

# Medical Application Solutions



**Allied Motion**

*Motion Solutions That Raise The Bar*

[www.alliedmotion.com](http://www.alliedmotion.com)



## MEDICAL APPLICATION SOLUTIONS from Allied Motion Technologies

Allied Motion products power a wide variety of medical devices and equipment. From rugged gearmotors for power wheelchairs to surgical hand piece motors to dialysis pumps, Allied Motion products are relied upon every day to deliver reliable performance for our medical products customers.

In *MEDICAL APPLICATION SOLUTIONS* we present a number of applications to illustrate how Allied Motion products provide innovative motion solutions for medical devices and equipment.

In addition, we include specifications for Allied Motion products that are particularly suitable for use in medical motion applications.

Contact our application engineering team to discuss your application requirements. We'll help you apply our products, and if needed show you how Allied Motion can develop a customized motion solution to meet your exact requirements.





## Medical Application Solutions

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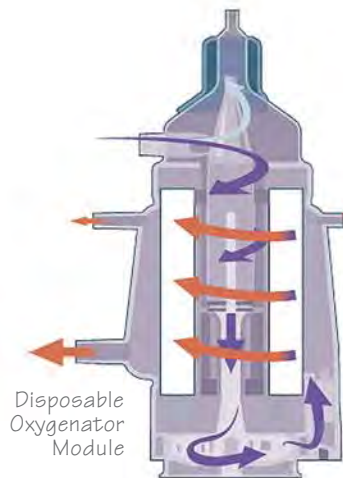


## Allied Motion Solutions: Customized to Meet Specific Requirements

### Cardiopulmonary Heart Bypass System

Allied Motion designed a magnetically-coupled brushless pump motor to drive a disposable integrated oxygenator module, the "heart" of this innovative heart bypass system.

The optimized low-voltage winding of the motor, a version of Allied Motion's Megaflux series, is driven by a custom-designed two-quadrant brushless drive module.



Custom Megaflux torque motor



ECM servo motor drive

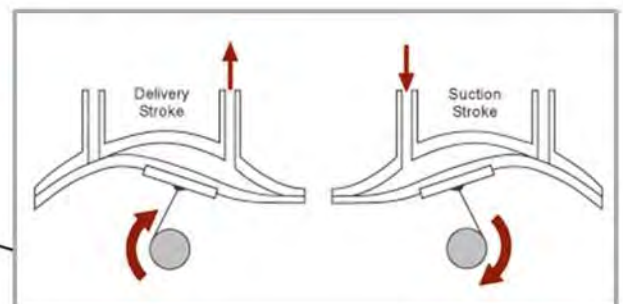
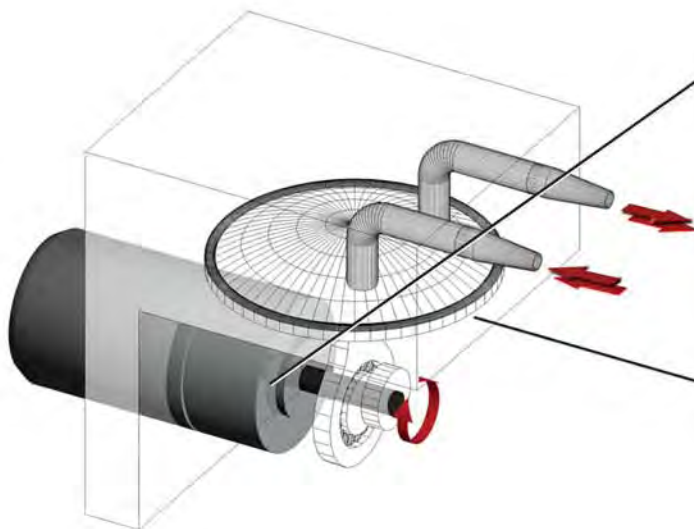
### Medical Diaphragm Pump

Medical diaphragm pumps, used to pump fluids and compress gases, benefit from the efficiency and smooth operation of Allied Motion's small brushless motors with integrated drive electronics.

Special bearing construction in Allied Motion's BL48 brushless motors easily handles the high pump loads in this application while achieving a minimum 10,000 hour service life.



BL48 brushless motor with integrated electronic drive



Diaphragm pump operating principle

# Allied Motion Solutions: Customized to Meet Specific Requirements

## Dialysis System

Patients with chronic kidney failure need hemodialysis (HD) therapy systems like the one shown here. Hemodialysis systems in turn rely on peristaltic pumps to smoothly and accurately control the flow of the patient's blood and the dialysis solution through the machine's dialyzer (artificial kidney).

The key to smooth, long-life, and reliable operation of peristaltic pumps as used in HD machines is the pump motor. Because of their efficiency, long service life, and reliability, Allied Motion's BL58 EB series brushless DC motors have been chosen for use in the HD system shown here, as well as for peristaltic pump applications in other types of medical equipment.



BL58 EB with spur gearhead



BL58 EB with gear pump



## Left Ventricular Heart Assist Device (LVAD)

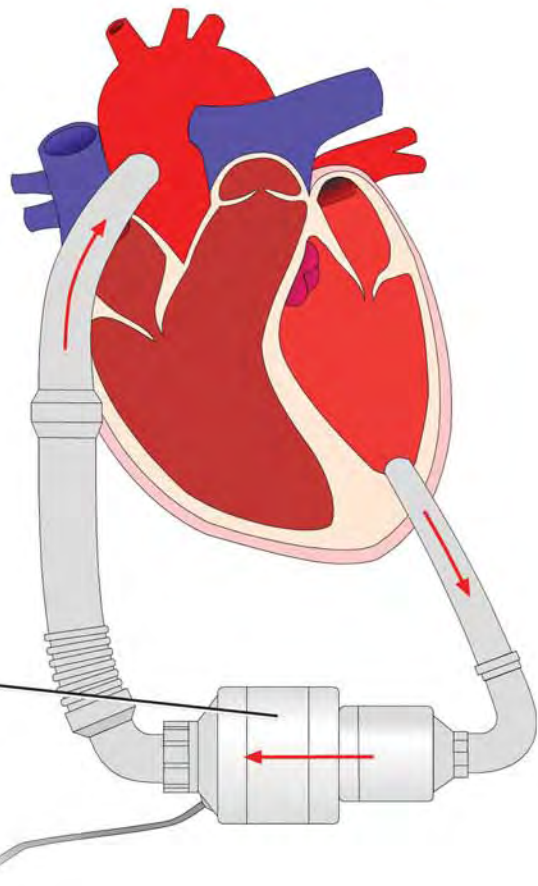
Left ventricular heart assist devices (LVAD) are essentially blood pumps developed to help assist the hearts of bridge-to-transplant patients and also for permanent support for end-stage heart failure patients.

In newer LVAD systems the pump is implanted in the patient, as the one shown here. This pump uses an axial flow design using a brushless DC torque motor. The pump is powered via a percutaneous connection to an external controller and battery packs, enabling the patient to be ambulatory.

Critical to the performance of advanced LVAD pumps are compact, highly efficient brushless motors, such as those designed by Allied Motion for LVAD applications.



Megaflux brushless DC torque motor



## Allied Motion Solutions: Customized to Meet Specific Requirements

### PAP Respiratory Ventilation

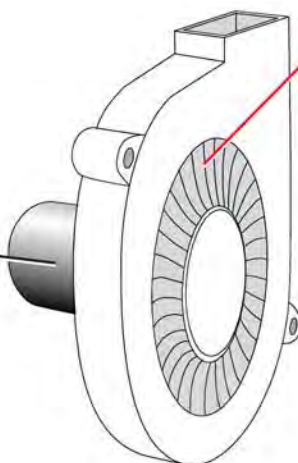
Positive airway pressure (PAP) respiratory ventilation is used to treat sleep apnea. All PAP systems (APAP, IPAP/EPAP) control a stream of compressed air to keep the patient's airway open so breathing is assisted, reducing or preventing apneas.

A key element of PAP machines is the air flow generator, basically a motor-blower that is controlled to generate precise pressure levels of air, typically in the range of 4 to 20 cm H<sub>2</sub>O.

Allied Motion's small, precision brushless DC motors such as the BL 21 EE shown here, are an ideal choice for PAP systems owing to their compactness, long life, and quiet operation.



BL21 EE brushless DC motor



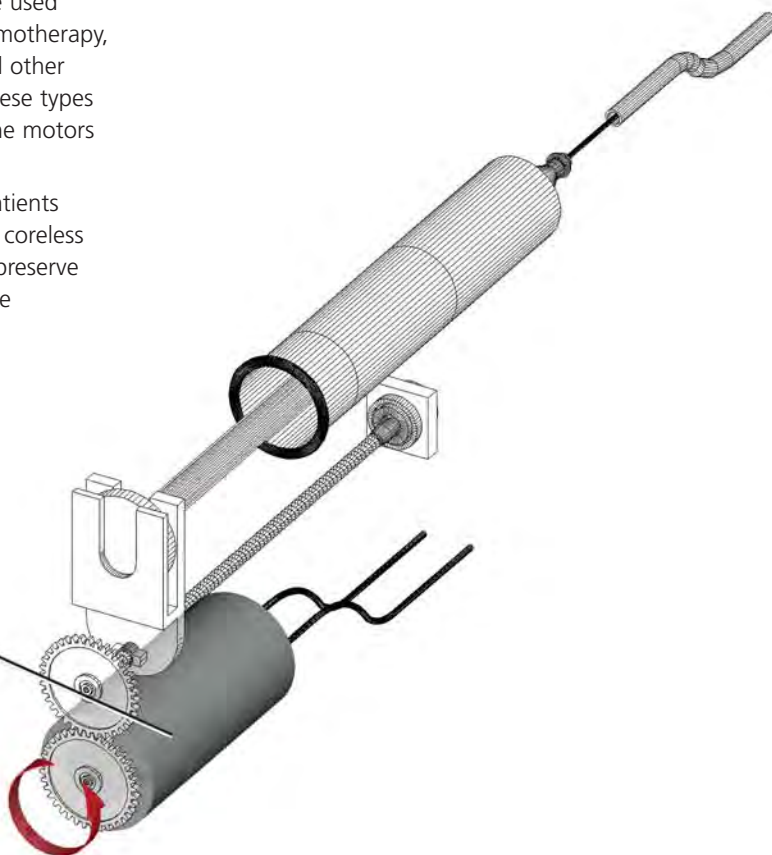
### Programmable Syringe Pump

Small portable and battery-operated syringe pumps are used extensively to administer infusions associated with chemotherapy, post operative and chronic pain control, antibiotics and other medications given parenterally. Typical flow rates for these types of syringe pump can range from 0.1 to 200 ml/h, so the motors used must have excellent speed controllability.

Miniaturization of these units for use by ambulatory patients requires reliable small motors like Allied Motion's CL29 coreless DC motors, which must be highly efficient in order to preserve battery life, which are highly efficient and help conserve battery power.



CL29 coreless DC motor  
with S30A gearhead



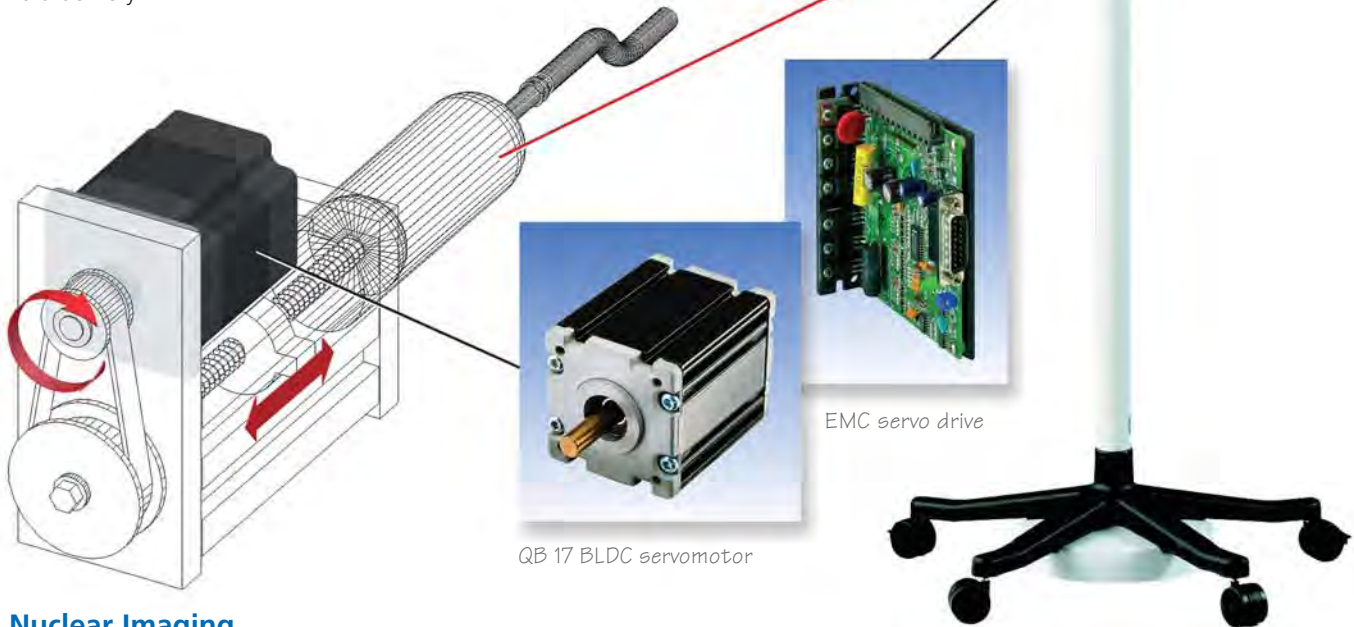


# Allied Motion Solutions: Customized to Meet Specific Requirements

## Angiographic CT Contrast Injector

Contrast injectors are essential accessories for modern CT scanners. They inject X-ray contrast fluid intravenously, which provides dramatic improvement in the overall quality of CT images of the circulatory system and many soft organs. The enhanced images enable more accurate diagnoses to be made.

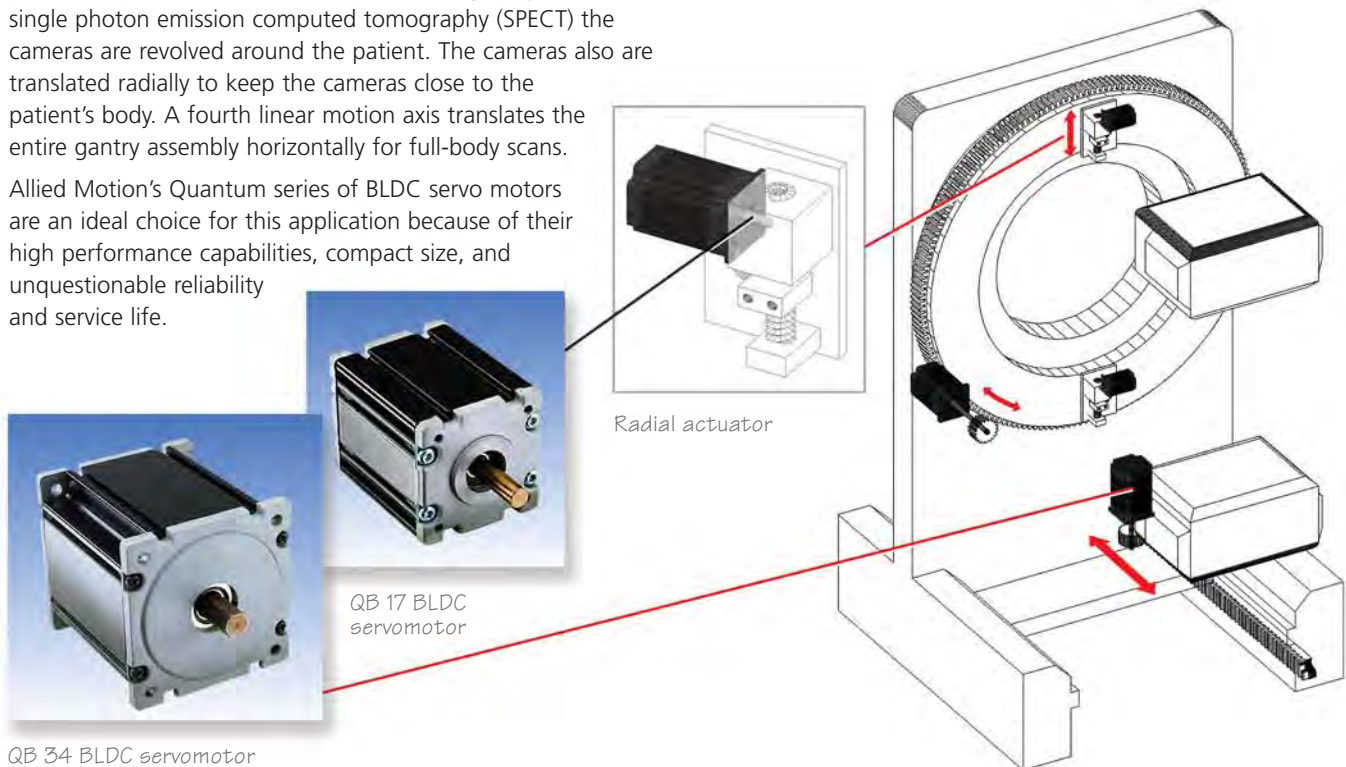
Allied Motion brushless servo motors and drives are used to precisely drive the injector piston to achieve smooth, accurate fluid delivery.



## 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.

Allied Motion's Quantum series of BLDC servo motors are an ideal choice for this application because of their high performance capabilities, compact size, and unquestionable reliability and service life.



## Allied Motion Solutions: Customized to Meet Specific Requirements

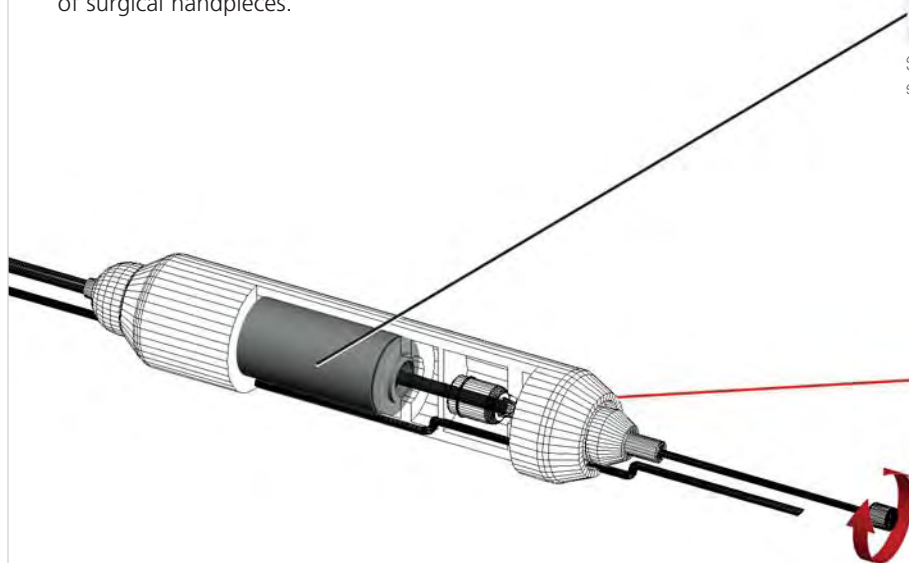
### Powered Surgical Handpiece

Small, light, efficient, high powered, well-balanced. These are extremely important characteristics of electric-powered surgical handpieces. In addition, surgical handtools must be rugged and reliable, and able to withstand hundreds of autoclave sterilization cycles.

Allied Motion's sizes 4 and 5 SLH slotless brushless DC motors are engineered specifically to meet the performance demands of surgical handpieces.



SLH high performance size 5 slotless BLCD motor



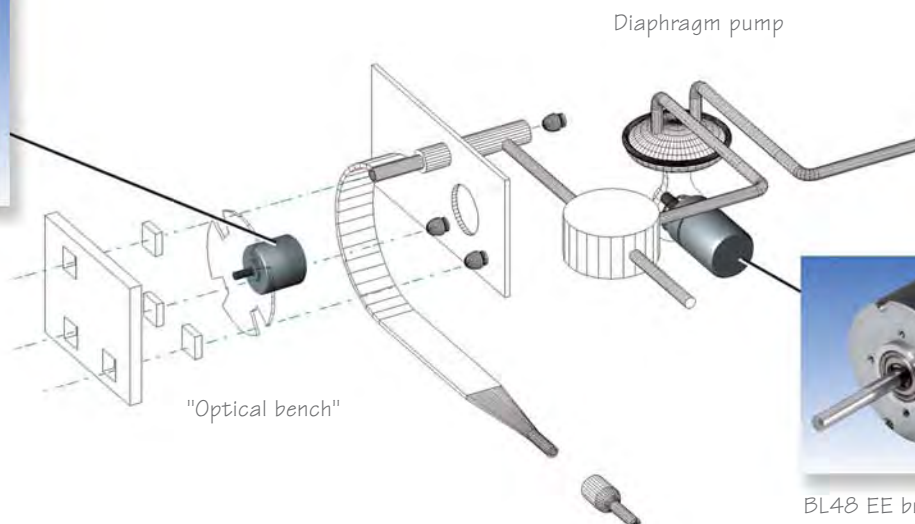
### Anesthesia Gas Monitoring System

Monitoring patient respiratory gas in surgery is critical for proper anesthetic administration. The heart of anesthesia gas monitoring systems is an "optical bench" and gas pump subsystem similar to that shown in the diagram.

Allied Motion supplies our small precision motors for use in AGM systems where accuracy, reliability and long life are critical concerns of system designers.



BL21 EE brushless DC motor



Diaphragm pump

"Optical bench"



BL48 EE brushless



# Allied Motion Solutions: Customized to Meet Specific Requirements

## Pharmacy Automation

It is estimated that every year approximately 770,000 people are injured or die from adverse drug events in North America. Many of those cases arise from human error in medication dispensing. Hence, the accuracy and higher efficiency afforded by automated prescription dispensing systems represents an enormous and real benefit to pharmacies, hospitals and patients alike.

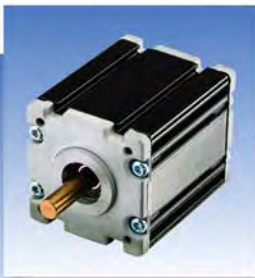
Because of their compact size, high performance and reliability, Allied Motion's servo motor and drive systems, and small coreless DC and BLDC motors are well-suited for powering automated medication retrieval and dispensing systems like the one shown here.



CL29 coreless DC motor



EMC servodrive



QB 17 BLDC servomotor



## Pipetting System for Automated Blood Analyzer

Blood analysis subjects samples to a sequence of steps that if done manually are very time-consuming. The fully automated pipetting subsystem shown here speeds the analysis. In this subsystem a set of pipettes is positioned to aliquot blood samples from primary test tubes and deposit them in secondary tubes. This subsystem must not only be fast but also accurate and smooth in handling the samples.

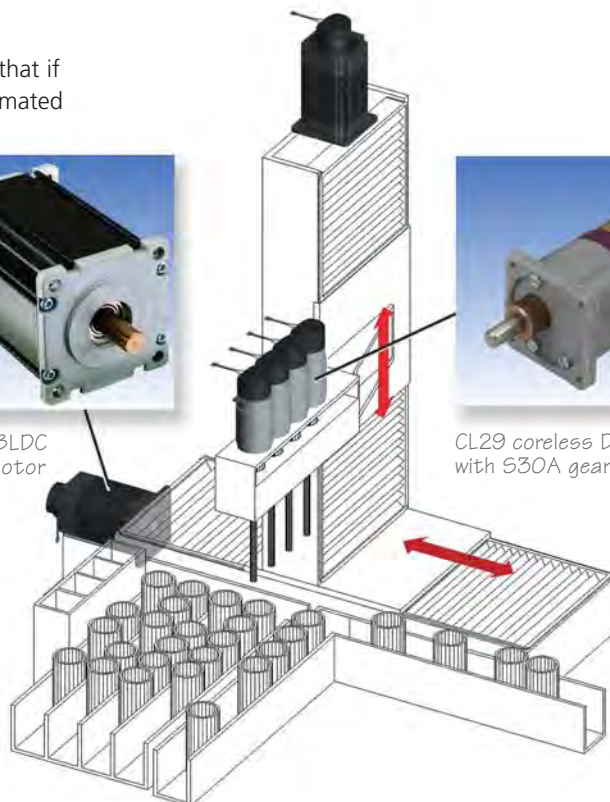
Allied Motion's small CL29 coreless DC motors with gearheads drive miniature leadscrews to withdraw or deposit precise amounts of fluid from or to the sample tubes, respectively. Quantum series servo motors power the X-Z mechanical translation system that precisely positions the pipetting system during operation.



QB23 BLDC servomotor



CL29 coreless DC motor with S30A gearhead



## Allied Motion Solutions: Customized to Meet Specific Requirements

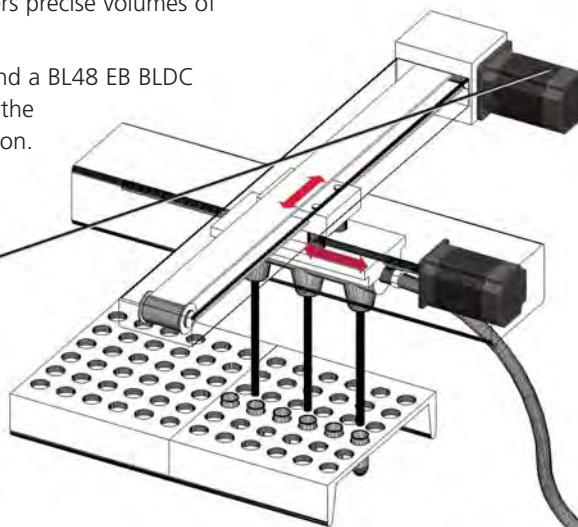
### Pharmaceutical Vial Filling System

Sterile filling of vials with medications, reagents, cytotoxic agents and other medical liquids requires automated filling systems like that shown here. An X-axis linear stage carries a Y-axis stage to quickly and precisely increment filler tubes over an array of vials. A peristaltic pump meters precise volumes of the fill liquid to the filler tube manifold.

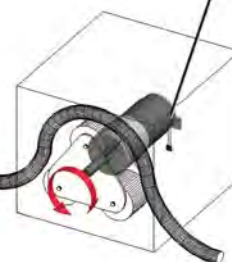
Allied Motion's Quantum servo motors and a BL48 EB BLDC pump motor proved to be well-suited to the requirements of this demanding application.



QB17 BLDC servomotor



BL48 EB brushless DC motor



Peristaltic pump

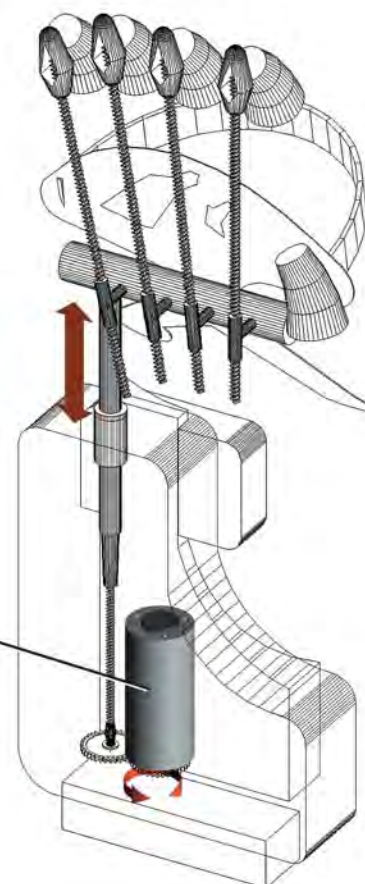
### Continuous Passive Motion (CPM) Finger Exerciser

Rehabilitation of joints and associated tendons can be expedited using motorized robotic devices that continuously exercise the affected digits. Such devices must be easy to use, lightweight, battery powered for ambulatory patients, and enable precise, controlled smooth movements.

The hand and finger exerciser shown here employs an Allied Motion CL40 coreless DC motor coupled with an efficient S38 spur reduction gearhead. The gearmotor drives a small telescoping leadscrew linear actuator, which reciprocally drives a glove-like assembly that holds the patient's hand. The result is smooth and continuous extension and flexure of the patient's joints.



CL40 coreless DC motor





# Allied Motion Solutions: Customized to Meet Specific Requirements

## Medical Mobility – Wheelchair Lift

Transporting and handling medical equipment is eased by specialized equipment designed for the purpose. An example is the mobile power wheelchair lift shown here.

Allied Motion's motors and gearmotors, such as the RA30 DC gearmotor used in this lift, provide trouble-free long-life service for durable medical equipment OEMs.



RA30 DC gearmotor



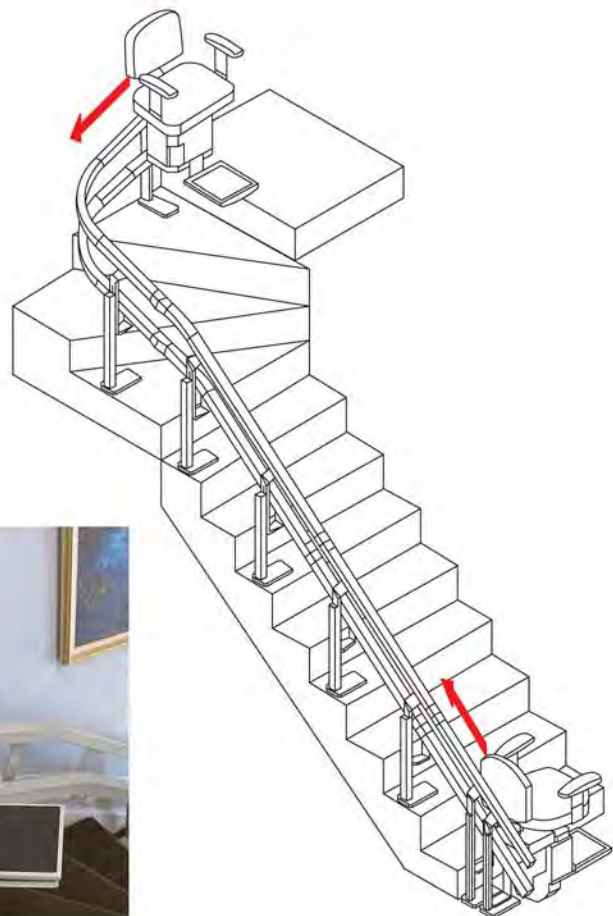
## Medical Mobility – Stair Lift

All powered medical access and mobility equipment like the stair lift shown here are expected to operate quietly and reliably over many years of hard, daily use.

That's why the manufacturers of this type of equipment demand rugged, reliable motor drives like Allied Motion's model PL30 parallel-shaft DC gearmotor.



PL30 DC gearmotor





## Allied Motion Solutions: Customized to Meet Specific Requirements

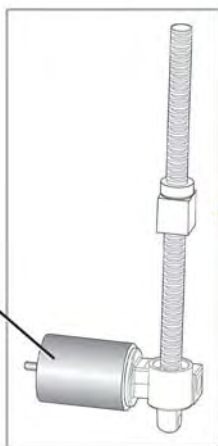
### Patient Handling Table

Being able to easily get onto an exam table increases the comfort of all patients during an exam, especially the elderly, the disabled, and children, helping the physician conduct a more thorough and accurate exam. A new generation of powered exam table shown here allows the patient to sit as in a chair. The table back is then lowered and the table base raised to the usual exam table positions.

Allied Motion's Endurance PJ series of DC motors power the back and base linear actuators in this new exam table, providing reliable, smooth, and quiet actuation of the table.



Endurance PJ PMDC motor



### Medical Mobility – Power Wheelchair

Allied Motion gearmotor power drives and transaxles provide dependable, long-life service for powered wheelchairs, as shown here, as well as scooters and other battery-powered medical mobility equipment.

Their overall ruggedness and "no-leak" gear boxes are two of the features of Allied Motion's gearmotors that set them apart from competition.



RA35 wheelchair DC gearmotor



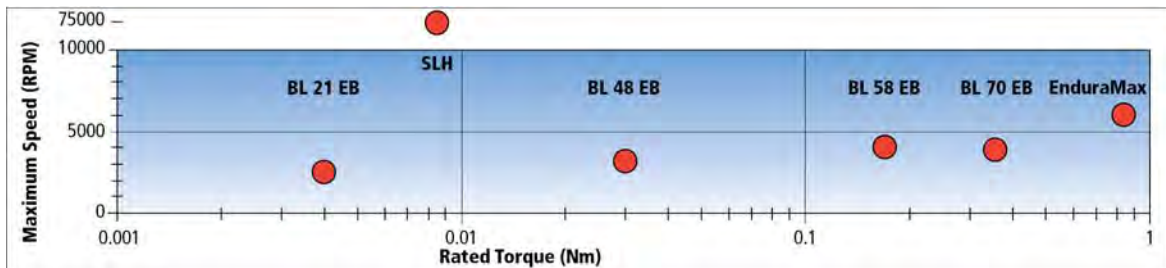
## Allied Motion Motors: With or Without Electronic Drives...



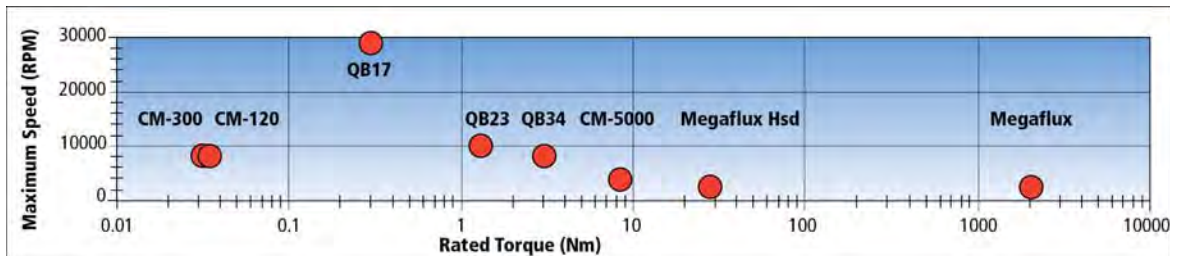
**Allied Motion's** know-how, experience, and products have been meeting the motion challenges of the medical industry for over 50 years.

### Motor Quick Select Guides

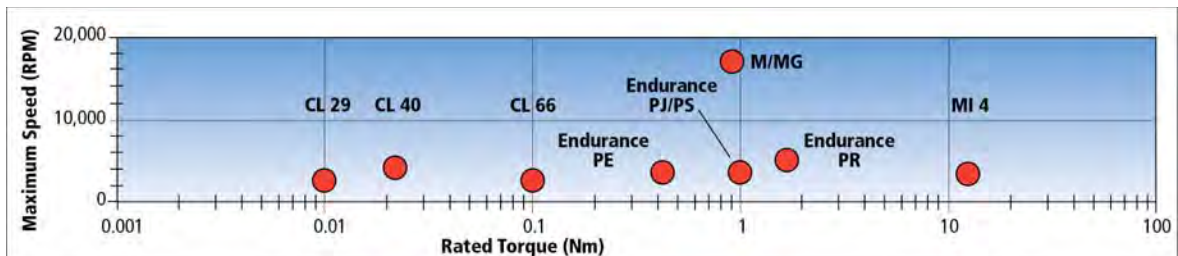
#### Brushless DC Motors



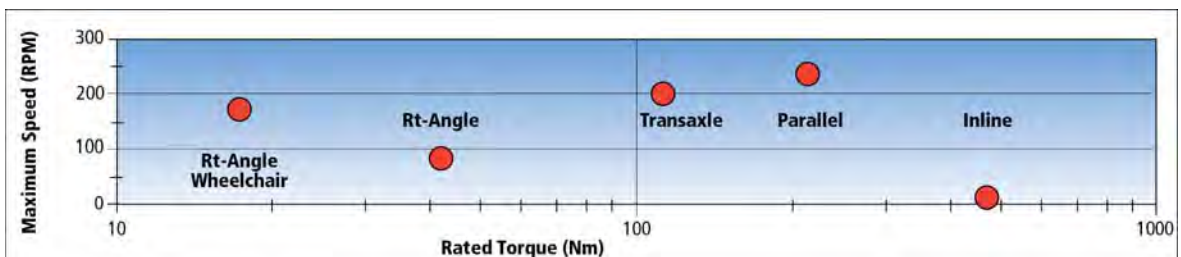
#### Brushless Servo & Torque Motors



#### PM Brush DC Motors



#### Gearmotors & Transaxles



\* Charts indicate maximum speed and maximum rated torque points for each motor or motor series.

## Allied Motion Motors: With or Without Electronic Drives...

### Brushless DC Motors

	Torque / Power <sup>1</sup>	Speed	Sizes	Voltages	Description
<b>SLH</b> 	1.2 oz-in (8.45 mNm) Stall: Up to 7.92 oz-in (56 mNm)	Up to 75000 RPM	Size 5 (0.5 in, 12.7 mm) dia.	24, 48 VDC	<ul style="list-style-type: none"> <li>Size 5 BLDC motors specifically designed for surgical hand pieces</li> <li>Double the performance of equivalently-sized competitive units</li> <li>Options include planetary gearhead and autoclavability</li> </ul>
<b>BL 21 EB</b> 	0.57 oz-in (4 mNm); 1.5 - 2 W	2500 RPM	0.945 in (24 mm) dia.	12, 24 VDC	<ul style="list-style-type: none"> <li>Small, high performance brushless DC motors with <b>integrated drive electronics</b> (EB models)</li> <li>EE models without integral drive electronics available</li> <li>Custom shaft, flange, and protection class</li> <li>Ideal for gearpumps, membrane pumps, peristaltic pumps, laser scanners, high performance fans and blowers, and document handling</li> </ul>
<b>BL 48 EB</b> 	3.1, 4.25 oz-in (22, 30 mNm); 8 - 12 W	3200 RPM	2.13 in (54 mm) dia.	12, 24 VDC	
<b>BL 58 EB</b> 	10.6 , 24 oz-in (75, 170 mNm); 35 - 50 W	2800 - 4000 RPM	2.68 in (68 mm) dia.	12, 24 VDC	
<b>BL 70 EB</b> 	30.5, 40.4, 50.3 oz-in (215, 285, 355 mNm); 85, 95, 110 W	3000 - 3800 RPM	2.72 in (69 mm) dia.	24, 42 VDC	
<b>EnduraMax BE</b> 	120 oz-in (846 mNm); 220 W	600 - 6000 RPM	3 in (75 mm) dia.	12, 24 VDC	

1. Continuous rating unless otherwise stated.



# Allied Motion Motors: With or Without Electronic Drives...

## Brushless Servo and Torque Motors

	Torque <sup>1</sup>	Speed	Sizes	Voltages <sup>2</sup>	Description
<b>Megaflux (Frameless)</b> 	1 oz-in to 1490 lb-ft (7 mNm to 2020 Nm)	Up to 2660 RPM (no load)	6.7 to 31.2 in (170 to 792 mm) dia.	150, 300 V	<ul style="list-style-type: none"> <li>Design optimization produces motors with industry-leading torque density</li> <li>High pole count maximizes torque output and rotational smoothness</li> <li>Up to 5-times the maximum speed of competitive units</li> <li>Up to twice the power density of competitive motors (measured by <math>K_m</math>) for maximum torque in the minimum space</li> </ul>
<b>Megaflux (Housed)</b> 	2.5 to 20.3 lb-ft (3.4 to 27.5 Nm)	Up to 2663 RPM	7.332 in (186 mm) dia.; (5.6 / 7.6 / 8.6 in axial length)	150, 300 V	<ul style="list-style-type: none"> <li>Integrated brushless torque motor, bearings, feedback, and housing</li> <li>Dual bearings for high load capacities: 227 kg (500 lb) normal load at 500 PRM with 5 yr. life</li> <li>Large through bore for air, water, or vacuum lines, optical beams, or electrical/signal wiring</li> <li>Options include up to 8192 PPR encoder, sealed housing to IP65, air bearing system</li> </ul>
<b>CM-5000</b> 	201 - 1192 oz-in (1.41 - 8.41 Nm)	Up to 4000 RPM	5.5 in OD x 2.5 in (140 mm OD x 65 mm)	12 - 300 V	<ul style="list-style-type: none"> <li>Direct-drive torque motor with 2 in. (50.8 mm) hollow shaft</li> <li>Integral digital or sine/cosine encoder for high resolution positioning applications</li> </ul>
<b>CM</b> 	CM-120: 1.6 - 4.8 oz-in (12 - 34 mNm)	Up to 8000 RPM	1.1 in sq. x 1.0 in (28 mm sq. x 25.4 mm)	12 - 48 V	<ul style="list-style-type: none"> <li>Compact brushless DC servo motors with integral encoder</li> <li>Designed for high precision positioning applications</li> <li>Integral high resolution encoder guarantees accuracy and repeatability within arc seconds</li> </ul>
	CM-300: 3.7 - 4.4 (26 - 31 mNm)	Up to 8000 RPM	1.5 in sq x 1.0 in (38 mm sq. x 32 mm)	12 - 48 V	
<b>Quantum</b> 	QB17: 11.5 - 43.5 oz-in (0.08 - 0.3 Nm)	Up to 29000 RPM	1.64 in (41.7 mm) sq.	24, 40, 130 V	<ul style="list-style-type: none"> <li>Standard NEMA 17, 23 and 34 sizes</li> <li>6-pole high-strength neodymium magnet rotor structure</li> <li>Custom winding, shaft, and connector designs to suit specific needs</li> <li>Frameless versions available for direct-drive applications</li> </ul>
	QB23: 51 - 182 oz-in (0.36 - 1.28 Nm)	Up to 10000 RPM	2.3 in (58.4 mm) sq.	24, 40, 130 V	
	QB34: 115 - 429 oz-in (0.81 - 3.03 Nm)	Up to 8000 RPM	3.42 in (86.9 mm) sq.	24, 40, 130 V	

1. Continuous rating unless otherwise stated.

2. Peak winding (bus) voltage

## Allied Motion Motors: With or Without Electronic Drives...






### Permanent-Magnet Brush DC Motors

	Torque / Power <sup>1</sup>	Speed	Sizes	Voltages	Description
<b>Endurance PE</b> 	10 - 60 oz-in (0.07 - 0.42 Nm); 22 - 150 W (1/4 HP)	Up to 3500 RPM	2.5 in (64 mm) dia.	12 - 48 VDC (fixed brush); 12 - 115 VDC (replaceable brush)	<ul style="list-style-type: none"> <li>• Cost-effective solution for commercial applications like mobile HVAC systems, pumps, and electric actuators</li> <li>• Reliable, custom-designed 2.5", 3.0", 4.0" diameter PMDC models rated up to 1 HP</li> <li>• Computer-aided design and testing (environmental, noise, vibration) ensure optimum performance</li> <li>• Long-life fixed brushes or replaceable brushes (PE series)</li> <li>• Self-aligning bronze sleeve bearings or sealed ball bearings</li> <li>• Options include EMI/RFI suppression, thermal overload, stainless shaft, class H winding, wash-down (IP56) rating, special-coated housing</li> <li>• Custom shaft, flange, and mounting</li> </ul>
<b>Endurance PJ / PS</b> 	20 - 140 oz-in (0.14 - 1 Nm); 44 - 181 W (1/3 HP)	Up to 3600 RPM	3.0 in (76 mm) dia.	12 - 48 VDC	
<b>Endurance PR</b> 	80 - 240 oz-in (0.56 - 1.69 Nm); 186 - 373 W (1/2 HP)	Up to 5000 RPM	4.0 in (101 mm) dia	12 - 48 VDC	
<b>CL 29</b> 	1.42 oz-in (10.1 mNm); 3 W	2400 - 2700 RPM	1.14 in (29 mm) dia.	6 - 24 VDC	<ul style="list-style-type: none"> <li>• Coreless PMDC motors ideal for medical devices, small pumps, mirror/prism drives, and ticket/currency dispensers</li> <li>• Coreless design for smooth, cog-free operation, no iron loss, and high efficiency</li> <li>• Precious metal commutation system in CL29 and CL40 models for low starting voltage</li> <li>• Low inertia rotor for rapid response</li> <li>• Optional spur or planetary gearhead with ratios up to 900:1</li> <li>• Options include incremental or absolute encoder, tachometer, ball bearings (CL29, CL40), custom windings and leads/connectors</li> </ul>
<b>CL 40</b> 	3.12 oz-in (22 mNm); 7 W 3.68 oz-in (26 mNm); 12 W	2600 - 3050 RPM 4100 RPM	1.57 in (40 mm) dia.	6 - 30 VDC	
<b>CL 66</b> 	14.2 oz-in (100 mNm); 25 W	1800 - 2540 RPM	2.6 in (66 mm) dia.	12 - 36 VDC	
<b>M, MG Series</b> 	Up to 130 oz-in (0.92 Nm) stall	Up to 17000 RPM	0.8, 0.875, 2.05 in (20, 22, 52 mm) dia.	4 - 50 VDC	<ul style="list-style-type: none"> <li>• AlNiCo magnet design for low torque fluctuation with varying temperature up to 100 °C</li> <li>• 7-bar commutator for low ripple</li> <li>• Gearhead ratios from 4.5:1 up to 8538:1 for optimized power transfer</li> <li>• Precision balance option for smoothness at high speed</li> </ul>
<b>MI 4</b> 	Up to 110 lb-in (peak) (12.5 Nm)	Up to 3300 RPM	4 in (102 mm) dia.	Up to 100 V	<ul style="list-style-type: none"> <li>• Rugged high torque DC motor</li> <li>• High slot count assures smooth operation and high power density</li> <li>• 33-bar commutator minimizes torque ripple</li> <li>• Optional encoder for position /speed feedback data</li> </ul>

1. Continuous rating unless otherwise stated.


# Allied Motion Motors: With or Without Electronic Drives...

## Gearmotors and Transaxles

	Torque / Power <sup>1</sup>	Speed	Sizes	Voltages	Description
<b>IL (Inline)</b> 	Up to 350 lb-ft (475 Nm) stall; up to 1.5 kW (2 HP)	Up to 1300 RPM; up to 500:1	4.75 in (121 mm) dia.	12 - 230 VDC	<ul style="list-style-type: none"> <li>2- or 4-pole brush PMDC or universal inline planetary 2 HP gearmotor</li> <li>Hardened steel gearing capable of handling extreme loads</li> <li>Replaceable brush design eases field service</li> <li>Custom mounting plates available to meet specific application needs</li> </ul>
<b>PL (Parallel)</b> 	Up to 1900 lb-in stall (215 Nm); up to 560 W (3/4 HP)	Up to 235 RPM; up to 93:1	3.6 in (91 mm) dia.	12 - 230 VDC, 230 VAC/VDC (universal)	<ul style="list-style-type: none"> <li>2- or 4-pole brush PMDC or universal parallel-shaft 3/4 HP gearmotor</li> <li>Multi-stage gearbox configurations enable a wide range of gear ratios</li> <li>Die cast aluminum gearbox maximizes strength, minimizes weight</li> <li>Custom shaft, leads, connectors to meet specific application needs</li> </ul>
<b>RA (Right Angle)</b> 	Up to 380 lb-in stall (42 Nm); up to 560 W (3/4 HP)	Up to 85 RPM; up to 90:1	3 in (76 mm) dia.	12 - 230 VDC, 115 VAC (rect.)	<ul style="list-style-type: none"> <li>2- or 4-pole brush PMDC right-angle 3/4 HP gearmotor</li> <li>Light weight, high strength die cast gearbox with multiple mounting options</li> <li>Fully sealed motor and gearbox for leak-free operation</li> </ul>
<b>RA (Wheelchair)</b> 	153 lb-in (17.2 Nm); up to 3/4 HP	Up to 170 RPM (177 RPM no-load); up to 12 mph	3.6 in (91 mm) dia.	12, 24, 48 VDC	<ul style="list-style-type: none"> <li>4-pole PMDC 3/4 HP gearmotor expressly designed for power wheelchairs (2-pole available)</li> <li>Fully sealed motor and gearbox for leak-free operation</li> <li>Designed for long, quiet service life</li> <li>Holding brake and release, connection, and mounting for specific chair designs</li> </ul>
<b>TA (Transaxle)</b> 	Up to 1000 lb-in (113 Nm); up to 890 W (1.2 HP)	Up to 200 RPM (250 RPM no-load); up to 15 mph	Up to 1500 lb (680 kg) axle weight	12 - 180 VDC	<ul style="list-style-type: none"> <li>2- or 4-pole brush PMDC 1.2 HP transaxle</li> <li>Die cast aluminum components minimize weight</li> <li>Hardened steel and powdered metal gears increase durability and life</li> <li>Differential action insures smooth cornering capability</li> </ul>

1. Continuous rating unless otherwise stated.



## Gearbox Solutions

	Gearbox Types	Gear Ratios	Speed Ranges	Description
	• Parallel Shaft (spur/helical)	5:1 up to 1103:1	1.5 up to 800 RPM	<ul style="list-style-type: none"> <li>Custom-designed gearboxes to exactly fit application needs</li> <li>Up to 10000 lb-in (1130 Nm) output torque</li> </ul>
	• Planetary (spur/helical)	3:1 up to 800:1	2 to 1300 RPM	<ul style="list-style-type: none"> <li>Custom shaft designs including thru shaft</li> <li>Hardened alloy steel gearing designs insure long service life</li> </ul>
	• Right-Angle (precision worm)	5:1 up to 120:1	10 up to 800 RPM	<ul style="list-style-type: none"> <li>Durable plastic gearing designs for smooth quiet operation</li> <li>Hardened precision ground worm (right angle models)</li> </ul>





# Allied Motion Drives and Encoder Solutions

## Drives

	Power	Current	Voltage	Type	Description
<b>Brushless DC</b> 	Up to 4.4 kW cont., 9.6 kW peak	5, 10, 15 Arms cont, 10, 20, 30 Arms peak	55 up to 330 VDC; 40 up to 240 VAC (BDH series)	BDI: Torque control; BDV: Velocity control; BDE: gear follower up to 4096:1 BDH: Torque or velocity control; VAC fed	<ul style="list-style-type: none"> <li>Four-quadrant, brushless DC (trapezoidal) servo drives for torque, velocity, or (geared) follower control of brushless DC motors</li> <li>High rated bandwidth and conversion efficiency</li> <li>Fully protected</li> <li>Integral regeneration control (33 W)</li> <li>Isolated signal stage (BDH)</li> </ul>
<b>Integrated Motor-Drives</b> 	Up to 220 W cont. (custom designs with power level to requirements)	Up to 15 Arms cont, 20 Arms peak (custom designs with current level to torque/power requirements)	1.5 up to 300 VDC as required by application	Brushless DC; Hall-effect or sensorless commutation	<ul style="list-style-type: none"> <li>Motors with integrated drive electronics minimize application wiring and component count</li> <li>Single- and four-quadrant, brushless DC drive designs</li> <li>Choice of Hall-effect or sensorless commutation</li> <li>Optional encoder for speed and positioning applications</li> </ul>

1. Continuous rating unless otherwise stated.

## Encoders

	Model	CPR <sup>1</sup>	Type	Size	Description
<b>Incremental</b> 	CP-200	Up to 1024	Sine-cosine	1.8 in (45 mm) sq. modular/kit	<ul style="list-style-type: none"> <li>Cost-effective kit encoder with A, B, index in sine or digital formats</li> <li>HHC model extends resolution to as great as to 500000 lines per rev</li> </ul>
	CP-250/270	Up to 1024/2048	Sq. wave		
	CP-250-HHC	Up to 125000	Sq. wave		
	CP-300/500	Up to 2500	Sine-cosine	1.5 in (39 mm) sq.	<ul style="list-style-type: none"> <li>300 series: shaft + bearing</li> <li>500 series: 0.5 in (12.7 mm) hollow shaft</li> </ul>
	CP-350/360/550/560	Up to 4096	Sq. wave		
	CP-800/900	Up to 6000	Sine-cosine	2.5 in (64 mm) dia.	<ul style="list-style-type: none"> <li>800 series: 3/8 in (9.53 mm) shaft + bearing</li> <li>900 series: 0.5 in (12.7 mm) hollow shaft</li> </ul>
	CP-850/870/950/970	Up to 16384	Sq. wave		
	CP-850-HHC/950-HHC	Up to 1.25 M	Sq. wave	2.5 in (64 mm) dia.	
	CP-3700	Up to 9000 Up to 36000	Sine-cosine Sq. wave	3.75 in (95 mm) dia.	<ul style="list-style-type: none"> <li>Large-bore high resolution encoder</li> <li>2.0 in (50.8 mm) hollow thru shaft</li> </ul>
	CP-3750-HHC	Up to 2.250 M	Sq. wave		
<b>Absolute</b> 	CP-350-08/550-08GC	8-bit absolute	Gray code	1.5 in (39 mm) sq.	<ul style="list-style-type: none"> <li>300 series: shaft + bearing</li> <li>500 series: 0.5 in (12.7 mm) hollow shaft</li> </ul>
	CP-350-10/550-10GC	10-bit absolute	Gray code		
	CP-850-12GC/ CP-950-12GC	12-bit absolute	Gray code	2.5 in (64 mm) dia.	<ul style="list-style-type: none"> <li>800 series: 3/8 in (9.53 mm) shaft + bearing</li> <li>900 series: 0.5 in (12.7 mm) hollow shaft</li> </ul>
	CP-850-14GC/ CP-950-14GC	14-bit absolute	Gray code		

1. CPR: Cycles Per Revolution; quadrature multiplication can be applied to increase effective line count by 4-times (not applicable to absolute models).

## Customer Assistance with Allied Motion Products...



**Allied Motion's** application engineering and customer service teams are available to assist you with all aspects of the selection and purchase of our products, including:

- Detailed product information and documentation
- Application analysis assistance
- Standard product selection
- Product customization and options guidance
- Specification development for special-designed products
- Price quotations
- Ordering and order status information
- Logistics assistance

For assistance with your medical application, call or email us using the contact information below.

### North America

	<i>Application Category</i>	<i>Typical Applications</i>
<b>(888) 227-9292</b> <b><a href="mailto:inquiry@alliedmotion.com">inquiry@alliedmotion.com</a></b>	<b>Medical Mobility, Therapy, and Fitness</b>	<ul style="list-style-type: none"><li>• Power wheelchairs and scooters</li><li>• Wheelchair/scooter lifts and elevators</li><li>• Patient beds/patient handling</li><li>• Treadmills/powered rehabilitation exercisers</li><li>• Physical therapy equipment</li><li>• Motorized medical/dental/hospital furniture</li></ul>
<b>(800) 856-0017</b> <b><a href="mailto:inquiry@alliedmotion.com">inquiry@alliedmotion.com</a></b>	<b>Medical Equipment and Instrumentation</b>	<ul style="list-style-type: none"><li>• Motorized surgical handtools</li><li>• Medical gas/liquid pumps</li><li>• Heart-lung machines</li><li>• Respiratory equipment</li><li>• X-Ray and nuclear medicine equipment</li><li>• Automated life sciences equipment</li><li>• Automated diagnostic instruments</li><li>• Pharmacy automation equipment</li></ul>

### Europe

<b>+31 (78) 621 9940</b> <b><a href="mailto:inquiry@alliedmotion.com">inquiry@alliedmotion.com</a></b>	<b>All Categories</b>	<ul style="list-style-type: none"><li>• All as above</li></ul>
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