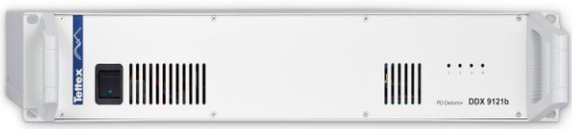
DDX 9121B

Modular Partial Discharge (PD) & Radio Interference Voltage (RIV) 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 DDX9121b flexible for any application. From single measuring input to simultaneous 9 measuring inputs. From traditional partial discharge according IEC60270 to RIV measurement or PD under DC. From pass/fail test to advance phase resolution time analysis. The DDX9121b includes all you need, and have all you want.

The DDX 9121B comprises 1 to 9 rack-mounted unit(s) communicating with a remote PC (not included), which handles the display of PD information using the DDX 9121b/SWR data acquisition and remote control software. The software displays test results, generates test reports, and provides a means to calibrate the system.

Digital filters allow the measurement frequency range to be at any range into the measuring band to suppress frequency dependent noise. In addition gating possibilities allow blanking out stationary interferences.

The reports can then be printed out from the software or displayed as a web page. With help of the software the user can also export the results for use in a spreadsheet. Software also provides bitmaps for inclusion in other reports.

FEATURES

- User defined measuring band.
- Modular design, 1 to 9 detectors, easily upgradable.
- Embedded switch with four PD inputs per detector.
- Simultaneous RIV and PD reading.
- PD patterns like *φϕ-q-n* (phase, magnitude, occurrence)
- High resolution spectrum analyzer with oscilloscope.
- Data acquisition and test report generation.
- AC and DC measuring modes

BENEFITS

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

Optimize your investment if your needs change. Unit can be easily upgraded (RIV, 4 inputs switch, simultaneous PD readings, PD on DC…)

Reduce your training time –The Windows based software makes the use of the device easier than ever. Operators can start using the device in minutes.

Straightforward replacement –replacement is as simple as removing the obsolete PD detector and measuring quadripole and installing the DDX9121b.

PD interpretation – The phase resolved analysis and recording capabilities allow for future data analysis.

Easy to integrate into test systems – Its compact design standard BNC measuring cables and remote control capabilities make it ideal for an integrated PD test system together with an AC power supply.

APPLICATIONS

Testing of:

- Power and distribution transformers
- Instrument Transformers
- Rotating Machines
- Power Capacitors
- Switchgears
- Surge Arrestors
- Research & Development

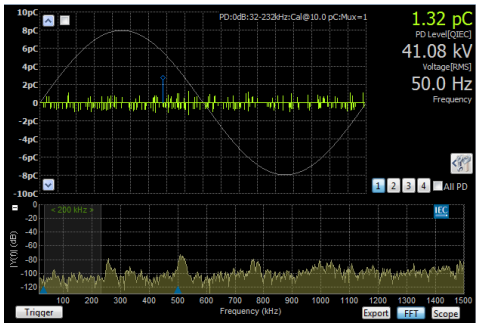
Designed by Tettex INSTRUMENTS

precision. swiss made.

HUBBELL HIGH VOLTAGE TEST SOLUTIONS

USER ORIENTATED INTERFACE

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 colours have been selected to reduce the strain on the user's eyes during long term testing.



Indications about the detector status, selected frequency band, input channel, PD level, Test voltage, and frequency are grouped in the scope window and can be displayed at any time.

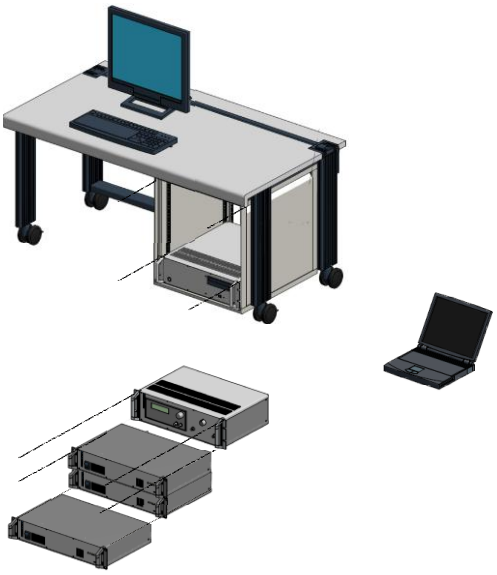
Detector settings are displayed next to the scope window by clicking the settings button, all options are grouped by category to make the configuration of the device easier than ever.

MODULAR DESIGN

for normal partial discharge test on one phase test objects the DDX9121-1 is equipped with one measuring input (DDX9121b-1).

For distribution transformers, the DDX9121b-MUX option (released by software code) add an embedded manual switch with "ALL" option. With this new feature the transformer is tested as a single phase test object, and switch is only used to locate the phase if PD level is above the limit.

For power transformers, several detectors (up to 9) can be combined and connected to a single computer providing simultaneous PD readings. Complete measuring system can be controlled from a laptop or built into a measuring desk.



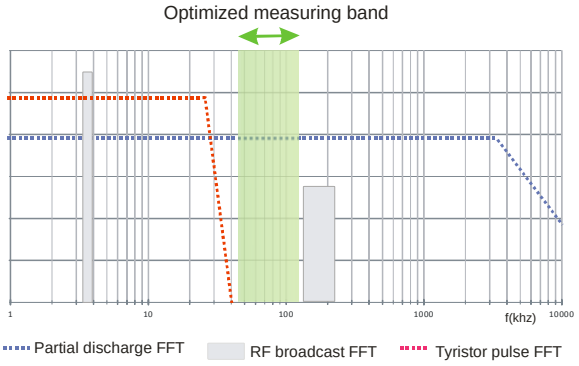
REAL TIME SIMULTANEOUS MEASUREMENTS

The DDX®9121b multi-detector PD system provides simultaneous PD level and phase resolved displays of the PD activity at any given moment during the test. A user can use this information to characterize and possibly locate the origin of discharge sources.

A chart recorder provides a hard copy of partial discharge level versus voltage and testing time for each channel in one customized graph. Any time during the test the partial discharge levels can be monitored and after the completion of the test, customized test reports for the multiple channels can be generated which automatically populate with snap-shots from notable events.

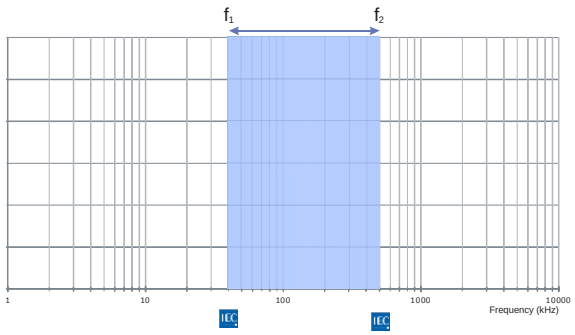
SELECTABLE MEASURING BAND

A wide band detector measures and displays the composite of all the signals and interference present within its bandwidth. Any PD activity will be difficult to differentiate from the noise floor. However, there could be a number of areas in the frequency spectrum where PD signals is at a much higher level than the unwanted interference. Defining a measuring band within these optimized areas will result in a higher measuring sensitivity and therefore a lower ground noise level.

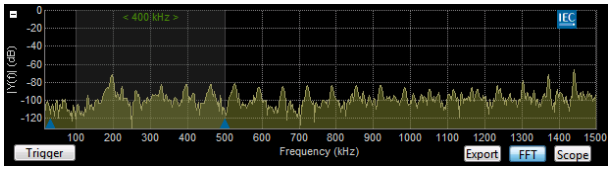


The IEC 60270 defines some limits in regards to the measuring band as following.

$30kHz < f_1 < 100kHz$
$f_2 < 500kHz$
$100kHz < \Delta f < 400kHz$



The DDX9121b is equipped with a frequency spectrum analyzer, where the operator can easily select the optimized measuring band based on the measured ground noise.



EASY TO CONFIGURE

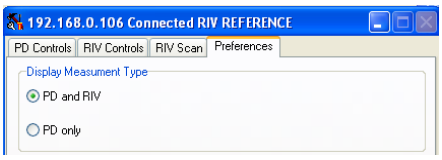
The DDX9121b measuring system is based on passive coupling impedances without batteries. In addition the wide range of the input voltage (140 V) makes the device connection easier than ever.

Just connect the coupling impedance (AKV9310) to your coupling capacitor, plug the DDX9121 to the net and connect through a normal or fiber optic (optional) LAN cable to the computer. Connect the included twin BNC cable between the DDX9121b and the impedance and start measuring PD.

SIMULTANEOUS PD AND RIV READINGS (OPTIONAL)

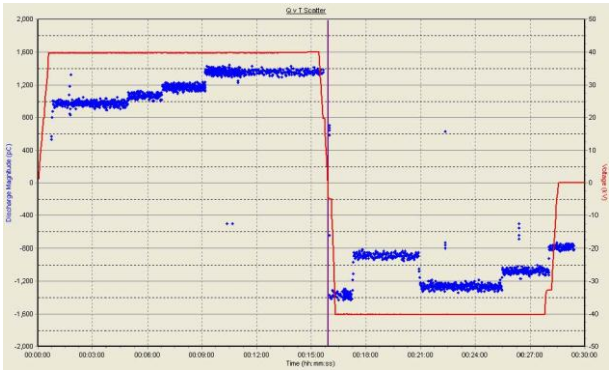
The DDX 9121b measures RIV according to ANSI and NEMA 107-1987, therefore the replacement of outdated RIV measuring instruments is straight forward without differences in measurement results.

Both RIV voltage (mV, According to NEMA 107-1987) and Partial discharge (pC, according 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.



PD UNDER DC (OPTIONAL)

While measuring PD on DC test voltage, an accurate recording of each PD event is of maximum importance, as the accepting/rejecting value will take into consideration not only the magnitude of the pulses, also the number of pulses during the test duration. The DDX9121b is a trusty device while doing this particular test.



DATA ACQUISITION & ANALYSIS

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 temporal and phase domain.

A chart recorder provides a hard copy of partial discharge level versus voltage and testing time for each channel in one customized graph. At any time during the test the partial discharge levels can be monitored and after the completion of the test, customized test reports for the multiple channels can be generated which automatically populate with snap-shots from notable events.

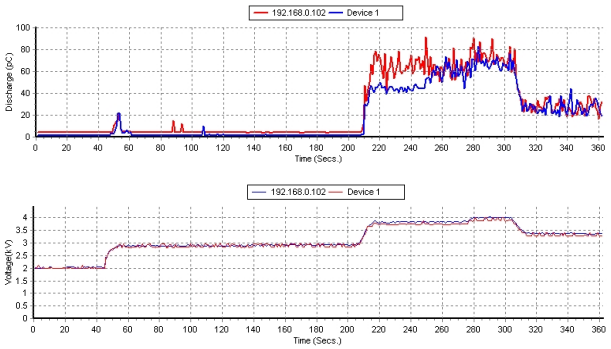
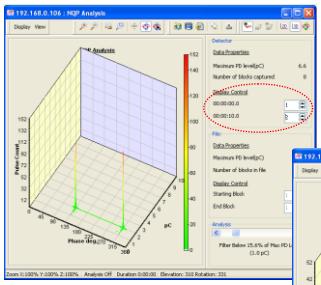


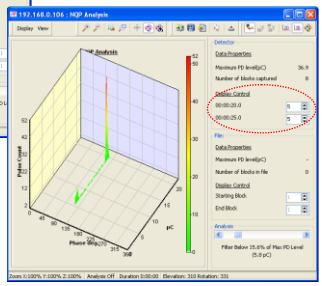
Chart Recorder with graphs PD vs. voltage and time

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. Snaps shots of the 3D patterns can be saved into a windows gallery for further uses like customized test report generation or to export them as image files.

Data filters and time-sliced views further permits a detailed look at the PD pattern as deep as every cycle of the applied test voltage and in certain cases, helps separate and identify noise interferences.



PD Pattern

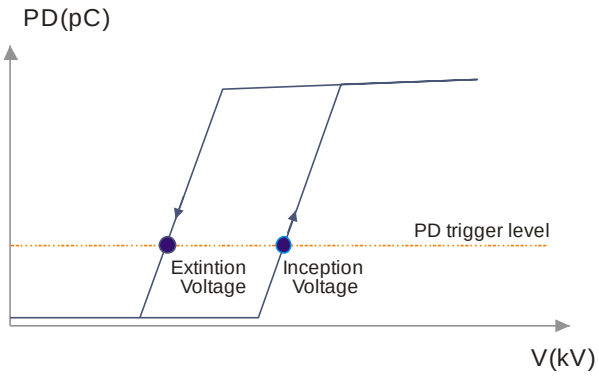


Noise Pattern

INCEPTION AND EXTINTION PD TEST

IEC 60270, on paragraph 8.3.1 describes the inception/extinction PD test. Generally the test is performed by increasing the voltage until the PD level reaches a trigger level, and then voltage is decreased until the PD level goes below the trigger level. Voltage levels are recorded at those two moments as Inception and extinction voltages.

The DDX9121b can show graphically the results of this particular test, and provide the inception and extinction voltages.



DATA EXPORT AND REPORTING

The reports are saved as HTML files containing graphs and charts. In addition all data can be exported as comma separated values(CSV) format for further analysis or highly customized test reports in other programs like MS Excel

STANDARD CONFIGURATIONS

	DDX9121-1	DDX9121-1/RIV	DDX9121-3	DDX9121-3/RIV	DDX9121-4	DDX9121-4/RIV	DDX9121-6	DDX9121-6/RIV	DDX9121-8	DDX9121-8/RIV
Simultaneous PD inputs	**1**	**1**	**3**	**3**	**4**	**4**	**6**	**6**	**8**	**8**
Non-simultaneous PD inputs Option DDX9121b/MUX	Opt 4	Opt 3	Opt 12	Opt 11	Opt 16	Opt 15	Opt 24	Opt 23	Opt 32	Opt 31
Simultaneous RIV inputs	Not	1	Not	3	Not	4	Not	6	Not	8
Non simultaneous RIV inputs Option DDX9121b/MUX	Not	Opt 3	Not	Opt 11	Not	Opt 15	No	Opt 23	Not	Opt 31
PD on DC Option DDX9121b/DC	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt
Phase resolve analysis	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spectrum analyzer and scope	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Selectable measuring band	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Opt -> Option

Other configurations than the ones below in regards to number of detectors or options are available upon request.

RIV calibrator included in the device picture is requested but has to be purchased separately

OPTIONS

DDX9121b/MUX

software key to enable the embedded non simultaneous 4 inputs

DDX9121b/DC

Software key to enable PD measurement under DC

DDX9121b/FO

Fiber optic adaptor to connect the DDX9121b and the computer

COMPUTERS AND RACKS

LAPTOP

Laptop with DDX9121b software preinstalled and configured. Windows 7 in English included.

MINIRACK

Rack on wheels for multi-detector configurations, rack can be located into the test room and connected to the computer through fiber optics

DESK WITH MINIRACK AND PCI COMPUTER

Desk with minirack including PCI computer, screen and mouse. DDX9121b and windows 7 pre-installed

TECHNICAL SPECIFICATIONS

PD Measuring	
Input Impedance	50 Ω
PD System Bandwidth	30 kHz ... 1.5 MHz (-6dB) (with internal analog filter)
	10 kHz ... 1.5 MHz (-6dB) (without internal analog filter)
Filter Center Frequency	Freely selectable (32 kHz ... 1.498 MHz)
Filter Bandwidth	4 kHz / 4.5 kHz / 9 kHz
	10 ... 100 kHz, in 10 kHz steps
	100 ... 500 kHz, in 50 kHz steps
	600 kHz ... 1 MHz, in 100 kHz steps
Sensitivity	< 0.1 pC (directly at AKV 9310/T quadripole input)
Input Atten. Range	0 dB / 20 dB / 40 dB
Linearity Error	< ±5 % (1 ... 100 % FSR)
Pulse Phase Resolution	0.35°

Voltage Measurement	
Input Voltage Range	0.14 ... 140 VAC (RMS)
	-200 ... -0.2 / +0.2 ... +200 VDC
Frequency Range	15 ... 400 Hz
Input Impedance	1.7 MΩ / 11 pF
Linearity Error	< ±1 % (0.1 ... 100 % FSR)
Synchronization	Voltage or Mains input
Synchronization Accur.	< 5°

Environmental	
Operating temperature	0°C ... +45°C
Storage temperature	-20°C ... +60°C
Relative Humidity	5% ... 80%, non-condensing

RIV Measurement System	
Frequency Range	850 ... 1150 kHz
IF Filter Bandwidth	4.5 kHz and 9 kHz
Image Rejection	> 55 dB
Stop Band Attenuation	> 70 dB @ ±7.5 kHz
	> 60 dB @ ±10 kHz
Linearity Error	±2 dB @ 10 Hz ... 1 kHz PRF, 1/10 ... 10x calibration level
Quasi-Peak Detector Response	According to NEMA 107, ANSI C63.2-1996

Power Supply & Mechanical	
Voltage	90 ... 264 VAC
Frequency	50 / 60Hz
Dimensions (WxDxH)	483 mm x 306 mm x 89 mm
Weight	6.2 kg
EMC	Compliant to EMC directive 2004/108/EC (EN 61326-1)
Safety	Low voltage directive 2006/95/EC (IEC 60010-1)
Vibration	MIL-STD-810G Table 514.6C-II, Category common carrier

Applicable Standards	
IEC-60060 Parts 1&2	ICEA T-24-380
IEC-60270	ASTM D1868-93
IEC-885-2 and 885-3	ANSI C57.113
IEEE Std. 4, 1995	ANSI C57.124-91
ANSI C63.2-1996	NEMA 107

ACCESSORIES FOR PD TESTING

CALIBRATORS

KAL 9520 High precision PD calibrator

High precision partial discharge calibrator touch screen controlled with a very wide, continuously variable output pC range

9216 hand held battery PD calibrator

Small battery powered PD calibrator. Pulses outputs ranges are 10, 100, 1000 and 10'000 pC

KAL 9530 RIV calibrator

RIV calibrator (KAL 9530) including a signal generator, RIV calibration set, clamp and a switching.

MEASURING IMPEDANCES

AKV 9310 passive universal coupling impedance

Compact impedance fully passive with enhanced sensitivity.

AKV 9330 Capacitors optimized coupling impedance

Active measuring impedance optimized for PD testing of power capacitor as per IEC 60270. It is rated for 300 amperes.

COUPLING CAPACITORS

9230 coupling capacitors

Consist of a high voltage unit mounted on a mobile (with wheels) base frame and includes a suitable top electrode and a coupling impedance.

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HUBBELL HIGH VOLTAGE TEST SOLUTIONS