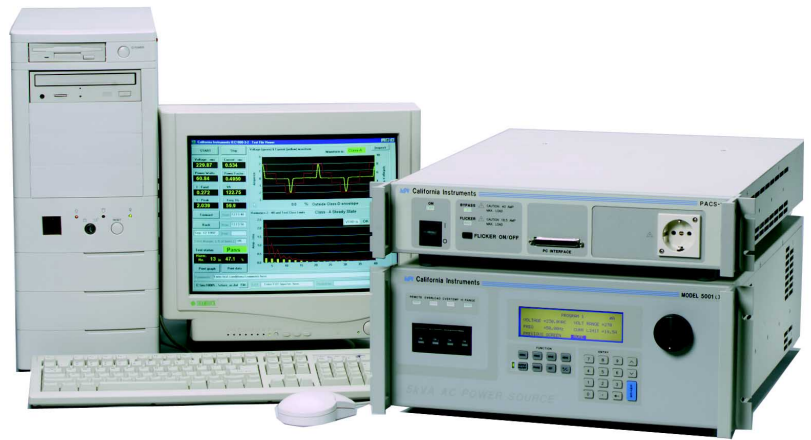


CTS Series



IEC Compliance Test Systems

*Complete test solutions for emissions
and immunity compliance testing of AC
and DC powered products.*

Version 3.0

CTS Series

CTS Series - Certified, Unique and Cost-Effective...

A growing number of electronic products manufactured today has to meet international regulatory requirements for emissions and immunity. This is particularly true for products sold in the European community as well as a growing list of countries in the Far East. The California Instruments CTS Series provides a cost-effective test solution aimed at verifying product compliance to a large number of AC and DC related harmonized test standards.

The California Instruments CTS system is used by many EMC labs around the world and is widely recognized for its wealth of features and capabilities combined with its ease of use.

Compliance Testing to:

- **EN / IEC 61000-3-2**
Harmonics - Including Am 14, < 16 Arms/Phase
- **EN / IEC 61000-3-12¹** (standard under development)
Harmonics, < 75 Arms/phase
- **EN / IEC 61000-3-3**
Flicker Measurement, < 16 Arms/phase
- **EN / IEC 61000-3-11²**
Flicker Measurement, < 75 Arms/phase
- **EN / IEC 61000-4-11 (option)**
AC Voltage Dips and Variations (option)
- **EN / IEC 61000-4-13 (option)**
Harmonics & Interharmonics (option)
- **EN / IEC 61000-4-14**
AC Voltage Fluctuations
- **EN / IEC 61000-4-17**
DC Ripple
- **EN / IEC 61000-4-28**
Frequency Variations

Pre-compliance Testing to:

- **EN / IEC 61000-4-27**
Three phase AC Voltage Unbalance
- **EN / IEC 61000-4-29**
DC Voltage Dips and Interruptions

NPL Certified Compliance

The CTS System has been certified by the National Physics Laboratory (NPL) in the United Kingdom for full compliance with the IEC Harmonics and Flicker standards. The NPL is an independent test laboratory and a recognized authority on AC calibration.

Unique Features and Benefits

The CTS Series of test systems provides the following unique benefits:

- Single and Three phase systems to accommodate a range of power levels.
- Direct PC bus access data acquisition system provides high sampling rate and resolution for accurate measurements and high speed data transfers, even in three phase mode, unlike competing IEC test systems which provide only limited throughput using IEEE-488.
- PC based harmonic and flicker test software provides real-time full color data display updates and continuous PASS/FAIL monitoring.
- Support for both **European** and **Japanese** standards.
- Simple user operation under Windows provides IEC test setup, data analysis, display and MS Word test reports.
- High resolution, no gap acquisition data storage to disk in ASCII format for post-acquisition analysis and reporting.
- Single Step and Fast Forward replay of recorded test data.

Cost-Effective and Upgradable

The use of PC based acquisition and processing of data and test limits provides a cost effective platform that can grow with your needs and ensures that more processing power will be available in the future without costly hardware upgrades. Single phase systems can be upgraded to three phase capabilities when your test load demands it.

The iX Series AC power source used in CTS systems (except 1251RP-CTS) provides a wealth of features and capabilities for other AC and DC power applications as well, further enhancing your return on investment.

Note 1: Support for future EN/IEC 61000-3-12 standard will require additional software which is not included. Three phase testing to 75 A/phase also requires a higher power AC source. Contact factory for details.

Note 2: Maximum current per phase supported on CTS is 37 A/phase for EN/IEC 61000-3-11 Flicker test. Contact factory for requirements above 37 A/phase.

CTS Series - Modular System Components

AC Power Source

Available in a choice of power levels ranging from 1250 VA to 30,000 VA, CTS Systems cover the complete range of single and three phase products that need testing to conform with existing and pending IEC standards. All iX Series AC sources meet IEC requirements for low voltage distortion and offer arbitrary waveform generation, precision measurements, and waveform analysis capabilities. Actual AC Source voltage distortion is measured in real-time during the harmonics test and any distortion that could affect the test results is clearly indicated.

All iX Series based CTS systems support full compliance testing for several IEC 61000-4 AC immunity standards as well (certain options may be required, see ordering information for details).

For cost sensitive situations, the entry-level 1251RP source based CTS system may be used to perform full compliance harmonics and flicker testing of low power loads with current crest factors of three or less.

Direct PC Data Acquisition

A high speed digital signal processor based data acquisition system is used to implement the required IEC compliance measurement system. Direct access to the PC bus ensures a much higher data throughput capability than typically found in single box IEC test systems that use the IEEE-488 instrumentation bus to communicate with the PC.

This architecture offers several advantages, not the least of which is the ability to support future versions of test standards by merely installing new PC software. This greatly reduces the risk of product obsolescence as test standards evolve. Furthermore, since the data is streamed to hard disk in real-time, a complete data record is created each time which may be used for audit purposes, further analysis or to prove compliance to the test standard.

A special signal conditioning and isolation unit is used to provide quick and easy connection between the AC source output and the Equipment Under Test. This unit provides the required isolation, signal conditioning and anti-alias filtering for the measurement system. The equipment under test can be plugged in the front panel mounted European style outlet (single phase systems only), or wired to a rear panel mounted terminal block.

Harmonics Analyzer

A key part of the CTS system is the IEC compliant power analyzer which provides detailed information on both voltage and current. Measurements of both harmonics and interharmonics are made in real-time with no measurement gaps to fully conform to the latest revision of the IEC 61000-4-7 test standard. AC source voltage and EUT power are monitored continuously during the entire test. Voltage distortion and current harmonic data is checked against IEC class limits for pass or fail detection. Comprehensive test reports can be generated easily.

Test limits are retained in a password protected database and can be updated if needed in the future without the need to change software. Other software changes as a result of changing IEC harmonics standard can be accomplished by simply installing new PC software. No harmonics testing software resides in system firmware which would require more costly field upgrades.

Flicker Reference Impedance

An IEC 868 compliant flicker meter is an integral part of the CTS software. The required IEC 725 compliant reference impedance is implemented in the iX Series AC Source using programmable output impedance. Programmable impedance offers improved accuracy compared to a lumped reference impedance and the ability to support different national standards without the need to switch out lumped reference impedance hardware. A good example is testing for compliance with the Japanese harmonics and flicker standard, which requires different impedance values to be programmed from the European test standard.

Optionally, a lumped impedance compliant with IEC 725 can be ordered for single or three phase iX Series based CTS systems. For three phase CTS systems, a lumped impedance option is recommended. The GUI software can be configured to use either impedance type during flicker testing.

The 1000iX-CTS and 30003iX-CTS systems do not support programmable impedance and require option -LR2 or -LR4 for flicker testing.

The 1251RP-CTS system comes standard with a lumped impedance which is integrated in the PACS-1RP.

Model 15003iX-CTS 15 kVA three phase test system shown in optional Cabinet

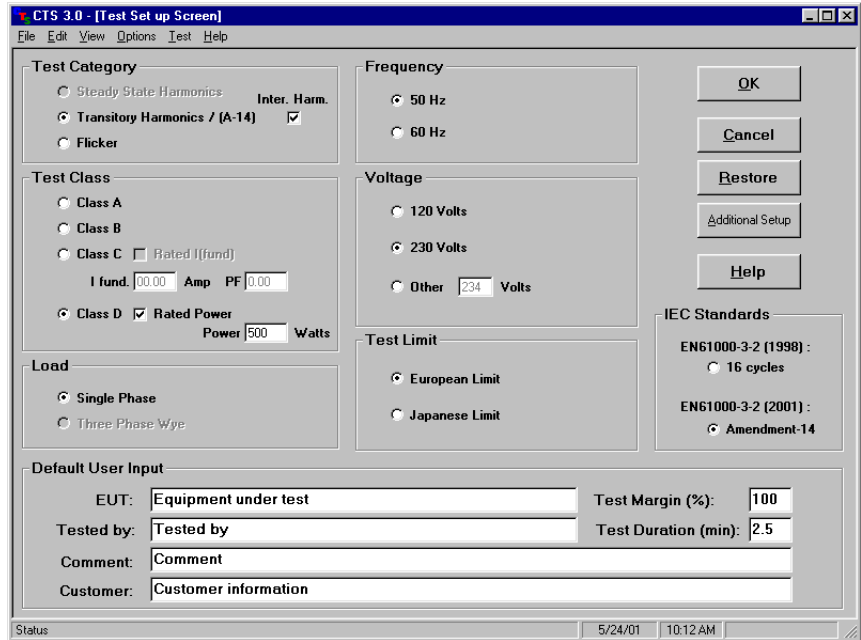


CTS Series - EN / IEC 61000-3-2 Harmonics Test - Includes Amendment 14

The CTS system offers full compliance harmonics testing per EN/IEC 61000-3-2 and is ready for EN/IEC 61000-3-12 (additional software will be required). Third generation software version 3.0 implements the latest revisions of the test standard.

The CTS system supports several new capabilities that are required to meet Amendment 14 of the IEC 61000-3-2 harmonics standard now and in the near future. This includes measurement of both harmonics and interharmonics and Partial Weighted Harmonics Distortion (PWH) evaluation per the latest IEC 61000-4-7 standard (General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto).

Despite these advanced capabilities, the CTS system remains as easy to use as it has been from its first inception.



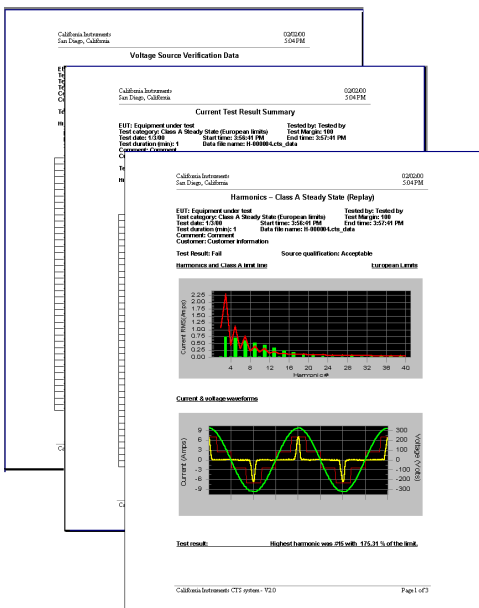
CTS System GUI Setup Window

Test Selections

At the onset of a harmonics test, the operator is able to select from a number of options using the setup screen shown here. Version 3.0 of the CTS software supports both the IEC 61000-3-2:1998 standard which may be used up until January 1, 2004 as well as the new Amendment 14 revision which may be used as of January 1, 2001. The newer standard limits the number of products that are class D to TV's, PC's and PC monitors. All other products that are not class B or C are classified as class A. This eliminates the need to check for the special current waveform on class D products as was the case under the prior revision of the harmonics standard. When selecting the older standard, the CTS system will acquire data in 16 cycle windows and perform an automatic class A or D check based on the current waveform template. When selecting Amendment 14, the IEC 61000-4-7 standard referenced in Amendment 14 is used and data is acquired in 10 cycles per window for 50 Hz EUT's and 12 cycles per window for 60 Hz EUT's. (200 msec time windows).

The power level of class C or D EUT's can be entered based on the manufacturer's rating. The CTS system will verify that the averaged EUT power is within 10 % of stated value and recalculate the limits for class C and D products if it is not in accordance with Amendment 14.

The operator can select nominal voltage and frequency for the EUT, all from the same setup screen. If needed, the Japanese evaluation method may be selected in lieu of the more common European standard. Settings can be saved to disk for later recall and are also retained with the data records of any test run.



Harmonics Test Report in MS Word

Simple buttons start and stop automated test.

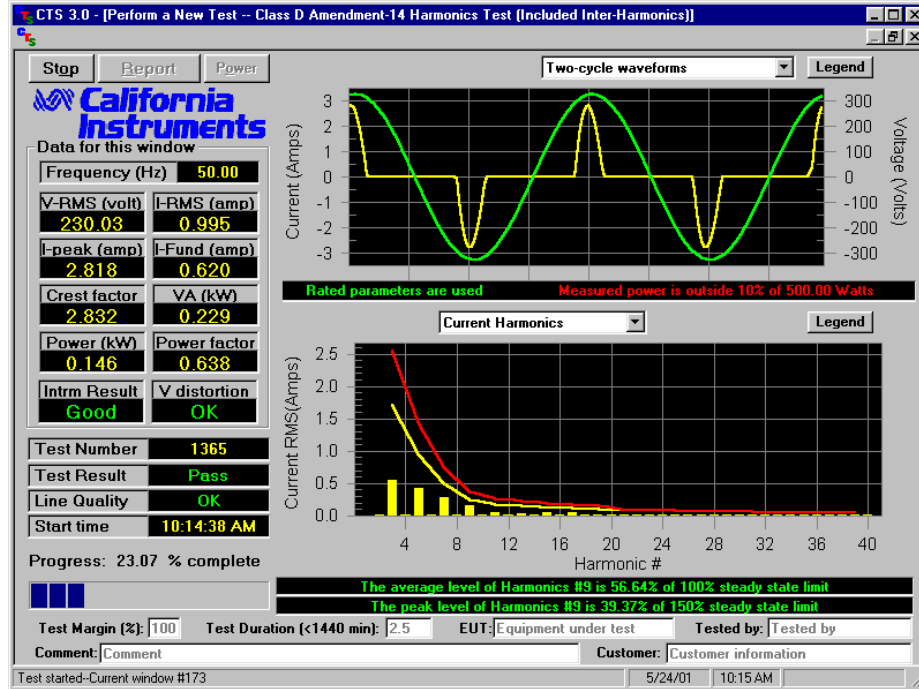
Key EUT electrical parameters are updated continuously.

User selectable test limit margin.

Test start time and test progress are clearly indicated.

Clearly marked Pass (Green) or Fail (Red) indication is active during the entire test run. AC Source distortion is also monitored at all times.

Graphs and reports provide complete test data documentation.



IEC Harmonics Test Window

Both Voltage and Current waveforms are shown in real-time.

Bottom graphs show current harmonics against IEC class limits. The user can also view the source voltage harmonics in real-time.

Equipment Under Test description and operator ID are added to all test reports.

Simple User Interface

All IEC Harmonics tests can be accessed from a single control and data display window on the PC. Simple on screen buttons control test setup and execution. During the test run, voltage and current time domain waveform displays are updated in real time. The left part of the display shows all power analyzer parameters for the EUT such as V_{RMS} , I_{RMS} , I_{FUND} , I_{PEAK} , Real Power, Apparent Power and Power Factor. The current harmonics window displays instantaneous current harmonics and a line marking the applicable test limits. During the entire test run, a clear PASS or FAIL indication is provided. Voltage distortion of the AC source is monitored during the entire test. Information about the operator and the unit under test can be entered. A general user comment field is provided to enter any relevant data concerning the test.

Available Data Displays

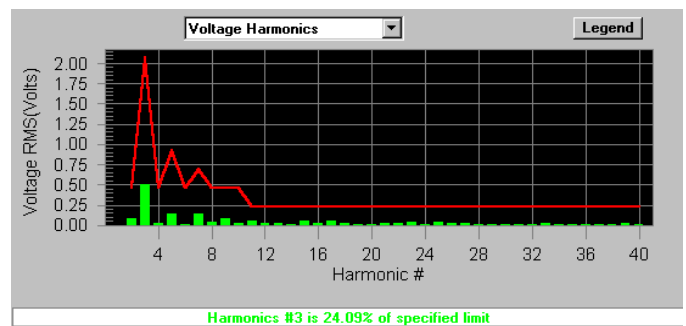
The following graphics displays are provided in Harmonics mode:

- Voltage and Current time domain
- Current Harmonics and IEC limits graph
- Source voltage distortion and IEC limit
- AC Source Voltage Harmonics and IEC limits graph
- Numeric display of F , V_{RMS} , I_{RMS} , I_{FUND} , I_{PEAK} , PF, W, VA

Test Reports & Data Records

A complete IEC harmonics test report, which includes all test results for the EUT, can be printed at the end of the test in MS Word format. This report includes voltage and current waveform graphs, current harmonic tables and class limits. A sample report is shown on the opposite page.

All graphs are included in the test report or can be copied to the Windows® Clipboard for inclusion in custom reports. In addition to these harmonics test reports, the CTS system also delivers comprehensive test data records - including voltage and current timing waveform data - on disk for use in detailed reporting or further data analysis applications. Data is stored in both compact binary and ASCII format files. The latter format can be loaded directly in popular spreadsheet programs. A test file replay mode is supported by the CTS system software that allows frame by frame playback of test data files for detailed analysis of EUT behavior. This replay capability also allows the CTS owner to submit test data to California Instruments for review so he can benefit from the experience of our technical staff when interpreting test results.



Real-time Voltage Distortion against IEC limit

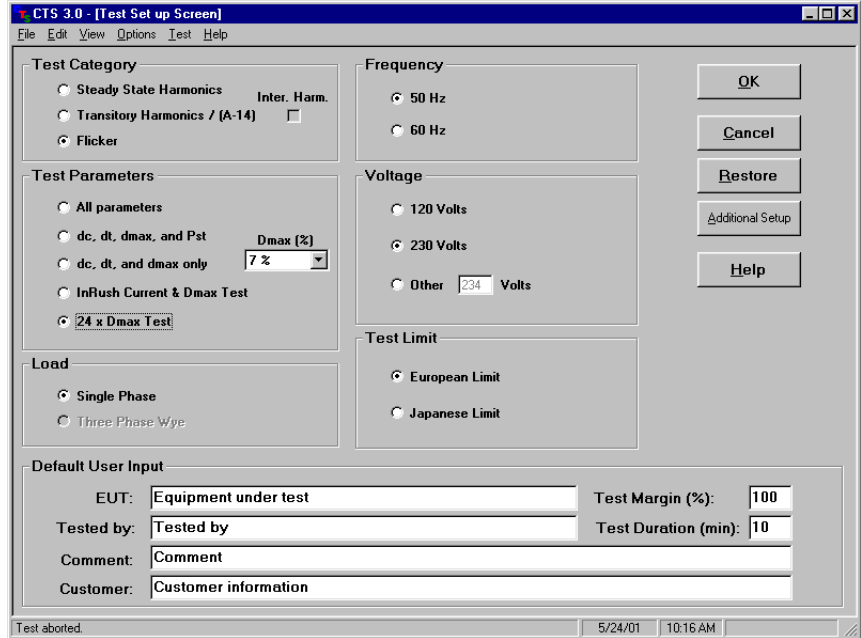
CTS Series - EN / IEC 61000-3-3 Flicker Test - Includes Amendment 1

The CTS system offers full compliance flicker testing in accordance with the latest revisions and amendments of the EN/IEC 61000-3-3 and EN/IEC 61000-3-11 flicker standards.

New in version 3.0 is measurement of EUT inrush current, semi-automatic data acquisition and average calculation for 24 each d_{max} tests and the new limit of 3.3 % for d_t and d_c parameters.

A choice of programmable and lumped reference impedances is available for either European or Japanese test requirements.

The CTS system remains one of the few flicker test systems that provide real-time flicker results while the flicker test is in progress, eliminating the need to wait for the end of a two hour test run only to find out an EUT failed.



CTS System GUI Setup Window

Test Selection

Flicker tests can be run at either 230 V, 115 V or a user specified nominal EUT voltage and at 50 or 60 Hz. While presently no official standard for 60 Hz flicker exists, the CTS system applies an equivalent algorithm based on standards work presently underway for 60 Hz flicker evaluation.

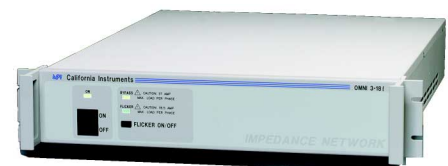
With the release of the latest IEC 61000-3-3 (including Amendment 1, 2001-01) and IEC 61000-3-11 flicker standards, the operator has an increased number of options for different types of EUT's. This is particularly true for the evaluation of d_{max} . These new choices are fully supported by the CTS system.

Test selections are made in much the same way as is the case for harmonics tests, providing a consistent user interface. Frequently used settings can be saved to disk if needed and any setup used is automatically saved with the test data recorded for possible replay later.

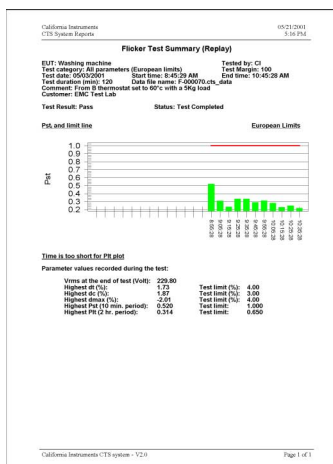
Test times for flicker generally extend up to two hours depending on the type of EUT. The CTS flicker mode can be run unattended. A large PASS or FAIL marquee can be set to appear on the PC screen at the end of the test which can be seen across the room. This means operator time can be used elsewhere more productively while the flicker test is in progress.

IEC 725 Reference Impedance

The required IEC 725 flicker reference impedance is automatically engaged when a flicker test is executed. iX Series AC power source based CTS configurations (except 1000iX-CTS and 3000iX-CTS) can use the programmable output impedance of the AC Source. For three phase CTS systems, a lumped reference impedance is recommended. See application note 119 for details.



Lumped Reference Impedance Option - LR3



Flicker Test Report in MS Word

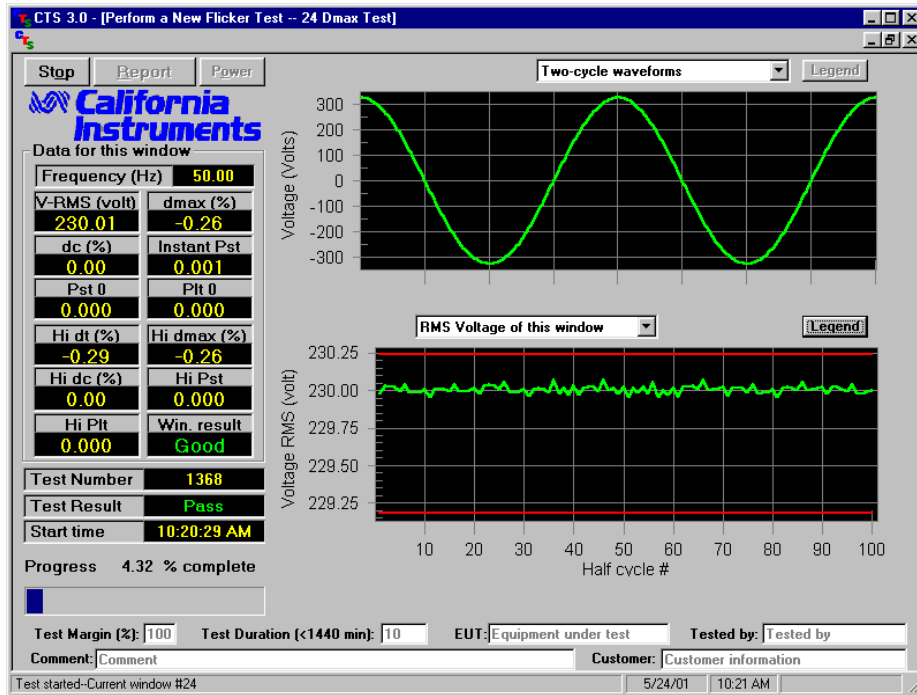
Start and Stop Flicker tests with the click of a button.

Start time, current time and stop time monitoring.

Highest values found during test are continuously shown and updated.

Clear Pass (Green) or Fail (Red) indication leaves no doubt about the test result.

User selectable test time.



Select test parameters and data display options.

IEC Test limits can be changed for pre-compliance applications.

Real time display of d_t , d_c and V_{rms} .

Continuous readouts of V_{rms} , d_{max} , d_c , P_{st} and P_{it} provide test progress feedback.

Equipment Under Test description and operator ID are added to all test reports.

IEC Flicker Test Window

Simple User Interface

The Flicker and harmonics test modes use similar, easy to use interfaces. Setup is minimal and test runs can be started quickly. During the test run, graphical displays of V_{RMS} , d_c and d_t as a function of time are updated continuously. The bottom part of the display shows Flicker test related parameters for the EUT such as V_{RMS} , d_{max} , d_c and d_t . At the end of the test sequence, short term (P_{st}) and long term Flicker (P_{it}) are calculated and a clear PASS or FAIL indication is provided.

Available Data Displays

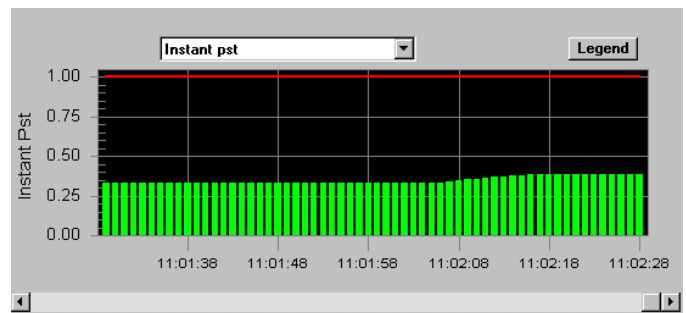
The following graphics displays are provided in the IEC 61000-3-3 test program:

- Chart of d_c and d_t versus time
- Chart of V_{RMS} versus time
- Color PASS/FAIL indicator
- Numeric display of V_{RMS} , d_{max} , d_c , P_{st} , and P_{it}
- Numeric display of maximum d_c , d_{max} , d_t , P_{st} and P_{it}

Test Reports and Data Logging

A Flicker test report can be printed at the end of the test in MS Word format. This report includes all flicker test results for the EUT. Inrush current and d_{max} measurement results if selected are included in the report. A sample report is shown on the opposite page.

The CTS system also records comprehensive test data records on disk for use in detailed reporting or further data analysis applications. Flicker data is stored in both compact binary and ASCII format files. The latter format can be loaded directly in popular spreadsheet programs. A test file replay mode is supported by the CTS system software that allows the CTS owner to submit test data to California Instruments for review so he can benefit from the experience of our technical staff when interpreting test results.



Real-time display of instantaneous Pst

CTS Series - EN / IEC 61000-4 Immunity Test¹

CTS systems extend their usefulness by offering a wide range of Immunity tests in addition to Harmonics and Flicker emission tests. These AC immunity tests are controlled from the PC using the included CIGUI32 AC source control software.

Pass or Fail results are determined by the operator based on an evaluation of the condition of the equipment under test at the end of the test run. Operator observations made during the test and settings used are included in the MS Word format test report.

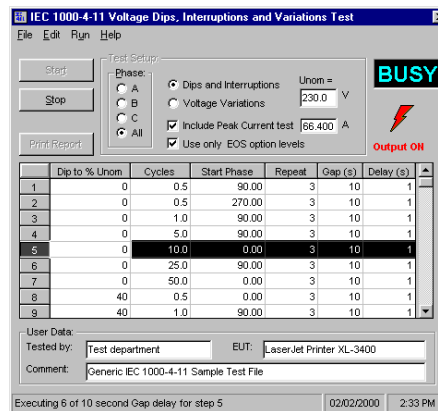
Test parameters for most EN/IEC 1000-4 tests are set by product committees for various product categories. The CIGUI32 software allows test parameters for any number of EUT's to be saved to disk. This makes it easy to create a library of commonly used IEC test setups for quick recall.

In addition to the IEC immunity tests, avionics power test standards Mil-Std-704 and RTCA DO-160 are available as options on iX power source based CTS systems.

EN / IEC 61000-4-11²

The Voltage Dips and Interruptions tests are included in the AC source control program supplied with the CTS system. The operator is presented with a simple screen that shows the type of test that will be run and the test duration. The operator can enter the desired nominal test voltage and frequency.

Clearly labeled buttons are provided for Test Run and Test Abort. Test parameters can be changed by the user if needed to accommodate different test levels called out by product standard committees. For AC source compliance, the EOS option is required. This option is available on 3001iX-CTS, 5001iX-CTS and 15003iX-CTS systems.

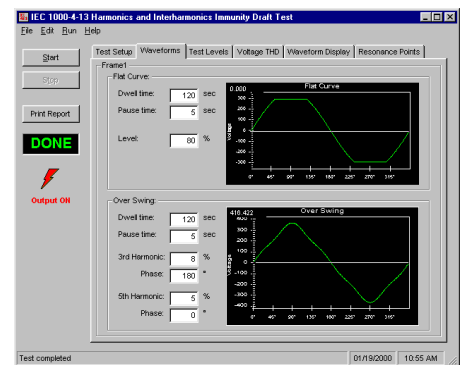


EN/IEC 61000-4-11 Test Window

EN / IEC 61000-4-13³

The iX Series AC/DC Source can be equipped with the -413 option to provide full support for EN/IEC 61000-4-13 harmonics and Interharmonics testing. An independent, digitally controlled sweep generator is used to superimpose interharmonics on the AC output. The AC source's data acquisition system is used to determine EUT resonance points during the frequency sweep test. Flat top curve and overswing curve waveforms are generated using the arbitrary waveform generation capability of the iX Series AC/DC source.

At the end of the test run, a detailed test report can be printed for complete documentation of test setup and results.



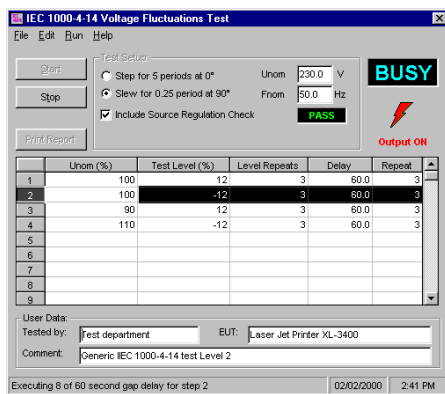
EN/IEC 61000-4-13 Test Window

¹) Compliant IEC 61000-4 Tests are not supported on RP-Series based CTS systems or systems without an AC source (100-CTS & 300-CTS-75).
²) IEC 61000-4-11 AC Source compliance requires -EOS option. ³) IEC 61000-4-13 test requires iX Series with -413 option.
⁴) IEC 61000-4-17, -27 and -29p test requires iX Series based CTS systems. 4-27 and 4-29 are pre-compliance only.

EN / IEC 61000-4-14

This test applies a series of precisely timed voltage fluctuations to the equipment under test. The nominal voltage and frequency of the EUT can be set by the operator.

Test levels are pre-programmed for level 1 and level 2 class EUT's or can be modified and saved to disk easily if needed. Changes can be made on screen using a spreadsheet style data entry grid and saved to disk. These test setups can be quickly recalled for application to different EUT's.

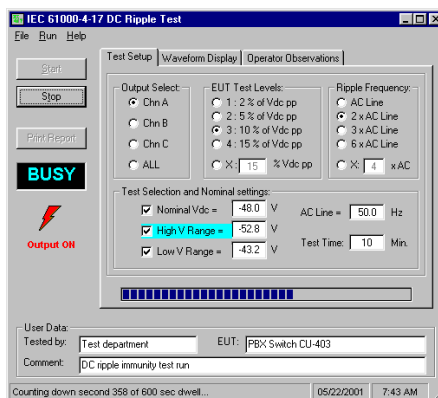


EN/IEC 61000-4-14 Test Window

EN / IEC 61000-4-17⁴

This test applies a DC ripple level in percent of DC nominal to the EUT. The test is done at nominal, high and low DC voltage levels. The ripple frequency can be programmed as a multiple of the AC line frequency. Test parameters are pre-programmed or can be modified easily if needed.

The DC voltage applied to the EUT is acquired by the power source and displayed graphically for reference.

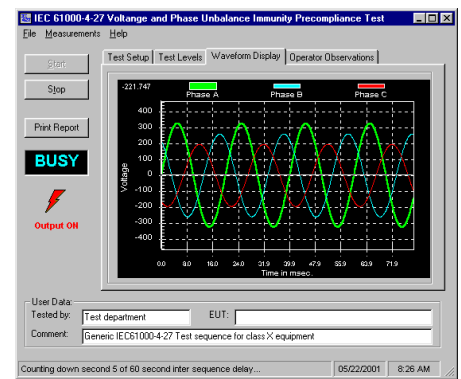


EN/IEC 61000-4-17 Test Window

EN / IEC 61000-4-27p⁴

This test applies a series of three phase voltage and phase angle unbalance conditions to the EUT. Test levels for EUT classes 2 and 3 as well as X (user defined) are provided. Additional test levels may be entered and saved for later recall as needed. Output voltage waveforms for all phases are acquired and displayed graphically during the test.

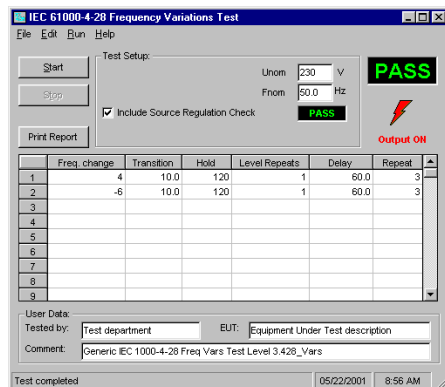
The AC source meets most of the test generator requirements and supports pre-compliance testing to this standard.



EN/IEC 61000-4-27 Test Window

EN / IEC 61000-4-28

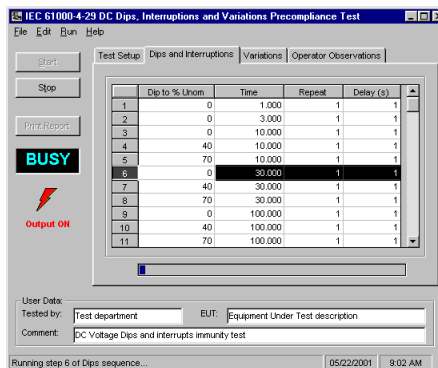
This test applies a series of slowly changing frequency variations to the EUT. The level and duration of the frequency shift can be set by the operator or recalled from a file. Test levels 2, 3 and 4, as specified by the IEC standard, are provided with the program. The user is capable of specifying a library of test sequences and test levels for different product categories. These test setups can be quickly recalled for application to the EUT.



EN/IEC 61000-4-28 Test Window

EN / IEC 61000-4-29p⁴

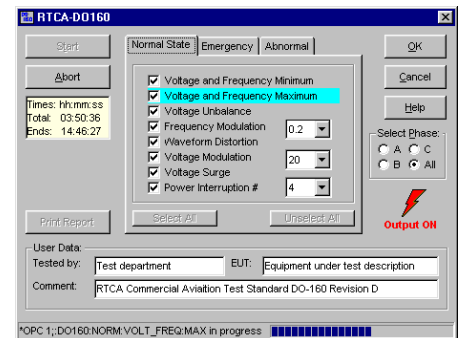
This test is similar to the IEC 61000-4-11 test but applies to DC powered products. A series of DC voltage dips, interruptions and variations is applied. Test levels and durations are generally defined by product category and can be entered using a spreadsheet data entry grid and subsequently saved to disk for later recall. The AC/DC source meets most of the test generator requirements and supports pre-compliance testing to this standard.



EN/IEC 61000-4-29 Test Window

MIL-STD-704 and DO-160

In addition to the European immunity test standards, the CTS system can be configured with Mil-Std-704E and RTCA/DO-160D Avionics power immunity test options. (-704 and -160 respectively). The -160 option includes the new EUROCAE ED-14D standard (115 V). These firmware options implement testing to these standards to further enhance the usefulness of the CTS test system. Available on iX Series based CTS systems only.



RTCA / DO-160D Test Window

CTS Series - Report Generation

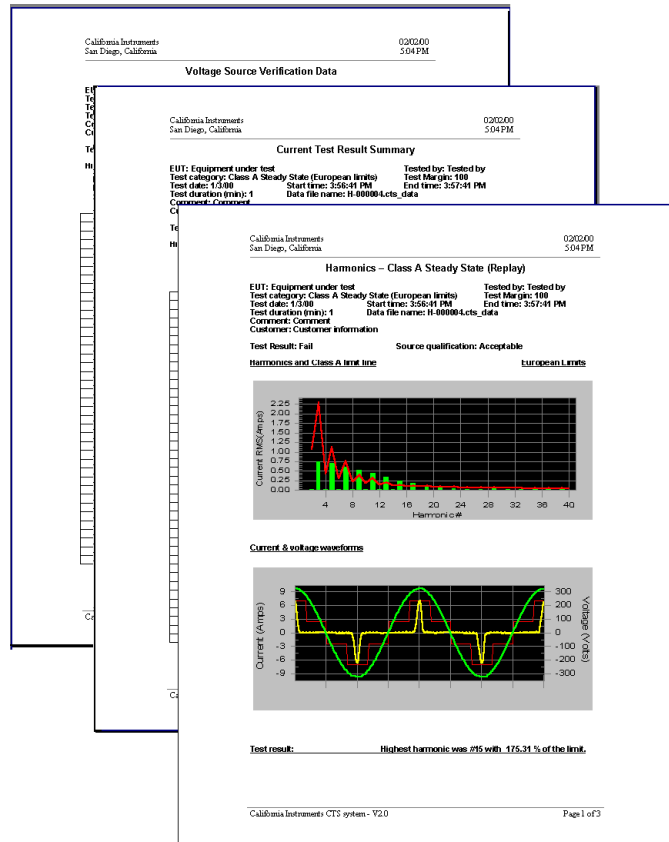
MS Word Test Reports

Test reports for harmonics, flicker and immunity tests are generated using MS Word format. This widely used report format can be integrated into more elaborate user specific reports covering all aspects of compliance testing if needed.

Test reports contain data on the EUT, the test lab and operator, all measurement results and a clear pass or fail indication. Harmonics test reports include current harmonics and voltage harmonics data in both bar charts and tabular formats.

Detailed measurement data is also available on disk and can be exported to a tab delimited ASCII text format for use in other application programs such as MS Excel. This allows further analysis of the acquired data for engineering troubleshooting purposes of EUT's that did not pass.

Note: A copy of MS Word must be installed on the PC to generate test reports.



CTS Series - PACS Specifications

The Power Analyzer and Conditioning System unit provides the required interface between the AC source, the Equipment Under Test and the PC. A high current (75 Arms) version, PACS-3-75, is supplied with 30003iX-CTS systems.

PACS Model:		PACS-1	PACS-3 (PACS-3-75)
Number of phases		1	3
Channels	Voltage and Current	2	6
Connector Style	Front panel	CEE/77 front	none
	Rear panel	terminal block	terminal block
Maximum voltage	Front panel	240 Vac	n/a
	Rear panel	300 Vac	480 Vac
Maximum current	Front panel	16 Arms	n/a
	Rear panel	40 Arms	40 Arms/ph (75 Arms/ph)
IEC 725 Reference Impedance ¹	RP-Series CTS:	internal	n/a
	iX-Series CTS:	programmable Z	programmable Z
	Optional Lumped:	option -LR1	option -LR3/-LR4
Input Power	Voltage	115 / 230 V ± 10 %	115 / 230 V ± 10 %
	Current / Frequency	< 0.5 A / 50 or 60 Hz	< 0.75 A / 50 or 60 Hz
Dimensions	HxWxD	3.5 x 16.8 x 22	5.25 x 16.8 x 22
	HxWxD	89 x 427 x 560	134 x 427 x 560

¹ 30003iX-CTS systems do not offer programmable impedance and require option -LR4 for Flicker test. Options -LR1 and -LR3 may be added to 3001iX-CTS / 5001iX-CTS or 15003iX-CTS configurations to be used in lieu of the standard programmable impedance. Option -LR1 is built-in to PACS-1. Option -LR3 and -LR4 consist of OMNI-3-18i and OMNI-3-37i respectively. See OMNI data under options on last page.

CTS Series - Measurement Specifications

The following specifications are valid for the power analyzer portion of the CTS.

PC Based A/D Conversion

The Harmonics Analyzer is implemented using a high performance Digital Signal Processor based PC plug-in A/D card. This digitizer connects directly to the Power Analyzer and Conditioning System (PACS) unit through a shielded cable. No other connections between the PACS unit and the PC are required.

The use of a fast multi-channel A/D card that transfers data to PC memory using Direct Memory Access (DMA) enables the CTS to perform continuous measurements without any gaps in measured data, an important requirement for compliance with IEC 61000-4-7 as well as IEC 868.

Signal Conditioning

The Power Analyzer and Conditioning System (PACS) unit is used to provide isolation between the PC based acquisition system and the Equipment Under Test (EUT). Precision current transformers provide accurate current sensing over three different current ranges for maximum resolution. The PC based acquisition system captures data on all current ranges and automatically selects the appropriate range to use for further processing. This eliminates the need for range switching as is commonly done in conventional power analyzers.

Anti-aliasing filters are provided for all voltage and current channels to prevent unwanted frequency components from affecting the measurement results.

The PACS unit provides a convenient way for the user to connect the unit under test. A single signal cable connects between the PC and the PACS unit and provides all the analog and digital signals needed to and from the A/D card.

A high current version of the PACS-3 (PACS-3-75) is supplied with the 300-CTS-75 and 30003iX-CTS system.

Measurement	Specification	Unit	
Bandwidth			
Anti Aliasing	> 60 dB at 5 kHz		
Bandpass ripple	< 2 % up to 2.5 kHz	%	
Volts			
Range	0.001 - 312.00	V _{rms}	
Max. input	1000	V _{peak}	
Max. crest factor	5:1		
Accuracy	±0.1 % ± 0.05 % FS ± 3 mV		
Resolution	10	mV	
Voltage CMRR	80	dB	
RMS Current			
Current ranges (Auto ranging)	4, 16, 40 / 75	A _{rms}	
Highest range	40 / 75	A _{rms}	
Max. input [permanent, no damage if < 200 A _{peak}]	40 / 75	A _{rms}	
Max. CF [40 / 75 A Range]	5:1 / 2:5:1	@ max Irms	
Max. CF [4 A Range]	20:1	@ max Irms	
Accuracy	±0.1 % ± 0.05 % FS ± 3 mA	mA	
Resolution	1	mA	
Power			
Range	0.1 - 24,000	W	
Accuracy	±0.25 % ± 0.25 % FS ± 20 mW	mW	
Resolution	0.1	W	
Apparent Power			
Range	0.1 - 24,000	VA	
Accuracy	±0.15% ± 0.15% FS±20mVA	mVA	
Resolution	0.1	VA	
Power Factor			
Range	0.000 - ± 1.000		
Accuracy	± 0.005		
Resolution	0.001		
Crest Factor			
Range	20:1		
Accuracy	± 0.005		
Resolution	0.001		
Frequency			
Range	45.0 - 65.0	Hz	
Accuracy	0.01 % of reading	Hz	
Resolution	0.1	Hz	
Harmonic Analysis			
Range	Fundamental to 40 th		
Accuracy Fundamental	±0.05% FS±0.05%/kHz		
Accuracy Harmonics	±0.1 %±0.1%/kHz		
Interharmonics resolution	5	Hz	
Measurement window	10, 12 and 16 periods		
Smoothing filter	1.5	sec	
Flicker			
Pst	Range	0.1 - 10	Pst
	Accuracy	3	%
	Resolution	0.01	
Pit	Integration time	10	min
	Range	0.1 - 10	
dmax	Integration time	120	min
	Range	0 - 100	%
dc	Range	0.1 - 100	%
dt	Range	0.1 - 100	%
dt over 3.3%	Range	0 - 1000	ms



CI400PCI - PCI A/D Card



CI68C - PACS to PC Cable

Note: For three phase configurations, all specifications are for L-N. Phase angle specifications are valid under balanced load conditions only. For PACS-3-75 models, maximum current range is 75 Arms.

Ordering Information

For specifications on the AC power source included with each CTS system, refer to the relevant AC Source data sheet.

Model	VA Power	AC Source	EN61000-4	PACS model
Single Phase Systems				
100-CTS	AC Line	none	-	PACS-1
1251RP-CTS	1250 VA	1251RP	-	PACS-1RP
3001iX-CTS	3000 VA	3001iX	◆	PACS-1
5001iX-CTS (-400)	5000 VA	5001iX (-400)	◆	PACS-1
10001iX-CTS (-400)	10000 VA	10001iX (-400)	◆	PACS-1
Three Phase Systems				
300-CTS-75	AC Line	none	-	PACS-3-75
15003iX-CTS (-400)	15000 VA	15003iX (-400)	◆	PACS-3
30003iX-CTS (-400)	30000 VA	30003iX (-400)	◆	PACS-3-75

PC Requirements

The CTS requires the use of a PC capable of running Windows 98™ or Win XP/2000. Recommended PC hardware specifications are as follows:

CPU	Pentium 4/Celeron 1.6 GHz or faster.
RAM	256 Mbytes or more.
Hard Disk	2 Gbytes or more. 20 Mbytes required for program storage.
Display	Color SVGA Monitor
Slots	Available PCI slot for A/D card.
Software	MS Word, Windows
IEEE-488	For control of the power source, a National Instruments IEEE bus controller and available PC slot or RS232 port are required.

California Instruments will quote a PC as part of the system on request. Contact factory for details.

Included with each CTS system:

-PCI CI400PCI PCI Bus, 16 bit A/D Card.

iX Series based CTS Options:

-LR1	Lumped Reference Impedance for 3/5001iX-CTS configurations. Installed in PACS-1.
-LR2 ¹	Lumped Reference Impedance for 10001iX-CTS configuration.
-LR3 ²	Lumped Reference Impedance for 15003iX-CTS. (OMNI-3-18i)
-LR4 ¹	Lumped Reference Impedance for three 30003iX-CTS. (OMNI-3-37i)
-LR5	Japanese Lumped Reference Impedance (100 V) for single phase systems. (OMNI-1-37iJ)

-EOS1	EN/IEC 61000-4-11 AC source compliance Electronic Output Switch for single phase CTS Systems.
-EOS3	EN/IEC 61000-4-11 AC source compliance Electronic Output Switch for 15003iX System.
-411	EN/IEC 61000-4-11 Voltage Dips and Interruptions test option. (included with -EOS options)
-413	EN/IEC 61000-4-13 Harmonics and Inter-Harmonics test option.
-LNS	Internal AC Line Sync. (iX Series only)
-XLS	External AC Line Sync. (iX Series only)

General Options:

C	Cabinet. System installed in 19" instrument rack. Highly recommended for all three phase systems. Prefix 'C' to standard model number to order.
CIC-PC	Suitable Pentium class PC with preinstalled CTS and CIGUI software. Includes Case, keyboard, mouse, Windows 98SE and MS Word.
CIC-PCX	Adds 15 inch monitor and printer to CIC-PC.
-RMS	Rack mount slides.
Accessories:	
CI400PCI	Spare PCI A/D Card
CI68C	Spare 37 pin signal interface cable for PCI.

Higher Power Systems

For higher power three phase systems, contact factory.

Note 1: Required item for Flicker test.

Note 2: Option -LR3 is recommended for 15003iX-CTS systems. See App note 119 for details.

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