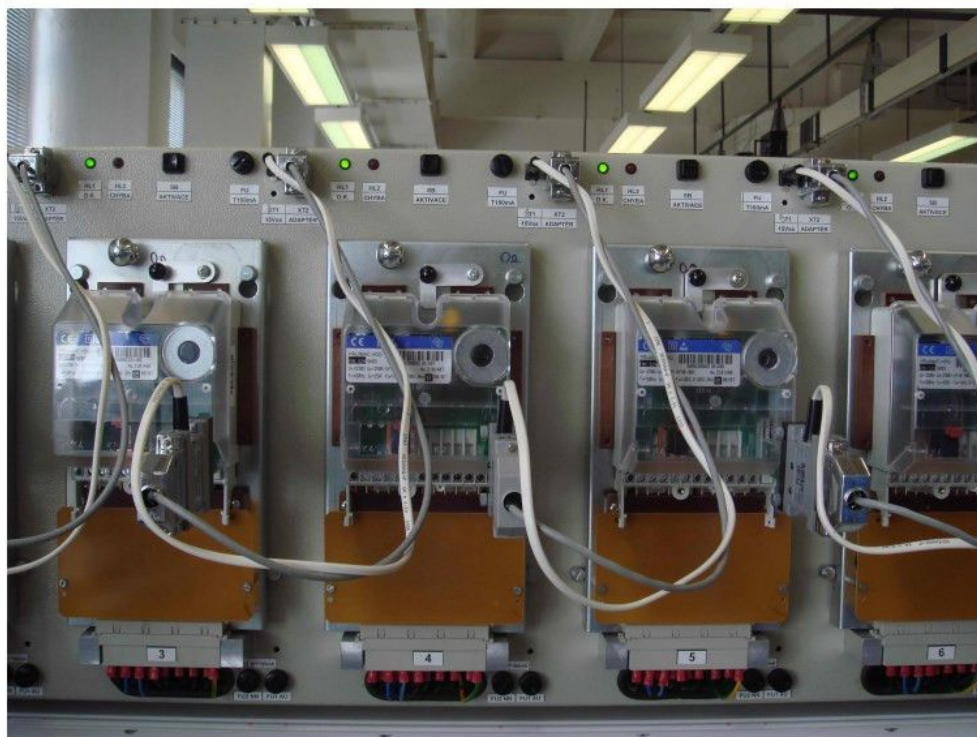




全球电能表校验专家

Globe Enrgy Meter Calibration Expert

**KAIPU**



## KP-S3000E THREE PHASE CALIBRATE TEST BENCH SPECIFICATION

ISO/IEC17025:2005



全球电能表校验专家

Globe Enrgy Meter Calibration Expert

**KAIPU**

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## 1. Introduction

KP-S3000E three phase energy meter test bench is a new generation, high precision energy meter calibration equipment. It uses the advanced technology and electronic components available in 90 decade . The test bench can be operated from embedded keyboard or operated from PC software.

## 2. Feature and function

- 1) Equipped with electronic phantom load power source, assuring high stability, security and large output capacity.
- 2)Automatic adjustment of current measurement range. Fault self-detection in voltage amplifier and current amplifier.
- 3) Equipped with RS-232C interface, can be operated from software.
- 4) Test results can be saved to database, can be inquired from database and can be export to EXCEL file and then printed out.

## 3. Technical specification

Specification of power source:

Power and consumption:

Power supply: 3P4W 3x220V $\pm$ 10%

Max consumption: 6000VA

### Current source:

Output current: 3 $\times$ 0.1A-3 $\times$ 100A

Adjusting resolution: 0.01% (min. 0.0001A)

Power factor: 0~3600; resolution: 0.10

Output frequency: 45Hz~65Hz;

THD(sine wave output): <1.0%

Stability of current during sine wave output: 0.1% (180s)

Output wave: sine wave

2-21 harmonic wave, total should be less than 40%

Odd harmonic waveform

Sub harmonic waveform

Output capacity: 50VA per meter position(max)

### Voltage source:

Output voltage: 3 $\times$ 30V - 3 $\times$ 400V

Load: The Load could be resistor / inductive / capacitive(<4 $\mu$ F)

Adjusting resolution: 0.01% (min. 0.1V)

Output frequency: 45Hz~65Hz;

THD (sine wave output): <1.0%

Voltage stability of power source during sine wave output: 0.1% (180s)

Output wave: sine wave

2-21 harmonic wave, total should be less than 40%

Output capacity: 15VA per meter position



#### 4. Reference Meter:

Power and consumption:

Power supply: 1P2W 220V  $\pm 10\%$ , 50Hz or 60Hz;

Max consumption: 30VA

Voltage input: 3 $\times$ 30V-3 $\times$ 480V (AC)

Current input: 3 $\times$ 0.01A-3 $\times$ 100A (AC)

Accuracy: 0.02% Accuracy (Optional)

Active power: 0.05% (PF>0.5)

Reactive power: 0.1% (PF>0.5)

Warm up time: < 2 minutes

Dimension: 482mm X 380mm X 140mm

Weight: <7.5 kg

#### 5.Error Calculator Technical specification

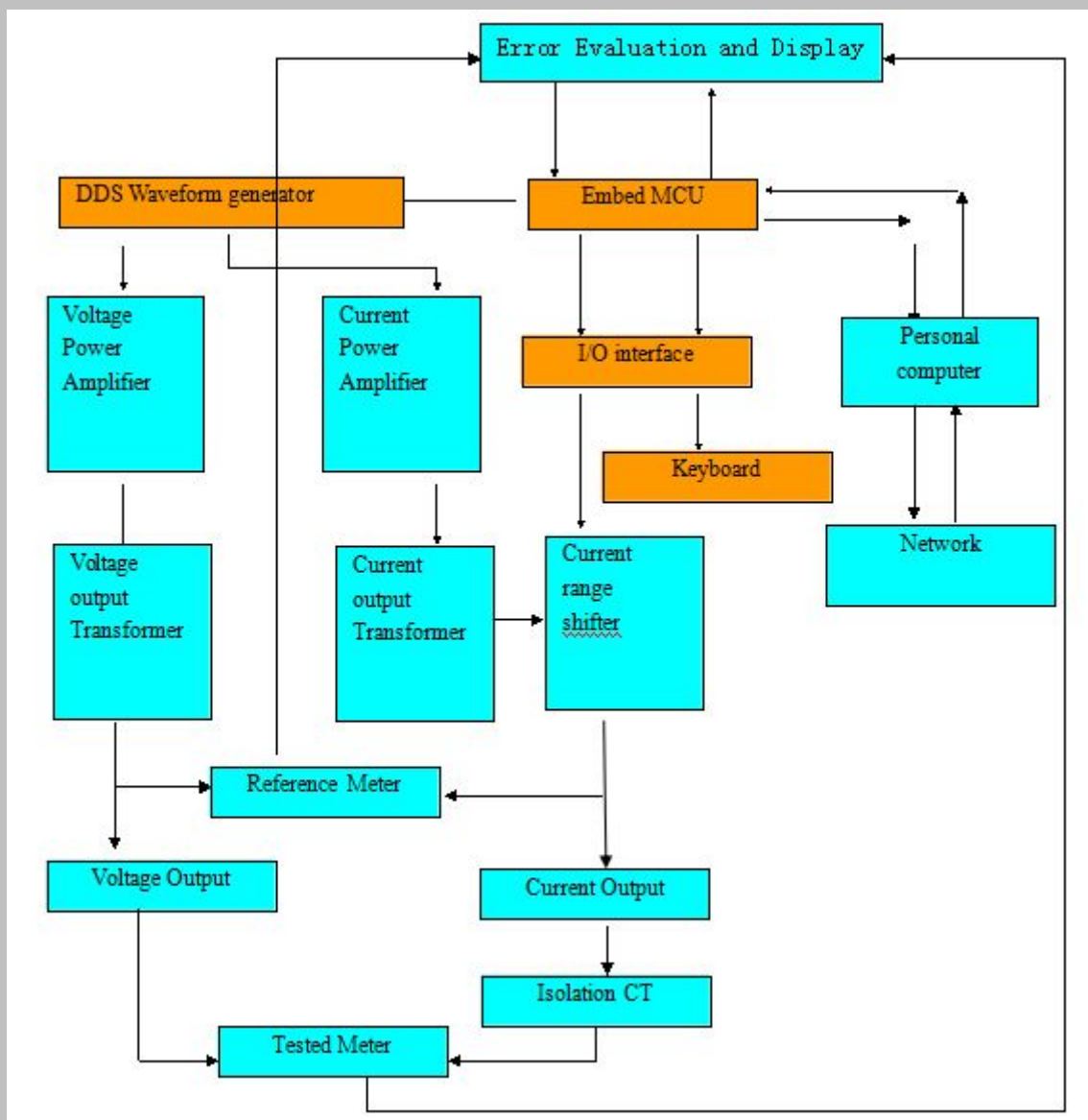
Impulse of tested meter could be: TTL / OC / Optical head

Max. frequency of impulse could be: 200Hz

Error display range: 0.001%-99.99%



## Working principle and frame



### Introduction:

#### 1) Signal generator

The   marked frame is included in signal generator box. Signal generator is equipped with DDS waveform technology (digital frequency modulation, amplitude modulation and phase modulation). Embedded MCU is the brain of signal generator, also it is the brain of test bench, signal generator generate high stability sine waveform which is send to voltage amplifier and current amplifier.

#### 2) Power amplifier

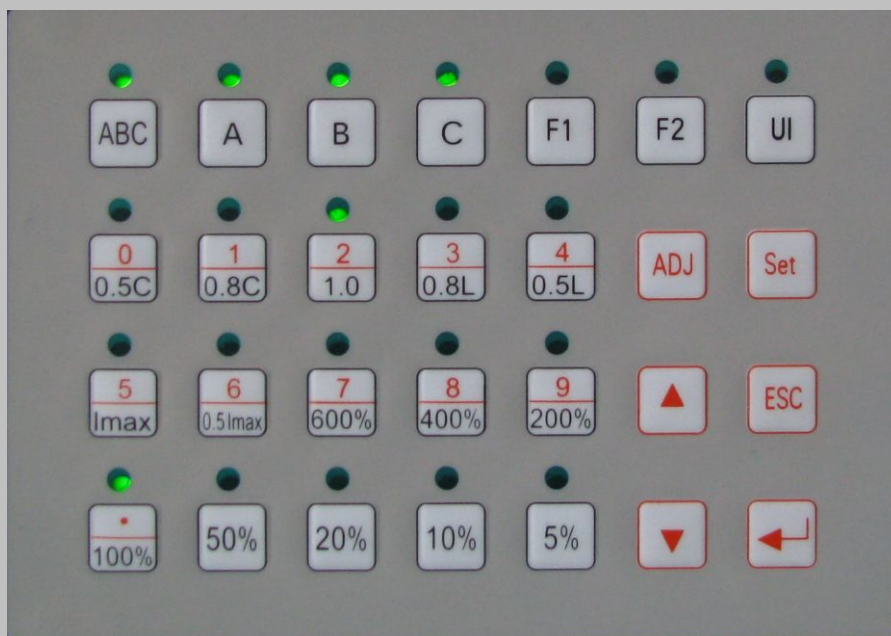
Power amplifier features stability and reliability with the PWM amplify technology and well-designed protection when output voltage shortcut or output current circuit open.

#### 3) Measurement

Error of tested meter is achieved by comparison with the reference meter.

## 6. Embed software user manual

### 6.1 Definition of Keyboard and Symbol of Display Unit



Key define:

F4: Starting UP test

F5: No load test

5% ~ 600% ,I max, 0.5Imax: Load select

Start: Output U&I

0 ~9: Number

0.5L, 0.8L, 1.0, 0.8C, 0.5C: Power Factor

. : Decimal

ABC、A、B、 C : Phase Select

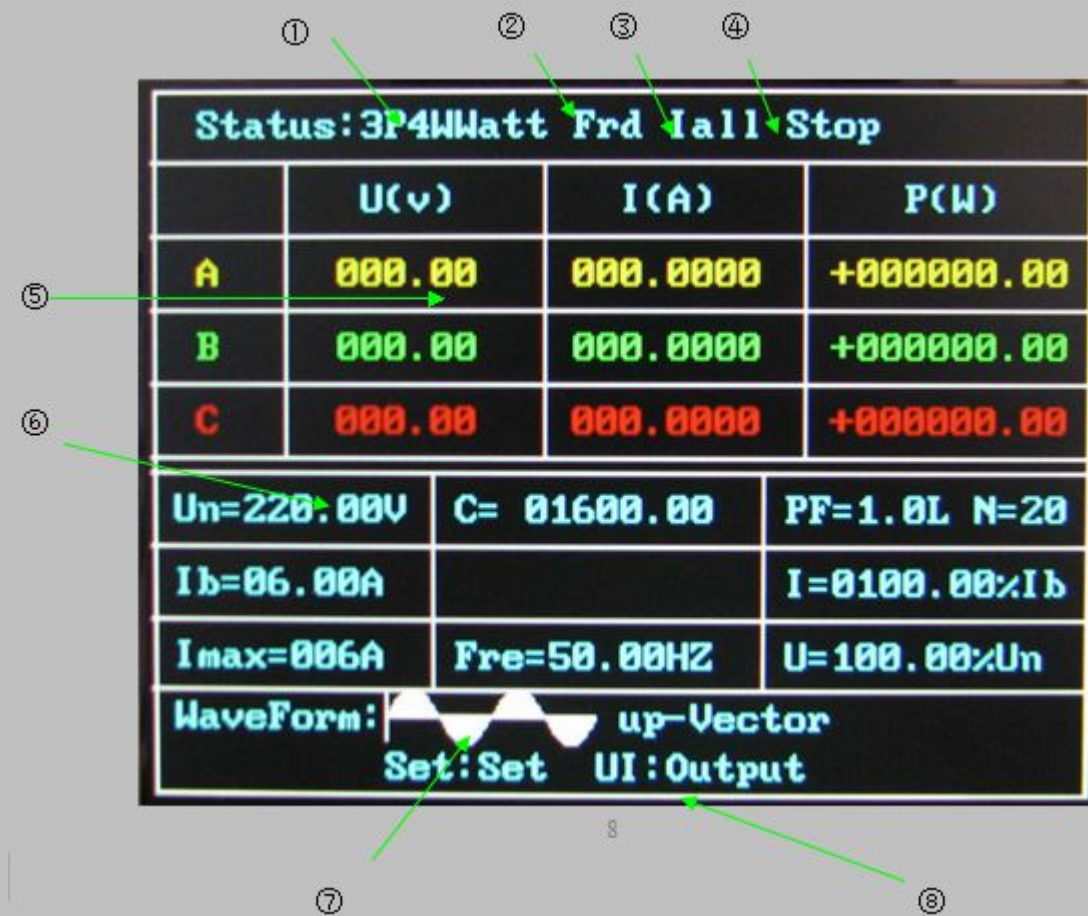
↑↓: up/down or Increase/decrease current/voltage

← : Enter key

Set: tested meter's parameter

## 6.2 Initial screen

Turn on power for equipment, the first screen will display as below:



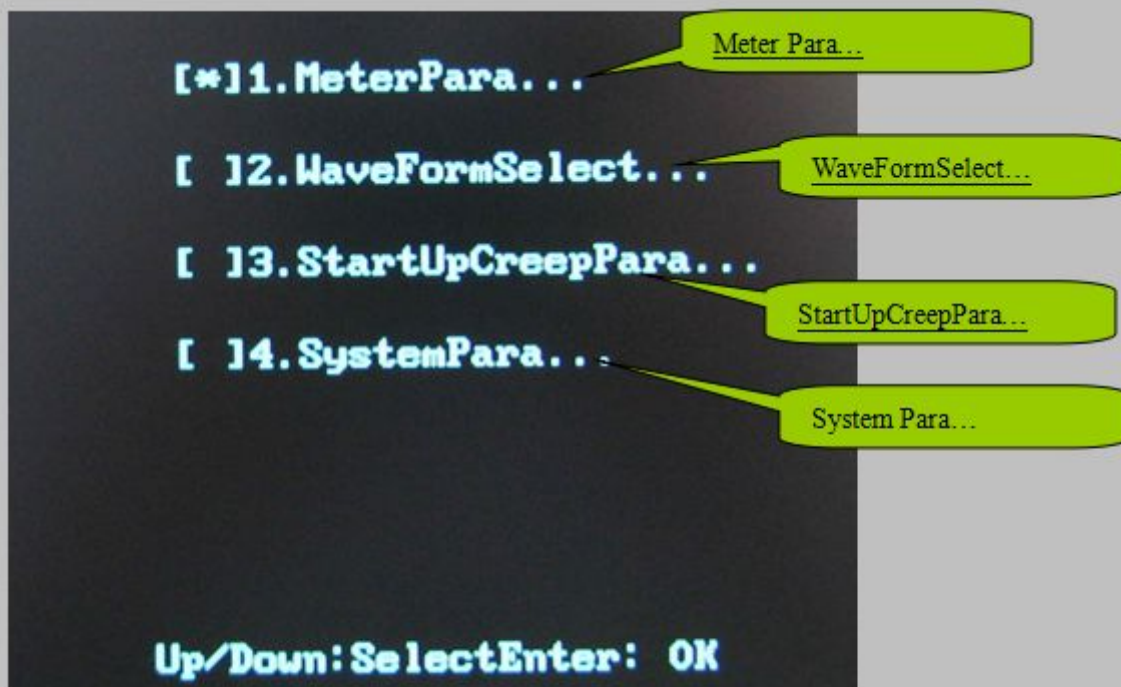
- ① tested meter type(style)
- ② Output phase sequence
- ③ Output current status
- ④ Output or not output
- ⑤ Real output value
- ⑥ Tested meter's Parameter
- ⑦ Output waveform
- ⑧ Help information



## 6.4 Tested Meter's Parameters And System Parameters

### 6.4.1 Parameter menu :

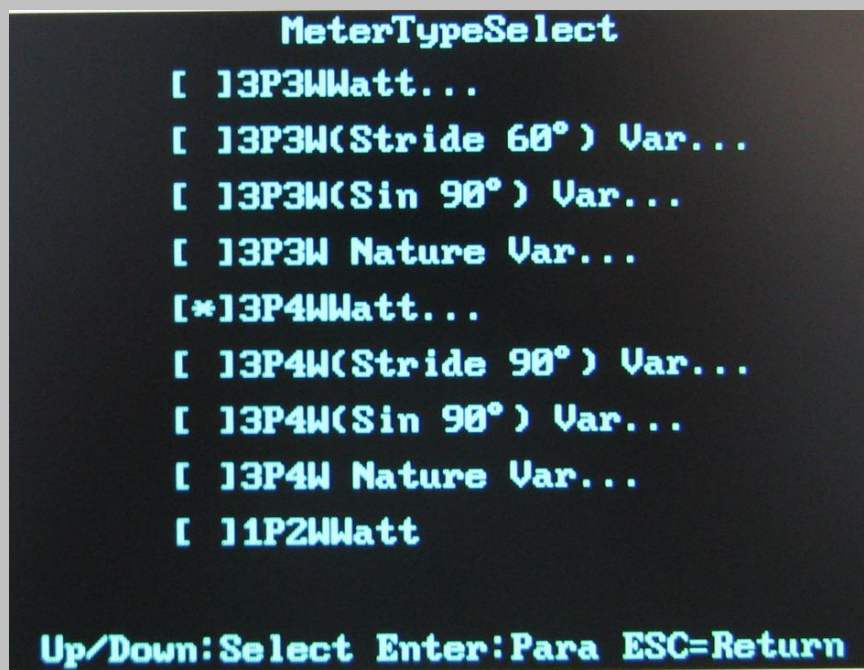
Press 'set' key will enter 'Parameter setting menu' . Parameter setting menu is display as below, select corresponding menu item to set parameters about tested meter or about system.



Use number key or ↑ / ↓ key to select menu, Press ESC Key will return to main screen.

### 6.4.2 Select tested meter's model(meter type or meter style )

User can select 'Meter Para...' then press Enter key, LCD will display as below;

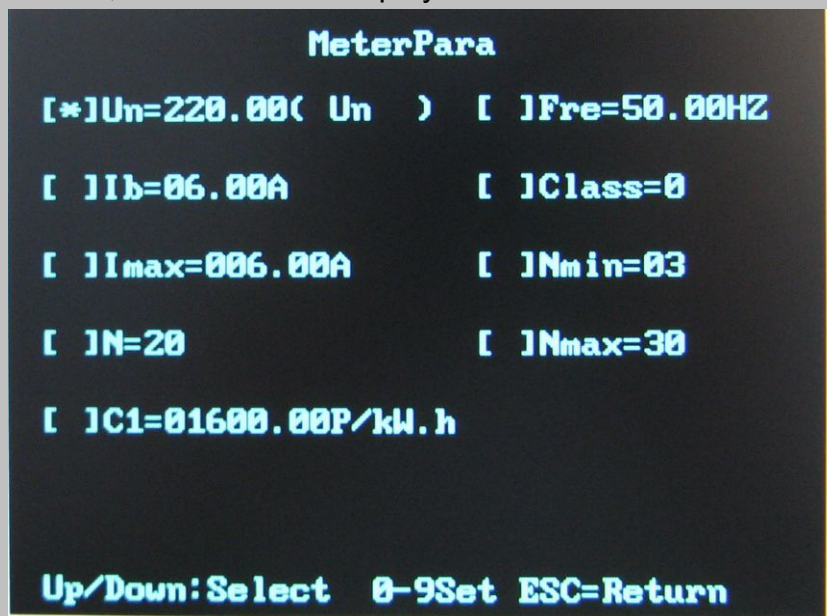




In this screen, please select corresponding tested meter's type(style).

#### 6.4.3 Set Parameters of tested meter[ Menu item 1]

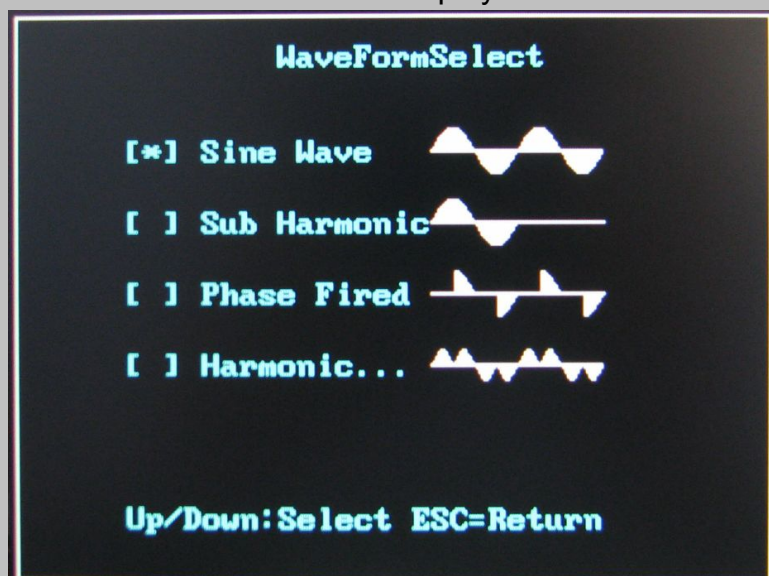
Select corresponding meter type(style), Then press key 'SET' or 'Enter' to input tested meter's parameters, the screen will display as below:



Use  $\uparrow\downarrow$  key to select corresponding setting item, press number key or decimal point to proceed setting. Press  $\uparrow\downarrow$  or press ESC will confirm any input data, press ESC will also confirm any input data and return to previous menu.. The effective frequency should be 45.00Hz – 65.00Hz . C is the tested meter's constant. N is the test round when output voltage is 100%Un and output current is 100%Ib, Nmax is the maximum test round and Nmin is minimum test round.

#### 6.4.4 Waveform Parameter[Menu item 2]

Select menu 'WaveformSelect...', Then press key 'SET' or 'Enter' to set Output waveform parameters of the instrument. the screen will display as below:



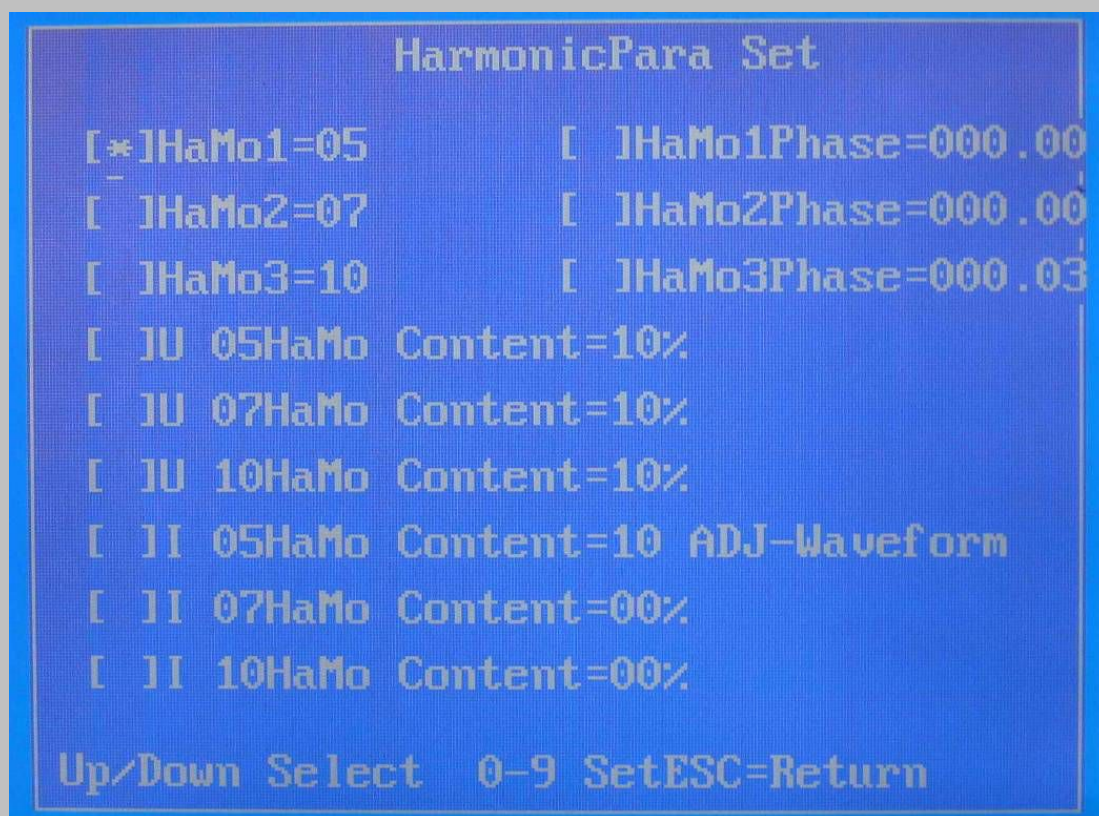
Sine Wave : Output voltage waveform and output current waveform is sine.

Sub Harmonic : Output voltage waveform is sine and output current waveform is sub harmonic .

Phase Fired : Output voltage waveform is sine and output current waveform is Phase Fired.

Harmonic... : Output voltage waveform can include harmonic waveform and output current can include harmonic waveform.

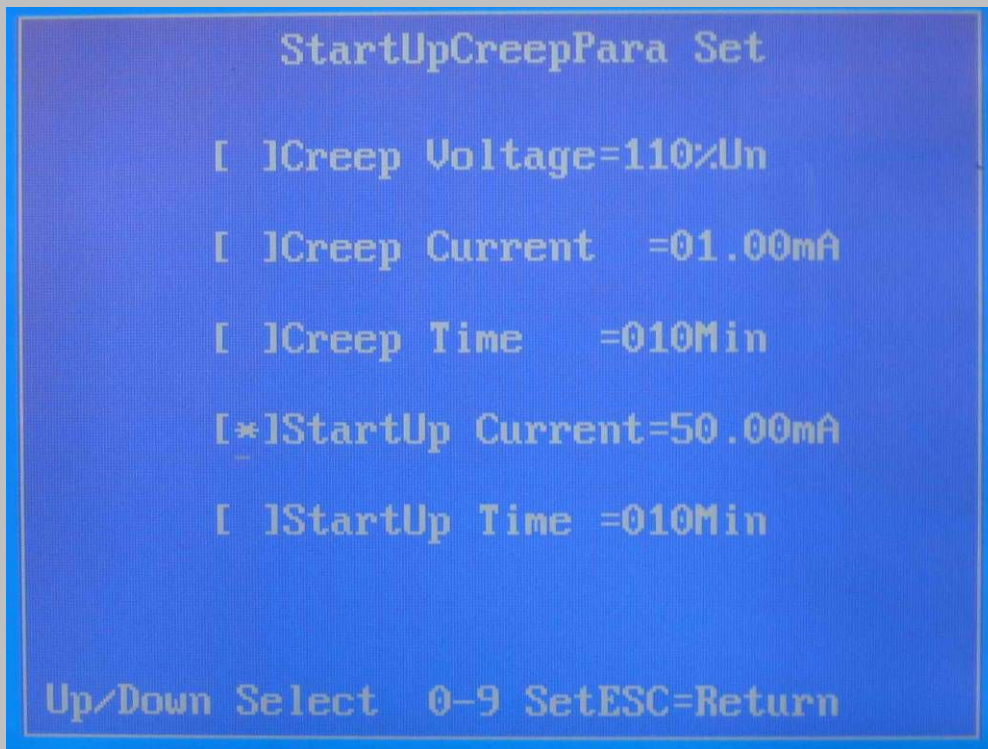
**If user select harmonic waveform output, user can set how much harmonic should be output. Press 'Enter' key will display next screen , here you can input the parameter of harmonic times and harmonic content.**



Use ↑↓ key to select corresponding setting item, press number key or decimal point to proceed setting. Press ↑↓ will confirm any input data. Press ESC will also confirm any input data and return to previous menu.

#### 6.4.5 Startingup test/no load test parameters[ Menu item 3]

Select menu 'StartingupCreep para...', Then press key 'SET' or 'Enter' to set tested meter's Starting up test/no load test parameters, the screen will display as below:



Use  $\uparrow\downarrow$  key to select corresponding setting item, press number key or decimal point to proceed setting. Press  $\uparrow\downarrow$  will confirm any input data. Press ESC will also confirm any input data and return to previous menu.

Latent U: It means when no load test, how much voltage should be added on tested meter

Latent I: It means when no load test, how much current should be added on tested meter, usually current is 0.

Latent T: It is the test time of no load test.

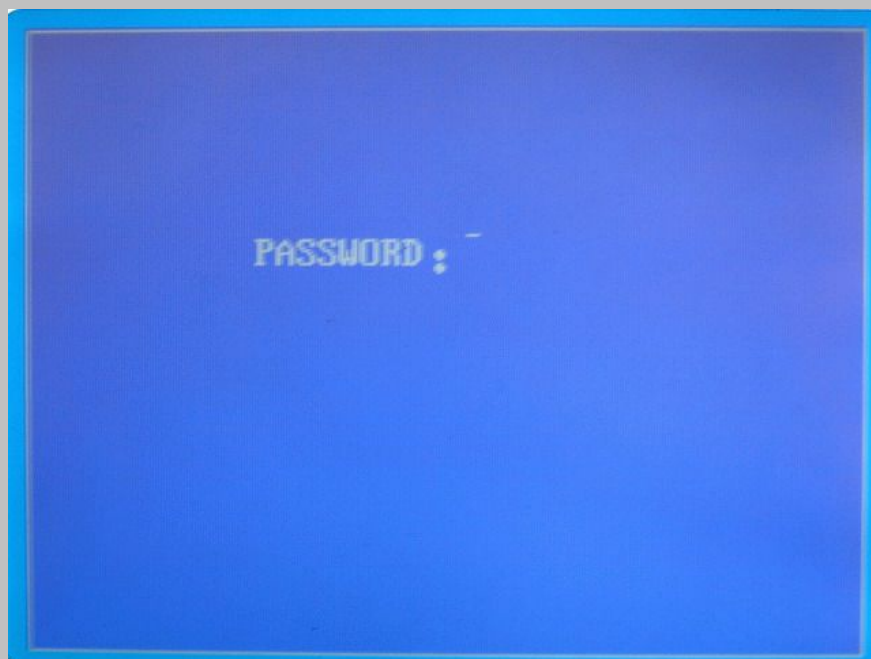
Initial I: It means when starting up test, how much current should be added on tested meter.

Initial T: It is the test time of starting up test.

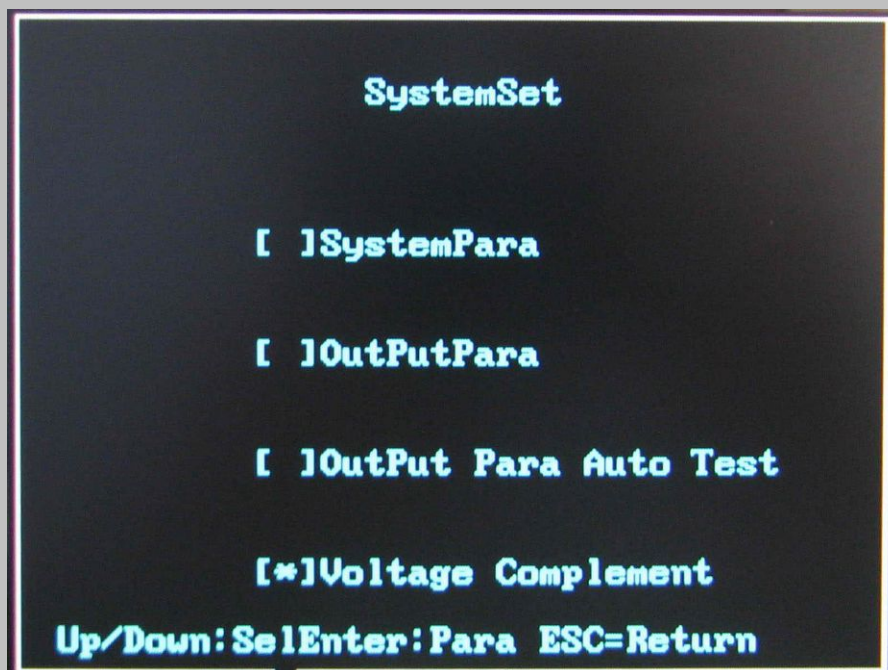
#### 6.4.6 system parameter[ Menu item 4]

Select menu 'SystemPara...', Then press key 'SET' or 'Enter' to set parameters about test instrument, these parameter are very important, in order to avoid these parameters being changed easily, user should input a password firstly, the screen will display as below:





Password of the equipment is "6003". After input password, the screen will display as below:

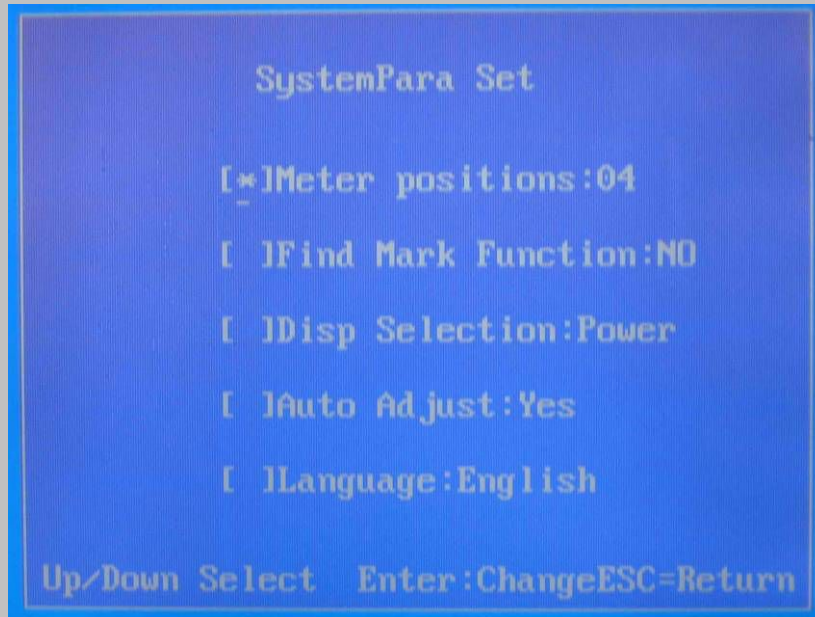


System parameter : System parameter include meter position / display selection and other system parameter.

Output Parameter : Output Parameter include voltage output parameter and current output parameter.

#### 6.4.6.1 System parameter

System parameter include meter position / display selection and other system parameter. Screen will display as below:



**Meter positions** : meter positions of the test equipment.

**Find mark function**: when processing starting\_up test or no\_load test ,if Find mark function is enabled, before processing starting\_up test or no\_load test, software will process Find mark function firstly.

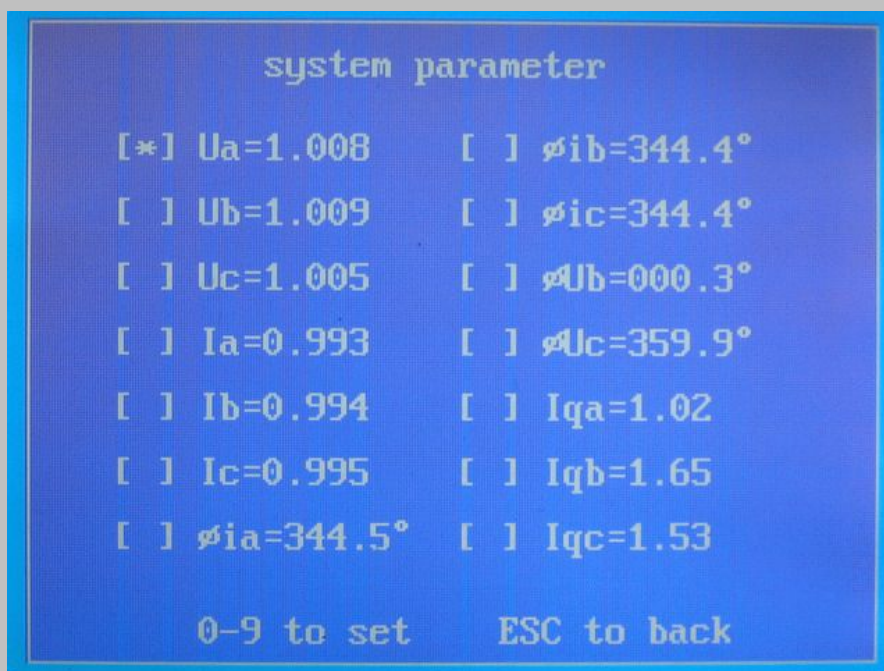
**Disp Selection**: user can select information displayed on the LCD, if select 'Power', the real output power will displayed on lcd when test equipment output voltage and current. if select 'Phase', the real output angle between voltage and current will displayed on lcd when test equipment output voltage and current.

**Auto adjust** : when testbench output voltage and current, embedded software will read real output value and real output angle between voltage and current, if the real output value or real output angle is different with the set value and if this function is enabled , embedded software will rectify the output value.

**Language** : select which language is used of the test equipment.

#### 6.4.6.2 Output Parameter

Output Parameter : Output Parameter include voltage output parameter and current output parameter, screen will display as below:



Ua,Ub and Uc are amplitude coefficient of voltage output.

[for KP-P1200, only Ua parameter is use ]

Ia, Ib and Ic are amplitude coefficient of current output.

[for KP-P1200, only Ia parameter is use ]

$\phi_{Ia}$ ,  $\phi_{Ib}$  and  $\phi_{Ic}$  is phase coefficient.

[for KP-P1200, only  $\phi_{Ia}$  parameter is use ]

$\phi_{Ub}$  and  $\phi_{Uc}$  is Ub and Uc phase coefficient.

Iqa, Iqb and Iqc is offset coefficient of current output.

(When coefficient being changed, the output value will be changed )

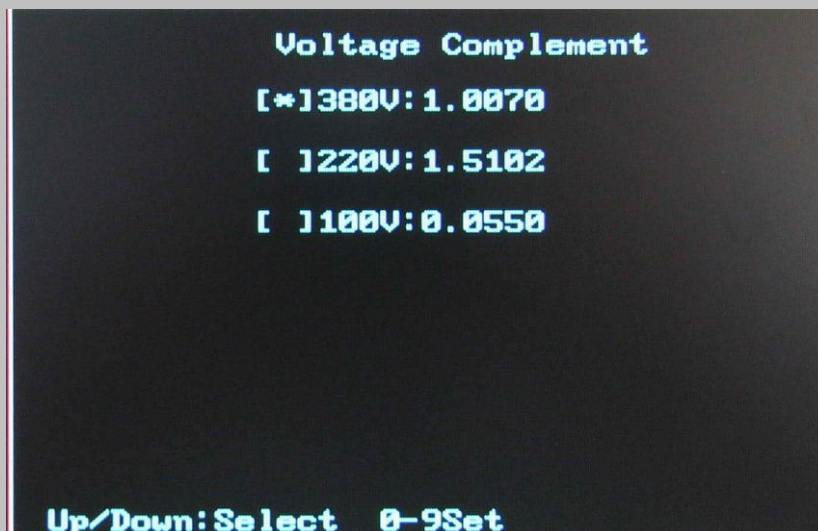


### 6.4.6.3 Output Parameter Auto Test

Auto test output compensate parameter.

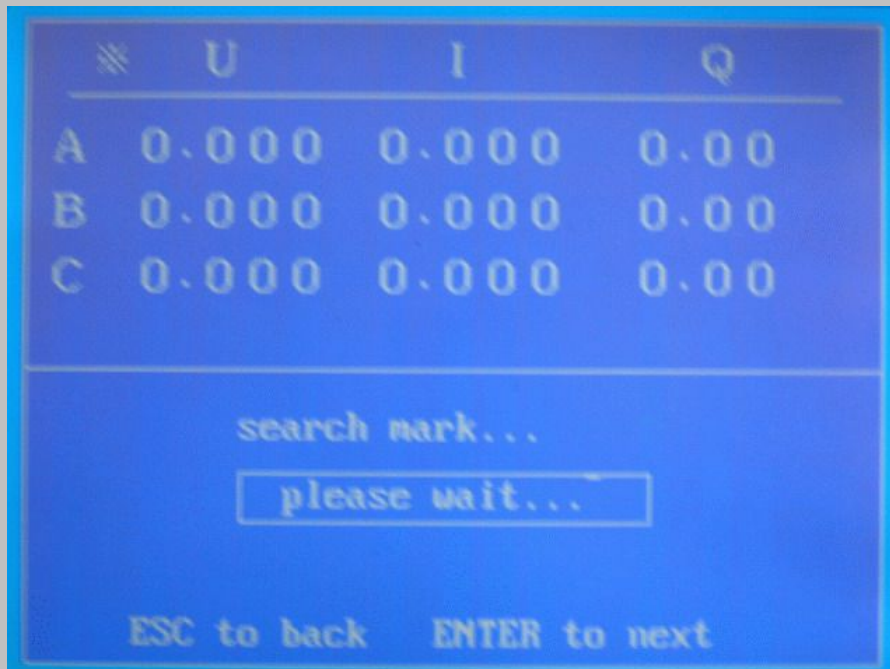
### 6.4.6.4 Voltage complement

Set the compensate parameter for 380V / 220V / 100V.



## 6.5 F1 Function (Starting up test)

Press F1 key software will begin 'Starting up test', LCD screen display as below ( If 'Search mark' function is enabled(in system ParaSet) ):



If 'Search mark' function is enabled(in system ParaSet), embedded software will process 'Search mark' function firstly, if 'Search mark' function is disabled, this screen won't display.

If 'Search mark' function is disabled(in system ParaSet), screen display as below

StartUp Test			
	U(V)	I(A)	P(W)
A	220.00	000.0050	+000000.00
	F(HZ)	Deg.(U/I)	Q(var)
	50.00	000.00	+000000.00
StartUp Current:05.00mA StartUp Time:015min Passed time:000min010sec			

### 6.6 F2 Function (no load test)

Press F2 key will begin 'no load test', LCD screen display as below

( If 'Search mark' function is enabled(in system ParaSet) ):

	U	I	Q
A	0.000	0.000	0.00
B	0.000	0.000	0.00
C	0.000	0.000	0.00
search mark... <div>please wait...</div>			
ESC to back    ENTER to next			

If 'Search mark' function is enabled(in system ParaSet), embedded software will process 'Search mark' function firstly, if 'Search mark' function is disabled, this screen won't display.

If 'Search mark' function is disabled(in system ParaSet), screen display as below



Creep Test			
*	U(V)	I(A)	P(W)
A	264.00	000.0000	+000000.00
	F(HZ)	Deg.(U/I)	Q(var)
	50.00	000.00	+000000.00
Creep Voltage:120%Un Creep Current:0.00mA Creep Time :500min Passed time:000min000sec			


### 6.7 Error test

Step 1: User should set tested meter's parameters correctly!

(refer to 8.4.2 Set Parameters of tested meter [Menu item 1])

Step 2: Select Output current (Ib%); Select power factor(1.0L/0.5L/0.8C);

Step 3: Press 'UI' key will begin 'Error test', LCD screen display as below:

Status:3P4WWatt Frd Iall Stop			
	U(V)	I(A)	P(W)
A	000.00	000.0000	+000000.00
B	000.00	000.0000	+000000.00
C	000.00	000.0000	+000000.00
Un=220.00V		C= 01600.00	PF=1.0L N=20
Ib=06.00A			I=0100.00%Ib
Imax=006A		Fre=50.00HZ	U=100.00%Un
WaveForm:  up-Vector			
Set:Set UI:Output			



## 7. Support & FAQs

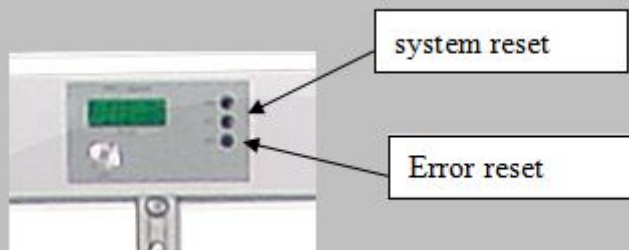
1) When the voltage circuit is shortcut or voltage amplifier is overloaded , or the current circuit is open, or current amplifier is overloaded, testbench will automatically lower down the output until to zero and display “ERR” ,It is recommended to lower down the output power, check the wire connection, then restart the power source output if everything is normal.

2) error test is abnormal

Please check whether the preset parameter for the tested meter and the system parameters are correct. Check whether the infrared collector works correctly

3) PTC-8000(Error calculator) doesn't work correctly

If Error calculator doesn't work correctly , it can be reset by pushing the button of “system reset” . In the process of calibrating meter, push the button of “error reset” to re-calculator Error.



4) please contact us if there is any malfunction of the equipment.

If test bench is alarm , please press ‘system reset’ to clear output firstly , after the voice of alarm is stopped, then please check current circuit and check voltage connect wire . the current circuit shouldn't be open and the output voltage shouldn't be shortcut.

Support Tel: +86 0573 86127220

**Measuring modes :**

- 1 Phase 2 wire active/reactive mode
- 2 phase 3 wire active/reactive mode
- 3 Phase 3 wire active/reactive/factitious reactive
- 3 Phase 4 wire active/reactive/factitious reactive



## Display :

- \*The reference meter has an LCD display, where operator can see .
- \*Phase voltage
- \*Phase current
- \*Phase angle and power factors
- \*Individual phase/ Total Active/ reactive/ apparent power etc

## Mechanical design

The power supply unit cabinet is designed as single-fold 19"-cabinet similar to Drawing (showing below) and consists of the following components:

- 1 unit of signal source
- 3 units of voltage amplifiers
- 3 unit of current amplifiers
- 1 unit of reference Meter

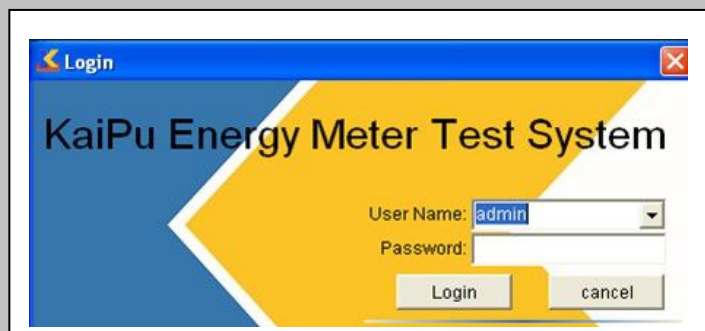
## Personal computer

The operation of the test equipment, the display of the actual values, the processing and display of the test results and the print out of the test report is carried out by the test computer. This computer is connected to the measuring system and to the power source.

## Application software

Kaipu software is an excellent combination of wide experience of Kaipu manufacturing of meter test equipment and latest software technology. Which control and operate automatic meter test

equipment using modern and highly flexible programs and user interfaces. This is accomplished with manual or automatic mode for testing, adjustment and calibration of electric power meters and auxiliary equipment. The use of proven and standardized engineering guarantees future reliability, flexibility and scalability of the Kaipu software applications as well as seamless integration into your company's business processes





The basic Version of Kaipu software is compatible with Window 7® and network compatibility, hence common features of WINDOWS® OS are also available.

Also network-compatible and based on MS-SQL Databases

\* includes import and export features for test processes and test results

\* provides comprehensive statistics features for quality control

\* consists of a number of programs, all capable of running on their own

\* provides a user interface for system control is designed for generation and control of automatic test procedures

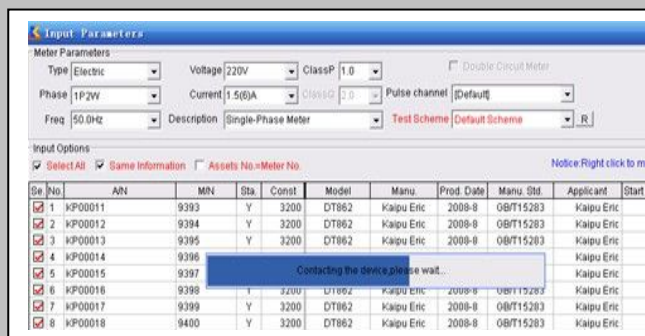
\* provides the ability of execution and debugging of VB scripts for data communication between software and the unit under test is displaying the test results of the meters under test

\* serves for evaluation, reporting and data processing

Kaipu software – more than just a simple program which contains a certain number of individual programs. Together all these programs make the software to a complete package going far beyond pure control and testing software.

Each program is capable of running by itself. This means for example that it is not required to start the large complex program just to input new meter type into the data base.

**Software specification please contact KAIPU company - “software manual. PDF”**



## 1.4 Isolating current transformer system ICT

The precision three-phase isolation current transformer ICT can be used to separate the generated test current. **This is strongly recommended, if meters with an irremovable connection between current and voltage might be tested.** The three-phase ICT provides the testing for single-phase and three-phase electricity meters. The ICT modules are designed for use in Kaipu test systems but they are also adaptable to test benches of other manufacturers. The module is designed as three-phase precision current transformer with combined electronic error compensation. The ratio of the transformer is 1:1.

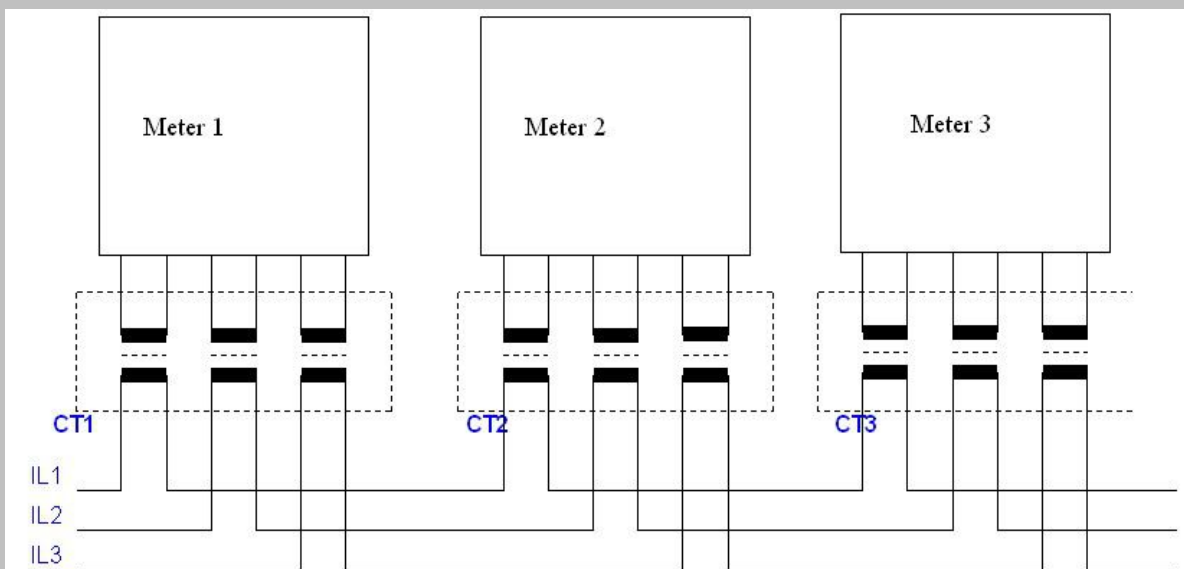
The ICT contains of the precision current transformer with combined electronic error compensation. Via this error compensation the magnetic flux in the core down to 0. Due to this method the ICT modules provide a high accuracy in small and large current ranges.

- \*Technical specification:
- \*Environment: +20 ~ +40°C
- \*Warm\_Up Time : 5Sec
- \*Max output capacity: 50VA
- \*Output Current: 0.005-120A
- \*Accuracy: 0.01%
- \*Power supply:  $\pm 15V$  DC



When user need to test closed IP links three phase energy meter on test bench, the current for every tested meter should be supply individually. we can't use isolated potential transformer on three energy meter test bench. This ICT can ensure the testing accuracy when closed IP links three phase energy meter on test bench.

### 1.41 The digram of ICT and tested meter on test bench:



From the digram,it shows the current for every tested meter is isolated by the ICT,the current supply to the meter from the output of every ICT.

ICT include 3 individual current transformer, the ratio of every transformer is 1:1.It can be used when testing Closed IP links energy meter, also it can be used when testing Open IP links energy meter.

In order to ensure the output current as same as the input current , ICT use error compensation PCB to ensure the output current equals to the input current strictly. When output current up to 100A, the output capacity is bigger than 50VA. When ICT have internal malfunction, the alarm LED will be lighted, it can remind the worker that the ICT is out of order and need to be checked.





# Laboratory

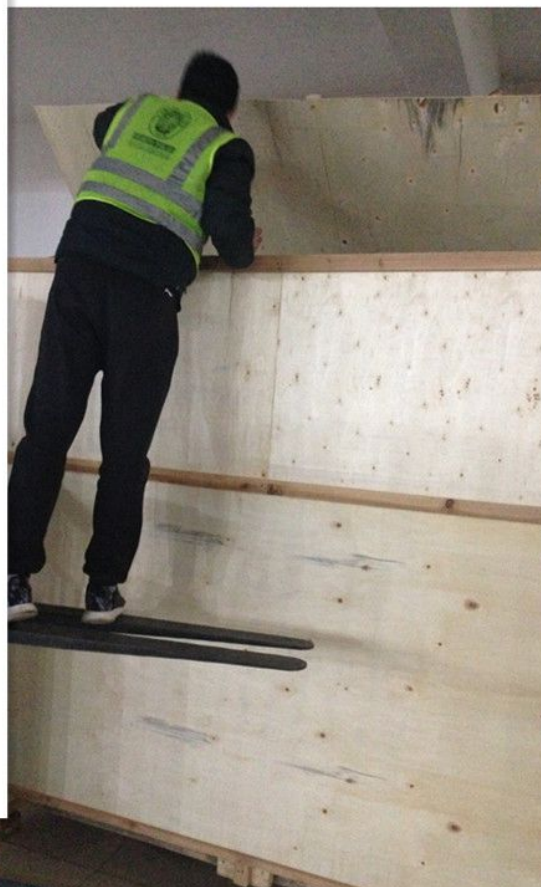


## Meter manufacturer use





## PACKING AND BV INSPECTION





## More option model :



- \* **KP-S1000 Single phase energy meter test bench**
- \* **KP-S3000 Three phase energy meter test bench**
- \* **KP-S4300 Withstand voltage test bench**
- \* **KP-P1001-C Portable single phase energy meter test bench**
- \* **KP-P3001-C Portable three phase energy meter test bench**
- \* **KP-S1100 Single phase aging and counting register bench**
- \* **KP-3100 Three phase aging and counting register bench**
- \* **KP-1100 Reference meter 0.02% or 0.05% class**
  
- \* **KP-S3000 compatible function for test 1ph and 3ph energy meter,  
Digital and machinery energy meter test bench**

More information please visit : [www.cnkaipu.com](http://www.cnkaipu.com)

Or contact to Joe Zhou e-mail: [Joe@cnkaipu.com](mailto:Joe@cnkaipu.com)

Free talk by WhatsApp ID: 86 181 5730 6758