



**The IP&E
Specialist**

Charging Equipment Application Guide

TTI, Inc., – A Berkshire Hathaway Company



The IP&E Specialist

The Specialist in Electronics Component Distribution

Founded in 1971, TTI has steadily grown to become a world leading specialist distributor of electronic components. The company was founded on the premise that passive component purchasing could be made more efficient by offering product specialization, customer-driven service and proprietary supply chain solutions.

Why TTI?

- **Technical Experts** TTI's European team of field-based Sales Engineers and local Product and Technical Specialists are here to support you; from understanding component trends, sustainable sourceability and new product roadmaps, to in depth technical support for your design from our technical engineering experts.

- **Value Added Services** Connector assembly is one of the most important value-added services at TTI, Inc. – Europe. We are specialized in distributing manufacturer controlled and certified connectors and interconnect solutions from globally leading suppliers. Thanks to a large inventory level of connector components, TTI, Inc. – Europe can serve any market requirements.



- **Global Distribution Centers** Our European headquarters is located just outside of Munich, Germany in Maisach-Gernlinden. In total, we have 45.000m² of dedicated warehouse space and local sales and technical support in over 40 locations across Europe. TTI has more than 195.000m² of automated warehousing in North America, Europe and Asia. All are linked into a global warehouse management system that provides superior customer service and overall business efficiencies. Wherever you are in the world, TTI can support you. Year after year, customers rate our inventory availability, on-time delivery and accuracy among the very best in the industry – contact us today to find out what a true specialist has to offer.

- **Quality and Reliability** TTI's global warehouses are all ISO-registered and have received certification to the ISO 9001 and ISO 14001 Standards. TTI Europe is also certified to EN9120/EN9100, IECQ-CECC and ISO/IEC 27001 Standards. Additionally, our European sales branches are ISO 9001 certified. TTI has one global documentation system that ensures that every TTI branch and warehouse in the world follows the same processes.



80+
Suppliers



45.000 m²
Warehousing Space



One of the largest Autostore systems in Europe



40
Sales Locations

24/7
Available to Order Online



www.ttieurope.com

Charging Equipment Applications

Charging Infrastructures

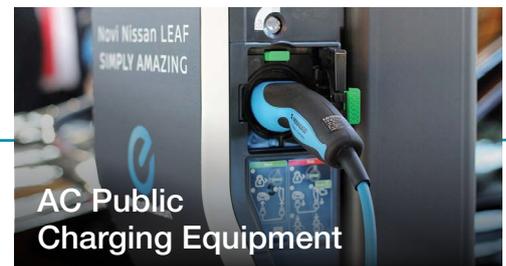
- Fleet charging
- Private charging
- Public charging
- Residential charging
- Workspace charging

Charging Technologies

- Autonomous charging
- Battery swapping
- Capacitive charging
- Conductive charging
- DC fast charging
- Hydrogen-powered charging
- Inductive charging
- Liquid cooled charging
- Mobile charging
- Off-grid charging
- Overhead/Pantograph charging
- Robotic charging
- Solar-powered charging
- Vehicle to home/grid charging
- Wireless charging

Charging Standards

- AC Type 1 – SAE
- AC Type 2 – ISO / IEC
- AC GBT
- DC CCS 1 & CCS2 CharIN
- DC CHAdeMO
- DC ChaoJi
- DC GBT
- DC Tesla supercharger
- DC North American Charging Standard (NACS)
- DC Megawatt Charging Standard (MCS)
- Wireless SAE J2954



Technology Trends

Antennas

- Wireless modules supporting Wi-fi & bluetooth
- Internal & External antenna for 4G/5G and GPS / Glonass

Capacitors

- Wider temperature range
- Custom HV Film Capacitors
- Increased use of Hybrid and Polymer Capacitors

Circuit Protection

- Din-rail Surge Protection in DC Chargers
- DC Busbar EMC Filters for DC Fast Chargers
- Residual Current Modules for AC Chargers

Connectors

- New charging standards - NACS / MCS - Up to 1500A
- More use of busbar technology
- Liquid cooling for currents above 500A
- Shutter outlets being used on AC Charging Equipment

Discrete Semiconductors

- 600V & 1200V Mosfet solutions
- Low voltage Mosfets and TVS protection diodes

Electromagnetic

- Custom high power inductors and transformers in DC units
- EMI suppression and filtering

Power Supplies

- New DC charging units exceeding 400kW Capacity
- Fast charge systems using modular rack power supplies
- Din-rail auxiliary power supplies used in AC Chargers

Relays

- 1500V contactors for DC applications
- 4 Pole Relays for AC Applications

Resistors

- Power Metal Strip current sense resistors
- Surface mount Thick Film power resistor technology

Sensors

- Higher current sensors for both cable and busbars
- Energy meters being used to monitor AC & DC Current use

Switches

- Enhanced sealing performance
- Need for emergency stops
- Anti-vandal proof switches



Charging Connectors

<p>Amphenol INDUSTRIAL PRODUCTS GROUP</p>	<p>Amphenol INDUSTRIAL PRODUCTS GROUP</p>	<p>Amphenol INDUSTRIAL PRODUCTS GROUP</p>	<p>Amphenol INDUSTRIAL PRODUCTS GROUP</p>
<p>IEC Type 2 Vehicle Connectors</p>	<p>IEC Type 2 Mode 3 Connectors</p>	<p>IEC Type 2 Standard socket-outlet</p>	<p>IEC Type 2 Outlet with Shutter</p>
<ul style="list-style-type: none"> • 500V AC • 16A, 32A, 1 and 3 Phase • 2.5 to 6mm² • TUV Certified, IP55 Mated 	<ul style="list-style-type: none"> • 500V AC • 16A, 32A, 1 and 3 Phase • 2.5 to 6mm² • TUV Certified, IP55 Mated 	<ul style="list-style-type: none"> • 500V AC • 16A, 32A, 1 and 3 Phase • 2.5 to 10mm² • TUV Certified, IP54 with Cap 	<ul style="list-style-type: none"> • 250V, 32A, 1-Phase • 480V, 32A, 3-Phase • Electronic Lock Available • IEC 62196-2 standard 2-II a
			
<p>Amphenol INDUSTRIAL PRODUCTS GROUP</p>	<p>Amphenol INDUSTRIAL PRODUCTS GROUP</p>	<p>Amphenol INDUSTRIAL PRODUCTS GROUP</p>	<p>Amphenol INDUSTRIAL PRODUCTS GROUP</p>
<p>IEC Combo 2 CCS2 Vehicle Connectors</p>	<p>IEC Combo 2 CCS2 Vehicle Connector Plus</p>	<p>IEC Combo CCS 2 - Liquid Cooled</p>	<p>Megawatt Charging Standard</p>
<ul style="list-style-type: none"> • 1000V DC • Up to 200A • 16 to 70 mm² • TUV Certified, IP44 Mated 	<ul style="list-style-type: none"> • 1000V DC • 400A - Air Cooled • 100 mm² (2 x 50mm²) cables • CE Certified, IP44 Mated 	<ul style="list-style-type: none"> • 1000V DC, 600A Max. • IEC 62196-2, IEC 62196-3 • > 10000 cycles • IP67 Enclosure, IP69 	<ul style="list-style-type: none"> • 1500V DC, 350A • IEC TS 63379 / IEC 61851-23-3 • > 20,000 Mating Cycles • IP67 / IP69
			
<p>Amphenol INDUSTRIAL PRODUCTS GROUP</p>	<p>Amphenol INDUSTRIAL PRODUCTS GROUP</p>	<p>Amphenol INDUSTRIAL PRODUCTS GROUP</p>	<p>• APTIV •</p>
<p>MCS - Liquid Cooled</p>	<p>North American Charging Standard - AC</p>	<p>North American Charging Standard - DC</p>	<p>AC Charging Pigtails – Type 2</p>
<ul style="list-style-type: none"> • 1500V DC, 350A or 1500A • IEC TS 63379 / IEC 61851-23-3 • Cooling - 1 feed pipe and 2 outlet pipes • IP67 / IP69 	<ul style="list-style-type: none"> • 600V AC, 40A, 50A, 80A • SAE J1772, SAE J3400, UL2251 • > 10,000 Mating Cycles • Type 3S IP67 	<ul style="list-style-type: none"> • 1000V DC, 200A to 600A • SAE J3400, UL2251 • > 20,000 Mating Cycles • IP67 / IP69 	<ul style="list-style-type: none"> • IEC62196 Type II, Up to 32A, • 1- or 3-Phase • Superior product durability • CE Certified Versions
			

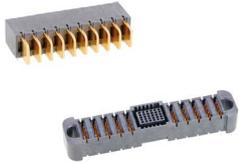
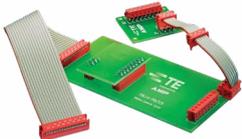
Charging Connectors

<p>• APTIV •</p>	<p>• APTIV •</p>		
<p>AC Mode 3 Jumper Cables</p> <ul style="list-style-type: none"> • IEC62196-2-1, IEC62196-2-2 and GB/T 20234 • 14,000 cycles • CE and CQC certification 	<p>AC Mode 2 Gen2 Charging Plugs</p> <ul style="list-style-type: none"> • EVSE restarts in the event of power grid fault • IEC62752 standard • IP67 Protection 	<p>AC Charging Solutions</p> <ul style="list-style-type: none"> • Standard ISO/IEC 62196-2 • 230 V/400 V, 16 A, 1 / 3 phases • 400 V, 32 A, 3 phases • 400 V, 63 A, 3 phases 	<p>DC Fast Charging Solutions</p> <ul style="list-style-type: none"> • 1000V, 80A, 200A, 250A • Tested according to IEC 62196 • Ergonomic functional design • Different lengths available
			
			
<p>AC IEC Type 2 Outlet (ECIER Series)</p> <ul style="list-style-type: none"> • IEC 62196 Type 2 Connector • EVSE Rear mount outlet • 20A, 32A, 63A • 1 or 3-Phase 	<p>ACI3 Coupler IEC Type 2 Plug</p> <ul style="list-style-type: none"> • IEC 62196 Type 2 pigtail • 20A, 32A, 63A • 1 or 3-Phase • Custom solutions available 	<p>ACI3-J2 Connection Cable IEC Type 2 Plug (Mode 3)</p> <ul style="list-style-type: none"> • IEC 62196 Type 2 mode 3 • EVSE to vehicle coupler • 20A, 32A, 63A • 1 or 3-Phase 	<p>AC IEC Type 1 Plug (EJCV Series)</p> <ul style="list-style-type: none"> • IEC 62196 Type 1 Connector vehicle inlet • 20A, 32A • Single phase (240VAC)
			
			
<p>CCS2 Fast Charging Connectors</p> <ul style="list-style-type: none"> • 200A, 250A and 300A • Boost mode up to 500A • Exchangeable mating face • Uncooled 	<p>CCS2 - Liquid Cooled</p> <ul style="list-style-type: none"> • Charging up to 500A at 1,000V • CCS 1 and CCS 2 variants • Dielectric liquid cooled cable • Minimized cable diameter and weight 	<p>KW01C / KW01E Series (CE)</p> <ul style="list-style-type: none"> • CHAdeMO 1.2 • V2H Guideline 2.1 • IEC62196-3 • 150A (@40°C) / 125A (@50°C), 500 VDC • CE Certified 	<p>KW02C Series</p> <ul style="list-style-type: none"> • CHAdeMO 1.2 • V2H Guideline 2.1 • IEC62196-3 • 37 A, 500 VDC • CE Certified
			

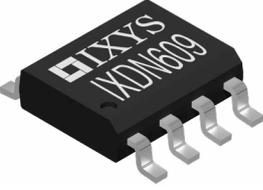
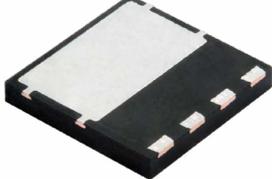
Charging & Power Connectors

			
<p>KW04 / KW11 / KW21 Series</p>	<p>AC Infrastructure Charging Sockets</p>	<p>CCS Charging Cables</p>	<p>CCS Charging Cables</p>
<ul style="list-style-type: none"> • CCS Type-2 • IEC62196-3 • 150A; 200A, 1000 VDC • CE Certified (TÜV Rheinland) • Removable front cover 	<ul style="list-style-type: none"> • 250V / 440V, 16A / 32A • 1- or 3-phase • Protective covers available • Optional shutter 	<ul style="list-style-type: none"> • Type 1 and Type 2 versions • Up to 250 kW charging power • Built in temperature sensors • Replaceable mating face • Customizable logo 	<ul style="list-style-type: none"> • Type 1 and Type 2 versions • Up to 250 kW charging power • Built in temperature sensors • Replaceable mating face • Customizable logo
			
			
<p>HPC CCS Charging Cables</p>	<p>HPC Cooling Unit</p>	<p>BarKlip® Series</p>	<p>BarKlip® OCP 48V BK500 IO</p>
<ul style="list-style-type: none"> • Type 1 and Type 2 versions • Up to 500 kW charging power • Built in temperature sensors • Replaceable mating face • Customizable logo • Cooling equipment required 	<ul style="list-style-type: none"> • Our passive cooling unit provides demand-oriented and efficient cooling for our liquid-cooled HPC charging cables. CHARX connect professional. 	<ul style="list-style-type: none"> • 10 points of contact for high reliability • Low halogen housing • Wide operating temperature -40°C to +150°C 	<ul style="list-style-type: none"> • Up to 500A per contact • Supports 48V Power Rack Architecture • Configurable plug-and-play solutions • Ultra-low contact resistance of 0.5mΩ
			
			
<p>PwrMAX® connector</p>	<p>PwrBlade+™ Connectors</p>	<p>Anytek Terminal Blocks</p>	<p>FIT Family Power Connectors</p>
<ul style="list-style-type: none"> • 100A per contact • Blind-mating • GCS® plating provides low resistance • Press-fit and solder tail termination 	<ul style="list-style-type: none"> • Up to 60A/contact • Modular power+ signal contacts • Low profile improves airflow 	<ul style="list-style-type: none"> • PCB & Pluggable Types • Through-hole and SMT • DIN Rail Terminal Blocks • Barrier Types 	<ul style="list-style-type: none"> • Wide range of power outputs: 8.0 - 23.0A • UL 94V-0 and glow wire compatible • Positive locking
			

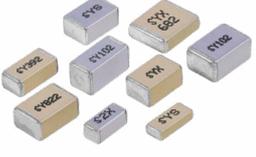
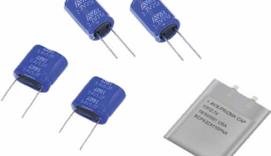
Power Connectors

<p>molex</p>	<p>molex</p>	<p>molex</p>	<p>molex</p>
<p>Extreme Guardian</p>	<p>EXTreme Ten60Power</p>	<p>Busbar Capabilities</p>	<p>PowerPlane Busbar Connectors</p>
<ul style="list-style-type: none"> • 600V, 80.0A, 2-6 circuits • 6 points of contact • Positive locking housing • Isolated receptacle terminals 	<ul style="list-style-type: none"> • Up to 60A per power blade • Available with 0 to 40 signal pins • 10mm low profile height 	<ul style="list-style-type: none"> • Molex offers a range of busbar solutions to meet your specific power and design needs. 	<ul style="list-style-type: none"> • Multiple points of contact • Low-voltage drop • Current: 80.0 to 300.0A • Various termination styles
			
<p>molex</p>	<p>molex</p>	 <p>AUTHORIZED DISTRIBUTOR</p>	 <p>AUTHORIZED DISTRIBUTOR</p>
<p>PowerWize</p>	<p>SW1 Interconnects</p>	<p>Dynamic Mini Series</p>	<p>Dynamic Series Connectors</p>
<ul style="list-style-type: none"> • Up to 1,000V and 190.0A. • Two sizes, 6.00 and 8.00mm • Headers can be mounted on either PCBs or busbars. 	<ul style="list-style-type: none"> • WtB/Wire-to-Busbar • 6.00mm (120.0A), 8.00mm (185.0A) and 11.00mm (300.0A) • Unique positive-locking design 	<ul style="list-style-type: none"> • Second lock design and protective latch concept • low profile • SMT reflow capability 	<ul style="list-style-type: none"> • Vibration resistant • Housings are keyed, preventing mis-mating and misalignment • Positive audible locking sound
			
 <p>AUTHORIZED DISTRIBUTOR</p>	 <p>AUTHORIZED DISTRIBUTOR</p>	 <p>AUTHORIZED DISTRIBUTOR</p>	 <p>AUTHORIZED DISTRIBUTOR</p>
<p>Micro-MaTch Connector Family</p>	<p>Heavy Duty Connectors with Dynamic Inserts</p>	<p>HCM – High Current Modular System</p>	<p>Snap-Lug Quick Disconnect Power Connectors</p>
<ul style="list-style-type: none"> • Tin plated contact design • One of the smallest systems available at 1.27mm • UL-recognized 	<ul style="list-style-type: none"> • Designed for harsh environments • Improved operational efficiency • Reliable and high density contact 	<ul style="list-style-type: none"> • 250 A / 350 A • Aluminum alloy housing • IP68 protection degree • salt spray resistance of up to 500 H 	<ul style="list-style-type: none"> • Snap-on, quick disconnect • Shrouded design option • Color coded and keyed • Single piece installation
			

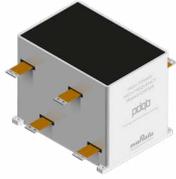
Discrete Semiconductors

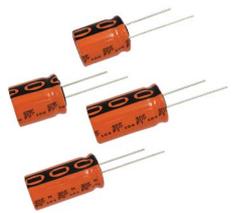
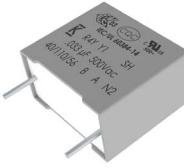
<p>BOURNS®</p>	<p>BOURNS®</p>	<p>Dialight</p>	<p>Littelfuse®</p>
<p>SM8S-Q TVS Diode Series</p>	<p>15KPA-SD-Q TVS Diode Series</p>	<p>621-Series Heavy Duty TriColor PMI</p>	<p>IXDN609 9A Ultrafast MOSFET Driver</p>
<ul style="list-style-type: none"> • Maximum Peak Power Dissipation: 6600 watts • Meets ISO 7637-2 / ISO 16750-2 • Compact DO-218 package 	<ul style="list-style-type: none"> • Maximum peak pulse power (10/1000 μs): 15 kW • Maximum peak pulse current (8/20 μs): 1 kA • Standoff Voltage: 16 to 66 volts 	<ul style="list-style-type: none"> • Nonmagnetic, corrosion resistant • Secured to prevent dirt, dust, and water penetration • IP66/IP67, IK10 and NEMA 4X 	<ul style="list-style-type: none"> • Wide Operating Voltage Range: 4.5V to 35V • Matched Rise and Fall Times • Low Propagation Delay Time • Low Output Impedance
			
<p>Littelfuse®</p>	<p>Littelfuse®</p>	<p>TOSHIBA</p>	<p>TOSHIBA</p>
<p>DMA10I1600PA 1600V Standard Rectifier</p>	<p>LSIC1MO120E0160 1200v SiC MOSFET</p>	<p>TW070J120B 1200V SiC MOSFET</p>	<p>TK040N65Z Si SuperJunction MOSFET</p>
<ul style="list-style-type: none"> • Planar passivated chips • Very low leakage current • Very low forward voltage drop • Improved thermal behavior 	<ul style="list-style-type: none"> • Extremely low gate charge and output capacitance • Low gate resistance for high-frequency switching • Ultra-low on-resistance 	<ul style="list-style-type: none"> • 1200V / 70mOhm • Embedded 1.35V SiC SBD • Robust gate drive 	<ul style="list-style-type: none"> • Fast switching, low Qg, low Coss • 650V, 40..190mOhm • TO-220(SiS), TO-247(-4), TOLL, DFN8x8 package options
			
<p>TOSHIBA</p>	<p>VISHAY</p>	<p>VISHAY</p>	<p>VISHAY</p>
<p>TRS8E65F - 650V SiC Schottky Barrier Diodes</p>	<p>SIHH11N60E - 600V Power MOSFET</p>	<p>VS-E5PX7506L Hyperfast Rectifier</p>	<p>VOMA617A Series VOMA618A Series</p>
<ul style="list-style-type: none"> • Low VF 1.45V • 2A single to 24A dual options • TO-220 / TO-247 / DFN8x8 package options 	<ul style="list-style-type: none"> • Low figure-of-merit Ron x Qg • Low input capacitance (Ciss) • Reduced switching & conduction losses • Ultra low gate charge (Qg) 	<ul style="list-style-type: none"> • Hyperfast and optimized Qrr • Best in class forward voltage drop and switching losses trade off • Optimized for high speed operation 	<ul style="list-style-type: none"> • AEC-Q101 qualified • High CTR with low input current • SOP-4 low profile package • High collector emitter voltage, VCEO = 80 V
			

Passives

<p>BOURNS®</p>	<p>BOURNS®</p>	<p>CHEMI-CON</p>	<p>CHEMI-CON</p>
<p>Gas Discharge Tubes</p>	<p>Current Sense Resistors</p>	<p>Nanocrystalline common mode choke coil (FW Series)</p>	<p>Non-flammable Metal Oxide Varistor (SV Series)</p>
<ul style="list-style-type: none"> • High voltage series • High current series • Fast acting series 	<ul style="list-style-type: none"> • Excellent long term stability • Low inductance • Low thermal EMF • AEC-Q200 compliant • Power rating up to 15 W @ 70 °C 	<ul style="list-style-type: none"> • Style: Toroidal • Category temp range -40°C ~ +130°C • Rated current: 10 ~ 50A • Rated inductance: 1.0~1 5.7mH, 100kHz • Maximum DCR: 1.2 ~ 18 mΩmax • AEC-Q200 qualified 	<ul style="list-style-type: none"> • Style: Radial • Category temp range: -40 ~ +125°C • Varistor voltage: 22 ~ 1,000V • Dimension: Ø5 ~ Ø20 • Non-flammable varistor • AEC-Q200 qualified
			
<p>CHEMI-CON</p>	<p>knowles</p>	<p>KOA</p>	<p>KYOCERA AVXX</p>
<p>Radial supercap (DKH Serie)</p>	<p>High Voltage MLCC</p>	<p>HPC Ceramic Pulse Resistors</p>	<p>1005392F0 – 5G/4G & Wi-Fi FPC Embedded Combo Antenna</p>
<ul style="list-style-type: none"> • Style: Radial • Category temp range: -20~+85°C • Rated voltage: 3V • Cap tolerance: -10 ~ +10%(K) / 25°C • Endurance: 65°C/ 2,000hrs 	<ul style="list-style-type: none"> • Safety capacitors with 305Vac rating • Safety capacitors with 1kVdc rating • Approvals to TÜV and UL specifications 	<ul style="list-style-type: none"> • Full ceramic body for HV and surge currents • 25 kV pulse voltage (HPC 3 - 5) • Power rating up to 5 W • Non-inductive • AEC-Q200 tested 	<ul style="list-style-type: none"> • Flexible substrate for easier integration • High performance and isolation characteristics • 114 x 30 x 0.2 mm
			
<p>KYOCERA AVXX</p>	<p>KYOCERA AVXX</p>	<p>Littelfuse®</p>	<p>Littelfuse®</p>
<p>DC Filtering Film Capacitors (FFLI / FFLR Series)</p>	<p>Supercaps</p>	<p>PSR Series</p>	<p>SPDx Surge Protection Devices</p>
<ul style="list-style-type: none"> • Voltage Range: 600V to 3800V • Capacitance Range: 105uF to 3000uF • Aluminum cylindrical case filled with self extinguishing Polyurethane Resin. 	<ul style="list-style-type: none"> • Superior reliability, passes 4000 hours life tests • Customized options for modules • Molded encapsulation and prismatic case options 	<ul style="list-style-type: none"> • Best-in-class DC performance • Bolted blade-style mounting • Ceramic body material • Extremely current limiting • Fast-acting 	<ul style="list-style-type: none"> • This globally-compliant, cost-effective Type 2 Surge Protective Device has higher nominal and total discharge current protection.
			

Passives

			
<p>HMOV Varistors</p>	<p>Circuit Protection Power Solutions</p>	<p>DE1 Series Safety Caps</p>	<p>High Power Transformers</p>
<ul style="list-style-type: none"> • High isolation voltage of 2500V • Thermal shock tested from -55°C to +125°C, 1000 cycles • High operating temperature of 125°C • Meets UL 1449 & IEC 60950-1 	<ul style="list-style-type: none"> • Excellent current-limiting • High short-circuit current rating • Precise clamping voltage • No wear-out mechanism 	<ul style="list-style-type: none"> • DIN 60384-14 • EN 60384-14 • UL 60384-14 • IEC 60384-14 	<ul style="list-style-type: none"> • Wide power range options: 30kW to 400kW • Up to 5kV input output isolation, higher isolation possible • Over 99.5% efficiency
			
			
<p>Aluminum Solid Capacitors OS-CON (SVPF series)</p>	<p>Hybrid Aluminum Electrolytic Capacitors (ZA series)</p>	<p>High Temperature Thick Film Chip Resistor (ERJH series)</p>	<p>Hi-Cap MLCC</p>
<ul style="list-style-type: none"> • Voltage of 16-50 VDC • Capacitance of 10-1000 μF • ESR of 12-40 mΩ 	<ul style="list-style-type: none"> • Operating Voltage Range: 25 to 63 VDC • Rated Capacitance Range: 10 μF to 330μF • Operating Temperature Range: -55°C to +105°C 	<ul style="list-style-type: none"> • High reliability: Metal glaze thick film resistive element • Achieve maximum category temperature 175°C and rated category temperature 105°C 	<ul style="list-style-type: none"> • AEC-Q200 qualified • VW 80808-2 qualified • Improved reliability due to Soft Termination Technology
			
			
<p>3-Phase Filters - FN Series</p>	<p>EMC / RFI Chokes - RT / RV Series</p>	<p>Fuse Holders</p>	<p>2 / 3 / 4 Line EMC Filters</p>
<ul style="list-style-type: none"> • Broad choice of EMC/RFI filters • Standardized and customer-specific solutions • Improves the immunity and safety of electrical and electronic equipment. 	<ul style="list-style-type: none"> • Rated currents from 6 to 63 A • Up to 600 VAC and VDC • 2- and 3-wire configurations • Horizontal and vertical PCB mounting types 	<ul style="list-style-type: none"> • Holders for a wide range of diverse fuses sizes • SMD or THT variants as well as panel mount • Horizontal and vertical mounting versions 	<ul style="list-style-type: none"> • 2-line up to 1600A, 3-line up to 2500A, 4-line up to 600A • Available with low Y-Cap • EMC support and accredited measurements (IEC 61851-21-2)
			

			
<p>DC Link</p>	<p>PTC Inrush Current Limiters</p>	<p>LRMA Series</p>	<p>EDLC Energy Storage Capacitors</p>
<ul style="list-style-type: none"> • High reliability for severe ambient conditions • Long life - 50.000h (85°C, rated voltage) • AEC-Q200 qualified capacitors available on request 	<ul style="list-style-type: none"> • Reduction of inrush current during charging process • Circuit protection in failure cases • Resetability 	<ul style="list-style-type: none"> • Metal Alloy 0.5mΩ to 500mΩ, to 0.5% tolerance • High temperature to 170°C • High power & Low thermal EMF versions • AEC-Q200 	<ul style="list-style-type: none"> • High lifetime up to 2000 h at 85 °C • Rated voltage: 3 V • High power density to 6,3 Wh/kg • Capacitance values from 5 F to 100 F
			
			
<p>T59 Ultra-low ESR Polytan Capacitors</p>	<p>IHLP Inductors</p>	<p>MKP 1848 Series - DC Link Film Capacitor</p>	<p>Auto Grade Surge Resistors</p>
<ul style="list-style-type: none"> • 100 % surge current tested • Extended voltage range up to 75VDC • Molded case 7343 EIA size • Lead (Pb)-free L-shaped face-down terminations 	<ul style="list-style-type: none"> • Short lead times - good availability • Ten different package sizes in several material compositions • Inductance range up to 100uH 	<ul style="list-style-type: none"> • Flame retardant • High durability • High pulse capabilities • High ripple current capabilities • Low ESL & Low ESR 	<ul style="list-style-type: none"> • AEC-Q200 qualified • Excellent pulse loading performance • EIA case size: 0402 to 2512 • Narrow tolerance down to ±0.5%
			
			
<p>AC Line Filters Dual Mode Coils</p>	<p>Metalized Polypropylene Y1-certified capacitor</p>	<p>Power Inductors</p>	<p>Wireless - Chip Antenna</p>
<ul style="list-style-type: none"> • Combine two functions, normal mode and common mode, in one coil • High impedance & High permeability 	<ul style="list-style-type: none"> • AC Input/Output EMI filtering • Class Y1 (IEC 60384-14) + THB Grade IIB • AECQ-200 	<ul style="list-style-type: none"> • One turn coil ferrite • Up to +125°C • High switching frequency • Low core loss • Low DCR 	<ul style="list-style-type: none"> • For Sub-GHz, WLAN/BT/ISM, GPS/GNSS, UWB LTCC technology • AEC-Q200 qualified • Technical support for tuning
			

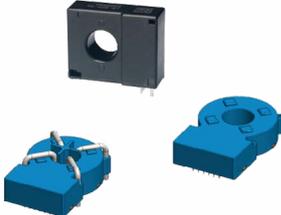
Power Products & Supplies

			
<p>FCM 30 kW Evergreen™ Shelf AC-DC</p>	<p>LCC Series</p>	<p>Surge Protection Device - 1210 Series</p>	<p>Surge Protection Device - SPD2-550-3P0-R</p>
<ul style="list-style-type: none"> Instant customization - Fast delivery of tailored solutions Modularity - Quick power scaling 38 W/in3 - More power in less space > 95% efficiency - Reduced utility costs 	<ul style="list-style-type: none"> 250W/ 650W full power IP64 rating with wide operating range No fan needed as conduction / convection cooled 	<ul style="list-style-type: none"> 100 kA max. discharge current rating Multi-pole uni-block design DIN Rail mountable UL 60691 compliant integrated thermal disconnect 	<ul style="list-style-type: none"> Capability to clamp and withstand high-energy transients Compact footprint Visual life indicator Pluggable modules
			
			
<p>IRM/MPM Series AC/DC Power Supplies</p>	<p>HDR, TDR, WDR Din Rail Power Supplies</p>	<p>EV100 / EV101 DC Fast Charger</p>	<p>Charx - DC Energy Meters</p>
<ul style="list-style-type: none"> 1-90W miniature encapsulated universal AC input with high efficiency Wide operating temperature and robust design 	<ul style="list-style-type: none"> Class I & Class II Isolation DIN Rail TS 35/ 7.5 or 15 mountable No load power consumption <0.75W (features can vary per each series) 	<ul style="list-style-type: none"> Output voltage of 150 to 1,000 – Volts DC (settable) Maximum output power of 30 kW Peak efficiency >96% 	<ul style="list-style-type: none"> Our MID-certified EMpro DC energy meters are suitable for the exact billing of HPC charging processes. The meters are optimized for e-mobility applications.
			
			
<p>Charx - charging controllers</p>	<p>Charx - Power Electronics & Distribution</p>	<p>Charx - Surge Protection</p>	<p>Energy Meter DRS-100-3P-MOD-01</p>
<ul style="list-style-type: none"> AC and DC charging controllers with scalable range of functions for private, commercial, and public charging stations 	<ul style="list-style-type: none"> AC/DC and DC/DC converter modules and matching distribution modules for 19" rack mounting for stable supply of fast charging stations – highly efficient, scalable, and quick to install. 	<ul style="list-style-type: none"> Special surge arresters for protecting charging stations and electric vehicles against damage due to lightning strikes and switching operations – for permanent availability. 	<ul style="list-style-type: none"> MID D Certified Direct connect to 100 A Easy to program and Din Rail mount Accurate and Cost effective
			

Relays & Contactors

			
<p>DCNLEV50</p>	<p>DCNEVT500</p>	<p>G7EB PCB AC-Power Relay</p>	<p>G9KA PCB-Power Relay</p>
<ul style="list-style-type: none"> • High current (50A) and high voltage (900V) contactor for charging applications • Epoxy resin ensures hermetic sealing • IP67 sealed 	<ul style="list-style-type: none"> • High current (500A) and high voltage (1800V) contactor for charging applications • Ceramic arc chamber • Withstand higher pressures and temperatures longer 	<ul style="list-style-type: none"> • High Power and high temperature type Power Relay with 480 VAC 100 A current 	<ul style="list-style-type: none"> • High Power and high temperature type Power Relay with 800 VAC 200 A current
			
			
<p>G9KC PCB Power Relay</p>	<p>HER Series</p>	<p>HES Series</p>	<p>HVC50 Series</p>
<ul style="list-style-type: none"> • High Capacity - 480V AC, 40 A • 4-pole High Power Relay • Low contact resistance: 6 mΩ max. • Contact gap: 3.6 mm min. 	<ul style="list-style-type: none"> • High Capacity - 480V AC, 40A • Terminals for a 3-phase system • Compact size • Contact gap: Min. 3.6mm 	<ul style="list-style-type: none"> • Size 2a and 2a1b 40A power relays • Max Switching Current 40A • Contact gap 3.2mm (VDE0126) • EN60947-4-1 mirror contact compliant 	<ul style="list-style-type: none"> • Up to 1500V DC and 600V AC • Dual coil with coil termination • Coil termination with TVS diode • Main terminals without polarity
			
	 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>
<p>HVC45 Series</p>	<p>ECK Series</p>	<p>ECP Series</p>	<p>K1K 1000V/1.000A High Power Relays</p>
<ul style="list-style-type: none"> • Up to 1000V DC and 300A DC • Bi-directional design • High short circuit handling capability up to 10 kA • Very compact size 	<ul style="list-style-type: none"> • 1000V DC, up to 250A DC • Hermetically sealed with ceramic technology • Switching voltage up to 1000VDC • Bi-directional contacts 	<ul style="list-style-type: none"> • Up to 1500VDC at 1000A • Continuous current capacity of 800A • Hermetically sealed with ceramic technology • Allows bi-directional load 	<ul style="list-style-type: none"> • High Performance in a Compact, Lightweight, Hermetically Sealed Contactor • Designed for up to 1000 V / 1000 A in Harsh Environment
			

Sensors & Switches

<p>Amphenol Advanced Sensors</p>	<p>Amphenol Advanced Sensors</p>	<p>Amphenol Advanced Sensors</p>	<p>PIHER <i>sensing systems</i> an Amphenol® company</p>
<p>Type NKA NTC Chip Thermistors</p>	<p>Type DK & GE Glass Encapsulated NTC Thermistors</p>	<p>WTF083B001 Coolant Temperature Sensors</p>	<p>TMR Current Sensor</p>
<ul style="list-style-type: none"> Versatile NTC chip thermistors with SN-coated Alloy 52 leads Three coating options: Epoxy – max 155°C HTF1 – max 170°C CR1 – max 190°C 	<ul style="list-style-type: none"> Hermetic glass seal, voltage isolation and excellent stability Temp. range -40 to + 300 °C Resistant to corrosive atmospheres and harsh environments 	<ul style="list-style-type: none"> Versatile coolant temp. sensor Compact IP67 design with integrated connector Operating temp. range -40 to +100 °C 	<ul style="list-style-type: none"> Open loop current transducer based on Hall effect 3-phase busbar mount // 3 simple analog ratiometric outputs Galvanic separation between power and control
			
<p>APEM an IDEC company</p>	<p>Honeywell</p>	<p>YAGEO GROUP KEMET</p>	<p>Littelfuse</p>
<p>PBA-Series</p>	<p>CSNV1500 Series</p>	<p>FG-R05 Current Sensors</p>	<p>RCM14 residual current monitor Series</p>
<ul style="list-style-type: none"> Sealed to IP68 or IP69K, easy to clean robust metal surface 	<ul style="list-style-type: none"> Measures up to 1500 A High accuracy, low temperature drift Excellent stability, reliability and EMC performance CAN communication 	<ul style="list-style-type: none"> AC and DC leak current sensor Digital output fault detection Complies to IEC62752:2016 New revisions coming 	<ul style="list-style-type: none"> Multiple models to support global standards for Level 2 (UL2231-2), Mode 2 (IEC62752) and Mode 3 (IEC62955) AC EV chargers UL2231-2 compliant model
			
<p>Panasonic INDUSTRY</p>	<p>TE connectivity AUTHORIZED DISTRIBUTOR</p>	<p>TE connectivity AUTHORIZED DISTRIBUTOR</p>	<p>TE connectivity AUTHORIZED DISTRIBUTOR</p>
<p>ESB33 Push Switches</p>	<p>AV Series Vandal Resistant Switches</p>	<p>35H / 1-Position HV Rotary Switches</p>	<p>AST2000H2 series hydrogen pressure transducer</p>
<ul style="list-style-type: none"> Automotive qualified Low profile, h=6.0 mm SMD type (Embossed taping) available 2-pole 2-throws are available 	<ul style="list-style-type: none"> 250VAC and 5A push button switch 	<ul style="list-style-type: none"> Mechanical switch which can handle switching currents up to 550A and a voltage of 1000VDC 	<ul style="list-style-type: none"> One piece design All 316L wetted material for optimal compatibility No oil-filled cavities leave no chance of contamination Digitally compensated
			



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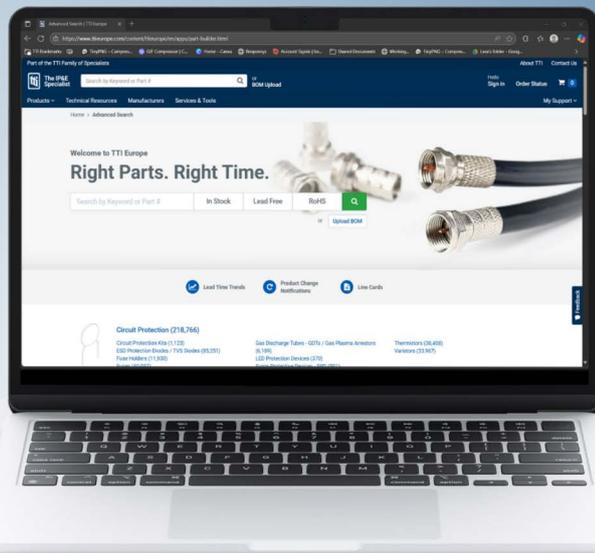
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Corporate Headquarters

TTI, Inc.
2441 Northeast Parkway, Fort Worth, Texas 76106 U.S.A.
T: +1 817 740 9000 | F: +1 817 740 9898
E: information@ttiinc.com

European Headquarters

TTI, Inc.
Ganghoferstr. 34, 82216 Maisach-Gernlinden Germany
T: +49 (0) 81 42 66 80 0 | F: +49 (0) 81 42 66 80 490
E: sales@de.ttiinc.com

European Sales Offices

Austria

Vienna
T: +43 (0) 18 79 85 90
E: sales.vienna@at.ttiinc.com

Belgium

Gent
T: +32 9 274 0670
E: sales.belux@nl.ttiinc.com

Bulgaria

Varna
T: +359 52 51 10 59
E: sales.varna@bg.ttiinc.com

Czech/Slovak Republic

Brno
T: +420 541 126 714
E: sales.brno@cz.ttiinc.com

Denmark

Brondbj
T: +45 (0) 43 29 35 35
E: sales.copenhagen@dk.ttiinc.com
Risskov
T: +45 (0) 38 41 31 00
E: sales.copenhagen@dk.ttiinc.com

Estonia

Tallinn
T: +372 664 81 00
E: sales.estonia@ee.ttiinc.com

Finland & Baltic Region

Espoo
T: +358 98 94 65 200
E: sales.finland@fi.ttiinc.com

France

Brive
T: +33 (0) 5 55 92 92 93
E: sales.france@fr.ttiinc.com
Bron
T: +33 (0) 472 81 2030
E: sales.lyon@fr.ttiinc.com
Bruz
T: +33 (0) 2 99 77 60 84
E: sales.rennes@fr.ttiinc.com
La Ciotat
T: +33 (0) 442 84 4142
E: sales.marseille@fr.ttiinc.com
Montigny Le Bretonneux
T: +33 (0) 130 13 7380
E: sales.paris@fr.ttiinc.com

Germany

Berlin
T: +49 (0) 30 8877 40 200
E: sales.berlin@de.ttiinc.com
Dortmund
T: +49 (0) 2301 91 304 0
E: sales.dortmund@de.ttiinc.com
Frankfurt
T: +49 (0) 6102 5999 100
E: sales.frankfurt@de.ttiinc.com
Hanover
T: +49 (0) 5 11 7 80 59 0
E: sales.hannover@de.ttiinc.com
Munich
T: +49 (0) 81 42 66 80 110
E: sales.munich@de.ttiinc.com
Pforzheim
T: +49 (0) 7231 14788 0
E: sales.stuttgart@de.ttiinc.com

Hungary

Budapest
T: +36 1 40 22 111
E: sales.budapest@hu.ttiinc.com

Ireland

T: +44 (0)1494 460000
E: sales.ireland@ie.ttiinc.com

Israel/Ray-Q Ltd.

Airport City
T: +972 3 975 3333
E: sales@ray-q.com

Italy

Civitanova Marche
T: +39 0733 81 8655
E: sales.milan@it.ttiinc.com
Florence
T: +39 (0) 55 094 63 76
E: sales.milan@it.ttiinc.com
Milan
T: +39 02 822 521
E: sales.milan@it.ttiinc.com
Naples
T: +39 081 4245719
E: sales.milan@it.ttiinc.com
Padova
T: +39 049 7802311
E: sales.milan@it.ttiinc.com
Rome
T: +39 0774 57 1302
E: sales.rome@it.ttiinc.com

Netherlands

Eindhoven
T: +31 (0) 40 290 1616
E: sales.belux@nl.ttiinc.com

Norway

Drammen
T: +47 (0) 92 66 87 66
E: sales.norway@no.ttiinc.com

Poland

Krakow
T: +48 605 475 479
E: sales.poland@pl.ttiinc.com
Kwidzyn
T: +48 55 279 67 57
E: sales.poland@pl.ttiinc.com

Portugal

Vila Nova de Famalicao
T: +351 252 493084
E: sales.barcelona@es.ttiinc.com

Romania

Cluj Napoca
T: +40 (0) 733 339 002
E: sales.romania@ro.ttiinc.com

South Africa

Pretoria
T: +27 86 111 2844
E: sales.southafrica@za.ttiinc.com

Spain

Barcelona
T: +34 (0) 93 645 25 75
E: sales.barcelona@es.ttiinc.com
Madrid
T: +34 (0) 91 416 11 90
E: sales.madrid@es.ttiinc.com
Vizcaya
T: +34 (0) 94 623 25 80
E: sales.bilbao@es.ttiinc.com

Sweden

Gothenburg
T: +46 (0) 31 741 12 90
E: sales.gothenburg@se.ttiinc.com
Stockholm
T: +46 (0) 8 594 11 800
E: sales.stockholm@se.ttiinc.com

Switzerland

Baar
T: +41 (0) 41 76741 90
E: sales.swiss@ch.ttiinc.com

Algeria, Egypt & Tunisia

T: +216 (0) 71 862 693
E: sales.tunis@fr.ttiinc.com

Morocco

T: +33(0) 555 92 92 93
E: sales.morocco@de.ttiinc.com

Turkey

Istanbul
T: +90 (0) 216 688 91 75 76
E: sales.turkey@tr.ttiinc.com

United Kingdom

High Wycombe
T: +44 (0)1494 460000
E: sales.london@uk.ttiinc.com
Manchester
T: +44 (0)161 872 2019
E: sales.london@uk.ttiinc.com

Resellers or Distributors

TTI Connect - Europe
T: +49 8142 6680 168
E: service@tticonnect.com

TTI, Inc. Headquarters Europe



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IECQ-P BSI 14.0013 (Germany)
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