

ภาคผนวก จ

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์





ORANGE INNOVATION COMPANY LIMITED

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CALIBRATION CERTIFICATE

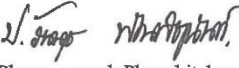
Certificate No.: 2021-0705

Date Issued: 29 Jul 2021

Customer : Suranaree University of Technology
Address : 111 University Avenue, Sub District Suranaree, Muang District,
Nakhon Ratchasima 30000, Thailand
Equipment : GAS DETECTOR
Manufacturer : WatchGas Detection
Model : MP400P
Serial Number : M00404001449
ID No./Tag No : -
Date Received : 27 Jul 2021
Date Calibrated : 27 Jul 2021
Calibration Location : Orange Innovation Laboratory
Calibrated by : Mr.Ittipon Anisakpitaya

Environment Condition

Temperature : (23±5) °C
Relative Humidity : (50±15) %

Approved by: 
(Ms. Phaweeranuch Phanphitchayan)
Calibration Laboratory Manager



Certificate No.: 2021-0705

Calibration Method

The Calibration was performed follow by comparison in-house method WI No.WI-LAB-01 , of the gas detector reading with the reference gas mixture for traceable measurement results. Based on the uncertainty

Tabulation of results

The table on the following page gives the calibration results and associated measurement uncertainties at approximately 95% confidence level of the gas detector under calibration.

Uncertainty of measurement

The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k=2$. It has been determined in accordance with EA publication EA-4/02 "Expression of the Uncertainty of Measurement in Calibration" and JCGM 100:2008 "Evaluation of Measurement Data Guide to The Expression of Uncertainty of Measurement." The value of the measured lies within the assigned range of value with probability of 95%

Traceability

- The certificate provides metrological traceability of measurement to recognized national standards. The reference gas mixtures used for calibration were produced by producers conforming to NIST
- Temperature & Humidity and Flow meter have been calibrated with ISO 17025 accredited laboratory.
- RMs have been manufactured under ISO 17034 and ISO 17025

Certificate Document : 2731/19 , 1341/19

Cylinder Number : D400507 , D882000



Certificate No.: 2021-0705

Calibration Results:

The calibration was performed following the 1-point calibration by using standard gasmixer in nitrogen at the inlet pressure of 1 bar and flowrate of 0.5 L/min



Without adjust

Sensors	Certified Concentration	Concentration Reading	Expanded Uncertainty (Relative value, $k=2$)
Oxygen	17.9 cmol/mol	17.43 cmol/mol	3.9% (0.7cmol/mol)
Carbon Monoxide	100 μ mol/mol	101.3 μ mol/mol	3.3% (3.3 μ mol/mol)
Methane	50%LEL (25 mmol/mol)	50.7%LEL (25.4 mmol/mol)	4.5% (2.3mmol/mol)
Hydrogen Sulfide	22.5 μ mol/mol	23.1 μ mol/mol	3.8% (0.9 μ mol/mol)



With adjusted

Sensors	Certified Concentration	Concentration Reading	Expanded Uncertainty (Relative value, $k=2$)
Oxygen	17.9 cmol/mol		
Carbon Monoxide	100 μ mol/mol		
Methane	50%LEL (25 mmol/mol)		
Hydrogen Sulfide	22.5 μ mol/mol		

Remark:

Calibrated by gas from Linde (Thailand) PCL.

Notice:

The above results are valid exclusively for tested / analyzed samples as mentioned in the report. Publicity and reproduce some part are prohibited unless written permission is attained from Orange Innovation Co., Ltd

End of Calibration Certificate

