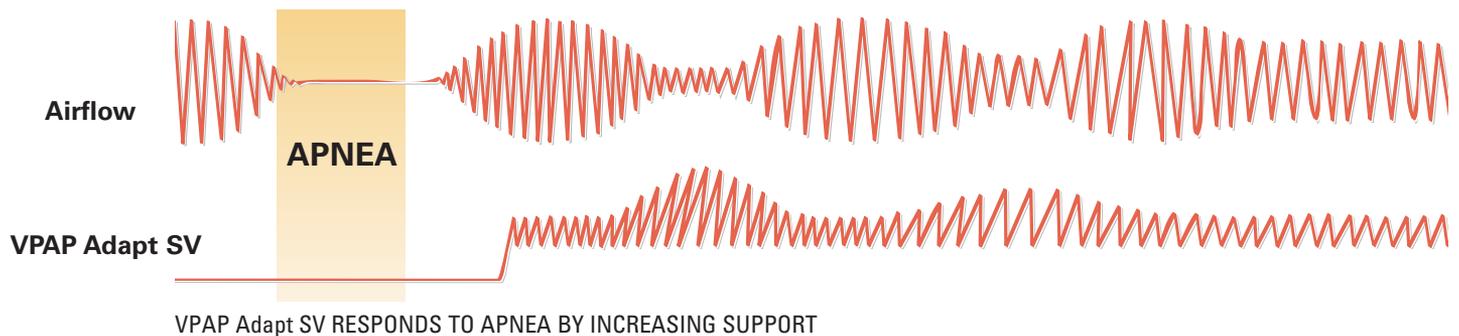


## VPAP Adapt SV™ and Adaptive Servo-Ventilation

### Technology Fact Sheet



#### VPAP Adapt SV™ and adaptive servo-ventilation

With its advanced adaptive servo-ventilation algorithm, the ResMed VPAP Adapt SV provides ventilatory support to rapidly treat all forms of central sleep apnea (CSA), mixed apnea and periodic breathing, commonly known as Cheyne-Stokes respiration (CSR).

#### The adaptive servo-ventilation algorithm delivers customized therapy

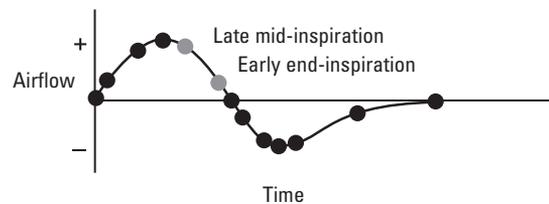
##### Ventilation to a moving target

To determine the degree of pressure support needed, the adaptive servo-ventilation algorithm continuously calculates a target ventilation. Based on respiratory rate and tidal volume, the target is 90% of the patient's recent average ventilation—that means that ventilation can vary gradually and naturally over the course of the night.

##### Patient/machine synchronization

The algorithm uses three factors to achieve synchronization between pressure support and the patient's breathing.

1. The patient's own recent average respiratory rate—including the ratio of inspiration to expiration and the length of any expiratory pause.
2. The instantaneous direction, magnitude and rate of change of the patient's airflow, which are measured at a series of set points during each breath.
3. A backup respiratory rate of 15 breaths per minute.



Delivered ventilation is matched to patient respiration via a series of set points identified in each breath.

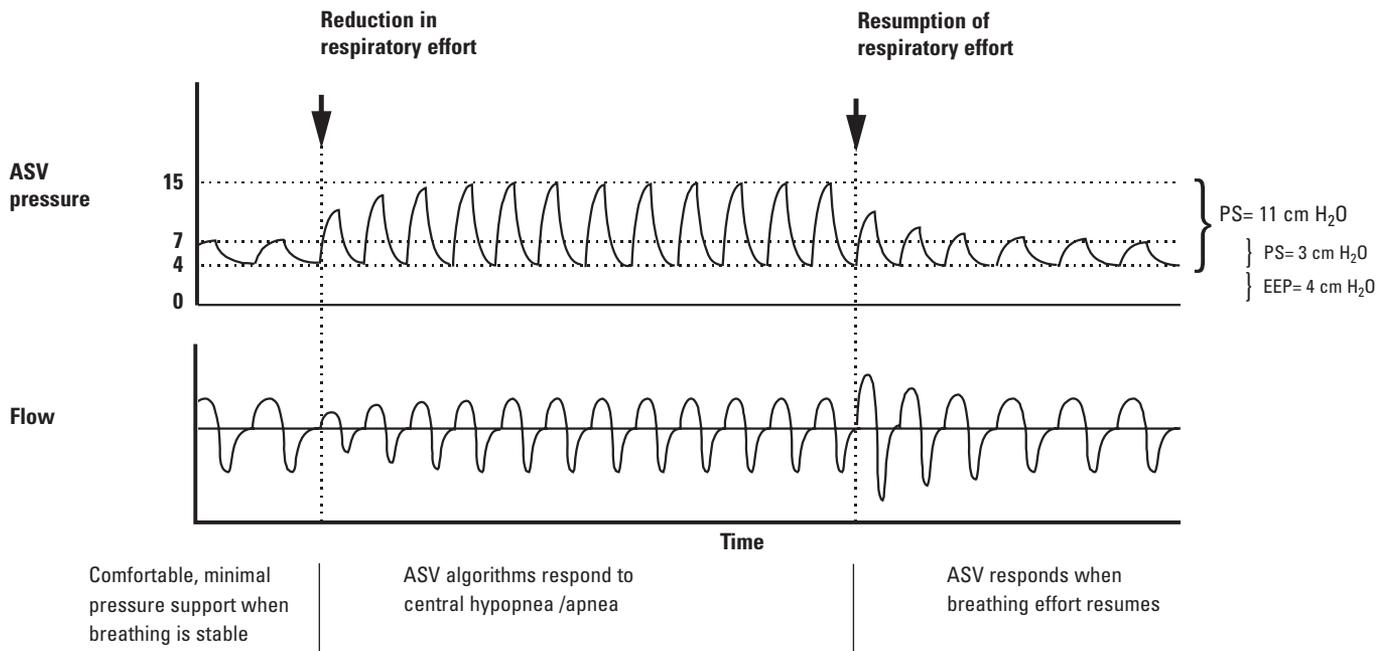
To ensure ventilatory support is synchronized to the patient's effort, the VPAP Adapt SV relies on factors 1 and 2. When a central apnea/hypopnea occurs, support initially continues to reflect the patient's recent breathing pattern. However, as the apnea/hypopnea persists, the device increasingly uses the backup respiratory rate.

#### Minimal support during stable breathing

The adaptive servo-ventilation algorithm starts working even before central sleep apnea events occur, from the moment the patient lies down, puts on the mask and switches on the VPAP Adapt SV.

As long as ventilation is at or above the target:

- the magnitude of the pressure support remains minimal—the default minimum value of 3 cm H<sub>2</sub>O provides enough support to do about half the work of breathing.



- the underlying end expiration pressure (EEP) can be adjusted by the clinician from 4 to 15 cm H<sub>2</sub>O, which helps reduce obstructive events and can also reduce central events.

### Support when it's needed

When a central hypopnea/apnea occurs and ventilation suddenly drops below the target:

- pressure support rapidly increases over a few breaths to keep ventilation at the target.
- the default maximum pressure support value of 15 cm H<sub>2</sub>O will fully ventilate a centrally apneic patient with an open airway and normal lungs.

### Adaptive support when breathing resumes

As breathing resumes and total ventilation exceeds the target:

- pressure support is rapidly reduced back toward the minimum 3 cm H<sub>2</sub>O.
- this reduces the likelihood of over-ventilation and hypocapnia, which can lead to vocal cord closure and further apneas.

### Why adaptive servo-ventilation instead of bilevel?

Most CSA/CSR patients have trouble tolerating conventional bilevel ventilatory support. The pressure must be adjusted to a constant high level to adequately support a patient during apnea/hypopnea. This leads to over-ventilation during periods of normal breathing or hyperpnea, which causes arousals and discomfort. It can even propagate more CSA events.

### The adaptive servo-ventilation algorithm stabilizes patient breathing

By ventilating the patient appropriately during periods of hypopnea and apnea and reducing support during periods of hyperventilation and normal breathing, the advanced adaptive servo-ventilation algorithm rapidly stabilizes breathing patterns and arterial blood gases and minimizes discomfort and arousals often associated with bilevel treatment.