



HAR-System

HAR1000 Testers



I Harmonics

II Flicker

III Three-Phase Extension

IV HARCS-Immunity

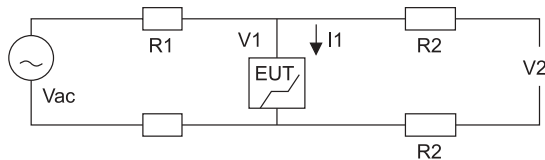


Harmonics and Flicker Sources and Standards

General Information

Harmonic currents

The non-linear load (EUT) generates a impulse current. Over the resistors R1 a voltage drop in line with the impulse current occurs. The non-linear impulse current is an emission of the EUT. For the harmonics fast fourier transformation (FFT) this current is measured.



The wide use of electronic equipment such as computers, printers, television sets, monitors and audio equipment, has expanded the harmonic current problem. This equipment has an input circuitry (switched mode power supply) that draws non-sinusoidal currents. Switched mode power supplies typically have a diode-capacitor rectifier input stage. The diodes conduct a.c. current and charge the capacitor only when the a.c. voltage is greater than the capacitor voltage. This creates a non-linear a.c. mains current that is harmonically rich. Devices such as lamp dimmers and electronic ballasts also draw non-sinusoidal currents because of the phase-angle control circuits.

Standards

IEC/EN 61000-3-2 Ed. 2.1/Amd. 14 (2001)

“Section 2: Limits for harmonic current emissions (equipment input current < 16 A per phase)”

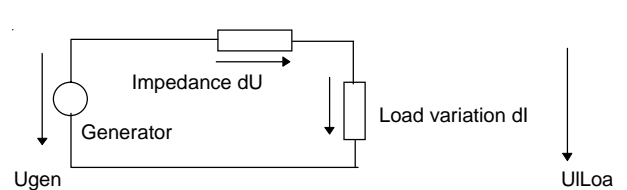
This standard covers both quasi-stationary harmonics and fluctuating harmonics. It supersedes IEC/EN 60555-2.

IEC/EN 61000-4-7 Ed. 1.0 (1991)

“Testing and measurement techniques - General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto”

Flicker (voltage variation)

Voltage variations in a low voltage networks are generated from cyclical variation of loads connected to the low voltage network. The power consumption of such loads changes and therefore the current. The voltage drop across the power line impedance changes with the fluctuating current.



The amplitude and frequency of the occurrences of these voltage fluctuations directly determine the level of flicker perceived by the human observer. Common source of flicker is equipment that produces time-varying loading conditions like hot plates, microwave ovens, laser printers, etc.

Compliance with these standards ensures that the voltage fluctuations do not cause incandescent lights to visible flicker in a way that causes an annoyance or health risk to human observers.

Standards

IEC/EN 61000-3-3 Ed. 1.1/Amd. 1(2002)

“Section 3: Limitation of voltage fluctuations and flicker in low voltage supply systems for equipment with rated current < 16 A”

The application range in the standard IEC/EN 61000-3-3 is focused on voltages between 220 - 250 V and 50 Hz. The standard supersedes IEC/EN 60555-3.

IEC/EN 61000-4-15 Ed. 1.0 (1997)

“Testing and measurement techniques - Section 15:

Flickermeter - Functional and design specification”

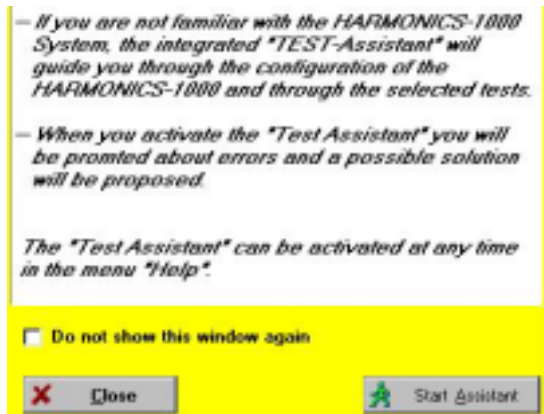
HARMONICS-1000 (HAR1000) General Information



The HARMONICS-1000 is a flexible one-box test and measurement equipment for testing and measuring harmonics and flicker on power supply. Because of the new designed amplifier (patent pending) the weight and the price of the HARMONICS-1000 are low.

The HARMONICS-1000 integrates all necessary components as:

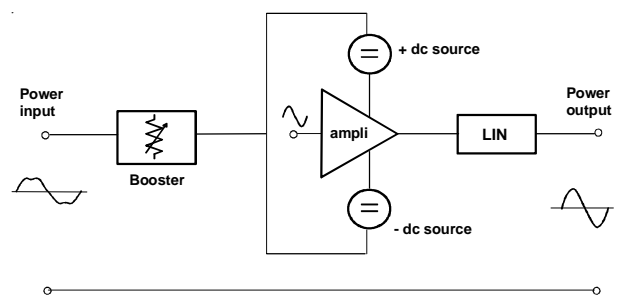
- power amplifier
- dual simultaneous harmonics analyzers
- four channel oscilloscope
- **HARCS software** which includes:
 - simultaneous harmonic spectrum analysis of both voltage and current
 - maximum harmonics in absolute and percentage of limits
 - recorder to quickly analyse test results
 - screen showing voltage and current in real time or as bar graph up to 40th harmonics
 - application assistant



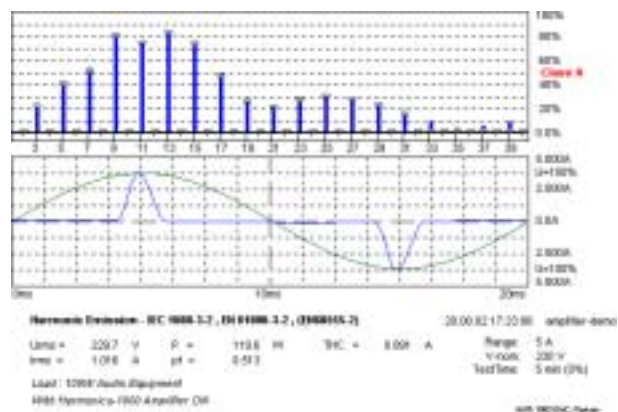
- measurements of *fluctuated harmonics* in real time
- Verification

- Automatic Pass/Fail indication based on the IEC-limits
- Measurement selectable in accordance with IEC 61000-3-2 or Amd. 14
- Selectable measurements: Harmonics or Harmonics and Interharmonics

For compliance tests a power supply amplifier is necessary. The HARMONICS-1000 includes a EMC PARTNER designed power amplifier (patent pending).



This amplifier guarantees that the power supply will fulfil the requirements of IEC 61000-3-2 paragraph A.2 Supply Source. Only with a power amplifier the harmonics test results are correct and comparable.



For flicker measurements the amplifier is also necessary to compensate the public power supply impedance.

Basic data

Dimensions: 550 x 450 x 180 mm (l x w x h)

Weight: 27 kg

Power supply: 230/115 V; 50/60 Hz; power < 800 VA (standby 100 VA)

Harmonics Part of HARMONICS-1000

Technical data

Measurements: Resolution: 14 Bit; basic accuracy: 0.2%

Current ranges: auto, 0.25 A, 0.5 A, 1 A, 2 A, 5 A, 10 A, 20 A, 50 A

Fourier: FFT, 4000 points over 16 periods in real time, rectangular-window, synchrony sampling

Measurements: V_{rms} , V_{peak} , I_{rms} , I_{peak} , Crest-Factor, Power-Factor, Power, App. Power, Freq., THD, $v[1]..v[40]$, $i[1]..i[40]$

Information: Continuous on-line analysis before test ends

EUT Power: max. 4 kVA (16 A, 250 V)

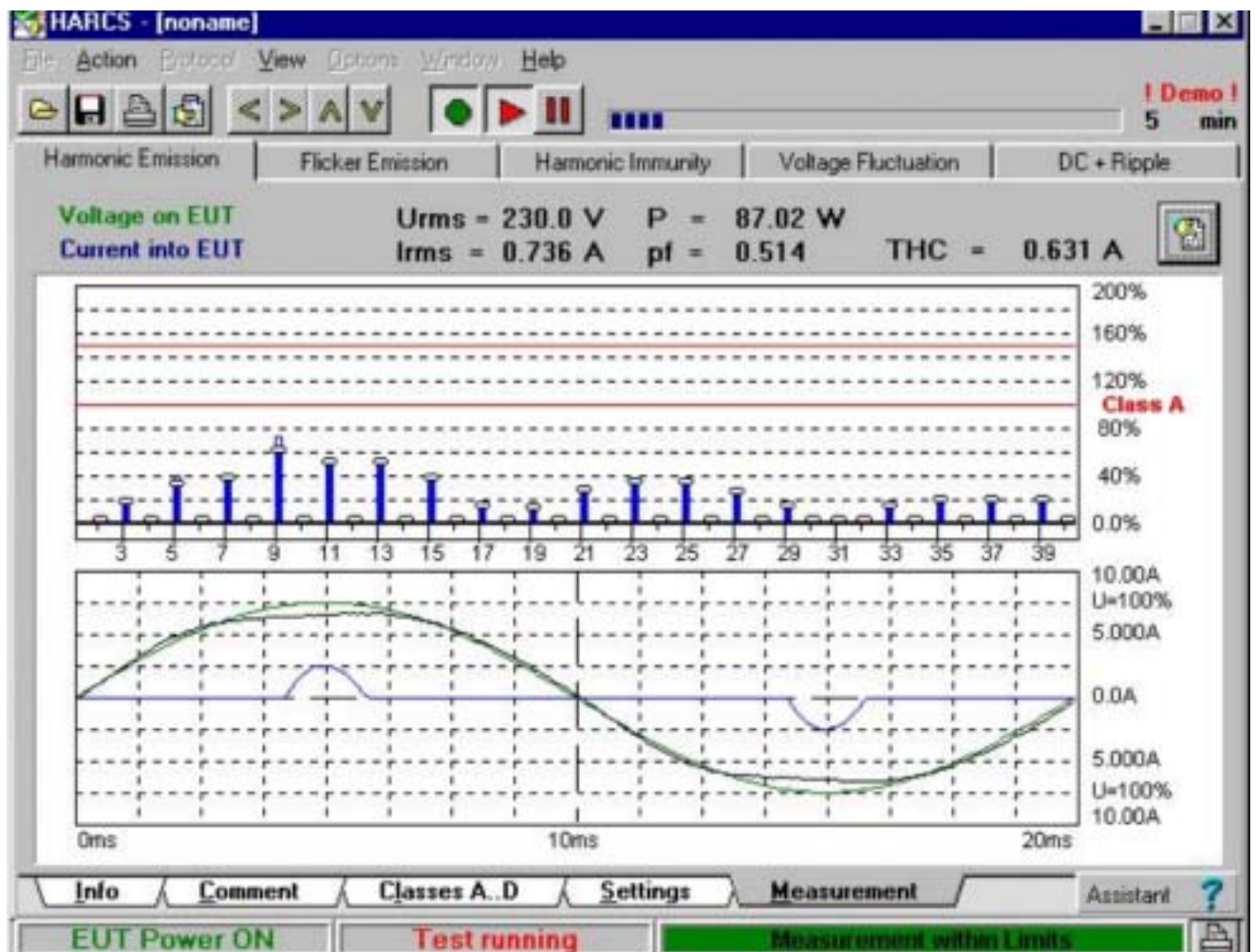
Some HARCS-window features

EUT Power ON: During the measurement the EUT power source voltage is checked. When "Out of Spec" is displayed the measurement results are too much influenced by a disturbed public power supply or by varying loads.

Order bar graph: The top of each order bar (blue = passed; red = failed) shows the fluctuation during the measurement. The maximums are stored. Class limits are shown as red lines.

Oscilloscope display: Three curves show the voltage on the EUT (green), the current on the EUT (blue) and the public power supply voltage (black).

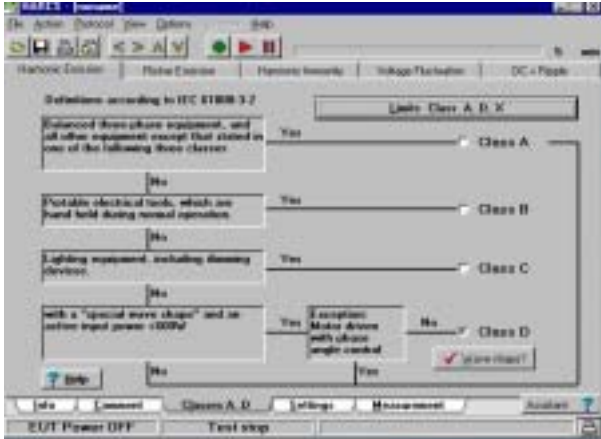
For further information please download the demo program HARCS from our website.



Harmonics Part of HARMONICS-1000

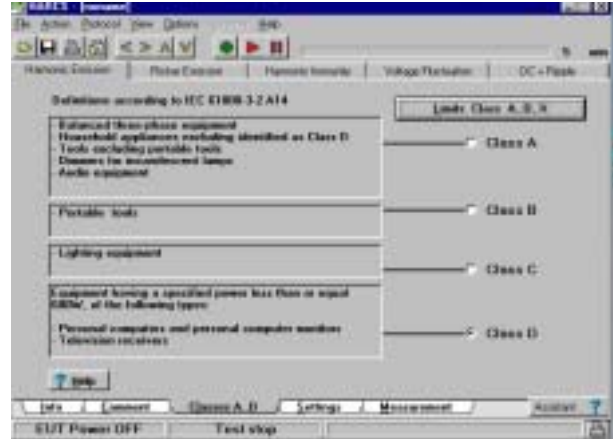
Two of the differences between IEC/EN 61000-3-2 (1995) and IEC/EN 61000-3-2 Ed. 2.1/A14 (2001)

1. Class D selection



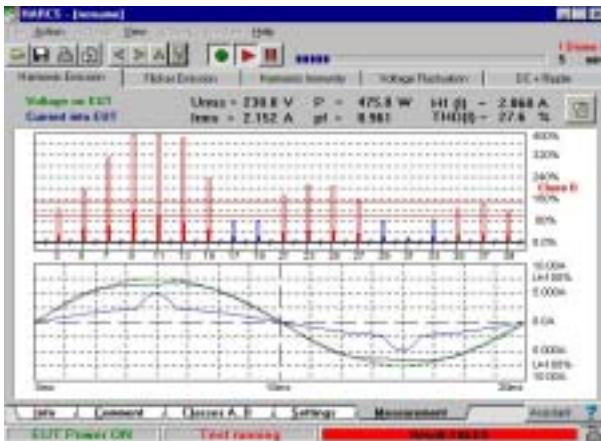
For class D a pre-measurement and wave-form control must be made.

During the transition period of five years both measurements can be done with the HAR1000.

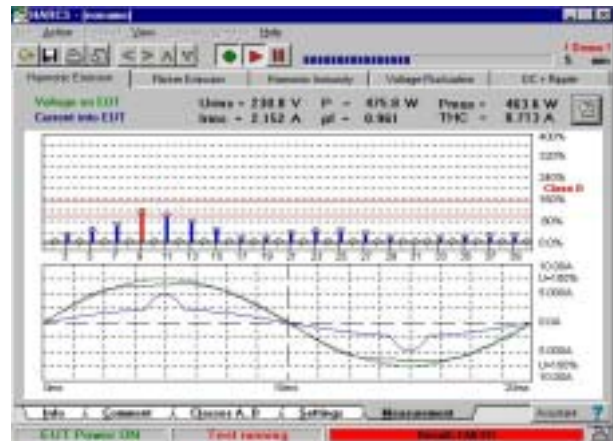


Class D equipment is defined in a list.

2. Comparison of measurement results with a laser printer as equipment under test

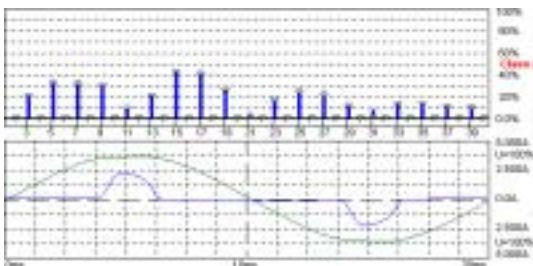


Actual measured results, limits defined by actual power

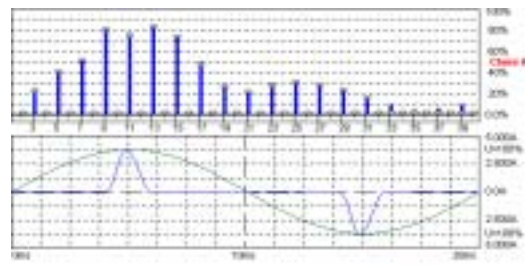


Average measurement, limits defined by max. power during measurement

How much the measurement results are influenced by the amplifier



Without the amplifier the measurement results are not correct and can not be compared.



With the amplifier the harmonics order gets higher and the passed failed indication is correct.

Flicker Part of HARMONICS-1000

Technical data

Measurements: Resolution: 14 Bit; basic accuracy: < 5 %; measuring the rms value all 5 ms of the past period; simulation of the “Light - Eye-brain” with a mathematical model; 668 logarithmic divided classes

Measurements: V_{rms} , I_{rms} , Power-Factor, Power, Freq., FL, PST, PLT, dUmax., dUc, dt, P50s, P10s, P3s, P1s

Information: Continuous on-line analysis before test ends

EUT Power: max. 4 kVA (16A, 250V)

Some HARCS-window features

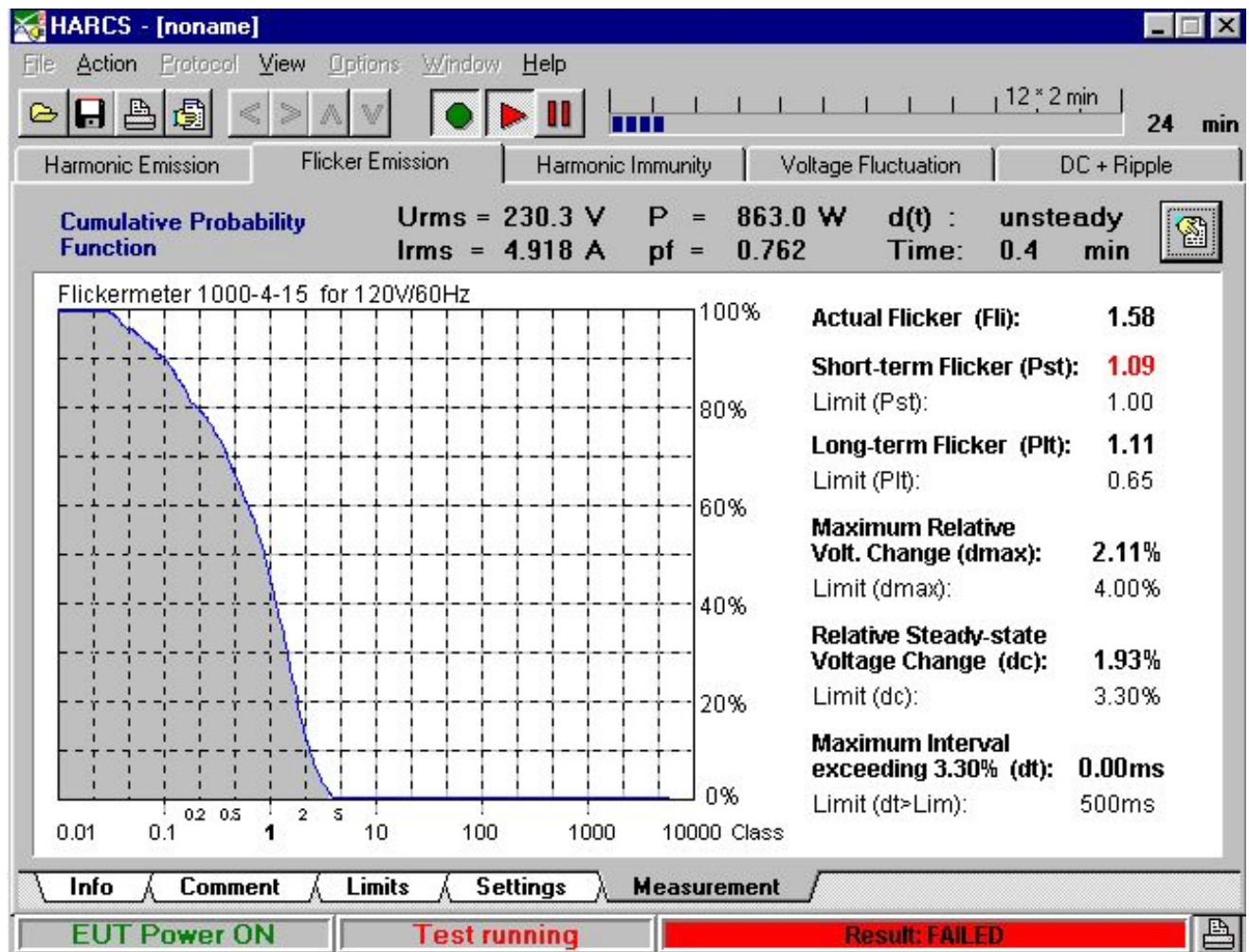
EUT Power ON: During the measurement the EUT power source voltage is checked. When “Out of Spec” is displayed the measurement results are too much influenced by a disturbed public power supply or by varying loads.

Icon hand with documents: The different parameters are calculated and displayed on-line.

Icon Printer: At any time the test results can be printed.

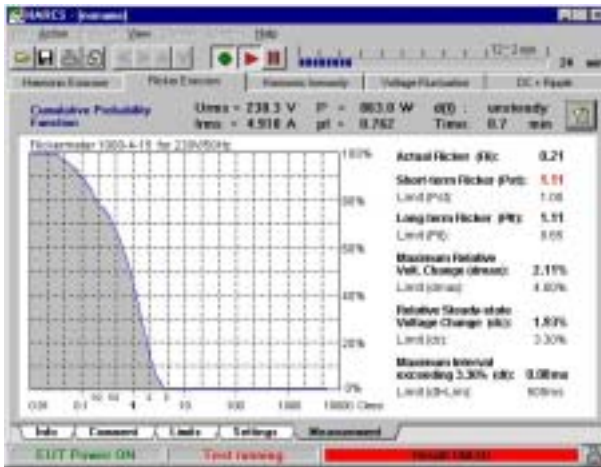
Limits: All limits can be changed. By pressing the help button the different parameters are explained.

For further information please download the demo program HARCS from our website www.emc-partner.com.

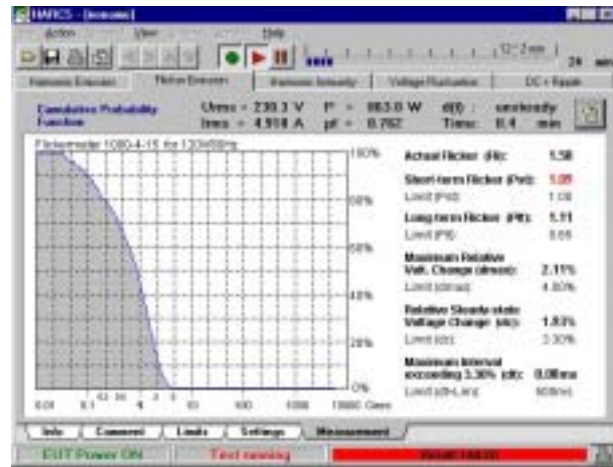


Flicker Part Of HARMONICS-1000

Measurement on 50/60 Hz EUT power supply

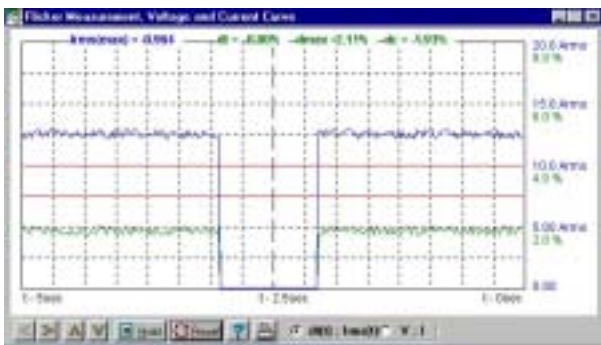


Flicker measurement 240 V/50 Hz: Clear indication of test time (e.g. 12 x 2 min)



Flicker measurement 120 V/60 Hz: The 50 or 60 Hz measurement depends on the EUT power input power supply.

Voltage and current measurement of the flicker meter



dt/t, I_{rms}: The influence of the inrush current can be determined (e.g. manual switching of EUT).



V_i: Switching action can also be displayed in the time domain.

Sophisticated protocol setting



In the window “Protocol Settings” the following possibilities can be activated and added in one protocol: graphs, tables, records, limit information, definitions and notes.

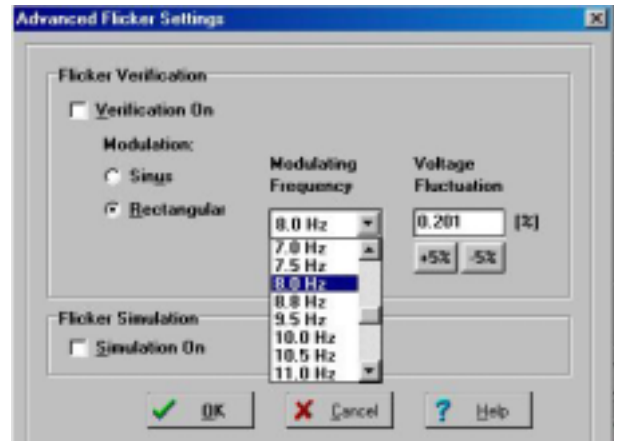
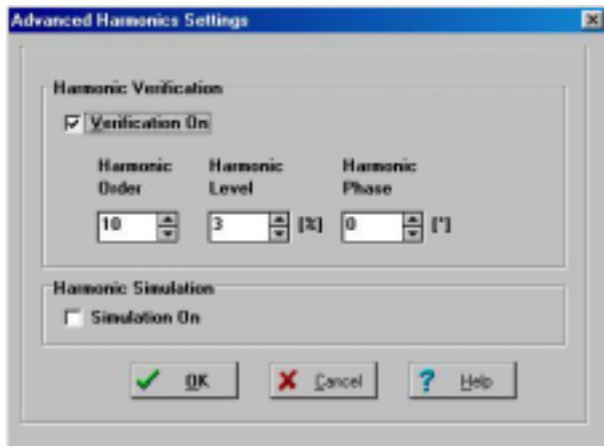
With “Destination” the type of file and the view path can be defined.

With “Include” the operator can fill in information about the equipment under test

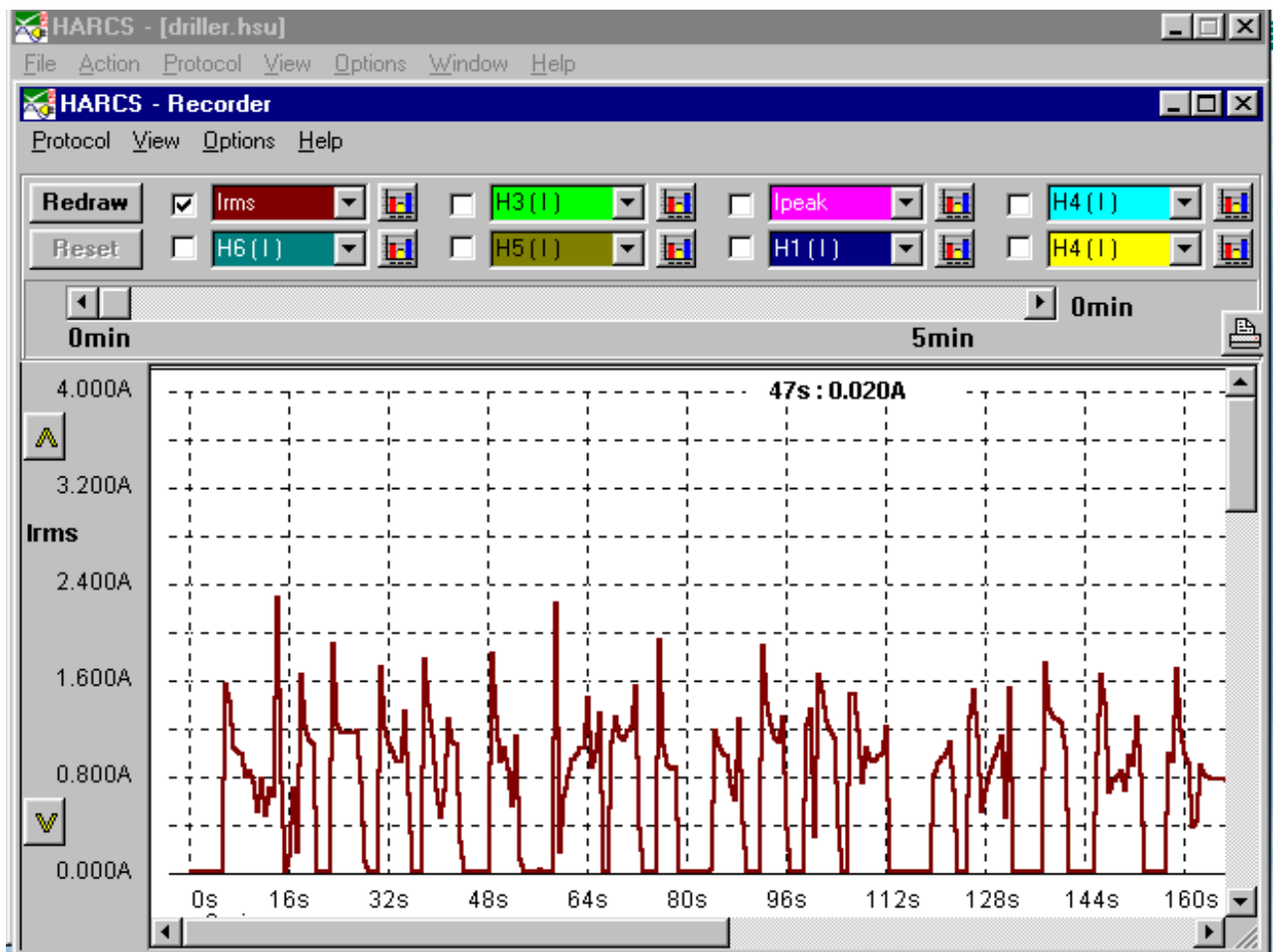
Examples of protocols can be found on our website www.emc-partner.com.

Verification and Recorder: Harmonics and Flicker

Verification of HARMONICS-1000
 The user of the equipment can at any time verify the harmonics or the flicker part. The flicker part verification is in accordance with the IEC/EN 61000-4-15. For the verification of the harmonics part individual order and percentage of the fundamental can be selected.



HARMONICS-1000 recorder
 Up to 8 different measured and analysed parameter data can be stored in a recorder. For failure analysis the recorded data can be displayed after the test. For professional countermeasure of harmonics and flicker problems the software HARCS-Emission includes "ANASIM".



Three-Phase Application: Harmonics and Flicker

EMC PARTNER's products

The product program of EMC PARTNER offers two possibilities:

You can order a single-phase HAR1000 first and extend the single-phase unit with the HAR-EXT1000 to a three-phase measuring system later, or you can buy directly the HAR1000-3P measurement system.

With the three-phase measurement system HAR1000-3P the following tests can be carried out on a three-phase power supply:

- harmonics measurements
- flicker measurements
- harmonics immunity tests
- voltage variation tests
- and 50/60 Hz ripple on d.c. supply

HAR1000 and HAR-EXT1000



HAR1000 and HAR-EXT1000 with PC

HAR1000

Dimensions: 550 x 450 x 180 mm (l x w x h)

Weight: 27 kg

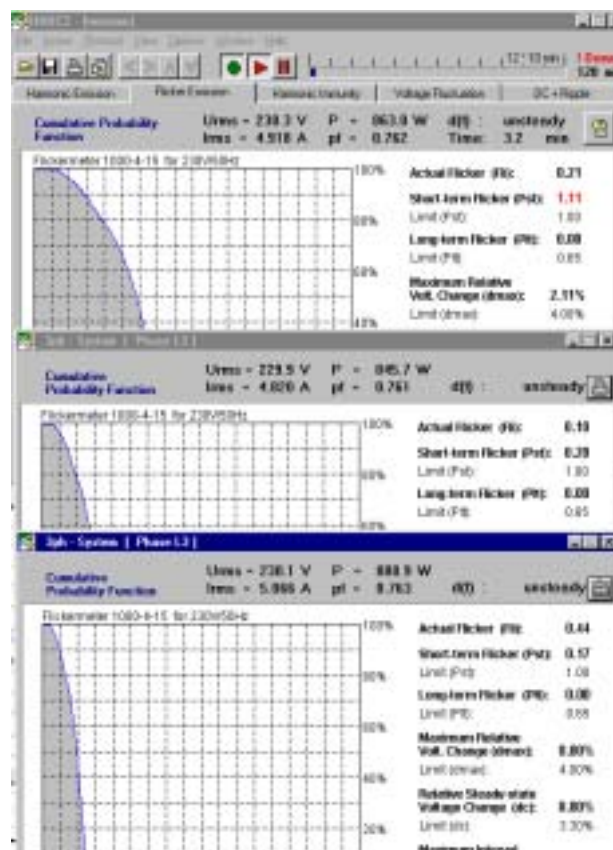
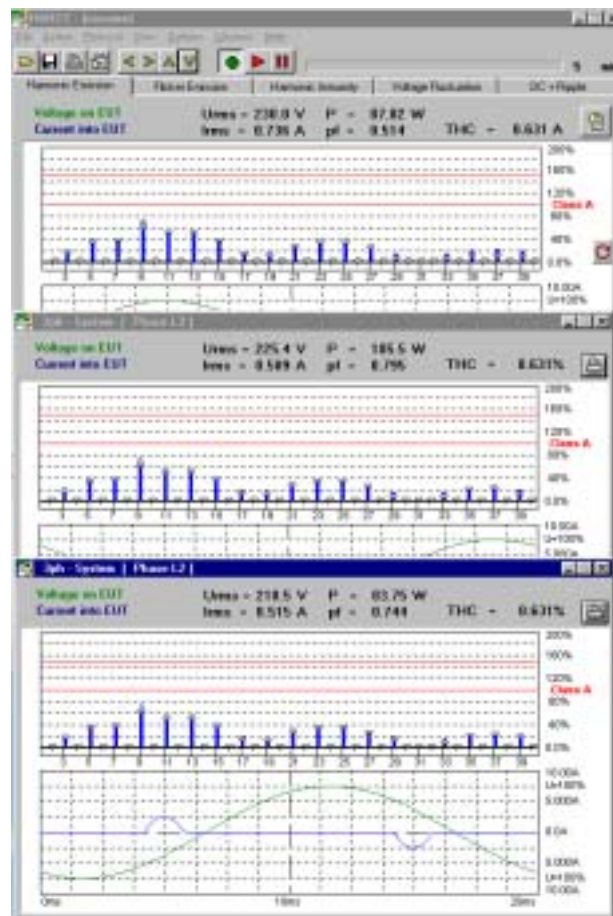
HAR-EXT1000

Dimensions: 550 x 450 x 180 mm (l x w x h)

Weight: 40 kg

HAR1000-3P

All technical data of the single-phase unit are also valid for the additional two phases of the HAR-EXT1000 (see technical data on previous pages).



HARCS-Immunity Software

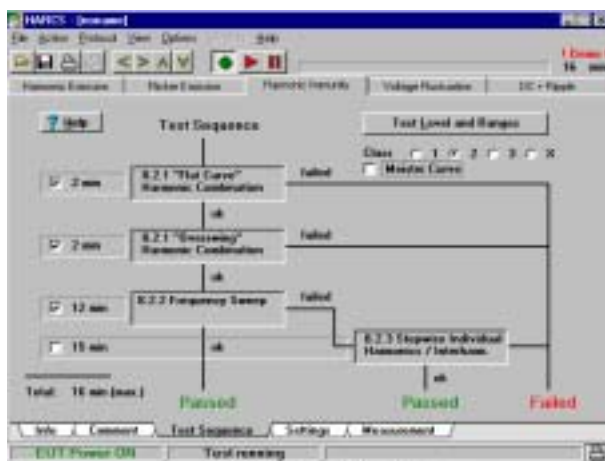
The accessory “HARCS-Immunity” extends the emission measurement system with **three immunity tests**.

The HARCS-Immunity software must be ordered separately to the HARCS emission software. For more information please visit our website www.emc-partner.com.

IEC 61000-4-13 Ed1 (2002)

Abstract:

Defines the immunity test methods and range of recommended basic test levels for electrical and electronic equipment with rated current up to 16 A per phase at disturbance frequencies up to and including 2 kHz (for 50 Hz mains) and 2,4 kHz (for 60 Hz mains) for harmonics and interharmonics on low voltage power networks. Establishes a common reference for evaluating the functional immunity of electrical and electronic equipment when subjected to harmonics and inter-harmonics and mains signalling frequencies. The test method documented in this part of IEC 61000 describes a consistent method to assess the immunity of an equipment or system against a defined phenomenon.

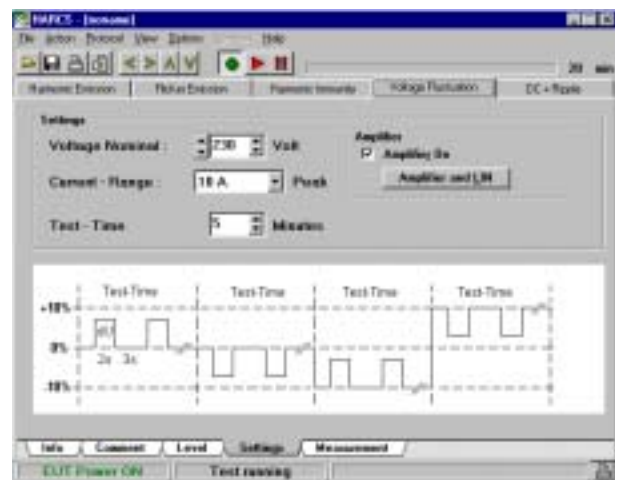


IEC 61000-4-14 Amd.1 Ed.1 (2001)

Abstract:

Applies to electrical and/or electronic equipment that have a rated input current up to 16 A per phase.

Aims to establish a reference for evaluating the immunity of electric and/or electronic equipment when subjected to positive and negative low amplitude voltage fluctuations. Only conducted phenomena are considered, including immunity tests for equipment connected to public and industrial power supply networks. Has the status of a Basic EMC publication.



IEC 61000-4-17 Amd. 1 Ed.1 (2001)

Defines test methods for immunity to ripple at the d.c. input power port of electrical or electronic equipment. Applies to low-voltage d.c. power ports of equipment supplied by external rectifier systems, or batteries which are being charged. This standard defines - test voltage waveform; - range of test levels; - test generator; - test set-up; - test procedure.



EMC PARTNER's Product Range

Immunity Tests



The TRA2000 performs all of the following transient tests on electronic equipment that are required for the CE-mark up to full levels: **ESD, EFT, surge, dips, a.c. magnetic field, surge magnetic field and common mode tests**. A large range of accessories for different applications is available: MF antennas, three phase couplers, verification sets, coupling kits, etc. The TRA2000 complies with IEC 61000-4-2, -4, -5, -8, -9, -11, -12p, -16, -29p.



The Modular Impulse Generator (MIG) performs **damped oscillatory tests**: 100 kHz, 1 MHz, voltage and magnetic field tests. The MIG complies with IEC 61000-4-8, -9, -10, -12 as well as with IEC 60255-4, -5, -22.



The HAR1000 with the Immunity software performs the following tests: **harmonics, voltage variation and ripple on d.c.** The HARMONICS-1000 complies with IEC 61000-4-13, -14, -17, -29p.

Lightning Tests

EMC PARTNER offers a wide range of testers in accordance with FCC 68 part D, ITU K.44, ETS 300 046, Bellcore and RTCA DO-160D, etc. for telecom, aircraft and military electronic equipment testing.



Component Tests



EMC PARTNER offers a wide range of modular impulse generators (MIG) for transient component testing on: varistors, arresters, surge protective devices (SPD), capacitors, circuit breakers, watt-hour meters, protection relays, insulation material, suppressor diodes, connectors, chokes, fuses, resistors, emc-gaskets, cables, etc.

EMC PARTNER has the largest range of impulse generators in the range up to 100 kV and 100 kA. Below is an example for an insulation tester up to 24 kV.



Emission Measurements



One unit performs all measurements on the power supplies of electronic equipment and products for the CE-Mark. The HAR1000 includes an amplifier for a clean power source, a line impedance network, the measurement systems Harmonics and Flicker. Accessories: three phase extension, "Immunity" and "ANASIM" software. Complies with IEC 61000-3-2 and -3.

We look forward to starting a dialogue with you

For more detailed information please contact our representative in your area or EMC PARTNER in Switzerland. For information on further products please visit also our website.

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We have Representatives in:

America: Canada, Mexico, USA, ...

Asia: China, Hong Kong, Israel, Japan, Malaysia, South Korea, Taiwan, ...

Australia: Australia, New Zealand

Europe: Austria, Belgium, France, Germany, Great Britain, Hungary, Ireland, Italy, Netherlands, Scandinavia, Spain, ...

You will find contact information for all representatives at EMC PARTNER's website www.emc-partner.com.

Your local representative:

EMC PARTNER offers the largest range of impulse test equipment up to 100 kA and 100 kV in the areas of:

Immunity Tests

Lightning Tests

Component Tests

Emission Measurements