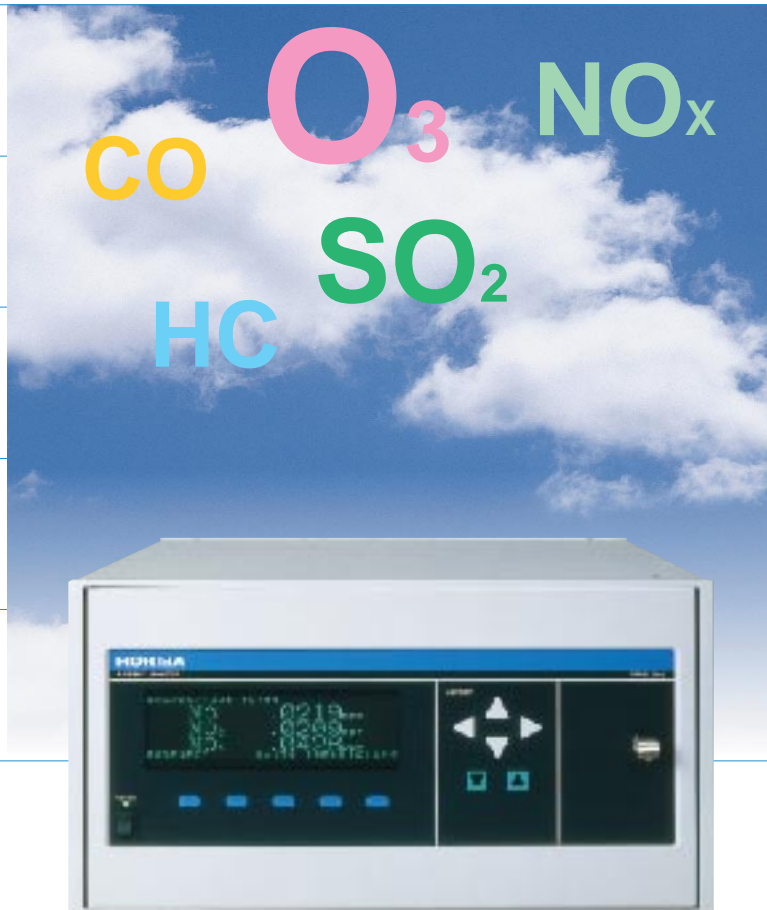


HORIBA

Explore the future

AIR POLLUTION MONITOR
AP-360CE Series



Type approved by European agencies and US.EPA



These ambient air pollution monitors are surprisingly compact and easy to maintain for such sensitive, precise and reliable instruments.

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FEATURES

Automatic calibration

Troublesome calibration procedures have been reduced to the push of a function key. At the Auto-Interval Calibration (AIC) menu you can set the start time, the start range, and the interval for the automatic calibration. The system clock and calendar then assure that your calibration instructions are executed precisely. To make things even easier, remote auto-calibration can also be done from your own computer, via the monitor's RS-232C serial port (optional).

Auto-range function

An auto-range function that automatically switches to the range best suited to the object gas concentration for both momentary and average values is included as a standard feature. As an option, even when randomly set to any range (within 10 times the range ratio), the auto-range function can still be used. Switching over from auto-range to manual-range is a simple task.

Selective data output

For each component measured, the system provides four types of data: momentary values, integrated values, moving averages, and simple averages. Any two of these may be output. Simultaneous output to any two external devices (e.g., PC, printer). The time-span for both average and integrated values may be specified (i.e., when the momentary value has not been selected). With the simple aver-

age values, three different timesettings can be specified.

Storing data in memory

Four different values may be stored in memory: three simple averages and the integrated value.

For example:

Average value #1 (3 min)	1,000 data sets
Average value #2 (30 min)	1,000 data sets
Average value #3 (3 h)	100 data sets
Integrated value (1 h)	1,000 data sets

Readout toggles to mg/m³

A touch of a button on the front panel is all that is needed to toggle the readout from ppm or ppb to mg/m³. (Not available on Model APHA-360CE, where CH₄ values are displayed as ppm, NMHC and THC as ppmC.)

Pressure-compensation

Automatic compensation for ambient pressure assures reliable data regardless of the weather or the monitor's location.

Easy-to-read 256 × 64 dot-matrix fluorescent readout display

Separate menus for measurement, calibration, alarms, maintenance, and other functions are easy to read on the fluorescent readout display. Menu switching is a one-touch operation.

FRONT PANEL

The alarms menu lets you see clearly any malfunction or error, including zero calibration errors, span calibration errors, and flow-volume errors. The maintenance menu gives digital readouts of valuable status information, including detector temperature and sample pressure.

Minimal influence from interference components and ambient temperature

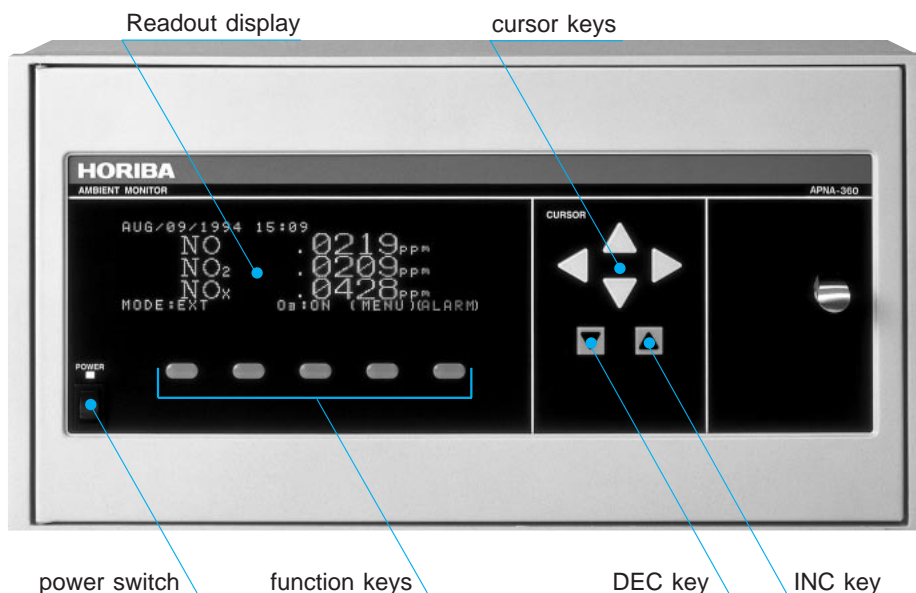
These monitors use Horiba's innovative detection technology and sampling method for outstanding sensitivity. The influence from interference components is minimal and results are very stable over long periods of measurement.

Input/output via RS-232C port (option)

The systems' RS-232C serial port can be used to transmit measured values, alarms, and other data to remote equipment. It can also be used to input changes to parameter settings and other data. A hard-copy printout of measured values can be produced by attaching a recorder to the RS-232C port.

At last — a small, compact system

A small, light-weight unit for each component to be measured fits neatly into a 19inch rack. This makes it easy to up-grade your system for multi-component capabilities. This new design offers great savings in valuable lab space.



Measurement

```
AUG/09/1994 13:00
O3 .0013ppm
MODE:EXT (MENU)(ALARM)
```

Calibration

```
[CAL] LINE= LINE= SPAN VALUE
O3 .0009ppm .0800ppm
ZERO=
SPAN=1.0000
(ZERO)(SPAN) (AIC)(EXIT)
```

Alarms

```
[ALARM]
1. FLOW
2. PRESS
3. MAINTENANCE
(EXIT)
```

Maintenance

```
[ANALOG INPUT]
1. SIGNAL
2. FLAME
3. CELL
4. SAMPLE
(EXIT)
```

APMA-360CE

Ambient **CO** Monitor



U.S.EPA Designation number: RFCA-0895-106

Umweltbundesamt, Pilot Station Offenbach, Report No.22, March 1996

Features

The cross flow modulation type, infrared-absorption technology eliminates the need for troublesome optical adjustments. For the user, this means very stable and sensitive (5 ppm F.S.) measurements.

The APMA-360CE uses an AS-type interference-compensating detector, and a flowing reference gas. The reference gas is generated by purging sample through an oxidation process, where an oxidizing catalyst burns the CO to CO₂. These features eliminate the interference effect of other elements, resulting in extremely high accurate measurements.

The APMA-360CE does not use components, such as reflecting mirrors, that attract foreign matter. This means the optical bench stays clean assuring you of stable results over long periods of time.

Principle

Cross flow modulation, infrared-absorption technology (NDIR)

Conventional technology uses an optical chopper to obtain modulation signals. Instead of this, the APMA-360CE uses a solenoid valve modulation. Fixed amounts of the sample gas and the reference gas are injected alternately into the measurement cell. With the cross flow-modulation method, if the same gas is used for both the sample gas and the reference gas (e. g., zero gas could be used for both), no modulation signal will be generated. This has the great advantage that, in principle, when analyzing minute amounts of gas there is no generation of zero-drift. An additional advantage is that the elimination of rotary sectors precludes the need for optical adjustment. These features assure greatly improved stability over long periods of measurement. A further improvement is that in the front chamber of the detector, the measurable components, including interference components, are detected; in the rear chamber, interference components only are detected. By means of subtraction processing, the actual signal obtained is one that has only very little interference influence.

Specifications

Principle: Cross flow modulation, non-dispersive infrared absorption technology (NDIR)

Application: CO in ambient air

Range:

Standard ranges: 0-10/20/50/100 ppm; 0-5/10/20/50 ppm; auto range ~ manual range selectable; can be operated by remote switching.

Optional (measurable) ranges: 4 ranges selectable from 0-100 ppm, within 10 times range ratio; auto range ~ manual range selectable; can be operated by remote switching.

Lower detectable limit: 0.02 ppm (3 sigma)

Repeatability: $\pm 1.0 \%$ of F.S.

Linearity: $\pm 1.0 \%$ of F.S.

Zero drift:

<LDL/day at lowest range

<0.2ppm/ week at lowest range

Span drift:

<LDL/day at lowest range

$\pm 1.0\%$ F.S./week

Response time (T₉₀):

Within 50 sec at lowest range

Sample gas flow rate: Approx. 1.5L/min

Indication: Measured value, range, alarm, maintenance screen

Alarms: During AIC, zero calibration error, span calibration error, temperature error in catalyzer, etc.

On-screen messages are available in four languages: English, German, French, and Japanese.

Input/output:

- 0-1V/0-10V/4-20 mA, to be specified (2 systems: either (1) momentary value and integrated or (2) moving average value)
- Contact input/output
- RS-232C

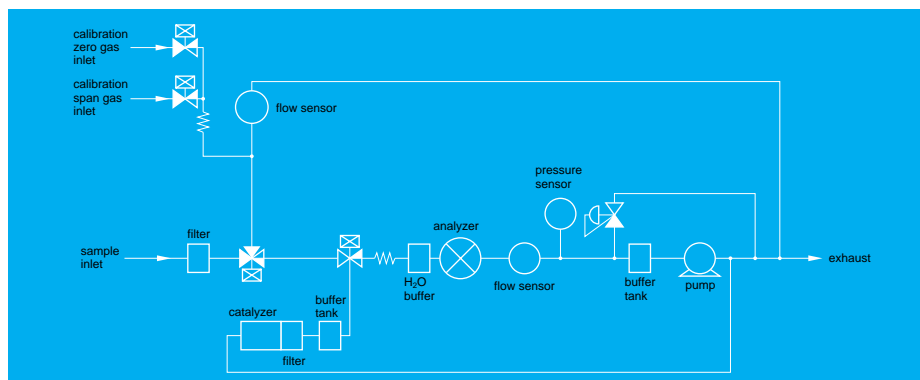
Ambient temperature: 5-40

Power: 100/110/115/120/220/230/240

VAC, 50/60 Hz (to be specified)

Dimensions: 430(W) x 550(D) x 221(H)mm

Mass: Approx. 20 kg,



APSA-360ACE

Ambient **SO₂** Monitor



U.S.EPA Designation number: EQSA-0197-114

TÜV Rheinland, Cologne, Report No. 936/805008/SO₂, 29.02.1996

Features

The APSA-360ACE uses an innovative detector and a new optical system for low background, high sensitivity (0.05 ppm F.S.), and greatly improved stability.

Fluorescent chamber design gives measurements with minimum influence from moisture.

The unit has built-in aromatic-hydrocarbon cutter with a selective transmission membrane. This reduces the influence of interference components. Coupled with Horiba's unique flow-path, it also makes it possible to extend the working life of the cutter and to take measurements free from influence from variations of sample flow.

In comparison with the FPD method, the APSA-360ACE design is (1) highly selective for SO₂, (2) requires no supplemental gas, and (3) gives linear output.

Compensation for the lamp's luminous energy guarantees prolonged span stability.

The sample inlet has a Teflon filter built-in.

The unit comes with a built-in a span-gas dilution unit.

Principle

UV fluorescence

The UV fluorescence method operates on the principle that when the SO₂ molecules contained in the sample gas are excited by ultraviolet radiation they emit a characteristic fluorescence in the range of 220-240 nm. This fluorescence is measured and the SO₂ concentration is obtained from changes in the intensity of the fluorescence. The reactive mechanism is (1) SO₂ + h₁ → SO₂* (3) SO₂* → SO + (O) (2) SO₂* → SO₂ + h₂ (4) SO₂* + M → SO₂ + M Here, (1) shows the excited state of the SO₂ molecules that have absorbed the amount of energy h₁ by ultraviolet radiation. (2) shows the amount of energy, h₂ emitted by the excited molecules as they return to the ground state. (3) shows the decomposition by the light emitted from the excited molecules. (4) shows the quenching, i.e., the energy lost by the excited molecules colliding with other molecules. The APSA-360ACE uses an Xe lamp as the light source, and the fluorescent chamber design mini-mizes scattered light. The optical system has been carefully designed with low background, making it possible to take measurements with a highly stable zero-point. In addition, a reference detector monitors any fluctuation in the intensity of the light source. This allows the unit to calibrate itself automatically for sensitivity, resulting in greater span stability.

Specifications

Principle: UV fluorescence (UVF)

Application: SO₂ in ambient air

Range:

Standard ranges: 0-0.05/0.1/0.2/0.5 ppm; auto range ~ manual range selectable; can be operated by remote switching.

Optional (measurable) ranges: 4 ranges selectable from 0-10 ppm, within 10 times range ratio; auto range ~ manual range selectable; can be operated by remote switching.

Lower detectable limit: 0.5 ppb (3 sigma)

Repeatability: ± 1.0 % of F.S.

Linearity: ± 1.0 % of F.S.

Zero drift:

<LDL/day at lowest range

<LDL/week at lowest range

Span drift:

<LDL/day at lowest range

<LDL/week at lowest range

Response time (T₉₀):

Within 120 sec at lowest range

Sample gas flow rate: Approx. 0.8L/min

Indication: Measured value, range, alarm, maintenance screen

Alarms: During AIC, zero calibration error, span calibration error, temperature error in catalyzer, light intensity error, etc.

On-screen messages are available in four languages: English, German, French, and Japanese.

Input/output:

- 0-1 V/0-10 V/4-20 mA, to be specified (2 systems: either (1) momentary value and integrated or (2) moving average value)
- Contact input/output
- RS-232C

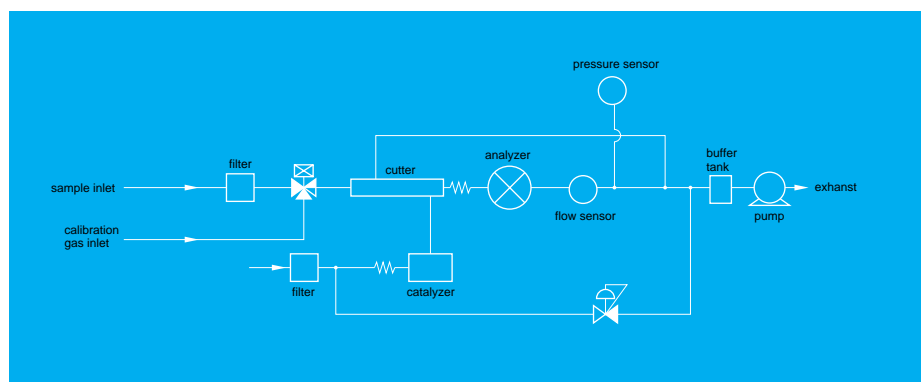
Ambient temperature: 5-40

Power: 100/110/115/120/220/230/240

VAC, 50/60 Hz (to be specified)

Dimensions: 430(W) × 550(D) × 221(H)mm

Mass: Approx. 25 kg,



APNA-360CE

Ambient **NO_x** Monitor



U.S.EPA Designation number: RFNA-0196-111

Umweltbundesamt, Pilot Station Offenbach, Report No.24, March 1996

Features

The APNA-360CE uses a combination of (1) the dual cross flow modulation type chemiluminescence principle and (2) the referential calculation method. This gives it the advantages of the single-detector method plus the ability to do continuous measurements of NO_x, NO, and NO₂. The design gives great stability and extremely high sensitivity (F.S. 0.1 ppm)

Standard equipment includes a drier unit with an automatic recycle function to provide dry ambient air as the ozone source. This makes longrun continuous measurements possible.

The detector uses a semiconductor sensor for compactness and long working life.

All the necessary features are built right into a single rack-sized unit, including a reference-gas generator, an ozone-source drier unit, an ozone decomposer, and a sampling pump. No supplemental gas is required.

Principle

Cross flow modulation type, reduced pressure chemiluminescence (CLD)

The chemiluminescence method uses the reaction of NO with O₃



A portion of the NO₂ generated as the result of this reaction becomes NO₂*. As these excited molecules return to the ground state, chemiluminescence is generated in the range of 600 nm 3,000 nm. The light intensity is in proportion to the concentration of NO molecules and by measuring it we obtain the NO concentration of the sample. A deoxidation converter changes the NO₂ to NO, which is measured. In other words, the NO₂ concentration can be obtained by the difference between (1) the NO_x concentration measured when the sample gas is directed through a converter and (2) the NO concentration measured when the gas is not run through the converter.

Specifications

Principle: Cross flow modulation type, reduced pressure chemiluminescence (CLD)

Application: NO₂, NO and NO_x in ambient air

Range:

Standard ranges: 0-0.1/0.2/0.5/1.0 ppm; auto range ~ manual range selectable; can be operated by remote switching. Optional (measurable) ranges: 4 ranges selectable from 0-10 ppm, within 10 times range ratio; auto range ~ manual range selectable; can be operated by remote switching.

Lower detectable limit: 0.5 ppb (3 sigma)

Repeatability: ± 1.0 % of F.S.

Linearity: ± 1.0 % of F.S.

Zero drift:

<LDL/day at lowest range

± 1.0ppb/week at lowest range

Span drift:

<LDL/day at lowest range

± 1.5 % of F.S./week

Response time (T₉₀):

Within 90 sec at lowest range

Sample gas flow rate: Approx. 0.8L/min

Indication: Measured value, range, alarm, maintenance screen

Alarms: During AIC, zero calibration error, span calibration error, temperature error in converter, etc.

On-screen messages are available in four languages: English, German, French, and Japanese.

Input/output:

- 0-1 V/0-10 V/4-20 mA, to be specified (2 systems: either (1) momentary value and integrated or (2) moving average value)
- Contact input/output
- RS-232C

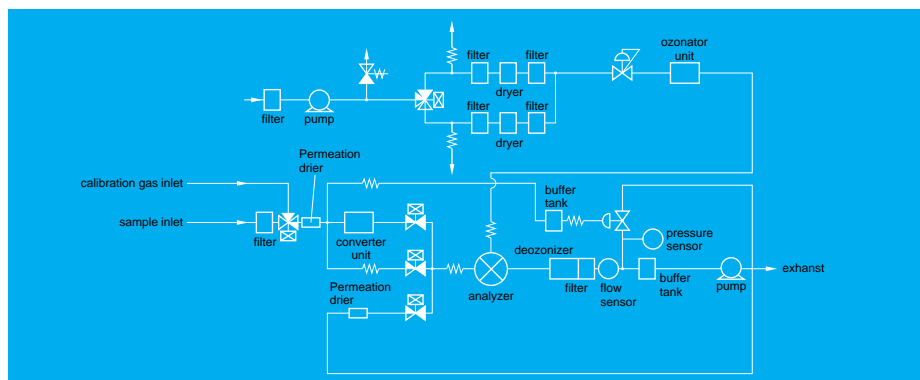
Ambient temperature: 5-40

Power: 100/110/115/120/220/230/240

VAC, 50/60 Hz (to be specified)

Dimensions: 430(W) × 550(D) × 221(H)mm

Mass: Approx. 26 kg,



APHA-360CE

Ambient **THC** Monitor



Umweltbundesamt, Pilot Station Offenbach, Report No.25 , March 1996

Features

The APHA-360CE uses a combination of (1) the flame ionization detection method (2) and selective-combustion. This gives it the advantages of the single-detector method plus the ability to do continuous, zero-drift free measurements of THC, NMHC, and CH₄. The design gives great stability and high sensitivity (F.S. 5 ppm)

The APHA-360CE has a relative-sensitivity correction function for CH₄ and NMHC.

A catalytic unit for generating reference gas and auxiliary combustion air is standard equipment in the APHA-360CE.

All the necessary features are built right into a single rack-sized instrument, including a catalytic unit for selective combustion (i.e., an NMHC cutter); a catalytic unit for generating reference gas and auxiliary combustion air; and a sampling pump. The only supplemental gas required is H₂.

Principle

Flame ionization detection method (FID) with selective combustion

The flame ionization detection method (FID) — used in combination with the selective-combustion system — utilizes the ionization that occurs as the result of the high-temperature energy from combustion at the tip of the burner jet when organic carbon compounds are introduced into the hydrogen flame. The hydrogen flame is located between two electrodes. When an electrical voltage is applied across these electrodes a minute ion current proportional to the hydrocarbon concentration is produced. This current is monitored by a low leakage amplifier, giving a voltage readout for THC. To measure CH₄ the sample gas is passed through the selective catalytic combustion unit (the NMHC cutter), which oxidizes NMHC without oxidizing CH₄. This is shown as A below. B represents the THC concentration measured without passing the gas through the NMHC cutter. Thus B - A will give the concentration of NMHC. The final concentration value is calculated using a relative-sensitivity correction coefficient, k, as shown below.

CH₄ Concentration A
NMHC Concentration k (B - A)
THC Concentration A + k (B - A)

Specifications

Principle: Flame ionization detection (FID) with selective combustion

Application: THC, NMHC, and CH₄ in ambient air

Range:

Standard ranges: 0-5/10/25/50 ppmC;
auto range ~ manual range selectable;
can be operated by remote switching.

Optimal (measurable) ranges: 4 ranges
selectable from 0-100 ppmC, within 10
times range ratio; auto range ~ manual
range selectable; can be operated by
remote switching.

Lower detectable limit: 0.022 ppmC (3 sigma)

Repeatability: ± 1.0 % of F.S.

Linearity: ± 1.0 % of F.S.

Zero drift:

<LDL/day at lowest range

± 0.05 ppmC/week at lowest range

Span drift:

<LDL/day at lowest range

± 0.5 % F.S./week

Response time (T₉₀):

Within 60 sec at lowest range

Sample gas flow rate: Approx. 0.5L/min

Indication: Measured value, range, alarm,
maintenance screen

Alarms: During AIC, zero calibration error,
span calibration error, temperature error
in zero gas purifier, ignition failure error,
etc.

**On-screen messages are available in four
languages:** English, German, French,
and Japanese.

Input/output:

- 0-1 V/0-10 V/4-20 mA, to be specified
(2 systems: either (1) momentary value and
integrated or (2) moving average value)
- Contact input/output
- RS-232C

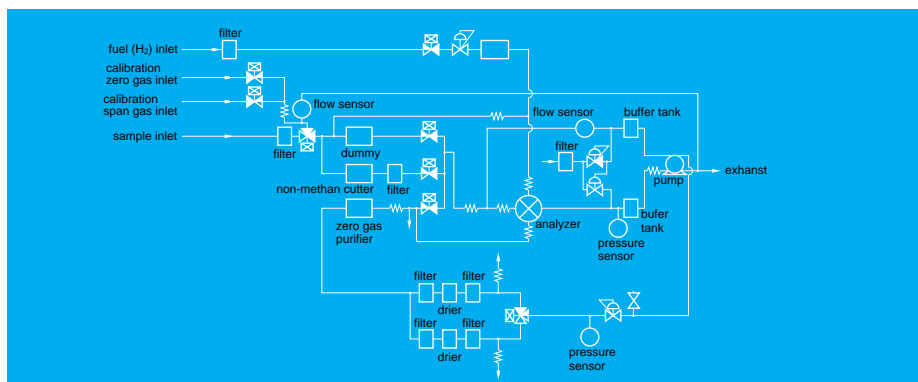
Ambient temperature: 5-40

Power: 100/110/115/120/220/230/240
VAC, 50/60 Hz (to be specified)

Dimensions: 430(W) × 550(D) × 221(H)mm

Mass: Approx. 33 kg,

Notes: ppmC is shown as symbol, not as
unit.



APOA-360CE

Ambient O_3 Monitor



U.S.EPA Designation number: EQOA-0196-112

Tüv Rheinland, Cologne, Report No. 936/805008/O₃, 29.02.1996

Features

The APOA-360CE uses the cross flow modulation type, ultra-violet-absorption method in conjunction with the comparative calculation method. This permits continuous measurement with great stability and high sensitivity (F.S. 0.1 ppm)

Horiba's innovative heated de-ozonizer provides reference gas by decomposing the O₃ found in the sample gas. This has the advantages of (1) reducing the influence from interference, (2) making the monitor insensitive to great changes in moisture content, and (3) prolonging the working life of the monitor.

All gas connections are either Teflon or glass.

Principle

Ultra-violet-absorption method (NDUV)

The ultra-violet-absorption method works on the principle that ozone absorbs ultra-violet rays in the area of 254 nm. Measurements are taken from continuous, alternate injections of the sample gas and the reference gas into the measurement cell, controlled by a long-life solenoid valve. The cross flow modulation method is characteristically zero drift-free. All fluctuations in the mercury-vapor light source and in the detector are automatically compensated for by a comparative calculation circuit. This means that, in principle, the APOA-360CE makes it possible to carry out zero-span drift-free, continuous measurements. In addition, HORIBA'S unique de-ozonizer for the comparison gas line is unaffected by interference elements or moisture retention, prolonged, stable measurement is possible.

Specifications

Principle: Ultra-violet-absorption method (NDUV)

Application: O₃ in ambient air

Range:

Standard ranges: 0-0.1/0.2/0.5/1.0 ppm; auto range ~ manual range selectable; can be operated by remote switching.

Optional (measurable) ranges: 4 ranges selectable from 0-10 ppm, within 10 times range ratio; auto range ~ manual range selectable; can be operated by remote switching.

Lower detectable limit: 0.5 ppb (3 sigma)

Repeatability: $\pm 1.0 \%$ of F.S.

Linearity: $\pm 1.0 \%$ of F.S.

Zero drift:

<LDL/day at lowest range

<LDL/week at lowest range

Span drift:

<LDL/day at lowest range

<LDL/week at lowest range

Response time (T₉₀):

Within 75 sec at lowest range

Sample gas flow rate: Approx. 0.8L/min

Indication: Measured value, range, alarm, maintenance screen

Alarms: During AIC, zero calibration error, span calibration error, temperature error in ozone separator, light intensity error, etc.

On-screen messages are available in four

languages: English, German, French, and Japanese.

Input/output:

- 0-1V/0-10V/4-20 mA, to be specified (2 systems: either (1) momentary value and integrated or (2) moving average value)
- Contact input/output
- RS-232C

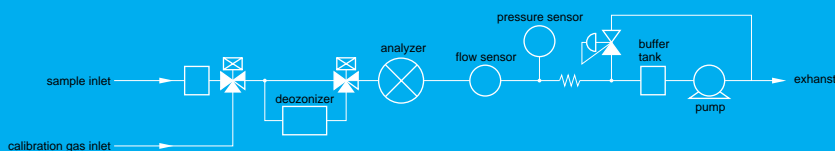
Ambient temperature: 5-40

Power: 100/110/115/120/220/230/240

VAC, 50/60 Hz (to be specified)

Dimensions: 430(W) × 550(D) × 221(H)mm

Mass: Approx. 20 kg,



H₂S/NH₃ Measurement

H₂S Measurement

Combined use of the H₂S converter unit and the APSA-360ACE SO₂ Monitor makes H₂S measurement possible. The H₂S converter unit contains two types of catalyst: SOx scrubber and H₂S converter. SOx is removed by the SOx scrubber, and then the H₂S that has passed through is converted into SO₂ by the H₂S converter. This SO₂ is then measured by the APSA-360ACE SO₂ Monitor for display as H₂S concentration.

NH₃ Measurement

Combined use of the NH₃ converter unit and the APNA-360CE NOx Monitor makes NH₃ measurement possible. The NH₃ converter unit contains two types of catalyst tubes: one which converts NH₃ into NOx, and one which allows the NOx in the ambient air to pass through directly. The difference in NOx value between the two is measured by the APNA-360CE NOx Monitor for display as NH₃ concentration.



Standard Gas Generator

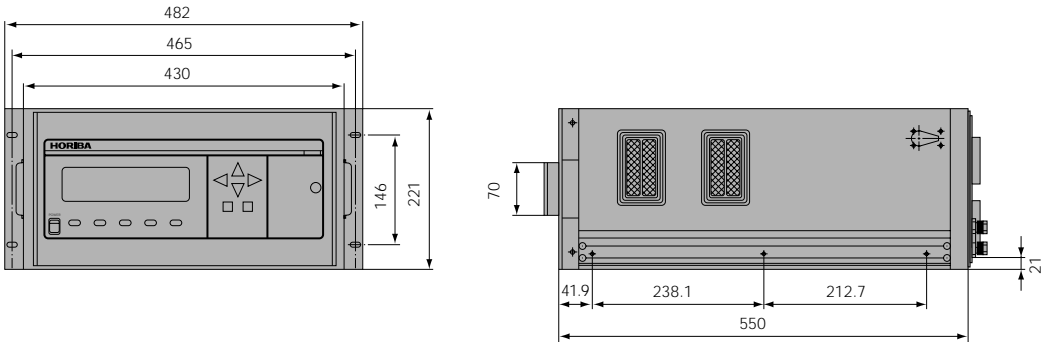
The SGGU Standard Gas Generator eliminates the problems of instability of bottled span gases containing low concentrations of SO₂ or NOx. The zero gas is also generated using ambient air. Reliable span gas of SO₂ or NOx at an extremely low concentration is generated by an innovative flow rate ratio mixing technique which dilutes a known standard gas of a sufficiently high concentration with zero gas produced within the unit. The OPGU, which generates pure hydrogen (H₂), is also available to provide a safe supply of fuel for the APHA-360CE (THC).



Standard 19-inch Packages

Each HORIBA AP-360CE Series Monitor is packaged in a light metal enclosure with sliding chassis suitable for either a table-top set-up in a research laboratory or mounting on a standard 19-inch rack for permanent installation. All the controls and serviceable components are accessible from the front for easy maintenance while the plumbing and cable connections are neatly arranged at the back.

APMA-360CE/APSA-360ACE/APNA-360CE/APHA-360CE/APOA-360CE Unit: mm



*Horiba continues contributing
to the preservation of the global
environment through analysis
and measuring technology.*



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