

DELPHI



TOGETHER WE POWER THE WORLD®

DISSOLVED GAS ANALYSIS (DGA) INSTRUMENTS

The Doble Delphi is an intelligent and robust on-line dissolved gas analysis (DGA) instrument. It measures dissolved gases to give a single figure parts per million value, and can provide either a value for hydrogen only, or a composite figure for key fault gas indicators. Designed for the harsh environments of substations and power transformer applications, the Doble Delphi is able to withstand full vacuum, has an optional pump for applications where oil circulation needs to be assisted, and provides both level and trend alarms and indications.

Understanding the health and condition of power transformers is a key element of the substation engineer's role. The Doble Delphi builds on industry experience to provide engineers with a useful tool that can detect and track the deterioration of a power transformer through DGA. Dissolved gas analysis is a standard means of detecting the by-products of deterioration: hydrogen, carbon monoxide and hydrocarbons are generated and dissolve in the insulating oil. Detection of changes in the levels of these gases in the oil is the first step in diagnosing a deteriorating transformer.

DGA is a powerful diagnostic tool usually provided through regular sampling of the oil. The Doble Delphi provides a continuous on-line capability, supporting the substation engineer in detecting and tracking power transformer deterioration.

There are absolutely no consumables required – no carrier gas – no filters.

Features:

Single value output

The Doble Delphi provides either a single value indication of Hydrogen in parts per million (ppm) or gives a combined single value ppm based on hydrogen, carbon monoxide, acetylene and ethylene. This provides incipient fault detection capability for deteriorating power transformers.

High accuracy and repeatability

The Doble Delphi gives a hydrogen value to within 10% with consistent measurements to ensure repeatability and accuracy.

Micro-pump circulation

The Doble Delphi provides an optional micro-pump for those applications where oil circulation within the transformer valve must be supplemented to ensure representative oil is available at the sensor. DGA is an integrating technique and the oil passing the sensor must be representative of the whole transformer. By providing a pump, additional circulation ensure the Doble Delphi 'sees' the transformer clearly.

Vacuum withstand

The Doble Delphi is able to withstand a vacuum (negative pressure on the sensor membrane) to 0.7 Mpa, allowing for on-line oil processing to continue with oil monitoring uninterrupted.

Moisture Detection

The Doble Delphi comes with an option to measure moisture in terms of relative saturation using the ever popular *DOMINO*®.

Temperature & Sensor Condition

The Doble Delphi provides measurement of sensor temperature to assist with interpretation of oil diagnostics. The sensor performs a monthly self check. Sensor condition is indicated through a remote alarm.



Features Continued:

Continuous Level and trend analysis

The Doble Delphi measures gas levels continuously and calculates daily and hourly trends for analysis of rapidly developing faults through two levels: 'high' and 'high-high' values configured by the user. The alarm levels are configured either through the front-panel of the Doble Delphi or through the PC based software application.

On-line alarms and indicators

The Doble Delphi provides both on-site visual indicators of alarms through red-orange-green front panel indicators for local use and relay connection for remote detection of alarm conditions.

Front-panel configuration and PC based Software

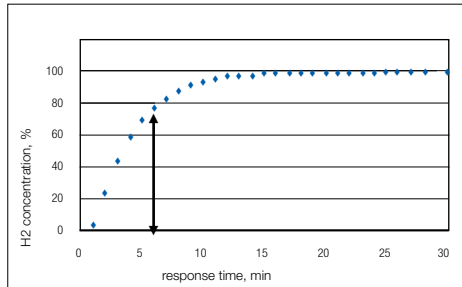
The Doble Delphi may be completely configured at the front panel of each unit: nameplate data, level and trend alarm settings. The PC based software allows for back up of data and comparison of multiple units.

Communication Options

RS485 comes as standard, with options for RS485/232 and RS485/TCP-IP.

Response time in oil:

to 80% of step change < 7 min



The response time of the other products using membrane separation technology: several hours even several days

Description:

The Doble Delphi is a compact on-line DGA sensor that mounts directly to a transformer valve or can be mounted adjacent to the transformer when the need arises. The Delphi is a robust instrument housed in a stainless steel enclosure that uses proven fuel cell technology to provide a reliable indication of the gas levels in the oil with easy to understand displays. It is made specifically for the substation environment both in durability and immunity to interference from substation noise. As a constant measuring device it provides results continuously as gas is continuously diffusing across the membrane to interact with the sensor allowing for an instantaneous measurement. An integrated pump provides fresh oil to the sensor and does not have to rely on oil movement within the transformer thus dramatically increasing the response time and value of the measurement. The Doble Delphi is the ideal tool to aid in managing transformer assets.

Key benefits:

- Patented* vacuum resistant membrane prevents failure during oil surges, maintenance or other activities (* patents in US and Canada).
- Fast response time: getting to 80% of step change in less than 7 minutes means that indications of a problem are given that much sooner and effectively
- Gas selectivity is high – meaning appropriate measurements rapidly, whether single gas or combined gas
- Micro pump option – allowing for oil circulation to ensure oil doesn't go stale and give misleading results
- Single valve application – with or without micro-pump – ensures minimal connection to the transformer
- Robust, field ready device comes complete with self-test and diagnostics automatically performed on the sensor itself.
- Sensor self check on a monthly basis to ensure performance.

Accessories (included):

- Sampling Port – inside the monitor cover
- Valve Connection hardware
- User's Manual
- Software – Delphi Diagnose

Accessories (optional):

- Power Supply – Power supplies can be modified for specific voltage needs
- Communications – other communication modules are available
- Cooling Adapter – to reduce the temperature of the oil coming into the sensor
- Moisture Module

Any tubing, valves, electrical wiring, conduit and off the transformer mounting brackets are the responsibility of the purchaser. Doble does provide requirements for these items.

Applications:

This on-line monitor provides real time dissolved gas analysis at a very reasonable price. Whether it is a large GSU or a 1 MVA industrial or distribution transformer, if it is critical component on your system then the Delphi is the dissolved gas monitor for you. Besides transformers, other applications include potential and current transformers.

The Doble Difference

Power transformer diagnostics have been a Doble strength and priority for over 90 years. With Doble's long history of oil analysis and transformer health and condition assessment, the Doble Delphi is an instrument which provides key data in a timely manner. The Doble Delphi fits in to the extensive Doble suite of on-line diagnostics, including bushing monitoring and PD detection, supporting the substation engineer when most needed – in real time at the point of decision.

Specifications are subject to change without notice.

