

ZXHL-100A
Contact Resistance Tester



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1. Overview

Nowadays Power Systems widely use model QJ44 DC double arm bridge to measure contact resistance while the minimum current of such model is 1mA which hardly find the decrease of cross-sectional area of transformers' conductive circuit conductor. The measurement of loop resistance of high voltage switchgear is affected by oil layer and oxide between static and dynamic contact port, so the resistance measurement value will be several times larger, and can not reflect the true value of contact resistance. Therefore, the Ministry of Electric Power in national standards SD301-88 "AC 500KV Electrical Equipment Transfer and Preventive Test Procedure" and new version of "Electrical Equipment Preventive Test Procedure" stipulate that the testing current of circuit breaker and isolating switch contact resistance is not less than 100A to ensure accurate test results.

ZXHL-100A Contact Resistance Tester measures up to the latest power system standards--DL/T845.4-2004 designed for measuring loop resistance of Switching Control Equipment using High-frequency switching power supply technology and digital circuit technology. Test current of the Tester is DC 100A, which is recommended in the national standards. The tester can measure the loop resistance at this value and display the result in digital. It is high precision and good stability and can meet most power systems' requirements in onsite high-voltage switches maintenance and high-voltage switches factory loop resistance measurement.

2. Functions

ZXHL-100A Contact Resistance Tester is suitable for measuring loop resistance of high-voltage switches in high-precision. It also applies on other test occasions that need high current and micro resistivity.

3. Features

- (1) High current: For latest power supply technology, the tester can continuously output high current which overcomes the weakness of instantaneous current produced by pulsed power. It can effectively breakdown/puncture the oxide layer of the switches and then get precise results.

- (2) Strong anti-interference ability: The last number of test data will stably show in the LCD screen only with ± 1 error even in strong Interference situation.
- (3) Long service life: All the precise resistances used in the tester can reduce the temperature's impact on the measurement results and military connectors can enhance vibration resistance.
- (4) Convenience: Small size, light weight.

4. Specifications

- (1) Measurement Range: 1~1999 $\mu\Omega$
- (2) Resolution: 1 $\mu\Omega$
- (3) Test Current: DC 100A
- (4) Measurement Accuracy: 0.5% $\pm 1d$
- (5) Display: current: three and a half LCD
- (6) Power Supply: AC220V $\pm 10\%$ 50Hz
- (7) Work Environment:
 Temperature: 10 $^{\circ}\text{C}$ ~40 $^{\circ}\text{C}$ Humidity: $\leq 80\%$ RH
- (8) Dimension: 300 \times 270 \times 200 mm
- (9) Weight: 5Kg (Accessories excluded)

5. Panel Layout

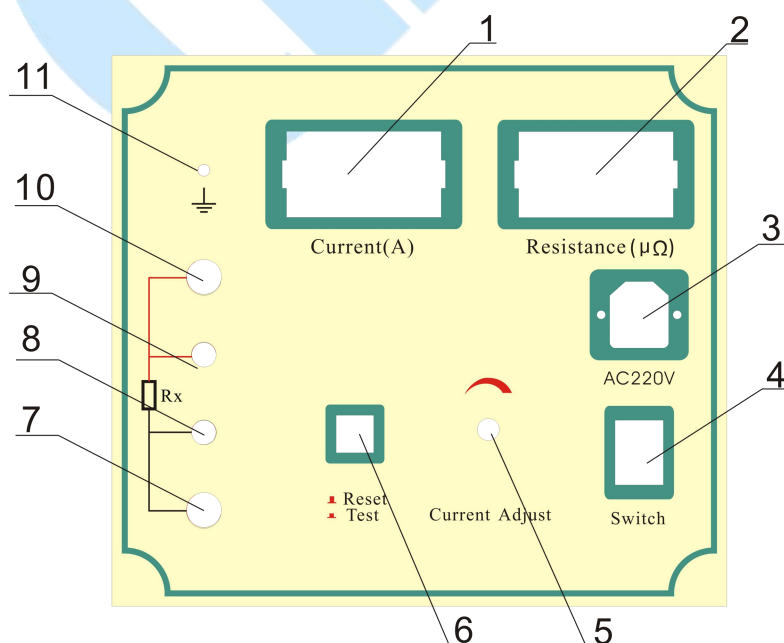


Figure 1 Panel Layout diagram

1.Current Display(A)	2.Resistance Display($\mu\Omega$)	3.Power Outlet
4.Power Switch	5.Current Regulation	6.Reset/Test Switch
7.Current Output I-	8.Measurement Input V-	9.Measurement Input V+
10.Current Output I+	11.Ground	

6. Work Principle

ZXHL-100A Contact Resistance Tester bases on the Current-voltage testing principle that also known as Four-line method testing technology. More details show in Figure 2.

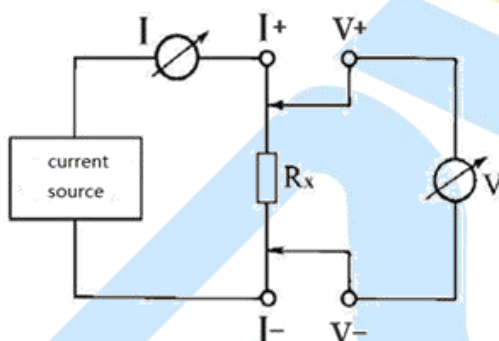


Figure 2 Schematic diagram

The current goes through I+ and I- ports to the resistance R_x , current value can be got from the ammeter I, and the voltage between V+ and V- will be shown in the voltmeter V. Based on data I and V, the resistance value can be calculated.

7. Operation Methods

(1) Wire as shown in the Figure 3.

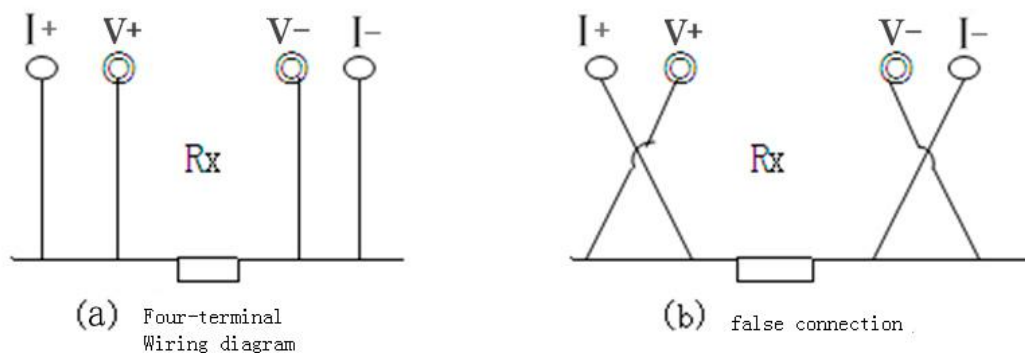


Figure 3 Four-terminal wiring diagram

(2) The junction of panel and test lines should be tightly screwed.

(3) You should use Four-terminal wiring method in which current line should be fasten to I+ and I- ports and voltage line should be fasten to V+ and V- ports. Current and voltage must have the same polarity.

(4) After checking the connection of the tester and test lines, connect 220V AC and start the tester.

(5) Adjust the “Current Regulation” knob to current 100.0A and press the “Reset/Test Switch” button, the data displayed in the monitor is the measured loop resistance value. If the measured current is not 100.0A, but I_0 , the ohmmeter will display R_0 , the actual resistance value is $R = 100 \times (R_0 \div I_0) \mu\Omega$.

(6) Completed measurement, please disconnect the power switch and put the test lines into accessories bag.

8. Problems and Solutions

Problems	Solutions
No respond after powering on	Check if AC power is on
	Check the power Cables
	Check if the fuse is blown out.
The current value displays 0A during measurement	Check if “Reset/Test Switch” button is pressed.
	Check if current output lines have poor contact.
Display actual current values but resistance value is 0	Check if “Reset/Test Switch” button is pressed.
	Check if current output lines have poor contact.
Display actual current values but resistance value is evidently larger or 1 (beyond range)	Check if resistance value is too large
	Check if voltage input lines places on the inner side of current output lines.
	Check if voltage output lines have poor contact or the port connected to the test piece is oxidized.

9. Notes

(1) Please read the manual carefully before using this tester.

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- (2) Please wire properly as recommended in the manual.
 - (3) This tester cannot measure resistance that is in a live circuit.
 - (4) The equipment should be firmly grounded during test.
 - (5) Arbitrary replacing the current line is forbidden.
 - (6) The tester should be put in ventilated, dry, cool and cleaning place. Pay attention to humid or erosive gas that may damage this equipment.

10. Packing List

(1) Contact Resistance Tester	1
(2) High current test pliers	2
(3) Earth lead	1
(4) Fuse (5A)	3
(5) Accessory bag	1
(6) AC 220V Power cord	1
(7) The instruction manual	1

Appendix A: Basic Knowledge about Contact Resistance

1、 What is contact resistance?

Contact resistance is the additional resistance caused by the connection of static contact and dynamic contact.

2、 What are the components of circuit breaker contact resistance?

Circuit breaker contact resistance is composed of shrink resistance and surface resistance of static contact and dynamic contact.

3、 What caused circuit breaker contact resistance out of work?

1) Contacts are burned because of Short.

2) If circuit breaker contact resistance is poor connected, that will cause changes in itinerary. Serious Excess load/Overload will cause the contact pressure or contact area changes.

3) Finished installation, the breaker has not been put into use for a long time, so the dynamic/static contacts are oxidized and the Surface Resistance becomes larger.

4) Due to long-term running the spring out of shape, which cause the contact pressure drop.

5) Long-term operation cause machine wear.

6) For less oil circuit breaker, unqualified insulating oil will lead the occurrence of acid reaction; the result is the contact surface being eroded. And insulating oil is mixed with impurities, after breaking the short-circuit current between dynamic contact and static contact, the residual carbon particles or metal powder will boost the contact resistance.

4、 What can affect contact resistance?

1) Material properties: Resistivity, hardness, chemical properties, mechanical strength and resistivity of metallic compound.

2) Contact form: Point contact, line contact and area contact.

3) Situations of contact area: The oxide film formed in contact area (the Silver exception), whose resistance is larger than that of metal.

4) Contact pressure

5) Roughness of contact area

Appendix B: Standard Reference for Conducting Loop Resistance of Circuit Breaker

Model	Loop Resistance of Each Phase ($\mu\Omega$)	Model	Loop Resistance of Each Phase ($\mu\Omega$)
SN1-10	<95	DW1-60G	200
SN2-10G	75	SW1-110	700
SN4-10	50—60	SW2-110I	180
SN4-20	50—60	SW3-110	160
SN4-10G	20	SW4-110	300
SN4-20G	20	SW6-110	180—220
SN5-10	100	SW2-220	400
SN6-10	80	SW4-220	600
SN10-35	<75	SW6-220	<400
DW1-35	550	SW7-220	<190
DW1-60	500	KW1-220	400
DW3-110	1100—1300	KW2-220	170
DW2-110	800	KW3-220	110
KW1-110	150	KW4-220	130
KW3-110	45	DW2-220	1520
KV4-110A	60	DW3-220	1200
DW3-110G	1600—1800	SW6-330	>600