

Pocket guide

Online PD Spot Tester liona





You may only work with this pocket guide after acquiring complete knowledge of the user manual.

For your safety

liona must only be operated by electrically trained persons who are familiar with the applicable national safety regulations.



DANGER

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

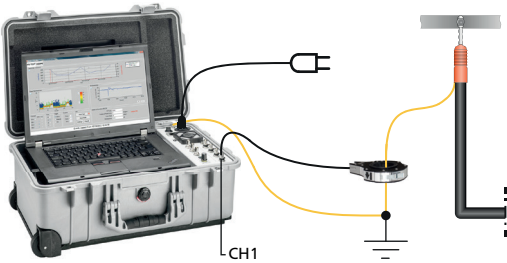
An online PD test is carried out on a live test object. During preparation and while performing the test, the user may come close to live parts. In so doing, there is danger of touching the active parts directly or indirectly.

- » Observe the safety instructions in the user manual.
- » Observe the national and international safety and accident prevention standards and guidelines.
- » Before commencing work, the responsible body must assess the risks for the specific working conditions. Protective measures are based on the risk assessment and must be followed at the workplace.
- » Make sure that the cable screen is not live.
- » Ensure that adjacent live parts are secured against accidental contact and flashovers with safety devices.
- » Maintain safety distances in compliance with EN 50110 or any standard applicable in your country.
- » Ensure that no person or tool or object remains in the danger zone.
- » If safe access to the connection points is not assured, turn off the voltage to the switchgear to connect or to disconnect the sensors.
- » Keep the measurement tasks as short as possible.
- » Use personal protective equipment for protection against electric shock and burns due to possible arcing faults.

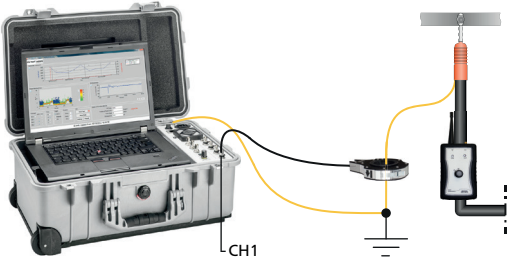
Connection diagram

Online PD test

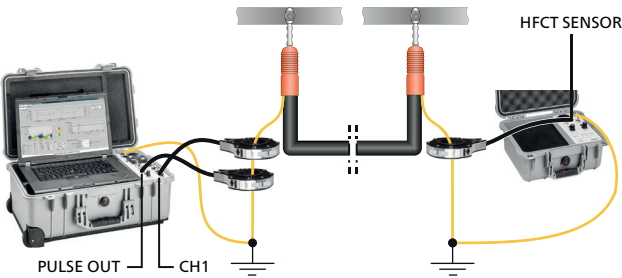
Mains operation



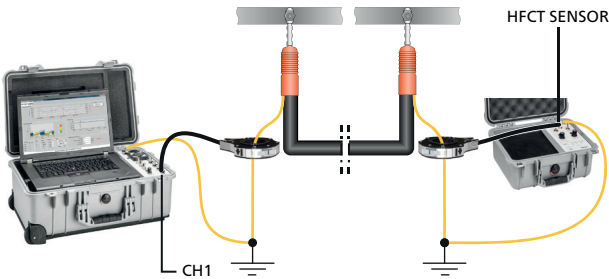
Battery mode with Sync Transmitter



Online cable length measurement



Online PD Mapping



Commissioning

1. Install liona in such a way that
 - a stable base is guaranteed,
 - liona is standing on a flat horizontal surface,
 - liona and the test object are accessible for the connections and operation,
 - sufficient safety distances are maintained.
2. Earth liona
3. Select the sensors and connection technology suitable for the local conditions.
4. Connect the sensors.
5. If safe access to the connection points is not assured, de-energise the switchgear to install and to dismantle the sensors.
 - a. Disconnect the test object.
 - b. Secure against re-connection.
 - c. Verify absence of operating voltage.
 - d. Earth and short all phases.
 - e. Provide protection against adjacent live parts.
6. Switch on liona, switch on laptop, and start the software.

Dismantling the test assembly

- » Dismantle the test assembly in the reverse order.

Online PD Test Process

1. Connecting the HFCT and/or TEV sensors

[\[➡ Connection diagram\]](#)

2. Selecting the trigger source

- **Mains operation:**
 - » Connect liona to the mains voltage.
- **Battery mode:**
 - » Connect Sync Transmitter.
[\[➡ Connection diagram\]](#)

Tip: If it is possible to connect to the mains voltage, use the mains as trigger source.

3. Switching on the test system

In mains operation:

1. Switch on liona.
2. Switch on laptop and start **Spot Tester** software.

In battery mode:

1. Switch on Sync Transmitter.
(*Power* LED lights up , *Sync* LED flashes )
2. Wait until the *Sync* LED turns a steady red.
3. Switch on liona.
4. Switch on laptop and start **Spot Tester** software.

4. Selecting the operating mode

- **PD TEST:** Automatic spot test for routine and repetitive tests
[\[➡ "Automatic PD Spot Test"\]](#)
- **SCOPE:** Mode for in-depth analyses
[\[➡ "Scope mode"\]](#)

5. Setting the software parameters

[\[➡ "Automatic PD Spot Test"\]](#) or
[\[➡ "Scope mode"\]](#)

6. Performing the test

[\[➡ "Automatic PD Spot Test"\]](#) or
[\[➡ "Scope mode"\]](#)

7. Evaluating the measurement data

[\[➡ "Automatic PD Spot Test – Evaluation"\]](#) or
[\[➡ "Scope mode"\]](#)

8. Creating a report

- For measurements in **PD TEST** mode:
- » Select channel and click the **Report** button.

TEV Sensors – Function and Connection

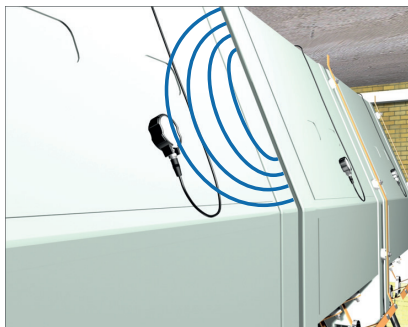


TEV sensors are used to detect local partial discharges in switchgear and in cable terminations (local PD).

Mode of operation

TEV sensors are capacitive couplers and detect transient earth voltages that are induced into the metal housing of switchgear through partial discharges.

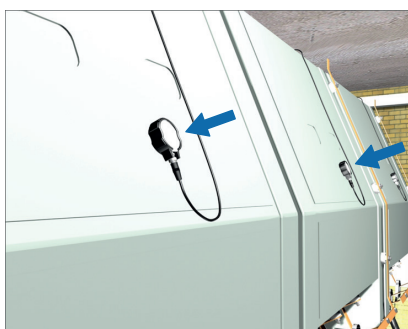
Signal detection through TEV sensor:



Connecting TEV sensors

1. Connect BNC coaxial cable to the signal output of the TEV sensor.
2. Connect TEV sensor to a signal input on liona (*CH1 – CH4*).
3. Secure TEV sensor using the built-in magnets to an earthed, metallic surface of the switchgear.

Note: TEV sensors can be attached in several positions inside or outside the switchgear. The optimum position of the sensor depends on the installation type.



In some installation types, you can achieve more precise measurement results if TEV sensors are positioned inside the switchgear.

Combination of TEV sensors and HFCT sensors

Both sensor types can be used during a test.

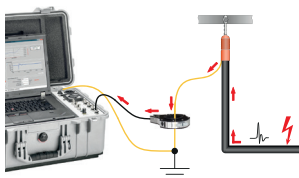
HFCT Sensors – Function and Connection



HFCT sensors are inductive high-frequency current transformers and are used to detect partial discharges in the cable (cable PD) and in switchgear (local PD).

Mode of operation

A signal is induced in the cable screen through a PD. The signal is spread across the cable screen and is decoupled at the earth connection through an HFCT sensor.

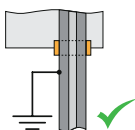


Connection requirements

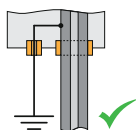
Collapsible HFCT sensors are placed around the earth connections of the cable screens. Therefore, the earth connection must be designed separately and must be safe to access.

It is **possible to connect the HFCT sensors to live cables** when the installation is built as follows:

Earthing of switchgear is insulated and executed externally.

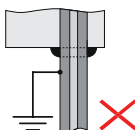


Earthing is executed internally, but is accessible from outside.

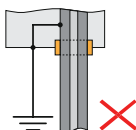


It is **not possible to connect the HFCT sensors to live cables** when the installation is built as follows:

Earthing is connected with the housing of the switchgear.



Earthing is executed inside the switchgear and is not accessible.



Connecting the HFCT sensors

Special safety measures are necessary when establishing connections to or near live parts. [[↪ "For your safety" & liona user manual](#)]



DANGER

Dangerous electric voltage

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

- » Never connect sensors to non-insulated live installation parts.
- » If safe access to the connection points is not assured, de-energise the switchgear to connect the sensors.

Sensor placed around the cable earth



Sensor placed around the cable and the cable earth



Sensor placed around the cable (false)



Automatic PD Spot Test

The **PD TEST** mode offers automatic spot testing of the cable route for partial discharges. This mode is recommended for routine and repetitive tests.

1. Start **Spot Tester** software and select **PD TEST** tab. Settings:

Channels

HFCT

TEV

Ch 4 ☐ ☐ ☐

Ch 3 ☐ ☐ ☐

Ch 2 ☒ ☐ ☐

Ch 1 ☒ ☐ ☐

View

4 ☐

3 ☐

2 ☐

1 ☒

Trigger

☒ Mains

☐ External

☐ FM

Duration

Days: 0

Hours: 0

Mins: 3

Test

Start measurement

Open

Save

Settings

Report

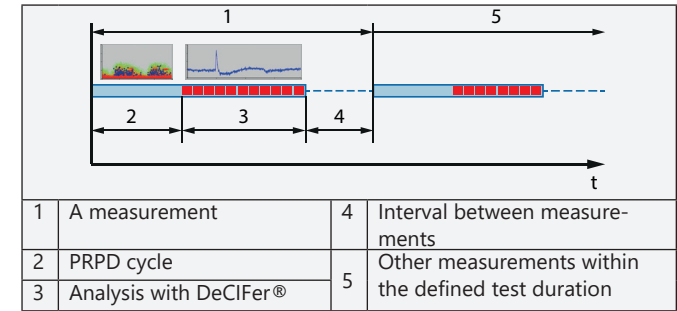
2. In the **Channels** area activate the channels to which the sensors are connected.
3. Select the type of the connected sensor on the respective channel.
4. In the **View** area select a channel that is to be displayed in the **Trend Data** and **PRPD** views.
5. Select a trigger source in the **Trigger** area:

• Mains.	Voltage from the mains supply system
• External.	External signal (TTL signal)
• FM.	Sync Transmitter (in liona's battery mode)

6. Set the test duration.
- Online PD spot test – 2 to 3 minutes per cable. If any intermittent faults are suspected, it is recommended continuing the test for a longer period.
7. If the colour coding in the **Phase Resolved Data** area does not correspond to your requirements, adjust it with the arrow keys.

Setting the PRPD measurement and DeCIFer® algorithm

A PD test comprises 2 steps: Phase-resolved PD data recording (PRPD) and analysis of power cycles with the DeCIFer® algorithm that filters and quantifies the PD pulses from the detected signals. The data is recorded according to the following principle:



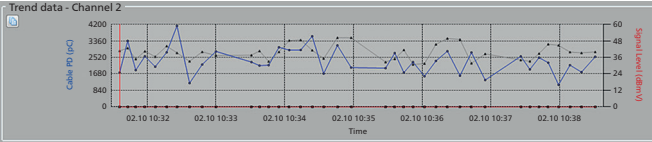
8. To set the PRPD test duration and the parameters of the DeCIFer® algorithm, click the **Settings** button.
- [\[🔗 liona user manual\]](#)
9. Click the **Start Test** button.
- The measurement starts and ends automatically after a set duration. The **Save as** dialog opens.
10. Select the save location and save the measurement data.

Automatic PD Spot Test – Evaluation

Four views are available for evaluating detected signals.

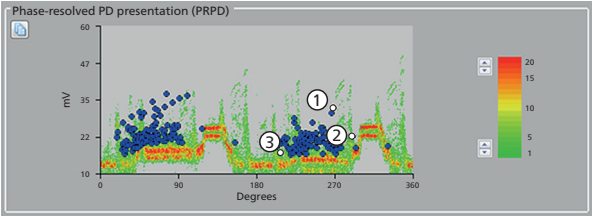
Trend Data

In this view, the detected partial discharges are shown on a selected channel over time.



Phase Resolved Data

In this view, the phase-resolved PD presentation is displayed.



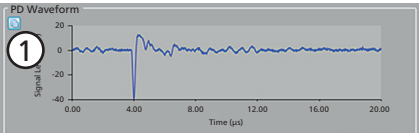
Legend:

- The colour coding indicates the number of pulse peaks at each position of the curve
- Blue points: cable PD, red points: switchgear PD (local PD)
- 1 – 3: PD, the waveforms of which are listed below.

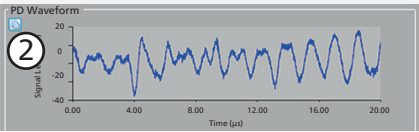
PD Waveform

» To display the waveform of a PD and its details, left-click a PD (blue or red point) in the PRPD view.

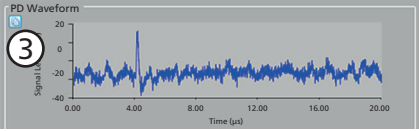
Example: Waveforms for the partial discharges that were selected in the above screenshot and their interpretation



Typical waveform of a cable PD



Possible noise signal



Cable PD behind a high noise signal

Details of Waveform

The detailed data and weighting (high, medium, low) are displayed below the waveform of the selected PD.

Details of Waveform 216/315

PD type:

Position in power cycle:

Pulse peak: dBmV

PD Magnitude: pC

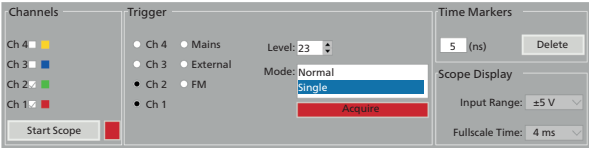
LOW PD

» To set the thresholds for the weighting of the PD, select the **SCOPE** tab and click the **Settings** button.

Scope Mode

The **Scope** mode is an oscilloscope function for 4 channels. This mode is recommended for in-depth analyses. Two views are available for this: **Scope** and **PRPD**.

1. Start **Spot Tester** software and select **SCOPE** tab. Settings:



2. In the **Channels** area activate the channels to be tested. All selected channels will be shown simultaneously.
3. Select a trigger source in the **Trigger** area:
- **Ch 1 to Ch 4:** The test is launched as soon as the defined threshold (**Level**) for the channel is exceeded.
 - **Mains:** Voltage from the mains supply system
 - **External:** External signal (TTL signal)
 - **FM:** Sync transmitter
» Use only if liona is in battery mode.
4. Select mode:
- **Normal:** Measurement curve is continuously updated.
 - **Single:** Measurement curve is recorded only on clicking the **Acquire** button.
5. In the **Scope Display** area, select a voltage range (y axis) and a time range.
6. Click the **Start Scope** button.
7. To toggle between the Scope and PRPD display, click the **SCOPE** or **PRPD** button.
8. You can adjust the PRPD display when it is enabled:
- **Polarity:** Unipolar or bipolar presentation
 - **Minimum:** Start value of y axis
 - **Maximum:** End value of y axis
 - **Number of pulses:** Colour coding for the pulse density
 - **Log:** Display in dB
 - **Linear:** Display in mV
9. To exit the measurement, click the **Stop Scope** button.

Scope display

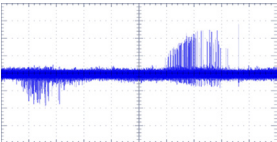
This displays the recorded analogue signal of each selected channel. The display is updated continuously as long as the trigger conditions are met.

PRPD display

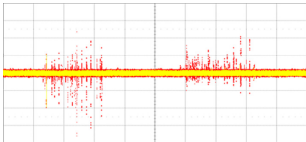
The PD signal recorded and synchronised according to the selected trigger source is displayed in relation to the power cycle of the selected channel.

Examples of PRPD display:

Cable PD pattern



Switchgear PD pattern



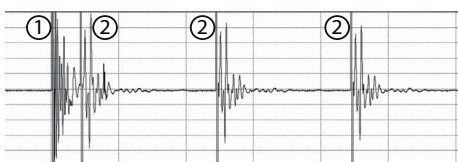
Measurement setup at far end

1. Place an HFCT sensor around the earth connection of the cable screen and connect to the *HFCT SENSOR* ① port on iPD. [\[↪ Connection diagram\]](#)
2. Switch on iPD ②.
3. Set trigger selector switch ③ to *LEVEL TRIGGER*.
4. Using the *TRIGGER LEVEL* rotary switch ④, select the threshold such that iPD is triggered by the signals from liona.



Measurement setup at near end

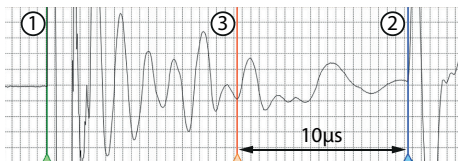
5. Place two HFCT sensors around the earth connection of the cable screen.
6. Connect both HFCT sensors to liona:
 - HFCT sensor 1 to *PULSE OUT* pulse output;
 - HFCT sensor 2 to *CH1* signal input.[\[↪ Connection Diagram\]](#)
7. Switch on laptop and liona and set a low pulse voltage with the *PULSE VOLTAGE* rotary switch (*PULSE* LED flashes ■).
8. Start **Cable Length** software.
9. Enter the following values for the cable length calculation:
 - Velocity of propagation $v/2$ (m/ μ s)
 - iPD time delay (standard setting: 10 μ s)
 - Voltage range of input signal
10. To start the measurement, click the  button. The detected signals will be displayed:



- ① Pulse from liona
- ② Pulse from iPD

11. To magnify the display, click anywhere in the display and drag over it with the mouse button pressed.
12. Right-click to place the liona marker (green) on the rising edge of the liona pulse.
Tip: To stop the display, click **Single Scan**.
13. Right-click to place the iPD marker (blue) on the rising edge of the first iPD pulse.

A third red marker is automatically placed at the iPD connection point. The cable length is calculated and displayed.



- ① liona marker
- ② iPD marker
- ③ iPD connection point (cable end)

14. To exit the measurement, click the  button.
15. Switch off the liona pulse voltage: Turn *PULSE VOLTAGE* rotary switch fully to the left (LED is off).

Measurement setup at far end

1. Place an HFCT sensor around the earth connection of the cable screen and connect to the *HFCT SENSOR* ① port on iPD. [\[↪ Connection diagram\]](#)
2. Switch on iPD ②.
3. Set trigger selector switch ③ to *AUTO SWEEP*.
4. Using the *OUTPUT PULSE VOLTAGE* rotary switch ②, set the level of the pulse transmitted by the iPD.

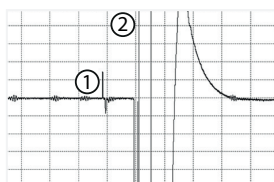


Measurement setup at near end

5. Place an HFCT sensor around the earth connection of the cable screen and connect to the *CH1* signal input on liona. [\[↪ Connection diagram\]](#)
6. Switch on laptop and liona.
7. Start **Mapping** software.
8. Enter the following values for PD mapping:
 - Voltage range of the input signal, trigger level

If no cable length measurement was carried out:

 - Cable length, propagation speed $v/2$ (m/ μ s), iPD test lead length
 - iPD time delay (standard setting: 10 μ s)
9. Enable the **Noise rejection** checkbox.
10. To start the measurement, click the button. The signal recorded on channel 1 (*CH1*) is displayed:



- ① PD pulses that trigger iPD
 - » If they are not visible, adjust the voltage range.
- ② iPD pulses
 - » If they are not visible, adjust the trigger level.

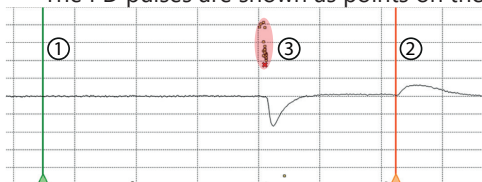
11. To magnify the display, click anywhere in the display and drag over it with the mouse button pressed.
12. Right-click to place the iPD marker on the rising edge of the iPD pulse.

Tip: To stop the display, click **Single Scan**.

One green marker is automatically placed at the cable start and one red marker at the cable end.

13. To start the PD mapping, click the button.

The PD pulses are shown as points on the diagram.



- ① Cable start
- ② Cable end
- ③ PD

14. To exit the mapping, click the button.
15. Right-click to place the PD marker at the PD position. The distance of the PD to iPD (to the far cable end) is automatically calculated and displayed.
16. To exit the measurement, click the button and create a report.



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