

HZDK-1000

DC Switch Ampere-Second Characteristic Tester



Huazheng Electric Manufacturing (Baoding) Co., Ltd



Notes



1. The instrument should be placed in a dry, ventilated room without corrosive gases.



2. Please do not disassemble, decompose or modify the instrument without permission, otherwise there is a risk of electric shock.



3. In order to give full play to the excellent performance of this product, please read the instruction manual carefully before using our products.

Dear user:

Thank you for choosing HZDK-1000 DC Switch Ampere-Second Characteristic Tester.

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 !

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I. Overview

At present, the DC feeder network of the substation mostly adopts a tree structure. From the battery to the power equipment in the station, it generally goes through three levels of power distribution, and each level of power distribution mostly uses DC circuit breakers as protective devices. Due to the mismatch of the protection action characteristics of the upper and lower DC circuit breakers, when a short circuit occurs in the lower power equipment during the operation of the DC system, it often causes the DC circuit breaker of the upper level to trip, thereby causing power outages in other feeder lines, and then causing accidents in the primary equipment of the substation such as high-voltage switches, transformers, capacitors, etc. In order to prevent the hidden dangers caused by the mismatch of the action characteristics of DC circuit breakers and other DC protective devices, the State Grid Corporation of China has stipulated that the ampere-second characteristic test must be carried out for newly installed and operating DC protective devices to ensure that the performance is consistent with the design, so as to ensure the correctness of the DC circuit differential coordination. Article 12, Paragraph 8 of the *"DC Power System Operation Specifications"* issued in 2005 stipulates that "DC fuses and air circuit breakers should be of qualified quality, and their fuses or settings should be graded and adjusted in accordance with relevant regulations, and checked regularly to prevent accidents from expanding due to incorrect operation"; Article 27 of the *"DC Power System Technical Supervision Regulations"* stipulates: "... automatic air circuit breakers should be subject to spot checks on characteristics and operating currents before use..."; Article 11 of the *"Measures for Preventing Accidents in DC Power Systems"* stipulates: "... spot checks on ampere-second characteristics and operating currents should be conducted before use..."

The ampere-second characteristics of DC protection devices are generally tested in national laboratories or testing stations. The equipment occupies a large area and requires a special charging device and a high-current load box, which is complicated to operate. Some operating units use substation battery packs to test the differential coordination of DC protection devices, but cannot accurately test their current-action time

characteristics. As a result, after the DC system is put into operation, on-site maintenance personnel cannot verify whether the ampere-second characteristics of DC protection devices meet the requirements because they do not have the corresponding testing methods and tools.

According to the actual situation of the ampere-second characteristic test of DC protection devices, our company has launched a DC circuit breaker ampere-second characteristic test system that is suitable for on-site use in substations, easy to carry, and highly automated. It can provide the operation and maintenance department with a means of testing the action characteristics of DC protection devices, and calibrate the action characteristics and differential coordination of DC protection devices, so as to improve the reliability of DC system operation and ensure the safe and reliable operation of the power grid.

HZDK-1000 DC circuit breaker ampere-second characteristic test system is suitable for the ampere-second characteristic test of DC circuit breakers with a rated current of 1A to 1000A, and can be used for the ampere-second characteristic test of DC fuses with a rated current of 6A to 150A.

II. Product Features

1. The instrument can be used alone or connected to a PC
 2. 7-inch LCD display, high-speed thermal printer, intelligent working process
 3. Power electronic control technology is used to generate large current output, the output current has fast response speed, high precision, and continuous adjustment
 4. Multiple high-precision sensors automatically switch current range and high-performance 14-bit AD acquisition chip
 5. With power-off storage function, 200 sets of test data can be stored
 6. Automatically save the setting data, and display the last setting data after power-off and restart
 7. The instrument has overheating, overcurrent, and overvoltage protection functions
- The instrument has strong anti-interference ability and strong electromagnetic compatibility

III. Technical Indicators

1. Power input: 220V $\pm$ 10%, frequency: 50Hz $\pm$ 0.5 Hz;
2. Test current range: 0-1000A;
3. Test current ripple coefficient: less than 5%;
4. Output current stability: $\leq$ 0.5%;
5. Time record: 0-999999S;
6. Ambient temperature: -20 $^{\circ}$ C to 50 $^{\circ}$ C

IV. The Use Of Single Instrument

1. Connect correctly according to the test requirements

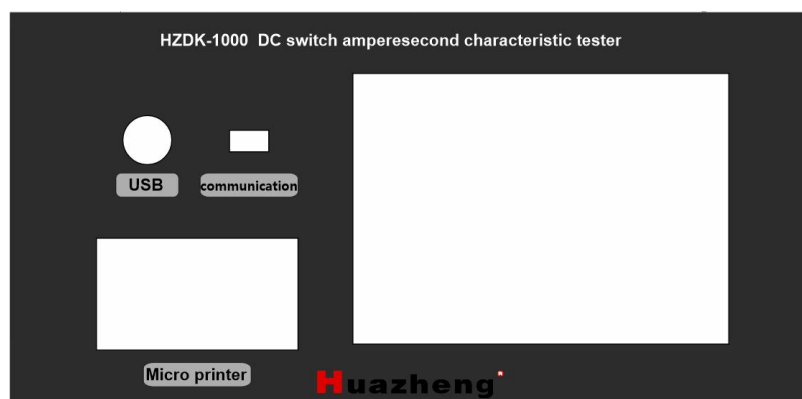


Figure 1 Touch screen main panel

2. Rear panel diagram



Figure 2 Rear panel

3. Software Usage

(1) Start the machine and use it

The computer is in the "Start Interface" after booting, as shown in Figure 3:

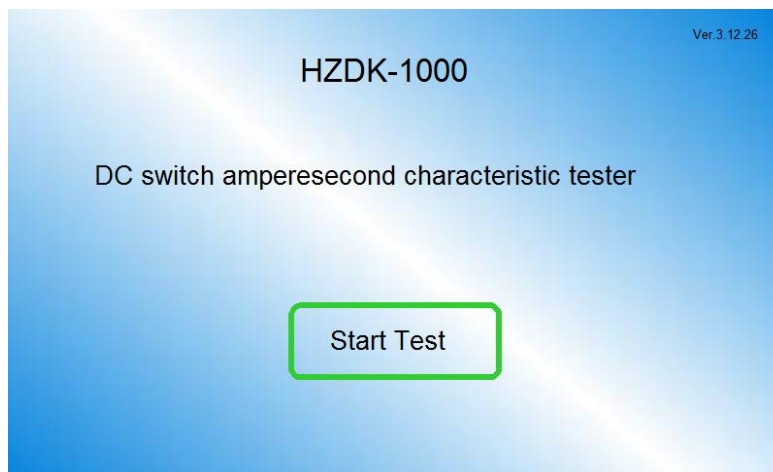


Figure 3 Start interface

Press "Start Test" to enter the main interface, as shown in Figure 4:

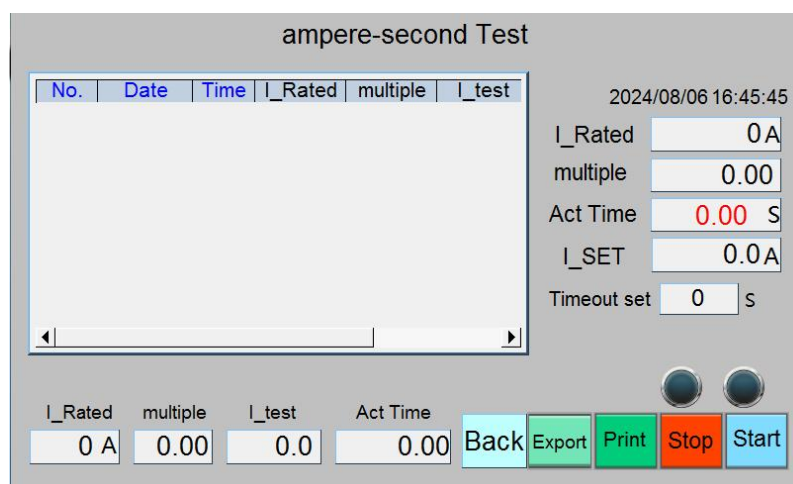


Figure 4 Main interface

Result display area: Displays the test results in a table format, with the title bar showing rated current, current multiple, action time, set current, and test time. The left side shows the test records, which can store 200 records, and the bottom shows the summary of the records.

Set data area:

Set the parameter data required in the test

Rated current is the rated current of the DC circuit breaker

Current multiple is the multiple of the rated current

Test time is the current output time, and it stops when the time comes

Action time is the trip time of the DC circuit breaker

(2) Setting parameters

For example, Figure 5:

ampere-second Test

2024/08/06 16:45:45

No.	Date	Time	I_Rated	multiple	I_test
			0 A	0.00	

I_Rated: 0 A
multiple: 0.00
Act Time: 0.00 S
I_SET: 0.0 A
Timeout set: 0 s

I_Rated: 0 A multiple: 0.00 I_test: 0.0 Act Time: 0.00

Back Export Print Stop Start

Figure 5 Settings interface

As shown in the figure: **I_Rated** box is the rated current input box, touch and click to set the value. **Multiple** box is the current multiple input box. After setting these two data, **I_SET** box calculates the actual output current by itself.

Output current = rated current x current multiple cannot exceed 1000. When outputting 1000A, the load line cannot exceed 10S.

(3) Printing

Press **Print** key and the device printer will print the test record.

(4) Ampere-second action test

The ampere-second action test is used to detect the characteristics of the DC circuit breaker's breaking (current multiple-time).

Pre-test inspection:

Circuit breaker check - whether the DC circuit breaker disconnects other electrical connections and is closed.

Connection check - This device outputs a DC current of 0-1000A. Be sure to tighten each contact point securely.

Test process:

First, set the rated current, current multiple, and test time. Then select "**Start**" to output the

current.

The system starts timing when the current is output. During the process, the tripping state of the DC circuit breaker is automatically captured as the end time, and the action time is the current test time.

During the current output process, press **Stop** to exit the test; according to the set test time, the test will also be exited when the time is up. After the test is completed, the system automatically disconnects the output current and stores the test data. A new test record can be seen in the test result area.

(5) Through current no action test

Through current no action test is a characteristic test used to detect the stability of the DC circuit breaker at around the rated current.

Pre-test inspection:

Circuit breaker check - whether the DC circuit breaker disconnects other electrical connections and is closed.

Connection check - This device outputs a DC current of 0-1000A. Be sure to tighten each contact point securely.

Test process:

First, set the rated current, current multiple, and test time. Then select "**Start**" to output the current.

The system starts timing when the current is output, and automatically captures the tripping state of the DC circuit breaker as the end time during the process, and the action time is the current test time.

During the current output process, press the **cancel** key to exit the test; according to the set test time, the test will also be exited when the timing is up.

After the test is completed, the system automatically disconnects the output current and stores the test data. A new test record can be seen in the test result area.

(6) USB flash drive copy

Press "**Export**" on the main page to automatically copy the experimental data to the USB drive. Open the USB drive on the computer, open "**TestData**" under the "**datalog**" file, and open the table, as shown in Figure 6

Date	Time	I_Rated	Multiple	Current_test	Action_time
2024/8/1	7:42:36	10	1	10	2.54
2024/8/1	8:48:04	20	10	200	1.44

Figure 6 USB disk copy

V. PC Online Use Method

1. Connect the instrument to the PC

The instrument and PC are connected via a network cable.

2. PC Software

Open the main interface, as shown in Figure 7:



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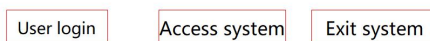


Figure 7 PC main interface

3. Software Usage

(1) User login: User name: admin, Password: 123456

(2) Click Access system to enter the software operation interface. As shown in Figure 8:

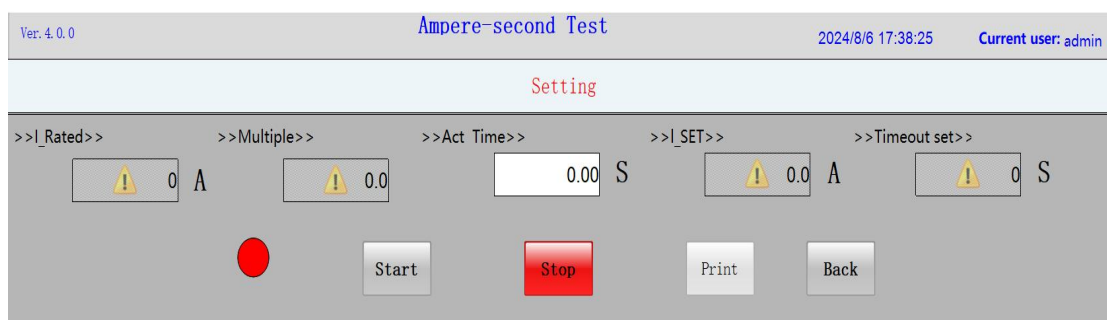


Figure 8 PC operation main interface

(3) Export to EXCEL: Click Print to export the current data to an EXCEL file. The file content is as shown in Figure 9:

	A	B	C	D	E	F	G
1	TIME	I_Rated	Multiple	Act Time	I_SET	Timeout set	
2	2024/8/6 17:38	0	0.0	0.00	0.0	0	

Figure 9

(4) Data record: You can view the current test data, as shown in Figure 10:

Date/Time	I_Rated	Multiple	Act Time	I_SET	Timeout set
1 2024/8/6 15:01:26	100	3.0	0.01	300.0	30
2 2024/8/6 15:01:40	10	3.0	0.01	30.0	30
3 2024/8/6 15:02:20	10	3.0	29.97	30.0	30
4 2024/8/6 15:03:24	150	3.0	0.01	450.0	30
5 2024/8/6 15:03:59	12	3.0	14.66	36.0	30

Figure 10

(5) Test interface: connect to the instrument, perform test operations, and import test data.

(6) Exit system:

You can exit this system software.

4. Test methods

Open the "Test Interface", as shown in Figure 11:

Ver. 4.0.0 Ampere-second Test 2024/8/6 17:38:25 Current user: admin

Setting

>>I_Rated>> >>Multiple>> >>Act Time>> >>I_SET>> >>Timeout set>>

0 A 0.0 0.00 S 0.0 A 0 S

Start Stop Print Back

Date/Time	I_Rated	Multiple	Act Time	I_SET	Timeout set
1 2024/8/6 15:01:26	100	3.0	0.01	300.0	30
2 2024/8/6 15:01:40	10	3.0	0.01	30.0	30
3 2024/8/6 15:02:20	10	3.0	29.97	30.0	30
4 2024/8/6 15:03:24	150	3.0	0.01	450.0	30
5 2024/8/6 15:03:59	12	3.0	14.66	36.0	30

Figure 11 Test interface

(1) A test data file contains only the test data of one DC circuit breaker. The test first sets the rated current, current multiple, and timeout time.

(2) Pressing "Start" will display the ampere-second action test data of this DC circuit breaker, and the data display record is below.

(3) Before the test, please perform relevant checks as when the instrument is used alone.

Close the DC circuit breaker and connect the network cable.

After setting the configuration data in this interface and connecting the instrument, press the "Start" button. The instrument will perform the test and output current until the test is completed. If you want to stop the test during the process, you can press the "Stop" button.

VI. Transportation And Storage

■Transportation

When the equipment needs to be transported, it is recommended to use our company's instrument packaging wooden boxes and shock-absorbing items to avoid unnecessary damage during transportation and cause unnecessary losses to you.

When the equipment is not in wooden boxes during transportation, stacking is not allowed.

When using our company's instrument packaging boxes, the maximum number of stacking layers allowed is two layers.

During the transportation of the equipment, the instrument panel should face up.

■Storage

The equipment should be placed in a dry, dust-free, ventilated and non-corrosive gas room. Stacking is not allowed without wooden box packaging.

When the equipment is stored, the panel should face up. And moisture-proof items are placed at the bottom of the equipment to prevent the equipment from getting wet.

VII. Packing List

No.	Item	Qty
1	Main engine	1
2	Power line	1
3	Ground wire	1
4	Test line	1
5	Communication line	1