maxisafe.com.au

Workplace Dust: Particle Size Matters for Safety

Particle size guide to monitor, mitigate and manage invisible health risks

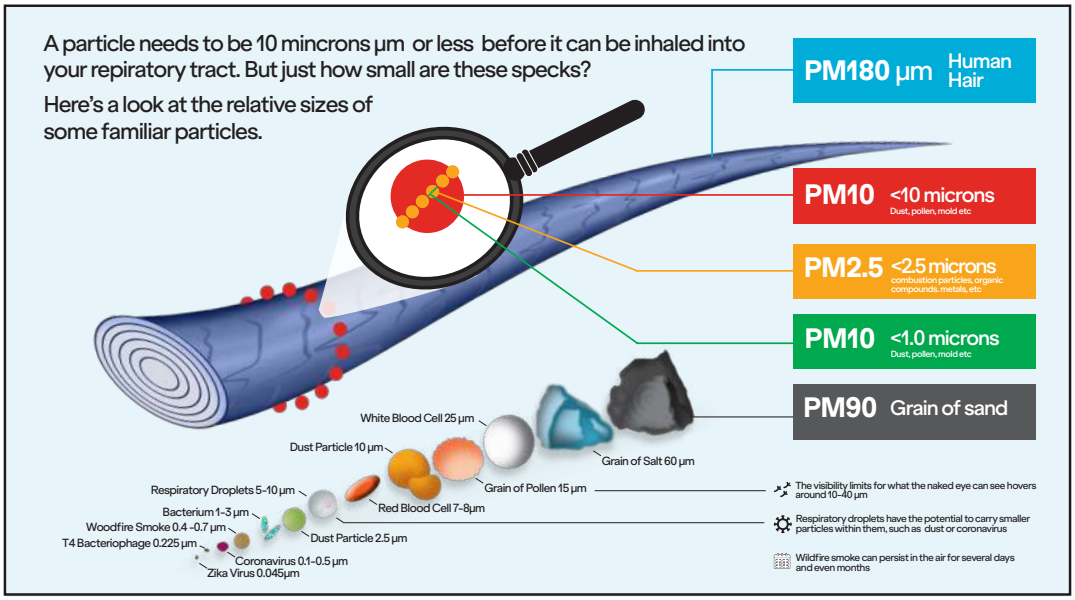
Contents

1. The dangers of dust

Occupational lung diseases are work-related conditions that affect the respiratory system and are caused by prolonged exposure to hazardous substances in the workplace.

If workers are exposed to hazards such as even short-term exposure in some cases they are at risk of developing serious health conditions.

2. Types of dust and particle size



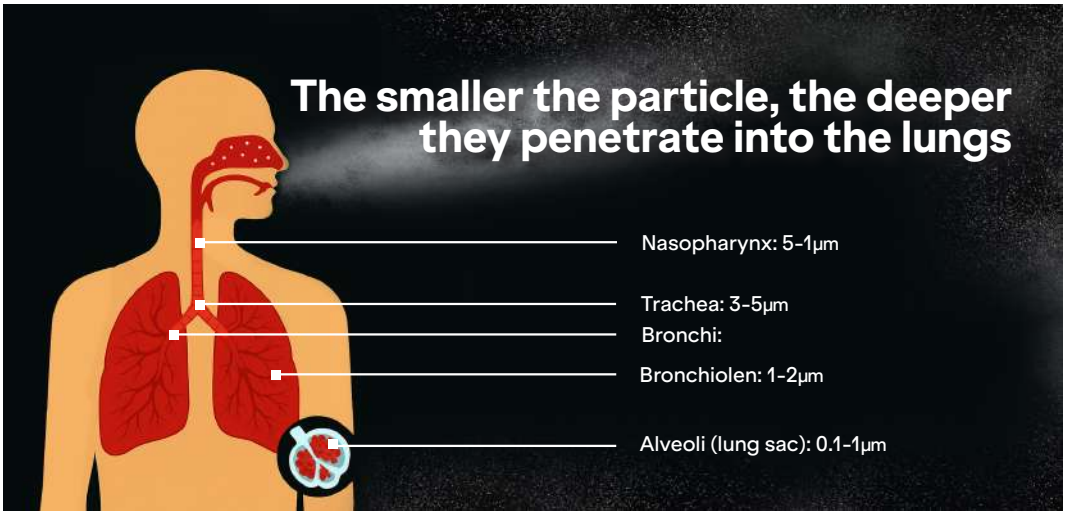
Common forms include:

- **Aluminium dust (aluminosis):** Leads to scarring and stiffening of lung tissues.
- **Asbestos (asbestosis):** Causes severe lung damage and increases the risk of mesothelioma.
- **Beryllium dust or vapours (berylliosis):** Leads to chronic beryllium disease, affecting the lungs and potentially other organs.
- **Cotton dust (byssinosis):** Known as "brown lung," it primarily affects workers in the textile industry.
- **Coal dust (coal workers' pneumoconiosis):** Commonly referred to as "black lung," caused by prolonged exposure to coal dust.

- **Hard metals (tungsten, tungsten carbide, cobalt):** Can result in hard metal pneumoconiosis, leading to chronic lung inflammation.
- **Crystalline silica (silicosis):** Caused by fine silica particles from construction, mining, and manufacturing industries.
- **Talc dust (talcosis):** Linked to lung scarring and inflammation from talc-containing materials.

Why dust is particularly dangerous:

- Fine particles (e.g., PM1, PM2.5, PM4) can penetrate deeply into the lungs, causing inflammation and long-term damage.
- Many hazardous dusts, such as silica are invisible to the naked eye, making exposure difficult to detect.
- Long latency periods: Symptoms often appear years or even decades after initial exposure, delaying diagnosis and treatment.
- Effective dust monitoring and control measures are essential to minimize exposure, protect worker health, and comply with workplace safety regulations
- Where can you find exposure limits in Australia?



3. Specific dust types

1 - Crystalline silica

- **Exposure Limit: 0.05 mg/m³ TWA**
  (Workers may require specific health monitoring; use, handling, and storage are restricted or prohibited.)

What Is Crystalline Silica?

Respirable crystalline silica is a naturally occurring mineral that forms the crystalline structure of silicon dioxide. It is a major component of natural stones like granite and sandstone and is also present in many manufactured products such as tiles, concrete, and engineered stone.

- **Manufacturing and construction:** Tasks like cutting, grinding, drilling, or sawing silica-containing materials generate fine silica particles.
- **Mining, quarrying, and tunneling:** These operations release significant amounts of airborne silica dust from rocks and soil.
- **Waste from processing silica-containing products:** Crushing or recycling concrete, bricks, or other materials creates silica dust.
- **Sand-based products:** Activities involving sandblasting or using sand-based materials release respirable silica particles into the air.

Why is silica dust dangerous?

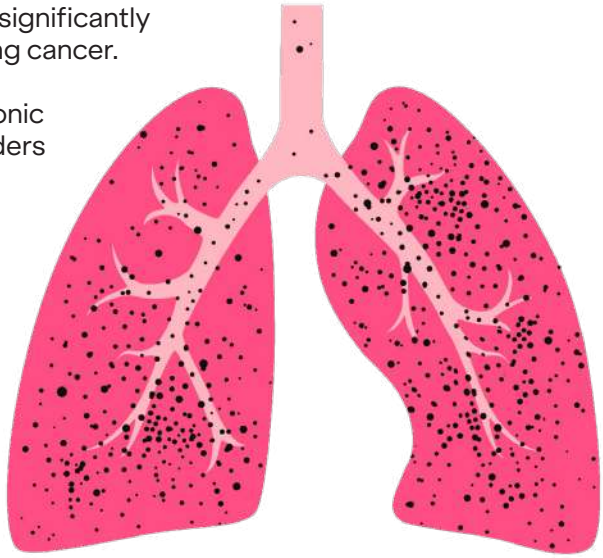
- Crystalline silica particles smaller than 10 µm (respirable crystalline silica) are invisible to the naked eye, remain airborne for extended periods, and can travel deep into the lungs. These particles pose significant health risks, including:

1. Short-term risks:

- Initial exposure can lead to coughing, throat irritation, and difficulty breathing.
- Disturbed dust creates immediate inhalation risks, especially in poorly ventilated environments.

2. Long-term health effects:

- **Silicosis:** A progressive and incurable lung disease caused by the buildup of silica particles in the lungs, leading to scarring and reduced lung function.
- **Progressive Massive Fibrosis (PMF):** Severe lung damage as silicosis advances, making breathing increasingly difficult.
- **Chronic Obstructive Pulmonary Disease (COPD):** Permanent lung damage, including chronic bronchitis and emphysema.
- **Lung Cancer:** Prolonged exposure significantly increases the risk of developing lung cancer.
- **Other Health Effects:** Includes chronic kidney disease, autoimmune disorders (e.g., lupus, scleroderma)



Who is at risk

- **Workers directly handling silica-containing materials:** Fabricating, installing, maintaining, or demolishing sillca-based products exposes workers to high levels of silica dust.
- **Personnel in dust-prone environments:**
  Poor house-keeping practices, such as dry sweeping or using high-pressure cleaners, can disturb settled silica dust and create airborne hazards.
- **How Silica Exposure Happens**
  While solid silica-containing materials pose no risk, dust generated from cutting, grinding, or other processing activities releases fine the air. The risks are higher when working with materials containing high levels of crystalline silica.
- **The Importance of Monitoring Silica Dust**
  Given its invisibility and potential for long-term harm,monitoring silica dust is critical to ensuring workplace safety. Real-time monitoring solutions like Dustlight provide immediate insights into exposure levels of particulate matters, enabling workers and safety teams to take swift action to minimise risks.

2-Welding Dust and Fumes

Exposure Limit: 1 mg/m^3 TWA

(Workers may require specific health monitoring; use, handling, and storage are restricted or prohibited.)

Welding fumes are a complex and hazardous mixture of chemicals generated during welding processes. The exact composition varies depending on:

- **The welding process:** Methods like MIG, TIG, or stick welding produce different types and amounts of fumes.
- **The metal(s):** Base metals such as stainless steel, aluminum, or carbon steel release specific hazardous substances.
- **Shielding gases or flux:** Gases like argon or helium and fluxes can contribute to harmful chemical reactions.
- **The welding rod composition:** Electrodes can emit toxic substances, including manganese or chromium compounds.
- **Contaminants or coatings:** Paints, oils, or rust on the metal surface add harmful by-products to the fumes.

Health Risks of Welding Fumes

1. Short-Term Health Effects:

- **Irritation:** Immediate exposure can irritate the nose, throat, and lungs, leading to coughing, wheezing, and a tight chest. These symptoms can disrupt work and impact respiratory health.
- **Asphyxiation:** Confined spaces without proper ventilation can cause oxygen deficiency, leading to difficulty breathing or even unconsciousness.
- **Metal Fume Fever:** A flu-like illness caused by inhaling metal oxides, resulting in fever, chills, and body aches. Symptoms typically subside after 24–48 hours but can severely impact productivity.

2. Long-Term Health Effects:

- **Asthma and Wheezing:** Repeated exposure can lead to chronic respiratory issues, making breathing difficult over time.
- **Lung Damage:** Persistent exposure may cause permanent lung damage, including bronchitis, pneumonia, or emphysema, all of which fall under chronic obstructive pulmonary disease (COPD).
- **Cancer:** Prolonged exposure to welding fumes increases the risk of lung and kidney cancers, especially when welding on materials containing chromium or nickel.

References: https://www.safeworkaustralia.gov.au/safety-topic/hazards/welding-fumes
https://www.safework.nsw.gov.au/hazards-a-z/welding-fumes

3 - Asbestos

Exposure Limit: 0.1 f/ml TWA

(Note: Dustlight cannot measure asbestos in PPM or f/ml; laboratory testing is required.)

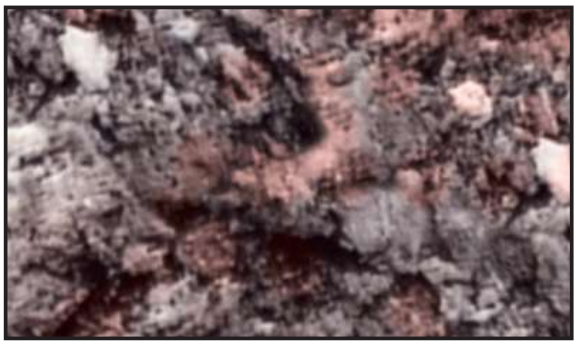
What is Asbestos?

Asbestos is a naturally occurring mineral widely used in construction, transportation, and industrial applications due to its durability, heat resistance, and insulating properties. Despite these advantages, asbestos is highly hazardous, leading to its ban in many countries, including its prohibition in December 2003.

Types of Asbestos

1. Friable Asbestos:

- Easily crumbles into a powder, releasing fibers into the air.
- High Risk: Friable asbestos poses a greater risk as its fibers can easily become airborne when handled or disturbed.



2. Non-Friable (Bonded) Asbestos:

- Mixed with cement or resin to keep fibers contained.
- **Risk if damaged:** When non-friable asbestos is broken or deteriorates, it can release hazardous fibers.

Why Is Asbestos Dangerous?

Asbestos fibers are microscopic, remain airborne for long periods, and are easily inhaled. Once inhaled, they embed in lung tissue, often causing diseases that appear years later.

Health Risk includes:

- **Asbestosis:** Chronic lung disease caused by scarring of lung tissue, leading to breathing difficulties.
- **Mesothelioma:** A rare, aggressive cancer of the lungs, abdomen, or heart lining.
- **Lung Cancer:** Exposure significantly increases the risk, especially for smokers.
- **Latency Period:** Symptoms often appear 20–30 years after exposure, delaying diagnosis and treatment.

Who is at Risk

- **Workers handling legacy asbestos materials:** Construction, demolition, or maintenance workers interacting with older buildings and equipment.
- **General workforce:** Employees exposed to airborne fibers due to poor asbestos management in older facilities.

Managing Asbestos in the Workplace

- **Asbestos Register:** Maintain a detailed inventory of asbestos-containing materials on-site.
- **Management Plan:** Develop safe handling, monitoring, and removal procedures.
- **Licensed Removal:** Only professionals with specialised training and licenses should remove asbestos.

Health Monitoring and Training

- Regular health monitoring is critical for early detection of asbestos-related diseases, particularly for workers previously exposed.
- Workers should be trained to recognize asbestos-containing materials and handle them safely to minimize risks.
- Organisations must ensure compliance with asbestos regulations, provide worker training, and actively monitor for potential hazards. Proactive management and proper handling are essential to minimise exposure and protect worker health.

4. Protection Through Detection

Comprehensive Monitoring for Workplace Safety

Dustlight is not just a device; it's a crucial tool to help protect the health and safety of workers in dust-prone environments. By providing continuous, real-time monitoring of dust particle sizes, Dustlight helps with regulatory compliance with occupational health standards and fosters a proactive approach to workplace safety. Its compact size, ease of use, and reliable performance make it an important tool for anyone needing to monitor dust exposure effectively.

Measurement Units

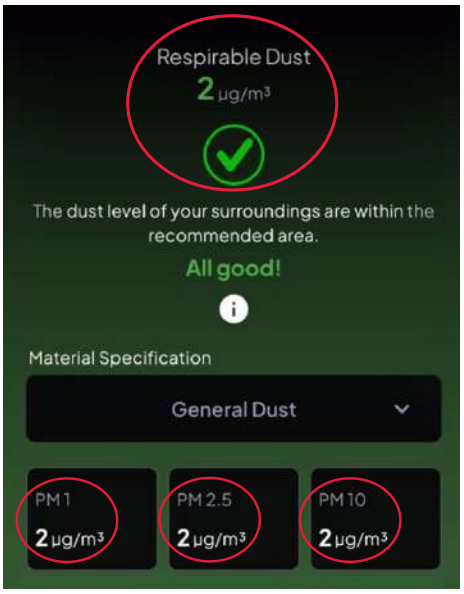
Dustlight displays measurements in $\mu g/m^3$, while Australian exposure limits are expressed in mg/m^3.

- 1 mg/m^3 = 1000 $\mu g/m^3$

Interpreting Dustlight Readings

- The Dustlight app shows four key readings (circled in red in Reference 4), representing dust volume in the air. These readings are differentiated byparticle size:
- PM1: Particles smaller than 1 micrometre (µm); extremely fine and remain airborne for long periods.
- PM2.5: Particles smaller than 2.5 µm; associated with respiratory and cardiovascular risks.
- PM4: Particles smaller than 4 µm; capable of penetrating deep into the lungs, posing significant health risks. This is the main reading for respirable dust.
- PM10: Particles smaller than 10 µm; settle in the upper respiratory tract.

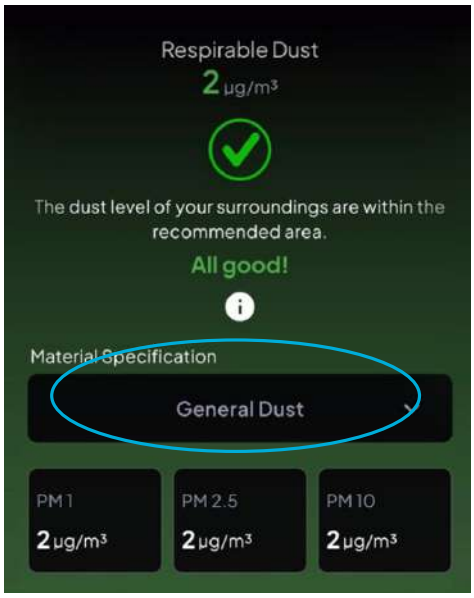
Reference 4



Material Specification

- The default setting is General Dust, providing an indicative measurement when the dust type is unknown.
- Material-specific configurations allow more accurate readings tailored to hazards like crystalline silica, welding fumes, or other workplace dust types. These can be adjusted via the app (circled in blue in Reference 5).

Reference 5



Real-Time Alerts

- Dustlight provides instant alerts when dust levels exceed predefined thresholds, enabling quick responses to protect worker health and prevent prolonged exposure.

Customizing Exposure Limits

- Selecting Australia in the Settings tab applies exposure limits set by SafeWork Australia.
- These limits can be customized by clicking the pencil icon and entering site-specific values, ensuring compliance with local regulations.

Additional Features

1. Compact and Wearable:

- Dustlight's lightweight (60mm x 60mm) design makes it easy to clip onto clothing or equipment, providing continuous monitoring without disrupting work.

2. Data Export and Reporting:

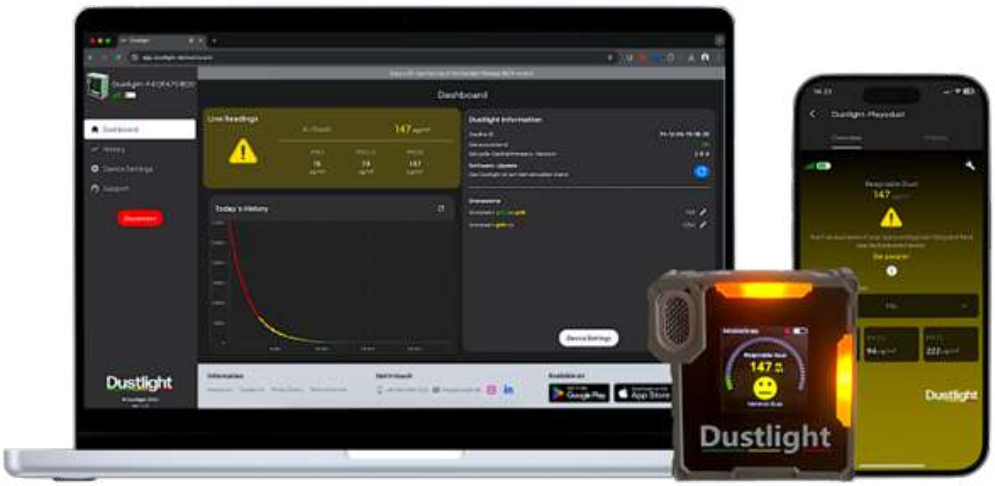
- The app allows users to export data for reporting and compliance, supporting safety audits and ESG reporting.

3. Battery and Connectivity:

- With long-lasting battery life and Bluetooth connectivity, Dustlight offers seamless performance and reliable syncing with its app.

4. Durability:

- Designed for harsh environments, Dustlight is ideal for industries like mining, construction, and manufacturing.



Dustlight Smartphone and Web App:
Seamless Integration for Data Monitoring

The Dustlight smartphone app enhances the device's functionality with:

1. Real-Time Monitoring

- View live dust readings, including PM1, PM2.5, PM4 (A-Dust), and PM10, directly on your phone.
- Receive instant alerts when dust levels exceed exposure thresholds, enabling immediate action.

2. Customisable Settings:

- Tailor exposure limits based on regional standards, such as SafeWork Australia, or set site-specific limits.
- Choose material-specific configurations for greater accuracy when monitoring specific hazards like welding fumes or crystalline silica.

3. Data Export and Sharing:

- Export measurement data in PDF (Business Plan users or CSV formats for reporting, compliance, and analysis.
- Share data easily with team members or management for collaborative safety measures.

4.User-Friendly Interface:

- Intuitive design ensures that anyone can use the app with minimal training.
- Includes a calendar view to access historical data by date.

The Dustlight Smartphone App is available on iOS and Android, while the Web App can be accessed by using app.dustlight.de

On the Dustlight unit display, shown in reference 6, it will show the A-Dust/PM4 volume reading.

Pressing the button on the side, you can switch to the history mode, which will show you a graph of your exposure over time.

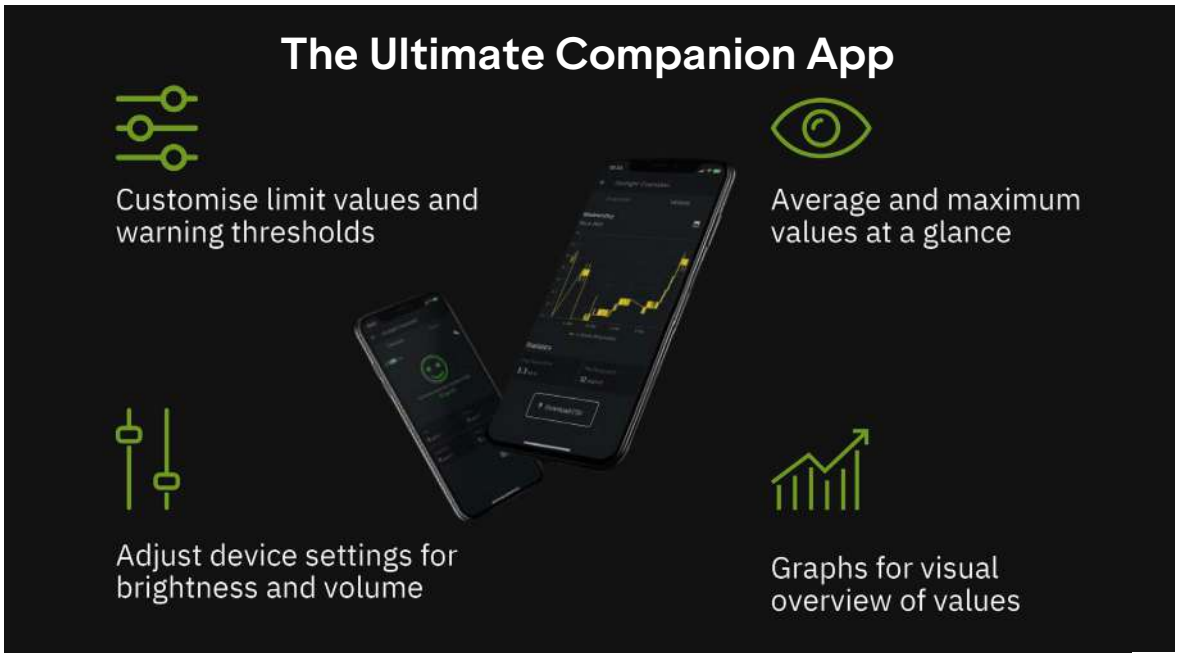
Reference 6

Dustlight - Smart Dust Monitoring

Real-time air quality insights, anytime, anywhere

The Dustlight App is your pocket-sized particle size monitor assistant, designed to help teams monitor and respond to dust exposure with ease.

Whether you need basic monitoring for free or advanced management tools, Dustlight has the right solution for you.



Data Analysis

With the Dustlight app, you can use the measurements from the device's internal memory and use the data logger function. Access real-time data with graphs and downloadable CSV files for your own research and tracking. Connect multiple devices to monitor your site.

Thresholds

- Adjust the warning thresholds and limits to meet the legal requirements of your industry / application
- Personalise the warning thresholds and limits.
- Adjust the warning sounds and displays on the device

Dustlight

Bluetooth® Technology

GET IT ON Google Play

Download on the App Store

Choose the Right Plan for Your Needs

Dustlight
Bluetooth® Technology

FREE BASIC PLAN	BUSINESS PLAN (Price on application)
Perfect for individuals and small teams who need simple, on-the-go monitoring.	For teams and workplaces needing comprehensive monitoring, reporting, and multi-device management.
✔ **iOS & Android Compatible** – Access from any smartphone	✔ **Live Data Access** – Monitor exposure levels in real time
✔ **Live Data Display** – Get real-time air quality insights	✔ **Cloud Storage** – Securely store and access data from anywhere
✔ **CSV Data Export** – Download and analyse measurement data	✔ **PDF Report Generation** – Generate professional reports in seconds
✔ **Local Data Storage** – Secure, offline access to historical readings	✔ **Device Management** – Assign roles, track usage, and control up to 15 devices
✔ **Device Management** – Connect and track your Dustlight device	✔ **Material-Specific Calibrations** – (Additional fee) Tailor measurements to different environments
✔ **Custom Alerts** – Set thresholds and receive notifications	✔ **Automated Insights** – Make data-driven decisions effortlessly
✔ **User-Friendly Interface** – Intuitive, efficient, and easy to use	✔ **Web-App Access** – Manage everything from a central dashboard

Corporate plan coming soon for teams with 15+ devices.