

Non-Linear Junction Detector «HW-24»

User's Manual



※ Before using this product, please read this manual carefully and keep it properly

USER MANUAL

1. Introduction

The non-linear junction detector “**HW-24**” (further NLJD) is used for search and location of electronic devices both in active and switch-off state.

The detector generates a response at the 2nd and 3rd harmonics when radiated by an RF probing signal. Semiconductor components of artificial origin will display a higher level on the second harmonic while corrosive semiconductor components of artificial origin will have a higher level on the third harmonic respectively. An NLJD analyzes the 2nd and 3rd harmonics response of the radiated objects, which enables a quick and reliable identification of electronic devices and corrosive semiconductors.

The NLJD “**HW-24**” automatically finds the best receiving frequency channel free of noise and distortion providing flawless operation even in the complicated electromagnetic environment.

There are two types of radiated signals:

- continuous wave carrier (CW);
- pulse modulated carrier.

This enables to combine wide detection range and reliable identification of the devices found.

Output power automatic control mode significantly simplifies operator's work. “**HW-24**” simultaneously displays the 2nd and 3rd harmonics levels at its LED panel.

Besides, the 2nd and 3rd harmonics levels can be estimated in turn aurally by click repetition rate reproduced through a built-in loudspeaker.

2. Specifications:

- Types of the radiated signal:

- continuous wave carrier;
- pulse modulated carrier.

Carrier frequency is 0.2MHz within 2406 ... 2414 tuning range.

Frequency selection is automatic.

- Maximum radiated power in the CW mode does not exceed 0.5W.

Peak radiated power in the pulse mode does not exceed 10W.

The radiated power level is controlled automatically by a built-in attenuator.

- Dynamic control range is 30dB down from the maximum output power value

with 11 level gradations. Real sensitivity of receivers is not worse than – 140dBW, provided signal to noise ratio is 10dB.

- Time of continuous operation with a lithium-Ion battery at the maximum radiated power is not less than:

- 3 hours in the pulse mode;

- 1.5 hours in the CW mode.

- Weight of the device equipped does not exceed 1kg.

- Operating conditions:

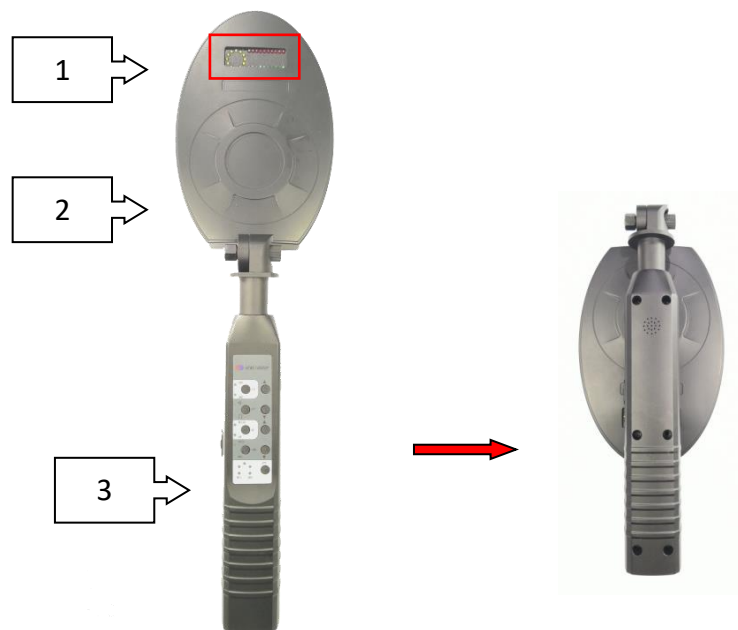
- ambient temperature: 5°C-40°C

- pressure > 400Pa

3. Product Components

3.1. The device includes units and accessories stated in the Table below:

No.	Description	Qty
1	Host	1
2	Charger	1
3	User Manual	1
4	Suitcase	1



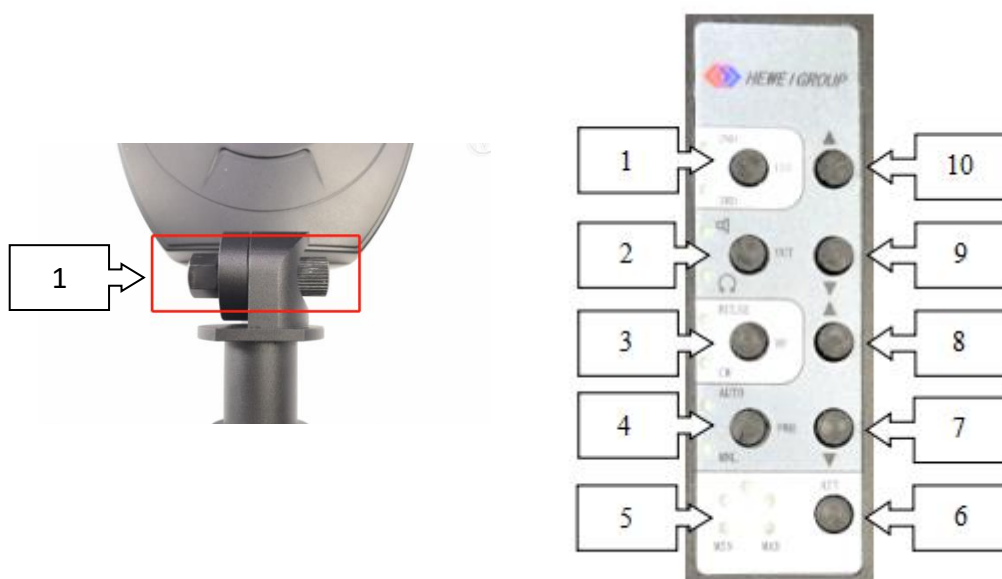
1. LED indicator light 2. receive/transmit antenna 3. operating handle(operating panel)

4. Units Introduction

4.1. The receiving-transmitting antenna unit with built-in LED indicators is used for:

- Analysis of distortion and interference in the instrument receiving path, which is made each time the detector transmitter is switched on. Therefore, if an interfering signal appears during operation (in a complicated electromagnetic environment) it is necessary to turn the detector transmitter off and on from time to time thus selecting an optimal frequency automatically, providing the best sensitivity and detection range of semiconductor components.
- Generation of CW or pulsed RF signal. Reception and digital processing of the 2nd and the 3rd frequency harmonics. Simultaneous display of the 2nd and the 3rd harmonics levels gives the opportunity to distinguish with a high reliability between signals of semiconductors integrated in electronic devices and natural corrosive ones which appear at connecting points of various metals.
- Demodulation of the 2nd and 3rd harmonics response, their amplification to the level required for built-in loudspeaker. The operator can listen to demodulated signals of the 2nd and 3rd harmonics. Also indicates signal levels of 2nd and 3rd harmonics.

4.2. The joint between the receive/transmit antenna and the handle is designed to be foldable. In addition, the antenna handle can be adjusted to an appropriate angle to facilitate detection. (left fig below)



4.3. The control panel is used to control operation of the detector. It consists of a case, control board, operation buttons and LED display screen.(right fig above).

Control buttons are divided into two groups by their function:

1- LEDs and LST button for switching of acoustic indication to the output of the 2nd or 3rd harmonics.

2- LEDs and OUT button for switching acoustic output of the built-in loudspeaker.

3- LEDs and RF button for switching between types of the radiated signal (CW – continuous, PULSE –pulsed).

The following buttons are referred to «POWER RF» group:

4- LEDs and PWR button for switch on/off the probing signal transmitter. When the switch on, the automatic mode of output power control is set by default. To switch over to a manual mode of output power control, just press a LEVEL button when a transmitter is turned on.

To return to the automatic mode, turn the transmitter off and then turn it on.

5,6 - LED and a button for receiving unit attenuator control.

7,8 - LEVEL buttons for control of radiated signal power in manual and auto modes (↑ - high, ↓ - low). It is possible to set maximum power level by pressing LEVEL button (↑ - high, ↓ - low) in auto mode before the probing signal transmitter is turned on.

9,10 - Volume buttons for volume control(↑ - high, ↓ - low). Functions of control panel indicators: continuous light of any indicator corresponds to “on” position, absence of light means “off” position. Simultaneous flickering of all indicators on the panel shows that the battery is discharged and needs to be replaced.

4.4. Power switch on the left side of the handle.(see below fig)



Earphone port



charging port

4.5. Battery charging is to be made with a power adapter and a battery charger supplied with the instrument only. For charging it is necessary to connect a low-voltage connector of the power adapter to the socket placed underneath the front side of the control panel.(see above fig)

A red LED is lightning while charging. When a battery is completely charged, a red LED turns green LED.

Charging time of a fully discharged battery does not exceed 5 hours (typical value is 3.5 h).

4.6. Using a power adapter supplied with the instrument to help observe charging indicator light. Using of other power adapters is forbidden.

5. Operation and Use

5.1. Pre-Operation Inspection

Inspect if any units or parts damaged or loose. Adjust the antenna and handle to the proper angle and lock it.(After device transportation at negative temperatures, it is necessary to keep the device in the switch-off state at room temperature at least 30 minutes.)

5.2. Operation Steps

1) Turn the device on by the power switch placed on the control panel. The 2nd and 3rd indicators on the control panel will light up, indicating that the detector has been powered on.

2) One yellow LED should be lightning on the antenna unit (a circle scale of the probing signal power indicator). Its initial position corresponds to the maximum power of the probing signal.

3) The probing signal transmitter is off (it is turned on after pressing PWR button only). The 2nd and 3rd harmonics indicators should not light.

4) Turn the probing signal transmitter on by pressing PWR button. This will switch on the transmitter mode and automatic selection mode of signal power control. The power of a radiated signal will change depending on a signal level at the 2nd harmonic receiver input. In the given mode, sound information of the 2nd harmonic response is put to the loudspeaker. When switching on mode 3rd by pressing LST on the control unit, output power of the transmitter is adjusted automatically depending on a signal level at the 3rd harmonic receiver input. Sound information of the 3rd harmonic response is put to the loudspeaker.

5) To switch over to the manual mode of the probing signal power control (MNL indicator lights up) press one of LEVEL buttons after the probing signal transmitter has been turned on. Turn the probing signal transmitter off and then turn it on for a reverse switch over.

6) During operation in premises with a lot of electronic devices, you will normally have to decrease the level of the probing signal by 2-4 points counterclockwise from the initial position.

The optimum level of the probing signal is reached by several experiments.

5.3. Charging Tips

Simultaneous flashing of all indicators on the control panel indicates that the battery is discharged and needs to be replaced urgently. In this case, the device should be powered off and charged in time.

Attention:

- 1). Do not direct the antenna towards the operator and people nearby.
- 2). Charging should be done in a charger supplied with the instrument only.
- 3). Self – assembling or - disassembling during charging is forbidden.
- 4). When not using the device for a long time, you need to charge it every 3 months.
- 5). After using the equipment, store it in a box protected from light and dry environment.

6. Search Recommendation

- 1) If possible remove electronic devices from the room examined. If it is impossible, examination should be done at a decreased radiated power.
- 2) In the CW mode, it is recommended to use manual operation mode.
- 3) Place the antenna unit parallel to the surface examined at the distance not exceeding 10cm.
- 4) Slowly moving the antenna unit parallel to the object surface examined and changing orientation of antennas, analyze changes in the signal received at the 2nd and 3rd harmonics visually by the indicator (aurally the click repetition rate should be maximum).
- 5) Analysis of the received 2nd and 3rd harmonics levels is made by number of LEDs.
- 6) When semiconductor components of artificial origin is found, you will normally see stable lightning of the 2nd harmonic indicator LEDs. While rapping at the suspected place of a p-n transition, readings of LEDs do not change.
- 7) When an oxidizing semiconductor components is found, you will observe stable lightning of the 3rd harmonic indicator LEDs. While rapping at the examined surface intensively, readings of indicators by the 3rd harmonic will change, as a rule.