

MAX-II metabolic cart (including ventilated hood)

<https://search.researchequipment.wur.nl/SearchDetail.aspx?deviceid=86ff45a3-564c-42f7-b02e-02e2117722c9>

Brand

AEI Technologies

Type

MAX-II Metabolic System



Contact

Annelies Bunschoten (annelies.bunschoten@wur.nl)

Organisation

Animal Sciences Group

Department

Human and Animal Physiology

Description

Indirect calorimetry is a non-invasive and accurate method to determine substrate utilisation and metabolic rate indirectly, by measuring the production of carbon dioxide (CO₂) and the consumption of oxygen (O₂). From these gas exchange measurements, type and rate of substrate utilisation can be assessed. The MAX-II metabolic cart enables indirect calorimetry in humans under resting conditions (by using a ventilated hood, bed available) and exercise conditions (by using a face mask, bicycle ergometer available).

Technical Details

- Paramagnetic Oxygen Analyzer

(Accuracy: $\pm 0.03\%$ O₂ over 10 – 21% O₂ range, repeatability: $\pm 0.03\%$ O₂, resolution: Digital Display $\pm 0.01\%$ O₂, Operating Range: 0 – 100% O₂).

- Infrared Carbon Dioxide Analyzer

(Accuracy: $\pm 0.03\%$ CO₂ over 0 – 7% CO₂ range, Repeatability: $\pm 0.03\%$ CO₂, Resolution: Digital Display $\pm 0.01\%$ of CO₂, Operating Range: 0 – 10% CO₂).

- Pneumotach Breath Volume Measurement System

(Flow Range: 0 to greater than 800 liters/minute, Volume Accuracy: better than $\pm 1.0\%$, Resistance to Flow: 2.8 cm H₂O at 400 liters/min).

- Sample Pump and Flow Controller.
- Heart Rate Interface with Polar monitor.
- Real time continuous Temperature, Humidity & Pressure Monitoring

(Temperature: $\pm 0.5\text{ }^{\circ}\text{C}$, Pressure: $\pm 1\text{ mmHg}$, Humidity: $\pm 3\%$ RH).

Applications

Measurement of resting metabolic rate: using the canopy mode of the MAX-II, resting metabolic rate (RMR) can be measured in a comfortable supine position. RMR can be used to estimate 24-hour caloric requirements and can measure substrate utilisation as reflected by the respiratory quotient.

Activity-associated energy expenditure: By combining breath by breath analysis and physical activity, energy expenditure can be calculated at a given work load. The volume of inhaled gas is measured using a flow meter and exhaled air is sampled for measurement of O₂ consumption and CO₂ production.

Complementary Techniques

- Canopy system for measurement of basal metabolic rate.
- Lode bicycle ergometer to combine metabolic measurement with physical activity.
- Mask kits for comfortable exercise testing.
- Kitchen utilities to measure energy expenditure in response to a meal.