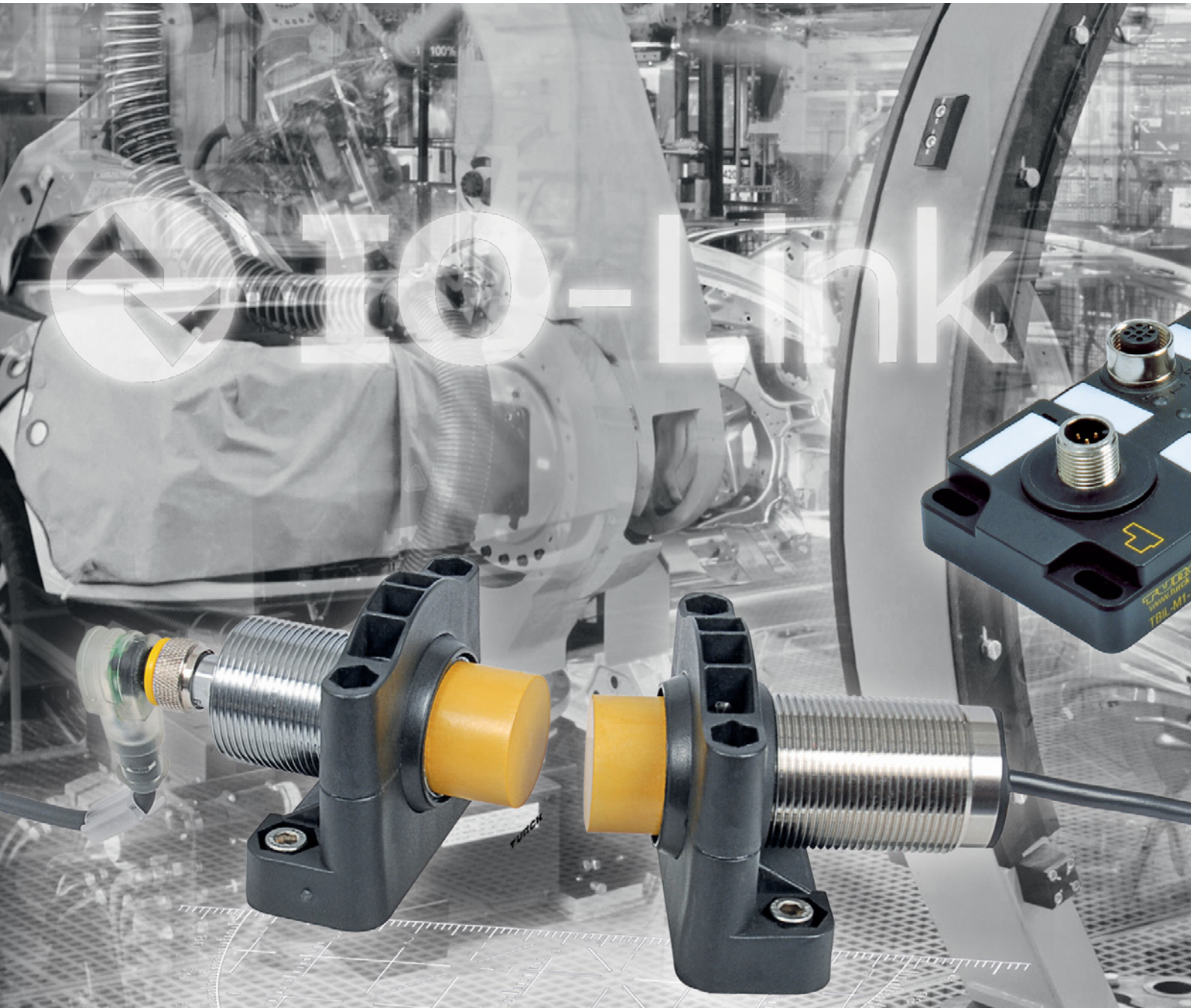
IO-Link for more Production Efficiency

IO-Link has arrived: The new communication standard offers measurable production advantages and added efficiency for numerous applications

IO-Link is quickly becoming an increasingly interesting option for users to create more transparency for the processes between the controller to the sensor. The communication standard offers many benefits, most importantly: reduced machine costs, more efficient production processes, and significantly improved machine and system availability. Turck offers users, who want to make the most of IO-Link, one of the most comprehensive IO-Link portfolio worldwide – beginning with a broad selection of sensors, to cables, inductive couplers and I/O hubs, all the way to programmable field bus and Ethernet solutions.

Less inventory requirements

IO-Link leads the way to countless new all-in-one solutions. A number of sensor output variations can be



mapped via a single IO-Link device. These are only in rare cases more costly than standard sensors. That is because firstly, many sensor types already operate on the basis of microprocessors, and IO-Link simply creates an interface for the communication with these sensors. And secondly, manufacturers and customers save costs for displays and buttons on the sensor itself, as they are then configurable via IO-Link. A number of different fieldbus modules for digital and analogue inputs and outputs or other types of signals can be replaced with a standardised IO-Link module. This will reduce warehousing costs, and is a significantly less cost-intensive solution for analogue I/Os than the traditional one.

Less machine costs

IO-Link also decreases costs for the user's connection technology. Standard three-core cables replace the much more expensive multi-pole or special shielded cables for analogue signals. IO-Link-capable signal distributors for digital inputs and outputs, the so-called I/O hubs, are well worth implementing even for a small number of I/Os. These signal distributors transmit up to 16 switching signals in a bundle via an IO-Link signal to the controller. This capability allows the quick and easy connection of existing digital field devices to an IO-Link master. Despite these options, IO-Link is not a replacement of field bus solutions, but in many cases it can be a meaningful addition.

Simple engineering

IO-Link will also save machine manufacturers time and money otherwise invested in engineering and installation. Where multi-pole cables and passive distributors are used for the connection of several sensors and actuators, users must carefully plan and monitor which sensor will be connected via which cable. A work step that is not only time consuming, but also error-prone. Since IO-Link connects every sensor or actuator – both analogue and digital – via a standard three-core cable, documentation and ePlanning will be significantly simplified. The I/O hub by Turck also offers this advantage for non-IO-Link-capable digital sensors and actuators.

Proactive maintenance

The more comprehensive information provided via IO-Link will furthermore allow proactive maintenance and asset management. The additional access to previously only internal sensor data, e.g. temperature data of linear or ultrasound sensors, acts as an early warning system for sensor faults and even cable breaks. Component replacements can be planned in advance, before a machine or system can go offline due to an unforeseen device failure. Alternatively, the system operator can wait until an actual defect occurs on a device that has been working at its limit for some time, and use this system downtime for the replacement of other devices that have signalled their impending end of life via transmitted diagnostics data. The actual device replacement can then be carried out by lesser qualified employees, as the controller will automatically assign the correct parameter set to the new sensors. The inductive linear position sensors by Turck, for example, allow the call-up of advanced diagnostics data on the status of the position encoder. A warning signal can then be issued if the position encoder is not in measuring or limit range.

Parametrisation and maintenance in the production process

The ability to communicate with sensors compensates for possible dirt deposits on optical sensors during a running production process. Should the switching threshold no longer be accurate at any point, then the controller will be able to adjust the setting via IO-Link. A sensor signal weakened by dirt deposits can therefore be easily parametrised again.

And should a sensor or other device have to be replaced due to a defect at some point, the procedure will be significantly less work-intensive, particularly for parametrisable devices. The PLC will have all the parameter data stored, and can simply upload it to the

IO-Link users benefit from reduced machine costs, simplified engineering processes and proactive maintenance

QUICK READ

There are not many topics on which automation manufacturers and users agree as they do on the topic of IO-Link. The new communication standard is set to make the transparent mapping of processes from the controller to the sensor a matter of course. The growing interest in IO-Link has been boosted significantly by the scenario Industry 4.0 and the media attention it has invoked to date. In contrast with the quite abstract vision of deserted factories devoid of a human workforce, the advantages of IO-Link have proven themselves very useful even today.

new sensor. This option is also very useful in case of production changes, where entire rows of sensors have to receive new parameters for the new production run. Instead of teaching every individual sensor locally, switching thresholds, sensor enhancements, sensitivity, and other parameters can be adjusted centrally, and for the entire sensor group simultaneously. These processes will then be clearly documented in the PLC.

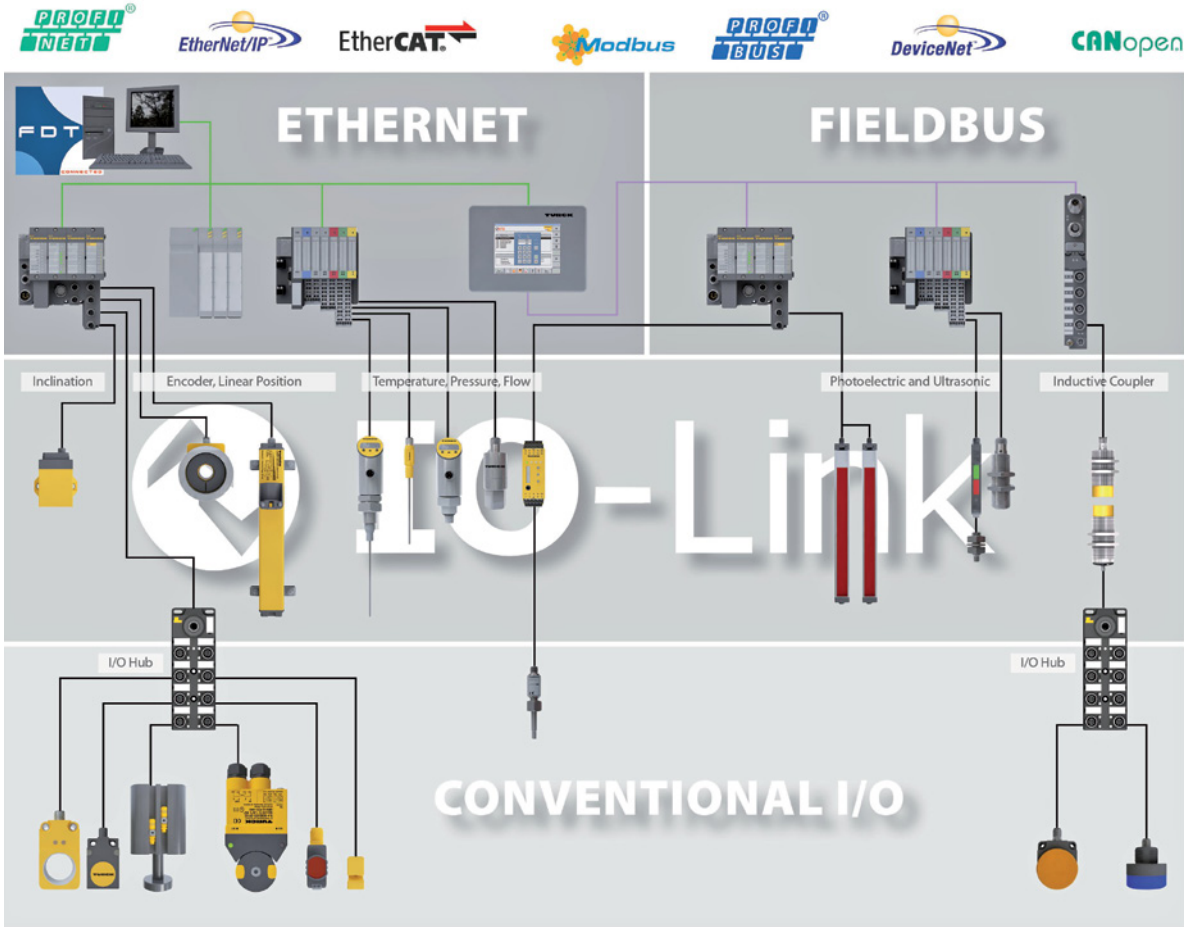
Increased production safety

IO-Link improves the safety and efficiency of production processes during tool changes at presses or robots. In addition to the automatic modification of the sensor parameters during tool changes, the exchanged tools can also be identified, which will make the additional installation of an RFID or barcode solution superfluous. This is made possible via IO-Link-capable passive distributors like the Turck I/O hub, as the devices come equipped with an application-specific tag, to which the user can add a custom description depending on the relevant tool. The controller will read the tag and identifies the tool by its unique ID number.

Example: Automotive pressing plant

Many of the advantages of I/O-Link are already being taken advantage of by industrial users. Turck inductive couplers provide contactless energy and data transfers between the press and pressing tools in automotive pressing plants. The data transfer between the coupler elements occurs via IO-Link. And since the pressing tool is equipped with controllable sensors as well as actuators, the IO-Link advantage of providing a bidirectional connection comes to the fore. Without IO-Link, digital input and output signals would have to be collected locally at the tool, a task previously

Turck offers a standardized IO-Link portfolio from the sensor to the master



What is IO-Link?

IO-Link unifies the communication between machine and system controls on the one hand, and sensors and actuators on the other. The standard has been compared to the USB connection on a PC. Both interfaces are serial and manufacturer-independent.

USB and IO-Link can both transmit energy and signals. Both standards are bidirectional, which means that sensors and actuators can both send and receive information via IO-Link. The key advantage of IO-Link is its communication capability. The one-sided transmission of information becomes bidirectional communication. It allows access to parameters and data previously inaccessible to controllers, or which could previously only be accessed via proprietary systems or directly at the sensor.

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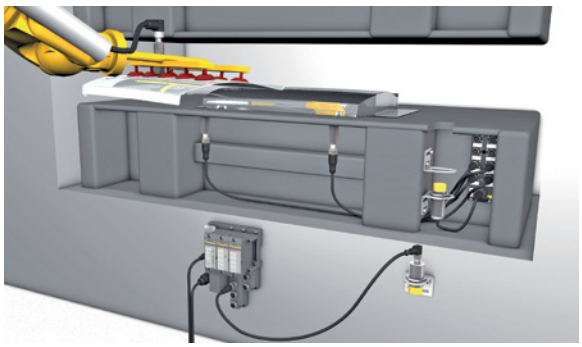
Turck is one of only very few manufacturers able to deliver complete IO-Link systems from master to sensor from a single source – and that universally also with protection type IP67.



The signals of the pressing tool are communicated contactlessly to the controller via the inductive coupler (yellow caps) and the I/O hub

resolved using passive distributors with multi-pole cables. Mechanical plug connectors on exchangeable tools are an expensive solution that moreover requires customisation. Furthermore, plug connectors tend to wear quickly, which means more costs and could result in unnecessary downtimes. The combination of a Turck contactless inductive coupler and I/O hub provides a low-cost and time-saving connection solution for all sensor and actuator signals.

Skid identification

The automotive industry has also begun using I/O hubs for identification purposes. On a production line, skids carrying automobile bodies are identified via an attached I/O hub. In addition to the identification, in this example all sensor data and energy information is transmitted via the Turck inductive coupler, and contactlessly coupled at each station of the production line.

Carousel ride operation

Li-linear position sensors by Turck monitor the lifting of the lateral arms in the carousel ride "Flying Fish" by Zierer. Here, the operator uses IO-Link for the parametrisation of the measuring range of the analogue output signal, as well as for accessing additional diagnostics information. The sensor transmits an alert via IO-Link when the position encoder is out of range. The carousel ride operator will in this case be prompted to carry out a safety routine. Other diagnostics information can be accessed via the controller. In this example, IO-Link helps to optimise passenger safety for the carousel ride operator.

IO-Link complete portfolio

A large number of manufacturers are involved in the development of the IO-Link communication standard. Most companies focus on a specific level of the automation pyramid, i.e. either the sensor or the master side. The Turck IO-Link portfolio is characterised by its vertical spectrum: Turck is one of only very few manufacturers able to deliver complete IO-Link systems from master to sensor from a single source – and that universally also with protection type IP67. On the master side, Turck offers the modular field bus and Ethernet IO systems BL20 and BL67, which come with master modules for IO-Link. The systems are available for multi-protocol Ethernet (Profinet, Ethernet/IP, and Modbus TCP) or Profibus. During the course of this year, Turck will be adding more field busses to the product range. The ultra-compact block designs TBEN-S will be available as an IO-Link master variant as of mid-2015.

The I/O hubs, which take over the job of passive distributors, take their place in the automation pyramid mid-way between field bus and connection technology. The connection specialist Turck also provides traditional three-core cable solutions as well as cables for analogue signals or field bus and Ethernet connectivity. The Turck sensor portfolio encompasses numerous variations with an IO-Link interface, e.g. metering sensors (pressure, flow, or temperature). Linear position sensors of the Li product family also come with a variant with IO-Link, as do the Turck ultrasound sensors RU.

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