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DCGL-666 DC Ground Fault Locator

V 1.0

NOTICE

Thank you for choosing our devices.

Read the instruction carefully before using, specially pay attention to the security warning and tips.

1. GENERAL DESCRIPTION

1.1 GENERAL :

The ground fault of DC system in power system is a kind of fault which is easy to happen and is harmful to power system. Whether it is positive or negative ground, it may cause the protection to be mis-operated or the protection to resist, endangering the normal operation of the power system.

DC system ground fault locator, is used for power station and transformer substation DC power system ground fault locating and pinpointing.

It adopts isolate programmable constant flow source to insert small current single to find the faulty point quickly, accurately and safely.

The waveform analysis method real-time calculate and display the resistive current value, the current direction and check the ground current waveform directly.

Device effectively get rid of the system distributed capacitance interference and solve the locating of high resistance ground，low resistance ground，AC in DC ground，instant ground，impulse interference，loop ground，single-point, multiple point ground and so on.

1.2 FUNCTION FEATHER:

- No need system power off, power on to locate the system ground fault on-line to rise the system safety.
- AC crossing into system checking function to avid the device damage of AC in
- Auto test the DC system voltage and auto adjust output voltage
- Intelligent distinguish the ground state and auto alarm when grounding.

- The transmitter detects fault information such as positive and negative bus voltage, fault resistance, grounding capacitance and balance resistance in real time.
- The transmitter supports DC and AC power supply modes;DC power supply without external power supply, direct power from the DC system, simple and convenient wiring.
- The transmitter can measure the DC system grounding resistance and distributed capacitance to the ground, and automatically calculate the optimal frequency of the output signal.
- In the current difference location mode, the receiver calculates and displays the resistive current in real time through the difference between the injected current signals, so as to determine the fault points in real time.The test sensitivity is greatly improved and can measure up to 1M insulation faults.
- Under the current waveform positioning mode, the receiver adopts waveform analysis digital signal processing technology to calculate and display the resistive current waveform in real time, so as to determine the fault point in real time.
- Using wireless communication technology, real-time data transmission, convenient and fast.
- Low battery indicator function of receiver: the instrument will automatically alert when the battery is under voltage.
- Receiver automatic power off function: within 60 minutes without operation or battery low voltage to a certain extent can be automatically power off.

1.3 SPECIFICATION:

Transmitter:

- Applicable DC system voltage grade 220V, 110V, 48V, 24V.
- Power supply mode of the transmitter: DC screen power supply (220V, 110V) or AC 220V power supply.If AC 220V power supply is used, the transmitter will automatically cut off the DC power supply loop, and AC 220V power supply is preferred.
- DC system voltage measurement range: DC 0~500V.
- DC voltage measurement resolution: DC 1V, accuracy: 5%±5V.
- The system for ground impedance measurement range: 0 ~ 1 m Ω, accuracy: 10% plus or minus 3 k Ω.
- The system insulation resistance measuring range: 0 ~ 1 m Ω, accuracy: 10% plus or minus 3 k Ω.
- AC crossing in voltage measurement range: AC 0~280V.
- AC voltage measurement resolution: AC 1V, accuracy: 5%±5V.
- Resistance to ground distributed capacitance value: branch ≤ 47UF, system total capacitance to ground ≤150 UF.
- Maximum current of transmitter output: 5mA.
- Transmitter output signal frequency:

Receiver positioning mode in current difference: 0.1Hz~0.25Hz adaptive frequency.

Receiver in current waveform locating mode: 0.5Hz/0.2Hz/0.1Hz.

Receiver:

- The insulation resistance measuring range: 0 ~ 600 k Ω.
- Insulation impedance measurement resolution: 1 k Ω.
- The resolution of earth leakage current detection: 0.1mA.

- Clamp dynamic range: clamp double wire (positive and negative bus clamp together) range: 0~40A (load) Single wire clamp range: -5A to +5A
- Receiver power supply: built-in rechargeable lithium battery.It can work for 20 hours, and the battery can be fully charged in 3~4 hours.
- Clamp power supply: 2 AA (No.5) alkaline dry batteries.Continuous working time of 10~20 hours (depending on battery quality).
- Wireless communication technology indicators

ISM frequency band: 433MHz.

Air speed: 2.4 KBPS.

Wireless communication signal power: 30dBm.

Other:

- Power consumption: transmitter <15W.Receiver <2W.
- Conditions of use: temperature :-10℃~40℃;Humidity 10~ 90% RH;< 4500 m elevation.
- Size:

Transmitter 280mm×220mm×90mm;

Receiver 220mm×125mm×55mm;

Signal calipers 180mm×60mm×35mm;

Current sensor 180mm×130mm×30mm

- Quality:

Transmitter 2.00kg;Receiver 0.90kg;

Signal clamp 0.21kg;Current sensor 0.18kg.

2. DEVICE COMPOSITION:

DC system ground fault locator consists of transmitter, receiver, signal clamp and current sensor, etc. :

2.1 TRANSMITTER:

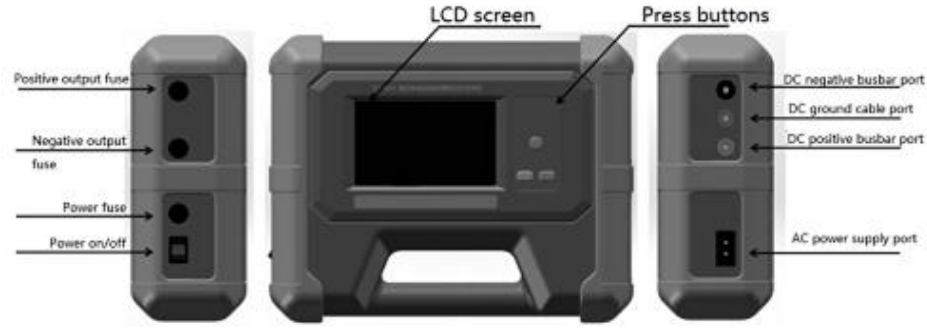


Fig.1 Transmitter appearance

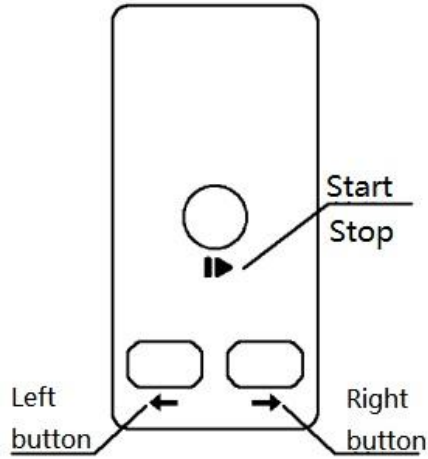


Fig.2 Transmitter press button

2.2 RECEIVER

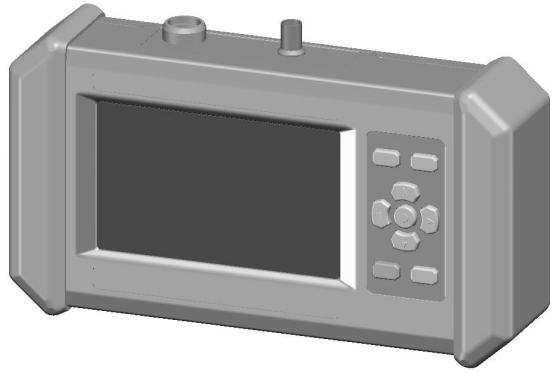


Fig.3 Receiver appearance

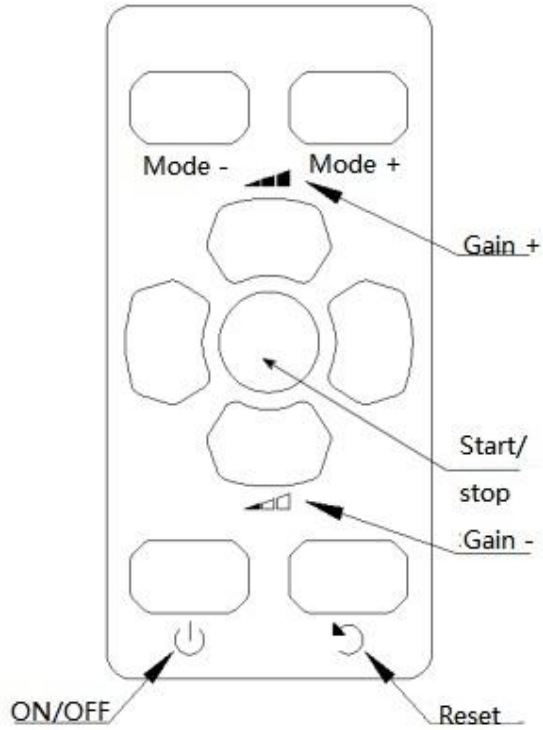


Fig.4 Button board

2.3 SIGNAL CLAMP

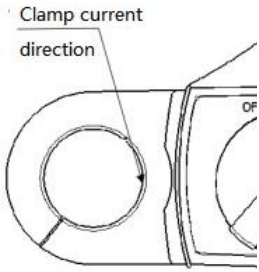


Fig.5 current sensor

1. jaw handle: press to open the jaw of the clamp.
2. Power on/off: turn on or turn off the working power of the clamp.
3. Power indicator: When the indicator light is on, the working power of the clamp is normal.
4. Low battery indicator: When the indicator light is on, it means that the battery of the clamp has been used up and a new battery needs to be replaced.
5. Reset: used for clamp output signal level zero setting.
6. Signal output port: output port of clamp signal voltage.
7. Signal clamp diameter: 23mm

2.4 CURRENT SENSOR

Fig 6 current sensor

3. WORK PRINCIPLE

The red output clip, green output clip and black output clip of the transmitter are respectively connected to the positive bus, ground bar and negative bus of the DC system, and the transmitter power on after confirming the wiring is correct.

First of all, the transmitter detects the positive bus voltage to ground and the negative bus voltage to ground respectively through the internal relay switching, so as to determine the positive bus fault or the negative bus fault.Then, the transmitter carries out parameter measurement on the weak current signal <5mA injected into the fault bus to determine the

fault resistance, balance resistance, grounding capacitance and other parameter information.

Receiver work in current differential positioning mode: according to the fault busbar and parameter information, signal clamp connect into the fault branch correctly, press the start/stop button,the transmitter begin to do HV output. Transmitter will output a 0.1 Hz to 0.5 Hz DC impulse signal.The receiver according to the signal difference before and after injection signal, so as to determine the fault point in real time;

Under normal circumstances, about 15s later, it can judge whether there is a fault in the current branch. If there is a fault, the fault probability pointer points to the red area, the buzzer alarm, and the lower right corner of the interface shows grounding.

If there is no fault in the busbar branch, the fault probability pointer points to the green area and the buzzer rings one time to indicate..

Then the signal clamp is clamped into another branch, and presses the receiver reset button to continue detection until the fault bus branch is detected.

When the detection is completed, presses the receiver start/stop button again, and the transmitter will stop the high-voltage output.

The receiver works in the current waveform location mode: Press the receiver start/stop button, and the transmitter starts to output high voltage. The optimal output frequency is automatically determined according to the fault impedance of the DC system and the magnitude of the distributed capacitance to the ground. The receiver determines the fault point in real time through the magnitude of the waveform amplitude.

If there is a fault, the display is a impulse waveform;If there is no fault, there is no impulse waveform.When change to new each branch, press the receiver reset button to continue detection until the fault bus branch is detected.When the detection is completed, presses receiver start/stop button again, and the transmitter will stop the high-voltage output.

Note: When the current sensor is connected to the receiver, the receiver will automatically switch to the current waveform locating mode.When the signal clamp is connected to the receiver, both operating modes can be used.

4. OPERATION METHOD

If the DC system is equipped with a fixed grounding line selection detection device, the line selection device should be shut down and the insulation alarm relay should be unplugged to avoid reducing the test accuracy when locate a grounding fault.

4.1 TRANSMITTER OPERATION METHOD

4.1.1 Wiring:

Power off the transmitter and connect the positive, negative, ground wire with the DC system according position.

Connect the Red clip to the power positive (+220V,+110V,+48V,+24V),connect the Black clip to the power negative (0 V) and connect Green clip with the system ground cable.

4.1.2 Power supply:

Use the DC power supply when the DC system is 220V,110V.

Use the 220V AC power supply when DC system is 48V,24V or DC system power off.

4.1.3 Transmitter operation steps:

After wiring the transmitter, power on and the screen will display Start information and in 1s, device will enter the testing status for power choice, display as below:

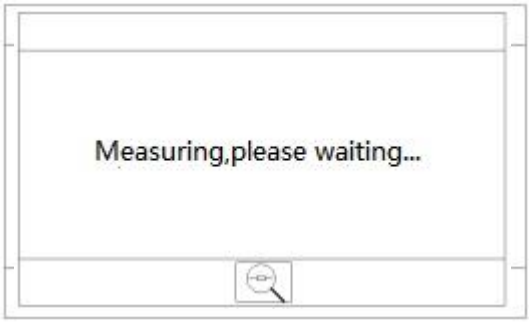


Fig 7 Output power choice interface

After power confirmed,enter the main interface as below

Fig 8 Interface during measuring

After waiting for about 2S,if any wiring error,device will alarm as below

Fig 9 Interface of error wiring

If any DC system AC crossing,the device will alarm as below:

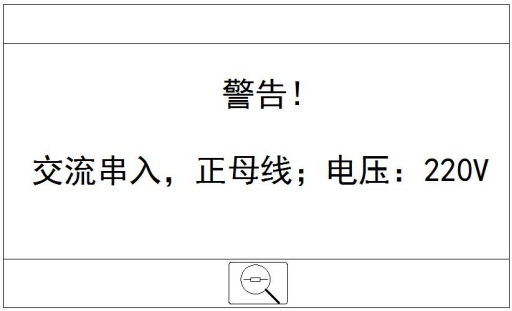


Fig.10 Principle reference

4.2 WORK MODE:

Work mode	Step voltage	Fault current	HV rod
Suitable fault	Buried cable	Laying cable through PVC	Cable laying on the holder

3.2.1 Prepare

According to the fault location results, the FLC-908D receiver and probe are carried to the detection area. The detection area is mainly selected according to the ranging results. For example, if the ranging result is 1000m, the detection area should be between 950m and 1050m.

Assemble the probe and connect the probe output wire to the signal input jack of CD-6680 (note the color corresponding)

Insert two probes into the soil along the cable path. The orientation of the two probes must be maintained during the fixing process, with the black probe towards the source and the red probe towards the distal end. The two probes are separated by a certain distance. When the signal is weak, the distance will be extended properly, and when the signal is strong, the distance will be shortened. When the signal is very close to the fault point, the distance can be very small for accurate fixing.

If the cable is laid through PVC pipe, access the current sensor according to the need, and measure the current flowing through the exposed fault cable through the sensor to find the location of the fault point.

3.2.2 Step voltage signal pinpointing

Press the power switch for more than 1 second, power on the FLC-908D, Insert the probe into the soil near the fault cable (do not hold the probe with your hand), press the RESET key, and observe the signal waveform of the FLC-908D LCD display. If the waveform amplitude is small, the gain should be turned up. Then observe the signal waveform of the FLC-908D LCD display until the gain is adjusted properly. Observe the arrow indicating the direction of fault. Then move forward about 10 meters along the direction indicated by the arrow to continue the measurement. When the FLC-908D display signal is strong and the arrow direction is reversed, it means that the fault point has been crossed. Shorten the moving distance and look back carefully for the point where the direction of the arrow changes and the signal is strong, which is the fault point. In the pinpointing process, if the signal amplitude displayed is very small, the direction indicated by the arrow will change from left to right. The measuring point is far from the fault point, so it can continue to move forward for measurement. Or increase the signal gain over a period of time, the direction indicated by the arrow will be stable. The fixed-point

process is shown in Figure 8.

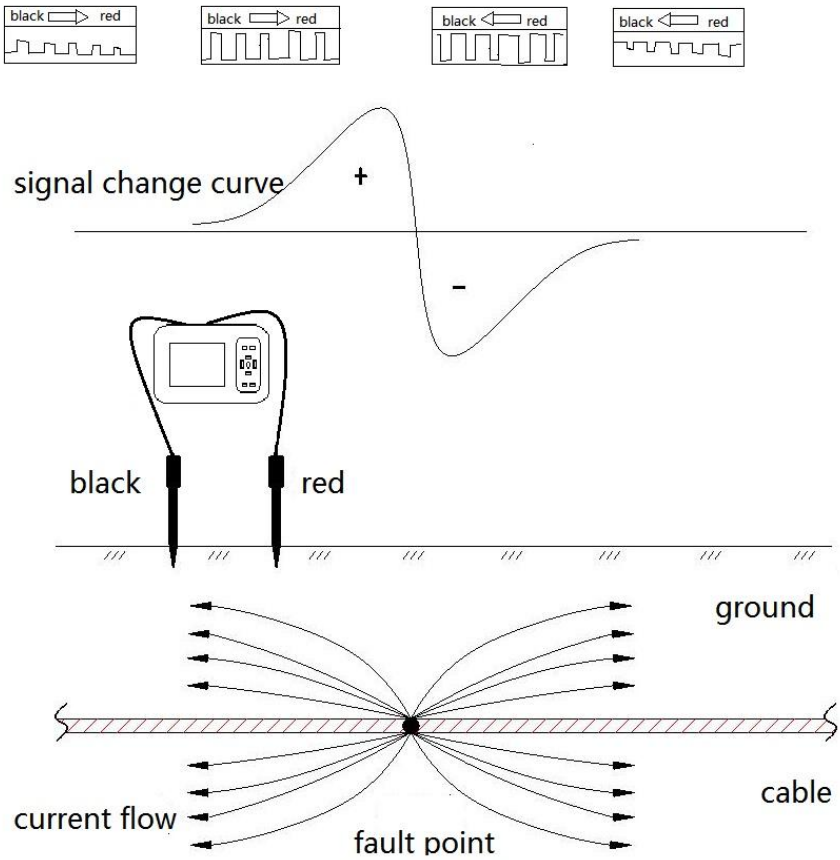


Fig.8 Step voltage pinpointing reference

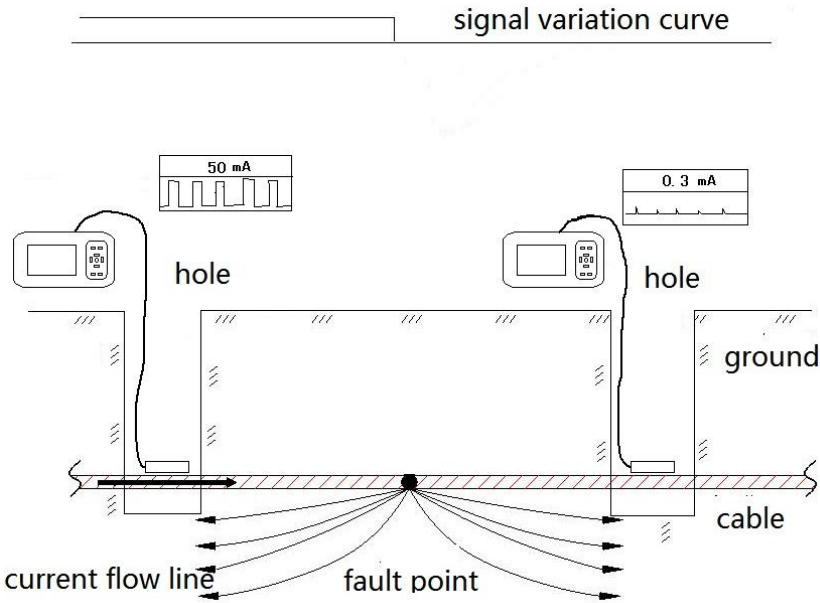
3.2.3 Fault current signal pinpointing

Step voltage signal pinpointing may fail when cable is laid through PVC pipe. Now we should

the fault current signal pinpointing method.

A current sensor is plugged in device to measure the current flowing through the faulty cable in the power hole. The current is present before the position of point of failure and disappears after over the point of failure. According to this feature, the fault point can be located between two bore holes. See Figure 9.

After inserting the current sensor, press the mode plus or minus key to switch to the fault-current pinpointing mode. During measurement, the current sensor should face up and the bottom side should be as close as possible to the cable under test. The direction of the arrow of the sensor should be consistent with the direction of the cable and point to the far end.



3.2.4 HV signal rod pinpointing

Fig.8 Step voltage pinpointing reference

Usage: suitable for cable laid on cable support, such as cable special tunnel, comprehensive trench, shared tunnel and other corridors or tunnel structures that used to hold a large number of cables laid on cable support.

Transmitter mode setting: remove the output line of the reference phase of the FLD-902D sheath rangefinder, and connect the output line of the fault phase to the fault sheath, then test ground wire connected to the earth. Press the DC/PULSE button to make the FLD-902D work in the DC output state.

When the cable insulation layer on the support in the tunnel is damaged, the high voltage rod is used to pinpoint. According to the different voltage at different positions, the fault point of the cable insulation layer can be quickly found. After inserting the high voltage probe, press the mode plus or minus key to switch to the high pressure probe fixed point mode to start measuring pinpointing .See Figure 10.

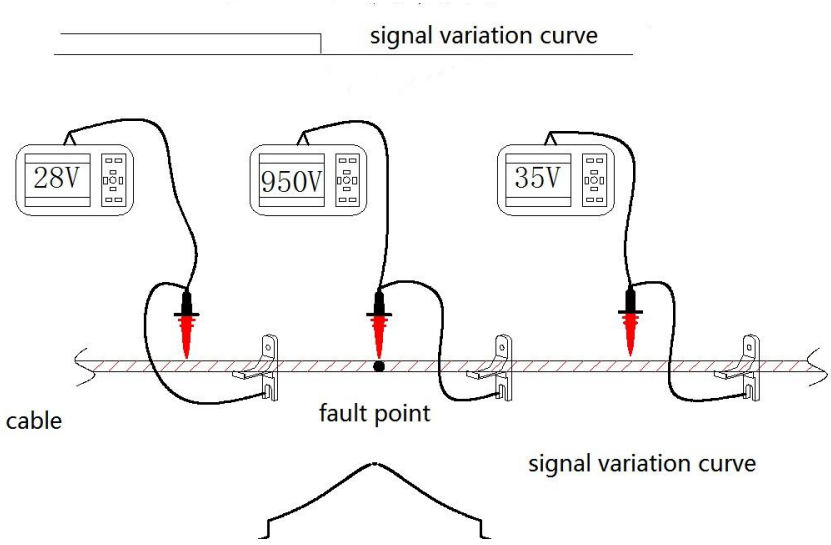


Fig.10 HV rod pinpointing section diagram

Safety warning!

The pinpointing of the high voltage rod involves the safety of people and equipment. Do not touch the cable body on the cable bracket when working!!!

NOTIFY.

1. The injection voltage using the pulsating DC method may be very high, and there may be high voltage on the cable surface (semiconductor layer) near the fault point, so it is forbidden to directly contact the cable body with the step voltage probe.

2. If there is a cement cover directly above the cable and the probe cannot be inserted, the test can be carried out in the nearby soil parallel to the cable. If the hardened ground area above the cable is large area and dry, wet the ground at the test point with water before measuring.

3. If there are multiple fault points in the protective layer, the ranging result is generally close to the most serious fault point, the point should be pinpoint and repaired first. If there is still a fault, the ranging and pinpointing process should be repeated until all the fault is repaired.

4. The output voltage of the high-voltage signal source should be lower than the withstand voltage standard of the cable sheath, generally not exceeding 10KV. Special attention should be paid especially when using the impact method.

5. For the core wire fault of three-core clad cable, if the armor at the fault point has been damaged, the step voltage method can also be used to assist the pinpointing point. However, since the armor is likely to be damaged at multiple points, the pinpointing point result is not unique, and it can only be used as an auxiliary method if other pinpointing methods (such as

acoustic magnetic synchronization method)not work.

5. WARRNATY AND MAINTIAN

Device main unit and accessories are one year guarantee of free maintain, battery is one year free replacement.Beyond one year, only charge for basic component cost for maintaining.

For device breakdown by incorrect using (in the warranty) or device quality problems over warranty, we are responsible for maintaining and only charge basic component cost.

When auto power-off, unable to power on or immediately shut after power on, it's possible because low battery. Charging first and again.

If other problems, don't to maintain by yourself, contact with us first.

(manual version:V1.0)