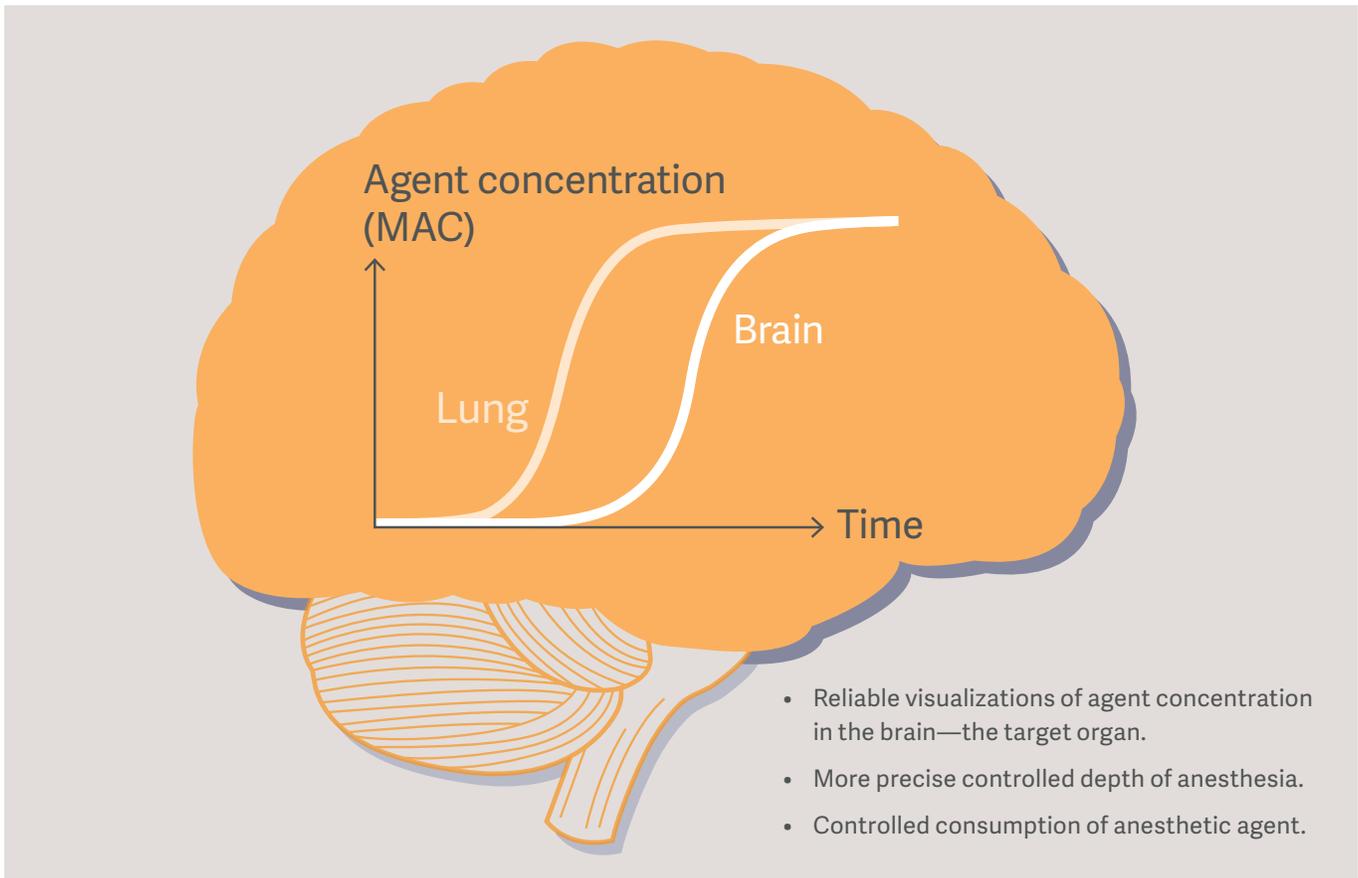




MAC Brain short guide

A tool for better anesthetic agent dosing



Due to pharmacokinetics, there is a time delay in agent concentrations between the lungs and the target organ, the brain. Getinge's unique MAC Brain tool visualizes the difference to support better dosing and planning of agent delivery, helping to reduce the risk of over- and under-dosing.^{1,2}

The MAC Brain value is an estimation of the development of the partial pressure of a volatile anesthetic agent in the brain. The partial pressure of anesthetic agent changes slower in the brain than in the lung. This delay is given by a time constant dependent on the volume of the brain, the solubility of the agent in brain tissue, the perfusion of the brain, and the solubility of the agent in blood. These four entities define the time constant describing the partial pressure delay in the brain. The variability of the agent's alveolar concentration is derived from continuous end tidal gas measurement. With this information, the differential equation describing the agent concentration in the brain, MAC Brain, can be calculated.

1. Kennedy R, McKellow M, French R, et al. Sevoflurane end-tidal to effect-site equilibration in women determined by response to laryngeal mask airway insertion. *Anesth Analg*. 2013 Oct;117(4):786-91.

2. Drews FA, Syroid N, Agutter J, et al. Drug delivery as control task: improving performance in a common anesthetic task. *Hum Factors*. Spring 2006;48(1):85-94.

When every measure matters



Getinge's innovative technologies for Personalized Anesthesia Delivery widen the scope for true personalization. Our proprietary innovations for ventilation-to-ICU standards, active hypoxia prevention, lung recruitment maneuvers, and precision agent dosage, help contribute to patient safety and care— even for very complex patients. The intuitive interface and ease of use promote a streamlined workflow.

End tidal measurements

When the age-adjusted calculated MAC value, based on the end tidal measurement, is in steady-state (i.e. when the partial pressure of agent in the blood, brain, and alveolar compartments are in equilibrium), we can assume that it reflects a probability of unconsciousness. But when the end-tidal based MAC are in a transitory stage of anesthesia, like induction, concentration changes, or emergence, this is no longer true. The MAC Brain is designed to be a drug advisory display that reflects the hysteresis between exhaled partial pressure and CNS partial pressure, thus helping the anesthetist.

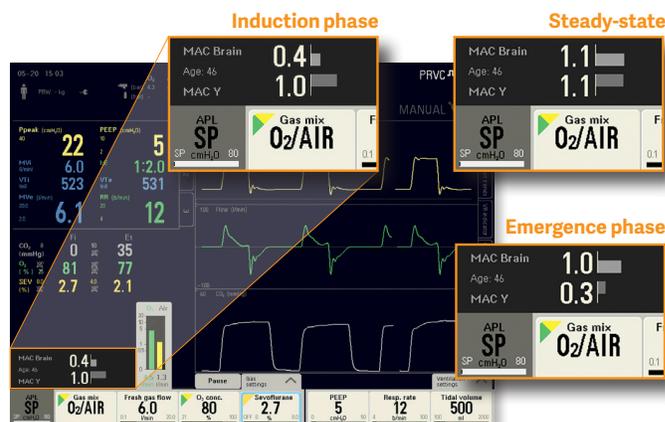
The system continuously calculates the estimated MAC Brain value based on the end tidal measurement of anesthetic agent and/or nitrous oxide. The value is updated at the end of each expiratory breath phase.

Requirements

The MAC Brain value is available both in manual and controlled ventilation modes. To have a valid MAC Brain value displayed on the screen, there are some requirements that need to be fulfilled:

- MAC Brain value should be enabled in the Start-up configuration.
- The patients' age must be more than 1 year.
- The EtCO₂ must be more than 1.7% for more than three consecutive breaths.

During the use of the Pause function or Inspiratory/ Expiratory hold function, or a disconnection lasting less than 40 seconds, the MAC Brain value will be paused during that time.



During induction, the MAC Y value, reflecting the alveolar concentration, increases much faster than in the target organ. During emergence, the MAC Brain will clearly show the delay of decreasing target organ concentration compared to the lungs.

Incidences of invalid data

The MAC Brain value becomes invalid (displayed as “***”) when:

- The first three consecutive breaths measured by the system have a MAC value of more than 0.3 MAC_{age}.
- The patient's age is altered during a case and volatile agent is being delivered.
- The EtCO₂ – FiCO₂ difference is less than 1.6%.
- No breaths are detected for 60 sec.

If any of the four above mentioned incidences occurs, the system will consider the MAC Brain invalid for the time it would take for alveolar/brain equilibrium to occur, which is approximately 10 minutes for the anesthetic agents used by the system.

MAC Brain, a Getinge proprietary innovation, is a standard feature on all Flow Family anesthesia machines (Flow-c, Flow-e, and Flow-i).



The presented values are for demonstration purposes only and do not reflect an actual clinical case.

Getinge is a registered trademark of Getinge AB, its subsidiaries, or affiliates in the United States or other countries • Maquet Flow-i, Getinge Flow-e and Getinge Flow-c are trademarks by Maquet Critical Care AB. • Copyright 2021 Getinge AB or its subsidiaries or affiliates • All rights reserved. • ⚠ CAUTION: Federal (US) law restricts this device to sale by or on the order of a physician. Refer to Instructions for Use for current indications, warnings, contraindications, and precautions.

Sales Office • Getinge • 1 Geoffrey Way • Wayne, NJ 07470 ·USA

Manufacturer • Maquet Critical Care AB • Röntgenvägen 2 SE-171 54 Solna • Sweden • +46 (0)10 335 73 00

www.getinge.com

