

Corporate Structure Facility Overview Capabilities & Products Overview

April 2024

TPI Website →

Product Listings →

Product Support →



LinkedIn →





Who are we...

- Established in late 1980's
- Leveraging our industrial, heavy equipment and automotive background to help **enable the electrification revolution**
- Focus on **electrification** and **alternative energy applications**
- **20+ years** experience in high current / high voltage applications
- **Global** production, design, technical and sales support
- Automotive **Certifications** (IATF, VDA)

Products & Capabilities

- **High Voltage Cable Assemblies** & Low Voltage Harnessing
- **Bus Bars** (Flex, Rigid, Sealed, Laminated, Molded, Shielded)
- Custom **Molded Solutions (HV, LV, Shielded)**
 - Splices, Flanges, Pass Thru, Securement, Sealing...
- **High Voltage Connectors**
 - Heavy Equipment *market leading* **PowerLok G1 and G2**
- **Low Voltage Connectors**
 - **HC, USCM** (new) and **USCL** (new) product families
- **Solar** (string harnesses, fuses, junctions, extensions)
 - Technology now supporting custom HV / EV solutions
- **Full Product Data on website** (www.tpil.com):

TPI Website





Corporate Structure

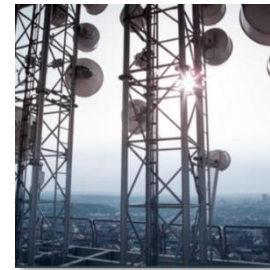
Amphenol®



MILITARY



COMM. AEROSPACE



MOBILE NETWORKS



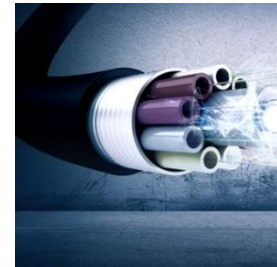
AUTOMOTIVE



IT & DATACOM



INDUSTRIAL



BROADBAND



MOBILE DEVICES

Amphenol HPI
High Power Industrial



Amphenol
TPI

AMPHENOL CORPORATION DIVISION STRUCTURE

Amphenol Corporation

Adam Norwitt (CEO)

AHES

Amphenol Harsh Environment Solutions

Luc Walter (President)

AHPI

Leon Zong
(Group GM)

ACAG

Eric Rushbrook
(Group GM)

AHTI

Ben Reed
(Group GM)

AIMG

Alberto Zaldini
(Group GM)

AIIO

Joerg Kersten
(Group GM)

ANAM

Ryan Fisher
(Group GM)

ACS

Amphenol Communication Solutions

Bill Doherty (President)

MCP

Richard Gu
(VP)

RFOB

Bill Callahan
(VP)

ACP

Gary An
(Group GM)

AHS

Rith Riccitelli
(Group GM)

AISS

Amphenol Interconnect & Sensor Systems

Jean-Luc Gavelle (President)

AGIS

Marc Wetsig
(Group GM)

ASTG

Pete Straub
(Group GM)

AAPG

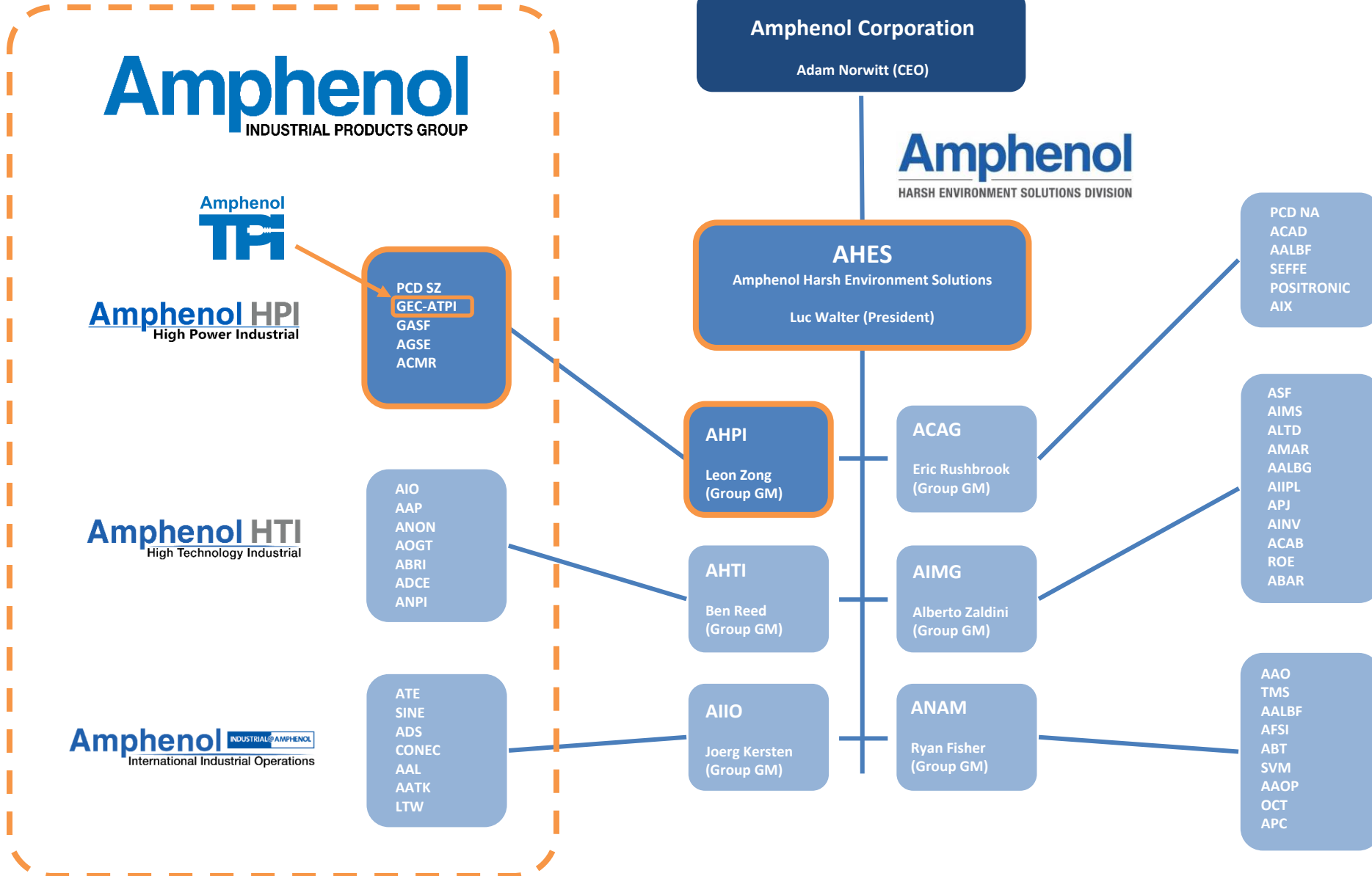
Dieter
Ehrmanntraut (VP)

Amphenol
HARSH ENVIRONMENT SOLUTIONS DIVISION

Amphenol
INDUSTRIAL PRODUCTS GROUP

Amphenol®

Amphenol®





Facility Overview

Global Facilities | North America



Winnipeg, Canada (2nd Location)

- **Added warehouse 2023, Office/Lab 2024**
- **Development Center & Warehouse**
- Engineering Development Center
- Warehousing & Supply Chain
- Supporting NA growth



Winnipeg, Canada

- Engineering, R&D, Customer Service, Logistics, Prototypes, Med/Low Volume Production
- Prototypes & Mold Tool & Die Design/Build
- 20,000 Square Feet, **Added 2nd (15k sq ft) site in Q1 2023**
- 85 Employees
- ISO 9001:2015 / IATF Pending



Nogales, Mexico

- Cable Harness Production for NA Market, High/Med Volume
- 65,000 Square Feet, **doubled footprint 2021, 20k Addition in 2022, 15k Addition in 2023**
- 360 Employees
- ISO 9001:2015 / IATF 16949:2016
- 10K warehouse added

Global Facilities | Asia & Europe



Changzhou, China (HQ, "GEC")

- Engineering, R&D, CS, Logistics, Prototypes, High/Med/Low Volume Production
- PowerLok, RadLok, and Busbar Design Center
- Over 200,000 Square Feet, **New building added in 2022 with focus on EV**
- More than 700 employees
- IATF 16949 / ISO 9001:2015 / ISO 14001:2015



Pecs, Hungary

- **Adding new site Q2 2024**
- Supporting existing customer base in Asia who are expanding into Europe
- Standard Product Warehouse & Cable Harness Production for European Market, High/Med Volume
- ISO 9001:2015 / IATF 16949: 2016



Hanoi, Vietnam

- **New site added in 2023**
- Initial focus on semiconductor and EV markets
- Cable Harness Production for NA Market, High/Med Volume
- ISO 9001:2015 / IATF 16949: 2016

Global Facility Map

Winnipeg, Canada
(NA HQ, R&D, Production)

Nogales, Mexico
(Production)

Pecs, Hungary
(Production)

Changzhou, China
(HQ, R&D, Production)

Guangzhou, China
(R&D)

Hanoi, Vietnam
(Production)

-  Existing Facilities
-  New Facilities
-  Potential Expansion (Solar / EV / Industrial Cable Assembly)
Phoenix and India



Products and Capabilities

Product Portfolio

Industrial Cable & Harness Assemblies



eMobility Interconnects & Cable Assemblies



Diesel Engine UVC/GP



Flexible & Rigid Bus Bars BARE / COATED / MOLDED



Solar Balance of System



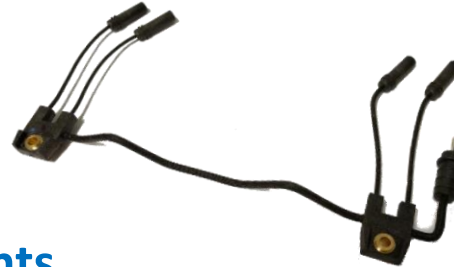
Products and Capabilities

Highlights:

- **High Temp – High Vibration – Harsh Environments**
- High / Medium / Low Volume Manufacturing
- Custom Wire Harness and Cable Assemblies
- **Specialty Overmolding** and **Sealing**
- Connector Design / Standard Products
- Custom Terminal / Contact Design

Key Processing Capabilities:

- **Overmolding / Insert Molding**
- **LV & HV Cable / Harness Assembly**
- Sealed Pass Thru Technology
- Braiding
- Encapsulating / Potting
- High Voltage / High Current Solutions
- Flexible & Rigid Bus Bars
- Heavy Gauge Ultrasonic Welding



Overmolding | Providing a solution....

- **Added durability and protection from the elements** (environmental, abrasion, vibration/flex, external forces, tampering) for internal components:
 - Wire jacket, conductors, crimps, solder joints and terminals
 - Splices at junctions and breakouts
 - Shielding and drain wires
- **Custom geometry and cable routing**
- **Integral securement options**
- Sealing options (IP67+, IP6k9k)
- **Enhanced electrical isolation and shielding**
- Improved chemical resistance and structural durability
- Replace backshells and hardware, cost reduction
- High flex strain reliefs
- Option when assembled components are not available
- Cost effective tooling and material options
- Logo's and marking options





Assemblies and Molded Solutions

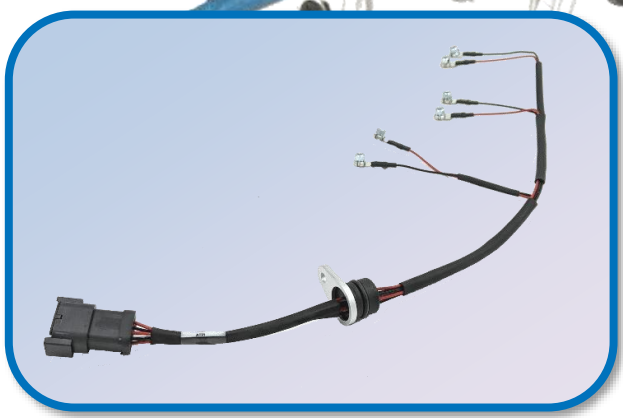
Diesel Engine UVC & Glow Plug Harnesses



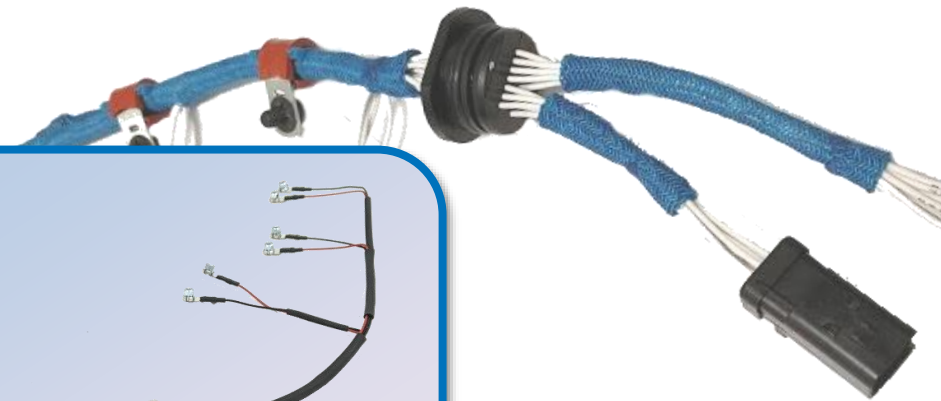
Fuel Injection Harness



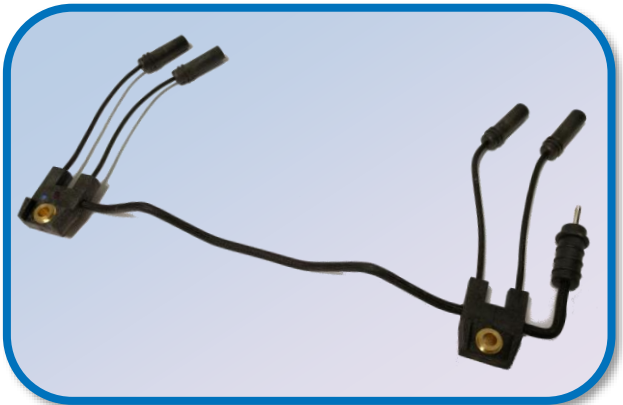
Fuel Injection Harness



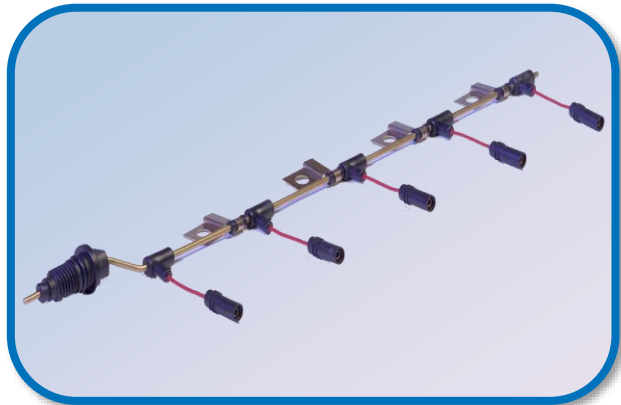
Fuel Injection Harness



Glow Plug Relay Assembly



Glow Plug Harness

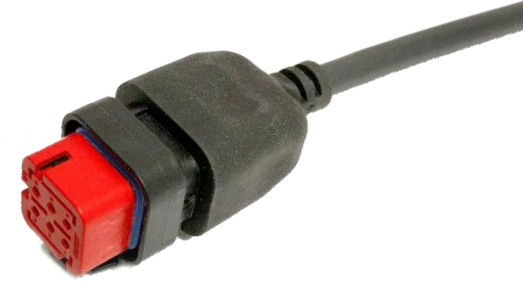


Glow Plug Harness



Overmolded Circulars w/ Multi Conductor Cable

Harsh Environment: Vibe/Flex/Debris



Overmolded Circular
90 and 180 Deg Backshell 4x
multi-conductor cable



Overmolded Securement, Mounts, Flex Joints and Splices

Harsh Environment Moldings:

Vibe, Flex, Debris, Chemical, Sealing

Aid in Routing/Assembly (reduce errors and time)

Poka Yoke final assembly on chassis



Overmolded Mounting Flange on Cable Assembly



Overmolded 30 Deg Mounting Point and Integrated Bushing



Overmolded mounting Point with Integrated Bushing



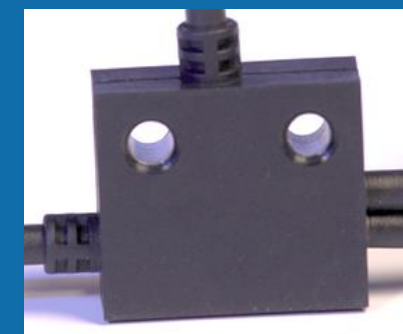
Bulkhead Pass Thru Grommet



Overmolded High Flex Mounting Point and Integrated Bushing

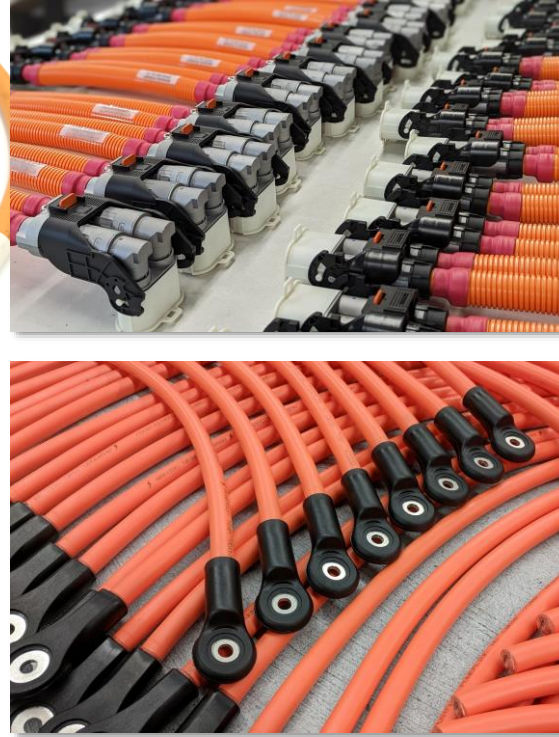


Overmolded High Flex Mounting Flange



Overmolded 3-Way Splice with Integrated Mounting Points

High Voltage Cable Assemblies | EV, HEV, ESS



Direct assembly, validation and test experience with various Amphenol & Third Party Connectors:

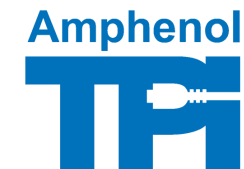


KOSTAL

Rosenberger



Amphenol
Industrial

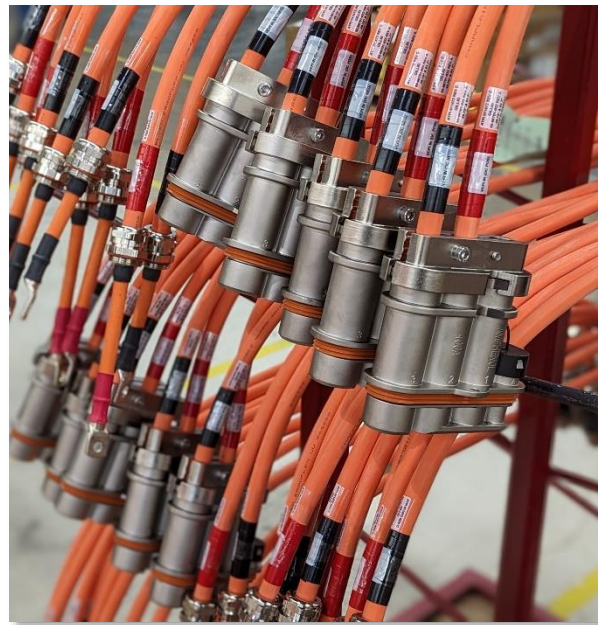


Capability Updates:

- Serialization and Traceability (Crimp/Weld, E-Test, Pull, Functional Testing, Pressure/Leak Test, CFM, Assembly)
 - Cable cut to Packaging
- Amphenol and Third Party Connectors
- In house die design, build, and crimp validation
- Common EV cable types in stock



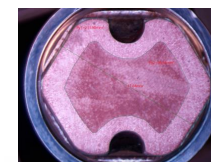
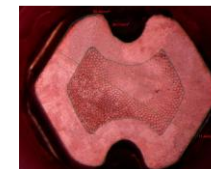
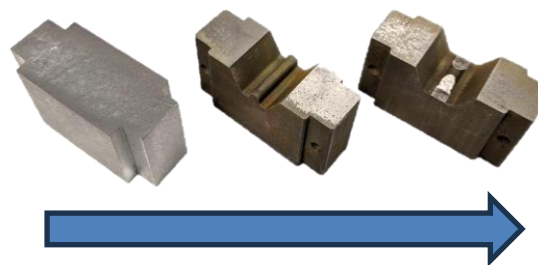
High Voltage Cable Assemblies | EV, HEV, ESS

**WEZAG®**

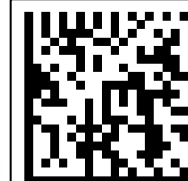
Capability Updates:

- Serialization and Traceability (Crimp/Weld, E-Test, Pull, Functional Testing, Pressure/Leak Test, CFM, Assembly)
 - Cable cut to Packaging
- Amphenol and Third Party Connectors
- In house die design, build, and crimp validation
- Common EV cable types in stock

RAPID in-house crimp die development & validation
(**< 1 week**)



**100% Traceability and
Serialization Capability
through Production**



ATPI: 011480 rev B

222 rev A

SN: 0000000100001

2024-04-09

Expanded Ultrasonic Weld Capabilities



TT7 Ultrasonic Welder

- North America Production
- Up to 180mm² (350 MCM) Copper to Lug
Market Leading Capability
- Able to support all custom and third party ultrasonic welded connector options
- Enables larger custom solutions (Splices)

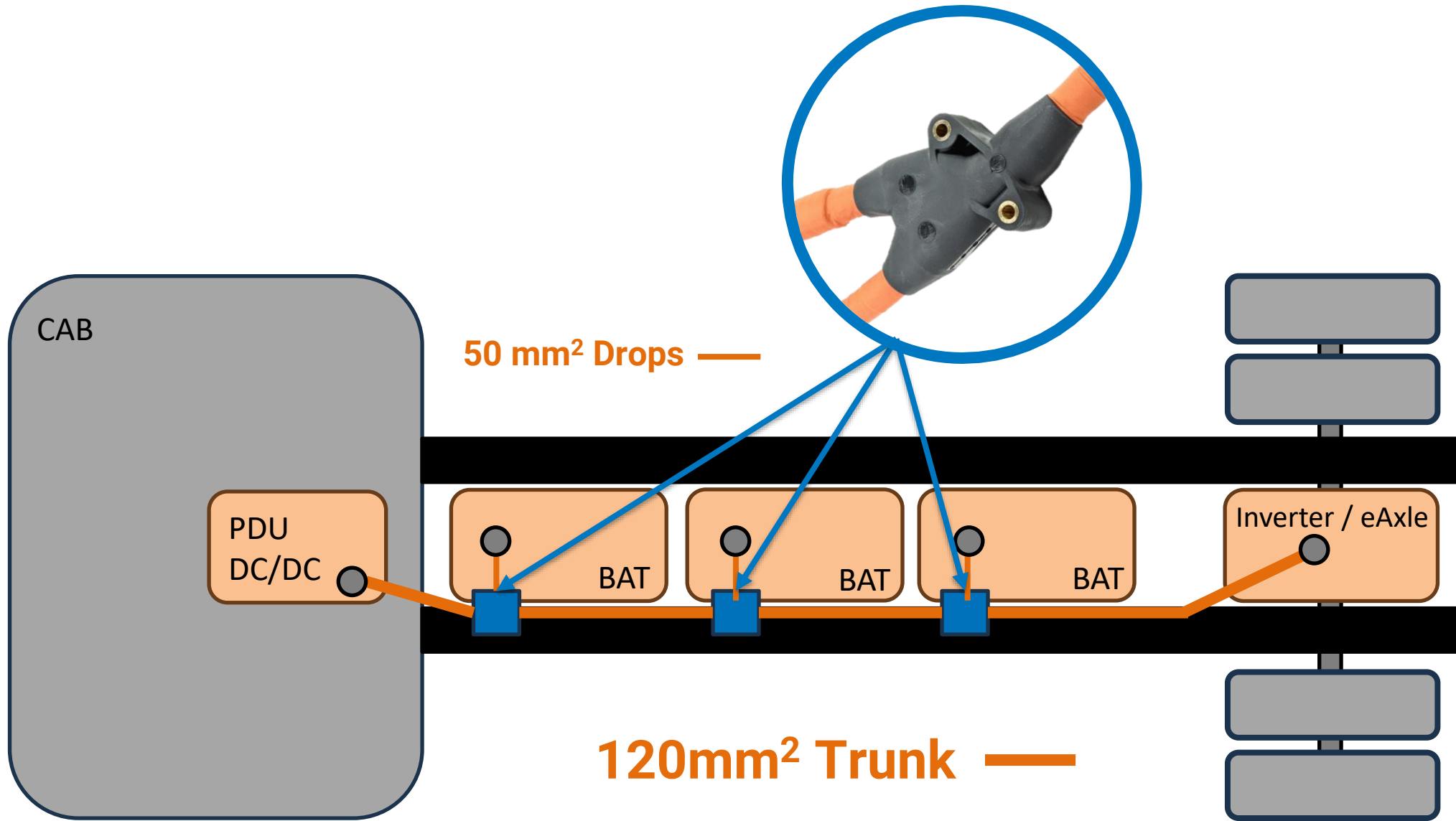
HV Molded Solutions



Molded Splices & Junctions

- Based on solar technology, field proven (10+ years)
- Bonding to Cable Jacket achieves IPx7, IPx8 (1000 hours), IP6K9K
- **Global Cable Options (XLPE/XLPO):**
 - Validated: PowerLink (China), Champlain (USA)
 - In process: Coficab (Europe/Mexico), Judd (USA), Amphenol TFC (USA)
- Shielded and Unshielded, **2.5mm² to 120mm²**
 - **Ultrasonic weld / busbar & crimped shield connection**
- Integrated securement bushings
- Custom Geometry (low cost tooling)
- **Trunk/Bus (120mm²/50mm²) designs in process with major OEMs (Heavy Equipment, Truck and Bus)**
- **Displace junction boxes -> Cost, Weight, Space savings for OEMs**
- Inline EV Fuses in development
- Options to provide pigtail to Tier 1 or full solution to OEM – Win majority of HV cable content

HV Molded Solutions | Concept Truck Chassis Trunk/Bus Application



Positive/Negative circuits not shown for clarity

Solar (PV) Overmolded Fuses and Junctions | String Harnesses

DC Current Rating	1500V
Junction Current Rating	50A
Connector Options	H4/MC4/EVO2
Cable Size Options	8AWG, 10AWG, 12AWG 4 AWG, 6 AWG
Ingress Protection Degree	IP 68 (1m water/24 hours)
Ambient Temperature Range	-40°C to +70°C
Material Safety	RoHS2 Compliant
Flammability Classifications	UL94-V0
Outdoor Suitability	UV Resistance, F1 Rated
Approvals	UL6703; UL4248-1; UL4248-18 Recognized UL9703 Listed

UL9703 / UL6703

**With all standard industry connector options
(TE, MC, Amphenol and more)**

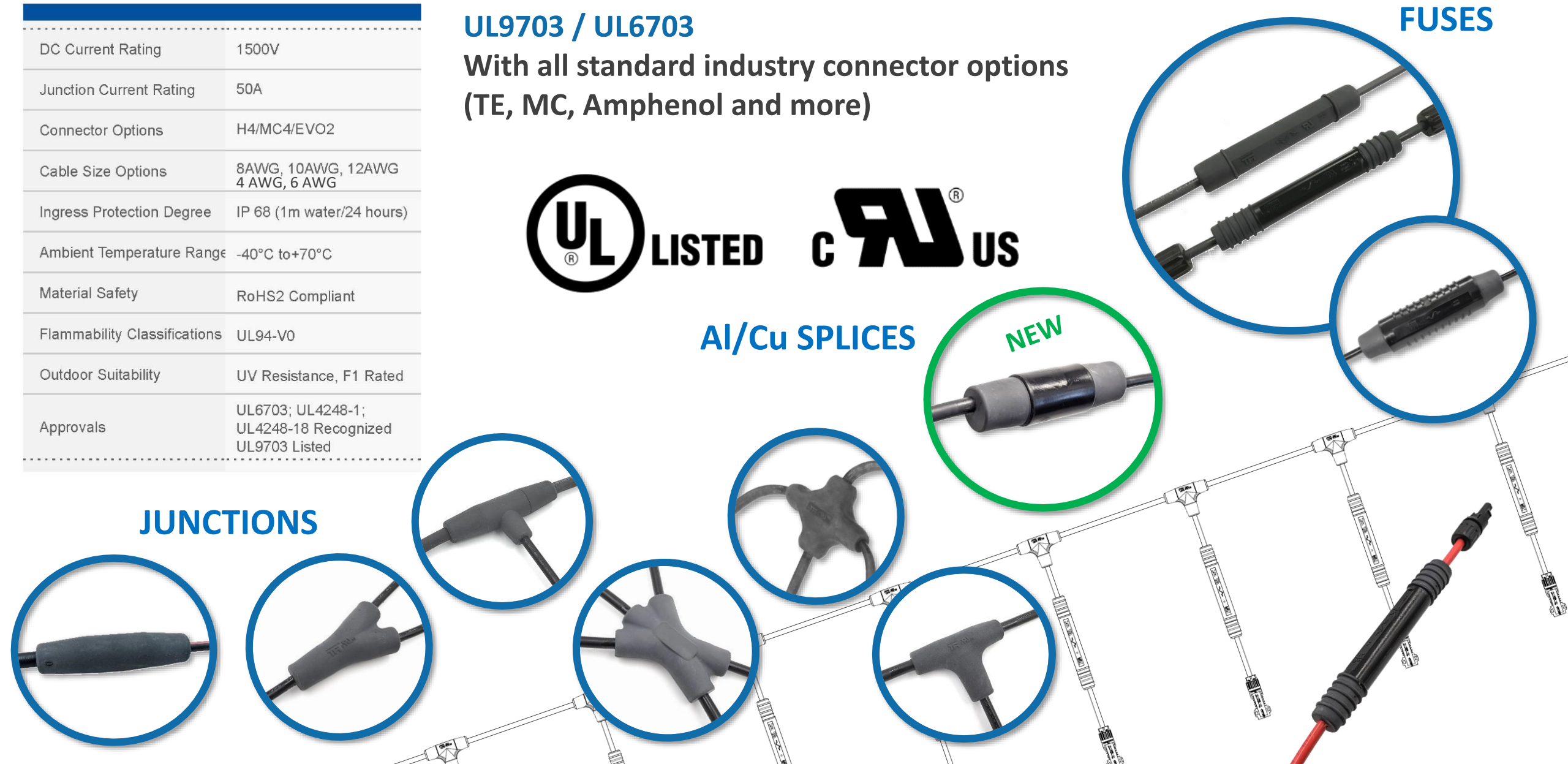


Al/Cu SPLICES

NEW

FUSES

JUNCTIONS





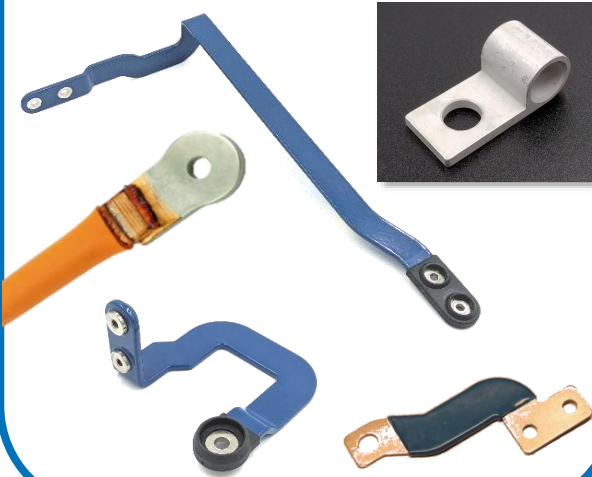
Bus Bars, Terminals, Lugs

Busbars

Product Listings →

RIGID

- Copper and Aluminum
- Bare, Powder coat and other Insulation options
- Terminal / Lug Design
- Value add options (PEM, Sockets, Pins, Boss...)
- Complex Bends
- Tin / Nickel / Silver plating



FLEX

- Copper and Aluminum
- Layered Strips and Rope/Braid options
- Preforming
- Fused Ends
- Hybrid Rigid/Flex
- Contact, Pin, PEM integration
- Insulation options



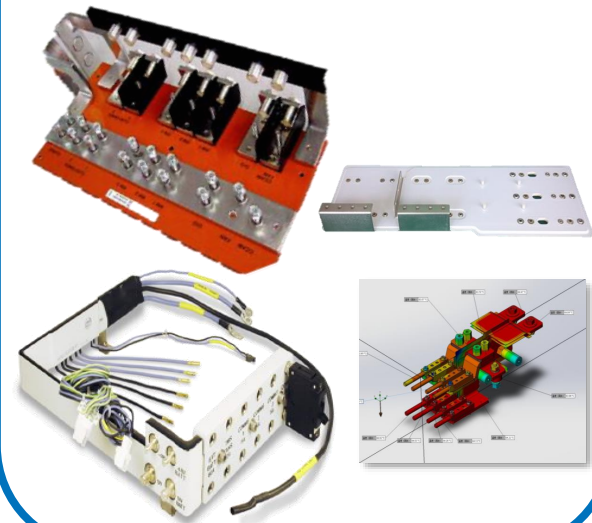
SEALED / MOLDED

- Fully Sealed Busbars
- Increased durability via overmolding
- Greater wall thickness allows for higher DWV
- Sealing of wires/cables to busbar
- Integrated fuses and components (sensors, PCB)
- Sealing interfaces for bolted and connector terminations



LAMINATED

- Full design support
- Full Thermal Analysis with Cross Section and Layer Optimization Capabilities
- High Voltage & High Current applications (1000A+)
- Value add assembly



Bus Bars | Flex, Rigid, Laminated, Molded

Flexible: Layered Strip



Flexible: Braided



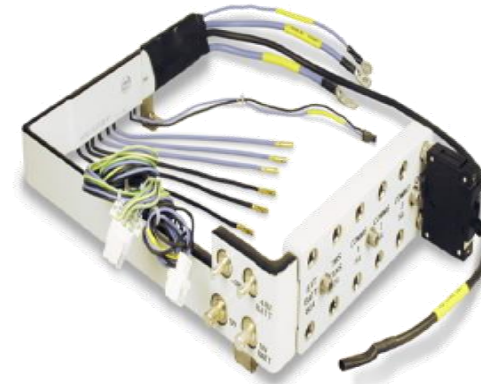
Rigid: Layered, Al & Cu



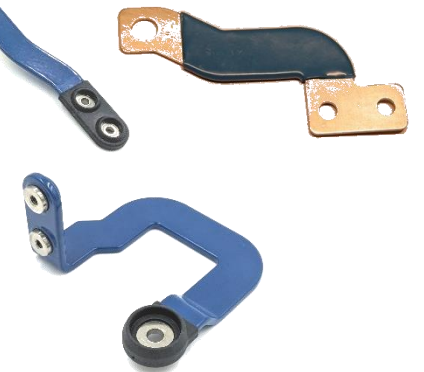
Molded



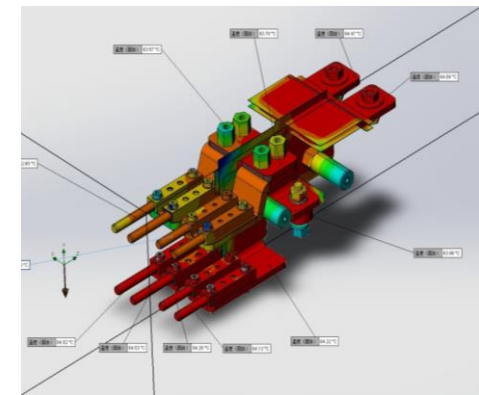
Assemblies: with Cable/Hardware



Rigid: Coated

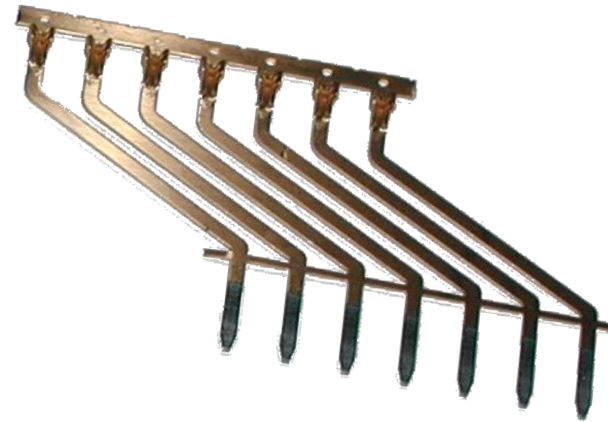


**Full Thermal Analysis
with Cross Section and
Layer Optimization
Capabilities**



Lug & Terminal | Contact Design

- Custom Terminal & Contact Design with Prototyping Capabilities
- Custom Lugs: machined, formed and cast
- Custom Geometry
- Ultrasonic Welded Lug Design
- Tin, Nickel, and Silver standard plating options
- UL / USCAR 21 Terminal & Crimp / Weld Validation Testing



HV Molded Solutions

Product Listings →

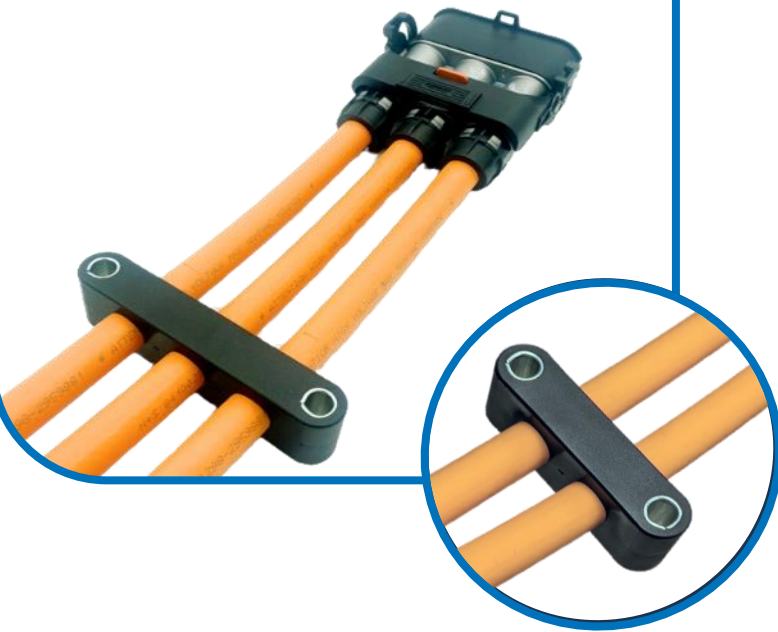
Molded Splices, Junctions & Flanges

- Based on solar technology, field proven (10+ years)
- Bonding to Cable Jacket achieves IPx7, IPx8 (1000 hours), & IP6K9K
- **Avoids compression set failures**
- High Vibe | High Temp
- Cost/Space/Weight Reduction
- Optional Shielding



Molded Cable Clamps

- Based existing molding technology, field proven (20+ years)
- Integrated securement bushings
- Custom Geometry (low cost tooling)
- Improved connector longevity
- **Poka-Yoke** assembly in application



Sealed Bus Bars and Interconnects

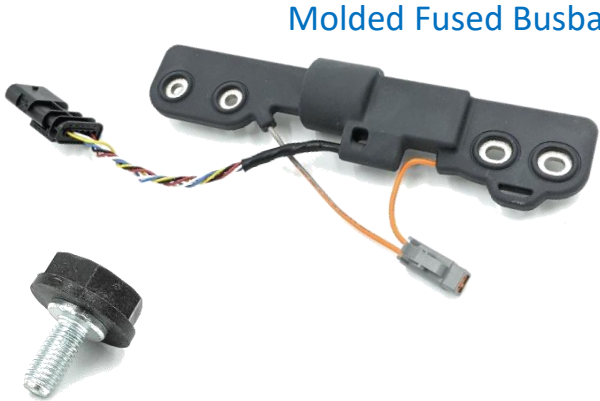
- Custom Geometry / Routing
- Bolted or RADSOX w/ Pin Connections
- Bus Bar to Cable Sealing
- Integrated Securement
- Encapsulated Fuses & PCBs



Sealed Bus Bar / Cable Interconnects

Custom Geometry / Routing
Bolted or RADSOK w/ Pin Connections
Bus Bar to cable Sealing
Integrated Securement
Encapsulated Fuses & PCBs
Sealed Cable to Flange

Molded Fused Busbar with Current Sensor



Molded r/a lug w/ RADSOK



Molded Lug/Bus Bar



U Cable Overmold



Molded HV Flange Concept to SOP



Molded Bus Bar w/ RADSOK & Shrouded Pins



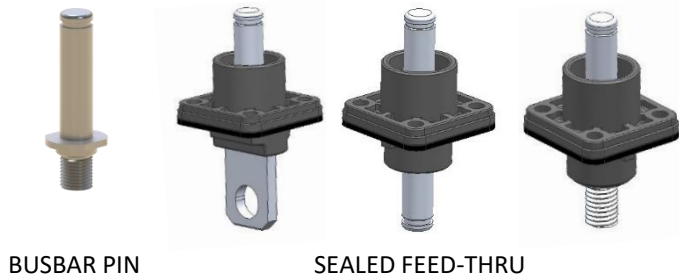
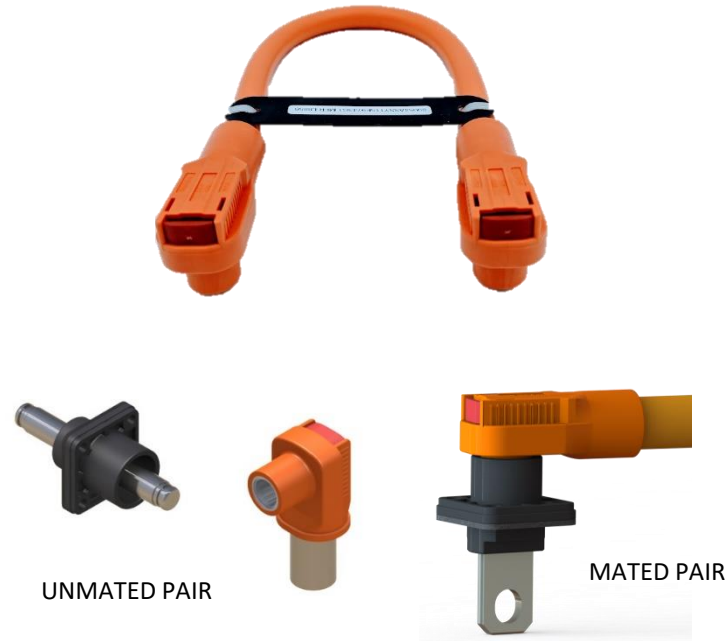


High Voltage Standard Products

RadLok | High Voltage High Current Quick Connect

RADLOK™

- **CURRENT RATING UP TO 500A @ 50C TR**
- **VOLTAGE RATING 1000V**
- **QUICK AUDIBLE LOCKING CLIP**
- **POSITIVE RETENTION, PRESS TO RELEASE**
- **FROM 10MM² TO 150MM² CABLE SIZE**
- 3.6, 5.7, 8, 10, 12, 14mm RADSOK
- **UL 1977 on 3.6 and 8mm**
- 3 COLORS OPTIONS
- FIELD CRIMPABLE OR OVERMOLDED
- RADSOK® CONTACTS
- Low cost =5.7mm & 8mm assembled.



APPLICATIONS

ELECTRIC VEHICLES

HYBRID SOLUTIONS

POWER DISTRIBUTION

ENERGY STORAGE

DATA CENTER

[Product Listings](#) →



PowerLok Family Updates

[Product Listings](#) →

PowerLok G1

- 1000 hr plating option (-N)
- 6K9K sealing added:
 - 200 & 500 G1 Assembled
 - In production
 - **300 G1, all configs**
 - **Q2 2024**
- New Coroplast/Leoni kits
- Hundreds of -G## configs available, able to accommodate almost any custom cable type with components on hand



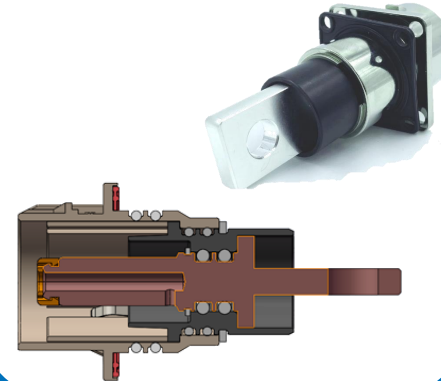
PowerLok G2

- 1000 hr plating option (-N)
- 140C Peak Op Temp Validation Complete – Derating available
- 1500V Rating across entire line (300 and 500 series)
- -2A2 and -CC configurations available for Leoni/Coroplast and Champlain cable
- 150mm² 500 available now
- 2 & 3 POS 500, straight and right angle in Q3 2024



Sealed Receptacles

- PowerLok G1 & G2 options
- Internal mechanical seals
- High Temp (hot oil)
- High Pressure
- High Duration
- Exceeds IP67/IP68/IP6K9K



PowerLok FSC

- Metal Housing, 2 POS Fast Battery Swap, 300A / 70mm²
- 16 signal with HVIL
- Grounding Contact
- Shielded
- 10,000 mating cycles
- Replaceable components
- Lug to Lug and Cable Termination Options
- 4 POS Planned



600 Unique G1 and G2 Configs

PowerLok G1 & G2 Series for EV | HEV | ESS

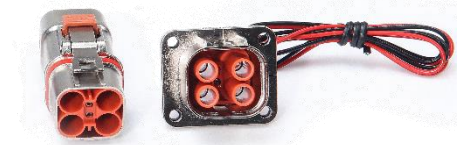
POWERLOK

PowerLok 40 & 60 Series:

- Accessory Power Connections
- 2, 3, and 4 pole options w/ HVIL
- 2.5, 4, 6, 10mm² cable (25 to 60A)
- Discrete and Multi Conductor Cable
- Shielded, Full Metal Housing
- IP67 (some configurations with 9K)



60 SERIES G2



40 SERIES G1

PowerLok 200, 300 and 500 Series:

- Primary Power Distribution Interconnects
- 25 up to 150mm² cable (150 to 500A solutions)
- 1 to 3 Pole options with HVIL, up to 6 mechanical keys
- G1: IP67, G2: IP67 and 9k
- Shielded, Full Metal Housing, Up to 500 hour salt spray
- Receptacle Termination Options: Bus bar lug, Threaded Stud, Custom



500 SERIES G2



300 SERIES G1

General:

- PowerLok G1 and G2 will run in parallel, G2 does not replace G1
- Primary applications: HEV/EV/Fuel Cell Heavy Equipment, Truck, Bus, Commercial Vehicles
- Configurations for various cable options (ex. Champlain, Leoni, Coroplast, H+S, etc.)
- Build to order, 8 week standard lead time, FCA Changzhou, China
- Technical Support & Customer service in North America

300 SERIES G2



500 SERIES G1



PowerLok G1 & G2 Product Updates

New G1 Configurations

NEW Plating -M (500 hours) and -N (1000 hours) salt spray plating options (Gray Zinc)

200 Series

- 25/35/50mm² PL01 Inline Receptacle Plug

300 Series

- -5 Plug Configurations (Designed for H+S Cable)
- 35/50/70mm² PL01 Inline Receptacle Plug

IN PROCESS
NEW 500 Series Assembled

- -5 Plug Configurations (Designed for H+S Cable) **+IP6K9K**

New G2 Configurations (-5 Thin wall H+S spec):

300 Series (initially released with 50 and 70mm² configs)

- 25mm² PL18 / PL28 / PL182 / PL282 / PL183 / PL283
- 35mm² PL18 / PL28 / PL182 / PL282 / PL183 / PL283
- **95mm²** PL18 / PL28 / PL182 / PL282 / PL183 / PL283
- PL182/PL282 – **4 Keys added:** (X, Y, U, V, W, T)
- -20 (threaded stud receptacles)
- PL19 & PL29 w/ -90 Receptacles (rotated HVIL)
- PL01 Inline Receptacle Plug

500 Series (initially released with 95 and 120mm² configs)

- 70mm² PL18 / PL28
- 150mm² PL18 / PL28
- -20 (threaded stud receptacles)
- -90 (90° rotated lug and HVIL receptacles)
- PL19 & PL29 (Straight and R/A plugs for -90 receptacles)
- PL01 Inline Receptacle Plug

Released

Released
2024 Planned

Released Q1 2023

Released Q4 2023

Released

Released Q1 2023

Released

Released

Released

2024 Planned

Released

Released Q1 2024

Released

Released Q1 2023

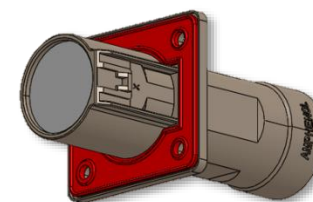
Released Q1 2023

2024 Planned

POWERLOK



PL01



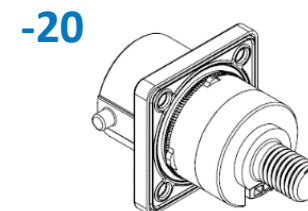
PL500 G1
+IP6K9K



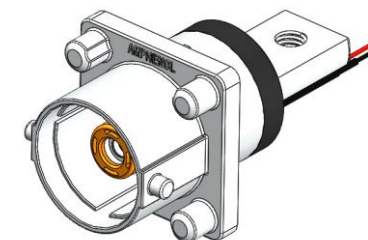
95mm² G2
150mm² G2



Reverse Mount



-20



PowerLok G1 & G2 Product Updates

UPRATING PowerLok G2 – 300 and 500 Series:

140 C Uprating (improved derating/t-rise) – Q3 2023

140 C RTI insulators, uprating current product offering – Released

1500V – Released (Full Series, All Configs)

Accessories and Components – Distribution Release

All Series G1 & G2

- | | |
|--|----------------|
| • Blind Plugs (Straight and Right Angle) | Released |
| • Dust Caps | Released |
| • Lever Locks | Released |
| • Crimp Barrels (for crimp analysis) | Q3 2023 |

New G2 Cable Options

Continuously adding options for Custom Cables

- Able to support additional cable types (design review, tooling, and validation)
- Typical LT's range from 8 to 16 weeks (subject to cable availability)
 - Ranges based on components required (machines vs. injection molded)
- Configurations available for some sizes of Leoni, Coroplast, Champlain, and more

New Families:

- | | |
|--------------------------|-------------------------|
| • -2A2 (LV214) | Released Q1 2024 |
| • -CC (Champlain) | Release Q2 2024 |



Coroplast
group

LEONI

HUBER+SUHNER

CHAMPLAIN
CABLE

COFICAB

NEW

PowerLok G1 & G2 Custom Configurations

108+ Custom PowerLok Base Configurations (-G##)

>600 Unique Configurations

97+ Unique Cable Types

38 Unique Global Cable Manufactures

Large selection of components,
we have a **Solution**



Cable Mfg's

PowerLink

Champlain

无锡鑫宏业

Coroplast

Coroflex

Leoni

Tricab

Prestolite

ELAND CABLE

H+S

New England

KYUNGSHIN CABLE

HEW Kabel

Kyungshin

COFICAB

Helkama

ProMark/ProEV

鑫宏业

日新

莱尼

LS Cables

LTK

Siechem

KollHoff

永晟

Gutmann-kabel

纵横

LAPP

Tricab

Force

WEICHENG

亨通

Yusin HR

Polar Wire

Nissei

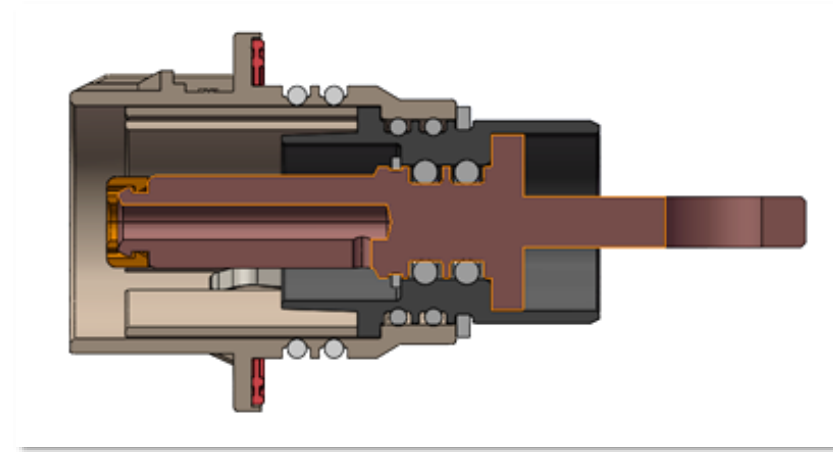
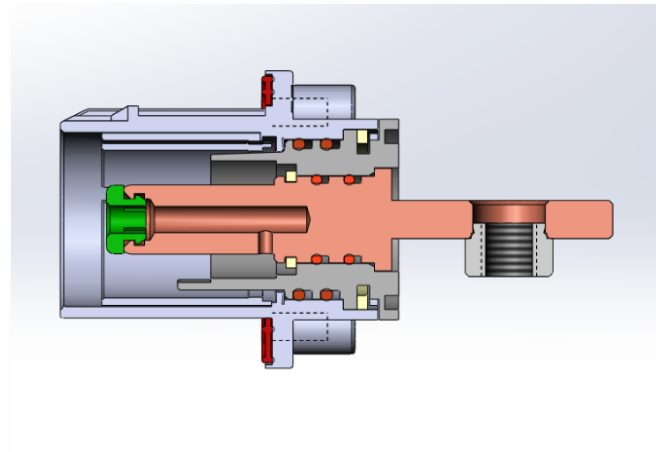
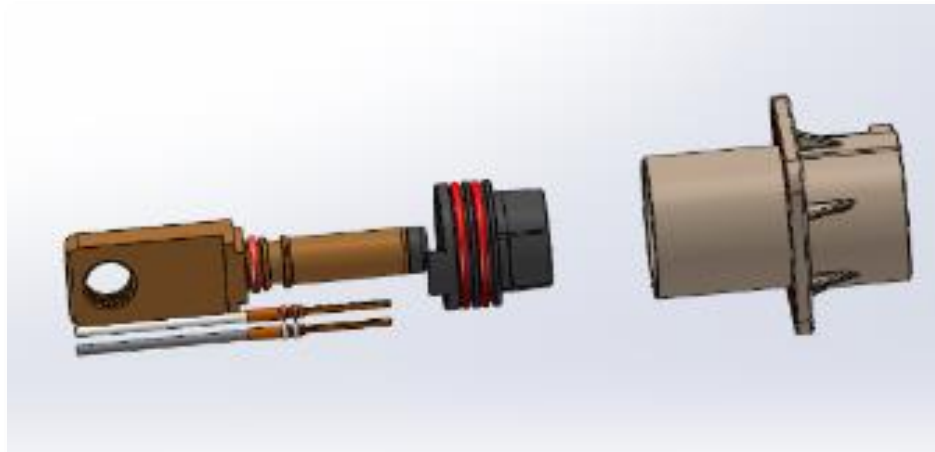
Gebauer & Griller

上上

PowerLok G1 & G2 Sealed Receptacles (Hot Oil with Pressure)

Internally Sealed Receptacle / Front & Reverse Mount:

- Custom sealed receptacles for **PowerLok G1 and G2**
 - HVIL versions in development
- 1, 2, and 3 Position
- Designed to retain fluid under pressure
- Ability to customize o-ring material for fluid type
- Peak temps: 125C, 140C
- **OEM tested up to 1.1 Million cycles @ 8 Bar, hot oil**
- Applications: eTurbo's / Oil Cooled Devices / Motors



PowerLok G1, G2, RadLok Tooling

WEZAG®

Expanding Partnership with Wezag

- Selected Wezag as a global tooling partner
- Crimp die design and press equipment competency
 - High and low volume solutions
- Established OEM relationships
- NA and European sites / support

Wezag (Tooling Partner)



Tooling Status

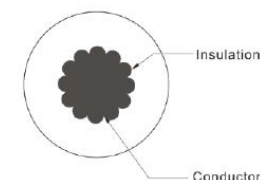
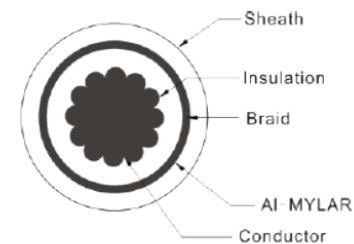
- PowerLok G2 -5 (H+S) Tools in stock
 - Wezag solution (die, holder, alignment jig) critical to crimp & assembly requirements
- PowerLok G2 95mm² update complete (2023)
- PowerLok G2 –CC, -2A2 in process
- PowerLok G1 -5 in process complete
- Able to tool all custom cable requirements
- Not just PowerLok – source for RadLok



PowerLink HV Cable

● Descriptions:

- Product Name: PowerLink HV Shielding Cable
- Material : Conductor: Stranded bare copper
Insulation: XLPE Orange
Mylar: PET
Braiding shielding: Tinned annealed copper wire with al-mylar
Jacket: XLPE Orange
- RoHS and REACH Compliant
- Standard: ISO 6722 Class C 125°C
- Features:
 1. Reliable to high-voltage & current conditions
 2. Flexible and easy to handle for harnessing
 3. Range from 2.5mm² to 150mm²
 4. Excellent EMI, EMC noise reduction
- Application: EV, HEV, FCEV, Battery and Energy Storage



CLASS D 150 DEG C VERSION AVAILABLE



Low Voltage | Signal & Power Standard Products

HC Series | Reverse Mount | Power & Signal

Product Listings →

HC Series

32 & 16 Position

Reverse Mounted, 3 Keys

32 Position

6 Power (14GA) – 13A

26 Signal (20GA) – 5A

16 Position

2 Power (14GA) – 13A

14 Signal (20GA) – 5A

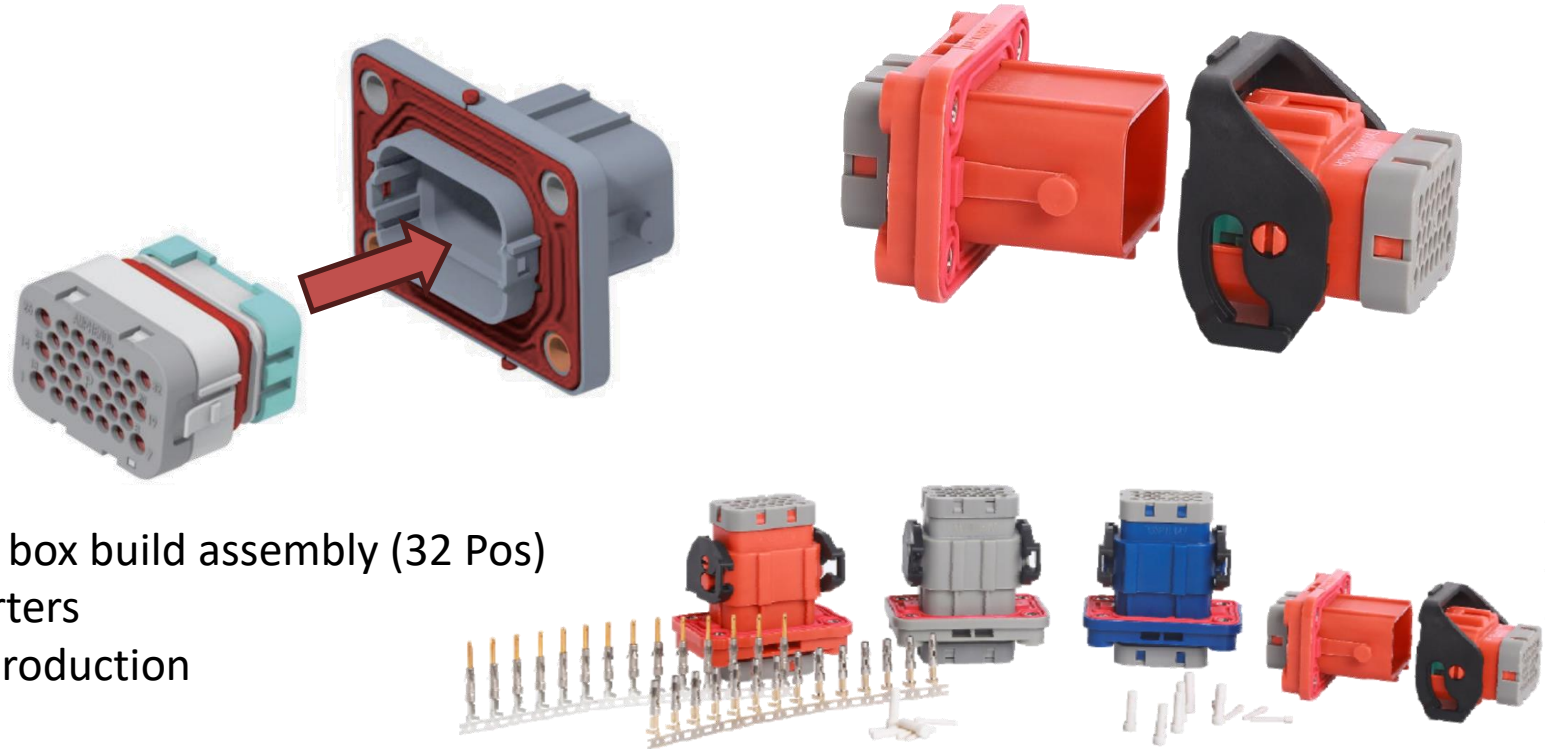
IP68 (24 hrs/1m), 3kV DWV

NEW Shell & Core Design for ease of box build assembly (32 Pos)

Primary Application: PDU's and Inverters

Low Cost, High Volume automated Production

NEW SHELL & CORE DESIGN (32 POS)



Automated Assembly Line Production

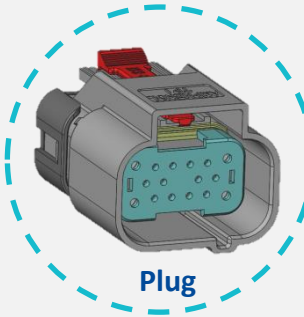
HC Signal Connector – 16 Position

NEW

- Current Rating: Power 13A MAX
Signal 5A MAX
- Cable Size:
 - Power 14~18AWG (2 POS)
 - Signal 20~22AWG (14 POS)
- Dielectric Withstanding Voltage:3000VDC
- Operating Temperature:-40°C~+125°C
- Protection Class:IP68(mated)
IP6K9K
- Mating Cycle: 100Min
- Available in A,B,C key
- Air leakage: 60Kpa



Receptacle



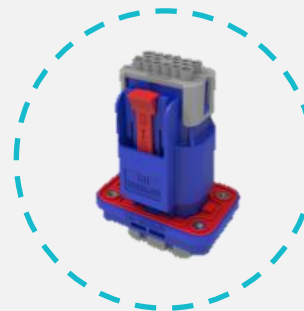
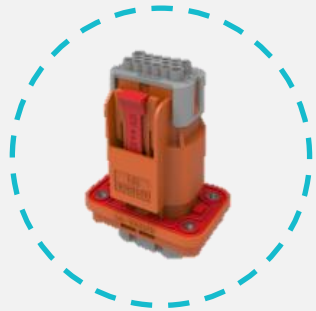
Plug

Application

BATTERY PACK

Motor Control Unit

OBC Signal Control Unit

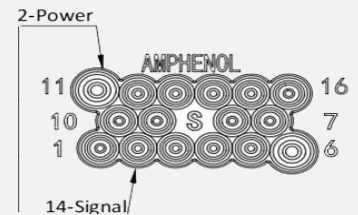
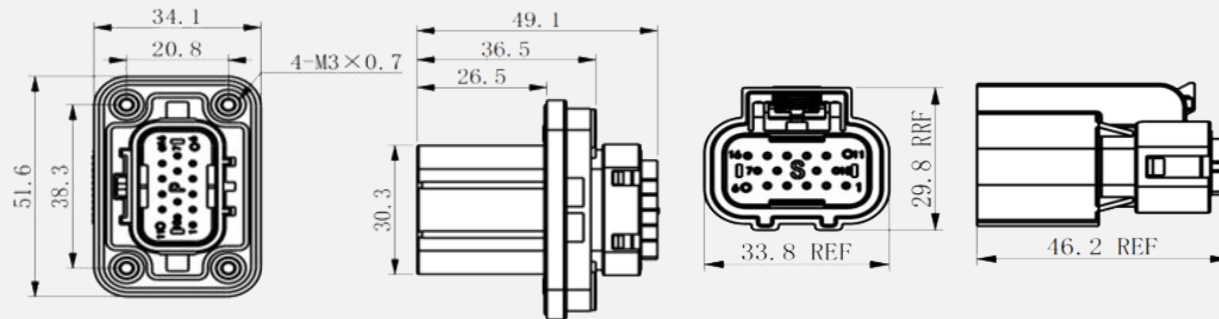


Application

BATTERY PACK

BMS SIGNAL TRANSMISSION

BMS POWER TRANSMISSION



USC Series | Ultra Sealed High Vibe – Power and Signal

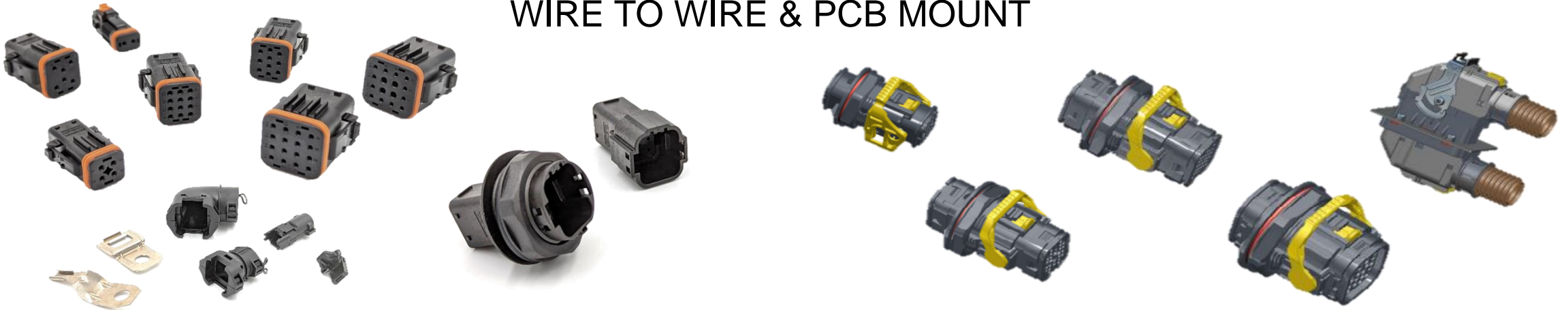
[Product Listings](#) →**NEW****USCM**

Dual Latch | 2 – 25 POS
Production Ready NOW

ULTRA SEALED**NEW****USCL**

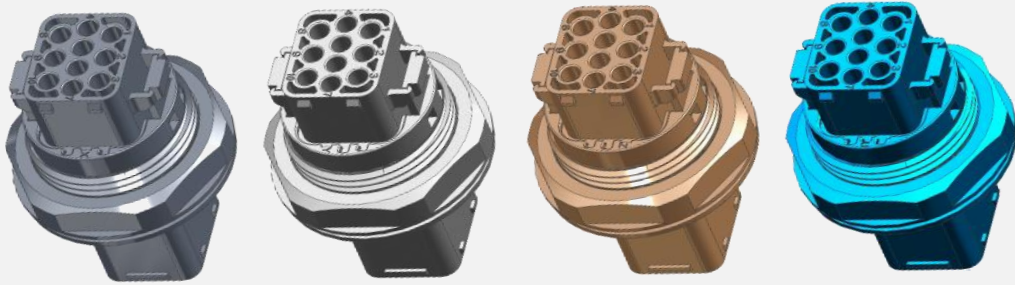
Lever Lock w/ CPA | 18 - 87 POS
In Final Validation, Q2 Release

250 VDC | 30A POWER (14GA) | 5A SIGNAL (20GA) | HIGH VIBRATION | ENHANCED ENVIRONMENTAL SEALING (IP68/9K/48kPa) | COST EFFECTIVE | FULL SERIES TOOLED WIRE TO WIRE & PCB MOUNT

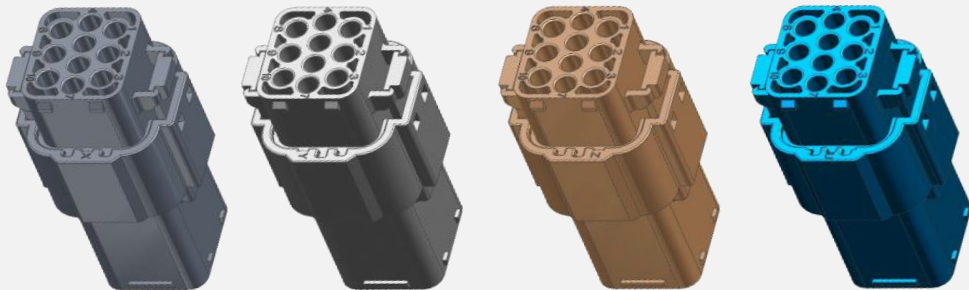


USC (Ultra Sealed Connector) Series Overview

USCM: 2 – 25 Position, Double Latch

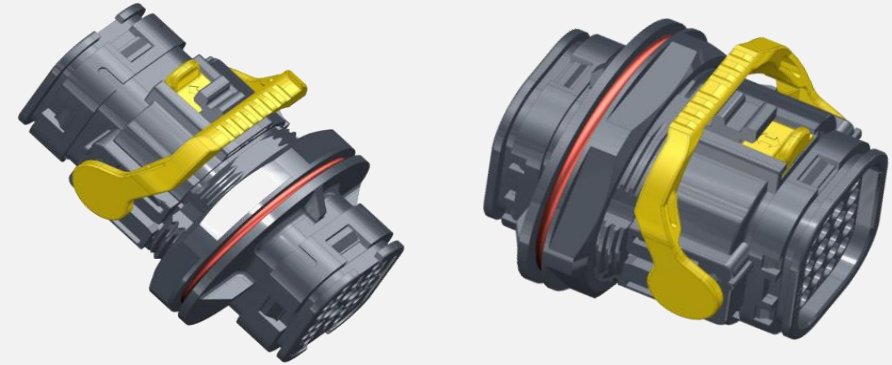


USCM – Jam Nut Version

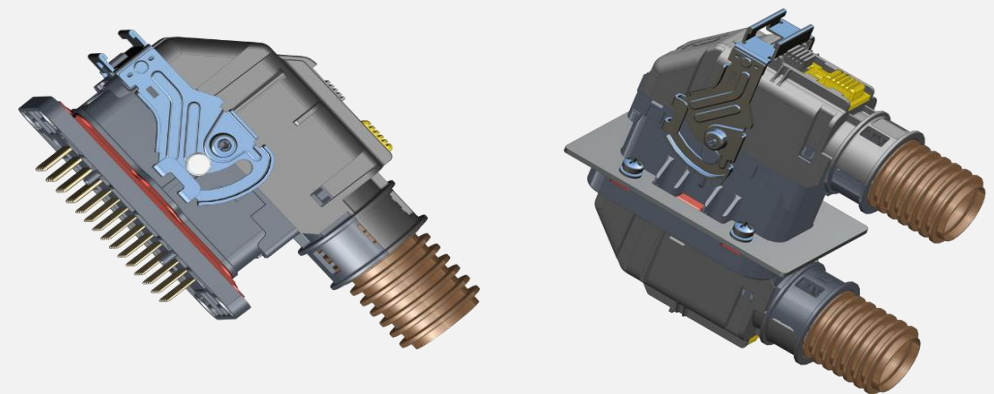


USCM – Cable-To-Cable Version

USCL: 18 – 87 Position, Lever Lock



USCL – Jam Nut Version



USCL – Flange Version

USCM Series (2, 4, 6, 8, 10, 12, 12+4, 16, 25 Position)

Production / Sample Support Timing: Q4 2023

USCM

Ultra Sealed Connector, Multiple poles

Market Leading Solution for:

SEALING (6K9K and Air Leak)
VIBRATION (Sev 3)
VOLTAGE (up to 250 VDC)
COST EFFECTIVE

USCM is a cost-effective connector series incorporating thermoplastic housings, silicone rubber seals and stamped contacts which delivers superior performance. The rugged construction and design ensure safe and reliable signal transmission and power supply for vehicles and industrial equipment in harsh environments.

USCM adopts individual sealing plugs to achieve excellent environmental sealing. The plug and receptacle each consist of a housing and contact locating cover. the series is available in two color options (black or gray) with a variety of securement/routing accessories. contact locating covers are used to ensure that the contact is aligned and accurately seated inside the connector housing; in addition, the plug locating cover offers enhanced sealing retention features to secure the interface seals to provide rugged sealing assurance and durability (**IP67, IP6K9K, IP68 & Air-Tight**).

USCM connectors are available in 4 housing sizes with 4 mechanical keying options, they are offered in arrangements ranging from 2 to 25 poles, the series provides a solution for high vibration resistance and high mechanical-shock resistance (**GB/T-28046 & QC/T 1067, V3** – commercial vehicle engine and transmission applications).



USCM series connector layouts - 2, 4, 6, 8, 10, 12, 12+4, 16, 25 Position

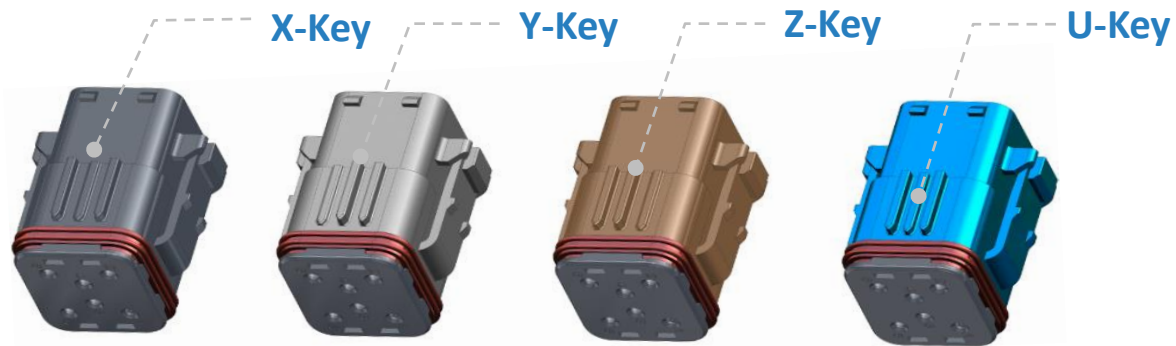
USCM Series	Layout	Plug	Recept. (cable to cable)	Recept. (Jam Nut)
2-Way				
4-Way				
6-Way				
8-Way				

Housing	Thermoplastic, Glass filled PA
Seal Gasket	Silicone Rubber
Interface Gasket	Silicone Rubber
Locating Cover	Glass filled PBT
Contacts	Copper alloy & stainless steel Nickel or gold flash plating

10-Way				
12-Way				
12+4-Way				
16-Way				
25-Way				

- Standard colors: Black and Gray
- Additional colors available upon request
- Housings available with angled or straight backshells
- Contacts available stamped with Nickle & Gold plating

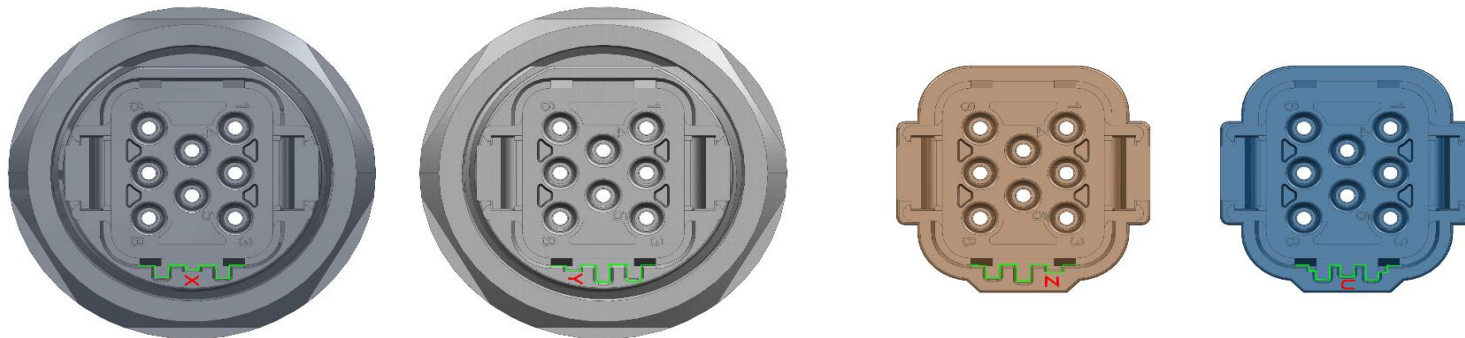
USCM structure overview – Mechanical Keying



Both of the Plug and Receptacle housings have mechanical keying- X/Y/Z/U, 4 options
Mismatch prevention



The Receptacle housing has mechanical keying- X/Y/Z/U, 4 options
Misplace installation prevention



Mechanical keying- X/Y/Z/U general view, after the Plug and Receptacle mated
Cable-to-cable version and Jam Nut version has the same keying structure

USCM series product overview - Features

Current Rating	Up to 13A@16# contacts, 30A@12# contacts
Operation Voltage	Up to 250V AC/DC (HV applications) – Target for 48+ VDC systems
Cable Range	24- 12 AWG (0.35mm² - 4. 0mm²) Insulator diameter ranges: #16: Ø1.2mm to 2. 40mm #12: Ø1.5mm to 3. 70mm
Operating Temp	-55°C to +125°C
Durability	Minimum 200 mating cycles
Waterproof	IP67, IP68 (1meter, 24H), IP6K9K
Flammability	UL 94 V-0
Dielectric Voltage	1500V ac for 60 s
Thermal Shock	-55°C to +125°C, 20 cycles
Physical Shock	50g's peak, 3axes, 11millisecond duration half-sine pulse, no loss of continuity >1µsec
Vibration	<p>Ref. SAE J2030_201506</p> <p>No unlocking or un-mating and exhibits no mechanical or physical damage after sinusoidal vibration levels of 20 G's at 10 to 2000 Hz in each of the three mutually perpendicular planes.</p> <p>No electrical discontinuities longer than 1µsec</p> <p>Ref. GB/T 28046.3 4.2.1.6.</p> <p>Sinusoidal vibration: $a_{max} = 120m/s^2$, 94h for each of the 3 axes</p> <p>Random vibration: $a_{max} = 177 m/s^2$, 94h for each of the 3 axes;</p> <p>There must be no loss of electrical continuity for more than 1 microsecond. If one or more terminal pairs are monitored, rather than the series resistor, there must be no instance in which the resistance of any terminal pair exceeds 7.0Ωfor more than 1 microsecond</p>
Salt Spray	96 H
Air-Tight	Pressure with 60kPa and keep 15s, no leakage
Temp. Endurance	1008H at 125°C, Insulation Resistance >100MΩ
Moisture Resistance	Ref. IEC60068-2-78, RH90-95%,40°C, 504 H; Insulation Resistance > 100MΩ
Humidity Steady	Ref. QC/T-1067.1, 10 Cycles; Insulation Resistance > 100MΩ



USCL Series (14+2, 22+4, 28, 32, 43+6, 71, 87 Position)

Production / Sample Support Timing: Q4 2023

USCL

Ultra Sealed Connector, Lever-Driven w/ CPA

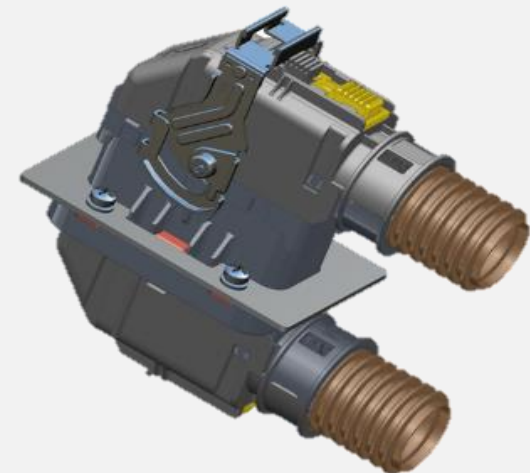
Market Leading Solution for:

SEALING (6K9K and Air Leak)
VIBRATION
VOLTAGE (up to 250 VDC)
COST EFFECTIVE

The USCL series is the solution for increasingly complex and highly reliable signal and power connection applications, its rugged design ensuring safe and reliable signal transmission and power supply for vehicle and industrial equipment in harsh environments.

An environmentally sealed connector series incorporating thermoplastic housings, silicone rubber seals and precision stamping contacts that delivers superior mechanical & electrical performances, the USCL connectors are designed to be high waterproof grade with integral real gasket or individual sealing plugs, up to **IP67, IP69K, IP68, and 48Kpa** airtight protection. The coupling and locking of the plug and receptacle are designed as levers and secondary locker (**CPA**) to provide tactile and audible feedbacks to the operator, ensuring the connector can be mated in right position easily and realize fast plugging and locking; precision stamping contact features low conduction resistance and high vibration resistance & mechanical shock resistance;

The USCL series is available in a variety of layouts (from **16 to 87 poles**) to meet the needs of multichannel signal and power connections.



USCL series connector layouts - 14+2, 22+4, 28, 32, 43+6, 71, 87 Position

USCL Series	Layout	Plug	Receptacle
14+2-Way			
22+4-Way			
28-Way			
32-Way			
43+6-Way			

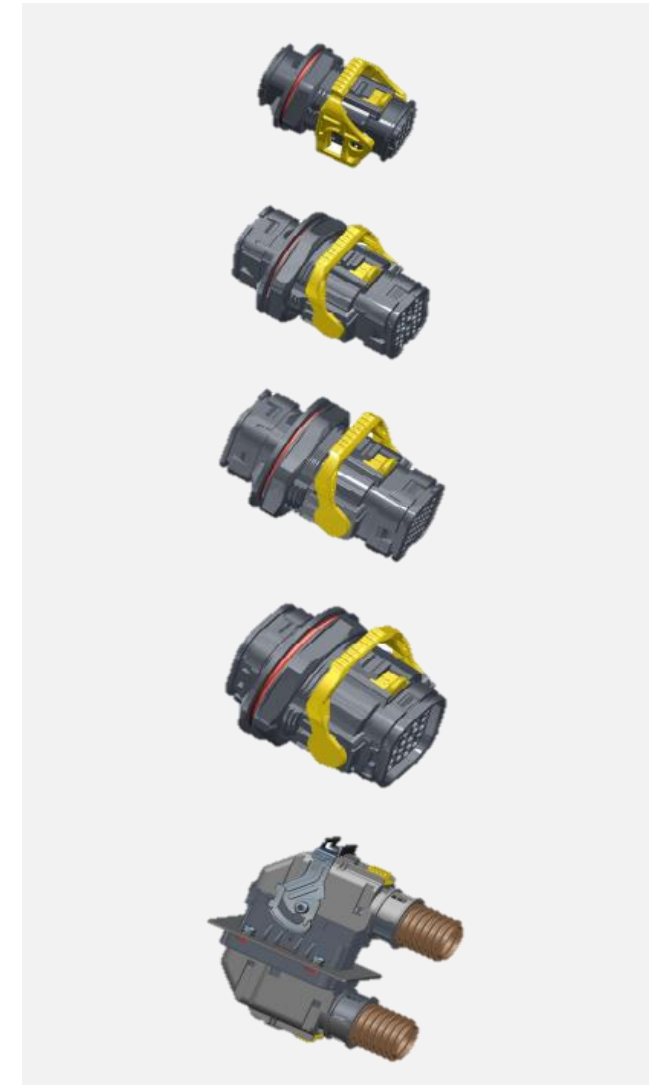
71-Way			
87-Way			

Housing	Thermoplastic, Glass filled PA
Seal Gasket	Silicone Rubber
Interface Gasket	Silicone Rubber
Locating Cover	Glass filled PBT
Contacts	Copper alloy & stainless steel Nickel or gold flash plating

- Standard colors: Black and Gray
- Additional colors available upon request
- Housings available with angled or straight Backshells
- Contacts available stamped with Nickel & Gold plating
- "+" Positions for 12ga (30A)

USCL series product overview - Features

Contact Current Rating	Up to 10A@20#signal contacts Up to 13A@16#signal contacts Up to 30A@12#power contacts
Operation Voltage	Up to 250V AC/DC (HV applications) – Target for 48+ VDC systems
Wire Range	24- 12 AWG (0.35mm ² - 4.0mm ²) Insulator diameter range: 16#: Ø1.5mm to 2. 70mm 12#: Ø2.2mm to 3. 81mm 20#: Ø1.3mm to 2. 20mm
Operating temperature	-40°C to +125°C
Durability	Minimum 200 mating cycles for stamped contacts Minimum 100 mating cycles for machined contacts
Environmental Sealing	IP67,IP68 (1m water with 24H) and IP6K9K (mated)
Flammability	UL 94 V-0
Dielectric Voltage	1000V dc for 60 seconds
Thermal Shock	-40°C to +125°C, 20 cycles
Physical Shock	50g's peak, 3axes, 11millisecond duration half-sine pulse, no loss of continuity >1µsec
Vibration	Ref. SAE J2030-201506 :-No unlocking or un-mating and exhibits no mechanical or physical damage after sinusoidal vibration levels of 20 G's at 10 to 2000 Hz in each of the three mutually perpendicular planes. No electrical discontinuities longer than 1 microsecond.
Salt Spray	96 hours
Air-Tight	Pressure with 48kPa and keep 15s, no leakage
Temperature Endurance	1008 hours at 125°C; Insulation Resistance > 100MΩ
Moisture Resistance	RH 90-95%, 40°C, 504 hours; Insulation Resistance > 100MΩ
Humidity Steady State	10 Cycles; Insulation Resistance > 100MΩ

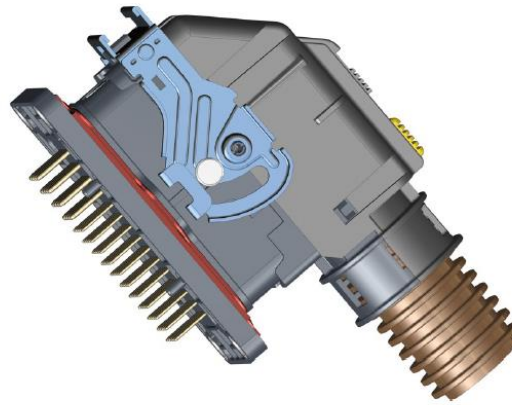
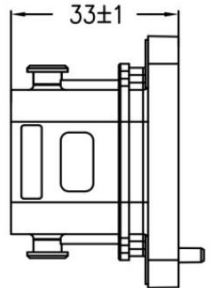
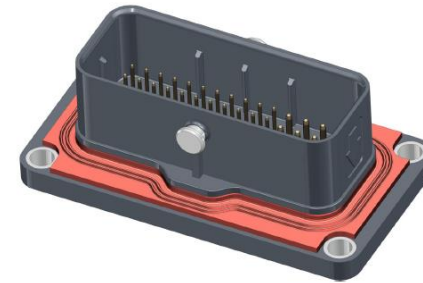
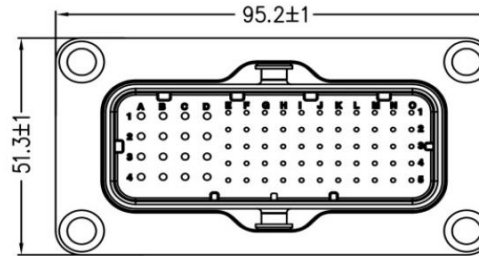


Future Release | USCM & USCL PCB Mount Options

PCB Mount Receptacles

USCL 71 Way PCB Mount
Receptacle in development

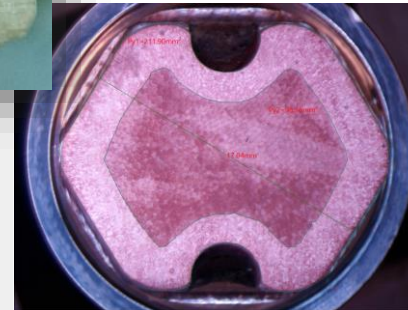
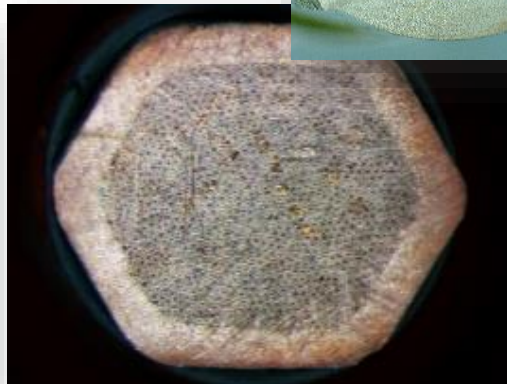
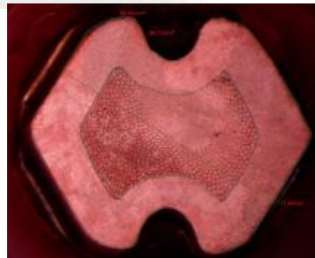
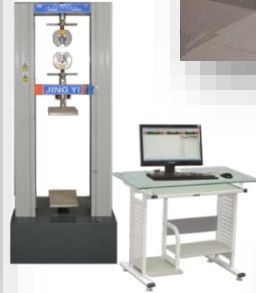
Additional USCM and USCL
PCB Mount configurations
planned





R&D, Testing & Compliance

Testing, Validation, R&D



OVERVIEW

- Internal Tooling Facilities
- Crimp Design & Build Capability
- 10k+ LB (50kN) Pull Testing
- Rapid Prototyping
- Design to Production
- Thermal ageing & shock, salt spray, and Electrical Validation (T-Rise, Derating, Hipot, IR, mOhm, ...)
- Vibe w/ Environmental Chamber
- Custom overmolds, connectors, terminals & electrical assemblies
- Cross Sectioning, Crimp Analysis
- Third Party Validation Partners:



Compliance

Regulatory

- RoHS & REACH
 - IMDS/CDX capability
- Conflict Minerals
- Labor Policy (ATPI Facilities and Suppliers)
- Workplace Safety and Health



Certification Bodies

- UL
- CSA
- TÜV
- CE

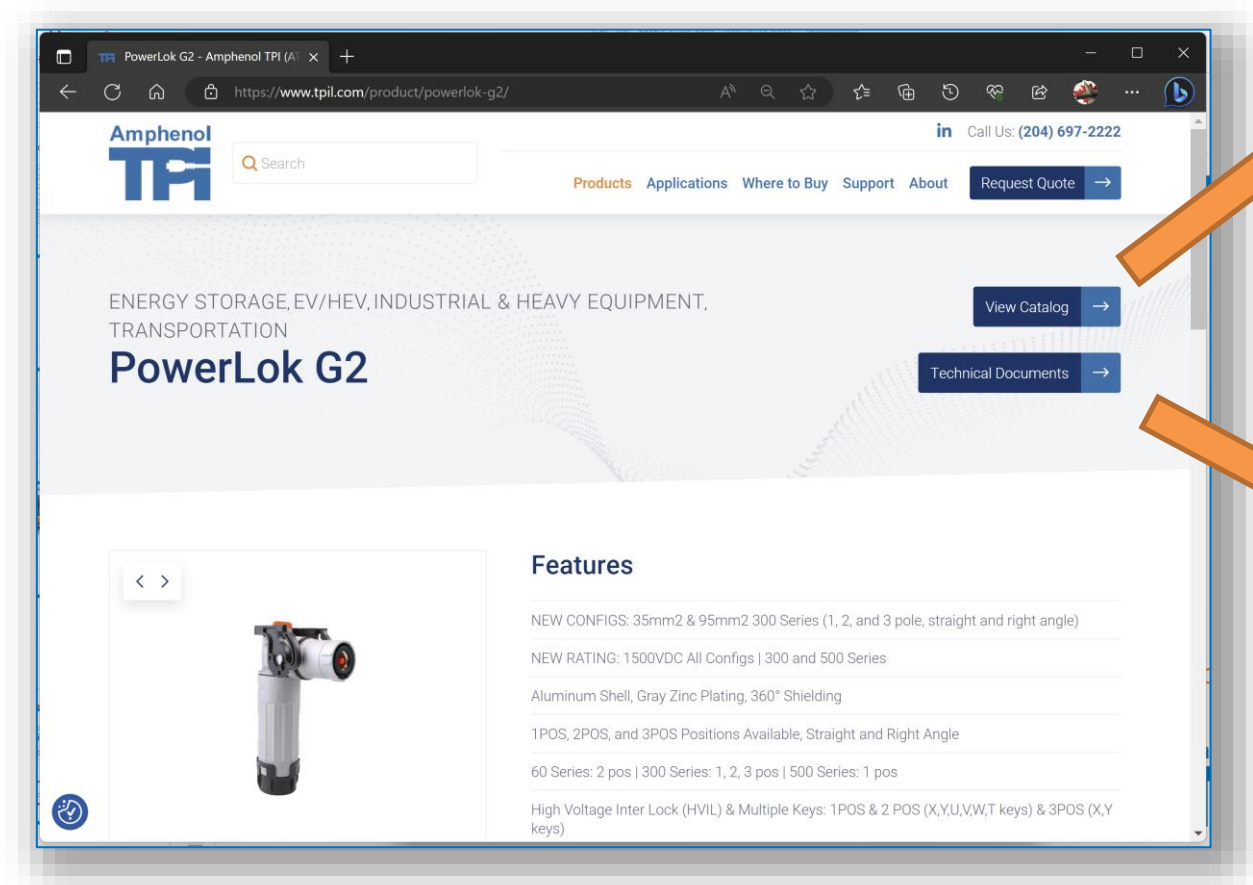




Product Data & Communication

Website and Product Info

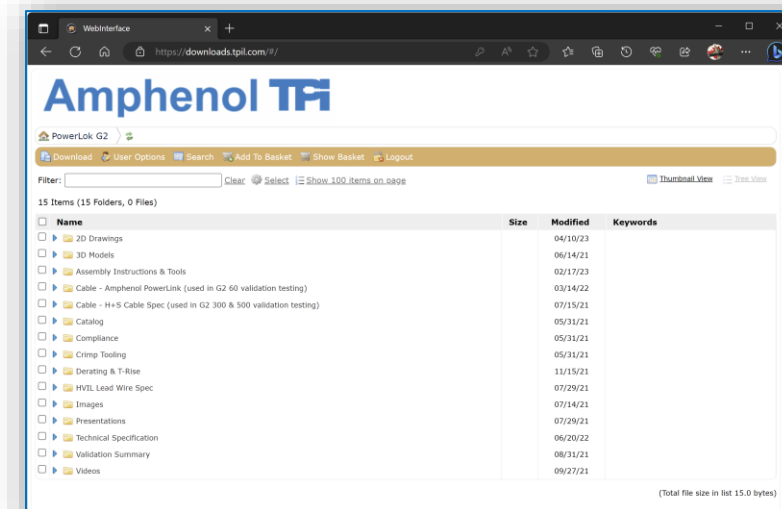
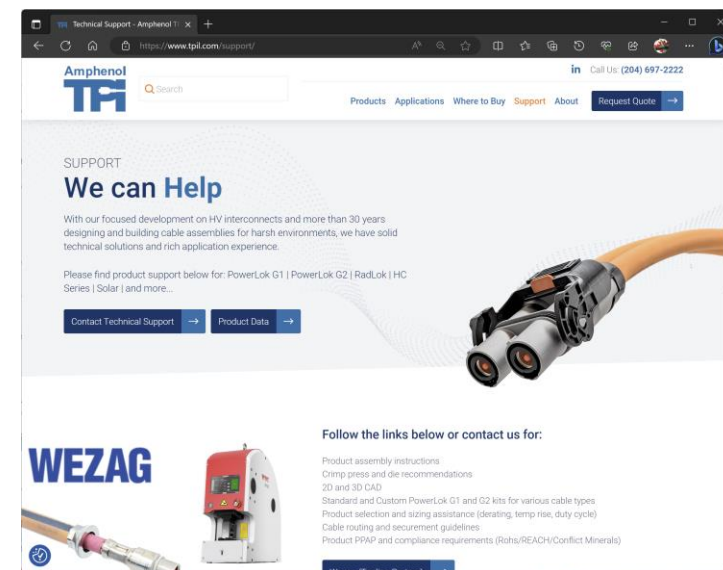
<https://www.tpil.com>



CATALOG

TECH DOCS (DOWNLOADS)

SUPPORT



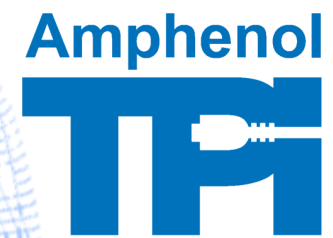
TPI Website





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Thank you!

TPI Website



Product Listings



Product Support



LinkedIn

