INTELLiVENT®-ASV®

The world's first Ventilation Autopilot

Swiss Quality

HAMILTON MEDICAL
Intelligent Ventilation since 1983

We live for ventilation technology

We live for ventilation technology that helps caregivers improve the lives of their critically ill patients. We believe that innovation is essential to meet the demands of critical care. To us, innovation is about realizing visionary new ideas and continuously improving existing products, always keeping patient safety and ease of use in focus.

We learn from our customers and from multi-disciplinary experts. And we invest in long-term research and development. We develop Intelligent Ventilation solutions: devices and consumables for the ventilation of all critically ill patients – from neonates to adults.

Jens Hallek
President

Bob Hamilton
Member of the board

The Ventilation Autopilot

What is INTELLiVENT-ASV?

Hamilton Medical developed the Intelligent Ventilation mode INTELLiVENT-ASV to make mechanical ventilation easier to use for the caregiver, and at the same time safer and more comfortable for the patient. It eliminates the need for separate modes for passive and active patients and reduces the number of controls that need to be set. INTELLiVENT-ASV automatically and continuously adjusts respiratory rate, tidal volume, inspiratory time, PEEP, and Oxygen depending on physiologic input from the patient (PetCO2, SpO2, lung mechanics, spontaneous breathing).

✔ Intelligent Ventilation mode for passive and active patients
✔ Applicable for adult and pediatric patients
✔ Automatically controls ventilator settings based on the targets for ventilation and oxygenation set by the clinician and on physiologic input from the patient
✔ Automatically applies lung-protective strategies
✔ Actively promotes automated weaning protocols using Quick Wean

INTELLiVENT-ASV is available as an option on the HAMILTON-G5, HAMILTON-C6 and HAMILTON-C3, and as a standard mode on the HAMILTON-S1.

The highest-ranking ventilation mode

A recent publication named ASV and the next generation INTELLiVENT-ASV as the highest-ranking ventilation modes on the market, based on technological capabilities related to the goal of patient safety, comfort, and liberation.[1]

Criteria	INTELLiVENT-ASV	ASV	Smart-Care®	Auto-mode	NAVA®	PAV
Patient safety	6	3	1	3	0	0
Patient comfort	4	4	3	3	4	3
Liberation	3*	1	3	1	1	0
Points total	**13**	**8**	**7**	**7**	**5**	**3**

1 Mireles-Cabodevila E. Respir Care. 2013 Feb;58(2):348-66. *Erratum in: Respir Care. 2013 Apr;58(4):e51.
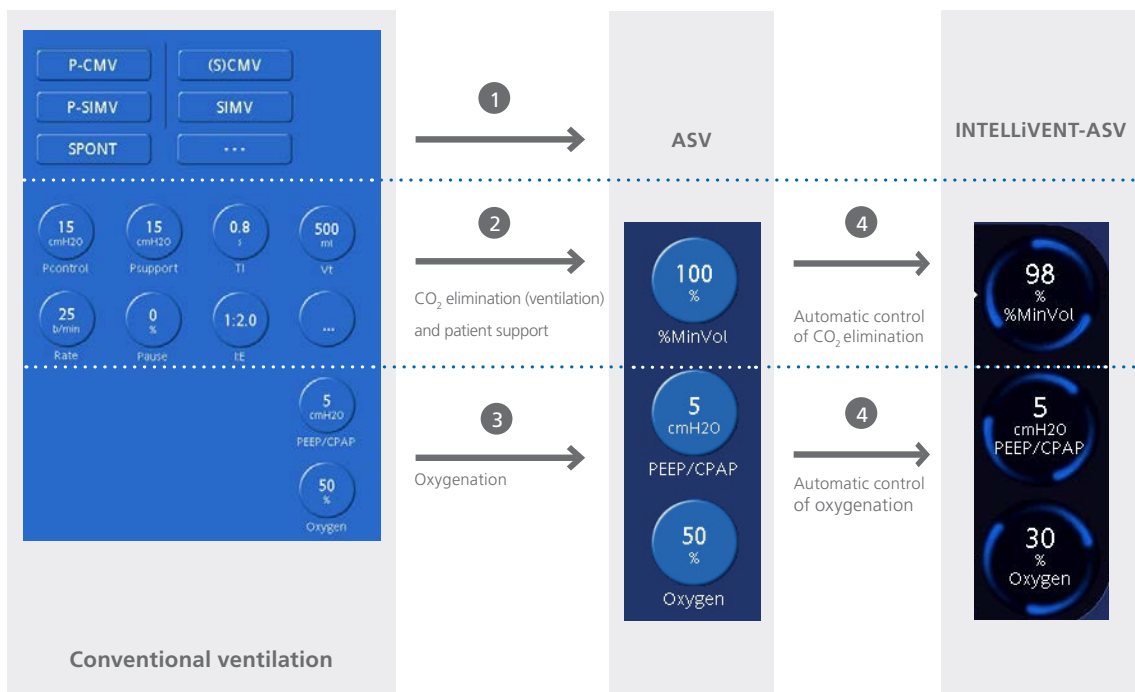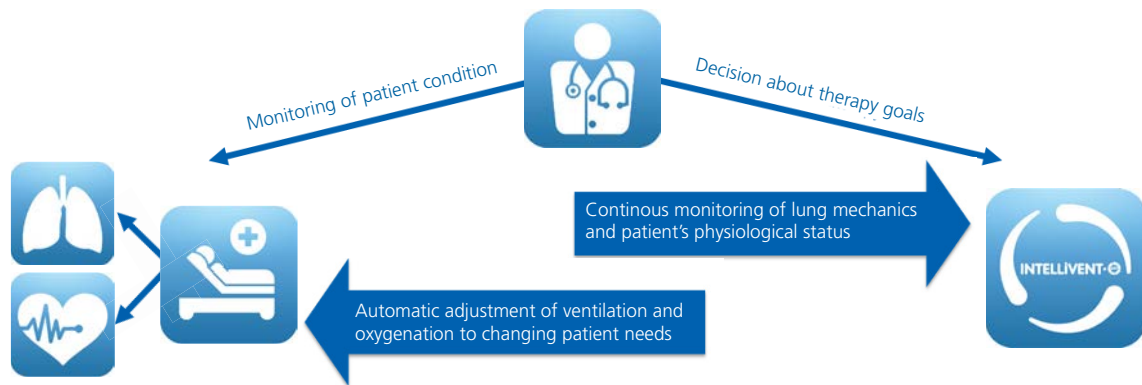
One mode from intubation to extubation

A paradigm shift in mechanical ventilation

In conventional ventilation modes, the clinician sets ventilator controls such as tidal volume or pressure, respiratory rate, and expiratory and inspiratory time to achieve clinical targets, including a certain level of alveolar ventilation and oxygenation for the patient depending on the patient's activity. With INTELLiVENT-ASV, the clinician only needs to adjust target ranges for PetCO2 and SpO2 based on the patient condition, and weaning strategy.

Define where you want the patient to be

The clinician adjusts targets for PetCO2 and SpO2 for the patient. INTELLiVENT-ASV then automates the management of the controls for CO2 elimination (%MinVol), and oxygenation (PEEP and Oxygen) based on these targets and on the physiologic input from the patient (PetCO2 and SpO2). INTELLiVENT-ASV continuously monitors the patient condition, and automatically and safely adjusts parameters to keep the patient within target ranges, with minimal clinician interaction, from intubation to extubation.

Monitoring of patient condition

Decision about therapy goals

Continous monitoring of lung mechanics and patient's physiological status

Automatic adjustment of ventilation and oxygenation to changing patient needs

How INTELLiVENT-ASV works

In INTELLiVENT-ASV, the clinician's most important inputs are the patient's gender and height to calculate ideal body weight, which is used to set various parameter values. INTELLiVENT-ASV then automatically selects ventilator settings, manages the transition between passive and active states, and actively promotes automated weaning protocols using Quick Wean.

The clinician selects the patient's clinical condition for either normal lungs, ARDS, chronic hypercapnia, or brain injury to determine the appropriate default target ranges for PetCO2 and SpO2. These target ranges can always be further adjusted manually based on clinical judgment.

Ventilation
In passive patients, the target minute volume is adjusted according to exhaled partial pressure of end-tidal CO2, measured by a mainstream sensor positioned at the Y-piece. In active patients, the target minute volume is adjusted according to respiratory rate. To reach the target minute volume (%MinVol), INTELLiVENT-ASV applies the ASV algorithms and rules.

Oxygenation
PEEP and Oxygen are adjusted according to SpO2, measured by pulse oximetry using a finger or ear probe. The combination of PEEP and Oxygen is selected according to a table derived from ARDSnet publications. [2, 3]

2 ARDSnet. N Engl J Med. 2000 May;342(18):1301-1308. | 3 Brower RG. N Engl J Med. 2004 Jul 22;351(4):327-36.

Ease of use

One mode for all

INTELLiVENT-ASV can be used for almost all of your adult and pediatric intubated patients, including post-operative, COPD, ARDS[4, 5, 6], and brain injury patients. It supports both active and passive patients, and automatically adjusts the level of support needed.

Visual decision support

Hamilton Medical's user interface is recognized as one of the best in the field.[7] It gives clinicians an instant overview of critical parameters and patient status, providing valuable aid to clinical judgment.

Provide patient-centered care with fewer resources

INTELLiVENT-ASV automatically and continuously adjusts respiratory rate, tidal volume, and inspiratory time depending on the patient's lung mechanics and effort. This eliminates the need for separate modes for passive and active patients, and reduces the number of controls that need to be set. Studies have shown that INTELLiVENT-ASV requires fewer manipulations and generates fewer alarms than conventional modes.[5] This helps to shorten training periods and to decrease the workload for the clinical staff.

4 Arnal JM. Crit Care. 2013 Sep 11;17(5):R196. | 5 Beijers AJR. Intensive Care Med. 2014 May;40(5):752-3. | 6 Jouvet P. Crit Care. 2012 May 16;16(3):R85. |
7 Vignaux L. Intensive Care Med. 2009 Oct;35(10):1687-91.

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INTELLiVENT-ASV is a complex mode with very advanced technology inside, but for the user it is very simple to handle.

Dr. Jean-Michel Arnal, Senior Intensivist

Intercommunal Hospital, Var Departement, Toulon, France
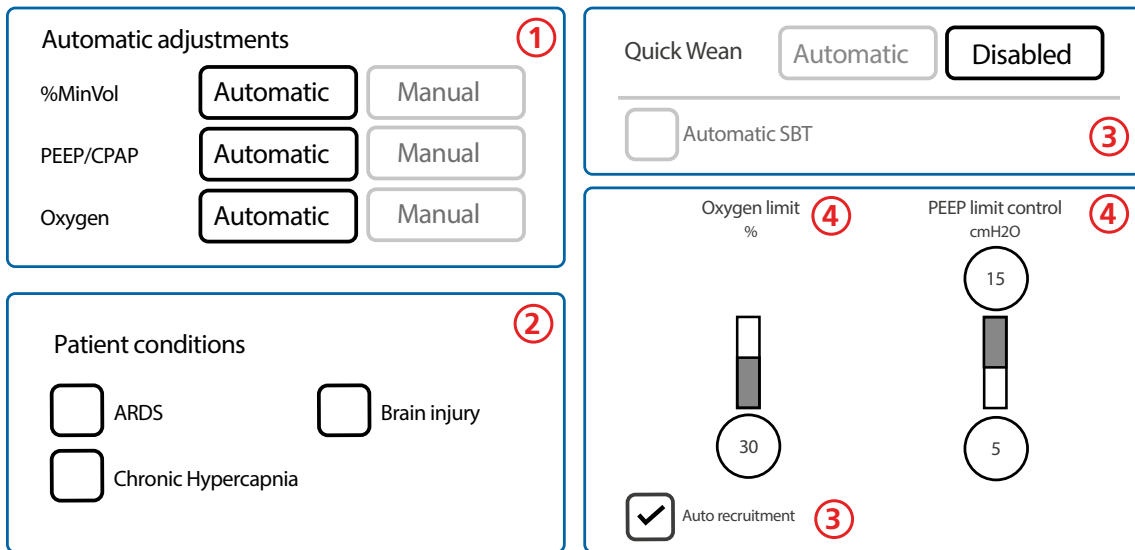
Four steps - as simple as that

Step 1: Activate the controllers
Activate the controllers to automate.

Step 2: Select patient's condition (startup settings and target ranges will be adjusted accordingly)
- ✔ Normal lungs (Default setting)
- ✔ ARDS
- ✔ Chronic Hypercapnia
- ✔ Brain injury

Step 3: Fine-tune the ventilation strategy
Activate Quick Wean if the patient is in a condition to be weaned (e.g., post-surgical). Activate auto-recruitment, if desired. Auto-recruitment is only performed when the patient is passive, auto-recruitment is enabled, SpO2 is below the target range, and the PEEP controller is set to automatic.

Step 4: Set the limits for PEEP and Oxygen
Define the lower limit for the Oxygen controller. Define high and low limits that the PEEP controller cannot exceed.

Keeping the patient on target

Within defined limits
With INTELLiVENT-ASV, the clinician sets targets for PetCO2 and SpO2 for the patient, thus defining the target zone (see red dotted frames below). INTELLiVENT-ASV then automates the controls for CO2 elimination (%MinVol) and oxygenation (PEEP/CPAP and Oxygen) based on these targets and on physiologic input from the patient (PetCO2, SpO2, fSpont, patient activity, and effort). INTELLiVENT-ASV continuously adjusts the values to keep the patient within the target zone, for both active and passive patients.

Ventilation management (%MinVol)
In passive patients, the %MinVol is adjusted based on PetCO2. In active patients, the %MinVol is adjusted based on the spontaneous rate (fSpont). The ventilation controller adjusts %MinVol breath by breath in proportion to the difference between the current PetCO2 and target PetCO2.

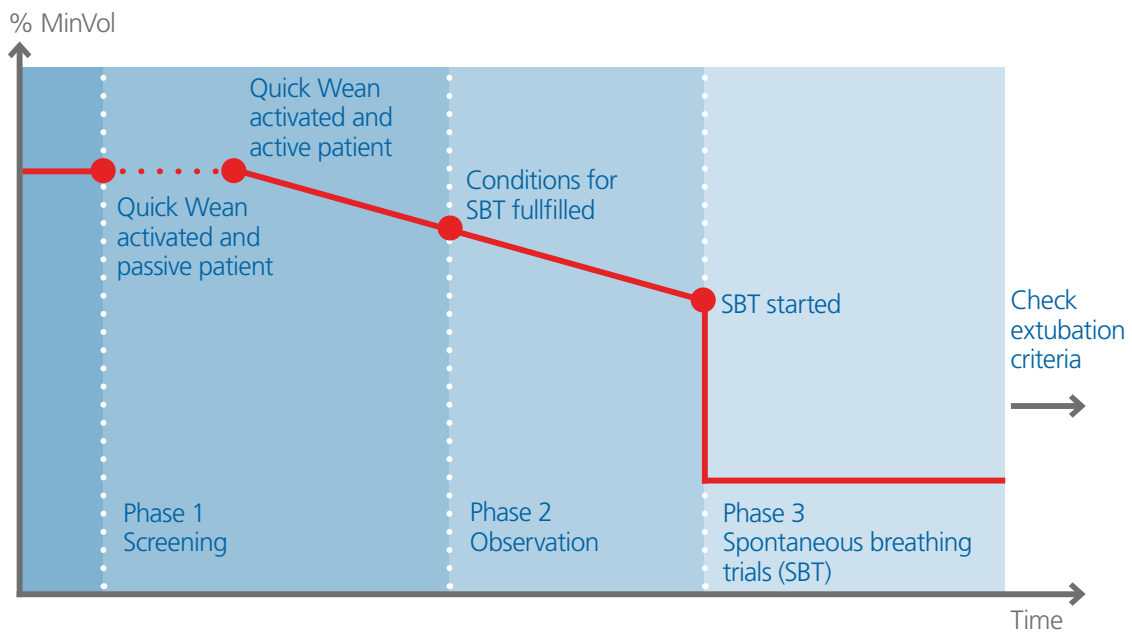### Oxygenation management (PEEP/Oxygen)
The lung-protective rules for oxygenation management, used during automatic PEEP/Oxygen management, are based on the ARDSnet guidance when increasing the therapy, and on the Open Lung concept when decreasing the treatment. The ventilator continuously monitors the patient's SpO2 during automatic PEEP/Oxygen management to avoid dangerous desaturation. As soon as the SpO2 is in the emergency zone, Oxygen increases to 100% and the ventilator generates an alarm.
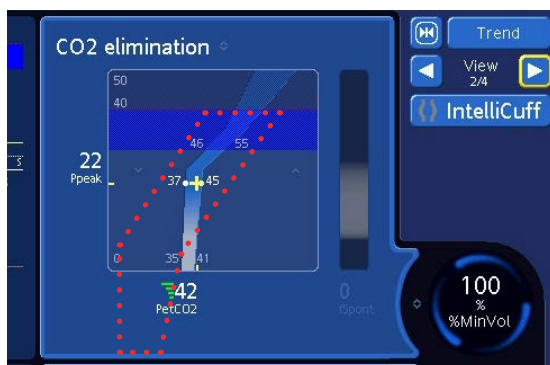
The CO_2 elimination map shows the patient's $PetCO_2$ value and the defined target zone (light-blue boomerang-shaped window).
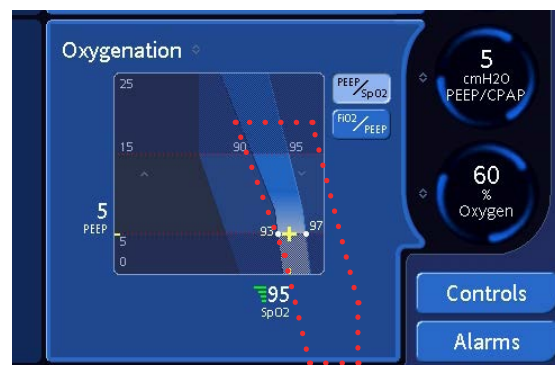
The Oxygenation map shows the patient's SpO_2 value and the defined target zone (light-blue window) as well as the emergency zone (dark blue).

% MinVol

Quick Wean
activated and
active patient

Quick Wean
activated and
passive patient

Conditions for
SBT fullfilled

SBT started

Check
extubation
criteria

Phase 1
Screening

Phase 2
Observation

Phase 3
Spontaneous breathing
trials (SBT)

Time

Automated weaning

Know when to extubate the patient
INTELLiVENT-ASV actively promotes automated weaning protocols using Quick Wean. Quick Wean provides continuous dynamic monitoring and control of patient conditions to evaluate the patient's potential readiness for extubation, including the possibility of conducting fully controlled spontaneous breathing trials (SBT).

Quick Wean operates in three phases
Phase 1:   Screening
Phase 2:   Observation
Phase 3:   SBT - if selected

Spontaneous breathing trials
When the SBT option is activated, an SBT automatically starts as soon as the defined weaning criteria are within the target zone, and the defined observation time has ended. If the spontaneous breathing trial is successful, you may consider extubating the patient.

More safety and comfort for your patients

Continuous adjustment to the patient condition
INTELLiVENT-ASV measures the patient's PetCO2, SpO2, lung mechanics, and activity on a breath-by-breath basis and automatically adjusts ventilation, thereby always supporting the patient at the level currently needed. INTELLiVENT-ASV automatically chooses ventilation and oxygenation settings according to the lung condition of the patient.[8]

Lung-protective ventilation
INTELLiVENT-ASV automatically employs lung-protective strategies to minimize complications from AutoPEEP and volutrauma/barotrauma. It also prevents apnea, tachypnea, dead space ventilation, and excessively large breaths.

More time in the optimal ventilation zone
Within the rules of this lung-protective strategy, INTELLiVENT-ASV encourages the patient to breathe spontaneously. INTELLiVENT-ASV provides more time in the optimal ventilation zone[9] and delivers more variable ventilation in spontaneously breathing patients as compared to conventional ventilation.[10]

8   Arnal JM. Crit Care. 2013 Sep 11;17(5):R196. | 9   Lellouche F, Intensive Care Med. 2013 Mar;39(3):463-471. | 10 Clavieras N, Anesthesiology. 2013 Sep;119(3):631-641.
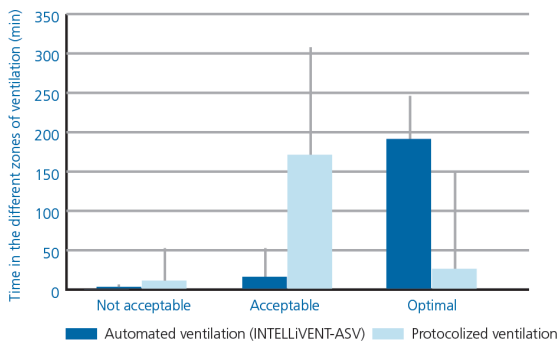
INTELLiVENT-ASV keeps patients in an optimal zone more often.[9]
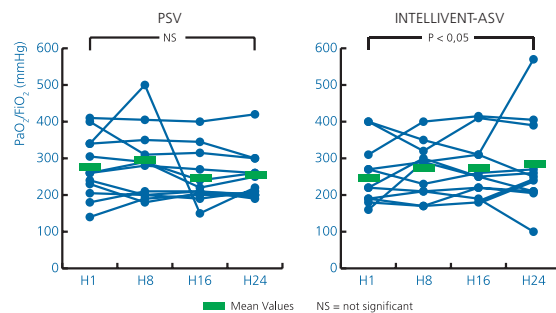
INTELLiVENT-ASV improved oxygenation in actively breathing ICU patients.[10]

Increase efficiency

Efficient ventilator management

Patients' lung mechanics change constantly during ventilation. Clinicians, however, do not always have the time to monitor and adjust settings for each patient, minute by minute and hour by hour. INTELLiVENT-ASV helps by adapting to the changing conditions and needs of each patient.[11] This reduces the workload of clinicians and simultaneously ensures safe and comfortable ventilation for the patient.

Less time needed for training and education

INTELLiVENT-ASV can reduce the time needed for standard settings and alarm management while maintaining ventilation quality.[12] This frees up time for other aspects of patient care. Additionally, the ease of use, intuitive operation, and the free e-learning offered by Hamilton Medical reduce the effort for in-house training and education.

11 Arnal JM. Crit Care. 2013 Sep 11;17(5):R196. | 12 Beijers AJR. Intensive Care Med. 2014 May;40(5):752-3.

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INTELLiVENT-ASV is safe, reacts quickly to changing patient conditions, and optimally supports the patient's breathing within the limits that we have defined.

Mathias Parthe, Head of ICU Training and Education
Triemli Hospital Zurich, Switzerland

Clinical studies on INTELLiVENT-ASV:
www.hamilton-medical.com/Landingpages/INTELLiVENT-ASV

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Intelligent Ventilation since 1983

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