

Aer 5X00-XXXX

Portable Alpha/Beta Continuous Air Monitor (CAM)



Applications:

- in nuclear facilities.
- in the NORM industry
- in mining operations
- in nuclear medicine

Features:

- continuously monitors breathing air for airborne long-lived radioactive aerosols (LLRD) and short-lived radon decay products
- radiation background caused by radon and ambient gamma radiation is fully compensated
- menu navigation via touch screen
- big wheels and light weight
- unique sealing mechanism prevents partial flow around the filter
- optionally, the device can be equipped with a vacuum adapter (KF/DN16) for connection to sampling lines
- the band filter is quick and easy to access
- all parameters relevant for reliable operation are continuously monitored and are part of the stored measurement data
- flexible alarm system
- several designs and many options for additional sensors/detectors (e.g. NaJ probe with nuclide identification) as well as system integration are available

Detector	<p>900mm² ion-implanted silicon detector</p> <p>open face sampling for minimum collection losses</p> <p>option: Tube connector for air inlet (vacuum flange KF/DN16)</p> <p>option: Double detector for dynamic Gamma background compensation (version G)</p>
Energy range	<p>80 keV....3 Mev (Beta)</p> <p>3...10 MeV (Alpha)</p>
Counting efficiency	<p>approx.20% (4 π)</p>
Filter /Stepper	<p>membrane filter tape (PTFE); 5µm pore size; length 30m; width 65mm; good for 330 filter steps</p> <p>pneumatic filter sealing for minimum leakage rate</p> <p>deposition rate >99,9%</p> <p>active filter test with respect to perforation and exhaustion</p> <p>tool-less replacement of filter coils</p> <p>more than 12 months autonomous operation in “normal” environment</p> <p>configurable trigger for filter stepping (e.g. each sample interval, fixed period, filter exhaustion, activity detected)</p> <p>required period for filter replacement <2 s</p>
Pump	<p>oil-free, durable, low-noise quality rotary vane pump (Becker)</p> <p>nominal airflow 35 SLPM (adjustable in the range between 30-100 SLPM)</p> <p>processor-controlled air flow for constant separation conditions (mass flow sensor)</p> <p>pressure drop across the filter 15...100 mbar (at 35 SLPM)</p> <p>noise emission approx. 51 dBA (at a distance of 1m)</p> <p>pump weight: VT4.4 - 7 kg (4 .1 m³/h)</p> <p style="padding-left: 40px;">VT4.8 - 11.5 kg (8.0 m³/h)</p>

Results	<p>Equilibrium Equivalent Concentration (EEC) for radon and thoron daughter products in Bq/m³</p> <p>exposure for Alpha and Beta emitters (LLRD) in Bqh/m³</p> <p>dose for Alpha and Beta emitters in μSv or DAC-hrs (dose coefficients adjustable by user)</p> <p>detection of Natural Uranium with automatic selection of the Unat dose coefficient</p> <p>average activity concentration for Alpha and Beta emitters in Bq/m³</p> <p>separate channel for Alpha gross counting in cps or Bq</p> <p>option: dose rate in μSv/h</p> <p>temperature, humidity, pressure, battery voltage</p> <p>flow rate, filter exhaustion, filter stepping, end of filter tape</p> <p>signals: alert, warning, no fault</p>
Standards	<p>IEC 60761-1</p> <p>IEC 60761-2</p> <p>IEC 61578</p> <p>IEC 61577-3</p> <p>IEC 1263</p> <p>CE, VDE</p> <p>DIN ISO 16639 (VDE 0493-1-6639)</p>
Compensation	<p>compensation of natural radon background by alpha spectroscopy with dynamic fitting of peak shape with respect to progressive filter exhaustion</p> <p>upper alpha energy threshold for LLRD = 5.6MeV</p> <p>static compensation of gamma background</p> <p>option: dynamic compensation of Gamma background by double detector</p> <p>dynamic shock rejection (mechanical shock) by pulse signal shape analysis</p>
LLRD Sensitivity	<p>approx. 25 cpm/(Bqh/m³)</p>
Measuring range	<p>0 ... 10.000 Bqh/m³ (0 ... 50 000 DACH(Pu))</p> <p>0,6 MBq/m³ over 1 minute</p>
Measurement	<p>up to 16 user definable sampling cycles (1s to 1year)</p> <p>predefined sampling cycles 1, 5, 15, 60 minutes</p> <p>predefined test cycles</p>

Detection limits	see tables below
Alert indication	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 pre-sent) pre-defined alerts for LLRD activity, low/high count rate, filter perforation, end of filter tape
Data storage	2GB SD card (> 1 200 000 data records) storage of all measured raw data incl. spectra
Operation	touch-screen 6 cm x 9 cm x (4,5"), graphic 240 x 128 high contrast even in direct sunlight backlight intuitive, straight forward menu structure
Interfaces	USB, RS232 (RS422/RS485 optionally) option: Net Monitors wireless (ZigBee) option: TCP/IP (Ethernet/WLAN) 6 additional configurable analogous sensor inputs 1 add. counter input (for models without GM-tube option only) option: relay contacts instead alert light tower
Power supply	230 VAC/50 Hz internal NiMH buffer battery 12 V / 3,8 Ah for more than 12 h operation in case of power interruption (without pump) self-retracting connection cable (6 m)
ATEX category	no
Housing	ergonomic, shapely design easy for decontamination

Versions/ Dimensions	<p>Trolley mountable (standard) version: 1110mm x 520mm x 490mm 54kg wheels 8"</p> <p>Wall mountable version: 540mm x 360mm x 200 mm <18 kg (without pump) 1000mm x 360mm x 320mm <35 kg (on Trolley and with pump)</p>
Environmental conditions	<p>0 ... 50 °C 5 ... 95 % rF. non-condensing 760 ... 1200 mbar</p>
Software dVISION	<p>remote control data transfer, visualization data management, export to text files system configuration creating / editing of measurement cycles network management</p>
Additional options	<p>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 an electric valve for flow control (wall mounted version for working with customer supplied vacuum supply)</p>
Calibration/Test	<p>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 diameters of 25mm or 36mm , activity 185Bq, recommended sources from: Eckert & Ziegler AMR02011, CDR02011 (25mm) or AMR03011, CDR03011 or similar flow rate check on top of the filter using adapter dome (version S with KF16 tube adapter) and low differential pressure air flow meter ($\Delta p < 15\text{mbar}$ @10 l/min) on filter surface</p>

Scope of delivery	USB cable RS232 cable filter roll (1x30m) or single filter set (1x100 pcs.) calibration certificate user manual (on CD as pdf-file) transportation case
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Aer53XX-XXXX

The Aer53XX-XXXX has a **separate detector/filter unit** instead of the built-in ones. This is connected to the device with a flexible tube and cable. This means that it can be positioned where contamination is most likely to occur, even when space is limited.

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| Connection | <ul style="list-style-type: none">• flexible tube (quick connector) (max. 6m)• cable (via plug connection on both sides, max. 6m) |
| Positioning | <ul style="list-style-type: none">• the detector/filter unit may only be operated vertically (detector upwards).• for transport, the unit is fixed on top of the basic device |

Detection Limits

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

- flow rate = 35 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)

Additional for beta measurement:

- F = 0,6
- gamma background = 0,1 μ Sv/h

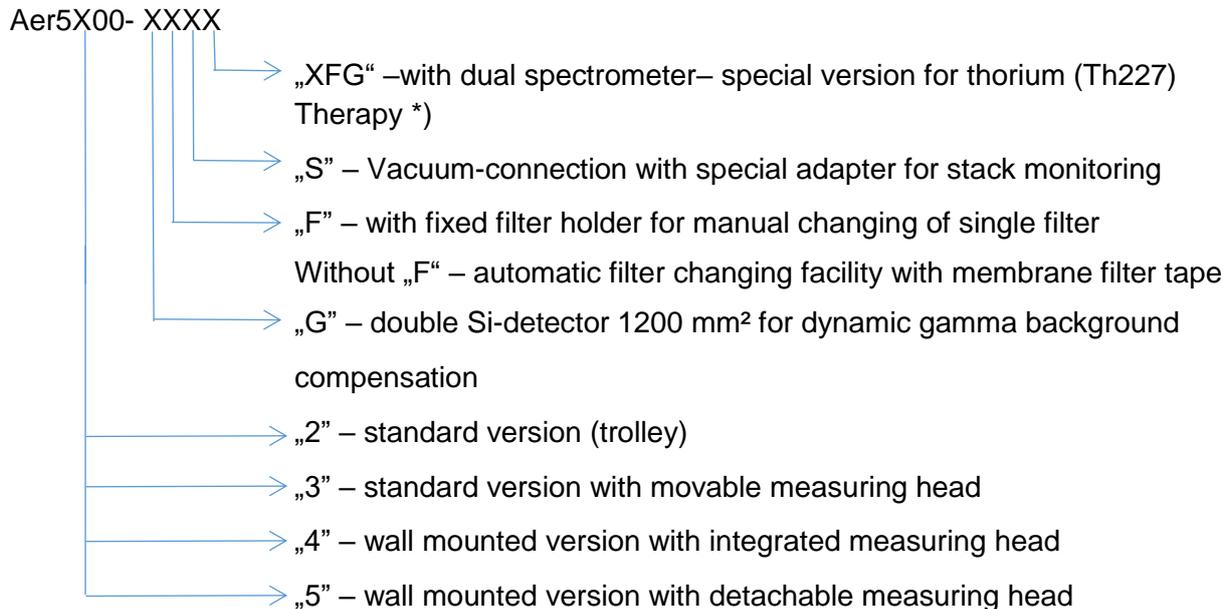
The assumption for the detection limit of the concentration is a momentarily step-like increase of air activity concentration up to the detection limit at the beginning of a sampling interval. Furthermore, it is presumed that there was no LLRD activity deposited on the filter.

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	0,92	4,6	55	0,38	1,9	4,6	0,22	1,1	0,9
20	1,25	6,2	75	0,54	2,7	6,5	0,33	1,6	1,3
50	1,92	9,6	115	0,88	4,4	10,6	0,58	2,9	2,3
100	2,70	13,5	168	1,33	6,7	16,0	0,95	4,7	3,8

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	2,75	0,014	165	1,21	0,006	14,5	0,69	0,004	2,8
20	3,74	0,019	224	1,65	0,008	19,8	0,95	0,005	3,8
50	5,76	0,029	345	2,55	0,013	30,7	1,47	0,007	5,9
100	8,06	0,040	483	3,58	0,018	43,0	2,06	0,010	8,3

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

Possible versions of the aerosol monitors Aer5X00-XXXX



*) Options XFG and G can not be combined

For example:

Aer 5200 – trolley-mounted HV-aerosol monitor with fixed measuring head, single Si-detector 1200mm², automatic filter changing facility with membrane filter tape (PTFE), and static gamma background compensation

Aer 5200-XFG – trolley-mounted HV-aerosol monitor with fixed measuring head, single Si-detector 1200mm², automatic filter changing facility with membrane filter tape (PTFE), and static gamma background compensation, with dual spectrometer for Thorium (Th227) therapy

Aer 5200-G - trolley-mounted HV-aerosol monitor with fixed measuring head, double Si-detector 1200mm², automatic filter changing facility with membrane filter tape (PTFE), and dynamic gamma background compensation

Aer 5200-GS - trolley-mounted HV-aerosol monitor with fixed measuring head, double Si-detector 1200mm², automatic filter changing facility with membrane filter tape (PTFE), and dynamic gamma background compensation, with special adapter for stack monitoring.

Aer 5200-GF – trolley-mounted HV-aerosol monitor with fixed measuring head, double Si-detector 1200mm², dynamic gamma background compensation, fixed filter holder for single membrane filter (PTFE) diam. 47mm

Aer 5300-GF – trolley-mounted HV-aerosol monitor with movable measuring head, double Si-detector 1200mm², dynamic gamma background compensation, fixed filter holder for single membrane filter (PTFE) diam. 47mm

Aer 5400 – wall-mounted HV-aerosol monitor with fixed measuring head, single Si-detector 1200mm², automatic filter changing facility with membrane filter tape (PTFE), and static gamma background compensation. Including pump & trolley.

Aer 5500-GF – wall-mounted HV-aerosol monitor with movable measuring head, double Si-detector 1200mm², dynamic gamma background compensation, fixed filter holder for single membrane filter (PTFE) diam. 47mm. Including pump & trolley.