Aer 5000 Desktop

Desktop Alpha/Beta Continuous Air Monitor (CAM)

Applications:

- for monitoring activity concentrations of airborne radioactive aerosols (**LLRD**) and measuring radon / thoron equivalent equilibrium concentration (**EECRn** & **EECTh**) 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 330 steps or nearly 1 year at one filter change/day

Detector	400 … 1200mm² ion-implanted silicon detector open face sampling for minimum collection losses option: Tube connector for air inlet (vacuum flange KF/DN16) option: Double detector for dynamic gamma background compensation
Energy range	80keV...3MeV (for 400mm^2 detector) or 150 keV...3 MeV (for 1200mm^2 detector) beta; 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 330 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 months 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 const. deposition conditions pressure drop across the filter 15…150mbar (at 10l/min) noise emission approx. 55 dBA (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 µSv 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 µSv/h temperature, humidity, pressure, battery voltage flow rate, filter exhaustion, filter stepping, end of filter tape

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TÜV SÜD ISO 9001

Standards	IEC 60761-1 IEC 60761-2 IEC 61578 IEC 61577-3 IEC 1263 CE, VDE 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 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	approx. 7 cpm/(Bqh/m³)
Measuring range	35 000 Bqh/m³ (175 000 DACh(Pu)) 2 MBq/m³ over 1 minute
Measurement	up to 16 user definable sampling cycles (1s to 1year) predefined sampling cycles 1, 5, 15, 60 minutes
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 present) 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) storage of all measured raw data incl. spectra
Display	touch screen 6cm x 9cm (4.5”); Graphic 240 x128 high contrast even in direct sunlight backlight
Operation	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 add.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)
Power consumption	<50 W
ATEX category	no
Housing	space saving desktop housing ease of decontamination
Dimensions	308mm x 308mm x 175mm (12” x 12” x 7”) plus detection head
Weight	8kg
Ambient conditions	0…50°C 5…95%rH, non-condensing 800…1100mbar
Software dVISION	remote control data transfer, visualization data management, export to text files system configuration creating / editing of measurement cycles network management
Additional options	sealed filter unit for connection to ventilation ducts GM-detector for gamma dose rate measurement double Si-detector 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