



# Air pollution factsheet

## Sulphur Dioxide

### What is SO<sub>2</sub>?

Sulphur dioxide is emitted naturally through the process of volcanism (volcanoes, hydrothermal vents etc.) and anthropogenically from the combustion of fuels containing sulphur, i.e. coal, heavy fuel oil and petroleum coke. It is also produced industrially in the manufacture of sulphuric acid.

### Why measure it?

Sulphur dioxide has long been recognised as a significant (or criteria) air pollutant due to both its adverse effects on human health and the great damage that it has on freshwater and terrestrial ecosystems through wet deposition, otherwise known as 'acid rain'.

As is typical with many other air pollutants, SO<sub>2</sub> is known to exacerbate cardiovascular and respiratory illnesses and diseases (such as asthma) where it causes inflammation and irritation in the nose and throat and can further lead to a narrowing of airways, a feeling of chest tightening and a shortness of breath.



In combination with particulate matter, SO<sub>2</sub> is a major component of winter-time smog which has historically due to the residential and industrial burning of coal, contributed towards the deaths of hundreds of thousands of people in the UK alone. The Great Smog of London was thought to have killed >4000 people in 1952/3 in just one 'episode' of air pollution.

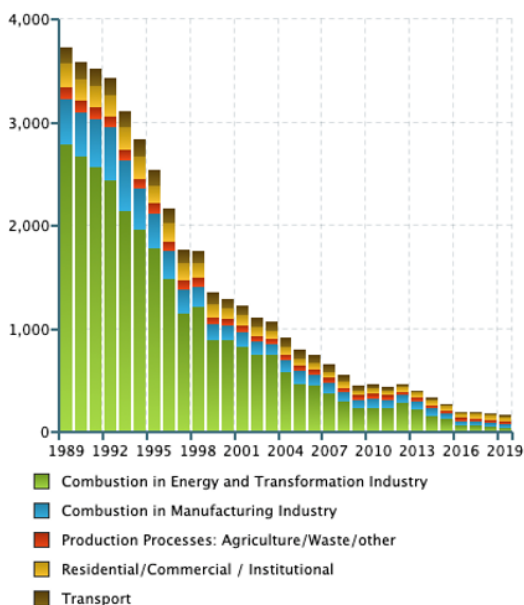
The ecological damage caused by the medium and long-range transport of SO<sub>2</sub> and subsequent wet deposition as acid rain, particularly on forests and freshwater ecosystems, has been both catastrophic and extensive, especially up to the late 1980's and early 1990's when stringent legislation was implemented, to drastically reduce SO<sub>2</sub> emissions.



Due to the phasing out of coal-fired power stations, and most residential heating now being fuelled by natural gas, SO<sub>2</sub> emissions have reduced significantly in the UK but they have not entirely gone away.

There are still localised 'hot-spots' around industrial processes, and some regions still burn peat, smokeless coal and other solid fuels. Worldwide shipping is also now one of the most significant contributors to global SO<sub>2</sub> pollution, impacting on local air quality around ports, harbours and coastal areas.

Sulphur Dioxide (kilotonne)



Picture shows how an Opsis open-path system could be used to measure SO<sub>2</sub> emissions from shipping.



266 µg/m<sup>3</sup> not to be exceeded more than 35 times a year (15 minute mean)

350 µg/m<sup>3</sup> not to be exceeded more than 24 times a year (1 hour mean)

125 µg/m<sup>3</sup> not to be exceeded more than 3 times a year (24 hour mean)

Conversion factors - 1 ppb = 2.66 µg/m<sup>3</sup> (@20°C and 1013mb)

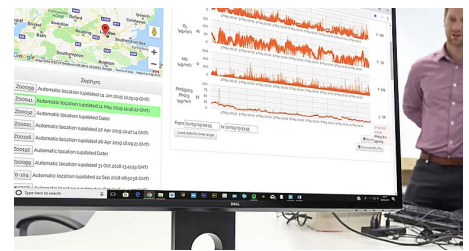
## ET's solutions for monitoring sulphur dioxide

### Indicative Monitors

The Zephyr is a compact and portable air pollution sensor that measures sulphur dioxide (with an enhanced cartridge) and other gases and particulate matter formed from harmful emissions. It was designed and built by an experienced development team, and is based on years of academic research.

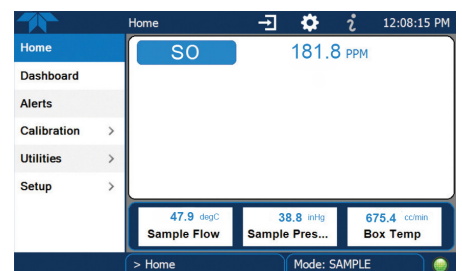


Zephyr Air Quality Sensor



### Reference Method

The Models T100 / N100 use the proven UV fluorescence principle, coupled with a state of the art user interface to provide easy, accurate and dependable measurements of low level SO<sub>2</sub>.



Teledyne API T/N 100 UV Fluorescent SO<sub>2</sub> analyser

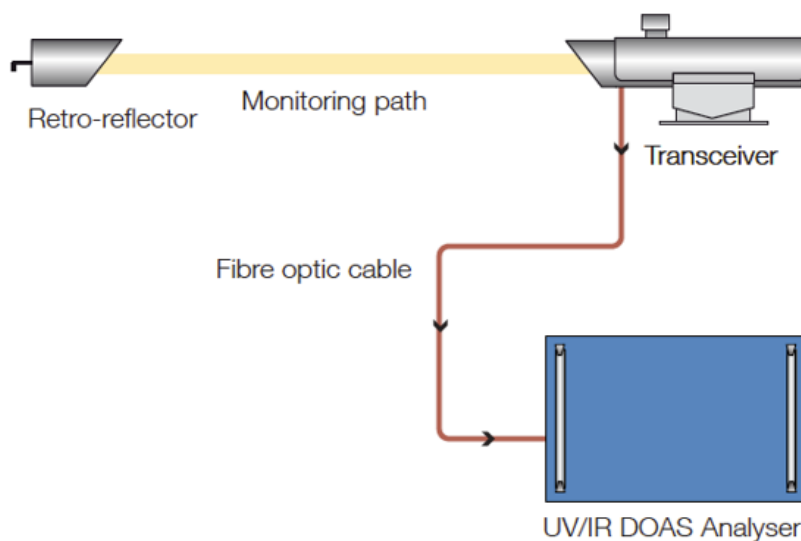
## Open-path monitoring system (ideal for ports and harbours)

The **Opsis open-path monitoring system** performs fast, non-contact, direct measurements of SO<sub>2</sub> and other multiple gases over an open-path using the DOAS (Differential Optical Absorption Spectroscopy) technique. The Opsis open-path system is **MCERTS approved** for the following gases: **NO<sub>2</sub>, SO<sub>2</sub>, O<sub>3</sub> and benzene**.



## System Overview

An Opsis system layout for monitoring emissions in the ambient air quality in harbours.



Our useful comparison table will enable to you see which option best suits your requirements.

	Zephyr (Enhanced)	TAPI T/N100	TAPI T/N100U	OPSIS DOAS
Type	Small form factor 'sensor' system	Continuous point monitoring analyser 'Ambient'	Continuous point monitoring analyser 'Trace Level'	Continuous remote sensing ambient open path system
MCERTS Approved	X	✓ (T100)	X	✓
US-EPA Approved	X	✓	✓	✓
Classification	Indicative	Reference	Based on Reference	Equivalent
Lowest Detection Limit (LDL)	3 ppb (Approx)	<0.4 ppb	50 ppt	0.5 ppb**
Dimensions / mm (H x W x D)	235 x 160 x 114	178 x 432 x 597	178 x 432 x 597	266 x 440 x 600
Weight / Kg	1.8	16.2 (14.1) ***	20.5	35
12V DC / Mains / Solar	✓ (All)	Mains	Mains	Mains
Can measure other gases / particulate matter	YES Gases and particulates	X	X	✓ Gases only
Internal zero span for automatic calibration checking.	X	✓	✓	X
Internal data logging	✓	✓	✓	✓
Web / Wi-Fi enabled	✓	Requires optional hardware	Requires optional hardware	Requires optional hardware

### NOTES

\*DOAS = Differential Optical Absorption Spectroscopy.

\*\* Based on 500 m measurement path.

\*\*\* Figure in brackets refers to weight of N100 SO<sub>2</sub> analyser

Contact us for more information on how we can help you monitor SO<sub>2</sub>.

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