Preface

Numerous attempts to create a uniform classification system for ventilation modes have been unsuccessful. In many cases, they were more technical in design and were therefore perceived as unsuitable in everyday clinical practice. The publication of ISO standard 19223:2019 has now opened a new chapter on the way to a uniform nomenclature for ventilation modes. It is not yet foreseeable when ISO 19223 will become binding.
Some professional groups have questioned the suitability of the first standard version. For example, the classification of ventilation modes does not differentiate between proportional pressure support with or without a non-invasive method for measuring resistance or compliance (PPS or PAPS) and control with neurally adjusted ventilatory assist (NAVA). From a clinical perspective, the goal of drawing clear distinctions between the various modes has only been achieved in part. Accordingly, it is still unclear how to tell the different modes apart. Previous classification systems based on simple allocation to the categories "spontaneous", "pressure controlled" or "volume controlled" fail to include modern ventilation modes such as dynamic BiLevel, and closed-loop control modes such as IntelliVent ASV. Such an approach is therefore of little help for users when it comes to classifying clinical suitability. In an endeavour to provide our readers with a meaningful system of classification, we have settled on the following categories:

Volume-controlled ventilation modes
In volume-controlled ventilation, the pre-set tidal volume is applied regardless of airway resistance or lung compliance. Ventilation pressures depend on the current resistance and compliance.

Pressure-controlled ventilation modes
In pressure-controlled ventilation, the inspiratory pressure (Pinsp) is kept constant. The applied tidal volume depends on compliance.

Spontaneous ventilation modes
In patients unable to sustain unassisted breathing, spontaneous ventilation modes can support spontaneous breathing by keeping the alveoli open, or by reducing the patient's increased work of breathing.

Hybrid ventilation modes
As a further development of pressure-control ventilation, hybrid ventilation modes combine the known advantages of pressure-controlled ventilation forms with those of volume-constant ventilation. The users define a safe window with the settings parameters, in which the pressure levels can automatically adjust to the respective changes in the patient's lung.

Closed-loop ventilation modes
The term 'closed loop' refers to a group of ventilation modes which use complex algorithms or different input variables. These allow ventilatory support to adjust automatically in line with the patient's needs.

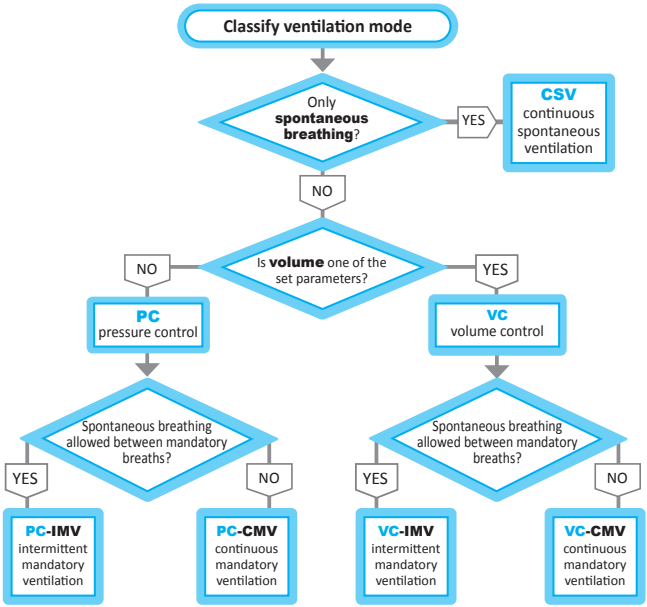
We are of course aware that one commonly finds small differences in the specifications of even similar modes of ventilation. Ventilation modes can also be modified with parameter settings (e.g., PSV with pressure support set to 0 = CPAP). However, these details have been carefully weighed, evaluated and allocated to the corresponding categories in the interest of comparability.

Due to the increasing relevance of outpatient ventilation devices in clinical use, the corresponding devices were also included in the comparison tables.

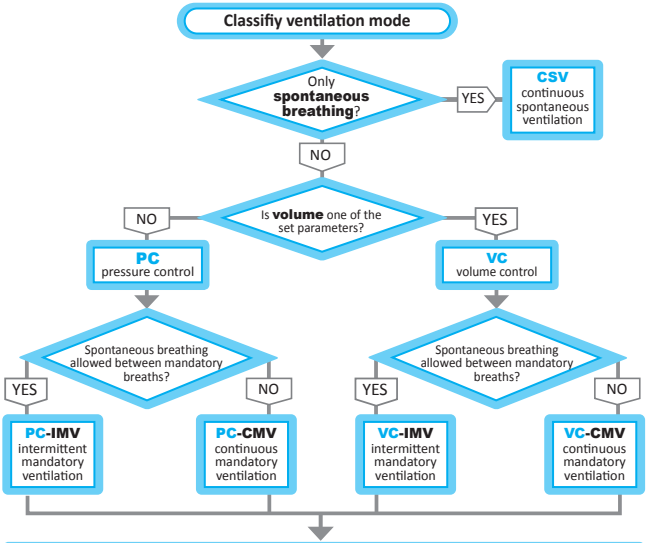
We would like to thank the RespiCode Trainings- und Simulationszentrum, Karlsruhe, Tobias Becher (UKSH Kiel) and Löwenstein Medical for their professional support.

Karlsruhe, August 2020
Peter Kremeier, Christian Woll

Chatburn 2007



Chatburn, Robert L. 2007. "Classification of Ventilator Modes: Update and Proposal for Implementation." Respiratory Care 52 (3): 301 LP-323. http://rc.rcjournal.com/content/52/3/301.abstract.

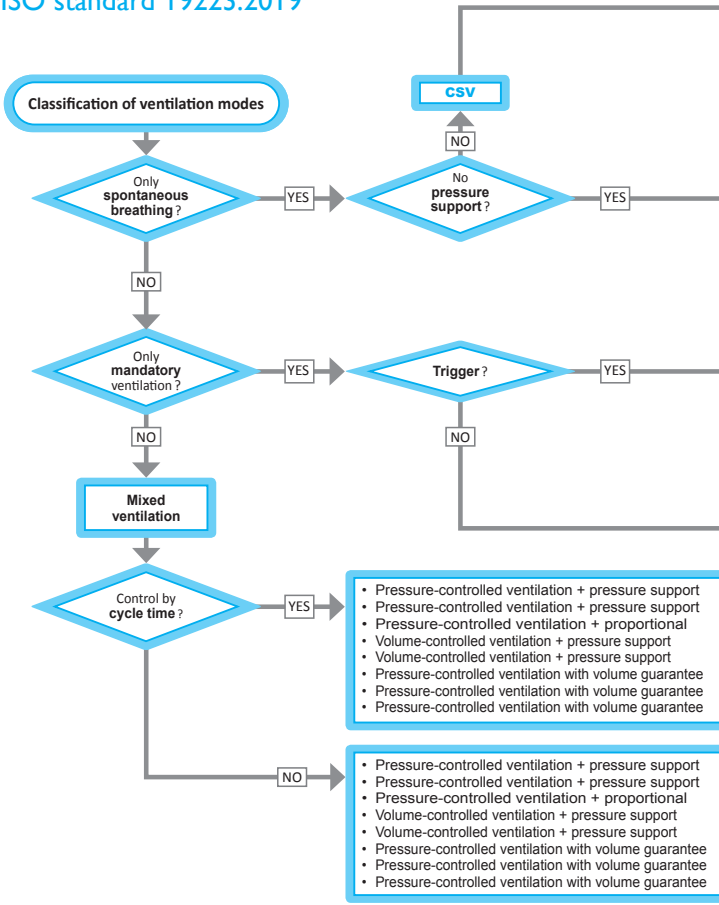


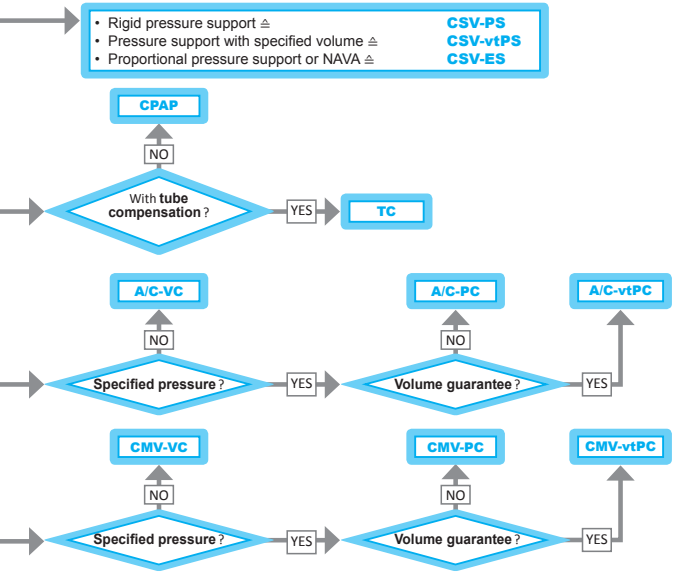
Supplement ventilation mode with the corresponding characteristic:

set-point	s	By adjusting the pressure ramp (pressure-controlled modes) or the flow pattern (volume-controlled modes)
dual	d	The ventilator switches automatically between volume control and pressure control.
servo	r	The pressure support is proportional to the inspiratory effort.
adaptive	a	In response to the changing patient status, the ventilator automatically adapts one target or more between two breaths.
biovariable	b	The ventilator adjusts the inspiratory pressure or the tidal volume randomly to mimic the variability observed during normal breathing.
optimal	o	The ventilator adapts the targets of the ventilatory pattern to achieve an overall performance characteristic (e.g., optimising the work of breathing).
intelligent	i	The control algorithms include artificial intelligence programs, such as rule-based expert systems or artificial neural networks.

Chatburn, Robert, Mohamad El Khatib, and Eduardo Mireles-Cabodevila. 2014. "A Taxonomy for Mechanical Ventilation: 10 Fundamental Maxims." Respiratory Care 59 (11): 1747–63. https://doi.org/10.4187/respcare.03057.

ISO standard 19223:2019





≙	S/T-PC\PS
with specified volume ≙	S/T-PC\vtPS
pressure support ≙	S/T-PC\ES
≙	S/T-VC\PS
with specified volume ≙	S/T-VC\vtPS
+ pressure support ≙	S/T-vtPC\PS
+ pressure support with specified volume ≙	S/T-vtPC\vtPS
+ proportional pressure support ≙	S/T-vtPC\ES

≙	SIMV-PC\PS
with specified volume ≙	SIMV-PC\vtPS
pressure support ≙	SIMV-PC\ES
≙	SIMV-VC\PS
with specified volume ≙	SIMV-VC\vtPS
+ pressure support ≙	SIMV-vtPC\PS
+ pressure support with specified volume ≙	SIMV-vtPC\vtPS
+ proportional pressure support ≙	SIMV-vtPC\ES