



DRTS-3

Advanced Protection Relay Test Set and Measurement System

- MULTI-FUNCTION EQUIPMENT DESIGNED FOR TESTING PROTECTION RELAYS, WATT-HOUR METERS, TRANSDUCERS
- LIGHTWEIGHT
- HIGH ACCURACY: BETTER THAN 0.1%
- UP TO 6 CURRENT AND 7 VOLTAGE OUTPUTS PLUS AUXILIARY D.C. SUPPLY
- TRANSIENT PLAYBACK AND HARMONICS GENERATION
- END TO END TEST OF LINE PROTECTION
- USB AND RS232 PORT

DRTS-3 has been designed to test:

- ALL PROTECTION RELAYS;
- WATT-HOUR METERS;
- TRANSDUCERS;
- METERS.

Application

DRTS-3 can test all the following relays

RELAY TYPE	IEEE No
Distance relay	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



DRTS-3 Specification

Three phase ac/dc current outputs

AC/DC current outputs

	CURRENT A	POWER VA	RESOLUTION	ACCURACY
3 X	0...12.5	80	760 μ A	0.1%
3 X	0...1.25		100 μ A	0.1%
3 X	0...0.125		10 μ A	0.1%
1 X	0...25	160	1.5 mA	0.1%
1 X	0...12.5	160	760 μ A	0.1%

- Three current sources with a common neutral.
- Independent adjustment of current outputs.
- Duty cycle: continuous.
- Waveform resolution: 24 bit.
- Capable of stepping or ramping the current.
- Rate of change programmable between ± 0.001 A/s and ± 999 A/s.
- Output accuracy: $\pm 0.1\%$ of the value $\pm 0.02\%$ of the range.
- Distortion: 0.1% total maximum.
- Automatic protection for overloads.
- Output frequency: from d.c. to 2000 Hz; transient 4 kHz.

Four phase AC/DC Voltage outputs

AC/DC voltage outputs

	VOLTAGE A	POWER VA	RESOLUTION	ACCURACY
4 X	0...125	80	7.6 mA	0.1%
3 X	0...12.5		760 μ A	0.1%
3 X	0...1		100 μ A	0.1%
1 X	0...250	160	15.2 mA	0.1%
1 X	0...125	160	7.6 mA	0.1%
OPTIONAL VOLTAGE RANGE				
4 X	0...300	80	18.2 mV	0.1%
3 X	0...125	80	7.6 mV	0.1%
3 X	0...12.5		760 μ V	0.1%
3 X	0...1		100 μ V	0.1%
1 X	0...600	160	36.4 mV	0.1%
1 X	0...300	160	18.2 mV	0.1%

- Four independent voltage sources, with a common neutral.

- Independent adjustment of voltage outputs.
- Duty cycle: continuous.
- Waveform resolution: 24 bit
- Capable of stepping or ramping the voltage.
- Rate of change programmable between ± 0.001 V/s and ± 999 V/s.
- Voltage accuracy: $\pm 0.1\%$ of the value $\pm 0.02\%$ of the range.
- Distortion: 0.1% total maximum.
- Automatic protection for overloads and counter-feed.
- Output frequency: from DC to 2000 Hz; transient 4 kHz.

The fourth voltage output can be selected by a switch to act as:

- . Fourth voltage output V4 (AC/DC);
 - . Zero-sequence component
- $$V_0 = (V_1 + V_2 + V_3) / 3 \text{ (vector sum)}$$

Auxiliary d.c. voltage supply

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

Power: 50 W or 2 A on all range; continuous duty.

Accuracy: $\pm 1\%$.

Automatic protection for overloads.

Angles

Phase angle range: 0°- 360°.

Angle resolution: 0.01°.

Angle accuracy: $\pm 0.1^\circ$.

Rate of change programmable between ± 0.1 °/s and ± 999 °/s.

Output frequency

Frequency range: from d.c. (0 Hz) to 1999.9999 Hz.

Transient 4 kHz.

Capable of selecting the output frequency on:

- . V1 only;
- . I1 only;
- . All voltages (V1-V3);
- . V4 only;
- . V1 and V4;
- . All outputs.

With all selections except the last one, other outputs generate the pre-fault frequency.

Maximum frequency error: 50 μ Hz (1 ppm).

Resolution: 100 μ Hz.

Rate of change programmable between ± 0.001 Hz/s and ± 999 Hz/s.

Capable of generating waveform with superimposed harmonic distortion.

Time measurements

Binary inputs: 8 inputs, clean or with voltage from 4 to 250V AC/DC, separated in two groups of 4, with two common points isolated at 1 kVac.

Selectable sensing voltage 5 V; 24 V; 48 V; 100 V; software controlled.

Selection of input debounce: from 0 to 2,000 μ 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; 125 VDC;

. 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 outputs are necessary.

Number of outputs: 6.

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.

Interface Connection

Type of interface: RS232 and USB.

Transmission rate: 57,600 baud.

Power supply

Mains power supply: 90 to 264 V A.C. single phase.

Frequency: 47 to 63 Hz.

Power consumption:

. at rest: less than 150 W;

. maximum load: 1000 W.

Case

Aluminum, with carrying handle.

Weight and dimensions

Weight: 12 kg.

Dimensions: 170 (h) x 470 (w) x 360 (d) mm.

Accessories supplied with the unit

Protective carrying bag.

Power supply cable.

Serial interface cable.

Serial port adapter, 9 to 25 way.

Connectors for AC Sources output, Binary Inputs/Outputs.

Instruction and maintenance manuals.

Additional External Amplifiers for DRTS-3

AMI-150

Three phase high current amplifier



Application

If high current or high power (or six current outputs) are needed for testing old electromechanical relays or for testing differential relays, the DRTS-3 can control the external high current, three phase amplifier model AMI-150.

AMI-150 Specification

AC/DC current outputs

	CURRENT A	POWER VA	RESOLUTION
3 X	0...50	150	3.0 mA
3 X	0...25	150	1.52 mA
3 X	0...12.5	150	1 mA
3 X	0...2.5	150	1 mA
3 X	0...0.05	0.1	0.003 mA
1 X	0...150	450	9.0 mA
1 X	0...50	450	3.0 mA

- Three independent current sources, without a common neutral.
- Accuracy: 0.5% of the range.
- Automatic protection for overloads.
- Waveform resolution: 24 bit.
- Frequency range: from 0 Hz to 999.9999 Hz.

Power supply

Mains power supply: 110 or 230 Vac single phase.

Frequency: 47/63 Hz.

Power consumption, maximum load: 800 W.

Weight and dimensions

Weight: 20 kg.

Dimensions: 470 (w) x 200 (h) x 380 (d) mm without handle.

Case

Aluminium, with handle.

Accessories supplied with the unit

Power supply cable.

Connection cable to DRTS-3.

AMIV-33

Three phase current and voltage amplifier



Application

The three phase current and voltage amplifiers AMIV-33 is an accessory for the DRTS-3 for tests that require six independent currents (differential relays) or seven independent voltages at the same time (synchronising devices).

The three voltage and the three current outputs of AMIV-33 can be generated together with DRTS-3: this allows paralleling current outputs, thus doubling output current and power.

It is also possible to double output power at same current.

AMIV-33 Specification

Current outputs

AMIV-33 with DTRTS-3: AC/DC current outputs

	CURRENT A	POWER VA	RESOLUTION
6 X	0...12.5	80	760 µA
6 X	0...1.25		100 µA
6 X	0...0.125		10 µA
3 X	0...25	160	1.5 mA
3 X	0...12.5	160	760 µA
1 X	0...25	320	1.5 mA
1 X	0...50	320	3 mA

AMIV-33 stand alone unit: AC/DC current outputs

	CURRENT A	POWER VA	RESOLUTION
3 X	0...12.5	80	760 μ A
3 X	0...1.25		100 μ A
3 X	0...0.125		10 μ A
1 X	0...25	160	1.5 mA
1 X	0...12.5	160	760 μ A

- Three independent current sources, with a common neutral.
- Output frequency: from 0 Hz to 2000 Hz; transient 4 kHz.
- Waveform resolution: 24 bit.
- Output accuracy: $\pm 0.1\%$ of the value $\pm 0.02\%$ of the range.
- Distortion: 0.1% total maximum.
- Automatic protection for overloads.
- Angle accuracy: $\pm 0.1^\circ$.

Voltage outputs

AMIV-33 with DRTS-3: AC/DC voltage outputs

	VOLTAGE V	POWER VA	RESOLUTION
7 X	0...125	80	7.6 mV
7 X	0...12.5		760 μ V
7 X	0...1		100 μ V
3 X	0...125	160	7.6 mV
1 X	0...125	320	7.6 mV
1 X	0...250	320	15 mV

AMIV-33 stand alone unit: AC/DC voltage outputs

	VOLTAGE V	POWER VA	RESOLUTION
3 X	0...125	80	7.6 mV
3 X	0...12.5		760 μ V
3 X	0...1		100 μ V
1 X	0...125	160	7.6 mV
1 X	0...250	160	15 mV

- Three independent voltage sources, with a common neutral.
- Output frequency: from 0 Hz to 2000 Hz; transient 4 kHz.
- Waveform resolution: 24 bit (14 for the amplitude,

10 for the shape).

- Voltage accuracy: $\pm 0.1\%$ of the value $\pm 0.02\%$ of the range.
- Distortion: 0.1% total maximum, with any load.
- Automatic protection for overloads.
- Angle accuracy: $\pm 0.1^\circ$.

Power supply

Power supply voltage: 90... 264 Vac single phase.

Frequency: 47/63 Hz.

Power consumption, maximum load: 1000 W.

Case

Aluminium, with carrying handle.

Accessories supplied with the unit

Power supply cable.

Interconnecting cable to DRTS-3.

Plastic carrying bag.

Weight and dimensions

Weight: 12 kg.

Dimensions: 170 (h) x 470 (w) x 360 (d) mm.

AMI-33

Three phase current amplifier



Application

The three phase current amplifier AMI-33 is an accessory for the DRTS-3 for tests that require six independent currents at the same time (differential relays).

The three current outputs of AMI-33 can be generated

together with the DRTS-3: this allows paralleling current outputs, thus doubling output current and power. It is also possible to double output power at same current.

AMI-33 Specification

AMI-33 with DRTS-3: AC/DC current outputs

	CURRENT A	POWER VA	RESOLUTION
6 X	0...12.5	80	760 μ A
6 X	0...1.25		100 μ A
6 X	0...0.125		10 μ A
3 X	0...25	160	1.5 mA
3 X	0...12.5	160	760 μ A
1 X	0...25	320	1.5 mA
1 X	0...50	320	3 mA

AMI-33 stand alone unit: AC/DC current outputs

	CURRENT A	POWER VA	RESOLUTION
3 X	0...12.5	80	760 μ A
3 X	0...1.25		100 μ A
3 X	0...0.125		10 μ A
1 X	0...25	160	1.5 mA
1 X	0...12.5	160	760 μ A

- Three independent current sources, with a common neutral.
- Output frequency: from 0 Hz to 2000 Hz; transient 4 kHz.
- Waveform resolution: 24 bit.
- Output accuracy: $\pm 0.1\%$ of the value $\pm 0.01\%$ of the range.
- Distortion: 0.1% total maximum.
- Automatic protection for overloads.
- Angle accuracy: $\pm 0.1^\circ$.

Power supply

Power supply voltage: 90 ... 264 Vac single phase.

Frequency: 47/63 Hz.

Power consumption, maximum load: 500 W.

Case

Aluminium case, with carrying handle.

Accessories supplied with the unit

Power supply cable.

Interconnecting cable to DRTS-3.

Plastic carrying bags.

Weight and dimensions

Weight: 7 kg.

Dimensions without the handle:

170 (h) x 230 (w) x 360 (d) mm.

Optional Accessories

IO-6432

Digital input and output expansion



Application

The option IO-6432 increases the number of logic inputs and outputs that can be monitored by DRTS-3. The option adds to inputs and outputs that are located in DRTS-3.

The IO-6432 is fitted internally the DRTS-3 unit.

IO-6432 Specification

Number of inputs: 64, by 4 groups of 16.

Inputs: logic, voltage from 5 to 130 V d.c.; maximum load current 3 mA.

Input and output groups are isolated from each other; they are also isolated from the rest of the instrument, from the mains supply and from the ground.

It is possible to separately program each input as Normally Open or Normally Closed or Disabled.

It is possible to separately program the timer stop of

each programmed input as Trip or Reset.
 Logic input time measurement resolution: 1 ms.
 Logic input time measurement accuracy: 2 ms.
 Number of outputs: 32, in 4 groups of 8.
 Type of outputs: open collector closing to zero;
 maximum voltage 130 V; minimum current capability
 15 mA.
 It is possible to separately program each logic output
 as Normally Open or Normally Closed.
 It is possible to separately delay each logic output with
 respect to currents and voltages.
 Delay range: 0 to 9999.99 s.
 Logic output time accuracy: 1 ms.

Optional GPS synchronizer



Application

External module for synchronization of two DRTS-3 sets via GPS system, for end to end test of differential relays.

1 digital output 0-24 Vdc, for synchronisation.
 1 selector to program the following pulse intervals: 5 s;
 10 s; 20 s; 30 s; 40 s; 60 s.
 Maximum timing error with respect to nominal: 2 μ s.
 Two test sets synchronized with GPS produce the
 maximum error of 50 μ s.
 Power supply: 110/220 Vac.
 The option includes the antenna and connection
 cables.
 Weight: 1.7 kg.
 Dimensions: 150 x 100 x 240 mm.
 Case: plastic case.

Optional transit case

Optional Protector-type plastic heavy duty transit case for air transport and for rough trips, available for DRTS-3, AMIV-33 and AMI-33 external amplifiers.

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 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.

