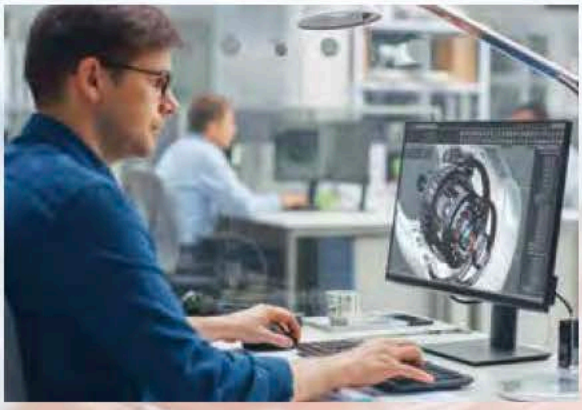
Design Keys for Next Generation Medical Equipment

Advanced Motion Control Solutions
for Current & Future Medical Needs

Allient
CONNECTING what matters

Gain the Cutting Edge in the Medical Industry

Medical equipment for patient care, mobility, lab analysis, preventive screening and more demand precision, noise reduction and reliability, and often times they won't be built with off-the-shelf motion technology. To develop advanced, differentiated solutions, you need high-performance, custom motion control products and the engineering expertise to optimize them for your application.



Experience + Vision in Medical Applications

Allient's decades of experience developing innovative medical motion control, drive, motor, and feedback solutions gives us a unique perspective and level of expertise not found in other suppliers. The result for you is quicker development cycles, an overall reduction in system cost and more robust, higher performing medical equipment.

Design Collaboration for Innovation and Speed-to-Market

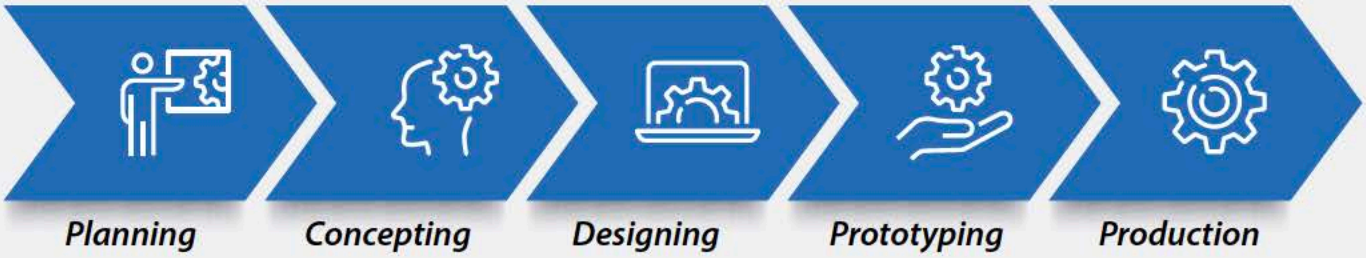
We tailor our engineering process to ensure we fully mesh with your team on the motion control aspects of your design. What's more, Allient is known in the industry for our willingness to develop customized solutions to help ensure our customers' objectives are met.

We Are Committed to Your Success

Our team hits the ground running at our first meeting.
We understand time-to-market is critical, so we streamline every step of the design process to fit your time constraints. Our engineers can travel to your facility, work side-by-side with your team, and quickly provide prototypes. And knowledgeable support is always just a phone call away.

Let us help transform your ideas into the best, most advanced medical solution on the market!

Our Proven Process Works



Development starts with requirements discovery, when our Class A team of design engineers works directly with your engineers to determine FIT and do a needs analysis. Your performance and mechanical requirements dictate our design approach and platform choices.

Leveraging our standard platform designs allows for quick-turn prototypes for 'proof of concept' while our team works in parallel to deliver production-intent designs that are fully tested to meet your specific application requirements. We use Model Based Design and Analysis, and critical quality tools like Design, Validation, Plan, and Reporting (DVP&R) and Pre-Production Parts Approval Process (PPAP) to ensure that the highest quality standards are met with the goal of zero defects in delivered products. With ISO 13485 certified production facilities, we continue to provide medical devices and related services that consistently meet customer and applicable regulatory requirements.

Supply Chain Management for Maximum Efficiency

With design and prototyping underway, our supply chain experts determine the best way to procure materials for your product in order to meet budget and on-time delivery.

Our established global supply chain enables us to engage top suppliers and ensure the component quality of the product we deliver to you.

Experience Matters — Our People & Technology Make the Difference

Slotless Motors

Patented design slotless motors for medical applications. Ideal for surgical hand tools, dental instruments, and surgical robot systems.

Allied Advantages:

- Patented winding design enabling double the performance vs competitive motors
- Near-zero cogging torque for smooth operation with minimal vibration
- Rated for 1000+ autoclavable cycles
- High-speed capability of up to 100,000 RPM
- Equipped with Rare Earth magnets to maximize torque output
- Special bearing and gearbox lubrication, along with high-performance laminations and high-speed ball bearings for extended life
- 20% cooler running, 20% longer life
- Gearheads in multiple ratios to increase torque

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Brushless Direct Drive Torque Motors and Part Sets

High performance housed and frameless brushless torque motors. Ideal for surgical robots, medical fluid pumps, nuclear imaging equipment, prosthetics and more.

Allied Advantages:

- High output torque at low speed eliminates mechanical backlash and lost motion
- Low cogging torque for smooth precise 360-degree rotation
- Large clear hollow shaft, enabling the passage of material through the motor center
- Available with integrated electronics, including hall sensors, hollow shaft encoders and mated drives
- Distributed or concentrated single-tooth windings & laminated stators

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Brushed and Brushless DC Gearmotors

Exceptionally designed integrated geared solutions. Ideal for positioning control on exam tables, patient beds, surgical microscopes, laboratory analysis equipment and more.

Allied Advantages:

- Right Angle, Planetary (epicyclic) and Parallel Shaft PMDC Gear Motors
- Designed with lifetime lubrication
- Choice of helical or spur designs for optimized noise and torque transfer
- In-house analysis tools to optimize geartrain and bearings per application.

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Brushless Servo Motors

Housed (NEMA) and frameless brushless servo motors. Ideal for robot base, shoulder and joint axes, along with multi-axis positioning systems found on nuclear imaging equipment, rehabilitation equipment and much more.

Allied Advantages:

- Optimization of windings and rotor designs for high efficiency, and extremely low cogging and torque ripple (<2%)
- Up to a 35% shorter motor compared to other servo motors on the market
- Optimized bearing system for low noise and long life, even at elevated temperatures
- Multiple feedback options able to meet virtually any positioning requirement, including resolver (standard), incremental encoder, SSI absolute encoder (up to 32-bit), Hiperface®, or Hiperface® DSL

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Meet our Controlled Motion Specialists — Allied Motion's engineers possess expertise in the key technologies critical to medical equipment motion control: advanced motion controls, drive electronics, frameless and housed brushless motors, and high precision feedback devices. Some technology examples are featured here. Customized and even clean-sheet solutions are developed in over 80% of our engagements with medical industry customers. We won't offer our customers standard-only choices when a custom design is clearly needed.

Powered Wheel Drives and Transaxles

Electric powered traction units ideal for medical mobility equipment such as patient transport equipment, powered wheelchairs and scooters, and surgical robot bases.

Allied Advantages:

- Choice of either PMDC brush or brushless DC motors – with or without integrated drive electronics
- Epicyclic gearing for high gear reduction and space savings
- Optimized gear geometry maximizes life and minimizes noise and vibration
- Alternate gearing materials for low Noise, Vibration and Harshness applications
- Modular mounting of motor and wheels for flexibility in design
- Capable of zero turning radius for precise maneuvering
- Hardened steel gears for exceptional durability
- Lifetime lubrication to reduce maintenance
- Rated for platform weights up to 1000 lbs.

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Brushless DC Motors with Integrated Smart Electronics

Brushless DC motors with integrated controllers. Ideal for torque, speed and/or position control applications, including patient beds, tables, surgical robot arm towers and seat adjustment.

Allied Advantages:

- Patented sensorless brushless technology
- Integrated controllers eliminate the wiring/cabling between these two elements as is normal in traditional, separate motor and drive combinations
- Torque and power density up to 40% better than brush DC motors
- Control networks like CAN can be directly integrated into the motor
- High power density for performance
- Minimum size and lighter weight
- Eliminates need for brush maintenance and no commutator wear for longer motor life

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Motor Drives

AC Servo, Brushless Servo, and Sensorless Brushless motor drives and controllers. Ideal for high performance plug-and-play solutions

Allied Advantages:

- Robust, patented sensorless speed control of brushless motors provides performance exceeding even conventional Hall commutated drives
- Designed to mate perfectly with our servo motors and torque motors, creating high performance plug-and-play servo solutions
- Available in both standard and custom-designed drive assemblies, which are integrated into our motor-drive series.
- Communication and command interfaces offered ranging from Ethernet to EtherCAT, CANopen over CAN, Modbus RTU, USB UART, to traditional ±10 V

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Power Wheelchair Control Systems

Control systems for power wheelchairs and motorized scooters. Safely and accurately control speed and seat positioning via touchscreens, joysticks, dials, buttons and toggle controls.

Allied Advantages:

- Standardized product platforms capable of being highly tailored to customers needs
- 24V single and dual channel controller solutions
- A range of joystick-based user controls are available from compact designs through to more advanced controls with touch screen technology
- Gyro and accelerometer sensors can be added to optimize driving performance or angular control of actuated components
- Standardized mounting and connector sets reduce operational costs
- Wireless LiNX Access programming tools are available for PC, iOS and Android (Q2 2020 release)

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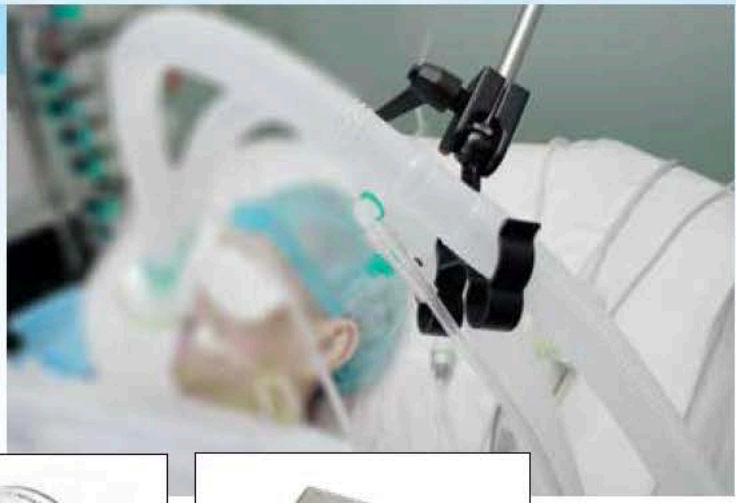
Medical Applications — Allient At Work

Patient Breathing Equipment



Air delivery systems for medical applications require precise, reliable pump solutions to accurately control pressure, flow and audible noise.

Allient's brushless DC motors and high-performance sensorless motor drives offer pump applications small size, long life, high torque density motor speed control, while being highly dynamic to accurately follow patient breathing rhythms.

- Anesthesia Breathing Systems
- CPAP Machines
- Respirators
- Ventilators

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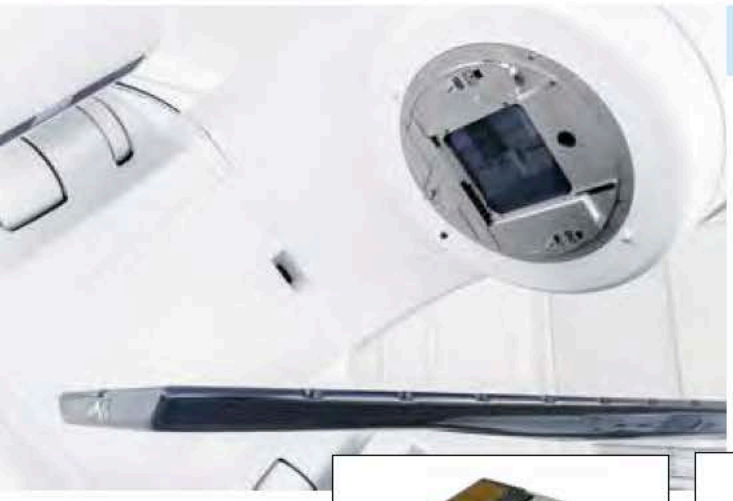
Brushless DC Motors

Sensorless Brushless Motor Drives



Cancer Screening & Oncology

Today's oncology equipment requires precise, reliable motion control for the screening and treatment of cancer patients.

Allient's housed and frameless brushless torque motors, encoders and planetary gearmotors provide the precision motion control and feedback required in mammography cancer cell screening and radiotherapy systems.

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Custom Motor-Encoder

Brushless DC Planetary Gear Motors

Medical Fluid Pumps

Fluid delivery systems for medical applications require precise, reliable pumps to accurately control flow, pressure and volume.

Allient's brushless servo motors, servo drives and brushless DC motors with integrated electronics and gearing provide reliable, quiet, long-service life motor solutions that are ideal for any type of medical fluid pump device:

- Blood Transfusions
- Cooling System Pumps
- Heart & Lung Machines
- Syringe Pumps
- Urinalysis & Dialysis Machines

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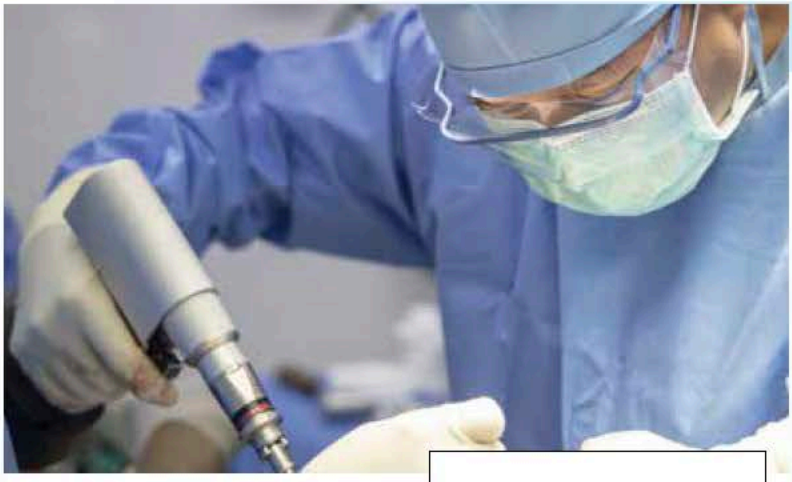
Frameless High Torque BL Motors

Brushless DC Motor with Spur Gearhead



Medical Hand Tools & Surgical Equipment

Powered medical hand tools used in dental and surgical applications require high performance motion control.

Allient's slotless miniature BLDC motors are sterilizable and provide high speed and high torque, with little to no cogging. Our patented technology enables these motors to deliver up to double the performance of equivalently sized motors.

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Near-Zero Cogging Slotless Motors with Autoclavable Gearboxes

Medical Applications — Allient At Work

Medical Microscopes & Imaging Cameras

Surgical and medical microscopes and imaging systems require precise positioning and control to adapt to the needs of the user.

Allient's high-torque brushless servo motors, housed direct drive brushless motors and encoders provide the motion control and feedback required to precisely position the various axes on the arm, and for the nano positioning required for height and lateral adjustment.

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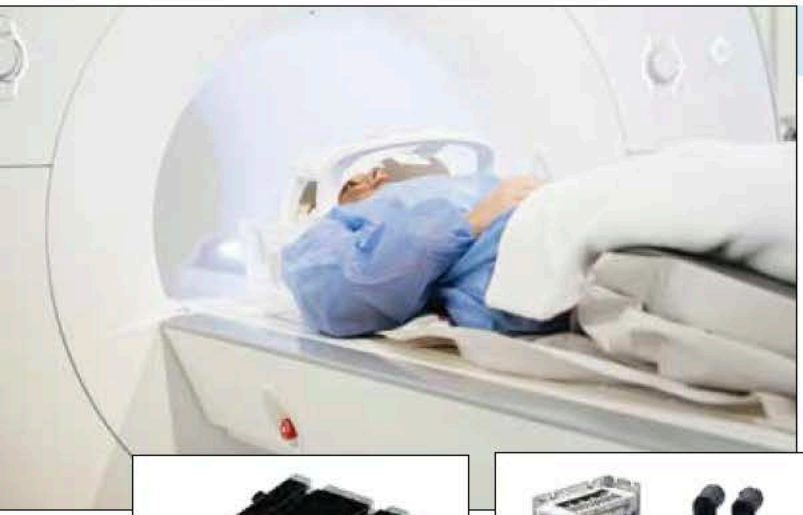
Planetary Gear Motors

Hollow Shaft Modular Optical Encoders



Housed NEMA Brushless Servomotors

Brushless Servo Motors with Drives

Nuclear Imaging

Some nuclear imaging systems use Anger cameras (photo scintillation imagers) to image radiopharmaceuticals in a patient. In positron emission computer tomography (ECT) or single photon emission computed tomography (SPECT), the cameras are revolved around the patient. The cameras also are translated radially to keep the cameras close to the patient's body. A fourth linear motion axis translates the entire gantry assembly horizontally for full-body scans.

Allient's housed NEMA brushless servomotors and our HeiMotion series of brushless servo motors and drives are an ideal choice for this application because of their high-performance capabilities, compact size, and unquestionable reliability and service life.

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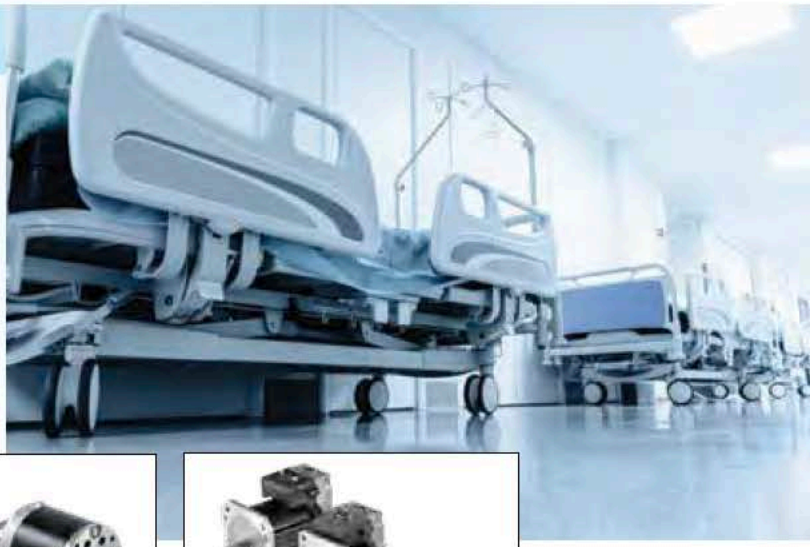
Patient Handling Equipment



Hospital beds, office exam tables, advanced operating tables and patient transport systems all require smooth, powerful and precise motion when moving or positioning a patient.

Allient's brushless DC motors with and without integrated electronics, advanced steering and traction solutions, along with our control systems provide precision control and positioning for height, depth, tilt and transporting of patients.

LEARN MORE

PMDC Brushed Motors

Brushless DC Motors with Integrated Electronics

Laboratory Analysis Equipment

Blood analysis requires a sequence of steps that if done manually are very time-consuming. An automated pipetting subsystem can speed up the analysis significantly. The subsystem must not only be fast but also accurate and smooth in handling the samples.

Allient's small CL series of coreless DC motors equipped with gearheads drive miniature leadscrews to withdraw or deposit precise amounts of fluid from or to the sample tubes. Quantum series servo motors power the X-Z mechanical translation system that precisely positions the pipetting system during operation.

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Coreless DC Motors with Gearhead

Housed NEMA Brushless Servomotors

Medical Applications — Allient At Work

Power Wheelchairs & Mobility Equipment

Medical mobility equipment such as power wheelchairs (tracked and wheeled) and scooters require dependable, quiet, long life motion control solutions.

Allient's brushed and brushless DC motors and gear motors, along with our traction and steering solutions and wheelchair control systems offer exceptional control, along with reliable, long-life operation in a variety of environments for these applications.

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Right Angle Shaft Gear Motors

Power Wheelchair Control Systems

Patient Rehabilitation & Advanced Prosthetics

The world of patient rehabilitation and prosthetics has seen significant technological advances in recent years. These devices demand precision control and feedback in order to achieve the levels of dexterity, sensitivity and sense of touch that is required.

Allient's high torque density motor kits (stator + rotor) and gear motors are ideal choices for the joints of such prosthetics and exoskeletons, assisting in providing rehabilitation patients the ability to recover quicker and more safely than ever before.

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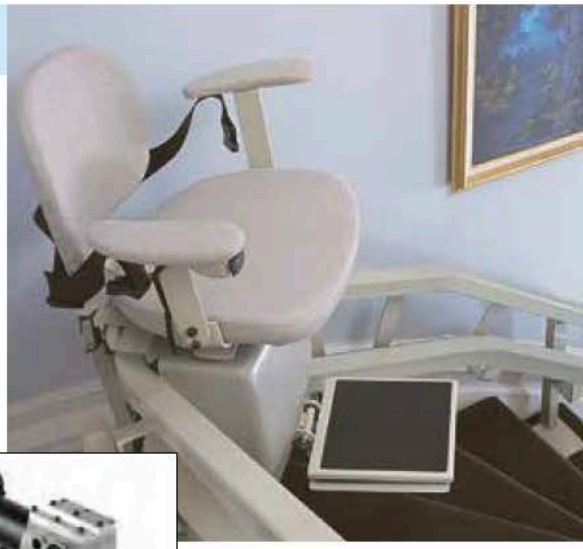
High Torque Density Frameless Brushless Motors

Stair Lifts



All powered medical access and mobility equipment, including stair lifts and elevator lifts, are expected to operate quietly and reliably over many years of numerous daily cycles. That's why the manufacturers of this type of equipment demand rugged, reliable motors that are also quiet and smooth to operate.

Allient's parallel-shaft and right-angle gear motors, equipped with PMDC or brushless DC motors, have been engineered into equipment like residential and commercial stair lifts applications to provide seat tilt functionality, speed control and movement along the rail.

LEARN MORE

Outer-Rotor Brushless DC Motors with Integral Drive Electronics

Right Angle Shaft Gear Motors

Surgical Robotics

Surgical Robots demand precise, quiet and smooth motion control. And they must perform exactly as the operator commands them to.

Allient's compact direct-drive joint motors and actuators, along with our precision gear motors and drive electronics are employed on the world's leading and innovative robotic surgery systems and applications, including:

- Surgical Robot Arm Systems
- Surgical Robot Control Consoles
- Advanced Patient Tables

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Frameless Outer-Rotor Brushless Motors

High Torque Frameless Brushless Servo Motors