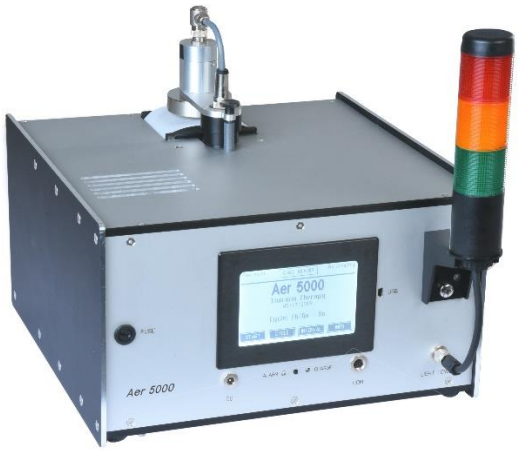
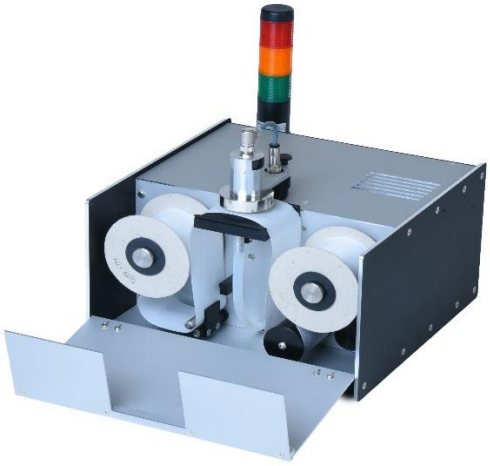
# Aer 5000 Desktop

**Desktop Alpha/Beta Continuous Air Monitor (CAM)**



## Applications:

- for monitoring activity concentrations of airborne radioactive aerosols (LLRD) and for measuring activity concentrations of airborne radon decay products (EEC) and/or potential alpha energy concentration (PAEC)
- at workplaces
- in nuclear facilities
- in the NORM industry
- in mining operations
- in nuclear medicine (Th-227, Ac-225, Ra-223 and Rn-219)
- for taking samples from ducts and chimneys of nuclear facilities

## Features:

- Continuous monitoring of breathing air for airborne long-lived radioactive aerosols (LLRD) and short-lived radon decay products
- Assessment and minimization of inhalation hazards for workers
- Alert workers to high levels of airborne activity
- Spectroscopic separation of the nuclides and complete compensation of the natural radon background for the LLRD measurement
- Menu navigation via touch screen
- All parameters relevant for reliable operation are continuously monitored and are part of the stored measurement data
- Flexible alert system
- Filter tape for over 360 steps or over 1 year at one filter change/day

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| **Detector** | 400 … 1200mm² ion-implanted silicon detector<br>Open face sampling for minimum collection losses<br>Option: Tube connector for air inlet (vacuum flange KF/DN16)<br>Option: Double detector for dynamic Gamma background compensation |
| **Energy range** | 80keV...3MeV (for 400mm$^2$ detector) or 150keV...3MeV (for 1200mm$^2$ detector) (Beta);<br>3…10MeV (Alpha) |
| **Counting efficiency** | approx. 20% (4π) |
| **Filter/Stepper** | Membrane filter tape (PTFE); 5µm pore size; length 30m; width 65mm; good for more than 360 filter steps<br>Pneumatic filter sealing for minimum leakage rate<br>Deposition rate >99,9%<br>Active filter test with respect to perforation and exhaustion<br>Tool-less replacement of filter coils<br>More than 12 months autonomous operation in “normal” environment<br>Configurable trigger for filter stepping (e.g. each sample interval, fixed period, filter exhaustion, activity detected)<br>Required period for filter replacement <2s |
| **Pump** | Brush-less, long-life, low noise quality membrane pump<br>Nominal air flow 8l/min (adjustable range 4 to 10l/min)<br>Processor controlled air flow for const. deposition conditions<br>Pressure drop across the filter 15…150mbar (at 10l/min)<br>Noise emission approx. 55 dBA (in 1m distance) |
| **Results** | Equilibrium Equivalent Concentration (EEC) for Radon and Thoron daughter products in Bq/m³<br>Exposure for Alpha and Beta emitters (LLRD) in Bqh/m³<br>Dose for Alpha and Beta emitters in µSv or DAC-hrs (dose coefficients adjustable by user)<br>Detection of Natural Uranium with automatic selection of the $U_{nat}$ dose coefficient<br>Average activity concentration for Alpha and Beta emitters in Bq/m³<br>Separate channel for Alpha gross counting in cps or Bq<br>Option: dose rate in µSv/h<br>Temperature, humidity, pressure, battery voltage<br>Flow rate, filter exhaustion, filter stepping, end of filter tape |



**SARAD GmbH**, Wiesbadener Str.10, 01159 Dresden, Germany,
Tel 0351/65807-19/-33, FAX 0351/6580718,
https://sarad.de, sales@sarad.de

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| **Standards** | IEC 60761-1<br>IEC 60761-2<br>IEC 61578<br>IEC 61577-3<br>IEC 1263<br>CE, VDE<br>DIN ISO 16639 (VDE 0493-1-6639) |
| **Compensation** | Compensation of natural Radon background by Alpha spectroscopy with dynamic fitting of peak shape with respect to progressive filter exhaustion<br>Upper Alpha energy threshold for LLRD = 5.6MeV<br>Static compensation of Gamma background<br>Option: dynamic compensation of Gamma background by double detector<br>Dynamic shock rejection (mechanical shock) by pulse signal shape analysis |
| **LLRD Sensitivity** | approx. 7 cpm/(Bqh/m³) |
| **Measuring range** | 35 000 Bqh/m³ (175 000 DACh(Pu))<br>2 MBq/m³ over 1 minute |
| **Measurement** | Up to 16 user definable sampling cycles (1s to 1year)<br>Predefined sampling cycles 1, 5, 15, 60 minutes |
| **Detection limits** | See tables below |
| **Alert indication** | Configurable alert thresholds for all measured results<br>Alert tower with green, yellow and red light, 360° visible<br>90dB signal buzzer (option)<br>Alert indication at display<br>Alert reset is configurable (either with confirmation by the user or automatic reset if the alert condition is no longer present)<br>Pre-defined alerts for LLRD activity, low/high count rate, filter perforation, end of filter tape |
| **Data storage** | 2GB SD card (> 800 000 data records)<br>Storage of all measured raw data incl. spectra |
| **Display** | Touch screen 6cm x 9cm (4.5”); Graphic 240 x128<br>High contrast even in direct sunlight<br>Backlight |
| **Operation** | Intuitive, straight forward menu structure |

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| **Interface** | USB, RS232 (RS422/RS485 optionally)<br>Option: Net Monitors wireless (ZigBee)<br>Option: TCP/IP (Ethernet/WLAN)<br>6 additional configurable analogous sensor inputs<br>1 add.counter input (for models without GM-tube option only)<br>Option: relay contacts instead alert light tower |
| **Power supply** | Power adapter 18V/60VA<br>Internal NiMH buffer battery 12V/1Ah for more than 6 hours operation in case of mains power interruption (without pump) |
| **Power consumption** | <50 W |
| **ATEX category** | No |
| **Housing** | Space saving desktop housing<br>Ease of decontamination |
| **Dimensions** | 308mm x 308mm x 175mm (12” x 12” x 7”) plus detection head |
| **Weight** | 8kg |
| **Ambient conditions** | 0…50°C<br>5…95%rH, non-condensing<br>800…1100mbar |
| **Software dVISION** | Remote control<br>Data transfer, visualization<br>Data management, export to text files<br>System configuration<br>Creating/Editing of measurement cycles<br>Network management |
| **Additional options** | Sealed filter unit for connection to ventilation ducts<br>GM-detector for Gamma dose rate measurement<br>Double Si-detector<br>Single filter facility / manually changing |



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**Calibration/Test**

Factory calibration in a Radon daughter product atmosphere with aerosol generator
Test sources Am-241 (Alpha) and Cs-137 (Beta); recommended are area sources with 185Bq nominal activity such as Eckert & Ziegler AMRB22757 and CDRB22758 (d 30mm x 0.8mm)
Flow rate check on top of the filter using adapter dome and low differential pressure air flow meter (Δp < 15mbar @10 l/min)

**Scope of delivery**

USB cable
RS232 cable
Fuse (x2)
Power supply adapter
Filter roll (1x30m)
Factory calibration certificate
User manual (on CD as pdf-file)
Transportation case

## Possible modifications of Air Monitor Aer 5000

Aer 5000-XXXX

- „XFG" – with dual spectrometer–
  special modification for Thorium (Th227) therapy
- „S" – with special adapter for stack monitoring
- „F" – fixed filter holder for single filter, diam. 47mm
  Without „F"– automatic filter changing facility with membrane filter tape (PTFE)
- „G" – double Si-detector 400…1200 mm² for dynamic gamma background compensation.
  Without „G" – single Si-detector 400…1200 mm² with static gamma background compensation

*) options XFG and G cannot be combined

## Detection Limits

The detection limits stated in the tables below are valid for following operational conditions:

- Flow rate = 8 l/min
- $k_{1-\alpha}$ =3 (99.8%)
- $k_{1-\beta}$ = 1.65 (95%)
- 1DAC(Pu) = 0.2 Bq/m³ (10CRF835)
- 1DAC(Sr90) = 200 Bq/m³ (10CRF835)

Additionally for Beta measurement:

- F = 0.6
- Gamma background = 0.1 µSv/h

The assumption for the detection limit of the concentration is a momentarily step-like increase of air activity concentration up to the detection limit at the beginning of a sampling interval. Furthermore it is presumed that there was no LLRD activity deposited on the filter.

| Alpha LLRD | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Po-218 *) | Detection limit T = 1min | | | Detection limit T = 5min | | | Detection limit T = 15min | | |
| Bq/m³ | Bqh/m³ | DACh | Bq/m³ | Bqh/m³ | DACh | Bq/m³ | Bqh/m³ | DACh | Bq/m³ |
| 10 | 2.7 | 13.3 | 160 | 0.74 | 3.7 | 8.8 | 0.4 | 2.0 | 1.6 |
| 20 | 2.7 | 13.3 | 160 | 1.0 | 5.0 | 12.0 | 0.57 | 2.8 | 2.3 |
| 50 | 3.7 | 18.3 | 220 | 1.54 | 7.7 | 18.5 | 0.95 | 3.7 | 3.7 |
| 100 | 5.0 | 24.9 | 285 | 2.21 | 11.1 | 26.6 | 1.41 | 5.7 | 5.6 |

| Beta LLRD | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Po-218 *) | Detection limit T = 1min | | | Detection limit T = 5min | | | Detection limit T = 15min | | |
| Bq/m³ | Bqh/m³ | DACh | Bq/m³ | Bqh/m³ | DACh | Bq/m³ | Bqh/m³ | DACh | Bq/m³ |
| 10 | 5.12 | 0.026 | 307 | 2.21 | 0.011 | 14.5 | 1.26 | 0.006 | 5.0 |
| 20 | 6.79 | 0.034 | 407 | 2.96 | 0.015 | 19.8 | 1.69 | 0.009 | 6.8 |
| 50 | 10.2 | 0.051 | 615 | 4.51 | 0.023 | 30.7 | 2.59 | 0.013 | 10.4 |
| 100 | 14.2 | 0.071 | 853 | 6.28 | 0.032 | 43.0 | 3.61 | 0.018 | 14.5 |

*) The activity concentration of Po-218 is always less than the one of Rn-222


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