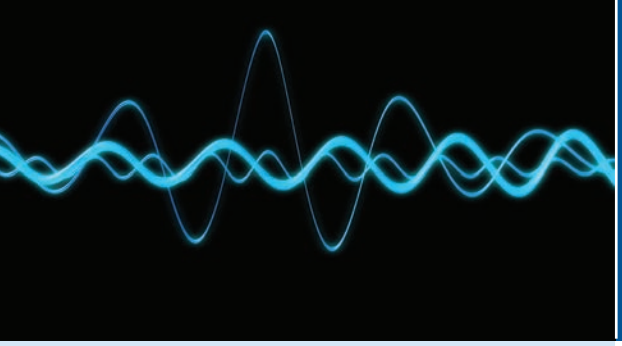


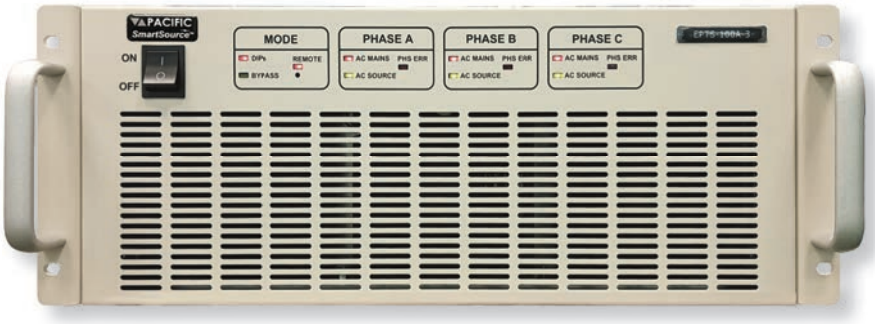
ELECTRONIC POWER TRANSFER SWITCH

EPTS SERIES

EPTS MODULE

Key features:

- Supports AC and DC Voltage Dips & Interruptions IEC61000-4-11, IEC61000-4-29 and IEC61000-4-34 and Test Standards
- Equivalent Korean KC Dips & Interruption standards
- Rack Mount Chassis integrates with ECTS2 Compliance Test Systems
- Test Suite Windows Software for Voltage Dips, Interruptions and Variations
  Programming and Execution
- Supports 1 to 5 μsec Rise/Fall times for AC Voltage Dips and 1 to 5 μsec Rise/Fall times for DC Voltage Dips
- Uses Mains Power or Generator for 100% AC Voltage
- Programmable AC & DC Source for fully programmable Dip Levels
- Single or Three Phase Version
- Supports currents up to 100 Amps
- Compatible with AFX, AGX, AZX, GSZ, LMX^2 and RGS Series Power Sources
- USB Interface for Control



AC VOLTAGE DIPS

VOLTAGE UNBALANCE

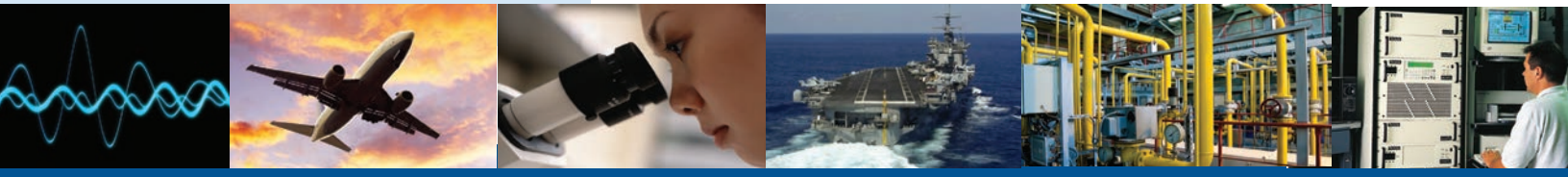
Overview

The Pacific Power Source Electronic Power Transfer Switch module (EPTS) uses solid state electronic switch technology to meet the IEC61000-4-11, IEC61000-4-29 and IEC61000-4-34 Test requirements for voltage dips, short interruptions and voltage unbalance with voltage transition rates less than 5 μsec for AC and DC tests. This supports full compliance testing of equipment for CE compliance.

Support IEC Standards

AC Voltage Dips, Interruptions and Variations
• IEC 61000-4-11 Ed. 3.0 : 2020 (< 16 Arms)
• IEC 61000-4-11 Ed. 2.1 : 2017 (< 16 Arms)
• IEC 61000-4-11 Ed. 2.0 : 2004 (< 16 Arms)
• IEC 61000-4-34 Ed. 1.1 : 2009 (> 16 Arms)
• KS C 9610-4-11 : 2020

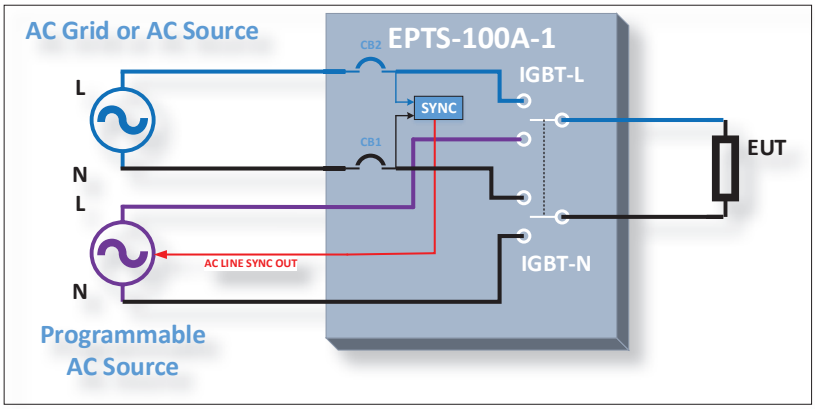
DC Voltage Dips, Interruptions and Variations
• IEC 61000-4-29 Ed. 1.0 : 2000
• KS C 9610-4-29 : 2020



Principle of Operation

The EPTS hardware is designed specifically to provide full compliance testing of products for CE marking. This requires support of the fast voltage rise and fall time called out in IEC test standards like IEC61000-4-11 or IEC61000-4-34.

This is accomplished by using an electronic power transfer switch controlled by the same IEC Test software that controls the AC dip level of the programmable power source. The nominal voltage to the unit under test is supplied by a second AC power supply or from the local mains.



Electronic Power Transfer Switch -- Functional Diagram

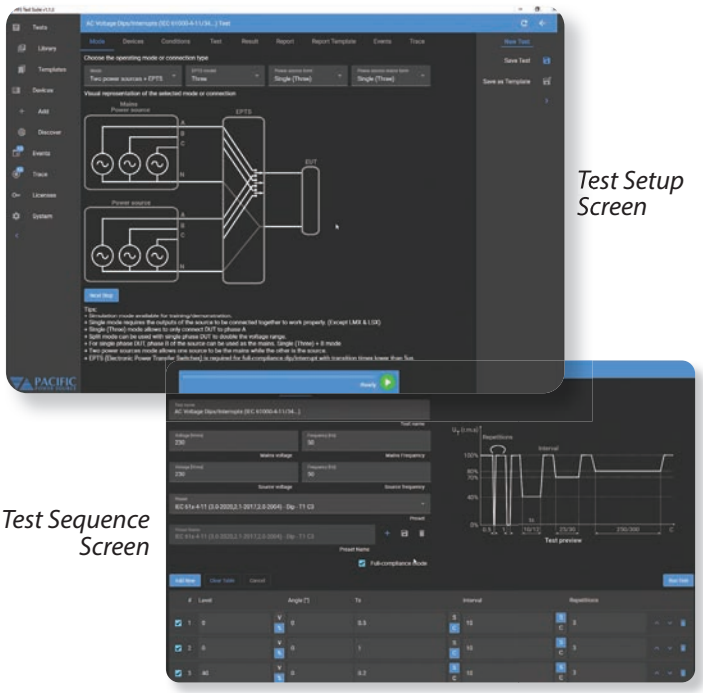
PPS Test Suite Software

The included IEC test software is used to control the voltage dip or interrupt phase angle and duration. It also controls the programmable power source to set the correct dip level in percent of nominal. Test sequences and time intervals can be created and saved for repeated use by product category. Test setup parameters include:

- Nominal Voltage: Any AC grid voltage from 100 to 240Vac
- Product test class: 1, 2, 3 or X.
- Dip Level in % of Unom: 0%, 40%, 70%, 80% or user defined
- Dip duration in cycles: 0.5 to 10000 cycles (or msec)
- Test Interval Time: 1.000 to 200.0 seconds

At the end of a test, the user is prompted to provide the pass/fail classification based on observation or examination of the EUT. Available selections are a, b, c or d.

A test report is generated by the EMC Test software to document test parameters and observed EUT performance. Available report formats are Adobe PDF and Rich Text (RTF).



Test Setup Screen

Test Sequence Screen

Choose the System Size You Need

Voltage Dips and Variation test systems come in all sizes and power levels. Entry level single phase systems start at up to 16A of current max.

A suitable power level LMX Series or AFX Series power source pairs with the EPTS-1-16A for a compact, bench top test systems.

For higher current needs and three phase applications, EPTS units start at 16Arms per phase and top out at 100Arms per phase.

LMX Series Based AC Voltage Dips Test System

Voltage Rise and Fall Time Compliance

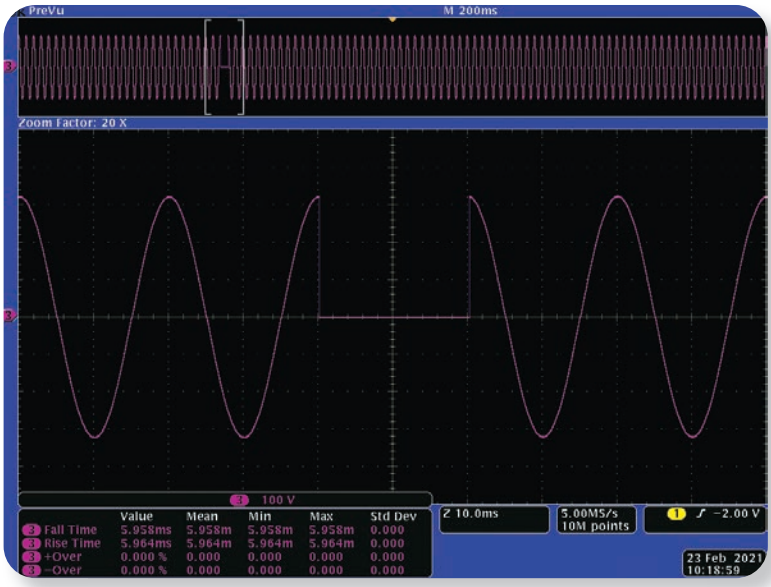
For full compliance to the IEC 61000-4-11/4-34 standards, the voltage rise and fall times as well as voltage over & under shoot **must** meet the stated standard requirements.

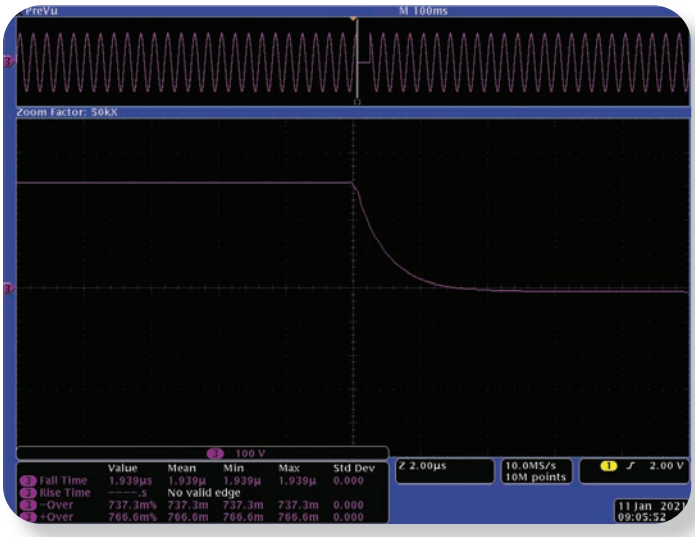
The EPTS meets this requirement into a 100 Ohm resistive load as can be seen in the scope traces shown.

These captures show a half cycle at 90° AC voltage dip to 0%, 40% and 70% of Unom. For each dip, the details for the rise and fall time are shown at a magnified time scale of 2 usec per division.

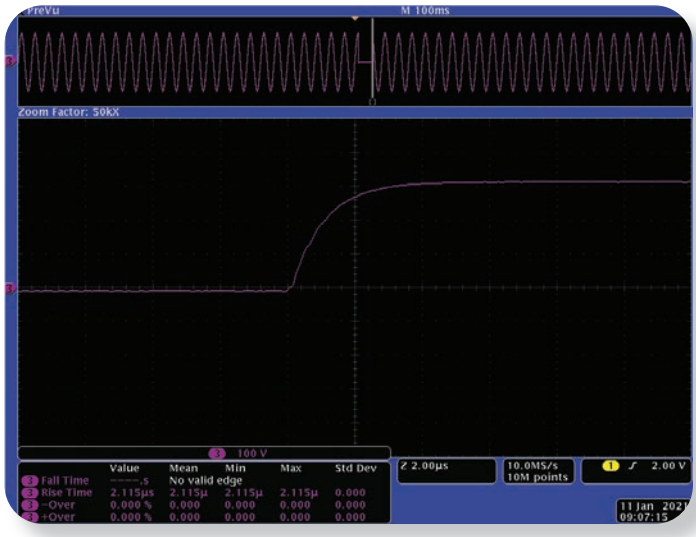
The EPTS unit supports rise/fall times less than 5 μsec for both AC and DC voltages dips.

Voltage Dip to 0% of Unom @ 90°



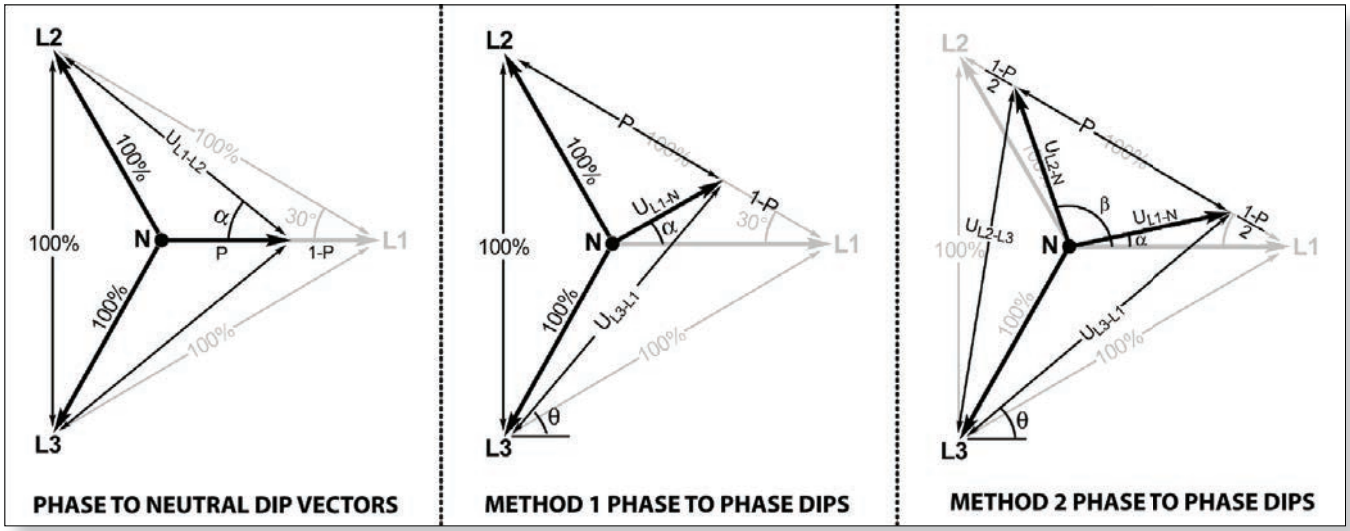


Fall Time < 5 μsec with no undershoot



Rise Time < 5 μsec with no overshoot

IEC61000-4-11 & IEC61000-4-34 Three Phase AC Voltage Drop Methods Supported



Three Phase Voltage Dips Vector Diagrams

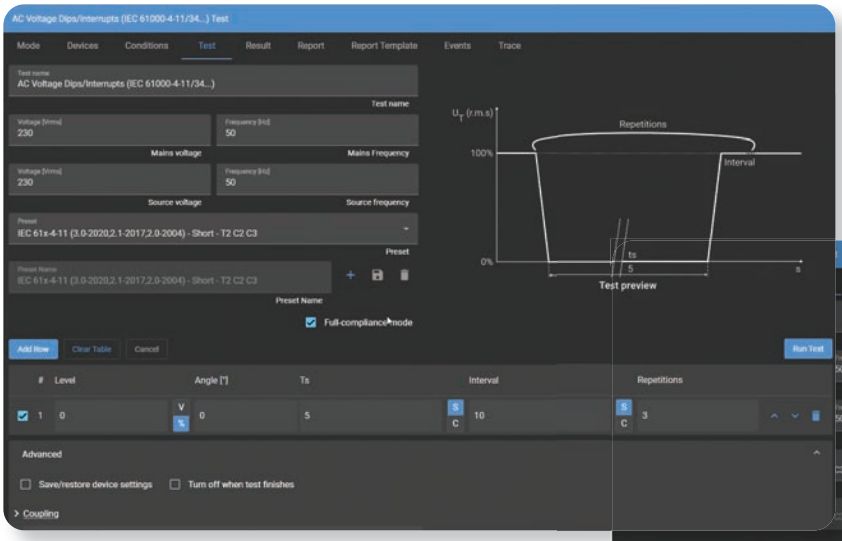
For three phase EUT's, voltages dips must be applied using several phase vector methods in order to meet full compliance with the IEC61000-4-11 or IEC61000-4-34 test standard. This is covered in Annex C of the standard.

The required application of voltage dips are:

- Phase to Neutral Dips - One phase is dropped at a time, repeated for all phases. Phase angles between A, B and C remain constant.
- Phase to Phase Dips - Method 1: Two phases are dropped at a time by changing the amplitude of **one** phase amplitude and two phase angles. Repeated for each phase.
- Phase to Phase Dips - Method 2: Two phases are dropped at a time by changing the amplitude of **two** phase amplitudes and two phase angles. Repeated for each phase pair.

The image below shows the required three phase voltage dip vector diagrams.

The Test Suite software supports all allowable methods and comes with these amplitude and phase angle settings in its Voltage Dips library. Sample Voltage Dips screens are shown at the bottom of this page.



IEC 61000-4-11 AC Voltage Dips Test Setup T1 C2 C3

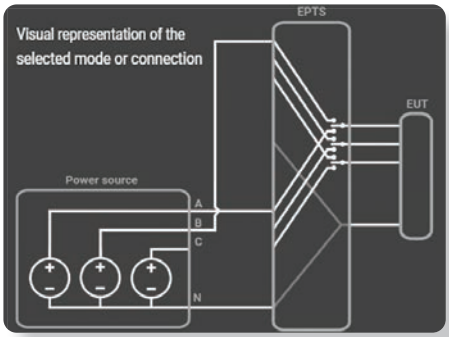
IEC 61000-4-11 AC Voltage Dips Test Setup T1 C3

IEC61000-4-29 DC Voltage Dips & Interruptions Tests

Dual DC Channel Test Setup

To ensure full compliance to the IEC 61000-4-29 test standard, the voltage rise and fall times **must** meet the stated standard requirements of less than 50 µsec. The EPTS supports < 5 µsec both criteria into a 100 Ohm resistive load.

If a 3 phase AC & DC Power Source is used, the EPTS will switch between two of the DC outputs (A & B) so no additional DC power supply is required.



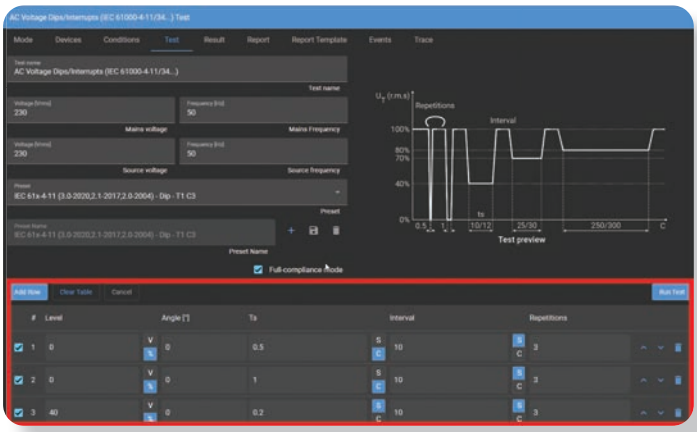
Pre-Compliance Test Mode

The Test Suite Windows software can be operated in pre-compliance mode in the absence of the EPTS power transfer switch hardware as needed.

This mode may be used for applications where full compliance is not required such as when performing in-house tests in preparation for submitting an EUT to a third party EMC lab for full compliance testing at a later time.

This allows the user to perform these tests using the programmable AC power source only and without the use of the local AC grid. In pre-compliance mode, the Test Suite software uses the power source's transient system to perform all IEC61000-4 tests listed.

In this mode of operation, the voltage rise and fall times for voltage changes may be longer than 5 µsec so full compliance may not be met.



IEC 61000-4-34 AC Voltage Dips Test without EPTS Hardware

Key EPTS Test System Benefits

- **Unlimited Custom Test Templates:** Design and reuse as many test templates as needed, adapting easily to any application.
- **Flexible Report Templates:** Create professional-looking reports customized to your brand and requirements.
- **Versatile Report Formats:** Export and edit results in HTML or DOCX, or generate ready-to-print PDF files.
- **Seamless IEC Test Automation:** Integrates effortlessly into automated test systems through API or SCPI commands.
- **Modern, Responsive and Multiplatform:** Built with a modern User Interface that's responsive across multiple devices.

Technical Specifications

PARAMETER	IEC REQUIREMENT	EPTS-xxA
AC Voltage Range	230Vac (Europe) 100, 120 or 200Vac (Japan)	255Vac max.
DC Voltage Range	360Vdc	360Vdc max.
Accuracy	< 5%	< 0.25%
Rise / Fall Time AC	1 to 5 usec	1 to 5 usec
Rise / Fall Time DC	1 to 50 µsec	1 to 5 µsec
Frequency	50.0 or 60.0 Hz ±2%	45.0 - 65.0 Hz
Phase error (3 phase)	< 5°	± 0.5°
Current		
IEC 61000-4-11, Max.	16A / Ph	100A / Ph[1)]
IEC 61000-4-34, Max.	75A / Ph	100A / Ph[1)]

Note 1: *Max. Current based on EPTS model. Max. available is 100A.*

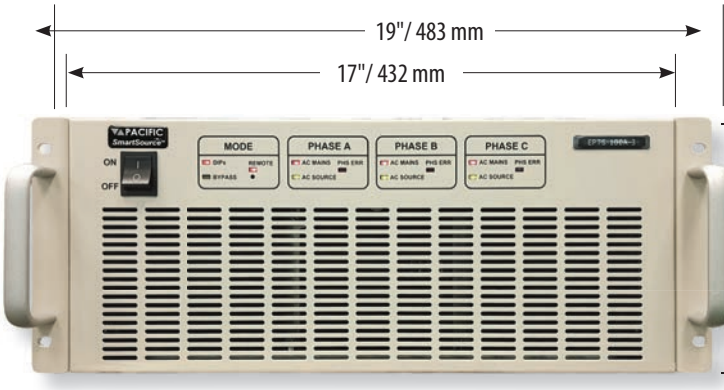
AC INPUT	
AC Input Voltage (Bias)	
All EPTS models	120Vac ~ 240Vac, 2W+G
Frequency	50 / 60 Hz
AC Current	2.0 A

TEST STANDARDS SUPPORTED	
IEC 61000-4-11	AC - Voltage Dips and Interruptions
IEC 61000-4-34	AC - Voltage Dips and Interruptions
IEC 61000-4-27	AC Voltage Unbalance (3 Phase mode only)
KS-C-9610-4-11	Korean equivalent of IEC 61000-4-11
KS-C-9610-4-34	Korean equivalent of IEC 61000-4-34

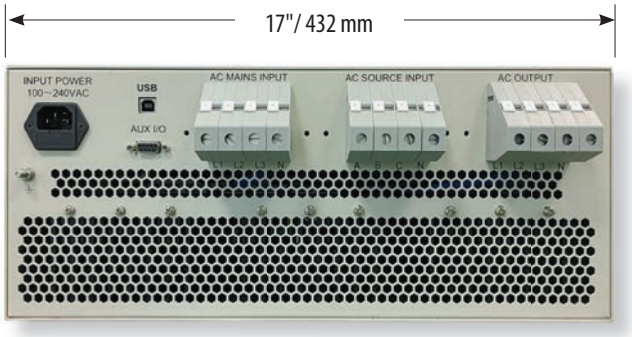
INTERFACES, INDICATORS & CONTROLS	
Connectors - Rear Panel	
Power Input	AC Mains, 1 or 3 Phases + Neutral AC Source, 1 or 3 Phases + Neutral
Power Output	To EUT, 1 or 3 Phases + Neutral
Control Interface	USB Device Type B, Rear panel
Line Sync	From AC Mains or Generator
Auxiliary I/O	DB9 Connector, Female, Rear panel
LED Indicators - Front Panel	
Mode	DIPS or Bypass
Phase Status	Mains or Source
Phase Error	For each Phase
Controls - Front Panel	
Power On/Off	Toggle Switch, Front panel

MECHANICAL & ENVIRONMENTAL	
Dimensions (HxWxD)	178 x 432 x 670 mm 7" x 17" x 26.4"
Weight	42.5 Kg / 93.7 lbs
Temperature	0 - 40° / 32 - 104°
Humidity	0-95 % non-condensing
Altitude	6500 ft / 2000 m (operating)
Insulation	
Line/Neutral to chassis	2500 Vdc

Dimensions



Front Panel View - 4U Chassis

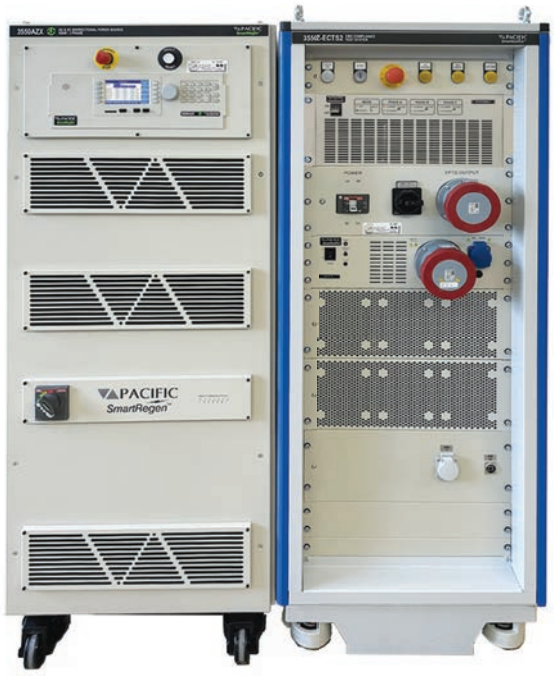


Rear Panel View - 4U Chassis

Generator Compliance Tables

IEC 61000-4-11 & IEC 61000-4-34	IEC REQUIREMENT	EPTS-100A-1 / EPTS-100A-3
Output Voltage at no load	Test Voltage ± 5% of residual voltage	Test Voltage ± 0.5%
Output Voltage Change with load: 100% output, 0-16 A 80% output, 0-20 A 70% output, 0-23 A 40% output, 0-40 A	< 5% of U_T	Complies
Output Current Capability - IEC 61000-4-11	16 A @ 100% U_T 20 A @ 80% U_T > 5 sec 23 A @ 70% U_T > 3 sec 40 A @ 40% U_T > 3 sec	Complies
Output Current Capability - IEC 61000-4-11	Determined by Power Grid	Based on Model configuration of AFX, AGX, AZX, GSZ, LMX and RGS Series specifications and power grid capacity, meets or exceeds requirements
Peak Inrush Capability - IEC 61000-4-11	Not limited by generator	
Peak Inrush Capability - IEC 61000-4-34 16A - 50A Rated Equipment 50.1A - 100A Rated Equipment > 100A Rated Equipment	 500A 1000 A Sufficient to maintain ±10% of U_T	
Voltage Over / Undershoot into 100 Ohm R Load	< 5% of U_T	< 5% of U_T
Voltage Rise & Fall Time into 100 Ohm R Load (See option VDT100R)	Between 1 and 5 µsec for currents < 75A Between 1 and 50 µsec for currents > 75A	1 to 5 µsec for currents < 100
Phase error (3 phase)	< ± 10°	± 0.5° (EPTS-100A-3)
Zero crossing control	± 10°	± 0.5°
Bypass Mode Current Rating	n/a	EPTS-x-16A: 16 Arms
		All other EPTS models: 100 Arms

IEC 61000-4-29	IEC REQUIREMENT	EPTS-100A-1 / EPTS-100A-3
Output Voltage Range	Up to 360Vdc	Up to 360Vdc
Output Voltage Change with load:	< 5% of U_T	< 0.25% of U_T
Ripple Content	< 1% of output voltage	< 1%
Voltage Rise & Fall Time into 100 Ohm R Load	Between 1 and 50 µsec	1 to 5 µsec
Voltage Over / Undershoot into 100 Ohm R Load	< 10% of Voltage change	< 5%
Output Current, Steady State	Up to 25A	Up to 100A



ORDERING INFORMATION:

EPTS units are available in either single or three phase version and at different max. current ratings as shown in the table here.

Available Models & Options:

Model	*Description*
EPTS-16A-1	Electronic Power Transfer Switch, 16A, Single Phase
EPTS-16A-3	Electronic Power Transfer Switch, 16A/phase, Three Phase
EPTS-32A-1	Electronic Power Transfer Switch, 32A, Single Phase
EPTS-32A-3	Electronic Power Transfer Switch, 32A/phase, Three Phase
EPTS-75A-1	Electronic Power Transfer Switch, 75A, Single Phase
EPTS-75A-3	Electronic Power Transfer Switch, 75A/phase, Three Phase
EPTS-100A-1	Electronic Power Transfer Switch, 100A, Single Phase
EPTS-100A-3	Electronic Power Transfer Switch, 100A/phase, Three Phase

ECTS2 EMC Test System with integrated EPTS-3-100A Voltage Dips Module

Service and Support

Pacific Power Source's customer support is second to none. Our Customer Support Program provides the training, repair, calibration, and technical support services that our customers value. So, in addition to receiving the right test equipment, our customers can also count on excellent support before, during and after the sale. With company owned support and service centers around the world, support is never far away.

Complete calibration and repair services are offered at our US, European and Chinese manufacturing facilities (see contact info below). Calibrations are to original factory specifications and are traceable to NIST (National Institute of Standards and Technology).

NORTH AMERICA
Pacific Power Source, Inc.
Irvine, USA
Phone: +1(949) 251-1800
Fax: +1 (949) 756-0756
Email: info@pacificpower.com
Web: www.pacificpower.com

EUROPE
Pacific Power Source Europe GmbH.
Kappelrodeck, Germany
Phone: +49 7842 99722-20
Fax: +49 7842 99722-29
Email: info@pacificpower.eu
Web: www.pacificpower.eu

CHINA
PPST Shanghai Co. Ltd.
Shanghai, China
Phone: +86-21-6763-9223
Fax: +86-21-5763-8240
Email: info@ppst.com.cn
Web: www.ppst.com.cn

Proudly Represented by:

PACIFIC® POWER SOURCE
2802 Kelvin Avenue, Suite 100
Irvine, CA 92614 -5897 USA
Phone: +1 949.251.1800
Fax: +1 949.756.0756
Toll Free: 800.854.2433
E-mail: sales@pacificpower.com
Web: www.pacificpower.com