

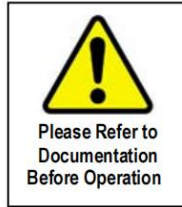


60kV VLF Hipot Test System with Integrated Tan Delta

HIVOLT VLF60T

USER MANUAL





1.Important notes

Safety precautions

This manual contains basic information about commissioning and operating the device/system. Therefore, it must be ensured that this manual is accessible to authorised and trained operating personnel at all times.

The operating personnel must read the manual carefully. The manufacturer will not accept liability for any damage to persons or materials caused by a failure to observe the safety instructions contained in this manual.

National standards and regulations must be observed.

Working with products

The generally valid electrical regulations of the country in which the device is installed and operated, as well as the existing national regulations for accident prevention and any internal regulations (work, operating, and safety regulations) of the operator must be observed.

After working on the system, it must be disconnected from the power supply and secured against being switched on again, discharged, earthed, and short-circuited.

Original accessories are used for system safety and functional reliability. The use of other parts is not permitted and leads to the loss of warranty

2. Safety instructions

Lifting and carrying devices

The device may only be lifted and carried using the carry handles provided on the side. Other parts of the device, such as the connection cables, are unable to withstand the forces that occur when the device is lifted and could therefore break or tear off.



WARNING

Risk of electric shock

Special attention and safety-conscious conduct is required by measuring personnel when handling high-voltage equipment and systems, especially during non-stationary operation. Here, VDE regulation 0104 "Erection and operation of electrical test equipment" or the corresponding EN 50191 as well as country-specific standards and regulations must be strictly observed.

3. Instrument Summary

The HIVOLT VLF60T is an ultra-compact and lightweight VLF Test set with integrated Tan Delta (TD) Diagnostics, in a rugged trolley for easy transport.

HIVOLT VLF60T offers outstanding features in terms of size, weight, safety and ease of use.

In order to meet international test guides (e.g. IEEE 400.2-2013) the HIVOLT VLF60T combines the small and lightweight VLF test set with an integrated Tan Delta diagnostics unit.

It can perform VLF and DC testing, tan delta testing. Assessments of cable condition can be carried out by the use of Tan Delta Diagnostics.

Important note:

Use the VLF test set properly. Test at the proper test voltage and time duration.

Abbreviated tests or tests at reduced voltage levels should not be performed. An improper test may aggravate cable defects that may cause cable failure later in service. The proper test voltage and time duration are essential to allow the VLF to do its job.

4 Technical description

4.1 System description

The HIVOLT VLF Series of hipot test sets provide true sine wave AC output voltage for the test of high voltage cables and other capacitive loads.

4.2 Features

- VLF withstand test with various frequencies (0.01. -0.1 Hz)
- With DC test facility
- Cable Testing According IEEE400
- 7" color touch screen display
- True sine wave output
- Tan Delta measurement with various frequencies (0.01. -0.1 Hz)
- Real-time display of actual output waveform
- Over voltage and current protect
- Easily exchangeable HV cable
- Intuitive menu operation
- Internal memory with time/date stamp
- Internal thermal printer
- Rugged and all-in-one portable design

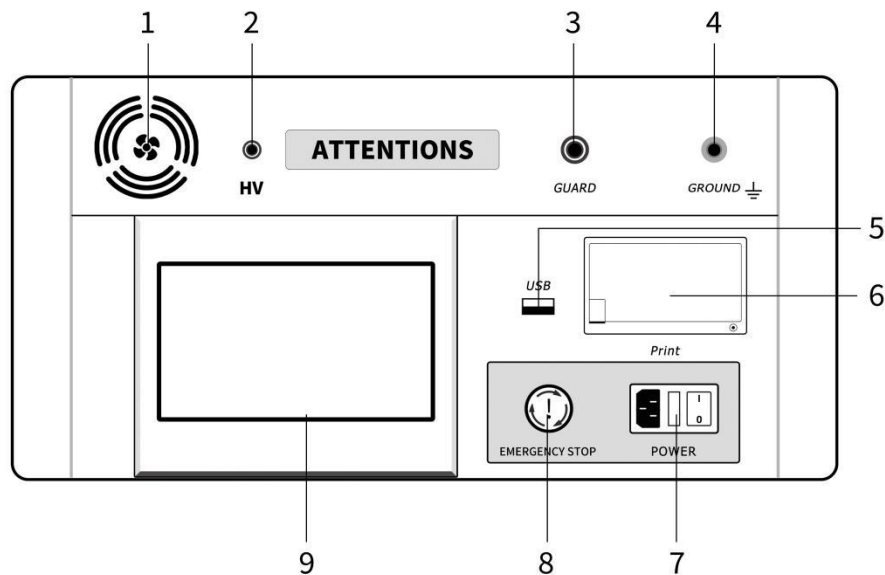
4.3 Technical data

The test system is specified by the following technical parameters:

Parameter		Value
Output voltage		0~44kV _{RMS} /0~60kV _{peak}
Output voltage (DC)		0~±60kV
Accuracy		±3%
Output current		0~20mA
Test voltage frequency		0.01Hz~0.1 Hz (auto variable frequency)
Load rating		0.5μ@0.1Hz@44kV _{RMS} 5μF maximum test capacity
Tan delta	Output voltage	0~44kV _{RMS} /0~60kV _{peak}
	Range	$0.01 \times 10^{-3} \sim 655.35 \times 10^{-3}$
	Accuracy	±1%
	Resolution	1×10^{-5}
Capacitance	Range	0.001 μF - 10 μF
	Resolution	0.001 μF
	Accuracy	±3%
Resistance	Range	1M Ω -65535M Ω
	Resolution	1M Ω
	Accuracy	±3%
Input voltage range		180~270VAC,50/60Hz
Duty		Continuous
Display		7" color touch screen
Memory		Internal memory with time/date
Operating temperature		- 20 ° C ... + 50 ° C
Storage temperature		- 25 ° C ... + 70 ° C
Relative humidity		85% at 30℃ (no condensation)
Dimensions		430*170*290mm
Weight		40kg

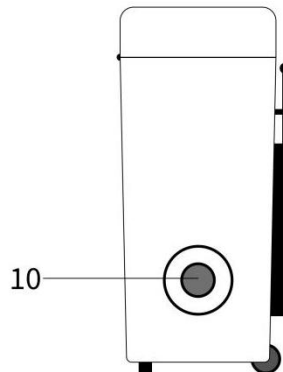
5.Display and operating elements

5.1 Front panel



Number	Description	
①	Cooling vent	For instrument cooling
②	HV output indicator lamp	This lamp will flash when high voltage is output
③	Guard port	For safety grounding. Only for performing VLF Tan Delta testing.
④	Protective grounding connection	For protective earthing
⑤	USB port	Temporarily unavailable. Will be used for output data in the future.
⑥	Thermal Printer	Print test data
⑦	Power switch	Turning the power on and off
⑧	Emergency stop button	In an emergency, press this button to abort the test.
⑨	Color touch display	Displays menu, options and status information.

5.2 Side Panel



Number	Description	Application
⑩	High voltage output port	Serves as connection point from the device to the HV connection lead. To connect: Screw the HV connection cable into the HV output connector and tighten.

6. Commissioning

Normal connection

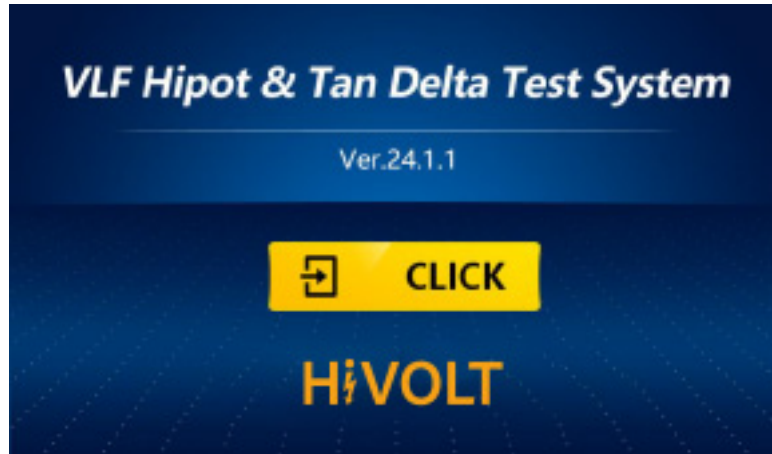
To connect the test system to the test object, proceed as follows:

1. Use the green/yellow earth cable to connect the device's protective earth connection to a suitable point on the protective earth system (station earth). Ensure that the connection points of the earth cable are not dirty or rusted and provide good metallic contact.
2. Connect the other end of the HV cable to the test object.
3. Connect the supplied power cord to the system's power receptacle and to a power socket.

7 Basic operation of the test system

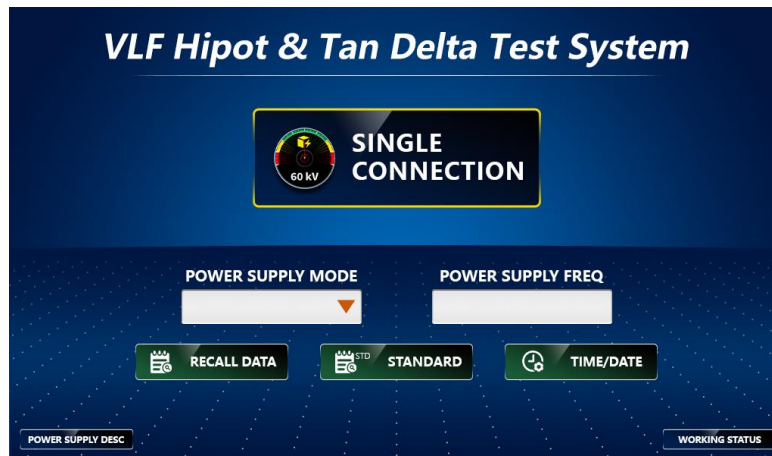
7.1 Welcome screen

Before it is switched on with the on/off button , the device is in the 'Out of service' state.
After turning on the power switch, the welcome screen will be displayed.



Push "Click" in the middle of the welcome screen to enter the Initialize screen.

7.2 Main screen



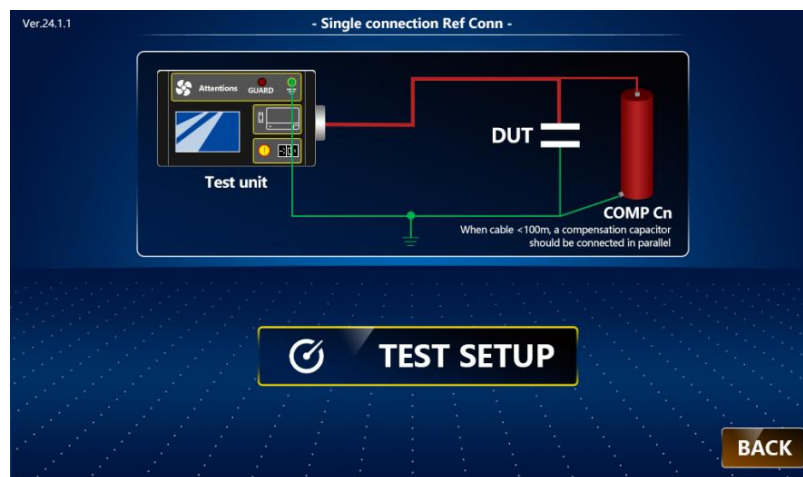
Menu Item	Description
SINGLE CONNECTION	Users can view the single connection mode connection diagram
POWER SUPPLY MODE	Power supply for the instrument, mains and variable frequency generator available. Select one according to the actual situation on site.
POWER SUPPLY FREQ	Automatic detection and display of power supply frequency

RECALL DATA	The stored data can be recalled
STANDARD	Recall STD.TD test result
TIME/DATE	Time and date can be set
POWER SUPPLY DESC	Users can see the precautions for using different power supply modes.
WORKING STATUS	Users can check the current working status of the instrument.

8.Performing VLF & DC tests and diagnoses

8.1 Preparing and starting the test

Click "Single connection" to enter the single connection screen:



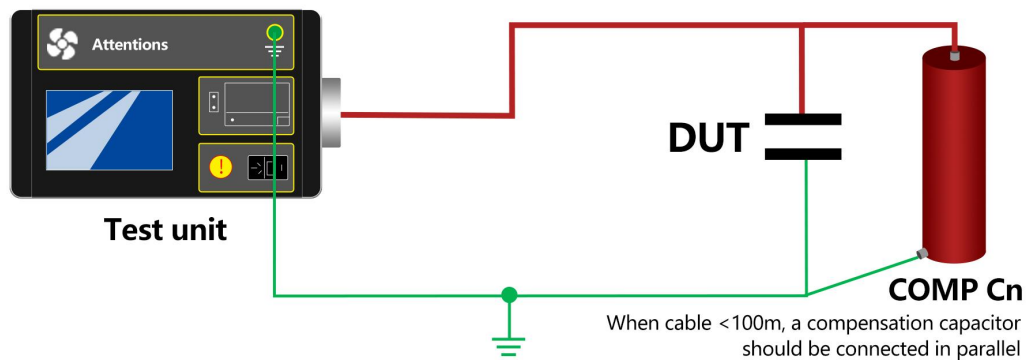
Check whether the test leads connection is proper according to the displayed connection diagram.



DUT with low capacitance

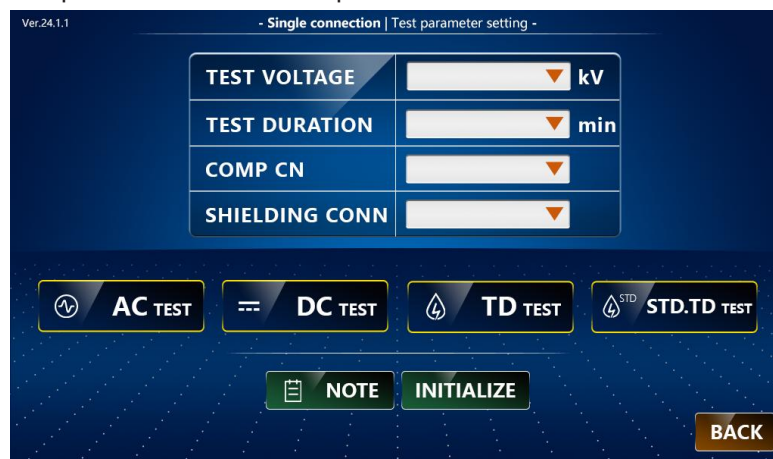
If the capacity of the DUT is lower than $0.05\mu\text{F}$, or the tested cable is shorter than 100 meters, the device will not be able to output voltage normally. A supplied compensation capacitor needs to be connected in parallel.

Reference connection diagram:



8.2 Setting measurement parameters

Click "Test setup" to enter the test setup screen:



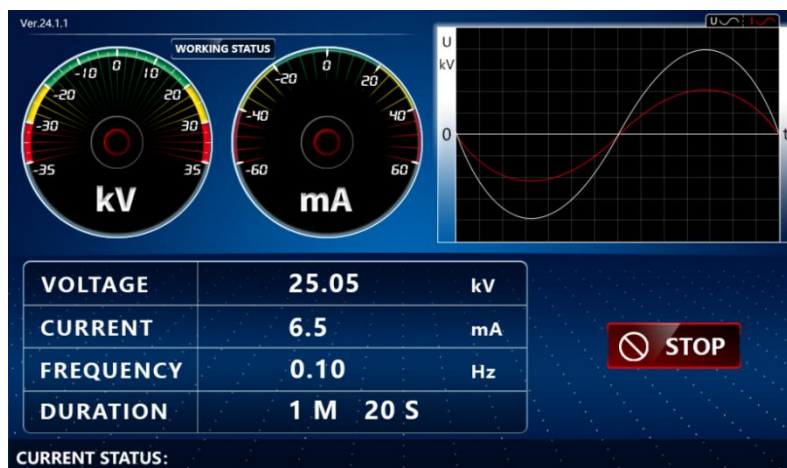
Item	Description
HIGHT VOLTAGE	Click the orange arrow and type in the test voltage in the drop-down box. The test voltage to be set is derived from the rated voltage of the connected cable and the guidelines to be applied for the test (e.g. recognized standards, factory standards, customer's specifications).
TEST DURATION	Click the orange arrow and enter the test duration in the drop-down box. The test duration to be set must be selected in accordance with the applicable guidelines (e.g. recognized standards, factory standards, customer's specifications).
COMP CN	According to whether the compensation capacitor is connected, click the orange arrow and select "Yes" or "No" in the drop-down box.

	 Note: For test objects with low capacitance, such as cables under 100 meters, a supplied standard capacitor must be connected in parallel during the test.
SHIELDING CONN.	In tan delta test, select "single" or "double" according to the actual test leads connection . In VLF or DC test, select "NO"
AC TEST	Start VLF AC automatic measurement
DC TEST	Start DC automatic measurement
TD TEST	Start tan delta automatic measurement
STD.TD TEST	Start tan delta automatic measurement according to IEEE400.2-2013
NOTE	Some facility descriptions can be viewed
BACK	Return to the previous screen

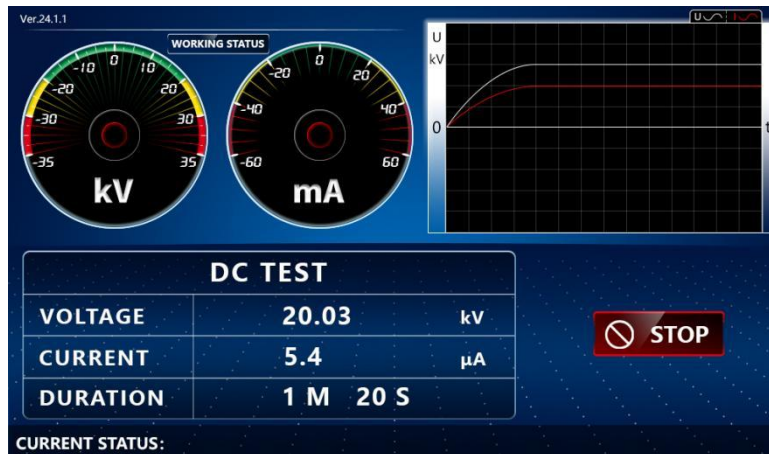
8.3 Starting the test

Click "AC" or "DC" and the device enters the testing interface

The AC testing screen is as follows:



The DC testing screen is as follows:

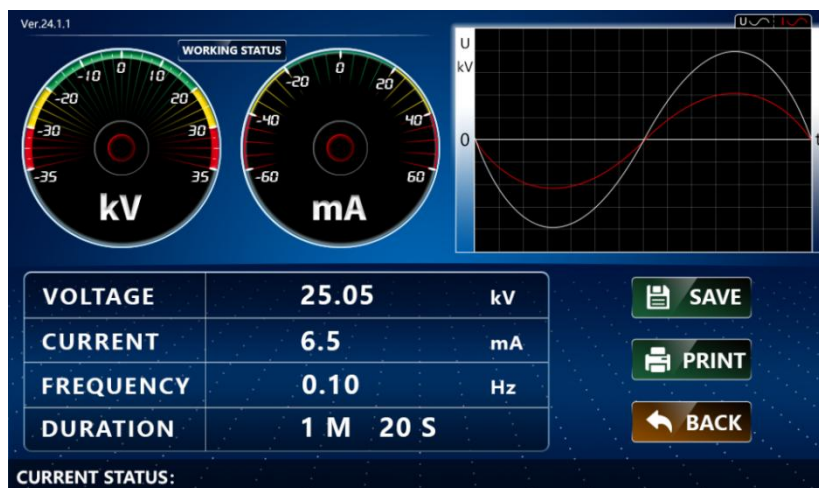


Item	Description
VOLTAGE	The test voltage being applied.
CURRENT	Current output during test
FREQUENCY	The relevant standards usually recommend a test frequency of 0.1 Hz for cable tests with VLF voltage. The maximum test frequency depends on the determined cable capacity and the test voltage being applied. In order to ensure the safety of the device, the device automatically adjusts the test frequency according to the capacity of the cable and the test voltage being applied.
DURATION	The test time to be set must be selected in accordance with the applicable guidelines (e.g. recognized standards, factory standards, customer's specifications).
STOP	Stop or abort a test.  If you click "Stop" or push emergency stop button before a test is completed, please wait patiently for the device to automatically discharge. When the discharge is completed, there will be a prompt on the screen. Then click "BACK". Clicking "BACK" before discharge is completed may cause damage to the instrument!

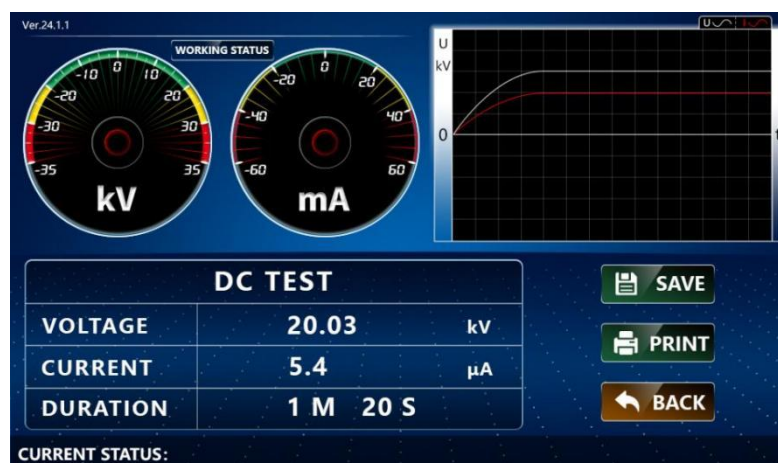
8.4 Conclusion of the test

After the defined test time has elapsed, test results are displayed.

AC test result screen:



DC test result screen:



SAVE	The test data will be saved to the internal memory
PRINT	Test data will be printed by internal thermal printer
BACK	Back to the main screen

9. Tan Delta

9.1 Application

The HIVOLT VLF60T is a VLF test unit with an integrated Tan Delta measuring system. It provides a high-voltage Tan Delta measuring system suitable for testing medium-voltage electrical insulation systems such as cables (including XLPE, PE EPR, PILC, etc.), capacitors, switchgear, transformers, rotating machines, insulators and bushings.

Tan Delta testing enables the cable test engineer to detect insulation defects before the cable fails in service. The Tan Delta test results of the test object can be easily measured,

recorded and displayed on the screen. The results can be easily stored in internal memory.

9.2 Test lead connection

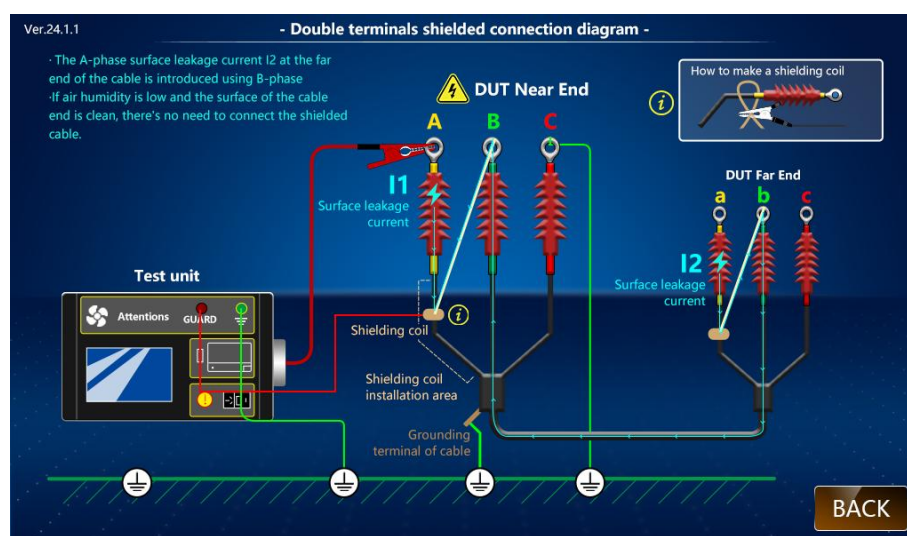
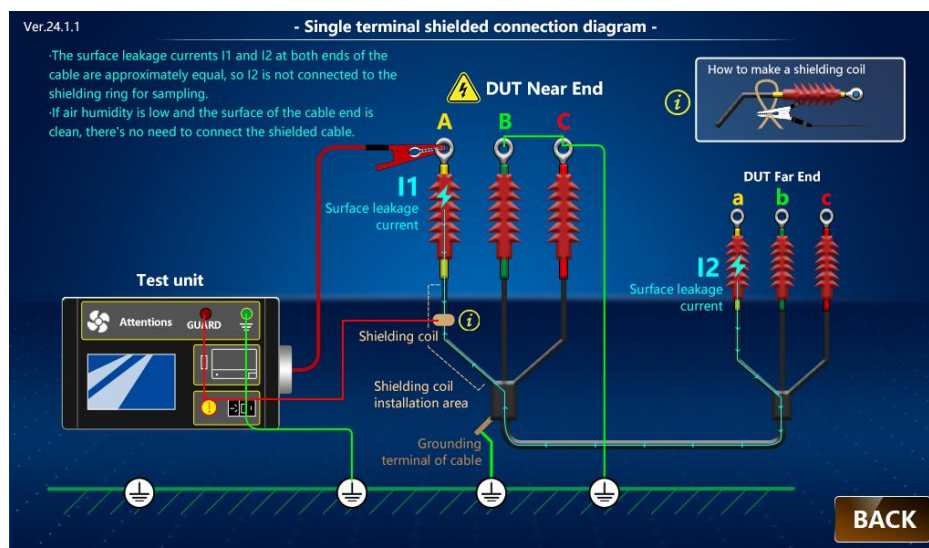
Connect the test leads according to the test leads connection diagram displayed on the screen or the connection diagram in the user manual.

The test leads connection method is the same as the VLF withstand test. If eliminating the affect of the surface leakage current at the cable end on the tan delta test, we can lead the leakage current into the VLF unit and deduct the affect of this leakage current from the total tan delta value.

The test leads connection method that inject the leakage current from one end of the cable to the VLF unit is called the single-shielding method;

The test leads connection method that inject the leakage current from both ends of the cable to the VLF unit is called the double-shielding method.

The two test leads connection methods are shown below:



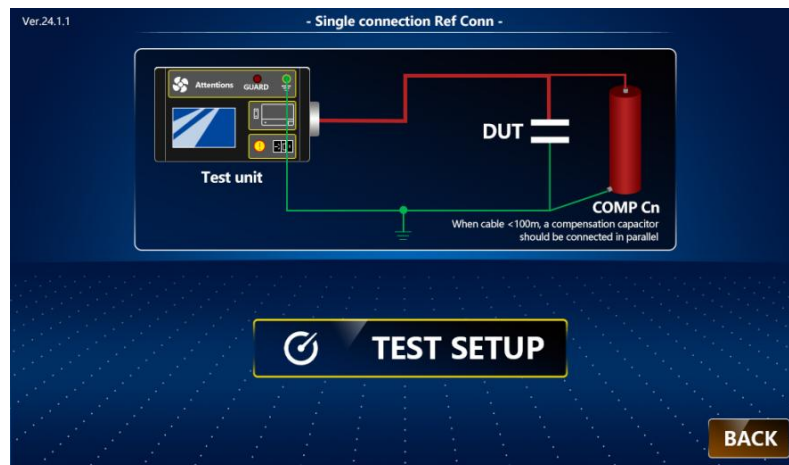
9.3 Start the test system

Turn on the power switch, click "Click" on the welcome interface, and click "Single Connection" (please refer to section 7 of this manual)

9.4 Performing Tan delta tests and diagnoses

9.4.1 Preparing and starting the test

Click "Single connection" to enter the single connection screen:



9.4.2 Setting measurement parameters

Click "Test setup" to enter the test setup screen:

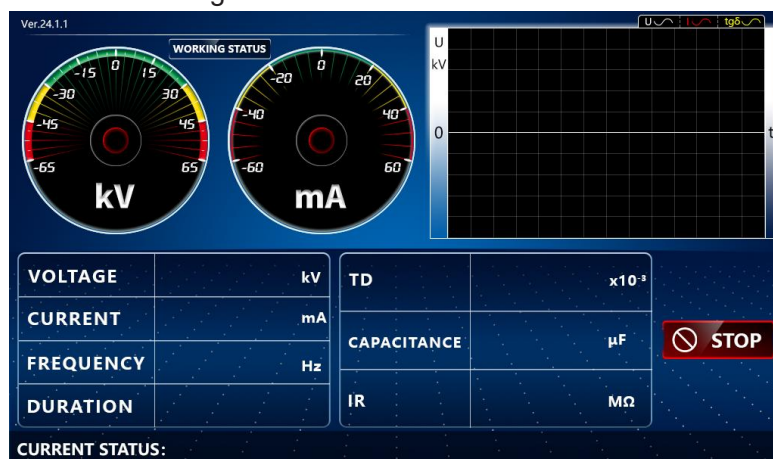


Item	Description
HIGHT VOLTAGE	Click the orange arrow and type in the test voltage in the drop-down box. The test voltage to be set is derived from the rated voltage of the connected cable and the guidelines to be applied for the test (e.g. recognized standards, factory standards, customer's specifications).
TEST DURATION	Click the orange arrow and enter the test duration in the drop-down box.

	The test duration to be set must be selected in accordance with the applicable guidelines (e.g. recognized standards, factory standards, customer's specifications).
COMP CN	According to whether the compensation capacitor is connected, click the orange arrow and select "Yes" or "No" in the drop-down box.  Note: For test objects with low capacitance, such as cables under 100 meters, a supplied standard capacitor must be connected in parallel during the test.
SHIELDING CONN.	In tan delta test, select "single" or "double" according to the actual test leads connection . In VLF or DC test, select "NO"
AC TEST	Start VLF AC automatic measurement
DC TEST	Start DC automatic measurement
TD TEST	Start tan delta automatic measurement
STD.TD TEST	Start tan delta automatic measurement according to IEEE400.2-2013
NOTE	Some facility descriptions can be viewed
BACK	Return to the previous screen

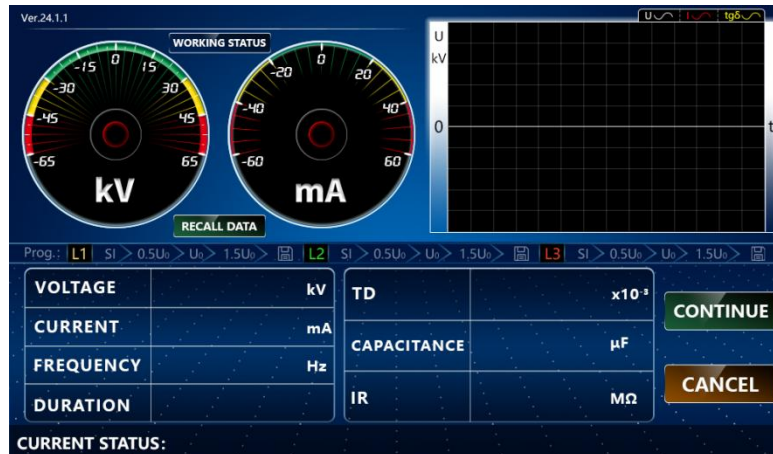
9.4.3 Starting the test

Click "TD TEST" or "STD.TD TEST" and the device enters the testing interface
The TD/ STD.TD TEST testing screen is as follows:

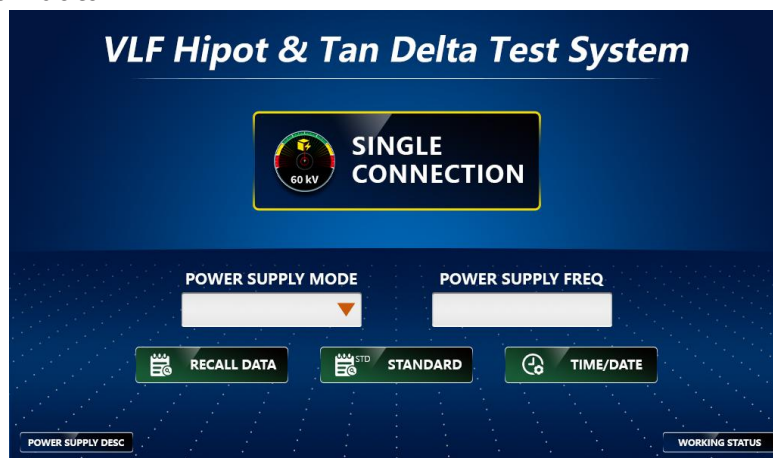


9.4.4 Conclusion of the test

After the defined test time has elapsed, test results are displayed.
TD test result screen:



9.4.5 Recall data



To recall the test results:

TD test results: Return to the main menu and click "Recall data".

STD.TD test results: Return to the main menu and click "STANDARD".

10. Repair and Maintenance

Maintenance

Repairs and service must only be done by RAPID-TECH or authorised service departments of RAPID-TECH.

RAPID-TECH also offers direct on-site support. Please contact our service office for more information.

The connecting cables, like the earthing cable, the power cord and the HV test lead need to be checked for damages and cleaned at regular intervals.

Behaviour at malfunction of normal operation

The equipment may only be used when working properly. When irregularities or malfunctions appear that cannot be solved consulting this manual, the equipment must immediately be put out of operation and marked as not functional. In this case inform the person in charge who

should inform the RAPID-TECH service to resolve the problem. The instrument may only be operated when the malfunction is resolved.

Behaviour in the event of continuous faults

In the event of damage, irregularity or faults that cannot be rectified using the instructions in this manual, the system must be immediately taken out of service and marked accordingly. Please contact the RAPID-TECH service team immediately to rectify the fault. The system must not be put back into operation until the fault has been rectified.