

T 1000 PLUS



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 and RS232 interface
- 2 auxiliary contacts for the test of autoreclosers

A P P L I C A T I O N

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
Under/over-voltage relay	27/59
Directional Power relay	32
Field relay	40
Reverse phase current relay	46
Phase sequence voltage relay	47
Incomplete sequence relay	48
Instantaneous over-current relay	50
Inverse time over-current relay	51
Power factor relay	55
Voltage balance relay	60
Ground detector relay	64
Directional over-current relay	67
Phase angle out of step relay	78
Automatic reclosing relay	79
Frequency relay	81
Pilot wire receiver relay	85
Lockout relay	86
Differential protection relay	87
Voltage directional relay	91
Power directional relay	92
Tripping relay	94



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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 or RS232 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.

T 1000 PLUS 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
10	5	400	steady	-
	10	800	60	15

AC voltage outputs

RANGE V AC	VOLTAGE OUTPUT V	MAXIMUM POWER VA	LOAD TIME s	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 s	RECOVERY TIME min
300	300	300	steady	-
	300	500	10	45

Other features of main outputs

- . 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
62.5	40
125	40
250	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: 40 Hz to 500 Hz.
- . Frequency adjustment: 1 mHz.
- . Rate of change: 1 mHz/s to 99.99 Hz/s.

Auxiliary DC voltage output

- . DC voltage range: 10...130 V or 20...240 V.
- . DC voltage power: 90 W at full range, continuous duty, with a current limit of 0.9 A @ 130 V and 0.45 A @ 240 V.
- . Push-button to enable or disable the output

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.

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%)

- . Possibility to test automatic reclosers.
- . Maximum number of reclosing commands: 99.

2 auxiliary contacts are available

- . Contacts range: 5 A; 250 V AC; 120 V DC.

OUTPUT CURRENT AND VOLTAGE MEASUREMENTS

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

Current measurement

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	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	40.000-499.999	1 mHz	±(0.1% + 1 mHz)

Other measurements

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.

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. Range, resolution, accuracy: see table below.

INPUT	RANGE	RESOLUTION	ACCURACY
20 mA	0.02 A DC	0.1 mA	$\pm (0.5\% + 0.1 \text{ mA})$
10 A	1.999 A AC	1 mA	$\pm (1\% + 2 \text{ mA})$
10 A	9.99 A AC	10 mA	$\pm (1\% + 20 \text{ mA})$
10 A	1.999 A DC	1 mA	$\pm (0.5\% + 2 \text{ mA})$
10 A	9.99 A DC	10 mA	$\pm (0.5\% + 20 \text{ mA})$

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	$\pm (1\% + 10 \text{ mV})$
99.99 V AC	10 mV	$\pm (1\% + 20 \text{ mV})$
599.9 V AC	100 mV	$\pm (1\% + 200 \text{ mV})$
9.999 V DC	2 mV	$\pm (0.5\% + 10 \text{ mV})$
99.99 V DC	10 mV	$\pm (0.5\% + 20 \text{ mV})$
599.9 V DC	100 mV	$\pm (0.5\% + 200 \text{ mV})$

OTHER CHARACTERISTICS

T 1000 PLUS 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 or RS232 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 and serial RS232.

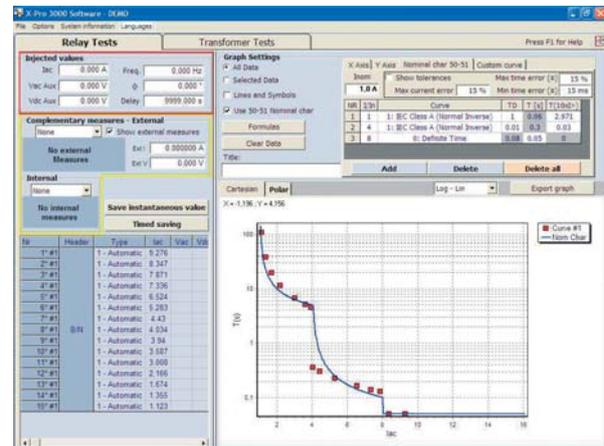
Power supply

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

Standard accessories

The instrument comes complete with the following items:

- . Set of test cables;
- . Mains cable;
- . RS232 and USB cable;
- . User's manual;
- . Spare fuses (no. 5), T5A.
- . Software TDMS with serial cable.



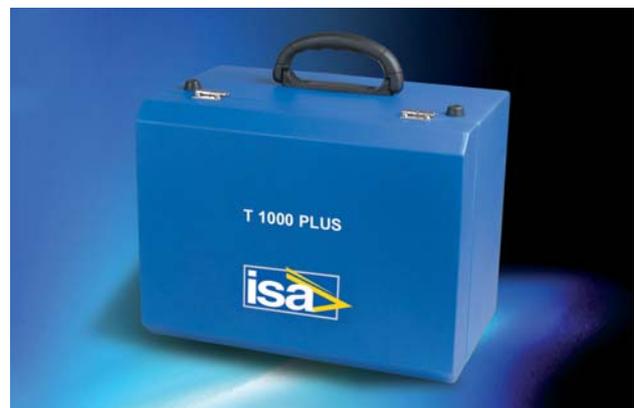
TDMS - Relay Test Result

Weight and dimension

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

Case

Alluminium case with cover and handle.



OPTIONS

T 1000 E PLUS

In this model, maximum main and auxiliary AC voltages are 500 V instead of 250 V.

Heavy duty transport case



Connection cables

The kit includes 17 cables in all, for any kind of connection.

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.

FT 1000 current filter

This external module removes AC current distortions.

T 1000 PLUS-15 Hz

In this model, the minimum auxiliary AC voltage frequency is 15 Hz.

Maximum output power becomes 20 VA. The auxiliary DC voltage is removed. Other characteristics are unchanged.

APPLICABLE STANDARDS

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

A) Electromagnetic Compatibility:

Directive no. 2004/108/EC

B) 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: 10 - 80% without condensing.

Ordering information:

CODE	MODULE
	T 1000 PLUS
91093	T 1000 PLUS complete with Software TDMS - 220V
81093	T 1000 PLUS complete with Software TDMS - 120V
30093	T 1000 E PLUS (500V Aux Voltage outputs) - 220 V complete with Software TDMS
71093	T1000 PLUS 15 Hz
17093	Heavy Duty Transport Case
18093	Set of test cables for models T 1000 PLUS
40093	D 1000 differential relay test module
41024	FT 1000 PLUS Mains Filter Unit

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ISA Srl
Via Prati Bassi, 22
21020 Taino VA - Italia
Tel +39 0331 956081
Fax +39 0331 957091
Web site: www.isatest.com
E-Mail: isa@isatest.com

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