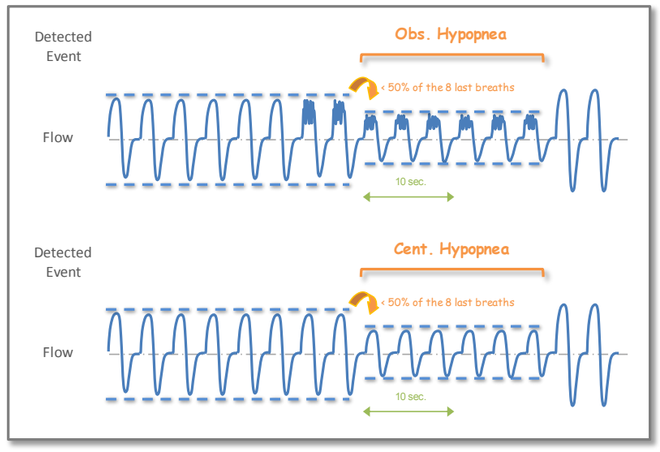
DreamStar™ Auto Algorithm

Obstructives or Centrals Hypopneas



The algorithm defines an hypopnea if, for at least 10 seconds, flow value is reduced for at least 50% versus the average value of the preceding 8 breaths.

Hypopneas are classified as **obstructive** by the concomitant detection of Inspiratory Flow Limitation or snoring.

Otherwise, they are classified as **central.**

Pressure Response

- Obstructive hypopnea
  - Pressure response on Runs of IFL of greater extent during concomitant identification of an hypopnea (see pressure response on Runs)
  - Snoring pressure response of greater extent during concomitant identification of an hypopnea (see pressure response on snoring).
- Central Hypopnea
  - No pressure increase

Control and Limits

- See controls and limits of pressure response for snoring and Runs of Inspiratory Flow Limitation.

Normal Respiration

In the absence of obstructive detected events , the DreamStar Auto algorithm considers the upper airways to be stable.

Pressure Response

- Fast decrease : 0,5 cmH_20 decrease if no detected event for 5 minutes, then subsequent decreases every minute if no event.
- Slow decrease : 0,2 cmH_20 decrease if no detected event for 5 minutes, then subsequent decreases every minute if no event.

Control and Limits

- Clinician chooses pressure decrease rate.
- Central events detection doesn't inhibit pressure decreases.
- Delivery pressure cannot decrease below min Pressure, set by clinician .

Leaks management

The algorithm continuously measures the level of total leakage including intentional leaks at the interface and any involuntary leakage around the mask or during mouth breathing. DreamStar Auto automatically compensates for the leakage to maintain the optimum level of delivered pressure. Response of the algorithm secondary to an event's detection will be inhibited in case of significant leakage beyond a value of 60 to 100 l / min (depending on the pressure level).

CE 0459

PLC002-01 / 2013

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DreamStar ™ Line

DreamStar™ Auto Algorithm Auto-CPAP

DreamStar™ Auto incorporates the Adaptive Pressure Stability technology of the DreamStar product line and the event detection of the DreamStar™ Info CPAP device to advance the concept of the right pressure at the right time.

Sleep specialists and CPAP users value auto-CPAP because they know pressure needs can vary throughout the night and night-to-night as a result of sleep stage, position, fatigue, and other factors.

Reclaiming the experience, DreamStar™ Auto algorithm analyzes each breath to detect early indicators of upper airway instability such as Inspiratory Flow Limitation or snoring. The differentiation between obstructive and central events allows the device to rise the pressure only in front of apneas or hypopneas known as obstructive. Pressure delivery with DreamStar Auto is smoothly and regularly adjusted throughout treatment to ensure an optimal therapeutic outcome and comfort for the patient.

Understanding how the unit responds to events as well as controls and possible adjustments of pressure limits allows clinicians to enhance patient treatment.

DreamStar™ Auto Algorithm

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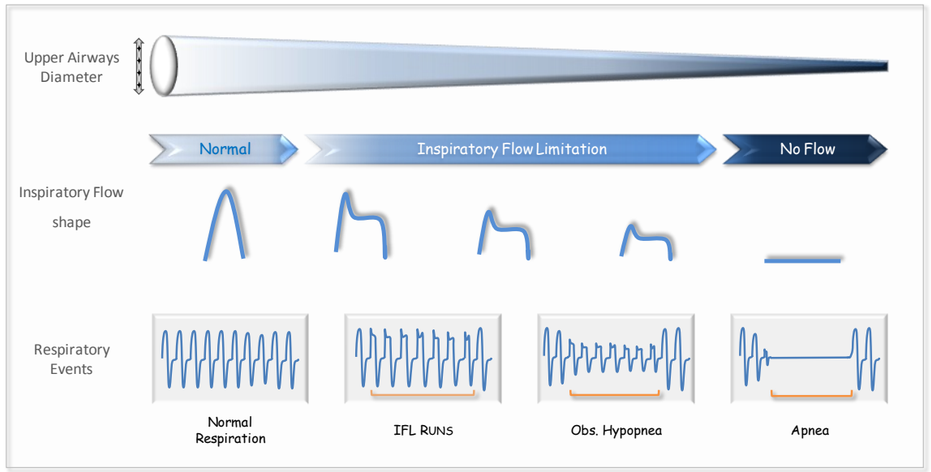
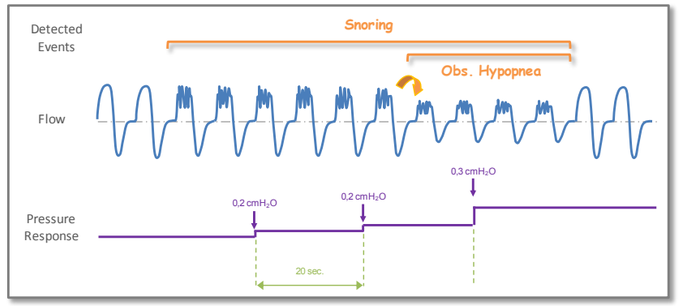
DreamStar™ Auto algorithm:

- ***Analyses breath by breath patient's respiration to determine early signs of upper airways instability, such as Inspiratory Flow Limitation, or obstructive events.***
- ***Differentiates Apnea and Hypopnea between Central or Obstructive.***
- ***At anytime delivers an optimal pressure, with pressure increases proportional to the severity of the detected events.***



SNORING



Snoring is an inspiratory noise caused by vibration of the soft parts of the pharyngeal walls and signs an increase of upper airway resistance.

Snoring is detected by the presence of acoustic vibrations

Pressure Response

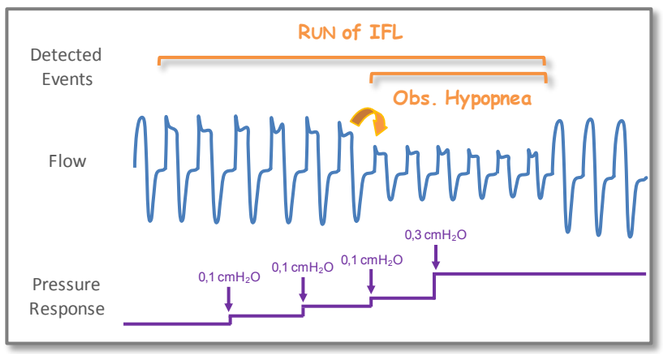
✧ Response proportional to the event's severity:
- 0,3 cmH_2O increase every 20 seconds if snoring is detected in conjunction with Hypopnea. .
- 0,2 cmH_2O increase every 20 seconds if snoring is in the absence of Hypopnea .

Control and Limits

✧ Maximum of 3 cmH_2O pressure increase for snoring in the absence of Hypopnea.

✧ Delivery pressure cannot exceed max Pressure, set by clinician.

INSPIRATORY FLOW LIMITATION



Inspiratory Flow Limitation (**IFL**), an early marker of upper airway instability supérieures[1], is detected by the algorithm when the inspiratory flow waveform contour, usually sinusoidal, undergoes changes such as flattening or niche on the inspiratory flow. This is done breath by breath, detecting deviations of the inspiratory flow waveform contour.

A series of flow limited breaths to is called **RUN** of Inspiratory Flow Limitation.

Pressure Response

✧ Response proportional to the event's severity:
- 0,3 cmH_2O increase on identification of RUN if in conjunction with Hypopnea (40% decrease from the Flow amplitude of the 8 last breaths).
- 0,1 cm H_2O increase on identification of RUN in absence of Hypopnea .

✧ The first pressure increase occurs upon detection of a RUN then every 2 cycles during the RUN.

Control and Limits

✧ Maximum of 4 increases or total of 1,2 cmH_2O on the same RUN.

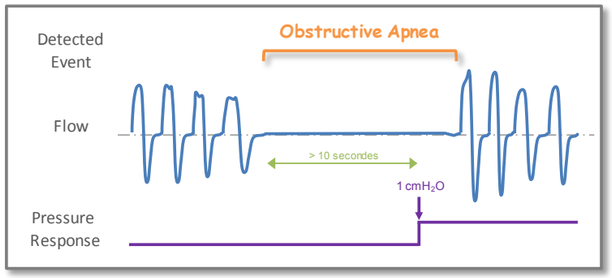
✧ Delivery pressure cannot exceed max Pressure, set by clinician.

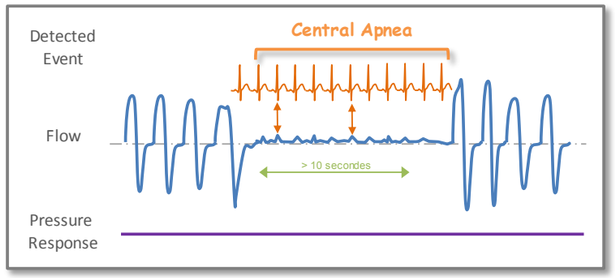
✧ Clinician can disable response on isolated Run of Inspiratory Flow Limitation (without conjunction of Hypopnea) .

OBSTRUCTIVES OR CENTRALS APNEAS

If no breath is detected by the algorithm Dreamstar ™ Auto for more than 10 seconds, an apnea is determined.

Apneas are classified as **central** by the concomitant detection of cardiac oscillations[2] reflecting patency of the upper airway lumen. Otherwise, the apneas are classified as **obstructive**.





Pressure Response

✧ Obstructive Apnea
- First increase of 1 cm H_2O once apnea is detected.
- If apnea persists, 2nd and 3rd increments of 1 cmH_2O every 15 seconds.

✧ Central Apnea
- Cardiac Oscillations detection inhibits pressure increase (even below the set maximum pressure on apnea)

Control and Limits

✧ Maximum 3 increments, up to maximum of 3 cmH_2O during single apneic event.

✧ Delivery pressure cannot exceed Max. Pressure on apnea, set by clinician.

✧ Return to preset Comfort pressure (ComfortP) or Min. P, if ComfortP<Min. P, if no breathing detected for 2 minutes.

1. Condos R. Flow Limitation as a Noninvasive Assessment of Residual Upper-Airway Resistance during CPAP Therapy of OSA. Am J Respir Crit Care Med 1994.

2. Ayappa I. Cardiogenic Oscillations on the Airflow Signal During Continuous Positive Airway Pressure as a Marker of Central Apnea. CHEST 1999