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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



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





[**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

Only Model KHA3000 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. C 61080-3-2 E-818 Set You can switch between the old and new standards to view the differences in real time. Harmonic measuring instrument standard IEC61000-4-7 IEC61000-4-7Ed2.0 IEC61000-4-7Ed1 0 Ed2.0/A1 200ms 200ms 10cycle/50Hz Window width 10cycle/50Hz 16cvcle 12cycle/60Hz 12cycle/60Hz Interharmonics Interharmonics None

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

Interharmonics

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

grouping

(unit of 5 Hz)*3

The unit can be easily upgraded from the front panel using a CF card*4 or USB memory*5.

grouping

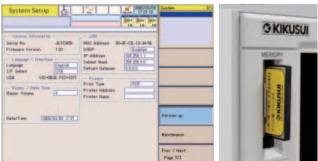
(unit of 5 Hz)

Integer order

harmonics only

*4: Users are requested to prepare CF cards.

*5: Support for USB memory is Only Model KHA3000.

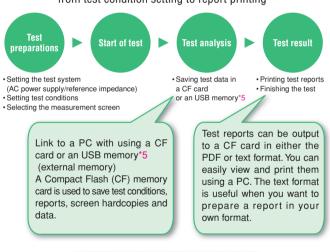


Conducting compliance testing without using a PC

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.

	000-92 Ed0	Marra : Hodel	JIS 81000-3-2 2005 3812 81080-3-12 2004
Diama Noninal Voltage	B000+4-7/Ers20 D 230V	Tipe S/Ne Tube : Guesi-Stat	Limitation Std IEC 81000-9-2 Ed3.0
Noniul Frequency Maxmirement Time(a) Margin(3)	150-62 150 100		Meas Technic BEC 51080-4-7 Ed2.8
		Definition of Power Heasured Specified Power(0)	Class 0
			Nominal Values
			To Meas Setting Page

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



Company Model name	PBU-Type07	2	Test Engine	e!		
Type Serial No.	Linit Teat 2007-00005		Type of test			00-3-22500.422
Operating mode Date of test Climatic condition	20270525	11:11:22	Classificatio		ENEIG 190 Class /	00-4-7-2002 341080-4-1(2002)
Mareo	Phototype		Power anal Supply Sou Reference 1	108		00,Ver1.30
Test Data of Cur FINAL TEST RES Vellege Current Parent		2	THC POHOLIM Normal		230W	A/81819A 19
Apparent Power	206.2444		Fundament Molecring (Morgin		0.5136 105 80%	8
HarriQider L	1.0400	REA PER	Avera internal	Man(A r		Jake

▲ Example of test report (harmonic compliance test)

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

IEC/EN61000-3-12	Ha	rmoni	ics		IEC 61000-3-	12 2004	UNLOCK	2009/03/09 17:23:09	HA 1/4 Limitation Std
	Set	Test	Ana		120 01000 0	16 6001		300V 300V	IEC 61000-3-2 Ed3.0 IEC 61000-3-2 Ed2.2 JIS 61000-3-2 2005
									► IEC 61000-3-12 2005
Measured values ———	Ch	Factor	Rsce	Sequ[VA]	Ssc[W]	Z[0hm]	THD(%)	PWHD[%]	FIED 81000-3-12 2004
	L1	I5	350.0	191.9	67163.5	2.38	175.56	135.83	
	L2	I5	350.0	0.4	153.4	1043.21	447.21	231.35	
	L3	PWHD	350.0	0.7	251.0	637.52	31.93	127.12	Limitation Std
	- Sett	ing of a	Standard	lest				· "	IEC 61000-3-12 2004
You can check the minimum	Limitati Neas Tr Equipme	schnic nt	IEC 61 Balar	000-3-12 200 000-4-7 Ed2 ced 3-P	0 Model: Type : S/No:				Meas Technic IEC 61000-4-7 Ed2.0
		oltage U		230		uasi-Stat			Equipment
Rsce values that clear the limit		urrent ()		Measured	_				
values on the real-time monitor.		urrent I		20.0		d Curr I1		asured	Balanced 3-P
	Nominal Measure	Sys Vol Frequence ment Tar	ay .	400 50Hz 150	Ref Fun Judgeme		33	.0	Rated of Equipment → Sub Menu
Set an estimated short-		of menerat							To Meas Setting Page
circuit ratio(Rsce) value	Voltag	Range t Range		Auto Auto	Curr In	aut Termi	nal Sh	unt	Prev / Next Page 1/4

■You can set test conditions while monitoring the measured values. For the equipment not applied within R (33), the minimum shortcircuit 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, I₃, I₅, I₇, I₉, I₁₁, I₁₃, THD and PWHD, and display in real time the minimum short-circuit ratio (Rsce) value of each harmonic order.

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

IEC/EN61000-3-11

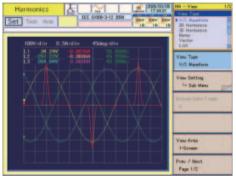
Volt fluctuation		2008/03/08	Vf	1/4
Set Test Ana	61000-3-11 Edl.0	300v 300v	Limitation Std IEC 61000-3-3(Per IEC 61000-3-30Mar IEC 61000-3-11 Ed	nualSw)
Limitation Std IEC 61000-3-11Ed1.0 Meas Technic IEC 61000-4-15 Ed1.1	Memo: Model: Tupe:			
Nominal Voltage 230V Nominal Frequency 50Hz	S/No :		Limitation Std IEC 61000-3-11 Ed	d1.0
		P) 24 15	Meas Technic IEC 61000-4-15 Ec	d1.1
Pst Meas Time(s) 600 Pst Meas Count 12	Rn test(Ω) 0. Xn test(Ω) 0.	16 10	Nominal Values └→ Sub Menu	P
dmax Limit Value	Uptions of Judgement Judge Factor Prate Ide Idemax	Plt		
Measurement Setting			To Meas Setting P	ege
Voltage Range Ruto Current Range Ruto	Curr Input Terminal S	hunt	Prev / Next Page 1/4	

- ■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.

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

• List of view types *The screens are examples of KHA3000.

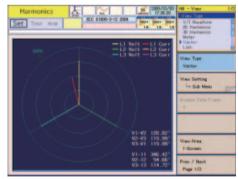
	Harmonic current test	Flicker/voltage fluctuation test
Graph display	 V/I waveforms 2D harmonics 3D harmonics THC Current trend Harmonic current trend Vector phases "Only Model KHA3000 	 V/I waveforms rms waveform St (short time flicker value) waveform CPF (cumulative probability) curve dc waveform dmax 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



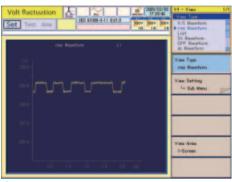
▲ 2D harmonics



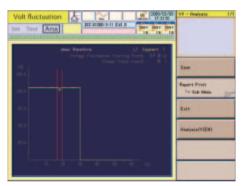
▲ Vectors *Only Model KHA3000

н	armonics	스	EE 6100-2-1	1	2083/05/25	HN - View 1/
Set	Test Ar	11	att Gitter 21	And in case of the local division of the loc	18 18 18 18	Hartar Vactor
u I	LintRd	MeasiXi	Ingleidegi	fineTil	Perilli	Flormonico List
1.			346.00			Cur+ Trend
2	0.00	0.13	22.25			
3		94.74	138.05			Visue Type
4	4.00	0.21	185.17			Harmonice List
5	10.70		292.42		1.000000	
4	2.65	0.29	308.01			View Setting
7	7.20	10.00	85.21		1.044444	1+ Sub Menu
	2.90	0.13	100.37		CONTRACTOR OF	
- 9		81.31	238.15			Browne Lieta Frank
10.1	1.60	0.13	256.00		CONTRACTOR OF T	
11	3.10		31.01		Contraction 1.	.4.
12	1.33	0.29	27.97		and the second second	
11	2.00	10.00	1001-90			
14		0.25	185.37			
15		25.33	136.01	entite		
16		0.21	396.03			Visc Grea
17		17.07	128.69			1-Screen
18		0.17	132.93		1.7 mmmm	1-20180
18		10.93	392.52			a hourse and
20		0.13	207.07		Contract 1	Pres / Next
23		6.64	市設			Fige 1/2

▲ Harmonic list



A rms waveform



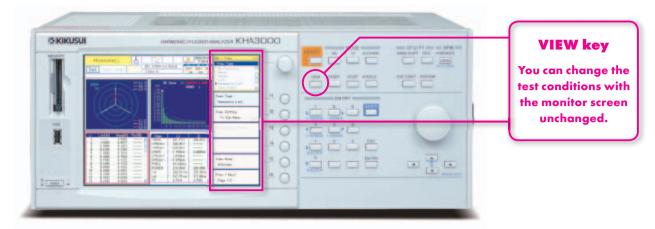
▲ dmax waveform

100000	COLUMN TWO IS NOT	TELÉTRET	TRAINING THE PARTY OF		1.54	3.58 0.58	de Ravellers draw Maveform
1.1	Pst	P0.1	PIS	P35	PIOS	P905	#113.3% Haveforry #Filiner List
Seg. 1	0.447	0.565	0.515	0,491	0.400	0.132	Residt List
Seg. 2	0.445	0.545	0.515	0.488	0.399	0.131	10 m m
Seg. 3	0.450	0.555	0.518	0.497	0.408	0.133	Wiew Type
509. 4	0.448	0.545	0.518	0.497	0.403	0.132	Flicker-List
Seg. 5	0.444	0.535	0.509	0.485	0.398	0.131	International Contraction
Seg. 6	0,445	0.545	0.515	0.408	0,400	0.132	View Setting
Seg. 7	0.443	0.545	0.506	0.482	0.394	0.129	4 Sub Here
Seg. 8	0.444	0.535	0.509	0.485	0.396	0.131	And and a second second
Seg. 9	0.447	0.955	0.515	0.491	0.400	0.133	Browns Segnerit
Seg. 10	0.445	0.545	0.512	0,488	0.398	0.131	12
Seg.11	0.449	0.545	0.522	0.497	0.406	0.133	
5eg.12	0,445	0.555	0.518	0,488	0.399	0.131	
	PIL						
	0.446						View Area
							1-Screen

uctuation 1 BEC 61000-3-3 (Put A Ana 3064 3064 3064 0 18 0 18 0 18 Hargin Hotz Hargin 100z PASS Nodel Nodel Type Ser Io 0.447 0.452 0.374 0.374 0.374 0.370 0.370 0.370 0.370 0.370 0.370 0.374 0.370 0.374 Report Print 0.445 0.450 0.448 0.444 0.445 0.443 0.444 0.447 0.445 0.449 0.445 0.448 0.439 0.439 0.422 0.422 0.452 Eatt 0.492 0.426 0.430 0.443 0.430 0.443 0.443 0.443 Products (VIEW) 0.446

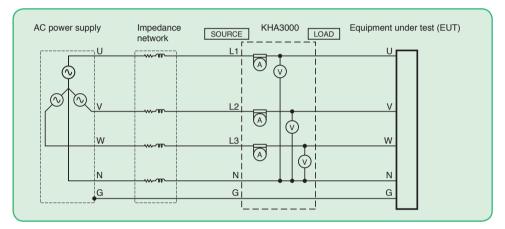
Result list

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 = 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.

247	Teet [Ana		C RACE	0-7-5 E413	201 201	100 100 100 100 100 100 100 100 100 100	Plate - View - Sub Herss Press - Renation Kay
			ages.	Pa	_	PA	ASS	Compare Mills Part Law
	Part(R)	[Ress[0]	Aster	Ho.	Ber(A)		Judge	In Side Marks
	0.7032	0.7525	-9.1	12	8.8007	0.0008		
1.21	0.6652	0.00243	0.0	199	0.0011	0.0012		
2	0.6670		0.0		0.0013	0.0015		
4	0.4211	0.4310	0.0		4.0015	0.0015	-	
10	0.3373	3373		÷.	0.0015	D.DOTS	-	-
13	0.2512	1,2513	4.0	14	0.0011	0.0012		
15	0.1780	8.1700			0.0071	0.0012	and in case of	
17	0.1159	4,1199	6.0		0.0007	0.0063	_	
191	0.0067	0.0768			0.0005	0.0005	-	
21	0.0467	0.0457	-	22	0.0003	0.0004	_	
23	0.0268	0.000	and the local division of the local division	24	0.0002	0.0002	and the second second	
25	0.0147	0.0147	_	28	0.0001	0.0007	_	
27	0.0076	0.0075	-	28	0.0001	0.0001	-	
288	0.0007	8.0037		38	0.0001	0.0001		Select View Phase
22	0.0012	8.0017	_	122	0.0001	0.0001	-	43
13	D. DEED	0.0077		34	0.0001	O.DEDT		1
35	0,0000	0.0001	-	36	0.0001	0.0001	Contract of the	Raturn
37	0.0001	0.0001		38	0.0001	0.0001		Contraction of the second s
30	0.0001	0.0001	-	100	0.0001	0.0001	Concession of the	

The IEC requirements

The measurement repeatability shall be within $\pm 5\%$ of limit value. IEC61000-3-12: The repeatability of the fundamental and 7th and lower harmonic orders shall be within $\pm 5\%$.

The repeatability of the harmonics beyond the 7th harmonic order shall be within $\pm 10\%$ or $\pm 1\%$ 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.

				iers (1 24	26 26	
-	Pask- 1 Pask)	30.46 25.04 25.60 0.002	Judge		1.4164 Pass		ASS	
	HeadEx3	Medical	LINNER	[Hu.	Rees[2]	Ren[1]	LINED	
1	100.00			2	0.10	0.13	0.28	
	0.03	0.05	0.90		0.00	0.03	0.20	
2	0.00	0.62	0.40	1.8	0.00	0.02	0.28	
	0.00	0.82	0.30	12	0.00	0.01	0,20	
9	0.00	0.01	0.20	12	0.00	0.01	0.20	
10	0.00	0.00	0.10	14	0.00	0.00	0,10	
6	0.00	0.00	0.10	12	0.00	0.00	0.10	
17	0.00	0,00	0,10	18	0.00	0.00	8,18	-
iii.	0.00	0.00	0.10	100	0.00	0.00	0.10	
21	0.00	0.00	0,10	22	0.00	0.00	0,10	
21	0.00	0.00	0.10	194	0.00	0.00	0.00	
274	0.00	0,00	0,10	28	0.00	0.00	8.18	
27	0.00	0.00	0.10	128	0.00	0.00	8,18	Reinst View Phase
28	0.00	0.00	0.10	39	8.00	8.00	8.18	and the second second
31	0.00	0.00	0.10	32	0.00	0.00	0.10	141
33	0.00	0.80	0.10	34	8.00	8.00	0.30	-
21	0.00	0.00	0.10	136	0.00	0.00	0.10	Return:
100	0.00	0.00	0.10	198	4.00	0.00	0.10	
24	0.00	0.00	0.10	40	0.00	0.00	0.38	

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.

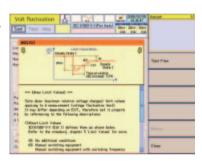
Basicme	185.			007 306V 3 18 18
100V/div	0.56/div	45dag/di	u .	
L1 61.04V L2 -307.560 L3 247.24	-0.03246			
ZA				
Iten		12	300 67 4	20.64
mut Voltage	230-45V	230.32V	230.57 V	230.457
resk+ Voltage	230.45V 328.96V	225.00 V	230.57 V 336.52 V	
nus Voltage Peak+ Voltage Peak- Voltage	230.45 V 335.96 V ~335.62 V		230.57 V	ananies .
nnus Voltage Peak+ Voltage Peak- Voltage nnus Current	230.45 V 325.36 V -325.92 V 0.4403 A	205.00 V -325.82 V 0.0329 A	230.57V 338.52V -335.22V 0.0045A	
nus Voltage Peak+ Voltage Peak- Voltage nus Current Peak+ Current	230.45 V 225.36 V - 325.62 V 0.4409 A 1.8196 A	335.00 V -325.82 V 6.0329 A -0.0354 A	230.57 V 335.52 V -335.22 V 0.9045 A 0.0022 A	0.4409.0
nus Voltage Yeek+ Voltage Yeek- Voltage Yeek+ Durrent Yeek+ Durrent	230.45 V 225.36 V -325.62 V 0.4409 A 1.81% A -1.5318 A	205.00 V -325.82 V 0.0329 A -0.0354 A -0.0372 A	230.57 V 336.52 V -335.22 V 0.9945 A 0.0022 A -0.0102 A	0.4409 A
nus Voltage Neak+ Voltage Neak- Voltage nus Current Neak+ Durrent Peak- Durrent Trequenco	230.45 V 225.36 V - 325.62 V 0.4409 A 1.8196 A	335.00 V -325.82 V 6.0329 A -0.0354 A	230.57 V 335.52 V -335.22 V 0.9045 A 0.0022 A	0.4409 A
nus Voltaga Peak+ Voltaga Nus Current Peak- Voltaga Nus Current Peak- Current Prequency Nus Power	230.45 V 205.95 V -305.62 V 0.4409 A 1.8196 A -1.5318 A 50.000 Hz	205.00 V -325.82 V 0.0229 A -0.0264 A -0.0372 A 48.339 Hz	230.57 V 336.52 V -335.22 V 0.0045 A 0.0022 A -0.0102 A 49.399 Hz	0.4409.0
	230.45 V 225.35 V -325.52 V 0.44039A 1.8196 A -1.5318 A 50.000 Hz 47.60 W	205 00 V - 225 82 V 0.0229 A -0.0364 A -0.0372 A 48.339 Hz 0.04 M	230.57 V 336.52 V -335.22 V 0.0045A 0.0022 A -0.0102 A 49.939 Hz -0.03 M	0.4409.A

These features make KHA Series a convenient

routine work tool for development and design processes.

The assist function provides guidance on standards and technical terms

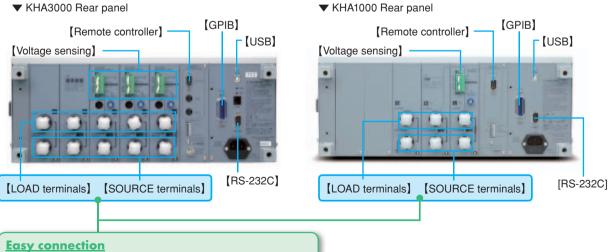
KHA Series are equipped with the "Assist function" that provides guidance on the technical terms used in the standards as well as the equipment class setting procedure. This function can support the users not familiar with the standards to readily get started with a test.



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 generalpurpose power analyzer by connecting it to your computer.

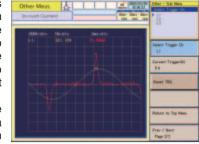


The terminals for power input and load output are separated. This arrangement prevents connection errors, thereby eliminating the risk of short-circuiting. Of course, voltage sensing at the load is supported as well. KHA3000 offers both simplicity and expandability.

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°.

Specifications

			KHA3000	KHA1000			
		input voltage	600Vrms / 900Vpeak (CAT I), 400Vrms (CAT II)	300Vrms / 560Vpeak (CAT I), 250Vrms (CAT II)			
Common input	Maximum i	input current	40Arms / 100Apeak, whichever is smaller 160Apeak (within 20 ms)	24Arms / 50Apeak, 80Apeak (within 20 ms)			
specifications	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			
	Rated volta	age for the range	150V / 300V / 600V	150V / 300V			
/oltage neasurement	Allowable of	crest factor	2				
unction	Display iter	m	TrueRMS a	and ±peak			
Accuracy			± (0.4% of rdng+	0.04% of range)			
	Rated curre	ent for the range	0.5A / 1A / 2A / 5A / 10A / 20A / 40A	0.5A / 1A / 2A / 5A / 10A / 20A			
Current	Allowable of	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)			
measurement function	Accuracy	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: \pm (0.5% of reading+0.2% of range) 1A to 20A range: \pm (0.5% of reading+0.1% of range)			
	*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)				
Power measurement	Display iter	m	Effective power, apparent power,	, , ,			
unction		ower accuracy	P ≥ 150W (±1% of rang				
Frequency	Measurem		Independent measurement of frequencies for voltages of L1, L2 and L3	Measurement of frequency for voltage			
neasurement		ent frequency aracy/resolution	45Hz to 65Hz / ± (0.15% of				
Phase	Measurem	,	Voltage / current phases, line volta	nhase*1 and harmonic phase			
measurement			0.00° to 359				
iunction		range/resolution	IEC 61000-3-2 Ed3.0/A2(2009), IEC 61000-3-	-2 Ed3.0(2005), IEC 61000-3-2 Ed2.2(2004),			
	Conforming standard Requirements for measuring		JIS C61000-3-2(2005), IEC 61000-3-12 Ed1.0(2004)*4 IEC 61000-4-7 Ed2.0/A1(2008), IEC 61000-4-7 Ed2.0(2002), IEC 61000-4-7 Ed1.0(1991)				
-	instrument standard Harmonic analysis order		40th (HA mode), 180th (OTHER mode)				
Harmonic current measurement	Interharmonics processing		Processing ON : IEC 61000-4-7 Ed2.0/ Processing OFF : IEC 6	A1(2008), IEC 61000-4-7 Ed2.0(2002)			
function	Window function		Rectar				
	Window width		10 cycles (50Hz) 12 cycles (60	·			
	Anti-aliasing filter		Cutoff frequency: 6 kHz, 4th Butterworth type (HA				
		dgment function	Current waveform inclusion rate of 95% or more				
Harmonic voltage *2	Measurem		Voltage, frequency and voltage harmonic inclusion rate				
measurement function	Voltage harr	monic analysis order	40th				
	Conforming	-	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/voltage	Pst accuracy		1 ± 5%				
fluctuation	Flicker	Pst measurement time	30 to 900 seconds				
analysis function	Voltage fluctuation	Measurement	Selectable between simultaneous measurement with Pst and independent measurement				
	dmax mea	surement of	3 to 24 times (Measuring time for each time: 30 to 180 seconds)				
General measurem		itching equipment					
Communication inte		1	Current/voltage waveform monitor, FFT analyzer and In-rush current measurement GPIB, RS232C, USB				
Removal data	Supported	media	Compact Flash memory card (CF ca	ard) *6, maximum capacity: 512 MB			
storage External equipment		ontrol (RS232C)	USB Memory*4, maxir Voltage, frequency, range, ON				
control function AC Input		oltage range					
Environmental		temperature and					
Withstanding voltag		uiges	1500VAC, 1 minute (AC input ↔ chassis),	1500VAC, 1 minute			
Dimensions (maxim			3550VAC, 1 minute (measuring terminal ↔ chassis)	5) Hy270 (330) Dmm			
	ium)		430 (455) W×177 (19	, , ,			
Weight Safaty			Approx. 10 kg	Approx. 8 kg			
Safety			Low voltage directive 2006 / 95 / EC E				
EMC *3			Conforming to the following instruction and standard re Power cord, voltage sensing terminal plug and sh				
Accessories			spare fuse and o				
1 n indiantas fra							

*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.

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.

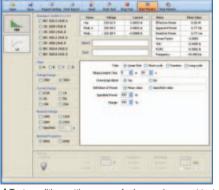
Program configuration of SD006-KHA Harmonics Analyzing Suite and SD005-KHA Harmonics Explorer

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	[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
Vf File Analyzer 3 Vf File Analyze		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	 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)

Setting items for test conditions of harmonic current test

Test condition setting screen for harmonic current test (HarmoCapture)

Common item setting	When IEC 61000-3-2 Ed 2.2 (2004)/Ed 3	3.0 (2005) and JIS C 61000-3-2 (2005) are selec	cted					
Wiring method setting	Class	Only when class C is selected	Only when class A of JISC 61000-3-2 (2005) is selected					
Limitation standard Measurement technique standard Voltage range Current range Current input terminal	Nominal voltage Nominal frequency Measurement time Margin Definition of power	Power factor and fundamental current Limit value	600W air conditioner					
	IEC 61000-3-12 (2004)							
Measurerment time	Single-phase equipment	Unbalanced three-phase equipment	Line and balanced three-phase equipment					
Equipment type Nominal frequency Margin Rated current (lequ) Ref. fund current (l1) Judgment Rsce Limit value	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

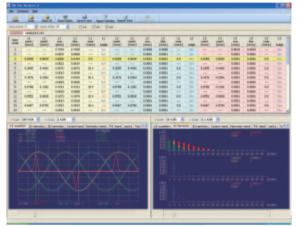
Common item setting	When Pst Auto is selected	When manual switch is selected	IEC 61000-3-11 Ed1.0
Wiring method setting Limitation standard Measurement technique standard Voltage range Current range Current input terminal	Nominal voltage Nominal frequency Pst measuring time Pst measurement count dmax 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)

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▲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.

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▲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.

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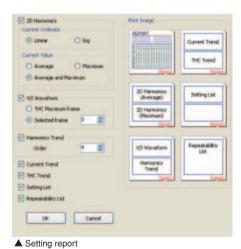
▲Example of the Excel

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.

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▲ Setting of harmonic test report



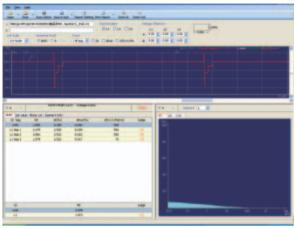
▲ Example of the Harmonic test report

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

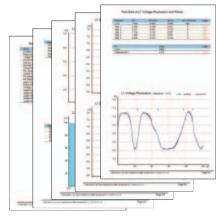
You can save the test result files in text format and use them in Microsoft Excel and other application programs.

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

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

General specifications

PCR2000LA	PCR4000LA	PCR6000LA			
Single phase 2kVA	Single phase 4kVA	Single phase 6kVA			
1 V	to 150V / 2V to 30	V0V			
20A / 10A	40A / 20A	60A / 30A			
4 times the	maximum current	(rms value)			
0 1	to 1 (advance or la	lg)			
	1Hz to 999.9Hz				
Input voltage fluctuation: Within ±0.1%					
Output current fluctuation: Within ±0.1V/±0.2V					
0.3% or less					
30 µs (standard value)					
Approx.4kVA	Approx.8kVA	Approx.12kVA			
48A / 24A or less	96A / 49A or less	72A or less 200V system input only			
Approx.69kg	Approx.120kg	Approx.160kg			
	430W × 550Dmm				
484Hmm	839Hmm	1105Hmm			
	Single phase 2kVA 1V 20A / 10A 4 times the 0 t Input volta Output curren 30 Approx.4kVA 48A / 24A or less Approx.69kg	Single phase 2kVA Single phase 4kVA 1V to 150V / 2V to 30 20A / 10A 40A / 20A 4 times the maximum current 0 to 1 (advance or la 1Hz to 999.9Hz Input voltage fluctuation: Within 0.3% or less 30 µs (standard valu Approx.4kVA Approx.8kVA 48A / 24A or less Approx.69kg Approx.120kg 430W × 550Dmm			

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

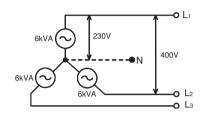
Item		Description	
	Z1	0.4 Ω + 0.37 mH, Single phase100V	
Impedance (Value when combined with AC power PCR2000LA or PCR4000LA using attached input cable)	Z2	0.38 Ω + 0.46 mH, Single phase200V	
	Z3	$0.4 \Omega + jn0.25 \Omega$, Single phase230V	
	Z4	$0.19 \Omega + 0.23 \text{ mH}$, 2 elements (Only 1 element can be set to 0.21 Ω + 0.14 mH)	
	Z5	$0.24 \ \Omega + jn0.15 \ \Omega$, 2 elements (Only 1 element can be set to $0.16 \ \Omega + ju0.1 \text{ mH}$)	
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 curren	t	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		$430(W) \times 484(H) \times 550(D)mm$ (Excluding protrusions and wheels)	
Weight		Approx.60kg	
Accessories		Input cable A : 1.5m1Input cable B : 1.5m1Control card1Control card mounting screw2Control cable : 2m1Power cord : 2.5m1Operation manual1WEIGHT sticker1	

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

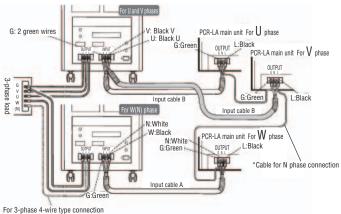
A line impedance network (LIN40MA-PCR-L) is required to perform compliance testing for voltage fluctuation and flicker standards. (The device is to be connected between the AC power supply and KHA1000.)



• 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)

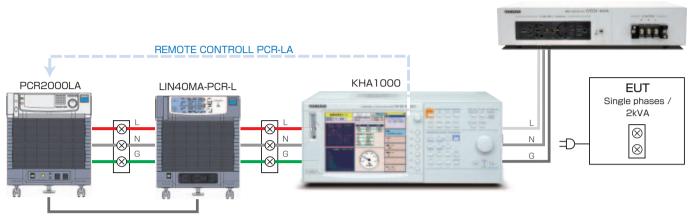
Item	Description	
Operation mode	Harmonic mode / Flicker mode	
Control type	Resistive load method (forced air cooling)	
Input voltage range	Single-phase 100VAC to 240VAC	
Input voltage type	Single-phase two-wires Single-phase three-wires (change by per phase) Three-phase four-wires (change by per phase)	
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	



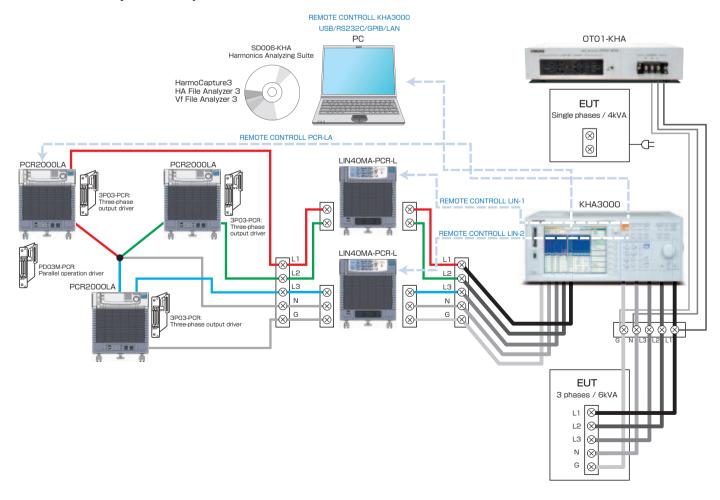
The OP02-KHAS(SPEC40425) is the resistive load device that confirms the operation of the "harmonic current/flicker measurement system" performs properly. The OP02-KHAS(SPEC40425) is able to perform the daily check of the harmonic measurement standard "EN/IEC61000-3-2", "EN/IEC61000-3-12", and the flicker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

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

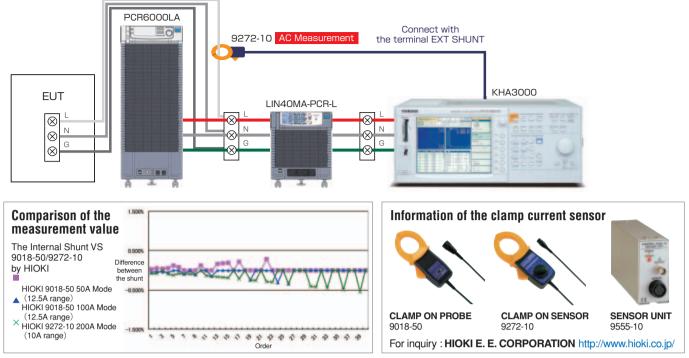
OTO1-KHA



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



The large current CT (Current Transformer) for the KHA3000

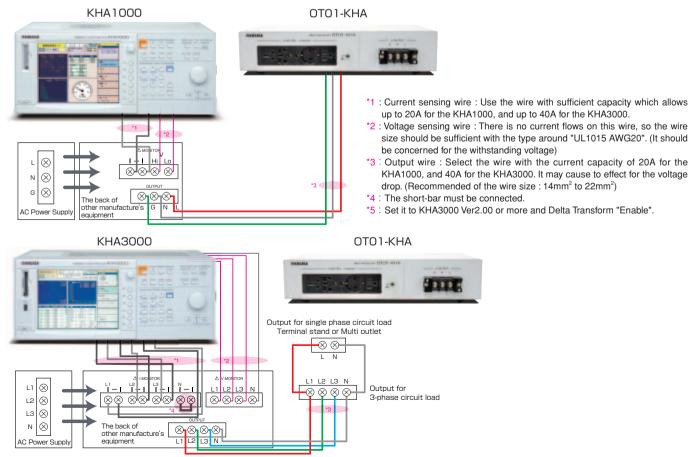


* The relative error between the measurement value by the internal shunt resistor and the measurement value of the harmonics curret by the clamp sensor (manufactured by HIOKI) is measured within ±0.6%, therefore, the sufficient precision is confirmed in the practical operation applied to the standard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

igstarrow 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).



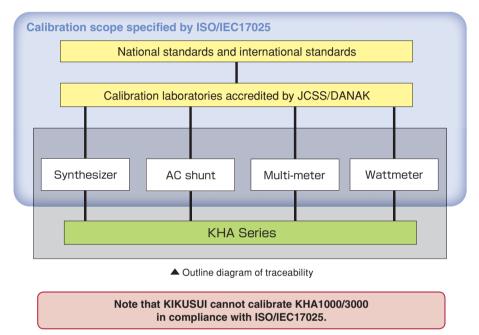
Calibration and Traceability

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.



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.



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