

# VLF tester and diagnostics device

**frida**



MWT  
**true**•sinus®

**Cable testing, cable sheath testing, cable sheath fault location**

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# 1 ABOUT THIS MANUAL

## 1.1 Using this manual

- ▶ Read this user manual fully before operating the product for the first time.
- ▶ Consider this user manual to be a part of the product and store it at an easily accessible location.
- ▶ This user manual contains all necessary information that is needed for the commissioning, cable testing, cable sheath testing and cable sheath fault location with **frida**.  
For **frida TD** also observe the additional manual for loss factor measurement.
- ▶ If this user manual is lost, please contact BAUR GmbH or your nearest BAUR representative (<http://www.baur.eu/baur-worldwide>).



## 1.2 Application of the instructions

These operating instructions apply to devices with a firmware version from 2.0.

The details of the firmware version currently installed are given at **Main menu > Device settings > Info**.

## 1.3 Structure of safety instructions

The safety instructions in this user manual are presented as follows:

<b>Danger symbol</b>  	 <b>SIGNAL WORD</b>  <b>Type of danger and its source</b> Possible consequences of violation. ▶ Measure to prevent the danger.
---	---

If a dangerous situation could arise at a specific step, the safety instruction is displayed immediately before this dangerous step and is shown as follows:






**Type of danger and its source.** Possible consequences of violation.

1. Measure to prevent the danger.




### Danger levels

Signal words in the safety instructions specify the danger levels.


 <b>DANGER</b>	Will lead to severe injuries or death.
 <b>WARNING</b>	May lead to severe injuries or death.

 <b>CAUTION</b>	May lead to light to moderate injuries.
<b>NOTICE</b>	May lead to material damage.

#### Danger symbols

	General danger
	Risk of electric shock
	Warning about explosive materials

## 1.4 View settings

Symbol	Meaning
▶	You are prompted for an action.
1.	Perform the actions in this sequence.
2.	
...	
a.	If an operation consists of several operating steps, these are specified with "a, b, c". Perform the operating steps in this sequence.
b.	
...	
1	Numbering in the legend
2	
...	
▪	List
	Indicates further information on the topic in the corresponding user manuals.

## 1.5 Note on the screenshots and graphics used

The screenshots and graphics used are intended to illustrate the procedure and may differ slightly from the actual state.



## 2 FOR YOUR SAFETY

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All BAUR devices and systems are manufactured according to the state of the art and are safe to operate. The individual parts and the finished devices are subject to continuous testing by our qualified personnel as part of our quality assurance system. Each device and system is tested before delivery.

However, the operational safety and reliability in practice can be achieved only when all necessary measures have been taken. The responsible body<sup>1</sup> and operator<sup>2</sup> of the device or system are responsible for planning these measures and monitoring their implementation.

Make sure that the responsible body and persons working with the device or system have carefully read through and understood the user manual for the device or system, as well as the user manuals for all associated devices, before starting work.

The responsible body and operator of the device or system are responsible for any injuries or damage resulting from non-compliance with this user manual.

### 2.1 Instructions for the operator

The product may be operated only by authorised and trained electrical engineers. An electrical engineer is a person who, owing to his professional education (electrical engineering), knowledge, experience and familiarity with the applicable standards and regulations, can assess the tasks assigned to him and detect possible dangers.

In addition, the operator must have:

- Knowledge of the technical equipment and operation of the product
- Knowledge of the testing and measurement procedures
- Knowledge of plant engineering (cable types, switchgear, etc.).

### 2.2 Intended use

The mobile and high performance BAUR frida VLF tester and diagnostics device is used

- for cable sheath testing and other tests of medium-voltage cables and electrical equipment,
- for cable diagnostics (frida TD): dissipation factor measurement, Monitored Withstand Test (MWT), partial discharge measurement in combination with BAUR's PD-TaD partial discharge diagnostics system
- for insulation testing on electrical equipment

If the device is used without observing this condition, safe operation cannot be guaranteed. The operator or user is liable for any damage to persons and property resulting from incorrect operation.

---

<sup>1</sup> Responsible body is the person or group that is responsible for the safe operation of the device and its maintenance (EN 61010-1, 3.5.12).

<sup>2</sup> Operator is the person who uses the device for its intended purpose (according to the definition of user in compliance with EN 61010-1, 3.5.11).

Proper use also includes

- Compliance with all instructions in this user manual,
- Compliance with the technical data and connection requirements given on the rating plate and in the user manual,
- Compliance with the inspection and maintenance tasks.

## 2.3 Avoid dangers, take safety measures

- ▶ When installing the test system and operating frida observe the following rules and guidelines:
  - Accident prevention and environment protection rules applicable for your country
  - Safety instructions and regulations of the country where frida is being used (according to the latest version)
  - EU/EFTA countries: EN 50191 *Installation and operation of electric testing systems*  
Other countries: The standard for installation and operation of electric testing systems applicable for your country
  - EU/EFTA countries: EN 50110 *Operation of electric systems*  
Other countries: The standard for operating electric systems applicable for your country
  - If necessary, other national and international standards and guidelines in accordance with the latest applicable version
  - Local safety and accident prevention regulations
  - Operational insurance association regulations (if any)

### Technical secure state of the system

Safety, function and availability depend on the proper condition of the system. Upgrades, modifications or alterations to the system are strictly prohibited.

- ▶ Operate the system only in a technical perfect condition.
- ▶ In the event of damage and malfunction, immediately stop the system, mark it accordingly and have the faults rectified by appropriately qualified and authorised personnel.
- ▶ Comply with the inspection and maintenance conditions.
- ▶ Use only accessories and original spare parts recommended by BAUR. The use of spare parts, accessories and special fittings that are not tested and approved by BAUR could adversely affect the safety, function and characteristics of the system.

### Check and maintain the safety devices

The safety devices must be inspected regularly for proper condition and function. frida must not be operated in case of defects or non-functional safety devices.

The safety devices must not be changed, bridged or switched off.

### No operation with condensation

Condensation can form in devices and systems due to temperature fluctuations and high air humidity, which in some components can lead from leakage currents and flashovers up to short-circuit.

Maximum danger arises when relatively high air humidity and temperature fluctuations occur in a device consecutively, e.g. which is the case when storing the device in an unheated room or when placed outdoors. When the device is then exposed to a high ambient

temperature, the cold device surfaces cool the air in the immediate vicinity, which leads to formation of condensation even inside the device.

In this process, two factors are crucial:

- The higher the relative air humidity, the faster the dew point is reached and water is condensed.
- The higher the temperature difference between the surfaces and the ambient air, the stronger the tendency for condensation.
- ▶ Always prevent condensation in devices. Temper the device and system before and during the measurements so that no condensation occurs.

#### **No operation in areas with risk of explosion and fire**

Measurements in direct contact with water, in environments with explosive gases and in areas with fire risks are not permitted. Possible danger zones are e.g. chemical factories, refineries, lacquer factories, paint shops, cleaning plants, mills and storage for milled products, tank and loading plants for combustible gases, liquids and solid matter.

### **2.3.1 Dangers when working with high voltage**



When performing tests and measurements with the system, dangerous - at times a very high - voltage is generated that is fed to the test object via an HV connection cable.



Personnel need to pay special attention and must be very careful while working with high electric voltage.

Commissioning and operation of the system are permitted only in compliance with the EN 50110 and EN 50191 (EU/EFTA countries) or with standards applicable in your country.

#### **Observe 5 safety rules**

- ▶ Comply with the following safety rules before beginning tasks in and on the electrical plant:
  1. Disconnect the test object.
  2. Secure against re-connection.
  3. Verify absence of operating voltage.
  4. Earth and short all phases.
  5. Provide protection against adjacent live parts.

	<div data-bbox="472 286 662 342"> <b>DANGER</b></div> <div data-bbox="472 376 758 409"><b>High electrical voltage</b></div> <div data-bbox="472 427 1072 456"><p>Danger to life or risk of injury due to electric shock.</p></div> <div data-bbox="480 474 1327 1055"><ul style="list-style-type: none"><li>▶ Before commencing work, the operator must assess the risks for the specific working conditions. Protective measures are based on the risk assessment and must be followed at the workplace.</li><li>▶ Connect the system as described in this user manual.</li><li>▶ Pay particular attention to ensuring the test object and system are earthed correctly.</li><li>▶ Observe the warning and safety signs on the system. Always check whether the warning signs are available and are legible.</li><li>▶ Never put the safety devices out of operation. It is forbidden to bypass the safety devices.</li><li>▶ Ensure that adjacent live parts are secured against accidental contact and flashovers with suitable covers (insulation mats, insulating safety plates).</li><li>▶ Cordon off all metal parts in the area of the test object terminals (connection point and far end). Insulate and earth the metal parts to avoid dangerous charges.</li></ul></div> <div data-bbox="472 1075 1299 1133"><p>The test object may still be live and carry dangerous voltage after a measurement, even after the system or device has been switched off.</p></div> <div data-bbox="480 1151 1316 1209"><ul style="list-style-type: none"><li>▶ Before removing the safety precautions, discharge, earth and short circuit all live parts.</li></ul></div>
---	--

	<div data-bbox="472 1346 676 1402"> <b>DANGER</b></div> <div data-bbox="472 1444 1034 1476"><b>Arcing fault when establishing a connection</b></div> <div data-bbox="472 1494 1252 1523"><p>Danger of burn injuries and electro-ophthalmia due to arcing fault.</p></div> <div data-bbox="480 1541 1251 1785"><ul style="list-style-type: none"><li>▶ Use suitable personal protective equipment to protect against arcing faults.</li><li>▶ Cover the adjacent live parts with an insulating material.</li><li>▶ Use only undamaged connection cables.</li><li>▶ Secure the connection points and far end of the test object.</li><li>▶ Use special locking devices to lock connection points.</li></ul></div>
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## 2.4 Special personal protective equipment

Personal protective equipment based on the risk assessment for the relevant working conditions is part of the frida safety concept.

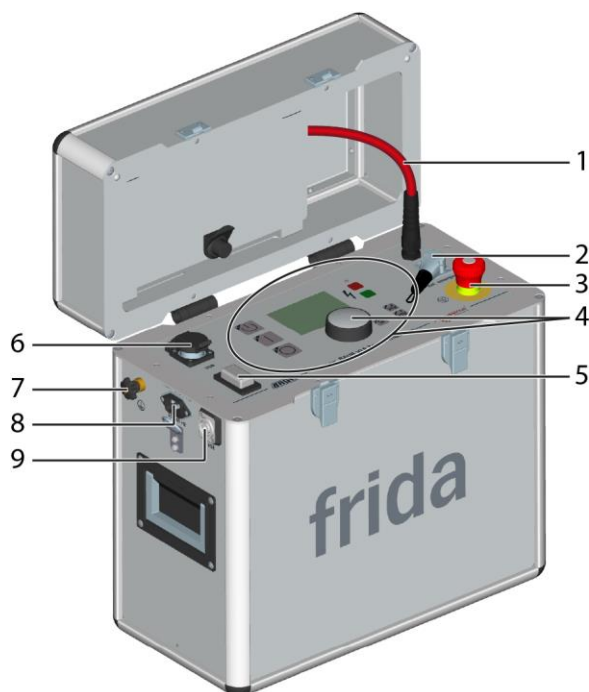
- ▶ Observe the national safety regulations and your company's working and operating instructions.

Dependent on the conditions of the work place, use the following protective equipment:

Protection against electrostatic charging, crushing, slipping and other accidents:	<ul style="list-style-type: none"> <li>▪ Safety footwear</li> </ul>
Protection against electrical hazards (arcing fault):	<ul style="list-style-type: none"> <li>▪ Certified safety clothing</li> <li>▪ Hard hat with visor</li> <li>▪ Insulating protective gloves</li> <li>▪ LV HRC fuse handle with sleeve</li> </ul>
Protection against noise:	<ul style="list-style-type: none"> <li>▪ Ear protection</li> </ul>
Protection against dangers from road traffic:	<ul style="list-style-type: none"> <li>▪ High visibility vest according to EN 471 (Protection class 2) or according to the applicable standards in your country for high visibility clothing for commercial use. <b>Important:</b> No high visibility vest during tasks with risk of arcs!</li> </ul>
Hand protection:	<ul style="list-style-type: none"> <li>▪ Safety gloves</li> </ul>

## 3 PRODUCT INFORMATION

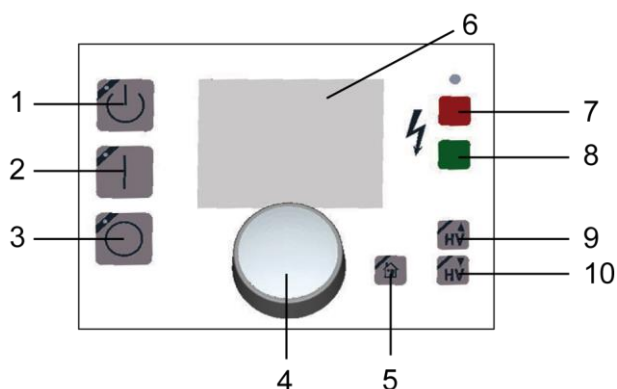
### 3.1 Full illustration





No.	Element	Function
1	HV connection cable	Is used to connect to the test object
2	Port for the external emergency off unit	Is used to connect the external emergency off unit (option) <b>Note:</b> If no external emergency off unit is used, a jumper plug must be plugged into this port (s. figure).
3	Emergency off button	Moves the system to the <i>Ready for operation</i> operating state. The emergency off button is equipped with a key lock to protect against restart, unauthorised start-up, and unauthorised or unintentional operation.
4	Rotary knob and control panel	Are used for menu navigation and controlling the device Further information: Chapter <i>Operating and display elements</i> (on page 15)
5	Mains switch	Is used to switch device on and off
6	USB connection	Is used to connect a USB cable or a USB drive

No.	Element	Function
7	Protective earthing connection	Is used to connect the protective earthing
8	Mains connection	Is used to connect the device to the mains voltage (100–260 V, 50/60 Hz)
9	Connection for the VSE box	Is used to connect the VSE box (frida TD)

## 3.2 Operating and display elements



No.	Element	Function
1	key	Changes the system to <i>Ready to switch on</i> operating state
2	key	Puts the system into the operating state <i>In operation</i> .
3	key	Deactivates the high voltage release and puts the system into the <i>Ready for operation</i> operating state
4	Rotary knob	Is used for menu navigation: <ul style="list-style-type: none"> <li>▶ Select menu item: Turn rotary knob.</li> <li>▶ Confirm selection or input: Press rotary knob.</li> <li>▶ Enter values: Turn rotary knob.</li> <li>▶ Change settings: Press rotary knob.</li> </ul>
5	key	Takes you back to the previous step
6	Display	Show the menu of the device
7	Red indicator light	Show the following operating states of the system: <ul style="list-style-type: none"> <li>▪ Flashing red: <i>Ready to switch on</i></li> <li>▪ Steady red: <i>in operation</i></li> </ul>
8	Green indicator light	Show the <i>Ready for operation</i> operating state

No.	Element	Function
9	 key	Is used to increase the test voltage during manual cable testing: <ul style="list-style-type: none"> <li>▶ Press once: The voltage is increased by 0.1 kV.</li> <li>▶ Keep pressed: The voltage is increased in steps. The steps start with 0.3 kV and become continuously larger until 1.5 kV are reached.</li> </ul>
10	 key	Is used to reduce the test voltage during manual cable testing: <ul style="list-style-type: none"> <li>▶ Press once: The voltage is decreased by 0.1 kV.</li> <li>▶ Keep pressed: The voltage is decreased in steps. The steps start with 0.3 kV and become continuously larger until 1.5 kV are reached.</li> </ul>

### 3.3 Demo mode

In the demo mode the same functions are available (except for the cable sheath fault location) as in the operating mode. This mode allows you to get to know all the functions and menus of the device without switching on the high voltage.

You can activate or deactivate the demo mode under **Main menu > Device settings > Demo mode**. Further information: Chapter *Activate or deactivate demo mode* (on page 41)

### 3.4 USB interface

The USB interface is used

- for data exchange via USB drive
  - Note:** The device supports only USB drives with the FAT32 and FAT16 file system. We recommend using USB drives with the FAT32 file system.
- for remote control via BAUR system software
- for firmware update through the BAUR representative.

### 3.5 Power supply

The voltage supply of frida can be provided both via an existing mains supply on site or even network-dependent via an external power generator.

- ▶ Before connecting the frida to the mains supply, make sure that the mains supply matches the specifications on the rating plate.

#### **NOTICE**

##### **Too high or too low mains voltage**

A low mains voltage adversely affects the function of the system, a high mains voltage can cause damage.

- ▶ Ensure that the supply voltage matches the specifications on the rating plate.



### 3.5.1 Operation of the device with an external power generator

#### Requirements for the supply voltage

- ▶ When operating frida with an external generator, make sure that the following voltage quality requirements are fulfilled.

Features	Values for the low voltage
Frequency	50/60 Hz
Slow voltage changes	230 V $\pm$ 10% (rms value for 10 min <sup>*/**</sup> )
Fast voltage changes	Max. 10 % (rms value for 10 ms <sup>*/**</sup> )
Voltage shape	Sine

\* Integration interval

\*\* The values correspond to the supply voltage requirements in compliance with EN 50160.

#### Requirements for the power generator

- ▶ Select an adequately measured power generator according to the power requirement.
- ▶ To ensure the voltage and frequency stability, use an **electronically stabilised power generator with inverter technology**, for example, Honda Generator Type EU 20i or another brand with similar technology.

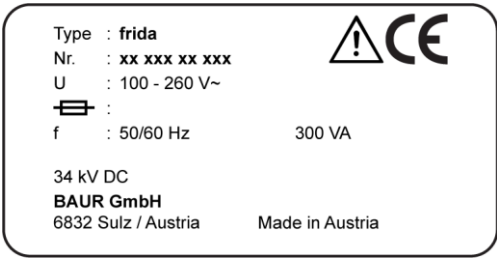
#### Required outputs:




Nominal voltage	230 V / 50 Hz	110 V / 60 Hz	120 V / 60 Hz	127 V / 60 Hz
Voltage shape	<b>Sine</b>	<b>Sine</b>	<b>Sine</b>	<b>Sine</b>
Rated power (continuous power)	Min. 600 VA	Min. 600 VA	Min. 600 VA	Min. 600 VA
Max. power	Min. 700 VA	Min. 700 VA	Min. 700 VA	Min. 700 VA
Nominal current	Min. 3 A	Min. 6 A	Min. 5 A	Min. 5 A

- ▶ Before commissioning, check with BAUR GmbH or your nearest BAUR representative, whether the selected power generator is suitable for supplying power to frida.

On request please specify the technical data of the relevant power generator: Rated power, max. power, nominal current and voltage shape at rated power and when idle.

3.6 Rating plate



Element	Description
Type	Device designation
Nr.	Serial number
U	Supply voltage If several supply voltages are possible, these are given consecutively one after another.
	Not applicable here
f	Mains frequency
VA	Max. recorded apparent output
34 kV DC	Max. DC voltage at the output
	General warning sign Indicates that there is a potential risk of danger when using the product and hence the user manual must be observed
	CE mark Indicates that the device or system conforms to CE.
BAUR GmbH 6832 Sulz / Austria	Name and address of the manufacturer
Made in Austria	Indicates the country in which the device was manufactured. Austria: Austria

## 3.7 Switching on the device or system

Switching on the BAUR systems and devices corresponds to the requirements for high voltage start up according to EN 50191.

Two steps - two conscious activations - are compulsory to switch on a system or device. The operating states *Ready for operation*, *Ready to switch on* and *In operation* can be identified by the indicator lights at any time.

### 3.7.1 Operating states

#### ***Out of operation***

Prerequisites: All safety measures necessary before stepping into the test area have been met.

- All power supplies, signal and control electric circuits are switched off.

#### ***Ready for operation***

Prerequisites: The safety measures of the *Out of operation* operating state that are necessary before stepping into the danger area are still in place.

- The power supplies for the signal and control current circuits of the switching devices are switched on.
- The test voltage supply is switched off and secured against accidental start.
- The green indicator light comes on.

#### ***Ready to switch on***

Prerequisites: All accesses to the test area are closed. The safety measures of the *Out of operation* operating state that are necessary before stepping into the danger area are lifted.

- The test voltage supply is switched off.
- The red indicator light comes on.

#### ***In operation***

Prerequisites: All accesses to the test area are closed.

- One or more test voltage supplies are switched on.
- The red indicator light comes on.

## 4 TECHNICAL DATA

Output voltage	
Frequency range	0.01 – 0.1 Hz
VLF truesinus®	1 – 24 kV <sub>rms</sub> (34 kV <sub>peak</sub> )
VLF square wave voltage	1 – 34 kV
DC voltage	±1 – 34 kV
Resolution	0.1 kV
Accuracy	1%
Load range (VLF testing)	1 nF – 8 µF
Output current	
Measurement range	0 – 14 mA
Resolution	1 µA
Accuracy	1%
Max. capacitive load	0.5 µF at 0.1 Hz, 24 kV <sub>rms</sub> / 34 kV <sub>peak</sub> 1 µF at 0.05 Hz, 24 kV <sub>rms</sub> / 34 kV <sub>peak</sub> 8 µF at 0.01 Hz, 18 kV <sub>rms</sub> / 25 kV <sub>peak</sub>
Dissipation factor measurement (frida TD)	
VLF truesinus®	1 – 24 kV <sub>rms</sub>
Load range	10 nF – 8 µF
Resolution	1 x 10 <sup>-6</sup>
Accuracy	1 x 10 <sup>-4</sup>
Measurement range	1 x 10 <sup>-4</sup> – 21 000 x 10 <sup>-3</sup>
tan δ measuring frequency	0.1 Hz
Automatic detection and compensation of leakage currents	with VSE box (optional)

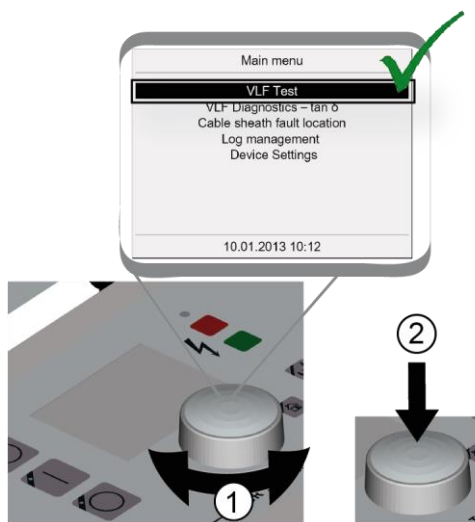
Diagnostic Reporter	
Used to process and evaluate test and measurement logs, based upon MS Excel, version from MS Excel 2007	
General	
Input voltage	100 – 260 V, 50/60 Hz
Power consumption	Max. 300 VA
Reverse voltage protected	up to 13 kV
Degree of protection	IP54 (in closed state)
Data interface	USB 2.0
Dimensions (W x H x D)	438 x 456 x 220 mm
Weight (incl. HV test lead)	Approx. 22 kg
Ambient temperature (operational)	-10°C to +50°C
Storage temperature	-20°C to +60°C
Safety and EMC	CE-compliant in accordance with Low Voltage Directive (2014/35/EU), EMC Directive (2014/30/EU), EN 60068-2-ff Environmental testing
User interface available in 13 languages	Czech, Chinese (CN), Chinese (TW), Dutch, English, French, German, Italian, Korean, Polish, Portuguese, Russian, Spanish

## 5 OPERATION OF THE DEVICE

### 5.1 Operate menu

Selection and setting is effected by means of the rotary knob. A selected menu item or a selected setting is highlighted by a dark cursor.

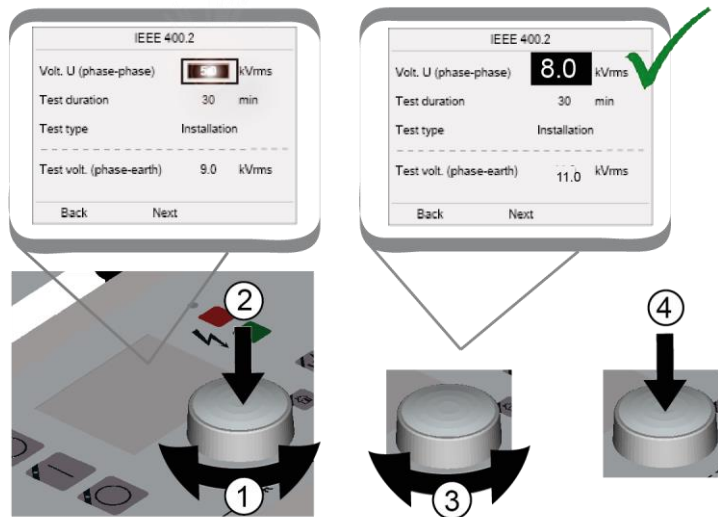
#### 5.1.1 How to select menu item



#### How to operate the rotary knob:

- ① ▶ Select menu item: Turn rotary knob until the cursor is set to the required menu item.
- ② ▶ Confirm selection: Press rotary knob.  
A new window or a context menu opens.

### 5.1.2 How to set value



#### How to operate the rotary knob:

- ① ▶ Select menu item: Turn rotary knob until the cursor is set to the required menu item.
- ② ▶ Confirm selection: Press rotary knob.  
The value flashes and can now be changed.
- ③ ▶ Set value: Turn rotary knob until the required value is set.
- ④ ▶ Confirm the input: Press rotary knob.

#### Alternative: Select setting

- ▶ Press rotary knob in order to change in between the possible settings.

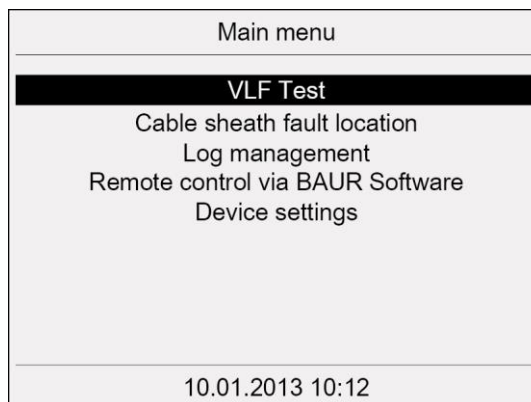
## 5.2 Symbols and abbreviations on the display

C	Electric capacity	S	Current voltage step
f	Frequency	Slew	Voltage slew rate (in the case of the voltage shape <i>Square wave</i> )
I	Output current	t	Test time
L	Phase on which the measurement or test is carried out	Thv	Operating temperature of high voltage unit
R	Resistance	Umax	Max. voltage
		Unom	Nominal voltage

## 5.3 Menus

### 5.3.1 Main menu

All functions and user settings can be accessed from the main menu.



Menu item	Description
<b>VLF Test</b>	<p>Opens a menu with the following menu items:</p> <ul style="list-style-type: none"> <li>▪ <b>Manual test:</b> Is used to configure and carry out manual VLF cable tests</li> <li>▪ <b>Automatic Test:</b> Is used to configure and carry out automatic VLF cable tests, standard tests and cable sheath testing</li> <li>▪ <b>Logs:</b> Is used to display and manage the logs from cable testing and cable sheath testing</li> </ul>
<b>Cable sheath fault location</b>	<p>Opens a menu with the following menu items:</p> <ul style="list-style-type: none"> <li>▪ <b>Start measurement:</b> Is used to configure and carry out cable sheath fault location</li> <li>▪ <b>Logs:</b> Is used to display and manage the logs from sheath fault location</li> </ul>
<b>Log management</b>	<p>Opens a menu with the following menu items:</p> <ul style="list-style-type: none"> <li>▪ <b>Delete all</b></li> <li>▪ <b>Export all to USB stick</b></li> </ul>
<b>Device settings</b>	<p>Opens a menu with the following menu items:</p> <ul style="list-style-type: none"> <li>▪ <b>Info:</b> Is used to display the device information such as serial number, firmware version etc.</li> <li>▪ <b>Language:</b> Is used to select the menu language</li> <li>▪ <b>Time &amp; Date:</b> Is used to set the time and date</li> <li>▪ <b>Switch-on menu:</b> Is used to select the switch-on menu</li> <li>▪ <b>Display contrast:</b> Is used to control the display contrast</li> <li>▪ <b>Test settings:</b> Is used to set: Add ambient temperature to log (on/off), Aut. voltage reduction (on/off)</li> <li>▪ <b>Demo mode:</b> Is used to enable/disable the demo mode</li> <li>▪ <b>Settings for remote control:</b> Is used to show or hide the <b>Remote control via BAUR Software</b> menu item in the main menu</li> </ul>

Menu item	Description
<b>Remote control via BAUR Software</b>	Is used for the remote-controlled execution of measurements and tests. <ul style="list-style-type: none"> <li>► In order to display this menu item in the main menu, activate its display under <b>Main menu &gt; Device settings &gt; Settings for remote control.</b></li> </ul>

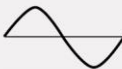
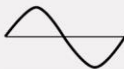
### 5.3.2 Test mode window


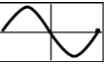
The test mode window for manual and automatic tests is used to start, control and stop cable testing.

1. In order to be able to access the test mode window, select the following menu items in the main menu depending on the actual test type **VLF Test > Manual test** or **Automatic test**.
2. If you have selected the **Automatic test** menu item, select a test sequence and, in the context menu, select the **Run** menu item. Following the detailed display of the test parameters of the test sequence selected, you arrive at the test mode window.

If you have selected the **Manual test** menu item, the test mode window opens.

The display in the test mode window differs depending on the voltage shape selected and the defined parameters. However, the basic structure is the same. Here, for example, test mode windows for manual test with voltage shape VLF Sine auto and automatic test with voltage shape VLF Sine are listed:

Manual test VLF Sine auto	TEST 1
	
0.0 kVrms	0.0 kVrms
f = 0.10 Hz	f = 0.10 Hz
Unom = 1.0 kVrms	Unom = 20.0 kVrms
I = 0.000 mA	I = 0.000 mA
Thv = 25 °C	Thv = 23 °C
t: 00:00min	t: 00:00/1min
S: 1/3	L: 1/3
Start Settings Back	Start Settings Back

Element	Function
	Here, the selected voltage shape is shown (image serves as an example only)
	This indicates that the test is running
<b>Start / Stop</b>	Starts the test / ends the test After starting the test, the <b>Start</b> menu item in the bottom menu bar changes to <b>Stop</b> .
<b>Settings</b>	Switches to the <b>Settings</b> menu where you can define the test parameters.

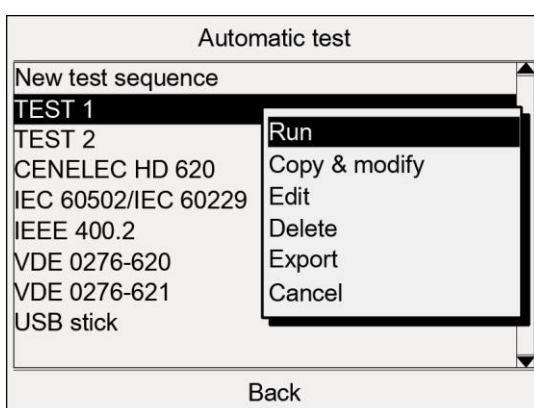


Element	Function
<b>Voltage</b>	This menu item appears after the start of a manual test.  During a manual test, the <b>Voltage</b> menu item moves the cursor to the input field for the nominal voltage ( <b>Unom</b> ). You can change the voltage immediately.
<b>Back</b>	Changes to the <b>VLF Test</b> menu

An explanation of the symbols and abbreviations for different measured values is given in the chapter *Symbols and abbreviations on the display* (on page 22).

### 5.3.3 Context menu

Some functions can be reached via a context menu, e.g.:



The context menu opens if you select a menu item and press the rotary knob, in order to confirm the selection.

#### Select menu item in the context menu:

1. Turn the rotary knob until the cursor is on the required menu item.
2. Press the rotary knob to confirm.

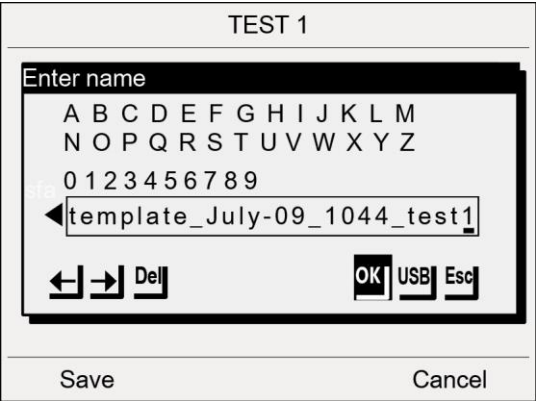
Depending on the context other functions are available in the context menu.

#### Close context menu:

- ▶ In the context menu, select the menu item **Cancel** and press the rotary knob to confirm.

5.3.4 Window for entering names

An alphabet window is used to enter a name for a log, a test sequence or to edit and enter cable data (for dissipation factor measurement).



Element	Function
	Moves the cursor to left
	Moves the cursor to right
	Deletes the character at the cursor position
	Confirms the entry and closes the window
	Rejects the entry and closes the window
	Opens the main directory of the USB drive inserted.

Input of letters or numbers:

- ▶ Select a letter or a number by turning the rotary knob and then press the rotary knob to confirm.
- ▶ Enter further letters or numbers until the name has been entered fully.
- ▶ In order to confirm the name entered, turn the rotary knob to select the button **OK** and then press the rotary knob to confirm.

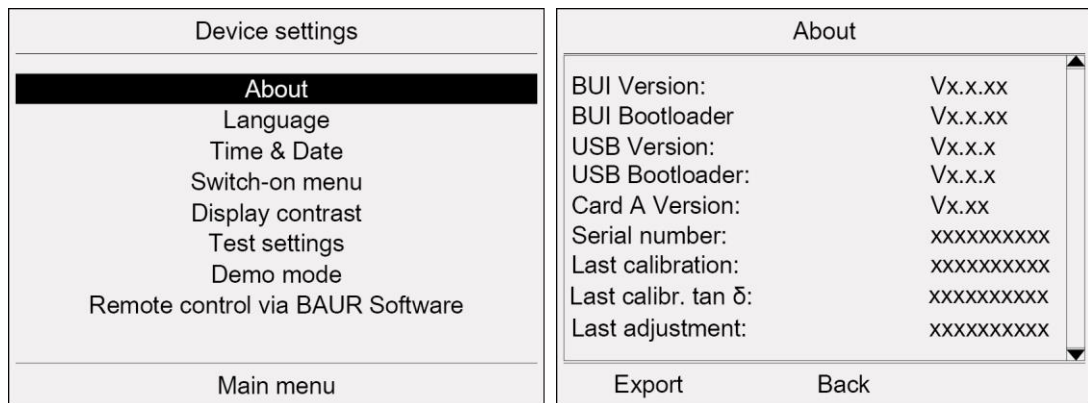
5.4 Display of the firmware version and other device data

- ▶ In order to display device data, select in the main menu the menu item **Device settings** > **Info** and press the rotary knob to confirm.

The following details will be shown:

- Firmware version (BUI version)
- Version of BUI boot loader
- USB version
- Version of USB boot loader
- Card A version
- Device serial number

- Date of last calibration
- Date of last adjustment
- frida / frida TD:
  - Date of last calibration from  $\tan \delta$  module
  - Date of last adjustment of  $\tan \delta$  module
- Availability of the option TD (dissipation factor measurement)
- Availability of the option VSE (VSE box for detecting and compensating leakage currents)
- Contact information of manufacturer



### 5.4.1 Exporting device data

You have the option to export the entire device information as a txt file:

1. Insert a USB drive in the USB port of frida.
 

**Note:** The device supports only USB drives with the FAT32 and FAT16 file system. We recommend using USB drives with the FAT32 file system.
2. Select in the menu **Info** the menu item **Export**.
 

A prompt appears asking whether you wish to export the device data to a USB drive.
3. Confirm the prompt with **Yes**.
 

The USB window with the display of the main directory of the USB drive opens.
4. If you wish to save the txt file with the device data to a folder, select a folder or create a new one.
 

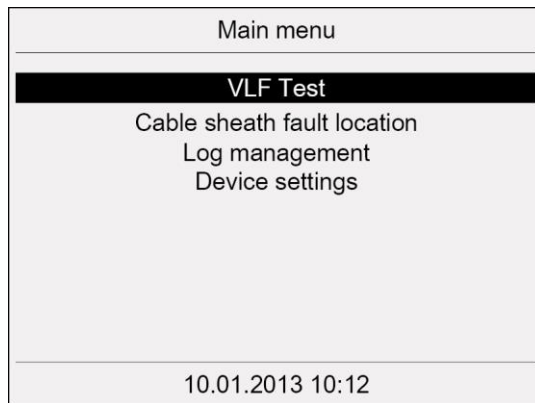
If you wish to create a new folder,

  - a. select the menu item **Create new folder** and press the rotary knob to confirm.
  - b. Enter a name and confirm this entry with **OK**.
5. In the lower menu bar, select the menu item **Save**.
 

The txt file is saved to the USB drive.
6. In order to be able to return to the menu **Device settings** select the menu item **Back**.

## 5.5 Cable testing: Overview of the available test types

Cable tests are configured and carried out in the menu **VLF Test** :



### Manual test

In the manual test mode you define the most important parameters such as voltage shape, maximum voltage, frequency, test time, switch-on delay and burn mode.

The test starts with the test voltage of 1 kV. The further test sequence is controlled by yourself in that you can increase or reduce the test voltage during the test.

### Automatic tests

Automatic tests are carried out on the basis of test sequences. In a test sequence, the most important parameters of a test are summarised.

You have the option to configure test sequences for different test tasks and to save the same for further use.

### Standard test sequences

In automatic test mode, 5 pre-programmed test sequences are available in accordance with the following standards:

- CENELEC HD 620 (Standardisation document)
- VDE DIN 0276-620 (German version of CENELEC HD 620)
- VDE DIN 0276-621 (German version of CENELEC HD 621)
- IEEE 400.2
- IEC 60502/IEC 60229 (Cable sheath testing)

## 6 COMMISSIONING

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- ▶ Please consider the following provisions and guidelines when installing the testing system and operating the BAUR testing and diagnostic systems:
  - Accident prevention and environmental protection regulations applicable for your country
  - Safety instructions and regulations of the country where the system is being used (according to the latest version)
  - EU/EFTA countries: EN 50191 *Erection and operation of electrical test equipment*  
Other countries: The standard for erection and operation of electric test equipment applicable for your country
  - EU/EFTA countries: EN 50110 *Operation of electrical installations*  
Other countries: The standards for operating electric systems applicable in your country
  - If necessary, other national and international standards and guidelines in the latest applicable version
  - Local safety and accident prevention regulations
  - Employers' liability insurance association regulations (if any)
- ▶ Use the personal protective equipment for protection against electric shock and burning due to possible arcing faults in compliance with the local work safety and accident prevention regulations.

### 6.1 Checks to perform before commissioning

1. Check the device and mechanical connections for damage.
2. Check electrical connections and cables for damage.  
Use only undamaged connection cable.
3. Once a month check that the emergency off button is working properly.  
Further information: Chapter *Monthly check of emergency off button* (on page 30)

### 6.1.1 Monthly check of emergency off button

- ▶ Check the function of the emergency off button on a monthly basis. Proceed as follows:
  1. Switch on the device. The device conducts a self-test after it is switched on.  
The switch-on menu appears in the display.
  2. Press the emergency off button.
  3. Select the menu item **Main menu > VLF Test > Manual test**.  
The message that the emergency off circuit is activated must be displayed. In this case, the emergency off circuit works properly.
  4. If no message on the activation of the emergency off circuit is displayed, immediately put the device out of operation and clearly mark it as defective. Contact your BAUR representative (<http://www.baur.eu/baur-worldwide>).



#### **DANGER**

#### **Dangerous voltage on device and test object**

Danger to life, risk of injury from high electric voltage.

5. Do not use the defective device under any circumstances.

## 6.2 Ensure there is no voltage at the work place

1. Disconnect the test object from all phases.
2. Secure the test object against re-energisation.
3. Ensure that there is no voltage.
4. In the station, connect all conductors of the test object with the station earth and short-circuit it.
5. Secure adjacent live parts against accidental contact and flashovers with suitable covers.

#### **For cable tests:**

#### **Note:**

- ▶ If the **cable sheath is not earthed**, establish a short earth connection to the station earth. The station earth is the neutral point of the earth connections.
- ▶ The earthing conductor should be as short as possible and show low impedance. Use a copper **earthing conductor with a cross-section of min. 16 mm<sup>2</sup>**.

## 6.3 Preparing the test object terminals





The test object terminals are **the connection point and the far end** of the test object.

1. Disconnect all operating resources that are connected to the test object and are not designed for the stipulated test voltage.
2. Cordon off all metal parts, e.g. lighting masts at the test object terminals or insulate them with insulating safety plates.
3. Earth all metal parts at the terminals to avoid dangerous charging.
4. All cables that are used in danger zones can also carry high voltage potential outwards. Therefore, remove these cables from the danger zone or ensure low-resistive earthing and short-circuit.
5. Follow the cable route and ensure that no work is being carried out underground on gas lines and that there are no other danger points.

#### **For cable sheath tests or cable sheath fault locations:**

- ▶ Disconnect the screen of the test object from the station earth on both sides.

## 6.4 Connecting the device

	<div data-bbox="470 360 1329 436" style="background-color: orange; padding: 5px;">  <b>WARNING</b> </div> <p><b>Danger due to electric voltage, flashovers at the connection point, or arcing fault on connection</b></p> <p>Electric shock on touching live and active parts and due to residual charges and induction voltages; Burns, electro-ophthalmia, hearing damage.</p> <ul style="list-style-type: none"> <li>▶ Use suitable personal protective equipment against electric shocks and arcing faults.</li> <li>▶ Observe the phase breaks.</li> <li>▶ Ensure that adjacent live parts are secured against accidental contact and flashovers with suitable covers (insulation mats, insulating safety plates).</li> <li>▶ You may touch the parts that were under voltage only if they are visibly earthed and short-circuited.</li> </ul>
	<div data-bbox="470 1008 1329 1084" style="background-color: orange; padding: 5px;">  <b>WARNING</b> </div> <p><b>High electric voltage through potential increase</b></p> <p>A fault can cause flashovers in the device. In this case, a potential increase of the housing is possible due to high short-circuit currents. Danger due to the potential increase is reduced when a protective earthing is connected properly.</p> <ul style="list-style-type: none"> <li>▶ Connect the protective earthing carefully. The protective earthing cable should be as short as possible and of low impedance.</li> </ul>

### 6.4.1 Installing the device

- ▶ Select the place of installation for the device in such a way that
  - a stable base is guaranteed.
  - the device and the test object are easy to access for the connections and operation.
  - sufficient safety distances are kept. Comply in this regard with EN 50110 for operation of electric systems (EU/EFTA countries) or the relevant standards applicable in your country.

### 6.4.2 Connecting for cable test

1. A protective earthing cable is included in the standard delivery of the frida. Connect the protective earthing cable to the station earth.
2. The earth connection terminal is located on the side of the device. Unscrew the earth connection terminal.
3. Connect the cable lug of the protective earthing cable to the earth connection screw.
4. Screw the earth connection screw back into the earthing connection.  
The device is now connected to the station earth.

5. If necessary, connect the protective earthing cable of the discharge and earth rod to the station earth.
6. Connect the high voltage connection cable of frida to the test object phase to test. Follow the connection examples below.
7. Remove the earthing and short-circuit connection from the phase to be tested:
  - at the connection point
  - at far end
8. Make sure that the phases not being tested are earthed and short-circuited.
9. If you are not connecting an external emergency off unit (option), ensure that the jumper plug is inserted in the port for the external emergency off unit.

If you are using an external emergency off unit, connect it as follows:

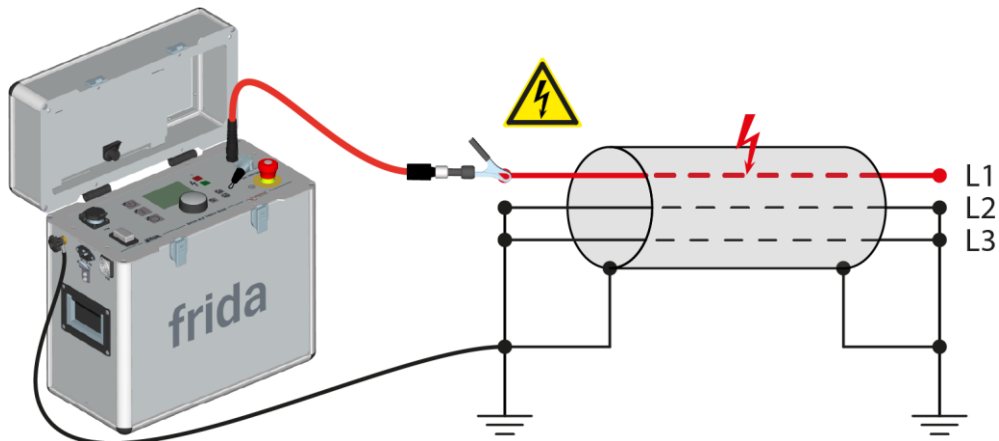
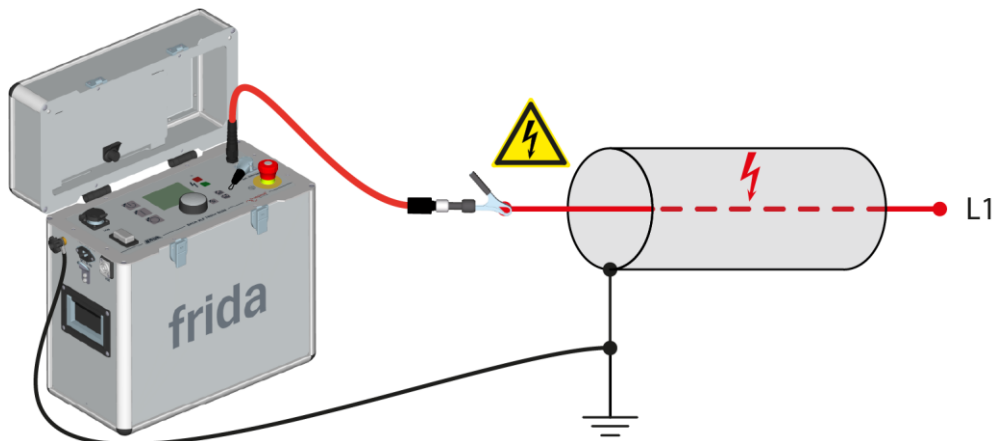
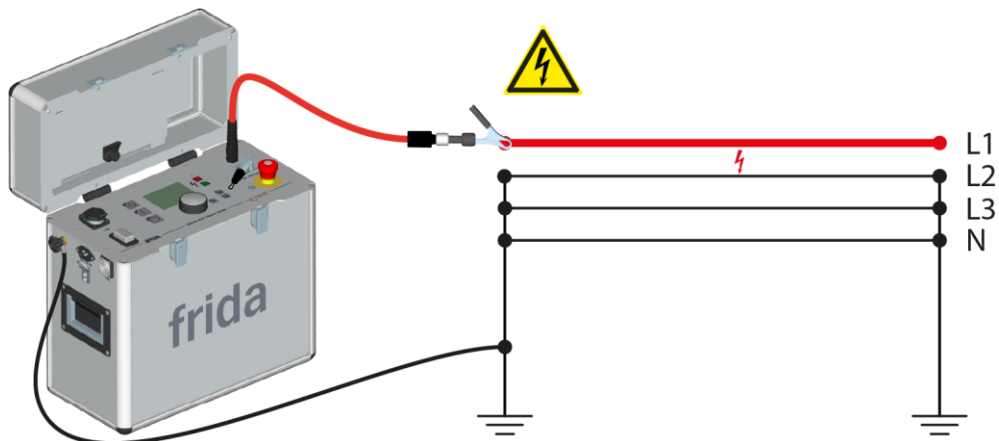
  - a. Mount the external emergency off unit so that it is easy to reach.
  - b. Remove the jumper plug from the port for the external emergency off unit.
  - c. Connect the external emergency off unit to the port for the external emergency off unit.

## Connection examples

### Note:

- ▶ If the **cable sheath is not earthed**, establish a short earth connection to the station earth. The station earth is the neutral point of the earth connections.
- ▶ The earthing conductor should be as short as possible and show low impedance. Use a copper **earthing conductor with a cross-section of min. 16 mm<sup>2</sup>**.



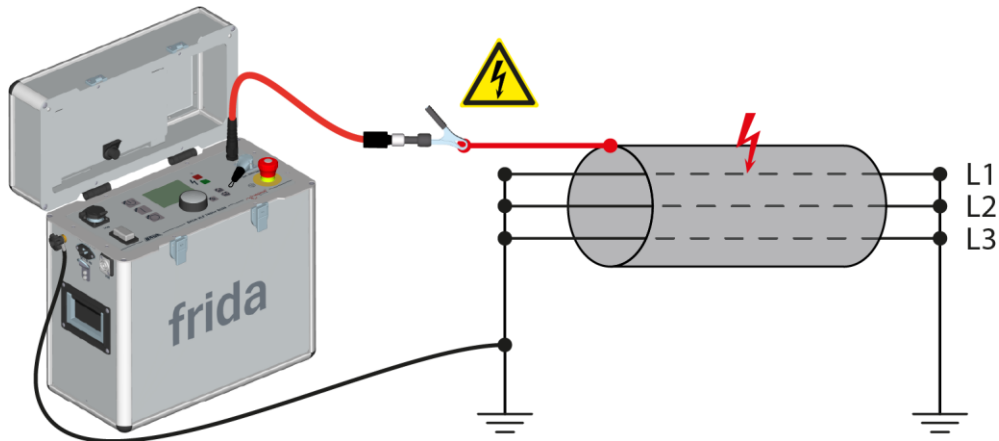
**3-phase shielded cable****1-phase shielded cable****3-phase unshielded cable**

### 6.4.3 Connecting for cable sheath testing and cable fault location

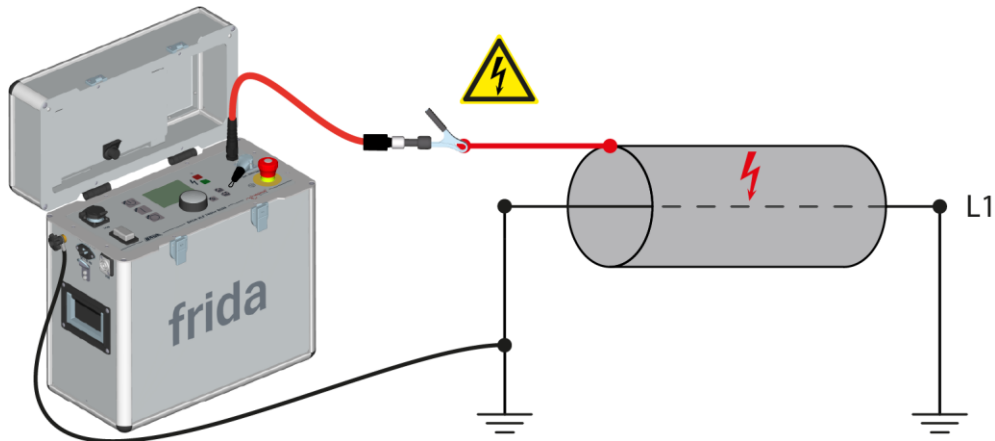
1. A protective earthing cable is included in the standard delivery of the frida. Connect the protective earthing cable to the station earth.
2. The earth connection terminal is located on the side of the device. Unscrew the earth connection terminal.
3. Connect the cable lug of the protective earthing cable to the earth connection screw.
4. Screw the earth connection screw back into the earthing connection.  
The device is now connected to the station earth.
5. If necessary, connect the protective earthing cable of the discharge and earth rod to the station earth.
6. Make sure that the screen of the test object is disconnected from the station earth on both sides:
  - at the connection point
  - at far end
7. Make sure that the phases not being tested are earthed and short-circuited.
8. Connect the high voltage cable of frida to the sheath of the cable to be tested. Follow the connection examples given below.
9. If you are not connecting an external emergency off unit (option), ensure that the jumper plug is inserted in the port for the external emergency off unit.  
If you are using an external emergency off unit, connect it as follows:
  - a. Mount the external emergency off unit so that it is easy to reach.
  - b. Remove the jumper plug from the port for the external emergency off unit.
  - c. Connect the external emergency off unit to the port for the external emergency off unit.

## Connection examples

### 3-phase shielded cable



### 1-phase shielded cable



## 6.4.4 Connecting the external power generator (optional)

### When using an external power generator

1. Connect the power generator to the station earth or to an earth rod.  
Use a copper earth cable with a cross-section of at least 2.5 mm<sup>2</sup>.
2. Earth all devices that are connected to the power generator.

### 6.4.5 Connecting to the supply voltage

#### NOTICE

##### Too high or too low mains voltage

A low mains voltage adversely affects the function of the system, a high mains voltage can cause damage.

- ▶ Ensure that the supply voltage matches the specifications on the rating plate.

1. Measure the mains voltage with a voltmeter.
2. Compare the mains voltage with the specifications on the rating plate.
3. Make sure that the mains supply earth is not isolated from the station earth.



#### CAUTION

**High electric voltage through potential increase.** Risk of personal injury due to electric shock. Damage to property due to potential differences from mains input to the housing.

4. Connect the system to the mains voltage. If necessary, use a country-specific adapter.

### Voltage supply via an external power generator



- ▶ Follow the instructions in the user manual for the external power generator.

- ▶ Make sure that selected power generators meet the necessary technical requirements for the voltage quality.

Further information: Chapter *Operation of the device with an external power generator* (on page 17)

## 6.5 Securing the test area

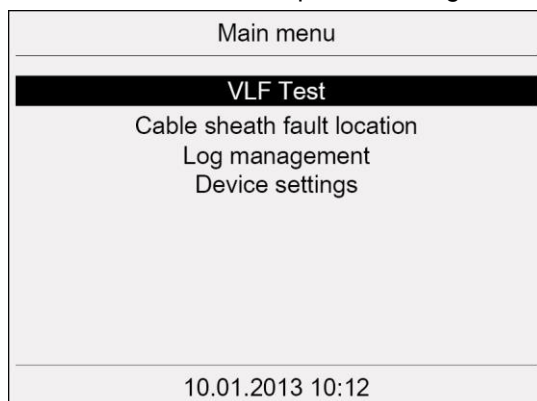
1. Mark out the path for pedestrians.
2. Protect the test lead (connection cable), e.g. with cable bridges or rubber mats. The cables must be protected against damage and there must be no danger of people tripping.
3. If the connection creates a hazard for the testing personnel and pedestrians, mark them.
4. The area around the test structure (test area) must be demarcated from workplaces and traffic in such a way that
  - *except for the tester, no other person can remain in the test area,*
  - *except for the tester, no other person can access the test area,*
  - *persons standing outside the boundary cannot reach the operating elements of the test system located inside the boundary. (EN 50191)*

The minimum height of individual boundaries must be 1 m.
5. If the system is cordoned off from general areas only with ropes, chains or bars, the entire test structure must be monitored during the test in compliance with EN 50191. If the test structure includes several local test areas, security guards must be appointed for each test area. But it is important that the testing personnel and the security guards understand each other well.

6. Mark the test area and terminals clearly. It must be very obvious that a cable test is in progress.
7. Make sure that unauthorised persons cannot access the local mains stations.

## 6.6 Switching on the device

- ▶ The main switch is located on the control panel. Use it to switch on the device.  
The device conducts a self-test after it is switched on.  
The switch-on menu appears in the display.  
Further information: Chapter *Selecting a switch-on menu* (on page 39)

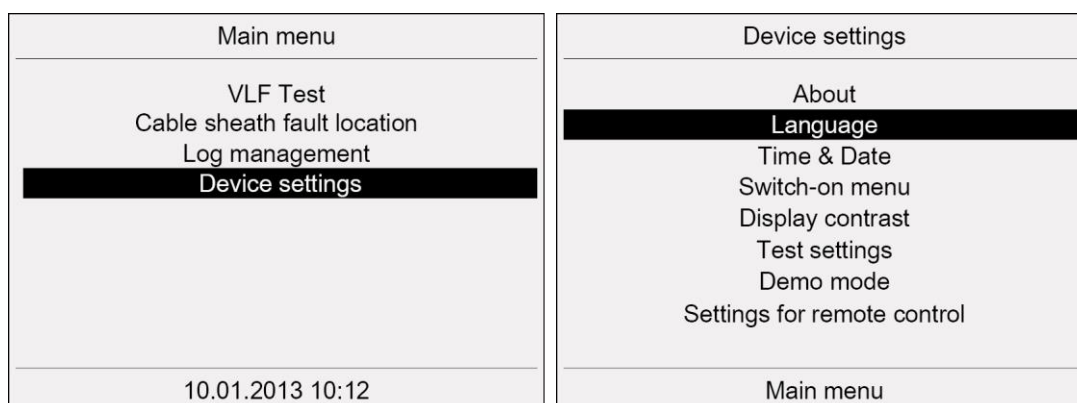


This puts the device into the operating state *Ready for operation*. The green lamp lights up and shows that all test voltage supplies are switched off.

## 6.7 Setting the device

In the menu **Device settings** you can enter the basic settings and view device data.

**Main menu > Device settings**



### 6.7.1 Selecting a language

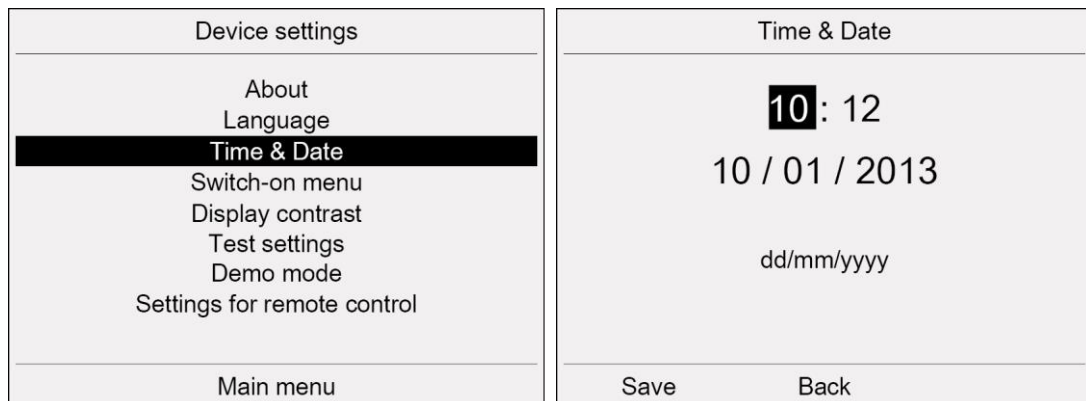
**Main menu > Device settings**



1. In the main menu, select the menu item **Device settings** and press the rotary knob to confirm.
2. Select in the menu **Device settings** the menu item **Language** and press the rotary knob to confirm.
3. Select a language and press the rotary knob to confirm.  
All show and protocols will be shown in the selected language.
4. In order to be able to return to the menu **Device settings** select the menu item **Back**.

### 6.7.2 Setting time and date

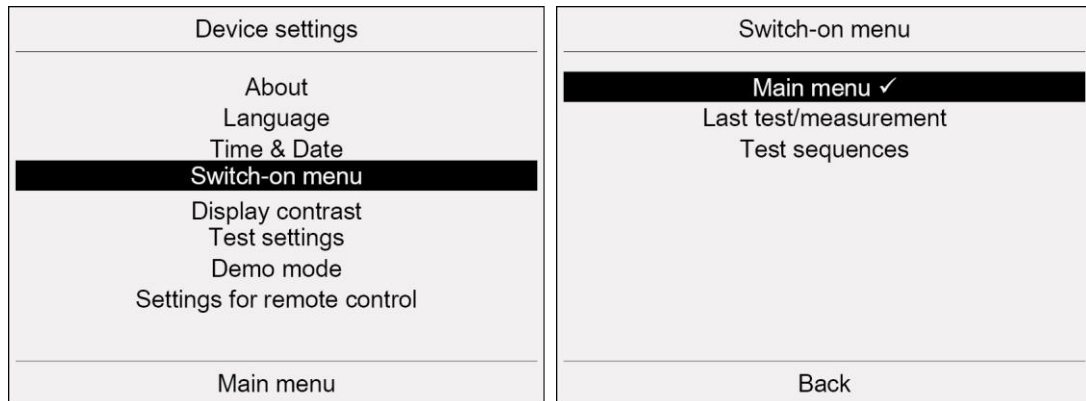
**Main menu > Device settings**



1. In the main menu, select the menu item **Device settings** and press the rotary knob to confirm.
2. Select in the menu **Device settings** the menu item **Time & Date** and press the rotary knob to confirm.
3. Select the respective input field and press the rotary knob to confirm.
4. Enter a value by turning the rotary knob and press the rotary knob to confirm.
5. Repeat steps 3 – 4 for all other input fields.
6. Select the menu item **Save** and press the rotary knob to confirm.  
The time and date are displayed in the main menu and added to the logs. The device switches to the menu **Device settings**.

### 6.7.3 Selecting a switch-on menu

**Main menu > Device settings**



1. In the main menu, select the menu item **Device settings** and press the rotary knob to confirm.
2. Turn the rotary knob to select the start menu you wish to use, and then press the rotary knob to confirm.

You have the following options:

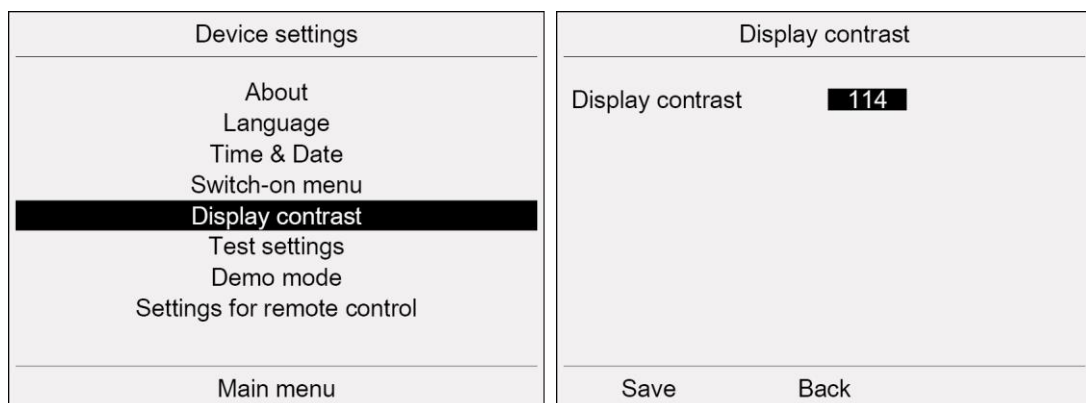
- **Main menu**
- **Last test / measurement**
- **Test sequences** - the window with a list of available test sequences for automatic testing.

Henceforth the selected menu will open each time you switch on the device.

3. In order to be able to return to the menu **Device settings** select the menu item **Back**.

### 6.7.4 Setting the display contrast

**Main menu > Device settings**



1. In the main menu, select the menu item **Device settings** and press the rotary knob to confirm.
2. Select in the menu **Device settings** the menu item **Display contrast** and press the rotary knob to confirm.
3. Enter the display contrast and press the rotary knob to confirm.  
The cursor moves to the menu item **Save**.
4. Press the rotary knob.  
The device switches to the menu **Device settings**.

### 6.7.5 Activate / deactivate setting “Add ambient temperature to log”

**Main menu > Device settings**

Device settings	Test settings
About	Add ambient temperature to log off
Language	
Time & Date	
Switch-on menu	
Display contrast	Aut. voltage reduction off
<b>Test settings</b>	
Demo mode	
Settings for remote control	
Main menu	<b>Back</b>

1. In the main menu, select the menu item **Device settings** and press the rotary knob to confirm.
2. In the **Device settings** menu, select the menu item **Test settings** and press the rotary knob to confirm.
3. Select the input field **Add ambient temperature to log** and press the rotary knob to confirm.
4. Press the rotary knob to select one of the following settings:
  - **on**: On completion of the test or measurement, a prompt for the ambient temperature appears. The ambient temperature is stated in the log.
  - **off**: The ambient temperature is not stated in the log.
5. In order to be able to return to the menu **Device settings** select the menu item **Back**.

### 6.7.6 Activate / deactivate automatic voltage reduction

**Main menu > Device settings**

Device settings	Test settings
About	Add ambient temperature to log off
Language	
Time & Date	
Switch-on menu	
Display contrast	Aut. voltage reduction off
<b>Test settings</b>	
Demo mode	
Settings for remote control	
Main menu	<b>Back</b>

1. In the main menu, select the menu item **Device settings** and press the rotary knob to confirm.
2. In the **Device settings** menu, select the menu item **Test settings** and press the rotary knob to confirm.
3. Select the input field **Aut. voltage reduction** in the **Test settings** menu and press the rotary knob to confirm.
4. Press the rotary knob to select one of the following settings:
  - **on**: If, during the preset test voltage, the load is too high, the test frequency and the test voltage are adapted to the load determined, and the test will be automatically



carried out with the highest possible frequency and the highest possible preset test voltage. The load is monitored during the test and the voltage – if possible – is increased again.

- **off.** A voltage adaptation to the load determined will not be carried out. If the load determined does not permit the preset test voltage, the test cannot be started.

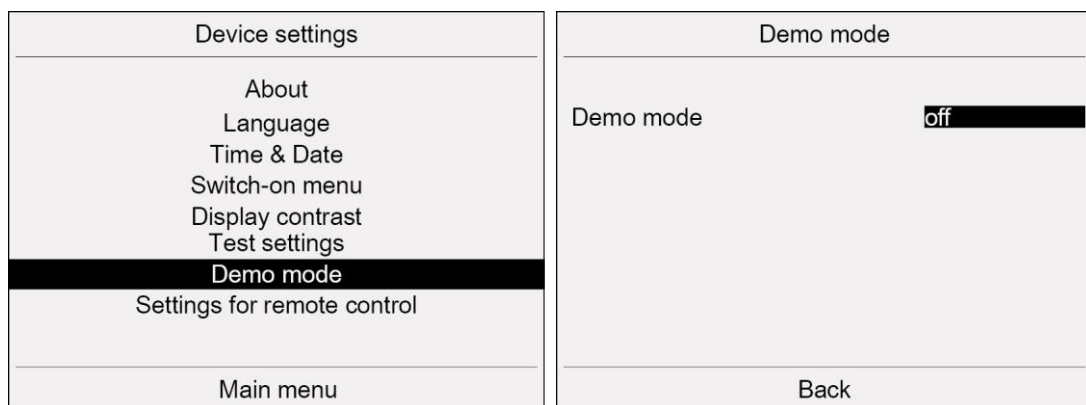
5. In order to be able to return to the menu **Device settings** select the menu item **Back**.

### 6.7.7 Activate or deactivate demo mode

In demo mode, you can get to know the menus on the device and all functions (except the cable sheath fault location) **without switching on the high voltage**. To operate the device in demo mode, you must press the **emergency off button**.

In demo mode, when you select functions that require a voltage release in operating mode, a message that you are in demo mode is displayed.

#### Main menu > Device settings



1. In the main menu, select the menu item **Device settings** and press the rotary knob to confirm.
2. In the **Device settings** menu, select the menu item **Demo mode** and press the rotary knob to confirm.
3. Press the rotary knob to select one of the following settings:
  - **on:** The demo mode is activated. A message prompts you to press the emergency off button:  
Press the emergency off button.
  - **off.** Operating mode is activated.
4. In order to be able to return to the menu **Device settings** select the menu item **Back**.

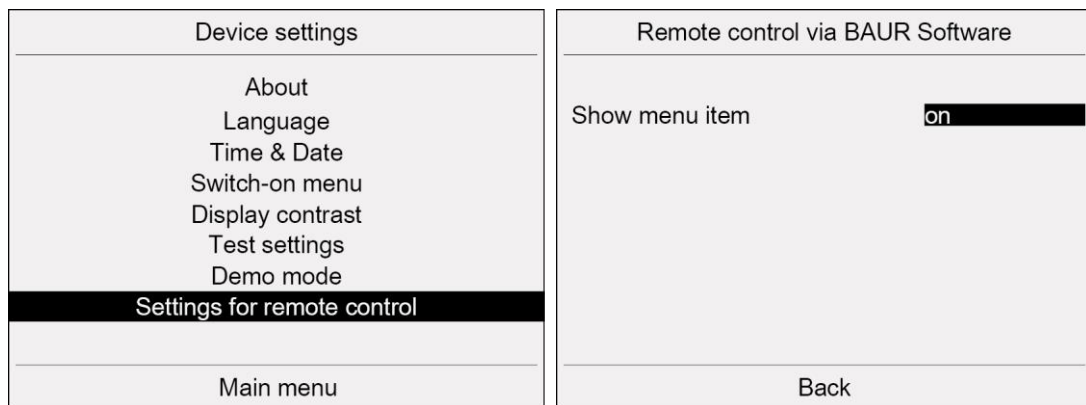
**Note:** In demo mode, remote control is not possible. If frida is remote controlled, the demo mode is disabled and you are prompted to unlock the emergency off button.

### 6.7.8 Settings for remote control via BAUR software

The USB interface enables the remote control of the device via BAUR software. Remote control is particularly recommended when you are also performing partial discharge diagnostics with PD-TaD (option) on the test object. You can configure and control test sequences on the laptop with the BAUR software. Note that MWT measurements can only be carried out on the device. A remote control of MWT measurements via BAUR Software is not possible.

The menu item for remote control is displayed in the main menu and can be shown or hidden in the **Device settings** menu.

**Main menu > Device settings**

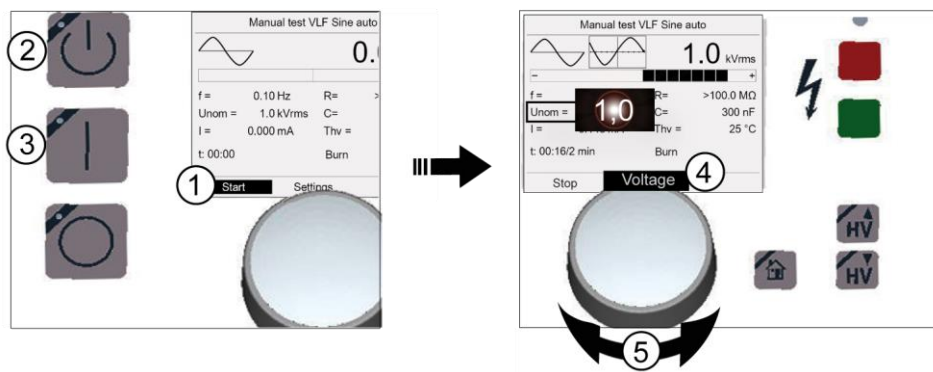


1. In the main menu, select the menu item **Device settings** and press the rotary knob to confirm.
2. In the **Device settings** menu, select the menu item **Settings for remote control** and press the rotary knob to confirm.
3. Press the rotary knob to select one of the following settings:
  - **on**: The menu item **Remote control via BAUR Software** is shown in the main menu. Tests or measurements can be performed by remote control.
  - **off**: The menu item **Remote control via BAUR Software** is hidden.
4. In order to be able to return to the menu **Device settings** select the menu item **Back**.

## 7 MANUAL TEST

### 7.1 Sequence of a manual test - Summary

In the following, the sequence of a manual test is described in principle. Instructions for performing a manual test can be found in the chapter *Perform test* (on page 46).



#### Sequence of a manual test:

##### Main menu > VLF Test > Manual test

- ① ▶ Start the test: select **Start**.  
In order to change the settings, select the menu item *Settings*.
- ② ▶ Press the key.
- ③ ▶ Press the key.  
The test is started.
  - ▶ Set test voltage:
- ④ ▶ Select the menu item **Voltage** and press the rotary knob.  
The cursor moves to the input field for the nominal voltage.
- ⑤ ▶ Use the rotary knob to increase or reduce the voltage and press the rotary knob to confirm the input.  
Alternative: Increase or reduce the voltage using the keys: or .
- ⑥ The test is completed automatically.
  - ▶ **Dangerous voltage at test object:** Before touching the test object, discharge, earth and short-circuit.  
Further information: Chapter *Discharging and earthing the test object* (on page 73)

## 7.2 Setting parameters

### 7.2.1 Setting options

For a manual test the following voltage shapes are available to you:

- VLF Sine auto (frequency = 0.1 Hz)
- VLF Sine
- DC+
- DC-
- DC
- Square wave auto (frequency = 0.1 Hz)
- Square wave

The setting options depend on the voltage shape selected.

The following table provides an overview of the parameters that can be set, depending on the voltage shape.

Parameters	VLF Sine auto	VLF Sine	DC+/DC-/DC	Square wave auto	Square wave
Max. voltage	1 ... 24 kVrms (adjustable)	1 ... 24 kVrms (adjustable)	1 ... 34 kV (adjustable)	1 ... 34 kV (adjustable)	1 ... 34 kV (adjustable)
Frequency	0.1 Hz (automatic)	0.01 ... 0.1 Hz (adjustable)	-	0.1 Hz (automatic)	0.01 ... 0.1 Hz (adjustable)
Slew rate	-	-	-	automatic	1 ... 100 kV/s (adjustable)
Test time	1 ... 120 min (adjustable)	1 ... 120 min (adjustable)	1 ... 120 min (adjustable)	1 ... 120 min (adjustable)	1 ... 120 min (adjustable)
Switch-on delay	0 ... 30 min (adjustable)	0 ... 30 min (adjustable)	0 ... 30 min (adjustable)	0 ... 30 min (adjustable)	0 ... 30 min (adjustable)
Burn mode	selectable	selectable	selectable	selectable	selectable

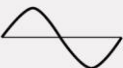
## 7.2.2 Procedure

**Main menu > VLF Test > Manual test**

Main menu	VLF Test
<b>VLF Test</b> Cable sheath fault location Log management Device settings	<b>Manual test</b> Automatic test Logs
10.01.2013 10:12	Back

1. In the main menu, select the menu item **VLF Test** and press the rotary knob to confirm.
2. Select in the menu **VLF Test** the menu item **Manual test** and press the rotary knob to confirm.

The test mode window with the display of all parameters of the last test opens. For example:

Manual test VLF Sine auto	
	0.0 kVrms
<hr/>	
f =	0.10 Hz
Unom =	1.0 kVrms
I =	0.000 mA
Thv =	25 °C
t:	00:00
Start	<b>Settings</b>
Back	

3. Select the menu item **Settings** and press the rotary knob to confirm.

Settings	
Voltage shape	<b>VLF Sine auto</b>
Max. voltage	24 kVrms
Frequency	auto Hz
Test time	5 min
Start delay	--- min
Burn	off
Back	

4. Select in the menu **Settings** the input field **Voltage shape** and press the rotary knob to confirm.
5. Select a voltage shape and press the rotary knob to confirm.

6. Depending on the voltage shape selected, set the following parameters:

- **Max. voltage**
- **Frequency**
- **Slew rate**
- **Test time**
- **Start delay**

If no switch-on delay is set, this is indicated in the menu **Settings** by ---.

- **Burn**

Following settings are possible:



**on:** The burn mode is enabled. During a breakdown, the test is continued, the generator automatically switches to burn mode and converts a high resistive fault to a low resistive connection.

**off:** The burn mode is disabled. During a breakdown, the test is cancelled immediately.

Further information: Chapter *Setting options* (on page 44)

7. In order to be able to return to the test mode window and start the test, select the menu item **Back**.

## 7.3 Perform test

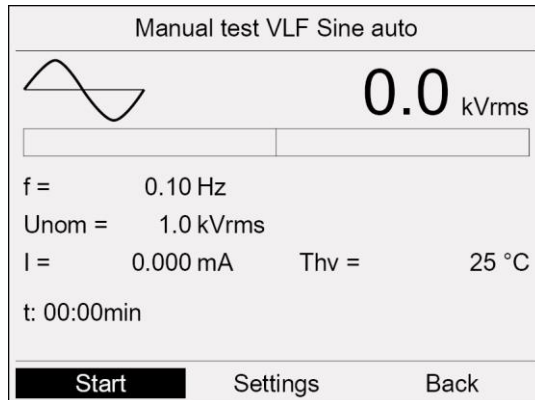
	 <b>WARNING</b>
	<p><b>Risk of arcing faults and noise that can damage hearing as a result of cable breakdown during testing.</b></p> <p>Danger to life as a result of electric shock, burns, electro-ophthalmia, hearing damage.</p> <ul style="list-style-type: none"> <li>▶ Use suitable personal protective equipment against electric shocks and arcing faults.</li> <li>▶ Use ear protection.</li> <li>▶ Keep a safe distance from the connection point of the test object according to the nominal voltage of the network.</li> </ul>

### Prerequisites

- The system is connected correctly.  
Further information: Chapter *Commissioning* (on page 29)
- The test area is secured.  
Further information: Chapter *Securing the test area* (on page 36)

1. Select the menu item **Main menu > VLF Test** and press the rotary knob to confirm.
2. In the **VLF Test** menu, select the menu item **Manual test** and press the rotary knob to confirm.

The test mode window with the display of all parameters of the last test opens. For example:



**Note:** The following screenshots refer by way of example to a manual test with voltage type VLF sine auto. The messages are independent of the selected voltage shape.

- If you want to use the displayed parameters for the current test without any changes, you can now start the test.

If you want to change the parameters for the current test, define them under the menu item **Settings**.

- In the bottom menu bar, select the menu item **Start** and press the rotary knob to confirm. The prompt for high voltage release appears on the display: **Press button <Ready for switch-on>**.

- Hold down the  key for at least one second.

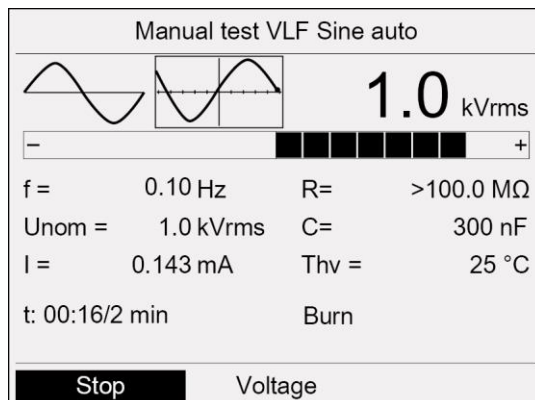
This puts the device into the operating state *Ready to switch on*. The red indicator light flashes for approx. 6 seconds. The prompt for switching on the high voltage appears on the display: **Press button <High voltage on>**.

If you wish to cancel high voltage activation and return to the test mode window, press the rotary knob.

- Press the  key while the red indicator light is flashing.

This puts the device into the operating state *In operation*. The red pilot lamp is steady.

The device determines the applied load. Load determination takes approx. 10 – 20 seconds depending on the load. This is shown by the message **Load determination in progress....** After load determination, the test starts with 1 kV. The menu item **Start** changes to **Stop**.




- You can change the nominal voltage in two ways:

**With the rotary knob:**


- In the bottom menu bar, select **Voltage** and press the rotary knob to confirm. The cursor moves to the input field for the nominal voltage.

- b. Turn the rotary knob until the displayed value corresponds to the desired value and press the rotary knob to confirm.

**With the keys for setting high voltage on the control panel:**

 key for increasing the test voltage:

- ▶ Press once: The voltage is increased by 0.1 kV.
- ▶ Keep pressed: The voltage is increased in steps. The steps start with 0.3 kV and become continuously larger until 1.5 kV is reached.

 key for decreasing the test voltage:

- ▶ Press once: The voltage is decreased by 0.1 kV.
- ▶ Keep pressed: The voltage is decreased in steps. The steps start with 0.3 kV and become continuously larger until 1.5 kV is reached.

The set nominal voltage is applied. The device builds up voltage to the desired end value. The test ends after the set test time.

**Note:** Information on the option of frequency and voltage adaptation depending upon the load capacitance of the test object can be found in the chapter *Activate / deactivate automatic voltage reduction* (on page 40).

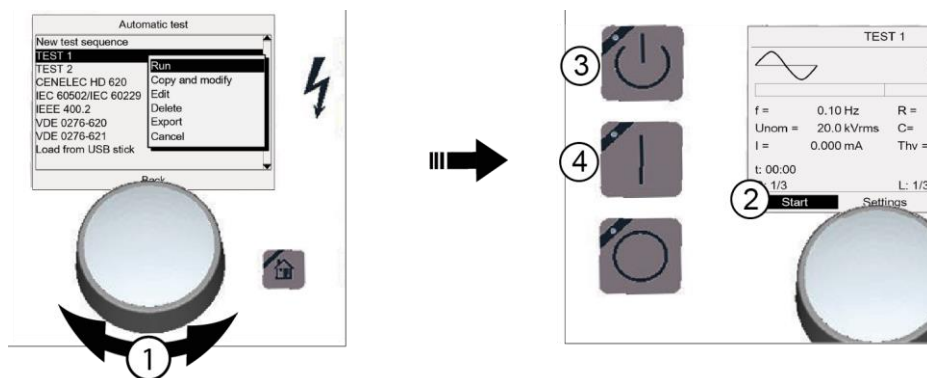
8. The chapter *Finishing the test or the fault location* (on page 71) describes how to complete the test and save the log, and lists the necessary safety measures.



## 8 AUTOMATIC TEST / STANDARD TEST / CABLE SHEATH TEST



### 8.1 Sequence of an automatic test - Summary

In the following, the sequence of an automatic test is described in principle. Instructions for performing an automatic test can be found in the chapter *Perform test* (on page 64).



#### Sequence of an automatic test:

##### Main menu > VLF Test > Automatic Test

- ① ▶ Select test sequence: Turn rotary knob until the cursor comes to rest on the required test sequence, and press the rotary knob in order to confirm the selection.
- ② ▶ Start the test: select **Start**.
- ③ ▶ Press the  key.
- ④ ▶ Press the  key.  
The test is started.
- ⑤ The test is completed automatically.
  - ▶ **Dangerous voltage at test object:** Before touching the test object, discharge, earth and short-circuit.  
Further information: Chapter *Discharging and earthing the test object* (on page 73)

## 8.2 Creating and managing test sequences

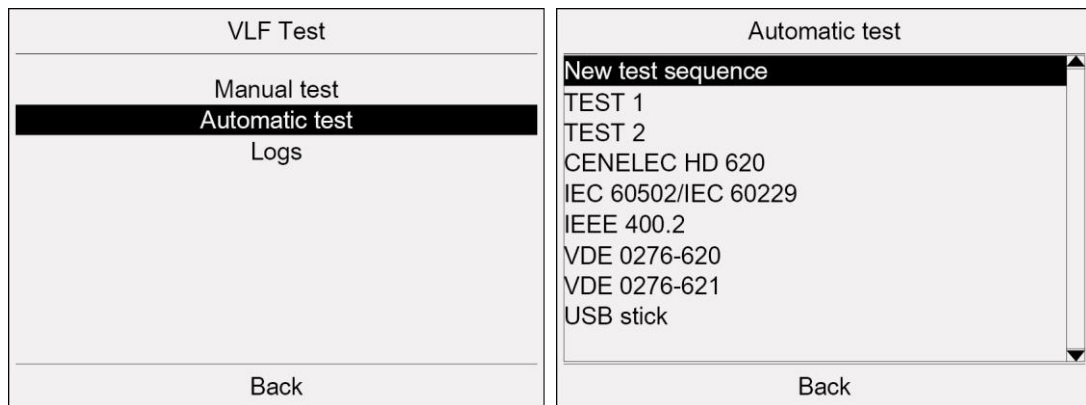
Automatic tests are carried out on the basis of test sequences. In a test sequence, the most important parameters of a test are summarised.

You have the option to configure test sequences for different test tasks and to save the same for further use. In addition, test sequences are available that have been pre-programmed in accordance with the requirements of the standards:

- CENELEC HD 620 (Standardisation document)
- IEEE 400.2
- VDE DIN 0276-620 (German version of CENELEC HD 620)
- VDE DIN 0276-621 (German version of CENELEC HD 621)
- IEC 60502/IEC 60229 (Cable sheath testing)

### 8.2.1 Menu “Automatic test”

**Main menu > VLF Test > Automatic test**

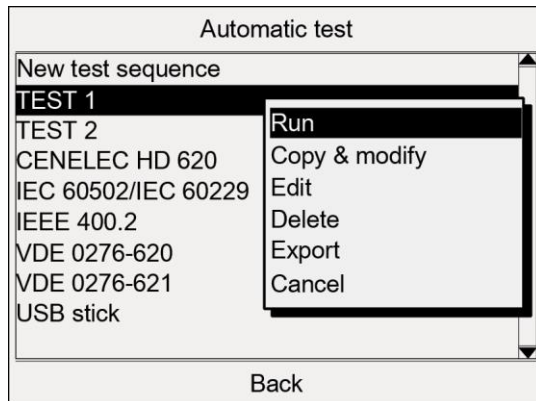


1. In the main menu, select the menu item **VLF Test** and press the rotary knob to confirm.
2. In the **VLF Test** menu, select the menu item **Automatic test** and press the rotary knob to confirm.

The following functions are available in the **Automatic test** menu:

- Start test in accordance with a pre-defined test sequence.  
Further information: Chapter *Perform test* (on page 64)
- Following a test sequence, start test from USB drive: Select **USB stick** menu item.  
Further information: Chapter *Selecting a test sequence for testing from USB drive* (on page 55)
- Create new test sequence: Select **New test sequence** menu item.  
Further information: Chapter *Creating a new test sequence* (on page 52)
- Import test sequence from USB drive: Insert a USB drive on which the required test sequence is saved and select the menu item **USB stick**.  
Further information: Chapter *Importing a test sequence from a USB drive* (on page 56)
- Managing test sequences: Select a test sequence and press the rotary knob to confirm.

A context menu for editing the test sequence opens.



Further information:

- Chapter *Editing a test sequence* (on page 55)
- Chapter *Exporting a test sequence to a USB drive* (on page 56)
- Chapter *Deleting a test sequence* (on page 55)
- Chapter *Creating a new test sequence on the basis of an existing one* (on page 54)

## 8.2.2 Setting options

For an automatic test the following voltage shapes are available to you:

- VLF Sine
- VLF Sine auto (frequency = 0.1 Hz)
- DC+
- DC-
- DC
- Square wave
- Square wave auto (frequency = 0.1 Hz)

Further setting options depend on the voltage shape selected.

The following table provides an overview of the settings dependent on the voltage shape.

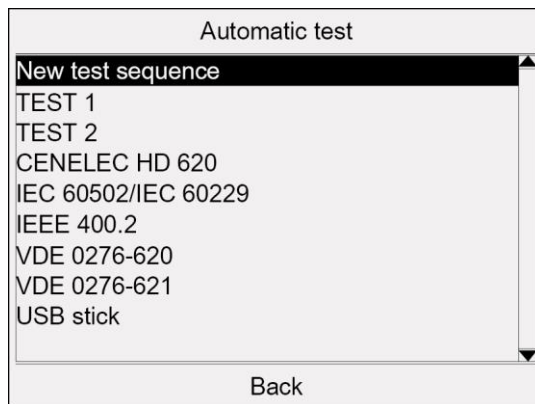
Parameters	VLF Sine auto	VLF Sine	DC+/DC-/DC	Square wave auto	Square wave
Max. voltage	1 ... 24 kVrms (adjustable)	1 ... 24 kVrms (adjustable)	1 ... 34 kV (adjustable)	1 ... 34 kV (adjustable)	1 ... 34 kV (adjustable)
Frequency	0.1 Hz (automatic)	0.01 ... 0.1 Hz (adjustable)	-	0.1 Hz (automatic)	0.01 ... 0.1 Hz (adjustable)
Number of phases	1 ... 3 (adjustable)	1 ... 3 (adjustable)	1 ... 3 (adjustable)	1 ... 3 (adjustable)	1 ... 3 (adjustable)
Number of voltage steps	1 ... 20 steps (adjustable)	1 ... 20 steps (adjustable)	1 ... 20 steps (adjustable)	1 ... 20 steps (adjustable)	1 ... 20 steps (adjustable)
Test voltage per step	1 ... 24 kVrms (adjustable)	1 ... 24 kVrms (adjustable)	1 ... 34 kV (adjustable)	1 ... 34 kV (adjustable)	1 ... 34 kV (adjustable)

Parameters	VLF Sine auto	VLF Sine	DC+/DC-/DC	Square wave auto	Square wave
Test time per step	1 ... 120 min (adjustable)	1 ... 120 min (adjustable)	1 ... 120 min (adjustable)	1 ... 120 min (adjustable)	1 ... 120 min (adjustable)
Slew rate	-	-	-	automatic	1 ... 30 kV/s (adjustable)
Burn mode	selectable	selectable	selectable	selectable	selectable

Each test sequence is saved under a freely defined designation and can be retrieved again later. Due to including the number of phases in the test sequence, tests can also be carried out on several phases. Test results are summarised in a log – differentiated according to phase.

### 8.2.3 Creating a new test sequence

1. In the main menu, select the menu item **VLF Test** and press the rotary knob to confirm.
2. Select in the menu **VLF Test** the menu item **Automatic test** and press the rotary knob to confirm.



3. Select in the menu **Automatic test** the menu item **New test sequence** and press the rotary knob to confirm.

The window **Test sequence** for setting the parameters of the new test sequence opens.

New test sequence	
Name	<b>TESTSET_1</b>
No. of steps (S) [1..20]	1
No. of phases (L) [1..3]	1
Voltage shape	VLF Sine auto
Max. voltage	24 kVrms
Frequency	auto Hz
Burn	on
Steps	Cancel

The device proposes a name consisting of the word *Testset* and a continuous number.

4. If you wish to assign a different name, select the input field **Name** and press the rotary knob to confirm.

The name input window opens.

5. Enter a name:
  - a. In order to navigate between letters, turn the rotary knob.
  - b. In order to confirm selection, press the rotary knob.
  - c. After entering the name, select the button **OK**, in order to confirm the entry.
6. Enter the number of voltage steps and press the rotary knob to confirm.
7. Enter the number of phases on which the test is to be carried out and press the rotary knob to confirm.
8. Select the voltage shape and press the rotary knob to confirm.
9. Depending on the voltage shape selected, set the following parameters:

- **Max. voltage**
- **Frequency**
- **Slew rate**
- **Burn**

Following settings are possible:

**on:** The burn mode is enabled. During a breakdown, the test is continued, the generator automatically switches to burn mode and converts high resistive faults to a low resistive connection.

**off:** The burn mode is disabled. During a breakdown, the test is cancelled immediately.

Further information: Chapter *Setting options* (on page 51)

10. In the lower menu bar, select the menu item **Steps**.

The window **Steps** for setting the voltage and duration of the individual steps opens.

New test sequence

Step	Test time min	Test voltage kVrms
Step 1	10	1.0
Step 2	1	1.0
Step 3	1	1.0

Max. voltage 10.0 kVrms

Back      Save      Cancel

New test sequence

Step	Test time min	Test voltage kVrms
Step 1	10	1.0
Step 2	1	1.0
Step 3	1	1.0

Max. voltage 1.0 kVrms

Back      Save      Cancel

11. Select a step and press the rotary knob to confirm.
12. In the window **Define step** set the test time and test voltage for the step selected.
13. Select the button **OK**.
14. Enter the test time and test voltage for each further step. Proceed in the same way as for setting the first step.
15. In the lower menu bar, select the menu item **Save**.

The device switches to the menu **Automatic test**. The test sequence thus newly created is shown in the list of test sequences.

### 8.2.4 Creating a new test sequence on the basis of an existing one

If you wish to create a new test sequence which will differ from an existing one in some minor details only, you can use the existing test sequence as a basis.

The original test sequence remains intact and is not changed.

**Main menu > VLF Test > Automatic test**

1. Select in the menu **Automatic test** select a test sequence and press the rotary knob to confirm.
2. In the context menu, select the menu item **Copy & modify**.  
The window **Test sequence** for the display of test sequence parameters opens.
3. Define the parameters for the new test sequence. To do this, proceed as you would when creating a new test sequence.

Further information: Chapter *Creating a new test sequence* (on page 52)

### 8.2.5 Creating a new test sequence on the basis of a standard test sequence

If you wish to create a new test sequence which will differ from an existing one in some minor details only, you can use the existing standard test sequence as a basis.

**Main menu > VLF Test > Automatic test**

1. Select in the **Automatic test** menu select a standard test sequence and press the rotary knob to confirm.
2. In the context menu, select the **Copy & modify** menu item.  
The **Test sequence** window for the display of test sequence parameters opens.
3. Define the parameters for the new test sequence. To do this, proceed as you would when creating a new test sequence.

Further information: Chapter *Creating a new test sequence* (on page 52)

### 8.2.6 Selecting a test sequence for the test

**Main menu > VLF Test > Automatic test**

1. Select in the menu **Automatic test** select a test sequence and press the rotary knob to confirm.
2. In the context menu, select the menu item **Run**.  
The parameters of the test sequence selected are shown.
3. In the lower menu bar, select the menu item **Next** and press the rotary knob to confirm.  
The test mode window for the start of the test opens. Further information on performing a test is given in the chapter *Perform test* (on page 64).

## Selecting a test sequence for testing from USB drive

If you have saved test sequences on a USB drive, you can select a test sequence from the USB drive and start the test directly from the USB drive.

1. Select in the menu **Automatic test** the menu item **USB stick** and press the rotary knob to confirm.

The window **USB** with the display of the main directory of the USB drive opens.

2. Select a test sequence and press the rotary knob to confirm.
3. In the context menu, select the menu item **Run** and press the rotary knob to confirm.

The parameters of the test sequence selected are shown.

4. In the lower menu bar, select the menu item **Next** and press the rotary knob to confirm.

The test mode window for the start of the test opens. Further information on performing a test is given in the chapter *Perform test* (on page 64).

### 8.2.7 Editing a test sequence

**Main menu > VLF Test > Automatic test**

1. In the **Automatic test** menu, select a test sequence which you wish to edit and press the rotary knob to confirm.

2. In the context menu, select the **Edit** menu item and press the rotary knob to confirm.

The **Test sequence** window for the display of test sequence parameters opens.

3. Change the parameters of the selected test sequence. To do this, proceed as you would when defining a new test sequence.

Further information: Chapter *Creating a new test sequence* (on page 52)

### 8.2.8 Deleting a test sequence

**Main menu > VLF Test > Automatic test**

1. Select in the menu **Automatic test** the test sequence which you wish to delete and press the rotary knob to confirm.

2. In the context menu, select **Delete** and press the rotary knob to confirm.

A prompt appears, asking if you really want to delete the test sequence.

3. Confirm the prompt with **OK**.

The test sequence is deleted.

### 8.2.9 Exporting a test sequence to a USB drive

**Note:** The device supports only USB drives with the FAT32 and FAT16 file system. We recommend using USB drives with the FAT32 file system.

1. Insert a USB drive in the USB port of frida.
2. In the main menu, select the menu item **VLF Test** and press the rotary knob to confirm.
3. Select in the menu **VLF Test** the menu item **Automatic test**.
4. Select a test sequence and press the rotary knob to confirm.
5. In the context menu, select the menu item **Export**.  
The window **USB** with the display of the main directory of the USB drive opens.
6. If you wish to save the test sequence to a folder, select a folder or create a new one.  
If you wish to create a new folder,
  - a. select the menu item **Create new folder** and press the rotary knob to confirm.
  - b. Enter a name and confirm this entry with **OK**.You have the option to create subfolders. In order to return to the superordinate folder, select the menu item **Back**.
7. In the lower menu bar, select the menu item **Save**.  
The test sequence is saved.
8. Acknowledge this save confirmation with **OK**.

### 8.2.10 Importing a test sequence from a USB drive

**Note:** The device supports only USB drives with the FAT32 and FAT16 file system. We recommend using USB drives with the FAT32 file system.

1. Insert a USB drive in the USB port of frida.
2. In the main menu, select the menu item **VLF Test** and press the rotary knob to confirm.
3. Select in the menu **VLF Test** the menu item **Automatic test**.
4. Select in the menu **Automatic test** the menu item **USB stick**.  
The window **USB** with the display of the main directory of the USB drive opens.
5. Select a test sequence which you wish to import into the device and press the rotary knob to confirm.
6. In the context menu, select the menu item **Import**.  
The test sequence is saved in the device memory.
7. Acknowledge this save confirmation with **OK**.  
If you wish to start a test based on a test sequence directly from the USB drive, select in the context menu the menu item **Run**. Further information on performing a test is given in the chapter *Perform test* (on page 64).



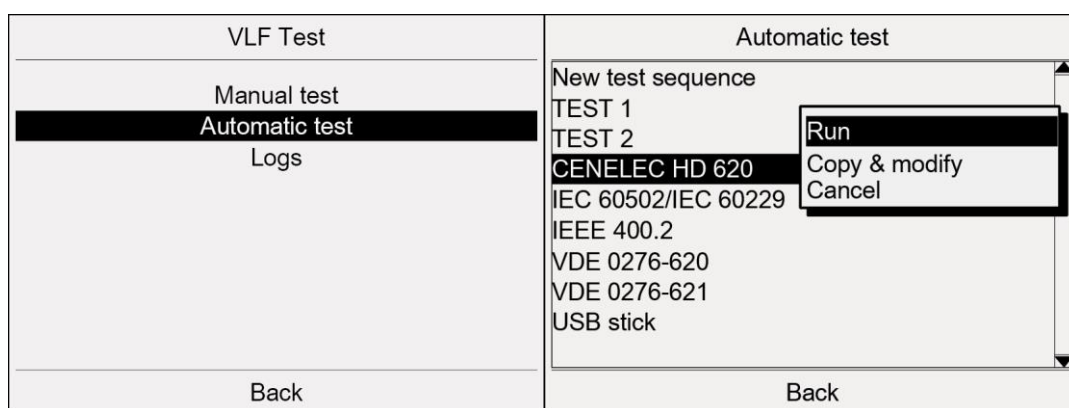
## 8.3 Setting parameters of a standard test sequence

4 pre-programmed test sequences for cable testing are available to you:

- CENELEC HD 620 (Standardisation document)
- VDE DIN 0276-620 (German version of CENELEC HD 620)
- VDE DIN 0276-621 (German version of CENELEC HD 621)
- IEEE 400.2

**Note:** The IEC 60502/IEC 60229 standard that is also listed under the menu item, refers to the cable sheath testing.

The pre-programmed standard test sequences are shown in the menu **VLF Test > Automatic test** and can be administered and configured there.



### 8.3.1 Cable testing according to CENELEC HD 620

Recommendations for performing a cable test according to CENELEC HD 620:

- Applicable for power distribution cable with extruded insulation for rated voltages of 3.6/6 (7.2) kV to 20.8/36 (42) kV
- Test alternating voltage: 0.1 Hz
- Test level (effective value): 3 x U<sub>0</sub>
- Test time: 60 min

**Main menu > VLF Test > Automatic test > CENELEC HD 620**

1. Select in the menu **Automatic test** the menu item **CENELEC HD 620** and press the rotary knob to confirm.
2. In the context menu, select the menu item **Run**.  
The window **CENELEC HD 620** opens.

Automatic test	
New test sequence	
TEST 1	
TEST 2	
<b>CENELEC HD 620</b>	Run
IEC 60502/IEC 60229	Copy & modify
IEEE 400.2	Cancel
VDE 0276-620	
VDE 0276-621	
USB stick	
Back	

CENELEC HD 620		
Volt. U <sub>0</sub> (phase-earth)	<b>5.0</b>	kVrms
-----		
Test volt. (phase-earth)	15.0	kVrms
Back      Next		

3. Enter the voltage U<sub>0</sub> (phase – earth) and the test voltage (phase – earth).  
U<sub>0</sub> is the rms value of the nominal voltage between an conductor (Phase) and earth.  $U_0 = U / \sqrt{3}$ .  
Thereby, U is the rms value of the nominal voltage between conductors.
4. Select the menu item **Next** and press the rotary knob to confirm.  
The test mode window for the start of the test opens. Further information on performing a test is given in the chapter *Perform test* (on page 64).

### 8.3.2 Cable testing according to IEEE 400.2

The IEEE 400.2 recommends different test voltages depending on the test type.

Test types according to IEEE 400.2:

- **Installation** - Test after installation of a cable system before installation of terminations/joints, connection and transition sleeves. This test is conducted to detect damage during transport, storage and installation.
- **Acceptance** - Test after installation of a cable system, including terminations/joints, connection and transition sleeves before the cable system is put into normal operation. This test is conducted to detect damage during installation.
- **Maintenance** - Test during life cycle of a cable system. This test is conducted to detect the age of a cable system and to check the operational viability. Maintenance tasks can be planned depending on the test results.

The following VLF test voltages (sinusoidal wave form) are recommended depending on the nominal voltage U of the cable.

The implemented test voltages correspond to the valid draft of the new IEEE 400.2:

Nominal voltage U (Phase – Phase) [kV]	Installation (Phase – Earth) [kV <sub>rms</sub> ]	Acceptance (Phase – Earth) [kV <sub>rms</sub> ]	Maintenance (Phase – Earth) [kV <sub>rms</sub> ]
5	9	10	7
8	11	13	10
15*	19 According to IEEE 400.2-2004 = 18 kV <sub>rms</sub>	21 According to IEEE 400.2-2004 = 20 kV <sub>rms</sub>	16
20 (new)**	24	26	20
25*	29 According to IEEE 400.2-2004 = 27 kV <sub>rms</sub>	32 According to IEEE 400.2-2004 = 31 kV <sub>rms</sub>	24 According to IEEE 400.2-2004 = 23 kV <sub>rms</sub>
28 (new)**	32	36	27
30 (new)**	34	38	29
35	39	44	33

\* In the currently valid version of IEEE 400.2-2004 lower test voltages are recommended for 15 kV cables and 25 kV cables than in the draft version of the new standard.

\*\* These nominal voltages have been newly included in the new IEEE 400.2.

In the draft of the new IEEE 400.2 new test voltages (for 20 kV, 28 kV and 30 kV cables) were included, in comparison to IEEE 400.2-2004 some test voltages were increased. If you wish to apply the test voltages of the IEEE 400.2-2004, prepare a user-specific template.

Recommended test time:

- Test types **Installation** and **Acceptance**: 15 to 60 min  
Approx. 89% disruptive breakdowns with damage to the insulation occur in the first 30 minutes (tested on plastic cables)  
Approx. 95% - after 45 minutes  
100% - after 60 minutes
- Test type **Maintenance**: 15 min

**Main menu > VLF Test > Automatic test > IEEE 400.2**

1. In the main menu, select the menu item **Automatic test** and press the rotary knob to confirm.
2. In the context menu, select the menu item **Run**.  
The window **IEEE 400.2** opens.

Automatic test	
New test sequence	
TEST 1	
TEST 2	
CENELEC HD 620	
IEC 60502/IEC 60229	
IEEE 400.2	Run
VDE 0276-620	Copy & modify
VDE 0276-621	Cancel
USB stick	
Back	

IEEE 400.2	
Volt. U (phase-phase)	5.0 kVrms
Test time	30 min
Test type	Installation
-----	
Test volt. (phase-earth)	9.0 kVrms
Back	Next

3. Enter the voltage U (phase - phase).  
U is the rms value of the nominal voltage between 2 phases.
4. Enter the test time.
5. Enter the test type. There are the following test types:
  - **Installation**
  - **Acceptance**
  - **Maintenance**
6. Select the menu item **Next** and press the rotary knob to confirm.  
The test mode window for the start of the test opens. Further information on performing a test is given in the chapter *Perform test* (on page 64).

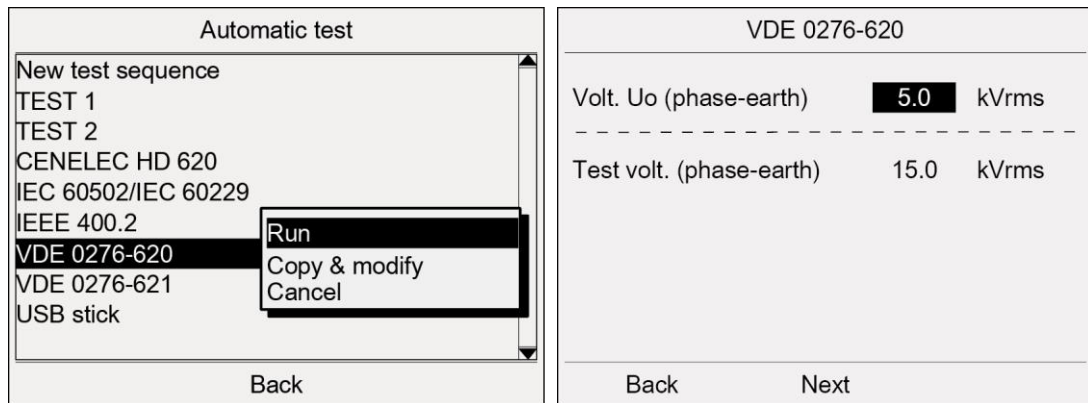
### 8.3.3 Cable testing according to VDE 0276-620

The VDE 0276-620 standard contains the German version of the standardisation document CENELEC HD 620 S1 Parts 1, 3C, 4C, 5C and 6C.

**Main menu > VLF Test > Automatic test > VDE 0276-620**

1. Select in the menu **Automatic test** the menu item **VDE 0276-620** and press the rotary knob to confirm.
2. In the context menu, select the menu item **Run**.

The window **VDE 0276-620** opens.



3. Enter the voltage  $U_0$  (phase – earth) and the test voltage (phase – earth).  
 $U_0$  is the rms value of the nominal voltage between an conductor (Phase) and earth.  $U_0 = U / \sqrt{3}$ .  
 Thereby,  $U$  is the rms value of the nominal voltage between conductors.
4. Select the menu item **Next** and press the rotary knob to confirm.  
 The test mode window for the start of the test opens. Further information on performing a test is given in the chapter *Perform test* (on page 64).

### 8.3.4 Cable testing according to VDE 0276-621

The VDE 0276-621 standard contains the German version of the standardisation document CENELEC HD 621 S1:1996 Parts 1, 2, 3C and 4C.

Recommendations for performing a cable test according to VDE 0276-621:

- Applies for power distribution cable with impregnated paper insulation for medium voltage
- Test alternating voltage: 0.1 Hz
- Test level (effective value):  $3 \times U_0$
- Test time: 30 min

**Note:** In mixed lines with PE/XLPE cables, the standard recommends a test time of 60 minutes.

**Main menu > VLF Test > Automatic test > VDE 0276-621**

1. Select in the menu **Automatic test** the menu item **VDE 0276-621** and press the rotary knob to confirm.
2. In the context menu, select the menu item **Run**.  
The window **VDE 0276-621** opens.

Automatic test	VDE 0276-621
<div style="border: 1px solid black; padding: 2px;">New test sequence</div> <div style="border: 1px solid black; padding: 2px;">TEST 1</div> <div style="border: 1px solid black; padding: 2px;">TEST 2</div> <div style="border: 1px solid black; padding: 2px;">CENELEC HD 620</div> <div style="border: 1px solid black; padding: 2px;">IEC 60502/IEC 60229</div> <div style="border: 1px solid black; padding: 2px;">IEEE 400.2</div> <div style="border: 1px solid black; padding: 2px;">VDE 0276-620</div> <div style="border: 1px solid black; padding: 2px;">VDE 0276-621</div> <div style="border: 1px solid black; padding: 2px;">USB stick</div>	<div style="border: 1px solid black; padding: 2px;">VDE 0276-621</div> <div style="border: 1px solid black; padding: 2px;">           Volt. <math>U_0</math> (phase-earth)    <b>5.0</b>    kVrms         </div> <div style="border: 1px solid black; padding: 2px;">           Test time                      30    min         </div> <div style="border: 1px solid black; padding: 2px;">           -----         </div> <div style="border: 1px solid black; padding: 2px;">           Test volt. (phase-earth)    15.0    kVrms         </div>
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Run</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">Copy &amp; modify</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">Cancel</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Back</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">Next</div>

3. Enter the voltage  $U_0$  (phase – earth).  
 $U_0$  is the rms value of the nominal voltage between an conductor (Phase) and earth.  $U_0 = U / \sqrt{3}$ .  
 Thereby,  $U$  is the rms value of the nominal voltage between conductors.
4. Enter the test time.
5. Select the menu item **Next** and press the rotary knob to confirm.  
 The test mode window for the start of the test opens. Further information on performing a test is given in the chapter *Perform test* (on page 64).

## 8.4 Setting parameters for cable sheath testing

The cable sheath testing is done according to the specifications of the IEC 60502. The test voltages are determined according to the IEC 60229 (Chapter 5):

- Test voltage: 4 kV per millimetre thickness of cable sheath
- Max. test voltage: 10 kV

**Main menu > VLF Test > Automatic test > IEC 60502/IEC 60229**

1. In the **Automatic test** menu, select the **IEC 60502/IEC 60229** menu item and press the rotary knob to confirm.
2. In the context menu, select the **Run** menu item and press the rotary knob to confirm.

The **IEC 60502/IEC 60229** window opens.

Automatic test	
New test sequence	
TEST 1	
TEST 2	
CENELEC HD 620	
IEC 60502/IEC 60229	Run
IEEE 400.2	Copy & modify
VDE 0276-620	Cancel
VDE 0276-621	
USB stick	
Back	

IEC 60502/IEC 60229	
Sheath thickness	2.0 mm
-----	
Test volt. (phase-earth)	8.0 kVrms
<div style="display: flex; justify-content: space-between;"> <span>Back</span> <span>Next</span> </div>	

3. Enter the sheath thickness of the cable in millimetres.

**Note:** The sheath thickness is contained in the cable specification.


The test voltage is calculated and indicated automatically.

4. Select the **Next** menu item and press the rotary knob to confirm.

The test mode window for the start of the test opens. Further information on performing a test is given in the chapter *Perform test* (on page 64).

If a breakdown occurs during cable sheath testing, you can pin-point the cable sheath fault immediately after testing. Further information: Chapter *Cable sheath fault location* (on page 67)

## 8.5 Perform test

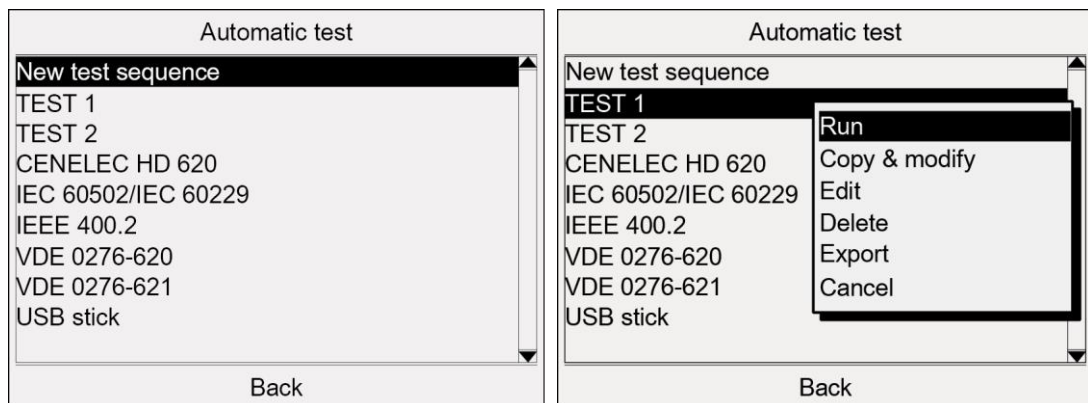
	<b>WARNING</b>
<p><b>Risk of arcing faults and noise that can damage hearing as a result of cable breakdown during testing.</b></p> <p>Danger to life as a result of electric shock, burns, electro-ophthalmia, hearing damage.</p> <ul style="list-style-type: none"> <li>▶ Use suitable personal protective equipment against electric shocks and arcing faults.</li> <li>▶ Use ear protection.</li> <li>▶ Keep a safe distance from the connection point of the test object according to the nominal voltage of the network.</li> </ul>	

### Prerequisites

- The system is connected correctly.  
Further information: Chapter *Commissioning* (on page 29)
- The test area is secured.  
Further information: Chapter *Securing the test area* (on page 36)

### Main menu > VLF Test > Automatic test

1. In the main menu, select the menu item **VLF Test** and press the rotary knob to confirm.
2. In the **VLF Test** menu, select the menu item **Automatic test** and press the rotary knob to confirm.



3. In the **Automatic test** menu, select a test sequence from the list and press the rotary knob to confirm.  
If you wish to create a new test sequence or edit the existing one, you will find further information in the chapters *Creating a new test sequence* (on page 52), *Editing a test sequence* (on page 55).  
If you wish to use a test sequence from a USB drive, select the menu item **Automatic test** in the **USB stick** menu and select a test sequence.
4. In the context menu, select the menu item **Run** and press the rotary knob to confirm.  
The window **Details** containing the test parameters opens.

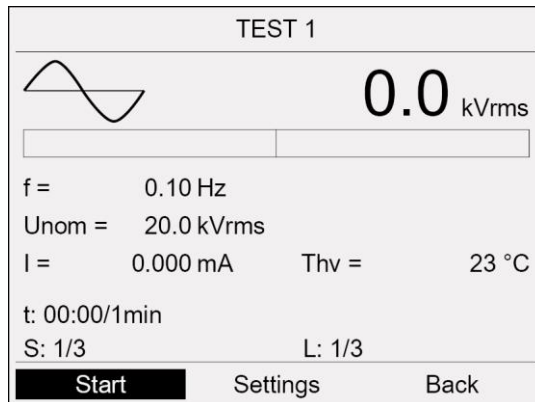


5. Check the test parameters.

If you wish to perform the test with the parameters specified, select the menu item **Next** in the bottom menu bar.

The test mode window for the start of the test opens.

**Note:** The following screenshots are examples. The messages are independent of the selected voltage shape.



6. If you wish to set a start delay for the test, select the menu item **Settings** and press the rotary knob to confirm.

Define a start delay.

7. In the bottom menu bar, select the menu item **Start** and press the rotary knob to confirm.

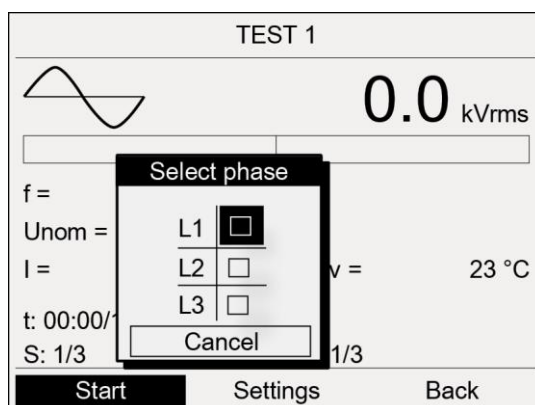
**Test on a phase**

If only one phase is specified in the test sequence, a prompt for high voltage release appears: **Press button <Ready for switch-on>**

Go to step 8.

**Test on several phases**

If more than one phase has been specified in the test sequence, a context menu for phase selection opens. The phases on which the test has already been carried out are indicated by means of a tick. If the test on a phase was cancelled, this is indicated by a cross.



a. Turn the rotary knob to select the phase, and then press the rotary knob to confirm. The prompt to connect the phase selected appears on the display.

b. If the phase selected has not yet been connected, connect it. Further information on connecting the test object can be found in the chapters *Connecting for cable test* (on page 31) and *Connecting for cable sheath testing and cable fault location* (on page 34).


- c. Select the menu item **Next**.

The prompt for high voltage release appears on the display: **Press button <Ready for switch-on>**.

8. Hold down the  key for at least one second.

This puts the device into the operating state *Ready to switch on*. The red indicator light flashes for approx. 6 seconds. The prompt for switching on the high voltage appears on the display: **Press button <High voltage on>**.

If you wish to cancel high voltage activation and return to the test mode window, press the rotary knob.

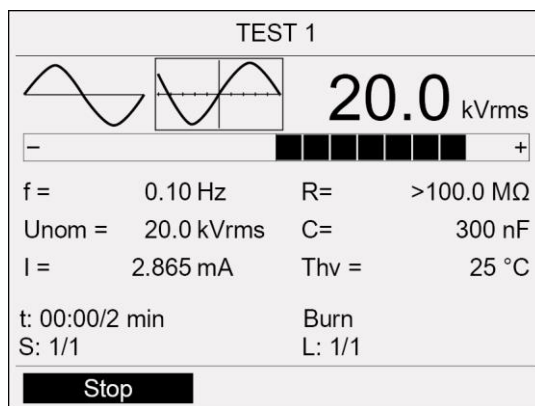
9. Press the  key while the red indicator light is flashing.

This puts the device into the operating state *In operation*. The red pilot lamp is steady.

The device determines the applied load. The load determination takes approx. 10 - 20 seconds depending on the load. This is shown by the message **Load determination in progress...**

**Note:** Information on the option of frequency and voltage adaptation depending upon the load capacitance of the test object can be found in the chapter *Activate / deactivate automatic voltage reduction* (on page 40).

The test is started after the load determination. The menu item **Start** changes to **Stop**.



The test ends after the set test time.

10. The chapter *Finishing the test or the fault location* (on page 71) describes how to complete the test and save the log, and lists the necessary safety measures.

## 9 CABLE SHEATH FAULT LOCATION

frida can be used together with the BAUR protrac® pin-pointing system ("Step voltage" set) for locating cable sheath faults.



- More information on locating cable sheath faults is given in the user manual for the pin-pointing system.

### 9.1 Setting parameters of the cable sheath fault location

#### 9.1.1 Setting options

Parameters	Setting range
<b>Max. voltage</b>	-1 to -10 kV (adjustable)
<b>Test time</b>	1 – 120 min (adjustable)
<b>Start delay</b>	0 – 30 min (adjustable)


#### 9.1.2 Procedure

**Main menu > Cable sheath fault location > Start measurement**

<div> Main menu </div> <div> VLF Test  VLF Diagnostics – tan <math>\delta</math>  <b>Cable sheath fault location</b>  Log management  Remote control via BAUR Software  Device settings </div> <div> 10.01.2013 10:12 </div>	<div> Cable sheath fault location </div> <div> <b>Start Measurement</b>  Logs </div> <div> Back </div>
--	--

1. In the main menu, select the menu item **Cable sheath fault location** and press the rotary knob to confirm.
2. Select in the menu **Cable sheath fault location** the menu item **Start measurement** and press the rotary knob to confirm.

The measurement mode window opens, displaying all parameters from the last cable sheath fault location. For example:

Cable sheath fault location			
		0.0 kV	
<hr/>			
f =	0.00 Hz		
Unom =	-1.0 kV		
I =	0.000 mA	Thv =	23 °C
t: 00:00			
Start		Settings	Back

3. Select the menu item **Settings** and press the rotary knob to confirm.

Settings	
Max. voltage	-1.0 kV
Test time	5 min
Start delay	3 min
<hr/>	
Next	

4. Select the input field **Max. voltage** and press the rotary knob to confirm.
5. Set the max. voltage and press the rotary knob to confirm.
6. Set the following parameters:
- **Test time**
  - **Start delay**
- Proceed in the same way as for setting the maximum voltage.
7. In order to be able to return to the measurement mode window and start the location process, select **Next**.

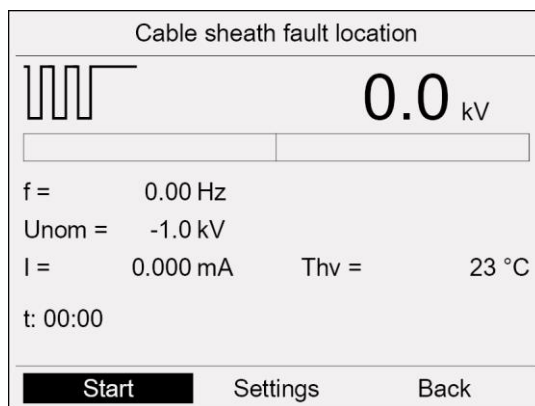
## 9.2 Performing cable sheath fault location



### Prerequisites

- The system is connected correctly.  
Further information: Chapter *Commissioning* (on page 29)
- The test area is secured.  
Further information: Chapter *Securing the test area* (on page 36)

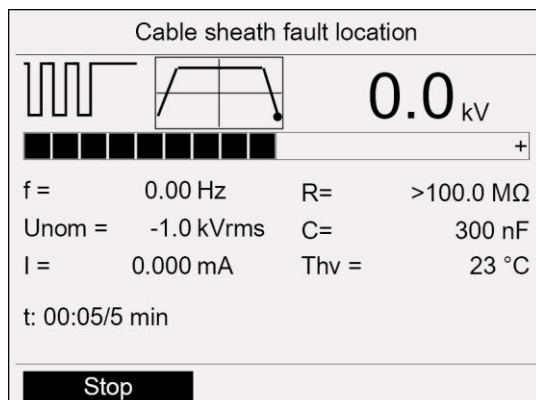
### Main menu > Cable sheath fault location > Start measurement

1. In the main menu, select the menu item **Cable sheath fault location** and press the rotary knob to confirm.
2. In the **Cable sheath fault location** menu, select the **Start measurement** menu item.  
The measurement mode window opens, displaying all parameters from the last cable sheath fault location.



3. If you want to use the displayed parameters for the current cable sheath fault location without change, you can now start the fault location.  
If you want to adjust the parameters for the current location process, define them in the menu item **Settings**.  
Further information: Chapter *Setting parameters of the cable sheath fault location* (on page 67)
4. In the bottom menu bar, select the menu item **Start** and press the rotary knob to confirm.  
The prompt for high voltage release appears on the display: **Press button <Ready for switch-on>**.
5. Hold down the  key for at least one second.  
This puts the device into the operating state *Ready to switch on*. The red indicator light blinks for approx. 6 seconds. The prompt for switching on the high voltage appears on the display: **Press button <High voltage on>**.  
If you wish to cancel high voltage activation and return to the measurement mode window, press the rotary knob.
6. Press the  key while the red indicator light is flashing.  
This puts the device into the operating state *In operation*. The red pilot lamp is steady. The device determines the applied load. The load determination takes approx. 10 - 20 seconds depending on the load. This is indicated by the message **Load determination in progress...**. The test is started after the load determination. The menu item **Start** changes to **Stop**.

If a short-circuit occurs during load determination, the message **Short-circuit on load determination!** is displayed. You can still perform cable sheath fault location. Acknowledge this message by pressing the rotary knob. The locating of cable sheath faults will continue.



- More information on locating cable sheath faults is given in the user manual for the pin-pointing system.

7. The chapter *Finishing the test or the fault location* (on page 71) describes how to complete the test and save the log, and lists the necessary safety measures.

## 10 FINISHING THE TEST OR THE FAULT LOCATION

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### 10.1 End test or fault location

After the test, the high voltage is reduced and the device is discharged internally. This is shown by the message **Discharge process**.

When the discharge process is completed, the device changes to the *Ready for operation* operating state. The red indicator light goes out, the green indicator light comes on. The device no longer delivers dangerous voltage. A safety message appears which prompts you to discharge, earth and short-circuit the test object.



#### **DANGER**

**Dangerous voltage on the test object and other live machine parts.** Danger to life, risk of injury from high electric voltage.

1. Before touching test object, discharge, earth and short-circuit the same: at the connection point and at the far end.  
You may touch the plant parts that were under voltage only if they are visibly earthed and short-circuited.
2. The safety message is hidden after approx. 5 seconds. In order to hide this message sooner, press the rotary knob. The device switches to the test mode start window.
3. To stop the test, select the menu item **Finish** and press the rotary knob to confirm.  
A prompt appears asking if you really want to save the log.
4. If you wish to save the log, confirm the prompt with **Yes**. You can find further information on saving the log in the chapter *Saving a log* (on page 72).  
If you do not wish to save any log, select the **No** button.  
To remain in the test mode window, select the **Cancel** button.
5. Information on turning off the device and taking the testing system out of operation can be found in the chapter *Putting the testing system out of operation* (on page 76).

## 10.2 Saving a log

1. If you have completed the test, select in the bottom menu bar the menu item **Finish** and press the rotary knob to confirm.  
A prompt appears asking if you really want to save the log.
2. Confirm the prompt with **Yes**.
3. If you have enabled the setting **Add ambient temperature to log**, then there appears an ambient temperature prompt.  
Enter the ambient temperature, at which the test has been carried out. This information is inserted into the log.
4. The window for entering a name for the log opens. The device suggests a name composed of date (month, day) and time.
5. If you want to save the log under another name, enter a name.
  - a. In order to navigate between letters, turn the rotary knob.
  - b. In order to confirm selection, press the rotary knob.
6. In order to save the log you have the following options:  
**Save log in the device memory:**
  - a. Select the button **OK** and press the rotary knob to confirm.**Save log on a USB drive:**
  - b. Insert a USB drive in the USB port of frida.
  - c. Select the button **USB** and press the rotary knob to confirm.  
The device switches to the USB drive directory.
  - d. Select a folder in which the log is to be saved.  
In order to create a new folder, select the menu item **Create new folder** and enter a name for the new folder.
  - e. Select the menu item **Save**.  
**Note:** If the test has been carried out on several phases, test results for all phases are saved in a single log.  
The log is saved to the USB drive.
  - f. Acknowledge this save confirmation with **OK**.



### 10.3 Cancelling the test manually

You can cancel the test manually at any time by frida. Proceed as follows:

1. For this purpose, select **Stop** in the bottom menu bar, and press the rotary knob to confirm.

After cancelling the test, the high voltage is reduced and the device is discharged internally. When the discharge process is completed, the device changes to *Ready for operation* operating state. The green indicator light comes on. The device no longer delivers dangerous voltage. The test voltage supply is switched off.



#### **DANGER**

**Dangerous voltage on the test object and other live machine parts.** Danger to life, risk of injury from high electric voltage.

2. Before touching test object, discharge, earth and short-circuit the same: at the connection point and at the far end.  
You may touch the plant parts that were under voltage only if they are visibly earthed and short-circuited.

► For further procedure see chapter *End test or fault location* (on page 71).

### 10.4 Discharging and earthing the test object

On completion of cable sheath testing or measurement the test object still carries a dangerous voltage.



#### **DANGER**

##### **Dangerous voltage in test object.**

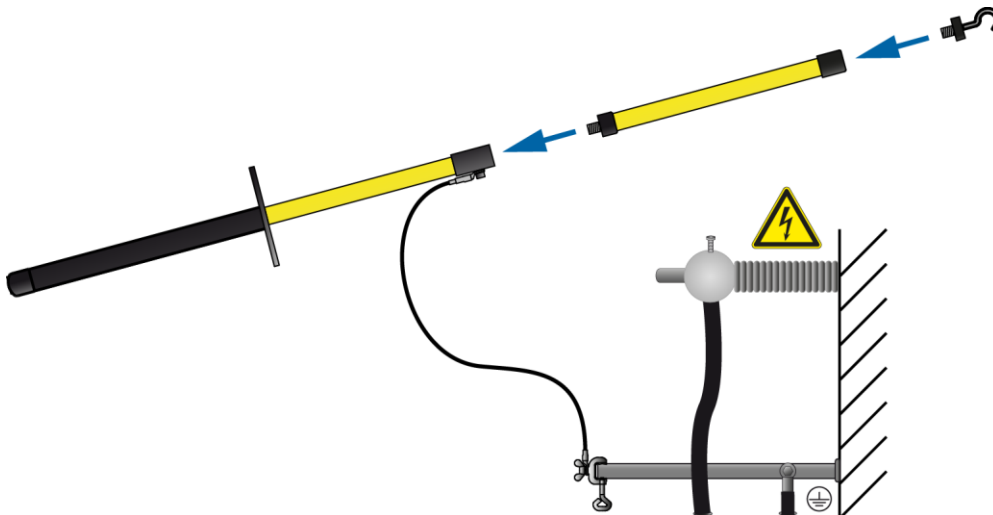
Danger of electric shock or risk of injury

- **Before touching, discharge, earth and short-circuit:** The test object at the connection point and at the far end.
- You may touch the plant parts that were under voltage only if they are visibly earthed and short-circuited.
- Connect the discharge and earth rod correctly to the station earth.
- Only use the discharge and earth rod if its surface is clean and dry.
- Hold the discharge and earth rod only at the handles!
- Observe the minimum discharge period in accordance with the capacitance of the test object.

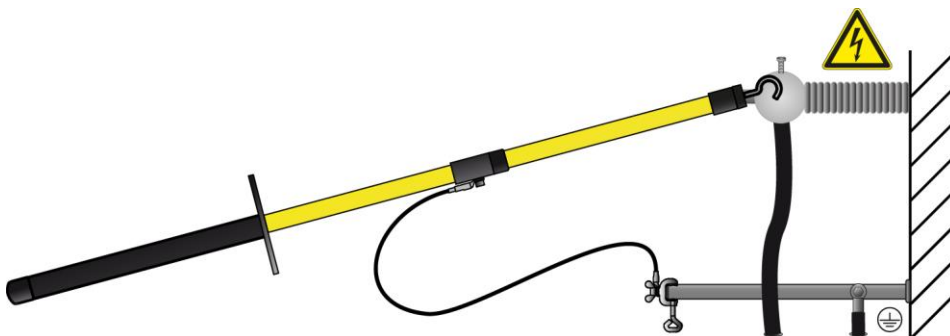
### 10.4.1 Discharging

	<b>⚠ DANGER</b>
	<p><b>Dangerous voltage in test object</b></p> <p>Danger to life or risk of injury due to electric shock or electric arcs.</p> <ul style="list-style-type: none"><li>▶ Use suitable personal protective equipment against electric shocks and arcing faults.</li><li>▶ Keep a distance of at least 50 cm from the protective earthing cable of the discharge and earth rod.</li></ul>

1. If not yet connected, connect the earth cable of the protective earthing cable of the discharge and earth rod to the station earth.
2. Assemble the discharge rod:
  - a. Screw the hook onto the discharge part.
  - b. Screw the discharge part onto the handle.





3. Use the black handle to hold the discharge and earth rod and make contact with the test object by touching it with the tip of the discharge and earth rod.

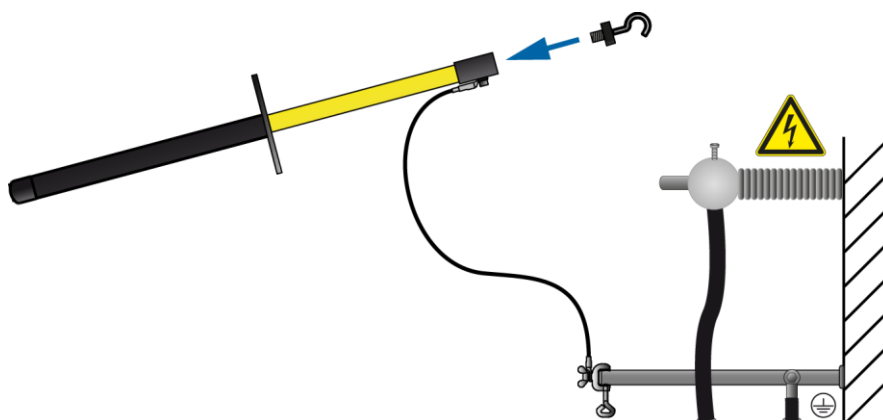


4. Observe the minimum discharge period in accordance with the capacitance of the test object.

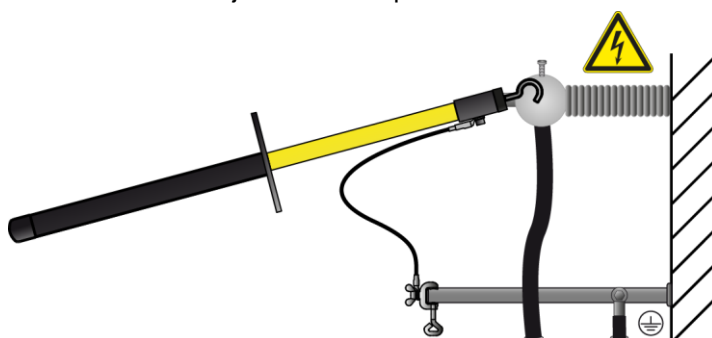
## 10.4.2 Earthing

	<div data-bbox="470 383 1324 465"> <b>DANGER</b></div> <div data-bbox="470 479 1324 698"><p><b>Dangerous voltage in test object</b></p><p>Danger to life or risk of injury due to electric shock or electric arcs.</p><ul style="list-style-type: none"><li>▶ Use suitable personal protective equipment against electric shocks and arcing faults.</li><li>▶ Keep a distance of at least 50 cm from the protective earthing cable of the discharge and earth rod.</li></ul></div>
---	---

1. If not yet connected, connect the earth cable of the protective earthing cable of the discharge and earth rod to the station earth.
2. Assemble the earth rod: Screw the hook into the handle.





3. Contact the test object with the tip of the earth rod.



4. Immediately after earthing, connect the earthing and short-circuit equipment to the test object.

## 10.5 Putting the testing system out of operation

### 10.5.1 Putting the testing system out of operation

	 <b>WARNING</b>
	<p><b>High electrical voltage</b></p> <p>Electric shock on touching live and active parts and due to residual charges if earthing is removed too early</p> <ul style="list-style-type: none"><li>▶ Disconnect the earth connections as the last connection of the test setup.</li><li>▶ Never disconnect the earth connections as long as power and other periphery connections are still connected.</li></ul>
<b>NOTICE!</b>	
<p>Damage to devices due to improper use.</p> <ul style="list-style-type: none"><li>▶ Do not switch off the device under load.</li><li>▶ Before switching off the device, bring it to the <i>Ready for operation</i> operating state.</li></ul>	

1. The main switch is located on the control panel. Switch off the device.
2. To disconnect the device completely from the mains voltage, pull out the mains plug.  
If you are using an external power generator, follow the user manual of the respective power generator.
3. Disconnect the high voltage connection cable.
4. Finally, disconnect the earth cable last.
5. If the cables are dirty, clean them and roll them onto the cable drum.
6. If necessary, remove the cordoning.
7. Remove the earthing and the short-circuit on the test object only if no subsequent work is required and if the test object is to be put back into operation.
8. Remove the barriers and marking of the test area.

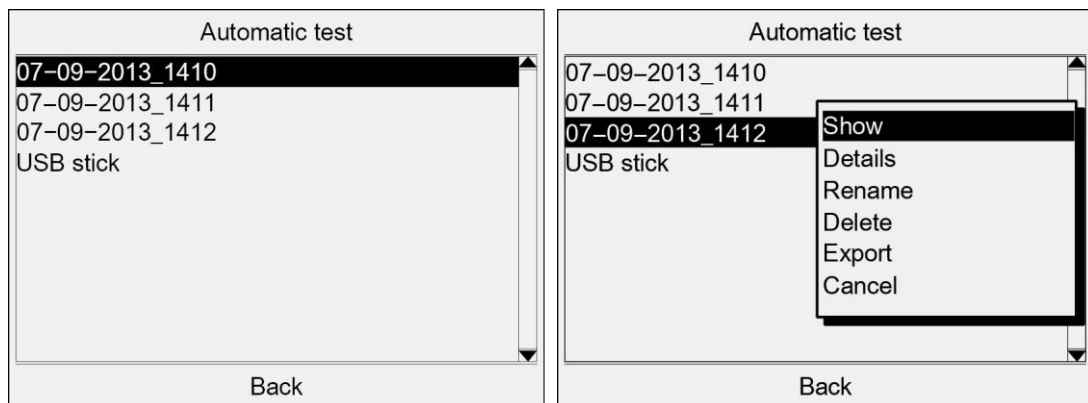
## 11 LOG MANAGEMENT

### 11.1 Displaying a log

- Depending on the test type, select the following menu item and press the rotary knob to confirm:

- Cable test - manual test: **Main menu > VLF Test > Logs > Manual test**
- Cable test - automatic test: **Main menu > VLF Test > Logs > Automatic test**
- Cable sheath fault location: **Main menu > Cable sheath fault location > Logs**

In the menu **Logs** all logs available for the test type selected are shown, e.g.:

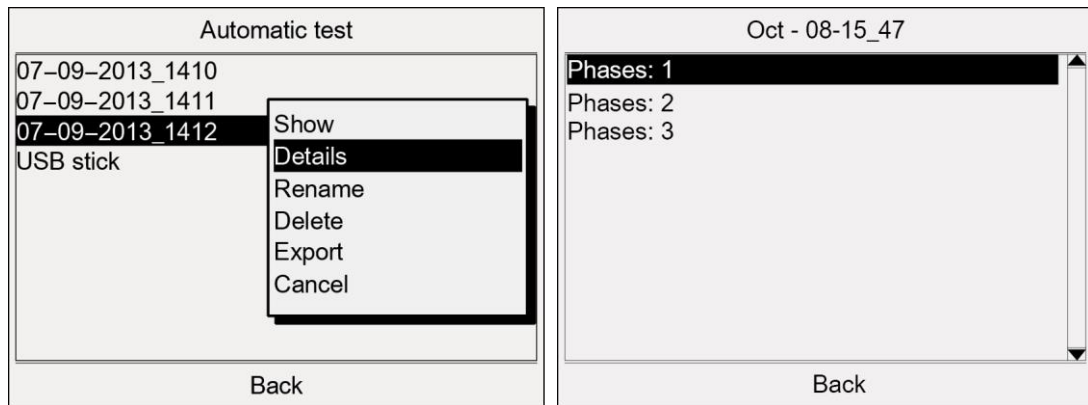


- Select a log and press the rotary knob to confirm.
- In the context menu, select the menu item **Show** and press the rotary knob to confirm.  
The selected log is displayed.
- In order to scroll through the text, turn the rotary knob.
- In order to be able to return to the menu **Logs** select the menu item **Back**.

### 11.2 Showing the test results per phase

During automatic testing you have the option to test up to three phases in one test sequence. In order to display the test results for individual phases, proceed as follows:

- In the main menu, select the menu item **VLF Test > Logs > Automatic test** and press the rotary knob to confirm.  
**Note:** The logs of the manual test and cable sheath fault location contain the test results for just one phase. However, here too, you have the option to display the test results in this view.
- Select a log and press the rotary knob to confirm.
- In the context menu, select the menu item **Details** and press the rotary knob to confirm.  
A listing of the phases tested will be shown.



4. Select a phase and press the rotary knob to confirm.  
The test parameters and test results for this phase are displayed.
5. In order to scroll through the text, turn the rotary knob.
6. In order to be able to return to the menu **Logs** select the menu item **Back**.

### 11.3 Renaming a log

1. Depending on the test type, select the following menu item and press the rotary knob to confirm:
  - Cable test - manual test: **Main menu > VLF Test > Logs > Manual test**
  - Cable test - automatic test: **Main menu > VLF Test > Logs > Automatic test**
  - Cable sheath fault location: **Main menu > Cable sheath fault location > Logs**
 In the menu **Logs** all logs available for the test type selected are shown.
2. Select a log and press the rotary knob to confirm.
3. In the context menu, select the menu item **Rename** and press the rotary knob to confirm.  
A window for entering a name opens.
4. Enter a new name for the log.
5. In order to confirm the entry, select the button **OK** and press the rotary knob to confirm.  
The new name of the log is saved.

### 11.4 Deleting a log

1. Depending on the test type, select the following menu item:
  - Cable test - manual test: **Main menu > VLF Test > Logs > Manual test**
  - Cable test - automatic test: **Main menu > VLF Test > Logs > Automatic test**
  - Cable sheath fault location: **Main menu > Cable sheath fault location > Logs**
 In the menu **Logs** all logs available for the test type selected are shown.
2. Select a log and press the rotary knob to confirm.
3. In the context menu, select the menu item **Delete** and press the rotary knob to confirm.  
A prompt appears, asking if you really want to delete the log.
4. Select the button **OK** and press the rotary knob to confirm.  
The selected log is deleted.

## 11.5 Exporting a log to a USB drive

**Note:** The device supports only USB drives with the FAT32 and FAT16 file system. We recommend using USB drives with the FAT32 file system.

1. Insert a USB drive in the USB port of frida.
2. Depending on the test type, select the following menu item:
  - Cable test - manual test: **Main menu > VLF Test > Logs > Manual test**
  - Cable test - automatic test: **Main menu > VLF Test > Logs > Automatic test**
  - Cable sheath fault location: **Main menu > Cable sheath fault location > Logs**In the menu **Logs** all logs available for the test type selected are shown.
3. Select a log and press the rotary knob to confirm.
4. In the context menu, select the menu item **Export** and press the rotary knob to confirm.  
The window **USB** with the display of the main directory of the USB drive opens.
5. If you wish to save the log to a folder, select a folder or create a new one.  
If you wish to create a new folder,
  - a. select the menu item **Create new folder** and press the rotary knob to confirm.
  - b. Enter a name and confirm this entry with **OK**.
6. In the lower menu bar, select the menu item **Save**.  
The log is saved to the USB drive.
7. Acknowledge this save confirmation with **OK**.  
The device switches to the respective menu **Logs**.

## 11.6 Reading a log from a USB drive

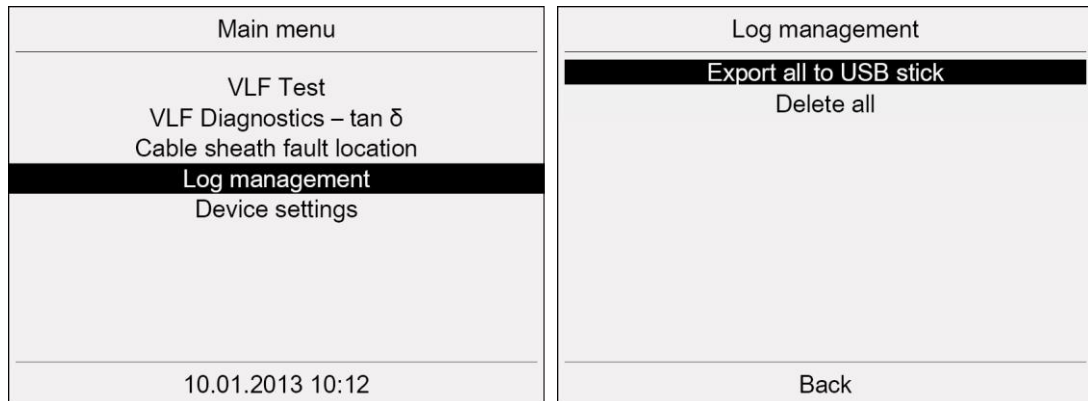
**Note:** The device supports only USB drives with the FAT32 and FAT16 file system. We recommend using USB drives with the FAT32 file system.

1. Insert a USB drive in the USB port of frida.
2. Depending on the test type, select the following menu item and press the rotary knob to confirm:
  - Cable test - manual test: **Main menu > VLF Test > Logs > Manual test**
  - Cable test - automatic test: **Main menu > VLF Test > Logs > Automatic test**
  - Cable sheath fault location: **Main menu > Cable sheath fault location > Logs**
3. Select the menu item **USB stick** and press the rotary knob to confirm.  
The **USB** window with the display of the main directory of the USB drive opens.
4. Select a log and press the rotary knob to confirm.
5. In the context menu, select the menu item **Show** and press the rotary knob to confirm.  
The selected log is displayed.  
**Note:** In order to display the test results per phase, select the following menu item in the context menu **Details**
6. In order to scroll through the text, turn the rotary knob.
7. In order to return to the main directory of the USB drive, select the menu item **Back**.

## 11.7 Exporting all logs to a USB drive

**Note:** The device supports only USB drives with the FAT32 and FAT16 file system. We recommend using USB drives with the FAT32 file system.

1. Insert a USB drive in the USB port of frida.
2. In the main menu, select the menu item **Log management** and press the rotary knob to confirm.

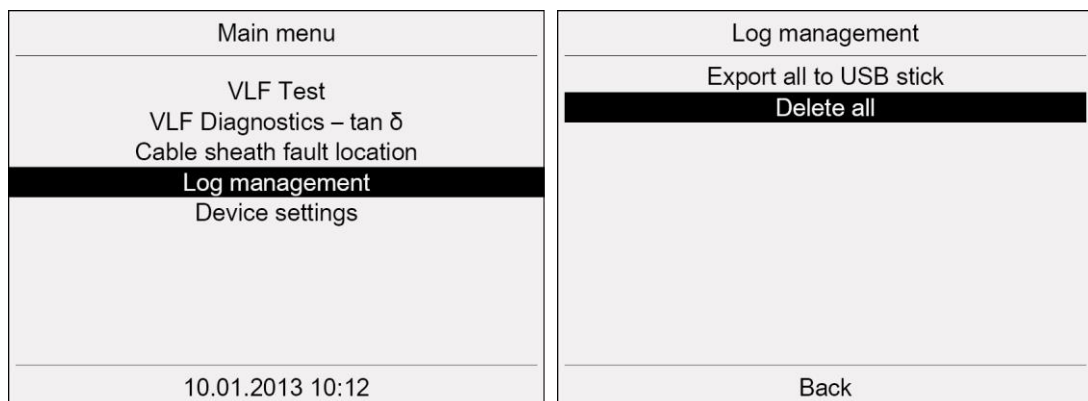


3. Select in the menu **Log management** the menu item **Export all to USB stick** and press the rotary knob to confirm.
4. In the context menu, select which logs you wish to export and press the rotary knob to confirm:
  - **VLF Test**
  - **VLF Diagnostics**

The logs are exported to the USB drive.
5. Acknowledge this save confirmation with **OK**.  
The device switches to the menu **Log management**.

## 11.8 Deleting all logs

1. In the main menu, select the menu item **Log management** and press the rotary knob to confirm.



2. Select in the menu **Log management** the menu item **Delete all** by turning the rotary knob, and then press the rotary knob to confirm.  
A prompt appears, asking if you really want to delete all logs.
3. Select the button **OK** and press the rotary knob to confirm.  
All logs are deleted.



## 11.9 Editing logs with the Diagnostic Reporter

Diagnostic Reporter is an Excel-based application. This application can be used to open, edit and save the exported test and measurement logs in the various formats available in Excel (such as e.g. PDF file, txt file or html file).

### System requirements

Software	Version
Firmware frida	from version 2.0
MS Excel	2007 – 2016

### 11.9.1 Start menu of Diagnostic Reporter

No.	Element	Function
1	<b>Select language</b>	► Select the language for the user interface and the logs. The following languages are available: English, German, French, Italian, Polish, Portuguese, Russian, Spanish, Czech
2	<b>Log</b> area – <b>Reset</b> button	► Click here to close the logs that have been loaded.
3	<b>Log</b> area – <b>Load</b> button	► Click here to load logs.
4	<b>Author</b> input field	► Enter the name of the author.
5	Input fields for company data	► Enter your company details.

No.	Element	Function
6	Buttons for setting the colours for the phase	Click here to define the colours for the representation of individual phases in test or measurement diagrams.
7	<b>Log settings</b> area – <b>Load</b> button	Click to select a logo for the header.

## 11.9.2 Log structure in the Diagnostic Reporter

The log shown is an example only and applies to a MWT measurement. The log structure is the same for all measurement types and VLF tests.

The screenshot displays the MWT measurement log interface. It includes the BAUR logo with the tagline 'ensuring the flow'. The interface is divided into several sections: 'MWT measurement log' (1), 'No Action Required' (2), 'Author' (3) and 'Project Data' (4), 'Cable Data' (5), 'Summary of measurement results' (6), 'Ramp-up' (7), 'Ramp-up curve' (8), 'Ramp-up measurement results' (9), 'Ramp-up threshold values' (10), 'MWT curve' (11), and 'MWT threshold values' (12). The 'Project Data' section includes fields for Log, Company, From Station, To station, and Date. The 'Cable Data' section includes fields for Number of phases, Cable Type, Nominal voltage, Comment, Weather conditions, and Temperature. The 'Summary of measurement results' section includes a table for Phase and Recommendation. The 'Ramp-up' section includes a table for Ramp-up curve. The 'Ramp-up measurement results' section includes a table for Ramp-up measurement results. The 'Ramp-up threshold values' section includes a table for Ramp-up threshold values. The 'MWT curve' section includes a table for MWT curve. The 'MWT threshold values' section includes a table for MWT threshold values.

1 — MWT measurement log

2 — No Action Required

3 — Author M. Tester

4 — Project Data

5 — Cable Data

6 — Summary of measurement results

7 — Ramp-up

8 — Ramp-up curve

9 — Ramp-up measurement results

10 — Ramp-up threshold values

11 — MWT curve

12 — MWT threshold values

No.	Element	Function
1	Log type	
2	Input field for the evaluation summary	<ul style="list-style-type: none"> <li>▶ Enter a summary of the test or measurement results or recommendation on how to proceed further.</li> </ul>
3	<b>Author</b>	In this field, the name is entered which was stated in the spreadsheet <i>Start</i> .
4	<b>Project Data</b> area	<p>This comprises the details on the project such as log name, the company and the cable route. The log name is taken from the measurement file.</p> <ul style="list-style-type: none"> <li>▶ If you wish to change the log name, enter a new name.</li> <li>▶ Enter the company data and the cable route.</li> </ul>
5	<b>Cable Data</b> area	<p>This comprises the details on the cable route. The data are taken from the measurement file.</p> <ul style="list-style-type: none"> <li>▶ If necessary, amend the details.</li> </ul>
6	Summary of the measurement results per phase	This applies to the MWT measurement and the dissipation factor measurement
7	Ramp-up trace	<p>The log shows the curve of the respective measurement or test. The sample log (MWT measurement) shows the ramp-up curve.</p> <p>The test curve is shown in the logs of the VLF test.</p>
8	Measurement results of the ramp-up stage for each phase	<p>This applies to the MWT measurement and the dissipation factor measurement</p> <p>In VLF test logs the measurement results per voltage step and phase are shown.</p>
9	Threshold values for the ramp-up stage	This applies to the MWT measurement and the dissipation factor measurement
10	MWT trace	This only applies to the MWT measurement
11	Threshold values for the MWT phase	This only applies to the MWT measurement

### 11.9.3 Before first use

- ▶ The USB drive supplied contains the *BAUR-DiagnosticReporter.xlsm* file.  
If this file has not yet been saved to your computer, do this now.

### 11.9.4 Opening logs with the Diagnostic Reporter

1. If the logs are located on the USB drive, insert the USB drive.
2. Copy the logs to the local hard disk.
3. Open the *BAUR-DiagnosticReporter.xlsm* file.  
As the file contains a macro, a safety warning will be triggered. This macro is required for the execution of Diagnostic Reporter.
4. In the safety warning line, click on the **Activate content** button.
5. In the **Start** spreadsheet, select the language in which the user interface of Diagnostic Reporter and the log are to be displayed.
6. In order to load a log, click on the **Load** button in the **Log** area.
7. In the **Open** dialog field – bottom right – select which logs are to be displayed:
  - All files
  - All measurement files
  - VLF Test
  - MWT Measurement (frida / frida TD)
  - $\tan \delta$  Measurement (frida / frida TD)
8. Select a file and click on the **Open** menu item.  
The log is opened.  
For editing the log, all Excel functions are available. For some frequently used functions such as **Print**, **Save** or **Save as** the buttons at the end of the log are additionally available.
9. Adapt the log name if necessary.
10. Enter the project data if required: Company data and cable line.
11. If required, add the data of the cable line: number of phases, insulation type, nominal voltage.
12. If required, enter the weather conditions in which the test or measurement took place, e.g. humidity conditions.
13. If you wish to adapt the layout of the log, you will find further information in the chapter *Adapting the log layout* (on page 85).
14. In order to save the log, go to the end of the log and click on the **Save as** button, select the format and the storage location and save the log under a new name.
15. In order to print the log, go to the end of the log and click on the **Print** button.

### 11.9.5 Adapting the log layout

In order to create individual logs, the Diagnostic Reporter provides you with the option to adapt the layout and e.g. to add a logo into the header or to adapt the footer. This layout is taken over for all newly imported logs.

1. Open the *BAUR-DiagnosticReporter.xlsm* file.  
As the file contains a macro, a safety warning will be triggered. This macro is required for the execution of Diagnostic Reporter.
2. In the safety warning line, click on the **Activate content** button.
3. In order to insert the company data into the log, enter the company data in the **Start** spreadsheet in the **Company data** area.
4. In order to enter the name of the author of the log into the log, enter the name in the **Start** spreadsheet in the **Company data** area.
5. In order to add a logo to the header of the log, click on the **Load** button in the **Log settings** area.
6. Select a logo.  
The logo is added.
7. In order to adapt the footer, note the Help from Excel.
8. Save the changes.  
When opening the logs, the new layout is used.

### Setting the chart colours

The log shows the curve of the respective measurement or test. You have the option to define colours for the representation of individual phases.

1. In order to define the colour for a phase, in the **Start** spreadsheet in the **Chart settings** area, click on the button located behind the respective phase.
2. There are two ways to select a colour:

#### Using colour selection

- Select the required colour in the colour selection window.

#### By entering the RGB values

- a. In the window of the colour selection, open the **User-defined** tab.
  - b. Enter the RGB values of the desired colour.
3. Click on the **OK** button.
  4. Save the changes.

When opening the logs, the new layout is saved.

## 12 REMOTE CONTROL VIA BAUR SOFTWARE (WITH PD-TAD)

The USB interface enables the remote control of the device via BAUR software. Remote control is particularly recommended when you are also performing partial discharge diagnostics with PD-TaD (option) on the test object. You can configure and control test sequences on the laptop with the BAUR software. Note that MWT measurements can only be carried out on the device. A remote control of MWT measurements via BAUR Software is not possible.

- ▶ Connect the frida to the laptop on which the BAUR software is installed and activate the remote control on the frida control panel.



Further information: Chapter *Activate remote control* (on page 87)

As the remote control of the device is only possible in the *In operation* operating state, you are prompted to release the high voltage when the remote control is activated.

**Important:** During remote control of the frida, you must continue to perform the following steps **directly on the device**:

- Release the high voltage upon activation of the remote control (device changes to the *In operation* operating state).
- Switch off the high voltage supplies after a test (device changes to the *Ready for operation* operating state)
- Release an emergency off command.

**Important instructions for remote control of frida:**

	 <b>WARNING</b>
	<p><b>High electrical voltage</b></p> <p>Danger to life or risk of injury due to electric shock</p> <ul style="list-style-type: none"> <li>▶ Always maintain visual contact with frida to detect possible dangers on time and to act immediately and appropriately in case of danger.</li> </ul>

- ▶ During remote control, the laptop must be as far as possible away from the frida to minimise interference during signal transmission.
- ▶ The USB cable that connects the frida to the laptop must be routed away from the HV connection cable to minimise interference during signal transmission.
- ▶ Note that protocols of tests and measurements performed via remote control are saved only in the BAUR software.

**Note:** In demo mode, remote control is not possible. If frida is remote controlled, the demo mode is disabled and you are prompted to unlock the emergency off button.

## 12.1 Technical and system requirements

### System requirements



- ▶ Refer to the data sheet for the BAUR software 4 for cable testing and diagnostics

### USB cable

- ▶ Use only the supplied USB cable or a USB cable with a comparable specification to connect the frida to the laptop:

USB cable	
Ports	Type A plug - Type A plug
Length	Max. 3.0 m
Version	USB 3.0
Type	A/m-A/m

## 12.2 Performing the test or measurement with the remote control

### 12.2.1 Configure the test in the BAUR software



- ▶ Before activating the remote control, in BAUR software configure the planned test or measurement.  
Follow the user manual for the BAUR software 4.

### 12.2.2 Activate remote control

1. Connect the frida to the laptop using the USB cable supplied with the device.
2. Switch on the laptop on which the BAUR software is installed.
3. Switch on frida with the main switch.
4. If the menu item **Remote control via BAUR Software** is not displayed in the main menu, you can show it in the **Device settings** menu.  
Further information: Chapter *Settings for remote control via BAUR software* (on page 42)

5. In the main menu, select the menu item **Remote control via BAUR Software** and press the rotary knob to confirm.



6. To activate the remote control, select the menu item **Start** in the **Remote control via BAUR Software** menu.  
To activate the remote control, you must activate the high voltage. The prompt for high voltage activation appears on the display.
7. Hold down the  key for at least one second.  
This puts the device into the operating state *Ready to switch on*. The red indicator light flashes for approx. 6 seconds. The prompt for switching on the high voltage appears on the display: **Press button <High voltage on>**.
8. Press the  key while the red indicator light is flashing.  
This puts the device into the operating state *In operation*. The red pilot lamp is steady. The remote control is activated. A corresponding message appears on the display.

### 12.2.3 Deactivate remote control

- ▶ To deactivate the remote control and to control the frida via the control panel, press **Stop**.


### 12.2.4 Perform test or measurement

1. Place the laptop for remote control as far away from the frida as possible.
2. Route the USB cable away from the HV connection cable.
3. Start the BAUR software on the laptop.  
The Dashboard opens.  
Perform the desired test or measurement. Follow the user manual for the BAUR software
- 4.



### End test or measurement

If you do not wish to perform further measurements or if you want to connect another phase:

1. End the measurement or test in the BAUR software.
2. On the **frida**, press the  **key**.

The device changes to the *Ready for operation* operating state and ceases to supply dangerous voltage. The red indicator light goes out, the green indicator light comes on. The test object is discharged by the device up to a specific residual voltage and reduces the high voltage.



#### **DANGER**

**Dangerous voltage on the test object and other live machine parts.** Danger to life, risk of injury from high electric voltage.

3. Before touching test object, discharge, earth and short-circuit the same: at the connection point and at the far end.  
You may touch the plant parts that were under voltage only if they are visibly earthed and short-circuited.

4. Remove the USB cable from the frida.
5. Use the main switch to switch off the device.

**Important:** If you switch off the device whilst there is a USB connection to the laptop, the device can continue to be supplied with power via the laptop's USB port. In this case a fault message is issued.

### 12.2.5 Troubleshooting

If problems occur during remote control, proceed as follows:

- ▶ Check if frida is switched on and the remote control is activated.
- ▶ Check if the USB cable is connected correctly. If not, connect the USB cable.
- ▶ Check if the USB cable is error-free. If not, replace the USB cable.
- ▶ Check if the USB connection to the device and laptop is intact. If not, rectify the fault on the relevant USB connection.

## 13 ERROR MESSAGES

When an error message appears, proceed as follows:

1. Check the power voltage and connection and earthing cables.
2. If you are prompted to restart the device, restart the device.
3. If the error occurs again after device restart, contact your nearest BAUR representative (<http://www.baur.eu/baur-worldwide>).

Specify the following data:

- Message on display
- Procedure that caused the error.

The following messages may be displayed:

Message on device	Information for reporting
<b><i>Power limit exceeded!</i></b>	At this load the power limit of the generator is exceeded. This message is displayed only for information.
<b><i>Max. capacity exceeded!</i></b>	The load limit of the generator is exceeded. This message is displayed only for information.
<b><i>Voltage rise not possible!</i></b>	Square wave: The voltage cannot be increased according to the defined voltage rise, as the load is too high. <ul style="list-style-type: none"> <li>▸ Reduce the voltage slew rate.</li> </ul>
<b><i>High voltage not released!</i></b>	<ul style="list-style-type: none"> <li>▸ Release the high voltage.</li> </ul>
<b><i>Load cannot be determined!</i></b>	This message is displayed only for information.
<b><i>Attention! Max. temperature exceeded!</i></b>	This message is displayed only for information.
<b><i>Short-circuit on load determination!</i></b>	This message is displayed only for information.
<b><i>Voltage rise not possible!</i></b>	Voltage rise too high for current load. <ul style="list-style-type: none"> <li>▸ Reduce the voltage slew rate.</li> </ul>
<b><i>Internal emergency-stop active!</i></b>	<ul style="list-style-type: none"> <li>▸ Unlock the emergency off button.</li> </ul>
<b><i>External emergency-stop active!</i></b>	<ul style="list-style-type: none"> <li>▸ Unlock the external emergency off unit.</li> </ul>
<b><i>Date was corrected!</i></b>	This message is displayed only for information.
<b><i>Time was corrected!</i></b>	This message is displayed only for information.

## 14 MAINTENANCE AND CARE

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<b>NOTICE</b>
---------------

<b>Damage to device due to improper handling</b>
--

The user is liable for damages caused due to improper maintenance or care.

- ▶ Never take apart the device. This can lead to device damages. Inside the device there are no components that could be serviced or repaired by the user.
- ▶ Maintenance tasks must be carried out only by personnel trained and authorised by BAUR

1. Switch off the device before starting any maintenance tasks.
2. To disconnect the device completely from the supply voltage, pull out the mains plug.

### 14.1 Cleaning

<b>NOTICE</b>
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<b>Damage to the device may be caused by using the wrong cleaning agents</b>
--

- ▶ Do not use any abrasive, corrosive cleaning agents or strong solvents.
- ▶ Ensure material compatibility.
- ▶ Do not clean the product with acetone or thinner.
- ▶ Never clean electrical devices with water.

#### **Cleaning the display**

Clean the displays with a dry or slightly damp lint-free cloth.

#### **Cleaning the device surfaces and connection cable**

1. Clean the device surfaces and connection cable with mild detergent and a lint-free cloth.
2. **NOTICE!** Damage to device due to leaking fluids. Do not allow liquids to leak into devices.

Note that the equipment is splash-proof only in the assembled state.

## 15 TRANSPORTATION AND STORAGE

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### 15.1 Transportation

During transport or if you are sending the frida to BAUR GmbH, a BAUR representative or to the technical service for repairs, observe the following:

- ▶ **NOTICE!** Damage to devices due to improper transport. **Transport frida only in vertical position.**
- ▶ During transport, comply with the ambient conditions specified in the technical data of the product. The technical data is given in the corresponding section of this user manual.
- ▶ Protect frida against strong vibrations.
- ▶ Protect frida against humidity.

### 15.2 Storage

- ▶ Store device only in vertical position.  
Storage temperature: -20 °C to +60 °C
- ▶ Always store device with the cover closed. The rubber seals integrated in the cover protect the user interface from dust.
- ▶ Protect against moisture.
- ▶ Protect against access by unauthorised persons.

## 16 WARRANTY AND AFTER SALES

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### Warranty

For warranty claims, please contact BAUR GmbH or your local BAUR representative (<http://www.baur.eu/baur-worldwide>). Warranty is cancelled in case of misuse.

### After Sales

For questions contact BAUR GmbH or your BAUR representative (<http://www.baur.eu/baur-worldwide>).



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## 17 DISPOSAL

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The final decommissioning and disposal of the device must be carried out in compliance with country-specific laws, regulations and standards.

Device components do not belong in the domestic waste.

- ▶ Dispose of electrical device components in accordance with the applicable national regulations.
- ▶ Dispose of the various device components in an environmentally friendly manner and in accordance with the applicable national regulations.

## 18 STANDARD DELIVERY AND OPTIONS

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### frida standard delivery

- BAUR frida VLF tester, incl.
  - HV connection cable, 5 m (fix mounted)
  - GDR 40-136 discharge and earth rod
  - Earth cable, 5 m, with earth terminal
  - Mains supply cord, 2.5 m
  - Diagnostic Reporter and video tutorial on USB drive
  - User manual
  - Pocket guide

### Options

- PD-TaD 62 portable PD diagnostics system
- GDR 40-136 discharge and earth rod
- External emergency off unit with signal lamps, 25 m or 50 m cable length

### frida TD standard delivery

- BAUR frida TD VLF tester and diagnostics device, incl.
  - HV connection cable, 5 m (fix mounted)
  - BAUR tan delta kit
  - GDR 40-136 discharge and earth rod
  - Earth cable, 5 m, with earth terminal
  - Mains supply cord, 2.5 m
  - Diagnostic Reporter and video tutorial on USB drive
  - User manual
  - Pocket guide

### Options

- VSE connection set (for the detection and compensation of leakage currents)
- PD-TaD 62 portable PD diagnostics system
- GDR 40-136 discharge and earth rod
- External emergency off unit with signal lamps, 25 m or 50 m cable length

## 19 DECLARATION OF CONFORMITY

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We



BAUR GmbH  
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declare, under our sole responsibility, that the BAUR product

**BAUR VLF tester and diagnostics device frida (VLF 24)**

to which this declaration refers, conforms to the following standards or standard documents:

- Low Voltage Directive 2014/35/EC  
EN 61010-1:2010  
EN 61010-2-030:2010  
EN 50191:2010
- EMC Directive 2014/30/EU  
EN 55011:2009 + A1:2010  
EN 61000-4-2:2009  
EN 61000-4-4:2012  
EN 61000-4-5:2014  
EN 61000-4-11:2004
- Environmental testing  
EN 60068-2-ff

Signed:                      Torsten Berth, Technical Director  
                                    Dr. Eberhard Paulus, Director QM/QS

Sulz, 30/11/2015

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