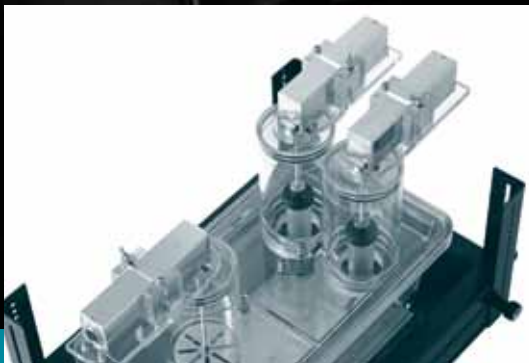


Sophisticated Life Science Research Instrumentation

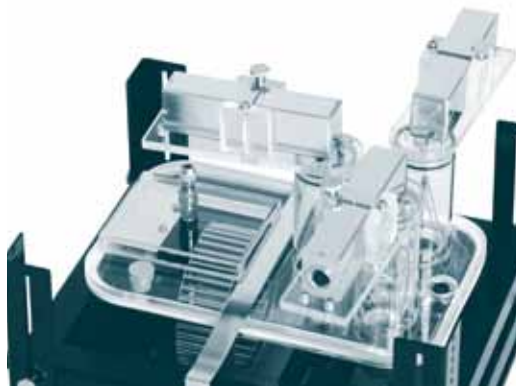


PhenoMaster

Calorimetry Module
Metabolism
Urine/Feces Analysis



Metabolism & Behavior Modularized



Home Cage Calorimetry

With the TSE Systems PhenoMaster CaloCages, automated indirect calorimetry of rodents in stress-free home cages becomes possible

YOUR BENEFITS

- **Security: uniform and precise air flow**
- **Economy: variable cage sizes**
- **Flexibility: calorimetry combinable with other modules**
- **Ease of use: minimum experimenter interference necessary**
- **Early warning: Supervision per remote alarm**
- **Turnkey system**
- **High throughput: racks and environmental control cabinet optional**

LITERATURE EXAMPLE

Obesity Research

Strassburg et al., AJP-Endocrinol Metab 2008

The group from Cincinnati, OH, investigated the long-term effects of ghrelin and its receptor agonists on energy balance in rats using a 32-place PhenoMaster combined indirect calorimeter.

Home Cage Measurement

- Based on standard home cage sizes
- Short animal habituation
- Long-term measurement without experimenter interference: stress-free with high animal welfare for reliable data
- Easy maintenance and cleaning
- Activity measurement and indirect calorimetry modules
- High accuracy: individual mass flow controller per cage
- Optional integration of telemetry

CaloSys Indirect Calorimetry

- NEW: catheter swivel system now available for CaloSys cages
- Parameters: O₂ and CO₂ (conc., consumption/production), flow, air temperature (optional), energy expenditure, respiratory exchange rate, heat
- High speed gas sensors optional: 40 sec. measuring time per cage possible
- Multiple gas sensor pairs available for single system multi-cage setups: increases measurement frequency particularly for short-term exercise calorimetry in CaloWheels and CaloTreadmills
- Multiplex sample switch unit for cage air samples
- High-speed air drying unit by Peltier principle, eliminating the need for error-prone mathematical compensation or additional vapor measurement
- 3-Gas calibration for higher precision and longer calibration intervals
- Push or pull operating configurations available
- Easy exercise calorimetry with in-cage voluntary running wheel

Activity Monitoring*

- Three-dimensional activity measurement by infrared light-beam frame (ActiMot2) with high time and spatial resolution

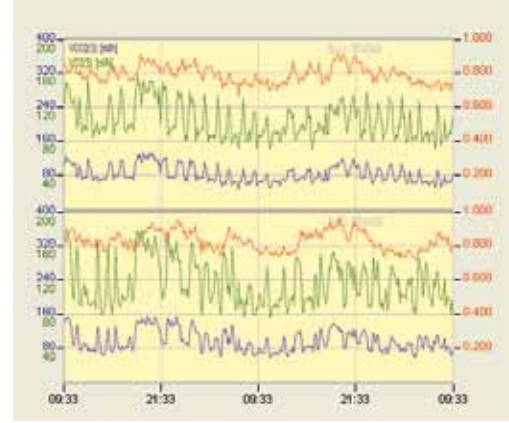
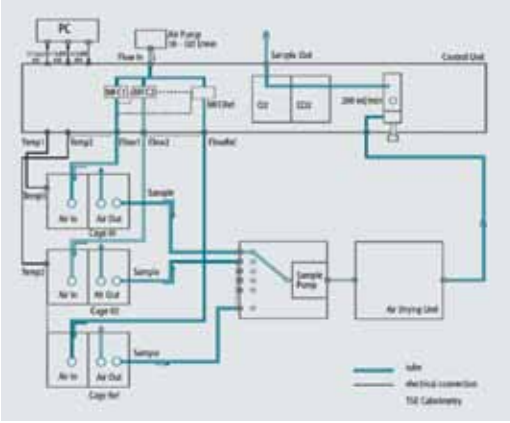
Drinking/Feeding/Body Weight*

- Gas-tight high-precision sensors mounted in the sealed lid
- Various sensor combinations possible, depending on cage size
- Food and drink containers of various sizes available
- Special drinking nipple prevents liquid loss
- Validated spillage protection containers
- Access control option for paired/yoked feeding Software

Software

- Multiple analysis software licenses included – enables independent analysis on different computers
- Cage control unit connects gas sensors to the software
- CaloSys software module specifies experimental parameters, allows continuous in-process monitoring, and records/stores data
- Standard or user-defined base values
- Parameter selectable for monitoring and data export
- Descriptive details noted in event markers
- Automatic storage of calibration data
- Data analysis and graphic display individually or in parameter groups
- Data export supporting major statistics programs

* See separate brochure



Metabolic PhenoCage & Exercise

Various paradigms outside the home cage are available for the PhenoMaster

General Features

- Virtually unlimited number of cages supported
- All paradigms controlled by PhenoMaster software

Metabolic PhenoCage

- Indirect calorimetry
- For mice and rats
- Minimal experimenter interference

Urine/Feces Analysis

- Simultaneous automated urine and feces separation and quantification, and optional feeding/drinking and infrared activity beam modules available
- High precision weighing sensors for urine/feces
- Urine freezer unit optional
- In open and calorimetry Metabolic PhenoCages

CaloWheel

- Forced wheels for speed-controlled exercise testing
- Automatic speed profiles
- Exercise calorimetry
- Alternatively: exercise wheel fitted inside the home cage

CaloTreadmill

- For rats or mice
- Fully computerized exercise calorimetry
- Motor coordination analysis
- Servo controlled driver motor
- Optimized grip on running belt
- Optional stimuli by electrified floor grid, air puff, or mechanical push/restriction

- Electrical stimulus on floor grid optional
- Infinitely adjustable incline
- Multiple CaloTreadmills individually controlled by single PhenoMaster software: workload limits can be programmed for each test animal, increasing throughput

Software

- All external paradigms controlled by PhenoMaster software
- User-defined exercise protocols
- Test data and exercise profiles stored for re-use
- Status overview: monitor running experiments at a glance
- Raw or sorted data analysis
- Easy data export for further statistical analysis
- Designed with decades of experience in data synchronization

YOUR BENEFITS

- **Simultaneous urine collection, freezing and measurement**
- **Simultaneous feces collection and measurement**
- **Flexibility: experimental design and analysis**
- **Easy to use: one modular software platform for all paradigms**
- **Versatile: combinatorial paradigms**
- **Minimum user maintenance: remote service option**

LITERATURE EXAMPLE

Hormones & Adiposity

Sutanto et al. JBC 2009

The research group from Chicago analysed the interplay between adipose tissues and energy homeostasis, supporting the notion that impaired fat mass expansion can lead to metabolic disturbances such as diabetes. Calorimetry, locomotor activity and food intake were measured over 3 days in a PhenoMaster CaloCage.

CALORIMETRIC CAGE STANDARD OPTIONS*						
CAGE TYPE	I	II GREENLINE	II US	II	III	IV
SPECIES	M	M	M	M	M/R	R
VOLUME (L)	2.5	6.5	7.1	4.9	12.0–14.4	45.2
LENGTH (MM)	195	379	186	267	425	595
WIDTH (MM)	92	199	298	207	265	380
HEIGHT (MM)	140	130	128	140	150 (M) 180 (R)	200
WEIGHT WITH LID & SENSORS (KG)	2.0	4.0	3.0	4.0	5.0	6.0
MAX. # OF SENSORS	3	5	5	5	5	9
ACCESS CONTROL	+	+	+	+	+	+
X-Y ACTIVITY	+	+	+	+	+	+
Z ACTIVITY	+	+	+	+	+	+
RUNNING WHEEL	–	+	+	+	+	+
HIGH-SPEED SAMPLING	+	+	+	+	+	+

* Based on Tecniplast standard cages. Other cage types available on request.

M = mouse, R = rat

TECHNICAL DATA				
	CaloTreadmill Mouse	CaloTreadmill Rat	CaloWheel Mouse	CaloWheel Rat
LENGTH/ DIAMETER (MM)	350	500	115	252
LANE/DRUM WIDTH (MM)	65	130	40	80
ROD DISTANCE (MM)	n.a.	n.a.	8.9	15.5
MOTOR DRIVE	+	+	+	+
SPEED CONTROL	+	+	+	+
INCLINATION	-10 – 25°		n.a.	n.a.
SPEED RANGE (M/SEC)	0.07 – 2		n.a.	n.a.
SHOCK STRENGTH (MA)	0 – 3.1		n.a.	

n.a. = not applicable

Specifications subject to change without notice

LITERATURE EXAMPLE

Obesity Research

Glier et al., Peptides 2010

M.B. Glier and colleagues analyzed the interplay between energy homeostasis-controlling neuropeptides by creating double knock out mice for SCD-1 and pMCH. After 58 hrs in PhenoMaster CaloCages, food intake and energy expenditure were found increased, possibly opening new treatment ways for obesity.

International Projects

