DDX 9121b

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

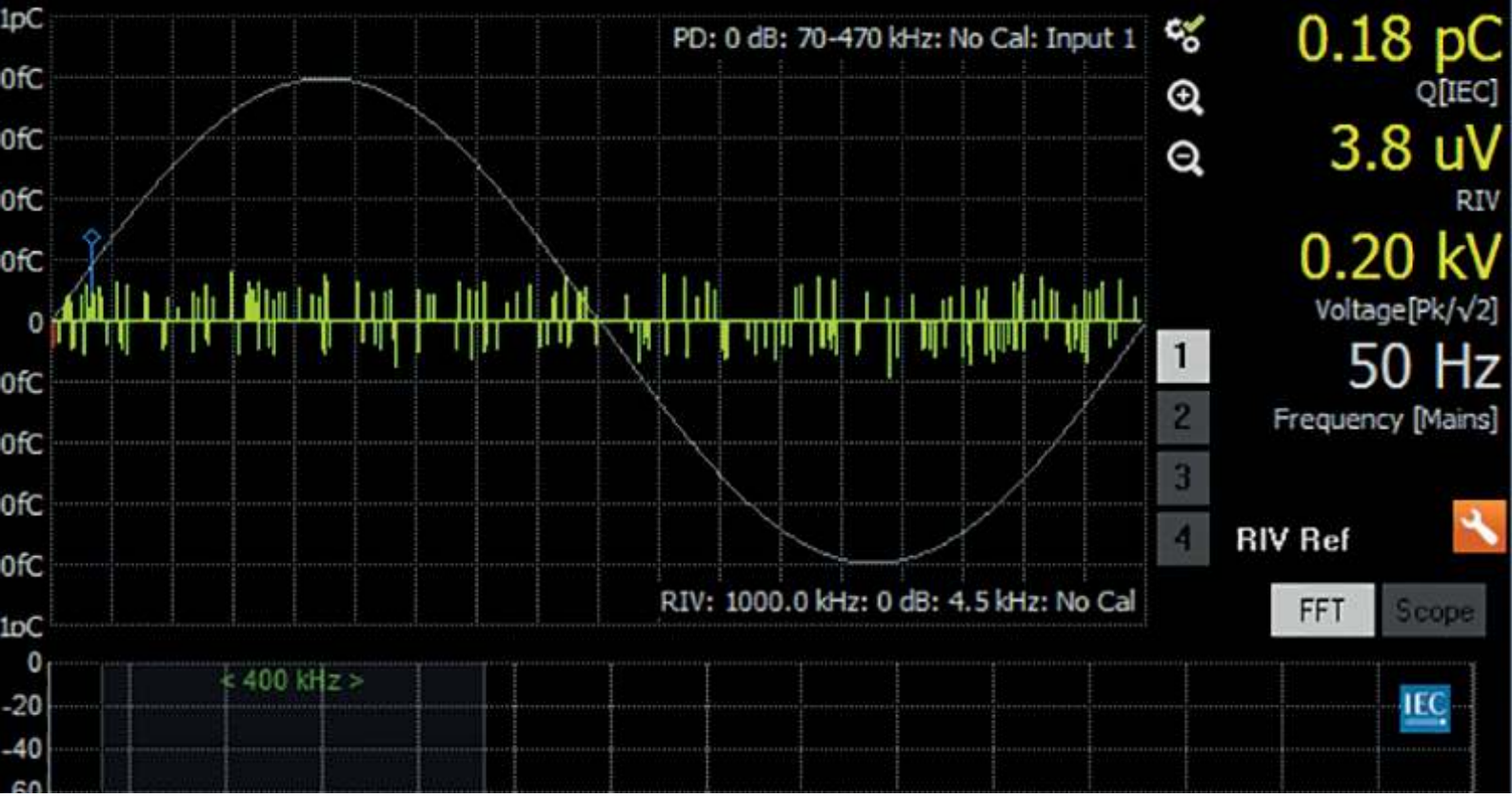
Leaflet



HAEFELY

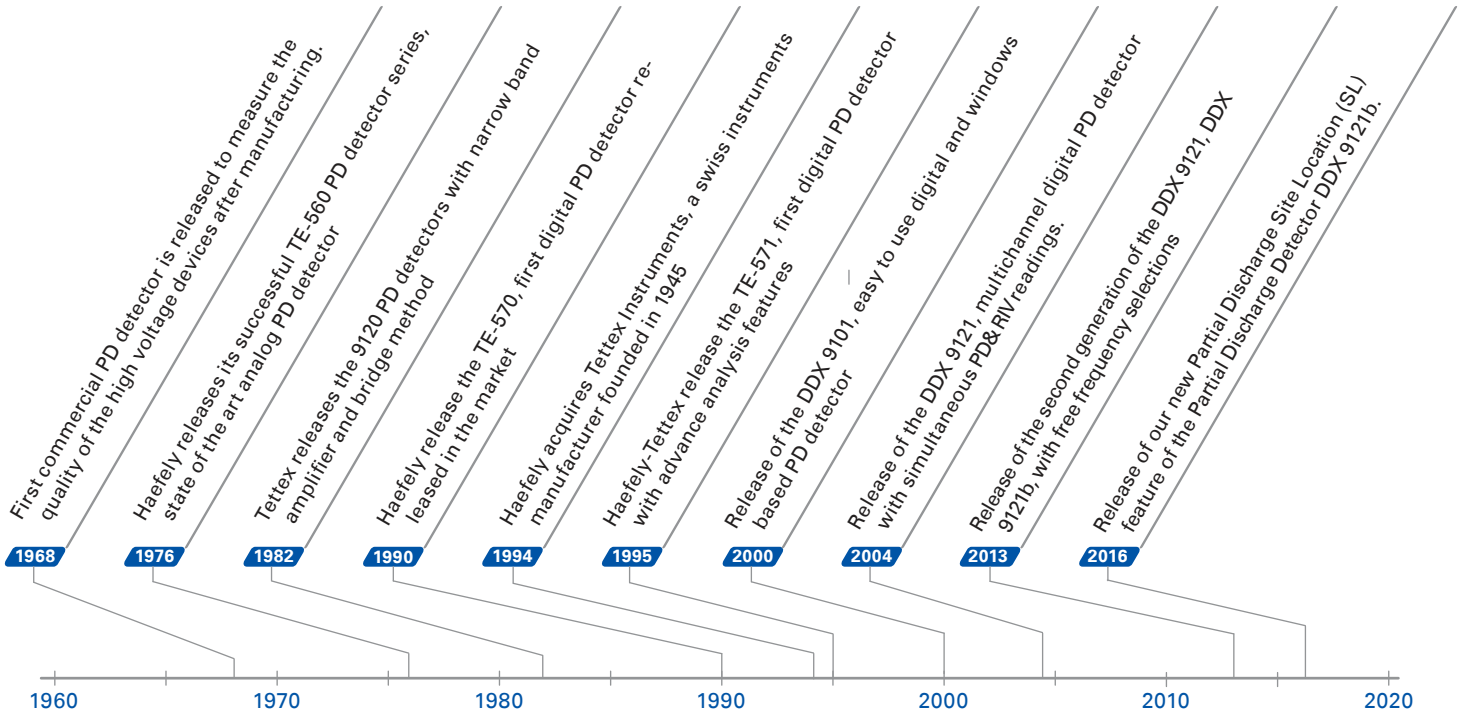
Current and voltage – our passion

Designed by Tettex INSTRUMENTS



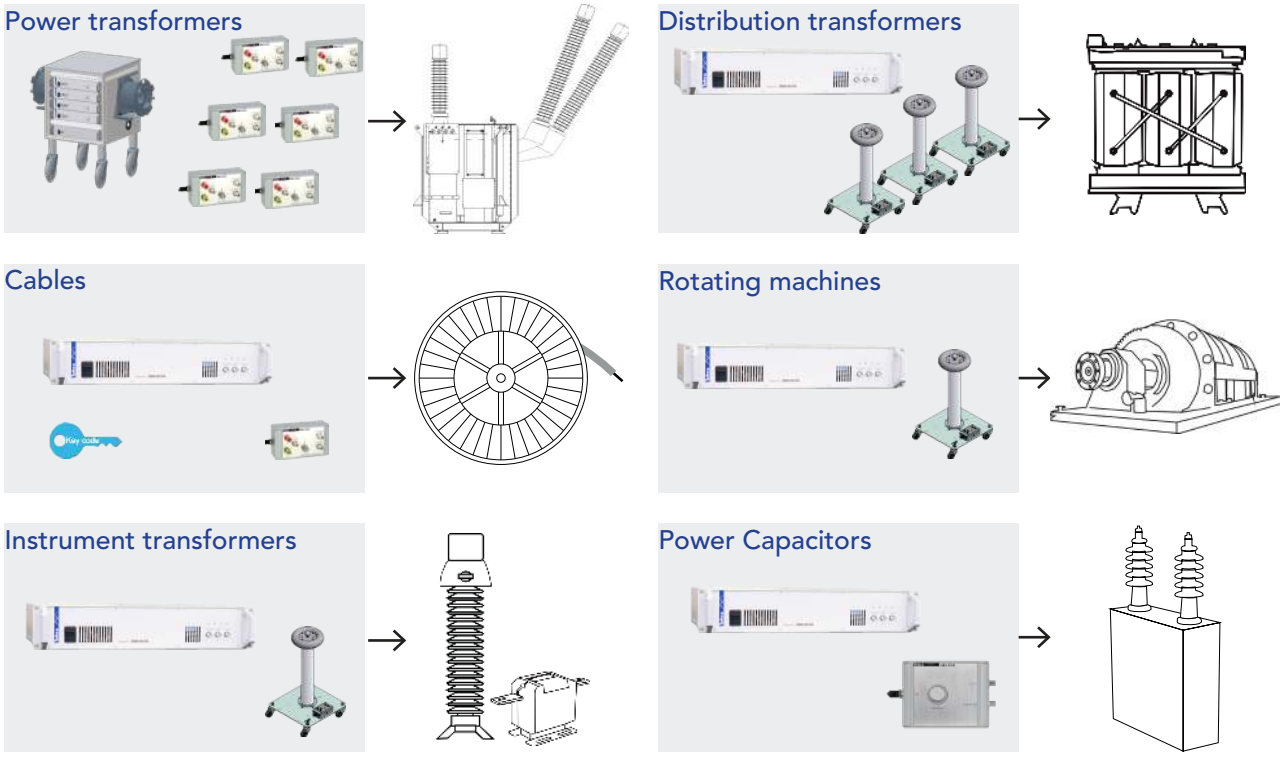
THE BEST TEAM IN BUSINESS

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, powerfull 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

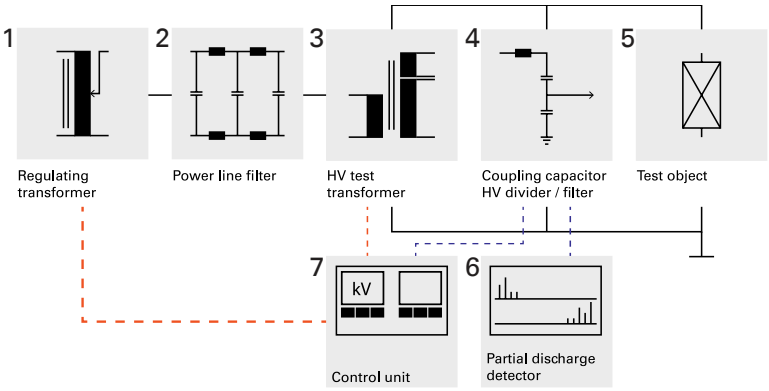




HAEFELY TEAS 570
First digital detector , 1991

PARTIAL DISCHARGE MEASUREMENT

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 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, succesor 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.



1. Regulating transformer
2. Line filter
3. High voltage transformer
4. Coupling capacitor
5. Test object
6. Partial discharge detector
7. Control unit

PARTIAL DISCHARGE AND NOISE

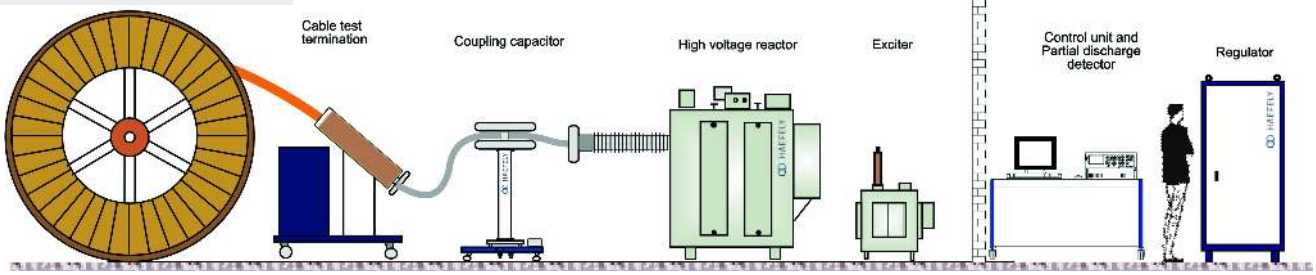
A partial discharge is a small current pulse which circulates inside the circuit created by the test object, the coupling capacitor and the measuring impedance. Electrical interferences, if large enough, could affect the sensitivity of the measuring system. Although several techniques exist for noise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

Radiated Noise picked by the measurement loop. Reducing measuring loop inductance will help

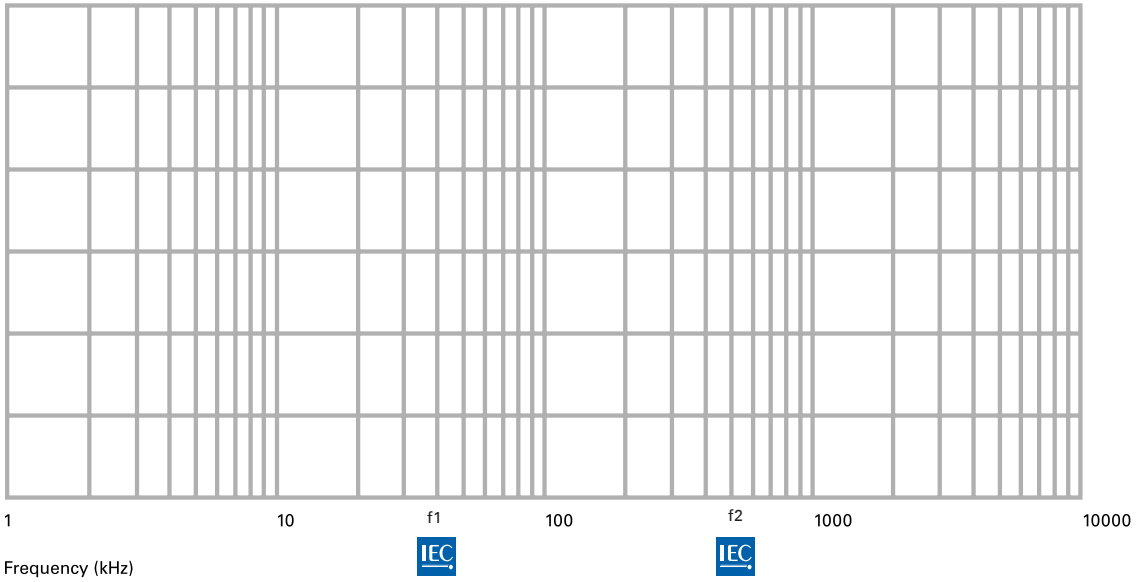
Induced noise, coming through the mains, band-rejecting filters could help.



Ground Noise, coming from ground circulating currents, independent earthing could help

MEASURING BAND

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.

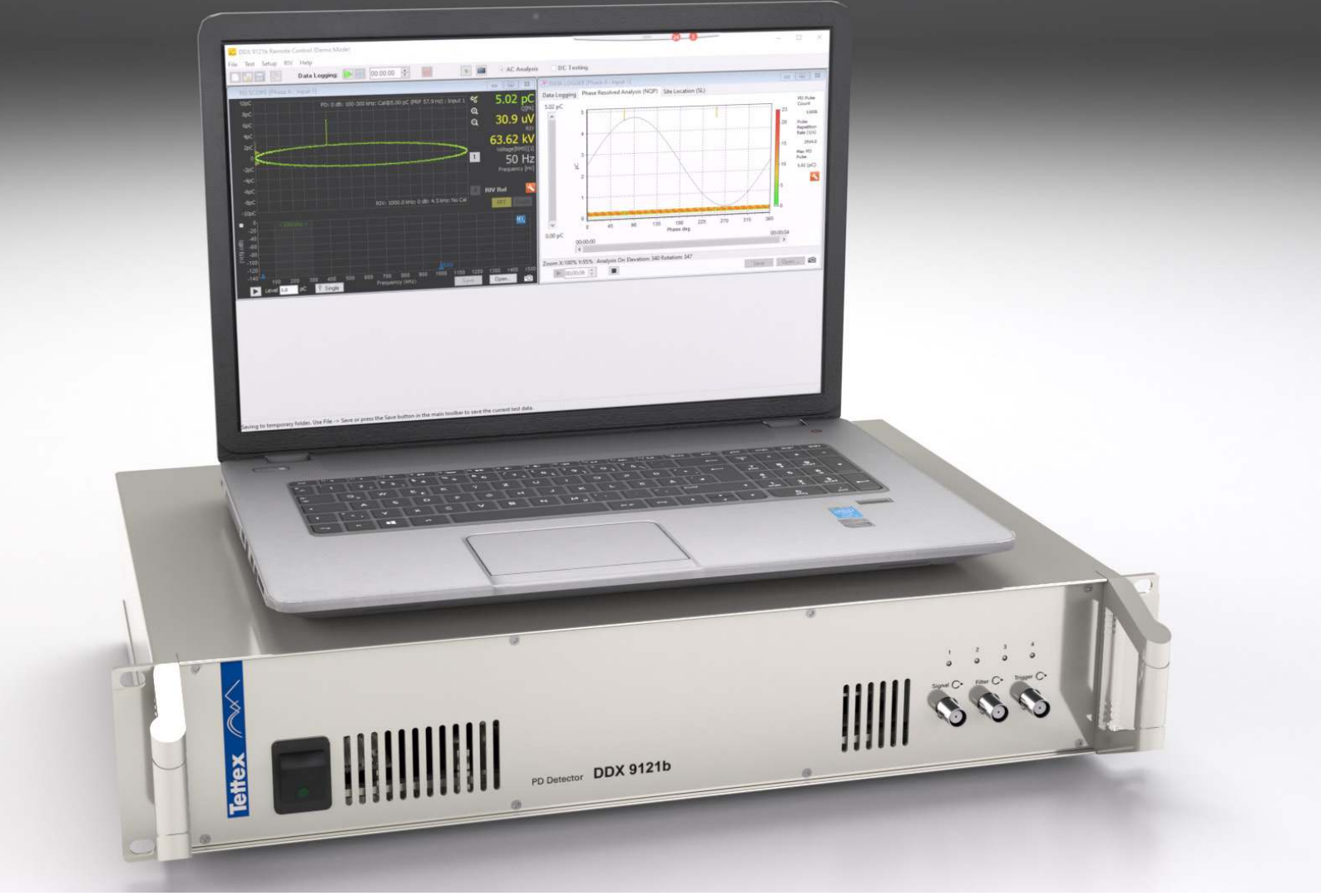


IEC60270 RECOMMENDED VALUES

30 kHz	≤ f1 ≤	100 kHz
	f2 ≤	1 MHz
100 kHz	≤ Df ≤	900 kHz

f_1 = Lower limit frequency
f_2 = Upper limit frequency
Df = Measurement bandwidth





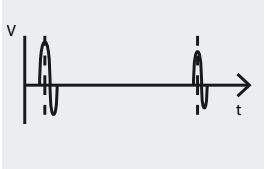
DDX 9121b - MULTICHANNEL DIGITAL PD DETECTOR

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.

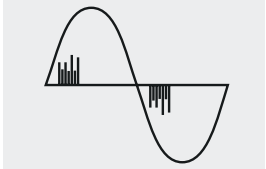
The user interface has been designed to make PD readings easy. All options are grouped by categories, and the scope window shows all test related information. Even specific colors have been selected to reduce the strain on the user's eyes during long term testing.

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.

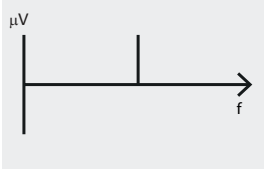


PD Cable Site Location


Partial discharge AC



Partial discharge DC



RIV

FEATURES		ADVANTAGES
• User defined measuring band • Unique combination of analog and high order digital filters • High resolution spectrum analyzer with oscilloscope	→	✔ Reduced ground noise – The built-in frequency spectrum analysis and selectable frequency band let the user optimize the setup quick and easy.
• Modular design, 1 to 9 detectors • Easily upgradable • Embedded switch with four PD inputs per detector (optional)	→	✔ Optimized investment - Unit can be easily upgraded (RIV, 4 inputs switch, simultaneous PD readings, PD on DC, etc.).
• PRPD (Phase Resolved Partial Discharge) pattern (fingerprinting) • Derived IEC quantities (average discharge current, repetition rate) • Data acquisition and test report generation	→	✔ 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.
• PD Site Location (SL) on power cables • Market unique "trigger on charge Q" feature	→	✔ Fast PD site location (SL) in power cables – SL function enables users to locate the site of failure in power cables in seconds.
• AC and DC measuring modes • Simultaneous RIV (NEMA & CISPR) and PD reading	→	✔ Applications versatility – DDX 9121b enables user to measure PD under AC or DC voltage stress, provides simultaneous RIV (NEMA & CISPR) and PD measurement as an option and can perform fast PD Site Location on cables.

MODULAR DESIGN

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

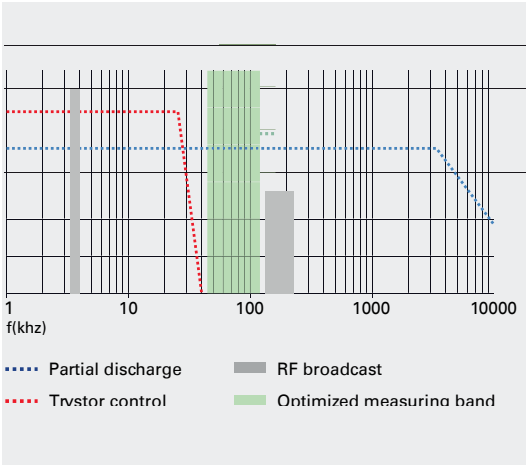
For distribution transformers, the DDX 9121b/ SKMX option (enable by software code) add an embedded manual switch with up to 4 inputs per unit.

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

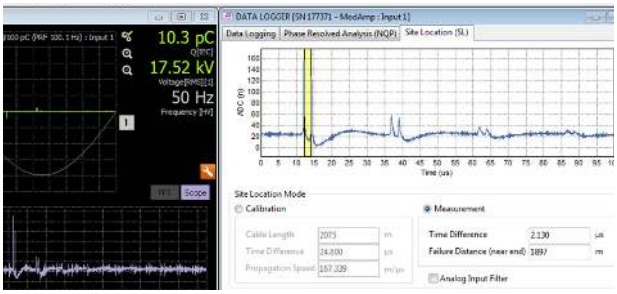
The built in frequency spectrum analysis and selectable frequency band let you optimize your setup in seconds.



PD CABLE FAULT LOCATION

The DDX 9121b-SL function is a significant advancement in PD site location. Thanks to the pre-set automated cursors it is not only extremely easy to use, but its real-time display window and data averaging function renders insignificant the background noise by increasing the Signal to Noise Ratio (SNR). Thanks to the sampling rate 100 MS/s (interpolated) and minimum time resolution 10 ns, approximately 1 m resolution is possible.

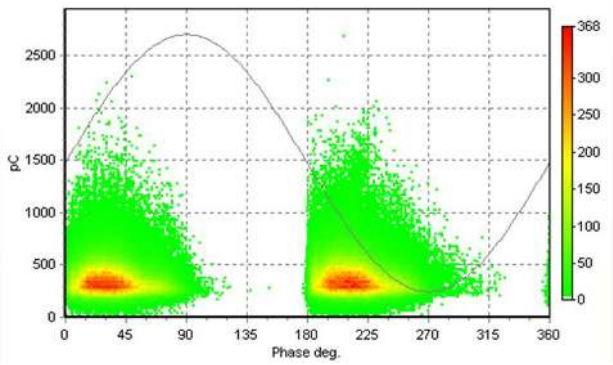
The device includes a market unique feature – trigger on charge Q - which enables user to perform PD cable site location by one mouse click without previous expertise. The oincluding averaging function enabes localization of faults up to 10 km cable length.



PD INTERPRETATION

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.

With the pattern acquisition and analysis module, several two- and three-dimensional PD pulse patterns of all the monitored channels (when equipped with a multiplexer) can be displayed and recorded. Snap shots of the 3D patterns can be saved into a windows gallery for further use like generation of customized test reports.

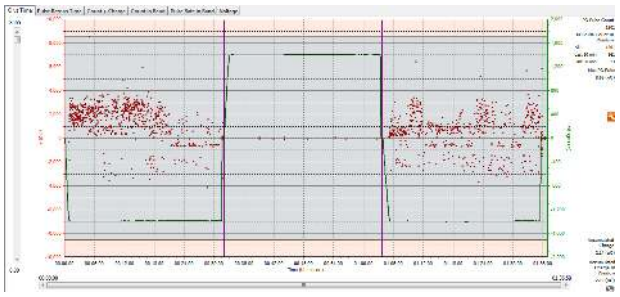


SIMULTANEOUS PD AND RIV READINGS

Both RIV voltage (mV, according to NEMA or CISPR) 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, a real-time comparison between PD and RIV level is possible utilizing two sets of independent high-performance digital filters.

PD UNDER DC

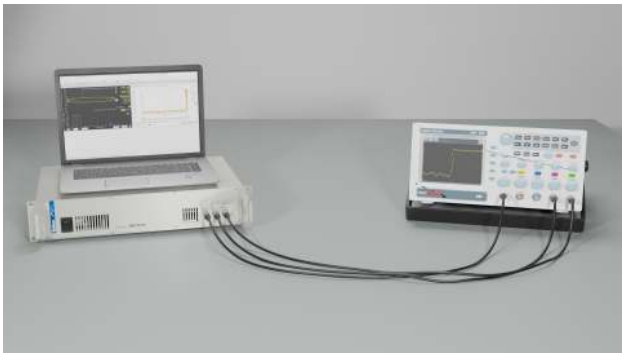
While measuring with PD on DC test voltage, an accurate recording of each PD event is of maximum importance. The DDX 9121b is a trusty device while doing this particular test.



ANALOG OUTPUTS

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.

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



STANDARD CONFIGURATIONS

	DDX 9121b-1	DDX 9121b-3	DDX 9121b-4	DDX 9121b-6	DDX 9121b-8
Simultaneous PD inputs	1	3	4	6	8
Non-Simultaneous PD inputs	4	12	16	24	32
Simultaneous RIV inputs [1]	1 Opt	3 Opt	4 Opt	6 Opt	8 Opt
PD on DC [2]	Opt	Opt	Opt	Opt	Opt
Phase resolve analysis	Yes	Yes	Yes	Yes	Yes
Spectrum analyzer and scope	Yes	Yes	Yes	Yes	Yes
Selectable measuring band	Yes	Yes	Yes	Yes	Yes

[1] With the optional DDX9121b/SKRIV software key option
[2] With the optional DDX9121b/SKDC software key option


DDX 9121b-1


DDX 9121b-3

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
DDX 9121b/SKRIV	Software Key to Enable RIV in the DDX 9121b PD Detector (NEMA & CISPR)
Communication	
DDX 9121b/FO	Fiber optic adapter to connect the DDX9121b and the computer
Trolley	
DDX 9121b/TROLL	Trolley on wheels for multi-detector configurations, trolley can be located in the test area


DDX 9121b/TROLL

ACCESORIES - MEASURING IMPEDANCES

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

AKV 9310

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.



AQS 9110a

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.



AKV 9330

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



ACCESORIES - RIV CALIBRATORS

KAL 9531

The RIV calibrator KAL 9531 has been designed to perform an RIV calibration together with our DDX 9121b PD detector. It is a market unique all in one single device which allows calibration according to the latest CISPR 18-2 as well as backward compatible with NEMA 107



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

9230

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

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

HV HIGH VOLTAGE
I INSTRUMENTS
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precision. swiss made.