

DRTS 3 PLUS



Advanced Protection Relay Test Set and Measurement System

- Multi-tasking equipment designed for testing protection relays, energy meters, transducers
- Particularly designed to test RTU (remote terminal unit) and PMU (phasor measurement unit)
- IEC61850 Protocol interface
- High accuracy: better than 0,05%
- Up to 3 current and 4 voltage outputs plus auxiliary DC supply
- USB and RS232 port
- Laptop PC or PDA control
- Powerful and lightweight

DRTS 3 PLUS has been designed to test:

- All protection relays;
- Watt-hour meters;
- Transducers;
- Meters;
- RTU and PMU.

A P P L I C A T I O N

DRTS 3 PLUS 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 PLUS Specification

Three phase AC/DC current outputs

AC/DC current outputs

	CURRENT A	POWER VA	ZMAX Ohm	RESOLUTION
3 X	0...15	100	0.44	230 μ A
3 X	0...1.5		0.44	23 μ A
3 X	0...0.15		0.44	2 μ A
1 X	0...45	300	0.15	690 μ A
1 X	0...15	200	0.88	230 μ A

- Three independent current sources with a common neutral.
- Independent adjustment of current outputs.
- Duty cycle: continuous.
- 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: $\pm 0.025\%$ typical, $\pm 0.1\%$ guaranteed.
- Distortion: 0.03% total maximum.
- Automatic protection for overloads and open circuit.

Four phase AC/DC voltage outputs

AC/DC voltage outputs

	VOLTAGE V	POWER VA	ZMAX Ohm	RESOLUTION
4 X	0...125	85	185	1.9 mV
3 X	0...12.5		185	190 μ V
3 X	0...1		185	19 μ V
1 X	0...250	160	390	3.8 mV
1 X	0...125	160	97	1.9 mV
OPTIONAL 300 V OUTPUT				
4 X	0...300	85	1125	4.6 mV
3 X	0...125	85	195	1.9 mV
3 X	0...12.5		195	190 μ V
1 X	0...600	160	390	9.2 mV
1 X	0...300	160	97	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: $\pm 0.1\%$ of the value, $\pm 0.02\%$ of the range.
- Distortion: 0.1% total maximum.

- 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

$$V_0 = (V_1+V_2+V_3)/3 \text{ or } V_0 = (V_1+V_2 +V_3/1.73).$$

Battery simulator (optional)

Output voltage: 0...260 V DC, program controlled.

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

Accuracy: $\pm 1\%$.

Automatic protection for overloads.

Step or ramp control.

Angles

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

Angle resolution: 0.01° .

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

Step or ramp control with a rate of change between $\pm 0.1^\circ/s$ and $999^\circ/s$.

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 μ Hz (0.5 ppm).

Resolution: 0.1 mHz.

Programmable DF/DT between ± 0.01 Hz/s and 999 Hz/s for easy testing of load shedding relays.

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: 0.02% typical, 0.1% guaranteed.

Distortion: 0.01% typical.

Binary inputs

10 binary inputs clean or with voltage from 24 to 250 VAC and

4 to 300 VDC, separated in two groups of 5, with two common points isolated at 1 kVAC.

Selection of the type of input: Voltage clean; 5 - 24 - 48 - 110 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) or, in cycles: 0 - 50,000,000 cycles (50 Hz); 0 - 60,000,000 cycles (60 Hz).

Resolution: 0.1 ms, 0.005 cycles.

Timer accuracy: 0.01% of reading \pm 0.1 ms.

Event recording resolution: 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.

Analog Measurements (optional):

DC Current measuring Input, Low

Measuring range: \pm 20 mA. Accuracy: 0.02%.

DC Voltage measuring Input, Low

Measuring range \pm 10 V. Accuracy: 0.02%.

AC/DC Current measuring Input, High

Measuring range: \pm 20 A. Accuracy: 0.1% DC; 0.2% AC

AC/DC Voltage measuring Input, High

Measuring range \pm 250 V. Accuracy: 0.1% AC; 0.05% DC.

Interface connection

Type of interface: USB and RS232 at 57.6 kbaud.

Power supply

Mains power supply: 90 to 264 VAC single phase.

Frequency: 47 to 63 Hz.

Power consumption: . at rest: less than 150 W;
 . maximum load: 1200 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.

Instruction and maintenance manuals.

DRTS 3 PLUS 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 3 PLUS HP (High Precision) version with respect to the standard one.

	STANDARD DRTS 3 PLUS	DRTS 3 PLUS HP
OUTPUT CURRENT	Typical: \pm 0.05% \pm 0.01% of range Maximum: \pm 0.1% \pm 0.02% of range	Typical: \pm 0.02% from 0.1 to 15 A Maximum: \pm 0.05% from 0.1 to 15 A
OUTPUT VOLTAGE	Typical: \pm 0.05% \pm 0.01% of range Maximum: \pm 0.1% \pm 0.02% of range	Typical: \pm 0.02% from 50 to 300 V Maximum: \pm 0.05% from 50 to 300 V
PHASE ANGLE	Typical: \pm 0.02° Maximum: \pm 0.1°	Typical: \pm 0.01° Maximum: \pm 0.02°
POWER	Typical: \pm 0.05% Maximum: \pm 0.2%	Typical: \pm 0.05% Maximum: \pm 0.1%

OPTIONAL ACCESSORIES

Output voltage

The output voltage can be up to 300 V instead of 125 V. This option is to be specified at order.

IEC 61850 communication protocol interface

The standard IEC 61850 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 3 PLUS and with the new software TDMS. By means of a dedicated hardware and the TDMS software, ISA DRTS 3 PLUS 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 3 PLUS.

#	Src Mac Address	Dest Mac Address	Queue ID	Data set Reference	Event Timestamp
1	00:80:82:59:1C:34	01:9C:CD:01:00:02	ABB_REL670LD0/LIN06G09G_ZM1_TRIPS	ABB_REL670LD0/LIN06ZM1_TRIPS	2007-10-02 15:58:27,838
2	00:80:82:59:1C:34	01:9C:CD:01:00:03	ABB_REL670LD0/LIN06G09G_ZM2_STARTS	ABB_REL670LD0/LIN06ZM2_STARTS	2007-10-02 16:00:35,954
3	00:80:82:59:1C:34	01:9C:CD:01:00:03	ABB_REL670LD0/LIN06G09G_ZM2_STARTS	ABB_REL670LD0/LIN06ZM2_STARTS	2007-10-02 16:00:35,954
4	00:80:82:59:1C:34	01:9C:CD:01:00:03	ABB_REL670LD0/LIN06G09G_ZM2_STARTS	ABB_REL670LD0/LIN06ZM2_STARTS	2007-10-02 16:00:35,954
5	00:80:82:59:1C:34	01:9C:CD:01:00:03	ABB_REL670LD0/LIN06G09G_ZM2_STARTS	ABB_REL670LD0/LIN06ZM2_STARTS	2007-10-02 16:00:36,877
6	00:80:82:59:1C:34	01:9C:CD:01:00:04	ABB_REL670LD0/LIN06G09G_ZM2_TRIP	ABB_REL670LD0/LIN06ZM2_TRIP	2007-10-02 16:00:36,877
7	00:80:82:59:1C:34	01:9C:CD:01:00:01	ABB_REL670LD0/LIN06G09G_TRIP	ABB_REL670LD0/LIN06STRIPS	2007-10-02 16:01:47,938

IN2-CDG CURRENT BOOSTER for 1 A rated high burden relays

With DRTS 3 PLUS 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, with 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.

GPS synchronizer

External module for synchronization of two DRTS 3 PLUS 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.

SHA-1 energy meters universal scanning head

SHA-1 is a scanning head that eases the test of energy meters. It 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:

- . Impulse duration: more than 60 us;
- . Impulse frequency: less than 500 Hz;
- . Duty cycle: 50%;
- . 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 3 PLUS;
- . The power supply transformer, for the power of 220 VAC, to supply the scanning head.

Palm control

The Palm Control is an innovative control of the DRTS 3 PLUS, which uses a PDA (Personal Digital Assistant) or Pocket PC that runs under the Windows Mobile operating system. We have developed a simple graphical interface that allows the users to have a low cost interface, extremely compact for simple and fast testing operations. The Palm Control has a colour touch screen that allows a simple graphical control of the DRTS 3 PLUS's outputs. The Palm Control is made by a PDA and the Mobile XPRO software module.



APPLICABLE STANDARDS

Electromagnetic compatibility

Directive no. 2004/108/EC.

Applicable Standard : EN61326-1 + A1 + A2.

Low voltage directive

Directive n. 2006/95/EC. Applicable standard: CEI EN 61010-1.

In particular: Operating temperature: 0 - 50°C; storage: - 25°C to 70°C; Relative humidity: 5 - 95% without condensing.

Ordering information:

CODE	MODULE
60153	DRTS 3 PLUS
	3 x I 0 ÷ 15 A
	4 x V 0 ÷ 125 V
	standard set of testing cables
10015	TDMS - Test & Data Management Software

Option for DRTS 3 PLUS

CODE	MODULE
81156	IEC61850 communication protocol interface
25156	High precision (HP) outputs; 0,05% accuracy outputs with SIT laboratory certificate (EU accredited)
33156	Voltage outputs 0 - 300 V for DRTS 3 PLUS
19153	Analog AC/DC Measurement module
18156	Aluminium transport case
15156	Set of Test cables
10161	GPS Synchronizer
20162	Universal scanning head for testing watt-hour meters SHA-6
94156	VDC output 0 ÷ 260 V 100 W, 2 A
98156	IN 2 CDG - Option for 1A High burden relays
ZSW30086	X.Pro Mobile (software) and PDA package Ipaq HX 2190 PDA with RS232 card
24156	Power Line Synchronizer

DRTS 3 PLUS ACCESSORIES



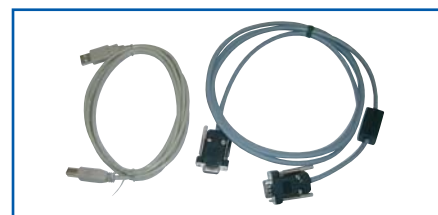
DRTS 3 PLUS
Heavy Duty
Transport Case



DRTS 3 PLUS
Plastic carrying bag



DRTS 3 PLUS
Standard Tests Leads



DRTS 3 PLUS
RS232 and USB
Communication cables

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