California Instruments BPS Series

Overview

- **High Power AC Source**
  Programmable AC power for frequency conversion and product test applications
- **Expandable Power Levels**
  Available output power of 30, 45, 75 and 90 kVA per unit and multi-unit configurations for power requirements up to 180 kVA and above
- **Remote Control**
  Standard RS232, USB and IEEE-488 (GPIB) and optional LAN interfaces are available for automated test applications.

Introduction
The BPS Series consists of multiple high power AC power systems that provide controlled AC output for ATE and product test applications.

This high power AC test system covers a wide spectrum of AC power applications at an affordable cost. Using state-of-the-art PWM switching techniques, the BPS Series combines compactness, robustness and functionality in a compact floor-standing chassis, no larger than a typical office copying machine. This higher power density has been accomplished without the need to resort to elaborate cooling schemes or additional installation wiring. Simply roll the unit to its designated location (using included casters), plug it in, and the BPS Series is ready to work for you.

Simple Operation
The BPS Series can be operated completely from its menu driven front panel controller. A backlit LCD display shows menus, setup data, and read-back measurements. IEEE-488, RS232C, USB and LAN remote control interfaces and instrument drivers for popular ATE programming environments are available. This allows the BPS Series to be easily integrated into an automated test system.

Configurations
The BPS is capable of delivering 30, 45, 75, 90, 150 or 180kVA of AC power. The 30 and 45kVA models come as dedicated single or three phase output while the 75, 90, 150 and 180kVA models are dedicated three phase.

For higher power requirements, simply parallel the BPS in multi-cabinet configuration. Multi cabinet systems always operate in three phase output mode commonly found in power systems.

Product Evaluation and Test
Increasingly, manufacturers of high power equipment and appliances are required to fully evaluate and test their products over a wide range of input line conditions. The built-in output transient generation and read-back measurement capability of the BPS Series offers the convenience of a powerful, and easy to use, integrated test system.

Avionics
With an output frequency range to 819 Hz, the BPS Series is well suited for aerospace applications. Precise frequency control and accurate load regulation are key requirements in these applications. The available remote control interfaces and SCPI command language provide for easy integration into existing ATE systems. The BPS Series eliminates the need for several additional pieces of test equipment, saving cost and space. Instrument drivers for popular programming environments such as National Instruments LabView™ are available to speed up system integration.

Choice of voltage ranges
Standard voltage ranges are 150V L-N (259V L-L) and 300V (519V L-L) and are direct coupled output.

For applications requiring more than 300V L-N (or 519V L-L), the optional -HV output transformer provides a third additional 400V L-N and 693 V L-L output range which is internal to the AC chassis. No external magnetics modules are required.

Multi-Box Configurations
For high power applications, two BPS75 or BS90 chassis can be combined to provide 150kVA or 180kVA of output power. For higher power requirement please contact sales for custom configurations.

30–180 kVA

150–400 V

0–400 A / Phase

≋	208	230	400
	480		

ETHERNET USB GPIB RS232

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AMETEK® PROGRAMMABLE POWER

Simple transition from R&D to Manufacturing.
The California Instruments Mx and RS Series are high performance, feature rich Research and Development solutions. That level of advanced performance is not always required in production and lab environments. Since the BPS shares common code structure and performance characteristics as the Mx and RS the BPS is ideally suited to easily transition into cost effective production solutions.

High Crest Factor
With a crest factor of up to 4.5, the BPS Series AC source can drive difficult nonlinear loads with ease. Since many modern products use switching power supplies, they have a tendency to pull high repetitive peak currents.

Remote Control
Standard RS232, USB and IEEE 488 (GPIB) along with optional LAN remote control interfaces allow programming of all instrument functions from an external computer. The popular SCPI command protocol is used for programming.

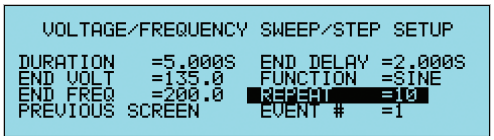
Application Software
Windows® application software is included. This software provides easy access to the power source's capabilities without the need to develop any custom code. The following functions are available through this GUI program:

- Steady state output control (all parameters)
- Create, run, save, reload and print transient programs
- Measure and log standard measurements
- Capture and display output voltage and current waveforms.
- Measure standard power measurements..
- Display IEEE-488, RS232C, USB and LAN bus traffic to and from the AC Source to help you develop your own test programs.

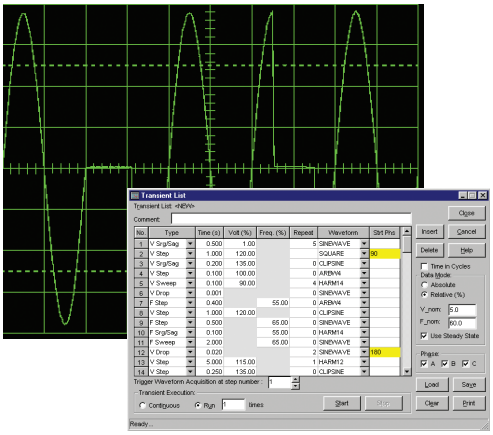
BPS Series - AC Transient Generation
The BPS Series controller has a powerful AC transient generation system that allows complex sequences of voltage and frequency to be generated. This further enhances the BPS's capability to simulate AC line conditions and disturbances. Transient generation is controlled independently yet time synchronized on all three phases. Accurate phase angle control and synchronized transient list execution provide unparalleled accuracy in positioning AC output events.

Transient programming is easily accomplished from the front panel where clearly laid out menu's guide the user through the transient definition process.

The front panel provides a convenient listing of the programmed transient sequence and allows for transient execution Start, Stop, Abort and Resume operations. User defined transient sequences can be saved to non-volatile memory for instant recall and execution at a later time. The included Graphical User Interface program supports transient definitions using a spreadsheet-like data entry grid. A library of frequently used transient programs can be created and saved using this GUI program.



Transient List Data Entry from the front panel.



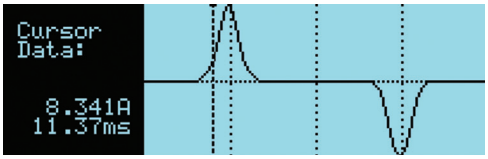
Transient List Data Entry in GUI program.

BPS Series - Measurement and Analysis
The BPS Series is much more than a programmable AC power source. It also incorporates an advanced digital signal processor based data acquisition system that continuously monitors all AC source and load parameters. This data acquisition system forms the basis for all measurement and analysis functions. These functions are accessible from the front panel and the remote control interface for the BPS Series.

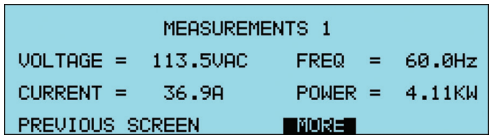
Conventional Measurements
Common AC measurement parameters are automatically provided by the data acquisition system. These values are displayed in numeric form on the front panel LCD display. The following measurements are available: Frequency, Vrms, Irms, Ipk, Crest Factor, Real Power (Watts), Apparent Power (VA) and Power Factor.

Waveform Acquisition
The measurement system is based on real-time digitization of the voltage and current waveforms using a 4K deep sample buffer. This time domain information provides detailed information on both voltage and current waveshapes. Waveform acquisitions can be triggered at a specific phase angle or from a transient program to allow precise positioning of the captured waveform with respect to the AC source output.

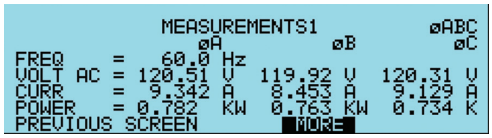
The front panel LCD displays captured waveforms with cursor readouts. The included GUI program also allows acquired waveform data to be displayed, printed, and saved to disk.



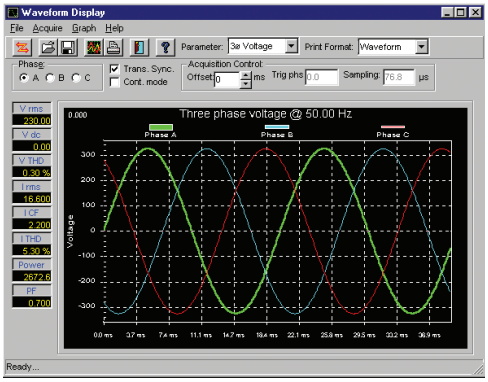
Acquired Current waveform (BPS Display).



Measurement data for single phase (BPS Display).



Measurement data for all three phases (BPS Display).



Acquired three phase voltage waveforms display on PC.

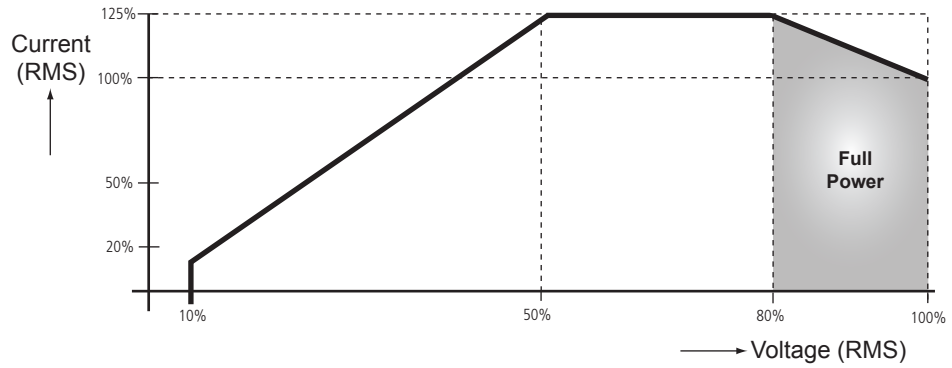
BPS Series : Specifications

Operating Modes	
BPS Series	AC
AC Mode Output	
Frequency	Range: 16.00-819.0 Hz, -LF Option: 16.00-500.0 Hz, Resolution: 0.01 Hz: 16.00 - 81.91 Hz, 0.1 Hz: 82.0 Hz - 819.1 Hz
Phase Outputs	1 or 3 Neutral: Floating, Coupling: DC (except for -HV option) Please specify Single (-1) or Three Phase (-3) for BPS30 and BPS45 at time of order.
Total Power	BPS30-1/3; 30kVA, BPS45-1/3: 45kVA, BPS75-3: 75kVA, BPS90-3: 90kVA, BPS150-3:150kVA, BPS180-3, 180kVA
Load Power Factor	0 to unity at full output current
AC Mode Voltage	
Voltage Ranges	Range: AC; V Low: 0-150 V; V High: 0-300 V Load Regulation: < 0.25 % FS to 100 Hz, < 0.5 % FS 100 Hz to 819 Hz Line Regulation: < 0.1% FS for 10 % line change
External Sense	Voltage drop compensation (5% Full Scale)
Harmonic Distortion (Linear)	Less than 0.5% from 16 - 66 Hz, Less than 1% from 66 - 500 Hz, Less than 1.25% above 500 Hz
DC Offset	< 20 mV
Load Regulation	0.25% FS @ - 100 Hz, 0.5% FS > 100 Hz
External Amplitude Modulation	Depth: 0 - 10 %, Frequency: DC - 2 KHz
Voltage slew rate	200 µs for 10% to 90% of full scale change into resistive load, 0.5V / µSec
AC Mode Current	
Output	See table below
Peak Repetitive AC Current	4.5 x RMS current for BPS30, 3.0 x RMS current for BPS45, 3.6 x RMS current for BPS75 and 3.0 x RMS current for BPS90. BPS150 is 2x BPS75 and BPS180 is 2x BPS90
Programming Accuracy	Voltage (rms): ± 0.3 Vrms, Frequency: ± 0.01 % of programmed value, Current Limit: - 0 % to + 5 % of programmed value + 1A, Phase: < 0.5° + 0.2°/ 100 Hz with balanced load
Programming Resolution	Voltage (rms): 100 mV, Frequency: 0.01 Hz from 16 - 81.91 Hz, 0.1 Hz from 82.0 - 819 Hz, Current Limit: 0.1 A, 3 phase mode, 1.0 A, 1 phase mode, Phase: 0.1°

Model	BPS30-1/3	BPS45-1/3	BPS75	BPS90	BPS150	BPS180
	30 KVA	45 KVA	75 KVA	90 KVA	150 KVA	180 kVA
	BPS30-1 V Lo:200 A V Hi: 100A Single phase BPS30-3 V Lo: 66.7A V Hi: 33.3A per phase 3 phase	BPS45-1 V Lo:300 A V Hi: 150A Single phase BPS45-3 V Lo: 100 V Hi: 50A per phase 3 phase	BPS75 V Lo: 166A V Hi: 83A per phase	BPS90 V Lo:200A V Hi: 100A per phase	BPS150 V Lo:332A V Hi: 166A per phase	BPS180 V Lo:400A V Hi: 200A per phase

Note: Constant power mode provides increased current at reduced voltage. See chart below

Constant Power AC Mode - Available Max. AC Current



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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Measurement

Measurements - Standard (AC Measurements)

Parameter	Frequency	RMS Voltage	RMS Current	Peak Current	Crest Factor	Real Power	Apparent Power	Power Factor	Phase
Range	16-100 Hz 100-820 Hz	0-400 V	0-300 A	0-800 A	0.00-6.00	90 kW	90 kW	0.00-1.00	0.0-360.0
Accuracy* (±)	0.01% + 0.01 Hz	0.05 V + 0.02% 0.1 V + 0.02%	0.15 A + .02% 0.3 A + .02%	0.15 A + 0.02% 0.3 A + .02%	0.05 0.05	30 W + 0.1% 60 W + 0.1%	30 VA + 0.1% 60 VA + 0.1%	0.01 0.02	2.0° 3.0°
Resolution*	0.01 Hz / 0.1 Hz	10 mV	10 mA	10 mA	0.01	10 W	10 VA	0.01	0.1°

* Measurement system bandwidth = DC to 6.7 kHz. Accuracy specifications are valid above 100 counts. Current and Power Accuracy and Range specifications are times three for BPS 150 and BPS180 in single phase mode. PF accuracy applies for PF > 0.5 and VA > 50 % of range

Protection

Over Load	Constant Current or Constant Voltage mode
Over Temperature	Automatic shutdown

Storage

Non Volatile Mem. storage	16 instrument setups,

Waveforms

Waveform Types	Std: Sine Wave

System Interface

Inputs	Remote shutdown
Outputs	Function Strobe / Trigger out

Remote Control

IEEE-488 Interface	IEEE-488 (GPIB) talker listener. Subset: AH1, C0, DC1, DT1, L3, PP0, RL2, SH1, SR1, T6, IEEE-488.2 SCPI Syntax
RS232C Interface	9 pin D-shell connector (Supplied with RS232C cable)
LAN (option)	Ethernet Interface: 10BaseT, 100BaseT, RJ45
USB	Version: USB 1.1; Speed: 460 Kb/s maximum
Output Relay	Push button controlled or bus controlled output relay

AC Input

Voltage	Must be specified at time of order. All inputs are L-L, 3ø, 3 wire + Gnd. 208 ± 10% VAC, 230 ± 10% VAC, 400 ± 10% VAC, 480 ± 10% VAC

Input Line Current (per phase)

BPS30-1/3	BPS45-1/3	BPS75	BPS90	BPS150	BPS180
116 ARMS @ 187 VLL 105 ARMS @ 207 VLL 60 ARMS @ 360 VLL 50 ARMS @ 432 VLL	175 ARMS @ 187 VLL 157 ARMS @ 207 VLL 90 ARMS @ 360 VLL 75 ARMS @ 432 VLL	285 ARMS @187 VLL 256 ARMS @ 207 VLL 147 ARMS @ 360 VLL 122 ARMS @ 432 VLL	350 ARMS @ 187 VLL 314 ARMS @ 207 VLL 180 ARMS @ 360 VLL 150 ARMS @ 432 VLL	Each BPS75 chassis requires its own AC service. Total Line currents are 2 x BPS75	Each BPS90 chassis requires its own AC service. Total Line currents are 2 x BPS90

Line Frequency	47 - 63 Hz
Efficiency	85 % typical
Power Factor	0.95 typical

AC Service

Inputs/Outputs	Rear panel connection
Regulatory	IEC61010, EN50081-2, EN50082-2, CE EMC and Safety Mark requirements
EMI	CISPR 11, Group1 , Class A
Connectors	All remote interface connections available from the rear panel.

Physical Dimensions

BPS30/45 Dimensions	Height: 50" 1270 mm, Width: 28.75" 731mm, Depth: 34.5" 876mm
BPS30/45 Weight	Per Chassis: Net: 1150 lbs / 522 Kg approximately, Shipping: 1231 lbs / 560 Kg approximately
BPS75/90 Dimensions	Height: 76" 1930 mm, Width: 32.0" 812mm, Depth: 40.0" 1016mm
BPS75/90 Weight	Per Chassis: Net: 1650 lbs / 748 Kg approximately, Shipping: 1731 lbs / 785 Kg approximately
Chassis	Casters and forklift openings.
Vibration and Shock	Designed to meet NSTA project 1A transportation levels. Units are shipped in wooden crate with forklift slots
Air Intake/Exhaust	Forced air cooling, front air intake, rear exhaust
Operating Humidity	0 to 95 % RAH, non condensing
Temperature	Operating: 0 to 40° C (30° C max in CP mode), Storage: -20 to +85° C

Supplied with
Standard: User/Programming Manual and Software on CD ROM. RS232C serial cable.

Input Voltage Settings
Specify input voltage (L-L) setting for each BPS system at time of order:

208 Configured for 208 V ±10 % L-L, 4 wire input.
230 Configured for 230 V ±10 % L-L, 4 wire input.
400 Configured for 400 V ±10 % L-L, 4 wire input.
480 Configured for 480 V ±10 % L-L, 4 wire input

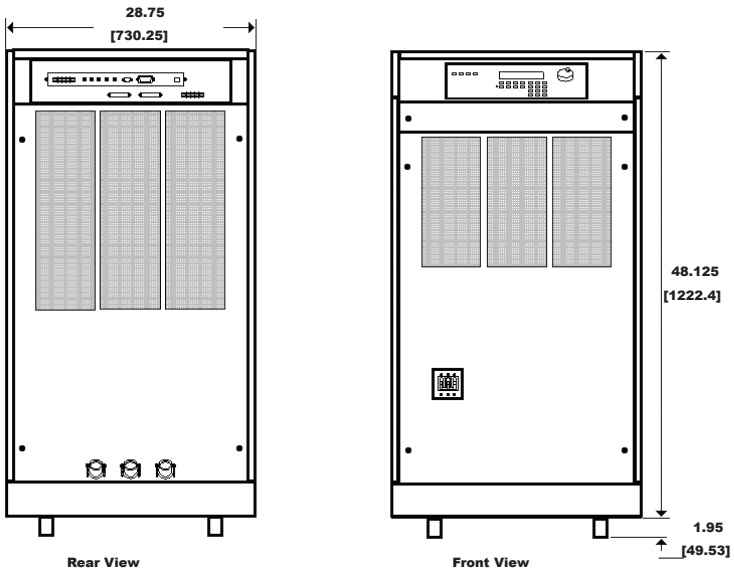
Standard Model Options

- LF Limits maximum frequency to 500 Hz.
-LAN Ethernet Interface.
-HV Adds 400 V L-N AC-only output range.

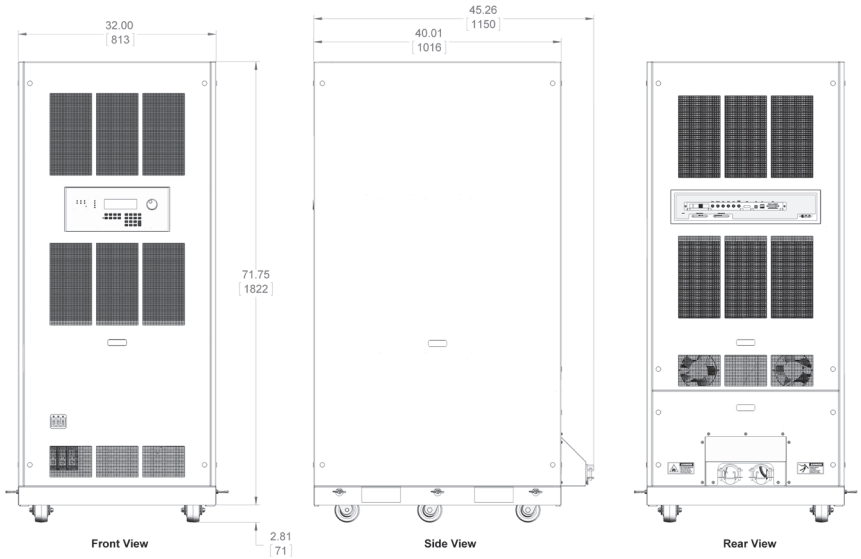
Packaging and Shipment

All BPS systems are packaged in re-usable protective wooden crates for shipment.

BPS30/45 Dimensions - single chassis



BPS75/90 Dimensions - single chassis



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