AETHALOMETER
MAGEE MODEL AE33

Elementary Carbon has the special property of absorbing visible light 100 to 1000 times more than other atmospheric aerosols.

The Aethalometer's measurement principle is thus based on the attenuation of the intensity of a beam going through a sample of airborne dust deposited on a filter.

Filtration is carried out on a belt tape. This tape will automatically advance when the attenuation of light radiation by dust accumulated on the filter exceeds the maximum limit accepted by the analyser.

BENEFITS

- "Full Spectrum" 7-Wavelength operation: UV – IR
- 1 Hz data at 7-Wavelengths
- Real-time DualSpot™ Technology* compensates for sample spot "loading effects", and provides additional information about aerosol composition
- Dynamic Active Zero built-in diagnostic performance check**
- Network Ready for remote management and data transfer; data stored also locally
- Quick-Clean analytical chamber
- Modular hardware for reliability and servicing
- 19" rack mountable

BLACK CARBON ANALYSER ON 7 WAVELENGTHS

MAGEE AETHALOMETRE AE-33

ORIGIN AND EFFECTS OF ELEMENTAL CARBON

Elementary Carbon - otherwise referred to as «black smoke» or «black carbon» according to the analysis methods - is generated by incomplete combustion and comes mainly from automobile exhaust, heating, thermal power plants and in general the combustion of fossil fuels and biomass.
Elemental carbon is a pollutant which has a doubly negative trait:

- It contributes to global warming and climate instability by absorbing light;
- Numerous epidemiological studies show that the correlation between health issues and the concentration of Elementary Carbon is higher than that of PM_{10} and $PM_{2.5}$ concentrations.

7 WAVELENGTH LIGHT SOURCE

The shorter the wavelength of the light source, the more the light absorption increases -for some chemicals such as aromatic hydrocarbons. This feature enables to assign a pollution episode to a particular transmitter. Several scientific contributions show that it is possible to assign some episodes to wood combustion rather than to traffic.

'DUAL SPOT' TECHNOLOGY

This new technology aims to overcome a common effect to all real time optical analysers that collect particles on a filter: the variation of the analyser's response according to the accumulated charge on the filter media. This effect, called 'spot loading' is variable and leads to a reduction of the analyser's response when the mass of aerosol deposited on the filter increases. When the attenuation of light radiation exceeds the limit of maximum attenuation, the filter tape advances and displays a blank area.

Ideally, the measured Elemental Carbon concentration value should be identical to that obtained in the previous filtering area, but experience shows that the new value of concentration is generally higher. This effect is essentially variable and depends on many parameters such as geographic location, season, and etc.

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'Dual Spot' technology eliminates the filter's undesirable effect. It consists in analysing the Elemental Carbon by taking the same aerosol sample on 2 parallel filter tapes.
These two filter tapes collect aerosols at a different rate which allows measurement of the same aerosol concentration at two different attenuation values. This method is applied to the seven wavelengths and helps calculate a correction factor.

ZERO AND AUTOMATIC GAIN

The AE-33 offers the possibility to automatically check the zero by means of an internal filter.
A set of glass elements with varying light absorption factors, calibrated by comparison with standards, ensures the checking of the response and the stability of the photo-detectors.

MODULAR CONSTRUCTION

Different subsets are easily removable for routine maintenance.
The measuring cell is mounted on a bayonet connector to be easily disassembled for cleaning.

INTERFACES

The AE-33 is equipped with the following interfaces:

- 21 cm colour touch screen
- USB port for transferring stored data
- USB port for installing a keyboard for easy initial setup
- RS232 port
- Ethernet port for data transfer, diagnostics and remote control

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TECHNICAL SPECIFICATIONS

SAMPLE COLLECTION MEDIA	Teflon-coated glass fiber filter tape
INTERNAL VACUUM PUMP	Dual diaphragm, brushless motor
LED OPTICAL SOURCE RANGE	Wavelength 370 – 950 nm
RESOLUTION	0.001 µg/m³ or 1 ng/m³ (user-definable display units)
DETECTION LIMIT (1 HOUR)	< 0.005 µg/m³
RANGE	< 0.01 to >100 µg/m3 Black Carbon
MEASUREMENT TIME BASE	1 second or 1 min (user selectable), resampling to any time resolution possible
AIR FLOW	2 – 5 LPM, user selectable, stabilized by closed loop control, non-condensing
USER INTERFACE	8.4" color touch-screen display
COMMUNICATIONS	Ethernet, RS232, USB
POWER SUPPLY	100-230VAC, 50/60Hz (auto-switching)
POWER CONSUMPTION	25 W average
DIMENSIONS (HXWXD)	28 x 43 x 33 cm
WEIGHT	21 kg

ECOMESURE

Réf.F89 V2