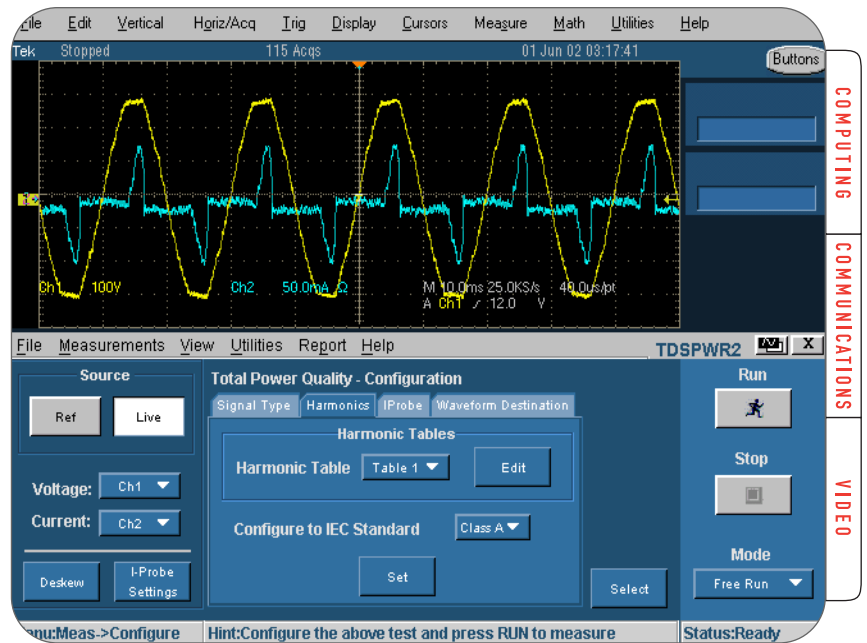


Test Pre-compliance to the EN61000-3-2 Current Harmonic Quality Standard



- ▶ **Power measurement and analysis software turns a TDS5000 or TDS7000 Series digital phosphor oscilloscope into an affordable, easy-to-use pre-compliance test tool.**

Introduction

As adding new power generation capacity becomes more difficult worldwide, power quality standards such as the EN61000-3-2 current harmonic standard governing power system disturbances are being implemented to maximize the efficiency of the existing total generation capacity. At the same time, the amount of electric power used by power electronic circuits – from low-power converters to high-power train drive systems – is continuously increasing. Even low-power equipment such as cellular-phone battery chargers can impact power system quality, due to the fact that thousands of such devices are simultaneously drawing power from the power network.

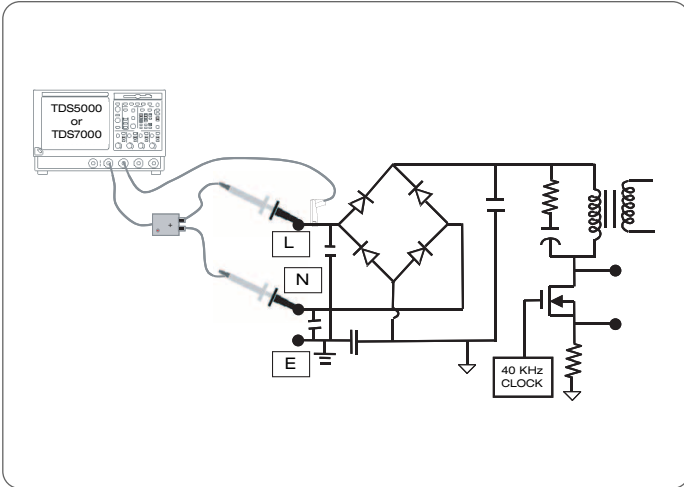
Power supply designers, working within regulatory requirements and faced with the challenge of improving efficiency while working with circuits that consume more power, must be able to characterize device performance and verify compliance. This calls for more complex analysis and measurements. For example, to ensure an AC/DC

power supply complies with EN61000-3-2, a designer needs to measure the current distortion of line-connected equipment, correct the power factor and then test for compliance. Power factor correction is typically accomplished using either a passive or active filter method, and then compliance tested on a full-compliance system, to which designers in many cases have limited access.

With the advent of sophisticated power measurement and analysis software such as Tektronix' TDS5000 or TDS7000 Series digital phosphor oscilloscope with TDS5000 or TDS7000 Series digital phosphor oscilloscope software, designers can use their digital phosphor oscilloscope to both analyze system performance and quickly test for pre-compliance from their bench, relying on the expensive full-compliance system only after the power supply is tested and has passed in a pre-compliance mode. A TDS5000 or TDS7000 Series digital phosphor oscilloscope with TDS5000 or TDS7000 Series digital phosphor oscilloscope software performs pre-compliance testing to the EN61000-3-2 standard and makes complete power quality measurements including true power, apparent power and power factor.

Test Pre-compliance to the EN61000-3-2 Standard

► Application Brief



► **Figure 1.** Pre-compliance test setup.



► **Figure 2.** I-probe impedance table menu.

Test Setup

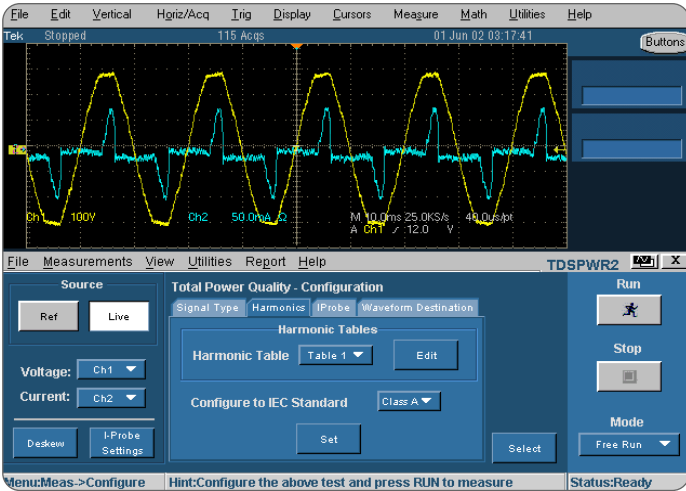
1. Connect the line voltage and current using Tektronix voltage and current probes. If Tektronix probes are used, the frequency response is automatically synchronized, ensuring accurate current harmonic results.
2. If you use non-Tektronix probes, TDS7000 will record the frequency response data in the frequency range of the current probe. Enter this data into the I-probe impedance table as shown in Figure 2. This data will be used in the limit table calculation portion of the pre-compliance test.

Configure and run the test:

EN61000-3-2 includes four classes of standards: Class A, B, C and D (see Table 1). TDS7000 supports pre-compliance testing to all four classes.

Table 1.

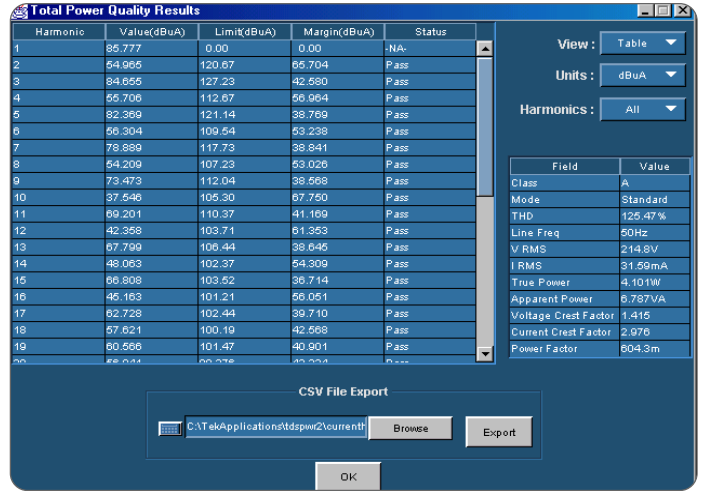
EN61000-3-2 Standard	Limits
Class A Balanced three phase equipment, household appliances, tools , excluding portable tools, dimmers for incandescent lamps, audio equipment	Defined by IEC
Class B Portable tools, arc welding equipment, which is not professional equipment	Defined by IEC
Class C Lighting equipment	Dynamic
Class D Personal computers and monitors, driving power less than or equal to 600W	Dynamic



▶ **Figure 3.** TDSPWR2 limit table menu.

The limit tables for Class A and B are defined by the IEC committee. However, Class C and D limits are dynamic in nature. They are derived from the power factor of the power supply under test and the power that can be driven by the power supply. TDSPWR2 automatically makes the required measurements and determines the limits for Class C and D measurements.

1. Select the appropriate IEC standard to configure the pre-compliance testing to type of Class, as shown in Figure 3.
2. Select set to load the limit table.
3. Select run. The oscilloscope automatically determines the required record length and sample rate based on the line frequency needed to meet the FFT window requirement defined in the selected EN61000-3-2 standard.



▶ **Figure 4.** Test results are shown in complete detail.

Test Results

TDSPWR2 provides detailed test results in table form, as shown in Figure 4. To switch between the table and bar graph, select view. You can scroll to see the 40th Harmonic component. Total Harmonic distortion (THD) in addition to true power, apparent power and power factor are also automatically computed and displayed for quick analysis. The “CSV” file export format lets you easily port this data to other applications for further analysis.

Conclusion

A TDS5000 or TDS7000 Series digital phosphor oscilloscope with TDSPWR2 power measurement and analysis software speeds and simplifies both design and compliance testing for power electronics devices.



TDS5000 Series DPO

The TDS5000 Series oscilloscope's fast waveform capture rate, live analog-like display, dedicated video triggers, and long record length make it the ideal solution for video design and development.



The P5205 Probe

The P5205 is a 100 MHz active differential probe capable of measuring fast risetimes of signals in floating circuits.



The TCP202 DC Coupled Current Probe

The TCP202 is used for displaying and measuring current in electronic circuits. It is ideal for power supply and motor drive design and device testing.

Contact Tektronix:

ASEAN / Australasia / Pakistan (65) 6356 3900

Austria +43 2236 8092 262

Belgium +32 (2) 715 89 70

Brazil & South America 55 (11) 3741-8360

Canada 1 (800) 661-5625

Central Europe & Greece +43 2236 8092 301

Denmark +45 44 850 700

Finland +358 (9) 4783 400

France & North Africa +33 (0) 1 69 86 80 34

Germany +49 (221) 94 77 400

Hong Kong (852) 2585-6688

India (91) 80-2275577

Italy +39 (02) 25086 1

Japan 81 (3) 3448-3010

Mexico, Central America & Caribbean 52 (55) 56666-333

The Netherlands +31 (0) 23 569 5555

Norway +47 22 07 07 00

People's Republic of China 86 (10) 6235 1230

Poland +48 (0) 22 521 53 40

Republic of Korea 82 (2) 528-5299

Russia, CIS & The Baltics +358 (9) 4783 400

South Africa +27 11 254 8360

Spain +34 (91) 372 6055

Sweden +46 8 477 6503/4

Taiwan 886 (2) 2722-9622

United Kingdom & Eire +44 (0) 1344 392400

USA 1 (800) 426-2200

USA (Export Sales) 1 (503) 627-1916

For other areas contact Tektronix, Inc. at: 1 (503) 627-7111

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