Huazheng®

HZ-2009

Circuit Breaker Analyzer

Huazheng Electric Manufacturing(Baoding) Co.,Ltd

Dear user:

Thank you for choosing HZ-2009 Circuit Breaker Analyzer.

We hope that this instrument can make your work easier and more enjoyable, so that you can get the feeling of office automation in the test and analysis work.

Before using the instrument, please read this manual, and operate and maintain the instrument according to the manual to prolong its service life. "Just a light press, the test will be completed automatically" is the operating characteristics of this instrument.

If you are satisfied with this instrument, please tell your colleagues; if you are not satisfied with this instrument, please call (0312) 6775656 to tell you to serve you at all times-Baoding Huazheng Electric Manufacturing Co., Ltd., our company will definitely make you satisfied !

Contents

I. Main functions and features

Ability : the instrument can test the vacuum circuit breaker ,sf6, oil circuit breaker, gis and etc. the test parameters include, close or open time ,delta time ,bounce time ,bounce cycles, multi-operation, stroke , gap ,over-travel ,overshoot ,rebound and the speed, with the ability of test results and graph display.

Immunity : withstand the 550KV electrostatic environment .

Transducer : with one analog transducer test ability .

Standard : with the standard of DL/T846.3—2004 (P.R.C.)。

Power : with internal dc power ,the voltage ranges from 5v to 260v.

Trigger : with four triggers to start the recording ,channels state, voltage, current and transducer.

HMI : via keypad and a large transflective LCD display (320 x 240 pixels).

Speed :supply series of speed definition with editable and un-editable selection.

Recording: with twelve channels ,coil current and transducer .

Print :with internal installed 58mm wide thermal printer.

Communication: with RS232 and USB communication interface.

Memory: with a SD card of 2GB,the maximum storage ability is 100 test results.

USB FLASH: USB and RS232 interface for data communication with the PC.

Help : the instrument has internal help topic .

II. Technical characteristics

Test channels : 12 channels with 25V，the current is 50mA

Transducer : one analog transducer .

TIME

Recording time length : 0～20.0s

Time accuracy : ±0.l%reading ± 2 LSB

Resolution : 0.1ms

Motion :

Range : 0～1000mm

Accuracy : ±1% reading ±1LSB

Resolution : 0.1mm

Velocity :

Ranges : 0.01～20.00m/s

Accuracy :±1%reading ±1LSB

Resolution : 0.01m/s

DC POWER :

Ranges : 5～260V

Max current : 20A

Accuracy : ±1%reading ±1LSB

Load change :≤1%

TRIGGER :

Voltage : 5～260V

Current : 0.1-20A

Transducer : the transducer states changes

Channels : channels states changed

DIMENSIONS :415mm×320mm×168mm

WEIGHT :8kg

OPERATION TEMPERATURE :-10℃～50℃

HUMIDITY : ≤80% RH

POWER SUPPLY :

Voltage :AC 220V±10%

FREQUENCE :50Hz±10%

SAFETY :

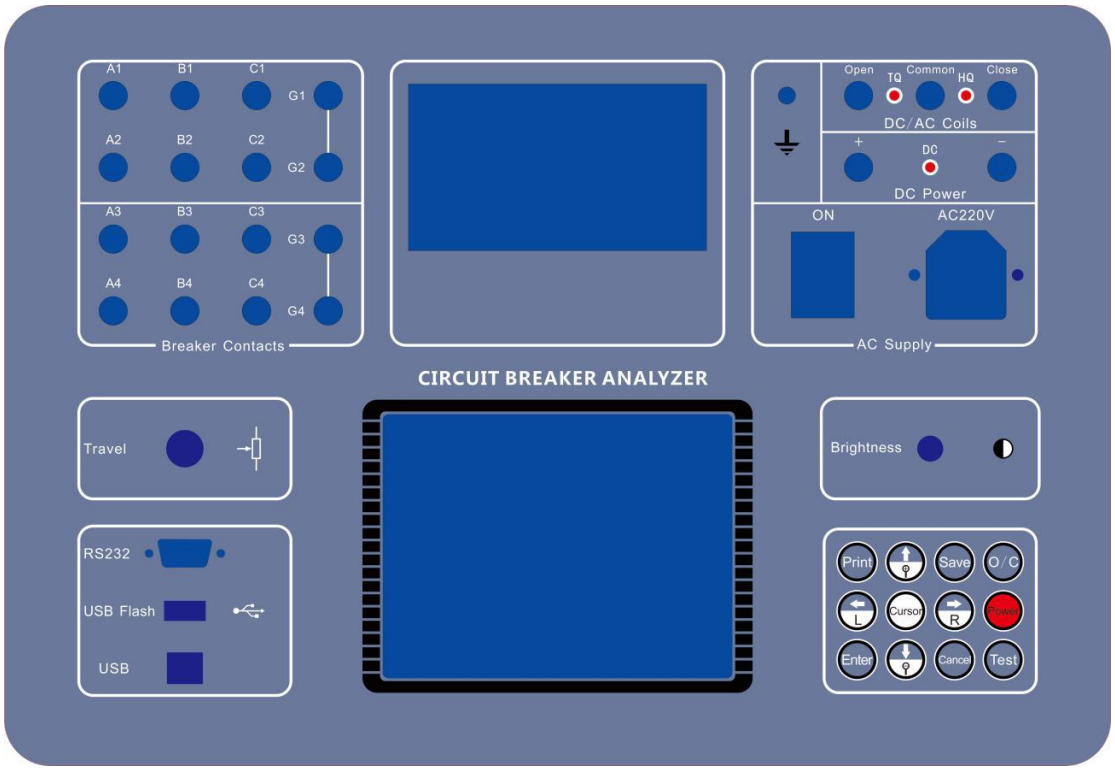
Insulation resistance＞2MΩ

Leakage current ＜3.5mA

Immunity :AC 1500V 50Hz，1min.

III. Method of operation

1.Panel wiring



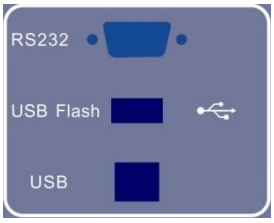
LCD :5.7″black and white lcd screen，the brightness is adjustable.

Printer：58mm wide thermal printer .

Ground：Protective earth connection.

Main supply： AC220V，50Hz with two fuse in the box, one in use ,the other for spare use .

Communication ：

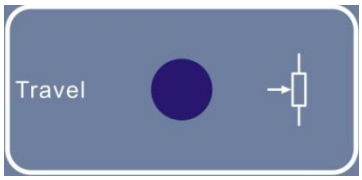


RS232C：57600bps。

USB FLASH DISK：export the test results to the external usb flash disk.

USB communication：connect to a pc via a usb cable.

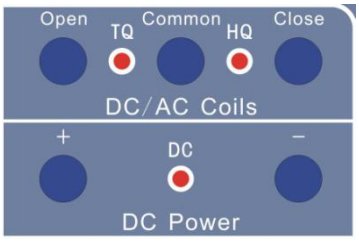
Transducer :



the connector with three lines, connect the transducer to the instrument.

Note that the transducer is combined with phase A1 only.

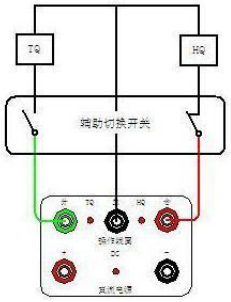
DC POWER：



+、- outputs the internal dc power ,it's also for the connection to an external power ,with a red led indicator.

Open , Common ,Close are the outputs to the circuit breakers' open or close coil . with led as indication.

Close or open can also be used as the external trigger.

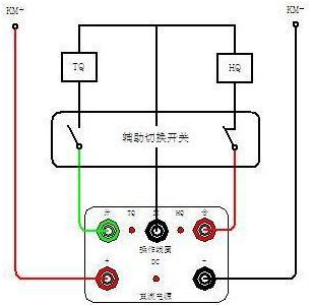


Typical connection ：

the instruments has three operation mode, internal power mode ,external power mode , external trigger mode .

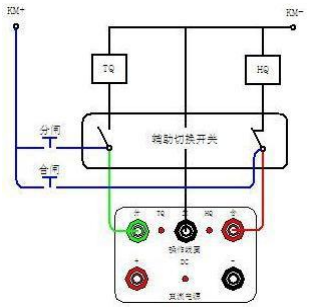
（1）Internal power mode：

The internal power outputs the dc voltage directly, the voltage can be used for the circuit breaker's coil , and can be used for the motor's charging voltage.



（2）External power mode：

The +、- can be connected to an external dc power ,then use the external power to do the tests of the circuit breaker.



（3）External trigger：

Connect the circuit breaker's close coil and open coil to the close , open and common port of the instrument. This is the external trigger mode.

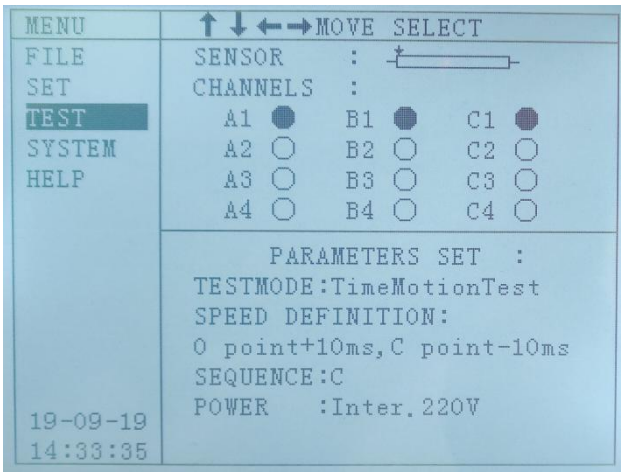
Notes : when the operation coil is ac driven mode ,the external trigger mode is useful.

CONTACTS: the contacts are used to connect the ports of a circuit breaker to the instrument.

Keyboard Specification：

O/C	O/C	Set the operation sequence between open and close			
Power	Power	Turn on the internal DC power or turn off it			
Test	Test	Start the test process			
Print	Print	Print the results table and the graph			
Save	Save	Save the results table and the graph			
Enter	Enter	Enter the setting			
Cancel	Cancel	Cancel the setting or return			
Cursor	Cursor	Set the graph between the screen move mode and zoom mode			
↑	↑/ZOOM IN	↑	Move cursor or zoom in or out	Zoom in	Zoom in or out the graph
↓	↓/ZOOM OUT	↓		Zoom out	
L	←/Left	←		L Move	Left or right move of the screen
R	→/Right	→		R Move	

2.menu specifications TEST



Sensor：this moving cursor indicates the location of the transducer.

Channels：

● indicates the very contact is closing ；

○indicates the very contact is opening.

Parameters set ： shows the current setting parameters.

TESTMODE：indicates the current test program's test mode。

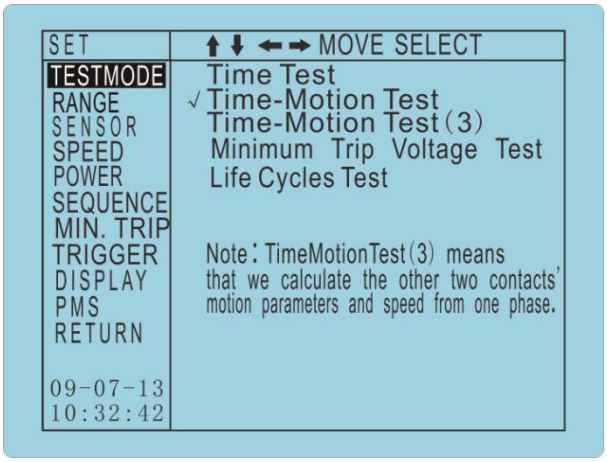
SPEED DEFINITION：indicates the current test program's speed definition。

SEQUENCE：the short key of the open or close set。This parameter can also be set from the MENU-SET-SEQUENCE。

POWER：indicates the current test program's power mode(internal power, external power or external trig mode)。

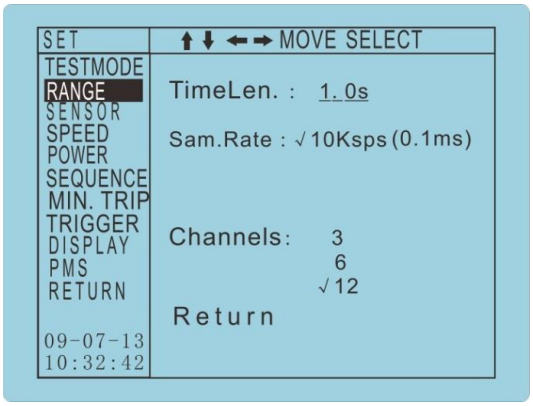
SET：set the test-mode, range, transducer(sensor),speed definition, power mode, sequence, minimum trip voltage , trigger and display of the test program。

（1）SET—TESTMODE：



TESTMODE：the test mode title has five options, such as time-test ,time-motion test ,time motion test(3),minimum trip voltage test, life cycles test, the operator can select the very test mode as he wants .

（2）SET—RANGE：

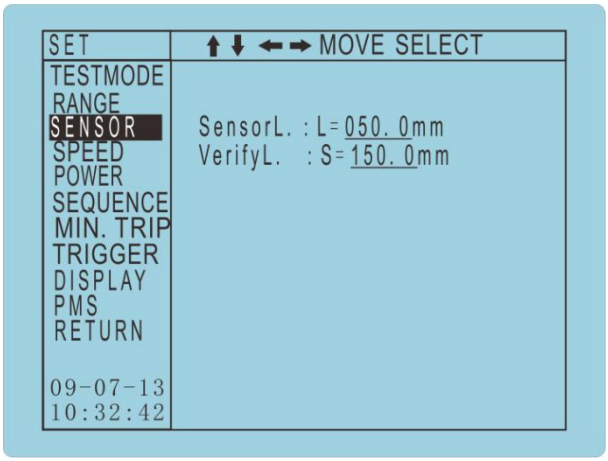


Time Length：the range can be set from 0.1 to 20.0s,this is the record time length。

SampleRate：The sample rate is 10Ksps .

Channels： this is the channels of the test program, it has three choices, includes 3 ,6 and 12。

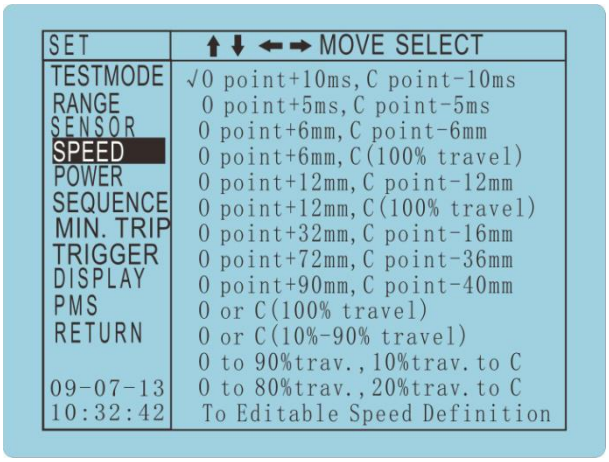
（3）SET—SENSOR：



Sensor Length：this is the line transducer's total electrical length, the operator can set the transducer's length here.

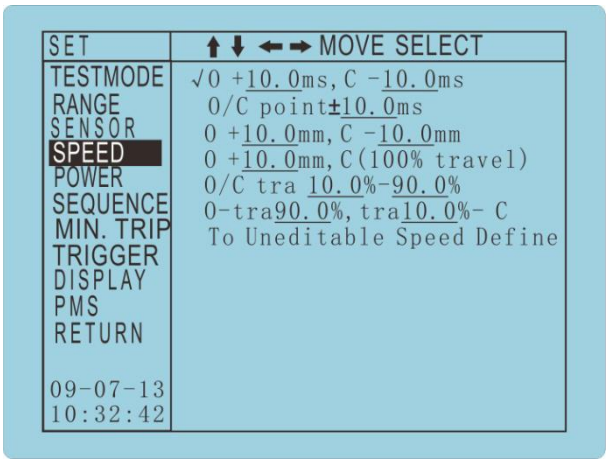
Verify Length：this is the rotary transducer the operator can set the circuit breaker's total length(stroke) here.

（4）SET—SPEED ：



For the reason that the speed definition of circuit breaker maybe different from each other ,the user can select the very speed definition of the test program.

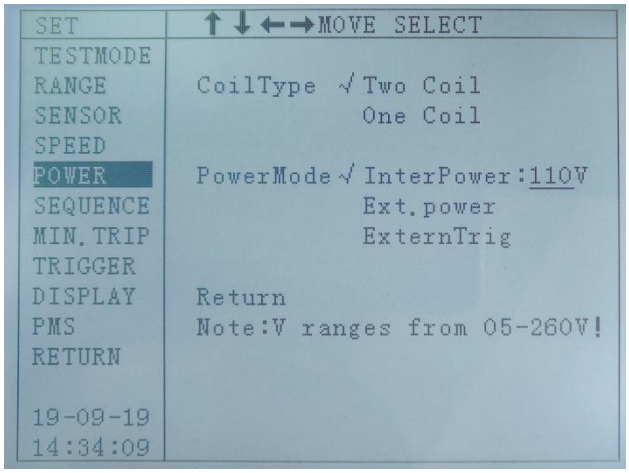
（ un-editable speed definition）



if the operator thinks that the speed definition in the un-editable speed definition part is not suitable, then the editable speed definition part maybe useful. Of course the operator can use the cursor in the graph to analyze the speed .

（editable part）

（5）SET—POWER：



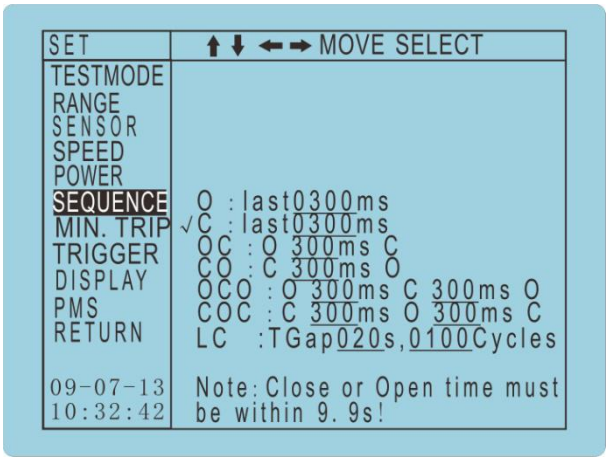
Internal Power：the operator can set the voltage from 5 to 260V.the +、- port on the instrument's face can output the internal dc voltage as setting.

External power：if the operator select external power, then internal power is turned off automatically, the operator can connect the external power to the

+、- part on the face。

External trigger：if the operator select the external trigger ,then the internal power is automatically turned off ,the operator can only connect the lines from the close coil and open coil's voltage to the face's open ,common and close ,then the instrument can be trigged from the open or close coil's dc or ac voltage.

（6）SET--SEQUENCE：



O/C：the open or close operation's voltage lasts XXXX ms

OC：the open operation's recording lasts XXX ms, and then output the close coil's voltage.

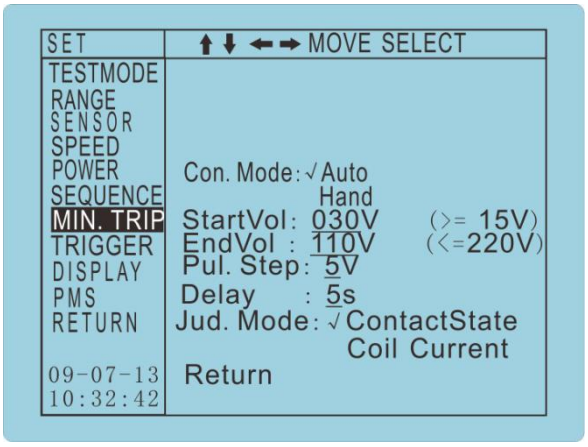
CO：the close operation's recording lasts XXX ms, and then output the open coil's voltage.

OCO：the open operation's recording lasts XXX ms, and then output the close coil's voltage, the recording time length lasts XXX ms, and then output the open voltage .

COC：the close operation's recording lasts XXX ms, and then output the open coil's voltage, the recording time length lasts XXX ms, and then output the close voltage .

LC: the life cycles test's time gap and the cycles of the operation can be set here .

（7）SET—MINIMUM TRIP VOLTAGE：



Control Mode：if the operator select the auto mode, then the following parameters can be set ,if the hand mode, the following parameters can't be set ,the voltage can range from 5V to 260V from the panel's keys.

Start Voltage：this is the start voltage that been added to the open or close coil.

End Voltage：this is the end voltage of the minimum trip voltage test .

Pulse Step：this is the increase step of the voltage .

Pulse Delay：this is the delay between the steps of the voltage .

Judge Mode：the instrument judges if the operation is over or not from the condition.

There are two choices:

One is to judge from the ports state, if the port states have been changed , the test is over, so the operator must connect the ports lines of the circuit breaker to the instrument.

Another choice is to judge from the coil's current state ,so the operator must connect the open or close coil to the open ,common and close of the panel.

The operator can only select only one at a time .

Notes：

DC110V coil ，start voltage can be set to 30V，the end voltage can be set to 110V；

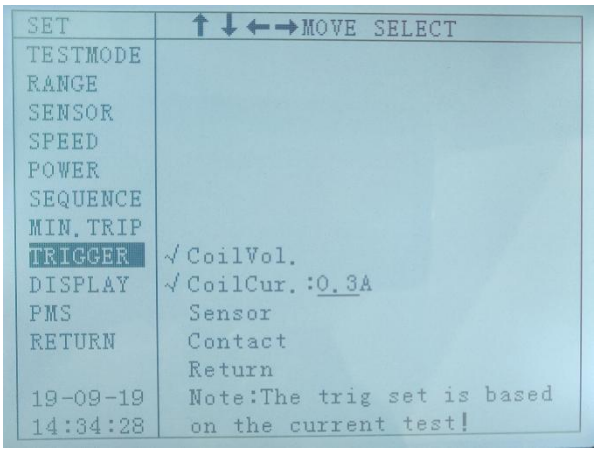
DC220V coil，start voltage can be set to 60V，the end voltage can be set to 220V；

If the steps is small, then the test time is much longer.

If the delay is large , then the test time is longer .

The test results table of the auto mode can be printed or saved, but the hand mode didn't support the save or print function.

（8）SET--TRIGGER：

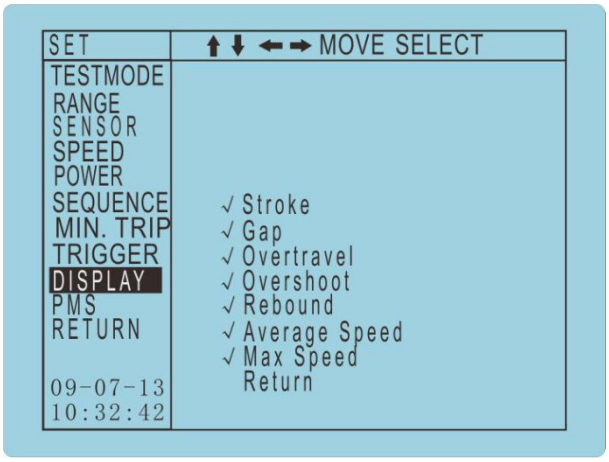


There are four choices for the trigger setting, such as the coil's voltage , coil's current , the sensor's state and the contacts' states. and the current's value can be set.

Notes:

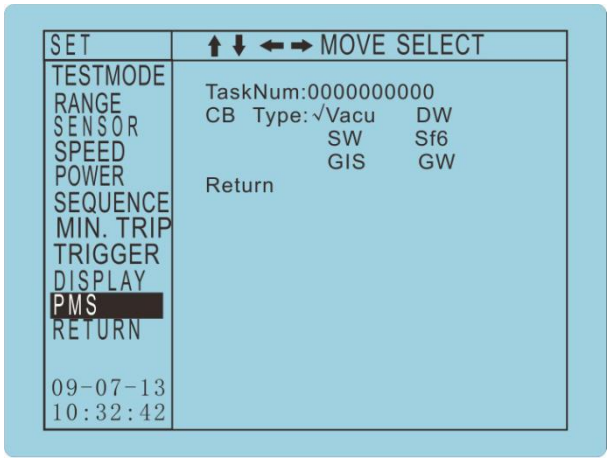
The trig set is based on the current test,so you should select as you need.

（9）SET--DISPLAY：



The user can select the parmeters to display or not display on test result table.

（10）SET--PMS：

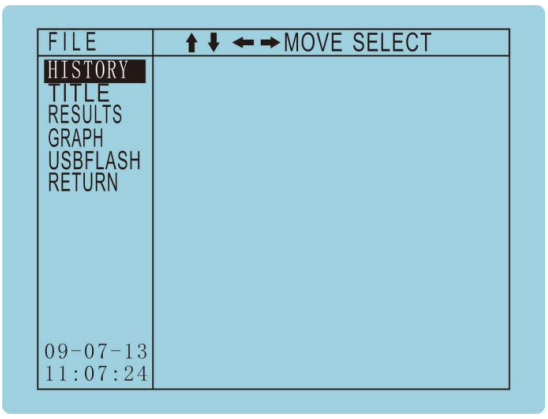


The PMS is for the ZheJiang Province's

Power System use, to send the test results to the pc terminal through Bluetooth communication.

FILE: the operator can see the history ,results table , graph and so on .

（11）FILE--HISTORY：



The operator can find ,open and delete the history test results.

（12）FILE--TITLE：

TEST	REPORT
Breaker type	
Manufacturer	
SerialNumber	
Breaker ID	1901-01-01
TestLocation	
Company Name	
Operator	
Instrument	
Reference	

this table supports the edit of the characters,numbers .

（13）FILE--RESULTS：

Test Time:2009-07-08 08:59:52 (C)

CHA.	C Time	Bouc.	Cyc.	
A1	0085.66	00.85	01	ΔA000.00
A2	0085.66	00.85	01	ΔB000.00
				ΔC000.00
				ΔABC001.00
B1	0086.08	01.66	01	Cur. Len. 065.70
B2	0086.08	01.66	01	Stroke 012.3
				Gap 011.5
				Overtra. 000.8
C1	0086.66	02.26	01	Oversho. 001.5
C2	0086.66	02.26	01	Rebound000.8
				Velocity 00.69
				MaxVelo. 00.80

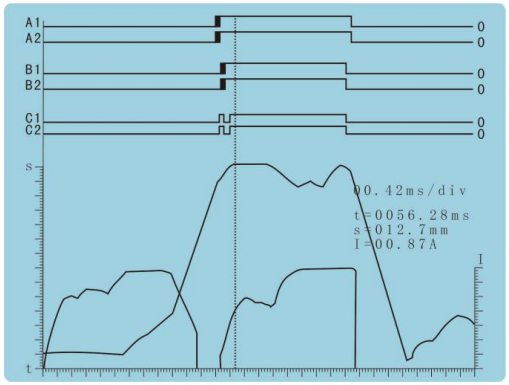
Note:base ms;mm;m/s. ⬇ to Graph

Press key Print，can print the test results table。

Press key ⬇，can enter into the graph.

Press key Cancel，can return to the upper menu。

（14）FILE--GRAPH：

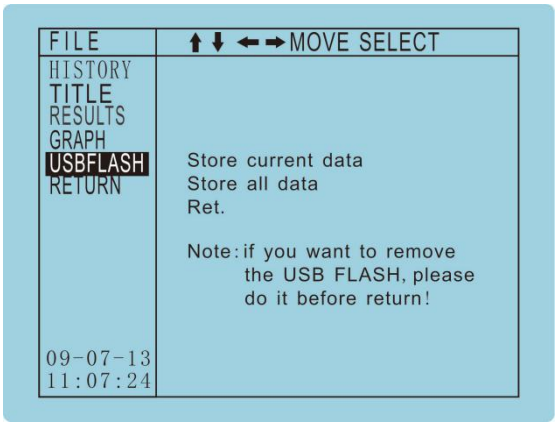


the operator can analyze on the graph：

press →、← to move the first cursor，and the current cursor's time and s are displayed on the screen; if press the enter ,the first cursor is been locked； then press→、← to move the second cursor, and this time the delta time and delta s are displayed on the screen ,and the velocity is displayed on the screen too.

during the cursor moving mode ,if press the key named cursor ,then enter to the graph's zoom mode ,so this time the operator can press the zoom in ,zoom out key to view the details of the graph ,and also the operator can press the left or right move key to move the content on the screen. If the operator press cursor key another time ,then the operation mode of the graph returns to the cursor moving mode again.

（15）File--USBFLASH：

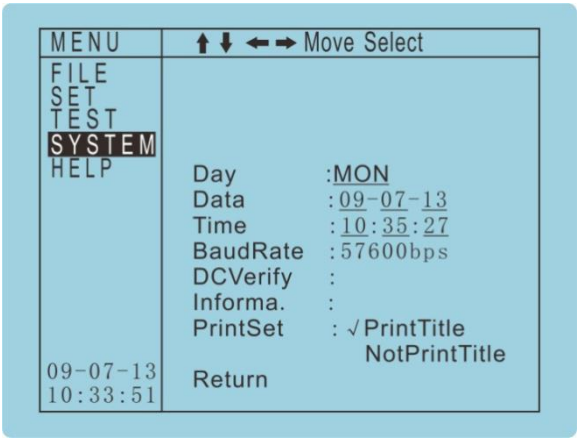


Store current data：store the current test data to the usb flash ,then on the pc software ,this test data can be opened.

Store all data：store all data in the instrument's memory to the usb flash disk.

Return: return to the upper menu.

（16）SYSTEM：



Day: set the day of week.

Data :set the year ,month and data.

Time :set the hour ,minute and second.

Baudrate：the baudrate is 57600bps。

DC Verify：Press key 

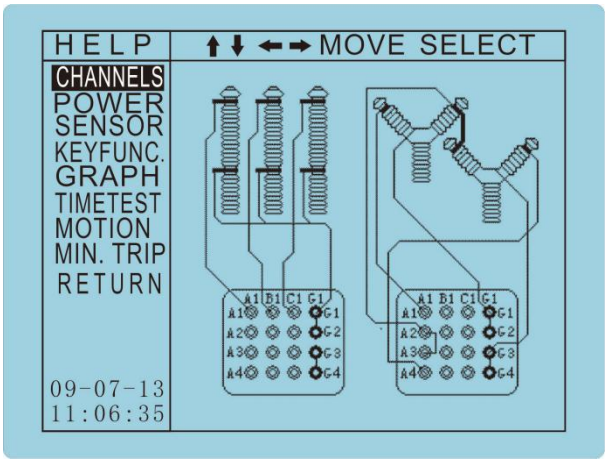
，enter into the verification of the voltage.

Information: this is used for the debug in the factory.

Printset：this is a choice between print the title or not print the title.

HELP：this is the help topic.

（17）HELP--CHANNELS：

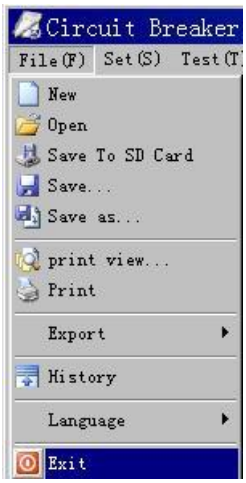


As show on the screen , the help menu displays the port connect way.

3.PC SOFTWARE SPECIFICATION

（1）PC SOFFWARE MENU：

①FILE



New : create a new test.

Open : open a test results.

Save to SD card：give a command to the instrument to save the current test results to the internal SD card .

Save :save the current test to the hard disk of PC.

Save as :the function is similar to the save .

Print preview: take a preview of the test results.

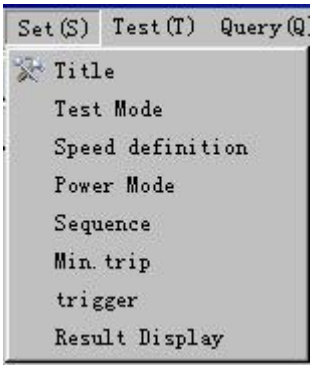
Print : print the test results on the printer directly.

Export : export the test results to the word or excel format.

History : can view the sd card's storage status and can upload ordelete the results.

Exit : exit the pc software of circuit breaker testing.

（2）SET MENU



Title：the title is a test information ,it's editable.

Test mode：this part has the time length , sample frequency ,test mode and sensor.

Speed definition : it has the channels ,max speed , and the speed definition.

Power mode : set the power mode of the test.

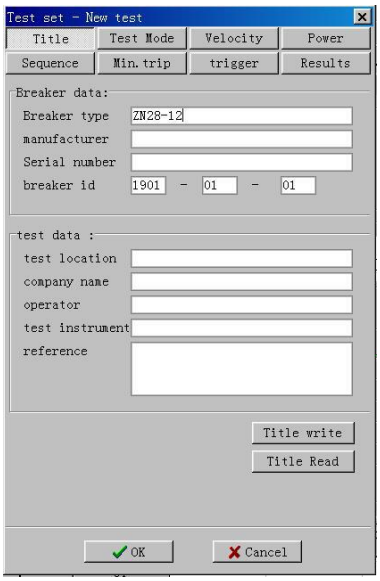
Sequence : set the open , close ,open-close , close-open ,close-open-close and open-close-open .

Minimum trip voltage : set the information of the minimum trip voltage test .

Trigger : set the trigger of the test plan .

Results display : set the parameters show or not show in the results table .

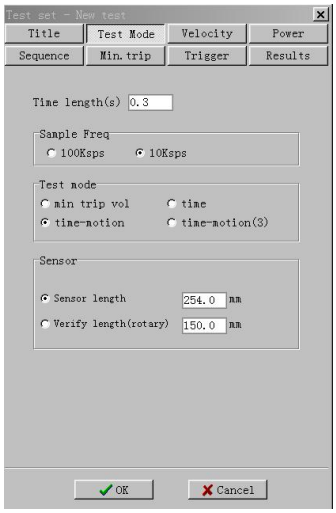
①Title



the operator can edit the circuit breaker's information and the tester's information ,these information can be stored on the pc .

title write : this means that the information can be send to the instrument ;

title read : this means that the information can be read to the software and display here .



② **Test mode**

Time length : the recording time length ranges from 0.1s to 20.0s .

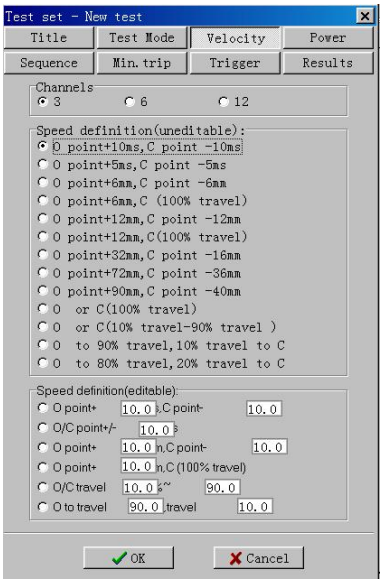
Sample frequency : The sample rate is 10Ksps,so the

Time resolution is 0.1ms.

Test mode : the instrument has four types of test modes ,time test, time motion test ,time motion test(3), minimum trip voltage test .

Sensor : the sensor length means that the total electrical length of the linear transducer. The verify length means that using the rotary transducer(resistive), the operator should enter the stroke of the circuit breaker here .

③Velocity

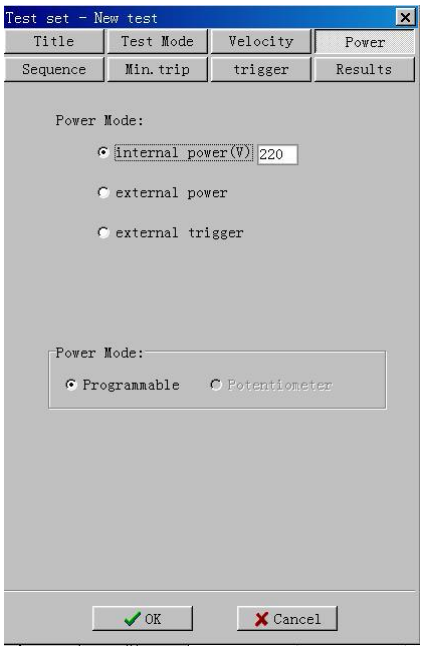


Channels : the instrument offer 3 choices ,3 ,6,12 .

The operator should select the right channels of the test .

Speed definition : the speed definition has the editable part and the un-editable part, the operator can select the speed definition of the test .

④Power



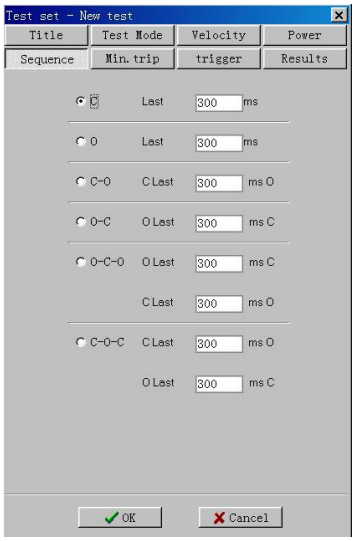
Internal power : the internal power can ranges from 15V to 250V.

External power : if the operator select external power, then internal power is turned off automatically, the operator can connect the external power to the

+、- part on the face.

External trigger : if the operator select the external trigger ,then the internal power is automatically turned off ,the operator can only connect the lines from the close coil and open coil's voltage to the face's open ,common and close ,then the instrument can be trigged from the open or close coil's dc or ac voltage.

⑤Sequence



O/C：the open or close operation's voltage lasts XXXX ms

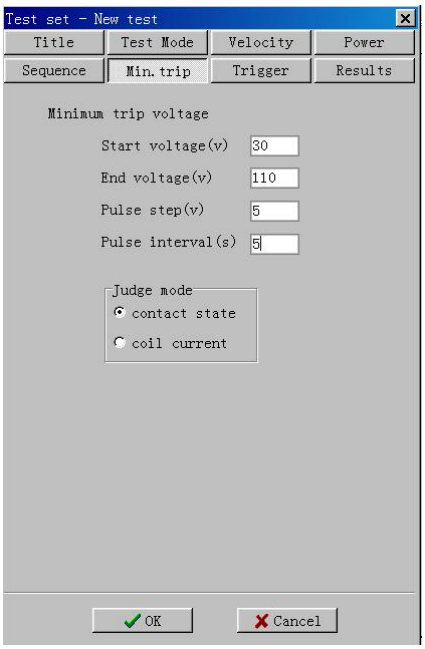
O-C：the open operation's recording lasts XXX ms, and then output the close coil's voltage.

C-O：the close operation's recording lasts XXX ms, and then output the open coil's voltage.

O-C-O：the open operation's recording lasts XXX ms, and then output the close coil's voltage, the recording time length lasts XXX ms, and then output the open voltage .

C-O-C：the close operation's recording lasts XXX ms, and then output the open coil's voltage, the recording time length lasts XXX ms, and then output the close voltage .

⑥Minimum trip voltage



Control Mode：if the operator select the auto mode, then the following parameters can be set ,if the hand mode, the following parameters can not be set ,the voltage can range from 15V to 260V from the panel's keys.

Start Voltage：this is the start voltage that been added to the open or close coil.

End Voltage：this is the end voltage of the minimum trip voltage test .

Pulse Step：this is the increase step of the voltage .

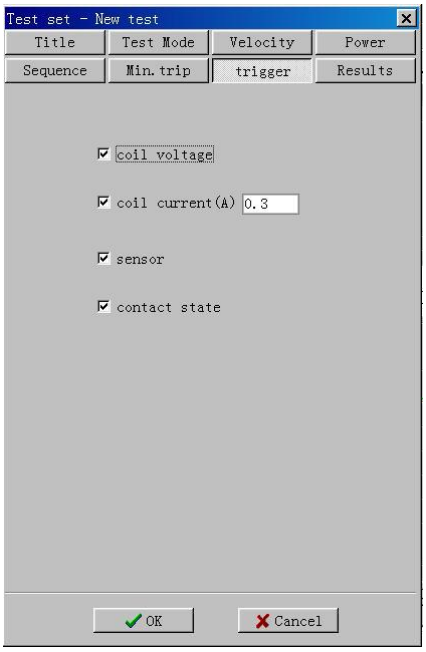
Pulse Delay：this is the delay between the steps of the voltage .

Judge Mode：the instrument judges if the operation is over or not from the condition.

There are two choices:

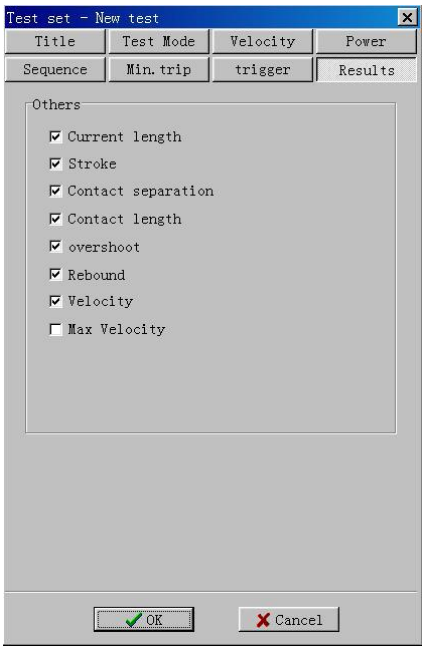
One is to judge from the ports state, if the port states have been changed , the test is over, so the operator must connect the ports lines of the circuit breaker to the instrument.

⑦Trigger



There are four choices for the trigger, such as the coil's voltage , coil's current , the sensor's state and the contacts' states. and the current's value can be set.

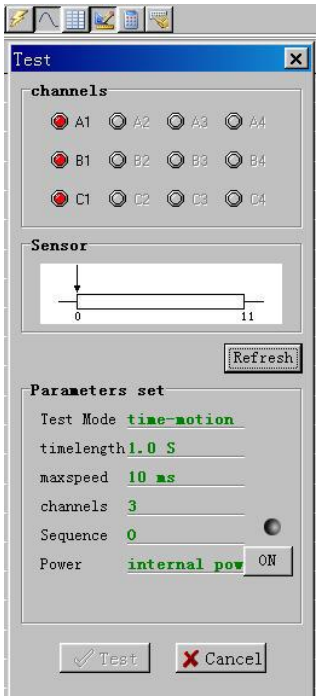
⑧Results



set the parameters display or not display in the test results table .the parameters includes the following

parameters, current length , stroke ,gap(contact seperation), overtravel(contact separation), overshoot, rebound ,average velocity ,max velocity .

3.Test Menu



Channels :

● indicates the very contact is closing ；

○indicates the very contact is opening.

Sensor : this cursor indicates the location of the transducer.

Parameters set :

Testmode :indicates the current test program's test mode。**Time length** : this is the recording time length.

Maximum Speed : the time interval for the speed calculation,the interval is 10ms.

Channels : indicate the test program's channels number.

Sequence : set the operation mode ,such as single close ,single open or multi-operation .

Power : indicate the power mode in the test program.

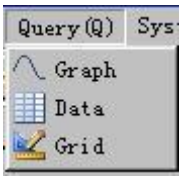
Refresh :refresh the status of the channels and the sensor .

ON : Press ON/OFF to turn on or turn off the internal dc power .

TEST : Press the test to start the test process.

CANCEL : cancel the test window.

4.Query

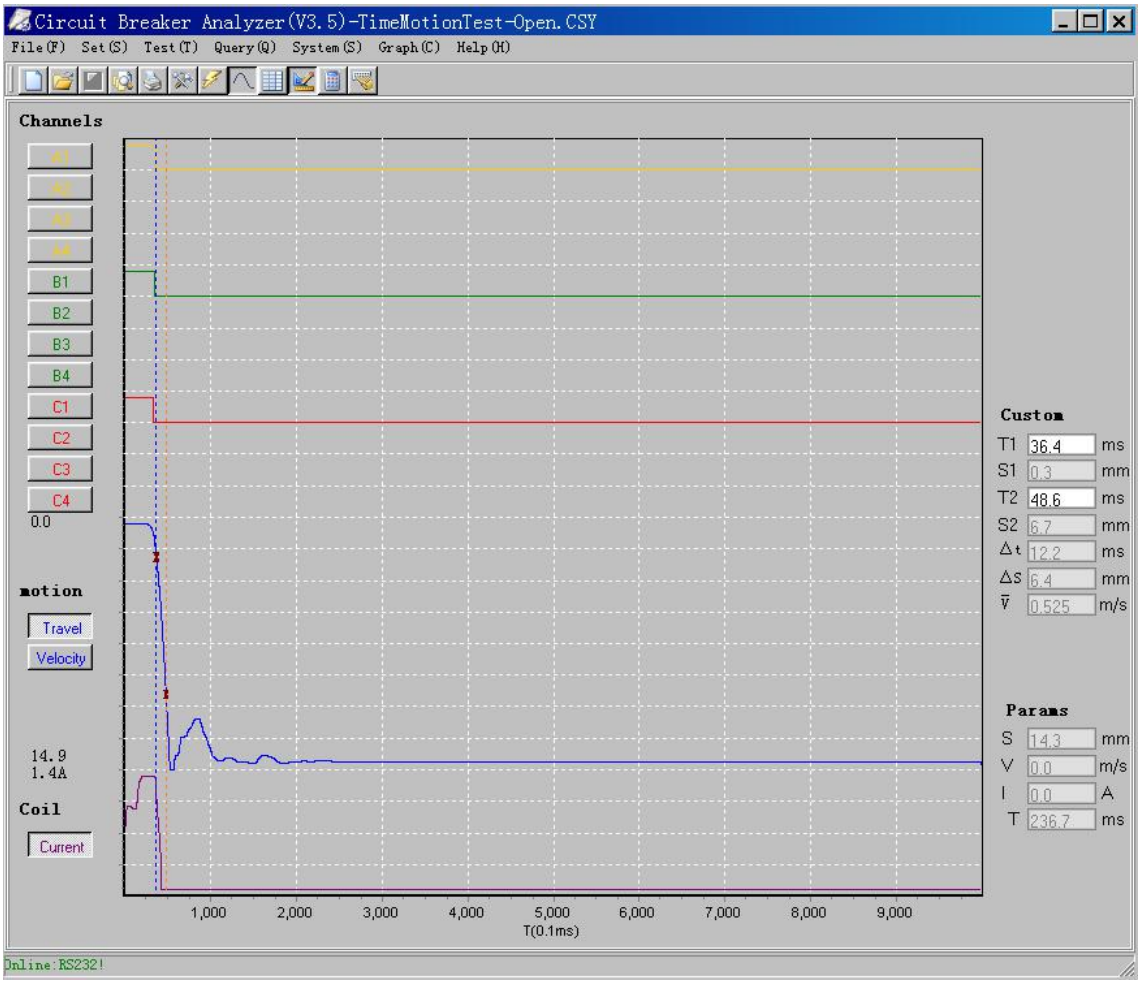


Graph : Press graph to view the graph with channels ,transducer curve and the parameters.

Data : display the test results .

Grid : press it to turn on or off the cursor .

（1）Graph



Operation of the graph

Zoom in : put the cursor of the mouse in the very area ,then drag from top-left to right-bottom.

Zoom out : put the cursor of the mouse in the very area ,then drag from right-bottom to top-left.

Cursor on :press the left key on the mouse once to put the cursor on .

Cursor off :press the right key on the mouse once to cancel the cursor .

Channels : display the selected channels's graph.

Motion : the demo display is the time-motion graph,press Velocity to the graph of the velocity，press motion to the motion graph.

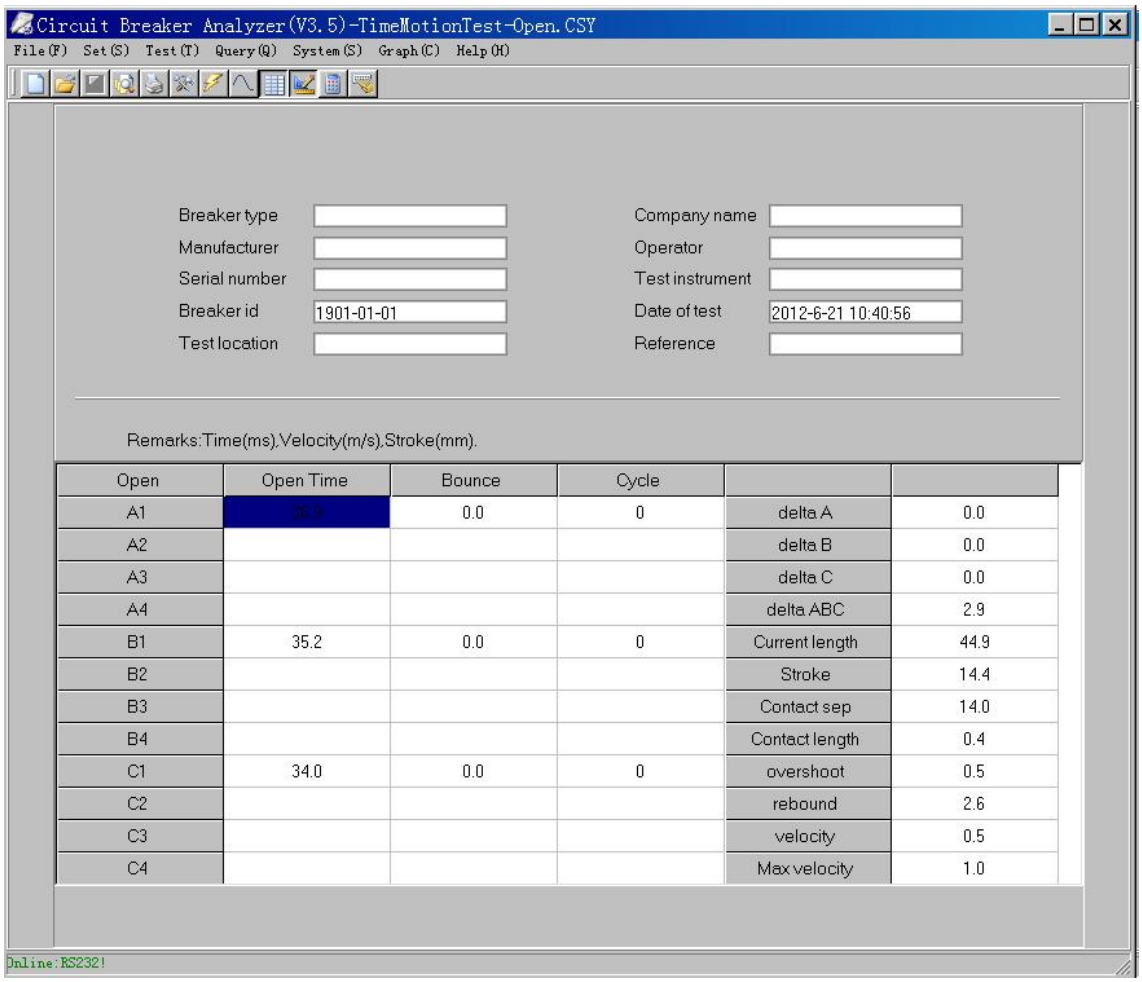
Coil current: display the current of the coil .

Time base : the time base of the x –axis .

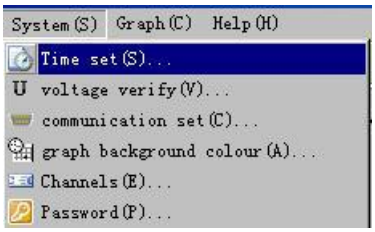
Analysis :

Move the cursor ，press the left key of the mouse once to put the first cursor(blue),then move the mouse put the second cursor(orange).so on the right of the window ,the results are displayed .

（2）Results Table



5. System



time set : set the time of the instrument or read back the time from the instrument.

Voltage verify : the verification of the internal power.

Communication set : set the communication mode (usb or rs232 , and the 232 port number).

Graph background color : set graph's background color.

6.Short Keys

Create a new test

Open a test of history

save a test

preview of the test report

print the test report with the results table and the graph

set

test

display graph

display the results table

cursor on or off

open the calculator

open the keyboard

7. Speed test installation

(1)Universal bracket installation:

The M5 screw head of the universal bracket is fixed on the fixing block on the linear resistance sensor or the fixing sheet on the angular resistance sensor, and the universal bracket fixing clip is fixed on the switch body.

(2)Linear displacement resistance sensor:

When in use, it is equipped with related connectors according to the test switch object and type.

(3)Angle resistance sensor:

When the switch is in the open or closed state, when installing the angular resistance sensor, you should pay attention to the axis arrow corresponding to the direction of the

big black point, so that it can avoid entering the invalid area when moving.120 degree or 345 degree angle sensor is optional, please refer to the packing list for details.

8.Testing method

Time test: (external power supply as an example, internal power supply and external synchronization can also be used)

Please set the test type to time test; the test range determines the length of time and the number of breaks; the operating power supply selects external power; the switching operation selection method, or press the switching button in the test interface, the trigger setting selects the trigger condition, and press the test button to proceed.

Time speed test: (external synchronization example, internal power supply and external power supply can also be used)

Please set the test type as time and speed test; the test range determines the length of time, the maximum speed, and the number of fractures; the sensor selects the length of the scale or the uncalibrated stroke value; the speed definition selection type; the operating power supply selects external synchronization; the closing operation selection method, Or press the switch button in the test interface, select the trigger condition for trigger setting, and press the test button to proceed.

Operating voltage: (Required internal power supply mode)

(1) Automatic mode: set the test type to the action voltage; the test range determines the number of breaks; the operating power source selects the internal power source; the action voltage selection conditions, the switch operation selection method, or press the switch button in the test interface, press the DC power button, and it appears "Power supply in preparation" prompt, press the test button to automatically increase the voltage, and the voltage will stop after the action. If necessary, you can press the test button to power on at this time, and press Cancel to exit to the data table. At this time, you can print and save the operating voltage value.

(2) Manual mode: set the test type to the action voltage; the test range determines the number of breaks; the operating power source selects the internal power source; the action voltage selection condition (the boost mode selects manual), the closing and opening operation selection method, or the opening and closing button in the test interface , Press the DC power button to turn on the internal power supply, press "↑" to increase the voltage, press "↓" to decrease the voltage, long press for quick adjustment, and press the test button to send out electrical pulses.

9.Parameter concept

（1）Time

Closing time: the time from the moment when the closing coil is energized to the first electrical connection of the moving and static contacts.

Opening time: the time from the moment when the opening coil is electrified to the first

electrical separation of the moving and static contacts.

Bounce time: refers to the time period from the first electrical connection (disconnection) of the moving and fixed contacts to the steady-state connection (disconnection) of the dynamic and static contacts.

Bounce times: refers to the number of bounce changes during the time from the first electrical connection (disconnection) of the moving and fixed contacts to the steady-state connection (disconnection) of the dynamic and static contacts.

Intra phase synchronization: different phases in phase a, B and C, which refers to the maximum difference of opening (closing) time of multiple fractures in switch phase.

Three phase synchronization: the difference between the maximum time phase and the minimum time phase in three phases.

Auxiliary switching time: the switching time of auxiliary switch, which refers to the time period from the instrument sending power to the control coil circuit until the loop is cut off by itself.

Gold short time: the period of contact between moving and stationary contacts in the closing and opening operation.

（2）Travel

Total travel: the displacement difference of moving contact from opening to closing or from closing to opening.

Open travel: the difference between total travel and contact travel.

Contact travel: the displacement travel difference between moving and stationary contacts under electrical contact.

Overshoot travel: the maximum overshoot travel amplitude during the moving contact movement.

Rebound travel: the maximum rebound (impact) travel amplitude during the moving contact movement.

（3）Speed

Speed: the opening / closing speed set according to the factory definition of the switch. Or just open / close speed, average speed.

Maximum speed: the maximum value of the average speed in the specified interval (0.1ms or 1ms or 10ms).

Speed definition: according to the requirements of switch manufacturer or national standard on speed definition, calculate the average speed of specified section during the recorded travel time (S-T) movement. $V = \triangle s / \triangle t = HL / \triangle T$, HL is the specified point segment, and $\triangle t$ is the motion difference of the specified point segment.

IV. Maintenance

1.Daily maintenance

（1）The instrument should be stored at -20℃～60℃, relative humidity <85%, ventilated, dry, and non-corrosive gas environment.

（2）When used outdoors, avoid rain and snow, and strong light exposure to avoid damage to the LCD and the instrument.

（3）Put in a special shock-proof outer box during transportation to avoid strong movement abrasion and vibration damage to the instrument.

（4）If the instrument is not used for a long time, please turn it on and power it on for 1 hour according to the storage conditions.

（5）When the printer is working, please do not tear the printing paper. When paper jam or paper replacement, please open the printer cover, squeeze the paper roll to take it out or put it into the bracket, and fix the reserved paper head through the cover slot.

（6）The sensor, test line, mounting frame and other accessories should be stored in the packing box in time after use to avoid damage or loss.

2.service support

1) After the user purchases the machine, please fill in and keep the product repair card for future maintenance.

2) If the instrument is damaged within three years after delivery (non-human damage), our company will be responsible for three guarantees of maintenance and lifetime maintenance within its normal service life.

3) The company is responsible for the supply of consumables and accessories for the instrument.

4) Please contact the technical service department of our company in time for all problems in use.

V.Precautions

1. please notice that it’s only allowed to work with well trained personnel and with the power systems familiar personnel.

2.the connect action of the test lines should be done before supply power to the instrument.

3. When the instrument is turned on, do not touch the measurement circuit, control output circuit and the conductors connected to it. Before connecting the input or output terminals of the instrument, be sure to ground the instrument reliably.

4.Try to use the special test leads and accessories provided by this instrument.

5.In the case of connecting the DC output line, before turning on the power switch and control switch of the instrument, be sure to confirm that the switch is malfunctioning, so as not to cause any possible personal and equipment hazards.

6.Avoid using it in humid, flammable and explosive environments.

7.The power supply of the instrument is 220V AC, and 380V is prohibited.

VI.Packing List

No.	Item	Qty
1	Main engine	1
2	Power line	1
3	Flat extension tool	1
4	Rotary installation tool	1
5	Adjustable wrench	1
6	Sensor connector	4
7	Medium clip (red 2 green 1 black 2)	5
8	Black short line	2
9	Screwdriver	2
10	Alligator clips(red 4 yellow 4 green 4, black 7)	19
11	Small clip (red 2 green 1, black 2)	5
12	Red test line	2
13	Black test line	3
14	Yellow test line	2
15	Green test line	2
16	Three core test line	1
17	Two core test line	1
18	Four core test line	1
19	Rotating sensor	1
20	Line sensor	1

21	The universal bracket	1
22	Connector (red 1 green 1 yellow 1 black 1)	4
23	Ground lead	1
25	Fuse pipe	4
26	Print paper	4
27	L-shaped gadget	1
28	RS 232 data cable	1
29	U disk	1