Mobile Electrification
Electronics and motors for mobile applications.
At Parker we understand that each mobile application brings unique requirements and demands with it. At the same time we understand the need to provide quick turn solutions for rapid prototypes and development. Parker Hannifin’s Mobile Electrification array of technologies has been specifically developed to quickly meet the needs of engine and vehicle developers in multiple markets.

**Electric Vehicle and Specialty Vehicle**
While electric only vehicles may often be smaller in size, the electronic control demands can be great. Vehicles in this space consist of:
- lawn & turf care equipment
- electric scooters
- electric cars

**Common applications in this space are:**
- traction control
- ancillary function control (blade lift, and deck control)
- dashboard control

**Light, Commercial and Heavy Duty Vehicles**
Mobile Electrification technologies offer flexible control add-ons and flexible power ranges to cover diverse applications in the electric vehicle and specialty vehicle markets.

**Typical applications include:**
- lower engine demand
- improved fuel efficiency
- audible noise reduction
- reduced emissions

Parker realizes that equipment that stands up to harsh environments is a requirement. We also know that every application requires different packaging to fit somewhere unique on the chassis of the vehicle. Our Mobile Electrification technologies are capable of handling high-temp, high-vibration, and corrosive elements. We design flexible packaging to meet your specific mounting requirements.

**Marine**
With fuel prices and environmental concerns on the rise, electrification of watercraft is becoming more popular. Electric propulsion systems developed with Mobile Electrification technologies are:
- clean
- reliable
- quiet

From personal watercraft to larger vessels, Parker’s Mobile Electrification solutions offer the flexibility needed for marine propulsion and pump needs.

<table>
<thead>
<tr>
<th>Markets</th>
<th>Electric Vehicle/Specialty Vehicles</th>
<th>Light/Commercial/Heavy Duty Vehicles</th>
<th>Marine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>Electric scooters, Electric cars, Floor cleaning equipment, lawn care equipment</td>
<td>Large diesels, lift trucks, construction equipment, Tier I and Tier II component suppliers</td>
<td>Small watercraft, personal watercraft, small submarines</td>
</tr>
<tr>
<td>Applications</td>
<td>Traction control, Blade lift, Deck control, Dashboard</td>
<td>Traction control, Boom lift/tilt, Power take-off, Compressor, Fuel pump, Power steering, Fans Generators</td>
<td>Propulsion Pump</td>
</tr>
<tr>
<td>Technology Needs</td>
<td>Feedback, Velocity control, Positioning control, CAN, Dashboard control, General purpose I/O, Analog input (Throttle)</td>
<td>Sensorless, Velocity control, CAN, Engine control communication, Robust start-up</td>
<td>Feedback/Sensorless, Velocity control, CAN, Dashboard control, General purpose I/O, Analog input (Throttle)</td>
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Capabilities and Benefits

Parker’s process and Mobile Electrification technology capabilities provide direct benefits to you, the vehicle and engine developer.

**Parker Process Benefits**

Working with companies that outsource electronic surface mount and assembly or brand label motors adds another layer of management, additional cost and longer lead times.

- **Parker’s full-surface mount and assembly manufacturing facility allows us to rapidly prototype your solution.**
- **Parker’s machining and assembly manufacturing center can provide custom motor assemblies to meet your specific needs.**

Take advantage of Parker’s 20+ years of experience in industrial design and manufacture of electronic assemblies and motors to make your vehicle development project a success.

**Mobile Electrification Technology Benefits**

Over 30 man years of development time has gone into creating the Mobile Electrification suite of technologies. Because we have spent the time developing, testing and deploying electronic control and motor technologies we can provide a rapid design solution to meet the power, control and mechanical needs of your vehicle development project.

Let our team of experienced design engineers handle the electronic control needs of your system so you can focus on the bigger picture.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Mobile Electrification Technology Capability</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature</strong></td>
<td>-40°C to 100°C Liquid cooled motors and electronics</td>
<td>Space savings Utilization of existing vehicle coolant loop</td>
</tr>
<tr>
<td><strong>Vibration</strong></td>
<td>Swept Sine 10 - 500 Hz @ 10 G</td>
<td>Improved reliability Improved PPM</td>
</tr>
<tr>
<td><strong>Dust/water ingress</strong></td>
<td>Conformally coated solutions Sealed packaging</td>
<td>Improved reliability Improved PPM</td>
</tr>
<tr>
<td><strong>Current/voltage</strong></td>
<td>12 VDC - 148 VDC 8A - 400A Peak Current (250 ms)</td>
<td>Scalable to fit multiple applications</td>
</tr>
<tr>
<td><strong>Fit under chassis</strong></td>
<td>Rapid mechanical prototyping Rapid PCB prototyping</td>
<td>Shorter time to market Limited chassis/engine mechanical redesigned required</td>
</tr>
<tr>
<td><strong>Audible noise</strong></td>
<td>&lt; 80 dB @ 100 hp</td>
<td>Improved noise abatement in populated areas</td>
</tr>
<tr>
<td><strong>Flexible control</strong></td>
<td>Sensorless/Feedback CAN communications Flexible I/O configuration Up to 8 A/D converters Up to 76 GPIO</td>
<td>Flexible interface with engine Control unit Control of external functions</td>
</tr>
<tr>
<td><strong>Efficiency</strong></td>
<td>Motor/Inverter &gt; 93% efficiency</td>
<td>Maximum battery life Maximum range Maximum time between recharge</td>
</tr>
</tbody>
</table>
Parker provides innovative customer solutions for electrification of the architecture, implements, and propulsion systems of high fuel efficiency vehicles. These offerings include the latest thinking in highly efficient power electronics, motors, generators, energy storage, and hydraulic components using technologies drawn from across the global Parker organization.

**Mobile Hardened Inverters & Converters**
Based on robust IGBT power platforms, Parker manufactures electronic power conversion devices for a wide range of mobile sub-systems. Applications include traction (vehicle propulsion motor drives), generator APU (Auxiliary Power Unit - converts and regulates generator output, charges batteries), implement drives, export power, and auxiliary drives (cab comfort, pumps, fans, compressors, etc.). Drives can be provided in heavy duty weather-tight enclosures to IP67 standards, and with automotive duty connectors to expedite installation and change-out. Air cooling, liquid cooling (water/glycol or hydraulic fluid), or an advanced 2-phase refrigerant cooling system are among the options available. Five pre-engineered frame sizes cover the wide range of common requirements, from 5 kW to 300 kW. Both AC induction and PMAC motors are compatible with these drives, and are compatible with a broad range of feedback devices. DC bus voltages through 1000 volts can be accommodated.

**Example of vehicular export power system architecture**
Parker Mobile Motor Family
These permanent magnet AC motors are designed with high torque density, and cover the same applications and power ranges of the inverter line. They can be used for traction drives or auxiliary functions, and are available in standard ratings, or in custom configurations. Air and liquid cooled variants are offered, depending upon the size and required duty of the motor. This family also includes generators, which are an essential part of the auxiliary power unit (APU) in a series hybrid design.

Energy Storage/Battery Systems
Mobile electric and hybrid electric platforms require a substantial amount of energy storage, especially where engine-off operation of implements or export power is required. We provide pre-engineered mobile hardened battery racks, using a variety of standard cell types from traditional lead-acid to advanced Lithium Ion. Battery management systems (BMS), which ensure safety and battery longevity, are included in these energy storage units. The BMS monitors loading, temperature, and health, manages charging and cell-to-cell balancing, and also communicates real-time battery status to the supervisory system.

Electro-Hydraulic Actuators
Applications such as front-end loaders, excavators, and aerial lift trucks require hydraulics for the operation of implements. Anti-idling laws and the desire to reduce fuel consumption and emissions have driven many vehicle manufacturers to consider hydraulic pumps driven electrically, as opposed to being coupled to an internal combustion engine. Combining Parker’s expertise in hydraulics, motors, and electronics results in an efficient and flexible solution, available from 250 W to 100 kW.

Parker Services Include:
- Specification Development
- Accelerated Prototyping
- Custom Drive Packaging
- System Installation
- Load Testing
- Local and On-site Training
- Global Service
Custom Electronics

Parker has the capability to develop custom designs and can uniquely support the project from design through manufacturing. Leverage our experience to lessen your risk. We are specialists in motor control, power management and power conversion.

Sensorless Motor Control

Parker has developed a core motion control platform and algorithm for control of a brushless motor on a variety of onboard applications. The platform is a single board design built for high temperature and high vibration environments. The design is suitable for traction control, fuel pumps, compressors and can be used for a variety of applications requiring high efficiency.

- Sensorless velocity control of a brushless three phase motor
- CAN communication for command and diagnostics
- Air or fluid cooling
- DC input of 48 to 170 VDC
- Custom start up sequences based on application
- Temperatures to 125°C
- Vibration to 6 G RMS

Examples

- Inverter for AC compressor on a hybrid vehicle
- Fuel filter pump system
- Traction inverter for electric vehicle
Specialty Rotary Motors

Parker has designed and manufactured hundreds of thousands of specialty and custom rotary servo motors for the past 18 years. These capabilities have generated propulsion for vehicles exploring the depths of the oceans, rotary actuation on today’s business jets and motors embedded in many unique land vehicles from excavation equipment to lawn mowers.

Through tight cooperation with our customers’ engineering team, Parker’s motor group eliminates the risk associated with converting to electric servo motors.

Give Parker the specifications and we deliver performance.

Specify
- Performance goals
- Environmental requirements
- Voltage/Current source
- Package size constraints

Design
- Speed/torque design
- Weight and volume design
- Thermal management
- Customized cable connector
- Shaft design
- Specialty mounting
- Advanced coating and sealing
- Smooth, flushed surfaces

Test
- Performance verification
- Quality assurance testing
- Certification testing
- Specialty testing

Production
- Flexible, modern manufacturing methods
- 100% automated inspection and operational testing
- High volume capacity
- Exceptional delivery

Parker Motor Technology
- Optimization for torque density
- Over 95% efficient
- Aerospace/military hardening techniques
- Innovative cooling techniques
- Segmented, bridged or toothless stator design for a broad spectrum of applications
- Proven and tested for high reliability

AIR
- Ailerons
- Horizontal stabilizer actuation
- Vertical stabilizer actuation
- Flaps
- Helicopter winches

LAND
- Electro-hydraulic actuation
- Electro-mechanical actuation
- Compressors, fans, pumps
- Missile pod positioning
- Generator for electric vehicles
- Traction control

SEA
- Gun turret positioning
- Primary propulsion, submarine
- Naval winches
- Bow/stern thrusters

Motors specially designed for...
Complete Motion Systems

Parker’s Electromechanical Automation Division brings together leading brands in industrial and high-tech automation, including Bayside, Compumotor, CTC, Custom Servo Motor, Daedal, IPS and Trilogy. Designed for easy configuration to make a complete motion system — from miniature precision for life sciences to overhead gantries for the factory floor — these best-of-breed individual components are available separately, so you can build a motion system from the ground up, or as a complete motion system to make integration simple, fast and easy.

Total System Solutions
Parker’s team of highly qualified application engineers, product development engineers, and system specialists can turn pneumatic, structural and electromechanical products into an integrated system solution. Moreover, our Selectable Levels of Integration™ allows you to choose the appropriate system, subsystem, or component to meet your specific need.

The Power of Parker
In today’s competitive, fast-moving economy, what good is an application that isn’t ready on time? This is especially true when compressed design cycles make the quick delivery of critical components essential. With factories strategically located on five continents, Parker offers an unrivaled delivery record, getting solutions out our door and onto your floor faster than ever.

Parker also has the industry’s largest global distribution network, with more than 8,600 distributors worldwide. Each of these locations maintains ample product inventory to keep your downtime to a minimum. And many distributors have in-house design capabilities to support your system and subsystem requirements.

Throughout the design process, Parker’s factory-trained electromechanical engineers work hand in hand with you day or night at 1-800-C-Parker. Our operators will connect you with a live, on-call representative who will identify replacement parts or services for all motion technologies.

parkermotion.com
Our award-winning Web site is your single source for
• Product information
• Downloadable catalogs
• Motion-sizing software

24/7 Emergency Breakdown Support
The Parker product information center is available any time of the day or night at 1-800-C-Parker. Our operators will connect you with a live, on-call representative who will identify replacement parts or services for all motion technologies.