

TDMS

- protective relays
- energy meters
- transducers
- power quality
- CT-VT
- power transformers
- ground grid
- circuit breakers
- batteries

THE INTEGRATED TESTING SOLUTION

TDMS is a powerful software package providing data management for acceptance and maintenance testing activities. Electrical apparatus data and test results are saved in the TDMS database for historical results analysis. The TDMS software organizes test data and results for all electrical apparatuses tested with ISA test sets and the related software.

The TDMS software controls and provides data acquisition from all ISA test sets:

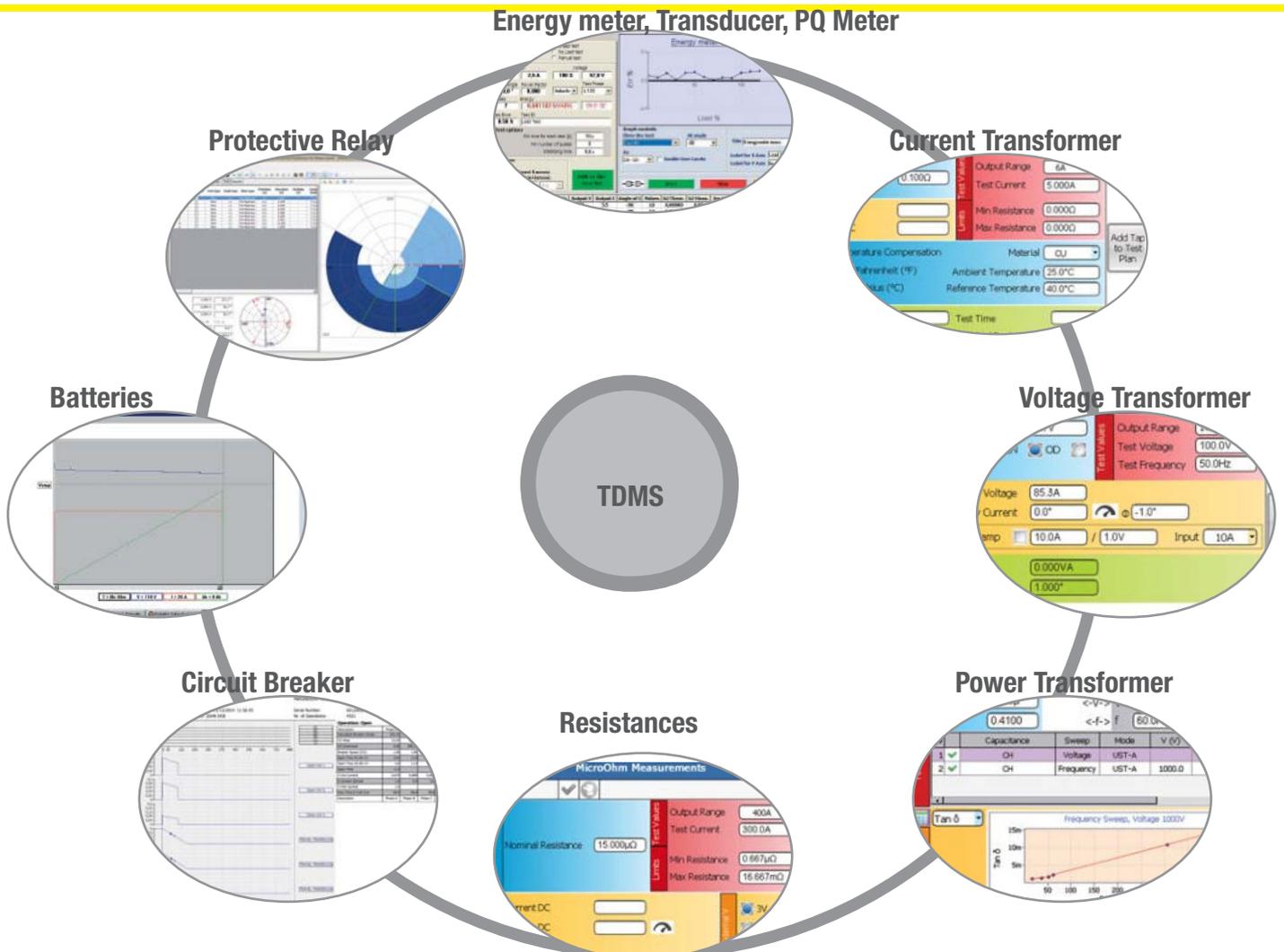
- . DRTS 66, DRTS 64, DRTS 34, DRTS 33, DRTS 6, DRTS 3+ - Relay and Energy meters test sets
- . eKAM, T 3000, T 2000, T 1000+ and TD 1000+ - Primary and Secondary injection test sets
- . STS 5000, STS 4000, STS 3000 *light*, TD 5000 and TDX 5000 - Current, voltage and power transformer test sets
- . CBA 3000, CBA 2000 and CBA 1000 - Circuit Breaker analyzers
- . BTS 200MKII - Battery load unit.

The TDMS software is also a powerful database.

It allows creating an electrical network with substations, feeders and the majority of electrical apparatuses, such as:

- . Relays
- . Instrument transformers
- . Power transformers
- . Circuit Breakers
- . Energy Meters
- . Transducers
- . Power Quality Meters
- . Resistances.

The TDMS Test & Data Management Software is the Integrated testing solution to perform any substation apparatus commissioning and maintenance.

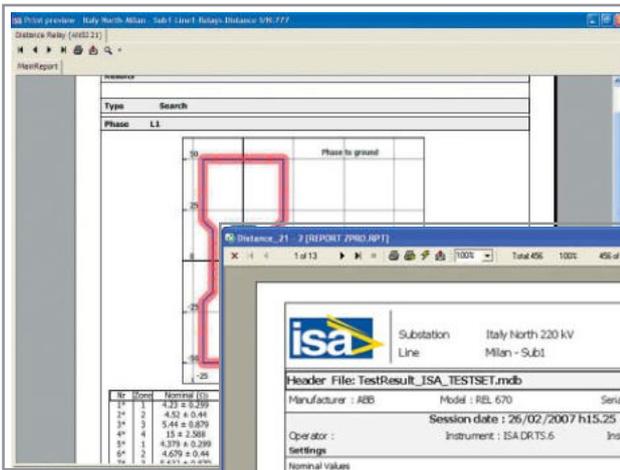


TDMS Report Editor

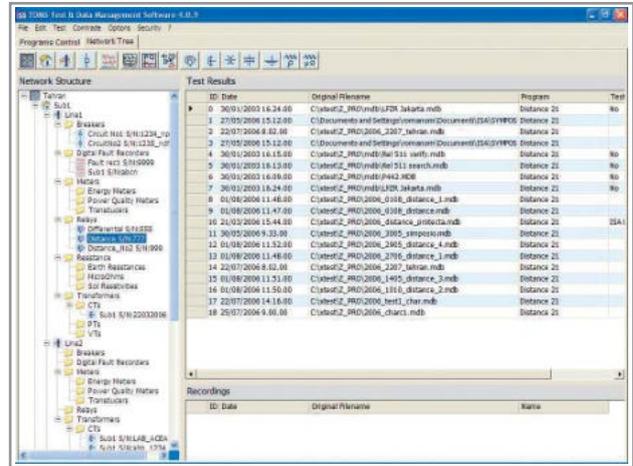
TDMS has a built-in Report Editor that allows generating professional test reports for a single test object, for a group of tested devices or for an entire substation.

It can create customized reports or use standard forms.

The TDMS Tests report can be exported in MS Office (Word and Excel), PDF or RTF formats.



TDMS Reports



TDMS Data base

TDMS is the control platform to run all ISA test software. Test programs, calibration, firmware, software upgrade and languages are all managed by TDMS.



TDMS Control Platform

TESTING PROTECTIVE RELAYS

TDMS

- protective relays
- energy meters
- transducers
- power quality
- CT-VT
- power transformers
- ground grid
- circuit breakers
- batteries

TDMS is a powerful software package to be used with all the automatic test systems manufactured by ISA.

TDMS allows testing:

- . Protective relays in transmission, distribution and power generation
- . Watt-hour meters
- . Transducers
- . Meters
- . Power quality meters.

TDMS runs on Windows XP, Windows Vista, Windows 7, 8 (both 32 and 64 bit versions) and 10.

Windows, Word and Excel are trademarks of MICROSOFT inc.

TDMS

OUT OF STEP - POWER SWING

SYNCHROCHECK RELAYS

O/C RELAYS

TEST PLAN EDITOR

DIFFERENTIAL RELAYS

DIRECTIONAL RELAYS

V,F,P RELAYS

LOSS OF FIELD RELAYS

PLAYING BACK TRANSIENT SIGNAL COMTRADE

DISTANCE RELAYS

RELAY APPLICATION DESCRIPTION

The TDMS software platform allows the user to select easily and quickly the most appropriate software package for the required application.

TDMS test software uses an open architecture easily expandable with additional software modules at any time.

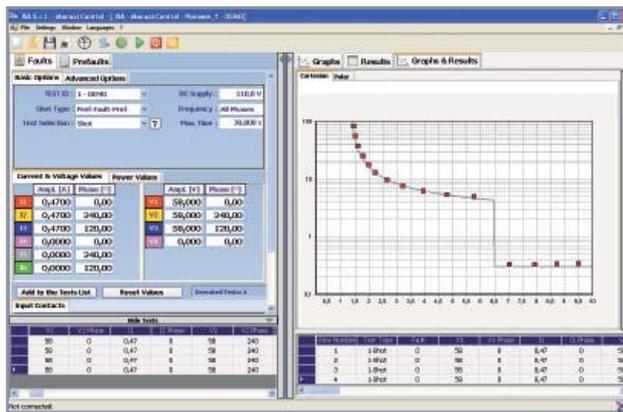
The TDMS Package can be used to test any protective relays in:

- Power Generation Plants
- Distribution network
- Transmission network
- Industries.

Manual control: test it as you like it

The manual control module has the following main characteristics:

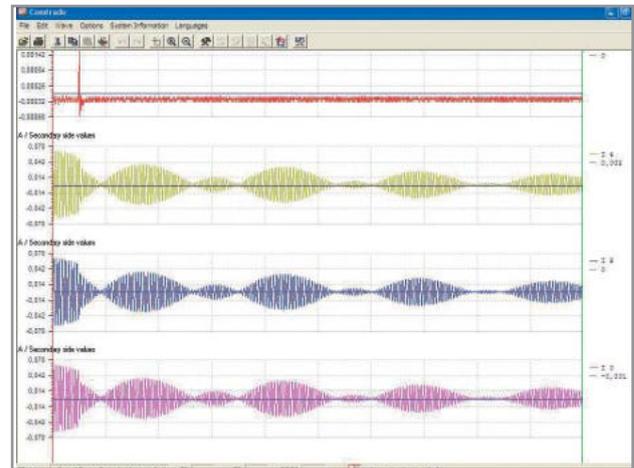
- Intuitive graphical user interface
- Virtual Front Panel control
- Graphical Vector control
- Ramp Test: sequence of tests with the ability of ramping any parameter up or down at the same time
- Threshold test: automatic determination of a threshold (current, voltage, frequency, phase angle)
- Rate of change (gradient) tests of frequency, voltage, current, phase-angle and V dc (Dx/Dt)
- The Harmonic generation module allows creating any wave form distortion
- The Report Manager allows test report customization to user requirements; results are exported in Windows formats.



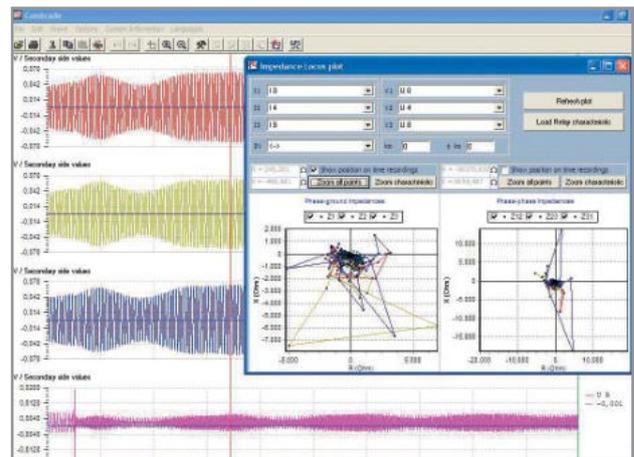
Manual control virtual front panel

Playback Waveform: reproduction of transient signals and waveform generation

- Playing back transient signal from digital fault recorders and numerical relays
- Analysis of relay operating time
- Graphical view and replay of analog and binary signals
- Impedance locus display
- Scale, cut, copy and paste of analog signals
- Supported file formats: COMTRADE, Excel
- Test reports for printing or exporting in Windows .TXT or WMF formats.



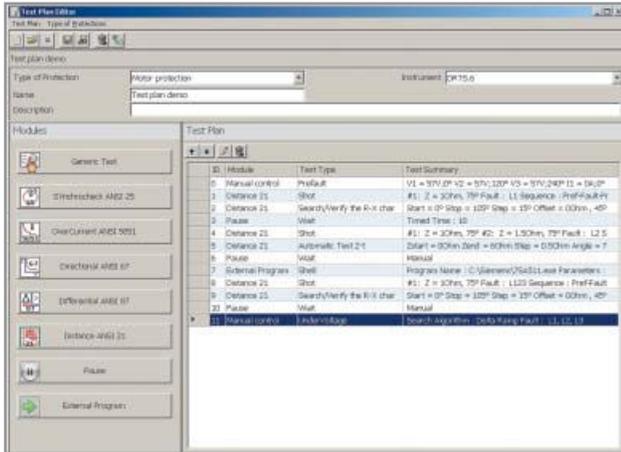
Comtrade: Playing back transient signals



Comtrade: Impedance locus display

Test Plan Editor

The Relay Test Plan Editor gives the user the possibility to create and run different test plans for different test applications.



Test Plan Editor

The Test Plan Editor allows creating a test plan using predefined macro functions available for any type of relays.

This feature is particularly useful for testing multifunction relays. The Test Plan can be associated to any relay in the TDMS list of programs. Before executing the test, it is possible to define relay setting and characteristics.

The Test Plan can be run two ways: the entire test plan can be executed, or the user can select the macros to be executed on the relay, according to his needs.

Finally the Test Plan can be printed and saved automatically into the TDMS database.

AUTOMATIC RELAYS TESTING IN POWER TRANSMISSION, GENERATION & DISTRIBUTION

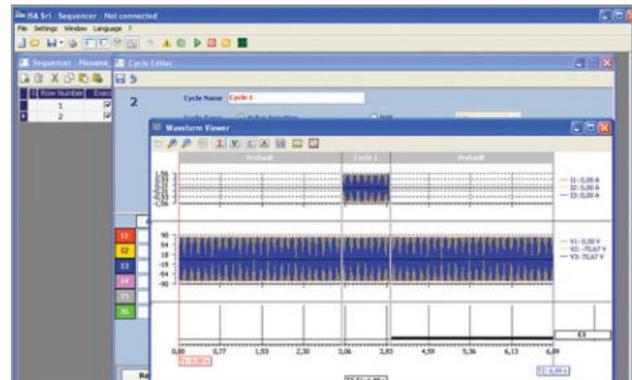
We explain now the automatic programs available in TDMS for the testing of protection relays. The following are the main characteristics common to all programs:

- Extremely easy to use
- Intuitive graphical user interface
- Click and test operation
- Definition of a sequence of tests
- Graphical definition of the nominal characteristic
- Automatic test and computing of deviation from the nominal values
- Report Manager allows test report customization to user requirements; results are exported in Windows formats
- Graphical definition of the nominal characteristic
- Automatic test and computing of deviation from the nominal values
- Automatic Pass-Fail assessment.

TDMS Software includes the following testing modules:

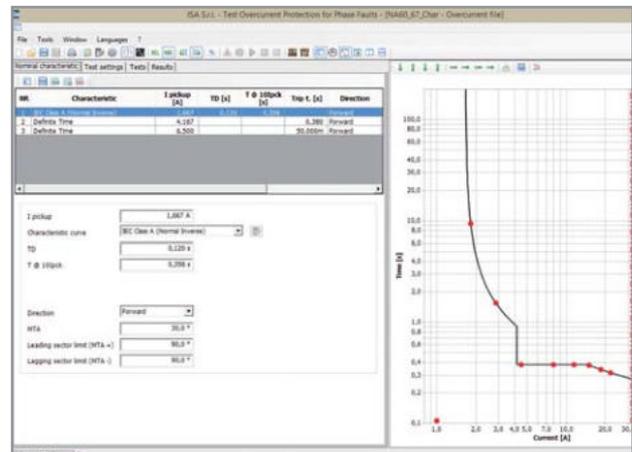
. Sequencer

The sequencer module is a software for determining the relays operating time and the logical sequence of the event.



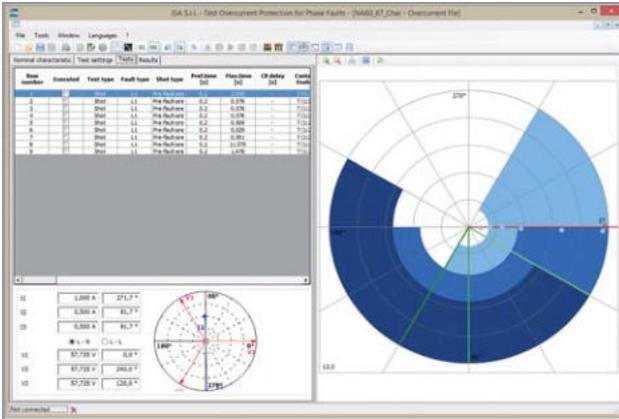
Sequencer

. **Overcurrent** for automatic testing of Over-Current (50 - 51 - 50N - 51N) and Directional Overcurrent (67 - 67N) relays, including all the standard curves IEC, IEEE and I2T.

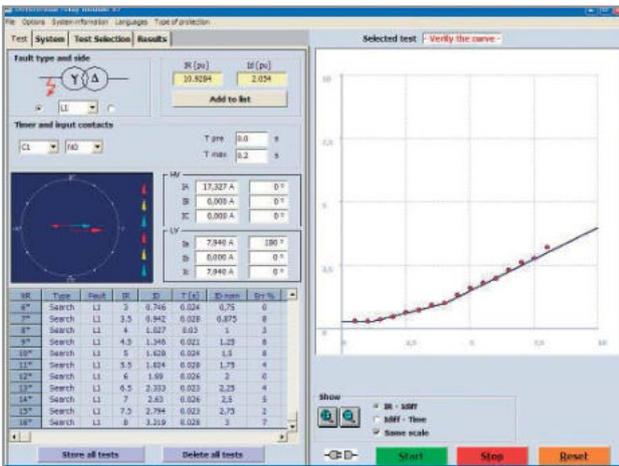


Overcurrent relay module

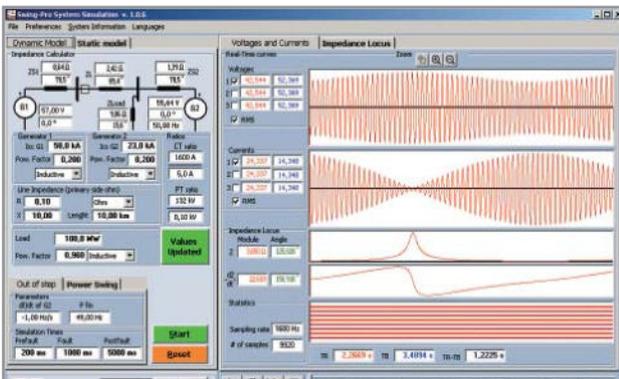
- . **Differential relays module**, for automatic testing of:
 - transformer differential (87T) and generator differential (87G) relays with 3 and 6 currents
 - End-to-End test for line differential (87L) relays with GPS (Global Positioning System) synchronization, using two DRTS XX test sets.
- . **Synchrocheck module-25**, for automatic testing of synchrocheck (25) relays, with 3 or 6 voltages control.
- . **Swing Pro module**: for testing power swing blocking and out of step function.



Directional relay module-67



Differential relay module-87



Swing Pro module

Distance Relays-21

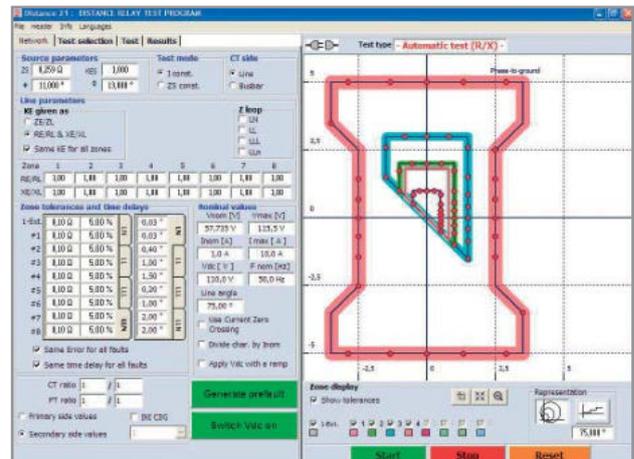
The Distance Relays-21 Module is a powerful software that allows users to perform the fully automatic testing of any distance relay, regardless of type or manufacturer, in HV and EHV Transmission networks.

Main characteristics:

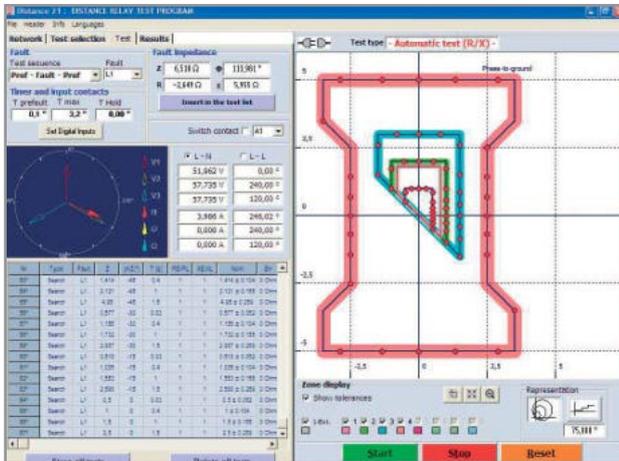
- Graphic user friendly interface
- Interactive Graphic editor of the nominal characteristic
- Automatic test and computing of deviation from the nominal values
- Sequencer Editor for creating test sequences, by entering fault impedances or entering currents/voltages and phase-angle quantities
- The Report Manager allows test report customization according to user requirements; results are exported in Windows formats.

Distance Relay-21 has the following testing features:

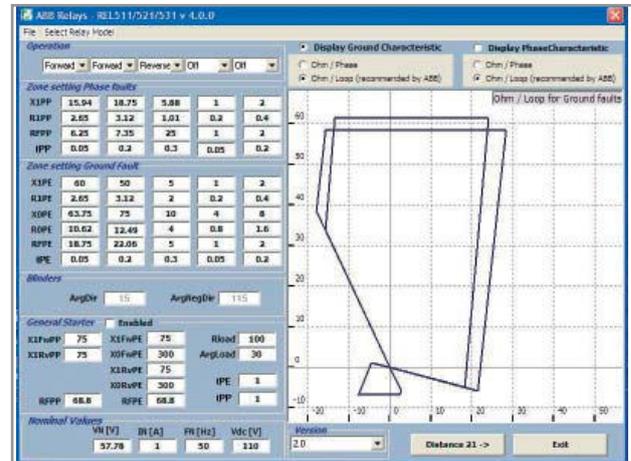
- Simulation of all types of faults: single phase, two phase, two phase to ground, three phase
- Click and test directly on the R-X diagram of any distance relay nominal characteristic
- Automatic test of a given nominal characteristic
- Automatic search of an unknown characteristic
- End to End test by means of two synchronized ISA test sets
- Power Swing Blocking test
- Auto-recloser test
- Developing fault test
- Switch-on-to-fault test
- Fuse failure simulation
- Direct import of the setting files from main relay manufacturers using any file format
- Import SET files from our old automatic test programs for distance relays written with X.TEST editor.



Distance relay-21 test program set-up



Distance relay-21 test program results



Distance relay module

Enhanced features

Other important features have been included to enhance the automatic test, like:

- Possibility to set different earth factors for each zone: this is important since more and more relays have this feature
- Possibility to set the earth factor as RE/RL and XE/XL
- Possibility to test the characteristic in terms of loop resistance and fault reactance (better known as Arc resistance compensation).

Distance relay libraries

A large number of special test programs for the main relay manufacturers is included in our Distance Relays Test Program Library.

Test programs for old electromechanical, solid state and numerical relays from AREVA, ASEA, ABB, ALSTOM, BBC, GE, GEC Alstom, Mitsubishi, SEL, SIEMENS, Toshiba and VAtch are included (please ask for the detailed list of test programs). These programs ask the relay settings, draw the nominal curve and test it automatically with the Distance Relay-21 program.

ISA also implemented the possibility to upload the relay setting file of main manufacturers (ABB, SEL, Alstom, Siemens, Toshiba, GE), generally available in XML, CSV, XRIO and txt format, directly and automatically into TDMS relay libraries, including a wide range of protection relays.

This new function thus allows considerable time saving as nominal characteristics are automatically created.

Advanced Editor

The Advanced Editor module allows creating any possible test plan for relay testing, using 24 commands only. Advanced Editor permits to use all parameters which are generated and controlled by all ISA relay test sets. The key difference with respect to the existing SEQUENCER or the Editor of Macro software is that with EDITOR it is possible to define any parameter as a variable, which will be defined later on as a function of the relay setting and to use logic commands such as if-then-else and so on.

TESTING ENERGY METERS, TRASDUCERS AND PQ METERS

This package is designed for the automatic test and calibration of:

- Energy meters
- Transducers
- Measuring instruments

The Measurement Software Package consists of three test programs:

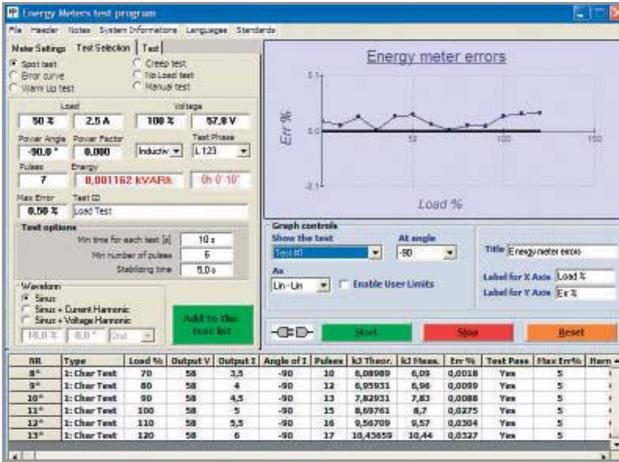
Energy meters

It allows automatic testing and calibration of energy meters according to the international standard IEC521.

- Test of class 1, 0.5, 0.2 or 0.1 energy meters
- Test without or with a standard meter
- Energy meter accuracy test - Load test
- Creep test
- No-Load test
- Automatic percentage of error computation.

Results

- Results are saved in graphical and tabular form for later use
- Test reports for printing or export in Windows .TXT or .WMF format.



Energy Meter Test Program control panel



Transducer Test Program manual control



Energy Meter Test Program manual control

Power quality meters

It allows the automatic testing of power quality meters, according to the international standard IEC61000-4-30.

Tested Parameters are:

- Change in power frequency
- Changes in supply voltage (dips, swells, rapid voltage changes...)
- Presence of flickers
- Voltage and current harmonics/interharmonics
- Voltage unbalance
- Transient voltages
- and others.

Transducers

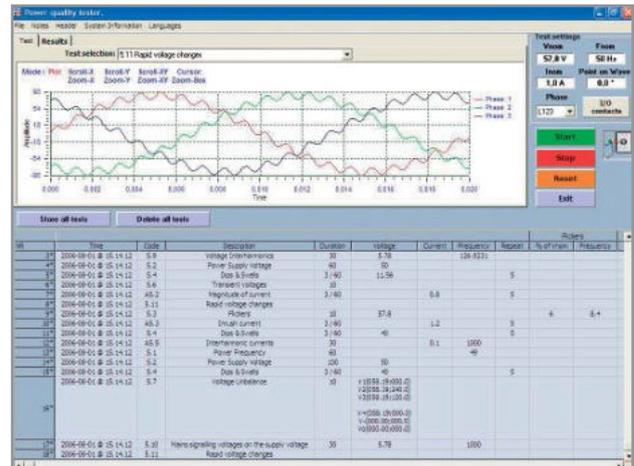
It has been designed for testing measuring transducers:

- Voltage, Current, Frequency and all types of all Power transducers.

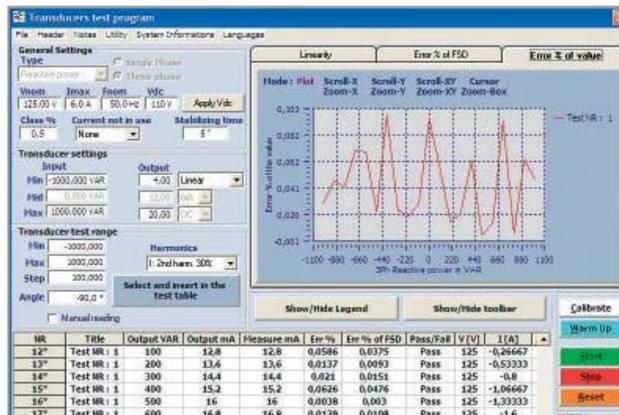
The software automatically computes the errors of transducers.

Results

- Results are saved in graphical and tabular form for later use
- Test reports for printing or export in Windows .TXT or .WMF formats.



PQ Meter Test Program control panel



Transducer Test Program control panel

Transcope Software Module

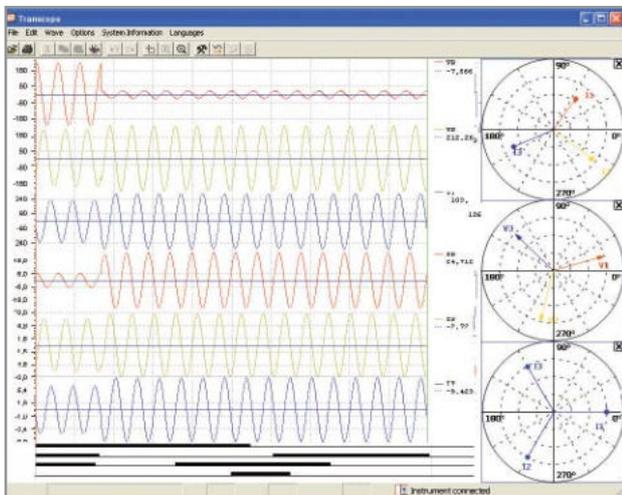
This software module is an option for DRTS 66. The option is to be specified at order.

With this option the 10 binary inputs of DRTS 66 can be configured as 10 analog voltage inputs. Transcope has the following features:

- . Three phase voltage and current (with external clamp or shunts), phase angle, wattmeter, frequency and harmonic meter
- . Oscilloscope
- . Analog Transient recorder
- . Sequence of event recorder.

The Transcope functions can be used during any other test function of the DRTS 66.

- Measurement features:
 - . Current and voltage: RMS values
 - . Phase angles between inputs
 - . Frequency
 - . Active, reactive and apparent power
 - . Energy
 - . Harmonic content. Measurements of the Total Harmonic Distortion, and of the distortion of all harmonic components up to the 40th.
- Oscilloscope feature: it is possible to select the trace to be viewed, and to view it on the DRTS 66 local display. The oscilloscope can be triggered on any trace.
- Recording feature: it is possible to use the test set as an analog transient recorder and as a digital sequence of event recorder.
- Extended triggering capability: positive and negative trigger thresholds and ROC thresholds on any of the voltage or current inputs.



Transcope

IEC61850 Interface Relay testing with Ethernet - based substation communication protocol

IEC 61850-8

By means of a dedicated hardware and the TDMS software, ISA DRTS 66 can expand its testing capabilities by handling IEC61850-8 GOOSE messages. The software uses GOOSE messages instead of physical contacts to verify the relay trip delay.

The screenshot shows the 'Goose Explorer' software interface. It displays a 'Goose List' table with columns for '#', 'Dest Mac Address', 'Control Block Reference', 'GOOSE ID', and 'Dataset Name'. Below this, there is a 'Goose Details' table with columns for '#', 'Name', 'Type', and 'Value'. The details table shows various parameters like 'GGIO4.Amb1.InstMag', 'GGIO4.Amb1.mag', 'GGIO4.Amb1.q', 'GGIO4.Amb1.l', 'GGIO4.Amb2.InstMag', 'GGIO4.Amb2.mag', and 'GGIO4.Amb2.l'.

Example of GOOSE messages

IEC 61850-9-2

The IEC 61850-9 -2 option allows generating measurement messages on the system bus. The option and the associated software provide the following features:

- . Injection of Sampled Values on the system bus, corresponding to CT and VT measurements
- . Test of relays connected to the system bus, by the generation of Sampled Values and the monitoring of the relay tripping, as described above.

The screenshot shows the 'IEC 61850-9-2' test set-up configuration window. It includes fields for 'Connected AP name' (A1), 'IED Name' (ISA), 'IP address' (192.168.15.100), 'Subnet mask' (255.255.254.0), 'IP Gateway' (192.168.15.101), 'SNTP primary address' (200.160.0.8), and 'SNTP secondary address' (200.160.0.8). There are also fields for 'OSI-AP-Title' (1,3,9999,23), 'OSI-AE-Qualifier' (23), 'OSI-PSEL' (00000001), 'OSI-SSEL' (0001), and 'OSI-TSEL' (0001).

IEC 61850-9-2 test set-up

Programmer Software Package

XTEST_X ISA

The package provides an OCX application (ActiveX) that allows controlling any Automatic Relay Test Set with high level languages, such as Visual Basic, Visual C++ or any other software that supports the ActiveX technology.

This is particularly useful for integrating the test set control into an existing software, that includes the control of other instruments, such as meters, converters and so on.

TESTING CURRENT AND VOLTAGE TRANSFORMERS

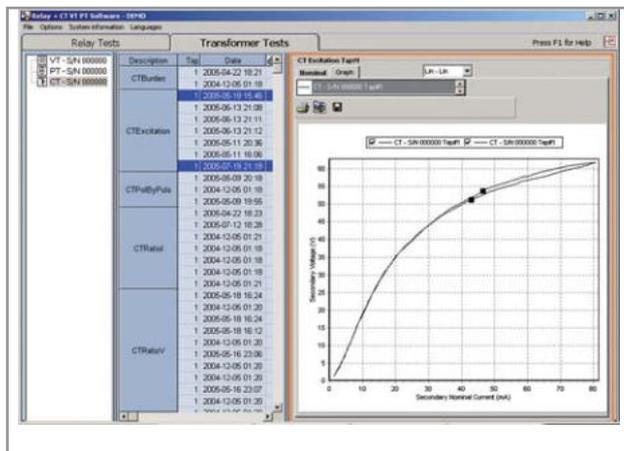
TDMS

- protective relays
- energy meters
- transducers
- power quality
- CT-VT-PT
- transformers
- ground grid
- circuit breakers
- batteries

The TDMS CT-VT Transformer software module is a powerful application that provides connectivity with the instruments of the T XXX and STS family: T 1000+ for relays testing, T3000 for relay and transformer testing, T 2000 for transformer testing, STS 5000 / STS 4000 / STS 3000 *light* with TD 5000 module for the test of current, voltage, power transformers and for tangent delta measurements.

Main test applications are:

- Relay Test Application
- Transformer Test Application
- Ground Grid Resistance and soil resistivity.



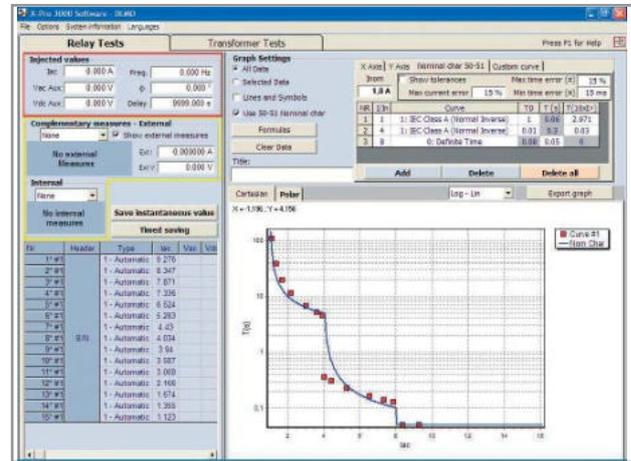
CT Saturation Curve Test Result

The software performs various tasks, such as:

- Download stored measures, performed in the field, and saved in the instrument local memory
- Open and save results in the Access Database (.MDB) format.

For T 1000+ and T 3000 in relay test application mode:

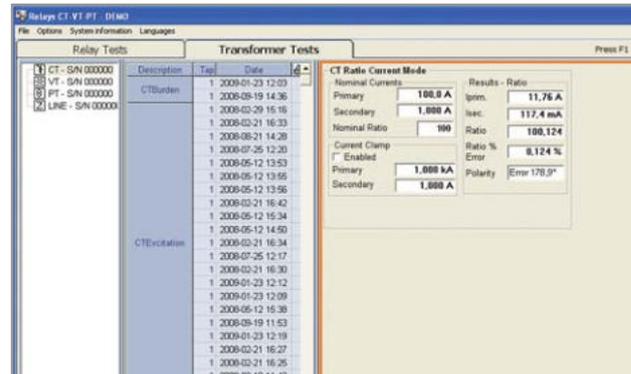
- Real time display of the measures made by the instrument
- Possibility to draw the nominal characteristic of the relay under test
- Perform calculations on the results
- Display and print Cartesian or Polar graphs of all combination of measures.



Relay Test Result

For T 2000 and T 3000 in transformer test application mode:

- Display and print transformer results
- Compare different CT excitation curves on the same graph
- Upgrade the firmware of the instrument
- Save or load the calibration values
- Save or load instrument settings.

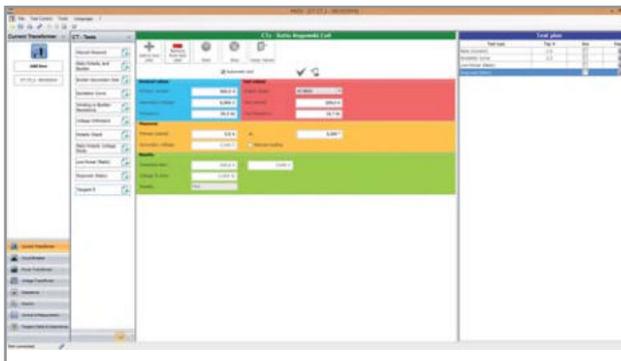


CT Test Result

TESTING CURRENT, VOLTAGE AND POWER TRANSFORMERS

PADS - Power Apparatus Diagnostic Software is a powerful software application, optionally included in TDMS software, that allows the remote control of the different product family: STS 5000, STS 4000, STS 3000 *light*, TD 5000, TDX 5000 and eKAM. The software performs various tasks, such as:

- . Control the test set remotely from PC
- . Create test plan
- . Download stored test results via Ethernet cable
- . Create and customize test reports
- . Print test results
- . Open and save results in TDMS database.



PADS - Test plan

STS family and TD 5000 test sets

STS family test sets are designed to test current, voltage, power transformers, circuit breaker and ground grid. The module TD 5000, in connection with STS test sets, performs capacitance and Tan Delta measurement. Available tests are:

Current Transformer Testing:

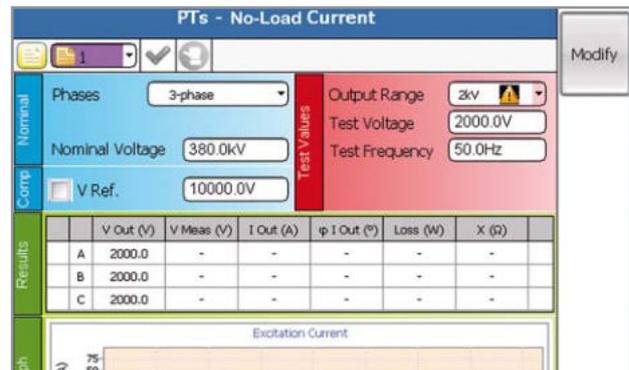
- . Ratio, Voltage mode
- . Ratio, polarity and burden with high AC current
- . Burden, secondary side
- . Excitation curve
- . Winding or burden resistance
- . Voltage withstand
- . Remote polarity check
- . Rogowski coil transformers
- . Low power transformers
- . Tan Delta measurements.

Voltage Transformer Testing:

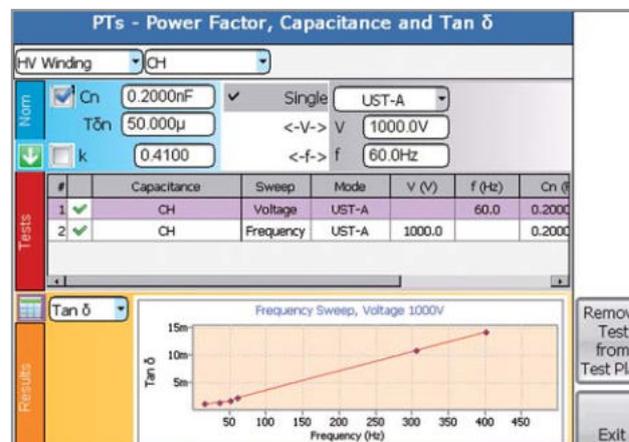
- . Ratio; polarity
- . Burden, secondary side
- . Ratio, electronic transformers
- . Voltage withstand
- . Remote polarity check
- . Tan Delta measurements.

Power Transformer Testing:

- . Ratio per TAP
- . Static and dynamic resistance of Tap Changer contacts
- . No-load current
- . Short-circuit impedance
- . Tan Delta measurements.



PT - No load current test



PT - Tan Delta test

Circuit Breaker Testing:

- . High DC current micro-Ohmmeter test
- . Tan Delta measurements.

Circuit Breaker and Relay Testing:

- . Current threshold and timing.

Ground Grid Testing:

- . Ground resistance and resistivity
- . Step and touch voltages.

TDMS

- protective relays
- energy meters
- transducers
- power quality
- CT-VT-PT
- transformers
- ground grid
- circuit breakers**
- batteries

- Display channels waveforms
- Calculation on data received from CBA 3000/CBA 2000/CBA 1000
- Compare different curves on the same graph
- Enhanced measurement features for motion, speed and acceleration analysis
- Test plans and test results can be viewed, edited, saved and printed
- Test results can be exported in Word, Excel, RTF and PDF formats
- Save or Upload the calibration values.

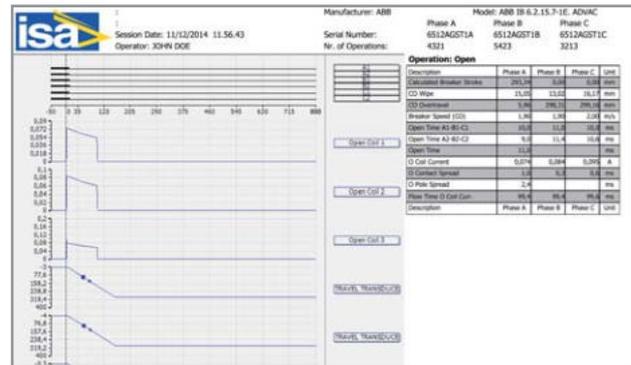
The CBA 3000/CBA 2000/CBA 1000 test report allows:

- setting the test sequence (time and motion test), static and dynamic resistance test, open-close and open-close-open command test
- displaying test results in a single page, with table and graph, thus allowing a better and easier results interpretation.

The TDMS - Circuit Breaker software module is a powerful application that provides connectivity with CBA 3000, CBA 2000 and CBA 1000 test sets for circuit breaker analysis.

The software performs various tasks, such as:

- Full control of the Circuit Breaker analyzers CBA 3000/CBA 2000/CBA 1000
- Download pre-defined test plans to the CBA 3000/CBA 2000/CBA 1000 test sets
- Download test plans defined with CBA 3000/CBA 2000/CBA 1000 to TDMS.
- Download test results (timing test, coil current, transducers and microhmeter measures) stored on CBA 3000/CBA 2000/CBA 1000 local memory.



Circuit Breaker Test Result

| Enabled | Description | Value | Unit |
|--------------------------|---------------------------------|-------|------|
| <input type="checkbox"/> | Min Open Coil Curr. | 0.3 | A |
| <input type="checkbox"/> | Max Open Coil Curr. | 30 | A |
| <input type="checkbox"/> | Min Close Coil Curr. | 0.3 | A |
| <input type="checkbox"/> | Max Close Coil Curr. | 30 | A |
| <input type="checkbox"/> | Max Open Time Open Coil Curr. | 1000 | ms |
| <input type="checkbox"/> | Max Close Time Close Coil Curr. | 1000 | ms |

| Enabled | Description | Value | Unit |
|--------------------------|--------------------------|-------|------|
| <input type="checkbox"/> | Max Open Contact Spread | 5 | ms |
| <input type="checkbox"/> | Max Close Contact Spread | 5 | ms |
| <input type="checkbox"/> | Max Open Pole Spread | 2 | ms |
| <input type="checkbox"/> | Max Close Pole Spread | 2 | ms |
| <input type="checkbox"/> | Max Open Time Phase 1 | 200 | ms |
| <input type="checkbox"/> | Max Open Time Phase 2 | 200 | ms |
| <input type="checkbox"/> | Max Open Time Phase 3 | 200 | ms |
| <input type="checkbox"/> | Max Close Time Phase 1 | 200 | ms |

Circuit Breaker Testing Parameters

ORDERING INFORMATION

CODE

10015 TDMS software