T1000 PLUS

Secondary Injection Relay Test Set

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Secondary Injection Relay Test Set

- Designed for testing relays and transducers
- Microprocessor controlled
- With phase angle shifter
- Frequency generator
- Test results and settings are saved into local memory
- High power outputs
- Oscilloscope function for current and voltage
- Large graphical display
- Compact and lightweight
- Possibility to synchronize several T 1000 PLUS test sets
- USB interface
- 2 auxiliary contacts for the test of autoreclosers

Application

The relay test set T 1000 PLUS is suited for the testing of the following types of relays:

RELAY TYPE	IEEE NO
Distance relay (3 sets)	21
Synchronizing device	25
Thermal	26
Under/over-voltage relay	27/59
Directional Power relay	32/92
Undercorrent	37
Negative sequence over-currrent	46
Phase sequence voltage relay	47
Incomplete sequence relay	48
Definite time over-current relay	50/50N
Inverse time over-current relay	51/51N
Power factor relay	55
Voltage balance relay	60
Ground detector relay	64
Directional over-current relay	67
Directional earth fault	67N
Automatic reclosing	79
Frequency relay	81>/81<
Load shed	81R
Pilot wire receiver relay	85
Motor protection	86
Differential protection relay (TD 1000)	87
Voltage directional relay	91
Tripping relay	94

Description

The instrument contains three separate generators:
- Main generator, that generates either AC current, AC voltage; DC voltage
- Auxiliary AC voltage generator, that generates an independent, phase shiftable AC voltage
- Auxiliary DC voltage generator, that generates the DC voltage that powers the relay under test

All outputs are adjustable and metered at the same time on the large, graphic LCD display.

T 1000 PLUS can operate without connection to a PC. With the multi-purpose knob and the LCD display it is possible to enter the MENU mode, that allows to set many functions, that make T 1000 PLUS a very powerful testing device, with manual and semi-automatic testing capabilities, and with the possibility to transfer test results to a PC via USB interface. These results can be recorded, displayed and analysed by the powerful TDMS software, that operates with all WINDOWS versions, starting from WINDOWS 98 included.

Specification

Main generator

The main generator has three outputs: currents, voltage AC, voltage DC. The following specifications apply to the separate usage of these outputs.

AC Current outputs

RANGE A AC	CURRENT OUTPUT A	MAXIMUM POWER VA	LOAD TIME s	RECOVERY TIME min
100	30	300	steady	-
	100	800	60	15
	250	1000	1	5
40	12	300	steady	-
	40	800	60	15
	80	1000	1	5
10	5	400	steady	-
	10	800	60	15
	20	1000	2	5

AC Voltage outputs

RANGE V AC	VOLTAGE OUTPUT V	MAXIMUM POWER VA	LOAD TIME min	RECOVERY TIME min
250	250	500	steady	-
	250	750	10	45

DC Voltage outputs

RANGE V DC	VOLTAGE OUTPUT V	MAXIMUM POWER W	LOAD TIME min	RECOVERY TIME min
300	300	300	steady	-
	300	500	10	45

Other features of main inputs

- Zero crossing control. Main AC outputs are generated and stopped as the output waveform crosses zero
- High resolution adjustment control
- Overload alarm message
- Thermal protection
- Possibility to reduce the output power to one fifth for low burdens

Auxiliary AC voltage output

- The auxiliary AC voltage output is isolated from the main AC current and voltage
- Range selection: software driven, by the multi-function knob and LCD display
- Auxiliary voltage power: 30 VA, continuous duty, at full range; 40 VA for 1 minute
- Push-button to enable or disable the output

Auxiliary AC voltage output

RANGE V	MAX POWER VA
65	40
130	40
260	40

Phase angle shifting

- Possibility to phase shift the auxiliary AC voltage output with respect to the main current or voltage
- Phase angle adjustment: via the multi-function knob
- Phase angle range: from 0° to 360°
- Adjustment resolution: 1° (degree)

Frequency generator & frequency r.o.c.

Possibility to change the frequency of the auxiliary AC voltage output. Frequency generation characteristics:

- Frequency range: 15 Hz to 550 Hz
- Frequency adjustment: 1 mHz
- Rate of change: 1 mHz/s to 99.99 Hz/s

Timer

The electronic digital timer has a fully automatic start and stop, both for make and break of the input, that can be either a clean (dry) contact or a contact under voltage (wet).

- Metering range, can also be performed in cycles
- Possibility to test automatic reclosers
- Maximum number of reclosing commands: 99

2 auxiliary contacts are available

Contacts range: 5 A; 250 V AC/DC

Output Current and Voltage Measurements

The following outputs are displayed at the same time on the LCD:

Current measurement

RANGE	RESOLUTION	ACCURACY
From 0 to 9.999 s	1 ms	± (1 ms + 0.005%)
From 10.0 to 99.99 s	10 ms	± (10 ms + 0.005%)
From 100.0 to 999.9 s	100 ms	± (100 ms + 0.005%)
From 1.000 to 9.999 s	1 s	± (1 s + 0.005%)

OUTPUT	RANGE	RESOLUTION	ACCURACY
10 A	1.999 A	1 mA	± (1% + 5 mA)
	19.99 A	10 mA	± (1% + 20 mA)
40 A	7.999 A	4 mA	± (1% + 20 mA)
	79.99 A	40 mA	± (1% + 80 mA)
100 A	19.99 A	10 mA	± (1% + 50 mA)
	199.9 A	100 mA	± (1% + 200 mA)
	249.9 A	100 mA	± (1% + 200 mA)

Voltage measurement

OUTPUT	RANGE	RESOLUTION	ACCURACY
250 V AC	1.99 V	1 mV	± (1% + 50 mV)
	19.99 V	10 mV	± (1% + 50 mV)
	199.9 V	100 mV	± (1% + 200 mV)
	299.9 V	300 mV	± (1% + 300 mV)
300 V DC	19.99 V	10 mV	± (0.5% + 50 mV)
	199.9 V	100 mV	± (0.5% + 200 mV)
	399.9 V	300 mV	± (0.5% + 300 mV)
65,130 V AC	19.99 V	10 mV	± (1% + 20 mV)
	199.9 V	100 mV	± (1% + 200 mV)
260 V AC	19.99 V	10 mV	± (1% + 20 mV)
	199.9 V	100 mV	± (1% + 200 mV)
	299.9 V	300 mV	± (1% + 300 mV)
130 V DC	19.99 V	10 mV	± (0.5% + 20 mV)
	199.9 V	100 mV	± (0.5% + 200 mV)
260 V DC	19.99 V	10 mV	± (0.5% + 20 mV)
	199.9 V	100 mV	± (0.5% + 200 mV)
	299.9 V	300 mV	± (0.5% + 300 mV)

Angle and frequency measurement

• Via the multi-function menu knob it is possible to select the measurement of angle or frequency
• Readings, resolution and accuracy: see table

MEASUREMENT	RANGE	RESOLUTION	ACCURACY
Phase	0-360	1°	1° ± 1 Digit
Frequency	15.000 - 499.999	1 mHz	±(0.1% +1 mHz)

Other measurement

MEASUREMENT	UNIT
Active Power, P = I*V*cos (j)	W
Reactive Power, Q = I*V*sin(j)	VAr
Apparent Power, S = I*V	VA
Impedance, Z = V/I	Ohm, °
Active Impedance Component, R = Z* cos(j)	Ohm
Reactive Impedance Component, X = Z* sin(j)	Ohm

External inputs measurement

• It is possible to meter current or voltage input

External current measurement

• Two inputs: 20 mA and 10 A
• Range, resolution, accuracy: see table below

INPUT	RANGE	RESOLUTION	ACCURACY
20 mA	0.02 A DC	0.1 mA	± (0.5% + 0.1 mA)
10 A	1.999 A AC	1 mA	± (1% + 2 mA)
10 A	9.99 A AC	10 mA	± (1% + 20 mA)
10 A	1.999 A DC	1 mA	± (0.5% + 2 mA)
10 A	9.99 A DC	10 mA	± (0.5% + 20 mA)

External voltage measurement

• Maximum input voltage: 600 V, AC or DC
• Range, resolution and accuracy: see table below

RANGE	RESOLUTION	ACCURACY
9.999 V AC	2 mV	± (1% + 10 mV)
99.99 V AC	10 mV	± (1% + 20 mV)
599.9 V AC	100 mV	± (1% + 200 mV)
9.999 V DC	2 mV	± (0.5% + 10 mV)
99.99 V DC	10 mV	± (0.5% + 20 mV)
599.9 V DC	100 mV	± (0.5% + 200 mV)

Other Characteristics

Local memory

• Test settings can be stored and recalled from the T 1000 PLUS local memory: up to 10 test settings
• Test results can be saved into a permanent local memory: up to 500 test results saved
• When the PC is connected setting can also be created and transferred into T 1000 PLUS using the software TDMS
• When the PC is connected test results can be transferred to the PC via USB port using the software TDMS, for saving and printing

Resistors

A set of resistors is supplied for the test of low impedance relays. Available values:

RESISTANCE OHM	POWER W	MAX CURRENT A
0,5	50	10
1	50	7
22	50	2.15
470	50	0.33
1000	50	0.22
2200	50	0.15

Interface

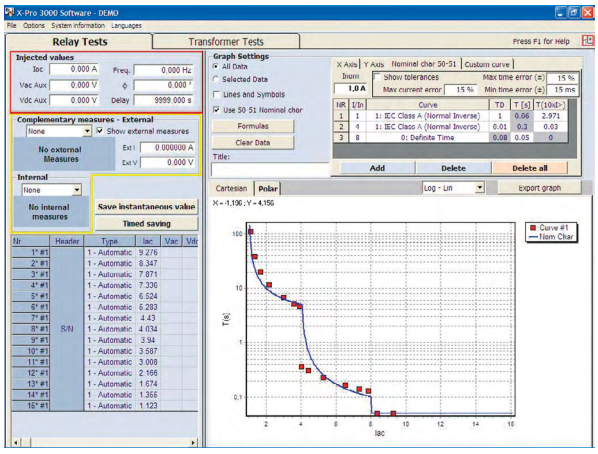
Interfaces for connection to PC: USB.

Power supply

• Mains supply to be clearly indicated in purchase order: 230 V ± 15% 50-60 Hz or 120 V ± 15%50-60 Hz
• Maximum supply current: 5 A

Standard accessories

The instrument comes complete with the following items:
• Set of standard test cables
• Mains cable
• USB cable
• User's manual
• Spare fuses (no. 5), T5A
• Software TDMS with serial cable



TDMS - Relay Test Result

Weight and dimension

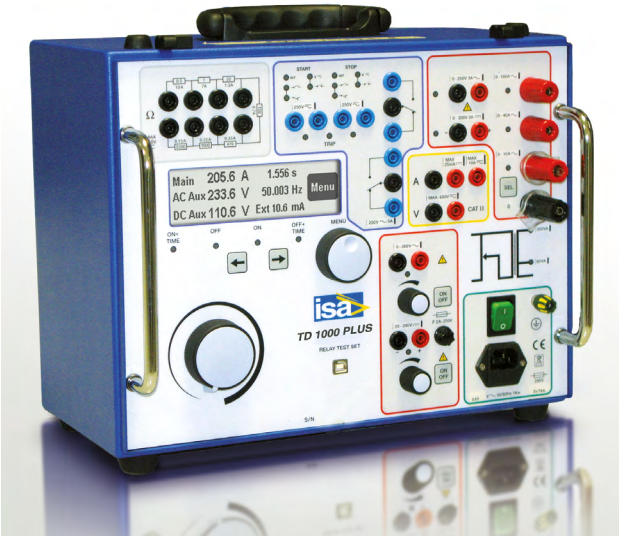
• Dimensions: 380 (w) x 300 (d) x 240 (h) mm
• Weight: 19 kg

Case

Alluminium case with cover and handle.

TD 1000 Plus

With two current outputs to test differential relay



TD 1000 Plus has two current outputs to test differential relay characteristic curve and not only the pick-up current. In addition, the frequency of this current can be changed as with voltages: this allows to test the second harmonic restraint characteristic of the differential relay. Last, the steady voltage output power is increased from 30 VA to 50 VA.

• Auxiliary AC voltage. Power: 40 VA, continuous duty, at full range; 50 VA for 1 minute. For lower voltages the limiting current is the following.

MAX CURRENT A	VOLTAGE V
20	3

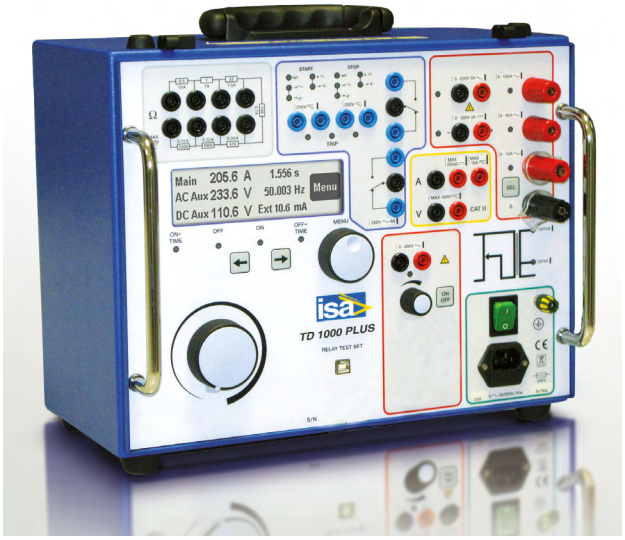
All other performances are the same as T 1000 Plus.

The request of this model must be specified at order.

TD 1000 Plus 15 Hz

With two current outputs to test differential relay and with high power at 15 Hz

TD 1000 Plus 15 Hz is identical to TD 1000 Plus except for the high power and full range at 15 Hz.
This allows testing old railway and generator protection relays.
TD 1000 Plus 15 Hz does NOT have the DC battery simulator.



• Power at 15 Hz: 25 VA on all ranges
• No Auxiliary DC voltage supply
• Weight: 21 kg

All other performances are the same as T 1000 Plus.
The request of this model must be specified at order.

T 1000 E Plus
Higher AC voltage outputs

In this model, AC voltage outputs are higher than in the standard version.

• Main AC voltage output
• Auxiliary AC voltage. Power: 30 VA, continuous duty, at full range; 40 VA for 1 minute. For lower voltages the limiting current is the following

All other performances are the same.
The request of this model must be specified at order.

RANGE V	MAX CURRENT mA
65	500
130	250
500	62

Options

Heavy duty transport case

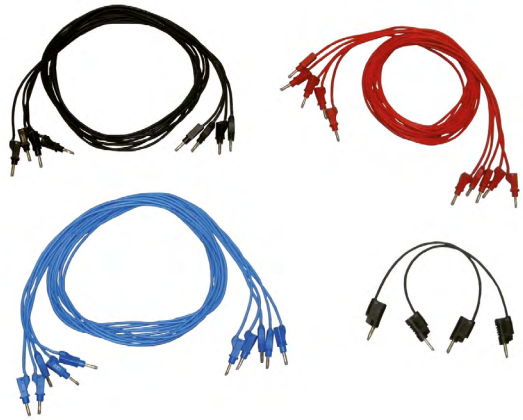
Heavy duty transport case in black plastics, with wheels, cover and handle.

Heavy duty transport case

Connections cables

The kit includes cables for any kind of connection.

T 1000 PLUS - Standard cable kit



T 1000 PLUS - Optional cable kit

D 1000 Differential relay test module

The differential relay test module D 1000 allows the test of the differential relay curve and also of the harmonic restraint characteristic.
The module performances are the followings:

- Input: from the test set auxiliary AC voltage output
- Output: 0 to 5 A CA
- Output power: 5 VA
- Dimension: 325 x 290 x 290 mm
- Weight: 7 kg

D 1000 Differential relay test module

FT 1000 current filter

This external module removes AC current distortions. It is connected in series to the relay under test, and guarantees a sinusoidal waveform also when testing current relays with reverse time characteristics, or with heavily saturating burdens, that tend to distort the current waveform.

- Current input ranges: 0.5 - 2 - 10 - 50 - 100 - 200 A, on terminal bushings
- Maximum power yield: 800 VA
- Filter burden: less than 200 VA at 200 A.

The burden is proportional to the range (50 VA at 50 A)

- Service: 50 A continuous service; 200 A for 30 s
- Selection of the mains frequency: 50 or 60 Hz, by switch
- Dimensions: 220 x 250 x 310 mm
- Weight: 15 kg

SHA 1000 scanning head

SHA 1000 is a scanning head that eases the test of energy meters. It is an universal scanning head because it can be used both with LED impulse electronic meters and Ferraris rotating disk meters; selection is performed via a switch located on the scanning head. In addition to this, a knob allows to adjust the sensitivity of the head. With rotating disk the sensor uses a green light beam that optimizes the recognition of any type of mark. With LED recognition the following specification applies:

- Impulse duration: more than 60 us
- With an LED signal having a space ratio 1:2, the frequency must be less than 500 Hz.
- Light wavelength: 500 to 960 nm (red: green and blue ARE NOT detected)

Outputs transducer for low level signal relays

The outputs transducer is an option that allows converting the high current and voltage outputs into low voltage signals.
The option is made of three components:
• The Outputs transducer, complete with the interface connector
• The connection cable from the transducer to a two BNC connectors and one RJ-45 connector, for the ABB relays REF542PLUS and REF601
• The connection cable from the transducer to one RJ-45 connector, for the THYSENSOR series of THYTRONIC relays

The items can be ordered separately: the Output transducer alone, or also one cable or both.

Output transducer module

Applicable Standard

The test set conforms to the EEC directives regarding Electromagnetic Compatibility and Low Voltage instruments.

• **Electromagnetic Compatibility:**
Directive no. 2004/108/EC

• **Low Voltage Directive:**
Directive n. 2006/95/EC.
Applicable standards, for a class I instrument, pollution degree 2, Installation category II:

- CEI EN 61010-1. In particular:
- Inputs/outputs protection: IP 2X - CEI 70-1
- Operating temperature: 0 to 50°C; storage: -40°C to 70°C
- Relative humidity: 5 - 95% without condensing

Ordering Information

CODE	MODULE
91093	T 1000 PLUS complete with Software TDMS and standard set of cables - 230V
81093	T 1000 PLUS complete with Software TDMS and standard set of cables - 120V
94093	TD 1000 PLUS complete with Software TDMS and standard set of cables - 230V
96093	TD 1000 PLUS complete with Software TDMS and standard set of cables - 120V
93093	TD 1000 PLUS 15 Hz complete with Software TDMS and standard set of cables - 230V
95093	TD 1000 PLUS 15 Hz complete with Software TDMS and standard set of cables - 120V
92093	T 1000 E PLUS (500V Aux Voltage outputs) complete with Software TDMS and standard set of cables- 230 V

CODE	MODULE
17093	Heavy Duty Transport Case
18093	Set of additional test cables for models T 1000 PLUS / T 1000-E PLUS / TD 1000 PLUS
40093	D 1000 differential relay test module
16093	FT 1000 Mains Filter Unit
43102	SHA 1000 scanning head
13093	Outputs transducer with interface connector and cables
11093	Connection cable and RJ-45 connector for ABB relays (REF542PLUS and REF601)
12093	Connection cable for THYTRONIC relays (Thysensor series)

T 1000 Plus / T 1000 E Plus / TD 1000 Plus Family - Features Comparison Table

	MAIN I AC MAX A	MAIN V AC MAX V	MAIN V DC MAX V	AUX V AC MAX V	AUX I AC	AUX I/V AC POWER @ 15 Hz VA	AUX V DC MAX V
T 1000 Plus 120 V	160	250	300	250	-	10	240
T 1000 Plus 230 V	250	250	300	250	-	10	240
T 1000 E Plus	250	500	300	500	-	10	240
TD 1000 Plus 120 V	160	250	300	250	20	10	240
TD 1000 Plus 230 V	250	250	300	250	20	10	240
TD 1000 Plus 15 Hz 120 V	160	250	300	250	20	25	-
TD 1000 Plus 15 Hz 230 V	250	250	300	250	20	25	-

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