EMC COMPLIANCE TEST SYSTEMS

ECTS2 SERIES

INTEGRATED TEST SYSTEMS

Key features ECTS2 Systems:

Available Emissions Tests:

- IEC 61000-3-2 Harmonics Emissions
- IEC 61000-3-12 Harmonics Emissions
- IEC 61000-3-3 Flicker Emissions
- IEC 61000-3-11 Flicker Emissions

Available Immunity Test Software:

- IEC 61000-4-11 (Option)
- IEC 61000-4-13 (Option)
- IEC 61000-4-14
- IEC 61000-4-17
- IEC 61000-4-27
- IEC 61000-4-28
- IEC 61000-4-29 (Option)
- IEC 61000-4-34 (Option)

Available Avionics Test Software:

- RTCA/DO160, Section 16
- MIL-STD 704
- Airbus ABD0100.1.8 (A380)
- Airbus ABD0100.1.8.1 (A350)
- Airbus AMD24C (A400M)
- Boeing 787B3-0147

Single or Three Phase Configurations

Extensive Data Reporting

Easy to Use Windows Software

Choice of Lumped Impedance Networks

GPIB RS232 USB UNIVERSAL SERIAL BUS LAN

Single Phase 16A System for IEC 61000-3-2 and IEC 61000-3-3

Three Phase System for IEC 61000-3-2 & -12 and IEC 61000-3-3 & -11

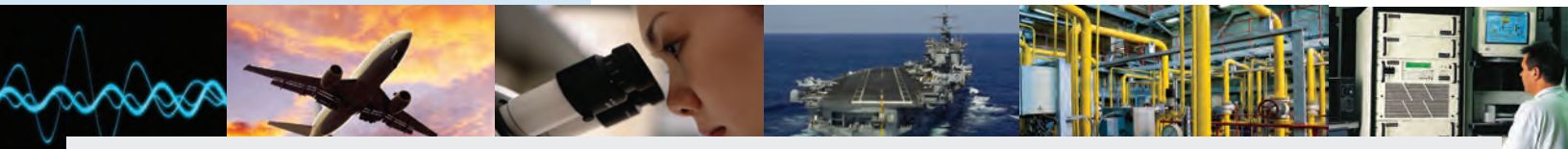
Overview

Pacific Power Source EMC Compliance Test Systems use a greatly enhanced harmonics and flicker measurement system and newly designed flicker impedance options to support single and three phase AC harmonics, flicker and immunity compliance testing up to the maximum required current of 75A per phase.

The measurement system uses a USB interface to the user's laptop or desktop eliminating the need for an integrated PC, monitor and keyboard compared to previous generation Harmonics and Flicker test systems.

AC power to the unit under test is still supplied by a Pacific Power Source LMX Series high performance linear power source for systems up to 16A/phase. For higher power systems up to 75A/phase, the compact and efficient AFX Series switch mode power source is used. The AC power output of these units easily exceeds the IEC 61000-3 standard requirements for the AC source.

All tests are computer controlled to eliminate operator errors and ensure consistent applications of the required test in full compliance with the IEC standards. Data is collected to the PC drive for record keeping and a comprehensive test report is generated at the end of the test. The windows based software uses intuitive graphical control elements to select the correct test mode and displays data in real time, while the test is in progress.



(ES) Equipements Scientifiques SA - Département Puissance Energie - 127 rue de Buzenval BP 26 - 92380 Garches
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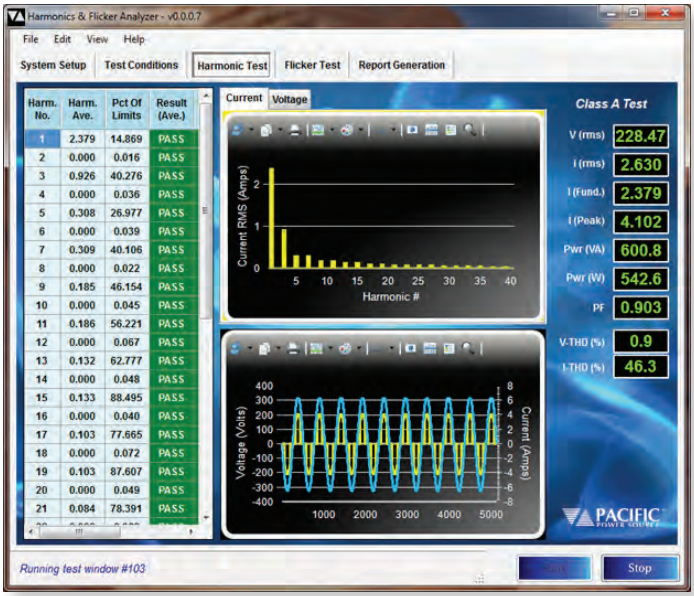
Fluctuating Harmonics Test Software

The single phase and three phase harmonics and flicker measurement modules (HFMM-1 / HFMM-3) are controlled by the HFa16 or HFa75 control software which fully implements the lat-est IEC 61000-3-2 & -3-12 Harmonics test standards. The HFMM is a precision power measurement instrument that can be cer-tified to ISO17025 by an accredited lab. The software guides the operator through all necessary steps, then acquires, dis-plays and reports on the results. Data is displayed in real-time during the test so the operator can monitor progress and inter-rupt the test if needed without having to wait until the end of the test run.

This saves the operator time by allowing them to interrupt the testing when a fault is found in the Equipment Under Test(EUT).

The screen below shows the current harmonics of the EUT during a test run. Color is used to highlight peak values, average values and IEC test limit values. This helps diagnose possible issues on equipment that does not pass early on. Since all acquired data is recorded, the user has the ability to scroll back and forth through time, frame by frame, to narrow in on any failure condition.



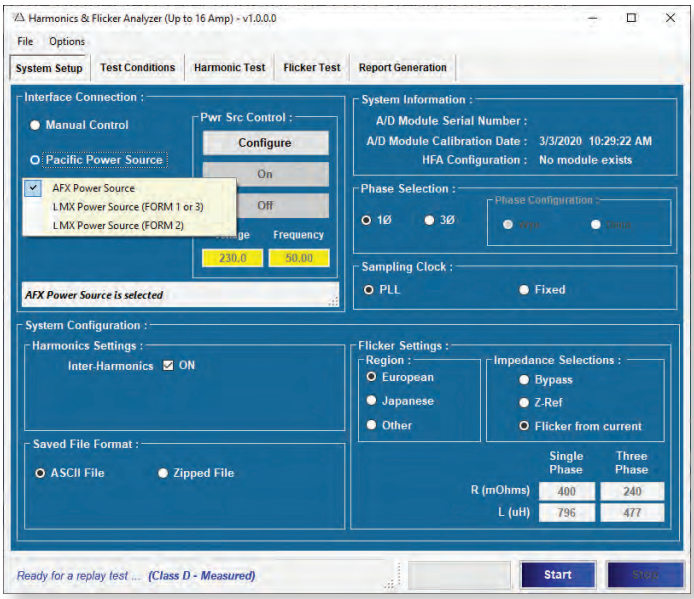
Harmonics Display showing use of color to highlight information

AC Power Source →

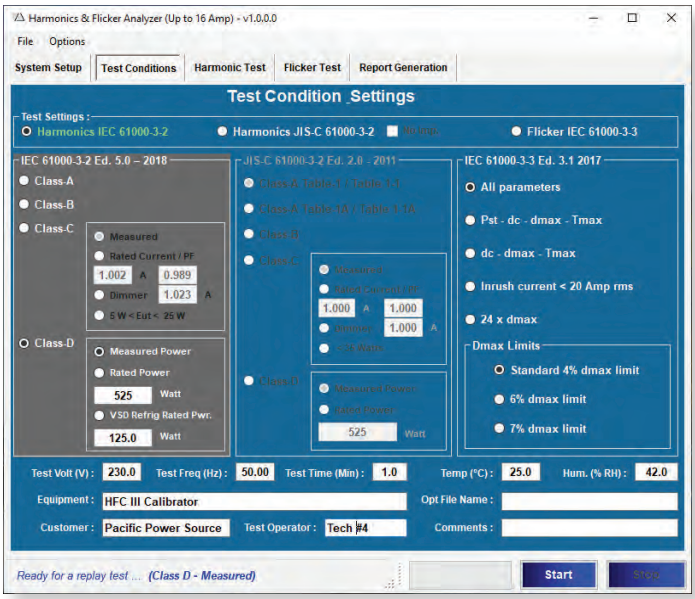
Measurement Unit with 40 A Flicker Impedance 3-Phase →

ECTS2 System Components

Intuitive operation guides the operator through the proper test selections for the EUT category to be tested:



System Setup selects AC Source, Flicker Impedance as needed



Test Conditions selection for IEC Standard applied and EUT Class

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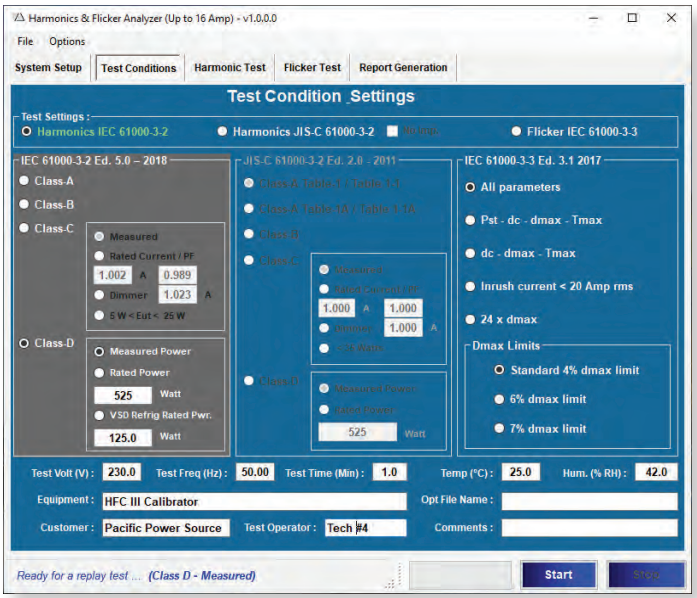
Flicker Test Software

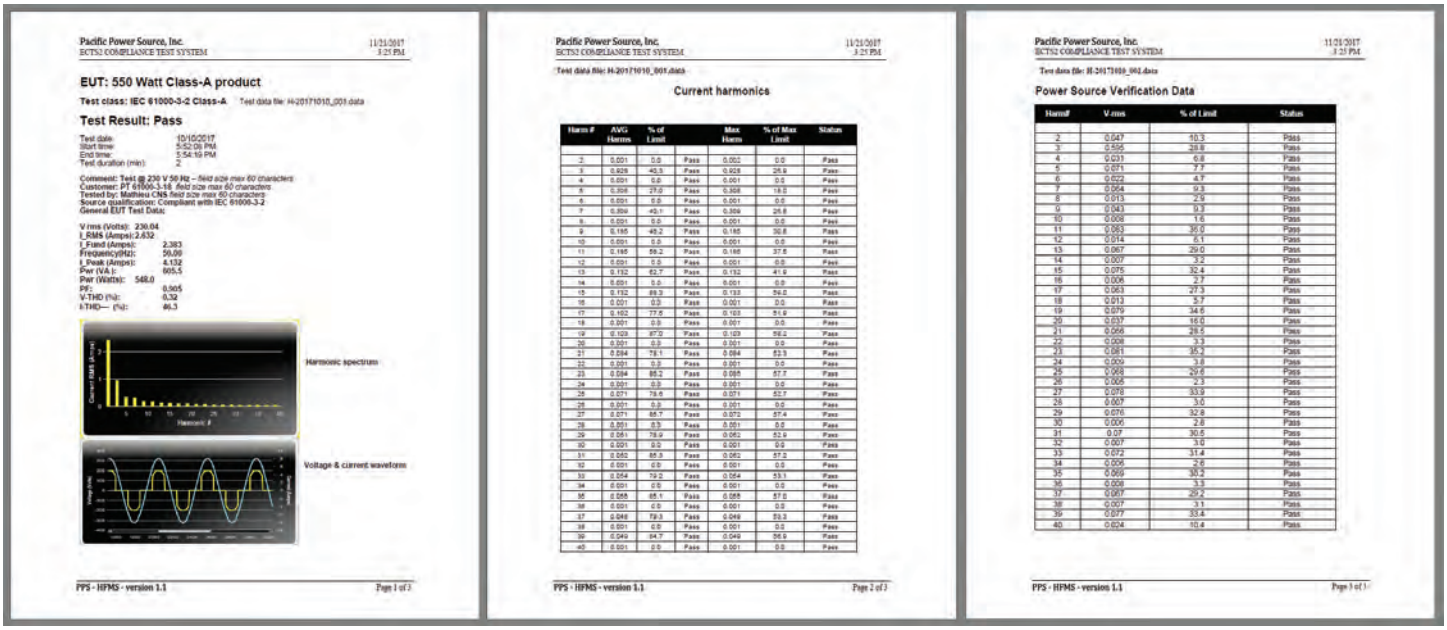
Flicker tests are set up and executed using the same logical step process shown for Harmonics. Both IEC 61000-3-3 and -3-11 standards are supported. Since flicker tests may have to run for up to two hours, the real time display of intermediate measurements data such as short term flicker (Pst) and instantaneous flicker sensations (IFS) can be helpful in predicting the possible outcome of the test early on. This helps reduce wasted time on tests that will fail.



Flicker Test Conditions selected from right hand side panel

Built-in Report Generator

Properly documenting the results of IEC compliance tests performed on a unit under test is very important. The HFa16 and HFa75 programs generate reports automatically. A three page sample report for Harmonics is shown below. The report format used is Rich Text File (RTF) which is easily converted to other formats as needed.



Test Reports are generated at the completion of each test covering all data and setting information - Harmonics Sample Shown

AC Power Source Compliance

Annex A, section A.2 of the IEC 61000-3-2 Harmonics test standard defines the minimally acceptable AC source requirements that have to be met during the test. Section 6.3 of the IEC 61000-3-3 Flicker standard does the same for Flicker testing. If the power source used for these tests does not meet these requirements, the results will be understated and a unit under test may pass where it otherwise would have failed.

The table to the right lists the requirements from the IEC standard as well as the actual performance specification of the LMX and AFX Series AC power sources. The LMX and AFX both exceed all requirements and represent some of the highest performing programmable AC power sources for Harmonics and Flicker testing available.

AC power source requirements for IEC 61000-3-11 and -3-12 are more relaxed than those shown in the table so the AFX also meets these to support up 86A/phase.

The compliance of the AC power source with these requirements is monitored during harmonics testing by the power analyzer and this information is available as part of the test report.

Specification	Requirement	LMX/AFX Spec.
Voltage		
Amplitude	230Vac RMS	500Vac RMS max.[1]
Accuracy	± 2.0 %	< 0.25%
Distortion		
Harmonics:	H3 < 0.9 %, H5 < 0.4 % H7 < 0.3 %, H9 < 0.2 % H2-H10 < 0.2 % H11-H40 < 0.1 %	LMX: V_{THD} < 0.1 % AFX: V_{THD} < 0.5% Individual harmonics checked by HFMM measurement system
Flicker:	V_{THD} < 3.0 %	LMX: V_{THD} < 0.1 % AFX: V_{THD} < 0.5%
Peak Voltage	between1.40 and 1.42 within 87° to 93° of zero crossing	1.4142 90.0°
Frequency		
Output	50.0 Hz	50.00 Hz
Accuracy		
Harmonics:	± 0.5 %	± 0.01 %
Flicker:	± 0.25 Hz	± 0.005 Hz
Phase Angle (3 Phase EUT)		
Phase error	< 1.5°	± 0.5°
Current		
IEC 61000-3-2, Max.	16A RMS / Ph	16A RMS / Ph
IEC 61000-3-12, Max.	75 A RMS / Ph	86A RMS/ Ph (AFX)

Note 1: Output Transformer Option may be required > 300Vrms

IEC Standard Revision Compliance Matrix

All ECTS2 Compliance Test Systems meet the most recent published editions of the relevant IEC 61000 standards per the table below.

IEC Standard	Category	Description	Supported Version	Edition	Dated
IEC 61000-3-2	Emissions	Limits for harmonic current emissions (equipment input current ≤16 A per phase)	IEC 61000-3-2:2018 RLV	5.0	2018-01-26
IEC 61000-3-3	Emissions	Limitation of voltage changes, voltage fluctuations and flicker ≤ 16 A per phase	IEC 61000-3-3:2013+AMD1:2017 CSV	3.1	2017-05-18
IEC 61000-3-11	Emissions	Limitation of voltage changes, voltage fluctuations and flicker ≤ 75 A and subject to conditional connection	IEC 61000-3-11:2017 RLV	2.0	2017-04-21
IEC 61000-3-12	Emissions	Limits for harmonic currents produced by equipment connected to public low-voltage systems >16 A and ≤ 75 A per phase	IEC 61000-3-12:2011	2.0	2011-05-12
IEC 61000-4-7	Reference	Testing and measurement techniques - General guide on harmonics and interharmonics measurements and instrumentation	IEC 61000-4-7:2002+AMD1:2008 CSV	2.1	2009-10-28
IEC 61000-4-15	Reference	Testing and measurement techniques – Flickermeter – Functional and design specifications	IEC 61000-4-15:2010 RLV	2.0	2010-08-24
IEC 60725	Reference	Reference impedances and public supply network impedances ≤75 A per phase	IEC TR 60725:2012	3.0	2012-06-27
IEC 61000-4-11	Immunity	Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests	IEC 61000-4-11:2020 RLV	3.0	2020-01-28
IEC 61000-4-13	Immunity	Harmonics and interharmonics includingmains signalling at a.c. power port, low frequency immunity tests	IEC 61000-4-13:2002+AMD1:2009+AMD2:2015 CSV	1.2	2015-12-14
IEC 61000-4-14	Immunity	Voltage fluctuation immunity test for equipment with input current not exceeding 16 A per phase	IEC 61000-4-14:1999+AMD1:2001+AMD2:2009 CSV	1.2	2009-08-12
IEC 61000-4-17	Immunity	Ripple on DC input power port immunity test	IEC 61000-4-17:1999+AMD1:2001+AMD2:2008 CSV	1.2	2009-01-28
IEC 61000-4-27	Immunity	Unbalance, immunity test for equipment with input current not exceeding 16 A per phase	IEC 61000-4-27:2000+AMD1:2009 CSV	1.1	2009-04-07
IEC 61000-4-28	Immunity	Variation of power frequency, immunity test for equipment with input current not exceeding 16 A per phase	IEC 61000-4-28:1999+AMD1:2001+AMD2:2009 CSV	1.2	2009-04-07
IEC 61000-4-29	Immunity	Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests	IEC 61000-4-29:2000	1.0	2000-08-30
IEC 61000-4-34	Immunity	Voltage dips, short interruptions and voltage variations immunity tests for equipment with mains current more than 16 A per phase	IEC 61000-4-34:2005+AMD1:2009 CSV	1.1	2009-11-26
IEC TR 61000-4-37	Calibration	Calibration and verification protocol for harmonic emission compliance test systems	IEC TR 61000-4-37:2016	1.0	2016-01-07
IEC TR 61000-4-38	Calibration	Test, verification and calibration protocol for voltage fluctuation and flicker compliance test systems	IEC TR 61000-4-38:2015	1.0	2015-08-24

Technical Specifications

AC OUTPUT - LMX Based ECTS2 Systems		
Power	Systems are available at various power levels. Starting at 4000VA single phase and 6000VA three phase.	
Number of Phases		
Single Phase	Phase A and Neutral	
Three Phase	Phase A, B, C and Neutral	
Frequency		
Range	20.00 Hz to 5000 Hz	
Resolution	0.01 Hz < 100 Hz	
Accuracy	0.01 %	
Voltage		
	Single Phase	Three Phase
Low Range	0-135 V L-N	0-135 V L-N 0-234 V L-L
High Range	0-270V L-N	0-338 V L-N 0-585 V L-L
Current		
Low Range	32 Arms	Starting at 16 Arms / phase
High Range	16 Arms	Starting at 8 Arms / phase

AC OUTPUT - AFX Based ECTS2 Systems		
Power	Systems are available at various power levels. From 15 kVA through 60 kVA single phase and three phase.	
Number of Phases		
Single Phase	Phase A and Neutral	
Three Phase	Phase A, B, C and Neutral	
Frequency		
Range	15.00 Hz to 1200 Hz	
Resolution	0.01 Hz < 100 Hz	
Accuracy	0.01 %	
Voltage		
	Single Phase	Three Phase
Range	0-400V L-N	0-400 V L-N 0-690 V L-L
Current		
Max.	125 Arms	Up to 167A /phase

AC INPUT - LMX Based ECTS2 Systems		
Type	Three Phase, 4 Wire (L1,L2,L3, Gnd)	
Frequency	47Hz - 63 Hz	
Voltage	380Vac ± 10%, L-L Delta	
Input Current	Max.	Required Service
4 kVA System	12ARMS/phase	20A/phase
12 kVA System	32ARMS/phase	40A/phase
Note: Consult factory for alternative power level systems and AC input configurations		

AC INPUT - AFX Based ECTS2 Systems		
Type	Three Phase, 4 Wire (L1,L2,L3, Gnd)	
Frequency	47Hz - 63 Hz	
Voltage	380Vac-480Vac ± 10%, L-L Delta	
Input Current	Max.	Required Service
	Refer to AFX Series Datasheet	
Note: Consult factory for alternative power level systems and AC input configurations		

MEASURED PARAMETERS	
Amplitude	Vrms, Irms, W, VA, PF, CF
Time	Frequency, Phase, Fundamental, Harmonics & Inter Harmonics
AC frequency synchronization	Phase Locked Loop

MEASUREMENT SPECIFICATIONS - HFMM		
Frequency		
Range	5 Hz - 20 kHz	
Resolution	0.05 Hz < 100 Hz	
Accuracy	0.01 %	
Voltage	HFMM-1	HFMM-3
No Inputs	1	3
Ranges	500Vrms (1500V pk-pk)	
Accuracy	0.1 % + 10 mV	
Current	HFMM-1	HFMM-3
Internal CT's	1	3
CT Rating	± 50 A pk	±150 A pk
Range	Multi Range, Auto Select	
Accuracy	0.1 % Rdg + 3 mA	
Phase		
Range	0.00° - 359.99°	
Accuracy	0.1° + (0.2° x kHz)	
Power		
Accuracy	0.15 % + 0.5 W	
Crest Factor		
Range	2 - 20 depending on rms input level	
Other		
IEC Modes	IEC 61000-3-2, IEC 61000-3-3, IEC 61000-3-11, 61000-3-12 (Harmonics & Flicker)	
Application Modes	Fluctuating Harmonics, Flicker Meter	

Model 140LMXT Linear - 4kVA

Model 3150AFX Switch Mode - 15kVA

Technical Specifications

REMOTE CONTROL		
Equipment	AC Source	HFMM
Digital	LAN, USB, RS232 & GPIB	USB
Analog Inputs	Aux, Modulation	
Analog Outputs	Transient Trigger Transient Pedestal Clock and Lock (A 0°)	
Software		
Included	PPSC or UPC Studio	HFa16 or HFa75
Optional	UPC or PPSC Test Manager	

ENVIRONMENTAL		
Equipment	AC Source	HFMM
Temperature	0 - 40°	
Relative Humidity	0-95 % non-condensing	
Altitude	6500 ft / 2000 m (operating)	
Heat Dissipation	6.5 kBTU / 6kVA Higher power systems proportionally higher	n/a

MECHANICAL	
Cabinet Dimensions (HxWxD)	
Single Phase, 4 kVA	28U Cabinet, 1220 x 801 x 573 mm 48" x 31.5" x 22.5"
Three Phase, 12 kVA	36U Cabinet, 1700 x 801 x 573 mm 67" x 31.5" x 22.5"
Higher Power Systems	Consult Factory
Cabinet Weight -LMX Based Systems (M)	
Single Phase, 4 kVA	419 lbs / 190 Kg
Three Phase, 12 kVA	871 lbs / 395 Kg
Cabinet Weight -AFX Based Systems (F)	
Three Phase, 12 kVA	
Three Phase, 15 kVA	
Higher Power Systems	Contact Factory
Note: Weights are approximate and may vary based on installed options.	

Lumped Flicker Impedance (LFZ) + HFMM

The requisite lumped impedance required during voltage flicker testing is included as part of the test system. Either a single phase impedance or a three phase impedance is installed, depending on system configuration. Flicker Impedances for IEC 61000-3-3 of 16A rms per phase and for IEC 61000-3-11 up to 75A rms per phase are available.

Note that the HFMM hardware can be integrated in the LFZ chassis so the HFMM chassis is eliminated when ordering an ECTS2 system with any LFZ flicker impedance.

Model	Specification	
Compliance	IEC 61000-3-3. IEC 61000-4-15, IEC 60725	
Available Impedance Modules (LFZ)		
Single Phase	Models LFZ-1-16, LFZ-1-40	
Three Phase	Models LFZ-3-16, LFZ-3-40, LFZ-3-75	
Impedance - Model LFZ-x-16		
Phase	R = 0.24 Ω	jX = 0.15 Ω @ 50 Hz
Neutral	R = 0.16 Ω	jX = 0.10 Ω @ 50 Hz
Impedance - Models LFZ-x-40 and LFZ-3-75 (IEC 61000-3-3 / -3-11)		
Phase[1]	R = 0.24 Ω / 0.15 Ω	jX = 0.15 Ω @ 50 Hz
Neutral[1]	R = 0.16 Ω / 0.10 Ω	jX = 0.10 Ω @ 50 Hz
Current Rating		
LFZ-1-16, LFZ-3-16	16 Arms per phase - IEC 61000-3-3	
LFZ-1-40, LFZ-3-40	40 Arms per phase - IEC 61000-3-11	
LFZ-3-75	75 Arms per phase IEC 61000-3-11	

Note 1: Impedance setting selected by HFa Control software for IEC 61000-3-3 or IEC 61000-3-11 based standard selection mode

LFZ-1-16 or LFZ-3-16 Three Flicker Impedance - Front View

LFZ-1-40 or LFZ-3-40 Flicker Impedance - Front View

Voltage Dips Transfer Switch Option

The IEC VOLTAGE DIPS module uses solid state electronic transfer switch technology to meet the IEC 61000-4-11 and IEC 61000-4-34 Test requirement for voltage dips and short interruptions with voltage slew rates less than 5 usec. This allows full compliance testing of equipment for CE compliance.

IEC 61000-4 Voltage Dips

The EPTS Series of Electronic Power Transfer Switches are designed to support full-compliance voltage dip testing for any dip level. It requires the use of AC mains or fixed AC generator for the nominal 100% test level and a programmable AC power source for the dip level needed. For IEC 61000-4-29 DC Dips and Variations testing, an AFX base ECTS system and an additional DC power supply are required.

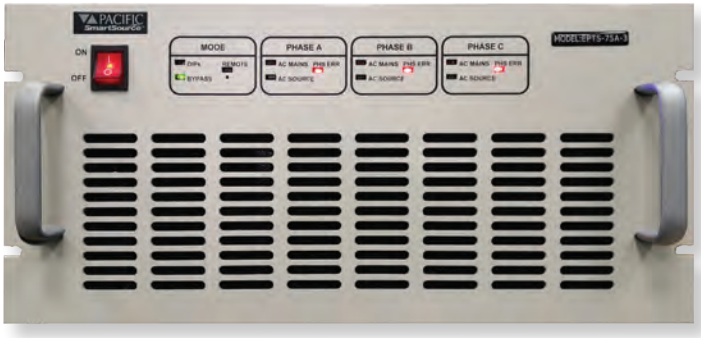
Power Connections

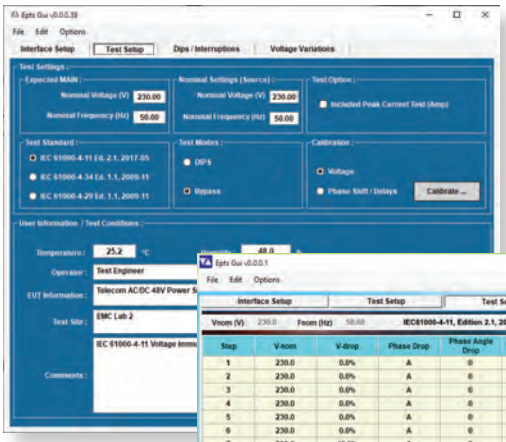
All power connections are made at the rear panel of the EPTS chassis. There are no user controls on the front other than the power On/Off switch. Status and Error indicators are provided for each phase. The EPTS generates a phase sync signal from the AC Main input to synchronize the programmable AC source. All control of the programmable AC power source and the EPTS is done using the included Windows IEC Test software.

Available Models:

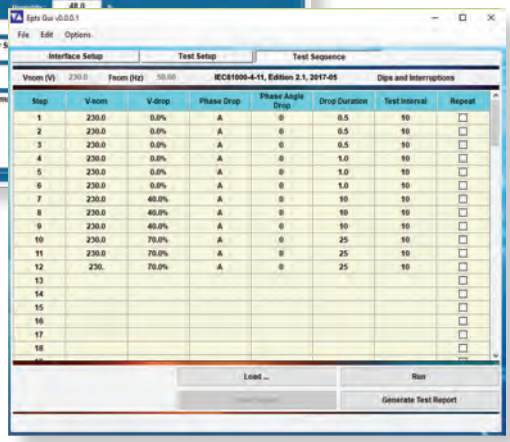
Model	*Description*
EPTS-16A-1	Transfer Switch, 16A, Single Phase
EPTS-16A-3	Transfer Switch, 16A/phase, Three Phase
EPTS-32A-1	Transfer Switch, 32A, Single Phase
EPTS-32A-3	Transfer Switch, 32A/phase, Three Phase
EPTS-75A-1	Transfer Switch, 75A, Single Phase
EPTS-75A-3	Transfer Switch, 75A/phase, Three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

Refer to EPTS Option Datasheet for technical specifications.





GUI - Test Setup Screen



GUI - Test Sequence Screen

Ordering Information:

Standard LMX Based Systems	
ECTS2-108L	750 VA Test System, Single Phase, 3 Arms @ 230V + LFZ-1-16. ECTS2-108L: No Cabinet. No cabinet. This inexpensive, low power system is ideally suited for lighting product (Class C) harmonics and flicker test requirements
ECTS2-140L-A	4 kVA Test System, Single Phase, 16 Arms @ 230V + LFZ-1-16. ECTS2-140L-A, Installed in 18U Cabinet.
ECTS2-160L-A	6 kVA Test System, Single Phase, 16 Arms @ 230V + LFZ-1-16. ECTS2-160L-A, Installed in 18U Cabinet.
Included Hardware	AC Power Source, Measurement System, Lumped Flicker Impedance, Receptacle Panel, System Wiring, Power Input Terminals
Included Software	HFa16 Software for IEC 61000-3-2 Harmonics and IEC 61000-3-3 Flicker Testing, PPSC Manager AC Source Control, PPSC Test Manager License, IEC-AC-4xx Test Sequences Bundle (IEC 61000-4-11, IEC 61000-4-14, IEC 61000-4-27, IEC 61000-4-28 and IEC 61000-4-34)
Documentation	User Manuals (PDF Format), Calibration Certificates

Options	
-413	IEC 61000-4-13 Harmonics and Inter Harmonics test option, includes Interharmonics Generator in AC Source and test sequences
EPTS-1-16A	Transfer Switch, 16A, Single Phase
Avionics Test Sequences	Various standards available. Consult factory for available options
Customization	Alternative configurations, power levels, outlet panels etc. are possible. Consult factory for custom configurations

Standard AFX Based Systems	
ECTS2-360F-n	6 kVA System, Single Phase, 26 Arms @ 230V + LFZ-1-16 Impedance
ECTS2-3150F-n	15 kVA System, Single, Split and Three Phase, 21.7 Arms/Phase @ 230V in 3 Phs Mode + LFZ-3-16 Impedance
ECTS2-3300F-n	30 kVA System, Single, Split and Three Phase, 43.3 Arms/Phase @ 230V in 3 Phs Mode + LFZ-3-40 Impedance
ECTS2-3450F-n	45 kVA System, Single, Split and Three Phase, 65.0 Arms/Phase @ 230V in 3 Phs Mode, LFZ-3-40 & LFZ-3-75 Impedances
ECTS2-3600F-n	60 kVA System, Single, Split and Three Phase, 86.9 Arms/Phase @ 230V in 3 Phs Mode, LFZ-3-40 & LFZ-3-75 Impedances
ECTS2-3750F-n	75 kVA System, Single, Split and Three Phase, 108 Arms/Phase @ 230V in 3 Phs Mode, LFZ-3-40 & LFZ-3-75 Impedances
ECTS2-3900F-n	90 kVA System, Single, Split and Three Phase, 130 Arms/Phase @ 230V in 3 Phs Mode, LFZ-3-40 & LFZ-3-75 Impedances
Included Hardware	AC Power Source, Measurement System, Lumped Flicker Impedance, Receptacle Panel, System Wiring, Power Input Terminals, Cabinet
Included Software[1]	HFa16 or HFa75 Software for Harmonics and Flicker Testing[1], PPSC Studio AC Source Control, PPSC Test Manager License, IEC-AC-4xx Test Sequences Bundle (IEC 61000-4-11, IEC 61000-4-14, IEC 61000-4-17, IEC 61000-4-27, IEC 61000-4-28, IEC 61000-29 and IEC 61000-4-34)
Documentation	User Manuals (PDF Format). Calibration Certificates

Note 1: Systems capable of 16A current per phase include HFa16 software license. System capable of more than 16A/phase include HFa75 software license. Either license can be added as an option.

ECTS2-3xxxF-n Cabinet Specifiers	
None	No cabinet included. For bench use or customer cabinet installation
A	All components installed in 18U Cabinet
B	All components installed in 28U Cabinet
C	All components installed in one or two 36U Cabinets

Options	
HFa16	Harmonics & Flicker test software for EUT's up to 16A per phase
HFa75	Harmonics & Flicker test software for EUT's up to 75A per phase
-413	IEC 61000-4-13 Harmonics and Inter Harmonics test option, includes Interharmonics Generator in AC Source and test sequences
EPTS-xx-1 / -3	IEC 61000-4-11 / IEC 61000-4-34 Electronic Power Transfer Switch
Avionics Test Sequences	Various standards available. Consult factory for available options
Customization	Alternative configurations, power levels, outlet panels etc. are possible. Consult factory for custom configurations

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).