CleanSpace™

see the air you breathe

Product Datasheet

CleanSpace™ Tag

Legal Notice

PRODUCT DATA SHEET FOR CLEANSPACE TAG (CSTAG1)

PRODUCT DESCRIPTION

CleanSpace™ is the world's first air pollution monitoring network that uses personal air pollution smart sensors (the CleanSpace Tag) to track exposure to air pollution in real-time and to crowd-source that data to provide insights and maps to avoid pollution hotspots.

You never have to plug in the Tag or change its batteries for the life of the device.

The tag is also 'powered by Freevolt'. Freevolt™ is a unique, patent-pending radio frequency (RF) energy harvesting technology designed to power Low Energy Internet of Things devices by recycling free, wasted RF energy from cellular and Wi-Fi transmissions, reducing operation and maintenance costs.

The CleanSpace™ Tag will start taking readings within 2 hours and will be continuously calibrated by Sensyne™'s machine learning. Depending on its use, the Tag reaches optimal accuracy within 2 weeks. Sensyne will keep calibrating the device to maintain it at optimal accuracy.

Created & manufactured by Drayson Technologies in the UK.

CLEANSPACE TAG & APP HOW IT WORKS

Measures CO:	pollution indicator for both indoor and outdoor environments
Measurement units:	parts per million (ppm) - air quality units used by EC, WHO, Defra for gaseous pollutants.
Measurement frequency:	changes with the mode of transportation and with the gas level to ensure pollution events are monitored correctly
CS Tag Memory:	2000 readings can be stored to allow historical data analysis
Smart sensor network:	uses an automated app that tracks air pollution exposure and controls sensor nodes, ease of access, customization
Powered by Freevolt:	when the threshold of the harvester is achieved
Sensyne algorithms:	machine learning algorithms to provide cost effective big data collection and analysis

PRODUCT FEATURES

- Integrated carbon monoxide (CO) sensor
- Bluetooth® Smart (BLE) connectivity
- Freevolt enabled Harvester – GSM1800 & WiFi (2.4 GHz ISM band)
- Life of Tag without Freevolt harvesting - 1.5 to 2.5 years, depending on use
- Effect of Freevolt on life of Tag – dependent on the RF density to which the Tag is subject
- Indoor & outdoor capability
- Automated optimized sample rate based on mode of transport and pollution levels
- Integrated notifications LED
- Memory of 2000 readings
- Dimensions: 66.5 x 131.5 x 9.5 mm
- Weight: 51 grams
- Associated CleanSpace app on Android and iOS

PRODUCT SPECIFICATION

BATTERY SPECIFICATIONS

	Min	Typical	Max	Unit
Battery Specifications				
Battery Operating Voltage Range	2.9	3.7	4.2	V
Battery Capacity		450		mAh

FREEVOLT RF ENERGY HARVESTER & SENSOR PERFORMANCE SPECIFICATIONS

	Min	Typical	Max	Unit
Freevolt Harvester				
GSM 1800	1.805		1.880	GHz
WiFi	2.400		2.495	GHz

CS Tag Threshold*	Vertical Polarisation	Horizontal Polarisation	Unit
GSM 1800	2,800	1,640	nW/cm^2
WiFi	1,870	10,750	nW/cm^2

*'Threshold' means the minimum RF density at which the Freevolt technology in the Tag generates power to trickle charge the battery, depending on polarisation and orientation of the antenna.

	Min	Typical	Max	Unit
Tag Sensors				
CO Sensor Concentration Range	0.3		492	ppm
CO Sensor Resolution		±0.3		ppm

* **Please note**: the performance of the sensor will be adversely affected by any blockage of the apertures in the Tag through which the sensor detects ambient air quality and temperature, as well as ingress of any contaminant (including water and dust) into the apertures.

Certifications	
CO Sensor	UL 2034, CSA STD 6.19-01, Conforms to UL 2075, ROHS
CleanSpace™ Tag	Eligible countries: Europe, US, Mexico, Canada, Japan, India, China

PRODUCT PERFORMANCE VALIDATION

Conducted by the Environmental Research Group at King's College London (KCL) and the National Physical Laboratory (NPL).

FAQs

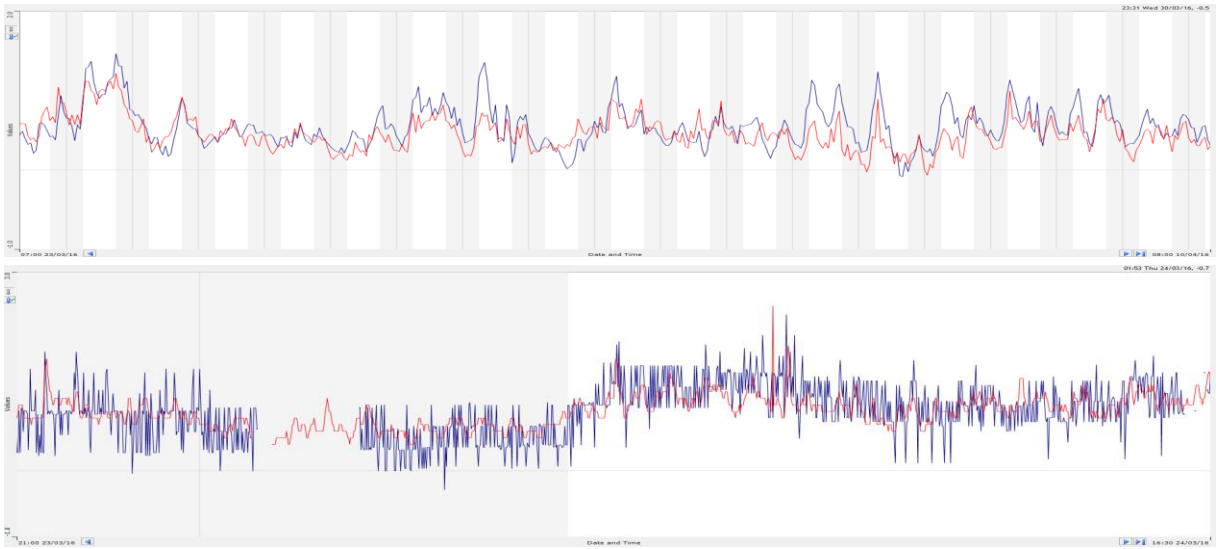
1. What pollutants do we measure? How accurate are the readings?

Average ambient concentrations of CO in ppm are 0 - 10ppm (KCL), with traffic related concentrations that can be much higher over short periods of time.

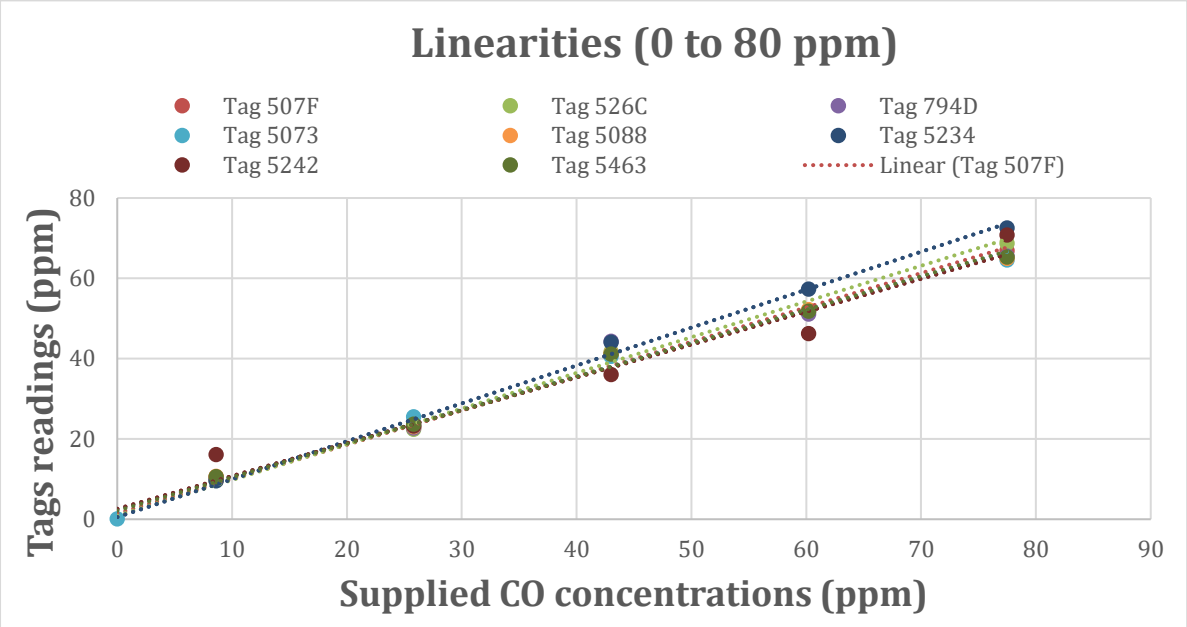
CS Tag measures CO linearly across very different CO ranges (0-80 ppm) when compared with reference monitoring equipment from KCL & NPL. The tags have been used with very different measurement frequencies (1 minute, 9 minute averages, 1h).

Resolution: ± 0.3 ppm, allows to track small changes of CO concentrations

As one-hour means, data from the Tag tracks well against the reference monitor. As one-minute means, the resolution of the Tag is shown to be approximately 0.3 ppm.



All tested Tags are linear over the whole range of CO concentrations. (NPL)

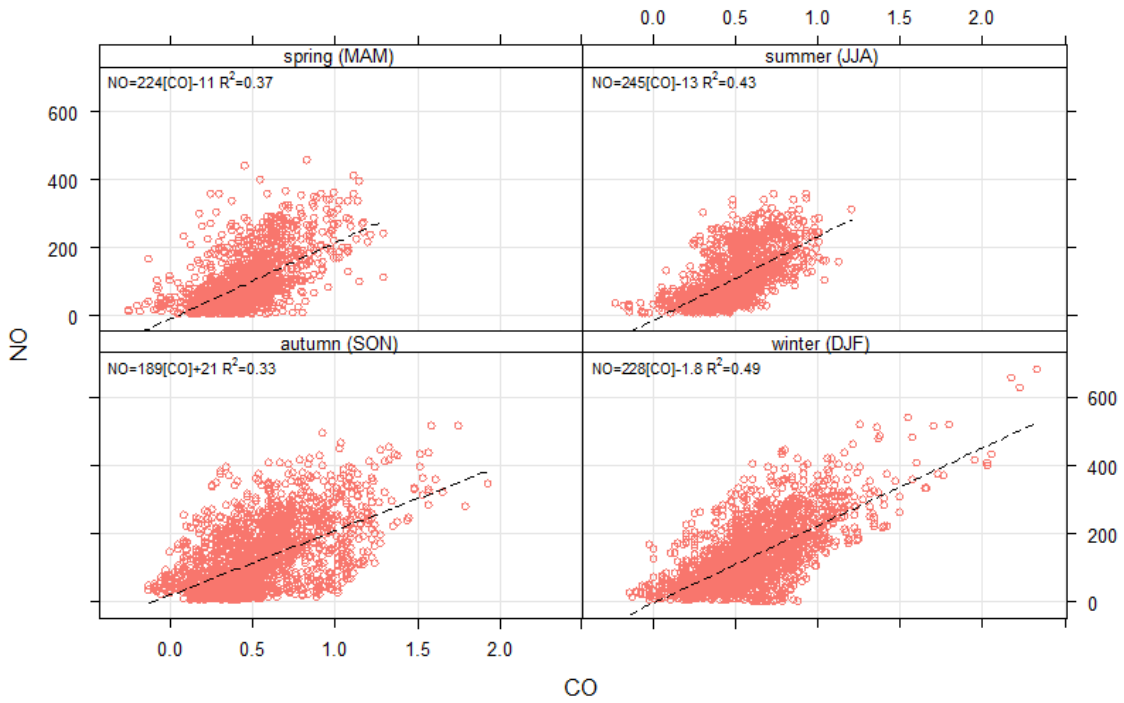


2. Why choose CO as the overall pollution indicator?

CO correlates well with all other main urban pollutants and across all seasons. (KCL)

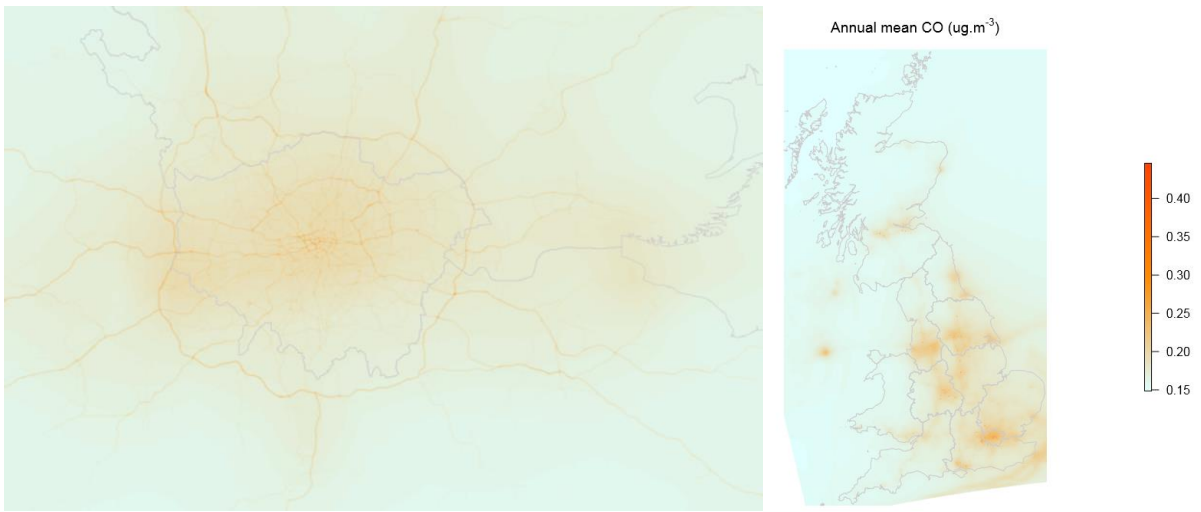
Pollutant	Correlation	Data source: KCL, ERG, May 2015-May 2016
CO vs NO	Seasonal	Linear relationship between the two pollutants, which is broadly consistent across seasons.
CO vs NO2	Seasonal	Linear relationship between the two pollutants, but which varies across seasons.
CO vs PM2.5	Seasonal/ episodic	Linear relationship during some periods, but varies across seasons and diverges during regional pollution episodes.
CO vs BC	Seasonal	Linear relationship between the two pollutants, which is broadly consistent across seasons.

CO shows a linear relationship with NO and with a stable gradient across seasons. (KCL)



3. Is CO related to urban or traffic emissions and therefore a good indicator in cities?

CO is a good indication of urban footprints and higher concentrations are seen along main roads as shown in the annual averaged CO map of London and UK. (KCL)



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