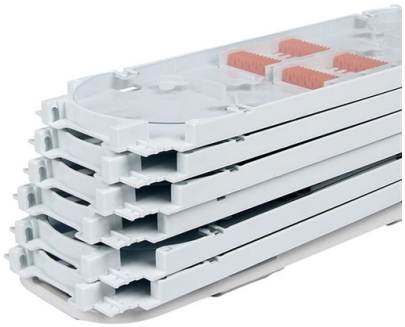
Selection Guide for Subway-Grade Single-Fiber Two-Way Remote Monitoring



Overview

The most prevalent sensing technology for structure monitoring applications is DSS, which monitors strain related to mechanical loads of structures.

Key Takeaways

Choose single-fiber two-way remote monitoring systems based on fiber type, core size, jacket rating, signal distance, and compliance with subway infrastructure standards.

Fiber Type and Core Selection

For subway-grade applications, single-mode fiber (SMF) is preferred over multimode fiber (MMF) due to its superior long-distance transmission and higher bandwidth capabilities, which are critical for two-way remote monitoring in extended subway tunnels.

SM

F cores typically measure 8. 3–9 µm, providing minimal signal loss and supporting high-speed data transfer. Multimode fiber may be used for short-distance connections (less than 300 meters), but SMF ensures future-proofing for network upgrades.

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Cable Jacket and Fire Safety

Subway environments require cables that meet plenum or riser fire ratings to comply with local fire codes and minimize smoke and toxic gas in case of fire. Common jacket materials include LSZH (Low Smoke Zero Halogen) or PVC with plenum rating, which provide mechanical protection and flexibility for installation in tight conduits or along tunnel walls. Signal Distance and Network SpeedTwo-way remote monitoring systems must account for signal attenuation and distance.

SM

F supports longer distances without repeaters, making it suitable for subway tunnels that span several kilometers. For high-speed monitoring (10G or higher), ensure the fiber and connectors are compatible with the required Ethernet or optical transceiver standards.

Remote Monitoring Module Selection

Modules like the SEL-2505 Remote I/O provide robust, compact solutions for two-way monitoring, supporting transfer-trip schemes and reliable communications in electrically noisy environments. When selecting modules, consider: Voltage tolerance (e.g., 900 Vdc traction power in subway systems)Environmental robustness (temperature, vibration, and humidity)Integration with existing SCADA or signaling systemsCompliance with Subway StandardsEnsure that both fiber and monitoring modules comply with subway infrastructure design standards, such as the Metrolinx DS-09, which outlines life safety, accessibility, and infrastructure coordination requirements.

This includes proper routing, protection from mechanical damage, and adherence to electrical and fire safety codes.

Installation Considerations

Use conduits or trays to protect fiber from mechanical stress. Maintain minimum bend radius to prevent signal loss. Label fibers and connectors clearly for maintenance and troubleshooting.

Consider future expansion by installing extra fibers or using modular connectors.

Summary

When selecting a subway-grade single-fiber two-way remote monitoring system: Prefer single-mode fiber for long-distance, high-speed transmission. Choose fire-rated, durable jackets suitable for subway tunnels. Ensure compatibility with remote I/O modules and SCADA systems.

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Follow subway design standards for safety, accessibility, and infrastructure integration. Plan for installation, maintenance, and future scalability. By following these guidelines, you can ensure reliable, safe, and future-proof two-way monitoring in subway environments.

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