

CONNECTING THE FUTURE

# Precision at the Cutting Edge:



Hirose's Impact on Surgical Robotics  
Innovative Connector Solutions



**HIROSE ELECTRIC AMERICAS**

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## Precision at the Cutting Edge:

### Hirose's Impact on Surgical Robotics

Surgical robotics is rapidly advancing and is expected to become a **\$14.3 billion dollar industry by 2030**. This growth reflects a broader acceptance and reliance on these technologies in healthcare. Leading this innovation, **Hirose has been at the forefront since 1937**, continuously advancing the development of essential high-quality connectors that enhance surgical precision, shorten recovery times, and improve outcomes. Our commitment to **innovating reliable, high-performance connectors** is critical in developing safer, more effective medical solutions globally.

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**\$14.3** billion dollar industry by **2030**



# Introduction to Surgical Robotics: History and Drivers

## The Evolution of Surgical Robotics: From Vision to Reality

Surgical robotics has evolved from science fiction to everyday clinical use. This transformation didn't happen overnight but is **the result of decades of innovation, aimed at enhancing surgical precision, reducing patient recovery times, and improving health outcomes.**



# Key Historical Milestones:

→ **1970s:** The concept of minimally invasive surgery begins to take shape, laying the groundwork for the development of surgical robots including:

- The introduction of **fiber optics and camera technology** enabled viewing internal body parts, crucial for MIS and endoscopic techniques.
- **Medical lasers** brought precision tools to surgery, influencing the design of robotic systems.
- The advent of **CT scans** allowed surgeons to see inside the body without incisions, essential for planning surgeries including those using robots.
- Advancements in **laparoscopy**, or "keyhole surgery," demonstrated the benefits of smaller surgical incisions, foreshadowing the utility of robotic assistance.
- Developments in **robotics and automation** outside of medicine provided the technical foundation for surgical applications.



→ 1985: This year marked the introduction of the first surgical robot, which was successfully used in a neurosurgical biopsy, a pivotal moment that showcased the potential of technology in medicine by significantly enhancing surgical precision and patient safety.



# Drivers of Technological Advancement:



**Improving Patient Outcomes:** Advancements aim to make surgeries less invasive, leading to faster recoveries and better overall health after surgery.

**Enhancing Surgeon Precision and Comfort:** New tools boost surgeons' ability to perform with greater accuracy while making their jobs less physically demanding.

**Boosting Hospital Efficiency:** Innovations help make surgeries quicker and less costly, improving how hospitals operate and potentially saving on expenses.

# The Technological Leap: Advancements Shaping the Future of Surgical Robotics

Surgical robotics is rapidly advancing, bringing new levels of precision, efficiency, and patient care to the operating room. Here's how the latest innovations are making a difference:

## Innovations Transforming Surgery:

- **Artificial Intelligence (AI):** AI is transforming surgical robotics, enhancing robot decision-making and precision. This integration leads to more autonomous procedures, allowing robots to support surgeons more effectively and handle a range of operations independently.
- **Augmented Reality (AR):** AR technology gives surgeons superhuman vision, overlaying critical information and 3D images onto the real surgical field, improving accuracy and safety during procedures.
- **Miniaturization:** Smaller, more agile robots are changing the game, allowing for procedures that were once highly invasive to be performed with minimal incisions, leading to quicker recoveries and less discomfort for patients.

# The Technological Leap: Advancements Shaping the Future of Surgical Robotics

As we look to the future, our goal is to continue advancing the frontiers of surgical robotics with innovative connector solutions.

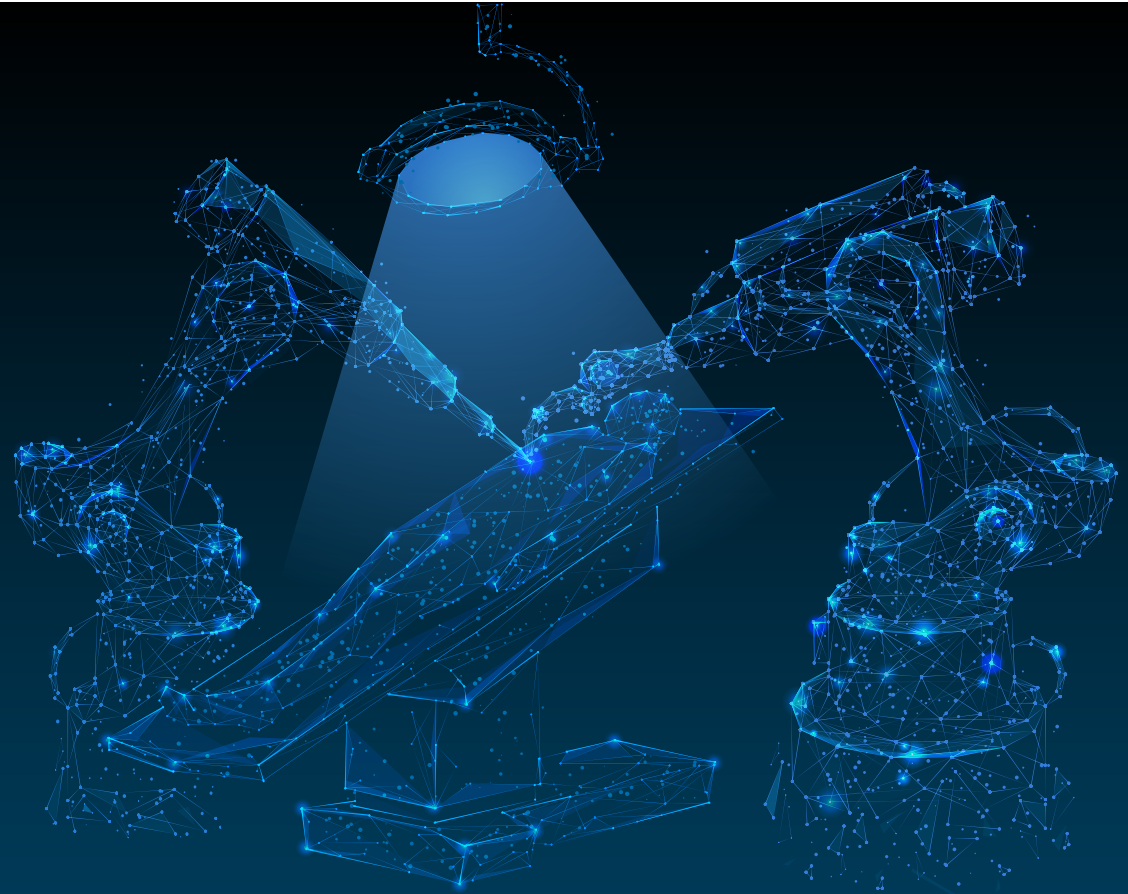
**Hirose stands ready** to meet this challenge, leveraging our **legacy of innovation and deep insights** into engineering needs. We are developing connector technologies that align with the **evolving demands of healthcare**. Hirose isn't just part of the history of surgical robotics; we're actively **forging its future, committed to delivering safer and more efficient surgical outcomes worldwide.**



# Surgical Robotic Designs + Hirose: Precision, Reliability, & Standards

The landscape of surgical robotics is one where precision and reliability aren't just goals—they're absolute necessities.

In this field, **every detail matters**, and the **standards are stringent**, reflecting the **critical nature** of surgical procedures.



# Hirose's Alignment:

Hirose's connectors are designed with this exact landscape in mind.

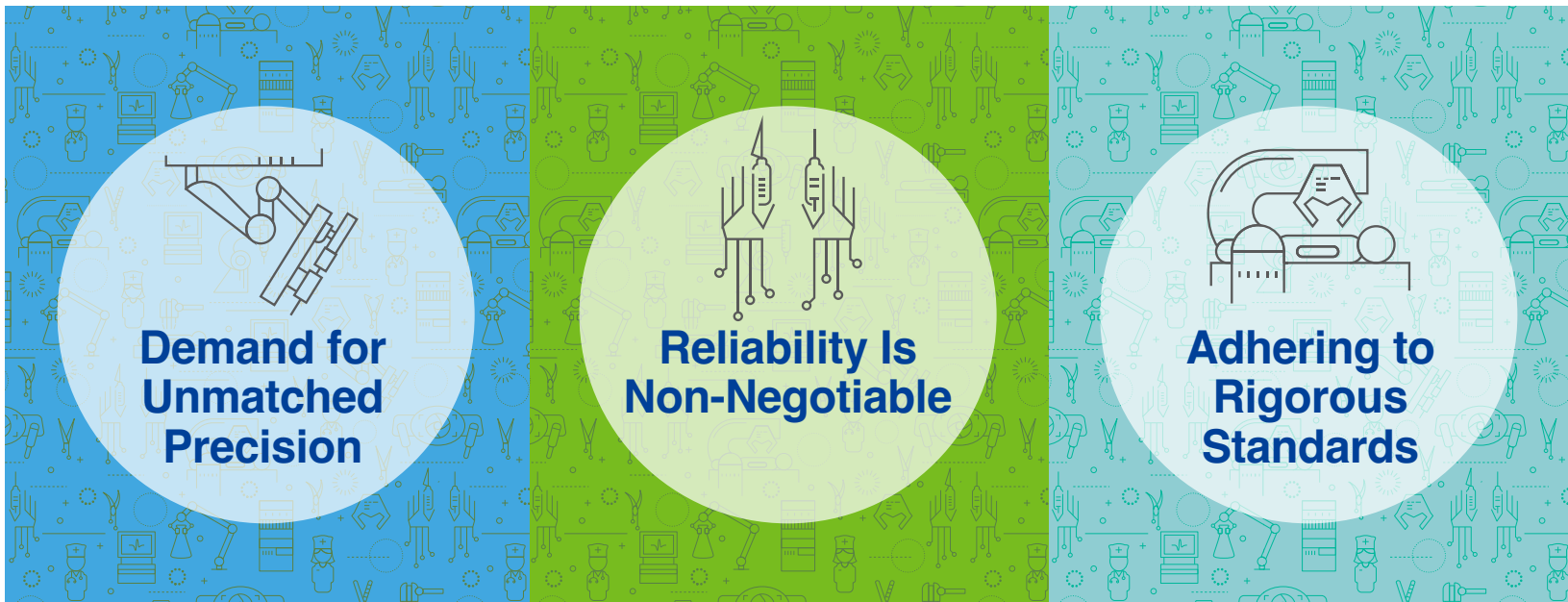
Our commitment to **precision and reliability** upholds the **rigorous standards** of surgical robotics, ensuring every component contributes to **successful outcomes**.

## Demand for Unmatched Precision

Surgical robots extend the capabilities of human surgeons, allowing for movements that are more precise and less invasive than ever before. **This precision reduces the risk of complications, minimizes scarring, and often results in faster recovery times for patients.**

## Hirose's Contribution:

At Hirose, we understand the **critical role precision** plays in surgical robotics. Our connectors are crafted to enable the **high precision** these robots require, **enhancing the effectiveness** of surgeries and patient recovery.

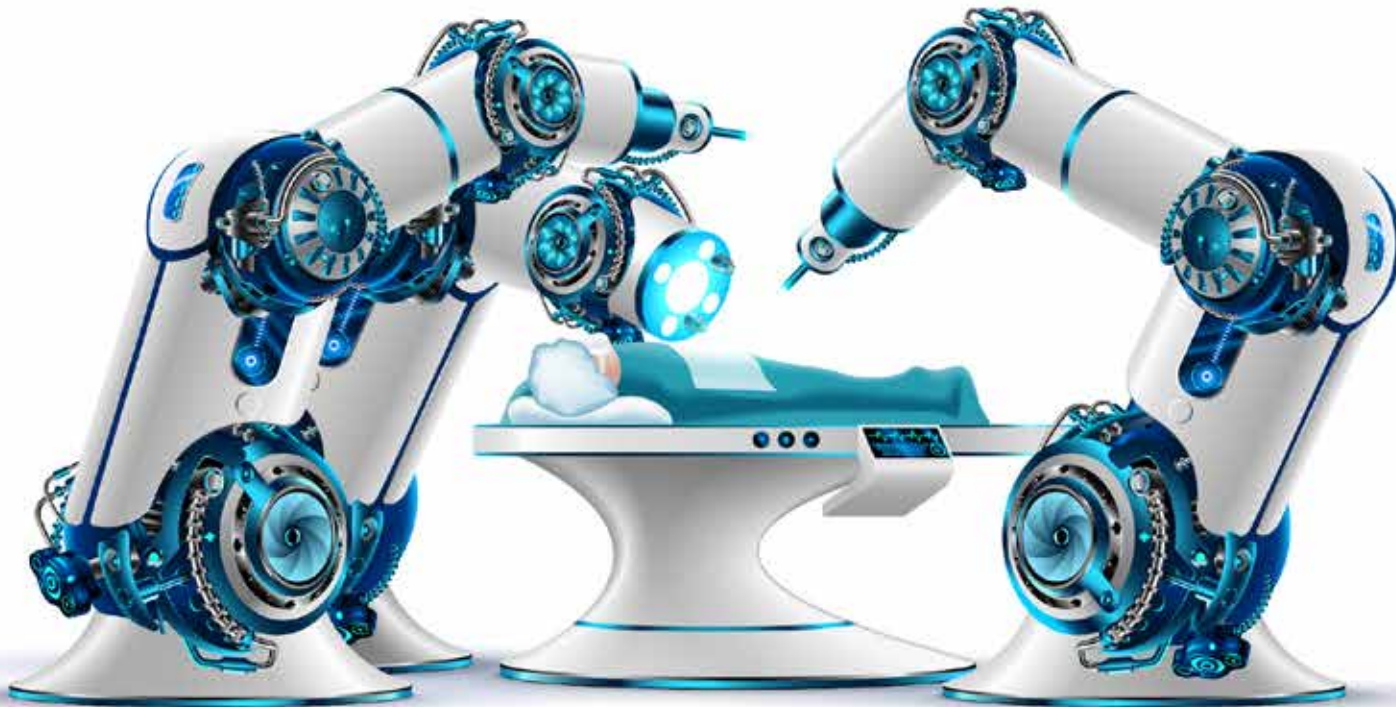


## Reliability Is Non-Negotiable

In the operating room, there's no room for error. The **reliability of every component, connection, and movement of a surgical robot directly impacts patient outcomes.** As such, the systems and technologies involved must **perform flawlessly** under pressure, **maintaining their integrity** over time and use.

## Hirose's Dedication:

We at Hirose take the reliability of our connectors seriously, ensuring they meet the **non-negotiable standards of surgical robotics.** Our products are **rigorously tested to perform under pressure,** safeguarding patient outcomes.



# Hirose's Alignment:

## Adhering to Rigorous Standards

Surgical robotics must comply with a complex web of industry standards and regulations that ensure **safety, efficiency, and compatibility**. These standards, often set by international regulatory bodies and medical institutions, cover everything from **material biocompatibility to data security and interoperability** between different devices and systems.

## Hirose's Compliance:

Hirose connectors are designed to fully comply with these **rigorous standards and regulations**, contributing to the **safety, efficiency, and compatibility** of surgical robotics. Our adherence to these standards is a testament to our commitment to **quality & reliability** in the medical field.

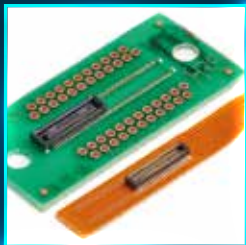


## The Lifeline of Surgical Robotics Success

With the demand for robot-assisted surgeries growing, **driven by technological advancements** and increasing acceptance, the **critical role** of our connectors has never been more apparent. Here's a closer look at how Hirose is making a **significant impact** in this rapidly evolving industry:

**Connectors are the lifeline of surgical robotics success, serving as essential links for uninterrupted power and secure data transmission.**

Preferred by some of the world's largest surgical robotics and medical device brands, Hirose connectors are trusted for their high-quality, reliable, and innovative designs.



# The Role of Connectors

## Comprehensive Solutions for Complex Needs

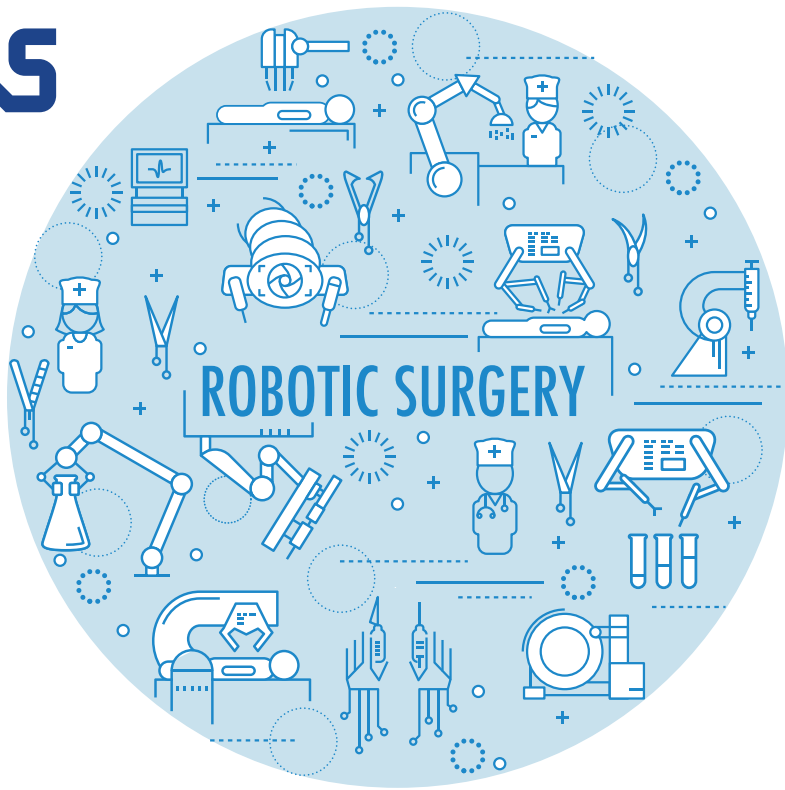
✓ **Tailored for Precision:** Hirose's connectors are engineered with unmatched precision that surgical robotics demands.

- Our products ensure that every movement and command translates into accurate action, vital for patient safety and successful outcomes.

✓ **Designed for Reliability:** In an environment where reliability is non-negotiable, Hirose connectors offer peace of mind. Manufactured to meet and exceed rigorous medical standards, our connectors ensure continuous, faultless performance under the most challenging conditions.

✓ **Adaptable to Innovation:** As surgical robotics evolve, so do our connectors. Hirose is at the forefront of connector technology, developing solutions that meet the future needs of robotics design, including miniaturization, high-speed data transmission, and advanced power requirements.





# The Role of Connectors

## Hirose's Connector Solutions: Powering Surgical Robotics

Hirose delivers essential connector technology **tailored for the critical applications of surgical robotics**. Our portfolio specifically addresses the operational demands of both the robotic arm and the endoscope, **ensuring seamless functionality and superior performance**.

## Why Leading Brands Trust Hirose

**1 → Unrivaled Quality & Expertise:**  
 Hirose's reputation is built on decades of manufacturing excellence and deep expertise in connector technology. This foundation of trust is why leading surgical robotics brands turn to us for their most critical projects.

**2 → Global Support Network:**  
 Our global presence ensures that we're there for our partners, wherever they are. From design consultation to after-sales support, Hirose offers a comprehensive support network that accompanies our world-class products.

**3 → Innovative Spirit:**  
 Constantly pushing the boundaries, Hirose invests heavily in research and development to stay ahead of technological trends. Our innovative spirit drives us to create connector solutions that are not just fit for today's challenges but are paving the way for tomorrow's advancements.

# Hirose's Connector Solutions: Powering Surgical Robotics

## Comprehensive Solutions for Complex Needs

### For the Robotic Arm:

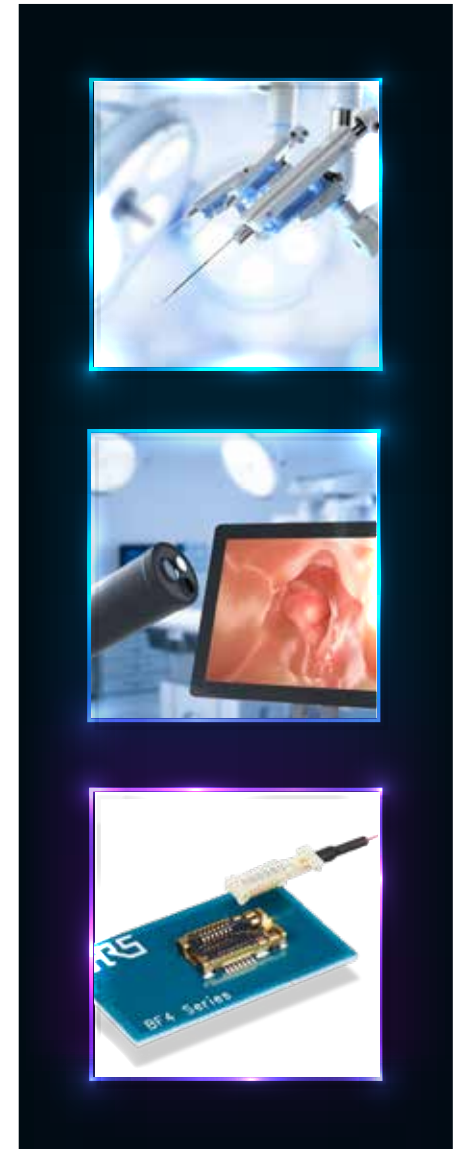
- **Compact Yet Powerful:** The **DF40 Series** provides high-density connections essential for the intricate workings of robotic arms, combining compact form with robust functionality.
- **Robust and Flexible:** Engineered for the dynamic demands of robotic arms, our connectors offer unmatched durability and adaptability.

### For the Endoscope:

- **High-Speed Data Transmission:** The Active Optical Cable (AOC) Series ensures high-quality, real-time imaging with lightning-fast data speeds, crucial for endoscopic precision.
- **Miniaturization:** The **DF57 Series** is specially designed for the limited spaces within endoscopes, offering reliable performance in a compact footprint.

### Innovative Design with the BF4M

- **Electrical Design with Optical Performance:** The **BF4M** uniquely bridges the gap between traditional electrical connectors and optical performance, incorporating an electrical-to-optical (E to O) and optical-to-electrical (O to E) conversion. This simplifies integration, ideal for high-speed data transmission needs.
- **Compact and Efficient:** Tailored for the compact spaces of surgical robotics, the **BF4M** offers significant advantages over traditional connectors by combining high-speed optical data transmission in a user-friendly form factor.



# Hirose's Connector Solutions: Powering Surgical Robotics

## Comprehensive Solutions for Complex Needs

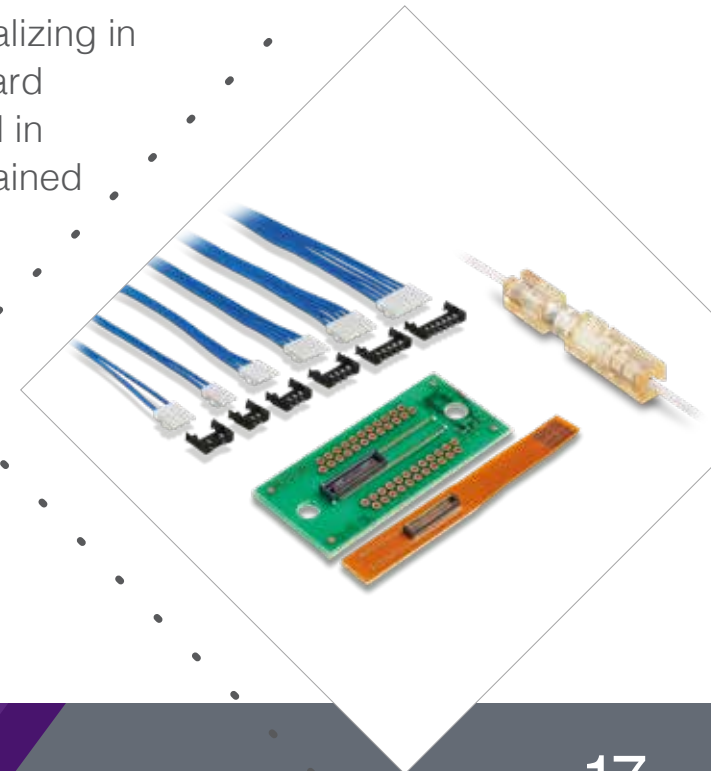
### Extending the Portfolio: LF and SFP Series, and More

- **LF Series:** For rugged durability and precise connectivity, the **LF series** provides robust solutions for demanding environments.

### Additional Comprehensive Connectivity Options:

- **DF40 and DF57 Series:** Specializing in board-to-board and wire-to-board connections, these series excel in high-density and space-constrained applications.

- **FJ Connector Series:** Revolutionizing fiber optic connections in tight spaces, the **FJ series** is designed for easy use and high reliability, essential for precision medical devices like endoscopes.



# The Hirose Advantage:

## Precision, Partnership, Progress

Our connectors are not just components but are part of a larger commitment to advancing medical technology with:

- **Ease of Integration:** Specifically designed to ease the adoption process for electrical engineers, our connectors, particularly the **BF4M**, blend traditional usability with advanced optical technology.
- **Unmatched Precision and Reliability:** Hirose connectors, across all series, are synonymous with quality. They ensure that surgical robotics systems operate with the precision and reliability necessary for the most delicate and critical medical procedures.
- **Forward-Thinking Innovation:** From the **BF4M's** unique E to O/O to E design to the versatile applications of the **LF and FJ series**, Hirose remains at the innovation forefront, ready to meet the future challenges of surgical robotics.

At Hirose, we do more than create connectors; we are **integral to advancing medical innovations**. Our products are meticulously engineered to meet the highest industry standards, including ISO certifications, **ensuring superior quality and reliability**. This commitment to excellence and our strict adherence to **global safety and quality standards** make Hirose connectors essential for the next generation of surgical robotics. As we continue to innovate within this dynamic field, our dedication helps ensure that surgical outcomes are **safer, more effective, and increasingly sophisticated** for patients and surgeons worldwide.