MPAC128
MPAC128-ATEX
Acoustic imaging camera

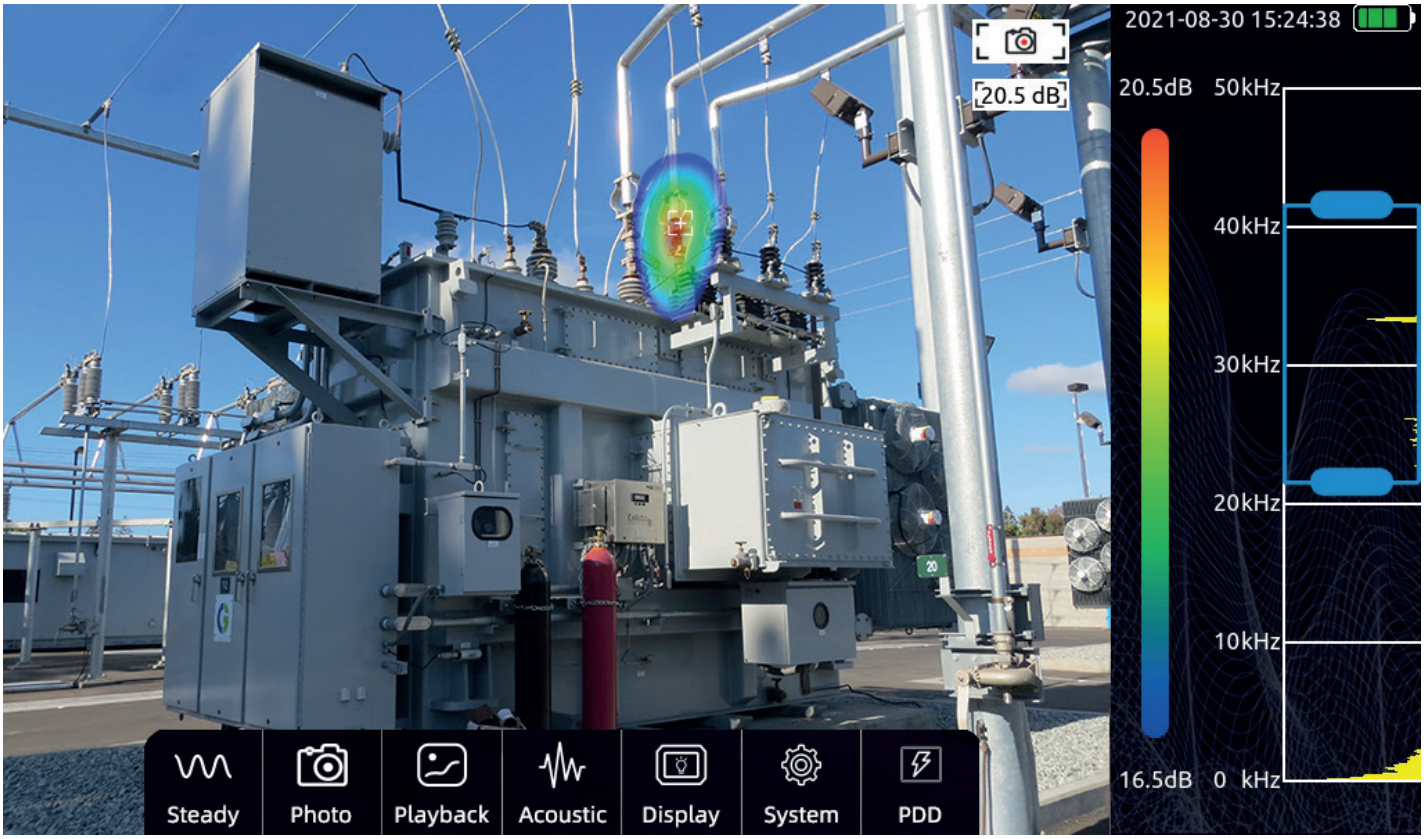
Megger

2024-4-5

EN
ENGLISH

What is acoustic imaging?

Many types of fault conditions, in particular, gas leaks and partial discharges, produce sounds. Sometimes, the sounds are audible, but more often, they are ultrasonic; that is, they are at frequencies above the limit of human hearing. By ‘listening’ for these sounds, it is possible, in principle, to discover that a fault is present and, by tracing the source of the sound, to find the location of the fault. This is the principle on which acoustic imagers work.



The Megger solution

Prevent critical asset failures, safety hazards, and costly disruptions by detecting partial discharge and gas leaks early. With Megger's acoustic imager, you can visualise gas leaks and dielectric breakdown risks that are otherwise invisible in finished products, process plants and electrical installation environments. This enables you to respond rapidly, preventing safety incidents, compliance violations, equipment damage, resource wastage, and costly unplanned downtime.

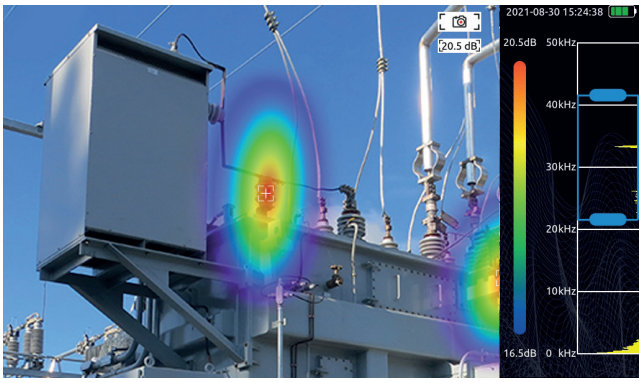
The Megger acoustic imager range consists of the **MPAC128** and the **MPAC128-ATEX** and are suitable for almost all PD applications and for many industrial applications, such as detecting compressed air leaks in non-hazardous areas.. The MPAC128-ATEX is ATEX-certified, so it can also be used in hazardous areas. In particular in the process industries, such as oil refineries and many types of chemical plant, the ATEX-certified version will be needed for use in areas where explosive vapours and gasses may be present. The MPAC128-ATEX is, of course, also suitable for use in non-hazardous areas.

MPAC128

MPAC128-ATEX

A key part of an acoustic imager is an array of microphones. The Megger acoustic imaging cameras have 128 microphones. The microphones pick up audible and ultrasonic sounds from a gas leak or partial discharge, using signal processing to suppress unwanted sounds so that the imager responds only to sounds from the fault.

Additional processing of the signals from the microphone array allows the instrument to determine the fault's precise direction and the fault's approximate physical size. This information is used to produce a coloured 'map' representing the fault, which is displayed on top of an ordinary digital image of the equipment that the acoustic imager is being used to examine. Colours are used to show the varying sound pressure or 'volume'.



This method of detecting and locating faults has several advantages, the most important of which is that it involves no contact with the equipment or installation being examined. In fact, with the Megger equipment, faults can be detected at distances of up to 120 m.

This has important safety implications.
When inspecting overhead power lines for possible PD, for example, there is no requirement for working at height and no need to approach energised conductors. Remote fault detection also saves time; a large section of plant can be surveyed for leaks in just a few minutes, whereas manual inspection to find leaks could take hours.

Key capabilities

The basic characteristics of the MPAC128 and MPAC128-ATEX are:

- Detection frequency: 2 to 48 kHz
- Detection range: 0.3 to 120 m
- Optical camera resolution: 8 megapixels
- Display refresh rate: 25 fps
- IP rating: IP54
- Microphones in array: 128
- Sound image Field of View (FOV) Horiontal: 62° Vertical: 48°

Other important features include:

- **ATEX Certification (MPAC128-ATEX only)**
  Having ATEX certification allows the camera to be used in Zone 2 potentially explosive environments.
- **Multiple gas types.**
  Leaks of pressurised gases can be detected, irrespective of the type of gas.
- **Easy operation.**
  In most applications, only two parameterss (frequency range and dynamic range) need to be set.
- **Leak rate quantification.**
  For gas leaks, the instrument provides an estimate of the leak rate, which means that the cost of the leak can be calculated.
- **Phase resolved partial discharge (PRPD).**
  This allows discrimination between different types of partial discharge, such as surface discharge, suspension discharge and corona discharge.
- **Focus function.**
  Invaluable in noisy environments, this narrows the angle of response of the microphone array, thereby reducing the effect of unwanted noises.
- **Ultrasonic monitoring.**
  Sounds with frequencies too high for human hearing are converted to audible sounds and can be monitored with headphones. This can help with pinpointing leaks.
- **Expandable storage.**
  Internal storage for results, images and videos can easily be expanded with a standard memory card.

For more information about the MPAC128 and MPAC128-ATEX visit www.megger.com or scan the QR code ➔

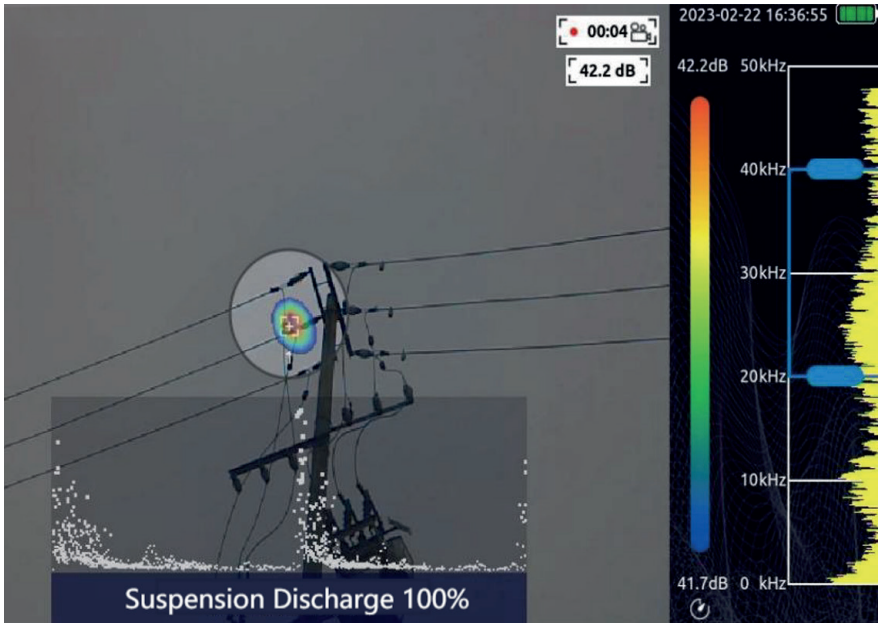
Application examples

Gas leak detection

Utilities/electrical power generation
Overhead lines
Industrial power systems
Oil and Gas refineries
Electrical OEMs
Rail transportation

Partial discharge detection

Oil and Gas refineries
Rail transportation
Industrial users of compressed air, including manufacturing, automotive, food and beverage, chemical processing, pharmaceuticals, textiles, packaging, plastics and rubber
Industrial product testing, including automotive, food and beverage, electrical, electronics, medical device, HVAC, packaging



MPAC128 with carry case and accessories; carry strap, power plug and cable, Ethernet to USB-C adapter, 32GB USB memory stick, USB adapter for SD card and micro SD cards.

MPAC128-ATEX

FAQs

Technology/capabilities

How does acoustic imaging work technically?

An array of 128 microphones picks up audible and ultrasonic sounds from a PD event or a gas leak. By looking at the phase difference between the sound waves at each of the microphones, the instrument can determine the direction to the source and also the approximate size of the source.

What gases can your camera detect leaks of?

Acoustic imagers work with any pressurised gas.

What causes partial electrical discharge and why detect it?

Partial discharge is caused by the partial failure of electrical insulation. The occurrence of partial discharge may indicate that the fault will progress to complete failure if no action is taken. Partial discharge, therefore, provides a valuable advance warning of potential insulation problems.

How accurate is the leak detection and discharge imaging?

At the maximum detection range of 120 m, the instruments will provide a reliable general indication of the location of the fault. The standard procedure would then be to approach the area more closely and, at shorter ranges, the location accuracy is even better.

Can your camera see through obstructions or insulation?

In general, acoustic imagers cannot see through solid objects which obstruct the passage of sound waves. They can, however, detect partial discharge on the surface of insulation.

What software analytics options come with the camera?

The instrument incorporates analytic functionality and can, for example, estimate the size of gas leaks to enable their cost to be calculated or produce phase resolved partial discharge information to help identify the type of PD event. In addition, reporting software is supplied that enables users to generate and export reports quickly and easily.

What is the ATEX code of the MPAC128-ATEX?

II 3 G Ex ic IIC T5 Gc

Are the Megger MPAC cameras designed for industrial use?

Yes. Both the MPAC cameras offer an IP54 environmental protection against water and dust ingress.

Application and environment

How loud does background noise impact functionality?

The Megger instruments use advanced technology to minimise the effect of background noise, and, in the majority of cases, this will be completely effective without further action by the user. However, the instruments offer a focus mode for use where the background noise is particularly severe. This reduces the angle of response of the microphone array and thereby minimises the impact of unwanted noise.

Does weather/temperature affect use cases?

The operating temperature range for the instruments is -20 to +50 °C, and their IP54 ingress protection rating means that they will not be damaged by operation in moderate rain. However, rain and high winds can affect the acoustic signals on which the instruments rely, so obtaining accurate results in adverse weather conditions may not be possible, especially when operating at large distances from the target.

Can't I just use an infrared or ultrasonic wand instead?

Infrared wands operate on an entirely different principle, looking for heat generated by a fault. Most cases of PD and almost all cases of gas leakage generate no heat, so an infrared wand will not detect the problem. Ultrasonic wands respond to sounds of the same type detected by acoustic imagers but are generally designed to be used only for leak detection at short ranges. They are unsuitable for PD detection and provide no image of the equipment being examined. They are, therefore, not useful for surveying large plants for leaks.

Other imagers have a frequency range of up to 100 kHz; why is yours only to 48 kHz?

There are a few technical reasons why extending the frequency range up to 100 kHz does not provide meaningful advantages.

- Most pressurised gas leaks and electrical partial discharges emit the strongest ultrasonic signals between 20 and 45 kHz. Higher frequencies get significantly attenuated. So, the key useful signals are covered by frequencies up to 48 kHz.
- Background acoustic noise increases markedly above 50 kHz. Extending the frequency range above 50 kHz means that the acoustic imager sees more noise. This obscures the leak signals instead of isolating them like the advanced algorithms in our imagers, which focus on the critical lower frequency bands.
- The wavelength of signals significantly above 50 kHz approaches the physical distance between the camera microphone sensors. This can lead to interference and crosstalk between the sensors. In contrast, limiting the frequency response to 48 kHz ensures accurate signal separation and triangulation of the sound source.

While in theory, collecting higher frequency data could provide a wider net, in practice the crucial emissions are concentrated below 50 kHz, with higher bands offering diminishing returns with lower signal strength and a higher rate of false positives. Focusing on refining sensitivity, resolution and noise reduction in the frequency band up to 48 kHz provides the best leak visibility.

Partial discharge

What is partial discharge?

Partial discharge (PD) refers to a localized breakdown of insulation in an electrical system, typically in high-voltage equipment such as transformers, cables, and switchgear. It is a phenomenon where a small electrical discharge occurs in a portion of the insulation material, rather than a complete breakdown of the entire insulation system. Partial discharges can be caused by various factors, including impurities in the insulation material, voids, cracks, or other imperfections.

What causes partial discharge?

Partial discharge is small electrical sparks in high voltage insulation systems caused by voids or gaps that allow dielectric breakdown when voltage exceeds the air gap withstand. It gradually degrades insulation.

What type of equipment experiences PD issues?

High voltage electrical equipment like switchgear, transformers, motors, generators, and cables. It is also common in aviation, vehicles, and insulating materials.

What are some partial discharge indicator patterns?

Corona (irregular discharge around sharp metal edges), surface tracking, arcing across wires or terminals, sparks through insulating barriers or cracks.

Is all partial discharge hazardous?

Not necessarily initially, but it indicates insulation flaws that can lead to failure. PD causes deterioration and cumulative damage over time.

What problems can untreated PD cause long-term?

Ultimately, total voltage breakdown failure causes fires, explosions and electrical shutdowns.

Gas leak detection

What causes pressurised gas leaks?

Cracks or gaps in valves, flanges, seals, hoses, tanks and pipelines allow contained gases to escape - caused by wear, corrosion, and faulty parts. Vacuum leaks let air in, disrupting negative pressure.

What hazards do gas leaks pose?

Flammable gases like natural gas and hydrogen risk fires/explosions. Toxic gases endanger health. Lost compressed air wastes energy and disrupts pneumatic processes.

How small a leak can your technology detect?

The minimum detectable leak rate is 0.92 ml/second for a 5 bar gas release at a 10 meter distance.

How do you accurately identify the leak location source?

Advanced acoustic sensors triangulate the ultrasonic frequency signature location while noise filters isolate. The superior resolution provides detailed emissions images.

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MPAC128-MPAC128-ATEX-BR-EN-V01 04 2024