



Fluke ii910 Precision Acoustic Imager Product Presentation

Introduce ii910

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Groundbreaking technology for PD detection AND visual leak detection

A better way to detect partial discharge

The future of corona and partial discharge detection is here. Now you can easily locate discharges with Fluke's innovative SoundSight™ technology that converts ultrasound into a clear visual.

Introducing the Fluke ii910 Precision Acoustic Imager

- Safely locate issues from a distance without the need for cumbersome cords or accessories
- No training required—simple to learn, fast to use
- Take live pictures of your scan and access rich data for analysis and reporting



Visual leak detection, more precise than ever

Now you can detect compressed air, gas or vacuum leaks with even greater sensitivity or from a farther distance.

Introducing the Fluke ii910 Precision Acoustic Imager

- Detect subtle leaks: small in size or due to lower pressure, or of a lower density gas
- Locate leaks up to 100 meters away
- Leak size and leak cost estimation analysis via LeakQ™ reporting tool
- No training required—simple to learn, fast to use



Industry Needs for Partial Discharge: Detection, Location, Quantification

Detection & Location of PD/Corona

Analysis & Diagnosis of PD/Corona

SEGMENT VERTICALS	<ul style="list-style-type: none"> Power Distribution, specially in High Growth Markets Industrial High Voltage 	<ul style="list-style-type: none"> Power Transmission Power Generation High voltage equipment OEM
NEEDS	<ul style="list-style-type: none"> Precise Location Fast routing & inspection Low training required 	<ul style="list-style-type: none"> Ability to quantify severity Trending and Analysis Export & Transmit rich data (Frequency, geotagging, etc.)
END USER	<ul style="list-style-type: none"> H-V Technician (mid-low sophistication) Uses ultrasonic tools 	<ul style="list-style-type: none"> Testing Engineer (Advanced user) Uses UV cameras and Advanced Sensors
BUDGET	<ul style="list-style-type: none"> \$\$ (can't justify Corona UV Camera \$40K spend) 	<ul style="list-style-type: none"> \$\$\$\$ (large budgets, e.g. utility tenders)
VALUE PROP.	<p>Cost-effective scanner to detect and locate PD&Corona acoustically, better than ultrasonic tools, at the visual performance of ultraviolet cameras</p>	<p>Advanced camera to detect and evaluate PD&Corona by providing visual reporting and severity assessment</p>
<div style="border: 2px solid red; padding: 5px; text-align: center;"> <p>ii910 PRIMARY TARGET</p> </div>		

INDUSTRY NEED: Effectively Detect, Locate, and Evaluate Corona & Partial Discharge

ii900 vs ii910

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ii900

Industrial Acoustic Imager



ii910

Precision Acoustic Imager

	ii900 Industrial Acoustic Imager	ii910 Precision Acoustic Imager
List Price USD	\$19,999	\$23,999
Summary	Standard sensitivity with higher enclosure rating to handle day to day needs in industrial environments . Designed to detect/locate compressed air, gas and vacuum leaks .	Greater sensitivity for difficult to detect compressed air, gas and vacuum leaks . Additional capability of partial discharge detection
Enclosure Rating (Ingress Protection)	IP40	IP40
Relative Severity	LeakQ™	LeakQ™ PDQ™
Frequency range (kHz)	2-52	2-100
Detection distance	Up to 70 meters (328 ft.)	Up to 120 meter (394 ft.)
Battery life	>6 hours	>6 hours
Operating temp	-10 / 45 C	-10 / 40 C
Sensitivity	Standard	High
Launch window	April-2019	September 2020

Workflow Example for a Basic Scanner: Detection & Location of Partial Discharge or Corona

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Detection & Location of PD/Corona on Distribution Grid and Equipment

- Troubleshooting and Predictive Maintenance
- Route-based scan for PD/Corona issues
- Detect, Locate, and Report issue for resolution
- Similar workflow for PD Inspection at industrial facilities

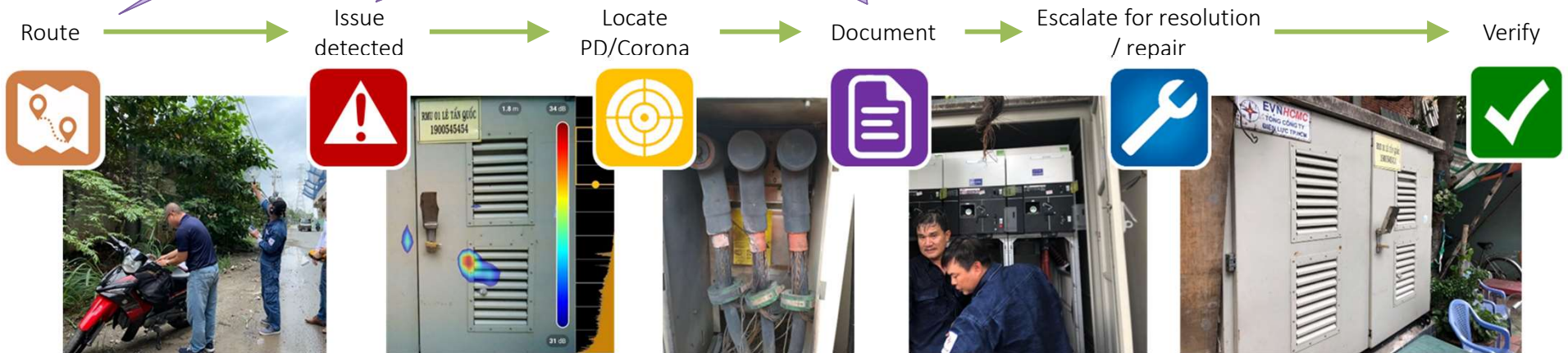
Benefits vs
Ultrasonic tools

Faster &
Easier

Less subjective, more
immune to noise

Better pinpointing and
reporting with pictures

More effective repair-
tracking with pictures



Scan to detect, locate, and report PD & Corona faster, easier and more effectively

Workflow Example for Advanced Camera: Analysis & Diagnosis of PD/Corona

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Inspection of Turbine/Motor Stator

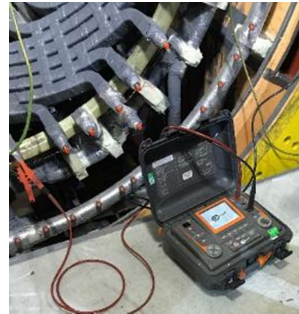
- Part of Quality Assessment in Manufacturing or
- or Part of Commissioning / Overhaul / Service
- PD Testing tools apply High Voltage and detect presence of PD
- Similar procedures for Transformers and other HV equipment

Wire PD testing
equipment
(High Volt Injection)

Secure
Area

Excite with High
Voltage

If PD
detected



With ii910



- Safer: remotely provides visual of PD points
- Faster scanning and pinpointing faulty slots
- Provides richer data for analysis
- Pictures for visual reporting

Today



IrisPower Corona Probe



- Requires proximity to hazardous area
- Point-by-point manual testing
- Manual reporting

Enables visual, remote location of PD, providing additional data for fault analysis

Workflow Example for Advanced Camera: Analysis & Diagnosis of PD/Corona

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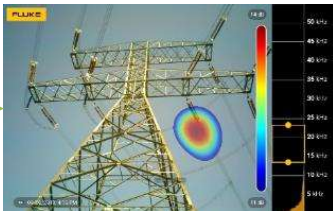
Condition Monitoring of Insulation on Arresters, Breakers, Insulators

- CM by utilities in High Voltage lines and Substations
- Require an assessment of severity / action needed
- Trending PD/Corona evolution over extended times
- Typically on remote and widespread locations

Inspect HV towers one by one



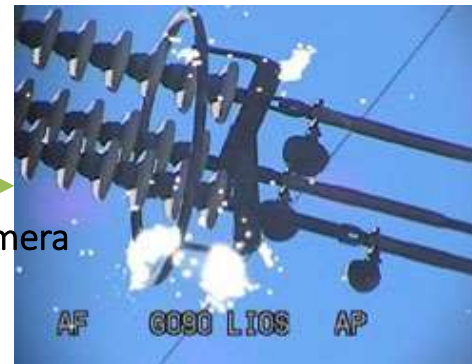
Corona Detected



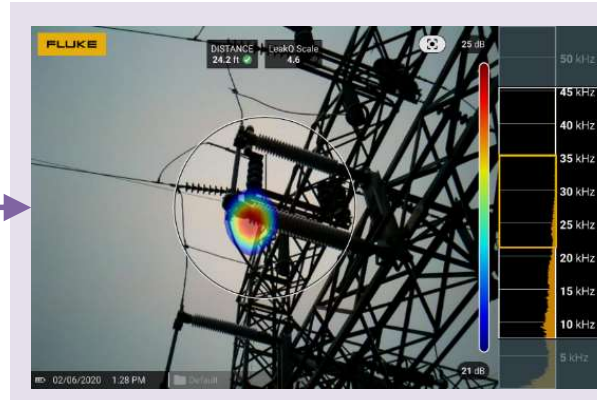
- Quantify levels
- Compare with previous measurements / trend
- Assess severity and required action

FLK-ii910

UV Camera



- Limited Field of View
- Interference of sunlight
- Limited to visual analysis, no quant data
- Other: Complex and delicate instrument



- Early and fast detection and scanning of large area
- Provides richer data for fault assessment and trending

Replaces Ultraviolet Cameras by providing richer data for analysis a lesser visual limitations

Application & Workflows #1: Inspecting Cabinets and Bus-bars for PD

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Detection of Partial Discharges and Arcing in HV / MV cabinets and on bus-bars

Need:

- Quickly detect where Partial Discharge is happening

Industry Vertical:

- Power Generation, Distribution and Transmission
- Heavy manufacturing, Electric Railway, O&G, Mining, Marine.

Persona:

- High Voltage Electrician or Inspector/Contractor

Problem:

- Avoid downtime, fires, insulator degradation, arcing
- Safety Implications on getting closer to test for PD
- Opening a hot HV cabinet requires HV PPE

Current Solution:

- Airborne and contact ultrasonic
- Transient-Earth Voltage (TEV)

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Competitive Advantages:

- Safety: able to detect from safer/higher distances
- More effective and fast in location of PD
- Easier, less training required
- Better documenting with pictures



PD on a busbar



Measuring PD with TeV meter



Scanning for PD with ultrasound "wand"



PD inspection through "ultrasonic window"

Application & Workflows #2: Inspecting Distribution Equipment for PD



Detection of Partial Discharges (and Corona) on Distribution Lines and Gear

Need:

- Quickly detect where Partial Discharge is occurring

Industry Vertical:

- Power Distribution, especially in HGM

Persona:

- High Voltage Electrician or Inspector/Contractor

Problem:

- Issues proliferate in aged, undermaintained and overloaded grid.
- PD entails public hazards inside urban areas
- Ultrasound is ineffective and slow, budget (and training) does not allow for a UV Cameras


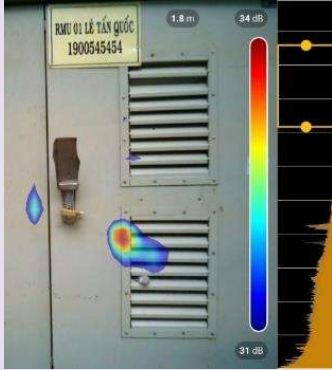
Current Solution:

- Airborne and contact ultrasonic
- Transient-Earth Voltage (TEV)
- Do nothing until it breaks (often catastrophic)



Competitive Advantages:

- More effective in outdoors than ultrasonic tools
- Faster for quick routing
- Easier for untrained users.
- Better documenting with pictures.



Inside of the cabinet with severe PD



Routes across the city to inspect distribution lines, cabinets & transformers using ultrasound



Cabinet on the streets of Hanoi, severe PD inside

Application & Workflows #3: Preventive Maintenance on Transmission Lines & Switch Yards

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Detection and Condition Monitoring of Corona on High Voltage towers and switchyards

Need:

- Quickly detect where Partial Discharge is occurring

Industry Vertical:

- Power Transmission Utilities,
- OEM and aftermarket service providers for utilities
- Power-Gen and Distribution utilities

Persona:

- Electrical Testing Engineer

Problem:

- Downtime, fires, losses, unnecessary washing
- Arcing, Ozone, EMC interference (environmental)
- Determine if found Corona/PD is a problem

Current Solution:

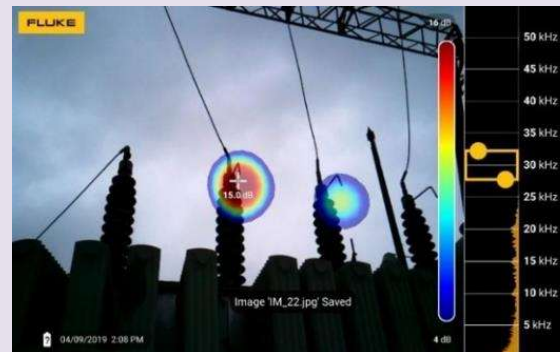
- Corona UV Cameras
- other: Radio-Frequency detectors, Ultrasonic detectors.
- Mounted solutions: on vehicle, helicopter, drones

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Competitive Advantages:

- Easier to use
- Less depending on external conditions (visual limitations of UV Cam, noise limitations of ultrasonic tools).
- Better Reporting Capabilities
- Cost vs UV cameras



Ultraviolet Cameras







Ultrasonic Detectors



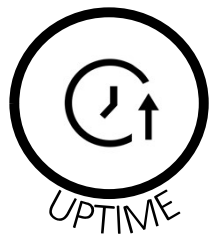
Radio-Frequency Detectors

Value Propositions by Segment/Persona

	① Industrial and Power Distribution		② HV Transmission Utility	③ OEM & Service Provider
Segment & Persona	Industrial HV Electrician  <p><i>"can ii900 tell if there is PD or arcs inside? so I do not have to put the suit to open it. Maintenance Tech at US refinery"</i></p>	Distribution Utility Technician  <p><i>"PD is bad when neighbors complain about noise or when arcing starts" Mr. Son - HV technician from Vietnam Utility</i></p>	Transmission Utility Engineer  <p><i>"I know there is corona, so what? I need to know if we have to do something about it" HV Engineer at Tennet (Netherlands)</i></p>	OEM HV Engineer  <p><i>"if this can show an inch of an insulation fault on a stator, you have something here" QA Testing Engineer at ELHAND</i></p>
Job Profile	<ul style="list-style-type: none"> Industrial Electrician, often in-house. Experience with Fluke tools, HV is part of his job, not necessarily main/most part O&G, Heavy Mfg., Marine 	<ul style="list-style-type: none"> Technician doing city or rural routes to detect PD/Corona on distribution equipment 	<ul style="list-style-type: none"> Electrical engineer performing routine inspections on transmission equipment, often outdoors. In-house or outsourced. 	<ul style="list-style-type: none"> Testing Engineer for an OEM or service provider for High Voltage Rotating Machine: Turbines, Motors. Experience in using monitoring & testing tools (e.g. Qualitrol's)
Job To be Done	<ul style="list-style-type: none"> Prevent arcing that can cause a safety incident and/or result in unplanned downtime 	<ul style="list-style-type: none"> Corona detection on lines and switchyards, often in or nearby urban infrastructure. Detect failures in a prone-to-fail grid 	<ul style="list-style-type: none"> Corona detection on lines and switchyards. Reduce loses in energy (lesser concern) and unneeded PM: excessive line washing, early preventive replacement of insulators 	<ul style="list-style-type: none"> Ensure insulation faults are found earlier in the production process
Solution Today	<ul style="list-style-type: none"> Airborne & contact ultrasound TEV Transient Earth Voltage IR camera (when fault is severe) 	<ul style="list-style-type: none"> Airborne Ultrasonic Tools Corona UV Camera (too expensive) UHF radio detectors 	<ul style="list-style-type: none"> UV Cameras from OFIL or Uvirco. IR Cameras (too late for Corona). Air-mounted on helicopters and drones. 	<ul style="list-style-type: none"> PD analyzers based on electrical injection Blackout tests using UV or high sensitivity cameras
Needs / Pain Points	<ul style="list-style-type: none"> Personal safety Easy to use without heavy training Rapid scanning to turn it into a regular PM 	<ul style="list-style-type: none"> Robust & rugged (Fragile UV cameras) Easy to use without training on the tool A tool that can be in each truck (or mopped) Pictures to escalate findings to engineers 	<ul style="list-style-type: none"> Personal safety Geo-location for disperse numerous assets Asses the severity of a PD/Corona fault Evaluate trends of that severity Determine/predict when action is needed. 	<ul style="list-style-type: none"> Detecting PD/Corona is solved. Once detected, no good method to pinpoint it. Safety vs testing in the dark (blackout) or getting too close to energized HV. Place/Mount camera and test remotely
Value Proposition	<ul style="list-style-type: none"> Superior replacement of ultrasound detectors: easier to learn and to use, faster, more effective Contactless solution compare with TEV PD detectors Report with visual images 		<ul style="list-style-type: none"> Cost-effective alternative to UV cameras. Without premium features such as WiFi, GPS, ambient sensors, But including PD quantification similar to UV 	<ul style="list-style-type: none"> Complementary PD-locator to work with PD testers, and PD monitors, which detect bt do not locate Report with visual images

Different electrical applications & personas with similar needs: making inspections faster, safer, less depending on training

Value Propositions: Partial Discharge



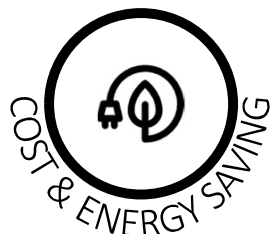
- The potential for a catastrophic event and **unplanned downtime/outage** as a result of undetected partial discharge/ corona is very real. Not only is there a **human safety risk**, **maintenance cost**, and **loss of revenue**, but the outage can impact the community at large.



- A high voltage grid includes multiple components which require proper **maintenance** and **inspection** to avoid **effects** like **arcing** or **flashover**. Preventive partial discharge / corona inspection, **maintenance**, and cleaning have proven to be best practices to **reduce** these **risks**.

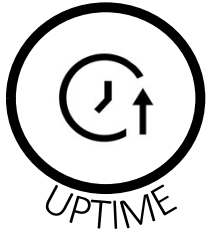


- Keeping your (asset) maintenance team safe and healthy is a top priority for each (asset) maintenance or sub station manager. By identifying partial discharge from a distance (up to 120 meters*) your team is able to **operate more safely** and **reduce** the **risk** of being **exposed** to potential **arcing** or even explosions as a result of flashovers.



- Besides additional labor costs for repairs and equipment damage, there are multiple examples of costs associated with network outages. These include loss of generated electricity of approx. 1,000 USD per minute for a medium sized power generation facility.

Value Propositions: Leak detection



- **Increase uptime** by detecting leaks without shutting down the line and choosing appropriate time to fix the critical leaks. This reduces full shutdown and costly fixes.



- Leaks cause a drop in system pressure, which can make air tools function less efficiently and adversely affect **production quality and output**



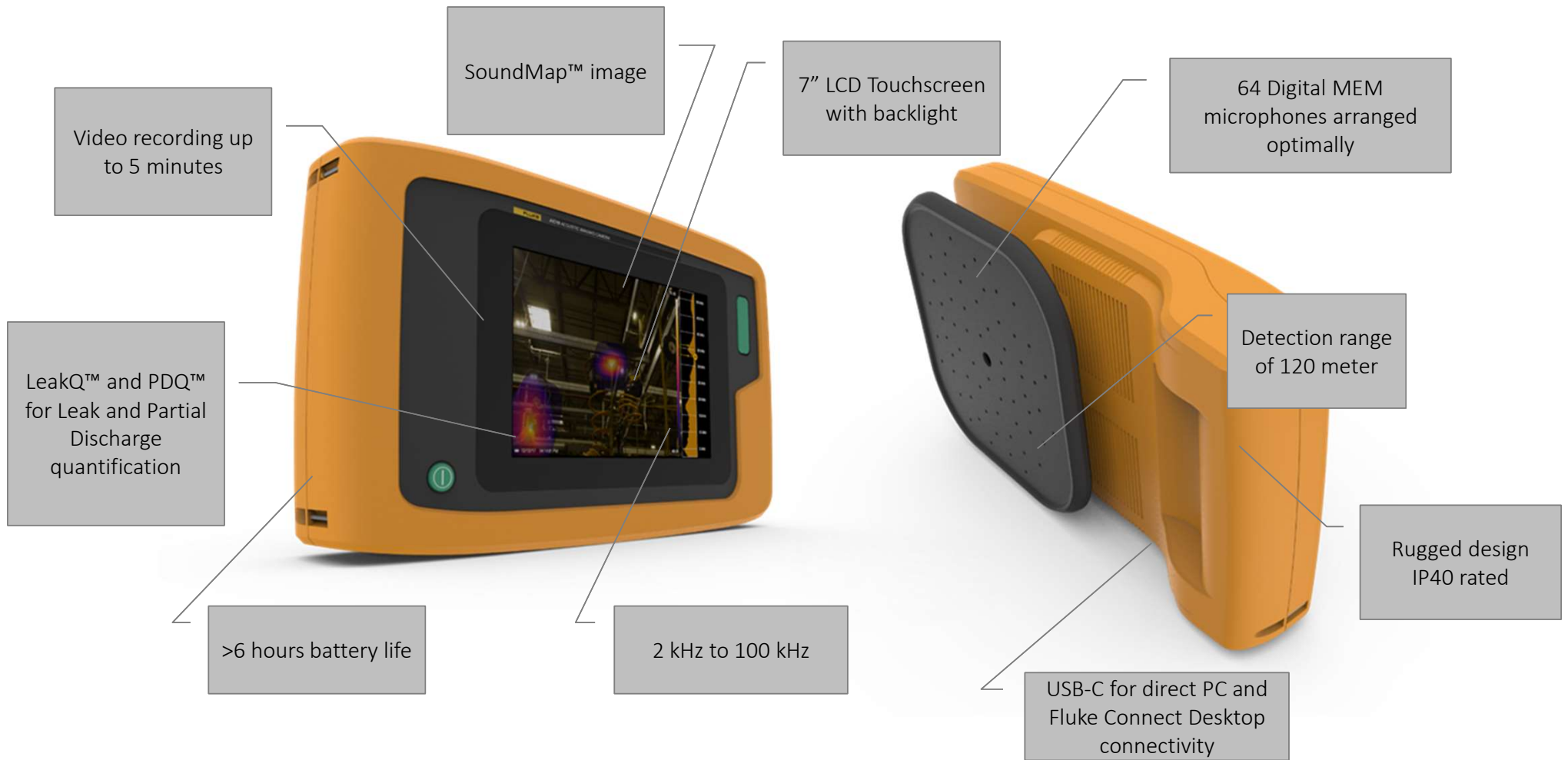
- An advantage of utilizing an acoustic imaging gas leak detection tool is that even from a distance one can **quickly detect the exact leak location**. Plus, **difficult to access areas that are potentially unsafe** can often be inspected effectively.



- Research has shown an average U.S. plant that has not been well maintained, can **waste** up to **30 %** of its total compressed air production capacity through **leaks**. This potential for energy savings is large.

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What	Why does it matter?
LeakQ™ and PDQ™ for Leak and Partial Discharge quantification	LeakQ™ and PDQ™ enables you to prioritize which leaks or discharge to fix first by easy estimation of sizes and costs by leak and by type and pulse counting for corona and partial discharge .
Video recording up to 5 minutes	Capture the behavior of the identified problem or capture a larger environment to review at a later stage the potential spots to review in further detail .
SoundMap™ image	A SoundMap™ is displayed in color or grey scale over a visual image allowing for easy visual location .
7" LCD Touchscreen with backlight	A 7" LCD capacitive touchscreen display for convenient control of user interface and using your fingers for input of notes.
2 kHz to 100 kHz	2kHz to 100kHz for detection of leaks and early detection of discharges across a wide range of frequencies .
Rugged design IP40 rated	More rugged to serve mechanical maintenance teams in industrial/harsh environments .
64 MEM microphones	64 special designed and positioned MEM microphones in the sensor head as well as proper algorithms to efficiently process the data providing you optimal detection capabilities .
>6 hours battery life	Including two batteries, each keeping you up and running for 6 hours.
Detection at long distances over 120 meters* (394ft)*.	Detect partial discharges and gas leaks at long distances up to 120 meters* (394ft)* to keep you at a safe distance or still find leaks at those remote or hazardous areas in your facility.
USB-C for direct PC and Fluke Connect Desktop connectivity	The Fluke ii910 can easily connect to a PC with a single cord.

*Depending on ambient conditions