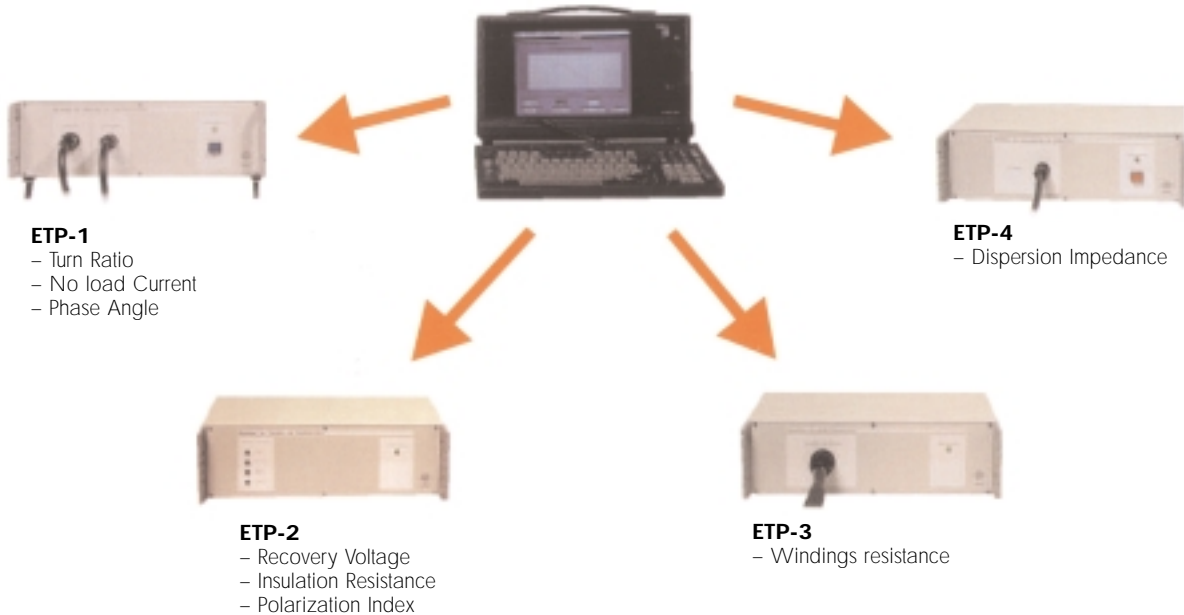


# ETP System

*Test System for predictive maintenance  
in Power Transformers*



# ETP System



## DESCRIPTION

ETP SYSTEM is a complete predictive maintenance instrument to detect the problems before unexpected failures appear in power transformers, autotransformers, and instrument transformers, reducing non-programmed shutdowns, transport, and catastrophic costs.

The main objective of the ETP system, is to optimise the maintenance costs, enabling an early detection of possible failures, improving management of the transformer data status, and reduces the time the transformer is out of service.

This system measures with a capacity to detect and confirm all possible problems in each of the following of the transformer parts:

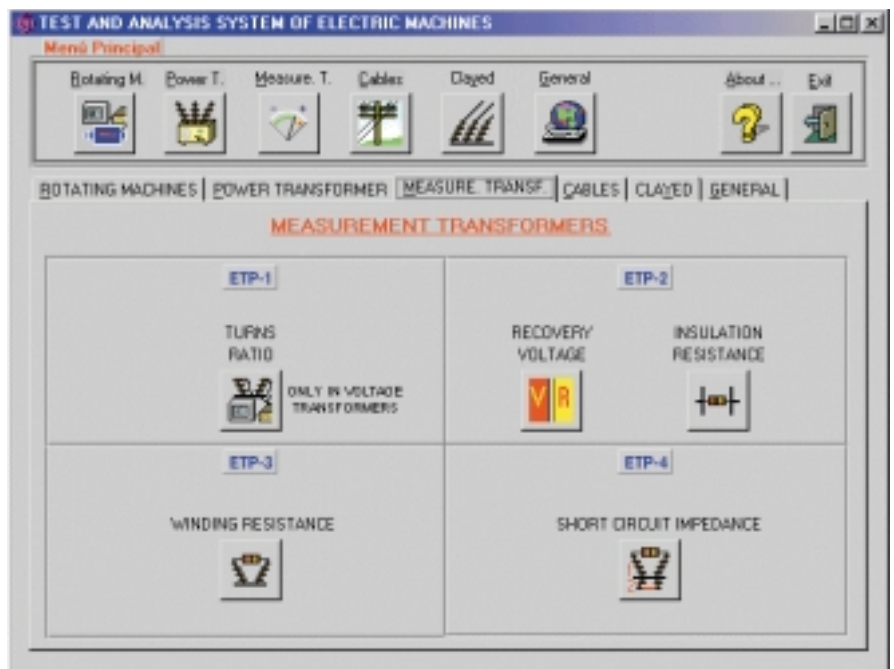
- Core.
- Windings integrity
- Liquid and solid insulation system
- Internal windings position
- Regulator

The ETP system makes the following measurements:

- Automatic three-phase turns ratio and an open circuit test.
- Recovery voltage test/Insulation Resistant test/Polarization Index.
- Automatic three-phase winding resistance test with temperature correction.
- Short circuit impedance / Short circuit current.

Besides the user-friendly software, automatic measurements, the test results, are numeric values and/or in graphic form are automatically stored, and test information can be printed.

In order to check and test incipient transformer problems, it's important to make all the tests in a relatively short time, and reduce external errors by measuring instruments and the operator.



Main menu screen

## ETP-1

### Transformer turn ratio test unit

#### DESCRIPTION

The ETP-1 is an automatic, computer driven test unit that allows the measure of the following parameters:

- Actual turn ratio on each position of the tap changer.
- No load power an currents, at the test voltage.
- Phase angle between V1-V2 and V1-I1.
- Automatic results, according with the connection group.

#### BENEFITS

- Connection to the transformer under test guided by the computer according with the particular connection group.
- Selection of the number of positions of the tap changer to be tested.
- Automatic Three phase measurements.
- Graphic real time display of the no load current wave form.
- The time for testing each tap changer position is less than 10 s.
- Turn ratio measurement range from 1:1 to 3000:1.

#### APPLICATIONS

Detection of possible problems in the tap changer and winding like short circuit between turns, poor internal contacts, open circuits, etc... and also, problems in the magnetic core through the visualization of the no load current.

It is possible to test any type of transformer, autotransformer or instrument transformer in single or three phase.

#### TECHNICAL SPECIFICATION

##### 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 |
|-------------------------------|----------------------------------|

## ETP-2

### Recovery voltage test unit

#### DESCRIPTION

The ETP-2 is an automatic, computer driven test unit that allows the measuring of the following parameters:

- Recovery voltage.
- Insulation resistance.
- Polarization index.

To measure them, it applies different levels of DC voltage, through a programmable voltage power supply, taking values automatically, on specified intervals. It allows the full study and analysis of the transformer paper/oil insulation status.

#### BENEFITS

- Graphic real time representation of the recovery voltage, insulation resistance, polarization index and time constant.
- Recovery voltage of the HV winding against the short circuited to ground LV winding.
- Insulation resistance and polarization index HV versus LV and HV versus LV + Ground.

#### APPLICATIONS

- The ETP-2 canwork with any transformer type.
- Allows to detect degradation of the solid/liquid insulation and to find whichisin bad condition.
- Ageing and contamination of the insulation.

#### TECHNICAL SPECIFICATION

##### TEST SIGNAL

|                         |                         |
|-------------------------|-------------------------|
| TEST VOLTAGE:           | 500/1000/1500/2000 V dc |
| TEST VOLTAGE STABILITY: | Better than $\pm 0.1\%$ |
| MAXIMUM CURRENT:        | 2 mA DC                 |

##### INSULATION RESISTANCE MEASUREMENT RANGE

|           |  |
|-----------|--|
| RANGES:   | 10 Mohm to 20 Gohm<br>20 Mohm to 50 Gohm<br>30 Mohm to 100 Gohm<br>40 Mohm to 100 Gohm                           |
| ACCURACY: | For values lower than 10 Gohm +/- 10% +/- 3 digits<br>For values between 10 Gohm to 100 Gohm +/- 5% +/- 3 digits |

##### RECOVERY VOLTAGE MEASUREMENT

|            |  |
|------------|--|
| RANGE:     | Auto-range from 0 up to 2000 V, 1 V resolution       |
| ACCURACY:  | $\pm 2\%$  |
| TIME BASE: | Selectable from 100 ms to 1000 ms in steps of 100 ms |

## ETP-3

### Windings resistance test unit

#### DESCRIPTION

The ETP-3 is an automatic, computer driven test unit that allows the measuring of the following parameters:

- Automatic, three phase winding resistance measurement.
- Automatic correction of the measured values to a particular temperature reference.
- Automatic calculus and representation of the composed (D or Y) and simple per phase resistance on each winding and tap changer position.

#### BENEFITS

- Three phase direct measurement without changes in the connection to the transformer of the test probes.
- Automatically, the unit magnetizes and demagnetizes the iron core between each measurement to stabilize the measuring current and to avoid dangerous discharges over instrumentation or, even, persons.
- Different measuring ranges, automatically selected, allow a total measuring range between 0.0001 Ohm to 1000 Ohms.
- Different test current injection ranges, automatically selected according with the load under test, allow a total test current range between 0.005 A to 20 A dc.
- Automatically corrects the obtained values per phase to a reference temperature.
- Changes in the test current or in the temperature does not affect to the accuracy of the measured values.

#### APPLICATIONS

Measures the ohmic value in all types of transformers and rotating machines, directly in three phase.

Allows to detect problems, like flying connections, defects in the tap changer, short circuit between turns, hot points in the windings, etc.

#### TECHNICAL SPECIFICATION

##### TEST CURRENT SIGNAL

|               |   |
|---------------|---|
| TEST CURRENT: | 5mA to 20 A in 5 auto-selected ranges.        |
| STABILITY:    | Better than $\pm 1\%$ of the selected current |

##### RESISTANCE MEASUREMENT

|                     |   |
|---------------------|---|
| RANGES:             | 10 $\mu\Omega$ , 100 $\mu\Omega$ , 1 $\Omega$ , 10 $\Omega$ , 100 $\Omega$ y 1000 $\Omega$ . Autorange. |
| MINIMUM RESOLUTION: | 1 $\mu\Omega$   |
| ACCURACY:           | $\pm 0,25\%$ of the reading $\pm 3$ digits  |

##### MEASURING MODE

Four wires, three phase, including the magnetization and demagnetization cycles.  
Winding Selection: HV, LV and Tertiary.

## ETP-4

### Dispersion impedance test unit

#### DESCRIPTION

The ETP-4 is an automatic, computer driven test unit that allows the measuring of the following parameters:

- Dispersion impedance.
- Short circuit current for the test voltage (200V).

#### BENEFITS

According with the transformer connection group the software guides the correct connection of the test leads.

- Measurement and graphic representation in real time of the short circuit current waveform, and the test voltage aswell.
- Calculates the dispersion impedance per phase.
- Allow measurements of primary versus secondary, primary versus tertiary, and secondary versus tertiary.

#### APPLICATIONS

Allow to detect possible coil displacements over the iron core.

#### TECHNICAL SPECIFICATION

##### TEST SIGNAL

|                  |        |
|------------------|--------|
| TEST VOLTAGE:    | 0-200V |
| MAXIMUM CURRENT: | 4 A    |

##### VOLTAGE MEASUREMENT

|                  |                        |
|------------------|------------------------|
| MEASURING RANGE: | 0 to 250V              |
| RESOLUTION:      | 0,1V.                  |
| ACCURACY:        | $\pm 2\% \pm 5$ digits |

##### IMPEDANCE/CURRENT RANGES

| RANGE | RESOLUTION. | IMPEDANCE    | ERROR                   |
|-------|-------------|--------------|-------------------------|
| 0,6A  | 1mA         | 100 $\Omega$ | $\pm 5\% \pm 10$ DIGITS |
| 6 A   | 10mA        | 1 K $\Omega$ | $\pm 5\% \pm 10$ DIGITS |

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