



# ART/100

Two source Automatic Relay Test Set

- HIGH POWER TEST SET FOR TESTING ALL DISTRIBUTION RELAYS
- 2 INDEPENDENT CONVERTIBLE SOURCES:
  - 2 CURRENT OUTPUTS
  - 2 VOLTAGE OUTPUTS
  - 1 CURRENT AND 1 VOLTAGE
  - PLUS AUXILIARY VOLTAGE DC
- DESIGNED FOR TESTING ELECTROMECHANICAL, SOLID STATE AND NUMERICAL RELAYS
- ONE PORTABLE CASE

## Application

**ART/100** can test all the following power generation and distribution relays

| RELAY TYPE                       | IEEE No |
|----------------------------------|---------|
| 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      |



## ART/100 Specification

The ART/100 includes 2 independent and convertible sources that allow the selection of 4 operating modes:

- 1 1 AC High Current output and 1 AC High Voltage output;
- 2 2 AC Voltage outputs (high range + low range);
- 3 2 AC Current outputs (high range + low range);
- 4 1 AC Low range current output and 1 AC low range voltage output.

### Mode 1:

**one voltage and one current output**

SOURCE 1, AC voltage: 12.5 - 62.5 - 125 - 250 V.  
Output power: 50 VA for all ranges, (except 25 VA for the 12.5 V range).

The minimum impedances are: 6.25 Ohm; 78 Ohm; 312 Ohm; 1248 Ohm, respectively.

SOURCE 2, AC current: 1 A; 2 A; 10 A; 50 A.

Output power: 125 VA for all ranges.

Maximum load impedances are: 125 Ohm; 31.25 Ohm; 1.25 Ohm; 0.05 Ohm, respectively.

### Mode 2:

**two current outputs**

SOURCE 1, AC current: 1 A; 2 A; 10 A; 50 A.

Output power: 125 VA for all ranges.

Maximum load impedances are: 125 Ohm; 31.25 Ohm; 1.25 Ohm; 0.05 Ohm, respectively.

SOURCE 2, AC current: 0.2 A; 0.4 A; 0.8 A; 4 A.

Output power: 50 VA for all ranges.

Maximum load impedances are: 1250 Ohm; 312 Ohm; 78 Ohm; 3.1 Ohm, respectively.

### Mode 3:

**two voltage outputs**

SOURCE 1, AC voltage: 12.5 - 62.5 - 125 - 250 V.  
Output power: 50 VA for all ranges, (except 25 VA for the 12.5 V range).

The minimum impedances are: 6.25 Ohm; 78 Ohm; 312 Ohm; 1248 Ohm, respectively.

SOURCE 2, AC voltage: 4 - 12.5 - 62.5 - 125 V.

Output power: 1 VA for 2.5 V; 25 VA for 12.5 V; 50 VA for 62.5 and 125 V.

The minimum impedances are: 6.25 Ohm; 6.25 Ohm; 78 Ohm; 312 Ohm, respectively.

### Mode 4:

**one current low range  
and voltage low range**

SOURCE 1, AC voltage: 4 - 12.5 - 62.5 - 125 V.  
Output power: 1 VA for 2.5 V; 25 VA for 12.5 V; 50 VA for 62.5 and 125 V.

The minimum impedances are: 6.25 Ohm; 6.25 Ohm; 78 Ohm; 312 Ohm, respectively.

SOURCE 2, AC current: 0.2 A; 0.4 A; 0.8 A; 4 A.

Output power: 50 VA for all ranges. Maximum load impedances are: 1250 Ohm; 312 Ohm; 78 Ohm; 3.1 Ohm, respectively.

### Common characteristics

Independent adjustment of current and voltage outputs.

Duty cycle: continuous.

Waveform resolution: 24 bit.

Capable of stepping or ramping the current and the voltage.

Rate of change programmable between  $\pm 0.001$  A/s and  $\pm 999$  A/s for the current, and between  $\pm 0.001$  V/s and  $\pm 999$  V/s for the voltage.

Output accuracy:  $\pm 0.5\%$  of the range.

Distortion: 1% total maximum.

Automatic protection for overloads.

### Auxiliary D.C. voltage supply

Output voltage: 0...260 V D.C., program controlled.

Power: 100 W or 2 A on all ranges; continuous duty.

Accuracy:  $\pm 1\%$ .

Automatic protection for overloads.

### Angle

Phase angle range:  $0^\circ$  -  $360^\circ$ .

Resolution:  $0.1^\circ$ .

Angle accuracy:  $\pm 0.5^\circ$ .

### Output frequency

Frequency range: from 25  $\mu$ Hz to 999.9999 Hz.

In Modes 1 and 3, capable of selecting the output frequency on:

. V1 only;

. All outputs.

With the first selection, the other output generates the pre-fault frequency.

Maximum frequency error: 50  $\mu$ Hz (1 ppm).

Resolution: 0.1 mHz.

Capable of generating a waveform with superimposed harmonic distortion.

### Time measurements

Binary inputs: 8 inputs, clean or with voltage from 4 to 240 VDC, separated in two groups of 4, with two

common points isolated at 1 kVac.  
 Selection of the type of input: Voltage clean; 5 V; 24 V; 48 V; 110 V; software controlled.  
 Selection of input debounce: from 0 to 2,000  $\mu$ s; software controlled.  
 Timer range: 0 - 999,999.9999 s (277 hours);  
 Resolution: 0.1 ms.  
 Timer accuracy: 0.01% of reading  $\pm$  0.1 ms.

### Counter inputs

These inputs allow testing energy meters, with high frequency outputs.  
 Number of inputs: 2; with no common zero point.  
 Frequency range: 0 to 50 kHz.

### Auxiliary outputs

Four timed auxiliary output contacts.  
 Characteristics of contacts with a resistive load:
 

- . Maximum voltage : 250 VAC;
- . Maximum current : 5 A.

 Range of programmable delay: from 0 to 999.99 s.

### Low Level Signal Outputs

The purpose of these low voltage outputs is to test protection relays that use transducers such as Rogowsky coils and voltage dividers; for this simulation low voltage inputs are necessary.  
 Number of outputs: 2.  
 Full range voltage output: 0... 7.26 V rms.  
 Full range current output: 0... 7.26 or 0...0.726 V rms.  
 Output current: 5 mA max.  
 Resolution: 0.43 mV or 0.043 mV.  
 Accuracy: 0.1% of range.  
 Distortion: 0.1%.

### Optional AC/DC current and voltage measuring inputs

#### DC Current, Low Level

Measuring range:  $\pm$  20 mA d.c. Accuracy: 0.03 %.

#### DC Voltage, Low Level

Measuring range  $\pm$  10 V d.c. Accuracy: 0.03%.

#### AC/DC Current measuring Input, High

Measuring range:  $\pm$  20 A. Accuracy: 0.2 % d.c. ; 0.3 a.c.

#### AC/DC Voltage measuring Input, High

Measuring range  $\pm$  250 V. Accuracy: 0.1% d.c.; 0.2 a.c.

### Serial Interface

Type of interface: RS232.  
 Transmission rate: 19,200 baud.

### Power supply

Power supply: 110/230 VAC  $\pm$ 15%,  
 50/60 Hz, with automatic supply selection.

Power consumption:

- . 100 W, no-load;
- . 400 W, full load.

### Case

One aluminum case with removable cover and with handles.

### Weight and dimensions

Weight: 25 kg.  
 Dimensions (including the cover):  
 250 (h) x 500 (l) x 370 (d), mm.

### Accessories supplied with the unit

Power supply cable.  
 Serial interface cable.  
 Serial port adapter, 9 to 25 way.  
 Connectors for AC Sources output, Binary Inputs/Outputs connectors.  
 Instruction and maintenance manuals.

### Optional accessory

#### IO-6432 Input output expansion card

Number of inputs: 64.  
 Number of outputs: 32.

## Applicable Standards

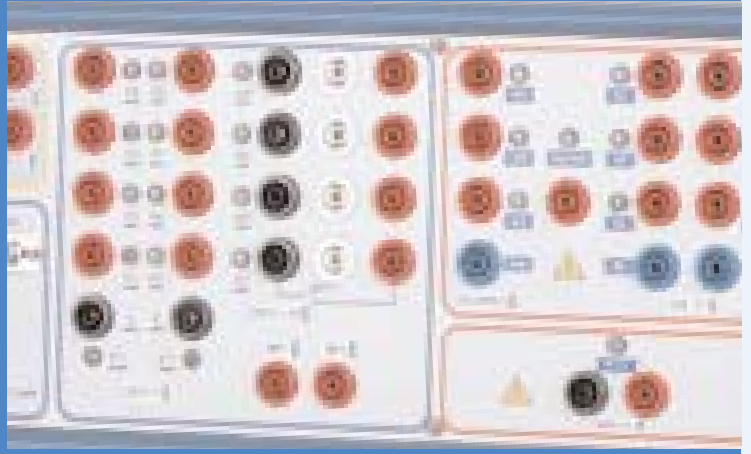
### Electromagnetic compatibility

Directive no. 89/336/CEE dated May 3, 1989, modified by the directive 92/31/CEE dated May 5, 1992.  
 Applicable Standards: EN 50081-2; EN 50082-2; EN 55011; EN 61000-3-3; EN 50082-2; ENV 50140; ENV 50141; ENV 50204; IEC 1000-4-2; IEC 1000-4-4; IEC 1000-4-6; IEC 1000-4-8.

### 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:
 

- . Operating temperature: 0 - 45°C;
- storage: -25°C to 70°C.
- . Relative humidity: 10 - 80% without condensing.



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