

BITT Technology

AMS02M-2008

Aerosol Monitoring System



Developed by BITT Technology
& Institute of Nuclear Techniques,
Technical University of Budapest

Profile: Measuring of radioactive aerosols, especially artificial nuclides

AMS02M-2008 is a special version of the AMS series of Bitt Technology. The AMS02 units are generally characterized as multi-detector equipment with an automatic sample changer. The AMS02M-2008 is having one or two radiation detectors but manual sample changing. By using the one detector system a PIPS detector is always inserted for the alpha and the beta (radon) measurement using a glass fibre filter.

At two detector system we build in additionally a 'NaI(Tl)' scintillation detector for Aerosol gamma and atomic Iodine measurement using an active carbon impregnated (charcoal) paper filter.

The filter skate can hold one or two filter plates. In case of one detector system, only an aerosol filter is fitted into the skate but at the two detector system two plates can also be fastened together.



The complete filter skate is inserted manually into the slot before starting the operation. It is strongly advised to insert a "fresh" filter into the slot even for background measurements. Filter-shaped calibration standards (^{137}Cs for the gamma detectors and $^{239}\text{Pu}/^{90}\text{Sr}$ for the alpha-beta detector) are required for regular gain and efficiency control.

Lead shielding

The sampling and measuring slot is housed in a lead shielding block. External gamma-ray background is attenuated by at least one order of magnitude.

Air flow pump

The nominal volume rate of the maintenance-free pump is $3.5 \text{ m}^3/\text{h}$. The output is measured indirectly by pressure sensor and temperature sensor.

The output rate is converted in "normal cubic metre" (20°C , 1 bar pressure). All activity values are related to this value (in Bq/m^3).

Computer

Pulses from the continuously operating detectors are processed by multi channel analyser cards with an effective channel range of 1k. All of these cards are Microcontroller cards which are controlled by an Industrial PC over an RS422 Interface.



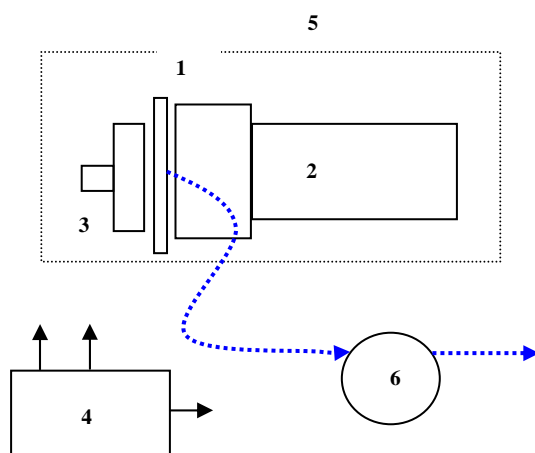
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The equipment consists of the following units (fig.):

A. Unit for continuous sampling:

1. Aerosol filter
2. NaI(Tl) detector
3. PIPS-detector
4. Microcontroller unit
5. Lead shielding
6. Maintenance-free air flow pump

Description

Mains power connections of the air flow pump and the computer should be plugged in. The "AMS02M-2008" program starts automatically after switching on the equipment. The main program controls the presence and status of each device then the actual task can be determined interactively by the user using the peripherals of the computer. If required, detector setting control ("gain check") is performed for both detectors.

Sensitivity

The smallest detectable radioactivity was calculated and determined for all detectors of the system, considering only realistic sampling and measurement situations. The figures given in Table IV. 1. below are in Bq/m³ units. They relate to the detector types, source-to detector geometry and - last but not least - to the data processing subroutines applied in the AMS02M-2008 system only.

Isotope Filter/detector	Duration of air filtering before warning message			Measurement time
	5 min	1 hour	12 hours	
normal mode				
¹³¹ I aerosol/NaI(Tl)	5.4	0.8	0.066	300 s
¹³⁷ Cs aerosol/NaI(Tl)	4.1	0.67	0.056	300 s
α -activity aerosol/PIPS	1.5	0.5	0.042	300 s
¹³⁷ Cs(β) aerosol/PIPS	2.5	0.7	0.052	300 s

Size: 600mm x 400mm x 1100mm

Weight: approx 110 kg

Power: 230 V AC / 50 Hz / 350 VA

Environment:

Temperature +15°C + 25°C

Relative humidity: 0 - 70 %

Accumulated air:

Temperature: -15°C + 40°C

Relative humidity: 0 - 99 %

Units:

Detectors:

- PIPS 1700 mm²
resolution \cong 55 keV (α ²⁴¹Am)

- 2" x 2" NaI(Tl)
resolution \cong 8 % (¹³⁷Cs 662 keV)
peak-to-total ratio > 30 % (¹³⁷Cs)
background ~ 4 cps

Pump:

Nominal flow rate ~ 3.5 (normal) m³/h

Filters: - 60 mm diameter glass fibre filter Schleicher & Schüll type 10 (DIN 24 184)



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