



# MHT410 Moisture, Hydrogen, and Temperature Transmitter

For online transformer condition monitoring



## Features and benefits

- Measures moisture and hydrogen directly in representative oil
- Compatible with mineral oil, natural ester oil, and synthetic ester oil
- Monitors health of the transformer in real time
- Real-time warning on transformer faults
- Unique probe design, robust and easy to install
- 5-year standard warranty
- Reliable device operation, no false alarms
- Maintenance-free design
- No cross-sensitivity to other gases

Vaisala MHT410 Moisture, Hydrogen, and Temperature Transmitter provides reliable online monitoring of insulating oil in power transformers.

### Real-time measurement

Vaisala Moisture, Hydrogen, and Temperature Transmitter MHT410 provides an accurate real-time measurement result for critical parameters measured in oil, enabling reliable conclusions on the transformer's condition without delay. With its unique probe design, MHT410 delivers accurate measurement and trend data about the health of the transformer in real time.

### Enabling proactive maintenance decisions

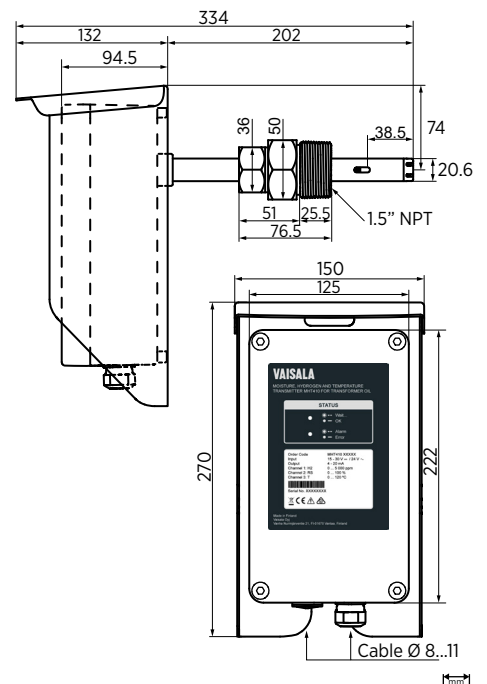
All of the transmitter's measured parameters are available through digital and analog outputs, providing information on transformer fault situations and enabling timely, proactive maintenance decisions to minimize expensive service shutdowns and outages.

### Robust and maintenance-free design

MHT410 is designed for ease of use in demanding environments. It has undergone extensive testing to ensure it withstands wide temperature changes, vibration and harsh outdoor conditions. The transmitter has no consumables or moving parts that could break, and is encased in an IP66-rated metal housing equipped with a weather shield.

Every unit is individually tested for a pressure of at least 10 bar and also withstands vacuum conditions. Special attention has also been given to EMC tolerance: for example, all electrical connections are isolated. MHT410 can also tolerate short-term power outages.

### Dimensions



# Technical Data

## Measurement performance

### Hydrogen

Measurement range (in oil)	0 ... 5000 ppm <sub>v</sub>
Accuracy <sup>1)</sup>	±10 % of reading or ±15 ppm <sub>v</sub> (whichever is greater)
Repeatability	±10 % of reading or ±15 ppm <sub>v</sub> (whichever is greater)
Minimum detection limit	15 ppm <sub>v</sub>
Typical long-term stability	3 % of reading / year
Cross sensitivity to other gases	< 2 % (CO <sub>2</sub> , C <sub>2</sub> H <sub>2</sub> , C <sub>2</sub> H <sub>4</sub> , CO)
Response time	63 % of full response: 2.5 h (when sensor is not in reference cycle) 90 % of full response: 17 h
Warm-up time	2 h, 12 h for full specification
Sensor	Catalytic palladium-nickel alloy film solid-state sensor

### Moisture in oil

Measurement range (in oil)	0 ... 100 %RS / a <sub>w</sub> 0 ... 1
Response time (90 % of full response at +20 °C (+68 °F) in still oil)	10 min
Sensor	HUMICAP® 180L2
Accuracy (including non-linearity, hysteresis, and repeatability):	
0 ... 90 %RS	±2 %RS (a <sub>w</sub> ± 0.02)
90 ... 100 %RS	±3 %RS (a <sub>w</sub> ± 0.03)

### Temperature

Measurement range	-40 ... +120 °C (-40 ... +248 °F)
Accuracy at +20 °C (+68 °F)	±0.2 °C (0.36 °F)
Sensor	Pt1000 RTD Class F0.1 IEC 60751

<sup>1)</sup> Accuracy specified is the accuracy during calibration against gas in oil standard. Field performance may be affected, for example, by variation in hydrogen solubility (partition coefficients) between different mineral oils.

## Inputs and outputs

Operating voltage	15 ... 30 VDC, 24 VAC (±15 %) (power supply input is galvanically isolated) <sup>1)</sup>
Power consumption	Typical 4 W, maximum 12 W

### Analog output (current) <sup>1)</sup>

Channels	3 isolated 4 ... 20 mA (loop powering)
External load	Max. 500 Ω
Error status indication in case of device error	3.5 mA default, user-configurable for each channel
mA output accuracy at +20 °C (+68 °F)	±0.125 % full scale
Temperature dependence of the analog outputs	±0.006 % / °C full scale

### Digital outputs <sup>1)</sup>

Interfaces	Isolated RS-485 half-duplex RS-485 (Service Port, non-isolated)
Protocols	Modbus RTU, DNP3, serial ASCII
Screw terminals	Wire size AWG 22-14 Single wire (solid) 1.5 mm <sup>2</sup> Stranded wire (flex.) 1.0 mm <sup>2</sup> Recommended wire torque 0.4 Nm

<sup>1)</sup> Max. isolation voltage 1.5 kV DC.

## Mechanical specifications

Mechanical connection on transmitter	1.5 in NPT (male)
Cable bushing (optional)	M20 × 1.5 for cable diameter 8 ... 11 mm (0.31 ... 0.43 in)
Conduit fitting (optional)	1/2 in NPT
Interface cable (optional, pre-assembled)	5 m (16 ft 5 in), 9.2 mm (0.36 in) outer diameter
Housing material	AlSi 10 Mg
IP rating	IP66
Transmitter weight without cables	4.1 kg (9.04 lb)
Self-diagnostics indication	Status LEDs, analog output, Modbus
Integrated data logging capabilities	Non-volatile memory, up to 44 years' storage with default logging
Individual functional test reports	Calibration test reports for moisture, hydrogen, and temperature; probe leak test report (5 bara nominal)
Factory warranty	5 years

## Operating environment

Oil type	Mineral oil / Natural ester oil / Synthetic ester oil
Oil temperature	-20 ... +75 °C (-4 ... +167 °F)
Operating temperature (electronics)	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	0 ... 100 %RH, condensing
Pressure tolerance (probe, short-term)	Max. 10 bara
Pressure tolerance (probe, continuous)	Max. 4 bara
Temperature tolerance, sensor head	-40 ... +120 °C (-40 ... +248 °F)
Integrated protection for short power outages	> 3 s
EMC standard EN 61326-1, Industrial environment; CISPR22 class B emission limits when DC powered	Fulfills the requirements of IEC 61000-6-5 in the following tests: IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11, IEC 61000-4-12, IEC 61000-4-16, IEC 61000-4-17.

## Display with relays (external option)

Pre-configured range for hydrogen	0 ... 5000 ppm <sub>v</sub>
Pre-configured alarm relays (user-reconfigurable)	Relay 1 trigger limit 200 ppm <sub>v</sub> (hi) Relay 2 trigger limit 1500 ppm <sub>v</sub> (hihi)
Input	4 ... 20 mA, loop-powered
Accuracy	0.05 % of span (-10 ... +60 °C (-14 ... +140 °F))
Relays	2 × solid state (SSR) Max. 250 VAC, 150 mA
Display	4-digit red LED, 14.5 mm
Dimensions (H × W × D)	100 × 100 × 57 mm (3.94 × 3.94 × 2.24 in)
Case protection	IP65
Case material and color	ABS plastic, grey
Cable glands	2 × M16×1.5



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