Huazheng

HZ-E-I
High Voltage Bridge Cable Fault Locator

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Instruction

1. Read the instructions carefully before use and operate in strict accordance with the instructions.
2. This equipment produces 15000V high voltage, improper use may endanger personal safety.
3. At least two people operate, one for wiring and another for checking. Make sure it is safe before use.
4. The grounding end of the instrument is the safe grounding point of the shell, the grounding must be reliable, use special grounding wire connecting to test ground grounding column, electrical cabinet grounding row or mechanical equipment feet.
5. Special attention, while the device is working, 9V battery will be at a high potential, therefore, replaced battery and battery cable must be put back and screw the battery box knob cover.
6. Discharge completely before people touch HV parts no matter during the test or test finish, put the ground wire finally.
7. As the company's products continue to update and improve, the manual maybe be different with the instrument, please contact the company if in doubt.

Content

I. Introduction

HZ-E-I high-voltage bridge locator is based on the MURRAY bridge principle. It is used for positioning a variety of wire and cable breakdown point or no breakdown but low insulation resistance value defect point, and high-voltage cable protection sheath faults. It can also be used for cable factory to test cable defects.

The device using SMPS to form high-voltage constant current source, no-load voltage is -15000V, short-circuit current is 30mA. Using a high sensitivity amplifier and galvanometer to indicate the balance, with the proportional potentiometer to form a balanced bridge and placed at high potential. Test line is the specially designed dual-core high-pressure rubber cable, use four-terminal resistance measurement to avoid the error arising from lead resistance, the test line is reliable grounding through braid shield, the panel operation button at the earth potential, operate the bridge through insulation bar. High voltage constant current sources and bridges are integrated in a portable industrial chassis. Therefore, the device voltage is high, light in weight, easy to operate and safe to use.

II.Function and application

HZ-E-I high-voltage bridge locator has three functions:

1 DC voltage test: the device can output 0 ~ 15kV DC voltage, can be used for cable DC voltage withstand test.

2 Burn through the point of failure: burn through and reduce the high resistance and flashover fault point resistance.

3 Fault pre-locating: Using bridge principle pre-positioning, four-terminal resistance measurement method to avoid the error arising from lead resistance.

HZ-E-I high-voltage bridge locator is particularly suitable for:

1 Installed cable high resistance breakdown point, in particular for the linear HV breakdown point which is difficult to burn to low resistance, such as cable middle connector linear high resistance breakdown.

2 Flashover breakdown point, after breakdown the constant current source can maintain the arc, a stable current through the bridge, the bridge has enough sensitivity.

3 Not yet breakdown but low resistance fault, for example, megger shows cable resistance is low, but under operating voltage the insulation defects can not be breakdown.

III.Technical parameters

1 Test voltage: 0 ~ 15kV, negative high pressure, continuously adjustable
2 The maximum current: 30mA
3 The test ratio accuracy: ± (0.2% • L ± 1) meters
4 Output voltage of outer sheath burn through: 0 ~ 15kV, continuously adjustable
5 Output current of outer sheath burn through: 30mA
6 Power source: AC220V ± 10%
7 Anti-interference ability: > 100VAC
8 Weight: ≤ 12kg
9 Dimensions: L478mm × W360mm × H316mm

IV.Packing list

Supply list as shown in Table 1:

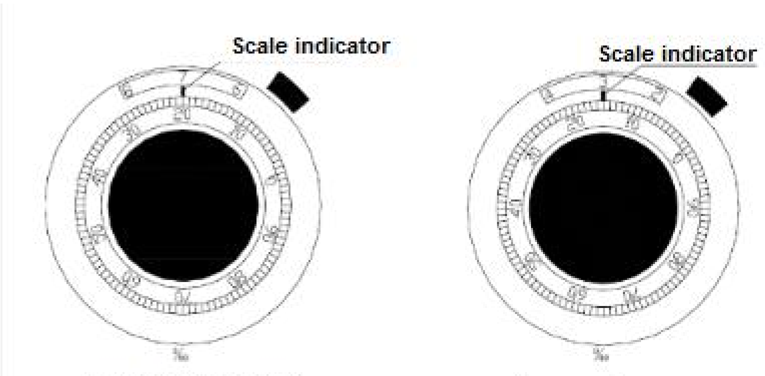
No.	Item	Qty
1	High voltage bridge locator	1
2	Rods	1
3	Special grounding wire	1
4	Power cord	1
5	Special short wiring (for 35kV and below)	1
6	Spare 9V battery	1
7	Spare fuse 2A	1

V.Panel descriptions

Figure 1 HZ-E-I panel diagram

1 Grounding : Device outer shell and bridge safety grounding point, through a special ground wire connected to the ground, during using must be reliable grounding to ensure

personal safety.
2 Output ammeter: the unit is mA.
3 Output voltage meter: the unit is kV.
4 Work instructions: voltage adjustment knob counterclockwise rotates to the end, switch closing on ZERO, the indicator is on, then output high voltage.
5 Power outlet: AC220V ± 10%, 50Hz.
6 Power switch: Switch on the light is on, switch off the light is off.
7 HV adjustment: high-voltage adjustment potentiometer with zero switch, counterclockwise adjustment to the end to hear a click, that means complete zero closing, clockwise adjustment for the boost, counterclockwise adjustment for the buck.
8 Galvanometer zeroing: Built-in amplifier, cable contact potential, thermoelectric potential, space electric field may make the pointer deviate from the zero. Setting zero after complete wire connection but before power is on to eliminate the interference.
9 Positioning milscale adjustment: for the bridge resistance adjustment, the outer ring corresponds to 100 ‰, the inner ring corresponds to 10 ‰ and 1 ‰. P ‰ = outer ring number + inner ring number, as shown in Figure 2 (a) reading as 720 ‰, Figure 2 (b) reading as 315 ‰.



(a) Micrometer reading 720% (b) Micrometer reading 315%

10 Battery switch / sensitivity adjustment: (1) galvanometer battery switch. (2) In the "OFF" position, short-circuit the proportional potentiometer, disconnect the galvanometer to prevent the impact current from damaging the bridge. (3) adjust the galvanometer sensitivity. Clockwise rotation to increase sensitivity gradually.
11 Galvanometer: indicating bridge balance.
12 Output line: red clip, test cable fore-end.
13 Output line: black clip, test cable end.
14 Battery: Switch on the battery, if the galvanometer does not move or move abnormally, may be low battery. You need to replace the 9V square battery. First turn off the power, then completely discharge the measuring line, unscrew the battery box knob cover, pull out the battery and replace. It should be noted that while the device is working, 9V battery will be at a high potential, therefore, replaced battery and battery cable must be put back and screw the battery box knob cover.

VI.Operating instructions

1 Locating principle
Using Murray Bridge to locate the breakdown point is a classic way which is convenient

and accurate. This method is based on that the core (or shield) resistance is evenly and proportionate to the length of the core. Figure 3 is a typical usage.

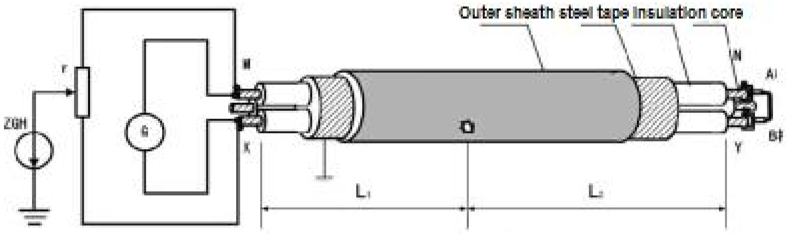


Figure 3 bridge wiring diagram

ZGH is a high voltage constant current source.

Faulty cable is B-phase core, the steel strip breakdown in the L1. The secondary cable is A-phase core. A-phase core and B-phase core has the same cross-section and length (L), the distance from the fault point to test point is L1.

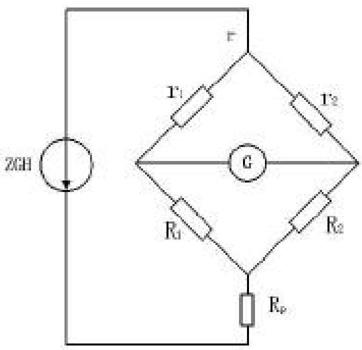
- Connecting the testing fixture to M and X point, both sides of fixture is the current potential side and should be reliable connection with the cable.

r is 10-turn potentiometer for adjusting balance which is form bridge together with A-phase and B-phase, the scale is permillage.

G is galvanometer, electrical null balance is adjustable.

Short-circuit N and Y ends by C-type fixture which is special for short-circuit at the far end.

Cable-L1 resistance is R1, cable-L2 and A-phase cable core resistance is R2. And the positioning bridge constitutes a Murray bridge circuit. The circuit principle is shown in Figure 4.



After the bridge is balanced $$\frac{R_1}{R_2} = \frac{L_1}{L + L_2}$$

$$r_1 + r_2 = r$$

$$\frac{r_1}{r_2} = \frac{R_1}{R_2} = \frac{L_1}{L + L_2}$$

Ratio-arm resistance is connected to 10-turn potentiometer, so resistance ratio P can be read by milscale directly. So,

$$\frac{L_1}{2L} = \frac{r_1}{r} = P\%_{00}$$

$$L_1 = 2 \times P\%_{00} \times L$$

It can be seen, as long as the bridge has a certain sensitivity and balance, the bridge method is simple and accurate.

2 The measurement steps

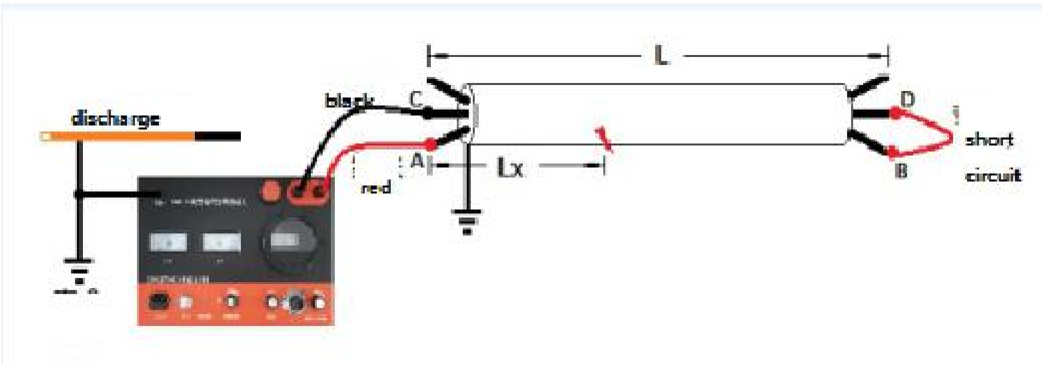


Figure 5 Schematic diagram of bridge wiring

(1) Using multimeter, megger or other HV withstand device to confirm the state of cable breakdown, record the ground insulation resistance or breakdown residual voltage and other values.

(2) Record the length, model, cross-section and other parameters of the cable to be tested, walk along the cable laying path to inspect. Reliably short-circuiting fault phases in the far end(the smaller of the contact resistance, the better). Leave one person stay in the far end to prevent from personal damage.

(3) Wiring. The device ground terminal should be connected to the ground body reliably. The discharge rod is connected to the ground terminal. Red clip (fore-end) connects to the fault line core, Black clip (back-end) connects to auxiliary wire core.

(4) Bridge zero adjustment. Switch on the battery, twist zero button to adjust galvanometer to zero (if the pointer on left side, clockwise twist zero button; if the pointer is on right side, counterclockwise twist zero button). After that, switch off battery. Make sure the battery switch is set to "OFF"! In the OFF position, not only turn off the galvanometer amplifier battery, but also short-circuit proportional potentiometer, disconnect the galvanometer. It can avoid damaging the bridge by pulsed current in the boom stage. Therefore, the battery switch must be in the "OFF" position before the current stabilizes.

(5) The power supply is connected to AC220V. The grounding point of the power outlet in the device is suspended, so the power cord is not required to be grounded reliably.

(6) Boost. First, counterclockwise twist the HV button to ZERO. Turn on the power switch and the power light is on.

(7) Slowly twist HV adjustment button clockwise, watch the voltmeter and ammeter until the ammeter over 8mA. If the current is unstable, keep boosting until reach to a stable

arc or conductive area, it will make current stable during test.

(8) Balance adjustment. Turn the button clockwise to increase the sensitivity until the galvanometer shows a significant deflection but not excessive, twist ‰ dial scale to adjust galvanometer to zero. (If the pointer is on left side, clockwise twist the ‰ dial scale; if the pointer is on right side, counterclockwise twist the ‰ dial scale). Improve the sensitivity step by step until the pointer deflection is sensitive to minor adjustments of the ‰button.

(9) Record the reading of ‰ dial scale as P1‰. Normally P1 ≤ 500, if not, that means wrong connecting of red clip and black clip.

(10) Reducing the voltage, turn off the power, then discharge and confirmed by another person. Change the position of clip (return grounding C-type clip no need to change the position) and repeat step (4).

(11) Record another reading P2, normally P1 + P2 = 1000. The process can avoid errors in reading and errors in the use of clip, P1 + P2 does not have to be completely equal to 1000. Between 990 and 1010 are normal. When the high-voltage is closing and no current output, repeat adjust sensitivity to ZERO can get a more accurate proportion.

(12). Calculation. The location of the fault point is: X = 2 × L × P1 ‰, special attention should be paid to "2" in the formula, the auxiliary cable doubles the cable length involved in the calculation.