Cordsets: A Critical Component for Enterprise-Wide Communication and Control

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Industrial cordsets are required for nearly every operation in a manufacturing plant, providing a key component for everything from providing sufficient power distribution to enabling facility-wide communication and control. Reliable cordset solutions are necessary for achieving and maintaining continued application operation and employee productivity. For these

reasons, connectors and cordsets should be a consideration during the initial design process to create a better system, save cost and improve machine efficiency.

Knowing an application’s connectivity requirements in the early phases of design will help lessen wiring errors and connection issues later during implementation, as well as aid in determining which cables are best suited for a given task and location. When selecting the proper connectors and cordset, there are several factors that should be taken into consideration, including the applications and intended use, the necessary components and the environment the cordset will be installed.

One area where industries continue to expand is networking. Reliable connectivity is a critical component in networking applications, providing a foundation for building enterprise-wide communication and control. By understanding the technology behind cordsets, how they are used in networking applications and the important role they play in industrial networking, users can achieve and maintain comprehensive facility connectivity with fewer cables and cordsets.

Technology Breakdown

The connector component of the cordset consists of a contact carrier or contact holder with either pins or bushings, based on whether it is a male or a female cordset. A female cordset is generally a receptacle that receives and holds the male cordset. In addition to male/female designation, cordsets are also characterized by physical construction, size, contact resistance, insulation between pins, resistance to entry of water or other contaminants, resistance to

pressure, reliability, longevity and ease of connecting and disconnecting.

To minimize connection errors, some cordsets are “keyed,” which means certain mechanical components on the cordset prevent mating except with a correctly oriented matching cordset—avoiding incorrect or damaging interconnections. Further, cordsets can also be specially designed to feature housings, such as threaded-style housing, with locking mechanisms for additional connection security. These designs prevent inadvertent disconnection or poor environmental sealing, providing resistance to water and dust ingress and protection in areas of high impact.

Most cordsets are also engineered to satisfy certain industry standards, including those set by the International Electrotechnical Commission (IEC), which standardizes the dimensions of a cordset. With the high volume of connections made in any given application or facility, it is important that cordsets meet specific design factors. For instance, interoperability/inter-mating between cordsets is

important as many manufacturers develop various products that all use the same cordset style. A cordset's features have a direct impact on whether it is selected for an application. For example, an A-Coded M12 cordset type would be used with sensor and actuators, a B-Coded M12 cordset with field buses and a D-Coded and X-Coded M12 cordset with Industrial Ethernet.

Together, connectors, cordsets and cables provide a complete connectivity solution, providing secure connections to everything from sensors and control equipment to networking devices. Available in a wide variety of configurations as well as housing styles and materials, these components are designed to deliver a comprehensive, reliable, end-to-end connection solution for virtually any connectivity requirement.

Cordset Features and Characteristics

Manufacturers are always looking for ways to increase productivity and efficiency to maximize profit growth. Using the proper cordset is often a key contributing element of an application's continued operation. These applications are typically subjected to a wide range of environmental conditions, and cordsets need to be able to withstand diverse, punishing elements such as moisture, dust, shock and vibration.

The environment where a cordset will be installed generally determines the type of cordset used. To provide the ideal level of performance, cordsets are available with Ingress Protection Ratings, such as IP65 or IP67, which ensure the solution is designed to prevent contaminants from entering the cordset and diminishing performance. For example, industrial applications with wide, spacious areas may use a larger cordset with a locking mechanism featuring an IP67 sealing gasket system to guard against water and vibration. Alternatively, a more compact IP20 cordset may be used for clean areas or inside control cabinets.

Cordsets are expected to perform in applications that involve everything from welding and high-flex robotics to washdown or hygienic conditions. Cordsets must also withstand shock and vibration, crushing and pulling, bending or twisting, dust and dirt, water, oils, chemicals, corrosive gasses or temperature extremes. Numerous industrial and process environments require approvals from various agencies like the NEC, UL or CSA.

Cordsets for Wireless Control and Communication

With applications moving faster than ever and industries becoming more competitive, maintaining effective control and communication has never been more crucial. One way facilities are achieving this is by utilizing Ethernet protocols to wirelessly connect to the entire enterprise. Ethernet enables networks to extend into hazardous locations or allows operators to include additional monitoring devices onto the network. Though by its very nature, the term "wireless" implies the absence of wires and cords, in order for this technology to operate, there must be a central point of connection or access point.

The wireless access point (WAP) is where the wireless system is connected to the

main network. Whether using an in-cabinet I/O solution or distributed I/O technology, cordsets are necessary for overall functionality. Connections need to be made within the WAP to fulfill both the signal and power requirements a wireless systems needs to operate. Signal and power connections within the WAP in industrial environments require the use of rugged industrial connectors and cordsets.

If the cordset is being used in Ethernet applications, additional factors need to be considered, as each Ethernet protocol, such as Modbus TCP/IP and Ethernet/IP, presents multiple differences, requiring cordsets with diverse performance standards and components. Before implementation, operators should analyze network communications signal requirements, including CAT 5, 5e, 6, 6A and 7, two pair or 4 pair cabling, D-code or X-code cordsets, solid or stranded cabling and shielded or unshielded cabling. This will enable users to select an appropriate solution. Also, for Ethernet applications, the pins and bushings are generally gold plated. The contact/carrier holder is often either made from a nylon or thermoplastic polyurethane (TPU) material.

One common type of cordset used in networking applications is an RJ45 cordset. Advancements have been made to traditional RJ45 cordsets, such as incorporating a bayonet-style mating interface along with IP67-rated protection to provide additional industrial strength where it is needed most. Plus, by requiring operators to perform a quarter turn to connect the cable to the node mates ensures that it is properly locked and sealed. Another common connector for industrial network applications is the M12 connector. The M12 connector is available as a 4- or 8-pole connection, can offer IP67/IP69K protection, and is available in molded or field wireable styles. Both the RJ45 and M12 connectors offer system configurator connection options. Based on the system communication speed requirements and environmental characteristics, both may be utilized in the same system.

In The Field

By using wireless Ethernet protocols to communicate with more devices and transfer data, industries require fewer cables and cordsets, enhancing access to critical data while simultaneously reducing installation costs and the potential for failure. However, given that there are fewer cordsets involved in these applications, choosing the appropriate cordset solution is even more crucial—serving as the central connection point for the network.

Industrial Ethernet can be used to connect the office with the plant floor by utilizing a single, reliable cordset and cabling platform with Ethernet connectivity and IP addressing. This convergence of open, standards-based Ethernet communications provides all the advantages of secure, seamless interoperability among industrial networks to enable continuous enterprise connectivity.

In addition to system integration and interoperability, there are multiple other benefits to be gained from implementing a complete, end-to-end Ethernet solution—from cabling and connectivity, to active components and associated hardware. Key business benefits include lower overall Total Cost of Ownership (TCO) and higher return on investment (ROI) resulting from real-time visibility and flexibility, reduced network maintenance and administration costs and labor and greater physical and virtual network security. Additionally, by not requiring multiple cable and cordset solutions, networks can extend into hazardous locations that were previously unconnected for unparalleled visibility and control.

When a totally wireless network is not feasible due to security, existing protocols or signal strength, protocol gateways for EtherNet/IP, PROFINET, Modbus TCP/IP, DeviceNet, CANopen or PROFIBUS provide a flexible in-the-cabinet system for distributed I/O. Gateways can be paired with a broad range of I/O slices to suit virtually any application’s communications and transparency requirements. Gateways can provide sophisticated features, such as dual Ethernet ports and functionality with digital and analog, as well as specialty modules. Some gateways are also equipped with an integrated Ethernet switch that allows a line topology between multiple gateways without using an external switch, providing a central connection point that eliminates the need for additional cable runs to the PLC or other devices.

Conclusion

Cordsets acts as building blocks for virtually any industrial operation and provide a foundational element for creating a wireless network. Understanding their function and importance in networking applications allow facilities to maintain effective communication and data access. Therefore, implementing the proper cordset component can reduce installation time, maintenance and system downtime, resulting in increased productivity and profitability for the entire enterprise.

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