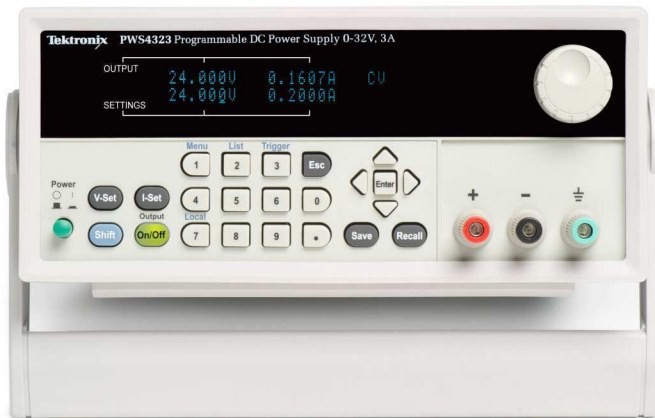# Programmable DC Power Supplies

## Tektronix PWS4000 Series Data Sheet



## Features & Benefits

**Key Performance Specifications**

- Linear Regulation
- Up to 72 V Output Voltage
- 0.03% Basic Voltage Accuracy
- 0.05% Basic Current Accuracy
- Less than 5 mV$_{p-p}$ Ripple and Noise

**Available Functions and Features**

- Output Voltage, Current, and Limits Displayed Simultaneously on a Bright Display
- Up to 40 User-defined Setup Memories
- Direct Parameter Entry using Numeric Keypad
- Adjustable Overvoltage Protection
- List Mode for Stepping through Stored Test Sequences
- Remote Sense to Compensate for Lead Resistance

**Connectivity**

- Rear Outputs and Trigger/Status Lines
- USB Device Port on Rear Panel for Quick PC Connectivity and Remote Programming
- Includes National Instrument's LabVIEW SignalExpress™ Tektronix Edition Software for Connecting Your Bench

**3-year Warranty**

**Tektronix**®

## Choose Your Voltage and Current – Quickly, Precisely

A wide current and voltage range, and flexible features, make the PWS4000 Power Supply Series a versatile addition to your bench. With 0.03% basic voltage accuracy and 0.05% basic current accuracy, you can be confident in the power supply's output value. Remote sense capability to eliminate the effect of voltage drop in your lead wires and noise of less than 5 mV$_{p-p}$ further ensures accurate power delivery. List mode and a USB port for remote programming accelerate complex test development. The PWS4000 Power Supply Series generates the power you need for your application – quickly and precisely.

## Total Control Over Your Output

All models of the PWS4000 Series include an overvoltage protection circuit that reduces the output voltage if it exceeds a user-specified threshold for any reason. The PWS4000 Series also allows you to prevent the voltage from being accidentally adjusted above a limit that you specify.

Setting an appropriate current limit can be critical for preventing damage to your device under test. With the PWS4000 numeric keypad, you can quickly and precisely specify a current limit before you start your test. The current limit is always visible on the display to keep you aware of this important setting. A user-definable password allows you to lock the front panel to prevent unwanted adjustments during critical tests.

## Designed to Make Your Work Easier

The PWS4000 Power Supply Series is designed with the ease-of-use and familiar operation you expect from Tektronix.

### Intuitive Operation

A rotary knob, with user-selectable step size, makes it easy to check circuit response to changing voltage or current. The direct-entry numeric keypad simplifies setting precise voltage and current values.

### Bright Display

A bright vacuum fluorescent display provides excellent readability at a distance, at an angle, or under dim lighting conditions. Meter readings and limits are always visible. You don't need to push buttons just to see your limits.

## Setup Memories

To save time when repeating tests, you can save your instrument settings in one of the 40 internal memory locations by simply pressing the Save button. Each time you want to recall that setting, just push the Recall button and choose the desired setup.

## Accelerate Complex Test Development

The built-in List mode allows you to define a custom sequence of voltage and current steps for your test. You can define up to 7 lists, and each list can have up to 80 steps. Lists can be configured to step through the sequence based on external triggers or front-panel button presses. Alternatively, you can specify a duration for each step and the instrument will automatically step through the sequence. For even more flexibility, a USB device port on the back panel makes it easy to connect the power supply to your PC for remote programming.

## Connect Your Bench for Intelligent Debug

You can use your preferred programming environment to control the PWS4000 using a USBTMC-compliant device port, or you can get quick results with the special Tektronix Edition of National Instrument's LabVIEW SignalExpress™ software. The PWS4000 Power Supply Series includes the Tektronix Edition of SignalExpress for basic instrument control, data logging, and analysis. The optional Professional Edition offers over 200 built-in functions that provide additional signal processing, advanced analysis, sweeping, limit testing, and user-defined step capabilities.

SignalExpress supports the range of Tektronix bench instruments[1], enabling you to connect your entire test bench. You can then access the feature-rich tools packed into each instrument from one intuitive software interface. This allows you to automate complex measurements requiring multiple instruments, and easily capture and analyze your results, all from your PC. Only Tektronix offers a connected test bench of intelligent instruments to simplify and speed debug of your complex design.

## Performance You Can Count On

In addition to industry-leading service and support, the PWS4000 Power Supply Series comes backed with a three-year standard warranty.

[1] For a complete listing of Tektronix instruments supported by NI LabVIEW SignalExpress, visit www.tektronix.com/signalexpress.

## Characteristics

**Electrical**

| Specifications | PWS4205 | PWS4305 | PWS4323 | PWS4602 | PWS4721 |
|---|---|---|---|---|---|
| DC Output Rating | | | | | |
|    Voltage | 0 to 20 V | 0 to 30 V | 0 to 32 V | 0 to 60 V | 0 to 72 V |
|    Current | 0 to 5 A | 0 to 5 A | 0 to 3 A | 0 to 2.5 A | 0 to 1.2 A |
| Maximum Power | 100 W | 150 W | 96 W | 150 W | 86 W |
| Load Regulation | | | | | |
|    Voltage | <0.01% + 2 mV | | | | |
|    Current | <0.05% + 0.1 mA | <0.05% + 1.5 mA | <0.05% + 0.1 mA | <0.05% + 0.5 mA | <0.05% + 0.1 mA |
| Line Regulation | | | | | |
|    Voltage | <0.01 % + 1 mV | <0.01 % + 1 mV | <0.01 % + 1 mV | <0.01 % + 2 mV | <0.01 % + 1 mV |
|    Current | <0.05 % + 0.1 mA | <0.05 % + 0.1 mA | <0.05 % + 0.1 mA | <0.05 % + 0.05 mA | <0.05 % + 0.1 mA |
| Ripple and Noise (20 Hz to 7 MHz) | | | | | |
|    Voltage | <1 mV$_{RMS}$ <br> <3 mV$_{p-p}$ | <1 mV$_{RMS}$ <br> <4 mV$_{p-p}$ | <1 mV$_{RMS}$ <br> <4 mV$_{p-p}$ | <1 mV$_{RMS}$ <br> <5 mV$_{p-p}$ | <1 mV$_{RMS}$ <br> <3 mV$_{p-p}$ |
|    Current | <3 mA$_{RMS}$ | <4 mA$_{RMS}$ | <3 mA$_{RMS}$ | <3 mA$_{RMS}$ | <3 mA$_{RMS}$ |
| Setting Resolution | | | | | |
|    Voltage | 1 mV | 1 mV | 1 mV | 1 mV | 2 mV |
|    Current | 0.1 mA | | | | |
| Setting Accuracy (using remote sense, 25 °C ± 5 °C) | | | | | |
|    Voltage | ±0.03% + 3 mV | ±0.03% + 3 mV | ±0.03% + 3 mV | ±0.03% + 6 mV | ±0.03% + 6 mV |
|    Current | ±0.05% + 2 mA | ±0.05% + 2.5 mA | ±0.05% + 2 mA | ±0.05% + 1.5 mA | ±0.05% + 1 mA |
| Readback Resolution | | | | | |
|    Voltage | 1 mV | | | | |
|    Current | 0.1 mA | | | | |
| Readback Accuracy (25 °C ± 5 °C) | | | | | |
|    Voltage | ±0.02% + 3 mV | ±0.02% + 2.5 mV | ±0.02% + 3 mV | ±0.02% + 6 mV | ±0.02% + 5 mV |
|    Current | ±0.05% + 2 mA | ±0.05% + 2.5 mA | ±0.05% + 2 mA | ±0.05% + 1.5 mA | ±0.05% + 1 mA |
| Overvoltage Protection | | | | | |
|    Range (typical) | 1 V to 19 V | 1 V to 29 V | 1 V to 31 V | 1 V to 59 V | 1 V to 71 V |
|    Accuracy | ±0.5% + 0.5 V | | | | |
|    Response time (typical) | <10 ms | | | | |

**Display**

Vacuum fluorescent display.

**Memory**

40 setup memories.

**List Mode**

Up to 7 lists can be defined, each with up to 80 steps. Each step includes a voltage limit and a current limit. For continuous sequences each step also includes a duration.

**Rear-panel Connections**

| Characteristic | Description |
| --- | --- |
| Communications | USB Device Port, Type B connector, USBTMC compatible<br>GPIB, optional (requires TEK-USB-488 GPIB to USB adapter) |
| Output, Sense, Status, and Control | Removable screw terminal block carries the following signals: |
| Output channel | Duplicates the front-panel outputs |
| Remote sense lines | Connection for remote sense |
| Control input | Multifunction TTL input which can function as a trigger input, output control line, or digital input |
| Status output | Multifunction TTL output which can function as a fault indication, or digital output |

**Power Source**

| Characteristic | Description |
| --- | --- |
| 110 V AC Setting | 99 $V_{RMS}$ to 132 $V_{RMS}$ |
| 220 V AC Setting | 198 $V_{RMS}$ to 264 $V_{RMS}$ |
| Frequency | 47 Hz to 63 Hz |
| Power Consumption | |
| PWS4205/4323/4721 | 250 VA |
| PWS4305/4602 | 350 VA |

**Physical Characteristics**

| Dimension | mm | in. |
| --- | --- | --- |
| Height | 88 | 3.47 |
| Width | 214 | 8.45 |
| Depth | 355 | 13.9 |
| **Weight** | **kg** | **lb.** |
| PWS4205 | 9.0 | 19.8 |
| PWS4305 | 9.6 | 21.2 |
| PWS4323 | 9.0 | 19.8 |
| PWS4602 | 9.6 | 21.2 |
| PWS4721 | 9.0 | 19.8 |

**Environmental and Safety**

| Characteristic | Description |
| --- | --- |
| Temperature | |
| Operating | 0 °C to +40 °C |
| Storage | –20 °C to +70 °C |
| Relative Humidity (Noncondensing) | |
| Operating | 5% to 95% relative humidity at up to +40 °C |
| Storage | 5% to 95% relative humidity at up to +40 °C<br>5% to 60% RH above +40 °C up to +70 °C |
| Altitude | |
| Operating | Up to 2,000 m |
| Storage | Up to 4,000 m |
| Electromagnetic Compatibility | European Union: EN 55011, Class A; IEC 61000-3-2; IEC 61000-3-3, IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11<br>USA: FCC, CFR Title 47, Part 15, Subpart B, Class A<br>Australia: EMC Framework, demonstrated per Emission Standard AS/NZS 2064 (Industrial, Scientific, and Medical Equipment) |
| Safety | European Union: Low Voltage directive 2006/95/EC; EN61010-1 2001<br>USA: Nationally recognized testing laboratory listing UL61010-1-2004<br>Canada: CAN/CSA C22.2 No. 61010-1 2004 |

**Warranty**

Three years.

# Ordering Information

### Models

| Model | Description |
|---|---|
| PWS4205 | Programmable DC Power Supply, 20 V, 5 A |
| PWS4305 | Programmable DC Power Supply, 30 V, 5 A |
| PWS4323 | Programmable DC Power Supply, 32 V, 3 A |
| PWS4602 | Programmable DC Power Supply, 60 V, 2 A |
| PWS4721 | Programmable DC Power Supply, 72 V, 1.2 A |

**PWS4000 Includes:** Power supply, line cord, Quick Start User Manual, Traceable Certificate of Calibration, documentation CD (includes user manuals, programmer's manual, and technical reference), and National Instruments LabVIEW SignalExpress Tektronix Edition CD.

Please specify power plug and preferred language option when ordering.

## Instrument Options

### Power Plug Options

| Option | Description |
|---|---|
| A0 | North America |
| A1 | Universal Euro |
| A2 | United Kingdom |
| A3 | Australia |
| A5 | Switzerland |
| A10 | China |
| A11 | India |
| A12 | Brazil |

### Language Options

| Option | Description |
|---|---|
| L0 | English |
| L1 | French |
| L2 | Italian |
| L3 | German |
| L4 | Spanish |
| L6 | Portuguese |
| L7 | Simplified Chinese |
| L8 | Traditional Chinese |
| L9 | Korean |
| L10 | Russian |

### Service Options

| Option | Description |
|---|---|
| C3 | Calibration Service 3 Years |
| C5 | Calibration Service 5 Years |
| CA1 | Provides a single calibration event, or coverage for the designated calibration interval, whichever comes first |
| D1 | Calibration Data Report |
| D3 | Calibration Data Report 3 Years (with Option C3) |
| D5 | Calibration Data Report 5 Years (with Option C5) |
| R5 | Repair Service 5 Years |

CE

ISO 9001    Product(s) are manufactured in ISO registered facilities.

ACCREDITED BY THE DUTCH COUNCIL FOR CERTIFICATION

**www.valuetronics.com**

**Contact Tektronix:**

ASEAN / Australasia (65) 6356 3900

Austria 00800 2255 4835*

Balkans, Israel, South Africa and other ISE Countries +41 52 675 3777

Belgium 00800 2255 4835*

Brazil +55 (11) 3759 7600

Canada 1 800 833 9200

Central East Europe, Ukraine, and the Baltics +41 52 675 3777

Central Europe & Greece +41 52 675 3777

Denmark +45 80 88 1401

Finland +41 52 675 3777

France 00800 2255 4835*

Germany 00800 2255 4835*

Hong Kong 400 820 5835

India 000 800 650 1835

Italy 00800 2255 4835*

Japan 81 (3) 6714 3010

Luxembourg +41 52 675 3777

Mexico, Central/South America & Caribbean (52) 56 04 50 90

Middle East, Asia, and North Africa +41 52 675 3777

The Netherlands 00800 2255 4835*

Norway 800 16098

People's Republic of China 400 820 5835

Poland +41 52 675 3777

Portugal 80 08 12370

Republic of Korea 001 800 8255 2835

Russia & CIS +7 (495) 7484900

South Africa +41 52 675 3777

Spain 00800 2255 4835*

Sweden 00800 2255 4835*

Switzerland 00800 2255 4835*

Taiwan 886 (2) 2722 9622

United Kingdom & Ireland 00800 2255 4835*

USA 1 800 833 9200

* European toll-free number. If not accessible, call: +41 52 675 3777

Updated 25 May 2010

**For Further Information.** Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit **www.tektronix.com**

15 Oct 2010                                                                 3GW-25253-0

**Tektronix**®