On-Line Transformer Monitor Installation Guide - Model DGA-LT1

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This document was originally composed in English and was subsequently translated into other languages. The fidelity of subsequent translations cannot be guaranteed. In case of conflict between the English version and another language version, the English version takes precedence.

Contents

Product Overview

The DGA-LT1 is a remotely-deployed transformer monitor which can be safely installed onto an energized or non-energized transformer to detect and measure dissolved hydrogen found in an electrical power transformer‘s insulating oil. The monitor is designed and constructed to operate in environmental conditions in Power Plants, Switchyards or Substations.

The DGA-LT1 is directly mounted to an existing valve on the transformer and circulates transformer oil within it to provide a continuous reading of hydrogen in ppm. Data can be viewed in the QualConnex® web application to track the hydrogen ppm levels over time and compare against user-defined caution and alarm settings.

The DGA-LT1 is a battery powered wireless sensor that transmits encrypted raw signals via RF frequency to the QGateway that are used for calculating hydrogen concentration, moisture concentration and temperature.

The DGA-LT1 measures hydrogen (H_2) without cross-interference from other gases. Hydrogen is formed under all known thermal fault conditions in the transformer and is one of the first gases to be generated, making it an excellent early indicator of a broad range of fault types.

The DGA-LT1 is designed to be installed and configured by the end-user. Configuration of the monitor’s alarms, settings and options is accomplished using the QualConnex web interface.

System Description

The DGA-LT1 provides a reliable means of monitoring gas (e.g., hydrogen) concentration, temperature, and moisture concentration in the dielectric insulating oil of electrical equipment at a lower cost than typical devices and also avoids the additional material and labour costs relating to installation of power and communications cables. The wireless sensor is battery powered and transmits data without the need for additional power or communications wires, cables or conduits.

A web based computer application, provides a monitoring dashboard and notification system to ensure that electrical assets including transformers across a wide geographical area can be quickly reviewed to identify transformers showing trends of increasing risk of failure while also receiving automated notifications based on alert thresholds.

The wireless dissolved gas analyzer configured for easy connection to transformers and other electrical equipment having insulating oil and includes sensors for measuring hydrogen gas levels, temperature, and moisture. As illustrated and discussed further below, the analyzer threads into drain valve of the transformer. The sensor includes an open body that is exposed to the oil and has a hydrogen sensitive chemochromic assembly in the open body. The color of the chemochromic assembly changes when exposed to hydrogen. Additionally, the analyzer includes sensors that detect the temperature and moisture concentration in the body of the electrical equipment.

The analyzer further includes a color sensor that measures the color of the chemochromic assembly due to changes in the hydrogen concentration in the insulating oil. The analyzer send the encrypted color, temperature, and moisture measurements through a communications network to remote monitoring equipment, such as a computer server.

Warranty

Qualitrol warrants its Goods to be free from latent defects in materials or workmanship for **the duration of the monitoring contract** initiated at the date of shipment. Additional details on terms and conditions are provided in the signed agreement.

Operating Environment

The DGA-LT1 is designed to operate within the following outdoor conditions:

- Altitude Range -2000 to 5,000 ft.
- Humidity Range 5% to 95%
- Ambient Temperature Range -40°C to +65°C
- Oil Inlet Pressure -20 psig to 20 psig
- Oil Inlet Temperature -40°C to +105°C (temperature at drain valve)

Items Shipped

Upon receipt of your DGA LT1 dissovled gas analyzer, it is important to verify the contents of the shipping carton with the packing list. After inspection of the contents, please notify Qualitrol directly if there are any signs of damage that may have occurred in transit. If possible, please retain the original shipping container and packing materials in the event that it becomes necessary to return the monitor.

Part Number	Description
DGALT1-11110	DGA LT1, Wireless Online Dissolved Gas Analyzer Measuring Hydrogen Concentration, Moisture Concentration and Oil Temperature, 1" Connection, RF 

Monitor Installation

CAUTION: Do not attempt to install your DGA-LT1 On-Line Transformer Monitor until you have read and fully understand the procedures outlined in this document.

Installation of the DGA-LT1 consists of the following:

- Site Preparation
- Mounting the Monitor
- Mounting the Gateway
- Bleeding Air from the Monitor
- Configuration

Site Preparation

NOTE: Qualitrol recommends a minimum size of 1" for the transformer oil supply valve and a minimum of 3" vertical clearance between the valve centerline and the transformer foundation for proper installation space.

Ensure the following prior to mounting the monitor:

- An adequate valve location for mounting the DGA-LT1 monitor has been identified
- **Transformer is oil-filled and a baseline Dissolved Gas Analyzer sample has been taken to provide baseline levels for Hydrogen concentration and Oxygen concentration for use in configuration of the system**
- All shipped items have been located

The following tools are required for installation of the DGA-LT1 monitor:

- Adjustable wrench and/or pipe wrench
- Teflon tape and pipe-thread sealant
- Container to collect oil during installation

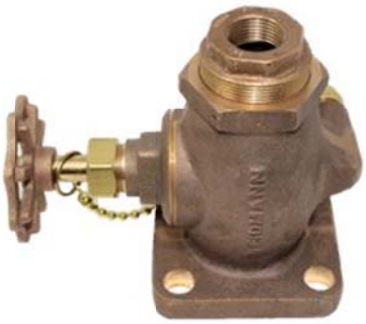
Note that installation of the sensors and gateway should take place from transformer closest to the cellular gateway location outwards to ensure that a communication path has been established for commissioning of each sensor.

Mounting the Monitor

NOTE: If the desired valve is not 1" NPT, then the appropriate hardware adapter must be installed.

1. Ensure the transformer valve is closed and remove any existing plug on the valve. Position a container to collect any oil after removing the plug. Remove any debris from the threads.

2. The DGA LT1 is designed for a 1" drain valve however bushings are optionally provided with the DGA-LT1 to install into a 2" drain valve. The bushings should be installed with pipe dope or Teflon tape to ensure a seal that prevents oil from leaking.



3. Wrap the threads of the DGA-LT1 with Teflon tape and apply a thin layer of pipe-thread sealant. Insert the threaded size of the sensor into the drain valve and tighten, ensuring the bleed valve on the sensor is located vertically. The brass fitting on the DGA LT1 provides a suitable location for an adjustable wrench to be used. (Teflon tape not show in photo)

The final installed DGA-LT1 are shown in the photos below on a 2” and 1” drain valve.

Commissioning

The following section outlines the method of commissioning and configuring the monitoring system.

1. After mounting the DGA-LT1 to the drain valve. Ensure there transformer is at or above 0 psig in pressure to prevent the intrusion of air into the transformer through the drain valve.
2. Place a container to capture transformer oil under the DGA-LT1 and then open the bleed valve on the DGA-LT1 monitor to allow the air to exit the brass sensor body.
3. After all air has exited the body of the monitor, close the bleed valve.
4. Turn on the sensor using the power toggle switch.
5. Press the ‘calibrate’ button to transmit the baseline measurement and GPS co-ordinates through the gateway.
6. Confirm that the communication from the sensor through the gateway to the central database has been achieved through QualConnex. Refer to QualConnex manual.

Canadian Compliance Statement

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada license-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :
(1) L'appareil ne doit pas produire de brouillage;
(2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

NOTE: Afin d'assurer la conformité aux exigences de la FCC en matière d'exposition aux radiofréquences, aucune modification de l'antenne ou de l'appareil n'est autorisée. Toute modification de l'antenne ou de l'appareil pourrait avoir pour conséquence que l'appareil dépasse les exigences en matière d'exposition aux radiofréquences et annule le droit de l'utilisateur de faire fonctionner l'appareil

FCC Compliance Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause interference

(2) This device must accept interference, including interference that may cause undesired operation of the device.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These Limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the users is encouraged to try to correct the interference by one or more of the following measures.

- Reorient or relocate the receiving antenna

- Increase the separation between the equipment and the receiver

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected

- Consult the dealer or an experienced radio/TV technician for help

Any changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.