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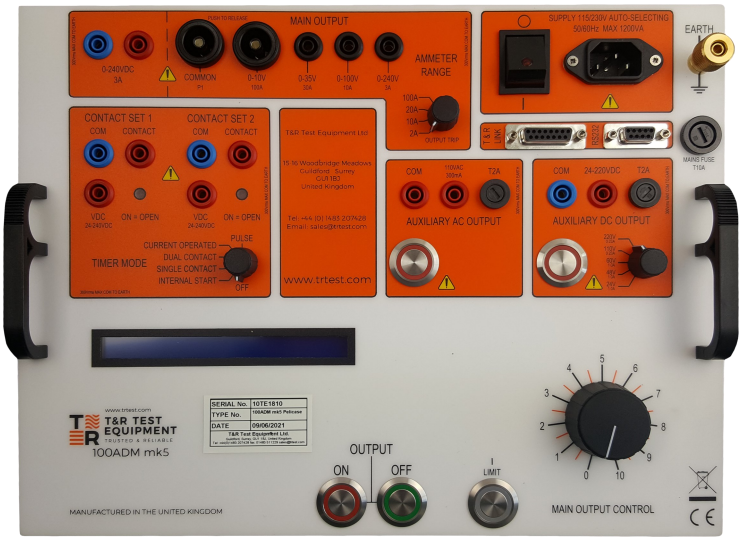
100ADM Mk6
Current Injection System



Features

- Clear and simple user interface
- 0-100A output current
- Current limit mode for fine current control
- True RMS metering with single cycle capture memory ammeter
- Multi-function auto-ranging timing system
- Auxiliary DC and AC output
- Large back-lit liquid crystal display
- Thermal and over-current protection
- Compact and portable
- Automatic mains voltage selection
- USB Storage

The 100ADM Mk6 provides commissioning and maintenance engineers with a flexible system for testing protective systems. It has an easy to understand panel layout and simple user interface. The status of every function can be seen at a glance, and there are no complex menus to navigate.

The 100ADM Mk6 keeps the familiar user interface of previous models but adds a new metering system that accurately measures the RMS of a single cycle. It also features a new current limit mode to provide very fine control of low currents, even into low impedance loads. Current limit mode also assists in testing self-powered overcurrent protection as fitted to many 11kV ring main units.

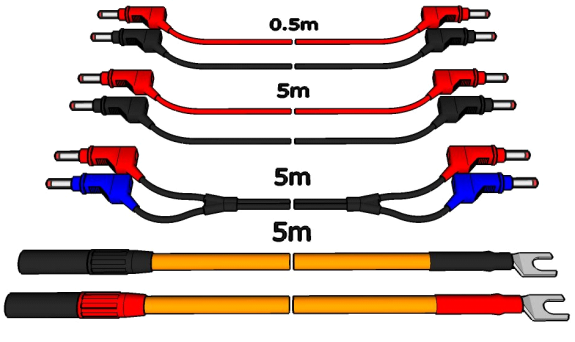
The unit has a range of outputs allowing injection of currents as low as a few mA and as high as 100A. Voltages up to 240V are available allowing high impedance current relays and voltage relays to be tested. Four true RMS metering ranges are provided, and the full scale of the meter (& trip level) can be set independently of output tap. Industry standard safety connectors are used on all inputs and outputs for convenience, reliability and safety.

A very flexible two channel timing system is provided, allowing trip times, reset times and reclose times to be quickly measured to a high degree of accuracy. The timer auto-ranges to measure from 1ms to 99999.9s.

The outputs of the 100ADM Mk6 are well protected. The main output is protected by overcurrent, duty cycle and thermal trips. The auxiliary DC supply is protected by a current limit, and the auxiliary AC supply is fuse protected.

A 24-220VDC switch-mode stabilised DC supply with current limiting is provided to power the relay under test. An isolated, separately switched 110Vac auxiliary supply is also provided.

The back-lit display on the 100ADM Mk6 is bright and clear with a wide viewing angle. The results of a test can be seen here as they appear on the display.



100ADM Mk6 Applications

IEEE No.	Type
27/59	Under/over voltage
37	Undercurrent
50/76	Instantaneous overcurrent Ground fault relay
51	IDMT overcurrent relay
59G	Neutral voltage displacement
67	Directional overcurrent (basic tests)
79	Auto recloser
86	Lockout relay
94	Tripping relay
90V	Voltage regulating relay, Miniature circuit breakers, Circuit breakers for equipment, Thermal relays

100ADM Mk6 Specification

Main Output

The main output on the unit has four taps, allowing the selection of output voltages up to 240V and output currents up to 100A.

	Current			Output V @230V	
Range	Cont	5 min*	1 min*	O/C	Load V
10V	33A	67A	100A	10.5V	8.7V@100A
35V	10A	20A	30A	36V	32V@30A
100V	3A	6A	10A	108V	99V@10A
240V	1A	2A	3A	276V	259V@3A
240VDC	1A	2A	3A		

**Off time of 15 minutes. On times based on ambient temperature of 25°C.*

I Limit Mode

The main output has a current limit mode that gives very fine control of output currents up to 10A. It also allows fine current control into very low impedance loads such as digital relays.

	Current				Output V @230V	
Range	Short circuit	Cont.	5 min	2 min	O/C	Load V
10V	10A	3A	6A	10A	8.6V	5V@5A
35V	3A	1A	2A	3A	29V	13V@2A
100V	1A	0.3A	0.6A	1A	88V	40V@0.6A
240V	0.3A	0.1A	0.2A	0.3A	224V	130V@0.2A

Auxiliary AC and DC Outputs

A switched, isolated auxiliary DC supply with current limit protection is available to power the relay under test, and a 110Vac auxiliary output is available for tests.

DC stabilised output	24V, 48V, 60V	1.0A
	110V, 220V	0.23A
Fixed AC output	110Vac	300mA

Metering

The output is metered by a digital true RMS system with a single cycle capture memory ammeter—whenever the timer stops and the output is switched off, the reading is held on the display. A current trip is set to 110% of full scale of the selected metering range.

Range	Resolution	Trip current	Accuracy	Acquisition time
2.000A	0.001A	2.2A	±0.5%rdg±5d	20ms
10.00A	0.01A	11A	±0.5%rdg±5d	20ms
20.00A	0.01A	22A	±0.5%rdg±5d	20ms
100.0A	0.1A	110A	±0.5%rdg±5d	20ms

Timing System

Range	0-999.999s/9999.99s/99999.9s autoranging
Resolution	1/10/100ms
Accuracy	0.01%rdg+2d (+4d current operated mode)
Contact o/c	24V
Contact s/c	20mA
VDC	24—240V

Each contact circuit will auto-select for normally open or normally closed contacts. A DC voltage of 24—240VDC may also be used to trigger either timer channel. Contact state is shown by an LED. The output automatically switches off at the end of the test to safeguard the relay under test.

Mode	Timer Start	Timer Stop
Internal start	Press 'ON'	C1 or C2 change
1 contact	C1 1st change	C1 2nd change
2 contacts	C1 change	C2 change
Current operated	Current > 10% of metering range	Current < 10% of metering range
Pulse	Press 'ON'	200ms

Pulse mode is used for setting the current level in devices sensitive to heating. Current is injected for 200ms.

Supply Requirements

115/230V±10% auto-selecting 50/60Hz 1ph 1200VA.

Protection and Safety

The unit is designed to comply with BSEN61010 and is CE marked. An earth terminal is provided for connection to a local earth for testing in sub-station environments.

Dimensions

Peli case: 560 x 456 x 265mm

Metal case: 390 x 315 x 225mm

Weight

23.9kg

20kg

Temperature Range

Storage -20°C to 60°C **Operating** 0°C to 45°C

Lead Set specifications

The 100ADM Mk6 is supplied with a lead set consisting of:

2 x 5m 25mm² 100A leads terminated in M10 fork crimps

2 x 5m, 2 x 0.5m 2.5mm² 25A leads with in 4mm plugs

1 x 5m 2 core 0.75mm² lead terminated in 4mm plugs

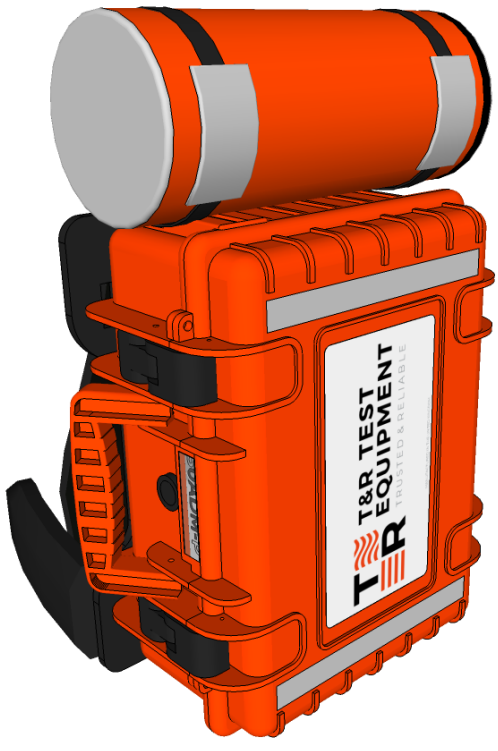
Accessories

Operating manual, output lead set, USB flash drive, mains lead and spare fuses.

Optional Accessories

100ADM-F Filter unit, RB10 resistor box, TPT9000 Transformer Polarity Tester, printer, pushbutton lead for runback timing on disc induction relays.

50ADM-P
Current Injection System with Phase Shift



Features

- 0-50A output current
- True RMS metering with 1 cycle capture
- Variable auxiliary AC voltage/current output with phase shift
- Auxiliary metering input V, f, φ, Z, P, S, PF, CT ratio, harmonics
- Variable auxiliary output 12-220VDC
- Multi-function auto-range timing system
- Current limit mode for fine control
- Data storage to USB memory key including waveform & harmonics
- USB keyboard interface
- Automatic mains voltage selection
- Optional Backpack System

The 50ADM-P is a smaller version of our current injection system the 200ADM-P Mk2. The unit has a range of outputs allowing injection of currents from 1mA to 50A. Voltages up to 18V are available on the main outputs. True RMS metering with single cycle capture is provided. Three current ranges allow the full scale of the meter and trip level to be set independently of the selected output. Industry standard safety connectors are used throughout for safe, reliable convenience.

The 50ADM-P has a flexible auxiliary AC output that can be used at up to 260V for voltage relays or up to 10A for current relays. The phase and frequency of this output are fully adjustable. This combination of voltage and current allows testing of relays that require two voltages, one voltage and one current or two currents.

An auxiliary metering input is provided that meters AC and DC voltage, current and frequency from the auxiliary outputs or external signals. The module can also take measurements in conjunction with the main current output to meter phase angle, power, impedance, CT ratio and harmonics.

A variable stabilised DC supply with current limit is provided to power the relay under test. The unit has a comprehensive timing system linked to the outputs allowing trip times, reset times and reclose times to be quickly measured to a high degree of accuracy.

The timer includes a current operated mode and can accurately test instantaneous trips. Two USB host sockets are provided to connect a memory key and keyboard. Results of every test can be stored to the memory key in spreadsheet format for later analysis. The keyboard allows entry of a comment against each result. In addition a graphics file of the waveform may be stored to the memory key. Harmonic analysis results can also be recorded.

Main Output

The main output on the unit has two taps, allowing the selection of output voltages up to 18V and output currents up to 50A.

Range	Continuous	5 minutes	1 minute
3.5V	16A	32A	50A
18V	4A	8A	12A

The above intermittent on times must be followed by an off time of 15 minutes, based on an ambient temperature of 25°C.

Protection: over current trip, duty cycle trip, thermal monitoring.

Auxiliary DC Output

Protection: current limit.

Range	Maximum A	Continuous Rating
12-60V	1A	25W
60-220V	0.23A	25W

50ADM-P Specification

Metering

The output is metered by a digital true RMS system with a memory ammeter - whenever the timer stops and the output is switched off, the current reading is held on the display. The currents for each phase are displayed simultaneously.

A current trip is set to 110% of full scale of the selected metering range. A current trip is automatically set to 105% of full scale of the current metering range to protect the device under test.

Protection: over current trip, duty cycle trip, thermal monitoring.

Range	Resolution	Trip current	Accuracy
5.000A	0.001A	5.25A	±0.6%rdg+5d
20.00A	0.01A	21A	±0.6%rdg+5d
50.00A	0.01A	52.5A	±0.6%rdg+5d

I Limit Mode

The main output has a current limit mode that gives very fine control of output currents up to 10A. It also allows fine current control into very low impedance loads such as digital relays.

Auxiliary Metering Inputs

Protection: fuse on current input.

Setting	Range	Resolution	Accuracy
Volts AC	300.0V	0.1V	±0.7%rdg+5d
Amps AC	5.000A	1mA	±0.7%rdg+5d
Phase	±180°	0.1°	±3°
Frequency	20-1000Hz	0.1Hz	±0.2%rdg+1d

Timing System

Range **0-999.999s/9999.99s/99999.9s autoranging**
Resolution **1/10/100ms**
Accuracy **0.01%rdg+2d(+4d current operated mode)**
Contact o/c **24V**
Contact s/c **20mA**
Vdc **24—240V**

Mode	Timer Start	Timer Stop
Internal start	Press 'ON'	Contact 1 or 2 change
1 contact	Contact 1 1st change	Contact 1 2nd change
2 contacts	Contact 1 change	Contact 2 change
MART (Multiple Auto -Reclose Timing)	Contact 2 change	Contact 1 change
Current operated	Current > 10% of metering range	Current <10% of metering range
Pulse	Press 'ON'	200ms
Aux AC	Aux AC on/switch freq to φ/ switch φ to freq	Contact 1 or 2 change

Supply Requirements

115V/230V ±10% auto-select 50/60Hz 1ph 2300VA max.

Temperature Range

Storage -20°C to 60°C Operating 0°C to 45°C

Accessories

The 50ADM-P is supplied with operating manual, output lead set, mains lead, spare fuses, USB keyboard, USB memory key, lead bag.

Lead Set specifications

The 50ADM-P is supplied with a high quality lead set including:

- 5m long Timing lead set
- 5m Long 20A rated L&N leads
- 1.5m Long 50A rated leads

Optional accessories

Filter unit, RB10 resistor box, TPT9000 Transformer Polarity Tester, pushbutton lead for run-back timing on disc induction relays, backpack.

Safety

An earth terminal is provided for connection to a local earth. The unit is designed to comply with BSEN61010 and is CE marked.

Dimensions

464 x 366 x 176mm

Weight

Main unit: 13.2kg

Full kit with backpack & leads: 16.6kg

50ADM-P Applications

IEEE no.	Type
21	Distance protection (phase at a time)
24	Volts/Hz
25	Check sync
27/59	Under/over voltage
32/P/Q	Directional power
37	Under-current/power
40	Field relay
46N	Negative sequence overcurrent relay
50/76	Instantaneous overcurrent
50	Ground fault relay
50V	Voltage restrained overcurrent
51	IDMT overcurrent relay
55	Power factor relay
59G	Neutral voltage displacement
67	Directional overcurrent
67N	Directional ground fault
78	Phase angle
79	Auto recloser
81	Under/over frequency
85	Pilot wire relay
86	Lockout relay
87	Differential relay
91	Directional voltage relay
92	Power directional relay
94	Tripping relay
	Voltage regulating relay
	Miniature circuit breakers
	Thermal relays
	CT mag curves

200ADM-P Mk2

Current Injection System with Phase Shift

Features

- 0-200A output current
- True RMS metering with 1 cycle capture
- Variable auxiliary AC voltage/current output with phase shift
- Auxiliary metering: V, f, Φ, X, Z, P, S, PF, CT ratio, harmonics
- Variable auxiliary output 12-220VDC
- Multi-function auto-ranging timing system
- Current limit mode for fine control
- Data storage to USB memory key including waveform & harmonics
- USB keyboard/printer interface
- Automatic mains voltage selection

The 200ADM-P Mk2 is a current injection system with a wide range of advanced features including phase shift, data storage and harmonic analysis.

The unit has a range of outputs allowing injection of currents between 1mA and 200A. Voltages up to 240V are available on the main outputs allowing high impedance current relays to be tested. True RMS metering with single cycle capture is provided. Four current ranges allow the full scale of the meter and trip level to be set independently of the selected output. Industry standard safety connectors are used throughout for safe, reliable convenience.

The 200ADM-P Mk2 has a flexible auxiliary AC output that can be used at up to 260V for voltage relays or up to 10A for current relays. The phase and frequency of this output are fully adjustable. This combination of voltage and current allows testing of relays that require two voltages, one voltage and one current or two currents.

An auxiliary metering module is provided that meters AC and DC voltage, current and frequency from the auxiliary outputs or external signals. The module can also take measurements in conjunction with the main current output to meter phase angle, power, impedance, CT ratio and harmonics.

A variable stabilised DC supply with current limit is provided to power the relay under test.

The unit has a comprehensive timing system linked to the outputs allowing trip times, reset times and reclose times to be quickly measured to a high degree of accuracy. The timer includes a current operated mode and can test instantaneous trips.

Two USB host sockets are provided to connect a memory key, keyboard or printer. Results of every test can be stored to the memory key in spreadsheet format for later analysis. The keyboard allows entry of a comment against each result. In addition a graphics file of the waveform may be stored to the memory key. Harmonic analysis results can also be recorded.

200ADM-P Mk2 Applications

IEEE No.	Type
21	Distance protection (phase at a time)
24	Volts/Hz
25	Check sync
27/59	Under/over voltage
32/P/Q	Directional power
37	Under-current/power
40	Field relay
46N	Negative sequence overcurrent relay
50/76	Instantaneous overcurrent
50	Ground fault relay
50V	Voltage restrained overcurrent
51	IDMT overcurrent relay
55	Power factor relay
59G	Neutral voltage displacement
67	Directional overcurrent
67N	Directional ground fault
78	Phase angle
79	Auto recloser
81	Under/over frequency
85	Pilot wire relay
86	Lockout relay
87	Differential relay
91	Directional voltage relay
92	Power directional relay
94	Tripping relay, Voltage regulating relay, Miniature circuit breakers, Thermal relays, CT mag curves

200ADM-P Mk2 Specification

Main Output

The main output on the unit has four taps, allowing the selection of output voltages up to 240V and output currents up to 200A.

	Current				Output @230V	
Range	Cont	5 min*	1 min*	6 sec**	O/C	Load V
10V	33A	67A	100A	200A	10.5V	8.7V@ 100A
35V	10A	20A	30A	-	36V	32V@ 30A
100V	3A	6A	10A	-	108V	99V@ 10A
240V	1A	2A	3A	-	276V	259V@3A
240V DC	1A	2A	3A	-		

Protection: over current trip, duty cycle trip, thermal monitoring.

**Off time of 15 minutes. On times based on an ambient temperature of 25°C.*
***6 second intermittent ratings available with 230V supply.*

Auxiliary Metering

The auxiliary metering input on the 200ADM-P Mk2 measures AC and DC voltage and current. The input is rated for 300V RMS or 5/10A RMS (10A for waveforms with a Crest Factor up to 1.5; 5A RMS for a CF of 3).

The module can take measurements using the main output and auxiliary input together to measure phase angle, power, impedance and CT ratio (for both 1A and 5A CTs). It can also analyse the harmonic content of the main output and auxiliary input up to 31st harmonic and calculate the THD of the waveform. Measurements may be logged to the USB key.

DC: Volts/Amps DC average & RMS ripple
AC: Volts/Amps AC RMS, frequency & phase angle
Power: S (VA), P (W) and power factor
Impedance: Z, X & phase angle (**Φ**)
CT ratio: Ratio relative to 1A & 5A CT and phase angle
Harmonic: Harmonics & THD main output & aux input
Protection: fuse on current input.

Setting	Range	Resolution	Accuracy
VDC/AC rms	300.0V	0.1V	±0.7%rdg±5d
Idc/AC rms	5.000A CF<3 9.999A CF<1.5	0.001A	±0.7%rdg±5d
Phase	-179.9°—+180.0°	0.1°	±3°
Frequency	40—100Hz	0.01Hz	±0.02%rdg±1d

Auxiliary AC Output and its Applications

The auxiliary AC output supplies an extra isolated voltage or current to the relay under test. The output is a digitally generated pure sine wave, and three ranges (two voltage and one current) are provided for maximum flexibility.

The output is adjustable from zero and can be phase shifted through 360°. It is also linked to the timer circuit.

Range	Maximum Output Voltage		Current	Current
Range	No load	Full load	Continu-ous	5 min on/ 15 min off
0-130V	144V	125V	0.23A	0.46A
0-260V	288V	250V	0.11A	0.23A
0-6V	6.6V	5V	5A	10A

Frequency range: 45 - 100Hz
Phase angle: 0 - ±180°

Protection: current limit and electronic trip.

1 Voltage — Over/Under Voltage Relays

Testing over and under voltage relays with the 200ADM-P Mk2 is simple—even checking delay times. Connect the main output in series with the auxiliary output to generate voltage steps with timing.

1 Voltage — Frequency Relays

The auxiliary AC output can be either phase locked to the supply or switched to variable frequency mode. Operating points are easily determined and the response of the relay timed.

1 Voltage + 1 Current — Various Relays

The phase shifting capability of the auxiliary output is ideal for testing directional overcurrent and earth fault relays. The main output is used to inject current and the auxiliary supplies the voltage coil. The same configuration is used to test reverse power relays and phase at a time testing of distance protection. Test of these relays is eased further by direct display of W, VA, phase angle and impedance. Testing an Automatic Voltage Regulating (AVR) relay with line drop compensation also requires a current and voltage with phase-shift. The two contact inputs can be used to show the state of the up/down contacts on the relay.

2 Currents — Bias Differential Relay

The 10A auxiliary AC output can be used to supply a second current to the relay under test as required by differential protection. This output, independent of the mains, can be used when a stabilised current is required.

2 Voltages — Check Sync Relay

The combination of the main output used as a voltage source and the auxiliary AC output meets the requirements of Check-Sync testing. With the auxiliary output set to variable frequency different frequencies may be applied to the relay inputs for checking the frequency matching function of the relay. Switching to phase lock mode then allows the phase check function of the relay to be tested.

Timing System

Each contact circuit will auto-select for normally open or normally closed contacts. A DC voltage of 24—240VDC may also be used to trigger either timer channel. Contact state is shown by an LED.

Mode	Timer Start	Timer Stop
Internal start	Press 'ON'	Contact 1 or 2 change
1 contact	Contact 1 1st change	Contact 1 2nd change
2 contacts	Contact 1 change	Contact 2 change
MART (Multiple Auto -Reclose Timing)	Contact 2 change	Contact 1 change
Current operated	Current > 10% of metering range	Current <10% of metering range
Pulse	Press 'ON'	200ms
Aux AC	Aux AC on/switch freq to φ/ switch φ to freq	Contact 1 or 2 change

For example, to time an IDMT current relay the relay contacts are connected to Contact set 1 and "internal start" mode is selected. When the main output is switched on, current injection and the timer starts. When the relay trips the timer stops and the output is switched off. All contacts are sensitive to changes of state rather than setting for normally open or normally closed. At the end of a test when the timer stops the output is switched off to safeguard the relay under test. LEDs indicate the contact state.

Setting the timer to AUX AC starts the timer when the auxiliary AC output is switched on or the output is switched from variable frequency to phase control or vice versa. This is ideal for testing trip times on under or over voltage protection and testing Check Sync Relays.

Timing System	
Range	0-999.999s/9999.99s/99999.9s autoranging
Resolution	1/10/100ms
Accuracy	0.01%rdg+2d (+4d current operated mode)
Contact o/c	24V
Contact s/c	20mA
VDC	24 - 240V

In addition the unit will time between changes on one set of contacts or two sets of contacts. Current operated mode starts and stops the timer on the rise and fall of current on the main output. This mode will test devices where the breaking contacts are in series with the sense circuit, as in thermal or thermal-magnetic circuit breakers.

Pulse mode is used for setting the current level in devices sensitive to heating. Current is injected for 200ms and the current recorded.

Metering

The output is metered by a digital true RMS system with a single cycle capture memory ammeter—whenever the timer stops and the output is switched off, the current reading is held on the display. A current trip is set to 110% of full scale of the selected metering range.

I Limit Mode

The 200ADM-P Mk2 has a current limit function for the main output that gives very fine current control for currents up to 10A. Low impedance loads such as microprocessor relays present no problem to the 200ADM-P Mk2, currents can be accurately controlled down to a few mA.

	Current (A)				Output V @230V	
Range	Short circuit	Cont.	5 min	2 min	O/C	Load V
10V	10A	3A	6A	10A	8.6V	5V@5A
35V	3A	1A	2A	3A	29V	13V@2A
100V	1A	0.3A	0.6A	1A	88V	40V@0.6A
240V	0.3A	0.1A	0.2A	0.3A	224V	130V@0.2A

Safety

An earth terminal is provided for connection to a local earth.The unit is designed to comply with BSEN61010 and is CE marked.

Supply Requirements

115V/230V ±10% auto-selecting 50/60Hz 1ph, 2300VA max.

Temperature Range

Storage -20°C to 60°C **Operating** 0°C to 45°C

Dimensions

Peli case: 560 x 456 x 265mm;

Metal case: 380 x 314 x 221mm;

Weight

22.6kg

19.5kg

Accessories

The 200ADM-P Mk2 is supplied with operating manual, output lead set, mains lead, spare fuses, USB keyboard, USB memory key.

Lead Set specifications

The 200ADM-P Mk2 is supplied with a high quality lead set including:

- 2 x 5m 25mm² 200A leads terminated in M10 fork crimps
- 2 x 5m, 2 x 0.5m 2.5mm² 25A leads terminated in 4mm plugs
- 1 x 5m 2 core auxiliary leads terminated in 4mm plugs

Optional accessories

Filter unit, RB10 resistor box, TPT9000 Transformer Polarity Tester, printer, pushbutton lead for runback timing on disc induction relays.

Auxiliary DC Output

The 200ADM-P Mk2 has a stabilised, variable DC output for powering the relay under test with an output of 12-220V in two ranges. The output is current limited and can supply loads requiring high inrush currents.

Range	Maximum A	Continuous rating
12-60V	1A	25W
60-220V	0.23A	25W

The unit is also available in a peli case; this must be specified at the time of ordering.

Storage of Results

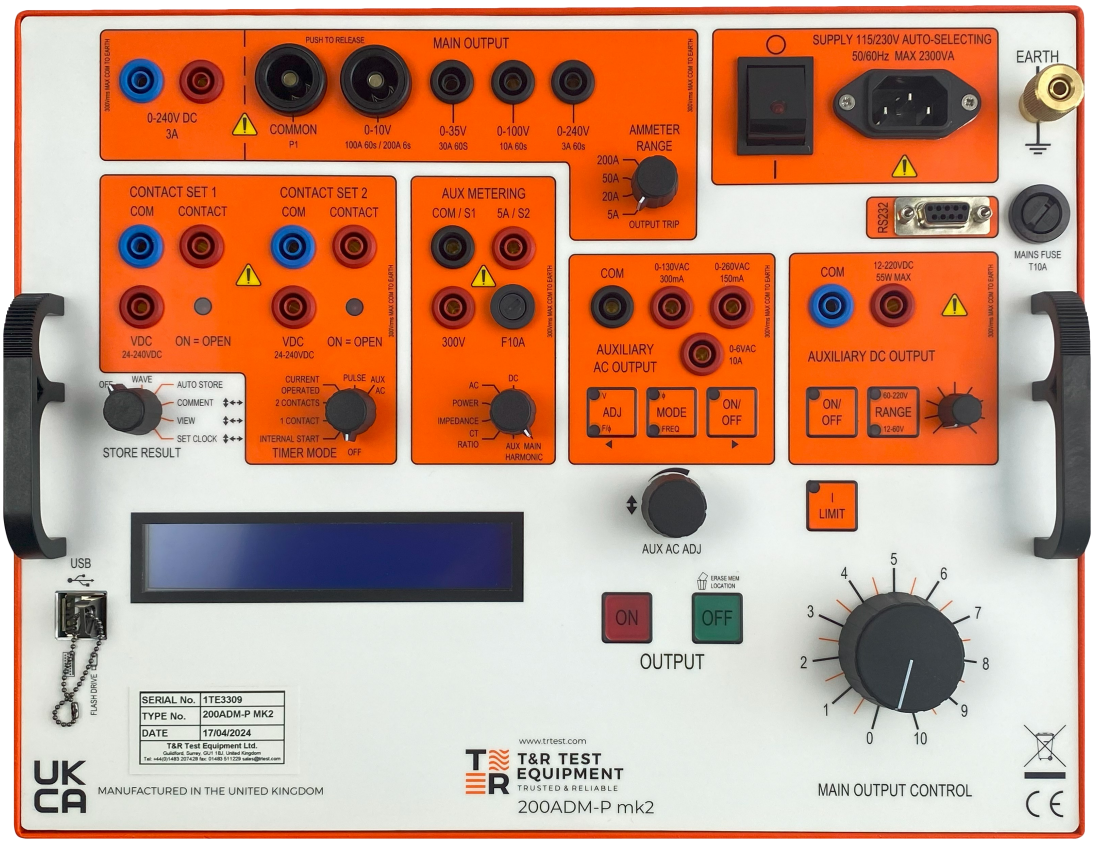
All test results from the 200ADM-P Mk2 can be stored in a USB memory key. The unit has a real-time clock to time and date-stamp all results. To log the results, first enter a comment for your results using the digital pot and arrow keys or optional keyboard, and then select AUTO STORE.

Whenever the timer stops, the time, current and all other parameters are added to a spreadsheet file on the USB key. You can then view the current set of results on the display or take the USB key out and open the file on your PC.

All results are stored in a folder on the USB key named with the test date in a file named with the time.

Sample data stored on USB key

Time	Date	Main A	Timer	Aux A	Aux V	Phase	Freq Hz	Comment
10:53:12	12/12/17	2.000	10.000	0.000	10.0	10.3	50.00	Overcurrent sub1 relay 12
10:53:30	12/12/17	5.000	3.000	0.000	10.0	10.3	50.00	Overcurrent sub1 relay 12
10:54:10	12/12/17	10.00	1.000	0.000	10.0	10.3	50.00	Overcurrent sub1 relay 12



100ADM-F
Current Filter Unit

The 100ADM-F filter unit reduces the level of current harmonics when testing electro-mechanical protection relays. It is designed for use with our range of secondary injection test sets.

All electromechanical protection relays have iron cores that saturate and distort the test current under high overload test conditions. This distortion causes significant errors in the measured trip time of these relays during testing. Distortion of the waveform can be a particular problem with disc induction type over-current and sensitive earth fault relays.

For example, testing a CDG11 disc induction over-current relay without a filter causes significant timing errors. The results below show the errors for a 1.3s 1A CDG11 over-current relay on its 0.5A plug setting, tested at 5A.

	Current	THD	Trip time	Error
No Filter	5A	34.5%	1.54s	18.5%
With Filter	5A	6.12%	1.30s	0%

The 100ADM-F has nine current ranges covering 0.25A to 100A and is supplied in an insulated case complete with protective cover and carrying strap.

Accessories
Current monitor plug and lead

Optional Accessories
100AL lead set

Temperature Range
Storage -20°C to 60°C **Operating** 0°C to 45°C

Dimensions
340 x 230 x 330mm

Weight
15.6kg

Frequency
The unit may be used at either 50Hz or 60Hz, selectable by a switch on the front panel.

Current Monitor
A current monitoring output is provided that gives an output of 0-100mA corresponding to the rated current for the range.

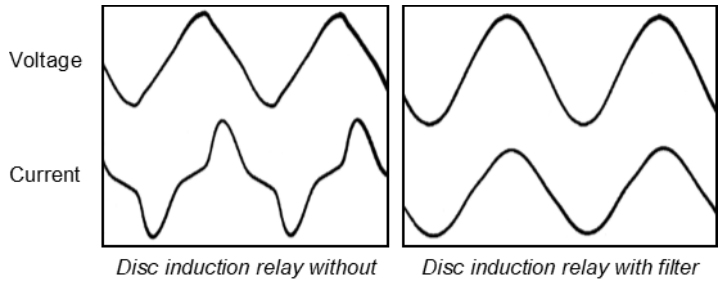
Features

- Forces test current to a sinusoid
- Improves timing accuracy when testing electromechanical relays
- 0.25A-100A ranges
- High overload capability
- 50/60Hz operating frequency
- High efficiency

100ADM-F Specification

Current Waveforms

The waveforms below show the current and voltage for a disc induction relay supplied from a 100ADM.



Disc induction relay without filter unit *Disc induction relay with filter unit*

Current Ranges and Ratings

Range	Continuous rating	5 min on/15 min off
0.25A	0.125A	0.25A
0.5A	0.25A	0.5A
1A	0.5A	1A
2.5A	1.25A	2.5A
5A	2.5A	5A
10A	5A	10A
25A	12.5A	25A
50A	25A	50A
100A	50A	100A

Range Selection
The lower ranges (0.25A-50A) are selected by a switch, and the highest current range (100A) is selected by a terminal.

Filter Unit Impedance

Range	Impedance (Ω)			
	50Hz	150Hz	250Hz	350Hz
0.25A	880Ω	17.5kΩ	30.4kΩ	41.5kΩ
0.5A	220Ω	4.38kΩ	7.65kΩ	10.3kΩ
1A	47.7Ω	950Ω	1.65kΩ	2.25kΩ
2.5A	7.8Ω	150Ω	250Ω	360Ω
5A	1.94Ω	38Ω	65Ω	90Ω
10A	510mΩ	9.5Ω	16.5Ω	22.5Ω
25A	85mΩ	1.5Ω	2.5Ω	3.6Ω
50A	22mΩ	380mΩ	650mΩ	900mΩ
100A	5.5mΩ	95mΩ	165mΩ	225mΩ

RB10
Resistor Box

Features

- Improves current control into low impedance loads
- Particularly suitable for solid state relays
- 0.5W—1666.5W in 8 steps
- Maximum current 0.2—10A
- Thermal cutout
- Compact & lightweight

The RB10 resistor box is used in conjunction with a current injection unit when testing low impedance relays and trips, allowing finer control of the current. The unit is designed for use with the 100ADM Mk6 and 200ADM-P Mk2, but may be used with any suitable current source.

The unit has eight resistance ranges with a maximum power dissipation of 50W for any one resistor.

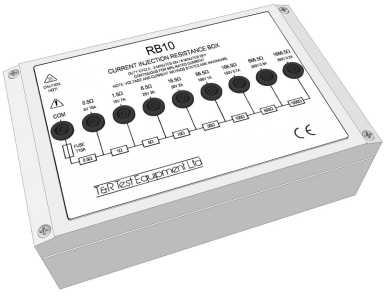
The RB10 is supplied in a robust aluminium case, and all connections are made by industry standard 4mm safety sockets.

Protection

The unit has over-temperature protection and the common terminal is fused with a T10A fuse.

Range Selection

The appropriate range is selected by 4mm safety sockets on the front panel of the unit.



RB10 Specification

Resistance Ranges and Ratings

The RB10 has eight resistance ranges:

Range	Continuous	Intermittent	Maximum
0.5W	5A	10A	5V
1.5W	3.5A	7A	10V
6.5W	1.5A	3A	25V
16.5W	1A	2A	50V
66.5W	0.5A	1A	100V
166.5W	0.35A	0.7A	150V
666.5W	0.15A	0.3A	250V
1666.5W	0.1A	0.2A	250V

*3 minutes on/8 minutes off

Temperature Range

Storage -20°C to 60°C **Operating** 0°C to 45°C

Dimensions

220 x 163 x 72mm
including earth terminal

Weight

2Kg

Optional Accessories

S000-0534 5m low current lead set

TPT9000
Transformer Polarity Tester

Features

- Fast polarity testing of both voltage and current transformers.
- Compact and light
- Easy to use
- Smart detection of incorrect connection
- Proving unit included in the kit as standard
- Fused lead sets included for user safety
- Supplied in a protective case.
- Long battery life

The TPT9000 is used for determining the correct polarity of current and voltage transformers. The TPT9000 automatically detects if the transformer has been connected incorrectly. The set also includes a proving unit to check the correct operation of the unit in the field.

The TPT9000 is designed to be used on 'dead' systems (i.e., no externally supplied voltages are present on the test object). Do not connect the TPT9000 to a live system. Always check that the power to the device under test is off. and the circuit is isolated before making any connections.

Proving Unit Included

Environment

The TPT9000 is designed for use in industrial and electrical substation environments.

Maximum altitude:	2000m
Temperature:	
operating	0°C to 45°C
storage	-20°C to 60°C
Relative humidity:	90% noncondensing
Protection rating:	IP20 in use

Supply requirements

The TPT9000 requires a single PP3 9V battery to operate. The battery level is automatically monitored, and the device will not perform a test if the battery voltage is below a useable level.

Overload protection

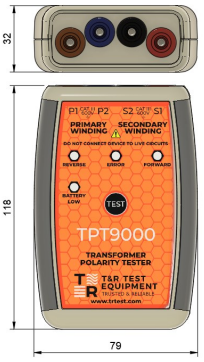
Each of the test leads must be fitted with a F500mA HRC fuse. This must be replaced with a fuse of the same type.

Test Leads

600V CAT IV fused test leads terminated in shrouded 4mm connectors.

TPT9000 Size

Tester: 118 x 79 x 32mm
With Proving Unit :143 x 79 x 32mm
Weight: 600g



750ADM Mk4
Current Injection System

Features

- Primary injection up to 750A
- 4V output*
- 16V 40A output for secondary injection
- True RMS memory ammeter with single cycle capture
- Multi-function timing system
- Large back-lit liquid crystal display
- Thermal and over-current protection
- Automatic switch-off at end of test
- Compact and portable
- Automatic mains voltage selection*
- USB Storage

*See specifications overleaf

T&R Test Equipment is a market leader in the field of current injection equipment. The range includes secondary injection units with 100A output capability up to 6000A primary injection systems. All have true RMS metering, a flexible timing system, and an easy to understand user interface.

The 750ADM Mk4 is a compact, rugged primary current injection system with a 750A output capability. The 750ADM Mk4 has a maximum no load output voltage of 5V. The unit is ideally suited to all low power primary injection tasks requiring up to 750A for short periods.

Unit type	Max. power	Max. current
750ADM Mk4	3kVA	750A
PCU1-SP + NLU5000	11.5kVA	3kA 5min/5kA 40s
CU-Ps Mk2 + PLU6000	20kVA	6kA

Where higher currents and powers are required for primary injection, 11kVA and 20kVA primary injection systems are also available.

The PCU1-SP and CU-PS MK2 systems have separate control units, allowing a wide range of load conditions to be met by different loading units.

PCU1-SP Mk3 + NLU5000

The unit has two outputs, allowing injection of currents as low as a few hundred milliamps and up to 750A. Voltages up to 16V are available on the 40A output, allowing higher impedance trips to be tested. Four true RMS metering ranges are provided, allowing the full scale of the meter and trip level to be set independently of the selected output. The metering has a capture time of less than 20ms, allowing the RMS of a single cycle to be accurately measured. Industry standard connectors are used on all inputs and outputs for convenience, reliability and safety.

The 750ADM Mk4 is comprehensively protected by electronic overcurrent and thermal trips.

The timing system is very flexible without compromising ease of use, allowing trip times, reset times and reclose times to be quickly measured to a high degree of accuracy. Two contact inputs are provided, each of which may be trigged by a volt-free contact or a DC voltage. The contact inputs auto-sense for normally open or normally closed contacts.

The 750ADM Mk4 can be used to test many devices including:

- Circuit breakers
- Primary injection of over-current relays
- Auto-reclosers
- MCB's
- CT ratio (with external meter for secondary current)

750ADM Mk4 Specification

Main Output

The main output on the unit has two taps, allowing the selection of output voltages up to 16V and output currents up to 750A. The unit operates at slightly reduced ratings when operating from a 115V supply.

		115V	230V
750A Output	Open circuit voltage	3.5V	5.0V
	Voltage at 500A	2.8V	4V
	Continuous current	125A	125A
	5 min on	250A	250A
	1 min on	440A	500A
	Max current	500A	750A
	Max current on time	10s	20s
40A Output	Open circuit voltage	10V	16V
	Full load voltage	7.5V	10V
	Continuous current	10A	10A
	1 min on	40A	40A

Metering

The output is metered by a digital true RMS system with a memory ammeter - whenever the output is switched off, the current reading is held on the display.

Range	Resolution	Trip current	Accuracy	Capture time
20.00A	0.01A	21A	±0.5%rdg+5d	20ms
50.00A	0.01A	53A	±0.5%rdg+5d	20ms
200.0A	0.1A	210A	±0.5%rdg+5d	20ms
750A	1A	788A	±0.5%rdg+2d	20ms

A current trip is automatically set to 105% of full scale of the selected metering range to protect the device under test.

Timing System

Range	0-999.999s/9999.99s/99999.9s auto-ranging
Resolution	1ms/10ms/100ms
Accuracy	±0.01%rdg+2d (except current operated)
	±0.01%rdg+4d (current operated mode)

The contact circuits have an open circuit voltage of 24VDC and a short circuit current of 20mA. Each contact circuit will auto-select for normally open or normally closed contacts. A DC voltage of 24-240VDC may also be used to trigger either timer channel.

The following functions are provided:

Mode	Timer Start	Timer Stop
Off	Timer inactive	Timer inactive
Internal start	Press 'ON'	Contact 1
Single contact	Contact 1	Contact 1
Dual contact	Contact 1	Contact 2
Current operated	Current > 20% of range	Current < 20% of range

The output is automatically switched off at the end of the test to safeguard the relay under test.

Supply Requirements

Auto-selecting

115V±10%	50/60Hz 1ph	1900VA max
230V±10%	50/60Hz 1ph	3900VA max

Temperature Range

Storage	-20°C to 60°C	Operating	0°C to 45°C

Dimensions

		Weight
Peli case:	560 x 456 x 265mm	27.4kg
Metal case:	380 x 314 x 221mm	23.5kg

Accessories

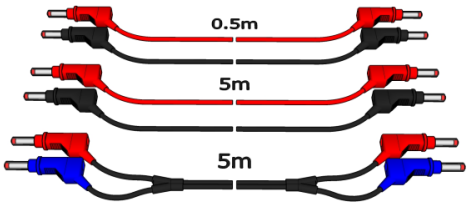
Operating manual, mains lead, and carrying strap.

Optional 750ADM-AL Lead Set specifications

A range of output leads is available to complement the 750ADM Mk4. The standard 750ADM-AL lead set is 3m long, recommended for use with a 230V Supply. A 1.5m lead set is also available, and is recommended when operating from a 115V supply.

The leads consist of double insulated 95mm^2 welding cable terminated in Dinse high current connectors at the 750ADM Mk4 end and high current welding clamps at the load end.

The 3m lead set weighs 9.8kg, including high current leads and timer leads. Low current timer leads are also included with the lead set:



Protection and Safety

The unit is protected by electronic over current and thermal trips on the outputs, and circuit breakers on the input and power circuit. An earth terminal is provided for connection to a local earth when testing in a substation environment. The unit is designed to comply with BSEN61010, and is CE marked.

PCU1-SP Mk3

Primary Current Injection System

Features

- 5kA maximum output current (higher overload currents for 2s)
- Multi-function digital timing system
- True RMS memory ammeter with single cycle capture
- 200A, 2000A and 5000A loading units
- Three range outputs on loading units except NLU200*
- Direct reading CT ratio and polarity
- Optional trolley mounting of system
- Secondary injection up to 100A
- Rugged, compact design
- USB Storage

The PCU1 series are medium powered primary current injection systems offering output currents up to 5000A. The system consists of a separate control unit containing all metering and control functions and a loading unit that provides the high current output. The PCU1-SP Mk3 is ideally suited to primary current injection, stability testing and circuit breaker testing. In addition, it offers direct-reading CT ratio and polarity tests and a 100A secondary injection output. T&R also offer the higher-powered CU-PS MK2 system.

Feature	PCU1-SP Mk3	CU-PS MK2
Primary injection	✓	✓
Max output power	11.5kVA 40s	20kVA 5 min
Secondary injection	✓	×
CT ratio/polarity test	✓	×

The PCU1-SP systems have a high accuracy timing system with 1ms resolution. Selection for normally open or normally closed contacts is automatic, and the status of the contacts is shown on the front panel. Timing modes are available for under and over current devices, re-closers, under and over voltage devices, current trips and circuit breakers.

Three loading units are available, delivering a maximum output current of 200A, 2000A or 5000A. Each loading unit, **except NLU200**, has three output taps to allow for a wide range of load impedances. For example, the NLU5000 may be configured to either give a maximum current of 5000A on the 2.3V range, 2500A on the 4.6V range or 1250A on the 9.2V range.

The control units are rated at 11.5kVA with a 2 second overload capability of 23kVA using pulse mode. All metering is digital and a memory facility is provided to hold the current reading when the output trips or is switched off.

PCU1-SP Mk3 + NLU5000

PCU1-SP Mk3 Specification

Protection and Safety

The PCU1 series and loading units are CE marked and are designed to meet the requirements of BS EN61010. The system is protected by electronic trips on the outputs, circuit breakers on the mains input, and control unit output. The unit also has a duty cycle trip on the loading unit output and thermal protection.

Supply Requirements

230V±10%, 45-65Hz 1ph 11.5kVA max (23kVA overload for 2s)

Loading Unit Current Metering

The AC output current is metered by a true RMS memory ammeter (acquisition time 200ms) with an LCD display. The current metering has 3 ranges corresponding to 10%, 50% and 100% of the maximum rating of the loading unit. The maximum obtainable current is set by the impedance of the test object and output leads.

NLU200

Range	Full scale	Resolution	Accuracy
10%	20.00A	0.01A	±0.5%rdg+5d*
50%	100.0A	0.1A	±0.5%rdg+5d*
100%	200.0A	0.1A	±0.5%rdg+5d*

NLU2000

Range	Full scale	Resolution	Accuracy
10%	200.0A	0.1A	±0.5%rdg+5d*
50%	1000A	1A	±0.5%rdg+5d*
100%	2000A	1A	±0.5%rdg+5d*

NLU5000

Range	Full scale	Resolution	Accuracy
10%	500.0A	0.1A	±0.5%rdg+5d*
50%	2500A	1A	±0.5%rdg+5d*
100%	5000A	1A	±0.5%rdg+5d*

* ±1.5%rdg+5d pulse mode

Timing System

The PCU1 systems have a flexible timing system with two contact inputs and 5 operating modes. Each contact circuit automatically selects for N/O or N/C contacts, and the status of each contact input is shown by an LED. The timing channels may also be triggered by a DC voltage between 24V and 240V.

Timer resolution	1ms
Timer full scale	999.999s
Timer accuracy	±0.01%rdg+2d (+4d current mode)
Contact O/C voltage	24V
Contact S/C current	20mA
Vdc input range	24-240Vdc

Timer mode	Timer start	Timer stop
Internal Start	'On' button	Contact
Single contact	Contact 1	Contact 1
Dual contact	Contact 1	Contact 2
Current operated	**I>20% rng	I<20% rng/Cont. 1
Pulse mode 0.2s *	'On button'	0.2s
Pulse mode 0.5s *	'On button'	0.5s
Pulse mode 1s *	'On button'	1s
Pulse mode 2s *	'On button'	2s
Off	Setting position	

***Pulse mode** applies current to the load for a maximum of the specified time. If contact set 1 changes state or the current drops below 20% of the metering range during the pulse time, the timer is stopped.

****Current operated mode** is used to time circuit breakers with no auxiliary contacts. The timer is started when the current exceeds 20% of the selected metering range (e.g. 100A on the NLU5000 500A range). The timer stops when the current falls.

Secondary Injection Output

Output Range	Continuous current	Intermittent current 5min on*	Intermittent current 1 min on*
0-5V	33A	67A	100A
0-15V	10A	20A	33A

*All on times must be followed by an off time of 15 minutes

Metering Range	Current trip	Resolution	Accuracy
10.00A	10.5A	0.01A	±0.5%rdg+5d
20.00A	21A	0.01A	±0.5%rdg+5d
100.0A	105A	0.1A	±0.5%rdg+5d

Control Unit Standard Accessories

Mains lead (5m), loading unit power and metering leads (5m), operating manual and spare fuses.

Dimensions		Weight
PCU1-SP	450 x 275 x 305mm	26kg
NLU200	450 x 275 x 370mm	49kg
NLU2000	450 x 275 x 370mm	50kg
NLU5000	450 x 275 x 370mm	60kg

Temperature Range

Storage -20°C to 60°C Operating 0°C to 45°C

Optional Loading Unit Specifications

Three loading units are available to provide a range of output currents.

NLU200 Loading Unit Intermittent Ratings

Voltage*	Current		
	Cont.	2min	40s
60V	40A	120A	200A
120V	20A	60A	100A

NLU2000 Loading Unit Intermittent Ratings

Voltage*	Current			
	Cont.	5 min	1 min	40s
4V	600A	1200A	1800A	2000A
8V	300A	600A	900A	1000A
16V	150A	300A	450A	500A

NLU5000 Loading Unit Intermittent Ratings

Voltage*	Current			
	Cont.	5 min	1 min	40s
2.3V	1500A	3000A	4500A	5000A
4.6V	750A	1500A	2250A	2500A
9.2V	375A	750A	1125A	1250A

*open circuit voltage at 230V mains

Optional Output Lead Set Specifications

Type	Length	CSA	Termination
2000NAL	1m to 5m	280mm^2	Copper bar
3000NAL**	1m to 3m	420mm^2	Copper bar
5000NAL**	1m to 3m	560mm^2	Copper bar

*Output currents above 3000A require very short leads, and longer leads will restrict the maximum current available

CU-Ps Mk2

Primary Current Injection System

Features

- 20kVA 5 minute output capability (higher overload currents for 1s)
- Multi-function digital timing
- 5000A and 6000A loading units
- Separate control and loading units
- Secondary injection up to 100A
- Direct reading CT ratio and polarity
- True RMS metering with 1 cycle capture
- Data storage to USB memory key including waveform & harmonics
- USB keyboard interface

The CU-Ps Mk2 primary current injection system is ideally suited to commissioning and maintenance testing where very high currents are required. The system consists of separate control and loading units for maximum flexibility. The control unit contains all control and metering circuitry, and is linked to the loading unit by control and metering cables.

The control unit may be used with one of two loading units providing between 5000A or 6000A for 5 minutes or up to 10 or 12kA for short periods. Each loading unit has two outputs which may be connected in series or parallel for maximum flexibility. For example, the PLU-6k may be configured to either give a maximum current of 3000A at 6.6V or 6000A at 3.3V.

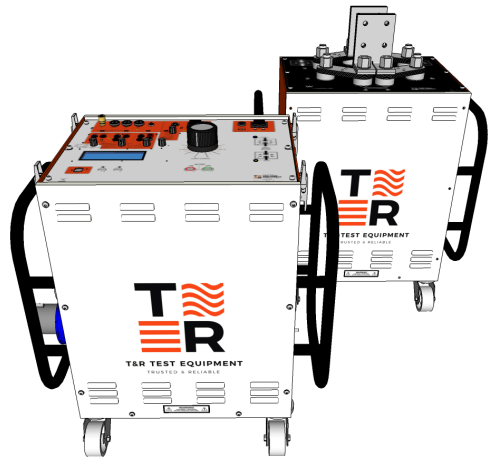
The control and loading units are each housed in tough steel cases fitted with castors and protective lifting handles. The loading units have a small plan area to allow them to be positioned as close as possible to the test object, minimising power requirements and maximising the available current.

The CU-Ps Mk2 control unit is shown here with a PLU-6k loading unit. This combination may be used to inject currents of up to 6000A for 5 minutes or 12000A for 1 second.

This unit is ideally suited to all primary current injection tasks, including testing under and over current relays, circuit breakers and CT ratio testing.

The control unit is rated at 20kVA and has digital metering. A memory facility is provided on the metering to hold the current reading when the output trips or is switched off. The current is automatically switched off when the device under test trips.

The CU-Ps Mk2 systems have a high accuracy timing system with 1ms resolution. Selection for normally open or normally closed contacts is automatic, and the status of the contacts is shown on the front panel. Timing modes are available for under and over current devices, re-closers, under and over voltage devices, current trips and circuit breakers.



CU-Ps Mk2 Specification

Loading Unit Current Metering

The AC output current is metered by a true RMS memory ammeter (acquisition time 20ms) with a liquid crystal display. The current metering has 3 ranges corresponding to 10%, 50% and 100% of the maximum rating of the loading unit. In addition, a 200% metering range is enabled in pulse mode for the 0.2s, 0.5s and 1s settings only.

PLU-5k

Range	Series Mode	Parallel Mode	Resolution	Accuracy
10%	250.0A	500.0A	0.1A	±0.5%rdg+5d
50%	1250A	2500A	1A	±0.5%rdg+5d
100%	2500A	5000A	1A	±0.5%rdg+5d
200%	5000A	10kA	10A	±1.5%rdg+5d

PLU-6k

Range	Series Mode	Parallel Mode	Resolution	Accuracy
10%	300.0A	600.0A	0.1A	±0.5%rdg+5d
50%	1500A	3000A	1A	±0.5%rdg+5d
100%	3000A	6000A	1A	±0.5%rdg+5d
200%	6000A	12kA	10A	±1.5%rdg+5d

±1.5%rdg+5d pulse mode

Timing System

The CU-Ps Mk2 systems have a flexible timing system with two contact inputs and 5 operating modes. Each contact circuit automatically selects for N/O or N/C contacts, and the status of each contact input is shown by an LED. The timing channels may also be triggered by a dc voltage between 24 and 240V.

Timer resolution	1ms
Timer full scale	999.999s
Timer accuracy	±0.01%rdg+2d
Contact O/C voltage	24V
Contact S/C current	20mA
Vdc input range	24-240Vdc

Timer mode	Timer start	Timer stop
Internal Start	'On' button	Contact
Single contact	Contact 1	Contact 1
Dual contact	Contact 1	Contact 2
Current operated **	I >20% rng	I <20% rng
Pulse mode 0.2s *	'On button'	0.2s
Pulse mode 0.5s *	'On button'	0.5s
Pulse mode 1s *	'On button'	1s
Pulse mode 2s *	'On button'	2s
Off	Setting position	

Pulse mode applies current to the load for a maximum of the specified time. If contact set 1 changes state or the current drops below 20% of the metering range during the pulse time, the timer is stopped. The maximum output current is increased in pulse mode. The maximum obtainable current is set by the impedance of the test object and output leads.

**Current operated mode* is used to time circuit breakers with no auxiliary contacts. The timer is started when the current exceeds 20% of the selected metering range (e.g. 1000A on the PLU-5k 5000A range). The timer stops when the current falls.

Secondary Injection Output

Output Range	Continuous current	Intermittent current 5min on*	1 min on*
0-5V	33A	67A	100A
0-16V	10A	20A	30A

*All on times must be followed by an off time of 15 minutes

Metering Range	Resolution	Accuracy	Current trip
10.00A	0.01A	±0.5%rdg+5d	10.5A
20.00A	0.01A	±0.5%rdg+5d	21A
100.0A	0.1A	±0.5%rdg+5d	30A

Supply Requirements

230V±10%, 45-65Hz 1ph 23kVA 5 min/46kVA 1s

Control Unit Standard Accessories

Spare fuse set, operating manual.
1 x 5m loading unit power interconnection lead.
1 x 5m loading unit metering interconnection lead.
1 x 2m mains lead.
1x 5m 100A leads and timer leads.

Dimensions

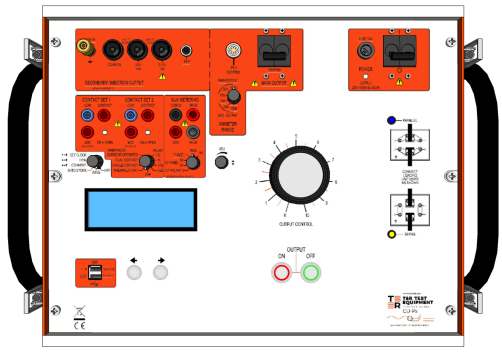
		Weight
Control unit	660 x 400 x 740mm	115kg
PLU-5k	660 x 400 x 740mm	155kg
PLU-6k	660 x 400 x 740mm	135kg

Temperature Range

Storage -20°C to 60°C, Operating 0°C to 45°C

Protection and Safety

The CU-Ps Mk2 series and loading units are CE marked and are designed to meet the requirements of BS EN61010. The system is protected by electronic trips on the outputs, circuit breaker and fuse on the mains input, and a circuit breaker on the control unit output. The unit also has a duty cycle trip on the loading unit output and thermal protection.



CU-Ps Mk2 Specification

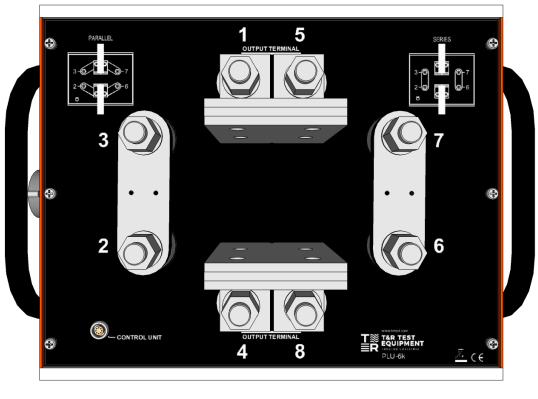
Loading Unit Output

The output of the loading unit is continuously variable from zero. Each unit may be operated in series/parallel mode to allow for a greater range of load impedances. All metering and tripping functions are handled by the control unit.

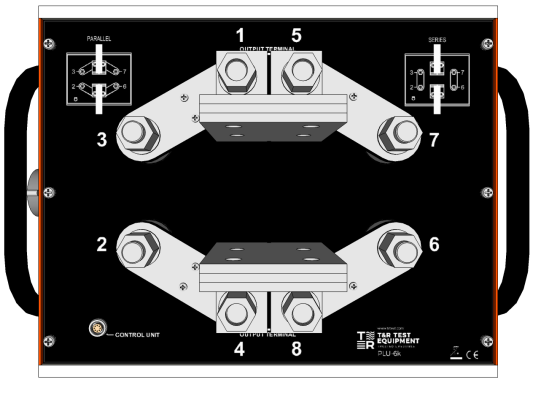
Primary Injection Output		PLU-5k		PLU-6k	
		Parallel mode	Series mode	Parallel mode	Series mode
Open Circuit V*		0-4V	0-8V	0-3.3V	0-6.6V
Contin-uous	Current	2500A	1250A	3000A	1500A
	Max kVA	10	10	10	10
5 min on/ 15	Current	5000A	2500A	6000A	3000A
	Max kVA	20	20	20	20
2 sec pulse	Current	8000A	4000A	9600A	4800A
	Max kVA	32	32	32	32
1 sec pulse	Current	10000A	5000A	12000A	6000A
	Max kVA	40	40	40	40
0.5 sec pulse	Current	10000A	5000A	12000A	6000A
	Max kVA	40	40	40	40
0.2 sec pulse	Current	10000A	5000A	12000A	6000A
	Max kVA	40	40	40	40

*open circuit voltage at 230V mains

Series Mode



Parallel Mode



Storage of Results

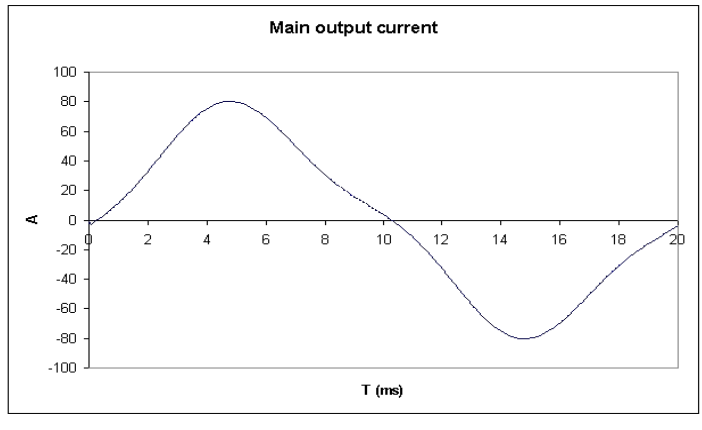
All test results from the CU-Ps Mk2 can be stored in a USB memory key. The unit has a real-time clock to time and date-stamp all results. To log the results, first enter a comment for your results using the optional keyboard, and then select AUTO STORE.

Whenever the timer stops, the time, current and all other parameters are added to a spreadsheet file on the USB key. You can then view the current set of results on the display or take the USB key out and open the file on your PC. All results are stored in a folder on the USB key named with the test date in a file named with the time.

Sample data stored on USB key

```
Time,       Date,     Main A,Timer,    Aux A,   Aux V,  Phase,  Freq Hz,  Comment
10:53:12,12/12/18,    2050,   10.000,  0.000,   10.0,   10.3,   50.00,    Breaker 12
10:53:30,12/12/18,    5120,   3.000,   0.000,   10.0,   10.3,   50.00,    Breaker 12
10:54:10,12/12/18,    1020,   1.000,   0.000,   10.0,   10.3,   50.00,    Breaker 12
```

Also the CU-Ps Mk2 can store a .CSV file of the waveform



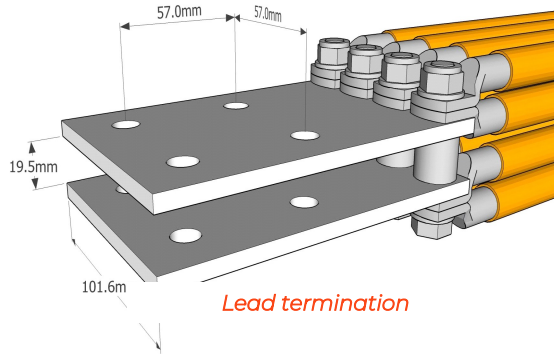
Optional Output Lead Set Specifications

A range of output lead sets are available to complement the CU-Ps Mk2 system with current ratings between 3000A and 6000A. The leads are double insulated and have good flexibility.

Type	Length	CSA	Termination
3000AL	2.5m	560mm²	Copper bar
4000AL	2.5m	700mm²	Copper bar
5000AL	2m	840mm²	Copper bar
6000AL	2m	1120mm²	Copper bar

Other output lead lengths are available on request.

Output currents above 3000A require very short leads, and longer leads will restrict the maximum current available.



Lead termination

DP5 DP20 DP40
High Voltage DC Discharge Probes

DP20 Discharge probe

Features

- For discharging high voltage cables after testing
- Earthing hook
- Highly flexible, clear silicone overed earth cable
- For use with PT30-10 cable test sets

The DP5, DP20, and DP40 discharge probes are designed for discharging high voltage cables after testing. The probes are supplied as standard accessories for the T&R PT18-10 and PT30-10 cable test sets, and are also available separately.

The discharge probes consist of a pointed probe connected to a 5m long earth lead via a series of surge resistors with an insulated handle. The earth lead insulation is clear silicone allowing the conductor to be easily inspected, and is terminated in an M6 hooked crimp.

	DP5	DP20	DP40
Maximum discharge voltage	5kV	20kV	40kV
Maximum discharge energy	0.9kJ	3.6kJ	7.2kJ
Maximum discharge capacitance	48µF	12µF	6µF
Resistance	10kΩ	30kΩ	60kΩ
Length	390mm	530mm	900mm
Earth lead length	0-5m	5m	5m
Earth lead CSA	6mm²	6mm²	6mm²

ES30 ES50 ES100
Earth Sticks

ES30

Features

- For earthing high voltage connections
- Highly flexible, clear silicone covered earth cable

The ES30, ES50 and ES100 earthing sticks are designed for earthing the high voltage connection after AC testing in accordance with BS-EN50191.

The earthing sticks consist of a hooked earth connection mounted on an insulated handle with a 5m earth lead.

The earth lead insulation is clear silicone allowing the conductor to be easily inspected, and is terminated in an M6 hooked crimp.

	ES30	ES50	ES100
Maximum voltage	30kV	50kV	100kV
Length	670mm	840mm	1270mm
Earth lead length	5m	5m	5m
Earth lead CSA	6mm²	6mm²	6mm²

Each of the earth sticks unscrews into two sections for easy storage and transport.

Note: Under no circumstances must these discharge/earthing probes be used on energised distribution systems.

KV5-100 Mk4
High Voltage AC Test System

Features

- Continuously variable output voltage 0-5kVac
- Variable trip circuit 2-12mA and 20-120mA
- Output voltage and current metering
- Visual and audible indication of test piece failure
- Compact lightweight instrument
- Burn feature giving 100mA maximum current on short circuit
- Key operated switch preventing unauthorised operation
- Complies with the testing requirements of BS1363

T&R Test Equipment is a market leader in the field of protection test equipment. The range includes primary and secondary current injection equipment up 6000A, voltage sources, micro-ohmmeters and high voltage test systems up to 100kV.

The KV5-100 Mk4 high voltage test set is a general purpose test instrument designed for testing insulation systems and the measurement of breakdown voltage on electrical plant and components.

The unit has an output voltage adjustable from zero to 5kV with accurate metering on both the output voltage and current. A zero-voltage interlock is provided, ensuring that the output may only be energised with the voltage control at zero.

The output voltage is metered by a large, linear analogue instrument with a dual-scale marking of 0-3kV and 0-6kV. Load current is metered by a second analogue instrument with 0-10 scale marking. Two current ranges are selectable: 0-10mA and 0-100mA.

The test object and output are protected by an adjustable current trip linked to the current metering range. The trip level may be set to 20-120% of the current metering range on 20% steps.

Breakdown of the test object is both audibly and visibly indicated. The alarm must be manually reset after a trip condition before testing can be resumed.

The instrument is supplied in a compact and portable case with permanently connected test leads. The test leads are terminated in clips. The unit is designed for operation in conjunction with a suitable interlocked test enclosure or high voltage test area.

KV5-100 Mk4 Specification

Output

The main output on the unit is variable between 0 and 5kVac. The output is rated at 50mA continuously and 100mA for 5 minutes followed by an off time of 15 minutes.

Metering

The output voltage is metered by an analogue instrument with 0-3kV and 0-6kV scaling.

Range	Accuracy
3kV	±1.5% of FS
6kV	±1.5% of FS

The output current is metered by a dual range analogue instrument with 0-10mA and 0-100mA ranges. The current trip may be set to 20-120% of the selected range in 20% steps.

Range	Trip Current	Accuracy
10mA	2-12mA	±3% of FS
100mA	20-120mA	±3% of FS

Overload Protection

An electronic overload protection circuit is provided on the KV5-100 Mk4, backed up by a fuse. The trip current is user selectable, and allows values between 2mA and 120mA to be set. A trip condition is indicated by an illuminated push button and an audible alarm.

Burn Circuit

When in circuit, the maximum short circuit current is limited to 100mA. When out of circuit, the maximum short circuit current is approximately 2A.

Output connections

The KV5-100 Mk4 is provided with battery clips for connection to the object under test. The unit is designed to be operated in conjunction with an interlocked test enclosure ensuring safety for the user.

Interlock Circuits

The unit has a zero volt interlock that prevents the output being energised unless the output control is in the zero position. An external interlock connection is also provided, allowing the fitting of external emergency off buttons and test enclosure/cage door interlocks.

KV50-100 mk3 output transformer.

Supply Requirements

115V±10%	50/60Hz	1ph	600VA max
240V±10% 5	0/60Hz	1ph	600VA max

Protection and Safety

The unit is protected by electronic over current trips on the outputs and a fuse on the mains. An earth terminal is provided for connection to a local earth.

The unit is designed to comply with BSEN61010, and is CE marked. The unit must be installed to the requirements of BS EN50191.

Temperature Range

Storage -20°C to 60°C **Operating** 0°C to 45°C

Dimensions

364 x 147 x 262mm

Weight

16.5kg

Accessories

Operating manual, mains lead, spare fuse.

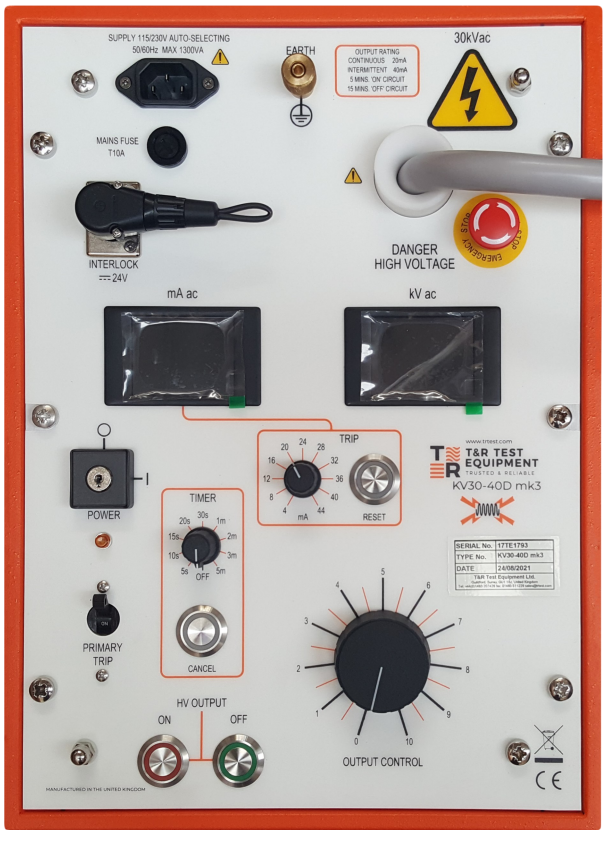
Variants

Other voltages and ratings for this unit are available as special products on request. Such as the KV4-300, a unit with a 4kV, 300mA rating. Units have also been supplied with a 3kV 250mA rating. If you would like a quote for your specific requirements please contact us.

The KV5-100 Mk4 is one of a range of high voltage test systems available from T&R Test Equipment.

Unit type	Voltage	Current
KV5-100 Mk4	5kV	100mA
KV15-80D	15kV	80mA
KV30-40D Mk4	30kV	40mA
KV30-100 mk3	30kV	100mA
KV50-100 mk3	50kV	100mA
KV50-200 mk3	50kV	200mA
KV100-100 mk3	100kV	100mA

KV30-40D Mk4
High Voltage AC Test System



Features

- 0-30kV output voltage
- Automatic mains voltage selection
- Key operated supply switch to prevent unauthorised operation
- Dual overload protection
- Variable electronic trip - 10-110% of rated output
- Voltage and current digital metering
- Zero-volt interlock
- External 24VDC interlock circuit
- Optional Test timer
- Emergency stop
- Visual indication of test piece failure

The KV30-40D Mk4 high voltage AC test set is a general purpose test instrument designed for testing insulation systems and the measurement of breakdown voltage on electrical plant and components.

Maximum Voltage	Maximum current	kV meter resolution	mA meter resolution
30kV	40mA	0.01kV	0.02mA

Breakdown of the test object is visibly indicated and the unit must be manually reset after a trip condition before testing can be resumed.

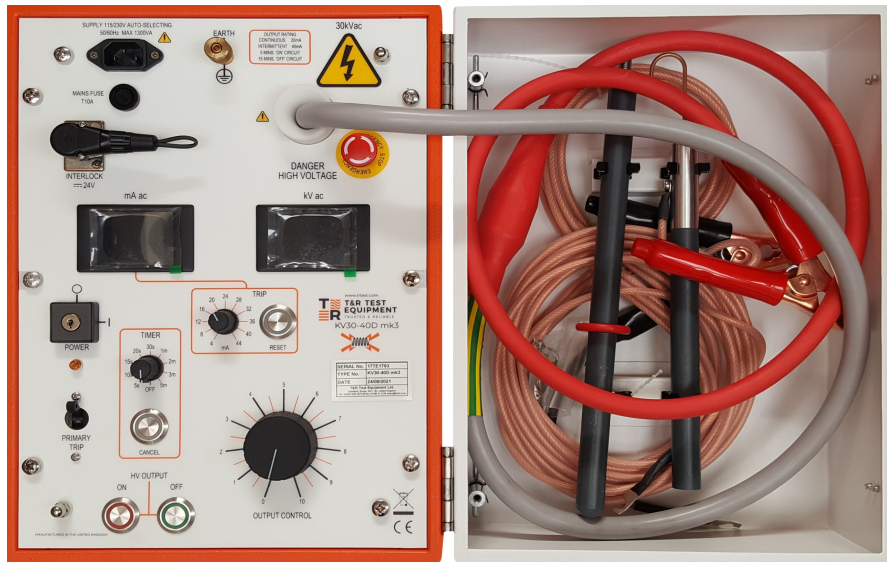
An optional test timer can be provided for pre-selectable test times of 5 seconds to 5 minutes.

The unit is supplied in a compact, portable case with a permanently connected 2 metre long HV output lead.

The output voltage is variable up to 30kV. A zero-voltage interlock is provided, ensuring that the output may only be energised with the voltage control at zero. The output voltage and current are metered by large true RMS reading digital meters.

The unit features automatic mains voltage selection and an external 24VDC interlock circuit for connection of emergency-off switches and interlock switches on the test enclosure.

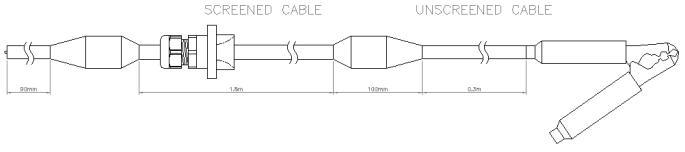
The test object and output are protected by an adjustable electronic current trip. The trip level may be set to 10-110% of the rated output in 10% steps.



KV30-40D Mk4 Specification

Supply Requirements
115V/230V±10% auto-selecting
50/60Hz 1ph 1200VA max

Output
The output of the KV30-40D Mk4 is supplied via a permanently connected partially screened high voltage cable. This stows in the lid for transit along with the ES30 earthing stick.



The output of the KV30-40D Mk4 is rated at 40mA on a duty cycle of 5 minutes on/15 minutes off or 20mA continuously. These ratings are based on an ambient temperature of 25°C.

Metering
The output voltage and current are metered by large, accurate true RMS digital meters. The meters are backlit and have a digit height of 8mm and analogue simulation.

Optional Test Timer
An optional pre-selectable test timer can be provided for timed tests of 5, 10, 15, 20, 30 seconds, 1, 2, 3 or 5 minutes. An alarm sounds when the test time has ended.

Overload Protection
Two overload protection circuits are provided on the units. The first is user selectable, and allows trip currents between 10% and 110% of the rated output to be set. A trip condition is indicated by an illuminated push button and an audible alarm. The second trip circuit is a magnetic circuit breaker operating on the primary of the HV transformer. This operates on large overloads (such as flashovers).

Accessories supplied with unit
Supply lead, spare fuse set, operating manual, 5m earth lead, ES30 earthing stick.

ES30 Earthing stick

Protection and Safety
In addition to the output protection the input and control supplies are protected by fuses.

All units are designed to meet the requirements of BS EN61010.

An earth terminal is provided on the transformer which must be connected to a low impedance local earth.

An emergency stop will cut all power to the output, when activated.

Temperature Range
Storage -20°C to 60°C **Operating** 0°C to 45°C

Dimensions
300 x 400 x 470mm

Weight
42kg

Special Products
If you require a different output voltage test system, please contact us with your specification and we will quote for a custom design.

The KV30-40D Mk4 is one of a family of 1200VA high voltage units spanning the range 6kV 200mA to 30kV 40mA. All supplied with digital metering.

Unit	Maximum Voltage	Maximum current
KV6-200D	6kV	200mA
KV10-120D	10kV	120mA
KV15-80D	15kV	80mA
KV30-40D Mk4	30kV	40mA

High voltage test systems are also available from T&R Test Equipment up to 100kV @ 100mA.

KV100-100 Mk3

VC24-24 Mk3

24kV Vacuum Bottle Check System

Features

- 0-24kV output voltage
- 24mA maximum output current
- Automatic mains voltage selection
- Key operated supply switch to prevent unauthorised operation
- Dual overload protection
- Variable electronic trip - 16, 20, 24mA
- Voltage and current metering
- Zero-volt interlock
- Emergency stop
- Visual indication of test piece failure

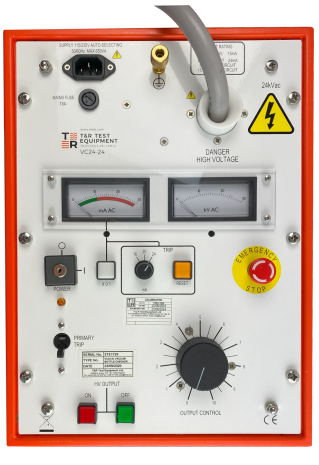
The VC24-24 MK3 is a general purpose high-voltage AC test set, ideal for Flash Testing of plant and switchgear, such as circuit breaker vacuum bottles, with voltages up to 24kV AC.

The output voltage is variable from zero to 24kV. A zero-voltage interlock is provided, ensuring that the output may only be energised with the voltage control at zero.

Unit	Maximum Voltage	Maximum current	kV meter full scale	mA meter full scale
VC24-24	24kV	24mA	30kV	3mA/30mA

The unit features automatic mains voltage selection and an emergency-off switch.

The output voltage and current are metered by large, linear analogue instruments. The unit has a x0.1 range on the mA meter.



The mA meter is marked with a green scale for currents under 10mA and a red scale for currents larger than 10mA.

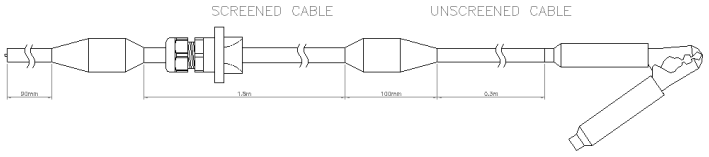
The test object and output are protected by an adjustable electronic current trip. The trip level may be set to 16, 20 or 24mA. Breakdown of the test object is visibly indicated and the unit must be manually reset after a trip condition before testing can be resumed.

The unit is supplied in a compact, portable case with a permanently connected 2 metre long HV output lead.

VC24-24 MK3 Specification

Output

The output of the VC24-24 MK3 is by a 2 metre long permanently connected partially screened high voltage cable terminated in a large clip.



Output Ratings

Unit	Output Voltage	Current (continuous)	Current (5 min)
VC24-24 MK3	0-24kV	15mA	24mA

The above intermittent on times must be followed by an off time of 15 minutes, and are based on an ambient temperature of 25°C.

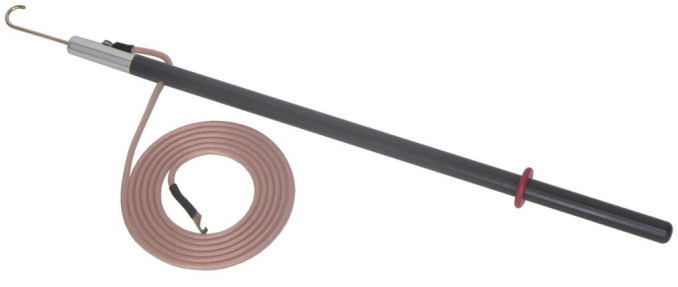
Metering

The output voltage and current are metered by large analogue instruments, with dual ranges on the current meter.

Meter	Low range full scale	High range full scale	Accuracy
kV meter	-	30kV	±2% of FS
mA meter	3mA	30mA	±2% of FS

Supply Requirements

115V/230V±10% auto-selecting 50/60Hz 1ph 650VA max.



ES30 Earthing stick

Overload Protection

Two overload protection circuits are provided on the unit. The first is user selectable, and allows trip currents of 16, 20 or 24mA to be set. A trip condition is indicated by an illuminated push button that must be pressed before testing can continue.

The second trip circuit is a magnetic circuit breaker operating on the primary of the HV transformer. This operates on large overloads (such as flashovers).

Protection and Safety

In addition to the output protection the input and control supplies are protected by fuses.

All units are designed to meet the requirements of BS EN61010.

An earth terminal is provided on the unit which must be connected to a low impedance local earth.

Temperature Range

Storage -20°C to 60°C **Operating** 0°C to 45°C

Dimensions

300 x 400 x 470mm

Weight

27kg

Accessories

Supply lead, spare fuse set, operating manual, 5m earth lead, ES30 earthing stick.

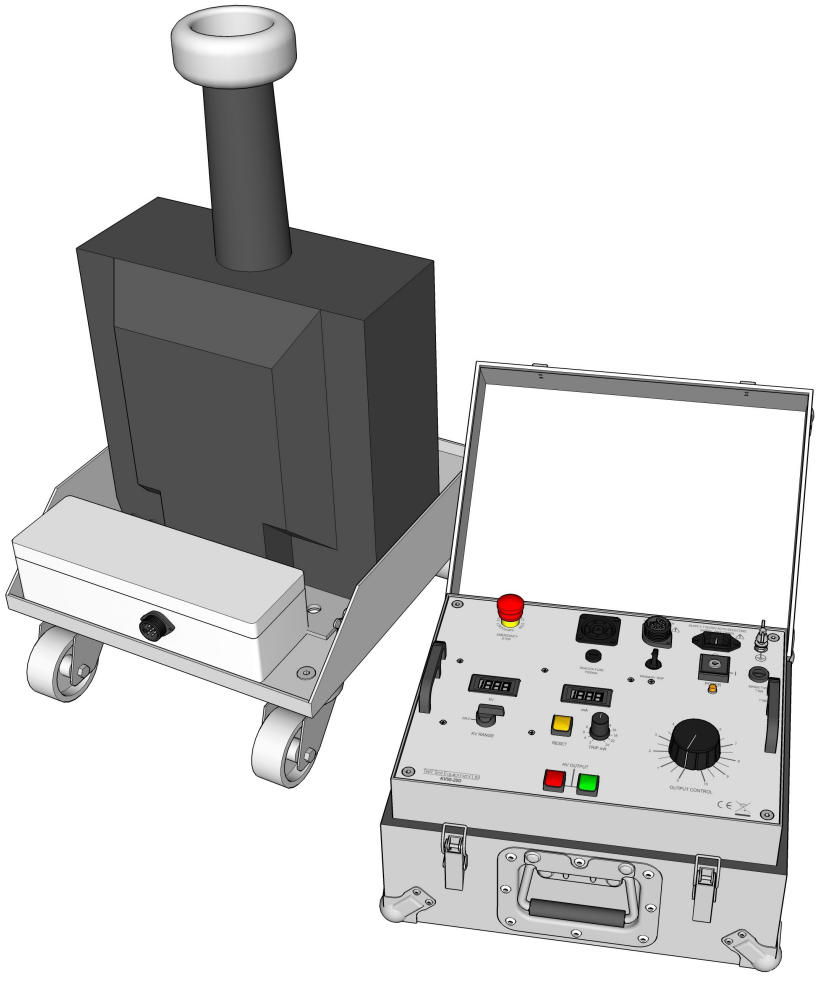
The VC24-24 MK3 is one of a family of high voltage units spanning the range 6kV 200mA to 30kV 40mA.

Unit	Maximum Voltage	Maximum current
KV6-200D	6kV	200mA
KV10-120D	10kV	120mA
KV15-80D	15kV	80mA
KV30-40D Mk4	30kV	40mA

High voltage test systems are also available from T&R Test Equipment up to 100kV @ 100mA.

KV100-100 Mk3

KV50-20D Mk3
High Voltage AC Test System



Features

- 0-50kV output voltage
- 20mA maximum output current
- Auto-selecting 115/230V supply voltage
- Key operated supply switch to prevent unauthorised operation
- Dual overload protection
- Variable electronic trip
- Voltage and current metering
- External interlock circuit
- Zero-volt interlock
- Visual indication of test piece failure
- Cast resin HV transformer

The KV50-20D is a low power portable high voltage AC test system designed for insulation testing. This system is equally suited to both development and routine testing of electrical insulation systems and plant.

The equipment consists of a control unit and a separate resin cast high voltage transformer linked by a 5 metre control cable. The control unit is housed in a rugged aluminium case with a hinged, removable lid for protection. The high voltage transformer is mounted on a base with swivel castors for mobility.

The control unit is fitted with a comprehensive range of facilities for control, metering and protection, including an emergency off switch. The output RMS voltage and current are displayed on digital meters. A variable electronic trip is provided, allowing the trip current to be set to 10-110% of rated output.

The unit is designed to be operated with the HV transformer inside an interlocked test enclosure. A connector is supplied on the control unit to connect interlock switches, extra emergency stop switches and external 24V beacons.

KV50-20D Specification

Output

The output of the KV50-20D is via a high voltage bushing. The bushing is designed to be connected to the object under test by an air insulated connection such as copper tubing or tinned copper wire (not supplied with the system). The earthy end of the HV winding is connected to earth via the current metering circuit.

Output voltage 0-50kVac

Output current 12mA continuous
20mA 5 min on/15min off

Metering

The output voltage is metered by a true RMS digital instrument.

	20kV range	50kV range
Full scale	19.99kV	50.00
Resolution	0.01kV	0.1kV
Accuracy (no load)	±2% of rdg + 5d	±2% of rdg + 5d
Accuracy (@12mA)	±5% of rdg + 5d	±5% of rdg + 5d

Load current is metered by a true RMS digital instrument.

	20mA range
Full scale	19.99mA
Resolution	0.01mA
Accuracy (no load)	±2% of rdg + 5d
Accuracy (@12mA)	±5% of rdg + 5d

Control

The output voltage is set by a continuously variable output control with a zero volt interlock - the output may only be switched on with the control in the zero position. The output voltage is switched on and off by illuminated push button switches.

The mains supply switch for the unit is a key operated switch. The key is trapped in the switch in the 'on' position.

Supply requirements

115/230V±10% auto-selecting 50/60Hz 1ph 1.5kVA.

Protection and safety

The output of the units are protected by variable electronic trips monitoring the output current, and a fixed over-current trip on the primary of the output transformer. The variable trip is adjustable in 10% steps between 10% and 110% of the rated output current.

The input and control supplies are protected by fuses.

The KV50-20D is designed to meet the requirements of BS EN61010. The unit must be installed in a high voltage test area complying with the requirements of BS EN50191.

Earth terminals are provided on the control unit and HV transformer that must be connected to a low impedance local earth.

Interlock circuits

Two interlock circuits are provided on the KV50-20D. A zero voltage interlock is fitted which prevents the HV output being energised unless the output voltage control is in the zero position. An external interlock circuit is also provided, allowing the fitting of external emergency off buttons and test cage door interlocks.

Beacon output

A beacon output is provided on the control unit to control 24V beacons (max 0.5A). The beacons mimic the state of the HV on and off indicators on the unit—green for HV off and red for HV on.

Temperature Range

Storage 20°C to 60°C **Operating** 0°C to 45°C

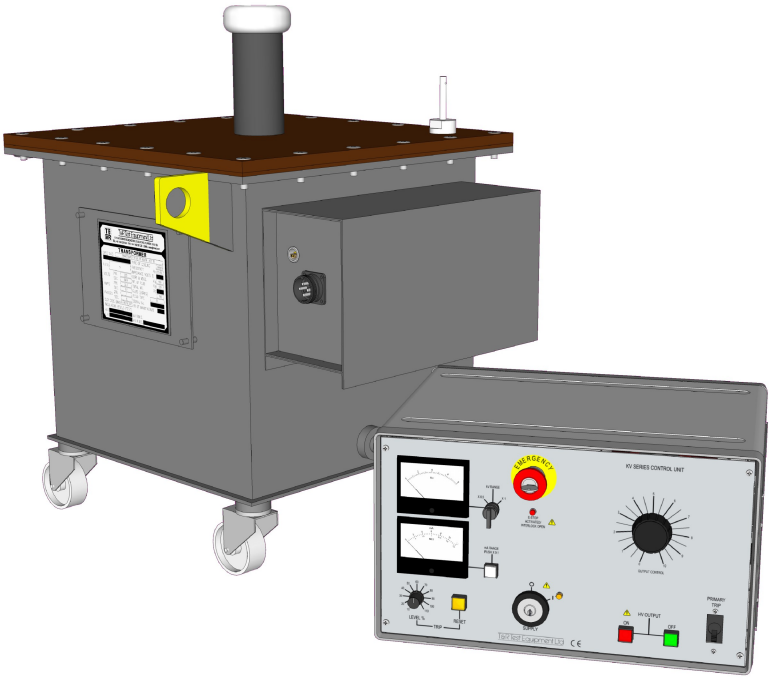
	Dimensions	Weight
Control Unit	380 x 314 x 221mm	17kg
Transformer	490 x 520 x 795mm	75kg

Accessories

1 x 2m power supply lead
1 x 5m interconnecting lead
1 x 3m test object earth lead
1 x 5m earth lead
Spare fuse set
Operating manual

KV30-100 Mk3 / KV50-100 Mk3

High Voltage AC Test Systems



Features

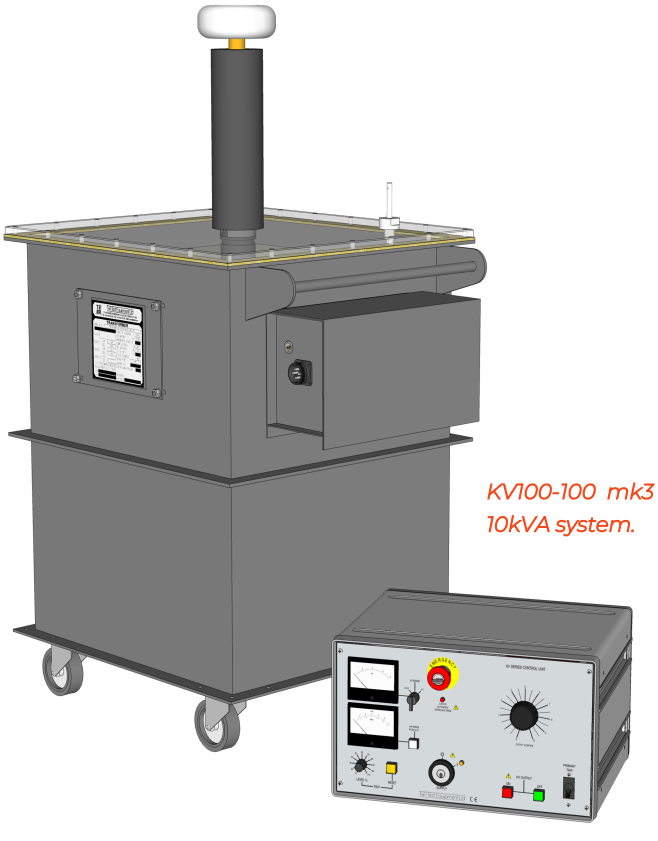
- 0-30kV (KV30-100 mk3) or
  0-50kV (KV50-100 mk3) output voltage
- 3kVA (KV30-100 mk3) or
  5kVA (KV50-100 mk3) output capability
- Key operated supply switch to prevent
  unauthorised operation
- Dual overload protection
- Variable electronic trip -
  10 -110% of rated output
- Voltage and current metering
- External interlock circuit
- Zero-volt interlock
- Visual indication of test piece failure

The KV30-100 mk3 and KV50-100 mk3 are high power, high voltage AC test systems designed for insulation testing. These systems are equally suited to both development and routine testing of electrical insulation systems and plant.

The equipment consists of a control unit and a separate oil filled high voltage transformer, linked by a 5 metre supply and control cables. The control unit is fitted with a comprehensive range of facilities for control, metering and protection. The output voltage and current are displayed on large, linear analogue instruments, and a variable electronic trip is provided, allowing the trip current to be set to 10-110% of rated output.

The high voltage transformer is housed in an oil-filled steel tank fitted with swivel castors for mobility. The units use a high voltage bushing for the HV output, and the other end of the HV winding is earthed. Both the KV30-100 mk3 and KV50-100 mk3 are equally suited to testing capacitive, resistive or inductive test objects.

If higher voltage or output power is required, please refer to our KV50-200 mk3/KV100-100 mk3 data sheet, detailing our 10kVA high voltage systems.



KV100-100 mk3
10kVA system.

KV30-100 mk3 / KV50-100 mk3 Specification

Output

The output of the KV series units is by a high voltage bushing. The bushing is designed to be connected to the object under test by an air insulated connection such as copper tubing (not supplied with the system). The earthy end of the HV winding is connected to earth via the current metering circuit.

Continuous Ratings

	KV30-100 mk3	KV50-100 mk3
Voltage	0-30kVac	0-50kVac
Current	50mA	50mA
Power	1.5kVA	2.5kVA

Intermittent Ratings (5 min. on/15 min. off)

	KV30-100 mk3	KV50-100 mk3
Voltage	0-30kVac	0-50kVac
Current	100mA	100mA
Power	3kVA	5kVA

If you require a different output voltage test system, please contact us with your specification and we will quote for a custom design.

Metering

The output voltage is metered on the primary of the HV transformer, connected to an average-reading dual scaled analogue instrument.

	x0.5 range	x1 range	Accuracy
KV30-100 mk3	0-20kV	0-40kV	±2% of FS
KV50-100 mk3	0-30kV	0-60kV	±2% of FS

The accuracies shown for voltage metering are for no-load conditions.

Load current is metered in the earthy end of the HV winding by an average-reading analogue instrument.

	mA Meter	Accuracy
KV30-100 mk3	0-120mA	±2% of FS
KV50-100 mk3	0-120mA	±2% of FS

Control

The output voltage is set by a continuously variable output control with a zero volt interlock - the output may only be switched on with the control in the zero position. The output voltage is switched ON and OFF by illuminated push button switches.

The mains supply switch for the unit is a key operated switch. The key is trapped in the switch in the ON position.

Supply Requirements

KV30-100 mk3 230V±10% 50/60Hz 1ph 3.5kVA max

KV50-100 mk3 230V±10% 50/60Hz 1ph 6kVA max

Protection and Safety

The output of the units are protected by variable electronic trips monitoring the output current, and a fixed over-current trip on the primary of the output transformer. The variable trip is adjustable in 10% steps between 10% and 110% of the rated output current.

The input and control supplies are protected by fuses.

The KV30-100 mk3 and KV50-100 mk3 are designed to meet the requirements of BS EN61010. The unit must be installed in a high voltage test area complying with the requirements of BS EN50191.

An earth terminal is provided on the transformer which must be connected to a low impedance local earth.

Interlock Circuits

Two interlock circuits are provided on the kV series test systems. A zero voltage interlock is fitted which prevents the HV output being energised unless the output voltage control is in the zero position. An external interlock circuit is also provided, allowing the fitting of external emergency off buttons and test cage door interlocks. The KV30-100 mk3 and KV50-100 mk3 external interlocks operate at 230Vac.

Temperature Range

Storage -20°C to 60°C **Operating** 0°C to 45°C

	Dimensions	Weight
KV30-100 mk3 Control Unit	370 x 480 x 290mm	25kg
KV50-100 mk3 Control Unit	370 x 480 x 290mm	25kg
KV30-100 mk3 Transformer	480 x 460 x 570mm	210kg
KV50-100 mk3 Transformer	490 x 520 x 795mm	230kg

Accessories

1 x 5m Power interconnecting lead

2 x 5m Metering interconnection leads

Spare fuse set, operating manual

Optional Accessories

Test duration timer (must be specified at the time of ordering).

KV50-200 Mk3 / KV100-100 Mk3

High Voltage AC Test Systems

Features

- 0-100kV (KV100-100 mk3) or 0-50kV (KV50-200 mk3) output
- 10kVA output capability
- Key operated supply switch to prevent unauthorised operation
- Dual overload protection
- Variable electronic trip 10-110% of rated output
- Voltage and current metering
- External interlock circuit
- Zero-volt interlock
- Visual indication of test piece failure

The KV50-200 mk3 and KV100-100 mk3 are high power, high voltage AC test systems designed for insulation testing. These systems are equally suited to both development and routine testing of electrical insulation systems and plant. Each unit is available in either a low partial discharge version or without a specified discharge level.

The equipment consists of a control unit and a separate oil filled high voltage transformer, linked by a 5 metre supply and control cables. The control unit is fitted with a comprehensive range of facilities for control, metering and protection.

Both systems include secondary tap metering as standard to ensure accurate voltage metering. The output voltage and current are displayed on large, linear analogue instruments, and a variable electronic trip is provided, allowing the trip current to be set to 10-110% of rated output.

The high voltage transformer is housed in an oil-filled steel tank fitted with swivel castors for mobility. The units use a low-discharge oil-filled bushing for the HV output. Both the KV50-200 mk3 and KV100-100 mk3 are equally suited to testing capacitive, resistive or inductive test objects. The partial discharge levels on the standard KV50-200 mk3 and KV100-100 mk3 are not specified.

KV50-200 mk3 / KV100-100 mk3 Specifications

Output

The output of the KV series units is by an oil filled high voltage bushing. The bushing is designed to be connected to the object under test by an air insulated connection such as copper tubing (not supplied with the system). The earthy end of the HV winding is connected to earth via the current metering circuit and a removable link. The removable link allows equipment supplied by the user to be connected into the earthy end of the HV winding for Tan-δ measurements.

Continuous Ratings

	KV50-200 mk3	KV100-100 mk3
Voltage	0-50kVac	0-100kVac
Current	100mA	50mA
Power	5kVA	5kVA

Intermittent Ratings (5 minutes on/15 minutes off)

	KV50-200 mk3	KV100-100 mk3
Voltage	0-50kVac	0-100kVac
Current	200mA	100mA
Power	10kVA	10kVA

If you require a different output voltage test system, please contact us with your specification and we will quote for a custom design.

Metering

The output voltage is metered using a tap on the HV winding connected to an average-reading dual scaled analogue instrument.

	x0.5 range	x1 range	Accuracy
KV50-200 mk3	0-30kV	0-60kV	±2% of FS
KV100-100 mk3	0-60kV	0-120kV	±2% of FS

Load current is metered in the earthy end of the HV winding by an average-reading analogue instrument.

	mA Meter	Accuracy
KV50-200 mk3	0-240mA	±2% of FS
KV100-100 mk3	0-120mA	±2% of FS

Control

The output voltage is set by a continuously variable output control with a zero volt interlock - the output may only be switched ON with the control in the zero position. The output voltage is switched ON and OFF by illuminated push button switches.

The mains supply switch for the unit is key operated. The key is trapped in the switch in the ON position.

Supply Requirements

230V±10% 50/60Hz 1ph 11kVA max

Protection and Safety

The output of the units are protected by variable electronic trips monitoring the output current, and a fixed over-current trip on the primary of the output transformer. The variable trip is adjustable in 10% steps between 10% and 110% of the rated output current.

The input and control supplies are protected by fuses.

The KV50-200 mk3 and KV100-100 mk3 are designed to meet the requirements of BS EN61010. The unit must be installed in a high voltage test area complying with the requirements of BS EN50191.

An earth terminal is provided on the transformer which must be connected to a low impedance local earth.

Interlock Circuits

Two interlock circuits are provided on the kV series test systems. A zero voltage interlock is fitted which prevents the HV output being energised unless the output voltage control is in the zero position. An external interlock circuit is also provided, allowing the fitting of external emergency off buttons and test cage door interlocks.

Temperature Range

Storage -20°C to 60°C **Operating** 0°C to 45°C

	Dimensions	Weight
KV50-200 mk3 Control Unit	370 x 480 x 290mm	37kg
KV100-100 mk3 Control Unit	370 x 480 x 290mm	37kg
KV50-200 mk3 Transformer	570 x 500 x 1020mm	220kg
KV100-100 mk3 Transformer	730 x 650 x 1350mm	390kg

Accessories

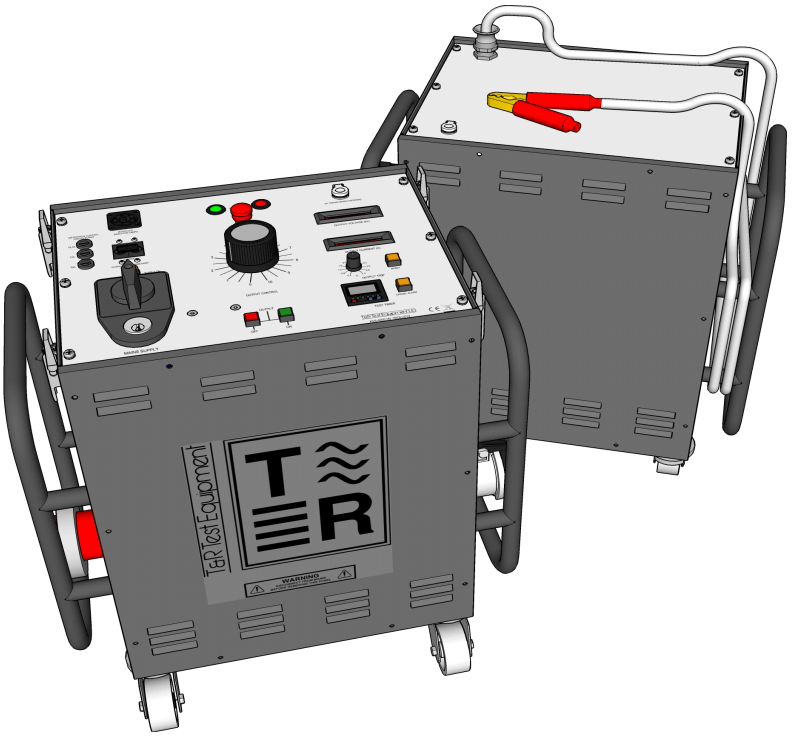
1 x 5m Power interconnecting lead
2 x 5m Metering interconnection leads
Spare fuse set, operating manual

Optional Accessories

Test duration timer (must be specified at the time of ordering).

HV TROLLEY2

High Voltage AC Test System



Double Trolley Version

Features

- 20kVA output capability
- 0-3kV to 0-15kV options available
- Accurate digital metering
- Key operated supply switch
- Dual overload protection
- Variable electronic trip 10-110% of rated output
- Voltage and current metering
- Optional 5s - 5min test timer
- External 24V interlock and zero-volt interlock
- Emergency stop switch

Single Trolley Version

The HV trolley2 series of units are high power AC flash test sets with a 20kVA output capability. The maximum output voltage can be customised to be any voltage up to 15kV. The unit is housed in a rugged aluminium enclosure with a cover to protect the control panel. It is mounted on wheels to allow easy movement within a production environment.

The HV trolley2 is provided with accurate digital voltage and current metering and a variable electronic trip. An external interlock input is also fitted to the unit. Outputs are provided to drive 24V warning beacons. The HV output is connected to the test object by a high voltage cable 5m long.

HV Trolley2 Specification

Output

The output of the HV Trolley2 series units is by a 5m long screened high voltage cable terminated in a large clip. A 5m long silicone covered earth lead is provided for the earth connection to the test object.

Unit	Output voltage	Continuous rating	5 min on/ 15 minutes off
KV3-7000/2	0-3kV	3.5A	7.0A
KV5-4000/2	0-5kV	2.0A	4.0A
KV8-2500/2	0-8kV	1.25A	2.5A
KV10-2000/2	0-10kV	1.0A	2.0A
KV12-1600/2	0-12kV	0.8A	1.6A
KV15-1200/2	0-15kV	0.6A	1.2A

Ratings

Other voltages up to 15kV are available—please contact us to discuss your requirements.

Metering

The output voltage and current are metered using a true RMS metering circuit. The output voltage measurement is taken from a divider on the output and will give accurate results regardless of load type.

Customisation

Certain aspects of the design can be customised at extra cost including HV & supply lead lengths, output voltage and supply voltage.

Unit	kV meter	kV meter	kV meter
KV3-7000/2	3.000kV	1V	0.8%±6d
KV5-4000/2	5.000kV	1V	0.8%±6d
KV8-2500/2	8.000kV	1V	0.8%±6d
KV10-2000/2	10.00kV	0.01kV	0.8%±6d
KV12-1600/2	12.00kV	0.01kV	0.8%±6d
KV15-1200/2	15.00kV	0.01kV	0.8%±6d

Unit	mA meter full scale	mA meter resolution	mA meter accuracy
KV3-7000/2	7.000A	1mA	0.8%±6d
KV5-4000/2	4.000A	1mA	0.8%±6d
KV8-2500/2	2.500A	1mA	0.8%±6d
KV10-2000/2	2.000A	1mA	0.8%±6d
KV12-1600/2	1.600A	1mA	0.8%±6d
KV15-1200/2	1.200A	1mA	0.8%±6d

Control

The output voltage is set by a continuously variable output control with a zero volt interlock - the output may only be switched on with the control in the zero position. The output voltage is switched on and off by illuminated push button switches.

The mains supply switch for the unit is a key operated switch. The key is trapped in the switch in the 'on' position.

Optional Test Timer

The HV trolley2 may optionally be supplied with a test timer (this must be specified at time of ordering, and cannot be retro-fitted). The following times are selectable via a switch: 5, 10, 15, 20 and 30 seconds and 1, 2, 3, and 5 minutes. An alarm sounds at the end of the test time.

Supply Requirements

Option 1	400V ±10%	50/60Hz	2ph	22kVA max
Option 2	230V ±10%	50/60Hz	1ph	22kVA max

The unit is fitted with a 5m supply lead and 5 or 10m interconnecting leads.

Protection and Safety

The output of the units are protected by variable electronic trips monitoring the output current and a fixed over-current trip on the primary of the output transformer. The variable trip is adjustable in 10% steps between 10% and 110% of the rated output current. The input and control supplies are protected by fuses.

An emergency stop switch is fitted to the unit.

The HV trolley2 series are designed to meet the requirements of BS EN61010. The unit must be installed in a high voltage test area complying with the requirements of BS EN50191.

An earth terminal is provided on the unit which must be connected to a low impedance local earth.

Interlock Circuits

Two interlock circuits are provided on the HV trolley2 test systems. A zero voltage interlock is fitted which prevents the HV output being energised unless the output voltage control is in the zero position. An external interlock circuit is also provided, allowing the fitting of external emergency off buttons and test cage door interlocks.

Temperature Range

Storage	-20°C to 60°C	Operating	0°C to 45°C

Unit	Dimensions	Weight
Control unit	660 x 400 x 740mm	115kg
HV transformer	660 x 400 x 740mm	130kg

Standard Accessories

1 x 5m earth lead terminated in croc clip

1 x 5m earth lead for connection to local earth (M10 ring crimp)

1 x ES30 earth stick. Spare fuse set, operating manual

PT15-10S Mk2 / PT30-10 Mk3

High Voltage DC Cable Test Systems

PT30-10 Mk3

Features

- ±15kVDC output (PT15-10S Mk2)
  ±30kVDC output (PT30-10 Mk3)
- 10mA output capability
- Both voltage and current metered on HV outputs
- Automatic earth system for dumping capacitive loads
- HV output plug & socket system
- Key operated supply switch to prevent unauthorised operation
- Automatic mains voltage selection for PT30-10 Mk3
- Visual indication of test piece failure
- Zero Volt interlock

T&R Test Equipment is a market leader in the field of protection test equipment. The range includes primary and secondary current injection equipment up to 6000A, voltage sources, micro-ohmmeters and high voltage test systems up to 100kV.

The PT15-10S Mk2 and PT30-10 Mk3 high voltage DC test sets are designed to perform tests on installed cables and jointing systems. The units have a variable output voltage with a maximum of ±15kVDC (PT15-10S Mk2) or ±30kVDC (PT30-10 Mk3). Both units have a maximum charging capability of 10mA. A zero-volt interlock is fitted that prevents the output being switched on unless the output control is at zero.

The units include an automatic load discharge system that discharges the cable under test when the output is switched off or a breakdown occurs. The internal dumping system can discharge a maximum of 2.5kJ on each output, corresponding to 10mF at 15kV or 4mF at 30kV. In the event of a test object failure, the overload circuit will automatically switch off the output voltage and earth the output via the internal discharge circuit. A manual discharge probe is also supplied as standard with both units, allowing higher load capacitances to be safely discharged.

The PT30-10 Mk3 units introduce automatic 115/230V mains voltage selection, allowing easy transition between site voltages.

The output voltage is metered by two large, linear, analogue instruments marked 0-15kV (PT15-10S Mk2) or 0-30kV (PT30-10 Mk3).

The PT15-10S Mk2 and PT30-10 Mk3 are part of a comprehensive range of AC & DC high voltage systems available from T&R Test Equipment. The line-up includes cable test sets from ±15kV to ±30kV DC and pressure test systems up to 100kVAC.

PT15-10S Mk2

The test object current is metered by two further analogue instruments with 0-10 scale marking. The meters read 0-10mA directly, or 0-1mA when the ÷ 10 push button is operated. The HV output from both units use a high quality plug and socket system, allowing for easy cable replacement.

PT15-10S Mk2 & PT30-10 Mk3 Specifications

Output

All of the PT series cable test systems have high quality high voltage output connectors, and are supplied with detachable, partially screened output cables.

Unit type	Voltage	Continuous	5 minutes
PT15-10S Mk2	0 to ±15kV	5mA	10mA
PT30-10 Mk3	0 to ±30kV	5mA	10mA

The above intermittent on times must be followed by an off time of 15 minutes, and are based on an ambient temperature of 25°C.

Metering

The positive and negative output voltages on the PT series are metered on the HV output by separate analogue instruments.

Unit	Range	Accuracy
PT15-10S Mk2	0-15kV	±1.5% of full scale
PT30-10 Mk3	0-30kV	±1.5% of full scale

The output current on both of the outputs is metered by a dual range analogue instrument. The 1mA range is selected by the ÷10 pushbutton adjacent to the mA meter.

Unit	Range	Accuracy
PT15-10S Mk2	10mA	±2.5% of full scale
	1mA	±2.5% of full scale
PT30-10 Mk3	10mA	±2.5% of full scale
	1mA	±2.5% of full scale

Overload Protection

The PT15-10S Mk2 and PT30-10 Mk3 are protected by an overload trip on the output that operates at 12mA.

Load Discharge System

The PT15-10S Mk2 and PT30-10 Mk3 are fitted with an automatic internal load discharge system that grounds the load via a 10/20kΩ resistor on each output when the output is switched off. The discharge system is rated to dissipate 2.5kJ once every 15 minutes on each output. The PT15-10S Mk2 can discharge a maximum load capacitance of 7.5mF per output from 15kV, and the PT30-10 Mk3 can discharge a maximum load capacitance of 4mF per output from 30kV.

Unit	PT15-10S Mk2	PT30-10 Mk3
Maximum discharge energy	2.5kJ	2.5kJ
Maximum discharge capacitance from unit max output voltage	10mF	4mF

The PT series units are supplied with a DP20 or DP40 manual discharge probe to allow the discharge of higher capacitance loads.

	PT15-10S Mk2	PT30-10 Mk3
Discharge probe supplied	**DP20**	**DP40**
Discharge probe max voltage	20kV	40kV
Resistance	30kW	60kW
Maximum discharge energy	3.6kJ	7.2kJ
Maximum discharge capacitance from DP max rated voltage	15mF	11mF

Supply Requirements

PT15-10S Mk2 115V/230V±10% auto-selecting 50/60Hz 1ph 250VA max

PT30-10 Mk3 115V/230V±10% auto-selecting 50/60Hz 1ph 750VA max

Protection and Safety

The output of the unit is protected by an overload trip, and the input and control supplies are protected by fuses.

The PT15-10S Mk2 and PT30-10 Mk3 are designed to meet the requirements of BS EN61010.

An earth terminal is provided on the units which must be connected to a low impedance local earth.

Temperature Range

Storage -20°C to 60°C Operating 0°C to 45°C

Dimensions Weight

PT15-10S Mk2 340 x 230 x 330mm 16.5kg unit only (23kg including bag & leads)

PT30-10 Mk3 471 x 191 x 362mm 25kg unit only (32kg including bag & leads)

Standard Accessories

Both units: **Supply lead, spare fuse, operating manual, 5m HV output leads, 5m output earth lead, keys**

PT15-10S Mk2 DP20 discharge probe, shoulder strap

PT30-10 Mk3 DP40 discharge probe, carry bag

Optional Accessories

	PT30-10 Mk3
10m HV leads	A064-111
10m earth lead	A064-112
15m HV leads	A064-100
15m earth lead	A064-101
20m HV leads	A064-156
20m earth lead	A064-157

DP20 Discharge probe

LLT
Live Line Testers

Features:

- All in one kit
- Up to 33kV voltage testing
- Overhead lines phasing
- Proven in the field world-wide
- High reliability
- Lightweight and easy to transport
- Robust heavy duty case
- -25°C to +55°C operating temperature range
- Self test facility
- Shock & drop resistant

The Live Line Tester Kits (LLT) have been specifically designed to perform measurements for both live voltage testing and phasing on overhead lines, in substations and within switchgear compartments.
Every kit includes all necessary components to effectively carry out these tests. Individual kits are available for system voltages of 3.3kV, 6.6kV, 11kv, 13.8kV and 33kV (50/60Hz).

The lower voltage versions are predominantly used in Universities and Hospitals while the higher voltage kits are more suitable for work on high voltage power lines. The equipment has been designed to operate within the temperature range: -25˚C to +55˚C.

Overhead Line Testing

Designed to comply with the requirements of IEC1243 part 2, the LLT uses long established techniques for high voltage measurement. All readings are displayed on an analogue meter, the housing of which can be rotated through 240 degrees to ensure a perfect viewing position.

A battery-operated proving unit allows the equipment to be tested before and after measurements have been made and can also be used to check full scale deflection on the meter. Adaptors are available to allow Bowthorpe Rods to be connected for testing of raised conductors and a Repeater Station can be supplied to replicate meter readings at ground level. Space is reserved in the carry case for such accessories.

All components are housed within a heavy duty carry case with secure compartments. Manufactured using high quality fiberglass, rods and polycarbonate mouldings, the equipment is suitable for both indoor and outdoor use, including wet conditions.

Each kit comprises of the following: Live line tester with earth lead, Phasing rod with phasing lead, 2 extension rods, 2 bent end adaptors, 2 overhead line adaptors, Proving Unit with batteries, Polymer Cleaning Kit, and Instruction manual.

Live Line Tester kit details

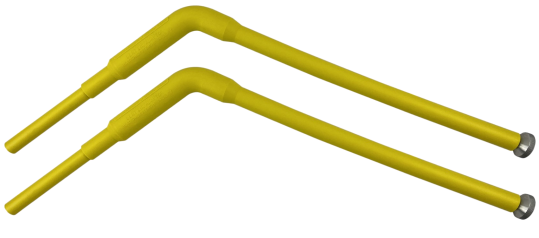
Tester	3.3kV	6.6kV	11kV	13.8kV	33kV
Resistor Chain	22.5MΩ	52.5MΩ	75MΩ	100mΩ	225MΩ
Measuring	5kV	10kV	15kV	20kV	40kV
RangeAccuracy	±5% FSD	±5% FSD	±5% FSD	±5% FSD	±5% FSD
Movement	100uA TB	100uA TB	100uA TB	100uA TB	100uA TB
Length with handle	1025mm	1025mm	1025mm	1025mm	1180mm
Weight:	1.4kg	1.4kg	1.4kg	1.4kg	2.3kg

Phasing Rod	3.3kV	6.6kV	11kV	13.8kV	33kV
Resistor Chain	22.5MΩ	52.5MΩ	75MΩ	100mΩ	225MΩ
Length	1025mm	1025mm	1025mm	1025mm	1025mm
Weight:	1.4kg	1.4kg	1.4kg	1.4kg	1.6kg

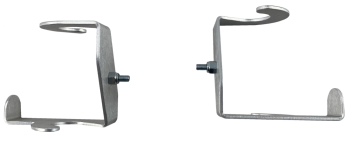
Extension Rods	All versions
Length	907mm
Weight:	0.65kg

Bent End Adaptors	All versions
Length	675mm
Weight:	0.27kg

Proving Unit	Voltage Output 3 to 5kV
Dimensions	185 x 145 x 120 mm
Weight:	1.6kg



Overhead Line Adaptors	All versions
Height	100mm
Weight:	0.08kg



HVD
High Voltage Detectors

Features:

- Automatic alarming above threshold voltage as default
- Fast response time , less than 1 second
- High Impact ABS body
- Proven in the field world-wide
- Self test facility
- Easy to use and Lightweight (0.6kg)
- Suitable for indoor/Outdoor use
- -25°C to +55°C operating temperature range
- Shock & drop resistant
- Standard safety yellow (other colours available)
- Various rod adaptors available to suit different operating rod styles
- Easy access for battery replacement

High Voltage Detectors (HVD's) are widely used throughout the electricity industry to determine that high voltage lines are de-energized prior to work being carried out, ensuring the safety of personnel. Designed to comply with relevant IEC standards, HVD's are available for use on system voltages up to 275kV.

The voltage setting to trigger activation (or threshold setting) can be set in accordance with IEC standards or in consultation with the user where detectors are used on a range of system voltages. All detectors have the facility to self check before and after use.

HVD's are battery operated electronic contact devices that give clear indication of the status of the line under test both visually, by means of super-bright LED's and audibly with a high intensity buzzer. This ensures clear indication even in conditions of bright sunlight and high background noise.

Overhead Line Testing

Each HVD standard kit comprises the following components housed within a purpose designed ABS heavy duty carry case:

- High Voltage Detector (HVD)
- Y Contact electrode
- Hook Contact Electrode
- Rod adaptor
- Polymer cleaning kit
- Instruction Manual

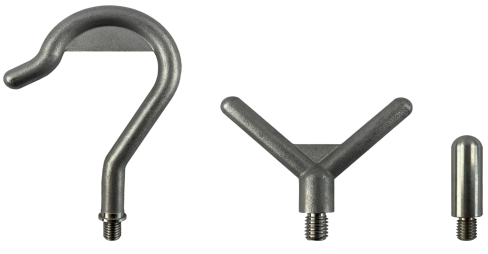
High Voltage Detector kit details

High Voltage Detectors (HVD's)

Visual Indication (Safe Condition): Green LED flashes at 2Hz
Voltage Present (Alarm Condition): Red LED flashes at 2Hz and Buzzer sounds with 3.1kHz tone, modulated at -70dBA at 1.5m.
Response Time: <1 second
Battery: 9v PP3-C IEC 6LF22

Contact Electrodes

Three sizes of aluminum hook are available in 40, 60 and 100mm. Alternatively, a straight 40mm stainless steel stud electrode, or Y contact electrode can be supplied.



Contact Electrode Extensions

To distance the detector away from any source of interference. Four sizes of electrode extension are available in 100, 250, 650, and 1000mm.

Rod Adaptors

Rod Adaptors are available for connecting to various operating poles shown from left to right are Bowthorpe, KP (Karl Pfisterer) and Universal Starwheel types .

Proving Unit

In addition to the self-test facility an external battery operated proving unit is available to check the completely assembled kit (threshold voltage dependent).
Output Voltage: 1100v P to P ±100v into a 20MΩ load.

High Voltage Detector types

A wide range of models are available to cover most distribution and transmission voltages used throughout the world. The following table contains a list of all the variations of High Voltage Detectors available.

HVD Type	Description	System Voltage	Threshold Voltage
HVD01/2A	HVD 11KV 2.5KV TH MA	11kV	2.5KV
HVD01/2B	HVD 11KV 1KV TH MA	11kV	1KV
HVD03/2A	HVD 33KV 4KV TH MA	33kV	4KV
HVD03/2B	HVD 33KV 5KV TH MA	33kV	5KV
HVD03/2C	HVD 33KV 14KV TH SA	33kV	14KV
HVD03/2D	HVD 25KV 7.5KV TH SA	25 - 30kV	7.5KV
HVD04/2A	HVD 11/33KV 3.6KV TH MA	11kV / 33kV	3.6KV
HVD04/2B	HVD 11/33KV 2.5KV TH MA	11kV / 33kV	2.5KV
HVD04/2C	HVD 11/33KV 1.2KV TH MA	11kV / 33kV	1.2KV
HVD05/2A	HVD 66KV 8KV TH MA	66kV	8KV
HVD06/2A	HVD 132KV 9KV TH MA	132kV	9KV
HVD06/2B	HVD 132KV 15KV TH MA	132kV	15KV
HVD06/2C	HVD 132KV 12KV TH MA	132kV	12KV
HVD06/2D	HVD 132KV 20KV TH MA	132kV	20KV
HVD07/2A	HVD 66/132KV 9KV TH MA	66/132kV	9KV
HVD08/2A	HVD 6.6KV 1.5KV TH MA	6.6kV	1.5KV
HVD08/2B	HVD 6KV 200V TH SA	0-6kV	200V
HVD09/2A	HVD 3.3/6.6KV 0.75KV TH MA	3.3/6.6kV	0.75KV
HVD10/2A	HVD 6.6/33KV 1.2KV TH MA	6.6/33KV	1.2KV
HVD11/2A	HVD 11/66KV 2.5KV TH MA	11/66KV	2.5KV
HVD12/2A	HVD 2.2/3.3KV 0.5KV TH MA	2.2/3.3KV	0.5KV
HVD13/2A	HVD 6.6/132KV 2.5KV TH MA	6.6/132KV	2.5KV
HVD13/2B	HVD 6.6/132KV 1KV TH MA	6.6/132KV	1KV
HVD14/2A	HVD 33/132KV 6KV TH MA	33/132KV	6KV
HVD14/2B	HVD 33/132KV 6KV TH MA	33/132KV	6KV
HVD15/2A	HVD 11/132KV 3.8KV TH MA	11/132KV	3.8KV
HVD16/2A	HVD 33/66KV. 10KV TH MA	33/66KV	10KV
HVD16/2B	HVD 33/66KV 4KV TH MA	33/66KV	4KV
HVD17/2A	HVD 250KV 1KV TH SA	250KV	1KV
HVD31/2A	HVD 11KV 0.7KV TH SA	11KV	0.7KV
HVD32/2A	HVD 11/33KV 2.5KV TH SA	11/33KV	2.5KV
HVD33/2A	HVD 44/132KV 10KV TH SA	44/132KV	10KV
HVD34/2A	HVD 11/33KV 1.5KV TH SA	11/33KV	1.5KV
HVD34/2B	HVD 11/33KV 2.5KV TH SA	11/33KV	2.5KV
HVD35/2A	HVD 2-11KV DEAD BREAK TESTER	2-11KV	100V
HVD36/2A	HVD 3.3/96KV 1.5KV TH SA	3.3/96KV	1.5KV
HVD37/2A	HVD 66/132KV 9KV TH SA	66/132KV	9KV

High Voltage Detector types

HVD Type	Description	System Voltage	Threshold Voltage
HVD38/2A	HVD 132KV. 9KV TH SA	132KV.	9KV
HVD40/2A	HVD 110/220KV 17KV TH SA	110/220KV	17KV
HVD41/2A	HVD 22/33KV 6.5KV TH SA NZ SPE	22/33KV	6.5KV
HVD42/2A	HVD 50/220KV 15KV TH SA NZ SPE	50/220KV	15KV
HVD43/2A	HVD 11/33KV 2KV TH SA NZ SPEC	11/33KV	2KV
HVD44/2A	HVD 11KV 1.5KV TH SA	11KV	1.5KV
HVD45/2A	HVD 22/115KV. 4KV TH SA	22/115KV	4KV
HVD45/2B	HVD 22/115KV. 5KV TH SA	22/115KV	5KV
HVD46/2A	HVD 22/24KV. 1KV TH SA	22/24KV	1KV
HVD46/2B	HVD 22KV 2.5KV TH SA	22KV	2.5KV
HVD47/2A	HVD 33KV 1KV TH SA	33KV	1KV
HVD47/2B	HVD 33KV DEAD BREAK TESTER	33KV	0.6KV
HVD47/2D	HVD 34KV DEAD BREAK TESTER	34kV	0.6kV
HVD47/2E	HVD 66KV DEAD BREAK TESTER	66kV	0.6kV
HVD48/2A	HVD 1/245KV. 0.4KV TH SA	1/245KV	0.4KV
HVD49/2A	HVD 11/220KV 2.5KV TH SA	11/220KV	2.5KV
HVD50/2A	HVD 2.4/36KV 0.75KV TH SA	2.4/36KV	0.75KV
HVD52/2A	HVD 275KV 25KV TH SA	275KV	25KV
HVD53/2A	HVD 15/85KV 2.5KV TH SA	15/85KV	2.5KV
HVD54/2A	HVD 10/38KV 4.8KV TH SA	10/38KV	4.8KV
HVD55/2A	HVD 10/36KV 2.5KV TH SA	10/36KV	2.5KV
HVD55/2B	HVD 12/36KV 2.5KV TH SA	12/36KV	2.5KV
HVD56/2A	HVD 230V 12KV TH SA	230KV	12KV
HVD57/2A	HVD 5/36KV 1KV TH SA	5/36KV	1KV
HVD57/2B	HVD 5/36KV	5/36KV	1KV
HVD57/2C	HVD 36KV 5KV TH SA	36KV	5KV
HVD58/2A	HVD 12kV 2.5kV TH SA	12kV	2.5KV
HVD59/2A	HVD 25/33kV 9kV TH SA	25/33kV	9KV
HVD60/2A	HVD 60/220kV 15kV TH SA	60/220kV	15KV
HVD61/2A	HVD 33/275kV 6kV TH SA	33/275kV	6KV
HVD62/2A	HVD 600V/110kV 600V TH SA	600/110kV	600V
HVD63/2A	HVD 69kV 8kV TH SA	69kV	8KV
HVD64/2A	HVD 3.4kV 1kV TH SA	3.4kV	1.0kV
HVD64/2B	HVD 3.3kV 0.75kV TH SA	3.3kV	0.75kV
HVD65/2A	HVD 6.6/38KV 1.2KV TH SA	6.6/38kV	1.2KV
HVD66/2A	HVD 3.3/33kV 1kV TH SA	1.5/36kV	1KV
HVD66/2B	HVD 1.5/36kV 1kV TH SA	1.5/33kV	1KV
HVD67/2A	HVD 161kV 12kV TH SA	161kV	12KV
HVD68/2A	HVD 150kV 12kV TH SA	150kV	12KV

HVD - Dead Break Testers

HVD35/2A, HVD47/2B, HVD47/2D & HVD47/2E

HVD35/2A Dead Break Testers

Features:

- Designed for use on capacitive test points of separable connectors
- Automatic alarming above threshold voltage as default
- Able to test insulated polymetric cables in fused cable boxes
- Up to 66kV Range and 100V or 600V Threshold
- High Impact ABS body
- Self test facility
- Easy to use and Lightweight (0.6kg)
- Suitable for indoor/Outdoor use
- -25°C to +55°C operating temperature range
- Shock & drop resistant
- Easy access for battery replacement

Dead Break Testers are widely used throughout the electricity industry to determine that high voltage lines are de-energized prior to work being carried out thus ensuring safety of personnel.

Designed to comply with relevant IEC standards, the HVD35/2A, HVD47/2B, HVD47/2D, and HVD47/2E have been specifically designed for use on capacitive test points of separable connectors and on insulated polymetric cables in fused cable boxes. These instruments have a very low threshold voltage 100V for the 11kV Type and 600V for the 33kV, 34kV, AND 66kV Types.

Dead Break Testers are battery operated electronic contact devices that give clear indication of the status of the line under test both visually, by means of super-bright LED's and audibly with a high intensity buzzer, this ensures clear indication even in conditions of bright sunlight and high background noises. All detectors have the facility to self-check before and after use.

Each Dead Break Tester kit comprises the following components housed within a purpose designed carry bag:

- High Voltage Detector (HVD)
- Contact electrode
- Short handle for use within confined spaces
- 250mm Contact Extension (HVD47/2B only)
- Polymer cleaning kit
- Instruction Manual

Other accessories are available depending on the configuration required.

HVD47/2B Dead Break Testers

HVI-15kV

High Voltage Indicator Kit

Features:

- Small and compact for use in confined spaces
- High immunity to interference fields
- Utilizes proven resistor chain method of measurement
- Proven in the field world-wide
- Self test facility
- Can be used on DC systems
- Suitable for indoor/Outdoor use
- -25°C to +55°C operating temperature range
- Clear safety limit marks
- Operator hand guard with viewing window
- Automatic battery check on Proving Unit
- Easy access for battery replacement

The High Voltage Indicator (HVI) is used to indicate the presence of voltage to ensure the safety of maintenance or installation personnel allowing the apparatus to be safely earthed. Voltage up to 15kV AC or DC, on busbars or within switchgear enclosures will be shown by means of neon indicators.

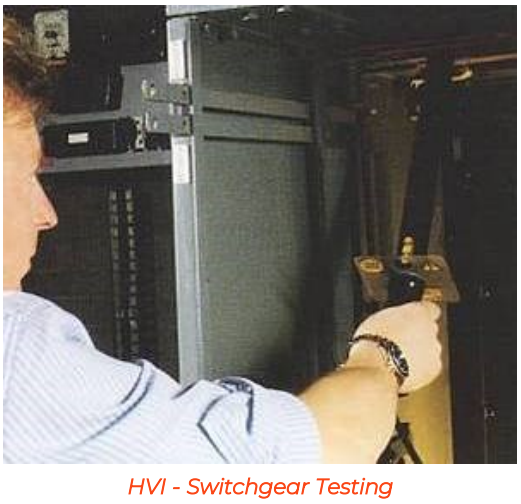
When used within switchgear, special bent end adaptors, 60˚ or 90˚, are available as accessories. A battery powered electronic proving unit is available to allow the fully assembled indicator to be tested at site before and after use.

After carrying out a proving test, the HVI can be applied to the HV source, the neon indicators will show whether there is voltage present. The indication will start as low as 200V by means of flashing neon lights which will gradually increase their rate of flash until steady state is reached at 6.35KV (the phase to earth voltage on an 11kV system).

Each complete HV Indicator kit comprises:

- Indicator complete with earth lead
- Proving unit complete with batteries
- Polymer cleaning Kit
- Instruction Manual
- Carry Satchel

*Individual items can be supplied separately.



HVI - Switchgear Testing

High Voltage Indicator kit details

High Voltage Indicator	
Range	0.2 to 15kV 50/60HZ and DC
Circuit Current	0.4mA nominal at 15kV 0.293mA nominal at 11kV
Dielectric Test	20kV for 1 minute
Length	485mm
Diameter	32mm
Weight	0.6kg

Proving Unit	
Output Voltage	300V DC nominal
Batteries	2 off C cells, IEC R14 or LR14
Battery Low	2V DC nominal
Length	255mm
Diameter	37mm
Weight	0.4kg

WPC1000 & WPC2000
Wireless Phase Comparator Kits

WPC1000

Features:

- Automatic alarming above threshold voltage as default
- 11kV / 33kV Voltage Range for WPC1000
- 66kV / 132kV Voltage Range for WPC2000
- Positive Indication of phase relationship
- 50m operating range in free air
- Built in self-check facility
- 433.9mHz operating frequency
- Shock and drop resistant
- High impact ABS body
- -25°C to +55°C operating temp range
- Indoor/Outdoor use regardless of weather conditions
- Easy access for battery replacement
- Built in self-check facility
- Self Proving facility
- Various rod adaptors available

The WPC1000 & WPC2000 Wireless Phase Comparator kits utilize a Transmitter module and a Receiver module to determine the Phase Relationship between two energized conductors at the same nominal voltage and frequency, eliminating the need for connecting cables. Kits are designed to comply with IEC 61481 standards for system voltages up to 132kV.

The Transmitter (TX) and Receiver (RX) modules are battery-operated electronic contact devices that provide a clear visible indication of the line's status. They utilize super bright LED lights and a high-intensity buzzer to accurately determine the phase relationship between two points at the same nominal voltage and frequency. This ensures clear indication, even in challenging conditions such as bright sunlight and high background noise.

During voltage checking, the Transmitter unit establishes contact with the live conductor. If the conductor's voltage exceeds the threshold, the Transmitter triggers and initiates the automatic voltage checking sequence. If the line remains live after 5 seconds, both RED LEDs illuminate solid, and the Line Phase Angle transmits to the Receiver.

Similarly, the Receiver Unit performs Voltage Checking by making contact with the live conductor. If the voltage exceeds the threshold, the Receiver activates and starts the voltage checking sequence. If the line remains live after 5 seconds, the RED LED lights up solidly.

Furthermore, to determine the phase angle shift between the Transmitter and Receiver, certain conditions are considered. An IN PHASE Condition indicates a phase angle shift nominally ≤±10°, shown by solid RED and GREEN LEDs and a continuous buzzing sound. However, an OUT OF PHASE Condition indicates a phase angle shift nominally >±20°, represented by a solid RED LED.

Please note that each module requires suitable insulating operating rods for safe distance from the HV source to ensure optimal performance.

WPC2000

WPC1000 & WPC2000 Kit Details

WPC Receiver

Visual Indication (Safe Condition): 1 Red LED & 1 Green LED

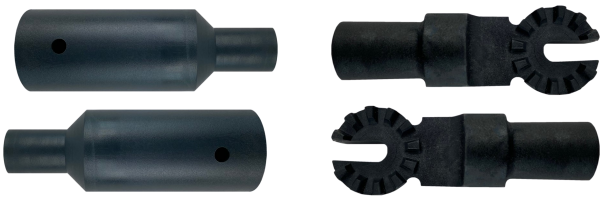
Audible Indication: Buzzer sounding continuously

WPC Transmitter

Visual Indication (Safe Condition): 2 Red LED's

Rod Adaptors

2 x Bowthorpe Rod Adaptors or
2 x Universal Star Wheel Adaptors



Contact Electrodes

2 x 40mm Aluminum contact electrodes

Accessories Bag

WPC Switchgear Kit Details

The Wireless Phase Comparator Switchgear Kit amplifies the capabilities of the WPC by enabling High Voltage Phase Comparison in Switchgear cubicles. With the elimination of trailing wires, it minimizes the risk of tripping and fosters a safer testing environment. Moreover, it extends the Phasing distance within rooms, providing greater flexibility during testing procedures.

Coupled 60° Bent End Adaptors

Black carry bag

Operating Handles

LLI

Live Line Indicator Kits

Features:

- For use on DC high voltage overhead lines up to 3000V DC
- Earth lead and clamp attached to long-length handle
- Red LED indicators when voltage is detected
- Loud 70dB alarm when voltage is detected
- Audible indication: Buzzer, 3.1 kHz tone, modulated @ 2Hz
- Can be used on third rail installations
- Battery check function
- Standard Thresholds: 250V / 500V / 1000V DC
- Resistor Chain: 1.5M**Ω / 3**M**Ω / 6**M**Ω**
- Operating time: 5 minutes nominal

The High Voltage DC Live Line Indicator Kit (LLI) is a battery operated electronic unit that has been specifically designed to test DC systems, with relevance to Mass Transit Railway (Metro) & Tram based models. Although usually applied to overhead catenaries they can also be used on “third rail” installations. Proving that the system is de-energised, and can thus be safely earthed, is important to both maintenance staff and system security.

The DC LLI gives both visual (high intensity flashing red LED’s) and audible (70dB) alarm should a conductor under test indicate as live. Three versions are available to cover the most common system voltages of 750V, 1500V and 3000V DC. Each version has a threshold setting of approximately 33% of system voltage, above which the line is deemed to be energised.

The unit is first armed with the test button which will cause the alarms to activate and upon releasing the button the red LED’s will be replaced by green ones and the audible alarm will stop. The green condition will remain active for about 5 minutes during which time the unit can be applied to the line under test and if the threshold is exceeded the warning alarms will again be activated. Pressing the test button also performs a battery check. A universal “star wheel” adaptor is also available to connect to other operating poles and alternative clamps are available to suit various earthing systems, e.g., buried rail.

Each complete LLI kit comprises:

- DC Live Line Indicator with earth lead & clamp
- Bowthorpe Rod adaptor incorporated into indicator case moulding
- Universal Star wheel Adaptor
- Hook, Y and straight electrode
- Polymer cleaning kit
- Instruction manual
- Carry satchel

LLI Tester