Capability Guide

High-speed electrical machines, drives and power electronics
World-class design and manufacturing from the UK

Turbo Power Systems (TPS) specialises in the design and manufacture of high-speed permanent magnet motors, generators, drives and power electronics.

Complete System Solutions

The design and manufacturing facilities in Gateshead, United Kingdom provides customers with a single supply source - a dual capability that combines innovative rotating electrical machines with leading edge power electronics technology.

Our extensive range of stand-alone and integrated solutions are continuously developed into new and innovative solutions for Original Equipment (OEMs), system integrators and volume end users.

- Direct drive Permanent Magnet motors up to 160,000 rpm and up to 1 MW
- Liquid cooled and air cooled inverters up to 1.2MW
- Integrated Motor and Drives packages
- Power Electronics for Energy, Industrial, Transport and Defence applications

TPS provides the enabling technologies needed to eliminate geared and oil-lubricated drive trains, improving efficiency, reliability and functionality.
A dynamic and focused team

As well as the latest technology, TPS brings you a highly skilled team of people with extensive engineering expertise, developing products that meet your commercial objectives. Our comprehensive engineering capability spans a wide market area bringing fresh thinking and superior design solutions to every new challenge you inspire us with.

Every innovation you need

We offer world-leading products to exacting customer requirements.

- Electrical & Mechanical design
- Software & Embedded design
- Electronic Circuit design
- Electromagnetic design
- System modelling or simulation
- Thermal modelling
- Control System design
- Rotor dynamic analysis
- Stress analysis & structural design
- Finite Element Analysis (FEA)
- Expertise in magnetic materials, high strength alloys and high temperature polymer structures such as carbon-fibre composite and electrical insulation systems

We developed a high power density, modular down-hole pump motor for the Oil & Gas industry to improve resource recovery and efficiency.

We developed a high power density drive to power the Override Jettison fuel pump on board the Boeing 787 Dreamliner.
Applications

Turbo Power Systems’ expertise is demonstrated by our global presence in dynamic and specialised market areas bringing value added solutions to customers with demanding performance, packaging and environmental challenges.

Our solutions service four sectors:

- Transport
- Energy
- Industrial
- Defence

Energy

TPS power dense, high-speed generators, converters and power electronics service a wide power range up to Multi MW ratings. They offer significant savings in volume and weight over conventional technologies.

Working with OEMs and integrators, we can provide building blocks or complete power conversion solutions for the following applications:

- Smart Grid Converters
- Distributed Generation
- Micro turbines
- Exhaust Gas Recovery
- Oil extraction and pumping
- Prime and standby power
- Renewable energy – solar, wind, tidal and wave
- Organic Rankine Cycle
- Waste Heat Recovery

Industrial

We design and manufacture high-speed motors, inverters and power electronics for a variety of industrial applications. Our in-house capabilities and flexibility empower us to consider all aspects of design and integration including cooling (e.g. air, gas, liquid and more) and packaging arrangements. This enables us to create bespoke products to suit the particular requirements of OEMs and integrators. With motor and drive systems up to 1MW, our products can be supplied independently, as a package or as an integrated solution in the configuration you require. Higher power ratings can be achieved through scaling our existing technology. We offer:

Motors and drives for:

- Air blowers
- Air compressors
- Gas blowers
- Gas compressors
- Electrical submersible pumps
- HVAC compressors
- Test & Dynamometer
- Special electrical machines

Power Electronics for:

- Variable Speed Drives
- Battery chargers
- Active Filters
- High voltage pulsed power supplies
Transport
With over three decades experience in the design and manufacture of power conversion and conditioning equipment for the Transport industry, TPS can offer innovative power electronic solutions which are compact, rugged and reliable. In addition, hardware and software upgrade programs and after sales repair & support makes TPS a key provider to the transport sector.

Defence
The requirement for mobile, lightweight, serviceable and efficient power solutions necessitates the need for novel approaches in the development of power electronics and electrical machines to meet the exacting needs of the Defence market.

TPS design and manufacture Defence solutions, applying our expertise in high power density electrical machines, power electronics technologies and advanced control system design to deliver advanced products in partnership with you.

Products include:
• Advanced propulsion motors and drives
• Distributed power supply systems
• Tactically Quiet Solutions
• In-field serviceable systems
Quality assured

Our process excellence is founded upon stringent adherence to quality. Our quality management systems have been approved to ISO 9001 and AS 9100 for aerospace.

All our products are delivered with a full manufacturer’s warranty. After-market services include full customer training and through-life technical support.

Testimonial

"When UK Power Networks knew that it had won Low Carbon Networks Fund funding for innovative power electronics devices to connect to Low Voltage distribution networks, we were pleased that Turbo Power Systems (TPS) was able to be our supplier. TPS has a team of knowledgeable engineers and designers who took time to understand our requirements and the importance of the project’s tight timescales. They maintained their design and approval processes whilst delivering all the equipment, allowing us to start our demonstration trial schemes on time".

Peter Lang, CEng MIET, Senior Technology Transfer Engineer, UK

High performance advantages

Our extensive engineering and manufacturing capabilities enable TPS to add value to high performance applications:

- Electrical machines with best in class efficiency, up to 99%
- Inverters offering system efficiencies exceeding 96% over the entire operating speed range
- Magnetic bearings greatly enhancing machine performance, reliability and end user cost of ownership
- Operating speeds within our product range up to 160,000 rpm
- Dual motor/generator modes within a single system
- Ruggedised and reliable power electronic solutions for harsh environment

The table below lists some examples of the experience we have gained in designing and manufacturing high performance machines, drives and power electronics:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Speed</th>
<th>Application</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>10kW</td>
<td>60,000rpm</td>
<td>Hybrid electric turbocharger</td>
<td>Motor/Generator &amp; Converter</td>
</tr>
<tr>
<td>15—500kW</td>
<td>20,000-70,000</td>
<td>High performance industrial drive</td>
<td>Inverter &amp; Motor</td>
</tr>
<tr>
<td>6-195kW</td>
<td>45,000-160,000</td>
<td>Microturbine</td>
<td>Starter/Generator &amp; Converter</td>
</tr>
<tr>
<td>50kW</td>
<td>3,600rpm</td>
<td>Electric submersible pump motor</td>
<td>Motor</td>
</tr>
<tr>
<td>150kW</td>
<td>30,000rpm</td>
<td>Hybrid turbocharger</td>
<td>Motor/Generator</td>
</tr>
<tr>
<td>400kW</td>
<td>30,000rpm</td>
<td>Mini-turbine</td>
<td>Generator</td>
</tr>
<tr>
<td>1200kW</td>
<td>20,000rpm</td>
<td>Mini-turbine and industrial motor</td>
<td>Motor/Generator &amp; Inverter</td>
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<tr>
<td>15W-25kW</td>
<td>-</td>
<td>Industrial battery chargers</td>
<td>Resonant converters</td>
</tr>
<tr>
<td>15-40kW</td>
<td>6,000rpm</td>
<td>Hybrid electric vehicle</td>
<td>Bidirectional inverter/Battery</td>
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<tr>
<td>12kW, 40kV</td>
<td>-</td>
<td>Machine tool, cutting and welding laser</td>
<td>Four channel laser power supply</td>
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<tr>
<td>400A, 25kV</td>
<td>-</td>
<td>Water disinfection equipment</td>
<td>Pulse power supply</td>
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<tr>
<td>5-25kW</td>
<td>-</td>
<td>Renewables—solar, tide, wave</td>
<td>Grid tied inverter</td>
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<tr>
<td>9kVA</td>
<td>-</td>
<td>Aerospace drive</td>
<td>Inverter</td>
</tr>
<tr>
<td>250-1200kW</td>
<td>-</td>
<td>Distributed generation</td>
<td>Grid linkable inverter</td>
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<tr>
<td>5kW</td>
<td>-</td>
<td>Catering Converter</td>
<td>Static converter</td>
</tr>
<tr>
<td>3kVA</td>
<td>-</td>
<td>At Seat power supplies</td>
<td>Inverter</td>
</tr>
<tr>
<td>65kVA/16kW</td>
<td>-</td>
<td>Auxiliary power supplies</td>
<td>Inverter &amp; LVPS</td>
</tr>
<tr>
<td>500/1100kW</td>
<td>-</td>
<td>Air Compressor System</td>
<td>Modular motors and drives</td>
</tr>
</tbody>
</table>

Put our experience to the test

We have extensive design, manufacture and testing facilities on site in Gateshead, United Kingdom. Our factories employ a cellular approach, with discrete areas for stator and rotor manufacture and power electronic systems assembly. Our state-of-the-art test cells are capable of testing electrical machines and power electronics to full speed and power, as well as undertaking the following tests:

- Agency certification
- Design validation and functional testing
- Equipment reliability studies
- Production acceptance testing
- System testing and qualification
TPS Vision:

“The Customers’ first choice for Electrical Power System Solutions”.

TPS Mission:

“Deliver excellence and continuously exceed Customers’ expectations by adding value in everything we do”.
Our capability is your advantage

TPS have recently expanded with a broader customer reach and product range. Our total manufacturing space exceeds 50,000 ft² and employs senior engineers and technicians with experience over 25 years.

Co-located engineering, manufacturing, quality, test and project management personnel ensure coordinated teamwork throughout the product development process providing a unified framework which delivers better response times and enhanced ‘design-for-manufacture’.