

Amphenol

INTERCONNECT AND VALUE ADDED SOLUTIONS BY DESIGN



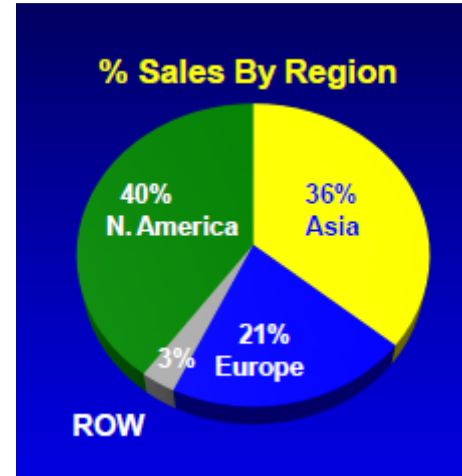
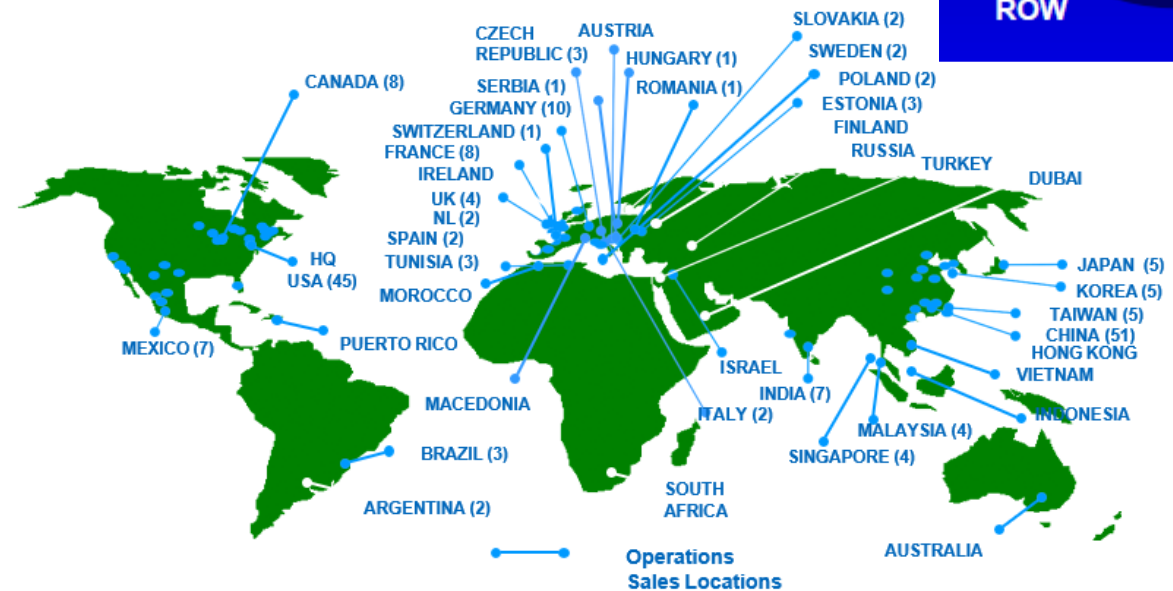
Electrification and Amphenol

Interconnect Products & Sensing Technology

www.amphenol.com

Introducing Amphenol

- Listed on **NYSE** since 1991
- **Second largest** interconnect manufacturer in the world
- Specialize in **high technology interconnect solutions**
- Complimentary acquisitions based on an **entrepreneurial** organization with strong leaders
- Over **96,000 employees** worldwide
- 2023E Net Sales: **\$12.6 bn**



Global Leaders in Interconnect & Sensing Technology in Various Markets



A Full Solution for Electrification

LOW AND HIGH VOLTAGE CONNECTIONS
FT. RADSOK® CONTACT TECHNOLOGY



AUXILIARY HV/LV
CONNECTIONS

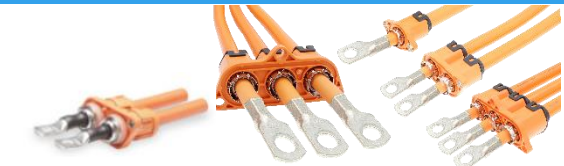


PTC AC

TRANSMISSION
CONNECTIONS



PASS-THROUGH



BATTERY SWAP MODULES (BSM)



BATTERY PACK



POWER
DISTRIBUTION
UNIT



MOTOR
CONTROL UNIT

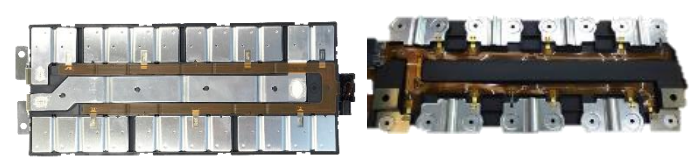


TEMPERATURE
SENSING



THERMAL RUNAWAY
DETECTION

BATTERY FLEX AND THERMISTOR HARNESS



DC/DC



CHARGER



MOTOR



PRESSURE AND P/T
COMBINED SENSING



COOLANT LEAK SENSOR



CABLE ASSEMBLY



MANUAL SERVICE
DISCONNECT



SAE / IEC / GB-T / MCS
CHARGING



DC/AC BIDIRECTIONAL
INVERTERS



RIGID AND FLEXIBLE BUSBARS



RESOLVER ALTERNATIVE



Battery Focus



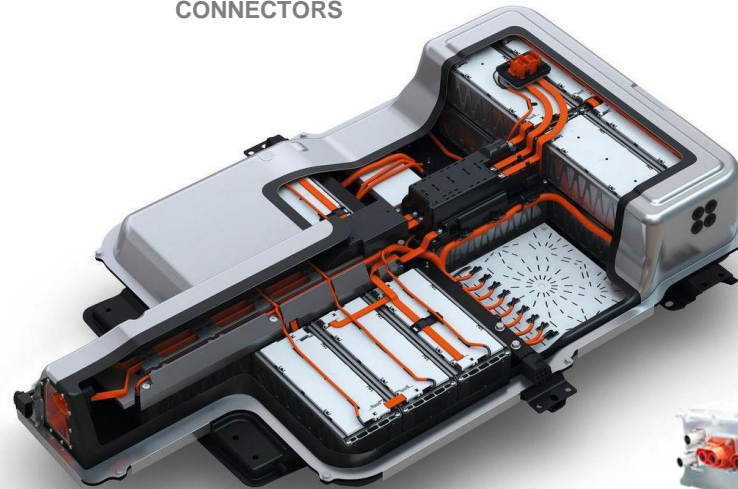
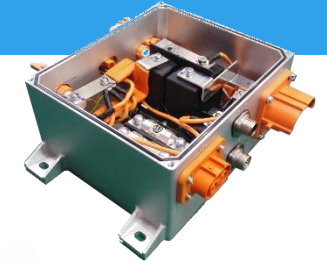
CELL CONNECTION SYSTEMS, POPULATED FLEX CIRCUITS



LOW PROFILE FPC CONNECTORS



BUSBARS



THERMAL MANAGEMENT COMP. AND ASSEMBLIES



MSD



BATTERY SWAP MODULES (BSM)



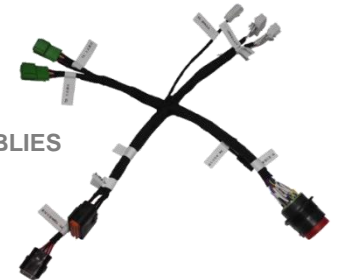
INNER LV/HV QUICK CONNECTIONS



HIGH VOLTAGE CONNECTIONS



PDU



CABLE ASSEMBLIES

THERMAL RUNAWAY DETECTION



Amphenol

INTERCONNECT AND VALUE ADDED SOLUTIONS BY DESIGN

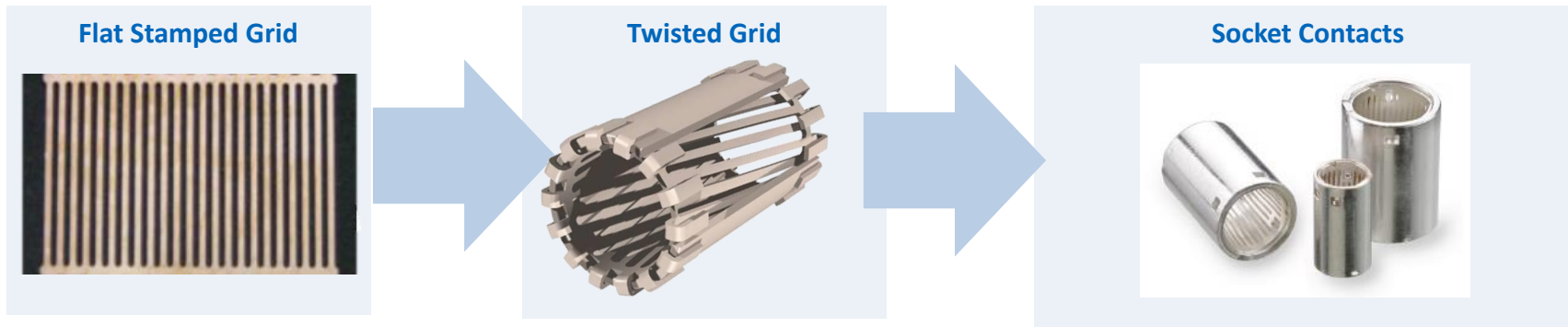


Products: Connectors

HV, LV

www.amphenol.com

At the Core of Power Connection: Radsok®



Pin Diameter	Current Rating at 25C	Current Rating at 85C
2.4 mm	60A	35A
3.0 mm	100A	60A
3.6 mm	120A	80A
5.7 mm	160A	120A
6.0 mm	160A	120A
8.0 mm	300A	200A
9.1 mm	350A	250A
10.0 mm	450A	300A
10.3 mm	500A	350A
11.1 mm	750A	500A
12.0 mm	750A	500A
14.0 mm	900A	600A
18.0 mm	1100A	750A
23.0 mm	1600A	1200A

Key Benefits:

- Higher Amperage with Smaller Envelopes
- High Durability
- High Current Ratings
- Low Mating Force

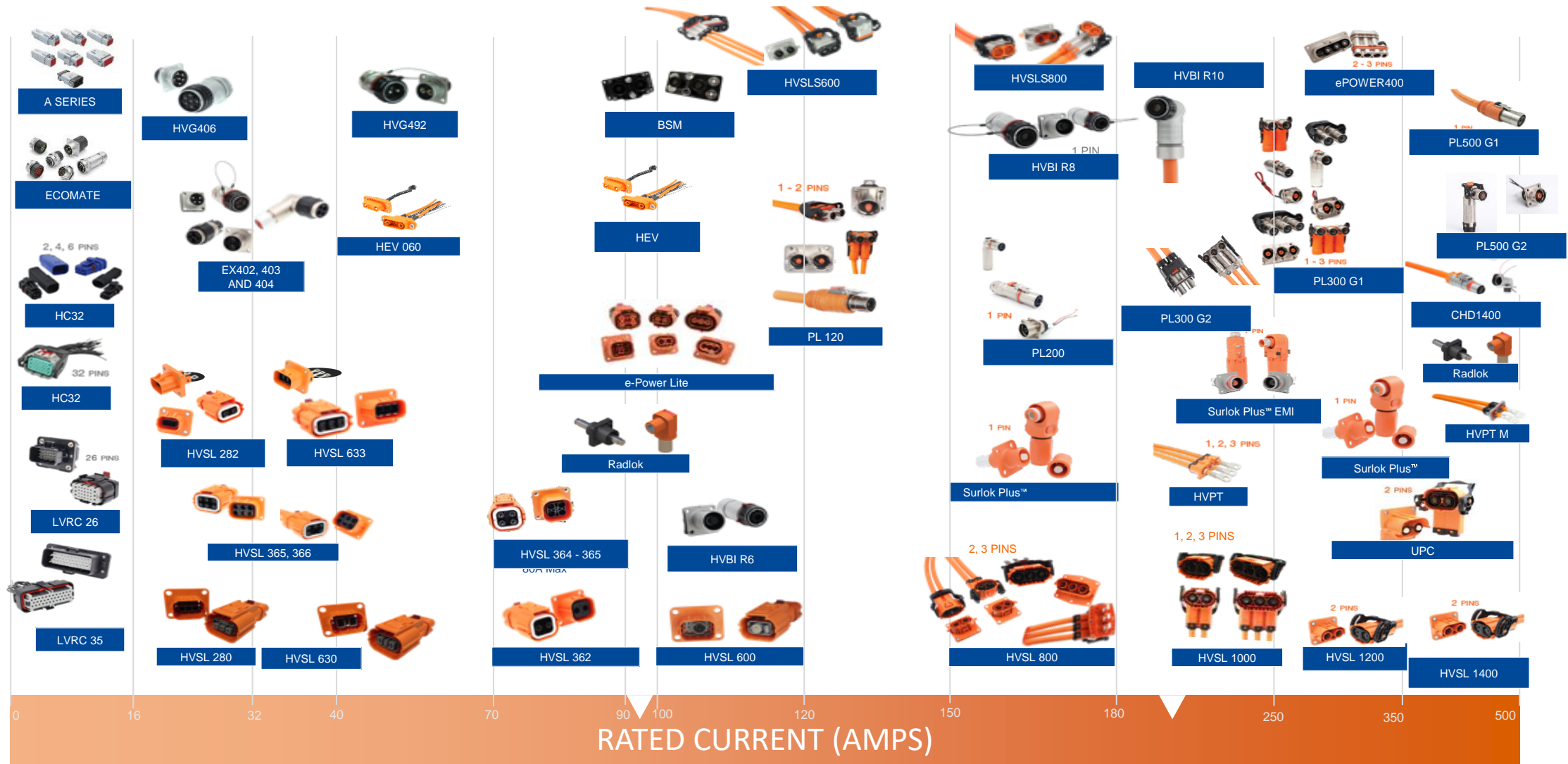


Next Gen (R8S)



- ✓ Smaller and Lighter
- ✓ Higher Current Capacity
- ✓ Reduced Cost
- ✓ Produced from 2 Parts Only
- ✓ Stamped and Formed
- ✓ RoHS Compliant- No CuBe

Amphenol Industrial Connectors by Current



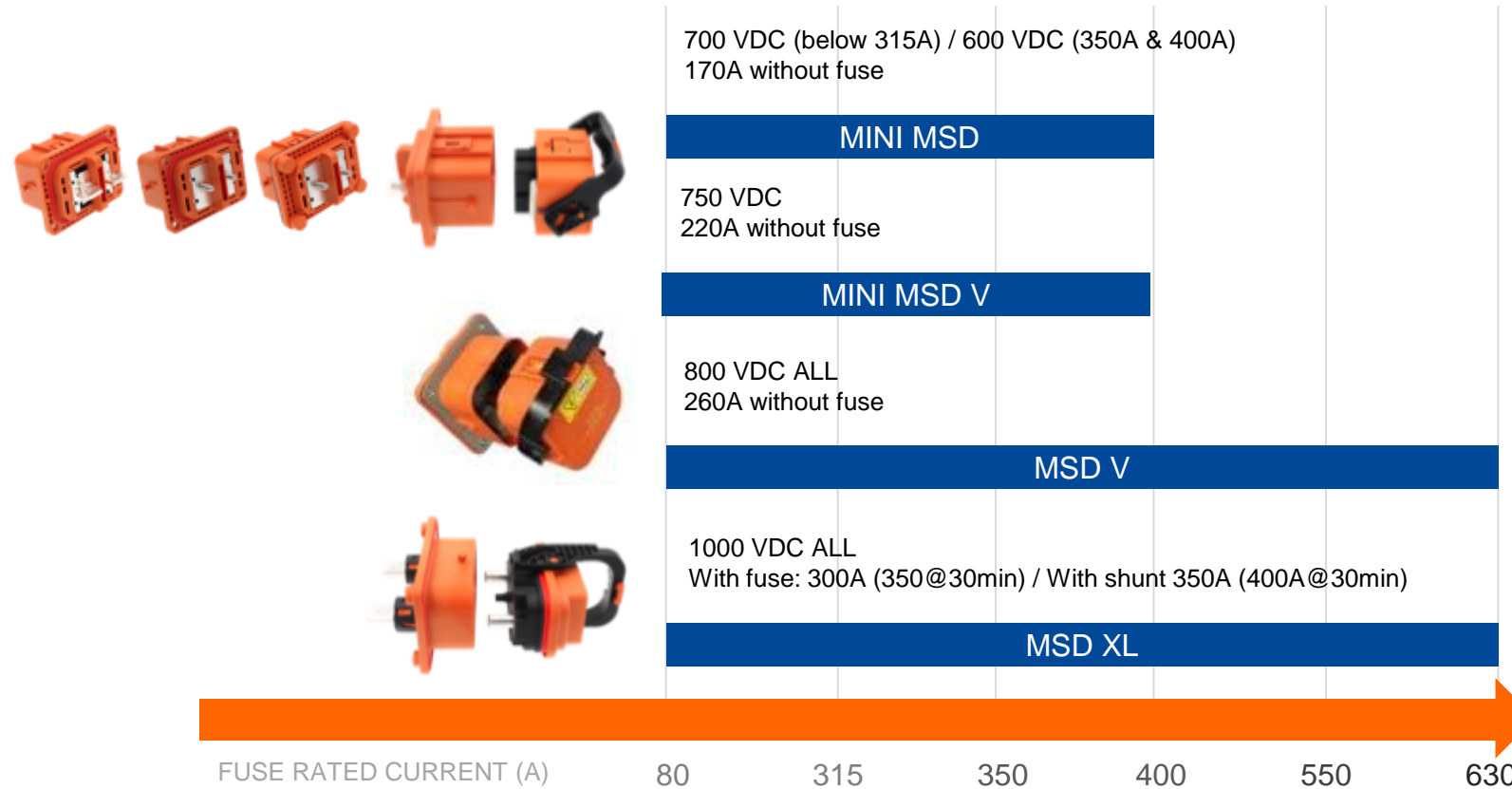
High Voltage Connections | Meets SAE-USCAR-2/37 and LV215 compliant



- Options up to 700A @ 85°C
- Options up to 300mm² cable size
- Options up to 1.500V DC
- IP67 / IP69K
- EMI Shielding
- Low/High Voltage Interlock
- Plastic or Metal Housing
- High Mating Cycles



Manual Service Disconnect (MSD)



EV Charging : Plugs & Inlets



Amphenol
INDUSTRIAL PRODUCTS GROUP

EV Charging



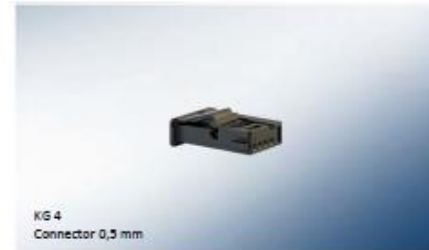
MCS	CCS1 UL	AC SAE J1772	CCS2 IEC	AC IEC	AC GB/T	DC
MCS LVL 1 Passive +350A	CCS1 Plug HPC LCC 500A	AC SAE Plug 16A to 80A	CCS2 Plug HPC LCC 500A	IEC Plug 16A to 80A	GB/T HPC LCC 600A	
MCS LCC Liquid Cooled LVL 2 2000A LVL 3 3000A	CCS1 Copper 125A - 350A	AC SAE - CAC 32A	CCS2 Copper 125A - 400A	IEC Jumper 16A to 80A	GB/T DC 80A to 250A	
MCS Inlet Passive LVL 2 1000A	CCS1 light 40A-65A-80A	AC SAE Portable Mode 1 16A to 32A	CCS2 light 40A-65A-80A	IEC Jumper 16A to 80A	GB/T Combo Inlet	
MCS Inlet Liquid Cooled LVL 3 3000A	CCS1 Inlet 65A - 500A	AC SAE Inlet 16A to 80A	CCS2 Inlet 65A - 500A	IEC AC Portable Mode 1 16A to 32A	GB/T Inlet AC or DC	

✦ Work in Progress 2022 ✦ Work in Progress 2023 Q1/Q2

Power & Signal Transmission

Contact Housings:

- 0.5-9.5mm contact systems
- Sealed or unsealed
- Male or female
- Hybrid options

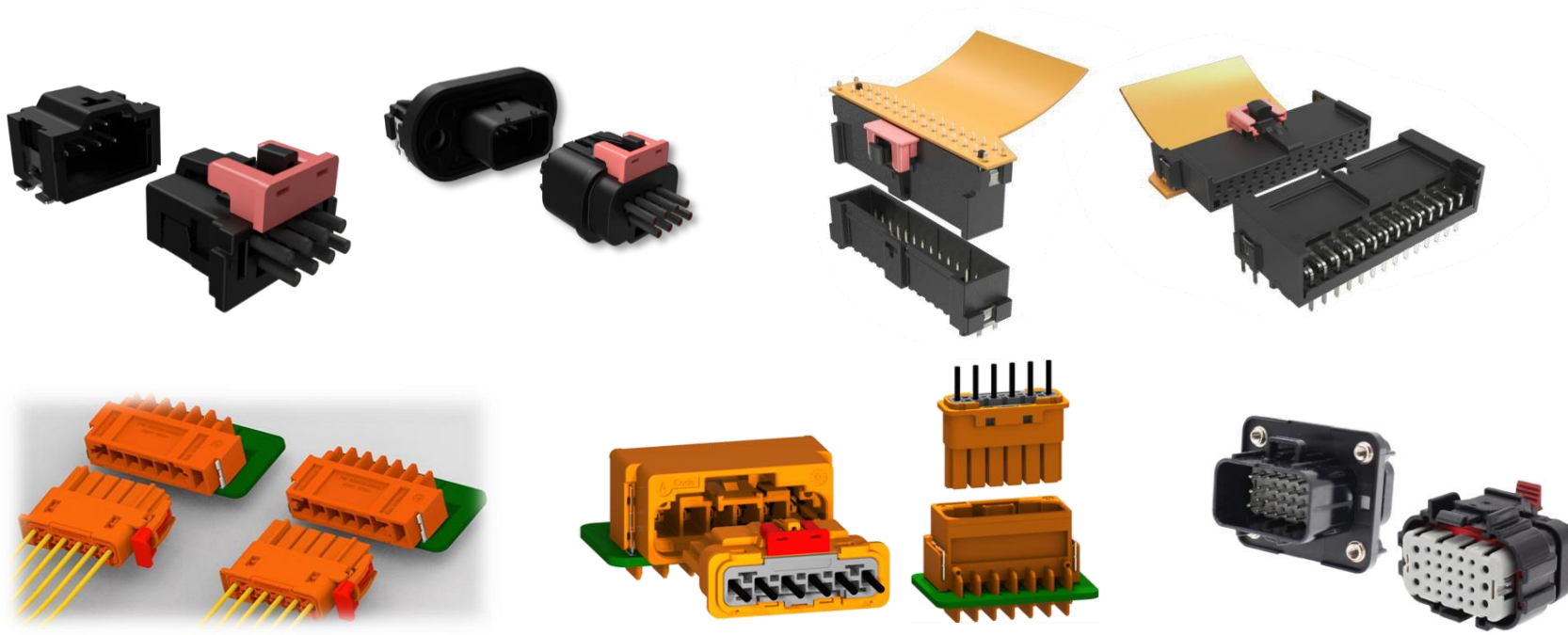


Aggregate Interfaces:

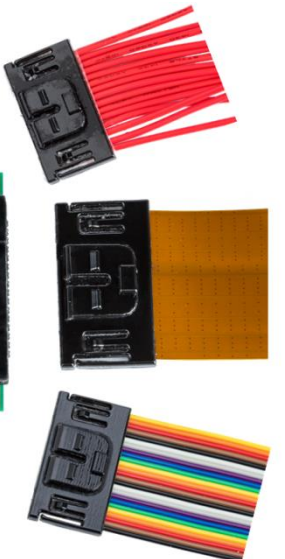
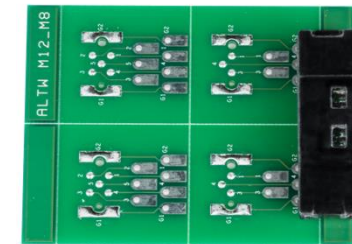
- HV/LV, combined HV/LV solutions
- Sealed or unsealed
- Shielded optional, electrical interlock possible
- Direct connection of interface to PCB via stamped parts or wire-bonded



Power & Signal Transmission



Multi-Pin and Lay-Out Configurations
Higher Amperage Capacity
Up to IP67 / IP69K rating
EMI Shielding available
Plastic or Metal Housing
Board-to-Board, Wire-to-Flex, Wire-to-Board



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INTERCONNECT AND VALUE ADDED SOLUTIONS BY DESIGN

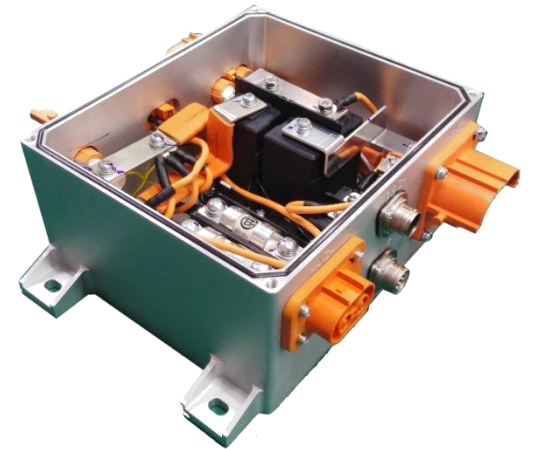
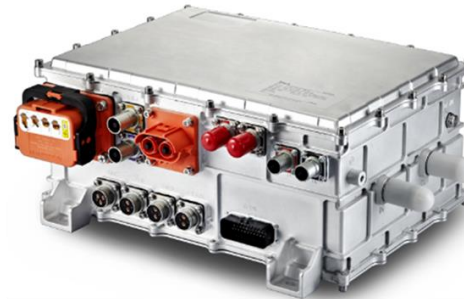


Products: Value Add Assembly

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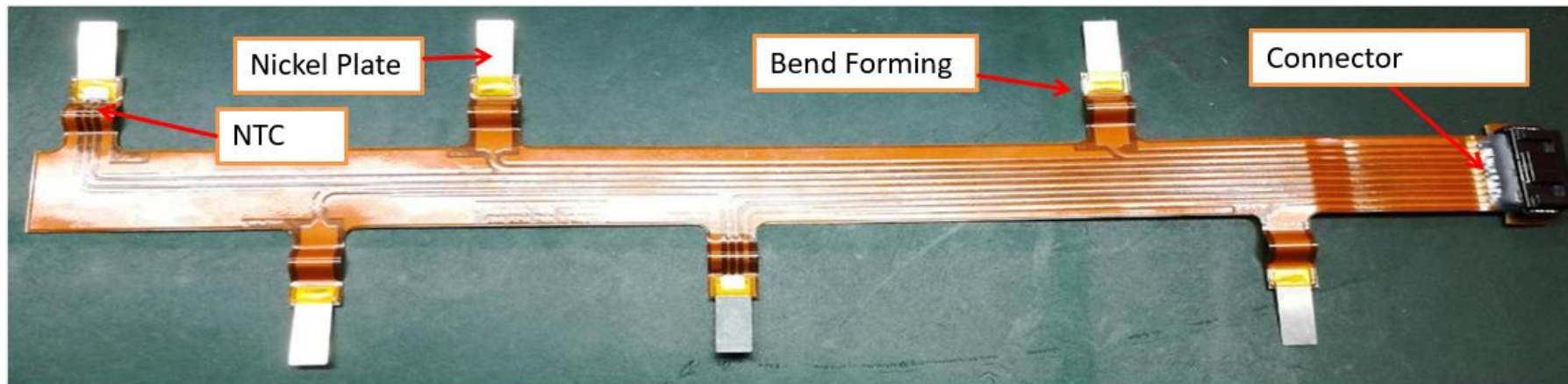
Power Distribution Unit (PDU)

- Power Distribution Unit
- Battery Disconnect Unit
- Battery Junction Box
- Built to print & Custom Design



Battery Flex Technology

Amphenol
Sincere



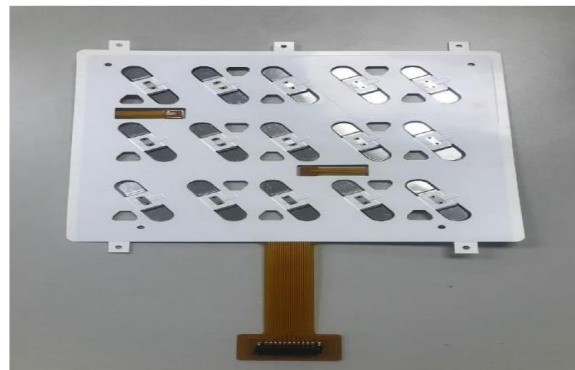
- Single, Multilayer, Rigid Flex, Circuits
- Harsh Environment: Reliable in high vibration, great chemical resistance
- Excellent Signal Integrity: EMI Shielding, Impedance Controlled, Twisted Pair
- Dynamic Flexure: Over 200K Bending Cycles with Standard Materials
- Multiple Surface Treatments
- Provide Design Flexibility, Reduce Weight, Lower Assy Cost & Labor Time, Pack Size Reduction

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Cell Connection Systems: Temperature and Voltage Measuring & Monitoring



Flexible printed circuit (FPC)



Laminated Busbar



Wire Bonding



Laminated Busbar

- Wired, Flex and Laminated options
- Sensors with EMC protection
- Stamping studies to optimize laser welding
- Plating when required
- Heat-stake and adhesive-mounted flex circuits
- Full Engineering support
- Modeling & design optimization
- Rapid proto, testing and validation
- Expertise in FPC, SMT, HV
- Printed fusible links, EMC protection, stress/swell analysis, DFMEA / PFMEA

Busbars



Custom busbar design: experts in modeling and simulating current flow, thermal response and induction mitigation

Applications:

- Inner Battery Connections
- Pack To Pack

Experience: copper and aluminum, all sizes

Supported in 3 major regions: NA, Europe, Asia

Wire Harnesses and Cable Assemblies: supported on all continents



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INTERCONNECT AND VALUE ADDED SOLUTIONS BY DESIGN



Products: Sensors

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Full Amphenol Sensors Portfolio

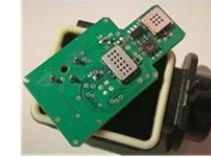
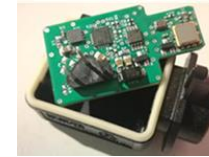
Delivering Value-Add  Sensors



NEW xEV Sensor Applications | Safety, Diagnostics, Robustness

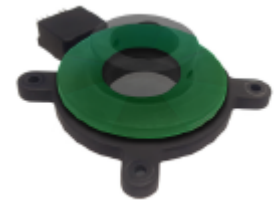
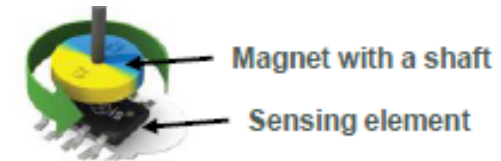
REDTR: Thermal Runaway Detection

- Mounted on Battery Management System
- Combined sensor technology: robust, durable, fast response to thermal runaway precursors\H2 and CO2 sensors
- Definitive Detection of single cell breach
- Layered detection to eliminate type 1 & 2 faults



Position Sensors & Controls

- Contactless Sensors: Hall Effect on Shaft Concentric
- Contactless Sensors: Hall Effect on Shaft Through Hole
- Contactless Sensors: Inductive Through Shaft High Speed



Current Sensors

- Open loop current transducer based on Hall Effect
- Measured current values from 200A to 1.500A
- Applied to battery management, motor control, power-electronics



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Emobility & Electrification**

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