

# A 3509, A, B, C Personal Dosimeters

**Monitoring of individual exposure doses from X-ray and gamma radiation with energy range from 15 keV to 10 MeV**



## Applications

- Radiation protective measures in case of nuclear disasters
- Roentgenology
- Therapeutic radiology
- Nuclear medicine
- Electronics (Ion implanters)
- Accelerating installations
- Nuclear research activities
- X-ray Crystallography and X-ray fluorescence spectroscopy, electronic microscopy

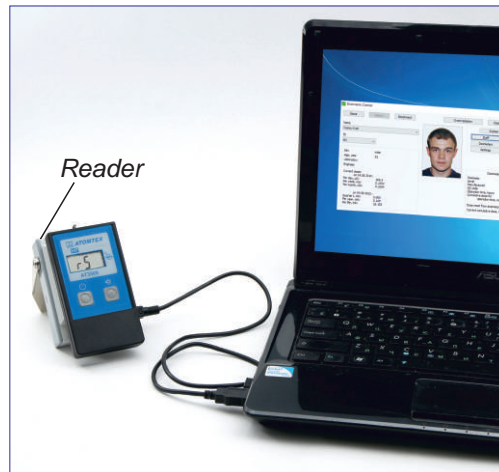
## Features

- Silicone planar detector
- Zero intrinsic background
- Simultaneous measurement of visceral radiation exposure Hp(10) and skin radiation exposure Hp(0.07) (AT3509B and AT3509C)
- Measurement in wide range of energies and dose rates
- Compensating filter and electrical energy dependence correction
- Resistance to impacts and vibration, dust- and moisture-proof, tolerance to electromagnetic interference
- Repeating impact protection (so called "Microphone effect")
- Parameter self-check
- Can be integrated into a system or used separately
- Low weight and small size
- Calibrated with water phantom ISO 30x30x15 cm
- Dosimeter-to-PC communication via IR-transmitter in reader

Pocket-size wide-range intelligent device is an ideal combination of accuracy, functionality, usability, reliability and price.

Dosimeters are designed for measurement of personal dose equivalent and personal dose equivalent rate of continuous X-ray and gamma radiation.

Dosimeter, PC-connectible reader and application software suite make an efficient automatic system for staff radiation exposure monitoring.



## Operating principle

Dosimeters provide dose range measurement in 7.5-order range and have individual sound and LED alarm function.

Microprocessor operation mode management, data processing, display on TFT screen and self-check function.

Accumulated dose data and dose accumulation history is saved in non-volatile memory when the device is powered off.

Measuring	3509 3509	3509 3509
p(10) continuous x &	+	+
p(10) continuous x &	+	+
p(0.07) continuous x &	-	+
p(0.07) continuous x &	-	+



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Ionizing radiations  
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## Specification

### Measurement range for:

Individual dose equivalent	
AT3509, AT3509A Hp(10)	1 $\mu$ Sv – 10 Sv
AT3509B Hp(10), Hp(0.07)	1 $\mu$ Sv – 10 Sv
AT3509C Hp(10), Hp(0.07)	1 $\mu$ Sv – 10 Sv
Individual dose equivalent rate	
AT3509, AT3509A p(10)	0.1 $\mu$ Sv/h – 1 Sv/h
AT3509B p(10), p(0.07)	0.1 $\mu$ Sv/h – 1 Sv/h
AT3509C p(10), p(0.07)	0.1 $\mu$ Sv/h – 5 Sv/h

**Limit of intrinsic relative error** of dose measurement without associated beta radiation  $\pm 15\%$

### Limit of intrinsic relative error of dose rate measurement

0.1 $\mu$ Sv/h – 1 $\mu$ Sv/h	$\pm 30\%$
1 $\mu$ Sv/h – 1 Sv/h	$\pm 15\%$
1 Sv/h – 5 Sv/h (AT3509C)	$\pm(15 + 0.001 p)\%$ , where p is dose rate in mSv/h

**Calibration error** for  $^{137}\text{Cs}$   $\pm 5\%$

### Energy range

AT3509, AT3509B,C	15 keV – 10 MeV
AT3509A	30 keV – 10 MeV

### Energy dependence

relative to 662 keV ( $^{137}\text{Cs}$ )	
Hp(10) in the following energy range	
15 keV – 1.5 MeV	$\pm 25\%$
1.5 MeV – 10 MeV	$\pm 60\%$
relative to 59.5 keV ( $^{241}\text{Am}$ )	
Hp(0.07) in the following energy range	
15 keV – 300 keV (AT3509B,C)	$\pm 30\%$

**Alarm thresholds** 1 of 8 independent dose thresholds, 1 of 8 independent dose rate thresholds

### Anisotropy in angular spacing $\pm 60^\circ$

For $^{137}\text{Cs}$ and $^{60}\text{Co}$	$\pm 20\%$
For $^{241}\text{Am}$	$\pm 50\%$

**Response time** to 10-fold dose rate change 5 s (for dose rate value  $> 1$  mSv/h)

**Radiation overloading** 10 Sv/h

**Burn-up life** 100 Sv

**Power** 2 x AAA type batteries; rechargeable cells can be used

**Continuous run time** 500 h

**Working temperature range**  $-10^\circ\text{C}$  to  $+40^\circ\text{C}$

**Relative air humidity** with temperature  $35^\circ\text{C}$  without moisture condensation 90%

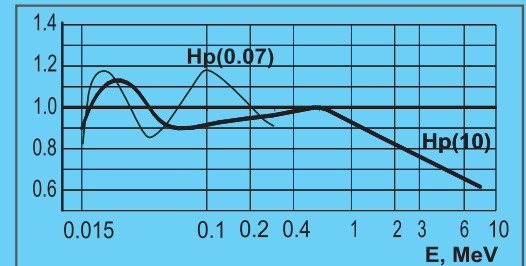
**Drop protection** From 1.5 m to hard surface

**Protection class** I 54

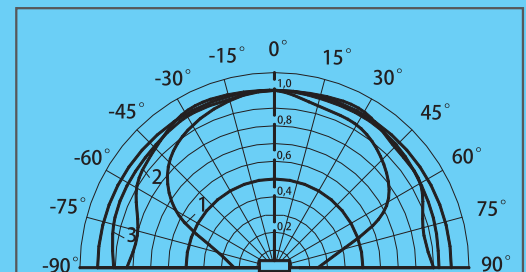
**Connection to PC** USB (via Reader)

**Overall dimensions** 105x58x23 mm

**Weight** 100 g (w/o batteries)



Normal energy relationship between AT3509B Dosimeter sensitivity and  $^{137}\text{Cs}$  gamma radiation energy of 662 keV



Normal AT3509 Dosimeter anisotropy for vertical position  
1 –  $^{241}\text{Am}$ ; 2 –  $^{137}\text{Cs}$ ; 3 –  $^{60}\text{Co}$

The personal dosimeters comply with:  
IEC 61526:2010 (confirmed by tests IAEA-EURADOS, IAEA-TECDOC-1564),  
GOST 27451-87,  
Safety requirements of IEC 61010-1:2010,  
EMC requirements of EN 55011:2009,  
IEC 61000-4-2:2008, IEC 61000-4-3:2008

*Design and specifications are subject to change without notice*



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