



The most fragile of lives deserve advanced personalized ventilation

Servo-n - the versatile ventilator to help neonates breathe, sleep and grow



Every neonate is unique. Now you can personalize the treatment.

Help them breathe, sleep and grow

As a NICU professional, you deserve the optimal tools to help tiny neonates, breathe, sleep and grow. Creating a calm, caring environment and finding just the right level of respiratory support, without over- or under-assist, is a delicate balance.¹ That is why, for the past 30 years, Getinge has constantly refined and optimized its Servo ventilators to provide advance respiratory care for your most fragile patients.

Avoid patient-ventilator asynchrony

Packed with one-of-a-kind therapy modes, Getinge Servo-n® allows you to avoid patient-ventilator asynchrony by continually assessing the baby's own physiology^{2,3,4} - every step of the way. As a result, you can personalize your respiratory treatment^{5,6} for each and every baby, helping to protect their lungs, brain and other developing organs.^{7,8,9}

A versatile neonatal solution

Whether it's invasive or non-invasive ventilation, HFOV or NAVA, Servo-n has all the ventilation modes you need to deliver high-end neonatal care, including a unique therapy (NAVA) for tailored respiratory treatments. In short, the kind of baby-friendly personalized ventilation your tiny patients deserve to get a good start in life.



One advanced ventilator. Many flexible treatment options.

How many neonatal ventilators do you have in your NICU right now? One for conventional ventilation? Another for HFOV? Yet another device for Nasal CPAP and High Flow therapy? While it's helpful to have options on hand, changing ventilators and patient circuits on tiny babies can jeopardize continuity of care. Servo-n solves this issue with an all-in-one solution for baby-friendly mechanical ventilation.

30 years of supporting demanding NICUs

Based on 30 years of close collaboration with neonatal professionals at hospitals all over the world, we've continued to refine and improve our neonatal ventilatory solution. Having now supplied close to 200,000 Servo ventilators, we also know that saving infants born as early as 22 weeks GA requires special modes of ventilatory support to mitigate risks and secure protective care.

Advanced baby-friendly respiratory support

An advanced solution for neonates, the Servo-n comes with unique ventilatory modes, monitoring and diagnostic capabilities to improve comfort and lower the work of breathing.¹⁰⁻¹² This may reduce the number of babies that need intubation,^{13,14} decrease the amount of sedation and pain medication,^{11,15-17} provide lower pressures and enhance oxygenation.^{3,12,15,17,18} These benefits may all contribute to allowing babies to rest more, so their energy can be spent on growing and maturing, rather than just trying to breathe.



Personalized lung and brain protection – every step of the way



Assess

Diaphragm monitoring (Edi) aids you, in determining and providing the appropriate support the babies want and need,² while managing sedation^{11,15-17} and monitoring apnea of prematurity.^{4,19,20}

Prevent

If Nasal CPAP is not enough to support babies on non-invasive ventilation, NIV NAVA® offers a viable alternative. Studies show that it may increase the chance of NIV success²¹ and reduce the need for intubation^{8,9} and sedation.

Protect

With NAVA, you have the opportunity to personalize the ventilatory support and protect the neonates lungs. And if the babies need controlled ventilation, PRVC is there for you.²²

Rescue

Built-in HFOV allows you to quickly start the therapy without losing mean airway pressure or having to switch ventilators.

Wean

There are several modes to help you wean with Servo-n. Most interesting is NAVA, which will essentially allow the patients to wean themselves.^{21,23}



Design so intuitive you won't even think about it

Neonatal ventilation can be complex. The Servo-n is designed to simplify this. In every design detail - from the touchscreen, with its clear, intuitive graphic user interface, to the hot swappable batteries and ergonomic engineering - it helps to streamline your workflow. This way, you spend less time operating the ventilator and more time caring for your baby.

Neonatal staff often praise our light, compact design with the baby-friendly ladybug. Yes, it supports a calm NICU environment. But make no mistake: Servo-n has all the advanced design features you would expect of a modern neonatal ventilator. An intuitive touchscreen makes it very simple to learn and easy to use. Help menus, recommendations and prompts ensure that your staff can adapt to the needs of each baby and follow guidelines. The interface also simplifies knowledge sharing, making it easy to retrieve screenshots and recordings or connect to a larger screen.

360° rotatable screen

The screen can be rotated 360°, depending on your clinical requirements. You can also mount it to a pendant or shelf. Then just choose your viewing preference - from Basic, Advanced and Loops to Servo Compass®, Distance and Family View. Alarm management helps you manage and avoid undesired alarms.

Highly rated by experts

Neonatal and ICU professionals gave the interface a 6.8 out of 7 (98%) usability rating.²⁴ It also comes with six battery slots, two as standard, providing 60 minutes of charge, with up to 180 minutes using six - making it highly suitable for intra-hospital transport.

98%

usability rating by
ICU professionals²³

See and deliver what your baby needs – at every step

The more you know, the better they do. But assessing the optimal level of support for a neonate can be challenging. Although there are many types of respiratory monitoring, Servo-n is the only ventilator that lets you measure the electrical activity of the diaphragm (Edi) and display it on-screen. This vital sign of ventilation can help you select the level of support required – during any mode of ventilation.^{4,25-27}



Optimal support at any time

Edi helps you detect and monitor work of breathing and the presence or absence of breathing.^{4,14,19} This may help you identify what type of support is best for your patients without delay.²⁷ It can help you prevent intubation but also determine when it is necessary.^{8,9} Once you decide on the most appropriate support, you can utilize Edi to optimize it.

Avoid asynchrony and disruptions

By comparing Edi with the pressure curve, you can identify patient-ventilator asynchrony, such as wasted efforts and delayed triggering.^{5,6} In addition, the Edi minimum can indicate if the diaphragm relaxes between breaths and helps to prevent derecruitment of alveoli during expiration.²⁸ Monitoring the diaphragm can also help you tailor caffeine treatment,²⁹ sedation,³⁰ kangaroo care³¹ and ideal resting positions.³² It may even be valuable in discovering disruptions in the respiratory drive and to help determine extubation readiness.³³

The neonatal Edi catheter has tiny electrodes that pick up signals originating in the brain's respiratory center and transmitted via the phrenic nerve to the diaphragm.

Assess growth and maturity

Edi allows you to trend and monitor the respiratory pattern and apnea. This will help you determine maturity and identify severe apnea that could otherwise lead to bradycardia or desaturation.³⁴



The Edi signal is displayed in the lower part of the screen.



Prevent intubation with our unique non-invasive therapies

You want to avoid intubation of the baby. But how do you personalize non-invasive ventilation based on the baby's current condition? With Servo-n, you get a full suite of safe and gentle non-invasive ventilation modes, from Nasal CPAP to our unique NIV NAVA, to conventional NIV modes - all of which can be used without switching ventilators.

Starting with Nasal CPAP

Every clinician's goal is to deliver Nasal CPAP as early as possible when needed. In the delivery room, its use can decrease the number of babies that need intubation and the number of overall ventilator days.^{35,36} The CPAP on Servo-n provides a constant distending pressure with varying flow to support spontaneous breathing, which may decrease the work of breathing.³⁷

Moving to NIV NAVA

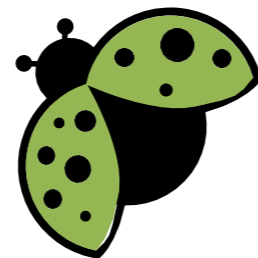
For some neonates (about 45%), Nasal CPAP is not enough.³⁸ This is when NIV NAVA can help. It uses the neonate's own diaphragm activity to drive the ventilation. This mode is leakage independent and increases patient-

ventilator synchrony^{10,21,26,39} which may result in less sedation.⁴⁰ Airway pressures and blood gases normalize with lower work of breathing, indicating higher chances of Nasal NIV success and less time on ventilatory support.^{21,39,41,42}

Clinical experience of Turku University Hospital

Fewer intubations with Nasal CPAP and NIV NAVA, among other ventilation modes, have proven useful for Professor Liisa Lehtonen, MD, Head of the Division of Neonatology at Turku University Hospital in Turku, Finland. She and her team have been conducting research into ways to optimize the long-term outcomes of preterm infants.

"We now see improved sleep and average weight gain, decreased exposure to painful procedures and pain medication, decreased risk of hyperventilation, fewer infections and less inflammation."^{43,44}



Professor Liisa Lehtonen, MD
Turku University Hospital, Turku, Finland



Personalize your lung and brain protection – with every tiny breath

The sooner your babies can be stabilized, the faster they can be weaned and recover. Your ability to achieve this will depend as much on your expertise as a NICU professional as on having access to advanced tools. Servo-n, with NAVA, PRVC, Automode, High Flow therapy and more, allows you to personalize the treatment for better outcomes.

Neurally Adjusted Ventilatory Assist (NAVA)

NAVA is superior in supporting spontaneous breathing in neonates, targeting poor compliance and poor blood gases, without a higher pressure setting that is often seen in other modes. When babies are on this mode, they tend to choose lower pressure and tidal volumes with improved compliance and synchrony, improving their blood gases and oxygenation.^{5,6} NAVA allows the neonates to regulate their own ventilation, limiting the risk of over- or under-assist. NAVA also lowers the work of breathing, increases comfort which may reduce the need for sedation. This may allow for more sleep and greater energy for growth and maturation.

Pressure Regulated Volume Control (PRVC)

PRVC is a volume-targeted mode that automatically adapts the inspiratory pressure to account for changes in lung mechanics. Separated regulation of controlled and assisted breaths reduces tidal volume swings and ensures low driving pressure, even when the patient starts to trigger the ventilator.

Automode

Automode supports smooth and safe patient transitions between controlled and supported ventilation. It seamlessly shifts between triggered and controlled breaths during irregular breathing - all without alarms and with an adjustable apnea time.



Protecting the brain

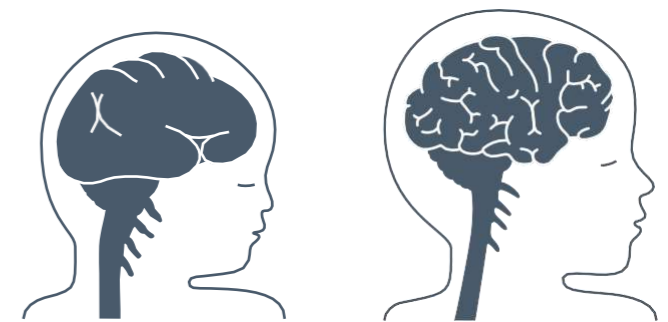
- Reduced risk of hyper- or hypo-ventilation since neonates self-regulate their blood gases^{12,28,45,46}
- The potential for improved duration and quality of natural sleep, thanks to improved ventilator-patient synchrony, comfort and breathing variability^{3,4,10-12}
- Less exposure to analgesics and sedatives minimizing the potential neurologic damage from these medications^{2,11,15-17}
- Indications for decreased length of stay in the ICU^{14,15,42}

Lowering pressure

The trend shown illustrates a neonate that was switched from SIMV to NAVA, resulting in an immediate drop in pressure. The baby is actively using his diaphragm, which lowers the pressure and allows him to recruit his own lungs with sighs.

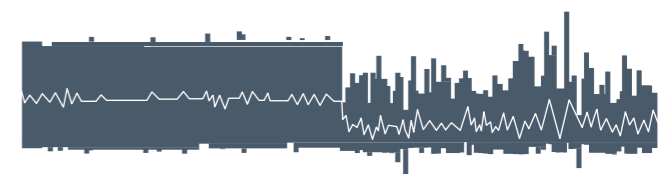
Improving comfort

Compare pressure control with NAVA below. NAVA's support is so sensitive the baby can breathe as she wants and needs with proportional assist. This improves synchrony and comfort and may allow the baby to spend energy on growing rather than fighting the ventilator.

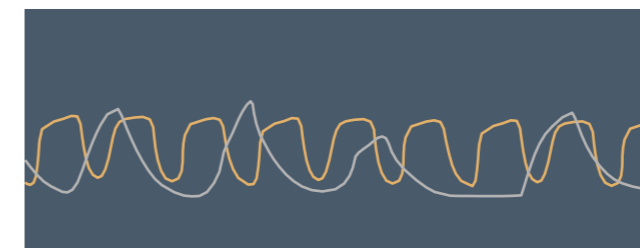


26 weeks GA

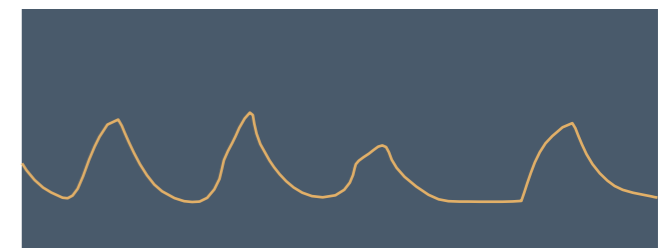
38 week GA



Switch from SIMV to NAVA (pressure curve trend)



SIMV, pressure curve (yellow) with Edi overlay (white)



Pressure curve in NAVA



Built-in high-frequency oscillatory ventilation with a difference

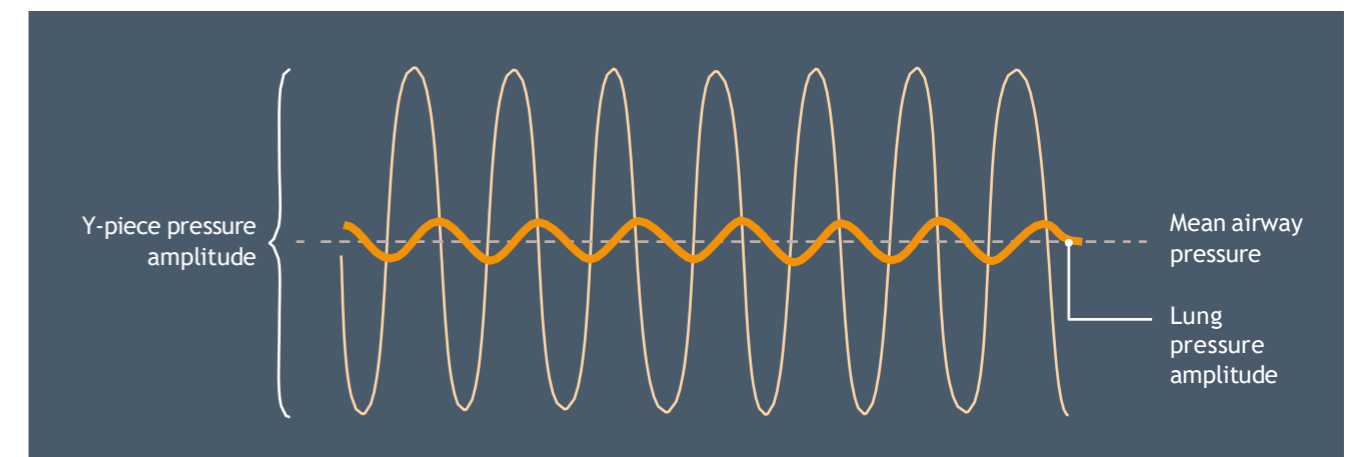
If your preterm infant is not responding to conventional mechanical ventilation or is in an acute, critical or poor state of health, it's good to know you've got a built-in HFOV mode on your Servo-n. This can be potentially life-saving in situations where seconds count, since you don't need to hook up a separate bulky HFOV unit.

High Frequency Oscillatory Ventilation (HFOV)

When conventional mechanical ventilation is not enough, HFOV can improve ventilation and oxygenation with minimal barotrauma.⁴⁷ HFOV delivers a small, yet precise, tidal volume at high frequency. It can give your patients a quick CO₂ washout and provide ventilation for pre- and full-term babies with just a switch from a conventional mode, reducing the stress on you and your patients. It can also be delivered with a volume target option, which helps reduce high frequency tidal volume fluctuation and lowers the incidence of out-of-target PCO₂.⁴⁷

Unique inertia-based HFOV concept

The Servo-n HFOV concept is different. Instead of just pushing in gas, it relies on the inertia of air in the patient circuit when the pressure at airway opening is modified rapidly, combined with very rapidly responding inspiratory valves and high-flow capability. A transducer rate of around 2,000 times per second is achieved using special microprocessor-controlled valves. The unique design with rapidly responding and synchronized inspiratory and expiratory valves results in active expiration and may facilitate low work of breathing.⁴⁸



The unique inertia-based HFOV concept on Servo-n relies on rapidly moving valves that push in gas during inspiration and then pull it out during expiration, helping to reduce work of breathing and encourage spontaneous breathing.

Personalized weaning on the path to better outcomes

Your ultimate goal is to encourage spontaneous breathing and gently ease the baby off ventilation entirely. Since each baby will be different, Servo-n helps you personalize this process to meet their individual weaning requirements, from invasive to non-invasive ventilation (NIV PC, Nasal CPAP and High Flow therapy) and beyond - on the same ventilator.

Assessing the readiness of weaning with Edi

The Edi signal can be an invaluable tool for you to assess and help predict the likelihood of successful weaning.

It is possible to follow the patient's progress and assess when assist is no longer necessary.^{25,27,33} When on CPAP and High Flow therapy or after all support has been removed, the patient's respiratory recovery can still be evaluated with the Edi signal.

Weaning from the start of ventilation

Servo-n supports weaning from every step of ventilatory treatment. PRVC automatically adjusts the peak pressure, achieving the set tidal volume based on compliance.

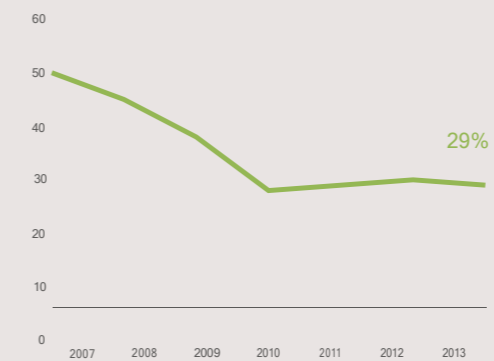
Applying NAVA in weaning

Spontaneous breathing with NAVA and NIV NAVA allows the diaphragm to work unhindered at the appropriate level. As the respiratory muscle improves and the disease subsides, the patients will essentially wean themselves. This can be observed by the decrease in amplitude of the Edi signal and a maintained tidal volume. You can further reduce the risk of re-intubation thanks to the leakage independence of NIV NAVA. This mode also allows for many types of interfaces that can be applied more comfortably.



The Toledo Hospital journey towards better outcomes

Reduced death and morbidity in neonates by 40%



Survival without morbidity increased by 40%



Decrease chronic lung disease by 70%



Reduction in median length of stay by 9 days



Dr. Howard Stein, MD, FAAP, at the Toledo University Hospital in Toledo, Ohio, USA, says there are a number of alterations to thank for his patients' improvements – PICC line reduction and non-invasive ventilation strategies, such as CPAP and NIV NAVA, to name a few. The neonates included in the data are below 1500 grams with no cardiac surgery and no ECMO.^{46,49}

Respiratory Monitoring

Edi monitoring, Y sensor, Servo Compass®, Open Lung Tool trends, CO₂ analyzer

Non-invasive modes

Nasal CPAP, NIV NAVA, NIV PC, NIV PS, High Flow therapy

Invasive modes

HFOV, PC, PRVC, VC, SIMV modes, Bi-Vent/APRV, Automodes, PS/CPAP, VS, NAVA

Intuitive touchscreen

360° rotation, 6 viewing modes, on-screen guides and prompts

Battery backup power

6 slots for hot swappable batteries (2 come as standard)

Expiratory cassettes

Interchangeable, with ultrasonic flow sensor

Ergonomic mobile cart

With optional drawer, support arm, Y piece holder, and gas cylinder restrainers for intra-hospital transport, etc.

Baby care

Miniflow patient interface, leakage compensation, integrated Aerogen nebulizer, Heliox therapy

Lockable wheels

Swivel castors enable 360-degree wheel rotation

Maximize uptime and boost your efficiency to lower cost of ownership

The Servo-n is safe, easy to use and cost-efficient to maintain. From flexible service agreements and baby-friendly consumables to interchangeable plug-in modules and HL7 connectivity, you get a complete, cost-efficient solution for pediatric and neonatal patients. All designed to protect your investment.

Wide range of accessories and consumables

You can choose from a wide range of lightweight and comfortable NICU-designed consumables that are all tested and approved for use on Servo-n. This includes everything from active and passive humidifiers and filter options to special catheters, nebulizers, interfaces, face masks and tubing. If your hospital has other Servo ventilators, you'll be glad to know that Servo-n shares many of the same components and interchangeable patient cassettes. This helps to improve efficiencies and drive down maintenance costs.

Effective, integrated nebulizer

In particular, our range of Aerogen® nebulizers offers intermittent or continuous use without affecting breathing. Easy and effective, they can be refilled during operation with a broad range of pharmaceuticals and controlled and monitored directly from your screen. Studies show that radioaerosol deposition into the lungs is significantly higher

with Aerogen®, a vibrating mesh design, versus traditional jet nebulization.⁵⁰

Preventive service agreements

With over 240 service centers worldwide, we keep in close touch with our NICU customers, supporting you with service agreements to maximize the long-term value of your investments. Our Getinge Care package offers four different levels of support, ensuring that your Servo-n is always delivering peak performance. Just ask us for details.

Less maintenance and more uptime

Finally, our Servo-n has few parts to clean and is built for simplified maintenance based on top-quality components. Should you require support, our skilled service technicians and sales staff, many of whom have worked in clinical neonatal care, are always on hand to support you, making sure you get original parts and the right warranties.

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