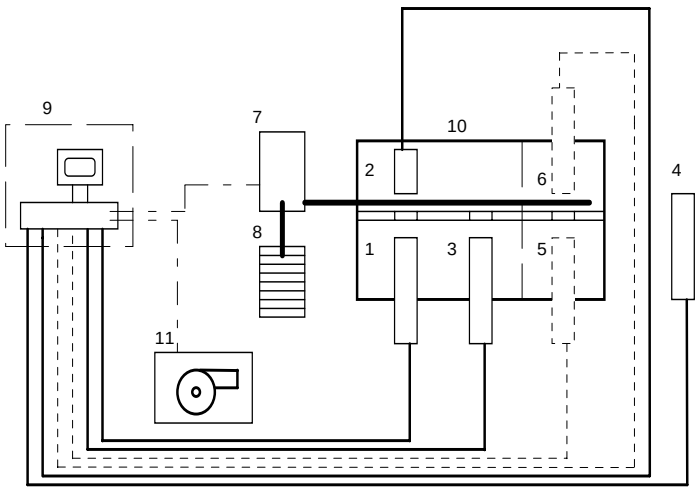
# BITT Technology
## AMS02
## Aerosol Monitoring System

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

Profile: Measuring of radioactive aerosols, especially artificial nuclides

The AMS 02 has been developed by BITT Technology and the Institute of Nuclear Techniques, Technical University of Budapest and includes the experience of more than 30 years. Among other things, the most important features are the reliable function also under difficult conditions, as well as the possibility of a maintenance-free operating over months.

The AMS 02 is an automatically working measuring system, for counting of radioactive aerosols, with routinely measuring of iodine, so that the non-natural radioactivity $\alpha$-, $\beta$- and $\gamma$-radiation is counted. The system is equipped with a remote control unit, which enables communication from and to the central unit at any time. The AMS 02 is a single filter system which enables different suction- and measuring programs. A further advantage is the possibility of testing the detectors through calibration filter. Furthermore, under usual conditions, used filters can be taken once more after decay of the natural radioactivity. Also filters can be extracted to make high-precise analysis in corresponding laboratories. Under usual conditions, one suction-cycle takes 24 hours with one and the same filter. Measuring-evaluations are made in intervals at 5 min. If there are abnormities, confirming in the next two measuring-cycles, that means after three measuring-cycles, the device switches on intensive-mode. On the intensive-mode a new filter is inserted and sucted for 1 hour. The measuring evalution enables an exact qualitative and quantitative statement concerning the $\alpha$-, $\beta$- and $\gamma$- nuclides, whereby the quality varies according to the detector type.




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

A. Unit for continuous sampling:
   1. Aerosol filter + NaI(Tl) detector
   2. Aerosol filter + PIPS-detector
   3. Iodine filter (molecular) +NaI(Tl)-detector
   4. Iodine filter (organic) + NaI(Tl)-detector

B. Further units:
   5. Optional, Special measuring equipment
   6. Optional, Special measuring equipment
   7. Filter manipulator
   8. Racks for filters (filter stock)
   9. Computer and control unit
   10. Lead shielding
   11. Maintenance-free air flow pump

face the invisibility

**for more information**
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## Description

The filter equipment is served by a manipulator from a stock of 500 filters. Therefore high flexibility is reached and different measuring-programs can be used, depending on the given conditions. Furthermore there is the possibility for extension of the measuring places and also for the filter stock.

## SENSITIVITIES

The smallest detectable radioactivity was calculated and determined for all detectors of the system, considering only realistic sampling and measurement situations. Values are given in Bq/m$^3$ units for measurement time of 300 sec. They relate to the detector types, source-to detector geometry and - last but not least - to the data processing subroutines applied in the AMS-02 system only.

**Isotop filter/Detector duration of air filtering Before warning message [Bq/m$^3$]**

| | 5 min | 1 hour | 2 hours |
|---|---|---|---|
| **Normal Mode** | | | |
| $^{131}$I aerosole/NaI(T1) | 5.4 | 0.8 | 0.066 |
| $^{131}$I iodine/NaI(T1) | 6.4 | 0.53 | 0.044 |
| $^{137}$Cs aerosole/NaI(T1) | 4.1 | 0.67 | 0.056 |
| $\alpha$-Activity aerosole/PIPS | 1.5 | 0.5 | 0.042 |
| $^{137}$Cs($\beta$) aerosole/PIPS | 2.5 | 0.7 | 0.052 |
| $^{137}$Cs aerosole/HP Ge | 6.7 | 0.77 | 0.061 |
| **Off-Normal-Mode (organic iodinefilter)** | | | |
| $^{131}$I iodine/NaI(T1) | 8.7 | 0.72 | 0.058 |
| **Continues organics iodine measuring** | | | |
| | | | 24 hours |
| $^{133}$Xe | | | 1.0 |

Data pertain to an assumed natural radon background of 20 Bq/m$^3$ EEC. Air flow rate is 10 m$^3$/h.

**TECHNICAL DATA:**

**Dimensions:** 73 x 92 x 152 (210) cm
**Weight:** approx.. 415 kg
**Power:** 230V AC / 50Hz / 950VA

**Operating conditions:**
Environment:
Temperature 15°C + 25°C
Relative humidity 0 - 70 %
Accumulated air**:**
Temperature -15°C + 40°C
Relative humidity 0 - 99 %

**Detectors**

Version 1:
Na (TI) 2"x2"(3 pcs.)
Resolution ≅ 8 % ($^{137}$Cs 662 keV)
Peak-to-total ratio > 30 % ($^{137}$Cs)
Background approx. 4 cps
PIPS 1700 mm²
Resolution ≅ 55 keV ($\alpha^{241}$ Am)
≅ 30 keV ($\beta$)

Version 2:
Na (TI) 2"x2"(2 pcs)
Resolution > 8 % ($^{137}$Cs 662 keV)
Peak-to-total ratio > 30 % ($^{137}$Cs)
Background ca. 4 cps
PIPS 1700 mm²
Resolution ≅ 55 keV ($\alpha^{241}$ Am)
≅ 30 keV ($\beta$)

Coaxial germanium detector (HP-Ge)
Resolution 2.0 keV FWHM at 1,33 MeV
Peak-to-total ratio 33% rel. at 1,33MeV

**Controllers:**
Industrial PC Pentium with Microcontroller cards : HDD~60 GB; FDD 1.44MB; CDRW; USB

**Pump:**
Nominal flow rate ~6 (normal) m³/h

**Filter:**
- glass -fibre filter: Schleicher & Schüll Type 10 (DIN 24 184) ∅ 60 mm
- paper filter with active carbon impregnated (charcoal) ∅ 60 mm
- Ag. Activated silica gel filter column

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