iCT1

Fully automatic Current and Voltage Transformer test set

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Key features

- Designed to test Current, Voltage and Combined Transformers
- Time saving testing: only 1 set up connection to perform all tests
- Main tests performed: Ratio & Phase Error, Excitation, Resistance, Accuracy, Burden
- 5-TAP integrated switchbox describing the behavior of the CT
- Able to test CT with saturation voltage up to 2kV and till 30kV applying DC indirect method
- Integrated Demagnetizer
- CT Explorer function: able to find the nameplate data of the CT
- Compact and lightweight
- Patented technology

Description

iCT1 is a fully automatic Current and Voltage Transformer test set, especially designed for testing CTs, VTs and Combined Transformers.
iCT1 grants a faster testing, thanks to its 5-TAP switchbox which allows to connect directly up to 5 taps, in this way the connection of the device is made only one time and without the need of any further manual operation.
The main tests performed by iCT1 are: Excitation, Accuracy, Ratio & Phase Error, Resistance and Burden and they are all executed in fully automatic mode, without user intervention. All tests are performed by generating current and voltage.

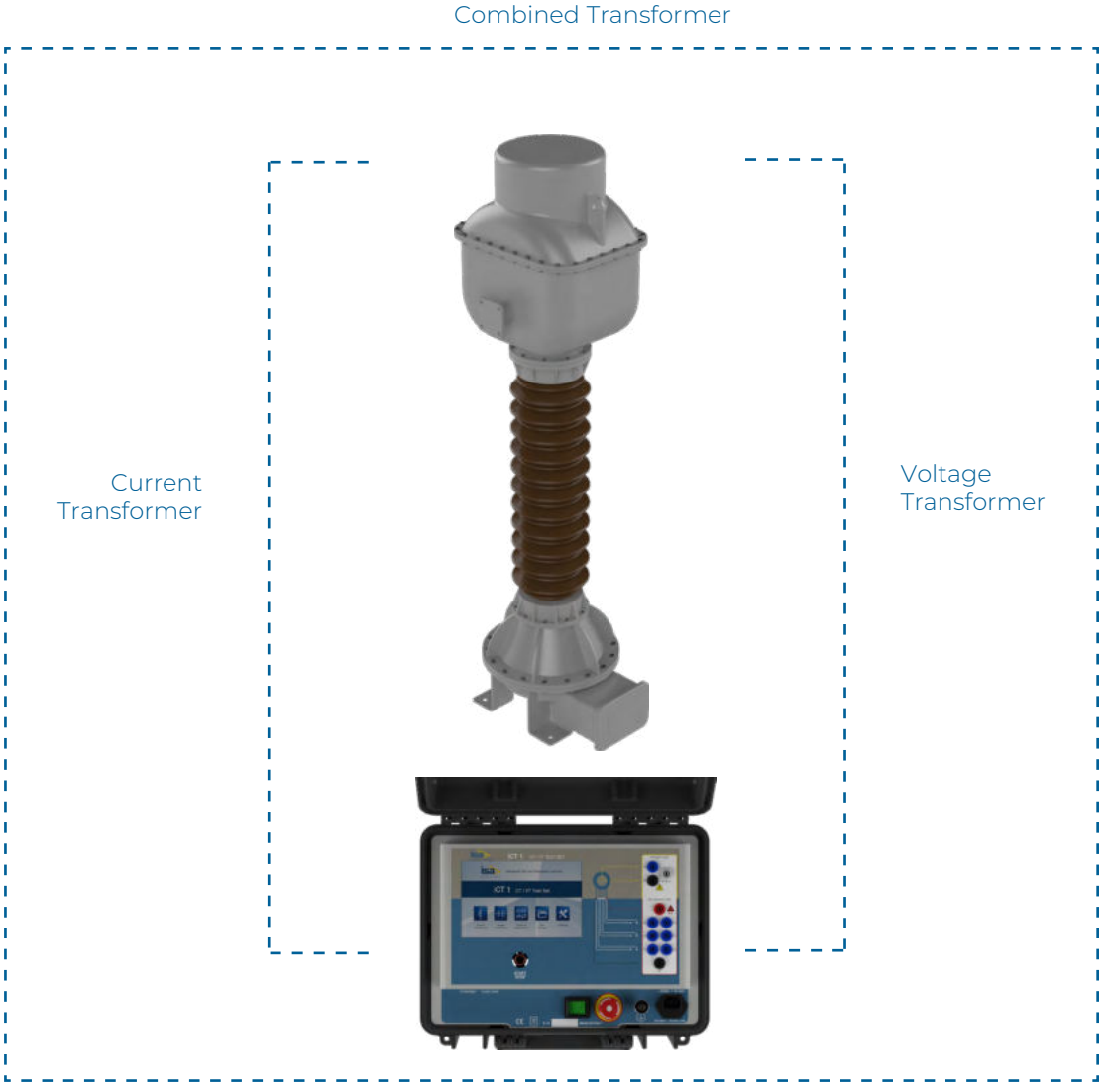
All the functionalities are managed by a 7'' color LCD touch screen interface, designed for the outdoor environment.

Test results are kept in a local memory or in a USB pen drive, and can be transferred to a PC along with settings, using ethernet (plug or wireless) connection.

Application

- Factory
  - iCT1 performs tests according to the international standards
  - High accuracy CT's up to class 0.1
  - Time saving testing, that allows a faster stage production
- Commissioning
  - Only one device for testing Current and Voltage Transformers and Combined Transformers
  - Able to test Current Transformers with a very high saturation voltage, up to 30 kV
  - Easy to carry

A combined solution for Current, Voltage and Combined Transformer testing



Current Transformer Tests

Turn Ratio and Polarity Voltage Mode
Burden Secondary Side
Excitation curve
Excitation curve DC method
Winding / Burden resistance
ALF / ISF
Leakage current AC
Accuracy test
CT Explorer
Demagnetizer

Voltage Transformer Tests

Ratio
Ratio electronics
Burden
No load current

In addition, the low AC voltage output supplies the external option HVB4000 (high voltage booster) for testing high voltage VTs over 240 kV.

Tests are performed in accordance with the following standards:

IEC EN 60044-1
IEC EN 60044-2
IEC EN 60044-5
IEC EN 60044-7
IEC EN 61869-x
ANSI / IEEE C57.13.1

Current Transformer Tests

• Turn Ratio and Polarity Voltage Mode

The ratio measurement is performed applying High Voltage AC to the CT secondary side, and measuring the CT primary voltage.

• Burden Secondary Side

The burden measurement is performed applying low AC current to the CT burden, and measuring the voltage drop.

• Excitation Curve (Knee Point)

The excitation curve is tested in two different methods:
• Standard Method: it is connected the high AC voltage output to the CT secondary side, slewing the voltage and measuring at the same time the output voltage and current.
• DC Curve Method: it is connected the low DC voltage generator to the CT secondary side, varying the voltage and measuring at the same time the output voltage and current.
Input parameters are taken from the CT Nominal Values window. The excitation curve test it's performed on all the connected taps to the instrument without any manual operation.

• Winding Resistance

The resistance (not impedance) is measured connecting the low DC current source to the winding or burden, and measuring the test current and the voltage drop.

• ALF / ISF

Purpose of the test is to calculate the ALF/ISF value using the Winding Resistance test results and the Burden Secondary Side test results. ALF = Accuracy Limit Factor and ISF = Instrument Security Factor. Input parameters: Burden and Winding test results. Results: ALF value.

• Leakage Current

The test is performed connecting the high AC voltage source between the CT secondary cabling and the ground or between the CT primary and secondary windings.

• Accuracy

The Accuracy test verifies automatically the CT characteristics (ratio error and phase error) according to the standards, typically at 120%, 100%, 20%, 5% and 1% of rated current.

• Demagnetizer

Purpose of this test is to apply a DC current with alternate polarity to the winding, in order to remove from the core the residual magnetism due to a previous winding resistance measurement.

CT Explorer

Sometimes the nameplate is not easy to be read or can be missing. Which nominal parameters have to be used in the test? iCT1 implements the CT Explorer functionality: from test results, thanks to the evaluation of the data, it is able to detect the most important nameplate data of the CT.

Voltage Transformer Tests

• Ratio

The ratio measurement is performed by applying high voltage to the VT primary, and measuring the VT secondary voltage.
The measurements are narrow filtered in order to reduce the noise, coming from the environment.

• Ratio Electronics

The ratio measurement is performed applying high voltage to the VT primary side, and measuring the low-level VT secondary voltage.
The measurements are narrow filtered in order to reduce the noise, coming from the environment.

• Burden

The burden measurement is performed applying low AC voltage to the VT burden, and measuring the corresponding current.

• Leakage Current

The test is performed connecting the high AC voltage source between the VT secondary cabling and the ground or between the VT primary and secondary windings.

Test Plan Editor

The Test Plan Editor is an innovative and advanced software module, allowing the operator to define a sequence of tests. The operator defines the desired sequence of tests and sets the parameters of each test: the Editor creates a sequence of tests to be performed automatically. The feature is available for the tests of both Current and Voltage transformers.

DC Method Test

Some transformers may have high saturation voltage above 2kV, in some cases they can arrive till to 30kV. Directly test this devices, due to high voltage, is hazardous for the user and requires a complex step-up transformer.
For these reasons iCT1 implements a low voltage method known as DC method.

This method allows iCT1 to be:

- Safe for the user (only 150 V dc)
- Lighter
- Faster

This provided solution builds a model that can determinate the behavior of the transformer at different frequencies and with different burdens.

Standard Connection Cables

- 1 main supply cable, 2 m long
- 1 grounding cable, 6 m long, 6 mm2, terminated on one side with a terminator, and on the other side with an earth connection clamp (2 cables for the optionally)
- 1 ETHERNET interface cable
- 1 USB pen drive
- 2 clamps for CT primary side connection. Clamp opening: 60 mm on the rear, 80 mm on the front
- 2 clamps for CT secondary side connection, with two sockets: one to connect the current or voltage, the other one to connect the measurement. Clamp opening: 60 mm on the rear, 80 mm on the front
- 6 alligator clips for measurements connections on secondary side (2 red, 3 black)
- 1 set of adaptors (tot. 10) from banana sockets to terminators, in different colors
- 2 connection cables for primary side measurements, 13m long (18 m long optionally)
- 6 connection cables for secondary side measurements, 6m long (10 m long optionally)
- 2 voltage connection cables, 6 m long (10 m long optionally) for generation on secondary side

Other Characteristics

Memory

- Up to 64 test plans
- More than 1,000 test results

Interfaces

- ETHERNET or WI-FI for the PC connection. The Ethernet port can be used also for remote service and maintenance
- USB port for the USB key: this serves to download test settings and results

Interfaces to external modules

- Commands to high voltage booster HBV4000

Main supply

100÷230 V ± 15%; 48÷62 Hz
Power consumption: Less than 1 kW in normal use
Dimensions and Weight: 410 (H)x340 (W)x205 (D) mm; 16 kg

Accessories

- User manual
- 5 spare fuses, type T8A
- Connection cables, provided in a case with handle

Technical Specification

Output Characteristics

Main generator

The main generator has 5 outputs:
- High AC voltage
- Low AC current
- Low DC current
- Low AC voltage
- Low voltage for excitation curve DC method

High AC voltage

The high AC voltage output up to 2kV is coming from a transformer that provides to insulate the outputs from the power supply.

- MAX Voltage 2000 V
- MAX Current 1 A

Low AC current

The output current can be manually adjusted using the front panel controls
- Imax 6A AC
- Vmax 100V AC
- Max Power 200VA

Low DC current

Output current can be manually adjusted using the front panel controls.
- Imax 6A DC
- Vmax 30V DC
- Max Power 180W

Low AC voltage

- Maximum output voltage: 180V AC
- Maximum output current: 3.5A AC
- Maximum output power:
  - Supply 230V : 400 VA (Power values with cosφ< 0.225)
  - Supply 110V : 350VA (Power values with cosφ< 0.175)

Low voltage for excitation curve DC method

- Maximum output voltage: 200V DC
- Maximum output current: 2Arms, 15A peak

Output frequency

- Frequency: 15Hz – 400Hz
- Frequency resolution: 10mHz
- Frequency accuracy: < 100 ppM; output voltage > 200 V

Other features of main outputs

- Zero crossing control: the generation starts and stops on the zero crossing
- Over-current: alarm message
- Thermal protection for: Power supply, Power amplifier, Power transformer. The operator is alerted by a message.

Input / Outputs Measurements

Input	Range	Resolution	Typical Error [<%rdg]	Typical Error [<%rg]	Guaranteed Error [±%rdg]	Guaranteed Error [±%rg]
AC current	10 A 1 A 0,1 A	1 mA 0,1 mA 0,01 mA	< 0,025 % < 0,025 % < 0,025 %	< 0,025 % < 0,025 % < 0,025 %	± 0,05% ± 0,10 % ± 0,15 %	± 0,1 % ± 0,05 % ± 0,05 %
DC current	15 A 1,5 A 0,15 A	1 mA 0,1 mA 0,01 mA	< 0,025 %	< 0,025 %	± 0,05 %	± 0,05 %
AC voltage primary side	300 V 30 V 3 V 300 mV	15 mV 1,5 mV 0,15 mV 0,015 mV	< 0,02 %	< 0,02 %	± 0,05 %	± 0,05 %
AC voltage secondary side	2100 V 200 V 20 V 2 V	100 mV 10 mV 1 mV 100 µV	< 0,02 %	< 0,02 %	± 0,05 %	± 0,05 %
DC voltage	200 V 20 V 2 V 200 mV 20 mV	10 mV 1 mV 100 µV 10 µV 1 µV	< 0,025 % < 0,025 % < 0,025 % < 0,025 % < 0,05 %	< 0,025 % < 0,025 % < 0,025 % < 0,025 % < 0,05 %	< 0,05 % < 0,05 % < 0,05 % < 0,05 % < 0,01 %	< 0,05 % < 0,05 % < 0,05 % < 0,05 % < 0,01 %

Type of measurement
True RMS for AC outputs DC component for DC outputs
Metering temperature coefficient
± 0,05 % / °C of the value ± 0,02 % / °C of the range

Ratio test

Accuracy for CT ratio measurements:

Ratio range	Typical accuracy	Maximum accuracy
0,8 ÷ 2000	± 0,02 %	± 0,05 %
2000 ÷ 5000	± 0,03 %	± 0,10 %
5000 ÷ 20000	± 0,05 %	± 0,20 %

Accuracy for VT ratio measurement

Ratio range	Typical accuracy	Maximum accuracy
1 ÷ 400	± 0,03 %	± 0,2 %
400 ÷ 1000	± 0,05 %	± 0,3 %
1000 ÷ 2500	± 0,05 %	± 0,5 %

Main Menu Display

Winding resistance test

Source	Resolution	Typical accuracy	Guaranteed accuracy
Low DC current 6 A max	0,1 mΩ	< 0,05 %	0,1 % 1 mΩ

Phase Angle

Metering range	Resolution	Accuracy (cosϕ 0.8 - 1)
0° ÷ 360.0°	0.01° (< 1 minute)	< 4 minutes (maximum) For amplitudes more than 10% of the metering range

Ordering information

CODE	MODULE
12183	iCT1 Standard test set with cable kit
10183	iCT1 Advance test set with cable Kit
10185C	iCt1 Software licence
17183	HVB4000 4kV High voltage booster for VT test
15183	Transit case
18183	Long cables test kit 18m for EHV CT

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