

Readme Supplement for pCO₂

Method Description:

Sampling and Equilibrator Design:

Depth of Sea Water Intake: 4.5 m

Location of Sea Water Intake: right side at bow

Equilibrator Type: showerhead-type equilibrator

Equilibrator Volume: approx. 1 L

Water Flow Rate: 4000-5000 mL min⁻¹

Headspace Gas Flow Rate: 400-900 mL min⁻¹

Vented: Yes

Drying Method for CO₂ in Water: Electron Cooler, Perma Purer Nafion Dryer, Chemical

Desiccant

Additional Information:

System Design:

Measurement Method:

Manufacturer of Calibration Gas:

CO₂ Sensor:

Measurement Method: dispersive infrared gas analyzer

Manufacturer: Nippon ANS, Inc.

Model: Underway pCO₂ measurement system using LI-7000 CO₂ Analyzer (modified by Nippon ANS, Inc.) by LI-COR

Environmental Control: none

Frequency: 4.5 min. for CO₂ air (2 analysis), and then 7 min. for CO₂ water (7 analysis)
(except during calibration routines)

Precision of CO₂water:

Precision of CO₂air:

Accuracy of CO₂water:

Accuracy of CO₂air:

CO₂ Sensor Calibration:

Manufacturer of CO₂ calibration gases: Taiyo Nippon Sanso Corporation, Japan

Method References:

CO₂ in Marine Air:

Measurement: after calibration gases

Location and Height: middle height of foremast (13m)

Sea Surface Temperature:

Location: bow thruster room

Manufacturer: Sea-Bird Electronics Inc.

Model: SBE38

Accuracy: 0.002 degree

Precision: 0.0002 degree

Calibration: Manufacturer calibration every single year.

Other comments:

Sea Surface Salinity:

Location: sea surface monitoring laboratory

Manufacturer: Sea-Bird Electronics Inc.

Model: SBE45

Accuracy: 0.005 (PSU)

Precision: 0.003 (PSU)

Calibration: Manufacturer calibration every single year.

Other comments:

Equilibrator Temperature:

Location: just upstream of shower head

Manufacturer: THERMOTEX CO. LTD, Japan

Model: Pt100 ohm

Accuracy: 0.20 degree

Precision: 0.03 degree

Calibration: Calibration is performed by a traceable mercury thermometer before the measurement.

Other comments:

Equilibrator Pressure:

Location: equilibration sector of equilibrator

Manufacturer: Druck

Model: RPT410V

Accuracy: 0.5 hPa

Precision:

Calibration: Certified calibration is performed every 2 years.

Other comments:

Atmospheric Pressure:

Location: Weather observation room at captain deck (13m)

Manufacturer: Setra System, USA

Model: Model-370

Accuracy: $\pm 0.02\%$

Precision: 0.010% FS

Calibration: Comparison with the portable barometer value, PTB220, VAISALA

Other Sensors:

Manufacturer::

Model:

resolution:

Uncertainty:

Calibration:

Other Comments:

Accuracy Info:

Method References: