TDMS*Pro*

Software Platform for Protective Relay Testing

isa

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TDMS Pro

TDMS Pro is an integrated software platform, designed to efficiently run tests and manage test data of almost any kind of electromechanical and digital relay from any manufacturer. From the simplest to the most complex type, it can be used for testing of all types of multifunction protection relays installed in power transmission and distribution networks, in production plants and industries. TDMS Pro allows to quickly and easily use the most appropriate software module for the required application. There are three modules that form the base of the platform: Relay Setting Manager, DRTS Configurator and Test Plan Editor. These modules allow the importation of parameters of the protective relays that are about to be tested and quick preparation of the tests.

The universal test set compatible with TDMS Pro are: DRTS 66, DRTS 64, DRTS 34 and DRTS 33.

TDMS Pro comes with two license levels, Standard and Advanced.

| TDMS Pro licenses for protective relay testing		
	Standard	Advanced
Relay Setting Manager	X	X
DRTS Configurator	X	X
Manual Control	X	X
Sequencer	X	X
Overcurrent	X	X
Playback Waveforms	X	X
Transcope	X	X
Transducers, Energy & PQ Meters	X	X
Test Plan Editor		X
Distance		X
Differential		X
IEC 61850		X
Transient fault		X
Power Swing		X

RSM - Relay Setting Manager

RSM allows to import the protective relay's setting file of each protection relay directly in their native format: RIO, XRIO, XML, TXT, CSV. If the setting file is not available, having Library greatly assists the user. the library of protective relays is a list of templates (specific for every user and model of relay) that allows the user to simply copy all the settings from the relay into a correctly chosen template, thus creating a version of a setting file. All the major relay producers such as ABB, Siemens, Alstom, Schneider, GE, SEL, Nari and many others are available. Once RSM is fully set up, the relay configuration is automatically made available for testing in every software module. Once the settings file has been created, the possible operations are:
• Add a protective function
• Copy a protective function
• Delete a protective function
• Copy a group of settings
• Delete a group of settings
• Define which group of settings is active
The settings file can be set as default at the start of each test module.
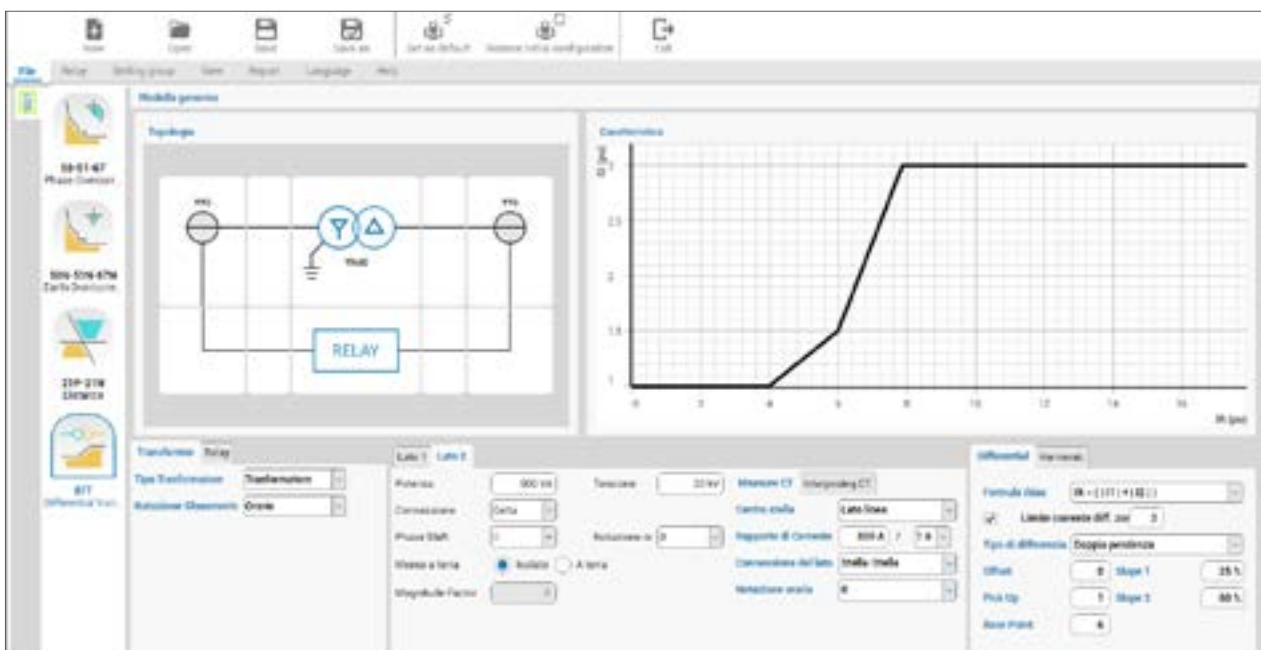
DRTS Configurator

DRTS Configurator allows the operator to set the universal relay test set in a way that best suits his needs. Once the connection with the PC is established, the optional modules installed in DRTS are automatically recognized and are immediately ready to be used in each software module for the execution of the tests.

If necessary, the operator can make changes to the configuration at any point in time, for example by setting the parallel connection of two current outputs to double the maximum current amplitude.

The creation of a configuration file takes place through a guided procedure. The procedure helps the operator in choosing the optional devices to be activated to then be used in each test module (for example GPS).

In that way, once the connection to the relay test set is established, the recognition of the present optional modules happens automatically.

Working like this, correct reproduction of the front and rear panels of the instrument in use is available. By selecting a specific section in both panels, the operator is given the opportunity to change its settings.

Test Plan Editor

The complete verification of a multifunctional protective relay requires an execution of numerous tests in sequence, using different software modules on the basis of the various protection functions enabled.

The purpose of Test Plan Editor is to simplify the creation of complex test sequences. Thanks to its great flexibility it is possible to recall and reuse each of the software modules available in TDMS Pro.
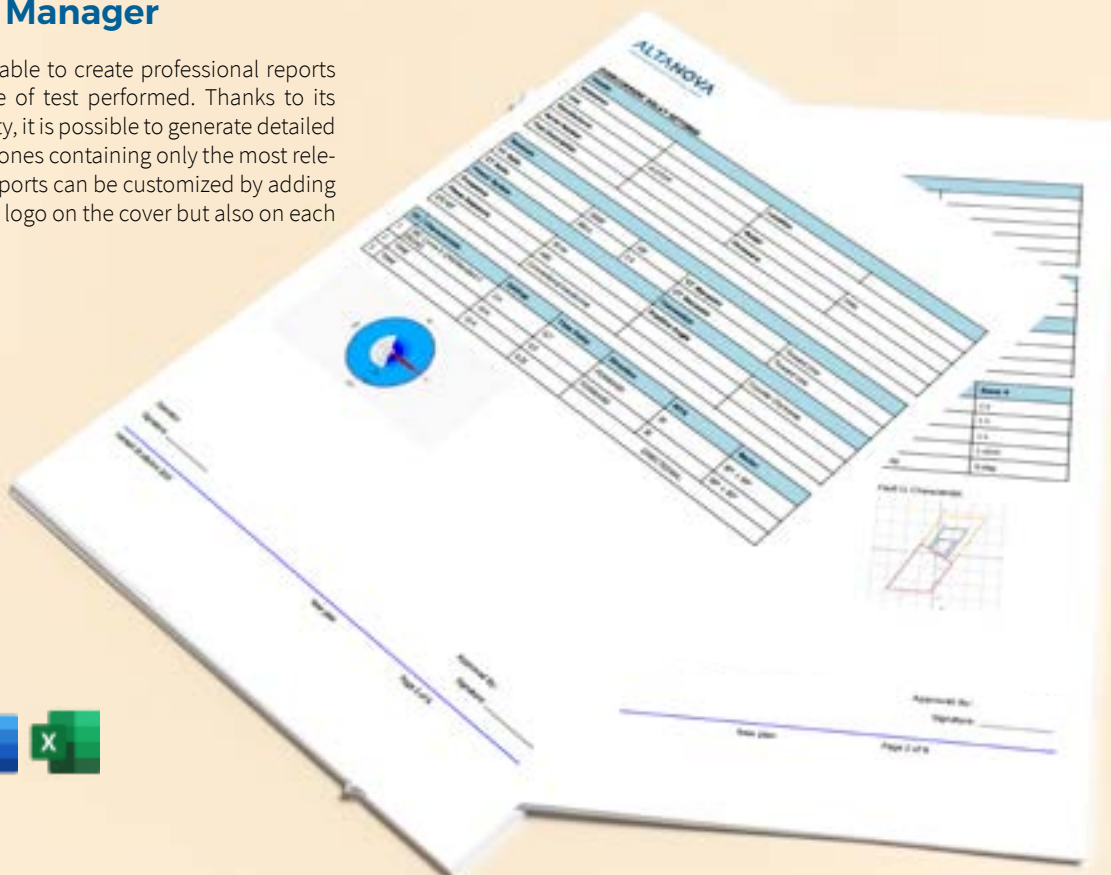
It is also possible to insert instructions to the operator by combining them with images for a better understanding of the operations to be performed. Once started, the sequence can be paused, stopped and finally restarted, starting from the point where it was interrupted.
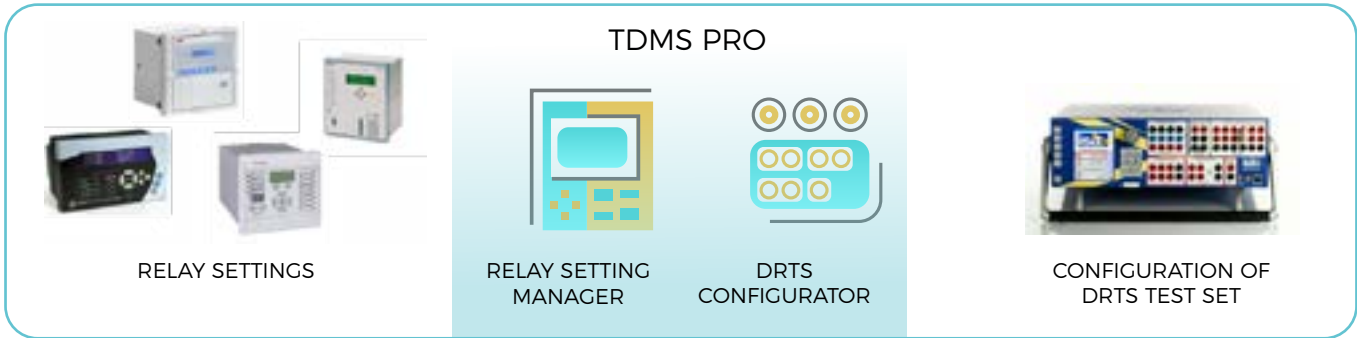
Finally, the results of each test will be collected and printed in a single general report.
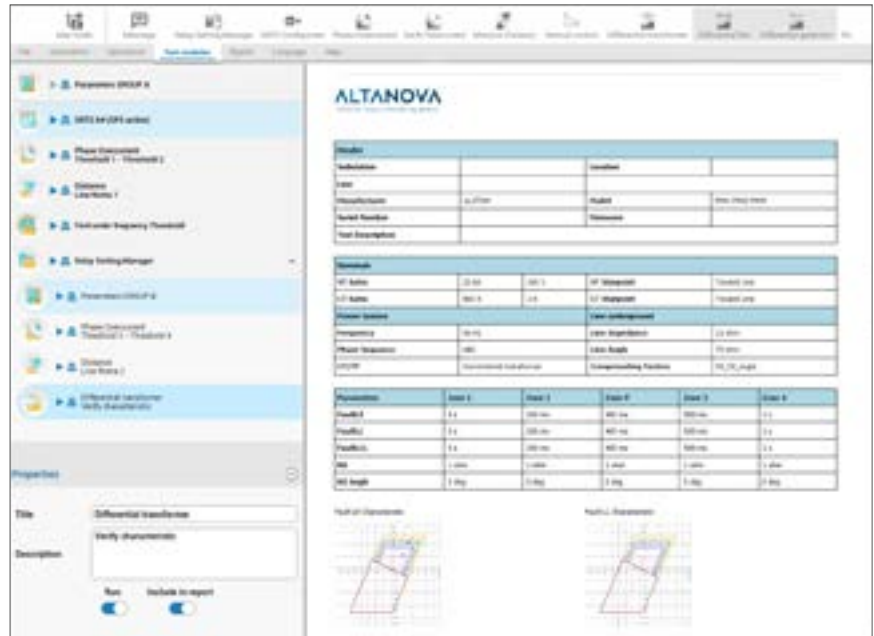
Report Manager

TDMS pro is able to create professional reports for each type of test performed. Thanks to its great flexibility, it is possible to generate detailed tables or the ones containing only the most relevant data. Reports can be customized by adding the company logo on the cover but also on each page.

TDMS PRO

| RELAY SETTINGS | RELAY SETTING MANAGER | DRTS CONFIGURATOR | CONFIGURATION OF DRTS TEST SET |

2 WAYS OF TESTING

TEST MODULES:
to perform a test of a protective function

TEST PLAN EDITOR:
to perform complex tests of multifunction relays

Manual Control

Sequencer

Playback Waveform

Distance

Overcurrent

Differential

Test Plan Editor

Manual Control

This software allows the operator to choose and set the test parameters with maximum freedom, exploiting the full potential of the DRTS test set. Each voltage and current output can have amplitude, angle and frequency changed independently. The tripping thresholds can be verified by setting gradual ramp tests or by varying the quantities generated with continuous slopes.
The test results are displayed in a table or a Cartesian graph.
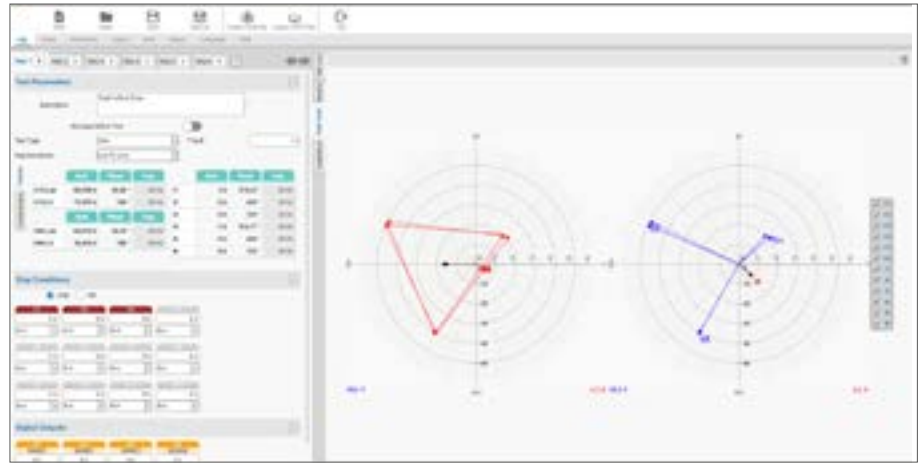
Playback Waveform (Comtrade)
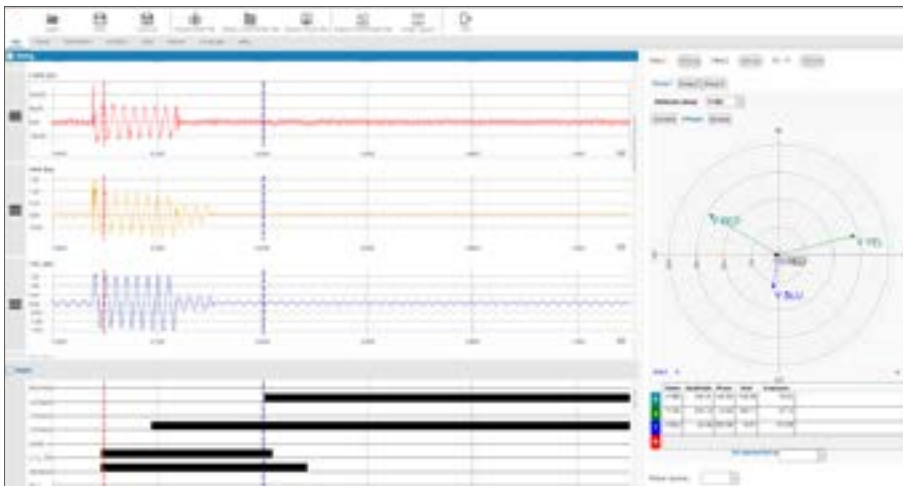
The Playback Waveform module is used for the accurate representation and reproduction of files containing the recording of a real fault event. In this way it is possible to verify the correct or incorrect behavior of the protective relay.
Playback Waveform allows a detailed analysis of the waveforms, evaluating the amplitude and phase values of each sample of the recording. It also allows to modify the recorded signals in order to study the behavior of the protection in similar, but not equal situations, to the real one.
The processing and verification functions are as follows:
- Variation of amplitudes on the whole recording or on parts of it
- Cut, copy, paste of the parts of the registration
- Measure the switching times of the relay's digital outputs
- Send a logic signal to the relay by switching a contact
- Calculation of the sequence components for each sample of the recording
- Display of the evolution of the fault in the impedance plain.

Sequencer

This module allows to create sequences of operations used to verify the programmable logic present in the protection relays, such as automatic re-closings or switch on to fault.
Sequencer allows the operator to choose and set the test parameters with maximum freedom, thanks to the integration of Relay Setting Manager. You can import the relay configuration and perform the simulation of faults.
Each step of the sequence allows to set a condition which, if fulfilled, lets the operator to proceed with the execution of the next step. The digital inputs and outputs are freely configurable independently in each phase of the sequence.
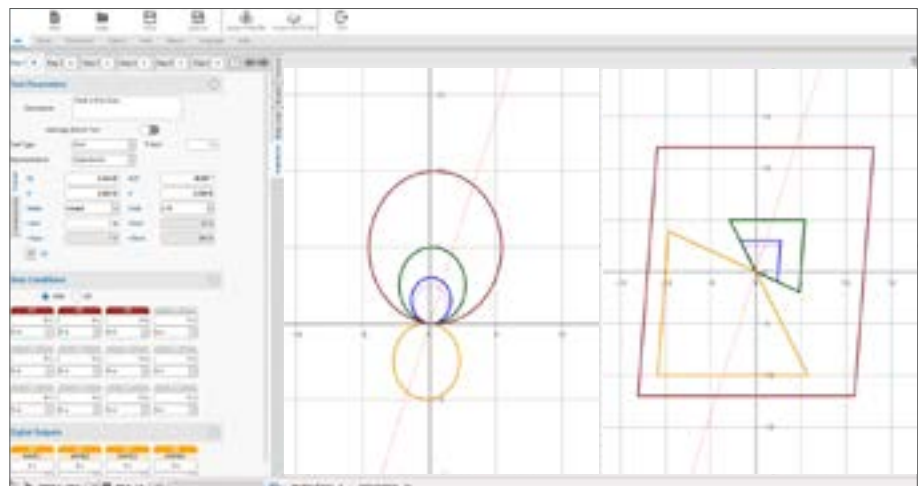
Distance

This module allows automatic tests to be carried out on all types and models of distance protection relays.

Thanks to the integration of the Relay Setting Manager, it is possible to import the relay configuration in its native RIO, XRIO, XML, TXT or CSV format and to perform calculations for the simulation of all types of faults (L-N, L-L, LL-N, LLL).

Once the settings of the protection have been loaded, its functionality can easily be verified by performing an automatic and complete check. It is possible to perform an automatic search on the basis of the tripping times if the parameters that describe the characteristic are not known.
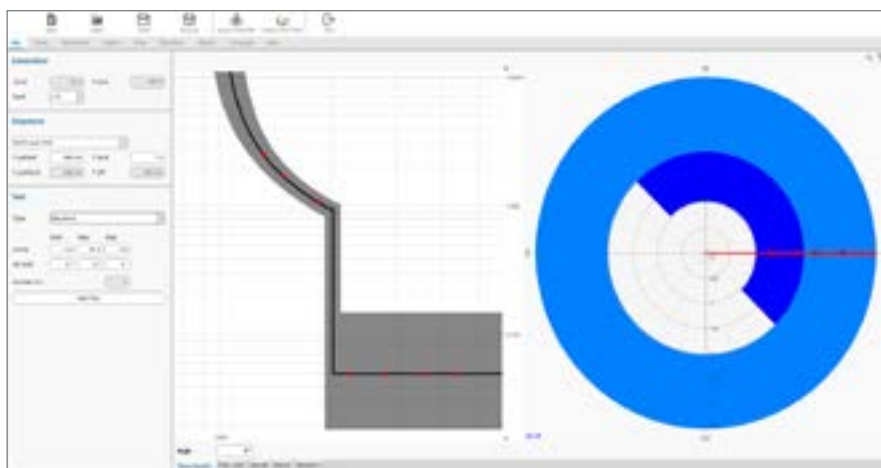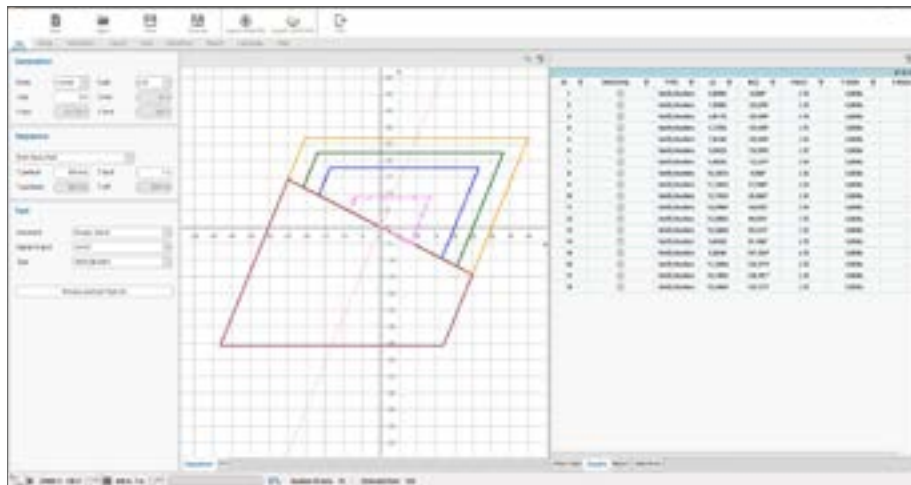
Overcurrent

This application provides the complete list of characteristic curves defined by the international IEC and IEEE standards. In few steps it is possible to choose the trip curves according to the relay settings, while through the Relay Setting Manager it is possible to automatically import the parameters exported by the protective relay.

The overcurrent characteristic can be expressed in values of primary side, secondary side or as a percentage of the rated current.

In the case of directional relays, the setting of the tripping sector is very flexible, just choose the convention of the positive angle - clockwise or counterclockwise, the sequence of phases, enter the limits of the tripping angles and the directional elements are ready to be tested.

Also, all functions for checking the protections for earth faults are available.


Differential

The differential module is divided into two distinct parts, one dedicated to checking the transformer differentials and the other for checking the generator differentials.

The application is designed to guide the operator while setting all the fundamental parameters. By using the Relay Setting Manager, it is possible to automatically import the parameters exported from the relay protection.

The differential currents are calculated by selecting the vector group and the transformer side, the type of fault (single-phase, phase-phase or three-phase), by indicating whether phase and homopolar sequence compensation is performed internally by the relay or if it has been performed through external transformers.

It is also possible to verify the functionality of the second and fifth harmonic blockings.

The verification of the differential intervention and of the characteristics of the harmonics can be performed completely automatically.
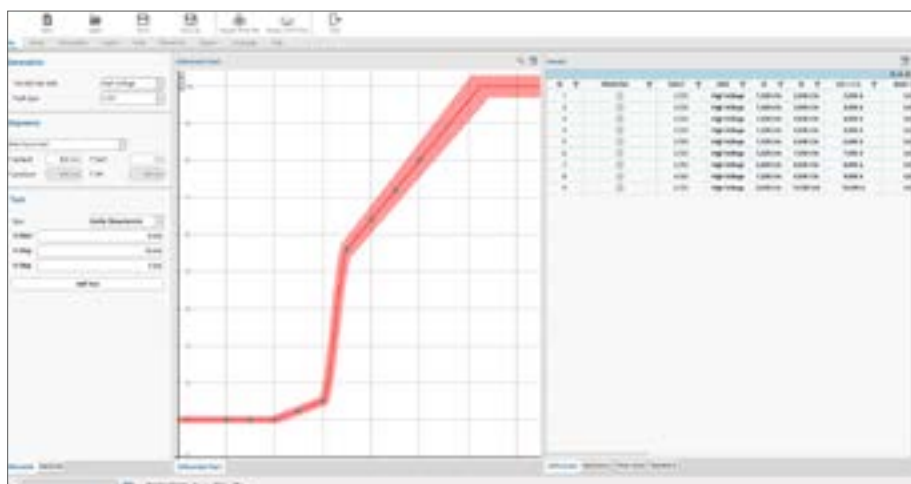
IEC 61850

Most of the modern protective relays today, as well as many secondary equipment use IEC 61850 protocol to exchange information amongst themselves. TDMS Pro uses a specific application to handle this protocol, and this application can be called from any other function of TDMS Pro. So, while using Distance or Differential or some other application of TDMS Pro, you can also be using the IEC 61850 application.

With the **IEC 61850 – 8** GOOSE messages - this application allows you to explore (sniff) the traffic on Substation Bus. It is also possible to Publish messages on a Substation Bus. A user can also select a message to be used as Virtual Contact that is later used to stop the generation of the test set, instead of using the relay's binary output. Apart from that we can also read the ICD, CID and SCD files to see the assignment of messages in the protective relay or the whole substation.

With the **IEC 61850 – 9 – 2** Sampled Values a user can generate up to 3 streams of 4 currents and 4 voltages and thus simulate up to 12 CTs and 12 VTs. The Sampled Values streams can be generated simultaneously with the normal voltage and current output channels of DRTS.

Transcope

Transcope is a module which allows the use of the corresponding option installed in DRTS test set. The option must be specified in the order.

With transcope the 10 binary inputs of DRTS can be configured as 10 analog voltage inputs expanding the performance of the DRTS with the following features:

- Three phase voltage and current measurement (with external clamp or shunts)
- Phase angle between imputs
- Frequency
- Harmonic content. Measurement of Total Harmonic Distortion and and of the distortion of all harmonic components up to the 40th.
- Oscilloscope
- Analog Transient recorder
- Sequence of event recorder.

Energy Meters, Transducers and PQ Meters

This software modules are designed for the automatic test and calibration of energy meters, transducers and PQ meters.

Energy meters

Automatic program for checking and calibrating single-phase and three-phase energy meters in accordance with IEC 687, 60736, 62053-21 standards.

- Calibration of counters in class 0.2 - 0.5 - 1
- Test of counters without sample counter, thanks to the
- high precision of the amplifiers of the DRTS test equipment
- Test of counters with sample counter
- Automatic and manual test
- Customizable test plans
- Automatic calculation of the error.

Transducers

Automatic program for the verification and calibration of power, voltage, current and frequency transducers.

- Automatic and manual test
- Automatic calculation of the error.

PQ Meters

It allows the automatic testing of quality meters according to the IEC 61000 - 4 - 30 standard.
This module carries out the tests by checking the following parameters:

- Frequency variations
- Voltage variations
- Presence of flickers
- Voltage and current harmonics / interharmonics
- Voltage unbalances
- Voltage transients.

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