IO-Link makes it possible for higher-level systems to access additional data parallel to the measured value – a powerful tool for predictive maintenance

Powerful Duo for IIoT

With the combination of IO-Link and cloud services, Turck enables a continuous data flow from the sensor to the cloud - and back again

The cloud services of the four tech giants Apple, Microsoft, Amazon and Google can considerably simplify our day-to-day work: No longer storing holiday photos on the limited memory of a smartphone but in your personal online folder; synchronizing calendar entries and contacts on several devices at the same time; or working jointly on the planning document for a club event. Companies naturally also want to fully utilize the benefits of cloud computing in industrial applications – with special requirements but with one common goal: Using data efficiently without unnecessarily loading the network and memory capacity.

Industrial clouds are also required to filter the relevant values out from the large amount of information gathered by field devices such as sensors and RFID read/write heads, i.e. reducing big data to smart data.

The cloud is thus far more than just a memory storage facility. Instead, it supports users such as with the fast integration of newly connected devices, gives automatic warning of any critical anomalies or visualizes the operating times of different tools. For this Turck offers end-to-end communication from the sensor right through to the cloud and this in both directions. This provides an intelligent exchange between the field level, controller, data cloud and the responsible service employee as soon as necessary.

IO-Link allows access to additional data

The IO-Link communication standard today already enables digitalization to be started in the direct machine environment. Many field devices are now equipped with processors which provide information in addition to the user data, such as diagnostics data or device information.

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End-to-end bidirectional communication down to the sensor/actuator level and with access to additional data – IO-Link increases the potential of industrial cloud services. Turck is combining both technologies and is thus opening up different possibilities of process optimization for users. For example, the simplification of operating steps such as sensor replacement, keeping process parameters in view or setting up the automatic condition monitoring of machines.

IO-Link enables access to these additional values by higher-level systems in parallel with the actual measured value. This turns an IO-Link device such as a sensor into a talking participant, which in turn increases the usability of cloud services at the other end of the automation pyramid. With IO-Link and cloud solutions Turck is connecting two trailblazing technologies and is thus ensuring end-to-end continuity "up to the last meter".

Preprocessing of signals with decentralized intelligence

Remote intelligence is needed in order to restrict data usage above the field level to smart data. In other words, the signals are preprocessed already in the fieldbus module. Turck's TBEN-L-8IOL IO-Link master, for example, enables users to configure directly which variables are transferred to the cloud. The remote evaluation of data also means that time-critical measurements are carried out in the field without causing an additional load on the communication networks. This ensures that even process sequences completed in millisecond cycles are undisturbed, while only specific data is available for further use. The cloud offers several routes to it: via cables using Turck's TBEN-L5-PLC-10 IP67 controller or via a wireless connection using the TCG20 IP67 cloud gateway with a Wifi or a mobile network.

Device identification together with IODD update

Where can the benefits of cloud and IO-Link be seen? For example, with the identification of devices when technical personnel commission a sensor or carry out maintenance. These operations can waste valuable time and are also the source of occasional errors. Connecting the cloud to a central database with all IO-Link device descriptions therefore makes more sense. A newly connected device in the field then transfers its manufacturer and device ID to the cloud, including the parameters and communication properties. A comparison with the database is then carried out in order to identify the IODD belonging to the sensor. The cloud also visualizes device data and can adapt parameters in the device if required.

Fast sensor exchange when faults occur

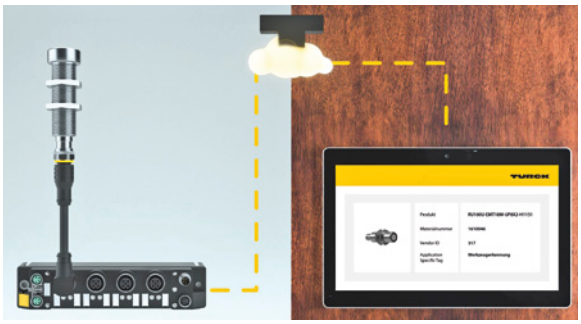
The same applies to the replacement of devices in the event of fault. As soon as a sensor reports a fault, this information is sent directly to an employee via the cloud. For this it is also possible to program alarms for which notifications can be sent by email or SMS, in addition to the visual notifications in the dashboard. As the device configuration of the sensor can be stored in the cloud, the faulty IO-Link device can be replaced immediately without any problems. The bidirectional exchange of information makes it possible for the cloud to identify the type of replacement sensor connected and configure it with the appropriate parameters.

Warning of mechanical wear

IO-Link additional data can also provide information about poor mechanical running. If an inductive sensor monitors the movement of a bolt for example, it can also provide information about the switching distance in addition to the switching pulse. As soon as the target reaches a critical distance to the sensor, this can also indicate increasing wear – the bolt has too much play. The cloud notifies maintenance engineers, who then have to act before the target is outside of the measuring range. However, early notifications mean that the service can already be carried out before this state is reached.

Value addition for condition monitoring

A measuring ultrasonic sensor also supplies data on signal quality in addition to the distance value. This gives users the possibility to not only query a level value, but also to receive an alarm, for example, if there is a buildup of foam on the surface of the liquid, which

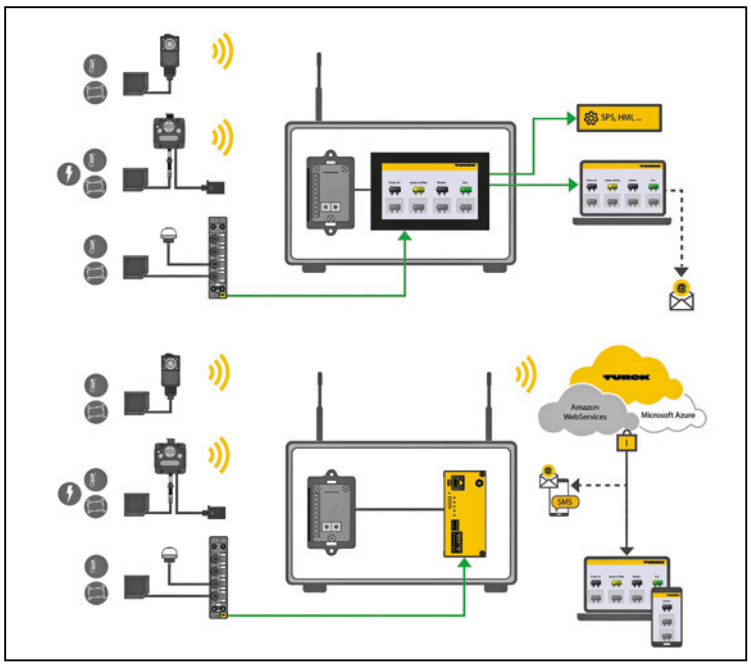


The cloud independently uses information from the intelligent IO-Link device in order to identify a sensor

The inductive sensor signals whether its target has deviated from the specified switching distance – thus indicating possible wear

The ultrasonic sensor also indicates the buildup of foam on the surface as well as supplying the level value

Users can conveniently see in the cloud dashboard the operating hours of each individual tool



Turck's cloud service can be hosted on the customer's in-house server or as a public cloud in the central data center – communication is handled via an encrypted protocol

would corrupt the measured value. In this case IO-Link extends the condition monitoring to initiate a second monitoring. At the same time the cloud ensures that information on level and surface reaches the employees early on, irrespective of the location or terminal device.

Keeping process parameters in view

Added value number five: Relevant process parameters can also be recorded by means of additional information in the cloud. If different tools are used in a machine, operators have to take their specified lifetime into account where possible. The process parameters of each tool can be transferred to the cloud so that this data can be used or stored. This is made possible, for example, with Turck's inductive coupler. After a tool change, the tool and the cloud carry out a contactless exchange of the values, such as the operating time between each other. Users can then view in the cloud the number of hours in which the individual tools were used or the particular downtime of a machine.

Turck Cloud Solutions enable Velco to provide effective support today for its customers and reduce costs for service callouts worldwide

Digitalization "up to the last meter"

Connecting IO-Link and cloud services together – this is one strength of Turck's IIoT solution for companies looking for an end-to-end digitalization right through to the individual sensor in the machine. Whether for commissioning and maintenance, condition monitoring or process optimization, the potential of IO-Link devices can be used as required. The cloud used here brings device and machine data to the screens of different terminal devices. It provides information on limit value overshoots or faults and, thanks to its bidirectional IO-Link communication, is itself an active system node, such as for comparing device information in a database.

IIoT in practice

The company Velco GmbH in Velbert is an example of how today's users can already benefit from an end-to-end sensor to cloud solution. The pressurized vessel, rotor gunning machines and injection plants from Velco are used worldwide in blast furnaces, steelworks, foundries and in the refractory industry. In order to provide rapid support for users in the event of malfunctions, the special machines are provided with a remote monitoring function. As the previous solution could no longer meet the latest requirements, Velco now users Turck's cloud based solution.

One page in a web browser enables this solution to provide an overview of all machines. Nobody has to note any addresses and thanks to responsive design everything can be run from a smartphone. Velco's customers who often hire out their machines to end users call up the dashboard of the Velco cloud and see their machines listed in the navigation window. If an employee clicks on one of the entries in the list, the dashboard provides a clear overview of all the relevant data. Besides some analog values such as water pressure or material level, there are also digital indicators such as for operating state or the status of the emergency stop button. The user can also see an operating hours counter and other numerical displays. The dashboard can be made up very easily by the users themselves – with just a few clicks and without any programming knowledge. The specialists can also remotely control the Velco machines via the dashboard if this is required for troubleshooting. The support technicians thus see from their desk whether the most minor faults such as "missing water supply" or "Emergency stop button pressed" can be excluded. Thanks to the additional data, they are able to effectively support any further troubleshooting.

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