GE

Digital Energy

HYDRAN* M2 "All-In-One"

Fault Gas, Moisture, Transformer Monitor with Transformer Models

fact sheet

Overview

Based on field-proven technology, the new Hydran M2 adds transformer mathematical models based on IEEE® and IEC® standards to provide real-time information on the overall performance of the transformer. This extends the monitoring to more failure modes than by dissolved gas and moisture monitoring alone.

When an unexpected failure of a transformer occurs, the operational and economic impacts are substantial. Today, many existing oil-insulated transformers used by electrical utilities and other industries are approaching the end of their design life and are exposed to significantly higher probabilities of failures. Stringent regulations on the supply of energy, the reduction of capital investment and operation expense budgets, and the shortage of specialized personnel are also increasing the need to extend the lifespan of these transformers.

Description

The Hydran M2 is an economical, yet powerful all-in-one transformer monitoring device that allows utilities and other customers to deploy transformer monitoring to a large number of transformers that will benefit from its advanced features.

The Hydran M2 with models is an early warning device for detection of primary faults at transformers and other oil-filled equipment with its on-line fault gas and moisture sensors. Additional analog and digital inputs allow the monitoring of other important transformer variables. The new transformer models extend the monitoring power and asset management capability of the Hydran M2, bringing more decision power to operation and maintenance personnel.

Key Benefits

Monitoring and performing real-time transformer modeling can help reduce the risk of unexpected and sometimes catastrophic failures. This also helps to avoid expensive clean-up, replacement, and unplanned downtime. Early detection of potential transformer problems is vital to the lifespan extension of critical transformers and provides significant business and operational benefits that will:

- Reduce inspection and maintenance costs by stretching out the time between routine maintenance activities
- Reduce unplanned outages with continuous condition monitoring and early detection of primary faults
- Provide greater lifespan confidence through the use of on-line model computations providing real-time transformer condition information
- Defer major replacement costs by optimizing the transformer's performance and extending its lifespan

System Features

- Real-time fault-gas and moisture-in-oil measurement system
- Vacuum-resistant gas extraction membrane
- Single-valve installation with no pumps or moving parts
- Microprocessor-based intelligent electronic device
- Full system self-test and self-diagnostics
- Type NEMA® 4X (IP 66) enclosure
- Alphanumeric display with scrolling control
- Four programmable relay contacts for alarms
- One relay contact for self-diagnostics
- Four I/O expansion plug-in connectors for a combination of:
  - Isolated 4-20 mA analog input card
  - Isolated dual-channel digital input card
  - Isolated 4-20 mA analog output card
- One communication expansion plug-in connector for:
  - Ethernet 10-100BaseT card
  - Analog modem
- Local isolated RS-232 serial port
- Isolated RS-485 serial port for remote communications
- Support to DNP3 protocol (serial or TCP/IP)
- Expanded logging of data and events at adjustable rates

imagination at work

• Adjustable alarms on gas, moisture, analog inputs and values calculated by transformer models based on levels or trends
• User-friendly client/server graphical user interface software (GUI) permitting multi-client access to transformer data via TCP/IP

Transformer Models

State-of-the-art on-line models based on the Hydran sensor inputs and additional transformer inputs via I/O expansion plug-in cards.
(Please consult table for required inputs per transformer model.)
• MVA model computes apparent power on each winding where load current is measured
• Winding hot-spot temperature computes the hot-spot on each winding where load current is measured
• Insulation aging computes insulation loss of life from IEEE® or IEC® guidelines
• Moisture in paper and bubbling computes moisture in winding insulation and the critical temperature for gas bubble inception
• Moisture in the main insulation pressboard barriers is computed
• Cooling efficiency model monitors the actual efficiency of the cooling system
• Cooling bank status computes the cumulative operation time of each cooling bank
• Tap changer position tracking records each operation and provides history of operations of the tap changer
• Tap changer thermal model computes temperature difference between the OLTC tank and the main transformer tank

Required and Optional digital inputs per transformer model (maximum of 4 expansion slots) • Each optional analog input supports one 4-20 mA input • Each optional digital input supports two "dry-contact" inputs • Appropriate sensors are required • GE offers temperature and current sensors (R = Required, O = Optional)	Std Hydran Readings		Analog Inputs								Digital Inputs	
	Relative Humidity (%RH)	Sensor Temperature (°C)	Top Oil Temperature (°C)	Load Current Winding H (A)	Load Current Winding X (A)	Load Current Winding Y (A)	OLTC Tap Position	OLTC Tank Temperature (°C)	Ambient Temperature (°C)	Bottom Oil Temperature (C)	Status of Cooling Banks #1 and #2	Transformer Energized
Winding H Apparent Power				R								
Winding X Apparent Power					R							
Winding Y Apparent Power						R						
Winding H Hot-Spot Temperature			R	R								
Winding X Hot-Spot Temperature			R		R							
Winding Y Hot-Spot Temperature			R			R						
Insulation Aging	R	R	R	R								
Moisture in Paper and Bubbling	R	R	R	R								
Moisture in Pressboard Barriers	R	R	R	R						R	O	
Cooling Efficiency			R	R					R		R	O
Cooling Bank Status											R	
OLTC Position Tracking							R					
OLTC Temperature Differential			R					R				

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