



## EarthSense Sensing Cartridge Calibration Certificate

Sensing Cartridge 1010

### Calibration summary

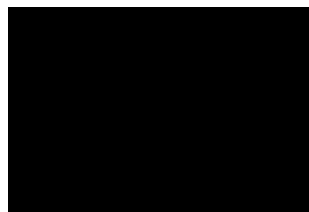
Start Date of calibration: 2019-06-16 09:00

End Date of calibration: 2019-06-19 09:00

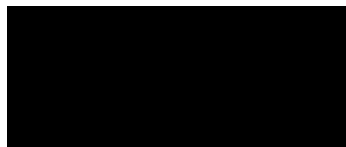
Location of calibration: Leicester University 0 (km) Background Urban

Pollutant	RMSE $\mu\text{g m}^{-3}$	$R^2$
NO <sub>2</sub>	4.411	0.705
O <sub>3</sub>	2.917	0.966
NO	2.431	0.401
PM <sub>2.5</sub>	2.909	0.835

Approved for customer shipment: Jordan White



Quality standards approval: Prof. Roland Leigh



## Zephyr air quality sensor

The Zephyr air quality sensor measures mass concentrations of Nitrogen dioxide (NO<sub>2</sub>), Ozone (O<sub>3</sub>) and Nitric oxide (NO), as well as mass concentrations of particulate matter with aerodynamic diameters of 1, 2.5 and 10  $\mu\text{m}$  (PM<sub>1</sub>, PM<sub>2.5</sub> and PM<sub>10</sub>). Internal temperature and humidity sensors provide means to account for environmental effects on the sensors used to measure trace gas and particle concentrations.

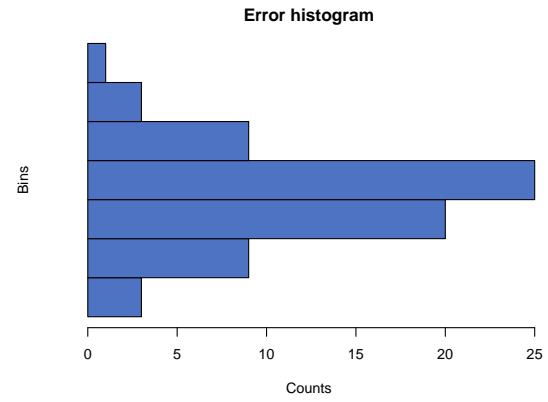
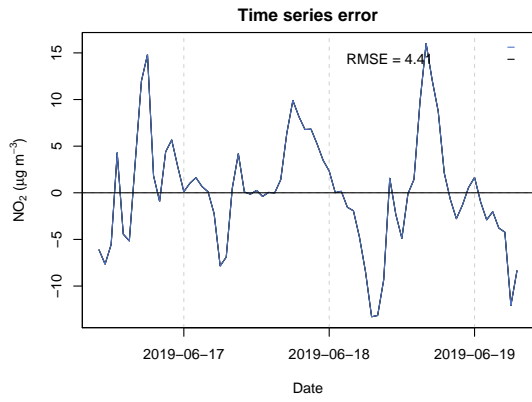
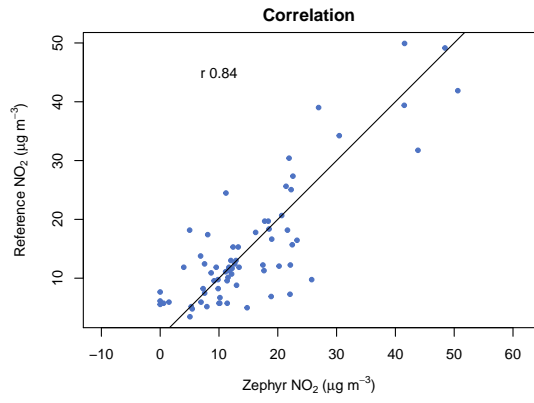
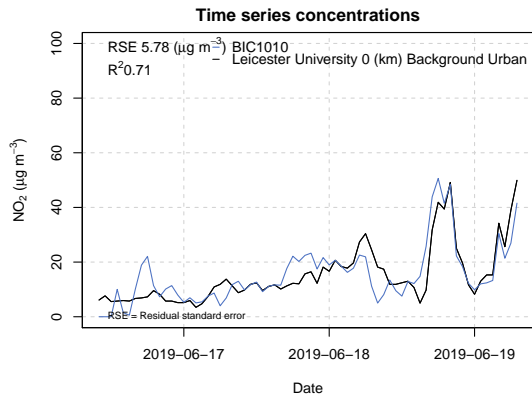
### Calibration

The cartridge that holds the gas and particle sensors is calibrated with data obtained during a period of co-location at an air quality reference site. The duration of this calibration is typically one week in order to observe a representative range of concentrations and environmental conditions. Subject to performance pass criteria being met during the co-location period, the Zephyr is approved for shipment to the customer.

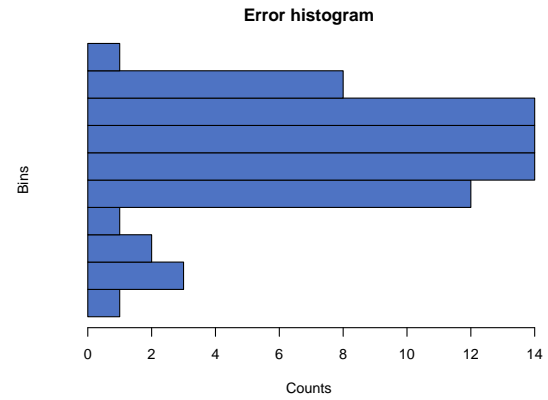
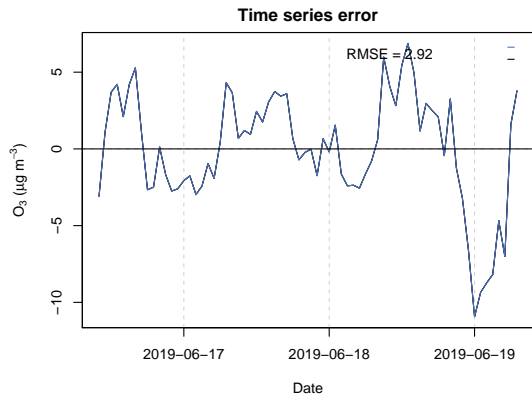
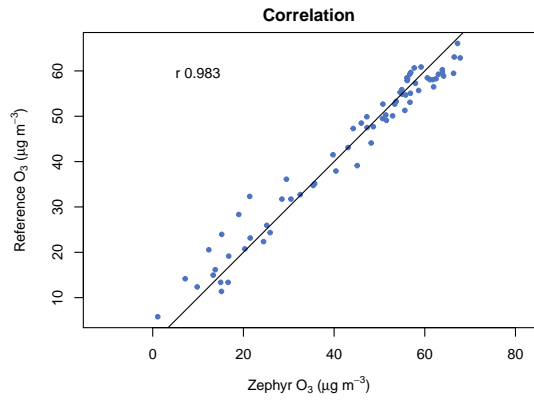
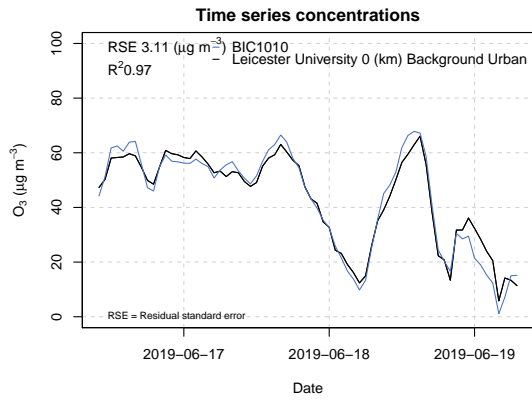
### Settling-in period

Upon customer deployment where possible, EarthSense recommends the sensor is set to measure ambient air for one week prior to the customer actively using the Zephyr for their desired application. Nominal in-field performance is assessed with the data collected by analysts at EarthSense. This typically involves comparative analysis with a regional average dataset from EU-standard reference analysers. Analysis carried out typically shows the calibration applied from the co-location period is appropriate, with some level of similarity in amplitude and diurnal trends measured by local EU-standard reference analysers. Shipping can occasionally cause a change to the expected signal, in which case local EU-standard reference analysers will be used to inform a new calibration.

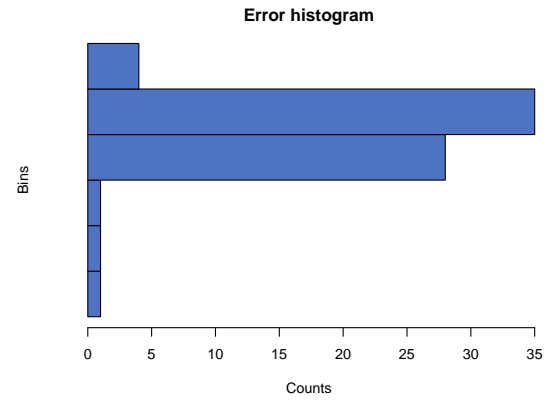
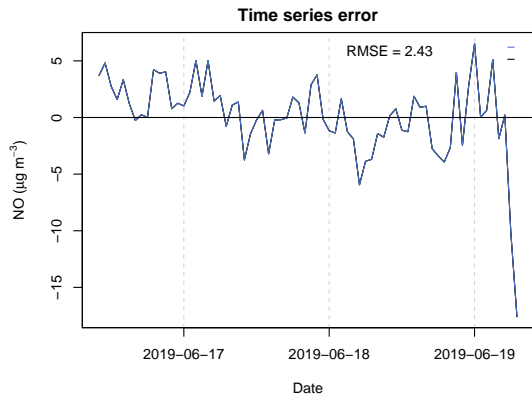
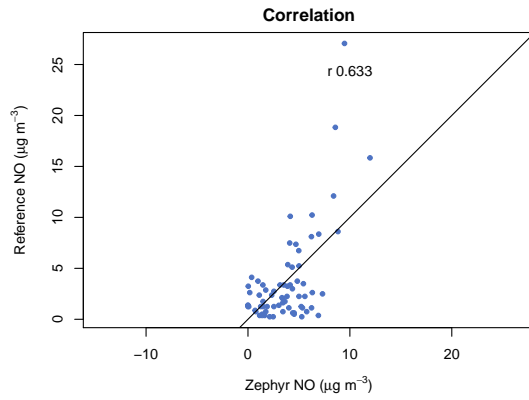
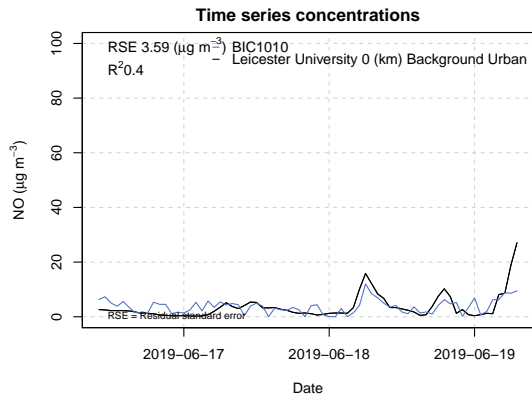
## NO<sub>2</sub> performance



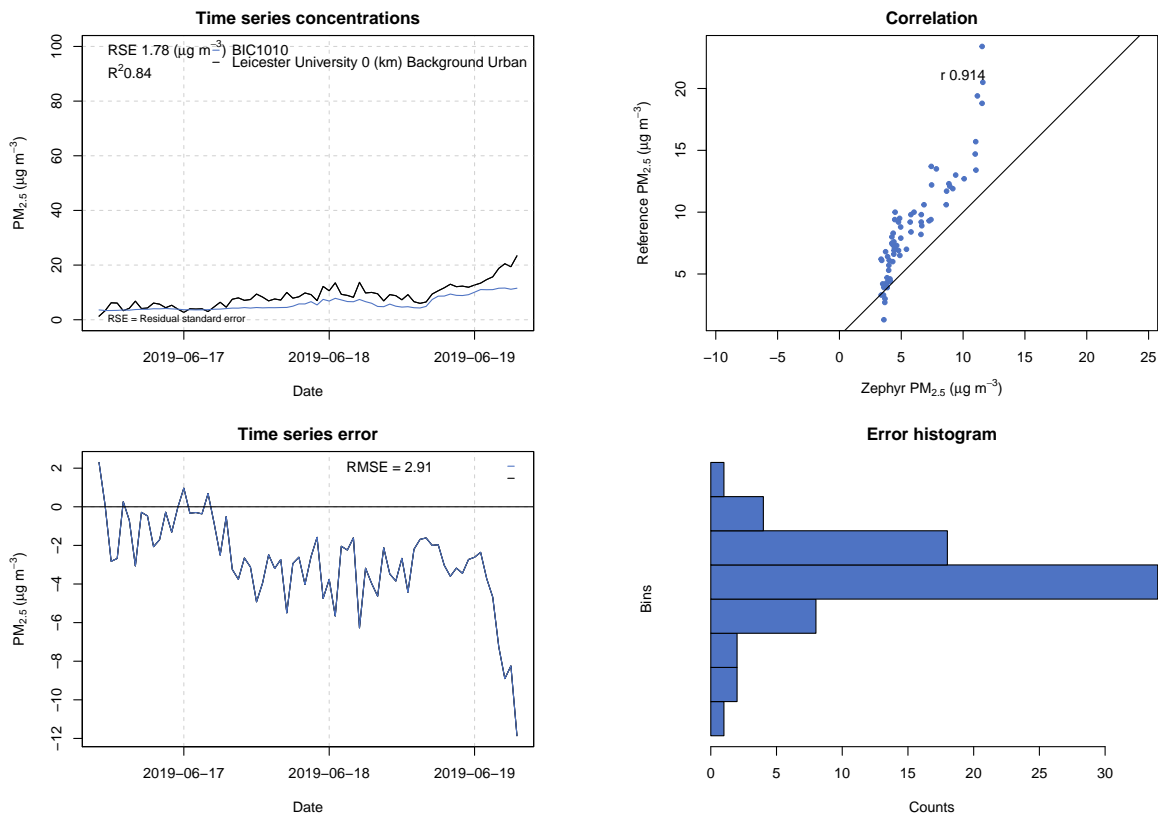
### O<sub>3</sub> performance



# NO performance



## PM<sub>2.5</sub> performance



## EarthSense periodic re-calibration

Zephyr resolved trace gas concentrations are available through the API link at the beginning of the report. The performance of Zephyr units are periodically checked at EarthSense, and where required remote re-calibrations are applied. These do not overwrite existing data, but are applied to all newly acquired data.

Periodic re-calibrations are made where systematic biases are present when comparing a Zephyr's data with a regional average of EU-standard reference stations for a representative environment category. For such analysis to be carried out, the Zephyr must be in a static, outdoors location for a minimum of 7 days.