

Lower Power DC Electronic Load AN235(F) Series



Product Introduction

The AN235(F) Series is a line of low-power DC electronic loads launched by Ainuo Instrument. It comes in two voltage ranges, 150V and 600V, with power ranges from 150W to 1200W. This series of electronic loads is primarily used for testing a variety of products in fields such as chargers, adapters, batteries, LED drivers, low-power switch power supplies, components, relays, military, aerospace, and more. Featuring a new-generation digital controller, the AN235(F) Series offers both conventional and multiple compound modes, along with serialization and automation capabilities. This caters to various needs such as programming and automated testing, making it capable of partially replacing testing systems.

Features

- Precision measurement technology supports accuracy of voltage $0.015\%+0.03\%\text{F.S.}$, current $0.03\%+0.05\%\text{F.S.}$, and power $0.1\%+0.1\%\text{F.S.}$
- Built-in dynamic load-pull mode, with a dynamic frequency up to 25kHz, and equipped with $V_{pk}\pm$ testing capability.
- Built-in LED mode, capable of simulating LED loads for testing LED power supplies.
- Tiny dynamic overshoot magnitude, less than 30% of the set current.
- Built-in constant current(CC), constant voltage(CV), constant resistance(CR), constant power(CP), short circuit simulation, over-current protection testing, serialization testing, and various other functions including automatic testing.

- Comprehensive protection features, supporting over-current, over-voltage, over-temperature, and reverse connection protection, among others.
- Built-in temperature acquisition circuitry and variable-speed fan control.
- Built-in battery mode suitable for discharging tests for energy integration.
- Flexible interface options, standard RS232, optional RS485.
- Lightweight design, featuring an injection-molded casing made of ABS+PC material, providing an elegant and aesthetically pleasing appearance while enhancing overall quality.

Serialized Models

AN235(F) Series offers a complete range of serialized models for selection, as shown in the following table:

Model	Features	Height	Width
AN23511 V2(F)	150V/30A/150W	2U	half width
AN23512 V2(F)	150V/60A/300W	2U	half width
AN23512B V2(F)	600V/15A/300W	2U	half width
AN23513(F)	150V/120A/600W	2U	half width
AN23513B(F)	600V/30A/600W	2U	half width
AN23514(F)	150V/240A/1200W	2U	half width
AN23514B(F)	600V/60A/1200W	2U	half width

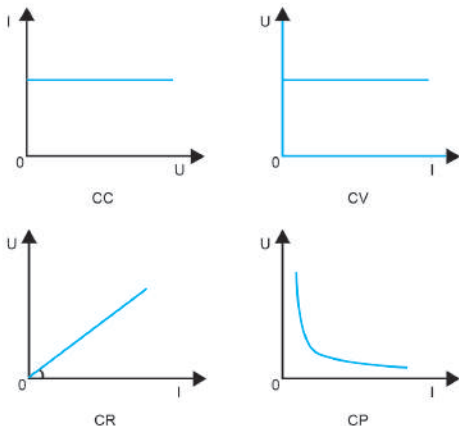
Applications

- Switching power supply testing
- Adapter, charger, and power bank testing
- Automotive electronics testing, such as fuses, control boxes, etc.
- Military and aerospace power supply testing
- Testing server power supplies and communication power supplies
- Battery discharge testing
- Relay simulation load testing
- Testing DC power supplies and power electronic components



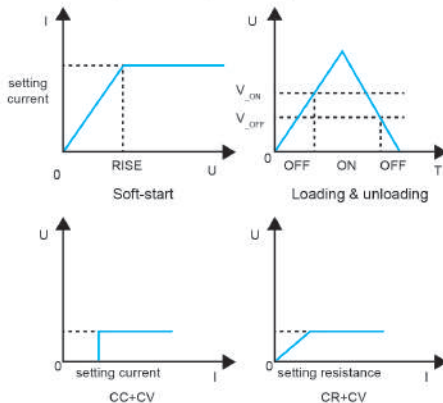
Basic Mode

The AN235(F) load incorporates four major basic modes: constant voltage mode(CV), constant current mode(CC), constant resistance mode(CR), and constant power mode(CP), meeting a wide range of testing needs.



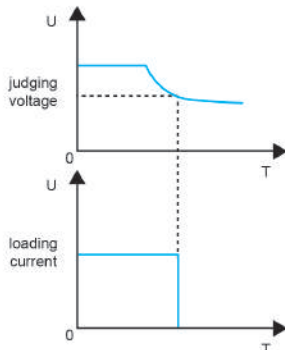
Composite Mode

The AN235(F) load integrates four major compound modes: soft start mode, load-unload mode, CC+CV mode, and CR+CV mode, meeting a wide range of testing needs.



BATY Mode - Dedicated Battery Test Mode

The AN235(F) Series load has a constant battery capacity test 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 a real-time display of the discharge level in Ah. BATY mode is also suitable for supercapacitors and other similar discharge tests.

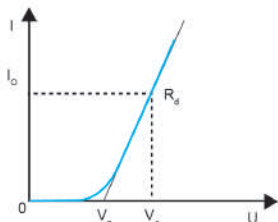


Adjustable Load Rise/Fall Slope

Various current rise/fall rates can be set for AN235(F) series loads as required. Current change rate: 2.5A/us; time: 20us-999999ms, resolution: 20us.

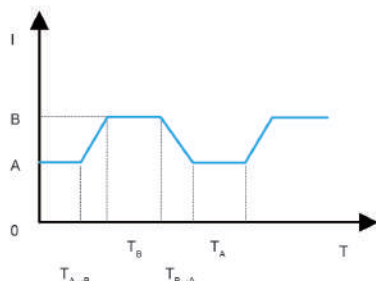
LED Mode - Simulate LED Load Mode

The AN235(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 unstable parameters of LED strips and resistive loads.



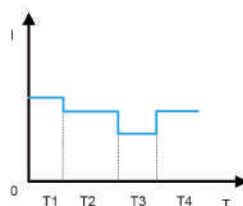
CCD Mode - Fast Dynamic Testing

The AN235(F) Series loads have built-in high-speed dynamic loading test function, with a 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 a sampling frequency of up to 25kHz.



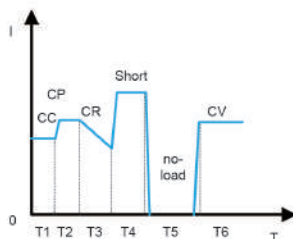
LIST Mode - Serialized Loading Function

The AN235(F) Series load has built-in simulated LED load mode, loading as shown below to simulate the characteristic 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 unstable parameters of LED strips and resistive loads.



AutoMode - Automatic Test Function

Up to 8 groups of data can be edited via built-in series test of AN235(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.

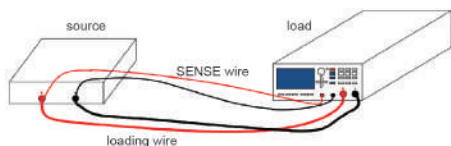


High Precision Measurement

AN235(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 AD, and 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

AN235(F) Series loads have remote measurement functions. When the current consumption on the load is high, the voltage drop generated by the load terminal, and the connection line between the load and the source under test is high and cannot be ignored. To ensure 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 operation panel, convenient for wiring.



I Monitor - Current Monitoring

AN235(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 problems.

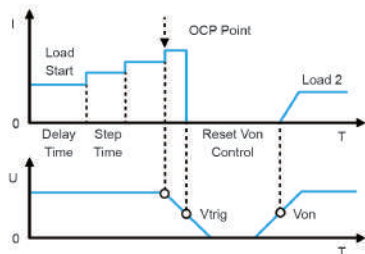
All-Round Protection

The AN235(F) Series load features high reliability and multiple protection and alarm mechanisms, including OVP (Over Voltage Protection), OCP (Over Current Protection), OTP (Over Temperature Protection), OPP (Over Power Protection), RVP (Reverse Voltage Protection), and SSP (Sense Protection).

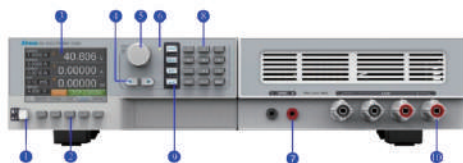
Precisely Lock The Power Protection Point

AN235(F) Series loads have OCP/OPP functions. Too large an output current of the source under test may cause damage. Therefore, most of the power sources under test have an 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).

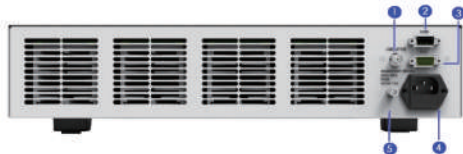
After setting the loading circuit and the threshold voltage, when the load detects that the voltage is less than or equal to the threshold, the loading stops, and at the same time, the current at the moment of protection is displayed on the screen, and the result is judged according to the protection point.



Panel Description



No.	Name	Description
①	Power supply switch	AC power supply switch of the electronic load master unit
②	F1-F5 Menu	F1-F5, shortcut menu
③	Display screen	Shows settings and measured data
④	Direction key	Direction key
⑤	Knob	Used for moving cursor up and down and adjusting parameters
⑥	Tricolor light	Indicator light for load working status
⑦	Vsense terminal	Remote detection of power supply voltage
⑧	Number keys	Number keys 0-9 and undo key
⑨	Control button	LOAD, MENU, ESC, ENTER
⑩	DC load terminal	Load terminal



No.	Name	Description
①	I_Monitor	Load current waveform detection
②	COM	RS232 or RS485 optional
③	PLC	Realize multiple PLC functions (reserved)
④	Power socket	Power input + fuse
⑤	Ground terminal	Connect to the group

Specifications

Model	AN23511V2(F)			
Constant Current Mode(CC)	Range	0-3A		0-30A
	Set Resolution	0.1mA		1mA
	Accuracy	0.03%+0.05%F.S.		
Constant Voltage Mode(CV)	Range	0.1-20V		0.1-150V
	Set Resolution	1mV		10mV
	Accuracy	0.03%+0.02%F.S.		
Constant Resistance Mode(CR) (When input voltage and current values $\geq$ 10% of full range)	Range	0.03 Ω -99.999 Ω / 100 Ω -999.99 Ω / 1000 Ω -9999.9 Ω		
	Set Resolution	0.001 Ω / 0.01 Ω / 0.1 Ω		
	Accuracy	Vin/Rset*(0.2%)+0.2%I.F.S.		
Constant Power Mode(CP) (When input voltage and current values $\geq$ 10% of full range)	Range	100W/150W		
	Set Resolution	1mW/10mW		
	Accuracy	0.1%+0.1%F.S.		
Voltage Measurement	Range	0-20V		0-150V
	Measurement Resolution	1mV		10mV
	Accuracy	0.015%+0.03%F.S.		
Current Measurement	Range	0-3A		0-30A
	Measurement Resolution	0.01mA		0.1mA
	Accuracy	0.03%+0.05%F.S.		0.03%+0.08%F.S.
Power Measurement (When input voltage and current values $\geq$ 10% of full range)	Range	100W/150W		
	Measurement Resolution	1mW/10mW		
	Accuracy	0.1%+0.1%F.S.		
Battery Test		Input voltage: Maximum voltage setting, Current resolution: Resolution for this range of current, Time range: 0-99.999 hours		
Dynamic Test		Testing frequency: 0-25kHz, Current change rate: 2.5A/ μ s, Time range: 20 μ s - 999.999ms, with a resolution of 20 μ s		
Current Soft Start Time		0-999999ms, time accuracy is 20 μ s		
Short Circuit Function		$\geq$ 1.1 times the range of this stage.		
Temperature	Working Temperature	0-40 $^{\circ}$ C		
	Storage Temperature	-25-70 $^{\circ}$ C		
Dimension	W*H*D (mm)	213*88*401		
Weight	Kg	6.7		6.6

Any changes to the above parameter specifications will not be notified separately.

Model	AN23512V2(F)		AN23512BV2(F)	
Constant Current Mode(CC)	Range	0-6A	0-60A	0-3A
	Set Resolution	0.1mA	1mA	0.1mA
	Accuracy	0.03%+0.05%F.S.		
Constant Voltage Mode(CV)	Range	0.1-20V	0.1-150V	0.1-60V
	Set Resolution	1mV	10mV	1mV
	Accuracy	0.03%+0.02%F.S.	0.03%+0.02%F.S.	0.03%+0.05%F.S.
Constant Resistance Mode(CR) (When input voltage and current values $\geq$ 10% of full range)	Range	0.03 Ω -99.999 Ω / 100 Ω -999.99 Ω / 1000 Ω -9999.9 Ω		
	Set Resolution	0.001 Ω / 0.01 Ω / 0.1 Ω		
	Accuracy	Vin/Rset*(0.2%)+0.2%I.F.S.		
Constant Power Mode(CP) (When input voltage and current values $\geq$ 10% of full range)	Range	100W/300W		
	Set Resolution	1mW/10mW		
	Accuracy	0.1%+0.1%F.S.		
Voltage Measurement	Range	0-20V	0-150V	0-60V
	Measurement Resolution	1mV	10mV	1mV
	Accuracy	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
	Measurement Resolution	0.01mA	0.1mA	0.01mA
	Accuracy	0.03%+0.05%F.S.	0.03%+0.08%F.S.	0.03%+0.05%F.S.
Power Measurement (When input voltage and current values $\geq$ 10% of full range)	Range	100W/300W		
	Measurement Resolution	1mW/10mW		
	Accuracy	0.1%+0.1%F.S.		
Battery Test		Input voltage: Maximum voltage setting, Current resolution: Resolution for this range of current, Time range: 0-99.999 hours		
Dynamic Test		Testing frequency: 0-25kHz, Current change rate: 2.5A/ μ s, Time range: 20 μ s - 999.999ms, with a resolution of 20 μ s		
Current Soft Start Time		0-999999ms, time accuracy is 20 μ s		
Short Circuit Function		$\geq$ 1.1 times the range of this stage.		
Temperature	Working Temperature	0-40 $^{\circ}$ C		
	Storage Temperature	-25-70 $^{\circ}$ C		
Dimension	W*H*D (mm)	213*88*401		
Weight	Kg	6.7		6.6

Any changes to the above parameter specifications will not be notified separately.

Model		AN23513(F)		AN23513B(F)	
Constant Current Mode(CC)	Range	0-12A	0-120A	0-3A	0-30A
	Set Resolution	1mA	10mA	0.1mA	1mA
	Accuracy	0.05%+0.05%F.S.	0.1%+0.05%F.S.	0.03%+0.05%F.S.	
Constant Voltage Mode(CV)	Range	0.1-20V	0.1-150V	0.1-60V	0.1-600V
	Set Resolution	1mV	10mV	1mV	10mV
	Accuracy	0.03%+0.02%F.S.		0.03%+0.02%F.S.	0.03%+0.05%F.S.
Constant Resistance Mode(CR) (When input voltage and current values $\geq$ 10% of full range)	Range	0.03 Ω -99.999 Ω / 100 Ω -999.99 Ω / 1000 Ω -9999.9 Ω			
	Set Resolution	0.001 Ω / 0.01 Ω / 0.1 Ω			
	Accuracy	$V_{in}/R_{set} \times (0.2\% + 0.2\% \text{I.F.S.})$			
Constant Power Mode(CP) (When input voltage and current values $\geq$ 10% of full range)	Range	100W/600W			
	Set Resolution	1mW/10mW			
	Accuracy	0.1%+0.1%F.S.			
Voltage Measurement	Range	0-20V	0-150V	0-60V	0-600V
	Measurement Resolution	1mV	10mV	1mV	10mV
	Accuracy	0.015%+0.03%F.S.		0.015%+0.03%F.S.	0.015%+0.05%F.S.
Current Measurement	Range	0-12A	0-120A	0-3A	0-30A
	Measurement Resolution	0.1mA	1mA	0.01mA	0.1mA
	Accuracy	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 voltage and current values $\geq$ 10% of full range)	Range	100W/600W			
	Measurement Resolution	1mW/10mW			
	Accuracy	0.1%+0.1%F.S.			
Battery Test		Input voltage: Maximum voltage setting, Current resolution: Resolution for this range of current, Time range: 0-99.999 hours			
Dynamic Test		Testing frequency: 0-25kHz, Current change rate: 2.5A/ μ s, Time range: 20 μ s - 999.999ms, with a resolution of 20 μ s			
Current Soft Start Time		0-999999ms, time accuracy is 20 μ s			
Short Circuit Function		≥ 1.1 times the range of this stage.			
Temperature	Working Temperature	0-40 $^{\circ}$ C			
	Storage Temperature	-25-70 $^{\circ}$ C			
Dimension	W×H×D (mm)	426×88×460			
Weight	Kg	12.4			

Any changes to the above parameter specifications will not be notified separately.

Model		AN23514(F)		AN23514B(F)	
Constant Current Mode(CC)	Range	0-24A	0-240A	0-6A	0-60A
	Set Resolution	1mA	10mA	0.1mA	1mA
	Accuracy	0.05%+0.05%F.S.	0.1%+0.05%F.S.	0.03%+0.05%F.S.	
Constant Voltage Mode(CV)	Range	0.1-20V	0.1-150V	0.1-60V	0.1-600V
	Set Resolution	1mV	10mV	1mV	10mV
	Accuracy	0.03%+0.02%F.S.		0.03%+0.02%F.S.	0.03%+0.05%F.S.
Constant Resistance Mode(CR) (When input voltage and current values $\geq$ 10% of full range)	Range	0.03 Ω -99.999 Ω / 100 Ω -999.99 Ω / 1000 Ω -9999.9 Ω			
	Set Resolution	0.001 Ω / 0.01 Ω / 0.1 Ω			
	Accuracy	$V_{in}/R_{set} \times (0.2\% + 0.2\% \text{I.F.S.})$			
Constant Power Mode(CP) (When input voltage and current values $\geq$ 10% of full range)	Range	100W/1200W			
	Set Resolution	1mW/0.1W			
	Accuracy	0.1%+0.1%F.S.			
Voltage Measurement	Range	0-20V	0-150V	0-60V	0-600V
	Measurement Resolution	1mV	10mV	1mV	10mV
	Accuracy	0.015%+0.03%F.S.		0.015%+0.03%F.S.	0.015%+0.05%F.S.
Current Measurement	Range	0-24A	0-240A	0-6A	0-60A
	Measurement Resolution	0.1mA	1mA	0.01mA	0.1mA
	Accuracy	0.05%+0.05%F.S.	0.1%+0.1%F.S.	0.03%+0.05%F.S.	0.03%+0.08%F.S.
Power Measurement (When input voltage and current values $\geq$ 10% of full range)	Range	100W/1200W			
	Measurement Resolution	1mW/0.1W			
	Accuracy	0.1%+0.1%F.S.			
Battery Test		Input voltage: Maximum voltage setting, Current resolution: Resolution for this range of current, Time range: 0-99.999 hours			
Dynamic Test		Testing frequency: 0-25kHz, Current change rate: 2.5A/ μ s, Time range: 20 μ s - 999.999ms, with a resolution of 20 μ s			
Current Soft Start Time		0-999999ms, time accuracy is 20 μ s			
Short Circuit Function		≥ 1.1 times the range of this stage.			
Temperature	Working Temperature	0-40 $^{\circ}$ C			
	Storage Temperature	-25-70 $^{\circ}$ C			
Dimension	W×H×D (mm)	426×88×460			
Weight	Kg	12.4			

Any changes to the above parameter specifications will not be notified separately.