

# DRTS 33

## Automatic Relay Test System



## The new generation of advanced test equipments for relays, energy meters, transducers and power quality meters

- Testing all relay technologies: electromechanical, solid state, numerical and IEC61850
- Manual control with color display
- Simultaneously available: 3 Current and 3 Voltage plus 1 battery simulator outputs
- High current outputs: 3 x 32 A, 1 x 96 A
- High power outputs: 3 x 420 VA, 1 x 1000 VA
- High accuracy outputs: better than 0.05%
- IEC 61850 protocol interface
- USB and Ethernet interface
- Pen drive interface
- Internal GPS and IRIG-B interface for end-to-end tests
- Advanced testing and data management software TDMS
- Complete library of relays from the major manufacturers
- Highest quality, safety and reliability

### Specifications

DRTS 33 is the leading edge, most powerful and accurate relay, energy meters (class 0.1) and transducers test set manufactured by ISA. The locally and PC controlled test set generates high precision (0.05% accuracy) signals using multiple DSP technology.

Four hardware configurations are available:

- DRTS 66: with 6 Current 6 Voltage generators plus 1 battery simulator
- DRTS 64: with 6 Current and 4 Voltage generators plus 1 battery simulator
- DRTS 34: with 3 Current and 4 Voltage generators plus 1 battery simulator
- DRTS 33: with 3 Current and 3 Voltage generators plus 1 battery simulator

Its powerful current outputs (3 x 32 A at 420 VA) and voltage outputs (3 x 300 V at 100 VA) allow to test any type of relays including electromechanical relays.

The test sets integrate the IEC 61850 protocol interface for testing relay with Ethernet-based substation communication protocol.

### Application

DRTS 33 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

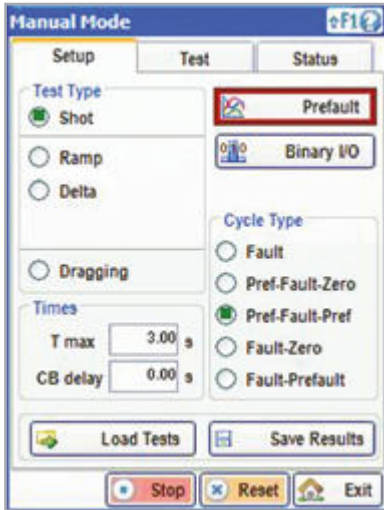
### Operator interface

DRTS 33 can be operated directly from the front panel by means of a large color graphical display, a rotary selector, a keypad and function keys. Two PC interfaces, USB and Ethernet, allow to control the test set with the advanced testing software TDMS. It can also be operated by the optional Local Touch Control (touch screen) module that can be used attached or detached from the test set.

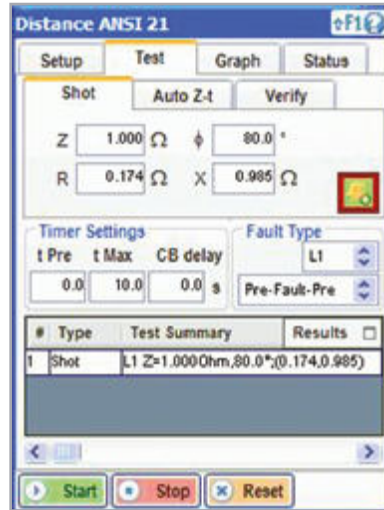


## Local control

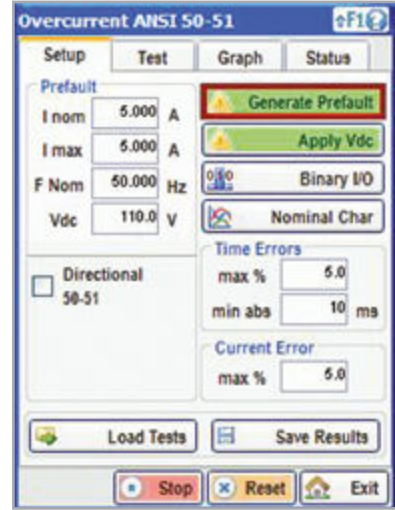
Manual test setup



Distance relay test setup



Over-current relay test result



## Technical specification

### Current Generator

#### Current Outputs

DRTS 33
3 x 0 ... 32 A AC
1 x 0 ... 96 A AC

### Output Power

#### Typical values

DRTS 33
3 x 420 VA at 32 A
1 x 1000 VA at 64 A

- Accuracy: typical  $\pm 0.02\%$  of the value  $\pm 0.01\%$  of the range; guaranteed 0.04% of the value  $\pm 0.01\%$  of the range
- Distortion: 0.05% Typical; 0.15% guaranteed
- Resolution: 0.1 mA at 32 A
- Connections: 4 mm banana sockets

### Voltage Generators

#### Voltage Outputs

DRTS 33
3 x 0 ... 300 V
1 x 0 ... 600 V

- Ranges: 12.5 V and 300 V

### Output Power

#### Typical values

DRTS 33
3 x 0 ... 300 V
1 x 0 ... 600 V
1 x 200 VA at 600 V

- One voltage output can be selected via software to act as an independent voltage output, or, via software, the output can be selected to be:  $V_0 = (V_1+V_2+V_3)/3$  or  $V_0 = (V_1+V_2+V_3)/1.73$  (bolded stays for vector sum)
- Accuracy: Typical  $\pm 0.025\%$  of the value  $\pm 0.01\%$  of the range; guaranteed  $\pm 0.06\%$  of the value  $\pm 0.015\%$  of the range
- Distortion: 0.015% Typical; 0.03% guaranteed
- Resolution: 0.4 mV at 12.5 V; 10 mV at 300 V
- Connections: 4 mm banana sockets

### Other Generator Characteristics

#### Output Frequency

Currents and Voltages output frequency: 0 to 3000 Hz.  
 For the voltage: 3 kHz at 60 V; 2 kHz at 100 V; 700 Hz at 300 V.  
 Transient: 0 to 5000 Hz.  
 Possibility to program 12 different frequencies on all outputs.  
 Maximum frequency error: 0.5 ppm.  
 Resolution:  $< 5 \mu\text{Hz}$ .

#### Phase Angle

Range:  $-360^\circ \dots +360^\circ$   
 Resolution:  $0.001^\circ$   
 Accuracy (voltages and currents) 50/60 Hz:  $0.01^\circ$  typical,  $0.02^\circ$  guaranteed

## Battery Simulator

0...260 V DC / 1 A

Power: 50 W or 1 A

Accuracy: 2%

Connections: 4 mm banana sockets

## Low Level Signal Outputs

(option included in code 87170)

Number of outputs: 6

Full range voltage output: 7.26 Vrms

Output current: 5 mA max

Resolution: 0.43 mV

Accuracy: 0.015% typical; 0.05% guaranteed

Frequency bandwidth: DC to 20 kHz

Connection: Multipole connector, rear side

## Binary Inputs

Number of inputs: 12 inputs.

Galvanic isolations: six groups of two inputs each, with six common points isolated among them.

Inputs characteristics: potential-free or with voltage, from 4.5 to 300 V DC (24 to 230 V AC). When the Transcope option is present, the maximum voltage is 600 V DC (425 V AC).

Selection of the type of input: dry; 5 V; 24 V; 48 V; 100 V

Trigger conditions: N.O./N.C./Edge/boolean(each input independent)

Timer range: Infinite

Timer resolution: 0.01 ms

Timer accuracy: 0.001% of the measure  $\pm$  0.1 ms

Sample rate: up to 10 kHz; with the Transcope option up to 50 kHz

Connections: 4 mm banana sockets

## Counter Inputs

Number of inputs: 2

Frequency range for pulses: 0 to 100 kHz

Connections: 4 mm banana sockets

## Binary Outputs Relays

Number of binary outputs: 4, make and break

Type: Potential free timed relays

Characteristics of the contacts with a resistive load:

- AC: 300 V; 8 A; 2400 VA
- DC: 300 V; 8 A; 50 W
- Programmable time delay: from 0 to 999,999.999 s
- Connections: 4 mm safety banana sockets

## Binary Output Transistors

(option included in code 87170)

Number: 4

Type: transistor, open collector outputs, dry, connected to a dedicated connector

Characteristics of the outputs: 24 V, 5 mA

Short circuit protection

Protection for voltages higher than 24 V

Programmable time delay: 0 to 999,999.999 s

Timing accuracy with respect to test start: 50  $\mu$ s

Connections: multipole connector, rear side

## Analog DC Measuring Inputs

- DC Current measuring input
- Measuring ranges:  $\pm$  20 mA and  $\pm$  5 mA
- DC accuracy, 20 mA:  $\pm$  0.02% of value  $\pm$  0.01% of range

- DC accuracy, 5 mA:  $\pm$  0.05% of value  $\pm$  0.02% of range. Connections: 4 mm banana sockets
- DC Voltage measuring input
- Measuring range  $\pm$  10 V
- DC Accuracy:  $\pm$  0.02% of value  $\pm$  0.01% of range. Connections: 4 mm banana sockets.

*NOTE: all specifications apply at 25 °C  $\pm$  2 °C. AC specifications apply for sinusoidal waveform and frequency between 48 and 62 Hz. Temperature drift:  $\pm$  0.01%/°C. Current outputs derating at 115 V AC power supply.*

## Interface Connections

Type of interfaces: USB, Ethernet, IEC 61850, IRIG-B.

Characteristics of USB interface:

- Transmission rate: 3x minimum
- Interface cable: 2 meters, included

Characteristics of the ETHERNET interface:

- Connector type: RJ-45
- Interface cable: 2 meters, included

Characteristics of the IEC61850 interface (optional):

- Connector type: RJ-45
- Interface cable: 2 meters, included

Characteristics of the IRIG-B connection (optional):

- Fiber optic connector, ST type

## Internal Memory

256 Mb internal memory suitable to store in the test set approximately 2.000 test results

## Pen Drive Interface

It allows saving and recalling local test setting and results

## Display - Keypad - Function Keys - Endecoder

- One Encoder: digital rotary switch
- One Keyboard: 12 keys
- Five Function keys
- Display: 256 colours, type LED, graphic 320 x 240 pixels; dimension 5.7 inches

## Power Supply

- Mains power supply: 85 to 264 V AC, sinusoidal, single phase
  - Frequency: 45 to 65 Hz
  - Power consumption:
    - stand-by: less than 150 W;
    - maximum load, 115 V supply: 1600 W;
    - maximum load, 230 V supply: 2700 W.
- Connection: Standard 16 A AC socket.

## Weight and Dimensions

Weight: 18 kg (39 lb)

Dimensions without the handle: 150 (h) x 466 (w) x 423 (d) mm (5.9 x 18.3 x 16.9")

## Accessories Supplied with the Unit

Protective carrying bag

Set of test leads: 12 cables

Power supply cable

Ground connection cable  
 USB and Ethernet cables  
 Instruction and maintenance manuals

### Applicable standards

#### Electromagnetic compatibility:

Directive 2004/108/EC. Applicable Standard: EN61326:2006.

#### Low voltage:

Directive 2006/95/EC (CE conform)  
 Applicable standard, for a class I instrument, pollution degree 2, installation category II: CEI EN 61010-1  
 Operating temperature: 0 - 55°C  
 Storage: -25°C to 70°C  
 Relative humidity: 5 - 95%, without internal condensation  
 Altitude: < 2000 m  
 Applicable also to external amplifiers AMI 332 and AMI 632

### Optional accessories

#### External Amplifiers

#### AMI 332 - Current Amplifier 3X32A



The three phase current amplifier AMI 332 is an additional device to DRTS 33. The option requires IRIG-B connection and output extension module on DRTS 33 and it includes three current generators at 32 A each. In connection with the DRTS 33, the option offers the following features:

- To control 6 currents at 32 A each at the mean time, for the test of two-secondary transformer protection relays
- To have a three phase generator at 64 A per phase
- To have a single phase generator at 96 A

CURRENT GENERATORS	POWER
3 x 0 ... 32 A AC	3 x 430 VA at 32 A AC
1 x 0 ... 96 A AC	1 x 1000 VA at 64 A AC

#### AMI 332 - Technical Specification

Accuracy: Typical 0.02% of the value ± 0.01% of the range; guaranteed 0.04% of the value ± 0.01% of the range  
 Distortion: 0.05% Typical - 0.15% guaranteed  
 Resolution: 1 mA  
 Connections: 4 mm banana sockets

#### AMI 632 - Current Amplifier 6X32A



The six phase current amplifier AMI 632 is an additional device to DRTS 33. The option requires IRIG-B connection and output extension module on DRTS 33 and it includes six current generators at 32 A each. In connection with the DRTS 33, the option offers the following features:

- To control 9 currents at 32 A each at the meantime, for the test of three windings transformer differential protection relays
- To have a six phase generator at 32 A per phase
- To have three phase generator at 64 A per phase
- To have a single phase output at 96 A

CURRENT GENERATORS	POWER
6 x 0 ... 32 A AC	6 x 430 VA at 32 A AC
3 x 0 ... 64 A AC	3 x 860 VA at 64 A AC
1 x 0 ... 128 A AC	1 x 1000 VA at 64 A AC

#### AMI 632 - Technical Specification

Accuracy: 0.02% of the value ± 0.01% of the range, Typical; 0.04% of the value ± 0.01% of the range, guaranteed  
 Distortion: 0.05% Typical; 0.15% guaranteed  
 Resolution: 1 mA  
 Connections: 4 mm banana sockets

#### Power Supply for AMI 332 and AMI 632

- Mains power supply: 85V to 264 V AC, sinusoidal, single phase
  - Frequency: 45 to 65 Hz
  - Power consumption:
    - at rest: less than 150 W
    - maximum load, 115 V supply: 800/1600 W
    - maximum load, 230 V supply: 1300/2700 W
- Connection: Standard 16 A AC socket

#### Accessories Supplied with the Units

Protective carrying bag, power supply cable, test leads kit and connection cable to DRTS 33.

## IN2-CDG Current Booster for 1 a Rated High Burden Relays

The option IN2-CDG includes 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

## HPB 600 and HPB 400 Current Boosters

These options are aimed at testing old electro-mechanical overcurrent relays; in particular, at relays rated 1 A. The power output is so high that it can test even relays rated at less than 1 A. Other features for HPB 400:

- Primary current: 32 A
- Secondary currents: 20 A, 4 A, 1 A

Other features for HPB 600:

- Primary current: 2 x 32 A.
- Secondary currents: 20 A, 10 A, 4 A, 1 A

For both options:

- Accuracy: 0.5% at half burden; 1% at full burden
- Connections: two safety sockets for the primary side; four safety sockets for the secondary side

## Transcope: Analog / Digital Recorder and Measurement Function

Optionally the test set can be provided with this feature to measure and record the following:

- 10 voltages or currents (with clamps or external shunts) AC and DC meter and recorder
- Phase angle, wattmeter, frequency, harmonics meter, power quality meter
- Oscilloscope functions
- Sequence of Event recorder (up to 10 digital inputs)
- Fault recording function

Input characteristics:

- Five isolated groups of two input circuits each
- Inputs ranges: 100mV; 1; 10; 100; 600 V
- Input impedance: 500 kOhm, 50 pF
- Measurement accuracy:  $\pm 0.06\%$  typical;  $\pm 0.15\%$  guaranteed
- Sampling frequency: 5 kHz, 10 kHz, 20 kHz, 50 kHz, software selection
- Total buffer size: 4 Mbytes
- Maximum recording duration:
  - at 5 kHz: 6 min for 1 input channel / 40 s for 10 input channels
  - at 50 kHz: 40 s for 1 input channel / 4 s for 10 input channels
- Connections: 4 mm banana sockets
- This option is to be specified at order

## Internal GPS Synchronizer

The GPS synchronizer is an internal module that allows to synchronize the test start of two DRTS 33 or other test sets.

Maximum timing error with respect to nominal:  $\pm 1 \mu\text{s}$

The option includes:

- The antenna
  - An extension cable for the antenna, 20 m long
- This option is to be specified at order.

## External GPS Synchronizer

The GPS synchronizer is an external module that allows to synchronize the test start of two DRTS 33. Features:

- 1 digital output 0-24 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  $\mu\text{s}$
- Lights to confirm: power-on; Locked; Pulse available
- 1 START and STOP push-button
- Power supply: 110/220 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

## SH 2003 Energy Meters Universal Scanning Head

SH 2003 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  $\mu\text{s}$
- 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 33
- The power supply transformer, for the power of 220 V AC, to supply the scanning head

## IEC 61850 Interface - IEC 61850-8

The standard IEC61850 describes the communication of devices in substations. IEC61850 messages coming from the devices connected to the substation network 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 IEC61850 substations it is necessary to access these data. This new feature is performed by the ISA Automatic Relay Test Set DRTS 33.

By means of a dedicated hardware and by the TDMS software, ISA DRTS 33 can expand its testing capabilities by handling IEC61850 messages. The IEC61850 Interface option for DRTS 33 is required for relay testing with Ethernet-based substation communication protocol. The IEC61850 Interface is mounted on the front panel of DRTS 33. The option has to be specified at order.



Heavy duty plastic transport case (Discovery type)



Heavy duty transport case

### IEC 61850 - 9 - 2

The IEC 61850-9 option allows generating measurement messages on the system bus. The option and the associated software provide the following features:

- injection of Sampled Values on the system bus, corresponding to CT and VT measurements;
- test of relays connected to the system bus, by the generation of Sampled Values and the monitoring of the relay tripping, as described above.

The connection is performed via an optical fiber connector, mounted on the rear of the test set. The option has to be specified at order.

### Relay Connection Cable Kit

This option can be added to the basic cable kit to provide. Connection to all test set sockets. It includes also 20 adaptors for terminal block connections and 3 jumpers to parallel current outputs.



Optional set of testing cables



Standard set of testing cables

### Transit Case

Three options are available:

- Heavy duty plastic transport case (Discovery type)
- Heavy duty transport case
- Soft carrying bag

### PLCK Polarity Checker Module

Checking the correct connection of CT's and VT's to protection relays is a problem because relays can be hundreds of meters away from the transformer. PLCK easily solves the issue. When this test is started, DRTS 33 generates a special, not sinusoidal waveform, which is injected into the connection cables. The polarity check is easily performed by connecting it at the relay site. PLCK has two lights: green and red. The green light turns on when the polarity is correct; the red light turns on when the polarity is wrong.



PLCK polarity checker

### Optional Local Touch Control

With the optional Local Touch Control the unit can be easily controlled using the rugged touch screen and the Manual Control software applications. The Local Touch Control can be used attached or detached to the test set.

When used attached to the test set the rugged Touch Local Control is fixed to the test unit by means of a robust hinged module. If detached from the test set the Local Touch Control unit can be easily managed as a rugged tablet touch screen controller.



Local Touch Control

## Ordering information

CODE	MODULE
45170	DRTS 66 6I/6V
35170	DRTS 64 6I/4V
22170	DRTS 34 3I/4V
10170	DRTS 33 3I/3V
40170	DRTS 66 6I/6V - with IRIG-B and output extension module
30170	DRTS 64 6I/4V - with IRIG-B and output extension module
20170	DRTS 34 3I/4V - with IRIG-B and output extension module
10015	TDMS - Test & Data Management Software

## External amplifiers

CODE	MODULE
80170	AMI 332 - 3I*
81170	AMI 632 - 6I*

*NOTE\*:* Internal GPS, IEC61850-9-2, zero power set cables and external amplifiers require code 87170- IRIG-B and output extension module.

## Optional accessories

CODE	MODULE
87170	IRIG-B synchronization and outputs extension module
88170	Internal GPS receiver with antenna and cable *
89170	IEC61850-9-2 Protocol Interface - Sampled values *
83170	IEC61850-8 Protocol Interface - Goose
70170	HPB 400 current booster
71170	HPB 600 current booster
98156	IN2-CDG - Current Booster for 1 A rated high burden relays
82170	TRANSCOPE - Analog/Digital recorder and measurement module
10161	GPS synchronizer - External module with antenna and cable
20162	SH 2003 energy meter universal scanning head
15170	Complete set of test leads
85170	Heavy duty plastic transport case
17170	Heavy duty transport case
18170	Soft carrying bag
29166	Active AC/DC Current Clamp 2 A - 80 A
72170	Power Line synchronizer with optical fiber output
19170	Stand-up support
13170	Zero power Thytronic thysensor cables set*
12170	Zero power ABB REF542PLUS & REF601 cables set*
41175	PLCK - Polarity checker
06170	Optional Local Touch Control