# California Instruments BPS Series

## 30–180 kVA

## 150-400 V

## 0-400A/ Phase

| | | | |
|---|---|---|---|
| ≈ | 208 | 230 | 380 |
| | 400 | 480 | 600 |

ETHERNET USB GPIB RS232

## Overview

- **High Power AC Power 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 of 150 and 180 kVA
- **Remote Control**
  Standard IEEE-488 (GPIB), RS232C & USB along with 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 BPS 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 optional 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 series can deliver 30, 45, 75, 150 or 180 kVA of AC power. The BPS30 and BPS45 models come as dedicated single or three phase output, while the BPS75, BPS90, BPS150, and BPS180 are dedicated three phase outputs.

**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.

Output voltage options, such as the -333 option, allow testing of high voltage 480VAC L-L products at 120% of nominal as required by IEEE 1547 (Table 1) “Interconnection system response to abnormal voltages”.

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.

**AMETEK**
**Programmable Power**
9250 Brown Deer Road
San Diego, CA 92121-2267 USA

AMETEK®
PROGRAMMABLE POWER

**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 IEEE-488 remote control interface 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.

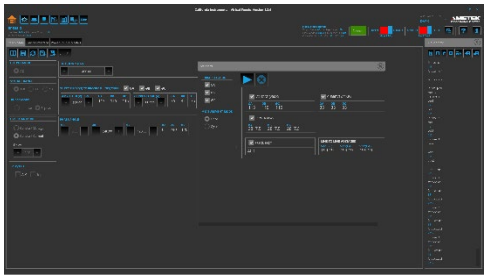
**Choice of Voltage Ranges**
The BPS Series includes 0 - 150V & 0 - 300V or optionally, 0 - 166V & 0 - 333V line to neutral. These models provide a maximum 3 phase output capability of 260 Vac & 520 Vac or 287 & 576V line to line respectively.
For applications requiring more than 333 V L-N (or 576 V L-L), the optional -HV output transformer provides an additional 0 - 400 V L-N and 0 - 693 V L-L output range for use in AC mode only. For custom applications the XV option is available and is user defined and offers up to 600VL-N (1,038VL-L)

**High Crest Factor**
With support for high crest factor loads, the BPS Series AC source can drive difficult nonlinear loads with ease. Since many modern products use switching power supplies, they tend to pull high repetitive peak currents. The BPS30 with a crest factor rating of 4.5 for example, can deliver up to 300 Amps of repetitive peak current (150 V AC range) per phase to handle three phase loads. Refer to the specifications for peak repetitive currents for each model.

**Remote Control**
Standard RS232C, 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:
  * Requires PC running Windows™ 7, 8.x, or 10
- Steady state output control (all parameters)
- Create, run, save, reload, and print transient programs
- Measure and log standard measurements
- Display IEEE-488, RS232C, USB, and LAN bus traffic to and from the AC Source to help you develop your own test programs.



Virtual Panels GUI Software

**Simple transition from R&D toManufacturing.**
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 productionand lab environments. Since the BPS shares a common code structure and performance characteristics with the MX and RS series, the BPS is ideally suited to easily transition into cost effective production solutions.

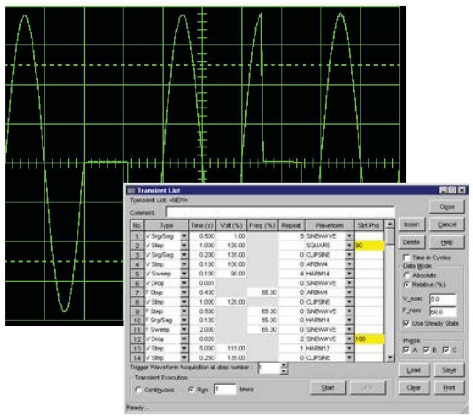
**BPS Series - AC Transient Generation**

The BPS Series controller has a powerful AC transient generation system that allows complex sequences of voltage, frequency and waveshapes 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 later. 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 on disk 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.

**Model**

Refer to table shown for model numbers and configurations

**Supplied with**

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. |
| 380 | Configured for 380V ± 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 |
| 600 | Configured for 600 V ±10 % L-L, 4 wire input |

**Standard Model Options**

| | |
|---|---|
| -333 | Configured for 166VAC and 333V AC L-N output ranges |
| -ES | Emergency Shut Off with Key Release |
| -LF | Limits maximum frequency to 500 Hz.. |
| -FC | Modifies output frequency control to ± 0.25% |
| -LAN | Ethernet Interface. |
| -HV | Adds 400 V L-N AC-only output range. |
| -HVC | Adds 0-400VAC L-N AC only output range with constant power mode. |
| -XV | Adds other AC-only output range. Consult factory for details. |
| -XVC | Adds other AC only output range with constant power mode. Consult Factory for details |

**Packaging and Shipment**

All BPS systems are packaged in reusable protective wooden crates for shipment.

# BPS Series Specifications

# 30-180 kVA

| AC Input | | | | | | | |
|---|---|---|---|---|---|---|---|
| Input Voltage | | Must be specified at time of order. All inputs are L-L, 3ø, 3 wire + Gnd.<br>208 ± 10% VAC, 230 ± 10% VAC, 380V ± 10% VAC, 400 ± 10% VAC, 480 ± 10% VAC, 480 ± 10% VAC. 600V ± 10% VAC | | | | | |
| | | **BPS30** | **BPS45** | **BPS75** | **BPS90** | **BPS150 *** | **BPS180 *** |
| Input Line Current (per phase) Steady State at full power load and Low line input | 208 | 116 ARMS @ 187VLL | 175 ARMS # 187 VLL | 285 ARMS @ 187 VLL | 350 ARMS @ 187 VLL | 570 ARMS @ 187 VLL | 700 ARMS @ 187 VLL |
| | 230 | 105 ARMS @ 207 VLL | 157 ARMS @ 207 VLL | 256 ARMS @ 207 VLL | 314 ARMS @ 207 VLL | 512 ARMS @ 207 VLL | 624 ARMS @ 207 VLL |
| | 380 | 62 ARMS @ 342 VLL | 95 ARMS @ 342 VLL | 154 ARMS @ 342 VLL | 177 ARMS @ 342 VLL | 292 ARMS @ 342 VLL | 354 ARMS @ 342 VLL |
| | 400 | 60 ARMS @ 360 VLL | 90 ARMS @ 360 VLL | 147 ARMS @ 360 VLL | 180 ARMS @ 360 VLL | 294 ARMS @ 360 VLL | 360 ARMS @ 360 VLL |
| | 480 | 50 ARMS @ 432 VLL | 75 ARMS @ 432 VLL | 122 ARMS @ 432 VLL | 150 ARMS @ 432 VLL | 244 ARMS @ 432 VLL | 300 ARMS @ 432 VLL |
| | 600 | 40 ARMS @ 540 VLL | 60 ARMS @ 540 VLL | 99 ARMS @ 540 VLL | 112 ARMS @ 540 VLL | 199 ARMS @ 540 VLL | 224 ARMS @ 540 VLL |
| | | NOTE: BPS150 and BPS180 are comprised of two chassis, (BPS150 is 2 x BPS75, BPS180 is 2 x BPS90) each require a separate AC Line service | | | | | |
| Distortion | | < 8% at full power, <20% below 35% of power | | | | | |
| Line Frequency | | 47 - 63 Hz. | | | | | |
| Efficiency | | 85 % typical | | | | | |
| Power Factor | | 0.95 typical | | | | | |

| AC Service | |
|---|---|
| Inputs/Outputs | BPS30/45: Front and side access, cables routed through rear panel, exit in back. BPS75/90/150/180 Rear Access |
| Regulatory | IEC/EN 61010-1 |
| EMI | CISPR 11 / EN 55011, Class A, , EN 61326-1, CE EMC (400 V Input models only -400 Option) |
| Connectors | AC Input & Output terminal block behind front cover. Rear Panel Connections: IEEE-488 (GPIB) connector Option, 9 pin Sub-D RS232C connector*, Remote voltage sense terminal block , System Interface Connector, DB-37, Ethernet connector Option. *RS232 DB9 to DB9 cable supplied |
| **Physical Dimensions / Environmental** | |
| BPS30/45 Dimensions | Height: 50.0" (1270 mm)<br>Width: 28.75" (731 mm)<br>Depth: 34.5" (876 mm) |
| BPS30/45 Weight | 1150 lbs. 522 Kg |
| BPS30/45 Shipping Weight | 1231 lbs 560 Kg, |
| BPS75/90 Dimensions | Height: 74.5" 1892.3 mm<br>Width: 30.3" 769.6 mm<br>Depth: 38.3" 972.8 mm |
| BPS75/90 Weight | 2150 lbs / 975 Kg approximately<br>2475 lbs / 1123 Kg approximately including –HV or –XV option |
| BPS75/90 Shipping Weight | 2450 lbs / 1111 Kg approximately<br>2775 lbs / 1258 Kg approximately including –HV or –XV option |
| Chassis | Individual cabinets: 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 % Relative Ambient Humidity, non-condensing |
| Temperature | Operating 0 to 40° C (30° max in CP mode), Storage: -20 to +85° C |

**Output Voltage Ranges**

| | | | Voltage Ranges | | |
|---|---|---|---|---|---|
| **Model** | **AC Output Power** | **Phase Outputs*** | **AC V Low/V high** | **-HV Opt** | **333 Opt AC V Low/V high** |
| BPS30 | 30kVA | 1 & 3 | 150/300 | 400 VAC | 166 / 333 |
| BPS45 | 45 kVA | 1 & 3 | 150/300 | 400 VAC | 166 / 333 |
| BPS75 | 75 kVA | 3 | 150/300 | 400 VAC | 166 / 333 |
| BPS90 | 90 kVA | 3 | 150/300 | 400 VAC | 166 / 333 |
| BPS150 | 150 kVA | 3 | 150/300 | 400 VAC | 166 / 333 |
| BPS180 | 180kVA | 3 | 150/300 | 400 VAC | 166 / 333 |

* Phase mode switching available on BPS30 and BPS45.

**-MB Option**

| **Model** | **AC Output Power** | **Phase Outputs** | **Controller** |
|---|---|---|---|
| BPS150-3-MB | 150 kVA | 3 | Dual BPS45 |
| BPS180-3-MB | 180 kVA | 3 | Dual BPS90 |

**Operating Modes**

All Models: Models AC only

**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 | BPS30/45: 1 or 3 phase selected at time of order, BPS75/90/150/180 3 phase; Neutral: Floating; Coupling: AC |
| Total Power | BPS30: 30 kVA, BPS45: 45 kVA, BPS75: 75kVA BPS90: 90 kVA, BPS150: 150 kVA, BPS180: 180kVA |
| Load Power Factor | 0 to unity at full output current |

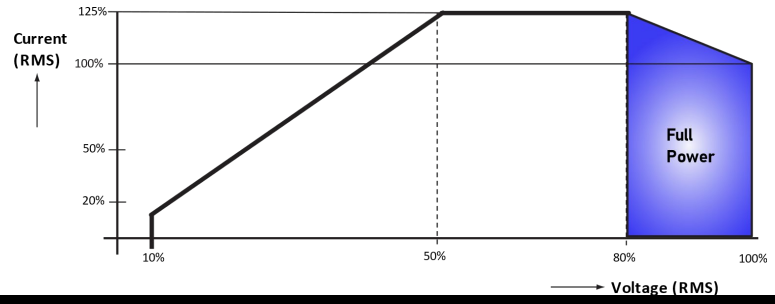
**AC Mode Voltage**

| Voltage Ranges (Std Unit has 150 and 300VAC, 333 Option has 166 and 333VAC) | Range | V Low | V High | | Regulation |
|---|---|---|---|---|---|
| | AC | 0-150 / 0-166V | 0-300 /0-333 V | | Load Regulation < 0.25 % FS DC to 100 Hz., < 0.5 % FS 100 Hz. to 819 Hz. |
| | | | | | Line Regulation < 0.1% FS for a 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 1.5% above 500 Hz. | | | | |
| DC Offset | < 20 mV | | | | |
| Load Regulation | 0.25% FS @ DC - 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 | | | | |

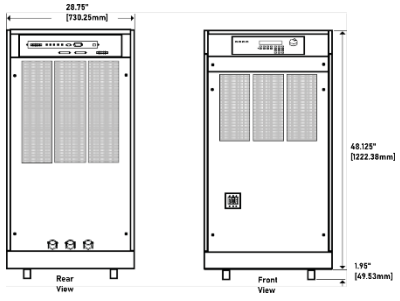
**AC Mode Current**

| Steady State AC Current @ FS V (Std Unit has 150 and 300VAC -333 Option has 166 and 333VAC) | Model / Option Low Range / High Range | | BPS30 3Ph / 1 Ph | BPS45 3 Ph / 1 Ph | BPS75 3 Ph | BPS90 3 Ph | BPS150 3 Ph | BPS180 3 Ph |
|---|---|---|---|---|---|---|---|---|
| | Standard | 150 | 66.6 A/ø / 200 A | 100 A/ø / 300 A | 166 A /ø | 200 A/ø | 332 A/ø | 400 A/ø |
| | | 300 | 33.3 A/ø / 100 A | 50 A/ø / 150 A | 83 A /ø | 100 A/ø | 166 A/ø | 200 A/ø |
| | -333 Option | 166 | 60 A/ ø /180.1 A | 90.1 A/ø / 270.3 | 150 A/ø | 180.2 A/ø | 300 A/ø | 360.3 A/ø |
| | | 333 | 30 A/ø / 90.1 A | 45 A/ø / 135 A | 75 A/ø | 90.1 A/ø | 150 A/ø | 180.2 A/ø |
| | Note: Constant power mode provides increased current at reduced voltage. See chart below | | | | | | | |
| Peak Repetitive AC Current | BPS30 up to 4.5 / BPS75 and BPS150 up to 3.6. / BPS45, BPS90, and BPS180 up to 3.0. (x rms current at full scale voltage) | | | | | | | |
| 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°/100Hz. 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: 0.1A, 3 phase mode, 1.0A, 1 phase mode, Phase: 0.1° | | | | | | | |
| Current Limit | Programmable from 0 A to max. current for selected range | | | | | | | |

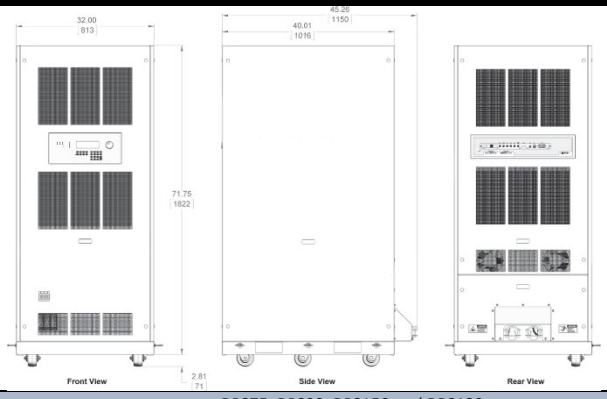
**Constant Power AC Mode - Available Max. AC Current**




**Chassis Dimensions**




BPS30 and BPS45




BPS75, BPS90, BPS150 and BPS180

| 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.<br>100-820 Hz. | 400 V | 0-160 A | 0-400 A | 0.00-6.00 | 0-15 kW | 0-15 kVA | 0.00-1.00 | 0.0-360.0 |
| | **Accuracy* (±)** | 0.01% + 0.01 Hz. | 0.05 V + 0.02%<br>0.1V + 0.02% | 0.15 A + 0.02%<br>0.3 A + 0.02% | 0.15 A + 0.02%<br>0.3 A + 0.02% | 0.05<br>0.05 | 30 W + 0.1%<br>60W + 0.1% | 30 VA + 0.1%<br>60VA + 0.1% | 0.01<br>0.02 | 2.0°<br>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 BPS75, BPS90, BPS150, BPS180 or BPS30/45 in single phase mode. PF accuracy applies for PF > 0.5 and VA > 50 % of range | | | | | | | | | |

| | **Parameter** | **Frequency Fundamental Harmonics** | **Phase** | **Voltage** | **Current** |
|---|---|---|---|---|---|
| Measurements - Harmonics | **Range** | 16.00-1000.0 Hz. / 32.00 Hz. - 16 kHz. | 0.0 - 360.0° | Fundamental Harmonics 2-50 | Fundamental Harmonics 2-50 |
| | **Accuracy* (±)** | 0.03% + 0.03 Hz. / 0.01 Hz. | 2° typ. | 750 mV 0.3% + 750 mV+0.3% /1 kHz. | 0.5 A / 0.3% + 150 mA +0.3% /1 kHz. |
| | **Resolution** | 0.01 Hz. | 0.5° | 10 mV / 10 mV | 100 mA / 100 mA |
| | * Accuracy specifications are valid above 100 counts. Accuracy specifications are for three phase mode.<br>Harmonics frequency range for BPS30/45 in single phase mode is 32Hz.- 48kHz. | | | | |

| | |
|---|---|
| **Protection** | |
| Overload | Constant Current or Constant Voltage mode |
| Over Temperature | Automatic shutdown |
| **Storage** | |
| Non-Volatile Mem. Storage | 16 instrument setups. |
| **Waveforms** | |
| Waveform Types | Sine |
| **System Interface** | |
| Inputs | Remote shutdown, External Sync, Clock/Lock |
| Outputs | Function Strobe / Trigger out, Clock/Lock |
| **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 Sub-D connector (Supplied with RS232C cable) |
| LAN (-LAN Opt. ) | 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 |

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.

© 2023 AMETEK Programmable Power All rights reserved. AMETEK Programmable Power is the trademark of AMETEK Inc., registered in the U.S. and other countries. Elgar, Sorensen, and California Instruments, are trademarks of AMETEK Inc., registered in the U.S.