

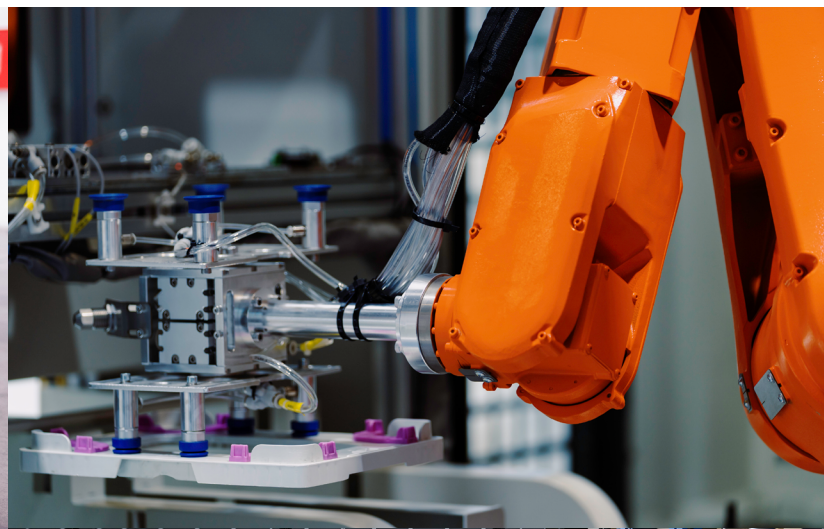
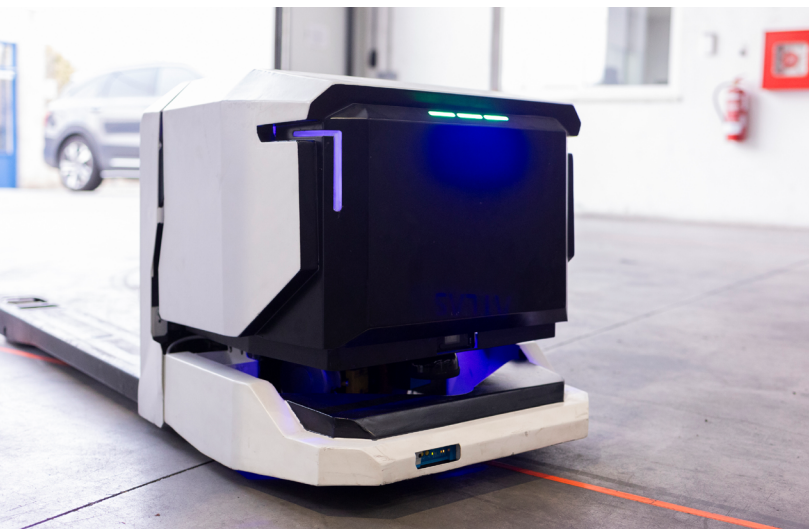


# Connectors for Industrial Robotics Applications

# Aptiv is a global technology company that enables a safer, greener and more connected future with scalable hardware and software solutions.

Our **Connection Systems** business offers a full range of connectivity products for power and data applications.

The portfolio includes low- and high-voltage connectors for conditions ranging from light duty to harsh environments, as well as high-speed data connectors that support increasing bandwidth requirements.



# Aptiv Connection Systems

## PIONEERING MODERN CONNECTIVITY SOLUTIONS

### Global Excellence in Connectivity

Aptiv Connection Systems stands at the forefront of electrical and electronic connectivity innovation, delivering premium connection systems that consistently exceed global customer expectations. Our cutting-edge technologies and processes are shaped by deep customer insights and a relentless pursuit of innovation. We remain dedicated to collaborating with partners to develop connectivity solutions that meet the increasingly demanding quality and performance standards in today's market sectors.

### Advanced Manufacturing & Design Capabilities

Using state-of-the-art manufacturing technologies and comprehensive design services, we create high-performance, cost-efficient connection systems available as both off-the-shelf and custom solutions. Our end-to-end approach encompasses the design, manufacturing, assembly, validation and delivery of electrical/electronic connectivity products that satisfy the most stringent industry requirements.

### Versatile Solutions Portfolio

Our diverse product lineup spans from signal-level to high-power connection systems, featuring both unsealed and sealed, ergonomically designed connections for inline, device and header applications. Our comprehensive offerings position Aptiv as a trusted single-source connectivity partner.

### Market Applications

Aptiv Connection Systems delivers specialized connectivity solutions across several sectors:

- **Agricultural equipment**
- **Automotive**
- **Construction machinery**
- **Energy market and power applications**
- **Industrial and robotics applications**
- **Marine applications**
- **Mass transit systems**
- **Medium- and heavy-duty trucks**
- **Motorcycle technology**
- **Recreational vehicles**
- **Urban air mobility (eVTOL)**

### The Aptiv Difference

#### Comprehensive Product Ecosystem

An extensive range of connectivity solutions

#### Pioneering Interconnect Technologies

At the cutting edge of the industry

#### Cross-Industry Expertise

Deep knowledge across multiple connector applications

#### A Holistic Systems Approach

Integrated solutions rather than isolated components

#### Customer-Centric Innovation

Solutions developed around real client needs

#### Exceptional Service Standards

Consistently exceeding customer expectations

#### A Robust Global Presence

Seamless support across international markets

# Connector Series for Low Voltage Applications



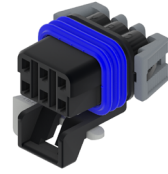
## NANOPACK™ CTS

Miniaturized connectors engineered for reliability in compact electronic applications



## CTS 1.2 SEALED

Sealed connection system delivering compact, reliable performance for harsh operating environments



## METRI-PACK™

Standard connection for heavy-duty performance, up to 20G vibration, 125°C and high-pressure spray

## CONNECTOR & TERMINAL RANGE

- 0.5 mm Series
- 2-way to 24-way configurations
- Inline, headers, mixed and device
- 105 °C maximum temperature
- IP67 and IPx9K sealed or unsealed
- 90° left/right or 180° covers (sealed)
- Sn or Ag plating

- 1.2 mm Series
- 2-way to 6-way configurations
- Inline and device
- 18.7A maximum current
- 175 °C maximum temperature
- Cable-sealed
- Sn or Ag plating

- 150, 280, 480, 630, and 800 Series
- 1-way to 16-way configurations
- Inline, headers, and mixed
- Maximum current: 14A (150 Series) up to 60A (800 Series)
- 125 °C maximum temperature
- Cable-sealed
- Sn, Ag, and Au plating

## FEATURES & BENEFITS

- Heavy-duty performance
- Ergonomic design
- Robust contact geometry
- Designed for high temperatures and vibration profiles
- Independent Secondary Lock (ISL) to detect partially installed terminals
- Best-in-class lock overstress protection
- Designed for automated harness assembly
- CPA (Connector Position Assurance) optional

- Short shroud design for small packaging footprint and long shroud design for easy mating device
- One-piece molded housing ensures best-in-class sealing performance
- Increased sealing performance through a unique three-rib robust seal design (175 °C version)
- Patented Smart Locking System version of the CPA prevents unmating in high vibration environments
- Compatible with wire dress back shells

- The comprehensive product range supports design flexibility and application versatility
- Supports both high-current and low-energy circuits for maximum electrical adaptability
- Robust terminals assure correct alignment and connection integrity
- Connector Position Assurance (CPA) and Terminal Position Assurance (TPA) provide superior connection reliability
- Environmental sealing provides exceptional protection against temperature extremes, chemicals and abrasion

## TYPICAL APPLICATIONS

- Safety systems
- Vision sensors
- Navigation systems
- CAN bus system

- Control modules
- PLC
- Lighting systems
- Proximity sensors

- Battery packs
- Traction motor sensors
- CAN bus systems
- Actuator signals

# Connector Series for Low Voltage Applications



## OCS 1.5 SEALED

Full inline and device connector series designed for improved reliability and a variety of uses across industries



## APEX™ 2.8 SEALED

Ergonomic design and heavy-duty performance to withstand heat, vibration and moisture in harsh conditions



## HES

Circular connectors engineered for uncompromising performance in extreme environments

### CONNECTOR & TERMINAL RANGE

- 2-way to 16-way, female and male
- Six standard indexes
- Primary lock reinforcement (PLR)
- CPA available
- 21A continuous maximum current rating
- -40 °C to +125 °C operating temperature range
- IP69K-rated sealing

- 2-way to 14-way configurations
- Inline and device
- 40A maximum current
- 150 °C maximum temperature
- Mat-sealed; IP68-rated

- 24 shell connectors
- Six terminal patterns
- Standard/reverse configurations
- Thin wall, regular wall and heavy wall
- 19 mm, 22 mm and 25 mm conduit adapters, straight and right angle
- 50-way to 60-way header system
- Pin/sleeve terminals compatible with MIL 390329 industry standard cavity
- Ni or Au plating

### FEATURES & BENEFITS

- Compatibility with industry standard mating interfaces
- Robust reliability and designed-in durability
- Housing lock overstress protection to prevent lock relaxation or damage
- Polyester resins for an enhanced audible click, to improve operator build feedback and dimensional stability in all seasons
- Optimized PLR for improved terminal unseat detection
- Cavity designed with a positive forward stop to prevent terminal push-through
- Optimized optional CPA that provides additional lock performance to ensure connectors stay mated

- Industry's most compact 2.8 mm system
- Fully protected interface seal
- PLR and CPA to ensure connection integrity
- Mechanical polarization to eliminate mismates
- Proven environmental sealing in harsh environments

- Three-rib seal design for up to 57% higher performance
- Up to 44% higher terminal retention while reducing plugging force
- Validated to SAE J2030
- HES terminals for improved electrical performance
- Ergonomic harness assembly
- Assembly benefits: lock window and alignment arrows; color-coordinated seals

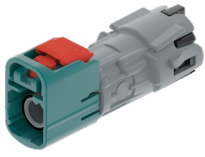
### TYPICAL APPLICATIONS

- Battery packs
- Ultrasonic sensors
- Motor feedback controls
- Steering and braking

- Temperature, proximity and torque sensors
- Lift motors
- Battery and related connections
- CAN bus systems

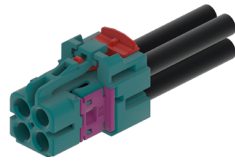
- ECU - main control outboard clusters
- Service modules
- Emergency stop system
- Safety systems and sensors

# Connector Series for High Speed Data Applications



## HIGH SPEED FAKRA (HSF)

Supporting multigigabit data rates and power over coax for a simpler design



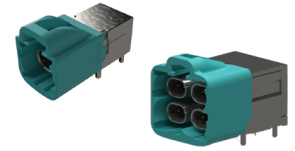
## MINI COAX

Supporting higher data rates up to 15 GHz as next-generation of high-speed FAKRA



## AMEC

Auto Mateable Modular Ethernet Connector can scale from 100 Mbps to 1 Gbps within the same footprint



## AMEC™-H (H-MTD®)

Next generation networking applications that support 2-wire data transmission interconnects

### PRODUCT SPECIFICATIONS

- |  |   |   |  |
|--|---|---|--|
| <ul style="list-style-type: none"> <li>• Up to 6 GHz</li> <li>• Temperature range: -40 °C - 105 °C</li> <li>• Vibration level: V1</li> <li>• Up to 2A maximum DC current</li> <li>• Up to class 3-rated sealed and unsealed</li> </ul> | <ul style="list-style-type: none"> <li>• 9 GHz up to 15 GHz</li> <li>• Temperature range: -40 °C - 105 °C</li> <li>• Vibration level: V1</li> <li>• Up to 2A maximum DC current</li> <li>• Up to class 3-rated sealed and unsealed</li> </ul> | <ul style="list-style-type: none"> <li>• Up to 100 Mbps and 1 Gbps</li> <li>• Ethernet ports 1-8</li> <li>• Inline and header connections</li> <li>• 050 components</li> <li>• Modular concept</li> <li>• Broad portfolio</li> <li>• UTP and STP cable</li> <li>• Mixed connectors</li> </ul> | <ul style="list-style-type: none"> <li>• 1 Gbps to 56 Gbps</li> <li>• Up to 20 GHz</li> <li>• Impedance: 100Ω</li> <li>• Return loss: ≥ 30dB, DC to 1 GHz</li> <li>• Power current: ≤ 1.5A DC</li> <li>• Temperature range: -40 °C - 105 °C</li> <li>• Channel Specification IEEE 802.3bp and IEEE 802.3ch</li> <li>• 1-way to 6-way configurations</li> <li>• Cable-sealed</li> </ul> |
|--|---|---|--|

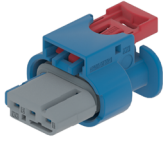
### FEATURES & BENEFITS

- |  |  |   |   |
|--|--|---|---|
| <ul style="list-style-type: none"> <li>• Stamped and formed terminal</li> <li>• FAKRA II interface</li> <li>• Wide variety of coax cables</li> <li>• Highest mechanical robustness</li> <li>• Serviceable designs</li> <li>• PCB connectors: SMD pin-in-paste soldering types</li> </ul> | <ul style="list-style-type: none"> <li>• Compact and reliable high-speed system offers up to 80% reduction in package size</li> <li>• Flexible design to support multiple connector variants</li> <li>• Proprietary outer crimp over braid design for improved mechanical strength and RF performance</li> <li>• Robust locking surface for improved terminal-to-cavity retention</li> <li>• Optional Connector Position Assurance (CPA)</li> <li>• Robust multiple key codes</li> </ul> | <ul style="list-style-type: none"> <li>• Outstanding performance for differential pair signal transmission</li> <li>• Stable performance across various temperatures and frequencies</li> <li>• Automated cable assembly process</li> <li>• Serviceable design</li> <li>• Anti-stubbing technology</li> <li>• Wide range of cable types</li> <li>• Secondary locks on terminals/housings</li> <li>• Ethernet protocols: Open Alliance and IEEE 802.3</li> </ul> | <ul style="list-style-type: none"> <li>• Fully shielded 2-wire data connectivity solution</li> <li>• Outstanding performance for differential pair signal transmission</li> <li>• Interface, PCB and cavity compatible to Rosenberger H-MTD®</li> <li>• Optional CPA</li> <li>• Optimized insertion force with improved retention force</li> <li>• Indexes A-D and Z</li> </ul> |
|--|--|---|---|

### TYPICAL APPLICATIONS

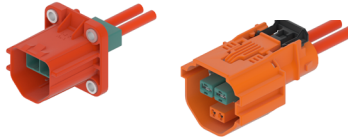
- |  |   |   |  |
|--|---|---|--|
| <ul style="list-style-type: none"> <li>• Antennas</li> <li>• GPS</li> <li>• Sensors</li> <li>• Telematics</li> </ul> | <ul style="list-style-type: none"> <li>• ADAS cameras</li> <li>• Smart sensors and modules</li> <li>• Power over coax</li> <li>• Radar</li> <li>• Supports autonomous driving applications</li> </ul> | <ul style="list-style-type: none"> <li>• Cameras</li> <li>• Antennas</li> <li>• Smart sensors and modules</li> <li>• Industrial ethernet</li> </ul> | <ul style="list-style-type: none"> <li>• Radar</li> <li>• Lidar</li> <li>• ECU</li> <li>• Industrial ethernet</li> <li>• Supports autonomous driving applications</li> </ul> |
|--|---|---|--|

# Connector Series for Power Applications



## 48V CONNECTORS

Broad portfolio of 48V connectors for up to 60V with proven, robust terminal systems to avoid intermittent contacts



## SHIELDPACK™ HV630

The largest global portfolio of auxiliary module connections, rated up to 1000V



## POWERPACK LV1000

High current carrying capacity, a proven terminal system and a compact design

### PRODUCT RANGE

- LVCS 0.64 and 2.8 Series
- CMC 0.64 V0 Series
- CTS 1.2 SensoMate® Series
- Apex 2.8 Sealed Series
- CTS 9.5 Sealed Series
- DCS 9.5 Power Sealed/4.8 Series
- Mixed CTS 9.5 and Apex 1.2 Series
- PowerPack LV 1000 and 2000 Connectors
- PowerPack 48V Sealed Ring Connectors
- Wire-to-device
- Cable exit orientation: 180°
- Temperature range: -40 °C - 125 °C
- 60A maximum current
- 1000V maximum DC voltage
- Electrical protection: IP2XB
- IP67 / IP6K9K-rated sealing
- Vibration level: V1
- Inline, device and pass-through applications
- 1-way and 2-way configurations
- Straight and right-angle versions
- 120A continuous maximum current rating
- 48V maximum DC voltage
- Temperature range: -40 °C to +125 °C
- IP67 / IP6K9K-rated sealing
- Unshielded
- Vibration level: V2

### FEATURES & BENEFITS

- Industry standard interfaces are supported
- Connectors withstand high vibration levels and operating temperatures
- Connectors meet IEC creepage and clearance standards up to 60V
- A terminal secondary lock eliminates terminal pushout risk
- Sealed connectors mitigate risk of electrochemical corrosion
- Inner connector with TPA can be plugged into header during device assembly (on wire-to-device)
- Tool-less unmating systems
- Finger proof/touch safe
- Panel mount to device with face seal
- Aluminum compression bushings
- ISO cable compatible
- Secondary terminal locking
- High current carrying capacity
- Proven terminal system
- Compact system design
- Field-proven in heavy duty applications
- Silver-plated multi-contact terminal system
- Sealed panel-mount pre-stages prior to fastening
- Panel-mount secured in place with self-tapping screws
- Pass-through connection accepts both straight and right-angle connectors

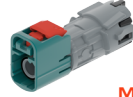
### TYPICAL APPLICATIONS

- Motor and drivetrain connections
- Lighting applications
- Battery connections
- Sensor and actuator connections
- DC-to-DC converter
- Battery packs
- On-board charger
- Auxiliary loads
- Battery packs
- Power inverters
- Electric motors
- Power distribution unit (PDU)

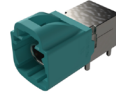
# Robotics Application Guide

## ROBOTIC ARM

FAKRA



AMEC-H



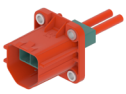
MINI COAX



### Navigation

- Cameras
- Laser scanners
- Vision systems
- Industrial ethernet
- Proximity sensors

HV630



48V



POWERPACK



### Power systems

- Electric motors
- Actuators
- Controllers

APEX



CTS 1.2



NANOPACK  
CTS



HES



### Electrical systems

- Electronic control module
- LCD display
- Temperature and force sensors
- CAN bus

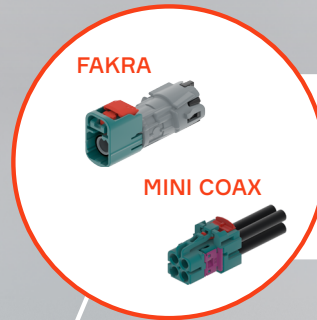
# Robotics Application Guide

## AGV/AMR



### Power systems

- Battery connections
- HV PDU
- Electric motors
- Power inlets



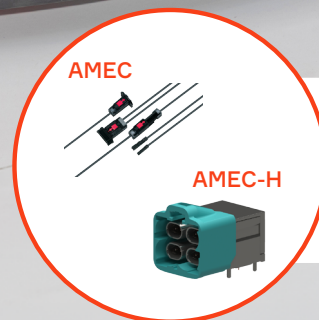
### Navigation

- Cameras
- Laser scanners
- Radar and lidar



### Electrical systems

- ECU
- PLC
- Control module
- Fuse box
- LCD display



### Safety

- Anti-collision strip
- Proximity sensors
- Emergency stop

# Robotics Application Guide


## HUMANOID



**AMEC**

**AMEC-H**

**MINI COAX**



- Navigation
- Cameras
  - Radar
  - Lidar

**48V**

**POWERPACK**



- Power systems
- Battery pack
  - 48V connection
  - Power management

**APEX**

**CTS 1.2**

**NANOPACK CTS**



- Electrical systems
- Torque motors
  - Sensors
  - Control modules
  - Actuators

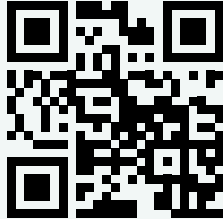
# Notes

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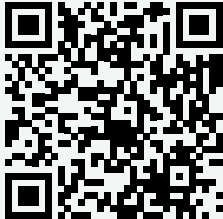


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BROWSE OUR E-CATALOG



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