



# Air Quality and Mold Detection Survey System

[More Information](#)

**SENSOR:** Pocket Particle AQI 2.0

**INDUSTRIES:** Home Inspection & Indoor Air Quality and Mold Detection

March 21, 2020  
Digital Environment LLC

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# About Digital Environment

Digital Environment builds internet and mobile products that enable real-time decision making for environmental conditions, physical assets, and work processes. These solutions enhance quality of life for consumers and increase operational efficiency for site owners and engineering companies.

The company operates two business units: Integrated Solutions and Platform Services.

**Integrated Solutions** adopts commercially-available digital sensors and instruments and provides end-to-end solutions for consumers, site owners, regulators, and engineering firms. These solutions empower users to manage their personal health, employee health, property, assets and liabilities.

**Platform Services** provides internet-based data collection, storage, organization, processing and reporting technologies to developers of digital instruments and sensors, including OEMs and university and research facilities. The technologies allow organizations to cloud enable existing and new product lines, including IoT and computer-based digital product lines.







Our development team consists of mobile application specialists, web application specialists, and engineers for hardware, firmware and systems integration. Working together we have built a sensor adaptation platform with a mobile solution and data management system, meaning we have the ability to adapt to almost any sensor on the market. This gives us the unique ability to streamline and process the data from these sensors and organize the readings in any customizable report.

We are currently active in the following industries; Home Inspection and Indoor Air Quality Surveying, Environmental Assessing, Medical Remote Patient Monitoring and Nuclear and Radiological Waste Management. We are constantly adapting new sensors for all types of industries, or reach is essentially limitless.



## Memberships and Affiliations

Digital Environment currently holds an active corporate or affiliate membership in the industries of Indoor Air Quality, Environmental Assessment and Home Inspection, with all of the following professional associations.

	<p><b>ASHI - American Society of Home Inspectors</b>          The oldest and most respected home inspector association. The only one recognized as a certifying body by the National Commission for Certifying Agencies (NCCA). ASHI offers: Resources that enable you to become a more successful home inspector.  <a href="https://www.homeinspector.org/">https://www.homeinspector.org/</a></p>
	<p><b>InterNACHI - International Association of Certified Home Inspectors</b>          One of the world's leading associations for home inspectors. They provide free training and certification, business development and marketing support.  <a href="https://www.nachi.org/">https://www.nachi.org/</a></p>
	<p><b>IAQA - Indoor Air Quality Association</b>          the only IAQ trade organization that connects all parts of the industry to collaborate and grow. IAQA provides the best education for all parts of the IAQ industry, translating science and standards into practice, properly informing consumers, and bringing critical feedback to industry leaders.  <a href="https://iaqa.org/">https://iaqa.org/</a></p>
	<p><b>EIA - Environmental Information Association</b>          Started as the National Asbestos Council, has spent 25 years at the forefront in providing the environmental industry with the information needed to remain knowledgeable, responsible, and competitive in the environmental health and safety industry.  <a href="http://www.eia-usa.org/">http://www.eia-usa.org/</a></p>
	<p><b>FABI - Florida Association of Building Inspectors</b>          Founded in 1984, FABI's mission is to educate home inspectors on technical and business skills. FABI's vision is to create a network of home inspectors to increase the value of this industry in the State of Florida.  <a href="https://fabi.org/">https://fabi.org/</a></p>
	<p><b>More to Come!!</b>          We are always seeking to become a part of reputable, insightful and impactful associations to the industries of Indoor Air Quality, Environmental Assessment and Home Inspection.</p>



# Air Quality and Mold Detection Survey System

The most important thing to keep in mind when using the Digital Environment Air Quality and Mold Detection Survey System is that what you will be doing is surveying the air quality for your customers. This is **NOT** a lab sample or lab test. **NO** consumable items, like air traps, tapes, air-o-cell cassettes or air canisters that require being sent to a lab for evaluation, are required. Our system simply counts the particulate matter, carbon dioxide and volatile organic compounds in the air. It does not speciate exactly what they are.

The air quality survey is considered the step before lab testing. The final report from our service will give you and the customer an indication that there are, or are not, concernable levels of airborne material measured and if further lab testing would be required.

## Requirements for Using the Air Quality and Mold Detection Survey System

- **NO** Training Certifications or Licenses
- Pocket Particle AQI 2.0 Sensor
- Mobile device running Android or iOS operating systems (Phone or Tablet)
- Digital Environment account subscription
- Internet Browser for Reports - Can be accessed via mobile device as well

## How Does It Work?

The sensor uses a fan to move air past a laser that determines the amount of particulate present in the air. After turning the sensor on, in the mobile app, it will take a few seconds to warm up and then both PM2.5 and PM10, eCO2 and eTVOC measurements will be shown on the SmartEnv Mobile Application and are updated every second. Surveying the air in each room should be done for at least 2-3 minutes and the surveyor should be slowly walking the perimeter of the room. This will give you the ability to pinpoint any contaminated areas within 3 feet inside the room.

It is recommended that for each property that is being surveyed a separate room be created to survey the air outside the property. We call this a control or base air quality reading. Essentially, if the air outside of the property is reading at high or unhealthy levels, the indoor air will not be reading much better.

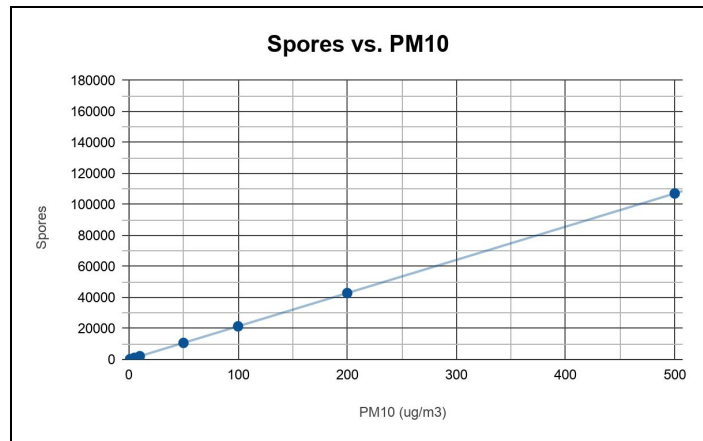
Once all of the areas or rooms in the property have been surveyed and completed a report will be automatically generated with all of the air quality survey readings organized and summarized for each room. This report is what you would issue to your customer and explain the overall indoor air quality results with. See the [Explaining the Air Quality Survey Report to the Customer](#) section for more information.



## Detecting Mold

Mold spores will typically show up as elevated 10 micron readings. You can find more information on mold spores from the EPA.<sup>1</sup>

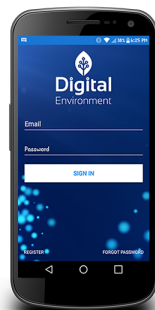
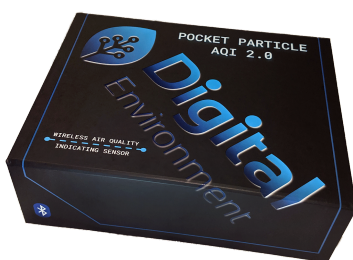
Mold spores are typically between 3 to 30 microns and will show up on the PM10 channel of the Pocket Particle 2.0 sensor. The readout from the sensor is micrograms per cubic meter. A rough conversion can be made using this number and the mass of a mold spore. The mass of a single mold spore has been estimated to be  $1.4 \times 10^9$  grams.<sup>2</sup> Across the entire range of mold spore sizes (3 to 30 microns) the PM10 channel is roughly 30% efficient at measuring the spores. Therefore, a PM10 reading of 10 micrograms per cubic meter would correspond to 2100 spores per cubic meter.



## What Air Quality Data Does the System Read?

These are the two particulate sizes typically measured when assessing air quality because they affect human health. This is because particles of these sizes are capable of entering the lower respiratory tract. The PM10 particles are capable of penetrating to the very deepest parts of the lungs while PM2.5 particles or smaller can cross the blood barrier.

The Pocket Particle AQI 2.0 sensor measures particulates in the air near two different sizes, 2.5 microns (PM2.5) and 10 microns (PM10). The concentration of each particle size in air is measured separately and the sensor reports the value in micrograms (of each particle size) per cubic meter (of air). This unit of measure is what is used for industrial health evaluations and is abbreviated  $\mu\text{g}/\text{m}^3$ . The Pocket Particle AQI 2.0 sensor also measures eCO<sub>2</sub> in ppm (parts per million) and eTVOC in ppb (parts per billion). You will find more detailed information for all parameters in this section.



<sup>1</sup> <https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home>

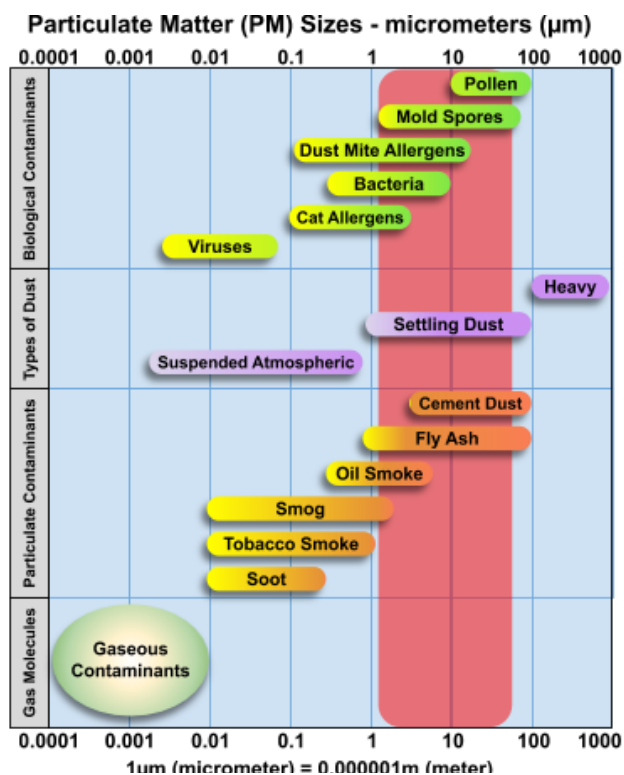
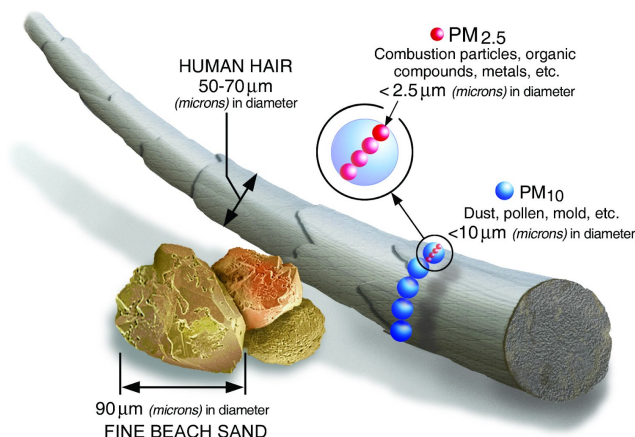
<sup>2</sup> Plant Relationships



## PM2.5 & PM10 - Particulate Matter Sizes in Micrometers

### What are PM2.5 and PM10 Pollutants?<sup>3</sup>

Particulate matter (PM) or particle pollution in the air is a mixture of airborne tiny particles and liquid droplets that consists of tiny solid fragments, liquid fragments, and fragments mixing with both solid and liquid.



These tiny fragments are made up of various components, such as acids, toxic exhaust, organic chemicals, metal, dust, soot, soil, or a mixture of these components. There are many classes of particulates. However, among these classes, PM10 and PM2.5 are the most regulated ones.

- PM10 refers to inhalable coarse particles that are with a diameter of about 10 micrometers.
- PM2.5 refers to fine particles that are 2.5 micrometers in diameter and smaller.

### Sources of PM2.5 & PM10

There are both natural and anthropogenic (i.e. manmade) sources of PM2.5. Carbonaceous (organic) material from traffic causes a direct adverse effect on health and has been identified as a most evident source of PM2.5. Burning fuels such as oil, gasoline, or wood can directly contribute to the rising of PM levels. On the other hand, windblown dust and chemical reactions between different gases (e.g., nitrogen, sulfur, phosphorus etc.) and other substances (e.g., ammonia) can indirectly enhance the rising of atmospheric PM levels.

Power stations as well as Industrial sources contribute most to manmade pollutants (35%), trailed by vehicles or road traffic (24%), suburban (13%), and shipping (10%). Natural sources of particulate matter include sea salt that results in 5-15% of urban background PM2.5 and with higher contributions found near the coastal areas.

<sup>3</sup> <https://www.medical-reference.net/2014/01/what-are-particulate-matter-25.html>



## Health Effects of PM2.5 & PM10

Exposure to airborne particulate matter (PM) has harmful consequences on human health, the environment, and climate change. Many researches have already provided multitudes of information concerning the hazardous adverse effects of PM exposure.

As PM2.5 are finer particles, they can penetrate deeply and travel through the respiratory system to reach the lung. The Committee on the Medical Effects of Air Pollutants (COMEAP) reported that high-level exposure to PM could increase hospital admissions and premature death of the old and sick because of respiratory and cardiovascular system illnesses. As evidence, the COMEAP showed statistical data on high pollution days and this data revealed that both PM10 and PM2.5 caused additional hospital admissions and premature deaths. The EPA has more information on the effects of particulate pollution.<sup>4</sup>

Long-term PM exposure is associated with chronic respiratory, cardiovascular, and neurological diseases, including lung cancer, neurodevelopmental disorders, poor cognitive function, diabetes, and heart attack.

Short-term PM exposure during pollution episodes can produce less severe effects, including temporary breathing difficulty, worsening of asthma symptoms, feeling of unwell, decreased activity level, etc.

In addition to adverse health effects, PM2.5 also has other widespread effects on the environment and climate change. The environmental effect can contribute to biodiversity loss, damaging plants as well as corrosion of buildings.

## eTVOC - Equivalent Total Volatile Organic Compounds

### What Does eTVOC Mean?

eTVOC stands for equivalent total volatile organic compounds (VOCs) and is a measurement of the total amount of any emitted gases coming from toxins and chemicals. When you have an enclosed space like a home or office, these emitted gases accumulate and pollute the air. The air quality survey does **NOT** speciate what all the VOCs are, it simply gives the total amount of all VOCs in the air.<sup>5</sup>

Volatile organic compounds are gases that are given off by many indoor sources that evaporate at room temperature. Concentrations of most volatile organic compounds are higher in indoor air than outdoor air.

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<sup>4</sup> <https://www.epa.gov/pmcourse/particle-pollution-exposure>

<sup>5</sup> <https://docs.smartcitizen.me/Components/sensors/CCS811/>





## Sources of VOCs

Some sources of VOCs include the burning of fuels such as gas, wood and kerosene and tobacco products. VOCs can also come from personal care products such as perfume and hair spray, cleaning agents, dry cleaning fluid, paints and paint thinner, lacquers, varnishes, hobby supplies, alcohols, vinegars and from copying and printing machines.

Elevated VOC levels could be caused by a **Mold** infestation, gas leak, or off gassing of building materials and is a concern for overall indoor air quality. These compounds include a number of toxic compounds, including benzene, toluene, and formaldehyde. **Mold** can produce a number of VOCs. These compounds are what produce the “musty” smell associated with **Mold** infested dwellings. While most of the compounds are innocuous, there is experimental evidence that some of these compounds could be toxic.<sup>6</sup> **Detection of VOC is yet another tool that can be used to detect and locate an active mold infestation, as they are only produced by actively growing mold colonies.**

VOCs can be released from products during use and even in storage. However, the amount of VOCs emitted from products tends to decrease as the product ages.

Formaldehyde, one of the most common VOCs, is a colourless gas with an acrid (sharp and bitter) smell. It is common in many building materials such as plywood, particleboard and glues. Formaldehyde can also be found in some drapes and fabrics and in certain types of foam insulation.

\*Formaldehyde compounds are not speciated with the Pocket Particle AQI 2.0 Sensor.\*

## Health Effects of VOCs

VOCs include a variety of chemicals that can cause eye, nose and throat irritation, shortness of breath, headaches, fatigue, nausea, dizziness and skin problems. Higher concentrations may cause irritation of the lungs, as well as damage to the liver, kidney, or central nervous system. Long-term exposure may also cause damage to the liver, kidneys or central nervous system.

Some VOCs are suspected of causing cancer and some have been shown to cause cancer in humans. The health effects caused by VOCs depend on the concentration and length of exposure to the chemicals.

Most people are not affected by short-term exposure to the low levels of VOCs found in homes. Some people may be more sensitive, such as people with asthma. For long-term exposure to low levels of VOCs, research is ongoing to better understand any health effects from these exposures.<sup>7</sup>

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<sup>6</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4591661/>

<sup>7</sup> <https://www.healthlinkbc.ca/healthlinkbc-files/air-quality-VOCs>



## eCO<sub>2</sub> - Equivalent Carbon Dioxide

### What Does eCO<sub>2</sub> Mean?

Equivalent carbon dioxide, also known as “CO<sub>2</sub>e”, “eCO<sub>2</sub>”, “CO<sub>2</sub>eq”, “CO<sub>2</sub>equivalent”, or even “CDE”, and these terms can be used interchangeably. This term is used for describing different greenhouse gases in a common unit. For any quantity and type of greenhouse gas, eCO<sub>2</sub> signifies the amount of CO<sub>2</sub> which would have the equivalent global warming impact. eCO<sub>2</sub> bottomline starts at 400 ppm (parts per million), the current environmental background level of CO<sub>2</sub>.<sup>8-9</sup>

### Sources of CO<sub>2</sub>

CO<sub>2</sub> is the fourth most abundant gas in the earth's atmosphere. At room temperature, carbon dioxide (CO<sub>2</sub>) is a colorless, odorless, non-flammable gas. At other temperatures and pressures, carbon dioxide can be a liquid or a solid. Solid carbon dioxide is called dry ice because it slowly changes from a cold solid directly into a gas.

Carbon dioxide is a byproduct of normal cell function when it is breathed out of the body. CO<sub>2</sub> is also produced when fossil fuels are burned or decaying vegetation. Surface soils can sometimes contain high concentrations of this gas, from decaying vegetation or chemical changes in the bedrock.<sup>10</sup>

### Health Effects of CO<sub>2</sub>

Exposure to CO<sub>2</sub> can produce a variety of health effects. These may include headaches, dizziness, restlessness, a tingling or pins or needles feeling, difficulty breathing, sweating, tiredness, increased heart rate, raised blood pressure, coma, asphyxia, and convulsions.<sup>11</sup>

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<sup>8</sup> <https://docs.smartcitizen.me/Components/sensors/CCS811/>

<sup>9</sup> <https://ecometrica.com/assets/GHGs-CO2-CO2e-and-Carbon-What-Do-These-Mean-v2.1.pdf>

<sup>10</sup> <https://www.dhs.wisconsin.gov/chemical/carbondioxide.htm>

<sup>11</sup> <https://www.dhs.wisconsin.gov/chemical/carbondioxide.htm>



# Explaining the Survey Report to the Customer

When the air quality survey has been completed and the report has been downloaded you can now explain the results with the customer. The first page will be a summary of all the data broken down by parameter (minimum, average and maximum) for each room. This data will be displayed with a colour coded comparison to the air quality ranges table within the report under the section "What Does the Air Quality Survey Data Mean?"

To explain the eTVOC and eCO<sub>2</sub> results please continue reading to the possible causes and solutions section.

To explain the PM<sub>2.5</sub> and PM<sub>10</sub> results a couple items should be noted. You can detect other types of particles that have a similar particle size. We have observed that pollen will set off the PM<sub>10</sub> channel. Excessive amounts of household dust will also likely be detected on both the PM<sub>2.5</sub> and PM<sub>10</sub> channels. For the PM<sub>2.5</sub> channel only, we have found that smoke will be detected even when it is difficult to smell. Second hand smoke from cigarettes has been found to be detectable for several hours, even if ventilation is attempted. Smoke from cooking or fireplaces is also easily detected. Smog from car exhaust can also be detected on the PM<sub>2.5</sub> channel. Regardless of source, excessive particulate matter present in a building has been shown to cause a wide range of health issues<sup>12</sup>, including asthma attacks, sick building syndrome, and increased incidence of respiratory infections.

**WHAT DOES THE AIR QUALITY SURVEY DATA MEAN?**

**PM<sub>2.5</sub> & PM<sub>10</sub> - Particulate Matter:**  
Reductions in airborne particulate matter have been shown to have a wide range of positive effects<sup>1</sup>. The toxicity of particulate matter depends on the type of particulate matter, but elevated particulate levels of all types have been associated with adverse health effects.

**Particulate Matter (PM) Sizes - micrometers (µm)<sup>2</sup>**

PM <sub>2.5</sub> /10 (µg/m <sup>3</sup> )	LEVEL <sup>3</sup>	MEANING
0 - 50	Good	Air quality is considered satisfactory air pollution poses little or no risk
50 - 100	Moderate	Air quality is acceptable
100 - 150	Unhealthy for Sensitive Groups	Members of sensitive groups may experience health effects
150 - 200	Unhealthy	Everyone may begin to experience health effects
200 - 300	Very Unhealthy	Health Alert: Everyone may experience more serious health effects
300 - 500	HAZARDOUS	Health Warning: Emergency conditions

**eTVOC - Equivalent Total Volatile Organic Compound:**  
Total VOC concentration represents all VOCs in the air. Some types of VOCs like formaldehyde are very dangerous and should be monitored at lower levels. Below is guidance published by the German Federal Environmental Agency that allows for direct comparison to the assessment data readings.

eTVOC (ppb)	LEVEL	EXPOSURE LIMIT	RECOMMENDATIONS <sup>5</sup>
0 - 65	Background	No Limit	No action required
65 - 220	Normal	No Limit	Ventilation recommended
220 - 660	Elevated	< 12 Months	Ventilation recommended, look for sources
660 - 2,200	High	< 1 Month	Intensified ventilation, look for sources
> 2,200	Dangerous	Hours	Should be avoided, intense ventilation

**eCO<sub>2</sub> - Carbon Dioxide Equivalent:**  
Elevated levels of carbon dioxide can cause headache and fatigue, while very high concentrations can cause dizziness, nausea, and vomiting. Extremely high levels can cause loss of consciousness and even death.

eCO <sub>2</sub> (ppm)	LEVEL	HEALTH EFFECTS <sup>6,7</sup>
250 - 350	Background	Normal level for outdoor air
350 - 1,000	Normal	Typical concentrations found in indoor air
1,000 - 2,000	Elevated	Symptoms will begin to develop, starting with drowsiness
2,000 - 5,000	High	Headaches, sleepiness, poor concentration, increased heart rate and slight nausea
> 5,000	Dangerous	Dizziness, fatigue, nausea, vomiting, loss of consciousness and death

<sup>1</sup> Fisk, W.J. (2013). Health benefits of particle filtration. Indoor Air 23(5), 357-368. doi:10.1111/ina.12058  
<sup>2</sup> https://www.epa.gov/indoor-air-quality-iaq/indoor-air-quality-iaq-faq#faq02  
<sup>3</sup> http://www.instituteforairquality.org/indoor-air-quality-iaq-faq#faq03  
<sup>4</sup> https://www.fda.gov/oc/ohrt/chemicals/chemicals/indoor-air-quality-iaq-faq#faq04  
<sup>5</sup> https://www.fda.gov/oc/ohrt/chemicals/chemicals/indoor-air-quality-iaq-faq#faq05  
<sup>6</sup> https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2816043/Carbon-dioxide-detection-and-indoor-air-quality-control.aspx#m1  
<sup>7</sup> https://www.medical-reference.net/2014/07/health-are-particulate-matter-25.html

## How to tell if the PM readings contain Mold Spores?

There are several possible airborne substances that can be detected in the PM<sub>2.5</sub> and PM<sub>10</sub> range. Below are some noteworthy examples of possible causes.

- Can you visibly see mold or a musty smell in the areas where the PM readings are high?
- Do the people smoke in the property or room?
- Has the shower been running within the past 2 hours, or cooking within the past 2-3 hours?
- Is there a fireplace located near or in the room?
- Is the room or property visibly dusty? Is the dust airborne or settled?
- Does the property contain any pets, cats or dogs?
- Is there any visible pollen or allergens in the air?

When the PM<sub>2.5</sub> and or PM<sub>10</sub> readings are elevated and keeping the above notes in mind you will be able to determine if there is a possible presence of airborne mold spores in the surveyed rooms.

<sup>12</sup> <https://iaqscience.lbl.gov/air-summary>



## Possible Causes

Refer to the “Sources of ...” sections for each of the air quality survey parameters to learn about possible causes.

- [Sources of PM2.5 & PM10](#)
- [Sources of VOCs](#)
- [Sources of CO2](#)

## Possible Solutions

Some of the possible solutions to reduce or clean the indoor air levels of all of the air quality survey parameters may be:

### PM2.5 / PM10

- Locate and remediate any sources of indoor **Mold**.
- Increase ventilation. Adding ventilation is a double-edged sword. Bringing more outside air in may add outdoor pollutants to indoor air. On the other hand, it may also equalize what is typically poorer quality indoor air with less toxic – but still polluted – outdoor air.
- Install an indoor air purifying system.
- Stop smoking indoors.
- The U.S. EPA currently provides no regulatory standards for indoor air, but does provide guidance to create a healthy indoor environment.

### eCO2

- There are no indoor air standards for CO<sub>2</sub>; however, high indoor air levels of carbon dioxide could be an indicator the HVAC (heating, ventilation, and air conditioning) system is not working properly.
- Examine the HVAC System is working correctly. High carbon dioxide levels can cause poor air quality and can even extinguish pilot lights on gas-powered appliances.
- Open the building windows.
- Turn on exhaust fans.

### eTVOC

- Make sure you get enough fresh, clean air into your home by opening windows.
- Increase ventilation by opening windows and doors after you bring new VOC sources into your house, such as new carpets, furniture, or drapes.
- Follow manufacturers’ labels when using household chemicals. If the label says “use in a well-ventilated area” go outside or to an area where an exhaust fan or open window provides extra ventilation.

## More About the Pocket Particle AQI 2.0 Sensor



The sensor wirelessly communicates data to a mobile device (iOS or Android) via Bluetooth connection. The sensor is powered by a rechargeable battery, when fully charged will last for roughly 2.5 hours of use. The LED on the sensor will change colours as the PM2.5 readings enter the different Air Quality table ranges.



An active WiFi connection or mobile device cellular signal with data plan is required while performing the survey. The communication requirement is to send the air quality readings to our cloud based data management system to organize and generate the report. We currently have plans to develop “Offline Mode”, where the mobile device WiFi or cellular data connection will not be required during the survey.

*\*More information can be found on the product insert User Manual or on our website <https://digienv.com/industries/homeins>.\**

## How Accurate is the Pocket Particle AQI 2.0 Sensor?

### NISTLab/SAI - PP2.0 Sensor Calibration and Accuracy Report



NISTLab SAI is an industry leader in the calibration and service of industrial hygiene instruments, environmental & personal monitors, HAZMAT equipment, audiometers, tympanometers and vision screening equipment. All calibrations are NIST traceable and performed to appropriate ANSI/ISO/IEC specifications.<sup>13</sup>

The Pocket Particle AQI 2.0 Sensor was sent to NISTLab/SAI in Greenville, South Carolina for a complete calibration and accuracy report. Below is a summary of the Certificate of Calibration - ISO 9001 Certified report. Aligned and calibrated per calibration procedure DM-001

- **Certificate Number:** 20171689-87708
- **Date Issued:** 9/15/2017
- **Calibrated to:** *(Device, Description, Report Number)*
  - 1012, PTU200, Vaisala PTU200 environ standard w/HMP45D probe, 20171852-88366
  - 1013, SKC 311-100/500/2000 100/500/2000 ML LAB BURRETTE KIT, caltec96675
  - 1024, HP 3456A PRECISION DIGITAL VOLTMETER, 1013870

<sup>13</sup> <https://nistlab.com/>

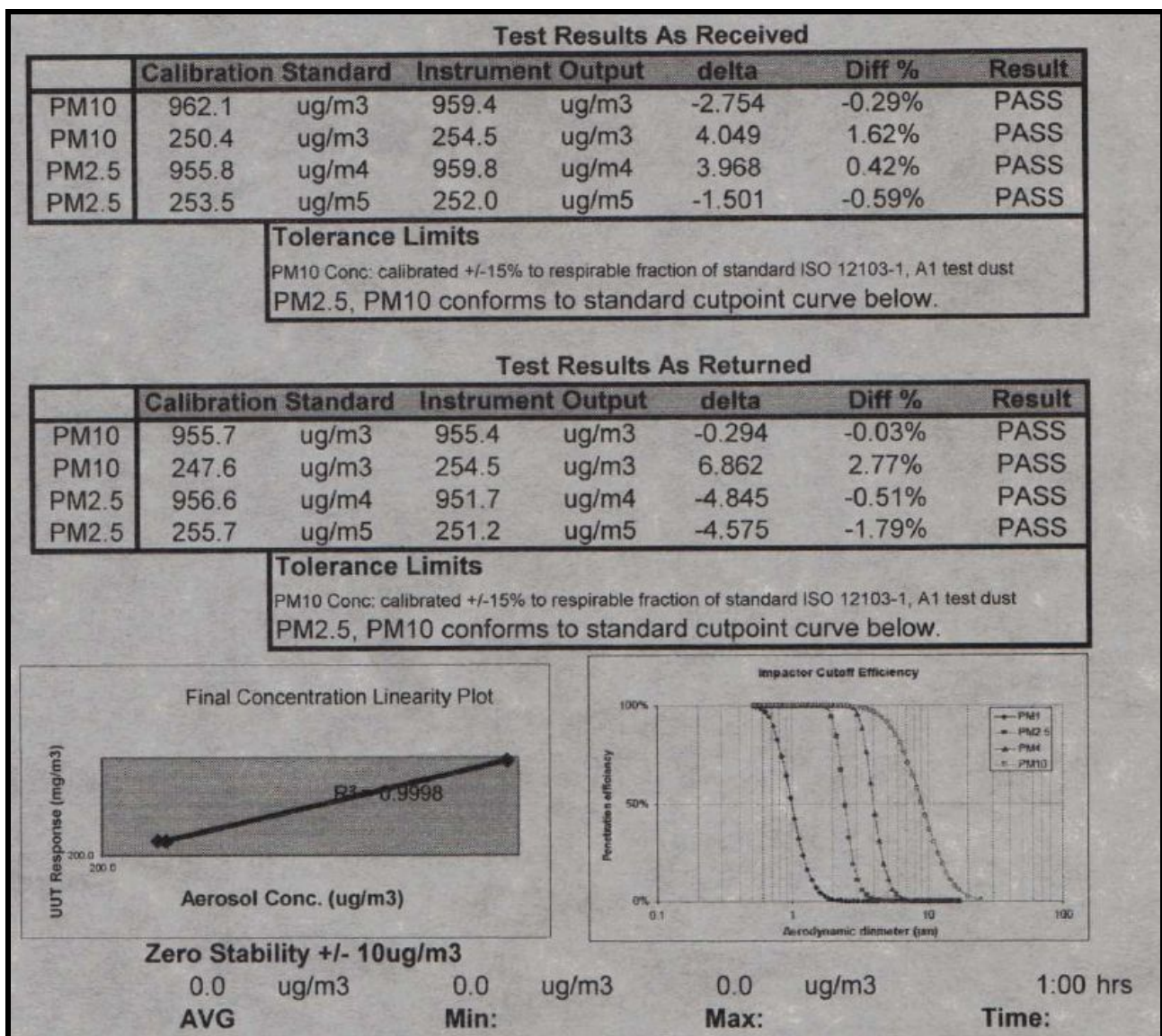




- 1040, iso 12103-1 - ISO 12103-1A1 ULTRAFINE TEST DUST < 20um DIA., 1018bu#01
- 1042, PHOTOMETER REAL TIME 90 DEGREE LIGHT SCATTERING PHOTOMETER, 90893646-171712
- 9011 & 8220, 6 CHANNEL 660nm 50mW OPTICAL PARTICULATE COUNTER, 70729122-23000157800449727

Information from NISTLab/SAI to Digital Environment relating directly to the calibrations performed on the Pocket Particle AQI 2.0 sensor states the following:

“Target specification was not resolved, and for good reason. There really is no absolute target specification for the term PMx.x. The unit was found to perform well against impactor plate curves as published by TSI.”



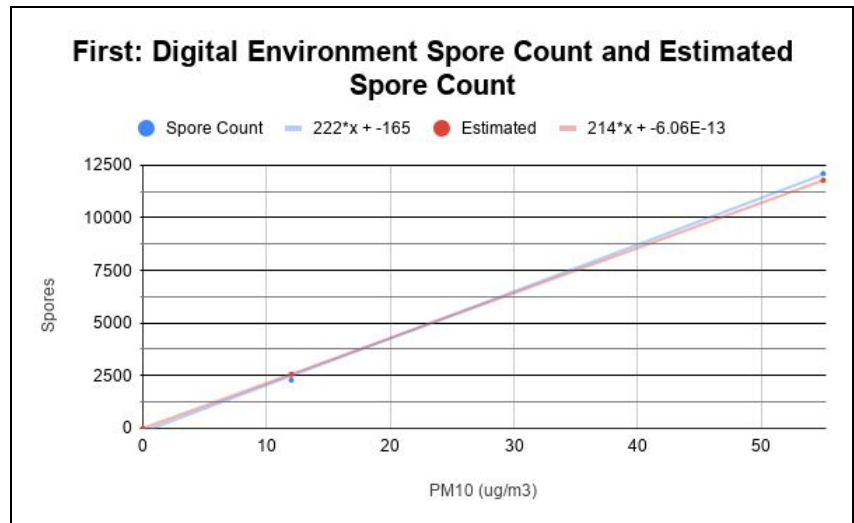
The previous image represents a summarization of the calibration and accuracy report results. The tested sensor had already passed all of the calibration standards that were being reviewed before the calibration test. Meaning that the sensor manufacturer’s calibrations are sufficient enough to consider the sensor accurate and calibrated to ISO 9001 Certification.

Digital Environment is very critical about the QA/QC processes implemented. A few units are selected from every manufactured batch of sensors delivered to us and sent to NISTLab/SAI for a quality assurance on their calibration and accuracy performance.

## Sensor Comparison Case Study

A townhouse with mold contamination in a water heater closet was evaluated by the Pocket Particle AQI 2.0 sensor as well as sampled by a mold professional deploying traps.

The **Blue line** are the mold spores counted by the lab test and the **Red line** is what our sensor readings estimated as the mold spore count.



The results from the mold professionals lab show good agreement with the estimated mold spore concentration measured by the Pocket Particle AQI 2.0 Sensor.

## Manufacturer Sensing Component Accuracies

The electronic sensing components within the Pocket Particle AQI 2.0 sensor have a manufacturer calculated relative error of:

- PM2.5** - Up to ± 15% / ± 10 µg/m³ / @ 25°C / Humidity 50%
- PM10** - Up to ± 15% / ± 10 µg/m³ / @ 25°C / Humidity 50%
- eTVOC** - Up to ± 2% / @ 25°C / Humidity 50%
- eCO2** - Up to ± 2% / @ 25°C / Humidity 50%

The NISTLab/SAI calibration and accuracy report confirms that the manufacturer calibration is well within the relative error percentages of 15%.



## Sensor Calibration

The sensor is not required to be sent anywhere to be calibrated. They are calibrated initially from the manufacturer and have an estimated effective lifespan of 3-5 years.

The sensor itself is calibrated every time it is powered off and on electronically. If you find that the sensor is constantly reading high parameter values immediately after turning it on, then take the sensor outside and see if the outdoor air lowers the readings at all. If the readings are still high, then it is possible there is a build up of material on the laser lenses. To clean them simply blow through the sensor with your breath to dislodge any material.

If you find the sensor is still reading high values all the time, please call **1-844-344-4368** or email [support@digienv.com](mailto:support@digienv.com) and speak to a member of our technical support team. The sensors come with a 1 year warranty and can be replaced due to malfunction.

## What Requirements Do I Need to Perform the Survey?

To sum everything up quickly, there are **NO regulations, standards, certifications or official training requirements required** to perform an Air Quality and Mold Survey. There are suggested limits and ranges of different air quality substances that have been outlined in our report table for you to explain to the customer.

## EPA (Environmental Protection Agency)

A brief summary of articles from the EPA related to Air Quality and Mold Standards. The EPA has no standards, safe levels, or regulatory certifications for anyone who is performing an Air Quality and or Mold Inspection / Survey. There are qualifications required for taking samples and tests through a lab, but that is not what the Digital Environment System does. There is more detailed information below from the EPA directly.





## **Are There Federal Regulations or Standards Regarding Mold?**<sup>14</sup>

Standards or Threshold Limit Values (TLVs) for airborne concentrations of mold, or mold spores, have not been set. Currently, there are no EPA regulations or standards for airborne mold contaminants.

For more information on mold, see our website at [www.epa.gov/mold](http://www.epa.gov/mold).  
You may also be interested in:

- Read the publication, "A Brief Guide to Mold, Moisture, and Your Home" at [www.epa.gov/mold/brief-guide-mold-moisture-and-your-home](http://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home) [EPA 402-K-02-003]

## **Who Can Test my Home or Clean, Fix and Remediate my Home for Mold?**<sup>15</sup>

EPA does not have a certification program for mold inspectors or mold remediation firms. EPA does not maintain a list of mold inspectors or mold remediation firms, though some states might.

Some states and organizations may require certification, training, or examinations for practitioners in the indoor air quality industry. Sometimes companies that provide radon, lead or asbestos inspection services provide mold assessment services as another part of their business. Ask about qualifications, training and experience and check references for professionals you are considering.

See our list of state contacts at:

[www.epa.gov/indoor-air-quality-iaq/epa-regional-office-and-state-indoor-air-quality-information](http://www.epa.gov/indoor-air-quality-iaq/epa-regional-office-and-state-indoor-air-quality-information).

The key to mold growth is moisture so part of assessing mold problems is looking for existing or potential moisture problems. Companies that provide water damage inspection services may help look for moisture and some may be familiar with mold problems as well.

There are no established safe levels or regulatory standards for mold, so, although testing can be done, it may be of limited use in helping to understand the problem. Mold assessment is mainly done through visual inspection of areas where there have been moisture problems or water damage.

The basics of mold, moisture control and cleanup are in the EPA publication "A Brief Guide to Mold and Moisture in Your Home" which is available on the EPA website at:  
[www.epa.gov/mold/index.html](http://www.epa.gov/mold/index.html).

For more information on the basics of mold, moisture control and cleanup, see:

- A Brief Guide to Mold, Moisture, and Your Home - [www.epa.gov/mold/brief-guide-mold-moisture-and-your-home](http://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home) [EPA 402-K-02-003]

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<sup>14</sup> <https://www.epa.gov/mold/are-there-federal-regulations-or-standards-regarding-mold>

<sup>15</sup> <https://www.epa.gov/mold/who-can-test-my-home-or-clean-fix-and-remediate-my-home-mold>



## **Mold Testing or Sampling**<sup>16</sup>

Is sampling for mold needed? In most cases, if visible mold growth is present, sampling is unnecessary. Since no EPA or other federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with federal mold standards. Surface sampling may be useful to determine if an area has been adequately cleaned or remediated. Sampling for mold should be conducted by professionals who have specific experience in designing mold sampling protocols, sampling methods and interpreting results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA), the American Conference of Governmental Industrial Hygienists (ACGIH), or other professional organizations.

*\*Digital Environment - Air Quality and Mold Survey System is not classified as mold testing or sampling, it is classified as a Survey.\**

## **ASTM (American Society for Testing and Materials)**

The ASTM has a couple of Standard Practice or Guides that relate to Evaluating Indoor Air Quality and Mold Growth. They are available for purchase on the ASTM website at the following links.



- **ASTM D7297**
  - Standard Practice for Evaluating Residential Indoor Air Quality Concerns
  - <https://www.astm.org/Standards/D7297.htm>
- **ASTM D7338**
  - Standard Guide for Assessment of Fungal Growth in Buildings
  - <https://www.astm.org/Standards/D7338.htm>

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<sup>16</sup> <https://www.epa.gov/mold/mold-testing-or-sampling>



# Insurance Requirements & Legal Liabilities

## **Insurance Requirements**

Please contact your current business insurance provider and let them know you will be offering your customers the additional service of Air Quality and Mold Detection Surveying. Most of our users current insurance policy already covers our air quality and mold detection surveying system. If your insurance policy already includes performing indoor air quality inspections or mold underwriter, our air quality and mold detection survey system would fall under these coverages.

Surveying is essentially a general examination of the air quality levels for PM2.5, PM10, eCO2 and eTVOC. You are not specifying what the parameter readings are, just simply taking a reading of how many units are currently present in the air.

This system does not classify you as a certified air quality or mold assessor, inspector, tester, or remediator. The system simply indicates the presence of measured airborne particulates and gives you the ability to explain the results to your customer using the Recommended Air Quality Levels Table. This can lead you to suggesting further investigation (i.e. lab sampling), or confirming the readings to be within the recommended safe levels.

*\*We recommend always contacting your insurance provider to confirm policy coverage when including any additional services being offered.*

## **Legal Liabilities**

Research and investigation from our legal department has deemed there to be **NO Legal Liabilities** associated with performing the Digital Environment - Air Quality and Mold Detection Survey.

The following general statements are the main reasons we can assure our NO Legal Liability claim:

1. The EPA has no specific training or certification requirements to perform an air quality survey.
2. The user or surveyor is not claiming to be a certified air quality or mold assessor, inspector, tester or remediator when using the air quality and mold detection survey system. Unless they have the proper qualifications to do so.
3. The survey is intended to aid the user in identifying areas that may require further lab sampling or investigation.
4. The survey is intended to give the customer an insight into their general indoor air quality conditions and levels.

If the above information and statements are not adequate enough for our “No Legal Liability” claim, we recommend contacting a legal professional for more information or confirmation.



## Disclaimer

### Interpretation and Definitions

#### **Interpretation**

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The following definitions shall have the same meaning regardless of whether they appear in singular or in plural.

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- By email: [support@digienv.com](mailto:support@digienv.com)
- By phone number: **1-844-344-4368**

