Treadmills

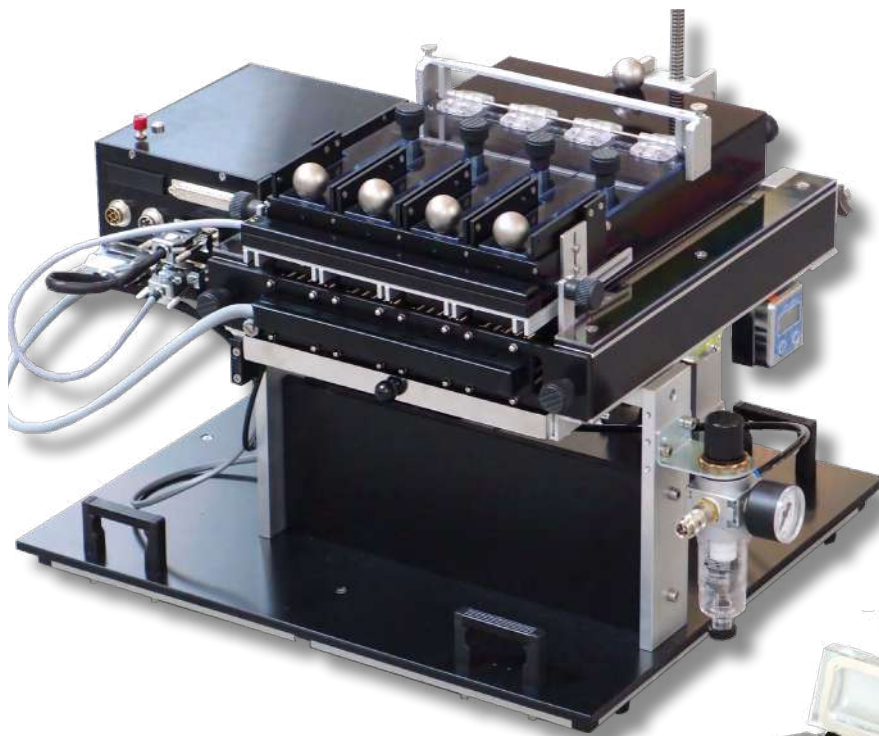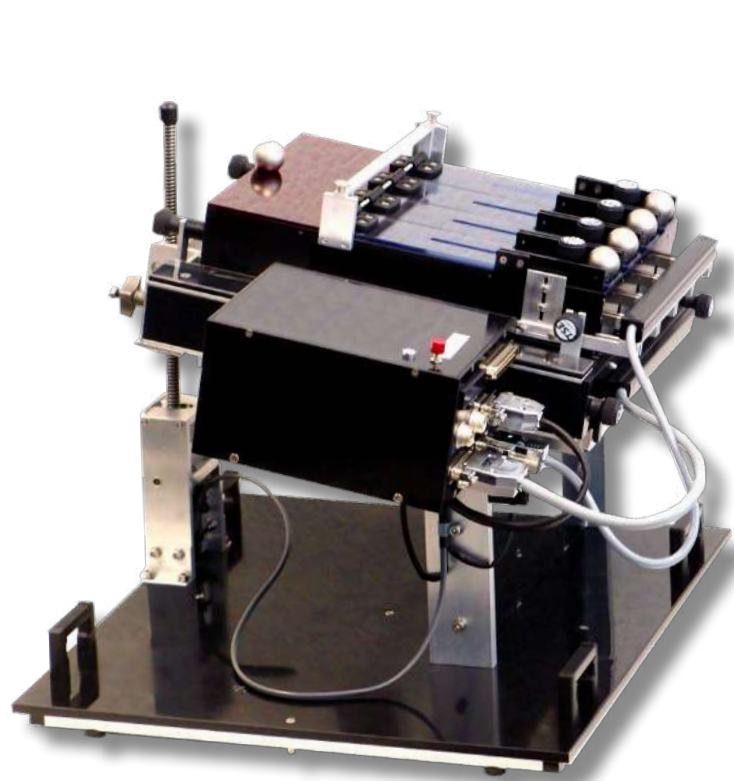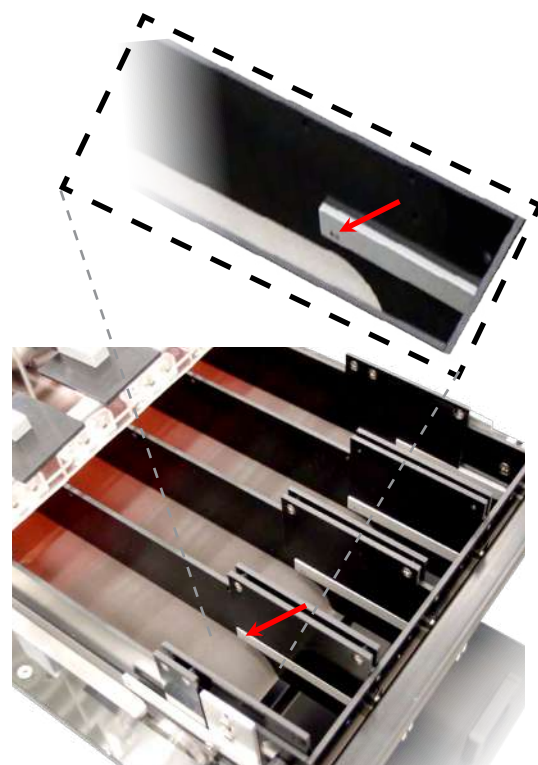## Motor Training, Fitness Monitoring &
Exercise Calorimetry
For Mice & Rats

4-lane treadmill tilted upwards

Lanes with doors open; arrows show infrared light beams

Treadmills: Key Features

- 1, 2, 4, 5 or 6 lane models for mice; 1, 2 or 4 lane models for rats
- Infrared light beam barrier detects if animal drifts off the belt
- Air puff, foot shock or manual pusher and a darkened front end keep the animal on track
- User-defined, software-driven speed profiles
- Online trial / performance monitoring, all lanes at a glance
- Individual or group data table ready for export

Hardware

- Computerized system for the investigation of general motor function and coordination, and application of customized exercise schedules (e.g. for motor recovery)
- The running belt is driven by a servo-motor at precise operator-defined tread speed
- The belt surface is specially manufactured for optimal grip
- The whole belt can be tilted up or downwards, thereby varying the work load / coordination demand; multi-lane models (with larger and heavier belt) feature a motor-controlled stepless adjustable incline, whereas single-lane models feature a manual incline adjustment mechanism
- Multi-lane models are delivered with separating panels, which divide the belt surface into separate exercise lanes, each suited for one animal
- Lanes are equipped with an infrared light beam barrier, which detects when the animal is falling behind, drifting off the belt
- If the animal drifts off the belt, it lands on a metal floor grid - a safety feature offering save grounds for fatigued animals

Multi-lane models:

- Combination systems suited for both, mice and rats
- Single belt system, durable with perfect grip
- Motor-driven stepless inclination adjustment

Single-lane models:

- Pure exercise treadmills OR CaloTreadmills (mouse only) for evaluation of exercise related metabolic changes

- Below the floor grid is an excrement outlet
- The lane cover is red (dark for animals) at the front end to increase the animal's motivation for running into that direction
- On top of each lane is a translucent hinged door allowing easy placement and removal of the animal

CaloTreadmills

- All single lane mouse treadmills can be connected to the TSE indirect gas calorimetry system (CaloSys) enabling metabolic measurements during different exercise conditions
- Configured for PUSH or PULL mode calorimetry with either air tight or non airtight cover, respectively
- Continuous calorimetry with sample collection at high temporal resolution permitting precise correlation of physical strain and metabolic readouts
- Gas sampling can also be timed / synchronized according to the phases of the running profile (e.g. at the beginning and end of each phase, where each phase is characterized by a certain speed)

Motivators

- Optional elements that help keeping the animals on track

Manual Pusher

- An optional manual pusher can be installed on the lane cover, which can be used to gently push animals back onto the running belt once they have "landed" on the floor grid
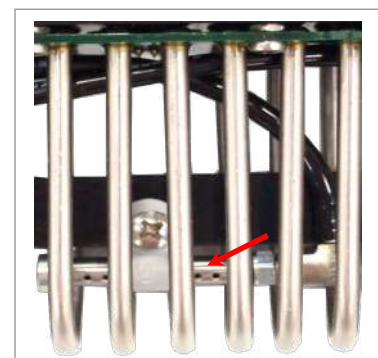
Foot Shock

- The floor grid can be equipped with an electric foot shock module
- Constant current electric stimuli are applied with user-defined intensity (0-3.1mA), duration, and inter-shock interval
- In multi-lane systems, floor grids of each individual lane shock indepently from each other
- Shocks are elicited automatically once the animal has interrupted the light beam barrier for a user-defined minimum duration
- Shocks may also be applied manually by the experimenter

Air Puff

- All Treadmills are preconfigured for addition of an optional air-puff module, which represents a highly effective alternative to foot shocks
- Integrated into the floor grid, valves emit an air puff against the ventral side of the animal
- Air puffs of adjustable strength are elicited either automatically upon beam break or manually by the experimenter

Unique-Feature

Software

- The treadmill software is a module of the flexible PhenoMaster software
- CaloTreadmill configurations require simple addition of the CaloSys software module, which appears as additional tab in the main task bar and fully interacts and synchronizes with the treadmill module
- The software is highly intuitive and offers numerous options for the definition of user-defined exercise protocols including:
  - Speed profiles up to 100 phases, each characterized by initial speed, final speed, and acceleration / deceleration time
  - Definition of electric shock or air puff conditions
- All entries and definitions are saved within the corresponding experiment file
- Speed profiles can be saved and reloaded for future experiments
- Data acquisition can be started individually for each lane or simultaneously for all lanes
- An online display shows: current phase within the speed profile, tread speed, elapsed phase time, current status of each lane
- Output parameters include: distance covered, wattage (power an animal invested considering the inclination angle, speed and animal weight), instances of getting off the belt / interrupting the light barrier (specified by time elapsed since start, at which phase of the speed profile, at what speed), shock deliveries
- Data can be viewed in table format and be exported as .csv-file

Top: floor grid for e-shocks with air puff holes
Bottom: manual pusher integrated into door

Phase	sec	rpm	rpm
1	20	2.00	40.00
2	5	40.00	55.00
3	20	55.00	5.00
4	20	5.00	55.00
5	20	55.00	5.00
6	20	5.00	55.00

Speed Profile — Setup — Save — Load

Top: speed profile editor; Bottom: acquisition window

Selected Publication

- **Jeppesen J et al. (2013)** LKB1 regulates lipid oxidation during exercise independently of AMPK. Diabetes, 26(5):1490-9; **Group of Kiens B, August Krogh Centre and Molecular Physiology Group, Department of Exercise and Sport Sciences, University of Copenhagen, Copenhagen, Denmark**

Service & Warranty

TSE Systems offers a Two (2) Years ALL-IN Premium Warranty with all new products, including:

- 24/7 technical hotline
- Remote maintenance and update function
- On-site visits upon necessity
- Free replacement parts during warranty

After the expiry of the warranty period, TSE Systems offers comprehensive extensions of the warranty or economical maintenance and repair contracts to ensure the continued smooth running of your instruments. Please contact us for further details.

www.TSE-Systems.com   Info@TSE-Systems.com