



Technical Performance Report

# Ranger | Dust vs Palas Fidas 200

aeroqual<sup>®</sup>

## Ranger | Dust vs Palas Fidas 200 Performance Report

**Aeroqual Ranger | Dust is the ultimate real-time handheld dust monitor, providing simultaneous measurement of multiple particulate matter size fractions (including PM<sub>1</sub>, PM<sub>2.5</sub>, PM<sub>4</sub>, PM<sub>10</sub> and TSP).**

So, how does it perform compared with a reference instrument?

We compared the performance of the Ranger | Dust against the EN16450 certified Palas Fidas 200 using ISO 12103 A1 ultrafine test dust.

### Experiment Setup

The Aeroqual Ranger | Dust with a new, calibrated PMX sensor head was placed in a glass chamber of dimensions 750 mm x 750 mm x 600 mm fitted with four 90 mm fans for air circulation. A Palas Fidas 200 was operated in ambient mode and sampled the chamber via a 12 mm ID tubing of length 500mm. ISO 12103 A1 test dust in a distilled water suspension, was nebulised into the chamber using a Palas AGK2000 nebuliser operating at 20-30 LPM fed with dry compressed air. Different test dust concentrations were generated by changing the dust suspension concentration. An air exhaust was positioned at the top of the chamber to safely remove expelled air.

### The Results

The particle mass measurements from each instrument for a constant level of test dust is shown in Figure 1. The measurement error for each size fraction was calculated using the equation:

$$\% \text{ error} = 100 \times \frac{|[\text{PM}]_{\text{test}} - [\text{PM}]_{\text{Palas}}|}{|[\text{PM}]_{\text{Palas}}|}$$

The Aeroqual Ranger | Dust matches the Palas reference instrument closely with measurement error below 5% for all particle mass fractions.

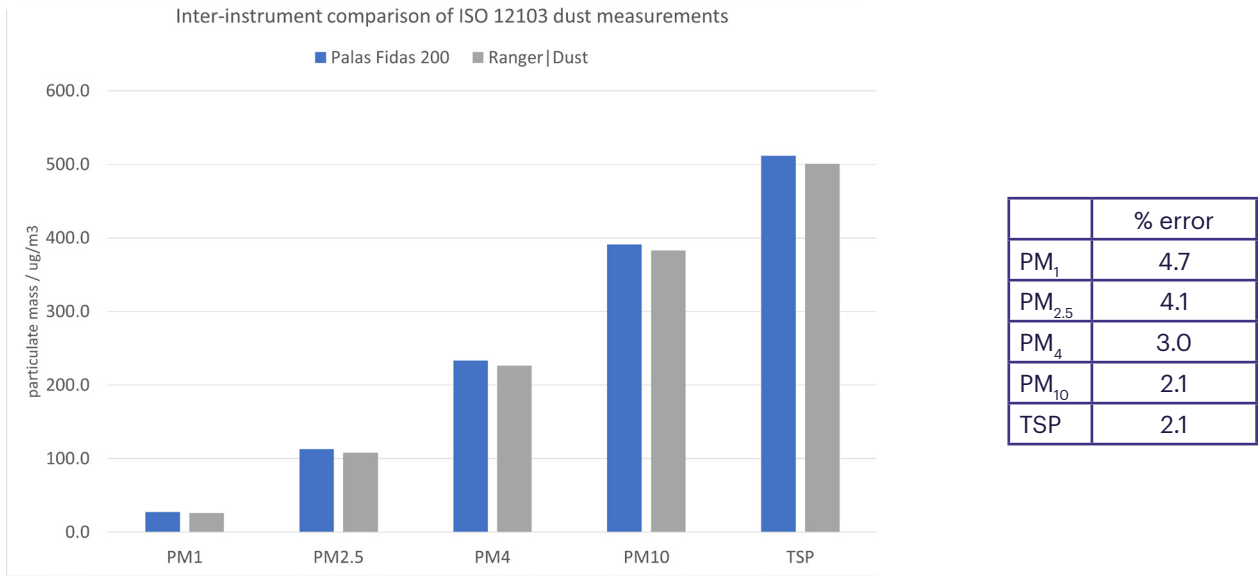
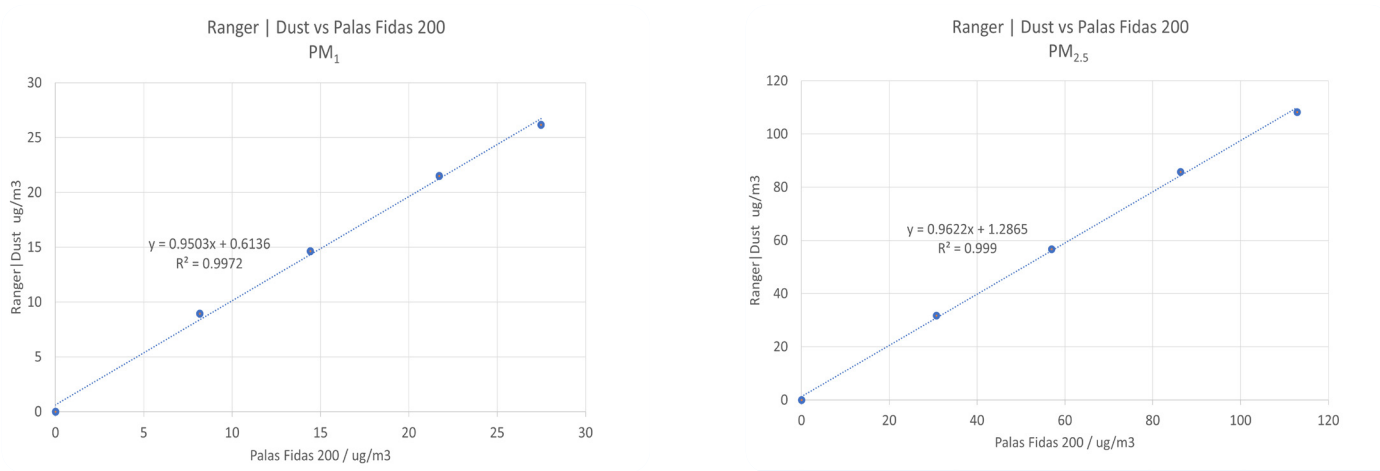


Figure 1: Particle mass measurements from the Palas Fidas 200 and Ranger Dust for a constant level of test dust, and measurement error calculated for each size fraction.

The linearity of response for the Aeroqual Ranger | Dust was determined by measurement at five dust concentrations and the coefficient of determination ( $R^2$ ) calculated for each size fraction versus the Palas Fidas 200. The results are shown in the figures below for each particle mass fraction.



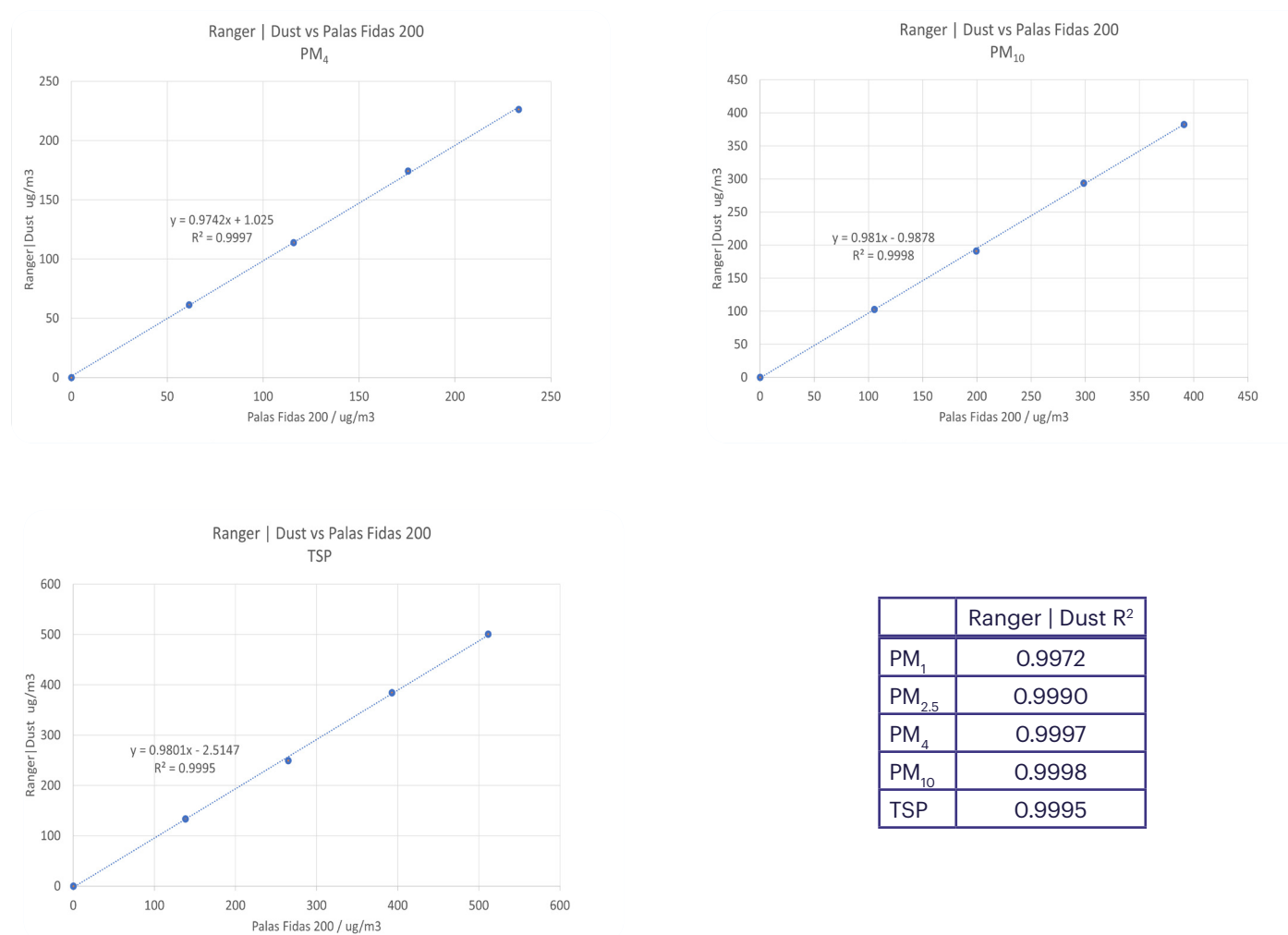


Figure 2: Linearity of response for the Ranger Dust versus the Palas Fidas 200 for PM<sub>1</sub>, PM<sub>2.5</sub>, PM<sub>4</sub>, PM<sub>10</sub>, and TSP, and calculated coefficient of determination (R<sup>2</sup>) for each size fraction.

## Discussion

The coefficient of determination (R<sup>2</sup>) for the Ranger | Dust for each particle size fraction is listed in the table above. The Ranger exhibits a high degree of linearity, with R<sup>2</sup> values very close to 1. This demonstrates the instrument has high performing optics and flow systems.

## Conclusion

The Ranger | Dust exhibited very similar performance to the certified Palas Fidas 200 reference instrument with ISO12103 A1 Arizona Road Dust. Its linearity was excellent with R<sup>2</sup> values greater than 0.99. Measurement error was very low - less than 5% - for all size fractions PM<sub>1</sub> to TSP.