DDX 9160/9161

Partial Discharge (PD & RIV) Detector Leaflet



DDX 9160



DDX 9161

HAEFELY

Current and voltage – our passion

Designed by
Tettex INSTRUMENTS



HISTORY

The best team in the business

Since the first PD detector in the 1960s, HAEFELY combined the best of HAEFELY, Tettex and Robinson experience in the release of the DDX™ 9160 partial discharge detector, powerful yet easy to use. Our partial discharge products range includes all one needs for factory testing. When it comes to partial discharge testing, you can't beat the HAEFELY instruments team.

Unique market lead device

HAEFELY, the pioneer company for partial discharge testing has been continuously developing and upgrading application specific high-voltage partial measuring/analyzing solutions over the years. The latest in a long line of distinguished PD detectors is the DDX 9160 and DDX 9161. HAEFELY has set a new benchmark with unmatched performance. The new front-end solution provides a solution with up to 4 PD and Voltage channels in a single compact body with the market leading «weight per channel» solution reaching only 1.3 kg for 4 channel option.

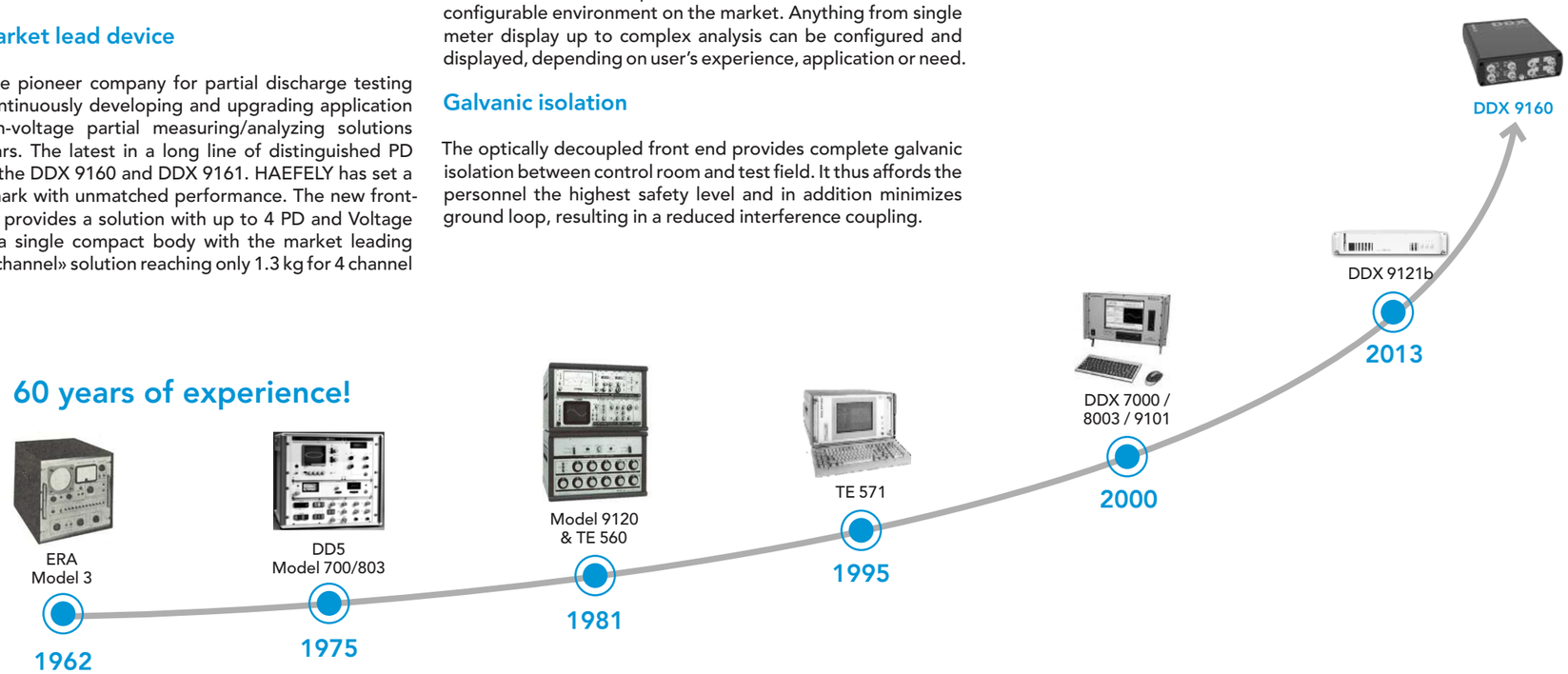
A powerful digital signal processing allows user to select any measuring frequency range within IEC 60270 and far beyond. This with the steepest filter characteristic for the high noise rejection. Unique built-in measuring impedance (AKV) makes the set-up easier and more compact than ever.

New software based on CaMS (HAEEFLY's Control and Measurement Studio) provides the most flexible and user-configurable environment on the market. Anything from single meter display up to complex analysis can be configured and displayed, depending on user's experience, application or need.

Galvanic isolation

The optically decoupled front end provides complete galvanic isolation between control room and test field. It thus affords the personnel the highest safety level and in addition minimizes ground loop, resulting in a reduced interference coupling.

60 years of experience!



FEATURES

- User-defined measuring band
- Unique flexible high order digital filters
- High-resolution spectrum analyzer with oscilloscope

- Modular design, simultaneous 1 to 4 channels
- Easily upgradable
- Daisy chain support up to 12 simultaneous channels

- Optically decoupled from computer
- Compact, reliable, and EMC hardened design, IP50

- PRPD (Phase Resolved Partial Discharge) pattern (fingerprinting)
- Data acquisition and test report generation

- Software layout flexibility and versatility
- Dark software mode

- PD Site Location (SL) on power cables

- Simultaneous RIV (NEMA or CISPR) and PD reading
- AC and DC measuring modes

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 (up to 12 simultaneous PD/RIV readings).

→ **Galvanic isolation** - Ensures the full safety of the operating personnel. With the DDX 9160 and 9161, there is no electrical connection between the control room and the high voltage test room.

→ **PD interpretation** - The phase-resolved analysis and recording capabilities allow future data analysis.

→ **Reduced training time** - Modern SW 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 single or multiple failures in power cables in seconds.

→ **Measuring time reduction** - Applications versatility and measuring time reduction.

APPLICATIONS

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

Compact

Battery-operated

Lab-optimized

Strong steelcase

DDX 9160

DDX 9161

Light-weight

Portable

Rugged Fiber Optics

Low-noise AC supply

PORTABLE OR LAB-OPTIMIZED DESIGN

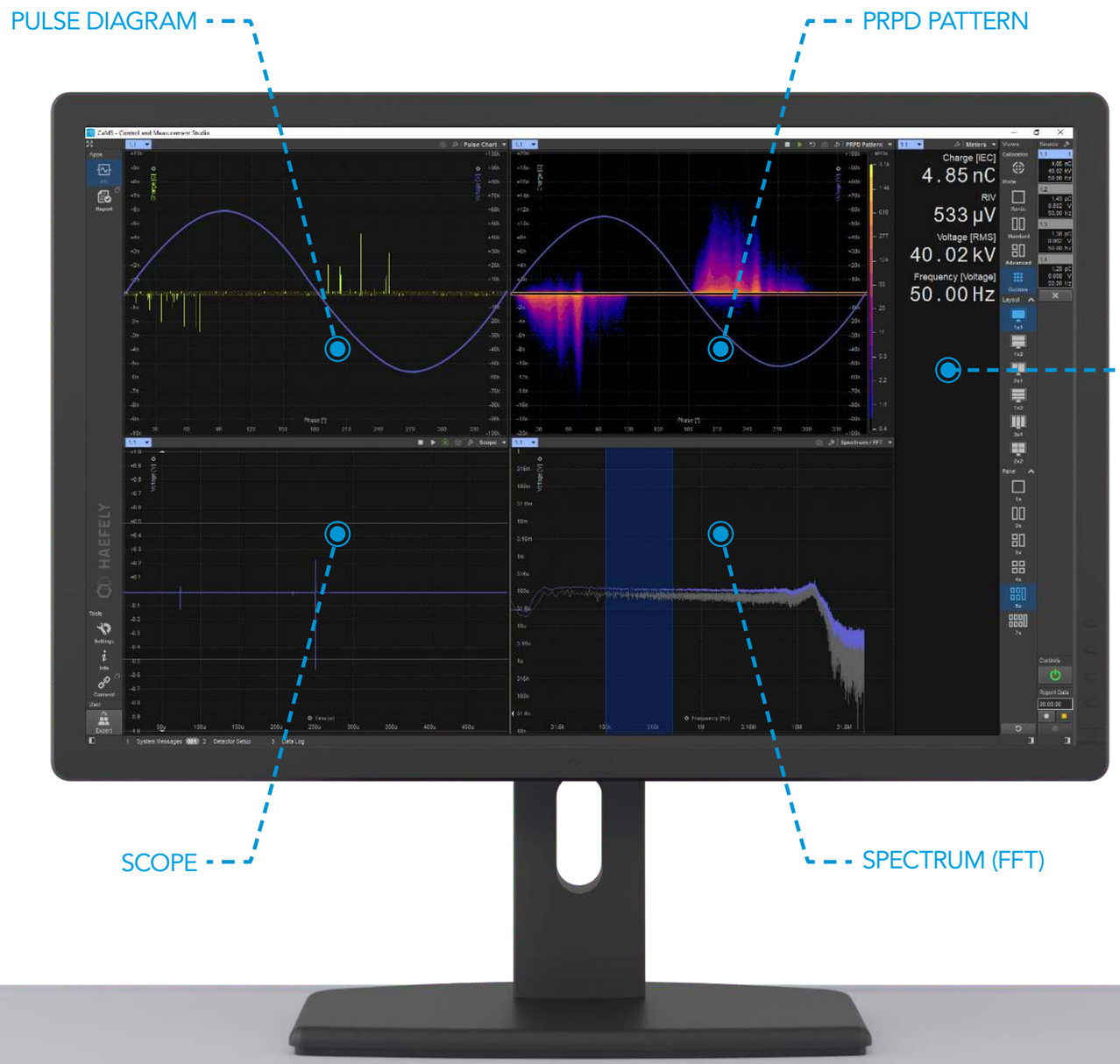
SOFTWARE

- 100 % free frequency selection within IEC 60270 range and beyond
- Optimal measuring frequency band settings
- The best signal-to-noise (SNR) ratio

PD measurement up to 20 MHz

- Time-domain analysis
- Optimized scope for PD analysis
- High recording depth of 500 µs

Scope view



- PD fault recognition
- Various colour palletes
- High sensitivity, down to 0.01 pC

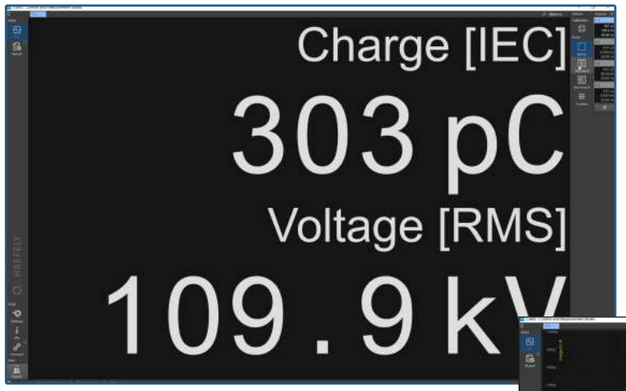
High-resolution PRPD patterns

- Frequency-domain analysis
- The finest 2.5 kHz resolution up to 50 MHz
- High-order digital filtering

Spectrum (FFT) view

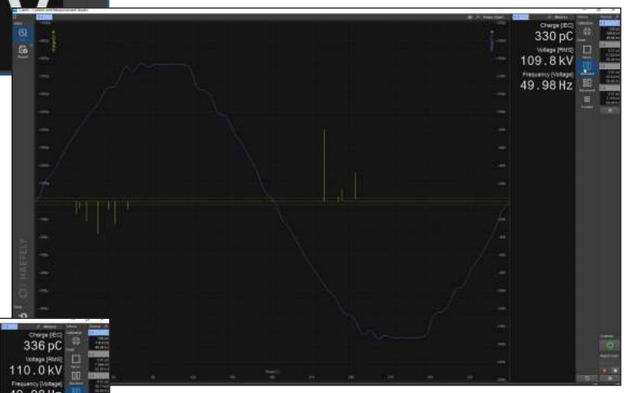
OPERATING MODES

HAEEFLY's CaMS™ (Control and Measurement Studio) utilizes the most flexible and user-configurable PD application software available on the market. It enables the controlling of single channel, multi-channel (up to 4 channels per unit) and/or multi-detectors. This modern SW displays a dark-mode and includes all the required PD-tools such as Meters, Pulse Diagram, PRPD pattern (fingerprinting), data recording - logger and more. The number of meter indicators, as well as their size, can be selected.



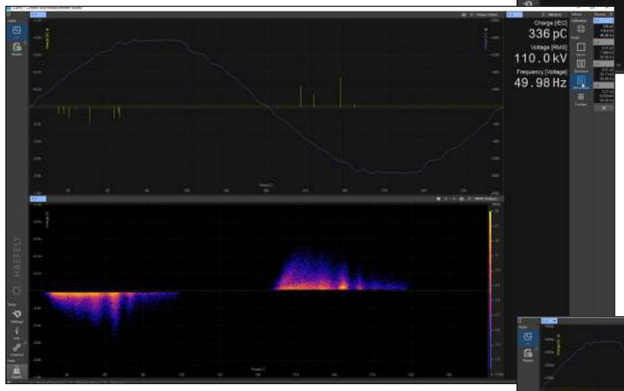
BASIC VIEW

The user can define the complexity of the GUI display. In the «Basic view», either one single meter (e.g. charge) or multiple meters including voltage, frequency and PD derived quantities (average discharge current, repetition rate, etc.) can be displayed.



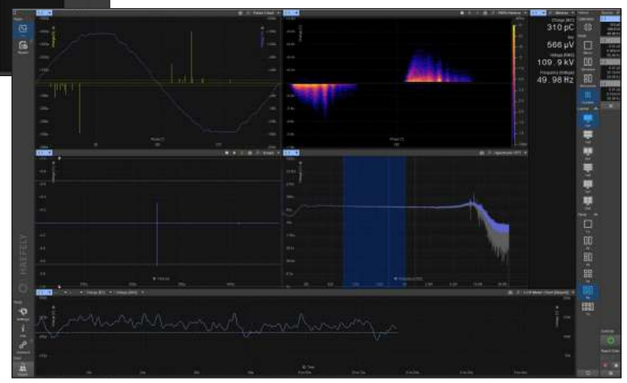
STANDARD VIEW

The «Standard view» offers Pulse Diagram and Meter widget for more precise PD analysis.



ADVANCED VIEW

The «Advanced view» allows further analysis using Pulse Diagram, PRPD pattern and Meter widget at the same time.



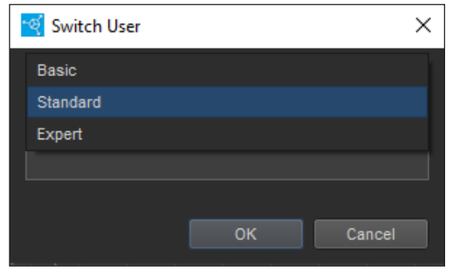
CUSTOM VIEW

The «Custom view» enables a user to configure his own view, that best fits his needs and preferences. Any combination of available diagrams and widgets is possible. This applies to a single-channel, multi-channel or multi-detector solution.

REPORTING, DATA EXPORT & USER ROLES

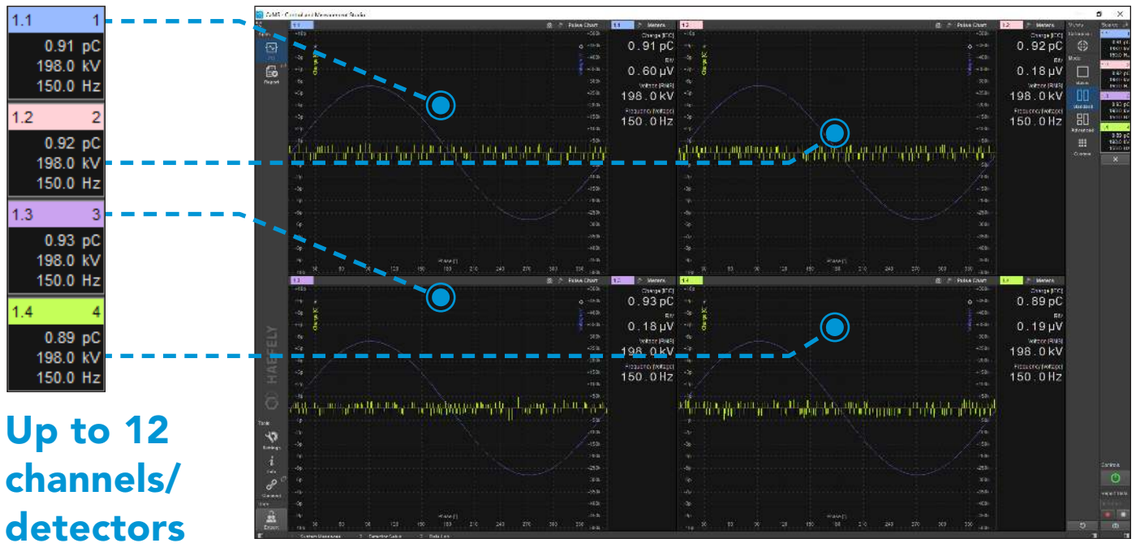


- Custom editable templates
- Print or PDF
- SQL database
- CSV and PNG data export



- User Roles
- Password protection
- Limited features and widget access

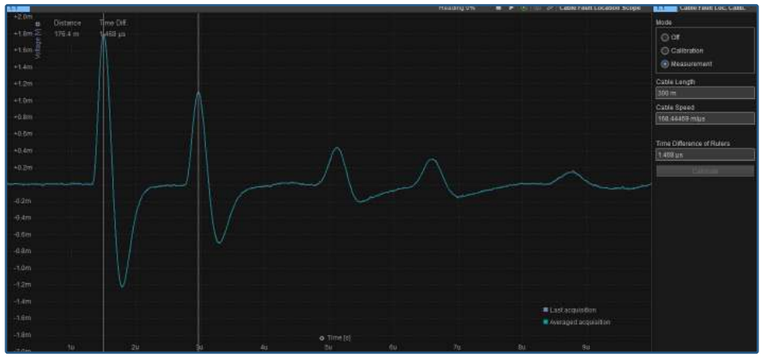
SIMULTANEOUS PD MEASUREMENT



Up to 12 channels/ detectors

POWER CABLES PD SITE LOCATION

Meet the most modern PD site location on the market using the latest technology advantages. A user needs to just connect the PD calibrator to the power cable end and enter the cable length into the software, the rest is done by DDX's user-friendly SW. Thanks to the sampling rate of 100 MS/s and minimum time resolution of 10 ns, approximately 1 m resolution is possible. The 20 MHz system bandwidth permits very high localization sensitivity towards the cable ends – typically 4 meters from the cable ends.

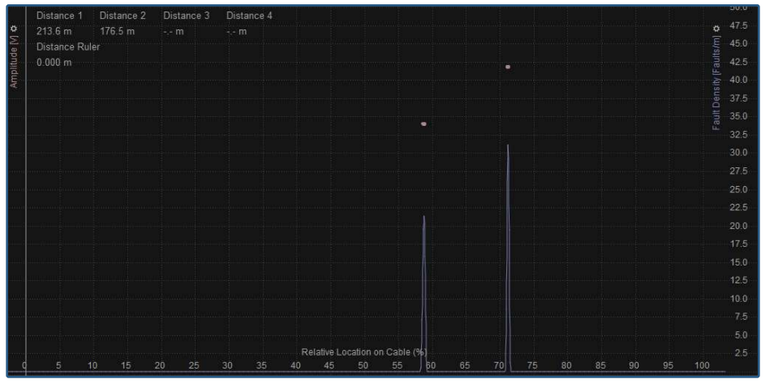


SINGLE FAULT

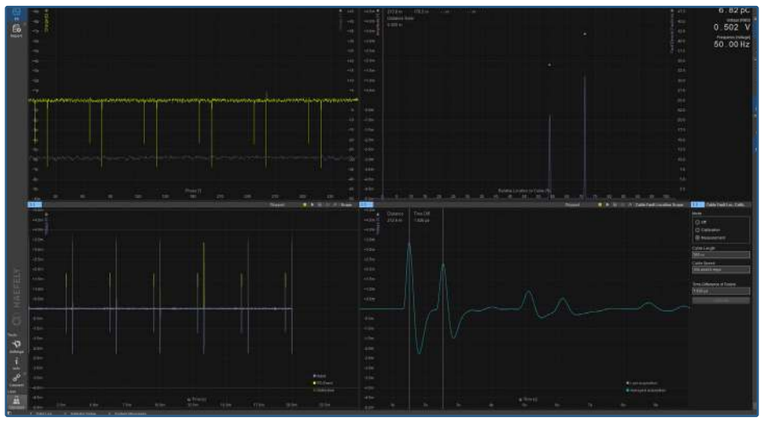
The included averaging function enables the localization of faults up to tens of kilometers of the cable length.

MULTI FAULT

PD map diagram serves for multiple PD fault localization utilizing so-called statistical time domain reflectometry. Thanks to the market-leading 20 ms recording depth the complete voltage cycles (50/60 Hz) are recorded so no PD fault can be missed out.



In noisy environments, advanced features such as straightforward usable FFT and user-definable site location dedicated digital filters can be used to gain the best signal-to-noise-ration (SNR).

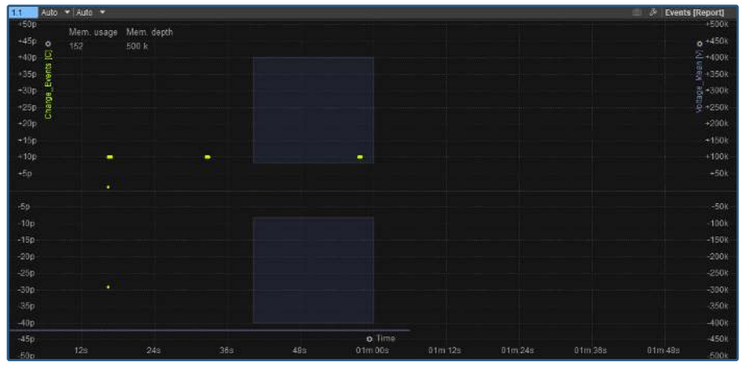


COMPREHENSIVE PD LOCALIZATION

Thanks to the versatility of the CaMS SW any combination of diagrams and meters can be defined and displayed by the user. From a simple single diagram view to a complex analysis display.

PD UNDER DC STRESS

PD measurement under DC stress is a complex task. All PD events needs to be recorded and counted within a specific time interval. DDX is a trustworthy partner in doing this task. It offers a simple meter displaying Q_{pk} and U_{mean} reading view but also an extensive analysis thanks to customizable display solution. The meter then offers a wide palette of magnitudes as for example accumulated charge, PD count (total or in the selected window), voltage ripple (in %), and much more.

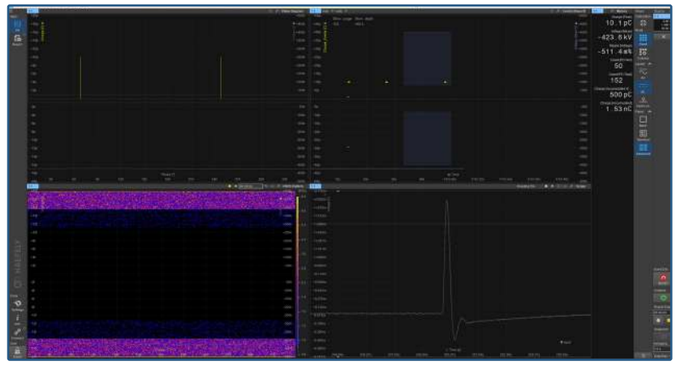


DC EVENTS DIAGRAM

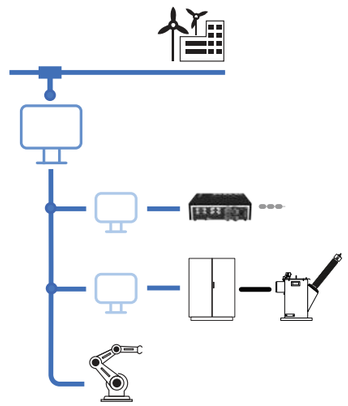
DC event diagram records each single PD event and allows user to define the pulse counting borders in the mean of charge and recorded time as per the international standards requirements.

CUSTOMIZABLE DISPLAY SOLUTIONS

Customizable display solution allows user to define the best fitting view for a given application – as e.g. displaying the PD pulse shape in high-resolution scope or PRPD pattern which helps to recognize AC-related or ripple-related PD activity.



REMOTE CONTROLS OF CaMS



CaMS software supports the SCPI protocol to remotely control all of its devices (including DDX 916x) and systems. The SCPI stands for Standard Commands for Programmable Instruments. It is widely used to communicate with test and measurement devices.

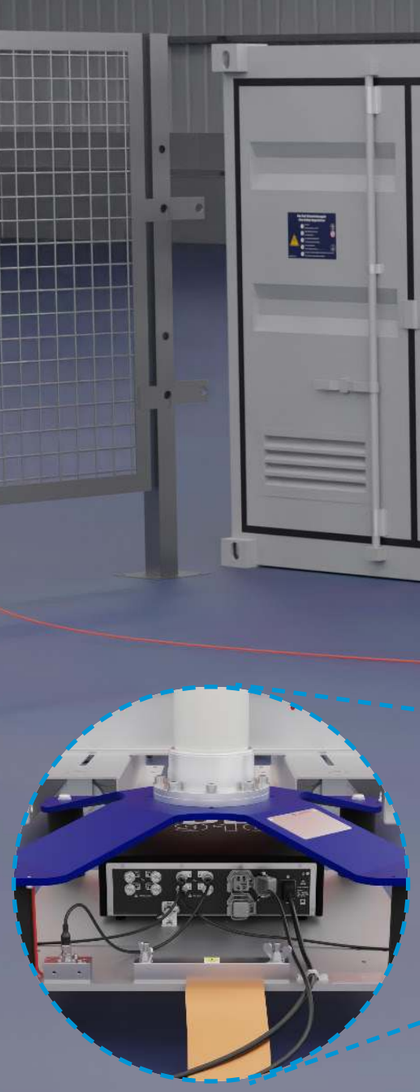
- Industry 4.0 compatible
- Automation and lean production ready
- Proprietary systems integration
- Remote control (RC) and communication

SINGLE DETECTOR, SINGLE INPUT APPLICATIONS

- Built-in measuring impedance
- Plug & Play
- Fiber optic

Learn more about HAEFELY's AC Test Sets (ACS)

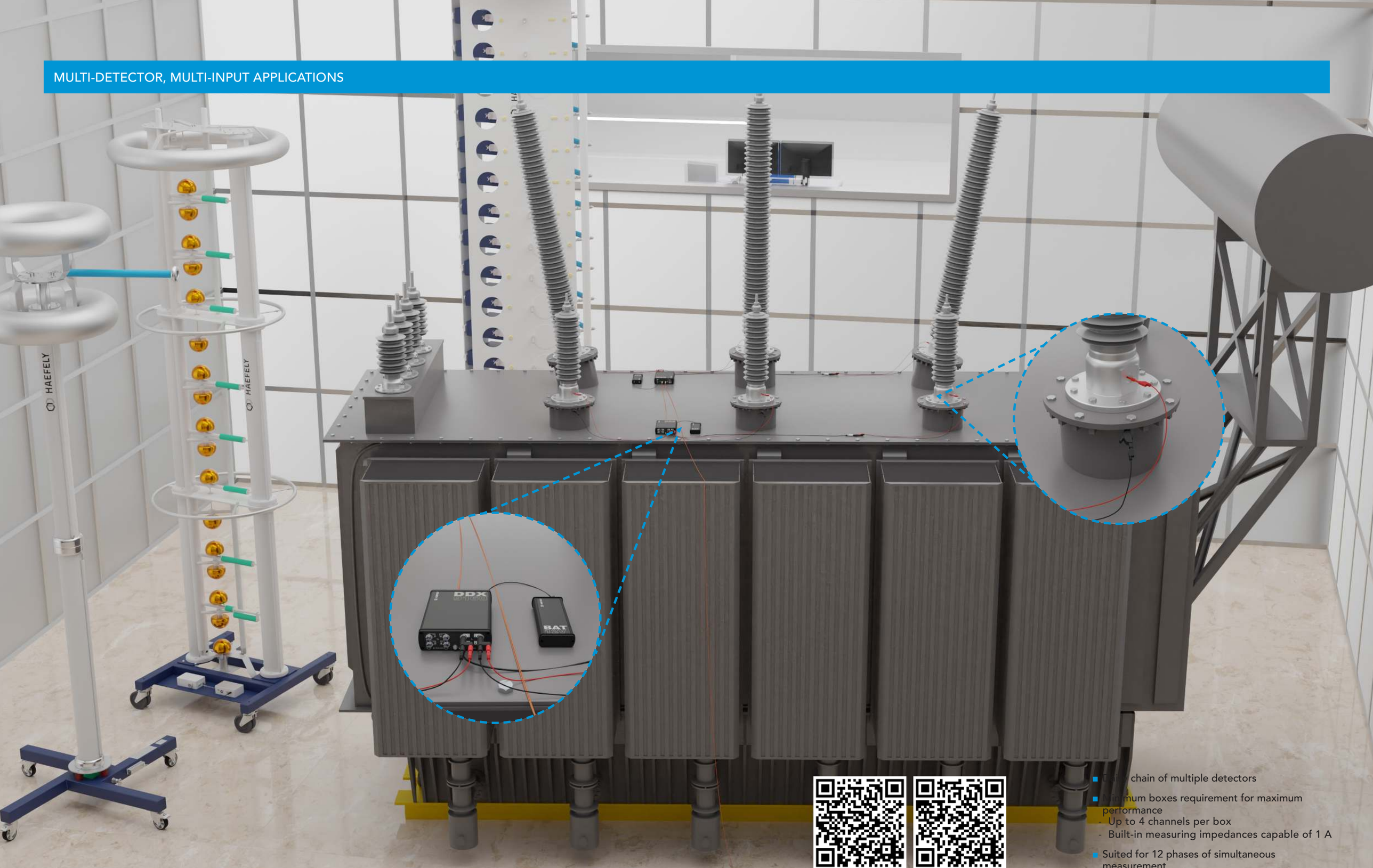
SINGLE DETECTOR, MULTI-INPUT APPLICATIONS



Learn more about HAEFELY's Distribution Transformer Test System (DTTS)

- Just one detector for simultaneous measurement on all 3 phases
- Quick and easy

MULTI-DETECTOR, MULTI-INPUT APPLICATIONS



- Daisy chain of multiple detectors
- Minimum boxes requirement for maximum performance
  - Up to 4 channels per box
  - Built-in measuring impedances capable of 1 A
- Suited for 12 phases of simultaneous measurement

Learn more about HAEFELY's Small Power Transformer Test System (SPTTS) and Impulse Voltage Test Systems

POWER CABLES PD TESTING AND FAULT LOCATION



Learn more about HAEFELY's Mobile AC Test System (RSKF) and cable test terminations (CTTS and KEV series)

- Resolution down to 1 m
- High processing power
  - Up to 20 ms time recording depth
  - Special digital filter sets for best SNR
- Single- or multi-PD fault location

PD DETECTOR DDX 9160

DDX 9160-1	PD Detector - Portable version (2-CH HW, 1-CH activated)	
DDX 9160-3	PD Detector with 3 simultaneous PD Input - Portable version (4-CH HW, 3-CH activated)	

DDX 9160 OPTIONS - HARDWARE

DDX 9160/BATT	Additional/spare battery pack for DDX 9160. *The capacity of the battery can be extended by connecting multiple batteries in parallel.*	
DDX 9160/SUP	External PD-free 12 V power supply for DDX 9160	

PD DETECTOR DDX 9161

DDX 9161-1	PD Detector - Rugged laboratory version (2-CH HW, 1-CH activated)	
DDX 9161-3	PD Detector with 3 simultaneous PD Input - Rugged laboratory version (4-CH HW, 3-CH activated)	

DDX 9161 OPTIONS - HARDWARE

DDX9161-X-LAB/ MSET-19RACK	Mounting set 19" 3HE for DDX 9161 laboratory	
DDX9161-X-/MSET-UNI	Universal mounting set for DDX 9161	

COMMON DDX 916X OPTIONS - ADD ON (SOFTWARE KEY)

DDX 916X/ SKCH1	Software Key to enable additional PD and V input/channel
DDX 916X/ SKSWA	Software Key to enable Advanced SW package - IEC derived quantities (I, P, D, qa, m, etc.), Scope & FFT, Windowing feature
DDX916X/ SKRIV	Software Key to enable RIV-NEMA and RIV-CISPR (external AKV 9360 required)
DDX 916X/ SKDC	Software Key to enable PD test under DC stress
DDX 916X/ SKSL	Software Key to enable PD site location on power cables

STANDARD PACKAGE

DDX 9160 - PORTABLE

- PD detector itself
- FiberLink – LC to USB
- 20 m LC fiber optic cable
- Battery with charger
- USB stick with SW
- PD connection accessories set – per channel
- Manual
- Quick Start Guide
- Rugged transport case

DDX 9161 - LABORATORY-OPTIMIZED

- PD detector itself
- FiberLink – Harting to USB
- 20 m Harting fiber optic cable
- USB stick with SW
- PD connection accessories set – per channel
- Manual
- Quick Start Guide

ACCESSORIES

Measuring Impedance & Other Sensors

AKV 9360-INT	AC/DC PD detector built-in measuring impedance 50 Ohm, 1 A; required one AKV per channel.	
AKV 9360	The AKV 9360 measuring impedance is a fully passive measurement impedance optimized for use with the DDX 9160 or DDX 9161. It allows simultaneous PD and RIV (NEMA or CISPR) measurement having 300 Ohm input impedance, covering current range up to 5 A.	
AKV 9360 Cable	The AKV 9360 Cable measuring impedance is a fully passive measurement impedance optimized for use with the DDX 9160 or DDX 9161. It allows simultaneous PD and RIV (NEMA only) measurement having 50 Ohm input impedance, covering a current range up to 10 A.	
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.	
HFCT	The HAEFELY's HFCT (High Frequency Current Transformer) is a split core sensor providing the possibility of PD indication in the wide frequency range. It is commonly used at the ground connections but it can be also used as a reference or indication at the bottom (low voltage) of the coupling capacitor or test object itself.	

RIV Calibrators

KAL 9531	The RIV calibrator KAL 9531 has been designed to perform an RIV calibration together with our PD detectors. 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.	

PD Calibrators

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 100 fC – 50 nC), 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.	

Coupling Capacitors

9231	The 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 (built-in or external) and processed in the PD detector.	

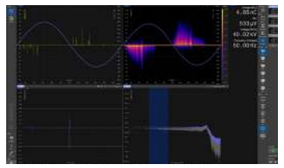
Computers

LAPTOP	Laptop, Intel processor, Windows 10, 15.6" display, Full HD (1920 x 1080)	
PCI 811c	Industrial PC (EMC tested, suitable for working in HV laboratories) Intel processor, Windows 10, Monitor 24", keyboard and mouse	





Hardware Introduction



Software Introduction



Application Examples



Power Cables PD Testing

Hardware introduction video

Software introduction video

Application examples video

Power cables PD testing video

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HAEFELY
Current and voltage – our passion

DISCOVER MORE ABOUT OUR PARTIAL DISCHARGE PRODUCT LINE



Coupling Capacitors
9231 Series



Coupling Capacitor 25 kV
9230/25/1-PD



Portable & Lightweight PD / RIV Detector
DDX 9160



Laboratory optimized PD / RIV Detector
DDX 9161



PD & RIV Calibrators
KAL 9511 - KAL 9531



Measuring Impedances
AKV 9360 - AKV 9360-SEK - AKV 9330

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V2408

HAEFELY

Current and voltage – our passion

HV HIGH VOLTAGE
IN INSTRUMENT
EM EMC

reliable. precision.