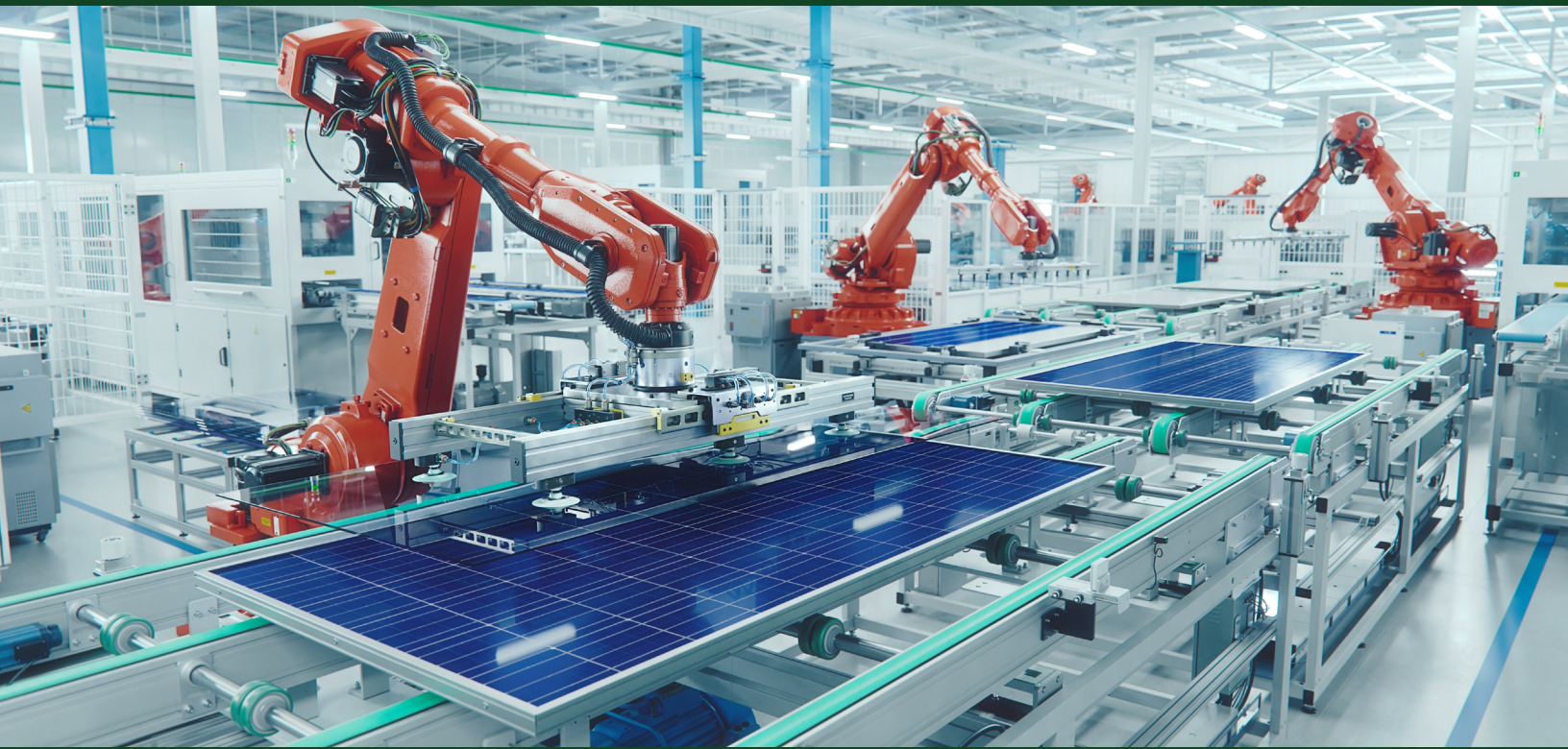




Industrial Interconnect Solutions

Advancing the Connected Factory





INDUSTRY
INDUSTRY 4.0

Industry 1.0 to 4.0

The journey of industrial development, marked by four distinct revolutions, has driven transformative advancements across industries. The **First Industrial Revolution** introduced mechanization through steam power, shifting production from manual labor to machine-driven processes. The **Second Revolution** further enhanced production efficiency with mass production techniques, assembly lines, and the use of electricity. The **Third Industrial Revolution** saw the introduction of computers, electronics, and automated systems, laying the foundation for digital transformation in manufacturing. Today, **Industry 4.0** builds on these advancements by integrating cyber-physical systems, IoT, AI, and big data, creating “smart” factories that communicate in real-time and adapt to changing demands autonomously.

Accelerated advancements in digital technology, connectivity, and AI continue to push the boundaries of Industry 4.0, leading to even faster, more efficient, and flexible production processes. This ongoing evolution enables industries to remain competitive in a rapidly shifting global landscape, positioning the industrial sector to adapt and thrive amid constant innovation and complex global challenges.

Industry 1.0



Mechanization

Mechanization, Steam Power, Water Power

Industry 2.0



Electrification

Electrification, Assembly Lines,
Mass Production

Industry 3.0



Automation


Automation, Computers, Robotics

Industry 4.0



Digitalization

Cyber-Physical Systems, IoT, Networks



Advancements in manufacturing digitalization reduce physical strain on operators and enhance safety by using sensors that predict potential risks and improve task efficiency.

718,000
annually

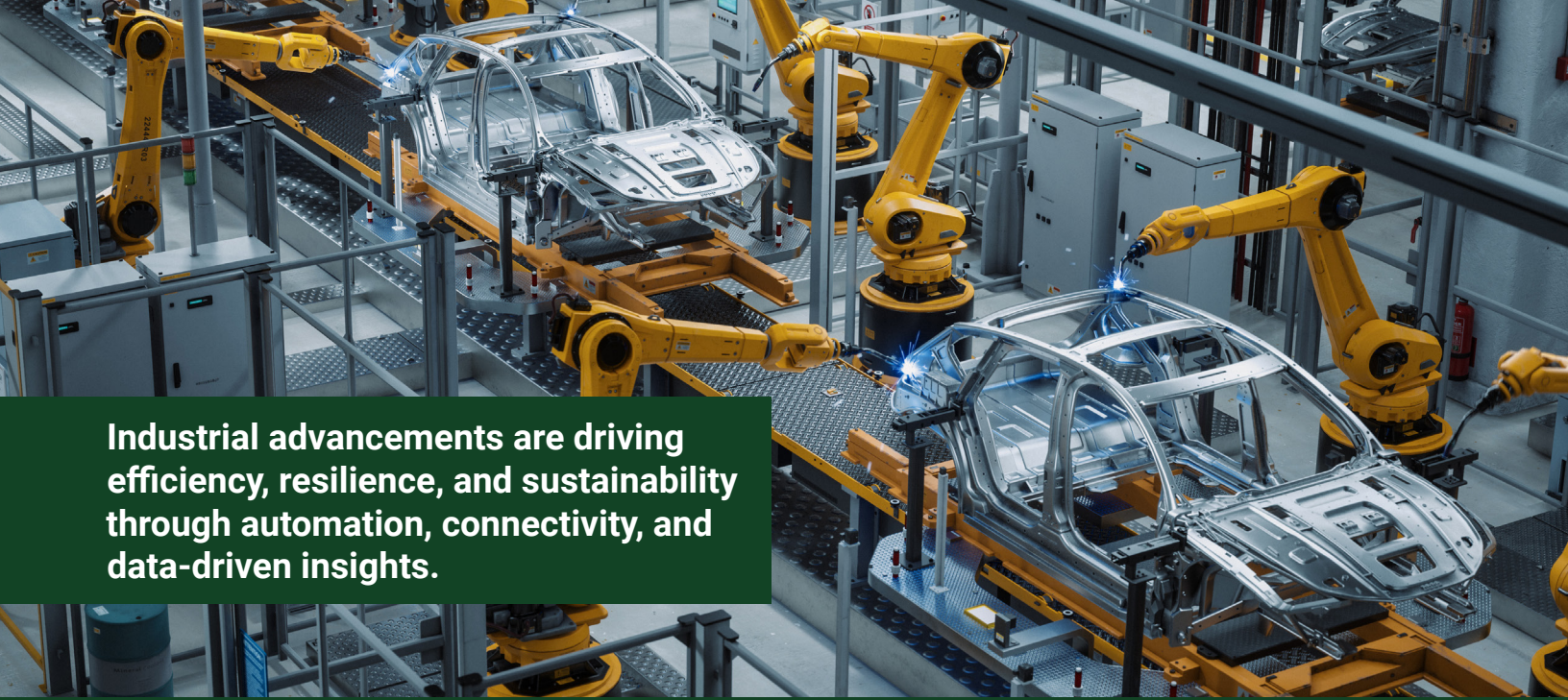
Annual installations of industrial robots is expected to rise to 718,000 by 2026 with over 4.25 million units operational in 2023, globally. ¹

+10.5%
CAGR

The global compound annual growth rate (CAGR) is 10.5% for industrial robots between 2023 and 2030. ²

~4.4
Zettabytes

With the power of Industry 4.0 and the implementation of artificial intelligence coupled with machine learning, manufacturers collectively are projected to generate 4.4 zettabytes of data by 2030. ³



Industrial advancements are driving efficiency, resilience, and sustainability through automation, connectivity, and data-driven insights.

APPLICATIONS

Smart Facilities

Smart Facilities harness advanced technologies like digital twins, AI, and IoT sensors to make industrial buildings—such as manufacturing plants, warehouses, and distribution centers—more adaptable and efficient. By gathering real-time data from equipment and infrastructure, these facilities enable predictive maintenance, optimized energy use, and dynamic control over environmental conditions. This responsive setup improves operational flexibility and reliability, allowing for faster data-driven decisions, minimized downtime, and streamlined industrial processes. Smart Facilities thus support both enhanced productivity and cost efficiency across the industrial landscape.

Example Applications

Access control, automated lighting, digital twin systems, energy-efficient HVAC controls, environmental monitoring, industrial sensors, network servers, predictive maintenance modules, robotic systems, security systems



Connectivity

Connectivity serves as the backbone of Industry 4.0 by enabling devices, machines, and systems to communicate seamlessly across an industrial network. Through real-time data exchange and remote monitoring, connectivity supports centralized control and enables informed decision-making across an organization. Industrial networks, powered by IoT, edge computing, and 5G, offer flexibility, speed, and stability essential for connected operations.

Example Applications

Communication modules, control panels, data hubs, edge computing devices, industrial 5G routers, industrial ethernet switches, IoT gateways, network servers



Automation

Autonomous systems continue to revolutionize the industrial landscape by handling repetitive, complex, and hazardous tasks with minimal human intervention. These systems bring speed, precision, and safety to manufacturing and logistics, enhancing productivity and reducing operational costs. Equipped with AI, sensors, and machine vision, autonomous systems adapt to varied tasks and optimize workflow efficiency within manufacturing, warehousing, and inspection.

Example Applications

3D printers, automated guided vehicles (AGVs), autonomous mobile robots (AMRs), CNC machines, cobots, conveyor systems, drones, machine vision modules, precision actuators, robotic pick-and-place systems, robotic welders



Supply Chain Integration

Supply Chain Integration bridges the gap between production and logistics, creating a streamlined, responsive supply chain from sourcing to distribution. By connecting inventory management, tracking, and logistics systems, manufacturers can achieve end-to-end visibility and flexibility. Integrated supply chains enable just-in-time production, minimize disruptions, and provide traceability, ultimately improving efficiency and customer satisfaction.

Example Applications

Automated warehouse sorters, fleet management systems, GPS devices, inventory scanners, networked logistics hubs, remote monitoring devices, RFID devices, servers



Energy Management Systems

Energy Management Systems (EMS) monitor, control, and optimize industrial energy use. By incorporating smart meters, load controllers, and battery storage, EMS ensures stable power quality, reduces peak loads, and manages backup sources to prevent downtime. These systems enable real-time adjustments to meet power demands, supporting cost-effective, reliable, and efficient energy distribution essential for operational continuity.

Example Applications

Backup generators, battery storage units, demand response systems, energy-efficient HVAC systems, load management controllers, power distribution panels, real-time energy monitoring devices, smart energy meters



Cybersecurity

Cybersecurity protects the interconnected systems of Industry 4.0, where data and devices are vulnerable to cyber threats. By securing networks, data, and devices, cybersecurity measures safeguard operational integrity and prevent costly disruptions. Effective cybersecurity is essential in maintaining trust and protecting valuable data across industrial systems, where connected technologies are crucial to both safety and efficiency.

Example Applications

Access control systems, security devices, servers, threat detection sensors



INDUSTRIAL DESIGN FACTORS

Environmental, electrical, and mechanical design considerations are critical factors in ensuring that connectors perform reliably in industrial applications. Environmental factors relate to the external conditions a connector may be exposed to, such as varying surroundings or stresses that could affect its durability. Electrical considerations focus on how effectively the connector can manage and transmit electrical signals, maintaining the integrity and safety of the system. Mechanical factors deal with the physical properties of the connector, such as its durability, stability, and fit within the overall design. Understanding these factors is crucial in the design process to ensure long-term reliability, minimize operational risks, and meet the requirements for industrial applications.



ENGINEERING DESIGN CONSIDERATIONS

Electrical

EMI/RFI Exposure

Electromagnetic and radio-frequency interference can disrupt signal integrity. Connectors with shielding, twisted cables, and grounded components are essential to prevent interference and maintain stable connections in electrically noisy environments.

Fieldbus Compatibility

Connectors must ensure seamless interoperability between different fieldbus protocols through standardized pinouts and electrical characteristics to maintain reliable system communication.

Grounding and Insulation

Industrial environments require reliable grounding and strong insulation to prevent electric shock and short circuits. Grounded connectors and high-quality insulative materials protect equipment and operators from electrical faults.

Power Loss and Efficiency

In power-intensive environments, connectors with low-resistance materials and efficient designs help reduce energy loss and ensure consistent power flow, supporting reliable and efficient facility operation.

Signal Integrity

High-speed industrial systems require connectors that maintain data signal clarity. Shielding and grounding help prevent data loss and interference, essential for automation and control systems.

Surge Protection

Connectors designed with surge protection in mind, safeguard infrastructure by channeling excess energy during electrical surges, preventing damage to critical systems.

Voltage and Current Rating

Industrial connectors must handle high voltage and current levels safely. High-grade insulation and robust materials prevent overheating and ensure connectors meet heavy-duty demands.

Engaging with EDAC, an experienced connector manufacturer, early in your design process can help address design considerations for your specific application to mitigate risk.

Environmental

Biological Exposure

Facilities in specific industries, like food processing or agriculture, may face challenges from biological contaminants, including bacteria, mold, and pests. Connectors used in these settings often require antimicrobial coatings or materials that can withstand frequent cleaning with harsh disinfectants.

Chemical Exposure

Connectors exposed to chemicals commonly present in industrial environments must be made from materials that resist acids, oils, and gases. This durability prevents degradation and extends the lifespan of connectors used in harsh conditions across a variety of sectors.

Dust, Debris, and Water

High IP-rated connectors keep out dust, debris, and moisture, ensuring consistent performance in harsh settings like manufacturing, mining, and outdoor applications.

Pressure and Vacuum Changes

Industrial environments, such as those in deep-sea or high-altitude applications, expose connectors to pressure variations. Sealed connectors ensure internal protection and consistent performance in these settings.

Temperature Extremes

Industrial connectors need to withstand high temperatures in processes like foundries or extreme cold in refrigerated facilities. Heat-resistant and cold-tolerant materials maintain performance under these conditions.

Mechanical

Dynamic Movement

Reliable automation systems require flexible connector designs that endure repeated bending and maintain signal integrity in robotic and dynamic equipment applications.

Installation and Maintenance

Efficient industrial operations rely on connector designs that are easy to install and service. Connectors with secure locking mechanisms, strain relief, and high mating cycle ratings ensure stable connections under dynamic stresses. These robust and accessible designs minimize downtime during routine maintenance, supporting optimal production efficiency and reliable performance across diverse applications.

Shock and Vibration

High-vibration environments, such as in heavy machinery or transportation, require connectors with secure locking mechanisms and shock-absorbing designs to prevent loosening and maintain stable connections.

Size and Weight Constraints

Space-limited equipment benefits from compact and lightweight connectors that optimize space without sacrificing durability, ideal for mobile or tight equipment.

Wear and Tear

Long-term production reliability demands highly durable connector designs that withstand repeated mating cycles and harsh daily usage while maintaining consistent electrical performance in demanding factory environments.

EDAC is committed to providing long-term product solutions to support extended product life cycles. On discontinued or phased out connectors that are critical to your production, EDAC would be pleased to review your requirements and offer a suitable off-shelf or turnkey solution.



Digital twins are virtual replicas of physical systems that use real-time data to optimize performance, predict maintenance, and enhance decision-making in complex industrial environments.

DIGITAL TWINS

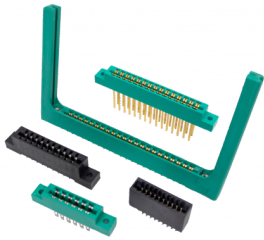
Digital twins are virtual models that replicate physical assets, systems, or processes, enabling industries to monitor, analyze, and optimize operations in real-time. By simulating real-world conditions with continuous data input, digital twins provide a live, adaptable view of complex systems, making them invaluable for predictive maintenance, risk assessment, and process optimization. These capabilities improve productivity, reduce downtime, and enable companies to refine operations without disrupting physical assets.

The industrial market benefits significantly from digital twins, as they facilitate data-driven decision-making, reduce unexpected equipment failures, and optimize resource allocation. Predictive analytics allow companies to foresee maintenance needs, avoiding costly disruptions, while real-time monitoring enhances operational efficiency and safety.

Technologies like AI and machine learning analyze data for predictive insights, while IoT sensors gather real-time information from physical systems, keeping the digital twin current. High-performance computing and cloud platforms support complex simulations and remote access, while 3D visualization enables detailed modeling. Together, these technologies power digital twins, helping industries create agile, responsive, and resilient operations.

INTERCONNECT SOLUTIONS

Card Edge Connectors



- Card edge connectors available in 446,000+ standard styles, with options for custom variations
- Contact spacing of 0.050", 0.100", 0.125", 0.150", 0.156" and 0.200"
- Selective gold plating on the contact mating area or gold all over with nickel underplating
- From 2 to 144 contacts in single, bridged, and dual rows with or without card support

Example Applications

Building management systems, CNC machines, load management systems, robotics, smart energy meters



Reliable Connection



Standard Designs



Durable Construction



High Density Solutions

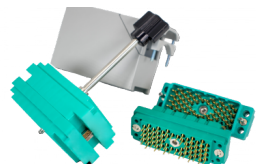


High Speed Solutions



Customizable

Rack and Panel Connectors



- Industry standard connector with high-reliability contacts
- Hermaphroditic contact design for no-fail and gas tight connections
- Crimp contacts are available pre-installed, separately in bulk, or on a reel for automated process

Example Applications

Automated security systems, building automation, energy storage units, HVAC controls, robotic equipment, test equipment



Reliable Connection



Durable Construction



EMI/RFI Shielding



Secure Locking

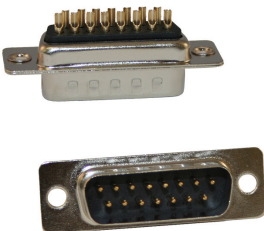


Alignment Features



Customizable

D-Sub Connectors



- In standard, high-density types and DVI formats with waterproof options available
- 9 to 50 pins (Standard), 15 to 78 pins (High-Density), 29 pins (DVI), and 22 standard contact layouts (Mixed Contact or Power Combo)
- Wide variety of footprints in vertical or right-angle orientations with multiple contact terminations
- Metal backshell options available that provide EMI and RFI protection

Example Applications

Autonomous mobile robots, fleet management systems, generators, inventory scanners, load controllers, machine vision systems, robotics



Standard Designs



Durable Construction



EMI/RFI Shielding



High Current Solutions



Waterproof Solutions



Customizable

INTERCONNECT SOLUTIONS

Modular & Magnetic Jack Connectors



- RJ11/RJ45 units are available in single or stacked multi-port configurations, with options for LEDs, shielding, and various mounting styles
- Available in right-angle or vertical orientations with through hole or SMT contact termination styles
- Modular jack connectors with integrated network magnetics save space and provide protection against noise, improving signal integrity

Example Applications

Access control devices, automated sorting systems, GPS units, inventory tracking devices, IoT gateways, network servers, secure communication modules



Standard Designs



Compact Design



Shielded and Unshielded



Multi-Port Solutions



Integrated Magnetics



Customizable

USB Connectors



- Up to 480 Mbps communication speed for standard USB 2.0
- Up to 5 Gbps communication speed for standard USB 3.0
- Up to 10 Gbps communication speed for standard USB 3.1
- Receptacle and plug USB 3.1 Type C available in 6, 16, and 24 pin options
- Synchronous and asynchronous data transfer methods
- Waterproof options are available with quarter-turn twist and lock overmold and o-ring

Example Applications

Routers, automated systems, edge computing devices, firewall devices, network servers



Multiple USB Types



Standard Designs



High-Speed Solutions



Compact Design



Waterproof Solutions



Customizable

HDMI Connectors



- Standard 19-pin type A, mini and micro versions are available
- Available in vertical or right-angle orientations and single or dual stacked
- Plating options from gold flash to 30µ" gold for high insertion cycles
- Synchronous and asynchronous data transfer methods
- Waterproof options are available with quarter-turn twist and lock overmold and o-ring

Example Applications

AR systems, control panels, machine vision, real-time monitoring displays, secure data modules



Reliable Connection



Standard Designs



Hi-Def Video and Audio



High Current Solutions



Waterproof Solutions



Customizable

Inline Connectors



- Non-waterproof inline connectors designed for high-density wire-to-wire and wire-to-board connections
- Contact termination options include PC tail, wire hole, wire wrap, SMT, and crimp
- Waterproof options available with double latch technology for increased retention
- IP52 and IP67 rated options available

Example Applications

Access control systems, autonomous systems, battery storage, drones, environmental sensors, HVAC controls



Reliable Connection



Durable Construction



Compact Design



Ease of Use

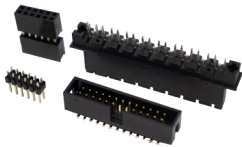


Waterproof Solutions



Customizable

Header Connectors



- Header pins can be cut to any height and board depth
- Wide variety of plating options
- Vertical, right-angle, or custom bend orientations
- Breakaway design allows for easy separation into smaller units
- PC tail, SMT, IDC, and press-fit contact terminations available
- DIN 41612 connectors provide durable and reliable connections in modular systems

Example Applications

Access control systems, CNC machines, energy meters, IoT sensors, load controllers, printers



Reliable Connection



Standard Designs



Durable Construction



Compact Design



Shrouded Solutions



Customizable

Magnetic Pogo Pin Connectors



- To develop truly versatile quick-release connectors, manufacturers need to look beyond conventional pin and socket designs
- The new range of magnetic pogo pin connectors are designed specifically for quick-release applications
- These connectors provide the same quick-disconnect functionality for up to 31 positions
- Premade cable assemblies available with multiple alternate terminating ends including USB, inline, and bare cable

Example Applications

Access control systems, autonomous mobile robots, control modules, IoT monitoring devices



Reliable Connection



Compact Design



Self-Cleaning Contacts



Magnetically Polarized



Quick-Release



Customizable

INDUSTRIAL CASE STUDIES

Automation is constantly advancing, driving greater efficiencies and lowering production costs across industries.



Humanoid Robots

Challenge

A robotic application required a reliable, waterproof (IP rated) D-Sub connector capable of handling both power and signal transmission, while withstanding dynamic movement and frequent disconnections.

Solution

EDAC developed a power combo waterproof D-Sub connector with appropriate contact plating to ensure durability and high mating cycles, providing a robust solution for reliable power and signal transmission in demanding robotics environments.





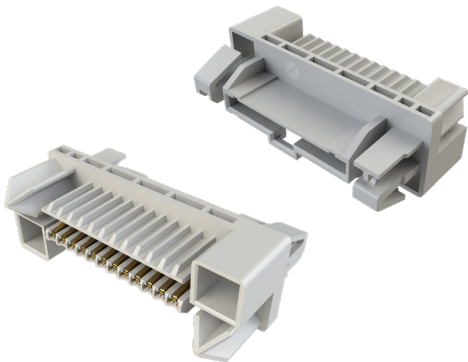
Industrial Printers

Challenge

A customer needed to replace a discontinued connector in a space-constrained application, requiring a solution that would not only fit within tight installation parameters but also offer easy mating to minimize assembly time and complexity.

Solution

EDAC provided a connector solution with optimal material selection and a hermaphroditic design, ensuring easy mating and installation, while meeting the space and performance requirements of the existing application.



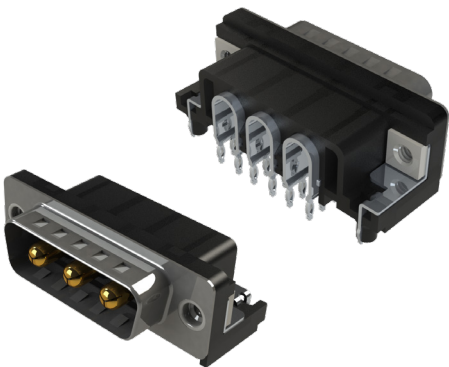
Industrial Power Generation

Challenge

Developing a power D-sub connector with press-fit contacts that could support 25 amps using a stamped process. The contact needed a 3-segment dome shape for full mating connectivity.

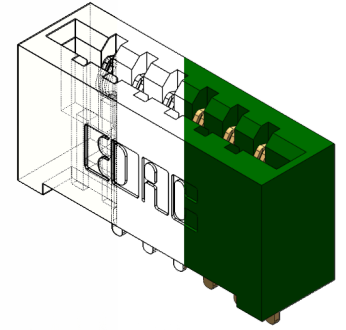
Solution

EDAC designed a cost-effective solution using standard housing and shell materials, with the customized stamped contact meeting the 25-amp requirement.



Designing custom interconnect solutions minimizes risk to your project and increases success, especially in industries with regulatory compliance requirements.

Custom solutions from concept to production in as little as 12 weeks



Why EDAC?

EDAC is a global leader in connector manufacturing, recognized for its innovative solutions and expertise since 1966. With a head office and design engineering center in Canada, EDAC offers a comprehensive range of interconnect products. We specialize in delivering tailored solutions to global customers, serving OEMs, ODMs, CMs, and distributors through an extensive network of fulfillment centers and highly skilled engineering and quality assurance teams. EDAC's commitment to total quality and seamless delivery ensures that our products meet the highest standards while consistently exceeding customer expectations.

At EDAC, our strength lies in collaboration and adaptability. We can offer custom solutions and value-added solutions, like wire harnesses and cable assemblies, with the flexibility to produce low and high-volume orders to customer specifications. With a robust, global team of engineers and program managers, we provide cost-effective, on-time solutions from prototype to production. Our dedication to integrity, innovation, and quality drives long-term partnerships and supports customer success in fast-evolving industries.

Certifications

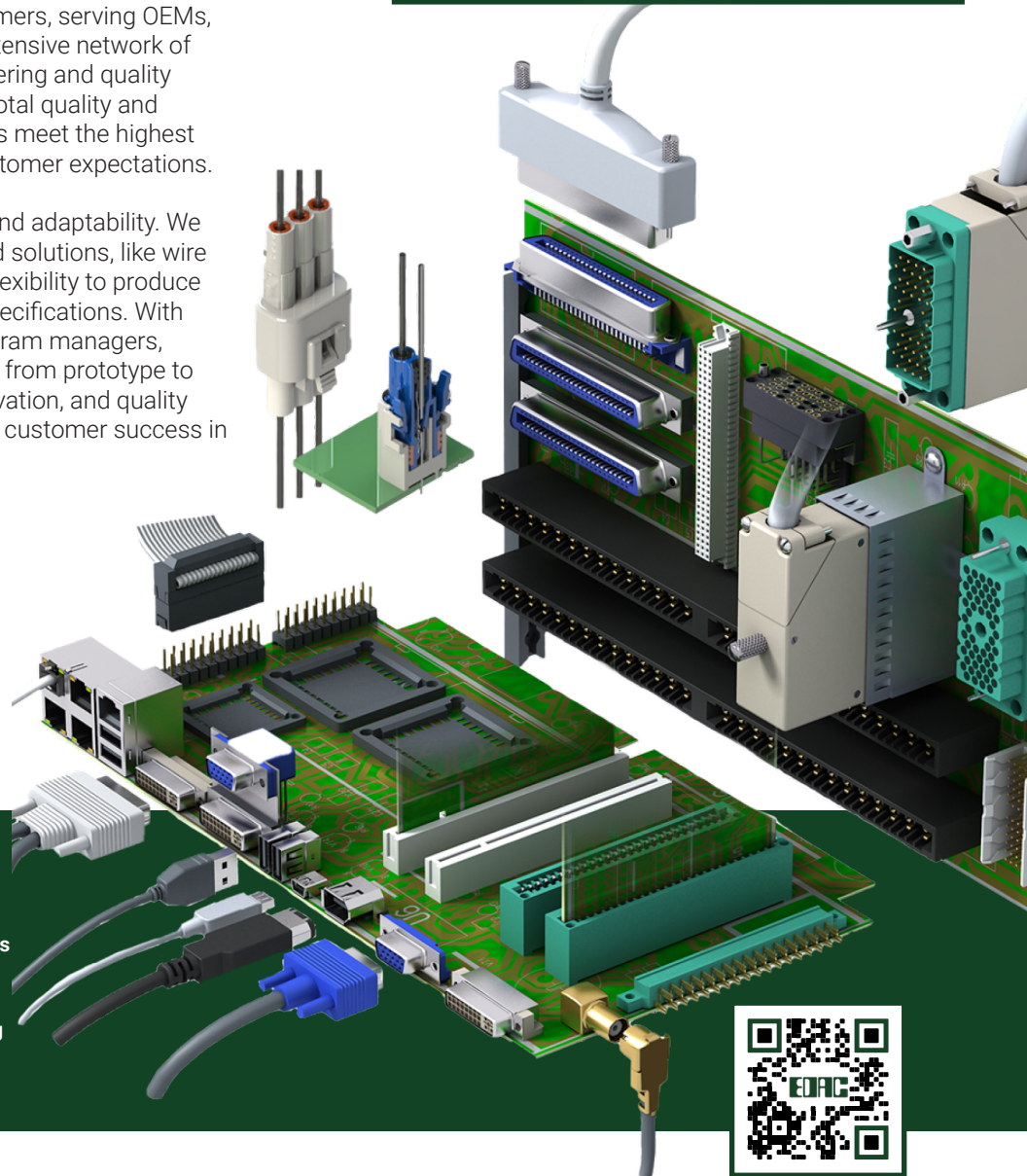


ECIA MEMBER
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Our Capabilities

- Manufacturing Excellence
- Exceptional Service
- Global Shipping
- Engineering Expertise
- Innovative Solutions
- Customized Designs
- Rapid Prototyping
- Quality Assurance
- Competitive Pricing



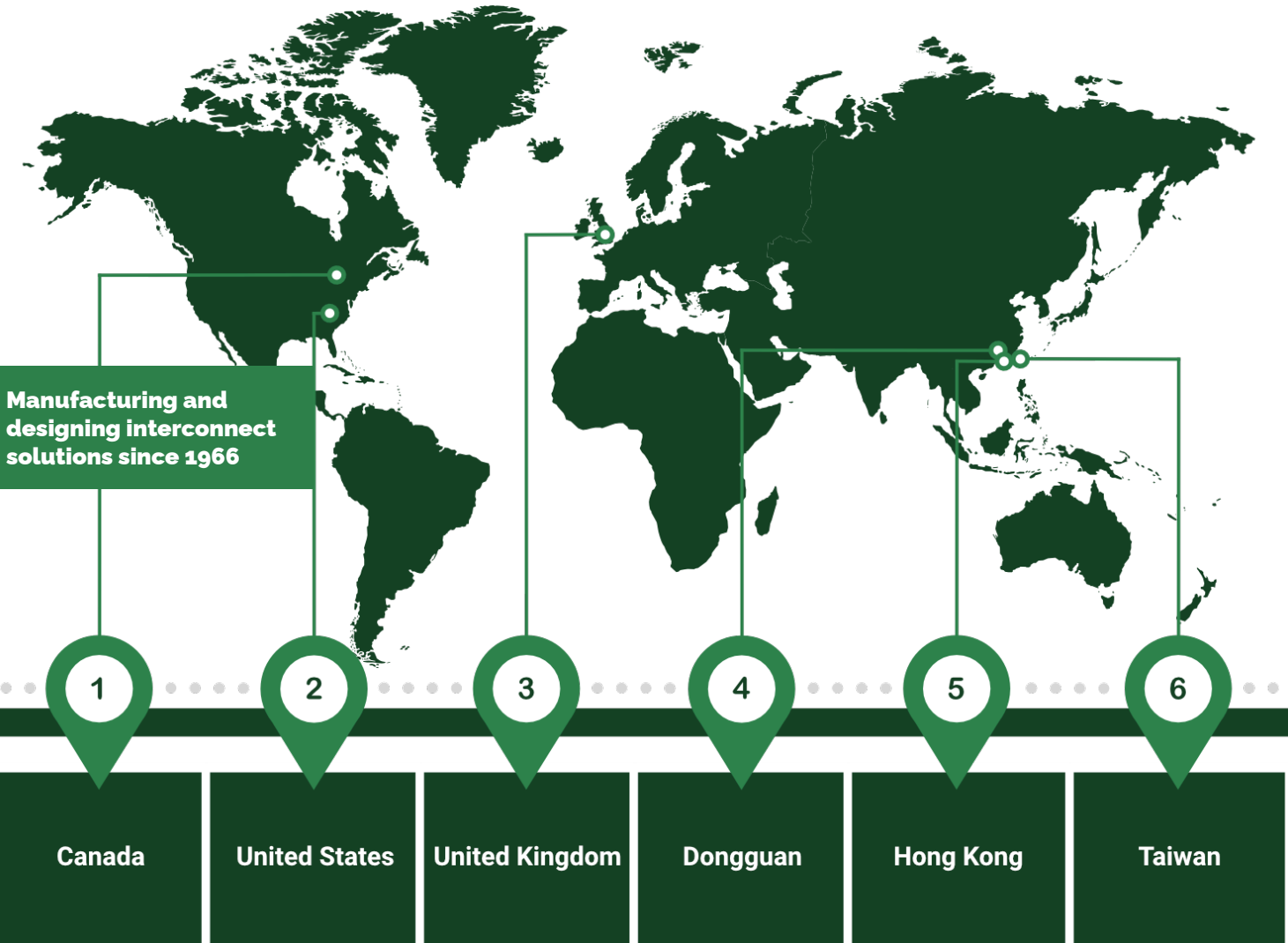
Product Catalog

EDAC's global presence and manufacturing excellence deliver cost-effective interconnect solutions, designed with the customer in mind, enabling seamless project execution and ensuring success through dedicated engineering teams and worldwide support.



Markets Served

Consumer	Medical	Ruggedized
Agriculture	Energy	Process Control
Transportation	Industrial	Robotics



¹ Müller, C., Kutzbach, N., & Jurkat, A. (n.d.). International Federation of Robotics. IFR International Federation of Robotics. <https://ifr.org/wr-industrial-robots/>

² Top 5 industrial manufacturing trends in 2024. Oracle. (2024, January 8). <https://www.oracle.com/industrial-manufacturing/industrial-manufacturing-trends/>

³ Data Generation by manufacturing industry. ABI Research: The Tech Intelligence Experts. (2024, July 25). <https://www.abiresearch.com/news-resources/chart-data/manufacturing-industry-amount-of-data-generated/>

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