

Aer 5000 Desktop

Portable Alpha/Beta Continuous Online Air Monitor (CAM)

The Aer5200 monitors the ambient air continuously to detect airborne radioactive aerosols (LLRD). Typical application fields are nuclear facilities, the NORM industry, mines and nuclear medicine (e.g. DIN ISO 16639 / VDE 0493-1-6639).

The unit is very suitable for limited space conditions due to its compact design.

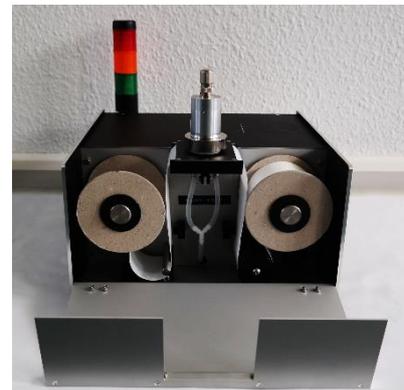
The aerosols will be deposited on the surface of a filter by the internal pump and will be analysed by spectroscopy. The natural background due to Radon and Gamma irradiation will be fully compensated.

The Aer5000 Desktop is instantly ready for operation after powering. The intuitive touch screen operation and the straight forward menu structure allow the operation even by unskilled staff. The ergonomic design, big wheels and low weight makes it easy to relocate the instrument if required. The stylish unit with plain surfaces can be easily decontaminated.

The pump works very quiet. The open face air inflow in combination with a regulated flow rate ensures a uniform and low-loss deposition of the aerosols on the filter surface. The large active filter diameter and the long filter tape used in the filter stepping unit results in outstanding operation periods without intervention. The unique mechanism for dynamic filter sealing avoids leakages as present in conventional movable-filter solutions. Optionally, the unit may be equipped with a vacuum adapter (KF/DN16) to connect sampling pipes or flexible tubes. Particle losses at the inlet become negligible by the special construction.

Because of the high sensitivity of the Aer5000 Desktop, very low detection limits and alert thresholds for Alpha and Beta exposure can be achieved. All parameter, necessary for proper operation are monitored continuously and are part of the stored measurement data. A flexible alert system warns the user in case of the exceedance of a threshold or any deviation from the normal operation mode. The signal tower can be removed from the housing for optimal visibility.

There are many options for additional detectors/sensors (e.g. NaI probe with nuclide identification) and system integration.



Aer 5200 – Technical Data

- Detector**
- 900mm² ion-implanted silicon detector
 - Option: Double detector for dynamic Gamma background compensation
 - Energy range 80keV...3MeV (Beta); 3...10MeV (Alpha)
 - Counting efficiency (4 π) approx. 20%
 - Open face sampling for minimum collection losses
 - Option: Tube connector for air inlet (vacuum flange KF/DN16)
- Filter/Stepper**
- Membrane filter tape (PTFE); 5 μ m pore size; length 30m; width 65mm; good for more than 300 filter steps
 - Pneumatic filter sealing for minimum leakage rate
 - Deposition rate >99,9%
 - Active filter test with respect to perforation and exhaustion
 - Tool-less replacement of filter coils
 - More than 12 month autonomous operation in “normal” environment
 - Configurable trigger for filter stepping (e.g. each sample interval, fixed period, filter exhaustion, activity detected)
 - Required period for filter replacement <2s
- Pump**
- Brush-less, long-life, low noise quality membrane pump
 - Nominal air flow 8l/min (adjustable range 4 to 10l/min)
 - Processor controlled air flow for constant deposition conditions
 - Pressure drop across the filter 15...150mbar (at 10l/min)
 - Noise emission approx. 51dBA (in 1m distance)
- Results**
- Equilibrium Equivalent Concentration (EEC) for Radon and Thoron daughter products in Bq/m³
 - Exposure for Alpha and Beta emitters (LLRD) in Bqh/m³
 - Dose for Alpha and Beta emitters in μ Sv or DAC-hrs (dose coefficients adjustable by user)
 - Detection of Natural Uranium with automatic selection of the U_{nat} dose coefficient
 - Average activity concentration for Alpha and Beta emitters in Bq/m³
 - Separate channel for Alpha gross counting in cps or Bq
 - Option: dose rate in μ Sv/h
 - Temperature, humidity, pressure, battery voltage
 - Flow rate, filter exhaustion, filter stepping, end of filter tape

Standards	<ul style="list-style-type: none">• IEC 60761-1• IEC 60761-2• IEC 61578• IEC 61577-3• IEC 1263• CE, VDE• DIN ISO 16639 (VDE 0493-1-6639)
Compensation	<ul style="list-style-type: none">• Compensation of natural Radon background by Alpha spectroscopy with dynamic fitting of peak shape with respect to progressive filter exhaustion• Upper Alpha energy threshold for LLRD = 5,6MeV• Static compensation of Gamma background• Option: dynamic compensation of Gamma background by double detector• Dynamic shock rejection (mechanical shock) by pulse signal shape analysis
LLRD Sensitivity	<ul style="list-style-type: none">• approx. 7cpm/(Bqh/m³)
Measurement range	<ul style="list-style-type: none">• 35000Bqh/m³ (175000DACH(Pu))• 2MBq/m³ over 1 minute
Measurement	<ul style="list-style-type: none">• Up to 16 user definable sampling cycles (1s to 1year)• Predefined sampling cycles 1, 5, 15, 60 minutes
Detection limits	<ul style="list-style-type: none">• See tables below
Alert indication	<ul style="list-style-type: none">• Configurable alert thresholds for all measured results• Alert tower with green, yellow and red light, 360° visible• 90dB signal buzzer (option)• Alert indication at display• Alert reset is configurable (either with confirmation by the user or automatic reset if the alert condition is no longer present)• Pre-defined alerts for LLRD activity, low/high count rate, filter perforation, end of filter tape
Data storage	<ul style="list-style-type: none">• 2GB SD card (> 1,200,000 data records)• Storage of all measured raw data incl. spectra
Handling	<ul style="list-style-type: none">• Touch screen 6cm x 9cm (4.5"); Graphic 240 x128• High contrast even in direct sunlight• Backlight• Intuitive, straight forward menu structure

- Interface**
- USB, RS232 (RS422/RS485 optionally)
 - Option: Net Monitors wireless (ZigBee)
 - Option: TCP/IP (Ethernet/WLAN)
 - 6 additional configurable analogous sensor inputs
 - 1 additional counter input (for models without GM-tube option only)
 - Option: relay contacts instead alert light tower
- Power supply**
- Power adapter 18V/60VA
 - Internal NiMH buffer battery 12V/1Ah for more than 6 hours operation in case of mains power interruption (without pump)
- Housing**
- Space saving desktop housing
 - Ease of decontamination
 - 308mm x 308mm x 175mm (12" x 12" x 7") plus detection head
 - 8kg
- Ambient conditions**
- 0...50°C
 - 5...95%rH, noncondensing
- Software dVISION**
- Remote control
 - Data transfer, visualization
 - Data management, export to text files
 - System configuration
 - Creating/Editing of measurement cycles
 - Network management
- Additional options**
- Separate filter unit (connection by hose and cable)
 - Sealed filter unit for connection to ventilation ducts
 - Wall mounted housing
 - Sodium Iodide gamma probe (2" x 2") with spectroscopy and nuclide identification
 - GM tube for dose rate measurement
 - CO and Methane sensors for usage in underground mines
 - GPS receiver
- 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 25mm or 36mm diameter and 185Bq nominal activity such as Eckert & Ziegler AMR02011/CDR02011 or AMR03011/CDR03011 or similar
 - Flow rate check on top of the filter using adapter dome and low differential pressure air flow meter ($\Delta p < 15\text{mbar}$ @10/min)

Detection Limits

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

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

Additionally for Beta measurement:

- F = 0.6
- Gamma background = 0.1μSv/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/m ³	Bqh/m ³	DACH	Bq/m ³	Bqh/m ³	DACH	Bq/m ³	Bqh/m ³	DACH	Bq/m ³
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/m ³	Bqh/m ³	DACH	Bq/m ³	Bqh/m ³	DACH	Bq/m ³	Bqh/m ³	DACH	Bq/m ³
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