

# Solving Wireless I/O Challenges with Simple Reliability:

SMC's EXW1



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## Abstract

Robotic arms, automatic tool changers, rotary indexing tables, and other industrial automation equipment subject communication cables to repeated rolling, bending, torsional stress, and variable flexing. This high-speed, dynamic movement accelerates cable wear and creates multiple failure points that can compromise machine performance over time. Similarly, in rotary applications, slip rings transmit electrical power and sensitive electronic signals from stationary bases to rotating tabletops. These applications require solutions that add cost and potential failure modes.

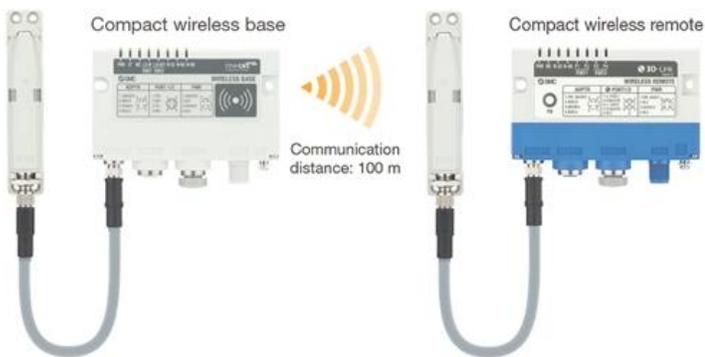
Wireless communication technology solves these challenges by eliminating the communication cables from moving components. Removing all but the power cable and pneumatic tubing frees up space within tight robot arm diameters, facilitates easier machine builds, and helps to reduce installation times. The EXW1 series uses an architecture designed specifically for factory floors, allowing users to remove communication cables from automation equipment without sacrificing reliability or impacting production schedules. The immediate benefits are less expenses for control cables, reduced cable clutter, and low exposure to electrical noise when communication and power cables would otherwise share the same bundle.

## Wireless I/O System Architecture

The EXW1 implements a base-remote architecture where a wireless base unit connects to the host PLC via industrial fieldbus protocols (EtherCAT, EtherNet/IP, PROFINET, DeviceNet, and CC-Link) and communicates wirelessly with distributed remote units. *Beyond traditional fieldbus connectivity, the EXW1 series also*

*supports OPC UA (Open Platform Communications Unified Architecture). This is a keystone of Industry 4.0 digital architecture that bridges the physical world of factory automation with enterprise IT systems. The capability provides users access to real-time production data for analytics, process optimization, and predictive maintenance. Remote units can be positioned at up to 100 meters from the base unit depending on operating environment, with the system supporting registration of up to 127 wireless remotes per base.*

The wireless communication operates within the 2.4 GHz ISM frequency band, which requires no license and is globally recognized under FCC CFR 47 Part 15 regulations. This frequency isolates all communication above the most common sources of industrial noise such as AC and DC welding equipment, motor starters, and heater contacts. EXW1 can deliver communication speeds of up to 1 Mbps with response times as fast as 2 ms with frequency hopping at 2 ms intervals across up to 79 available channels. This rapid channel switching means that even if interference corrupts transmission on one frequency, the system has already moved to a clear channel before the next data packet.



**EXW1 base-remote architecture with wireless communication up to 100m. Image Credit: SMC**

### EXW1 Hardware and I/O Capabilities

The EXW1 series' wireless base units achieve approximately 81% volume reduction and 79% weight reduction compared to the [EX600-W series](#) remote modules. The wireless remote units for valve manifolds achieve 63% reduction in installation area and 66% reduction in weight, making them suitable for end-of-arm tooling applications where weight can affect a robot's performance and/or energy consumption. However, the small footprint does not come at the expense of I/O flexibility. Engineers can select digital input/output modules with e-CON or M12 grommet connectors in PNP or NPN configurations to match existing sensor and actuator installations. The IO-Link remote units also support Class A / Class B port configurations with automatic communication speed detection for COM1, COM2, and COM3 devices. This allows intelligent sensors to transmit extended diagnostic data through the wireless link, not just simple on/off status.

Analog input remotes accept standard voltage and current signals with 16-bit resolution, while valve manifold remotes connect directly to SMC's SY, JSY, and VQC series [solenoid valves](#). Environmental protection meets

industrial requirements with IP67 ratings on M12 grommet and valve manifold configurations. Here, operating temperatures span from -10 to +55 degrees C, and vibration and impact resistance conforms to EN 61131-2 standards. For installations where the remote unit must reside inside a metal enclosure, the wireless adapters and external antenna sets can help to maintain the radio link without compromising enclosure integrity.

### Configuration and Diagnostics

Commissioning complexity can undermine the time savings that wireless I/O provides during installation. For example, if the pairing base and remote units require specialized equipment or extensive configuration procedures, the benefits of eliminating cable runs diminish. The EXW1 provides multiple commissioning paths to match different scenarios. For example, IO Configurator software handles comprehensive setup—including I/O point allocation and device pairing—while NFC reader/writer support enables contactless configuration without cable connections. For facilities where IT policies restrict software installation, EtherNet/IP and PROFINET base units offer web server interfaces that are accessible through standard browsers.

Beyond initial setup, the diagnostic capabilities of the EXW1 transform how maintenance teams approach wireless I/O systems. Rather than simply indicating communication status, the EXW1 logs retry counts, signal strength indicators, and operational data to internal memory—with CSV export capability for further analysis. LED indicators on base and remote units also provide visual feedback on signal quality during installation and troubleshooting.

Additionally, the EXW1 offers a measurement function that tracks ON/OFF timing and operation counts for predictive maintenance. Monitoring solenoid valve operation frequencies and cylinder cycle times let maintenance teams identify components approaching end-of-life before failures occur, preventing unplanned downtime.

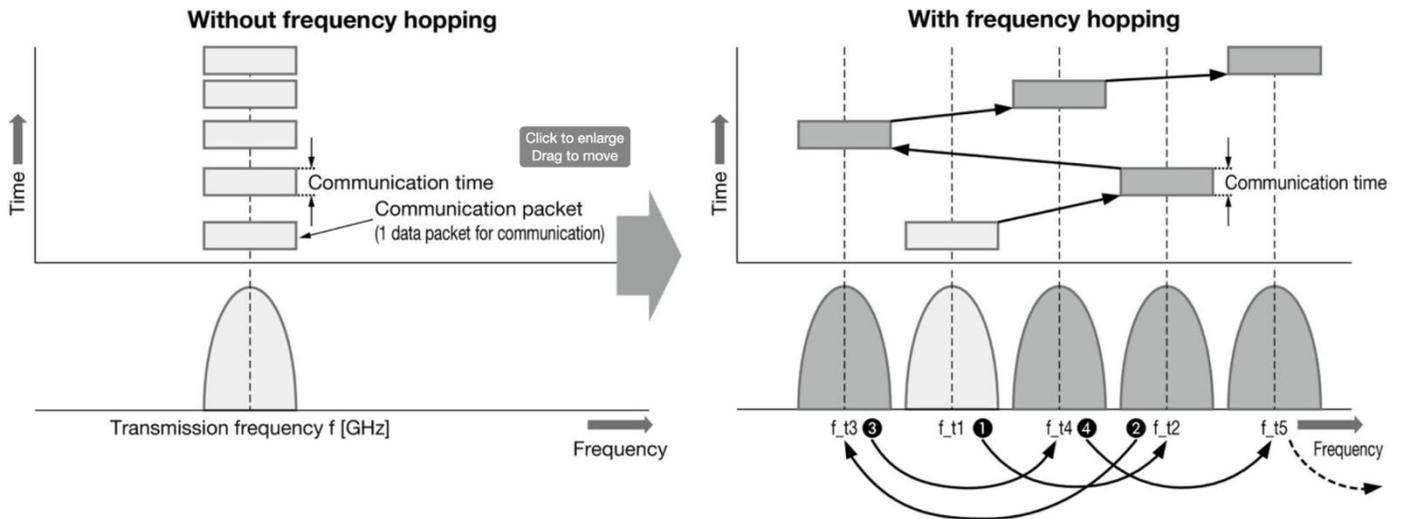


## Performance and Reliability

In industrial automation systems, the decision to deploy wireless I/O often depends on whether the communication link can match the hardwired reliability in real-life production conditions. A key reason for this is because factories are challenging RF environments. In factories, existing wireless LANs, Bluetooth devices, AGVs, and electromagnetic emissions from production equipment compete for limited spectrum and can interfere with I/O communications.

The EXW1 series addresses interference with multiple complementary mechanisms. Frequency hopping across 79 channels ensures that interference on any single frequency affects only one transmission cycle before the system moves to a clear channel. When the frequencies used by other wireless devices in the facility are known, the Frequency Channel Select function allows manual exclusion of those channels from the hopping sequence. This further reduces the chance of collisions. Also, the event communication system minimizes the EXW1's own RF footprint by transmitting only when I/O states change rather than continuously polling. This ability reduces interference with other devices sharing the environment.

**EXW1 system configuration with PLC/PC connectivity and wireless remote interfacing with field devices. Image Credit: [SMC USA](https://www.smccorp.com)**



**Frequency hopping distributes communication packets across multiple channels, ensuring that interference on any single frequency affects only one transmission cycle. Image Credit: SMC**

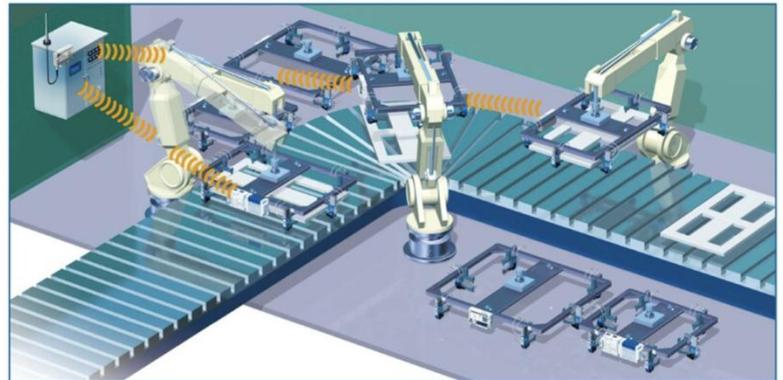
When communication interruptions occur, the EXW1 can initiate automatic recovery. The base unit continues reconnection attempts until the link re-establishes, and if connectivity cannot be restored after 31 retries, an alarm bit alerts the control system. In addition, the EXW1 series provides security with unique product identification codes, ensuring that only paired devices communicate to prevent unauthorized remotes from joining the network.

### Key Applications

Wireless I/O is well-suited for applications where cable routing creates ongoing operational burdens. Robotic end-of-arm tooling is an example of an ideal application. In this context, high-speed operation routinely subjects cables in robot arms to mechanical stress, and failures require time-consuming troubleshooting through tightly packed wire bundles. Removing communication cables only leaves the power and pneumatic lines, which simplifies the cable package and limits any electrical faults to easily diagnosed power issues. The reduced bundle diameter also frees up more space within robot arms. This facilitates easier builds and reduces installation time.

### For tool changing

- A communication cable is not necessary for moving parts.
- Minimized disconnection risk
- Shorter time for establishing communication (startup time)



**Wireless I/O eliminates communication cables in automatic tool changing applications, reducing disconnection risk and setup time. Image Credit: SMC**

Automatic tool changers can benefit from removing communication connectors that wear with extended mating cycle, such as pins bending, contacts degrading, and alignment issues. By simplifying the interface to electrical power and compressed air, engineers can eliminate these failure modes and maintenance burdens.

Rotary indexing tables are another viable use case. These systems typically require slip rings to pass electronic signals between stationary bases and rotating tabletops, which increases the cost and maintenance needs. Wireless valve manifolds can help eliminate signal transmission

through the rotating interface entirely, so slip rings only need to handle electrical power. This also allows the manifold to mount directly onto the rotating table, closer to actuators, which shortens tubing runs and improves pneumatic response times.

## Conclusion

The challenges of implementing I/O in industrial automation applications range from mechanical stress on cables and complex slip ring requirements to difficulty with troubleshooting access. All of these challenges stem from an assumption that communications must flow through physical conductors. SMC's EXW1 challenges that limitation by using wireless I/O that meets industrial reliability requirements. This capability is delivered through purpose-built RF architecture, diagnostics, and hardware that is designed to meet the weight and space constraints of the most demanding industrial applications.

*For more information on SMC's EXW1 or product-specific inquiries, please contact [SMC USA](#).*