

Instruction manual

MOUSE VENTILATOR



ugobasile.com

Cat. No 28025 / 28125

Ventilators and Gas Anesthesia



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SAFETY CONSIDERATIONS

Although this instrument has been designed with international safety standard, this manual contains information, cautions and warnings which must be followed to ensure safe operation and to retain the instrument in safe conditions.

Service and adjustments should be carried out by qualified personnel, authorized by ugo basile organization.

Any adjustment, maintenance and repair of the opened instrument under voltage should be avoided as much as possible and, when inevitable, should be carried out by a skilled person who is aware of the hazard involved.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

28025 / 28125
Instruction Manual
dated July 2020
Revision 1



Mouse Ventilator

Cat. No. 28025

General

This new Respirator, which completes the well known Ugo Basile line of Ventilators, features:-

- The **tidal volume**, in the range 0.1-1 ml (or 0.05-0.5 with the smaller piston installed), can be selected via its knob either while the pump is running or at a standstill. The stroke volume scale is ample, provided with precise engraved marks.
- The **rate**, selected by a knob, is indicated by a 3-digit solid state display, in the range 60-300 strokes per minute.
- Suitable channels and ports provide the witching of the air flow, with practically **no dead space**.
- A unique **variable stroke linkage** mechanism operates the piston.

The reciprocating motion is adjusted and transmitted to the piston by rods and articulated joints only, which leads to minimal wear, no backlash, silent operation and exact stroke reproducibility.



Unique Design

Reliable

Compact

Silent

Main Features

- Ideal for use with mice, small birds and perinatal rats
- Optional 0.5 ml cylinder/piston assembly
- Purely mechanical, with impeccable finishing: lifetime lasting
- Quiet operation and negligible electrical noise

CONTENTS

1	<u>GENERAL</u>	1
1.1	SYNCHRONIZED START / STOP	2
1.2	A CLOSER LOOK	2
1.3	KINEMATICS	2
1.4	PNEUMATICS	3
1.4.1	CYLINDER & PISTON	3
1.4.2	DISTRIBUTION	3
1.4.3	THE CONNECTION SQUARE	3
1.5	THE ARRANGEMENT OF THE VENTILATOR COMPONENTS	4
2	<u>INSTALLATION</u>	4
2.1	UNPACKING & PRELIMINARY CHECK	4
2.2	NOTES ON THE INSTRUCTION MANUAL	5
2.3	BEFORE APPLYING POWER	5
2.3.1	MAINS SWITCH	5
2.3.2	FUSE HOLDER	6
2.3.3	MAINS CORD	6
2.4	CONNECTIONS	6
2.5	ADDITIONAL SAFETY CONSIDERATION	6
3	<u>OPERATION</u>	7
3.1	SWITCHING ON	7
3.2	STROKE VOLUME	7
3.3	RATE	7
3.4	SYNCHRONIZED START/STOP	7
3.5	HOOK UP TO ANIMAL	8
3.6	CHANGING THE CYLINDER/PISTON ASSEMBLY	8
4	<u>MAINTENANCE</u>	10
4.1	ELECTRICAL	10
4.2	LUBRICATION	11
4.2.1	LUBRICATING LINKAGE & SLIDING PLATES	11
4.2.2	LUBRICATING CYLINDER/PISTON	12
4.3	LONG INACTIVITY	12
4.4	CUSTOMER SUPPORT	12
5	<u>SPECIFICATIONS</u>	13
6	<u>ORDERING INFORMATION</u>	14
6.1	OPTIONAL	14

FIGURE INDEX

Figure 1 “Basic Layout” 1
Figure 2 “The Connection Square” 4
Figure 3 “Power Module” 5
Figure 4 “Ventilation Cannula” 8
Figure 5 “Changing Cylinder/Piston Assembly” 9
Figure 6 “Lubrication” 11
Figure 7 “Exploded View” 13

MOUSE VENTILATOR

Cat. **28025 / 28125**

1 GENERAL

The **28025 Mouse Ventilator** is a mechanically unique positive pressure pump, according to Starling's ventilation method, designed for use with mice, but also suitable for very small birds, perinatal rats, etc., which features:

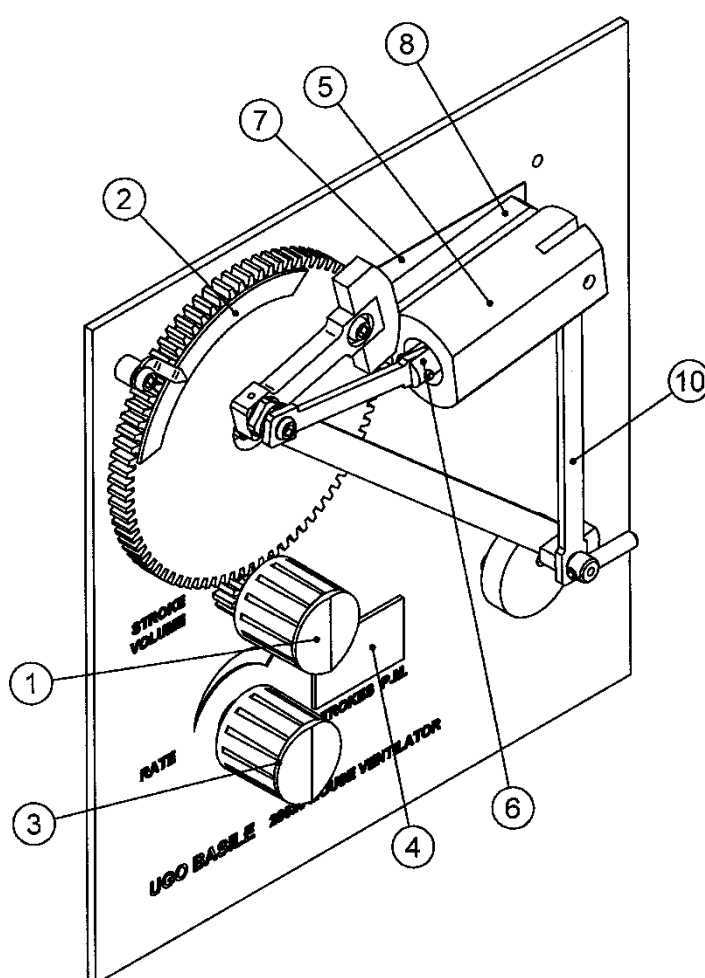


Figure 1 "Basic Layout"

- a) The **tidal volume**, in the range 0.1 - 1 ml (or 0.05 - 0.5 ml when the smaller cylinder/piston is installed) can be selected via the knob (1) either while the pump is running or at a standstill. The stroke volume scale (2) is ample, provided with precise engraved marks. See Figure 1 "Basic Layout".
- b) The **rate**, selected by the knob (3) is indicated by a 3-digit solid state display (4), in the range 60-300 strokes per minute.

- c) Suitable channels and ports, machined in the mobile and stationary plates of the oscillating cylinder set-up, provide the switching of the air flow, with practically **no dead space**.
- d) A unique **variable stroke linkage** mechanism, very similar in principle to the one embodied in the well-known Ventilators 7025 and 6025 of our make, operates the piston.

The reciprocating motion is adjusted and transmitted to the piston by rods and articulated joints only, which leads to minimal wear, no backlash, silent operation and exact stroke reproducibility.

The instrument is compact and light, cm 20x13x18.5 and 2.5 Kg, see picture, and it is **self-contained**: in other words, it embodies its power supply which feeds the geared motor, its feedback controller and the rate display.

1.1 Synchronized START / STOP

For electrophysiological recording, X-ray and imaging, it is beneficial if not essential to minimize any extraneous movement of the anesthetized animal during a procedure.

A Mouse Ventilator version is available, Cat. **28125**, see paragraph 6.1-Optional, in which a **synchronised START/STOP function** is embodied in the circuit. This function gives the operator a means to stop and restart the respirator at “full lungs” point, via an external trigger pulse.

See also paragraph 3.4-Synchronized Start/Stop.

1.2 A CLOSER LOOK

1.3 Kinematics

A D.C. geared motor which embodies a miniature tachometer to provide a precise speed control is coupled to an interchangeable cylinder/piston assembly, via a unique variable stroke linkage (see the colour picture, Figure 1 “Basic Layout” and Figure 6 “Lubrication”) whose features are listed below:

- i) The piston almost touches the cylinder end at each stroke, regardless of the preset volume. This insures that all air taken into the pump is expelled with each stroke.
- ii) The stroke can be adjusted via its volume knob either while the pump is running or at a standstill. The volume is clearly indicated **on a stationary dial** rather than on a mobile slotted link or by graduation marks on the cylinder.
- iii) The mechanism does not incorporate the slotted link assembly found on other ventilators. The reciprocating motion is generated, adjusted and transmitted to the piston by pivoting joints and rods only.

The lack of sliding friction leads to:

- a. practically no wear
- b. no backlash and hence silent operation
- c. exact stroke reproducibility
- d. minimal maintenance requirements.

1.4 Pneumatics

1.4.1 Cylinder & Piston

The cylinder (5) is machined from a Perspex block. Particular care has been taken in finishing its inside surface (diamond lapping) to minimize the piston wear. The cylinder is fastened to a base plate of aluminium alloy, coated with a hard oxide layer (8).

The piston is made of Ertacel*, a wear resistant plastic compound which provides minimum friction and good air tightness.

Two cylinder/piston combinations are available, 0.1-1 ml and 0.05-0.5 ml, see paragraph 5-ORDERING INFORMATION. The pistons of both combinations 28025-010 and 28025-005 are supplied complete with their piston links.

1.4.2 Distribution

The distribution takes place via two plates of aluminium alloy, coated with a hard aluminium oxide layer, coupled and held in contact at moderate pressure, to enable them to slide one over the other with minimum friction.

One of these plates, the mobile one (8), has been already mentioned in paragraph 1.4.1: it is the cylinder base-plate, which is provided with a suitable port, connected to the cylinder chamber.

The cylinder oscillates, driven by the link (10), to match the mentioned port, in correct sequence, to the ports/channels machined on the larger stationary plate (7). In this way **Ventilator 28025** accomplishes the **distribution** of the air flow according to the ventilation cycle.

The plate (7) is fastened to the structure of the Ventilator and is fitted with the air intake/outtake set. These four connection tubes form what we have christened *the connection square*, see Figure 2 "The Connection Square", because the tubes are closely packed at the vertices of one cm square.

So close that the tubes have been cut in different lengths, to ease the insertion of the plastic or rubber tubing or input/output, also shown in Figure 2 "The Connection Square".

1.4.3 The connection Square

The intake-outtake functions are engraved on the plate and numbered as follows:

- 1 **room air** intake of air or any other non-explosive gas mixture

* Acetal Resin, brand name POM-C, conforms to DIN 7728

- 2 to lungs** delivery of air to the lungs
- 3 from lungs** delivery of the expired air to the port which is open during the expiration and shut during the inspiration phase
- 4 expired air** outtake of the expired air; the air can be recovered for sampling, partial recycling, testing positive expiration pressure, etc.

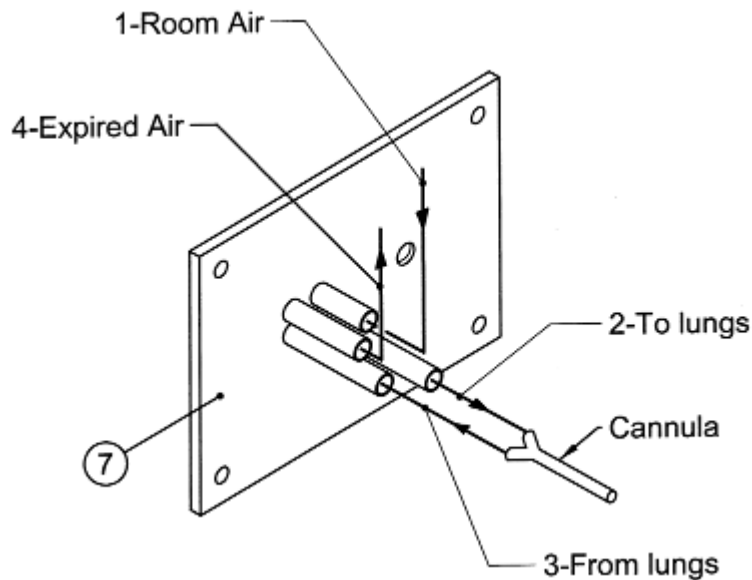


Figure 2 “The Connection Square”

1.5 The Arrangement of The Ventilator Components

The backbone of the instrument is a thick aluminium alloy plate (27) onto which most components are fastened: in Figure 7 “Exploded View” we find the geared motor (12), the PCB (printed circuit board) (11) and the stationary distribution plate (7) we have already met in paragraph 1.4.2, illustrated in Figure 2 “The Connection Square”.

The transformer (13) is fastened on the H-shaped beam (30) which, in combination with the handle panel (31), holds together the side panels, the front plate (27) and the other bottom and top panels, which are not drawn in order to provide a clearer picture of the main components.

On the left panel (right, in the back view!) there is the slot (32) on which the power module (see Figure 3 “Power Module”) is installed.

2 INSTALLATION

2.1 Unpacking & Preliminary Check

Check the contents of the shipment for completeness, packing list to hand, and visually inspect the instrument as soon you take it out of the packaging. Use the **Check List** supplied.

The functional design of the cabinet which avoids protruding elements is the best known defence against rough transport handling. If however the instrument is damaged or, after having tested it, fails to meet rated performances, notify the carrier and our company immediately.



Protect the environment!

Dispose of packaging properly, according to existing and applicable waste management rules and regulations.

2.2 Notes on the Instruction Manual

The Plantar Test Instruction Manual included in the package (on the USB pen-drive) is necessary for the correct installation and operation of the instrument.

We recommend reading the manual with attention, as it is essential for the correct installation and operation of the instrument.

Please save the manual, ready to be consulted by the qualified personnel who use the instrument. Print it, only if necessary.

Our Instruction Manuals are available as free download on our web. For any additional information and/or assistance, you are welcome to contact our Service Department (see paragraph 4.4-Customer Support) specifying the series number of your instrument.

2.3 Before Applying Power

Position the instrument on a stable bench or table surface.

Consider the Power Module, on the instrument back panel, which encompasses – from left to right - the inlet connection of the mains cord, the mains switch and the fuse holder.

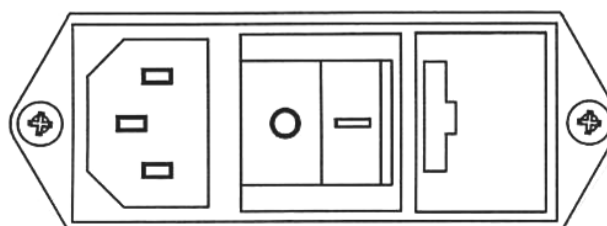


Figure 3 “Power Module”

Take a look at the Power Module, on the left side wall of the Ventilator, which encompasses the inlet connection of the mains cord, the mains switch and the fuse holder.

2.3.1 Mains Switch

This two-pole toggle switch, which complies with international safety standards, provides a visual cue, meaning:

- **OFF** when pressed to the “O” side
- **ON** when pressed to the “I” side

2.3.2 Fuse Holder

The instrument is provided with 2 fuses, on both neutral and live. To replace fuses, if necessary, pull out the fuse slide, see We recommend 400mA timed fuses, type T400mA.

The use of repaired fuses and the short circuiting of the fuse holders must be avoided.

2.3.3 Mains Cord

It is a standard cable, Cat. # E-WP008. Make sure your power outtake is provided with a reliable ground connection, see also 2.4 & 2.5.

2.4 Connections

Connect the mains cord to a power outtake, **provided with a reliable earth connection**, The mains cord is a standard cable, Cat. E-WP 008.

2.5 Additional Safety Consideration

- a. Place your Ventilator on a steady flat surface.
- b. Do not obstruct free and comfortable access to the power module.
- c. Use original accessories and spare parts only, see also paragraph 6-ORDERING INFORMATION.
- d. Immediately disconnect and replace a damaged mains cord.
- e. Do not operate in hazardous environments or outside prescribed environmental limitations (i.e., 0°C / +40°C, 95% relative humidity, non-condensing), see also paragraph 5-SPECIFICATIONS.
- f. Do not feed the pump intake with explosive gas mixture.



UGO BASILE DOES NOT ACCEPT ANY RESPONSIBILITY FOR PROBLEMS OR HARM CAUSED TO THINGS OR PERSONS ARISING FROM:

- INCORRECT ELECTRICAL SUPPLY;
- INCORRECT INSTALLATION PROCEDURE;
- INCORRECT OR IMPROPER USE OR, IN ANY CASE, NOT IN ACCORDANCE WITH THE PURPOSE FOR WHICH THE INSTRUMENT HAS BEEN DESIGNED AND THE WARNINGS STATED IN THE INSTRUCTION MANUAL SUPPLIED WITH THE INSTRUMENT;
- REPLACEMENT OF ORIGINAL COMPONENTS, ACCESSORIES OR PARTS WITH OTHERS NOT APPROVED BY THE MANUFACTURER;
- SERVICING CARRIED OUT BY UNAUTHORIZED PERSONNEL.

3 OPERATION

3.1 Switching On

Switch on the 28025 by acting on the Mains Switch placed on the left side wall of the instrument; see paragraph 2.3.1-Mains Switch. The digital display labelled STROKES PER MINUTE will light, denoting that the instrument is on.

Get familiar with the stroke and rate control.

3.2 Stroke Volume

The stroke volume is adjusted by the knob (1) on the front panel, see Figure 1 “Basic Layout”, and is indicated on the scale (2).

3.3 Rate

The control potentiometer (3) adjusts the geared motor to the desired speed, which is indicated on the 3-digit display (4) labelled **STROKES PER MINUTE**.

The speed is unaffected by either mains voltage variations, changes of torque load, different cylinder/piston combinations, airway alterations, wear of the sliding components, status of the lubrication, etc.

Turn the speed-control knob slowly. The electronics takes about one second to manage the speed control function, taking into account that any reciprocating machine presents two torque peaks at each revolution.

The digital display assures an excellent reproducibility: you adjust the revs. per minute against a displayed number, in lieu of overlapping a pointer and a scale mark.

3.4 Synchronized Start/Stop

The operation of the Ventilator may be “paused” by an external TTL logic signal. This feature, available on model **28125** (see paragraph 6.1-Optional) is particularly useful when the operation of the Ventilator is software controlled.

This special model of Mouse Ventilator is provided with optional synchronous stop feature; you will notice **two BNC connectors** on the left side of the Ventilator case.

The BNC marked “**SYNCHRON**” supplies a square pulse (5V amplitude, 20 ms duration) at each ventilator stroke, when the piston is at the upper dead point (i.e., when the piston almost touches the cylinder bottom – the lungs are inflated).

This **trigger signal** can inform/command a number of recording and/or actuating devices.

To obtain the synchronous stop, it is necessary to send a 5V signal (grounded negative) to the **STOP** BNC-connector. 10 ms duration is adequate.

The Ventilator will automatically restart after a 5-6 second time interval. This time lag can be adjusted via an internal RC element.

3.5 Hook up to Animal

A “Y” connection should be inserted between the tracheal cannula and the two tubelets coming from the respirator. Better to use a single piece cannula-Y connection, if available, see Figure 4 “Ventilation Cannula”.

We recommend our model, Cat. **28025-323**, see paragraph 6-ORDERING INFORMATION. The single piece makes it possible to minimize the segment of the piping in which the air goes back and forth thus preventing the animal to rebreath part of the air expired in the previous respiration cycle.

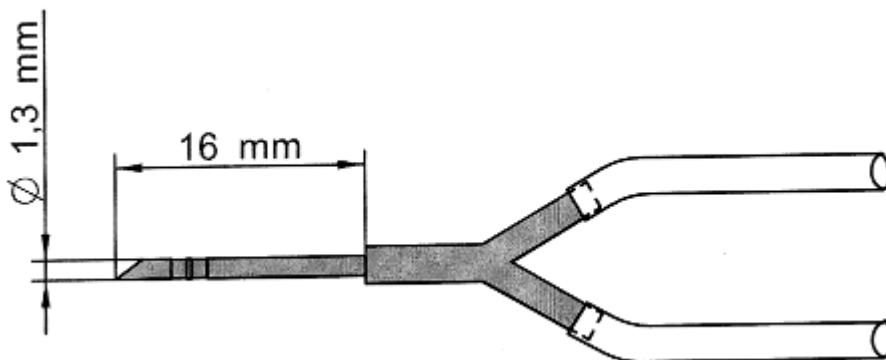


Figure 4 “Ventilation Cannula”

Also bear in mind that the connection tubelets should be as short as permitted by a neat experimental set-up, to minimize the flow impairment due to the air friction, which increases dramatically when operating with tubes in the range of 1-2 mm I.D.

3.6 Changing the Cylinder/Piston Assembly

This operation is necessary when the user replaces the **28025-010**, 0.1-1 ml cylinder piston assembly by the **28025-005**, 0.05-5 ml one or vice versa.

Operate as follows:

- a) Remove the plastic cap (**19**), see Figure 7 “Exploded View”, which protects the spring washer set and thrust ball bearing assembly. Exert a combination of a gentle pull and rotation as when uncorking a small bottle.
- b) Remove the self-locking nut 4MA (**20**) by the appropriate 7mm wrench on the head of the cylinder threaded stud (**9**), see Figure 5 “Changing Cylinder/Piston Assembly”.

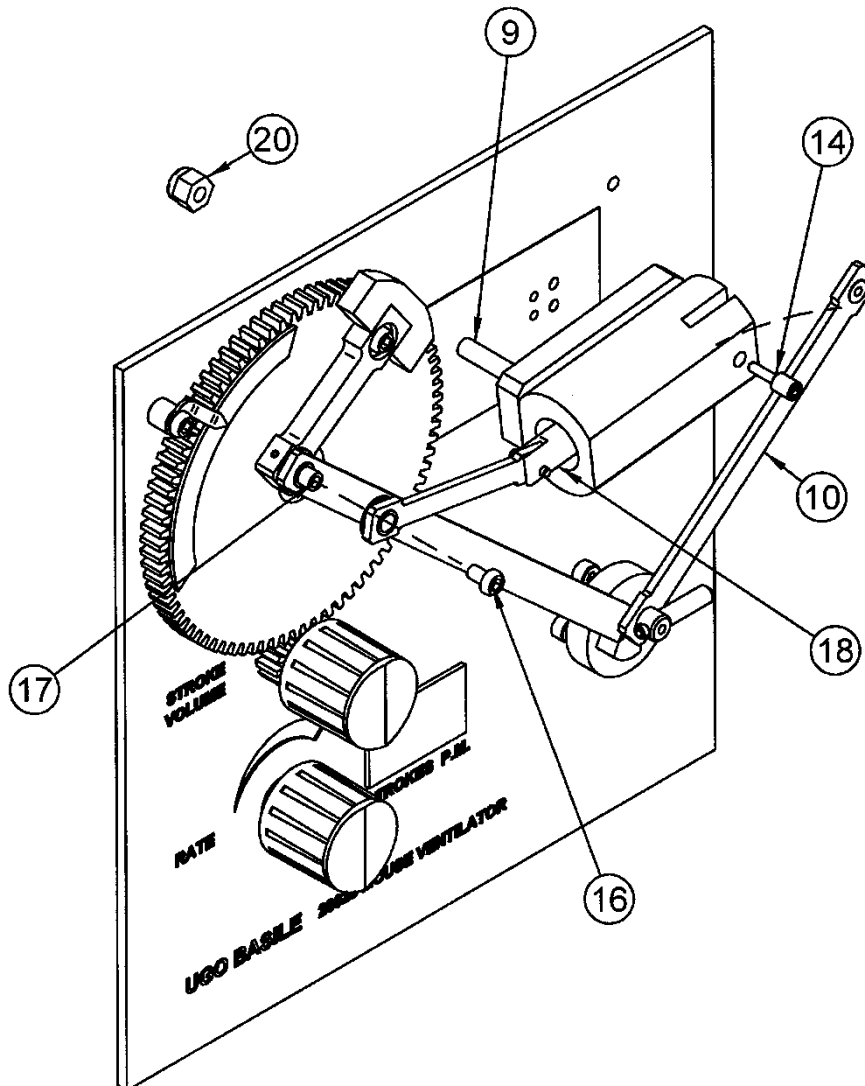


Figure 5 “Changing Cylinder/Piston Assembly”

- c) Extract the set of spring washers and the thrust ball bearing. Pay attention to these small parts and to their “order of insertion”, to avoid doubts when you have to reassemble the whole.
- d) Remove the pivot (14) of the distribution link (10), by the Allen wrench provided. Rotate the link sidewise.
- e) Remove the 3MA screw (16) placed on the head of the “main Connecting pivot” (17) by the Allen wrench provided. The pivot connects together the *dynamic trio*, namely the swinging, piston and main links*.
- f) Extract the cylinder/piston assembly. The piston is complete with its link which should not be detached. Don’t remove the gudgeon (18)!

All the described operations require a modicum of manual dexterity and a bit of patience is recommended. Avoid using improvised tools which may lead to damage of precise and costly components.

* See Figure 6 “Lubrication” for the “mechanically correct” names of the members of the kinematic linkage.

To position the fresh cylinder/piston assembly, carry out the same sequence in reverse order.

What is the main problem of reassembling? It is the grade of tightening which is proportional to the torque you apply to the wrench.

Once the self-locking nut (20) is driven to firm contact with the spring-thrust bearing package, an extra quarter of turn of the nut is in general sufficient.

Excessive tightening increases the friction without improving the air tightness which is already sufficient when the two elements of the sliding valve are in firm contact.

4 MAINTENANCE

While any service of the instrument is to be carried out by Ugo Basile personnel or by qualified personnel, authorized by UGO BASILE organization, this section of the instruction manuals describes normal maintenance procedures which can be carried out at the customer's facility.



UNPLUG THE MAINS CORD BEFORE CARRYING OUT ANY MAINTENANCE JOB!

4.1 Electrical

To inspect and/or replace the fuses, **disconnect the mains cable first!** Insert a miniature screwdriver in the slot indentation, see Figure 3 "Power Module", and snap out the slide which houses the fuses.

The Mouse Ventilator universal mains input accepts any voltage from 85 to 264 Volt AC., for which we recommend the use of 2 timed fuses (type T400mA).

Snap in the fuse slide: the mechanical "click" ensures that it is locked.

4.2 Lubrication

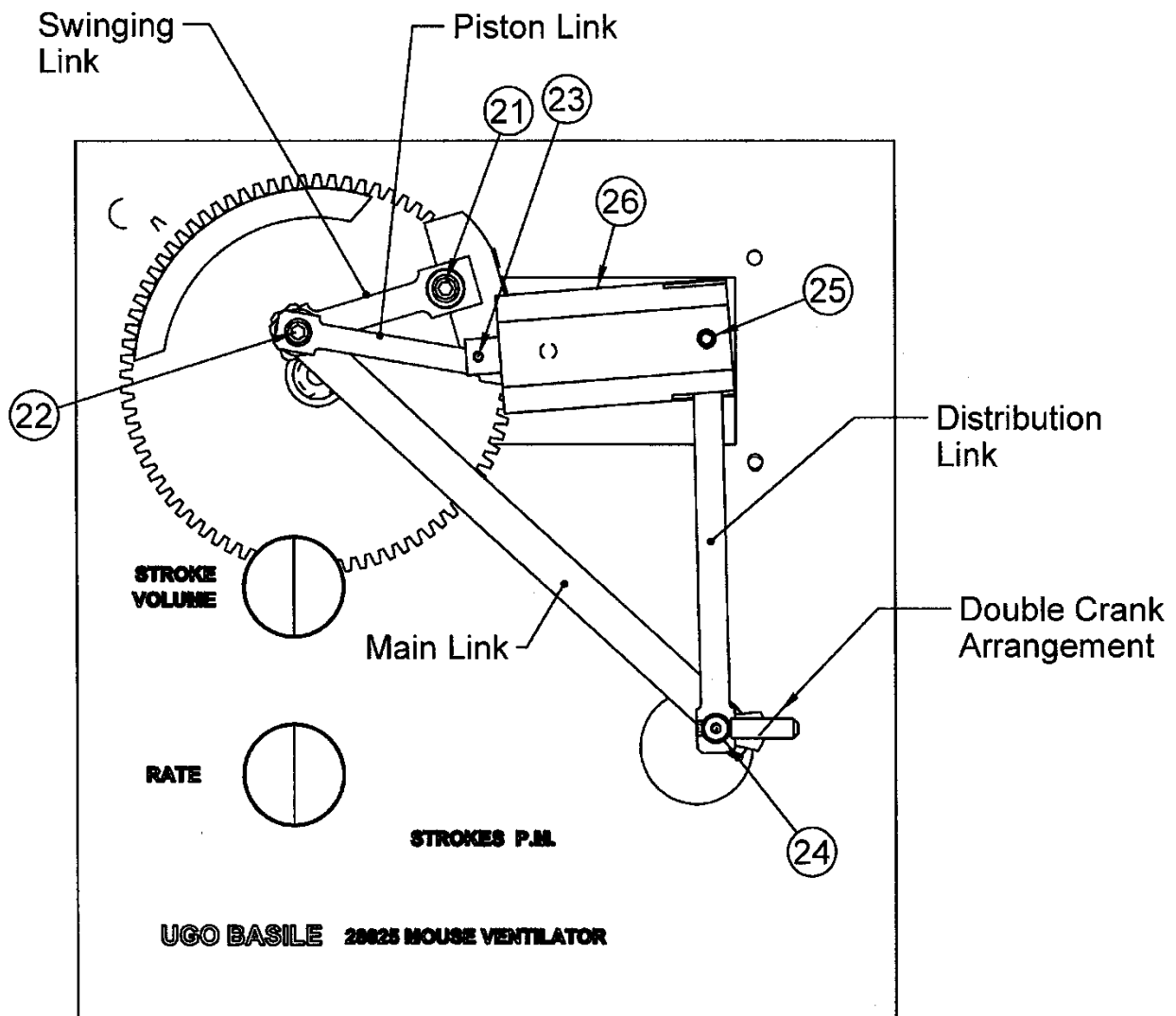


Figure 6 “Lubrication”

4.2.1 Lubricating Linkage & Sliding Plates

Every 200 hours of operation, lubricate the bearing of the swinging link (21), the triple joint (22), the piston gudgeon (23), the distribution link bearing (25), the double crank arrangement (24), see Figure 6 “Lubrication”, by applying one drop of oil, ideally the one supplied with the standard package, see paragraph 6-ORDERING INFORMATION

Before oiling, remember to unplug the power cord: your squirt can spout or – worse – your fingers may be pinched by the shearing action of the linkage, if the respirator is accidentally switched on.

Also apply a drop of oil to the contact point (26) between the stationary and the mobile plates of the slide valve.

Turn the respirator on for 1-2 minutes: the motion and capillary action will combine for a thorough bearing lubrication.

4.2.2 Lubricating Cylinder/Piston

Every 100 hours of operation, apply 1-2 drops of oil to lubricate the cylinder/piston contact surface. Operate the respirator at minimum speed and stop it when the piston is at the upper dead point: in plain words, nearest to the cylinder bottom. Then turn the respirator casing and lay it on its right side.

In this way, the cylinder is vertical and a drop of oil, when you turn the respirator on for one minute, will be evenly distributed by motion, gravity and capillary action.

4.3 Long Inactivity

After long storage, the Ventilator may not start to run at the minimum setting (50-60 S.P.M.): the torque at that setting may not be sufficient to break away aged lubricant film, in particular at the piston /cylinder and distribution plate interface.

After some 10-15 seconds at the higher speed, the problem is generally over.

4.4 Customer Support

For any further information you may desire concerning the use and/or maintenance of the Plantar Test and accessories, please do not hesitate to contact our **service department** (or our local distributor) either directly or via our support page <http://www.ugobasile.com/support.html> :



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sales@ugobasile.com

Before sending any instrument to our factory for repair, please contact our logistics department to obtain a return authorization number (RMA) and shipping/packing instructions.

We may not be held responsible for damages during transport due to poor packing. Whenever possible, please use the original packing.

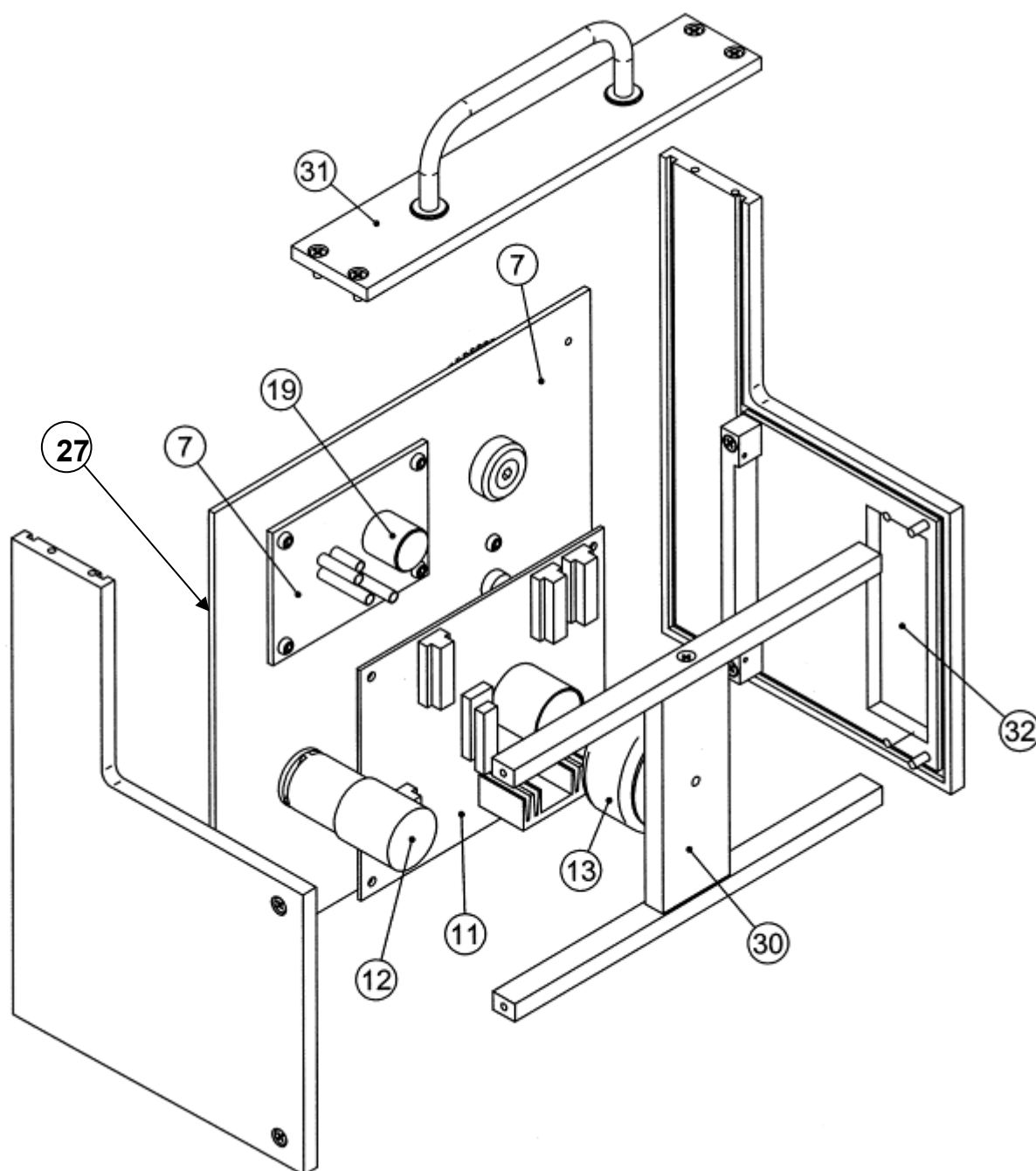


Figure 7 “Exploded View”

5 SPECIFICATIONS

Rate	:	60 to 300 strokes per minute
Rate Read-Out	:	on digital display
Start-Stop	:	by synchronised command (mod. 28125 only)
Stroke Volume	:	0.1 to 1 or 0.05 to 0.5 ml, depending on the cylinder/piston installed
Stroke Volume Reproducibility	:	+/- 2%

Stroke Volume Scale	:	precision engraved, 0.05 ml divisions
Power Requirements	:	Universal mains 85-264 VAC, 50-60Hz
Operating Temperature	:	10° to 40° C
Sound Level	:	< 60 dB
Weight (net)	:	Kg 2.5
Shipping Weight	:	Kg 5.0 approx.
Dimensions	:	20 x 13 x 18.5 cm
Shipping dimensions	:	49 x 39 x 30 cm

6 ORDERING INFORMATION

28025 Mouse Ventilator, complete with 0.5 or 1 ml cylinder/piston assembly (according to order) and following standard accessories:

28025-010 1 ml Cylinder/Piston Assembly, complete with its base plate (8, see Figure 1)

28025-005 0.5 ml Cylinder/Piston Assembly, complete with its base plate

28025-301 Dust Cover

28025-302 Instruction Manual

28025-321 Perspex Vertical Lid

28025-322 Oiler

28025-323 Cannula -Y connection, tubes, etc., in a plastic case

28025-324 Set: 7mm wrench for the 4MA nut (20), and Allen wrench for all screws

E-WP008 Power Cord

* Set of 2 fuses

6.1 Optional

28125 Mouse Ventilator, special model provided with suitable circuit and BNC connector **for synchronized Start/Stop**, see paragraph 3.4-Synchronized Start/Stop, complete with the same set of standard accessories as 28025

28025-320 Animal Operating Table



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CE CONFORMITY STATEMENT

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We hereby declare that

Instrument. **MOUSE VENTILATOR**
Catalog number **28025 - 28125**

*is manufactured in compliance with the following European Union Directives
and relevant harmonized standards*

- *2006/42/CE on machinery*
- *2014/35/UE relating to electrical equipment designed for use within certain voltage limits*
- *2014/30/UE relating to electromagnetic compatibility*
- *2011/65/UE and 2015/863/UE on the restriction of the use of certain hazardous substances in electrical and electronic equipment*

Account Manager

Mauro Uboldi

Nome / Name

October 2018

Date

Firma / Signature

ugobasile.com



Pain and Inflammation



Ventilators and Gas Anesthesia



Behaviour, Conditioning, Reward



Behaviour, Mazes, Tracking



Tissue baths, Transducers, Recorders



Miscellaneous, ECT, LMD



Blood Pressure, Vital Functions



Metabolism, Feeding Behaviour



Muromachi Microwave Fixation



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