Harmonic/Flicker Analyzer
KHA Series

Supports harmonic and flicker compliance testing of single-phase and three-phase equipment

IEC61000-3-2 Ed3.0/A2 (Harmonics for 16A or less)

IEC61000-3-3 Ed2.0, Ed1.2 (Flicker for 16A or less)

IEC61000-3-11 (Flicker for over 16A)*

IEC61000-3-12 (Harmonics for 75A or less)*

IEC61000-4-7 Ed2.0/A1, Ed2.0, Ed1.0 (Interharmonics ON/OFF)

*Only Model KHA3000

KIKUSUI

Harmonic /Flicker Analyzer

Harmonic and flicker analyzer compliant with the latest versions of the IEC and JIS standards

The KHA series is a Harmonic/Flicker Analyzer that complies to the standard of IEC /EN and JIS. The KHA1000 is dedicated for the single-phase equipment with two wires, and the KHA3000 applies to the test exceeding 16A of the single-phase and three-phase equipment (up to 40A per phase). Furthermore, the KHA series is compliant with both existing and the latest version of measurement technique standards, so you can simply select the measurements of the latest version of standard including the interharmonics, and for the conventional measurement that applies only the integral multiple harmonics without using any other device. In addition to the real-time display that can be used like an oscilloscope and FFT analyzer, the KHA series offers the real-time judgment of compliance with standards. Using the KHA series alone, you can judge test results and prepare result reports without using a PC. On top of that, you can easily configure the test system combined with the AC power supply (PCR-LA Series) and the line impedance network (LIN40MA-PCR-L).

*Measurement beyond 40A/phase can be supported by firmware ver.2.00 or later of KHA3000, and clamp-on probe on shelves.

Harmonic/Flicker Analyzer

KHA Series

Type for the "Three-phase / Single-phase with large current" **KHA3000**

Type for the "Single-phase" **KHA1000**

[Complied standards] Compliance with the following standards can be tested.

Category	Limit value standard Edition	Measurement technique standard Edition
Harmonic current	IEC61000-3-2:Ed3.0/A2(2009) [EN61000-3-2:2006/A2:2009] IEC61000-3-2Ed3 [EN61000-3-2:2006] IEC61000-3-2Ed2.2 [EN61000-3-2A2:2005] JIS C61000-3-2:2005 IEC61000-3-12 Initial version [EN61000-3-12:2005]*	IEC61000-4-7Ed2.0/A1[EN61000-4-7:2002/A1:2009] IEC61000-4-7Ed2[EN61000-4-7:2002] IEC61000-4-7 Initial version[EN61000-4-7:1993]
Flicker/voltage fluctuation	IEC61000-3-3:2008 [EN61000-3-3:2008] IEC61000-3-3Ed1.2 [EN61000-3-3A2:2005] IEC61000-3-11 Initial version [EN61000-3-11:2000]*	IEC61000-4-15Ed2.0:2010 [EN61000-4-15:2010] IEC61000-4-15Ed1.1[EN61000-4-15A1:2003]

Note: The Chinese Standard GB17625.1-2003 conforms to IEC61000-3-2:2001, thus, tests can be carried out using this unit by specifying the nominal voltage (220V/380V) for IEC61000-3-2 Ed2.2.
*Only Model KHA3000

Characteristics and Features

◆ Applying to the single phase and the three-phases* (40A/phase)

	16A/phase or less*1	16A to 75A/phase*2
	IEC61000-3-2, -3-3	IEC61000-3-12, -3-11
Single phase	**KHA1000** dedicated for single phase (16A or less).	
3 phases		**KHA3000** Covers all.

*1: The JIS specifies 20A/ phase or less.
*2: For measurement of 40A or more phase current, an optional device (external current sensor) is required.

◆ Installed with the latest standards of both harmonic and flicker limits

Refer to the table **[Complied standards]** specified on the bottom of left page.

*The latest standard is referred to the DOP(Date of issue)of the EN standard.

◆ Complied with the old and new versions of harmonic measuring instrument standards IEC61000-4-7

To select the standard, your desired combination can be arranged by choosing from the limit value standarad and the testing measurement standard.
*It is only a combination made beforehand in KHA1000.

You can switch between the old and new standards to view the differences in real time.
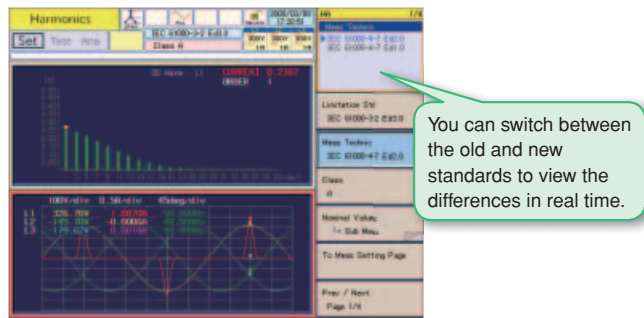
| Harmonic measuring instrument standard	IEC61000-4-7 Ed2.0/A1	IEC61000-4-7Ed2.0	IEC61000-4-7Ed1.0
Window width	200ms 10cycle/50Hz 12cycle/60Hz	200ms 10cycle/50Hz 12cycle/60Hz	16cycle
Interharmonics	Interharmonics grouping (unit of 5 Hz)*3	Interharmonics grouping (unit of 5 Hz)	None Integer order harmonics only

*3: It isn't grouping below the second harmonics.

◆ Easy upgrade when standards are updated (supports the latest standards)

The unit can be easily upgraded from the front panel using a CF card*4 or USB memory*5.
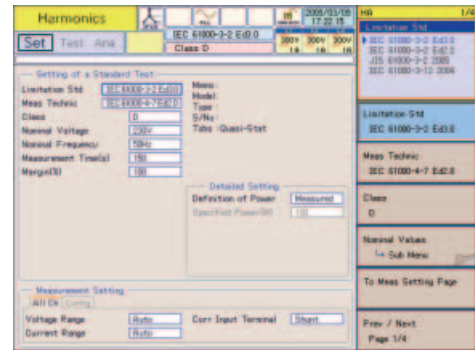*4: Users are requested to prepare CF cards.
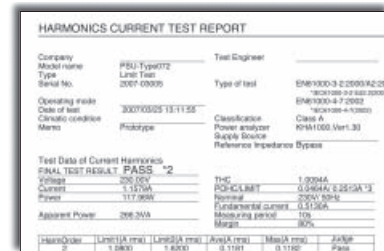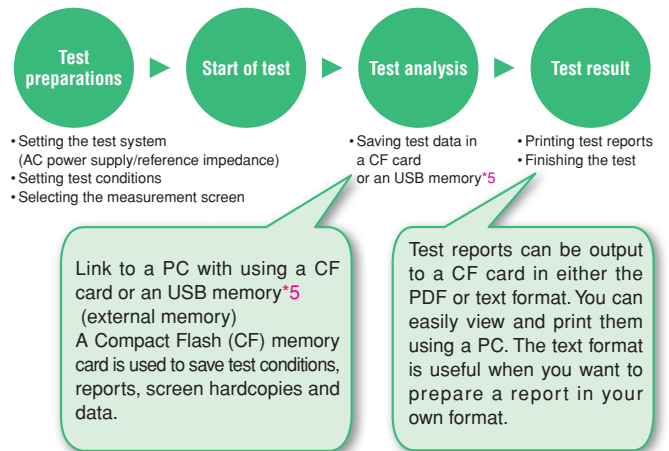*5: Support for USB memory is Only Model KHA3000.
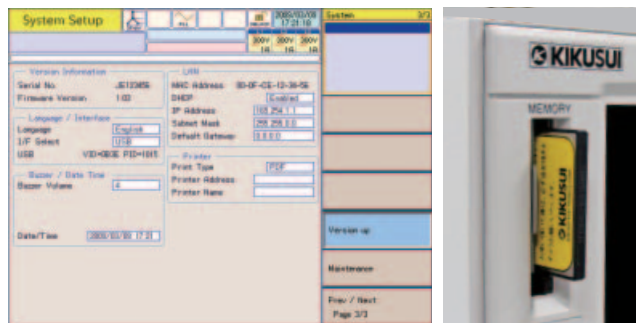
◆ Conducting compliance testing without using a PC

Using this device alone, you can perform a series of test processes - from setting test conditions and running the test to judging test results against limit values and outputting result reports - without the use of a PC. The device displays pass/fail results and spectrum data on the screen in real time. What's more, since KIKUSUI's PCR-LA Series AC power supply can be controlled from KHA Series, you can set up an easy-to-use test system whereby the operation panel of this device can be used as the main console.

● Operation flow using KHA Series
- from test condition setting to report printing

Test preparations ▶ **Start of test** ▶ **Test analysis** ▶ **Test result**

- Setting the test system (AC power supply/reference impedance)
- Setting test conditions
- Selecting the measurement screen

- Saving test data in a CF card or an USB memory*5

- Printing test reports
- Finishing the test

Link to a PC with using a CF card or an USB memory*5 (external memory)
A Compact Flash (CF) memory card is used to save test conditions, reports, screen hardcopies and data.

Test reports can be output to a CF card in either the PDF or text format. You can easily view and print them using a PC. The text format is useful when you want to prepare a report in your own format.

HARMONICS CURRENT TEST REPORT

▲ Example of test report (harmonic compliance test)

◆ Measurement of harmonic compliance test (16A to 75A/phase) *Only Model KHA3000

● IEC/EN61000-3-12

Measured values ⟶

You can check the minimum Rsce values that clear the limit values on the real-time monitor.

Set an estimated short-circuit ratio(Rsce) value

■ You can set test conditions while monitoring the measured values. For the equipment not applied within R (33), the minimum short-circuit ratio (Rsce) value that clears the limit values up to R (350) needs to be calculated. KHA3000 can automatically calculate the short-circuit ratio (Rsce) values from its the short-circuit ratio (Rsce) measured values, I_3, I_5, I_7, I_9, I_{11}, I_{13}, THD and PWHD, and display in real time the minimum short-circuit ratio (Rsce) value of each harmonic order.

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◆ Measurement of flicker compliance (voltagee fluctuation) test (16A to 75A/phase) *Only Model KHA3000

● IEC/EN61000-3-11

■ You can enter the default Ztest prescribed in IEC61000-3-11. It can be used when you declare the current of the connecting power supply is 100A or more per phase or when declaring the maximum allowed system impedance (Zmax).

■ Judgment of limit values is not required for some items depending on the equipment. For this reason, KHA3000 is designed to let you select desired items.

◆Real-time display & measurement that gives you a quick grasp of the EUT status

## ● List of view types *The screens are examples of KHA3000.

|	Harmonic current test	Flicker/voltage fluctuation test
Graph display	● V/I waveforms ● 2D harmonics ● 3D harmonics ● THC ● Current trend ● Harmonic current trend ● Vector phases *Only Model KHA3000	● V/I waveforms ● rms waveform ● St (short time flicker value) waveform ● CPF (cumulative probability) curve ● dc waveform ● dmax waveform ● d (t) > 3.3% waveform
List display	● List (real-time measured values) ● Harmonic list ● Result list	● Flicker list ● Result list ● d measurement (manual switch)
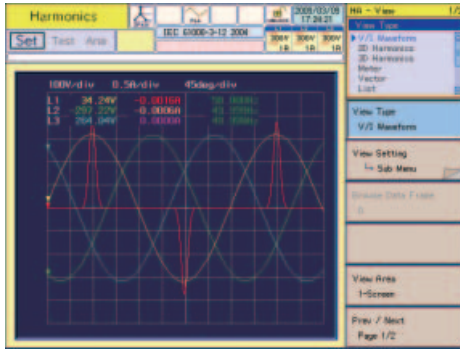
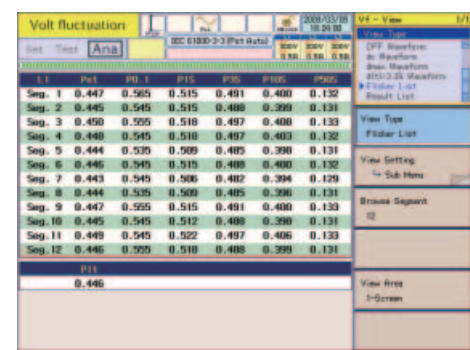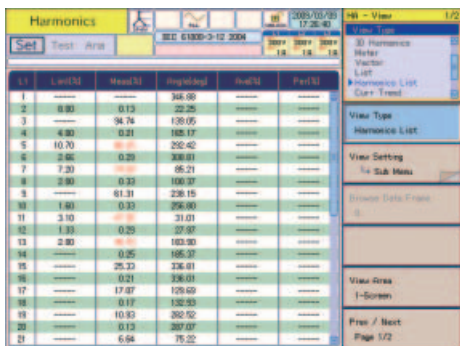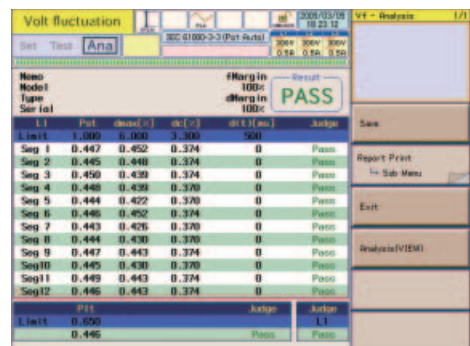▲ V/I waveforms
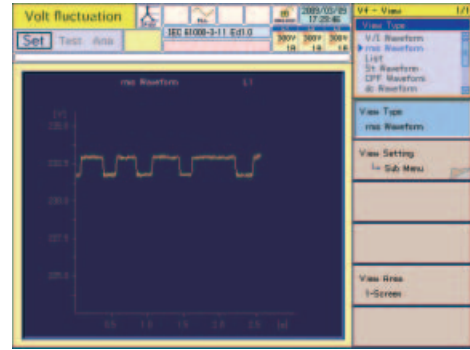
▲ rms waveform
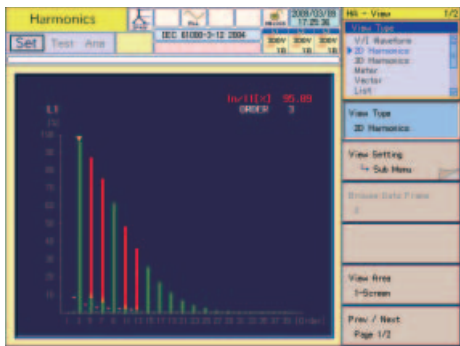
▲ 2D harmonics
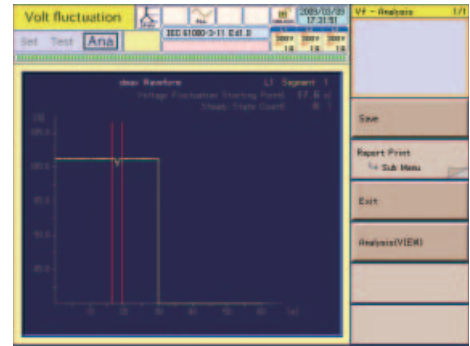
▲ dmax waveform
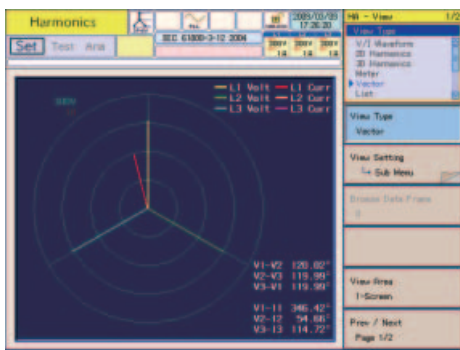
▲ Vectors *Only Model KHA3000
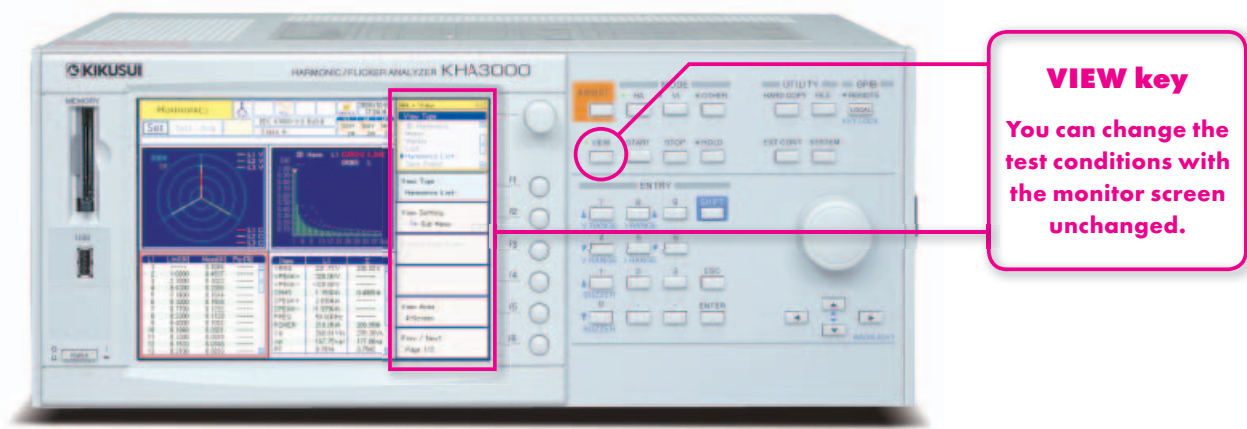

▲ Flicker list

▲ Harmonic list

▲ Result list

◆ Allows changes in the test conditions while monitoring

◆ Capable of simultaneous measurement of the three-phases *Only Model KHA3000

The long-time flicker value in all segment time, "Plt" is specified to be 2 hours for the flicker monitoring period. For three-phase equipment, measurement can be taken for each phase, but that will take 2 hours x 3 = 6 hours. Simultaneous measurement of three-phases can shorten the measuring (testing) time to 2 hours.
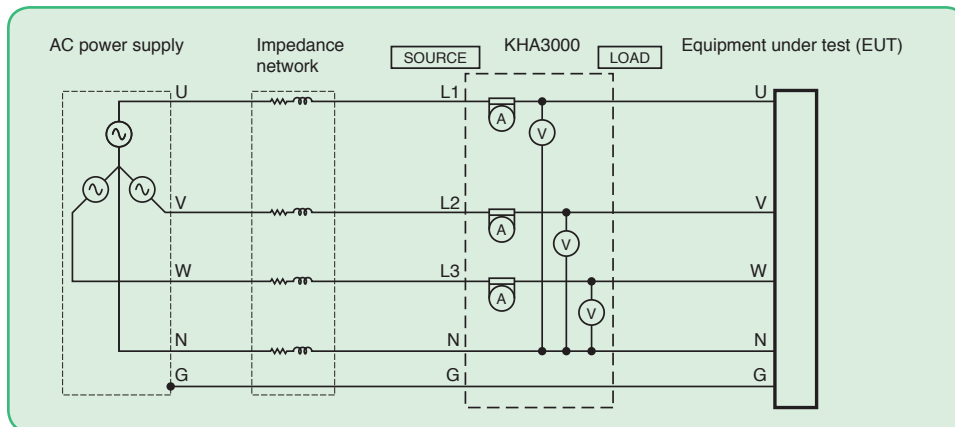
◆ In order to fully cover the EUT input methods, you can set the wiring method (single phase, single phase 3-wire, three-phase 3-wire and three-phase 4-wire). In addition, for the setting of L1, L2 and L3 (channels), you can select interlock or independent. This allows appropriate measurement for equipment with largely different phase currents.

◆ In order to support measurement of each channel for 3 phases, the voltage and current ranges were separated for each channel and AUTO range was established for each.
In addition, you can adjust the DC offset for each range with a single touch.

◆ Supporting "repeatability" check

Comparison can be made between the present measurement data and the past measurement data to check whether or not the error is within the specified allowable range. This feature is helpful in evaluating the "repeatability" that is required in harmonic compliance testing.

The IEC requirements

The measurement repeatability shall be within ±5% of limit value.
IEC61000-3-12: The repeatability of the fundamental and 7th and lower harmonic orders shall be within ±5%.
The repeatability of the harmonics beyond the 7th harmonic order shall be within ±10% or ±1% of the reference fundamental current, whichever is larger.

◆ Equipped with a quality check function for the testing power supply

KHA Series are equipped with a function to measure the voltage, frequency, peak voltage and distortion rate of the AC power used for harmonic compliance testing in order to check whether or not the power supply is adequate for the intended test.

The IEC requirements

IEC61000-3-2: The voltage harmonics must be the following values or less. 3rd (0.9%), 5th (0.4%), 7th (0.3%), 9th (0.2%), even harmonic order between 2nd and 10th (0.2%), 11th to 40th (0.1%)
IEC61000-3-12: Output voltage and harmonic inclusion rate under no load 5th (1.5%), 3rd and 7th (1.25%), 11th (0.7%), 9th and 13th (0.6%), even harmonic orders between 2nd and 10th (0.4%), 12th and 14th to 40th (0.3%)

◆Providing all major basic measurements

KHA Series are capable of measuring all major basic items including voltage, current, power, power factor, apparent power, reactive power and frequency.

It also provides other measurement functions such as waveform monitoring and measurements of rush current and harmonic current in low frequency zones.

These features make KHA Series a convenient routine work tool for development and design processes.

◆Rush current measurement

KHA Series observes the waveform of the rush current exceeding the trigger level. It can also observe the voltage waveform. It capable to measure a rush current up to 160A peak.

The measuring range can be expanded to a high current by using an optional external current sensor with updating the firmware.
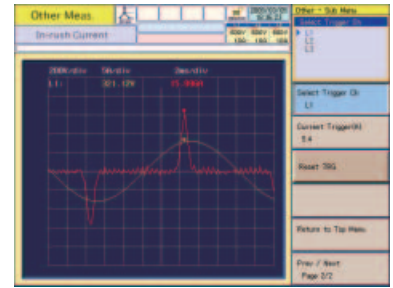
A rush current can be measured while the EUT is connected. This saves you from going through the trouble of preparing an oscilloscope and current probe. Set the input phase angle of the AC power supply using the application software (SD006-KHA), and turn on the unit. The rush current can be measured with good reproducibility. The phase angle can be set in the unit of 1°.

◆The assist function provides guidance on standards and technical terms

KHA Series are equipped with the "Assist function" that provides guidance on the technical terms used in the standards as well as the equipment class setting procedure. This function can support the users not familiar with the standards to readily get started with a test.
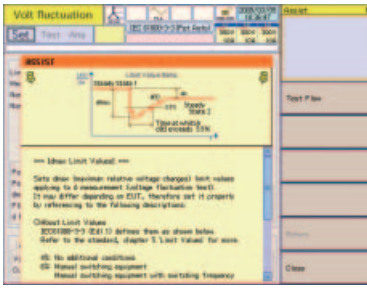
◆User-friendly terminals and interfaces

KHA Series comes standard with GPIB, RS232C and USB.
SCPI commands make it possible to use the unit as a general-purpose power analyzer by connecting it to your computer.

▼ KHA3000 Rear panel

【Remote controller】 【GPIB】
【Voltage sensing】 【USB】
【LOAD terminals】 【SOURCE terminals】
【RS-232C】

▼ KHA1000 Rear panel

【Remote controller】 【GPIB】
【Voltage sensing】 【USB】
【LOAD terminals】 【SOURCE terminals】
[RS-232C]
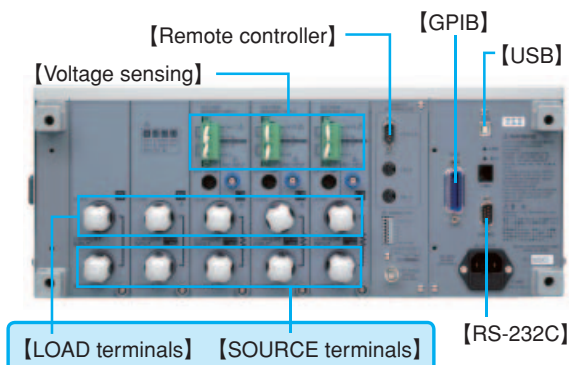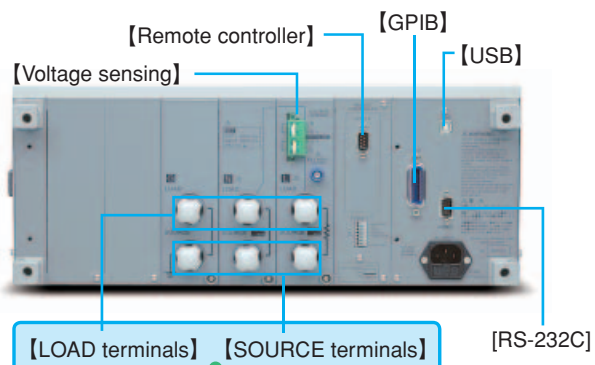
Easy connection

The terminals for power input and load output are separated. This arrangement prevents connection errors, thereby eliminating the risk of short-circuiting.

Of course, voltage sensing at the load is supported as well.

KHA3000 offers both simplicity and expandability.

Specifications

		KHA3000	KHA1000
Common input specifications	Maximum input voltage	600Vrms / 900Vpeak (CAT I), 400Vrms (CAT II)	300Vrms / 560Vpeak (CAT I), 250Vrms (CAT II)
	Maximum input current	40Arms / 100Apeak, whichever is smaller 160Apeak (within 20 ms)	24Arms / 50Apeak, 80Apeak (within 20 ms)
	Number of input channels	3 channels for both voltage input and current input (L1, L2 and L3)	1 channels for both voltage input and current input
	Voltage measurement input switching	Single-phase 2-wire, single-phase 3-wire, three-phase 3-wire and three-phase 4-wire	Single-phase 2-wire
Voltage measurement function	Rated voltage for the range	150V / 300V / 600V	150V / 300V
	Allowable crest factor	2	
	Display item	TrueRMS and ±peak	
	Accuracy	± (0.4% of rdng+0.04% of range)	
Current measurement function	Rated current for the range	0.5A / 1A / 2A / 5A / 10A / 20A / 40A	0.5A / 1A / 2A / 5A / 10A / 20A
	Allowable crest factor	0.5A to 20A range:4, 40A range:2.5 (up to 20 ms)	0.5A to 10A range:4, 20A range:2.5 (up to 20 ms)
	Accuracy *1 — 45Hz to 65Hz	0.5A range: ± (0.5% of reading+0.2% of range) 1A to 40A range: ± (0.5% of reading+0.1% of range)	0.5A range: ± (0.5% of reading+0.2% of range) 1A to 20A range: ± (0.5% of reading+0.1% of range)
	Accuracy *1 — 66Hz to 2.4kHz	0.5A range: ± ((0.5 + 0.417×n kHz) % of reading+0.2% of range) 1A to 40A range: ± ((0.5 + 0.417×n kHz) % of reading+0.1% of range)	0.5A range: ± ((0.5 + 0.417×n kHz) % of reading+0.2% of range) 1A to 20A range: ± ((0.5 + 0.417×n kHz) % of reading+0.1% of range)
Power measurement function	Display item	Effective power, apparent power, reactive power and power factor	
	Effective power accuracy	P ≥ 150W (±1% of range) , P < 150W (±1.5W)	
Frequency measurement function	Measurement input	Independent measurement of frequencies for voltages of L1, L2 and L3	Measurement of frequency for voltage
	Measurement frequency range/accuracy/resolution	45Hz to 65Hz / ± (0.15% of reading+2digits) / 0.001Hz	
Phase measurement function	Measurement item	Voltage / current phases, line voltage phase*4 and harmonic phase	
	Measuring range/resolution	0.00° to 359.99° / 0.01°	
Harmonic current measurement function	Conforming standard	IEC 61000-3-2 Ed3.0/A2(2009), IEC 61000-3-2 Ed3.0(2005), IEC 61000-3-2 Ed2.2(2004), JIS C61000-3-2(2005), IEC 61000-3-12 Ed1.0(2004)*4	
	Requirements for measuring instrument standard	IEC 61000-4-7 Ed2.0/A1(2008), IEC 61000-4-7 Ed2.0(2002), IEC 61000-4-7 Ed1.0(1991)	
	Harmonic analysis order	40th (HA mode), 180th (OTHER mode)	
	Interharmonics processing	Processing ON : IEC 61000-4-7 Ed2.0/A1(2008), IEC 61000-4-7 Ed2.0(2002) Processing OFF : IEC 61000-4-7 Ed1.0(1991)	
	Window function	Rectangular	
	Window width	10 cycles (50Hz) 12 cycles (60Hz), 16 cycles (50Hz / 60Hz)	
	Anti-aliasing filter	Cutoff frequency: 6 kHz, 4th Butterworth type (HA mode), 15kHz 4th Butterworth type (Other mode)	
	Class D judgment function	Current waveform inclusion rate of 95% or more (equivalent to JIS C61000-3-2:2003 Class D)*5	
Harmonic voltage *2 measurement function	Measurement item	Voltage, frequency and voltage harmonic inclusion rate	
	Voltage harmonic analysis order	40th	
Flicker/voltage fluctuation analysis function	Conforming standard	IEC 61000-3-3 Ed2.0(2008), IEC 61000-3-11 Ed1.0(2000)*4	
	Requirements for measuring instrument standard	IEC 61000-4-15 Ed2.0(2010), IEC 61000-4-15 Ed1.1(2003)	
	Flicker — Pst accuracy	1 ± 5%	
	Flicker — Pst measurement time	30 to 900 seconds	
	Voltage fluctuation — Measurement method	Selectable between simultaneous measurement with Pst and independent measurement	
	dmax measurement of manual switching equipment	3 to 24 times (Measuring time for each time: 30 to 180 seconds)	
General measurement function		Current/voltage waveform monitor, FFT analyzer and In-rush current measurement	
Communication interface		GPIB, RS232C, USB	
Removal data storage	Supported media	Compact Flash memory card (CF card) *6, maximum capacity: 512 MB USB Memory*4, maximum capacity: 16 GB	
External equipment control function	PCR-LA control (RS232C)	Voltage, frequency, range, ON phase, OUTPUT ON and OFF	
AC Input	Nominal voltage range	100 to 240V AC 50Hz to 60Hz	
Environmental conditions	Operating temperature and humidity ranges	0℃ to 40℃ , 20%rh to 80%rh (no condensation)	
Withstanding voltage		1500VAC, 1 minute (AC input ↔ chassis), 3550VAC, 1 minute (measuring terminal ↔ chassis)	1500VAC, 1 minute
Dimensions (maximum)		430 (455) W×177 (195) H×270 (330) Dmm	
Weight		Approx. 10 kg	Approx. 8 kg
Safety		Low voltage directive 2006 / 95 / EC EN 61010-1 Class I Pollution degree 2	
EMC *3		Conforming to the following instruction and standard requirements: EMC instruction 89/336/EEC EN 61326	
Accessories		Power cord, voltage sensing terminal plug and short-circuit wire kit (with a dedicated screwdriver), spare fuse and operation manual	

*1: n = indicates frequency. *2: Measurement power quality check function   *3: Limited to products with a CE marking provided on the panel.
*4: Only Model KHA3000   *5: Only Model KHA1000
*6: Users are requested to prepare the CF card. Note that the maximum supported capacity of a CF card is 512 MB. The following CF cards have been verified:

Manufacturer	Model	Capacity	Manufacturer	Model	Capacity
Buffalo	RCF-X64M, RCF-X128M, RCF-X512M	64MB, 128MB, 512MB	Toshiba	CF-FA128MT	128MB
I/O Data	CF85-128M	128MB	Lexar Media	CF064-231J	64MB
San Disk	SDCFB-128-J60	128MB	Princeton	PCF-64	64MB

Compact Flash™ is a registered trademark of Sandisk Corporation in the US.

Options

◆ KHA3000 Application software **[SD006-KHA] Harmonics Analyzing Suite Ver 2.2**
◆ KHA1000 Application software **[SD005-KHA] Harmonics Explorer Ver 3.5**

This dedicated application software consists of 3 programs. Using this software, you can set test conditions and control the execution of tests. You can also control the AC power supply (PCR-LA) used for tests. Furthermore, you can print the harmonic spectrum, and current and voltage waveforms on your reports.

■Program configuration of SD006-KHA Harmonics Analyzing Suite and SD005-KHA Harmonics Explorer

| SD006-KHA	SD005-KHA	Specifications
HarmoCapture 3	HarmoCapture	Offers functions to set conditions for harmonic current tests and voltage fluctuation tests, read test conditions, execute tests and save and display test result data. ● Test condition setting ● Start/stop of test ● Retrieval of test result files ● Display of measured values ● Control of AC source PCR-LA ● Entry of comments ● Report printing
HA File Analyzer 3	HA File Analyzer	Offers functions to analyze harmonic test data. ● Display of test result list ● Display of graphs (V/I waveforms, 2D harmonics, 3D harmonics, vectors, current trend, harmonic trend and THC trend) ● Saving of test result files in text format and repeatability check ● Report printing
Vf File Analyzer 3	Vf File Analyzer	Offers functions to analyze voltage fluctuation test data. ● Display of test result list and display of flicker list ● Display of graphs (dc%, dmax%, d(t) >3.3%) (CPF) ● Saving of test result files in text format ● Report printing

[System requirements]
● Microsoft Windows 7, Vista (HomePremium, Business or Ultimate) or XP Service Pack 2 or later
● Microsoft.NET Framework 2.0
● Minimum 256 MB memory
● Minimum XGA resolution
● Minimum 100 MB of free hard disk space
● CD-ROM drive
● Mouse or other pointing device
● VISA library (NI-VISA 3.3.0 or later, Agilent I/O libraries Suite 14.1 or later, or KI-VISA 3.0.4 or later)
● USB cable (only when using the USB interface)

● HarmoCapture 3 / HarmoCapture

HarmoCapture 3 / HarmoCapture lets you control KHA Series remotely from a PC in the same way you control it from the operation panel of the device. The program will start as appropriate for the test mode.
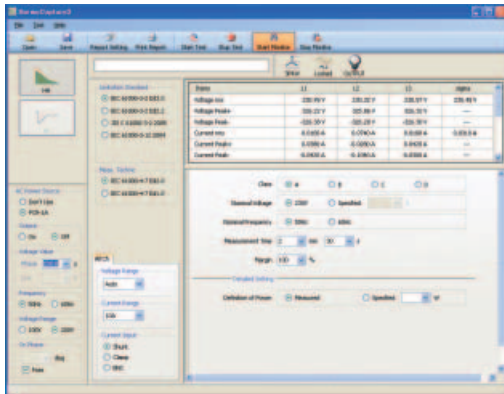
▲Test condition setting screen for harmonic current test (HarmoCapture 3)
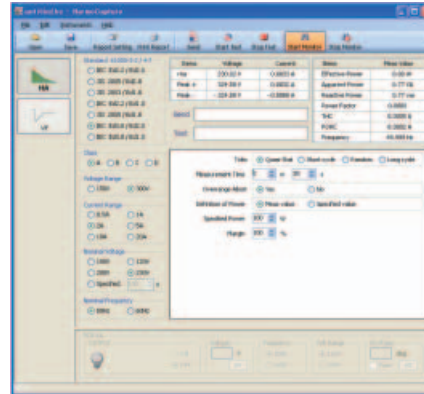
▲Test condition setting screen for harmonic current test (HarmoCapture)

▲ Comment input

■Setting items for test conditions of harmonic current test

Common item setting	When IEC 61000-3-2 Ed 2.2 (2004)/Ed 3.0 (2005) and JIS C 61000-3-2 (2005) are selected		
Wiring method setting Limitation standard Measurement technique standard Voltage range Current range Current input terminal	Class Nominal voltage Nominal frequency Measurement time Margin Definition of power	Only when class C is selected	Only when class A of JISC 61000-3-2 (2005) is selected
		Power factor and fundamental current Limit value	600W air conditioner

	IEC 61000-3-12 (2004)		
Measurerment time Equipment type Nominal frequency Margin Rated current (Iequ) Ref. fund current (I1) Judgment Rsce Limit value	Single-phase equipment	Unbalanced three-phase equipment	Line and balanced three-phase equipment
	Rated voltage (Up)	Rated voltage (Up) Nominal system voltage (Unom)	Rated voltage (Ui) Nominal system voltage (Unom)

■Setting items of test conditions for flicker and voltage fluctuation test

Common item setting	When Pst Auto is selected	When manual switch is selected	IEC 61000-3-11 Ed1.0
Wiring method setting Limitation standard Measurement technique standard Voltage range Current range Current input terminal	Nominal voltage Nominal frequency Pst measuring time Pst measurement count dmax limit value Flicker margin d margin Judgment limit value	Nominal voltage Nominal frequency d measuring time d measurement count d max limit value d margin Judgment limit value	Nominal voltage Nominal frequency Pst measuring time Pst measurement count d max limit Flicker margin d margin Test impedance Judgment limit value

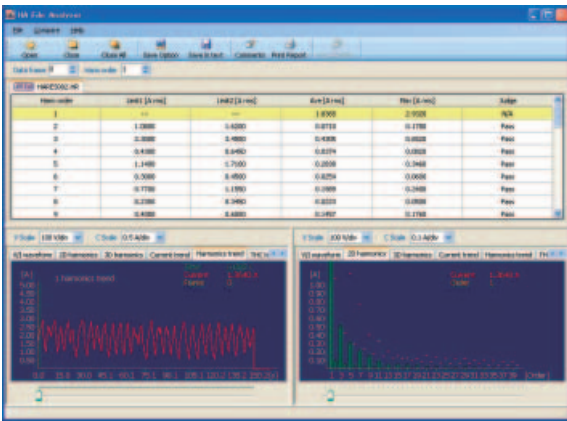## ● HA File Analyzer 3 / HA File Analyzer

HA File Analyzer 3 / HA File Analyzer are application programs that allows you to analyze the data in the test result files (xxx. hr3 / xxx.hr) saved by HarmoCapture 3 / HarmoCapture. It is not necessary to connect with KHA Series to run, so, you can analyze test data anywhere you want.

■Screen configuration

| Result list	Lists the result files of harmonic current tests.
Graphs and data	Displays graphs of the harmonic current test result file.
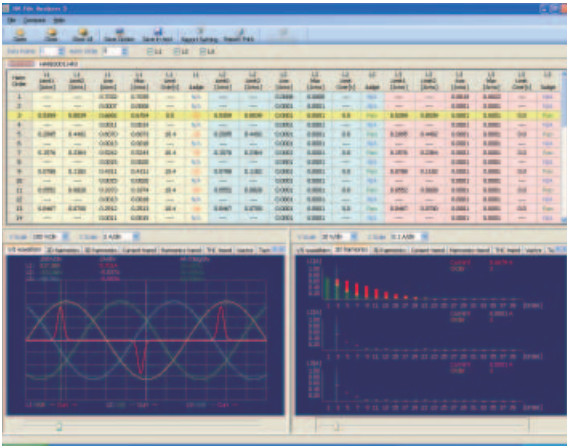
▲Screen configuration (HA File Analyzer 3)

▲Screen configuration (HA File Analyzer)

■Repeatability of check results

HA File Analyzer displays the judgment results for the files shown in the result list along with the judgment results for each order. The file can be compared from 2 to 15 files.
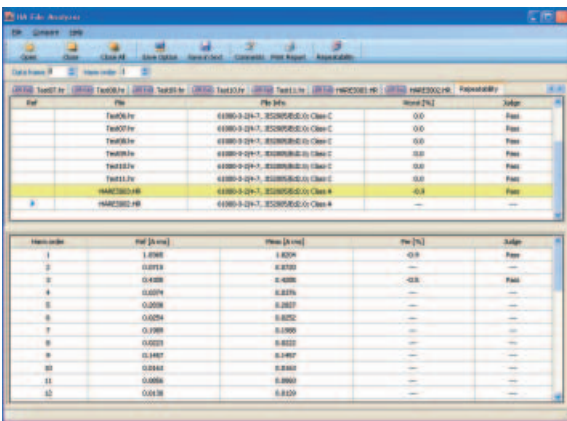
▲Example of the repeatability check result display

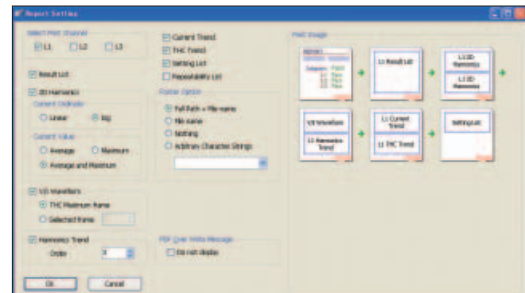### ■Saving test result files in the text format

You can save the test result files in the text format and use them in Microsoft Excel and other application programs.

▲Example of the Excel
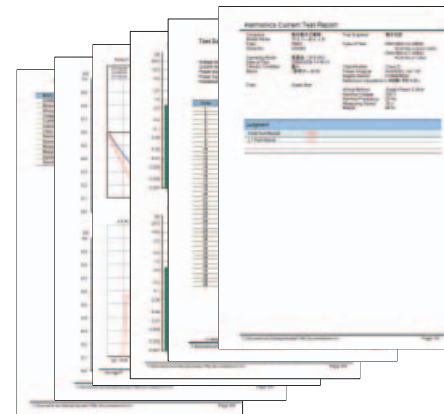
■Printing test result file reports

You can generate and print reports (PDF files) from the test result files saved by KHA Series or HarmoCapture 3 / HarmoCapture.


▲ Setting of harmonic test report

▲ Setting report

▲ Example of the Harmonic test report

● VF File Analyzer 3 / VF File Analyzer

VF File Analyzer 3 / VF File Analyzer are application programs that allows you to analyze the data in the test result files (xxx. vr3 / xxx.vr) saved by HarmoCapture 3 / HarmoCapture. It is not necessary to connect with KHA Series to run, so, you can analyze test data anywhere you want.

■Screen configuration

Waveform over entire measuring time	Display the waveforms of voltage fluctuations in individual measuring time periods, each concatenated with another along the time axis.
Result/setting data list	Display the list of the test results, flicker and test conditions.
Graphs and data	Displays the graph of cumulative probability for each phase.
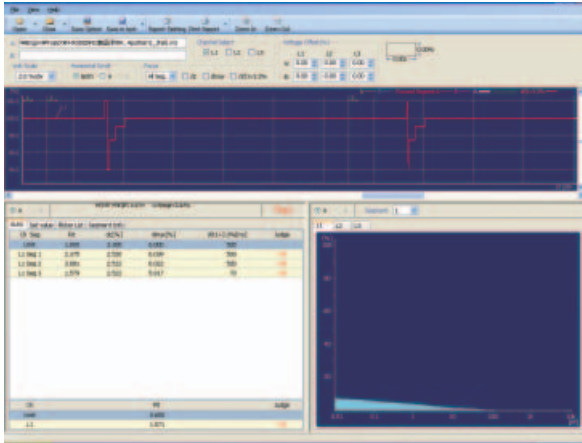
▲Screen configuration (VF File Analyzer 3)

■Test result list in the case of manual switching

"Voltage fluctuations arising from manual opening and closing," as defined in Annex B of IEC61000-3-3 A1 (2001), are measured. An arithmetic average is calculated of 22 of the measurement values obtained from up to 24 measurements, excluding the maximum and minimum values, in order to judge test results.
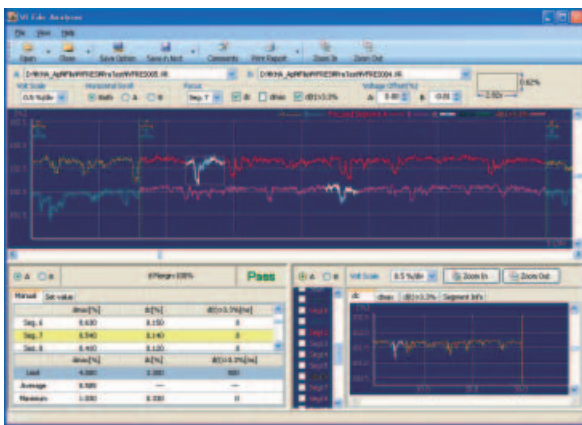

▲Example of test results in the case of manual switching (VF File Analyzer)
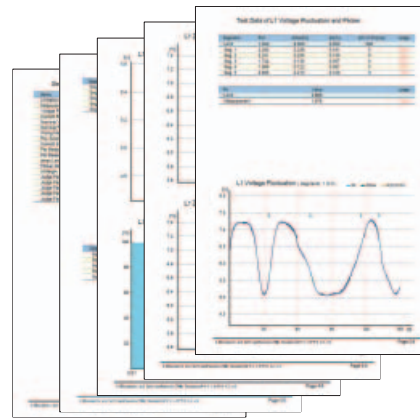
■Saving test result files in text format

You can save the test result files in text format and use them in Microsoft Excel and other application programs.

■Printing test result file reports

You can generate and print reports of the test result files saved by KHA3000 or HarmoCapture 3 in PDF format.
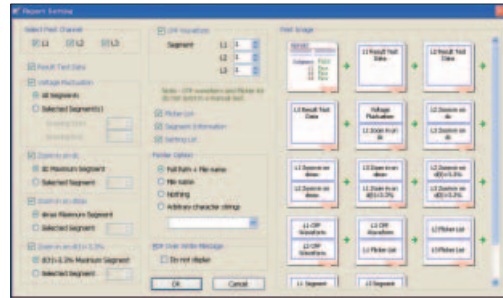
▲ Setting of flicker test report

▲ Example of the Flicker test report

11

◆ AC power [PCR-LA series] For details, please refer to the unit catalog and the KIKUSUI website.
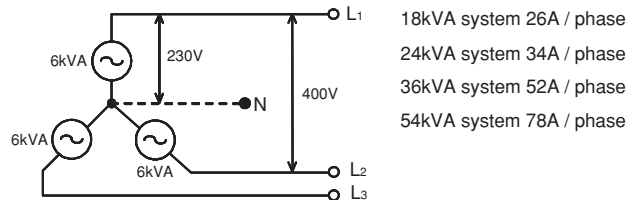
■ General specifications

Item/model	PCR2000LA	PCR4000LA	PCR6000LA
Output capacity	Single phase 2kVA	Single phase 4kVA	Single phase 6kVA
Output rating (AC)	1V to 150V / 2V to 300V		
Maximum current	20A / 10A	40A / 20A	60A / 30A
Maximum peak current	4 times the maximum current (rms value)		
Load power factor	0 to 1 (advance or lag)		
Frequency	1Hz to 999.9Hz		
Output stability	Input voltage fluctuation: Within ±0.1%		
	Output current fluctuation: Within ±0.1V/±0.2V		
Output voltage waveform distortion	0.3% or less		
Output voltage response speed	30 µs (standard value)		
Input apparent power	Approx.4kVA	Approx.8kVA	Approx.12kVA
Input current	48A / 24A or less	96A / 49A or less	72A or less 200V system input only
Weight	Approx.69kg	Approx.120kg	Approx.160kg
Dimensions	430W × 550Dmm		
	484Hmm	839Hmm	1105Hmm

■ Current and power capacity

IEC standard	230V	Single phase	3 phases
16A to 75A	75A	Approx. 18kVA (6kVA ×3)	Approx. 54kVA (6kVA ×9)
	40A	Approx. 10kVA (6kVA ×2)	Approx. 30kVA (6kVA ×6)
	26A	6kVA (PCR6000LA Single phase)	18kVA (PCR6000LA ×3)
16A or less	17.3A	4kVA (PCR4000LA Single phase)	12kVA (PCR4000LA ×3)
	8.6A	2kVA (PCR2000LA Single phase)	6kVA (PCR2000LA ×3)

* The models in the PCR-W and PCR-M series can also be used by manual operation.
Note that they cannot be used in locations with open sites.

18kVA system 26A / phase
24kVA system 34A / phase
36kVA system 52A / phase
54kVA system 78A / phase

◆ Impedance network [LIN40MA - PCR-L] *Built to order

■ Specifications

Item		Description
Impedance (Value when combined with AC power PCR2000LA or PCR4000LA using attached input cable)	Z1	0.4 Ω + 0.37 mH, Single phase100V
	Z2	0.38 Ω + 0.46 mH, Single phase200V
	Z3	0.4 Ω + jn0.25 Ω, Single phase230V
	Z4	0.19 Ω + 0.23 mH, 2 elements (Only 1 element can be set to 0.21 Ω + 0.14 mH)
	Z5	0.24 Ω + jn0.15 Ω, 2 elements (Only 1 element can be set to 0.16 Ω + ju0.1 mH)
Impedance error (at OUT-PUT terminal)	Resistance (DCR)	Z1, Z2, Z3: ± 3% Z4, Z5 : ± (3% + 0.01 Ω)
	Reactance (45Hz to 3kHz)	Z1, Z2, Z3: ± 5% Z4, Z5 : ± (5% + ju0.01 Ω)
Rated voltage, frequency and current	Z1	100V (50Hz / 60Hz) 40.0A, 160.0 Apeak
	Z2, Z4	200V (50Hz / 60Hz) 20.0A, 80.0 Apeak
	Z3, Z5	230V (Z3), 400V (Z5) 17.4A, 69.6 Apeak
Short-time rated current		1.5 times the rated current (10 minutes)
Voltage monitor		1/20±1% of output terminal voltage (50Hz / 60Hz) Insulation output
Current monitor		For clamp ammeter. Receptacle current path
Output terminal	Terminal panel	M6 screw
	AC receptacle	Compatible with plugs in the following countries: Japan, USA, Canada, Australia, Switzerland, Italy, England and European countries with the DIN standard
Overheat protection		Detects overheating inside and turns off output of AC power PCR-LA main unit.
Control power input		85VAC to 250VAC (without switching) 50Hz / 60Hz, Approx.45VA
Working temperature and humidity ranges		23℃ ± 5 ℃, 85 %rh or less
Withstand voltage	AC1.5kV, 1 minute	Output power input vs. case
	AC500V, 1 minute	Input vs. case, output vs. case VOLTAGE MONITOR vs. input VOLTAGE MONITOR vs. output
Dimensions		430(W) × 484(H) × 550(D)mm (Excluding protrusions and wheels)
Weight		Approx.60kg
Accessories		Input cable A : 1.5m 1 Input cable B : 1.5m 1 Control card 1 Control card mounting screw 2 Control cable : 2m 1 Power cord : 2.5m 1 Operation manual 1 WEIGHT sticker 1

A line impedance network (LIN40MA-PCR-L) is required to perform compliance testing for voltage fluctuation and flicker standards. (The device is to be connected between the AC power supply and KHA1000.)

● **Supports three-phase 4-wire load with 2 units of LIN40MA-PCR-L.**
Simultaneous use of 2 units of LIN40MA-PCR-L (Manual operation)

▼ Three-phase wiring diagram
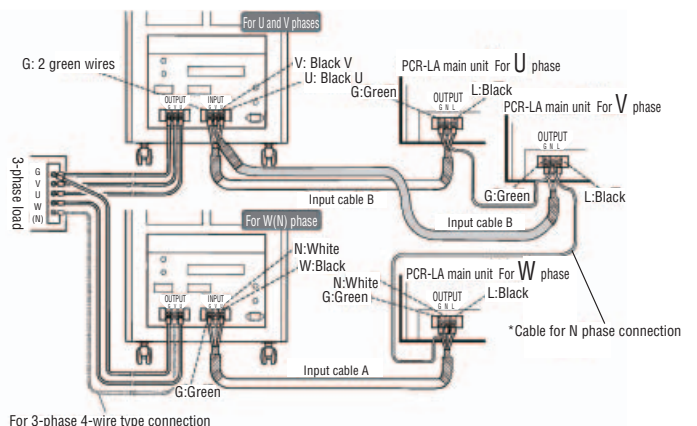
◆ Accessories and others

■Multi-outlet (20A or less single phase)

OT01-KHA

This unit allows you to connect various types of plugs used around the world.

■Rack mount brackets

[For KHA3000/1000]
KRB4 (inch)
KRB200 (millimeter)
[For OT01-KHA]
KRB2-TOS (inch)
KRB100-TOS (millimeter)

■Ethernet port [Factory-set option]

*Specify when ordering. *Only Model KHA1000

You can print on the network printer directly from the ethernet port. Easy to build a harmonic test system without the use of a PC.

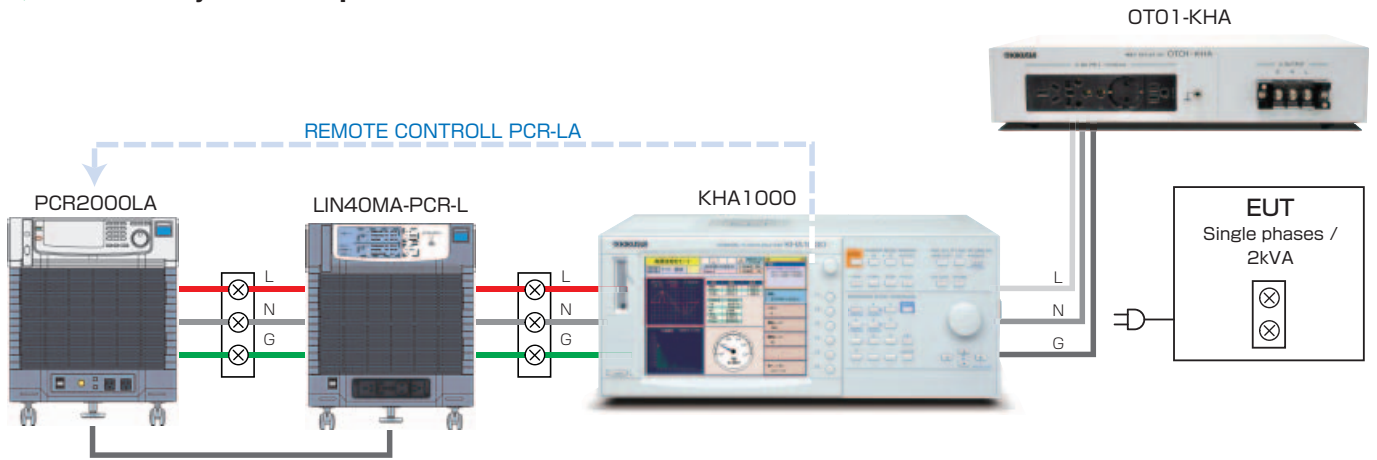## ■Daily Pre-test Checker

OP02-KHAS（SPEC40425）

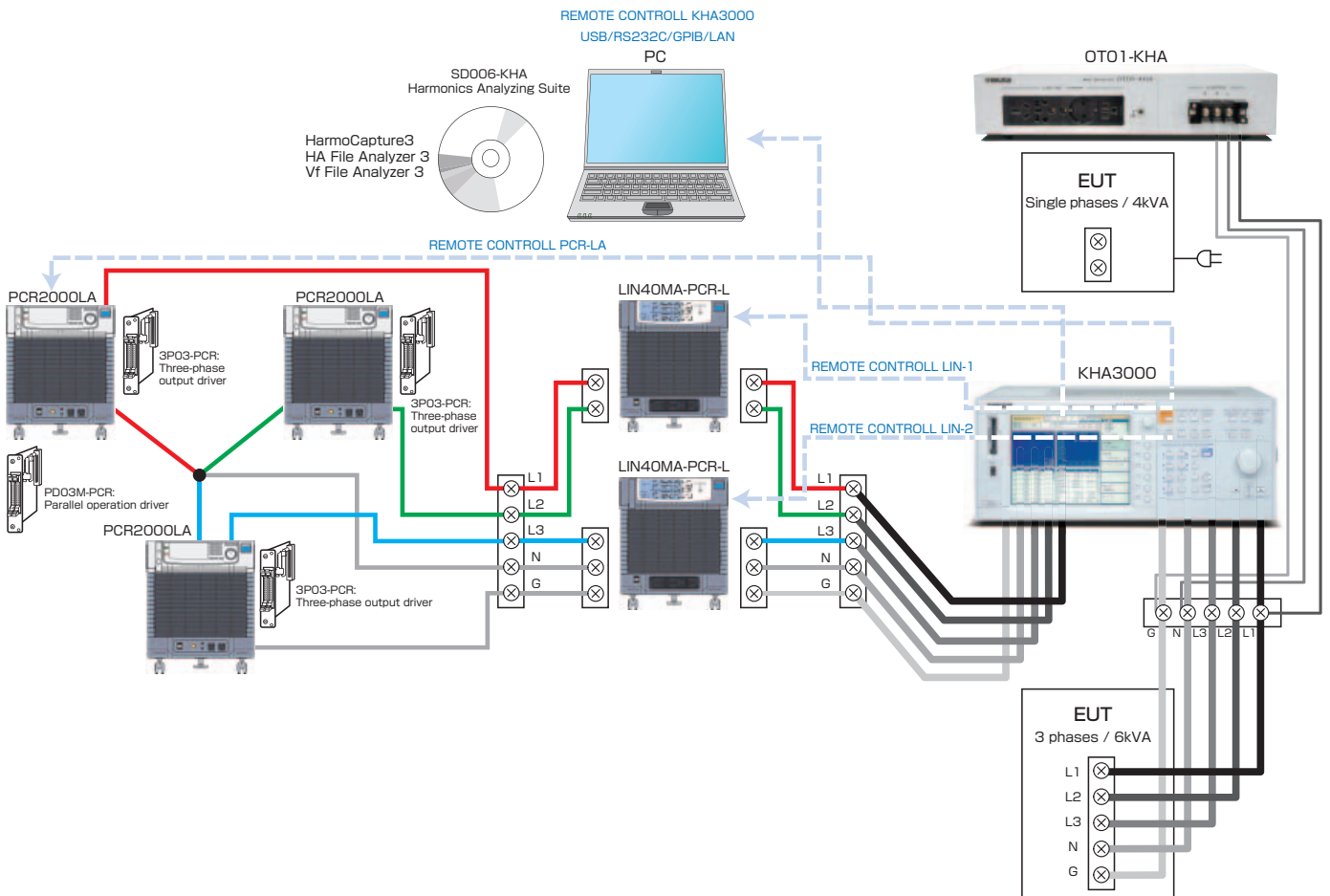| Item	Description
Operation mode	Harmonic mode / Flicker mode
Control type	Resistive load method (forced air cooling)
Input voltage range	Single-phase 100VAC to 240VAC
Input voltage type	Single-phase two-wires Single-phase three-wires (change by per phase) Three-phase four-wires (change by per phase)
Input current	2.3A±5% (when at the setting voltage of 230V) 1.0A±5% (when at the setting voltage of 100V) *Maximum power when through the phase contorl
Allowable current for the external load connecting terminal	Approx. maximum 10A
Harmonic generation method	Phase control
Phase angle variation range	Approx. 10 to 170 (when at the setting voltage of 100V or 230V)
Thermal protection	Yes (ALARM lights on, a buzzer sounds)
Flicker generation method	Square-wave ON/OFF control by the electronic timer
Flicker frequency setting range	Approx. 0.5Hz to 20Hz
Warm-up time	Approx. 10 minutes
Power supply for the activation	Single-phase 86VAC to 264VAC, less than 75W (possible for common use of the measurement circuit)
Withstanding voltage	Between the Input and FG(Frame Ground) 1830V, less than 5mA
Dimensions	214(W)×124(H)×400(D)mm (Excluding the projected components)
Weight	Approx. 6kg

The OP02-KHAS(SPEC40425) is the resistive load device that confirms the operation of the "harmonic current/flicker measurement system" performs properly. The OP02-KHAS(SPEC40425) is able to perform the daily check of the harmonic measurement standard "EN/IEC61000-3-2", "EN/IEC61000-3-12", and the flicker measurement standard "EN/IEC61000-3-3", "EN/IEC61000-3-11" for the "harmonic current/flicker measurement system"
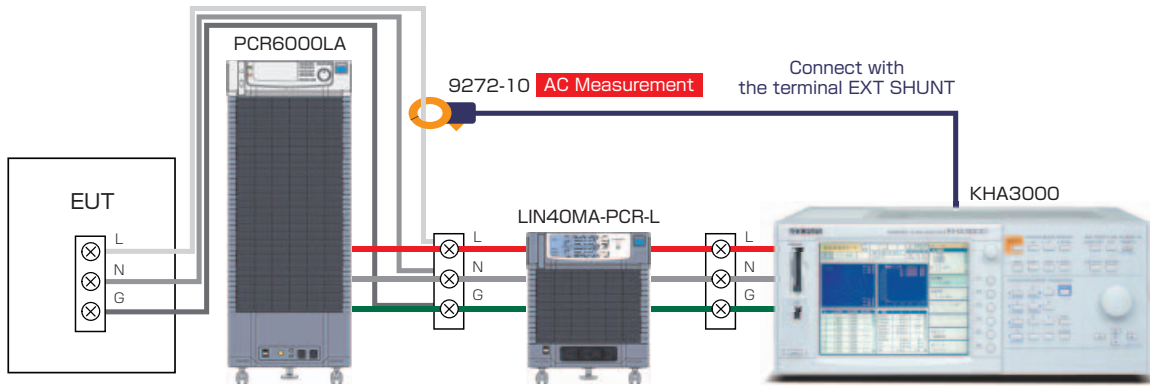
System Components

◆ **KHA1000 System Components** [For Single phases / 2kVA, Standalone]

OTO1-KHA

REMOTE CONTROLL PCR-LA

PCR2000LA   LIN40MA-PCR-L   KHA1000

L
N
G

L
N
G

L
N
G

EUT
Single phases /
2kVA

◆ **KHA3000 System Components** [For Single phases / 4kVA, 3 phases / 6kVA, PC Control]

REMOTE CONTROLL KHA3000
USB/RS232C/GPIB/LAN
PC

SD006-KHA
Harmonics Analyzing Suite

HarmoCapture3
HA File Analyzer 3
Vf File Analyzer 3

OTO1-KHA

EUT
Single phases / 4kVA

REMOTE CONTROLL PCR-LA

PCR2000LA

3PO3-PCR:
Three-phase
output driver

PCR2000LA

3PO3-PCR:
Three-phase
output driver

LIN40MA-PCR-L

REMOTE CONTROLL LIN-1

KHA3000

REMOTE CONTROLL LIN-2

PD03M-PCR:
Parallel operation driver

PCR2000LA

3PO3-PCR:
Three-phase output driver

LIN40MA-PCR-L

L1
L2
L3
N
G

L1
L2
L3
N
G

G N L3 L2 L1

EUT
3 phases / 6kVA

L1
L2
L3
N
G

◆ The large current CT (Current Transformer) for the KHA3000

PCR6000LA

9272-10 **AC Measurement**

Connect with the terminal EXT SHUNT

EUT
- L
- N
- G

LIN40MA-PCR-L
- L
- N
- G

KHA3000
- L
- N
- G

Comparison of the measurement value

The Internal Shunt VS 9018-50/9272-10 by HIOKI

- ■ HIOKI 9018-50 50A Mode (12.5A range)
- ▲ HIOKI 9018-50 100A Mode (12.5A range)
- ✕ HIOKI 9272-10 200A Mode (10A range)

Difference between the shunt

Order
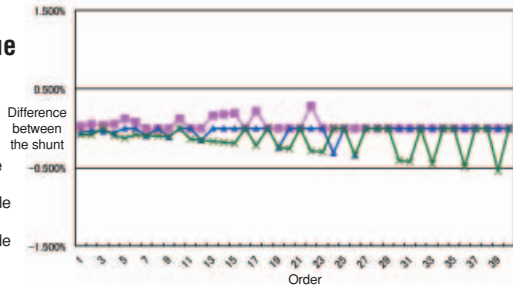
Information of the clamp current sensor

CLAMP ON PROBE
9018-50

CLAMP ON SENSOR
9272-10

SENSOR UNIT
9555-10

For inquiry : **HIOKI E. E. CORPORATION** http://www.hioki.co.jp/

* The relative error between the measurement value by the internal shunt resistor and the measurement value of the harmonics curret by the clamp sensor (manufactured by HIOKI) is measured within ±0.6%, therefore, the sufficient precision is confirmed in the practical operation applied to the standard requirement of 5% specified in the IEC61000-4-7.
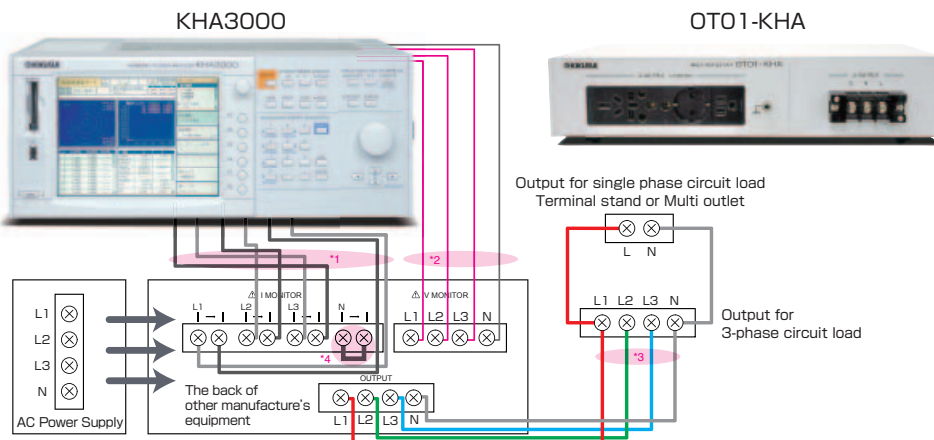
· ·

◆ Application example of the combination system with other manufacture's equipment

Use the terminal "I Monitor" and "V Monitor" on the back of RIN.

* In order to satisfy the voltage drop of 0.5Vrms in the measurement specified in the IEC61000-4-7, it is recommended that the wiring between the OUTPUT and the SOURCE terminal of the KHA series must be connected short and use the thick cable as possible (at least thicker than 8mm2, 16mm2 to 22mm2 for measuring more than 16A).

KHA1000

OTO1-KHA

- L
- N
- G

AC Power Supply

The back of other manufacture's equipment
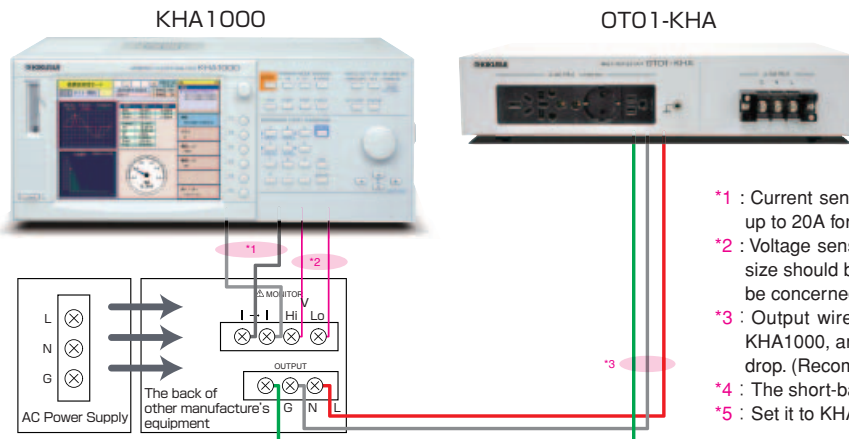
*1 : Current sensing wire : Use the wire with sufficient capacity which allows up to 20A for the KHA1000, and up to 40A for the KHA3000.
*2 : Voltage sensing wire : There is no current flows on this wire, so the wire size should be sufficient with the type around "UL1015 AWG20". (It should be concerned for the withstanding voltage)
*3 : Output wire : Select the wire with the current capacity of 20A for the KHA1000, and 40A for the KHA3000. It may cause to effect for the voltage drop. (Recommended of the wire size : 14mm^2 to 22mm^2)
*4 : The short-bar must be connected.
*5 : Set it to KHA3000 Ver2.00 or more and Delta Transform "Enable".

KHA3000

OTO1-KHA

Output for single phase circuit load
Terminal stand or Multi outlet
- L N

- L1
- L2
- L3
- N

AC Power Supply

The back of other manufacture's equipment

Output for 3-phase circuit load
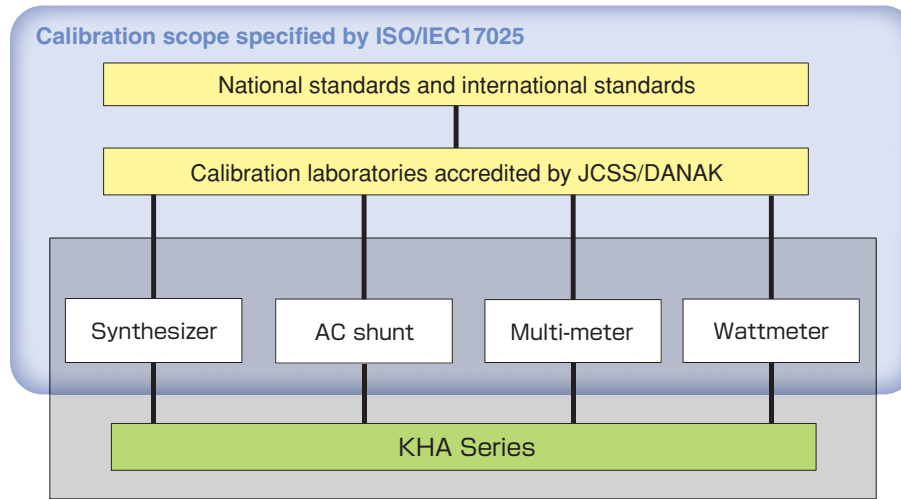- L1 L2 L3 N

Calibration and Traceability

◆ **Calibration of ISO/IEC17025: Provided with calibration/data (measuring equipment in use)**

In order to meet the customers' request for traceabity of the calibration of KHA Series for ISO/IEC17025, we have established the "traceability system" as shown in the figure below. (It is used for the production and inspection of KHA1000/3000.)

When the "Certificate of traceability with Calibrator Data" is requested, a copy of the "Calibration Certificate" can be also attached as achargeable option. (issued by the organizations shown in ▢.

Calibration of KHA Series is carried out using the measuring instruments calibrated in compliance with ISO/IEC17025.

Calibration scope specified by ISO/IEC17025

National standards and international standards

Calibration laboratories accredited by JCSS/DANAK

| Synthesizer | AC shunt | Multi-meter | Wattmeter |

KHA Series

▲ Outline diagram of traceability

Note that KIKUSUI cannot calibrate KHA1000/3000 in compliance with ISO/IEC17025.

Thus, the calibration data for KHA Series that can be provided at the moment does not contain of "the Expression of Uncertainty".
A copy of the data that contains of "the Expression of Uncertainty" for the measuring instruments used for calibration can be attached as a chargeable option.

If you need data issued by accredited calibration laboratories (with the logos), please contact our sales representatives.

●Distributor: