

MODULAR CONNECTORS

Enabling Harness Automation



Zonal Architectures

ZONE ORIENTED EE ARCHITECTURE ENABLES OPTIMIZED WIRING AND NEW CONNECTORS

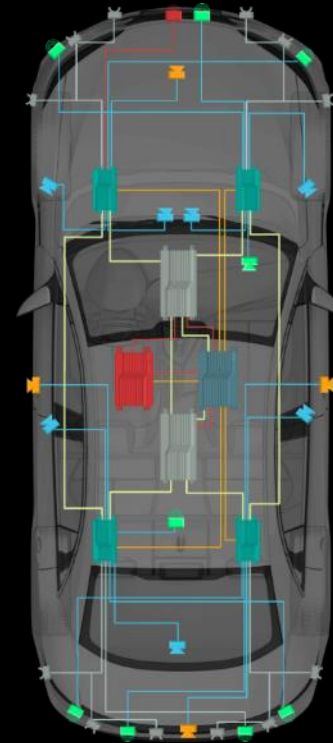
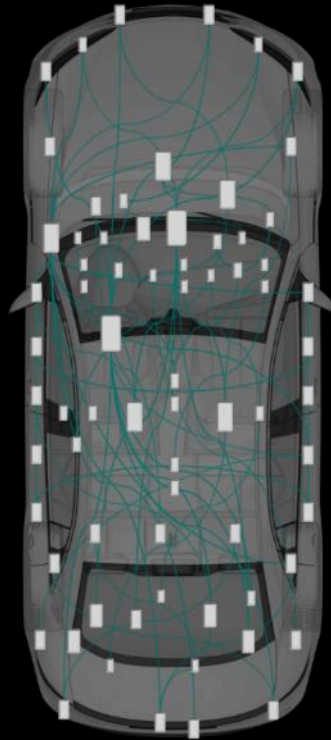
Classic

Domain Oriented

- Single ECUs even for small functions
- Complex wiring connectivity
- Limited scalability
- Long wires (up to 10m)
- Connectors with high amount of cavities



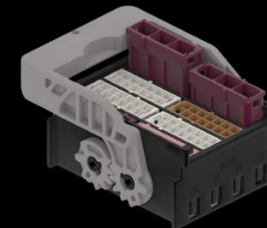
Conventional Connector



SVA™

Zonal Architecture

- Zone PDC`s -> less ECUs by integration
- Simplified less complex wiring
- Point-to-point connections with reduced wiring length
- Wire length suitable for automation equipment
- Connectors modularized



Modular Connector

Why We Need Harness Automation

Industry Challenges



Labor Inflation and Availability



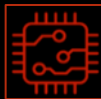
Geo-Political Risk



Complex architectures require higher level of quality



Miniaturization



Traceability

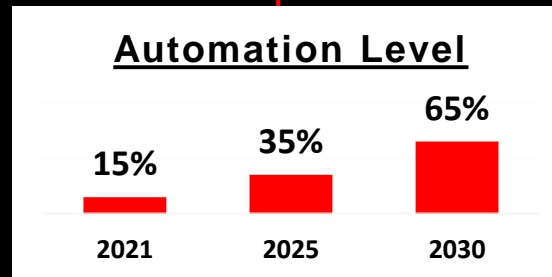


Long supply chains and CO²

Our Solution

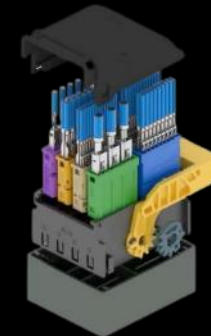
Wiring harness automation leveraging modular connection systems

- Improved quality
- Reduced dependency on labor
- Enabler for localized manufacturing



Typical estimation of wiring harness automation

Modular Connections



Modular Connector Versus Mixed/Hybrid Connector?



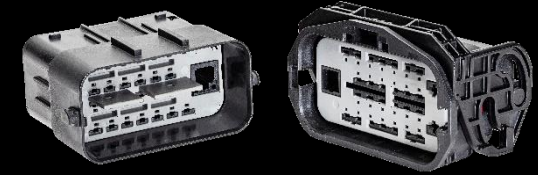
Modular Connectors

Building blocks of various terminal types and sizes in standardized modules that can be aggregated in a collector housing to create a flexible, optimal connection system for devices and other applications



Mixed Connectors

Multiple terminal sizes in one connector (1.2, 0.5, 2.8, etc)



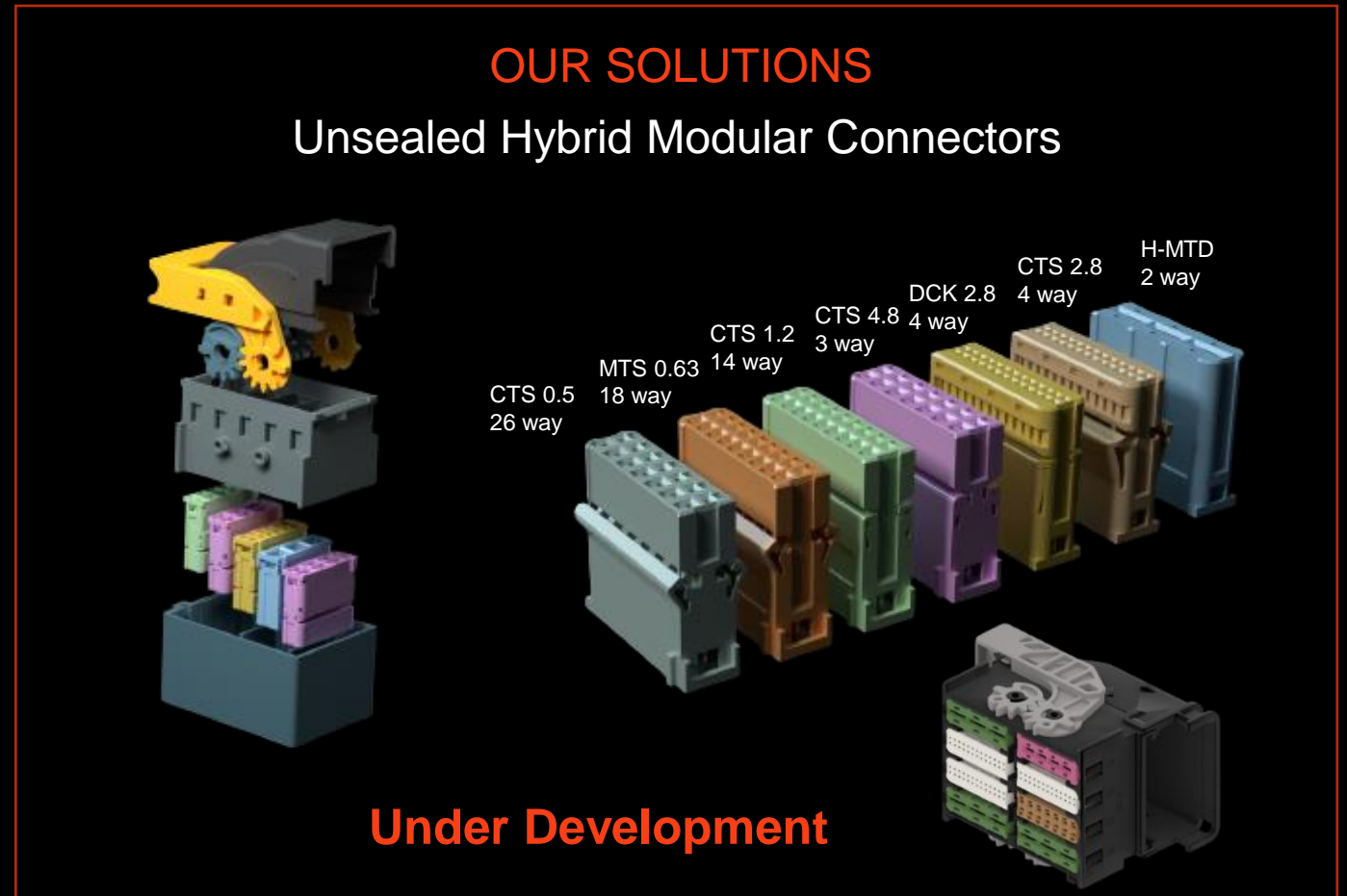
Hybrid Connectors

Data terminals added to standard signal and power terminals (H-MTD, MCA)

Modularity - Modular Interconnect Solutions

Unsealed systems to support next generation controllers

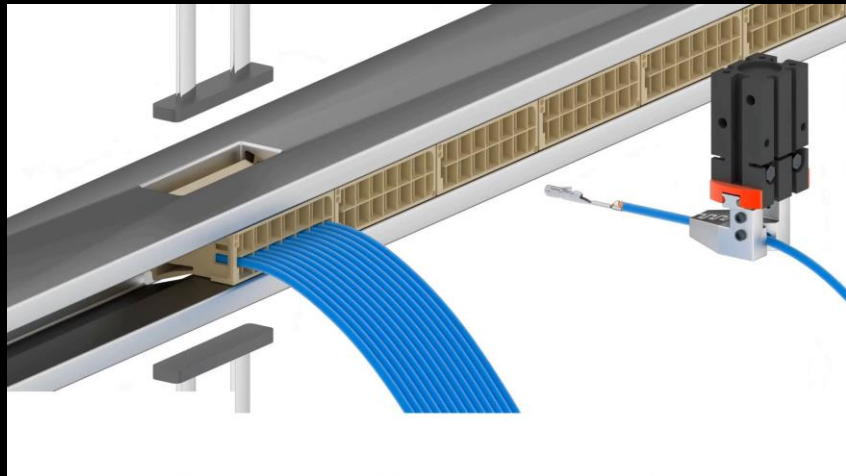
- Modular connector design to offer maximum flexibility for new architecture design requirements
- Modular connectors accommodate various modules, terminals, and high-speed data ports to maximize scalability without requiring multiple new connector designs
- Connectors can accommodate up to 8 modules
- Existing in both horizontal and vertical configurations to meet device packaging constraints



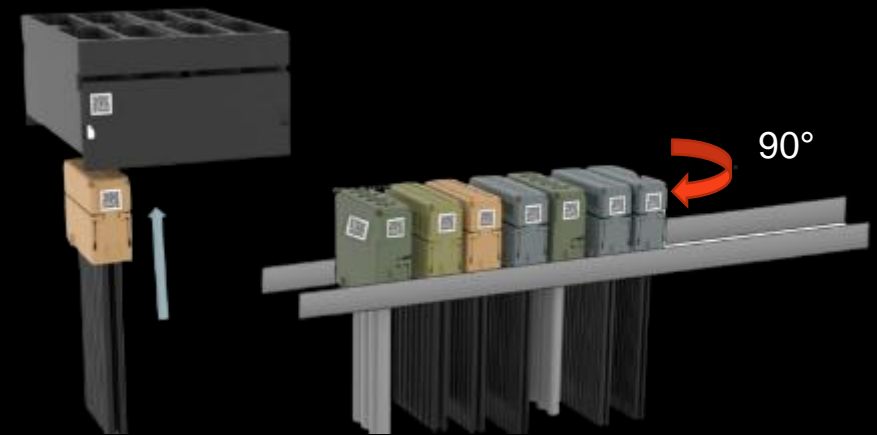
Modularity – Automation by Design

Unsealed systems - **Under Development**

- Our connector and wiring experts are leading the industry defining standards for wiring assembly automation
- Connector designed and approved for wiring automation.



1- Auto plug in of terminals (need video sequence)

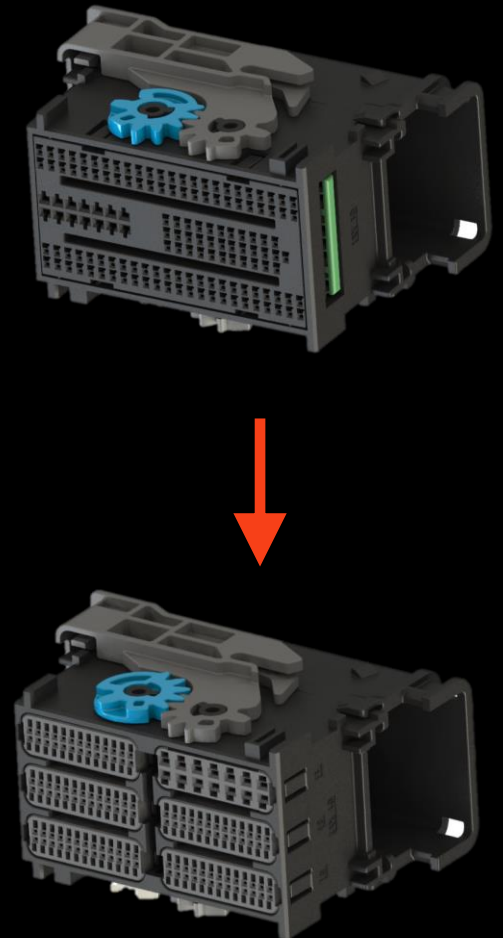


2- Automated assembly of modules in the connector

Modular Connectors Benefits

Benefits over Fixed High I/O Connectors

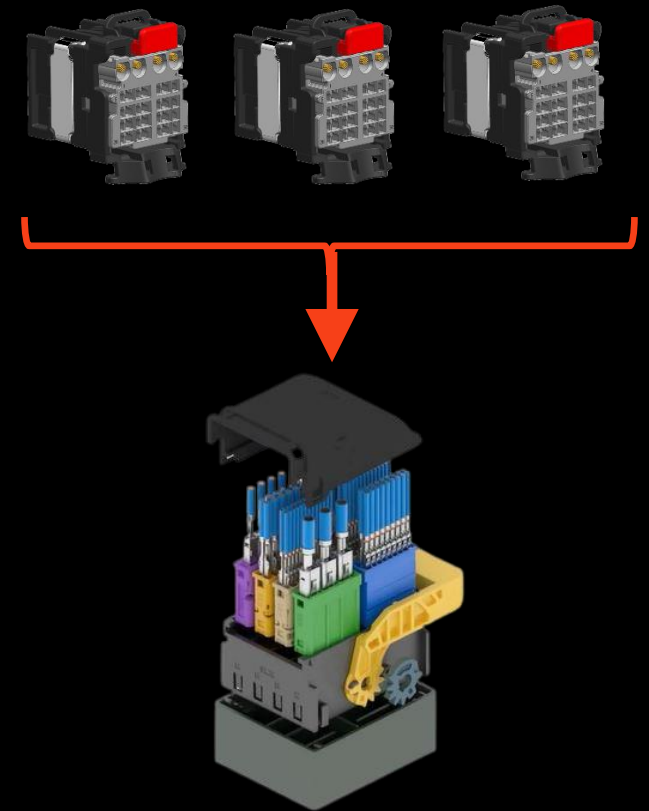
- Designed for auto-plugging during harness assembly
- Allows terminal mix and grouping options
 - Optimal closed kits during harness manufacturing to improve quality
 - Optimal I/O for the device requirements
- Various collector housing options allow interface flexibility
- Allows flexibility of swapping modules for future terminal mixes
- Terminal mix can include high speed data
- Auto-plugging can reduce risk of wire damage during plugging
- Auto-plugging enables wire gauge reductions that reduce mass and cost



Modular Connectors Benefits

Benefits over Multiple Medium I/O Handmate Connectors

- Designed for auto-plugging during harness assembly
- Allows terminal mix and grouping options
 - Optimal closed kits during harness manufacturing to improve quality
 - Allows flexibility of swapping modules for future terminal mixes
- Terminal mix can include high speed data
- Lever mate assist for improved ergonomics
- Connector count reduction reduces vehicle assembly plant labor
- Auto-plugging can reduce risk of wire damage during plugging
- Auto-plugging enables wire gauge reductions that reduce mass and cost



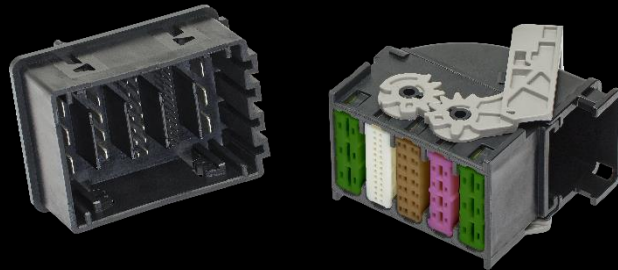
Headers for Modular Connectors

Benefits of related I/O Pinheaders - Under Development

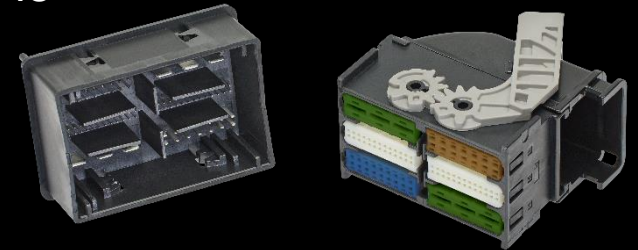
- Allows flexibility of combining standardized modules for future mixes acc. to
- Can integrate high speed data (H-MTD, MCA, AMEC)
- Standardized off-the-shelf over allows flexibility in application, prototyping & time-to-market
- Additional combinations in 1- & 2-row layout possible



4 Modules
2-row



5 Modules
1-row



6 Modules
2-row



8 Modules
2-row

• **A P T I V** •

Thank you.