

Compact Wheel Drives for Electric Vehicles

Combining servo motor, gearing and wheel design makes system integration easy

The Servo Wheel™ combines a brushless DC motor with planetary gears in a lightweight, aluminum housing to provide a compact solution for vehicle control. The Power Wheel's unique design makes system integration easy. You no longer have to purchase the motor, gearhead, wheel, electronics and bracket from different sources. Parker does all of the work for you. From component sourcing to actual assembly, Parker engineers designed the Power Wheel with your application in mind. All you have to do is bolt it up and go!



Single-Piece Construction Motor Shaft

The first stage's planetary section sun gear is integrated into the single-piece construction motor shaft, to provide higher reliability in a compact package.



Planetary Gears

The planetary input stage provides a first pass reduction that is capable of carrying high torques with high input speeds in a small package.

Features

Brushless DC motor amplifiers designed for common motion profiles in battery powered vehicles

- 12, 24, 36 and 48 volt operation
- Current and temperature feedback control for safe, reliable operation
- Multiple input architectures for easy communication with higher-level controllers and navigation systems

Permanent magnet brushless motors

- High efficiency for longer run times between battery charges
- Greater power to size ratio for a compact package
- Integral hall sensors for motor TRAP commutation
- Long life and maintenance free-operation
- High input speeds in excess of 10,000 RPM
- No internal sparking – safe in explosive environments
- Low EMI, eliminating the need for heavy shielding

Planetary gears provide high torque-carrying capability in a small package

The gears are built into the hub of the wheel, making the package compact and lightweight. This design also increases the radial load-carrying and shock loading capacity of the entire system.

Polyurethane tires are ideal for applications in hospitals, schools, and airports – any place requiring non-marking materials. This material is also ideal for high load carrying applications like material handling.

Integrated Output Stage

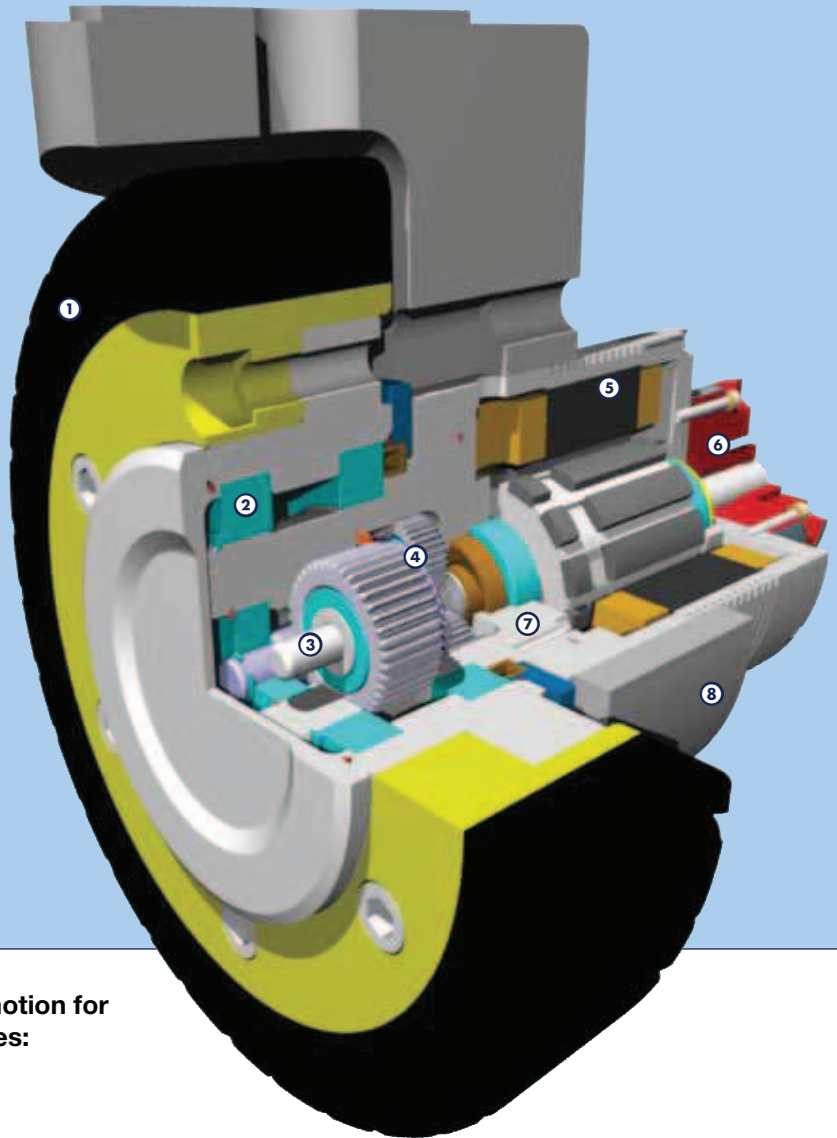
The second stage planetary's unique design uses two planets for higher efficiency. Built entirely into the wheel, it utilizes an otherwise wasted area to provide a compact, space-saving package. Two large diameter bearings support the weight, protecting the gears from shock loading and dramatically increasing the radial load carrying capacity of the wheels.





Design Features

- ① Polyurethane antistatic tires
- ② High load capacity ball bearings to accommodate heavy vehicle loads
- ③ Single piece stainless steel gears and shaft for high quality and reliability
- ④ Dual stage planetary gear design delivers high torque and high efficiency in a compact package
- ⑤ Brushless motor provides efficient, maintenance-free power
- ⑥ Encoder/brake extension for optional add-ons
- ⑦ Sealed unit for operation in hostile or wet environments
- ⑧ Aluminum alloy housing reduces weight and provides optimum heat dissipation



Servo Wheel™ Drive System provide motion for small, battery-powered, electric vehicles:

- Automated cleaning equipment
- Health care equipment
- Robotic & material handling equipment
- AGV's



Performance Specifications*

Wheel Diameter (inches)	Ratio	High Speed Motor Performance Models				High Torque Motor Performance Models			
		Max Speed (mph)	Wheel RPM @ Max Speed	Continuous Torque (in -lb)	Peak Torque	Max Speed (mph)	Wheel RPM @ Max Speed	Continuous Torque (in -lb)	Peak Torque
6	20:1	3.5	196	150	450	3.0	168	340	1020
	24:1	2.7	151	180	540	2.5	140	408	1224
	30:1	2.3	128	225	675	2.0	112	510	1530
	36:1	2.0	112	270	810	1.5	84	612	1836
8	20:1	4.5	189	150	450	3.8	159	340	1020
	24:1	3.6	151	180	540	3.0	126	408	1224
	30:1	3.0	126	225	675	2.5	105	510	1530
	36:1	2.5	105	270	810	2.0	84	612	1836

* All models have a maximum load capacity of 1000 lbs. Performance based on 24 volt operation. Other performance requirements may be met with a different power supply or choice of different motor winding. Please contact Parker Application Engineering to inquire about these options.

Motor Constants**

		High Speed Motor Performance Models	High Torque Motor Performance Models
Stall Current Continuous	Arms	22.2	41.5
	Amps DC	27.1	50.8
Peak Current	Arms	70.0	131.1
	Amps DC	85.7	160.6
Voltage Constant	V/rad/s	0.0377	0.0515
	Vrms/krpm	2.79	3.81
Torque Constant	Nm/Arms	0.046	0.06
	Oz*in/Amp DC	5.33	7.29
Resistance	ohm	0.070	0.033
Inductance	mH	0.1	0.1
DC bus Voltage	VDC	24	24
Winding Thermal Resistance Ambient Case	°C/W	1.68	1.02
		0.56	0.32
Temperature Ambient Max Winding	°C	25	25
		155	155
Thermal Time Constant Motor Winding	minutes	22	28
		1.7	2.8
Rotor Shaft Viscous Damping Dynamic Friction	Nm/krpm	0.0021	0.0068
	Nm	0.0060	0.0193
Number of rotor magnet poles		8	12

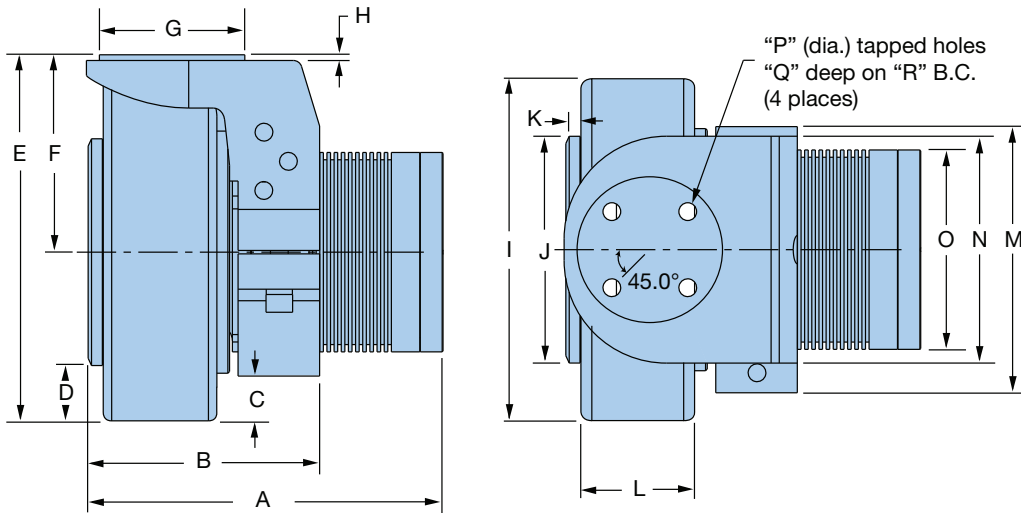
** Motors used as standard are Parker K064100-3D motor for High Speed Models and K089100-1D winding for High Torque Models.

DX Series Servo Wheel™



Dimensions

Free 3D Solid Models and drawings available at parkermotion.com



Wheel Diameter (in)	Motor Performance	A* Without Brake		B		C		D		E		F	
		mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
6	High Speed	158.75	6.25	104.1	4.1	20.3	0.8	25.4	1.0	165.1	6.5	87.9	3.46
	High Torque	175.26	6.90	104.1	4.1	20.3	0.8	25.4	1.0	165.1	6.5	87.9	3.46
8	High Speed	158.75	6.25	104.1	4.1	45.7	1.8	50.8	2.0	218.4	8.6	116.8	4.60
	High Torque	175.26	6.90	104.1	4.1	45.7	1.8	50.8	2.0	218.4	8.6	116.8	4.60

* Consult factory for increased length with encoder and on brake option.

Wheel Diameter (in)	Motor Performance	G		H		I		J		K		L	
		mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
6	High Speed	65.0	2.559	2.54	0.1	152.4	6.0	101.1	3.98	6.86	0.27	50.8	2.0
	High Torque	65.0	2.559	2.54	0.1	152.4	6.0	101.1	3.98	6.86	0.27	50.8	2.0
8	High Speed	65.0	2.559	2.54	0.1	203.2	8.0	101.1	3.98	6.86	0.27	50.8	2.0
	High Torque	65.0	2.559	2.54	0.1	203.2	8.0	101.1	3.98	6.86	0.27	50.8	2.0

Wheel Diameter (in)	Motor Performance	M		N		O		P		Q		R	
		mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
6	High Speed	118.6	4.67	101.1	3.98	88.9	3.5	7.94	5.16	25.4	1.0	47.98	1.889
	High Torque	118.6	4.67	101.1	3.98	88.9	3.5	7.94	5.16	25.4	1.0	47.98	1.889
8	High Speed	118.6	4.67	101.1	3.98	88.9	3.5	7.94	5.16	25.4	1.0	47.98	1.889
	High Torque	118.6	4.67	101.1	3.98	88.9	3.5	7.94	5.16	25.4	1.0	47.98	1.889

Gearmotors

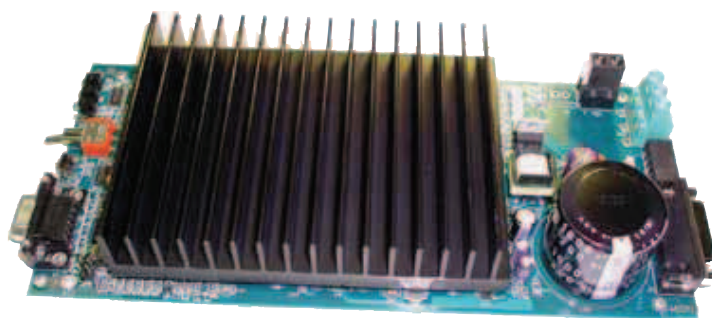
Digital Servo Amplifier Accessory

Provides High Current Control for Servo Wheel™ Drives

This digital servo amplifier provides DSP-based digital closed-loop, four-quadrant PWM control of force or torque of permanent magnet, linear or rotary, brush or brushless DC motors. Our PWM current control algorithm, current sensing method, and advanced switching scheme yields performance comparable to a linear servo amplifier.

This digital drive will reduce expensive motor drive stocking requirements because it will control brush-type, brushless-trapezoidal and brushless-sinusoidal motors.

Setup is easy. The operating configuration – motor type, motor parameters, operating voltage, peak and continuous current limits and system parameters for velocity or position control are all input by the user to a PC-based setup program that automatically downloads the information, with the computed algorithm, into the flash memory of the drive via an RS-232 port. The drive can be reconfigured at any time by running the setup-program.



Features

- High-performance DSP-based servo controls motor force or torque. Control of velocity or position using the motor's Hall of encoder signals is an option
- Controls brush-type, brushless-trapezoidal and brushless-sinusoidal motors
- User inputs motor parameters, voltage, peak and continuous current limit into Windows-based setup software. Setup software automatically downloads the algorithm for a 2kHz current loop bandwidth via RS-232 communications
- Proprietary PWM software controlled switching scheme yields ultra-low ripple at low current levels, zero crossover distortion, and minimizes EMI in noise sensitive applications
- Differential amplifiers accept a single $\pm 10V$ analog current command for trapezoidal brushless and brush type motors
- Optional inputs allow digital commands through the RS-232 or serial peripheral interface
- 3 output current ranges and scale factors available
- Optically isolated digital inputs for Enable/Reset, Brake, and \pm Travel Limits
- Motor current monitor output, and optically isolated digital outputs provide controller fault indication
- Configurator program provides drive status and fault history via RS-232 link
- Fault protection makes this drive virtually indestructible
- Operates from one low-cost 24 – 48 VDC unregulated power supply or battery



Specifications

Part Number	11564041	11564045
Input Power Bus	24 to 48 VDC	24 to 48 VDC
Continuous Output Power (Max.)	450 watts ¹	1350 watts ¹
Continuous Output Current	10 amps ¹	15 amps ¹
Peak Output Current	20 amps ¹ (1 sec typ.)	40 amps ¹
Scale Factor (A / V)	2	6
Voltage @ Continuous Output Current	Input Bus Voltage - 3 Volts Typ.	Input Bus Voltage - 3 Volts Typ.I
Max Heat Sink Temperature	Disables if >70°C	Disables if >70°C
Current Loop Bandwidth	2 kHz Typ.	2 kHz Typ.
Switching Frequency	40 kHz	40 kHz
Minimum Maintenance	100 UH	100 UH
Weight	25 oz	25 oz

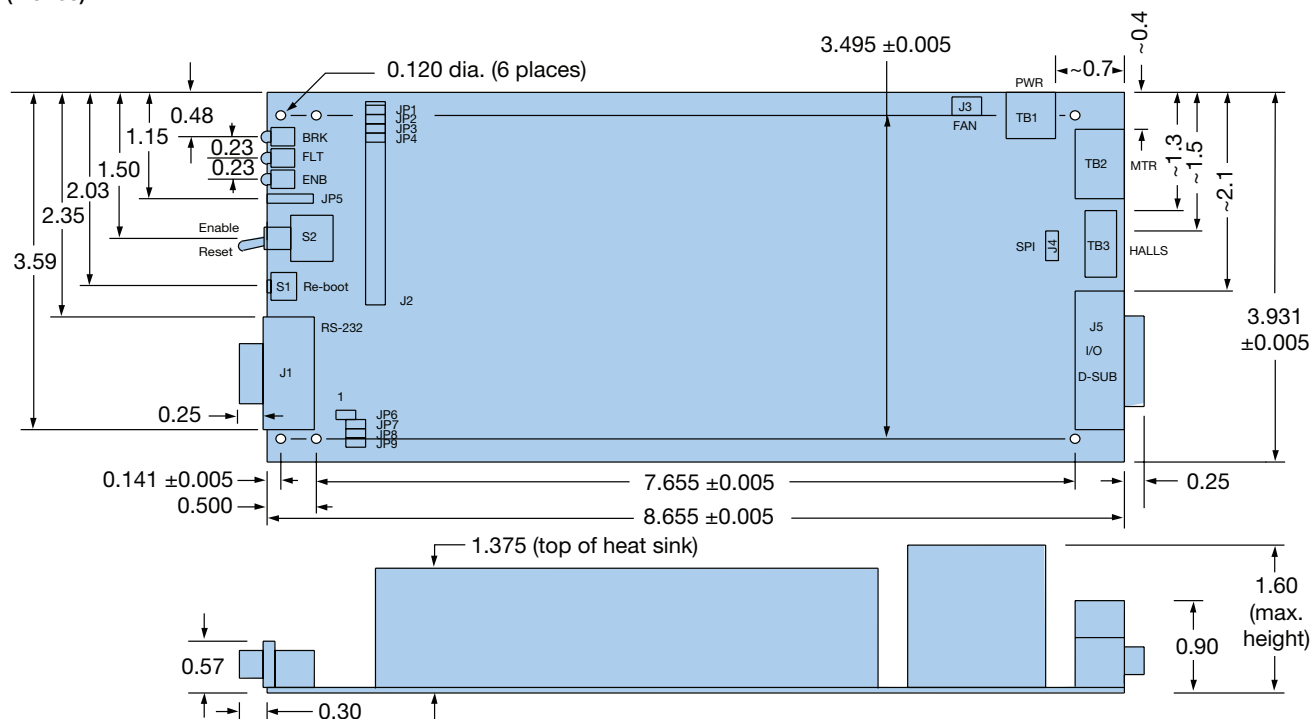
¹ Depends on ambient operating temperature and heat sink. For the >10 amperes continuous output, we recommend forced convection cooling with a minimum airflow of 100 CFM. Consult factory for assistance.

Operating Control Signals and Indicators

Input analog control signal	±10 Volts
Digital Input Commands	Rs-232, SPI
Peak Current limit	Software adjustable
Continuous Current Limit	Software adjustable
Drive Enable/Reset	5V logic, optically isolated
(+) Travel Limit	5V logic, optically isolated
(-) Travel Limit	5V logic, optically isolated
Brake	5V logic, optically isolated
Fault and/or Brake Status	5V logic, optically isolated
Drive Enabled indicator	Green LED
Brake indicator	Red LED
Fault indicator	Red LED
Digital Hall Effect Sensors	3 channels, +5 Volts, Gnd

Mounting Dimensions

(inches)



DX Series Servo Wheel How to Order

Choose wheel size, ratio, motor performance, supply voltage, tire material, and brake option from the chart below.

Servo Wheel Ordering Information

① ② ③ ④ ⑤ ⑥ ⑦

Order Example:

DX A 1 1 K S 3

①	②	③	④	⑤	⑥	⑦
Series	Wheel Size (Diameter)	Ratio	Motor Performance	Supply Voltage	Tire Material	Brake/Encoder
DX	A = 6" B = 8"	1 = 20:1 2 = 24:1 3 = 30:1 4 = 36:1	1 = High speed 2 = High torque	K = 24 VD X = Other	S = Polyurethane black x tread R = Polyurethane black * Other tire compositions available upon request	0 = None 1 = Encoder 2 = Brake 3 = Encoder & Brake (50 in-lb)