IO-Link and the Industrial Internet of Things

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The vendor-independent interoperability aspects of IO-Link make this non-fieldbus method of connecting plant floor devices and systems an appealing way to jump-start Internet of Things initiatives.

One key to making the Industrial Internet of Things (IIoT) and smart factories a reality is two-way communication between low-level sensors and actuators and higher-level controllers, automation systems and manufacturing execution systems (MES).

IO-Link does just that.

IO-Link enabled devices not only transmit machine data to factory management systems, they let a control system download parameter data to the device, which, in turn, can send status information back to the controller. Thus, IO-Link devices facilitate machine commissioning and startup, can make adjustments while a machine is running, and provide monitoring and diagnostic capabilities. The end result is increased machine and process flexibility, better overall productivity and less downtime.

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IO-Link is the first I/O technology to be adopted as an international standard (IEC 61131-9) and lets devices from various manufacturers communicate with each other. However, it is important to note that IO-Link is not a fieldbus. It enables point-to-point communication between field devices and the automation system. Traditionally, integrating a fieldbus interface all the way down to the lowest field-level device was expensive. IO-Link is a straightforward and economical system that transmits binary, analog, parameterization and diagnostic data via simple, unshielded three-wire cable.

A basic IO-Link system consists of a master; devices like sensors, valves, motor starters and RFID readers; cables up to 20 m long (typically with factory-assembled M12 connectors); and configuration software tools. The IO-Link master can have several channels, one for each connected device, and it can be integrated into a PLC or controller and serve as a gateway to fieldbuses such as DeviceNet, Profinet and EtherNet/IP. As a result, it serves as the connection between individual devices and the plant automation system.

Key advantages of IO-Link include:

- *Automatic detection and parameterization of the IO-Link device.* During initial setup, a device's operating parameters are stored in the master. Once connected, the master recognizes the device and enables automatic startup. If a device like a sensor fails, it can be swapped out and parameterization data stored in the master automatically downloads to the replacement device.
- *Device monitoring and diagnostics.* IO-Link per-

mits equipment components and systems to be monitored and proactively managed. Diagnostic information supplied by IO-Link devices lets the control system track data and trends, facilitating preventive maintenance and improving machine uptime. In the event of a fault, it pinpoints the problem, thereby making troubleshooting easier. No special expertise is necessary on the part of maintenance technicians.

- *Changes on the fly.* Parameters can be quickly adjusted for installed devices while the machine is running. For example, consider a pressure regulator controlling the force that a pneumatic cylinder applies to a product. If the next product requires a different force, users can reconfigure the regulator's pressure set points on the fly and keep production running. That substantially differs from the conventional, time-consuming process of having a machine operator manually reset pushbuttons or adjustment screws. The ability of the controller to quickly and remotely change device settings is a key attribute of IIoT. It minimizes the transition time from one type of operation to another and gives machines greater flexibility to handle a wider range of products.
- *Reduced spare-part costs.* By exploiting the configuration capabilities of IO-Link, one device can be configured to have different output functions—such as a sensor that's NO or NC.

All these advantages, combined together with vendor independence and interoperability, make IO-Link a significant tool for successfully implementing IIoT and Industry 4.0.

Festo offers a range of IO-Link compatible products, including IO-Link masters, pressure and flow sensors, displacement encoders and position transmitters, valve terminals, proportional pressure regulators and stepper motor controllers.

A few examples include:

- *An IO-Link master with CECC controller* with four IO-Link ports operates with electric and pneumatic actuators. It reduces installation and networking costs for intelligent sensors and valve terminals and provides valuable diagnostic options.
- *Proportional pressure regulators VPPM* connected to IO-Link are used for testing, metering and pressing applications in food, automotive, electronics and light-assembly industries.
- *Position transmitter SDAT* with an IO-Link interface accurately detects piston position for process monitoring in screw driving, riveting, welding, pressing and clamping tasks.

In addition, Festo has application knowledge in both factory and process automation and can offer basic and advanced training for industrial users.