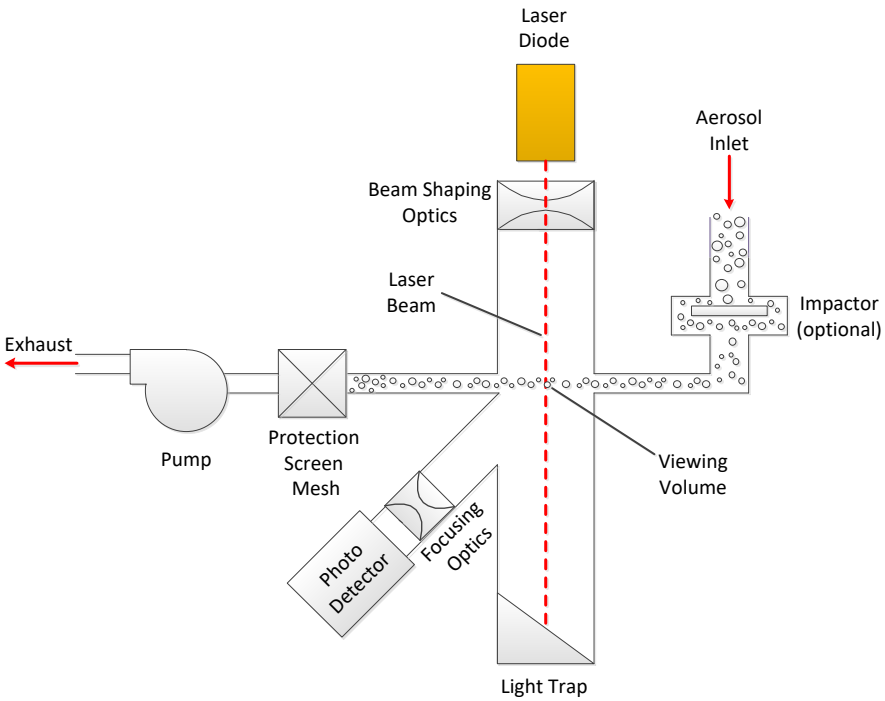
SidePak™ Personal Aerosol Monitor Theory of Operation

Model AM520/AM520i

Application Note EXPMN-010 (A4)

The SidePak™ AM520/AM520i Personal Aerosol Monitors use light scattering photometric technology to determine aerosol mass concentration in real-time. Aerosol is drawn into the sensing chamber in a continuous stream. The aerosol stream is illuminated with a small beam of laser light. Particles in the aerosol stream scatter light in all directions. Focusing optics at 90° to both the aerosol stream and laser beam collects some of the scattered light and focuses it onto a photo detector. The detection circuitry converts the intensity of light scattered to a voltage. This voltage is directly proportional to the intensity of light scattered which is directly proportional to the mass concentration of the aerosol. The voltage is read by the processor and multiplied by an internal calibration constant to yield factory calibrated mass concentration. The internal calibration constant is determined from the ratio of the voltage response of the SidePak™ AM520/AM520i monitor to the known mass concentration of the calibration test aerosol (A1 Test Dust).



Photometric light scattering aerosol monitors respond linearly to the aerosol mass concentration. The scattered light is dependent upon particle size, particle size distribution, particle density, the index of refraction, and particle morphology. The sensing volume of the SidePak AM520/AM520i monitor is constant and is defined by the intersection of the aerosol stream and the laser beam. Mass concentration is determined from the intensity of light scattered by the aerosol within the fixed sensing volume. Since the sensing volume is known, the information can be easily converted by the SidePak AM520/AM520i microprocessor to units of mass per unit volume (mg/m^3).

The SidePak™ AM520/AM520i aerosol monitor are calibrated against a gravimetric reference using the respirable fraction of standard ISO 12301-1, A1 Test Dust. This test dust has a wide size distribution covering the entire size range of the SidePak AM520/AM520i and is used as the calibration test dust because it is representative of a wide variety of ambient aerosols.

If you need very accurate mass concentration readings and use the SidePak™ AM520/AM520i monitor in an environment where a specific aerosol type predominates, you can recalibrate the unit for that aerosol. See Application Notes ITI-009, EXPMN-013 and EXPMN-014 for explanations of how to conduct custom calibration factor studies and to calculate custom photometric calibration factors for diesel particulate matter and respirable silica.

Knowledge Beyond Measure.

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