

# ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

## ISO RECOMMENDATION R 1758

DIRECT READING POCKET TYPE ELECTROSCOPE EXPOSURE METERS

1st EDITION

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## BRIEF HISTORY

The ISO Recommendation R 1758, *Direct reading pocket type electroscopes exposure meters*, was drawn up by Technical Committee ISO/TC 85, *Nuclear energy*, the Secretariat of which is held by the American National Standards Institute (ANSI).

Work on this question led to the adoption of Draft ISO Recommendation No. 1758, which was circulated to all the ISO Member Bodies for enquiry in December 1968. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	Italy	Switzerland
Belgium	Netherlands	Thailand
Brazil	Peru	Turkey
Colombia	Poland	U.A.R.
Germany	Portugal	United Kingdom
Greece	Romania	U.S.A.
Hungary	South Africa, Rep. of	U.S.S.R.
Iran	Spain	Yugoslavia
Israel	Sweden	

The following Member Bodies opposed the approval of the Draft :

France  
New Zealand

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided to accept it as an ISO RECOMMENDATION.

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## DIRECT READING POCKET TYPE ELECTROSCOPE EXPOSURE METERS

### 1. SCOPE

This ISO Recommendation applies to direct reading pocket type exposure meters for X- and/or gamma radiation, with an airtight sensitive volume, working in the range, or part of the range, from 30 keV up to 3 MeV, excluding use in mixed fields of ionizing radiation, for instance, gamma-neutron fields.

#### NOTES

1. In order to verify whether the exposure meters are in accordance with specifications, set down in sections 8 and 9 of this ISO Recommendation, clearly defined methods of test shall be used. These methods will be dealt with in a future ISO Recommendation.
2. This ISO Recommendation does not cover the dimensions of the terminals, as this is considered to belong to the scope of the International Electrotechnical Commission (Technical Committee 45).

### 2. DEFINITION

In this ISO Recommendation a direct reading pocket exposure meter is understood to be an instrument to be carried on the person and from which the exposure can be read directly; the meter operates on the principle described in section 3.

### 3. PRINCIPLE

A direct reading exposure meter consists essentially of an electroscopes connected to a capacitor. This capacitor is charged by a charging device, which may or may not be built-in, thus giving the indicator a deflection which can be read against a calibrated scale by means of an optical system.

If the exposure meter is exposed to X- and/or gamma radiation, ionization of the gas between the electrodes occurs. As a result of this, the position of the movable electrode changes; the change in the deflection on the calibrated scale is a measure of the exposure at the location of the exposure meter.

### 4. MARKINGS

- 4.1 The scale shall be marked in röntgen (R) or milliröntgen (mR). The scale shall indicate the unit used. The scale shall be divided into at least 10 and not more than 25 divisions. At least every 5th scale line shall be larger and numbered.
- 4.2 An indication shall be provided on the meter of the energy range for which it is intended. The energy range shall be indicated in kilo-electronvolts (keV) or in mega-electronvolts (MeV) (see also clauses 9.1 and 10.6).

- 4.3 Each meter shall be provided with an individual indelible identification mark, for recording purposes.
- 4.4 The proper reading position shall be given in the directions for use and if possible on the instrument, unless the reading of the instrument is independent of the orientation (see also clause 9.6).

## 5. ADJUSTMENT AND SEALING

If the sensitivity of the exposure meter is adjustable, the instrument shall be sealed in such a way that the adjustment cannot be changed without breaking the seal.

## 6. CLEANING

All exterior surfaces of the instrument shall be hard and smooth, with as few joints as practicable, to ensure easy cleaning in case of radioactive contamination.

## 7. MECHANICAL STRENGTH

The construction shall be sufficiently rugged so that if the exposure meter is dropped in any orientation onto a wooden floor from a height of 1 m, the change in indication of the instrument will not be more than 10 % of the measuring range. Also the accuracy shall remain within all the limits specified in section 9.

## 8. EFFECT OF AMBIENT CONDITIONS

- 8.1 All the specifications concerning accuracy given in section 9 shall be determined under standard test conditions as follows :
- temperature :  $20 \pm 5$  °C
  - relative humidity :  $65 \pm 5$  %
- 8.2 The sensitivity to variations of temperature between  $- 10$  °C and  $+ 50$  °C shall be such that the deviation compared with the response at  $+ 20$  °C is less than 10 % of the reading.
- 8.3 An exposure meter shall stay within the limits of accuracy as specified in section 9, if the pressure of the outer air changes from the normal atmospheric pressure (1013 mbar) to 0.6 or 1.2 times this pressure.
- 8.4 If the instrument is equipped with a lens, the instrument shall be so constructed that it is not damaged by exposure to direct sunlight. The instrument should be readable at a lighting of  $0.03$  cd/cm<sup>2</sup> at the inlet surface.

## 9. ACCURACY

- 9.1 For the energy range indicated on the exposure meter the sensitivity shall not deviate by more than 10 % of its nominal value.
- 9.2 In the range between 20 and 100 % of full scale deflection, the response of the exposure meter to a reference radiation, chosen within the limits specified in clause 9.1, shall not, after correction for the energy dependance, deviate by more than 10 % from the true exposure, provided the exposure rates do not exceed the permissible maximum as indicated in the directions for use.
- 9.3 The repeatability of any indication, the ambient conditions remaining the same and using the same radiation source, should not deviate from the average reading by more than 5 %.
- 9.4 The leak of charge of an exposure meter with a measuring range of 100 mR or more shall not exceed 2 % of its maximum scale reading in 24 hours, if it is placed in surroundings where the exposure rate amounts to a maximum of 0.02 mR/h and where the atmospheric conditions are as defined in clause 8.1.
- 9.5 When the instrument is disconnected from the charging source, the movement of the pointer shall not exceed 5 % of the measuring range for 200 mR range exposure meters, and not exceed 2 % if the range exceeds 200 mR. The movement shall be completed within 10 seconds.
- 9.6 The indication shall not vary by more than 5 % of the maximum scale value due to any change in position of the exposure meter. If this condition cannot be fulfilled, the directions for use shall give the proper position of the exposure meter during the reading (see also clause 4.4).
- 9.7 The response of the instrument at any angle not exceeding  $50^\circ$  from the direction of maximum response of the instrument shall not be less than 70 % of this maximum response.