



# TOA4 Online™

Developed and hosted by Delta-X Research Inc

## Product Information

### Summary

*TOA4 Online* is an Internet web-based service based on the Delta-X Research *Transformer Oil Analyst*™ software, version 4.0. It interprets dissolved-gas and insulating fluid test data for power transformers and other liquid-filled electrical apparatus. It provides a variety of reports and graphs to support basic testing, condition assessment, and maintenance tasks. Data uploaded to *TOA4 Online* can be kept in the TOA4 database or deleted after analysis and report generation are completed. Automatic dissolved gas analysis and fluid quality analysis employ up-to-date methods which have been mathematically enhanced to account for measurement "noise" often found in DGA data. Trends and rates of change are included in the analysis. Analysis norms are user-configurable, and a built-in review process allows for the insertion of expert comments and recommendations to be included in reports. Preconfigured graphs are provided for visualizing data and results. The *TOA4 Online* web-based service is available by subscription and can be accessed via the Internet with any CSS-compliant web browser.

### Dissolved Gas Analysis

Transformer dissolved gas analysis (DGA) detects apparent faults based on changes in concentrations of hydrogen, methane, ethane, ethylene, acetylene, carbon monoxide, carbon dioxide, oxygen, and nitrogen. Powerful mathematical trend analysis methods are applied to ensure good performance even at the high sampling rates used for fault investigation or online monitoring. DGA diagnostic methods used in TOA4 employ mathematical techniques to account for the significant measurement error which is often present in DGA data. Supported diagnostic methods for transformer DGA include the Duval triangle method and the Rogers gas ratio diagnostics. New gas ratio diagnostic methods for tap changers, voltage regulators, and oil circuit breakers are supported. Particle size distributions and metals in oil are incorporated into the oil circuit breaker diagnostics.

DGA results include an equipment condition code (1-4); a diagnostic code; warnings of any gas concentrations, increments, rates of change, or ratios that exceed standard limits; and short interpretive remarks and recommendations. Also calculated are Equivalent Total Combustible Gas (ETCG), Estimated Safe Handling Limit (ESHL), Estimated Gas Monitor Value, and several combustible gas ratios.

A new graphical Trend Analysis report is provided for the interpretation of data from online monitoring equipment or from intensive sampling of equipment under diagnostic surveillance. An Equipment Comparison report shows the latest test results for a selected piece of equipment next to a statistical summary of results for similar equipment. A statistical summary of how the analysis norms have classified test results for the relevant population of equipment is also provided.

### Fluid Quality Analysis and Other Tests

Automatic fluid quality analysis includes Acid number, Interfacial tension, Dielectric breakdown kV, Power factor at 25 C and 100 C, Dissipation factor (tan delta) at 90 C, Color, Oxidation Inhibitor, and Water.

Other tests supported include Trace Elements, Particle Analysis, PCB, Furan Analysis, Corrosive Sulfur, Oxidation Inhibitor, Passivator, Pour Point, Fire Point, Flash Point, Specific Gravity, Viscosity, and Static Electrification Tendency.

Calculated variables include Fluid Quality Index, Relative Water Saturation, Dew Point, and Power Factor Ratio.

Analysis results include a fluid condition code (1-4); a moisture condition code (1-4), a PCB content code (1-4), a short summary diagnosis; warnings of any data values or changes that exceed norm limits; and interpretive remarks and recommendations. Specific problems reported are oil oxidation, oil contamination, high moisture content, low oxidation inhibitor, and evidence of thermal degradation of cellulose.

### User-Configurable Analysis Norms

Norms used in automatic data analysis can specify limits for gas concentrations, gas increments, gas generation rates, gas ratios, dissolved-gas saturation, water saturation, dew point, and basic fluid quality tests. Analysis norms can be created and edited. Up to three levels of limits can be defined for low value, high value, increment (i.e., change relative to baseline), and rate of change.

A set of analysis norms, based on published IEEE, IEC, and other standards, is provided for power transformers, voltage regulators, tap changers, and vacuum-type tap changers. The subscriber can modify these norms or create new ones to satisfy special requirements.

## Easy to Access and Use

The *TOA4 Online* user interface is your web browser. *TOA4 Online* works like a web site. Pages can be bookmarked for frequent reference, printed, or saved to disk. Graphs and other images can be saved or copied and pasted into documents. No software is installed on your computer. It does not matter what version of Windows, Mac OS/X, or Linux you have. *TOA4 Online* is available at all times (except for a few minutes a month when we do software upgrades and server maintenance). Each *TOA4 Online* subscription has one or more authorized user login ID's.

## Data Transfer and Storage

Data for processing by *TOA4 Online* is uploaded in data files in a simple comma-delimited (.csv) or tab-delimited format. Data files exported from *TOA3* are accepted by *TOA4 Online* with little or no modification required. The data upload operation is performed by means of a web browser form which opens a standard File Open dialog for choosing the file to upload. After *TOA4* has accepted the data, minor edits are permitted, and data analysis can be performed at the click of a button. After analysis, review, and reporting are completed, the data may be left on the *TOA4 Online* server for future additional processing or for viewing by others from your company, or you may delete your data from the server at any time. Data, including analysis results, can be downloaded from *TOA4 Online* in .csv, or tab-delimited format for processing or storage on your own computer.

Some labs and manufacturers of monitoring equipment provide data in files which are directly compatible with *TOA4 Online*. You can authorize your lab to upload your data directly to *TOA4 Online* for you, so that you can avoid data import problems.

## User Security Levels

Different security levels can be assigned to specific users under one subscription. Experts can review and edit analysis results. Data entry personnel can handle routine data entry. Most users will probably find read-only access adequate for obtaining the information they need. The currently supported user types and security levels are:

### Full User

Administrator:	Can edit or configure anything in the account.
Supervisor:	Can activate analysis; edit, review, and certify data and results; and maintain norms.
Operator:	Can upload and edit data. Cannot modify norms or reviewed data.
Read-only:	Can view data, results, and norms. Can download data. Cannot edit anything.

### Restricted User

Data supplier:	Can download equipment information or upload test data. Cannot edit or view anything else.
Read-only:	Can view data, results, and norms. Can download data. Cannot edit anything.
RPC user:	An external server or application accessing <i>TOA4</i> automation features via an RPC protocol.

Users within a multi-database *TOA4 Online* subscription can be given access to, or excluded from, any combination of the databases belonging to that subscription. A full user can be assigned different security levels in different databases.

## Subscription Information

A *TOA4 Online* subscription provides some standard features and may also include certain optional items, as summarized here. Normally, the subscription term is one year, but a multi-year term can be arranged by request.

### Base Package

One full user  
 One restricted (data supplier) user  
 One database  
 Startup assistance (new subscription only)  
 Technical support (phone, e-mail, Webex)

### Optional Additions

Additional full users  
 Additional restricted (data supplier) users  
 Additional restricted (read-only) users  
 Additional databases  
 Automated (RPC) access

### Miscellaneous Optional Services

Data preparation (hourly rate)  
 Extra online training (hourly rate)  
 In-person training (by quotation)  
 Diagnostic consultation with qualified expert - phone, fax, e-mail (hourly rate)

For further information, contact your *Transformer Oil Analyst* vendor or Delta-X Research Inc. Delta-X Research Sales and Marketing can be contacted by phone at **919-544-8191** or by e-mail as **sales@deltaxresearch.com**.

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