GD-610

Faulty Insulator Long-distance Laser Locating Detector

Operating Manual

Wuhan Lvnengde Precision Testing Technology Co., Ltd

1.safety precaution of GD-610

before operating GD-610 in potential explosive environment，please read the safety notice carefully.

●please make sure the environment conditions according with the corresponding the protection grade of GD-610

●in any case, do not to try maintaining or replace the subassembly of GD-610.when trouble happen, please connect us

●must operate in non-potential explosive environment

●must charge GD-610 in non-potential explosive environment

●BATTR800-02 is the only authorized power supply

●maximum allowed indoor temperature : -40～50℃

●static electricity of displayer has potential menace, avoid it

●avoid friction

●avoid falling

2.overview

Usually， the high voltage distribution network and power transmission and transformation equipment go wrong due to flashover because of degradation of insulator、earthing or porcelain cracked and so on. The failure of grid effects production activity and personal safety. Timely find and remedy the trouble of insulator is important to continuous and safe operation of the high-voltage grid

Until nowthe common test method is as follow：

● Spark-fork：the most common test method until now, this method judging good or bad of the insulator by whether there is spark between the spark-fork and insulator.

●Small-ball discharge：the common test method. This method analyze voltage distribution of the insulator by testing the arcing distance between the small ball of both ends on the insulator, thereby judging whether the tested insulator is normal or not. This method needs to adjust the distance of the two ball frequently and with high misjudgment rate.

●Thermal infrared imager：the more advanced method. It makes the online test by make use of the principle of heat-effect on the surface of insulator. This method is very effective to the insulator with semiconducting glaze on the surface. Because insulator of this kind , while operating, surface of the normal

insulator with large current and high temperature rise, but however the surface temperature of the bad insulator is lower several degrees. It's very easy to identify by the thermal infrared imager. But for the glass insulator or ordinary glaze insulator, the surface temperature between the good and bad insulator is only about 1℃. That's make it hard to test and the accuracy difficult to guarantee under complex climate and field environment conditions.

●**Insulation resistance:** also a more advanced method. By making use of the current sensor to test the leakage current flow from one end to another of the insulator , then transmit the result to the information processing center and process the information centralized, thereby realizing the telemetering of the insulator. But this means exit a great flaw: every bunch insulator needs a set of inspection equipment, in actual use the user can not bear because the cost is too high , and also the maintenance and repair must act after cutting the power.

●**Laser Doppler vibration method:** take advantage of the different center frequency of vibration between dehiscent insulator and normal insulator. By external force such as knocking the iron tower or ultrasonic generated by the ultrasonic generator, use a parabola style speculum to aim at the tested insulator or laser source to aim at the tested insulator ,that stir up tiny vibration of the insulator. And then aiming at the insulator by the laser of the laser Doppler , getting the centre frequency of the tested insulator according to the spectrum analysis of reflection signal. On the basis of the centre frequency the user can judge the good and bad of the insulator. However the machine is invalid for the not dehiscent insulator and it's enormous、heavy、hard to maintain、high cost and ect, all the disadvantages limit the range of applications.

● partial discharge：The sound radiation of partial discharge appear in the total sound spectrum. Hearing the sound is possible but depend on individual hearing ability. There are advantages for instrument to test the ultrasonic in the sound spectrum： instrument is more sensitive and irrelevant to operator. Furthermore, frequency above sound spectrum is more directional. In addition, ultrasonic tested by instrument can filter the useless noise in the environment，thereby realizing more accurate positioning. In the high voltage distribution network system， the power line 、 the insulator and other equipment the partial discharge is common， by testing the ultrasonic of the partial discharge the user can make sure where the discharge happened that provide an important reference to the maintenance . No need to cut power or disassemble equipment and also widely used in railway、chemical、automobile、military industry and so on .

GD-610 Long-distance partial discharge tour-inspection detector is a high sensitive product designed to convenience of testing partial discharge. By complex impedance high sensitive probe, analyzing the discharge signal ， filtering the complicated and changeable environmental signal, making partial discharge high frequency acoustic spectrum pure and outstanding. That's convenient for electrical engineer to find potential fault point.

3. Brief introduction of GD-610

GD-610 Long-distance partial discharge tour-inspection detector is used for finding the accurate position of the bad insulator in power station and transformer substation. It's suitable for testing partial discharge of electrical equipment、corona discharge、high-voltage switch and so on.

Test items

● test the unknown reason flashover failure of the on line

insulator（repeatedly trip and switch on）

- failure of composite insulator
- high-voltage connector discharge
- detect discharge caused by the poor connect of the switch in high voltage equipment
- corona discharge detecting
- pollution flashover detecting

Range of application

Electric power、rural area electricity、hydraulic engineering and other department where with electrical power grid. And it’s also suitable for production、users of high-voltage equipment such as industrial and mining enterprises 、research and development institution and so on.

4.operating principle

when flashover happened in the power transmission line of power station and transformer substation due to the degraded insulator. The flashover will produce a kind of high frequency ultrasonic. The high frequency can’t be heard by our ear. Sound collector of GD-610 collect and amplified the sound, input it into the detector. The detector adopt unique microcomputer to shape、amplified、process this weak signal and then transform it to audio frequency signal. The user can hear the sound by an earphone and see the signal strength indication on the displayer. By this method the users judge the degradation degree of the insulator. The GD-610 has strong directionality（the laser lock the source of sound, detect the accurate position of the degraded insulator）. The result provide technical support and improve work efficiency， that’s fulfill the final aims of detecting the failure by this instrument.

5.functional characteristics

● small size、light-weight、novel and aesthetic structure、complete functions、easy to operate、safe and reliable

●long-distance detecting、laser aiming,accurately located the bad insulator and the equipment, 100% correct judgement.

●aluminum alloy frame, firm and portable

● stereo headset and LCD dual indicator, obvious effect.

●strong anti-interference capability

●high intelligentized

（1）have the function of date locking

（2）lower voltage protection（while the voltage is low, the instrument auto power-off）

（3）constant current charge, auto off while full charged

● high quality lithium battery, charge-discharge 1000 times, equiped intelligentized charge-discharge system to increase the service life of battery

6.technique data

Main part	1	Center frequency: 40KHz±2Hz
	2	sensitivity: AC 10KV distance 18M AC 35KV distance 25M AC 110KV distance 50M AC 220-500KV distance 50M
	3	Operating voltage: 7.4V（two lithium-ion batteries）
	4	size: 250×125×140（mm）
Aluminum alloy tray	1	Laser wavelength: 650nm beam divergence: 0.4mard power: ≤50mw size: 16×0mm
	2	3.5×30 scope, dismountable hand shank, tripod standard hold-down nut.
	3	High frequency sensor: centre frequency fo: 40KHz±2Hz centre capacitance Co: 2500±20%PF operating temperature: -20～60℃ weight: 2.17kg
headset	1	Rated impedance Z: 125Ω
	2	Frequency range: 100Hz-10KHz
	3	sensitivity: （1W/1m）60dB
Charger	1	input: AC220V±10%
	2	Input Voltage frequency: 50Hz±5%
	3	output: DC 8.4V
	4	Output current: 1A
	5	Packing size : 470mm×340mm×420mm
	1	Working humidity:（0～100）%RH
	2	Operating temperature: -30～60℃
	3	Total machine weight: 7.18kg

7.whole structure

1、component part

Aluminum alloy tray（locate and receive signal）

Stereo headset

Charger

Packaging box

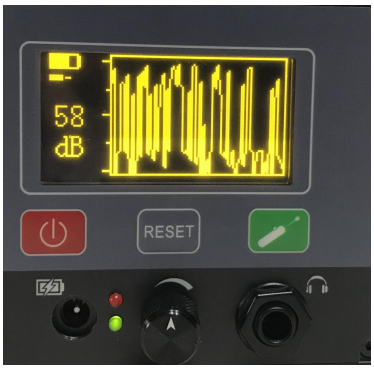
2、Aluminum alloy tray（locate and receive signal）

- Laser source：locate the position of bad insulator
- Sound collector：collect ultrasonic wave the discharged insulator emitted
- High frequency sensor：receive signal
- Mainpart

panel：

displayer：

Display the strength of the signal

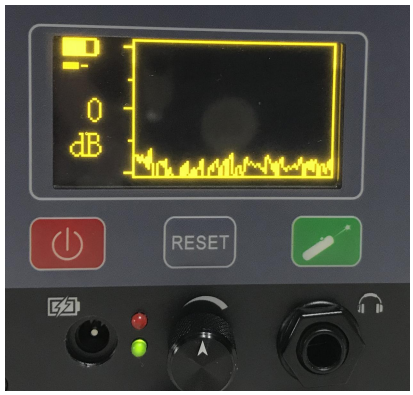


power on:

 “power on/off”key ：in shutdown mode，press this key to turn on ，the displayer display the following characters，2 seconds the machine go normal working mode

power off:

in on mode，press “power on/off”key ，the machine turn off



charge hole:

 when charging，insert the plug of the charger into this hole，the indicator of the charger turn red，when fully charged，the indicator go green。While the indicator turn green，，the charger turn into tiny-current mode. The charging time about 4 hours.

Volume adjustment:

Adjust the volume of the headset. To protect your hearing, turn this rotary knot to proper position

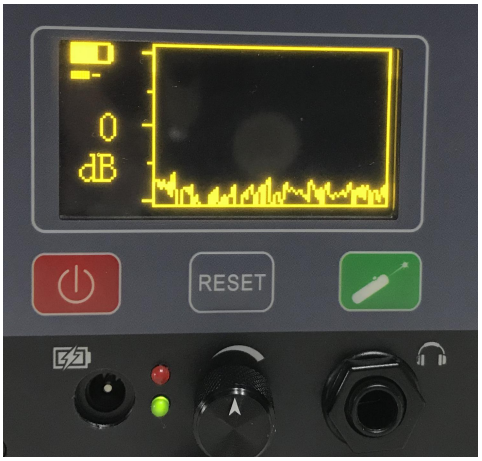
Headset jack:

Inset the plug of the headset to hear the ultrasonic signal and the displayer display the logo of the headset.

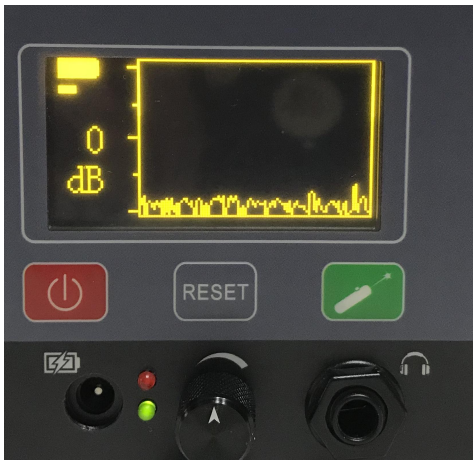
Insert the headset

Laser switch:

Default on. The displayer show the status of the laser.



Laser on



laser off

Reset:

when system halted, press the reset button to restart

3、The DB value on the LCD displayer

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DB is not a absolute value but a relative one.

formula: dB＝10Lg（X/Xr）Lg means logarithm based on 10, Xr is the reference value.

General speaking, the reference value Xr is the sound power that human get heard.

the following relationship ：

dB＝0, X＝Xr, that is volume of 0 DB is human can heard just right。dB=-1, X=0.1Xr, means **negative DB and can’ t heard, positive DB express the sound volume that human can heard**。DB value reduce every 10 means that the sound power reduce 10 times , dB value increase every 10 and the sound power increase 10 times, dB=10, X=10Xr。

Express the sound and noise by DB own the other one advantage: the sound human heard is relative change but not absolute change.

Logarithm Scale can just imitate the reaction that human ear heard the sounds.

8、operational approach

1、open the packaging and get out the instrument

2、get out the headset , insert the plug into the headset jack

3、test

●press the ‘on/off key’, the display show the boot screen and at the same time the laser on. If the display show low battery, please charge it（the first time you should charge more than 10 hours）

●adjust the volume knob to the max 。

●aiming the laser to the insulator or some other high-voltage equipment（such as high-voltage switch）, if the head set appear the discharge sounds “click click” and at the same time the LCD displayer shown the DB value. That’s indicate that the insulator is poor performance. If the ‘click’ sounds is loud and the DB value is big please pay attention to this insulator because it is severely damaged.

● if test nearby the utility pole and transformer, to avoid misjudgment please go a multi-point detection around the utility pole and transformer.

●when testing the transformer substation, if many places discharging and the discharging quantity is large. DB value on the screen is full and can’t distinguished. Please rotate the volume knob to the proper position. Mainly located the discharge source by the sounds we heard and the DB value assist. If the laser aim at the insulator and the DB value turn bigger and when deviated the DB value decrease or turn zero. It means that the insulator is discharge failure or insulation deterioration. While cutting power and maintaining we should pay focus on.

●to save the battery and extend service of the laser. After finishing the test please turn off the laser.

9、matters needing attention

To guarantee the testing go on smoothly and safety , please attention the followings:

1、 when maintaining, the user should keep a safety distance off the live equipment. Non-specialized staff do not operate the instrument

2、 to avoid damage eyes, direct the laser to eyes is forbidden.

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3、if the battery is low , please charge the battery timely

4、do not disassembly the instrument in any case. If it work abnormal please contact us we will solve the problem in time.

5、insulator of different manufacture with different material and technology, the DB value of the discharge is different.

6、after heard the discharge sounds（the sounds including discharge high-frequency sounds and sounds from the insulation resistance deteriorate）,in principle , we should targeted maintenance、appearance inspection、clean、scrub and ect.

7、after scrub, we still heard the discharge sounds, that is means the insulator is not pollution discharge and it is seriously degraded.

8、in dry weather 10KV（distance 6-18M）, 27KV（distance 6-10M）, 35KV(distance 10-22M),110KV(distance 20-40M),220KV(distance 30-45M), 500KV（distance 35-50M）.the fault sounds got heard〔DB value ＞20（reference value）〕, that illustrate the insulator is poor quality or insulator above 27KV is low resistance.

9、if testing the flashover breakdown, affected by the weather（such as sunny day、cloudy day、greasy day）, the value maybe different. If in the sunny day the fault sounds can’t tested but greasy day can, than is to say the breakdown is low however if sunny day tested the sounds it means the breakdown is serious.

10、in certain humility（morning、greasy day）the sounds do not heard, we can reduce the frequency of scrubbing. Avoid aimless scrubbing every insulator, time-saving and labor-saving, reduce the workload.

11、in dry weather the tested insulator usually behave low resistance and flashover faults. High humility day mainly polluted fault.

12、in the same power line, compare some different insulators, that method can judge rapidly the broken-down insulator。

13、in the same power line, when heard more than one insulators discharge signal, you should first check the DB value bigger one and then check the smaller.

14、the running cars、walking man may emit ultrasonic wave but it's discontinuous. Sometimes it may interfere the instrument. Please attention it.