

The most accurate metabolic system in the world



AEI

Our Technology Specifications

S-3A Oxygen Analyser

The fastest, most accurate and most stable oxygen analyser in the business.

Accuracy:	0.01% for S-3A/I (Full range to 100%) 0.003% for S-3A/II (Full range to 100%)
Response time:	0.1 seconds to 90% value
Stability:	0.01% in 24 hrs
Sensitivity:	0.001% (Full range to 100%)



AEI METABOLIC SYSTEMS

CD-3A Carbon Dioxide Analyser

The fastest, most accurate Carbon Dioxide analyser in the business.

Accuracy:	0.02% (0 to 15% range)
Response time:	0.025 seconds to 90% value
Stability:	0.02% in 8 hrs
Sensitivity:	0.001% (Full range)



AEI METABOLIC SYSTEMS

High Accuracy Pneumotach Flow Meter

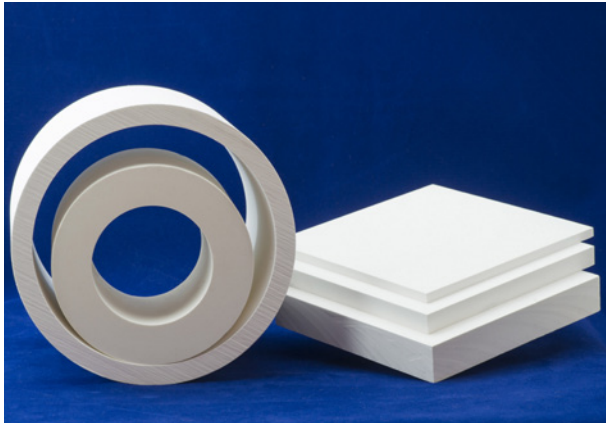
High Accuracy Pneumotach Flow Meter

Accuracy:	<1.0% Full range (best in the business)
Stability:	0.01% Full range
Range:	0 to 800 litres /min (4 times overspec)



AEI METABOLIC SYSTEMS

Why our systems are so much more accurate



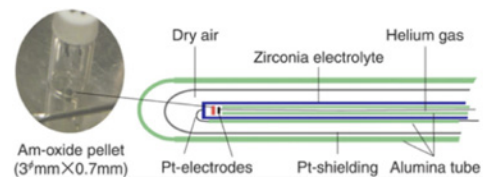
ZIRCONIA

AEI METABOLIC SYSTEMS

We use a patented Zirconia Oxide sensor technology

- It only reacts to Oxygen unlike other sensors
- It is extremely accurate and stable
- It has a lifespan of about 30 years

CATHODE	$O_2 + 4E \rightarrow$	$2O_2$
ANODE	$2O_2 \rightarrow$	$O_2 + 4E$



Other Sensor Deficiencies

Paramagnetic

- Less accurate (0.05% translates to 2%VO₂ error)
- less stable
- N₂ & CO₂ paramagnetic properties interfere with accuracy
- 5-8 year lifespan

Galvanic / Electrochemical Cell

- Less accurate
- Very unstable
- 1-2 year lifespan (expensive)

Photosynthesis Experiment (O₂)

Our Zirconia system is the only metabolic system that is sensitive and accurate enough to be used to sense O₂ coming from leaves in Photosynthesis. Since Bjorkman and Gauhl, 1970, many similar papers have been published every decade using our technology. A small sample is below.

Bjorkman and Gauhl, 1970
John P. Krall, 1993 (Maize plant)
Vello Oja 2011 (Sunflower leaves)
Agu Laisk, 2015 (cell cultures in vitro)

Why is the Oxygen sensor the most important factor in metabolic measurement?

The following table is converted from Gore et. al
(The Australian Institute of Sport)

RELATIVE ERROR	TYPICAL	ABSOLUTE ERROR	% VO ₂ ERROR
+1% FeO ₂	0.5	0.17%	-6.46
+1% Vi	2.0	1.36 L/min	+1.00
+1% Pbarr	0.05	7.6 mmHg	+1.01
+1% CO ₂	1.0	0.03%	-0.23

The smallest amount of Oxygen error (0.17%) will transpose as a very large error in VO₂ (6.46%)

Reference values

VO₂ = 4.5495 • VI STPD = 136.10 • VE STPD = 136.70 • FIO₂ = 0.1751% • O₂ = 0.2093% • Haldane assumptions

Projected VO₂ Error for various metabolic systems

(Based on manufacturer specifications – absolute values)

MANUFACTURER & MODEL	O ₂ SENSOR TYPE	O ₂ CELL LIFESPAN	O ₂ ACCURACY % ABSOLUTE	CO ₂ ACCURACY % ABSOLUTE	VENTILATION ACCURACY % ABSOLUTE	VO ₂ ERROR
AEI Tech.	Zirconia	20-30 years	0.01	0.02	1	1.16
Other 1	Galvanic fuel cell	12-18 months	0.04	0.04	2	2.96
Other 2	Paramagnetic	5-10 years	0.1	0.02	2	5.73
Other 3	Paramagnetic	5-10 years	0.1	0.1	2	5.85
Other 4	Galvanic fuel cell	12-18 months	0.1	0.1	3	6.25

Note that our systems provide the highest accuracy for both Oxygen and Ventilation on the market, giving rise to muchg superior metabolic accuracy.



Contact us

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