

Increase safety in Hydrogen installations, by detecting hydrogen leaks by the speed of sound

Presentation for: EPSC Webinar

Presenter: Martin T.Olesen

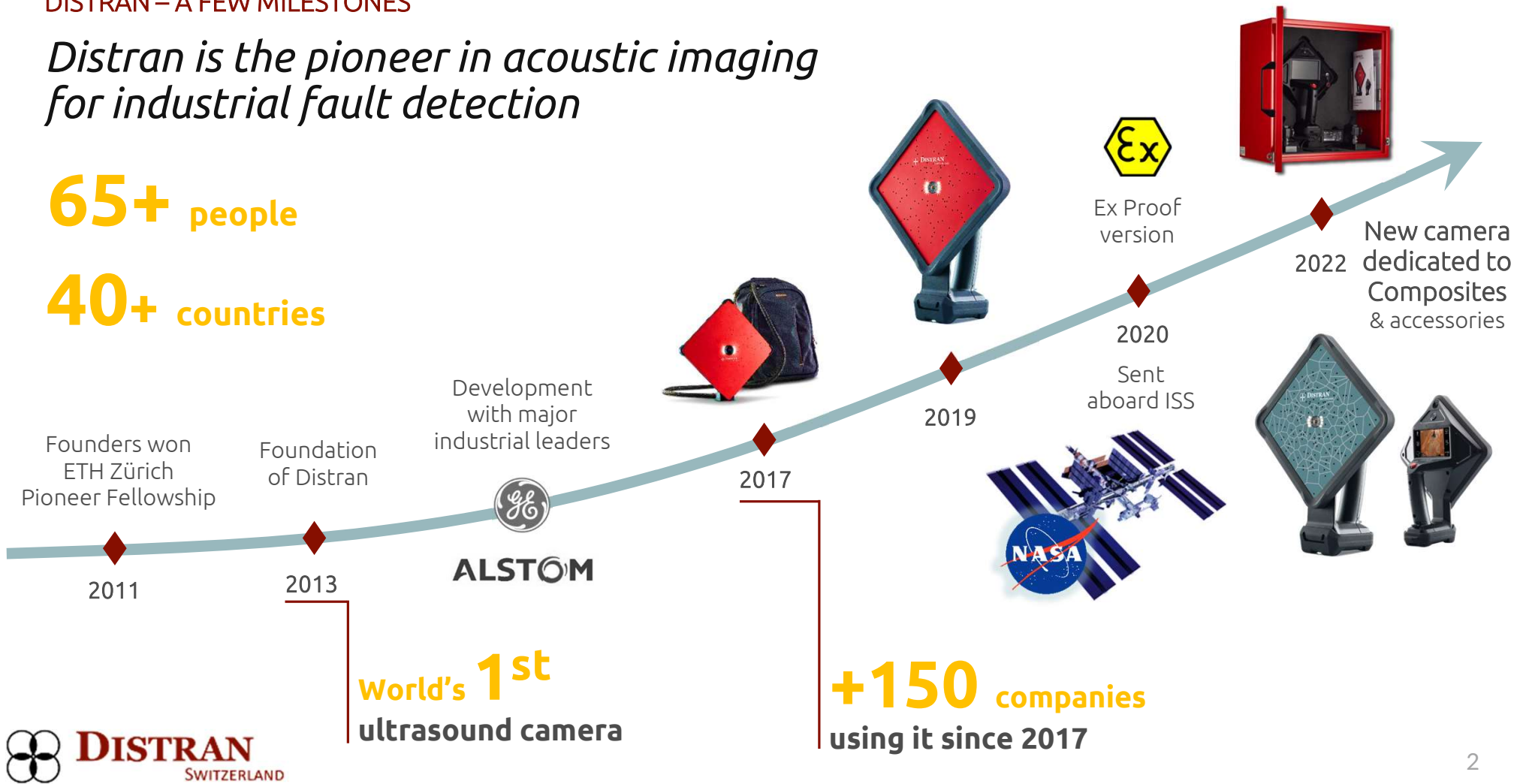
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DISTRAN – A FEW MILESTONES

Distran is the pioneer in acoustic imaging for industrial fault detection

65+ people

40+ countries



Introduction

- This is an introduction to the acoustic Gas Leak Detection concept.

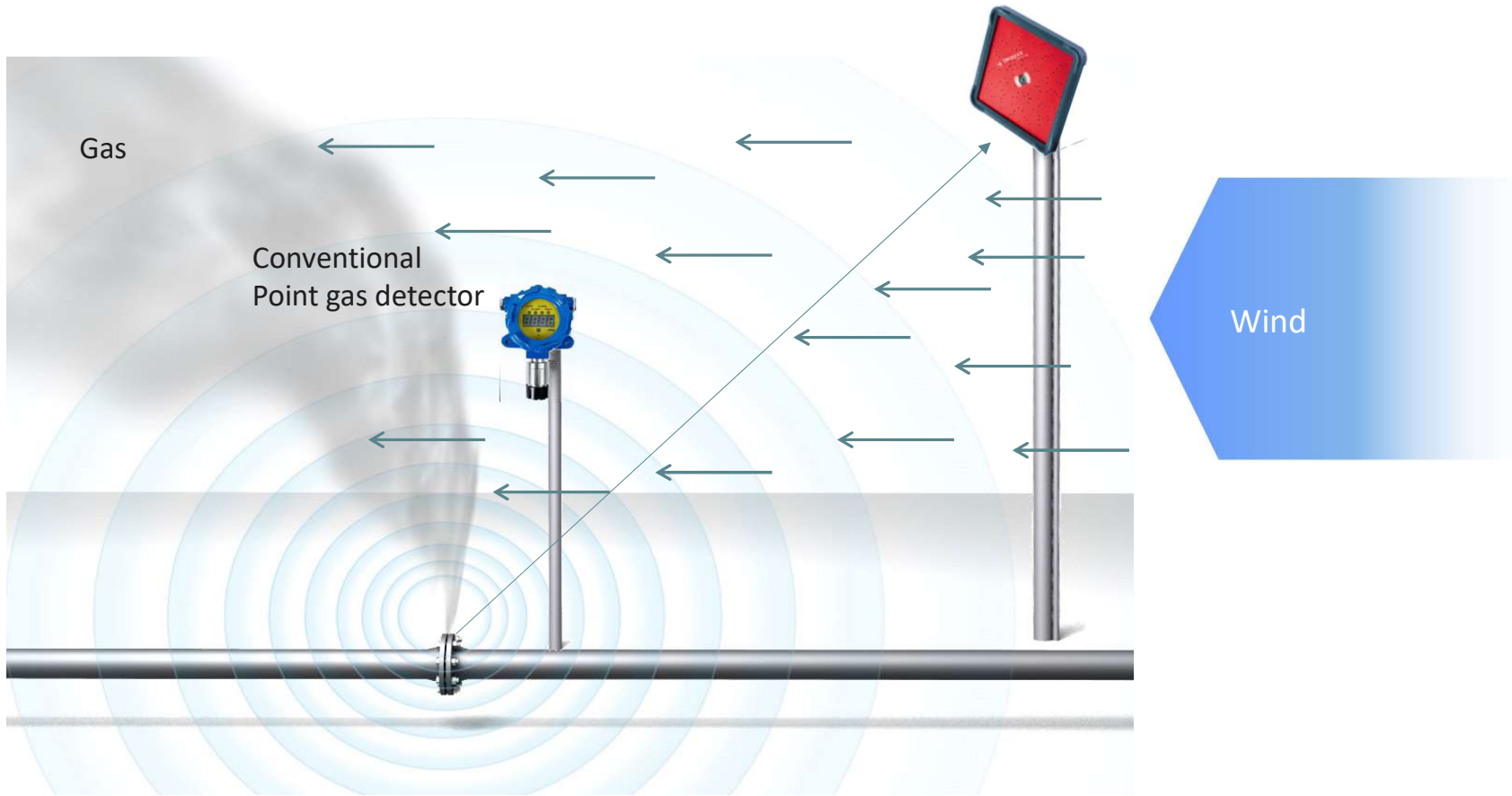
With this presentation we explain how and why this technology can help to increase SAFETY in pressurized gas installations, such as H2 and Power-to-X plants to ensure that dangerous gas leaks are detected **extremely fast** so proper action can be taken to avoid catastrophic escalations and explosions.

Why is hydrogen safety very important?

- Hydrogen is extremely flammable (explosive)
- Hydrogen can self ignite when leaking under certain conditions.
- Hydrogen is very light, so it dilutes very fast after leaking.
- Hydrogen is often handled in very high-pressure installations.
- Hydrogen burns with an invisible flame.

Why Acoustic detection

Distran Sonicview acoustic detector

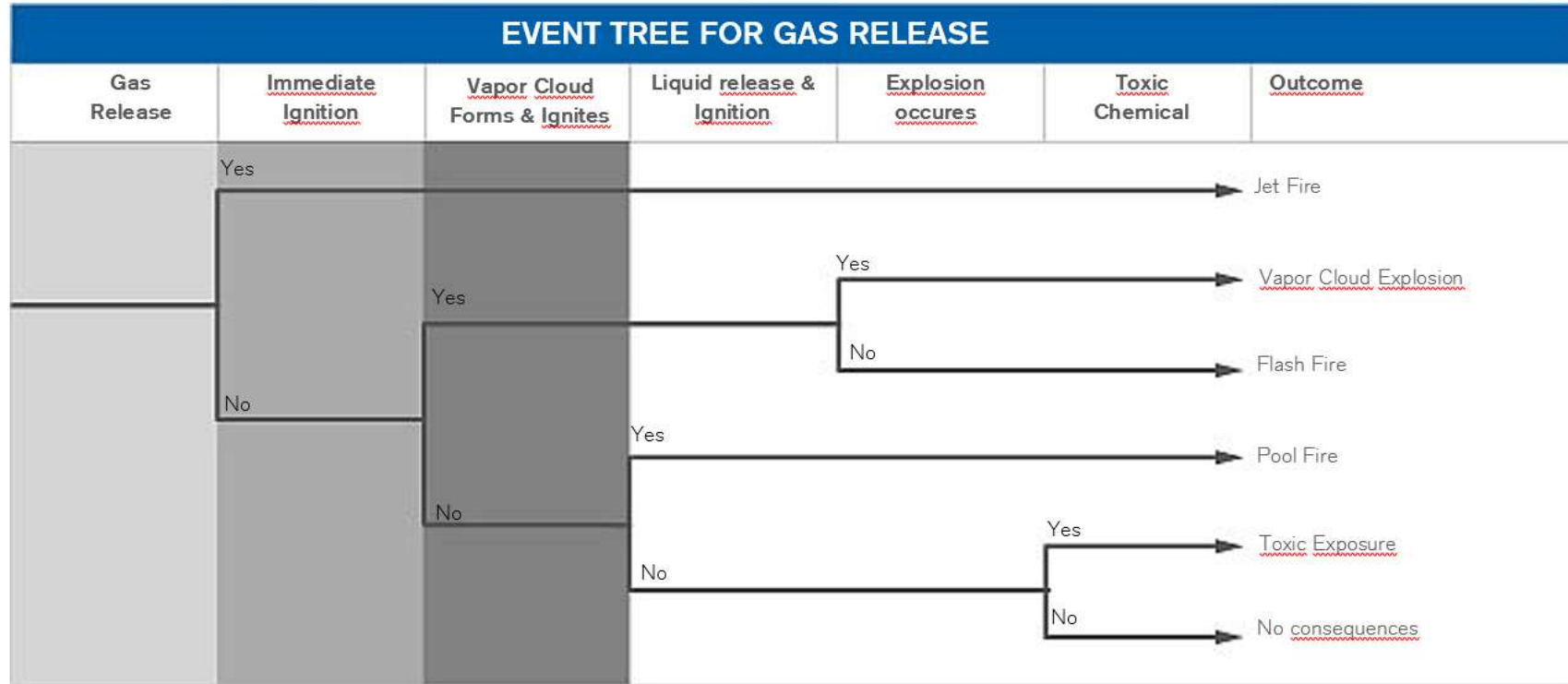


Where to implement acoustic gas leak detection

- Mainly outdoor installations
- Where very fast response time to gas leaks is necessary
- Pressurized gas installations (Oil & Gas, H2 installations, refineries)
- In combination with conventional gas detectors
- Can be configured in voting actions with other detectors



Safety and speed of detection



Fast acoustic response

Conventional gas detector response

Gas concentration (LEL or ppm) versus Leak rate

Lower Explosive Level (% LEL):

LEL is a concentration parameter for flammable gasses measured in a range from 0 to 100%. If 100% LEL are measured, it means the ratio between flammable gas and O₂ in the air (21%) will create a combustion and explosion.

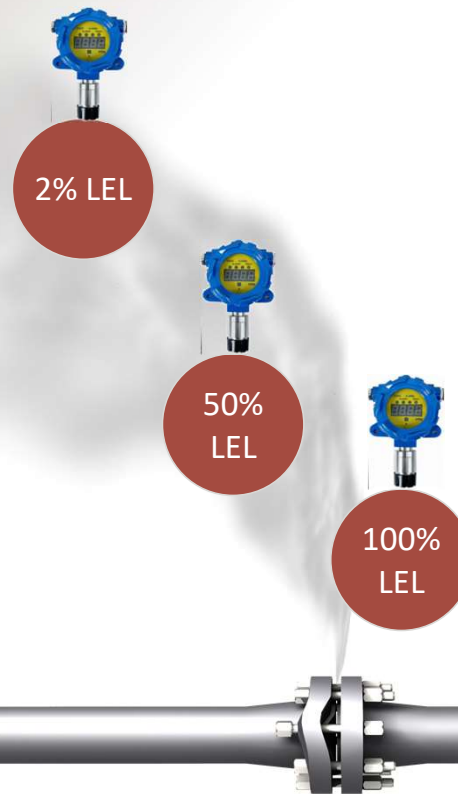
Leak rate (kg/s) or Liter/Hour:

The leak rate (mass flow rate) of the gas from the leak will determine how fast a gas cloud, at a certain size, can be accumulated. The faster the gas can be detected, when it starts to leak, the faster a potentially dangerous leak ignition can be avoided.

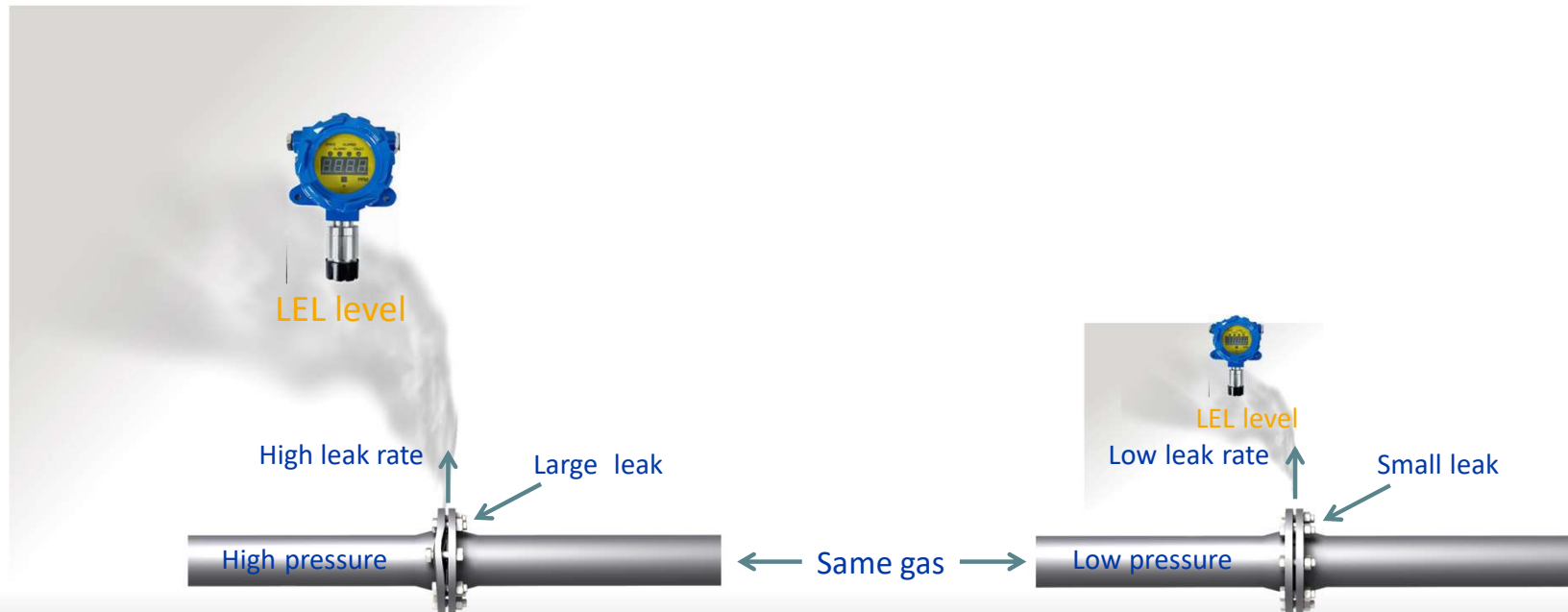
Measuring gas concentration outside ... What do we actually measure?

Concentration measurement outside depends on:

- Wind direction
- Dilution of the gas cloud from gas leak to detector
- Distance between gas detector and gas leak
- Gas type



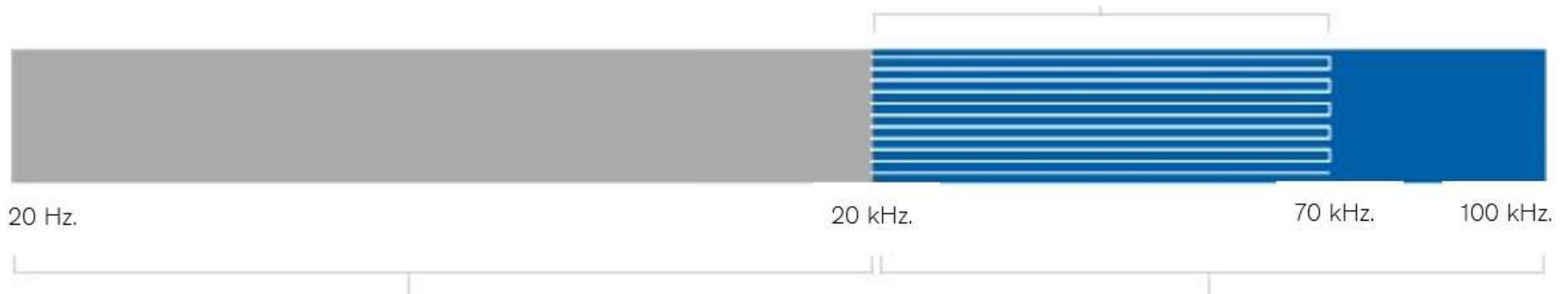
Gas concentration (LEL or ppm) versus Leak rate



The Leak rate (massflow rate) is how much gas escapes through the leak in Kg/sec

What is ultrasound?

The acoustic gas detector is designed to "hear" sound frequencies above 20 kHz (ultrasound). This prevents normal man-made mechanical noise to cause constant false alarms in the acoustic detector.



Audible sound, human audible hearing,
20 Hz to 20 kHz

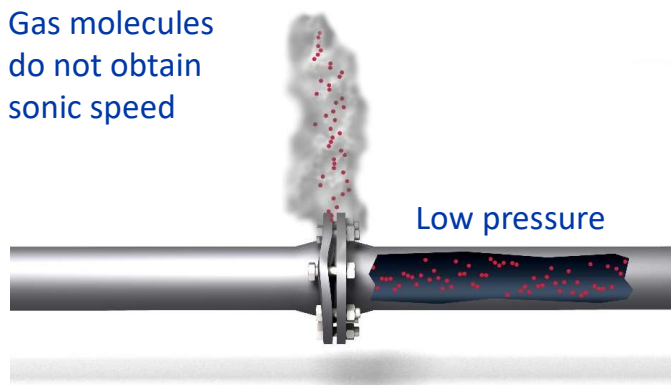
Most acoustic background noises are
present in this frequency range.

Ultrasound, inaudible sound above 20
kHz

Very limited acoustic noise in this
frequency range even in very noisy
environments.

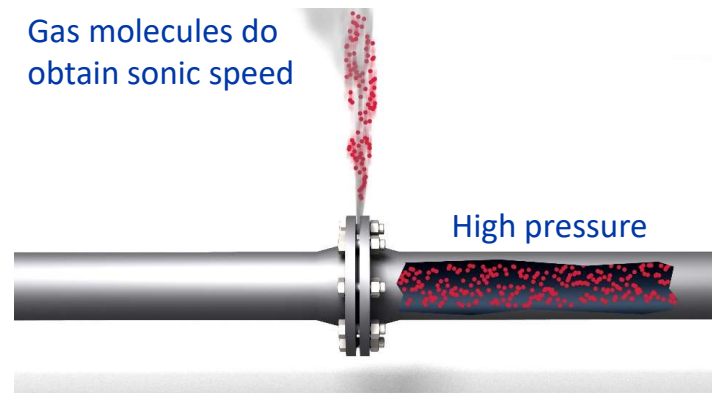
How is the ultrasound generated in pressurized gas installations?

Gas molecules do not obtain sonic speed



Low pressure and large leak will not generate ultrasound since the gas molecules will not obtain sonic speed through the leak.

Gas molecules do obtain sonic speed



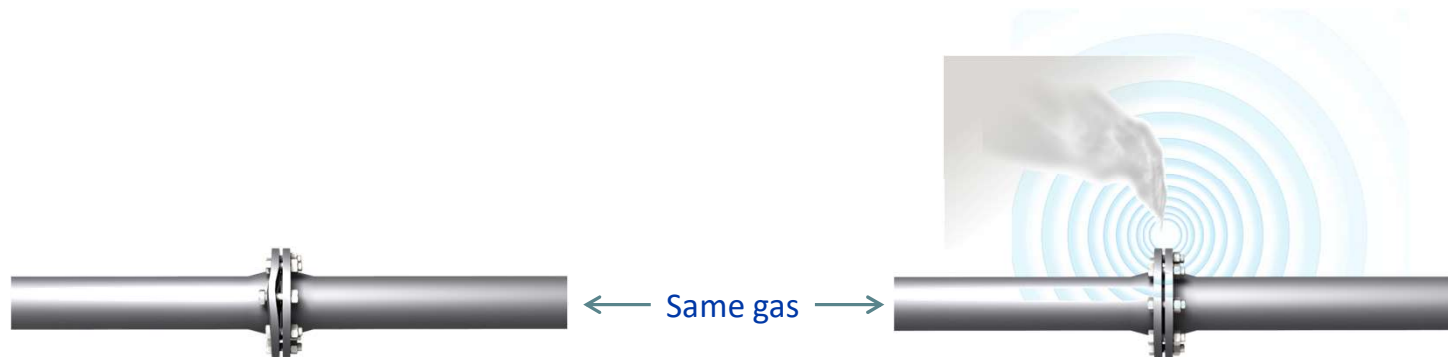
High pressure will generate ultrasound since the gas molecules will obtain sonic speed through the leak.

Only gasses in gaseous state when they leak can be detected by UGLD, but not liquid gas leaks.

Leak rate versus ultrasound

High leak rate =
High level
ultrasound

Low leak rate =
Low level ultrasound

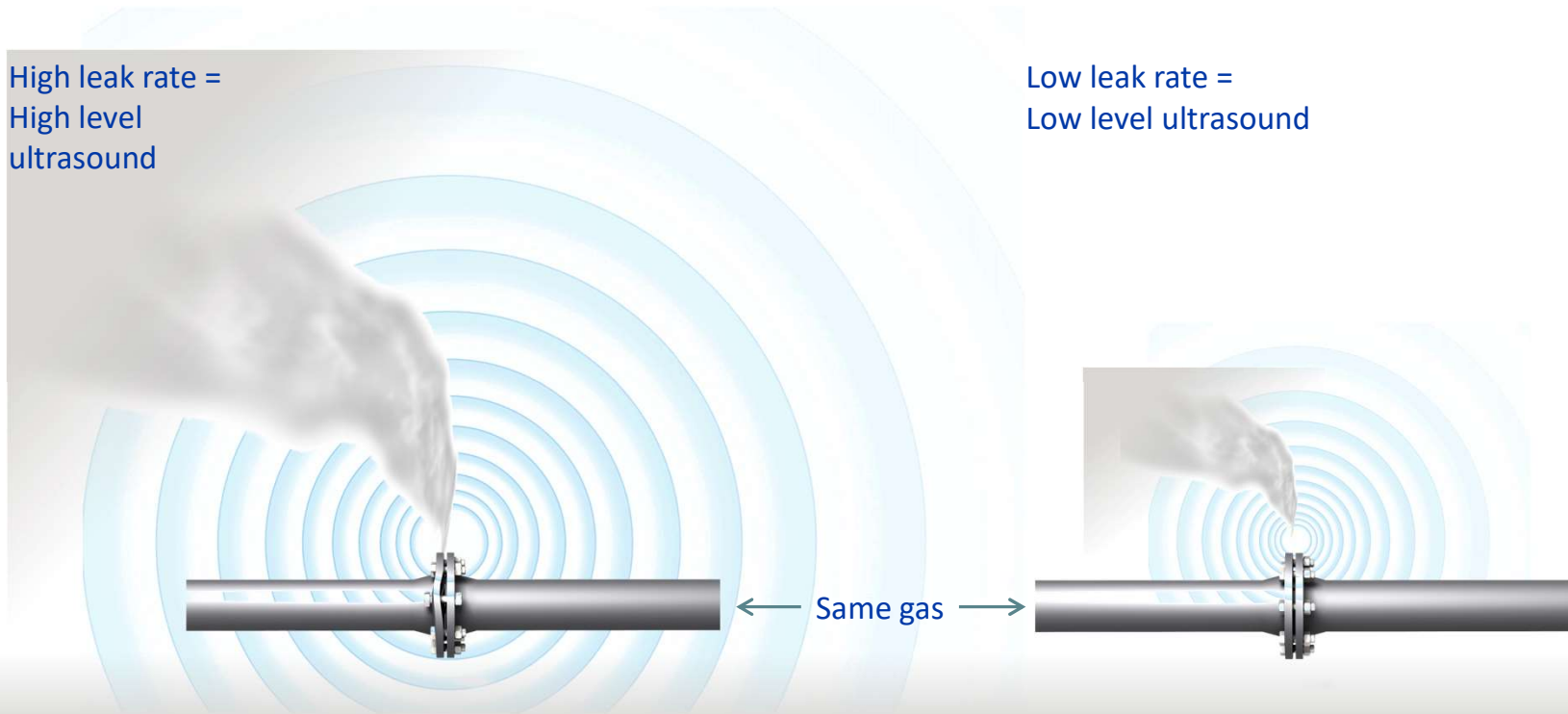


Leak rate is how much gas escapes through the leak in kg/sec

Leak rate versus ultrasound

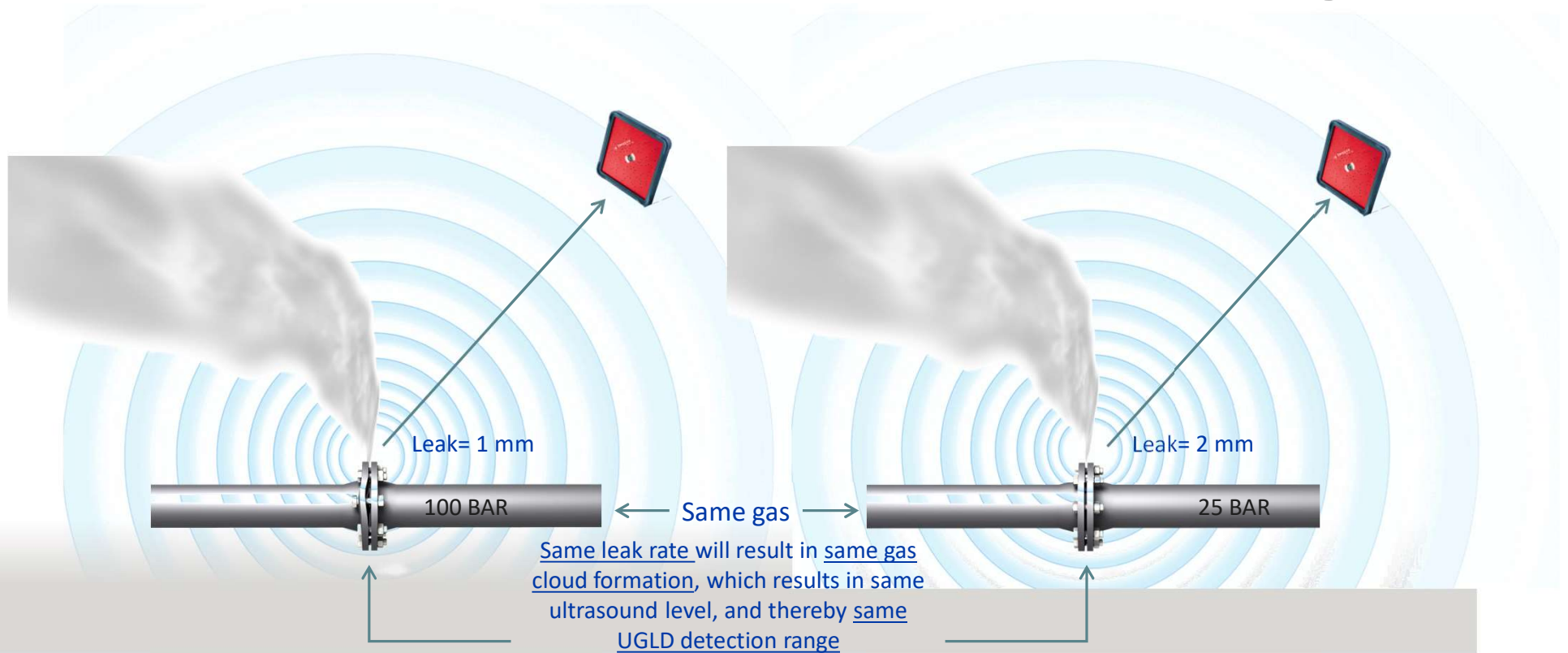
High leak rate =
High level
ultrasound

Low leak rate =
Low level
ultrasound



Leak rate is how much gas escapes through the leak in kg/sec

The leak rate will determine the gas cloud size and the acoustic detector detection range

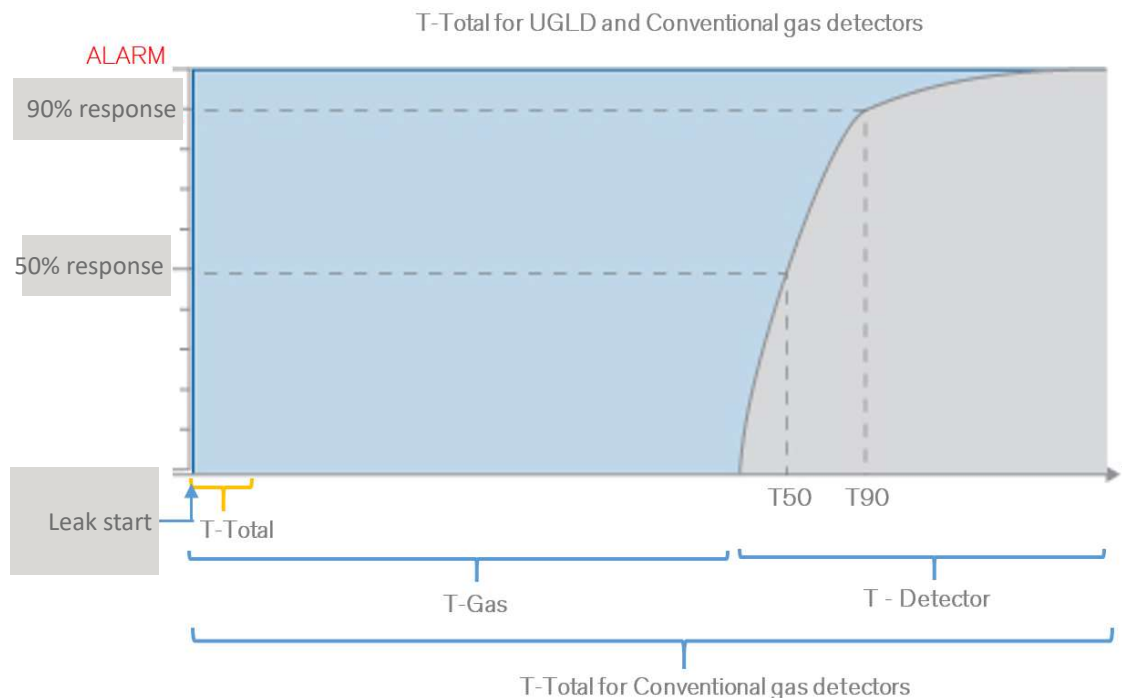


Understanding response time in a gas detection system and T90 vs total responds time

Ultrasonic delay time
vs. gas accumulation

Total speed of response (conventional)
=
T-Gas + T-Detector

Total speed of response =
T Delay + T Speed of sound



What IS a hydrogen gas leak??

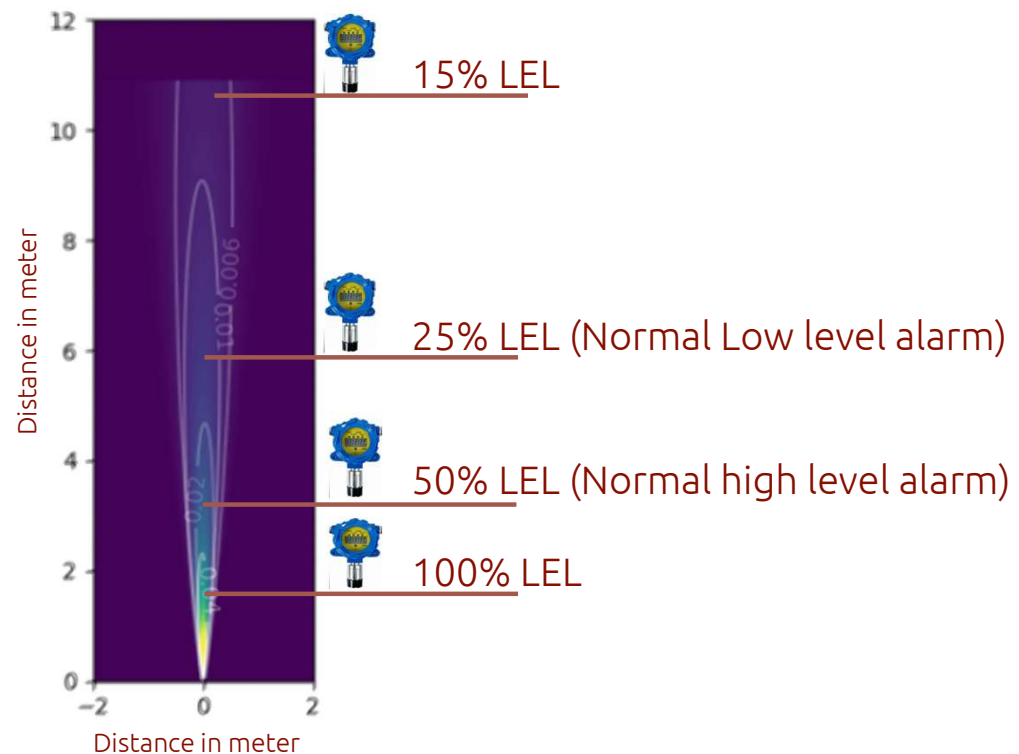
Eksample:

Hydrogen leak
700 Bar and 0.3 mm orifice

Leak rate; 0.01 kg/sec (10g/sec)
440 000 L/h

Such leak will only be detected
6 meter away at 25% LEL and
less than 2 meters to the sides.

Acoustic detection will detect
such leak INSTANTLY more than
20 meters away!



Distran revolutionary new FIXED Distran SonicView gas leak detector.

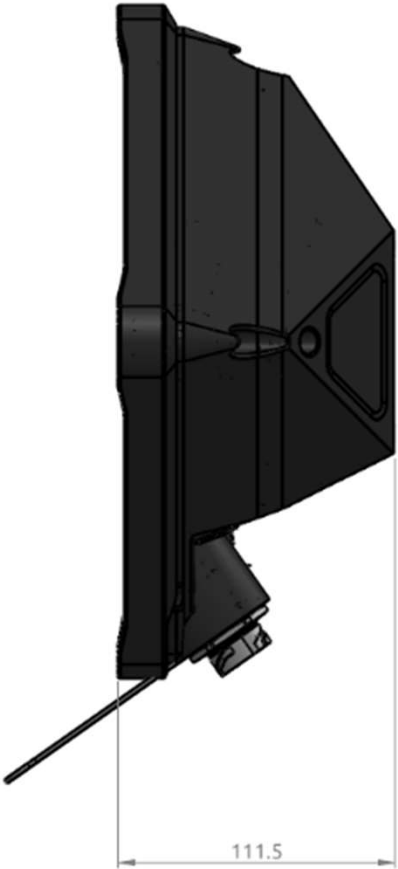
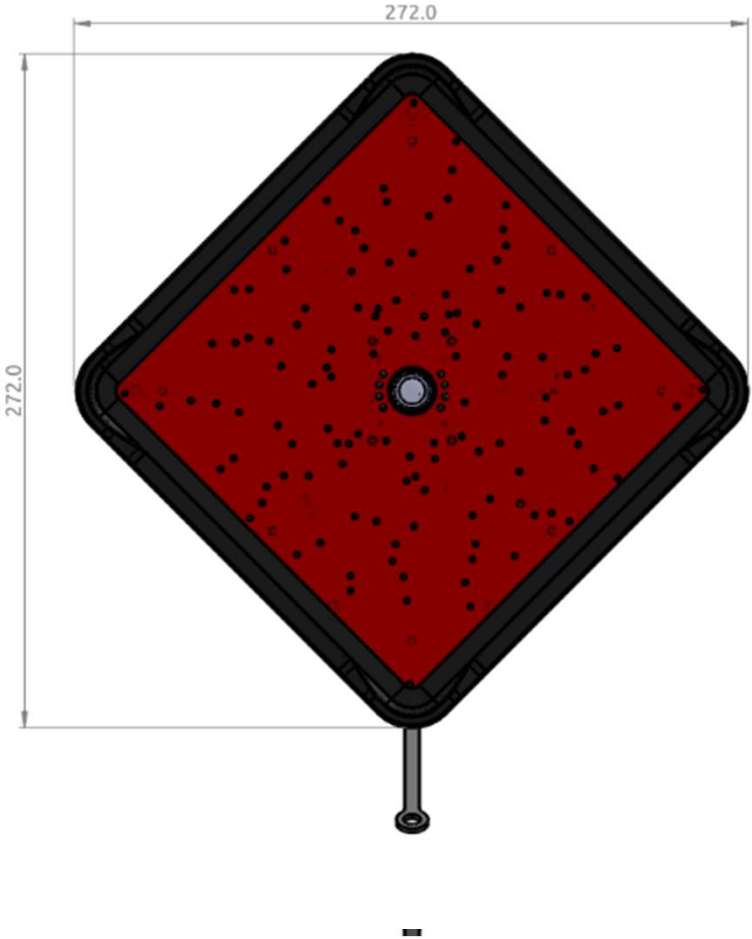
Why Distran SonicView gas leak detector:

- Very fast detection of dangerous gas leaks
- Large detection range up to 20 Meters
- Detection of very small has leaks, 100 Liter/Hour or less
- PINPOINTING of the potential gas leaks
- Only slightly affected by wind and gas dilution
- Indication of gas leakrate
- Live view from camera, or connection to DCS via OPC-UA interface

In other words.....INCREASED SAETY in H2 and Natural gas installations.

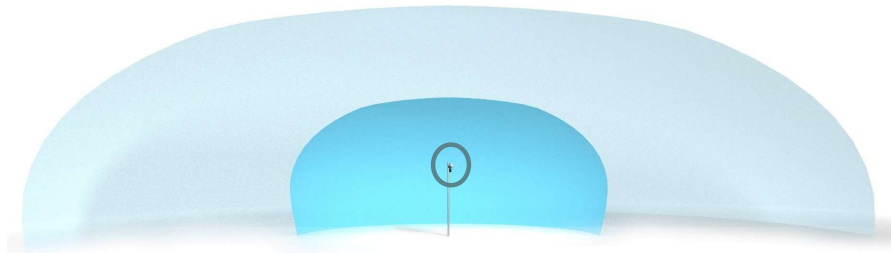


Distran SonicView fixed Ultrasonic Gas Leak Detector

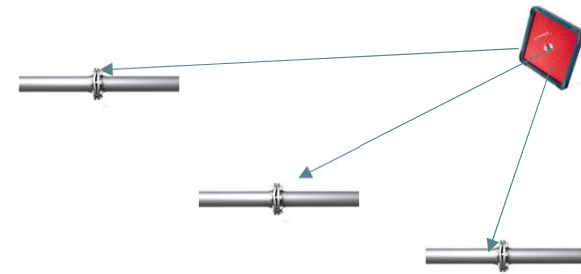


Conventional UGLD versus the NEW Distran SonicView technology

The detection range for the UGLD, for a specific gas, will vary depending on the ultrasonic (not audible) background noise. In normal noise areas, the detection range for e.g. methane will be up the 15 meters, and in very high noise areas 6-8 meters.



Conventional UGLD only area coverage,
but NO pinpointing of leaks

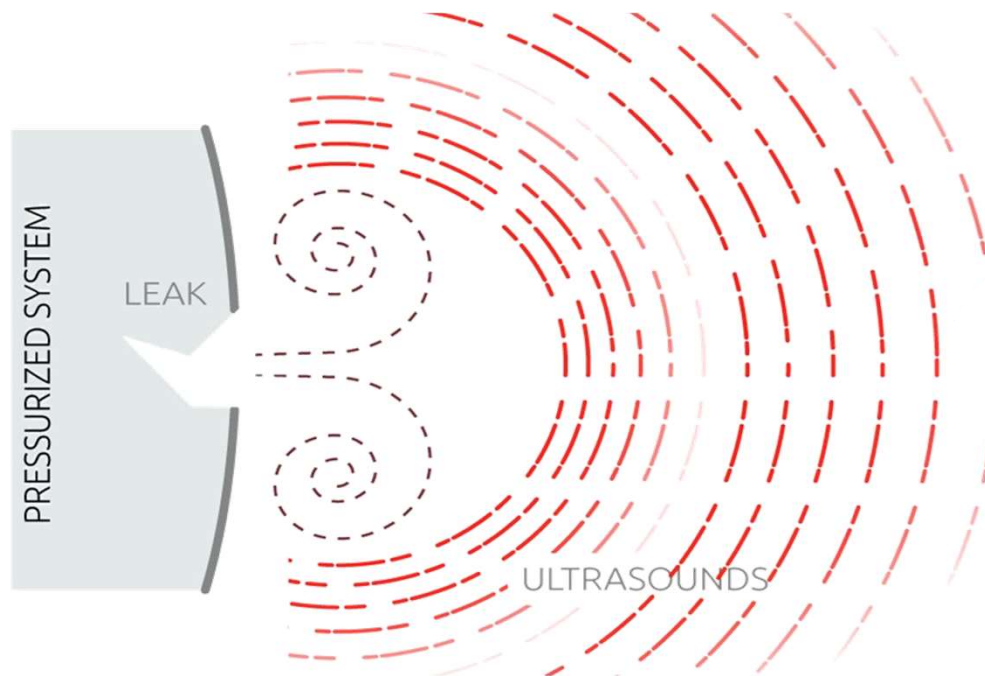


Distran SonicView area coverage and pin pointing leaks

OUR TECHNOLOGY: ACOUSTIC LEAK IMAGING

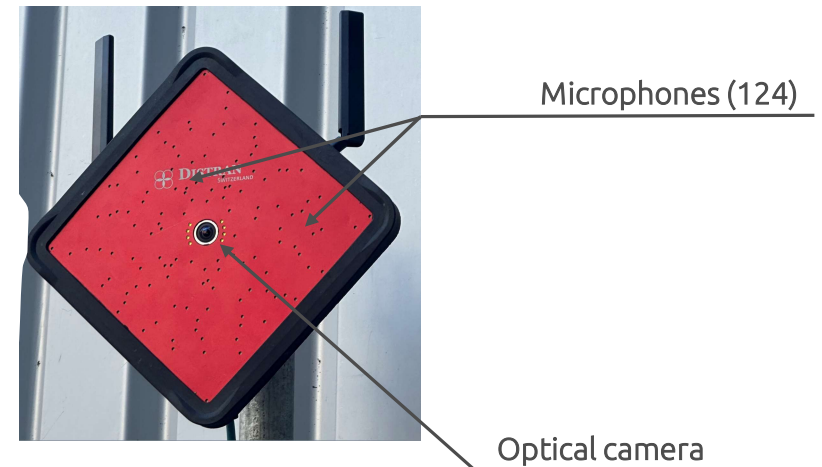
Detection principle in both portable and fixed gas leak detection cameras from Distran.

Gas leaks emit ultrasounds
Ultrasounds are picked up by ultrasound cameras



An ultrasound camera is composed of:

- an array of 124 microphones sensitive to ultrasounds
- the microphone array generate a acoustic picture that pinpoint the location of the gas leak.
- an optical camera



Live view from camera

Pinpointing of gas leak!

- ◆ Acoustic camera

- ◆ Alerting in real-time

list of **alarm history**

- each alert has **date/time + video picture**
incl. indication of the **pinpoint position** of the leak
- transmitted via Ethernet
- affected **zone**
- **alarm value** in L/h

- ◆ Constant monitoring w/o alerting

Live stream **providing supervision** on temporary works on site like maintenance or construction works.



Live view from camera

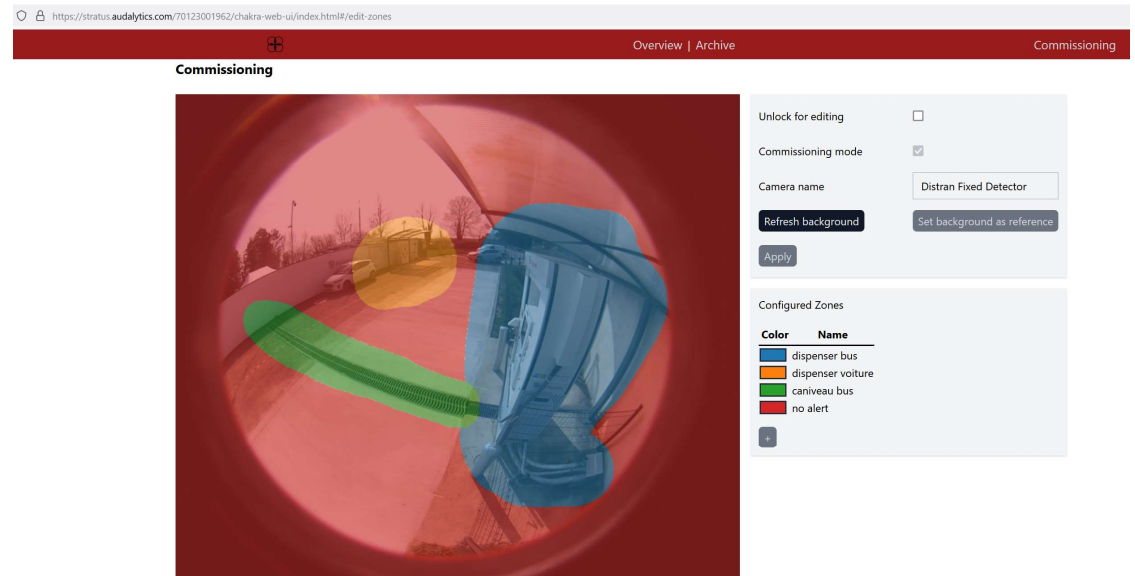
Distran fixed ultrasound monitoring - features

- ◆ Graphical definition of alarm zones and thresholds.
- ◆ Recording alarms and corresponding pictures/videos of monitored areas with the leak's pinpointed position.
- ◆ Detection of leaks down to 100 liter/hour
- ◆ Detection range of 20m
- ◆ 180° field of view



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Commissioning

Commissioning Equipment (Hose assembly)



Regulator connect to gas cylinder

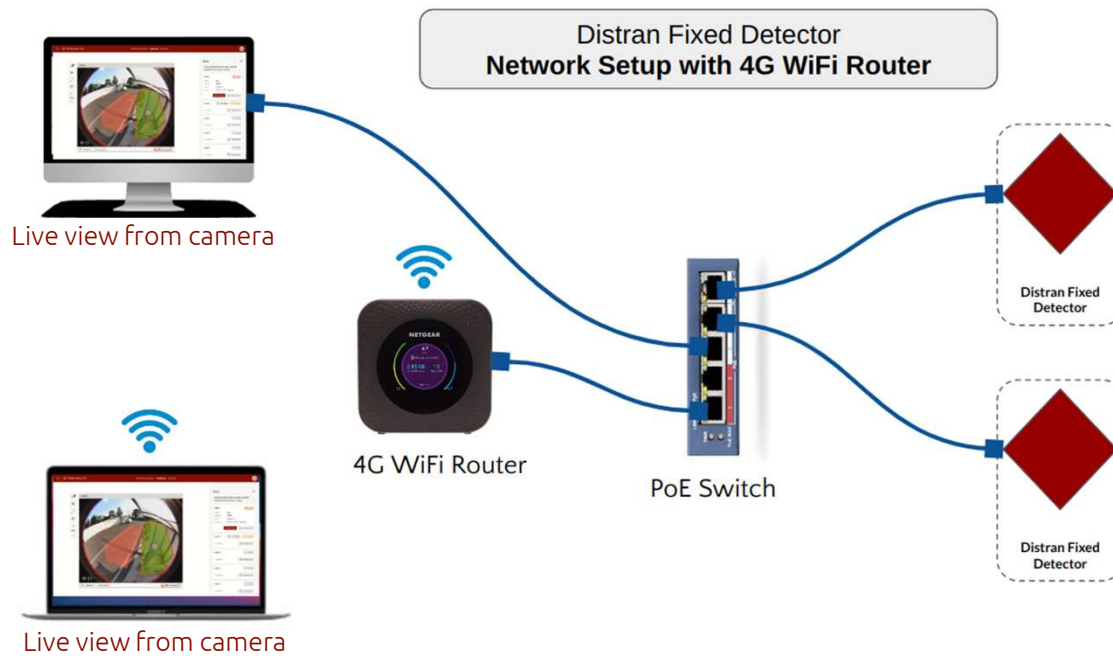
3 metre high pressure flexible hose

Nozzle with pressure-gauge and valve



DISTRAN
SWITZERLAND

Proposed connectivity of the DISTRAN Cameras.



The DISTRAN Cameras will be connected to an independent 4G network. A local, dedicated PC will be connected to this network, on which the live view of the cameras will be visible. OPC-UA and 4-20 mA connection also possible

Customer will also have remote access to the cameras, with a secure log in, via a Web-UI Proxy



Contact Us!

Name: Martin T.Olesen

Email: Martin.Tr.Olesen@distran.ch

Phone: +45 61357746

Distran AG

Heinrichstrasse 200 - 8005 Zürich, Switzerland

sales@distran.ch | +41 44 271 15 79

Visit our website: distran.swiss