Huazheng®

HZ7411
Circuit Breaker Dynamic Characteristic Tester

User Manual

Huazheng Electric Manufacturing (Baoding) Co., Ltd

Contents

I Product technical parameters

1.1 Use environment

Input power：220V±10%，50Hz±10%

Atmospheric pressure：86～106kpa

Temperature:：－10～40℃

Humidity：≦80%RH

1.2 Safety performance

Insulation resistance：＞2MΩ

Dielectric strength: the power supply withstands the power frequency of the cabinet at 1.5KV for 1 minute, no flashover and flashover

1.3 Basic parameters

1.3.1 Time

When the range is selected from 250-4000ms, the resolution is 0.1ms and the error is 0.1ms ± 1 word; when the range is 10000-20000ms, the resolution is 1ms and the error is 1ms ± 1 word.

1.3.2 Speed

Range is 20.00m / s, resolution is 0.001m / s, error: ± 0.01m / s ± 1 word

1.3.3 Current

The range is 10A (20A), the resolution is 0.01A, and the error is 1% ± 0.1A.

1.3.4 Closing resistance

The range is 50-2000Ω, the resolution is 0.1Ω, and the error is% 1 ± 1Ω.

1.3.5 Output Power

DC5 ～ 270V digital adjustable 10A (20A) (instantaneous operation).

1.3.6 Stroke

Switch type	Range（mm）	Resolution（mm）	Error
Vacuum circuit breaker	50	0.1	1%±1 word
SF6 circuit breaker	300		
Less oil circuit breaker	1000		

Table 1

II Performance

2.1 Time

The machine can measure the natural parting and closing time of 12 metal fractures, the same period time, the same period time, the same period time, the gold short time, the no flow time, the closing spring time of the process of closing - parting, dividing - parting and dividing - dividing; Some models can measure the pre-casting time of closing resistance.

2.2 Speed and stroke

This tester can record and measure the closing bounce time, the number of bounces, the bounce process, and the bounce waveform of each fracture.

2.3 Speed and stroke

This tester can record and calculate the rigid points, rigidity, maximum speed, average speed, total travel, opening distance, over travel, rebound amplitude, time-travel characteristic curve.

2.4 Current and voltage

This tester can record the opening / closing current value and current waveform of the opening / closing coil, and provides DC5 ～ 270V / 10A (20A) digital adjustable circuit breaker operation power supply, automatically completes the low voltage operation test of the circuit breaker, and measures the open circuit. The operating voltage of the device.

2.5 Closing resistance

Some models of this machine can measure 6-way closing resistance value and its pre-throw time at the same time.

III Term definitions

♦ Opening / closing time: When the opening / closing coil is powered on as the timing starting point, the time to the opening / closing of the moving and static contacts.

♦ In the same period: Among the same phase, the difference between the maximum and minimum opening / closing time.

♦ Phase-to-phase synchronization: The difference between the maximum and minimum opening / closing time among three phases.

♦ Average speed: During the opening (closing) process, remove the front and back of the moving contact by 10%, take the middle 80%, the ratio of the travel of the moving contact to time.

♦ Maximum speed: During the opening (closing) process, after the moving contact starts to move, the moving contact movement is taken as a speed measurement unit every 10ms until the moving contact movement stops, and several speed unit values are obtained. The speed value is the maximum speed of opening (closing).

♦ Rigid opening / closing speed: According to the manufacturer of the switch to be tested, the switch model is different, and each manufacturer defines different rigid opening and closing speeds. This tester includes various different definitions in it. User chooses (as shown in the table below)

No.	Speed definition	Applicable circuit breaker model
1	10ms after opening before closing	Certain oil switches and SF6 circuit breakers
2	5ms each after opening before closing	Certain oil switches
3	10ms each after opening before closing	
4	6mm before closing and after opening	Some 10kv vacuum circuit breakers
5	Speed before closing, 6mm after opening	
6	12mm before closing and after opening	Some 35kv vacuum circuit breakers
7	16mm before closing, 32mm after opening	LW8-35 type SF6 circuit breaker
8	36mm before closing, 72mm after opening	LW6 type SF6 circuit breaker
9	120mm before closing and after opening	LW7 type SF6 circuit breaker
10	10% to fracture	SF6 circuit breakers in some Xi'an switch factories

Table 2

If none of the above definitions meet the current speed definition of the short circuit being tested, the

user can select the "Custom" option in the parameter setting interface-speed definition option, enter and save a speed definition that conforms to the rules. Alternatively, you can also choose a closer speed definition to measure, and then manually cut out the required rigid opening / closing speed (ratio of travel to time in the sampling section) in the time-stroke characteristic curve in the measurement result.

IV Panel layout

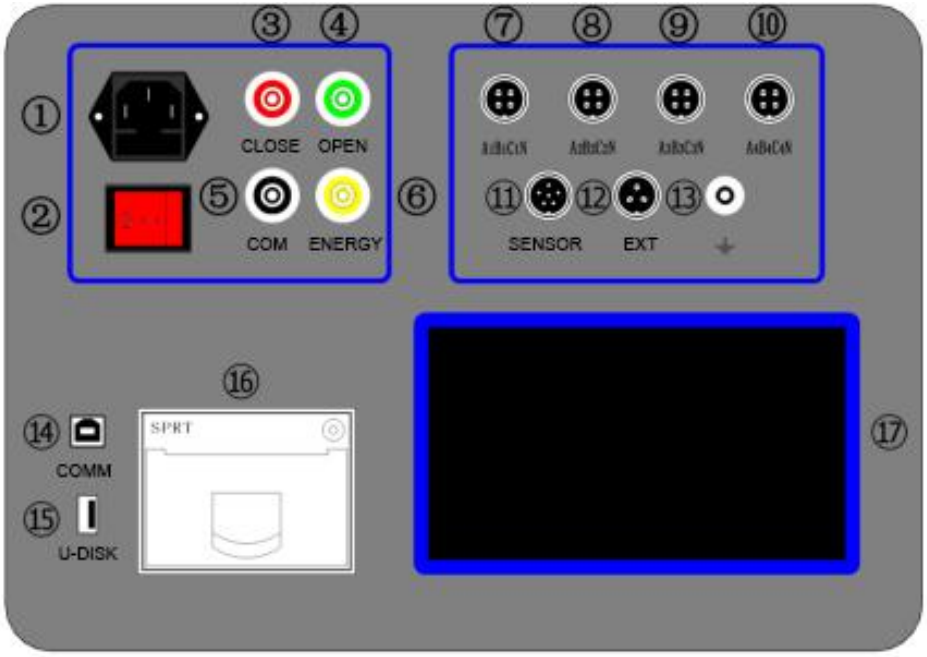


Figure 1

No.	Panel logo	Function Description
①	socket	Instrument AC220V working power switch and socket
②	switch	
③	Close	Internal DC power closing output
④	Open	Internal DC power trip output
⑤	Com	Internal DC power output common terminal
⑥	Energy	Short-term energy storage power supply for the energy storage motor of the circuit breaker under test
⑦	A1B1C1N	12 channels on / off time measurement channel
⑧	A2B2C2N	
⑨	A3B3C3N	
⑩	A4B4C4N	

⑪	Sensor	Motion sensor signal channel
⑫	Ext	External trigger signal channel
⑬		Grounding post
⑭	Com	USB communication port
⑮	U-Disk	USB storage port
⑯		printer
⑰		LCD screen

Table 3

V Menu operation instructions

The LCD screen of this machine is a 1024 * 600 pixel resistive touch color screen. After booting, the LCD screen enters the home menu interface after playing the boot animation. There are 6 function area buttons on the homepage, which are "Data measurement", "File management", "Brightness adjustment", "Time calibration", "System settings", and "Serial communication" Click the buttons to enter the corresponding operation interface.

Figure 2

5.1 Data test

The data measurement interface is divided into upper, middle, and lower 3 areas (see Figure 3). The upper display area of the screen displays the current closing and opening status of the 12-way fracture in real time. The opening and closing of the fracture is displayed in red and the opening is displayed in green.

The middle part of the screen is the test mode selection area, providing a total of 8 test modes, which are "Auto Test", "Open Test", "Close Test", "Manual Open and Close", "Open and Close Test", and "Open and Close Test". "," Open and close, "and" low-voltage test. " In the automatic test mode, the instrument automatically selects the opening test or the closing test according to the current port status (the opening test is performed when 1 of the 12-way break is closed). In the low-voltage test mode, the instrument automatically judges whether the low trip or low trip occurs according to the current status of each fracture (the low trip is performed when one of the 12 fractures is closed). The user can select the corresponding test mode according to the test requirements and the current fracture state. After clicking the mode button, it will automatically jump to the corresponding operation interface.

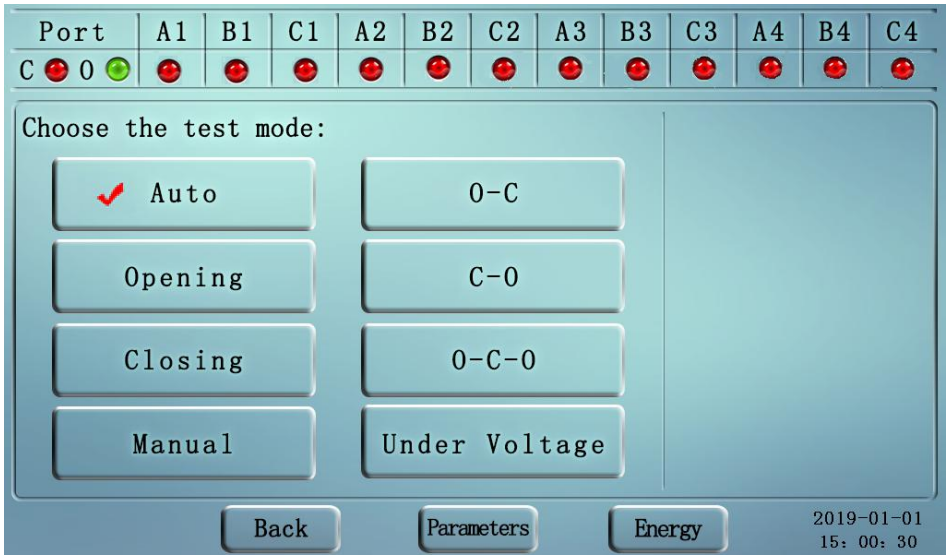


Figure 3

At the bottom of the screen is a page-turning button area, which has three buttons: "Back to Home", "Parameter Setting" and "Motor Energy Storage". Click the button to jump to the corresponding operation interface.

After clicking the "Parameter Setting" or "Test Mode" button, the screen jumps to the corresponding test mode interface.

5.1.1 General test mode

When the selected test mode is one of "Auto test", "Open test", "Close test", "Open and close test", "Close and open test" and "Open and close", the page jumps The following interface (Figure 4)

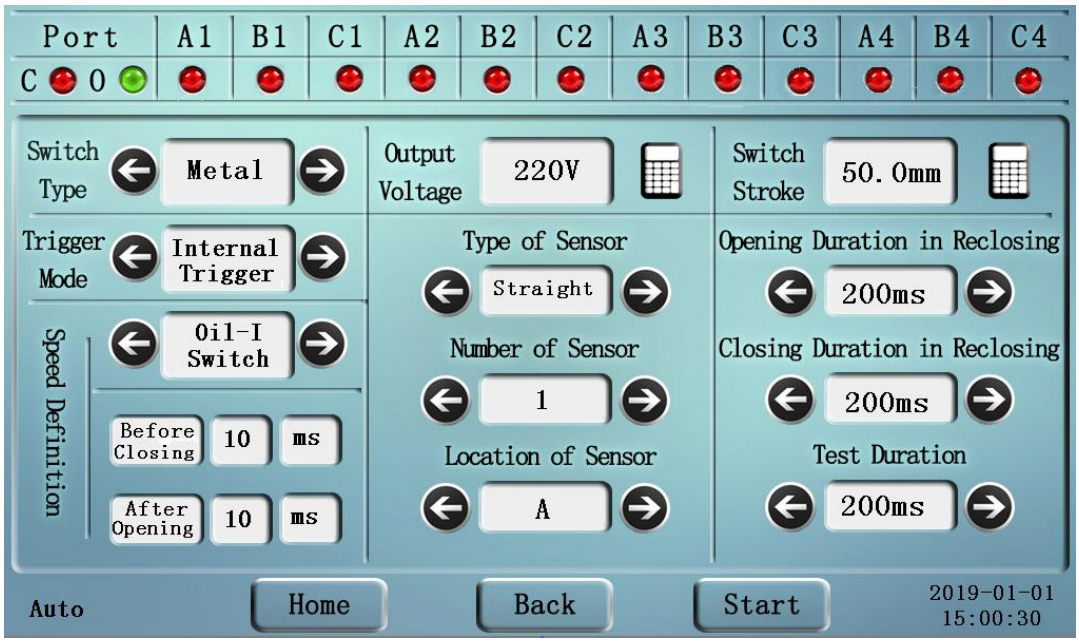


Figure 4

The operation interface is also divided into three areas: the fracture status display area in the upper part, the parameter setting area in the middle part, and the page turning button area in the lower part. The functions of the upper and lower areas are similar to the mode selection interface and will not be described again. It mainly introduces the selection and setting of each parameter in the central parameter setting area.

♦ Switch type: Some models of this machine support the selection of combined resistance contact and metal contact mode. The default is metal contact.

♦ Trigger mode: The trigger mode is divided into two working modes: internal trigger and external trigger. The internal trigger mode is to use the internal DC power of the instrument to drive the on / off coil of the device under test. In the external trigger mode, the internal DC source of the instrument does not work, but the on / off coil of the device under test is driven by the on-site power. The external voltage action signal is used as the timing starting point. This parameter can only be selected in "Auto test", "Open test" and "Close test" modes, and the default is "Internal trigger" in other modes.

♦ Speed definition: This parameter is used to define the calculation rules of rigid opening / closing speed to meet the different requirements of different switch manufacturers and models. This machine has built-in 10 common speed definition modes and a custom mode that can be saved in case of power failure. If the above method still can't find a satisfactory speed

definition, you can first select the "10ms before closing" mode, measure the "time-travel characteristic curve", and then perform corresponding analysis on the curve to obtain the corresponding speed value.

♦ Output voltage: Set the output operating voltage value according to the needs of the field (it is invalid to set this item in external trigger mode).

♦ Sensor: The sensor needs to set three parameters: type, quantity and position. Types include displacement and angle; the number defaults to 1 (some models can be set to 3); the position is the sensor installation position. If it is a displacement sensor, set it to "A phase", " "B-phase" or "C-phase", if it is an angle sensor, the default setting is A-phase.

♦ Switch stroke: Enter the total stroke value of the switch when using the angle sensor; enter the marked stroke value of the sensor when using the angle sensor.

♦ Test time: The total test time is the time of the internal DC power output voltage. This time should meet a. When doing a single opening and closing test, it should meet the inherent opening and closing time of the device under test; b. When doing a re-closing test, it should meet the inherent opening and closing time that is greater than the multiple actions of the device under test Sum of time.

♦ Reclosing time: This item needs to be set during reclosing test. The reclosing and closing time is counted as T closing and closing, and the reclosing and closing time is counted as T closing and closing. T opening and closing is the period of time from powering on the opening coil to powering on the closing coil. T closing is the period of time from powering on the closing coil to powering on the opening coil.

Open—$T_{open\text{-}close}$—Close—$T_{close\text{-}open}$—Open

When you select the "close-to-open" test mode in the mode selection interface, the "General Mode" and "Special Mode" options will pop up on the right. The above-mentioned reclosing time can optionally be performed in the normal mode. If special mode is selected, the time parameters $T_{open\text{-}close}$ and $T_{close\text{-}open}$ will be automatically set to 0ms and cannot be changed. Because the working mode at this time is that when any one of the 12 groups of ports detects a closing signal during the closing process, it immediately stops the closing command and opens the opening command until the test time is reached.

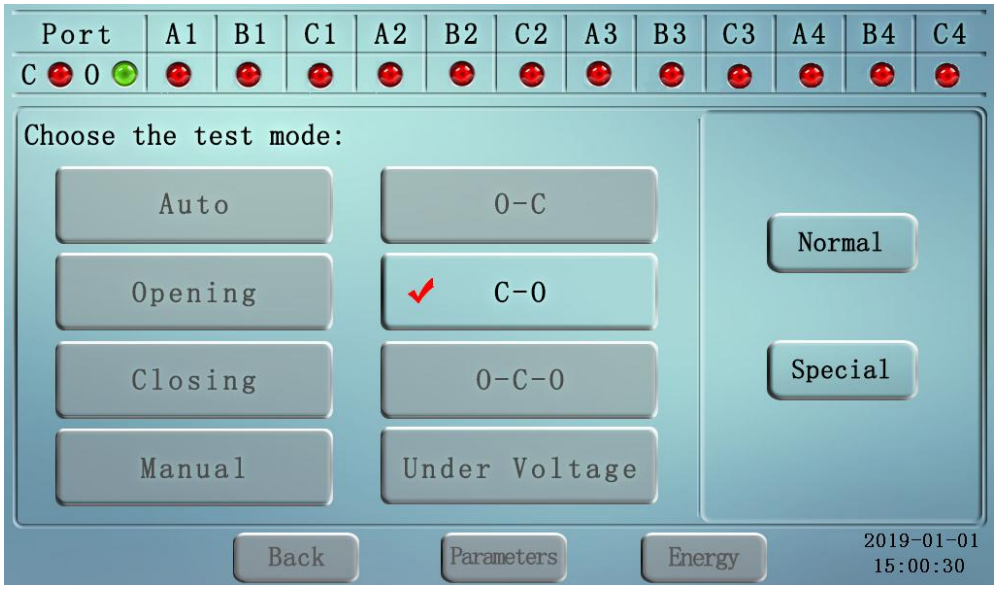


Figure 5

After setting the test parameters, click the "Start Test" button to perform the test. After the test is completed, enter the data interface (see Figure 6). The parameters shown in the figure are the parameters before the test. Enter the corresponding interface by selecting the button in the upper right corner of the figure. For example, the "test data" interface contains all the test result data, and the "graphic analysis" contains the dynamic graphics and current and displacement curves of each port. In the “Storage and Print” interface, operations such as transferring to a USB flash drive, printing data, and deleting data can be performed.

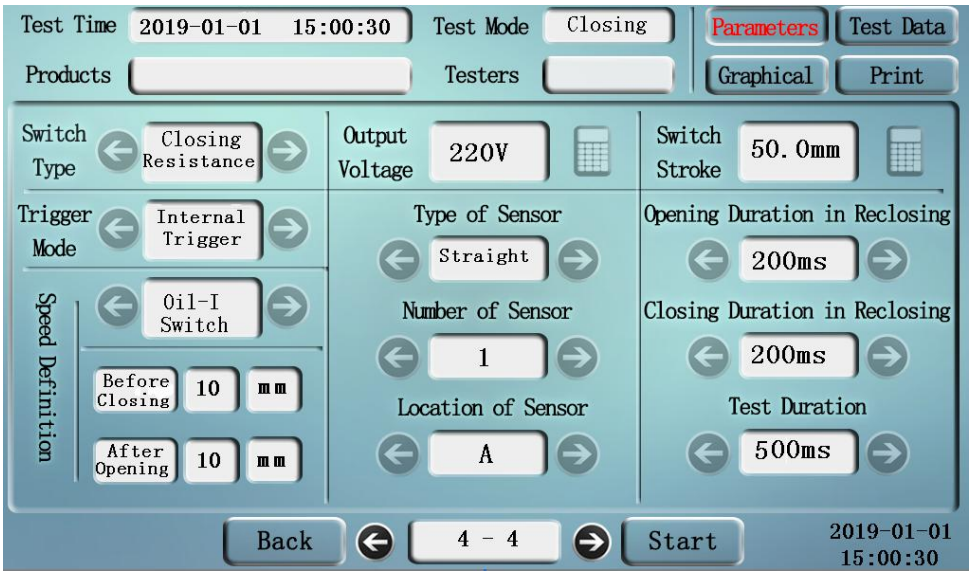


Figure 6

5.1.2 Manual opening and closing

Select the "Manual Open / Close" test mode, the screen will switch to the "Start Test" interface in this mode, press the "Input Voltage" button and enter the corresponding voltage value and confirm, and select "Close" according to the switch status analog indicator. Or "open" button to operate (Figure 7).

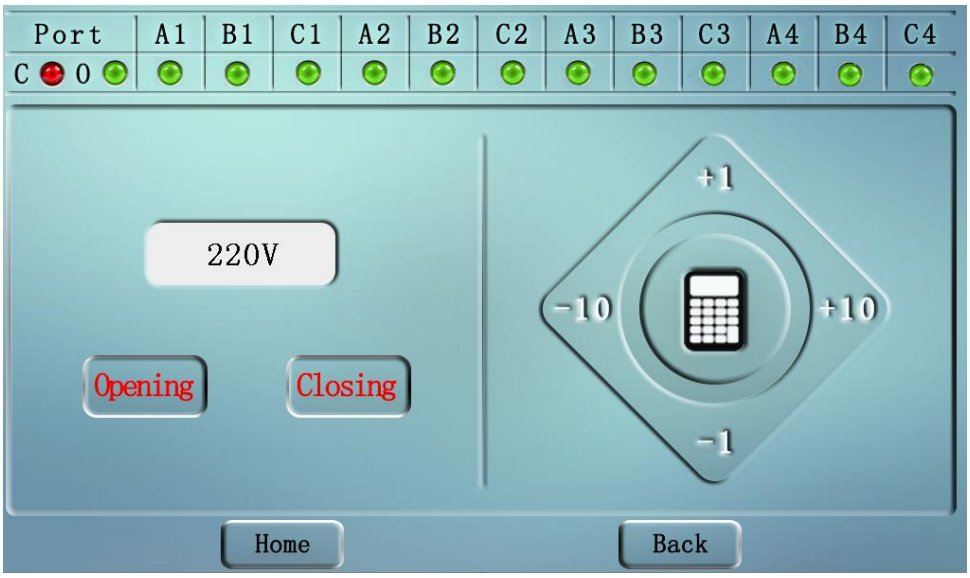


Figure 7

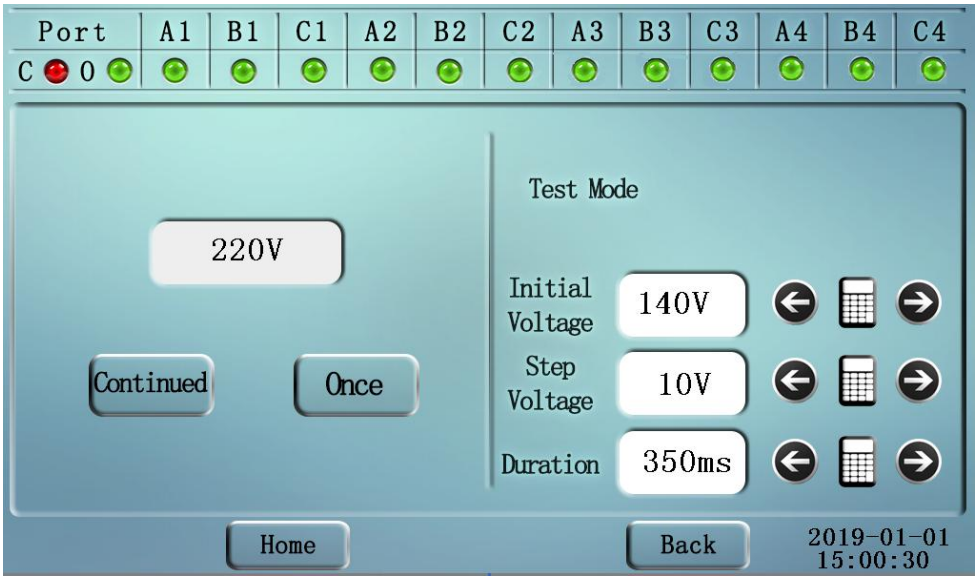


Figure 8

5.1.3 Low voltage test

If you select the “Open / Close Low Jump” test mode, the screen will switch to the “Start Test” interface in this mode, and set the “Control Pulse Width” (that is, the coil power-on time), “Initial Voltage”, and “Step Voltage” in this order. ", Select" Single "or" Continuous "mode for boost operation. The use of this function is that the instrument automatically determines whether it is closed or opened according to

the port status (see Figure 8).

VI Data query

Click the "Data Query" button to enter the historical data viewing interface. This item is divided into four parts: "test record", "test data", "graphic analysis" and "storage printing", which are basically the same as the interface after the test is completed.

The "test record" contains the test result number, time, test product information, test personnel and test parameters;

"Test data" includes the same period, three-phase synchronization, opening / closing time, rigid opening / closing speed, maximum speed, average speed, opening distance, overtravel, total stroke, coil current, coil resistance, and phase Information such as bounce time and number of bounces.

The "graphic analysis" includes the 12-way fracture bounce curve, the displacement curve of the test fracture, and the coil current curve. And by selecting specific t1 and t2 values, the average speed in the specified motion interval can be obtained. The specific operations are as follows:

In the initial state, the background of the value display areas of t1 and t2 are white. Clicking on any one of the white areas will change the background color (the background color of t1 becomes pink and the background color of t2 becomes light green) and the same color light will be displayed Ruler. At this time, click the color change area again to manually enter the time (less than or equal to the test duration value) or click anywhere on the display area of the bounce curve and displacement curve, and then move the cursor ruler to select the specified time scale. During input or movement, t1 / t2, S1 / S2, I1 / I2, will dynamically display the time, displacement value and coil current value of the cursor ruler, △t and △S will dynamically display the time and displacement difference of the selected position ,**V** is the average speed in the time interval between t1 and t2. The calculation formula is::

△t=|t1-t2| Unit ms;

△S=|S1-S2| Unit mm;

V =△S/△t Unit m/s;

"Stored print" can optionally print test data or data or graphics in graphic analysis, and can save the current data to a USB storage device, so that the data can be analyzed by supporting software on a PC.

VII Other settings

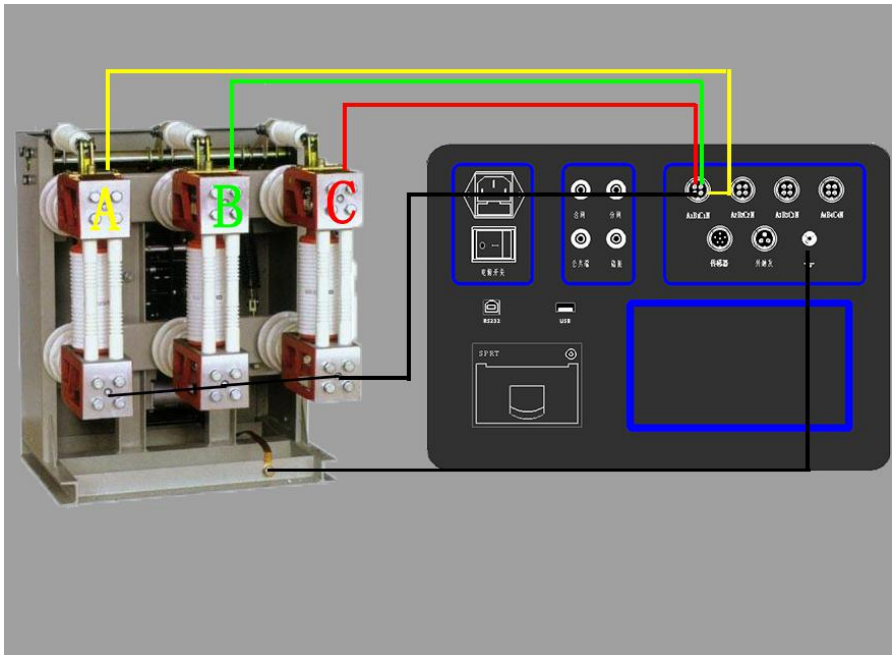
The “brightness adjustment” and “time calibration” in the main interface can be operated according to

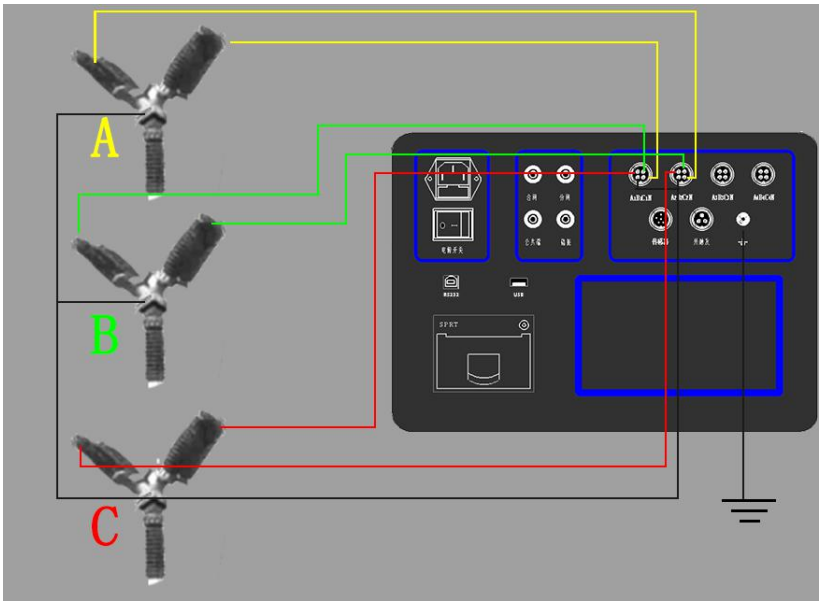
the interface prompts, and will not be repeated here. The “system settings” are the factory parameters of the instrument, which cannot be set by non-production personnel.

VIII Field connection

8.1 Ground and port connections

This machine is equipped with a special grounding wire. Please connect the protective ground ⏚ of the instrument to the field ground before performing other wiring and operations. After the test, turn off the power of the instrument, remove the other wires, and finally remove the ground wire. This machine's fracture line is a four-core sheathed wire with four colors: yellow, green, red, and black, which correspond to ABC and the public end, respectively. The connection method is shown below.

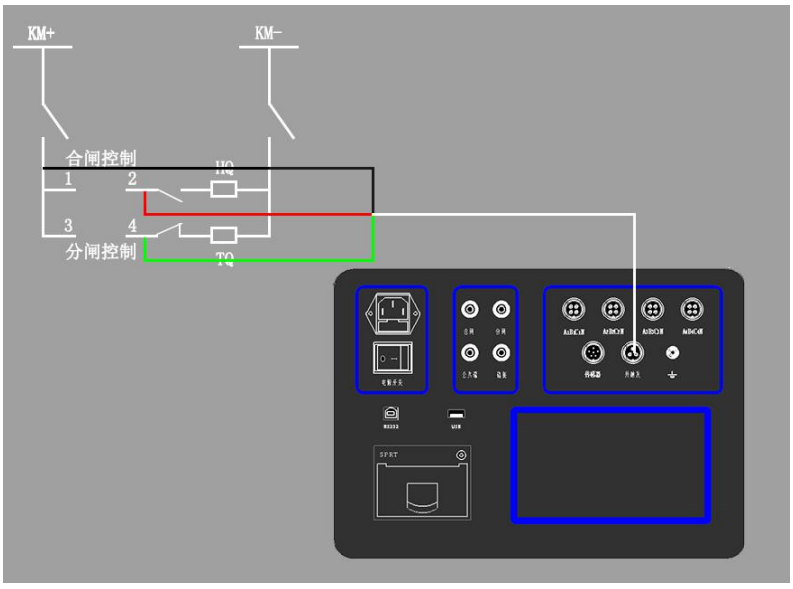




8.2 Control line connection

This machine provides 3-core sheathed wires as internal power output conductors (red is the closing conductor, green is the opening conductor, and black is the power common terminal) and 3-core sheathed wires are used as external operating voltage acquisition leads.

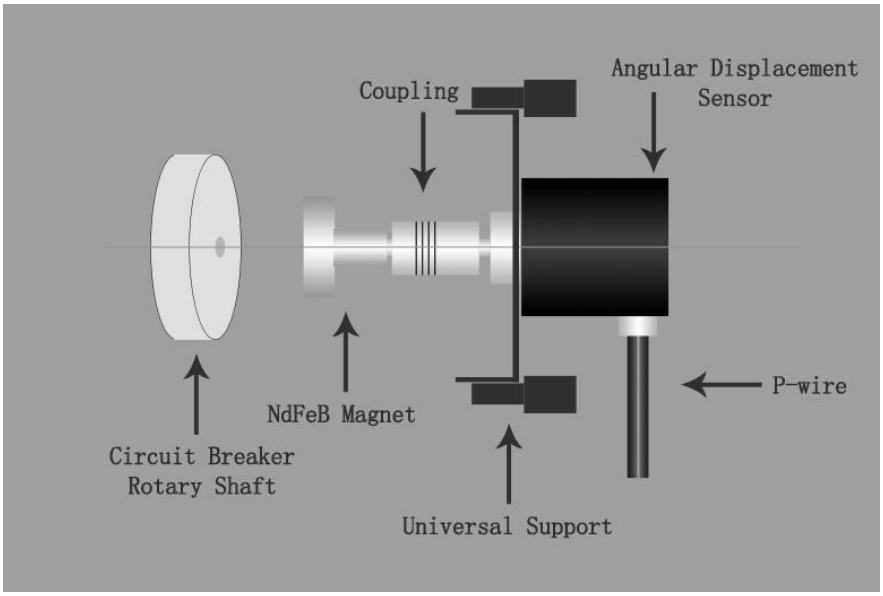
When the switch-on and switch-off control power is provided by the instrument, disconnect the control power in the switch control box under test (usually disconnect the fuse connected to the control power in the control box and the control bus), but the power supply of the switch mechanism cannot be cut , And then wire as shown below. The instrument can only provide DC current internally. Use the instrument's internal power supply to “internal trigger”. If the on-site switch is an AC operating mechanism, please use the "external trigger" method.



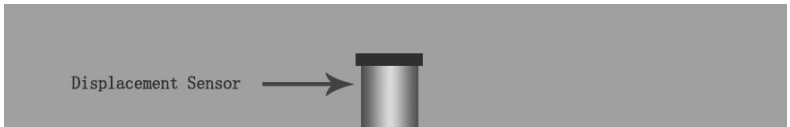
When using an external field power supply for the opening and closing control, the "internal power supply" is not wired. When the switch is single-tested, two wires “externally triggered” are connected to both ends of the brake coil; when the switch is single-tested, the two wires “externally triggered” are connected to both ends of the open-circuit coil. When operating with an external power supply, use the "external trigger" method. External trigger mode can be tested regardless of whether the switching mechanism is AC or DC.

8.3 Sensor connection

This machine provides two types of sensors: angle and displacement. Select the appropriate sensor according to the measured switch. For some imported and joint-venture switches, the linear drive part is enclosed inside the switch body. When the switch manufacturer leaves the factory for speed tests, the switches are tested on the switch opening and closing indicators or rotary shafts. In this case, angle sensors are used. The axis of the rotation sensor should be kept concentric with the axis of the switch as much as possible, otherwise the rotation of the sensor will be hindered, and the burr of the measured curve will be very heavy, which will affect the accuracy of the test data.



If you need to measure the stroke of the switch very accurately, you need a linear sensor. There are three types of linear sensors: 50mm, 200mm and 300mm. 50mm linear sensor is used to measure the travel speed of vacuum switch; 200mm, 300mm is used to measure the SF6 switch travel and speed These two sensors are non-standard configurations. Take a certain type of vacuum switch as an example, as shown below. When installing the linear resistance sensor, ensure that the sensor's moving axis can



move in a straight line, and fix the sensor with a magnetic universal bracket. The method is similar for SF6 switch and oil switch.

IX On-site common problems

9.1 On-site closing and opening control wiring is incorrect or there is a problem in the control loop

Find the control wiring diagram of the on-site control cabinet and ask relevant professionals to find the closing and opening coils and switch auxiliary contacts respectively. Refer to Appendix II of this manual for control wiring diagrams and instructions for rewiring. Check the control circuit to ensure that the circuit is unblocked.

9.2 The instrument prompts "Power supply current output exceeds limit, over-current protection action"

a. It is possible that the output of the instrument is short-circuited due to the wrong control wiring, which causes the short-circuit protection function to start, and the instrument "closes and opens the control power" has no output. Shut down at this time, and check the wiring again according to the first item above.

b. The instrument may not be driven normally due to the excessive coil load on site.

① For the switch of the electromagnetic mechanism, the driving current required by the switch closing coil is large (up to 100A or several hundred amps), and the maximum load capacity of the instrument operating power supply is 15A. As a result, the load is too large and the instrument cannot be driven normally. Generally, the closing control line is connected to the closing contactor coil in front of the closing coil, and the switch contactor is controlled by the instrument. The contactor is used to drive the switch closing coil to make the switch act. "Trigger" mode operation switch closes.

② For the switch of hydraulic and spring mechanism, the default is “excessive load” when the output current of the instrument is greater than 6A. Please take a look or use a multimeter to measure the

resistance of the closing coil to confirm that the closing coil current is large. Then please check the wiring carefully, make sure that the closing output is not short-circuited, and then restart after power off.

9.3 The instrument has no DC power output

This kind of situation may be caused by the burnout of the power supply insurance of the instrument and the loss of power supply to the entire instrument. At this time, the replacement insurance can be replaced. Or the internal power supply of the instrument has failed. At this time, external triggering can be used for measurement. After the test is completed, notify the company to return to the factory for repair.