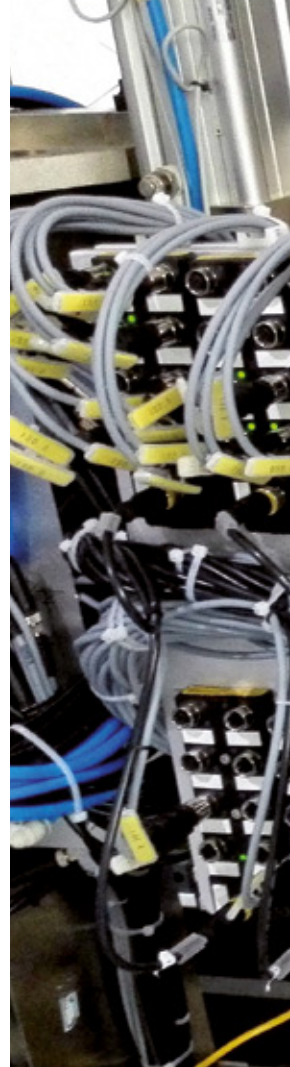


Simple Differential Equation

At the differential gear production plant of a Chinese auto parts supplier, Turck is showing how its IO-Link solution for signal connection is easy, fast and efficient



The automotive industry is a highly competitive sector. Nowadays, automotive plants in Asia, Europe and America are building very good cars, and the differences in quality between the particular vehicle classes are marginal. This competitive pressure is also felt by the auto parts supplier sector. Some manufacturers are renowned for the tough way in which they handle their suppliers. The positive side of this competitive pressure is the increased production efficiency that it has developed. Suppliers have to keep their production flexible and ensure that setups and modifications can be carried out quickly. To do this, they are increasingly relying on systemic production and products. Modular concepts enable larger quantities of individual components and shorter development and production times.

Use of differential gears

One example of these developments is the production of axle differential gears for automobiles. Differential gears ensure that the wheels of a vehicle can move at different speeds. When a vehicle is cornering, an axle differential gear is necessary so that the outer wheel can cover a greater distance than the inner wheel. The differential balances out the different speeds of the wheels. For off-road driving, four-wheel drives have the ability to block single differentials or all of them in order to transfer the power from stuck wheels to all wheels. Four-wheel drive vehicles also have a central differential in order to distribute the drive power to the front and rear axles.

Many sensors in gear production

Several magnetic field sensors on the production line of the differential gears detect the positions of pneumatic cylinders and clamps, while proximity switches detect components of the differentials themselves. There are also many actuators such as air valves, solenoid valves and other devices, which perform the commands of the controller.

Multicore cables and passive junctions failed

Initially, the customer wanted to connect the signals of sensors and actuators to the fieldbus gateways in the control cabinet using passive junctions and multicore cables. However, this solution didn't meet all of the specified requirements. The costs of the cable lengths and the extensive wiring effort involved had a negative

QUICK READ

A Chinese manufacturer of differential gears uses Turck's TBIL IO-Link hub to connect hundreds of sensors and actuators in production. Each of these junction boxes connects up to 16 sensors or actuators via IO-Link. The solution saves minutes of the time required for assembling multicore cables while also reducing costs. The solution is completed with Turck's BL20 Profibus gateways with IO-Link master modules. Besides switching signals, they also bring RFID data and analog signals to the PLC.



effect on the overall cost. Many cables for the passive junctions would have had to be prepared manually and then connected again to the I/O modules in the control cabinet. Commissioning would have been particularly prone to errors as well as being time consuming. The solution would also have been very expensive and difficult to maintain.

Troubleshooting during cable inspection would have initially presented a lot of problems: As the types and models of the sensors installed are the same, the cable markings are also identical apart from one or two digits. Assignment errors were therefore bound to happen. The search for and rectification of wiring errors would in turn be very time consuming and complex. The customer recognized this before the solution was chosen and obtained further advice from Turck.

IO-Link solution fast and efficient

Turck could offer a space saving solution that simplified the wiring of the production workbenches and which nevertheless could be implemented cost effectively. The system also allowed the implementation of diagnostics right down to the sensor level.

The customer used a Siemens controller with Profibus-DP. Turck consequently offered a BL20 Profibus gateway for the control cabinet in conjunction with IO-Link master modules. Turck's IO-Link compatible TBIL junction boxes are ideal for connecting the sensors and actuators in the field. These I/O hubs use IO-Link to bring up to 16 binary signals to the IO-Link master via a standard sensor cable. The 16-bit process signal of the

IO-Link protocol is therefore not used for an analog process value, but for transferring 16 individual switch signals for digital input or output signals. As the TBIL I/O hubs offer protection to IP67, they can be mounted directly in the field as close as possible to the sensors and actuators. IO-Link is a digital protocol that allows the use of standard three-wire cables, which eliminates the need for any expensive shielding and lengthy cable commissioning.

Efficient and transparent network structure

This network structure, consisting of I/O hubs and Profibus DP gateways with IO-Link master modules, enabled the user to avoid the need for any time consuming wiring in the control cabinet as well as making savings in the terminals, expensive cables, and space required. The solution also provided an outstandingly simple and clear network structure that prevented faults already at the installation stage.

If any faults occurred later, however, maintenance was simple thanks to the use of IO-Link. The location of faults can be identified right down to the individual field device and differentiated between a wire break or a short circuit. The central configuration of the entire system from the controller ensures the central availability of all relevant information. This simplifies both maintenance and documentation.

Space saving and flexible

An IO-Link module on the BL20 gateway provides four IO-Link masters. This means that up to 64 binary signals

Economy program: 26 TBIL I/O hubs means 26x savings on multicore cables and their assembly

Besides hundreds of switching signals, two BL20 gateways also bring signals from RFID read/write heads and analog signals to the PLC



can be connected with a single module. The flexibility of the overall solution is always ensured. Additional IO-Link master modules or other I/O modules can be connected easily to the BL20 gateway.

The customer was able to successfully complete the commissioning of the system quickly. As many identical sensors are connected and only TBIL I/O hubs were used as I/O-Link devices, the workload involved was manageable anyway.

Analog signals via IO-Link

IO-Link is still unfamiliar territory for many customers. Some were initially skeptical, particularly due to the unusual setup in the controller. However, after an IO-Link installation is completed, most customers are convinced of the benefits. In the application described, the customer realized that he would also be able to connect all measuring sensors for pressure and temperature with IO-Link as long as they have an interface. Special analog input modules are thus just as unnecessary as the expensive shielded cables for analog signals. The analog sensor could be connected directly next to the I/O hub to IO-Link master module of the BL20. The sensor parameters can then be set directly from the controller. The customer intends to examine this option with future projects.

The project engineer for the customer is impressed by IO-Link: "We have good reason to believe that the

IO-Link communication interface will be the top choice for the new generation of intelligent devices. Devices with IO-Link communicate data digitally and can thus exchange process values as well as configuration information and diagnostic data. The information exchange is transparent on the entire section from the sensor right up to the controller."

Turck benefit: System expertise in IO-Link

Turck offers one of the most extensive IO-Link portfolios on the market. From measuring and switching sensors, to connection technology and the TBIL I/O hub, right through to IO-Link masters for the most important fieldbuses and Ethernet protocols in IP20 and IP67. This system diversity is virtually unique on the market. Customers benefit from Turck's mature system know-how.

The integration of the IO-Link devices on Turck IO-Link masters via the controller will be even easier in the future. The setting options of the Turck devices are integrated into the GSDML file of the Turck IO-Link master. For the customer, this means it is only necessary to read the GSDML in the controller software in order to set up a device. The devices just have to be selected on the master. The IO-Link device parameters to be set can be selected via drop-down fields instead of having to program IO-Link call function blocks manually.

The time saved means that the installation can be put into production even faster, thus offering an edge in highly competitive markets such as the auto parts supplier industry.

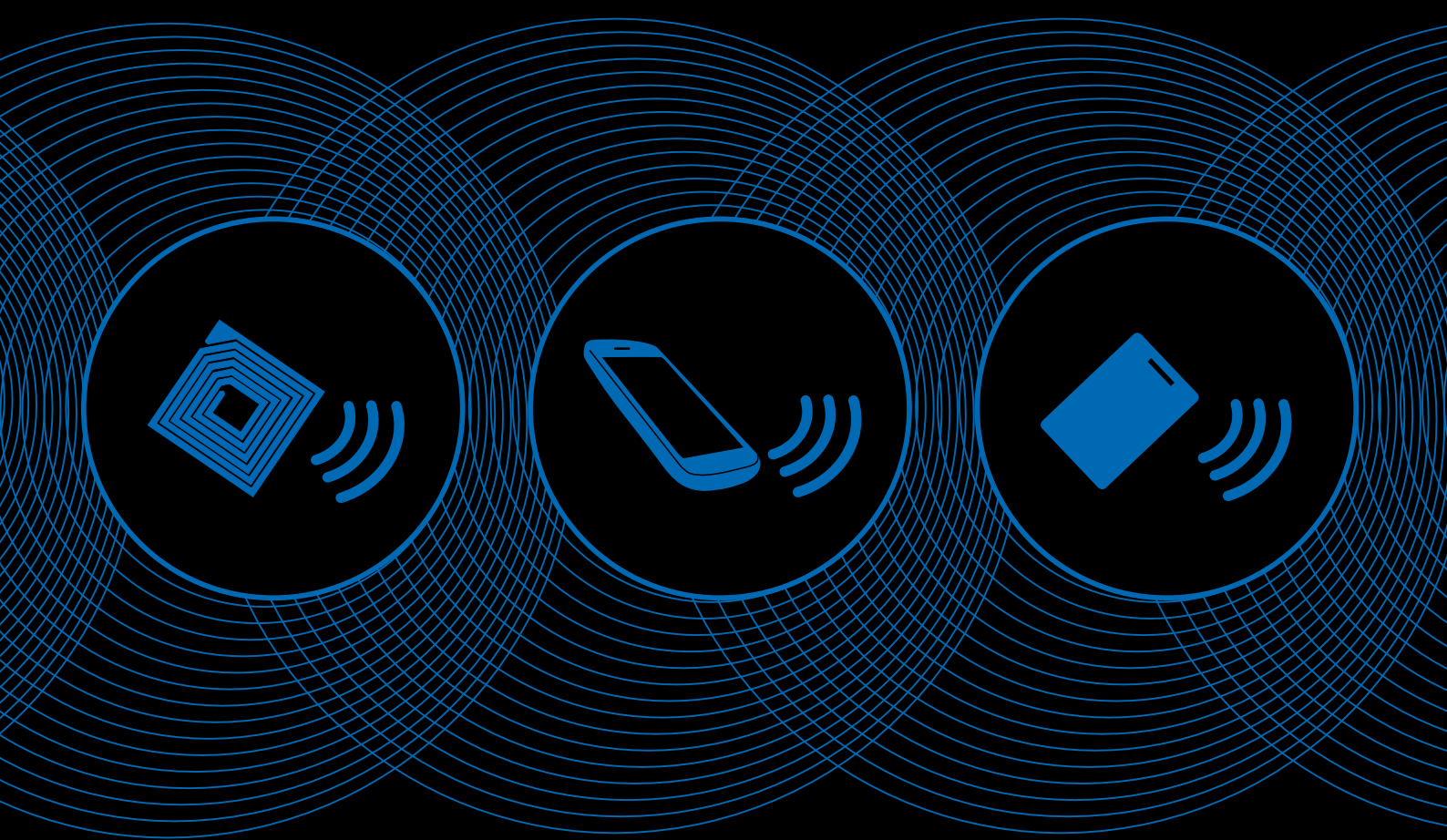
PRODUCTS USED

Profibus-DP gateway	BL20-GW-DPV1
IO-Link master	BL20-E-4IOL
I/O hub	TBIL-M1-16DXP

Author | Yu Gu is Fieldbus Product Engineer at Turck in China
Webcode | more21555

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