

# CaloBox

Push-button Respirometry for experimental research



Product information

# CaloBox

## Reliable and easy-to-use metabolic measuring

### INTRODUCTION

The PhenoSys CaloBox is a reliable and easy-to-use metabolic measuring device for experimental research and teaching. It is specifically designed to make indirect calorimetry of mice and small vertebrates feasible for every researcher. You simply press "Start" and the CaloBox does the job.

### KEY FEATURES

- Measurement of metabolic rate ( $O_2$ ,  $CO_2$  and  $H_2O$ )
- Direct report of energy expenditure and respiratory exchange ratio
- Push-button operation
- No air drying required
- Continuous recording with down to 4 sec interval
- Runs smoothly 24/7
- Automatic zero adjustment
- All sensor data accessible

### CALOBX SETUP

The CaloBox package comes as a ready-to-use set-up. This entails the CaloBox itself, with its sensor and pump functionality, the computer with preinstalled software package, and a tubing set. Connect the tubing to our optimized measuring cuvette for mice or to your own chamber and start your experiment.

### APPLICATIONS

Due to its high measuring accuracy, reliability, and easy handling the CaloBox is used in basic and applied research as well as in teaching. It finds its application in all fields of experimental research related to animal metabolism, nutrition, thermoregulation, torpor, bioenergetics, and animal behavior.

### KEY FUNCTIONS

- Internal pumps for air flow through animal cuvette (30-150 l/h)
- Measurement intervals of down to 4 s
- No drying of air required
- Measurement of  $O_2$ ,  $CO_2$ , and water vapor content in sample air
- Comparison of sample air to reference air
- Calculation of metabolic rates:
  - $O_2$  consumption ( $VO_2$ )
  - Carbon dioxide production ( $VCO_2$ )
  - Water vapor evaporation ( $VH_2O$ )
  - Respiratory exchange ratio (RER, RQ)
- Energy expenditure (EE) calculation based on  $VO_2$  and RER
- Automatic adjustment of gas sensors with reference air (zero adjustment) in pre-set intervals
- Results are continuously recorded and displayed
- Raw data of all sensors stored for user defined calculations



# PhenoSys CaloBox – discover the principle of easy and convenient usability

Small, portable, simple, reliable and user-friendly technology  
Push one button and get results

## SOFTWARE

The CaloBox software follows the principle of easy and convenient usability.

For each measuring point all relevant parameters are displayed and the corresponding respiratory exchange ratio (RER) and the energy expenditure (EE) are directly calculated.

You can easily align measurement intervals and zero adjustment, add comments, or check the sensors.

The software saves two output files in .csv format.

The first file contains the results for a straight forward analysis. The second file includes the raw data with every single sensor output, giving you full freedom of data analysis and experimental control.

## ORIGIN

The CaloBox is the result of years of development by Prof. Gerhard Heldmaier, professor for animal physiology at Marburg University, Germany.

PhenoSys is proud to make the CaloBox available to the scientific community jointly with Prof. Heldmaier.



*“ After having used conventional indirect calorimetry setups for many years myself, and introducing students into the secrets of direct and indirect calorimetry, I am confident about the validity of first law of laboratory work: anything that can go wrong, will.*

*This showed me that there is need for the development of a small, portable, simple, reliable and user-friendly technology – the CaloBox: you push one button, and you get results. ”*





## Technical Specifications

Resolution	
Dimensions	350 × 300 × 158 mm (L×W×H)
Weight	3.5 kg
Power	100-240 V
Internal battery	2.2 h
Sensors	
<b>O<sub>2</sub>-sensor</b>	O <sub>2</sub> fuel cell
Range	0-25 Vol %
Response time	12 sec
Accuracy	up to +/- 0.001 Vol %
Sensor life time	5 years
<b>CO<sub>2</sub>-sensor</b>	NDIR-cell (non dispersive infrared)
Range	0-0.5 Vol %
Response time	2 s
Accuracy	up to +/- 0.001 Vol %
Resolution	0.001 Vol %
<b>Humidity sensor</b>	Relative humidity
Range	0-80 %rF
Response time	8 s
Resolution	+/- 1.8 %rF
Accuracy	0.025 %
<b>Temperature (at sensor unit)</b>	
Range	-40-80 °C
Accuracy	+/- 0.3 °C
Resolution	0.04 °C
<b>Temperature (at animal cuvette)</b>	Resolution: 0.1 °C
Resolution	0.1 °C
Air Flow	
Pump	longlife membrane pumps with brushless dc motor and iron free rotor
Sampling	0.5-2.5 sLpm (30-150 L/h)
Response time	60 ms
Repeatability	+/- 0.5 %

### RECENT PUBLICATIONS

Wellbrock AHJ, Eckhardt LRH, Kelsey NA, Heldmaier G, Rozman J, Witte K. 2022 Cool birds: first evidence of energysaving nocturnal torpor in free-living common swifts *Apus apus* resting in their nests. *Biol. Lett.* 18: 20210675.

Elfers K, Armbrrecht Y, Brede M, Mazzuoli-Weber G, Heldmaier G, and Breves G 2022 How much does it cost? Teaching physiology of energy metabolism in mice using an indirect calorimetry system in a practical course for veterinary students. *Adv Physiol Educ* 46: 145–157.

Yamagata T, Kahn MC, Prius-Mengual J, Meijer E, Sabanovic M, Guillaumin MCC, van der Vinne V, Huang Y, McKillop LE, Jagannath A, Peirson SN, Mann EO, Foster RG, and Vyazovskiyb VV. 2021 The hypothalamic link between arousal and sleep homeostasis in mice. *PNAS Vol.* 118 No. 51

Martire VL, Berteotti C, Bastianini S, Alvente S, Valli A, Cerri M, Amici R, Silvani A, Swoap SJ, and Zoccoli G. 2020 The physiological signature of daily torpor is not orexin dependent. *Journal of Comparative Physiology* 190:493–507



 **PHENOSYS**

PhenoSys GmbH

Eichborndamm 167 Bldg. 42

13403 Berlin ▪ Germany

phone: 49 (0) 30 28 87 98 67

e-mail: [info@phenosys.com](mailto:info@phenosys.com)