Grip Strength Meter
For Mice & Other Small Laboratory Animals

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TSE Grip Strength Meter

General Information

The **TSE Grip Strength Meter System** is a measuring system for determining the gripping strength, i.e. holding strength, of a small laboratory animal.

Within the context of neuromuscular investigations this test system can be used to quantify the effects of hormones, toxins, muscle relaxants as well as disease or the aging process on the muscular strength of the animal.

The system can be configured for rats, mice or other small laboratory animals.

In the trial setup the animal pulls a special height-adjustable grip which is mounted to a high-precision force sensor.

The standard sensor for mice allows a measurement of up to 600 Pond, the standard sensor for rats up to 2000 Pond. Other measuring ranges are available on request (see ordering information).

If the animal releases the grip then the force value is shown on a digital display of a connected control unit. In addition, the analog waveform can be outputted on a chart recorder.

For maximum convenience the setup can be connected to a computer via COM or USB connection.

The **TSE GSM software for Windows** allows easy data acquisition. If the animal releases the grip, the force value is shown on the computer monitor and is simultaneously stored in a CSV file for further statistical calculations.
System Components

BASIC System

The BASIC system is supposed to be connected to a chart recorder. It is available for rats and mice. It comprises

- a base plate
- a control unit ("amplifier unit") that provides power for the force sensor and carries out amplification and filtering of the measuring signal. The measured force (in Pond) can be read off from the digital display
- a special height-adjustable sensor module that contains the force sensor (species-specific maximum force range)
- two species-specific stainless steel grips that can be easily exchanged:

For MOUSE
1. Standard grip "4-Paw-Measurement" (fore- and hindlimbs), angled (20 degrees)
2. Grasping grip "2-Paw-Measurement" (forelimbs only), straight

For RAT
1. Mesh grip "2-Paw-Measurement" (forelimbs), angled (25 degrees)
2. Grasping grip "2-Paw-Measurement" (forelimbs), straight

PC BASED System

The PC BASED system comprises all the components of the BASIC system plus

- the TSE GSM software for Windows
- a RS-232 cable to connect the control unit to the serial port of the computer. A RS232/USB adapter is included so that the connection can also be made via a USB port of the PC

1 Pond = 9.807 x 10^-3 Newton
Performing an Experiment…

… with the BASIC system

The chart recorder – a recorder with an input range of 0 … 10V is required – has to be calibrated first in order to read off absolute values from the waveform. This is done using a calibration weight.

The measurement is then started by triggering the gripping reflex of the animal.

If the animal holds on firmly to the grip then this is pulled backwards with a continuous movement.

The movement should be horizontal to the base plate and in line with the attachment axis of the grip.

The measured force is outputted on the display of the control unit, and the waveform is displayed on the chart recorder.

When the animal releases the grip the measured value is shown on the display (this value is “frozen” by the instrument).

After a trial is finished the next experiment can be started immediately without resetting the display.
… with the PC BASED system

When the TSE GSM program has been started the following buttons are available on the main screen:

![GSM main screen]

**Setup**  Setup window for entering control parameters  
**File**  Definition of data file  
**Start**  Starts data acquisition mode  
**Stop**  Stops data acquisition mode  
**End**  Exits the program  
**Marker**  Creates a text entry in the results table

Now the Animal and Trial Data…

![Animal and trial data]

…as well as the Control Parameters have to be entered in the setup.

**Sensor Limit**: Here the maximum capacity (Pond) of your system has to be selected in order to obtain correct measurements: 600 (mice) or 2000 (rats).

**Store Date (on/off)**: Clicking the option on stores current date with each measuring value.

**Store Time (on/off)**: Clicking the option on stores current time with each measuring value.

**Store Maximum (on/off)**: Activating this checkbox stores the maximum value during a single measurement. When the animal is pulled backwards the software measures the force continuously. In some cases the value output by the display on the instrument and by the green display area is not the maximum value. In this case it might be interesting for the user to also have the maximum value outputted.

**Com Port No.**: Number of the serial port where the sensor is connected (USB connections are addressed as virtual COM ports).

![Control parameters]

The List Separator and the Decimal Separator for the export file are also selected here.

With the START button the system is put into the "Ready" state. The gripping reflex of the animal is now triggered.

The measured force is outputted on the control unit display. When the animal releases the grip the measured value is shown on the display of the instrument - this value is now transferred to the PC and displayed in the trial monitor of the GSM software.

![Display of measured values]

Simultaneously the value is stored in a CSV file.

After a trial is finished the next experiment can be started immediately without resetting the display.

The CSV result file can be used for further-reaching statistical calculations in statistics packages (e.g. SAS) or spread sheets (e.g. EXCEL).
Partial List of Users

- AMT, Amsterdam, The Netherlands
- ARMGO Pharma, Inc., New York, NY, USA
- Bayerische Julius-Maximilians-Universität Würzburg, Würzburg, Germany
- Chang Gung Memorial Hospital, Niaosong Township, Kaohsiung County, Taiwan
- Charité - Universitätsmedizin Berlin, Berlin, Germany
- Columbia University, New York, NY, USA
- CSL Behring Biotherapies for LiveTM, Marburg, Germany
- DSM Nutritional Products Ltd., Kaiseraugst, Switzerland
- DZNE, Rostock, Germany
- EGIS Pharmaceuticals Ltd., Budapest, Hungary
- Evotec Neurosciences GmbH, Hamburg, Germany
- F. Hoffmann-La Roche AG, Basel, Switzerland
- Freie Universität Berlin, Berlin, Germany
- Georg-August-Universität Göttingen, Göttingen, Germany
- GSF-Forschungszentrum f. Umwelt & Gesundheit, GmbH, Neuherberg, Germany
- Harvard Medical School HMS, Boston, MA, USA
- Heinrich-Heine-Universität, Düsseldorf, Germany
- Indiana University School of Medicine, Indianapolis, IN, USA
- Industrial Toxicology Research Centre, Lucknow (U.P.), India
- Ingenium Pharmaceuticals AG, Neuherberg, Germany
- IVAX Drug Research Institute Ltd., Budapest, Hungary
- Johann Wolfgang Goethe-Universität, Frankfurt/Main, Germany
- Johannes Gutenberg-Universität Mainz, Mainz, Germany
- Johns Hopkins University, Baltimore, MD, USA
- Karolinska Institute, Stockholm, Sweden
- King’s College London, London, Great Britain
- Leibniz-Institut für Neurobiologie, Magdeburg, Germany
- Max-Planck-Institut für Experimentelle Medizin, Göttingen, Germany
- MDS Pharma Services, Bothell, WA, USA
- MedImmune, LLC, Gaithersburg, MD, USA
- Medizinische Universität Graz, Graz, Austria
- National University of Singapore, Singapore, Singapore
- Netherlands Institute for Neuroscience (NIN), AZ Amsterdam, The Netherlands
- Sanofi-Aventis Deutschland GmbH, Frankfurt/Main, Germany
- SANOFI-SYNTHELABO RECHERCHE, Toulouse, France
- Slovak Academy of Sciences, Bratislava, Slovakia Republic
- Universita di Padova, Padova, Italy
- University College London, London, Great Britain
- University of California - San Diego - UCSD, LaJolla, CA, USA
- University of California, Irvine, Irvine, CA, USA
- University of Helsinki, Helsinki, Finland
- University of Melbourne, Melbourne, VIC, Australia
- University of Pennsylvania, Philadelphia, PA, USA
- University of Washington, St. Louis, MO, USA
- Universitätsklinik Hamburg-Eppendorf - UKE, Hamburg, Germany
- Universiteit Leiden, RA Leiden, The Netherlands
- vivo Science GmbH, Gronau, Germany
- Yale University, New Haven, CT, USA
Publications


## Ordering Information

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Mouse Systems</strong></td>
<td></td>
</tr>
<tr>
<td><strong>BASIC</strong></td>
<td></td>
</tr>
<tr>
<td>303500-M/E-1</td>
<td><strong>Grip Strength Meter Mouse, BASIC</strong></td>
</tr>
<tr>
<td></td>
<td><strong>600g load cell</strong> *</td>
</tr>
<tr>
<td></td>
<td>Consisting of: Grip Strength Meter sensor module for mouse, complete with 2 grips</td>
</tr>
<tr>
<td></td>
<td>(mounted on a base plate, height-adjustable) + amplifier system</td>
</tr>
<tr>
<td></td>
<td><strong>Grips:</strong></td>
</tr>
<tr>
<td></td>
<td>■ Standard grip &quot;4-Paw-Measurement&quot; (fore- and hindlimbs), angled at 20 degrees</td>
</tr>
<tr>
<td></td>
<td>■ Grasping grip &quot;2-Paw-Measurement&quot; (forelimbs only), straight</td>
</tr>
<tr>
<td></td>
<td><strong>Technical data:</strong></td>
</tr>
<tr>
<td></td>
<td>■ Measuring range 0-600 g (alternative 0-1 kg, 0-2 kg, 0-3 kg, 0-6 kg)</td>
</tr>
<tr>
<td></td>
<td>■ Safe overload 300 % R.C.</td>
</tr>
<tr>
<td></td>
<td>■ Ultimate overload 400 % R.C.</td>
</tr>
<tr>
<td></td>
<td>■ Accuracy +/- 0.02 % R.O.</td>
</tr>
<tr>
<td></td>
<td>■ Repeatability +/- 0.01 % R.O.</td>
</tr>
<tr>
<td><strong>PC BASED</strong></td>
<td></td>
</tr>
<tr>
<td>303500-M/C-1</td>
<td><strong>Grip Strength Meter Mouse, PC-BASED</strong></td>
</tr>
<tr>
<td></td>
<td><strong>600g load cell</strong> *</td>
</tr>
<tr>
<td></td>
<td>Consisting of: Grip Strength Meter sensor module for mouse, complete with 2 grips</td>
</tr>
<tr>
<td></td>
<td>(mounted on a base plate, height-adjustable) + amplifier system + software package GSM for WINDOWS</td>
</tr>
<tr>
<td></td>
<td><strong>Grips:</strong></td>
</tr>
<tr>
<td></td>
<td>■ Standard grip &quot;4-Paw-Measurement&quot; (fore- and hindlimbs), angled at 20 degrees</td>
</tr>
<tr>
<td></td>
<td>■ Grasping grip &quot;2-Paw-Measurement&quot; (forelimbs only), straight</td>
</tr>
<tr>
<td></td>
<td><strong>Technical data:</strong></td>
</tr>
<tr>
<td></td>
<td>■ Measuring range 0-600 g (alternative 0-1 kg, 0-2 kg, 0-3 kg, 0-6 kg)</td>
</tr>
<tr>
<td></td>
<td>■ Safe overload 300 % R.C.</td>
</tr>
<tr>
<td></td>
<td>■ Ultimate overload 400 % R.C.</td>
</tr>
<tr>
<td></td>
<td>■ Accuracy +/- 0.02 % R.C.</td>
</tr>
<tr>
<td></td>
<td>■ Repeatability +/- 0.01 % R.O.</td>
</tr>
</tbody>
</table>

For connection to PC via COM (RS232) port or USB connector
## Ordering Information

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sensor Module</strong></td>
<td></td>
</tr>
<tr>
<td>303500-M/SEN</td>
<td>Grip Strength Meter Sensor Module Mouse</td>
</tr>
<tr>
<td></td>
<td>600g load cell *</td>
</tr>
<tr>
<td></td>
<td>Without base plate</td>
</tr>
<tr>
<td></td>
<td>For connecting to an existing Grip Strength Meter</td>
</tr>
<tr>
<td></td>
<td>Consisting of: Grip Strength Meter sensor module for mouse, complete with 2 grips</td>
</tr>
<tr>
<td></td>
<td><strong>Grips:</strong></td>
</tr>
<tr>
<td></td>
<td>■ Standard grip &quot;4-Paw-Measurement&quot; (fore- and hindlimbs), angled at 20 degrees</td>
</tr>
<tr>
<td></td>
<td>■ Grasping grip &quot;2-Paw-Measurement&quot; (forelimbs only), straight</td>
</tr>
<tr>
<td></td>
<td><strong>Technical data:</strong></td>
</tr>
<tr>
<td></td>
<td>■ Measuring range 0-600 g (alternative 0-1 kg, 0-2 kg, 0-3 kg, 0-6 kg)</td>
</tr>
<tr>
<td></td>
<td>■ Safe overload 300 % R.C.</td>
</tr>
<tr>
<td></td>
<td>■ Ultimate overload 400 % R.C.</td>
</tr>
<tr>
<td></td>
<td>■ Accuracy +/- 0.02 % R.O.</td>
</tr>
<tr>
<td></td>
<td>■ Repeatability +/- 0.01 % R.O.</td>
</tr>
</tbody>
</table>

### 2. Rat Systems

<table>
<thead>
<tr>
<th>BASIC</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>303500-R/E-1</td>
<td>Grip Strength Meter Rat, BASIC</td>
</tr>
<tr>
<td></td>
<td>2000g load cell **</td>
</tr>
<tr>
<td></td>
<td>Consisting of: Grip Strength Meter sensor module for rat, complete with 2 grips</td>
</tr>
<tr>
<td></td>
<td>(mounted on a base plate, height-adjustable) + amplifier system</td>
</tr>
<tr>
<td></td>
<td><strong>Grips (Forelimbs Only):</strong></td>
</tr>
<tr>
<td></td>
<td>■ Mesh grip, angled at 25 degrees</td>
</tr>
<tr>
<td></td>
<td>■ Grasping grip, straight</td>
</tr>
<tr>
<td></td>
<td><strong>Technical data:</strong></td>
</tr>
<tr>
<td></td>
<td>■ Measuring range 0-2 kg (alternative 0-600 g, 0-1 kg, 0-3 kg, 0-6 kg)</td>
</tr>
<tr>
<td></td>
<td>■ Safe overload 300% R.C.</td>
</tr>
<tr>
<td></td>
<td>■ Ultimate overload 400% R.C.</td>
</tr>
<tr>
<td></td>
<td>■ Accuracy +/- 0.02% R.O.</td>
</tr>
<tr>
<td></td>
<td>■ Repeatability +/- 0.01% R.O.</td>
</tr>
</tbody>
</table>
## Ordering Information

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PC BASED</strong></td>
<td><strong>Grip Strength Meter Rat, PC-BASED</strong></td>
</tr>
<tr>
<td>303500-R/C-1</td>
<td>2000g load cell **</td>
</tr>
</tbody>
</table>

Suites for 2-Paw-Measurement (Forelimbs)

Consisting of: Grip Strength Meter sensor module for rat, complete with 2 grips (mounted on a base plate, height-adjustable) + amplifier system + software package GSM for Windows

### Grips (Forelimbs only):
- Mesh grip, angled at 25 degrees
- Grasping grip, straight

### Technical data:
- Measuring range: 0-2 kg (alternative 0-600 g, 0-1 kg, 0-3 kg, 0-6 kg)
- Safe overload: 300% R.C.
- Ultimate overload: 400% R.C.
- Accuracy: +/- 0.02% R.O.
- Repeatability: +/- 0.01% R.O.

For connection to PC via COM (RS232) port or USB connector.

<table>
<thead>
<tr>
<th>Sensor Module</th>
<th><strong>Grip Strength Meter Sensor Module for Rat</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>303500-R/SEN</td>
<td>2000g load cell **</td>
</tr>
</tbody>
</table>

without base plate

For connecting to an existing Grip Strength Meter

Consisting of: Grip Strength Meter sensor module for rat, complete with 2 grips

### Grips (Forelimbs only):
- Mesh grip, angled at 25 degrees
- Grasping grip, straight

### Technical data:
- Measuring range: 0-2 kg (alternative 0-600 g, 0-1 kg, 0-3 kg, 0-6 kg)
- Safe overload: 300% R.C.
- Ultimate overload: 400% R.C.
- Accuracy: +/- 0.02% R.O.
- Repeatability: +/- 0.01% R.O.
## Ordering Information

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3. Individual Components</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Grips Mouse</strong></td>
<td></td>
</tr>
<tr>
<td>303500-M/GST</td>
<td>Spare Standard Grip for Grip Strength Meter Mouse</td>
</tr>
<tr>
<td></td>
<td>&quot;4-Paw-Measurement&quot; (fore- and hindlimbs), angled at 20 degrees</td>
</tr>
<tr>
<td>303500-M/GGRASP</td>
<td>Spare Grasping Grip for Grip Strength Meter Mouse</td>
</tr>
<tr>
<td></td>
<td>for &quot;2-Paw-Measurement&quot; (forelimbs), straight</td>
</tr>
<tr>
<td><strong>Grips Rat</strong></td>
<td></td>
</tr>
<tr>
<td>303500-R/GMESH</td>
<td>Spare Mesh Grip for Grip Strength Meter Rat</td>
</tr>
<tr>
<td></td>
<td>&quot;2-Paw-Measurement&quot; (forelimbs), angled at 25 degrees</td>
</tr>
<tr>
<td>303500-R/GGRASP</td>
<td>Spare Grasping Grip for Grip Strength Meter Rat</td>
</tr>
<tr>
<td></td>
<td>for &quot;2-Paw-Measurement&quot; (forelimbs), straight</td>
</tr>
<tr>
<td><strong>Various</strong></td>
<td></td>
</tr>
<tr>
<td>303500-M+R-BP</td>
<td>Grip Strength Meter Sensor Base Plate for Mouse and Rat</td>
</tr>
<tr>
<td>303500-M+R/AMP</td>
<td>Grip Strength Meter Amplifier System for Mouse and Rat</td>
</tr>
<tr>
<td>303500-M+R/SW</td>
<td>Grip Strength Meter Software Package for Grip Strength Meter Mouse and Rat</td>
</tr>
</tbody>
</table>

* This is the standard sensor for mice. Other force ranges available are: 0-1kg, 0-2kg, 0-3kg, 0-6kg.

** This is the standard sensor for rats. Other force ranges available are: 0-600g, 0-1kg, 0-3kg, 0-6kg.

Please note that the “g” unit given in the table above is equivalent to “pond”.
Product Overview

This overview illustrates additional products which are supplied by TSE Systems. Detailed information concerning each of the items listed below can be found on our website, for any additional information please do not hesitate to contact us:

- **Behavior**
  Conditioning, Activity & Exploration, Video Tracking, Mazes, Startle Response, Anxiety & Depression, Motor Function & Performance, Rotameter

- **PhenoMaster / LabMaster**
  Calorimetry, Drinking & Feeding & Body Weight, Home Cage Activity, Running Wheel

- **New Behavior Products**
  IntelliCage (cognitive screening for up to 16 mice living in a social group in a home cage environment)
  NeuroLogger (4 channels wireless EEG recording & activity)

- **Kinematic Analysis**
  MotoRater (evaluation of locomotor functions using high-speed video tracking: Ladder / Walking / Wading / Swimming)

- **Analgesia**
  Hot Plate, Tail Flick, Randall Selitto, Power Meter (Incapacitance Tester)

- **Physiology**

- **Inhalation**
  Head Nose Only and Whole Body Exposure Units, Aerosol Generation & Conditioning, Aerosol Analysis, Inhalation Software

- **Stereotaxic Instruments**

- **Isolated Organs**
  Organ Bath Systems, Langendorff and Working Heart Systems

- **Microtomes**
  Krumdieck Tissue Slicer

- **Pumps & Infusion**
  Syringe Pumps, Animal Infusion Systems

- **Surgery & Handling**
  Operating Tables, Homeothermic Blankets, Temperature and ECG Pads
PhenoMaster - Overview

TSE PhenoMaster System is an automated modular high throughput research system for the assessment of specific gene associated functions on the behavioral and physiological phenotype of small laboratory animals. It allows for the multi-dimensional in-vivo phenotyping of individual mutant strains by means of automated long-term monitoring of the animals in a home cage environment, by integrated operant behavioral assays as well as by additional temporary dedicated behavioral test paradigms.

**Modules & options available:**
- Spontaneous home cage activity (infrared light-beam frame X,Y,Z)
- Drinking & feeding behavior
- Body weight monitoring
- Voluntary running wheel activity with additional functionalities (time/ distance/ workload control, automated motor skill testing)
- Operant wall for cognitive tests
- Illumination (selective / aversive light stimuli)
- Air-puff or electrical shock option for aversive stimulation
- Indirect calorimetry for metabolic phenotyping
- Telemetry / transponders for physiological phenotyping

**Temporary paradigms:**
- Open field test
- Hole-board test
- Light / dark test
- Place preference

System control, data acquisition, storage and data analysis tools are provided by the PhenoMaster platform. Flexible data export offers the link to professional data mining solutions. PhenoMaster thus opens a new dimension for phenomics approaches.

For further information please refer to the PhenoMaster Website (www.Phenomaster.com) or the dedicated TSE PhenoMaster brochure.
Service & Warranty

TSE Systems offers a Two (2) Years ALL-IN Premium Warranty with all new products, including:
- 24/7 technical hotline
- Remote maintenance and update function
- On-site visits upon necessity
- Free replacement parts during warranty

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