Methane

CH_4

Where is it found?

Methane (CH_4) is the most abundant organic molecule in the atmosphere, being one of the most important greenhouse gases. It is colourless, odourless and insoluble in water. The main anthropogenic emission sources are due to the production and transport of coal, natural gas, and oil. CH_4 emissions also result from livestock and other agricultural practices, land use and solid waste landfills. Other natural sources include reduced, anoxic portions of wetlands and portions of ecosystems undergoing organic decomposition.

Why is it harmful?

High levels of CH_4 can result in vision problems, memory loss, nausea, vomiting, and headache. In severe cases, there may be changes in breathing and heart rate, balance problems, numbness, and unconsciousness. If exposure is large or continues for a longer period, it can kill. CH_4 contributes to the formation of tropospheric ozone and particulate pollution.

CH_4 cartridge

K-CH4-A-01/ K-CH4-B-01

The Methane Cartridge has a built-in non-dispersive infrared sensor (NDIR) ideal to measure concentrations for industrial applications with concentrations higher than 1,500 ppm. Besides, it includes an automatic baseline calibration to maintain the long-term stability with no effect of humidity, temperature, and pressure, which are corrected in the algorithm.

Technical specifications

Type	NDIR [A] MEMS [B]
Unit of measurement	mg/m^3, ppm
Measurement range [1]	0 - 50,000 ppm (5% vol) [A] 0 - 300,000 ppm (30% vol) [B]
Resolution [2]	100 ppm [A] 1 ppm [B]
Operating temperature range [3]	-20 to 50°C [A] -35 to 70°C [B]
Operating RH range [4]	0 to 99 %RH
Recommended RH range [4]	0 to 95 %RH [A] 0 to 99 %RH [B]
Operating life [5]	> 5 years [A] > 4 years [B]
Guarantee range [6]	100% vol

Limit of Detection (LOD) [7]	1,000 ppm [A] 60 ppm [B]
Repeatability [8]	500 ppm [A]
Response time [9]	< 90 sec [A]
Typical accuracy [11] [12]	±3 % of F.S. [A] ±30 ppm + 10% of reading [B]
Typical precision R^2 [10]	-
Typical slope [10]	-
Typical intercept (a) [10]	-
DQO - Typical U(exp) [13]	-
Typical Intra-model variability [14]	< 500 ppm [A]

* See notes on page 30

CO

Carbon monoxide

Where is it found?

CO is found in fumes produced any time fuel burns in cars or trucks, small engines, stoves, lanterns, grills, fireplaces, gas ranges, or furnaces.

Improperly ventilated appliances and engines, particularly in a tightly sealed or enclosed space, may allow carbon monoxide to accumulate until dangerous levels.

Why is it harmful?

Carbon monoxide or CO is an odourless and colorless pollutant gas that can cause death.

When CO is inhaled into the body, it mixes with the blood avoiding the oxygen absorption.

The CO exposure of a person over a certain period of time can cause illness and even death.

CO cartridge

(A) K-CO-A-01 / (B) K-CO-B-01

The Carbon Monoxide Cartridge has a built-in electrochemical sensor with very low noise electronics allowing the measurement from very low concentrations (ppb) up to several ppm. To cover different applications, there are two measurement ranges: **Type A** measuring most common concentrations range, and **Type B**, a higher range version that can measure up to 500 ppm, decreasing the accuracy at low concentrations.

This cartridge is very stable over time with a lifespan that can go beyond the specification for several months under no extreme environments.

Technical specifications

Type	Electrochemical
Unit of measurement	µg/m³, ppb(A) mg/m³, ppm(B)
Measurement range(1)	0 - 12,000 ppb(A) 0 - 500 ppm(B)
Resolution(2)	1 ppb(A) 0.01 ppm(B)
Operating temperature range(3)	-30 to 50 °C
Operating RH range(4)	0 to 99 %RH
Recommended RH range(4)	15 to 90 %RH
Operating life(5)	> 24 months
Guarantee range(6)	1,000 ppm

Limit of Detection (LOD)(7)	10 ppb(A) 0.02 ppm(B)
Repeatability(8)	20 ppb(A) 0.05 ppm(B)
Response time(9)	< 30 sec(A) < 180 sec(B)
Typical accuracy (MAE)(10)	± 80 ppb(A) ± 0.1 ppm(B)
Typical precision R^2 (10)	> 0.85
Typical slope(10)	0.78 - 1.29
Typical intercept (a)(10)	-50 ppb ≤ a ≤ +50 ppb(A) -0.1 ppm ≤ a ≤ +0.1 ppm(B)
DQO - Typical U(exp)(11)	< 20%
Typical Intra-model variability(12)	< 3 ppb(A) < 0.05 ppm(B)

CO_2

Carbon dioxide

Where is it found?

CO_2 is a result of normal cell function when it is breathed out of the body. Besides, it is an essential element in photosynthesis, the process by which plants make food and energy. Levels of atmospheric CO_2 have increased since the Industrial Revolution. The primary causes are deforestation and the burning of fossil fuels such as coal, for electricity, heat production and for transportation (cars, ships, planes, etc.). It could also be formed, as a secondary pollutant, by CO oxidation.

Why is it harmful?

Carbon dioxide (CO_2) is the fourth most abundant gas in the Earth's atmosphere being the main Greenhouse gas. It is an odourless, colourless, and non-toxic gas although its emission is an environmental global problem, being the main gas pollutant contributing to the climate change. Besides, it is a contributor of the acid rain, oceans acidification and could displace oxygen (O_2) and nitrogen (N_2). CO_2 is removed from the atmosphere when it is absorbed by plants and algae as part of the biological carbon cycle.

CO_2 cartridge

K-CO2-B-01

The Carbon Dioxide Cartridge has a built-in non-dispersive infrared sensor (NDIR) ideal to measure from low to high concentrations that can be found in the atmosphere. Besides, it includes an automatic baseline calibration to maintain the long-term stability with no effect of humidity, temperature and pressure, which are corrected in the algorithm.

Technical specifications

Type	NDIR
Unit of measurement	mg/m³, ppm
Measurement range[1]	0 - 5,000 ppm
Resolution[2]	1 ppm
Operating temperature range[3]	-20 to 50 ºC
Operating RH range[4]	0 to 99 %RH
Recommended RH range[4]	15 to 95 %RH
Operating life[5]	> 7 years

Response time[9]	< 30 sec
Typical accuracy (MAE)[10]	± 30 ppm

NO

Nitric oxide

Where is it found?

Nitrogen oxide is emitted from automotive engines and the burning of coal, oil, diesel fuel, and natural gas, specially from electric power plants. It is also emitted by cigarettes, gas stoves, wood burning, and silos that contain silage.

Why is it harmful?

Nitric oxide (NO), also called nitrogen oxide, is a colorless toxic gas originated by the oxidation of nitrogen. It contributes to climate change and its inhalation affects human health. When it reacts with sunlight and other chemicals, such as sulphur dioxide (SO_2), it forms smog and acid rain. The inhalation of high levels of nitric oxide can cause respiratory problems, particularly in vulnerable groups, such as asthmatics, and it affects to cardiovascular and immune systems.

NO cartridge

K-NO-A-01

The Nitric Oxide Cartridge has a built-in electrochemical sensor ideal to measure from very low ppb concentrations up to several ppm than can be found in the atmosphere close to pollution sources (vehicles, industries...). This cartridge is very accurate and stable with very good temperature correction algorithm and can work beyond two years easily under no extreme environments. The cartridge can suffer from a small zero drift (some ppbs) over time that can be easily corrected with the remote Apex Calibration Tool available on Apex Cloud Software.

Technical specifications

Type	Electrochemical	**Limit of Detection (LOD)**[7]	2 ppb
Unit of measurement	µg/m³, ppb	**Repeatability**[8]	4 ppb
Measurement range[1]	0 - 5,000 ppb	**Response time**[9]	< 30 sec
Resolution[2]	1 ppb	**Typical accuracy (MAE)**[10]	± 4 ppb
Operating temperature range[3]	-30 to 40 °C	**Typical precision R^2** [10]	> 0.9
Operating RH range[4]	0 to 99 %RH	**Typical slope**[10]	0.9 - 1.12
Recommended RH range[4]	15 to 85 %RH	**Typical intercept (a)**[10]	-2 ppb ≤ a ≤ +2 ppb
Operating life[5]	> 24 months	**DQO - Typical U(exp)**[11]	< 20%
Guarantee range[6]	20 ppm	**Typical Intra-model variability**[12]	< 1 ppb

Nitrogen dioxide

NO_2

Where is it found?

The major source of NO_2 is combustion of fossil fuels: coal, oil and gas. Most of the NO_2 in cities is derived from motor vehicle's exhausts. Other sources of NO_2 are petrol and metal refining, electricity generation from coal-fired power stations, other manufacturing industries and food processing.

Why is it harmful?

Nitrogen dioxide (NO_2) is a pollutant criterion that contributes to the formation of photochemical smog, which has significant impact on human health. Breathing increased levels of NO_2 inflames the lining of the lungs and reduces immunity to lung infections. The result is wheezing, coughing, colds, flu and bronchitis, as well as more frequent and intense asthma attacks.

NO_2 cartridge

K-NO2-A-01

The Nitrogen Dioxide Cartridge has a built-in electrochemical sensor which has **no interference with Ozone** thanks to its embedded O_3 filter, making the cartridge ideal to measure the concentrations found in the atmosphere, from very low levels in clean environments to high concentrations in polluted areas of cities or industries. However, the cartridge can be affected by fast humidity transients reducing its accuracy during these events.

Technical specifications

Type	Electrochemical	**Limit of Detection (LOD)**[7]	2 ppb
Unit of measurement	µg/m³, ppb	**Repeatability**[8]	4 ppb
Measurement range[1]	0 - 5,000 ppb	**Response time**[9]	< 60 sec
Resolution[2]	1 ppb	**Typical accuracy (MAE)**[10]	± 5 ppb
Operating temperature range[3]	-30 to 40 °C	**Typical precision R^2** [10]	> 0.85
Operating RH range[4]	0 to 99 %RH	**Typical slope**[10]	0.78 - 1.29
Recommended RH range[4]	15 to 85 %RH	**Typical intercept (a)**[10]	-4 ppb ≤ a ≤ +4 ppb
Operating life[5]	> 24 months	**DQO - Typical U(exp)**[11]	< 25%
Guarantee range[6]	20 ppm	**Typical Intra-model variability**[12]	< 1 ppb

Ozone

O_3

Where is it found?

Ozone (O_3) is found in the troposphere and it is the result of the atmospheric reaction of a number of precursor pollutants, which come from both natural and man-made sources. Precursor pollutants are originated by human activities and include hydrocarbons and nitrogen oxides. They are largely emitted by cars and other vehicles, fossil fuel power plants, oil refineries, the agriculture sector and a number of other industries.

Why is it harmful?

Ozone (O_3) is a reactive gas that exists in two layers of the atmosphere: the stratosphere (upper layer) and the troposphere (at ground level and up to 15 km). Ozone, in the upper layer, is essential to protect the Earth from the sun's ultraviolet rays. At lower levels, it is an important greenhouse gas and an air pollutant, which is harmful to human and ecosystem's health. It is also the major component of urban smog.

O_3 cartridge

K-O3-A-01

The Ozone cartridge has a built-in electrochemical sensor that detects NO_2 and O_3 concentration. Then, to measure accurately the O_3 concentration, it is required to have installed in the same device the NO_2 Cartridge. Thus, thanks to Apex algorithm, it is possible to deliver accurate measurements of Ozone, with no NO_2 infl uence, even at high temperature which are related to higher O_3 concentration due to the sun radiation.

Technical specifications

Type	Electrochemical	**Limit of Detection (LOD)**[7]	3 ppb
Unit of measurement	µg/m³, ppb	**Repeatability**[8]	4 ppb
Measurement range[1]	0 - 2,000 ppb	**Response time**[9]	< 70 sec
Resolution[2]	1 ppb	**Typical accuracy (MAE)**[10]	± 8 ppb
Operating temperature range[3]	-30 to 40 °C	**Typical precision R²** [10]	> 0.9
Operating RH range[4]	10 to 99 %RH	**Typical slope**[10]	0.85 - 1.18
Recommended RH range[4]	15 to 85 %RH	**Typical intercept (a)**[10]	-3 ppb ≤ a ≤ +3 ppb
Operating life[5]	> 24 months	**DQO - Typical U(exp)**[11]	< 20%
Guarantee range[6]	20 ppm	**Typical Intra-model variability**[12]	< 1 ppb

Hydrogen sulfide

H_2S

Where is it found?

Most of this gas present in the atmosphere has natural origin by the organic matter decomposition. Anthropically, it occurs in processes in which sulphur compounds and organic matter are involved at high temperatures. Some industrial activities that emit this gas are paper pulp manufacturing, oil refining, water treatment plants and the viscose manufacturing textile industry.

Why is it harmful?

Hydrogen Sulfide (H_2S) affects mainly to the respiratory system with the first symptoms being nose, throat and eyes irritation. This compound begins to be detected by human smell at concentrations much lower than those that can have harmful effects on health. Short-term exposures of high concentrations can cause headache, dizziness and vomiting.

H_2S cartridge

(A) K-H2S-A-01 / (B) K-H2S-B-01

The Hydrogen Sulfi de cartridge has a built-in electrochemical sensor very sensitive tc its specifi c pollutant allowing the sensor to detect any change in H_2S œncentrations. This cartridge responds and detects **Methyl Mercaptan (CH_4S)**. To cover different applications, there are 2 measurement ranges: **Type A**: detect low ppb concentrations in real environments. Although Apex algorithm corrects well the temperature varia-tions, it is not recommended to use this cartridge to detect levels below 10 ppb. **Type B**: a higher range version that can measure up to 20 ppm, decreasing the accu-racy at low concentrations.

Technical specifications

Type	Electrochemical
Unit of measurement	µg/m³, ppb(A) mg/m³, ppm(B)
Measurement range(1)	0 - 2,000 ppb(A) 0 - 20 ppm(B)
Resolution(2)	1 ppb(A) 0.01 ppm(B)
Operating temperature range(3)	-30 to 50 °C
Operating RH range(4)	0 to 99 %RH
Recommended RH range(4)	15 to 90 %RH
Operating life(5)	> 24 months
Guarantee range(6)	100 ppm

Limit of Detection (LOD)(7)	2 ppb(A) 0.01 ppm(B)
Repeatability(8)	4 ppb(A) 0.01 ppm(B)
Response time(9)	< 60 sec
Typical accuracy (MAE)(10)	± 10 ppb(A) ± 0.05 ppm(B)
Typical precision R^2 (10)	> 0.8
Typical slope(10)	0.78 - 1.29
Typical intercept (a)(10)	-2 ppb ≤ a ≤ +2 ppb(A) -0.02 ppm ≤ a ≤ +0.02 ppm(B)
Typical Intra-model variability(12)	< 2 ppb(A) < 0.02 ppm(B)

Sulphur dioxide

SO_2

Where is it found?

Sulfur Dioxide (SO_2) is invisible and has a nasty smell. It is produced by the combustion of any substance that contains sulfur. The main source of SO_2 in the atmosphere comes from combustion of coal or fossil fuels while small sources are in metallurgy and naturally by volcanic eruptions. Locomotives, ships and other vehicles that burn fuel with a high sulfur content are other emission source. Besides, it can react with other compounds in the atmosphere contributing to particulate matter pollution.

Why is it harmful?

SO_2 gas is a respiratory tract and eye irritant, affecting very fast to humans (10-15 minutes). Long-exposures affect to the lung defences and aggravate existing cardiovascular disease. It also causes damage in ecosystems and it contributes to acid rain when oxidized to sulfuric acid. This provokes an acidification of ecosystems, injuries and necrosis in vegetation and deterioration of materials.

SO_2 cartridge

K-SO2-A-01

The Sulfur Dioxide Cartridge has a built-in electrochemical sensor which presents high cross-sensitivities with O_3 and NO_2. When used together with the NO_2 and O_3 car-tridges, the Apex algorithm is capable of correcting from these cross-sensitivities improving the accuracy of the measurements. However, it is not recommended for outdoors application requiring accurate SO_2 measurements at very low concentra-tions (<20 ppb).

Technical specifications

Type	Electrochemical	**Limit of Detection (LOD)**[7]	3 ppb
Unit of measurement	µg/m³, ppb	**Repeatability**[8]	5 ppb
Measurement range[1]	0 - 10,000 ppb	**Response time**[9]	< 60 sec
Resolution[2]	1 ppb	**Typical accuracy (MAE)**[10]	± 15 ppb
Operating temperature range[3]	-30 to 40 °C	**Typical precision R^2** [10]	> 0.7
Operating RH range[4]	0 to 99 %RH	**Typical slope**[10]	0.78 - 1.29
Recommended RH range[4]	15 to 90 %RH	**Typical intercept (a)**[10]	-5 ppb ≤ a ≤ +5 ppb
Operating life[5]	> 24 months	**DQO - Typical U(exp)**[11]	< 25%
Guarantee range[6]	100 ppm	**Typical Intra-model variability**[12]	< 3 ppb

Ammonia

NH3

Where is it found?

Ammonia (NH_3) is a colourless gas with a pungent odour that can be detected by humans at 0.4-1 ppm, being the exposure limit 50 ppm. NH_3 is originated from both natural and anthropogenic sources, being the main source agriculture (fertiliser application and fabrication) and livestock (manure management), followed by the waste and water management (slurries, composting and landfills). Other sources are household and industrial cleaners, that can affect directly to humans exposed to them.

Why is it harmful?

NH_3 is a volatile gas poisonous if inhaled at high concentrations, causing respiratory tract and eyes irritation, while causing throat and skin irritation in lesser amounts. It is highly soluble in water, so it is associated with acid deposition, eutrophication, affecting to land and water ecosystems by reducing the biodiversity. Besides, it is explosive when mixed with air or oxygen at very high concentrations. NH_3 also contributes to the formation of particulate aerosols in the atmosphere as a secondary particulate precursor.

NH_3 cartridge

K-NH3-A-01

The Ammonia cartridge has a built-in electrochemical sensor capable of measuring from low to high concentrations with a typical noise below 0.1 ppm when the ambient temperature is under 25ºC. The Cartridge presents cross-sensitivities with NO_2, O_3, Cl_2 and SO_2 that can be negligible in most applications. However, it also presents cross-sensitivity to H_2S, which is quite relevant because they can co-exist and both measurements can be essential for the same purpose. That's why, it is recommended to use it together with the H_2S cartridge, which allows the Apex algorithm to correct from this cross- sensitivity.

Technical specifications

Type	Electrochemical
Unit of measurement	mg/m³, ppm
Measurement range(1)	0 - 50 ppm
Resolution(2)	0.01 ppm
Operating temperature range(3)	-10 to 50 ºC
Operating RH range(4)	0 to 99 %RH
Recommended RH range(4)	15 to 90 %RH
Operating life(5)	> 24 months
Guarantee range(6)	100 ppm

Limit of Detection (LOD)(7)	0.02 ppm
Repeatability(8)	0.03 ppm
Response time(9)	< 45 sec
Typical accuracy (MAE)(10)	± 0.3 ppm
Typical Intra-model variability(12)	< 0.1 ppm

VOCs

Volatile Organic Compounds

Where is it found?

Volatile Organic Compounds (VOCs) can be produced by fuel combustion (wood, coal, gasoline etc.) such as mobile sources and industries. They can be released to the atmosphere due to gasoline, paint, and solvents evaporation from above ground storage tanks. Another of the most important emission sources is biogenic, by vegetation natural release.

Why is it harmful?

Many VOCs are toxic and can cause cancer, mutations, and/or other serious health problems. One of the most harmful compounds is the benzene, which can cause leukaemia. Some of them contribute to ozone formation with associated health effects, environmental and climate effects. Also, contribute to the formation of CO_2 and secondary organic aerosols that can warm and cool the atmosphere, respectively.

VOCs cartridge

(A) K-VOCs-A-01 / (B) K-VOCs-B-01

The Volatile Organic Compounds Cartridge has a built-in photoionization detector (PID) sensor provided with a 10.6 eV light energy source to measure accurately hundreds of VOCs commonly found in indoor and outdoor environments. Its cutting-edge design avoids any undesirable humidity effect, giving 10,000 hours of continuous operation.

To cover different applications, there are 2 measurement ranges: **Type A:** detect low ppb concentrations in real environments. Apex algorithm corrects the temperature, humidity and pressure variations allowing accurate measurements from very low concentrations (<5 ppb) up to >3 ppm, with very low variability between sensors. **Type B:** a higher range version that can measure up to 40 ppm, decreasing the accuracy at low concentrations (<1 ppm).

Technical specifications

Type	Photoionization detector
Unit of measurement	µg/m³, ppb (A) mg/m³, ppm (B)
Measurement range(1)	0 - 3,000 ppb (A) 0 - 40 ppm (B)
Resolution(2)	1 ppb (A) 0.01 ppm (B)
Operating temperature range(3)	-40 to 60 °C
Operating RH range(4)	0 to 99 %RH
Recommended RH range(4)	0 to 99 %RH
Operating life(5)	10,000 hours
Guarantee range(6)	50 ppm (A) 60 ppm (B)

Limit of Detection (LOD)(7)	1 ppb (A) 0.01 ppm (B)
Repeatability(8)	5 ppb (A) 0.02 ppm (B)
Response time(9)	< 12 sec (A) < 10 sec (B)
Typical accuracy (MAE)(10)	± 10 ppb (A) ± 0.1 ppm (B)
Typical precision R^2 (10)	> 0.99
Typical slope(10)	0.99 - 1.002
Typical intercept (a)(10)	-9 ppb ≤ a ≤ +9 ppb (A) -0.08 ppm ≤ a ≤ +0.08 ppm(B)
Typical Intra-model variability(12)	< 3 ppb (A) < 0.1 ppm (B)

Particulate Matter

Where is it found?

Particles are emitted from a wide range of man-made sources. The most significant are road transport, non-combustion processes, industrial combustion plants and processes, commercial and residential combustion and power plants. Natural sources are less important and include volcanoes and dust storms.

Why is it harmful?

Particles may be seen as ones of the most critical of all pollutants. Particulate matter is the generic term to classify air pollutants comprising of suspended particles in the air. The size, surface, number and composition of particles play an important role in human health effects. The upper respiratory tract is affected by PM_{10} while lung alveoli is affected by ultrafine particles (<0.1 µm diameter).

Particles can cause premature mortality in patients suffering from lung or heart disease, provocate heart attacks, aggravate asthma, reduced lung functionality, irritation in airways, coughing, difficult breathing, etc.

PM sensor

The Particulate Matter sensor consists on an Optical Particle Counter (OPC). To cover different applications, two particle sensors are available:

- **Type A** (specific for Apex AIR Pro stations): an OPC capable of measuring particles from 0.3 µm up to 40 µm. Then, the PM_1, $PM_{2.5}$, PM_4, PM_{10}, Total Suspended Particles (TSP) and Total Particle Counter (TPC) are calculated assuming a particle density profile. Field co-location studies have shown that the expected field performance is comparable to Palas Fidas 200 equivalent instrument.
- **Type B** (specific for Apex AIR Lite stations): sensor with a range of measurement from 0.3 µm up to 10 µm. The sensor monitors accurately PM_1 and $PM_{2.5}$ concentration, while (*) the expected error for PM_{10} is higher in presence of coarse particles.

The effect of humidity is perfectly corrected with the embedded algorithm achiving high accuracy at any environmental conditions except under foggy days or condensation, where the data is automatically invalidated by the software ApexAirCloud. Further calibrations can be applied at a specifi c site to match the mass concentrations. Also, the particle size distributions are available on Apex Cloud.

PM1
PM2.5
PM4
PM10
TSP
TPC

Technical specifications

Type A (only for Apex AIR Pro)

Type	Optical particle counter
Unit of measurement	µg/m³
Measurement range[1]	0 - 1,000 µg/m³ (PM1) 0 - 2,000 µg/m³ (PM2.5) 0 - 2,000 µg/m³ (PM4) 0 - 10,000 µg/m³ (PM10) 0 - 15,000 µg/m³ (TSP) 0 - 8,000 counts/cm³ (TPC)
Resolution[2]	1 µg/m³ 1 count/cm³ (TPC)
Operating temperature range[3]	-10 to 50 °C
Operating RH range[4]	0 to 99 %RH
Recommended RH range[4]	0 to 95 %RH
Operating life[5]	> 24 months
Repeatability[8]	2 µg/m³ (PM1) 3 µg/m³ (PM2.5) 3 µg/m³ (PM4) 5 µg/m³ (PM10) 6 µg/m³ (TSP)
Response time[9]	< 10 sec

Limit of Detection (LOD)[7]	0.5 µg/m³ (PM1) 0.5 µg/m³ (PM2.5) 0.5 µg/m³ (PM4) 1 µg/m³ (PM10) 1 µg/m³ (TSP)
Typical accuracy (MAE)[10]	± 2 µg/m³ (PM1) ± 3 µg/m³ (PM2.5) ± 3 µg/m³ (PM4) ± 4 µg/m³ (PM10) ± 6 µg/m³ (TSP)
Typical precision R² [10]	> 0.9 (PM1) > 0.8 (PM2.5) > 0.8 (PM4) > 0.7 (PM10) > 0.7 (TSP) > 0.8 (TPC)
Typical slope[10]	0.85 - 1.18
Typical intercept (a)[10]	-1.8 µg/m³ ≤ a ≤ +1.8 µg/m³ (PM1) -2 µg/m³ ≤ a ≤ +2 µg/m³ (PM2.5) -2 µg/m³ ≤ a ≤ +2 µg/m³ (PM4) -3 µg/m³ ≤ a ≤ +3 µg/m³ (PM10) -4 µg/m³ ≤ a ≤ +4 µg/m³ (TSP)
DQO - Typical U(exp)[11]	< 50%
Typical intra-model variability[12]	< 2 µg/m³

Type B (only for Apex AIR Lite)

Type	Optical particle counter
Unit of measurement	µg/m³
Measurement range[1]	0 - 1,000 µg/m³
Resolution[2]	1 µg/m³
Operating temperature range[3]	-10 to 60 °C
Operating RH range[4]	0 to 99 %RH
Operating life[5]	> 24 months
Repeatability[8]	3 µg/m³ (PM1) 3 µg/m³ (PM2.5) 6 µg/m³ (PM10)
Response time[9]	< 10 sec

Limit of Detection (LOD)[7]	0.5 µg/m³ (PM1) 0.5 µg/m³ (PM2.5) 0.5 µg/m³ (PM10)
Typical accuracy (MAE)[10]	± 3 µg/m³ (PM1) ± 3 µg/m³ (PM2.5) ± 6 µg/m³ (PM10) *
Typical precision R² [10]	> 0.7 (PM1) > 0.75 (PM2.5) > 0.5 (PM10) *
Typical slope[10]	0.80-1.25 (PM1) 0.83-1.20 (PM2.5) 0.75-1.35 (PM10) *
Typical intercept (a)[10]	-2 µg/m³ ≤ a ≤ +2 µg/m³ (PM1) -3 µg/m³ ≤ a ≤ +3 µg/m³ (PM2.5) -9 µg/m³ ≤ a ≤ +9 µg/m³ (PM10) *
DQO - Typical U(exp)[11]	< 50% (PM1 - PM2.5) < 75% (PM10) *
Typical intra-model variability[12]	< 2 µg/m³