

DOES YOUR EXISTING
GAS LEAK DETECTION SYSTEM

PICK UP LEAKS?



THE ULTRASOUND ADVANTAGE

Technologies that have traditionally been used in fixed installations to detect hydrocarbon gas leaks, such as Catalytic/IR Point Sensors and IR Open Path Sensors all have one limitation: in order for a leak to be detected, the gas itself must either be in close proximity to the detector or within a pre-defined area. Unfortunately, outdoor environmental conditions such as changing wind directions and quick dispersion of the gas cloud from a leaking outdoor installation often cause traditional gas detection systems to fail simply because the gas never reaches the detector.

The MSA Ultrasonic Gas Leak Detectors are based on robust microphone technology; they detect outdoor leaks by sensing the distinct high frequency ultrasound emitted by all high

pressure gas leaks. With the unique ultrasonic sensing technology, leaking gas itself does not have to reach the sensor – just the sound of the gas leaking.

Unlike other technologies, the MSA ultrasonic gas leak detectors have no delicate optical alignment which can be affected by vibration, rain and fog, or solar radiation. Nor can they be saturated by poisonous or highly concentrated gases. On the contrary, the detectors' stainless steel microphone is maintenance-free.

The patented SENSSONIC™ self-test technology ensures full integrity and failsafe operation of our most advanced ultrasonic gas leak detector UltraSonic EX-5.



THE MSA PRODUCTS AND SERVICES

The MSA products are developed in close co-operation with the world's leading oil and gas suppliers to ensure reliable operation in some of the harshest environments on Earth. All MSA products are designed to withstand tough corrosive environments and constantly changing weather conditions. They are designed for permanent monitoring of manned or unmanned on- and offshore gas installations. Installation locations include remote arctic locations as well as desert conditions.

The MSA ultrasonic gas leak detectors are all based on robust and proven microphone technology. The detectors are low-maintenance devices and easily tested and calibrated onsite with a portable unit. The product range includes:

THE ULTRASONIC EX-5

- Stainless steel, "Ex d" explosion-proof enclosure
- SENSSONIC™ self-test technology for failsafe operation
- 4-20 mA analogue output with HART 6.0
- RS 485 Modbus communication interface
- ATEX, IECEx, CSA/FM certified

THE ULTRASONIC IS-5

- Intrinsically safe "Ex i", stainless steel enclosure
- 4-20 mA analogue output
- Visual local indication (LED)
- ATEX, IECEx, certified



CONCERNS

BACKGROUND NOISE IMMUNITY

Most noise sources (machines, turbines, generators) generate sound below the detectable frequency range of the MSA detectors. However, to ensure that the ultrasonic gas leak detectors are not influenced by other noise sources onsite, it is normally recommended to perform a background noise mapping survey prior to installation.

FALSE ALARMS

Spontaneous air releases from certain industrial sources could also trigger an ultrasonic gas leak detector. Therefore, the MSA detectors have a built-in delay function to prevent such false alarms from occurring.

WHAT IS ULTRASOUND?

A sound wave is simply a pressure pulse in the air, which is detected by the human ear the same way that it is detected by a microphone. The human ear can only perceive sound waves in the frequency range between 20Hz and 20kHz.

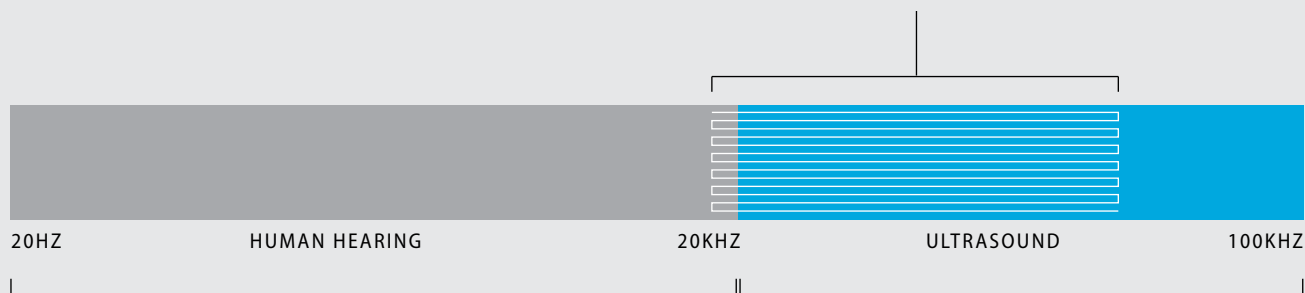
Sound waves with a frequency range higher than 20kHz are commonly referred to as ultrasound; and while they exist

beyond the range of normal human hearing, they can be detected by MSA's special microphone technology which is an integrated part of the MSA gas leak detectors. When a pressurised gas is released through a hole or a fissure, the leak produces "broad-band" acoustical noise, ranging from the audible frequency range up to the ultrasonic frequency range.



THE ACOUSTICAL DETECTION RANGE OF THE MSA ULTRASONIC EX-5

Very few background noises will occur in this range. However, leaking gas will produce ultrasound clearly detectable within this range. The MSA gas leak detector responds to sound that falls within this range.



ACOUSTICAL SOUND WITHIN the human hearing range.

Most background noise in plants and other industrial facilities, including turbines, motors, and compressors, falls within this frequency range. The MSA detectors do not respond within this area.

ACOUSTICAL SOUND BEYOND the human hearing range.

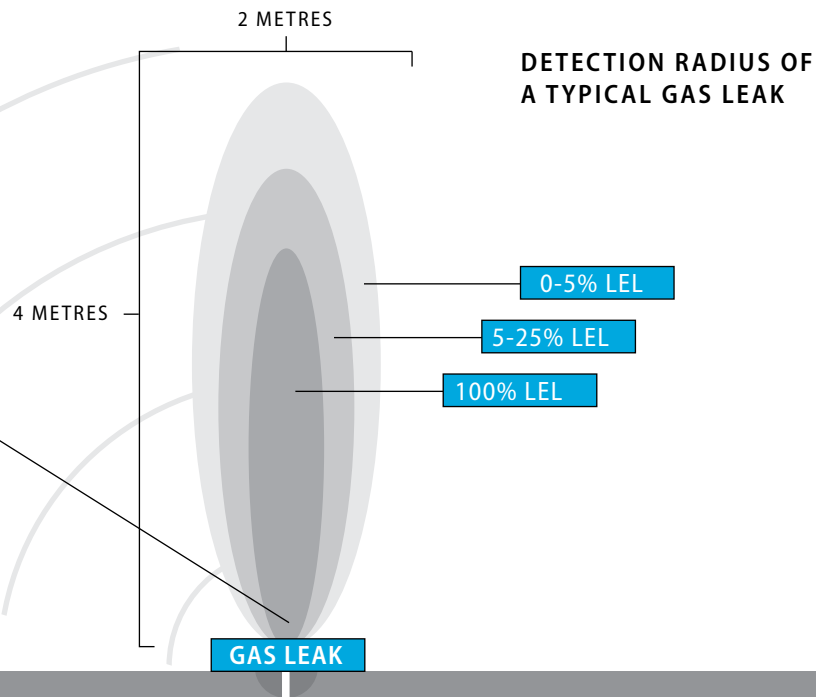
GAS LEAK RATE

- The leak rate corresponds to how much gas is released from a leak per second. The leak rate unit of measurement is kilograms/second (kg/s).
- A gas leak that generates a high leak rate is dangerous since it can quickly accumulate into an explosive and dangerous gas cloud.
- From gas dispersion studies, a gas leak rate of 0.1 kg/s is considered to be a small gas leak. As an example, a 0.1 kg/s gas leak can be formed by a leak of 4 mm at a gas pressure of 40 BAR (700 psi).
- MSA ultrasonic detection technology can detect a leak at a leak rate of 0.1 kg/s up to 20 m away.

THE NATURE OF LEAKING GAS

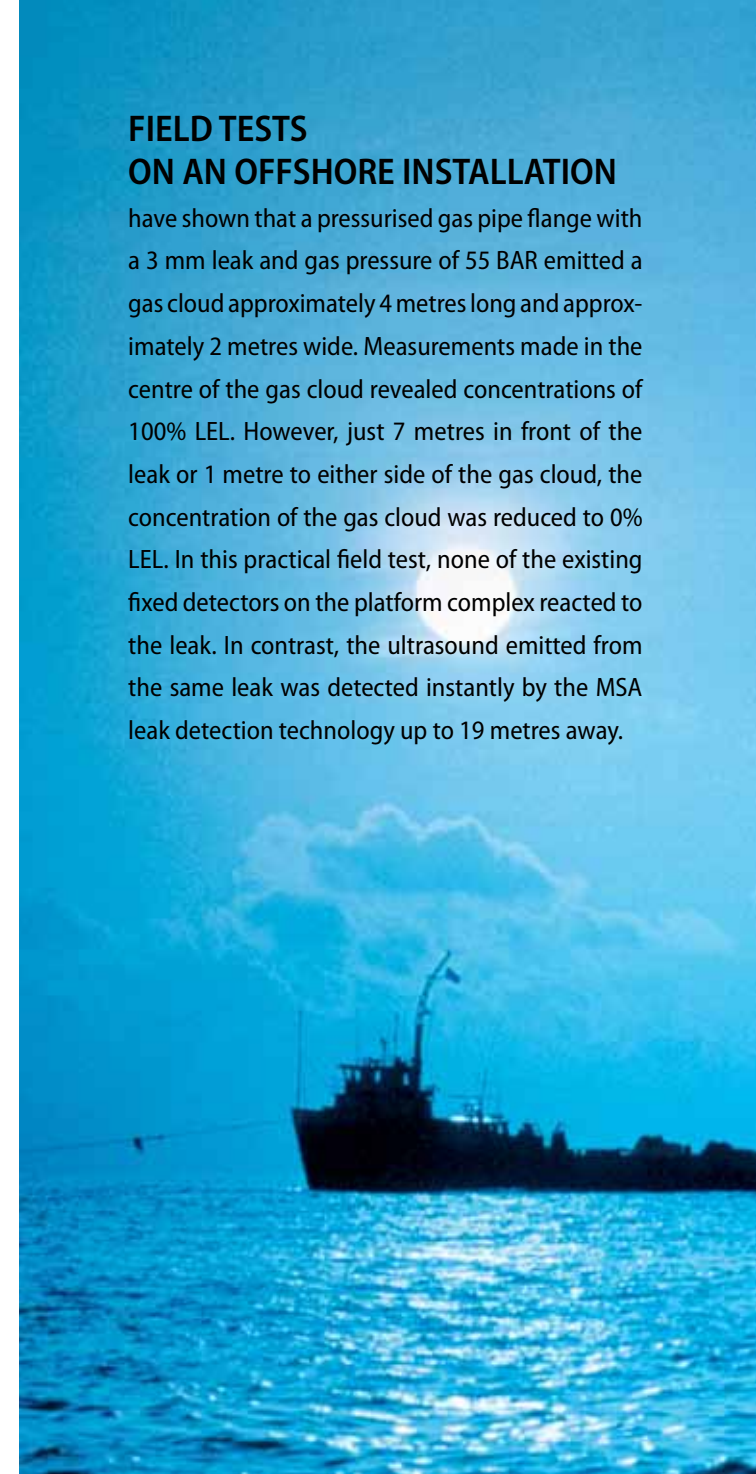
The concentration of leaking gas is always highest closer to the source of the leak, gradually diluting as it drifts away from the source. Traditional detection technologies rely on a build-up of the concentration of the leaking gas. In closed indoor gas installations, these technologies work fairly well. However, in outdoor installations even very large gas leaks

dilute quickly and are significantly affected by changing wind directions – making them very difficult to detect. Instead of measuring a concentration in LEL, MSA ultrasonic detection technology detects gas leaks instantly at a pre-defined leak rate.



FIELD TESTS ON AN OFFSHORE INSTALLATION

have shown that a pressurised gas pipe flange with a 3 mm leak and gas pressure of 55 BAR emitted a gas cloud approximately 4 metres long and approximately 2 metres wide. Measurements made in the centre of the gas cloud revealed concentrations of 100% LEL. However, just 7 metres in front of the leak or 1 metre to either side of the gas cloud, the concentration of the gas cloud was reduced to 0% LEL. In this practical field test, none of the existing fixed detectors on the platform complex reacted to the leak. In contrast, the ultrasound emitted from the same leak was detected instantly by the MSA leak detection technology up to 19 metres away.



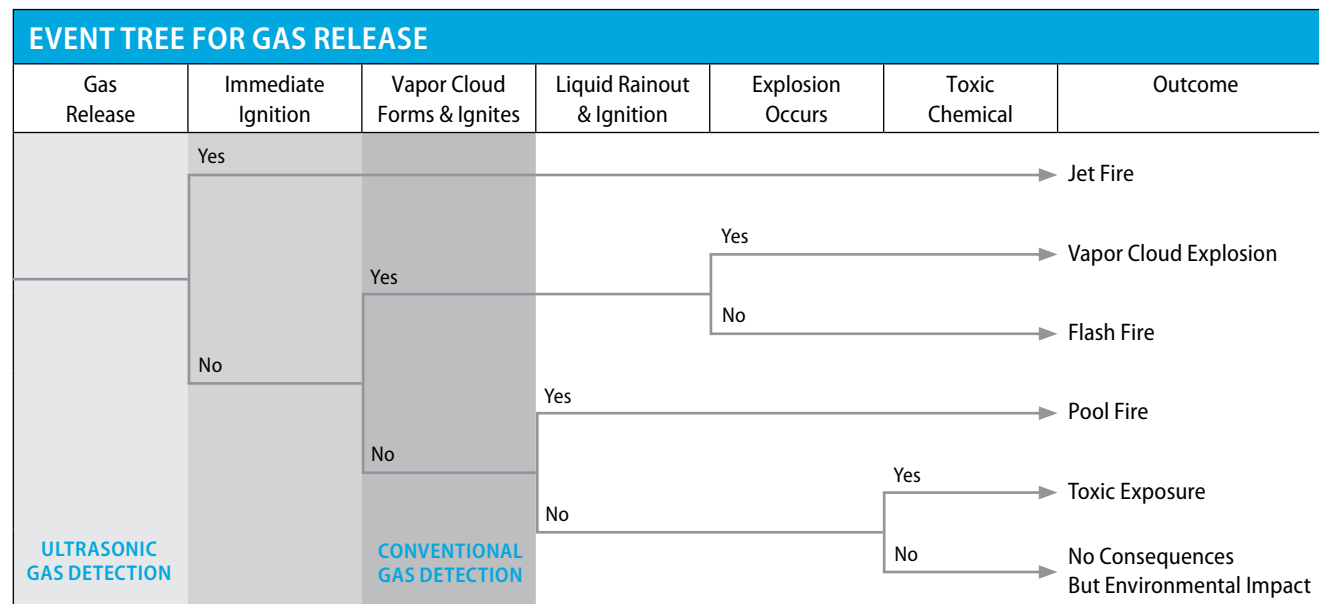


COMPARATIVE GAS RELEASE EVENT TREE

Operators in the petrochemical industry are constantly looking at ways to reduce risk, prevent loss, and ensure safe and reliable production. One of the key elements in achieving this and increasing the overall efficiency is by speeding up the response time of the F&G detection system.

The Gas Release Event Tree below puts the effects of a gas leak into perspective. It is evident that the deployment of appropriate technology to detect hazards at the earliest

stage (initiation), before they have time to develop or escalate has a significant impact on major accident risk reduction. Traditional gas detection systems need to wait for the gas to form a vapour cloud, which may or may not ignite, and which may or may not allow loss prevention by enabling shutting down the gas facility in time. Ultrasonic Gas Leak Detectors respond at the speed of sound at gas leak initiation, unaffected by changing wind directions and dilution of the gas.





HOW TO ENSURE FAILSAFE OPERATION

In field instrumentation, particularly in harsh outdoor environments, faults or breakdowns can occur. What is NOT acceptable is when such faults or breakdowns are left unrevealed, especially if safety is involved. The SENSSONIC™ self-test technology meets the challenge of ensuring failsafe operation for our most advanced ultrasonic gas leak detector.

SENSSONIC™ self-test technology provides a full acoustic integrity test of the UltraSonic EX-5 ultrasonic gas leak detector every 15 minutes using a high-quality sound transducer

transmitting an airborne ultrasonic signal to the detector's microphone system. This ensures that the microphone and the electronics are tested continuously within well-defined tolerances, and that the operator is warned if the detector should fail this regular test.

The SENSSONIC™ technology provides reliable and failsafe operation for the MSA ultrasonic gas leak detectors, protecting your assets and ensuring human safety in your industrial facility.



MSA

SYSTEM IMPLEMENTATION



To ensure maximum performance from an ultrasonic gas leak detection system certain factors should be taken into consideration.

INITIAL CONSIDERATIONS

First of all, it should be considered which facilities are to be monitored – is it an open or a very congested facility? One should be aware that all joining parts, including pipe flanges,

valves, manifold systems, wellhead areas, etc., can be potential leak sources in high pressure gas installations.

DETERMINING A LEAK SIZE

The next decision to make is what leak size needs to be detected. Even leaks as small as 2 mm can be detected by the MSA gas leak detectors. For optimal installation of the detectors, the gas pressure of the system as well as the level of the

average acoustical ultrasonic background noise in the area to be covered should then be decided. If the plant facility is still under construction, MSA can be consulted to estimate optimal locations.

PLANT MAPPING

To determine the optimal trigger level for the MSA detectors at a given location, and thereby decide the coverage radius, an ultrasonic background noise mapping can be performed. MSA may assist customers doing this.

ONSITE SYSTEM COMMISSIONING

An ultrasonic gas leak detection system can be commissioned by means of simulated nitrogen gas leaks at a leak rate of e.g. 0.1 kg/s. This will verify that the detection system picks up leaks according to the pre-defined performance standards.

REGULAR MAINTENANCE

Normally the MSA detectors do not need maintenance or calibration. However, if plant regulations require so, a portable test unit can be used.



ALONE OR IN COMBINATION

The MSA ultrasonic gas leak detectors can be used alone or in conjunction with traditional detection methods.

TRADITIONAL GAS DETECTION TECHNOLOGIES

Infra-red point detection

Detection technology:
Infra-red light

Coverage:
The gas must come into physical contact with the detector

Catalytic point detection

Detection technology:
Pellistor sensor

Coverage:
The gas must come into physical contact with the detector

IR open path detection

Detection technology:
Infra-red light

Coverage:
Gas must pass through a predefined beam of infra-red light

ABOUT MSA

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More than 115 years of experience and capability in comprehensive safety solutions have made MSA a modern and forward-looking company for the protection of people, facilities and the environment.

With around 5,500 staff worldwide, and our own research and development centres in Pittsburgh (USA), Berlin (Germany) and Suzhou (China), MSA has become one of the leading suppliers of the most modern safety technologies.

Today MSA is already the biggest name for personal protective equipment and gas measurement technology, offering the largest range of products worldwide.

MSA is one of the few suppliers of permanent gas measurement technology that develops and manufactures a complete range of products and integrates them into system solutions. This is the only possible way to develop optimum systems that can meet all customer requirements at an excellent performance-price ratio – an unbeatable case for safety and flexibility. Whether stand-alone, or integrated into existing control and monitoring systems, MSA offers made-to-measure solutions.

The ultrasonic gas leak detection technology is now so well-established that it is being used worldwide by most of the major oil and gas producers.

MSA – GAS LEAK DETECTION AT THE SPEED OF SOUND!