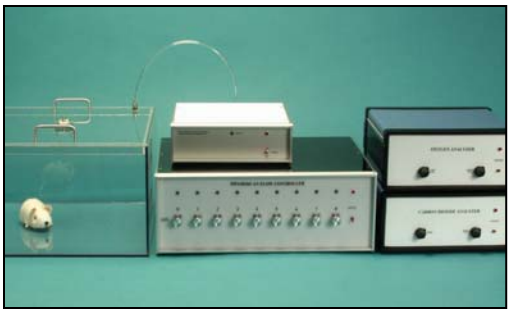
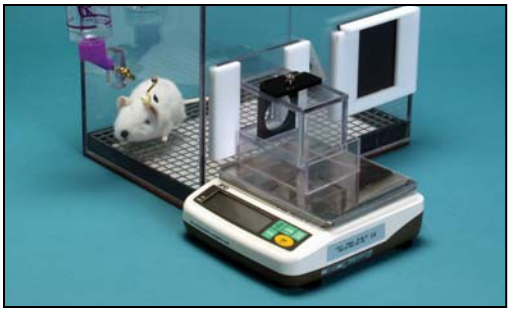
Behavioral Research

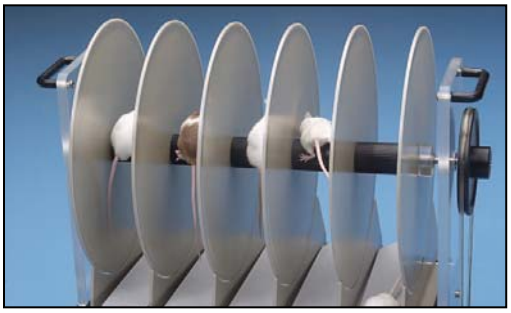


NEW Metabolic Monitoring System, see pages G4 and G5



NEW Food and Liquid Consumption System, see pages G6 and G7

NEW Grip Strength Meter, see page G10



NEW Rota-Rod Treadmill for Mice, see page G13

NEW Dynamic Plantar Anesthesiometer, see page G19

NEW Animal Activity Monitoring System

- Versatile
- Study open field, reaching behavior, place preference, temperature sensation, metabolic studies and more!
- Stores and replays activity data for up to 32 animals
- Windows-based system
- Staggered start time – data collection on each animal begins as soon it is placed in the monitor
- Beam block checks – pre- and post-check all beams to ensure complete data collection, alarm sounds when beam is blocked

This Monitoring System measures animal activity via a grid of invisible infrared light beams. A number of equally spaced beams traverse the animal cage from front to back and an equal number of beams traverse the same cage from left to right. The body of the animal placed within the monitor will cause some of these beams to be broken, thus revealing its position in the (X-Y) plane. A set of primary vertical (Z) activity sensors can be incorporated into the System to monitor rearing or jumping activity. Additionally, a secondary set of vertical sensors can be positioned for holepoke/nosepoke behavior.

The System's Analyser collects the beam status information from the activity monitor and subjects it to rapid analysis. Each time it receives the beam status, it is able to determine the position of the animal. It determines the animal position 100 times per second, which is equivalent to having a high-speed motion camera. This speed is crucial for studying stereotypic activity, which can have a frequency of 7 to 10 repetitions per second. It is also vital to the study of hyperactivity where the animal can traverse the entire cage in fractions of a second.

This System is also designed to fully account for tail flicks and does not permit it to become a part of ambulatory activity. The Analyser can effectively develop a dynamic picture of the animal activity. This dynamic picture reveals whether the animal is resting, ambulating, rearing or performing stereotypic activity. Stereotypy is defined as any activity that is small in size and repetitive in nature - e.g. grooming, scratching, head bobbing, etc. Please note that the system cannot differentiate between these various forms of stereotypy. Special processing determines if the animal is moving in circles anywhere in the cage.

The Heart of this System is the Software. The versatile software tools meet even the most demanding research criteria. It is a true windows 32-bit application (Windows 95/98/2000). This System is the only Windows based system with powerful tools for storing and reproducing/replaying activity data for up to 32 animals which can be repeatedly analyzed for all variables.

Each Software package is comprised of the basic program which is a complete data analysis setup for tracking animals. A zone layout utility allows you to create and edit zones, choose, manipulate and copy parameters from one zone to another. The plotting software can process an average plot of travel, display it to screen and generate a paper plot for each experiment. The playback tool allows an experiment to be replayed frame by frame. Frames before and after a specific point can be examined in higher detail using this software utility. The graphing function allows the user to graph real-time data as it is being collected. Data charts can be displayed for 16 animals at a time.

Hardware Options

1. Vertical Sensors
2. Partition for large/small animal modes
3. Hole Poke or Nose Poke using primary vertical sensors
4. Hole Poke or Nose Poke using primary and secondary vertical sensors
5. Enclosure for Place Preference (light/dark)
6. Activity Wheel for mice or rats
7. Sound Attenuating Chambers
8. Temperature Monitoring
9. Integrated Systems – Metabolic Monitoring and Food and Liquid Consumption Systems for metabolic and food/liquid consumption monitoring
10. Special animal cage with removable catch tray, stainless steel grid floor, lid with ventilation holes and handles.

A standard system includes a Monitor with horizontal X-Y sensors and optional Z sensor, Analyser, Windows based software and animal test chambers - a computer rounds out the set up. The system is flexible and options can be added as needed.

NEW Animal Activity Monitoring System

System Requirements - USB Technology

- Pentium IV 1.7 Hz or Faster
- WIN-2000, XP
- 128 MB RAM
- 40 GB Hard Drive
- CD-Rom Drive
- Floppy Drive
- One or more USB Ports
- Keyboard/Mouse Ports
- Video Accelerator Card –16 MB Ram
- CD Read/Write Drive
- Direct X V5.XX or Higher
- Physical Characteristics Activity Monitor

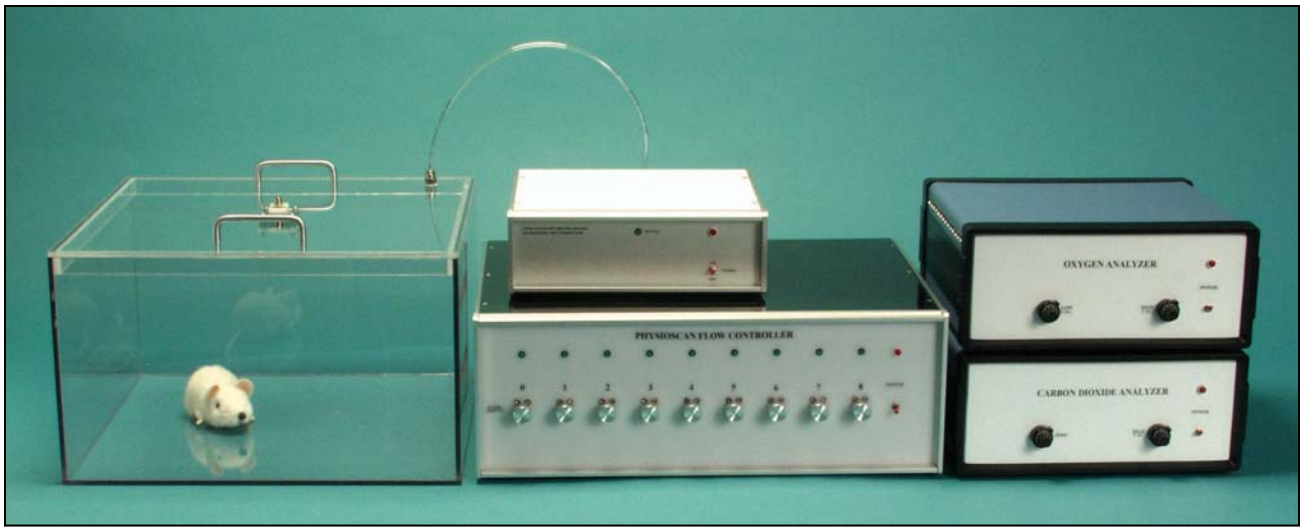
Specifications

Resolution:	
No. of Beams (in X axis) (left-right)	16
No. of Beams (in Y axis) (front-back)	16
No. of Beams (in Z axis) vertical	16
Beam Spacing	2.5 cm (1.0 in)
Beam Diameter	4 mm (0.16 in)
Scan rate (each beam)	100 times/sec
Dimensions:	
Without Vertical Sensors, H x W x D	9 x 49 x 53 cm (3.5 x 19.3 x 20.9 in)
With Vertical Sensors, H x W x D	31 x 49 x 53 cm (12.2 x 19.3 x 20.9 in)
Cage Size, L x W x H	42 x 42 x 30 cm (16.5 x 16.5 x 11.8 in)
Analyzer, L x W x H	26.5 x 25 x 7.5 cm (10.5 x 10 x 3 in)
Power	115/220 VAC
Weight	5 kg (10 lbs)

Catalog No.	$	Product
BS4 72-7183		Monitor for the Animal Activity Monitoring System, X, Y Horizontal Axis
BS4 72-7184		Primary Vertical Sensor for Rearing Activity
BS4 72-7185		Analyzer for Animal Activity Monitoring System, Includes USB and Power Cord
BS4 72-7186		Software for Animal Activity Monitoring System, Win-2000/Xp Based with Zone Mapping, Playback and X-Y Coordinate
BS4 72-7187		Acrylic Animal Cage, Includes Acrylic Assembly Kit
BS4 72-7188		Acrylic Animal Cage with Dividing Partition, Includes Acrylic Assembly Kit
BS4 72-7189		Dividing Partition for Animal Cage, Includes Acrylic Assembly Kit
Activity Monitor Options		
BS4 72-7190		Multi Animal Monitoring Option for studying two small animals simultaneously on one monitor
BS4 72-7191		Black (Dark) Enclosure for Light/Dark Studies
BS4 72-7192		White (Opaque) Enclosure for Light/Dark Studies
BS4 72-7193		Activity Wheel with Cage Insert
Hardware Options		
BS4 72-7194		Sound Attenuating Chamber
BS4 72-7195		Sound Attenuating Chamber Controller
Replacement Parts		
BS4 72-7196		Power Cord
BS4 72-7197		Interconnecting Cable (Monitor to Analyzer)
BS4 72-7198		USB Communication Cable
Hole Poke/Activity Combination System		
BS4 72-7199		Hole/Poke Monitor*, For Use with the Animal Activity Monitoring System
BS4 72-7200		Analyzer Upgrade for Existing Animal Activity Monitoring System for Hole Poke Activity Studies
BS4 72-7201		Existing Software Upgrade for Hole Poke Activity Studies
Replacement Hole Poke Boards		
BS4 72-7202		Non-Baited Hole Poke Board, Rat, 16 Holes, 2.22 cm (7/8 in) Diameter
BS4 72-7203		Non-Baited Hole Poke Board, Mouse, 16 Holes, 1.59 cm (5/8 in) Diameter
BS4 72-7205		Baited Hole Poke Board, Rat, 16 Holes, 2.22 cm (7/8 in) Diameter
BS4 72-7204		Baited Hole Poke Board, Mouse, 16 Holes, 1.59 cm (5/8 in) Diameter

** Note: Items BS4 72-7183 and BS4 72-7184 are required when studying Hole/Nose Poke and Locomotor Activity. Hole Poke Monitor Includes the Sensor Panel, Masking Panel, Baited or Non-Baited Hole Board, Distribution Hub, all Cables and Accessories. User should specify type of board.*

NEW Metabolic Monitoring System



- Oxygen consumption, VO_2
- Carbon dioxide production, VCO_2
- Respiratory exchange ratio, CO_2/VO_2
- Calorimetry
- Positive/Negative pressure systems available
- Respiration rate
- Windows based software

This Metabolic Monitoring System is ideal for measurement of oxygen consumption and carbon dioxide production in lab animals. It uses open circuit calorimetry technique. It is very flexible, the size of the animal is immaterial. The data can be analyzed by the statistical packages. The system comes with windows based software.

Up to eight animal cages can be monitored simultaneously. An animal is placed in the cage and the lid is lightly shut to provide a partial seal. Ambient air is pumped through the cage. The amount of air entering the cage is precisely measured by a mass flow meter (STP 0ºC and 760 mmHg), and is traceable to the National Bureau of Standards. Most of the exhaust air goes to the atmosphere. A small sample of the exhaust is monitored for O_2 and CO_2 content by zirconia and infrared sensors. Both sensors are very accurate and maintenance free. Unlike electrochemical cells, zirconia cells provide higher accuracy and do not have to be replaced.

The system described above generates small positive pressures within the animal cages and is generally known as a positive pressure system. For some experiments, a negative pressure system is more appropriate. Both systems are offered.

O_2 consumption and CO_2 production are calculated on the basis of known gas fractions both at the input and the exhaust ports of the cage and with the amount of air flowing through the cage.

Parameters Measured

The following parameters are measured in the standard model: Oxygen consumption (mL/kg/hr), carbon dioxide production (mL/kg/hr), respiratory exchange ratio (CO_2/VO_2) and heat Kcal/hr).

Options

This Metabolic Monitor System can be used simultaneously with the Animal Activity Monitoring System, see pages G2 - G3, for ambulatory activity and a Treadmill for exercise. The modular construction of the products allows for monitoring one to four animals in the standard model. On special requests the systems can be expanded to eight animals.

The combination of the Metabolic Monitor and Activity Monitoring System permits measurement of metabolic rate and animal locomotor activity simultaneously, thus allowing correlation between activity and metabolic rate. The Activity Monitoring Systems measures both horizontal and vertical activity.

The combination of this Metabolic Monitor and the Animal Treadmill, see page G15, is useful for measuring Work (W) and fatigue points in conjunction with metabolic rate. The Treadmill is an animal exerciser with a shocker. Both the speed and the angle of inclination of the exerciser are user adjustable

This Metabolic Monitoring System can also be integrated with the Food and Liquid Consumption Monitor, see pages G6 - G7, to measure the correlation between food and liquid intake and metabolic rate.

Each Metabolic Monitoring System includes a metabolic monitoring system analyzer, O_2 analyzer, CO_2 analyzer, custom designed air tight animal test chamber and Win-2000/XP Based Software.

NEW Metabolic Monitoring System

Specifications

Parameters Measured	The following parameters are measured in the standard model: Oxygen consumption (mL/kg/hr), carbon dioxide production (mL/kg/hr), respiratory exchange ratio (CO_2/VO_2) and heat Kcal/hr)
Oxygen Sensor:	
Sample Flow Rate	200 ml/Min
Type	Zirconia
Range	18% to 22% O_2 standard (0% to 100% O_2 available by special order)
Resolution	0.001% O_2
Accuracy	±0.005% O_2
Repeatability	±0.002% O_2
Drift	0.005% O_2 over 24 hours
Response Time	0.3 seconds
Temperature Coefficient	Negligible
Pressure Coefficient	Negligible
Humidity	0% to 90% Relative humidity non condensing
Carbon Dioxide Sensor:	
Sample Flow Rate	200 ml/min
Type	Non-dispersive infrared NDIR
Range	0% to 2% CO_2
Resolution	0.001% CO_2
Accuracy	±0.025% CO_2
Repeatability	±0.01% CO_2
Drift	Auto zero before each sample eliminates zero drift
Response Time	2.5 sec
Temperature Coefficient	005%/degree C
Mass Flow Meter:	
Thermal Range	0 to 5 SLPM/0 to 20 SLPM
Resolution	0.001 SLPM
Accuracy	±0.02 SLPM
Response Time	0.25 seconds
Temperature and Pressure	Effects are eliminated by sensor design and computer compensation
Humidity	0% to 90% relative humidity non-condensing
Flow Pumps Vacuum	Capacity 5 SLPM/20 SLPM
Dimensions, L x W x H	
Statistical Analyzer	25.4 x 27.31 x 10.16 cm (10 x 10.75 x 4 in)
O_2 Analyzer	26.67 x 30.48 x 13.97 cm (10.5 x 12 x 5.5 in)
CO_2 Analyzer	26.67 x 30.48 x 13.97 cm (10.5 x 12 x 5.5 in)
Flow Controller	36.83 x 49.53 x 17.78 cm (14.5 x 19.5 x 7 in)
Cages	Custom designed
Weight (all analyzers)	5.44 kg (12 lbs)
Weight (flow controller)	17.69 kg (39 lbs)
Weight (cages)	2.72 kg (6 lbs)
Weight (Drierite columns)	1.13 kg (2.5 lbs)
System Requirements	PC compatible computer MS-WINDOWS® 98 Second Edition, WIN-2000 (does not run on Windows®-NT) Pentium IV 700 MHz,10 GB Hard Drive, 64 MB RAM, 3.5 Inch Floppy Drive; CD-ROM Drive, CD Read/Write Drive; USB port; PS2 style KEYBOARD and MOUSE ports, Direct X version 5.0 or higher; Video accelerator card with 16 MB RAM

Catalog No.	$	Product
BS4 72-7206		1 Channel Metabolic Monitoring System, Includes 2 Channel Flow Controller and 2 Drierite Columns
BS4 72-7207		2 Channel Metabolic Monitoring System, Includes 3 Channel Flow Controller and 3 Drierite Columns
BS4 72-7208		4 Channel Metabolic Monitoring System, Includes 5 Channel Flow Controller and 5 Drierite Columns
BS4 72-7209		6 Channel Metabolic Monitoring System, Includes 7 Channel Flow Controller and 7 Drierite Columns
BS4 72-7210		8 Channel Metabolic Monitoring System, Includes 9 Channel Flow Controller and 9 Drierite Columns
BS4 72-7211		Replacement Drierite Column, pkg. of 1

NEW Food and Liquid Consumption System

- Mice or Rats
- Precise measurement of food and liquid consumption
- System expandable up to 64 weight stations
- Win-2000 based software
- Specially-designed cages (virtually eliminates spillage)
- Diagnostics Mode collects prescribed number of samples
- Lock Workstation
- Animal is easily inserted and removed from animal test chamber, since nothing is attached to the lid. Test chambers are designed so that an animal can live in them for long periods of time
- Bar floor and catch tray is easily removed for cleaning
- Due to the long-term stability of the weight stations (scales), calibration of stations may be done once a year
- Stations can even be calibrated for variations in gravity at different locations
- Automatic signaling of unstable station readings

This Food and Liquid Consumption System is designed to provide nutrition researchers with the ability to precisely monitor food and liquid consumption of laboratory animals over time. In contrast to other systems, this system monitors consumption directly by weighing the reservoir continuously.

This system consists of an Analyzer to which 64 stations (weight scales) can be attached. The weight information of each station is organized into food and liquid consumption. Each food or liquid reservoir is placed on a sensitive balance and introduced to the animal via specially designed cages. The cages are designed to permit animals ready access to reservoir while preventing spillage or other loss.

Tunnel adapters permit use by animals of differing weights and sizes from entering the animal test chamber or defecating/ urinating into the food reservoir.

This system can be used in many modes. All stations can be used for food or liquid monitoring or half for food and half for liquid. When used solely for food monitoring a water bottle mount is provided. Lock Workstation Feature – When the workstation is locked, the experiment will continue to run to completion without intervention. This is to prevent changes being made either deliberately or accidentally. The program will remain locked even after the experiment has terminated. To unlock the computer, reenter the password.

This Food and Liquid Consumption System can be integrated with the Animal Activity System and the Metabolic Monitoring System, see pages G2 - G3 and G4 - G5.

"DMS" Data File Variables

- Cage - specific to scale
- Experiment - reference experiment data
- Sample - grouped by time into sequential bins - numbered in order
- Durationmn - experiment data grouped in sequential bins
- Consumedg - amount in grams of food or drink consumed by subject
- Addedg - amount in grams of food or drink added to scale by the user
- SPC - scales per cage
- Username - name of user obtained from system logon
- Filename - name of data file specified by user at collect time
- Expdurhr - experiment duration (hours)
- Expdurmn - experiment duration (minutes)
- Subjectid - subject identification
- Comment - user specified comment
- Collect - version used to generate original data file
- Start_time - experiment start time
- Start_date - experiment date
- Diet Software - WIN 2000 compatible application can handle up to 64 weight measuring scales (food or liquid)

Minimum PC System Requirements

- Microsoft® Win-2000 or XP
- Pentium/AMD 800MHz
- 40 GB Hard Drive (2 GB for storing data)
- CD-Read/Write Drive
- GeForce 16 MB Ram Video Card
- Keyboard/Mouse
- Color Monitor
- USB ports

NEW Food and Liquid Consumption System

Specifications

Animal	Capacity	Resolution
Rats (standard)	300 g	0.1
Mice	200 g	0.01
Construction (Analyzer)	High quality acrylic, stainless steel grid floor	
Construction (Scale)	Anodized aluminum	
Power	115/120 V, 60 Hz	
Dimensions, W x L x H:		
Analyzer	35.56 x 27.94 x 8.89 cm (14 x 11 x 3.5 in)	
Animal Test Chamber	22.86 x 33.02 x 24.13 cm (9 x 13 x 9.5 in)	
Mouse Tunnel	3.81 x 5.72 x 3.05 cm (1.5 x 2.25 x 1.2 in)	
Rat Tunnel	6.35 x 11.23 x 6.35 cm (2.5 x 4.42 x 2.5 in)	
Rat Blocking Doors	11.43 x 11.23 x 0.53 cm (4.5 x 4.42 x .21 in)	
Rat Tunnel Adapters	6.35x 5.21 x 0.53 cm (2.5 x 2.05 x .21 in)	
Mouse Tunnel Adapters	2.54 x 3.61 x 0.28 cm (1 x 1.42 x .11 in)	
Mouse Tunnel Steps	2.54 x 3.81 x 0.53 cm (1 x 1.5 x .21 in)	
Weight (Cage/Tunnel/Scale)	5.44 kg (12 lbs)	
Weight (Analyzer)	3.63 kg (8 lbs)	

Catalog No.	$	Product
BS4 72-7226		Diet Win-2000/Xp Based Software
BS4 72-7228		Standard Rat Cage (Polycarbonate), Includes Tunnel, Food Tray, Cage Lid, Tray and Bottle Entry
Accessories and Replacement Parts		
BS4 72-7227		Spring Loaded Sipper Tube
BS4 72-7237		Food Tray
BS4 72-7238		Cage Lid
BS4 72-7239		Bedding Tray
BS4 72-7240		Food Tunnel Adapter, Small White
BS4 72-7241		Food Tunnel Adapter, Large White
BS4 72-7242		Food Tunnel Adapter, Small White, Cannulated
BS4 72-7243		Food Tunnel Adapter, Large White, Cannulated
BS4 72-7244		Food Tunnel Adapter, Solid Black

Food and Liquid Consumption System

Channels	Diet Analyzer	Weigh Station Rat	Mouse
4 $	–	BS4 72-7216	BS4 72-7221
8 $	BS4 72-7212	BS4 72-7217	BS4 72-7222
16 $	BS4 72-7213	BS4 72-7218	BS4 72-7223
32 $	BS4 72-7214	BS4 72-7219	BS4 72-7224
64 $	BS4 72-7215	BS4 72-7220	BS4 72-7225

Custom Cage Designs, Weigh Station NOT included

Stations/cage	Rat	Mouse
1 $	BS4 72-7230	BS4 72-7229
2 $	BS4 72-7232	BS4 72-7231
3 $	BS4 72-7234	BS4 72-7233
4 $	BS4 72-7236	BS4 72-7235

Rodent Activity Wheel and Cage

BS4 60-1943 Rodent Activity Wheel and Cage shown complete with Water Bottle, Waste Tray, Support Stand and Counter (not included)

- Easy measurement of rodent activity
- For rats and hamsters
- All stainless steel wheel construction
- Clear polycarbonate cage for visibility and strength

This Rodent Activity Wheel provides an easy, convenient method for measuring lab rodents' physical activity in response to chemical or environmental stimuli. It is especially useful for research involving circadian rhythms or pharmaceutical testing. The Rodent Activity Wheel and Cage package comes complete with: stainless steel activity wheel, wheel hub and support, sheet and activity wire lids and polycarbonate cage with cut away bottom and stainless steel floor grid.

The Activity Wheel allows the animal to exercise voluntarily. It has long-lasting, low-friction Teflon TFE bushings for quiet, smooth action. The stainless steel hub and support rod provide strength and durability and the wide wheel allows small to large animals to exercise. A Magnetic Switch with LCD Counter is available as an accessory for recording animal activity on the Wheel, counted as wheel revolutions. The Magnetic Switch can be used with both the rat and mouse wheels.

The clear polycarbonate Cage has glass-like clarity and excellent impact strength. The cut-out bottom allows changing of bedding and removal of excreta without disturbing the animal. (Meets NIH floor space requirements for a single rodent). A solid stainless steel lid covers the opening at the edge of the Activity Wheel while a wire lid with exclusive lid locks fasten securely to the cage body. These lids prevent the animal from escaping. The wire lid incorporates a water bottle support with rubber stopper guard and a U-shaped food hopper for pellets.

Specifications

Dimensions:

Overall, H x W x D	36.4 x 26.8 x 50 cm (14.25 x 10.375 x 19.5 in)
Wheel, OD x W	34.5 x 9 cm (13.5 x 3.5 in)

Floor Area:

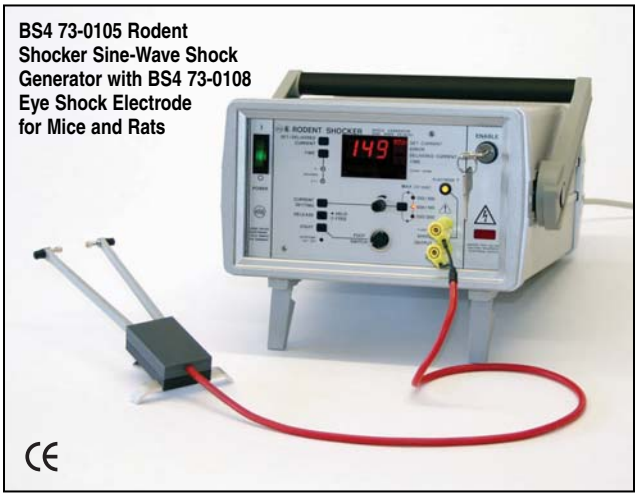
Cage	929 cm^2 (144 in^2)
Cage With Wheel	516 cm^2 (80 in^2)

Catalog No.	$	Product
For Rats		
BS4 60-1943		Rat Activity Wheel and Cage
BS4 60-1944		Polycarbonate Waste Tray Collects excreta, H x W x D, 3.5 x 28 x 45 cm (1.375 x 11.125 x 17.5 in); requires use of BS4 60-1945 Support Stand, see below, pkg. of 1
BS4 60-1945		Support Stand for Cage and Waste Tray for Rat Cage, Stainless steel, supports one Activity Cage with Wheel and Waste Tray; allows removal of Waste Tray without disturbing the Cage or animal
BS4 60-0506		Polycarbonate Water Bottle for Rat Cage, 500 ml Glass clear and shatterproof. Extremely rugged. Permanent, molded-in graduations for easy measurement. Complete with chew-proof type 316 SS cap and sipper tube. Exclusive 1.8 mm sipper tube opening minimizes spontaneous dripping
BS4 60-1946		Magnetic Switch with LCD Counter The Magnetic Switch counts whole revolutions of the Activity Wheel. Operates on an extended-life battery (included). A safety lock position on the reset button helps eliminate accidental resettings. Assembly required to connect unit to the Activity Wheel and Cage. Works with both Rat and Mouse Wheel.
For Mice		
BS4 60-2429		Mouse Activity Wheel and Cage
BS4 60-2425		Polycarbonate Waste Tray for Mouse Cage
BS4 60-2423		Support Stand for Cage and Waste Tray for Mouse Cage
BS4 60-2424		Polycarbonate Water Bottle for Mouse Cage
BS4 60-1946		Magnetic Switch with LCD Counter, see description above

Did you know?

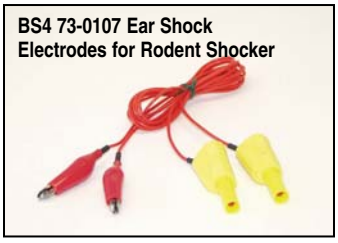
Harvard Apparatus now owns Hugo Sachs Elektronik. The HSE isolated organ baths set the industry standard. They can be found in the Isolated Organ and Tissue Section K.

HSE-HA Rodent Shocker Sine-Wave Shock Generator



BS4 73-0105 Rodent Shocker Sine-Wave Shock Generator with BS4 73-0108 Eye Shock Electrode for Mice and Rats

Foot Switch for BS4 73-0105 Rodent Shocker



BS4 73-0107 Ear Shock Electrodes for Rodent Shocker

- For testing anticonvulsant drugs
- For mice and rats
- Two types of electrodes are available: for eyes or ears
- Foot Switch operation

Cerebral seizures, preferably in mice, are produced using constant sinusoidal alternating current to determine the effect of anticonvulsant drugs. For the reliable induction of seizures it is necessary to achieve satisfactory current flow. Eye electrodes and (especially in mice) ear electrodes are used for this purpose. The ear electrodes offer the advantage that the course of the seizure can be observed more clearly, but have the disadvantage of a larger contact resistance. It is important that the electrodes are properly moistened! Normally the output circuit for constant current ensures the required stimulus response even for different impedances (a.c. resistances) of the animal on test. The stimulation voltage is increased inside the unit until the selected stimulation current is produced. After application the current actually used can be indicated. The stimulus duration can also be pre-set and the elapsed time is monitored on a bargraph (line of LEDs). The parameter evaluated is the percentage frequency of convulsions in a group of rodents at constant current.

The stimuli produced are not without danger to the operator; with an open output circuit (no animal connected to the unit) the stimulation voltage at stage 3 can reach its maximum of 750 Volt. In order to ensure operator safety the stimulus can only be triggered when two separate buttons 'RELEASE' (unblocking the inhibit circuit) and 'START' are operated in sequence. In addition the stimulus output is floating and has no connection to ground. The current can therefore flow only between the two electrodes! As a further safety measure the output is automatically switched off if it is not connected to an object or if the contact between electrode and tissue is interrupted during stimulation. To increase the stimulation current the CURRENT SETTING button is pressed and the control to the right of it rotated to obtain the required stimulation current. This additional measure has been introduced in order to remind the user of the increasing danger. Rubber gloves must be worn when working with the unit. A foot switch is supplied for triggering the stimulus; when working with the eye electrode one hand is used to hold the animal while the other holds the flexible forceps-shaped eye electrode. The output sockets are protected against contact. Only HSE shock electrodes with the original HSE safety banana plugs may be used. There are two types of shock stimulation electrodes for applying electric shock to mice and rats for testing anticonvulsant drugs. These are eye and ear electrodes.

The eye electrodes are bipolar. They are made from a flexible plastic 'forceps'. Each forcep end has a stainless steel button covered by thin leather. The leather must be moistened with saline solution prior to use. Only a low shock energy is required since the eye is a highly conductive point.

The ear electrodes consist of two well-insulated nickel-plated crocodile clips. The contact points are formed by two chlorided silver discs 6 mm diameter and 1 mm thick. This type of application requires a large shock energy since the contact resistance to the tissue is relatively high even when the skin is moistened. The advantage of this method is that the mice can be raised up by the electrodes so that the convulsions can be observed closely.

Specifications

Stimulation Frequency	50 Hz or 60 Hz according to supply frequency
Stimulus Duration	0.1 sec to 9.9 sec in steps of 0.1 sec, selected after pressing a button, the selected time is indicated
Stimulus Energy	Up to 75 W
Output	Constant current, fully floating
Output Current	0 to 300 mA, 0 to 150 mA, 0 to 100 mA depending on maximum stimulation voltage selected, the setting is made on a 10-turn potentiometer and the selected value is shown on the digital display
Limitation of Maximum Stimulation Voltage	250 V, 500 V, 750 V in 3 steps, selected by button
Digital Display	The selected stimulation current is indicated continuously in mA, the actual current applied is shown during application and can be called up later by pushing a button, the selected stimulation time is shown on pressing the TIME button, bargraph indicates the course of the stimulation time.
Supply	110 V, 60 Hz or 220 V, 50 Hz
Dimensions, H x W x D	150 x 260 x 360 mm (5.91 x 10.2 x 14.2 in)
Weight	5 kg (11 lb)

Catalog No.	$	Product
BS4 73-0105		Rodent Shocker Sine-Wave Shock Generator with Foot Switch, 115 VAC, 60 Hz
BS4 73-0106		Rodent Shocker Sine-Wave Shock Generator with Foot Switch, 230 VAC, 50 Hz
BS4 73-0107		Ear Shock Electrodes for Mice and Rats, pair
BS4 73-0108		Eye Shock Electrode for Mice and Rats

NEW Grip-Strength Meter

- For Mice or Rats

This system measures the force that is required to make a mouse or rat release its grip. It is ideal to measure the effects of drugs, toxins, muscle relaxants, disease, ageing or neural damage on muscle strength.

The rat or mouse is placed over a Perspex plate, in front of a grasping trapeze. Rodents instinctively grab anything they can to try to stop this involuntary backward movement. The will continue to grip the trapeze until the pulling force overcomes their grip strength. After the animal loses its grip, the peak preamplifier automatically stores the peak pull force and shows it on a liquid crystal display.

The sensor mechanism is a T-shaped or trapeze-shaped bar whose height is adjustable. The bar is fitted to a force transducer connected to the Peak Amplifier. The Mouse unit is similar to the rat model except the grasping trapeze is proportionately sized for mice and the transducer sensitivity is adjusted to measure the grip strength of mice.

The data supplied by the peak amplifier is available in digital and analog form. The peak amplifier is provided with a connector for branching it to the Multifunction Printer.

A complete system is comprised of the follow components:

1. A base plate of black sand-blasted Perspex, complete with upright and open-side boss-head
2. A grasping-bar (a grasping trapeze is also supplied)
3. A force transducer of adjustable height, provided with connection cable & connector to the peak amplifier
4. A peak amplifier

Peak Preamplifier

Both the Grip Strength Meter for Rats and the model for Mice are used with this Peak Amplifier. It automatically discriminates whether the grip force is generated by the rat and mouse transducer and expresses them in grams and in decimal of grams respectively.

The data supplied by the peak amplifier is available in digital and analog form. The waveform of the pull can be externally recorded, for example via a channel recorder or the signal may be taken to a data acquisition system. Data from this meter may be recorded directly using a 6-channel printer available as an accessory.

The Peak Amplifier is lodged into a resilient cabinet. The front and back panels are anodized aluminum and feature extremely durable engraved markings.

Grip-Strength Meter is supplied complete with the following components:

Peak Amplifier, incorporating a digital display, Force Transducer Suitable for Either Rats or Mice, Trapezes for Either Rats or Mice, T-shaped bar for Either Rats or Mice, Perspex Plate with 10 mm diameter upright, Open-Side Boss Head, Table Clamp, Mains Cable, Set of 2 fuses for either 115 V or 230 V operation, and Instruction Manual.

Catalog No.	$	Model	Product
BS4 72-6713		47105/115 V	Grip-Strength Meter for Rats, 115 V
BS4 72-6714		47105/230 V	Grip-Strength Meter for Rats, 230 V
BS4 72-6715		47106/115 V	Grip-Strength Meter for Mice, 115 V
BS4 72-6716		47106/230 V	Grip-Strength Meter for Mice, 230 V
Accessories			
BS4 72-6686		2600-S/115V	6-Channel Multi-Function Printer for Grip Strength Only, 115 V
BS4 72-6687		2600-S/230V	6-Channel Multi-Function Printer for Grip Strength Only, 230 V
Replacement Parts			
BS4 72-6717		47105-002	Force Transducer Assembly for Rat
BS4 72-6718		47105-003	Force Transducer Assembly for Mouse
BS4 72-6719		47105-004	Pespex Plate with 10 mm Diameter Upright
BS4 72-6720		47105-321	Trapeze for Rat
BS4 72-6721		47105-324	Trapeze for Mouse
BS4 72-6722		47105-322	T-Shaped Bar for Rat
BS4 72-6723		47105-323	Table Clamp
BS4 72-6724		E-WP008	Mains Cable
BS4 72-6725		4003	Open-Side Boss Head
BS4 72-6726		47105-302	Instruction Manual

NEW Multi-Function Printers

- 6-Channel or 48-Channel Models Available
- Ideal for use with:
  - Constant Speed Rota-Rod Treadmills
  - Accelerating Speed Rota-Rod Treadmills
  - Plantar Test
- Dedicated Model for Grip Strength Recording
- Graphic Display
- Thermal Printer
- RS232 to PC

These multi-function printers are a micro-controlled device to acquire counting or timing data from up to 6 or 48 independent channels.

The data can be printed on thermal paper in real time. Data may also be exported to a PC via an RS232 connector. The export of data requires the Win-DAS software. Data is transferred via serial communication. The data can be directly routed to the PC in real time or downloaded later on. The computer must be an IBM (or compatible) PC, provided with Windows® 95 or 3.1 operating system. The data collected by the Win-DAS program from each instrument are automatically stored into individual files, ready to be managed by most statistical analysis packages available (Lotus, Excel, etc.).

These Printers have internal memory, where the data can be stored to be unloaded at a later time. This makes it truly flexible multipurpose data acquisition system.

Instrument Function

These printers have a graphic display which presents all available commands. The operator chooses by simply acting on the 4-button keyboard located below the display.

The data string for any activated channel, in order from left to right, shows: the input channel number among the six available, the datum proper in 5 digits (3 integers and 2 decimals for timing mode and 5 integers for counting mode) and the elapsed time expressed in minutes (2 digits) from the start of the trial in progress. The data string may also contain some experiment information (animal number, gender, etc.).

Each channel can acquire data from instruments which supply counting or timing TTL signals such as Plantar Test, Rota-Rod Treadmills, etc. A 48-channel is also available. Each printer is supplied complete with a roll of Heat Sensitive Paper and a 9-Pin Cable to connect the printer to a PC computer.

Specifications

Power	115 or 230 V, 50/60 Hz, 30 VA maximum
Dimensions, H x W x D:	
6-Channel	12 x 26 x 13 cm (4.7 x 10.2 x 5.1 in)
48-Channel	12 x 26 x 13 cm (4.7 x 10.2 x 5.1 in)
Weight:	
6-Channel	3.5 kg (7.7 lb)
48-Channel	3.5 kg (7.7 lb)
Shipping Weight:	
6-Channel	6.50 kg (14.3 lb) approx.
48-Channel	6.50 kg (14.3 lb) approx.

Catalog No.	$	Model	Product
BS4 72-6682		2600/115V	6-Channel Multi-Function Printer, 115 V
BS4 72-6683		2600/230V	6-Channel Multi-Function Printer, 230 V
BS4 72-6684		2650/115V	48-Channel Multi-Function Printer, 115 V
BS4 72-6685		2650/230V	48-Channel Multi-Function Printer, 230 V
BS4 72-6686		2600-S/115V	6-Channel Multi-Function Printer for **Grip Strength Only**, 115 V
BS4 72-6687		2600-S/230V	6-Channel Multi-Function Printer for **Grip Strength Only**, 230 V
Accessories			
BS4 72-6671		2010	Win-DAS Software Package for Windows® 95 or 3.1
BS4 72-6688		2610	Individual Flat Connection Cable (for 7600/7650, 7700/7750)
BS4 72-6689		2615	Individual Multi-Plug Connection Cable with Adaptor (for 37215, 47105/47106, 7360, 7370, 7452, 7550, 7570)
Replacement Parts			
BS4 72-6690		2605	Heat Sensitive Paper Roll for 6-Channel Printer
BS4 72-6691		2606	9-Pin Cable for Connection between Printer and PC

NEW Constant Speed 4 Lane Rota-Rod Treadmills for Rats

- Accurate repeatable speeds
- Run 4 rats or mice simultaneously
- Automatic recording of fall time via solid state clock

The Rota-Rod technique has great value in research involving screening of drugs that are potentially active on motor coordination. These Rota-Rods are the result of many years of research in cooperation with the latest development in behavioral and pharmacological research. They consist of four 7 cm diameter drums which are machined to provide grip for the animal. Five flanges divide the drums into four separate compartments, enabling four rats to be on the treadmill simultaneously.

Principle of Operation

The drum cylinders, whose angular speed can be varied by a simple belt gear, turn on ball bearings. They are driven by a heavy duty DC motor which sets the rotors in motion via the belt gear at the speed selected. The constant speed models operate at fixed angular speeds, selectable via pulley cones. An accelerating model for mice is also available.

Drive speed is practically unaffected by voltage variations, friction or wear. This ensures that screening runs can be repeated in constant operating conditions.

Four liquid crystal second counters, driven by a solid state clock synchronized to the mains frequency, trip at one second intervals. When a mouse or rat falls off its cylinder section on to the plate below, the plate trips and the corresponding counter is disconnected, thereby recording the animal's endurance time in seconds.

Conditioning the Animal

Some research workers think advisable to carry out some kind of "conditioning" before starting the motor coordination test. With the drums at minimum speed each rodent is placed in its section in order to familiarize it with the revolving drum. After two-three training runs of 1-2 minutes at intervals of 2-3 hours, the rodent should be ready for the test proper.

Data Acquisition and Recording

These Rota-Rod Treadmills are supplied with a connector (D15) for branching them to the 6-Channel Multifunction Printer, see page G11 This printer is a microprocessor controlled device designed to acquire data from 6 independent channels. Each Rota-Rod requires 4 channels for recording the data. The data is stored in the internal memory and is shown on its graphic display. The data may also be printed real time or may be exported to a PC computer. The data export to a PC requires the purchase of the Win-DAS Software Package, see accessories. This must be purchased as a separate product.

Each Treadmill is supplied complete with the following components: Dust Cover, Trip Plate, complete with Spring & Iron Keeper, Transmission Belt, Spare Fuses for either 115 V or 230 V and Instruction Manual.

Specifications

Speed Settings	8, 10, 12, 14 or 16 revolutions per minute
Power Requirement	115 V or 230 V, 50/60 Hz
Dimensions	63 x 50 x 49 cm (24.8 x 19.7 x 19.3 in)
Weight	10.50 kg (23.2 lb)
Shipping Weight	18.50 kg (39.7 lb), approx.

Catalog No.	$	Model	Product
BS4 72-6666		7700/115V	Constant Speed Rota-Rod for Rats, 115 V, complete
BS4 72-6667		7700/230V	Constant Speed Rota-Rod for Rats, 230 V, complete
Accessories			
BS4 72-6682		2600/115	6-Channel Multi-Function Printer, 115 V
BS4 72-6683		2600/230	6-Channel Multi-Function Printer, 230 V
BS4 72-6671		2010	Win-DAS Software Package
Replacement Parts			
BS4 72-6672		7701	Rat Rota-Rod Treadmill Dust Cover
BS4 72-6673		7703	Rat Rota-Rod Treadmill Trip Plate, complete with spring & iron keeper
BS4 72-6674		7706	Rat Rota-Rod Treadmill Transmission Belt

Bibliography

Method Papers

- *N.W. Dunham & T.S. Miya: "A Note on a Simple Apparatus for Detecting Neurological Deficit in Rats & Mice" J. Am. Pharmaceut. Assoc., Scientific Edit., XLVI: No. 3, 1957*
- *B.J. Jones & D.J. Roberts: "The Quantitative Measurement of Motor Inco-ordination in Naive Mice Using an Accelerating Rotarod" J. Pharm. Pharmac.: 20: 302-304, 1968*

Papers Dealing With Rota-Rod Techniques

- *R. Duane Sofia: "Comparison of Two Methods for Measuring Drug-Induced Neurotoxicity" J. Pharmaceut. Sc.: 58, No. 7: 900-901, 1969*
- *H. Kuribara et alia: "Effects of Central Depressants on Rota-Rod and Traction Performances in Mice" Japan J. Pharmacol.: 27: 117-126, 1976*
- *M. S. Dar et alia: "Possible Role of Adenosine in the CNS Effects of Ethanol" Life Sciences: 33: 1363-1374, 1983*
- *M. S. Dar & W.R. Wooles: "Effect of Chronically Administered Methylxanthines on Ethanol-Induced Motor Inco-ordination in Mice" Life Sciences: 39: 1429-1437, 1986*
- *G.E. Leighton et alia: "Pharmacological Profile of PD 117302, a selective K-Opioid Agonist" Br. J. Pharmacol.: 92: 915-922, 1987*

For complete details on the 6-Channel Multi-Function Printers, see page G11.

NEW Accelerating 5 Lane Rota-Rod Treadmills for Mice

- 2 speed settings:
  - Constant
  - Accelerating
- Run 5 mice simultaneously
- Automatic recording of fall time via solid state clock

The micro processor controlled Rota Rod for mice features a front panel with a large, very readable back-light display. The panel can be oriented to select the most comfortable angle for the operator, to avoid glare, etc.

This Mouse Rota Rod has two operating modes:

Constant Speed Mode – where the angular speed (RPM) is preset by the operator, in the range between 4 and 50 rotations per minute.

Accelerating Speed Mode - where the operator presets both the duration and the steepness of the ramp, e.g., 4 minutes to pass from 4 to 40 RPM, 5 minutes to pass from 6 to 30 RPM, etc.

The display shows the actual angular speed (RMS at each instant) in real time. It also shows the endurance time of each animal and the speed at which the animal looses its grip and falls.

The data of each experiment can be stored or routed in real time to the PC.

This Rota-Rod operates under the same principle as the Constant Speed Rota-Rod Treadmill but with an added Acceleration feature. The "Rota-Rod" technique has been originated by a 1957 paper of N.W Dunham and T.S Miya and has proved to be of great value in research involving screening of drugs which are potentially active on motor coordination.

These Rota-Rods are the result of many years of research in cooperation with the latest development in behavioral and pharmacological research; they basically consist of five 3 cm diameter drums which are suitably machined to provide grip. Six flanges divide the drums, enabling five mice to be on the treadmill simultaneously.

By operating with animals running on an accelerating drum, screening results are less scattered. In other words, a single "session" acts as conditioning and training run. This model has been originated by a paper of B.J. Jones and D.J. Roberts "The Quantitative Measurement of Motor Inco-ordination in Naive Mice Using an Accelerating Rotarod."

The machine is provided with a motor drive which operates in ACCELERATION, LOCK or RESET mode. The acceleration phase is monitored by a bar-graph type of speed indicator, placed on the front panel.

Conditioning the Animal

Some research workers think advisable to carry out some kind of "conditioning" before starting the motor coordination test. With the drums at minimum speed each rodent is placed in its section in order to familiarize it with the revolving drum. After two-three training runs of 1-2 minutes at intervals of 2-3 hours, the rats should be ready for the test proper.

Data Acquisition and Recording

These Rota-Rod Treadmills are supplied with a connector (D15) for branching them to the 6-Channel Multifunction Printer, see page G11. This printer is a microprocessor controlled device designed to acquire data from 6 independent channels. Each Rota-Rod requires 4 channels exported to a PC computer. The data export to a PC requires the purchase of the Win-DAS Software Package, see accessories. This must be purchased as a separate product.

Each Treadmill is supplied complete with the following components: Dust Cover, Trip Plate, complete with Spring & Iron Keeper, Transmission Belt, Spare Fuses for either 115 V or 230 V and Instruction Manual.

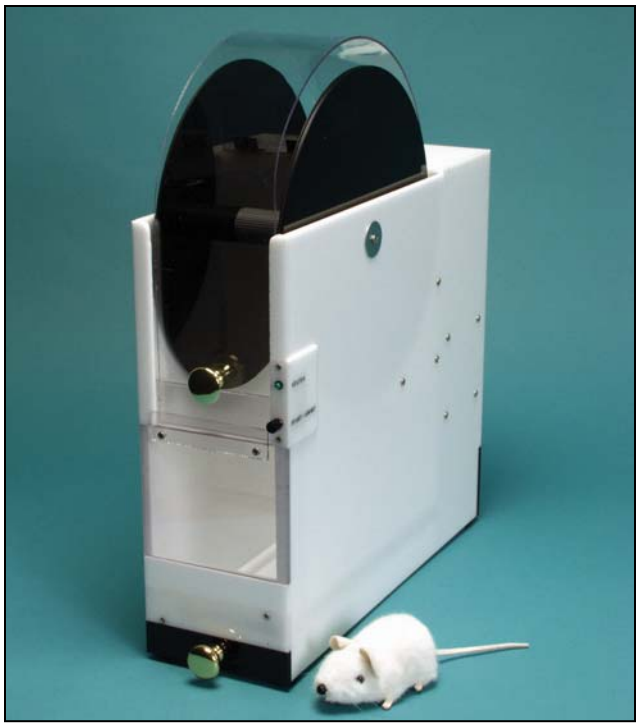
Specifications

Power Requirement	115 V or 230 V, 50/60 Hz
Dimensions, H x W x D	45 x 37 x 25 cm
Weight	6.10 kg
Shipping Weight	13.00 kg (approx.)

Catalog No.	$	Model	Product
BS4 72-6680		47600/115V	Rota-Rod Treadmill for Mice, 115 V
BS4 72-6681		47600/230V	Rota-Rod Treadmill for Mice, 230 V
Accessories			
BS4 72-6682		2600/115V	6-Channel Multi-Function Printer, 115 V
BS4 72-6683		2600/230V	6-Channel Multi-Function Printer, 230 V
BS4 72-6671		2010	Win-DAS Software Package
Replacement Parts			
BS4 72-6672		7701	Rat Rota-Rod Treadmill Dust Cover
BS4 72-6673		7703	Rat Rota-Rod Treadmill Trip Plate, complete with Spring & Iron Keeper
BS4 72-6674		7706	Rat Rota-Rod Treadmill Transmission Belt
BS4 72-6676		7601	Mouse Rota-Rod Treadmill Plastic Cover
BS4 72-6677		7603	Mouse Rota-Rod Treadmill Trip Plate, complete with spring & Iron Keeper
BS4 72-6678		7606	Mouse Rota-Rod Treadmill Transmission Belt
BS4 72-6679		7616	Mouse Rota-Rod Treadmill Instruction Manual

Bibliographies *– See facing page*

NEW Accelerating Single Lane Rota-Rod



- Study fatigue and coordination
- Operate up to 16 independent chambers with zero interaction
- Each channel is completely independent and is capable of:
  - Forward and reverse direction
  - Speeds up to 100 rpm
  - Automatic fall detection
- Software adjustable (duration and intensity) foot shock (0 to 2.5 mA)
- Enclosed design prevents escape
- Chambers are available with or without shock
- Removable tray for easy cleaning
- For mice or rats (with addition of rat adapter)

This Accelerating Rota-Rod apparatus is used to study the fatigue and coordination of up to 16 mice or rats. The system will automatically prompt the operator to load each animal by ID to a specific channel and then run the appropriate speed/shock profile on that animal. The operator must simply follow the color coded instructions on the video monitor to complete the testing for all animals in a minimum time. The researcher is relieved of the responsibility of keeping track of the animals, the experiment protocol for each animal and the recording of the performance of each animal.

The system can easily be converted from a mouse rod to a rat rod by using the rat adapter (70 mm rod). Each test chamber has its own motor drive. Shock is available to prevent interaction between animals. This system is capable of running identical protocols in all 16 channels; more than one researcher can use the system simultaneously.

System Requirements

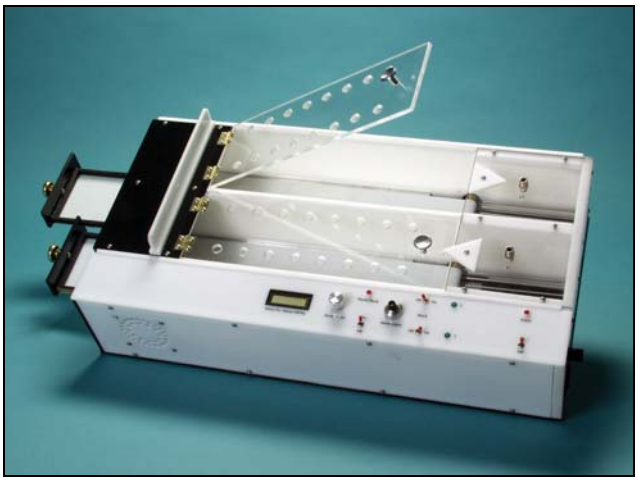
- MS Windows® 2000 or Windows® XP
- Pentium III 733 MHz with USB ports
- 128MB RAM
- 10GB Hard Drive
- CD-ROM Drive
- PS2 style keyboard and mouse ports
- Direct X Video Card (16MB)

Specifications

Test Chamber Dimensions, H x W x D	50.8 X 14.0 X 43.2 cm (20 x 5.5 x 17 in)
Test Chamber Weight	6.8 kg (15 lbs)
Height from Top of Rod to Shock Grid	34.9 cm (13.8 in)
Speed Selection	0 to 100.0 RPM
Diameter of Mouse Rod	30 mm (11.8 in)
Diameter of Rat Rod	70 mm (27.6 in)
Width, Each Chamber	10.9 cm (4.3 in)
Shock Intensity	0 to 2.0 mA
Shock Duration	0 to 60.0 sec

Catalog No.	$	Product
BS4 72-7035		Accelerating Rota-Rod Test Chamber for Mouse, 30 mm
BS4 72-7036		Rota-Rod Windows Software
BS4 72-7037		Rota-Rod Rat Adapter, 70 mm
BS4 72-7038		Rota-Rod Shock Option
BS4 72-7039		Rota-Rod Motor Belt Replacement

NEW Treadmill for Mice and Rats



- Study exercise physiology in rats and mice
- Compact, light weight, quiet unit for exercising
- Speed control and indication
- Air tight chambers for $V0_2/VC0_2$ studies
- Electrical shock stimulus
- Easy to clean with slide out trays

This Treadmill is an economical treadmill. It consists of endless conveyor type belts driven by a DC servo motor with optical encoder for precise speed control. The animals are separated from each other by opaque partitions. The motor drive electronics permits the user to select any speed from 0 up to 100 meters per minute. The grade can be adjusted manually or optionally with a motorized grade adjuster.

A shock grid is built into each channel which can be used to train animals to run. In addition, the front of the treadmill is made of dark acrylic so that the animals can run towards the darkened section of the channel (runway). Thus, the animals are provided with both negative and positive stimuli resulting in a significantly reduced training period.

Another unique feature is the slide out trays that make it very easy to clean the unit.

A major advantage offered by this Treadmill is the special design of the belt and shock bars. This provides the animal with a tactile warning that it is approaching the shock bars. The animals thus learn to speed up without being shocked, thus reducing trauma.

The runways can be made air tight to permit the researcher to conduct gas exchange studies ($VO_2/VC0_2$) on each animal separately. The Metabolic Monitoring System can be combined with the treadmill for such studies.

The Treadmill is constructed to optimize exercise volume to provide fast response in gas exchange studies.

Specifications

Parameters of Study	Exercise, training, $V0_2$, $VC0_2$, $V0_2$ max
Species	Rats and mice, separate size treadmill for each species
Number of Chanels/Lanes	Select from 2, 4 or 6 lanes
Dimensions, H x W x D	
Mouse Treadmill 2 Lanes	
Overall	62.23 x 34.29 x 15.24 cm (24.5 x 13.5 x 6 in)
Exercise Area	50.80 x 6.35 x 10.16 cm (20 x 2.5 x 4 in)
Shock Grid Area	16.51 x6.35 x 10.16 cm (6.5 x 2.5 x 4 in)
Weight	14.51 Kg (32 lbs)
Mouse Treadmill 4 Lanes	
Overall	62.23 x 42.55 x 15.24 cm (24.5 x 16.75 x 6 in)
Exercise Area	50.80 x 6.35 x 10.16 cm (20 x 2.5 x 4 in)
Shock Grid Area	16.51 x 6.35 x 10.16 cm (6.5 x 2.5 x 4 in)
Weight	24.95 kg (55 lbs)
Mouse Treadmill 6 Lanes	
Overall	62.23 x 50.80 x 15.24 cm (24.5 x 20 x 6 in)
Exercise Area	33.02 x 6.35 x 10.16 cm (13 x 2.5 x 4 in)
Shock Grid Area	12.70 x 7.62 x 10.16 cm (5 x 3 x 4 in)
Weight	68.04 kg (150 lbs)
Rat Treadmill 2 Lanes	
Overall	62.23 x 38.10 x 15.24 cm (24.5 x 15 x 6 in)
Exercise Area	43.18 x 11.43 x 10.16 cm (17 x 4.5 x 4 in)
Shock Grid Area	16.51 x 11.43 x 10.16 cm (6.5 x 4.5 x 4 in)
Weight	20.87 kg (46 lbs)
Rat Treadmill 4 Lanes	
Overall	86.36 x 60.96 x 15.24 cm (34 x 24 x 6 in)
Exercise Area	43.18 x 11.43 x 10.16 cm (17 x 4.5 x 4 in)
Shock Grid Area	16.51 x 11.43 x 10.16 cm (6.5 x 4.5 x 4 in)
Weight	45.36 kg (100 lbs)

Treadmill for Mice and Rats

Channels	No Grade Adjustment		Motorized Grade Adjustment	
	Non Air Tight Runway	Air Tight Runway	Non Air Tight Runway	Air Tight Runway
2 Channel Mouse $	BS4 72-7040	BS4 72-7052	BS4 72-7046	BS4 72-7058
2 Channel Rat $	BS4 72-7041	BS4 72-7053	BS4 72-7047	BS4 72-7059
4 Channel Mouse $	BS4 72-7042	BS4 72-7054	BS4 72-7048	BS4 72-7178
4 Channel Rat $	BS4 72-7043	BS4 72-7055	BS4 72-7049	BS4 72-7179
6 Channel Mouse $	BS4 72-7044	BS4 72-7056	BS4 72-7050	BS4 72-7180
6 Channel Rat $	BS4 72-7045	BS4 72-7057	BS4 72-7051	BS4 72-7181

Catalog No.	$	Product
BS4 72-7182		Replacement Motor Drive Belt

Custom design to accommodate any size animals available by special order.

Plantar Test (Hargreaves' Method)

- For measurement of hyperalgesia to thermal stimulation in unrestrained animals
- Automatic detection of the behavioral end point
- Validity unaffected by repeated testing
- Greater bioassay sensitivity than other thermal or mechanical tests
- Each animal can serve as its own control

The Plantar Test (Hargreaves' Method) enables the researcher to discern a peripherally mediated response to thermal stimulation caused by drugs in the unrestrained rat.

The system consists of:

- A movable infrared source
- A glass pane onto which the rat enclosure is located
- A controller

A rat is placed into one of the three compartments. After an acclimation period, the infrared source is placed under the glass floor and is positioned by the operator directly beneath the hind paw. A trial is commenced by depressing a key which turns on the infrared source and starts a digital solid state timer.

When the rat feels pain it will withdraw its paw. The withdrawal of the paw causes a sudden drop in the reflected radiation which switches off the infrared source and stops the reaction time counter. The withdrawal latency is calculated to the nearest 0.1 second. The 3-compartment enclosure has been provided to speed up the test when a number of animals are involved. In each compartment the animal is unrestrained.

The Heat-Flux Infrared Radiometer 37300 has been designed to calibrate infrared sources, in particular the Plantar Test.

Calibration Radiometer

Each plantar test is accurately calibrated via an infrared radiometer to make sure that its infrared source delivers the same power flux (expressed in mW per square cm) and hence a nociceptive stimulus of the same intensity.

The end user should consider the Heat-Flow Infrared Radiometer Model an extremely useful accessory. This Infrared Radiometer is a battery operated, self sufficient instrument complete with infrared probe, digital meter and adaptors for the Tail Flick and Plantar Test. All parts are neatly lodged in a sturdy plastic case with punched foam lining.

This Radiometer enables the experimenter to:

i) Check (and adjust if necessary) the I.R. emission. In fact, the I.R. output of the Plantar Test may in the course of one-two years undergo to 2-3% reduction, due to dust gathered on the optics, blackening of the I.R. bulb, accidental knocks, ageing of components due to thermal cycles, etc.

Moreover, in case the bulb is replaced or the electronics serviced, output alteration of more significant magnitude, say, 8-10%, may take place.

ii) Make sure that two or more Plantar-Test units deliver thermal nociceptive stimuli of exactly the same intensity. Balance them, if necessary.

iii) Know the I.R. energy (1 mW for the duration of 1s corresponds to 1 mJ) in absolute terms, a useful datum to compare with any equal or different method/instrument described in the literature

Plantar Test (Hargreaves' Method)

Data Acquisition

The Plantar Test is provided with a connector (D15) for branching it to the 6-Channel Multi-Function Printer or the 48-Channel Multi-Function Printer, see page G11. Both Multi-Function Printers are microprocessor controlled devices, designed to acquire data from either 6 or 48 independent channels. Each Plantar Test requires 1 channel. The data is stored in the internal memory and is shown on its graphic display. The data may also be printed real time or may be exported to a PC computer. The data export to a PC requires the purchase of the Win-DAS Software Package, see accessories. This must be purchased as a separate product.

The data, stored in the 2600/2650 internal memory and shown on its graphic display, can be printed out in real time and/or routed to the PC; in the latter case, the 2010 Win-DAS Software Package is required.

The Plantar Test System includes:

Controller, Emitter/Detector Vessel, complete with cable, Platform with supporting columns, Framed Glass Pane, Three-Compartment Rat Enclosure, Spare Bulb, Mains Cable, Instruction Manual, 1.5 mm Allen Wrench, Dust Cover, and Set of Fuses for 230 V operation or 115 V operation.

Specifications

Starting	Via keys on the I.R. Vessel. Additional key on the controller panel
Infrared Intensity	Adjustable in the interval 10 to 99 (in one digit steps)
Reaction Time	Three-digit LED display, 0.1 second steps
Infrared Bulb	Halogen "Bellaphot", Mod. 64607 OSRAM, 8 V - 50 W
Calibration	Via appropriate I.R. Radiometer
Connection to PC	Through DELTA 15-pin connector
Power Requirement	115 V or 230 V, 50/60 Hz, 60 VA maximum
Operating Temperature	15° to 30°C
Dimensions (assembled)	85 x 40 x 35 cm (33.5 x 15.7 x 13.8 in)
Weight	13.00 kg (28.7 lb)
Shipping Weight	27.50 kg (60.6 lb) approx.

Catalog No.	$	Model	Product
BS4 72-6692		7370/115V	Plantar Test, 115 V
BS4 72-6693		7370/230V	Plantar Test, 230 V
Accessories			
BS4 72-6682		2600/115 V	6-Channel Multi-Function Printer, 115 V
BS4 72-6683		2600/230 V	6-Channel Multi-Function Printer, 230 V
BS4 72-6684		2650/115 V	48-Channel Multi-Function Printer, 115 V
BS4 72-6685		2650/230 V	48-Channel Multi-Function Printer, 230 V
BS4 72-6671		2010	Wind-DAS Software Package
BS4 72-6703		37300	Heat-Flux Infrared Radiometer
Replacement Parts			
BS4 72-6670		7371	Controller
BS4 72-6694		7372	Emitter/Detector Vessel, complete with cable
BS4 72-6695		7373	Platform with supporting columns
BS4 72-6696		7375	Framed Glass Pane
BS4 72-6697		7376	Three-Compartment Rat Enclosure
BS4 72-6698		7365	Spare Bulb
BS4 72-6699		7377	Mains Cable
BS4 72-6701		7379	1.5 mm Allen Wrench
BS4 72-6702		7381	Dust Cover for Controller

Bibliography

Methods Paper:

- *K.M. Hargreaves, R. Dubner, F. Brown, C. Flores and J. Joris: "A New and Sensitive Method for Measuring Thermal Nociception in Cutaneous Hyperalgesia." Pain 32: 77-88, 1988.*

Additional Papers:

- *K.M. Hargreaves, R. Dubner and J. Joris: "Peripheral Action of Opiates in the Blockade of Carrageenan-Induced Inflammation" Pain Research and Clinical Management. Vol. 3. Elsevier Science Publishers, Amsterdam: 55-60, 1988*
- *G. Benneth and Y.K. Xie: "A Peripheral Neuropathy in Rat that Produces Disorders of Pain Sensation Like Those Seen in Man" Pain 33: 87-107, 1988.*
- *M. Iadarola and G. Draisci: "Elevation of Spinal Cord Dynorphin mRNA Compared to Dorsal Root Ganglion Peptide mRNAs During Peripheral Inflammation" In: The Arthritic Rat as a Model of Clinical Pain? by J. Besson and G. Guilbaud (eds.) Elsevier Press, Amsterdam: 173-183, 1988.*
- *A. Costello and K.M. Hargreaves: "Suppression of Carrageenan-Induced Hyperalgesia. Edema and Hyperthermia by a Bradykinin Antagonist" European J. Pharmacol., 1989.*
- *K.M. Hargreaves, R. Dubner and A. Costello: "Corticotropin Releasing Factor (CRF) has a Peripheral Site of Action for Antinociception" European J. Pharmacol., 1989.*
- *J. Hylden, R. Nabin, R. Traub and R. Dubner: "Expansion of Receptive Fields of Spinal Lamina I Protection Neurons in Rats with Unilateral Adjuvant-Induced Inflamma-tion: The Contribution of Central Dorsal Horn Mechanisms" Pain 37: 229-244, 1989.*

For complete details on 6-Channel and 48-Channel Multi-Function Printers, see page G11.

For complete details on Heat-Flux Infrared Radiometer, see page G18.

NEW Heat-Flux Infrared Radiometer

- Calibrates the Infrared emission of Plantar Test
- Digital display
- Takes only seconds to use

The Heat-Flux Infrared Radiometer has been designed to calibrate I.R. sources, in particular the classic Plantar Test, to make sure they deliver the same power flux and hence a nociceptive stimulus of the same intensity.

This Heat-Flux Infrared Radiometer is a battery operated, self sufficient instrument complete with infrared probe, digital meter and adaptors for the Plantar Test. The Infrared Radiometer enables the experimenter to:

i) Check (and adjust if necessary) the infrared emission. In fact, the infrared output of the Plantar Test may in the course of one to two years undergo to 2-3% reduction, due to dust gathered on the optics, blackening of the infrared bulb, accidental knocks, ageing of components due to thermal cycles, etc. Moreover, in case the bulb is replaced or the electronics serviced, output alteration of more significant magnitude, say, 8-10%, may take place.

ii) Make sure that two or more Plantar-Test units deliver thermal nociceptive stimuli of exactly the same intensity. Balance them, if necessary.

iii) Know the infrared energy (1 mW for the duration of 1sec corresponds to 1 mJ) in absolute terms, a useful datum to compare with any equal or different method/instrument described in the literature.

The measuring only requires a few seconds. The I.R. probe is positioned on the Plantar Test after the suitable adaptor is fitted on the threaded head of its heat-sink. The reading on the digital display gives the I.R. power output in mW per square centimeter. The calibration, if necessary, of the I.R. radiation source, is carried out by adjusting the supply current of the I.R. bulb, see the instruction manuals of the Plantar Test.

The Heat-Flux Infrared Radiometer Complete Package includes:

Digital Heat-Flux Meter (complete with cable/connector & 9V battery) and I.R. Probe neatly lodged in a sturdy plastic case with punched foam lining.

Specifications

Dimensions, H x W x D	11 x 37 x 32 cm (4.3 x 14.6 x 12.6 in)
Weight	2.00 kg (4.4 lbs)
Shipping Weight	3.20 kg (7.1 lbs)

Catalog No.	$	Model	Product
BS4 72-6703		37300	Heat-Flux Infrared Radiometer, Standard Package
Accessories			
BS4 72-6728		37300-322	Adaptor for Plantar Test
BS4 72-6729		37300-320	Probe Front Cover

Dynamic Plantar Anesthesiometer

- Models for Mice or Rats
- For the assessment of animal sensitivity to the light touch of the paw
- Computer compatibility, direct connection to a PC with optional software
- Read-out via multifunction graphic display
- Print-out by thermal printer

The Dynamic Plantar Anesthesiometer consists of a movable force-actuator below a network platform upon which the operator deposits the rodent. A Perspex enclosure renders the animal unrestrained for the duration of the experiment.

The operator places the actuator beneath the paw (proper placement ensured via an angled mirror) and the actuator confers a use-defined force on a Von Frey-type filament. The filament exerts an increasing force to the plantar surface, starting below the threshold of detection and increasing until the animal removes its paw. At the retraction reflex movement when the paw is withdrawn, the registers and displays the actual force at which paw withdrawal occurred.

The Dynamic Plantar Anesthesiometer is a new instrument for the assessment of "touch sensitivity" on the plantar surface of the rodents. Somesthetic (mechanical) stimulation has a long history of effective clinical use to diagnose pathologies of hyper- or hypo- anesthesia, brought about by drugs, neural pathology or experimental lesions, etc., in model systems and experimental systems using laboratory animals.

The instrument consists of:

- Movable touch-stimulator unit
- Framed metal mesh
- Two-compartment enclosure
- Microprocessor controlled electronic unit

The electronic unit is enclosed into a tiltable cylindrical case of original design, with graphic LCD display, serial port (RS-232) and a thermal printer. The unit also has an internal memory for data storage, scrolling screen review, and optional output to PC.

The rat, mouse or other small rodent moves about freely in one of the two compartments of the enclosure, positioned on the metal mesh surface. Following acclimation after cessation of exploratory behavior, the operator places the touch-stimulator unit under the animal's paw, using the adjustable angled-mirror to position the filament below the target area of the paw. A START key is provided at both sides of the handle of the touch-stimulator vessel, to help both left- and right-handed operators.

Pressing START invokes the following automatic sequence:

a. An electro-dynamic actuator of proprietary design lifts a straight plastic filament
b. The filament touches the plantar surface and begins to exert an upward force below the threshold of feeling
c. The force increases (at your preset rate of application), until a stop signal is attained. The stop signal is either the animal removing the paw or the point at which greatest preset force is met.

The actuator filament (0.5 mm diameter) produces force over the entire range of all typical anesthesiometer test devices. Paw withdrawal reflex is automatically recorded using two metrics: the latency until withdrawal, in seconds, and the force at which paw was withdrawn, in grams.

Data Acquisition

The Dynamic Plantar Anesthesiometer is microprocessor controlled and features direct PC output. Internally-stored data can be routed via a 9-pin D-type connector to the PC serial port (RS232). Data output requires Win-DAS Software to interface the Dynamic Plantar instrument and PC. This Windows® based Data Acquisition Software Package stores the data into individual files which make the date easily exportable to most statistical analysis packages available on the market.

Each Anesthsiometer is supplied complete with the following components:

Controlled Electronic Unit, Touch Stimulator, complete with Filament Actuator and Adjustable Angled-Mirror, Platform with Supporting Columns, Metal Mesh, Two-Compartment Animal Enclosure, Set of Two 0.5 mm Diameter Stainless-Steel Filaments and Two Calibration Weights (5 & 50 G), Animal-Enclosure Partition, to Divide Each Compartment in 4 Spaces (Standard), Mains Cord, Set of 2 fuses for either 230V or 115V operation, and Instruction Manual.

Specifications

Starting	Via keys on the touch-stimulator vessel
Force Range	0 to 50.0 grams, in 0.5 g steps
Force Increasing Rate	Adjustable in the interval 1 to 20 seconds, in 1 s steps
Filament Travel	12 mm
Latency Time	Read-out on the graphic display, in 0.1s steps
Connection to PC	Through DELTA 9-pin connector. See DATA ACQUISITION
Power Requirements	115 or 230 V, 50/60 Hz, 20 W maximum
Dimensions:	
Electronic Unit, H x W x D	12 x 26 x 13 cm (4.73 x 10.2 x 5.1 in)
Assembled Platform	40 x 50 x 32 cm (15.75 x 19.7 x 12.6 in)
Total Weight	10.20 kg (22.5 lb)
Shipping Weight	18.50 kg (40.8 lb), approx.

Catalog No.	$	Model	Product
BS4 72-6704		37400/115V	Dynamic Plantar Aneasthesiometer
BS4 72-6705		37400/230V	Dynamic Plantar Aneasthesiometer
Accessories			
BS4 72-6671		2010	Win-DAS Software Package
BS4 72-6712		37400-321	Set of Two 0.5 mm Diameter Stainless-Steel Filaments and Two Calibration Weights (5 & 50 G)
BS4 72-6727		37400-324	Animal-Enclosure Partition, to Divide Each Compartment in 4 Spaces

Analgesia Meters

Tail Flick Analgesia Meter

- For rapid screening of analgesic drugs using rats (as described by D'Amour and Smith)

This meter measures a rat's reaction time to radiant energy, from a 150 watt light source. The beam is focused on its tail using a parabolic reflector. The energy of the light source can be adjusted and the display indicates, as a percentage, how much energy is being utilized.

An optical sensor is located underneath the focused light source. The rat should be positioned such that its tail obscures the focused light source from the sensor. When the system is started, either using the supplied footswitch or front panel mounted start key the light source illuminates and a timer starts counting in tenths of a second. When the rat's tail flicks, indicating its pain threshold, it uncovers the sensor. This tail movement turns off the timer and light source. Reaction time can be read directly from the display in seconds and tenths of a second.

A standard parallel port permits connection to a printer to record the trial number, energy level and reaction time. A calibration facility allows the light source to be set to the desired level before commencing with the experiment.

Specifications

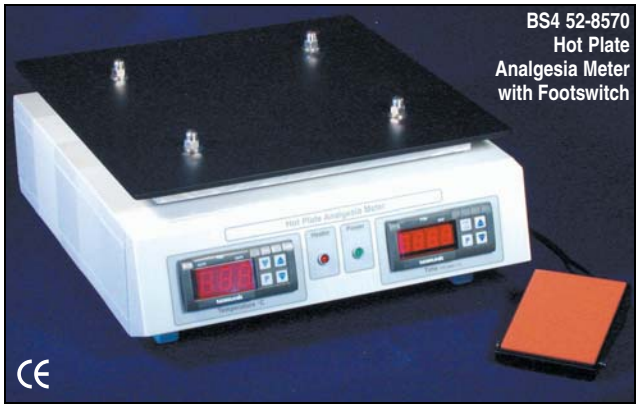
Lamp Intensity	150 W, adjustable between 0 and 100% in 1% increments
Timer Range	0 to 99 min 59.9 secs in 0.1 sec steps
Printer Interface	Centronix parallel
Lamp Heat Control	Digital DC regulated
Dimensions, H x W x D	260 x 450 x 260 mm (10 x 18 x 10 in)
Weight	9 kg (19.8 lbs)

Catalog No.	$	Product
BS4 52-9487		Tail Flick Analgesia Meter, 115 VAC, 60 Hz
BS4 52-9495		Tail Flick Analgesia Meter, 240 VAC, 50 Hz

Did you know ?

Harvard Apparatus has new nitric oxide sensors that have 100 times the sensitivity of any existing nitric oxide sensors. See the Cell Biology Section M of this catalog for complete details.

Hot Plate Analgesia Meter



- Digital Display of Plate Temperature
- Digital Timer with Remote Start Stop
- Accurate Temperature Control from 35°C to 65°C (±0.3°C)

The New Harvard UK Hot Plate Analgesia Meter is a sophisticated temperature control and timing system, and has been designed to perform rapid and precise screening of the narcotic type analgesic drugs (Morphine, Codeine, etc.) according to the Eddy and Leimback hot plate test. This method evaluates the reaction time of mice when a heat stimulus is applied to the plantar surface. This reaction time increases when a central analgesic is administered to the animal.

Utilizing a simple user interface the user can quickly and easily set up the required hot plate temperature and a large easy to read LED display shows the current temperature.

The timer requires a single press of the Start / Stop Key to start and another press to stop, with reset automatically executed when timing is initiated. This function is also duplicated by a remote Start/Stop footswitch (supplied). The reaction time is again clearly displayed on a large LED display.

Using digital electronics, the hot plate temperature is constantly monitored and regulated to ensure the actual temperature and the desired temperature accurately match. The system also monitors the heating characteristics of the system and uses this data to minimize heating overshoot, providing faster temperature stabilization.

Specifications

Temperature Range	35° to 65°C
Temperature Stability	± 0.3°C
Temperature Control	Digital Proportional PWM
Timer	Digital Readout in 0.1 sec increments
Timer Range	0 to 9 mins 59 secs 9 tenths of a sec
Remote	Momentary make to Start/Stop
Remote Socket	6.35 mm 2 Pole Jack
Animal Container	Two furnished, large round cylinders
Mains Supply Voltage	115 VAC / 230 VAC, 50/60 Hz (factory set)
Dimensions, H x W x D	128 x 275 x 293 mm (5 x 10.8 x 11.5 in)
Weight	4.5 kg (9.9 lb)

Catalog No.	$	Product
BS4 52-8570		Hot Plate Analgesia Meter 110 to 115 VAC, 60 Hz
BS4 52-8588		Hot Plate Analgesia Meter 220 to 230 VAC, 50 Hz