ION Science
MiniPID 2 Sensor Guide

ionscience.com/usa
Unrivaled Gas Detection.

About ION Science

Unrivaled Gas Detection

What we do

ION Science is a leading UK manufacturer of gas detectors and sensors. Our patented, humidity resistant PID sensor technology is trusted by major global gas detection manufacturers for the fast, accurate detection of volatile organic compounds (VOCs).

Applications

Our sensors are designed for use across a wide number of industries and applications, wherever you have a need to detect gases and vapors, including:

Industries

- Oil & gas
- Petrochemical
- Pharmaceutical and medical
- Food & beverage
- Universities & laboratories
- Government & defence
- Manufacturing
- Semiconductors
- Construction
- Aerospace
- Water

Applications

- Air Quality
- Fence line monitoring
- Fugitive monitoring
- Industrial health and safety
- HVAC & Building Control
- Semi-conductor
- Leak detection
- Power storage
- Solar farms
- Li-ion battery monitoring
- Site investigation
- Fertility & Clandestine labs
- Emergency response
- Fracking
- Decontamination

Our commitment to you

We are committed to developing and manufacturing the best performing sensors to give you the most accurate and reliable measurements. This is backed by an unrivaled level of customer service and support. By bringing critical component manufacturing under our roof, we offer the best quality in the market while remaining price competitive.

OEM Gas Sensors

Volatile Organic Compounds (VOCs)

Why use a VOC sensor?

VOCs are a wide range of naturally and synthetically occurring chemicals which are found almost everywhere. They are described as volatile because they evaporate at temperatures found on Earth, releasing molecules into the atmosphere. VOCs are extremely useful for mankind, they form the building blocks of many synthetic materials (plastics, rubbers, glues, paints, etc.), used to create pharmaceuticals and are a great fuel for transport and heating.

While many VOCs have no adverse effects on health and the environment, some are harmful. Short-term exposure health effects include eye, nose, and throat irritation. Long-term exposure, including very low concentrations you may not aware of, can damage the liver, kidneys, central nervous system, and cause certain cancers. Therefore, accurate sensing of VOCs is critical for protecting people, the environment, and optimizing industrial processes.

Why use photo-ionization detection (PID)?

VOCs can be measured in air using a variety of principles; however, some are cross-sensitive to common atmospheric gasses including CO_2, CO, SO_x, NO_x, and water vapor at ppb levels. PID is not sensitive to these and is recognized as the most accurate method for VOC detection. The key advantage of the ION Science PID sensor is its world-leading humidity resistance and long-term stability. In addition, it offers the best temperature stability on the market.

Principle of PID

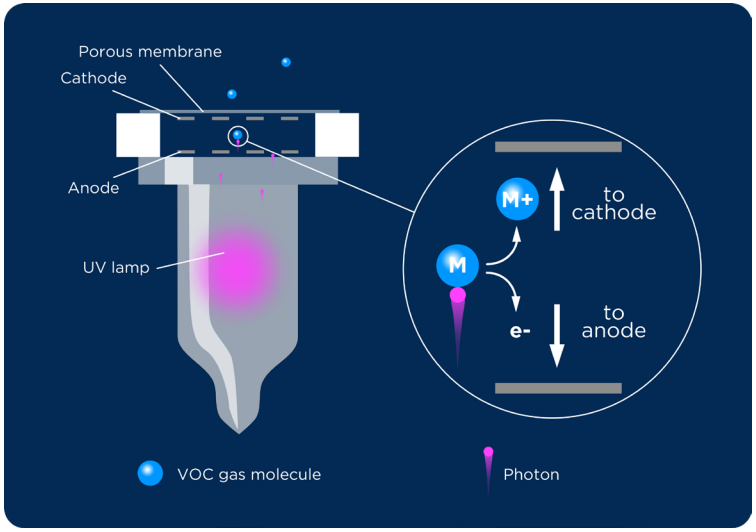
Photoionization Detection (PID)

Principle of PID

Photoionization is produced by the absorption of a high energy photon by a molecule. If the energy of the photon is greater than the ionization energy of the molecule, it will be ionized. Ions are detected at a pair of electrodes where changing current is proportionate to the concentration.

The figure below shows how an Ion PID sensor works. A miniature UV lamp generates high energy photons, which pass through the lamp window into the ionization/ detection chamber. Sample gas diffuses through a membrane on the opposite side.

The inset on the lower right shows what happens on a molecular level. When a photon with enough energy strikes a molecule M, an electron (e^-) is ejected. The M^+ ion travels to the cathode and the electron (e^-) travels to the anode, resulting in a current. This current is proportional to the gas concentration. The electrical current can be displayed as a ppm or ppb concentration. Not all molecules can be ionized and the major components of air, i.e., nitrogen, oxygen, carbon dioxide, argon, etc., do not cause a response, but most VOCs do give a response.



What PID to choose

10.0 eV, 10.6 eV or 11.7 eV?

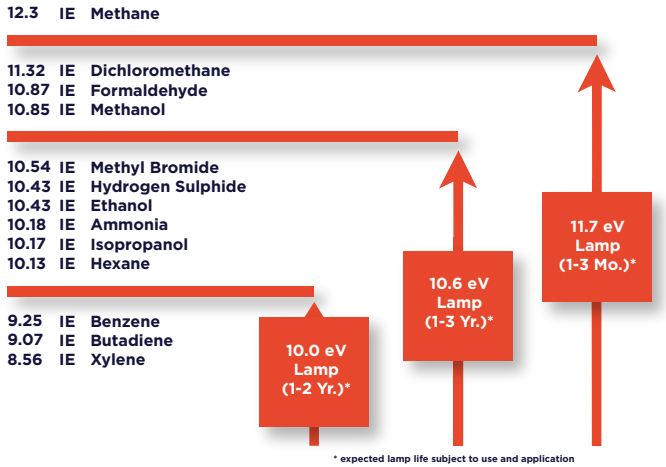
Which sensor to choose?

We offer a range of PID sensors to offer the best solution for your application. The choice of PID begins with the gas you want to detect.

For successful detection of VOCs by PID, the following guidelines are useful to follow:

- Less than 10 carbon atoms
- Have boiling point of less than 482°F.
- Have a vapor pressure greater than 4.0 x 10^{-5} mBar

If your target gas meets these criteria, the next step is decide what energy (eV) sensor you require. ION Science offers three energy sensors: 11.7, 10.6 and 10.0 eV. The 11.7 sensor detects the most chemicals, while 10.0 detects the least. If you are interested in only detecting VOCs with a lower ionization energy, a lower energy sensor will provide a level of selectivity. A common use of lower energy sensors is detecting aromatics, including BTEX. Aromatics have ionization energies less than 10.0 eV and are commonly present with long chain hydrocarbons possessing higher ionization energies.



The next step of sensor choice depends on the concentration you want to measure, which is broadly divided into ppb or ppm measurement. We have 4 sensors for detecting ppb levels and 2 for ppm levels.

Sensor	MiniPID 2 PPM WR	MiniPID 2 PPM	MiniPID 2 PPB WR	MiniPID 2 PPB	MiniPID 2 HS	MiniPID 2 10.0 eV	MiniPID 2 11.7 eV
Electrode Stack Color	Blue	Blue	White	White	Red	White + Gold Spot	White
Minimum Detection Limit	500 ppb	100 ppb	20 ppb	1 ppb	0.5 ppm	5 ppb	100 ppb
Range	>10,000 ppm	>4,000 ppm	>200 ppm	>40 ppm	>3 ppm	>100 ppm	>100 ppm
Response Time T90 (S)	<3	<3	<8	<8	<12	<8	<8
Sensitivity	>0.4 mV/ppm @ 100 ppm	>0.65 mV/ppm @ 100 ppm	>5 mV/ppm	>30 mV/ppm	>600 mV/ppm	>15 mV/ppm	>1 mV/ppm

Technical details

Gas Sensors with State-of-the-Art Sensing Technology

ATEX IECEx UL EX EAC

Power and Signal	
Supply Voltage (using internal regulator)	3.6 – 18 V (non-intrinsically safe 10–18 V)
Supply Voltage (using a regulated power supply)	3 – 3.6 V
Current	20 – 32 mA (130 mA for 100 ms at start up)
Power Consumption	100 mW at 3.3 V
Output Signal (using internal regulator)	0 – 3.2 V
Output Signal (using a regulated power supply)	0 to rail voltage – 0.1 V
Environmental	
Temperature Range	-40 to 65°C
Relative Humidity Range	0 – 99% RH, non-condensing
Lifetime	
Sensor Expected Life	>5 years
Lamp Life	10.6 eV - 10,000 Hours

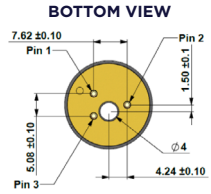
Sensor dimensions

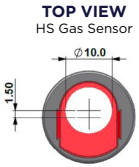
Bottom view pins;

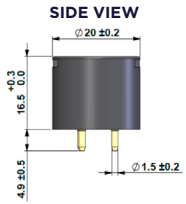
Pin 1:
Positive Supply Voltage

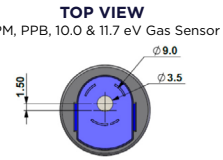
Pin 2:
Sensor Output

Pin 3:
0V Ground









Dimension in mm

Boards

Evaluation and Development Boards

For rapid assessment and integration of MiniPIDs, ION Science offers the Sensor Development Kit (SDK). The kit is comprised of two boards: the sensor PCB with removable gas hood and analog outputs, and the integration board supplying power to the sensor PCB and provides 4-20, RS 485 outputs with a 4-20 input. PC software allows the SDK to operate any MiniPID 2 straight out of the box.

Sensor PCB	
Dimensions	50mm x 62mm
Weight	40g (72g when fitted with hood & PID)
Nominal Volatage	5 Vdc ± 500mV
Supply Cables	0.5 to 1.5mm^2
Flow Rate (max)	300 ml/min
Pressure (max)	<300mBar
Operating Humidity	0-99 % RH (non-condensing)
Operating Temperature	-20 °C to +60 °C

Integration PCB	
Dimensions	99mm x 82mm
Weight	70g
Nominal Voltage	12V to 30 Vdc ± 500mV
Typical Power	< 200mA when connected to a PID via the sensor board
Supply Cables	0.5 to 1.5mm^2
Maximum Contact Load	100 Vac / 2A
Operating Humidity	0-99 % RH (non-condensing)
Operating Temperature	-20 °C to +60 °C

Spares and repairs

Additional Accessories and Replacement Parts for your MiniPID 2

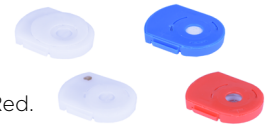
ION Science provide a wide range of accessories and replacement parts available for our gas sensors. Please see below:

Sensor accessories

- PID lamp cleaning kit:
  Used to clean the lamp within the MiniPID sensor to remove dirt, grease, and grime from the lap window to ensure optimal performance.

- Sensor stack removal tool:
  The PID sensor stack removal tool allows safe, easy removal of the stack from the PID sensor.

Sensor replacement parts

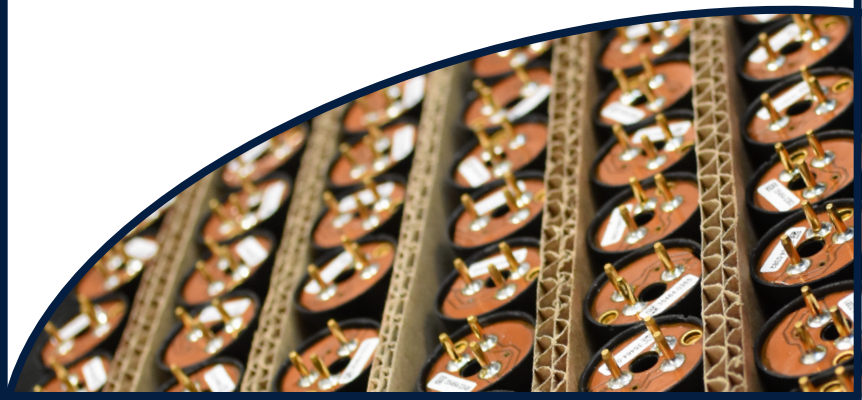


- Electrode stacks:
  We supply 4 different stacks for each variant of our MiniPID with a color range of White, White + Gold, Blue & Red.

- Lamps:
  Replacement lamps specific to sensor voltage

- Lamp spring:
  The lamp spring ensures the lamp stays tightly coupled with the electrode stack.

For the full list of parts, please contact:
info@ionscienceusa.com or visit
ionscience.com/usa/sensors-and-components/



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ION Science Global Offices

We have International ION Science offices located in the UK (Cambridge - Head Office), China (Shanghai), Germany (Mettmann), India (Bhuj), France (Cavalaire-sur-Mer), and Italy (Bologna).

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