

AQ-SPEC

Air Quality Sensor Performance Evaluation Center

Evaluation Summary

Sensor Description

Manufacturer/Model:
Aeroqual/AQY-R

Pollutants:
O₃

Time Resolution:
1-min

Type: Gas Sensitive
Semiconductor



- Overall, the accuracy of the Aeroqual AQY-R sensors ranged from 73.7% to 89.8%. Overall, the sensors underestimated the O₃ measurements from FEM T400 in the laboratory experiments at 20°C and 40% RH.
- The Aeroqual AQY-R sensors exhibited high precision for all T/RH combinations and all O₃ concentrations.
- The Aeroqual AQY-R sensors (IDs: 0193, 0194, 0195) showed low to moderate intra-model variability in the field and laboratory evaluations.
- Data recovery was ~91% - 100% from all units in both field and laboratory evaluations.
- The Aeroqual AQY-R sensors showed very strong correlations ($0.94 < R^2 < 0.98$, 5-min mean) with the corresponding FEM T400 data in the field evaluation and very strong correlations with the FEM T400 in the laboratory evaluations ($R^2 \sim 0.99$).
- The same three Aeroqual AQY-R units were tested both in the field (1st stage of testing) and in the laboratory (2nd stage of testing).

Field Evaluation Highlights

- Deployment period 04/14/2022 to 06/12/2022 : the three Aeroqual AQY-R sensors showed very strong correlations with the corresponding FEM O₃ data.
- The units exhibited low intra-model variability and data recovery for O₃ measurements was ~94% from all units.

Additional Information

Field evaluation report:

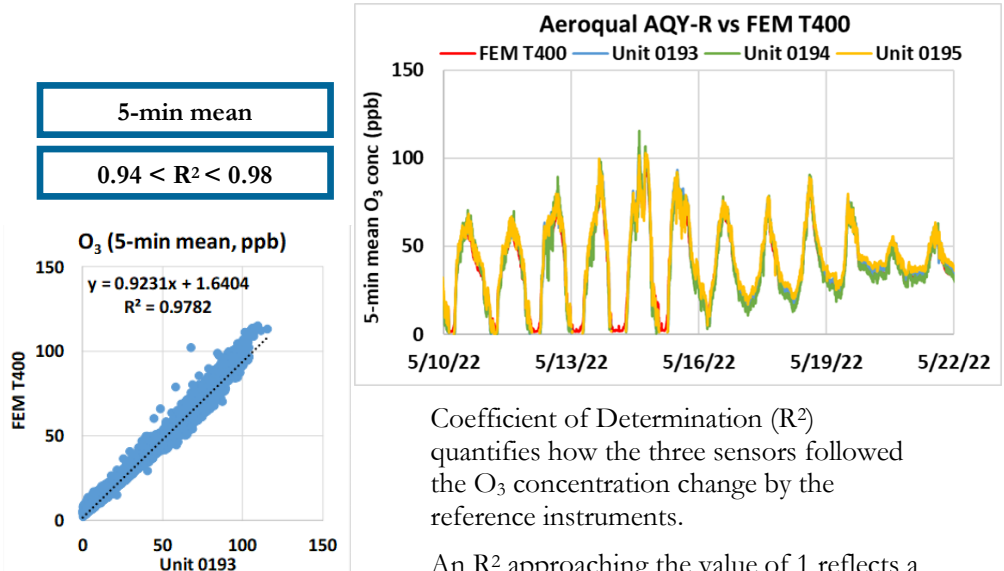
<http://www.aqmd.gov/aq-spec/evaluations/criteria-pollutants/field>

Lab evaluation report:

<http://www.aqmd.gov/aq-spec/evaluations/criteria-pollutants/laboratory>

AQ-SPEC website:

<http://www.aqmd.gov/aq-spec>



Coefficient of Determination (R^2) quantifies how the three sensors followed the O₃ concentration change by the reference instruments.

An R^2 approaching the value of 1 reflects a near perfect agreement, whereas a value of 0 indicates a complete lack of correlation.

Laboratory Evaluation Highlights

Accuracy (O₃)

$$A (\%) = 100 - \frac{|\bar{X} - \bar{R}|}{\bar{R}} * 100$$

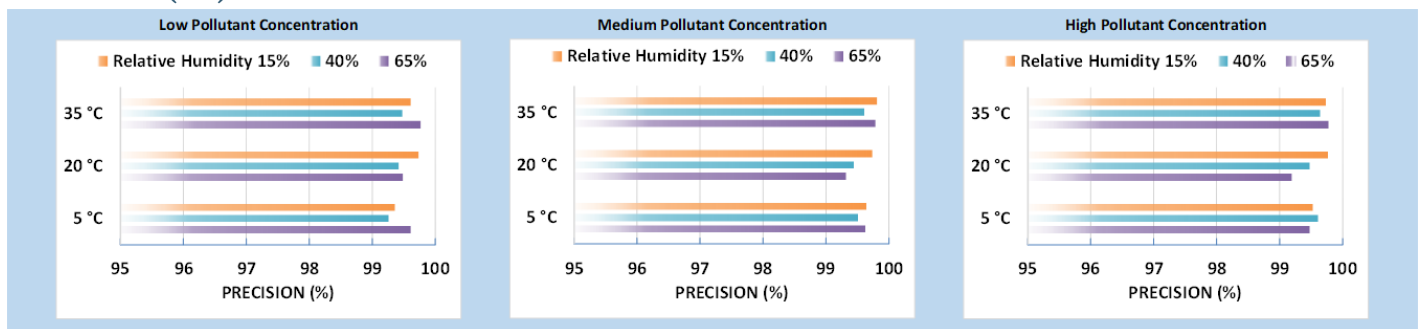
Steady State (#)	Sensor Mean (ppb)	FEM T400 (ppb)	Accuracy (%)
1	24.8	28.5	86.8
2	42.7	47.5	89.8
3	74.3	88.6	83.8
4	110.9	150.6	73.7

Accuracy was evaluated by a concentration ramping experiment at 20°C and 40% RH. The sensor's readings at each ramping steady state are compared to the reference instrument.



A negative % means sensors' overestimation by more than two fold. The higher the positive value (close to 100%), the higher the sensor's accuracy.

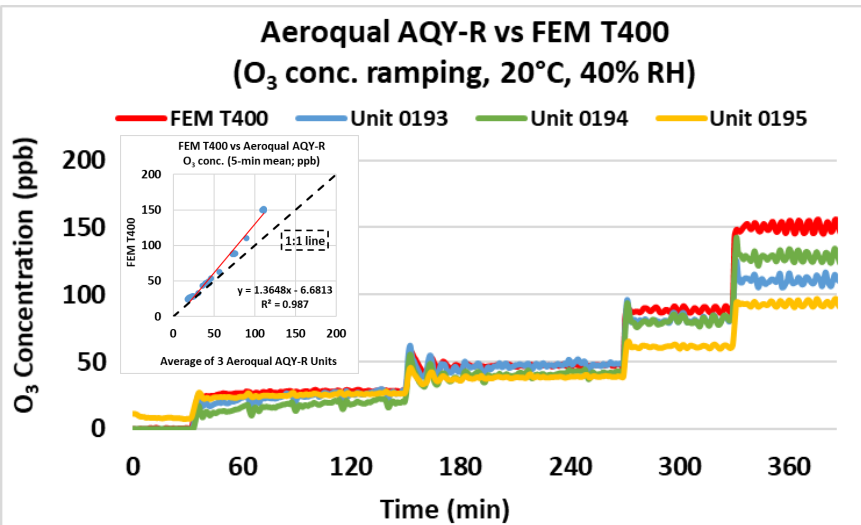
Precision (O₃)



100% represents high precision.

Sensor's ability to generate precise measurements of O₃ concentration at low, medium, and high pollutant levels were evaluated under 9 combinations of T and RH, including extreme weather conditions like cold and dry (5°C and 15% RH) cold and humid (5°C and 65% RH), hot and humid (35°C and 65% RH), or hot and dry (35°C and 15% RH).

Coefficient of Determination



The Aeroqual AQY-R sensors showed very strong correlations with the corresponding FEM T400 O₃ data (R² ~ 0.99) at 20°C and 40% RH.

Climate Susceptibility

From the laboratory studies, temperature and relative humidity had minimal effect on precision of the Aeroqual AQY-R sensors' ozone measurements.

Observed Interferents

N/A



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