MADE IN ITALY

by FLAEM® PRO LINE

Pulmo Waves®

Device for respiratory physiotherapy

Respiratory physiotherapy

Accumulation of secretions in certain parts of the human respiratory system can take place for different reasons.

For example, some thorax or abdominal surgery operations may require prolonged anaesthesia and force the patient to a long period of reduced mobility, thus conditioning its psychophysical recovery. The reduced mobility of thorax and abdomen reduces the amplitude of breathing and, subsequently, oxygen supply and, at the same time, it causes secretions to increase or stagnate. Particularly debilitated patients often cannot cough properly to remove secretions.

In other cases, patients suffer from serious pathologies which cause an excessive production of secretions or mucociliary clearance anomalies. Examples include ciliary dyskinesia or cystic fibrosis with all related complications.

The treatment of airways for the removal of secretions, that is respiratory physiotherapy, can be executed with different pneumatic devices available on the market, which generally modify the patient's expiratory phase, in particular regulating the pressure or the volume of the air expired.

The positive expiratory pressure (PEP) mask is definitely widespread, in particular for the treatment of patients suffering from chronic bronchial obstruction (COPD).
Essentially, the PEP mask can be positioned on the face in order to enclose mouth and nose and is endowed with a one-way valve and an adjustable resistance which intercepts the expiratory output of the valve. Brea-thing with PEP allows the creation of a positive endobronchial pressure during the expiratory phase.

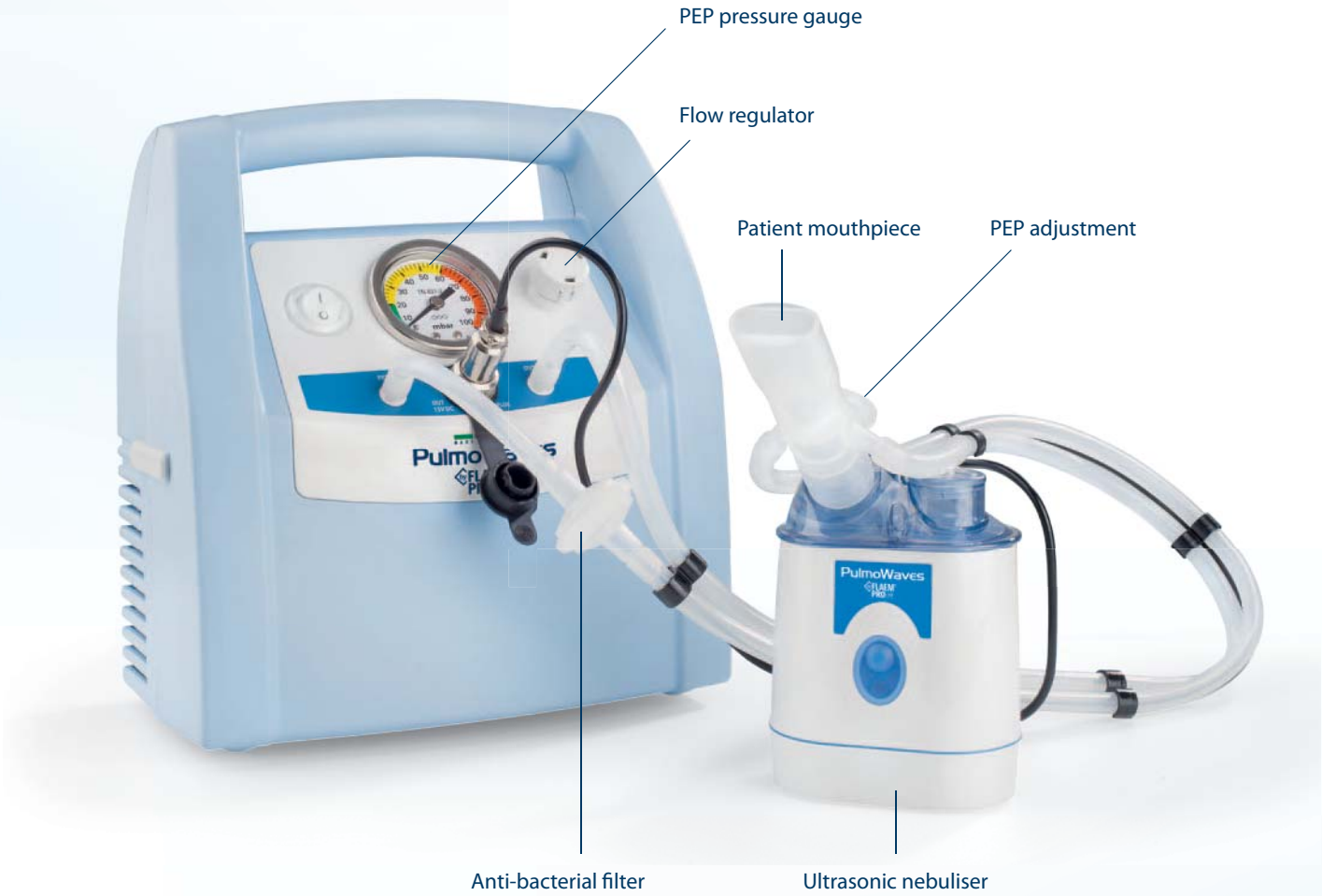
The effect of the positive pressure is to maintain the airways open for a longer period during the expiration phase, thus preventing bronchial collapse in areas with unstable and damaged walls. Therefore, temporary increase in pressure facilitates ventilation in most peripheral lung areas, re-expansion of scarcely ventilated areas or not ventilated at all, and mobilisation of secretions from peripheral areas towards the centre of the bronchi.

In addition, there are many devices available on the market that exploit the same functional principle as PEP masks; in particular, they create a positive pressure during the expiratory phase for about two-thirds of the phase itself, thus allowing the patient to terminate expiration spontaneously, that is at atmospheric pressure.

A very widespread device also in hospitals is called FLUTTER. Basically, it is composed of a mouthpiece with PEP function, but it is also equipped with a resistance than can be timely adjusted in terms of oscillatory mode.
The resistance that obstructs patient expiration in an oscillatory way, determines the creation of an oscillatory positive expiratory pressure in the relevant airways, ranging between 10 and 20 cmH_20, which facilitates the separation of mucus from bronchial walls. Variations in positive expiratory pressure are slow, that is they have a reduced frequency below 15 Hz.
Another device is composed by an air compressor connected to a facial mask configured to accelerate the air expired by the patient, that is to increase air flow during expiratory phase, with the aim of creating a vacuum in airways to facilitate secretion separation.

As stated above, the solutions available on the market generally operate during the patient's expiratory phase, exploiting only one phase of breathing.

PulmoWaves®



PulmoWaves® is a non-invasive device for respiratory physiotherapy, particularly indicated for removing tracheobronchial secretions.

It is a system composed of a pneumatic compressor, an ultrasonic **nebuliser** and a **dispenser** with a PEP device. The operation is based on the generation of **vibrations** by the pneumatic compressor that is automatically activated by the patient's inspiratory action. These **vibrations**, whose amplitude is adjustable via the flow regulator on the device console, enable the removal of mucus obstructions that clog the airways.

In order to prevent airways becoming dry during treatment, the flow inhaled by the patient also draws saline solution nebulized and produced by the ultrasonic **nebulizer**. The system features a a 5-position adjustable PEP device for the management of the expiration phase; the intensity of flow can be measured by the pressure gauge on the device console.

PulmoWaves® can also be used without the nebuliser.

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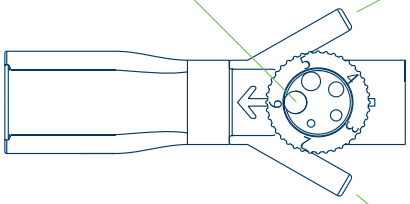
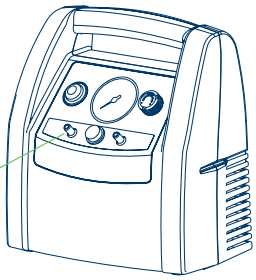
Flow meter

Pressure gauge

Ring nut of PEP connector regulator

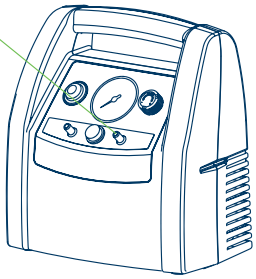




Connection to vacuum sensor

Inhalation valve

Universal with valve open in suction closed in expiration

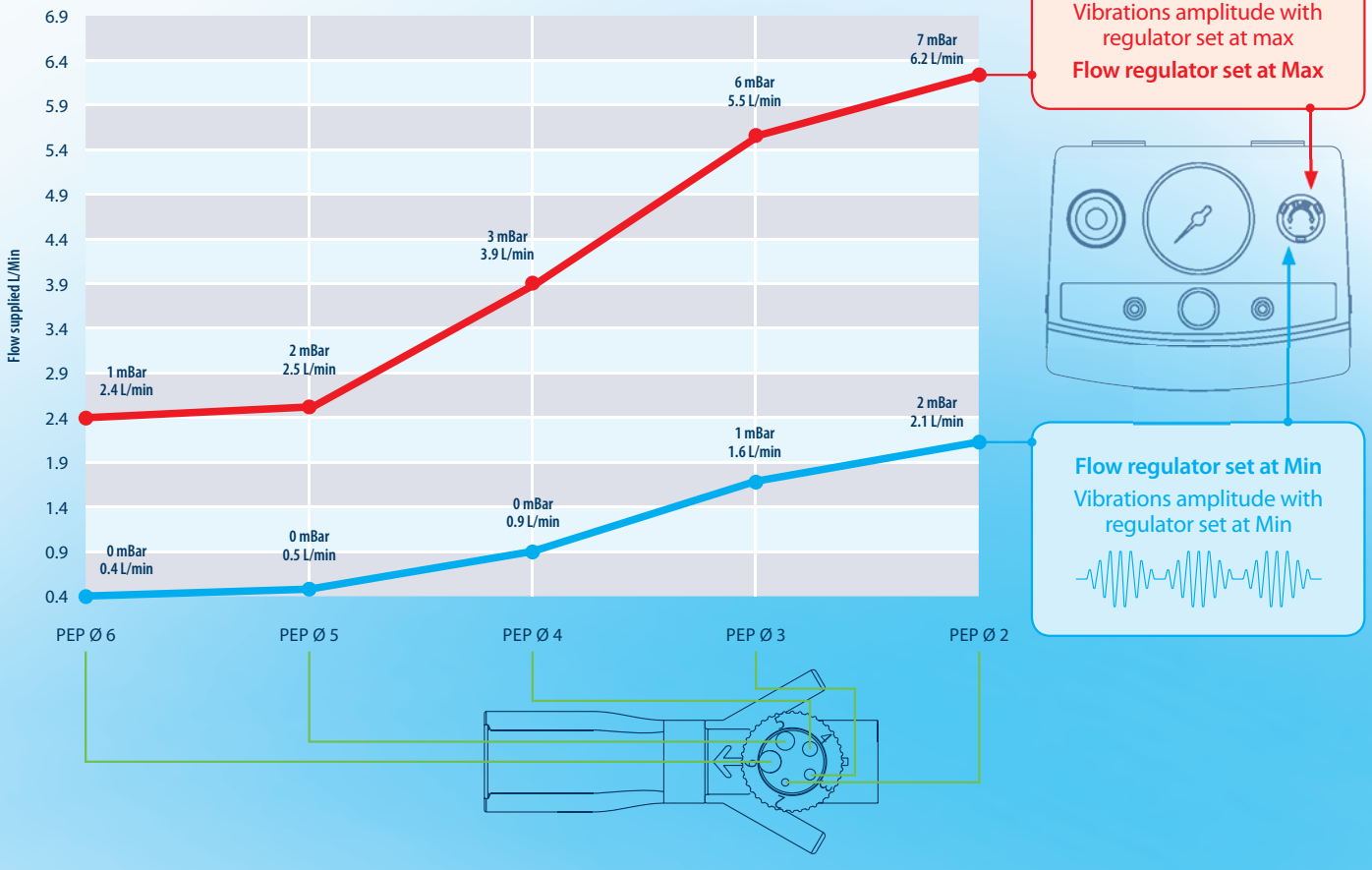


Connection to vibration generator

Table showing maximum and minimum flow and pressure values supplied by PulmoWaves® and combined with dispenser with PEP ring nut adjusted in the 5 available positions connector holes

Connector holes		Max flow regulator				Min flow regulator			
Hole diameter		Flow		Pressure		Flow		Pressure	
Ø	2	6.2	L/min	7	mbar	2.1	L/min	2	mbar
Ø	3	5.5	L/min	6	mbar	1.6	L/min	1	mbar
Ø	4	3.9	L/min	3	mbar	0.9	L/min	0	mbar
Ø	5	2.5	L/min	2	mbar	0.5	L/min	0	mbar
Ø	6	2.4	L/min	1	mbar	0.4	L/min	0	mbar

Graphical representation of maximun and minimum flow and pressure values supplied by PulmoWaves® and combined with dispenser with PEP ring nut adjusted in the 5 available positions



Technical specifications

PulmoWaves by FLAEM PRO LINE

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Compressor

Power supply/power	230 V~50 Hz/140 VA
Pulse rate	~50 Hz
Noise (at 1 m)	55 dB (A) (approx.)
Unit size	22 (L) x 11 (P) x 23 (H) cm
Unit weight	2.730 Kg
Carry bag dimensions	27 (L) x 17 (P) x 25 (H) cm
Warranty	2 years

Ultrasonic nebuliser

Power source	15 VDC
Nebulisation ml/min[1]	Min 5.7 µm Max 6.3 µm
MMAD[1]	0.7
Breathable fraction <5µm[1]	Min 40% Max 36%
Medication cup capacity[1]	6 ml

[1] Data recorded according to ANNEX CC of EN 13544-1

Operating conditions

Temperature	min 10° C	max 40° C
Air humidity	min 10%	max 95%
Atmospheric pressure	min 69KPa	max 106KPa

Storage conditions

Temperature	min -25° C	max 70° C
Air humidity	min 10%	max 95%
Atmospheric pressure	min 69KPa	max 106KPa

Type BF applied parts are: patient accessories (Q)

Accessories

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