# Example calculation for oxygen measurement uncertainty

This supports the Environment Agency guidance [Monitoring stack emissions: maximum uncertainty values for periodic monitoring](https://www.gov.uk/guidance/monitoring-stack-emissions-maximum-uncertainty-values-for-periodic-monitoring).

1. Oxygen correction factor =

(21 − O2 % reference) ÷ (21 − O2 % measured)

2. Uncertainty of oxygen correction =

$$\left(\frac{21-O\_{2}\% reference}{21-O\_{2} measured × 21-O\_{2} measured}\right) ×uncertainty of O\_{2} measurement$$

3. Uncertainty of oxygen factor (%) =

(uncertainty of O2 correction ÷ oxygen correction factor) × 100

4. Overall measurement uncertainty (mu) (%) =

$$\sqrt{mu of the determinand^{2}+mu of the oxygen correction factor^{2}}$$

The example calculation is based on a:

* reference oxygen of 11%
* measured oxygen of 13%
* mu of oxygen measurement of 0.5% (absolute value)
* mu of pollutant measured (for example, particulates) of 15%

1. Oxygen correction factor = (21 − 11) ÷ (21 − 13) = 1.25

2. mu of oxygen correction = (21 − 11) ÷ ((21 − 13) × (21 − 13)) × 0.5 = 0.0781

3. Overall mu for the oxygen correction (%) = (0.0781 ÷ 1.25) × 100 = 6.25%

4. Overall uncertainty for the measurement =

$$\sqrt{15^{2}+6.25^{2}}=16.25\%$$

The measurement uncertainties in this example are the expanded uncertainties at a 95% confidence interval.

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