DDX 9121b

Modular Partial Discharge (PD) & Radio Interference Voltage (RIV) detector

Leaflet

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HAEFELY
Current and voltage – our passion
THE BEST TEAM IN BUSINESS

Since The first PD detector in the 60’s, Haefely-Tettex combined the best of both worlds in the release of the DDX™ 9121b Partial Discharge Detector, powerful yet easy to use. Our partial discharge product offering includes all one needs for factory testing. When it comes to partial discharge testing, you can’t beat the Haefely instruments team.
APPLICATIONS

- Power and distribution transformers
- Instrument transformers
- Rotating machines
- Switchgears (MV/HV/GIS)
- Surge arresters
- Bushings
- Cables
- Power capacitors
- Components testing
- Research and development

Power transformers

Distribution transformers

Cables

Rotating machines

Instrument transformers

Power Capacitors

HAEFELY TEAS 570
First digital detector, 1991
Partial discharge testing is a standard method of determining the quality of electrical insulation. Partial discharges can be caused by poor design, manufacturing faults, mechanical damage, aging, etc. The ability to measure low levels of partial discharges is referred to as sensitivity. As partial discharges happen inside the test object, only indirect effects can be quantified. Back in 60's the general layout (see beside diagram) and technical specifications of the measuring device were defined. The IEC60270, successor to the earlier standards, specifies the today’s requirements to perform a reliable partial discharge test. Special care has to be taken in fulfilling all requirements, because wrong results can be caused by non-conforming test layout or configurations.

A partial discharge is a small current pulse which circulates inside the circuit created by the test object, the coupling capacitor and the measuring impedance. Electrical interferences, if large enough, could affect the sensitivity of the measuring system. Although several techniques exist for noise reduction, the optimization of the test circuit is the most efficient procedure to increase the sensitivity.

The DDX 9121b combines analog and high order digital filters to reach the highest noise rejection within the IEC 60270 requirements. The included noise FFT analysis, powerful and yet easy to use, makes the measuring band definition easy even for non-trained operators.

Our long experience of more than 60 years performing partial discharge test will provide you with the best solution to fulfill your particular needs.
The frequency measuring band affects drastically the partial discharge test. A measurement band which is within the IEC or ANSI requirements has to be selected to get reliable measuring results. All our detectors measure within the IEC/ANSI defined frequency band.

**IEC60270 RECOMMENDED VALUES**

\[
\begin{align*}
30 \text{ kHz} & \leq f_1 \leq 100 \text{ kHz} \\
f_2 & \leq 1 \text{ MHz} \\
100 \text{ kHz} & \leq D_f \leq 900 \text{ kHz}
\end{align*}
\]

\(f_1\) = Lower limit frequency  
\(f_2\) = Upper limit frequency  
\(D_f\) = Measurement bandwidth
The DDX 9121b is the latest in the DDX family for partial discharge & radio interference voltage testing. With the DDX 9121b you can setup, control, test, monitor and generate test reports from a single computer. Its modular design makes the DDX 9121b flexible for any application. From single measuring input to simultaneous 9 measuring inputs. From traditional partial discharge according to IEC60270 to RIV measurement or PD under DC. From pass/fail test to advance phase resolution time analysis. The DDX 9121b includes all you need, and has all you want.

The user interface has been designed to make PD readings easy. All options are grouped by categories, and the scope window shows all test related information. Even specific colors have been selected to reduce the strain on the user’s eyes during long term testing.

The DDX9121b increases the laboratory sensitivity as it is equipped with digital filters allowing the measurement frequency band to be shifted into a less noisy range and suppressing frequency dependent noise. In addition there are gating possibilities to blank out static interferences.

The reports can be printed out or displayed as a web page. Users can also export the results to a spreadsheet. Software also provides bitmaps for inclusion in other reports.
The built-in frequency spectrum analysis and selectable frequency band let you optimize your setup in seconds.

Unit can be easily upgraded by acquiring software keys (4 inputs switch, PD on DC, cable fault location) or adding additional hardware (RIV boards or additional detectors for simultaneous measurement).

For distribution transformers, the DDX 9121b/ SKMX option (enable by software code) add an embedded manual switch with up to 4 PD inputs per detector (optional).

For three phases test (for example power transformers), several detectors (up to 9) can be combined and connected to a single computer providing simultaneous PD readings. The detectors can be installed on a trolley on wheels and can be located in the test room connected to the computer through fiber optic cables.

### FEATURES

- User defined measuring band
- Unique combination of analog and high order digital filters
- High resolution spectrum analyzer with oscilloscope
- Modular design, 1 to 9 detectors
- Easily upgradable
- Embedded switch with four PD inputs per detector (optional)
- PRPD (Phase Resolved Partial Discharge) pattern (fingerprinting)
- Derived IEC quantities (average discharge current, repetition rate)
- Data acquisition and test report generation
- PD Site Location (SL) on power cables
- Market unique “trigger on charge Q” feature
- AC and DC measuring modes
- Simultaneous RIV and PD reading

### ADVANTAGES

- Reduced ground noise – The built-in frequency spectrum analysis and selectable frequency band let the user optimize the setup quick and easy.
- Optimized investment - Unit can be easily upgraded (RIV, 4 inputs switch, simultaneous PD readings, PD on DC, etc.).
- PD interpretation – The phase resolved analysis and recording capabilities allow future data analysis.
- Reduced training time – The Windows based software makes the use of the device easier than ever. Operators can start using the device in minutes.
- Fast PD site location (SL) in power cables – SL function enables users to locate the site of failure in power cables in seconds.
- Applications versatility – DDX 9121b enables user to measure PD under AC or DC voltage stress, provides simultaneous RIV measurement as an option and can perform fast PD Site Location on cables.

### MODULAR DESIGN

Unit can be easily upgraded by acquiring software keys (4 inputs switch, PD on DC, cable fault location) or adding additional hardware (RIV boards or additional detectors for simultaneous measurement).

For distribution transformers, the DDX 9121b/ SKMX option (enable by software code) add an embedded manual switch with up to 4 inputs per unit.

For three phases test (for example power transformers), several detectors (up to 9) can be combined and connected to a single computer providing simultaneous PD readings. The detectors can be installed on a trolley on wheels and can be located in the test room connected to the computer through fiber optic cables.

### INCREASE SENSITIVITY

The built-in frequency spectrum analysis and selectable frequency band let you optimize your setup in seconds.
The advanced data acquisition and analysis software allows a wide variety of possibilities such as recording PD pulses of each and every test voltage cycle and analyzing them both in the time and phase domains.

The device includes a market unique feature – trigger on charge Q - which enables user to perform PD cable site location by one mouse click without previous expertise. The oincluding averaging function enables localization of faults up to 10 km cable length.

Analog outputs allow connecting any external device for further post-processing of raw data for e.g. external oscilloscopes, data loggers etc. Outputs might be used also for triggering the PD signal during the acoustic/UHF PD fault location with external oscilloscope.

- Signal- PD Amplifier Output (raw signal, bandwidth limited by measuring setup)
- Filter- Digital PD Filter Output (filtered signal, bandwidth defined by remote software settings)
- Trigger- 3.3 V TTL Output (triggering by phase position or pulse amplitude as defined by remote software settings)

Both RIV voltage (mV, according to NEMA 107-1987) and partial discharge (pC, according to IEC 60270) measurements are done simultaneously, therefore both are performed in a single test without overstressing the test object. In addition, real time comparison between PD level and RIV is possible.
### STANDARD CONFIGURATIONS

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<th>Configuration</th>
<th>DDX 9121b-1</th>
<th>DDX 9121b-1/RIV</th>
<th>DDX 9121b-3</th>
<th>DDX 9121b-3/RIV</th>
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<th>DDX 9121b-4/RIV</th>
<th>DDX 9121b-6</th>
<th>DDX 9121b-6/RIV</th>
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</table>

### OPTIONS

#### Software Keys

- **DDX 9121b/SKMX**: Software key to enable the 4 embedded non-simultaneous inputs
- **DDX 9121b/SKSL**: Software key to enable PD Site Location
- **DDX 9121b/SKDC**: Software key to enable PD measurement under DC

#### Communications

- **DDX 9121b/FO**: Fiber optic adapter to connect the DDX9121b and the computer

#### Trolleys

- **DDX 9121b/TROLL**: Trolley on wheels for multi-detector configurations, trolley can be located in the test area
The AKV 9310 measuring impedance is a fully passive measurement system optimized for use with the DDX 9121b. It is equipped with an internal voltage divider and a dedicated 4mm output connector for an external low-arm device.

The AQS 9110a measuring impedance is a fully passive measurement system optimized for use with the DDX 9101b as well as previous HAEFELY PD detectors. It is equipped with a user selectable three positions internal voltage divider.

The AKV 9330 is used for PD testing of large power capacitors. It is an ideal IEC 60270 compliant solution for this particular application.

The RIV calibrator KAL 9530 has been designed to perform an RIV calibration together with our DDX 9121b PD detector. The unit injects a calibration signal at the desired frequency into the test object through a specially designed RIV calibration set (cable set, probe and clamp).
ACCESORIES - PD CALIBRATORS

The coupling capacitor together with the coupling impedance separates the PD pulses (high frequency) from the normal AC signal (low frequency).

**KAL 9511**
The KAL 9511 is a family of basic PD calibrator covering most of the common demands. It fulfills IEC 60270 requirements. The output range can be selected among different models according application requirements.

**KAL 9510**
The KAL 9510 is an intermediate PD calibrator, it includes a wide range (from 1 to 50'000 pC), and a touchpanel control for easy to use.

**KAL 9520**
The KAL 9520 has been designed to exceed the standard requirements of a PD calibrator. Its wide range (from 100fC - 50nC), its small injection capacitor and its advanced features (double pulse, polarity pulse selection, internal and external synchronization, linear range selection, etc.) make the KAL 9520 unique.

ACCESORIES - COUPLING CAPACITORS

Coupling capacitor is a part of the partial discharge measuring circuit. A closed loop for the high frequency PD signals is established between the test object and the coupling capacitor. The PD pulses are then captured by the measuring impedance and brought to the PD detector.

ACCESORIES - COMPUTERS

Laptop with DDX 9121b software preinstalled and configured. Windows 7 in English included.

PCI 511 Specially designed industrial computer to be used in high voltage laboratories under extreme electromagnetic conditions (Ex. Chopped impulses)
Global Presence

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Current and voltage – our passion