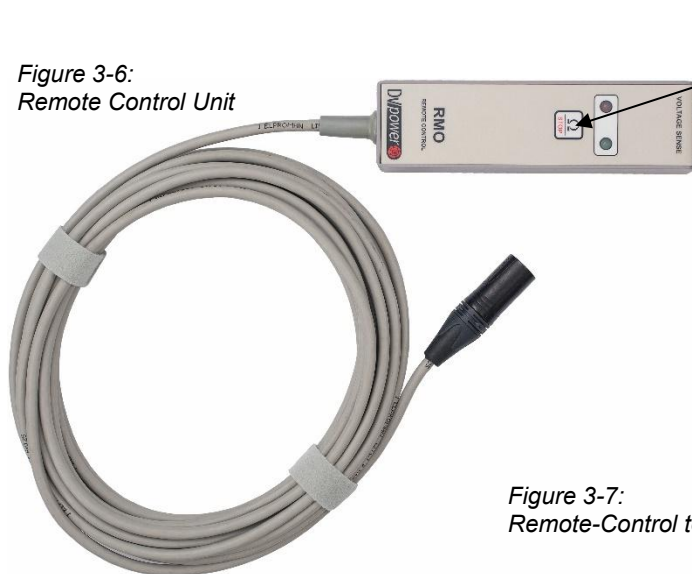
Figure 3-5:
 Connecting
 Remote
 control
 unit



Turn off the GGT and plug in the Remote-Control Unit to the connector on the GGT's front panel.

Connect the Remote-Control Unit to the test object (Rx) in such a way that the measuring cables from the "Voltage Sense" sockets are situated as close as possible to Rx, and in between the current feeding cables from the GGT. That way, both the cables and the clamps' typical contact resistance is largely excluded from the resistance measurement.

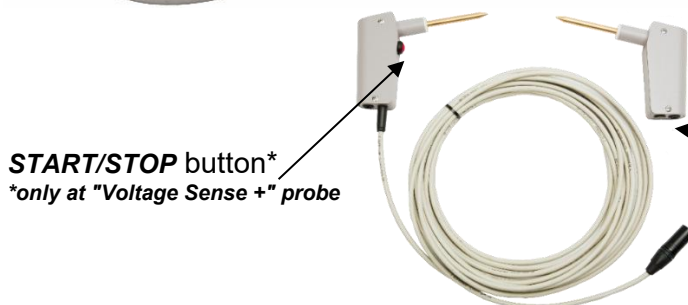
Figure 3-6:
 Remote Control Unit



START/STOP button*

Sockets to connect the Remote-Control Unit directly to a test object "Voltage Sense +" and "Voltage Sense -"

Figure 3-7:
 Remote-Control test probes



START/STOP button*
 *only at "Voltage Sense +" probe

Socket to connect the Remote Control "Voltage Sense -" probe with "Voltage Sense +" probe (one with trigger button).

Depending on the situation, the Ω /STOP button has various functions:

- When the green LED flashes a new test can be started by pressing this button
- When the green LED is continuously ON, pressing this button will prepare the GGT for a new test, using the test parameters set on the GGT.

- While a test is running (the green and the red LEDs flash alternately), pressing this button stops the test immediately.



Never connect the Remote-Control Unit to any other device but the GGT. The Remote-Control can only be used during the SINGLE test mode.

3.7 Settings

To set GGT's Rmax, Language, Date and Time, and Module Address, press and hold **SET** button for 3 seconds to select **Settings** menu.

Figure 3-8:
Settings menu



Press **STOP** to cancel and return to the **Ground Grid** menu.

Setting Rmax

To set GGT's Rmax value, please use the ► button, and then **ENTER** button to select the **Set Rmax** menu.

Figure 3-9:
Rmax menu



In the **Rmax** menu, define the status of **Rmax** (**On** or **Off**) and assigned value of resistance.

Using the ► button move the cursor to the position of **Rmax** menu status and using ▲/▼ buttons select **Off** (Figure 3-9) or **On** option.

Using the ► button move the cursor to the position of assigned value of resistance and using ▲/▼ buttons select desired value between 1 $\mu\Omega$ and 9999 $\mu\Omega$. The default value is 1000 $\mu\Omega$ (figure 3-9). When device is turned off and then turned on, GGT remembers the last saved setting of Rmax value and a status. Once these parameters are defined, press **ENTER** to change to the **Settings** menu.

Setting GGT's Language

To set GGT's language, please use the ► button, and then **ENTER** button to select the **Set Language** menu.

Figure 3-10:
The **Language** menu



Move the cursor using the ► button and select the desirable language.

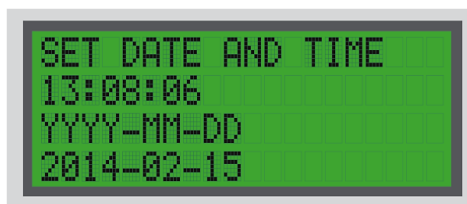
Press **ENTER** to confirm and return to the **Settings** menu.

Press **STOP** to cancel and return to the **Settings** menu.

Setting GGT's Date and Time

To set GGT's date and time, please use the ► button, and then **ENTER** button to select the **Set date and time** menu.

Figure 3-11:
Date and Time menu showing
GGT's internal date and time



Move the cursor to the desirable position using the ► button and change the value with the ▲/▼ buttons.

One of three different date formats can be selected:

1. YYYY-MM-DD
2. DD-MM-YYYY
3. MM-DD-YYYY

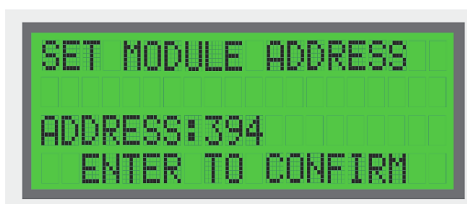
Press **ENTER** to confirm and return to the **Settings** menu with saved setup.

Press **STOP** to cancel and return to the **Settings** menu without saved setup.

Setting GGT's Module Address

To set GGT-M remote module address, please use the ► button, and then **ENTER** button to select the **Set module address** menu. Three last numbers of the GGT-M serial number should be used for address (e.g., for GGT-M module with S/N XXGT394M, the address should be 394).

Figure 3-12:
Set module address menu



3.8 Setting the Measurement Parameters

3.7.1 Ground Grid Test

Turn the GGT power switch **ON**. The GGT will display the **Ground Grid** menu and the green LED is **ON**.

Figure 3-13:
Ground Grid menu
 at the GGT main unit



In the **Ground Grid** menu, test is performed using predefined test parameters – test current and test duration. By default, the test current is set to 300 A with duration of 60 s. If it is necessary, all test parameters can be changed.

Using ► button to move the cursor to the position of a test current and using the ▲/▼ buttons select a desired value. Available test current values are from 10 A to 300 A in 10 A steps.

Use the ► button to move the cursor to the position of a memory location. Use the ▲/▼ buttons to select a desired memory position (here **Memory: 013**) to which obtained results will be saved.

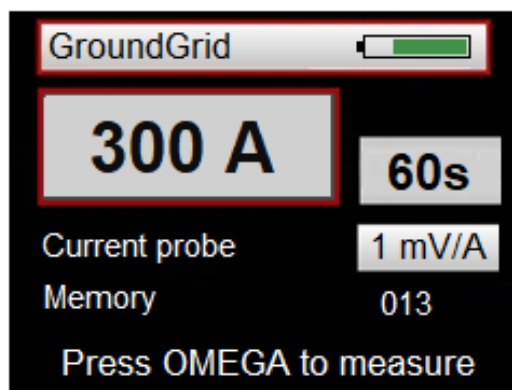
Use the ► button to move the cursor to the position of a test current duration (here **60 s**) and use the ▲/▼ buttons to select a desired value.

3.7.1.1 Ground Grid Test with the GGT-M Remote Control Unit

During ground grid integrity testing, test operator should take measurements on multiple grounding leads in the substation. The test can be controlled remotely by the battery-operated GGT-M module that has wireless communication with GGT main unit.

When the GGT-M device is turned on, the staring screen below is displayed:

Figure 3-14:
Ground Grid menu at
 the GGT-M remote module



The test can be started by pressing the **Ω** button (1-click to test principle).

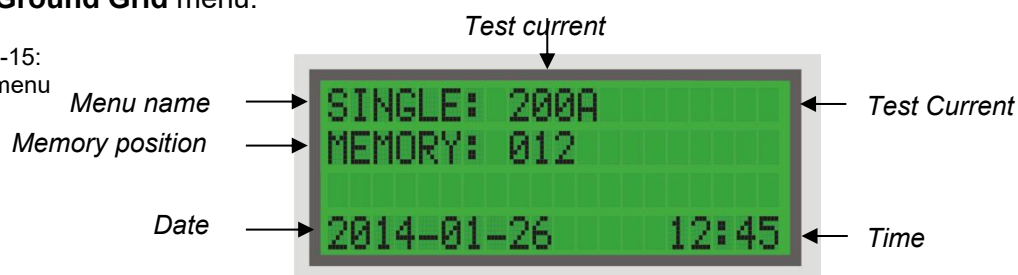
Test current can be changed in 10 A steps with use of the ▲/▼ buttons. By pressing ENTER button, the next field is selected – duration of the test. The maximum test duration is set to 60 s, and it can be changed in 10 s steps (e.g., 10 s, 20 s, 30 s, 40 s, 50 s or 60 s) with use of the ▲/▼ buttons. Press ENTER to confirm and select the next field – Current probe. One of two current probe ranges can be selected with use of the ▲/▼ buttons (1 mV/A or 10 mV/A).

The memory location is also displayed on the GGT-M module, but this parameter can be changed at GGT main unit only, since the results are saved in the memory of the GGT main unit.

3.7.2 Single Test

Turn the GGT power switch **ON**. Press **SET** button to go to the **Single** menu. Press **STOP** to return to the **Ground Grid** menu.

Figure 3-15:
Single menu



Before a test can be started, the following parameters need to be defined in the **Single** menu:

- Test current - the following values can be selected:
5 A, 10 A, 20 A, 50 A, 100 A, 200 A, and 300 A.
- Memory position, 000-499

In the **Single** menu, define a test current for the test (e.g., **200A**). To do so please set the desired value by using the **UP/DOWN** buttons.

Using the ► button move the cursor to the memory location position and using the ▲/▼ buttons select a desired memory position to which the obtained results will be saved. Once the test is completed the last measured result will remain registered in GGT, and the memory position is automatically switched over to the next memory position. The result can be recalled later by selecting that memory position number.

3.7.3 Continuous Test

Turn the GGT power switch **ON**. The GGT will display the **Ground Grid** menu. Go to **Contin** menu by pressing **SET** button twice. Press **STOP** to return to the **Ground Grid** menu.

Figure 3-16:
Contin menu



In the **Contin** menu, please define a test current, memory location and test current duration time.

Using ► button to move the cursor to the position of a test current and using the ▲/▼ buttons select a desired value.

Use the ► button to move the cursor to the position of a test current duration (e.g., **60 s**) and use the ▲/▼ buttons to select a desired value.

Use the ► button to move the cursor to the position of a memory location. Use the ▲/▼ buttons to select a desired memory position (e.g., **Memory: 020**) to which obtained results will be saved. Upon the test completion (either due to time expiration or because the test is interrupted by pressing the **STOP** button) the last measured result will remain registered in the GGT memory.

The **Ω** button should be used to record the results during the preselected test time in CONTIN mode.

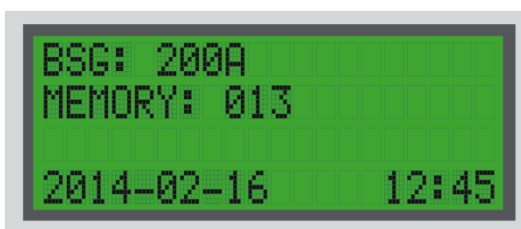


Note: If DV-Win software is used during the test, all measurements can be registered in Excel table format, with option of additional editing and graphic presentation.

3.7.4 BSG Test

Turn on the GGT with the power switch on the test set. The display shows the **Ground Grid** menu. Go to **BSG** menu by pressing **SET** button three times.

Figure 3-17:
The **BSG** menu



Define a test current through the circuit breaker (e.g., **200 A**) and a memory position (e.g., **Memory: 013**). Once these parameters are defined, press **ENTER** to change to the **Ready** state.

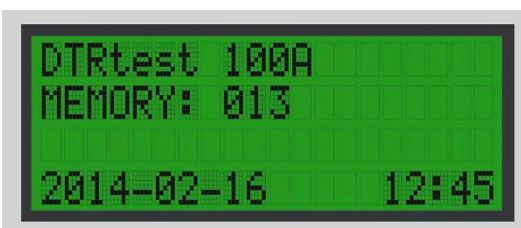


Note: The current clamps should be connected to the instrument and turned ON. The measurement range 300 A (1 mV/A) should be selected.

3.7.5 DTR Test

Turn on the GGT with the power switch on the test set. The display shows the **Ground Grid** menu. Go to **DTRtest** menu by pushing **SET** button four times.

Figure 3-18:
The **DTRtest** menu



DTRtest menu is specially designed for resistance measurement of the dead tank circuit breakers.

The contact resistance measurement of dead tank circuit breakers requires a different approach compared to the live tank circuit breakers due to their design. A DC current used for this measurement flows directly through the current transformers mounted in the bushings. Presence of current transformers (CT) on this type of circuit breakers may introduce errors during a test due to CT magnetizing process. For this reason, **it is necessary to saturate a CT prior to measurement.**

As mentioned, DTRtest menu is specially designed for dead tank circuit breakers testing and all calculations for detecting the saturated condition of CTs is done by internal algorithm. Accordingly, the process of measurement parameters setting, and testing is very simple and does not differ much from testing in SINGLE/CONTIN/BSG test modes.

The user only needs to define a test current through the circuit breaker (e.g., **100A**) and a memory position (e.g., **Memory: 013**).

The following test current values can be selected: 5 A, 10 A, 20 A, 50 A, 100 A, 200 A and 300 A.

Once these parameters are defined, press **ENTER** to change to the Ready state.

3.9 Measuring with GGT

3.8.1 Ground Grid Test

Test can be performed with predefined test parameters – test current and test duration or with other selected parameters using **Ground Grid** menu. After selecting test parameters press **ENTER** to change to the **Ready** state.

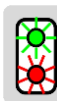
Figure 3-19:
Ready state



The **Ready** state displays the selected test current (e.g., **300A**), duration of the test (e.g., **60 sec**) and memory location of the result (e.g., **Memory: 013**). If one of these values must be changed, press **STOP** button to return to the **Ground Grid** menu.



The flashing green LED indicates GGT is now ready to start the test. Press the **START** button to run a test.

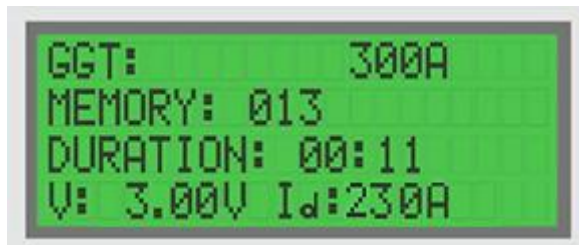


During the test, both green and red LEDs flash alternately. The display shows test current and the output voltage value. The time passed since the beginning of the test is also shown on the display.



Note: To stop the test, please press the **STOP** button at any time during the test. The current will immediately drop to 0 A.

Figure 3-20:
Ground Grid menu
 during the test

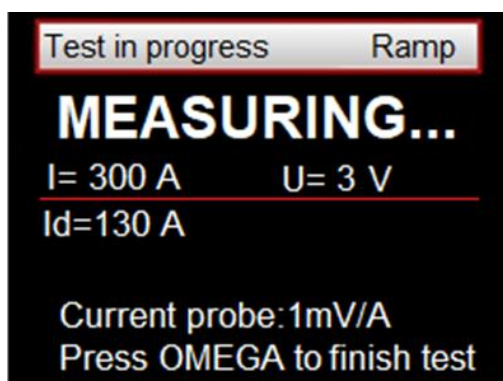


Upon completion of the test (either due to expiration of selected time or using the **STOP** button) the last measured result will remain registered at the previously selected memory location.

3.8.1.1 Measurement with GGT-M remote module

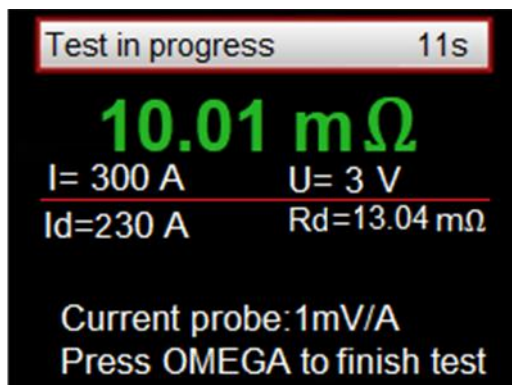
As already explained, the ground grid integrity test can also be controlled by the GGT-M module. After the test parameters are set, test is started by pressing **Ω** button. The following screen will be displayed at GGT-M remote module:

Figure 3-21:
Ground Grid menu
 during the test by
 GGT-M module



When the selected current is reached, the measurement of the resistance is displayed on the screen of GGT-M module, as well as total generated current (I) and voltage drop (U). Since the down current (Id) is also measured by current clamps connected to GGT-M module, this value is also displayed, as well as resistance calculated in refer to this current value (Rd).

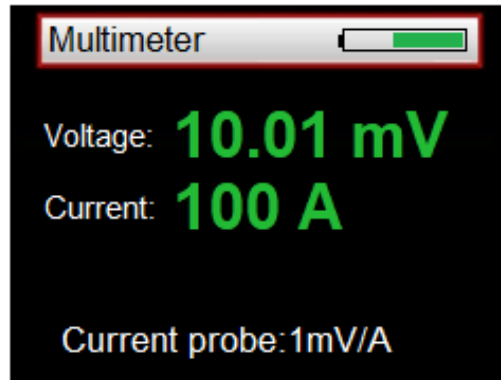
Figure 3-22:
Ground Grid menu
 during the measurement
 by GGT-M module



3.8.1.2 Using GGT-M remote module as multimeter

Additional function of GGT-M remote control module is Multimeter mode which is activated by pressing SET button in the starting screen (GGT mode). In multimeter mode, user can measure voltage with use of voltage sense leads or current with use of current clamps.

Figure 3-23:
Multimeter menu in
GGT-M module



3.8.2 Single Test

Before a test can be started, both a test current and a memory position need to be defined using the **Single** menu. Once these parameters are defined, please press **ENTER** to change to the **Ready** state.

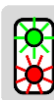
Figure 3-24:
Ready state



The **Ready** state displays the test current and memory position defined. If one of these values must be changed, press **STOP** to return to the **Single** menu.

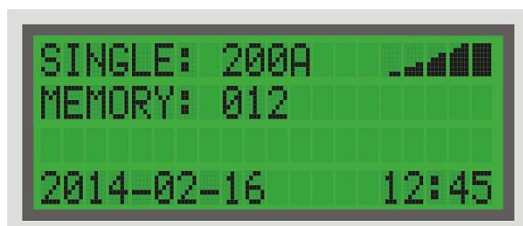


The flashing green LED indicates GGT is now ready to start the test. Press the **START** button to run a test. At the start of the test, the internal cable connection safety check is done automatically by the device itself. In case of e.g., a disconnection, an alarm is activated, and the error message is shown on the display.



During the test, both the green and the red LEDs flash alternately. The display shows a graphical representation of the output current that ramps from 0 A to the defined maximum value (e.g., **200A**).

Figure 3-25:
Single menu during the test



Once the current ramp reaches its maximum value, GGT measures the current through the test object and the voltage at the test object for 1s, calculates the resistance from these values, and saves the data at the predefined memory location.



Afterwards, GGT ramps down the output current from the predefined value to 0 A. After 0 A is reached, the test is finished, and the green LED is ON.



Note: To stop the test at any time, press the **STOP** button. The current will immediately drop to 0 A.

3.8.3 Continuous Test

Before the test can be started, a test current, duration of the test and memory location must be defined using **Contin** menu. Press **ENTER** to change to the **Ready** state.

Figure 3-26:
Ready state
 In CONTIN mode



The **Ready** state displays the selected test current (e.g., **100A**), duration of the test (e.g., **60 sec**) and memory location of the result (e.g., **Memory: 020**). If one of these values must be changed, press **STOP** button to return to the **Contin** menu.



The flashing green LED indicates GGT is now ready to start the test. Press the **START** button to run a test.

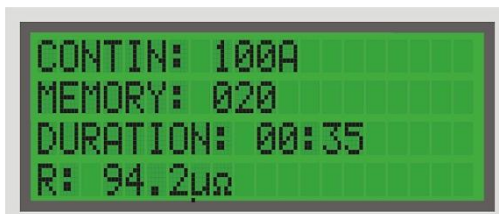


During the test, both green and red LEDs flash alternately. The display shows test current (e.g., **100A**) and the current value of the measured resistance (here **94,2μΩ**). The time passed since the beginning of the test is also shown on the display (here **00:35 s**)



Note: To stop the test, please press the **STOP** button at any time during the test. The current will immediately drop to 0 A.

Figure 3-27:
Contin menu
 during the test



Upon completion of the test (either due to expiration of selected time or using the **STOP** button) the last measured result will remain registered at the previously selected memory location.

By pushing the **Ω** button the recent test result is stored in the internal device memory.



Note: If DV-Win software is used during the test, all measurements will be registered in the Excel table format, allowing additional editing and graphic presentation options.

3.8.4 BSG Test

Before a test can be started, both a test current and a memory position need to be defined using the **BSG** menu. Once these parameters are defined, please press **ENTER** to change to the **Ready** state.

Figure 3-28
 The **Ready** state
 in BSG mode



The **Ready** state displays the test current, and a memory position defined. If one of these values must be changed, press **STOP** to return to the **BSG** menu.

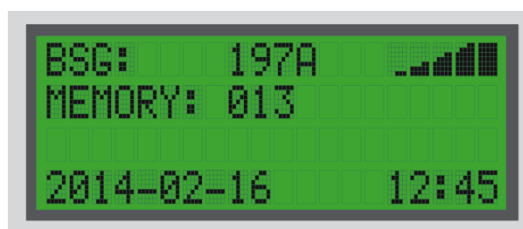


The flashing green LED indicates GGT is now ready to start the test. Press the **START** button to run a test. At the start of the test, the internal cable connection safety check is done automatically by the device itself. In case of e.g., a disconnection, an alarm is activated, and the error message is shown on the display.



During the test, both the green and the red LEDs flash alternately. The display shows a graphical representation of the output current that ramps from 0 A to defined maximum value (here **197 A**).

Figure 3-29:
 The **Contin** menu
 during the test



The GGT measures the current through the test object and the voltage at the test object for 1s, calculates the resistance from these values, and saves the data at the predefined memory location.



Afterwards, GGT ramps down the output current from the predefined value to 0 A. After 0 A is reached, the test is finished, and the green LED is ON.



Note: To stop the test at any time, press the **STOP** button. The current will immediately drop to 0 A.

The GGT device measures the current through the ground circuit connection (with the current clamps) and subtracts this value from the measured test current. In this way, the test current through the test object is calculated.



Note: The accuracy of a measured resistance in this menu is lower than accuracy in the **Single** or **Contin** menus due to accuracy of a current clamp-meter. The clamp-meter accuracy is $\pm (1 \% \text{ of rdg} + 0.3 \text{ A})$.

3.8.5 DTRtest

Before a test can be started, both a test current and a memory position need to be defined using the **DTRtest** menu. Once these parameters are defined, please press **ENTER** to change to the **Ready** state.

Figure 3-30:
The **Ready** state



The **Ready** state displays the test current and memory position defined. If one of these values must be changed, press **STOP** to return to the **DTRtest** menu.



The flashing green LED indicates GGT is now ready to start the test. Press the **START** button to run a test. At the start of the test, the internal cable connection safety check is done automatically by the device itself. In case of e.g., a disconnection, an alarm is activated, and the error message is shown on the display.



During the test, both the green and the red LEDs flash alternately. The display shows a graphical representation of the output current that ramps from 0 A to the defined maximum value (here **100A**).

Figure 3-31:
The **DTRtest** menu
during the test



As mentioned, presence of current transformers (CT) on this type of circuit breakers may introduce errors during the test due to CT magnetizing process. For this reason, it is necessary to saturate a CT prior to measurement.

Once the current ramp reaches its maximum value, GGT measures the current through the test object and the voltage at the test object for each 1s, calculates the resistance from these values. The device compares the results to detect when the CTs are saturated. After the device detects that CTs are saturated it displays the result, saves it in the internal memory and stops the test automatically.



Afterwards, GGT ramps down the output current from the predefined value to 0 A. After 0 A is reached, the test is finished, and the green LED is ON.



Note: To stop the test at any time, press the **STOP** button. The current will immediately drop to 0 A.

3.9 Measurement parameters

The table below provides GGT device accuracy parameters under the maximal test current per the range being used.

Table 3-1 Measurement parameters for GGT series

Range	Recommended Test Current	Nominal Resistance	Full Range Display	Resolution	Typical accuracy
1	200 A – 300 A	1 mΩ	999,9 μΩ	0,1 μΩ	± 0,1 % rdg ± 0,1 % FS
2	100 A – 200 A	10 mΩ	9999 μΩ	1 μΩ	± 0,1 % rdg ± 0,1 % FS
3	50 A – 100 A	20 mΩ	20,00 mΩ	10 μΩ	± 0,1 % rdg ± 0,1 % FS
4	20 A – 50 A	50 mΩ	50,00 mΩ	10 μΩ	± 0,1 % rdg ± 0,1 % FS
5	10 A – 20 A	100 mΩ	99,99 mΩ	10 μΩ	± 0,1 % rdg ± 0,1 % FS
6	10 A	500 mΩ	500,0 mΩ	0,1 mΩ	± 0,1 % rdg ± 0,1 % FS
7	5 A	1 Ω	999,9 mΩ	0,1 mΩ	± 0,1 % rdg ± 0,1 % FS

3.10. Duty Cycles

During tests GGT generates a high DC current that heats up the test set. To prevent overheating, certain duty cycles apply depending on the test current being used during CONTI mode and GGT mode.

Table 3-2:
Cooling times
for GGT device

Test current (A)	Test duration time (sec)	Cooling time (sec)
5, 10, 20, 50, 100, 200 A	10, 20, 30, 40, 50, 60, 90, 120, 150, 180, 240, 300, 450, 600, Unlimited	0
300 A CONTI mode	10, 20, 50, 90	0
	150	30
	300	60
	450	120
	600	180
300A GGT mode	10	10
	20	30
	30	40
	60	90

After the continuous 600 s test, the instrument will automatically stop the test, and the new one can start again after 180 s. This is only when the 300 A test current is used.

A built-in control prevents these cooling times from being skipped. If a start of the next test is attempted within the cooling period, the display shows "Wait" message and a timer displays remaining time till the end of a prescribed cooling period. After a cooling period has elapsed, start the test using the set test parameters by pressing the **START** button. Cooling of GGT is supported by a built-in fan that is automatically activated every time a test is started from the **Ready** state. It continues running 5 minutes after the test is finished.



Note: If the instrument is switched off immediately after the test, it will detect that the necessary cooling time has not passed. During the next start-up of the instrument, the remaining cooling time will be completed before a new test can be started.

3.11 Test Results

Once a test is finished, the GGT automatically changes to the **Result** menu to display the test results. For measurements in **CONTIN** and **DTRtest** menus only the last performed test is shown. The test current value displayed on the device screen is the maximal test current reached.



Note: If the defined test current could not be reached, this could be due to a too high resistance of the test object and/or of the current cables, then the instrument will start with the maximum possible current.

The **Result** menu is displayed for 10 seconds, and the display automatically goes back to the start menu.

Figure 3-32:
Result menu showing
the test results obtained
in Ground Grid test

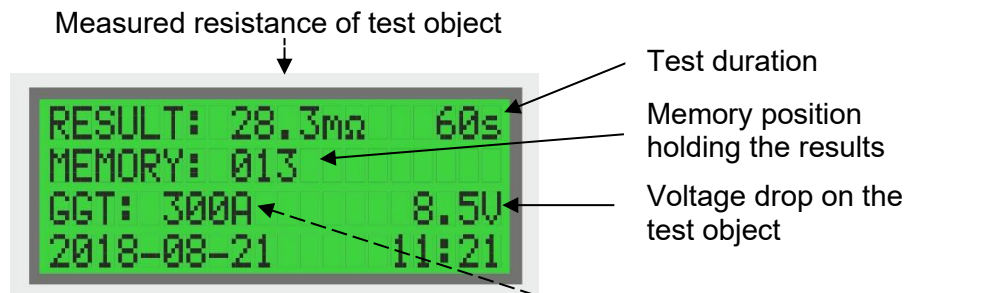


Figure 3-33:
Result menu showing
the test results obtained
in Single test

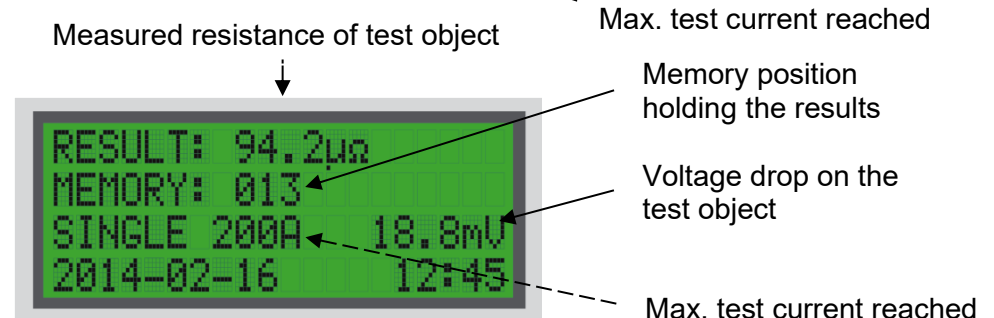


Figure 3-34:
Result menu showing
the test results obtained
in Continuous test

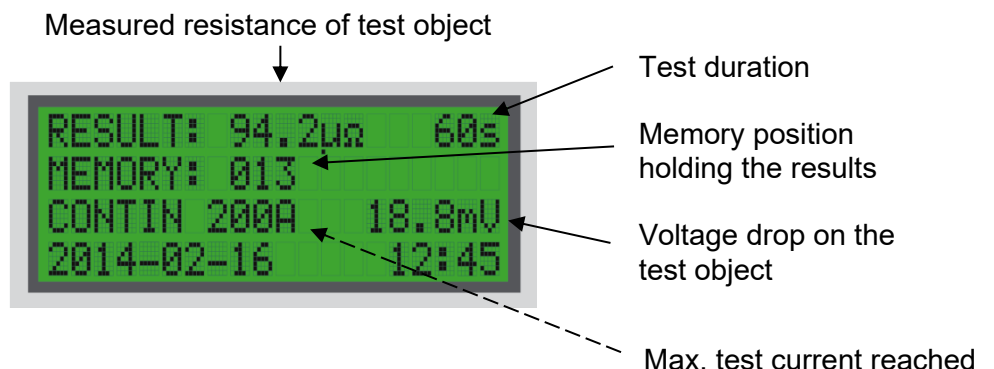


Figure 3-35:
The **Result** menu
showing the test results
obtained in BSG test

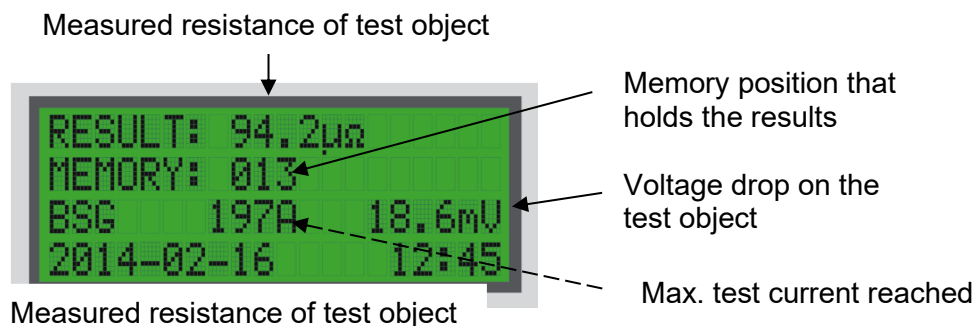
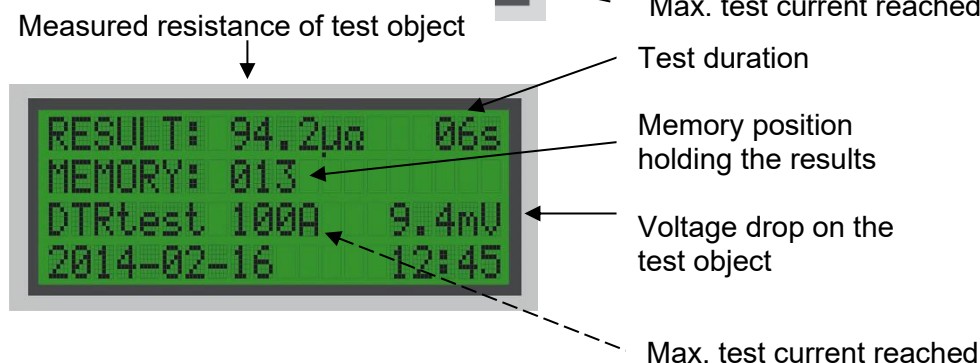


Figure 3-36:
Result menu showing
the test results obtained
in DTRtest



Starting a new test with the same current value:

- press the **ENTER** button to change to the **Ready** state with same test conditions,
 - press the **START** button to run the test.
- The current value remains the same as in the previous test. The memory position increases by one.

Starting a new test with a different current value:

- press the **STOP** button to change to the starting menu (**Ground Grid**, **Single** or **Contin**), set a new current value and/or another memory position,
- confirm entries by pressing the **ENTER** button,
- start the test by pressing the **START** button.

3.11.1 Test results when Rmax function is enabled

If the **Rmax** menu is set to option **ON**, once a **SINGLE** test is finished, GGT automatically changes to the **Rmax** to display the test results in case the measured resistance is equal or greater than the maximum assigned value.

Figure 3-37:
The **Rmax** showing
the test results





In case of the Continuous and DTRtest modes, first time when the measured resistance is equal or greater than maximum assigned value, GGT automatically stops the test and changes to the **Rmax**. In this case device displays the last measured resistance equal or greater to a maximum assigned value and time of obtaining that.

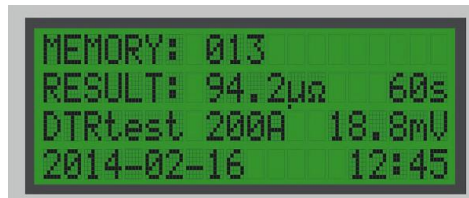
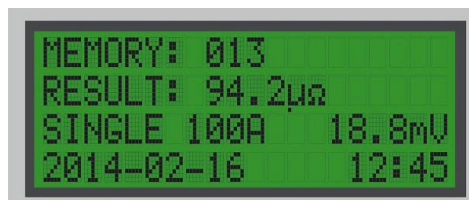


The red LED lights continuously and the alarm buzzer is activated indicating the assigned maximum value in **Rmax** menu is exceeded (or equaled).

3.11.2 Memory menu

Turn the GGT power switch ON. The GGT will display the **Ground Grid** menu. Press **SET** button four times to go to the **Memory** menu. When in the **DTRtest** menu, press **SET** button once to go to the **Memory** menu.

Figure 3-38:
Memory menu showing
 the test results



3.11.3 Deleting Results of Previous Tests

In the **Memory** menu, press **ENTER**.

Figure 3-39: The **Memory** menu showing an option to delete all saved measurements from the memory positions



Press **ENTER** one more time to delete all saved measurements from the memory positions.
Press **STOP** to leave the **Memory** menu without deleting any measurements.

3.11.4 USB Flash Drive Feature

Data from the GGT's internal memory can be exported to a USB flash drive. To do that, plug in the USB flash drive into the GGT device, by pressing SET button reach the "USB FLASH DRIVE" menu, select the desired range of the results to be exported and press ENTER button. The data will be saved in TXT and CSV formats.

4 Error Messages

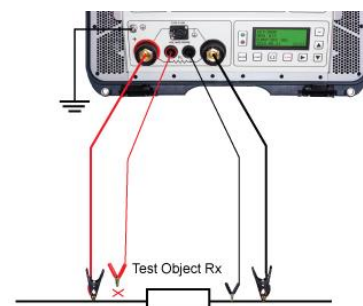
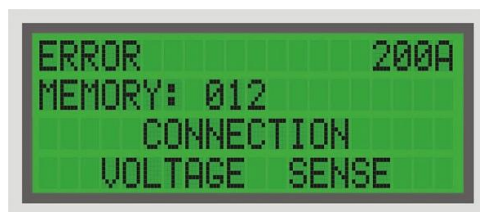
Any operational error is indicated by a red LED and an audio alarm. Furthermore, the display indicates an error status message.

To stop the alarm buzzer, remove the status message on the display, and to return to the **Single** menu, press the **STOP** button.

4.1 Error Message "Connection VS"

If one of the "Voltage Sense" cables is disconnected from the test object, or from the test set at the start of the test, the error message "Connection VS" is displayed.

Figure 4-1:
 Disconnection of a
"Voltage Sense" cable
 and corresponding error
 message

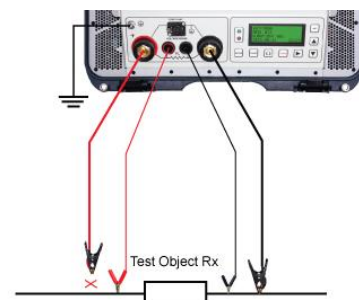


Note: Voltage sense cables disconnection, occurred during the test, will cause an erroneous result. The display will not show this as an error message.

4.2 Error Message "Open Connection"

If one of GGT current cables ("+" or "-") is disconnected, from the test set or from the test object at the start or during the test, the error message "Open Connection" is displayed.

Figure 4-2:
 Disconnection of the current
 cables and corresponding
 error message





Note: The error message "Open Connection" can be displayed not only in case one of the current cables is disconnected, but also in case of high-test resistance due to bad contact. It is recommended to clean the contact surface of the circuit breaker terminal before testing with the GGT device.

4.3 Error Message "Polarity"

This message is displayed if the polarity of measuring cables is incorrect. In this case connect measuring cables correctly and repeat the test.

Figure 4-3:
Error message
"Polarity"



4.4 Error Message "Change Current"

This message is displayed if during the test the voltage exceeds the maximum allowed value. In this case reduce the test current and repeat the test.

Figure 4-4:
Error message
"Change Current"

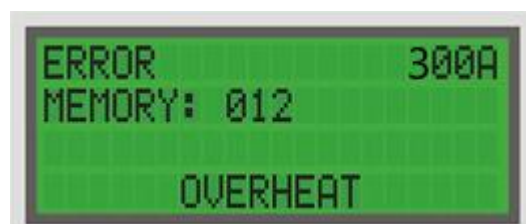


Note: The error message "Change Current" is disabled in Ground Grid mode.

4.5 Error Message "Overheat"

The message is displayed when GGT device's operating temperature rises too high due to a high ambient temperature or, despite the duty cycle time control, too many high current tests were performed in too short of a time.

Figure 4-5:
Error message
"Overheat"



In this case, wait for the test set to cool down and repeat the test.

4.6 Error Message "Malfunction"

If this message is shown on the display, or if GGT cannot operate anymore at all, a serious internal error occurred.

Figure 4-6:
Error message
"Malfunction"



Note: Please do not open GGT without permission and instructions given by IBEKO Power AB. Contact the IBEKO Power AB (refer to the Section "Manufacturer Contact Information").

5 Troubleshooting

If it is suspected that the device is presenting inaccurate results, the following tests should be performed:

5.1 Maximum current test

If the device is unable to reach the set test current on the test object, the following procedure should be performed:

5.1.1 Testing with test shunts

This test can be done in the office or in the field.

1. Connect two test shunts R_1 (100 $\mu\Omega$) and R_2 (1 m Ω) in series with Ground Grid Tester as shown in the Figure 5.2. *Please make sure to use only the original set of cables intended for that device.*
2. Set the maximum test current on the GGT device and start the test (**Single** test).
3. If the selected current is reached the device is working correctly.
4. If the selected current cannot be reached, please contact the DV Power Support Team.

5.1.2 Testing with the test object (in the field)

This test is performed in the field, using the test object. Purpose of the test is to measure the total resistance, the resistance of the test object, as well as the resistance of the connections.

1. Connect the GGT device to the test object as shown in the Figure 5.1: Connect the voltage sense clamps to the screws on the current cable's clamps. Position the sense conductors outside the loop made by the current cable conductors' leads. *Please make sure to only use the original set of cables intended for that device.*



NOTE: This connection method is used **ONLY** for this test. When performing a regular resistance measurement of the test object, it is necessary to make sure that the Kelvin (4-wire) measuring method is applied – the voltage sense connections must be connected directly to the test object.

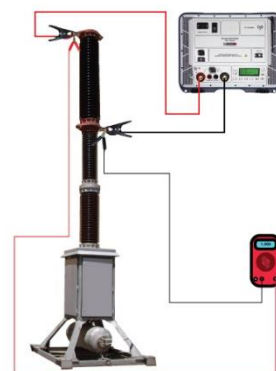


Figure 5.1
Test connection

2. Set the maximum current on the GGT device and start the test (Single test).
3. Read the resistance obtained from the GGT device. Please note that in this case the resistance of the test object is increased by the resistance of contacts between Current cables and a test object.

4. If the measured resistance exceeds several hundred micro-ohms ($\sim 500\mu\Omega$) the resistance of the contacts is too high. Please perform the necessary actions to lower the resistance of these contacts.
5. If the measured resistance is low, and the device still cannot reach some test currents, please contact the DV Power Support Team.



NOTE: If a voltmeter is available in the test field, connect the voltmeter to the Voltage Sense inputs of the device. Total resistance of the test object can be calculated by dividing the voltage obtained from the voltmeter by the current generated from the device (shown on the display):

$$R = \frac{U_v}{I_d}$$

5.2 Measurement accuracy check

If it is suspected that the device is presenting inaccurate results, the accuracy check described below should be performed:

5.2.1 Accuracy check

1. Connect two test shunts R_1 ($100\mu\Omega$) and R_2 ($1\text{ m}\Omega$) and Voltage Sense cables as shown in the Figure 5.2.
2. Set Single test on the device, set the first test current from the list and start the test. Read the resistance value measured by the Ground Grid Tester and compare it to the expected values written in the Table 5.1. Repeat this step for all test currents written in the Table 5.1.
3. Connect the Voltage Sense cables in parallel to the R_2 test shunt and repeat tests described in the previous step.
4. If the measured results differ from the expected values, please proceed to the next step (Section 5.2.2) – looking for the root cause of inaccurate measurements.

5.2.2 Test currents check

1. Short circuit the Voltage Sense input of the device and connect a digital voltmeter in parallel to the R_2 test shunt as shown in the Figure 5.3.
2. Set **Contin** test (**10s**) on the device, set the first test current from the list and start the test. Note the voltage V_2 measured by the voltmeter and compare it to the expected one: $V_2 = I \cdot R_2$.
3. Repeat the test for all test currents specified in the Table 5.2. If the measured voltages do not differ significantly from expected ones, the device is generating current correctly. Please proceed to the next step.

5.2.3 Voltage measurement check

1. Connect the Voltage Sense cables in parallel to the R_1 test shunt and digital Voltmeter in VS input of the device, as shown in the Figure 5.4.
2. Set **Conti** test (10s) on the device, set the first test current from the list and start the test. Note the resistance measured with the GGT device (R_{1meas}), the voltage V_1 measured with the voltmeter, and calculate the resistance:

$$R_{1cal} = \frac{V_1}{I}$$

3. Repeat the test for all the test currents specified in the Table 5.3. If the calculated resistances does not differ significantly from the resistances measured with the GGT device, the device is measuring correctly.

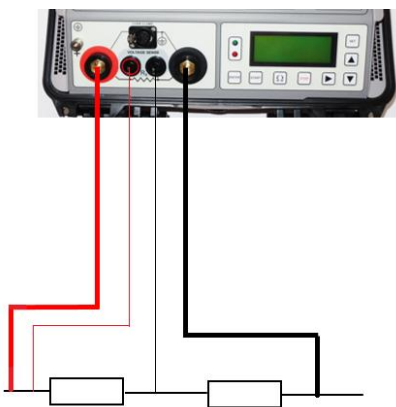


Figure 5.2 – Connection diagram

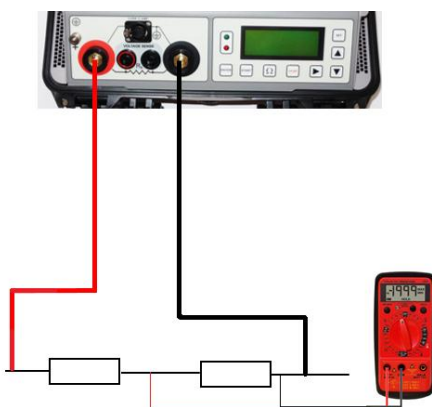


Figure 5.3 –Connection diagram

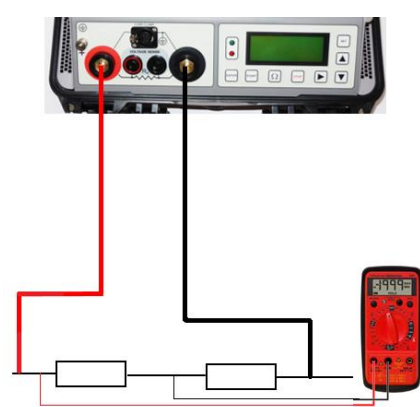


Figure 5.4 – Connection diagram

I [A]	R_1 [$\mu\Omega$]	R_2 [m Ω]
50	98,9 – 101,1	0.989 – 1,011
100	98,9 – 101,1	0.989 – 1,011
200	98,9 – 101,1	0.989 – 1,011
300	98,9 – 101,1	0.989 – 1,011

Table 5.1 – Expected results

I [A]	V_2 [mV]
50	49,45 – 50,55
100	98,9 – 101,1
200	197,8 – 202,2
300	296,7 – 303,3

Table 5.2 – Expected results

I [A]	R_1 [$\mu\Omega$]	V_1 [mV]
50	98,9 – 101,1	4,945 – 5,055
100	98,9 – 101,1	9,89 – 10,11
200	98,9 – 101,1	19,78 – 20,22
300	98,9 – 101,1	29,67 – 30,33

Table 5.3 – Expected results

5.3 TestCom application

In case TestCom application is not provided, please contact the DV Power Support Team to request the latest version.

1. Connect the device to a computer and turn it ON.
2. Run the TestCom.exe.
3. Click "Connect" to establish a communication between the device and the computer.
4. Click "Start" and a log file will be generated in the same folder where TestCom.exe is located.
5. Send the log file to DV Power Support Team for analysis.



NOTE: If experiencing problems with running TestCom.exe, please install the Patch.exe, which is included in the TestCom archive. After the installation, it should be possible to run TestCom.exe.

6 Customer Service

Before calling or sending an e-mail to Customer Service for assistance, please perform the following steps:

1. Check all cable connections.
2. Try the test on another instrument, if available.
3. Perform the troubleshoot procedure.
4. Have the following information available:
 - Instrument serial numbers, hardware configuration, and software revision
 - Exact description of the problem, including the test object information, error messages and the sequence of events before it appeared
 - List of solutions that have been tried

The Customer Support Department can be reached at:

Local support (Sweden): +46 8 731 78 24

International support: +46 70 0925 000

E-mail: support@dv-power.com



Note: Email communication is preferred for support issues, since the case is then documented and traceable. Also, the time zone problems and issues with occupied telephones do not occur.

7 Packing the Instrument for Shipment

If you need to send the instrument to DV Power for servicing, please contact the DV Power Customer Service for return instructions at:

Local support (Sweden): +46 8 731 78 24

International support: +46 70 0925 000

E-mail: support@dv-power.com



Note: DV Power is not responsible for shipping damage. Please protect each instrument from shipping and handling hazards carefully. Please ensure protective covers are securely in place. Instruments should be sent to DV Power freight pre-paid unless other arrangements have been authorized in advance by DV Power Customer Service.

To prepare an instrument for shipment, please follow these instructions:

1. Disconnect and remove all external cables. Do not include manuals and cables, unless recommended by DV Power Customer Service.
2. Reuse the original packing material if it is available. If it is not, pack the instrument for shipment according to the instructions for fragile electronic equipment. It is recommended use two-wall minimum corrugated cardboard box with a minimum 5 cm (2 inch) thick poly foam padding, or a wooden crate with minimum of 5 cm (2 inch) thick poly foam padding all around.

8 Technical Data

Mains power supply (GGT200 & GGT300 devices)

- Connection according to IEC/EN60320-1; C320
- Mains supply: 90 V – 264 V AC
- Frequency: 50 / 60 Hz
- Power consumption: 3100 VA (GGT300), 2100 VA (GGT200) @ 230 V AC
2800 VA (GGT300), 1900 VA (GGT200) @ 115 V AC
- Circuit breaker with thermal overload protection: 20A/240V AC
 - *Designed according to UL 1077 standard (Supplementary Protectors for Use in Electrical Equipment)*
 - *For primary protection of the electrical panel a circuit breaker designed according to the UL 489 standard shall be used.*

Battery (GGT-M remote module)

- Type: Li-Ion 7,4 V, 2900 mAh
- Charging time: 2 h

Output data

- Test current ranges and load intervals for:

- **Ground Grid test mode;**

100 A	5 min
200 A	150 s
300 A*	60 s

*available for GGT300 model only

- **CONTI Micro Ohmmeter mode:**

100 A	unlimited
200 A	unlimited
300 A*	10 min

*available for GGT300 model only

Measurement data

- Resistance range: 0 – 999,9 mΩ
- Resolution

0,1 μΩ – 999,9 μΩ	0,1 μΩ
1,000 mΩ – 9,999 mΩ	1 μΩ
10,00 mΩ – 99,99 mΩ	10 μΩ
100,0 mΩ – 999,9 mΩ	0,1 mΩ
- Typical accuracy ± (0,1 % rdg + 0,1 % FS)
- Guaranteed accuracy ± (0,2 % rdg + 0,2 % FS)

Environmental conditions

- Operating temperature: -20 °C – +55 °C / -4 °F – +131 °F
- Storage & transportation: -40 °C – +70 °C / -40 °F – +158 °F
- Humidity: up to 95 % relative humidity
- Installation/overvoltage category: II
- Pollution degree: 2

Dimensions and Weight

- GGT200 & GGT300 dimensions 503 x 406 x 193 mm / 19.8 x 15.9 x 7.6 in
- GGT200 & GGT300 weight: 14,6 kg / 32.1 lbs
- GGT-M remote module dimensions: 226 x 116 x 50 mm / 8.9 x 4.5 x 1.9 in
- GGT-M remote module weight: 0,9 kg / 1.98 lbs

Data storage and transfer

- Internal memory locations 500 measurements / USB flash drive feature
- Connection Interface
 - USB serial interface to connect to an external PC or RS232 interface (optional)
 - Bluetooth communication module (optional) works in combination with RS232 interface
 - Wi-Fi (RF) communication between GGT and GGT-M

Low Voltage Directive

Directive 2014/35/EU (CE conform)
Applicable standards, for a class I instrument, pollution degree 2, Installation category II: IEC EN 61010-1

Electromagnetic Compatibility (EMC)

Directive 2014/30/EU (CE conform)
Applicable standard: EN 61326-1

Mechanical Protection

- GGT Ingress Protection Rating IP67 (with closed lid)
- GGT-M Ingress Protection Rating IP40

9 Instrument & Accessories

GGT instrument with included accessories	Article No
Ground Grid Tester GGT300	GGT300-N0-03
Ground Grid Tester GGT200	GGT200-N0-03
- DV-Win PC software including USB cable - Mains power cable - Ground (PE) cable - Transport case	

Standard accessories	Article No
Current cables 2 x 10 m 70 mm ² and heavy-duty sense cables 2 x 10 m	CSHD-10-70VMFM
Current cables 2 x 10 m 50 mm ² and heavy-duty sense cables 2 x 10 m	CSHD-10-50VMFM
Current and sense cables 2 x 35 cm 70 mm ² with alligator clamps (A4)	CS-0Z35-70VMA4
Current and sense cables 2 x 35 cm 50 mm ² with alligator clamps (A4)	CS-0Z35-50VMA4

GGT-M remote control module with included accessories	Article No
Ground Grid Tester Module for Remote Control GGT-M	GGTMRC-MOD-0
- Power supply adapter 3 A - Transport bag and carrying belts	

Standard accessories	Article No
Current clamp 30/300 A power supplied from the instrument with 5 m cable	CCCA-0300-01
Voltage sense cables	S2-0122-BPBP

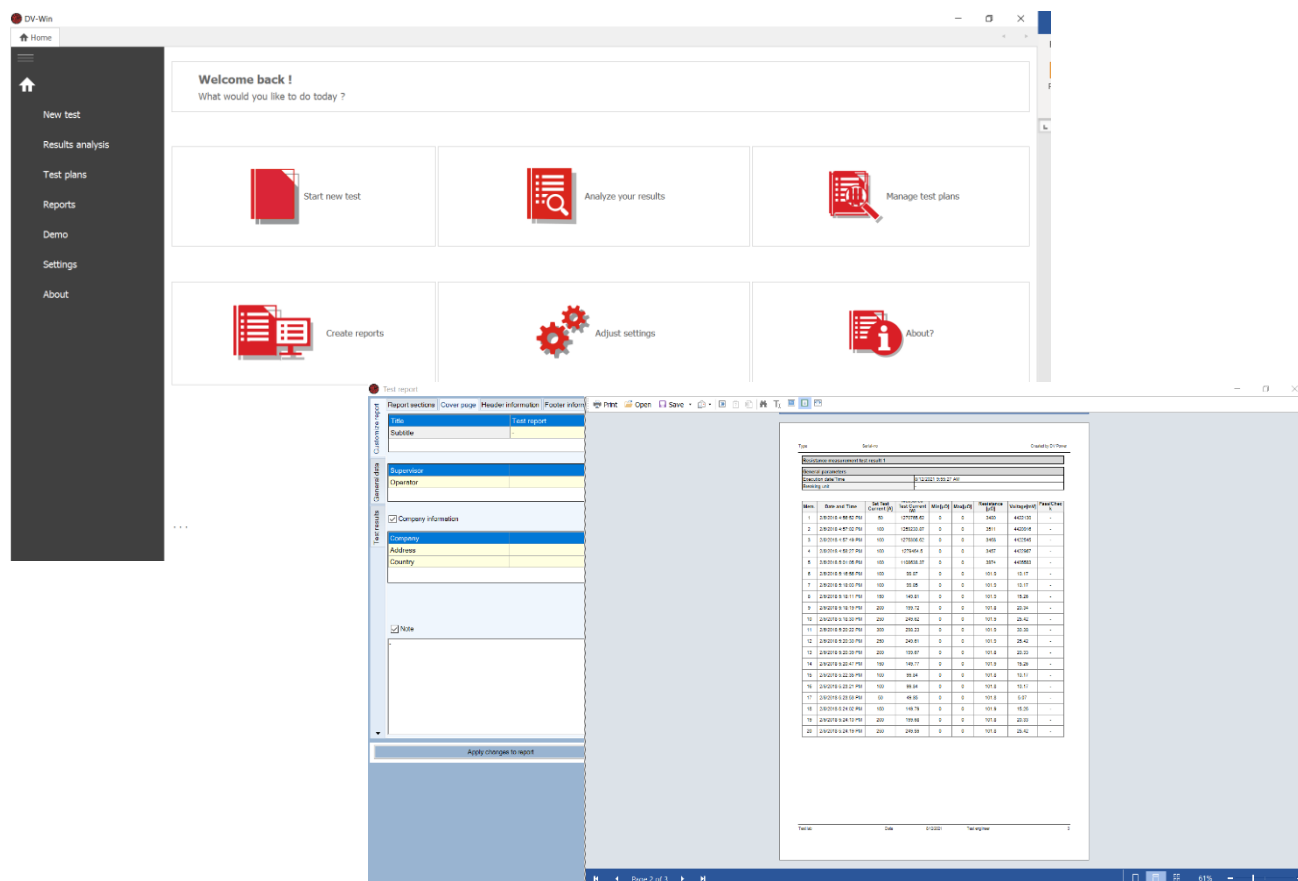
Optional accessories	Article No
Current cables 2 x 5 m 70 mm ² and heavy-duty sense cables 2 x 5 m	CSHD-05-70VMFM
Current cables 2 x 5 m 50 mm ² and heavy-duty sense cables 2 x 5 m	CSHD-05-50VMFM
Red current cable extension 20 m 70 mm ² and sense cable 20 m	RECS-20-70VMFM
Red current cable extension 20 m 50 mm ² and sense cable 20 m	RECS-20-50VMFM
Remote control unit + cable set	RMORCU-09-00
Remote control test probes (with trigger button)	RMO-RCTP-TB0
Test shunt 100 $\mu\Omega$ (600 A/60 mV)	SHUNT-600-MK
Cable plastic case - large size	CABLE-CAS-03
Cable plastic case with wheels – large size	CABLE-CAS-W3
Cable plastic case with wheels – extra-large size	CABLE-CAS-W4
Current and sense cables 2 x 35 cm 70 mm ² with C clamps	CS-0Z35-70VMC0
Current and sense cables 2 x 35 cm 50 mm ² with C clamps	CS-0Z35-50VMC0
Current and sense cables 2 x 35 cm 70 mm ² with battery clamps (B3)	CS-0Z35-70VMB3
Current and sense cables 2 x 35 cm 50 mm ² with battery clamps (B3)	CS-0Z35-50VMB3
Sense cables 2 x 1 m with alligator clamps (A2)	S2-01-02BPA2
Cable bag	CABLE-BAG-00

* 70 mm² current cables are for GGT300 and 50 mm² current cables are for GGT200

DV-Win software

*Included in the purchase price

- Full control of the device in test
- Test reports available in several formats
- Several filters for results download to a PC
- Sampling time feature for CONTIN mode
- Detailed Help menu



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