



# Buxco<sup>®</sup> Rat Head-Out Plethysmography

## Designed for the Demanding Safety Assessment Environment

Head-Out plethysmographs are used to measure basic respiratory endpoints in conscious, restrained subjects. Using a direct measurement approach, this simple and reliable method relies on the expansion and contraction of the thorax to calculate inspiratory and expiratory flows and volumes. This solution significantly reduces overall system cost as compared to other solutions as it requires fewer peripheral components and laboratory space.



### Features

- Available in three sizes to accommodate the most common weight ranges
- Small 125-200\* grams, Medium 200-400\* grams, Large 400-600\* grams (\*approximate)
- Compatible with most data acquisition, amplifier, and transducer solutions
- Modular design, easy to load subject, and easy to disassemble for cleaning
- Robust polycarbonate tubing, capable of handling high temperature cleaning processes
- Patented Allay<sup>TM</sup> restraint, promotes a more natural and relaxed respiratory pattern
- Removeable one-piece silicone neck seal for improved acclimation and comfort
- Removeable one-piece silicone rear cap fitted with pneumotach screen and flow transducer
- Molded silicone components are durable and suitable for high temperature cleaning processes
- Integrated pneumotach utilizes a perimeter reinforced screen, and is quickly replaced without tools
- Integrated transducer ports to enable quick and easy transducer connection without tubing\*\*
- Low drift, high-accuracy solid-state flow transducer in a small ruggedized form factor
- Accessory ports accommodate infusion lines, biopotential leads, or other required chamber access
- Compatible with implantable telemetry to acquire additional physiologic endpoints

### How it Works

The Head-Out chamber uses a differential pressure transducer and pneumotach screen to measure the difference between atmospheric pressure and the pressure inside the chamber. An airtight seal is created around the subject's neck; allowing the head to be positioned outside the chamber while rest of the body is inside the chamber. After a simple calibration, oscillatory pressure changes from the rat's respiration induce a measurable differential pressure across the resistance of the pneumotach screen which is measured by the flow transducer. The pressure changes are linear to air flow. The signal from the transducer is acquired by the data acquisition hardware and processed by the software, converting it to a flow and volume signal. The signals are then analyzed; calculating a variety of derived parameters including: Breaths per minute, Tidal Volume, Minute Volume, Peak Inspiratory Flow, Peak Expiratory Flow, Inspiratory Time, Expiratory Time.

\*\* When using Buxco flow transducer

## **Key Benefits**

### **Economical**

The simple, easy to use, robust design of the Buxco head-out chamber is economical to purchase, maintain and run high volume studies. Available in three sizes to accommodate a wide range of subject weights. All related hardware and software are compatible with all chamber sizes making transitions between sizes quick, easy, and cost effective. The ease at which the chamber can be disassembled and cleaned reduces labor costs.

### **Improved Animal Welfare**

DSI's utilizes the patented Allay restraint system which secures the animal without compressing the thorax as done with many other plunger-type restraint devices. This design improves animal comfort and data quality since the rodent exhibits a more natural and relaxed respiratory pattern. Breathing patterns observed using a plunger style chamber can be unnatural, and frequently exhibit inspiratory holds as the animal struggles to breathe.

### **Durable and Easy-to-Clean**

The tubular components are made from durable polycarbonate which have a higher heat tolerance than other materials often utilized. The temperature tolerance enabling use of industrial cage washing systems to easily clean the chambers. The neck seals and rear plethysmograph cap are made of a flexible and durable molded silicone. These components have a higher heat tolerance than other materials often utilized. These components are compatible with industrial cage washing systems and autoclave sterilization methods.

### **Efficiency / Ease of use / Acclimation**

The new chamber design improves upon the traditional thick rubber and thin latex laminated neck seal design which made it difficult to load the subject; the thin latex was also prone to tearing as it did not maintain its flexibility over time. This required regular seal replacement which was a tedious and time-consuming process. DSI's new design has dramatically improved the subject loading technique. First the subject is restrained using the Allay restraint clip within the restraint tube, then the silicone neck seal is inserted over the subject's head, followed by adding the rear tube and inserting rear cap. By separating those tasks, the restraint system makes it easy to safely restrain the rodent and make an airtight seal around its neck. The rodent can be acclimated at different points throughout the process in order to allow them to slowly adjust to the confinement of the chamber.



Compatible with most data acquisition, amplifier, and transducer solutions.  
Shown with DSI's ACQ-7700 signal conditioner.