



GC FOR ANALYSIS OF DISSOLVED GASES IN TRANSFORMER OIL (TOGA)

The GC for Analysis of Dissolved Gases in Transformer Oil (TOGA) TT-3612 is designed for accurate and reliable dissolved gas analysis (DGA) of electrical insulating oils. It conforms to the ASTM D3612 standard test method, providing a proven solution for gas chromatography analysis of gases dissolved in transformer oil. The system is suitable for oils with a viscosity of 20 cSt or less at 40°C, supporting consistent and repeatable testing results.

Under thermal and electrical stress, insulating oil and oil-immersed components can decompose and generate gaseous byproducts. These gases dissolve in the oil and provide critical insight into the operating condition of electrical equipment. The TT-3612 allows precise measurement and identification of these dissolved gases, helping determine the type, severity, and progression of potential faults within transformers and other oil-filled electrical apparatus.

By monitoring changes in gas composition and concentration over time, the TT-3612 supports condition assessment and early fault detection. This analytical approach helps evaluate transformer health, estimate remaining service life, and reduce the risk of unexpected failures. Designed to support efficient laboratory workflows, the TT-3612 also aligns with ASTM D3612 Method C, which utilizes automated headspace sampling to improve sample throughput compared to traditional extraction methods.

Key Highlights

- Designed for dissolved gas analysis (DGA) of transformer insulating oil
- Fully compliant with ASTM D3612 gas chromatography standards
- Enables early detection of thermal and electrical abnormalities
- Supports condition monitoring and fault trend analysis over time
- Suitable for high-throughput laboratory testing environments

APPLICATIONS

The Torontech TT-3612 provides a comprehensive Dissolved Gas Analysis (DGA) of insulating oils in accordance with ASTM D3612. This method is the definitive diagnostic tool for assessing the internal health of oil-filled electrical apparatus. By quantifying specific fault gases, it allows for the early detection and characterization of incipient thermal and electrical faults, such as arcing and overheating, enabling proactive asset management and preventing catastrophic failures.

This predictive diagnostic analysis is indispensable for the asset management programs of:

- **Electric Power Utilities:** As the primary method for monitoring the health of the entire fleet of power and distribution transformers, forming the backbone of condition-based maintenance and grid reliability strategies.
- **Heavy Industrial Facilities:** For large industrial sites with critical high-voltage transformers, DGA is essential for preventing unplanned outages that can halt production in refineries, data centers, and manufacturing plants.
- **Renewable Energy Operators:** To ensure the long-term reliability of transformers at wind and solar installations, where equipment failure directly impacts power generation and profitability.
- **Electrical Testing & Service Providers:** As a core service offering, providing specialized diagnostic testing and health assessments of high-value electrical assets for a wide range of industrial and utility clients.

FEATURES

- The TOGA uses an Ethernet communication interface, allowing it to easily form a local area network for long-distance data transmission, remote control, and remote diagnosis.
- It has a powerful and comprehensive power-on self-diagnosis function, intuitive fault information display, power failure storage protection, and anti-power interference features.
- It uses a special anti-pollution composite column technology for transformer oil, greatly improving the column's service life.
- The instrument undergoes strict aging tests before leaving the factory, with parameters preset, so the user only needs to perform a simple start-up operation.

GC for Analysis of Dissolved Gases in Transformer Oil (TOGA)

Small dead volume Injection system

GC for Analysis of Dissolved Gases in Transformer Oil (TOGA)

High-precision gas flow control system

TECHNICAL SPECIFICATIONS

1. Injection volume: 1ml, with a minimum detected concentration of (ul/L)
2. Ambient requirements: 32°F to 104°F
3. Accuracy: $\pm 0.1^{\circ}\text{C}$
4. Temperature control range: Ambient +5°C to 450°C
5. Analysis cycle: 7 minutes
6. Power: 1.9KW
7. Dimensions: 660 x 560 x 480 mm

GC for Analysis of Dissolved Gases in Transformer Oil (TOGA)

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High efficiency conversion device

GC for Analysis of Dissolved Gases in Transformer Oil (TOGA)

FID (High sensitivity and low noise)

1. Real-time computer control and data processing

The TOGA system can expand the 10/100M Ethernet interface and connect to a local area network computer for remote data acquisition and management. This enhances device flexibility and promotes efficient laboratory applications.

The user-friendly software interface makes it easy to set parameters including temperature, range increase, events, and detector settings. Intuitive functions include FID automatic ignition, TCD switching bridge flow, temperature control activation and deactivation, range increase and decrease, and various timed events.

2. Unique gasification chamber and detector design

The innovative inlet design addresses injection bias, while the dual-column compensation feature mitigates baseline drift from program heating and reduces background noise, achieving lower detection limits.

The vaporization chamber design minimizes dead volume. Replacing injection pads, liners, polarizing poles, collecting poles, nozzles, and other accessories is straightforward. Main components like filling columns, capillary injectors, TCD, and FID detectors can be fully disassembled with just one wrench, simplifying maintenance.

3. High precision and stable temperature control system

The primary control circuit uses an advanced microprocessor, large-capacity FLASH, and EEPROM memory for reliable data preservation. The integrated circuit board design for measurement, control, and power supply enhances the TOGA's anti-interference capability and reliability.

The microprocessor-based temperature control circuit ensures that the temperature accuracy in each heating zone reaches 0.1°C. The column chamber features a double overtemperature protection device, halting heating and reporting faults if temperatures exceed the set limit.

The intelligent double rear door technology maintains accurate temperature control when the column chamber temperature is near room temperature and allows for rapid cooling. The twenty-step programmed heating accommodates the analysis of complex samples with a wide range of boiling points.

4. Simple operation interface

The 7-inch LCD display supports capacitive touch, making it intuitive and easy to operate. It includes a self-diagnosis function and fault location display. The data power-off protection function ensures that operating data is preserved even after a power failure.

5. Protection

The system will stop heating if there is no carrier gas, protecting the column and thermal conductivity cell.

6. Auto ignition

The TOGA system allows for automatic ignition scheduling and includes hydrogen protection to extinguish the flame if needed.

Temperature control parameters

- Column Oven: Ambient +5°C to 450°C, Accuracy: $\pm 0.1^{\circ}\text{C}$
- Injector: Ambient +5°C to 450°C, Accuracy: $\pm 0.1^{\circ}\text{C}$

- Detector: Ambient +5°C to 450°C, Accuracy: $\pm 0.1^\circ\text{C}$
- Maximum control: 7 paths temperature

Column Oven parameters

- Volume: 260 mm x 270 mm x 230 mm
- Programmed heating: 20 steps
- Programmed heating rate: 1 to 80°C/min (0.1°C increment)
- Retention time of each step: 0 to 655 minutes (1-minute increment)
- Automatic rear opening design for fast cooling, taking only 7 minutes to cool from 350°C to 50°C
- Powerful, low-noise fan for temperature uniformity

Detector

FID

- Unique and stable amplifier technology, with a specially treated signal amplification board for stable operation under harsh conditions
- Suitable for packed and capillary columns
- Operating temperature: 450°C
- Minimum detection limit: $< 5 \text{ pg C/s}$ (n-Hexadecane)
- Linear dynamic range (LDR): 10^7 ($\pm 10\%$)
- Data acquisition frequency: 100Hz
- Automatic ignition: Auto hydrogen cut-off after flame extinguishment

TCD

- Suitable for packed and capillary columns
- Fast stabilization time, small dead volume, short equilibrium time
- Operating temperature: 400°C
- Data acquisition frequency: 100Hz

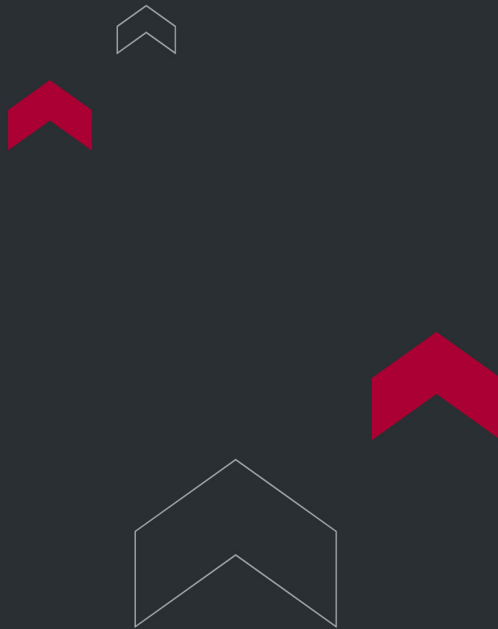
- Linear dynamic range (LDR): 10^5 ($\pm 10\%$)
- Minimum detection limit: < 800 pg propane/mL (Helium)

Others

- Dimensions: 586 x 500 x 530 mm
- Weight: 46 kg
- Rated voltage: 220V ± 50 Hz, Power ≤ 2.5 kW

Chromatogram

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Torontech Inc.

251 Consumers Road, Suite 1200
Toronto, Ontario, M2J 4R3, Canada 

Phone: +1 416 368 2721 | Fax: +1 416 981 7652
Email: info@torontech.com

Torontech, LLC

601 Brickell Key Drive, Suite 700
Miami, FL 33131, USA 

Toll-Free: 1-866-383-7919
Email: sales@torontech.com

Torontech ME FZE

Meydan Grandstand, 6th Floor,
Meydan Road, Nad Al Sheba,
Dubai-261440, UAE 

Phone: +971 488 19252
Email: me@torontech.com

