

SMC Expert Article – IO-Link

IO-Link to move easily to smart sensors

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As industry turns to digital, IO-Link stands out as an easy to implement and cost-effective solution.

When it was launched in 2009, IO-Link was unlike anything the industry had ever seen before. IO-Link is not a fieldbus, but an ally to fieldbus. IO-Link connects automation IO-devices in a way that other solutions haven't been able to offer. It is a simple, serial, bi-directional point-to-point connection for signal transmission and energy supply under any networks, fieldbuses, or backplane buses, which enable to connect sensors and actuators to the fieldbus or industrial Ethernet. As a standardized interface (IEC 61131-9) based on a digital protocol, IO-Link works in the smallest of devices from any manufacturer around the globe. Created for sensor-level use, IO-Link relies typically on standard M12 or M8 connectors and three-wire cables to make sensors "smart". It communicates process data including a limited amount of parameters (e.g. temperature, humidity, color, etc.) and translating it into actual values. Smart sensors that utilize IO-Link can transmit current and exact temperature readings without the risk of analog data conversion.

An IO-Link system consists of an IO-Link device (a sensor or actuator) and an IO-Link master. Each IO-Link device is connected to one physical port on the IO-Link master. The IO-Link master acts as a converter or gateway that translates the IO-Link "message" into a fieldbus message to share information with the control system.



SMC's IO-Link Master Unit

It is important to note, however, that IO-Link won't be able to support every type of sensor or actuator. The protocol can transmit up to 32 bytes of process data per cycle making it not suitable for transmitting large amount of data generated by devices such as cameras for example. For typical two-byte process data and with a typical cycle time of about 2.3ms (with COM2 or 38.4 kbps data rate) and about 0.4ms (with COM3 or 230.4 kbps), it's fast enough for most factory automation application (10ms or more) but it won't fit for high-speed applications. Finally, we should mention that cables have distance limits: The cable between the IO-Link device and IO-Link master must be 20 m maximum (if the current of the IO-Link device is lower than 200mA and with core cross-sectional area of 0.35mm²) maximum to ensure transmission rates. In case of higher currents special calculations for maximum cable length is required.

The Value of IO-Link

If your production necessitates frequent changeovers or if your operations are downtime sensitive, it will bring you significant advantages:

- **Easy remote Configuration and Monitoring:** device and sensor parameters can easily be changed remotely as needed, saving valuable time in the manufacturing process. Sensor outputs and status alerts can be monitored remotely in real time to help you quickly identify and resolve problems before they cause downtime. In that case the sensor can be replaced without configuring it.
- **Visibility of all equipment:** Smart sensors equipped with IO-Link can communicate their own status via the IO-Link master to the PLC.
- **Cost Savings:** In addition to saving time, IO-Link also reduces overall system costs. The sensors just rely on the IO-Link communication interface, which is much more cost-effective. IO-Link does not require any special or complicated wiring. IO-Link also eliminates the need for analog cards, important also for miniaturization.
- **Vendor Independence:** IO-Link is a vendor-independent technology.
- **Flexible:** deploying IO-Link does not need to be an all-or-nothing approach. It can be built gradually—as time and budgets allow.

Because IO-Link can be integrated into virtually any fieldbus or automation system where sensors and/or actuators are used, it is ideal for factory and logistics automation applications such as assembly line automation – for simplified product changeovers and fast installation or for packaging – to validate machine processes.

SMC's IO-Link products can help you improve your productivity and reduce your costs, granting dynamic production processes and leading to the **Smart Flexibility** the industry is seeking. Plus, they will let you bet on the continuous improvement of your company's **industrial maintenance** strategy.