

CONNECTING THE FUTURE

Empowering Smart Factories:



How Hirose Connects the Future of Manufacturing
Innovative Connector Solutions for Industry 4.0 and Sustainable Production



HIROSE ELECTRIC AMERICAS

Table of Contents

1 Introduction

2 Key Drivers in Smart Manufacturing

3 Smart Factory Trends

- Interconnectivity
- Emerging Trends: IoT, Machine Learning, and Big Data
- Specific Applications: Advanced Robotics, Drones in Manufacturing, and Industrial Sensors

4 Pioneering the Future of Smart Factories

Introduction

Smart factories are revolutionizing the manufacturing landscape with groundbreaking **innovations in automation, robotics, and data-driven solutions**. As a manufacturer ourselves, we are dedicated to embracing these advancements while providing **innovative connector solutions** to address the ever-growing demands of modern manufacturing. Join us on this exciting journey as we delve into the world of smart factories, uncovering the trends shaping the future of manufacturing and exploring the role of **connector technologies** in bringing this vision to life.



Defining Smart Manufacturing

Industry 4.0, Smart Manufacturing, and the Transition to Industry 5.0



Smart factories have emerged as a **response to the growing demands of modern manufacturing**, enabling companies like ours to **optimize production, boost efficiency, minimize waste, and tackle workforce challenges head-on**. At the heart of modern manufacturing is Industry 4.0, a game-changing movement where digital technologies, automation, and advanced data analytics converge. The next step, Industry 5.0, blends automation with a **human-centric focus on worker wellbeing and societal value**. This powerful combination shapes the future of smart manufacturing.

As connector industry experts, Hirose Electric's advanced solutions unlock the full potential of both Industry 4.0 and 5.0. **Offering seamless integration and unparalleled performance**, we are committed to empowering smart factories and sharing our insights and experiences to help manufacturers thrive.

Key Drivers

Key Performance Drivers in Smart Manufacturing

Manufacturing has come a long way since the First Industrial Revolution, where steam engines and mechanized production lines were the norm. In contrast to the manual labor and limited technology of the past, experts like Hooi Tan, President of Global Operations and Supply Chain at Flex, predict that "In 2023, **data scientists, engineers, and architects will be the most critical factory workers** around." This transformation underscores these vital roles.

“In 2023, economic uncertainty will put additional momentum behind the technology that makes reshoring possible.”

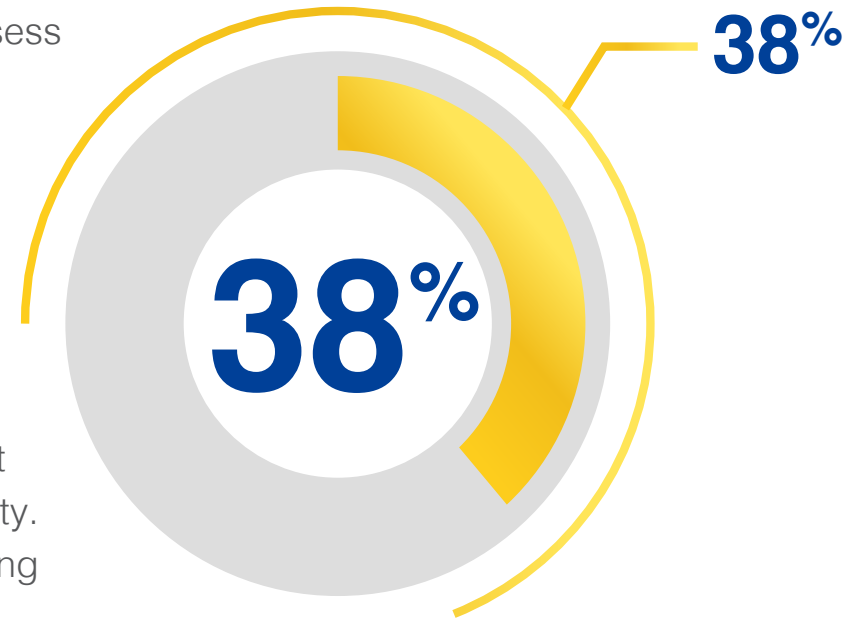
- Paolo Avagliano, COO at Bright Machines

Reshoring helps manufacturers gain better control over their:

- Supply Chain
- Minimize Logistics Costs
- Respond More Quickly to Market Changes.

Beyond consumer influences, key performance drivers of this change include:

- **Global Dynamics:** Intense global competition and reshoring trends, spurred by economic conditions and geopolitical shifts, have made it imperative for manufacturers to improve efficiency, reduce costs, and strategically realign their supply chains to maintain their competitive edge.
- **Workforce Challenges:** As manufacturers ourselves, we possess firsthand experience with the complexities of labor shortages, high turnover rates, and the demand for skilled workers.
- **Resource Optimization:** As global competition intensifies; manufacturers must find ways to remain competitive and profitable while addressing environmental concerns and responsibly managing scarce resources.
- **Sustainability:** Manufacturers are motivated to implement eco-friendly practices, not just to reduce environmental impact but also to improve operational efficiency and long-term viability.
- **Regulation:** Smart factories face complex governance, including cybersecurity, data privacy, AI rules, and proposed carbon reporting, all requiring advanced data-tracking.



According to a recent poll of 360 manufacturers, nearly four-in-ten (38%) respondents are planning to reshore their operations due to the economic climate.

Revolutionizing Smart Factory Trends: Hirose's Edge

Trends in Smart Factories and Hirose's Solutions

Hirose Electric's advanced connector solutions play a crucial role in the **evolving landscape of smart factories, enabling manufacturers to embrace digital transformation and unlock unparalleled efficiency and intelligence.** As we explore the trends that are shaping the future of manufacturing, we'll showcase how Hirose Electric's advanced connector solutions play a critical role in empowering smart factories and unlocking their full potential.

Interconnectivity: The Backbone of Smart Factories

Interconnectivity is the heart of smart factories, **ensuring seamless communication and data exchange between devices, systems, and machines.** This heightened level of coordination drives efficiency, productivity, and informed decision-making. Hirose Electric provides **high-performance connectors that ensure reliable connections and minimal signal loss for seamless communication between devices.**

Our versatile solutions cater to various applications, including data, power, and signal transmission, to enable smooth integration of factory components. By **collaborating with manufacturers to create tailored connector solutions,** we can address unique interconnectivity needs and provide a more efficient and effective solution for the smart factory.



Multifunctional Connectors

Multifunctional Connectors are an emerging trend in interconnectivity that benefits smart factories by offering space-saving advantages. These connectors **ingeniously have dedicated power and signal contacts** and integrate a shielded housing for high-speed transmission capabilities and noise prevention. Hirose Electric is among the few companies offering these innovative solutions. These multifunctional connectors, also referred to as **hybrid**, support a variety of applications, such as electric motors, batteries, and device communication, **ultimately driving productivity, performance, and cost-efficiency in smart factories.**



insight



productivity



cost-
efficiency



performance

Emerging Trends

Emerging Trends: IoT, Machine Learning, & Big Data

Internet of Things (IoT):

The hottest three letters in manufacturing. **IoT enables smart factories to interconnect devices, systems, and machines**, allowing for real-time data exchange and advanced automation. Hirose offers a comprehensive portfolio of connector solutions designed to meet the unique challenges of IoT applications. Our high-speed data connectors ensure **reliable connections and minimal signal loss, facilitating seamless data transmission and communication** between IoT devices. Hirose's power and signal connectors, such as the LF and FX23, provide dedicated pins for power and signal, ensuring efficient power delivery and reliable signal transmission for IoT devices, **optimizing performance and minimizing energy loss**. As IoT devices become smaller and more integrated, Hirose offers compact and robust connector solutions designed to meet the **space constraints and durability requirements** of these applications, such as the DF40 connector.



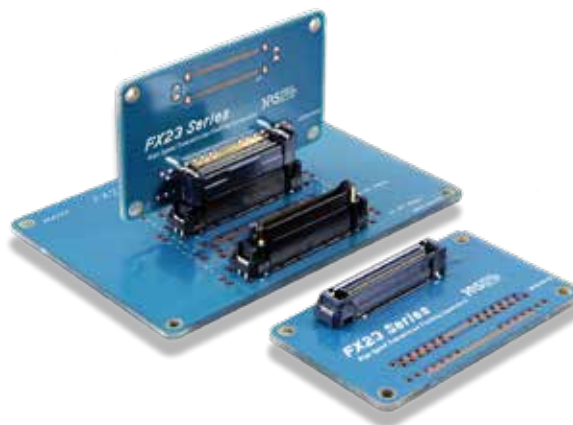
➔ **High-speed data connectors:**

Reliable connections,
minimal signal loss.



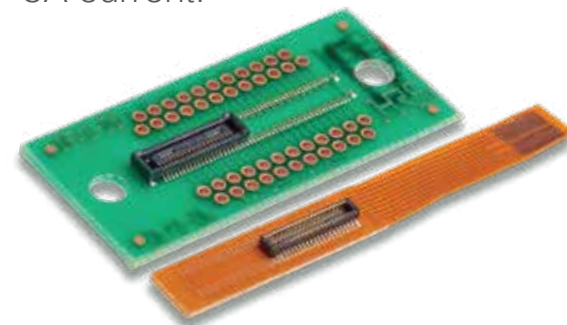
➔ **Power and signal connectors:**

Efficient power delivery, reliable signal
transmission, optimal performance.



➔ **Compact and robust connectors:**

Meets space constraints, durable,
handles data transmission, up to
5A current.



Did You Know?

Ethernet technology is revolutionizing communication in smart factories, providing a universal language that enables seamless communication between machines with different applications and languages. Hirose's connectors are at the forefront of this transformation, designed to meet universal Ethernet protocols and effectively translate various software and hardware languages into Ethernet. By embracing Ethernet technology and offering connectors that support a universal language, Hirose empowers smart factories to unlock new levels of efficiency, productivity, and cost savings.

Emerging Trends

Machine Learning & Artificial Intelligence:

Machine learning and AI are revolutionizing the world of smart factories, empowering them to optimize production, resource allocation, and quality control, thereby unlocking unprecedented levels of efficiency and productivity. Hirose is at the forefront of this transformative trend, offering a range of **innovative connector solutions** to seamlessly **integrate machine learning and AI** into smart factories.

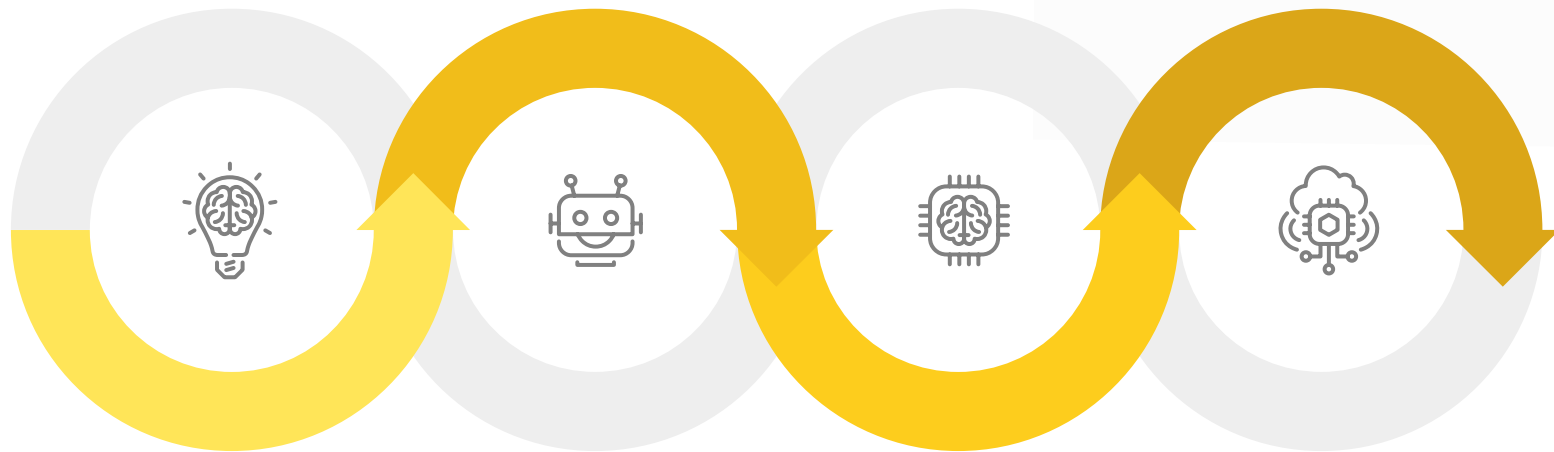
Our miniaturized connectors deliver **exceptional design flexibility for complex AI systems**, ensuring uninterrupted data transmission and high-speed signal integrity crucial for AI applications. **Rapid data transmission** is essential for communication between sensors and field devices in machine learning and AI applications. That's why Hirose offers **cutting-edge high-speed solutions** in board-to-board, wire-to-board, and I/O connections, ensuring data is transmitted seamlessly between each device. To guarantee accurate and consistent data transmission, we offer reliable connectivity solutions featuring high mating durability connectors and highly robust connectors, such as the ix™ Industrial series, **that can withstand any environment**.



Revolutionary Connectors for Smart Machine Learning

With Hirose's connector solutions, smart factories can harness the full potential of machine learning and AI, achieving unparalleled levels of efficiency, productivity, and informed decision-making.

- **Miniaturized connectors:** design flexibility, uninterrupted data transmission, high-speed signal integrity.
- **Reliable connectivity:** accurate, consistent data transmission in any environment.
- **High-speed solutions:** board-to-board, wire-to-board, and I/O connections.



Emerging Trends

Big Data:

Big Data is a game-changer in manufacturing, enabling companies to **actively collect, analyze, and leverage massive amounts of data generated within smart factories.** By harnessing the power of Big Data, manufacturers can optimize processes, predict maintenance needs, uncover hidden opportunities for improvement, and effectively scale operations.

At Hirose, we understand the importance of Big Data in modern manufacturing. That's why we **provide connector solutions that facilitate seamless transmission of Big Data**, empowering manufacturers to unlock the full potential of their smart factories. Our FunctionMAX™ connectors, such as the FX23, deliver **maximum functionality** for industrial applications, boasting an extensive range of board-to-board connectors designed to cater to diverse needs. The FX23 ensures **high-speed transmission and hybrid power design**, making it a reliable choice for Big Data applications. To address high-speed transmission requirements, we offer our Floating BtoB connectors, featuring a unique floating design that ensures signal integrity and tackles alignment issues. We pride ourselves on having one of the **largest portfolios of floating connectors**, catering to the most demanding applications. Moreover, our connectors incorporate **data security protocols** to guarantee secure data transmission and prevent unauthorized access. With Hirose's connector solutions, manufacturers can confidently collect, analyze, and harness Big Data to **optimize their operations and secure a competitive edge.**

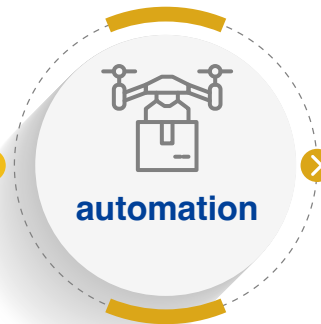
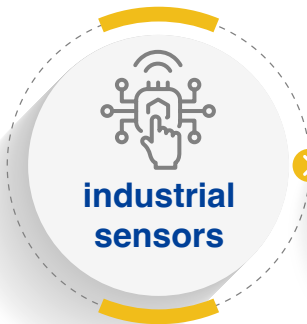
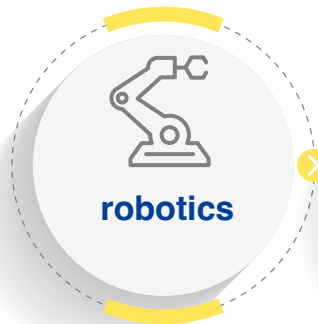
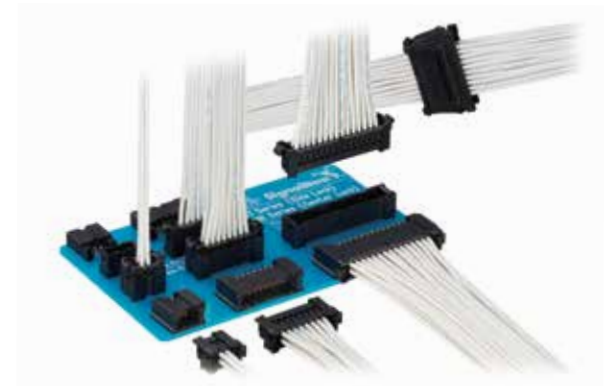
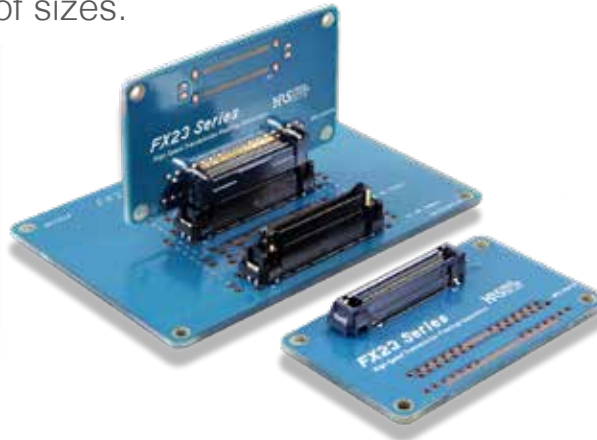


Unleashing Big Data: Connector Solutions for Manufacturing

- **FunctionMAX connectors:**
Maximum functionality, floating design, high-speed transmission, innovative applications.

- **Floating Board to Board:**
Signal integrity, alignment solutions, high-speed transmission, wide variety of sizes.

- **Data security protocols:**
Reliable, secure data transmission, advanced protocols, no unauthorized access.



Applications

Utilizing IoT, Machine Learning, and Big Data

Manufacturers are leveraging the power of IoT, machine learning, and big data to **drive innovation and transform their operations**. This has led to the emergence of advanced robotics, drones, and industrial sensors that offer **greater automation, flexibility, and intelligence**, revolutionizing manufacturing processes.



Advanced Robotics:



Advanced Robotics is transforming manufacturing processes as the focus shifts from traditional Automated Guided Vehicles (AGVs) to more sophisticated systems like Autonomous Mobile Robots (AMRs) and collaborative robots (Cobots) that **work together to deliver significant cost efficiencies and improved performance through interconnectivity.**

Hirose's slim in-line connectors, such as the DF62/DF62W, address the minimal space available for robotic arms. These connectors offer a **water-resistant, slim design for internal wiring, ensuring secure and reliable connections in tight spaces.**

Our robust I/O multi-functional connectors feature a strong die-cast shell

and user-friendly locking control, ensuring reliable connectivity for advanced robotics. And our space-saving design solutions with **smooth contours, noise-resistant EMI pathways, and floating features that absorb misalignment** make Hirose the go-to choice for manufacturers seeking cutting-edge solutions for their advanced robotics applications.



DF62W Series

Empowering Advanced Robotics: Hirose's Innovative Connectors

- ➔ Slim in-line connectors: Minimal space for robotic arms.
- ➔ Robust multi-functional connectors: Strong shell, user-friendly locking control.
- ➔ Space-saving design for mobile robots: Smooth contours, noise-resistant EMI pathways, floating features.

Drones in Manufacturing:



Drones are becoming an integral part of the manufacturing process, being used for tasks such as **inspection, surveillance, and transportation**. Hirose offers a range of connector solutions that address the unique challenges of drone applications, such as size and weight constraints. Our micro board-to-board connectors provide **lightweight and powerful connectivity solutions** for drones. Additionally, our waterproof connectors, like the HR30 Series, are designed to protect against water ingress in demanding environments, making them ideal for **sensor interconnection in industrial control applications**. With our micro coaxial connectors, we support high-resolution video and data connectivity while maintaining **signal integrity and high data transmission speeds**. These solutions allow for increased safety, efficiency, and precision in the manufacturing process.



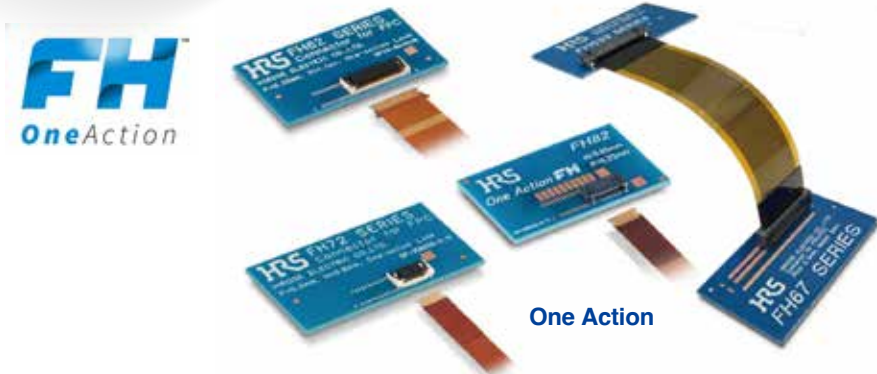
Taking Flight with Hirose: Drone Connector Solutions

- Micro board-to-board: Lightweight, small connectors for drones.
- Waterproof connectors: Protection against water ingress in demanding environments.
- Micro coaxial connectors: High-speed data transmission and signal integrity.

Industrial Sensors:

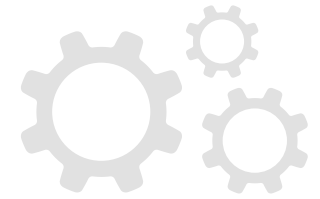


Industrial Sensors are a **key part of the data collection process in smart factories**, providing real-time information that can be analyzed and acted upon. Hirose offers a range of connector solutions designed to meet the specific needs of industrial sensor applications. Our Interface connectors are tailored to each unique application, while our **OneAction FH™ connectors are compact, shielded, and user-friendly, specifically designed for industrial sensor applications**. Additionally, our smart connectors, including the ix Industrial™ series and several circular solutions, support both industrial Ethernet and wireless communication, making them **ideal for Industry 4.0 applications**.



Sensing the Future: Hirose's Connector Solutions for Industrial Sensors

- ➔ Tailored interface connectors, including Zero Insertion Force (ZIF) connectors, for any application.
- ➔ Compact, shielded, and user-friendly OneAction FH connectors for industrial sensors.
- ➔ Smart connectors for industrial Ethernet and wireless communication, ideal for Industry 4.0.



Conclusion



Pioneering the Future of Smart Factories

At Hirose, our **unwavering commitment to innovation and excellence** enables manufacturers to overcome the challenges of a rapidly evolving industry and thrive in a highly competitive market. By delivering customizable and diverse connector solutions for various applications and prioritizing sustainability and environmental responsibility, we set ourselves apart as **a leading force in the connector industry**.

We strongly believe in a **collaborative approach** to tackle industry challenges, actively engaging with our customers, partners, and industry experts to co-create a future where **smart factories drive unparalleled productivity and growth**. As we continue to push the boundaries of possibility, Hirose's connector solutions remain integral to this journey, fostering the **limitless potential of smart manufacturing** and shaping a brighter future. Together, we are pioneering a new era in manufacturing, where technological advancements and human ingenuity converge to create a brighter, more sustainable future for generations to come.

With Hirose's connector solutions, we are not only connecting the present but also **Connecting the Future** of manufacturing.