

# ETP-1

*Transformer turn ratio measurement unit*



# ETP-1

## MAIN FEATURES

- The connection to the transformer taps is guided from the computer to avoid connection errors.
- Enables to select the number of the tap changer positions to be measured, as the software informs the position that should be measured each time.
- For each tap changer position, a three phase automatic measurement is performed. It is not necessary to change the connection to the transformer taps.
- The no load test current waveform is presented on the computer screen. It detects possible problems in the iron core.
- The test time for each three phase test position is less than 10 seconds.
- The measuring range has a ratio between 1:1 to 3000:1.

## DESCRIPTION

The measurement equipment ETP-1, is a unit that automatically performs the following measurements on all types of power, distribution or instrument transformers:

- Actual turn ratio for each position of the tap changer.
- No load current and power, at the test voltage.
- Polarity and phase angle between voltages and voltage/current.
- Automatically calculates results according with the connection group.

## APPLICATION

The user-friendly software, quick measuring speeds, and the ability to get instantaneous organized results (on the screen, recorded or printed), the ETP-1 has great advantages when performing the following tasks:

- Quality Control after the manufacturing process.
- Reception of new or repaired transformers.
- Detection of possible problems during the maintenance task itself.
- Integrates the data inside a predictive maintenance program.

Through the Turn Ratio Measurement and the ability to show this on line in a comparative graphic form for each of the tap changer position, possible problems of the wiring and/or in the tap changer such as short-circuit between turns, bad contacts, incorrect internal connection, open circuits, etc..., can be easily detected.

Using the value and waveform of the excitation current (No Load Current), possible problems in the iron core can be easily detected as well.

The power loss, the phase angle between the primary and secondary voltages ( $V1/V2$ ), and the phase angle between primary voltage and its current, is measured and shown to the user. These values and its relationship offer confirmation of the possible problems detected with the other measurements.

The Transformer Turn Ratio Measurement ETP-1 has a number of unique features which allows a substantial difference in application terms, with other TTR units that exist on the market.

The biggest advantage is the speed of the test (less than 10s per tap changer position) enabling the testing of all the

positions in a very short time. Not only this, but the results are automatically stored in a file, presented on the screen in figures and graphic terms and are very easy accessible for further analysis, if desired. The unit measures (phase to phase) in less than ten seconds per position, and presents the measured or calculated values of the following parameters:

- Turn ratio per phase, according with the connection group.
- Phase angle between primary and secondary voltage.
- Phase angle between primary current and voltage.
- Waveform of the primary current.
- Waveform of the primary and secondary voltage.
- Apparent (VA), reactive (VAR) and active (W) power at the test voltage.
- RMS value of the no load current at the test voltage.

The software control, accordingly with the type and group of connection that the transformer under test has, delivers the connection instructions to the operator through a color code avoiding connection errors.

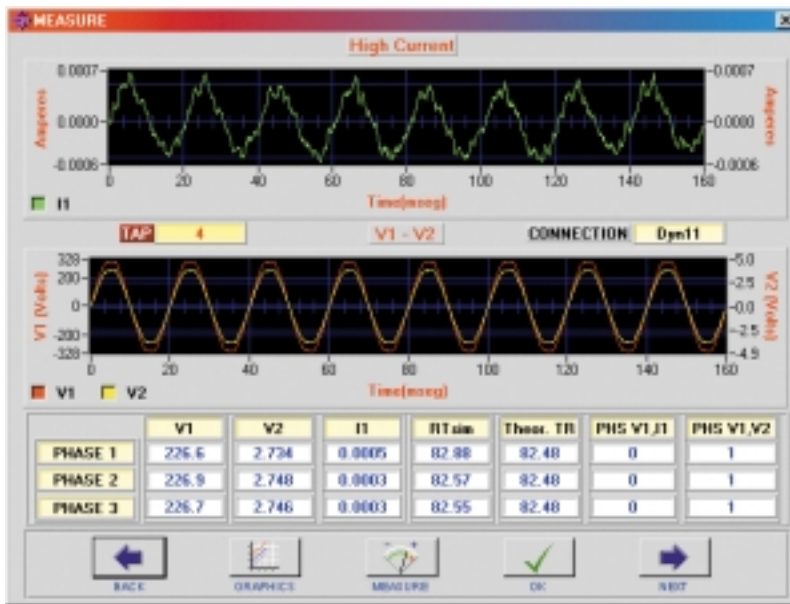
The software also allows selecting the type of tap changer, number of positions, and the number of taps to be tested. This selection configures a result score filled with all the results per position. Also it automatically presents a comparative graphic between the theoretical and actual measured values for each tap changer position.

The following types of voltage transformers can be tested with the ETP-1, despite the size and power:

- Power Transformers (single or three phase).
- Distribution Transformers (single or three phase).
- Power Autotransformers (single or three phase).
- Instrument Voltage Transformers.



## TEST RESULTS SCREENS OF THE ETP-1 UNIT



Measuring Screen

**ETPRT - TURN RATIO MEASUREMENTS**

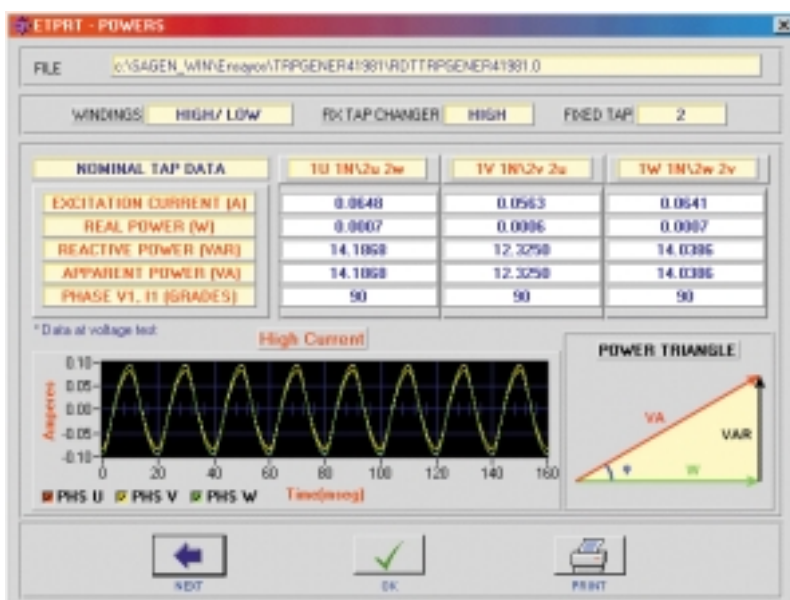
FILE c:\SAGEN\_WIN\Energy\TRPGENER41381\RDTRPGENER41381.0

TURN RATIO WINDINGS ALTA / BAJA FK TAP CHANGER HIGH FKED TAP 2

POS	Theoretic T.R	1U 1N/2v 2w		1V 1N/2v 2u		1W 1N/2w 2v	
		RTS.MED.DA	ERROR (%)	RTS.MED.DA	ERROR (%)	RTS.MED.DA	ERROR (%)
1	1.702	1.681	1.23	1.681	1.23	1.681	1.23
2	1.716	1.697	1.11	1.686	1.17	1.697	1.11
3	1.731	1.710	1.21	1.710	1.21	1.710	1.21
4	1.746	1.725	1.15	1.725	1.20	1.725	1.15
5	1.761	1.740	1.19	1.739	1.25	1.740	1.19
6	1.777	1.756	1.16	1.755	1.24	1.756	1.16
7	1.793	1.771	1.23	1.770	1.26	1.771	1.23
8	1.809	1.788	1.16	1.787	1.22	1.787	1.22
9	1.825	1.803	1.21	1.802	1.26	1.802	1.26
10	1.842	1.820	1.19	1.819	1.25	1.820	1.19
11	1.859	1.836	1.24	1.835	1.29	1.835	1.29

BACK GRAPHICS OK PRINT NEXT BACK PAGE NEXT PAGE

Results per tap changer position



Results of the measured current and power in no load conditions

## TECHNICAL SPECIFICATION

The ETP-1 is a fully computer controlled unit and is supplied with its associated software. The software can be installed in any PC with an RS-232 serial port, as are all the units which are compose in the EPT System.

### TEST SIGNAL

TEST VOLTAGE:	220 V AC RMS $\pm 10\%$
MAXIMUM TEST CURRENT:	2 A RMS

### VOLTAGE MEASUREMENT RANGE

CHANNEL V1 (PRIMARY VOLTAGE):	250 V AC maximum
CHANNEL V2 (SECONDARY VOLTAGE):	250 V AC maximum
TURN RATIO:	From 1/1 up to 3000/1
TURN RATIO ACCURACY:	$\pm 0.1\%$ of the reading

### CURRENT MEASUREMENT RANGE

CHANNEL I1 (PRIMARY CURRENT):	Auto-range form 0.1 mA up to 2 A
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### OTHER SPECIFICATION

<ul style="list-style-type: none"> <li>• Connection group and number of tap changer positions to test are selectable through the computer menu.</li> <li>• Automatic switching of the phase to be measured.</li> <li>• Measurement selection among: HV to LV, HV to Tertiary, and LV to Tertiary.</li> <li>• On line generation and presentation of the test results on the screen or printed. The test results are automatically recorded in a file, without any intervention of the user.</li> <li>• The ETP-1 is supplied with the necessary three phase test cables, for the primary and secondary connection. These are 8 meter lengths with an optional 12 meter extension lead, enabling to reach all transformer sizes.</li> </ul>
<b>DIMENSIONS:</b> Portable 19 inches standard 3U - 6.5 Kg.

### OTHER ASSOCIATED PRODUCTS

ETP-2	Recovery Voltage and Insulation Measuring Unit
ETP-3	Winding Resistance Measurement Unit
ETP-4	Short Circuit Impedance Measurement Unit
ETP SYSTEM	The total package of all 4 ETP Units.

DISTRIBUTED BY:

**EUROSMC, S.A.**

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