TSE systems

PhenoMaster NG

One platform. Complete phenotyping.

KCAL

24ʰ SERVICE TECHNICAL SUPPORT
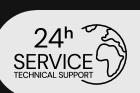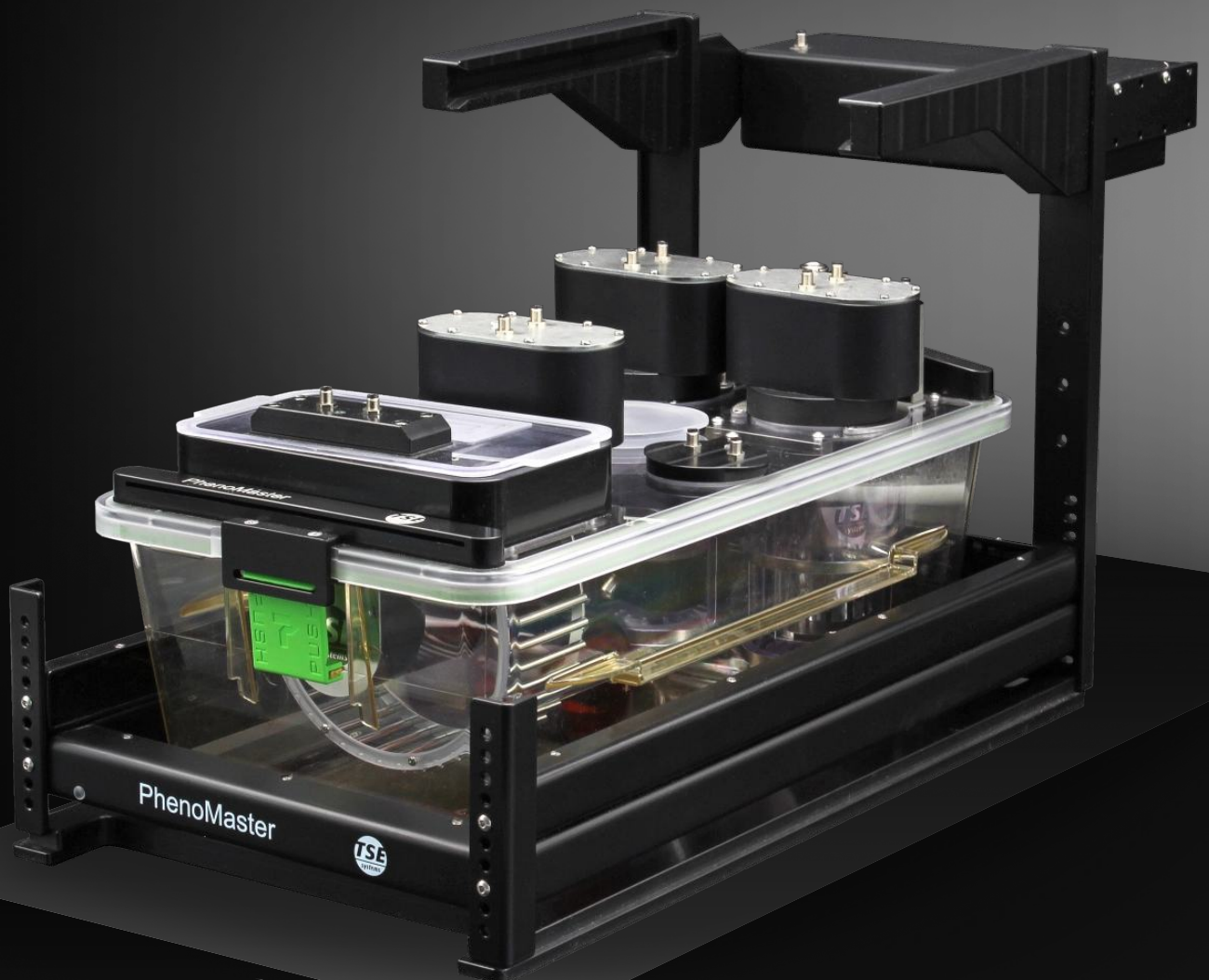
The Next-Generation Home-Cage Phenotyping for Rodents

As the most advanced home-cage phenotyping platform, PhenoMaster enables researchers to integrate metabolic, behavioral, and physiological measurements into one synchronized system – continuously, automatically, and non-invasively.

Its modular architecture covers every aspect of in vivo research – from indirect calorimetry and activity monitoring to microbiome interactions and feeding behavior analysis – generating precise, reproducible data and deeper scientific insights across disciplines.

Measure More

Capture 100+ phenotyping parameters – continuously, precisely, in real time
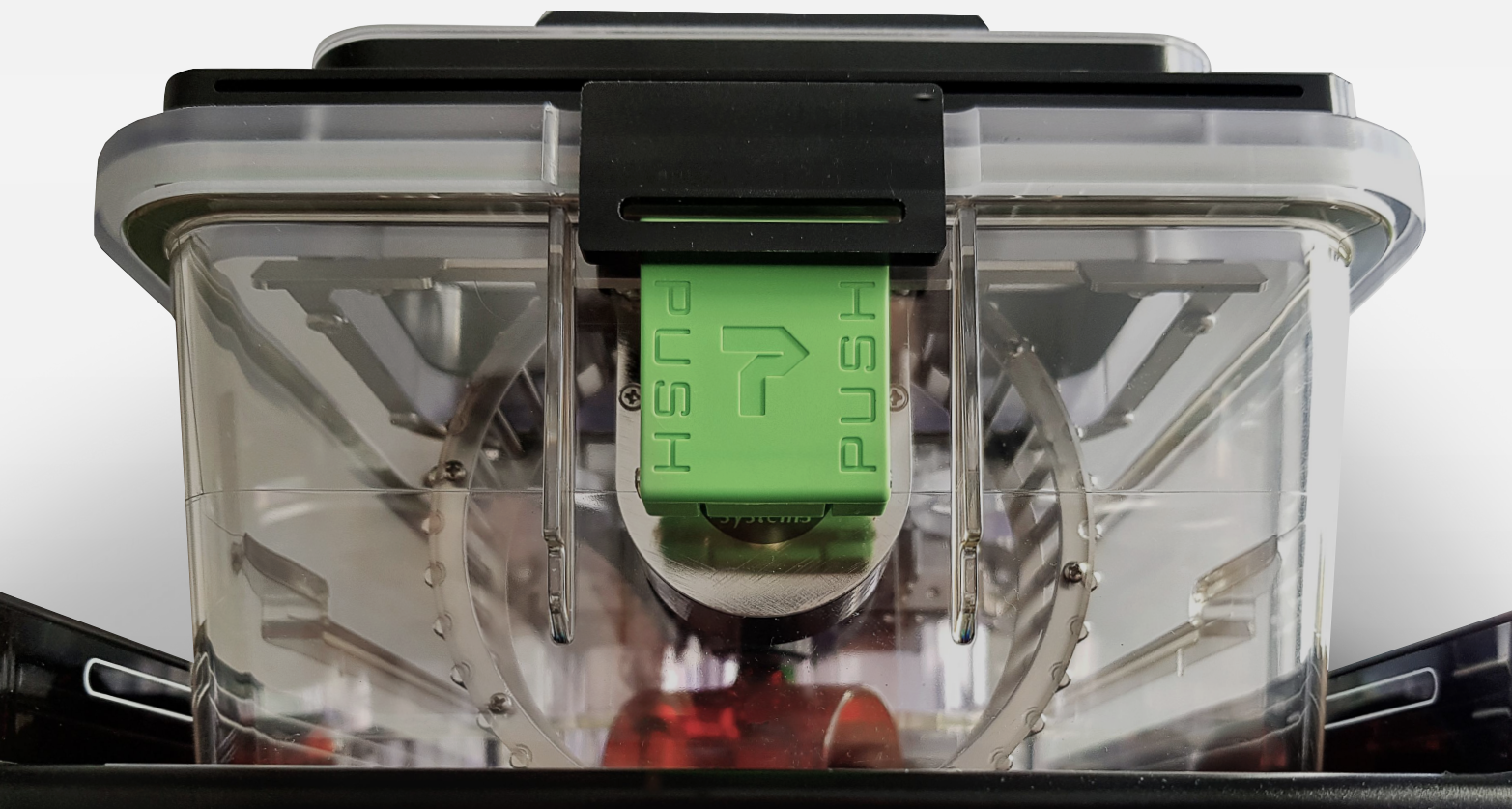
Trust the Data

Proven in 4000+ publications. PhenoMaster delivers reproducible data that stands up to any validation.

Stay in Sync

Every signal – metabolism, activity, behavior – synchronized in one continuous data stream.

400+

Trusted laboratories worldwide

4000+

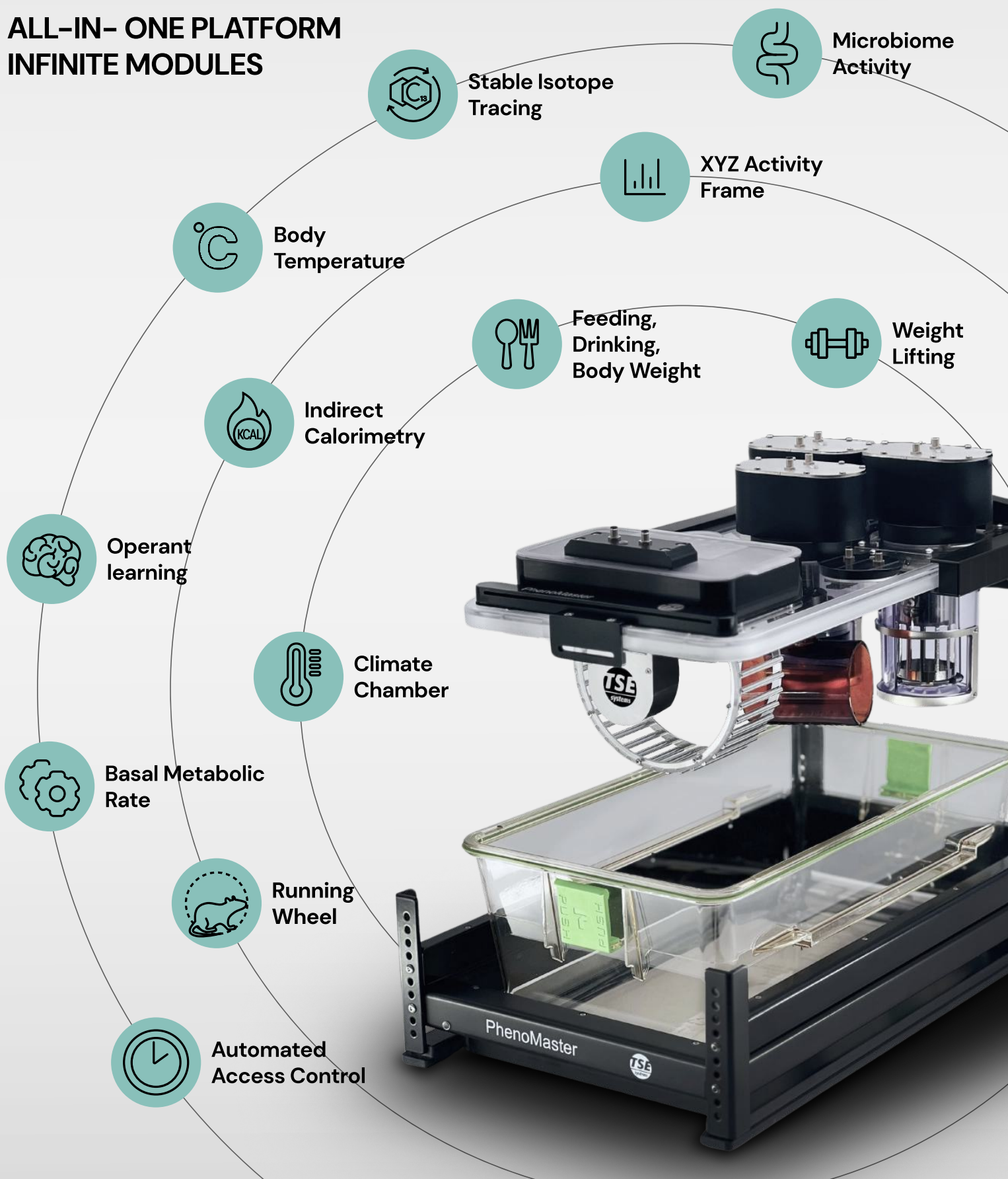Used in publications

15+

Integrated modules

Click to watch the most advanced metabolic phenotyping platform in action

From Metabolism to Behavior.
Complete Phenotyping.

Benefit from the widest selection of modules available on the market – designed to deliver insights that no other system can provide.

ALL-IN- ONE PLATFORM INFINITE MODULES

- Microbiome Activity
- Stable Isotope Tracing
- XYZ Activity Frame
- Body Temperature
- Feeding, Drinking, Body Weight
- Weight Lifting
- Indirect Calorimetry
- Operant learning
- Climate Chamber
- Basal Metabolic Rate
- Running Wheel
- Automated Access Control

PhenoMaster

Metabolism.
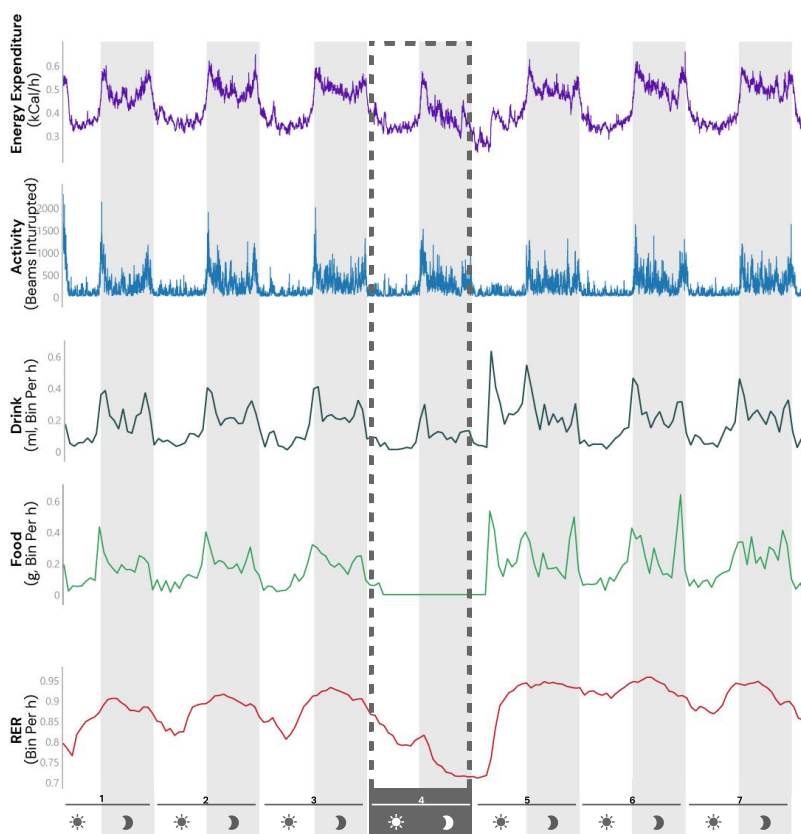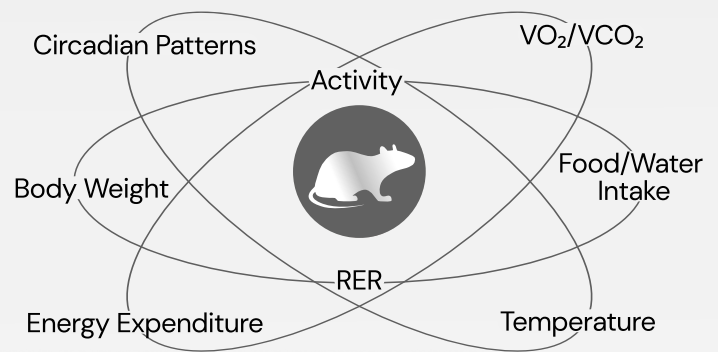# Reliable data. Reproducible results.

PhenoMaster NG captures every dimension of metabolic performance through continuous, synchronized data streams.

From oxygen consumption to respiratory exchange ratio, every parameter is measured with high temporal resolution and precision – allowing researchers to quantify energy balance, substrate utilization, and metabolic flexibility in real time.

The system integrates indirect calorimetry with advanced sensing of temperature, humidity, food and liquid intake, and body weight – all aligned in a unified data architecture for reliable and reproducible phenotyping.

ONE EXPERIMENT.
ONE TIMELINE.
COMPLETE SYNCHRONIZATION.

Long-term real-time monitoring of metabolic parameters in a cohort of mices shows precise synchronization across PhenoMaster modules.

Circadian Patterns · Activity · VO$_2$/VCO$_2$ · Body Weight · Food/Water Intake · Energy Expenditure · RER · Temperature

1 Across alternating light and dark phases, PhenoMaster clearly captures the circadian rhythm of nocturnal rodents. Energy expenditure and activity patterns show perfect temporal alignment, reflecting real time synchronization

2 Drinking behavior follows the same rhythmic pattern – increasing at night alongside feeding and activity, and decresing during the resting "light" phase.

3 During the fasting period (day 4), food intake stops and RER shifts and rebound accordingly, demonstrating metabolic adaptation captured by PhenoMaster.

CaloMax HS – The New Benchmark in Indirect Calorimetry

The most advanced indirect calorimetry technology ever engineered.

- 3× faster multiplex measurement engine
- Real-time hardware diagnostic for minimum downtime
- Extended sensor lifespan for long-term reliability
- 3 time smaller footprint
- Pre-filter unit for dust-free airflow

- Dual-pump redundancy for continuous operation
- Innovative Air-Conditioning system
- Multi-sensor board for different gas sensors integration and streamline response
- Automated moisture removal
- Minimum cabling for effortless handling

One platform. ———————————— Unlimited insight:


CaloMax HS · TSE systems

FLEXIBLE. SCALABLE. PRECISE.

PhenoMaster is a fully modular platform for indirect calorimetry and metabolic phenotyping – designed to evolve with your research.

Different cage architectures, gas analyzers, and sensor configurations can be flexibly combined to match any experimental design – from single-animal setups to large-scale high-throughput studies.

Continuous:	1 gas analyzer per cage, real-time 1s resolution	Short-term, acute studies
Multiplex:	Shared gas analyzers cycling between cages	Long-term, comparative experiments
Accelerated Multiplex:	Parallel analyzer pairs for simultaneous measurements	Cutting total runtime and expanding research flexibility

Beyond standard O_2 and CO_2 detection, the system also supports sensors for stable isotope tracing ($^{13}CO_2$/$^{12}CO_2$) and detection of CH_4 and H_2, expanding metabolic research into new analytical dimensions.

CH_4 CO_2 $^{12}CO_2$ O_2 H_2 $^{13}CO_2$
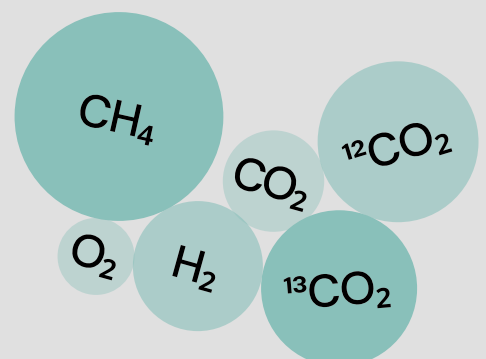
Behavior.
Activity. Exercise.

PhenoMaster covers key aspects of rodent behavior – from feeding to cognition, from spontaneous activity to exercise.

The system enables both broad phenotyping and the ability to zoom in on specific behavioral features with unmatched precision.

INGESTIVE BEHAVIOR & BODY WEIGHT

• Precise sensors continuously track food, liquid intake and body weight

• Perfect for choice and preference studies

• Up to four access controls enable: scheduled, paired or yoked feeding, and deprivation paradigms

Up to 4 Sensors per Cage

Spill & Leak Protection

High-Fat-Feeder   Programmable Access

More details: ➤

RUNNING WHEELS

• Designed for long–term studies in standard, workload, and skilled versions

• Quantify exercise, motor skills, and circadian motor learning activity patterns

• Available in durable stainless steel or smooth closed–surface design

Programmable Workload

Motor-Skilled Tests

Enable/Disable   Resistance Running

More details: ➤

LOCOMOTOR ACTIVITY
ActiMot3

• Infrared activity frame with unparalleled 1.25 mm resolution

• From circadian patterns, to physical displacement and animals fine behavior

• Operates under any light conditions

Unique Cage Lid Holder

Finest Infrared Technology

5 mm Sensor Spacing   100+ Parameters

More details: ➤

OPERANT WALL
Cognition & Memory

• Unique module for cognitive and motivation testing in home cage

• Equipped with nose pokes, levers and sensors for long-term testing

• Ideal for extensive, long-term and fully-automated studies

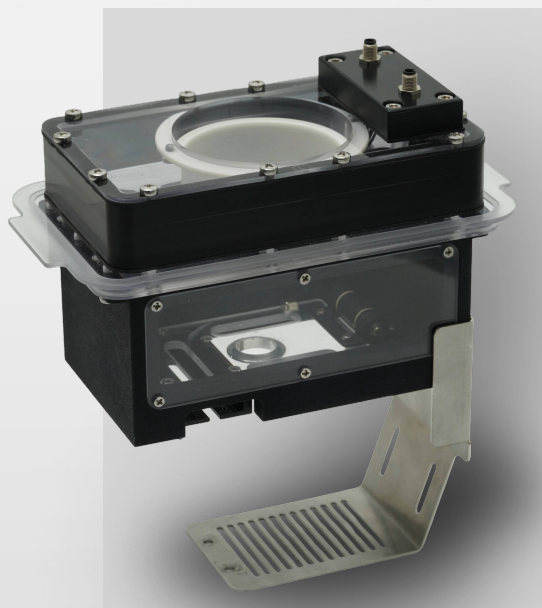Operant Behavior   Self-Administration

Food or Liquid Reward   Gut-Brain Axis

More details: ➤

WEIGHTLIFTING MODULE
Resistance Training

• Unique innovation for resistance training in rodents

• Adjustable weights enable standardized exercise paradigms

• Opens new perspectives in metabolism, aging, and muscle physiology research

Resistance Training   Muscle Adaptation

Adjustable Weights   Unique Innovation

More details: ➤

Unique Features

1 MULTI-SENSOR GAS ANALYSIS

All gas sensors are integrated into one native multi-board from a single manufacturer – not a patchwork of devices. This ensures the fastest speed, the highest precision, and unmatched stability in metabolic readouts.

2 SPECIAL CAGE LID HOLDER

Our exclusive design makes daily handling faster and easier. Bottles, feeders and bedding can be refilled in seconds – no need for extra hands or workspace.
The built-in holder keeps the lid in place during animal handling, reducing workload and technical effort.

3 FAST CALIBRATION & DATA ANALYSIS

System calibration takes only 20 minutes before starting experiment. After data collection, results are processed quickly using the new Software Analytics Package – delivering comprehensive insights in record time.

4 ISOLATORS & ENVIRONMENTAL MONITORING

Keep your experiments clean and controlled. Cages can be placed inside isolators for germ-free or infectious studies, protecting both animals and researchers.
The Lab Environmental Monitor continuously tracks CO_2, temperature, humidity, light and noise. Alarm system with push notifications ensures experiment safety.

PhenoMaster

Up to 18 cages per chamber

Transparent doors

Temperature, humidity, light control

5	**CROSS-SPECIES COMBI SYSTEM**	A single modular platform supporting both mice and rats. Adjustable airflow and shared core modules allow precise adaptation to different species and cage volumes – maximizing flexibility and efficiency.
6	**GAS SENSOR FOR H_2 DETECTION**	Optional gas sensor integrated into indirect calorimetry to measure gut-derived hydrogen production, enabling advanced analysis of microbiome activity.
7	**EXTENSIVE CAGE SELECTION**	PhenoMaster offers a wide selection of specialized cages – including OptoCage, Urine & Feces Collection Cages, Basal Metabolic Rate Cage, Iso-Cage, Obese-Rat Cages, etc.
8	**ADVANCED EXERCISE MODULES**	Comprehensive suite of exercise tools – from voluntary running wheels to programmable resistance wheels and the Weightlifting Module.
9	**CAGE-LEVEL CLIMATE MONITORING**	Temperature and humidity sensors integrated into the cage lid track the exact microenvironment of each animal, ensuring consistent data and reproducible result.
10	**HUMIDITY CONTROL**	Humidity is a critical factor in metabolic research, influencing thermoregulation and energy expenditure. PhenoMaster is the only system allowing researchers to control this key variable inside the climate chamber.

SCIENTIFIC BREAKTHROUGHS POWERED BY PHENOMASTER

Discovering New Pathways in Metabolic Control

With the help of the PhenoMaster, Professor Matthias Tschöp and his team **identified a new class of multi-receptor drugs targeting** GLP-1, GIP and glucagon pathways, revolutionizing the treatment of obesity and metabolic diseases.

🖰 Case study

Pioneering Stable Isotope Integration

In 2018, TSE Systems pioneered the integration of ^{13}C and ^{12}C isotope sensors directly into the PhenoMaster indirect calorimetry system, enabling fully automated in vivo substrate tracing and **setting a new standard for metabolic research worldwide.**

📰 Articles

Decoding the Microbiome in Controlled Environments

PhenoMaster platform enabled fully automated measurement of H_2 and CH_4 gases and introduced specialized isolators for germ-free animal studies, allowing researchers to investigate the complex dialogue between microbiota and host metabolism with unprecedented precision.
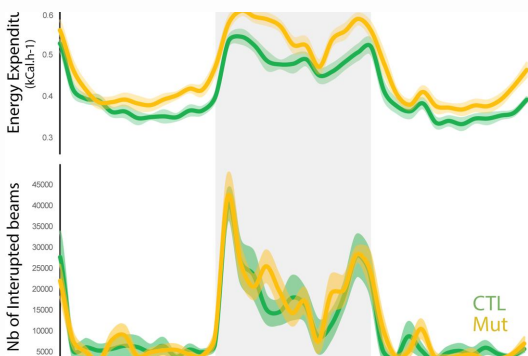
☆ Best practice

Analyze Faster. Discover More.

Turn complex datasets into clear insights with the new PhenoMaster Analytics Software, automated data preprocessing and standardized output sagnificantly reduce analysis time – allowing you to focus on discovery instead of manual processing.
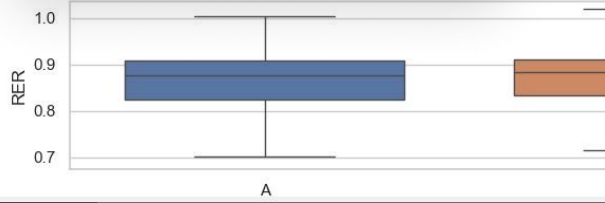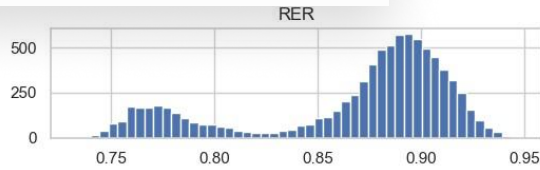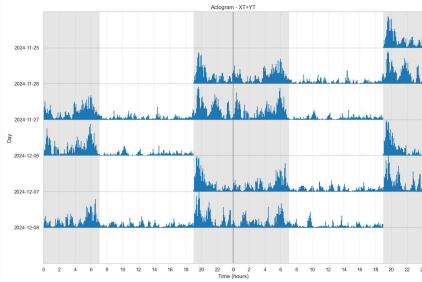
Powerful visualization tools and advanced statistics such as ANOVA, ANCOVA, and principal component analysis enable deep, flexible exploration of metabolic and behavioral results.

Built for reproducibility, collaboration, and speed – all in one seamless platform.

Investigation of energy expenditure and locomotor spontaneous activity in various animal cohort
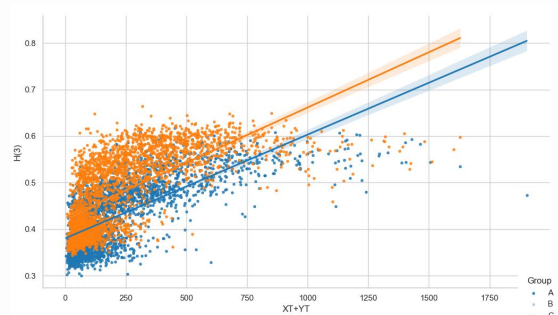

Actogram Analysis

ANCOVA and linear regression analysis of the relationship between EE and activity across genotypes

Statistical analysis across different genetic backgrounds and conditions
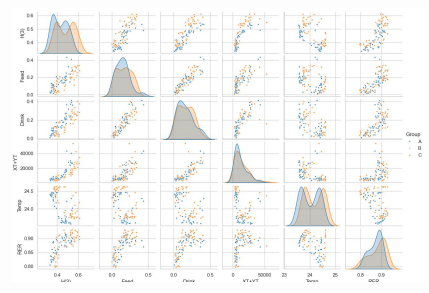
Why PhenoMaster?

MAXIMUM DATA FROM ONE EXPERIMENT

Over 15 integrated modules – including Calorimetry, Microbiome Gas Sensors, Activity, Feeding, Body Weight, Operant Wall, Running Wheel, Weight–Lifting Module, and Stable Isotope Tracing – deliver 100+ synchronized data readouts from a single setup.

ENHANCED ANIMAL WELFARE & SPACE EFFICIENCY

Up to 30 % more engaged living space, reduced disturbance through non–invasive refilling, and a clean, open design that minimizes stress and intervention – because data quality starts with animal wellbeing.

CONTINUOUS INNOVATION & SEAMLESS UPGRADES

Since 2004, PhenoMaster never stands still. Out team continuously develops new modules, sensors and analytics tools – keeping the platform at the forefront of research technology. Each upgrade integrates effortlessly, giving users early access to the latest innovation without replacing existing hardware.

GERMAN QUALITY & SAFETY

Manufactured in Germany under strict ISO 9001 quality standards. Precision engineering ensures reliability, safety, and extended lifespan–benchmark of durability and trust. Dedicated technical & scientific support helps maintain performance and achieve consistent results.

> "
> The TSE PhenoMaster system has been critical to advancing our science, and our ability to precisely quantify a broad range of metabolic outcomes in our rodent models. The service team has aided us every step of the way in troubleshooting and keeping us up and running. Working with Gary has been amazing. He assisted us every step of the way from evaluating a purchase to ensuring prompt and attentive service even after the purchase.

Brian DeBosch
Associate Professor | Washington University
School of Medicine
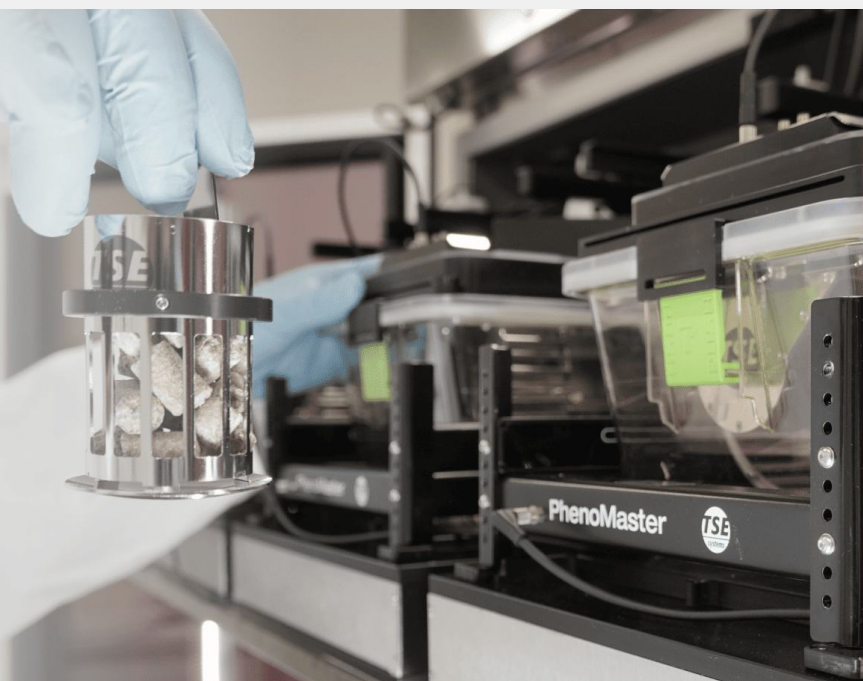
Your next discovery starts here

Connect

1 CLICK HERE:

Consult

2 BOOK A 20-MINUTE DISCOVERY CALL

Discuss your research goals with our experts

Configure

3 GET YOUR TAILORED SYSTEM CONFIGURATION

Optimized for your study design and parameters