



DOBLE IN-SERVICE TESTING & ASSESSMENT

Spark P2

UNIVERSAL HAND-HELD PARTIAL DISCHARGE SURVEYOR



SPARK P2

Universal Hand-Held Partial Discharge Surveyor



INSULATION SYSTEM DIAGNOSTICS ON THE GO

The Doble Spark P2 is a universal hand-held Partial Discharge (PD) and Radio Frequency Interference (RFI) insulation system and substation survey tool. It utilizes a wide range of PD and RFI detectors and analysis methods, enabling operators to identify PD in a wide range of test objects.

Key Features

- Universal hand-held device with 7h battery life. No PC required for operation.
- Expert Mode and Automatic Mode

Subject matter experts can customize every setting and detector configuration of the Spark P2 to utilize its wide range of analytical tools helping them to identify PD in the most complex scenarios. Non-expert users can utilize customizable measurement templates and automatic acquisition methods to reliably acquire quality data without extensive training requirements or PD expertise.

- UHF Antenna RFI Surveys and UHF narrow band tuner.

Whether walking through a substation with a monopole antenna or using a directional antenna, the Spark P2's UHF detector and analytical tools allow to identify PD within substations by utilizing contactless antennas from a safe distance.

Additionally, the UHF detector can be utilized to assess transformers and GIS with suitable UHF sensors. The Narrow-band tuner provided by Spark P2 is significantly more sensitive than frequency shifter measurement methods, and is specifically suited for in-service and commissioning testing of test objects where UHF sensors are available (GIS, TX).

- Transient Earth Voltage (TEV) Surveys

Switchgear assessments can be performed with TEV sensors placed on the enclosures of individual cabinets to analyze and identify PD.

- High Frequency Current Transformer (HFCT) Surveys

HFCTs can be utilized on a wide range of test objects, such as cable accessories, transformers, and circuit breakers. They are typically placed around the ground connections of the device under test.

- Acoustic Emission (AE) Testing

Use ultrasonic microphones to identify PD in liquid and gas filled insulation systems such as transformers and GIS.

- No need for external amplifiers, attenuators, filters, frequency shifters, or other accessories. Any required signal conditioning tool is built-in and software controlled.
- Power external amplifiers and sensors with built-in amplifiers directly from the device, software controlled, without the need for additional accessories.

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Measurement Applications and Methods

AIR INSULATED SWITCHGEAR

Testing of individual switchgear compartments and bus compartments using TEV and AE sensors.

Identifying developing defects in air insulated switchgear is made easy with the Spark P2.

The detectors provided in the Spark P2 allow for the use of sensors such as TEV or acoustic.



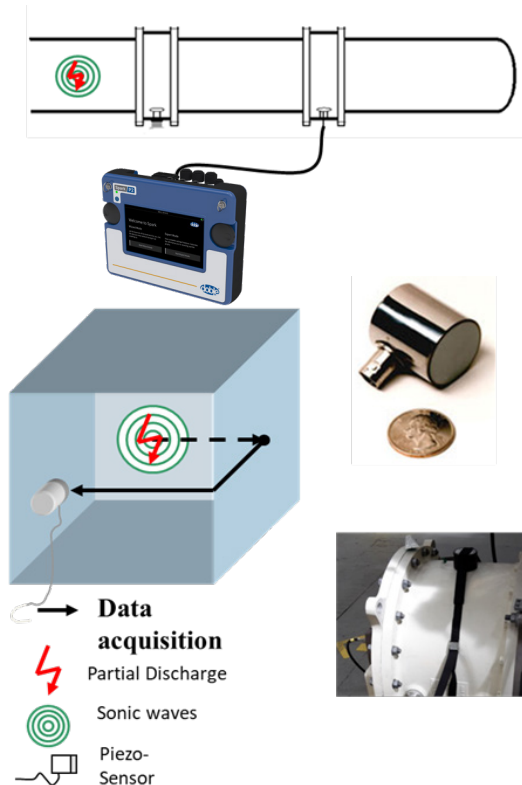
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Measurement Applications and Methods

GAS INSULATED SWITCHGEAR

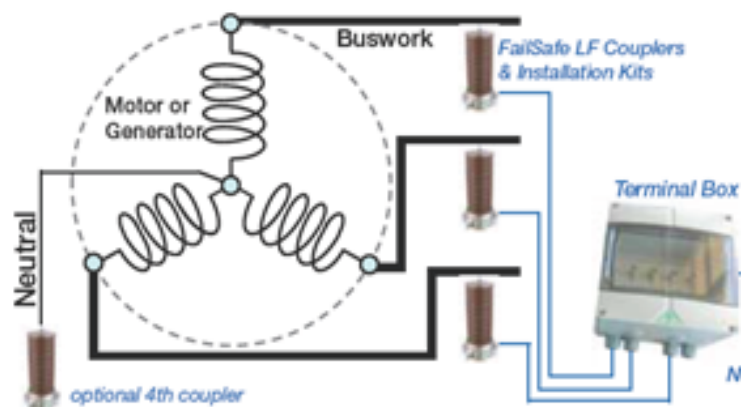
The instrument enables the user to utilize internal UHF spacer sensors, HFCTs, and acoustic emission sensors to identify and locate partial discharge within GIS installations. The UHF narrow band tuner enables the user to measure PD in environments where noise is present that would contribute to frequency shifter based measurements.



ROTATING MACHINES

Spark P2 can interface directly to available capacitive couplers and derive PD as well as synchronization signals.

The optional UWB detector can be used to acquire PD pulses as integrative charge measurements.



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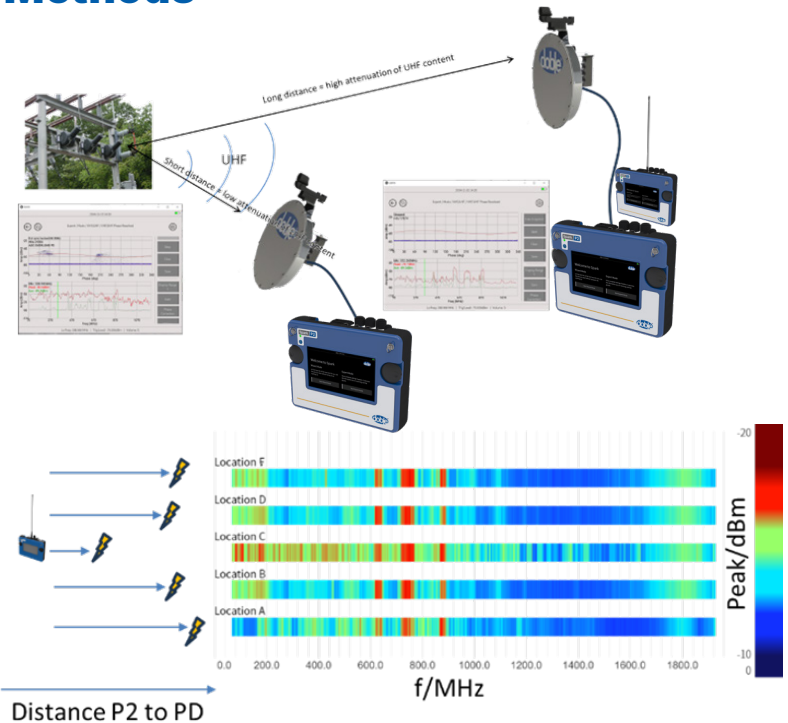
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Measurement Applications and Methods

SUBSTATION SURVEY

Radio Frequency Interference Measurements with aerial or directional antennas in UHF mode allow to identify areas where PD is present within a substation, without physical contact to the test object.

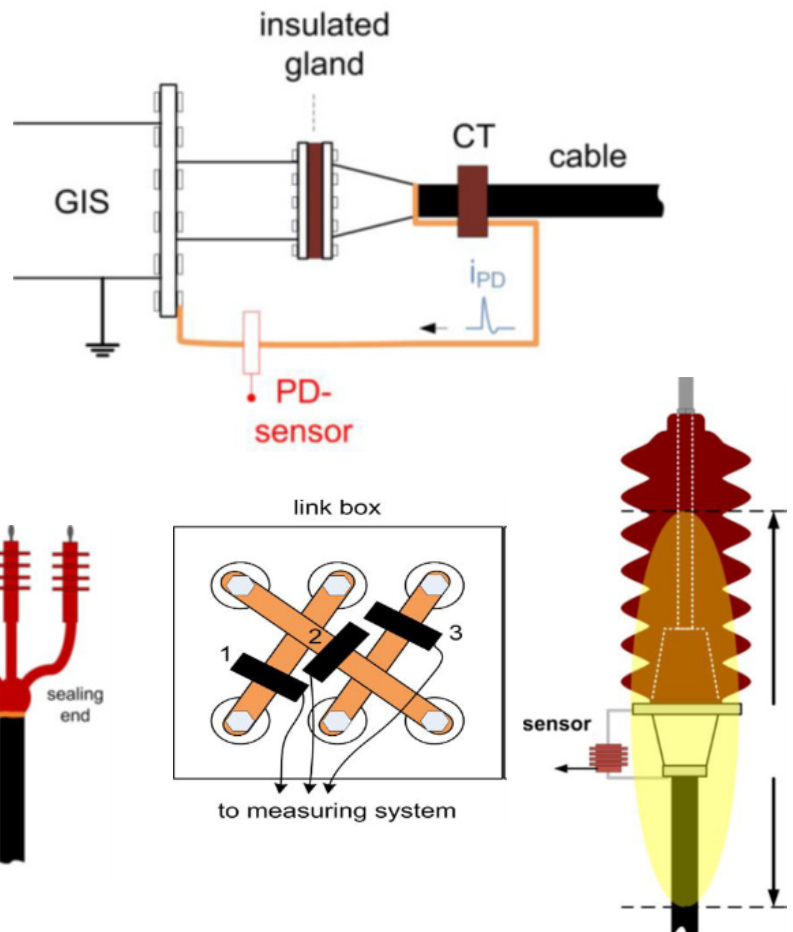
If an asset is identified as being suspicious of showing partial discharge activity, the Ultra-Wide-Band and Acoustic Emission detectors of the Spark P2 allow for the use of high frequency current transformers and acoustic microphones to further investigate the device under test.



CABLE ACCESSORIES

High frequency current transformers can be used to identify PD within cable accessories by placing these sensors on suitable ground connections.

Using Very High and Ultra High frequencies in measurements on cable accessories the measurement sensitivity for these accessories is greatly increased while becoming less sensitive to nuisance signals from further away.



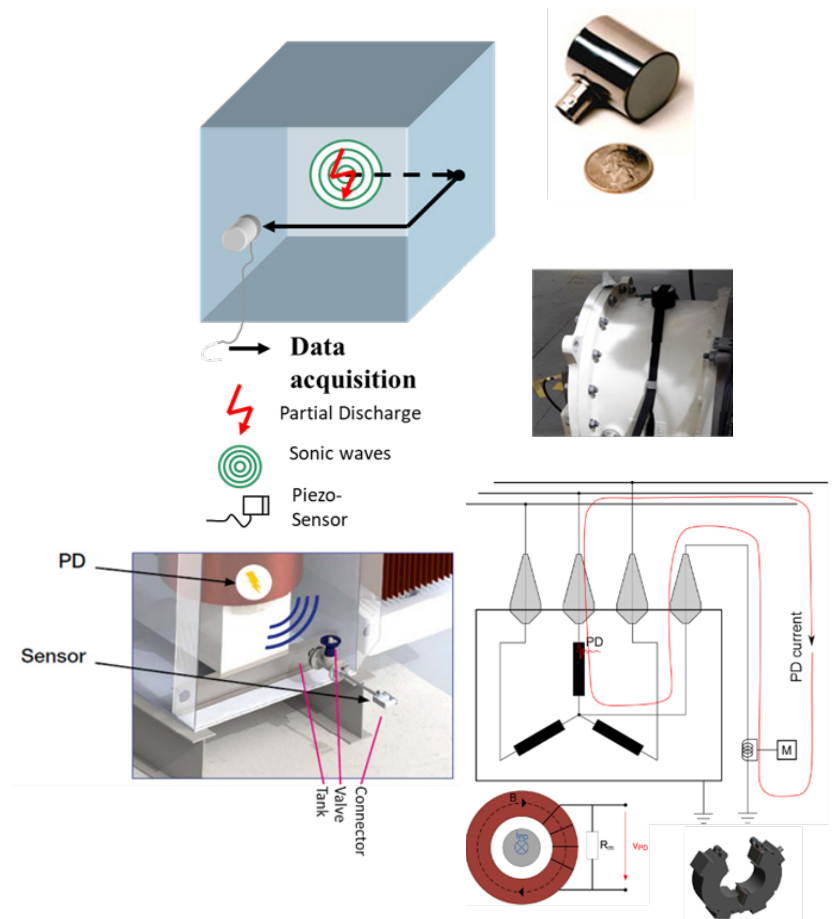
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Measurement Applications and Methods

TRANSFORMER PD FIELD ASSESSMENTS

Various different detectors can be utilized to identify PD in power transformers. HFCTs placed on suitable tank and neutral ground connections allow for analysis of PD in HF and UWB frequency ranges. Internal UHF sensors can be used to detect radio frequency emissions of PD within the transformer tank. Acoustic emission sensors placed on the tank walls allow to detect PD sounds within the tank.



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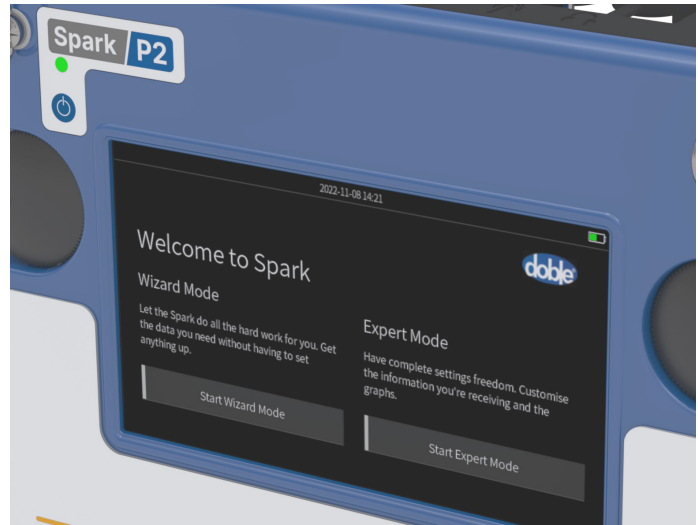
PD Detection Tools and Methods

FULL AUTOMATIC ACQUISITION WIZARD MODE

Take full advantage of the advanced detectors without the need for a subject matter expert. The automatic acquisition mode enables users of all skill levels to acquire reliable HF and UHF data.

Customizable measurements templates and menu structures allow to meet the user's custom test regiment requirements.

Each measurement is associated with site and asset information, to strengthen data management.



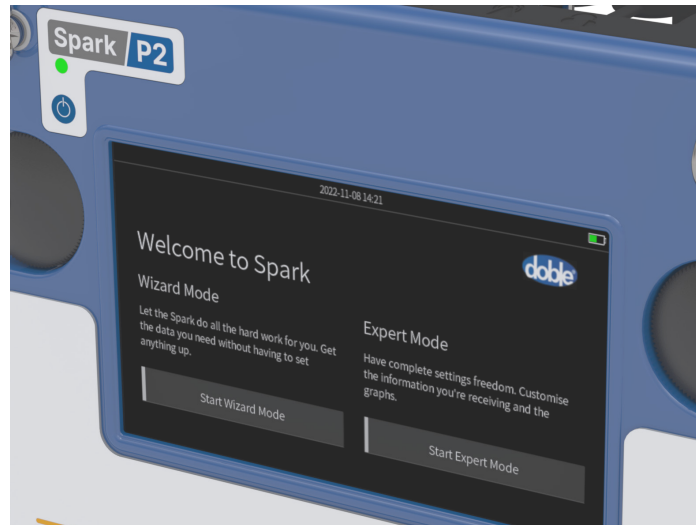
FULL CONTROL EXPERT MODE

Full control of all aspects of the acquisition system, its various detectors and diagnostic tools.

The user can choose:

- UHF Measurements (Spectrum, Time Resolved, Phase Resolved)
- HF Measurements (Spectrum, Time Resolved, Phase Resolved)
- UWB/IEC Measurements (Phase Resolved)
- Acoustic emission testing (Phase Resolved)

Fully customizable input configuration including internal amplifiers and attenuators, filters, DC offset for powered sensors and external amplifiers.



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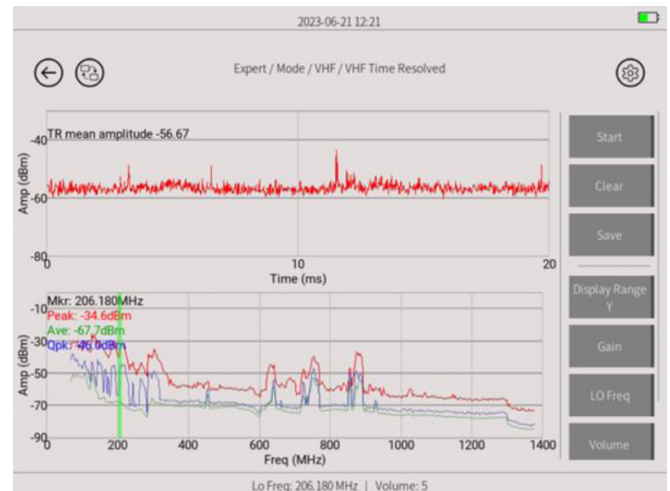
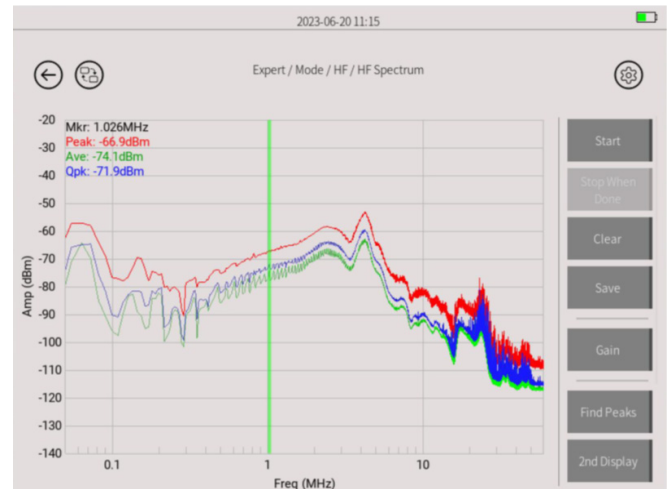
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PD Detection Tools and Methods

SPECTRUM ANALYSIS

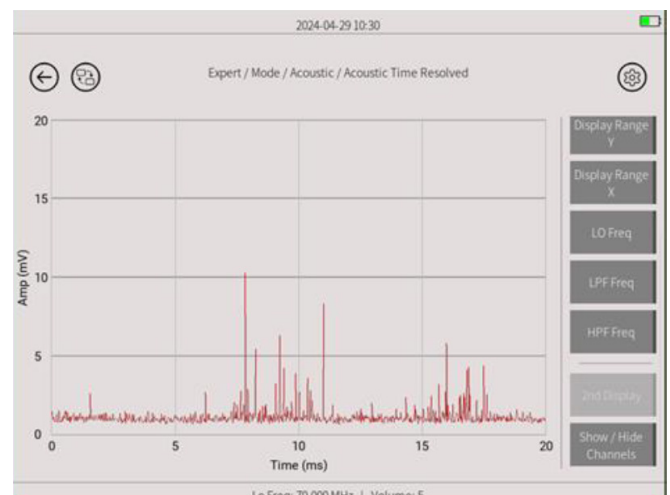
Analyzing signal characteristics using the spectrum analyzer allows to identify frequency ranges where pulse shaped signals are present, to then specifically measure at these frequencies, ignoring adjacent bands with potential noise and nuisance signals. The Spark P2 supports Peak, Quasi-Peak, and Average Spectrum measurements, with a sweep time across the entire bandwidth of less than 5 seconds.

Spectral data can be displayed at the same time as time or phased resolved data, allowing the user to tune to frequencies of interest and observe signal characteristics in real time.



TIME RESOLVED ANALYSIS

Time Resolved analysis allows the user to observe PD signals in real time, synchronized with the power frequency in the device under test.



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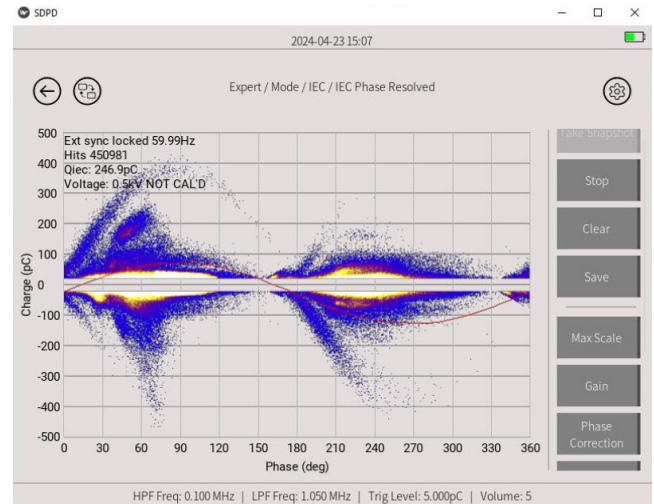
PD Detection Tools and Methods

PHASE RESOLVED ANALYSIS

Phase Resolved PD analysis enables to diagnose and differentiate different types of PD as well as to differentiate PD from noise, allowing for reliable diagnostics.

In UWB/IEC mode, and ultra-wide-band detector with up to 60MHz bandwidth is used.

HF and UHF detectors utilize a tunable narrow-band detector with 1MHz (HF) and 6MHz (UHF) bandwidth, allowing to avoid measurements in frequency ranges where noise is present.

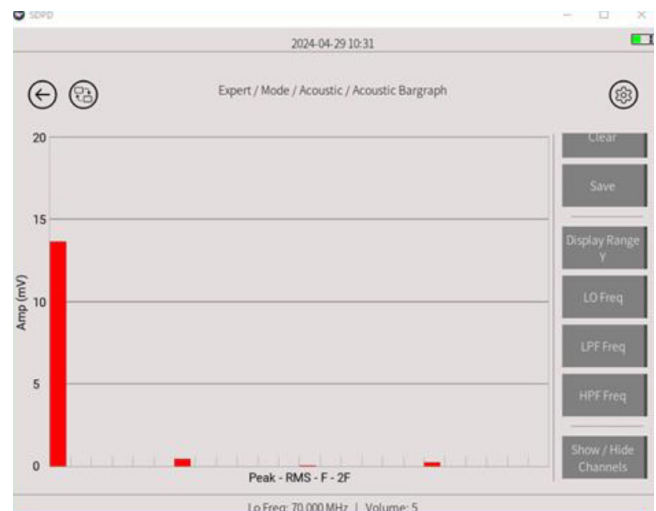


SIGNAL COMPONENT ANALYSIS / BAR GRAPHS

A simple analytical tool which helps to easily evaluate whether the PD may be present inside a test object. The Bar Graph analysis decomposes a measure signal into four components:

- Peak
- RMS
- 1x Power Frequency (F)
- 2x Power Frequency (2F)

The ratio between peak and RMS allows to determine whether pulse shaped signals are present. A strong F component indicates corona, a strong 2F component indicates the presence of PD in a given input signal. Works in HF, UHF, and acoustic modes.



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Specifications

UHF Detector		Detector Bandwidth	56 MHz to 2GHz
		Gain Stages	-20dB, 0dB, 20dB, 40dB
		Total Dynamic Range	> 120dB
		Narrow-Band Tuner Bandwidth / RBW	6MHz
		Special Features	Switchable 12VDC offset for external UHF sensor amplifiers
HF Detector		Detector Bandwidth	9 kHz to 56 MHz
		Gain Stages	-20dB, 0dB, 20dB
		Total Dynamic Range	> 120dB
		Narrow-Band Tuner Bandwidth /RBW	9kHz, 120kHz, 1MHz
UWB Detector		Integrative Charge Measurement	
		Gain Stages	-20dB, 0dB, 20dB
		Total Dynamic Range	>120dB
		Detection Level (QIEC)	<150fC
		f_{min}	100 kHz
		f_{max}	60 MHz
Acoustic Emission Detector		Gain Stages	0dB, 20dB
		f_{min}	1kHz
		f_{max}	1MHz
		Special Features	Switchable 28VDC offset for sensors with integrated amplifiers
Reference Voltage Input / Sync		Gain Stages	-40dB, -20dB, 0dB, 20dB
		f_{min}	0Hz (DC measurement)
		f_{max}	800Hz
		Special Features	Radio frequency dongle sync (RF module plugged into 120V/230V AC to derive line sync, optional)
		Internal Sync	Configurable oscillator (variable frequency)
Input Channels (BNC)			1x UHF
			1x HF/UWB/Acoustic
			1x Sync
Power Supply			110v/230V 2A to 12Vdc
Input Protection			50VAC

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Mechanical	
Dimensions (WxHxD)	10 x 8 x 3.5 inches 25.4cm x 20.3cm x 8.9cm
Weight	Approximately 6 lbs / 2.7 kg

Environmental	
IP Rating	IP 67 (closed in travel case) IP 53 (outside of case)
Operating Temperature	-20° to + 50°C
Storage Temperature	-20° to +70°C

Power Supply	
	115-230 VAC 50Hz/60Hz, 1A (to 12VDC, 2A)
Battery	4 Li-ion batteries at 2 cells, 7.2 Volts, 3.35 Ah, 25Wh each Total capacity: 100 Wh

