

# 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 unplanned outages.

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 in order 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
- Extend monitoring capabilities using additional sensors (for load, oil temperature) and built-in calculation of transformer models based on IEEE standard
- Wide range of communication options and protocols (including IEC® 61850) simplifying integration into SCADA or DCS systems
- 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. Inputs for other sensors
- Gas sensor responds 100% to Hydrogen (general fault gas) and is also sensitive to Carbon Monoxide (overheated paper) Acetylene (arcing) and Ethylene (overheated oil) thus covering main failure root causes
- 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, sensor or battery needing replacement

## 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

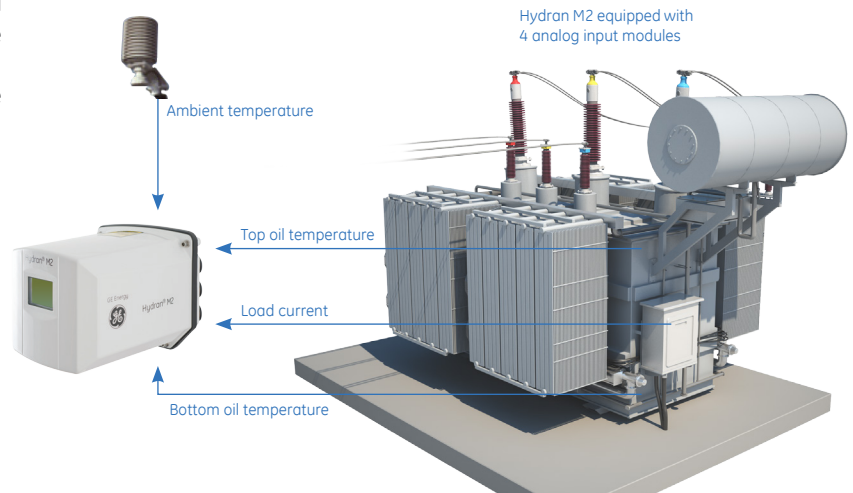


## Transformer Models

The Hydran M2 offers transformer mathematical models 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

#### Gas Sensor

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

<b>Measurement range</b>	0-2000 ppm (volume/volume, H <sub>2</sub> equivalent)
<b>Measurement accuracy</b>	± 10 % of reading ± 25 ppm (H <sub>2</sub> equivalent)
<b>Measurement repeatability</b>	highest of ± 5 % of reading or ± 5 ppm
<b>Relative sensitivity</b>	H <sub>2</sub> : 100 % of concentration CO: 15 ± 4 % of concentration C <sub>2</sub> H <sub>2</sub> : 8 ± 2 % of concentration C <sub>2</sub> H <sub>4</sub> : 1.5 ± 0.5 % of concentration
<b>Response time</b>	10 minutes (90% of step change)

#### Moisture Sensor

Thin film capacitive type sensor immersed in insulating oil

<b>Measured range</b>	0-100% RH
<b>Measurement accuracy</b>	± 2% RH
<b>Measurement repeatability</b>	± 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

Gas and moisture level and trend data output using Hydran, Modbus®, DNP 3.0 or IEC 61850 protocols over RS-485

### 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

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

### Enclosure Rating

NEMA Type 4X certified, meets requirements of IP66

### 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

<b>Dimensions</b>	315 x 219 x 196 mm 12.4 x 8.63 x 7.72 "
<b>Installed weight</b>	7.5Kg (16.5lb)
<b>Shipping weight</b>	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

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)

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