ZX3030C Portable
Three Phase Testing Device
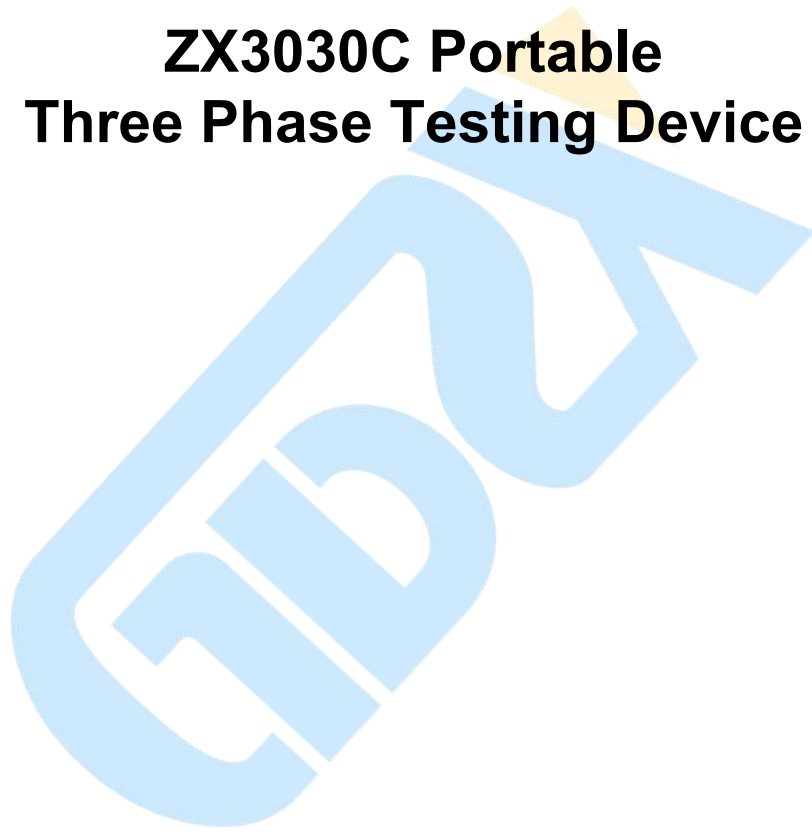
Contents

Ⅰ、Product Description

ZX3030C Three Phase Testing Device bench apply luxury aluminum alloy case, and detachable aluminum alloy hanging rack.It can be used for testing all kinds of three phase energy meters that accuracy is 1.0 or less.

Ⅱ、Features

1. Equipment feature

1) Adopt integration structure, built in 0.05 class three phase wide-range multifunctional digital standard meter, its all parameter can be read by software.

2) Adopt the latest DDS technology,36000 point waveform synthesis technology, large-scale CPLD and 32 position built-in system, the signal source has the feature of high output stability, low adjustment fineness, and small distortion.

3) Adopt the latest RAM system 7 inch color touch LCD, can show plenty of information, such as three phase voltage, current, active power, reactive power, apparent power, energy vector diagram and waveform analysis graph and so on.

4) Adopt small size and high efficiency digital amplifier, which efficiency is higher than 90%, 300KHz carrier frequency, with the feature of small distortion, low calorific value, high efficiency.

5) Has complete protection function, voltage short circuit alarm, current open circuit and overload alarm.

6) Built-in high stability constant temperature crystal oscillator, output 500kHz high precision pulse, can test energy meter clock, cooperate with calibration software, it can test day time error, time frame cutting error etc.

7) Equipped with 485 communication port, can make all kinds of communication test for multifunctional energy meter.

8) Can without computer, it can auto calibrate energy meter according to

the built-in regulation, and can save more than 10000 meter data.

9) Equipped with a USB port, can update program through USB flash disk, and can derive saved data. When connect with mouse, you can operate the equipment directly.

2. regular function

① creeping test

② starting test

③ basic error

④ harmonic function

3. Multifunction test (need to work with management software)

① influence quantity test

② indication error

③ day timing error

④ max demand error

⑤ communication protocol consistency check

⑥ time frame switch error

Ⅲ、**Technical Indicators**

1. Accuracy Class:0.05、0.1

2. Computer connect port: RS232 communication port

3. Three phase power source technical parameter

1) Output voltage

       3 * 57.7V Y   3*100V △

       3 * 220V Y   3*380V △

2) adjustment range：0～120％

3) adjustment fineness: better than 0.01%

4) Output current：25mA、0.1A、1A、5A、25A、100A

5) Continuously adjustment range:0~120%, adjustment fineness：better than 0.01%

6) Min. output current: 1mA （accuracy：＜5%）

7) Output power

       voltage circuit：3×50VA

current circuit： 3×150VA

8) Output stability of voltage、current and power：≤0.02％/120S

9) Output waveform distortion≤ 0.5％

10) Three phase symmetry: better than 120º±0.3º

11) Frequency range： 45Hz～65Hz ，adjustment fineness： 0.01Hz

12) phase shift range：-180.0º ～180.0º ，adjustment fineness:0.01º

13) Indicator class:

　　voltage and current accuracy：±0.01%

　　Phase meter accuracy：±0.01º

　　Frequency meter accuracy:±0.01Hz

4. Built-in three phase standard meter technical parameter

1)   Input voltage

　① Input voltage range（V）： 40—480

　② Input voltage gear（V）： 60、120、240、480

　③ accuracy class：0.02%

　④ capacity: 600V

　⑤ input load   ≤0.5mA（480V）

2) Input current

　① input range（A）: 0.01—100

　② input gear（A）:100、50、25、10、5、2.5、1、0.5、0.25、0.1、0.05、0.025

　③ accuracy class：0.02

　④ capacity : 150A

3) Accuracy

　① Accuracy class：0.05% (0.1A~120A)

　② Power test accuracy

　　a. active power test accuracy：0.05%/0.1%（PF≥0.5）

　　b. reactive power test accuracy: 0.1%、0.2%（PF≥0.5）

　③ Electric energy test accuracy

　　a. active energy test accuracy:0.05%、0.1%（PF≥0.5）

　　b. reactive energy test accuracy:0.1%、0.2%（PF≥0.5）

5) The equipment has complete protection function: voltage short circuit protection,

current open circuit protection, overload protection, display overvoltage protection;

6) Can make 2~21harmonic test, voltage break off and drop test, harmonic amplitude is adjustable

7) power supply：230V ± 10％～50Hz

8) Max power consumption：300 VA

9) Work environment: temperature 20℃± 5℃ relative humidity≤85％

Ⅳ、**Working Principle**

The equipment adopts distributed built-in system, each sub-system has its independent small system, has the feature of advanced structure, easy to extend, stable working etc.

The equipment is composed by man-machine operation interface, main control system, high precision signal source, error processing system, voltage (current) power amplifier, voltage and current output part etc.

Working principle is the equipment adopts ARM built-in system, exchange all kinds of order and data through internal RS232 port, each part coordinate and be a whole.
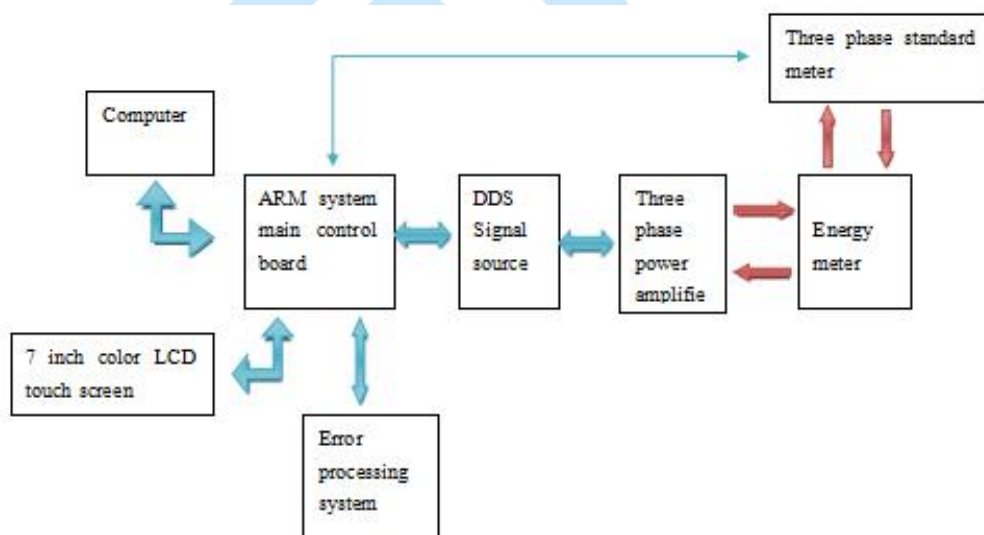
Ⅴ、**Device Introduction**

ZX3030C internally installed multifunction signal generator, adopts DDS technology, wide-scale FPGA and built-in ARM system, which can generate 6 channel independent adjustable output signal, 3 voltage signal and 3 current signal. The master control system connects with PC with a RS232 port, and connects with error processing system with another RS232 port to control the switch of current circuit by 485 communication port; connects with three phase standard meter by the third RS232 port. Internally installed 7 inch color touch LCD, 64M electric memorizer, which can save 10000 energy meter error data. The operation function is modularized and man-machine interface is friendly. The device equipped with a USB port, can updated the system and download error data by a USB flash disk. It can also operate by external connecting a mouse
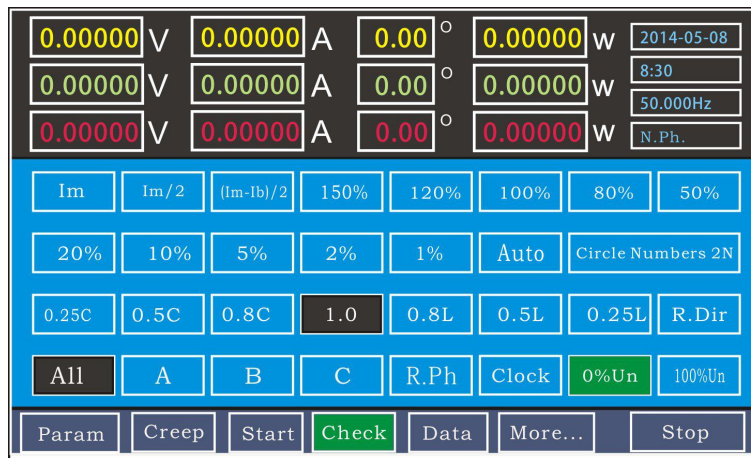

The five core aviation plug on the top left of back panel is the impulse output port of built-in standard meter, it can output standard meter's high frequency and low frequency. The middle RS232 is three line serial communications, can connect with computer; the three aviation plug on bottom left is the impulse input port of three tested energy meter. Other

ports are 4 voltage output port and 6 current output port.

1. LCD Introductio

After power on and initialize, enter starting up default interface:

0.00000 V	0.00000 A	0.00 °	0.00000 W	2014-05-08
0.00000 V	0.00000 A	0.00 °	0.00000 W	8:30 / 50.000Hz
0.00000 V	0.00000 A	0.00 °	0.00000 W	N.Ph.

Im	Im/2	(Im-Ib)/2	150%	120%	100%	80%	50%
20%	10%	5%	2%	1%	Auto	Circle Numbers 2N	
0.25C	0.5C	0.8C	1.0	0.8L	0.5L	0.25L	R.Dir
All	A	B	C	R.Ph	Clock	0%Un	100%Un

Param	Creep	Start	Check	Data	More...	Stop

1) Display interface contains three function modules:

① The top is electrical parameter, shows the output voltage, current, phase angle, active power, reactive power and the right part shows time, date, frequency and phase sequence.

② The middle is the operation button of relevant function module, you can input relevant function by finger touch.

③ The below part is calibration function module, contains energy meter parameter setting, creeping test, starting test, error test, error data, more function and stop function. If you switch the function module, the middle part will also change accordingly.
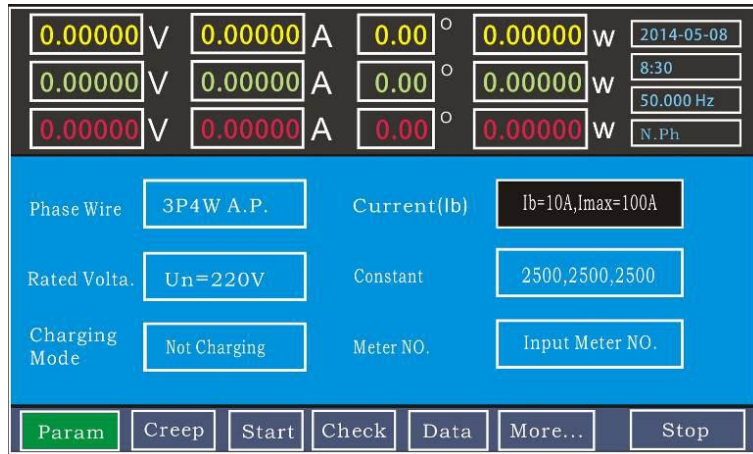
2. Usage of LCD

For example: the tested energy meter is three phase four-wire active energy meter, its rated voltage:220V rated current:5A meter constant 1200, max current 60A. It will make error test, creeping test, and starting test.

1) Energy meter parameter setting

Press the button 【meter parameter】 to enter the setting interface:

If the displayed parameter is the same with energy meter parameter, you do not need to set it anymore. Press the other function button to exit. Otherwise, click any color lump to set the energy meter parameter. See below picture:

In the above picture, the first half part is parameter setting area, the middle is phase angle, and the last half area is number key

Click the number key, you can set the parameter on the first half part

① Definition of each part:

a. 【Meter type】you can choose the meter type from the following eight type: three-phase four-wire active, four-wire sine reactive, 90 reactive, 60 reactive, three-phase three-wire active, three-phase sine reactive, two-phase three-wire active and single-phase.

b. 【rated voltage】you can choose the rated voltage according to the energy meter's nameplate. If there is no needed voltage, you can input

the value with number key in the last black area.

c. 【rated current】 It is the rated current Ib, list the frequently-used current value; If there is no needed current, you can input it directly with the number key. 【MAX】 is the maximum current, it can also input by number key.

d. 【meter constant】 the signal source can input three different constant. This three constant must be input, otherwise the calculation error will make mistake.

e. 【ok】 button, click to confirm

【back space】 you can delete the previous number by press this button when you input number.

【ESC】 click this button to cancel the setting before and exit the setting interface.

② set the tested energy meter parameter to the following:

a. Meter type: three-phase four-wire active

b. rated voltage：220V

c. rated current：5A, max current：60A

d. meter constant：1200

2）Creeping test

① In the main interface, press the **[creep]** to enter the setting interface:

In this picture:

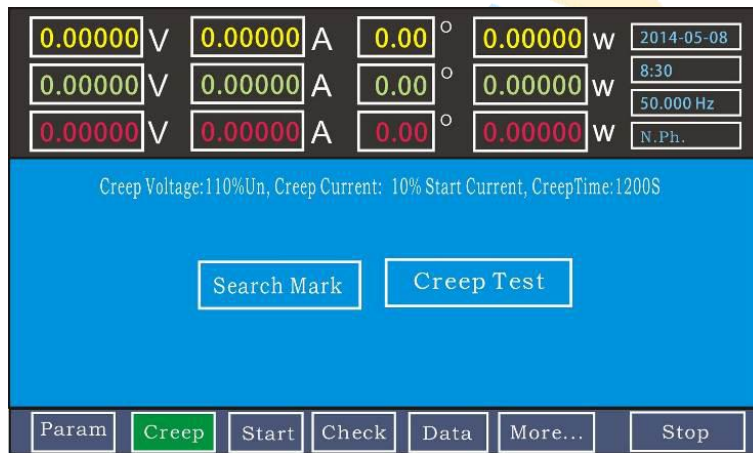a. [creep voltage] click this button to set creeping voltage, how much percent of the rated

voltage. The test is 110%U=242V

b. 【creep current】to set the creeping current, how much percent of the starting current. The test is 10%*5*0.5%=2.5mA。

c. 【creep time】according to the needs to input the creeping time. The test is 1200S

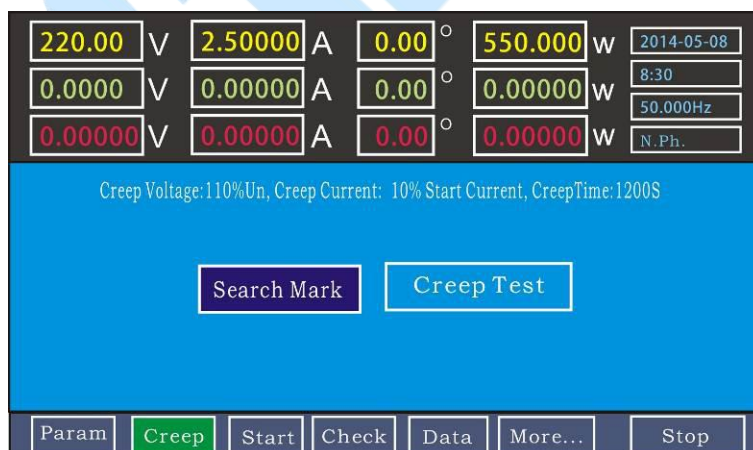d. 【black mark current】to set the catch black mark current, how much percent of rated current. The test is 5*50%=2.5A

② **Test step**

Set creeping parameter ➡ catch black mark ➡ creep test.

After setting parameter in the parameter setting interface, press **[ok]** to confirm the setting and exit, and enter the creeping test interface.
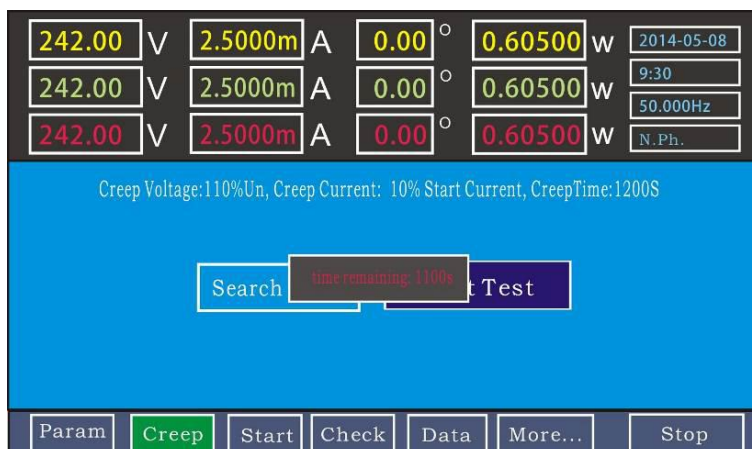
0.00000 V	0.00000 A	0.00 °	0.00000 W	2014-05-08
0.00000 V	0.00000 A	0.00 °	0.00000 W	8:30
0.00000 V	0.00000 A	0.00 °	0.00000 W	50.000 Hz
				N.Ph.

Creep Voltage:110%Un, Creep Current: 10% Start Current, CreepTime:1200S

Search Mark   Creep Test

Param | Creep | Start | Check | Data | More... | Stop

If it is mechanical meter, it needs catch black mark, press **[marker]**; set the test of grasping black mark.

220.00 V	2.50000 A	0.00 °	550.000 W	2014-05-08
0.0000 V	0.00000 A	0.00 °	0.00000 W	8:30
0.00000 V	0.00000 A	0.00 °	0.00000 W	50.000Hz
				N.Ph.

Creep Voltage:110%Un, Creep Current: 10% Start Current, CreepTime:1200S

Search Mark   Creep Test

Param | Creep | Start | Check | Data | More... | Stop

Voltage adjust to 220V, current adjust to 5*50%=2.5A, when finish adjusting power source, each meter position shows 【-----】, if grasp the black mark, it will shows 【--1--】；when all meter position complete, press 【stop】to finish the work.
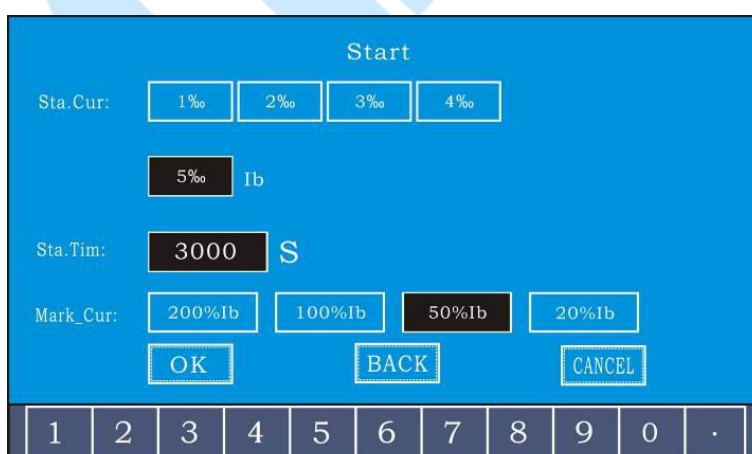
Press 【start testing】again to enter creeping test, power source will modulate according to the setting data.

242.00 V	2.5000m A	0.00 °	0.60500 W	2014-05-08
242.00 V	2.5000m A	0.00 °	0.60500 W	9:30 / 50.000Hz
242.00 V	2.5000m A	0.00 °	0.60500 W	N.Ph.

Creep Voltage:110%Un, Creep Current: 10% Start Current, CreepTime:1200S

Search   time remaining: 1100s   Test

| Param | Creep | Start | Check | Data | More... | Stop |

After modulation, error display window show "000000", set test time to decrease. At this time, meter generate impulse, error display will increase count. When test time becomes O, the equipment will descend the voltage to rated voltage and descend current to 0. According to the meter position count value, to judge manually the creeping test is qualified or not. If there is impulse number, it is unqualified. We suggest to connect computer and operate with software, it can judge the result automatically.

3) Starting test

① On the main interface, press the function button [start], to enter starting setting.

Start

Sta.Cur: 1‰   2‰   3‰   4‰
            5‰ Ib
Sta.Tim: 3000 S
Mark_Cur: 200%Ib   100%Ib   50%Ib   20%Ib
       OK   BACK   CANCEL

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | . |

a. 【starting current】this button is to set starting current, it is the parts per thousand of the rated current.

b. 【starting time】this button is to set starting time, input the time as per requirement. In

this test, the time is 3000S.

c. 【Black mark current】 is the button to set the current of catching black mark. It is the parts per hundred of rated current. In this test, the value is 2.5A.

② **Test step**

Set starting parameter ➡️ catch black mark ➡️ start testing

After setting parameter, press [ok] to confirm and enter starting test interface.
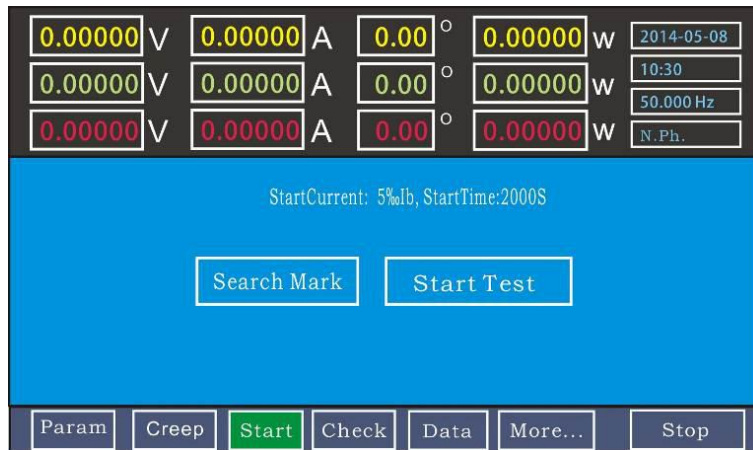

If to calibrate mechanical meter, it need to catch black mark, press [catch black mark] button;

The equipment make catching black mark test.

Voltage adjust to 220V, current adjust to 5*50%=2.5A, power source complete adjusting, each meter position shows [-----], if catch black mark, meter position shows [--1--]; when all meter position complete, press [stop] button, to finish the work.

Press [start test] button, to start testing, the power source modulates as per the set data.
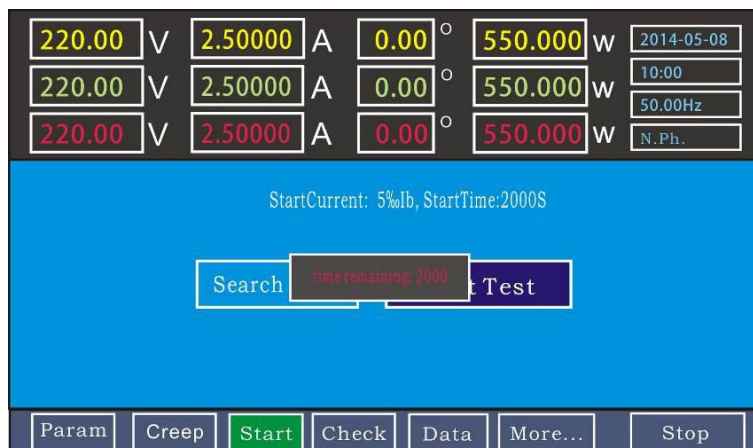
After modulation, error display window show"000000", set test time to decrease. At this time, meter generate pulse, error display will increase count. When test time becomes O, the equipment will descend the current. According to the meter position count value, to judge manually the starting test is qualified or not. If there is pulse number, it is qualified. We suggest to connect computer and operate with software, it can judge the result automatically.
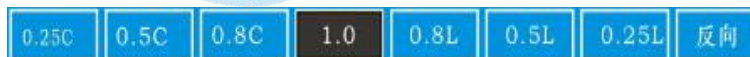
4) Error test

Press [calibrate] button, to error calibration interface:
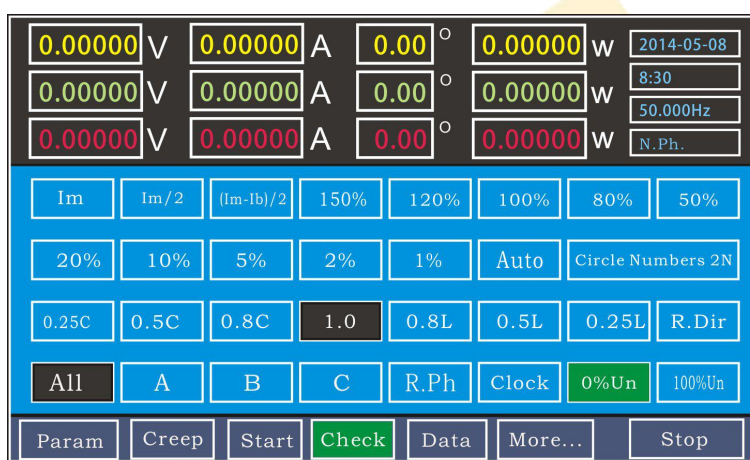
① Button introduction
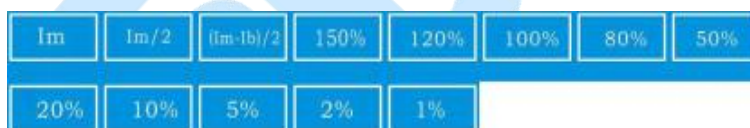
➢ Current loading key， actual value is the parts per hundred of rated current.

➢ Power factor key， adjust the power factor between voltage and current

➢ Voltage loading key, each key refer to the relevant rated voltage percent

➢ Circle number setting key, when count error, calculate tested meter circle number is 3. If set to 2, the error calculator will calculate the

meter error after 2 circle finished

Auto

➢ Auto key, the equipment will test automatically

Clock

➢ Clock key, it can calibrate the time of tested meter with time output. (optional function)

| All | A | B | C |

➢ When calibration you need to choose test unit, [ABC],[A],[B],[C]

② Test step

Meter parameter setting ⟹ power factor key ⟹ Current load key ⟹ show error

After finish setting meter parameter, enter calibration state to test error value of each point. First press power factor key, then press current load key. At this time, signal source output voltage and current signal. The equipment adjust to the relevant power automatically.

A：External installed error display time

Error display window shows system stable time and begin to count down, when reach to "000000",the error display window shows "A00000"， then begin to sample and calculate error. In the 6 digit LED nixie tube, the first two digit before decimal point is standard meter pulse number, the last two digit after decimal point is the tested meter sampling pulse number. When the circle number descend to 00, shows error value. The error range is -99.9％～99．9％. When it shows A.0000, means the result >99.9%; when it shows –A.0000, means the result <-99.9%

To change different current load key, you can calibrate error of relevant load point. To calibrate all load point error.

B：built-in error processing time

Press 【error】 button，enter error display interface:
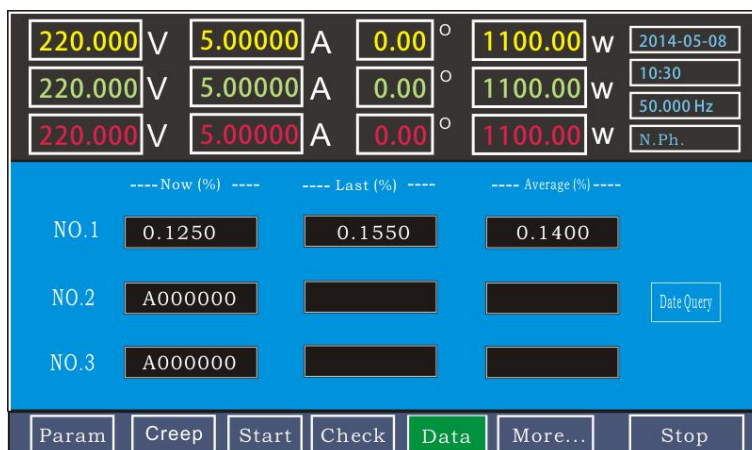
At the same time shows three tables for error.

When change load point，you need to press [calibrate] button to enter calibration interface, choose current load point. And after modulation of voltage,current and phase position, press [error] button again to enter error display interface. Circle like this, to complete calibrating of all load point.

> **Note: when you change power factor point, you must press current load key. Otherwise, signal generator will not output updated signal.**

③ **Method to change cylinder number**

Press[circle setting 3N] button ⟹ press number key ⟹ press current load key.

> **Note:Do not omit the last step to press current load key, otherwise the signal generator will respond as per the pristine setting value.**

5) Manual adjusting method of output quantity

Sometimes (such as when calibration the equipment) we need to adjust the output quantity optionally. At this time, we need to manually adjust output amplitude, phase position, frequency. Press [More function] button, to enter menu of more function.
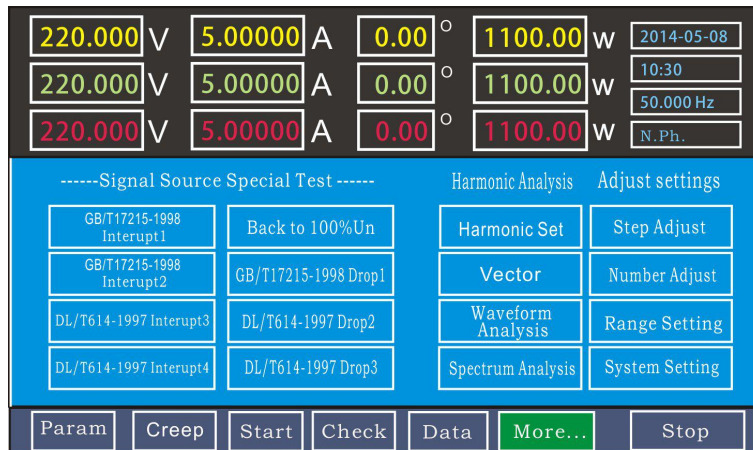
Two method: step Adjust and Number Adjust

A：Number Adjust

Press【Number Adjust】 to enter its menu
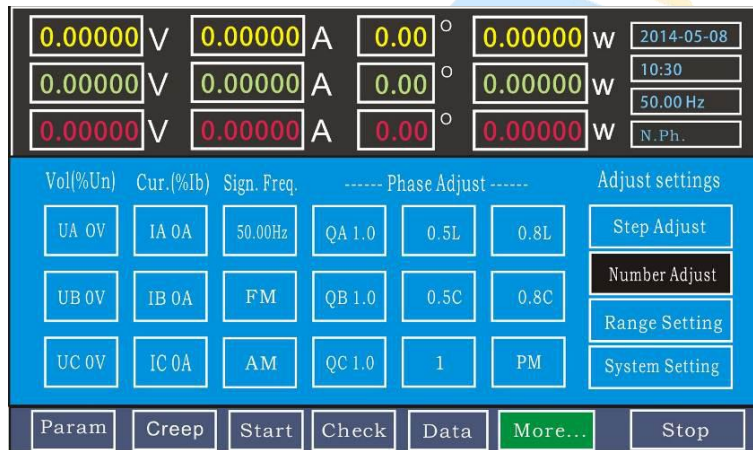
**Number Adjust procedure:**

➢ Set voltage and current value ⟹ press [AM] button,to output amplitude modulation.

➢ Set frequency value ⟹ press [FM] button, to output frequency modulation.

➢ Set phase position ⟹ press [PM] button to output phase modulation.

➢ Voltage, current, frequency can be set directly by inputting number.

B：Step Adjust procedure

Press [step Adjust] button to enter its menu:
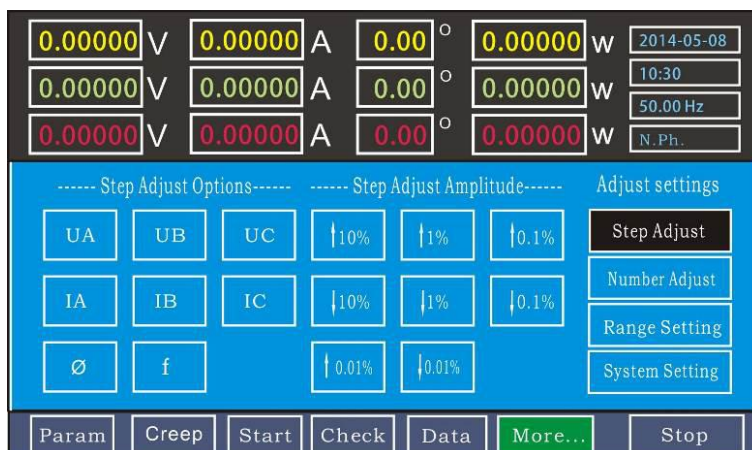
Choose what need to be adjusted, then press 10%、1%、0.1%、0.01% key to adjust it.

6) Harmonic wave test

The equipment can overlay 2~21 sub-harmonic respectively or simultaneously in the output quantity of voltage and current unit, and can make harmonic performance test. The harmonic component, range and phase position can be set as per the requirement. The equipment can output random waveform that fit the function $f = A_1Sinw1t + A_2sinw2t + \ldots\ldots + AnSinwnt$ (n<21)

Press [More function] to enter its menu:

Press [harmonic setting] button to enter its interface:
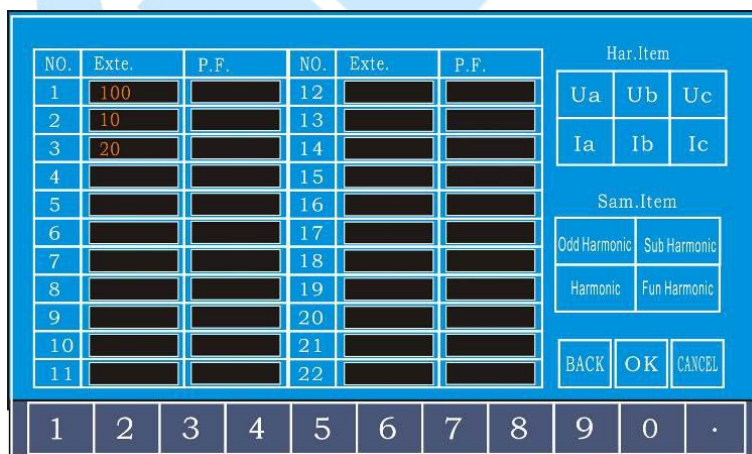
In this interface

➢ [odd harmonic] is the button of odd harmonic, press this button then press [confirm] button to output odd harmonic.

➢ Press [sub-harmonic] button, then press [confirm] button to output

sub-harmonic.

➢ Method to output random harmonic:

Choose harmonic item（Ua、Ub、Uc、Ia、Ib、Ic）➡️ input the amplitude and phase position of each harmonic (harmonic amplitude ＜40%）➡️ press[harmonic] button ➡️ press [confirm] button ➡️ press [current load] button to output current and voltage.

Note: After finish the harmonic test, do press [fundamental harmonic] button, then press [OK] button to exit harmonic test. Otherwise, the output signal is the signal of last time.

Ⅵ、**Output Vector Diagram And Phase Angle**

（phase angle: -180.0 ~ 180.0 voltage ahead of current is positive, otherwise is negative）

1. three-phase four-wire active

		0.25L	0.5L	0.8L	1.0	0.8C	0.5C	0.25C
合元	A	75.5	60.0	30.0	0.0	-30.0	-60.0	-75.5
	B	75.5	60.0	30.0	0.0	-30.0	-60.0	-75.5
	C	75.5	60.0	30.0	0.0	-30.0	-60.0	-75.5
A元		75.5	60.0	30.0	0.0	-30.0	-60.0	-75.5
B元		75.5	60.0	30.0	0.0	-30.0	-60.0	-75.5
C元		75.5	60.0	30.0	0.0	-30.0	-60.0	-75.5

2. three-phase three-wire active

		0.25L	0.5L	0.8L	1.0	0.8C	0.5C	0.25C
合元	A	75.5	60.0	30.0	0.0	-30.0	-60.0	-75.5
	C	75.5	60.0	30.0	0.0	-30.0	-60.0	-75.5
A元		45.5	30.0	0.0	-30.0	-60.0	-90.0	-105.5
C元		105.5	90.0	60.0	30.0	0.0	-30.0	-45.5

3. Single phase

	0.25L	0.5L	0.8L	1.0	0.8C	0.5C	0.25C
A	75.5	60.0	30.0	0.0	-30.0	-60.0	-75.5

4. Three-phase four-wire reactive or three-phase four-wire sine reactive

		0.25L	0.5L	0.8L	1.0	0.8C	0.5C	0.25C
合	A	14.5	30.0	60.0	90.0	120.0	150.0	165.5
	B	14.5	30.0	60.0	90.0	120.0	150.0	165.5
元	C	14.5	30.0	60.0	90.0	120.0	150.0	165.5
A 元		14.5	30.0	60.0	90.0	120.0	150.0	165.5
B 元		14.5	30.0	60.0	90.0	120.0	150.0	165.5
C 元		14.5	30.0	60.0	90.0	120.0	150.0	165.5

5. Three-phase three-wire reactive or three-phase sine reactive

		0.25L	0.5L	0.8L	1.0	0.8C	0.5C	0.25C
合	A	14.5	30.0	60.0	90.0	120.0	150.0	165.5
元	C	14.5	30.0	60.0	90.0	120.0	150.0	165.5
A 元		-15.5	0.0	30.0	60.0	90.0	120.0	135.5
C 元		44.5	60.0	90.0	120.0	150.0	180.0	-165.5

6. display vector disgram

In the main interface, press [more function] button, to enter more function interface:
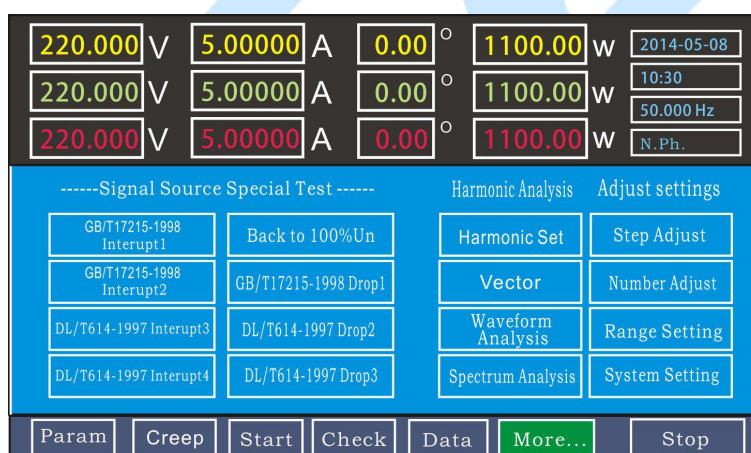
Press 【vector diagram】 button to enter vector diagram interface:

In this interface, it shows voltage, current, phase position, active power, reactive power, apparent power and vector diagram.

In this interface, you can adjust electric indicator directly

7. Single phase meter test method

1) Hang the single phase meter to the current output A phase, connect the voltage wire to the below U and UN （do not connect it to the three phase voltage output port, the equipment collocate voltage PT at A phase, single phase meter can not be tested unhooked.）
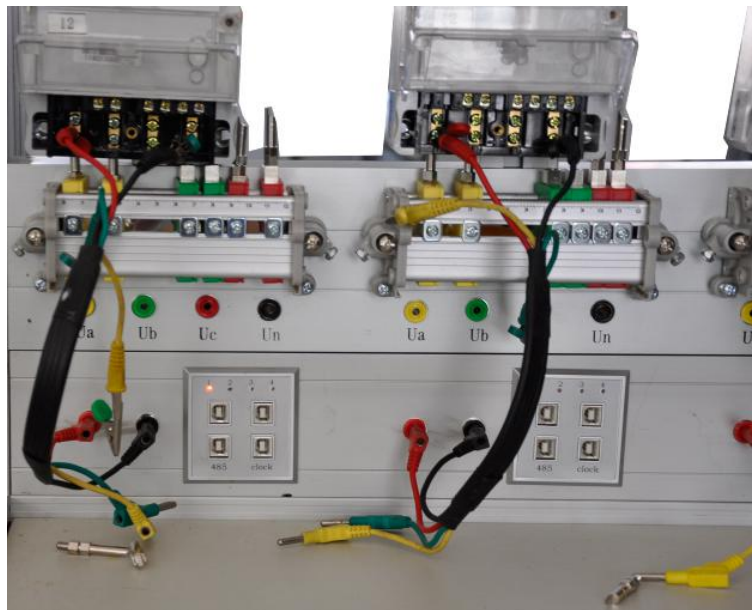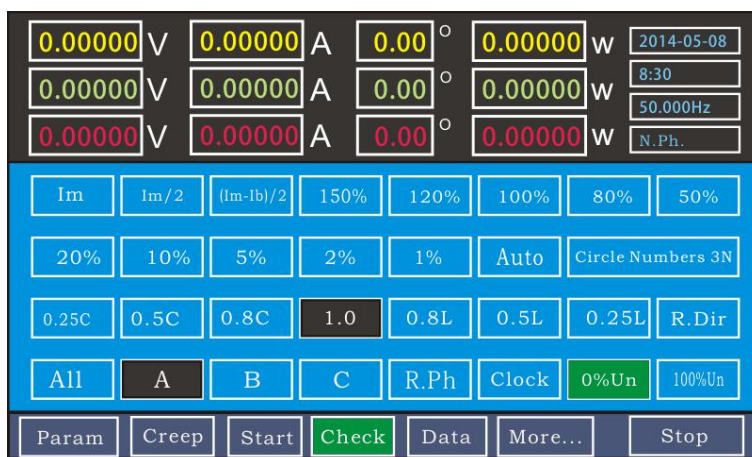

2) Parameter setting

According to the setting method of 5.2.1, choose meter type to [single], other parameter setting is the same with three phase energy meter.

3) Calibration method

All calibration method is the same with 5.2.2.2, except the current only output A phase.

Ⅶ、 Configuration List

1. Internal installed error processing system

No.	Name	Specification	Quantity	Remark
1	Host	ZX3030C	1	
2	hanging rack	3 position	1	
3	current wire	100A	6	
4	voltage wire		3	
5	impulse wire		3	
4	computer connect wire	RS232	1	
5	Standard impulse output wire		1	For test

2. External error processing system

No.	Name	Specification	Quantity	Remark
1	Host	ZX3030C	1	
2	hanging rack	3 position	1	Vertical type
3	485 /clock communication wire		3	
4	impulse wire		3	
5	computer connect wire	RS232	1	