

ACTIVITY, MOTOR CONTROL & COORDINATION SPONTALEOUS PAIN - POSTURAL DEFICIT • PAIN - THERMAL ALLODY-NIA / HYPERALGESIA • PAIN - MECHANICAL ALLODYNIA / HYPERAL-GESIA • ANXIETY & DEPRESSION DISORDER • LEARNING - MEMORY - ATTENTION - ADDICTION • PHARMACOLOGY & PHYSIOLOGICAL PA-RAMETERS • SURGERY & STEREOTAXY EQUIPMENT • METABOLISM

MEETING YOUR NEEDS BY DESIGNING INNOVATIVE AND HIGH-QUALITY SOLUTIONS FOR YOUR RESEARCH

# STUDIES ON ACTIVITY, MOTOR CONTROL & COORDINATION



- Grip Test
- Activity Wheels
- Ladder Test
- Kinetic Weight Bearing



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AN EASY WAY TO OBJECTIVELY QUANTIFY THE MUSCULAR STRENGTH OF RODENTS



#### HOW DOES IT WORK?

The Grip Strength Test is **simple to operate**: the operator holds the animal by the tail (mice) or the body (rats) and lowers it toward the apparatus.

Depending on the disease studied, the animal is allowed to grab the metal grid with 4 paws or the T-bar with 2 paws (front or hind). It is then pulled backwards in the horizontal plane until it release the grasping tool. The force applied to the grid or to the bar, just before it loses grip, is recorded as the Peak force.

The measurement is accomplished using a **highly accurate** force sensor at a sampling rate of 1000Hz to ensure that peak forces are perfectly captured. Results are displayed in grams, newtons, or lbs (user's choice) directly on the large LCD screen of the instrument.

# BIO-GS3 Grip Strength Test



INSTRUMENT OVERVIEW

Bioseb's Grip Strength Test is **an easy way to objectively measure the muscular strength** of rodents (mouse and rat) by determining the maximal force developed when the operator tries to pull it out from a designed grid or bar.

Having been documented in more than 300 publications, it is now a standard for all Phenotyping Centers. In this regard, it has been validated by the EMPRESS (European Mouse Phenotyping Resource of Standardised Screens), is used around the word for the study of neuromuscular functions and to assess the effect of drugs, toxins, and neurodegenerative diseases on muscular degeneration.

#### **KEY FEATURES**

- Largely reviewed, standard test (300+ publications)
- Peak force catch at a very high frequency of 1000 Hz
- Up to 100 value internal memory
- Embedded statistic calculations on those values
- Dedicated accessories (T shape Bar and Grid) specifically designed for Mice and Rats

An **internal statistical computation** has been included in the electronic device. Once the number of trials per subject (sample) has been defined, the Peak force for each trial, Mean Force/animal, standard deviation, etc are recorded in the internal memory for data transfer through BIO-CIS software: a very useful feature for those having large cohort of subjects.

Sensor Capacity	0 – 2, 5 kg (25N) - Other capacities on request.
Accuracy	0,1 % of full scale
Display resolution	0.1 g
Sampling resolution	1000 Hz
Data Output	USB to computer via dedicated cable
Internal memory	100 individual values
Overall dimensions	Footprint of 400x180x200 mm
Power supply	Power adaptor (100-240 V) or rechargeable battery (included)
Grid and Bars	Stainless steel, with a specific design to protect the animal paws from injuries, different grids and bars are available depending on the specie and the limbs to be tested.

#### TECHNICAL SPECIFICATIONS

### BIO-GS3: Bioseb's Grip Strength Test - Already a classic!

#### DEDICATED SOFTWARE

The BIO-CIS Software allows you to reduce inter-operator variability. BIO-CIS can be used in two different ways with the Grip Strength Test:

**Direct measurement:** When the Grip Test is connected to the BIO-CIS software during measurement, the software displays the real-time graph of applied force vs time in real-time and store the value in an Excel spreadsheet The curve is a real help for new users of the instrument as it allows the operator to work on is gesture. It increase reproducibility between measurements from the same operator but also reproducibility between operators as well.

**Indirect measurement:** Transfer of internal memory of the Grip test to the computer as an Excel spreadsheet.



#### ACCESSORIES



#### HIGHLIGHTHED BIBLIOGRAPHY Exhaustive list on our website

Evidence that corticofugal propagation of ALS pathology is not mediated by prion-like mechanism, Progress in neurobiology (2021), J. Scekic-Zahirovic et al, DOI: 10.1016/j.pneurobio.2020.101972

Autonomous climbing- An effective exercise mode with beneficial outcomes of aerobic exercise and resistance training, Life sciences (2021), Shen et al, DOI: 10.1016/j.lfs.2020.118786

Proinflammatory and bone protective role of calcitonin gene-related peptide alpha in collagen antibody-induced arthritis, Rheumatology (Oxford) (2021), T. Maleitzke et al, DOI: 10.1093/rheumatology/keaa711.

Characterization of a CholesteroNitrone (ISQ-201), a Novel Drug Candidate for the Treatment of Ischemic Stroke, Antioxidants (2020), E. Martínez-Alonso, DOI: 10.3390/antiox9040291

#### ORDERING INFORMATIONS

Reference	Description
BIO- <b>GS3</b>	Grip Strength Test for rats/mice
	incl. stand, console, power supply
	& 1 grasping accessory
BIO- <b>gripgs</b>	Grid for mice
BIO- <b>GRIPGR</b>	Grid for rats
BIO- <b>GRIPBS</b>	Bar for mice
BIO- <b>GRIPBR</b>	Bar for rats
BIO-GRIPBR-HALF	Special L-Bar for rats

Reference	Description
BIO- <b>GS3-50N</b>	Equipped with 50N sensor, special model for strong rats
BIO- <b>CIS</b>	Force ramp software values
ET-BIO- <b>GT</b>	Calibration with certificate
BIO-GS3-CONTROL	Kit for Grip test maintenance

Contact us for more details info@bioseb.com

#### FOR MORE INFORMATION, VISIT OUR WEBSITE: WWW.BIOSEB.COM/GRIPTEST

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# BIOSEB In Vivo Research Instruments

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AN EASY WAY TO QUANTIFY RODENTS' SPONTANEOUS ACTIVITY IN THEIR HOME CAGE ENVIRONMENT



The rat version of our Spontaneous Activity Wheel

#### HOW DOES IT WORK?

Bioseb's wheels are easy-to-use, time-efficient and reliable.Thanks to the large cage size, a single animal can be housed for several days undisturbed. Animals benefit from free access to a running wheel, and the large diameter allows for comfortable and natural exercise. The height of the wheel is sufficient to accommodate normal cage bedding. A convenient "Pause" option in the recording software allows researchers to clean the cage with minimal data interruption.

Two different setups available :

#### Stand alone:

Thanks to embedded LCD counter, the distance travelled by the subject over the time is displayed on real-time for each single cage. An economical solution for basic activity monitoring!

#### Fully-Integrated-monitoring solution:

A straightforward solution for the comprehensive monitoring of up to 64 cages simultaneously. Thanks to the recording software, Bioseb's Activity Wheels monitor and anayse up to 22 parameters automatically!

# **BIO-ACTIVW:** Spontaneous Activity Wheels

Bioseb's Spontaneous Activity Wheel is **an easy and costefficient way to quantify rodents' spontaneous motor activity in their home cage environment**. Separate models are available to accommodate both rat and mouse monitoring.

The system allows you to record parameters pertaining to the **voluntary exercise of animals**, which freely decide upon timing and intensity. Monitoring and recording typically takes place over extended periods of time (several days or weeks) in order to analyze and evaluate differences in behavior and exercising patterns induced by drugs or surgical manipulation. Though the analysis focuses on spontaneous activity, it is highly relevant for long-term studies on alterations of the circadian rhythm.

Measurements include: distance run both directions, average/ min/max speed, acceleration, total time in the wheel, and can be displayed in statistical form or sorted by customizable time periods.

#### **KEY FEATURES**

- Allows monitoring of spontaneous motor activity
- Minimal stress: large living cage, mesh lid, free access to food and water
- Reliable: coding disk, LCD screen counter & IR sensors
- Accurate rotation measurement: records accel. pattern
- Excellent angular resolution (22°) & time resolution (1 s)
- High Material Quality : low wheel rod friction, to ensure natural exercise
- Clever design : only one cable per cage !
- Practical, sturdy design: durable & easy to clean
- Software allows simult. monitoring of up to 64 wheels
- Cost-effective setting: operator independent with fully-integrated system
- Suitable for both rats and mice

#### TECHNICAL SPECIFICATIONS

Dimensions of Mouse setup BIO-ACTIVW-M	Cage Type II L, made of Polycarbonate Wheel diam 23 cm, Lane width : 7cm, made of Stainless Steel Overall Dimensions (LxWxH) : 37x21x28cm
Dimensions of Rat setup BIO-ACTIVW-R	Cage Type III, made of Polycarbonate Wheel diam 34 cm, Lane width : 9cm, made of Stainless Steel Overall Dimensions (LxWxH) : 49x27x41cm
Angular resolution	22° in both directions
Minimum Analysis Period	10 sec
Power supply	240 / 110 V, 50 / 60 Hz

### BIO-ACTIVW: Spontaneous activity wheels for rats and mice

#### DEDICATED SOFTWARE

For a comprehensive analyze of the subject's activity profile over the entire experiment duration, the recording software BIO-ACTIVW-SOFT allows monitoring of up to 64 wheels, when connected to a single PC. For each individual wheel or group of wheels, the parameters measured are: :

- Travelled distance (m or km)
- Speed
- Acceleration m/(min.s)
- Number of exercise events
- Subject's activity duration (s)
- All parameters can be displayed for Clockwise and/or Counterclockwise direction, if necessary

The software has been carefully developed for simple and convenient use :

- One screen displays Activity Monitoring for all wheels
- Suitable for long-term studies : pause recording during cage cleaning!
- Customized setting according to user's needs
- Data can be re-compiled in analytical mode on an adjustable period of 10 s up to 24hr or more
- Data outputs : .csv and .xls

#### DOMAINS OF APPLICATION

- General physical activity
- Motor-function
- Alterations of circadian rhythms
- Indirectly: depression & mood disorders, stress response
- Drug screening
- Phenotyping
- Metabolic Diseases, Obesity, energy-balance
- Cardio-vascular disorders

#### MAINTENANCE

- Standard cage and coding disk: made of transparent polycarbonate: visual inspection & standard cleaning procedures
- Rotating wheel, supporting rod, and meshed lid: made of stainless steel and dismountable for cleaning
- Counter, with power unit (no risk of data loss due to low battery): easily removable for cleaning and sensor adjustment.

#### HIGHLIGHTED BIBLIOGRAPHY

Peripherally Acting -Opioid Receptor Agonists Attenuate Ongoing Pain-associated Behavior and Spontaneous Neuronal Activity after Nerve Injury in Rats, Anesthesiology (2018), V Tiwari, M Anderson et al., DOI: 10.1097/ ALN.000000000002191

Evoked and Ongoing Pain-Like Behaviours in a Rat Model of Paclitaxel-Induced Peripheral Neuropathy, Pain Research & Management (2018), LA Griffiths, NA Duggets et al., DOI 10.1155/2018/8217613

#### ORDERING INFORMATION

Reference	Description	Reference	Description
BIO-ACTIVW-M	Wheel for mice with Power unit	BIO-ACTIVW-R	Wheel for rats with Power unit
<b>BIO-ACTIVW-MA</b>	Additional Wheel for mice	BIO-ACTIVW-RA	Additional Wheel for rats
BIO-ACTIVW-SOFT	Data Acquisition Software		

#### FOR MORE INFORMATION, VISIT OUR WEBSITE: WWW.BIOSEB.COM/WHEELS

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The mice version of our Spontaneous Activity Wheel

Neuromuscular diseases :

- Duchenne muscular dystrophy, ALS
- Non-reflexive tests of inflammatory pains
- Behavior/exercise pattern differences induced by drugs or surgical manipulation
- Comparative studies Forced vs. Spontaneous Exercise
- Recovery after surgery, SCI

and much more...





# BIOSEB In Vivo Research Instruments

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THE PERFECT TOOL TO MEASURE RODENT WALKING SKILLS IN AN AUTOMATIC WAY



#### HOW DOES IT WORK?

The horizontal ladder is constructed of a Plexiglas corridor with **removable plastic rungs** that are inserted with a regular spacing to create a floor. The purpose of the test is to access the foot "faults" (misplacement of the limbs between 2 rungs) made by the animal while traversing the corridor. Animals with regular/skilled motor function will place their paws on each rung, while **subjects with coordination or motor impairments will make faults**.

In order to automatically identify and anatomically assign the faults, the system combines 2 distinctive technologies :

• **More than 150 Infrared detectors** located along the corridor, coincident with each ladder rung position, identify every fault instance

• **High speed Video tracking** using an under mount camera detects the exact paw that made each fault

The ladder is provided with a regular rung pattern appropriately scaled for mouse or rat respectively. Rungs may be removed to create an irregular pattern to avoiding training bias, increase the difficulty of the task (create traps) or assess learning and memory.



#### INSTRUMENT OVERVIEW

A horizontal ladder test is commonly used to assess the walking capability of mice and rats, and their motor-function using both forelimbs and hindlimbs in a coordinated pattern.

Applications in neurodegenerative studies, as well as Spinal cord injury, osteoarthritis and ischemia/ stroke models are increasing. To achieve research goals, investigators are in need of accurate instruments that precisely measure loss or gain of function in compromised animals and during recovery.

With the Automatic BIO-LADDERTEST, Bioseb now offers the perfect tool to measure rodent walking skills in an automatic way!

Based on our existing Foot-Misplacement Apparatus, the Automatic Ladder Test packages easy-to-use software, video tracking camera, and a comfortable elevated frame with the enclosed adaptive ladder for **the most sensitive and comprehensive solution for evaluating skilled walking in mice and rats.** 

#### KEY FEATURES

- Fully automatic detection of skilled walking
- Accurate identification of the paw generating each fault
- Possibility to differentiate complete faults from slips
- Rat or Mouse ladder compatible
- Requires no-or-minimal animal training
- Plug & Play: minimal software configuration
- Video Replay Mode for each run

#### **TECHNICAL SPECIFICATIONS**

<b>Overall frame dimensions</b>	1360 (H)* 2238 (W) * 405 (D) mm
Corridor depth	10 cm (Rats) / 6 cm (Mice)
Space between rungs	Rats: 3 cm; Mice: 1 cm
Video camera	HD USB CMOS 2048 x 1536, 120 img/s + Lens F1.6, 4.4-11mm
Power supply	Computer supplied via USB cable

## **BIO-LADDERTEST:** Auromatic Ladder Test for Mice and Rats

### DEDICATED SOFTWARE

With its innovating Analyze Mode, the Automatic Ladder Test software synchronizes the input from the infrared sensors and video stream and employs an elaborated algorithm to perform **automatic recognition of valid runs for each subject**, identify and count foot faults, and assign the responsible paw to each fault.

Each run is saved for replay, validation and commentary. Experiment management is organized by group, then trials per animal, and displayed in the active software window. Results are organized in tables and can be exported as excel files.

The software is able to differentiate 4 types of gait behavior :

• Regular steps : when the animal successfully grabbed a rung with its paw to move forward.

• **Crossing errors :** crossing faults are classified as complete foot misplacements because the paw reached between the ladder rungs breaching the infrared beams.

Play Stop Prev. Next

• Slip pattern : when the paw slipped off a rung after having been placed but it is not an actual crossing error.

ParkinsonMyopathy

Muscles diseases

• Osteoarthritis

Phenotyping

• **Overlap errors :** when the rear paw doesn't grab the same bar as the previous corresponding front paw but instead grabs one or two bar behind the front paw. With a normal gait pattern, front and rear paws from the same side (rear/left) grab the same bars.

#### DOMAINS OF APPLICATION

- Cortical stroke
- Recovery from Brain injury
- Recovery from Spinal Cord injury
- Neurodegenerative diseases
- Motor-system lesion
- Aging

#### SUPPLIED WITH

- High speed camera
- Specific frame support for corridor and under mount camera
- Dedicated software license
- The Ladder test is also fully compatible with the standard Foot Misplacement Apparatus (FMA)

#### ORDERING INFORMATION

Reference	Description
BIO-LADDERTESTR	Complete Automatic Ladder Test for Rats
BIO-LADDERTESTM	Complete Automatic Ladder Test for Mice
BIO-LADDERTESTD	Complete Automatic Ladder Test for Mice and Rats
BIO-LADDER-SOFT	Upgrade of the Foot Misplacement Apparatus to an Automatic Ladder Test

#### FOR MORE INFORMATION, VISIT OUR WEBSITE: WWW.BIOSEB.COM/EVF

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Carerivaents	Results	Restri				
1.5.3	Paw id	Error time	Duration (a)	(nor position (on	Error bar index	Error on b
	Rear	1.86	0.13	53.91	27	na
	Rear	2.15	0.17	60.02	10	na
	tions	2.89	0.14	78.33	19	no
	Real	5.14	0.05	82.45	41	nà
	Rear	3.52	0.11	84.43	12	110.

Bioseb's New Automatic Ladder Test Software

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EXCLUSIVE: YIELDS INFORMATION CURVES ON THE FORCE DISTRIBUTION OVER TIME FOR EACH PAW INDEPENDENTLY



#### HOW DOES IT WORK?

The principle of the test is based on the analyse of each step of the animal during the cross of a corridor. The Kinetic Weight Bearing instrument **combines the video tracking of a freely walking rodent with the measurement of the weight applied by each paw in real time**. This postural analysis is done by approximately 6000 force sensors composing the whole floor of the corridor.

The KWB is able to **assess a large amount of gait parameters automatically**. This includes the step numbers for each paws with mean and peak Forces (mN), step durations, Speed of the paws, cadence, overlaps, and several other step patterns.

The KWB is able to compare the path of the animal's "Geometric Center of Gravity" with the actual "Weighted Center of Gravity", and show significant differences. Changes in weight distribution from left to right, front to back and contra-lateral compensation are also measured.





# **KWB:** Ground-breaking! Kinetic Weight Bearing

#### INSTRUMENT OVERVIEW

After several years of weight bearing technology development, Bioseb introduced the only automatic test for gait analyses directly assessing the weight distribution on each paw in rodents (mice or rats).

The KWB Instrument provides information on applied weight as well as the speed and acceleration of each paw as the animal moves toward an end point of a runway platform - thus **providing data on coordination and gait comparison**, paw to paw and step to step! KWB generates this quantitative data on footprints and gait in spontaneously moving animals.

The unique "sensor-mat" technology designed by Bioseb for accurate measurement of weight distribution on each paw has been refined and adapted to allow kinetic analysis, allowing the KWB to track gait during a walking sequence of at least 5 steps in a corridor.

#### DOMAINS OF APPLICATION

- Neurodegenerative diseases
   Brain or spinal cord injury
- Parkinson's disease
- Osteoarthritis
- Neuropathic pain
- AgingMuscles diseases
- Neurotrauma: Nerve Crush,
  SNI, etc.
- Phenotyping
- Cerebral ischemia

#### **KEY FEATURES**

- Real-time display: curve & average weight for each paw
- Automatic Measurement of gait parameters
- Automatic paw identification
- Records Gravity Center Path and video barycenter
- Available for rats and for mice with easy switch between both
- Easy un/mounting and cleaning
- Adjustable corridor width for various animal sizes
- Very ethical test, no induced pain for the animal and no restrain or discomfort

Rat entering and exiting the corridor of Bioseb's Kinetic Weight Bearing (KWB)

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AtaxiaBrain trauma

### KWB: Kinetic Weight Bearing - With force distribution curves



#### DEDICATED SOFTWARE

#### **Parameters measured:**

- Mean forces/weight ratio
- Peak force for each paw/ animal weight
- Stride length /paw
- Swing duration /paw (s)
- Stance duration/ paw (s)
- Propulsion duration /paw (s)
- Step duration /paw (s)
- Paw speed
- Cadence

- BoS front rear
- Overlap left/right
- Scored prints/total
- Steps number for each paw
- Peak surface for each paw
- Animal speed
- Animal weight (g) (given by the
- operator) Ratio of any 2 parameters



#### SOFTWARE: FORCE DISTRIBUTION CURVES FOR EACH PAW



#### **TECHNICAL SPECIFICATIONS**

Frame - Overall dimensions (mm)	1810 (H) x 2228 (W) x 405 (D)
Rat corridor - Dimensions (mm)	260 (H) x 1130 (W) x Adjustable depth (from 60 to 165 mm)
Mouse corridor - Dimensions (mm)	150 (H) x 550 (W) x Adjustable depth (from 35 to 85 mm)
Camera	HD USB 744x480 + Wide Angle lens
Power supply	Camera and sensors both powered through USB port
PC Requirements	Windows 7 or 10 - RAM 4 Gb - iCore 5 processor or later

#### ORDERING INFORMATION

Reference	Description
BIO- <b>KWB-M</b>	For mice
BIO- <b>KWB-R</b>	For rats
BIO-KWB-DUAL	For rats and mice

Contact us for more details: info@bioseb.com

#### HIGHLIGHTHED BIBLIOGRAPHY

New tool to assess walking patterns in the development of OA pain: kinetic weight bearing, Osteoarthritis & Cartilage (2017), N. Malek, J. Mlost, M. Kostrzewa, K. Starowicz, Inst. of Pharmacology Polish Academy of Sci., Krakow, Poland DOI: 10.1016/j.joca.2017.02.221

Exhaustive list on our website

#### FOR MORE INFORMATION, VISIT OUR WEBSITE: WWW.BIOSEB.COM/KWB

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