

ABSTRACT

This project evaluates the performance of microsensors for ambient air quality monitoring in accordance with the Indonesian National Standard (SNI) 9178:2023. This standard encompasses calibration, field collocation, and data validation. The measurement methods used are Light Scattering for particulate matter and NDIR (Non-Dispersive Infrared) for gases, chosen for their accuracy, resolution, and responsiveness. Testing was conducted through calibration and field collocation tests. Calibration results show that the PM_{2.5} sensor (SKU: SEN0460) and CO₂ sensor (SKU: SEN0219) have slope values close to 1 with coefficients of determination (R^2) of 0.9956 and 0.99753, respectively, indicating high accuracy. Collocation tests showed varied performance. Of the 26 samples, only 18 met the standard deviation criteria ($SD \leq 5 \mu\text{g}/\text{m}^3$), while the rest showed greater variability. The coefficient of variance ($CV \leq 30\%$) of all 26 samples met the acceptance criteria. The slope value of 0.8649 falls within the acceptable range of 1.0 ± 0.35 , and the intercept (b) value of 0.4416 is within the acceptable range of $-5 \leq b \leq 5$. The coefficient of determination (R^2) of 0.9301 is well above the requirement of ≥ 0.70 , indicating good accuracy and linearity. However, only 12 of the 26 samples met the RMSE criteria ($\leq 7 \mu\text{g}/\text{m}^3$), and 22 of the 26 samples met the NRMSE criteria ($\leq 30\%$). Error detection methods and box plots were used to improve data validity, successfully reducing measurement errors and increasing data accuracy. The microsensors demonstrated reasonably good performance in terms of consistency, accuracy, and linearity but require more frequent recalibration and maintenance to reduce prediction errors and control external factors, thereby meeting the SNI 9178:2023 standard.

Keywords: Accuracy, Box plot, Error detection, Calibration, Field collocation, Ambient air quality, Light Scattering, Linearity, Microsensors, NDIR (Non-Dispersive Infrared), NRMSE, Precision, SNI 9178:2023, RMSE, Data validation.