



T/1000 RELAY TEST SET

- MICROPROCESSOR CONTROLLED
- WITH PHASE ANGLE SHIFTER AND FREQUENCY GENERATOR
- DESIGNED FOR TESTING RELAYS AND TRANSDUCER
- TEST RESULTS AND SETTINGS ARE SAVED INTO LOCAL MEMORY
- HIGH POWER OUTPUTS
- LARGE GRAPHICAL DISPLAY
- COMPACT AND LIGHTWEIGHT
- POSSIBILITY TO SYNCHRONIZE MORE T/1000 TEST SET

APPLICATION

THE RELAY TEST SET T/1000 IS SUITED FOR THE TESTING OF THE FOLLOWING TYPES OF RELAYS:

RELAY TYPE	IEEE No
Distance *	21
Synchronizing	25
Over/under-voltage	27 - 59
Power, varmetric or wattmetric	32 - 92
Under current	37
Reverse phase current	46
Instantaneous overcurrent	50
Ground fault	50N
Timed overcurrent	51
Power factor	55
Directional overcurrent	67
Directional ground fault	67N
Automatic reclose	79
Frequency	81
Frequency rate of change	81
Motor protection	86
Differential **	87
Directional voltage	91
Tripping relay	94
Voltage regulation	
Thermal	
Timers	

* Three T/1000 are necessary
** Differential circuit



The instrument contains three separate generators:

- . Main generator, that generates either a.c. current, a.c. voltage; d.c. voltage;
- . Auxiliary a.c. voltage generator, that generates an independent, phase shiftable a.c. voltage;
- . Auxiliary d.c. voltage generator, that generates the d.c. voltage that feeds the relay under test.

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

T/1000 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 a very powerful testing device, with manual and semi-automatic testing capabilities, and with the possibility to transfer test results to a PC via the RS232 interface. These results can be recorded, displayed and analysed by the powerful X.PRO-1000 software, that operates with all WINDOWS versions, starting from WINDOWS 98 included.

T/I 1000 SPECIFICATION

I. MAIN GENERATOR

The main generator has three outputs: currents, voltage a.c., voltage d.c.. The following specification apply to the separate usage of these outputs. It is possible to use them at the same time, provided that the total maximum load is not exceeded.

A.C. CURRENT OUTPUTS

RANGE A a.c.	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

A.C. VOLTAGE OUTPUT

RANGE V a.c.	VOLTAGE OUTPUT V	MAXIMUM POWER VA	LOAD TIME min	RECOVERY TIME min
250	250	500	STEADY	-
	250	750	10	45

D.C. VOLTAGE OUTPUT

RANGE V d.c.	VOLTAGE OUTPUT V	MAXIMUM POWER W	LOAD TIME min	RECOVERY TIME min
300	300	300	STEADY	-
	300	500	10	45

OTHER FEATURES OF MAIN OUTPUTS

- . Zero crossing control. Main a.c. outputs are generated and stopped as the output waveform crosses zero.
- . High resolution adjustment control.
- . Overload alarm message.
- . Thermal protection.

AUXILIARY A.C. VOLTAGE OUTPUT

- . The auxiliary a.c. voltage output is isolated from the main a.c. 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.

AUXILIARY A.C. VOLTAGE OUTPUT

RANGE V	MAX POWER VA
62.5	40
125	40
250	40

PHASE ANGLE SHIFTING

- . Possibility to phase shift the auxiliary a.c. 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 a.c. 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 D.C. VOLTAGE OUTPUT

- . D.C. voltage range: 20...130V or 20...240V.
- . D.C. voltage power: 90 W at full range, continuous duty, with a current limit of 0.9 A @ 130V and 0.45 A @ 240V.

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 contact or a contact under voltage.

RANGE	RESOLUTION	ACCURACY
From 0 to 9.999 s	1 ms	± (1 ms + 0.005%)
From 10.00 to 99.99 s	10 ms	± (10 ms + 0.005%)
From 100.0 to 99999.9 s	100 ms	± (100 ms + 0.005%)

- . Metering range, in cycles:

RANGE	RESOLUTION	ACCURACY
From 0 to 999.9 cycles	0.1 cycles	± (1 ms+0.005%)
From 1000 to 4999995 cycles@50 Hz	1 cycle	± (10 ms+0.005%)
From 1000 to 5999994 cycles@60 Hz	1 cycle	± (100 ms+0.005%)

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

AUXILIARY OUTPUT CONTACT

- . Contacts range: 5 A; 250 V a.c.; 120 V d.c.

OUTPUTS CURRENT AND VOLTAGE MEASUREMENT

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	$\pm (1\% + 5 \text{ mA})$
	19.99 A	10 mA	$\pm (1\% + 20 \text{ mA})$
	79.99 A	40 mA	$\pm (1\% + 80 \text{ mA})$
40 A	19.99 A	10 mA	$\pm (1\% + 50 \text{ mA})$
	199.9 A	100 mA	$\pm (1\% + 200 \text{ mA})$
	249.9 A	100 mA	$\pm (1\% + 200 \text{ mA})$

VOLTAGE MEASUREMENT

OUTPUT	RANGE	RESOLUTION	ACCURACY
250 V a.c.	19.99 V	10 mV	$\pm (1\% + 50 \text{ mV})$
	199.9 V	100 mV	$\pm (1\% + 200 \text{ mV})$
	299.9 V	300 mV	$\pm (1\% + 300 \text{ mV})$
300 V d.c.	19.99 V	10 mV	$\pm (0.5\% + 50 \text{ mV})$
	199.9 V	100 mV	$\pm (0.5\% + 200 \text{ mV})$
	399.9 V	300 mV	$\pm (0.5\% + 300 \text{ mV})$
65,130 V a.c.	19.99 V	10 mV	$\pm (1\% + 20 \text{ mV})$
	199.9 V	100 mV	$\pm (1\% + 200 \text{ mV})$
	260 V a.c.	19.99 V	10 mV
260 V a.c.	199.9 V	100 mV	$\pm (1\% + 200 \text{ mV})$
	299.9 V	300 mV	$\pm (1\% + 300 \text{ mV})$
	130 V d.c.	19.99 V	10 mV
199.9 V		100 mV	$\pm (0.5\% + 200 \text{ mV})$
260 V d.c.		19.99 V	10 mV
	199.9 V	100 mV	$\pm (0.5\% + 200 \text{ mV})$
	299.9 V	300 mV	$\pm (0.5\% + 300 \text{ mV})$



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° \pm 1 DIGIT
FREQUENCY	40.000 - 499.999	1 mHz	$\pm (0.1\% + 1 \text{ mHz})$

OTHER MEASUREMENT

MEASUREMENT	UNIT
ACTIVE POWER, $P = I^*V \cdot \cos(\varphi)$	W
REACTIVE POWER, $Q = I^*V \cdot \sin(\varphi)$	VAr
APPARENT POWER, $S = I^*V$	VA
IMPEDANCE, $Z = V/I$	Ohm, °
ACTIVE IMPEDANCE COMPONENT, $R = Z^* \cos(\varphi)$	Ohm
REACTIVE IMPEDANCE COMPONENT, $X = Z^* \sin(\varphi)$	Ohm

EXTERNAL INPUTS MEASUREMENT TEST OF TRANSDUCERS

- It is possible to meter current or voltage input.

EXTERNAL CURRENT MEASUREMENT

- Maximum input current: 10 A, a.c. or d.c.
- Range, resolution, accuracy: see table below.

RANGE	RESOLUTION	ACCURACY
0.02 A d.c.	0.1 mA	$\pm (0.5\% + 0.1 \text{ mA})$
1.999 A a.c.	1 mA	$\pm (1\% + 2 \text{ mA})$
9.99 A a.c.	10 mA	$\pm (1\% + 20 \text{ mA})$
1.999 A d.c.	1 mA	$\pm (0.5\% + 2 \text{ mA})$
9.99 A d.c.	10 mA	$\pm (0.5\% + 20 \text{ mA})$

EXTERNAL VOLTAGE MEASUREMENT

- Maximum input voltage: 600 V, a.c. or d.c.
- Range, resolution and accuracy: see table below.

RANGE	RESOLUTION	ACCURACY
9.999 V a.c.	2 mV	$\pm (1\% + 10 \text{ mV})$
99.99 V a.c.	10 mV	$\pm (1\% + 20 \text{ mV})$
599.9 V a.c.	100 mV	$\pm (1\% + 200 \text{ mV})$
9.999 V d.c.	2 mV	$\pm (0.5\% + 10 \text{ mV})$
99.99 V d.c.	10 mV	$\pm (0.5\% + 20 \text{ mV})$
599.9 V d.c.	100 mV	$\pm (0.5\% + 200 \text{ mV})$

OTHER CHARACTERISTICS

T/1000 LOCAL MEMORY

- . Test settings can be stored and recalled from the T/1000 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 using the software X.PRO 1000.
- . When the PC is connected test results can be transferred to the PC via RS232 port using the software X.PRO 1000, for saving and printing.
- . Set of resistors, for the test of low impedance relays. Available values:

RESISTOR 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

SERIAL INTERFACE

Serial interface for connection to PC:

- . Interface: serial RS232; baud rate 57600 baud.

POWER SUPPLY

- . Mains supply: 230 V \pm 15%; 50-60 Hz.
- . Maximum supply current: 5 A.

STANDARD ACCESSORIES

- . The instrument comes complete with the following items:
 - Mains cable;
 - User's manual;
 - Spare fuses (no. 5), T5A.

OPTIONAL SOFTWARE

Software X.PRO 1000 with serial cable.

WEIGHT AND DIMENSION

- . Dimensions: 380 (W) * 300 (D) * 240 (H) mm.
- . Weight: 19 kg.

CASE

Alluminium case with cover and handle.

APPLICABLE STANDARDS

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

A) Electromagnetic Compatibility:

Directive no. 89/336/CEE dated may 3, 1989, modified by the directive 92/31/CEE dated may 5, 1992.

B) Low Voltage Directive:

Directive n. 73/23/CEE, modified by the directive 93/68/CEE. 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.

