Hardware User's Manual

Air flow & switching unit



References:

LE4004FL (76-0812), LE4002FL (76-0811), LE1334 (76-0823)

Publication:

Software V1.9 PB-MF-MAN-034-REV1.1



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1. SYMBOLS TABLE

Recognizing 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.	\bigwedge
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.	Â
Decontamination of equipment 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 use. 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 use. Users must follow preventive maintenance instructions. If the equipment requires service, arrange this through your local distributor. All units must be cleaned and decontaminated prior to being sent for Inspection, Servicing, Repair or Return.

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.
- E. Once the equipment is installed in the final place, the main power switch must be easily accessible.
- F. Only use power cords that have been supplied with the equipment. In case that you have to replace them, the spare ones must have the same specs that the original ones.
- G. Charlen Make sure that the AC voltage in the electrical network is the same as the voltage selected in the equipment. Never connect the equipment to a power outlet with voltage outside these limits.



For electrical safety reasons you only can connect equipment to (\square)

WARNING PO

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.



PC Control

Some of these instruments are designed to be controlled from a PC. To preserve the integrity of the equipment it is essential that the attached PC itself conforms to basic safety and EMC standards and is set up in accordance with the manufacturers' instructions. If in doubt consult the information that came with your PC. In common with all computer operation the following safety precautions are advised.



• To reduce the chance of eye strain, set up the PC display with the correct viewing position, free from glare and with appropriate brightness and contrast settings

• To reduce the chance of physical strain, set up the PC display, keyboard and mouse with correct ergonomic positioning, according to your local safety guidelines.



4. MAINTENANCE



WARNING: Failure to follow the instructions in this section may cause equipment fault.

- PRESS KEYS SOFTLY Lightly pressing the keys is sufficient to activate them.
- Equipment does not require being disinfected, but cleaning to remove urine, faces and odour is suggested to maintain proper function. Using a wet cloth or paper with soap (which does not have a strong odour) is recommended. NEVER USE ABRASIVE PRODUCTS OR DISSOLVENTS.
- NEVER pour water or liquids on the equipment.
- Once you have finished using the equipment turn it off with the main switch. Clean and check the equipment so that it is in optimal condition for its next use.
- The user is only authorized to replace fuses with the specified type when necessary.



Figure 1. Power inlet, main switch and fuse holder.

FUSE REPLACEMENT OR VOLTAGE SETTING CHANGE

In case of an over-voltage or other incident in the AC net making it impossible to turn on the equipment, or if the equipment voltage setting is incorrect, check fuses according to the following procedure.

1 Remove power cord from the power inlet.



2 Open fuse-holder by pulling the flange with a regular screwdriver.



Figure 2. Open fuse-holder door.

3 Extract fuse holder using the screwdriver.



Figure 3. Extract fuse-holder.

4 Replace fuses if necessary. Insert fuses in the fuse-holder in the correct position.





INCORRECT



5 Insert the fuse-holder again, positioning it according to the voltage in the AC net.





Figure 5 Fuse holder position.

6 If the fuses blow again, unplug the equipment and contact technical service.



For electrical safety reasons, never open the equipment. The power supply has dangerous voltage levels.

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6. INTRODUCTION

The LE400 is a multi-chamber air supplier, individually controlling the air flow supplied to up to 4 chambers. This apparatus also sequentially switches the air from the experimental chambers to the LE405 gas analyser.

Flow is regulated individually for each chamber. This gives the investigator greater flexibility, allowing them to work simultaneously with different species, such as mice and rats. This individual flow adjustment also makes it possible to evaluate the effect of the flow on metabolic experiments.

The LE400 was designed to work with the LE405 gas analyser as well as the Metabolism software for data acquisition and analysis. The complete Oxylet Pro system allows metabolic studies in rodent research models, which require very high sensitivity and stability.



Figure 6. LE400 Air Supply & Switching Unit.

The LE400 makes it possible to increase the number of metabolic chambers monitored up to 40. In such cases, multiple LE400s are connected to the local bus sync, shipped with all equipment. This scalability makes it easy to adapt the system to meet both current and future research needs.



7. EQUIPMENT DESCRIPTION



7.1. FRONT PANEL

Figure 7. Front Panel.

- Time: Shows the switching time. •
- +/-: Increases/decreases the timer. .
- Auto/Manual: Selects the working mode: Automatic or Manual. •
- Room Air: The system will take the air from the room when this key is pressed. •
- **On**: Selects the metabolic chamber. •
- **Pilots**: The active chamber is indicated by a blinking light. •
- Flow: Shows the flow supplied to each chamber. •
- **Regulators**: All independent adjustment of the flow supplied to each chamber.



WARNING: If you exceed the maximum measurable flow, the indicator will show "E1", error 1. Close the corresponding regulator to eliminate this error.





Figure 8. Rear Panel.

- Air Inlet: Double air inlet.
 - The bigger inlet is used to supply air into the pump. This air is supplied to the chambers.
 - The smaller inlet is used to sample the air of the room when the system is measuring **ROOM AIR**.
- **Pump Outlets:** There is one pump outlet for every chamber. The air goes from this outlet to the inlet of the chamber.
- Inlets: There is an inlet for each chamber. The air comes from the outlet of the chamber to this *inlet* and then is sent to the LE405 analyser through the *Sample Outlet*. The *Manifolds* must be connected to the *inlets*.
- **Sample Outlet:** The air from the switched chamber is sent through this outlet to the LE405 gas analyser, in a sequential way when you are working in *Automatic* mode or continuously when you are working in *Manual* mode.
- **Analog Flow:** Analog signal proportional to the flow supplied to the chamber that is switched at this time. The voltage-flow ratio is 0.1+1.8*V/l/min.



• **Event Marker:** Analog signal indicating that the chamber switched at this moment. The relationship between voltage and chamber is the following:

Event Marker (V)	Active Chamber
	Chamber
0	None
0.5	Room Air
1	Chamber 1
1.5	Chamber 2
2.0	Chamber 3
2.5	Chamber 4

• **Sync:** Synchronism signal with LE400 and LE405.



WARNING This is not an inlet to a local Ethernet network although the connector is the same.

- **USB:** USB port to connect to the computer.
- **Power Inlet:** This is the power inlet, main switch and fuse holder. To power on and power off the equipment.

7.3. FILTERS

The tubes that are connected to the **AIR INLET** nozzles of the LE400 carry a filter at the other end that prevents solid particles from entering the system.



Figure 9: Air Inlet filters.



- The larger diameter tube is used to provide air to the pump and is fitted with a 0.3 μm filter.
- The smallest tube is used to sample the room air; it is fitted with a 0.45 μm filter.

7.4. ROOM AIR RESERVOIR

It is highly recommended that the air supplied by the LE400 to the chambers comes from a location with minimal fluctuations in the concentrations of oxygen and carbon dioxide. This source may be an air tank or other stable source outside the facility. If you do not have these conditions, then we could use a bowl or empty bottle where we could connect air tubes of **LE400**.

As an option Panlab can supply the stabilizer air reservoir **LE1334**; which provides a feasible solution to reduce fluctuations in ambient air concentrations supplied to the chambers. The reservoir should be located on the site of the room where the greatest possible stability of the air is got inside or outside the experimental room.

Each reservoir **LE1334** can be connected to a maximum of two air suppliers **LE400**. To connect simply remove the air filters of the tubes (see Figure 9) and connect them to the appropriate inlets located on the reservoir **LE1334** lid, according to the diameter (see Figure 10)





Figure 10. Air reservoir.

7.5. MANIFOLDS

In order to prevent that in measurement transitions, overpressure reaches to the gas analyser when an electro valve opens, you must connect the Manifolds in LE400 air inlets.

Manifolds are used when you work with the metabolism system with food and drink, but they aren't used with **Tradmill** studies.



Figure 11. Manifold.



8. WORKING WITH THE LE400

Switch on the equipment. The display will light up and will show the version e.g. "**Pn1.9 LE -4 oo**". If working with several devices, switch all of them on. (If one device is switched off it will block the local network. Disconnect the sync cable from this device to avoid this effect.).



WARNING: In the event of any problem, remember to indicate the version number.

The display will then show the number assigned to the equipment e.g. " **1 NE**". Afterwards, the initial test starts, showing the number 9 in all digits and counting down to o. The equipment then goes to automatic or manual operating mode.

Adjust the air flow supplied to each chamber by means of the associated regulators until the desired value is shown on the indicator.



WARNING: It is normal for a modification in one regulator to change the value in other chambers. This is due to changes in the pressure generated by the pump. Therefore, every time a regulator is modified, check the flow in the other chambers.

It is recommended to check the airflow every 24 hours.

The flow value depends on kind of the animal, size, and so on. The following airflows are suggested for work with the LE405 gas analyser:

Animal	Static (l/min)	Dynamic (l/min)
Mouse	0.2-0.4	0.3-0.7
Rat	0.5-0.8	0.7-1.2
Rabbit	1.5-2.0	1.8-2.4

8.1. MANUAL MODE

Press	the	Auto Manual	key	to	enter	m	anua	۱m	ode.	The	associated	pilot	remair	ns off () in thi	is
					Time (min)							•				
											66 .					

mode. Notice that the **under** indicator also stays off in manual mode.

In	this mode the active chamber is selected by pressing the associated	On	key or l	Air	
if	you want to switch with the air in the room.				



The switched (or active) chamber is shown by the blinking 🕷 of the corresponding pilot.

8.2. AUTOMATIC MODE

In automatic mode, the equipment performs a cyclic sequence with the selected chambers and room air. When a complete cycle is performed, the system automatically starts over with a new cycle. The switching time then determines the time between each switch from one chamber to another.

To activate the automatic mode:

- Press until the corresponding pilot lights up. The display shows the switching time.
- Change the value at your convenience using keys (Under the default configuration of the LE405 analyser, i.e. filters and so on, at least 1 min of switching time is recommended).
- Press the end key corresponding to the last chamber to include in the cycle. The pilots of all previous chambers come on. If there are several LE400 units,

pressing the will select all chambers in all units with an identification number lower than the unit with the pressed key.

The active chamber, that is the switched chamber connected to the analyser, is shown with the corresponding pilot shinking.

The automatic cycle is repeated with all the chambers that have their pilot 🛑 light on.

The sampling frequency of room air is set up in the "**SE**" switching sequence. To change this value see paragraph 9.2. According to the configured value, the equipment will change the sampling frequency of room air to once per switch, once per 2 switches or once per 4 switches.



WARNING: You cannot leave the LE400 set in neither Manual nor Automatic mode without selecting a chamber, otherwise communications with computer will be blocked waiting that an active chamber is established (Room Air or conventional chamber). In other words, once the mode Automatic or Manual is set, you must activate

In other words, once the mode **Automatic** or **Manual** is set, you must activate a chamber so that LE405 knows the origin the gas that is currently analysing and then it can send data to the computer.



9. SET-UP

The LE400 allows configure the following parameters:

- Equipment identification number.
- Room air sampling frequency.
- Memorizing.
- Units of time.

The set-up of these parameters is described in the following paragraphs.

9.1. EQUIPMENT IDENTIFCATION NUMBER

When working with more than one LE400, assign different numbers to each device, so that the information transmitted can be acknowledged. If working with only one LE400, the air supply unit must always be set to 0 (master). If another unit is added later, set the unit number to 1 and then successively up to unit number 9.

To enter the device number set-up, press the key when the display shows 8 in all digits during the initial test after the power is turned on. The chamber 1 flow indicator will show "NE", number of equipment. The number assigned to this unit will be shown

on the **base** indicator.

- Press the keys to modify the value.
- Press the key to record the changes, or press to exit without saving any changes.

9.2. ROOM AIR SAMPLING FREQUENCY

To change the room air sampling frequency:

To enter the room air sampling frequency set-up, press the key when the display shows **5** in all digits during the initial test after the power is switched on. The flow indicator of chamber **1** will show **"SE"** and the number corresponding to the room air

sampling mode will be shown on the **under the shown** indicator according the following table:



Nº SE	Room air sampling frequency					
0	Automatic according to the selected switching time.					
	If time< 5min the room air is sampled once every 4 chambers.					
	If 5min <time<10min 2<="" air="" every="" is="" once="" room="" sampled="" th="" the=""></time<10min>					
	chambers.					
	If time >10 min room air is sampled with each chamber switch.					
1	The room air is sampled after every chamber switch.					
2	The room air is sampled once every 2 chamber switches.					
4	The room air is sampled once every 4 chamber switches.					

- Press the keys to modify the value.
- Press the key to record the changes, or press to exit without saving any changes.

9.3. MISCELLANEOUS SET-UP

Switching time units can also be changed from minutes to seconds for special applications. A memorizing mode is also available. In memorizing mode, the equipment remembers the last operative selection, even in the event of a black-out. This setting is especially useful if there are frequents faults in the mains, and for long-lasting experiments since it prevents the loss of experiment data due to faults in the mains. The equipment will start a new cycle when the voltage is recovered. In non-memorizing mode, the equipment will start in automatic mode but without any selected chamber.

indicator of chamber 1 will show "nC" and the indicator will show the number for the miscellaneous set-up according the following table:

Nº nC	Unit of time	Memorizing
0	Minutes	No
1	Minutes	Yes
2	Seconds	No
3	Seconds	Yes

- Press the keys to modify the value.
- Press the key to record the changes, or press to exit without saving any changes.



10. EQUIPMENT CONNECTION

10.1. ELECTRICAL CONNECTIONS

The following figure shows electrical connections in a system with 3 LE400's, one LE405 gas analyser and a computer.



Figure 12. Electrical connections.

The next table lists the necessary connections:

	FROM	ТО	PURPOUSE
18	LE405 Sync	LE400 Sync	Sync signal between LE405 and LE400
ıb	LE400 Sync	LE400 Sync	Sync signal between LE400 and LE400
1C	LE400 Sync	LE400 Sync	Sync signal between LE400 and LE400
2	LE405 RS232	PC Com port	Connection with the computer

Some points must be taken into account:

- All the LE400 units must have a different ID number (see chapter 9.1).
- A maximum of 10 LE400 units can be connected to one LE405.
- Valid ID range numbers are from o to 9.



- The LE400 must not be ordered physically by the ID number, for example if you have 3 units with numbers, 0, 1 and 2, you can connect them 0-1-2, 0-2-1, 1-2-0, 1-0-2, 2-1-0 or 2-1-0.
- If there is a LE4002 in the system, only one can be present and the ID number must be the last one.
- ID numbers must be consecutive beginning by o, in other words first LE400 must have the ID number o.
- The SYNC ports are symmetrical. You connect the first LE400 to the LE405 using one of the SYNC ports and you will use the free SYNC port to connect to the next LE400 unit in case it was necessary.
- In the last LE400 unit one of the SYNC ports will be free.



WARNING: All Sync plugs and cables are identical, and can be interchanged at your convenience. Remember that this is not a local Ethernet inlet although the connector is the same.



10.2. PNEUMATIC CIRCUIT

10.2.1. <u>CONNECTING OUTLRT TUBES</u>



Figure 13. Tube connection and disconnection.



WARNING: This equipment features a system that keeps the tube affixed into the Outlets. Simply push the tube firmly to connect it. To remove any tube from the outlets (see Figure 13), press the plastic ring inwards (2) and then pull the tube to remove it (3).

10.2.2. <u>CONNECTING MANIFOLDS AND AIR INLET TUBES</u>



Figure 14. Connecting the Manifolds.



WARNING: This equipment features a system that keeps the **Manifold** affixed into the air Inlets. Simply push the **Manifold** firmly to connect it. To remove any **Manifold** from the inlets (see Figure 14), press the plastic ring inwards (2) and then pull the **Manifold** to remove it (3).



In order to connect the tubes to the **Manifold** metal end, simply insert the tube in the metal end in case of the mouse chamber (\emptyset_4 mm) or insert the metal end in the tube in case of rat chamber (\emptyset_6 mm).



Figure 15. Connecting the inlet air tubes to the Manifolds. A) Mice chamber B) Rats chamber.

10.2.3. <u>CONNECTING THE AIR SAMPLING TUBES</u>

This kind of connectors that keep affixed the tube (explained in the chapters 10.2.1 and 10.2.2) are not used in the tubes labelled as 4 and 5 that appear in the following schematics of this chapter. These silicone tubes are inserted in the metal outlets of the **AIR INLET** just pushing them to surround the metal pipe.

10.2.4. <u>CONNECTION WITHOUT AIR RESERVOIR</u>

	FROM	то	Diameter of Tube	Colour
1	LE400 Sample Outlet	LE405 Sample Inlet	4mm+Nafion	purple
2 ¹	LE400 Chamber N Outlet	Chamber N Inlet	6mm	Green
31	Chamber N Outlet	LE400 Chamber N Inlet	4mm/6mm² +	Red
			Manifold	
4	Air Inlet	Room	4.5mm	Blue
5	Air Inlet	Room	9.5mm	Blue

The arrows indicate the direction of airflow.

The following figure shows the pneumatic circuit in a system with one LE400, four chambers and one LE405 gas analyser.

¹ These connections are repeated for each chamber.

² The diameter of these tubes is 6mm for Rats chamber and 4mm for Mice chambers.





Figure 16. Pneumatic circuit for one LE400.



WARNING: The tubes 4 and 5 which respectively serve for sampling the room air and the air inlet to the pump must be placed as far away as possible from the fan outlet to prevent air pollution as electro valves system expels air from chambers inside the equipment. Both tubes are attached and should be placed away from sources of air pollution. "Air pollution" refers to breathing from either animals or people.



10.2.5. <u>CONNECTING SEVERAL LE400 WITHIUT AIR RESERVOIR</u>

The following figure shows the pneumatic circuit in a system with two LE400's, eight ages and one LE405 gas analyser.



Figure 17: Pneumatic circuit for two LE400.

The arrows indicate the direction of airflow.

	FROM	ТО	Tube Ø	Colour
14	LE400 Sample Outlet	LE405 Sample Inlet	4mm+Nafion	Purple
1′4	LE400 Sample Outlet	LE400 Sample Outlet	4mm+T	Purple
2 ⁵	LE400 Chamber N Outlet	Chamber N Inlet	6mm	Green
3 ⁵	Chamber N Outlet	LE400 Chamber N Inlet	4mm/6mm ⁶ +	Red
			Manifold	
4 ⁴	Air Inlet	Room	4.5mm	Blue
4 ^{′4}	Air Inlet	Room	4.5mm	Blue
5 ⁴	Air Inlet	Room	9.5mm	Blue
5 ^{′4}	Air Inlet	Room	9.5mm	Blue

⁴ These connections are repeated for each control unit LE400.

⁵ These connections are repeated for each chamber.

⁶ The diameter of these tubes is 6mm for Rats chamber and 4mm for Mice chambers.





WARNING: The tubes 4 and 5 which respectively serve for sampling the room air and the air inlet to the pump must be placed as far away as possible from the fan outlet to prevent air pollution as electro valves system expels air from chambers inside the equipment. Both tubes are attached and should be placed away from sources of air pollution.

10.2.6. <u>CONNECTION WITH AIR RESERVOIR</u>

The following figure shows the pneumatic circuit in a system with one LE400, 4 chambers and one LE405 gas analyser.



Figure 18. Pneumatic circuit for one LE400 with Air Reservoir.



The arrows indicate the direction of airflow.

	FROM	ТО	Diameter of Tube	Colour
1	LE400 Sample Outlet	LE405 Sample Inlet	4mm+Nafion	purple
2 ⁷	LE400 Chamber N Outlet	Chamber N Inlet	6mm	Green
3 ⁷	Chamber N Outlet	LE400 Chamber N Inlet	4mm/6mm ⁸ +	Red
			Manifold	
4	Air Inlet	Room	4.5mm	Blue
5	Air Inlet	Room	9.5mm	Blue

WARNING: The tubes 4 and 5 which respectively serve for sampling the room air and the air inlet to the pump must be placed as far away as possible from the fan outlet to prevent air pollution as electro valves system expels air from chambers inside the equipment. Both tubes are attached and should be placed away from sources of air pollution.

10.2.7. CONNECTING SEVERAL le400 WITH AIR RESERVOIR

The following figure shows the pneumatic circuit in a system with two LE400's, 8 ages and one LE405 gas analyser.



Figure 19. Pneumatic circuit for two LE400 with air reservoir.

⁷ These connections are repeated for each chamber.

⁸ The diameter of these tubes is 6mm for Rats chamber and 4mm for Mice chambers.



The arrows indicate the direction of airflow.

	FROM	ТО	Tube Ø	Colour
1 ⁹	LE400 Sample Outlet	LE405 Sample Inlet	4mm+Nafion	Purple
1′ ⁹	LE400 Sample Outlet	LE400 Sample Outlet	4mm+T	Purple
2 ¹⁰	LE400 Chamber N Outlet	Chamber N Inlet	6mm	Green
3 ¹⁰	Chamber N Outlet	LE400 Chamber N Inlet	4mm/6mm ¹¹	Red
			+ Manifold	
4 ⁹	Air Inlet	Room	4.5mm	Blue
4 ^{′9}	Air Inlet	Room	4.5mm	Blue
5 ⁹	Air Inlet	Room	9.5mm	Blue
5 ^{′9}	Air Inlet	Room	9.5mm	Blue



WARNING: The tubes 4 and 5 which respectively serve for sampling the room air and the air inlet to the pump must be placed as far away as possible from the fan outlet to prevent air pollution as electro valves system expels air from chambers inside the equipment. Both tubes are attached and should be placed away from sources of air pollution.

⁹ These connections are repeated for each control unit LE400.

¹⁰ These connections are repeated for each chamber.

¹¹ The diameter of these tubes is 6mm for Rats chamber and 4mm for Mice chambers.



11. PROCEDURE FOR REPLACING THE AIR INLET FILTERS

11.1. ROOM AIR FILTER CHANGE

To change the Room Air filter, e. g. 0.45μ m filter, simply turn the filter counterclockwise while holding the white tube connector.

To place the new filter, drop it into the white luer connector, and turn the knob clockwise to lock it into position.



Figure 20: 0.45µm filter change.

11.2. PUMP FILTER CHANGE

The o.3 μ m is a one direction filter with an input side (labelled) and an output side (unlabelled). This filter should be checked weekly and has to be replaced if it is dirty or clogged.

To change the filter pump, first remove the dirty filter by pushing it out from the tube. Then press firmly to connect the output side (unlabelled side) of the new filter to the room air tube.



Figure 21. 0.3µm filter change.



WARNING: The status of the filters should be checked weekly. It is important the correct position of the filter. The labelled side of the filter has to face the fluid. The unlabelled side of the filter has to be connected to the tube.



12. TROUBLESHOOTING

ISSUE	SOLUTION
The equipment does not turn on.	 Check that the mains voltage is the same for which the device is designed. Check that the mains cable is connected. Check fuses.
The system doesn't recognize all the connected air suppliers.	 Check that all the sync cables are properly connected between the air suppliers. Refer to section <u>10.1</u> to find more information on this. Check that every LE400 has a consecutive and different identification number assigned to it. Refer to section <u>9.1</u> in order to complete this task. If there is a LE4002 in the system, only one can be present and the ID number must be the last one.
When adjusting the flow of a channel with the regulator button, the flow doesn't increase properly.	 Check the 0.3 µm filter located in the room air tube and replace it if dirty. Refer to section <u>11.2</u> in order to complete this task. If the problem persists, contact the technical support team.
The flow indicator in the channels drifts down along an experimental session with Metabolism.	 Check the 0.3 µm filter located in the room air tube and replace it if dirty. Refer to section <u>11.2</u> in order to complete this task. Check if the room air tubes are not collapsed or bent.
The sampled room air is very unstable during the experiment.	 Put the room air tubes away from the chamber inlets in the back of the equipment preferably oriented to a stable air source location of the room. Use an empty carboy or other air chamber as a buffer reservoir. Refer to section <u>7.4</u> for more information.
The active chamber is not properly shown on the front panel of the LE405.	 Verify the correct connection of the cable RJ45 between the LE405 and the LE400 device. Refer to troubleshooting section of the LE405 user's manual for more directions on this issue.



ISSUE	SOLUTION
There is no change in the O2, CO2 gas concentrations when the system changes the active channel from room air to chamber.	 Verify the correct connection of the chamber tubes to the channel air inlet and outlet in the back of the equipment. Refer to troubleshooting section of the LE405 user manual for more directions on this issue.



PREVENTIVE MAINTENANCE 13.

	EXPERIMENT	WEEKLY	ANUALLY
CHECK FILTERS		$\overline{\mathbf{V}}$	
CHECK NEUMATIC	$\overline{\mathbf{A}}$		
CONNECTIONS			
SELECT A CHAMBER	$\overline{\mathbf{A}}$		
OR ROOM AIR AFTER			
SETTING MANUAL OR			
AUTOMATIC MODE			
CHECK FLOW	$\overline{\mathbf{A}}$		
ADJUSTMENT ¹²			
REPLACE FILTERS ¹³			\checkmark

 ¹² In long term experiments you should check the flow every 24 hours.
 ¹³ The frequency of filter change depends on cleaning of the environment. It has been established one year as a guide, but if you see that they get dirty before they should be changed more often.



14. TECHNICAL SPECIFICATIONS

	Universal oo to 240 VAC
Frequency:	
Input surge current:	(18 A at 11 C)/AC/c = 6 A at 220/AC
Fuse type:	a fuses ryanom a A T delayed fusion
Maximum Bower	
Conducted Noice	25 W ENGROUP /CIERDAN/CIERDAN class P
Collucted Noise:	
Safety Ground Leakage Current:	0.62 mA maximum at 130 V
Warm un time.	c1 min
Maximum proceure at inlate	$\sim 1 \text{ kg/cm}^2$
Adjusted flow range	
Aujusteu now range:	
Display resolution:	0.1 I/min
Switching time range:	1-99 min
Flow adjust:	An independent regulator for each chamber
Chambers per equipment:	4
Maximum number of equipment:	10
Maximum number of chambers:	40 for each analyser
Operation modes:	Automatic / Manual
Anti-blackout system:	Yes
Room air switching sequence:	Configurable
Room air switching time:	o-5 min limited
Acoustic Noise:	38 dBA
FLOW SENSOR	
Technology:	Thermal Mass Flow
Number of sensors:	One for each channel (chamber)
Measurement range:	0-2.5 l/min
Internal Resolution:	0.01 l/min
Linearity:	0.1 l/min
, Noise:	< 0.01 l/min
Repeat accuracy	+-3% F.S. max 25°C
Accuracy:	+- 4% F.S.
PUMP	
Technology:	Membrane Linear Pump
Life:	>30.000 hours
Maximum flow at free air:	15 l/min
ANALOGIC SIGNAL OUTPUTS	
Connectors:	Panel BNC female
Event Marker	0.5 V in steps of 0.5 V for each chamber
Flow Output:	0.1-4.7V 1.8V/l/min
Flow accuracy:	+/_1% F S
	17-1701.5.
Operating temperature:	10° C to $\pm 10^{\circ}$ C
Operating Relative Humidity	$10 \times 10^{+40} \times 10^{-10}$
Storage tomporature.	0° to $\pm co^{\circ}$ non-condensing
Version	1 1 Low Spood (1 5 Mbits/s)
Connector	Tupo D
	і уре в
wiath x Height x Depth:	230 x 155 x 310 mm
weight:	о.3 кд



DECLARACIÓN DE CONFORMIDAD DECLARATION OF CONFORMITY DECLARATION DE CONFORMITÉ

Nombre del fabricante: Manufacturer's name: Nom du fabricant:		Panlab s.l.u. www.panlab.com info@panlab.com	
Dirección del fabricante: Manufacturer's address: Adresse du fabricant:		Energía, 112 08940 Cornellà de Llobregat Barcelona SPAIN	
Declara bajo su responsabil Declares under his respons Déclare sous sa responsabil	lidad que el producto: ibility that the product: lité que le produit:	AIR SUPPLY & SWITCHING	
Marca / Brand / Marque:		PANLAB	
Modelo / Model / Modèle:		LE400	
Cumple los requisitos esenciales establecidos por la Unión Europea en las directivas siguientes: Fulfils the essential requirements established by The European Union in the following directives: Remplit les exigences essentielles établies pour l'Union Européenne selon les directives suivantes:			
2006/95/EC [2004/108/EC [2012/19/EU [Directiva de baja tensión / Low Voltage / Basse tensión Directiva EMC / EMC Directive / Directive CEM La Directiva de Residuos de Aparatos Eléctricos y Electrónicos (WEEE) / The Waste Electrical and Electronic Equipment Directive (WEEE) / Les déchets		
2011/65/EU F (6	d'equipements électriques et électroniques (WEEE) Restricción de ciertas Sustancias Peligrosas en aparatos eléctricos y electrónico (ROHS) / Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (ROHS) / Restriction de l'utilisation de certaines substances dangereuses dans les équipements électriques et électroniques		
2006/42/EC	2006/42/EC Directiva mecánica / Machinery directive / Directive mécanique		
Para su evaluación se han aplicado las normas armonizadas siguientes: For its evaluation, the following harmonized standards were applied: Pour son évaluation, nous avons appliqué les normes harmonisées suivantes:			
Seguridad / Safety EMC: FCC: Safety of machine	/ Sécurité: EN61010-1: EN61326-1: FCC47CFR 1 ry: EN ISO 1210	2011 2012 Class B 15B Class B 00:2010	
En consecuencia, este producto puede incorporar el marcado CE y FCC: Consequently, this product can incorporate the CE marking and FCC: En conséquence, ce produit peut incorporer le marquage CE et FCC:			
En representación del fabricante:			
En représentation du fabric	ant: Carme Can General Ma	alís inager	
Cornellà de Llobregat, Spai 30/04/2014	Panlab s.l.u n	., a division of Harvard BioScience	



(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.

F) Remargues 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

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 sequenti 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.

PB-MF-MAN-034-REV1.1