DELTA-X
R E S E A R C H

Data Integration Documentation

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Version 2.0

TOA4 Data Import File Requirements

1   Introduction

TOA4 Online is a web site for managing and interpreting insulating fluid test data for high-voltage transformers and related equipment. The most common way to get lab results into the TOA4 database is to put them in a simple spreadsheet-like text file that is uploaded to the web site and then imported. The contents of such a data file look something like this:

```
apprtype,equipnum,tank,sampledate,lab_name,jobnum,fluidtempc,ift,acidnum,d877
TRN,999456,MAIN,2014-08-15,LAB_MART,PS3712,35,28.3,0.070,56.0
LTC,801552,LTC,2014-08-16,LAB_MART,PS3713,,38.2,0.010,35.0
```

Most spreadsheet and database software can save or export data in "CSV" format like this. The important things to notice are: the TOA4 field names in the first row; the second and third rows representing oil sample test data for a transformer and a tapchanger; the equipment identification fields matching the samples to the "parent" equipment in the database; some sample dates in ISO numeric yyyy-mm-dd format; some numeric data values; and the way a missing value for "fluidtempc" is represented in the second data row. This is just a simple example, but it illustrates all the most important points. Additional data fields can be included (making the rows longer). Their correct spellings, meanings, and units are explained at the end of this document. Technical support contact information is also provided there.

2   Data File Requirements

1. **CSV File Format.** The data file must be a comma- or tab-delimited text file in which:

   • The first row contains field names, and

   • Each subsequent row contains oil sample test data (one row per sample).

   • The character encoding is ASCII, UTF-8, ISO-8859-1 (also called Latin-1), or Windows-1252. If you don't know what this is, ignore it and hope for the best. Most spreadsheet and database software can read and write files like this.

2. **Field names in first row.** The first row of the file must contain field names recognized by TOA4. The order of fields is not important. Extra fields not recognized by TOA4 are allowed but may be ignored or in some cases may give rise to "duplicate field" errors. The TOA4 fields most commonly used in data files are described in the Appendix below.

3. **Data rows.** Items in each row must be separated by either commas or tab characters. Only one kind of separator character (comma or tab) should be used - not both in the same file. Text items and dates can optionally be enclosed in double quotes (").

4. **Multiple samples.** A single data file can contain more than one sample per equipment, and it may also contain data for more than one piece of equipment.

5. **Equipment identification.** Each data row must contain a nonblank value for **apprtype** and either **equipnum** or **serialnum**. The equipment identification (**apprtype** combined with either **equipnum** or **serialnum**) must agree exactly with the equipment identification used in the client's TOA4 database, or TOA4 will refuse to import the data.

6. **Sample identification.** In addition to the equipment identification, each data row must contain a nonblank value for **sampledate**, as well as a **tank** name conforming to the tank naming conventions used in the client's TOA4 database.

7. **Dates.** Date values (e.g. for **sampledate**) must be all-numeric, with a four-digit year, two digit month, and two-digit day. Unless the client specifically requests otherwise, date values should be given in ISO 8601 yyyy-mm-dd numeric format. Acceptable variants are: **yyyy-mm-dd** or **yyyy/mm/dd** or **yyyy.mm.dd** or **yyyymmdd**.

   For example, these date expressions fit the recommended format: 2014-08-15 or 2014/08/15 or 2014.08.15 or 20140815.

   Omit time of day (hh:mm or hh:mm:ss) from all dates unless it is needed.

   Non-ISO numeric date formats which can be used are in the form month-day-year or day-monthyear, with a separator such as a slash (/), dash (-), or dot (.). **Roman numeral months and month abbreviations (like "Aug") are not accepted.**

8. **Text data.** Text data items must not contain commas, tab characters, carriage return characters, embedded quotation marks, or degree symbols and other special characters. Avoid including leading or trailing space characters in text data items.

9. **Numeric data.** Numeric data items must not contain units or other non-numeric characters. For example, $37°C$ is not a valid entry for **fluidtempc** because neither the degree symbol nor the letter C should be included. Likewise, <5 is not a valid entry for **h2** because the less-than symbol is not allowed. (But it would be allowed for **totalpcb**).

10. **Blank data.** Blank data items must be empty, not containing space characters or string expressions such as " ".

3 Recommendations

1. To ensure compatibility with the client's TOA4 database, the **client should provide** the correct **apprtype, equipnum** (or **serialnum**), **tank**, and **sampledate** for each sample submitted to the lab.

2. **Unused columns can be omitted from the data file.** For example, if no values for propane and propylene are reported, then the **c3h8** and **c3h6** columns can be omitted. Similarly, if trace elements are not reported in a set of fluid quality results, then the trace element columns can be omitted from the data file.

3. Import file names should have an **extension of .txt or .csv.** Please be careful in naming files because users may overwrite data files or have other problems if files have duplicate names. One suggestion would be to include a date or job number in the filename, e.g. 20070321.csv. If an odd file extension is used, Windows or Excel may make wrong assumptions about how to open the file.

4 See also

TOA4 Online analysis variables and related fields. Names and specifications of all TOA4 data fields. See:

   https://www.toa4online.com/toa/help/variables
   https://www.toa4online.com/toa/help/data_fields

Detailed data file requirements help page in TOA4 Online. See:

   https://www.toa4online.com/toa/help/datafiles_req

Examples of TOA4 data files. Download from:

   http://www.deltaxresearch.com/arpaxnog/toa4_example_data.zip

5 Technical assistance

For advice and technical assistance related to TOA4 Online data imports, contact Delta-X Research:

Web site: http://www.deltaxresearch.com/

Tech Notes blog: http://deltaxresearch.wordpress.com/

E-mail: support@deltaxresearch.com

Telephone: 250-592-2998

6   Appendix - Most commonly used TOA4 data fields

Name	Format	Description
apprtype	text(10)	Apparatus type
equipnum	text(50)	Unique permanent identifier of equipment
serialnum	text(50)	Equipment serial number
tank	text(20)	Tank or sampling valve identifier
sampledate	yyyy-mm-dd	When sample was collected
container_id	text(30)	Sample syringe or jar ID
fluidtempc	integer	Temperature of oil as sampled
sampler	text(30)	Initials or name of sampler
reason	text(30)	Reason for sampling
jobnum	text(30)	Job number for batch of samples
lab_name	text(30)	Name of analytical lab
labrecvdate	yyyy-mm-dd	Date when lab received sample
labtestdate	yyyy-mm-dd	Date when lab analysis was done
labreportnum	text(30)	Reference number used by test lab
ordernum	text(30)	Contract or PO number for analysis
h2	integer	Hydrogen (ppm = μL/L)
ch4	integer	Methane
c2h6	integer	Ethane
c2h4	integer	Ethylene
c2h2	integer	Acetylene
c3h8	integer	Propane
c3h6	integer	Propylene
co	integer	Carbon monoxide
co2	integer	Carbon dioxide
o2	integer	Oxygen
n2	integer	Nitrogen
acidnum	n.nn	Acid number (mg KOH/g)
ift	n.n	Interfacial tension (millinewtons per meter - same as dynes per centimeter)
d1816_1	n.n	Dielectric breakdown-VDE electrode-1mm (kV)
d1816_2	n.n	Dielectric breakdown-VDE electrode-2mm (kV)
d877	n.n	Dielectric breakdown-flat electrode (kV)
iec156	n.n	Dielectric breakdown - IEC 156 (kV)
pf25	n.nnn	Fluid power factor at 25 C (percent)
pf100	n.nnn	Fluid power factor at 100 C (percent)
tan_delta	n.nnn	Fluid dissipation factor (tan delta) (percent)
inhibitor	n.nnn	Oxidation inhibitor concentration (percent)
color	n.n	Fluid color index
d1275a	text(30)	CORROSIVE or NON-CORROSIVE
d1275b	text(30)	CORROSIVE or NON-CORROSIVE
visual	text(30)	Standardized oil appearance descriptive text
water	integer	Water content of insulating fluid (μL/L)
fq_water	integer	Water content of sample in bottle or can (μL/L), for comparison with 'water' above
relsaturation	integer	Relative saturation of water in insul. fluid (percent) (include only if measured directly)
totalpcb	n.n	Total PCB concentration (mg per kg) or '< n.n' where n.n is numeric, or 'NA', 'ND'.
copper	n.n	Metal concentration (micrograms per liter) (other trace elements treated similarly)

Table 1: TOA4 Online Commonly Used Data Fields

Note – See these TOA4 Online help pages and related pages linked to it for information about more fields that can be used in TOA4 data import files:

https://www.toa4online.com/toa/help/variables

https://www.toa4online.com/toa/help/data_fields

Document Revision Notes

Date	Version	Changes	Author
2014-09-2	1.2	Updated Initial Draft	Neil Schemenauer
2017-07-19	2.0	Updated format	Steven Herchak