



California Instruments 3091LD

3000–12000 VA

3000VA Programmable AC Loads

50–350 VRMS

- **Multi-mode AC Electronic Load**
Flexible solution for a wide range of AC power test applications
- **3000 Watt Power Dissipation**
Master / Auxiliary configurations for higher power and multi phase applications
- **50 to 350 V, 45 Hz to 440 Hz**
Commercial, Military and Avionics applications
- **Programmable Crest & Power Factor**
Test AC power products for real-world conditions
- **Built-in Measurements**
Eliminates the need for additional test equipment in bench or ATE applications
- **Remote Control**
IEEE-488 and RS232C Interface for automated test applications



30 ARMS

AC Loads

The 3091LD is designed to provide precisely controlled, non-linear loads for testing AC power generation equipment such as UPS's and AC sources. In addition, any active or passive current carrying devices such as switches, circuit breakers, fuses, connectors and power semiconductors can be tested. Traditionally, many of these products are tested using resistive load banks. This approach does not simulate real-world conditions such as switching DC/AC converters found in many AC powered products. This type of conventional testing does not fully exercise the equipment under test (EUT) under worst case operating conditions. High peak currents and low power factor loads can significantly impact the operating characteristics of a UPS or AC power product. The 3091LD AC Load can simulate high crest factor and variable power factor load conditions. This provides an effective method of testing AC products against real-world conditions and can significantly increase product reliability. Unless properly exercised, product defects may go undetected until a unit is used at a customer site, resulting in costly field returns.

Front Panel Control

The AC load can be operated from an easy to use, menu driven front panel. Product tests can be performed quickly in an R&D setting by punching up specific load conditions on the front panel and reading the measurement screen of the 3091LD. This fast interactive front panel control mode can be used during a product's early development cycle to isolate potential performance problems before the product leaves the engineering lab.

Automated Testing

The 3091LD can be deployed in ATE test stations using either IEEE-488 or RS232C remote control. The industry standard SCPI (Standard Commands for Programmable Instrumentation) protocol is used and instrument drivers are available to ease test software development. The built-in metering functions of the 3091LD AC load can be used to eliminate the need for additional test equipment such as meters, power analyzers and oscilloscopes.

This and the reduced size of the 3091LD compared to passive load banks, represents a savings in both cost and rack space.

Power Levels

Each 3091LD is capable of dissipating 3000 W of single phase AC power. For higher power or three phase applications, a 3091LD master unit can be combined with one or more auxiliary 3091 units. The master 3091LD unit provides the required consolidated measurements so the test system controller - or the operator - need only interface to the master unit, regardless of the specific configuration. Single, split or three phase configurations can be software configured from the master 3091LD when combined with 3091 slave units.

User Control

All AC load modes are easily set from the front panel using a menu-driven user interface. The large LCD screen is used to display setup information as well as measurement data. Measurements include volt RMS, volt peak, current RMS, current peak, crest factor, true power, apparent power, power factor and frequency. Both voltage and current waveforms at the load input terminals can be digitized and displayed on the front panel graphical LCD. This allows EUT output behavior to be

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analyzed quickly without the need to hook up additional test equipment. A Windows graphical user interface (GUI) is provided to expand the measurement and display capabilities of the 3091LD. The GUI can be used to save and print test results for report purposes.

Crest Factor and Power Factor control

When operating in constant current or constant power mode, the 3091LD supports crest factor control by narrowing the conduction angle of the current waveform in order to match the requested crest factor. Thus, the peak current is increased while retaining the RMS current level. While the apparent power remains constant, the true power decreases. This results in a reduced true power factor. Consequently, as crest factor is increased, the true power factor automatically decreases. The load further controls power factor by shifting the current with respect to the input voltage (displacement power factor). Both leading and lagging power factor control is available. A phase shift of the current is only possible if the crest factor is higher than 1.414. Thus, crest factor and power factor control ranges are coupled as shown in the graph to the right.

Front Panel

The large LCD screen is used to display setup information as well as measurement data.

The 3091LD can be used to emulate a wide variety of AC load conditions to support real-world testing and evaluation of UPS and AC source products. Specifically, the following modes can be selected:

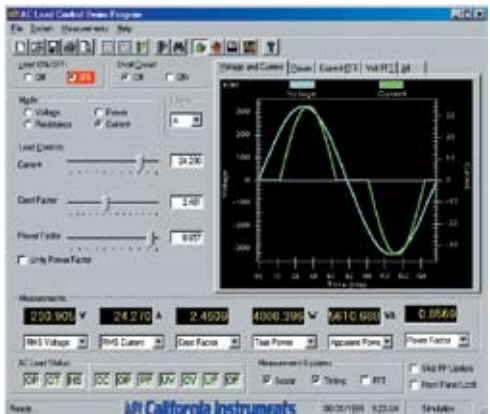
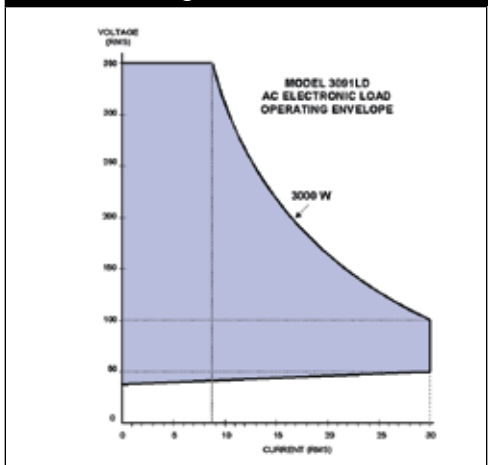
Mode	Description
Constant Power	CP This mode effectively emulates constant power loads such as switching power supplies
Constant Resistance	CR Emulates a conventional resistive load or power resistor. A programmable range from 2.5 Ohms to 1000 Ohms covers a wide range of applications. This mode can be used to replace conventional resistive load banks.
Constant Current	CC Provides a constant current load. This mode may be used to simulate both linear (resistive) and non-linear (active loads for voltage regulation testing.
Constant Voltage	CV This mode emulates a shunt regulator load and may be used to test current source products.
Short circuit	SC Test the short circuit protection mode of the EUT by providing a short condition. The 3001LD can handle surge currents of up to 300 Amps for up to 50 msec and sustained currents of 30 Amps in this mode of operation. The low voltage cut-off of the load can be programmed from 50 Volts up.

Measurements include volt RMS, volt peak, current RMS, current peak, crest factor, true power, apparent power, power factor and frequency. Both voltage and current waveforms at the load input terminals can be digitized and displayed on the front panel graphical LCD. This allows EUT output behavior to be analyzed quickly without the need to hook up additional test equipment. A Windows graphical user interface (GUI) is provided to expand the measurement and display capabilities of the 3091LD. The ICS can be used to save and print test results for report purposes.

Power & Crest Factor Control Range



Load Power Rating curve for 3091LD



3091LD : Specifications

3000–12000 VA

Ratings	
Power	3000 W @ 0-37° C; 2400 W @ 38-50° C
Current	30 ARMS
Voltage	50 to 350 VRMS
Frequency	45 to 440 Hz
Max. Peak Power	13 kW (up to 20% duty cycle)
Max. Peak/Surge Current	90 APEAK Surge: 300 APEAK for 50 ms
Max. Peak Voltage	500 VPEAK
Operating Modes	
Constant Current	Range: 0 to 30 ARMS; Accuracy: 0.2 % of full scale; Resolution: 0.05 % of full scale; Min. Set Current: Voltage / Maximum Set Resistance
Constant Voltage	Range: 50 to 350 VRMS; Accuracy: 0.2 % of full scale; Resolution: 0.05 % of full scale
Constant Resistance	Range: 2.5 to 100 Ohms, 100 to 1000 Ohms; Accuracy: 1% FS, 5% FS; Resolution: 0.05 % FS; Max. Set Resistance: 1 / (Freq.*1.3e-5)
Constant Power	Range: 3000 W @ 0-37° C, 2400 W @ 38-50° C; Accuracy: 0.5% of full scale; Resolution: 0.1% of full scale
Crest Factor	Range: 1.4142 to 4.0, limited to 90 Apeak; Accuracy: 1 % of full scale; Resolution: 0.1 % of full scale
Power Factor	Range: 0 to 1 lead or lag limited by Crest factor settings; Accuracy: 1 % of full scale; Resolution: 0.1 % of full scale
Shourt Circuit Mode	Max. Surge current: 300 APEAK, up to 50 msec; Max. Cont. current: 30 ARMS; Max. Voltage drop: 2.5 VRMS
Measurements	
Frequency	Range: 45 to 440 Hz; Accuracy: 0.1% FS; Resolution: 0.05% FS
Voltage	Range: 50 to 350 VRMS; Accuracy: 0.1% FS; Resolution: 0.05% FS
Peak Voltage	Range: 50 to 500 V; Accuracy: 0.5% FS; Resolution: 0.1% FS
Current	Range: 0 to 30 ARMS; Accuracy: 0.2% FS; Resolution: 0.1% FS
Peak Current	Range: 0 to 90A; Accuracy: 0.5% FS; Resolution: 0.1% FS
Crest Factor	Range: 1,4142 to 4.0; Accuracy: 0.5% FS; Resolution: 0.1% FS
Apparent Power	Range: 0 to 3000 VA; Accuracy: 0.5% FS; Resolution: 0.1% FS
True Power	Range: 0 to 3000 W; Accuracy: 0.5% FS; Resolution: 0.1% FS
Peak Power	Range: 0 to 45,000 W; Accuracy: 1% FS; Resolution: 0.1% FS
Reactive Power	Range: 0 to 3000 VA; Accuracy: 0.5% FS; Resolution: 0.1% FS
Power Factor	Range: 0 to 1; Accuracy: 0.5% FS; Resolution: 0.1% FS
Resistance	Range: 2.5 to 100 Ohms, 100 to 1000 Ohms; Accuracy: 1% FS, 5% FS; Resolution: 0.05% FS
Protection	
Over Current	Limited by input - Circuit Breaker and Set Maximum Current Limit in software.
Over Voltage	Output protected for voltage transients over 500 V in hardware.
Over Power	Power limited at maximum average and peak rated power in hardware. Limited to Set Maximum Power Limit in software.
Over Temperature	Monitors heat sink temperature.
Mechanical Specifications	
Dimensions	H: 8.75" (222 mm), W: 16.88" (429 mm), D: 25" (635 mm)
Weight	74 lbs / 34 Kg.
Remote Sensing	Max. 2V drop between sense and load lines
Isolation	1000 V between input and chassis ground
Audible Noise (@1meter)	Audible Noise (@ 1meter): Low power: 49.0 dBA; Full power: 69.5 dBA
Control Power Input	115 Vac or 230 Vac (model -230) ± 10%, 47 to 63Hz
Operating Temperature	3000 W @ 0-37° C, 2400 W @ 39-50° C
Interfaces	
GPIB	Standard

Note: Specifications are subject to change without notice. Specifications are warranted over an ambient temperature range of 25± 5° C. Unless otherwise noted, specifications are per phase for a sinewave with a resistive load and apply after a 30 minute warm-up period. For three phase configurations, all specifications are for L-N. Phase angle specifications are valid under balanced load conditions only.

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3091LD

Ordering Examples:

1 x 3091LD-RMS
2 x 3091-RMS

Three unit, 9000 Watt system with rack slides.
3091LD-RMS-230

Remote Control

IEEE-488.2 GPIB talker, listener
Subset: AH1, CO, DC1, DT1, L3,
PPO, RL2, SH1, SR1, T6

Language: SCPI
RS232C

Baud rates: 9600, 19200, 38400

Handshake: RTS/CTS

Format: 8,n,1

Language: SCPI

Options:

-230 AC Line input 230 V L-N. Must be specified at the time of original order.

-BTM Bench Top Model. No handles and rack mount ears. Must be specified at the time of original order.

-MSK Master/Auxiliary Cable Kit Required to use 3091LD as auxiliary unit.

-RMS Rack Mount Slides

C1-CS Cabinet. Add prefix "C" to model number to order a rack mounted system.

Note: For rack mounting, option -RMS is recommended.

Single table top unit rated for 230 V L-N input.

Supplied with:

- Instruction / Programming Manual
- Windows™ Graphical User Interface
- Load Input Connector
- RS232C Serial Cable

AC and DC Sources

Expand your AC test systems with line input immunity testing of voltage sags, surges, swells and drop-outs using the California Instruments iX Series of programmable AC and DC power sources. The iX Series is an ideal companion product to the LD Series AC loads, providing 3000 VA to 30 kVA of AC power.

Features include arbitrary waveforms, transient generation and extensive measurements.

Configurations

Higher power AC loads or multi phase AC loads can be created by combining one 3091LD master with one or more 3091 auxiliary units in a rack system. Contact factory for system configuration information.

Standard controller versions with single voltage range

Model	Output	Input Voltage
3091LD	3000 W AC Load	115V
3091	3000 W AC Load Auxiliary	115V

