

Troubleshooting guide

Environmental factors that impact Particle Counters

Most consumer-grade air quality sensors use optical particle counters (OPCs). These work by:

1. Shining a tiny laser or LED through an air stream
2. Counting each flash of light scattered by a particle

Because they rely on light scattering, anything that affects the optical path or the airflow can distort the readings. The major influences are:

1) Humidity

How it affects readings:

- Water droplets scatter light like particles.
- Hygroscopic particles (dust, salts, smoke) absorb water and grow when humidity is high.
- Growth can make them *look* like larger particles (so a PM_{0.3} or PM₁ count can spike in humid conditions).

Typical impact:

- At RH > 70%: counts can increase 1.5×–5× or more.
- At RH > 85–90%: readings often become unreliable.

Why it happens:

The sensor can't tell water droplets from actual pollution.

2) Ambient light leaking into the sensor

How it affects readings:

- Bright sunlight or strong LED lighting entering the sensor chamber can add “noise” to the signal.
- Some sensors misinterpret random noise as particle events → false high counts.

Typical impact:

- Usually small but can be noticeable if the sensor sits in direct sunlight or under bright directional lighting.

3) Airflow variability

OPCs depend on a controlled airflow to ensure each particle passes through the beam in a predictable way.

Problems:

- If placed in a drafty spot (near vents, windows, fans), airflow may be too fast → undercount.
- If obstructed or in a dead air zone → overcount or unstable count.

4) Household aerosols that aren't “pollution”

Many particle counters don't distinguish between:

- steam
- cooking mist
- shower humidity
- aerosol sprays
- dust from bedding
- fine droplets from humidifiers

So, you may see spikes unrelated to harmful PM_{2.5}.

How likely is this to be a problem in everyday domestic use?

Short answer: quite common, but usually not dangerous

Here's a practical breakdown:

Situation	Likelihood of inaccurate readings	Notes
Normal indoor RH (30–60%)	Low	Sensor performs fairly well.
High humidity bathroom, shower, kitchen steam	Very high	False PM spikes are common.
Near windows with sunlight, bright lamps	Moderate	Possible noise, occasional spikes.
Near HVAC vents or fans	Moderate to high	Airflow turbulence causes fluctuating readings.
Using humidifiers (especially ultrasonic)	Extremely high	Most OPCs mistake droplets for high PM pollution.

Is this a *health risk* problem?

No, it's not dangerous. The issue is measurement accuracy, not actual air quality - in other words:

- The sensor may *claim* your air is dirty
- But nothing harmful is actually present
- It's just optical or environmental interference

Is this a *practical* problem?

It depends on what you're using the data for:

If you want to:

- Track trends
- Know when cooking causes spikes
- Compare rooms
- Trigger a purifier to turn on/off

→ Low cost consumer sensors are absolutely fine.

If you need:

- Regulatory-grade PM_{2.5}
- Scientific measurements
- Reliable data in high humidity
- Exact mass concentrations

→ Consumer sensors will struggle, and environmental influences become a real problem.

How to minimise environmental interference at home

- Keep the sensor away from bathrooms and kitchens unless you're specifically monitoring them.
- Avoid direct sunlight.
- Keep 1–2 feet away from walls/objects to maintain stable airflow.
- Avoid placing it directly in the path of air vents.
- Avoid placing it near humidifiers (biggest issue of all).
- If humidity is high, interpret readings cautiously.

See Particle Monitor for thresholds

Colour guide:

BLUE: good | **GREEN: moderate** | **AMBER: poor** | **RED: unhealthy** | **DARK RED: hazardous**