Hardware User's Manual

Rotameter



References:

LE902SR (76-0244), LE902AS (76-0245), LE902ASE (76-0555), LE902BT (76-0556), LE902RP (76-0247)

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1. SYMBOLS TABLE

Recognising the symbols used in the manual will help to understand their meaning:

DESCRIPTION	SYMBOL
Warning about operations that must not be done because they can damage the equipment	
Warning about operations that must be done, otherwise the user can be exposed to a hazard.	<u>_!</u>
Protection terminal ground connection.	Ð
Warning about a hot surface which temperature may exceed 65°C	
Warning about a metal surface that can supply electrical shock when it's touched.	A
Decontamination of equipments prior to disposal at the end of their operative life	
Waste Electrical and Electronic Equipment Directive (WEEE)	

2. GOOD LABORATORY PRACTICE

Check all units periodically and after periods of storage to ensure they are still fit for purpose. Investigate all failures which may indicate a need for service or repair.

Good laboratory practice recommends that the unit be periodically serviced to ensure the unit is suitable for purpose. You must follow preventive maintenance instructions. In case equipment has to be serviced you can arrange this through your distributor. Prior to Inspection, Servicing, Repair or Return of Laboratory Equipment the unit must be cleaned and decontaminated.

Decontamination prior to equipment disposal



In use this product may have been in contact with bio hazardous materials and might therefore carry infectious material. Before disposal the unit and accessories should all be thoroughly decontaminated according to your local environmental safety laws.



3. UNPACKING AND EQUIPMENT INSTALLATION



WARNING: Failure to follow the instructions in this section may cause equipment faults or injury to the user.

- A. No special equipment is required for lifting but you should consult your local regulations for safe handling and lifting of the equipment.
- B. Inspect the instrument for any signs of damage caused during transit. If any damage is discovered, do not use the instrument and report the problem to your supplier.
- C. Ensure all transport locks are removed before use. The original packing has been especially designed to protect the instrument during transportation. It is therefore recommended to keep the original carton with its foam parts and accessories box for re-use in case of future shipments. Warranty claims are void if improper packing results in damage during transport.
- D. Place the equipment on a flat surface and leave at least 10 cm of free space between the rear panel of the device and the wall. Never place the equipment in zones with vibration or direct sunlight.



For electrical safety reasons you only can connect equipment to

power outlets provided with earth connections

This equipment can be used in installations with category II overvoltage according to the General Safety Rules.

The manufacturer accepts no responsibility for improper use of the equipment or the consequences of use other than that for which it has been designed.



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5. INTRODUCTION

The LE 902 Rotation Meter is an equipment designed for an easy and precise measurement of the rotation behaviour in rats or mice. It is made up of:

- The LE 902/Sr, a bi-directional low friction rotation sensor. This allows the animal complete freedom of movement.
- The LE 902/As Rat Harness or LE 902/ASE Mouse Harness with a lock closure to adjust it to the rodent body and a connecting wire.
- The LE 902/Rp, a cylindrical or oval container with a supporting rod (for mounting the rotation sensor).



Figure 1. Rotation meter with harness and cylindrical or oval container.

The LE 902/Sr Rotation Sensor provides a separate output for right and left turns (always considering right/left sides from the perspective of looking down on the device). The output signal can be adjusted from 1 to 16 pulses/turn.

Output from the LE 902/Sr can be used to feed external counters, such as the LE 3806 Multicounter (up to 15 sensors) or the LE 902Cc (a counter with 2 displays, one for each direction of rotation).





Figure 2. LE 902Cc and LE 3806 Multicounter.

The sensors always consider separate counts for right and left turns, it does not matter the number of sensors connected to the LE₃806. The LE 3806 has time programming capability, thus making it possible to obtain the turn count at preselected time intervals. The LE 3806 allows connection to a PC via a communications port RS 232, and data is maintained permanently by back–up batteries.

The LE 902Cc is a counter with two displays, one for each direction of rotation of the Rotameter.

The LE 902/As is a separate adjustable animal harness closed with a lock, with a length that allows it to be used with a wide range of animals. The harness provides an easily managed fixing support for a connecting wire, to link the animal to the rotation sensor.

The LE 902/Rp is a cylindrical container built of transparent Perspex (3 mm), with a lateral support for a vertical stand (200-mm length).



Figure 3. Rotation sensor with the harness connected to the rotation axis.



6. EQUIPMENT DESCRIPTION



Figure 4. Rotation Sensor.

- **SUPORT AXIS:** This metal bar fixes the rotation sensor to the container.
- **ROTATION ENCODER AXIS:** This axis is joined to the animal harness. It can freely turn clockwise and counter-clockwise.
- **LEDS:** Both red LEDs come on momentarily every time the rotation sensor gives a pulse.
- **OUTPUT JACKS:** A 5V pulse is given by these 3.5mm stereo jacks. The number of pulses per turn will depend on the settings of the rotation sensor.

The LE 902/Sr Rotation Sensor is formed by an optical rotation encoder, able to detect the right/left turns produced on its axis with a resolution of 256 pulses/turn.

There is a decoder circuit that is fed with the output of the optical encoder and that gives the final output of the LE 902/Sr sensor.

The number of pulses per revolution is adjustable between 1 and 16, which determines a rotational angle between pulses.



Pulses per turn	Angle between pulses
1	360°
2	180°
4	90°
8	45°
16	22,5 ⁰

Factory setting is 4 pulses per revolution.

The Rotameter can configure the working mode with an internal selector.

- ALL: All partial rotational movements of the animal in both directions are counted.
- FIL (Filter): Delete animal swinging movements (Swing). It also ensures an output pulse only with partial rotation movements of a preselected angle (360°, 180°, 90°, 45°, 22.5°). These swinging movements below the preselected angle are not counted.

Factory setting is **FIL** mode.



Figure 5. Fixing support, harness and lock.

The harness is snapped onto the shaft of the rotation sensor, it has a locking clip to fit the animal's body.



7. EQUIPMENT CONNECTION

7.1. WITH LE 3806

The following schematic shows the electrical connections of the LE 902 Rotation meter to the LE 3806 Multicounter. As the LE 3806 has 30 connections and each LE 902 has 2 outputs, a maximum number of 15 Rotation Meters can be connected to the Multicounter.



Figure 6. Connection to the LE 3806 Multicounter.



The necessary connections and cables are listed in the following table:

	FROM	ТО	CABLE
1	LE 902 right output	LE 3806 input n*	3.5mm stereo jack
2	LE 902 left output	LE 3806 input (n+1)*	3.5mm stereo jack
3	LE3806 RS-232	PC COM Port	DB25 to DB9 cable

*n is a number between 1 and 29. Usually, if the right output is connected to one channel the left output is connected to the following channel.

7.2. WITH LE 902Cc

Each LE 902Cc can only be connected to one LE 902 Rotation meter. It has two inputs, one for each direction of rotation.



Figure 7. Connection with LE 902Cc.

The necessary cables and connections are listed in the following table.

	FROM	то	CABLE
1	LE 902 left	LE 902CC left	3.5mm stereo jack
2	LE 902 right	LE 902CC right	3.5mm stereo jack



8. NUMBER OF PULSES BY TURN CHANGE

The Rotation meter comes pre-set with 4 pulses per revolution, but can be set to 1, 2, 4, 8 or 16 pulses per revolution.

To change the settings follow the next steps:

- 1) Remove the cover on the side where the LEDs are by unscrewing the 4 screws on the corners.
- 2) In the circuit board you will see two double pin strips with numbers 1, 2, 4, 8 and 16, one for each direction of rotation of the rotation meter.



Figure 8. Number of pulses by turn change.

- 3) Change the jumper in each sense of rotation as shown in the Figure to set the number of pulses by revolution.
- 4) Place the cover by screwing the 4 screws.



WARNING: the number of pulses per revolution of the sensor and the selection of the number of pulses per revolution in **Sedacom** program must be the same so that the program expresses the total number of laps completed.



9. CHANGING WORKING MODE

The Rotation meter comes pre-set for Filter mode working. To change the settings follow the next steps:

- 1) Remove the cover on the side where are the LEDs by unscrewing the 4 screws on the corners.
- 2) In the circuit board you will see a three pin stripe with the labels FIL and ALL one for each working mode.



Figure 9. Working mode change.

- 3) Change the jumper as shown in the Figure to set the working mode.
- 4) Place the cover by screwing the 4 screws.



10. WORKING WITH THE EQUIPMENT

10.1. CONDUCTING AN EXPERIMENT

- 1. Connect the rotameter to the counter as seen in chapter 7.
- 2. Place the animal in the container.
- 3. Secure the animal to the harness.
- 4. Attach the harness to the rotation axis of the rotameter.
- 5. During the experiment the counter will count the number of pulses for turn in each rotation direction of the rotameter *(See chapter 8)*.
- 6. Once the experiment has ended unfasten the animal from the harness and remove the animal from the container.
- 7. Clean the harness and the container so that they are in good conditions for the next experiment.

10.2. CLEANING THE CONTAINER



WARNING: In order to clean the container never use alcohol or alcoholic derived products, otherwise stripes will appear in the transparent plastic.

To clean the container you can use a slightly wet cloth and then dry it with a dry cloth. If it's too dirty you can wet the cloth with a soapy solution, then remove foam with a wet cloth and finally dry it with a dry cloth.

10.3. HARNESS CLEANING

Harness is made of a steel wire coated with a silicon tube. In order to clean it use a cloth wetted with alcohol can be used. Be careful that the alcohol does not touch the container.



11. TROUBLESHOOTING

This table features instructions to solve the most frequent problems.

PROBLEM	SOLUTION		
The equipment does not count turns.	 Check that the rotameter is connected to the counter. Check that the harness is secured to the rotation axis of the rotameter. Check that the rotameter axis is not blocked. 		
The rotameter axis is slowed or blocked.	 In order to grease the rotameter rotation axis you must use only dielectric oil. Otherwise you can damage the electronic devices inside the rotameter. 		



12. PREVENTIVE MAINTENANCE

	EXPERIMENT
CLEAN THE CONTAINER	
CHECK THE CONNECTIONS	
CHECK THE HARNESS MOUNTING	



13. TECHNICAL SPECIFICATIONS

Supply Voltage:	5 0 VDC +0 25 VDC
Supply Current:	26 mA maximum
Output Voltage:	
Low Output:	o.8 V maximum
High Output:	4 V minimum
Output Current:	1 mA
ENVIRONMENTAL CONDITIONS	
Operating temperature:	10°C to +40°C
Operating relative humidity:	o% to 85% RH, non-condensing
Storage temperature:	o°C to +50°C, non-condensing
FACTORY SETTINGS	
Output:	4 pulses per turn
Angle per pulse:	90°
Pulse width:	15ms
Pulse amplitude:	5V DC TTL
Working mode:	FIL
Pulses per turn:	1, 2, 4, 8, 16
Angle per pulse:	360°, 180°, 90°, 45°, 22.5°
OUTPUT CONNECTIONS	
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Figure 10. C	Output connections

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GB Note on environmental protection:



After the implementation of the European Directive 2002/96/EU in the national legal system, the following applies:

Electrical and electronic devices may not be disposed of with domestic waste. Consumers are obliged by law to return electrical and electronic devices at the end of their service lives to the public collecting points set up for this purpose or point of sale. Details to this are defined by the national law of the respective country. This symbol on the product, the instruction manual or the package indicates that a product is subject to these regulations. By recycling, reusing the materials or other forms of utilising old devices, you are making an important contribution to protecting our environment.

E) Nota sobre la protección medioambiental:



Después de la puesta en marcha de la directiva Europea 2002/96/EU en el sistema legislativo nacional, Se aplicara lo siguiente:

Los aparatos eléctricos y electrónicos, así como pilas y baterías, no se deben tirar a la basura doméstica. El usuario está legalmente obligado a llevar los aparatos eléctricos y electrónicos, así como pilas y baterías, al final de su vida útil a los puntos de recogida municipales o devolverlos al lugar donde los adquirió. Los detalles quedaran definidos por la ley de cada país. El símbolo en el producto, en las instrucciones de uso o en el embalaje hace referencia a ello. Gracias al reciclaje, a la reutilización de materiales i a otras formas de reciclaje de aparatos usados, usted contribuirá de forma importante a la protección de nuestro medio ambiente.

) Remarques concernant la protection de l'environnement :



Conformément à la directive européenne 2002/96/CE, et afin d'atteindre un certain nombre d'objectifs en matière de protection de l'environnement, les règles suivantes doivent être appliquées.

Elles concernent les déchets d'équipement électriques et électroniques. Le pictogramme "picto" présent sur le produit, son manuel d'utilisation ou son emballage indique que le produit est soumis à cette réglementation. Le consommateur doit retourner le produit usager aux points de collecte prévus à cet effet. Il peut aussi le remettre à un revendeur. En permettant enfin le recyclage des produits, le consommateur contribuera à la protection de notre environnement. C'est un acte écologique.

D Hinweis zum Umweltschutz:



Ab dem Zeitpunkt der Umsetzung der europäischen Richtlinie 2002/96/EU in nationales Recht gilt folgendes: Elektrische und elektronische Geräte dürfen nicht mit dem Hausmüll entsorgt werden. Der

Elektrische und elektronische Geräte dürfen nicht mit dem Hausmüll entsorgt werden. Der Verbraucher ist gesetzlich verpflichtet, elektrische und elektronische Geräte am Ende ihrer Lebensdauer an den dafür eingerichteten, öffentlichen Sammelstellen oder an die Verkaufstelle zurückzugeben. Einzelheiten dazu regelt das jeweilige Landesrecht. Das Symbol auf dem Produkt, der Gebrauchsanleitung oder der Verpackung weist auf diese Bestimmungen hin. Mit der Wiederverwertung, der stofflichen Verwertung oder anderer Formen der Verwertung von Altgeräten leisten Sie einen wichtigen Beitrag zum Schutz unserer Umwelt.

Informazioni per protezione ambientale:



Dopo l'implementazione della Direttiva Europea 2002/96/EU nel sistema legale nazionale, ci sono le seguenti applicazioni:

I dispositivi elettrici ed elettronici non devono essere considerati rifiuti domestici. I consumatori sono obbligati dalla legge a restituire I dispositivi elettrici ed elettronici alla fine della loro vita utile ai punti di raccolta collerici preposti per questo scopo o nei punti vendita. Dettagli di quanto riportato sono definiti dalle leggi nazionali di ogni stato. Questo simbolo sul prodotto, sul manuale d'istruzioni o sull'imballo indicano che questo prodotto è soggetto a queste regole. Dal riciclo, e re-utilizzo del material o altre forme di utilizzo di dispositivi obsoleti, voi renderete un importante contributo alla protezione dell'ambiente.

P) Nota em Protecção Ambiental:

Após a implementação da directiva comunitária 2002/96/EU no sistema legal nacional, o seguinte aplica-se:



Todos os aparelhos eléctricos e electrónicos não podem ser despejados juntamente com o lixo doméstico Consumidores estão obrigados por lei a colocar os aparelhos eléctricos e electrónicos sem uso em locais públicos específicos para este efeito ou no ponto de venda. Os detalhes para este processo são definidos por lei pelos respectivos países. Este símbolo no produto, o manual de instruções ou a embalagem indicam que o produto está sujeito a estes regulamentos. Reciclando, reutilizando os materiais dos seus velhos aparelhos, esta a fazer uma enorme contribuição para a protecção do ambiente.