

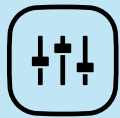
# Solutions for Humanoid Robots

Humanoid robots employ an anthropomorphic chassis with articulated, multi-axis joints that provide extensive degrees of freedom and dynamic motion. Autonomous operation requires distributed electronics for actuation, sensing and power management to be tightly integrated into the robot's confined spaces, with a high-performance central processor providing coordination. This architecture creates significant interconnect challenges, requiring densely routed connections to support high-speed data, power distribution and control signals within an extremely limited footprint, while maintaining reliability under vibration, shock and thermal cycling inherent to human-centric environments.

Molex addresses these demands with compact, high-density interconnect solutions designed for mixed-signal versatility and mechanical durability. Board-to-board connectors enable tight PCB stacking within distributed processing modules, while flexible circuits and cable assemblies simplify routing through articulated structures. Wire-to-board connectors with positive-lock retention and vibration-resistant contacts ensure stable power delivery and signal integrity under constant movement, enabling reliable autonomous operation in advanced humanoid robot designs.



Humanoid Robot



Computing System



Power System



Perception System



Body Actuation



Dexterous Hands

## MOLEX SOLUTIONS FOR HUMANOIDS

| MiniCirc<br>Connectors                 | HSAutoLink C<br>Interconnect System  | EXTreme Ten60<br>High-Power Connectors        | Printed Electronics<br>Touch Foils |
|----------------------------------------|--------------------------------------|-----------------------------------------------|------------------------------------|
|                                        |                                      |                                               |                                    |
| Application Use                        |                                      |                                               |                                    |
| Servo motor connections                | LiDAR sensor interface to main PCBA  | Hybrid power distribution for robot actuators | Finger tactile sensors             |
| Product Benefits                       |                                      |                                               |                                    |
| Compact circular design                | High-speed differential connectivity | High-current power contacts                   | Ultra-thin flexible sensors        |
| Secure mating and vibration resistance | Flexible I/O interface design        | Power and signal integration                  | Responsive touch sensing           |

# Humanoid Robot

## Perception System

Board-to-board connectors ([SlimStack](#))

[FFC/FPC connectors](#)

Circular connectors ([M12](#), [MiniCirc](#))

I/O connectors ([HSAutoLink C](#),  
[High-Speed FAKRA-Mini](#), [USB](#))

Wire-to-board connectors  
([Micro-Lock Plus](#), [Pico-Clasp](#), [Rely-On](#))

## Body Actuation

Cable assemblies ([Signal/low-power cables](#))

Circular connectors ([SPE](#), [MiniCirc](#))

Wire-to-board connectors  
([Micro-Lock Plus](#), [Pico-Lock](#))

## Dexterous Hands

Board-to-board connectors ([SlimStack](#))

[FFC/FPC connectors](#)

Wire-to-board connectors  
([Zero-Hachi](#), [Pico-EZmate](#))

Printed Electronics ([Flexible Hybrid Electronics](#))  
[Flexible Printed Circuits \(FPCs\)](#)



## Computing System

Board-to-board connectors  
([SlimStack](#), [Mirror Mezz](#), [ZN Stack](#))

Cable assemblies ([Signal/low-power cables](#))

Circular connectors ([Nano-Change M8](#),  
[M12](#), [MiniCirc](#))

I/O connectors ([HSAutoLink C](#),  
[High-Speed FAKRA-Mini](#))

Wire-to-board connectors  
([Micro-Fit](#), [DuraClik](#), [CLIK-Mate](#))

## Power System

Board-to-board connectors ([SlimStack](#),  
[Flexi-Latch+](#))

[FFC/FPC connectors](#)

[Premo-Flex Flat Flexible Cables \(FFC/FPCs\)](#)

Cable assemblies ([Signal/low-power cables](#))  
High-Power connectors ([EXTreme Ten60](#),  
[EXTreme Guardian](#))

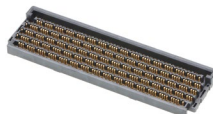
Wire-to-board connectors  
([Nano-Fit](#), [Micro-Lock Plus](#),  
[MX150 Mid-Voltage](#))



[Micro-Lock Plus  
Connectors](#)



[High-Speed  
FAKRA-Mini  
Interconnect System](#)



[Mirror Mezz  
Connectors](#)



[M12  
Connectors](#)



[SlimStack Floating  
FSB3 Connectors](#)

## References

### [Wire-to-Board Connectors](#)

[UL-approved](#)  
[Signal options](#)  
[Glow Wire offerings](#)  
[Fit families](#)

### [Board-to-Board Connectors](#)

[UL-approved](#)  
[Micro product reference guide](#)

### [I/O Connectors](#)

[Digital product board](#)  
[USB Connectors](#)

### [FFC/FPC Connectors](#)

[Digital product board](#)  
[Core products](#)  
[Easy-On Connectors](#)  
[Premo-Flex FFCs](#)  
[FPC solutions](#)

### [Circular Connectors](#)

[Nano-Change M8 Connectors](#)  
[M12 Connectors](#)  
[M23 Connectors](#)

### [Cables](#)

[Power and signal](#)  
[Pre-crimped leads](#)  
[Custom cable creator](#)

## SUBASSEMBLY BREAKDOWN

**Computing System** - Processes sensor data and coordinates motion, balance and interaction.

**Power System** - Delivers high-density power to support mobility and compute loads.

**Perception System** - Captures and processes visual and spatial data for recognition, navigation and awareness

**Body Actuation** - Enables joint movement for locomotion, balance and terrain adaptation

**Dexterous Hands** - Provide precise movements for grasping, manipulation and interaction

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