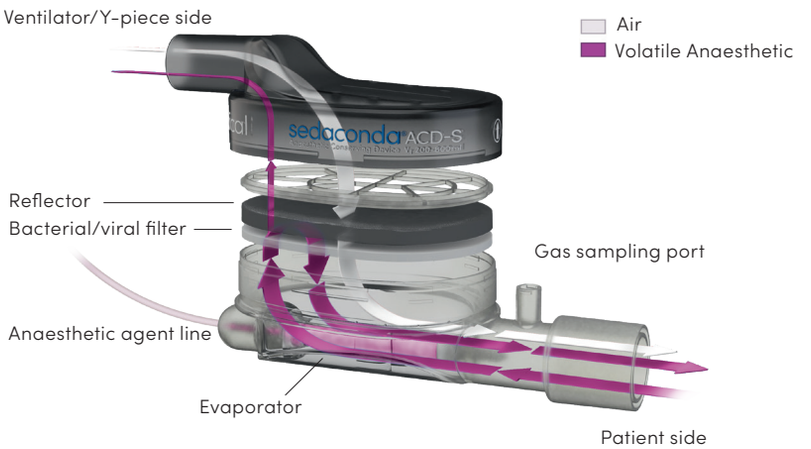
How effective is the Sedaconda® ACD in terms of humidification?

Sedaconda ACD (Anaesthetic Conserving Device) is a medical device enabling delivery of inhaled anaesthetics to invasively ventilated patients. The Sedaconda ACD is inserted in the breathing circuit between the endotracheal tube (ET tube) and the Y-piece and contains an evaporator which enables vaporisation of inhaled anaesthetics.



Thanks to an effective carbon filter (reflector) in the Sedaconda ACD, approximately 90% of the exhaled anaesthetic is adsorbed during expiration and reflected back to the patient during inspiration. This enables the inhaled anaesthetic to be reused, hence decreasing its overall consumption.

In addition to reflecting volatile anaesthetics, the Sedaconda ACD provides airway humidification by reflecting the heat and moisture in the patient's own breath in the same way as other heat and moisture exchangers (HMEs) do. Owing to its design with a carbon filter and an electrostatic bacterial/viral filter, the Sedaconda ACD is a very effective HME.

HMEs are passive humidifiers and according to the industry standard (ISO 9360-1:2009), their performance is graded by measuring the amount of moisture that is lost over the device. The Sedaconda ACD loses between 5-7 mg/L (depending on size of device and tidal volume), which places it among the top three performing HMEs when compared against 29 commercially available HME filters (figure 1).

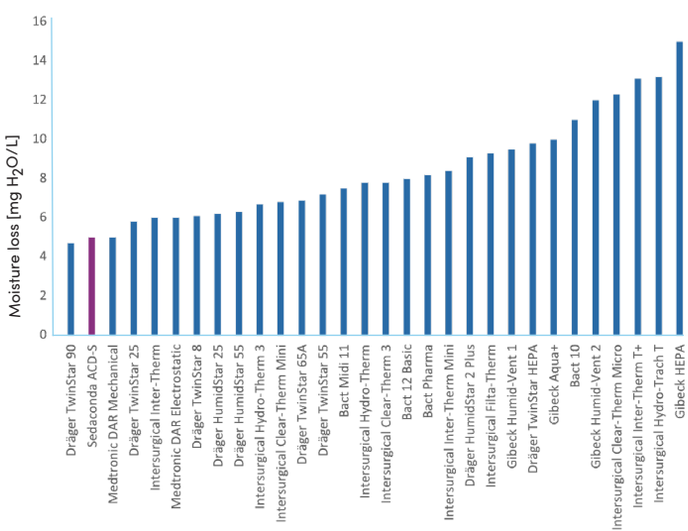
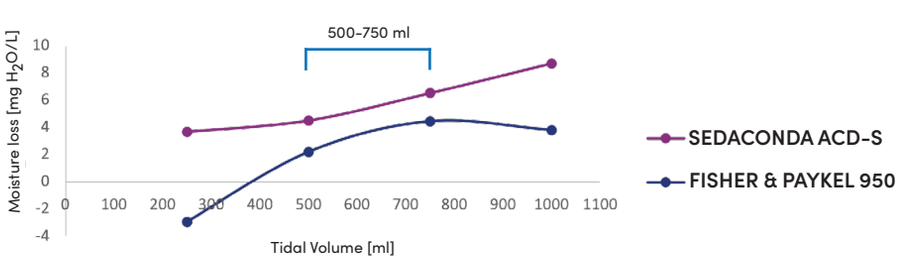


Figure 1. Performance of commercially available passive humidifiers in terms of moisture loss. The Sedaconda ACD ranks among the top-performing HME devices. Data extracted from manufaturers' product sheets.

Active humidification works differently to HMEs as there is no reflection of heat or moisture. With active humidifiers, moisture is provided by adding water to the system and adjusting the temperature of the inspired air, for which the devices are placed on the inspiratory limb.

Although HMEs and active humidifiers work differently, it is possible to measure the moisture loss that occurs while using either type of system. When tested according to the HME standard ISO 9360, the loss of moisture while using an active humidifier or the Sedaconda ACD device did not differ much, as shown in figure 2.



Fugure 2. Performance in terms of moisture loss of the Sedaconda ACD and a commercially available active humidifier. The devices (Sedaconda ACD and Fisher & Paykel 950) were tested according to the HME standard ISO 9360, whereby moisture loss was measured for different tidal volumes in a test lung water canister during prolonged use.

Using an established hygrometric bench test method[1], the performance of the Sedaconda ACD in terms of the humidity delivered at inspiration was found to be 31 mgH_2O/L. As a reference, the recommended range for active humidifiers according to the American Association for Respiratory Care (AARC)[2] should be as a minimum 33 mgH_2O/L over the clinically relevant range of gas flowrates (figure 3).

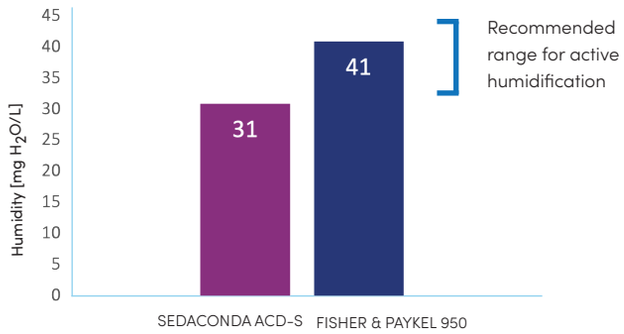


Figure 3. Inspiratory humidity at tidal volume 500 ml. The humidification delivered in each breath was measured according to the hygrometric method[1], whereby relative humidity and temperature of inhaled air were measured close to patient while using the Sedaconda ACD-S or the active humidifier Fisher & Paykel 950. The standard for active humidifiers recommended by AARC[2] is shown for reference.

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The potential clinical impact of this small difference is unlikely to be clinically significant. In fact, the benefit of choosing one humidification system over another is a matter of debate and according to the literature, the evidence available to date indicates no significant difference between passive and active humidifiers on clinical outcomes[3,4]. A large meta-analysis that pooled data from 2442 critically ill patients from 18 randomized controlled trials (RCTs) showed that active humidification was not superior to HMEs in terms of preventing occlusion of endotracheal tube/tracheostomy, pneumonia or mortality[3]. Moreover, a trend favouring HMEs was observed in the studies including a high percentage of patients with pneumonia at admission and with prolonged mechanical ventilation. The meta-analysis concluded that the choice of humidifier should be made according to the clinical context of each patient. Another large meta-analysis found similar results when analysing data from 2848 patients from 34 clinical trials, and concluded as well that the available evidence did not support the superiority of either humidification approach over the other[4].

Clinical evidence shows no superiority of active humidification over HME[3]

18 RCTs

2442 mechanically ventilated patients

No statistical difference in preventing:

- ✓ Occlusion of endotracheal tube/tracheostomy
- ✓ Pneumonia
- ✓ Mortality

In summary, when the Sedaconda ACD is placed in the standard position reflecting the anaesthetic gas, it provides airway humidification to the patient as efficiently as a gold standard HME, and with a delivery of humidity similar to an active humidifier. In addition, the moisture loss when using the Sedaconda ACD does not differ much from when using active humidification. Importantly, many years of clinical experience using the Sedaconda ACD support its efficiency in terms of airway humidification.

References: 1. Lellouche F et al., 2009 Chest;135(2):276-286. 2. AARC Clinical Practice Guideline. Humidification during mechanical ventilation. Respir Care 1992;37(8):887-890. 3. Vargas M et al. Crit Care 2017;21:123. 4. Gillies D et al. Cochrane Database Syst Rev 2017;9:CD004711.

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Before use, please refer to the Instructions for Use (IFU) for each product

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