User Manual

frida

Portable VLF High Voltage Testing Device

truesinus®
digital technology

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Symbols in this user manual

To find the important information quickly the appropriate passages of text are marked with symbols (any symbols not listed here are self-explanatory).

Additional and special information (literature etc.) on the relevant subject are available from BAUR.

Important information about the device!
You must read it!

This text contains important information

Copyright

We reserve the right in the interests of our customers to make amendments as a result of further technical development. Illustrations, descriptions and scope of supply are therefore not binding.
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Preface

This manual contains all the necessary information about the correct use of the described devices. Please read this manual carefully before you use the devices.

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or contact your nearest BAUR representative.

Safety advice

The system has been manufactured to the current state of technology and is safe to operate. The individual parts and the finished devices are continuously tested within the scope of our quality assurance measures by our qualified personnel.. Every device is fully tested before delivery. Every person who deals with the connection, bringing into use, operation or maintenance of the product must have read and understood the complete user manual. The operating company must therefore ensure that only authorised persons work with the system. The operating person is obliged to report immediately any changes occurring in the device that detrimentally affect safety.

Proper use

frida is used to test high voltage cables and rotating machines. Any other use or use exceeding the above shall be considered improper use. The manufacturer will not be liable for the resulting damages. The risk is carried solely by the user. In every case the local safety and accident prevention legislation shall apply to the operation of the system.

Warranty

We are obliged - on the written request of the purchaser - as quickly as possible to make good or replace, as decided by us, all parts that can be shown to have become defective or unusable as a result of poor materials, defective design or faulty construction. We will bear only the cost of the repair and the parts replaced. Transport to us and back to you, packaging and insurance shall be at the cost of the purchaser. The **period of warranty is 12 months** from the date of delivery. We accept no liability for damage arising from normal wear, improper handling or non-observance of the instructions for use or safety advice! We refuse to accept any liability if the purchaser himself or a third party carries out repairs or modifications to the device! Transport damage and wear parts e.g. fuses are not covered by the warranty!

In addition we refer you to the "**General Conditions of Sale and Supply**" of:

BAUR Prüf- und Messtechnik GmbH,
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1 Use

The ***frida*** high voltage test generator is used for the testing of medium voltage cables with extruded insulation in accordance with VDE DIN 0276-620 (CENELEC HD 620) and IEEE P400.2, for impregnated paper insulation in accordance with VDE DIN 0276-621 (CENELEC HD 621) and IEEE Std 400-2001 and other high voltage insulation up to 23 kV_{rms}. VLF (very low frequency) testing allows insulation damage to be detected in the shortest possible testing time and does not detrimentally affect the quality of the insulation material. Furthermore with ***frida*** you can carry out DC testing up to +/-30 kV. The device also allows a square wave voltage of +/- 30 kV with an adjustable slew rate to be created. The frequency of the created alternating voltage can be varied within the range 0.01 Hz to 0.1 Hz to extend the load range, either manually or automatically. The device also has a preset mode for cable sheath fault testing and location.

1.1 Cable testing

The use of oiled paper and mass impregnated cables in energy transmission by plastic cables has required changes in cable testing procedures. The DC test procedure used successfully for decades for paper-insulated mass impregnated cables proved unsuitable for the testing of plastic cables. On the one hand serious faults were seldom detected whilst on the other hand the use of DC tests led to the build-up of long-lasting space charges. These space charges can lead to the insulation strength being exceeded locally when the operating AC voltage is applied and to the formation of electrical trees. The insulation is irreversibly damaged by this and complete breakdown is only a matter of time. Something that countless failures of plastic insulated cables after successful DC testing confirm. For this reason the industry has been searching for several years for a new way of testing plastic cables. Testing at very low frequency (VLF), which is also suitable for mass cables, has replaced DC testing in practice. In terms of official standards, the 0.1 Hz high voltage test has been accepted as an alternative testing technique to DC testing in the European harmonisation document CENELEC HD 620 S1 for plastic-insulated and in HD 621 S1 for oiled and mass impregnated cables.

Recommended tests after cable installation, if required

	Tests		Requirements	Test procedure
1	Voltage test on the insulation [1) 2)]			
1.1	Test AC voltage 45 to 65 Hz			
	- Testing level (effective value)	2 U_o		
	- Duration of test	60 min	No breakdown	
	Alternative:			
1.2	Test AC voltage 0.1 Hz			
	- Testing level (effective value)	3 U_o		
	- Duration of test	60 min	No breakdown	
2	Test for intactness of the plastic outer sheath on installed cables		It is recommended not to exceed a voltage of 3 kV or 5 kV respectively when using DC voltage for PVC or PE sheaths. The information on any damage to a cable sheath normally appears within one minute.	

1) The test levels and durations are given as preferred values and have been determined based on the currently available experience of labour and networks.
2) If the cable ends in a transformer or in sealed switchgear then this test requires the customer to obtain the agreement of the manufacturer of the transformer or the switchgear.

1.2 Cable sheath testing

Cable sheath testing is carried out in order to detect damage to cable sheaths. To do this a DC test is carried out in accordance with the applicable standard (see table above).

1.3 Cable sheath fault location

frida can be used in combination with a step voltage meter (e.g. UL) to pin-point the location of cable sheath faults. To do this a cyclical voltage is applied in accordance with the diagram below. The damage to the cable sheath can then be pin-pointed with the step voltage meter.

2 Features

An important advantage of the device is its portability, especially when used on site. The compact design means that the device can also be carried within the site. Testing in bad weather is not problem as the equipment is completely protected against splash water. A graphics display with a menu for all control functions ensures ease and simplicity of operation. User-defined test sequences (e.g. incremental voltage testing) can be defined in order to set up an automatic test procedure. All test records can be read out and printed from the USB memory stick.

- Fully automatic test procedure in accordance with VDE DIN 0276-620, IEEE P400.2, VDE DIN 0276-621 and IEEE 400-2001
- Input power only 350 W
- Short-circuit proof
- Timer function with automatic switch-off device
- Easy transportable
- Menu-guided in different languages

Safety equipment

- Constructed in accordance with VDE DIN 0104, EN 50191
- Switch-on interlock for high voltage, zero interlock
- Emergency-off switch
- Status display of all important safety functions

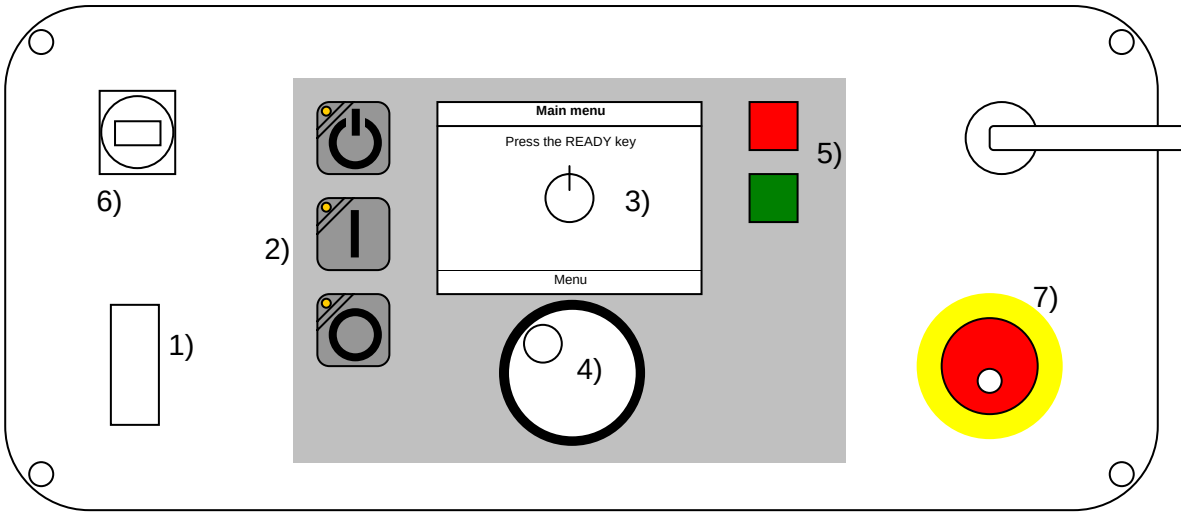
Operating modes

Automatic test procedures and manual tests:

- VLF test at 0.1 Hz
- VLF test with automatic frequency selection
- DC voltage test
- Square-wave voltage test
- Square-wave voltage test with automatic frequency selection
- Cable sheath fault location

3 Operating controls

3.1 High voltage operating control unit



1)	Main switch	For switching ***frida*** on and off
2)	HV keys	High voltage (HV) ready / on / off
3)	Display	Displays of menus and readings
4)	Rotary knob	Navigation and confirm button (press)
5)	Status indicator high voltage	Attention – red light = HV on
6)	USB socket	Data exchange by USB memory stick
7)	Emergency – off	Switches off the high voltage

3.2 Connection panel right side

1) Network connection
2) Ground line

3.3 Connection panel left side

1) External emergency-off plug/socket

3.4 Menu navigation

Selecting the fields in the toolbar:
Turn the rotary knob to move the selection highlighting over the fields. To select press the rotary knob.

3.5 Voltage and current display

Different values are used for display and input depending on the selected voltage shape:

	Sinus	DC	Square	Sheath fault location
Voltage - set	Effective	Transient	Peak	Peak
Voltage - display	Effective	Transient	Peak	Transient
Current - display	Effective	Transient	Leakage	Transient

4 Bringing into use

4.1 Important basic rules

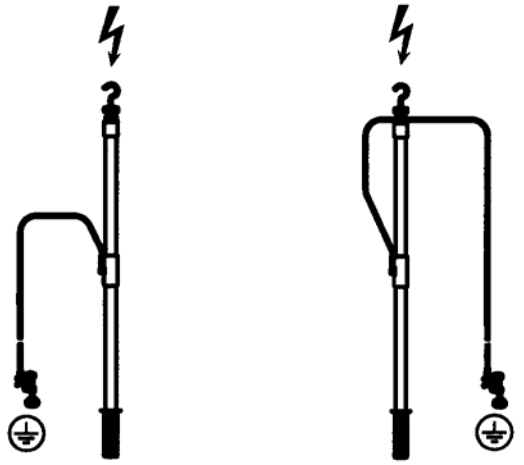
frida is used to test disconnected lengths of cable. Before connecting the device to the cable length to be tested you must therefore ensure that the cable is disconnected and deenergised. Observe the statutory and operational safety regulations!

Never operate the device in a potentially explosive atmosphere.

Before every contact with the object to be tested it must be discharged and earthed by means of a discharge/earth rod. It must remain earthed whilst you are working on the object.

4.2 Discharge and earth rod

The protective ground cable of the discharge and earth rod must be connected to the station ground. The discharge resistance of the combined discharge and earth rod can be short-circuited to earth the object under test:



Discharge rod Earth rod

The object under test is discharged by the ***frida*** VLF generator after proper completion of a test. Before any contact with the object under test it must be earthed. There may still be voltage at the object under test after a breakdown in the cable or after an interruption in measurement (e.g. by pressing the emergency-off button) and therefore it must first be completely discharged and then earthed before any contact is made.

For proper discharge and/or earthing, the protective ground cable of the rod must be solidly connected to the station ground or protective ground. Touch the rod only by its handle when discharging and/or earthing the rod. The minimum discharge time stipulated on the discharge rod must be observed when discharging it.

4.3 Preparing the device for cable testing

Preparing the cable

Disconnect the object under test on all contacts, secure against it being switched on again and check that it is deenergised. Isolate adjacent live parts. It must be ensured that when high voltage is applied there can be no arcing or breakdown to the adjacent parts of the station or the cabling. In the case of multi-wire objects under test, all wires, except for the ones being tested, must be connected to the station ground. Clean the terminals if necessary.

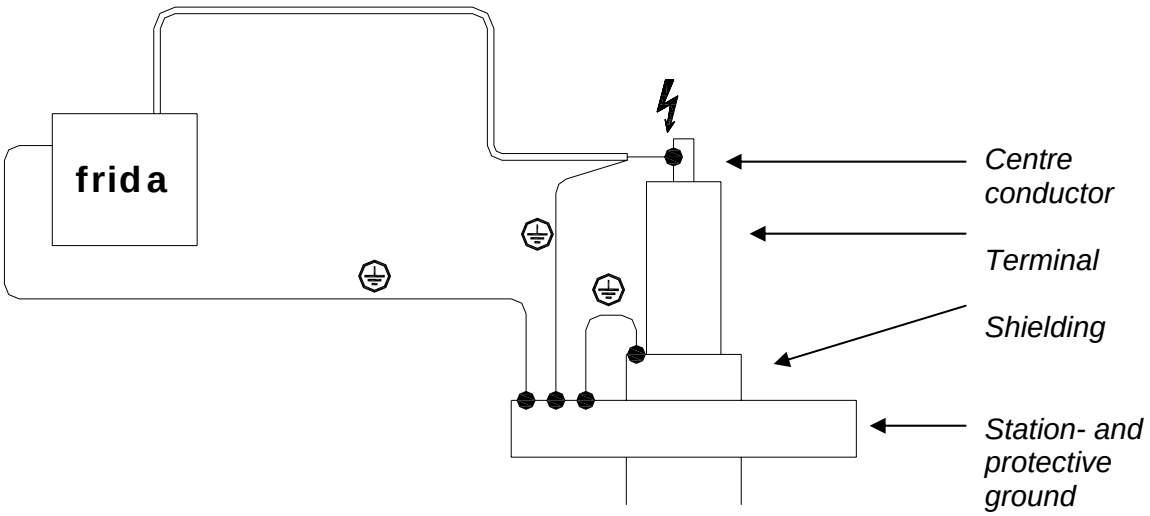
Connecting the protective ground cable

Connect ***frida*** with the supplied protective ground cable (yellow-green) at the protective ground connector (connection panel) to the station protective ground. A screw terminal is provided on the protective ground cable for this.

Connecting the high voltage feed cable

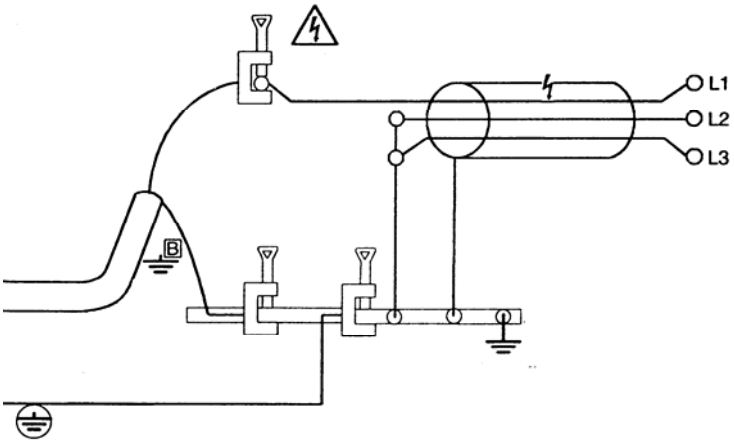
Connect the shielding connector of the high voltage feed cable to the earthed sheath of the cable under test. Connect the high voltage connector with the centre conductor of the cable under test. A crocodile clip is attached to the high voltage feed cable for this.

Please observe the advice about discharging and earthing and the general safety regulations.

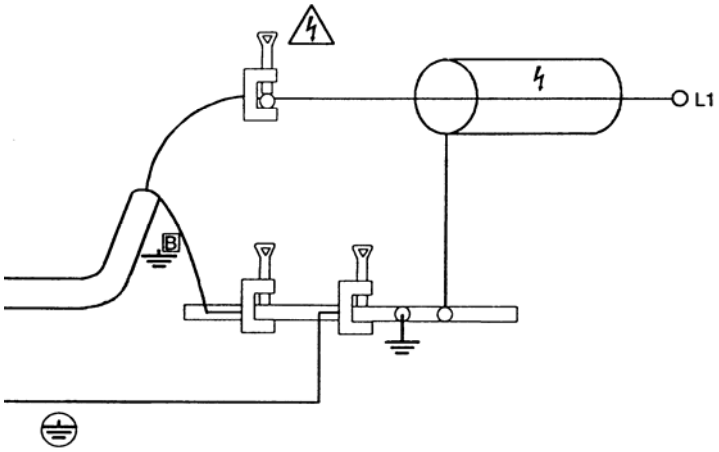


Connecting to various cable types

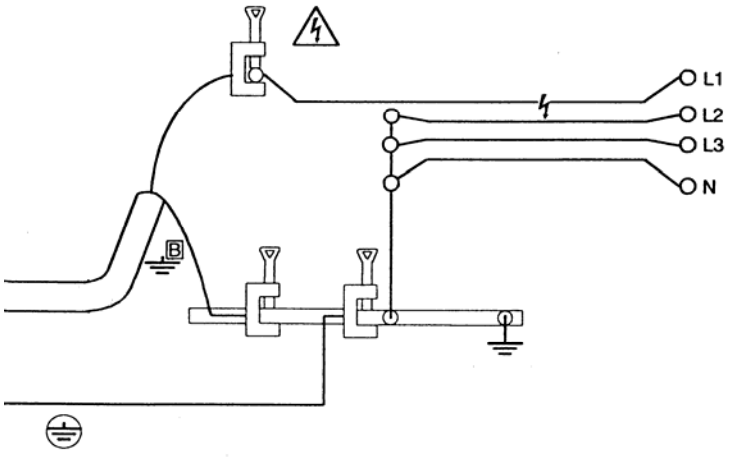
Connecting to a 3-phase shielded cable



Connecting to a 1-phase shielded cable



Connecting to a 3-phase unshielded cable



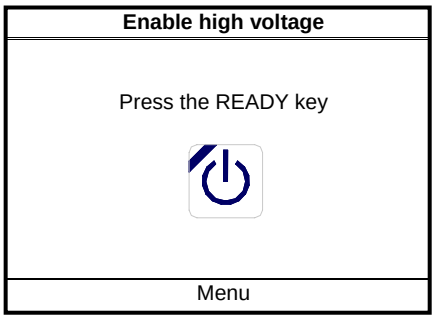
4.4 Switching high voltage on and off

High voltage may be switched on and off on the ***frida*** testing device using the three keys to the left of the display. The yellow background illumination indicates which key needs to be pressed for the next step. A flashing or illuminated HV light indicates the system status.

High voltage can also be enabled later, but no later than the start of a test. High voltage is not necessary for making the system settings or for entering test procedures.

Ready for operation

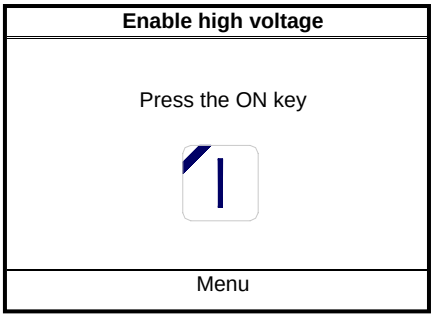
Switching on the main switch places the device in the "**Ready for operation**" state. This state is indicated by the illumination of the green light.



Press the yellow-highlighted key for a minimum of 1 second.

High voltage ready to switch on

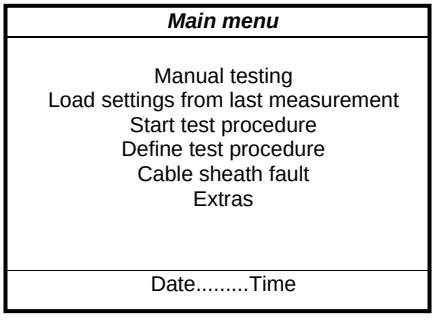
Displayed by a red flashing warning light (6 seconds)



To set the device **"In operation"** the key must be pressed within the period that the light is flashing. If the key is not pressed within this time the device reverts to the **"Ready for operation"** state.

In operation

Operation is indicated by the red illuminated warning light.



On switching on, ***frida*** displays main menu.

Attention! In the **Operation** state it must be assumed that high voltage is present at the output!

Switching off

After completing the cable testing:

- Press this key.
- This key activates the discharge device, which discharges the cable and the internal capacitor through resistances. The device is once more in the **“Ready for operation”** state

For safety reasons the high voltage connection must be earthed before making any contact. (The BAUR discharge and earth rod is used for this)

Emergency – off

After activating the emergency-off switch frida returns to the “Ready for operation” state. The emergency-off message must be cancelled.

4.5 Load determination

Before the start of a measurement ***frida*** determines the size of the applied load. This information is required to achieve the best match of the device’s regulation system to the object under test. Load determination restarts every time high voltage is switched on (“In operation”) and is retained until high voltage is switched off again (“Ready for operation”).

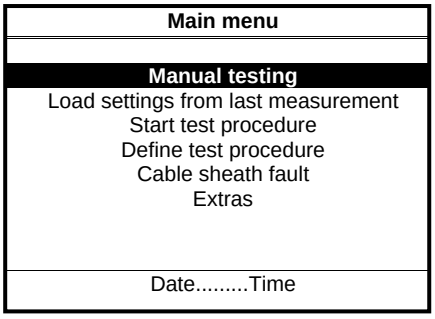
Load determination is running! X

A message appears on the monitor during load determination. Load determination takes between 10 and 20 seconds per load.

Attention! High voltage is present at the output!

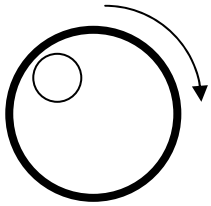
4.6 Using the menu

After connection to the network and bringing into use ***frida*** displays the main menu. All applications can be selected from the main menu.

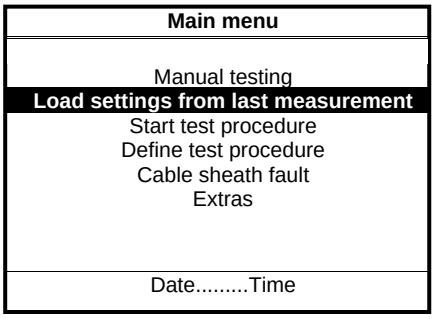


From the main menu you can select different test methods, define test procedures or make device settings.

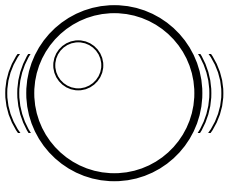
Turning the rotary knob allows you to choose between the various menu points



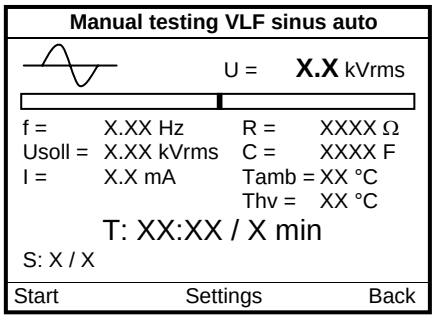
Turn the knob clockwise



And the selection highlight moves downwards



Press the knob to confirm your selection.



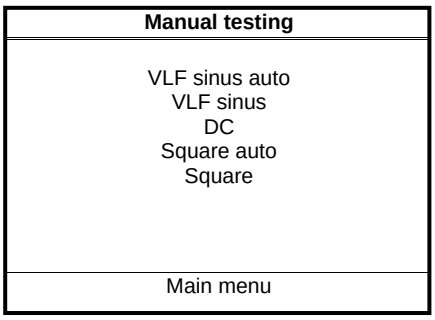
The corresponding menu appears.[1]

The bottom line of the monitor offers further options to move within the frida menu system:

“Back”	Back to previous menu point
“Main menu”	Back to the main menu
“Settings”	Opens the menu with parameters
“Next”	Forward to the next menu point

[1] If high voltage has not been enabled, a prompt appears indicating that this still remains to be done.

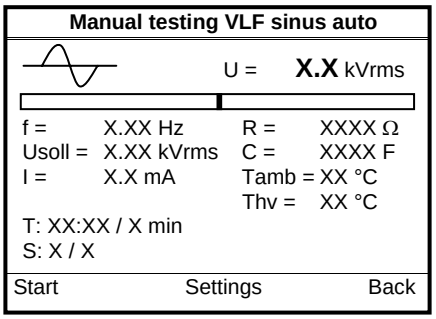
5 Manual testing



You can access the menu “Manual test“ from the main menu. Here you can select from the various voltage shapes generated by ***frida***

“Main menu” Back to the main menu

5.1 VLF sinus auto



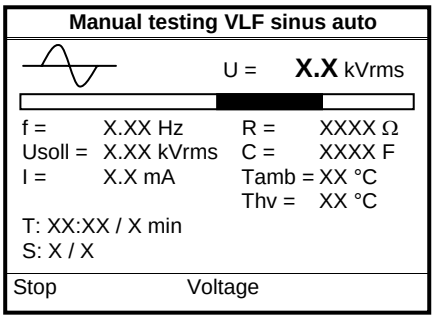
In the **VLF sinus auto** mode the device selects the frequency to match the applied load.

“Start“ starts the measurement.

“Back” Back to previous menu point

“Settings” Opens the settings dialogue.

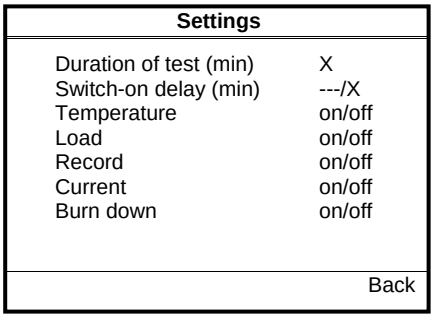
Attention! High voltage is present at the output!



To end the test select “Stop“.

In manual mode the generator always starts with a set voltage of 1kV. Voltage input is activated by the menu point “Voltage”.

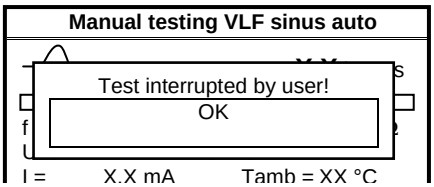
The set voltage can be altered by moving cursor to the value for “Usoll“ with the rotary knob and selecting it by pressing the knob. Now you can alter the value.



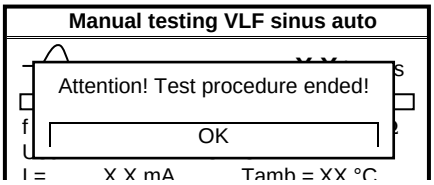
In the “Settings“ menu you can change various settings for the test methods.

Duration of test:	In manual mode the test ends after the set period
Switch-on delay:	The test begins only after the expiry of the period set here.
Temperature:	Display on/off
Load:	Display on/off
Record:	Record function on/off
Current:	Display on/off
Burn down:	Burn down mode on/off

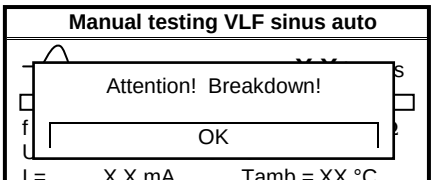
Possible results



If the test is ended with “Stop“, a message appears which can be confirmed by pressing the rotary knob.



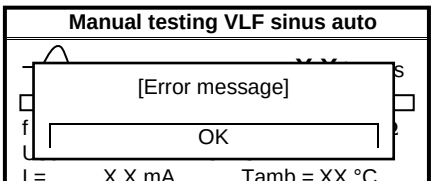
After expiry of the set test duration the generator stops automatically. The device found no breakdown.



The device found a breakdown.

If burn down is activated the generator automatically switches into burn down mode.

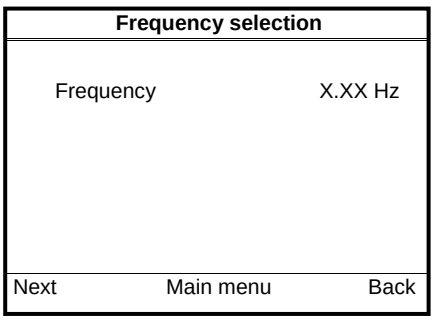
If burn down is not activated the generator switches off.



An error has occurred during the test.

- (⇒ “9.2 Error messages”)

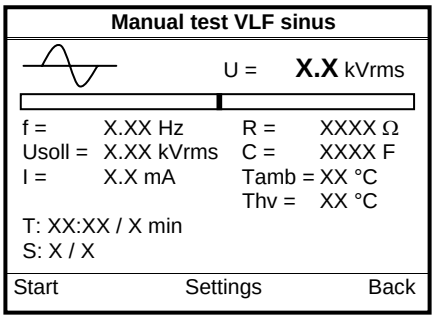
5.2 VLF sinus



In **VLF Sinus** mode the frequency can be set by the user.

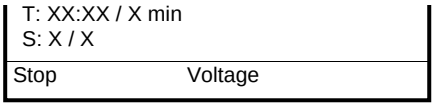
To do this move the cursor to the value for the frequency using the rotary knob and press the knob to select. Now you can alter the value. A further press on the rotary knob confirms your input.

“Next”	Forward to the next menu point
“Back”	Back to previous menu point
“Main menu”	Back to the main menu



“Start“ starts the measurement.

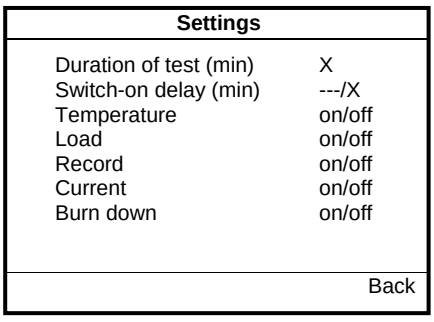
“Back”	Back to previous menu point
“Settings”	Opens the settings dialogue.



Attention! High voltage is present at the output!

To end the test select “Stop“.

“Voltage” activates voltage input.



In the “Settings“ menu you can change various settings for the test methods.

Duration of test:	In manual mode the test ends after the set period
Switch-on delay:	The test begins only after the expiry of the period set here.
Temperature:	Display on/off
Load:	Display on/off
Record:	Record function on/off
Current:	Display on/off
Burn down:	Burn down mode on/off

5.3 DC

DC selection	
DC DC+ DC-	
Main menu	Back

There are various options for DC mode. They differ only in the possible polarities of the voltage.

“DC+“ allows only positive voltages,
“DC-“ allows only negative voltages,
“DC“ has no limitations on polarity

“Back”	Back to previous menu point
“Main menu”	Back to the main menu

Manual test DC			
DC		U =	**X.X** kV
f =	X.XX Hz	R =	XXXX Ω
Usoll =	X.XX kV	C =	XXXX F
I =	X.X mA	Tamb =	XX °C
		Thv =	XX °C
T: XX:XX / X min			
S: X / X			
Start	Settings		Back

“Start“ starts the measurement.

“Back”	Back to previous menu point
“Settings”	Opens the settings dialogue.

Attention! High voltage is present at the output!

T: XX:XX / X min		
S: X / X		
Stop	Voltage	

To end the test select “Stop“.

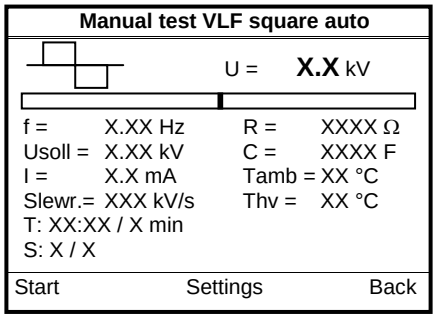
“Voltage” activates voltage input.

Settings	
Duration of test (min)	X
Switch-on delay (min)	---/X
Temperature	on/off
Load	on/off
Record	on/off
Current	on/off
Burn down	on/off
	Back

In the “Settings“ menu you can change various settings for the test methods.

Duration of test:	In manual mode the test ends after the set period
Switch-on delay:	The test begins only after the expiry of the period set here.
Temperature:	Display on/off
Load:	Display on/off
Record:	Record function on/off
Current:	Display on/off
Burn down:	Burn down mode on/off

5.4 Square auto



In the **VLF square auto** mode the device selects the slew rate to match the applied load.

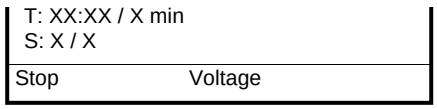
“Start“ starts the measurement.

“Back” Back to previous menu point

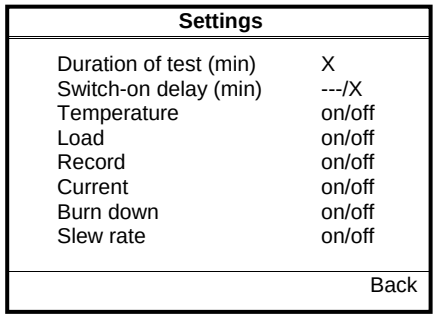
“Settings” Opens the settings dialogue.

Attention! High voltage is present at the output!

To end the test select “Stop“.



“Voltage” activates voltage input.



In the “Settings“ menu you can change various settings for the test methods.

Duration of test:	In manual mode the test ends after the set period
Switch-on delay:	The test begins only after the expiry of the period set here.
Temperature:	Display on/off
Load:	Display on/off
Record:	Record function on/off
Current:	Display on/off
Burn down:	Burn down mode on/off
Slew rate:	Display on/off

5.5 Square

Select frequency	
Frequency	X.XX Hz
Slew rate:	X kV/s
Next	Main menu Back

In **VLF square** mode the frequency and the slew rate can be set by the user.

To do this move the cursor to the value for the frequency or slew rate using the rotary knob and press the knob to select. Now you can alter the value. A further press on the rotary knob confirms your input.

“Next”	Forward to the next menu point
“Back”	Back to previous menu point
“Main menu”	Back to the main menu

Manual test VLF square			
		U =	**X.X** kV
f =	X.XX Hz	R =	XXXX Ω
Usoll =	X.XX kV	C =	XXXX F
I =	X.X mA	Tamb =	XX °C
Slewr.=	XXX kV/s	Thv =	XX °C
T: XX:XX / X min			
S: X / X			
Start	Settings		Back

“Start“ starts the measurement.

“Back”	Back to previous menu point
“Settings”	Opens the settings dialogue.

Attention! High voltage is present at the output!

T: XX:XX / X min	
S: X / X	
Stop	Voltage

To end the test select “Stop“.

“Voltage” activates voltage input.

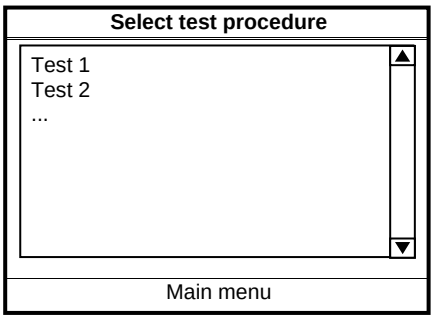
Settings	
Duration of test (min)	X
Switch-on delay (min)	---/X
Temperature	on/off
Load	on/off
Record	on/off
Current	on/off
Burn down	on/off
Slew rate	on/off
	Back

In the “Settings“ menu you can change various settings for the test methods.

Duration of test:	In manual mode the test ends after the set period
Switch-on delay:	The test begins only after the expiry of the period set here.
Temperature:	Display on/off
Load:	Display on/off
Record:	Record function on/off
Current:	Display on/off
Burn down:	Burn down mode on/off
Slew rate:	Display on/off

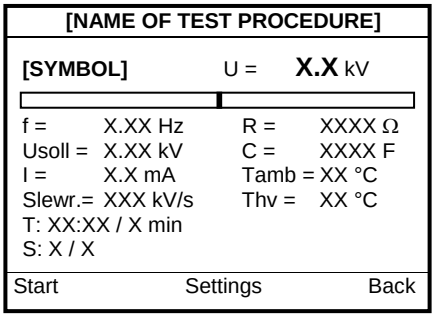
6 Automatic test procedures

6.1 Starting a test procedure



In the “Select test procedure“ menu you can select from the defined test procedures using the rotary knob. Pressing the knob confirms your input.

“Main menu” Back to the main menu

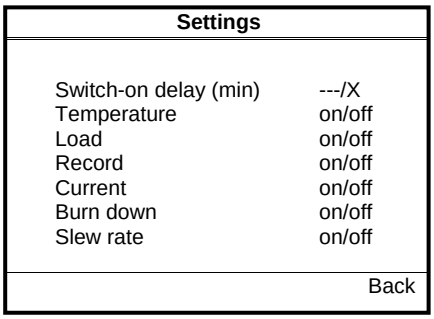


The device displays the screen for the selected test procedure. The arrangement on the screen corresponds to that for the manual mode. In addition the current step and the number of steps is displayed.

“Start“ starts the measurement.

“Back” Back to previous menu point

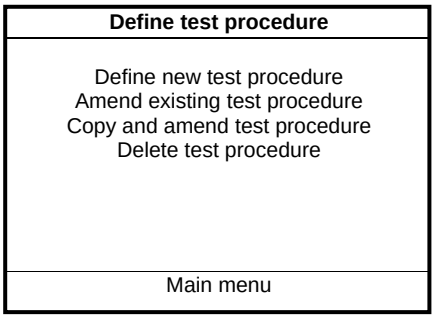
Attention! High voltage is present at the output!



In the “Settings“ menu you can change various settings for the test methods.

Switch-on delay:	The test begins only after the expiry of the period set here.
Temperature:	Display on/off
Load:	Display on/off
Record:	Record function on/off
Current:	Display on/off
Burn down:	Burn down mode on/off
Slew rate[2]:	Display on/off

6.2 Defining a test procedure

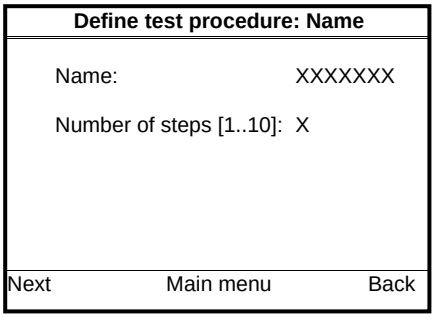


There are various ways to define a test procedure.

“Main menu” Back to the main menu

[2] The slew rate is only active in the square voltage shape.

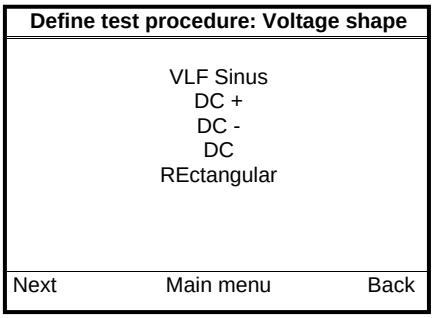
6.2.1 Defining a new test procedure



First enter the name and number of voltage steps for the new test procedure.

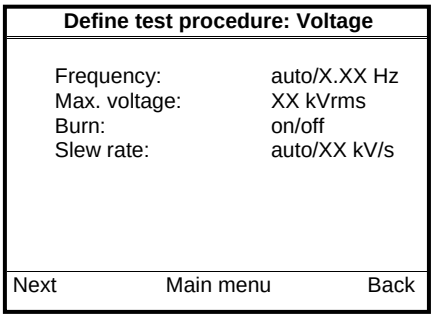
To do this move the cursor to the value for the name or number of steps using the rotary knob and press the knob to select. Now you can alter the value. A further press on the rotary knob confirms your input.

“Next”	Forward to the next menu point
“Main menu”	Back to the main menu
“Back”	Back to previous menu point



Use the rotary knob to select the voltage shape. The next screen is called up automatically.

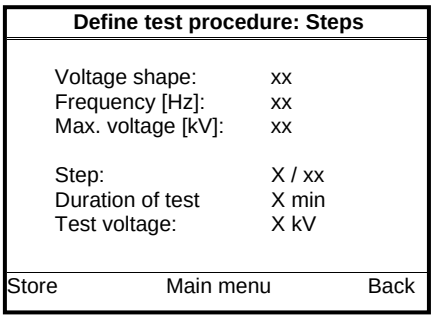
“Next”	Forward to the next menu point
“Main menu”	Back to the main menu
“Back”	Back to previous menu point



Move the cursor to the appropriate field using the rotary knob and press the knob to select. Now you can alter the value. A further press on the rotary knob confirms your input.

“Next”	Forward to the next menu point
“Main menu”	Back to the main menu
“Back”	Back to previous menu point

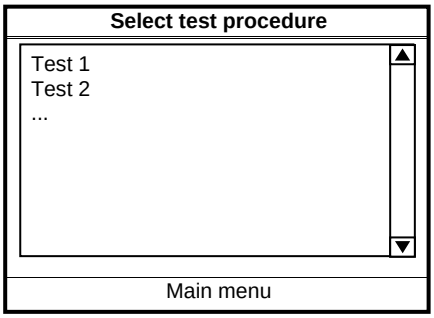
Note:
Some of the parameters for the various voltage shapes are hidden!



Move the cursor to the appropriate field using the rotary knob and press the knob to select. Now you can alter the value. A further press on the rotary knob confirms your input.

“Store”	Stores the test procedure
“Main menu”	Back to the main menu
“Back”	Back to previous menu point

6.2.2 Amending existing test procedures

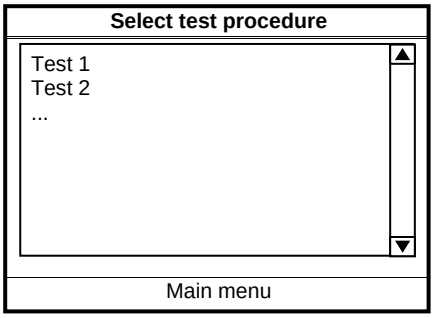


In the “Select test procedure“ menu you can select a defined test procedure using the rotary knob. Pressing the knob confirms your input.

The following step corresponds with that for defining a new test procedure (⇒ 6.2.1 Defining a new test procedure). The initial settings correspond with those for the stored test procedure.

“Main menu” Back to the main menu

6.2.3 Copying and amending a test procedure

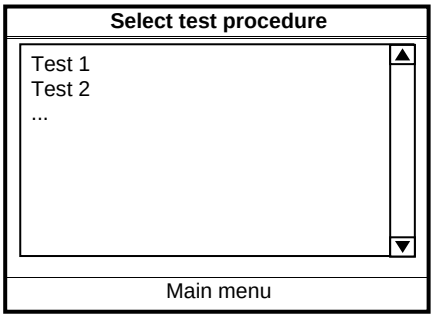


In the “Select test procedure” menu you can select a defined test procedure using the rotary knob. Pressing the knob confirms your input.

The following step corresponds with that for defining a new test procedure (⇒ 6.2.1 Defining a new test procedure). The initial settings are copied from the existing test procedure and a name suggested. This can be changed to suit the user.

“Main menu” Back to the main menu

6.2.4 Deleting a test procedure



In the “Select test procedure“ menu you can select an existing test procedure using the rotary knob. Pressing the knob confirms your input.

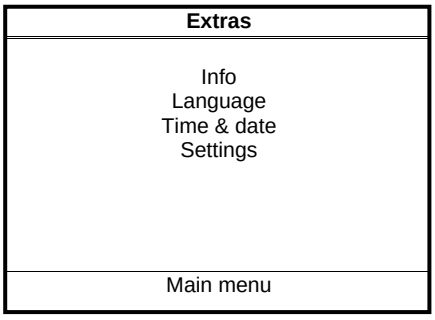
The message appears:

“Attention! Deleting a test procedure?”

To delete a test procedure this prompt must be confirmed with “OK“.

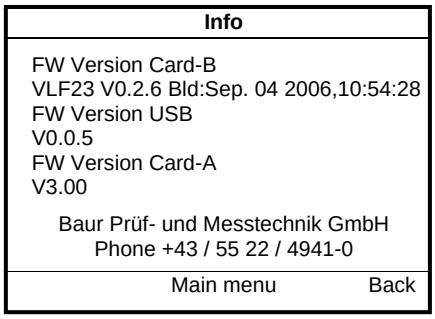
“Main menu” Back to the main menu

7 Extras - device settings



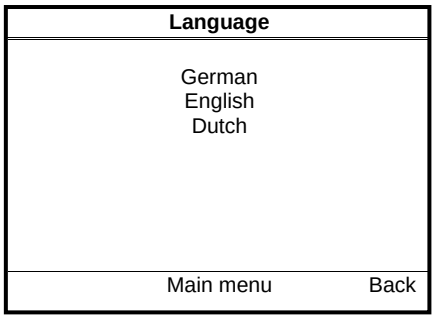
7.1 Extras

The “Extras“ menu allows you to set various parameters on ***frida***



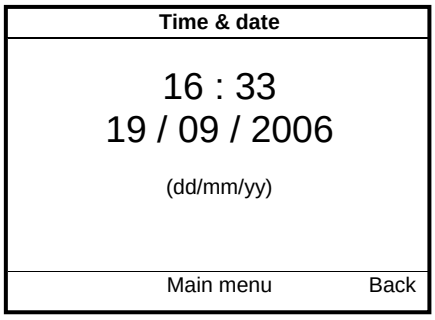
7.2 Info

Information about the firmware versions of the ***frida*** components can be accessed from the “Extras“ menu under “Info“.



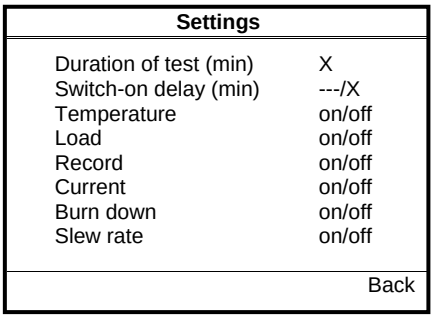
7.3 Language

In the “Language” menu you can make ***frida*** country-specific. The display and the record will then appear in the selected language.



7.4 Time & date

The current date and time can be set in the “Extras“ menu under “Time & date“. The date is added to every stored test record and displayed in the main menu.



7.5 Settings

In the “Settings“ menu you can change various settings for the test methods.

Duration of test:	In manual mode the test ends after the set period
Switch-on delay:	The test begins only after the expiry of the period set here.
Temperature:	Display on/off
Load:	Display on/off
Record:	Record function on/off
Current:	Display on/off
Burn down:	Burn down mode on/off
Slew rate:	Display on/off

7.6 Updating

Frida can be updated. Please contact your local representative or Baur after-sales service.

8 Technical data

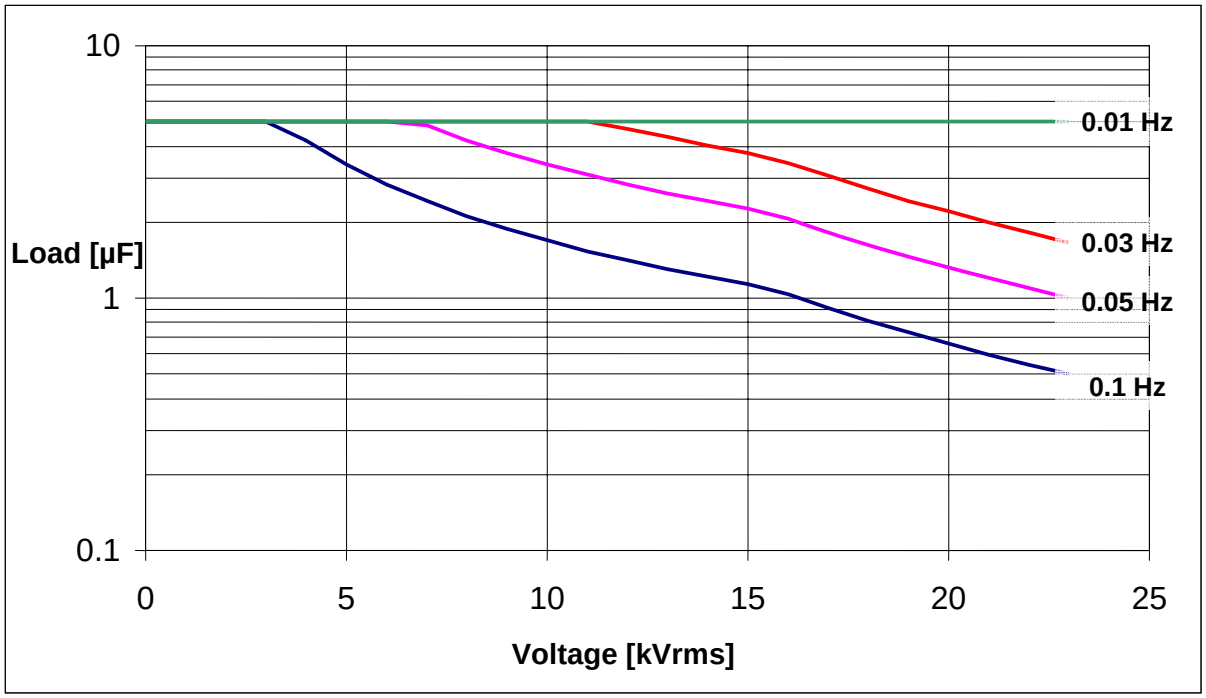
8.1 General technical data

Power supply	110 V_{AC} … 230 V_{AC}, 50 Hz / 60 Hz
Max. input power	350 W
Max. input current 110 V_{AC}	3 A
Max. input current 230 V_{AC}	1.5 A
Output voltage truesinus ®	1 kV_{RMS} … 23 kV_{RMS}
Output voltage DC	+/- 1 kV … 30 kV
Output voltage square	1 kV … 30 kV_P
Frequency range output voltage	0.01 Hz … 0.1 Hz
Max. output power	166 VA
Maximum operating time without interruption	60 minutes
Duty cycle	1h operation / 4h pause
Length HV feed cable	5 m
Monitor	Illuminated LCD display, automatic brightness adjustment
Operation	One knob operation by means of rotary knob
Operating temperature	-10 ... +50 °C
Storage temperature	-20 ... +60 °C (DIN EN 60068-2-1 and -2-2)
Data interface	USB 2.0
Format data record	Text format, ASCII
Languages	German, English, Dutch,
Ingress protection	Splash water and dust protected (IP 54)
Mechanical strength:	DIN EN 60068-2-27, MIL STD 810 F
Dimensions	438 mm x 411 mm x 220 mm
Weight (without accessories)	20 kg
Weight (complete)	22.7 kg

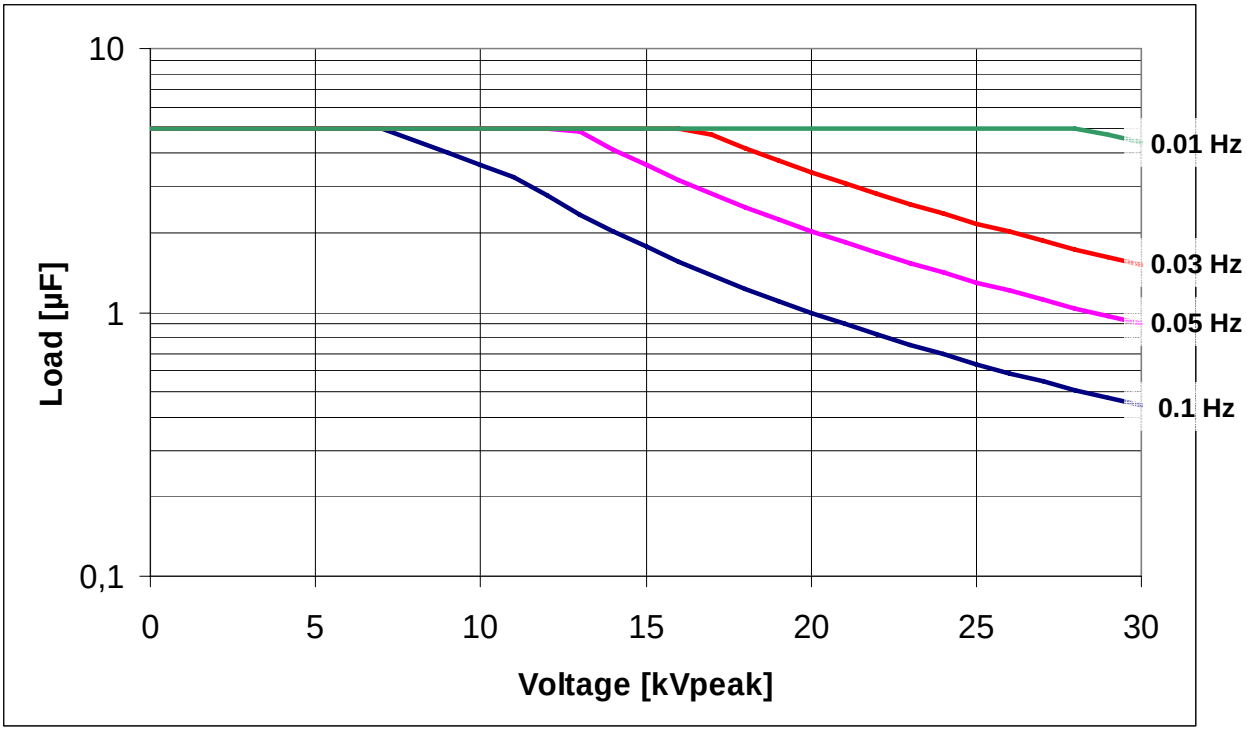
We reserve the right to make modifications

8.2 Load diagram

Load diagram VLF truesinus®



Load diagram VLF Square-wave



9 Maintenance

9.1 Servicing

On grounds of safety, measures that involve opening the device may be carried out only by instructed, authorised service personnel.

Service personnel:

- can call upon appropriate training, experience and instruction.
- have knowledge of the applicable standards, regulations, accident prevention legislation and operating conditions.
- are in the position to carry out the required tasks whilst recognising and avoiding the possible dangers.
- are obliged to report immediately any changes occurring in the device that detrimentally affect safety.
- are familiar with the device, its functions and the possible sources of danger.
- can call upon their knowledge for the maintenance and servicing of the device.
- have been expressly authorised by BAUR to open the device and carry out modifications to it.

9.2 Error messages

If an error message appears check the supply voltage and connection cables. If the message appears again make a note of the **error text** and the **procedure** that led up to the error. Inform your nearest BAUR representative, who will immediately provide you with further help.

9.3 Cleaning

- Clean the device, especially the display, preferably using a dry or slightly damp cloth only. You may use a mild cleaning agent for cleaning the housing. Never use an abrasive cleaning agent!
- Do not use chemicals or benzene for cleaning!
- Do not allow liquids to get inside the device! Never immerse the device in water!
- Close the lid of the device before you put it away. The integrated rubber seal in the lid protects the operating panel from dirt.

10 Accessories, options and spare parts

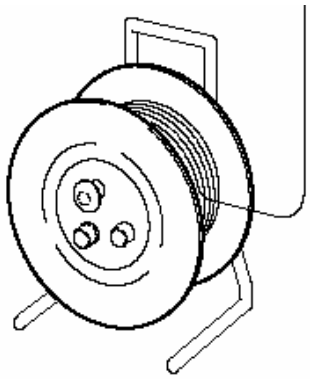
10.1 Delivery includes

- ***frida*** VLF generator (including 5m high voltage cable)
- Discharge/earth rod EES 40
- Ground line 10m
- Mains cable
- User manual de/en
- USB memory stick
- Bridge connector emergency – off
- Carrying sling

10.2 Optional accessories

External emergency – off

An external emergency-off switch with an indicator light is available to provide a higher level of safety when working in uncertain situations.



10.3 Replacement parts

If required the following replacement parts can be obtained from the Baur customer services department:

- Discharge/earth rod EES 40
- Ground line
- Mains cable
- Crocodile clips red, black
- USB memory stick
- Bridge connector emergency – off
- Carrying sling

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