NEW

Harmonic/Flicker Analyzer
MODEL KHA3000

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

IEC61000-3-2 Ed3.0 (Harmonics for 16A or less)
IEC61000-3-3 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/Ed1 (Interharmonics ON/OFF)

KIKUSUI

Harmonic /Flicker Analyzer

Capable to handle the single-phase and the three-phase equipment for the test exceeding 16A of current

KHA3000, in addition to the complied standards and features of the KHA1000 (dedicated for single phase), is equipped for the harmonic and flicker compliance test exceeding 16A of the single-phase and the three-phase equipment. With this unit alone, you can take highly accurate simultaneous three-phase measurements up to 40A/phase*. Furthermore, the KHA series is compliant with two measurement technique standards, the existing and the latest versions, so you can simply select to take measurements for the latest standard including interharmonics and for the conventional 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 unit offers the real-time judgment of compliance with standards. Using this unit alone, you can judge test results and prepare result reports without the use of a PC. On top of that, you can easily set up a standard compliance test system by combining KHA3000 with an AC power supply (PCR-LA Series) and a line impedance network (LIN40MA-PCR-L).

*Support for measurement beyond 40A/phase is scheduled with an external current sensor (option) and an update of the firmware.

Harmonic/Flicker Analyzer
KHA3000

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

Category	Limit value standard Edition	Measurement technique standard Edition
Harmonic current	IEC61000-3-2Ed3 [EN61000-3-2:2006]	IEC61000-4-7Ed2 [EN61000-4-7:2002] IEC61000-4-7 Initial version [EN61000-4-7:1993]
	IEC61000-3-2Ed2.2 [EN61000-3-2A2:2005]	
	JIS C61000-3-2:2005	
	IEC61000-3-12 Initial version [EN61000-3-12:2005]	
Flicker/voltage fluctuation	IEC61000-3-3Ed1.2 [EN61000-3-3A2:2005] IEC61000-3-11 Initial version [EN61000-3-11:2000]	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.

Characteristics and Features

◆Applied 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**[*3]	**KHA3000** Covers all.
3 phases		

*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.
*3: KHA1000 is dedicated for single phase (16A or less).

◆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.

◆Comply 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.
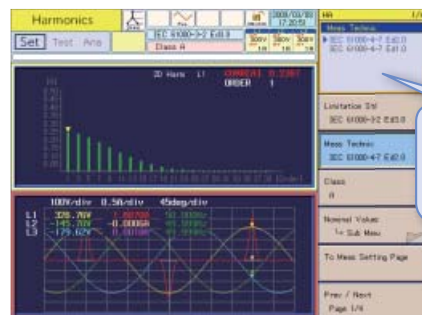
You can switch between the old and new standards to view the differences in real time.

Harmonic measuring instrument standard	IEC61000-4-7Ed2	IEC61000-4-7Ed1
Window width	200ms 10cycle/50Hz 12cycle/60Hz	16cycle
Interharmonics	Interharmonics grouping (unit of 5 Hz)	None Integer order harmonics only

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

The unit can be easily upgraded from the front panel using a CF card.
*Users are requested to prepare CF cards.
*Support for USB memory is currently under development.
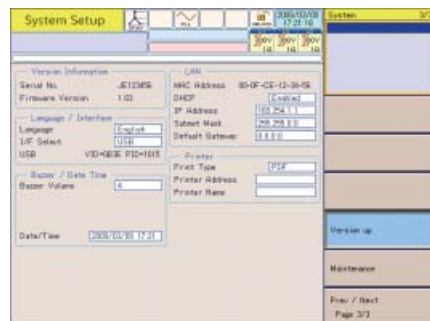
◆No need for a PC for compliance testing

Using this device alone, you can perform a series of test processes - from setting test conditions and running the test to judging the test results and outputting result reports - without the use of a PC. You can enter comments from the test condition setting screen.

●Operation flow using KHA3000 - from test condition setting to report printing

Test preparations ▶ **Start of test** ▶ **Test analysis** ▶ **Test result**
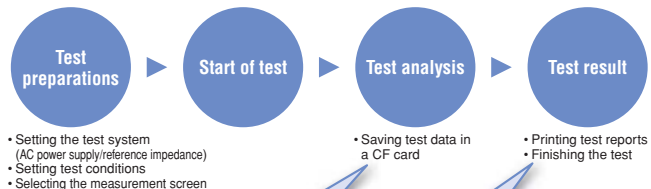
• Setting the test system (AC power supply/reference impedance)
• Setting test conditions
• Selecting the measurement screen

• Saving test data in a CF card

• Printing test reports
• Finishing the test

Link to a PC with a CF card (external memory)
A Compact Flash (CF) memory card is used to save test conditions, reports, screen hardcopies and data.
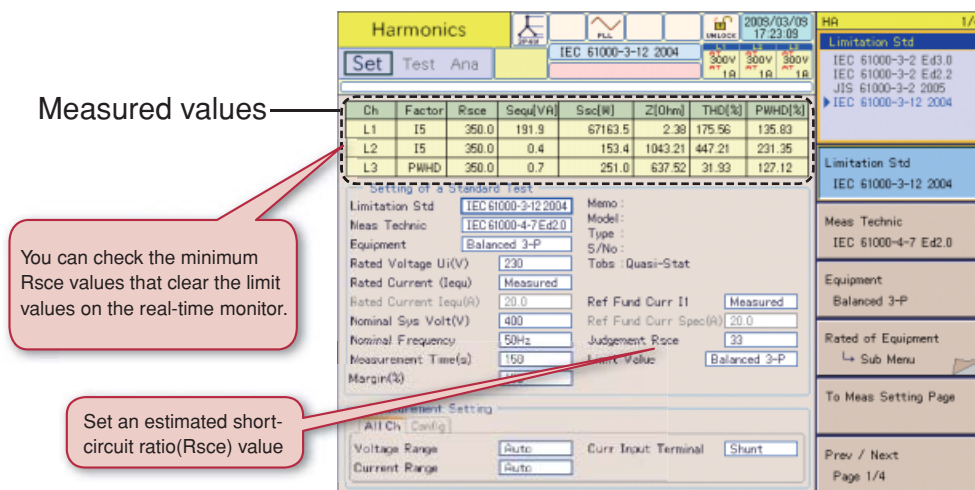*Support for USB memory is currently under development.

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.

▲ Example of test report (harmonic compliance test)

◆Measurement for harmonic compliance test (16A to 75A/phase)
●IEC/EN61000-3-12

Measured values

You can check the minimum Rsce values that clear the limit values on the real-time monitor.
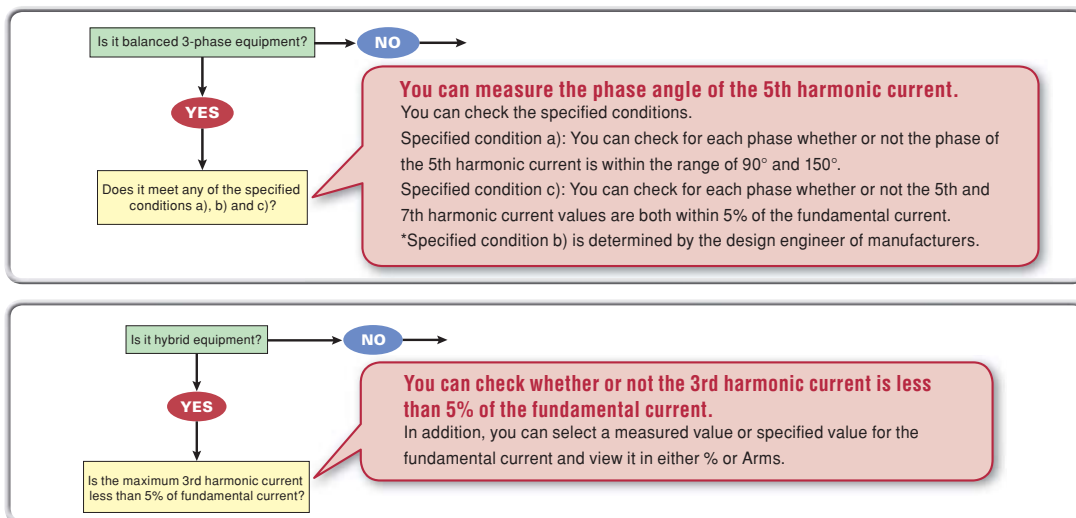
Set an estimated short-circuit ratio(Rsce) value

■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.

[Reference] The test flow of IEC61000-3-12 limit value application procedure
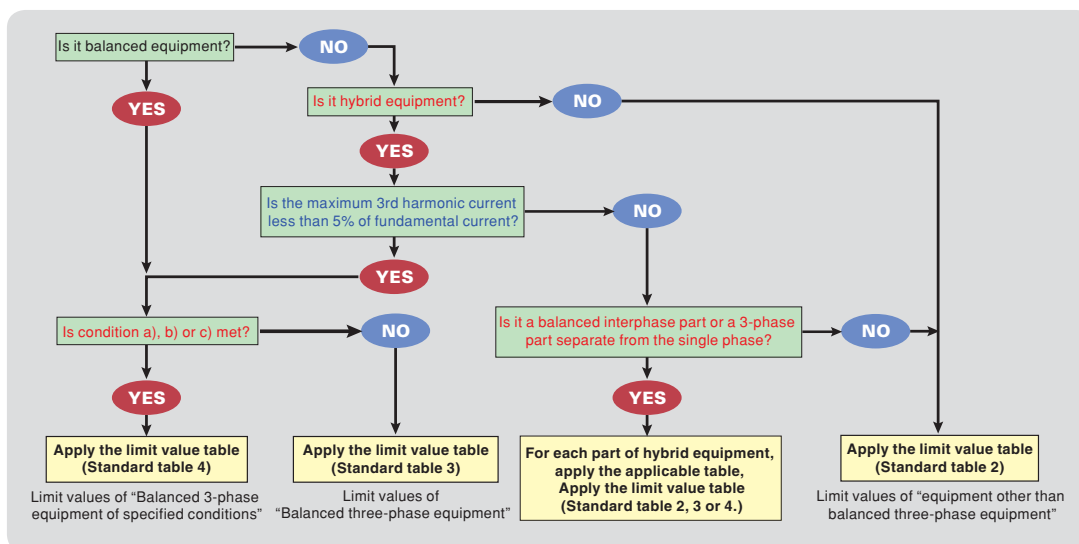
Select a category of the equipment for IEC61000-3-12 (single phase, line, balanced three-phase and unbalanced three-phase) and follow the flowchart. You can select limit values for the category.

Is it balanced 3-phase equipment? — NO →
YES ↓
Does it meet any of the specified conditions a), b) and c)?

You can measure the phase angle of the 5th harmonic current.
You can check the specified conditions.
Specified condition a): You can check for each phase whether or not the phase of the 5th harmonic current is within the range of 90° and 150°.
Specified condition c): You can check for each phase whether or not the 5th and 7th harmonic current values are both within 5% of the fundamental current.
*Specified condition b) is determined by the design engineer of manufacturers.

Is it hybrid equipment? — NO →
YES ↓
Is the maximum 3rd harmonic current less than 5% of fundamental current?

You can check whether or not the 3rd harmonic current is less than 5% of the fundamental current.
In addition, you can select a measured value or specified value for the fundamental current and view it in either % or Arms.

## ◆Measurement for flicker compliance (voltagee fluctuation) test (16A to 75A/phase)
●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.

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[Reference] Outline of IEC61000-3-11 test
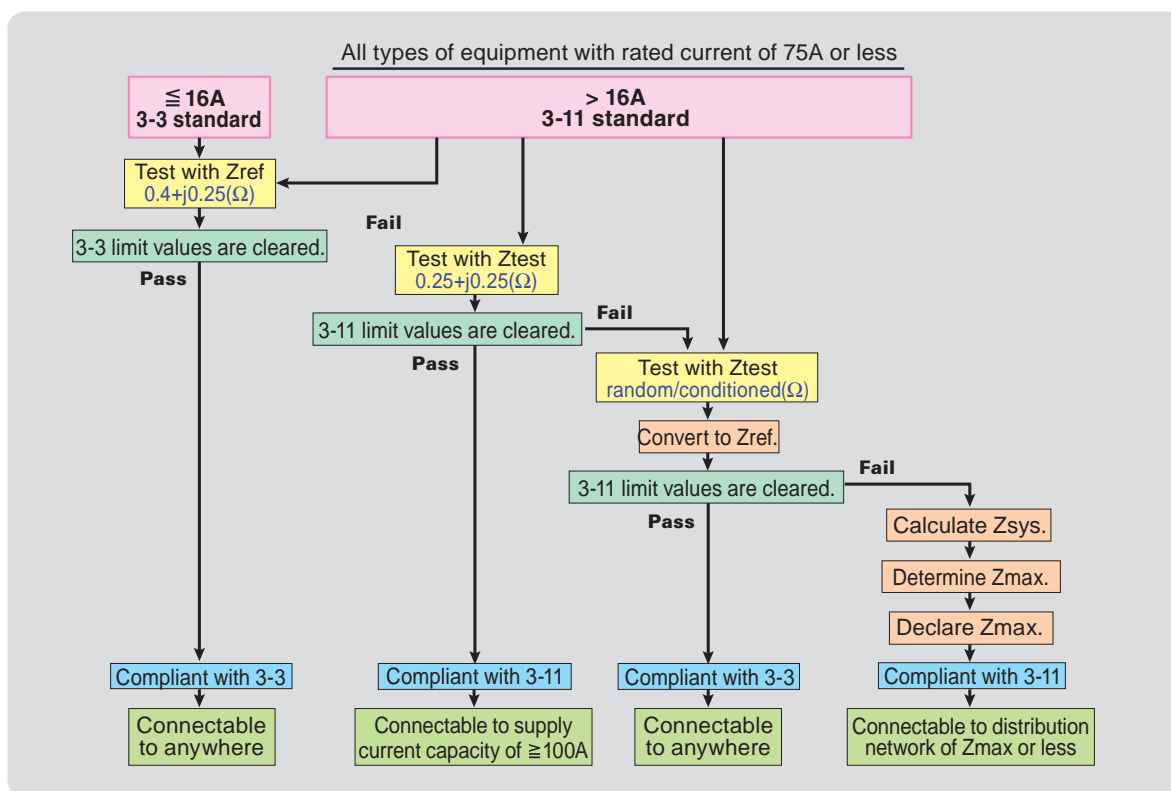
◆ You can specify test impedance.
   You can select the standard value ($0.25\Omega + j0.25\Omega$) or specified values.
   *You can enter specified values for Z_A test and X_A test (for reactance) in the range of 0.001Ω to 9.999Ω.
   In addition, you can enter specified values for neutral line impedance Z_N and X_N.
◆ KHA3000 automatically calculates the measured values (dc, dmax, Pst and Plt) and makes a judgment whether or not they are below the limit values. When the converted values did not clear the limit values, the unit automatically calculates the system impedance and displays the minimum value of the 4 Zsys values as Zmax. This Zmax is declared for IEC61000-3-11.
   In manual switching, KHA3000 can calculate Zsys1 and Zsys2 only and display the smaller of the two as Zmax. (This is possible by switching the display items.)

$$Zact \leq Zmax$$

◆ When testing with randomly selected impedance, time measurement d (t) > 3.3% is not necessary. (You can remove it from judgment using the judgment option.)

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

●**List of view types**

|	Harmonic current test	Flicker/voltage fluctuation test
Graph display	● V/I waveforms ● 2D harmonics ● 3D harmonics ● THC ● Current trend ● Harmonic current trend ● Vector phases	● 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)
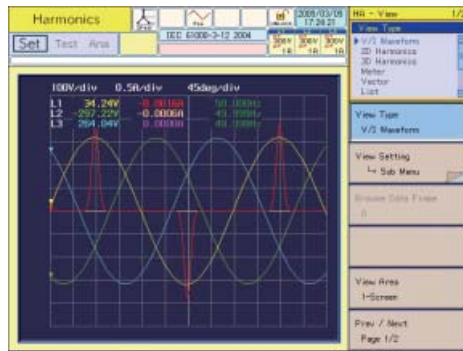
▲ V/I waveforms
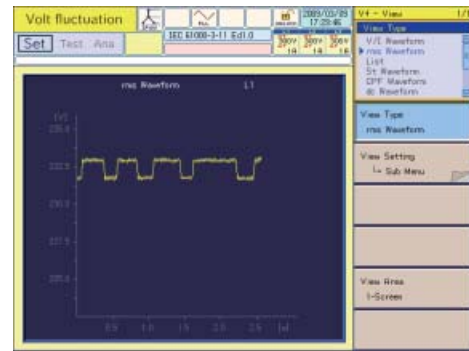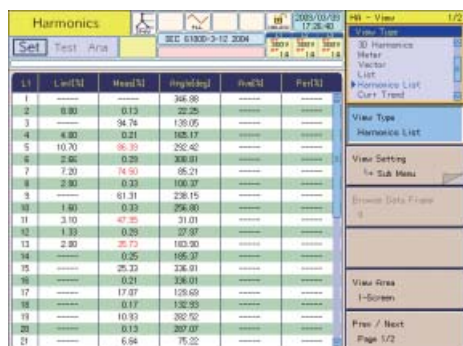

▲ rms waveform

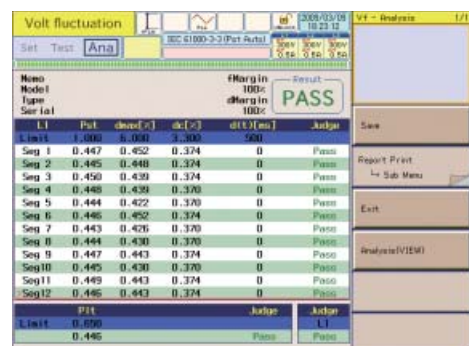▲ 2D harmonics
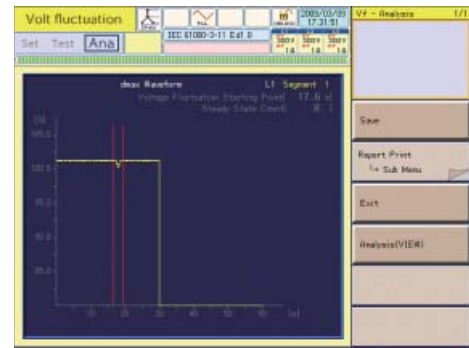
▲ dmax waveform
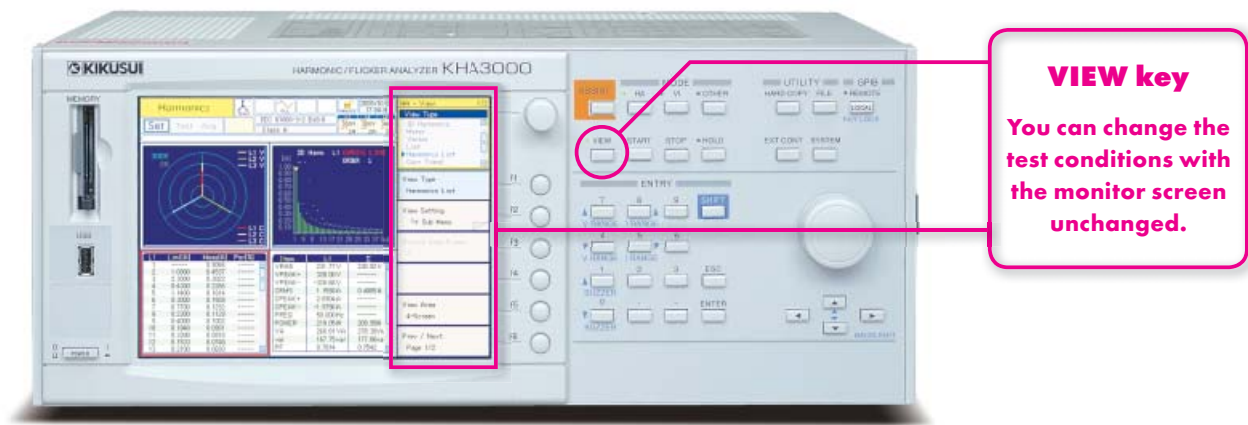

▲ Vectors

▲ Flicker list

▲ Harmonic list

▲ Result list

◆Allows changes in the test conditions while monitoring

◆Capable of simultaneous measurement of the three-phases

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.
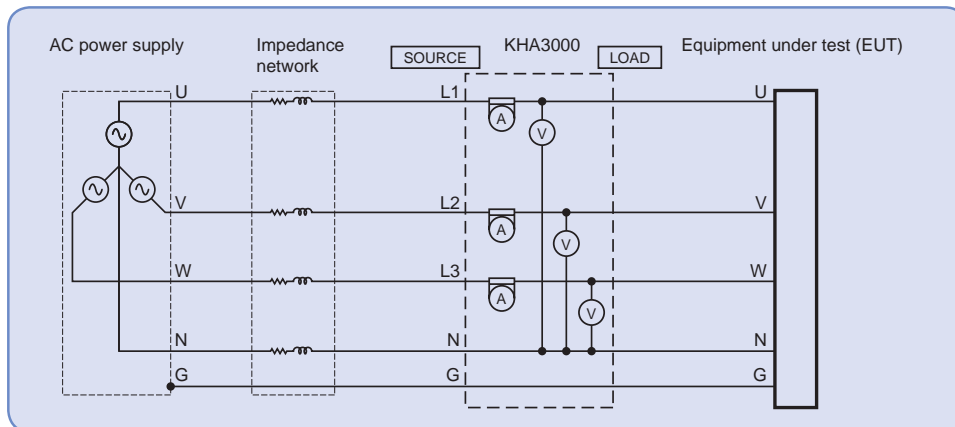
◆ In order to fully cover the EUT input methods, you can set the wiring method (single phase, single phase 3-wire, three-phase 3-wire and three-phase 4-wire). In addition, for the setting of L1, L2 and L3 (channels), you can select interlock or independent. This allows appropriate measurement for equipment 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.

◆Supports "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%.
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

KHA3000 is 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

KHA3000 is 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 KHA3000 a convenient routine work tool for development and design processes.
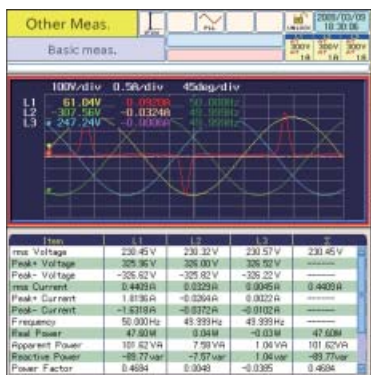
◆Rush current measurement

KHA3000 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.
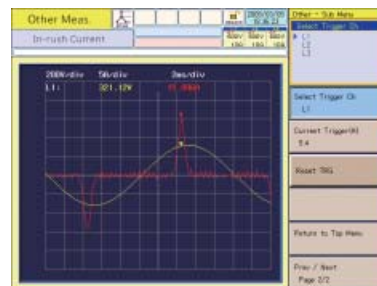
A rush current can be measured while the EUT is connected. This saves you from going through the trouble of preparing an oscilloscope and current probe. Set the input phase angle of the AC power supply using the application software (SD006-KHA), and turn on the unit. The rush current can be measured with good reproducibility. The phase angle can be set in the unit of 1°.

◆The assist function provides guidance on standards and technical terms

KHA3000 is 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.
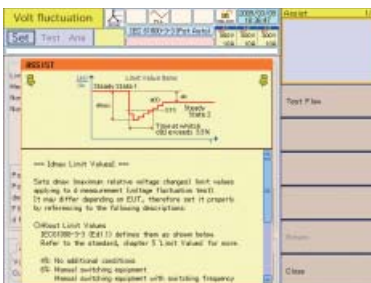
◆Generates test reports in both PDF and text formats

Reports can be output to a CF card in either PDF or text format.
You can easily view and print them using a PC.
The text format is useful to convert into your own format.
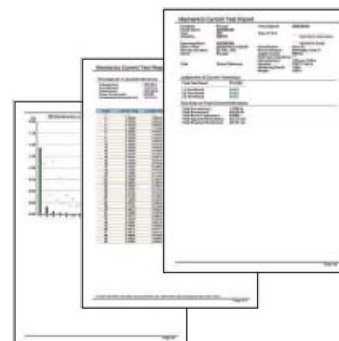
◆User-friendly terminals and interfaces

KHA3000 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.

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.

▼ Rear panel

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

⚠MONITOR
I　　V
I → I　Hi　Lo

Reference impedance back monitor terminal

[Voltage sensing wire] Since current does not flow,the wire equivalent to UL1015 AWG20 is sufficient. (Withstand voltage is required.)

[Current sensing wire] Select a wire that can withstand 40A maximum. (It affects a voltage drop.) 21 mm² is recommended.

Example of regular connection
· Maximum of 40A can be measured.
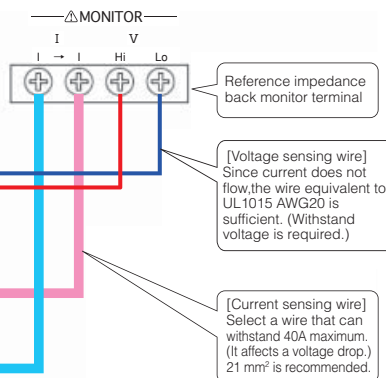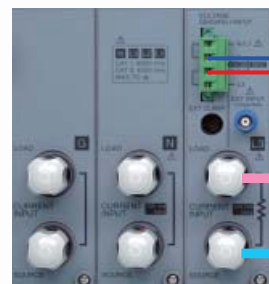
· When replacing an other manufacturer's power analyzer, connect as shown above. You can continue using the unit as before.
· If the power value is negative, switch the polarity of either the voltage or current sensing wire to fix it.

Specifications

Item		Specification
Common input specifications	Maximum input voltage	600Vrms / 900Vpeak (CAT I),400Vrms (CAT II)
	Maximum input current	40Arms / 100Apeak, whichever is smaller 160Apeak (within 20 ms)
	Number of input channels	3 channels for both voltage input and current input (L1, L2 and L3)
	Voltage measurement input switching	Single-phase 2-wire, single-phase 3-wire, three-phase 3-wire and three-phase 4-wire
Voltage measurement function	Rated voltage for the range	150V / 300V / 600V
	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
	Allowable crest factor	0.5A to 20A range:4
		40A range:2.5, 4 (up to 20 ms)
	Display item	TrueRMS and ±peak
	Accuracy *n indicates frequency.	45Hz to 65Hz / 0.5A range: ± (0.5% of rdng+0.2% of range) / 1A to 40A range: ± (0.5% of rdng+0.1% of range)
		66Hz to 2.4kHz / 0.5A range: ± ((0.5 ＋ 0.417×n kHz) % of rdng+0.2% of range) / 1A to 40A range: ± ((0.5 ＋ 0.417×n kHz) % of rdng+0.1% of range)
Power measurement function	Display item	Effective power, apparent power, reactive power and power factor
	Effective power accuracy	P ≥ 150W (±1% range) , P < 150W (±1.5W)
Frequency measurement function	Measurement input	Independent measurement of frequencies for voltages of L1, L2 and L3
	Measurement frequency range/ accuracy/resolution	45Hz to 65Hz / ± (0.15% rdng+2digits) / 0.001Hz
Phase measurement function	Measurement item	Voltage / current phases, line voltage phase 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、IEC 61000-3-2 Ed2.2、JIS C61000-3-2 (2005) IEC 61000-3-12 Ed1.0
	Requirements for measuring instrument standard	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 (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)
Harmonic voltage measurement function (Measurement power quality check 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 Ed1.2, IEC 61000-3-11 Ed1.0
	Requirements for measuring instrument standard	IEC 61000-4-15 1997+Amd1 (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), maximum capacity: 512 MB
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	1500V AC, 1 minute (AC input <--> chassis), 3550V AC, 1 minute (measuring terminal <--> chassis)	
Insulation resistance	AC input <--> chassis	500 Vdc, 100 MΩ or higher
	Test terminal <--> chassis	
Dimensions (maximum)	430 (455) W×177 (195) H×270 (330) Dmm	
Weight	Approx. 10 kg	
Safety	Low voltage directive 2006 / 95 / EC EN 61010-1 Class I Pollution degree 2	
EMC*1	Conforming to the following instruction and standard requirements: EMC instruction 89/336/EEC EN 61326 Application requirement All cables and wires used to connect this product must be shorter than 3 m.	
Accessories	Power cord, voltage sensing terminal plug and short-circuit wire kit (with a dedicated screwdriver), spare fuse and operation manual	

*1. Limited to products with a CE marking provided on the panel.

Options

◆KHA3000 Application software [SD006-KHA]
Harmonics Analyzing Suite Ver 2.00

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

HarmoCapture 3	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 ● Control of AC source PCR-LA ● Start/stop of test ● Entry of comments ● Retrieval of test result files ● Report printing ● Display of measured values
HA File Analyzer 3	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	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 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)
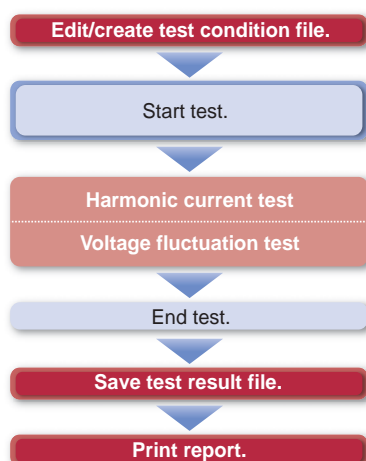● USB cable (only when using the USB interface)

●HarmoCapture 3

By remotely controlling KHA3000, you can edit the test conditions, execute tests and print reports.
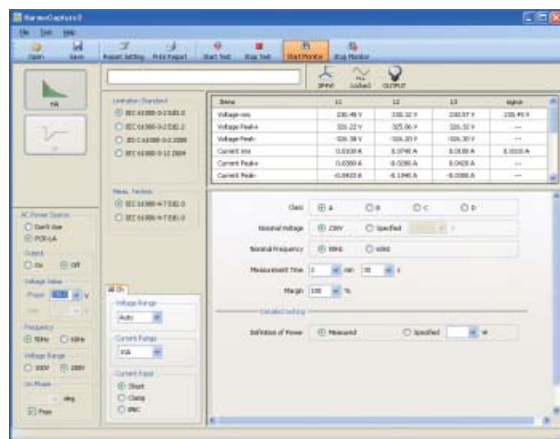
▲ HarmoCapture 3
   Test condition setting screen for harmonic current test

[Workflow: Test flow]

Edit/create test condition file.

Start test.

Harmonic current test
Voltage fluctuation test

End test.

Save test result file.

Print report.

■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	Class	Only when class C is selected	Only when class A of JISC 61000-3-2 (2005) is selected
Limitation standard	Nominal voltage	Power factor and fundamental current	600W air conditioner
Measurement technique standard	Nominal frequency	Limit value	
Voltage range	Measurement time		
Current range	Margin		
Current input terminal	Definition of power		
	IEC 61000-3-12 (2004)		
Measurerment time	Single-phase equipment	Unbalanced three-phase equipment	Line and balanced three-phase equipment
Equipment type	Rated voltage (Up)	Rated voltage (Up)	Rated voltage (Ui)
Nominal frequency		Nominal system voltage (Unom)	Nominal system voltage (Unom)
Margin			
Rated current (Iequ)			
Ref. fund current (I1)			
Judgment Rsce			
Limit value			

■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	Nominal voltage	Nominal voltage	Nominal voltage
Limitation standard	Nominal frequency	Nominal frequency	Nominal frequency
Measurement technique standard	Pst measuring time	d measuring time	Pst measuring time
	Pst measurement count	d measurement count	Pst measurement count
Voltage range	dmax limit value	d max limit value	d max limit Flicker margin d margin
Current range	Flicker margin	d margin	Test impedance
Current input terminal	d margin	Judgment limit value	Judgment limit value
	Judgment limit value		

●HA File Analyzer 3

HA File Analyzer 3 is an application program that allows you to analyze the data in the test result files (xxx.hr3) saved by HarmoCapture 3. It is not necessary to connect with KHA3000 to run, so, you can analyze test data anywhere you want.
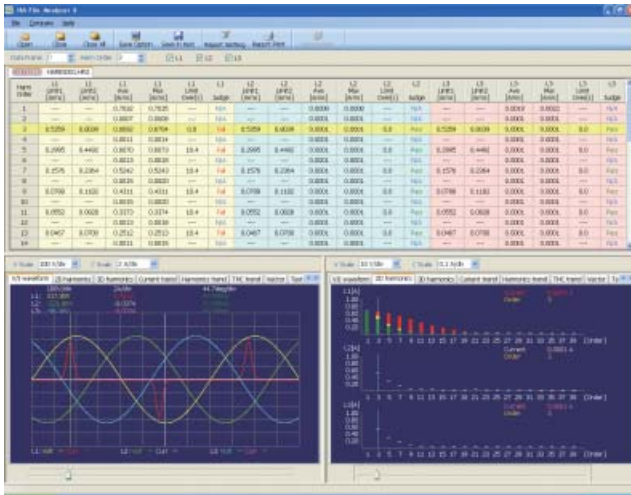
■Screen configuration

|	
Result list	Lists the result files of harmonic current tests.
Graphs and data	Displays graphs of the harmonic current test result file.

■Repeatability 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.

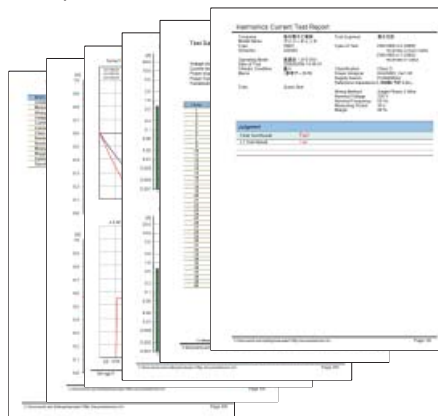### ■Saving test result files in the text format

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

■Printing test result file reports

You can generate and print reports (PDF files) from the test result files saved by KHA3000 or HarmoCapture 3.
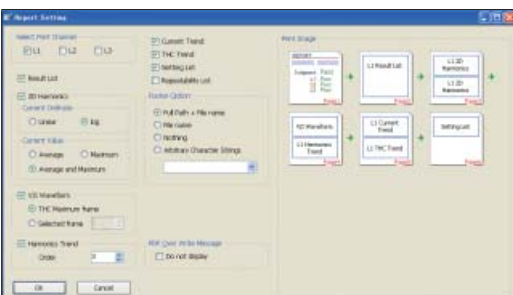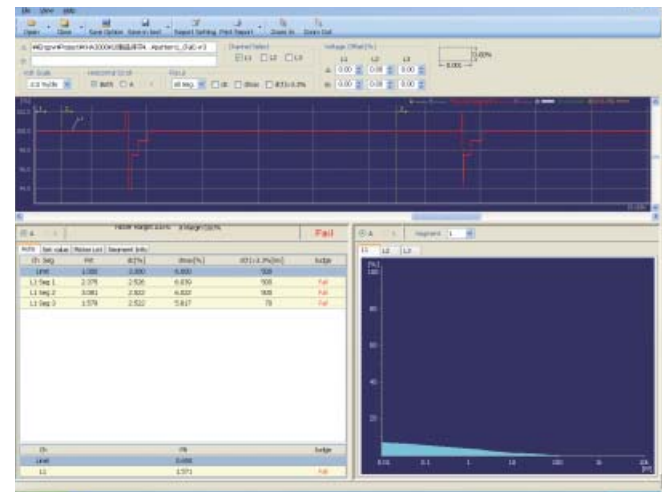

▲ Setting of harmonic test report

▲ Harmonic test report (example)

●VF File Analyzer 3

VF File Analyzer 3 is an application program that allows you to analyze the data in the test result files (xxx.vr3) saved by HarmoCapture 3. It is not necessary to connect with KHA3000 to run, so, you can analyze test data anywhere you want.

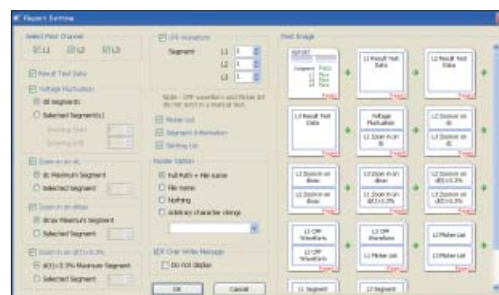### ■Screen configuration

|	
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.

■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

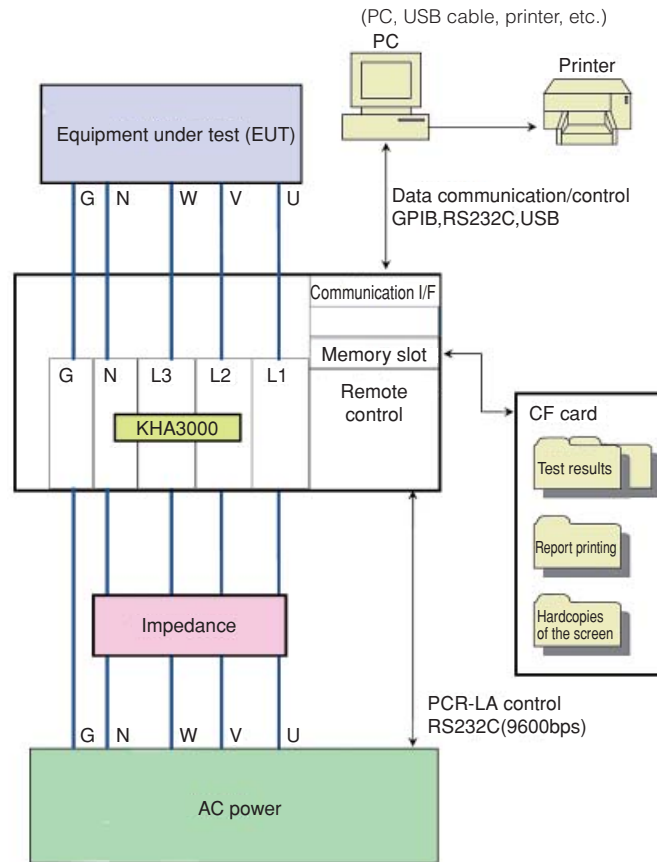You can generate and print reports of the test result files saved by KHA3000 or HarmoCapture 3 in PDF format.

▲ Setting of flicker test report
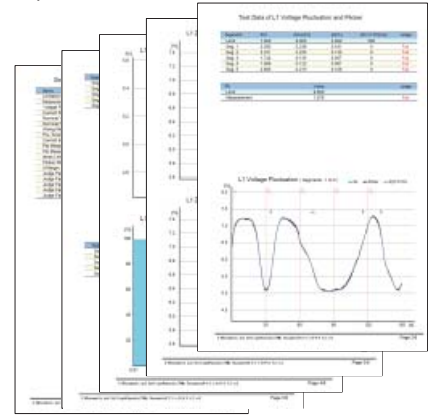
▲ Flicker test report (example)
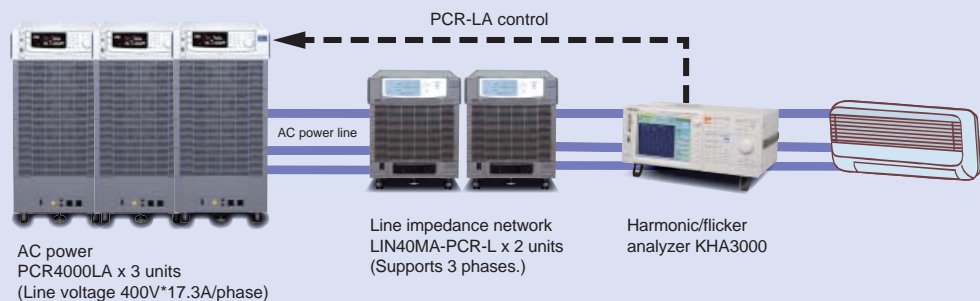
11

◆System components required for test

■KHA3000 test system configuration table [Example of single-phase/three-phase (12 kVA) system]

		Model	Quantity	Necessity
1	Harmonic/flicker analyzer main unit	KHA3000	1	◎
	External memory (CF card) max 512 MB	Refer to the recommended part listed under the optional items	1	○ Required for upgrades
	AC input cable (KHA - SOURCE terminal)		1	
2	Application software	SD006-KHA	1	○ Useful. Simplifies operation
	Personal computer		1	
	Communication cable (KHA main unit)	USB cable	1	
	Printer (supplied with cable)	*As required	1	
3	AC power (4kVA × 3)	PCR4000LA	3	○ Existing equipment
	Three-phase output driver (for three-phase output)	3P03-PCR-LA	1	○ Existing equipment
	Parallel operation driver (for parallel operation)	PD03M/S-PCR-LA	3	○ Existing equipment
	Parallel terminal	PT02-PCR-LA	1	
4	Reference impedance (for 1Φ/3Φ)	LIN40MA-PCR-L	2	○ Existing equipment
5	Multi-outlet for single phase load	OT01-KHA	1	
6	Calibration data (traceability certificate)	*As required	1	
7	Harmonic/flicker daily checker	*Under development	1	

Measuring circuit for flicker three-phase 4-wire equipment

(Example of system configuration:
EN standard 12 kVA)

AC power
PCR4000LA x 3 units
(Line voltage 400V*17.3A/phase)

Line impedance network
LIN40MA-PCR-L x 2 units
(Supports 3 phases.)

Harmonic/flicker
analyzer KHA3000

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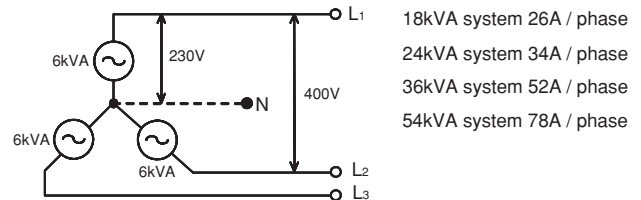
◆ Impedance network [LIN40MA - PCR-L]   *Built to order

■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		430W × 484H × 550Dmm (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

●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

For 3-phase 4-wire type connection
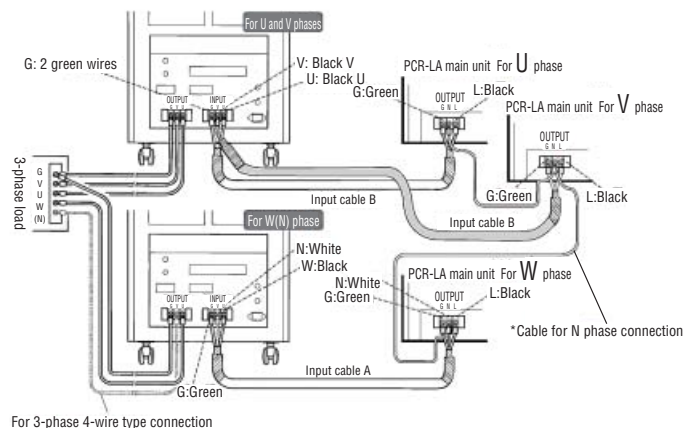
◆Accessories and others

■CF (Compact Flash) memory card

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:

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

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

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

OT01-KHA

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

■Current sensor for high current Under development

■Rack mount brackets

[For KHA3000/1000]
KRB4 (inch)
KRB200 (millimeter)

[For OT01-KHA]
KRB2-TOS (inch)
KRB100-TOS (millimeter)

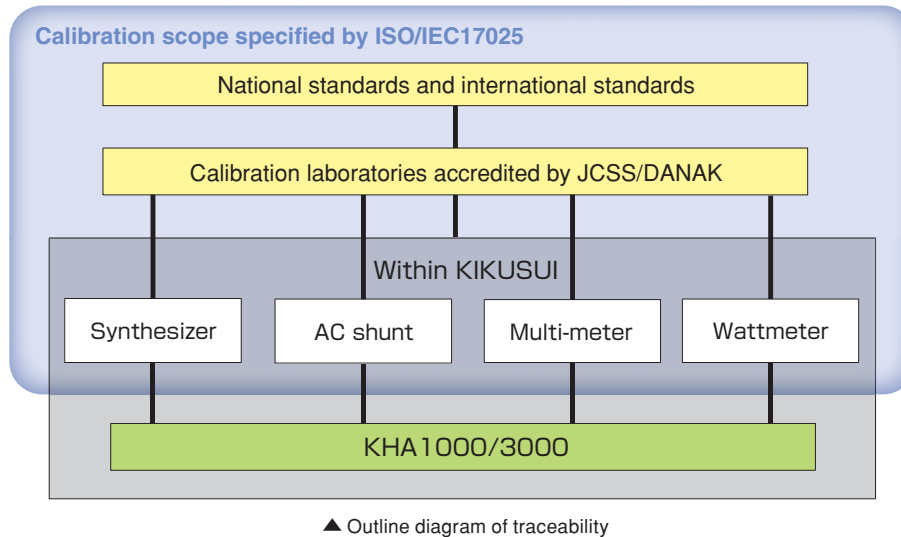## ■Harmonic/flicker daily checker Under development

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 KHA1000/3000 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 KHA1000/3000 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│
   └─────────────────────────────────────────────────┘
        │         │            │             │
              Within KIKUSUI

   ┌───────────┐ ┌──────────┐ ┌────────────┐ ┌────────────┐
   │Synthesizer│ │ AC shunt │ │ Multi-meter│ │ Wattmeter  │
   └───────────┘ └──────────┘ └────────────┘ └────────────┘
        │         │            │             │
   ┌─────────────────────────────────────────────────┐
   │               KHA1000/3000                        │
   └─────────────────────────────────────────────────┘
```

▲ Outline diagram of traceability

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

Thus, the calibration data for KHA1000/3000 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.

Dedicated for single-phase
(16A or less) equipment
Supports IEC and JIS
compliance tests

Harmonic/Flicker Analyzer

KHA1000

● Supported standards
IEC61000-3-2 Ed3.0 (2005-11)
JIS C61000-3-2 : revised version (2005-3)
IEC61000-3-3 Ed1.2 (2005-10)

■ No need for a PC for compliance testing
■ Customization function to simplify time-consuming test condition setting
■ Real-time measurement that gives you a quick grasp of the EUT status
■ Assist function that guides you on standards and technical terms
■ CF card offering smooth interaction with a PC
■ Capable of measuring fundamental power source characteristics
■ Simplified connection systems with separated power supply input and load power
■ Test reports available in both PDF and text formats
■ Equipped with GPIB, RS-232C and USB interfaces as standard
■ Dedicated application software SD005-KHA (optional)

■KHA1000 Specification

Item		Specification
Common input specifications	Maximum input voltage	300 Vrms/560 Vpeak
	Maximum input current	24 Arms/50 Apeak 80 Apeak (20 ms or less)
Voltage measurement function	Rated voltage for the range	150 V, 300 V
	Allowable crest factor	2
	Display item	TrueRMS/±peak
	Accuracy	± (0.4% rdng + 0.04% range)
Current measurement function	Rated current for the range	0.5, 1, 2, 5, 10, 20A
	Allowable crest factor	4 (0.5 A to 10 A range)
		2.5 (20 A range)
	Accuracy	± (0.5% rdng + 0.1% range) *Excluding 0.5 A range
Power measurement function	Display item	Effective power, apparent power, reactive power, and power factor
	Accuracy	$P \geq 150$ W (±1% range), P < 150 W (±1.5 W)
Frequency measurement function	Measured frequency range/accuracy	45 Hz to 65 Hz/ ± (0.15% rdng + 2digit)
Harmonic current measurement function	Conforming standards	IEC61000-3-2Ed3.0:2005 IEC61000-3-2Ed2.2:2004 JIS C61000-3-2:2005 JIS C61000-3-2:2003
	Requirements for Measuring instrument standard	IEC61000-4-7Ed2 (2002) IEC61000-4-7Ed1 (1991)
	Harmonic analysis order	40th/180th (OTHER mode)
	Accuracy 45 Hz to 65 Hz	± (0.5% rdng + 0.1% range) *Excluding 0.5 A range
	66 Hz to 2.4 kHz	± ((0.5 + 0.417 × nkHz) % rdng + 0.1% range)
	Interharmonics processing	IEC61000-4-7Ed2 (2002) IEC61000-4-7Ed1 (1991)
	Window function	Rectangular
	Window width	10 cycles/50 Hz, 12 cycles/60 Hz, or 16 cycles/ (50 or 60 Hz)
	Anti-alias filter	Cut-off frequency 6 kHz, 4th-Butterworth filter
	Class D judgment function	Current waveform inclusion rate of 95% or more (equivalent to JIS C61000-3-2:2003 Class D)
Measurement power quality check function	Measurement items	Voltage, frequency, and voltage harmonic inclusion rate
	Voltage harmonic analysis order	40th
Flicker/voltage fluctuation analysis function	Conforming standards	IEC61000-3-3Ed1.2: (2005)
	Requirements for Measuring instrument standard	IEC61000-4-15Ed1.1: (2003)
	Flicker Pst/Plt accuracy	1±5%
	Pst measarement time	30 to 900 seconds
	Voltage fluctuation Measurement method	It shall be possible to choose between measuring voltage fluctuation along with Pst and measuring voltage fluctuation alone.
	Dmax measurement of manual switching equipment	3 - 24 times (one measurement period ranging from 30 to 180 seconds)
General-purpose measurement functions	Current/voltage waveform monitor, FFT analyzer, and In-rush current measurement	
Communication interfaces	GPIB, RS232C, USB	
Removal data storage	Supported media	Compact flash memory card (CF card)
External device control function	PCR-LA control (RS-232C)	Voltage, frequency, range, output on and off
AC Input	Nominal voltage range	100 to 240 VAC 50/60 Hz
Environmental conditions	Operating temperature and humidity ranges	0 to 40°C, 20 to 80%rh (no dew condensation)
Withstanding voltage	1500 VAC; one minute	
Dimensions (max.)	430 (455) W × 177 (195) H × 270 (330) Dmm	
Weight	Approx. 8 kg	
Safety	EN61010-1:2001, ClassI	
EMC	IEC61326-1 A3:2003	
Accessories	Power cord, junper connector for voltage input connection (with a dedicated screwdriver), and operation manual	

●Distributor: