

**GALILEO**

Intelligent Ventilation



Infant - Pediatric - Adult


**HAMILTON**  
**MEDICAL**

# GALILEO

In intensive care you look for more than world-class ventilatory performance. You demand ventilators that deliver reliable data and easy-to-follow user guidance for better clinical decisions and improved patient outcomes, together with low operating costs throughout the working life of your investment.

In short, you need systems that ensure:

- superior performance in complex environments
- improved patient outcomes
- reduced costs of ownership

HAMILTON MEDICAL was born from a passion to improve the life of ventilated patients and the people who care for them. We began in 1983 with a new generation of intelligent microprocessor controlled intensive care ventilators featuring revolutionary new modes and diagnostic tools. Today we maintain this tradition with the world's finest ICU ventilation technologies and a total dedication to **Intelligent  Ventilation.**

# Delivering Intelligent Ventilation



The GALILEO is HAMILTON MEDICAL's full-functioned intensive care ventilator for infant, pediatric, and adult patients.

## **A clinically complete ventilation solution**

The GALILEO ventilator family offers a full spectrum of capabilities, including invasive to noninvasive and advanced ventilation modes, plus tube resistance compensation.

## **Extensive and configurable monitoring**

The GALILEO's monitoring package, featuring 26 parameters, loops, waveforms, and trends, gives you the data you want, in the way you want it. You can configure the display with user-selected monitoring parameters.

## **Tools for intelligent clinical decision making**

Intelligent features like adaptive support ventilation (ASV) and the P/V Tool help you determine appropriate ventilator settings, based on the patient's respiratory mechanics.

## **Intelligent user interface**

The GALILEO's intuitive user interface helps ease the required setup and monitoring. Rated highest in an independent user survey, the interface requires little training.

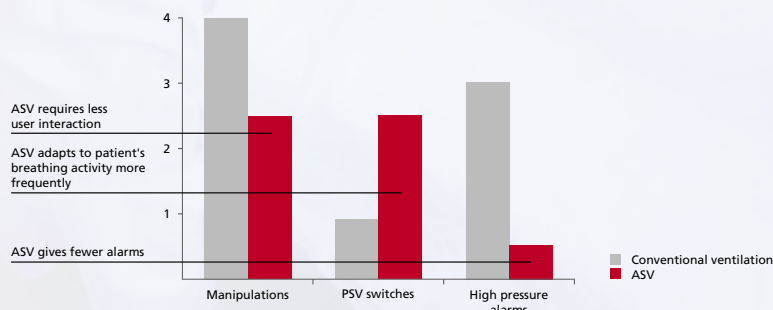





# Superior performance in complex environments



In everyday use, ASV requires less user interaction, adapts more frequently to the patient's breathing activity, and significantly reduces the incidence of alarms compared to conventional modes.\*



\*Petter AH et al. Anesth Analg 2003; 97:1743-50

In high-pressure situations, the **Intelligent**  **Ventilation** mode ASV helps your patient – and you – pull through. ASV is an easy-to-use and safe mode of ventilation for the respiratory management of your intubated patients.

## Simplifies ventilator management

You just make a few simple settings and ASV does the rest. It calculates and delivers a breath pattern based on your patient's changing respiratory mechanics and spontaneous activity. This breath pattern is optimized for comfort and safety, with the desired minute ventilation delivered at the lowest possible pressure.

Easy to use and extremely safe, ASV automatically adapts to the patient throughout their course of ventilation, typically with no mode changes required.

## Clearly shows you the patient-ventilator interaction

You can watch as ASV adjusts ventilation to your patient's needs




The ASV target graphics screen shows:

- Minute volume curve showing target volume
- Safety frame showing limits for lung-protective ventilation
- Actual tidal volume/respiratory frequency combination
- Optimal tidal volume/respiratory frequency combination with which the patient will be ventilated

## Improved patient outcomes



With its full range of **Intelligent  Ventilation** features, the GALILEO has the tools you need to optimally treat each patient. That translates into fewer days on the ventilator and shorter stays in the ICU.

### Advanced modes for expanded treatment options

The GALILEO's DuoPAP and APRV modes encourage spontaneous breathing, even in the most acute phases of the disease process. In these related modes you set two pressure levels for two time periods.

Noninvasive ventilation (NIV) on the GALILEO allows for a logical progression from acute disease to full recovery. It can decrease the need for intubation and promote early extubation. NIV is correlated to reduced mortality in COPD patients, reduced ventilation time in COPD and ARF patients, and reduced complication rates of ventilator-associated pneumonias.

### P/V Tool for more intelligent patient assessment

The automated P/V Tool uses an empirical and repeatable method to find best PEEP, based on respiratory mechanics. It also enables sophisticated lung recruitment maneuvers and therapy assessment.

This maneuver records the static pressure/volume curve quickly and easily at the bedside. It employs an adjustable pressure ramp, in which airway pressure is slowly increased to an upper limit as resultant volume and pressure are recorded.


After the maneuver, the cursor function lets you inspect inflection points so that you can easily visualize the linear portion of the compliance curve.





## Reduced costs of ownership



**Intelligent  Ventilation** means help meeting your financial goals, too. The GALILEO lets you optimize clinical resources and skills while reducing ownership and management overhead.

### **One ventilator, all patients**

A single device is all you'll need when you ventilate with the GALILEO. Not only does it cover the whole spectrum of patients, but it also offers a full range of ventilation capabilities. As your patient's condition improves and their ventilation needs change, the GALILEO adapts – its invasive and noninvasive modes serve the patient from intubation through extubation.

### **Optimized patient treatment**

The most appropriate treatment – ventilator settings optimized to your patient's respiratory mechanics with the help of ASV and the P/V Tool – means your patient is off the ventilator and on the road to recovery faster. That benefits your patient's health and reduces your costs, too.

### **Reduced training costs**

The GALILEO's intuitive interface simplifies ventilator setup. That translates into easy training and less chance of operator error.

# The complete solution



1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

1. Access to monitoring, maneuvers, and event log
2. Ventilation mode and user-configurable monitored parameters
3. Graphics: numeric monitored data, three waveforms, loop, trends, freeze and cursor function
4. Auxiliary pressure input
5. Pneumatic nebulizer connection
6. Proximal flow sensing
7. Integrated oxygen monitor
8. Oxygenation
9. Manual breath
10. Monitoring and control knobs (press and turn)
11. Most important control settings
12. Access to modes, control settings, and alarms

## Full spectrum of ventilation capabilities

Including ASV, DuoPAP, APRV, noninvasive ventilation, and conventional modes plus tube resistance compensation (TRC).

## Patient-oriented monitoring

HAMILTON MEDICAL's proximal Flow Sensor ensures the most precise flow and pressure measurements for better patient assessment. Patients also benefit from a more sensitive trigger.

## Extensive monitoring package

26 parameters, including lung mechanics plus additional weaning parameters such as PTP, P0.1, and respiratory time constants. Waveform, loop, trend displays, ASV target graphics screen, freeze and cursor function. Optional auxiliary pressure monitoring capability, e.g., esophageal pressure. P/V Tool and inspiratory and expiratory pause respiratory maneuvers.

## Ergonomic user interface

Two press-and-turn knobs and large color display

## Intrahospital transport capability

Internal battery backup plus optional gas cylinder holder for intrahospital transport

## Communications interface

RS-232, nurse call, I:E timing

[www.hamilton-medical.com](http://www.hamilton-medical.com)

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| Controls                              |  | Others   |  |
|---------------------------------------|--|--|--|
| Ventilation modes                     | (S)CMV (A/C), SIMV, SPONT, ASV, P-CMV, (P-A/C)<br>P-SIMV, APVcmv, APVsimv, DuoPAP, APRV, NIV   | Flow Sensor dead space   | Waveform freeze and cursor function, inspiratory/expiratory hold   |
| Special functions                     | Manual breath, 100% O <sub>2</sub> , standby, sigh, apnea backup   |  |  |
| Patient types                         | Adult, pediatric, infant   |  |  |
| Rate                                  |  |  |  |
| Mandatory modes                       | 5 to 120 b/min   |  |  |
| SIMV, P-SIMV, DuoPAP                  | 1 to 60 b/min  |  |  |
| Tidal volume/target tidal volume*     | 2 to 2000 ml (10 to 2000 ml in volume-controlled modes)  |  |  |
| PEEP/CPAP and P low (DuoPAP and APRV) | 0 to 50 cmH <sub>2</sub> O   |  |  |
| Oxygen                                | 21 to 100%   |  |  |
| I:E ratio                             | 1:9 to 4:1   |  |  |
| Inspiratory time                      | 0.1 to 10 s (10 to 80% of cycle time)  |  |  |
| Pause time                            | 0 to 8 s (0 to 70% of cycle time)  |  |  |
| Peak flow                             | 1 to 180 l/min   |  |  |
| T low (APRV)                          | 0.2 to 30 s  |  |  |
| T high (DuoPAP and APRV)              | 0.1 to 30 s  |  |  |
| Pressure trigger                      | 0.5 to 10 cmH <sub>2</sub> O below PEEP/CPAP   |  |  |
| Flow trigger                          | 0.5 to 15 l/min  |  |  |
| Automatic base flow                   | 4 to 30 l/min, depending on flow trigger setting   |  |  |
| Pressure control                      | 5 to 100 cmH <sub>2</sub> O, added to PEEP/CPAP  |  |  |
| Pressure support                      | 0 to 100 cmH <sub>2</sub> O, added to PEEP/CPAP  |  |  |
| P high (DuoPAP and APRV)              | 0 to 50 cmH <sub>2</sub> O   |  |  |
| Pressure ramp                         | 25 to 200 ms   |  |  |
| Expiratory trigger sensitivity (ETS)  | 5 to 70% of inspiratory peak flow  |  |  |
| % minute volume (ASV)                 | 25 to 350%   |  |  |
| Flow patterns                         | Sine, square, 100% decelerating, 50% decelerating  |  |  |
|                                       |  |  |  |
| Monitoring                            |  | Alarms   |  |
| Pressure                              | Peak, mean, minimum, plateau, PEEP/CPAP, AutoPEEP  | Operator-adjustable  | Low/high minute volume, low/high pressure, low/high tidal volume, low/high rate, apnea time, air trapping  |
| Flow                                  | Inspiratory peak, expiratory peak  | Special alarms   | Oxygen concentration, disconnection, loss of PEEP, exhalation obstruction, check settings, Flow Sensor alarms, ASV/APV alarms, power supply, batteries, oxygen/air supplies                                    |
| Volume                                | Expiratory tidal volume, expiratory minute volume, leakage volume  | Loudness   | 50 dB(A) to 85 dB(A)   |
| Time                                  | Inspiratory, expiratory, I:E ratio, total frequency, spontaneous breath frequency  | Event log  | Storage and display of up to 1000 events with time stamp   |
| Oxygen                                | Airway oxygen concentration  |  |  |
| Lung function parameters              | Inspiratory resistance, expiratory resistance, static compliance, inspiratory time constant, expiratory time constant, imposed work of breathing, pressure time product, rapid shallow breathing index, P <sub>0.1</sub> |  |  |
| Real-time waveforms/loops             | Simultaneous display of up to three waveforms or one loop based on: volume, flow, airway pressure, or auxiliary pressure   |  |  |
| Trending                              | Simultaneous display of up to three parameter trends, selected from 26 possible monitoring parameters, for 1, 12, or 24 hours  |  |  |
|                                       |  |  |  |
|                                       |  | Electrical and gas supplies  |  |
|                                       |  | Input voltage  | 100 to 240 V ~ ±10%, 50/60 Hz  |
|                                       |  | Power consumption  | 210 VA maximum   |
|                                       |  | Backup battery time  | 1 hour typical with fully charged battery  |
|                                       |  | Oxygen and air supplies  | 200 to 600 kPa (29 to 86 psi)  |
|                                       |  |  |  |
|                                       |  | Environment  |  |
|                                       |  | Temperature  | 10 to 40 °C (operating), -10 to 60 °C (storage)  |
|                                       |  | Humidity   | 30 to 75% noncondensing (operating)<br>5 to 85% noncondensing (storage)  |
|                                       |  | Altitude   | Up to 3000 m (9843 ft)   |
|                                       |  |  |  |
|                                       |  | Physical dimensions  |  |
|                                       |  | W x D x H  | 440 x 620 x 1540 mm (17.3 x 24.4 x 60.6 in.)<br>with standard trolley<br>440 x 620 x 1415 mm (17.3 x 24.4 x 55.7 in.)<br>with short trolley<br>382 x 433 x 719 mm (15.0 x 17.0 x 28.3 in.)<br>with shelf mount |
|                                       |  | Weight   | 48 kg (105 lb) with standard trolley,<br>35 kg (77 lb) with shelf mount  |
|                                       |  | Display  | 10.7 in., TFT color, backlit   |
|                                       |  | Main patient outlet  | ISO 22M/15F  |
|                                       |  | Air and oxygen inlets  | DISS male, NIST (option)   |
|                                       |  |  |  |
|                                       |  | Hardware options   |  |
|                                       |  | Nebulizer; communications interface including RS-232C port, remote nurse's call, and I:E ratio |  |
|                                       |  |  |  |
|                                       |  | Standards  |  |
|                                       |  | IEC 60601-1, IEC 60601-1-2, IEC 60601-2-12, EN 794-1, C22.2 No. 601.1, UL 60601-1              |  |

Note: 1 hPa = 1 mbar ≈ 1 cmH<sub>2</sub>O

\* Tidal volume delivered in pressure-based ventilation modes depends on both the applied inspiratory pressure and lung mechanics. In the GALILEO infant application, this volume may be as low as 2 ml. This is different from GALILEO APV modes, where the smallest tidal volume setting is 10 ml.

## GALILEO ventilation modes

| Mode          | Description   | Type     | Patient age group |           |        |
|---------------|---|----------|-------------------|-----------|--------|
|               |   |          | Adult             | Pediatric | Infant |
| (S)CMV (A/C)  | (Synchronized) controlled mandatory ventilation                                 | Volume   | ✓                 | ✓         |        |
| SIMV          | Synchronized intermittent mandatory ventilation                                 | Volume   | ✓                 | ✓         |        |
| P-CMV (P-A/C) | Pressure-controlled mandatory ventilation                                       | Pressure | ✓                 | ✓         | ✓      |
| P-SIMV        | Pressure-controlled synchronized intermittent mandatory ventilation             | Pressure | ✓                 | ✓         | ✓      |
| SPONT         | Pressure support ventilation  | Pressure | ✓                 | ✓         | ✓      |
| DuoPAP        | Dual positive airway pressure   | Pressure | ✓                 | ✓         | ✓      |
| APRV          | Airway pressure release ventilation   | Pressure | ✓                 | ✓         | ✓      |
| NIV           | Noninvasive ventilation   | Pressure | ✓                 | ✓         |        |
| APVcmv        | Adaptive pressure ventilation + controlled mandatory ventilation                | Adaptive | ✓                 | ✓         | ✓      |
| APVsimv       | Adaptive pressure ventilation + synchronized intermittent mandatory ventilation | Adaptive | ✓                 | ✓         | ✓      |
| ASV           | Adaptive support ventilation  | Adaptive | ✓                 | ✓         |        |

## GALILEO monitoring parameters

| Parameter | Type           | Unit                   | Description  |
|-----------|----------------|------------------------|--|
| Ppeak     | Pressure       | cmH <sub>2</sub> O     | Peak airway pressure   |
| Pmean     | Pressure       | cmH <sub>2</sub> O     | Mean airway pressure   |
| Pminimum  | Pressure       | cmH <sub>2</sub> O     | Minimum airway pressure  |
| Pplateau  | Pressure       | cmH <sub>2</sub> O     | Plateau airway pressure  |
| PEEP/CPAP | Pressure       | cmH <sub>2</sub> O     | Positive-end expiratory pressure / continuous positive airway pressure |
| Insp Flow | Flow           | l/min                  | Peak inspiratory flow  |
| Exp Flow  | Flow           | l/min                  | Peak expiratory flow   |
| VTE       | Volume         | ml                     | Expiratory tidal volume  |
| ExpMinVol | Volume         | ml                     | Expiratory minute volume   |
| VLeak     | Volume         | ml                     | Leakage volume at the airway   |
| I:E       | Time           |                        | Inspiratory : expiratory ratio   |
| fTotal    | Time           | b/min                  | Total breathing frequency  |
| FSpont    | Time           | b/min                  | Spontaneous breathing frequency  |
| TI        | Time           | s                      | Inspiratory time   |
| TE        | Time           | s                      | Expiratory time  |
| Oxygen    | Oxygen         | %                      | Airway oxygen concentration (FiO <sub>2</sub> )                        |
| Cstat     | Lung mechanics | ml/cmH <sub>2</sub> O  | Static compliance  |
| P01       | Lung mechanics | cmH <sub>2</sub> O     | Airway occlusion pressure  |
| AutoPEEP  | Lung mechanics | cmH <sub>2</sub> O     | AutoPEEP or intrinsic PEEP   |
| PTP       | Lung mechanics | cmH <sub>2</sub> O*s   | Pressure time product  |
| RCexp     | Lung mechanics | s                      | Expiratory time constant   |
| RCinsp    | Lung mechanics | s                      | Inspiratory time constant  |
| Rexp      | Lung mechanics | cmH <sub>2</sub> O/l/s | Expiratory flow resistance   |
| Rinsp     | Lung mechanics | cmH <sub>2</sub> O/l/s | Inspiratory flow resistance  |
| RSB       | Lung mechanics | 1/l*min                | Rapid shallow breathing index  |
| WOBimp    | Lung mechanics | J/l                    | Imposed work of breathing  |

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