

200ADM-P

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 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 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 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
59C	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 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 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

Setting	Range	Resolution	Accuracy
VDC/AC rms	300.0V	0.1V	$\pm 0.7\% \text{rdg} \pm 5\text{d}$
Idc/AC rms	5.000A CF<3	0.001A	$\pm 0.7\% \text{rdg} \pm 5\text{d}$
Phase	-179.9°–	0.1°	$\pm 3^\circ$
Frequency	40–100Hz	0.01Hz	$\pm 0.02\% \text{rdg} \pm 1\text{d}$

Protection: fuse on current input.

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		Current	Current
Range	No load	Full load	Continuous	5 min on/
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 - $\pm 180^\circ$

Protection: current limit and electronic trip.

1 Voltage – Over/Under Voltage Relays

Testing over and under voltage relays with the 200ADM-P 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
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.

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.

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

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 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, currents can be accurately controlled down to a few mA.

Range	Current (A)			Output V @230V		
	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

RS232 port for connection to a printer or PC and T&R Link contact output and phase lock connection for DVS3 Mk2.

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 \pm 10% auto-selecting 50/60Hz 1 ph, 2300VA max.

Temperature Range

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

Dimensions

560 x 456 x 265mm

Weight

22.6kg

Accessories

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

Lead Set specifications

The 200ADM-P 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, printer, pushbutton lead for runback timing on disc induction relays.

Auxiliary DC Output

The 200ADM-P 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 metal case; this must be specified at the time of ordering

Storage of Results

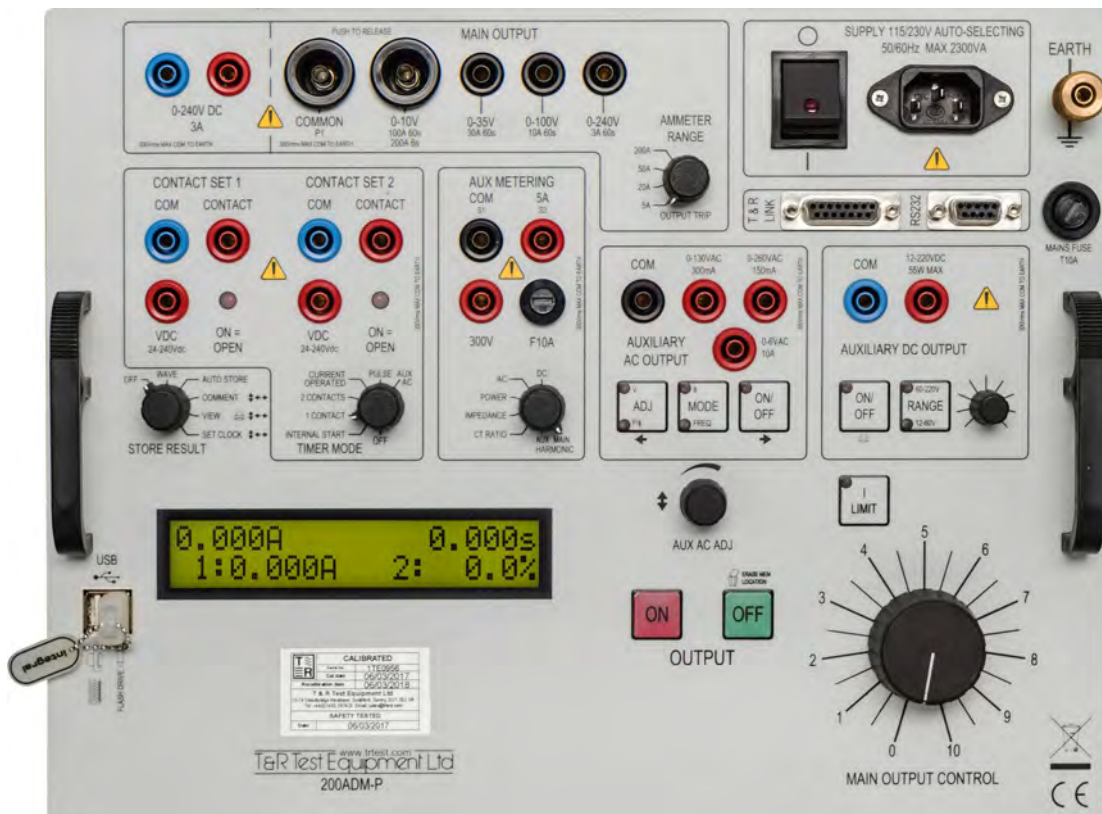
All test results from the 200ADM-P can be stored in a USB memory key. The unit has a real-time clock to time and date-stamp all results. To log the results, first enter a comment for your results using the digital pot and arrow keys or optional keyboard, and then select AUTO STORE. Whenever the timer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

Also, the 200ADM-P can store a .BMP file of the waveform to the USB key.

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 subl relay 12
10:53:30	12/12/17	5.000	3.000	0.000	10.0	10.3	50.00	Overcurrent subl relay 12
10:54:10	12/12/17	10.00	1.000	0.000	10.0	10.3	50.00	Overcurrent subl relay 12



50A-3PH_{mk2}

3 Phase Current Injection System



Features

- Clear and simple user interface
- 3 phase current output
- 0-50A per phase output current
- True RMS digital metering
- Memory ammeter
- Multi-function timing system
- Auxiliary metering input
- Large back-lit liquid crystal display
- Thermal and over-current protection
- Compact and portable
- 220V 3 Φ or 400V 3 Φ supply options*
- 115V-440V 3 wire supply with optional supply transformer

*See supply requirements overleaf

T&R Test Equipment is a market leader in the field of current injection equipment. The range includes secondary injection units with 50A 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 50A-3PH mk2 is a three phase injection system providing commissioning and maintenance engineers with a flexible system for testing protective systems. It has an easy to understand panel layout and a simple user interface. The status of every function can be seen at a glance, and there are no complex menus to navigate.

The unit has a range of outputs allowing injection of currents as low as a few mA and as high as 50A. Voltages up to 18V are available on the main outputs. Three true RMS metering ranges are provided, allowing the full scale of the meter and trip level to be set independently of the selected output. Industry standard safety connectors are used on all inputs and outputs for convenience, reliability and safety.

The 50A-3PH mk2 is protected by electronic over current and duty cycle trips on the outputs, thermal monitoring on the power components, and fuses on the input and regulator. An earth terminal is provided for connection to a local earth.

The unit is designed to comply with BSEN61010, and is CE marked.

An auxiliary metering input is provided and can measure voltage, current, frequency, and the phase between any of the current outputs and an external voltage or current.

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 independently isolated contact inputs are provided, and the timing system may also be used as a stand-alone timer.

The 50A-3PH mk2 can be used to test many types of single and three phase secondary protection including:

- Over and under current relays
- Power relays
- IDMT relays
- Tripping relays
- Auto-reclosers
- Thermal relays
- Time delay relays
- Miniature circuit breakers
- Earth fault relays



The back-lit display on the 50A-3PH mk2 is bright and clear with a wide viewing angle. The results of a test can be seen here as they appear on the display.

50A-3PH mk2 Specification

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.

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.

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

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

Auxiliary Metering Inputs

An auxiliary metering input is provided which is able to measure RMS voltage or current. In addition the frequency of the external input may be measured, and the phase measured between any of the phase outputs and the auxiliary metering input.

Setting	Range	Resolution	Accuracy
Volts AC	270.0V	0.1V	±0.7%rdg+5d
Volts AC	270.0V	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

The current input is protected by a F6.3A fuse.

Auxiliary Output

A single phase isolated 110Vac 300mA/220Vac 150mA auxiliary output is provided.

Lead Set Specifications

The 50A-3PH is supplied with a lead set including:

6 x 3m 4mm² output leads with 4mm plugs

2x3m 2x0.5m 2.5mm² auxiliary leads with 4mm plugs

RS232 and T&R Link

An RS232 port is provided to allow connection of a printer or PC and the T&R link output provides a phase lock reference for a DVS3 phase-shifting voltage source.

Dimensions

560 x 456 x 265mm

Weight

24.9kg

Supply Requirements

The supply voltage requirements for the unit must be specified at the time of ordering. The unit is available for operation from either a 400V 4 wire 3φ supply or 220V 3 wire 3φ supply. The optional delta-star supply transformer allows the 400V unit to operate from other supply voltages.

Option 1: 400V-10%+14% 50/60Hz 3ph 1kVA

Option 2: 220V-6%+14% 50/60Hz 3ph 1kVA

Timing System

Range 0-999.999s **Resolution** 1ms
Accuracy 0.01%rdg+2d (+4d current operated mode)

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

The following functions are provided:

Mode	Timer Start	Timer Stop
Internal start	Press 'ON'	Contact 1
Single contact	Contact 1	Contact 1
Dual contact	Contact 1	Contact 2
Current operated	Current > 10% of range	Current < 10% of range

Pulse mode is used for setting the current level in devices sensitive to heating, and allows current to be injected for 500ms, and the current recorded.

Current operated mode operates on one output phase (selectable).

Temperature Range

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

Accessories

Operating manual, output lead set, mains lead, spare fuse set.

Optional Accessories

Delta-Star supply transformer, filter unit, printer, leadset carry case.

Optional Delta-Star Supply Transformer

The optional delta-star supply transformer allows operation from 115V, 230V, 400V, and 440V 3 wire supplies, selected by a switch on the unit. An auxiliary single phase output is also provided to supply power to a DVS3 voltage source.

Input: 115V, 230V, 400V, 440V ±10%
3 wire 3 phase 1500VA max

3Φ output: 400V 4 wire 600VA
1 min on/15 min off
1Φ output: 230V 300VA
5 min on/15 min off

