

## PT-01-26: AIR XS Repeat Testing

Repeat testing AIR XS over multiple samples against Gravimetric indicated  $0.05\text{mg}/\text{m}^3$

The purpose of this testing is to establish the following understandings:

- A. The testing protocol meets an accepted repeatability vs known methodology (Gravimetric/XRD analysis) over numerous tests.
- B. The AIR XS monitor demonstrates acceptably consistent results under the same conditions.
- C. Despite known variability in all dust sampling, under fixed conditions AIR XS meets the standards set out in the manufacturers' information.
- D. Confidence in the average measurement despite inherent variability in the characteristics of particulate including but not limited to size distribution and RCS concentration.
- E. To provide information relevant to use applications to allow users to make considered decisions based on a local environment.

### 1. Testing environment methodology

Test Chamber has a volume of  $1\text{ m}^3$ . A simple schematic to show its design is provided in Figure 1.

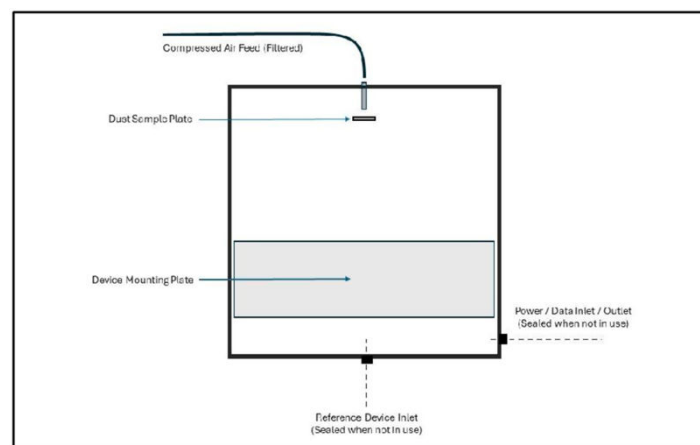


Figure 1: Schematic to show general design layout of Troler Test Chamber

Figure 1.

An air compressor, controllable via a ball valve, was connected to the chamber delivering 6 bar of clean air supply, filtered for moisture and additional particulates (2 x High Efficiency Particulate Air [HEPA] filters in line with a moisture and oil trap).

The Troler Test Chamber has the facility to mount multiple AIR XS devices and

multiple active pumped samplers (cyclone samplers) on the device mounting plate within it.

The AIR XS unit was elevated above the chamber floor to prevent any restriction to airflow movement.

The Trolex Test Chamber was sealed during test operations.

## 2. Establishing the expected average reading

Current methodology for establishing a mass reading of airborne RCS utilises sampling pumps with corrected flow rates (dependent on manufacturer). The recognised inherent accuracy of this methodology at this level of loading is typically between  $\pm 30$  and  $\pm 50\%$  (dependent on loading region study, technology and environment).

Throughout Gravimetric testing up to 3 x static cyclone samplers were placed into the Test Chamber at set locations to sample for the period.

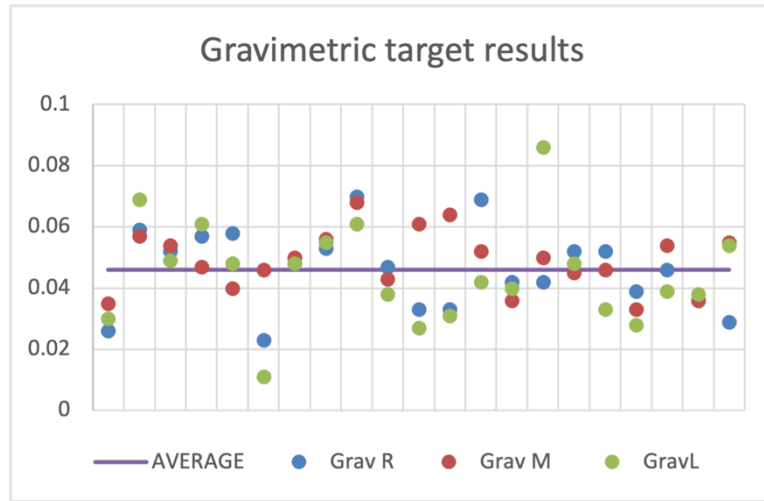
All reading devices were positioned to ensure there was no bias/hot spots. The samplers were located at a suitable distance from each other and any other real-time device to prevent air flow interference as reasonably possible but still representative of the same air space.

It was noted that sampling heads less than 30 cm from each other or other devices resulted in the device with a lower flow rate being significantly effected  $\sim \pm 20\%$ .

Weight correction is made based on “blank” samples also sent, in some cases “blank” samples have no material weight therefore no corrections are made, in other examples there can be a mass of up to  $\sim \pm 30\%$  of the total reading at this level, this is considered good practice under industry standards.

These variability factors are widely known and accepted in the industry.

Over the course of 3 months 63 Gravimetric tests were performed with the same methodology, the average reading of RCS reported back at  $0.048 \text{ mg/m}^3$  as per Graph A.



**Graph A.**

**Note:** This test was the same protocol as the original benchmark performed on ‘HG2064’ on 14<sup>th</sup> March 2024 in [Test Document \(TX8100-PT-01-24\)](#) under the same conditions.

The Summary of these reports showed reports showed that the Compliance method of measurement (Gravimetric sampling and XRD analysis) generated an RCS response as follows:

Sampler	mg/m <sup>3</sup>
1	0.054
2	0.038
3	<0.034

Under this testing Trolex AIR XS generated a response of 0.054 mg/m<sup>3</sup>.

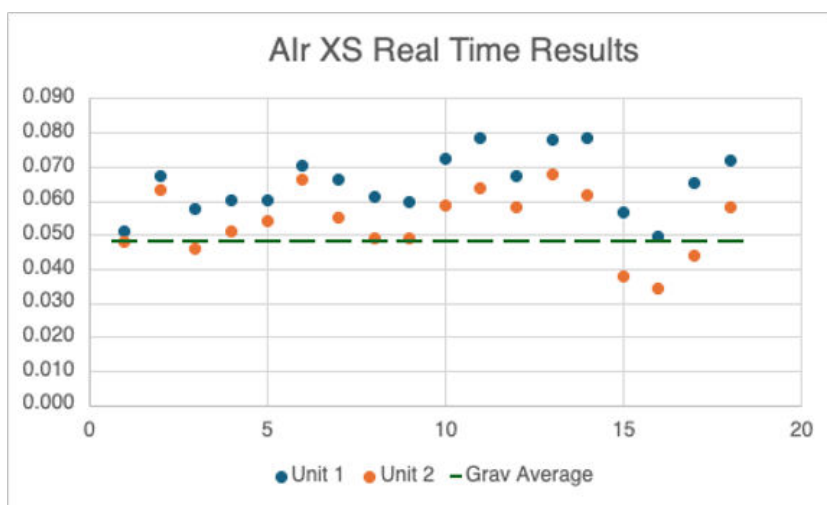
### 3. AIR XS testing

There are no real-time crystalline detection methods currently available to provide reliable short-term response data to the presence of RCS therefore total mass over time is used as a comparative measurement.

(2 Units), ‘IE02006’ and ‘JL00380’ were entered into the same testing protocol to drive 36 results, these units are representative of current product units.

No pumped samplers were used in the testing chamber whilst AIR XS was being tested (see [section 2](#) on interference between sampling devices ~±30%).

Graph B below shows the results for AIR XS the average being 0.059 mg/m<sup>3</sup>.



Graph B.

## 4. Summary

Average RCS values remain directionally aligned with Gravimetric reference measurements.

Under strict and reasonably practicable controlled testing conditions using currently available controlled particle mix “accuracy” in any single test can produce a wide spread of results for both existing and new technologies, this is expected due the following aspects.

- Particle size control
- Particle sample control
- Particle distribution control
- Air flow control
- Reference sample control
- Inherent detection capabilities

All testing was performed under strict conditions with skilled, trained operatives following documented protocols under common scientific expectations, and inline, where applicable with industry practice. Therefore, the above are considered variables controlled as reasonably practicable.

Averages for both detection methodologies delivered around the expectations of  $0.05 \text{ mg/m}^3$  ( $\pm 30\%$ ) the current lowest legislated limit over 8 hours, despite spread in Minimum and Maximum readings on single occasions. This aligns with the current global lowest legislative limit for an 8-hour period [OSHA 1910.1053(c)]

	Average reading (mg/m <sup>3</sup> )
AIR XS	0.059
Pumped sampler/XRD	0.048

AIR XS real time detection indicates higher reading on average by 0.011 mg/m<sup>3</sup> ( $\pm 23\%$  compared to Gravimetric average). Real time delivered a more consistent reading with a spread between its lowest and highest readings of 0.042 mg/m<sup>3</sup>, compared to Gravimetric at 0.075 mg/m<sup>3</sup>.

	Highest reported RCS (mg/m <sup>3</sup> )	Lowest reported RCS (mg/m <sup>3</sup> )	Range (mg/m <sup>3</sup> )
AIR XS	0.076	0.034	0.042
Pumped sampler/XRD	0.086	0.011	0.075

## Limitations

- Chamber conditions represent controlled calm air environments and may not replicate dynamic occupational exposure scenarios
- Particulate crystallinity fluctuations cannot be benchmarked in real time
- Small data sets can be misinterpreted to both benchmarking and testing results

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Please see product user manual (TX8100-UM-EN · P5633.1601) for product specificities which should be considered relevant to application.

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