Amphenol® RF

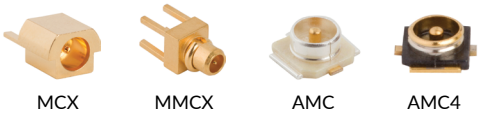
RF INTERCONNECT SOLUTIONS FOR HUMANOID ROBOTICS

Unlike standard industrial robots that are fixed and task-specific, humanoid robots are mobile and engineered to complete tasks that are typically performed by humans. They can assist, collaborate with or even replace actual people in controlled environments. As humanoid systems become more advanced they require interconnect solutions that deliver precision engineering and reliable, high-frequency performance. Amphenol RF delivers the expertise needed for next generation robotic technology, offering products that enhance perception, communication and control within compact designs. With proven reliability and scalable integration, the development of human-centric robotic systems is limitless.

Arms and Legs

- Tactile and Pressure Sensors
- Motor Driver PCB

The arms and legs of a humanoid robot incorporate tactile and pressure sensors along with motor-driver PCBs. Flexible wiring harnesses, board-to-board interconnects and compact signal connectors are used to route control and sensor signals through each joint, where space is limited and motion is continuous.



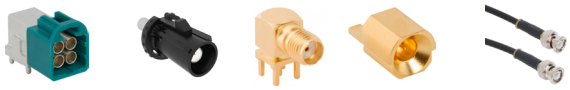
MCX, MMCX, AMC, AMC4

SMP, SMPM

Head

- Camera Module
- Audio Processing Module
- Vision Sensor PCB
- LiDAR

The head of a humanoid robot integrates key systems, including the camera module, audio processing module, vision sensor PCB and LiDAR capabilities. These components work together to enable real-time sensing and navigation through continuous data acquisition from multiple sensors. FAKRA connectors play a crucial role in this process by providing reliable and high-frequency signal transmission for these modules.

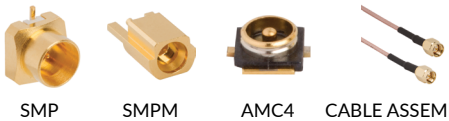


AUTOMATE-MINI FAKRA, FAKRA, SMA, HD-EFI, ULTRA FLEXIBLE/ HIGH-FLEX CABLE ASSEMBLIES

Body

- Computing Module (AI Processor)
- Power Module
- Battery

The body of a humanoid robot houses core systems, including the computing module, power distribution module and battery management system. These elements manage processing, energy delivery and battery monitoring to ensure stable operation and long runtimes. Our board-to-board solutions support efficient power routing and communication between these subsystems, enabling consistent performance under demanding robotic workloads.



SMP, SMPM, AMC4, CABLE ASSEMBLIES

BOARD-TO BOARD SOLUTIONS

Chest

- Control Module
- Wireless Communication Module

The chest of a humanoid robot typically contains the system controller and wireless communication modules. The system controller functions as the robot's central brain, processing sensor inputs, interpreting the environment and coordinating decision-making.

SMA, AMC

Humanoid robots rely on internal and external connections. RF interconnects in humanoid technology reliably manage data and power while maintaining signal integrity in compact, high-vibration environments.

APPLICATIONS

Manufacturing

- Material handling
- Parts movement
- Assembly assistance
- Machine maintenance
- Quality inspection

Warehouse and Logistics Operations

- Moving totes
- Transporting containers
- Feeding conveyors
- Material transfer between workstations

CORE COMPETENCIES

- Waterproof IP67/68 sealed and ruggedized solutions
- Customized hybrid solutions supporting RF, signal and power
- Board-to-board connectors for direct connection between PCBs
- Custom cable assemblies and sub-systems

SUPPORTING THE CORE SYSTEMS OF HUMANOID ROBOTS

Reliable High-Frequency Connectivity

Board-to-board interconnect solutions support high-frequency signal transmission for wireless modules in humanoid robotos. Compact designs enable dense system architectures while ensuring consistent performance for Wi-Fi, Bluetooth and 5G communication.

Enhanced Perception and Navigation

RF Interconnect solutions including FAKRA, Mini-FAKRA and HD-EFI enable high-performance connections for camera, radar and wireless systems. This allows humanoid robots to achieve precise sensing, real-time data processing and accurate navigation.

Robust and Reliable System Performance

Amphenol RF designs interconnect systems that withstand vibration, mechanical stress and demanding operating conditions. They support safety-critial functions and simplify integration across complex robotic systems.

DESIGN FEATURES

IP-Rated Waterproof Options Available

Waterproof sealed solutions are engineered to protect your application from outside elements and are fully tested to IP67 specifications in the mated and unmated condition.

Vibration-Resistant Designs

One-piece bodies and other design considerations are taken into account to provide a more robust option for applications where there are concerns for the security of the locking interface due to external conditions.