



# DustDetect

Protect your engines against 'dusting'!



## A real-time warning system to prevent engine 'dusting'

Undetected air-induction leaks can lead to rapid engine failure, machine downtime, and loss of production for your engine. Enter DustDetect, a revolutionary air-filtration monitoring system offering groundbreaking solutions to safeguard engines against harmful particulate intrusion.

Dust (silica) ingress into combustion chambers causes catastrophic damage.

*"1 g of dust ingested per engine horsepower is enough to destroy an engine." - Cummins Filtration, Inc.*

**DustDetect** instills users with unmatched confidence in safeguarding their engines by proactively spotting potential filter issues before they become more serious.

Utilising certified optical laser sensing technology and sophisticated algorithms to accurately monitor particulate matter from PM0.5 to PM2.5.

## Reduce accidents and improve productivity.

Featuring four distinct air-sample inlets and an additional four pressure inputs, **DustDetect** offers real-time analysis of particles in filtered air, guaranteeing peak engine protection, performance, and longevity.



## Why Dust Detect?

### Detect silica intrusion before it strikes!

Safeguard your engines today.



#### Low-Cost Retrofit

DustDetect shields engines from dusting. A simple, quick installation of DustDetect is a cost-effective solution that prevents the replacement of an entire engine.



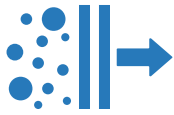
#### Optical Sensing

Utilises certified optical laser sensing technology and advanced algorithms for precise monitoring of PM0.5 to PM2.5, featuring four independently controlled sample inputs.



#### Local Alerts

DustDetect notifies the driver through a light tower and horn, ensuring immediate awareness and prompt action.



## Setting a new standard: DustDetect's Revolutionary Approach

**DustDetect** revolutionises air-filtration monitoring with real-time analysis, safeguarding engines from 'dusting'. Unlike traditional methods that rely on outdated metrics, **DustDetect** ensures optimal engine protection, performance, and longevity by proactively identifying potential issues before they escalate. DustDetect is the future of engine protection.



### Cloud-Based Data and Remote Alerts

**DustDetect** includes access to a cloud-based dashboard that allows for real-time and historical tracking and monitoring of air-sample data. The **DustDetect** System can be configured to send alerts to designated maintenance and engineering personnel in the event that a monitored parameter exceeds specified limits.

Harnessing the power of online analytics with **DustDetect** empowers operators to optimise air filtration across a large fleet of mining trucks. By providing real-time insights into air-quality and filtration efficiency, **DustDetect** enables operators to:

- Monitor Performance
- Predict Maintenance Needs
- Implement Targeted Interventions
- Drive Continuous Improvement



### Communications Flexibility

The **DustDetect** System supports LTE cellular and GPS protocols, with the option of having CAN J1939, Modbus TCP, and Wi-Fi enabled. In addition, **DustDetect** has been designed to work with industry-standard maintenance management platforms so that data and alerts can be communicated directly to existing monitoring systems.

**DustDetect** not only sends remote alerts but also offers the option to notify the driver through a light tower and horn in case of detecting dust intrusion, ensuring immediate awareness and prompt action.

## Cloud-based data and remote alerts



### Android and iOS support

DustDetect comes with a dedicated app for both Android and iOS.



### Personal Alerts

Truck drivers receive personal alerts when the air quality in the diesel engine drops below critical levels.



### Automated Reporting

Automated reporting streamlines operations and maintenance, promoting efficiency throughout.



### Real-Time Monitoring

Continuous online sampling ensures that there is no lapse in protection.



### Connectivity

Supports 4G and Wi-Fi for offloading critical operational data



### 4 Air-sample Inputs

Includes 4 inputs for independent sampling of 4 air-inlets (QSK-60)



### Fast Installation

Fast installation enables quick roll-out across a large fleet



### Web Dashboard

Track a large fleet of vehicles through DustDetect portal



### Pressures

4 additional pressure inputs, e.g. checking regeneration dpf

## Navigating the Dust Dilemma - DustDetect Innovative Solutions

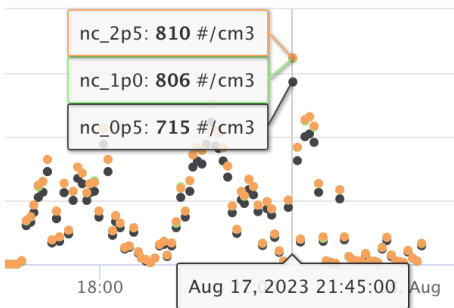
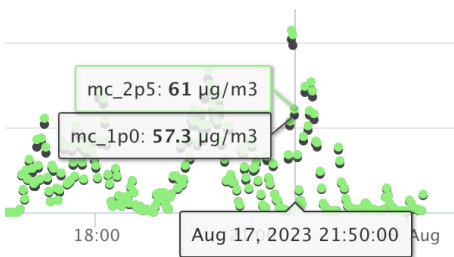
Dust, comprising a significant portion of Silicon Dioxide (silica), possesses hardness and abrasive properties that render it valuable in numerous industrial applications, including sandblasting, grinding, and polishing. However, when introduced into an engine, silica dust can inflict substantial harm. Its abrasive nature can, e.g. lead to the polishing of liners, resulting in the loss of compression and fuel seepage into the oil. Over time, these detrimental effects culminate in engine failure, underscoring the critical importance of effective filtration systems to safeguard engine integrity and performance.

- Silica (silicon dioxide) is a major component of dust, renowned for its hardness and abrasive properties
- When introduced into engines, silica dust poses a significant threat
- **DustDetect**, our advanced monitoring system, facilitates early detection of silica intrusion, enabling timely intervention
- Effective filtration systems are crucial for mitigating the adverse effects of silica dust

## Intelligent Measurement Methodology

DustDetect takes samples when the engine load passes a pre-set threshold. Accurate monitoring requires maintaining a turbulent flow regime within the sample lines, effectively preventing any particles from “dropping out”. Sufficient turbulence is required for the system to ensure accurate particulate measurements. The chosen approach mitigates the risk of obtaining low readings caused by particle dropout at low loads and prevents sudden surges in readings that could occur when increased loads carry previously dropped-out particles into the sensor.

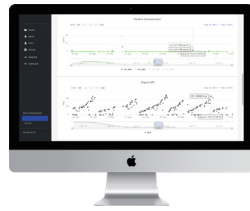
- Engine-load-specific sample thresholds ensure the accuracy of particulate measurements.
- High-resolution particulate and GPS data drives customer insights on fleet performance and high-dust locations, allowing for operational improvements.



### Global connectivity

DustDetect is designed to be online. When offline, it will log data and offload as soon as connectivity is restored. DustDetect has a built-in 4G modem but can also be connected through Ethernet.

- Global connectivity through 4G LTE
- Use Ethernet in case cellular connectivity is unavailable.



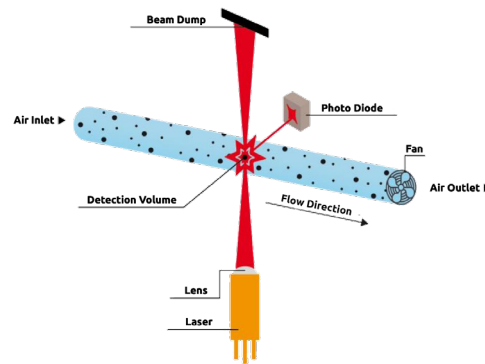
## Full Web Dashboard

A full web dashboard is available for real-time monitoring and configuration of a large fleet of DustDetect units. Alerts can be set and analysed.

- Web dashboard for trending, alerting, and fleet management.
- Both DustDetect and the web dashboard can be fully branded.

## Android and iOS Apps

The DustDetect module is capable of sending notifications through a dedicated app available on both iOS and Android platforms. This feature keeps drivers informed about the quality of air filtration in real-time, enabling prompt action when necessary.



Measurements principle laser scattering (source: Sensirion AG)

## Certified Optical Sensor

A MCERT-certified particulate sensor using laser scattering technology for accurate measurement of the size and quantity of particulates up to PM2.5. The projected lifetime of this sensor is 5–10 years. It can, however, easily be changed out if required.

- Particulate bins: PM0.5, PM1.0, and PM2.5
- Mass concentration range: 0-1 000 µg/m<sup>3</sup>
- PM2.5 calibrated to TSI DustTrak™ DRX 8533 Ambient Mode

## Specifications

Parameter	Range	Accuracy	Min. Detection
Particulate Matter 0.5 (PM0.5)	0 to 3 000 #/cm <sup>3</sup>	±100 #/cm <sup>3</sup>	1 #/cm <sup>3</sup>
Particulate Matter 1.0 (PM1.0)	0 to 1 000 µg/m <sup>3</sup> 0 to 3 000 #/cm <sup>3</sup>	±10 µg/m <sup>3</sup> ±100 #/cm <sup>3</sup>	1 µg/m <sup>3</sup> 1 #/cm <sup>3</sup>
Particulate Matter 2.5 (PM2.5)	0 to 1 000 µg/m <sup>3</sup> 0 to 3 000 #/cm <sup>3</sup>	±10 µg/m <sup>3</sup> ±100 #/cm <sup>3</sup>	1 µg/m <sup>3</sup> 1 #/cm <sup>3</sup>
4 Pressure Inputs	0.5 Vdc to 4.5 Vdc (ratiometric to supply)	16 bit ADC	

## DustDetect samples inlet air post-filtration to assess the filter’s effectiveness

Filtering combustion air for diesel engines like the Caterpillar 3516 is crucial. The objective is to prevent the massive intake of air (ranging from 2 to 10 million litres per hour), from carrying harmful particles into the engine. To date, the effectiveness of the inlet filter is monitored by measuring the pressure drop across the filter.

- The life of an engine is determined by the rate at which it ingests abrasive contaminants.
- Approximately 1 gram of dust per HP is sufficient to destroy an engine (Cummins Filtration Inc.)

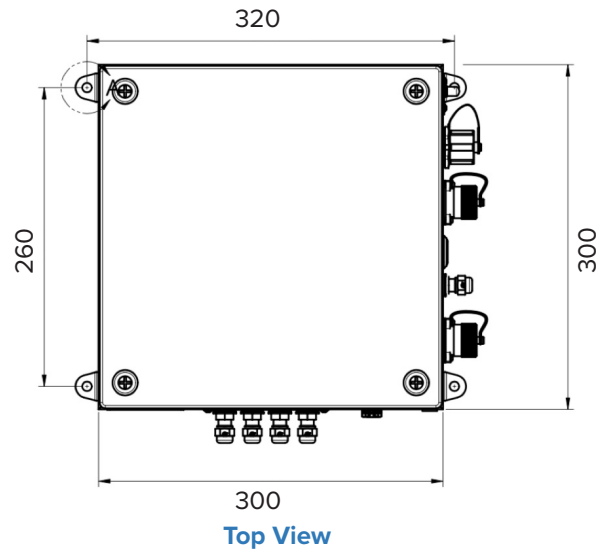




## Controller Specifications

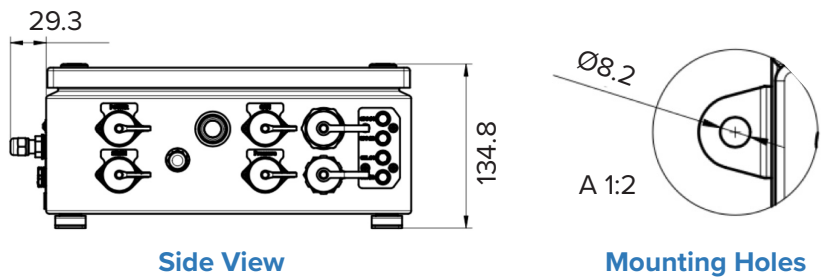
### DustDetect Housing

- 300 x 300 x 120 mm enclosure size
- Sheet steel housing, powder-coated with IP 66 rating
- 320 x 260 mm mounting points (to be mounted on shock mounts)
- Weight: 11 kg
- 4 JIC 7/16" air inputs, 1 JIC 7/16" air exhaust
- Easy-to-install binder connectors for providing power and other (optional) IO
- 1 ethernet port for Modbus TCP or local network connection
- 4 SMA (F) connection for cellular, GPS and satellite communication



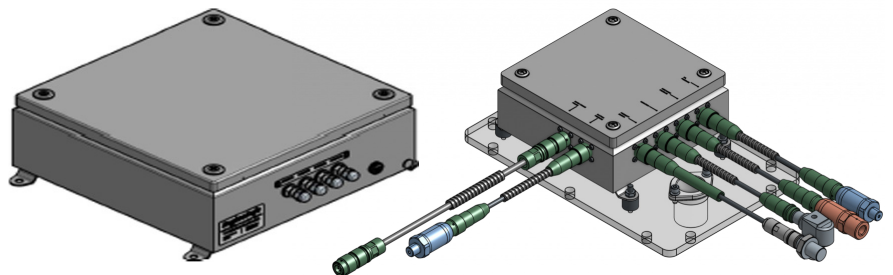
### Electronic Control Unit (ECU)

- 10 V to 30 V input power, 2 A
- 4 programmable solenoid valves w/thresholds
- Variable sampling rate (2 minutes to 1 hour)
- **Communications**
  - Cellular
  - GPS
  - CAN j1939 (option)
  - Modbus TCP (option)
  - Wi-Fi (option)
- 3 dry contacts (Ok, Warning, Danger Signals)



### ECU Environmental Ratings

- Operating temperature: -10 °C to +60 °C
- Storage temperature: -40 °C to +70 °C
- Built in anti-vibration and shock-resistance
- Performs best at 10 °C to 40 °C



### Sensors

- **Particles**
  - MCERTS certified
  - High-accuracy laser scattering measurement
  - Contamination resistant technology
  - Particle Mass concentration (PM 1.0, 2.5)
- **Pressure**
  - 0-100 PSI pressure rating
  - Operational temperature: -40 °C to 105 °C
  - 4 inputs for extra measurements
  - 0.5-4.5 Vdc ratiometric



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