

**TSE**  
Technical & Scientific  
Equipment GmbH



# **TSE RotaRod System**

**Computerized Treadmill for Mice and Rats**

# T S E RotaRod System

## Computerized Treadmill for Mice and Rats

### 1. The System

Coordinated locomotor activity on the RotaRod is used to assess the effect of drugs which impair motor coordination of the skeletal muscles or have an influence on fatigue resistance. Active drugs will alter the ability of the animal to remain on the RotaRod.

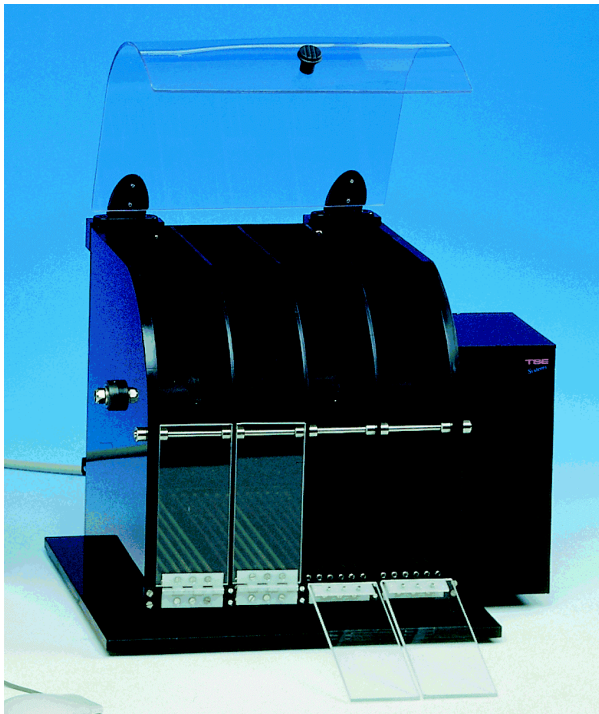
Our fully computerized electronically controlled system for mice and rats consists of

- the four-lane RotaRod \*,
- a control unit,
- an interface for an IBM-AT compatible computer and
- the RotaRod software for Windows.

\* *The system can be extended for up to 8 combined four-lane RotaRod units. Please ask for a special quotation!*



- The RotaRod apparatus basically consists of a drum whose surface is manufactured to provide grip for the animal.
- Flanges divide the drum into separate exercise lanes, enabling up to 4 animals to be on the treadmill simultaneously.
- The system can be altered for use with either **rats or mice** by mounting interchangeable expanders onto the central axis.
- Each unit is equipped with an escape prevention cover made of clear acrylic.
- The feces collection trays can be easily removed for cleaning purposes.
- The motor speed is controlled electronically. Two programmable speed modes are available: constant speed mode and acceleration mode, where the speed changes continuously over the course of the exercise.
- 4 individual timers are used to measure time spent on the treadmill.
- Animal falls are detected by light-beam sensors mounted into each compartment.
- Each compartment has a separate stainless steel floor grid that can be used as shock grid if required.



The RotaRod runs according to a user-defined exercise protocol created with the help of the flexible **RotaRod software**.

Prior to each experiment the speed of rotation (rpm), whether constant or accelerating, and the intensity and duration of the shock (if shocker is present) can be programmed.

Constant mode:	speed 1- 60 rpm
Accelerating mode:	initial speed 1 - 60 rpm
	final speed 1 - 60 rpm
	acceleration time 1 - 600 sec
Shock intensity:	0.1 – 3.1 mA
Shock length:	0.1 - 10.0 sec

If a fall is detected the system registers the total time the animal has spent on the rod (in seconds). An electrical stimulus can be delivered then.

All animal and experimental identifiers, the experimental parameters as well as the activity data are stored in **text format** for import into statistical or spreadsheet packages (e.g. EXCEL).

We can provide you with your personal data output format - please give us a detailed description of your special needs and we will provide you with a special quotation!

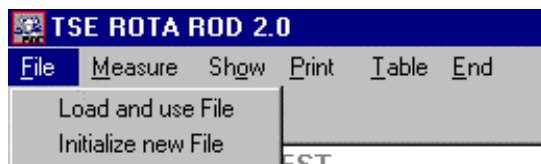
## 2. Trial preparation

The diagram below shows the main menu screen.

Main Menu Screen

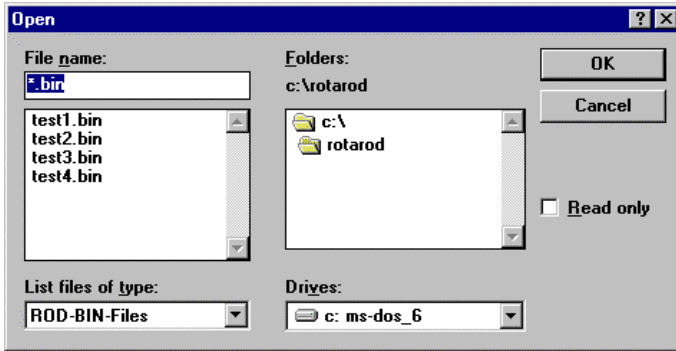
The screen will give information on the parameters used for the next experiment. The top of the display describes the different descriptive parameters, the bottom of the display gives information on the control parameters. The measuring values already stored in the file are shown („Stored records“).

### 2.1. Defining the file for a measurement

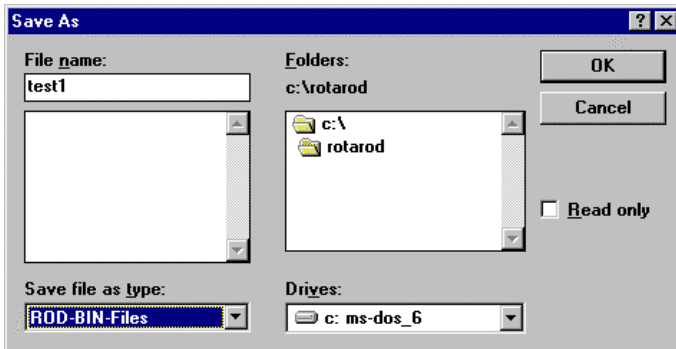


#### 2.1.1. Using an existing file („Load and use file“)

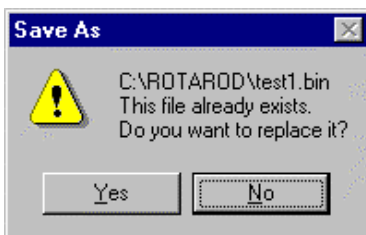
If the name of an already existing file is entered or selected, then the data of the next measurement will be added to the existing data file. All the setup parameters of the loaded files will be used. They cannot be changed!



### 2.1.2. Creating a new file („Initialize new file“)



A new name has to be entered here. After confirmation with OK, the **setup** is automatically entered. If the name of an already existing file is entered then the following message appears:



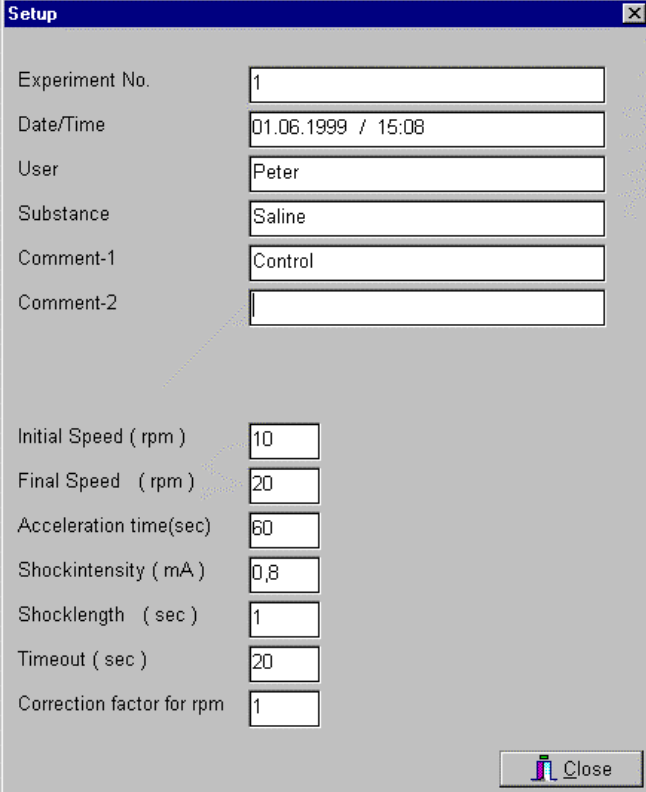
With YES the contents of the file will be overwritten with the next measurement.

## 2.2. The setup

If a new file is initialized then the setup window opens.

If an already existing file is loaded then no changes can be made.

Here the user can enter all global descriptive and control parameters:



Experiment No.	1
Date/Time	01.06.1999 / 15:08
User	Peter
Substance	Saline
Comment-1	Control
Comment-2	
Initial Speed ( rpm )	10
Final Speed ( rpm )	20
Acceleration time(sec)	60
Shockintensity ( mA )	0,8
Shocklength ( sec )	1
Timeout ( sec )	20
Correction factor for rpm	1

### Descriptive parameters

The following entry fields are available to characterize the experiment:

**Experiment No. / User / Substance / Comment-1 / Comment-2**

If no entry is made then the entry field is **not** output in the protocol and the export file.

Date and time are automatically supplied by the system.

### Exercise parameters

#### **Initial Speed: 1 - 60 rpm**

This entry determines the initial rotational speed of the treadmill, when the switch Start/Stop is pressed. In constant mode this speed is maintained constant throughout the experiment. In acceleration mode this sets the starting speed.

#### **Final Speed: 1 - 60 rpm**

Valid only in acceleration mode: This function determines the final speed of the treadmill after the acceleration time has elapsed.

- If this value is set to the same value as the initial speed or to a smaller value the instrument runs in constant mode.

**Acceleration time: 0 - 600 sec**

The rate of acceleration is set by the acceleration time parameter.

- If >0 it determines the time taken to accelerate from the initial speed to the final speed (**acceleration** mode).
- If this field is set to **0**, the rod is running in **constant** mode (with constant initial speed).

**Timeout: 10 – 600 sec**

This parameter sets the maximum duration of the experiment. If the animal has not left the rod until then the maximum time will be stored in the file.

*Example:*

The RotaRod is programmed to accelerate from a speed of 1 rpm (**initial speed**) to 10 rpm (**final speed**) over an **acceleration time** of 10 minutes.

**Rod with shock facility****Shock Intensity: 0.1 – 3.0 mA**

This value predefines the shock intensity. The shock is delivered after the animal has fallen from the rod onto the metal grid. Although an entry is obligatory the shock can be disabled by entering 0 in the entry field „Shock length“.

**Shock Length: 0.0 - 10.0 sec**

This value predefines the shock duration. 0=no shock



### 3. Measurement

Once all setup parameters have been entered or an existing file has been called up, pressing the menu item **Measure** will commence the experiment preparation phase.

	-1-	-2-	-3-	-4-
Status	STOP	STOP	STOP	STOP
Value	0.0	0.0	0.0	0.0
Animal	1	2	3	4
Marker	AB	CD	EF	GH
Weight	200	220	180	190
Dose	10mg/kg	20mg/kg	30mg/kg	40mg/kg
Action	Delete	Delete	Delete	Delete
Control	Start/Stop	Rpm : 0.0	Ignore	Close

Measure Mode screen (before the motor is started: Rpm:0.0)

- On top of each rod the actual status of each compartment is reported (status panel: RUN or STOP).
- Now all individual rod parameters have to be entered. Each lane can be characterized separately. The following input fields are available:

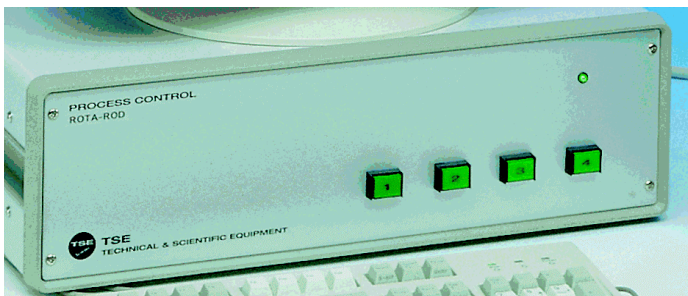
#### **Animal / Marker / Weight / Dose**

Note: In order not to disrupt the protocol format no more than 8 (animal no.) resp. 7 characters (marker, weight, dose) should be entered.

In a future version of the software these parameters will be used to select specific measurements for analysis.

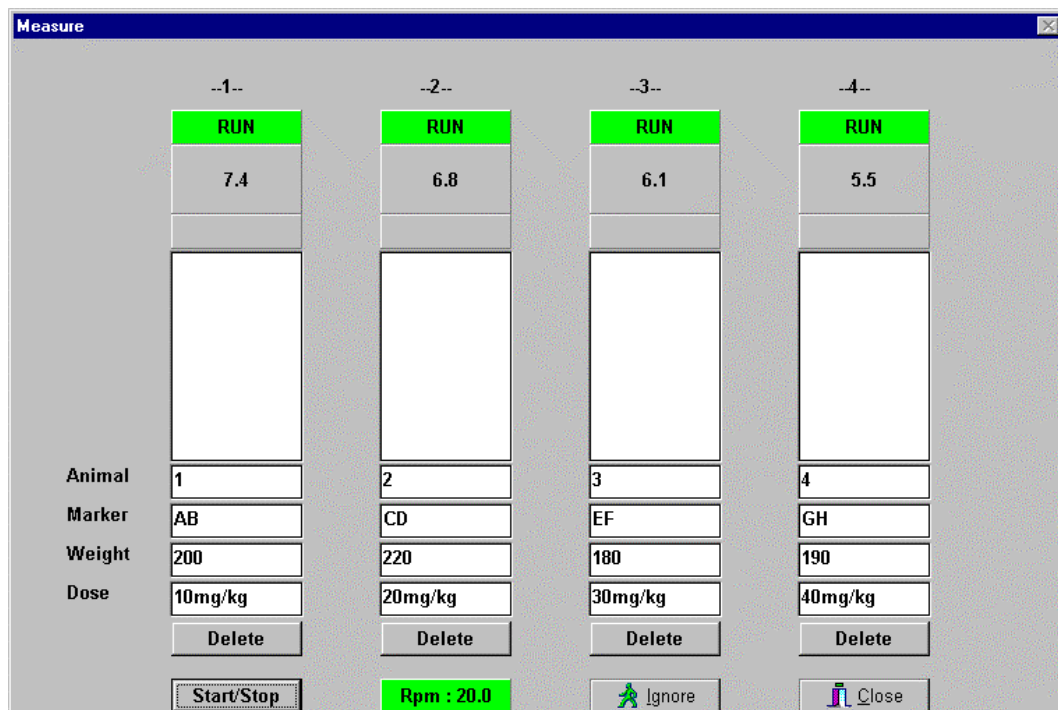
- The rod drive is started by pressing the **Start/Stop** switch.
- The motor will speed up to the initial speed.
  - This is the **constant speed** in constant mode.
  - If the RotaRod is programmed for **acceleration** it will start at the initial speed but will accelerate up to final speed. The rate of acceleration is set by the "Acceleration time" parameter.

- The current speed is continuously displayed („Rpm“).
- **The animals are quickly placed one by one onto the central axis** and each individual timer is started by simultaneously pressing the corresponding **timer knob** on the control unit.
- If desired, the escape prevention covers can be closed.



Control unit – timer knobs

- The status changes to RUN.



After starting the motor. The animals are already on the rod.

- The timer clock below the status panel counts the time elapsed.
- If an animal falls of the rod and interrupts the light-beam sensor the corresponding timer is stopped. The **time spent on the rod** is shown in the table below.

	-1-	-2-	-3-	-4-
	STOP	STOP	STOP	STOP
	10.7	10.8	10.9	11.1
	12.8 8.8 11.9 10.7	12.7 9.8 10.2 10.8	12.5 11.2 6.8 10.9	12.5 12.9 8.9 11.1
Animal	1	2	3	4
Marker	AB	CD	EF	GH
Weight	200	220	180	190
Dose	10mg/kg	20mg/kg	30mg/kg	40mg/kg
	Delete	Delete	Delete	Delete
	Start/Stop	Rpm : 20.0	Ignore	Close

After the 4<sup>th</sup> run using the same animals

- If an entry has been made in the field „Shock length“ a **shock** of the preset length and intensity is delivered through the grid. An active shocker is displayed with a red message field.

-1-
STOP
5.6
Shocker
5.6

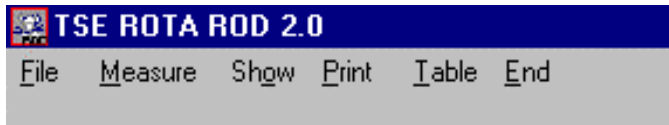
- If the preset maximum time (Timeout) has been reached and the animal is still on the rod then this time is entered into the table.
- The rod can be stopped manually anytime by pressing the **Start/Stop** switch again.
- The lane parameters can be changed anytime.
- Leaving the measuring mode and entering it again for further measurements starts a new data block in the protocol and in the file.
- **Delete** will delete the last value, even while a measurement is running.
- **Ignore** is used to leave the measure mode if the values are not to be stored.

**Note:**

If you are unfamiliar with placing the animals on the running rod or if the animals are not trained we recommend the following procedure:

- Enter a low initial speed (e.g. 1rpm).
- Enter the desired constant speed value as final speed (e.g. 16 rpm).
- Enter a short acceleration time (e.g. 5 or 10 sec).
- Place the animals quickly on the rod *while the motor is still stopped*.
- Take care that they don't turn around on the axis as they will fall down when the motor is started.
- Start the motor with the Start/Stop switch.
- After the final speed has been reached, press the timer knobs on the control unit to start the measurement.

## 4. Data Output



### 4.1. Menu item SHOW

Animal	Marker	Weight	Dose	Date	Time	Rod	Sec
1	AB	200	10mg/kg	01.06.99	11:44	1	12.8
1	AB	200	10mg/kg	01.06.99	11:45	1	8.8
1	AB	200	10mg/kg	01.06.99	11:45	1	11.9
1	AB	200	10mg/kg	01.06.99	11:45	1	10.7
2	CD	220	20mg/kg	01.06.99	11:44	2	12.7
2	CD	220	20mg/kg	01.06.99	11:45	2	9.8
2	CD	220	20mg/kg	01.06.99	11:45	2	10.2
2	CD	220	20mg/kg	01.06.99	11:45	2	10.8
3	EF	180	30mg/kg	01.06.99	11:44	3	12.5
3	EF	180	30mg/kg	01.06.99	11:45	3	11.2
3	EF	180	30mg/kg	01.06.99	11:45	3	6.8
3	EF	180	30mg/kg	01.06.99	11:45	3	10.9
4	GH	190	40mg/kg	01.06.99	11:44	4	12.5
4	GH	190	40mg/kg	01.06.99	11:45	4	12.9
4	GH	190	40mg/kg	01.06.99	11:45	4	8.9
4	GH	190	40mg/kg	01.06.99	11:45	4	11.1

The **measuring values** stored in the file can be displayed after the experiment has been finished or after loading a file by activating the menu item **Show**.

The values are sorted by **rod number**. If new measurements have been added to an existing file then the data block starts again with rod 1. The 2<sup>nd</sup> sorting criterion is the test time.

### 4.2. Menu item PRINT

This function will generate a **report** which is output to a printer giving details of the file name, date and time, control settings and descriptive parameters. The report will list the time spent on the rod for each of the compartments in use.

Time and date output in the table header correspond to the time when the new file has been initialized.

**TSE - ROTA-ROD V2.0      TEST6**

Experiment No.            : 1  
 Date/Time                : 01.06.1999 / 11:42  
 User                      : ES

Initial Speed ( rpm ) : 20  
 Final Speed ( rpm ) : 20  
 Acceleration time(sec) : 0  
 Timeout ( sec ) : 20

Animal	Marker	Weight	Dose	Date	Time	Rod	Sec
1	AB	200	10mg/kg	01.06.99	11:44	1	12.8
1	AB	200	10mg/kg	01.06.99	11:45	1	8.8
1	AB	200	10mg/kg	01.06.99	11:45	1	11.9
1	AB	200	10mg/kg	01.06.99	11:45	1	10.7
2	CD	220	20mg/kg	01.06.99	11:44	2	12.7
2	CD	220	20mg/kg	01.06.99	11:45	2	9.8
2	CD	220	20mg/kg	01.06.99	11:45	2	10.2
2	CD	220	20mg/kg	01.06.99	11:45	2	10.8
3	EF	180	30mg/kg	01.06.99	11:44	3	12.5
3	EF	180	30mg/kg	01.06.99	11:45	3	11.2
3	EF	180	30mg/kg	01.06.99	11:45	3	6.8
3	EF	180	30mg/kg	01.06.99	11:45	3	10.9
4	GH	190	40mg/kg	01.06.99	11:44	4	12.5
4	GH	190	40mg/kg	01.06.99	11:45	4	12.9
4	GH	190	40mg/kg	01.06.99	11:45	4	8.9
4	GH	190	40mg/kg	01.06.99	11:45	4	11.1

### 4.3. Menu item TABLE



All animal and experimental identifiers, the experimental parameters as well as the activity data can be stored as export text files for import into statistical or spreadsheet packages (e.g. EXCEL).

2 different export formats are available:

<b>*.CSV</b>	Column separator <b>semicolon</b>
<b>*.TXT</b>	Column separator <b>tab</b>

After activating the menu item, the file name displayed corresponds to the name of the measuring file. It can be changed if desired.

The structure of the export file is compatible with all data base formats.

TSE - ROTA-ROD V2.0      TEST6

Experiment No.            : 1  
 Date/Time                : 01.06.1999 / 11:42  
 User                      : ES

Initial Speed ( rpm )   : 20  
 Final Speed    ( rpm ) : 20  
 Acceleration time(sec) : 0  
 Timeout ( sec )        : 20

Animal	Marker	Weight	Dose	Date	Time	Rod	Sec
1	AB	200	10mg/kg	01.06.99	11:44	1	12.8
1	AB	200	10mg/kg	01.06.99	11:45	1	8.8
1	AB	200	10mg/kg	01.06.99	11:45	1	11.9
1	AB	200	10mg/kg	01.06.99	11:45	1	10.7
2	CD	220	20mg/kg	01.06.99	11:44	2	12.7
2	CD	220	20mg/kg	01.06.99	11:45	2	9.8
2	CD	220	20mg/kg	01.06.99	11:45	2	10.2
2	CD	220	20mg/kg	01.06.99	11:45	2	10.8
3	EF	180	30mg/kg	01.06.99	11:44	3	12.5
3	EF	180	30mg/kg	01.06.99	11:45	3	11.2
3	EF	180	30mg/kg	01.06.99	11:45	3	6.8
3	EF	180	30mg/kg	01.06.99	11:45	3	10.9
4	GH	190	40mg/kg	01.06.99	11:44	4	12.5
4	GH	190	40mg/kg	01.06.99	11:45	4	12.9
4	GH	190	40mg/kg	01.06.99	11:45	4	8.9
4	GH	190	40mg/kg	01.06.99	11:45	4	11.1

File structure after import into Excel

The **decimal separator** depends on the Windows regional settings (dot or comma).

## TSE Technical & Scientific Equipment GmbH

Saalburgstr. 157  
 D-61350 Bad Homburg / Germany

Phone:        **+49 (0) 6172-789-0**  
 Fax:         **+49 (0) 6172-789-500**  
 E-mail:      **info@TSE-Systems.de**  
 Internet:    **http://www.TSE-Systems.de**