



Focused Photonics Inc.



Air Quality Monitoring System

Focused Photonics Inc.

AQMS-100 Zero Air Generator

FPI AQMS-100 provides ultra pure pollutant-free zero air for analytical purpose. Remote monitoring and configuration can also be achieved through digital access.



Key Features

- ❖ Ultra high purity zero air output
- ❖ Integrated dew point sensor
- ❖ Regenerative dryer utilizing molecular sieve to perform maintenance free advantage
- ❖ High performance scrubbers to remove hydrocarbon, CO, SO₂, NO, NO₂ and Ozone
- ❖ Remote display and configuration on key functions

Principle

The AQMS-100 generates clean and dry zero air by removing components which will cause interference on monitoring results.

Regenerative scrubber

The scrubber is filled with molecular sieve which has multiple holes and filters only water molecule with certain diameter.

A second molecular sieve will be alternate for raw air diversion while the other is under regeneration by injecting compressed air to remove moisture.

HC/CO/NO scrubber

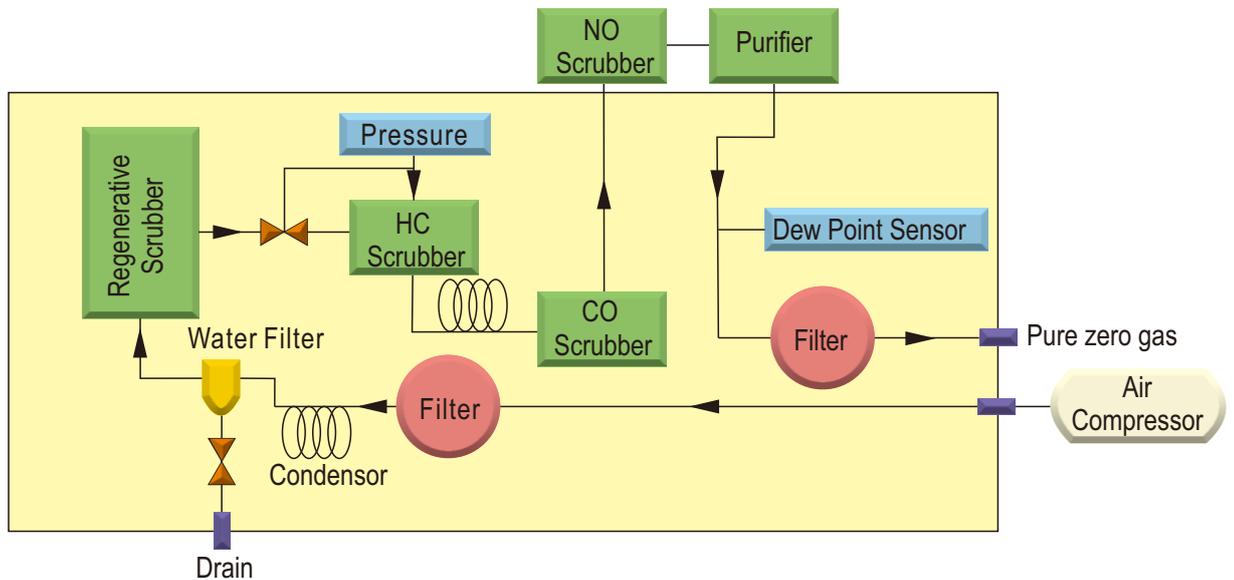
To remove hydrocarbon, CO and NO, three dependent scrubbers applying catalytic reaction are used, where HC and CO will be converted into CO₂ which does not interfere analysis and NO will be converted into NO₂ which will then be removed by purifier.



Technical Data

| | |
|-----------------------|---|
| Output | 20 SLPM at 30 psig |
| Dew Point | -30 °C |
| Output Concentration | SO ₂ : <0.025 ppb NO: <0.025 ppb NO ₂ : <0.025 ppb O ₃ : <0.3 ppb CO: <10 ppb CH ₄ : <5 ppb Other HC: <0.25 ppb |
| Power Requirement | 100~240 VAC, Converter applicable |
| Operating Temperature | 0~40 °C |
| Dimensions | 221mm(H) x 482mm(W) x 554mm(D) |

System Drawing



*Molecular sieve are utilized in regenerative scrubber

*Activated carbon are utilized in purifier

AQMS-200 Dynamic Dilution Calibrator

FPI AQMS-200 multi-gas calibrator utilizes mass flow controller to perform standard zero and span calibration with up to 4 gas sources.



Key Feature

- ❖ Stable trace level ozone output down to 0.1 ppm
- ❖ Optional ozone generator, gas phase titration and photometer for independent ozone calibration
- ❖ User selectable output include RS232 and ethernet
- ❖ High performance mass flow controller provides stable and linearized output

Technical Data

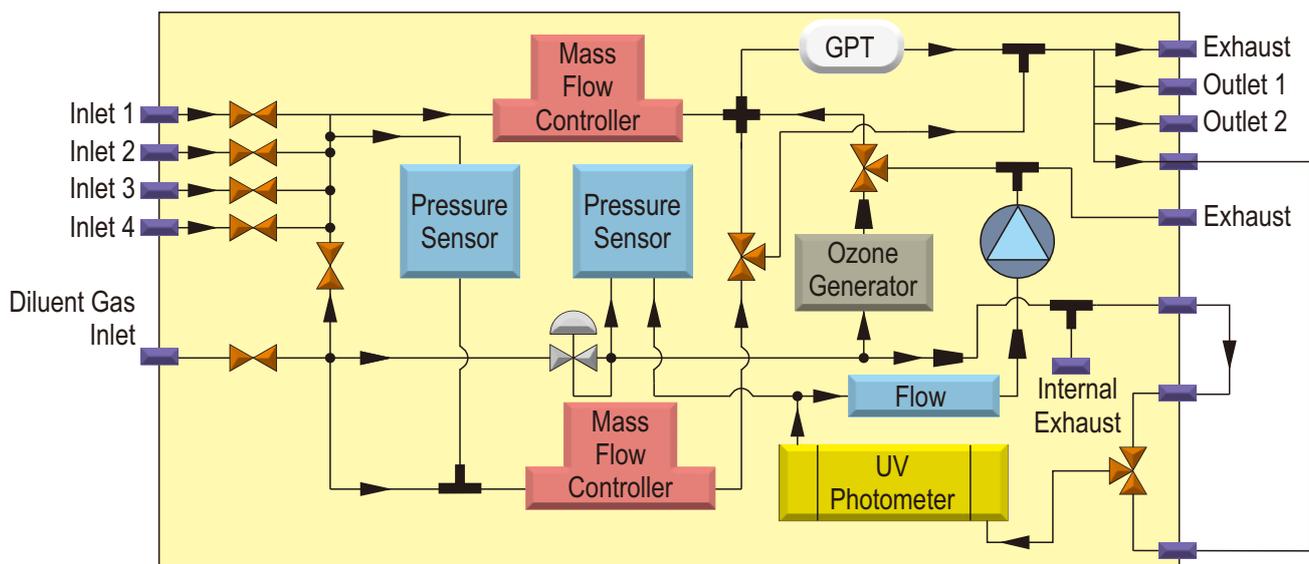
| | | |
|-----------------|-------------------------|--------------------------------|
| Dilution System | Flow Accuracy | $\pm 1\%F.S.$ |
| | Repeatability | $\pm 0.2\%F.S.$ |
| | Linearity | $\pm 0.5\%F.S.$ |
| | Response Time | < 60s (T98) |
| | Flow of Dilution Air | 0~5 SLPM, 0~10 SLPM, 0~20 SLPM |
| | Flow of Span Air | 0~50, 0~100, 0~200 cc/min |
| | Calibration Gas Input | 4 |
| | Diluent Gas Input Ports | 1 |



Technical Data

| | | |
|-------------------------------|-----------------------|------------------------------------|
| Ozone Generator (Optional) | Output | 0.1~6 ppm |
| | Stability (7 days) | ± 1% |
| UV Photometer (Optional) | Range | 0~100 ppb to 0~10 ppm (Selectable) |
| | Precision | 1 ppb |
| | Linearity | ± 1%F.S. |
| | Rise/Fall Time | < 20s (photometer response) |
| | Response Time | < 180s (T98) |
| | Zero Drift (7 days) | 1 ppb |
| Physical and Communication | Power Requirement | 100~240 VAC, 45~55 Hz |
| | Dimensions and Weight | 178mm x 432mm x 604mm, 15kg |
| | Operating Temperature | 5~40°C |
| | Communication | RS232, RS485, Ethernet |

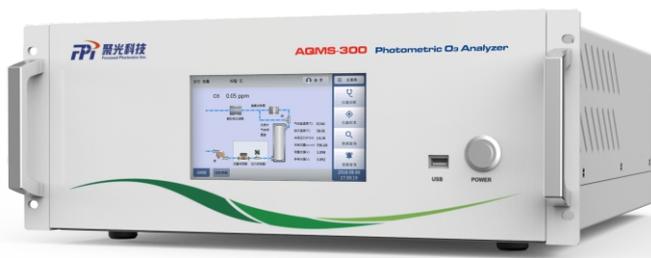
System Drawing



Focused Photonics Inc.

AQMS-300 Ozone Analyzer

FPI AQMS-300 Ozone (O_3) analyzer measures ambient O_3 concentration in ppb level by utilizing UV photometric absorption technology.



Key Features

- ❖ Accurate direct UV absorption with reference comparison
- ❖ Compliance with US EPA reference method
- ❖ Various outputs include ethernet and Rs232
- ❖ User friendly interface with large screen
- ❖ Continuous system diagnosis with alarm
- ❖ Multi-tasking software allows viewing test variables while operating
- ❖ Temperature and pressure compensation
- ❖ Internal data logging with 1 min to 365 day multiple averages

Principle

The concentration of ambient ozone is proportional to UV light absorption since there is a significant characteristic absorption for ozone on wavelength of 254nm.

Periodical diversion on sample flow passing through the ozone scrubber will generate reference measurement, which is compared with sample measurement to provide stable and representative result.

Ozone scrubber

The ozone scrubber is filled with MnO_2 as catalyst, which will convert O_3 to O_2 to form reference gas. Meanwhile, the presence of other components remains the same.

Data storage and analysis

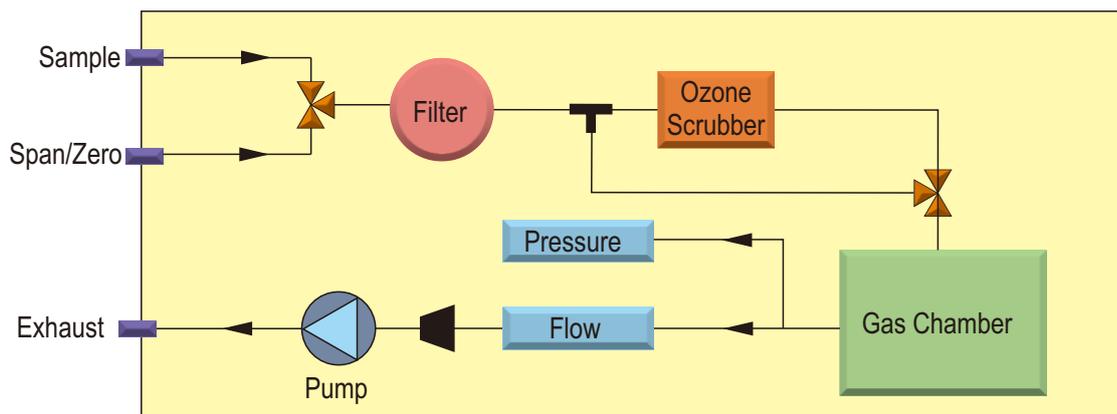
Stored data are easily retrievable through the serial or ethernet port via PC client software, allowing operators to perform predictive diagnostics and enhanced data analysis by tracking parameter trends.



Technical Data

| | |
|------------------------|---|
| Standard Range | Min: 0~100 ppb F.S. Max: 0~10 ppm F.S. (Selectable) |
| Zero Noise | < 0.3 ppb (RMS) |
| Span Noise | < 0.5% of reading (RMS) above 100 ppb |
| Lower Detectable limit | < 0.6 ppb (RMS) |
| Zero Drift (24 hours) | < 1 ppb |
| Span Drift | < 1% F.S. |
| Response Time | < 20s (T95) |
| Precision | < 0.5% |
| Linearity | < 1% F.S. |
| Sample Flow Rate | 800 cc/min \pm 10% |
| Operating Temperature | 20~30°C range (per US EPA guidelines). Instrument may be safely operated over the range of 5~40°C |
| Power Requirement | 100~240 VAC, Converter applicable |
| Dimensions and Weight | 178mm(H) x 432mm(W) x 609mm(D), 15kg |

System Drawing



Focused Photonics Inc.

AQMS-400 Carbon Monoxide Analyzer

FPI AQMS-400 carbon monoxide (CO) analyzer measures ambient CO concentration by employing non-dispersive infrared with gas filter correlation method technology



Key Features

- ❖ 14 meters optical path to perform high reliability
- ❖ Five years guarantee on GFC wheel
- ❖ Compliance with US EPA reference method
- ❖ Various outputs include ethernet and Rs232
- ❖ User friendly interface with large screen
- ❖ Continuous system diagnosis with alarm
- ❖ Multi-tasking software allows viewing test variables while operating
- ❖ Temperature and pressure compensation
- ❖ Internal data logging with 1 min to 365 day multiple averages

Principle

Infrared energy emitted by light source is passed through gas chamber containing the air sample, and the quantitative absorption of energy by CO in the sample cell is measured by corresponding detector.

GFC

GFC (Gas filter correlation) technology is utilized to remove interference caused by moisture and other backgrounds.

Two gas filled chambers are mounted on a rotating disc, which pass through an IR beam alternately. The measure chamber is filled with nitrogen while the reference chamber is filled with high concentration CO. IR beam then passes through the sample gas cell. The difference in absorbance is measured and provides a direct output of the gas concentration.

Data storage and analysis

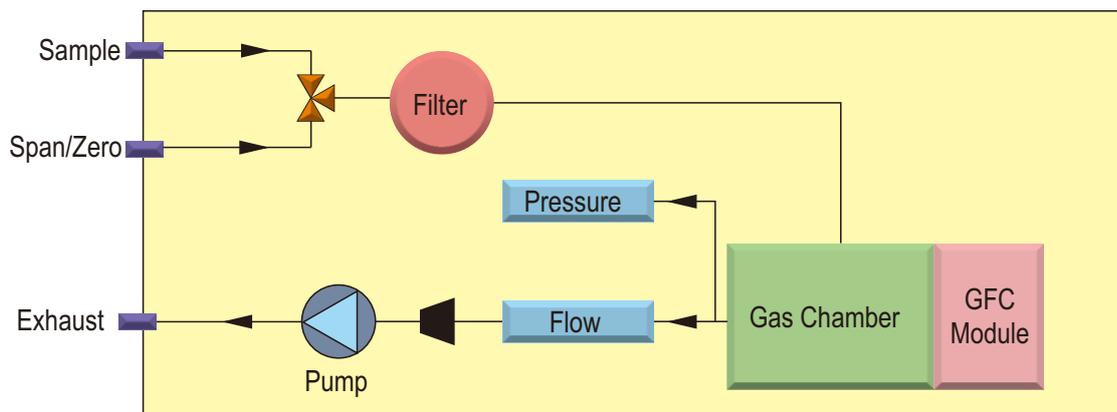
Stored data are easily retrievable through the serial or ethernet port via PC client software, allowing operators to perform predictive diagnostics and enhanced data analysis by tracking parameter trends.



Technical Data

| | |
|------------------------|---|
| Standard Range | Min: 0~50 ppm F.S. Max: 0~1,000 ppm F.S. (Selectable) |
| Zero Noise | < 0.04 ppm (RMS) |
| Span Noise | < 0.25 ppm |
| Lower Detectable limit | < 0.08 ppm |
| Zero Drift (24 hours) | < 0.1 ppm |
| Span Drift | < 1% F.S. |
| Response Time | < 60s (T90) |
| Precision | < 0.5% |
| Linearity | < 1% F.S. |
| Sample Flow Rate | 800 cc/min \pm 10% |
| Operating Temperature | 20~30°C range (per US EPA guidelines). Instrument may be safely operated over the range of 5~40°C |
| Power Requirement | 100~240 VAC, Converter applicable |
| Dimensions and Weight | 178mm x 432mm x 609mm, 25kg |

System Drawing



AQMS-500 Sulfur Dioxide Analyzer

FPI AQMS-500 sulfur dioxide (SO₂) analyzer applies UV fluorescence technology recommended by US EPA as federal reference method for trace level SO₂ measurement.



Key Features

- ❖ Compliance with US EPA reference method
- ❖ Various outputs include ethernet and RS232
- ❖ User friendly interface with large screen
- ❖ Continuous system diagnosis with alarm
- ❖ Multi-tasking software allows viewing test variables while operating
- ❖ Temperature and pressure compensation
- ❖ Internal data logging with 1 min to 365 day multiple averages
- ❖ Critical orifices provide flow stability

Principle

AQMS-500 measures the intensity of the characteristic fluorescence released by SO₂ in an ambient air sample contained in the gas chamber when the air sample is irradiated by ultraviolet light passed through the chamber.

UV source

The pulsing of the UV source lamp serves to increase the optical intensity whereby a greater UV energy throughput and lower detectable concentration are realized.

Removal of interferences

The permeation scrubber acting as hydrocarbon kicker removes aromatic hydrocarbon such as xylene and naphthalene which causes interference.

Optical filtering are employed to improve the rejection of interference from high nitrogen oxides.

Data storage and analysis

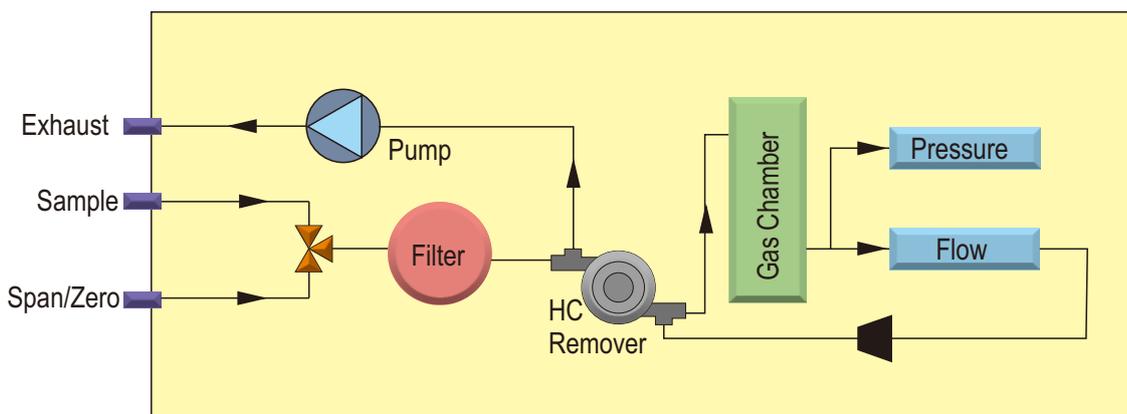
Stored data are easily retrievable through the serial or ethernet port via PC client software, allowing operators to perform predictive diagnostics and enhanced data analysis by tracking parameter trends.



Technical Data

| | |
|------------------------|---|
| Standard Range | Min: 0~100 ppb F.S. Max: 0~20 ppm F.S. (Selectable) |
| Zero Noise | < 0.4 ppb (RMS) |
| Span Noise | < 2.5 ppb |
| Lower Detectable limit | < 0.5 ppb |
| Zero Drift (24 hours) | < 1 ppb |
| Span Drift | < 1% F.S. |
| Response Time | < 80s (T90) |
| Precision | < 1% |
| Linearity | < 1% F.S. |
| Sample Flow Rate | 650 cc/min \pm 10% |
| Operating Temperature | 20~30°C range (per US EPA guidelines). Instrument may be safely operated over the range of 5~40°C |
| Power Requirement | 100~240 VAC, Converter applicable |
| Dimensions and Weight | 178mm(H) x 432mm(W) x 597mm(D), 22kg |

System Drawing



AQMS-600 Nitrogen Oxides Analyzer

FPI AQMS-600 nitrogen oxides (NO-NO₂-NO_x) analyzer utilizes chemiluminescence technology indicated by US EPA as federal reference method for monitoring on multiple forms of nitrogen oxides.



Key Features

- ❖ Permeation dryer on Ozone generator
- ❖ Catalytic Ozone scrubber
- ❖ Independent ranges for NO_x, NO and NO₂
- ❖ Compliance with US EPA reference method
- ❖ Various outputs include ethernet and RS232
- ❖ User friendly interface with large screen
- ❖ Continuous system diagnosis with alarm
- ❖ Multi-tasking software allows viewing test variables while operating
- ❖ Temperature and pressure compensation
- ❖ Internal data logging with 1 min to 365 day multiple averages

Principle

Nitrogen oxides in ambient are measured indirectly by photometrically measuring the light intensity, resulting from the chemiluminescent reaction of nitric oxide (NO) with ozone (O₃).

NO₂ is first quantitatively reduced to NO by means of a converter. NO, which commonly exists in ambient air together with NO₂, passes through the converter unchanged causing a resultant total NO_x concentration equal to NO + NO₂.

PMT

The optical filter(660nm) attached on PMT provides reliable measurement, and temperature are controlled between 6~8°C with only 0.1°C fluctuation by a thermoelectric cooler, ensure the measurement stability.

Ozone generation

Permeation dryer are introduced in ozone generation to provide long system durability without any replacement.

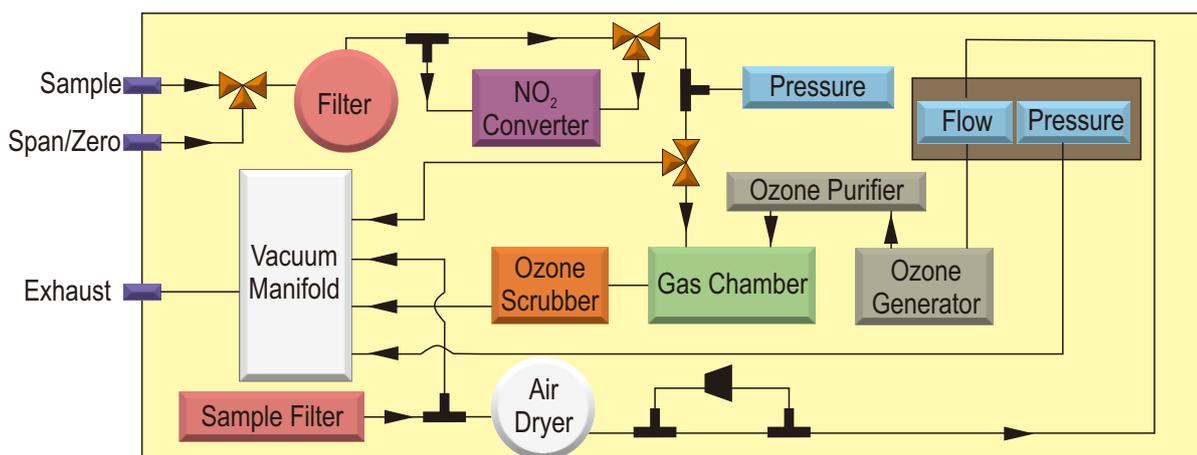
An catalytic ozone scrubber is standard for maximum safety and pump life before exhaust.



Technical Data

| | |
|------------------------|---|
| Standard Range | Min: 0~100 ppb F.S. Max: 0~20 ppm F.S. (Selectable) |
| Zero Noise | < 0.4 ppb (RMS) |
| Span Noise | < 2.5 ppb |
| Lower Detectable limit | < 0.4 ppb |
| Zero Drift (24 hours) | < 0.4 ppb |
| Span Drift | < 1% F.S. |
| Response Time | < 40s (T90) |
| Precision | < 1% |
| Linearity | < 1% F.S. |
| Sample Flow Rate | 500 cc/min \pm 10% |
| Operating Temperature | 20~30°C range (per US EPA guidelines). Instrument may be safely operated over the range of 5~40°C |
| Power Requirement | 100~240 VAC, Converter applicable |
| Dimensions and Weight | 178mm(H) x 432mm(W) x 609mm(D), 22kg |

System Drawing



BPM-200 Continuous Particulate Monitor

The BPM-200 measures ambient particulate by using well applied beta ray attenuation technology. PM2.5 measurement can also be achieved by introducing corresponding cyclone.



Key Feature

- ❖ Compliance with US EPA equivalent method
- ❖ Automatic continuous operation up to 60 days
- ❖ Auto zero and span calibration
- ❖ Low maintenance and operation requirement
- ❖ User selectable measurement cycle
- ❖ Various output with serial printer and GPRS as optional
- ❖ Stable and long life time radiation source

Principle

Particulate matter sample is pulled by a vacuum pump and concentrated on filter tape spot, the concentrated sample is advanced to measuring position where between beta ray source and detector.

An attenuation signal of beta ray is detected which represents the mass of sample particulate. Particulate concentration can be determined by dividing mass to volume which has been strictly controlled during sampling with fixed flow rate.



Technical Data

| | | |
|---------------------------|-------------------------------------|--|
| Principle | Beta ray attenuation | |
| Performance Specification | Resolution | 1 $\mu\text{g}/\text{m}^3$ |
| | Lower Detectable Limit | 1 $\mu\text{g}/\text{m}^3$ |
| | Reproducibility | < 7% |
| | Range | 1 mg/m^3 to 10 mg/m^3 Selectable |
| | Sample Cycle | 1~360 min |
| | Sample Flow Rate | 16.7 L/min |
| | Flow Accuracy | $\pm 1\%$ F.S. |
| | Flow Stability | $\pm 2\%$ F. S. |
| | Beta Source | ^{14}C (Carbon -14), 10 μCi |
| | Beta Detector Type | GM tube |
| Filter Tape | Glass fiber filter tape, 60 days of | |
| Environmental | Operating Temperature | 5~40°C |
| | Ambient Humidity | 0~90% RH, noncondensing |
| | Ambient Pressure | 86~116 kPa |
| Physical and Electrical | Power Supply | 220 \pm 10% VAC, 50 \pm 1 Hz |
| | Power Consumption | 350W with pump and heater |
| | Dimensions and Weight | 310mm x 430mm x 400mm, 25kg |
| Communication | Communication Port | RS232, RS485 |
| | Digital I/O | Two digit input, four-digit output |
| | Analog I/O | Two (4~20)mA , 1~5V/0~5V output Two (4~20)mA input |
| | Other | Optional serial printer and GPRS |



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