

Personal Radiation Alarm Dosimeter

LK-3600

Operating Instruction Manual

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## 1. Overview

LK-3600 personal radiation alarm dosimeter is a kind of small-scale equipment, which is made by new SCM technology, can work in relatively harsh environment, and with strong anti-interference ability. It is mainly used to detect x ray,  $\gamma$  ray and  $\beta$  ray, according to LCD screen you can directly read the "RATE"; "DOSE" and "STORE DOSE". In the range of measurement, the value can be pre-fixed or threshold pre-alarmed, it would emit sound-light alarm when the value displayed exceed the threshold or blocked, prevent workers from being injured by excessive dose. The instrument is low power consumption, multi-function, small size, convenient taking. It is widely used in NDT, nuclear power station, nuclear submarine, isotope application and hospital cobalt treatment etc.

## 2. Features

1, High sensitivity, stable and reliable.

2, Super LCD English display functions, state display at a glance.

3, When measuring radiation dose rate, display dose rate, accumulated dose and storage accumulated dose, it has variety of selections on dose rate Alarm threshold. According to the high-low of dose rate and accuracy choice the measure time, general measure time is 02s. When measure relatively small doses, please select 10 or 20 seconds.

4, Specially designed the nature test function, it can test if the equipment works normally, convenient to self-check and measuring department examination.

5, With accumulated dose memory function, after power - failure, data can be stored permanently, and don' t lost.

6, Low power consumption, multi-function, small size, convenient taking. . ;

7, Simple operation and easy to use.

### 3. Equipment Appearance Instructions.

- ①LCD data shows;
- ②" "key: power switch;
- ③" " key: model conversion key;
- ④" " key: unlock, delete storage, date-setting key;
- ⑤" " key: month-setting key;
- ⑥indicator;
- ⑦Buzzer;

### 4. Working Principle

Under the irradiate of  $\alpha$ ,  $\gamma$ ,  $\beta$ -ray, detector output sequence pulse, the pulse number corresponds to  $\gamma$ -ray dose rate, after input and shaping, it forms a certain scope standard pulse into the SCM, SCM complete all of the digital processing functions, input LCD display, super threshold signal input sound-light circuit alarm. Working circuit as follows:

#### 1, Detectors:

High sensitivity GM counting tube, after energy compensation, reduce high, low-energy response difference, counter tube converted  $\gamma$ -ray into electrical pulses signal, input and form SCM circuit.

#### 2, SCM

SCM is using multi-function embedded PIC SCM. Its characteristic is high speed, low voltage, low energy consumption, single power supply. The SCM completes all the digital processing functions: Pulse numeration, get rid of the interference of suddenly low and suddenly high numerical. Calculation shows, time-based happen, output alarm signal, etc.

### 3, Display

The display is specially equipped with English display function, LCD display. English display state, showing clear. After startup, full-screen display dose rate, dose rate threshold, labeling symbols of measuring time and power, as shown in figure A:

### 4, Alarm

Alarm circuit is composed of LED and buzzer, when exceed the threshold, it would sound and flash.

### 5, Keys

The equipment has four keys, (1) " " key (2): " " key, (3) " " key: unlock, delete storage, date-setting key. (3) " " month-setting key.

### 6, Power Supply:

Two.5# 1.5 V high-performance alkaline batteries.

## 5. Main Technical Performances

1, Through G-M counter compensation, improve the low-energy response.

2, Instrument with high sensitivity, will respond to the natural environment.

3, For radiation occasions  $\gamma$ ,  $\alpha$ ,  $\beta$  rays.

4, Measuring range, dose rate: 0.000usv/h—5msv/h

accumulated dose: 6-digit LCD display 000.000—999.999msv

5, Energy response:  $< \pm 30\%$  (50KeV—1.3MeV).

6, Relative basic error:  $< \pm 10\%$  (137Cs Source 662 KeV  $\gamma$  Radiation 1msv/h).

7, Alarm response time:  $\leq 3$  seconds.

8, Alarm function

Dose rate threshold alarm: alarm threshold value:  
0.5, 1.0, 2.5, 10, 30, 50 $\mu$ Sv/h.

9, With accumulated dose memory function, after power-failure, data can be stored permanently, it can undertake 1 million times storage and erased.

10, Battery voltage indication.

Icon shows the battery voltage in the upper right corner of Instrument LCD, when battery shows three full grids, power is about 2.8V-3.2V, when battery shows two grids, the power is about 2.5V-2.8V, when battery shows one grid, the power is about 2.1V-2.5V, when battery shows without grid, the power is under 2.1V, it is in the state of less power.

11, Working environment requirements:

Temperature: -10 - +50 $^{\circ}$ C Humidity: reach 90% (no condensation)

12, Weight: 130g (not including battery)

13, Size: 150mm x 73mm x 31mm

## **6. Usage**

### 1. Battery installation

Open the battery cover, put two AA(5#) 1.5V high-performance alkaline battery into the box in correct polarity, fasten the battery cover.

### 2. starting up:

(1) Press the bottom key “ ”, if buzzer emits a long sound, that shows starting up normally, if no sound or a short sound, that is not normal, the instrument should be immediately shut down, after 3 seconds later, you can start it up, LCD screen shows as FIGURE A.

(2) Press the right key “ ”, the LCD screen show the accumulated dose, Dose rate threshold, measuring time, and battery indicator, shows as FIGURE B:

(3) Then press the right key “ ”, the LCD screen shows as FIGURE C:

The first line shows: "STORE DOSE", the second line shows the month, date when first used. Press the left key " ", press once shows "U1" at the right end of LCD, the continuous two presses shows "U2", continuous three presses shows "OP", then press this key again, "STORE DOSE" is reset, date value plus 1, adjust the date, pressing the top key " " can adjust the month, then press the right key " " to return to the LCD display of starting state.

*Note: DO NOT alter after setting the year and month, altering the value make the "STORE DOSE" clear. FIGURE C is specially set for viewing "STORE DOSE" and "Starting Time", should exit the screen before detecting.*

### 3. Measuring:

The instrument has three measurement state : "RATE", "DOSE", " STORE DOSE".

(1) "RATE" state: Measuring dose equivalent rate, unit: usv/h or msv/h.

Threshold value alarm: at the state of FIGURE C, press the key " ", then press the key " " can switch the Alarm threshold value: 0.5、1.0、2.5、10、30、50usv/h.

Occlusion alarm: when level of radiation sites  $> 5\text{msv} / \text{h}$ , the instrument will emit a continuous sound-light Alarm, counting tube will be blocked.

(2) "DOSE" state: Measuring accumulated dose equivalent. Unit: usv or msv. Measuring time: at the state of FIGURE B, press the key " ", then press the key " ", we can modify the measuring time at the right-bottom corner of the screen: 01s、02s、05s、10s or 20s.

### **Note:**

*If used in radiation detection, medical radiation and other stronger radiation, we can select 01s, 02s or 05s; if used in the natural conditions or weaker radiation sites, select 10s or 20s.*

4. If we need to observe the frequency and time of alarm at the natural conditions, we can operate as follows: at the state of FIGURE A, press the key " " and hold on, then press the key " ", then loosen the key " ", loosen the key " " again, LCD shows as FIGURE D, the first line shows time .the second line shows alarm

times. If there is no alarm counting value after 1 minute, the instrument perhaps has some problems or due to the low battery.

**Note:**

*(1) When there is no grid, the electricity is under voltage, we should replace the battery in time; the instrument will not work normally if there is no electricity.*

*(2) When Normal detection, should t exit the natural detection (shutting down then starting up that will exit the natural detection).*

*(3) At the state of FIGURE C, backlighting and constant lighting, should exit the FIGURE C state for saving power.*

5. Power off: Turn off the power switch “ ” after use. If not used for a long time, the battery should be removed to avoid the damage to the instrument.

**7. Reference**

1. Report recommended by ICRP60.

Radiation dose limit for the professionals: the effective dose of 5 years 100msv, average annual 20msv, but any year can not exceed 50msv.

Dose limit for residents: 1 msv /year (if the average is not more than 1msv in continuous 5 years , individual years may be slightly higher.)

2. Radiation dose and dose equivalent relationship can be showed as:

$$1\text{sv}=100\text{rem}\approx 100\text{R}$$

$$1\text{u sv} \cdot \text{h}^{-1}\approx 0.1\text{R} \cdot \text{h}^{-1}$$

**8. Packing List**

Radiation Alarm Dosimeter	1
Operating Manual	1
Quality Certificate	1
Warranty Card	1