

Hydran M2 (Mark III)

Enhanced DGA monitoring for transformers

Transformers are key and expensive components of the electrical grid and knowledge of their health condition is essential to having a reliable network. When a transformer's insulation system is overstressed, gases are produced that dissolve in the oil. Dissolved Gas-in-oil Analysis (DGA) is recognized as the best indicator of developing faults.

The Hydran™ M2 is a continuous on-line dissolved gas and moisture in oil monitoring device that alerts personnel of developing fault conditions in their transformer. It provides key monitoring information and minimizes the risk of an unplanned outage.

Through the connection of additional sensors (for example top and bottom tank oil temperature, transformer load or ambient temperature), additional information can be captured and used to correlate with DGA and moisture values for a more in-depth analysis of the transformer's condition.

This wealth of data can, not only be transmitted raw using the M2's wide range of communication options but can also be converted into useful information through the on-board calculation of IEEE® standard's based transformer mathematical models to provide further condition information.

Key Benefits

- Continually measures dissolved fault gases and moisture in oil for early identifications of potential issues before they become critical transformer failures
- Choice of gas sensor: traditional "Composite gas" or more basic "Hydrogen only"
- Built-in calculation of transformer models based on IEEE standard (for mineral oil only)
- Wide range of communication options and protocols simplifying integration into SCADA or DCS
- Third generation of this proven design, with very large global installed base
- Supports new lower flammability ester based oils as well as mineral transformer insulation oils

Applications



Power Utilities

- All-in-one solution for important medium size transformers
- Focuses and prioritizes asset replacement strategy



Industrial Plants

- Reduces the risk of process interruption due to power failure
- Minimizes costly production downtime



Asset Supervision

- Easy to permanently install on a single transformer oil valve. No extra piping or pump required. Optional inputs for other sensors
- Choice of gas sensor: "Hydrogen only" or "Composite gas" which responds 100% to Hydrogen (general fault gas) and is also sensitive to Carbon Monoxide (paper) Acetylene (arcing) and Ethylene (oil)
- Moisture sensor measures water in the oil, a result of insulating paper degradation (produces CO + water) or leaking gaskets

Configurable Alarms

- An alarm is raised when an abnormal level of fault gas or moisture is detected. Two alarm levels (one for Alert and one for Alarm) can be set to show increasing severity
- Alarms can also be set on values from optional analogue input cards or from optional calculated transformer models
- Automatic self-test every 15 days will trigger service alarm if it detects a fault, including power failure, oil valve closed, faulty sensor

Mark III Improvements

- Completely overhauled with improved sensor durability, new electronic boards and power supply to make it RoHS compliant while increasing device reliability and capabilities
- Suitable for transformers using mineral insulating oil but now also ester based oils (natural or synthetic)
- Compatibility with GE's acclaimed Perception™ software to download, trend and analyze transformer data

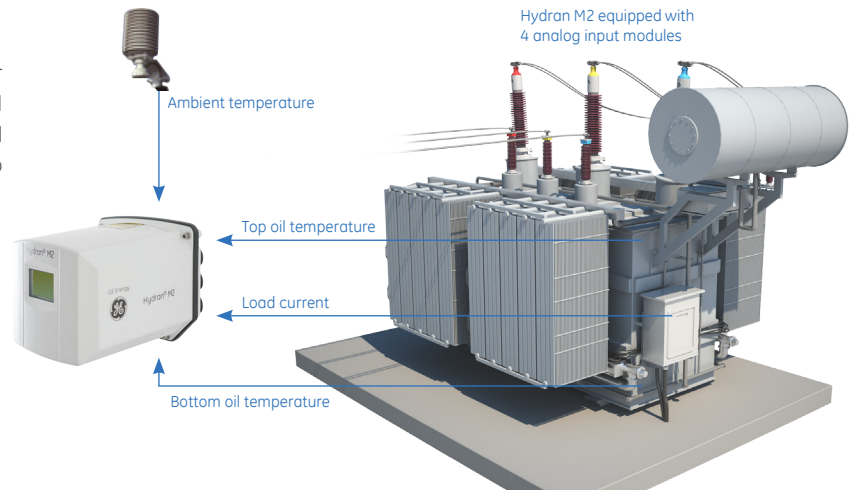


Transformer Models

The Hydran M2 offers transformer mathematical models for mineral oil based on IEEE standards and correlated with field experience. They use inputs from the available sensors and transform the received data into useful real time information to further understand the overall health of the transformer.

Possible models output examples:

- Estimated winding hot spot temperature
- Moisture level in paper
- Moisture bubbling temperature
- Insulation ageing
- Overloading capacity
- Cooling efficiency
- OLTC temperature differential



Technical Specifications

MEASUREMENTS

Fuel cell type sensor behind a gas permeable membrane in contact with transformer insulating oil

Range	25-2000 ppm (volume/volume, H ₂ equivalent)
Accuracy	±10% of reading ±25 ppm (H ₂ equivalent)
Response time	10 minutes (90% of step change)

"Composite Gas" Sensor

Relative sensitivity	H ₂ : 100% of concentration CO: 15 ± 4 % of concentration C ₂ H ₂ : 8 ± 2 % of concentration C ₂ H ₄ : 1.5 ± 0.5 % of concentration
Repeatability	highest of ±5% of reading or ±5 ppm

"H₂ Only" Gas Sensor

Relative sensitivity	H ₂ : 100% of concentration Interference from CO, C ₂ H ₂ and C ₂ H ₄ less than 3% of concentration
Repeatability	highest of ±5% of reading or ±10 ppm

Moisture Sensor

Thin film capacitive type sensor immersed in insulating oil

Range	0-100% RH
Accuracy	± 2% RH
Repeatability	± 2% RH

FEATURES

Display

Backlit LCD, 128 x 64 pixels

Keypad to setup unit and acknowledge alarms

Digital Communications

RS-232 port (DB-9 connector), for local connection to computer for configuring the system

RS-485 (terminal block), isolated to 2000Vac RMS, for remote communication or connection to local Hydran network

Level and trend data output for gas and moisture available in a range of protocols (some optional): Hydran, Modbus®, DNP 3.0 or IEC 61850

Alarms

5 different alarms: Gas and Moisture Alert (Hi), Gas and Moisture Alarm (HiHi), Service Alarm (sensor, temp, ...)

Gas alarms can be set on gas level reached or on hourly or daily trend (gas level rate of change)

Moisture alarms can be set on level reached or average level

Alarms can also be configured for optional additional analogue inputs or for calculation results from optional transformer models

5 dry contact relays (type C, SPDT), NO/NC, 3A@250Vac resistive load, 3A@30Vdc resistive load

Manual Sampling

Easily accessible external oil sampling port for glass syringe with Luer stop cock

ENVIRONMENT

Conditions

Operating ambient temperature	-40°C to +55°C (-40°F to +131°F)
Operating ambient humidity	0-95% RH, non-condensing
Oil temperature at valve	-40°C to +105°C (-40°F to +221°F) with finned heat sink adapter option
Oil pressure at valve	0-700KPa (0-100psi) Vacuum resistant sensor

Enclosure Rating

NEMA Type 4X certified, meets requirements of IP56

Power Requirements

90-132 Vac or 180-264 Vac switch mode universal power supply, 47-63 Hz, 650VA max

Mechanical

Has a 1.5" NPT male thread but can also mount on a 1" or 2" female NPT valve using optional adapters

Dimensions 315 x 219 x 196 mm

12.4 x 8.63 x 7.72 "

Installed weight 7.5Kg (16.5lb)

Shipping weight 9.0Kg (20lb)

OPTIONS

Finned heat sink adapter (1.5") for use when ambient temp > 40°C (104°F) or oil temp > 90°C (194°F).

Valve adaptor 1" to 1.5" or 2" to 1.5"

Transformer models calculations (for mineral oil only)

Analogue input cards, 4-20mA, 10V load max, isolated to 2000Vac RMS

Dual digital input cards for dry contacts, internal wetting 24Vdc, isolated 2000Vac

Analogue output cards, 4-20mA, 10V load max, isolated to 2000Vac RMS

PSTN analogue modem V92/56K

GSM/GPRS wireless modem

Network Ethernet communication using copper (RJ-45) or multimode fibre optic (ST)

Oil temperature sensor, magnetic mount, (4-20mA)

Split core load CT (4-20mA)

Ambient temperature sensor (4-20mA)

Product Ordering Part Numbers		Mineral Oil	Natural Ester Oil	Synthetic Ester Oil
HYDRAN M2	"Composite gas" sensor	HYDRAN_M2	HYDRAN_M2-NE	HYDRAN_M2-SE
	"Hydrogen only" sensor	HYDRAN_M2-H2	✗	✗



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