DRTS 6

Automatic Relay Test System

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Advanced Relays, Energy Meters and Transducers Test Set

- Multi-tasking test set designed for testing protection relays, energy meters, transducers
- Powerful and lightweight
- High accuracy: better than 0.1% (standard); HP model better than 0,05%
- IEC61850 Protocol interface
- Up to 9 current and 6 voltage outputs plus auxiliary DC supply (option)
- Laptop PC or PDA control
- USB and RS232 interfaces
- Advanced testing and data management software TDMS
- Complete library of relays from the major manufacturers
- Highest quality, safety and reliability
- Worldwide high quality technical support in 100 countries

DRTS 6 Specification

Six phase AC/DC current outputs

AC/DC current outputs

	CURRENT A	POWER VA	ZMAX Ohm	RESOLUTION
6 X	0...15	80	0.35	1 mA
6 X	0...1.5		0.35	0.1 mA
6 X	0...0.15		0.35	0.1 mA
3 X	0...15	100	0.44	1 mA
3 X	0...1.5		0.44	0.1 mA
3 X	0...0.15		0.44	0.1 mA
3 X	0...30	160	0.18	2 mA
3 X	0...3		0.18	0.2 mA
3 X	0...0.3		0.18	0.2 mA
3 X	0...15	160	0.71	1 mA
2 X	0...45	240	0.12	3 mA
1 X	0...90	480	0.06	6 mA
1 X	0...30	320	0.35	2 mA

- Six independent current sources with a common neutral
- Independent adjustment of current outputs
- Duty cycle: at 20°C ambient temperature: 3*15 A continuous; 6*7.5 A continuous; 6*15 A 3 minutes
- Waveform resolution: 28 bit
- Capable of stepping or ramping the current
- Rate of change programmable between ± 0.001 A/s and ± 999 A/s
- Output accuracy: ± 0.05% typical, ± 0.1% guaranteed
- Distortion: 0.1%
- Automatic protection for overloads and open circuit

Application

DRTS 6 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

Four phase AC/DC voltage outputs

AC/DC voltage outputs

	VOLTAGE V	POWER VA	ZMAX Ohm	RESOLUTION
4 X	0...300	85	1125	4.6 mV
3 X	0...300	100	900	4.6 mV
3 X	0...125	100	160	1.9 mV
3 X	0...12.5		160	190 µV
1 X	0...600	200	1800	9.2 mV
1 X	0...300	200	450	4.6 mV

- Four independent voltage sources, with a common neutral
- Independent adjustment of voltage outputs
- Duty cycle: continuous
- Waveform resolution: 28 bit
- Capable of stepping or ramping the voltage
- Rate of change programmable between ± 0.001 V/s and ± 999 V/s

• Voltage accuracy: ± 0.1% of the value, ± 0.02% of the range
• Distortion: 0.1% total maximum, with any load.
• Automatic protection for overloads, counter-feed and short circuit
• The fourth voltage output can be selected to act as:
  - Fourth voltage output V4 (AC/DC)
  - Zero-sequence component

VO = (V1+V2+V3)/3 or VO = (V1+V2 +V3/1.73)

Battery simulator

Output voltage: 0…260 V DC, program controlled.
Power: 100 W or 2 A on all range; continuous duty.
Accuracy: ± 1%.
Automatic protection for overloads.
Step or ramp control.

Angles

Phase angle range: 0° - 360°.
Angle resolution: 0.01°.
Angle accuracy: ± 0.1°.
Possibility of slewing all the angles.
Variation range: 0.1°/s to 999 °/s.

Output frequency

Frequency range: from DC (0 Hz) to 2000 Hz.
Transient 5 kHz.
Capable of generating different frequencies on any output.
Maximum frequency error: 25 µHz (0.5 ppm).
Resolution: 0.1 mHz.
Possibility of slewing the frequency, with a slope from 0.001 Hz/s to 999.999 Hz/s. Resolution: 0.001 Hz/s.
Capable of generating waveform with superimposed harmonic distortion.

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: 6.
Full range V & I output: 0...7.26 V rms.
Frequency: DC to 20 kHz.
Output current: 5 mA max.
Resolution: 0.43 mV or 0.043 mV.
Accuracy: 0.1% of range.
Distortion: 0.1%.

Binary inputs

10 binary inputs clean or with voltage from 24 to 425 V AC and 4.5 to 600 V DC, separated in two groups of 5, with two common points isolated at 1 kV AC.
Selection of the type of input: Voltage clean; 5 - 24 - 48 - 100 V; software controlled.
Selection of the input debounce duration, from 0 us to 2 ms, in 64 steps of 32 us each, program controlled.
Timer range: 0 - 999,999.9999 s (277 hours) or, in cycles:
0 - 50,000,000 cycles (50 Hz);
0 - 60,000,000 cycles (60 Hz).
Resolution: 0.1 ms.
Timer accuracy: 0.025% of reading ± 0.1 ms.

Counter inputs

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

Auxiliary outputs

Four timed relay contacts; both normal open and normal closed provided.
Characteristics of contacts with a resistive load:
  - Maximum voltage: 300 V AC/DC
  - Maximum current: 8 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: 6.
Full range V & I output: 0... 7.26 V rms.
Frequency: DC to 20 kHz.
Output current: 5 mA max.
Resolution: 0.43 mV or 0.043 mV.
Accuracy: 0.1% of the range.
Distortion: 0.1% typical.

Analog Measurements (optional):

DC Current measuring Input, Low
Measuring range: ± 20 mA.
Accuracy: 0.02% of range ± 0.01% of value.
DC Voltage measuring Input, Low
Measuring range ± 10 V.
Accuracy: 0.02% of range ± 0.01% of value.
AC/DC Current measuring Input, High
Measuring range: ± 20 A.
AC accuracy: 0.2% of range ± 0.1% of value.
DC accuracy: 0.1% of range ± 0.1% of value.
AC/DC Voltage measuring Input, High
Measuring range ± 250 V.
AC accuracy: 0.1% of range ± 0.1% of value.
DC accuracy: 0.05% of range ± 0.05% of value.

Interface connection

Type of interface: USB and RS232 at 57.6 kbaud.

Power supply

Mains power supply: 90 to 132 and 180 to 264 V AC, sinusoidal, single phase. Frequency: 47 to 63 Hz.
Power consumption:
- stand-by: less than 150 W
- maximum load: 1600 W

Case

Aluminum, with carrying handle.

Weight and dimensions

Weight: 18 kg.
Dimensions: 170 (h) x 470 (w) x 430 (d) mm.

Accessories supplied with the unit

Protective carrying bag.
Set of test leads.
Power supply cable.
Serial interface cable and USB cable.
Ground connection cable.
Instruction and maintenance manuals.
TDMS software.

DRTS 6 HP High Precision option

This option has enhanced characteristics with respect to the standard model. This model is conceived for the test of class 0.2 energy meters.
The following table summarizes the performances of the DRTS 6 HP (High Precision) version with respect to the standard one.

STANDARD DRTS 6 ACCURACY	
OUTPUT CURRENT	Typical: ± 0.05% ± 0.01% of range Maximum: ± 0.1% ± 0.02% of range
OUTPUT VOLTAGE	Typical: ± 0.05% ± 0.01% of range Maximum: ± 0.1% ± 0.02% of range
PHASE ANGLE	Typical: ± 0.02° Maximum: ± 0.1°
3 PHASE POWER	Typical: ± 0.05% Maximum: ± 0.2%

STANDARD DRTS 6 HP ACCURACY	
OUTPUT CURRENT	Typical: ± 0.02% from 0.1 to 15 A Maximum: ± 0.05% from 0.1 to 15 A
OUTPUT VOLTAGE	Typical: ± 0.02% from 50 to 300 V Maximum: ± 0.05% from 50 to 300 V
PHASE ANGLE	Typical: ± 0.01° Maximum: ± 0.02°
3 PHASE POWER	Typical: ± 0.05% Maximum: ± 0.1%

Additional External Amplifiers for DRTS 6

AMI 99 Three phase current amplifier

The three phase current amplifier AMI 99 is an additional device to the DRTS 6. DRTS 6 in connection with AMI 99 allows to have 9 currents or 6 currents at 30 A per phase or three currents at 60 A per phase.

AMI 99 with DRTS 6

	CURRENT A	POWER VA	ZMAX Ohm	RESOLUTION
9 X	6 x 0...15	80	0.35	230 µA
	3 x 0...30	160	0.18	460 µA
9 X	6 x 0...1.5			23 µA
	3 x 0...3			46 µA
9 X	6 x 0...0.15			2.3 µA
	3 x 0...0.3			4.6 µA
6 X	0...30	160	0.18	460 µA
6 X	0...3		0.18	46 µA
6 X	0...0.3		0.18	4.6 µA
3 X	0...60	320	0.09	920 µA
3 X	0...6		0.09	92 µA
3 X	0...0.6		0.09	9.2 µA
1 X	0...180	960	0.029	2.8 mA

AMI 99 stand alone

	CURRENT A	POWER VA	ZMAX Ohm	RESOLUTION
3 X	0...30	160	0.18	460 µA
3 X	0...3		0.18	46 µA
3 X	0...0.3		0.18	4.6 µA
1 X	0...30	320	0.35	460 µA
1 X	0...90	480	0.06	1.38mA

- Three independent current sources, with a common neutral
- Automatic range switch and independent range selection
- Waveform resolution: 28 bit
- Output accuracy: ± 0.1% of the output, ± 0.02% of the range
- Distortion: 0.1% total maximum, with any load
- Automatic protection for overloads
- Angle accuracy: ± 0.05°

Power supply

Mains power supply: 90 to 264 V AC, single phase.
Frequency: 47 to 63 Hz.
Power consumption:
- stanby: less than 100 W
- maximum load: 1000 W

Weight and dimensions

Weight: 16 kg.
Dimensions: 170 (h) x 470 (w) x 430 (d) mm.

Case

Case: aluminium, with carrying handle.

Accessories supplied with the unit

- Protective plastic bag
- Mains supply cable to DRTS 6
- Interconnecting cable to DRTS 6

AMIV 66 Three phase current and two phase voltage amplifier

The three phase current and two phase voltage amplifier AMIV 66 is an accessory for the DRTS 6 for tests that require nine independent currents at the same time (two secondary differential transformers), or six voltages at the same time (synchronising devices), or six currents and six voltages.
The three current outputs of AMIV 66 can be generated together with DRTS 6: this also allows paralleling current outputs, thus increasing output current and power.

Three phase current generator

AMIV 66 with DRTS 6

	CURRENT A	POWER VA	ZMAX Ohm	RESOLUTION
9 X	0...15	80	0.35	230 µA
9 X	0...1.5			23 µA
9 X	0...0.15			2.3 µA
3 X	0...45	240	0.12	690 µA
3 X	0...4.5			69 µA
3 X	0...0.45			6.9 µA
1 X	0...135	720	0.04	2 mA

AMIV 66 stand alone

	CURRENT A	POWER VA	ZMAX Ohm	RESOLUTION
3 X	0...15	80	0.35	230 µA
3 X	0...1.5		0.35	23 µA
3 X	0...0.15		0.35	2.3 µA
1 X	0...15	160	0.71	230 µA
1 X	0...45	240	0.12	0.69mA

- Three independent current sources, with a common neutral
- Automatic range switch and independent range selection
- Waveform resolution: 28 bit.
- Output accuracy: ± 0.1% of the output, ± 0.02% of the range
- Distortion: 0.1% total maximum, with any load
- Automatic protection for overloads
- Angle accuracy: ± 0.05°

Two phase voltage generator

AMIV 66 with DRTS 6

	VOLTAGE V	POWER VA	ZMAX Ohm	RESOLUTION
6 X	0...300	85	1060	4.6 mV
6 X	0...125	85	185	1.9 mV
6 X	0...12.5	8	185	190 µV
1 X	0...600	400	200	9.2 mV
1 X	0...300	400	50	4.6 mV

AMIV 66 stand alone

	VOLTAGE V	POWER VA	ZMAX Ohm	RESOLUTION
2 X	0...300	100	900	4.6 mV
2 X	0...125	100	160	1.9 mV
2 X	0...12.5	10	160	190 µV
1 X	0...600	200	1800	9.2 mV
1 X	0...300	200	450	4.6 mV

- Two independent voltage sources, with a common neutral
- Output frequency: from 0 Hz to 2000 Hz; transient 5 kHz
- Waveform resolution: 28 bit
- Output accuracy: ± 0.1% of the value, ± 0.02% of the range
- Distortion: 0.1% total maximum, with any load.
- Automatic protection for overloads and counter-feed
- Angle accuracy: ± 0.05°.

Power supply

Power supply voltage: 90 to 264 V AC single phase.
Frequency: 47 to 63 Hz.
Power consumption:

- stanby: less than 100 W
- maximum load: 500 W

Case

Aluminium, with carrying handle.

Accessories supplied with the unit

- Power supply cable
- Relay connection cables kit
- Interconnecting cable to DRTS 6
- Plastic carrying bag

Weight and dimensions

Weight: 18 kg.
Dimensions: 170 (h) x 470 (w) x 360 (d) mm.

AMV 66 Two phase voltage amplifier

The two phase voltage amplifier AMV 66 is an accessory for the DRTS 6, for tests that require six voltages at the same time (synchronising devices).

Two phase voltage generator

AMV 66 with DRTS 6

	VOLTAGE V	POWER VA	ZMAX Ohm	RESOLUTION
2 X	0...300	80	1125	4.6 mV
2 X	0...125	80	195	1.9 mV
2 X	0...12.5		195	190 µV
1 X	0...600	160	390	9.2 mV
1 X	0...300	160	97	4.6 mv

AMIV 66 stand alone

	VOLTAGE V	POWER VA	ZMAX Ohm	RESOLUTION
6 X	0...300	80	1125	4.6 mV
6 X	0...125	80	195	1.9 mV
6 X	0...12.5		195	190 µV
1 X	0...600	320	195	9.2 mV
1 X	0...300	320	50	4.6 mv

- Two independent voltage sources, with a common neutral
- Output frequency: from 0 Hz to 2000 Hz; transient 5 kHz
- Waveform resolution: 28 bit
- Output accuracy: ± 0.1% of the output, ± 0.02% of the range
- Distortion: 0.1% total maximum, with any load
- Automatic protection for overloads and counter-feed
- Angle accuracy: ± 0.05°

Power supply

Power supply voltage: 90 to 264 V AC single phase. Frequency: 47 to 63 Hz.
Power consumption, maximum load: 500 W.

Case

Aluminium, with carrying handle.

Accessories supplied with the unit

- Power supply cable.
- Interconnecting cable to DRTS 6.
- Plastic carrying bag.

Weight and dimensions

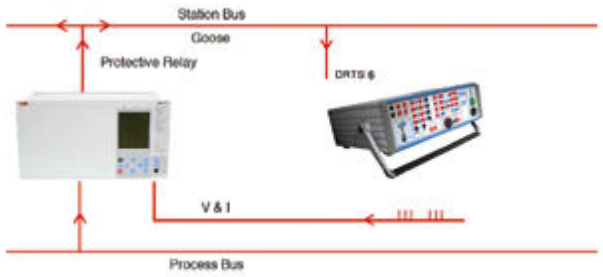
Weight: 7 kg.
Dimensions: 170 (h) x 230 (w) x 360 (d) mm.

Optional Accessories

IEC61850 Interface

The standard IEC61850 describes the communication of devices in substations. IEC61850 messages coming from the devices connected to the substation network (such as a relay) are also called GOOSE. GOOSE messages describe binary status signals over the substation network and are also used for relays tripping. For relay testing applications within IEC 61850 substations it is necessary to access to these data. This new feature is performed by ISA Automatic Relay Test Set DRTS 6 and with the TDMS software. By means of a dedicated hardware and the TDMS software, ISA DRTS 6 can expand his testing capabilities by handling those IEC61850 messages.

The IEC61850 Interface option for DRTS 6 is required for relay testing with Ethernet-based substation communication protocol. The IEC61850 Interface is mounted directly on the front panel of the DRTS 6.



IN2-CDG current booster for 1 A rated high burden relays

With DRTS 6 the full power of 100 VA is available only at the current of 15 A. The option IN2-CDG by means of a set of three current transformers, has the following characteristics:
Primaries: 12.5 A and 15 A;
Secondaries: 0.5 A; 1 A; 2.5 A; 5 A;
Nominal power: 100 VA;
Current ratio error: 0.2.
Case: plastic.
For the single phase test of the CDG relay it is possible to have three times the above power, connecting current outputs in series.

IN 2 CDG - Option for High Burden Relays

I100A current booster

The option I100A is a set of six current transformers, that allows to perform the following tests:

- With DRTS 6, 3x50 A
- With DRTS 6 and AMI 99, 6X50 A (differential relays) or 3x100 A (over-current relays)

Characteristics:
Primary: 3x(2x15) +3x30 A;
Secondary: 6x50 A, that can be put in parallel, to form 3x100 A;
Nominal power: 6x120 VA @ 50 A, or 3x240 VA, steady;
Current ratio error: 0.5;
Frequency range: 40 Hz to 2 kHz.
Case: plastic.
Dimensions: 400 x 300 x 175 mm.
Weight: 12 kg.
Inputs from DRTS 6 are put in parallel inside the option: all transformers have 30 A on the primary and 50 A on the secondary. The option includes twelve connecting cables to DRTS 6 and AMI 99 current outputs.

GPS synchronizer

The GPS synchronizer is an external module that allows to synchronize the test start of two DRTS 6.

GPS synchronizer

Features:

- 1 digital output O-24 V DC, for synchronization
- 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 µs
- Lights to confirm: power-on; Locked; Pulse available
- 1 START and STOP push-button
- Power supply: 110/22O V AC

The option includes:

- the antenna
- an extension cable for the antenna, 20 m long
- two cables, red and black, 2 m long, with banana terminations, for the connection to the test set trip input
- the power supply cable

Weight: 1.7 kg.
Dimensions: 150 (w) x 100 (h) x 240 (d) mm.
Case: aluminium.
Two test sets synchronized with GPS produce the maximum error of 50 µs.

SH 2003 Energy meters universal scanning head

SH 2003 is a scanning head that eases the test of energy meters. lt is an universal scanning head because it can be used both with LED impulse electronic meters and Ferraris rotating disk meters. 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:

- lmpulse duration: more than 60 µs
- lmpulse frequency: less than 500 Hz
- Light wavelength: 500 to 960 nm (red)

The option includes:

- A support to keep the scanning head in front of the energy meter
- The cable, 2 m long, from the scanning head to the DRTS 6
- The power supply transformer, for the power of 220 V AC, to supply the scanning head
- Two safety banana plugs for the connection to DRTS 6

SH- 2003

Transit case

Three options are available:

- Heavy duty transit case (Discovery type) in black plastics, with handle and wheels
- Heavy duty transit case in aluminium, with handle and wheels
- Soft carrying bag

Testing cables

This option includes additional cables, with different colours.

SEI Option for the series connection of currents

This option is made of a set of three burdens that equalize the load for current outputs of DRTS 6. Each burden includes two resistors rated 22 Ohm 1 W; at maximum load it causes an error of – 1.6 %. The burden is easily connected to current outputs by means of three safety banana sockets plus plugs, that ease connections.

PAV Option for the parallel connection of voltages

The option includes small resistors to be connected in series to voltage outputs of DRTS 6 and of AMV 66 or AMIV 66 options. Burden is 1 Ohm for tests up to 125 V and 5.7 Ohm for tests at 300 V; at maximum load it causes an error of – 0.5%.

- Case: plastic
- Dimensions: 22 x 45 x 85 mm
- Connections to the instrument: two wires 0.2 m long, with safety banana plugs
- Connection to the load: by a safety banana plug
- 125 V or 300 V selection: by switch

PAI Option for the use at 30 A, three phase

The option PAI is made of four jumpers, that ease the paralleling of output sockets: I1 and I4; I2 and I5; I3 and I6, and of the two IN sockets: this eases the connection to the relay under test.

Mains synchroniser

The option is made of a plug that fits into the mains, and that has two banana sockets for the connection to the test set counting input. The purpose is to synchronize the outputs of two test sets to the mains: as the synchronisation is repeated every 2 minutes, the test set stays locked to the mains for the infinity. The option includes a circuit that squares the sinusoidal mains waveform; the isolated output is a square-wave with an amplitude of 18 V nominal, running at the mains frequency.

There are two instances where the option can be necessary:

- Generating a current or voltage into a device that is also taking a signal from the mains
- Synchronising two test sets to the mains, and then using them to test line differential relays

Stand up support

The stand-up support allows using the test set in a stand-up position. This is very useful in case of too small room or no support for the test set. There is enough room for the power supply cord, and for the cooling air to flow in.

Stand up support

Applicable Standard

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

A) Electromagnetic Compatibility:
Directive 2004/108/EC (CE conform)
Applicable standard: EN 61326:2006

B) Low Voltage Directive:
Directive 2006/95/EC (CE conform)
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 EN 60529
- Operating temperature: 0°C to 55°C; storage: -25°C to 70°C
- Relative humidity: 5 - 95% without condensing

AMI 99

AMIV 66

AMV 66

Optional set of testing cables

Standard set of testing cables

Custodia in alluminio

Borsa morbida

Valigia rigida di trasporto

Ordering Information

CODE	MODULE
30156	DRTS 6 6 x I 0...15 A - 4 x V 0...300 V 1 x VDC output 0...260 V at 100 W Standard set of test cables Soft carry bag TDMS - Test & Data Management Software

External Amplifiers

CODE	MODULE
27156	AMI-99 (3 x I - 0 … 30 A at 160 VA)
28156	AMV-66 (2 x V - 0 … 300 V at 80 VA)
13156	AMIV-66 (3 x I - 0 … 15 A at 80 VA) (2 x V - 0 … 300 V at 80 VA)

Optional Accessories for External Amplifiers

CODE	MODULE
15156	Set of testing cables
18156	Aluminium Transport Case

Optional Accessories

CODE	MODULE
19153	Analog AC/DC Measurement Module
23156	High Precision (HP) outputs; 0.05% accuracy outputs with SIT laboratory certificate (EU accreditated)
81156	IEC61850 Interface, hardware and software
98156	IN 2 CDG - Option for High Burden Relays
47156	I 100 - 100 A Current Booster
10161	GPS syncronizer
20162	SH 2003 energy meter universal scanning head
15156	Additional set of test cables
77156	Heavy duty transport case (Discovery type)
18156	Aluminium transport case
48156	Soft carrying bag
35150	SEI option to put in serie the current outputs
36156	PA-I option to put in parallel the current output (3 x 30A)
34156	PA-V
24156	Mains synchronizer
19170	Stand up support
59156	Thytronic thysensor cables set
58156	ABB zero power cables set

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