

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 1759

INDIRECT READING CAPACITOR TYPE POCKET EXPOSURE METERS
AND ACCESSORY ELECTROMETERS

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BRIEF HISTORY

The ISO Recommendation R 1759, *Indirect reading capacitor type pocket exposure meters and accessory electrometers*, 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. 1759, 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	Iran	Sweden
Belgium	Israel	Switzerland
Brazil	Italy	Thailand
Colombia	Netherlands	Turkey
Czechoslovakia	Peru	U.A.R.
Denmark	Poland	United Kingdom
Germany	Romania	U.S.A.
Greece	South Africa, Rep. of	U.S.S.R.
Hungary	Spain	Yugoslavia

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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INDIRECT READING CAPACITOR TYPE POCKET EXPOSURE METERS AND ACCESSORY ELECTROMETERS

1. SCOPE

This ISO Recommendation applies to indirect reading capacitor type pocket exposure meters and the associated electrometers for X- and/or gamma radiation, 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 an indirect reading pocket exposure meter is understood to be a capacitor type ionization chamber, to be carried on the person and by means of which the exposure can be read from a separate electrometer, which is not normally connected with the pocket exposure meter; the meter operates on the principle described in section 3.

3. PRINCIPLE

An indirect reading exposure meter consists essentially of an ionization chamber, associated with a capacitor with a constant capacity. This capacitor is charged to a certain voltage, which is measured by means of an electrometer.

If the exposure meter is exposed to X- and/or gamma radiation, ionization of the gas between the electrodes occurs, resulting in a decrease of the charge. The corresponding voltage drop can be read from the electrometer and is a measure of the exposure at the location of the exposure meter.

4. MARKINGS

- 4.1 The scale of the electrometer should be marked in röntgen (R) or milliröntgen (mR). If such is not the case, the directions for use shall clearly explain the relation between the indication given by the instrument and the exposure.
- 4.2 An indication shall be provided on the exposure meter of the energy range for which it is intended. The energy range shall be indicated in kilo-electronvolts (KeV) or 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.

5. ADJUSTMENT AND SEALING

If the sensitivity of the instrument 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 a fully charged ionization chamber is dropped in any orientation onto a wooden floor from a height of 1 m, its charge will not change by 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 ON THE IONIZATION CHAMBER

- 8.1 All the specifications concerning accuracy given in section 9 shall be determined under standard test conditions, as follows :
 - temperature : 20 ± 5 °C
 - relative humidity : 65 ± 5 %.
- 8.2 For an airtight ionization chamber, 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 For a non-airtight ionization chamber, 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 after an air density correction has been applied.
- 8.4 An airtight ionization chamber shall stay within its 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.
- 8.5 A non-airtight ionization chamber shall stay within its 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, after an air density correction has been applied.
- 8.6 The pressure in a non-airtight ionization chamber shall follow changes in the pressure of the outer air within 1 minute, if the latter changes between 0.6 and 1.2 times the normal atmospheric pressure (1013 mbar).

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 dependence, 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 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 The response of the instrument at any angle not exceeding 50° from the direction of maximum response of the instrument shall not be less than 70 % of this maximum response.