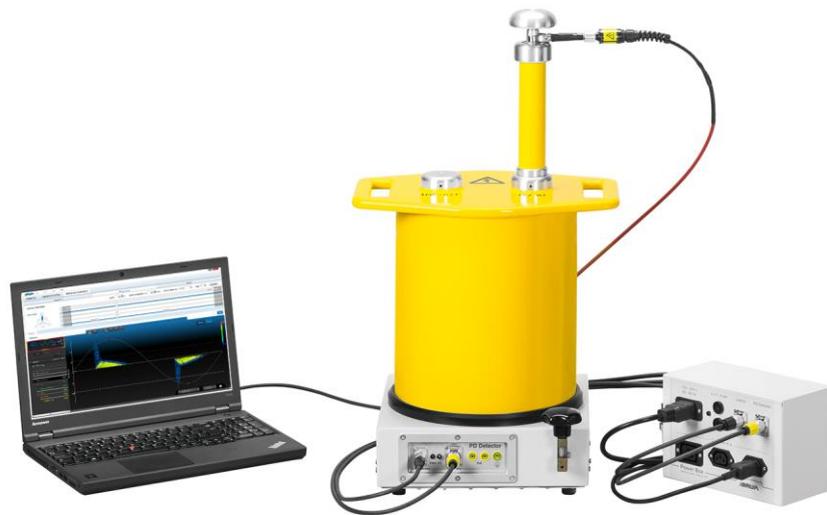


# Portable PD diagnostics system

## PD-TaD 62



The figure is illustrative

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# 1 ABOUT THIS MANUAL

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## 1.1 Using this manual

This user manual contains all necessary information that is needed for the commissioning and operation of the described product.

- ▶ Read this user manual completely before operating the product for the first time.
- ▶ Consider this user manual to be a part of the product and store it in an easily accessible location.
- ▶ If this user manual is lost, please contact BAUR GmbH or your nearest BAUR representative (<http://www.baur.eu/baur-worldwide>).

## 1.2 Applicable documents

This user manual applies in conjunction with the following documents:

- User manual for the BAUR software 4
- User manual for the frida or viola VLF HV generator used
- For parallel PD and dissipation factor measurements and Full MWT: Supplementary manual for dissipation factor measurement using frida TD or viola TD

## 1.3 Structure of safety instructions

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

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

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:

 **SIGNAL WORD**

**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

	<b>General danger</b>
	<b>Risk of electric shock</b>

## 1.4 View Settings

Symbol	Meaning
▶	You are requested to perform an action.
1. 2. ...	Perform the actions in this sequence.
a. b. ...	If an operation consists of several operating steps, they are specified with "a, b, c". Perform the operating steps in this sequence.
1 2 ...	Numbering in the legend
▪	List
	Indicates further information on the topic.
	Indicates tools required for the subsequent tasks.
	Indicates spare parts required for the subsequent tasks.
	Indicates required cleaning agents.

## 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.

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## 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 Intended use

The PD-TaD 62 portable PD diagnostics system is used in combination with a BAUR VLF HV generator for carrying out:

- Partial discharge testing and location
- Parallel partial discharge and dissipation factor measurement
- VLF cable testing with parallel partial discharge testing
- Full MWT: VLF cable testing with parallel partial discharge and dissipation factor measurement

For dissipation factor measurement and Full MWT, a VLF HV generator with a dissipation factor function is required.

If the system is not used in accordance with this stipulation, safe operation cannot be guaranteed. The user is liable for any damage to persons and property resulting from incorrect operation!

Proper use also includes

- compliance with all instructions in this user manual, and all other applicable documents,
- compliance with the technical data and connection requirements given on the rating plate and in the user manual and any other applicable documents,
- compliance with the inspection and maintenance instructions for the system and its components.

---

<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).

## 2.2 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 PD-TaD 62 and respective VLF HV generator
- Knowledge of the testing and measurement procedures
- Knowledge of plant engineering (cable types, switchgear, etc.).

## 2.3 Avoiding dangers, taking safety measures

- ▶ When installing the test system and operating PD-TaD 62 observe the following rules and guidelines:
  - Accident prevention and environment protection rules applicable for your country
  - Safety instructions and regulations of the country where PD-TaD 62 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)

### **Only operate the system if it is in a technically safe condition.**

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.
- ▶ Only use the PD-TaD 62 for the intended VLF HV generators specified on the data sheet.  
Connecting the PD-TaD 62 to VLF HV generators with a higher output voltage can lead to flashovers.
- ▶ 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 facilities that are not tested and approved by BAUR could adversely affect the safety, function and features of the product.

**Do not dismantle the HV coupling unit**

The housing of the HV coupling unit is sealed and gas-tight and may not be opened.

- ▶ Do not dismantle the HV coupling unit.
- ▶ Do not screw any components onto the HV coupling unit. Opening the housing can damage the device.

**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.

**Lifting and carrying the transport cases**

- ▶ To transport the transport cases containing the PD-TaD 62 and accessories, pull them along on their wheels.
- ▶ The transport cases and their contents weigh approx. 38.0 kg or 22.5 kg.  
Lifting or carrying the transport cases requires two people.

**2.3.1 Dangers when working with high voltage**

During tests and measurements with the PD-TaD 62, dangerous - at times 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 PD-TaD 62 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.

	 <b>DANGER</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>▶ 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>▶ Cordon off all metal parts in the area of the test object terminals (connection point and far end). Insulate and earth metal parts to avoid dangerous charges.</li> </ul> <p>After a measurement or test - after switching off the device or system - the test object can still be live with dangerous voltage.</p> <ul style="list-style-type: none"> <li>▶ Before removing the safety precautions, discharge, earth and short circuit all live parts.</li> </ul>

	 <b>DANGER</b>
	<p><b>Arcing fault when establishing a connection</b></p> <p>Danger of burn injuries and electro-ophthalmia due to arcing fault.</p> <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>

### 2.3.2 Guaranteeing immediate measures in an emergency

The system may be operated only if a second person with visual and audio contact to the tester is present and is in the position to detect possible dangers and to act immediately and properly.

With an external emergency stop device (optional), it is possible to mount the trigger for the emergency stop outside the test system so that it may be reached quickly in an emergency.

## 2.4 Special personal protective equipment

Personal protective equipment based on the risk assessment for the relevant working conditions is part of the PD-TaD 62 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>

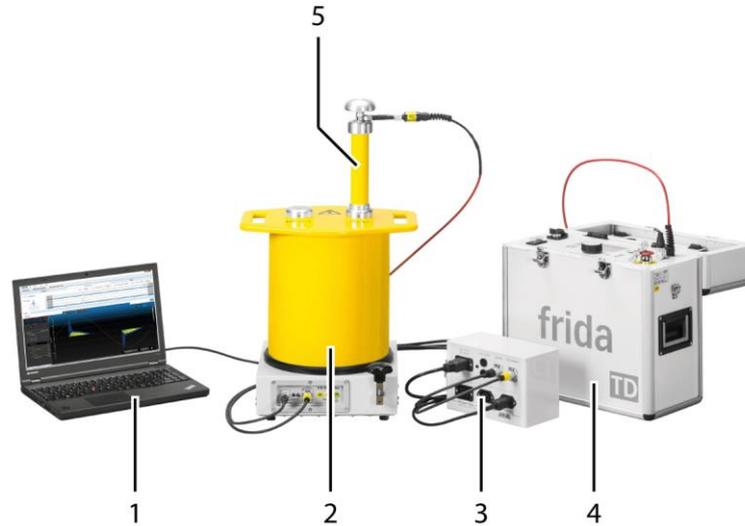
## 3 PRODUCT INFORMATION

### 3.1 Available methods

Measurements using the following methods are possible with the PD-TaD 62:

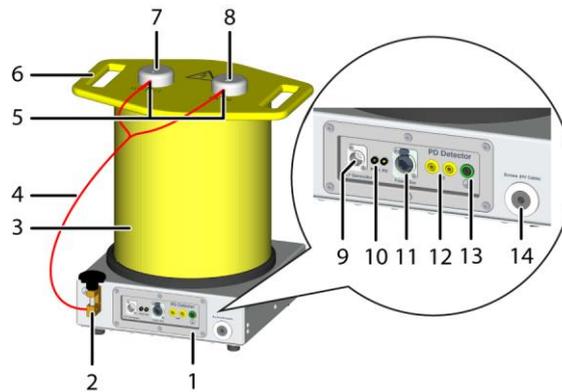
Method	Description	Required VLF HV generator
Partial discharge testing	Is used to identify and locate PD activities in the cable insulation	frida / viola
Parallel partial discharge and dissipation factor measurement	<p>Is used for:</p> <ul style="list-style-type: none"> <li>▪ Identify and locate PD activities in the cable insulation</li> <li>▪ Evaluate the dielectric condition of the insulation and indicate PD (determine the ageing condition and identify latent damage)</li> <li>▪ Better detection of hidden faults (e.g. moist joints) by the conditioning of weak points and simultaneous monitoring of <math>\tan \delta</math> values and PD activities</li> </ul> <p>With this method, the partial discharge and dissipation factor measurement are carried out simultaneously.</p>	frida TD / viola TD
VLF cable testing with parallel partial discharge testing	<p>Is used for:</p> <ul style="list-style-type: none"> <li>▪ VLF cable testing</li> <li>▪ Identify and locate PD activities in the cable insulation</li> </ul> <p>With this method, the cable testing and partial discharge testing are carried out simultaneously.</p>	frida / viola
Full MWT	<p>Is used for:</p> <ul style="list-style-type: none"> <li>▪ Evaluate the dielectric condition of the insulation, indicate PD</li> <li>▪ Identify and locate PD activities in the cable insulation</li> <li>▪ Intelligent withstand voltage testing with shorter test time for cables in good condition</li> <li>▪ Better detection of hidden faults (e.g. moist joints) by the conditioning of weak points and simultaneous monitoring of <math>\tan \delta</math> values and PD activities</li> </ul> <p>With this method, the VLF cable testing and partial discharge and dissipation factor measurement are carried out simultaneously.</p>	frida TD / viola TD

### 3.2 Full illustration of the PD-TaD and system components



No.	Element	Function
1	Laptop	The laptop with the BAUR software 4 installed on it forms the graphical interface for controlling the PD diagnostics system and evaluating the measurement results. The measurement results are displayed, analysed and archived in the BAUR Software.
2	PD-TaD 62	<p>The PD-TaD 62 comprises</p> <p><b>HV coupling unit (with integrated measurement impedance)</b></p> <p>Is used to couple out high-frequency PD pulses via a measurement impedance (in accordance with IEC 60270) and convert them into equivalent voltage signals</p> <p><b>PD measuring unit</b></p> <p>Is used to record and process the voltage signals from the HV coupling unit and measure partial discharges</p>
3	Power Box	<p>Is used for:</p> <ul style="list-style-type: none"> <li>▪ Power supply for all system components</li> <li>▪ Data transmission between the laptop and PD measurement unit</li> </ul>
4	VLF HV generator	Is used as VLF voltage source for the measurements
5	HF filter	Is used to minimise external influences on the measurement results

### 3.3 PD-TaD



No.	Designation on device	Element	Function
1	–	PD measuring unit	Is used for the measurement and location of partial discharges
2		Protective earthing connection	Is used to connect the protective earthing The earthing connection for the short circuit cable is located on the side of the protective earthing connection.
3	–	HV coupling unit with integrated measurement impedance	Is used to couple out high-frequency PD pulses via a measurement impedance (in accordance with IEC 60270) and convert them into equivalent voltage signals
4	–	Short-circuit cable	Is used to short-circuit the HV ports <i>HV IN</i> and <i>HV OUT</i> and the protective earthing (for the transportation and storage of the PD-TaD)
5	–	Port for the short-circuit cable	Is used to connect the short circuit cable to the HV ports <i>HV IN</i> and <i>HV OUT</i> Two connection sockets are provided on each of the HV connectors for the short-circuit cable: on the top and on the side.
6	–	Handles	Are used to lift and carry the PD-TaD
7	<i>HV OUT</i>	HV output	Is used to connect the PD-TaD to the test object
8	<i>HV IN</i>	HV input	Is used to connect the PD-TaD to the VLF HV generator
9	<i>VLF Generator</i>	Port	Is used to connect the PD-TaD to the VLF HV generator
10	<i>PWR</i>	LED	<ul style="list-style-type: none"> <li>Does not come on: PD-TaD is not supplied with voltage.</li> <li>Is on continuously: PD-TaD is supplied with voltage.</li> </ul>
	<i>PD</i>	LED	<ul style="list-style-type: none"> <li>Does not come on: No measurement performed</li> <li>Flashing: PD events are being received. The LED lights up for half a second if a PD event occurs.</li> </ul>

No.	Designation on device	Element	Function
11	Power Box	Port	Is used to connect the PD-TaD to the Power Box using a PoE cable (for power supply and data transmission)
12	VSE	Ports	Are used to connect the VSE cable for the dissipation factor measurement (to detect and account for leakage current)
13		Protective earthing connection	Is used to connect the protective earthing
14	Screen (HV Cable)	Port	Is used to connect the screen of the HV connection cable

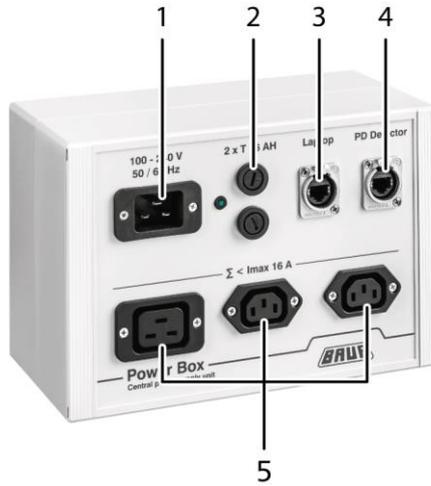
**Note:** The HV coupling unit is supplied in a sturdy transport case. The transport case is also used to protect the device against humidity and dirt during storage.



### 3.4 Power Box

The Power Box acts as the power supply for all system components:

- PD-TaD 62
- VLF HV generator
- Laptop



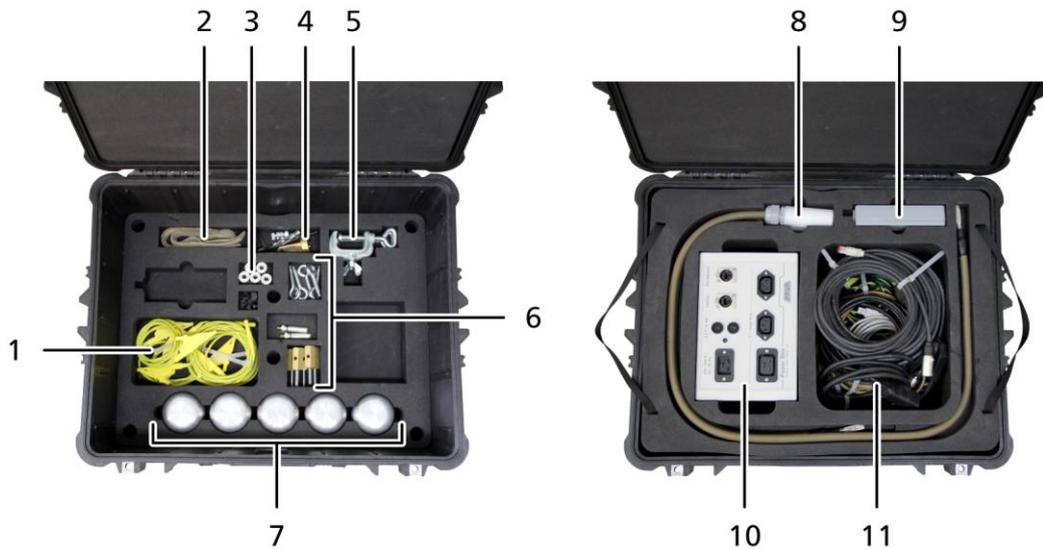
No.	Element	Function
1	Mains voltage connection	Is used to connect the Power Box to the mains voltage When the mains voltage is connected, the LED next to the mains voltage connection lights up.
2	Device protection fuse	Used to protect the Power Box and connected system components Type: T 16 AH
3	Laptop port	Is used to connect the laptop The laptop is used for data transmission and is connected to the Power Box via the Ethernet cable (included in the standard delivery).
4	PD Detector port	Is used to connect the PD measuring unit of the PD-TaD 62 The PD measurement unit is connected to the Power Box via a PoE cable. The PoE cable is used for the power supply of the PD-TaD 62 and for data transmission.
5	Ports for system power supply	Are used to connect the VLF HV generator and the laptop to the power supply on the Power Box Max. current 16 A

### 3.5 HF filter

The HF filter is used to minimise external influences on the measurement results. The HF filter is supplied in the PD-TaD 62 transport case.



### 3.6 Connection set in transport case



No.	Element	Function
1	VSE cables	Are used for detecting leakage currents during a dissipation factor measurement
2	Guard rings (conductive Velcro strips)	Used for the measurement setup for the dissipation factor measurement for detecting leakage currents
3	Distance pieces for anti-corona hood	Are used for fitting anti-corona hoods of the anti-corona protection device
4	Connection piece for HF filter	Is used to connect the HV connection cable of the VLF HV generator to the HF filter
5	HV connection terminal	Is used to connect the HV connection cable to the test object
6	Various fixtures and fittings	Used to lay and secure the connection cables
7	Anti-corona hoods of the anti-corona protection device	Used to protect against corona discharges
8	HV connection cables, length 0.7 m and 1.2 m	Are used to connect the PD-TaD 62 to the test object
9	Calibrator CAL1B/CAL1E	Is used to calibrate the PD test circuit
10	Power Box	Is used for: <ul style="list-style-type: none"> <li>▪ Power supply for the system components</li> <li>▪ Data transmission between the PD-TaD 62 and the laptop</li> </ul>
11	Connection cables	Are used to connect the system components and the power supply, and for data transmission between the system components Further information: Chapter <i>Connection cables</i> (on page 22)

### 3.6.1 Calibrator

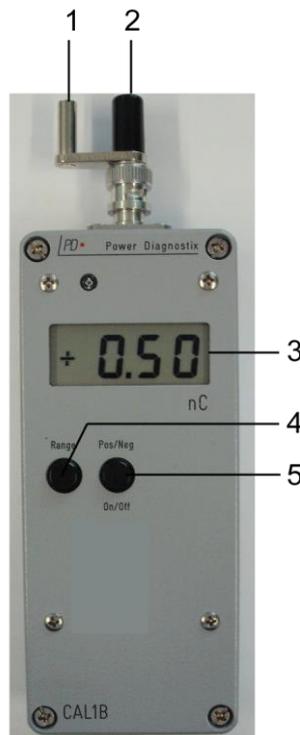
Before you can perform a partial discharge measurement, the test circuit must be calibrated to the following parameters:

- Charge (in nC)
- Cable length or speed of the PD pulses.

The delivered calibrator is connected to the test object for the calibration.



► For information on calibrating the PD measurement system, refer to the user manual for the BAUR software.



No.	Element	Function
1	Protective earthing port (metal port)	Is used to connect the protective earthing
2	Signal output (black port)	Is used for connection to the test object.
3	Display of selected charge in [nC]	
4	<i>Range</i>	Is used for setting the calibration charge Possible settings: <ul style="list-style-type: none"> <li>▪ CAL1B: 0.10, 0.20, 0.50, 1.00, 2.00, 5.00, 10.00 nC</li> <li>▪ CAL1E: 0.50, 1.00, 2.00, 5.00, 10.00, 20.00, 50.00 nC</li> </ul>

No.	Element	Function
5	<i>Pos/Neg</i>	▶ Press briefly to set the polarity of the signal.
	<i>On/Off</i>	▶ To switch on, press briefly.
		▶ To switch off, press for approx. 3 seconds.

- ▶ Note that the calibrator must be removed from the test circuit before switching on the high voltage source.

**Note:** After some time, the calibrator automatically switches off to extend the battery life. If you have not yet completed the calibration, switch on the calibrator.

### 3.6.2 Connection cables

No.	Figure	Cable	Length	Function
1		HV connection cables (2 pcs)	0.7 m / 1.2 m	Are used to connect the PD-TaD 62 to the test object
2		Mains supply cord <ul style="list-style-type: none"> <li>▪ C19 – SCHUKO®</li> <li>▪ C19 – N5/15 (USA)</li> </ul>	2.5 m	Is used to connect the Power Box to the mains voltage (90 – 264 V, 47 – 63 Hz)
3		Connection cable C5 – C14G	2.5 m	Is used for the power supply of the laptop via the Power Box
4		Connection cable C13 – C14G	1.8 m	Is used for the power supply of the frida / frida TD via the Power Box
5		Connection cable C19 – C20G	2.5 m	Is used for the power supply of the viola / viola TD via the Power Box
6		PoE cable	10 m	Is used for the power supply of the PD-TaD 62 and for data transmission

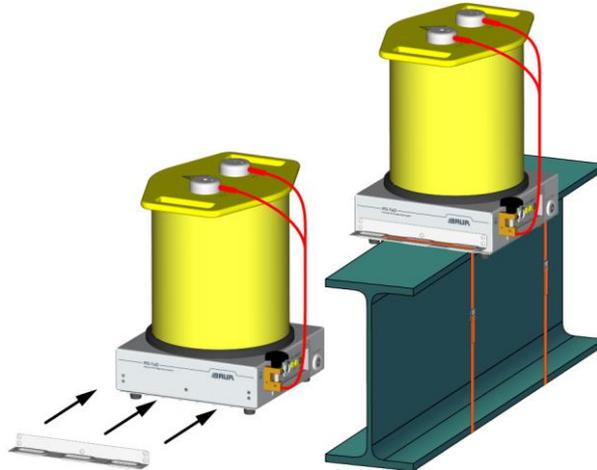
No.	Figure	Cable	Length	Function
7		Ethernet cable	3 m	Is used to transmit data between the PD-TaD 62 and the laptop via the Power Box
8		tan δ cable	10 m	Is used for data transmission for dissipation factor and MWT measurements between the VLF HV generator and the PD-TaD 62
9		Calibrator connection cables		Used to connect the calibrator to the PD test circuit
10		Protective earthing cable Cross section: 16 mm <sup>2</sup>	1.5 m	Is used to connect the PD-TaD 62 to the protective earthing
11		VSE cables with Ø 4 mm connector and a connection clip  (2 pcs)	3 m	Are used to connect the PD-TaD 62 for the dissipation factor measurement for detecting leakage currents <ul style="list-style-type: none"> <li>▪ Connection between PD-TaD 62 and near end of protective ring</li> <li>▪ Connection between PD-TaD 62 and adjoining de-energised phase as return line at near end</li> </ul>
12		VSE cables with 2 connection clips  (2 pcs)	1.5 m	Are used to connect the PD-TaD 62 for the dissipation factor measurement for detecting leakage currents <ul style="list-style-type: none"> <li>▪ Connection between far end of protective ring and adjoining de-energised phase as return line</li> </ul>
13		USB cable 3.0 Plug A on A	3 m	Is used to remotely control the VLF HV generator

**Note:** A mains supply cord for the laptop is supplied in the laptop bag.

- ▶ Only use this mains supply cord for charging the laptop and when working in the office. When taking measurements, attach the laptop to the power supply on the Power Box.

### 3.7 Mounting bracket

The mounting bracket is used to mount the PD-TaD 62 on a cross beam or a similar supporting structure by means of tensioning straps. The mounting bracket is supplied in the PD-TaD 62 transport case.



### 3.8 Power supply

The power supply for the entire system incl. the PD-TaD 62, laptop and VLF HV generator is centralised via the Power Box.

The Power Box is fitted with two fuses for max. current 16 A (T 16 AH).

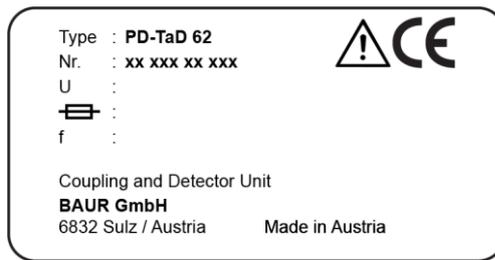
Device	Power supply
Power Box	90 – 264 V, 47 – 63 Hz
PD-TaD 62 (PD measuring unit)	Via Power Box
VLF HV generator	Via Power Box
Laptop	Via Power Box

### 3.9 Markings on the PD-TaD 62

#### Safety markings

Location and type	Explanation
On the HV coupling unit:	<b>Risk of electric shock</b>
	Once the measurements are complete, there may still be high voltage on the <i>HV IN</i> and <i>HV OUT</i> ports, which could cause serious injury as a result of an electric shock if touched.

#### Rating plate



Element	Description
Type	System designation
Nr.	Serial number
U	Not applicable here
	Not applicable here
f	Not applicable here
Coupling and Detector Unit	HV coupling unit with PD measuring unit
	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

## 4 TECHNICAL DATA

PD-TaD 62	
HV coupling unit:	
Input voltage	44 kV <sub>rms</sub> / 62 kV <sub>peak</sub>
Capacitance of coupling capacitor	10 nF
PD measuring unit:	
Power supply and data transmission	Via Power Box (Power over Ethernet)
Signal gain	0 – 75 dB
Degree of protection	IP54
Dimensions (W x H x D)	Approx. 410 x 463 x 369 mm
incl. HF filter	Approx. 410 x 668 x 369 mm
Weight	Approx. 17 kg
incl. HF filter	Approx. 17.5 kg
Calibrator	
Electrical charge (pulses)	
CAL1B	0.1 / 0.2 / 0.5 / 1 / 2 / 5 / 10 nC
CAL1E	0.5 / 1 / 2 / 5 / 10 / 20 / 50 nC
Power supply	9 V block battery, DIN/IEC 6F22
BAUR system software	
Multilingual user interface	in 23 languages
For more details, see the data sheet for BAUR system software (PD testing)	
Partial discharge location	
Theoretical measurement range	10 – 12,800 m (at 80 m/μs)
Velocity of propagation	50 – 120 m/μs
Sampling rate	100 MSamples/s (10 ns)
PD measurement range	1 pC – 100 nC
Accuracy	Approx. 1% of cable length
Resolution	0.1 pC / 0.1 m

Dissipation factor measurement & MWT	
Automatic detection and compensation of leakage currents	integrated
Measurement control	with BAUR VLF generator frida TD, viola TD
For more details, see the data sheet for the respective VLF generator	
Laptop	
Processor	Intel Core i5
Operating system	Windows 7 Ultimate 32-bit (or higher)
Working memory	At least 4 GB
Hard disk	At least 256 GB SSD
Power Box	
Input voltage	90 – 264 V, 47 – 63 Hz
Power consumption	max. 3,500 VA
Max. current	16 A
Interface PD-TaD 62	Ethernet (PoE)
Dimensions (W x H x D)	160 x 120 x 240 mm
Weight	Approx. 1.7 kg
General	
Ambient temperature (operational)	-10°C to +50°C
Storage temperature	-20°C to +60°C
Rel. humidity	Non-condensing
Safety and EMC	CE compliant in accordance with Low Voltage Directive (2014/35/EU), EMC Directive (2014/30/EU), Environmental testing EN 60068-2-ff
Transport case: Weight and dimensions (W x H x D)	
Transport case 1 with PD-TaD 62	approx. 38 kg; 800 x 581 x 482 mm
Transport case 2 with accessories	approx. 22.5 kg; 627 x 497 x 303 mm

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## 5 OPERATING THE PD-TAD 62

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### 5.1 Switching on the system

#### Prerequisite

All power supply cables are connected.

Further information:

- Chapter *Connecting the system for PD measurement* (on page 35)
- Chapter *Connecting the system for parallel PD and dissipation factor measurement or Full MWT* (on page 43)

#### Procedure

Two steps are required to switch on the entire system:

- Connecting the Power Box to the power supply.  
The PD measurement unit of the PD-TaD 62 will be switched on automatically.
- Switch on the VLF HV generator with the main switch on the control panel.

The operating state of the system is indicated by red and green pilot lamps on the control panel of the VLF HV generator.

#### 5.1.1 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.

**5.2 Switching off the system following faults or in emergencies**

The system’s emergency off button is located on the VLF HV generator.

- ▶ In the event of a fault or an emergency, immediately press the emergency off button. Pressing the emergency off button puts the system in the safe *Ready for operation* operating state.

**5.3 Managing measurements**

Measurements using the PD-TaD 62 are configured and managed as follows:

**Partial discharge testing**

Operating steps	Operating interface
Switching on, releasing and deactivating the high voltage	on the VLF HV generator
Configuring, starting and controlling the measurements	in the BAUR system software on the laptop
Evaluating the measurement results	in the BAUR system software on the laptop

**Sequential partial discharge testing, dissipation factor measurement, cable testing**

Operating steps	Operating interface
Switching on, releasing and deactivating the high voltage	on the VLF HV generator
Configuring, starting and controlling the measurements	in the BAUR system software on the laptop*
Evaluating the measurement results	in the BAUR system software on the laptop*

\* Sequential dissipation factor measurement and cable testing can be carried out via the VLF HV generator’s remote control function in the BAUR system software.

**Parallel partial discharge and dissipation factor measurement**

Operating steps		Operating interface
Switching on, releasing and deactivating the high voltage		on the VLF HV generator
Configuring, starting and controlling the measurements	PD measurement steps:	in the BAUR system software on the laptop
	Dissipation factor measurement steps:	on the VLF HV generator
Evaluating the measurement results	PD testing:	in the BAUR system software on the laptop
	Dissipation factor measurement:	on the VLF HV generator or using Diagnostics Reporter on the laptop

**Full MWT**

Operating steps		Operating interface
Switching on, releasing and deactivating the high voltage		on the VLF HV generator
Configuring, starting and controlling the measurements	MWT measurement steps (with $\tan \delta$ )	on the VLF HV generator
	PD measurement steps:	in the BAUR system software on the laptop
Evaluating the measurement results	MWT with $\tan \delta$	on the VLF HV generator or using Diagnostics Reporter on the laptop
	PD testing	in the BAUR system software on the laptop

**VLF cable testing with parallel partial discharge testing**

Operating steps		Operating interface
Switching on, releasing and deactivating the high voltage		on the VLF HV generator
Configuring, starting and controlling the measurements	PD testing:	in the BAUR system software on the laptop
	VLF cable testing	on the VLF HV generator
Evaluating the measurement results	PD testing:	in the BAUR system software on the laptop
	VLF cable testing:	on the VLF HV generator or using Diagnostics Reporter on the laptop

### 5.4 Symbols on the display of the VLF HV generator

C	Electric capacitance	TD	Current dissipation factor
I	Output current	MTD	Mean value of dissipation factor
Ivse	Leakage currents acquired through the VSE box	SDTD	Dissipation factor stability: Standard deviation
R	Resistance	$\Delta$ TD	Change of the dissipation factor between successive voltage steps.
Umax	Max. voltage	$\Delta$ TDt	Change of the dissipation factor over time
L	Phase on which the measurement or test is carried out	M	Current measurement
t	Test time	S	Current voltage step
Eval.	Evaluation	Ramp-up	Ramp-up stage of a MWT measurement (increasing the voltage in steps)
MWT	MWT stage of an MWT measurement (VLF voltage test)		Column with the evaluation of the measured values for the ramp-up stage (indicates the alarm level)
	Column with the evaluation of the measured values for the MWT stage (indicates the alarm level)		The measurement has not been started or evaluations are yet to be carried out.
	Measured value or measured values are within the permissible range.		Alarm level "Risk": The defined threshold value has been reached or exceeded.
	Alarm level "High risk": The defined threshold value has been reached or exceeded.		The measurement was cancelled: The defined threshold value has been reached or exceeded.
R-TD external	Dissipation factor measurement is measured using the external resistance of the PD-TaD 62		

## 6 CONNECTING THE SYSTEM

- ▶ 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 Specific safety instructions

	 <b>WARNING</b>
	<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.</p> <p>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>

	 <b>WARNING</b>
	<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;</p> <p>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>

## 6.2 Lifting and carrying the transport case

- ▶ To transport the transport cases containing the PD-TaD 62 and accessories, pull them along on their wheels.

To extend the telescopic handle of the transport case, release the locking mechanism (1) and extend the telescopic handle (2).



- ▶ The transport cases and their contents weigh approx. 38.0 kg or 22.5 kg. Lifting or carrying the transport cases requires two people.

## 6.3 Checks to perform before commissioning

1. Check all system components and mechanical connections for damage.
2. Check electrical connections and connection cables for damage.  
Use only undamaged connection cables.

## 6.4 Ensuring there is no voltage at the work place

Before connecting the test object follow the 5 safety rules:

1. Disconnect the test object.
2. Secure against re-connection.
3. Verify absence of operating voltage.
4. Provide protection against adjacent live parts.
5. Earth and short all phases.

**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>**.

## 6.5 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.

## 6.6 Setting up the system

- ▶ Place the PD-TaD 62 as close to the test object as possible.
- ▶ Select the place of installation for the VLF HV generator in such a way that
  - a stable base is guaranteed,
  - the VLF HV generator is accessible for making connections and for operation, and
  - sufficient safety distances are maintained. You must comply with EN 50110 for the operation of electrical installations (EU/EFTA countries) or the relevant standards applicable in your country.
- ▶ Set up the Power Box so that the PD-TaD 62, the VLF HV generator and the laptop can be connected to the Power Box.
- ▶ Set up the laptop so that you can work comfortably. You could place the laptop on a transport case, for example.

### 6.6.1 Securing the PD-TaD 62 to the cross beam

If the connection point is located on a pole for example, it may be necessary to attach the PD-TaD 62 to a cross beam or a comparable sub-structure.

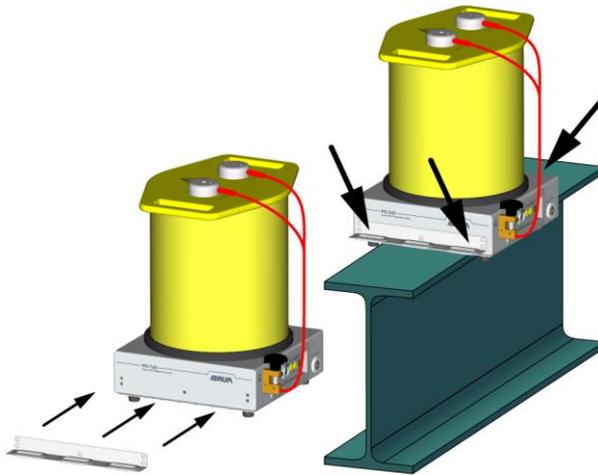
## Prerequisite



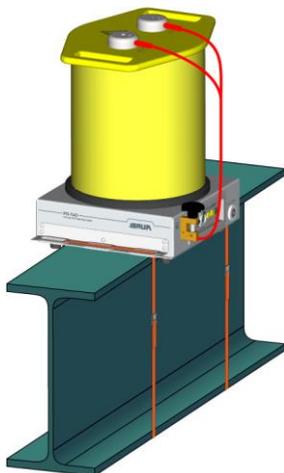
Offset screwdriver for Torx® screws, size TX 25 / 67 x 25 mm

## Procedure

The following illustration demonstrates an example for attaching the PD-TaD 62 to a cross beam.



1. Loosen and remove the 5 screws on the underside of the PD-TaD 62.
2. Screw the mounting bracket to the PD-TaD 62 using the 5 screws (see Fig.).
3. Repeat steps 1 to 2 on the opposite side of the PD-TaD 62.
4. Place the PD-TaD 62 on the cross beam.
5. Guide the tension belts through the recesses located on both sides of the mounting brackets and fasten the PD-TaD 62 on both sides with the tension belts.
6. Tighten the tension belts and check the stability of the PD-TaD 62.  
Ensure that the tension lock is located below the device.



**Note:** The tension belts are not included in the PD-TaD 62 standard delivery.

## 6.7 Points to note during connection

The following factors are crucial for precise measurement results:

- Short connections
- Protective earthing cable should be a flat copper strip (standard delivery)
- Maximum possible distance between the connection cables and the adjacent system components not to be tested
- Keep the HV coupling unit of the PD-TaD 62 and the terminations clean and dry
- No current loops in the power supply

## 6.8 Use of the anti-corona protection

To achieve measurement results that are as precise as possible, we recommend using the anti-corona protection device. Corona discharges on sharp edges in a test setup may cause a high noise level. The anti-corona hoods included within the standard delivery protect sharp-edged parts in order to prevent corona discharges affecting the measurement result.

## 6.9 Earth system

**Note:**All the necessary connection cables and connecting elements are included in the standard delivery.

1. A 16 mm<sup>2</sup> protective earthing cable is included in the standard delivery of the PD-TaD 62. Use this cable to connect the protective earthing connection of the PD-TaD 62 to the station earth (directly on the test object screen).  
**Important:** To keep the antenna effect to a minimum and thus prevent interference, the protective earthing cable must be a flat copper strip which is kept as short as possible.
2. Earth the VLF HV generator. Follow the user manual for the VLF HV generator in question.
3. A short-circuit cable is secured to the earthing terminal on the PD-TaD 62. Connect this short-circuit cable to the *HV IN* and *HV OUT* ports.
4. If you are using a VLF HV generator with a 50 m long HV connection cable, connect the screen (operational earthing) of the HV connection cable to the *Screen (HV Cable)* port of the PD-TaD 62.

## 6.10 Connecting the system for PD measurement

### 6.10.1 Connecting the system to the frida VLF HV generator

#### Prerequisites

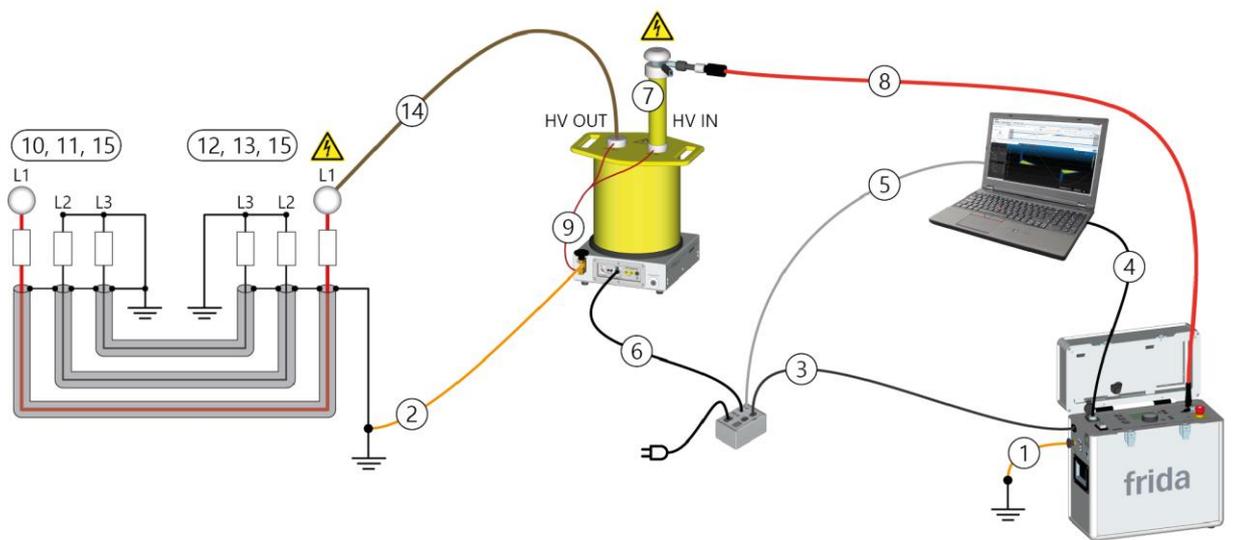
- The workplace must be de-energised, earthed and short-circuited.  
Further information: Chapter *Ensuring there is no voltage at the work place* (on page 33)
- The connection points and far end are prepared for the measurement tasks.  
Further information: Chapter *Preparing the test object terminals* (on page 33)
- HV coupling unit of PD-TaD and the cable terminations of the test object are clean and dry.  
Further information: Chapter *Cleaning the PD-TaD 62 and system components* (on page 99)

### Required equipment

- PD-TaD incl. connection cables
- HF filter
- PoE cable
- Laptop incl. Ethernet and USB cable
- Anti-corona protection

**Note:**All the necessary connection cables and connecting elements are included in the standard delivery.

### Procedure



### Important:

- ▶ To keep the connection cable between the PD-TaD and the test object short, place the PD-TaD as close as possible to the test object.  
To avoid interference due to partial discharge at the connection point, make sure the PD-TaD is placed a sufficient distance away from metal and live parts.  
If the connection point is higher up, put the PD-TaD on a substructure. Further information: Chapter *Securing the PD-TaD 62 to the cross beam* (on page 33)
- ▶ Keep all connections as short as possible.
- ▶ Lay out the connection cables in such a way that no loops are created.

The numbering in the table gives the sequence of steps for connecting the test object.

No.	Cable	Step
1	Protective earthing cable of the VLF HV generator	Earth the VLF HV generator. Further information: User manual for the respective VLF HV generator
2	Protective earthing cable of PD-TaD 62 (flat copper strip)	Connect the PD-TaD 62 to the station earth (close to the test object cable screen). Further information: Chapter <i>Earth system</i> (on page 35)

No.	Cable	Step
<b>On the VLF HV generator:</b>		
–	–	<p>If present, connect the external emergency off unit to the VLF HV generator (⚡ port).</p> <p>If you are not using an external emergency off unit, ensure that a jumper plug is inserted into the ⚡ port on the VLF HV generator.</p>
3	Connection cable C13 – C14G	Connect the VLF HV generator (mains supply) to the Power Box (port depends on the connection cable).
<b>On the laptop:</b>		
4	USB cable	For the remote control of the VLF HV generator: Use a USB cable to connect the laptop to the VLF HV generator.
5	Ethernet cable	Use the supplied Ethernet cable to connect the laptop to the Power Box ( <i>Laptop</i> port).
–	–	If you do not want to run the laptop off its battery, connect the laptop to the Power Box to establish a power supply. To do so, use the connection cable with the C14G plug.
<b>At the PD-TaD 62:</b>		
6	PoE cable	<p>Connect the PoE cable:</p> <ul style="list-style-type: none"> <li>▪ to the Power Box (<i>PD Detector</i> port) and</li> <li>▪ to PD-TaD 62 (<i>Power Box</i> port)</li> </ul> <p>This is used for power supply and data transmission at the same time.</p>
7	–	<p>Connect the HF filter to the <i>HV IN</i> port.</p> <p>Further information: Chapter <i>Connecting the HF filter to the PD-TaD 62</i> (on page 55)</p>
8	HV connection cable of the VLF HV generator	<p>Connect the HV connection cable to the HF filter at the <i>HV IN</i> port.</p> <p>Further information: Chapter <i>Connecting the HF filter to the PD-TaD 62</i> (on page 55)</p>
9	Short-circuit cable of PD-TaD 62	On the PD-TaD 62, remove the short-circuit cable from ports <i>HV IN</i> and <i>HV OUT</i> .
<b>At the far end of the test object:</b>		
10	–	Clean the cable termination of the phase to be tested carefully.
11	–	Attach the anti-corona hoods of the anti-corona protection device to the cable termination of the phase to be tested.
<b>At the near end of the test object:</b>		
12	–	Clean the cable termination of the phase to be tested carefully.
13	–	Attach the anti-corona hoods of the anti-corona protection device to the cable termination of the phase to be tested.

No.	Cable	Step
14	HV connection cable of PD-TaD 62	<p>Connect the PD-TaD 62 (<i>HV OUT</i> port) to the phase to be tested.</p> <p>To do this, select the shorter of the two supplied HV connection cables.</p> <p>Place the HV connection cable as far away as possible from the adjacent live and earthed parts.</p>
<b>At the near and far end of the test object:</b>		
15	–	<p>Remove the earthing and short-circuit connection from the phase to be tested.</p> <p>Make sure that the phases not being tested are earthed and short-circuited.</p>

## 6.10.2 Connecting the system to the viola VLF HV generator

### Prerequisites

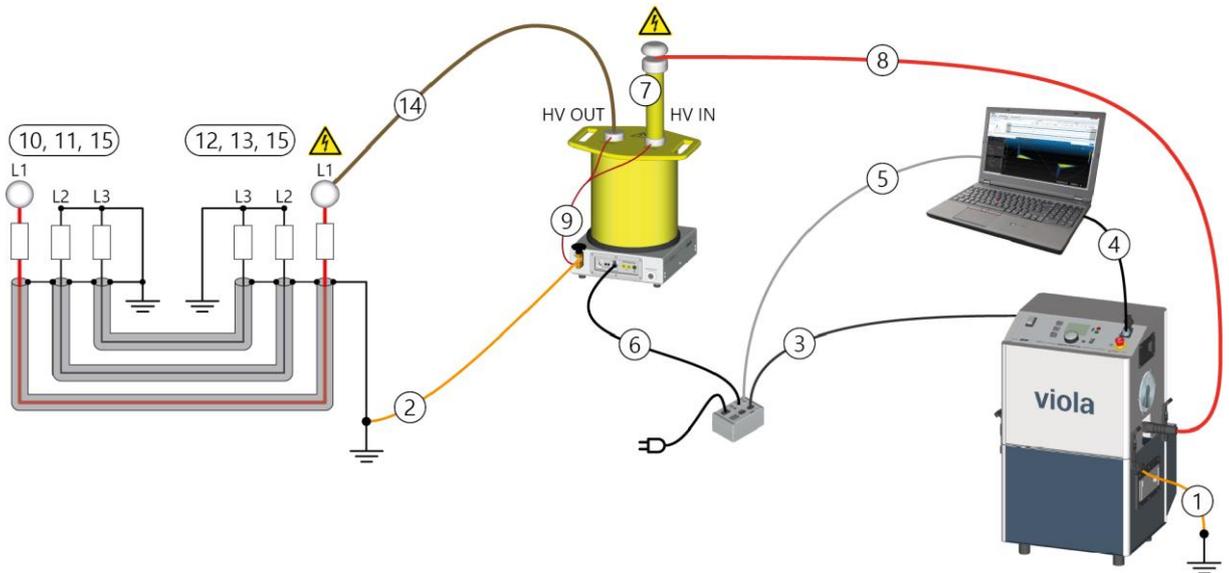
- The workplace must be de-energised, earthed and short-circuited.  
Further information: Chapter *Ensuring there is no voltage at the work place* (on page 33)
- The connection points and far end are prepared for the measurement tasks.  
Further information: Chapter *Preparing the test object terminals* (on page 33)
- HV coupling unit of PD-TaD and the cable terminations of the test object are clean and dry.  
Further information: Chapter *Cleaning the PD-TaD 62 and system components* (on page 99)

### Required equipment

- PD-TaD incl. connection cables
- HF filter
- PoE cable
- Laptop incl. Ethernet and USB cable
- Anti-corona protection

**Note:**All the necessary connection cables and connecting elements are included in the standard delivery.

**Procedure**



**Important:**

- ▶ To keep the connection cable between the PD-TaD and the test object short, place the PD-TaD as close as possible to the test object.  
To avoid interference due to partial discharge at the connection point, make sure the PD-TaD is placed a sufficient distance away from metal and live parts.  
If the connection point is higher up, put the PD-TaD on a substructure. Further information: Chapter *Securing the PD-TaD 62 to the cross beam* (on page 33)
- ▶ Keep all connections as short as possible.
- ▶ Lay out the connection cables in such a way that no loops are created.

The numbering in the table gives the sequence of steps for connecting the test object.

No.	Cable	Step
1	Protective earthing cable of the VLF HV generator	Earth the VLF HV generator. Further information: User manual for the respective VLF HV generator
2	Protective earthing cable of PD-TaD 62 (flat copper strip)	Connect the PD-TaD 62 to the station earth (close to the test object cable screen). Further information: Chapter <i>Earth system</i> (on page 35)

**On the VLF HV generator:**

-	-	If present, connect the external emergency off unit to the VLF HV generator (⚡ port).  If you are not using an external emergency off unit, ensure that a jumper plug is inserted into the ⚡ port on the VLF HV generator.
3	Connection cable C19 – C20G	Connect the VLF HV generator (mains supply) to the Power Box (port depends on the connection cable).

No.	Cable	Step
<b>On the laptop:</b>		
4	USB cable	For the remote control of the VLF HV generator: Use a USB cable to connect the laptop to the VLF HV generator.
5	Ethernet cable	Use the supplied Ethernet cable to connect the laptop to the Power Box ( <i>Laptop</i> port).
–	–	If you do not want to run the laptop off its battery, connect the laptop to the Power Box to establish a power supply. To do so, use the connection cable with the C14G plug.
<b>At the PD-TaD 62:</b>		
6	PoE cable	Connect the PoE cable: <ul style="list-style-type: none"> <li>▪ to the Power Box (<i>PD Detector</i> port) and</li> <li>▪ to PD-TaD 62 (<i>Power Box</i> port)</li> </ul> This is used for power supply and data transmission at the same time.
7	–	Connect the HF filter to the <i>HV IN</i> port. Further information: Chapter <i>Connecting the HF filter to the PD-TaD 62</i> (on page 55)
8	HV connection cable of the VLF HV generator	Connect the HV connection cable to the HF filter at the <i>HV IN</i> port. Further information: Chapter <i>Connecting the HF filter to the PD-TaD 62</i> (on page 55)
9	Short-circuit cable of PD-TaD 62	On the PD-TaD 62, remove the short-circuit cable from ports <i>HV IN</i> and <i>HV OUT</i> .
<b>At the far end of the test object:</b>		
10	–	Clean the cable termination of the phase to be tested carefully.
11	–	Attach the anti-corona hoods of the anti-corona protection device to the cable termination of the phase to be tested.
<b>At the near end of the test object:</b>		
12	–	Clean the cable termination of the phase to be tested carefully.
13	–	Attach the anti-corona hoods of the anti-corona protection device to the cable termination of the phase to be tested.
14	HV connection cable of PD-TaD 62	Connect the PD-TaD 62 ( <i>HV OUT</i> port) to the phase to be tested. To do this, select the shorter of the two supplied HV connection cables. Place the HV connection cable as far away as possible from the adjacent live and earthed parts.
<b>At the near and far end of the test object:</b>		
15	–	Remove the earthing and short-circuit connection from the phase to be tested.  Make sure that the phases not being tested are earthed and short-circuited.

### 6.10.3 Connecting the system using an HV connection cable with operational earthing (option)

#### Prerequisites

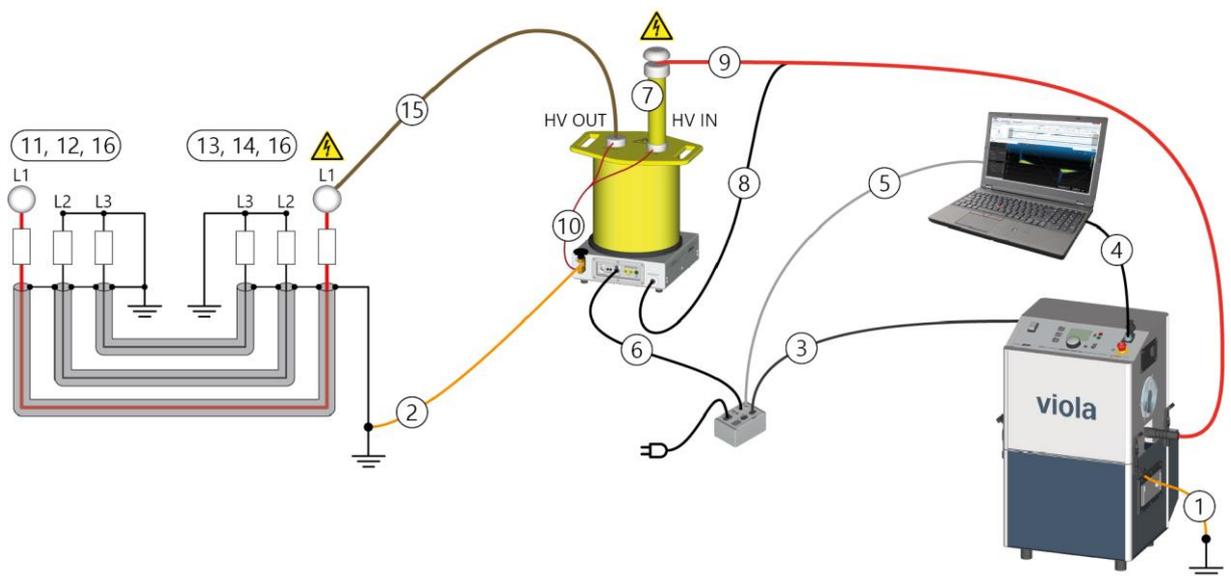
- The workplace must be de-energised, earthed and short-circuited.  
Further information: Chapter *Ensuring there is no voltage at the work place* (on page 33)
- The connection points and far end are prepared for the measurement tasks.  
Further information: Chapter *Preparing the test object terminals* (on page 33)
- HV coupling unit of PD-TaD and the cable terminations of the test object are clean and dry.  
Further information: Chapter *Cleaning the PD-TaD 62 and system components* (on page 99)

#### Required equipment

- PD-TaD incl. connection cables
- HF filter
- PoE cable
- Laptop incl. Ethernet and USB cable
- Anti-corona protection

**Note:**All the necessary connection cables and connecting elements are included in the standard delivery.

#### Procedure



**Important:**

- ▶ To keep the connection cable between the PD-TaD and the test object short, place the PD-TaD as close as possible to the test object.

To avoid interference due to partial discharge at the connection point, make sure the PD-TaD is placed a sufficient distance away from metal and live parts.

If the connection point is higher up, put the PD-TaD on a substructure. Further information: Chapter *Securing the PD-TaD 62 to the cross beam* (on page 33)

- ▶ Keep all connections as short as possible.
- ▶ Lay out the connection cables in such a way that no loops are created.

The numbering in the table gives the sequence of steps for connecting the test object.

No.	Cable	Step
1	Protective earthing cable of the VLF HV generator	Earth the VLF HV generator. Further information: User manual for the respective VLF HV generator
2	Protective earthing cable of PD-TaD 62 (flat copper strip)	Connect the PD-TaD 62 to the station earth (close to the test object cable screen). Further information: Chapter <i>Earth system</i> (on page 35)
<b>On the VLF HV generator:</b>		
–	–	If present, connect the external emergency off unit to the VLF HV generator (⚡ port).  If you are not using an external emergency off unit, ensure that a jumper plug is inserted into the ⚡ port on the VLF HV generator.
3	Connection cable C19 – C20G	Connect the VLF HV generator (mains supply) to the Power Box (port depends on the connection cable).
<b>On the laptop:</b>		
4	USB cable	For the remote control of the VLF HV generator: Use a USB cable to connect the laptop to the VLF HV generator.
5	Ethernet cable	Use the supplied Ethernet cable to connect the laptop to the Power Box ( <i>Laptop</i> port).
–	–	If you do not want to run the laptop off its battery, connect the laptop to the Power Box to establish a power supply. To do so, use the connection cable with the C14G plug.
<b>At the PD-TaD 62:</b>		
6	PoE cable	Connect the PoE cable: <ul style="list-style-type: none"> <li>▪ to the Power Box (<i>PD Detector</i> port) and</li> <li>▪ to PD-TaD 62 (<i>Power Box</i> port)</li> </ul> This is used for power supply and data transmission at the same time.
7	–	Connect the HF filter to the <i>HV IN</i> port. Further information: Chapter <i>Connecting the HF filter to the PD-TaD 62</i> (on page 55)

No.	Cable	Step
8	HV connection cable of the VLF HV generator	Connect the screen of the HV connection cable to the <i>Screen (HV Cable)</i> port.
9	See above	Connect the HV connection cable to the HF filter at the <i>HV IN</i> port. Further information: Chapter <i>Connecting the HF filter to the PD-TaD 62</i> (on page 55)
10	Short-circuit cable of PD-TaD 62	On the PD-TaD 62, remove the short-circuit cable from ports <i>HV IN</i> and <i>HV OUT</i> .
<b>At the far end of the test object:</b>		
11	–	Clean the cable termination of the phase to be tested carefully.
12	–	Attach the anti-corona hoods of the anti-corona protection device to the cable termination of the phase to be tested.
<b>At the near end of the test object:</b>		
13	–	Clean the cable termination of the phase to be tested carefully.
14	–	Attach the anti-corona hoods of the anti-corona protection device to the cable termination of the phase to be tested.
15	HV connection cable of PD-TaD 62	Connect the PD-TaD 62 ( <i>HV OUT</i> port) to the phase to be tested. To do this, select the shorter of the two supplied HV connection cables. Place the HV connection cable as far away as possible from the adjacent live and earthed parts.
<b>At the near and far end of the test object:</b>		
16	–	Remove the earthing and short-circuit connection from the phase to be tested. Make sure that the phases not being tested are earthed and short-circuited.

## 6.11 Connecting the system for parallel PD and dissipation factor measurement or Full MWT

### 6.11.1 Connecting the system to the frida TD VLF HV generator

#### Prerequisites

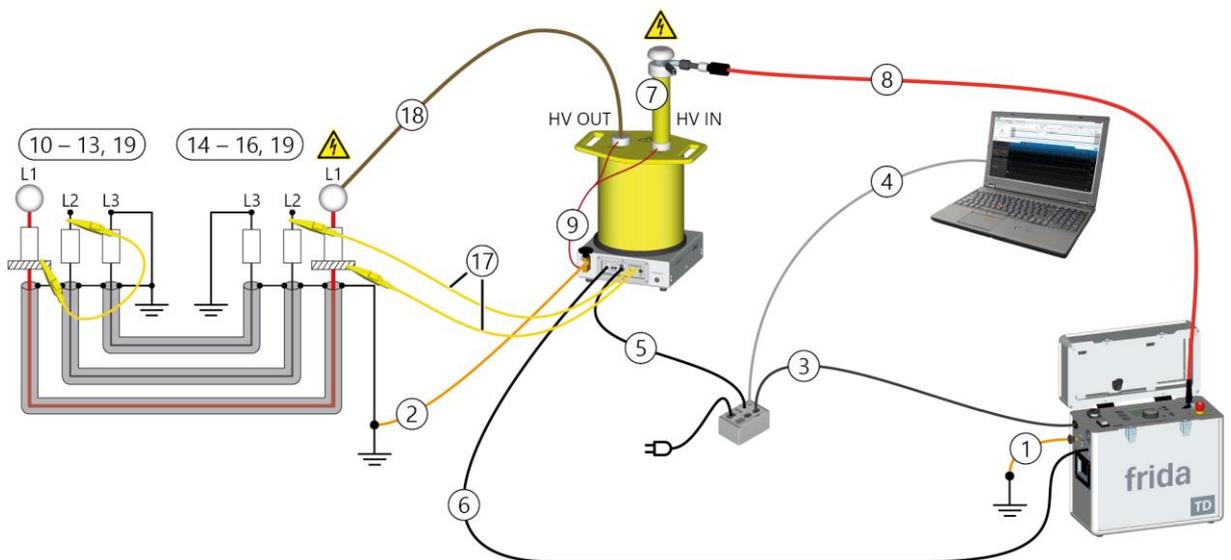
- The workplace must be de-energised, earthed and short-circuited.  
Further information: Chapter *Ensuring there is no voltage at the work place* (on page 33)
- The connection points and far end are prepared for the measurement tasks.  
Further information: Chapter *Preparing the test object terminals* (on page 33)
- HV coupling unit of PD-TaD and the cable terminations of the test object are clean and dry.  
Further information: Chapter *Cleaning the PD-TaD 62 and system components* (on page 99)

## Required equipment

- PD-TaD incl. connection cables
- HF filter
- PoE cable
- tan- $\delta$  cable
- VSE cable
- Protective rings (conductive hook and loop fastener tape)
- Laptop incl. Ethernet and USB cable
- Anti-corona protection

**Note:** All the necessary connection cables and connecting elements are included in the standard delivery.

## Procedure

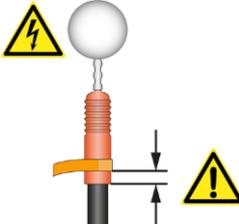
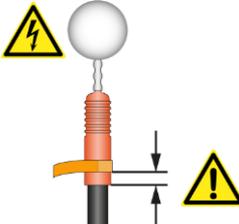


### Important:

- ▶ To keep the connection cable between the PD-TaD and the test object short, place the PD-TaD as close as possible to the test object.  
To avoid interference due to partial discharge at the connection point, make sure the PD-TaD is placed a sufficient distance away from metal and live parts.  
If the connection point is higher up, put the PD-TaD on a substructure. Further information: Chapter *Securing the PD-TaD 62 to the cross beam* (on page 33)
- ▶ Keep all connections as short as possible.
- ▶ Lay out the connection cables in such a way that no loops are created.

The numbering in the table gives the sequence of steps for connecting the test object.

No.	Cable	Step
1	Protective earthing cable of the VLF HV generator	Earth the VLF HV generator. Further information: User manual for the respective VLF HV generator
2	Protective earthing cable of PD-TaD 62 (flat copper strip)	Connect the PD-TaD 62 to the station earth (close to the test object cable screen). Further information: Chapter <i>Earth system</i> (on page 35)
<b>On the VLF HV generator:</b>		
–	–	If present, connect the external emergency off unit to the VLF HV generator (⚡ port).  If you are not using an external emergency off unit, ensure that a jumper plug is inserted into the ⚡ port on the VLF HV generator.
3	Connection cable C13 – C14G	Connect the VLF HV generator (mains supply) to the Power Box (port depends on the connection cable).
<b>On the laptop:</b>		
4	Ethernet cable	Use the supplied Ethernet cable to connect the laptop to the Power Box ( <i>Laptop</i> port).
–	–	If you do not want to run the laptop off its battery, connect the laptop to the Power Box to establish a power supply. To do so, use the connection cable with the C14G plug.
<b>At the PD-TaD 62:</b>		
5	PoE cable	Connect the PoE cable: <ul style="list-style-type: none"> <li>▪ to the Power Box (<i>PD Detector</i> port) and</li> <li>▪ to PD-TaD 62 (<i>Power Box</i> port)</li> </ul> This is used for power supply and data transmission at the same time.
6	tan $\delta$ cable	Connect the tan $\delta$ cable: <ul style="list-style-type: none"> <li>▪ to the VLF HV generator (<i>PD Detector</i> port) and</li> <li>▪ to PD-TaD 62 (<i>VLF Generator</i> port).</li> </ul>
7	–	Connect the HF filter to the <i>HV IN</i> port. Further information: Chapter <i>Connecting the HF filter to the PD-TaD 62</i> (on page 55)
8	HV connection cable of the VLF HV generator	Connect the HV connection cable to the HF filter at the <i>HV IN</i> port. Further information: Chapter <i>Connecting the HF filter to the PD-TaD 62</i> (on page 55)
9	Short-circuit cable of PD-TaD 62	On the PD-TaD 62, remove the short-circuit cable from ports <i>HV IN</i> and <i>HV OUT</i> .
<b>At the far end of the test object:</b>		
10	–	Clean the cable termination of the phase to be tested carefully.

No.	Cable	Step
11	–	Attach the anti-corona hoods of the anti-corona protection device to the cable termination of the phase to be tested.
12	Protective ring (conductive hook and loop fastener tape)	<p>Attach a protective ring to the cable termination of the phase to be tested – directly over the screen.</p> <p><b>Important:</b> Ensure that the protective ring does not come into contact with the screen.</p> 
13	VSE cables with 2 connection clips (yellow)	<p>Use the VSE cable to short-circuit the protective ring to a de-energised phase on which no measurement is to be taken.</p> <p>The de-energised phase is used as a return circuit for leakage currents from the far end.</p>
<b>At the near end of the test object:</b>		
14	–	Clean the cable termination of the phase to be tested carefully.
15	–	Attach the anti-corona hoods of the anti-corona protection device to the cable termination of the phase to be tested.
16	Protective ring (conductive hook and loop fastener tape)	<p>Attach a protective ring to the cable termination of the phase to be tested – directly over the screen.</p> <p><b>Important:</b> Ensure that the protective ring does not come into contact with the screen.</p> 
17	VSE cables with Ø 4 mm connector and a connection clip (yellow, 2x)	<p>Connect a VSE cable to each of the VSE ports on the PD-TaD 62.</p> <p>From the VSE ports connect a VSE cable to:</p> <ul style="list-style-type: none"> <li>▪ the protective ring of the phase to be tested.</li> <li>▪ the de-energised phase that is used as a return circuit for leakage currents from the far end.</li> </ul>
18	HV connection cable of PD-TaD 62	<p>Connect the PD-TaD 62 (HV OUT port) to the phase to be tested.</p> <p>To do this, select the shorter of the two supplied HV connection cables.</p> <p>Place the HV connection cable as far away as possible from the adjacent live and earthed parts.</p>

No.	Cable	Step
<b>At the near and far end of the test object:</b>		
19	–	<p>Remove the earthing and the short-circuit connection:</p> <ul style="list-style-type: none"> <li>▪ on the phase to be tested.</li> <li>▪ on the de-energised phase that is used as a return circuit for leakage currents from the far end</li> </ul> <p>Ensure that the phases that are not used for the measurement are earthed and shorted.</p>

### 6.11.2 Connecting the system to the viola TD VLF HV generator

#### Prerequisites

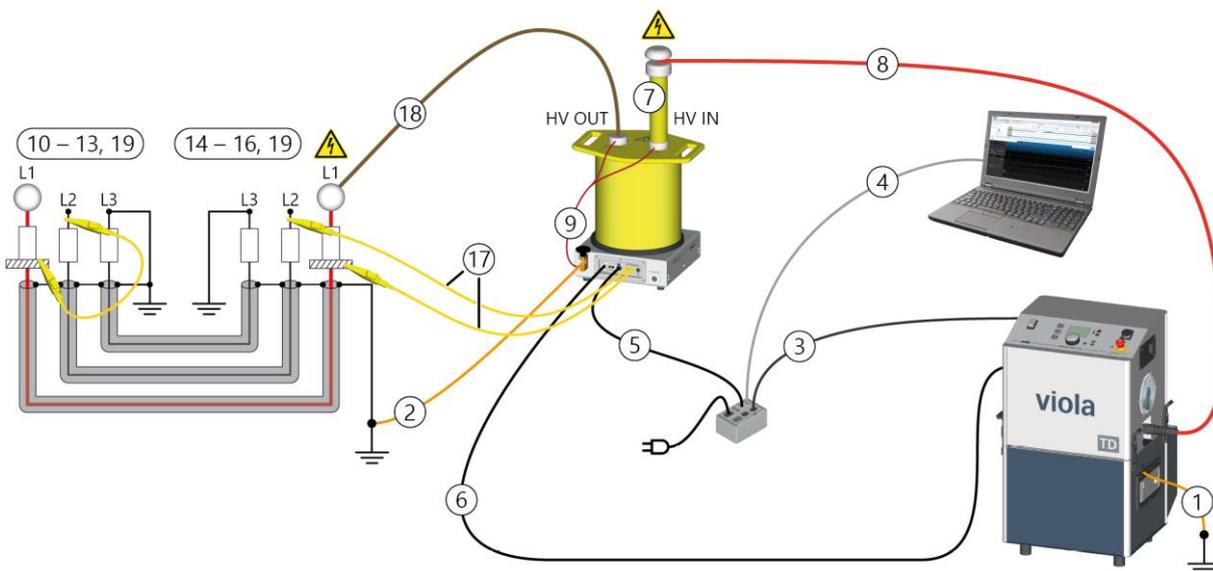
- The workplace must be de-energised, earthed and short-circuited.  
Further information: Chapter *Ensuring there is no voltage at the work place* (on page 33)
- The connection points and far end are prepared for the measurement tasks.  
Further information: Chapter *Preparing the test object terminals* (on page 33)
- HV coupling unit of PD-TaD and the cable terminations of the test object are clean and dry.  
Further information: Chapter *Cleaning the PD-TaD 62 and system components* (on page 99)

#### Required equipment

- PD-TaD incl. connection cables
- HF filter
- PoE cable
- tan- $\delta$  cable
- VSE cable
- Protective rings (conductive hook and loop fastener tape)
- Laptop incl. Ethernet and USB cable
- Anti-corona protection

**Note:** All the necessary connection cables and connecting elements are included in the standard delivery.

**Procedure**



**Important:**

- ▶ To keep the connection cable between the PD-TaD and the test object short, place the PD-TaD as close as possible to the test object.  
To avoid interference due to partial discharge at the connection point, make sure the PD-TaD is placed a sufficient distance away from metal and live parts.  
If the connection point is higher up, put the PD-TaD on a substructure. Further information: Chapter *Securing the PD-TaD 62 to the cross beam* (on page 33)
- ▶ Keep all connections as short as possible.
- ▶ Lay out the connection cables in such a way that no loops are created.

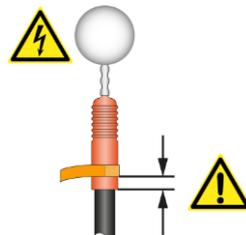
The numbering in the table gives the sequence of steps for connecting the test object.

No.	Cable	Step
1	Protective earthing cable of the VLF HV generator	Earth the VLF HV generator. Further information: User manual for the respective VLF HV generator
2	Protective earthing cable of PD-TaD 62 (flat copper strip)	Connect the PD-TaD 62 to the station earth (close to the test object cable screen). Further information: Chapter <i>Earth system</i> (on page 35)

**On the VLF HV generator:**

–	–	If present, connect the external emergency off unit to the VLF HV generator (⚡ port).  If you are not using an external emergency off unit, ensure that a jumper plug is inserted into the ⚡ port on the VLF HV generator.
3	Connection cable C13 – C14G	Connect the VLF HV generator (mains supply) to the Power Box (port depends on the connection cable).

No.	Cable	Step
<b>On the laptop:</b>		
4	Ethernet cable	Use the supplied Ethernet cable to connect the laptop to the Power Box ( <i>Laptop</i> port).
–	–	If you do not want to run the laptop off its battery, connect the laptop to the Power Box to establish a power supply. To do so, use the connection cable with the C14G plug.
<b>At the PD-TaD 62:</b>		
5	PoE cable	<p>Connect the PoE cable:</p> <ul style="list-style-type: none"> <li>▪ to the Power Box (<i>PD Detector</i> port) and</li> <li>▪ to PD-TaD 62 (<i>Power Box</i> port)</li> </ul> <p>This is used for power supply and data transmission at the same time.</p>
6	tan δ cable	<p>Connect the tan δ cable:</p> <ul style="list-style-type: none"> <li>▪ to the VLF HV generator (<i>PD Detector</i> port) and</li> <li>▪ to PD-TaD 62 (<i>VLF Generator</i> port).</li> </ul>
7	–	<p>Connect the HF filter to the <i>HV IN</i> port.</p> <p>Further information: Chapter <i>Connecting the HF filter to the PD-TaD 62</i> (on page 55)</p>
8	HV connection cable of the VLF HV generator	<p>Connect the HV connection cable to the HF filter at the <i>HV IN</i> port.</p> <p>Further information: Chapter <i>Connecting the HF filter to the PD-TaD 62</i> (on page 55)</p>
9	Short-circuit cable of PD-TaD 62	On the PD-TaD 62, remove the short-circuit cable from ports <i>HV IN</i> and <i>HV OUT</i> .
<b>At the far end of the test object:</b>		
10	–	Clean the cable termination of the phase to be tested carefully.
11	–	Attach the anti-corona hoods of the anti-corona protection device to the cable termination of the phase to be tested.
12	Protective ring (conductive hook and loop fastener tape)	<p>Attach a protective ring to the cable termination of the phase to be tested – directly over the screen.</p> <p><b>Important:</b> Ensure that the protective ring does not come into contact with the screen.</p>

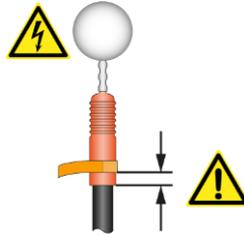


No.	Cable	Step
13	VSE cables with 2 connection clips (yellow)	Use the VSE cable to short-circuit the protective ring to a de-energised phase on which no measurement is to be taken.  The de-energised phase is used as a return circuit for leakage currents from the far end.

**At the near end of the test object:**

14	–	Clean the cable termination of the phase to be tested carefully.
15	–	Attach the anti-corona hoods of the anti-corona protection device to the cable termination of the phase to be tested.

16	Protective ring (conductive hook and loop fastener tape)	Attach a protective ring to the cable termination of the phase to be tested – directly over the screen.  <b>Important:</b> Ensure that the protective ring does not come into contact with the screen.
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17	VSE cables with Ø 4 mm connector and a connection clip (yellow, 2x)	Connect a VSE cable to each of the VSE ports on the PD-TaD 62.  From the VSE ports connect a VSE cable to: <ul style="list-style-type: none"> <li>▪ the protective ring of the phase to be tested.</li> <li>▪ the de-energised phase that is used as a return circuit for leakage currents from the far end.</li> </ul>
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18	HV connection cable of PD-TaD 62	Connect the PD-TaD 62 (HV OUT port) to the phase to be tested.  To do this, select the shorter of the two supplied HV connection cables.  Place the HV connection cable as far away as possible from the adjacent live and earthed parts.
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**At the near and far end of the test object:**

19	–	Remove the earthing and the short-circuit connection: <ul style="list-style-type: none"> <li>▪ on the phase to be tested.</li> <li>▪ on the de-energised phase that is used as a return circuit for leakage currents from the far end</li> </ul> Ensure that the phases that are not used for the measurement are earthed and shorted.
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### 6.11.3 Connecting the system using an HV connection cable with operational earthing (option)

#### Prerequisites

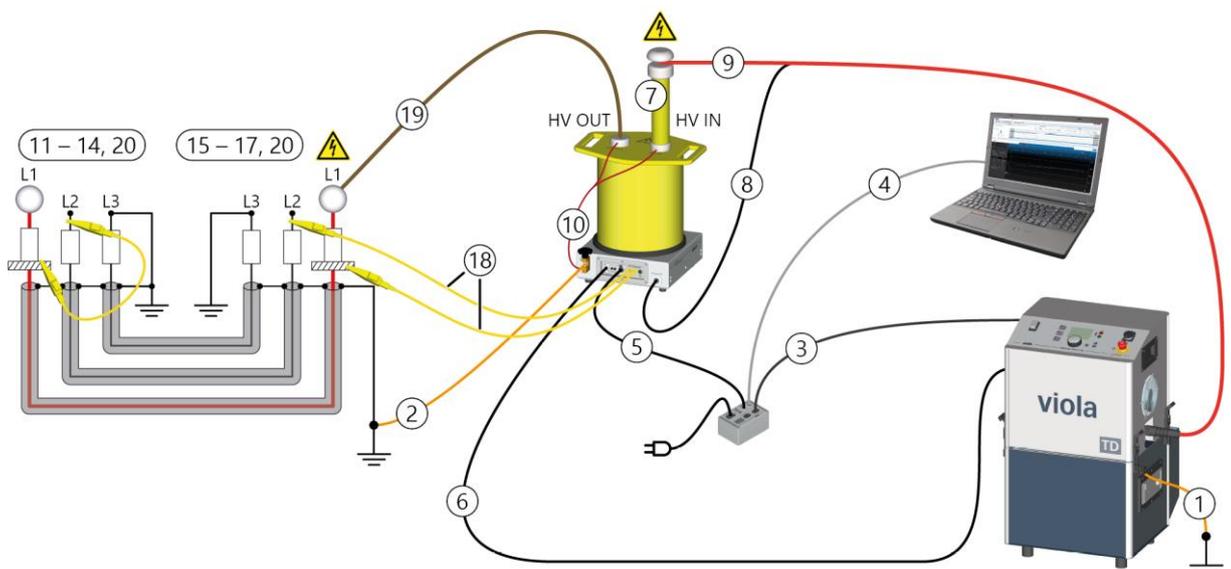
- The workplace must be de-energised, earthed and short-circuited.  
Further information: Chapter *Ensuring there is no voltage at the work place* (on page 33)
- The connection points and far end are prepared for the measurement tasks.  
Further information: Chapter *Preparing the test object terminals* (on page 33)
- HV coupling unit of PD-TaD and the cable terminations of the test object are clean and dry.  
Further information: Chapter *Cleaning the PD-TaD 62 and system components* (on page 99)

#### Required equipment

- PD-TaD incl. connection cables
- HF filter
- PoE cable
- tan- $\delta$  cable
- VSE cable
- Protective rings (conductive hook and loop fastener tape)
- Laptop incl. Ethernet and USB cable
- Anti-corona protection

**Note:**All the necessary connection cables and connecting elements are included in the standard delivery.

#### Procedure



**Important:**

- ▶ To keep the connection cable between the PD-TaD and the test object short, place the PD-TaD as close as possible to the test object.

To avoid interference due to partial discharge at the connection point, make sure the PD-TaD is placed a sufficient distance away from metal and live parts.

If the connection point is higher up, put the PD-TaD on a substructure. Further information: Chapter *Securing the PD-TaD 62 to the cross beam* (on page 33)

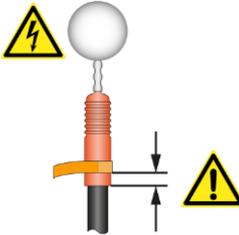
- ▶ Keep all connections as short as possible.
- ▶ Lay out the connection cables in such a way that no loops are created.

The numbering in the table gives the sequence of steps for connecting the test object.

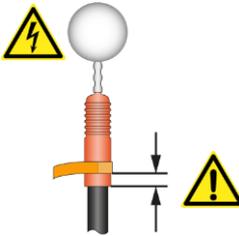
No.	Cable	Step
1	Protective earthing cable of the VLF HV generator	Earth the VLF HV generator. Further information: User manual for the respective VLF HV generator
2	Protective earthing cable of PD-TaD 62 (flat copper strip)	Connect the PD-TaD 62 to the station earth (close to the test object cable screen). Further information: Chapter <i>Earth system</i> (on page 35)
<b>On the VLF HV generator:</b>		
–	–	If present, connect the external emergency off unit to the VLF HV generator (⚡ port).  If you are not using an external emergency off unit, ensure that a jumper plug is inserted into the ⚡ port on the VLF HV generator.
3	Connection cable C13 – C14G	Connect the VLF HV generator (mains supply) to the Power Box (port depends on the connection cable).
<b>On the laptop:</b>		
4	Ethernet cable	Use the supplied Ethernet cable to connect the laptop to the Power Box ( <i>Laptop</i> port).
–	–	If you do not want to run the laptop off its battery, connect the laptop to the Power Box to establish a power supply. To do so, use the connection cable with the C14G plug.
<b>At the PD-TaD 62:</b>		
5	PoE cable	Connect the PoE cable: <ul style="list-style-type: none"> <li>▪ to the Power Box (<i>PD Detector</i> port) and</li> <li>▪ to PD-TaD 62 (<i>Power Box</i> port)</li> </ul> This is used for power supply and data transmission at the same time.
6	tan δ cable	Connect the tan δ cable: <ul style="list-style-type: none"> <li>▪ to the VLF HV generator (<i>PD Detector</i> port) and</li> <li>▪ to PD-TaD 62 (<i>VLF Generator</i> port).</li> </ul>
7	–	Connect the HF filter to the <i>HV IN</i> port.  Further information: Chapter <i>Connecting the HF filter to the PD-TaD 62</i> (on page 55)

No.	Cable	Step
8	HV connection cable of the VLF HV generator	Connect the screen of the HV connection cable to the <i>Screen (HV Cable)</i> port.
9	See above	Connect the HV connection cable to the HF filter at the <i>HV IN</i> port. Further information: Chapter <i>Connecting the HF filter to the PD-TaD 62</i> (on page 55)
10	Short-circuit cable of PD-TaD 62	On the PD-TaD 62, remove the short-circuit cable from ports <i>HV IN</i> and <i>HV OUT</i> .

**At the far end of the test object:**

11	–	Clean the cable termination of the phase to be tested carefully.
12	–	Attach the anti-corona hoods of the anti-corona protection device to the cable termination of the phase to be tested.
13	Protective ring (conductive hook and loop fastener tape)	Attach a protective ring to the cable termination of the phase to be tested – directly over the screen. <b>Important:</b> Ensure that the protective ring does not come into contact with the screen.
		
14	VSE cables with 2 connection clips (yellow)	Use the VSE cable to short-circuit the protective ring to a de-energised phase on which no measurement is to be taken. The de-energised phase is used as a return circuit for leakage currents from the far end.

**At the near end of the test object:**

15	–	Clean the cable termination of the phase to be tested carefully.
16	–	Attach the anti-corona hoods of the anti-corona protection device to the cable termination of the phase to be tested.
17	Protective ring (conductive hook and loop fastener tape)	Attach a protective ring to the cable termination of the phase to be tested – directly over the screen. <b>Important:</b> Ensure that the protective ring does not come into contact with the screen.
		

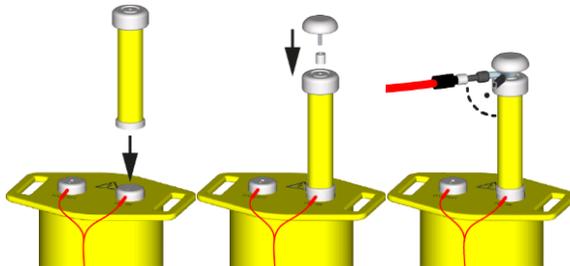
No.	Cable	Step
18	VSE cables with Ø 4 mm connector and a connection clip (yellow, 2x)	<p>Connect a VSE cable to each of the <i>VSE</i> ports on the PD-TaD 62.</p> <p>From the <i>VSE</i> ports connect a VSE cable to:</p> <ul style="list-style-type: none"> <li>▪ the protective ring of the phase to be tested.</li> <li>▪ the de-energised phase that is used as a return circuit for leakage currents from the far end.</li> </ul>
19	HV connection cable of PD-TaD 62	<p>Connect the PD-TaD 62 (<i>HV OUT</i> port) to the phase to be tested.</p> <p>To do this, select the shorter of the two supplied HV connection cables.</p> <p>Place the HV connection cable as far away as possible from the adjacent live and earthed parts.</p>
<b>At the near and far end of the test object:</b>		
20	–	<p>Remove the earthing and the short-circuit connection:</p> <ul style="list-style-type: none"> <li>▪ on the phase to be tested.</li> <li>▪ on the de-energised phase that is used as a return circuit for leakage currents from the far end</li> </ul> <p>Ensure that the phases that are not used for the measurement are earthed and shorted.</p>

## 6.12 Connecting the HF filter to the PD-TaD 62

The HF filter is used to minimise external influences on the measurement results. We recommend using the HF filter for all PD tests.

### 6.12.1 Connection without a connection piece

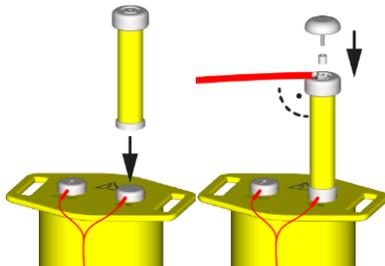
#### frida / frida TD



1. Screw the HF filter onto the *HV IN* connection of the PD-TaD 62.
2. With a threaded bolt and distance piece, screw an anti-corona hood onto the HF filter.
3. Connect the HV connection cable of the frida / frida TD to the distance piece on the HF filter.

Ensure that the HV connection cable leads away at a right angle to the HF filter.

#### viola / viola TD

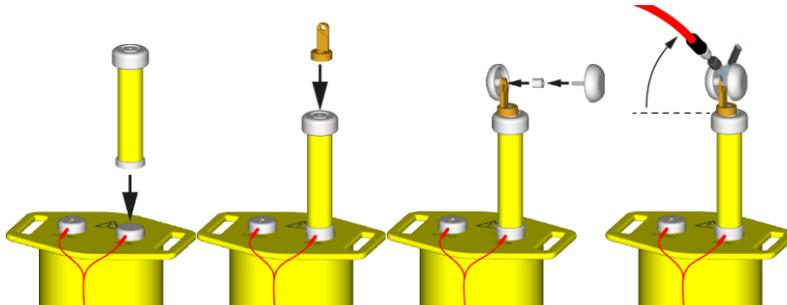


1. Screw the HF filter onto the *HV IN* connection of the PD-TaD 62.
2. Remove the HV connection terminal from the HV connection cable on the viola / viola TD.
3. With a threaded bolt and distance piece, screw the cable lug of the HV connection cable and an anti-corona hood onto the HF filter.

Ensure that the HV connection cable leads away at a right angle to the HF filter.

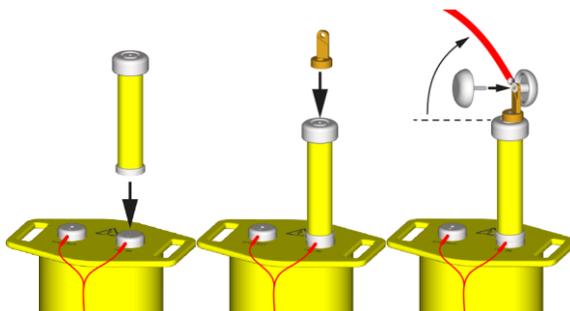
## 6.12.2 Connection with a connection piece

### frida / frida TD



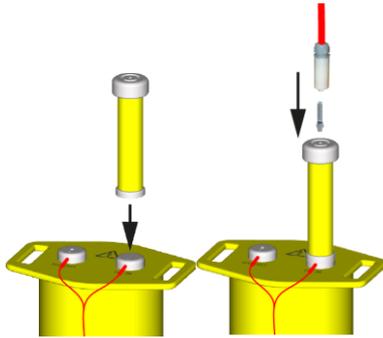
1. Screw the HF filter onto the *HV IN* connection of the PD-TaD 62.
2. Fit the connection piece on the HF filter and screw it on tight.
3. Screw the two anti-corona hoods together with a distance piece onto the connection piece.
4. Connect the HV connection cable of the frida / frida TD directly to the connection piece. Ensure that the HV connection cable leads upwards at an angle of at least 30° to the HF filter.

### viola / viola TD



1. Screw the HF filter onto the *HV IN* connection of the PD-TaD 62.
2. Fit the connection piece on the HF filter and screw it on tight.
3. Remove the HV connection terminal from the HV connection cable on the viola / viola TD.
4. Attach the cable lug of the HV connection cable and an anti-corona hood to the connection piece.  
The connection piece has a groove to guide the cable lug so that the HV connection cable is lead upwards at an angle of at least 30° to the HF filter.
5. Attach a second anti-corona hood and screw it on tight.

### 6.12.3 Connection with an HV connection cable with MC plug



1. Screw the HF filter onto the *HV IN* connection of the PD-TaD 62.
2. Screw the threaded pin (included in the standard delivery) to the HF filter.
3. Insert the MC plug-and-socket connection of the HV connection cable onto the threaded pin and screw it on tight.

### 6.13 Connecting the system 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. Check whether the PD-TaD 62, VLF HV generator and, if the case may be, the laptop are connected to the Power Box to receive a power supply.
5. Connect the Power Box to the mains voltage.  
The green LED on the Power Box and the LEDs *PWR* and *PD* on the PD-TaD 62 light up.

## 6.14 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.

## 7 PREPARING A MEASUREMENT

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### 7.1 Switching on the system and starting the BAUR software

1. Switch on the VLF HV generator with the main switch.  
The VLF HV generator switches to the *Ready for operation* operating state.
2. The PD measurement unit of the PD-TaD 62 will be switched on automatically if you supply it with voltage via the Power Box. Wait until all the LEDs on the PD-TaD 62 display the ready for operation status.
  - *PWR* – green
  - *PD* – orange



3. Start the BAUR software 4 on the laptop.  
The Dashboard opens.



- ▶ For information on performing the diagnostics methods, refer to the user manuals for the BAUR software 4.
- 

### 7.2 Selecting a cable route and entering cable data



- ▶ For information on selecting or entering cable data, refer to the user manual for the BAUR software 4.
-

## 8 PARTIAL DISCHARGE MEASUREMENT

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- 
- ▶ For information on calibrating the PD test circuit and performing PD testing, refer to the user manual for the BAUR software 4.
  - ▶ For information on operating the VLF HV generator, refer to the user manual for the respective VLF HV generator.
-

## 9 PARALLEL PARTIAL DISCHARGE AND DISSIPATION FACTOR MEASUREMENT

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During a parallel PD and dissipation factor measurement, the dissipation factor measurement steps on the VLF HV generator and the PD measurement steps are configured and controlled via the BAUR system software.

The dissipation factor measurement is carried out on the basis of templates. A template offers the following information:

- Program: Parameters for carrying out the diagnostic testing
- Evaluation criteria

You have the option to configure templates for different diagnostics tasks and save them for further use.

When creating templates you can combine existing programs and evaluations in any way or create new programs and evaluations. A template in accordance with IEEE 400.2 is also available.

These instructions describe how to set up a new template based on an existing program and an existing evaluation, and on a template in accordance with IEEE 400.2. Further information on the templates and how to create programs and evaluations can be found in the user manual for the VLF HV generator in question.

### 9.1 Creating templates for dissipation factor measurements on the VLF HV generator

#### 9.1.1 Create new template for dissipation factor measurement

##### Where you can create a template

You can create templates for dissipation factor measurements on the VLF HV generator (see description below).

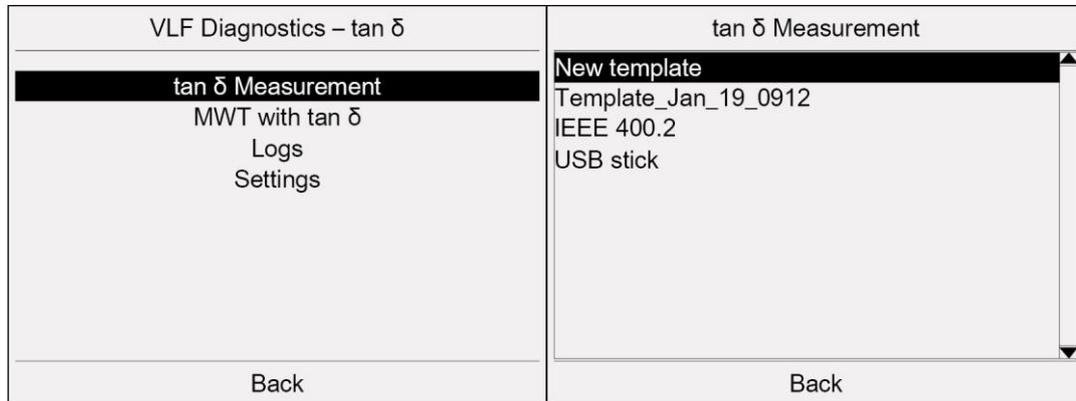
##### How you can create a new template

You can create a new template in different ways:

- completely new from scratch  
Further information: Chapter *Creating a template newly from scratch* (on page 62)
- on the basis of a template that you have created at an earlier point in time  
For the new template a new program and a new evaluation can be created or already existing programs and evaluations can be selected and, if necessary, adapted.

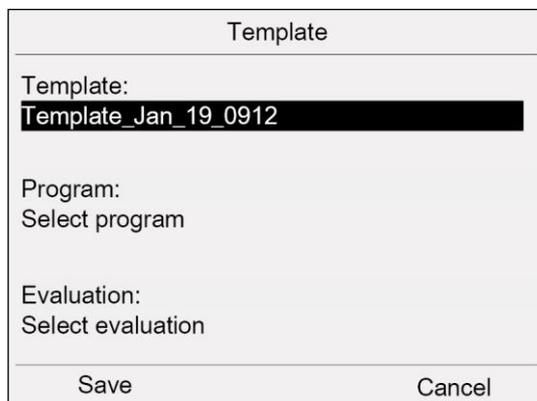
### Creating a template newly from scratch

1. In the main menu, select the menu item **VLF Diagnostics –  $\tan \delta$**  and press the rotary knob to confirm.
2. In the menu **VLF Diagnostics –  $\tan \delta$**  select the menu item  **$\tan \delta$  Measurement** and press the rotary knob to confirm.



3. In the menu  **$\tan \delta$  Measurement** select the menu item **New template** and press the rotary knob to confirm.

The window **Template** for setting the parameters of the new template opens.



### Entering a name

The device proposes a name consisting of the word **Template**, the date (month and day) and the time.

1. 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.
2. 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.

### Selecting a program

You have 3 options for selecting a program:

- select existing program (see the description below)
- change and select existing program
- create new program



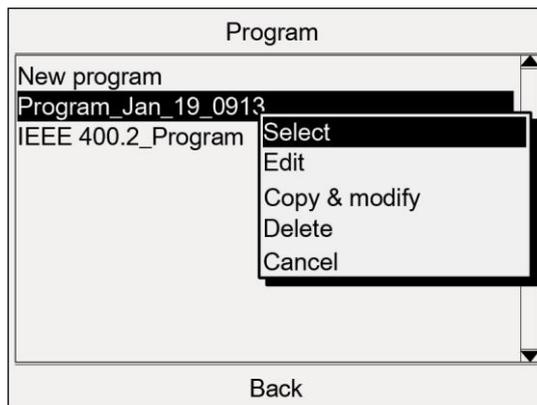

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Further information on creating new programs and changing existing programs can be found in the user manual for the VLF HV generator in question.

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### Select existing program

1. In the **Template** window, select the input field for the program and press the rotary knob to confirm.
2. In the **Program** menu, select a program and press the rotary knob to confirm.



If you wish to (re-)use a program according to IEEE 400.2, select it, select the **Copy & modify** menu item in the context menu and, if required, adapt the program.

3. In the context menu, select the **Select** menu item.  
The program is included in the current template.

### Selecting an evaluation

You have 3 options for selecting an evaluation:

- select existing evaluation (see the following description)
- change and select existing evaluation
- create new evaluation



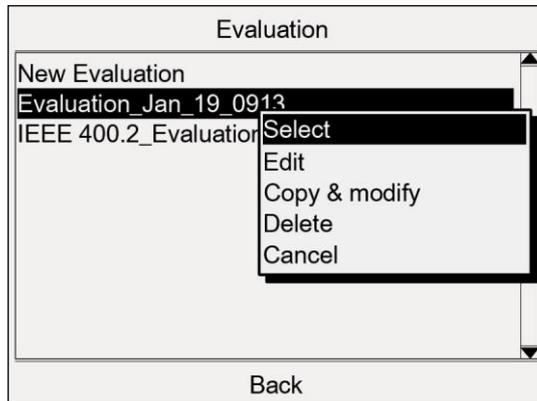

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Further information on creating new evaluations and changing existing evaluations can be found in the user manual for the VLF HV generator in question.

---

### Select existing evaluation

1. In the **Template** menu, select the input field for the evaluation and press the rotary knob to confirm.



2. In the **Evaluation** menu, select an evaluation and press the rotary knob to confirm.  
If you wish to (re-)use an evaluation in accordance with IEEE 400.2, select it, select the **Copy & modify** menu item in the context menu and, if required, adapt the evaluation.
3. In the context menu, select the **Select** menu item.  
The evaluation is included in the current template.
4. To save the template, select the **Save** menu item.

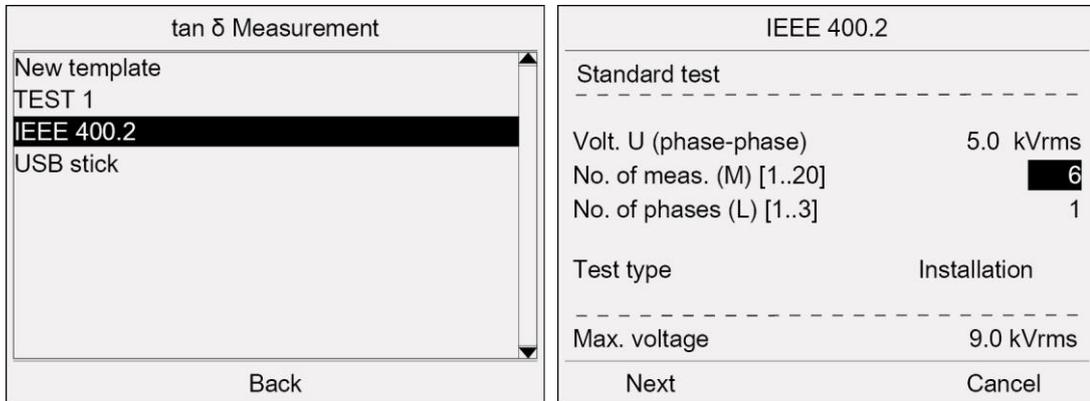
### 9.1.2 Template according to IEEE 400.2: Set parameters

The parameters of this template correspond to the valid draft of the new IEEE 400.2. The exact details about the implemented test voltages and evaluation criteria are given in the frida TD or viola TD user manuals.

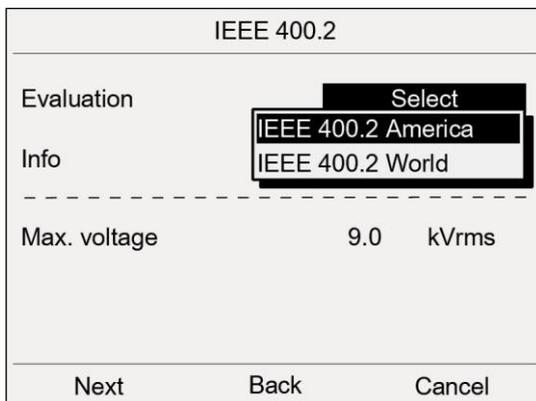
Test types according to IEEE 400.2:

- **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.

1. In the main menu, select the menu item **VLF Diagnostics – tan δ** and press the rotary knob to confirm.
2. In the **VLF Diagnostics – tan δ** menu, select the menu item **tan δ Measurement** and press the rotary knob to confirm.
3. Select the **IEEE 400.2** menu item and press the rotary knob to confirm.  
The **IEEE 400.2** window opens.



4. Set the following parameters:
  - Voltage U (phase – phase)  
Setting range: In accordance with the specifications of the draft IEEE 400.2 (the max. test voltage according to the respective VLF HV generator)
  - Number of measurements per voltage step (1 - 20)
  - Number of phases (1 - 3)
  - Test type  
The following test types are available: Installation, acceptance inspection (commissioning) and maintenance.  
The max. voltage is automatically determined and displayed after voltage U (phase – phase) has been entered.
5. Select the **Next** menu item and press the rotary knob to confirm.  
The dialog for selecting the evaluation opens. The cursor is in the input field for the evaluation.



6. Press the rotary knob in order to select an evaluation.
7. In the context menu, select whether you wish to use evaluation criteria for America or for other countries (World) according to IEEE 400.2, and press the rotary knob to confirm.

8. In the next context menu, select which insulation the test object has and press the rotary knob to confirm. You have the following options:
  - Evaluation for XLPE cable
  - Evaluation for EPR cables
  - Evaluation for PILC cables
9. Select the **Next** menu item and press the rotary knob to confirm.  
The measurement mode window for starting the measurement opens.




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Further information on the implemented test voltages and the set threshold values in accordance with IEEE 400.2 can be found in the user manual for the VLF HV generator in question.

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## 9.2 Performing parallel PD and dissipation factor measurements



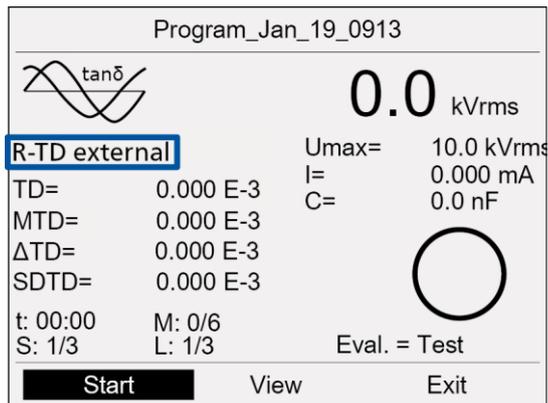
- 
- ▶ For information on calibrating the PD test circuit and performing PD testing, refer to the user manual for the BAUR software 4.
  - ▶ For information on operating the VLF HV generator, refer to the user manual for the respective VLF HV generator.
- 

### Prerequisites

- The system is connected correctly.  
Further information: Chapter *Connecting the system* (on page 31)
- The test area is secured.  
Further information: Chapter *Securing the test area* (on page 58)

### Procedure

1. Calibrate the PD test circuit.  
Further information: User manual for the BAUR software 4
2. In the main menu of the VLF HV generator, select the menu item **VLF Diagnostics –  $\tan \delta > \tan \delta$  Measurement**.
3. Create a template for the dissipation factor measurement on the VLF HV generator.  
Further information: Chapter *Creating templates for dissipation factor measurements on the VLF HV generator* (on page 61)  
The measurement mode window opens. The VLF HV generator automatically recognises if the PD-TaD 62 is connected. When the PD-TaD 62 is connected, **R-TD external** will appear in the measurement mode window.



This means that:

- the PD-TaD 62 has been recognised by the VLF HV generator,
  - the dissipation factor measurement is measured using the external resistance of the PD-TaD 62.
4. If **R-TD external** is not displayed in the measurement mode window:
- a. Check the ports on the VLF HV generator (port *PD Detector*) and the PD-TaD 62 (port *VLF Generator*).
  - b. If the ports are OK, contact your nearest BAUR representative (<http://www.baur.eu/baur-worldwide>).

**Note:** If the PD-TaD 62 is connected, but not recognised by the VLF HV generator, the measurement results will be highly distorted.

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

If only one phase is specified in the program for the dissipation factor measurement template used, a prompt for high voltage release appears. This will take you to the next step.

#### Measurement on several phases

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

- a. Turn the rotary knob to select a phase, and then press the rotary knob to confirm. You have the option to repeat the measurement on a phase.  
The prompt for connecting the selected phase appears on the display.
  - b. If the selected phase has not yet been connected, it must be connected.  
Further information: Chapter *Connecting the system for parallel PD and dissipation factor measurement or Full MWT* (on page 43)
  - c. Select the menu item **Next**.  
The prompt for high voltage release appears on the display.
6. Hold down the  key for at least one second.  
The VLF HV generator switches to the *Ready for operation* operating state. 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 the high voltage release and return to the measurement mode window, press the rotary knob.
7. Press the  key whilst the red indicator light is flashing.  
The VLF HV generator switches to the *In operation* operating state. The red indicator light comes on.

The VLF HV generator 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....**

**Note:** Information on adapting the frequency and voltage adaptation according to the load capacitance of the test object is given in user manual of the respective VLF HV generator.

The dissipation factor measurement is started after the load determination. The menu item **Start** changes to **Stop**.

The following message is displayed in the display of the VLF HV generator: **Start PD measurement on PD-TaD.**

8. Confirm the message on the VLF HV generator with **Yes** and start the PD testing in the BAUR system software on the laptop.

Further information: User manual for the BAUR software 4

The dissipation factor measurement ends automatically after the stipulated measuring time for each voltage step. However, the applied voltage remains available for the PD testing.

The following message is displayed in the display of the VLF HV generator: **Select <Yes> to continue the tan  $\delta$  measurement.**

9. To continue the dissipation factor measurement at the next voltage step, confirm the message by pressing **Yes**.

The following message is displayed in the display of the VLF HV generator: **Start PD measurement on PD-TaD.**

10. Repeat steps 7 and 8 for further voltage steps.

The measurement ends automatically after the last voltage step or after reaching one of the preset threshold values. After the measurement, the high voltage is reduced and the VLF HV generator is discharged internally. This is shown by the message **Discharge process.**

When the discharge process is completed, the VLF HV generator changes to the *Ready for operation* operating state. The green indicator light goes out, the red indicator light comes on. The VLF HV generator 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.

11. 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.

Further information: Chapter *Discharging and earthing the test object* (on page 93)

12. Discharge and earth the *HV IN* and *HV OUT* ports of the PD-TaD 62 using the discharge rod of the VLF HV generator (standard delivery of VLF HV generator).

13. To stop the measurement, select the menu item **Finish** and press the rotary knob to confirm.

A prompt appears asking if you want to save the log for the measurement carried out on the VLF HV generator.

14. Confirm the prompt by pressing **Yes**. You can find further information on saving the log in the chapter *Saving the log of the measurements carried out on the VLF HV generator* (on page 86).

In order to remain in the measurement mode window, select the **Cancel** button.

Information on the evaluation of measurement results: Chapter *Evaluating a parallel measurement or Full MWT* (on page 86)

### 9.3 Displaying the measurement results during the measurement on the VLF HV generator

During the measurement the current measured values are displayed continuously and evaluated in accordance with the selected evaluation criteria.

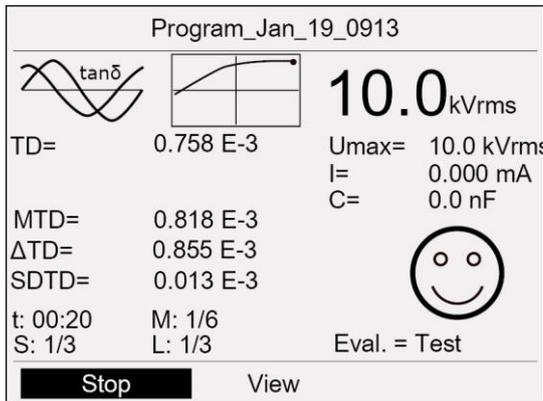
Further information: Chapter *Symbols on the display of the VLF HV generator* (on page 30)

The following views are available to you: Main view, detail view and diagram  $\tan \delta$  versus voltage

- ▶ To toggle between views, select the **View** menu item in the lower menu bar and press the rotary knob to confirm.

#### Main view

The main view is the measurement mode window in which all measured values are continuously displayed.

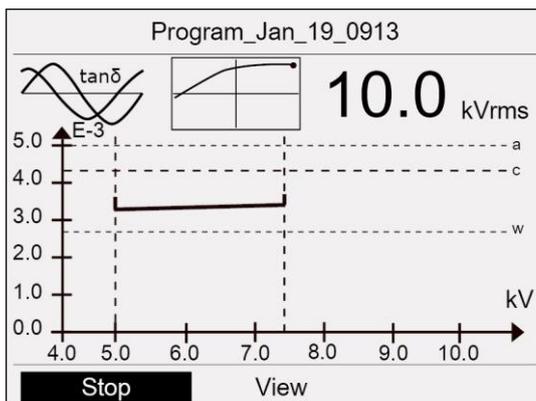


#### Diagram $\tan \delta$ versus voltage

In the diagram the determined average  $\tan \delta$  values (MTD) per phase are shown in dependence of the voltage.

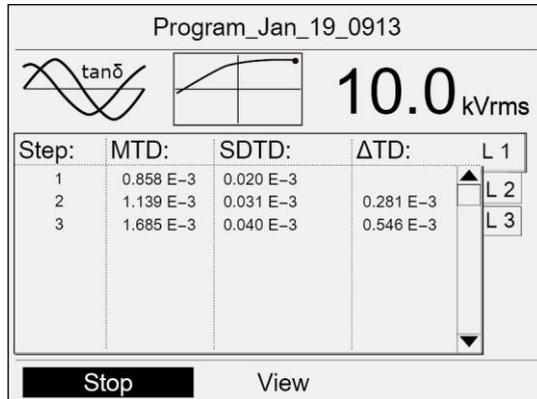
The threshold values for  $\tan d$  are displayed by dotted lines as follows:

- a - Alarm level *Cancel*
- c - Alarm level *High risk*
- w - Alarm level *Risk*



### Detail view

The detail view shows a tabular summary of the following values per phase and per voltage step: The mean value of the dissipation factor, stability of the dissipation factor (standard deviation) and change of the dissipation factor between successive steps.



- ▶ In order to display all measured values for a step or time interval, select a step in the detail view and press the rotary knob to confirm.

For navigating between the measurement results for different phases, turn the rotary knob.

## 9.4 Measuring another phase

**DANGER**

**Dangerous voltage at test object and other live plant parts.**

Danger to life or risk of injury due to electric shock.

- ▶ Before touching the test object, discharge, earth and short it: 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.

The measurement ends after the preset time or after reaching one of the preset threshold values. After the measurement, the high voltage is reduced and the device is discharged internally. This is shown by the message **Discharge process**.

When the discharge process is complete, the device goes over into the *Ready for operation* operating state. The green indicator light goes out, the red 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.

Further information: Chapter *Discharging and earthing the test object* (on page 93)

1. Discharge and earth the *HV IN* and *HV OUT* ports of the HV coupling unit with the discharge rod of the VLF HV generator (standard delivery of VLF HV generator).
2. Disconnect the connected phase.
3. Connect the required phase.

Further information: Chapter *Connecting the system for parallel PD and dissipation factor measurement or Full MWT* (on page 43)

4. In the lower menu bar of the VLF HV generator menu, select the menu item **Start**.

Further information: Chapter *Performing parallel PD and dissipation factor measurements* (on page 66)

## 10 FULL MWT

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During a Full MWT measurement, the MWT measurement steps on the VLF HV generator and the PD measurement steps are configured and controlled via the BAUR system software.

An MWT measurement is carried out on the basis of templates. A template offers the following information:

- Program: Parameters for carrying out the diagnostic testing
- Evaluation criteria

You have the option to configure templates for different diagnostics tasks and save them for further use.

When creating templates you can combine existing programs and evaluations in any way or create new programs and evaluations. A template in accordance with IEEE 400.2 is also available.

These instructions describe how to set up a new template in accordance with IEEE 400.2 and with an existing program and an existing evaluation. Further information on the templates and how to create programs and evaluations is given in the user manual of the respective VLF HV generator.

### 10.1 Creating templates for MWT measurements on the VLF HV generator

#### 10.1.1 Create a new MWT template

You can create a new template in different ways:

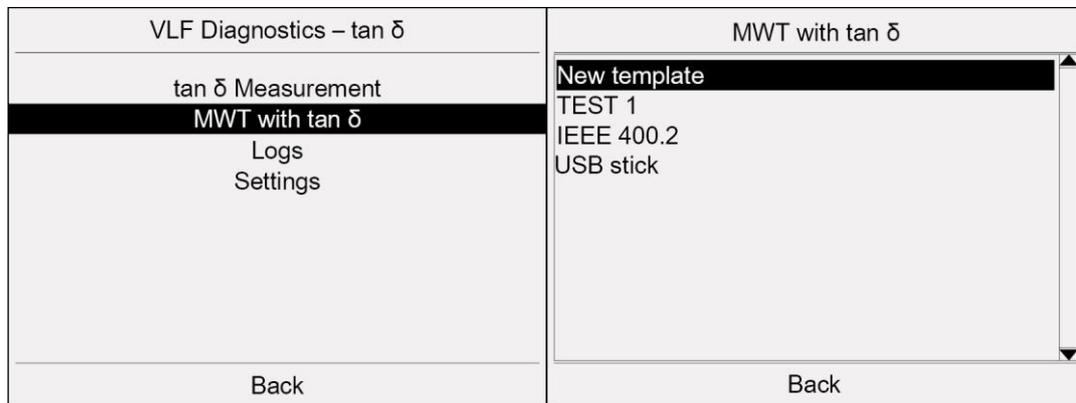
- completely new from scratch
- on the basis of a MWT template that you have created at an earlier point in time

For the new template a new program and a new evaluation can be created or already existing programs and evaluations can be selected and, if necessary, adapted.

**Note:** You can only create MWT templates on the VLF HV generator.

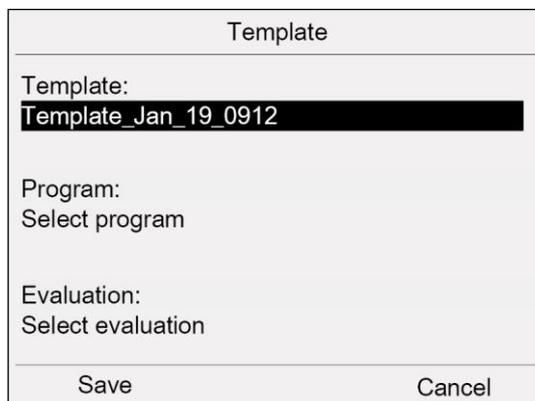
## Creating a MWT template newly from scratch

1. In the main menu, select the menu item **VLF Diagnostics –  $\tan \delta$**  and press the rotary knob to confirm.
2. In the menu **VLF Diagnostics –  $\tan \delta$**  select the menu item **MWT with  $\tan \delta$**  and press the rotary knob to confirm.



3. In the menu **MWT with  $\tan \delta$**  select the menu item **New template** and press the rotary knob to confirm.

The window **Template** for setting the template parameters opens.



## Entering a name

The device proposes a name consisting of the word **Template**, the date (month and day) and the time.

1. 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.

2. 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.

## Select program

You have 3 options for selecting a program:

- select existing program (see the description below)
- change and select existing program
- create new program



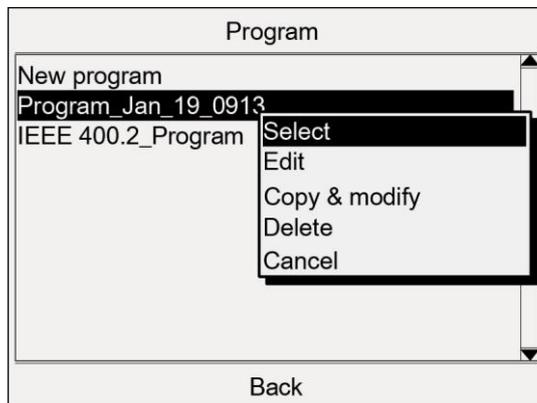

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Further information on creating new programs and changing existing programs can be found in the user manual for the VLF HV generator in question.

---

### Select existing program

1. In the **Template** window, select the input field for the program and press the rotary knob to confirm.
2. In the **Program** menu, select a program and press the rotary knob to confirm.



If you wish to (re-)use a program according to IEEE 400.2, select it, select the **Copy & modify** menu item in the context menu and, if required, adapt the program.

3. In the context menu, select the **Select** menu item.  
The program is included in the current template.

### Selecting an evaluation

You have 3 options for selecting an evaluation:

- select existing evaluation (see the following description)
- edit and select existing evaluation
- create new evaluation



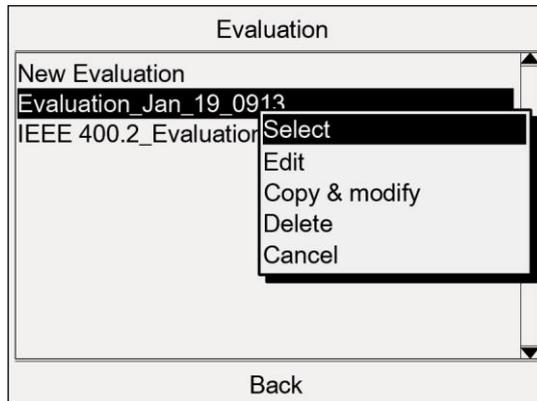

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Further information on creating new evaluations and changing existing evaluations can be found in the user manual for the VLF HV generator in question.

---

### Select existing evaluation

1. In the **Template** menu, select the input field for the evaluation and press the rotary knob to confirm.



2. In the **Evaluation** menu, select an evaluation and press the rotary knob to confirm.  
If you wish to (re-)use an evaluation in accordance with IEEE 400.2, select it, select the **Copy & modify** menu item in the context menu and, if required, adapt the evaluation.
3. In the context menu, select the **Select** menu item.  
The evaluation is included in the current template.
4. To save the template, select the **Save** menu item.

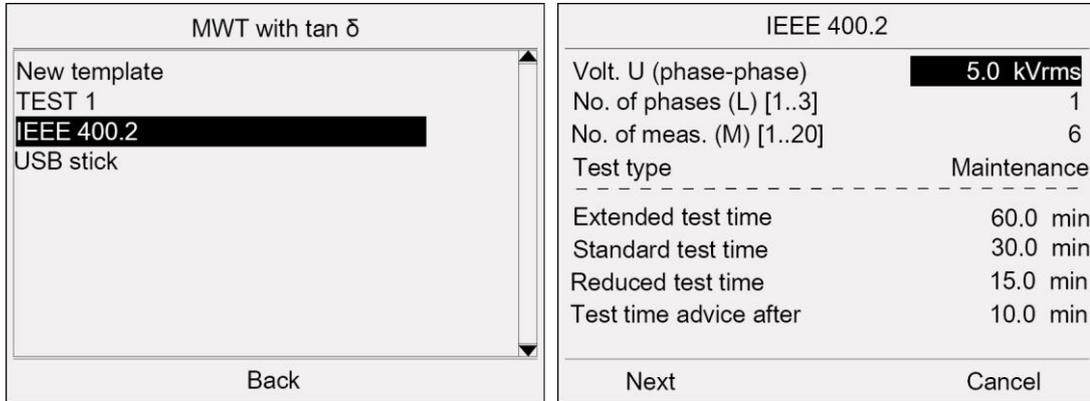
### 10.1.2 MWT template according to IEEE 400.2: Set parameters

The parameters of this template correspond to the valid draft of the new IEEE 400.2. The exact details about the implemented test voltages and evaluation criteria are given in the frida TD or viola TD user manuals.

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.

1. In the main menu, select the menu item **VLF Diagnostics – tan δ** and press the rotary knob to confirm.
2. In the **VLF Diagnostics – tan δ** menu, select the menu item **MWT with tan δ** and press the rotary knob to confirm.
3. Select the **IEEE 400.2** menu item and press the rotary knob to confirm.  
The **IEEE 400.2** window opens.

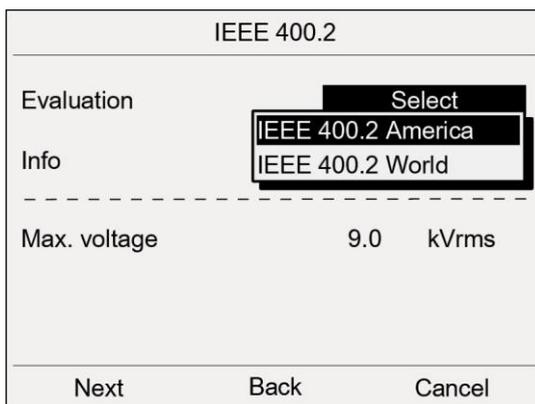


4. Set the following parameters:
  - Voltage U (phase – phase)  
Setting range: In accordance with the specifications of the draft IEEE 400.2 (the max. test voltage according to the respective VLF HV generator)
  - Number of phases (1 - 3)
  - Number of measurements per voltage step (1 - 20)
  - Test type: Installation, acceptance inspection (commissioning) or maintenance.

The max. voltage is automatically determined and displayed after voltage U (phase – phase) has been entered.

The following parameters are determined by the standard and cannot be changed:

- Extended test time
  - Standard test time
  - Reduced test time
  - Time after which a test time recommendation is to be issued by the device
5. Select the **Next** menu item and press the rotary knob to confirm.  
The dialog for selecting the evaluation opens. The cursor is in the input field for the evaluation.



6. Press the rotary knob in order to select an evaluation.

7. In the context menu, select whether you wish to use evaluation criteria for America or for other countries (World) according to IEEE 400.2, and press the rotary knob to confirm.
8. In the next context menu, select which insulation the test object has and press the rotary knob to confirm. You have the following options:
  - Evaluation for XLPE cable
  - Evaluation for EPR cables
  - Evaluation for PILC cables
9. Select the **Next** menu item and press the rotary knob to confirm.  
The measurement mode window for starting the measurement opens.



Further information on the implemented test voltages and the set threshold values in accordance with IEEE 400.2 can be found in the user manual for the VLF HV generator in question.

## 10.2 Performing a Full MWT measurement

	<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>



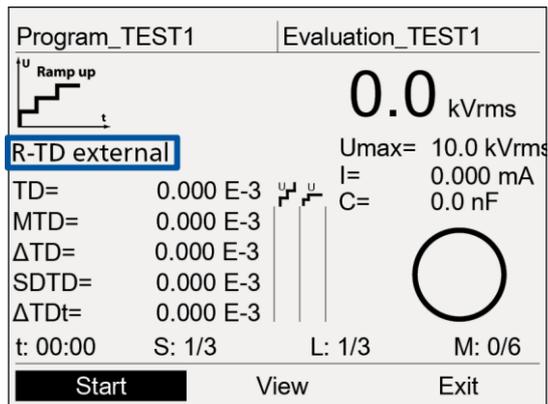
- ▶ For information on calibrating the PD test circuit and performing PD testing, refer to the user manual for the BAUR software 4.
- ▶ For information on operating the VLF HV generator, refer to the user manual for the respective VLF HV generator.

### Prerequisites

- The system is connected correctly.  
Further information: Chapter *Connecting the system* (on page 31)
- The test area is secured.  
Further information: Chapter *Securing the test area* (on page 58)

### Procedure

1. Calibrate the PD test circuit.  
Further information: User manual for the BAUR software 4
2. In the main menu of the VLF HV generator, select the menu item **VLF Diagnostics –  $\tan \delta > MWT$  with  $\tan \delta$** .
3. Create a template for the MWT measurement on the VLF HV generator.  
Further information: Chapter *Creating templates for MWT measurements on the VLF HV generator* (on page 71) and user manual for the VLF HV generator in question  
The measurement mode window opens. The VLF HV generator automatically recognises if the PD-TaD 62 is connected. When the PD-TaD 62 is connected, **R-TD external** will appear in the measurement mode window.



This means that:

- the PD-TaD 62 has been recognised by the VLF HV generator,
  - the dissipation factor measurement is measured using the external resistance of the PD-TaD 62.
4. If **R-TD external** is not displayed in the measurement mode window:
    - a. Check the ports on the VLF HV generator (port *PD Detector*) and the PD-TaD 62 (port *VLF Generator*).
    - b. If the ports are OK, contact your nearest BAUR representative (<http://www.baur.eu/baur-worldwide>).

**Note:** If the PD-TaD 62 is connected, but not recognised by the VLF HV generator, the measurement results will be highly distorted.

5. In the bottom menu bar, select **Start** and press the rotary knob to confirm.  
If only one phase is specified in the program for the dissipation factor measurement template used, a prompt for high voltage release appears. This will take you to the next step.

#### Measurement on several phases

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

When the **Split MWT measurement** function is activated, the context menu is also used for selecting the measurement stage (Ramp-up or MWT) on the respective phase. The phases on which the respective measurement stage has already been carried out are indicated by means of a tick. If a measurement stage on a phase was cancelled, this is indicated by a cross.

- a. Turn the rotary knob to select a phase and, if necessary, that measurement stage which is to be measured. Press the rotary knob to confirm. You have the option to repeat the measurement on a phase.

The prompt for connecting the selected phase appears on the display.

- b. If the phase selected has not yet been connected, connect it.

Further information: Chapter *Connecting the system for parallel PD and dissipation factor measurement or Full MWT* (on page 43)

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

The prompt for high voltage release appears on the display.

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

The VLF HV generator switches to the *Ready for operation* operating state. 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 the high voltage release and return to the measurement mode window, press the rotary knob.

7. Press the  key whilst the red indicator light is flashing.

The VLF HV generator switches to the *In operation* operating state. The red indicator light comes on.

The VLF HV generator 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....**

**Note:** Information on adapting the frequency and voltage adaptation according to the load capacitance of the test object is given in user manual of the respective VLF HV generator.

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

The following message is displayed in the display of the VLF HV generator: **Start PD measurement on PD-TaD**

8. Confirm the message on the VLF HV generator with **Yes** and start the PD testing in the BAUR system software on the laptop.

Further information: User manual for the BAUR software 4

First the ramp-up stage is carried out. The dissipation factor measurement ends automatically after the stipulated measuring time for each voltage step. However, the applied test voltage remains available for the PD testing.

The following message is displayed in the display of the VLF HV generator: **Select <Yes> to continue the tan  $\delta$  measurement**

9. When you have finished the PD testing, confirm the message with **Yes** to continue the dissipation factor measurement with the next voltage step.

The following message is displayed in the display of the VLF HV generator: **Start PD measurement on PD-TaD**

10. Repeat steps 7 and 8 for further voltage steps.

#### **Select test time**

The ramp-up stage is followed by the voltage test (MWT stage). After the preset time, the test time recommendation is displayed. This recommendation is based on the measurement results in the ramp-up stage and the first measurement results of the MWT stage that have already been entered. A new menu item **Test time** appears in the bottom menu bar.

**Note:** If no dissipation factor values have been selected for evaluation in the program, the test time of 30 minutes is proposed in accordance with the recommendation by NEETRAC, The National Electric Energy Testing Research and Applications Center (see Fletcher, Hampton, Hernandez, Hesse, Pearman, Perkel, Wall, Zenger: First practical utility implementations of monitored withstand diagnostics in the USA, Jicable 11, A.10.2)

11. Select the remaining test time.

The Full MWT measurement ends after the set test time. After the measurement, the high voltage is reduced and the VLF HV generator is discharged internally. This is shown by the message **Discharge process**.

When the discharge process is completed, the VLF HV generator changes to the *Ready for operation* operating state. The green indicator light goes out, the red indicator light comes on. The VLF HV generator 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.

12. 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.

Further information: Chapter *Discharging and earthing the test object* (on page 93)

13. Discharge and earth the *HV IN* and *HV OUT* ports of the PD-TaD 62 using the discharge rod of the VLF HV generator (standard delivery of VLF HV generator).

14. To stop the measurement, select the menu item **Finish** and press the rotary knob to confirm.

A prompt appears asking if you want to save the log for the measurement carried out on the VLF HV generator.

15. Confirm the prompt by pressing **Yes**. You can find further information on saving the log in the chapter *Saving the log of the measurements carried out on the VLF HV generator* (on page 86).

In order to remain in the measurement mode window, select the **Cancel** button.

Information on the evaluation of measurement results: Chapter *Evaluating a parallel measurement or Full MWT* (on page 86)

### 10.3 Displaying the measurement results during the measurement on the VLF HV generator

During the measurement the current measured values are displayed continuously and evaluated in accordance with the selected evaluation criteria.

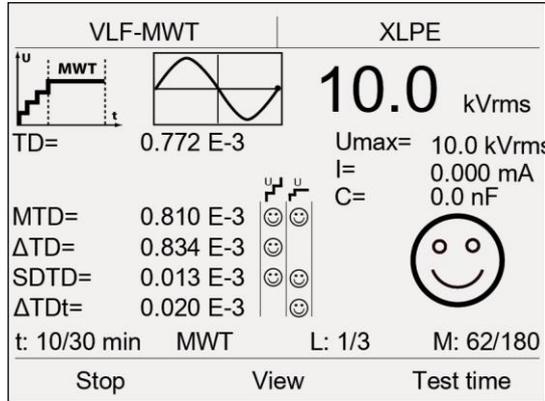
Further information: Chapter *Symbols on the display of the VLF HV generator* (on page 30)

The following views are available to you: Main view, detail view and diagrams  $\tan \delta$  versus voltage as well as  $\tan \delta$  versus time.

- ▶ In the lower menu bar, in order to toggle between views, select the menu item **View** and press the rotary knob to confirm.

**Main view**

The main view is the measurement mode window in which all measured values are continuously displayed.

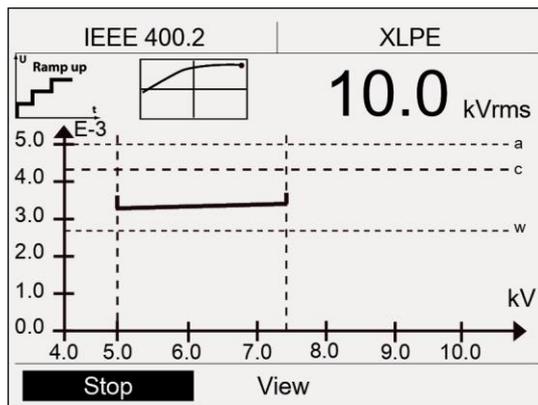


**Diagram tan δ versus voltage (for the ramp-up stage)**

In the diagram the determined average tan δ values per phase are shown in dependence of the voltage.

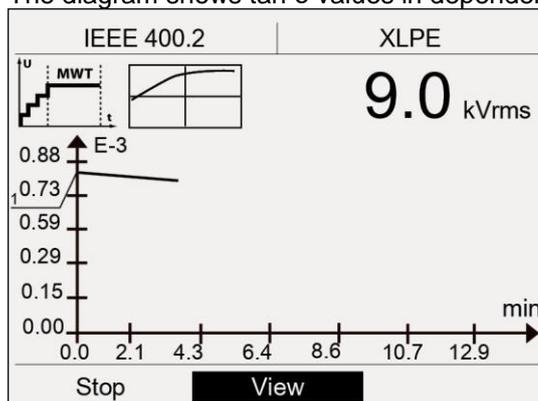
The threshold values for tan d are displayed by dotted lines as follows:

- a - Alarm level *Cancel*
- c - Alarm level *High risk*
- w - Alarm level *Risk*



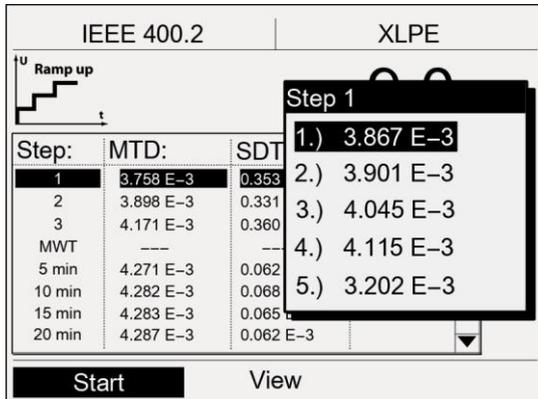
**Diagram tan δ versus time (for the MWT stage)**

The diagram shows tan δ values in dependence of the test time.



**Detail view**

The detail view shows a tabular summary of the dissipation factor values per phase and per voltage step. In the case of an MWT measurement the column *MTD* also shows the dissipation factor values that were measured in 5 minute intervals during the MWT stage.



- ▶ On completion of a measurement you can display in detail view all measured values for a step or a time interval: For this purpose, in detail view, select a step and press the rotary knob to confirm.
- ▶ For navigating between the measurement results for different phases, turn the rotary knob.

## 10.4 Taking a measurement on the next phase or starting the next measurement stage

### 10.4.1 The “Split MWT measurement” function is not activated

The measurement ends after the two measurement stages (ramp-up and MWT) have been carried out on the respective phase. After the measurement, the high voltage is reduced and the VLF HV generator is discharged internally. This is shown by the message **Discharge process**.

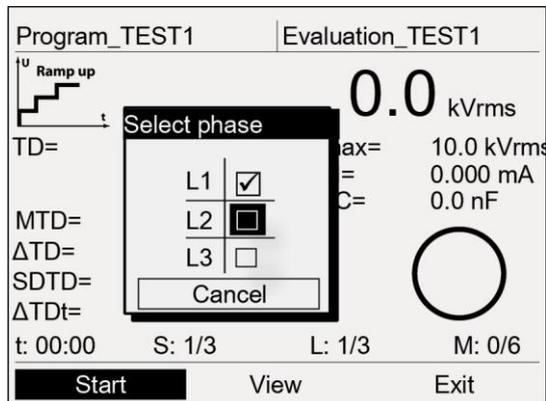
When the discharge process is completed, the VLF HV generator changes to the *Ready for operation* operating state. The red indicator light goes out, the green indicator light comes on. The VLF HV generator no longer delivers dangerous voltage. A safety message appears which prompts you to discharge,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

On completion of the measurement you have the following options:

### Repeat the measurement on the same phase

Proceed as follows:

1. In the lower menu bar, select the menu item **Start**.



2. Select the same phase in the context menu.
3. Repeat the measurement.

Further information: Chapter *Performing a Full MWT measurement* (on page 76)

### Starting a measurement on another phase

	<b>! DANGER</b>
	<p><b>Dangerous voltage at test object and other live plant parts.</b></p> <p>Danger to life or risk of injury due to electric shock.</p> <ul style="list-style-type: none"> <li>▶ Before touching the test object, discharge, earth and short it: at the connection point and at the far end.</li> <li>▶ You may touch the plant parts that were under voltage only if they are visibly earthed and short-circuited.</li> </ul>

1. Discharge and earth the *HV IN* and *HV OUT* ports of the HV coupling unit with the discharge rod of the VLF HV generator (standard delivery of VLF HV generator).
2. Disconnect the connected phase.
3. Connect the required phase.

Further information: Chapter *Connecting the system for parallel PD and dissipation factor measurement or Full MWT* (on page 43)

4. In the lower menu bar of the VLF HV generator menu, select the menu item **Start** and perform the measurement.

Further information: Chapter *Performing a Full MWT measurement* (on page 76)

## 10.4.2 The “Split MWT measurement” function is activated

If the **Split MWT measurement** function is activated, the measurement ends on completion of the selected measurement stage. After the measurement, the high voltage is reduced and the VLF HV generator is discharged internally. This is shown by the message **Discharge process**.

When the discharge process is completed, the VLF HV generator changes to the *Ready for operation* operating state. The red indicator light goes out, the green indicator light comes

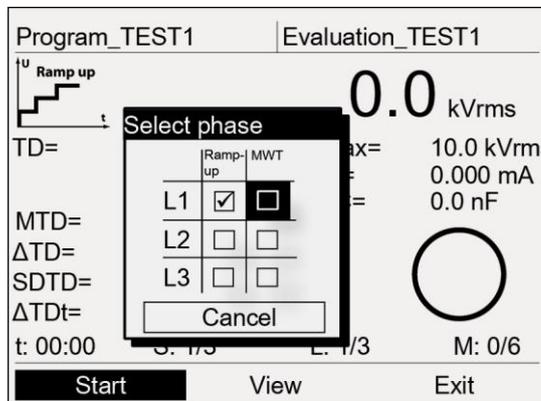
on. The VLF HV generator no longer delivers dangerous voltage. A safety message appears which prompts you to discharge, earth and short-circuit the test object.

On completion of a measurement stage you have the following options:

**Carry out the next measurement stage (ramp-up or MWT) on the same phase**

Proceed as follows:

1. In the lower menu bar, select the menu item **Start**.



2. In the context menu, select the next measurement stage on the same phase.
3. Repeat the measurement.

Further information: Chapter *Performing a Full MWT measurement* (on page 76)

**Starting a measurement on another phase**

**! DANGER**

**Dangerous voltage at test object and other live plant parts.**  
 Danger to life or risk of injury due to electric shock.

- ▶ Before touching the test object, discharge, earth and short it: 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.

1. Discharge and earth the *HV IN* and *HV OUT* ports of the HV coupling unit with the discharge rod of the VLF HV generator (standard delivery of VLF HV generator).
2. Disconnect the connected phase.
3. Connect the required phase.

Further information: Chapter *Connecting the system for parallel PD and dissipation factor measurement or Full MWT* (on page 43)

4. In the lower menu bar of the VLF HV generator menu, select the menu item **Start** and perform the measurement.

Further information: Chapter *Performing a Full MWT measurement* (on page 76)

**Note:** You have the option of completing the measurement at a later point in time. Further information: Chapter *Completing a measurement at a later point in time* (on page 97)

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## 11 VLF CABLE TESTING WITH PARALLEL PARTIAL DISCHARGE TESTING

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Whereas VLF cable testing shows whether a cable can withstand a load over a specified test duration, PD testing identifies and locates the PD activities of the cable insulation.

The simultaneous performance of VLF cable testing and PD testing can reduce the test time for cables that are in good condition.

1. Connect the test object for PD testing.  
Further information: Chapter *Connecting the system for PD measurement* (on page 35)
2. Calibrate the PD test circuit.
3. Start VLF cable testing.
4. Configure and start PD testing in the BAUR software.
5. Monitor the trend of the PD measurement results during testing.



- ▶ Information on calibrating the PD test circuit as well as performing PD testing and VLF cable testing is given in the user manual for the BAUR software 4.
  - ▶ Information on operating the VLF HV generator is given in the user manual for the respective VLF HV generator.
-

## 12 EVALUATION OF PARTIAL DISCHARGE TESTING

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- ▶ For information on evaluating the PD measurement results, refer to the user manual for the BAUR software 4.
-

## 13 EVALUATING A PARALLEL MEASUREMENT OR FULL MWT

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During the parallel PD and dissipation factor measurement and during the Full MWT test, the measurement results of the PD testing and the dissipation factor measurement or MWT measurement with  $\tan \delta$  are evaluated separately.

- ▶ Evaluate the PD measurement data in the BAUR software 4 on the laptop.  
Further information: User manual for the BAUR software 4
- ▶ Evaluate the dissipation factor measurements or MWT measurement with  $\tan \delta$  on the VLF HV generator or on the laptop using Diagnostics Reporter.  
To transfer the measurement data from the dissipation factor measurement or the MWT test to the laptop, proceed as follows:
  - a. Select one of the test logs.
  - b. Export the log to the laptop using a USB drive.
  - c. If you want to process the logs on the laptop, use the Diagnostic Reporter.
 Further information: User manual for the respective VLF HV generator

### 13.1 Saving the log of the measurements carried out on the VLF HV generator

1. When you have completed the measurement, in the bottom menu bar, select 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 by pressing **Yes**.
3. If you have enabled the setting **Add ambient temperature to log**, an ambient temperature prompt appears.  
Enter the ambient temperature at which the diagnostic testing 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 the VLF HV generator.
  - 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.  
To create a new folder, select the menu item **Create new folder** and enter a name for the new folder.

- e. Select **Save** menu item.  
The log is saved to the USB drive.
- f. Acknowledge this save confirmation by pressing **OK**.

## 13.2 Using Diagnostic Reporter to edit logs of the dissipation factor and MWT measurements

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

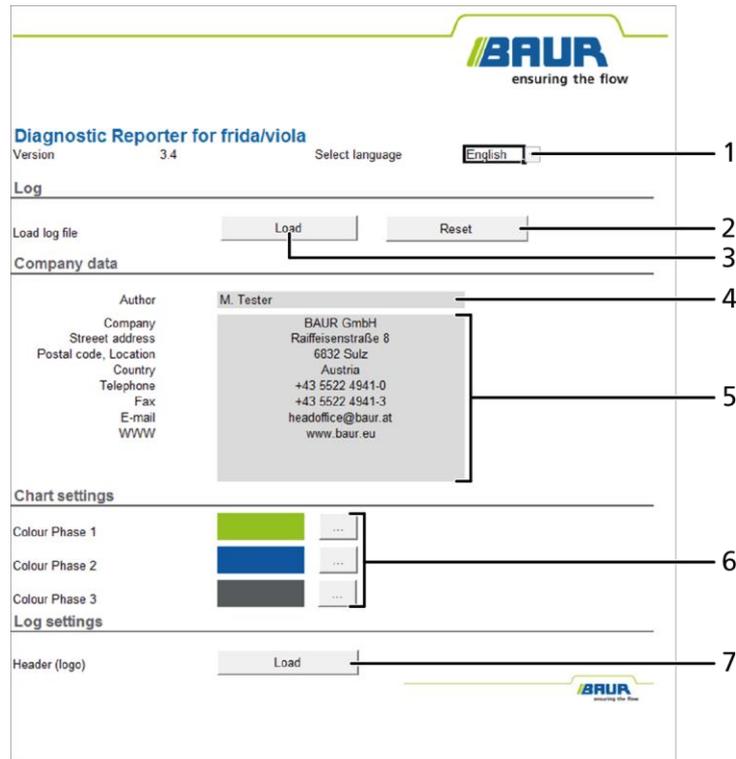
Software	Version
Firmware PD-TaD 62	from version 2.0
MS Excel	from version 2007

### 13.2.1 Settings for MS Excel 2010 under Windows 10

If the Diagnostic Reporter is installed on a PC with Windows 10 and MS Excel 2010, a decimal point must be defined as the thousands separator in the Excel options.

1. Open MS Excel 2010.
2. Open the Excel options by selecting the **Options** button  in the **File** tab.  
The **Excel options** window opens.
3. In the Excel options, open the **Advanced** tab.
4. Disable the **Use system separators** checkbox.  
The **Decimal separator** and **Thousands separator** input fields become active.
5. Enter a decimal point in the **Thousands separator** input field.
6. Confirm the change by pressing **OK**.

### 13.2.2 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.
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.

### 13.2.3 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 shows a diagnostic log form with the following sections and callouts:

- 1** — MWT measurement log
- 2** — No Action Required
- 3** — Author: M. Tester
- 4** — Project Data
 

Log	June-05-18_23
Company	Company XY
From Station	E 302
To station	E 405
Date	05.06.2018
- 5** — Cable Data
 

Number of phases	2
Cable Type	XLPE
Nominal voltage	10,0 kV
Comment	
Weather conditions	
Temperature	10 °C
- 6** — Summary of measurement results
 

Phase	Recommendation
L1	
L2	
- 7** — Ramp-up curve
- 8** — Ramp-up measurement results
- 9** — Ramp-up threshold values
 

	MTD [E-3]	SOTD [E-3]	ΔTD [E-3]
Risk	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
High risk	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Cancel	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
- 10** — MWT curve
- 11** — MWT threshold values
 

	MTD [E-3]	SOTD [E-3]	ΔTD [E-3]	ΔTD (-) [E-3]
Risk	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
High risk	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Cancel	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

No.	Element	Function
1	Log type	
2	Input field for the evaluation summary	▶ Enter a summary of the test or measurement results or recommendation on how to proceed further.
3	<b>Author</b>	In this field, the name is entered which was stated in the spreadsheet <i>Start</i> .

No.	Element	Function
4	<b>Project Data</b> area	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. <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	This comprises the details on the cable route. The data are taken from the measurement file. <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	The log shows the curve of the respective measurement or test. The sample log (MWT measurement) shows the ramp-up curve.  The test curve is shown in the logs of the VLF test.
8	Measurement results of the ramp-up stage for each phase	This applies to the MWT measurement and the dissipation factor measurement  In VLF test logs the measurement results per voltage step and phase are shown.
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

### 13.2.4 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.

### 13.2.5 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 TD/viola TD)
  - $\tan \delta$  Measurement (frida TD/viola 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 92).
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.

### 13.2.6 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.

## 14 DISCHARGING AND EARTHING THE TEST OBJECT

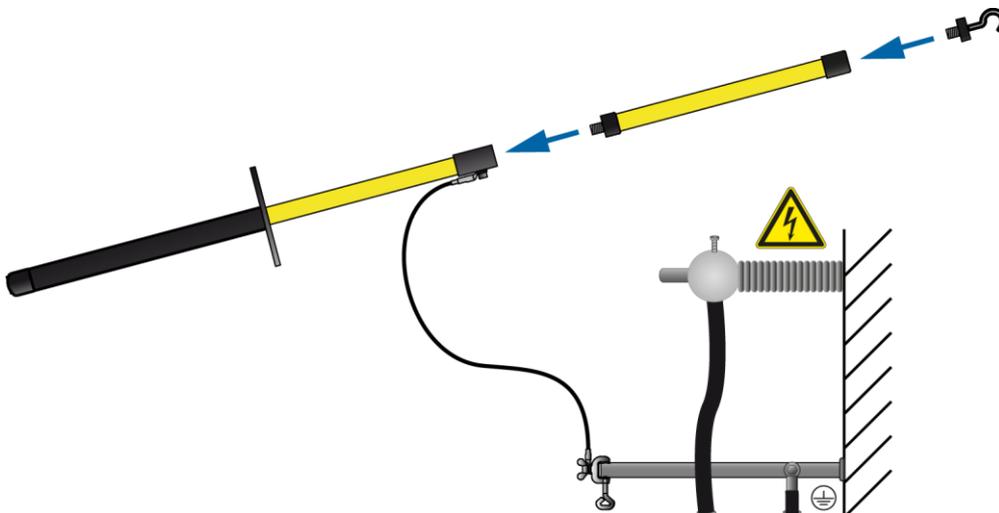
On completion of cable testing or measurement the test object still carries a dangerous voltage.

	 <b>DANGER</b>
	<p><b>Dangerous voltage in test object.</b></p> <p>Danger of electric shock or risk of injury</p> <ul style="list-style-type: none"><li>▶ <b>Before touching, discharge, earth and short-circuit:</b> The test object at the connection point and at the far end.</li><li>▶ You may touch the plant parts that were under voltage only if they are visibly earthed and short-circuited.</li><li>▶ Connect the discharge and earth rod correctly to the station earth.</li><li>▶ Only use the discharge and earth rod if its surface is clean and dry.</li><li>▶ Hold the discharge and earth rod only at the handles!</li><li>▶ Observe the minimum discharge period in accordance with the capacitance of the test object.</li></ul>

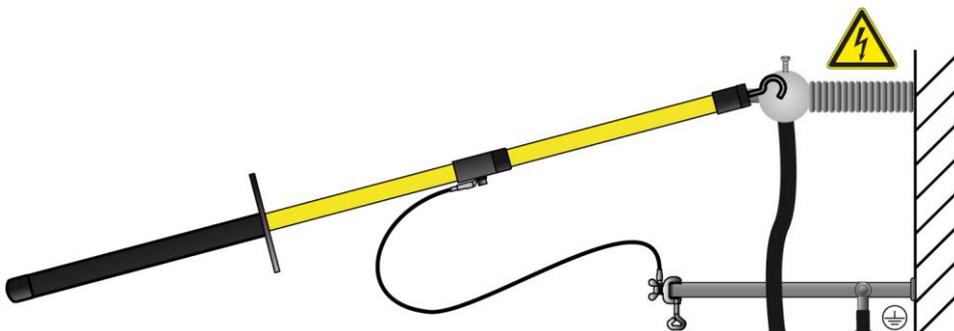
## 14.1 Discharging

	 <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.

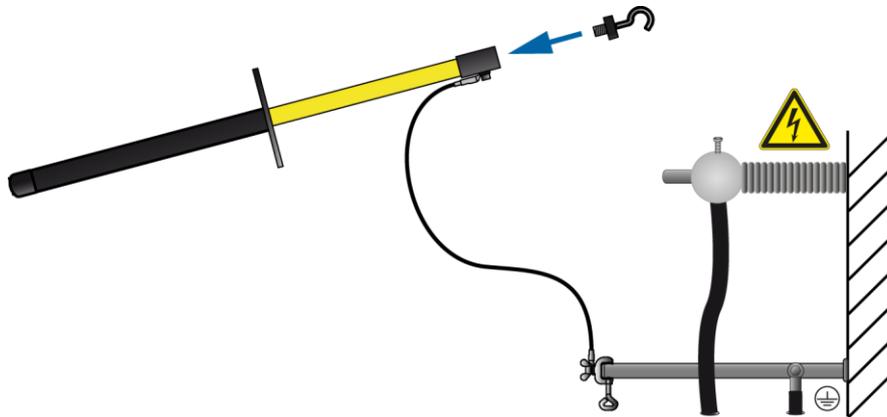


4. Observe the minimum discharge period in accordance with the capacitance of the test object.

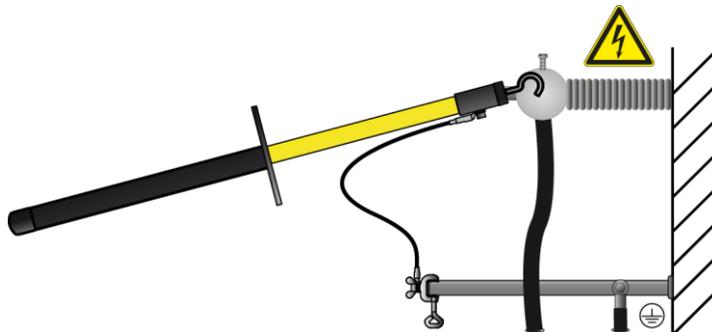
## 14.2 Earthing

	 <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 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.

## 15 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>

### **NOTICE**

Damage to devices due to improper use.

- ▶ Do not switch off the device under load.
- ▶ Before switching off the device, put it in the *Ready for operation* operating state.

1. Switch off the VLF HV generator. Follow the user manual for the VLF HV generator in question.
2. Disconnect the system completely from the mains voltage.
3. Disconnect the HV connection cables.
4. Establish a short-circuit connection between the HV ports *HV IN* and *HV OUT* and the protective earthing connection on the PD-TaD 62. Insert the short-circuit cable into the side sockets on the HV ports *HV IN* and *HV OUT* so that the short-circuit cable plugs are not pulled out during transportation.
5. Finally, disconnect the earth cable last.
6. If the cables are dirty, clean them and store them in the designated place.
7. If necessary, remove the cordoning.
8. 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.
9. Remove the barriers and marking of the test area.

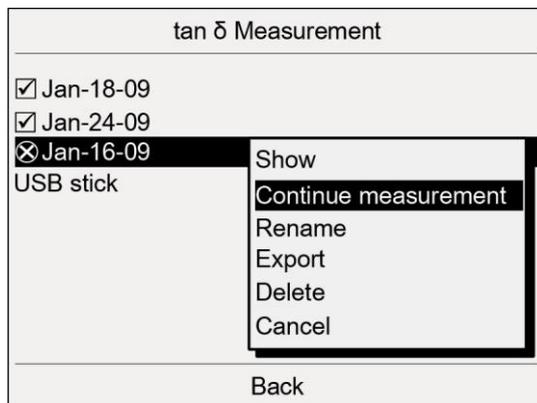
## 16 COMPLETING A MEASUREMENT AT A LATER POINT IN TIME

This chapter discusses how to continue a parallel PD and dissipation factor measurement and a Full MWT measurement.

If you have saved the log following cancellation of the dissipation factor measurement or MWT measurement and the PD test, you can complete this measurement at a later point in time.

1. Depending on the diagnostics type, select the following menu item and press the rotary knob to confirm:
  - Parallel PD and dissipation factor measurement: **Main menu > VLF Diagnostics –  $\tan \delta$  > Logs >  $\tan \delta$  Measurement**
  - Full MWT: **Main menu > VLF Diagnostics –  $\tan \delta$  > Logs > MWT with  $\tan \delta$**

If the measurement is not complete, this is indicated by a cross.
2. Select the relevant log and press the rotary knob to confirm.



3. In the context menu, select the menu item **Continue measurement** and press the rotary knob to confirm.
 

The measurement mode window opens.

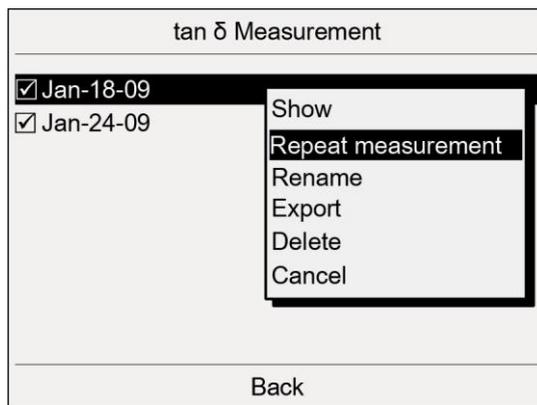
**Important:** To be able to compare the results, set the same measurement conditions.

Further information:

  - Chapter *Performing parallel PD and dissipation factor measurements* (on page 66)
  - Chapter *Performing a Full MWT measurement* (on page 76)

## 17 REPEATING A MEASUREMENT AT A LATER POINT IN TIME

1. Depending on the diagnostics type, select the following menu item and press the rotary knob to confirm:
  - Parallel PD and dissipation factor measurement: **Main menu > VLF Diagnostics –  $\tan \delta$  > Logs >  $\tan \delta$  Measurement**
  - Full MWT: **Main menu > VLF Diagnostics –  $\tan \delta$  > Logs > MWT with  $\tan \delta$**
2. Select the relevant log and press the rotary knob to confirm.



3. In the context menu, select the menu item **Repeat measurement** and press the rotary knob to confirm.

The measurement mode window opens.

Further information:

- Chapter *Performing parallel PD and dissipation factor measurements* (on page 66)
- Chapter *Performing a Full MWT measurement* (on page 76)

**Important:** Even if you only want to repeat the dissipation factor measurement, you still need to connect the PD-TaD 62. Since the first measurement was performed using the PD-TaD 62, the dissipation factor was measured using the external resistance of the PD-TaD 62. To be able to compare the measurement results, it is important to create the same measurement conditions.

## 18 MAINTENANCE

### 18.1 Special maintenance instructions

#### **NOTICE**

##### **Damage to device due to improper handling**

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

#### **NOTICE**

The housing of the HV coupling unit is locked gas-proof and may not be opened.

- ▶ Do not dismantle the HV coupling unit.
- ▶ Do not screw any components onto the HV coupling unit. Opening the housing can damage the device.

### 18.2 Cleaning the PD-TaD 62 and system components

#### **NOTICE**

##### **Damage to the device may be caused by using the wrong cleaning agents**

- ▶ 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.



- Mild detergent for cleaning the surfaces of the device
- Lint-free cleaning cloth

- ▶ Keep the connectors and the surface of the HV coupling unit (PD-TaD 62) clean and dry. Dirt and moisture will have a negative effect on the measurement results.
- ▶ Clean the device surfaces with mild detergent and a lint-free cloth on a regular basis.
- ▶ Clean the connection cables and terminations with mild detergent and a lint-free cloth.

## 18.3 Replacing the device protection fuses in the Power Box

### Prerequisites

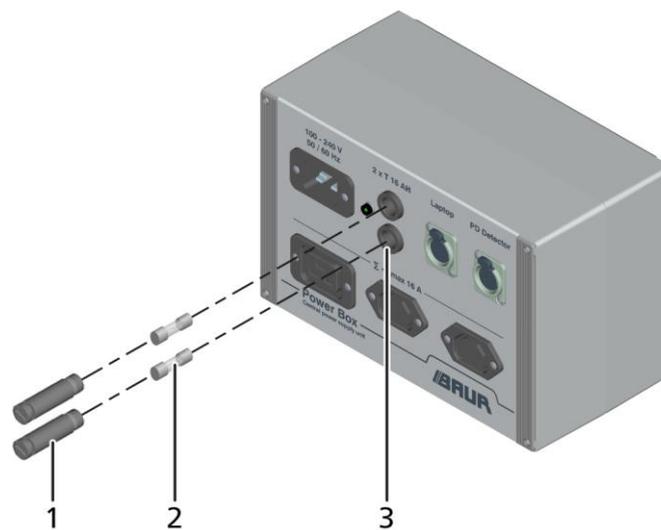


Flat-blade screwdriver, size 1.2 x 6.5 mm



Device protection fuses: 2 x T 16 AH (250 V / 16 A time lag), rated breaking capacity 1500 A (H)

### Procedure



- |   |                |
|---|----------------|
| 1 | Fuse cartridge |
| 2 | Fuse           |
| 3 | Groove         |

1. Unscrew the fuse cartridge (1) out of the groove (3).
2. Replace the fuse (2).
3. Screw the fuse cartridge (1) back into the groove (3).

## 18.4 Replacing the calibrator battery

### NOTICE

#### Material damage may be caused by the wrong polarity of the battery

Wrong polarity of the battery can damage the electronics.

- ▶ When inserting batteries, pay attention to the polarity of the battery.

### Prerequisites



Phillips screwdriver (size 2)



Battery type: 9 V block battery, DIN/IEC 6F22

### Procedure

1. Switch off the calibrator with the On/Off switch.
2. Loosen the screws in the corners on the front side of the housing and open the calibrator housing.



3. Remove the old batteries.
4. Insert new batteries.
5. Close the calibrator housing and screw it tight.
6. Dispose of the old batteries in compliance with the local regulations.

## 18.5 Accessories and spare parts

- ▶ Only use accessories and original spare parts recommended by BAUR.
- ▶ Only use the supplied connection cables or cable of the same specification.  
PoE cable: If it is necessary to replace the PoE cable for connecting the Power Box and the PD-TaD 62, use a standard commercially available Ethernet cable of category 5.
- ▶ Order accessories and spare parts from your nearest BAUR representative (<http://www.baur.eu/baur-worldwide>).

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## 19 FAULTS AND CORRECTIVE MEASURES

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**NOTICE****Damage to device due to improper handling**

The user is liable for damages caused due to repairs.

- ▶ 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.
- ▶ Repairs must be carried out only by personnel trained and authorised by BAUR

### 19.1 Malfunction and error messages

When a fault or an error message occurs on the VLF HV generator or the BAUR system software, proceed as follows:

1. Check the supply voltage, the connection cables and earth cable.
2. Check that the fuses in the Power Box are OK.  
Further information: Chapter *Power Box* (on page 18)
3. Check whether the PD-TaD 62 or the VLF HV generator are in the required operating state.
4. Restart the laptop.  
Start the BAUR system software and check whether the fault continues to occur.
5. If the fault occurs again, write down the error text and the procedure that caused the error to occur.
6. Put the system out of operation and mark it accordingly.
7. Contact your nearest BAUR representative (<http://www.baur.eu/baur-worldwide>).



Further information on the error messages of the VLF HV generator and BAUR system software can be found:

- in the user manual for the respective VLF HV generator
  - in the user manual for the BAUR system software
-

## 20 TRANSPORTATION AND STORAGE

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### 20.1 Transportation

During transportation or if you are sending the PD-TaD 62 system components to BAUR GmbH, a BAUR representative or to the technical service for repairs, observe the following:

*NOTICE!* Damage to device due to improper transportation.

- ▶ Only transport the PD-TaD 62 system components in the intended transport cases.
- ▶ During transportation, 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.
- ▶ To prevent the short-circuit cable plug from being pulled out during transportation, ensure that the short-circuit cable is inserted into the HV ports *HV IN* and *HV OUT* in the side.
- ▶ Protect all PD-TaD 62 system components against strong vibrations.
- ▶ Protect all PD-TaD 62 system components against moisture.
- ▶ To transport the transport cases containing the PD-TaD 62 and accessories, pull them along on their wheels.

To extend the telescopic handle of the transport case, release the locking mechanism (1) and extend the telescopic handle (2).



- ▶ The transport cases and their contents weigh approx. 38.0 kg or 22.5 kg. Lifting or carrying the transport cases requires two people.

## 20.2 Storage

- ▶ Only store the system components in the intended transport cases with closed lids.
- ▶ During storage, comply with the ambient conditions specified in the technical data of the product. Information on the technical data is given in the corresponding section of this user manual.
- ▶ Protect the system and components from humidity.
- ▶ Protect the system against unauthorised access.

## 21 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>).



BAUR GmbH

Raiffeisenstraße 8  
6832 Sulz / Austria  
[service@baur.at](mailto:service@baur.at)  
[www.baur.eu](http://www.baur.eu)

## 22 DISPOSAL

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

System components do not belong in the domestic waste.

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

## 23 DELIVERY SCOPE AND OPTIONS

---

### Standard delivery

#### PD-TaD 62 incl.

- |  |                  |
|--|------------------|
| ▪ HV coupling unit with integrated PD measuring unit | Transport case 1 |
| ▪ HF filter, mounting bracket                        |                  |
| <hr/>  |                  |
| ▪ Power Box  |                  |
| ▪ CAL1B or CAL1E calibrator                          | Transport case 2 |
| ▪ Connection set incl. connection cable and adapter  |                  |
| ▪ User manuals                                       |                  |
| <hr/>  |                  |
| ▪ Laptop incl. carrying bag                          |                  |
| ▪ BAUR system software 3.x on USB drive              |                  |
| ▪ Windows 7 Ultimate for laptop on USB drive         |                  |

On request, integration into cable test vans

### Options

- Phase-resolved PD presentation
- CAL1B or CAL1E calibrator

### HV sources

(not included in the standard delivery of PD-TaD 62)

- frida BAUR VLF tester
- viola BAUR VLF tester

HV sources incl.  $\tan \delta$  measurement function:

- frida TD BAUR VLF tester and diagnostics device
- viola TD BAUR VLF tester and diagnostics device

## 24 DECLARATION OF CONFORMITY

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We



BAUR GmbH  
Raiffeisenstraße 8  
6832 Sulz / Austria  
headoffice@baur.at  
www.baur.eu

declare, under our sole responsibility, that the BAUR product

**BAUR Portable PD diagnostics system PD-TaD 62 with Power Box**

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 61000-3-2:2014  
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: Dr. Markus Baur, CEO

Sulz, 19/06/2018

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## 25 GLOSSARY

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### A

#### **Anti-corona protection**

Anti-corona hoods are used to protect against corona discharges at the terminations

### C

#### **Change of the dissipation factor between successive steps**

Change of the dissipation factor between pre-defined successive voltage steps (Designation on the display:  $\Delta TD$ )

#### **Change of the dissipation factor over time**

Change of the dissipation factor within the first 10 minutes of the MWT stage (designation on the display:  $\Delta TDt$ )

#### **Connection point (near end)**

The connection point or the near end represents the end point of the test object to which the PD-TaD 62 is connected.

### D

#### **Dissipation factor, dielectric dissipation factor**

Abbreviation:  $\tan \delta$

Tangent of the dissipation angle - amount of the ratio between the ideal capacitive current and the real total current. The difference between these two values is determined by the ohmic dissipation current and various different polarisation mechanisms.

The greater the dissipation angle is, the higher the dielectric dissipation is.

### F

#### **Far end**

The far end represents the end point of the test object opposite the connection point.

#### **Full MWT**

Full MWT is a combination of VLF cable testing, PD and dissipation factor measurement.

While cable testing shows whether a cable system can withstand a load over a specified test time, the PD test identifies and locates the PD activities in the cable insulation. The dissipation factor measurement evaluates the condition of the cable and allows conclusions as to ageing or any latent damage.

It is also easier to detect hidden faults (e.g. moist joints) through conditioning of weak points and simultaneously monitor dissipation factor values and PD activities.

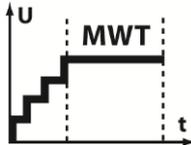
The cable is not damaged due to the reduced measuring time thanks to the combination of various methods.

## M

### MWT stage

The MWT stage is a component part of the Monitor Withstand Test.

Designation on the display:



In the MWT stage the actual cable testing is carried out with a continuous dissipation factor measurement\* and partial discharge testing\* at a defined test voltage.

\* The following equipment is required:

- Dissipation factor measurements: BAUR VLF HV generator with  $\tan \delta$  measurement function
- PD testing: BAUR PD-TaD

## N

### Near end (connection point)

The connection point or the near end represents the end point of the test object to which the PD-TaD 62 is connected.

## P

### Parallel PD and dissipation factor measurement

This method combines the statements of a PD test and a dissipation factor measurement.

While the PD test identifies and pinpoints PD activities in the cable insulation, the dissipation factor measurement evaluates the condition of the cable and allows conclusions as to ageing or any latent damage.

It is also easier to detect hidden faults (e.g. moist joints) by conditioning weak points and simultaneously monitoring dissipation factor measurement values and PD activities.

The cable is not damaged due to the simultaneous PD and dissipation factor measurement and thus the reduced test time.

### Partial discharge (PD)

Electrical discharge that only partially bridges the insulation between conductors (see International Electrical Dictionary of IEC).

### Partial discharge measurement

The PD test identifies and pinpoints PD activities in the cable insulation.

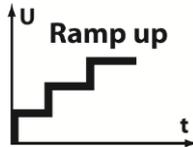
### Power over Ethernet (PoE)

*Power over Ethernet (PoE)* is a process by which network-enabled devices can be supplied with power via the Ethernet cable.

## R

### Ramp-up stage

The ramp-up stage is a component part of the MWT and is used for an initial evaluation of the cable condition during the voltage build-up – before the actual VLF cable testing (Monitored Withstand Test MWT).



In the ramp-up stage, the test voltage is built up. During this time, a dissipation factor measurement\* and a partial discharge testing\* are carried out at pre-defined voltages (e.g.  $0.5 \times U_0$ ,  $1 \times U_0$  and  $1.5 \times U_0$ ). The measurement results provide information on the condition of the cable and allow the subsequent cable testing to be adapted to that cable condition.

\* The following equipment is required:

- Dissipation factor measurements: BAUR VLF HV generator with  $\tan \delta$  measurement function
- PD testing: BAUR PD-TaD

## S

### Stability of the dissipation factor

Change of the dissipation factor over time for a constant test voltage (Designation on the display: SDTD).

The stability of the dissipation factor is determined on the basis of the standard deviation of the dissipation factor during a voltage step.

### System

All of the technical components that are connected to one another and related to one another and which are regarded as a single unit with regard to their function.

## V

### VLF cable testing with parallel PD test

This method combines the statements of a PD test and VLF cable testing.

While the cable test shows whether a cable can withstand a load (e.g.  $2 \times U_0$ ) over a specified test time, the PD test identifies and locates the PD activities in the cable insulation.

The simultaneous performance of VLF cable testing and the PD test reduces the test time for cables that are in good condition.

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BAUR GmbH

Raiffeisenstraße 8  
6832 Sulz / Austria  
headoffice@baur.at  
www.baur.eu