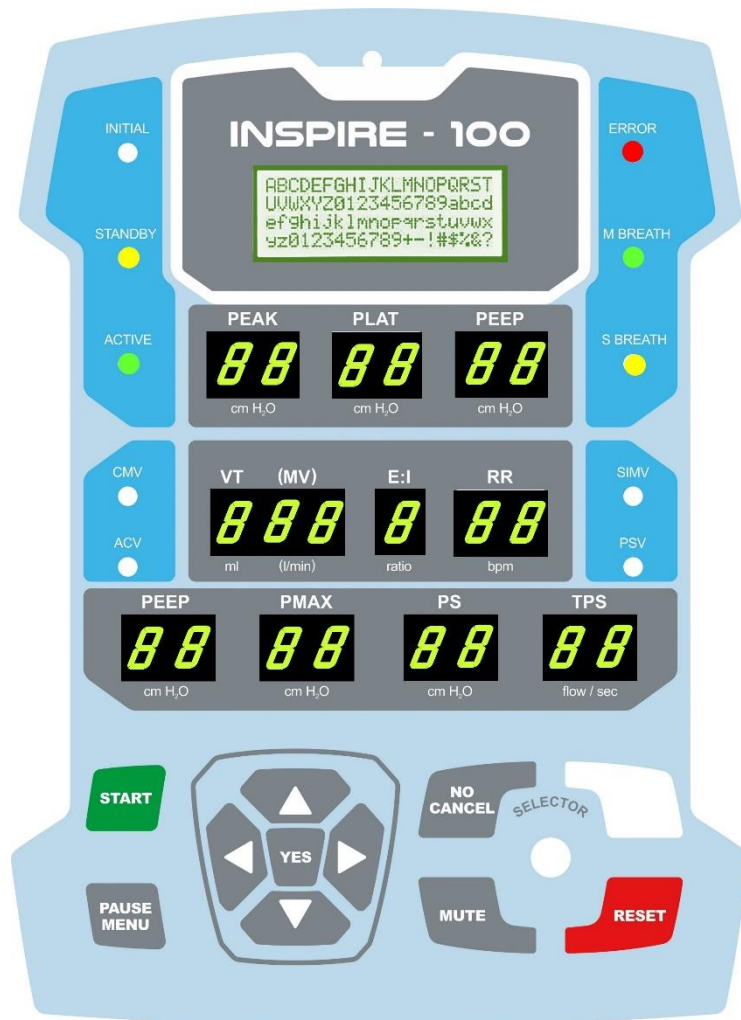# INSPIRE-100
Emergency Respiration Assist Device

Frequently Asked Questions

What is Non-invasive ventilation?

Using a face mask to get air from the ventilator into your lungs is called non-invasive ventilation. The face mask fits tightly over the patient's nose and mouth to help the patient breathe. This method is recommended if the patient's breathing problems are not severe enough to require a breathing tube. This method is also used to help the patient get used to breathing on his own after the breathing tube is removed.

The benefits of this type of ventilation are as below.
- It can be more comfortable than a breathing tube.
- It allows the patient to cough.
- The patient may be able to talk and swallow.
- The patient may need less sedative and pain medicines.
- It lowers some risks, such as pneumonia, that are associated with a breathing tube.

What is Invasive ventilation?

In more serious cases, a breathing tube is placed into the patient's windpipe, and the breathing tube (also called an endotracheal tube) is connected to a ventilator that blows air directly into the patient's airways. The process of putting the tube into your windpipe is called intubation.

Usually, the breathing tube is inserted into the patient's nose or mouth. The tube is then moved down into the throat and windpipe. The endotracheal tube is held in place by tape or a strap that fits around the patient's head.

What is "weaning"?

"Weaning" is the process of slowly decreasing ventilator support to the point when the patient can start breathing on his own. Once the patient shows that he can successfully breathe on his own, he is disconnected from the ventilator.

What is a BVM bag?

A bag valve mask (BVM), sometimes referred to as an Ambu bag or a Manual Resuscitator Bag, is a self-inflating bag used to provide ventilation to the person not breathing normally. It consists of a self-inflating bag, one-way valve, mask, and an oxygen reservoir.

What is an oxygen reservoir?

A bag valve mask can be used without being attached to an oxygen tank to provide "room air" (21% oxygen) to the patient. However, BVM devices also can be connected to a separate bag reservoir, which can be filled with pure oxygen from a compressed oxygen source, thus increasing the amount of oxygen delivered to the patient.

An oxygen reservoir has two one-way valves. The properties of the reservoir are as below.
- Reservoir must be at least the volume of the bag
- Oxygen flow rate equal to, or higher than, the minute volume of the patient allows 100% oxygen to be delivered
- Inlet valve allows room air to enter if fresh gas flow is inadequate and an outlet valve allow oxygen to flow out if pressure is excessive

What is a PEEP valve?
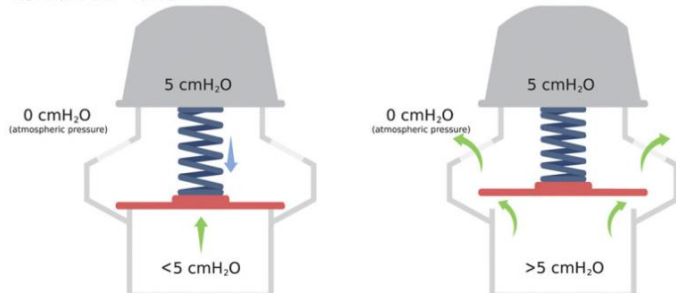
PEEP valves are adjustable pressure release valves. They are commonly used in conjunction with bag valve masks (BVMs) and vent exhaled gases to the atmosphere. When the pre-valve pressure exceeds the valve setpoint, a diaphragm opens and allows flow. When pre-valve pressure drops below the valve setpoint, the diaphragm closes and flow across the valve stops.

What is a Non-Rebreathing valve?

Non-rebreathing valves prevent rebreathing of the gases by ensuring unidirectional flow of gases. The inhaled and exhaled gases follow different paths, and the exhaled gas never finds its way into the inhalation tube.

What is a HEPA/HME filter?

Heat and Moisture Exchanger Filter (HMEF) is usually incorporated with a microbiological filter that provides passive humidification.

A pleated high-performance HEPA filter is integrated with Heat and Moisture Exchanger (HME) to support infection control in ventilation treatment.

These filters typically Include a gas sampling port with tethered strap and cap.

Hydrophobic media supports bacterial/viral efficiency of 99.99%.

What is respiratory dead space?

Dead space simply means volume in the respiratory circuit that does not participate in gas exchange in the lungs. Gas exchange occurs at the alveoli in our lungs so every anatomical structure above it is dead space. This includes the nasal/oral passages, pharynx, larynx, trachea, and the bronchi.

In a patient who is not on a ventilator, the source of gas is the ambient air and the anatomical dead space starts at the mouth opening. In a ventilator patient, the source of gas is the ventilator and its tubing.

The breathing circuit for Inspire-100 is as in Figure below. The blue-cylindrical area is the ventilator dead space. The key point is that the inspiratory limb is constantly filled with fresh gas and can be thought of as an extension of the ventilator itself. So, for all practical purposes, the source of gas in a ventilated patient is the Non-Rebreathing-Valve component of the ventilator circuit.
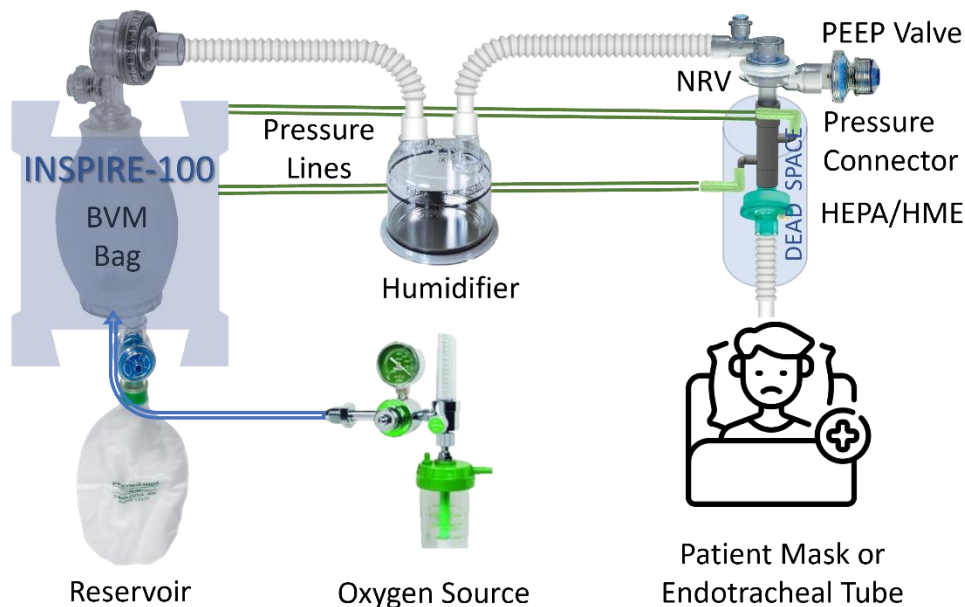
Any equipment that is between the patient and the Non-Rebreathing-Valve constitutes dead space (in addition to the anatomical dead space itself). At minimum, this includes the endotracheal tube in an intubated patient. Other potential sources include heat and moisture exchanger (HME) etc. So, it is important that the Non-Rebreathing-Valve be placed as close to the patient as possible.

When should the BVM bag be replaced?

BVM bags have a limited lifetime, and the system issues a warning when it is time to replace the one in use. In addition, the BVM bag should be monitored for signs of fatigue every 4 hours of use. Replace the BVM bag if it fails to deliver the desired pressures or volumes, as this may be a sign of fatigue. Always replace the BVM bag between patients. Inspire-100 has been tested with the Surginatal Disposable Resuscitator.

Why is the target pressure or volume not achievable sometimes?

It depends upon the size of the BVM bag and whether it is fatigued. Adjust the respiratory rate (RR) or inspiratory to expiratory time ratio (I:E). Check the breathing system for obstructions or kinks. Replace the resuscitator bag.

Does INSPIRE-100 support BiPAP ventilation mode?

A non-invasive BiPAP mode of ventilations is similar to PSV mode with a patient mask. Table below is a quick comparison.

Comparison	PSV	BiPAP
Invasive/Non-invasive	Invasive	NIV
Needs an intact patient's drive to breathe	Yes	Yes
Patient triggered breaths are pressure supported	Yes	Yes
Constant pressure at the end of the breath	PEEP	EPAP
Pressure delivered when breath initiated	PS	IPAP
Patient controls inspiration duration and breath cycling	Yes	Yes

To emulate BiPAP using BiPAP terminology, set INSPIRE-100 ventilation mode to PSV, set PEEP to desired EPAP value and set PS to desired IPAP value.

There is an additional feature provided by INSPIRE-100 via the Minute Volume parameter. If the Minute Volume parameter is set to anything other than "---" (don't-care), the minute volume is monitored during PSV mode and alarms are issued if the measured value falls short of the desired set value. If this condition persists, the PSV mode is replaced by SIMV mode automatically.

Does INSPIRE-100 monitor FiO2?

INSPIRE-100 doesn't have an internal oxygen sensor. You can use an accessory FiO_2 monitor, and SpO_2 pulse oximetry to monitor patient oxygenation. See the Inspire-100 Operating Manual for more information on FiO_2 flow and minute ventilation.

Which INSPIRE-100 parts should be replaced or cleaned between patients?

Replace all parts outside of the INSPIRE-100 chassis, which are the ventilator tubings, filters, HME, patient valve assembly, and pressure sensing tubings, between patients. You should also replace the BVM bag inside the chassis between patients.

What patient monitoring is recommended with INSPIRE-100?

It is recommended to monitor patient arterial blood gases and SpO_2, at a minimum. If you use Assist Control, it is also recommended that you conduct CO_2 monitoring as well.

Where is the WEB dashboard recording saved?

INSPIRE-100 dashboard saves the recording database in the browser on the computer being used. Thus, the recording saved on one browser is not directly available on another browser even though it may be on the same computer. Use the import/export feature to transfer the recording database between browsers or between computers.