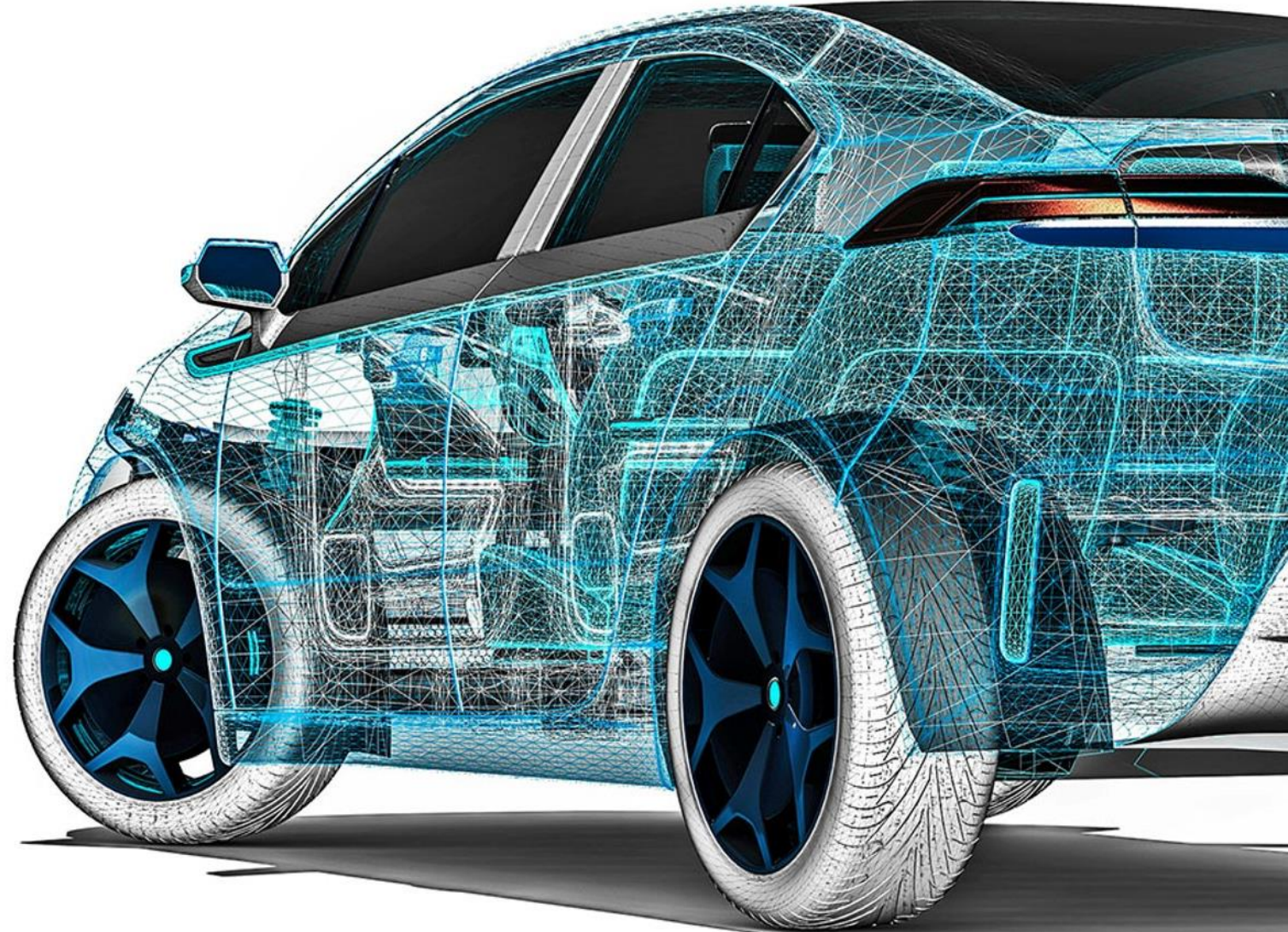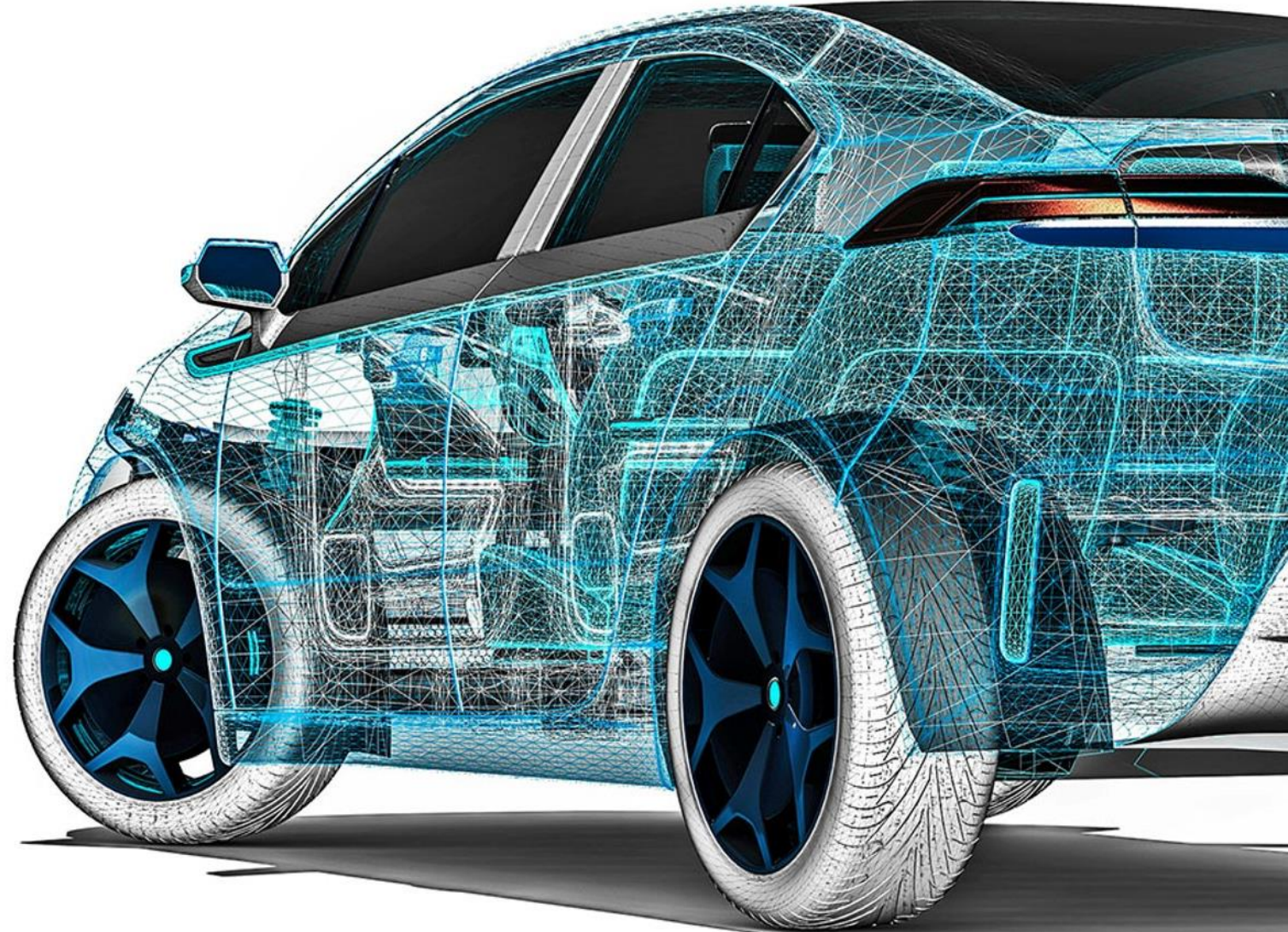# GEMnet
Multi-gigabit Differential Connector System from TE Connectivity (TE)

EVERY CONNECTION COUNTS

Market and
Technology Trends

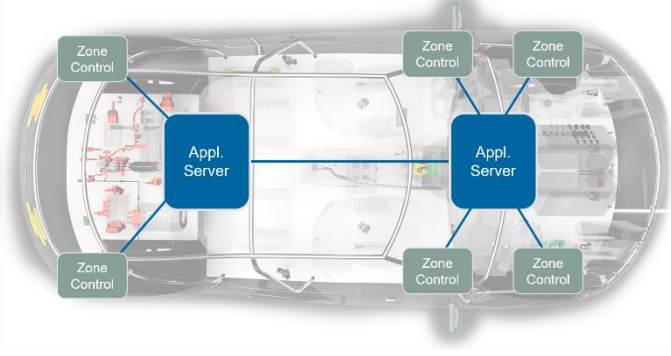**EVERY CONNECTION COUNTS**
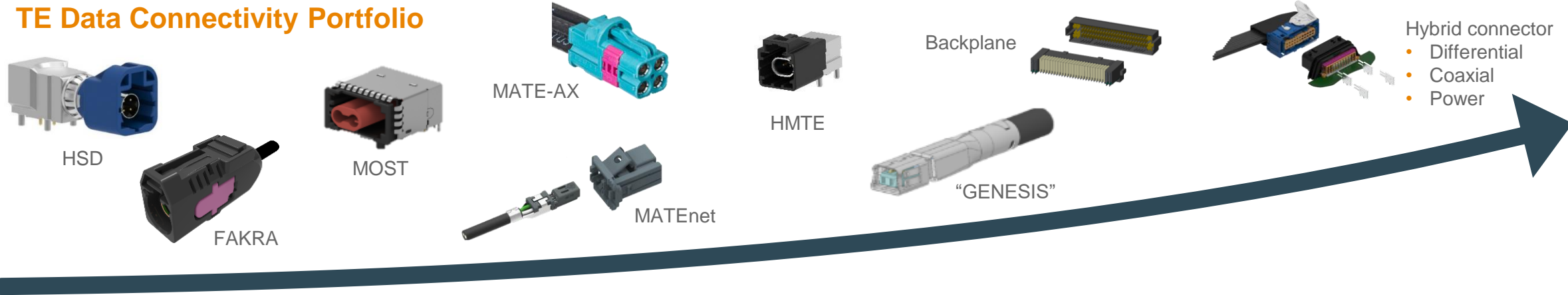
Automotive Architectural Evolution

LEGACY
Functional Based

▶

STATE-OF-THE-ART
Switch Based

▶

FUTURE
Zonal Domains
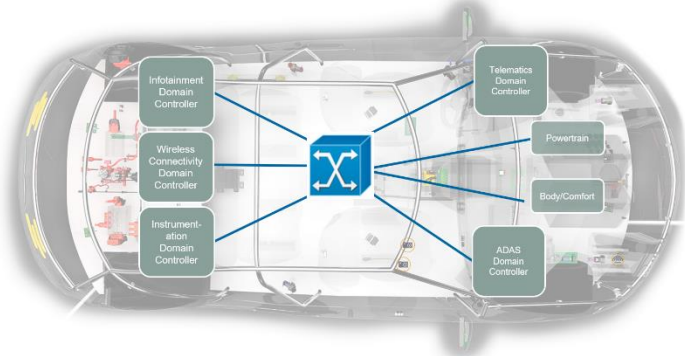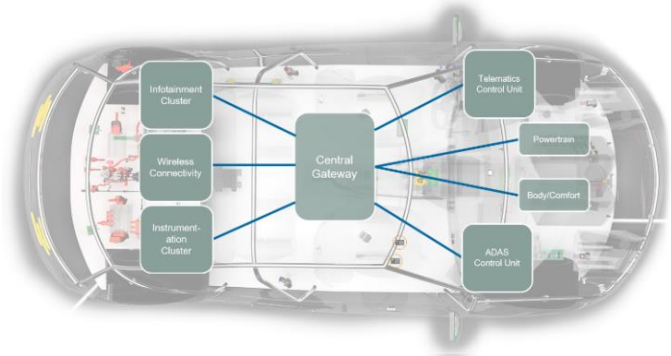
TE Data Connectivity Portfolio

HSD

FAKRA

MOST

MATE-AX

MATEnet

HMTE

"GENESIS"

Backplane

Hybrid connector
- Differential
- Coaxial
- Power

Automotive Applications Driving Bandwidth

| USB |
| RSE |
| FM, DAB, TV |
| Gesture |

Infotainment

| Wi-Fi/BT/NFC |
| 3G/4G/5G |
| GPS/GNSS |

Wireless Connectivity

| Head up Display |
| Driver Information |
| Cluster |
| Central Information |

Instrumentation

Switch Based Data Routing

Telematics

| TCU |
| 3G/4G/5G |
| Gateway |
| V2X (DSRC,C-V2X) |

Powertrain

| Suspension Module |

Body/Comfort

| Headlamps |
| OTA |
| Diagnosis |

ADAS

ADCAM*	Highway Pilot*	Blind Spot Detection*
Mirror Replacement*	Cross Traffic Alert*	Distance/Speed Recognition*
Pedestrian Warning*	Emergency Braking*	Lane Assist*

*Preferred Sensor	Camera	Radar	Lidar
	ADCAM	Distance/Speed Rec.	Highway Pilot
	Mirror Replace-ment	Cross Traffic Alert	Pedes-trian Warning
	Lane Assist*	Blind Spot Detection	

- Differential preferred
- Coaxial preferred

High Performance Automotive Grade Porfolio

COAXIAL

FAKRA
Coaxial connector system supporting frequencies up to 6 GHz

MATE-AX
Miniaturized coaxial connector system for high-end multi-Gigabit applications and high frequency radio signals up to 15 GHz

DIFFERENTIAL

HSD/HSL
Star-Quad fully shielded connector system, supports up to 6 Gbps

MATEnet
Scalable and modular connector system for high volume applications (e.g., 100/ 1000BASE-T1)

GEMnet
High performance differential connector system for high-end multi-Gigabit applications up to 56 Gbps

Primary Design Drivers		FAKRA	MATE-AX	HSD/HSL	MATEnet	GEMnet
Performance			●	●		●
Miniaturization			●	●		●
Robustness		●	●	●	●	●

GEMnet – Industry Compatible Robust Multi-Gigabit Automotive Connectors with 90° and 180° Terminals

PERFORMANCE	CONFORMANCE
• 56 Gbps • 15 GHz • 100 Ohm impedence	• OPEN Alliance TC9, IEEE802.3ch, IEEE802.3cy • USCAR interface standards

KEY FEATURES	
• Robust automotive design • High cable retention force • Scoop proof	• Anti-stubbing features • CPA • ≥ 25 mating cycles

TYPICAL APPLICATIONS	**Automotive Ethernet:** 100BASE-T1, 1000BASE-T1, 2.5/5/10GBASE-T1
	SerDes: GMSL, APIX, GVIF, FPD-Link, ASA Motion Link, MiPi, HDBase-T
	Others: USB, PCIe

90° / 180° TERMINALS

Housing Portfolio	180° male and female housing (sealed & unsealed)			
	1 port	2 port	4 port	6 port
	90° female (sealed & unsealed)			
	1 port	2 port		4 port

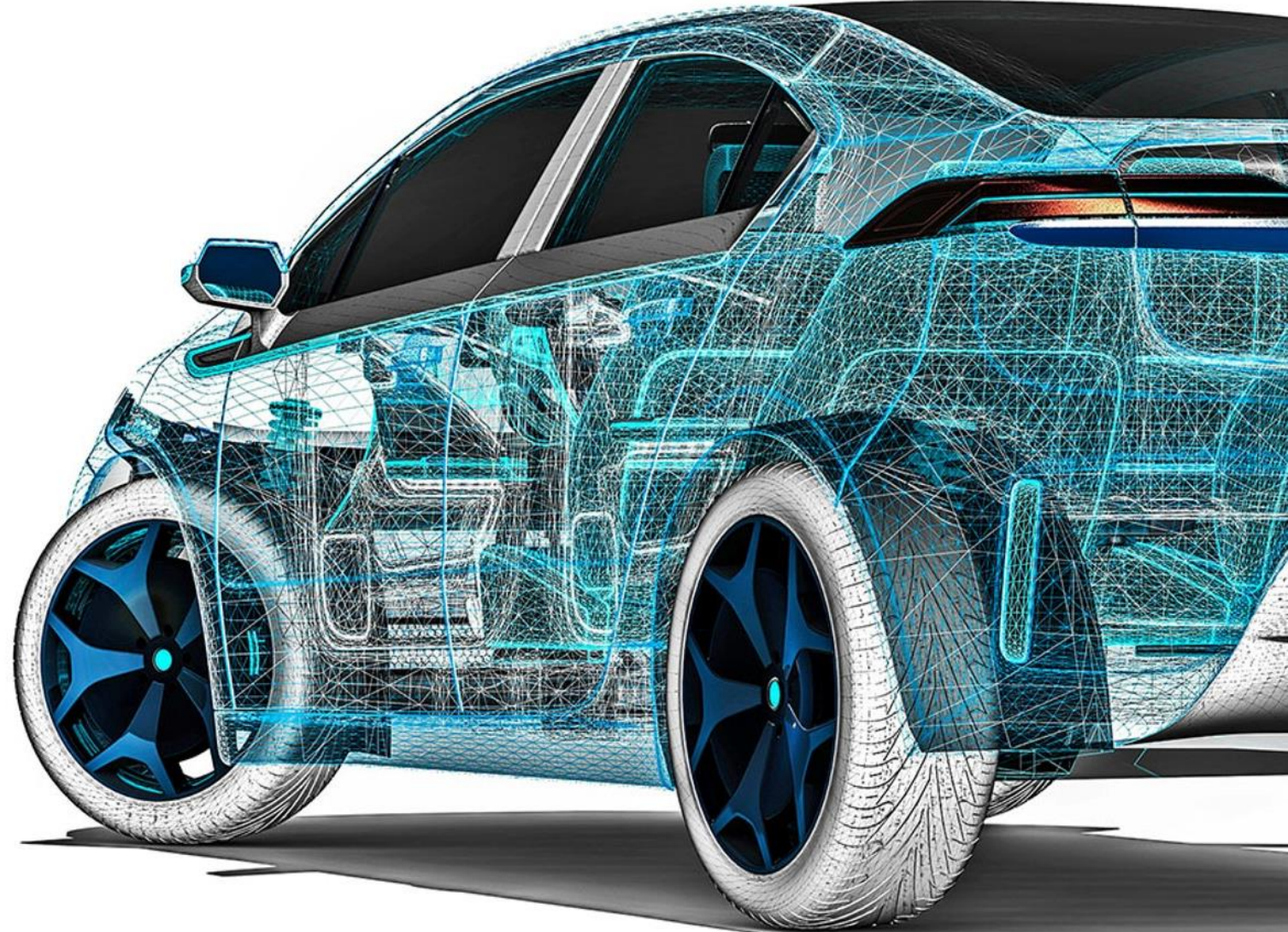| Header Portfolio	90° & 180° header (sealed & unsealed)			
	1 port	2 port	4 port	6 port

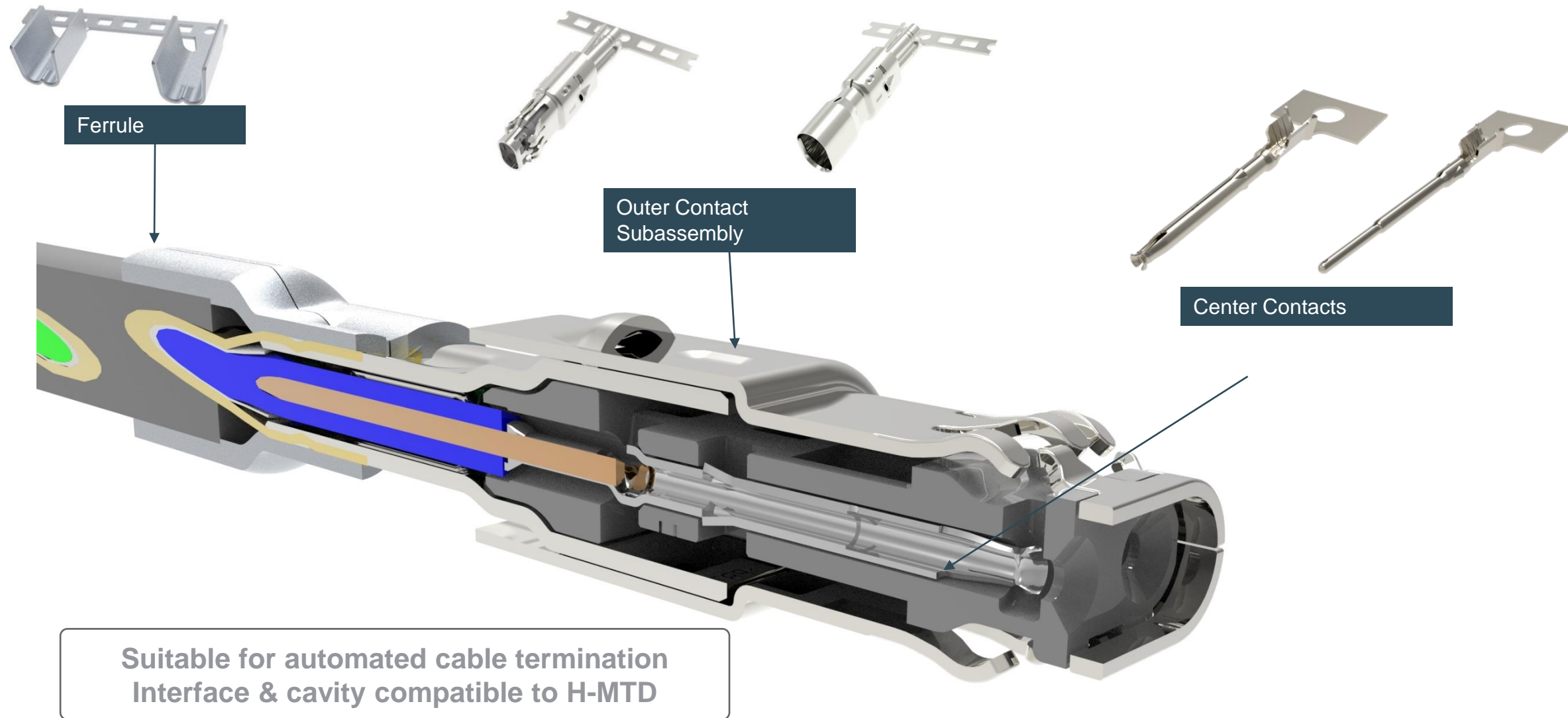*Hybrid Housing and Headers on demand

Technical slides Differential: GEMnet Multi-Gigabit Differential Connector system

Mated Connector Pairs

EVERY CONNECTION COUNTS

GEMnet 180° Terminal System

Ferrule

Outer Contact Subassembly

Center Contacts

Suitable for automated cable termination
Interface & cavity compatible to H-MTD

GEMnet 180° Terminal System

Rear Outer Contact

Front Outer Contact

2x Laser Welds

Dielectric

4x Crimp

Rear Outer Contact

4x Laser Welds

Dielectric

Front Outer Contact
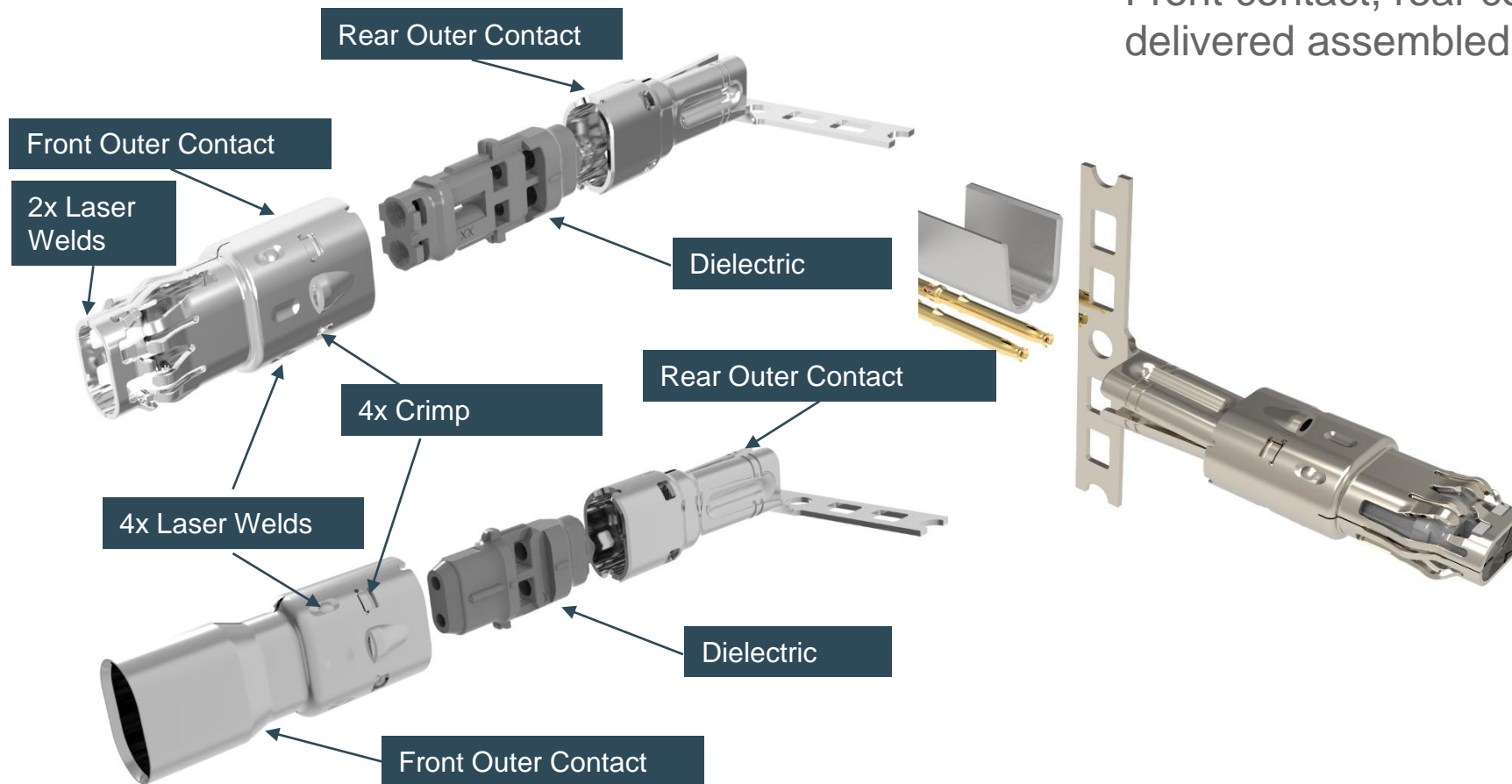
- Front contact, rear contact, and dielectric delivered assembled out of die on reel.

GEMnet Terminal System: Design Advantages

- Low-cost stamped ferrule, provided on strip

- Contact assembly cavity compatible with H-MTD
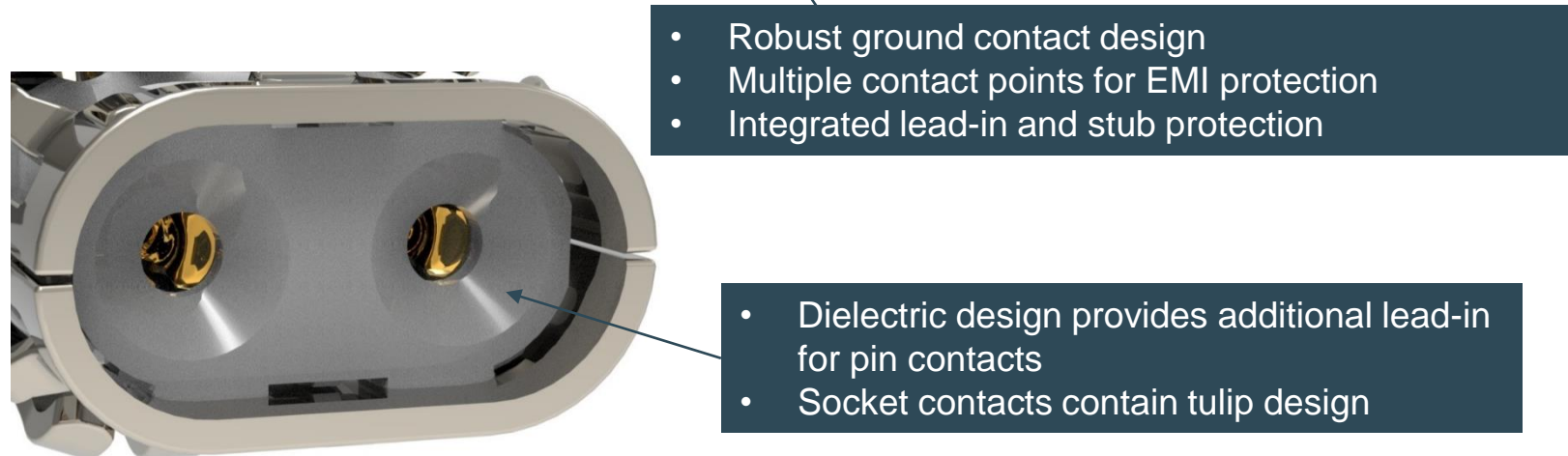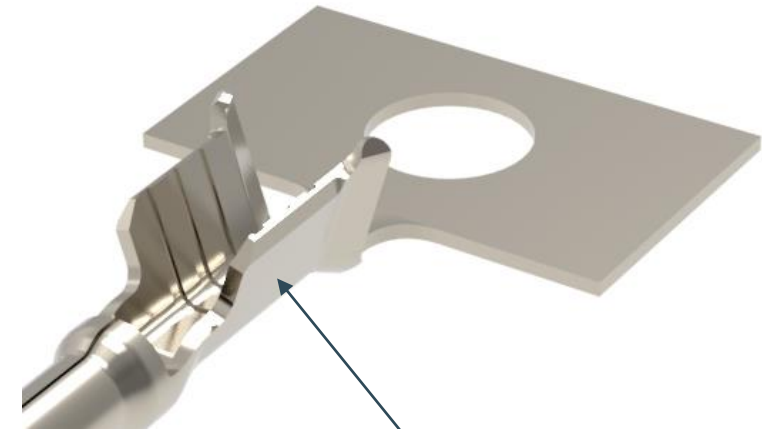
- Robust ground contact design
- Multiple contact points for EMI protection
- Integrated lead-in and stub protection

- Minor modifications to proven MATE-AX crimp design

- Dielectric design provides additional lead-in for pin contacts
- Socket contacts contain tulip design
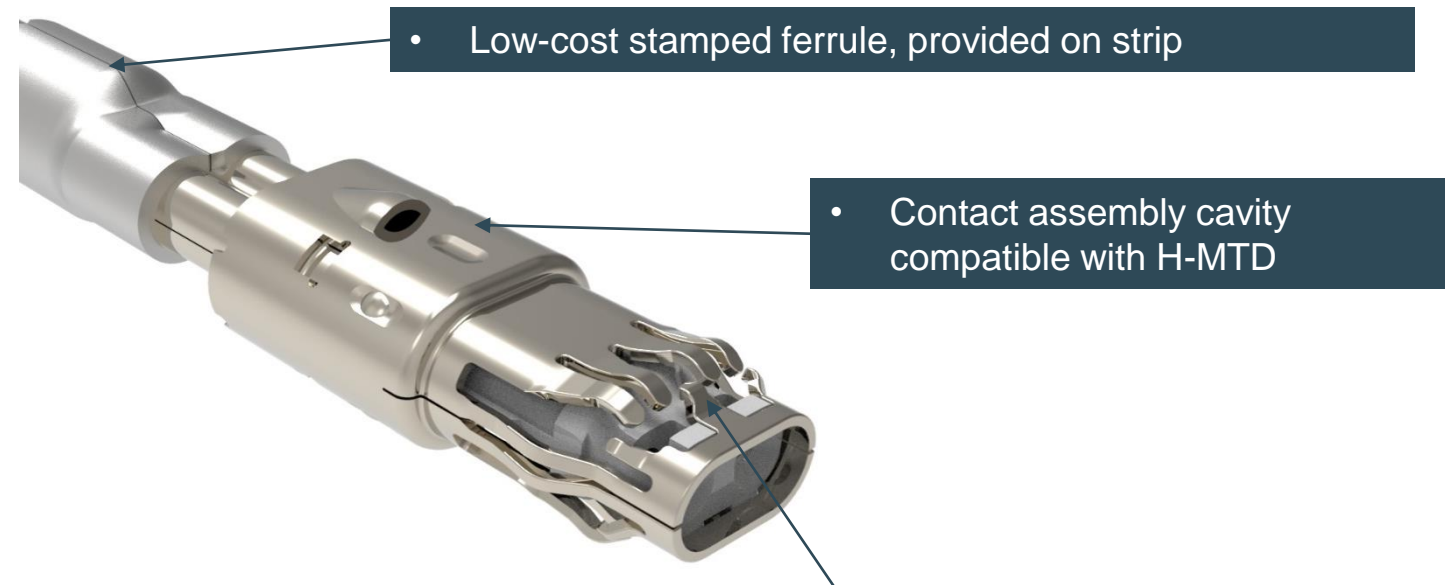
GEMnet 90° Terminal System (new design pending)

Outer Ferrule

Inner Ferrule

Outer Contact Subassembly

Center Contacts

Terminal assembly

Suitable for automated cable termination
Interface compatible to H-MTD
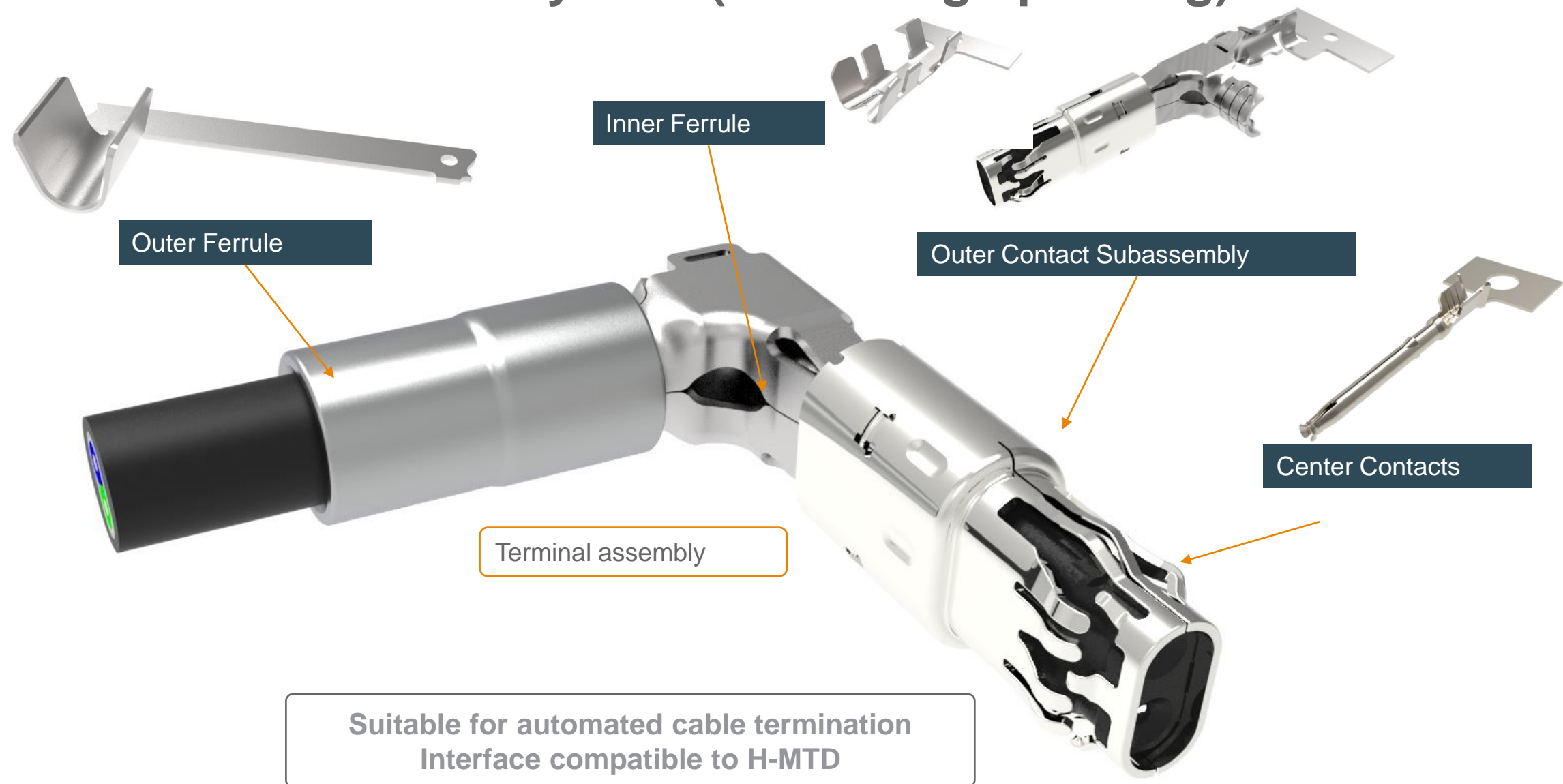
GEMnet Connector System Plug Components

TPA

CPA

Pin Terminal Assembly

Pin Housing

Plug Housing

Plug Terminal Assembly

TPA
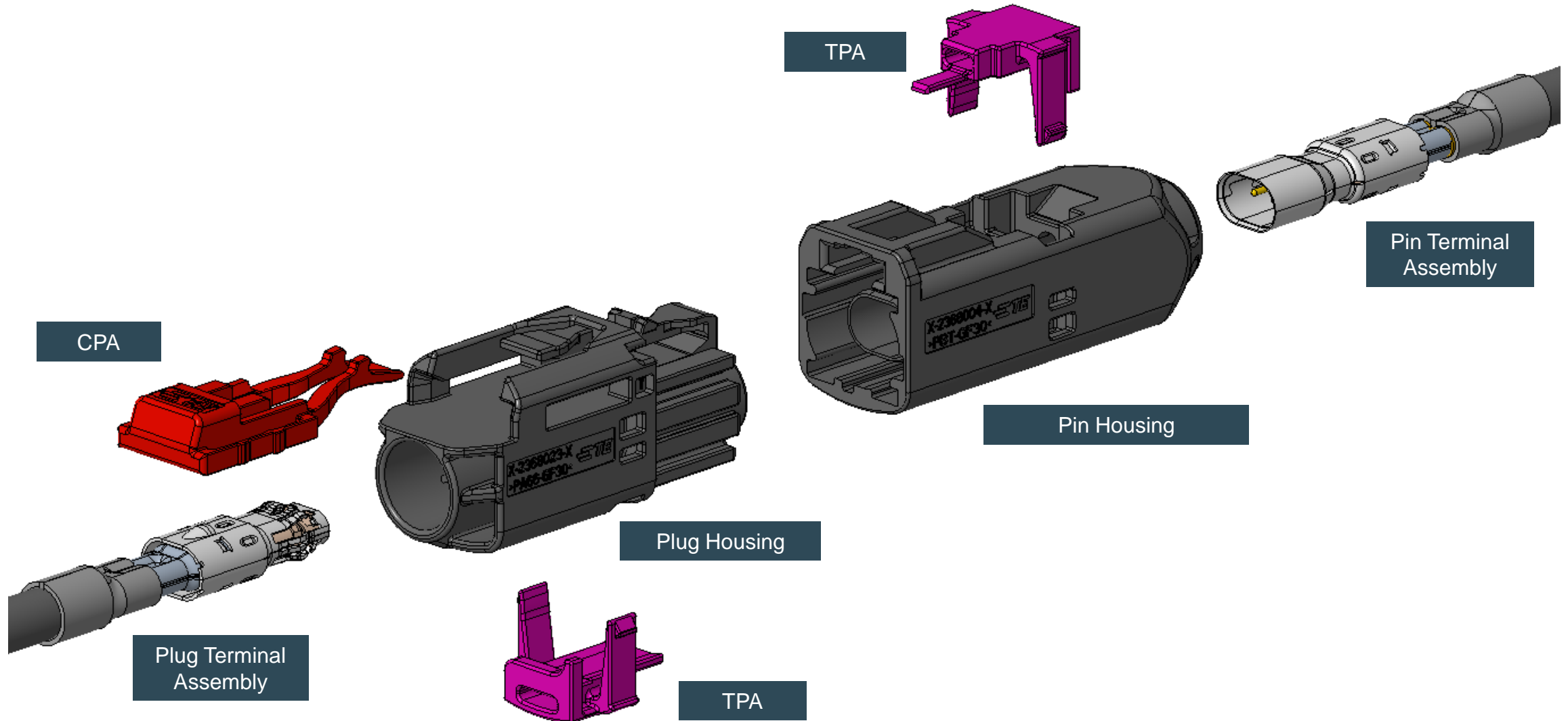
Industry Compatible Interface
H-MTD USCAR-EWCAP (PN: 999-U-002-1-Z05)

Plug Housing
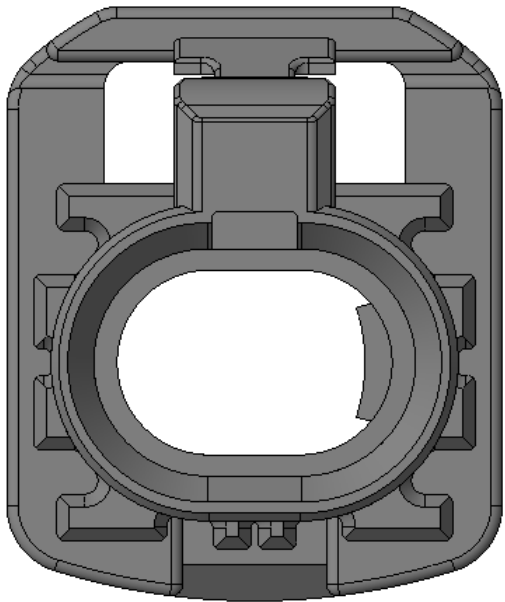
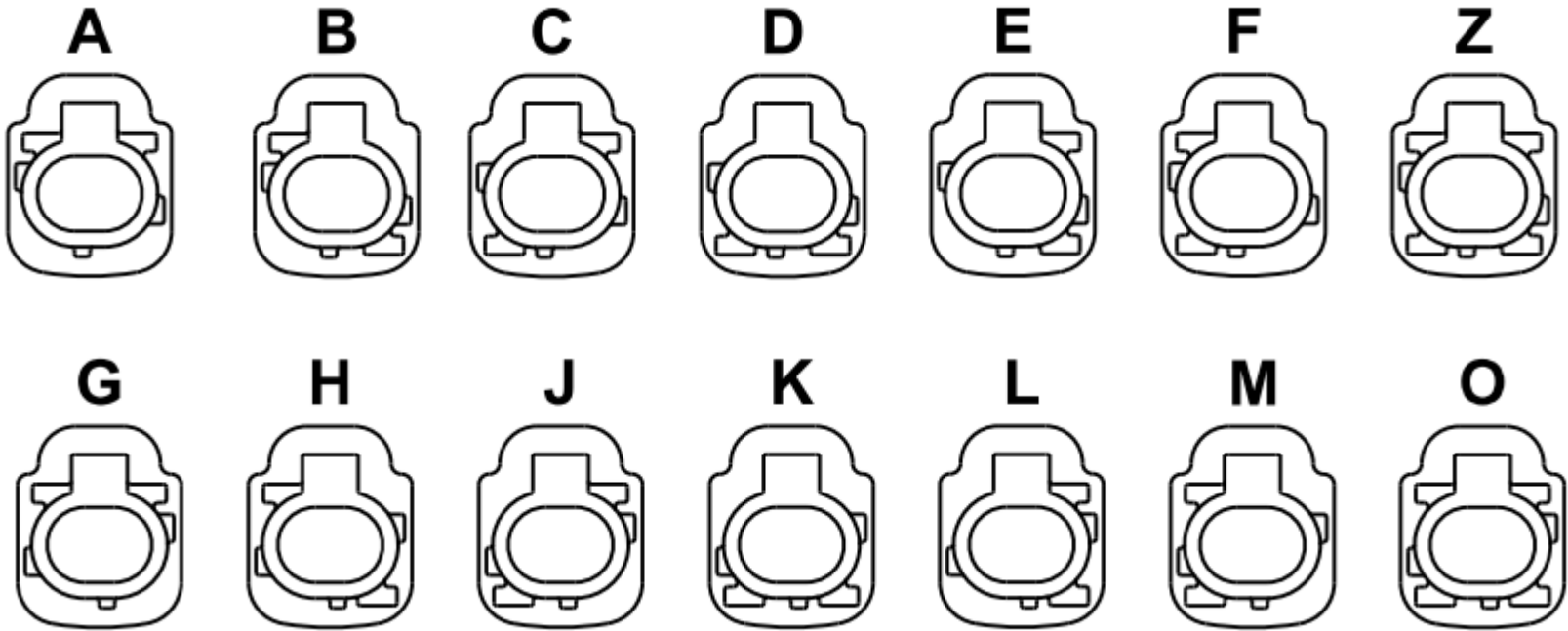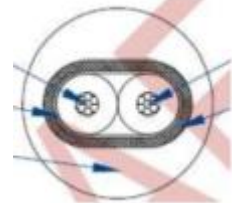**Key Codes: 12 Keys, 2 Neutral (Z & O)**

A   B   C   D   E   F   Z

G   H   J   K   L   M   O

GEMnet Connector System Cable Construction

Twisted & Shielded Differential Pair

Braid over Foil Construction
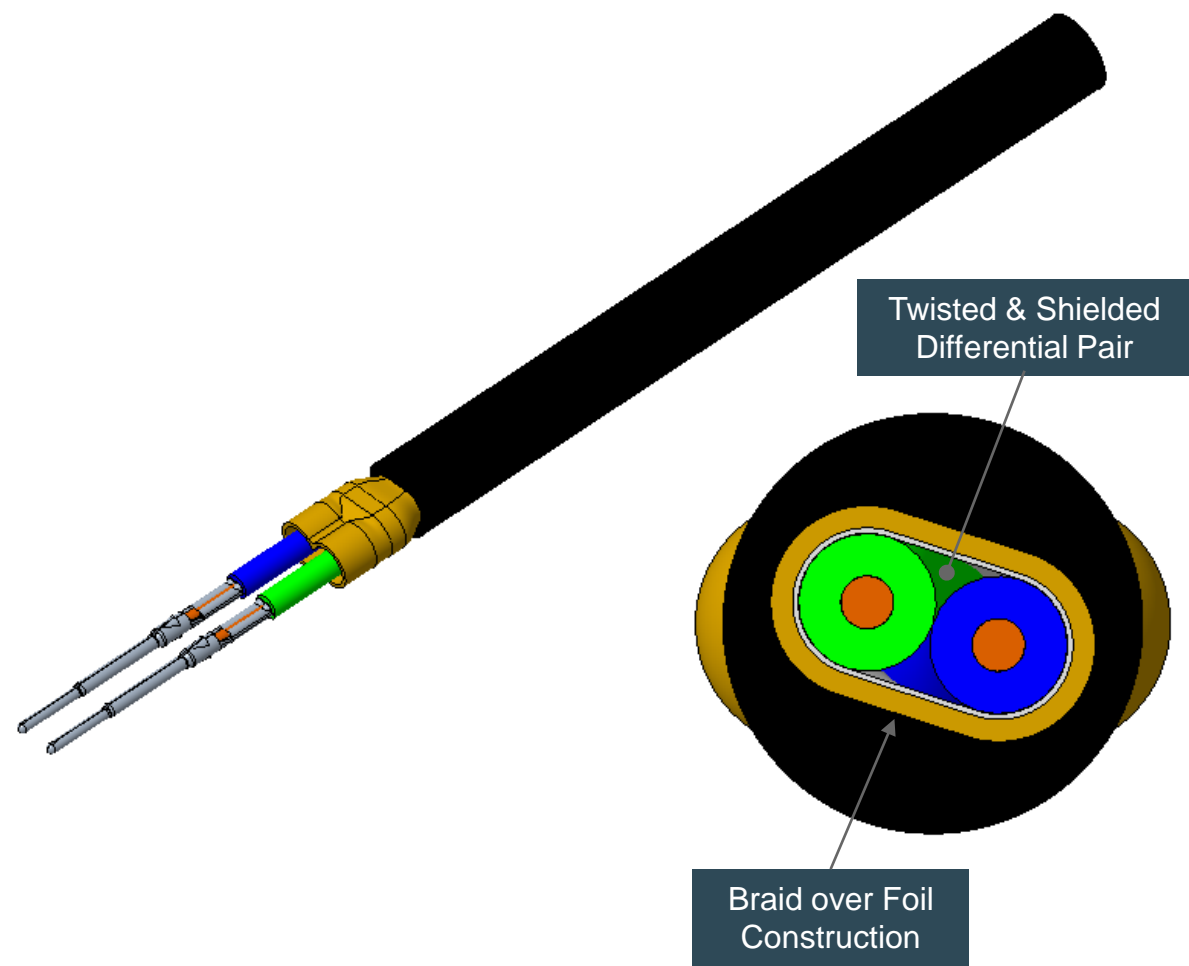
Item	Dacar 686-3
Speed	Multi-GHz (Oval)
Jacket Dia	2.8 ±0.2
Braid Dia	3.0 ±0.2 x ?
Conductor Dia	0.48
Cond Die Dia	1.23 ±0.03
Conductor Area	0.14 mm ^2
Inner Sheath Dia	N/A
n-wires	7
Wire Dia	0.16 mm
Lay-length	19 mm
Braid Dia/Weave	16 x 6 x 0.1 mm
Operating Temp	-40°C to +105°C
Cable Diagram	

GEMnet Connector System Design Advantages

1. Forward Stop and Terminal Clocking Feature

   1.1 Terminal & Forward Stop in 12 O-Clock Position

   1.2 TPA cannot be closed when Terminal is in

       6 O-Clock Position

2. Integrated Lead-in Terminal Feature

3. Integrated Stub Protection

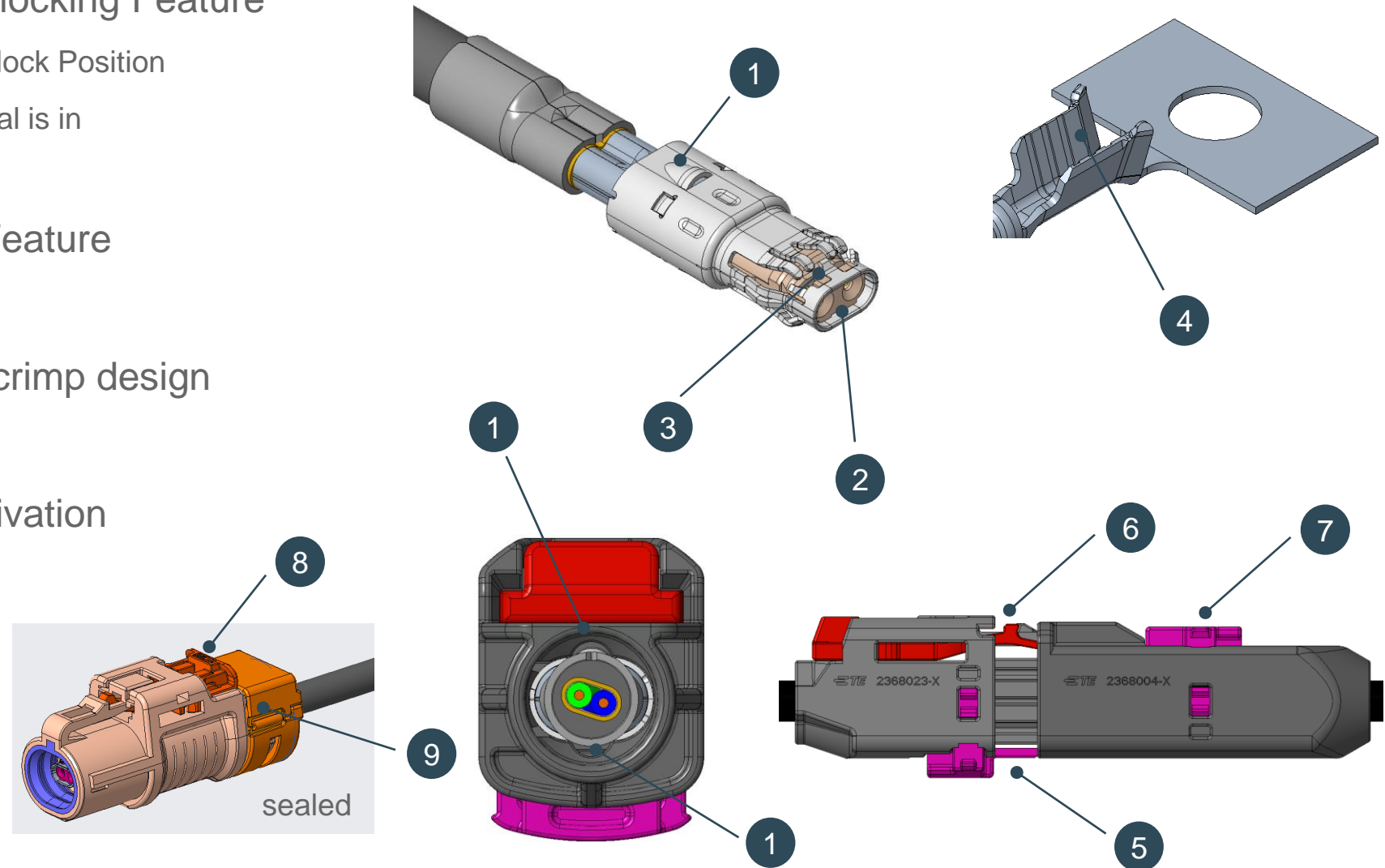4. Enhanced proven MATE-AX crimp design

5. Plug TPA Mating Block

6. CPA protection from false activation

7. TPA function

8. Identical CPA to unsealed

9. Hinge design on rear cover

   (for maintenance purpose)

sealed

GEMnet Connector System Value Proposition

Performance

Supports up to **15GHz** bandwidth

Supports current and future Ethernet standards, and upcoming SerDes links

Robustness and Reliability

Terminals fully protected with **"lead-in" function** and **stub-protection** feature

Meets USCAR and LV-214 specifications

Smart Design

Poke-yoke with **terminal polarization**

Standard T&C design
- **TPA and CPA** function
- Rear cover „**hinge**" design for sealed plugs

Straight & angled version Header/Housing/Terminal

Architecture

Terminals are designed for existing (domain-based) and future (zonal) architecture

About TE Connectivity
TE Connectivity is a global industrial technology leader creating a safer, sustainable, productive, and connected future. Our broad range of connectivity and sensor solutions, proven in the harshest environments, enable advancements in transportation, industrial applications, medical technology, energy, data communications, and the home. With more than 85,000 employees, including over 8,000 engineers, working alongside customers in approximately 140 countries, TE ensures that EVERY CONNECTION COUNTS. Learn more at www.te.com and on LinkedIn, Facebook, WeChat and Twitter.

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