# SLE5000

## Infant Ventilator with HFO


SLE

When the smallest thing matters

# SLE5000 - The Total Solution for Infant Ventilation

*Shown on optional roll stand. Ventilator may be mounted either way round on stand.*

SLE is a world leader in the design and manufacture of neonatal ventilators. Years of ventilation experience have given the company an understanding of the challenges facing clinicians when caring for the tiniest and most critical babies.

From being pioneers of neonatal Patient Triggered Ventilation (PTV) in the 1980's, to the introduction of combined HFO (High Frequency Oscillation) in the 1990's, SLE has maintained a position of leadership in neonatal ventilation.

The company's guiding principle is to support clinical and nursing staff in their everyday work. SLE has developed close relationships with leading universities, hospitals and other specialists and has created a ventilator that meets the highest standards using innovative solutions to clinical challenges.

The knowledge and experience gained during years of development is evident in the SLE5000 ventilator: the result of SLE's ongoing commitments to innovation, competency and care.

Modes include: CPAP, CMV+ TTV, PTV, PSV, SIMV+ TTV + PSV, HFO, HFO+CMV

- Ability to preset parameters in all modes of operation
- Powerful HFO with *active* expiration to cover a wide range of patients
- Full colour, total touch-screen operation
- Integral flow monitoring measuring lung mechanics and displaying of loops and waveforms
- Trending of measured parameters
- Standard patient circuit for all modes including HFO (except with NO therapy)
- Unique, patented valveless technology
- Integral battery with up to 60 minutes operating capability
- Software based, allowing for upgrading to versions with new or improved functions

# Advanced Ventilator Features

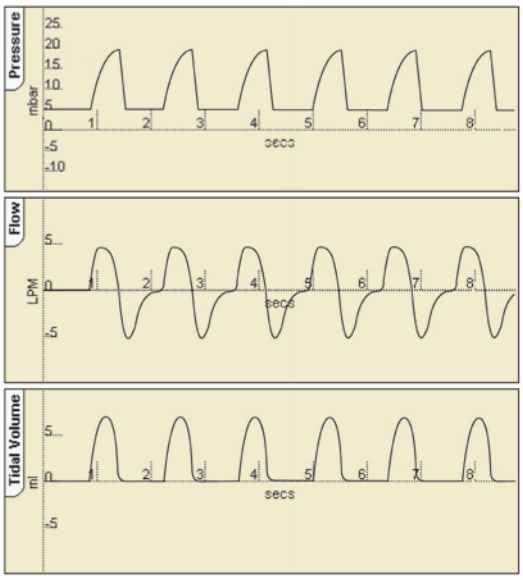
## Targeted Tidal Volume (TTV)

There is increasing clinical evidence to suggest that it is volutrauma that causes lung injury, which is worsened by barotrauma. It is also evident that efficient gaseous exchange is dependant on the delivery of appropriate tidal volumes.

Targeted Tidal Volume enables the user to select a target volume that they wish to achieve, allowing the ventilator to adjust PIP and Ti to achieve and maintain the selected tidal volume.

Main benefits of TTV:

- Reduction in volutrauma
- A stable tidal volume accommodating changes in resistance and compliance
- A more stable $PaCO_2$,at the lowest possible pressure resulting in reduced episodes of hypocapnia and hypercapnia
- Reduction in barotrauma
- Ability to self wean



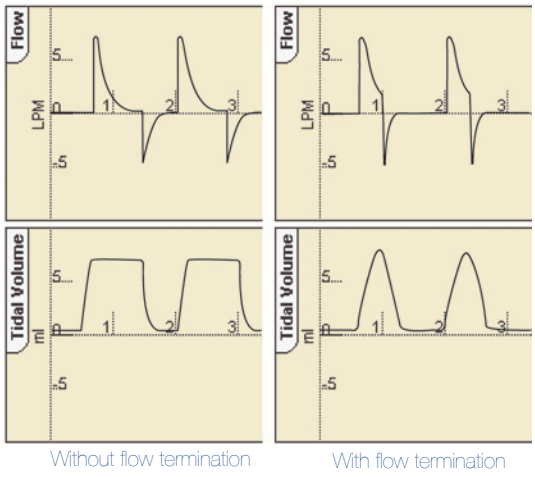

## Pressure Support Ventilation (PSV)

In this mode of ventilation the infant has the ability to trigger and terminate every breath. The main aim of PSV is to reduce the 'work of breathing' (WOB) in the spontaneously breathing infant.

Main benefits of PSV:

- Reduced WOB
- Improved infant/ventilator synchrony
- Reduced need for sedation
- Retraining of respiratory musculature
- Reduced time to wean

PSV is designed and used in the weaning process and can be used with or without Synchronous Intermittent Mandatory Ventilation (SIMV).




Without flow termination

With flow termination

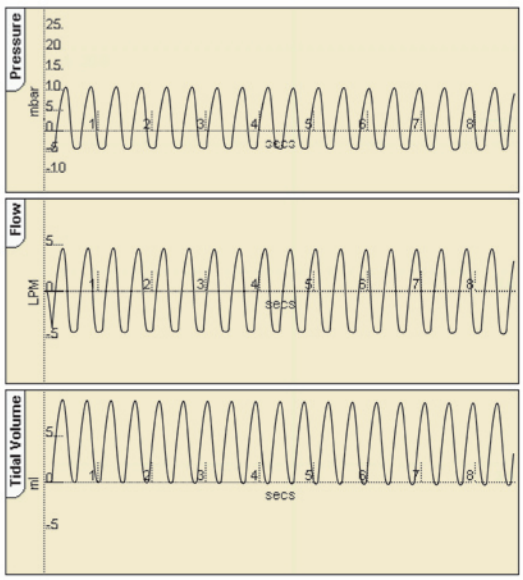
## High Frequency Oscillation (HFO)

In the SLE5000, HFO is powerful enough to cater for a wide range of patients from 300 g to 20 kg, dependant on lung mechanics.

The SLE5000 provides sinusoidal ventilation with *active* expiration.

Main benefits of HFO:

- Improves ventilation at lower pressures
- Higher levels of PEEP can be used without having to use high peak airway pressures to maintain appropriate levels of $CO_2$
- Produces more uniform lung recruitment
- Reduces airleaks
- Improved oxygenation in infants with severe RDS



# Features and Functions

User Interface

Brightly coloured user touch screen. Easy-to-use, logical sequence allowing quick, smooth adjustments.

Mode Panel

The mode panel is the user's interface to all mode related functions.

Audible and Visual Alarms

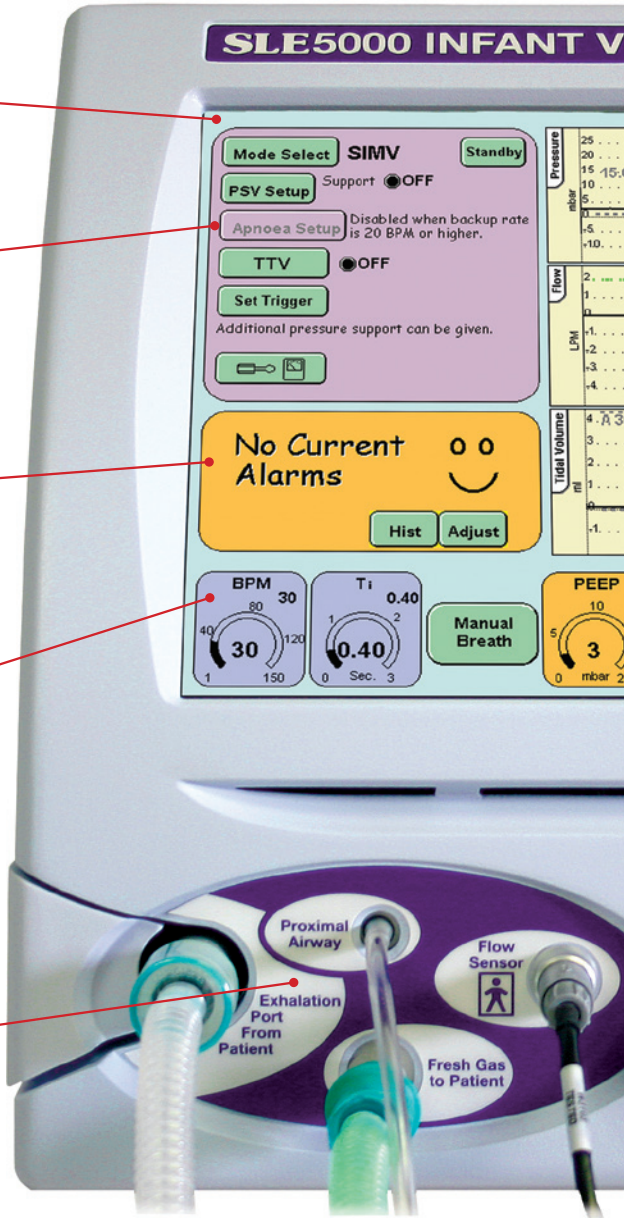
The alarm panel provides an immediate audible and pictorial view of the alarm condition, thus allowing easy monitoring, plus an alarm history of the last 100 conditions.

Pre-Setting Facility

Parameters can be preselected for the next mode whilst continuing to ventilate the patient in the current mode of ventilation.

Patient Circuit Connections

Front panel mounted patient circuit connections with (autoclavable) exhalation block.




# Principles of operation of the SLE5000 valveless system

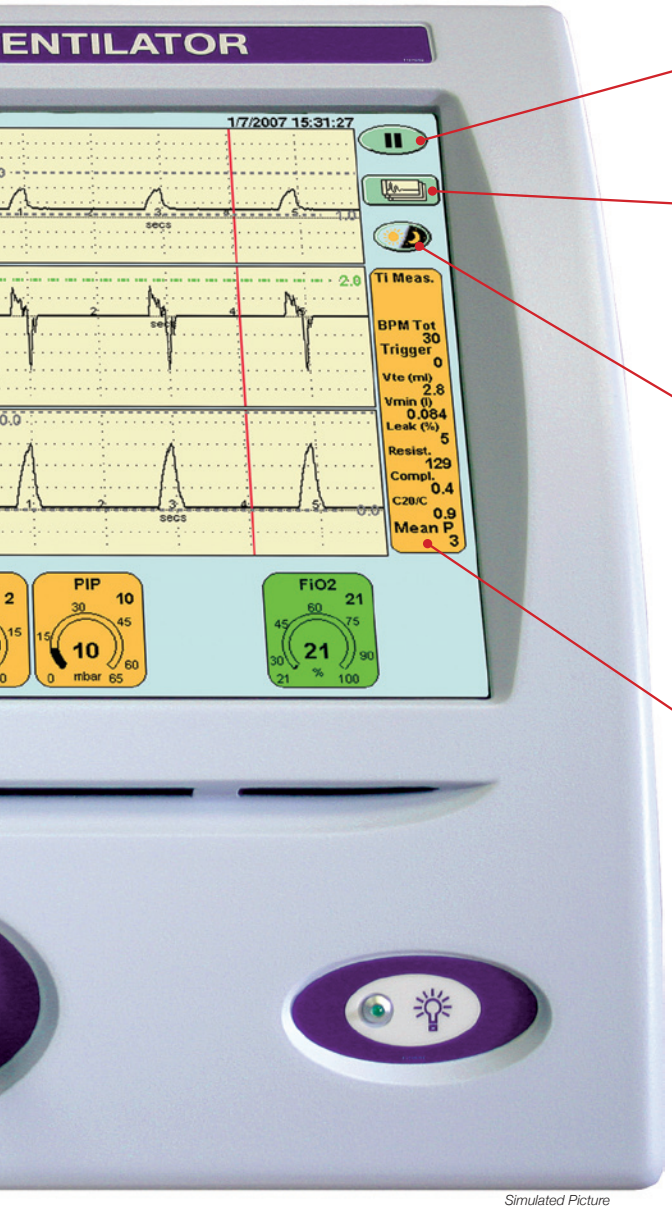
A constant flow of fresh gas is supplied to the patient circuit at 8 lpm. The expiratory manifold has three jets (❶, ❷ and ❸). The front jet (❶) is used to generate an opposing flow to the fresh gas in the exhalation manifold and thereby creates CPAP/PEEP.

The rear jet (❷) is used to generate the Peak Inspired Pressure (PIP) in the same way.

A third (reverse) jet (❸) is used during High Frequency Oscillation (to produce an *active* negative pressure) in addition to helping eliminate excess circuit pressure.

To avoid gas dilution these jets are supplied with the same oxygen concentration as the fresh gas supply. Sophisticated software controls the rate and duration of the flow of driving gas into the exhalation manifold in opposition to the fresh gas flow. The opposing flow acts as a pneumatic piston and creates a pressure wave at the ET manifold.

Since the opposing flow pressure is set by pressure regulators it automatically compensates for patient and circuit compliance changes.




*Simulated Picture*

Screen Pause

Freezes waveforms for review.

Graphic Select

Allows display of real-time or trends of flow, pressure and volume.

Loops depicting flow/volume, flow/pressure and volume/ pressure may also be shown.

Night Mode and Screen Lock

A low-level light mode for night time environments with automatic screen locking.

Auto activation on an alarm condition.

Real-time Data Display

Real-time lung mechanics measurements and ventilatory data.

This allows for continuous feedback for making crucial clinical decisions.

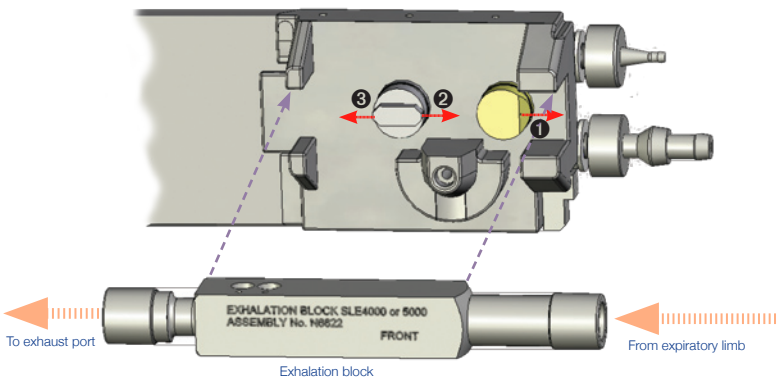
# How does it work...?

The illustration shows the exhalation block removed from its mountings in the ventilator. When replaced, the jets (❶ and ❷) can create a positive pressure on flow from the patient circuits's expiratory limb.

Jet ❸ is used to create a negative pressure and gives *true* active expiration.

Since there are no valves or other blockages in the system, there is minimal resistance to the patient.

Fewer moving parts means there is less to clean *and* less risk in terms of wrong assembly or infection.



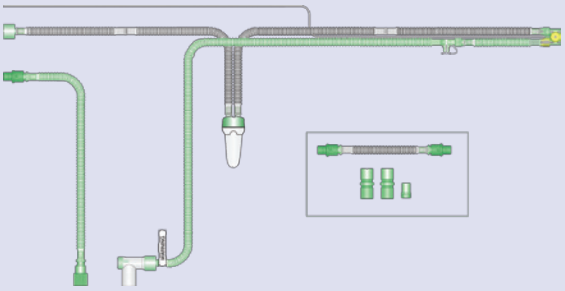

Exhalation block

# SLE5000 Patient Circuits

BC5188/100

Single use breathing circuit for use with SLE4000 and SLE5000 infant ventilators. Temperature port 100 mm from ET manifold (single use). Circuit comes complete with filter connection kit and adaptors.

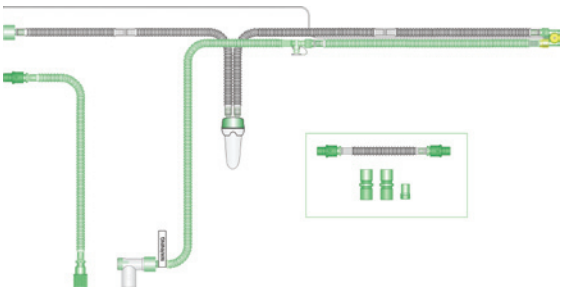
*Sold in box quantity of 15*



BC5188/400

Single use breathing circuit for use with SLE4000 and SLE5000 infant ventilators. Temperature port 400 mm from ET manifold (single use). Circuit comes complete with filter connection kit and adaptors.

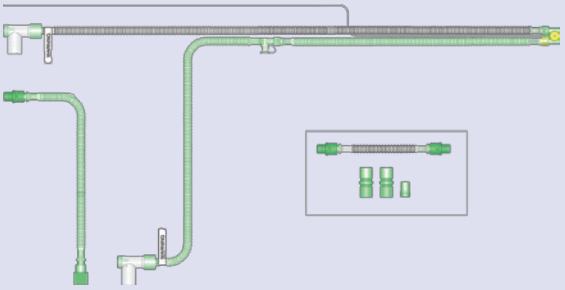
*Sold in box quantity of 15*



BC5288/DHW

Dual heated wire breathing circuit for use with SLE4000 and SLE5000 infant ventilators. Temperature port 400 mm from ET manifold (single use). Circuit comes complete with filter connection kit and adaptors.

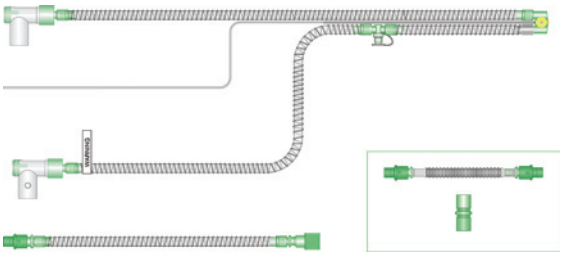
*Sold in box quantity of 15*



BC5488/DHW

Dual heated wire smooth bore breathing circuit for use with SLE4000 and SLE5000 infant ventilators. Temperature port 170 mm from ET manifold (single use). Circuit comes complete with filter connection kit and adaptors.

*Sold in box quantity of 15*



BC6216

Nitric Oxide delivery kit, set of connectors (Paediatric delivery).

BC2508

Nebuliser kit (Paediatric delivery).

BC4110/KIT

Nitric Oxide adaptor kit for BC5188/100 and BC5188/400 breathing circuits (SLE4000 and SLE5000 infant ventilators).

*Sold in box quantity of 5*

BC4110/ASY

Nitric Oxide dual hose scavenging filter assembly for SLE4000 and SLE5000 infant ventilators.

*Sold in box quantity of 1*

# Technical Specification

## Ventilation Modes: Conventional

### CPAP / PTV / PSV

| | |
|---|---|
| Inspiratory Time: | 0.1 to 3.0 sec |
| CPAP Pressure: | 0 to 20 mbar |
| Inspiratory Pressure: | 0 to 65 mbar |
| Volume Targeting: | 2 to 200 ml |
| $FiO_2$: | 21% to100% |

### CMV / SIMV

| | |
|---|---|
| BPM: | 1 to 150 |
| I:E Ratio: | (11.2:1 to 1:600) |
| Inspiratory Time: | 0.1 to 3.0 sec |
| PEEP Pressure: | 0 to 20 mbar |
| Inspiratory Pressure: | 0 to 65 mbar |
| Volume Targeting: | 2 to 200 ml |
| $FiO_2$: | 21% to 100% |

## Ventilation Modes: HFO Ventilation

### HFO Only

| | |
|---|---|
| Frequency Range: | 3-20 Hz |
| I:E Ratio: | 1:1 |
| Delta Pressure range: | 4 to 180 mbar |
| Mean airway range: | 0 to 35 mbar |
| $FiO_2$: | 21% to 100% |

### HFO+CMV

| | |
|---|---|
| BPM: | 1 to 150 |
| Inspiratory Time: | 0.1 to 3.0 |
| Frequency Range: | 3-20 Hz |
| I:E : | (11.2:1 to 1:600) |
| Inspiratory Pressure: | 0 to 65 mbar |
| Delta Pressure range: | 4 to 180 mbar |
| Mean airway range: | 0 to 35 mbar |
| $FiO_2$: | 21% to 100% |

## Monitoring Parameters

### Measurement of Flow and Volume

| | |
|---|---|
| Flow Sensor Type: | 10 mm dual-hot-wire anemometer (autoclavable or single use) |
| Flow Rate: | 0.2 to 32 lpm (Accuracy ±8%) |
| Expiratory Tidal Volume: | 0 to 999 ml |
| Expiratory Minute Volume: | 0 to 18 litres |
| Deadspace: | 1 ml |
| Weight: | 10 g |

### Conventional Ventilation and combined modes only:

| | |
|---|---|
| Tube Leakage: | 0 to 50% (Resolution: 5%, averaged over 5 breaths) |
| Breath Rate (total): | 0 to 150 BPM |
| Dynamic Compliance: | 0 to 100 ml/mbar (Resolution: 1 ml/mbar) |
| C20/C: | Resolution 0.1 |
| Sampling Time: | 2 ms |
| Resistance: | 0 to 1000 mbar .second/l |
| Triggering: | Inspiratory flow (0.2 to 10 lpm) |

*The above values are measured under ATPD (ambient temperature and pressure, dry) conditions.*

### Oxygen Concentration

| | |
|---|---|
| Range: | 21 to 100% (Resolution 1%) |

### Pressure

| | |
|---|---|
| Real-time Pressure measurement: | Resolution 1 mbar |
| Sampling time: | 2 ms |
| Peak Pressure: | 0 to 175 mbar (resolution 1 mbar) |
| PEEP Pressure: | 0 to 175 mbar (resolution 1 mbar) |
| Mean Pressure: | -175 to 175 mbar (resolution 1 mbar) |

*In HFO combined mode, Delta P is measured during expiration only*

### User Settable alarms

### High Pressure

Autoset when patient pressure controls are adjusted or can be manually adjustable

| | |
|---|---|
| Range: | 10 to 110 mbar |
| Resolution: | 0.5 mbar |

### Cycle Fail

Autoset when patient pressure controls are adjusted or may be manually adjusted

### Low Pressure

Autoset when patient pressure controls are adjusted or can be manually adjustable

| | |
|---|---|
| Range: | -10 mbar (Conventional) -70 mbar (HFO modes) to 10 mbar below high pressure threshold |

### Low Tidal Volume

| | |
|---|---|
| Range: | 0 to 200 ml |
| Resolution: | 0.2 ml |

### Low Minute Volume

| | |
|---|---|
| Range: | 0 to 0.02 litres below High Minute Volume threshold |
| Resolution: | 0.1 litre |

### High Minute Volume

| | |
|---|---|
| Range: | 0.02 to 18 litres |
| Resolution: | 0.1 litre |

### Apnoea time

Settable only in CPAP or when Backup rate is less than 20 BPM

| | |
|---|---|
| Range: | 3 to 60 sec |
| Resolution: | 1 second |

## Power, Dimensions, Standards etc.

### Power Requirements

| | |
|---|---|
| Voltage : | 100-250 V 50-60 Hz |
| Power : | 115 VA |
| Battery back up: | 45-60 minutes (dependant on mode of operation) |
| Battery charging: | Full charge 24 hours, 80% charge after 8 hours |

### Outputs

RS-232C

### Air and $O_2$ input

| | |
|---|---|
| Pressures: | 3-5 bar |
| Fresh Gas Flow: | 8 litres/min |
| Maximum gas flow: | 60 litres/min |

### Operating Environment

| | |
|---|---|
| Temp: | 10-40 ºC |
| Humidity: | 0-90% (non-condensing) |

### Dimensions

| | |
|---|---|
| Size, ventilator only: | 330mm W x 330mm H x 470mm D |
| Height on short stand: | 114 cm |
| Height on tall stand: | 131 cm |
| Weight, ventilator only: | 21.8 kg |

### Constructed to conform to:

BS EN 475:1995
BS EN 60601-1:1990
BS EN 60101-1-2:1993
BS EN 60601-1-4: 1996
BS EN 60601-1-12:2006
Medical Devices Directive (93/42/EEC)

European conformity mark: CE 0120

### Environmental storage conditions

*When packed for transport or storage:*

| | |
|---|---|
| Ambient Temperature: | -40 °C to +70 °C |
| Relative Humidity : | 10% to 90% (non-condensing) |
| Atmospheric Pressure: | 500 hPa to 1060 hPa |


SLE Limited.
Twin Bridges Business Park, 232 Selsdon Road,
South Croydon Surrey CR2 6PL UK
Telephone:+44 (0)20 8681 1414 • Fax: +44 (0)20 8649 8570
E-mail: sales@sle.co.uk • Web: www.sle.co.uk

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