OPERATING INSTRUCTIONS

PARI Jet-Nebulizer

Art. No. 73-1963

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(Version 1 / 08/ 04 Zi)

Contents

1. Introduction, manufacturer's details
These Operating Instructions describe the function and the use of the PARI Jet-Nebulizer. They represent an essential part of the apparatus and must be kept close to the apparatus, accessible to all users.

All the information in these Instructions has been assembled after careful examination but does not represent any warranty of product properties. Alterations in line with technical progress are reserved.

2. Manufacturer
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3.Copyright

4. Trademarks
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Do read these Operating Instructions!
We strongly recommend that you carefully read and observe these Operating Instructions.
We do not take any responsibility for any damage caused by inappropriate operation of the apparatus.

5. Application
This Jet-nebulizer is used for aerosol applications to whole animals or isolated lungs in physiological and pharmacological research laboratories.

6. Summary of function
The nebulizer is used in combination with the most usual rodent ventilators, the body plethysmographic boxes or the isolated perfused lung systems to apply aerosols.

7. Safety notes
As flammable or explosive liquids and gases are used; fire hazard!
Any combustible material in the presence of oxygen represents a fire hazard.

Toxic substances:
Where any toxic substances (gases, test substances, cleaning agents) are being used, it is essential to conform to the appropriate handling directions in order to prevent any health hazard to the user. Toxic substances must be disposed of in accordance with the appropriate regulations.

Protect mains-operated electrical equipment against liquids!
Electrical equipment must be set up and operated in accordance with their Operating Instructions. Special care must be taken in positioning it so that no liquid can pass into it. Never store any liquid above the equipment.

Avoid operating the equipment with wet hands. Over longer periods, electrical contacts and perfusion solutions are incompatible. In addition the equipment will remain looking good and presentable for a longer time. Who likes the appearance of a salt-encrusted or dirty front panel?

8. Items required
In addition to the nebulizer and the essential consumables (e.g. compressed air, solvent) it is necessary to provide the following items and equipment to operate the system:

❒ Plethysmographic box for anesthetized or restrained animals with appropriate connecting kit.

or

❒ Aerosol application chamber with appropriate connecting kit.

or

❒ Isolated lung system with appropriate connecting kit.

or

❒ Animal ventilator e.g. Inspira, Small animal ventilator Model 683, Starling's Miniature Ideal Ventilator, UB-7025, Minivent, Microvent ... All with the appropriate connecting kit

and

❒ Aerosol evacuation system e.g. evacuation hood, filter canister, active evacuation system, Fluovac System ... or aerosol filter system.

9. Unpacking

Careful packaging ensures that transport damage is largely excluded. If unexpectedly the nebulizer appears damaged on delivery you should immediately notify the forwarding agent, the post office or the rail authority in order to have the damage recorded. Damaged packaging should always be kept as evidence.

10. Technical description

The aerosol nebuliser is a jet nebuliser which requires an operating pressure of approx. 1.5 bar. 100% of the particles are below 10 µm, 60% below 2.5 µm. The particle size can be taken from Table 1 and 2 and diagram 1 and 2. The values were obtained using 5 ml of 0.9% saline solution and 1.5 bar pressure.

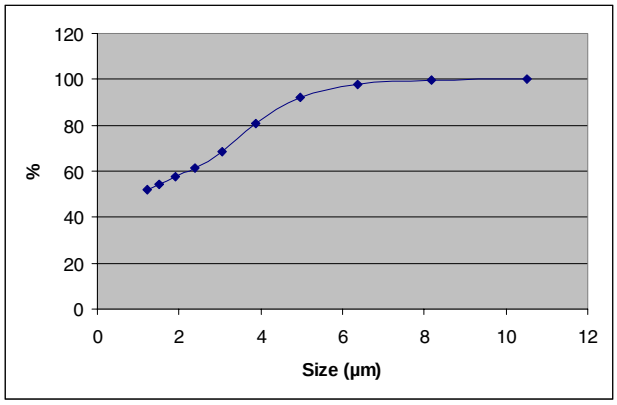


Diagram 1

Size (µm)	% below
1.22	52.0
1.52	54.5
1.90	57.7
2.40	61.5
3.04	68.3
3.88	80.9
4.97	92.2
6.37	98.0
8.19	99.7
10.50	100.0

Table 1

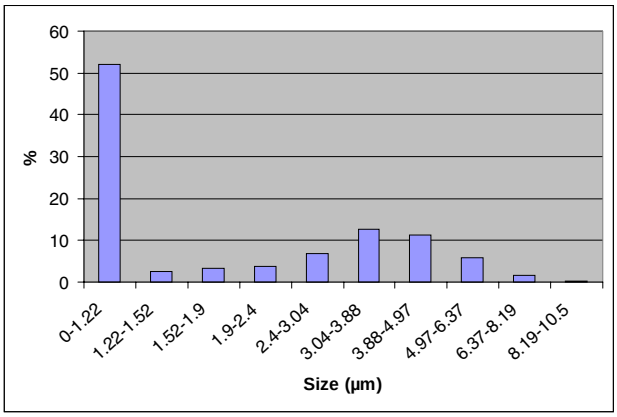


Diagram 2

Band in µm	% in band
0 - 1.22	52.0
1.22 - 1.52	2.5
1.52 - 1.9	3.2
1.9 - 2.4	3.8
2.4 - 3.04	6.8
3.04 - 3.88	12.6
3.88 - 4.97	11.3
4.97 - 6.37	5.8
6.37 - 8.19	1.7
8.19 - 10.5	0.2

Table 2

11. Connecting Diagram

The nebulizer is supplied with a stopper on the upper outlet. The compressed air connection must be connect to a supply source of 1.5 bar. The air flows through the jet assembly and generates aerosol. The aerosol exits over the outlet port. The outlet port must be connected to the ventilator, the exposition case, the plethysmograph box or the isolated lung systems.

It is important to make sure of total evacuation of the remaining aerosol.

Compressed Air Connection

The port for compressed air inlet is barbed and has an outher diameter of 5.5 mm.
The operating pressure is about 1.5 bar. It is important to ensure that the connecting tubing for the compressed air is suitable for this pressure. The required airflow is about 5 l/min.
For easier switching of and refilling we recommend to use a fast connection kit (73-3300) available from HUGO SACHS ELEKTRONIK - HARVARD APPARATUS GmbH

Aerosol outlet Connection

The aerosol outlet has a outer diameter of 20 mm and an inner diameter of 17 mm. This outlet needs to be adapted for the application.
For the HUGO SACHS ELEKTRONIK - HARVARD APPARATUS GmbH systems there are different adaptors available.
For ventilators, plethysmographic boxes, exposure boxes, isolated lung systems. Call for the relevant adaptor to your system.

12. Operation

The top outlet of the nebuliser is closed by a stopper. This is fitted at the factory but should be checked to ensure that it has not been lost during transport or during unpacking.
The operating pressure is about 1.5 bar. It is important to ensure that the connecting tubing is suitable for this pressure. The jet flow is depending on the applied pressure see diagram 3

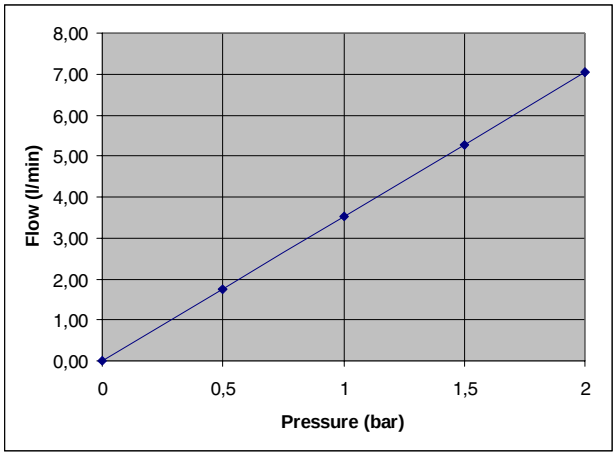


Diagram 3

13. Concentration Evaluation

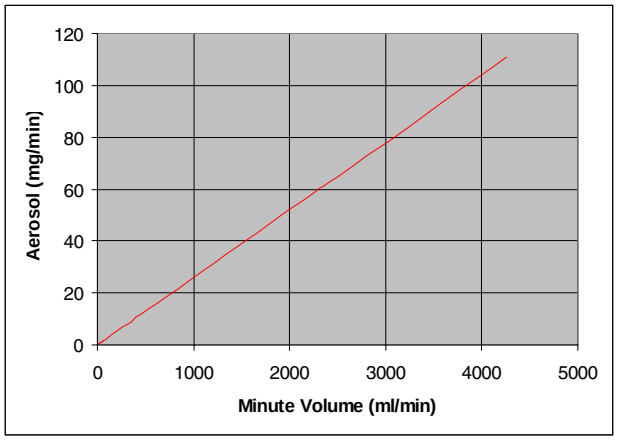
The nominal flow for the nebulizer is 5.0 l/min at a pressure of 1.42 bar. It is linear up to a pressure value of 2 bar.
By using a 0.9% NaCl solution at a pressure of 1.42 bar the total output rate of NaCl solution is 130 mg/min.

The recommended operating pressure is 1.5 bar the resulting jet-flow is 5.28 l/min.
By using a 0.9% NaCl solution at apressure of 1.5 bar the total output rate of NaCl solution is 137.28 mg/min.

For an animal having a minute volume of 160ml/min, the inhaled amount would be:

$$\frac{160\text{ml/min} \times 137.28\text{ mg/min}}{5280\text{ ml/min}} = 4.16\text{ mg/min}$$

For more information see the following diagrams



General diagram at 1.5 bar
Mouse Minute volume 20 - 50 ml/min
Rat Minute volume 140 - 180 ml/min
Guinea Pig Minute volume 130 - 200 ml/min
Rabbit Minute volume 400 - 600 ml/min
Dog Minute volume 3 - 4 l/min

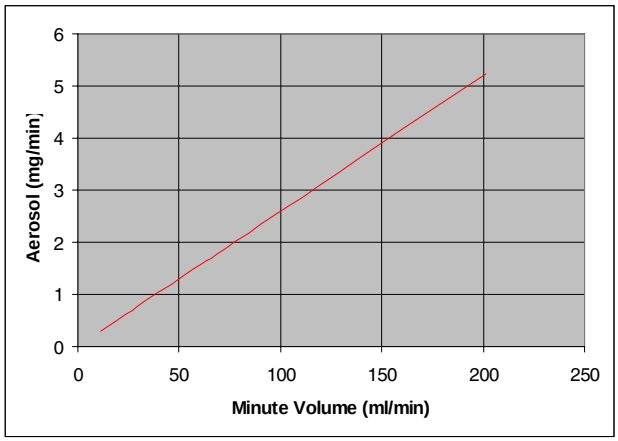


Diagram for rodents at 1.5 bar
Mouse Minute volume 20 - 50 ml/min
Rat Minute volume 140 - 180 ml/min
Guinea Pig Minute volume 130 - 200 ml/min

14. Preparation of the nebuliser for application of aerosol

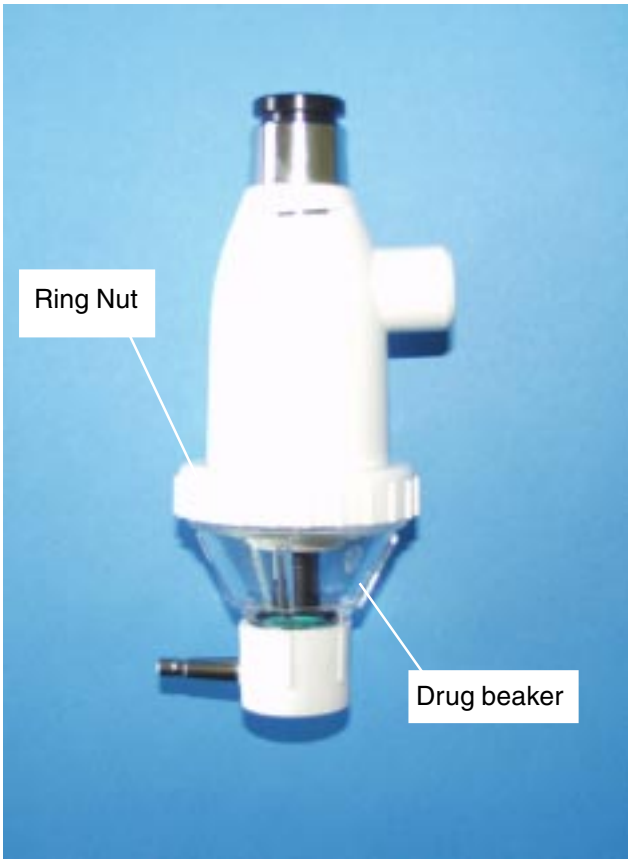
Place the substance at the required dilution into the nebuliser. To do this, unscrew the ring nut while holding the drug beaker in position, and take off the collector with filter cap. The solution, approx. 2 ml, is placed into the drug beaker.

Make sure that the medication is filled not higher than the upper scale marking (max. level 10 ml). If you overfill the nebuliser and the medication leaks out of the bottom, please empty and clean. Then fill the nebuliser with the medication again.

The beaker is then fitted back into position in the reverse order. It is important to check that the collector and the filter cap are fitted correctly.

Before the nebulizer is started, ensure that all parts are firmly connected to each other. Make sure that the tubing is connected firmly to the compressed air supply and to the nebuliser.

The medication nebulisation can be adversely affected by an incorrectly assembled nebuliser.



15. Cleaning the nebuliser

- Dismantle the nebuliser (see §19.).

Recommended method: using warm tap water

- Clean all parts of the nebulizer thoroughly for 5 minutes with warm tap water (approx. 40°C) and a little dishwashing liquid (dosage according to the manufacturer's recommendations).
- Then rinse all parts thoroughly under running water (approx. 40°C without dishwashing liquid).
- Drain off well. Excess water can be removed by shaking the parts.

Possible alternative: wash in the dishwasher

- Clean the nebuliser in your dishwasher (not together with dirty crockery).
- Distribute the nebuliser parts in the cutlery basket.
- Select a program of at least 50°C.

16. Manual cleaning disinfection

Recommended procedure:

The effectiveness of this procedure has been proven using the Korsolex ® -Endo-Cleaner cleaning agent in association with the Korsolex ® basic disinfectant made by BODE CHEMIE HAMBURG.

- The components must be placed in a 0.5% solution of Korsolex ® -Endo-Cleaner and approx. 50°C warm water, and cleaned thoroughly for 5 minutes.
- The components are then placed for 15 minutes in a 4% disinfectant solution of Korsolex ® basic.
- Then thoroughly rinse the components under warm running water and leave them to dry completely on a clean, dry and absorbent surface (for at least 4 hours).

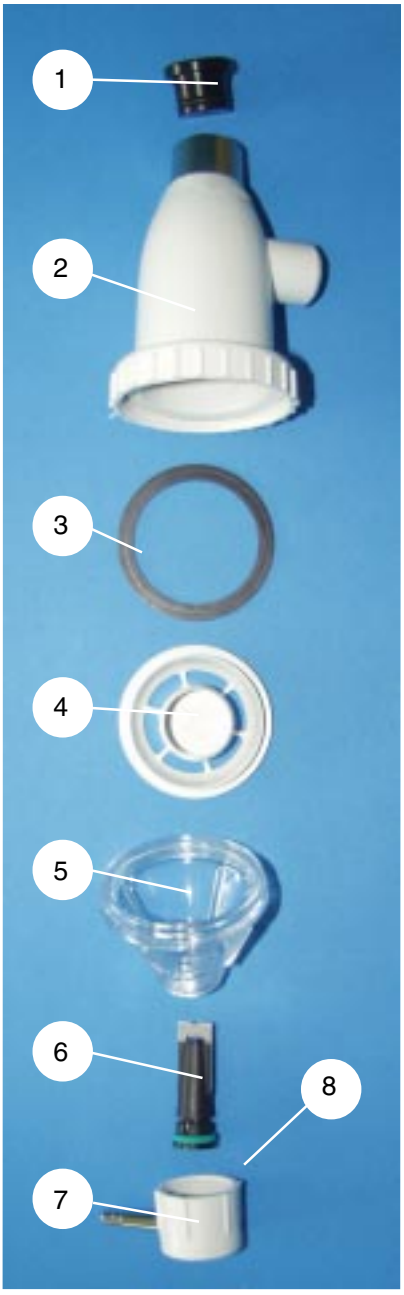
17. Care of the tubing

- If condensation is visible in the tubing,remove the tubing from the nebuliser after treatment and insert the connecting tube in the compressed air supply.
- Leave the connecting tube in the air supply until the air-flow through the tube has eliminated any last traces of condensation.
- Replace the tubing in the case it becomes contaminated.

18. Practical and Safety information !!!!

You should daily make a regular inspection of the tubing. It is also important to verify before each experiment if there is not any part obstructing the evacuation system, and that the evacuation system is working properly. The Nebulizer should never be switched on before the evacuation system is connected and started

19. Dismantling the nebulizer / Replacement parts



(1) Stopper
(2) Nebuliser cap. Art. No. 64.43.10
(3) Sealing ring. Art. No. 70.02.08
(4) Filter cap.Collector. Art. No. 64.43.20
(5) Drug beaker. Art. No. 73-3388
(6) Jet assembly. Art. No. 19.70
(7) Nebuliser base. Art. No. 70.20
(8) Sealing washer. Art. No. 70.02.09

20. Reply form

Please take a few minutes of your time in order to write to us on any difficulties in understanding the Operating Instructions or in the use of the device. With your feedback you will help to improve our products and the system documentation and make them more user-friendly.

Please tell us

☞ where you have found mistakes,

☞ where the arrangement was not clear and what you did not understand,

☞ and where you would like to see improvements.

Many thanks for your kind assistance.
Yours HUGO SACHS ELEKTRONIK-
HARVARD APPARATUS GmbH

Your name _____

Organisation _____

Street _____

Town _____

Phone/Fax _____

eMail _____

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Please send this sheet or a copy to:
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Gruenstrasse 1, D-79232 March-Hugstetten, Germany

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