

HZMN-D3 HV Circuit Breaker Simulator



Contents

I.Product Features And Uses	1
II.Technical Parameters	1
III.Panel Function Description	3
IV.How To Use	7
V.Experimental Examples	11
VI. Packing List	13

I.Product Features And Uses

HZMN-D3 The simulated circuit breaker (hereinafter referred to as the simulated circuit breaker) is specifically designed for relay protection with switch linkage simulation tests. It is manufactured using integrated circuits to realize trip and close time setting, input signal logic control, and power electronic devices with protection . The trip coil is designed with independent dual circuits and can simulate... 6-500KV The operating behavior of three-phase or single- phase operating circuit breakers with single or double trip coils at various voltage levels . Suitable for use in power systems, industrial and mining enterprises, research institutes, professional colleges, and protection manufacturers. As a replacement device for the actual circuit breaker during transmission tests of relay protection and automatic devices with switchgear systems, it offers accurate and reliable operation with no limit on the number of operations, greatly improving the accuracy and completeness of the test, minimizing the number of actual circuit breaker operations, and extending service life. It is an important supporting equipment for relay protection testing.

II.Technical Parameters

Operating power supply voltage AC: 220V $\pm$ 10% 50Hz Operating current less than 0.5A.

Trip and close operation voltage: DC: 88V~220V.

Trip time selection: 20ms to 990ms, minimum step size 10ms, with an error not exceeding ± 5 ms.

The closing time can be selected from 20ms to 990ms, with a minimum step size. 10ms, with an error not exceeding ± 5 ms.

Trip and closing current selection according to 220V Calculate: 0.25A, 0.5A, 1.0A, 2.0A, 3.0A, 4.0A, 5.0A.

When trip coils I and II are used in parallel, the trip current doubles.

The tripping and closing currents are automatically cut off by controlling the tripping and closing times.

circuit breaker is operated using the "Manual Closing" and "Manual Tripping" buttons on the panel , no current flows through the simulated

circuit breaker's tripping and closing coils.

Circuit breaker failure: When the simulated circuit breaker failure button is pressed, the simulated circuit breaker does not operate. The tripping and closing currents are disconnected after a 1-second delay, and then resume current flow after another 20 seconds. When the delay is 1s Then disconnected, then via 20s The current was then restored.

Phase-by-phase/Three-phase operation selection: Allows for either phase-by-phase or three-phase operation, selectable via the phase-by-phase/three-phase button.

Manual trip/close function selection: Enables manual three-phase tripping and closing.

Output capacity: Normally open and normally closed contacts: AC 220V/5A, DC 220V/0.5A.

Output contacts The simulated circuit breaker has 12 pairs of independent output contacts, divided into two groups corresponding to the simulated circuit breaker trip coils. Each phase of the trip coil has two pairs of normally open and normally closed contacts, with corresponding indicator lights displaying their status.

Hand jump, hand contact point The manual trip and manual close contacts each have a pair of synchronous output normally open contacts. When the manual trip button is pressed, the green trip indicator light illuminates, the manual trip contact closes, the contact indicator light illuminates and delays for 60 seconds, then the contact opens and the indicator light goes out. When the manual close button is pressed, the red close indicator light illuminates, the manual close contact closes, and the contact indicator light illuminates.

Dimensions and weight: 330mm×220mm× 180mm, 6kg.

III. Panel Function Description



Figure 1

1. Trip I input terminal the three-phase / phase-splitting button is in phase-splitting mode, this set of terminals simulates the phase-splitting operation of circuit breaker I.

The trip input coil terminal is connected to the phase trip output terminal of the phase operation box of the protection panel. During phase trip, the trip pulse only causes the corresponding phase to operate, while the other two phases remain unchanged.

the three-phase / phase-separation button is in three-phase mode, this set of terminals is the trip input coil terminal for simulating the three-phase operation of the circuit breaker. Any one phase is connected to the trip output terminal of the three-phase operation box of the protection panel, and the trip pulse will cause all three phases of the simulated circuit breaker to operate.

COM1 DC common terminal, this terminal is connected to the negative terminal of the DC power supply of the protection panel.

2. Tripping II input terminals the three-phase / phase-splitting button is in phase-splitting mode, this set of terminals simulates the phase-splitting operation of circuit breaker II.

The trip input coil terminal is connected to the phase trip output terminal of the phase operation box of the protection panel. During phase trip, the trip pulse only causes the

corresponding phase to operate, while the other two phases remain unchanged.

the three-phase / phase-separation button is in three-phase mode, this set of terminals simulates the three-phase operation of a circuit breaker .

The trip input coil terminal, any one phase, is connected to the trip output terminal of the three-phase operating box of the protection panel. The trip pulse will cause all three phases of the simulated circuit breaker to operate.

COM2 is the DC common terminal. This terminal is connected to the negative terminal of the DC power supply of the protection panel .

3. Closing input terminal When the three-phase / phase-separation button is in three-phase mode, this set of terminals serves as the closing input coil terminal for simulating three-phase operation of the circuit breaker. Any one phase is connected to the closing output terminal of the three-phase operation box of the protection panel. During three-phase closing, the closing pulse will cause all three phases of the simulated circuit breaker to operate.

three-phase / phase-separation button is in phase-separation mode, this set of terminals simulates the closing input coil terminals during phase-separation operation of a circuit breaker, and is connected to the phase- separation closing output terminals of the three-phase operation box of the protection panel . During phase-separation closing, the closing pulse only activates the corresponding phase, while the states of the other two phases remain unchanged.

COM3 is the DC common terminal. This terminal is connected to the negative terminal of the DC power supply of the protection panel .

4 (5, 6). Output contact I normally open and normally closed contact terminals (A)

Connection point, B Connection point, C (Connection point) Output connection point

I. Six sets of independent normally open and normally closed contacts, A, B, C Two sets of contacts per phase. When the corresponding phase switch is in the tripped position, the normally open contact of that phase opens and the normally closed contact closes; when it is in the closed position, the normally open contact of that phase closes and the normally closed contact opens. The capacity of these six sets of contacts is: AC:

220V. ·5A, DC: 220V 0.5A.

7 (8, 9). Output contact II normally open and normally closed contact terminals (A)

Connection point, B Connection point, C Output contacts II consist of six sets of independent normally open and normally closed contacts, A, B, C. Two sets of contacts per phase. When the corresponding phase switch is in the tripped position, the normally open contact of that phase is open and the normally closed contact is closed; when it is in the closed position, the normally open contact of that phase is closed and the normally closed contact is open. The capacity of these six sets of contacts is: AC: 220V. ·5A, DC: 220V 0.5A.

10. Hand-jump contact point This is a normally open contact, controlled by the manual trip/close button. When the manual trip button is pressed, the contact closes and delays. 60s It disconnects afterward and is not controlled by the trip/close time setting.

11. hand contact This is a normally open contact, controlled by the manual trip/close button, and not by the trip/close time setting.

12 (13, 14, 18, 19, 20). Closed position indicator light.

When the simulated circuit breaker is in the closed position, this set of red lights is on; when it is in the tripped position, this set of lights is off.

15 (16, 17, 21, 22, 23) - Trip position indicator lights

When the simulated circuit breaker is in the tripped position, this set of green lights is on; when it is in the closed position, this set of lights is off.

24(25). Trip current selection button This button selects the trip coil current of the corresponding circuit breaker in the simulation. (Total number of circuit breakers is...) 7
File, default

for 0.25A. This trip current is based on the input operating power supply voltage. 220V
The result of the calculation. This button is for cycle selection.

26. Closing current selection button This button selects the simulated circuit breaker closing coil current, which is divided into several parts. 7 The default setting is 0.25A .
This closing current is based on the input operating power supply voltage. 220V
The result of the calculation. This button is for cycle selection.

27. Trip Time Setting Switch This switch is set to simulate the tripping time of circuit breaker I (II), ranging from 20ms to 990ms. Arbitrary settings .

28. Closing Time Setting Switch This switch is set to simulate the closing time of a circuit breaker, ranging from 20ms to 990ms. Arbitrary settings.

29. Three-phase / phase split button This button is a three-phase / phase-splitting button. When this button is pressed, the indicator light above will show green when it is in phase-splitting mode, and the indicator light above will show red when it is in three-phase mode.

30. Three-phase / phase-by-phase indicator light A green display indicates a single-phase state, while a red display indicates a three-phase state.

31. Manual trip / close button This button is a trip / close button. When this button is pressed, the indicator light above will show green when it is in manual trip mode, and the indicator light above will show red when it is in manual close mode.

32. Trip / Close Indicator Light A green light indicates a tripped circuit, while a red light indicates a closed circuit.

33. Circuit breaker failure button When the simulated circuit breaker failure button is pressed, the simulated circuit breaker does not operate, and there is a delay in tripping and closing current. 1s Then disconnected, then via 20s The current was then restored .

34. Circuit breaker failure indicator light When the circuit breaker failure button is pressed , this red light flashes. 20s The rear light goes out, simulating the circuit breaker working normally.

35. Power switch This switch is the main power switch for the simulated circuit breaker.

36. Power Socket This socket inputs... AC : 220V AC power supply, built-in If the indicator light on the panel does not illuminate when the power switch is turned on, it means that the 0.5A fuse has blown and should be replaced with a fuse of the same specification.

37. Grounding terminal

IV.How To Use

1. Connect the power supply by inserting the 220V AC power cord into the power socket on the analog circuit breaker panel and turning on the power switch. At this time, the analog circuit breaker is in the tripped state. The green light of the manual trip indicator is on, and the green light of the three-phase trip indicator is on (i.e., the green indicator light at the normally closed position of the output contact).

2. Manual trip and close buttons: These buttons allow test personnel to manually trip and close the simulated circuit breaker .

Press "Manual closing" Button, manual closing, red indicator light illuminates, simulating the circuit breaker entering three-phase closing state, three-phase closing indicator red light illuminates ((That is: the red indicator light at the normally open position of the output contact)contact in the output contacts closes; the "manual closing contact" closes, the indicator light illuminates and remains on. The manual closing contact can simulate the state after the circuit breaker control switch is closed, and is used to perform non-corresponding start reclosing tests.

Press "Manual Trip" Press the button, the green indicator light for manual tripping will illuminate, simulating the circuit breaker entering a three-phase tripping state. The three-phase tripping indicator will then illuminate red and green (i.e.: The normally closed green indicator light in the output contact closes; the "manual closing contact" opens; the "manual trip contact" closes, the indicator light illuminates and opens after a 60-second delay. The manual trip contact can simulate the manual trip state of a circuit breaker control switch and is used for manual trip discharge tests of reclosing devices.

3. The trip and close settings are equivalent to the trip and close coil circuits of the actual circuit breaker. In practical applications, they replace the trip and close outputs of the actual circuit breaker and are connected to the protection device or control circuit.

selected using the "Current Selection" button in the tripping and closing current settings , according to the actual tripping and closing current of the circuit breaker.

The tripping and closing times can be selected using the "Closing Time" and "Trip Time" buttons according to the actual tripping and closing times of the circuit breaker.

The operating mode of the simulated circuit breaker can be selected using the "Trip/Close" and "Three-Phase/Separate Phase" buttons . When the simulated circuit breaker is in separate phase operation mode, the trip and close inputs can be used for testing with a single phase, and the trip and close currents should be connected separately for each phase. When the simulated circuit breaker is in three-phase operation mode, the trip and close inputs can be used for testing with all three phases, and the trip and close currents can be connected to any phase; alternatively , a single input can be selected to use each phase as a single three-phase circuit breaker, simulating three phases.

Operation of a single three-phase circuit breaker.

Trip coil circuits I and II are two completely independent trip current circuits with identical functions. When a trip current occurs in either circuit, the simulated circuit breaker can switch from the closed state to the tripped state, and a corresponding set of trip position indicator lights will illuminate. This can simulate the operating characteristics of a circuit breaker equipped with dual trip coils. If there are two trip currents, they should be connected to trip circuits I and II respectively. If there is only one trip current, this trip current can be connected to any trip circuit, or trip circuits I and II of the same phase can be connected in parallel to increase the trip current.

4. Output contacts Groups I and II of the contacts correspond to trip coils I and II, with each phase having two pairs of normally open and normally closed contacts. The operating state of the contact output corresponds to the trip and close current.

Output contact I and output contact II operate independently. When only trip circuit I has tripping current, output contact I operates, the red light at the normally open position illuminates, the normally open contact closes, the green light at the normally closed position goes out, and the normally closed contact opens. Output contact II does not operate; it only operates when trip circuit I... II. When there is current, the output contacts I and II can only act simultaneously .

5. Circuit Breaker Failure: When the "Circuit Breaker Failure" button is pressed, the simulated circuit breaker is in a failed state, and the circuit breaker failure indicator light flashes red. At this time, when tripping or closing current is applied, the simulated

circuit breaker does not operate and operates after a delay . 1s Afterwards, the tripping and closing currents are automatically cut off, and then... 20s After a delay, the trip and close circuits are automatically reconnected, simulating that the circuit breaker is in normal working condition.

6. The test wiring simulates a circuit breaker used in conjunction with a microprocessor-based relay protection tester and protection devices to replace the actual circuit breaker. It allows for complete transmission tests of the protection device's tripping and closing of the circuit breaker. See the diagram below for the wiring method. 2 , Figure 2 The middle section is the test wiring for the double trip current coil. When there is only one trip current, the other one should not be connected. During the testing of the protection device, the wiring method for the simulated circuit breaker in the secondary circuit is to disconnect the trip and closing coils of the actual circuit breaker from the secondary circuit, and then connect the simulated circuit breaker... A, The trip and close coils of B and C are connected to the secondary circuit accordingly, working in conjunction with the protection and testing instruments to complete the overall testing of the protection device. The wiring diagram is shown in the figure. 3 (Single-phase connection).

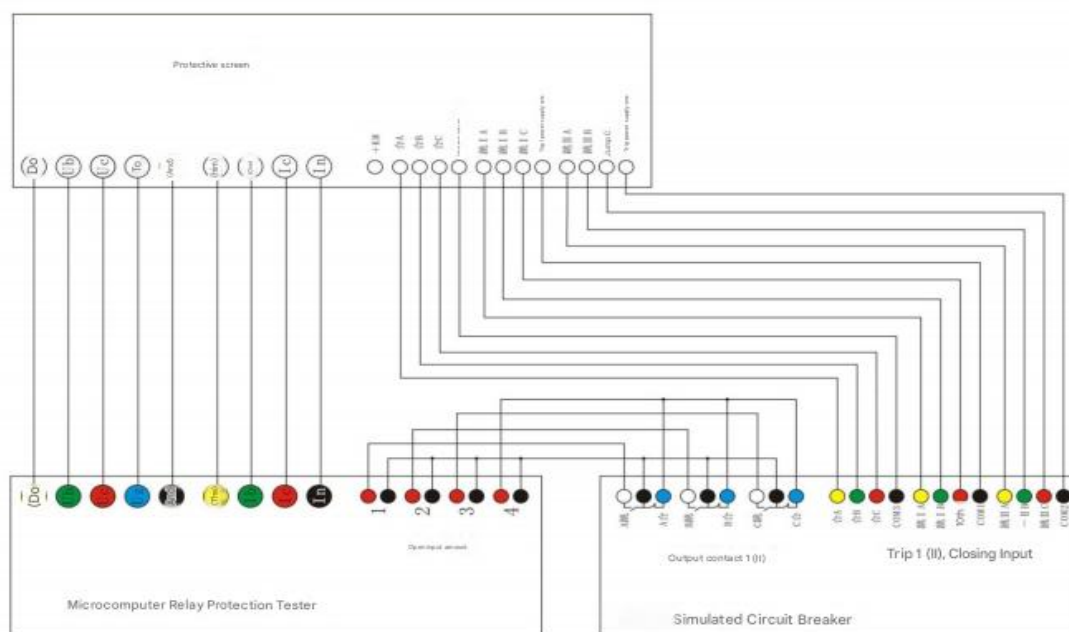
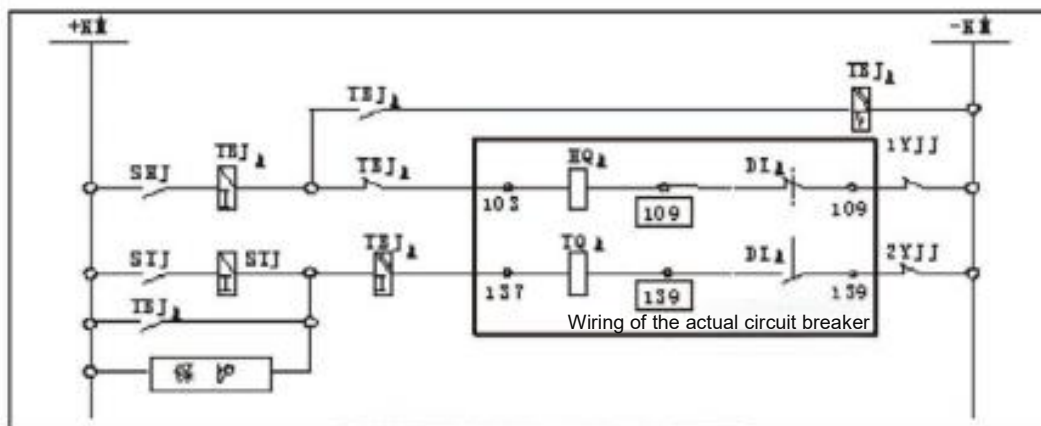
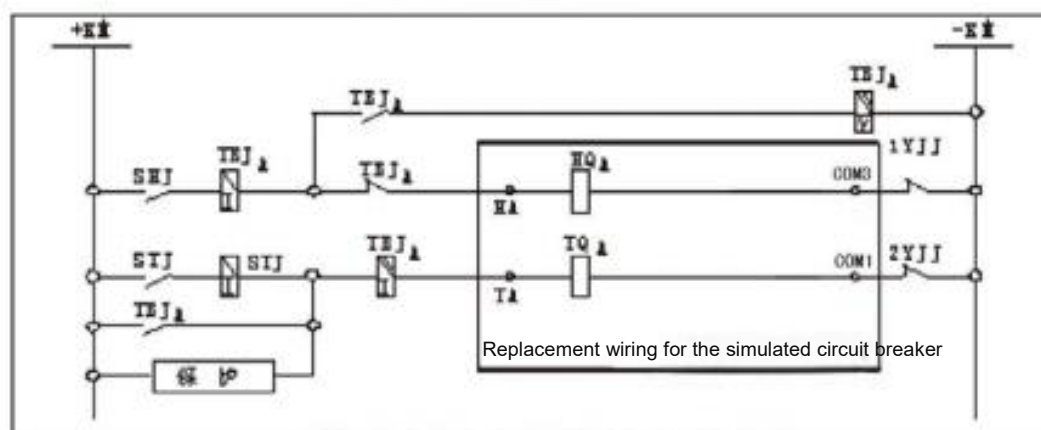


Figure 2



Wiring diagram for the secondary circuit of the actual circuit breaker



Wiring diagram for replacing the secondary circuit of the actual circuit breaker with a simulated one

Figure 3

When the circuit breaker trips in a system fault using a phase-by-phase tripping method , the simulated circuit breaker's tripping input is connected to the tester according to phases A, B, and C. When the circuit breaker trips in a system fault using a three-phase tripping method , the simulated circuit breaker's tripping input can be arbitrarily connected to any one of phases A, B , or C of the tester. The normally open or normally closed output contacts of the simulated circuit breaker correspond to the normally open or normally closed contacts of the actual circuit breaker in the secondary circuit (excluding the auxiliary contacts of the circuit breaker connected in series with the trip and close coils in the operating circuit), and can be connected to the protection device as needed for the test. The wiring between the simulated circuit breaker and the tester involves connecting the normally open or normally closed output contacts of the simulated circuit breaker to the input terminals of the tester. In the entire transmission

test, the normally open or normally closed output contacts of the simulated circuit breaker should be connected to the input terminals of the tester to realize the protection action behavior and secondary circuit integrity test throughout the entire process from fault to circuit breaker tripping.

V.Experimental Examples

1. Test wiring HZMN-D3 Simulated circuit breaker with relay protection tester to test four sides CSL-101B The distance protection system of the entire set and the failure protection of the protection device are shown in the figure.4.

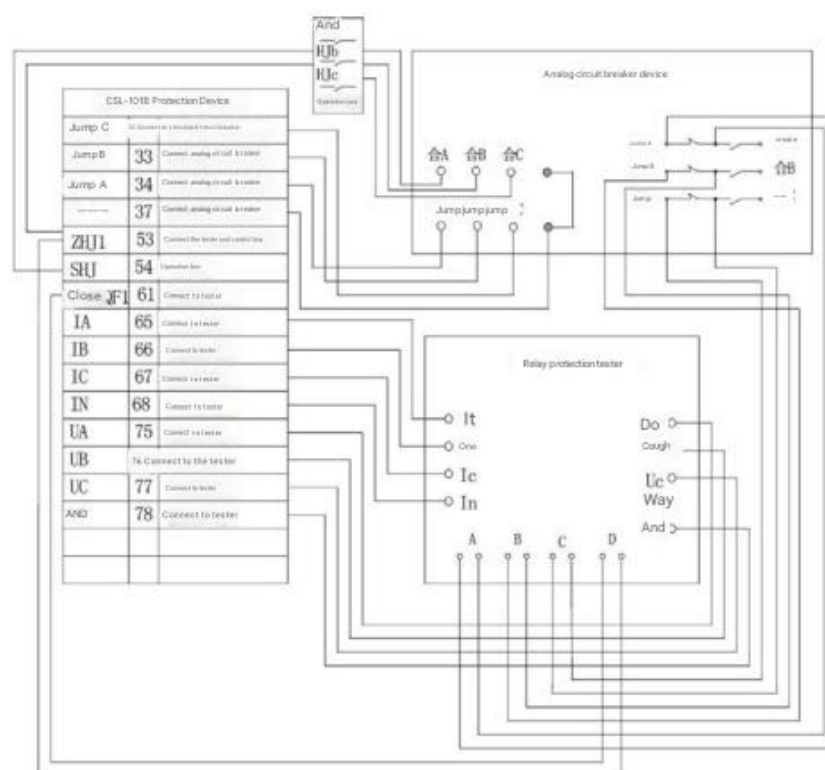


Figure 4

2. Experimental explanation of the four sides CSL-101B The protection device selects the combined reclosing mode. Therefore, in the event of a single-phase fault, when the protection trips and the reclosing is initiated, the output contact of the reclosing relay in the control box activates the phase-specific closing relay. HJa, HJb, and HJc are used to close the simulated circuit breaker via the contacts of the phase-by-phase closing relay , thus achieving phase-by-phase closing.

When a system fault occurs, the protection device activates, causing the simulated circuit breaker to trip. The output contacts operate synchronously, with normally open contacts

opening and normally closed contacts closing. The normally closed contacts are then connected to the input of the testing instrument. A, B, C When testing the protection trip, during the reclosing test, connect the reclosing relay of the protection device.

The input quantity D of the point-to-point tester is used to test the reclosing action time.

When testing the failure protection, press the "Circuit Breaker Failure" button on the simulated circuit breaker to apply a fault simulation quantity to the protection device, causing the protection to trip. However, the simulated circuit breaker does not trip. At this time, the tester still outputs a fault quantity. Because the simulated circuit breaker fails to operate, the failure protection of the protection device is activated.

3. Test Procedure : Step 1: Disconnect the trip and close control wiring of the primary equipment from the control circuit and connect it to the simulated circuit breaker.

Step 2: Test the wiring. (See diagram)

Step 3: Based on the tripping and closing times of the primary equipment circuit breaker and the current values of the tripping and closing coils.

Set the tripping and closing times and tripping and closing current values of the simulated circuit breaker.

Step 4: Close the simulated circuit breaker using the control switch in the circuit or the manual "close" button of the simulated circuit breaker .

Step 5: Add fault parameters and conduct a complete group test.

Step 6: Press the "Circuit Breaker Failure" button on the simulated circuit breaker to test the failure protection by adding fault parameters.

4. The tripping and closing process simulates the tripping and closing action of a circuit breaker (see figure). 5).

Simulate the closing operation of the circuit breaker through DCS Alternatively, it can be done by operating the control switch.

Simulated circuit breaker parameter settings: circuit breaker closing time is 80ms, tripping time is 40ms, and protection reclosing action time is...300ms.

Figure 5 shows the coordinate diagram of the entire process of closing, tripping, and reclosing. When the simulated circuit breaker receives a closing command, it goes

through... 80ms The closing time delay simulates the closing action of a circuit breaker, simultaneously outputting contact actions: normally open contacts close, and normally closed contacts open. Similarly... When the simulated circuit breaker receives a trip command, after... 40ms After the trip time delay, the simulated circuit breaker tripping action is initiated, and the contact actions are simultaneously output: normally open contacts open and normally closed contacts close; after 300ms... During the reclosing time delay, the protection system issues a reclosing command, and then... 80ms Closing time delay

At that time, the simulated circuit breaker reclosed.

When the simulated circuit breaker fails, although a trip command is received, it does not trip; current remains in the current coil and is maintained. 1s The current then disappears, interval 20s It then automatically returns to the current-carrying state.

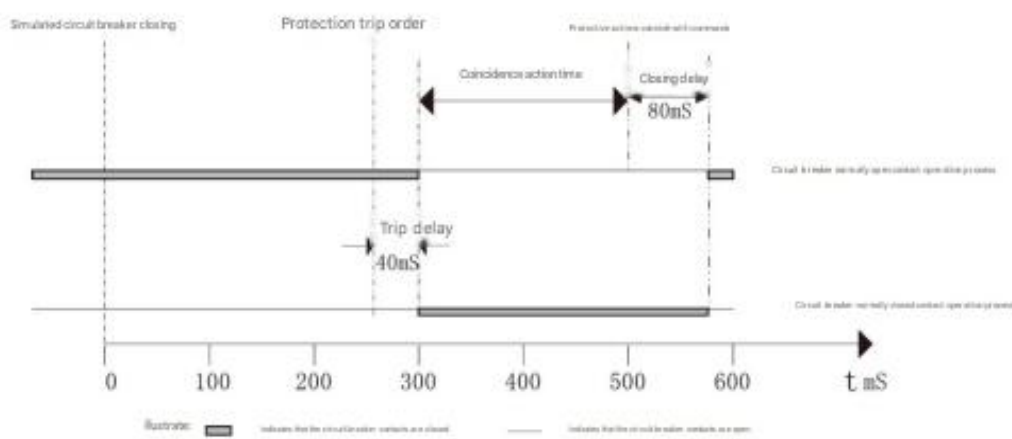


Figure 5

VI. Packing List

No.	Item	Qty
1	Power cord (250V-5A)	1
2	Four-core sheathed test lead (4×1.2mm ² -3m)	3
3	Test lead (1.6mm ² -6m)	6
4	Transparent grounding wire (2.5mm ² -2m)	1
5	Special clamp (10mm)	18
6	Fuse tube (20×5-2A)	4