

Air pollution factsheet

Nitrogen Dioxide

What is NO₂?

Nitrogen dioxide (NO₂) is a reactive reddish-brown gas with a pungent, acrid odour and along with nitrogen oxide (NO), is part of the family of oxides of nitrogen which we call NOx.

Along with PM_{2.5} and PM₁₀ particulates, NO₂ is one of the most important and prevalent urban pollutants and is estimated to contribute to more than 40,000 excess deaths per year in the UK alone.

All fossil-fuel combustion processes in air produce NOx with road transport being the main source, followed by electricity generation, other industrial processes, and residential and commercial central heating.

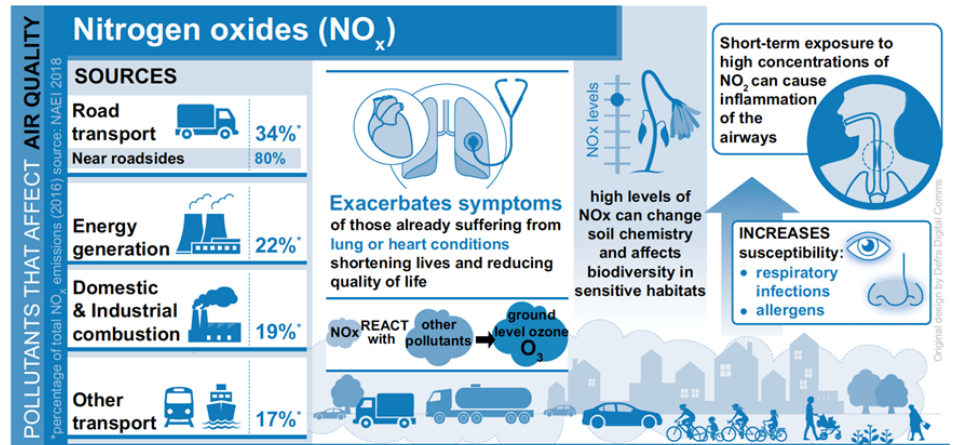


Image Credit: DEFRA 2019

NO₂ conversion factors (@ 20°C and 1013mb) 1 ppb = 1.91 µg/m³

NO₂ limit values (UK) 40 µg/m³ not to be exceeded as an annual mean and 200 µg/m³ not to be exceeded more than 18 times per year as a 1-hour mean.

Why measure it?

NO₂ is associated with adverse effects on human health. At high levels it causes inflammation of the airways and long-term exposure may affect lung function and respiratory symptoms. It can exacerbate symptoms in asthma sufferers as well as increased susceptibility to allergens in allergy sensitive individuals.

As well as the impacts of increased concentrations of NO₂ on human health, NO₂ and NOx also impacts upon habitats, ecosystems and the natural environment including leaf and needle damage, acidification and eutrophication leading to the loss of biodiversity. NO₂ also has an important part in photochemical atmospheric reactions where it contributes towards the formation of ground level ozone (O₃), another highly reactive air pollutant. [Click here to see our Ozone factsheet.](#)

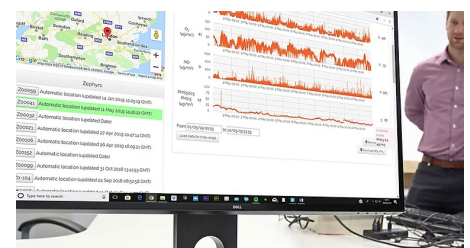
ET's solutions for monitoring nitrogen dioxide

Indicative Monitors

The **Zephyr** is a compact and portable air pollution sensor that measures NO₂, 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 **Model T200** and **NEW N200** NO/NO₂/NO_x analysers use the proven chemiluminescence detection principle, coupled with state-of-the-art electronics to allow accurate and dependable low level measurements for use as an ambient analyser or dilution CEMS monitor.



Teledyne-API T200 and NEW N200 Chemiluminescence NO_x / NO₂ / NO Analysers

Next Generation Analysers

The **ICAD (Iterative Cavity enhanced Differential Optical Absorption Spectroscopy)** NO₂ / NO_x / NO in situ monitor from AirYX uses direct optical absorption spectroscopy. This gives the advantage of direct NO₂ measurements without interferences to other substances or the need of drying mechanism which introduce new interferences.

The ICAD is available in several configurations NO₂ only, 2 x NO₂ or NO₂ / NO / NO_x.

The **T500U CAPS NO₂** analyser represents the next generation of criteria pollutant monitoring technology for the direct measurement of NO₂ in air. The instrument utilizes a patented* Cavity Attenuated Phase Shift (CAPS) technique to provide an extremely sensitive, fast and accurate NO₂ measurement in a cost effective and low maintenance instrument package.

The **Model N500 CAPS NO_x** analyser uses superior cavity attenuated phase shift (CAPS) spectroscopy to measure true NO₂, NO_x, and NO gases. The instrument combines direct NO₂ measurements with highly efficient gas phase titration (GPT) to convert and measure the NO gas component.



Other solutions for monitoring NO₂

The **Opsis open-path monitoring system** performs fast, non-contact, direct measurements of ozone 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: NO₂, SO₂, O₃ and benzene.



Opsis open-path monitor

Contact us for more information on how we can help you monitor NO₂.

01453 733200

www.et.co.uk

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

	Zephyr	TAPI 200	TAPI N200	TAPI T200P	TAPI T500U	TAPI N500	AirYX ICAD	OPSIS DOAS
MCERTS approved	X	✓	Pending	X	✓	✓	X	✓
US-EPA Certified	X	✓	Pending	✓	✓	✓	X	✓
TUV Certified	X	✓	Pending	✓	✓	✓	X	✓
Measures NO ₂ directly	X	X	X	X	✓	✓	✓	✓
Principle of operation	Sensor Based	CLD*1	CLD*1	CLD Photo*2	CAPS*3	CAPS*3	ICAD*4	DOAS*5
Class	Indicative	Ref. Method	Ref. Method	Based on Ref. Method	Next gen.	Next gen.	Next gen.	Open-path
Reference method equivalence.	X	N/A	N/A	X	✓	✓	X	✓
Portable	✓	X	X	X	X	X	✓	X
12VDC	✓	X	X	X	X	X	✓	X
220V AC	✓	✓	✓	✓	✓	✓	✓	✓
Solar	✓	X	X	X	X	X	X	X
Power / W	19	110+ Pump	100+Pump	160 + Pump	80 (inc Pump)	110 (Inc Pump)	<30 (Inc.Pump)	260*
Lowest Detection Limit (LDL) ppb	4.0	< 0.2	< 0.2	< 0.2	< 40 ppt	< 0.1	0.3	0.5 (500m path)
Ranges / ppb	0-10,000	0-50 0-20000	0-50 0-20000	0-50 0-4000 ^T 0-20000	0-50 0-1000	0-50 0-1000	0-5000	0-1000
Trace level variant available?	X	Yes T200U	Yes N200U	Yes T200UP	Sensitive enough for trace levels.	Sensitive enough for trace levels.	X	X
Dims. / mm (H x W x D)	235 x160 x 114	178 x 432 x 597	178 x 432 x 617	178 x 432 x 597	178 x 432 x 597	178 x 432 x 597	140 x 400 x 400	266 x 440 x 600
Weight / Kg	1.75 to 2.0	18.0	15.9	18.0	15.0	15.0	<10.0	35.0*
Can measure other gases / dust?	Yes (gases and PM ₁₀ & PM _{2.5})	NO, NO ₂ (NOx)	NO, NO ₂ (NOx)	NO, NO ₂ (NOx)	NO ₂ only	NO, NO ₂ (NOx)	NO ₂ only or NO, NO ₂ (NOx)	Yes inc. O ₃ , SO ₂ , BTX*
Internal zero/span for auto calib checking.	X	✓ (opt.)	✓ (opt.)	✓ (opt.)	✓ (opt.)	✓ (opt.)	X	X
Internal data logging	✓	✓	✓	✓	✓	✓	✓	✓
Inc. web enabled SIM card.	✓	X	X	X	X	X	X	X
LAN / Ethernet	X	✓	✓	✓	✓	✓	✓	✓
Wifi	✓	X	X	X	X	X	✓	X

Notes for table.

Principles of operation.

CLD*1 Chemiluminescence with moly converter. CLD Photo*2

Chemiluminescence with 'blue light' photolytic converter (True NO₂).

CAPS*3 Cavity Attenuated Phase Shift. ICAD*4 Iterative Cavity Enhanced

DOAS. DOAS*5 Differential Optical Absorption Spectroscopy (UV).

^T Maximum range of TAPI T200P for NO₂ = 0-4000 ppb

OPSIS DOAS* Power 260W is full system power (AR500 analyser 110W plus emitter PSU 150W). Weight (35 kg) is AR500 analyser only. AR500 UV DOAS analyser can measure many other gases including NO, SO₂, O₃, benzene, toluene, xylene (BTX) and more.