

# Aisys™ CS<sup>2</sup> End-tidal Control and ecoFLOW:

What's the difference?



The Aisys CS<sup>2</sup> Anesthesia Delivery System is a scalable, flexible, and functionally integrated workstation that features our most advanced design, ventilation, respiratory monitoring, and breathing system. This anesthesia system is designed for mixing and delivering inhalation anesthetics, air, O<sub>2</sub>, and N<sub>2</sub>O. The Aisys CS<sup>2</sup> machine offers two optional software technologies (End-tidal Control and ecoFLOW) to aid clinicians with the delivery of low-flow anesthesia.

## End-tidal Control (Et Control) mode explained

End-tidal (Et) Control\* is an optional gas delivery mode (Figure 1) on the Aisys CS<sup>2</sup> anesthesia delivery system where the clinician sets the target end-tidal oxygen (EtO<sub>2</sub>) and target anesthetic agent (EtAA) values. The system monitors the EtO<sub>2</sub> and EtAA values and **automatically** adjusts the gas composition and total flow to maintain the set targets.

The Et Control algorithm is updated for each new patient detected breath, as reported by the airway module. The minimum flow setting for Et Control mode safeguards the patient by maintaining at least the minimum set flow delivered to the patient to help prevent delivery of a hypoxic mixture.

Unlike Fresh Gas Control mode and ecoFLOW, Et Control has a number of safety mechanisms in place to help clinicians protect the patient. Safety mechanisms include the delivery of increased flow when temporary issues arise and an Auto Exit option when an issue arises that requires clinician interaction or a condition that cannot be resolved during the case.

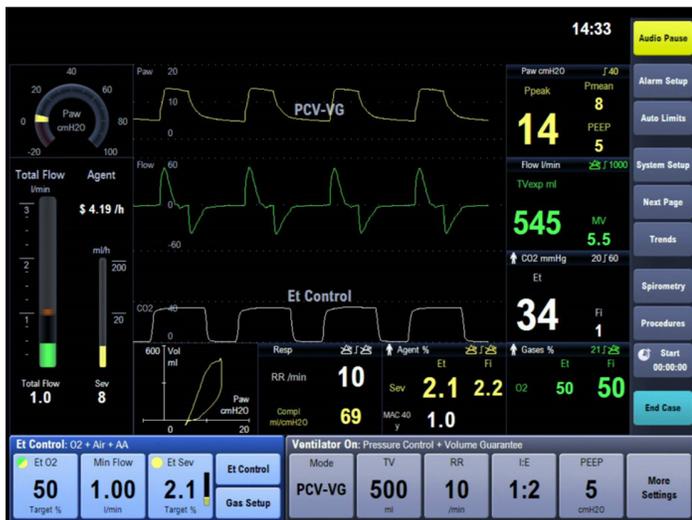


Figure 1. Et Control mode settings on the Aisys CS<sup>2</sup> anesthesia machine can be seen in the bottom left panel where targets for EtO<sub>2</sub> (50%), Min Flow (1.00 l/min) and EtAA (2.1%) are displayed.

## ecoFLOW mode explained

ecoFLOW is a clinical decision support tool that provides data on the total oxygen (O<sub>2</sub>) required within the fresh gas flow to help ensure that the minimum FiO<sub>2</sub> target is achieved. Using ecoFLOW to guide clinicians with **manually** lowering fresh gas flows helps to mitigate the risk of hypoxic gas mixture delivery and avoid excess fresh gas flow to help reduce the environmental impact of anesthetic agent use.

ecoFLOW provides a split screen view (Figure 2) that shows the approximate minimum O<sub>2</sub> flow to maintain a preset FiO<sub>2</sub> value and consists of O<sub>2</sub> Total Flow tube, Minimum FiO<sub>2</sub> marker and agent flow indicator. The flow needed to maintain the FiO<sub>2</sub> indicated on the FiO<sub>2</sub> marker is specific to each patient and is calculated using the fresh gas flow settings, the patient's oxygen uptake, the dilution effect of the agent being delivered and the effects of the circle breathing system.

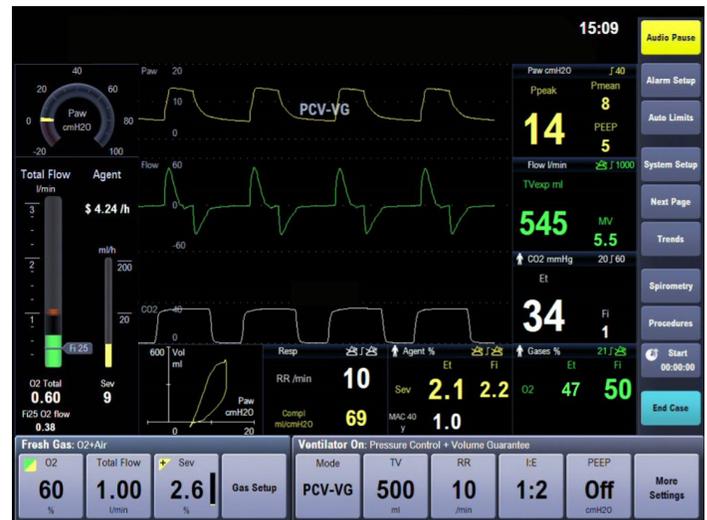


Figure 2. ecoFLOW display on the Aisys CS<sup>2</sup> anesthesia machine showing fresh gas flow settings in the bottom left panel. The FiO<sub>2</sub> indicator can be seen on the Total Flow tube (green) and the Agent cost can be seen in the ml/h tube indicator (yellow).

\* End-tidal Control in the United States is indicated for patients 18 years of age and older.

## End-tidal Control & ecoFLOW Comparison Guide

<p><b>Mode</b></p>	<p><b>End-tidal Control</b> (Et Control) is an optional, fresh gas delivery software offered on the Aisys CS<sup>2</sup> Anesthesia Delivery System. When active, this mode is simple, vigilant, and efficient at delivering low-flow anesthesia. Anesthesia providers simply set the targets for end-tidal oxygen and anesthetic agent, and the Et Control software will automatically adjust fresh gas concentrations to quickly achieve and maintain these targets, regardless of changes in the patient's hemodynamic and metabolic status.</p>	<p><b>ecoFLOW</b> is an optional, software feature offered on GE HealthCare anesthesia delivery systems. It is designed to support low-flow practices by giving clinicians visual information to assist them in manual titration of fresh gas flow. The visual indication demonstrates patient oxygen requirements at a given fresh gas flow setting. As clinicians reduce their fresh gas flows, they can clearly see whether the oxygen concentration in the fresh gas flow is adequate. All adjustments of the fresh gas flow are manual. There are no alarms specifically related to ecoFLOW and no automatic adjustments are made to any machine settings. Visually, the clinician has a clear depiction of the minimum required oxygenation, which may help them confidently reduce their flows while preventing hypoxia.</p>
<p><b>Required Gas Module</b></p>	<p>Requires End-tidal Control-compatible CARESCAPE™ Respiratory Gas Module (E-sCAiOE or E-sCAiOVE) with fresh gas sample connection and enabled with Et Control software</p>	<p>Requires a CARESCAPE Respiratory Gas Module (E-sCAiO, E-sCAiOV, E-sCAiOVX, E-sCAiOE, E-sCAiOVE) enabled with ecoFLOW software</p>
<p><b>Settings Required</b></p>	<p>Clinician selects desired end tidal oxygen and end tidal anesthetic agent, and the software then <b>automatically titrates</b> to achieve the desired values in the most efficient way possible</p>	<p><b>Clinician manually sets fresh gas oxygen, total flow, and anesthetic agent percentage</b> using information from graphical depiction of adequate fresh gas oxygen.</p>
<p><b>Speed to Desired Settings</b></p>	<p>Has been proven to consistently reach at least 90% of the clinician's setting within 90 seconds<sup>1,2</sup></p>	<p>Varies – relies on <b>manual clinician interaction and vigilance</b></p>
<p><b>Hypoxia Prevention</b> <i>Hypoxia is low oxygen in body tissues and causes symptoms like difficulty breathing and rapid heart rate. Hypoxia can be life threatening.</i></p>	<p><b>Automatically maintains set oxygen concentration</b> to help avoid hypoxic conditions</p>	<p>On screen guidance recommends appropriate oxygen concentration, but requires <b>manual clinician interaction and vigilance</b> to adjust settings</p>
<p><b>Response to Patient Changes</b> <i>(Physiological/Metabolic)</i></p>	<p><b>Automatically adjusts settings</b> to maintain target oxygen and target anesthetic agent concentrations regardless of changes in physiological or metabolic conditions</p>	<p>On screen guidance regarding oxygen requirements is updated (if appropriate), but requires <b>manual clinician interaction</b> to adjust settings</p>
<p><b>Clinician Interaction</b></p>	<p><b>Has been proven to reduce machine key presses by 50%<sup>3</sup></b> when compared to manual control</p>	<p>Relies on <b>manual clinician interaction</b> with device as patient status changes throughout the case</p>
<p><b>Cost Savings</b></p>	<p>Has shown up to <b>25% reduction in anesthetic agent utilization<sup>2,3</sup></b> when compared to manual control</p>	<p>Varies – <b>relies on manual clinician interaction</b></p>
<p><b>Environmental Impact</b></p>	<p>A study has shown up to <b>44% reduction in greenhouse gas emissions<sup>4</sup></b> when compared to manual control</p>	<p>Varies – <b>relies on manual clinician interaction</b></p>

## References

1. Et Control user's reference manual (5824844-USA), Et Control Accuracy Graph.
2. Refer to GE HealthCare Et Control Pivotal Study Report DOC2163005.
3. S. Singaravelu and P. Barclay, Automated control of end-tidal inhalation anaesthetic concentration using the GE Aisys Carestation. *British Journal of Anaesthesia* 2013; 110 (4): 561–6.
4. Tay. S, et al. Financial and environmental costs of manual versus automated control of end-tidal gas concentrations, *Anaesth Intensive Care* 2013; 41: 95-101.

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