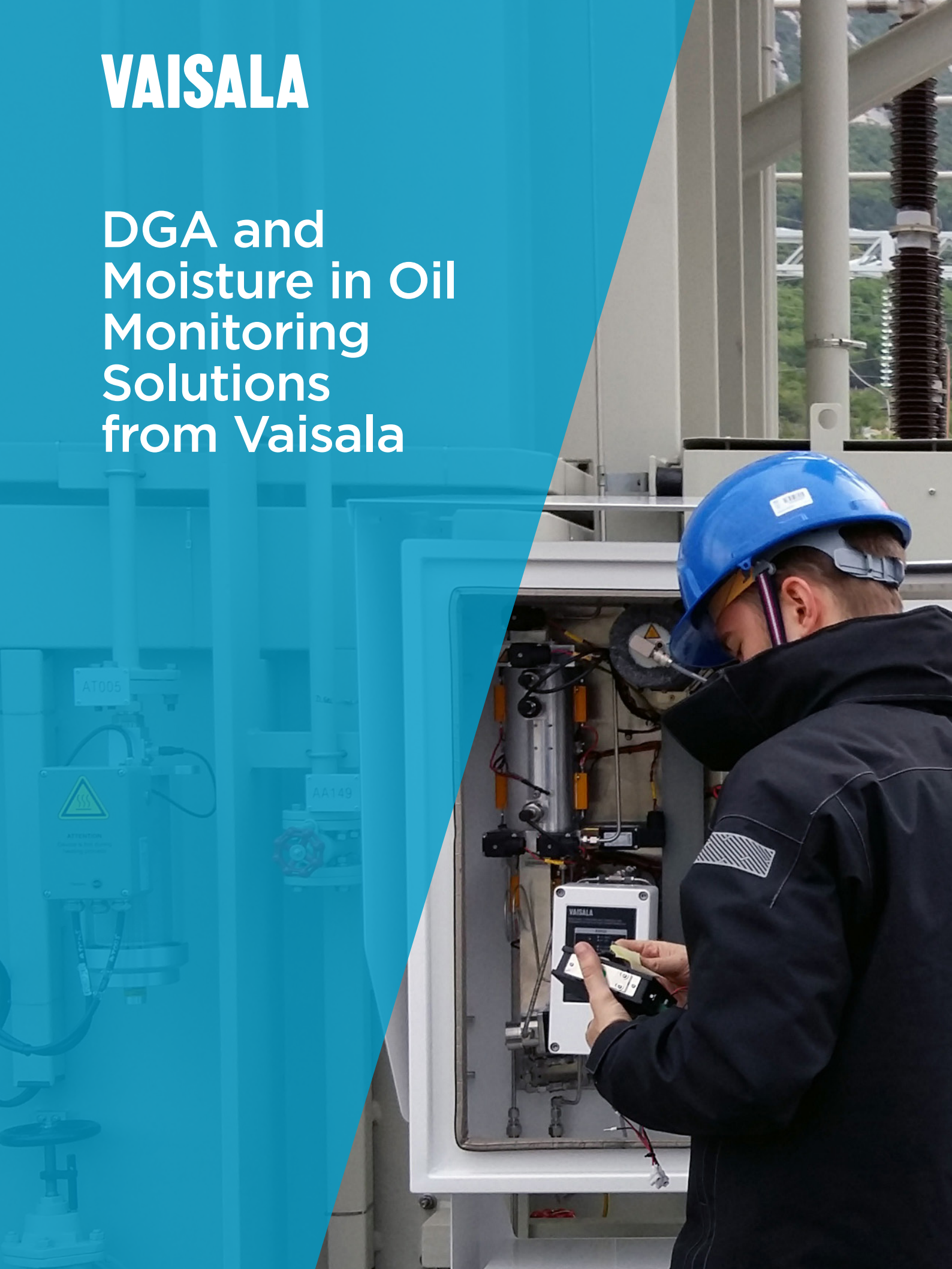


# VAISALA

## DGA and Moisture in Oil Monitoring Solutions from Vaisala

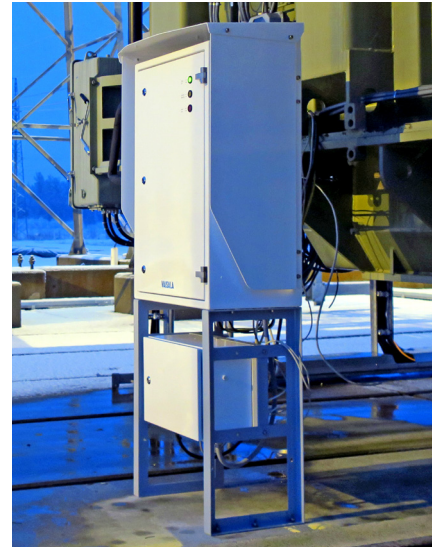


# Vaisala Optimus™ OPT100 Multi-Gas DGA Monitor

## Providing Maintenance-free Reliable Dissolved Gas Monitoring and Fault Analysis

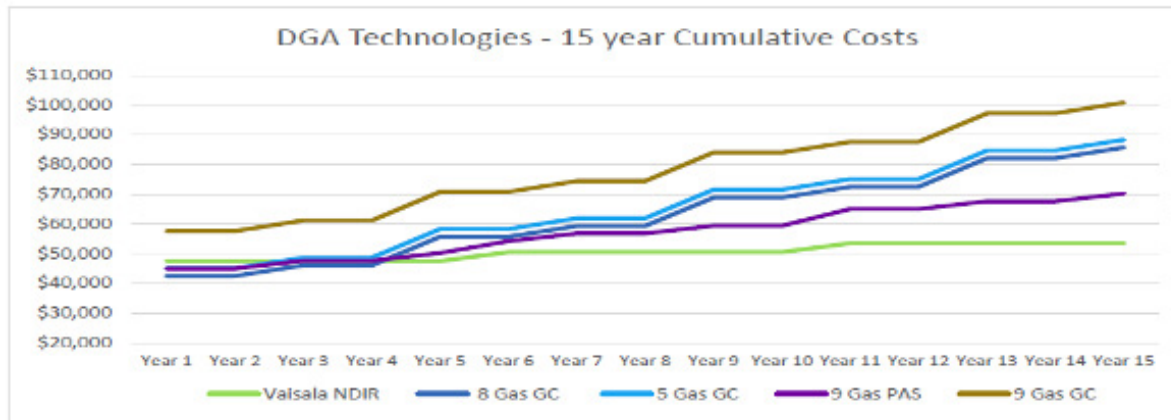
Vaisala DGA solutions are designed to be maintenance free using proven Vaisala technologies and direct measurements of the gases.

- ✓ Vaisala’s own technology with vacuum gas extraction means a stable, and repeatable measurement for the long term.
- ✓ No annual maintenance or consumables means the OPT100 has the lowest total cost of ownership of any multi-gas DGA on the market.
- ✓ Fully tested with NIST traceable certificates and a 2-year warranty.



### Lowest Total Cost of Ownership

- No annual maintenance or consumables
- Ease of install <2 hours
- All 7 fault gases, plus moisture monitoring
- Integrated pressure sensor allows for leak detection without the need for expensive O<sub>2</sub>/N<sub>2</sub> sensors
- Integrated browser based interface for commissioning, administration and DGA analysis



*15-Year Total Cost of Ownership Analysis of DGA Technologies*

### Durable Design/High Quality Construction

- Designed for extreme and caustic environments with an IP66 powder coated marine grade aluminum enclosure and stainless-steel tubing.
- Hermetically sealed closed loop system eliminates risk of drift caused by contamination.
- 2-year warranty

### Proven, Precise and Highly Stable Technology

- Proven auto-calibrating NDIR light source ensures stable long-term measurement.
- Provides accurate measurements at all transformer sites, regardless of age or type of mineral oil.
- Unique FPI spectral scanning IR filter ensures full visibility of gases, identifying and minimizing cross sensitivity.
- Patented vacuum gas system extracts almost 95% of dissolved gas, for more accurate measurement.
- Unique system driven by a single magnetic pump (no diaphragms or seals that can wear out) as well as magnetic valves, means a highly repeatable process that minimizes maintenance.

# Vaisala Optimus™ OPT100 Mobile Solution

## Optimus technology on an integrated trailer allows for DGA monitoring where and when you need it



### Key features

- IP66 Marine Grade Enclosure with integrated weather shield
- One switch Power disconnect/120V power cord included
- 3 removable leveling jacks and integrated bubble level
- Swagelok Hose connections and 2x30" stainless-steel flexible hosing
- Road legal trailer, with jack and spare tire
- Integrated lockable storage cabinet



### The OPT100 Mobile is a Plug and Play Solution

The unit can be deployed on a live transformer in under 2-hours and includes optional cellular modem connection for remote communication.

The OPT100 Mobile is designed for online monitoring and analysis of transformers that are gassing. It can also be implemented on transformers returning to service, or for delivery/repair certification.

When paired with the MHT410,

the OPT100 Mobile is intended as a cost effective solution for monitoring medium voltage fleets.

The OPT100 Mobile is the only DGA solution of its kind on the market, and is an excellent opportunity for any asset management team.

### Included components for set up and operation:

- Stainless-steel hoses plus basic adaptors sets
- Power cable with standard AC plug
- Mechanical Locks and site security features
- Cover, lockable gear box, spare tire and jack
- Wireless modem/Integrated Antennae for remote communication



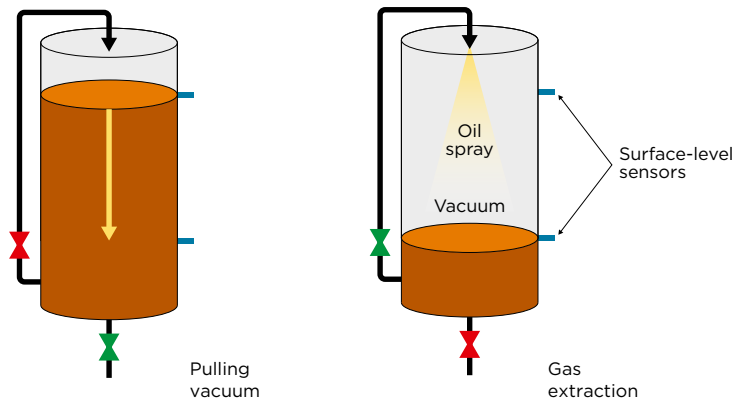
# Vaisala Optimus™ DGA Technology

Vaisala's engineering has proven itself time and again, developing and manufacturing monitoring solutions of the highest quality for measurement in some of the harshest and most demanding environments. Vaisala continues to maintain that focus on quality, centralizing all production, from the sensor wafer chips to the testing and calibration systems, at the world headquarters and R&D center in Vantaa, Finland.

With the Optimus™ DGA Solutions, Vaisala has developed a measurement system based on our proven NDIR light absorption technology combined with unique designs and new patented systems to bring to market an unmatched offering which is unlike any other DGA device in the world.

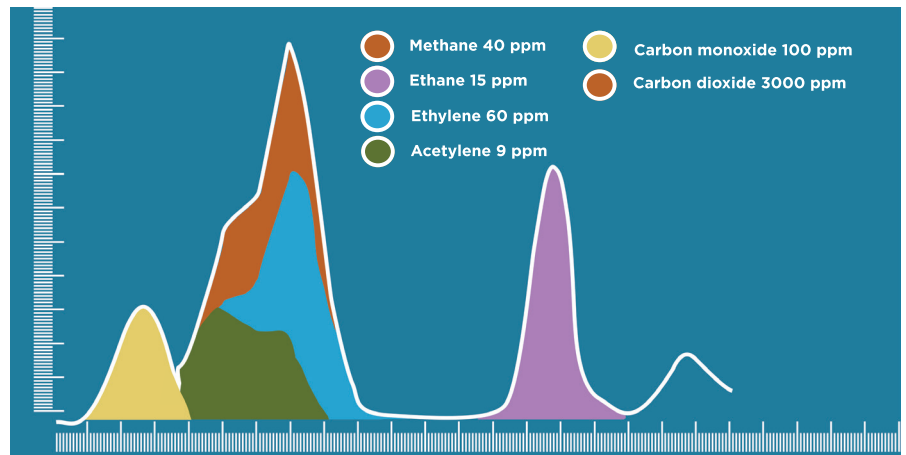
## Vacuum Gas Extraction Technology

- Vaisala's patented Vacuum gas extraction technology uses a magnetic pump to create a low-level vacuum which enables extraction of nearly 95% of the dissolved gases
- By reversing this process, the gases are dissolved and returned to the oil. By maintaining a closed loop system we can avoid contamination and eliminate some drift mechanisms



## NDIR Absorption Technology

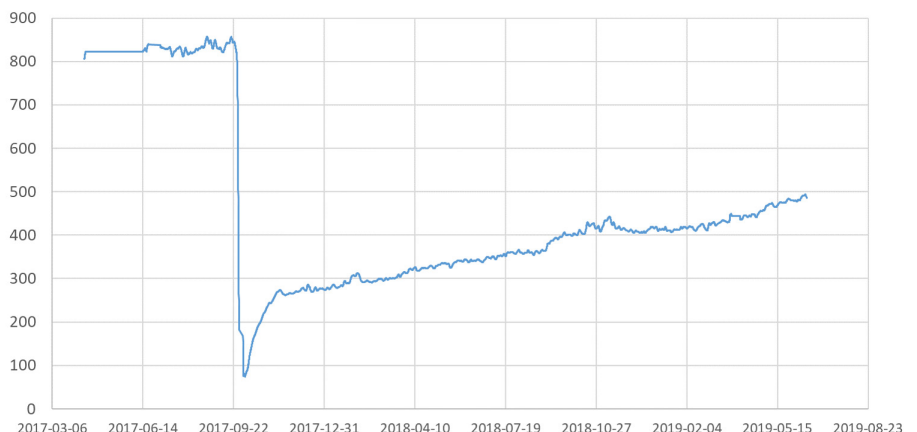
- Based on Vaisala's Fabry Perot Interferometer, our patented sensor measures the spectrum of IR wavelengths
- Patented auto-reference function eliminates sensor drift by applying a vacuum purge to the IR sensor chamber after each measurement cycle followed by a reference measurement for calibration
- Integrated Microglow light technology is the next-generation infrared technology



*Spectrum Scanning by FPI*

## Leak Detection Technology

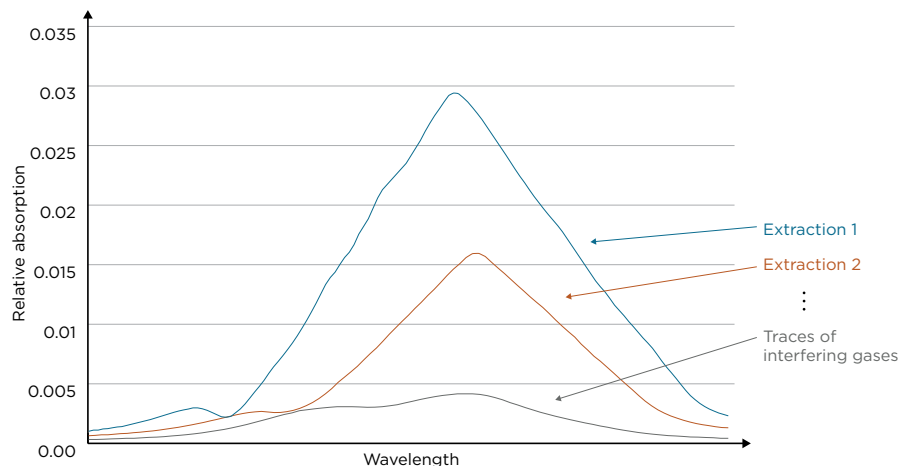
- Vaisala's unique system uses pressure sensors to identify leaks in sealed transformers
- Eliminates the need for costly and unreliable O<sub>2</sub>/N<sub>2</sub> sensors and their calibration



*Leak Detection via Total Gas Pressure*

## Auto-calibration Technology

- Allows for more precise identification and elimination of site/oil specific disturbing gasses
- Done through gas extraction under different conditions
- Process identified in proprietary software and not calculated in rolling averages or Duval analytics
- Our patented auto-calibration is critical in preventing long term drift



Visualization of auto-calibration process

## Maintenance Free Design

All potential drift variables are minimized, including:

- Any outside contamination entering the system
- Sensor and light source drift/calibration
- Detector Drift/Cross Sensitivity to disturbing gasses

VAISALA SOLUTIONS	VARIANCE FACTORS:				
	IR reference	Tunable filter	Auto-calibration	Vacuum clean + T	Hermetic structure
Light source	✓				
Filter		✓			
Detector	✓				
Contamination	✓			✓	✓
Cross-sensitivity		✓	✓		✓

## Ruggedized Design

- Hermetically sealed system
- Magnetic valves, fail closed
- IP66 Marine grade aluminum enclosure with powder coating and weather shield
- Separated high voltage and low voltage enclosures
- Extreme environment tolerant computer
- Ground mount, wall mount, mobile platforms
- Swagelok piping and fittings



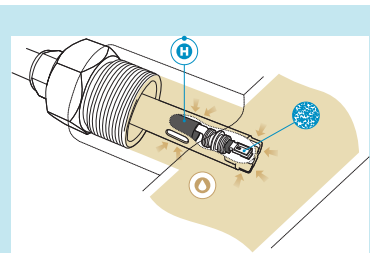
# Vaisala MHT410 Hydrogen Gas & Moisture Monitor

## Ruggedized “in-oil” measurement device that guarantees reliable long-term hydrogen and moisture measurements with no maintenance

The MHT410 monitors the Hydrogen and Moisture in Oil (ppm and %RS) levels in real time, using thin film capacitive sensors, directly in the flow of the transformer oil. There are no pumps, membranes, filters or capillary tubes to maintain and replace.

It can be installed in under 30 minutes and includes years of data storage, configurable relays as well as all standard communication protocols and relays.

The MHT410 can also be paired with the Indigo520 for added functionality, from a color touch screen display, POE and added inputs.



The MHT410's unique design places both the hydrogen and moisture sensors directly in the flow of the oil, ensuring the most precise and reliable measurement.

By eliminating the need for pumps or membranes and filters to separate the gas from the oil, the need for any consumables or maintenance is also eliminated.

## Why is the Vaisala MHT410 Gas & Moisture Solution Unique?

### Only in situ measurement device on the market

- Only the Vaisala MHT410 puts the solid-state (capacitive) sensors directly in the oil flow to measure  $H_2$  and  $H_2O$  directly in the insulating oil
- Works with mineral oil, synthetic and natural esters, and silicone oil

### Offers high precision and long-term repeatability

- Vaisala has been manufacturing capacitive humidity sensors for over 40 years and is considered the standard for most high performance industrial applications - we then applied this knowledge and expertise to industrial applications, including moisture in oil

### Ruggedized design, with no moving parts or consumables

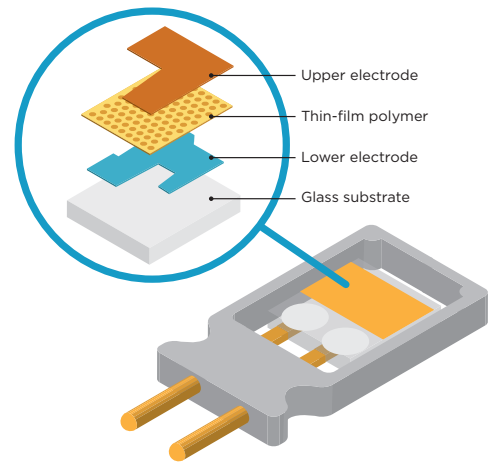
- Best warranty in the industry - 5 years
- IP66 rated enclosure
- No filters, membranes, capillary tubes
- No pumps, heating plates or moving parts
- No regular maintenance required

# Vaisala Moisture in Oil Transmitters

Vaisala has been the trusted leader in moisture in oil measurement technology for over 25 years manufacturing our patented sensors in our own in-house cleanrooms

## Vaisala Moisture in Oil Sensors

- Providing both % Relative Saturation as well as ppm outputs
- % Relative Saturation measurement is independent of oil type, age, and temperature automatically adjusting with changing conditions
- Valid for all oil types - mineral, synthetic, and natural ester based fluids
- Unmatched measurement accuracy and stability of up to  $\pm 1$  %RS
- Minimum 3-year calibration interval



Structure of the HUMICAP™ sensor

## Vaisala Moisture in Oil Solutions



**The Vaisala MMT330 Series** is our flagship line offering maximum configurability with multiple probes and options for display, alarm relays, power supplies, and output communications.



**The Vaisala MMT162** is our smallest, most economical option best suited for applications using small diameter oil lines.



**The Vaisala MM70** is our unique handheld unit ideal for spot checking moisture in insulating oils and verifying fixed mount Moisture in Oil sensors. Also available with a Dewpoint probe for transformer dryness testing.

## Introducing Vaisala's Indigo Platform

A modular system, based on smart probes that can be used independently or integrated with the Indigo 520 Industrial transmitter to extend the probes features and add a local display. The Indigo 520 can be paired with the MHT410 Single Gas DGA and Moisture in Oil device.

Here are just a few of the key innovations we designed into this platform:

- Increased measurement accuracy for both % Relative Saturation and ppm
- Dual probe capability - multiple probes connecting to one transmitter provides more application flexibility
- Integrated memory within each probe results in zero downtime when swapping out probes in the field

MMP8 Smart Probe



Indigo 520 Transmitter

# About Vaisala

For over 80 years, Vaisala has been a global leader in high performance measurement instrumentation designed for the most demanding environmental and industrial applications in the world. Innovation and quality are the cornerstones of Vaisala's success. In order to maintain this high level of quality, every sensor is designed and manufactured in our own cleanrooms at our factory and R&D center in Helsinki, Finland.

Vaisala, known globally for lightning detection systems and renewable energy solutions, has also led in the Power Industry with best-in-class moisture in oil and dew point measurement instruments. Our proven technologies have become the standard for many of the world's largest electric utilities, systems integrators and OEM's.

Vaisala has continued to apply this expertise and experience with industry leading solutions for measuring dissolved gases in transformers including a single-gas/moisture in oil solution, the MHT410, and a multi-gas analyzer, the OPT100.



**VAISALA**

Please contact us at  
[www.vaisala.com/contactus](http://www.vaisala.com/contactus)

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