



AUXILIARY POWER SUPPLY (APU) – METRO

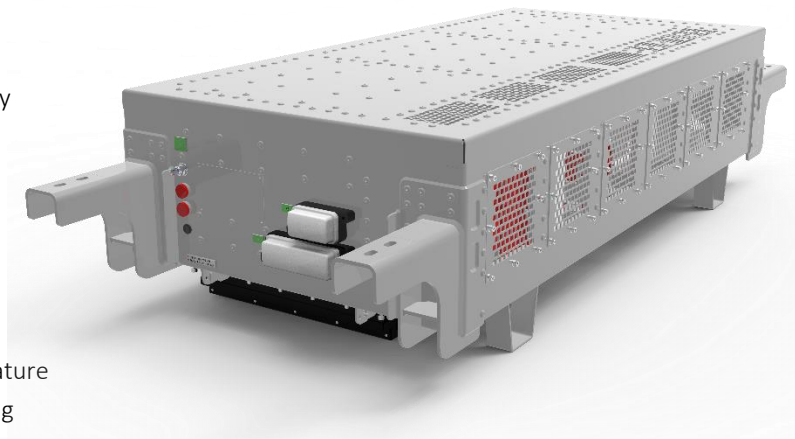
16.9kVA/13.5kW London Underground Central Line

Key Technical Features

- ✓ Powered by DC fourth rail
- ✓ APU consist of the following major components
 - Input Filter
 - HF DC-DC converter for Galvanic Isolation
 - PWM Two Level 3Ø Inverter with AC filter
 - LVPS with DC filter
 - DC distribution stage
 - Control & Monitoring hardware
- ✓ Galvanic isolation between input and output
- ✓ Use of Silicon Carbide (SiC) MOSFETS
- ✓ Natural cooling
- ✓ Designed to withstand transients
- ✓ Event monitoring and fault logging via TPS proprietary portable test equipment (PTE) software
- ✓ Dead battery start
- ✓ Intelligent Communications
 - Vehicle communications – MVB
 - Diagnostics – Ethernet
- ✓ Protection Features
 - Over voltage, overcurrent and over temperature
 - Independent LVPS output voltage monitoring

Key Benefits to Operators and Fleet Owners

- ✓ Designed to operate in extreme weather conditions
- ✓ Cutting edge technology for improved efficiency and low carbon foot print
- ✓ Light weight and compact construction
- ✓ Fit and forget maintenance free solution for reduced life cycle costs
- ✓ Modular approach for maintenance on-train
- ✓ Intelligent monitoring and diagnostics
- ✓ Quiet in operation





Input Voltage	630 Vdc (or 750Vdc) Nominal
Input Voltage Range	500 Vdc - 1000 Vdc (Degraded performance 400 Vdc to 500 Vdc)
Galvanic Isolation	Yes, via a HF DC-DC stage incorporating SiC MOSFETS
Inverter Output Voltage	3Ø, 230 Vac ±5 % line-to-line, 50 Hz ±2 %
Inverter Output rated Power	16.9 kVA continuous (13.5 kW @ 0.8 PF)
Inverter output Voltage THD	<5 %, in normal operating range
Motor Starts	The Inverter is rated to be able to start all motor loads
LVPS output voltage	48.0 Vdc (Nominal)
LVPS output power	13.5 kW continuous
Battery temperature compensation	Yes, it is included
Protection	Electronic overvoltage and over current protection Overload protection
Environmental Protection	IP65; magnetics section - IP20
Noise	<72 dBA at 4.6 metres
Efficiency	>96% at full load
Weight	235 kg
Dimensions	1540mm (L) x 750mm (W) x 418mm (H) (excluding hanger brackets)
Operating temperature and Humidity	-25°C to +40°C, 0 to 95 % humidity
Cooling	Naturally cooled
Portable Test Equipment (PTE)	Yes, software provided royalty free for intelligent diagnostics

TPS has a pedigree of over 40 years in designing, manufacturing and delivering ultra-efficient power electronics solutions for multiple applications in the Railway industry. Our range of power conversion products focuses greatly on high efficiency, lightweight and compact systems, reliability and an improved total cost of ownership. We offer “cradle to grave” services including design, development, manufacture, validation, maintenance, repair and overhaul. Over 5000 units built in our facility are operating successfully across the globe: North America, China, Brazil, Malaysia, Netherlands, Turkey, Saudi Arabia and the UK.

On metro platforms specifically, TPS has delivered more than 2000 Auxiliary Power Supply (APS) units globally, as follows: District Line, London Underground - UK; CTA 5000, Chicago Transit Authority - US; Rocket Fleet (T1, H6 and S1), Toronto Transit Authority - Canada; M1 Line, Ankara Metro - Turkey; CQ 312 Fleet, Metropolitan Atlanta Rapid Transit Authority - US. Other metro units successfully operating globally include Malaysia KL Putra metro fleet, Montreal metro Canada and Beijing Airport Express.

To discuss your project or for any further information please contact our marketing department at marketing@turbopowersystems.com, or ring us on +44 (0) 191 482 9288/ 9251/ 9278.



Turbo Power Systems Ltd

1 Queens Park | Queensway North | Team Valley Trading Estate | Gateshead | NE11 0QD | United Kingdom

T: +44 (0) 191 482 9200 | F: +44 (0) 191 482 9201

E: marketing@turbopowersystems.com | W: www.turbopowersystems.com

Innovation and Technology

TPS has a pedigree of over 40 years in designing, manufacturing and delivering ultra-efficient power electronics solutions for multiple applications in the Railway industry. Our range of power conversion products focuses greatly on high efficiency, lightweight and compact systems, reliability and an improved total cost of ownership.

The core innovation is in the area of effectively deploying Wide-bandgap (WBG) semiconductors in high frequency power electronic circuits. By incorporating WBG semiconductors like Silicon Carbide (SiC) along with our excellent power electronics experience in the LU APS, we are able to bring the following benefits when compared to using Insulated Gate Bipolar Transistors (IGBTs):

- Operate at higher voltages & current thereby reducing system complexity and cost whilst improving reliability
- Operate at relatively higher temperatures
- Operate with better thermal conductivity i.e. heat is conducted effectively thereby reducing cooling requirements and optimising system costs
- Improve switching speed of the circuits resulting in much smaller storage, capacitors and inductors resulting in cost effective and efficient system
- Operate with better energy band gap resulting in a robust system mitigating effects of heat, radiation and electromagnetic fields.

An innovation at this level comes along with its very own challenges. These include system stability issues due to switching speeds, electrical noise and interference with other equipment. However, TPS's 40 plus years pedigree in power electronics combined with its commercialisation of innovative products have helped in resolving these issues.

There are a very few companies that are at the forefront of research in the application of SiC devices and TPS will be one of the pioneers to effectively use this device for the Rolling Stock market.