

LNGK-III High Voltage Switch
Dynamic Characteristic Tester

User Hand Book

Wuhan Lvnengde Precision Testing
Technology Co., Ltd

Special safety tips:

1. After the instrument arrives at the site, please connect the protective ground of the instrument to the ground before proceeding with other wiring and operations; After the test is completed, turn off the power supply, then remove the other components, and finally remove the ground wire.
2. Before using the instrument, check if the input power supply is AC 220V, otherwise it may damage the instrument.
3. There is high voltage inside the instrument. To ensure safety, please do not disassemble it without authorization.

Before using the instrument with power on, it must be placed in a dry and flat environment for use!

When the instrument is not in use, it should be placed in a dry and non corrosive environment. If it is not used for a long time, it must be powered on once a month for two hours each time.


The starting current of the energy storage motor is more than 10 times its rated current. Use the internal power supply of the instrument to store energy for the motor. The starting current must not exceed 25A, otherwise there is a possibility of burning out the internal DC switching power supply. Please operate with caution! It is generally suitable for energy storage in vacuum switches of 35kV and below (coil voltages of DC110V and DC220V).

Thank you for choosing our company's product. Please read the instruction manual carefully before using the instrument for the first time. Due to continuous product improvement, design and specifications are subject to change without prior notice.

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1 .The product technical parameters

Tips: In this manual, menus or options on the software interface are enclosed in 【 】 . For example, 【File】 → 【Open Data】 means to select 【File】, 【Open Data】 on the menu, and press the button on the panel.  Indicates pressing the buttons on the panel.

1.1 Environment

Input Power: 220V $\pm 10\%$ 50Hz $\pm 10\%$

Atmospheric pressure: 86~106kPa

Temperature: -20~45℃

Humidity: $\leq 80\%RH$

1.2 Security

Insulation resistance: $> 2M\Omega$

Dielectric strength: 1.5KV power on the chassis power frequency withstand voltage for 1 minute, no flashover and arcing.

1.3 Basic parameters

◆ **Time:** range 0- 64000.0ms resolution 0.1ms error $\leq \pm (0.1\%rdg+0.1)$

◆ **Speed** : range 0-20.00m / s resolution 0.01m / s error $\leq \pm (1\%rdg+0.1)$

◆ **Stroke:**

	Range	Resolution	Error
Vacuum Circuit Breaker	50.0mm	0.1mm	$\leq \pm (1\%rdg+1)$
SF ₆ Breaker	300.0mm		
Oil Circuit Breaker	1000.0mm		

◆ **Coil Current:** Range 40.00A resolution 0.01A error $\leq \pm (1\%rdg+0.1)$

- ◆ **Coil resistance:** Range 30.0k Ω Resolution 0.1 Ω Error $\leq \pm (1\% \text{rdg} + 0.1)$
- ◆ **Output Power:** DC0 ~ 270V digital adjustable / 30A Resolution 1V error $\leq 1\% \text{rdg}$
- ◆ **Size & Weight:** 420mm (L) \times 350mm (W) \times 230mm (H) 8.7kg

2. the performance characteristics

2.1 Performance

- **Time:** 12 fracture inherent points, closing time, with the same period of interphase period.
- **Reclosing:** Each fracture together close -open, open-close, open-close-open. Metal short time, no current interval time value. First open time, first close time, second open time.
- **Bounce:** Every fracture closing bounce time, number of bounces, bouncing process, bouncing waveform; each fracture break bouncing amplitude.
- **Speed:** Just minutes, just close speed, maximum speed, and time - trip characteristic curves.

Stroke: total trip, opening distance, overshoot, and overshoot stroke rebound amplitude.

- **Current:** Open, close gate coil current, resistance and current waveforms.
- **Operating voltage:** DC0 ~ 270V/30A machine provides digitally adjustable power circuit breakers, high voltage circuit breaker automatically complete action test, measuring the value of the operating voltage printed circuit breakers.

2.2 Features

- ◆ Instrument IPC architecture for domestic production of all models of metal contacts SF₆ switchgear, GIS combination of electrical, vacuum switch, oil switch and column switches, contacts and so on.
- ◆ Sensor: Acceleration speed sensor, rotation speed sensor, linear stroke sensor installation is very easy and simple. Three phase speed, stroke, opening distance, overtravel and other parameters are displayed.
- ◆ 30A high-power DC output, LED digital meter display DC voltage, easy to operate and clear.

- ◆ **Trigger: Internal trigger, external trigger, sensor trigger and manual trigger.** Manual triggering allows for the performance testing of manually split circuit breakers (without closing and closing coils), such as manual split switches on poles. Sensor triggers are used primarily for special requirements such as switch shops.
- ◆ **Energy storage output:** The instrument can provide a maximum starting current of 25A DC adjustable energy storage power supply, and can automatically control the motor's energy storage without rewiring after connecting the wires at once. Attention: The starting current of the energy storage motor is more than 10 times its rated current. It is generally suitable for on-site energy storage of 35kV and below vacuum switches (with coils of DC110V and DC220V).
- ◆ **Lock release power supply:** directly replace the on-site DC power supply, release the switch lock, and facilitate the completion of switch testing.
- ◆ Host big screen, straight-through, wide temperate backlit LCD, contrast electronic adjustment. Perfect full Chinese menu prompts, switch action once all the data and waveform display maps.
- ◆ Host can store 1000 groups live points, closing test results, real-time clock inside, easy to archive storage test date and time. The USB interface is used for data transfer and program upgrades. RS232 port for online operation (optional).
- ◆ Instrument has a powerful data analysis capabilities, to the circuit breaker parameters of the mechanical properties of the indicators for effective analysis. Built-in fast micro-printer, print all data and maps.
- ◆ Break-in life testing function for circuit breakers, isolation switches, and other switchgear, with multiple functions for one machine.

3. The definition of terms

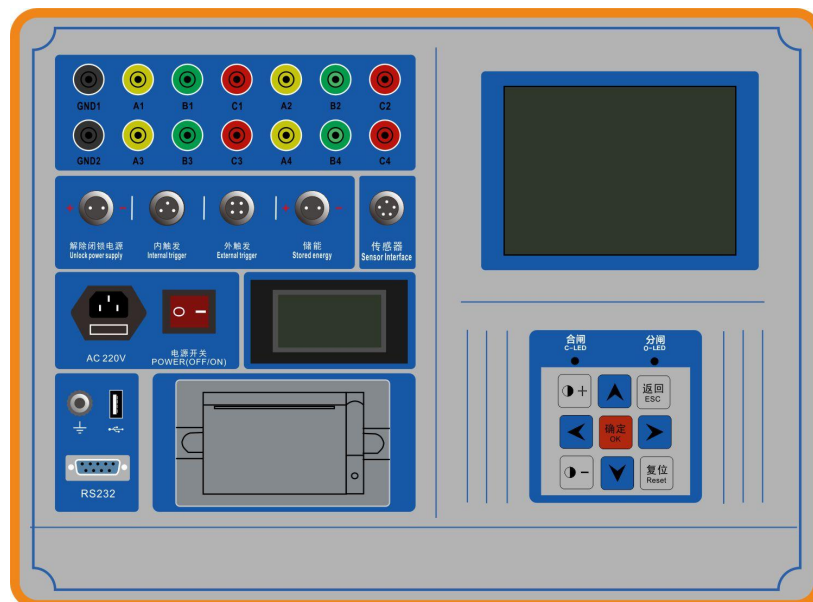
- **Open (Close) gate time::** minute open(close) tripping coil power as the starting time, the dynamic and static contact just minutes open(close) of the time.
- **With the same period:** The same phase among the open (close) opening time difference between the maximum and minimum.
- **Interphase period:** Three among the open (close) opening time difference between the maximum and minimum.
- **Average speed:** Open (close) gate process, the moving contacts total stroke before and after each take 10%, to take the middle 80% of the moving contact sport stroke versus time.
- **Maximum speed:** Open (close) gate process, the moving contacts begin to exercise, take the moving contact sport every 10ms as a speedometer unit until stopped moving contact sport, get the value of a number of speed units, the largest unit speed value is the open (close) brake






maximum speed.

- **Just minutes open(close) Speed** : According to the manufacturer the test switch different switch models, the various manufacturers define different just open(close) speed
 - **10 ms before close or after open**: IEC standard, part of the oil switch and some SF₆ switch;
 - **Before and after open and close 5ms**: Part of the oil switch;
 - **LW8-35**: LW8-35 type SF₆ switch;
 - **10% to fracture**: Xi'an Switch Factory production part of the SF₆ switchgear;
 - **ABB-HPL245B1**: ABB's 220kV SF₆ switch;
 - **LW6**: LW6 type SF₆ switch;
 - **Average speed**: Shenyang Switch Factory production part of the SF₆ switchgear;
 - **LW33-126**: LW33-126 type SF₆ switch;
 - **Before close or after open 10mm**: Part 35KV vacuum switch;
 - **Before close or after open 5mm**: Part 10KV vacuum switch;

As mentioned several definitions are not being used, the user can test the instrument in accordance with the measured travel time curve (stroke directional), Just minutes open(close) Speed , sampling rate segment, the instrument automatically calculates the user-defined Just minutes open(close) Speed (sampling period of time than the trip).

4. Panel layout



No.	Panel logo	Description
①	Protective earthing terminal	contact with the earth (GND)
②	A1 B1 C1 A2 B2 C2 A3 B3 C3 A4 B4 C4 GND1 & GND2	12 Roads fracture measurement channel , A1 B1 C1 和 A2 B2 C2 common terminal connect GND1 , A3 B3 C3 和 A4 B4 C4 common terminal connect GND2.
③	Unlock power supply	Used to unlock the secondary circuit system of the circuit breaker.
	Internal trigger power supply	When connecting to the "internal power" socket, the machine provides a power supply for closing and opening control
	Energy storage	Connected to energy storage motor for starting DC motor with a current $\leq 10A$ for energy storage
④	external trigger	external trigger mode, directly and received points, co-ends of the coil, the coil taken as a signal synchronization signal.
⑤	Energy storage	The DC energy storage power supply provided in the instrument is adjustable from DC0-270V
⑥	sensor	speed sensor signal input
⑦	USB RS232	Used for exporting test data and upgrading instrument software, RS232 is the upper computer communication interface (optional)
⑧	power switch	power input $220V \pm 10\%$ $50Hz \pm 10\%$
⑨	printer	Print test reports and curve
⑩	Function key module	 Electronic adjustment of LCD contrast
		 Move the cursor left and right
		 Move the cursor up and down or increase or decrease the value at the current cursor position
		 Select the current menu or confirm the operation
		 Return to the higher-level menu or cancel the operation

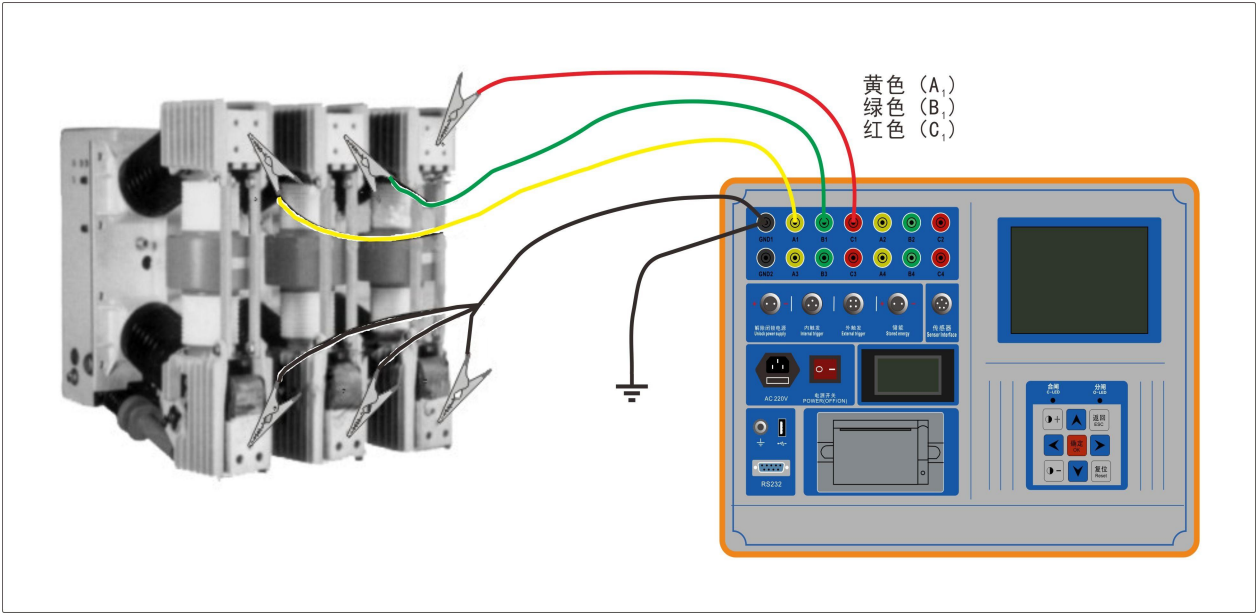
		<div> <div>复位 Reset</div> <div>Instrument reset</div> </div>
⑪	LCD display screen	Large screen, wide temperature band, background light LCD, full display of all data and graphs

5. Field Wiring

Special Safety Tips: Instrument to the scene, Please first instrument to protect the earth connection with the site, prior to all other wiring and operation after the test, turn off the power to the instrument, and then split the other line, and finally removed the ground.

5.1 fracture signal wire

Wiring diagram of three break switch



Chinese translation in the picture:

- 黄色(A1): yellow
- 绿色(B1): green
- 红色(C1): red
- 黑色 (GND) black

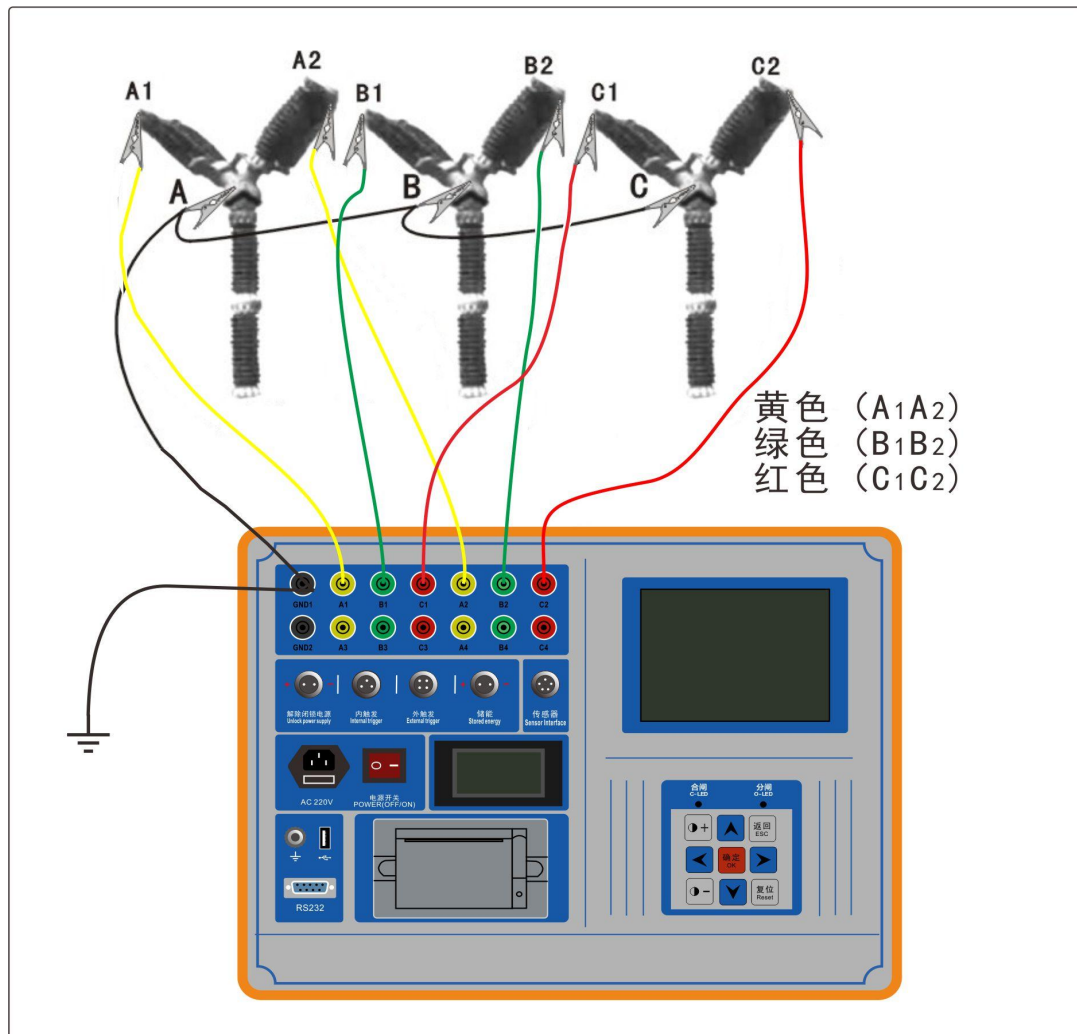
For the three fracture switch, the switch can be grounded at one end, a termination signal test taken fracture, but can not make the switch to ground at both ends, otherwise unable to

complete the test.

The signal ground of A1B1C1 and A2B2C2 fractures is GND1, while the signal ground of A3B3C3 and A4B4C4 fractures is GND2.

To avoid interference from the induction coil, the circuit breaker break near the transformer must be used as a common grounding terminal on site, and the other end of the circuit breaker break must be connected to the signal testing ABC socket (this end of the break must not have a grounding condition, otherwise data cannot be tested).

Fracture wiring diagram (six fracture)



Chinese translation in the picture:

黄色(A1 A2): yellow
绿色(B1 B2): green
红色(C1 C2): red
黑色(GND): black

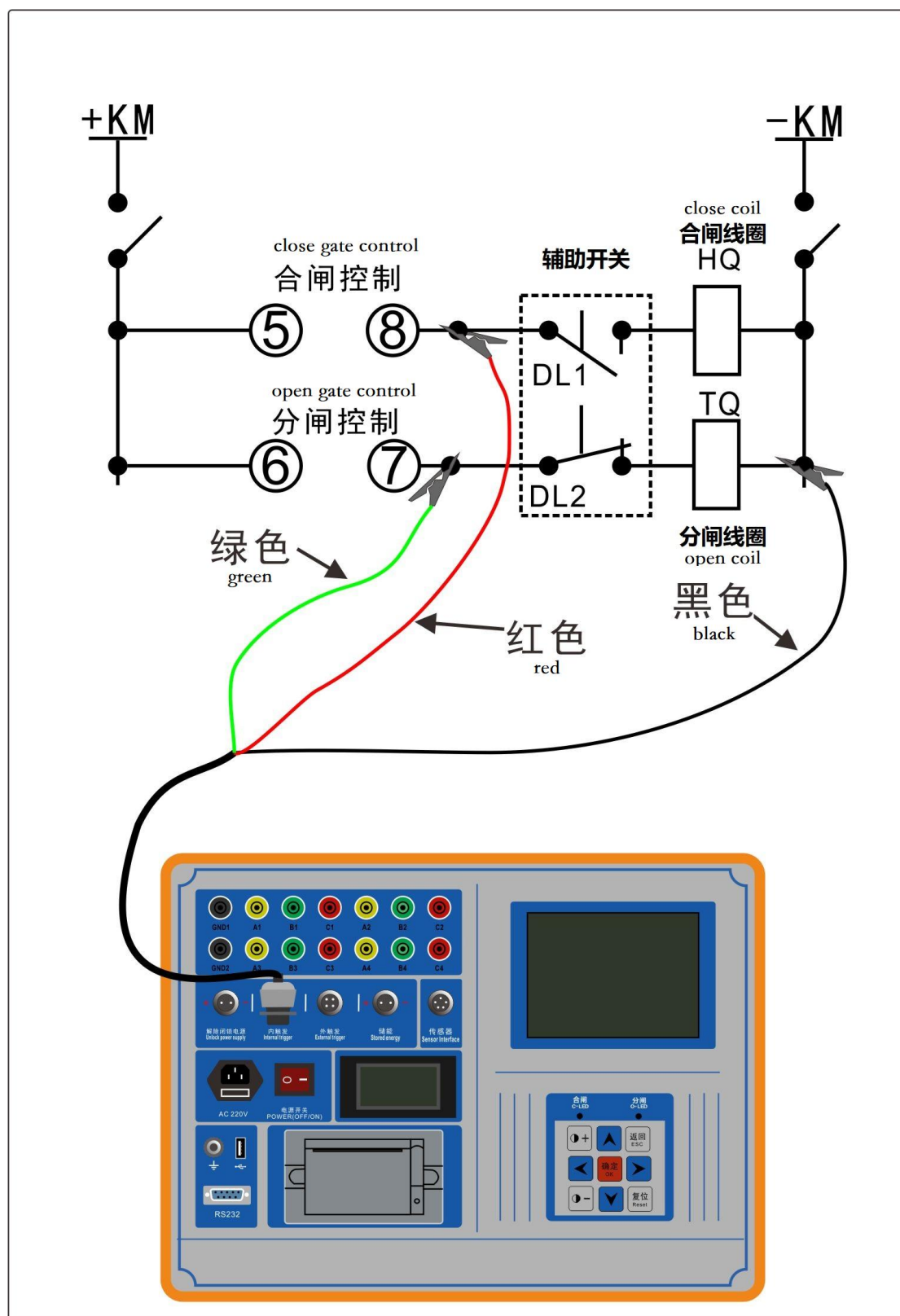
For the six fracture switch, test, must ensure that the switch is not grounded at both ends phenomenon, otherwise unable to complete the test.

5.2 Closing and opening control wire

A closing and opening control mode switch test is divided into two kinds: internal trigger internal power supply mode and the external trigger external power supply mode. Test of two kinds of methods can only choose a way.

5.2.1 Internal trigger internal power control wiring diagram

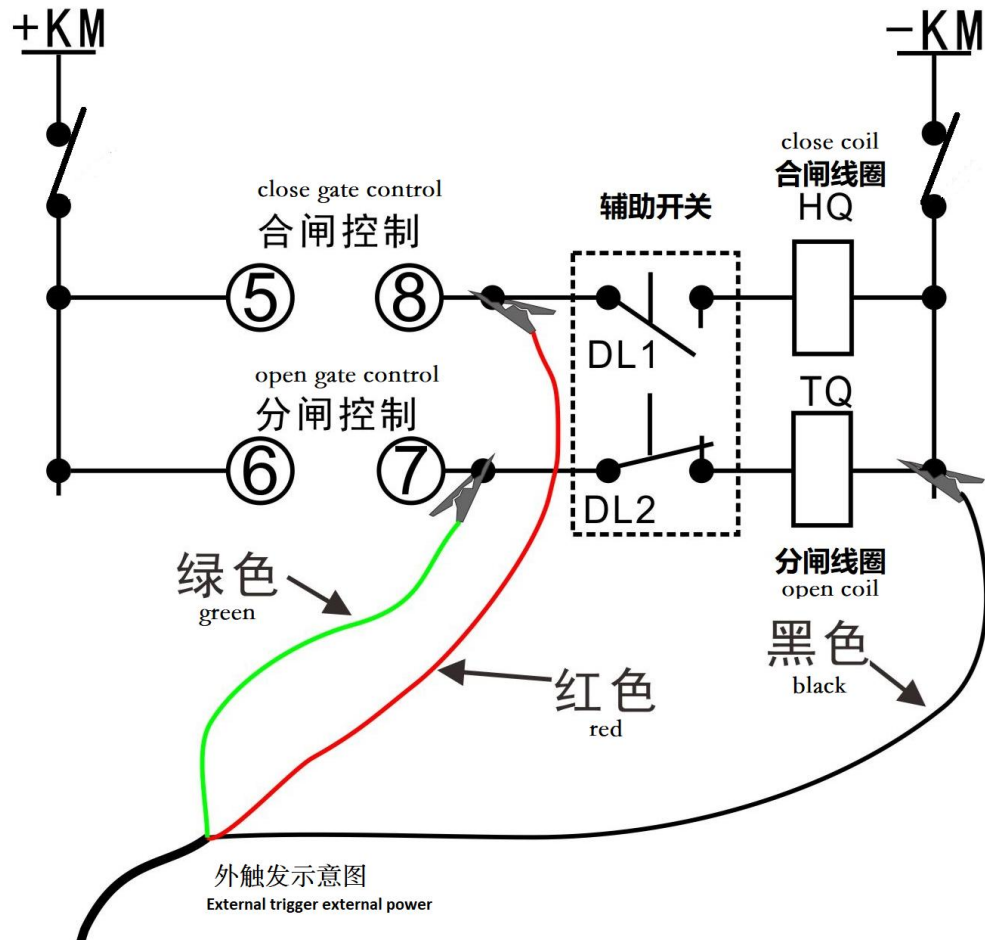
Note: The internal trigger uses the instrument's internal output DC power supply to operate the switch. So before wiring, the control power supply inside the control box of the tested switch must be disconnected (usually by unplugging the fuse connecting the control power supply inside the control box to the control bus). If the energy storage power supply of the switch mechanism is cut off at the same time, the switch cannot automatically store energy, but at this time, the energy storage interface provided by the instrument can be used for energy storage. If the energy storage power supply of the switch mechanism is not cut off, it is strictly prohibited to use the instrument energy storage interface for energy storage.



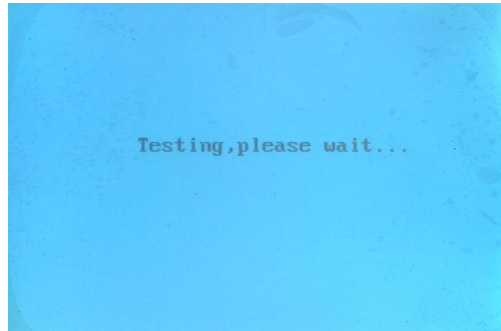
Tip: internal instrument can only provide DC power supply, with the internal trigger use of the internal power of the instrument. If the switch is AC current operation mechanism, please use the external trigger mode.

5.2.2 External trigger external power connection diagram

Externally triggering the external power supply is to use the control power supply of the on-site circuit breaker system itself as the switching control power supply. At this time, the panel "internal trigger" 3-core aerial plug control power supply output is not wired. Wire the 4-pin aerial control line as follows:



Tip: use the external power supply operation, use external trigger mode. The external trigger mode regardless of switching mechanism is AC or DC can be tested. The use of external trigger, trigger line connected, instrument set external trigger mode, then operating instrument closing or opening, so that it is waiting for the signal state, appeared the following interface:



This time can operation of circuit breaker button electric closing and opening, switch, instrument will appear the measurement results.

5.2.3 Sensor triggering and manual triggering

Sensor triggering and manual triggering are mainly used in switch factories or special switch applications. For example, the load switch of the wireless circle. Sensor triggering or manual triggering can be used. Under these two methods, the opening control line can be left disconnected.

The operation method is: first, connect the ground wire and fracture wire as described earlier, then set the triggering method of the instrument to [sensor trigger] or [manual trigger], and then operate the instrument to perform the corresponding opening or closing test. The instrument is under the "testing, please wait" interface, and at this time, operate (manual or electric) the switch to close or open the test. After the action is completed, the instrument will display a waveform graph, and you can select the corresponding viewing operation.5.3 Sensor installation. The instrument is equipped with three kinds of speed sensor, respectively, in different circumstances. Three kinds of sensors used in a sensor signal lines are connected to the instrument of the "sensor" socket.

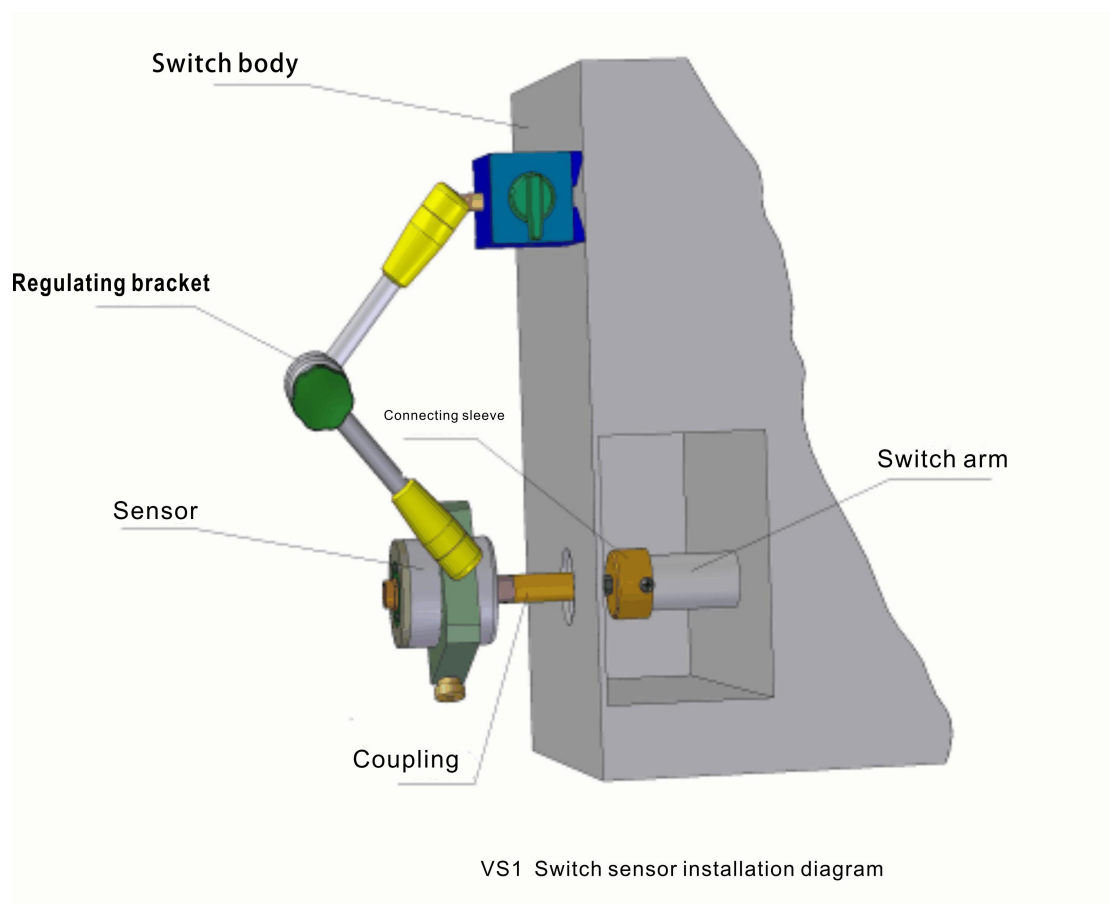
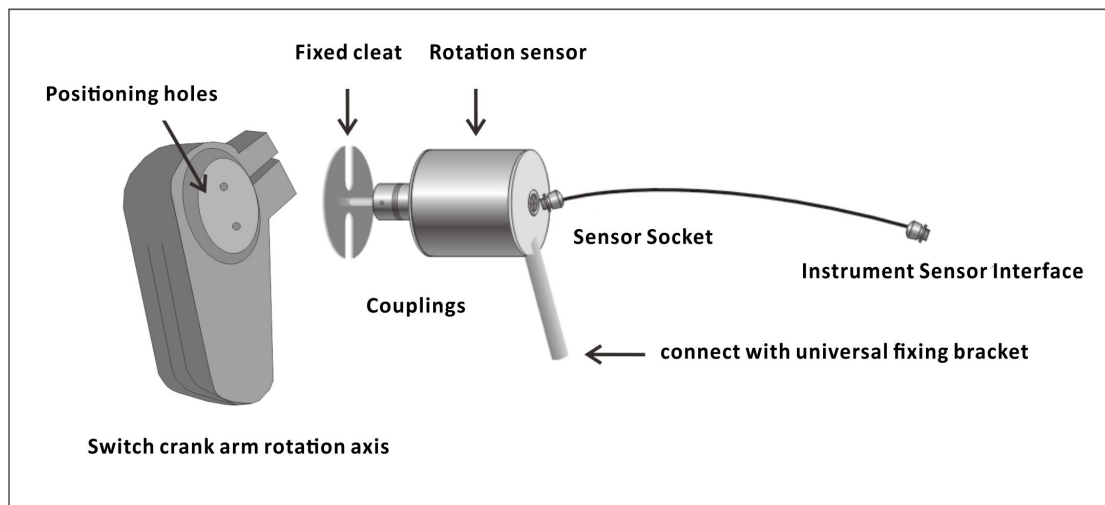
5.3 Sensor installation

The instrument is equipped with three kinds of speed sensor, respectively, in different circumstances. Three kinds of sensors used in a sensor signal lines are connected to the instrument of the "sensor" socket.

5.3.1 Rotation sensor

Universal sensors for linear motion sensor for tachometer, some switches, especially the import and joint switch, linear transmission parts are enclosed in a switch body inside, universal

sensors cannot find the installation site. Switch manufacturer's factory doing speed tests, the switching division indicator or a test rotating shaft, in which case use a rotation sensor.



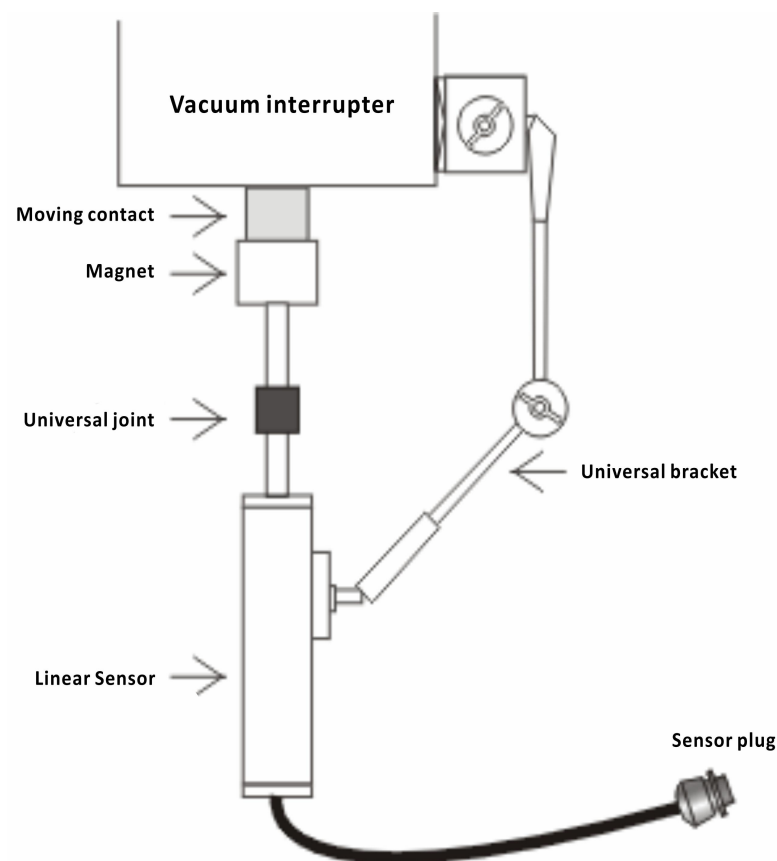
Installation Note: The axis of rotation sensor should be kept concentric with the axis of rotation switch, otherwise hinder the rotation sensor, the measured curve burrs heavy, affect the accuracy of the test data.

5.3.2 Linear Sensor

If you need to very accurately measure the stroke of the switch, you need to use the travel sensor. Also called linear sensor stroke sensor, commonly used in three models, namely 50mm, 200mm and 300mm.

50mm linear sensor for the measurement of vacuum switch; 200mm, 300mm stroke for SF₆ switch, velocity measurements, and these two specifications for non-standard configuration. To a certain type vacuum switch, for example, as shown below. Linear sensor during installation, to ensure that the sensor axis of motion to linear motion, magnetic universal holder with fixed sensors. For SF₆ switch, oil switch, install a similar way.

Tip: stroke sensor cumbersome nature of its on-site installation, this product is not conventional accessories. Users may need for different switch mounting bracket of their own design, keep the sensor lever and switch dynamic Parallel and synchronous movement of the contacts, can be very accurately Measure the movement of the switch and the corresponding travel speed.

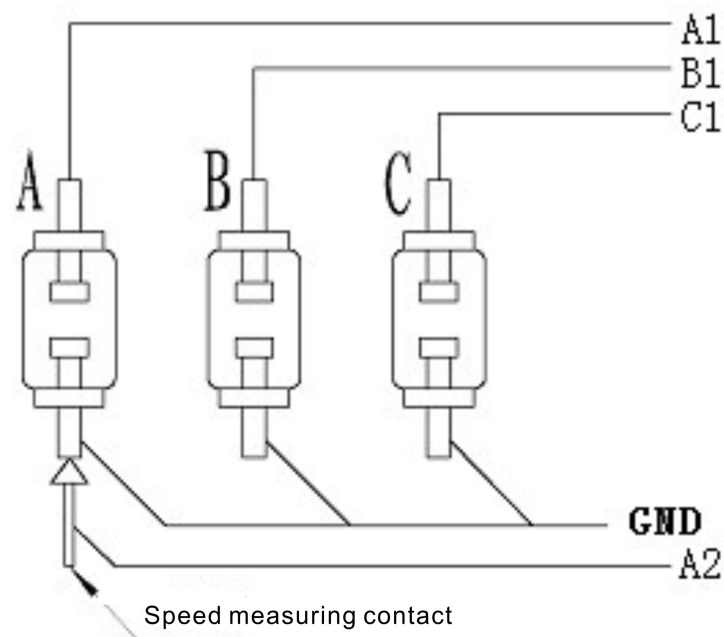


5.3.3 Auxiliary contact sensor (optional)

- ① The auxiliary contact sensor is mainly used for the speed test of the vacuum switch.

Speed contact mounting: Attach the auxiliary contact sensor to the switch under test and connect it to the break A2 via a wire.

- ② The three-phase moving contact is reliably shorted and connected to GND (the ground end of the instrument panel $\text{—}\overline{\text{—}}\text{—}$), and the three-phase static contacts are connected to the breaks A1, B1, and C1, respectively. As shown below:



- ③ Speed contact adjustment:

- a) When measuring the average speed over the entire stroke, such as the switching speed is defined as: 6mm after the average score. Then, the high voltage switch is placed in the open state, and the speed measuring contact and the moving contact are just turned on, and can be judged by whether the state of the instrument break A2 is the combined position. However, there must be no state of the thimble spring of the compression contact sensor, otherwise the measurement accuracy will be affected.
- b) When measuring the speed within a certain stroke before or after the division, for example, the switching speed is defined as: 6 mm after the combination. Then put the high voltage switch in the closed state. Adjust the distance between the speed measuring contact and the moving contact to achieve the required spacing. After the front part is divided by 6mm, the distance between the contact sensor ejector pin and the moving contact is adjusted to 6mm.

5.3.4 Acceleration speed sensor (Universal speed sensor, optional)

The speed sensor typically used conventional slide resistance or photoelectric sensor (optical encoder sub-gratings and two kinds), which two types by the moving and stationary parts. Speed, the switches are respectively mounted on the moving part (the moving contact or the lift lever) and a stationary member (the cap base or switch base), but also with the better. Thus, for different switch on the need to produce a lot of different mounting bracket, on-site installation and removal is very difficult.

Our company after years of research, for the first time will be measured acceleration technology used in switching speed, the solution of the switching field speed sensor installation is difficult, with difficulty, testing difficulty technical problem, because on-site installation convenient, simple, easy to operate, so the acceleration speed sensor also known as Universal I sensor.

Universal sensor mounting tips:

The universal sensor fastened directly to the lift rod installed in the switch, or horizontal connecting rod, or other drive rod.

Installation Note:



1: universal sensor socket should be directed to the same direction of movement of the actuator rod, try to keep the lever parallel. If you pretend to skew may cause the measured data are not allowed.

2: Universal sensor mounting rod thickness should be based on different selection of cards corresponding radius of the sensor is firmly stuck in the moving rod, cannot shake. Switching operation, the sensor lever should immediately move together, not with lever between the relative shaking, or can cause the test data are not allowed.

3: The universal sensor installed in the switch movable lever, the switching operation, the sensor should be left up and down around a certain position space, does not cause the sensor during the movement and the surrounding switch part collision damage.



6. Menu operation

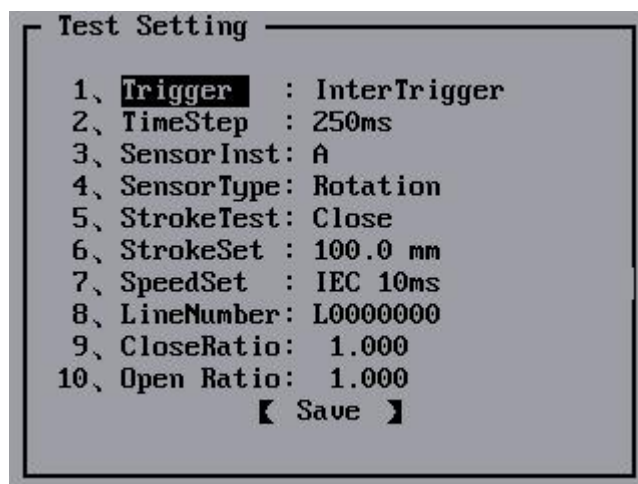
Turn on the power button , press   key to adjust the LCD contrast until the best results. Press [OK] key enter the main menu interface instrument.◦



Top of the screen for the instrument operation main menu, from left to right **【View】**、**【Test】**、**【Set】**、**【File】**、**【About】** five main menu , Highlight Department said the location where the cursor is currently.◦

6.1 Main menu **【Set】**

Before the test, the instrument settings for various operating states.



6.1.1 【TestSet】

Trigger:

InterTrigger : Instruments internal DC power supply control switch opening, closing operation;

ExternalTrigger : DC power supply inside the instrument does not work, use the on-site power supply (AC-DC can be) operated switch action. Switching operation, the instrument taken from the coil voltage signal for starting time.

SensorTrigger: Instrument sensor action as the starting time for the column switch or other manually open close gate operated switch earlier, speed and other parameters tested.

Manual triggering: The opening and closing control line does not need to be connected, and is used for parameter testing such as switch synchronization, bounce, speed, etc. for column switches or other manual closing and opening operations.

① **Time Step**: Operating voltage of an internal power supply output length of time.

250ms : General switch single open, single close trial, the election 250ms duration;

500ms : General switch single open, single close trial, the election 500ms duration;

1000ms : Old generator outlet switch as SN4-10G, SN4-20G's closing time is generally greater than 500ms, make this switch single open, single close test, choose 1000ms duration;

When performing the "open close open" operation on the switch, select a duration of 1000ms or 2000ms;

2000ms and above: Pressure isolation switch test or other application

- ② **SensorInst:** According speed sensor mounted in different positions to select.
- ③ **SensorType:** Accelerometer, Rotation and linear sensors are three options.
- ④ **StrokeTest:** Linear sensor, if need be measured simultaneously switch trips, it must be this open; Accelerometer, Rotation sensor, it will be this close.
- ⑤ **StrokeSet:** Accelerometer, Rotation sensor, the input value of the total travel of the switch. Linear sensor test switch trip itinerary will be set to switch total stroke; linear sensor with speed, but also measuring switch stroke parameters, then the time to set the input sensor label stroke stroke value.
- ⑥ **SpeedSet:** Several instruments have been cured 10 speed is defined (Note: This 10 several definitions may need to use a PC to redefine the instrument and cured), depending on the switch model, select the appropriate definition. If you can not find the appropriate definitions, general admission "befor close after open 10ms" (IEC standard) measured "Time - stroke characteristic curve" on the curve and then the corresponding velocity values corresponding analysis.



The following options are expressed



Behind C O 5ms; Behinde close or open 5ms

B C A O 6mm: Before close or after open 6mm

B C A O 10mm: Before close or after open 10mm

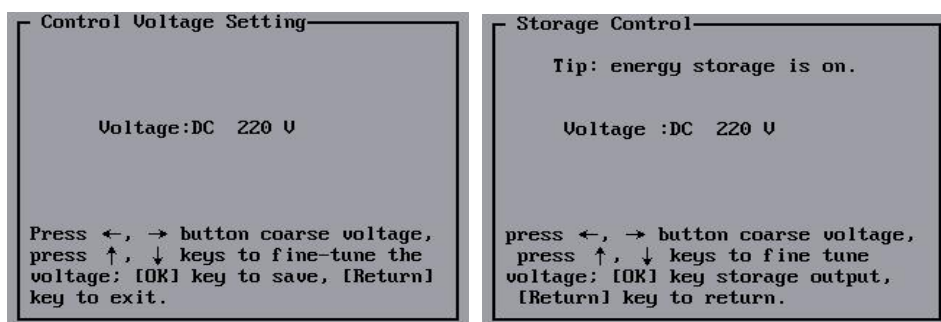
- ⑦ **LineNumber :** Mainly used to edit a data directory, the test data stored in different directories.
- ⑧ **Closing coefficient and opening coefficient:** For different circuit breakers, sometimes the speed measurement on the crank arm and connecting rod may deviate due to different conversion coefficients. This coefficient is for on-site correction and is usually defaulted to 1.00. Modifications can only be made when needed.

Prompt: Press [OK] key enter submenu, then press [OK] key when under the sub-menu on the right shows the contents of the bars. At this time, we can use  ,  key coordinate





 ,  key to change setting. When all setup complete, Move the cursor to the bottom of the screen [Save], and then press [OK] key to complete all settings.

6.1.2 【Voltage】

According to the site need to set the operating voltage of the switch, such as DC220, DC110V. Specific methods of operation LCD screen interface reference text prompts.



6.1.3 【TimeSet】

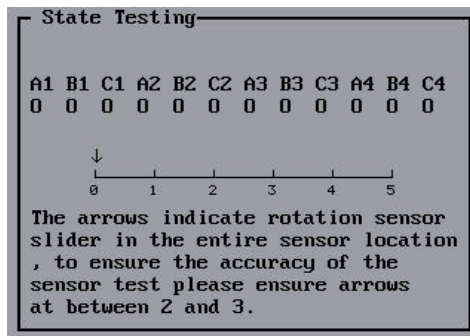
Date and time the factory has a good tune. If needed, a key   cooperation   key to select the appropriate content. Then press [OK]key to save,[Return] key exit.

6.1.4 【ParaOpt】

【◆】 selected, 【 】 unselected, Shielding parameters。

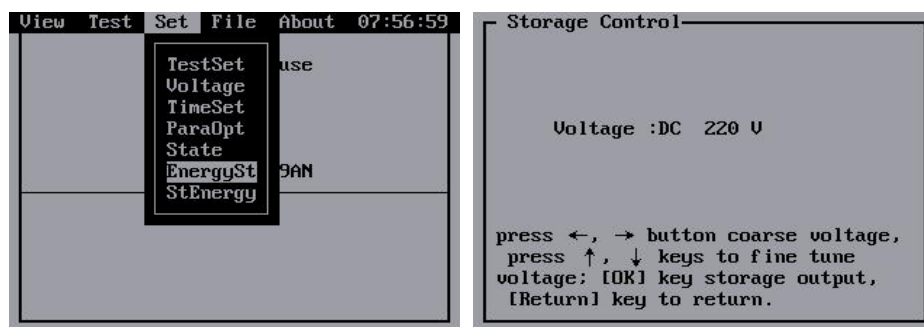
6.1.5 【State】

Detecting rotation sensor is working properly, the installation is reasonable. Specific detailed LCD text



6.1.6 【EnergySt】

Storage power 2 core flight inserted the red line connected to the positive electrode, the black line is connected with the negative pole. Instrument output adjustable DC power storage 0-270V, follow the on-screen prompts. **The starting current of the energy storage motor is more than 10 times its rated current. Use the internal power supply of the instrument to store energy for the motor. The starting current must not exceed 25A, otherwise there is a possibility of burning out the internal DC switching power supply. Please operate with caution!**



6.2 Main menu 【Test】

After setting the instrument to carry out tests. Use ◀ 、 ▶ moves the cursor to the [test] menu, as shown below:



6.2.1 【AutoTest】

Instrument automatically determines the switching state of fracture do closing or opening test, the fracture line must be connected.

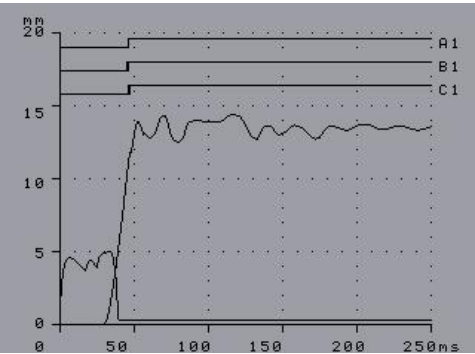


Note: There is short circuit detection function default. If you don't like this function. Enter [Abou] menu, see the copyright information. Press ◀ key and ▶ key, release the button when prompted, then press [ok] key. Reset or shutdown, short-circuit detection function of automatic recovery. Following the same content don't explain!

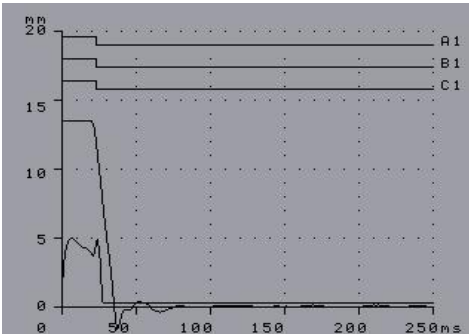
6.2.2 【C-Test】 , 【OpenTest】、

Switch single close, single open test. Test results are as follows:

C	A	B	C	Gap
1	46.3	45.6	46.3	
2				
3				
4				
Simu	0.0	0.0	0.0	0.7
Rebo	0.4	0.4	0.8	ms
Spee	0.69	0.70	0.69	m/s
Over	3.0	3.6	3.0	mm
MaxSpeed	0.90 m/s		Over	0.9 mm
Current	1.63 A		Stro	13.6 mm

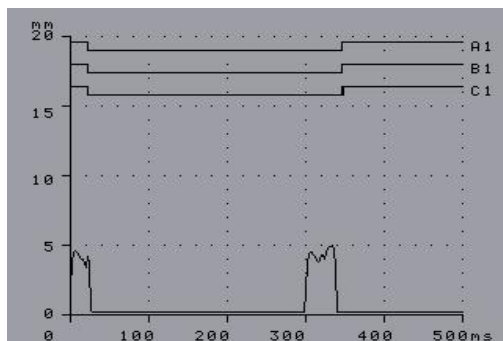


O	A	B	C	Gap
1	23.4	23.8	23.9	
2				
3				
4				
Simu	0.0	0.0	0.0	0.5
Spee	0.98	0.98	0.98	m/s
OpDi	11.4	10.9	10.8	mm
MaxSpeed	1.04 m/s		Rebo	0.4 mm
Current	1.53 A		Res i	144.1 Ω



6.2.3 【O-C】

Switch "open - close" test, setting "open-t2-close" control interval after the test, the switch directly opening time, no current time value.



	F1	H1	No I	
A1	22.7	47.7	325.0	
B1	23.1	47.0	323.9	
C1	23.3	47.5	324.2	
Re-C speed				
Current	1.61A			

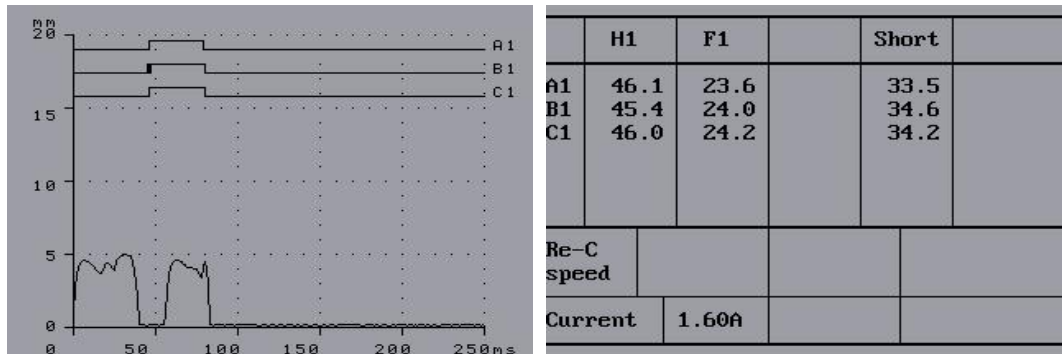
6.2.4 【C-O】

Switch "close - open" test, setting "close-t1-open" to control the time interval after the test, the switch directly closing time, the value of metal short. Test results are as follows:

重合闸脉宽设置

合 50 ms 分

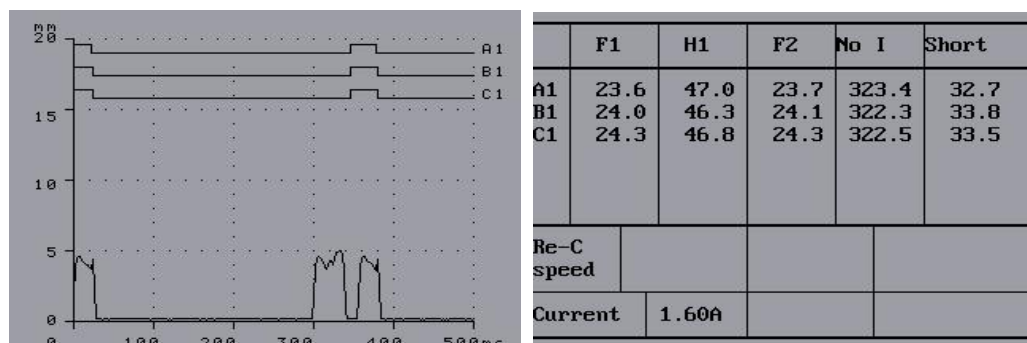
内触发时，通过键盘更改合、分闸控制时间脉冲，按【确定】继续测试，按【返回】退出测试。



6.2.5 【O-C-O】

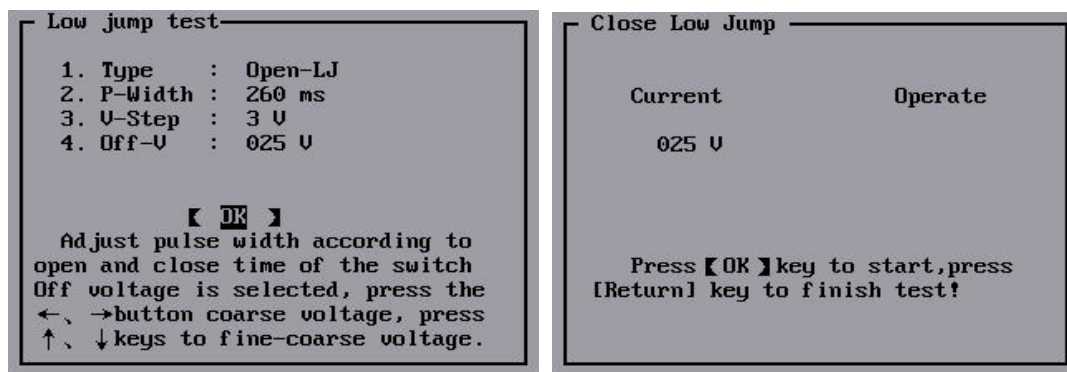
Switch "open - close - open" test, setting "open-t2-close-t1-open" to control the time interval after the test, the switch directly opening time, metal short time, no current time value.

Note: The control interval t1 is the time from power on to play for closing coil opening coil power during this length of time, control the time interval t2 is the time from power-on to the opening coil power play to give the closing coil this length of time. For the "close-t1-open", "open-t2-close", "open-t2-close-t1-open" operation, the control switch is set to the time interval t1 proper time, with a considerable switch closing time, control time opening interval t2 is set to the proper time, and the switch opening time considerably, For example, 300ms.





6.2.6 【CLOWJump】、【OLowJump】

Closing, opening automatic low-voltage action test, enter the interface, according to the instrument's screen operations to the prompts. Note: 【P-Width】 use ◀ key or ▶ key to set We must ensure that more than 200ms.



6.2.7 【Auto LW 】

After entering the interface, follow the instrument's screen operation prompts to operate. The instrument is based on the status of port A1(The wires at the upper and lower ports of the A1 fracture must be connected properly) One click operation to complete the low voltage test. When the switch is activated, it stops boosting and automatically depressurizes.



Note: 【P-Width】use  key and  key combinations, , ensure that the pulse width is greater than 200ms.

6.2.8 【M-SW】

Repeat multiple opening and closing tests on the switch at a certain set voltage. For example:

At 30% of the rated voltage, operate the switch continuously for three times, and the switch should be reliable without action, that is, use this function to complete.

Before conducting switch tests at the rated voltage, the switch needs to be opened and closed multiple times before conducting the test. This function is also used.

Internal voltage verification: Use a multimeter to measure the "internal trigger" 3-core aviation plug, and control the closing or opening end of the power output, press  key or  key. Output closing and opening voltage test comparison.

6.2.9 【LifeTest】

The instrument sets the time interval and number of tests for closing and opening, and can perform a break-in test on the switch. Additionally, it can be used as an aging test before the instrument leaves the factory.

6.3 Main menu 【View】

After the instrument completes the test, view, analyze, and print the test results.


6.3.1 【Curve】

The comprehensive curve graph of the test results, including the time waveform, bounce waveform, time stroke curve, coil current waveform, etc. of each fracture, are all displayed on a coordinate graph with time as the horizontal axis.





6.3.2 【AllData】

Display the measured results in the form of a table, including the intrinsic opening and closing time values of each fracture, in-phase synchronization, interphase synchronization, rigid opening and closing speed, maximum speed, coil current, total switch stroke, overtravel, overshoot, rebound amplitude, and other parameters.

6.3.3 【Bounce】

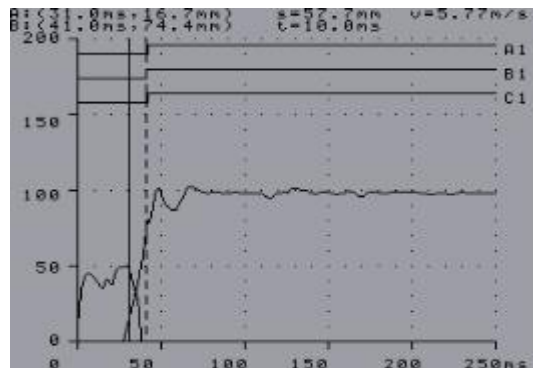
Display the bounce time and bounce count of each fracture. If you want to see a more detailed bouncing process for each fracture. Under the “More” cursor, press  key, you can see a more detailed bouncing process of the corresponding fracture at the first closing moment, first opening moment, second closing moment, second opening moment.



To print the bounce results, “more” cursor, press  key or  key clear “more”, the press  key 【Vies】 menu, press  key 【Print】 print data。



6.3.4 【Analysis】

Analyzing the measured "time travel" curve can obtain relevant data analysis, of course, the most important data analysis is to obtain the data of the rigid opening and closing speed. As shown in the following figure:



Operation tips:

Entering the "Analysis" interface, there are two vertical coordinate lines on the "Time Stroke" curve: a solid line and a dashed line. The dashed line is located at the rigid opening and closing point of channel A. The solid line is the defined point for the rigid opening and closing speed. The upper left corner of the screen displays the coordinate values of the intersection of the two coordinate lines and the stroke curve. The horizontal axis represents time, and the vertical axis represents the travel position point of the switch moving contact at this time. The solid line can move left and right, but the coordinate point will change in real time during movement. The dashed line cannot move.



Press  、  key can switch between solid and dashed lines.

“ $S = XX.X \text{ mm}$ ” The difference between the ordinates of two coordinate points on the stroke curve;

“ $t = XX.X \text{ ms}$ ” The difference between the horizontal coordinates of two coordinate points on the stroke curve;

“ $V = XX.XX \text{ m/s}$ ” The ratio of the difference between the vertical and horizontal coordinates of

two points is the average speed of the moving contact between these two points. If we set these two points according to the definition of the switch manufacturer's rigid opening and closing speed, then V is the measured rigid opening and closing speed.

Of course, key or key move two coordinate lines to the corresponding positions and check the difference in the vertical coordinates of the two coordinate points. You can see data such as opening distance, overtravel, overshoot stroke, rebound amplitude, etc. On the curve, you can also see a series of data that are not displayed in the "comprehensive data table", such as the starting motion time point of the moving contact, for analysis purposes.

6.3.5 【TestInfo】

After the test is completed, review the various parameter settings selected during the test.

6.3.6 【PrintAll】、【Print】

【PrintAll】 Print all test parameters. 【Print】 Print the current display of the screen.

6.4 Main menu 【File】

After the instrument completes the test, the preservation of the test results and subsequent retrieval.


6.4.1 【FileOpen】

Retrieve the saved test results from the instrument.

6.4.2 【SaveFile】

Save the measured results in the instrument memory, with the circuit number name as the folder. The results of the same number test can be saved in the same folder, distinguished by time. The saved results can be permanently saved as long as they are not deleted.

6.4.3 【DelFile】、【D-Folder】

【 DelFile 】 You must specify the corresponding directory and folder, and select the corresponding file after entering to delete the data. 【 D-Folder 】 You must specify the corresponding directory folder, press  key delete the directory and all data under it.

6.4.4 【U_Save 】【U_Update】

Use a USB flash drive for related operations. Generally, USB drives of brands below 4G are used for operation.

6.5 Main menu 【About】

The intellectual property ownership of the instrument, software version number, factory serial number of the instrument, company website, email, address, after-sales contact number, and other related information.

7. Field wiring and the matters needing attention

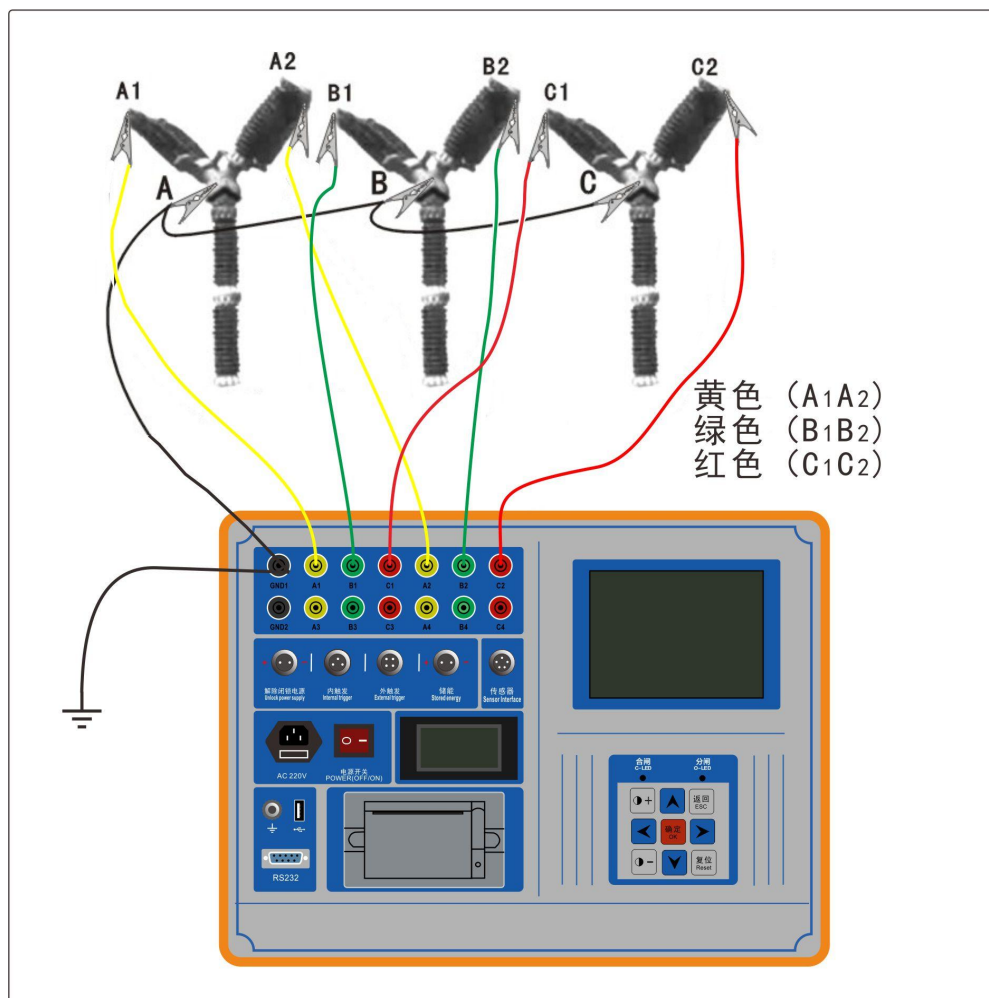
7.1 safety preparations

First of all to ensure that subjects switch in the pre state overhaul, both ends of the knife switch connected ground, the switch is closed, cutting off the power operation of high voltage circuit breaker, avoid and instrument internal DC "collision", a simple approach is to take control of insurance.

7.2Field wiring

- 1 Instrument grounding must be reliable metal columns connected with the ground;
- 2 With the test line will be moving contact short circuit of three phase circuit breaker, and then is connected with the instrument metal grounding column is reliable, then the switch

fracture line connected. For the inductive electric strong 220 KV, 500 KV high voltage circuit breaker wiring to bring the best insulating gloves. The fracture line wiring diagram in Figure below.



Chinese translation in the picture:

黄色(A1 A2): yellow
绿色(B1 B2): green
红色(C1 C2): red
黑色(GND): black

3 Install sensor.

4 Additional information

① Operation power is DC or AC. If the DC can use the internal power of the instrument, if not DC must use power instrument besides the external synchronization signal trigger (External trigger) test.

- ② Operation power is DC220V or DC110V must be set before the test, adjustment.
- ③ Closing and opening control line connection method. For hydraulic or spring mechanism, the closing coil current is less than 30A, the instrument internal DC power supply can directly drive. Switching control can directly engage brake coil, but the best assistant node level string into the coil former. For the electromagnetic coil current is greater than 30A, the instrument internal DC power supply cannot be directly driven, must the front stage contactor coil instrument closing control received the closing coil's test.
- ④ For the field switch locking time, may meet cannot move the test operating instruments within the power switch, you must unlock can test. Or by external trigger test.
- ⑤ The two ends of the knife switch is opened, the next step will be to test.

7.3 The test finished clearing

Operating instrument for mechanical properties test on switch. The test finished off the instrument power supply, switch on the two ends of the knife. Remove instrument switching control line, fracture line and the speed sensor and its signal line, and then can remove switch moving contact short wires, final demolition wire. Then the restoration of the site, the end of the test work.

8.Common technical problems and approaches.

8.1 A scene with the instrument control, open close gate operation, the switch does not operate.

8.1.1 Live open close gate control wiring is incorrect or control loop problems.

Approach: Find the site control cabinet control wiring diagram, ask the relevant conservation professionals find out open close coil and switch auxiliary contacts, see Appendix II of this manual control wiring diagram and instructions re-wiring. Check the control circuit, to ensure smooth flow loop.

8.1.2 The on-site coil load is too large, and the instrument cannot be driven normally

Solution:

For switches of electromagnetic mechanisms, the required driving current for the closing coil of the switch is high (up to 100A or a few hundred amperes), while the maximum carrying capacity of the instrument operating power supply is 30A. Causing excessive load, instrument unable to drive normally.

On site, the closing control wire is usually connected to the closing contactor coil in the front stage of the closing coil, and the instrument is used to control the switch contactor to close. The contactor is used to drive the switch closing coil, causing the switch to act. Alternatively, the switch can be closed using an "external trigger" method.

8.1.3 check whether the instrument operating power supply with DC output

Provided internally with a multimeter instrument operating power supply voltage calibration check. (See section 6.2.8 of this manual ③ items). Such as voltage output is normal, perform other tests; such as no voltage output, then:

(1) Instruments Thermal Protection

Approach: Shutdown, and then wait 5 minutes before turning test.

(2) Instrument's internal power supply is damaged

Approach: using live switchgear operating power, the use of "external trigger" operation. (Refer to the manual 5.2.2 description of operation). The same time notify The Company Depot Repair or provide an alternate dryers.

8.1.4 the switching mechanism exists to protect locking (such as Siemens, ABB switch)

Approach:

- ① use of instruments available within the power operation switch, close open gate test must be lifted atresia, please scene technician or switch manufacturers officer under the control of site control cabinet wiring diagrams to help lift lockout.
- ② with site operation power supply, with "external trigger" tests.

8.2 the instrument to do a single open, a single close test, the switching action, but no data show.

8.2.1 the ground is not completely connected

Approach: carefully check the ground, re-tighten the ground.

8.2.2 Closing no data, then closing the control loop is damaged, open no data, then the open control circuit damage.

Approach: on-site with a good way power control channel that temporary test. Such as closing no data, then use the open gate channel test switch, Method is to open gate control lines (green, black line) connected to the closing coil, and with the open gate control to operate the switch closing the testing process. After field testing returned for repair or notify the Company provide backup machine.

8.3 the instrument together to do a single test, the switch is closed, they immediately separated.

8.3.1 the switch control circuit in question

Approach: carefully check the switch control circuit troubleshooting.

8.3.2 open gate control channel damage

Approach: Remove the open gate control line, just switch on the control channel with a test (see the second, three treatment approaches), the test is completed Depot Repair.

8.4 the printer can take the paper but cannot print text, graphics

8.4.1 printing paper installed upside down

Approach: re-installed correctly thermal paper.

8.4.2 thermal printer thermal head is broken

Approach: Depot Repair thermal printer thermal head.

9. Technical Q & A

9.1 the instrument site grounded, why the first ground line, and then followed by the fracture line?

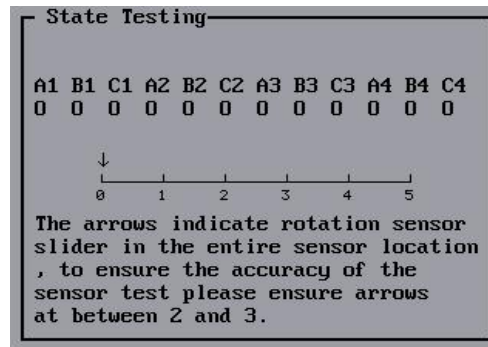
A: The field test, since the high voltage switch (especially 220kV above) between the ground and tend to fracture a high induced voltage, this voltage value is large, energy is small, but enough to threaten the safety of the instrument itself. Inside the instrument, the fracture signals are input to the indirect discharge circuit. First ground wire connected to the discharge circuit real priority, then connect the signal line fracture, even when a high voltage is induced fracture, but also through the bleeder circuit vent into the earth, thus ensuring the safety of the instrument channel fracture.

9.2 How to judge whether the instrument works normally?

The following two aspects can be used to determine whether the instrument is normal.

①、Is the time fracture test channel normal? Is the resistance speed sensor normal?

Answer: Operate the button to enter the main menu **【Set】 — 【State 】**, The top of the instrument's LCD display screen displays the fracture status of 12 fractures. The middle indicates whether the sliding wire resistance speed sensor works normally. The screen displays the following image:



In this interface, if the fracture input is suspended, the LCD displays "open", and if the fracture is short circuited to ground, it displays "closed". So connect each fracture to the ground (panel metal grounding column) and observe the change of the port status display on the upper end of the LCD to determine whether the instrument fracture time channel is normal. Rotate or pull the selected rotation sensor or linear sensor, and the arrow will slide evenly, indicating that the sensor is also working properly.。

②、Is the voltage output normal?

Press the operation key to enter the main menu【Set】—【Voltage】. If the panel digital Voltmeter displays voltage, the instrument voltage output is normal.

9.3 what is just open (close) speed? What is the difference between with time and distance section defines the switch just open (close) Speed ?

A: The so-called just open (close) speed is a high speed switch just open (just close) period of time (or a distance) the average speed. If time is defined in the standard, IEC standards and our national standard is generally defined as before close after open 10ms the average speed. For some countries or some switch manufacturers define the different instruments can my company through data analysis functions redefined. Both can be defined as the time period, it can be defined as the distance segment, the flexibility to easily provide high-voltage switching speed test. For example a vacuum switch, 10KV switch ON distance is generally $S = 11\text{mm}$ or so, It's just close (open) speed is defined as t just close (just open) 6mm average speed. Some manufacturers also defined as the following:


- (1) Take full average closing, opening just minutes after taking the average speed of 6mm;
- (2) Closing to take full average, average speed throughout the open to take;

With data analysis, but also easy, depending on the vacuum switch speed test. In addition, the vacuum switch speed test, due to the open gate process buffering mechanism works, the whole open gate process, and the average speed is very low. General definitions of the vacuum

switch buffer mechanism during open gate function before the average speed, the average speed of the entire process, i.e. taking full average closing, opening just minutes after taking the average speed of 6mm is closer to the true value. 35KV vacuum switch to open away from the generally $S = 22\text{mm}$ or so, so all of the above for the definition of 10KV vacuum switching speed value 6 to 10 or 11 can be.

10. The instrument submission

10.1 There are two rows of fracture 1, socket panel, A1B1C1 and A2B2C connected to ground together (The upper end of the metal grounding columns). A3B3C3 and A4B4C4

connected to ground together, Virtual ground . If the time, over the same period, jumping and other parameters to simultaneously test 12 fracture, must be ground pole and virtual connected, then the detection device of black earth column.

10.2 Time synchronization bounce time test and related parameters, Instrument [TestSet] menu must choose a different test time, must ensure the output test time is not less than the standard time generator pulse duration.

10.3 When calibrating, the sensor settings must not select auxiliary contacts. You can choose from several other sensors.

10.4 If you want to test the speed of the definition of speed, select the corresponding speed definition. If the average speed, then speed is defined "the same as the average speed". Straight stroke sensor standard for the 50mm linear sensor, please do not go beyond its pull stroke, so as to avoid damage to the sensor.

10.5 the instrument settings menu [ParaOpt] some omitted parameters, if necessary, please select the instrument, test results will be displayed, or to omit.