LDS800

Partial Discharge Detector

Operation Manual

catalogue

LDS800’s safety precautions

Before using LDS800 in a potentially explosive environment, please carefully read the safety precautions.

- Please ensure that your usage environment is suitable for the corresponding LDS800 protection level.
- Under no circumstances should you attempt to repair or replace LDS800 components by yourself. When the instrument malfunctions, please contact the manufacturer for maintenance or replacement.
- Dismantling and maintenance must be carried out outside a potentially explosive environment.
- BATTR300-02 is the only authorized and designated power supply for LDS800 .
- The maximum allowed room temperature is:
  - T3：-15℃ to 50℃。
  - T2：-15℃ to 60℃。
- Potential threat of static electricity on the display, avoiding static electricity：
  - Avoid friction
  - Avoid dry cleaning
- Do not use LDS800 portable instrument boxes in hazardous areas.

Catalog

1. Introduction

Partial discharge mainly refers to high-voltage electrical equipment. According to the statistics of the power grid, partial discharge is an important cause of insulation breakdown in high-voltage electrical equipment and also an important indicator of insulation degradation. The partial discharge is that occurs in the insulation of power equipment under the action of a sufficiently strong electric field. This discharge is limited to only causing partial short circuit of insulation between conductors without forming conductive channels. Each partial discharge has some impact on the insulation medium, with slight partial discharges having a smaller impact on the insulation of power equipment and a slower decrease in insulation strength; but strong partial discharge can quickly reduce the insulation strength. This is an important factor that causes insulation damage to high-voltage power equipment. Therefore, when designing insulation for high-voltage power equipment, it is necessary to consider that under the long-term working voltage, strong partial discharge is not allowed to occur within the insulation structure. The power grid should strengthen monitoring the equipment in operation. When partial discharge exceeds a certain level, the equipment should be taken out of operation for maintenance or replacement. In a solid dielectric medium containing gas or liquid, when the local field strength of the gas or liquid with breakdown field strength reaches its breakdown field strength, this part of the gas or liquid begins to discharge. The partial discharge is generally caused by a particularly concentrated local electric field inside the insulation or on the insulation surface. Usually, this discharge is characterized by a pulse duration of less than 1 μs. When partial discharge occurs in insulation, it will affect the insulation life. Each discharge, the impact of high-energy electrons or accelerated electrons, especially the long-term partial discharge, will cause various forms of physical effects and chemical reactions. For example, when charged particles hit

the outer wall of the bubble, they may break the Chemical bond of the insulation and cause cracking, damage the sub structure of the insulation, cause insulation degradation, and accelerate the insulation damage process.

1. Partial discharge is a precursor to local overheating and aging of electrical and mechanical components;

2. The trend of partial discharge is the exponential increase of partial discharge over time, which is a tortuous process. At a certain stage, it may decrease, but at a certain stage, it increases;

3. When partial discharge is generated in the insulation structure, it will be accompanied by the generation of electrical pulses, ultrasound, electromagnetic radiation, light, chemical reactions, and cause local heating and other phenomena;

Due to the above characteristics of partial discharge, how to avoid and remove partial discharge in electrical equipment, so as to ensure normal and safe operation of the equipment, has become the most important consideration for power equipment maintenance personnel. In order to eliminate this latent fault phenomenon, many online detection methods of partial discharge phenomenon have been derived for electric pulse, ultrasonic, electromagnetic radiation and other signals generated with partial discharge.

The LDS800 handheld partial discharge tester developed by our company is a multi-functional handheld instrument, which detects partial discharge of equipment based on transient ground voltage, ultrasonic, Ultra high frequency and high-frequency current detection methods; Suitable for partial discharge detection of electrical equipment such as cables, GIS, switchgear, and transformers.

2.Basic Principles

1. Transient ground voltage

When partial discharge occurs in high-voltage electrical equipment, the discharge energy first accumulates in the grounded metal part adjacent to the discharge point, forming electromagnetic waves that propagate in various directions. The electromagnetic

waves generated by the discharge propagate through the joints of the metal box or the gasket of the gas insulated switch, while generating a transient ground voltage that is transmitted to the ground through the external surface of the metal box of the equipment.

Transient ground voltage of the partial discharge monitoring is based on the basic fact that normal power equipment rarely emits transient ground wave signals between 3-100MHz. When using this principle for partial discharge monitoring, the relationship between pulse signal and voltage phase does not need to be considered, so it can be used for routine status monitoring of a large number of equipment in the power grid.

Due to the fact that auxiliary equipment in power stations, such as lighting systems with electronic ballasts, charging systems using semiconductor switching elements for voltage regulation, carrier communication equipment, and discharge tubes with live display in the main circuit, may generate signals in the above frequency bands, attention should be paid to excluding and distinguishing such interference signals when applying partial discharge monitoring technology in this method. If necessary, other testing instruments such as spectrographs and oscilloscopes can be used to confirm partial discharge and distinguish interference signals.

2. Ultrasound

Electrical equipment generates sound waves during discharge. The frequency spectrum of sound waves generated by discharge is very wide, ranging from tens of Hz to a few MHz. Signals with frequencies below 20kHz can be heard by the human ear, while ultrasonic signals above this frequency must be received by ultrasonic sensors. Based on the relationship between the energy released by discharge and sound energy, the change in sound pressure of ultrasonic signals is used to represent the change in energy released by partial discharge. By measuring the sound pressure of ultrasonic signals, the strength of discharge can be inferred, which is the basic principle of ultrasonic signal detection of partial discharge.

3. Ultra high frequency

The insulation strength and breakdown field strength in power equipment insulators are both high. When partial discharge occurs within a very small range, the breakdown process is fast, resulting in a steep pulse current with a rise time of less than 1 ns and excitation of electromagnetic waves with frequencies up to several GHz. The basic principle of partial discharge detection Ultra high frequency method is to detect Ultra high frequency electromagnetic wave signals generated during partial discharge in power equipment through UHF sensors, so as to obtain information related to partial discharge and realize partial discharge monitoring. Ultra high frequency detection frequency band is 300MHz-1.5GHz. According to different field equipment conditions, built-in Ultra high frequency sensors and external Ultra high frequency sensors can be used.

Due to the fact that on-site corona interference is mainly concentrated in the frequency band below 300MHz, UHF method can effectively avoid on-site corona interference and has high sensitivity and anti-interference ability. It can achieve advantages such as partial discharge live detection, positioning, and defect type identification.

4. High frequency current

The insulation strength and breakdown field strength of power equipment insulators are both high. When partial discharge occurs within a small range, the breakdown process is fast and a steep pulse current will be generated. Partial discharge occurs inside high-voltage electrical equipment, and the discharge current propagates along the grounding wire to the ground. Pulse current generated by partial discharge can be detected on the equipment grounding wire. The high-frequency current sensor HFCT based on this method generally uses Rogowski coils. The detection of electrical equipment grounding wires using high-frequency current sensors is a non-invasive method, and the tested equipment does not need to be shut down, making it simple and reliable.

3. Main functions of the product

(1) The transient ground voltage detection function uses the transient ground voltage method to detect the internal discharge activity of the switchgear;

(2) The ultrasonic detection function depends on the built-in non-contact airborne sound sensor in the host, and uses the ultrasonic method to detect the discharge activity of the switchgear; Ultrasound is commonly used for long-distance partial discharge inspection, ultrasonic gas leakage detection, ultrasonic partial discharge positioning, and partial discharge detection of switchgear.

(3) Ultra high frequency detects the function time domain mode of ultra- high frequency detection.

(4) High frequency current detects the discharge level of high frequency current.

(5) Historical data function: Users can save, view, or delete measured data.

5. Precautions

(1)When testing, it should be ensured that the metal casing of the electrical equipment is well grounded before using the probe.

(2)Strictly follow the safety operation regulations, and do not take measurements during thunderstorms or high environmental humidity.

(3) Ensure a safe distance between the high-voltage section and the instrument, probe, and operator at all times.

(4)Do not perform measurements immediately upon high voltage energization.

(5)Do not interfere mechanically (such as shaking or knocking), electrically (such as increasing voltage), or physically (such as heating) during the testing process.

(6)Do not operate instruments and their accessories in explosive environments.

(7)There is high voltage inside the battery charger, and users are not allowed to open the device and repair it on their own; Do not open the cover or disassemble internal parts.

(8) This instrument is not suitable for self-maintenance and repair by the user. If a malfunction occurs, the instrument should be returned to the equipment manufacturer.

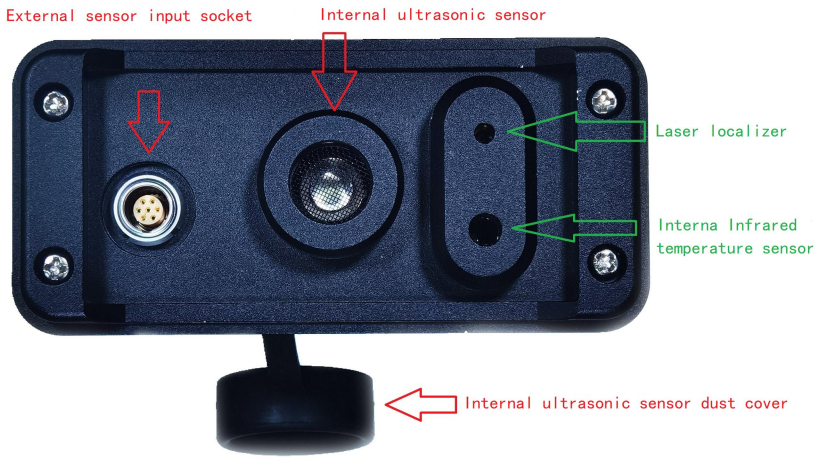
(9) When working in narrow corners, caution must be exercised as proximity to other grounding points may affect the accuracy of readings.

This instrument is designed to detect partial discharge sources in medium to high voltage (MV/HV) equipment. The discharge source often has a latency period, and the insulation performance may also fail due to reasons other than partial discharge. If no discharge is detected, it does not necessarily mean that the device has no discharge activity. If significant discharge is detected and determined in the equipment connected to the medium and high voltage power system, the responsible unit for the equipment should be notified immediately.

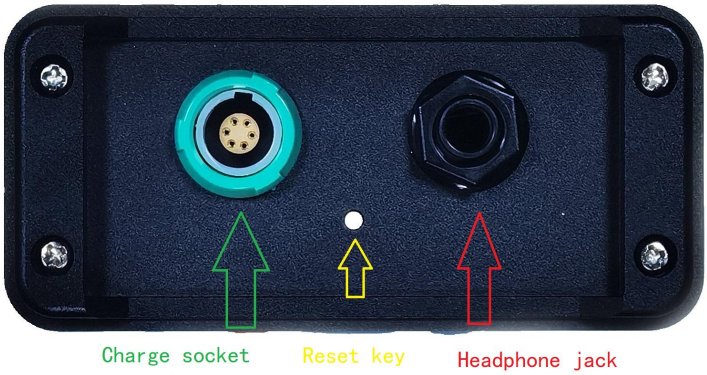
Instrument Introduction

1. Front of the host

2. Top of the instrument



3. Bottom of the instrument



4. Overview of the instrument

The host

（Including built-in ultrasound sensor ）

Bend detector and cable

（ Optional）

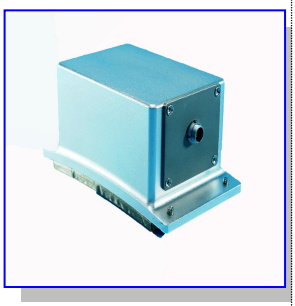
charger

（standard configuration）

headphone

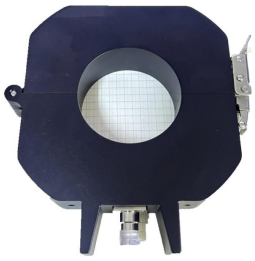
（standard configuration）

External TEV&AE probe(standard configuration)



UHF probe

（ Optional ）

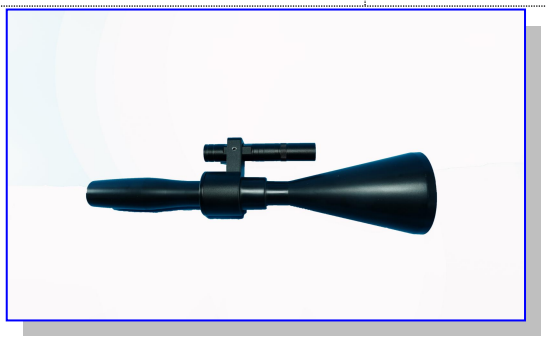


HFCT probe

（ Optional ）

Contact-type ultrasonic probe

（ Optional ）



Horn ultrasonic probe

(Optional)		

5. Battery charging

The LDS800 run by a built-in lithium battery，Connect the battery charger plug to the socket at the bottom of LDS800.

LDS800 can only be charged in a completely non explosive environment.

Due to the unique self discharge rate of lithium batteries, it is recommended to charge the LDS800 battery at least every 3 months even if not in use, and only use the charger provided by LDS.

The charging time is usually 4-5 hours. When the charger indicator light is fixed green, it indicates that the LDS800 battery charging is complete.

LDS800 can be charged both when turned off and on.

special charger of LDS800

A fully charged battery can provide you with a continuous usage time of at least 12 hours. This depends on whether you need to use backlight and the power consumption

of certain external sensors.

operation

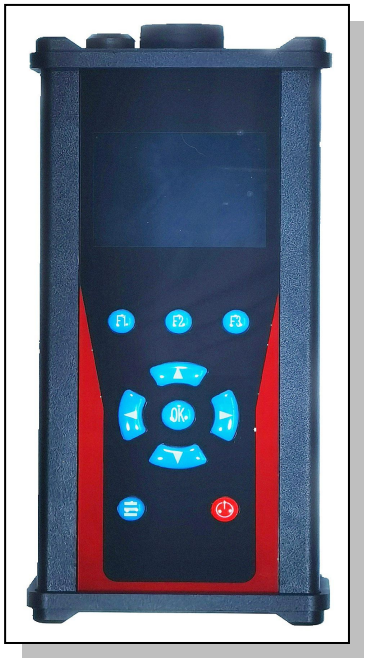
1. Turn on and off LDS800

Power on：

There is a power button (red) in the lower right corner of the panel, and after pressing it, you will see the loaded information item displayed on the screen. If you do not see this display, it is possible that the battery is low. Please charge the instrument promptly

shutdown：

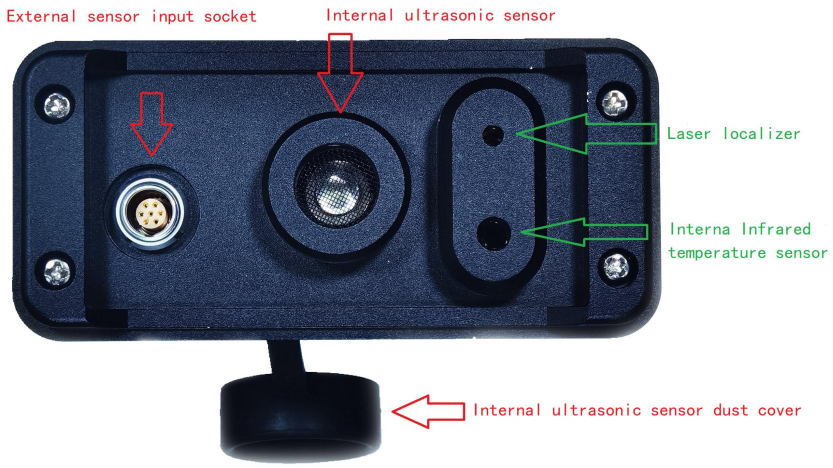
The instrument will automatically shut down when the power button is pressed.



2. Connecting and removing external sensors

The LDS800 is equipped with LEMO type sockets for connecting external sensors . It is a commonly used industrial connector that is widely used due to its high

reliability and durability



Plug into LEMO connector:

- Insert the plug marked with a red dot into the external sensor interface of the host.
- Insert the plug vertically into the external sensor interface of the host.

When an external sensor is connected to LDS800, the instrument host will automatically recognize it.

Unplug the LEMO connector:

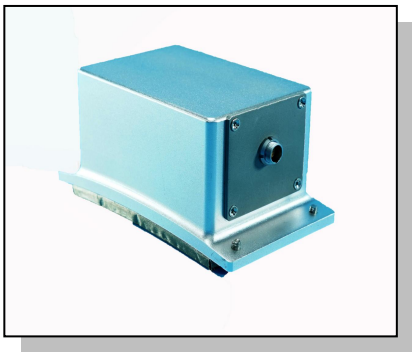
- ***Lift the ring at the bottom of the plug facing the connecting wire.***
- ***Pull out the plug vertically.***
- ***Please do not rotate the connector or directly pull the connection when pulling it out.***

LEMO connectors are as follows :

Bend ultrasonic probe （ optional accessories）

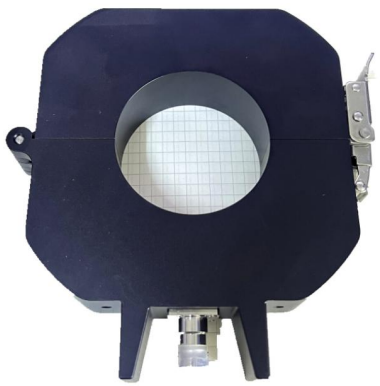
Generally used for close range ultrasound localization — it's an external ultrasound sensor（in sensor selection）

Remote ultrasonic probe （ optional accessories ） ---- it's an external ultrasound sensor（in sensor selection）

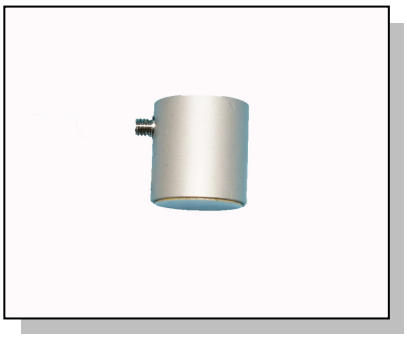


UHF external probe UHF （**optional accessories**） --- it's a Super high frequency sensor（**in sensor selection**）

Using TEV ultrasound two in one external probe（standard configuration）. Generally used for testing switchgear - it is a ground wave sensor or an external ultrasonic sensor（**in sensor selection**）



HFCT External probe （ **optional accessories**）-- It's a high-frequency current sensor（**in sensor selection**）



Contact-type ultrasonic probe（optional accessories）

Generally used for detecting partial discharge in high-voltage transformers - it is an external ultrasonic sensor（in sensor selection）

3. Run and store the high sensitivity measuring instruments

Measurement settings

The LDS800 is very simple to use, without the need for too many settings. You only need to set the amplification rate according to the up and down arrows on the right side of the display screen. When the arrows disappear, it is the best signal acquisition range.

During measurement, the volume can be adjusted by pressing the left and right buttons, and the volume level will be displayed in the upper right corner of the screen.

Store data

Pressing F1 on the test page will store the current test data, such as dBuV, A value, time, and other information to memory. At the same time, the amount

of data stored in the current memory will be displayed on the right side of the disk icon in the bottom left corner of the screen.

store data

press F1 to store the current test data，number beside the disk icon on the left corner of the screen will increase one

read data

Press F2 key to view historical test data, as shown in the following figure：

Press the right button to enter the deletion prompt, select "YES" to delete all data, press "NO" to exit the interface, and press the left button on the historical

data browsing page to return to the testing interface status.

4. Turn on and off the built-in laser locator

Press F3 to turn on the built-in laser locator, as shown in the figure:

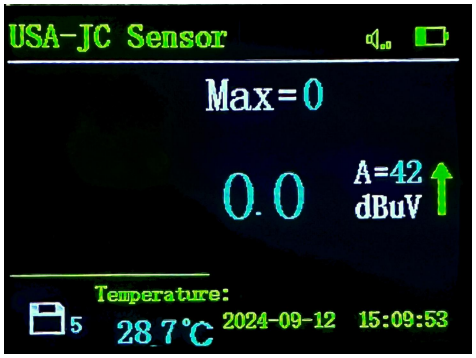
Press F3 again to turn off the built-in laser locator（Laser locator is a laser lamp）

5. Instrument settings

Press the "Enter key" in the testing interface to enter the setting interface, including home page return, sensor selection, parameter setting, time setting, auto power-off and factory restoration. Different parameters can be set according to user's preferences

Return to Home Page

Click "Enter key" to return to the Home screen



After entering and returning to the homepage, you can see the waveform, sensor model, adjustable magnification, value of the magnification, number of archives, date, sound volume, and battery level.

6. Sensor selection

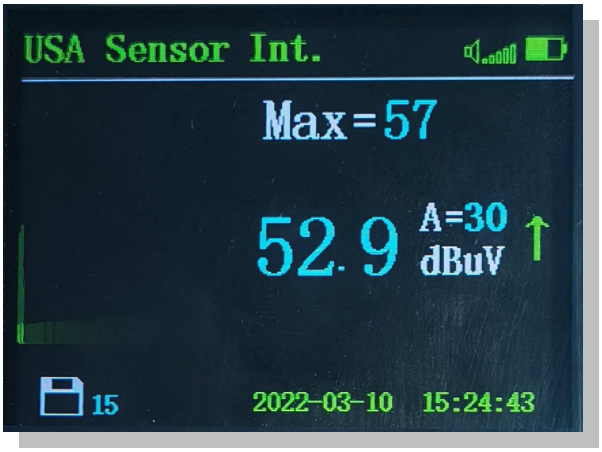
Click "Enter key" to enter the setting interface, then press "Left and Right key" to select sensor selection, and click "Enter key" to enter the sensor selection interface

There are five options:

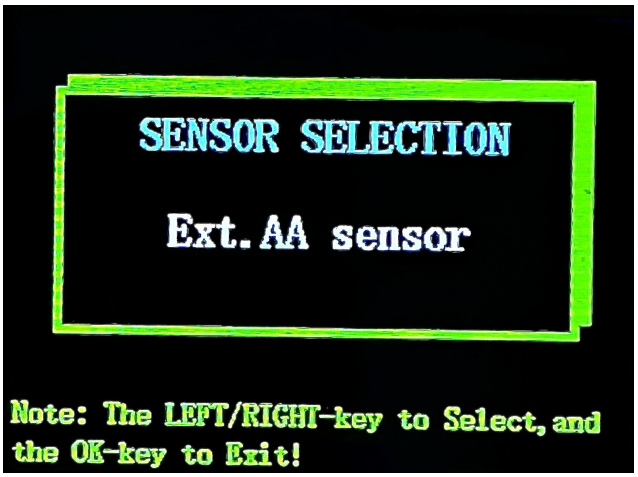
- **internal ultrasonic sensor**
- **External ultrasonic sensor**
- **Ground wave sensor**
- **Super high frequency sensor**
- **High frequency current sensor**

After entering the sensor selection, select the internal ultrasonic sensor 。

Note: Select with the left and right keys, and press the "Enter key" to select and exit.



After selecting the internal ultrasound sensor, the sensor type in the Home page will be changed to the built-in ultrasound sensor.（USA Sensor Int)。

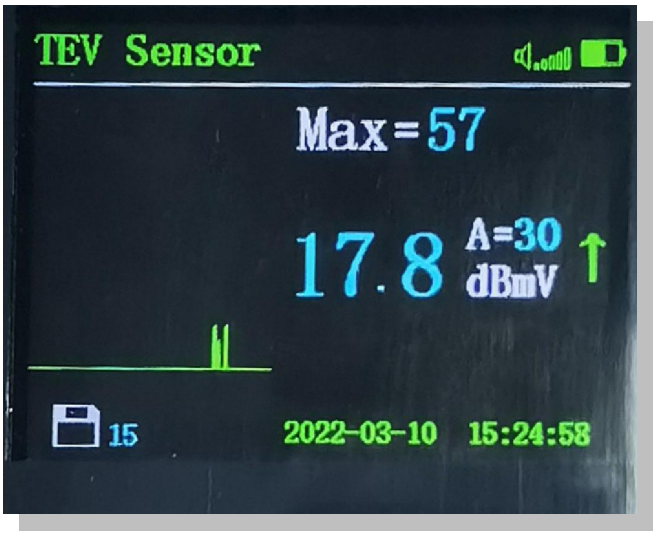


After entering the sensor selection, select the external ultrasonic sensor. Note: Left and right key selection, Enter key to exit.

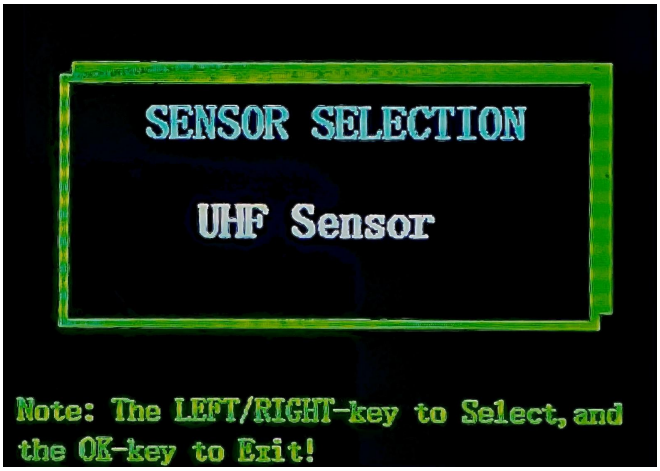
After selecting an external ultrasound sensor, return to the "Return to Home" page and the sensor type will change to an external ultrasound sensor（USA Sensor Ext)。

After entering the sensor selection, select the ground wave sensor.

Note: Left and right key selection, Enter key to exit



After selecting the ground wave sensor, return to the "Return to Home" page and change the sensor type to ground wave sensor（TEV Sensor)。



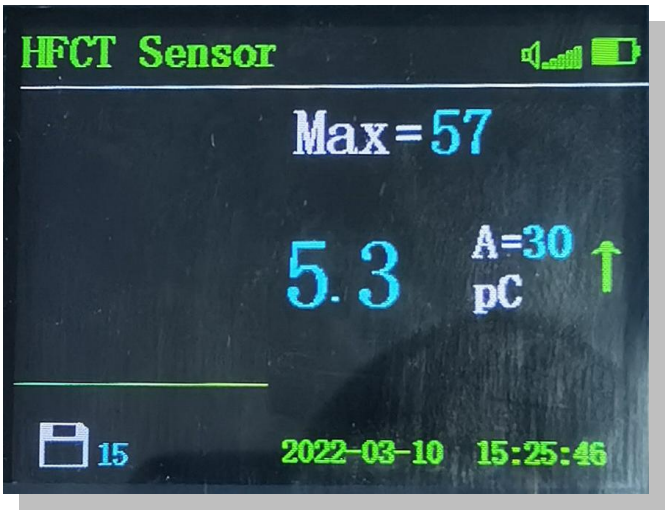
After entering Sensor Selection, select ultra-high frequency sensor

Note: Left and right key selection, Enter key to exit

After selecting the ultra-high frequency sensor, the sensor type in the Return Home page will be changed to ultra-high frequency sensor（UHF Sensor)。

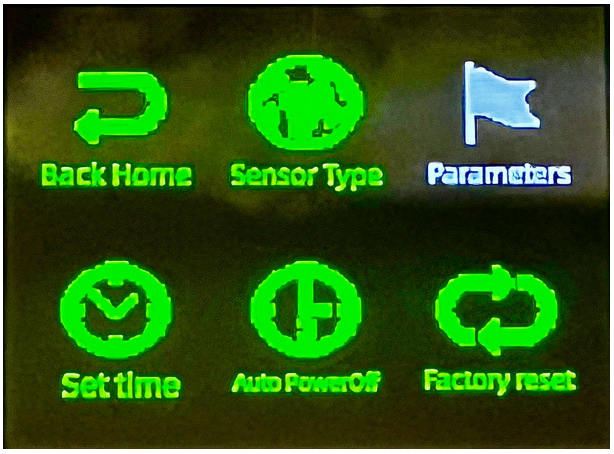
After entering the sensor selection, select the high-frequency current sensor.

Note: Left and right key selection, Enter key to exit

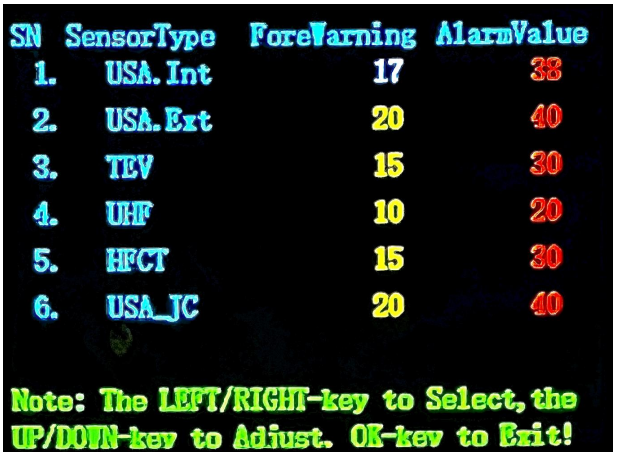


After selecting a high-frequency current sensor, return to the "Return to Home" section and change the sensor type to a high-frequency current sensor（HFCT Sensor)。

7. Parameter settings



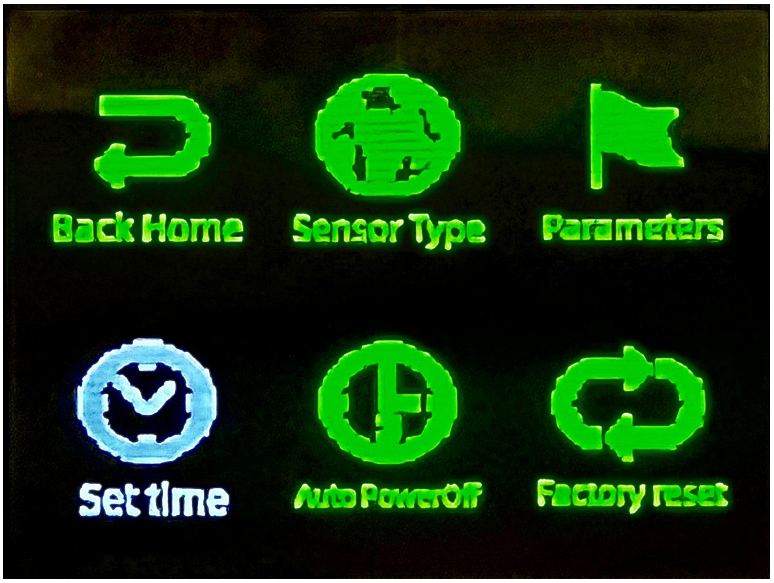
Click the parameter settings



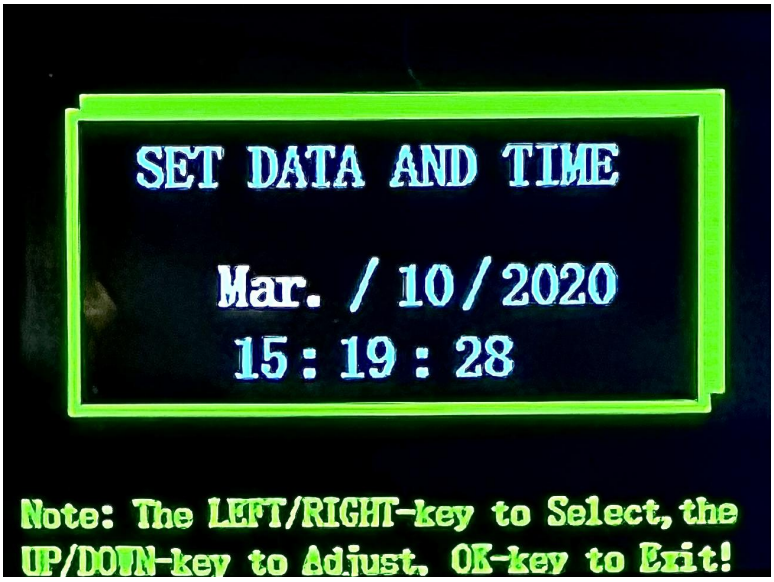
After entering the parameter settings, you can see the sensor category, warning values, and alarm values.

Note: Left and right key selection, up and down key adjustment, Enter key to exit.

8. Set Time



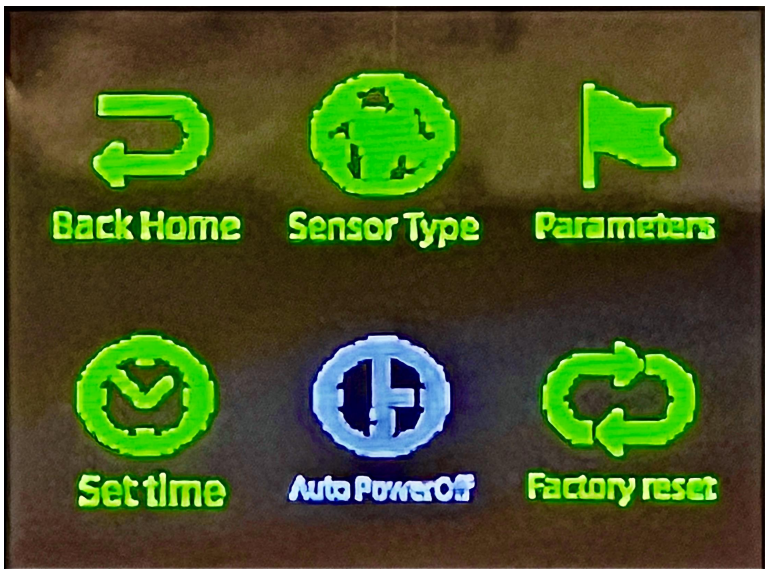
Click the "set time" icon



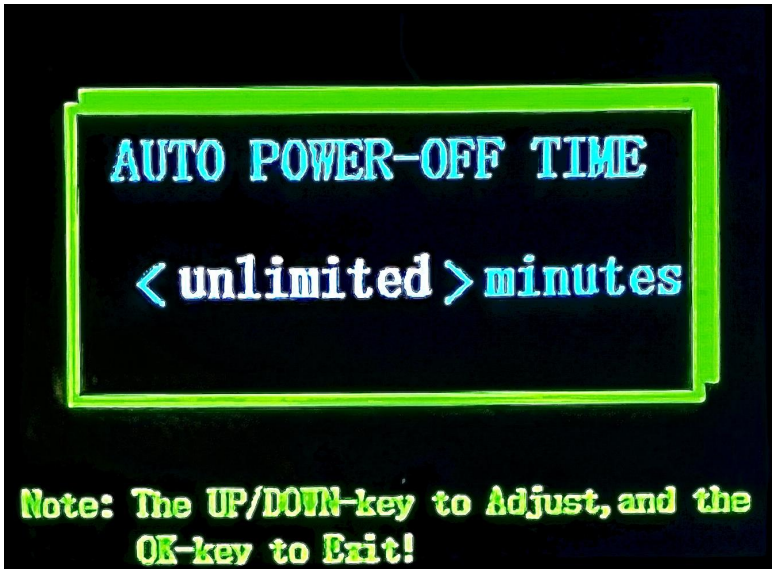
After entering the set time, the time can be set

Note: Left and right key selection, up and down key adjustment, Enter key to exit.

9. Scheduled shutdown



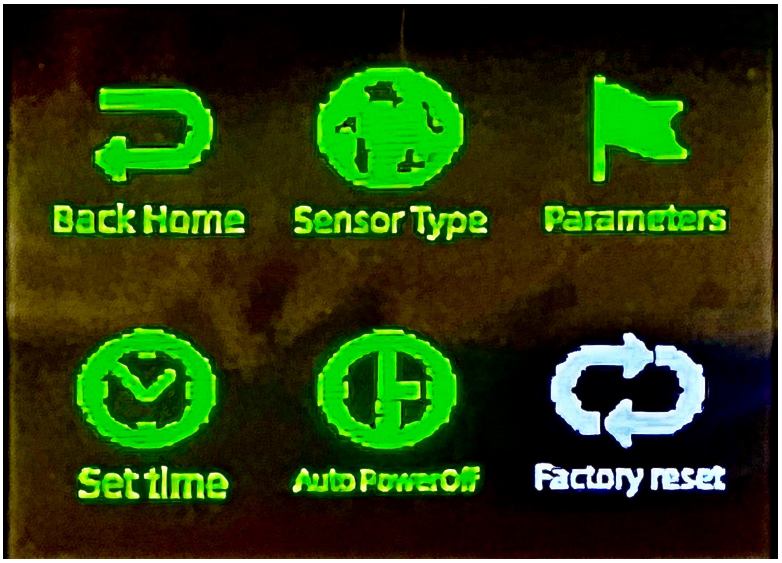
Click on Auto poweroff



After entering Auto power-off, you can set the timed shutdown time.

Note: Press up and down to adjust, and press Enter key to exit.

10. restore factory



Click to restore factory

After entering factory restoration, Factory reset can be restored

Note: Left and right key selection, Enter key to exit

Technical specifications for all LDS800 versions

1. The detailed technical specifications are as follows

Function	Multifunctional handheld partial discharge tester
Screen	High resolution, true color LCD display with backlight (320 × 240 pixels)
Internal sensor	Built in high sensitivity sensor and infrared temperature sensor (standard configuration)
External sensor	Link through specific connectors (LEMO 7-pin connector)
Date recorder	4000 measurements in total (measurement data)
Battery pack (*)	Rechargeable battery type: Standard capacity: 3.5Ah Life: 1000 to 2000 charging/discharging cycles Charging time: 4-5 hours Protection: Short circuit, reverse connection, and temperature protection
automatic power off	Automatically power off after the preset time
operation temperature	-15℃～+60℃
shell	Imported rolled aluminum material
weight	About 900g (including battery)
size	220mm×100mm×40mm（Length×Width×Height）
headphone	Noise isolation, NRR25 decibels

（*）For optimal performance, this battery pack is equipped with an electronic

management system (including digital serial number, capacity, and temperature management).)。

2. Specific technical specifications of LDS800

LDS800 according to IEC60079-060079-11 and 60079-26

Please check the room temperature before using LDS800 in potentially explosive environments. The maximum and allowable room temperature is:

- -15℃～50℃（T3）
- -15℃～60℃（T2）

Please check the electrical compatibility of non LDS sensors before using LDS800 in potentially explosive environments

3. Battery charger

Charger type	Dedicated to LDS800 NiMH batteries
Power supply	110VAC～230VAC +15%/-10% 50/60Hz
P o w e r	25W
Protection	Temperature protection, limited to 60℃/140°F
status indicator	○ Green LED continuously lit: battery charging completed ○ The red LED remains on: normal charging
insulation	Double insulation
w e i g h t	300g
s h e l l	PPE
conform to	IEC 60950 （CB certificate）

4. Declaration

LDS800 multi-function detector

The LDS800，comply with the following European regulations：

- IEC standard EN 61010-1
- EMC compatibility regulations 2004/108/CE
- Low voltage regulations 2006/95/CE

So the equipment printed with EC label means that it compliant with current EU regulations。

In order to comply with the prescribed operating rules, the design of this device follows the following principles:

- LDS800 do not emit EMC（electromagnetic compatibility）
- LDS800 do not affected by external electromagnetic radiation interference（EMI）
- LDS800 design with electrostatic discharge protection（ESD）

NOTE：The user has the obligation to pass on this user manual to future users or resell it to other users

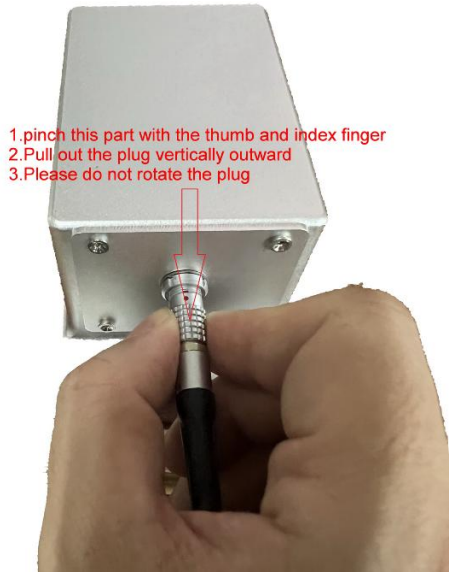
Accessory usage instructions

1. UHF sensor

（1）UHF sensor’s　Positioning slot

（2）insert the plug into the socket

（3）pull out the plug



2. TEV sensor

(1) TEV socket’S positioning slot

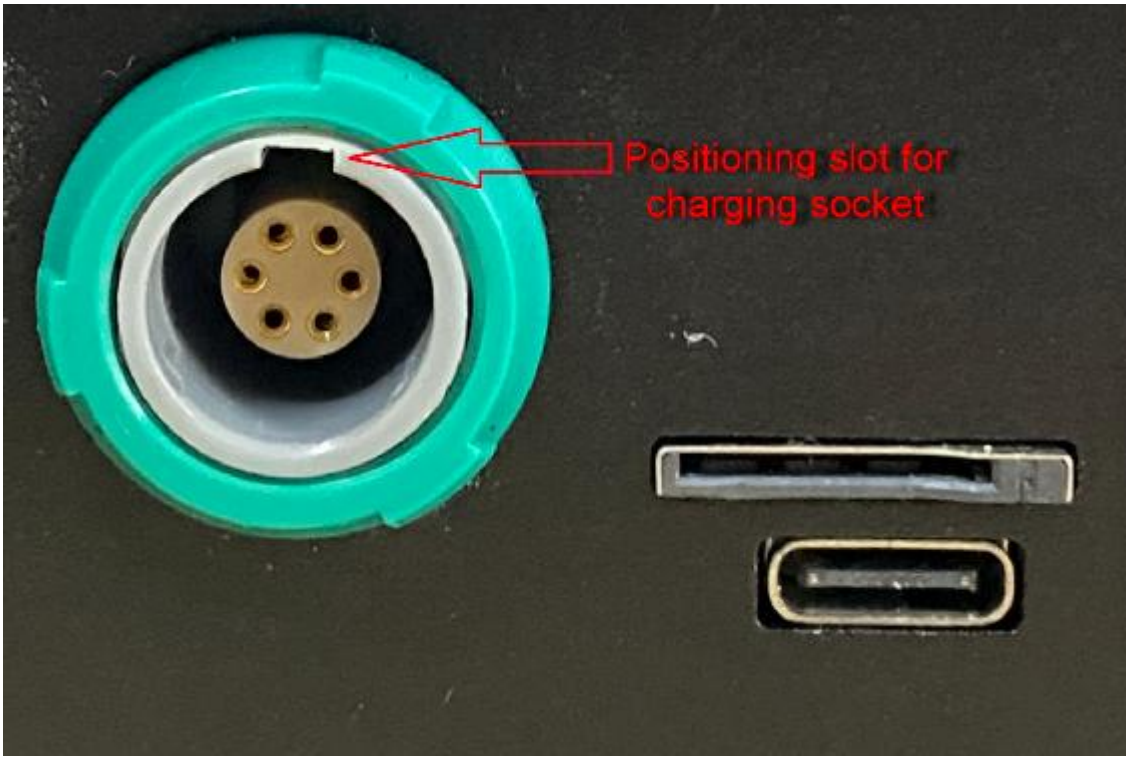
(2) Insert the plug into the socket

(3) Pull out the plug

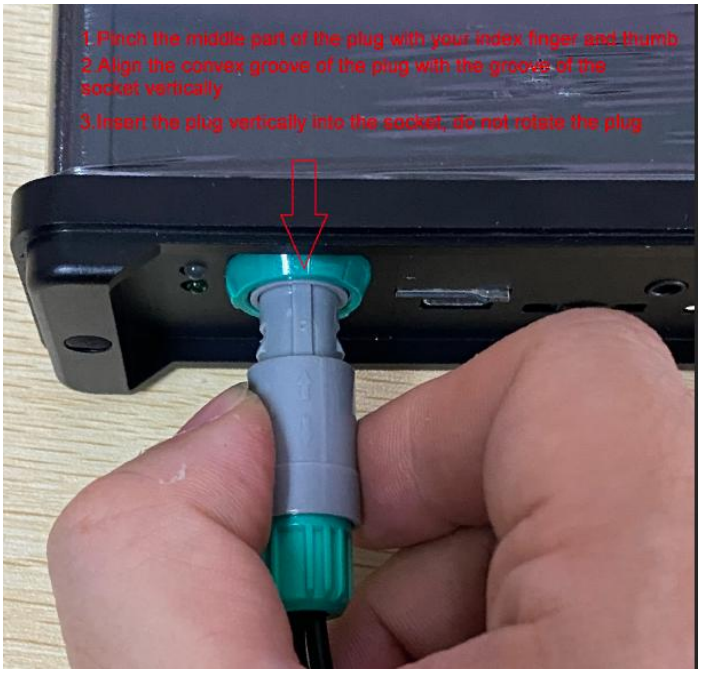
3. Instructions for using the charger of the instrument

Attention: The battery charger is used to charge the instrument, and the plug is vertically inserted and removed. Do not rotate the plug during use, otherwise it may cause damage

(1) Charging socket



(2) Insert the charging plug into the socket

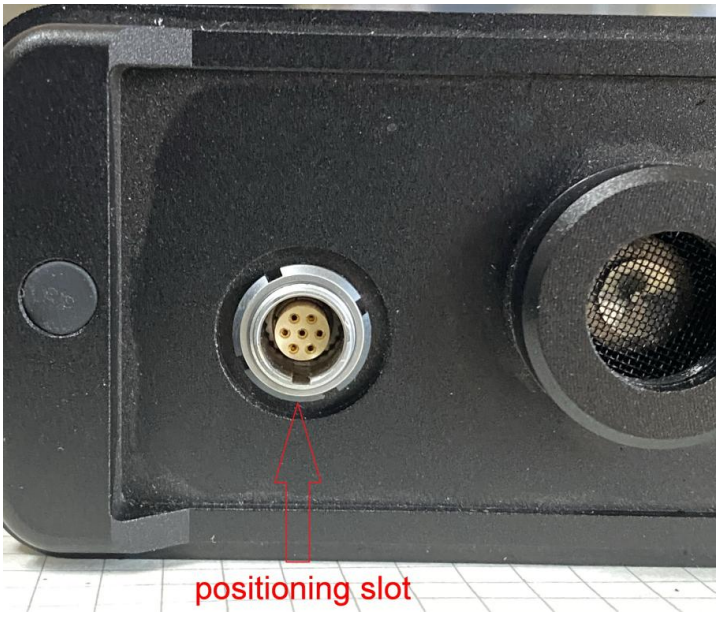


(3) Pull out the charging plug

4. Connect the external sensors

(1) Instructions for External Sensor Plug

(2) Host socket instructions



(3)insert the plug

1. Pinch the anti-slip groove with index finger and thumb
2. Align the positioning slot and the red dot
3. Insert the plug vertically into the socket，please do not rotate the plug

(4)Pull out the plug

1. Pinch the anti-slip groove with index finger and thumb
2. Pull out the plug vertically outward
3. Please do not rotate the plug

Warranty and Liability Scope

guarantee

The LDS800 Provide a one-year maintenance guarantee。But the warranty period for batteries and accessories (chargers, headphones, sensors, etc.) is 6 months 。The warranty includes free replacement of materials for all components with manufacturing faults, provided that the damage is caused by non user factors.

The warranty does not include transportation, loading and unloading, and import。

If the product is damaged due to improper use or accidental damage, altered in any way, repaired without authorization, or disassembled without written authorization, no warranty will be provided

Scope of Responsibility

In any case, neither the agent nor any related company shall be liable for any damages, including but not limited to business losses, business interruptions, information loss, defects in LDS800 components or their accessories, personal injury, time loss, monetary or material losses, or any other direct or indirect losses caused by use, or inability to use this product, even if the product has been warned that it may have been damaged.

Note: In order to continuously improve the customer experience, the company will continue to upgrade the functions or interfaces of the instrument. There may be differences between different software and hardware versions, and our company has the final interpretation right!