



High Precision Programmable DC Electronic Load  
AN23500(F) Series



## Electronic Load AN23500(F) Series

### Product Introduction

The AN23500(F) series DC electronic load is a new DC load launched by Ainuo Instruments, covering voltage of 150V, 600V, and the power 150W~1.2kW. This series of electronic load is mainly used for testing of products in many fields such as new energy vehicle OBC, power battery, charging spot test, power electronics, servo/server power supply, high voltage UPS, photovoltaic, grid energy storage, aerospace and other fields. A new generation of digital controller is adopted, with built-in five modes and a variety of advanced modes, to meet the programming, automated testing and other needs.

### Features

- Precision measurement, with accuracy of voltage 0.015%+0.03%F.S., current 0.03%+0.05%F.S. and power 0.1%+0.1%F.S.;
- Built-in dynamic loading mode, up to 25kHz dynamic frequency, Vpk+/- test;
- Built-in LED to simulate LED load and test LED power supply;
- Minor dynamic overshoot amplitude, less than 30% of set current;

- Built-in constant current (CC), constant voltage (CV), constant resistance (CR), constant power (CP), short circuit simulation, overcurrent protection test, series test, AUTO test etc.;
- Complete protection, including OCP (overcurrent protection)/OVP (overvoltage protection)/ OTP (overtemperature protection)/RVP (reverse connection protection), etc.;
- Built-in temperature acquisition chip and speed-adjustable fan control;
- Built-in battery, suitable for discharge test for power integration;
- Flexible interface, standard RS232, optional RS485;
- Light, ABS+PC injection molding shell, beautiful and generous.

Model	150V	600V	Height	Width
150W	AN23510(F)		2U	1/2U
150W	AN23511(F)		2U	1/2U
300W	AN23512(F)	AN23512B(F)	2U	1/2U
600W	AN23513(F)	AN23513B(F)	2U	2U
1200W	AN23514(F)	AN23514B(F)	2U	2U



High Voltage and High Power DC Electronic Load  
AN23600E(F) Series



AC/DC Electronic Load  
AN29(F) Series

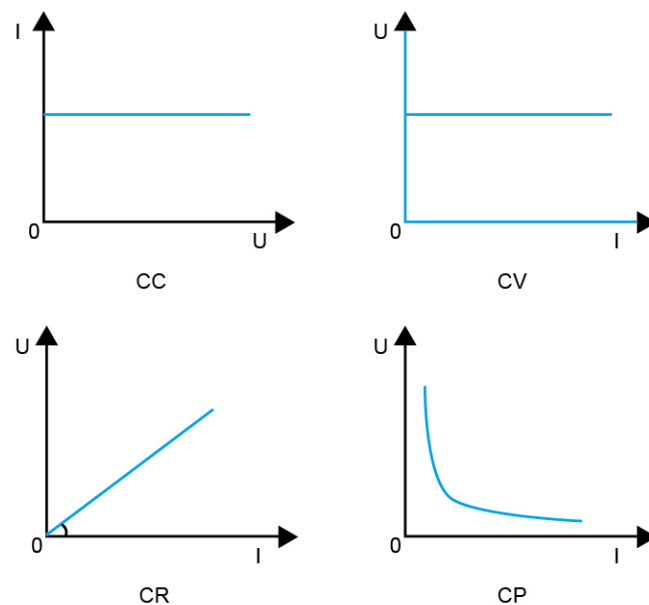
## Applications

- Switch power supply test
- Server power supply and communication power supply test
- Adapter, charger and portable charger test
- Battery discharge test
- Automotive electronics test, such as fuses, control boxes, etc.
- Relay simulation load test
- Military aerospace power test
- DC power supply and power electronic components test



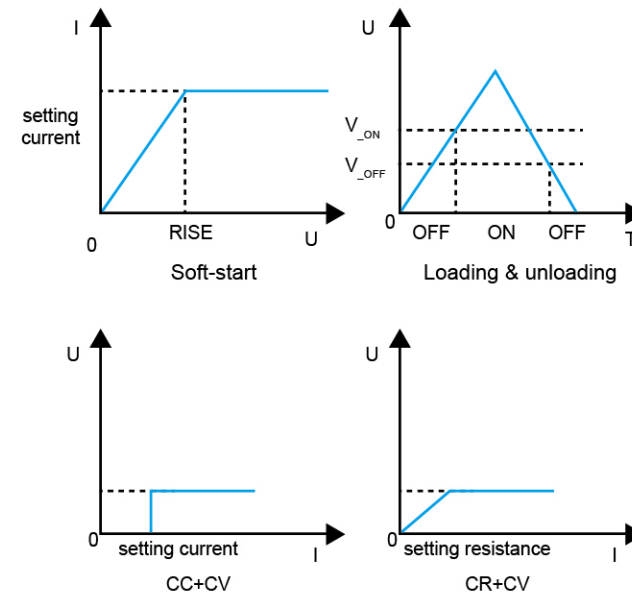
## Basic Modes

The AN23500(F) load has four built-in basic modes: constant voltage (CV), constant current (CC), constant resistance (CR), and constant power (CP), suitable for various testing.



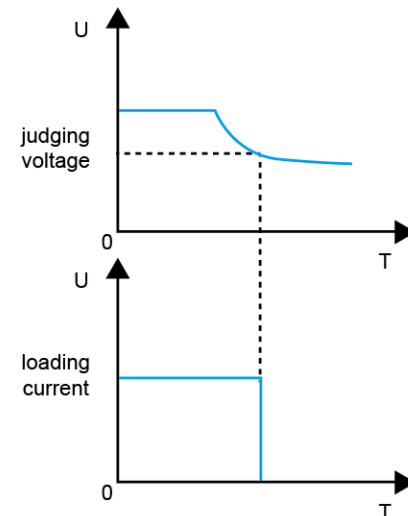
## Combined Modes

The AN23500(F) load has four built-in combined modes: soft-start, loading/unloading, CC+CV, CR+CV, suitable for various testing.



## BATY Mode - Dedicated Battery Testing Mode

The AN23500(F) series load has constant battery capacity test mode, and discharge via constant current (CC) mode. Voltage threshold can be set for judgment. When the battery voltage drops to the threshold, the loading automatically stops, and the current output of the battery under test is turned off to avoid damage to the battery due to over-discharge. The load provides real-time display of discharge level in Ah. BATY mode is also suitable for supercapacitors and other similar discharge tests.

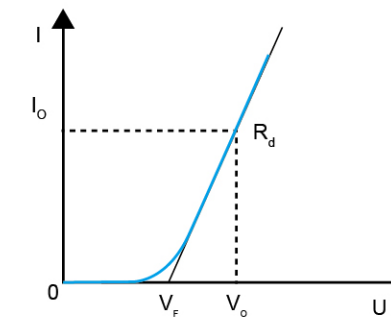


## Adjustable Load Rise/Fall Slope

Various current rise/fall rate can be set for AN23500(F) series loads as required. Current change rate: 2.5A/us; time: 20us-999999ms, resolution: 20us.

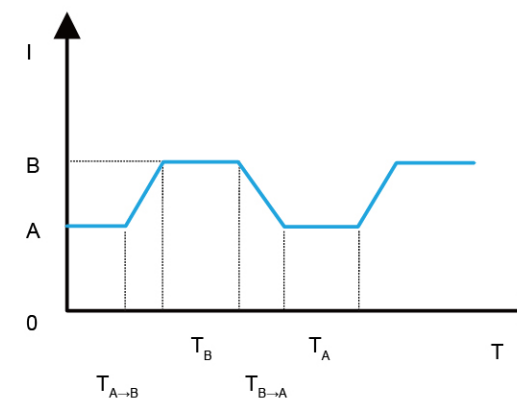
## LED Mode - Simulate LED Load Mode

The AN23500(F) series load has built-in simulated LED load mode, loading as shown below to simulate the characteristics that the current of LED is 0 before it is turned on and rises according to the volt-ampere curve after it is turned on. Electronic load is adopted to simulate loading so as to avoid light pollution or instable parameters of LED strips and resistive loads.



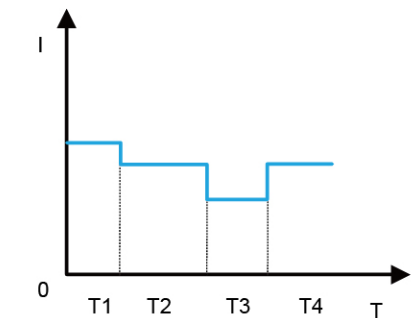
## CCD Mode - Fast Dynamic Test

The AN23500(F) series loads have built-in high-speed dynamic loading test function, with dynamic change up to 25kHz, including three modes: continuous, pulse and trigger. You can set the current loading value, loading time, rise/fall time, etc., as shown in the figure below. In addition to dynamically loading, the load also provides peak-to-peak voltage measurement with sampling frequency up to 25kHz.



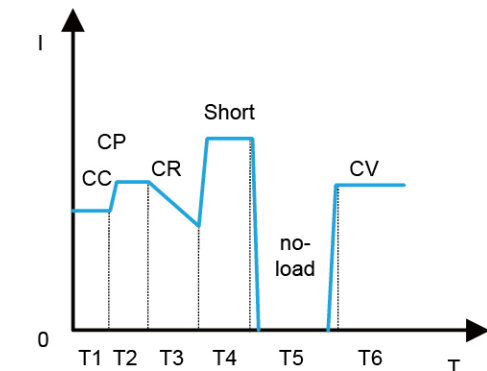
## LIST Mode - Series Loading

Up to 8 groups of data can be edited via built-in series test of AN23500(F) load. 200 steps can be edited in each group, and the execution time (0-100s) of each step can be edited. Various loading current waves are provided for battery discharge, server, communication power mixed load modulation etc. as an effective supplement to dynamic current testing.



## Auto Mode - Automatic Test

Up to 8 groups of data can be edited via built-in series test of AN23500(F) load. 50 steps can be edited in each group, including three (6) modes: no-load, constant current (CC), constant voltage (CV), constant power (CP), constant resistance (CR) and short-circuit; 4 parameters can be edited, tested and compared: current, voltage, power and resistance, and the delay test time (0.2~100s) can be edited, while considering the speed and accuracy of the test.



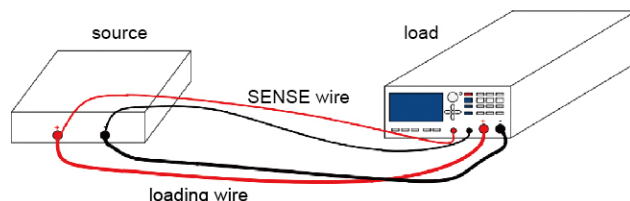
## High Precision Measurement

AN23500(F) series load has two levels of voltage/current measurement. Taking AN23514(F) as an example, the voltage is 20V/150V, suitable for low voltage and high voltage applications at the same time; the current is 24A/240A, providing more accurate current measurements for various applications. High-precision A/D, D/A chips are adopted, some models support accuracy of voltage 0.015%+0.03%F.S., current 0.03%+0.05%F.S., and power 0.1%+0.1%F.S.



## Remote Measurement

AN23500(F) series loads have remote measurement function. When the current consumption on the load is high, the voltage drop generated by the load terminal, the connection line between the load and the source under test is high and cannot be ignored. To ensure the measurement accuracy, the remote test (SENSE) is added. Select the remote test when the loading current is large or for test items with strict voltage requirements. The SENSE terminal is set at the front of operation panel, convenient for wiring.

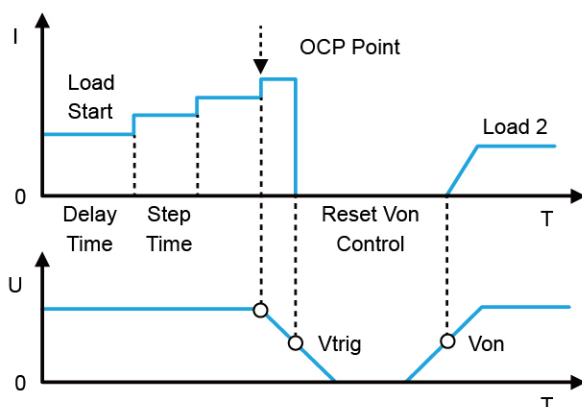


## I Monitor - Current Monitoring

AN23500(F) series loads have an analog current output terminal (BNC), outputting 0~5.5V analog signal corresponding to 0~maximum current. It can be directly connected to an external voltmeter or oscilloscope through the BNC terminal for real-time monitoring of current waves without additional current probes.

## Precisely Lock The Power Protection Point

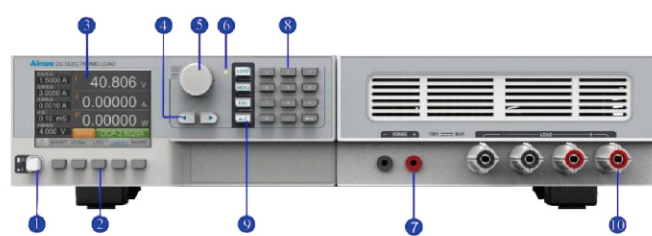
AN23500(F) series loads have OCP/OPP function. Too large output current of the source under test may cause damage. Therefore, most of the power sources under test have overcurrent protection function: when overloaded, the output voltage will be reduced or the output will be stopped. Therefore, a test mode for this condition is set for the load - Over Current Test (OCP). After setting the loading circuit and the threshold voltage, when the load detects that the voltage is less than or equal to the threshold, the loading stops, and at the same time, the current at the moment of protection is displayed on the screen, and the result is judged according to the protection point.



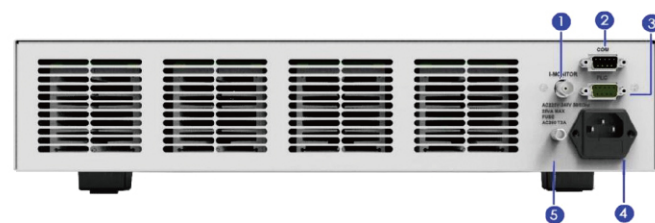
## Complete Protection

AN23500(F) series load is highly reliable with a variety of protections, including: OVP (overvoltage protection), OCP (overcurrent protection), OTP (overtemperature protection), OPP (overpower protection), RVP (reverse connection protection), SSP (SENSE protection).

## Panel



No.	Name	Description
①	Power switch	AC power switch of electronic load host
②	F1-F5 menu	F1-F5, shortcuts
③	Display screen	Display setting and measurement
④	Direction buttons	Left/right keys
⑤	Knob	Move the cursor up/down and adjust parameters
⑥	Tricolor indicator light	Load working LED
⑦	Vsense terminal	Remote detection power voltage
⑧	Number key	Number keys 0-9 (Cancel key)
⑨	Control buttons	LOAD、MENU、ESC、ENTER
⑩	DC load terminal	Loading terminal



No.	Name	Description
①	I_Monitor	Loading current wave detection
②	COM	RS232 or RS485 optional
③	PLC	Various PLC functions (reserved)
④	Power socket	Power input
⑤	PE terminal	Connect to ground

## Specifications

Model		AN23510(F)		AN23511(F)		AN23513(F)		AN23513B(F)	
Constant Current(CC)	Range	0-3A	0-30A	0-3A	0-30A	0- 12A	0-120A	0-3A	0-30A
	Resolution of setting	0.1mA	1mA	0.1mA	1mA	1mA	10mA	0.1mA	1mA
	Accuracy	0.03%+0.05%F.S.				0.05%+ 0.05%F.S.	0.1%+ 0.05%F.S.	0.03%+0.05%F.S.	
Constant Voltage(CV)	Range	0.1-20V	0.1-150V	0.1-20V	0.1- 150V	0.1-20V	0.1- 150V	0.1-60V	0.1-600V
	Resolution of setting	1mV	10mV	1mV	10mV	1mV	10mV	1mV	10mV
	Accuracy	0.03%+0.05%F.S.		0.03%+0.02%F.S.		0.03%+0.02%F.S.		0.03%+ 0.02%F.S.	0.03%+ 0.05%F.S.
Constant Resistance(CR) (when input voltage and current≥10% of full range)	Range	0.03Ω-99.999Ω / 100Ω 999.99Ω / 1000Ω-9999.9Ω							
	Resolution of setting	0.001Ω / 0.01Ω / 0.1Ω							
	Accuracy	Vin/Rset*(0.2%)+0.2%I.F.S.							
Constant Power(CP) (when input voltage and current≥10% of full range)	Range	100W/150W				100W/600W			
	Resolution of setting	1mW/10mW				1mW/10mW			
	Accuracy	0.2%+0.2%F.S.		0.1%+0.1%F.S.		0.1%+0.1%F.S.		0.1%+0.1%F.S.	
Voltage measurement	Range	0-20V	0-150V	0-20V	0-150V	0-20V	0- 150V	0-60V	0-600V
	Resolution of setting	1mV	10mV	1mV	10mV	1mV	10mV	1mV	10mV
	Accuracy	0.015%+0.05%F.S.		0.015%+0.03%F.S.		0.015%+0.03%F.S.		0.015%+ 0.03%F.S.	0.015%+ 0.05%F.S.
Current measurement	Range	0-3A	0-30A	0-3A	0-30A	0- 12A	0- 120A	0-3A	0-30A
	Resolution of setting	0.01mA	0.1mA	0.01mA	0.1mA	0.1mA	1mA	0.01mA	0.1mA
	Accuracy	0.05%+0.1%F.S.		0.03%+ 0.05%F.S.	0.03%+ 0.08%F.S.	0.05%+ 0.05%F.S.	0.1%+ 0.08%F.S.	0.05%+ 0.05%F.S.	0.1%+ 0.08%F.S.
Power measurement (when input voltageand current≥10% of full range)	Range	100W/150W				100W/600W			
	Resolution of setting	1mW/10mW				1mW/10mW			
	Accuracy	0.2%+0.2%F.S.				0.1%+0.1%F.S.			
Battery test		Input voltage: Max. set voltage; current resolution: current resolution of the stage; time: 0-99.999H							
Dynamic test		Test frequency: 0-25KHz; current change rate: 2.5A/μs; time: 20μs-999999ms, resolution: 20μs							
Current soft start time		0-999999ms, accuracy: 20μs							
Short circuit function		≥1.1 times the range of the stage							
Temperature	Operating temperature	0~40℃							
	Storage temperature	-25~70℃							
Dimensions		W×H×D (mm)				213×88×401			
Weight		Kg				6.7			
						6.6			
						12.4			
						12.0			

Model		AN23512(F)		AN23512B(F)		AN23514(F)		AN23514B(F)	
Constant Current(CC)	Range	0-6A	0-60A	0-3A	0- 15A	0-24A	0-240A	0-6A	0-60A
	Resolution of setting	0.1mA	1mA	0.1mA	1mA	1mA	10mA	0.1mA	1mA
	Accuracy	0.03%+0.05%F.S.				0.05%+ 0.05%F.S.	0.1%+ 0.05%F.S.	0.03%+0.05%F.S.	
Constant Voltage(CV)	Range	0.1-20V	0.1- 150V	0.1-60V	0.1-600V	0.1-20V	0.1- 150V	0.1-60V	0.1-600V
	Resolution of setting	1mV	10mV	1mV	10mV	1mV	10mV	1mV	10mV
	Accuracy	0.03%+0.02%F.S.		0.03%+ 0.02%F.S.	0.03%+ 0.05%F.S.	0.03%+0.02%F.S.		0.03%+ 0.02%F.S.	0.03%+ 0.05%F.S.
Constant Resistance(CR) (when input voltage and current≥10% of full range)	Range	0.03Ω-99.999Ω / 100Ω-999.99Ω / 1000Ω-9999.9Ω							
	Resolution of setting	0.001Ω / 0.01Ω / 0.1Ω							
	Accuracy	Vin/Rset*(0.2%)+0.2%F.S.							
Constant Power(CP) (when input voltage and current≥10% of full range)	Range	100W/300W				100W/600W			
	Resolution of setting					1mW/10mW			
	Accuracy	0.1%+0.1%F.S.							
Voltage measurement	Range	0-20V	0- 150V	0-60V	0-600V	0-20V	0- 150V	0-60V	0-600V
	Resolution of setting	1mV	10mV	1mV	10mV	1mV	10mV	1mV	10mV
	Accuracy	0.015%+0.05%F.S.		0.015%+ 0.03%F.S.	0.015%+ 0.05%F.S.	0.015%+0.03%F.S.		0.015%+ 0.03%F.S.	0.015%+ 0.05%F.S.
Current measurement	Range	0-6A	0-60A	0-3A	0- 15A	0- 12A	0- 120A	0-3A	0-30A
	Resolution of setting	0.01mA	0.1mA	0.01mA	0.1mA	0.1mA	1mA	0.01mA	0.1mA
	Accuracy	0.03%+ 0.05%F.S.	0.03%+ 0.08%F.S.	0.03%+ 0.05%F.S.	0.03%+0. 08%F.S.	0.05%+ 0.05%F.S.	0.1%+ 0.08%F.S.	0.05%+ 0.05%F.S.	0.1%+ 0.08%F.S.
Power measurement (when input voltageand current≥10% of full range)	Range	100W/300W				100W/600W			
	Resolution of setting					1mW/10mW			
	Accuracy	0.1%+0.1%F.S.							
Battery test		Input voltage: Max. set voltage; current resolution: current resolution of the stage; time: 0-99.999H							
Dynamic test		Test frequency: 0-25KHz; current change rate: 2.5A/μs; time: 20us-99999ms, resolution: 20μs							
Current soft start time		0-99999ms, accuracy: 20μs							
Short circuit function		≥1.1 times the range of the stage							
Temperature	Operating temperature	0~40 ℃							
	Storage temperature	-25~70 ℃							
Dimensions		W×H×D (mm)				213×88×401			
Weight		Kg				6.7			
						6.6			
						12.4			
						12.0			

Note: Power F.S. = Vrange F.S. × Irange F.S.