

more@**TURCK**

Pentathlete

IMX interface series offers a five-fold innovation leap in the disciplines: compactness, speed, accuracy, safety and globality



Modernizing the I/O Level

Users benefit from Turck's migration concept for replacing older control systems and renewing the I/O level

Control Cabinet in View

The IMX12-CCM control cabinet guard continuously monitors the relevant ambient variables in control cabinets and boxes

Mixed Double

Turck's dual and angle sensors reliably monitor the positions of butterfly valves or three-way flaps according to the application

A New Era



When the Achema fair takes place every three years, it's not only the chemical industry that is excited about the event in Frankfurt. For automation experts like us, the fair is always a focal point where we present our latest developments that are of particular relevance to users in the process automation sector.

One highlight at the Turck stand this year is without doubt the new IMX interface technology platform, for which the first devices are now being showcased in Frankfurt. Although Turck has been offering an extensive range of interface devices on the market for a long time, the IMX series represents the beginning of a new era. It is the result of many talks with people like you, who have explained to us their specific requirements. Consistently developed on the

basis of state-of-the-art electronics and with worldwide approvals, the devices offer you the highest level of investment security. The narrow 12.5 mm housing design also guarantees a high channel density.

Our cover story on page 4 explains in detail how you can benefit from the IMX series. However, this special edition of the more@TURCK customer magazine also gives you a brief overview of our portfolio for the process industry – from the excom multi-zone I/O system right through to the dual and angle sensors for monitoring the position of butterfly valves. You should also take a look at our brand new control cabinet guard on page 20. The device combines interface technology with sensors and thus enables the actual state of control cabinets or boxes to be monitored at all times without any major effort.

We will be glad if these articles give you one or two ideas or if you wish to speak with our process automation specialists about the specific challenges you face.

In the meantime we hope you will find the content of this magazine informative

Yours sincerely,

Ulrich Turck, managing partner

Content

COVER STORY

INTERFACE TECHNOLOGY: Pentathlete 04
Turck's new IMX interface device platform provides a five-fold innovation leap in the following disciplines: compactness, speed, accuracy, safety and globality

INSIDE

INTERVIEW: »Clever Migration Concept« 08
Dr. Ulla Reutner, editor in chief of the trade magazine P&A, speaks with Frank Rohn, vice president sales process automation, about Turck's I/O solutions for the control cabinet

TREND

I/O SOLUTIONS: At Home Everywhere 10
With its excom multi-zone solution Turck is offering a highly flexible I/O system for the process industry which allows tailored communication in any application area – from zone 1 and 2 right through to the safe area

APPLICATIONS

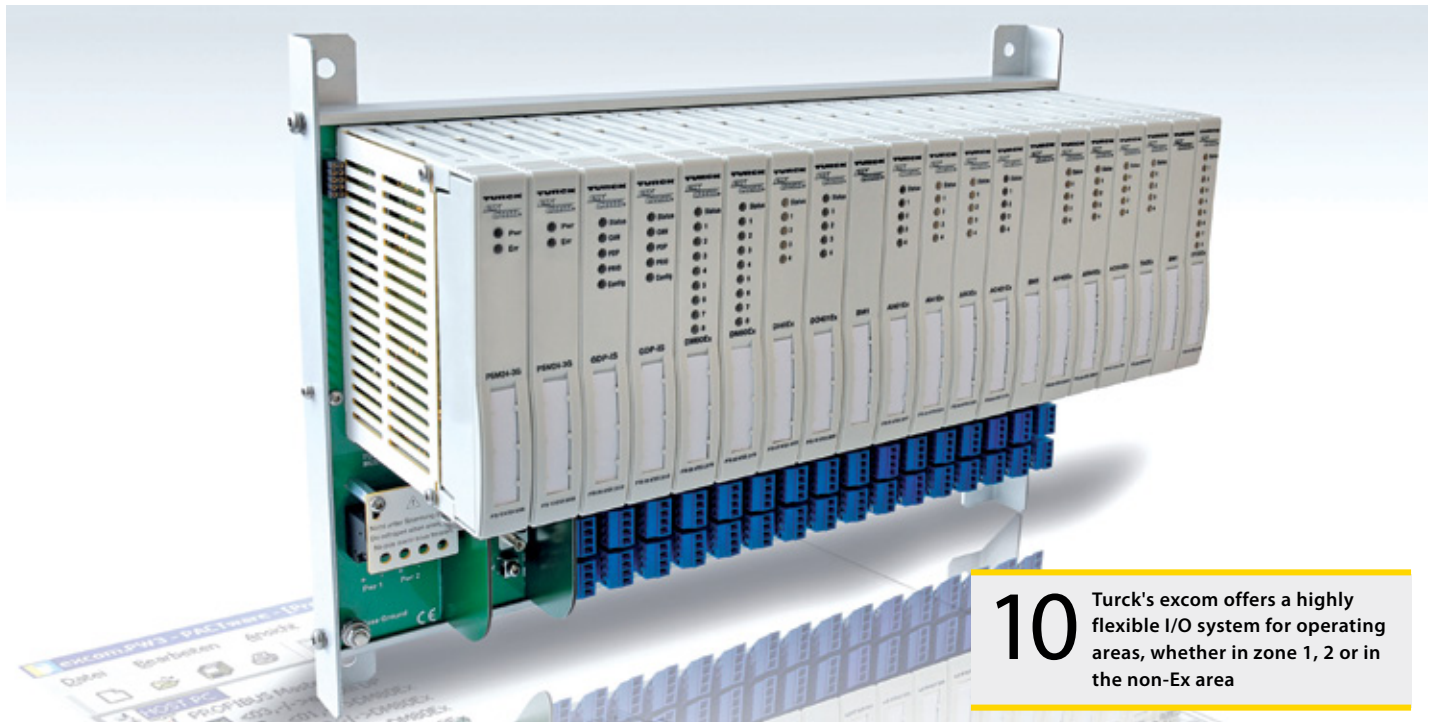
REMOTE I/O: Safe Burn Off 14
The acetic acid production plant of a Chinese company is using Turck's excom remote I/O system

REMOTE I/O: Valuable Waste 16
In biogas upgrading plants of Purac Puregas Turck's I/O-system excom enables convenient maintenance directly in zone 1

TECHNOLOGY

REMOTE I/O: I/O System on Board 18
Turck's I/O system excom with its MT16-2G/MSA rack has been certified for use on board ships by four major classification societies

SENSOR/INTERFACE TECHNOLOGY: Cabinet Guard 20
Turck's latest IMX12-CCM cabinet guard monitors the ambient variables inside control cabinets and thus sheds light on the blind spot between field device diagnostics and the control system



10 Turck's excom offers a highly flexible I/O system for operating areas, whether in zone 1, 2 or in the non-Ex area



20 The IMX12-CCM cabinet guard has temperature, absolute humidity and triangulation sensors on board

SENSOR TECHNOLOGY: Mixed Double 24
 Extensive dual and angle sensor series from Turck monitors flap and valve positions reliably to suit the application

SERVICE

CONTACT: Your fast route to Turck 26
 How, where and when to find us

CONTACT: Imprint 27



24 Intelligent concept: Dual sensors and the matching angle sensors for the binary or analog position feedback of butterfly valves or three-way flaps

Turck presents the first interface devices of the brand new IMX12 generation at the ACHEMA 2015

Pentathlete

Turck's new IMX interface device platform provides a five-fold innovation leap in the following disciplines: compactness, speed, accuracy, safety and globality

A look at the development of interface technology will show that manufacturers and customers increasingly have three key requirements: Safety, particularly with regard to Ex separation and functional safety (SIL), the space requirement on the DIN rail, as well as performance – particularly with regard to the speed and accuracy of the devices. Although existing interface devices can meet these requirements to a certain extent, the possibility of their further development is normally limited.

For many years, Turck has offered a wide range of interface devices on the market which have also been continually adapted to the latest developments. However, it is only with a completely new electronic platform that a manufacturer can offer future-proof innovations based on state-of-the-art technology, which can provide customers with investment security for the next decade. Turck has therefore invested a

great deal of time and money in the development of a completely new generation of interface technology. Having rigorously tested the IMX series and having acquired an extensive range of approvals for it, the Mülheim-based automation specialist is launching the first devices of the new IMX interface platform at the Achema 2015. This not only sets new standards in terms of the traditional issues of safety, space and performance already mentioned, but also opens up new markets, such as in mobile equipment, thanks to its 10...30 VDC capability.

Functional safety and Ex separation

The issue of functional safety has grown in importance in recent years. In the beginning, safety integrity levels (SIL) had been equated with quality. However, plant operators have gradually developed a greater understanding of safety in their applications. Manufacturers



have consequently had to meet these resulting challenges. Turck directed its development process for the new IMX series completely in compliance with the requirements of IEC 61508. Recognized independent bodies have certified this process. The comprehensive manuals and commissioning guides support customers in the operation of the devices in functional safety circuits.

Global approval portfolio

Ex approvals can also present a challenge, particularly when the same device is required for use in different countries. Unfortunately, the Ex approval world is not as uniformly harmonized worldwide as in Europe, where the ATEX directive is applicable in all countries. Different continents mean different standards. The challenge of all device manufacturers is to cover the different requirements of all relevant Ex approvals

QUICK READ

Proven technology has advantages and disadvantages: Although it may be well-established and fully mature, at some point it cannot be developed any further. If additional performance is required, the only solution is a consistent innovation using the latest technology and providing customers with security for the next decade.

Turck is meeting these requirements with its new IMX interface series, which will be premiered at the Achema fair. With more compact housing dimensions, more accurate and faster devices, SIL2 certification and several international Ex approvals for worldwide use, Turck is raising the standard for interface technology to a new level.

The devices of the IMX12 series can be used seamlessly in a voltage range from 10 to 30 VDC. This therefore opens up the possibility of use in new applications that are supplied from batteries, PV collectors or small wind turbines.



combined – preferably in one device. This is what Turck has managed successfully with the IMX series: The devices have been comprehensively approved for Europe, North America, South America, China and Asia and are provided with UL, FM, ATEX, Nepsi, Kosha, Imetro and IEC-Ex certification. Shipping approvals will also be available in the near future. The global approval portfolio of the IMX series enables the customer to operate the devices reliably at different locations worldwide.

Minimum space requirement

Whilst Turck's MK series required almost three centimeters in width for nearly twenty years in order to process one temperature signal, the current IM series only requires 18 millimeters for the same task. The new IMX series now only requires 6.25 millimeters per temperature signal. Thanks to the small 12.5 millimeter housing width, and up to four terminal banks per side, these devices achieve a channel density that is unrivaled on the market. The space requirement on the DIN rail for the isolating switching amplifiers with a relay output (2-channel 4-wire resistance temperature sensors) has even been reduced to half of that required by the IM series. Thanks to the four removable terminal banks, only those terminals concerned have to be removed, even when replacing three-wire sensors.

Maximum accuracy

Turck has managed to increase the performance of the new series in spite of the small mounting width – in terms of accuracy as well as in terms of speed. This is highlighted particularly with the IMX12-AI EX analog signal isolator. The new electronic design makes it considerably less sensitive to external factors such as temperature or voltage fluctuations. The effect of the interface device on the overall performance of a complete measuring circuit is thus considerably reduced. The device operates much more accurately

and thus meets the increased demands of the field devices for accuracy.

However, the linearity error of the devices is not the only factor considered with regard to accuracy. Many other error factors, which often only appear in the small print of the manufacturers' data sheets, should also not be ignored. Data sheets cannot be used as the sole basis of device comparisons. Ambient influences such as temperature, power supply fluctuations or changes in the connected load can have a considerable effect on the performance of devices. Turck specifies these errors and field conditions, and includes effects such as repeatability and hysteresis in the total error calculation. The so-called total performance is calculated from this together with the temperature coefficient. It does not reflect abstract laboratory conditions but the performance in the field. It has been verified that the analog signal isolators and temperature measuring amplifiers of the IMX series have the best overall performance in terms of accuracy of all 12.5 mm interface devices.

15000 Hz measuring frequency

The IMX12-DI EX isolating switching amplifier also offers maximum values in terms of speed. Input frequencies, which were previously the reserve of special frequency transducers, can be transferred inexpensively, reliably and in a minimum of space. With up to 15,000 Hz, measured values can be optimally resolved, enabling precise measuring without the negative effect of a signal conversion. Thanks to the high measuring frequency, analog measuring values can be transferred with a high resolution and accuracy. The normal temperature coefficient, which usually has a considerable influence with analog measurements, is unnecessary. No other isolating switching amplifier on the market can achieve this to date.

Process industry, skids and stand-alone units

The process industry, with the chemical, pharmaceutical and oil and gas sectors in particular, are the principal target sectors for interface devices. A new special feature of the IMX series will enable Turck to also provide solutions that were previously not possible in some applications: The devices of the IMX12 series can be used seamlessly in a voltage range from 10 to 30 VDC. This therefore opens up the possibility of use in new applications that are supplied from batteries, PV collectors or small wind turbines. This possible use in smaller mobile and autonomous installations makes the IMX devices particularly interesting for manufacturers of small to medium-sized plants. Thanks to the international approvals available, manufacturers of centrifuges, decanters or biomass power stations can use the new interface devices in plants for worldwide export.

Growing portfolio

Besides devices for standard digital input/output signals and analog input/output signals, the range of the IMX12 product series includes temperature



Up to four 2-pole terminals – each on the Ex and non-Ex side – can now take 2-channel temperature measuring amplifiers in 4-wire PT100 connection technology

measuring amplifiers and speed transducers in different designs. Turck is presenting the first devices of the IMX series at the Achema fair: the IMX12-TI 2-channel temperature measuring amplifier, the IMX12-DI Ex isolating switching amplifier, the IMX12-DO valve control module, as well as the IMX12-AI EX HART analog signal isolator and the IMX12-AO HART output analog signal isolator. The IMX series will then later be expanded into a complete interface device series which meets all the requirements of the target markets also in the coming years. In other words, long-term investment security for customers is absolutely ensured.

Author | Klaus Ebinger is product manager interface technology at Turck

Infos | www.turck.com/imx

Webcode | more31500e



Mr. Rohn, when it comes to replacing outdated control systems what are the main critical factors involved?

Apart from the choice of control system supplier, the most important issue for many users is choosing the right technology for connecting the field devices. Shall I use the fieldbus technology, remote I/Os or interface or system I/O solutions? We can recognize a clear trend here: More and more users are becoming interested in system or remote I/O solutions on account of their performance. We can identify here a significantly faster growth than in fieldbus technology.

What in your view are the arguments against the use of fieldbus solutions?

Besides the use of special transmitters, fieldbus technology also requires specially trained maintenance personnel with fieldbus know-how. With I/O solutions, it is only necessary to measure 4-20 mA. Furthermore, with the right I/O systems, you can also use Hart and implement efficient asset management. You have

almost the same functionality as with the fieldbus, but have no problems when incorporating new field devices. With I/O systems you can send hundreds of signals to the control system via one connection. With a fieldbus, a maximum of ten signals per segment is possible. A new segment must then be sent to the system. This can only be achieved with a complex topology. Parallel wiring is often also required since the fieldbus technology does not allow for simple signal types.

What is the difference between system I/O and remote I/O?

With conventional remote I/O technology, point-to-bus, you reach the installation via Profibus in order to access the remote I/O to which the signals of the field devices are sent. By system I/O we understand our solution for positioning I/O systems including the Ex isolation directly in the control cabinet and connecting them with control systems. Here we replace the control systems own I/O level and if necessary the separate Ex isolation.

What is the reaction of the control system manufacturers to this concept?

The control system manufacturers also benefit from our approach since they have lost some projects with their own I/O cards, because the overall solution simply became too expensive, too large or too slow. They became more competitive when they used excom as the I/O level.

And how can the user benefit by this solution?

A system I/O solution is not only more attractive than the I/O levels of control systems in terms of price. The user also saves space and can always use the same cards with our excom system, regardless of which control system is connected and whether excom is used as a system or remote I/O. This means simple engineering, also with standard 4-20 mA technology. The system is easy to expand and we can bring Hart signals right up to the control system. You then also have a diagnostics function for the transmitters already locat-

»When replacing legacy control systems together with an I/O level, users benefit from our clever migration concept.«

Frank Rohn | Vice president sales process automation | Turck

The replacement of older control systems and the associated updating of the I/O level are issues currently facing many process automation engineers. Frank Rohn, vice president sales process automation at Turck, promises that with the right migration concept and the portfolio required for this, users can retrofit their plants without any major mechanical effort.

ed in the field. The high speed backplane bus enables us to achieve very good cycle times.

You promise a very clever migration concept. What do you mean by this?

Firstly, we offer excom as a universal I/O solution that can be used both in the non-Ex area as well as in zones 2 and 1. The user can thus deploy the same system in the field as remote I/O or in the control cabinet directly at the control system. This is the success of excom, it is an all-round complete system that has everything: Racks, power supply units, standard I/O modules – with or without intrinsic safety – identical engineering, and last but not least all approvals, since recently even for use on ships. excom is the latest state of the art, and there is currently no better system on the market. In migration projects there are also two more points to be considered: Our solution is compact in the 19" format so that old technology can be replaced without any major mechanical effort required. Furthermore, we offer if necessary com-

plete pre-wired control cabinet solutions via our subsidiary Turck mechatec.

What do you mean by major mechanical effort?

Where previously around 150 control system I/Os could be installed in one cabinet, excom allows up to 720. As the excom racks are based on the 19" format, the user can simply remove his own I/O cards in 19" racks and mount the excom stations. This saves three or four cabinets and enables both the I/O card of the control system and also the I/O level to be installed in one cabinet. We have been successful in many branches in the process industry with this concept – from the pharmaceutical sector right through to the oil and gas industry. There are now over 10,000 excom stations in operation worldwide in completely different application fields, connected to all sorts of different control systems. Naturally many customers also fit excom in new installations but the major business currently involves migration. Our BL20 I/O system can also be an interesting alterna-

tive to excom here if the features of intrinsic safety and continuous availability with redundant systems are not so important in a process plant.

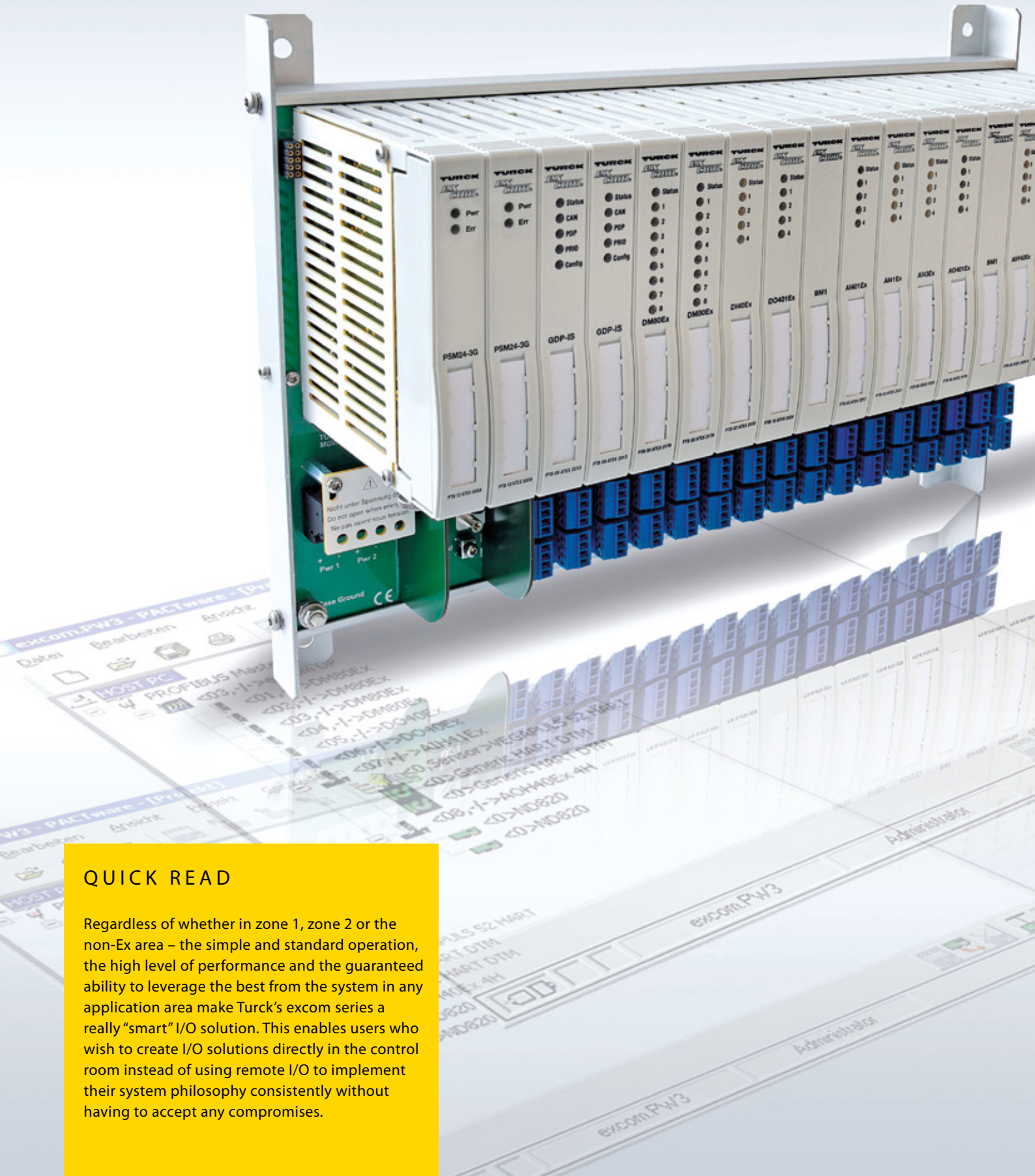
As BL20 comes from the field of factory automation, does the system also meet the requirements of process automation?

You are right. BL20 was originally developed for manufacturing automation. However, unlike our competitors in this sector, we have further developed this solution with our process technology know-how and now offer a Hart card, for example, or the possibility of hot plugging, i.e. removable or pluggable modules. This enables a card to be replaced quickly without any effort. Last but not least, BL20 ensures optimum integration in control systems since we also use a DTM – exactly as with excom.

Author | Dr. Ulla Reutner, chief editor at trade magazine P&A, conducted this interview

Web | www.pua24.de

Webcode | more31530e



QUICK READ

Regardless of whether in zone 1, zone 2 or the non-Ex area – the simple and standard operation, the high level of performance and the guaranteed ability to leverage the best from the system in any application area make Turck’s excom series a really “smart” I/O solution. This enables users who wish to create I/O solutions directly in the control room instead of using remote I/O to implement their system philosophy consistently without having to accept any compromises.

At Home Everywhere

With its excom multi-zone solution Turck is offering a highly flexible I/O system for the process industry which allows tailored communication in any application area – from zone 1 and 2 right through to the safe area

The process is actually simple: The further the I/O level is extended into the field, the less wiring is required for connecting the field devices to the control system of an installation. Normally a remote I/O station only requires one bus cable – or two with redundant designs – to be routed from it to the control system. Remote I/O solutions also normally save space in the control room because the I/O level is moved to the field. These solutions are also easy to plan.

excom for the Ex area

Turck's excom has already provided this kind of remote I/O system for use in zone 1 for the past fifteen years. The system transmits the process and diagnostic data of the periphery and communicates, if necessary, with the HART field instrumentation. This provides the control system with additional information on process values, diagnostics and asset management directly in digital form. Furthermore, this is provided in a topology that requires considerably fewer bus cables than the H1-based Foundation Fieldbus and Profibus PA fieldbus systems. Compared to system I/O solutions in the control room, the wiring requirement is much smaller.

The excom family offers a compact module rack and power supply units for use in the safe area

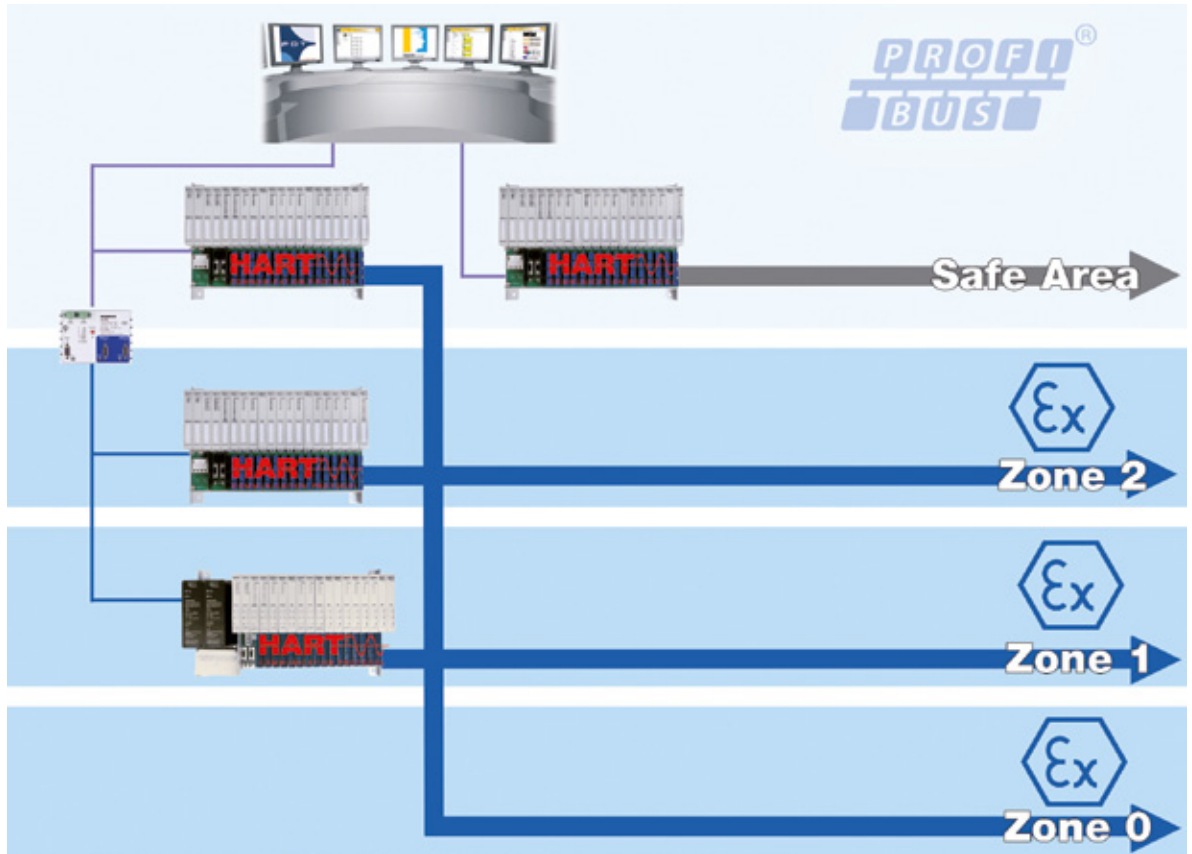
excom for the control room

However, not all users share the preference for I/O installations in the field. Some customers in Germany, as well as some manufacturers in Asia, place importance on having their entire I/O technology directly in the control room and connected to the DCS solutions. The reasons for this are multiple. Wage costs for wiring the field devices in Asia are less expensive than in Europe. The cost saving benefit resulting from the reduced wiring of a remote I/O solution is therefore less significant. Turck has been meeting the demands of this trend since 2012 with an extended excom portfolio, which since then also offers excom solutions for the non-Ex area and therefore also optimally caters for these system I/O applications.

Flexible application scenarios with one series

The use of excom as a system I/O, like the use of excom in the Ex area, provides the benefit that a separate





interface technology for galvanic isolation or Ex separation is unnecessary. The little planning and space required compared to conventional interface technology applications therefore also pays out here.

The functions and handling of the system are the same for both types of installation. There is a standard structure and operating philosophy, both for the integration in the DCS system as well as for DTM-based asset management. The system can in all cases be maintained and modified during operation. This applies both to adding individual measuring points as well as to extending a system with additional modules. The tried and tested redundancy options of excom are also fully supported.

A standard Ex-i periphery supports signal processing and field device control from zones 0, 1 and 2. If this periphery is installed in zone 1 and 2 in order to detect signals as closely as possible to the location of the instrumentation, a specially optimized power supply unit is available for this application, which generates an intrinsically safe system voltage. The interface to the fieldbus, in this case Profibus DP, is also intrinsically safe. This configuration enables the entire system to be fully maintained during use in the Ex area.

The identical Ex-i periphery can now, however, also be used in the non-Ex area. The high signal density of excom can offer here the possibility of operating up to 24 I/O modules, which further reduces the basic installation costs. The special power supply unit for this application area makes the entire system considerably

more compact. A special gateway provides the necessary protection of the Ex-i periphery to the bus so that a separate segment coupler is not required for implementing the intrinsically safe physical bus characteristics of RS485-IS.

Offer for the safe area extended

Even with exclusively non-Ex area applications, the user benefits from the advantages of the excom family: Two modules for digital 24 VDC signals were recently added to the range. A separate module for this purpose in the safe area has not been available to date. The new modules now close this gap. The DO80-N is suitable for connecting 24 VDC 3-wire digital sensors in

Free choice: The excom family offers tailor-made modules for any location

SMART SYSTEM I/O

Wherever redundancy is an important issue in plant communication, the right excom system can be operated according to the specific application requirements, regardless of whether as a classical remote I/O solution or as a cost-optimized I/O level of the control system. For installations in which redundancy is not required, Turck also offers the BL20 I/O system, which originally comes from factory automation but which was enhanced for use in the process area, such as with HART transparency.

Turck has been meeting the demands of the trend to use more I/O solutions directly in the control room with an extended portfolio, which also offers excom solutions for the non-Ex area and therefore also optimally caters for these system I/O applications.

PNP or NPN versions. Turck is now also offering a suitable module for digital output signals in the safe area. The DO80-N 24 VDC output supplies 24 VDC with 0.5 A. Its short circuit protection can be configured as locking or non-locking in order to adapt it optimally to the application at hand.

Both modules are therefore ideal for migration projects since their switching behavior can be adapted to the application in the controller. The DI and DO modules guarantee the reliability of the process information by monitoring your communication and also the auxiliary supply. Even loose contacts are reliably detected and signaled on the DI80-N.

TI41 new for the Ex area

The excom portfolio is also being continuously expanded for the Ex area, and Turck recently optimized the TI41 module for temperature signals from Pt100, Cu100 and Ni100 sensors. Its electronics was streamlined compared to the previous version. Although thermocouples cannot be connected to the TI41, it offers greater precision for highly accurate temperature measuring. The leaner electronics circuit also offers a cost saving benefit for the user.

New firmware and new DTM

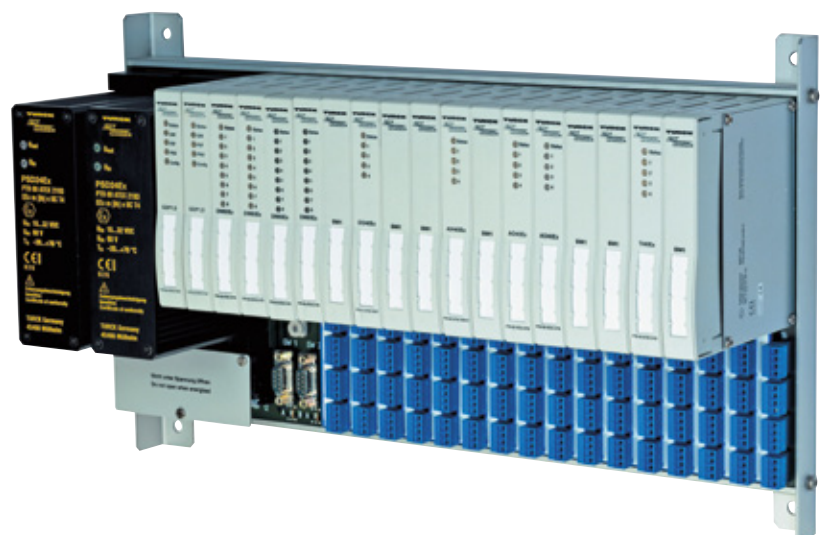
In terms of software, Turck has expanded the functionality of the gateway firmware and the DTM. The GDP-IS FW 2.3 firmware for excom in zone 1 now supports all new modules. Information and maintenance functions can now also be integrated in compliance with the profile. The new software now makes excom open for DD based asset management, such as for the predictive maintenance of field devices. HART protocols are tunneled to the field device in compliance with the profile. The new DTM likewise supports all new modules. The overview of the system status was improved with an enhanced diagnostics view. General systems states are now supported better with a DTM-based access.

Module rack for eight modules

Turck is offering in the range a particularly compact module rack for smaller installations in the field. The MT08 offers space for eight electronic modules and like other module racks guarantees a high availability thanks to a redundant power supply and redundant communication modules.

The housing series for the module racks has also been standardized. The depth of all variants is 260 millimeters with the corresponding widths of 460, 650 and 800 millimeters for excom installations with 8, 16 or 24 modules. The flange plate on the bottom can now be replaced in order to adapt the cable routing to individual customer requirements. The standard flange plates provide space for up to 120 M16 or M20 cable glands and can now be replaced individually.

Author | Peter Praske is product manager fieldbus systems process automation at Turck
Webcode | more31505e



Turck has been offering the excom I/O system for use in zone 1 for the past fifteen years

Two excom stations are installed in control cabinets at the foot of the gas flare stack



Natural gas flare stacks are used in the petrochemical industry or other chemical plants to occasionally burn off any gas that is produced in the production plant. These natural gas flare stacks process the flare gas and other exhaust gases, and ensure the safety and stability of the entire process.

Customer requirement

The plant of a major Chinese coal and chemical company produces 400,000 tons of acetic acid a year. Flare stacks play a particularly important role here in ensuring the safety of the entire plant. During the production of acetic acid, excess gases must be flared off during specific process incidents. Otherwise the entire plant would be facing an incalculable risk. Conventional natural gas required to ignite the gas flare is also present in the gas flare stack, as well as other explosive gases. Intrinsically safe electronic components must be used in the hazardous area at the flare stacks.

A wide range of different field instruments, such as pressure and temperature transmitters, level transmitters, gas detectors, valve controls, solenoid valves and other instruments, are used at the gas flare stacks. In all, 44 measuring signals (sensor signals) and 39 control signals (actuator signals) have to be connected in the field to the DCS. In order to ensure the interference immunity of the signals, the customer required the galvanic isolation of the individual signals.

The enormous safety relevance of the gas stacks meant that the plant owner placed a great deal of importance on the standard and quality of the electrical components used. However, these components also had to be cost efficient and easy to maintain in spite of the high level of quality and reliability required. The gas flare stacks required the use of intrinsically safe technology due to the explosion protection specified.

The customer also required a redundant connection for the communication between the flare stacks and the DCS. As the flare stacks were located far away from the DCS, it must also be ensured that the data reaches the control system fast enough and vice versa in spite of the long signal distance involved.

Perfect combination

The customer uses two excom remote I/O stations from Turck for the connection of the 83 signals of the gas flare stacks. The system fully meets all the customer's requirements: The remote I/O station is compact, easy to install and can be implemented with explosion protection in Zone 1. excom can also be implemented with a redundant communication and power supply in order to provide the required level of failsafe performance. The customer was also impressed by the optocouplers used, which enabled the required communication speed to the DCS to be achieved. The optocouplers transfer the Profibus signal to the fiber optic cable for the long transmission section.

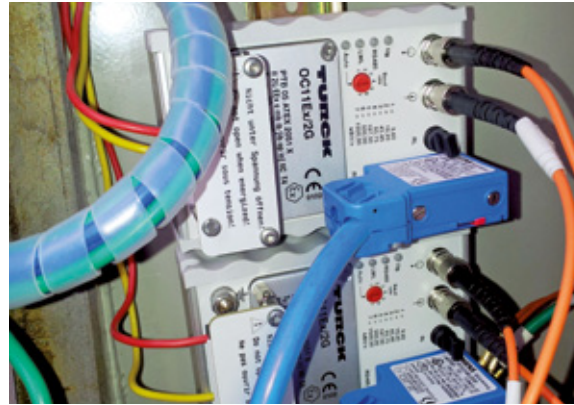
An excom station consists of the module rack, power supply unit, gateway and the individual I/O modules. With its diverse I/O modules the system

Safe Burn Off

The acetic acid production plant of a Chinese company is using Turck's excom remote I/O system



Other modules can be added to excom if field devices need to be retrofitted



The optocouplers bring the Profibus signal from excom to the DCS via fiber optic cables

offers outstanding performance and high channel density. With its safety barrier function, the I/O system can connect intrinsically safe field devices directly as the associated equipment. Unlike the standard I/O systems available that are isolated in groups, all I/O of excom come with integrated galvanic isolation for each individual input and thus provide the level of interference immunity required by the customer without the need for external signal isolators.

The excom system uses Profibus DP, a mature and reliable bus protocol which can transfer detailed diagnostic data as well as controlling and monitoring the field instruments. A redundant communication connection and power supply is provided throughout: starting with the power supply units and the gateways, to the optocouplers, right through to the redundant implementation of the DP communication modules of the DeltaV DCS from Emerson. If a field device fails, this is indicated by the DCS or the LED on the excom station. The technicians on site can swap the appropriate device during operation. The modules in the excom system can be fitted and removed during operation. This ensures that the communication with the field devices is absolutely reliable and fail-safe.

Another reason for the use of excom was the excellent scalability of the remote I/O system, an important requirement for the Chinese company. The connection of additional field devices only requires additional modules to be plugged onto free slots in the module rack. In order to make larger expansions, additional excom stations can simply be connected to the existing Profibus network. This considerably simplifies requirements for the designers and technicians of the customer when further expanding field communication during operation.

Signal conversion via optocouplers

The Chinese customer was also impressed by how simply the signals are converted from the copper cable to the fiber optic cable. The Profibus signal is sent to the DCS via two pairs of redundant optocouplers. "With Turck's excom system supporting the Profibus DP protocol and the system portfolio including redundant optical transmission, our requirements for long-distance communications are met perfectly," says

engineer Lei Zhang, responsible for the electrical engineering and instrumentation of the plant.

The benefit of the fiber optic connection is the fact that the OC11Ex/3G optocoupler on the DCS converts the electrical signal to an intrinsically safe optical signal that the customer can route in zone 1 to the second optocoupler (OC11Ex/2G). This converts the optical signal once more into an intrinsically safe electrical signal. This ensures the intrinsic safety of the entire Profibus network, as well as providing faster signal transmission via fiber optic cable. The optical signals are moreover completely immune to electromagnetic interference. Thanks to the high-speed fiber optic connection, all the field devices can be evaluated, monitored and if necessary controlled in the control center of the plant.

Conclusion

Compared to other remote I/O solutions, the Turck solution was more user-friendly, efficient and reliable for use at the gas flare stacks. The modular structure of excom reduces error sources and considerably simplifies maintenance as well as system expansion. These were the key benefits for the customer.

Author | Baolai Tian is PA product manager at Turck China in Tianjin
Webcode | more31550e

QUICK READ

A Chinese company uses Turck's excom for the redundant, safe and explosion protected connection of remote gas flare stacks to the central DCS of the plant. Two remote I/O stations at the gas flare stacks provide the connection of the field devices to the Profibus DP network. Besides the simple installation, expansion and maintenance of excom, the customer particularly appreciates the high-speed signal transmission to the DCS over large distances that the Turck solution provides.

Valuable Waste

In biogas upgrading plants of Purac Puregas Turck's I/O-system excom enables convenient maintenance directly in zone 1

Almost every human activity creates waste. But waste can be a valuable resource. Excess agricultural produce, manure, wastewater sludge, household and restaurant waste are perfect raw materials for biogas production. The biogas can be upgraded to pure biomethane, which is used as vehicle fuel or for injection into the natural gas grid. The digestion of organic solids produces raw biogas that contains 50 - 70 % biomethane, 30 - 50 % carbon dioxide and traces of sulphur, nitrogen and oxygen.

With its gas company Purac Puregas the Swedish Läckby Water Group offers biogas upgrading plants. The Purac Puregas gas plants take this raw biogas and upgrade it to practically pure bio methane. With its chemical absorption process, called CAPure, the plants remove carbon dioxide and hydrogen sulfur (H₂S) from the raw biogas. That increases the efficiency of the biogas plant and improves its ecobalance. The system

ensures that 99,9% of the methane in the raw biogas is upgraded to biomethane for commercial use. For big producers of natural waste like local waste management enterprises biogas production can be a useful renewable energy source.

Purac Puregas has found a way to limit the startup costs for biogas plants with a modular approach. Usually when customers want to enlarge their plant they have to build a complete second plant with a second control system and other elements doubling the existing plant. With the modular concept the customer only invests in the startup once. To enlarge the biogas plant later they add more gas skid modules to their existing plant. The skids are hooked up the existing plant and connected to the PLC-system and its Profibus. The single skids can be shipped like a container. By the current state Purac Puregas is the only biogas plant manufacturer with such a modular concept.

The whole biogas plant consists of three modules



excom for compressor room

For the gas plant of a local energy company in Sävsgö Purac Puregas looked for a better remote I/O solution for its biogas plant skids. In the compressor room of every plant module a remote I/O system in zone 1 collects all sensor and other signals from the hazardous areas. The former remote I/O could not be operated directly in zone 1. For maintenance, the customers always had to shut down the plant module and de-gas the compressor room. A lot of time, work and money were required - often for minor problems like, for example, a wire break.

Convenient maintenance

Turck introduced its remote I/O system excom to Purac Puregas. Unlike the system being used, excom can be mounted directly in zone 1. Additionally, the excom status LEDs are easily visible through the window of the stainless steel box the excom is mounted in. The electrical staff of the local waste company, for example, can now easily identify potential problems. And if necessary, the customer can get simple remote support just by calling Purac Puregas and describing what the status LEDs are signaling or the diagnostic messages show.

Most of the time Turck's or Purac Puregas' support staff can tell what the cause of the error is just by interpreting the LED signals. With the old I/O system a service engineer from Purac Puregas had to work on site. Today a phone call instead of a long distance maintenance visit is a very efficient way to solve problems. In case of a defect module, excom supports hot swap in run to change modules without downtime. This allows a defect module to be changed while the plant is still running quickly and efficiently; another feature the old remote I/O could not offer. Despite all those features Turck's excom still equals the price level of the customer's former I/O system.

According to Anders Rosengren, senior electrical engineer at Purac Puregas, the easy maintenance of excom was the major reason for the system change: "The well visible LEDs and the easier maintenance through hot swap in run were our main reasons for excom. Besides that, excom matches aesthetically. We try to build everything in stainless steel. With its designated stainless steel housing excom fits like a hand in a glove."

QUICK READ

The Swedish Purac Puregas company is an expert for biogas upgrading plants, which can upgrade biogas from fermented household garbage and other organical waste very efficiently into methane and CO₂. Purac Puregas recently improved the maintenance work for its gas plants with a new remote I/O system that met all their demands: Turck's excom system for use in hazardous and non hazardous areas.

BL67 withstands swedish winters

During the project Purac Puregas found other solutions in the Turck portfolio to enhance their gas plant. In the outdoor parts of the plant, at the CO₂-absorption tower, a fieldbus system has to connect several valve indicators to the Profibus of the PLC. Turck's modular fieldbus I/O system BL67 with a temperature range up to -40 °C can be used outdoors even in harsh swedish winters. The Profibus is connected to the PLC via the same node as excom. The Turck segment couplers SC12 provide the intrinsically safe Profibus. The direct outdoor mounting of the BL67 saves Purac Puregas the construction of a preheated control cabinet and that accounts for the energy efficiency of the gas plant as the preheaters would use energy themselves.

Another BL67 station connects digital and analog signals from several sensors and indicators in what is called the CApure room. BL67 could score especially with its modular architecture: If the plant is enlarged and sensors or actuators have to be added, the system can be extended easily. Another point is the easy connection of the periphery with ready-made cables with premoulded M12 connectors. No wiring or connection with a cable clamp or screw terminal is needed equaling more security and time efficiency. A sensor can be practically replaced within a few seconds.

Resume

This project demonstrates how a solution provider can win customers over. Starting with one product other helpful solutions come in sight. Today Purac Puregas is using Turck products in three automation layers. Beginning with sensors over the connectivity to segment couplers and also the fieldbus remote I/O solutions including BL67 and excom. For Purac Puregas,



»The well visible LEDs and the easier maintenance through hot swap in run were our main reasons for excom. Besides that, excom matches aesthetically. We try to build everything in stainless steel.«

Anders Rosengren,
Purac Puregas

Keeping cool: With a temperature range up to -40 °C Turck's BL67 I/O system resists even Swedish winters

export projects using the excom solution is a useful improvement. Whether in gas plants in Germany, Switzerland or other European countries: within one day the customer can get a Turck exchange product if needed. And in the future the company will also install Turck's DSU35 inductive dual sensors for rotary actuators for their valve indication.

Author | Thomas Pettersson is District Sales Manager at Turck Sweden

User | www.lackebywater.se

Webcode | more31551e

I/O System on Board

Turck's I/O system excom with its MT16-2G/MSA rack has been certified for use on board ships by four major classification societies



To connect several field devices on ships to the control systems, the system planner basically has several alternatives: interface, remote or system I/O and exclusively fieldbus solutions. The classical method of signal transmission is point-to-point wiring, i. e. interface technology. This transfers the individual measuring signal from a measuring instrument in the field directly to the PLC.

But especially on ships or oil platforms cabinet space is very limited what leads planners on ships to consider point-to-bus wiring – also called remote I/O or system I/O. The signals of the field instrumentation are collected on an I/O station, converted to a digital protocol and forwarded to the control system via a bus cable. In this way, the DCS only requires one communication interface instead of several analog or digital input and output cards.

Turck's remote I/O system excom is on the market for more than ten years now. Initially it was designed for process automation in high availability plants. Over the years the I/O solution turned out to be a success story for explosion proof areas where redundancy is

a must. As in process plants, redundancy usually is a must on oil platforms, LPG tankers or oil tankers and some other special purpose seagoing vessels as well.

Ship approval for excom

Turck has lately extended the range of its remote I/O system excom with a ship approval. The I/O system has been certified for maritime applications and can now also be used in applications requiring certification from Germanischer Lloyd, Det Norske Veritas, Bureau Veritas or Lloyd's Register. This includes, for example, the mounting in control consoles, housings or cabinets on board seagoing vessels, tankers or oil platforms. Specially for the increased requirements of the shipbuilding sector, Turck has designed its own mechanically reinforced module rack to thus ensure safe use on board.

Benefits on board

On ships, as well as in plants, excom can be installed in both zone 2 and in zone 1. All modules with intrinsically safe circuits through to zone 0 can be used in the MT16-2G/MSA module rack and are approved for use

QUICK READ

The I/O system excom has proved its benefits in many highly available plants in process industries. Since 2014 excom has been certified for marine applications by major classification societies. Its high availability and compact dimensions draw interest of manufacturers of oil and LPG tankers and other special purpose vessels with hazardous locations.



in the maritime environment. This benefits the user not only in terms of components optimized for a particular zone, but also because of the standard concept for configuring and parametrizing the periphery and field instrumentation. If this system is installed in zones 1 and 2, a specially optimized power supply unit is available that generates the intrinsically safe system voltage. The interface to the fieldbus, in this case Profibus-DP, is also intrinsically safe.

No additional housings needed

The excom system meets all relevant EMC requirements without the implementation of any additional measures, such as metal housings or EMC cable glands. So the installation in a control room is possible without any additional EMC protection. This allows to substitute conventional wiring via interface technology from the field device to the DCS. If the specific application requires the use of housings, these just have to comply with explosion protection requirements. The high density of the system reduces required cabinet space and excom can be mounted directly in the hazardous areas.

Plug and Play

Especially on vessels or on oil platforms downtime of the DCS is no option. excom perfectly meets this requirement with hot swapping and full redundancy. The system can be serviced and changed at any time. The I/O modules – including the power supply modules – can be plugged and unplugged during ongoing operation, even in zone 1, without disturbing the field communication.

Redundant power supply and communication

The system allows a fully redundant setup for the power supply and the communication interface. As a standard feature, excom also provides a system redundancy solution for the bus structure. This allows the redundant excom system to be connected via redundant bus technology to a process control system with a Profibus master. Thanks to the open standard and Turck's implementation of different redundancy concepts, the communication redundancy can be operated with any available DCS on the market.

Easy system integration

The excom system comes with an easy integration in DCS systems and its scan functionality allows to parameterize HART field devices before the DCS system is installed. The functions and handling are the same for all types of installation. There is a standard structure and operating philosophy, both for configuration using GSD files or DTMs, and for asset management. In all cases the system can be maintained and modified during operation. This applies both to adding individual measuring points, as well as to extending a system with additional modules.

Autor | Peter Praske is product manager fieldbus systems process automation at Turck

Webcode | more31572e

Turck's excom I/O system has been certified for maritime use by Germanischer Lloyd, Det Norske Veritas, Bureau Veritas and Lloyd's Register





QUICK READ

As part of the diagnostic monitoring of devices in the field and control level, it is often the transmission routes and interfaces that are ignored. On-site cabinets with I/O systems – particularly in legacy installations – are thus nowadays often the Achilles heel of the installation technology. Condition monitoring here was previously only often possible with considerable effort. Turck's IMX12-CCM cabinet guard offers an easy solution for reliable cabinet condition monitoring – also with existing installations. The device on the DIN rail monitors correct door closure, humidity and temperature, and outputs an alarm signal to the control level if the limit value is reached.

Cabinet Guard

Turck's latest IMX12-CCM cabinet guard continuously monitors the relevant ambient variables inside control cabinets and thus sheds light on the blind spot between field device diagnostics and the control system

Availability and reliability are parameters which are of prime importance for the operation of process plants – unscheduled downtimes considerably reduce profitability. For this reason, the operation of installations without any intelligent sensors is a rare occurrence nowadays. Besides the actual process parameters, additional information is sent to the control level simultaneously. For example, measuring ranges can be adjusted during operation or the state of the equipment can be queried. These features offer several benefits and increase the availability of plants. In recent years, considerable advances have been made, and field instruments have now been developed into real all-rounders.

If you consider the causes of unscheduled plant downtimes, you will often find that it is not faults in the instrumentation or control technology that stop the production process but the connections between the levels. The information routes, converters and connection points in the field are the elements which are found in analysis to be weak points. This infrastructure is mostly not suitable for direct exposure to the harsh ambient atmosphere that is very often found in processing plants. These devices are therefore installed in cabinets that protect them from humidity, temperature and other risks – such as mechanical loads.

Protection not permanent

As long as the control cabinet does not have any faults, the devices installed in them are well protected from external influences. However the protection offered can decrease as the period of operation and also the load increase. This can be due to mechanical damage, the aging of sealing material, but also human error such as incorrect closing. The cause may often involve creeping processes that lead to a failure of the devices installed in the control cabinets and thus also to a complete shutdown of the plant.

Modern electronic devices nowadays have their own onboard temperature monitoring. The measure-

The CCM multi-function sensor is adapted automatically to the local conditions. Any extensive programming for normal operation is unnecessary

Besides the interface technology, Turck's control cabinet guard offers a range of sensors which monitor the actual status of the environment: a temperature sensor, an absolute humidity sensor and a triangulation sensor were integrated in the IMX12-CCM.



ments monitor the temperatures at critical points on the PCBs. This data can for example be read via modern fieldbus systems and processed further. Whilst these are good features in principle, they ignore some important points: Not every plant concept is based on one fieldbus topology. In such cases, additional diagnostic information can only be supplied by providing additional interfaces on the devices. However, very few companies make the effort required and so plant sections without any particular

communication technology cannot be monitored. Furthermore, the temperature in the control cabinet cannot be derived reliably from the temperature on a printed circuit board. This particularly applies to large units. The measurement at a local hotspot can conceal the general temperature. The device temperature therefore provides little information about the condition of a control cabinet and could lead to incorrect interpretations. Moreover, temperature alone is not a parameter from which the general degree of protec-

tion of an enclosure or a control cabinet can be derived. Additional variables, such as humidity, light and position have to be integrated in the monitoring concept instead, in order to ensure optimum and reliable operation.

Condition monitoring for the control cabinet

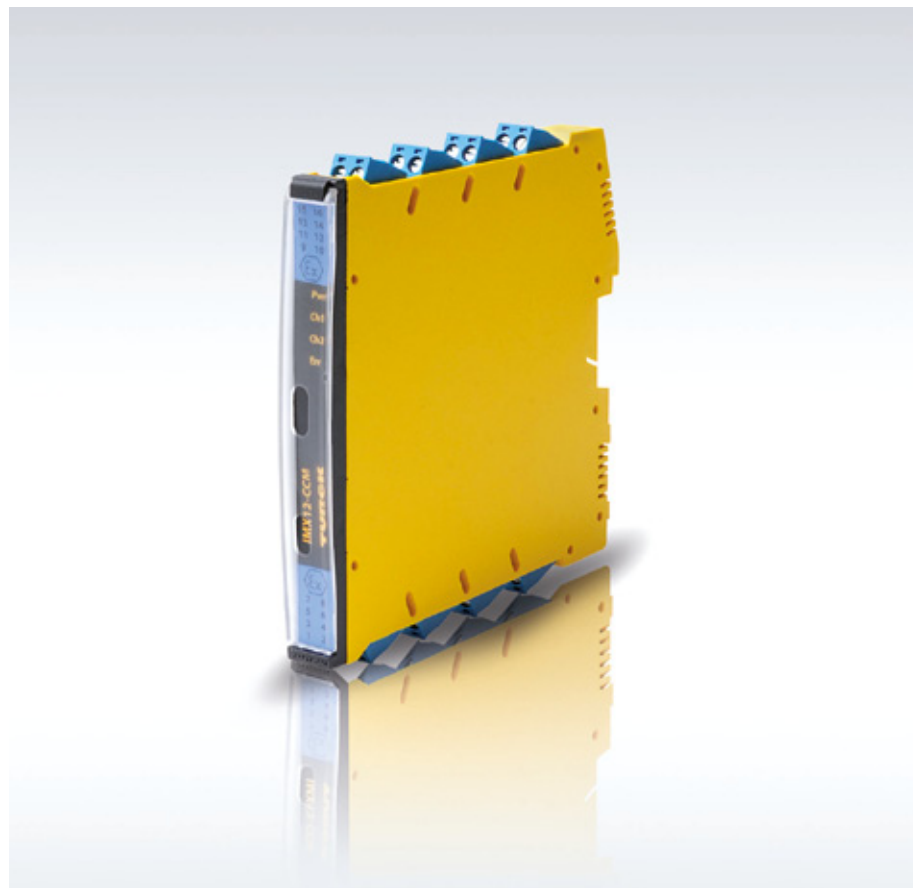
Turck has tackled this issue and developed a device which can be retrofitted in virtually any control cabinet or box, and which can be configured for the local conditions through a simple teach-in process. The new IMX12-CCM (Cabinet Condition Monitoring) cabinet guard indicates the degree of protection of the control cabinet with a single switch signal. The 18 mm wide device comes with an intrinsically safe 2-wire isolating transducer interface, thus enabling it to be used also in explosion hazardous areas. This means that only a maximum of four wires and available space on a DIN rail are required to install and commission the IMX12-CCM. The teach-in process can be carried out without the need for a computer or an additional tool. The standard HART interface is provided for additional diagnostic options, such as for reading out the absolute measured values.

Multi-functional device

Besides the interface technology, Turck's control cabinet guard offers a range of sensors which monitor the actual status of the environment: a temperature sensor, an absolute humidity sensor and a triangulation sensor were integrated in the IMX12-CCM. This last sensor measures the precise distance to the cover or door. If the door is not closed correctly, the device indicates this condition and the operator can rectify the fault directly.

As humidity in closed systems is a recurring problem, its continuous monitoring is an important aspect of condition monitoring. The cause of humidity can be seals which have become porous and leaky due to environmental influences, or also faulty ventilation systems. Humidity increases slowly but constantly, and can suddenly cause a device failure. As these effects are mostly only detectable over a long period, the IMX12-CCM monitors these long term trends and outputs a signal to the control level if limit values are exceeded, in order to deal with instrumentation failure in advance. The cabinet guard continuously processes the recorded data of the sensors and compares it with the taught safe condition. As soon as defined limit values have been exceeded, this is indicated to the control level via a potential-free contact. This enables interventions to be made quickly and effectively.

The basic version of the IMX12-CCM will be available beginning in 2016. Another variant will follow which, besides the integrated sensors, also offers the possibility to connect external sensors and integrate them in the monitoring concept. This enables users to also monitor large control panels. The relevant parameters are measured at defined locations and the door locking is monitored with reed contacts. The measuring of additional parameters such as shock and vibration is planned for the future, in order to ensure



that the protection of critical infrastructure is as comprehensive as possible.

Conclusion

The CCM cabinet guard is suitable for the continuous monitoring of protection in enclosures and control cabinets in the field, even in the explosion hazardous area. The simple mounting and integration in the existing topology enables it to be used not only in new installations, but also in existing plant sections. No additional cabling is required as the existing signal reserve can mostly be used. The combining of different parameters produces an optimum monitoring function and thus considerably improves the availability and reliability of the plant. The CCM multi-function sensor is adapted automatically to the local conditions. Any extensive programming for normal operation is unnecessary. More comprehensive diagnostics can be called up via the HART interface.

The 12 mm wide device comes with an intrinsically safe 2-wire isolating transducer interface, thus enabling it to be used also in explosion hazardous areas

Author | Klaus Ebinger is product manager interface technology at Turck

Webcode | more31570e

Mixed Double

Extensive dual and angle sensor series from Turck monitors flap and valve positions reliably to suit the application

Position feedback signals, such as the “open” / “closed” signals from butterfly valves and ball valves or valve position of three-way flaps, are extremely common in process engineering. The sensors required for this are generally installed in a plastic housing with a somewhat complex mechanical construction. The large diversity of individual components increases the price, usually requires costly readjustment work in order to set the switch points. The Atex guideline also stipulates that all the different components such as the housing, sensors or microswitches including their associated wiring, must be tested separately. Testing in compliance with the SIL Directive IEC 61508 further increases the testing effort and expense involved.

Well thought-out concept: The compact dual sensors and the angle sensors are identical in construction and can be fitted and commissioned quickly and reliably

Dual sensors for binary positions

When combined with the well thought-out actuating elements, Turck's dual sensors considerably simplify the detection of binary positions for a long time. The dual sensors come in a compact housing and offer an optimum range of connection options as well as being easy to install. The most important series of the dual

sensor range is the DSC26 housing style for the food industry and the DSU35 series for the chemical, petrochemical and pharmaceutical industry.

Depending on the safety position, both ‘spring opening’ and ‘spring closing’ drives are used in installations. In this case, around ten percent of the drives are clockwise rotating with the ‘spring opening’ function. For these special cases, customers of other manufacturers either have to use different actuating elements (pucks) or assemble the actuating elements manually. Both options have associated disadvantages, and often lead to unnecessary long downtimes when maintenance and service is due.

Flexible actuating elements

Turck has the solution for both these requirements: The BTS-DSU35-EB1 actuating element can detect both rotation directions. It has two actuating pins so that it can be used easily for both anticlockwise and clockwise rotating drives. It can also be read easily if it is has to be mounted horizontally due to lack of space. The position indication of the puck is clearly visible from all





Thanks to the extensive range of accessories, the dual sensor can also be fitted to a manual valve

sides and can be moved by 90° without any tools required.

Another special actuating element from Turck provides a solution for another special case: Sometimes applications require the use of NC monitoring. In such cases, it would also be possible to use specially designed sensors with an NC output. However, using Turck's actuating element, BTSDSU35-EU2, with an undampened end position is much easier. This inverts the detection of the end position and eliminates the need to change the sensor. This actuating element for undampened end positions can also be used to change the LED function of the Namur sensors. The LEDs on Namur sensors are lit when the sensor is not actuated. In this case, the 'Closed' LED is therefore lit when the valve is opened. The actuating element can thus be used to ensure the correct LED indication for the 'Closed' position. As previously described, this puck can also be used for anticlockwise or clockwise rotating drives.

The extensive range of accessories for the Turck dual sensors considerably expands their application range. The various actuating elements make it possible to meet a wide range of application requirements. Special stainless steel brackets enable the sensors to be fitted to even manual valves without any problem.

No problem with SIL

Often the greatest challenge facing plant engineers is not in the installation itself but in the office: The approval of the designs is often more complex than the designs themselves. Also here, the dual sensors are one step ahead of similar products: The SIL Directive

QUICK READ

Dual and angle sensors offer several benefits for the position feedback of automated butterfly valves and ball valves. They do not require a separate housing and allow easy handling in compliance with Atex and SIL requirements. Turck offers an extensive range of accessories to enable even special solutions to be implemented with standard sensors.

IEC 61508 calls for an increasing number of position feedback signals. Modular housings mostly fail here due to their mechanical complexity. Customized solutions are often difficult to handle due to their manufacturer-specific characteristics, and any 'second source' suppliers available are often not approved or are restricted to one type. In contrast, all standard Namur sensors from Turck are suitable and TÜV-certified for use in safety systems, including SIL2 in accordance with IEC 61508. 100 % compatibility with all standard Namur processor devices or (safety) PLC systems with Namur inputs is thus guaranteed.

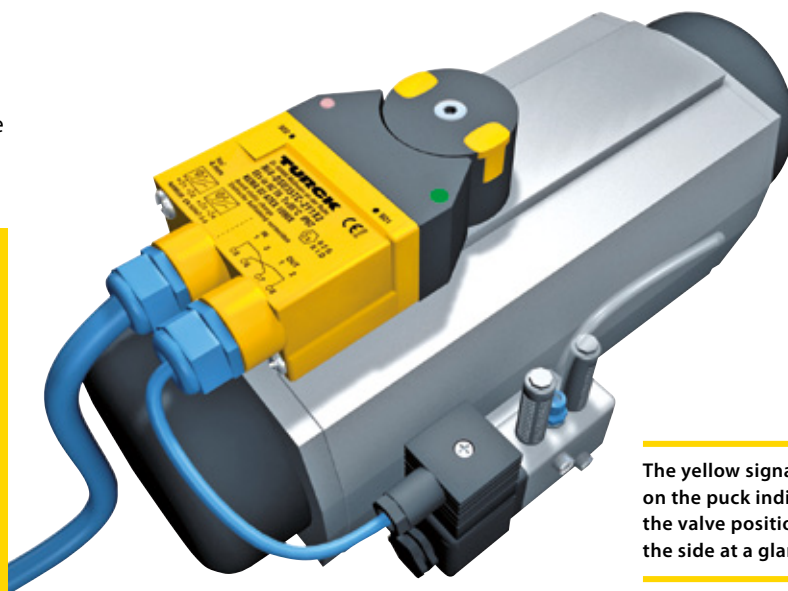
Angle sensors with analog output characteristic

Turck also offers robust and contactless solutions for capturing analog flap positions over the entire angular range: the Ri-DSU35 angle sensors and the well-established Ni4-DSU35 dual sensors are identical in construction. While dual sensors only capture two positions, the Ri-DSU35 sensors instead are able to monitor three-way flaps. For wiring into the Ex zones 1 and 21, we offer loop-powered intrinsically safe devices with a 4...20 mA output.

An additional benefit of the Ri-DSU35 sensor is the possibility to detect the valve position during cleaning cycles. This is only possible thanks to their 360° detection ability. The new sensors also contribute to a better system availability because they detect the wear of seals. Wear results from many switching cycles causing the ON/OFF positions to exceed the originally adjusted angular range.

The user also profits from the enormous mounting flexibility of the device. The sensor can be mounted on all standard rotary actuators with the extensive range of available accessories. For mounting on very large drives, you may possibly need additional accessories. For this, Turck offers stable spacer plates with the matching accessories. No matter how large the drive, always the same sensor-actuator combination is used.

Author | Sander Makkinga is product manager position and proximity sensors at Turck
Webcode | more31571e



The yellow signal pin on the puck indicates the valve position from the side at a glance

Trade Shows

At numerous national and international trade shows, Turck will introduce you to current product innovations and reliable solutions for factory and process automation. Be our guest and see for yourself.

Date	Trade Show	City, Country
15.06. – 19.06.2015	Achema	Frankfurt, Germany
16.06. – 19.06.2015	Expo Pack	Mexico City, Mexico
23.06. – 26.06.2015	Mioige	Moscow, Russia
14.07. – 16.07.2015	Semicon	San Francisco, USA
14.09. – 18.09.2015	MSV	Brno, Czech Republic
22.09. – 24.09.2015	hi Technology and Industry Expo	Herning, Denmark
28.09. – 30.09.2015	Pack Expo	Las Vegas, USA
07.10. – 10.10.2015	Convención Internacional de Minería	Acapulco, Mexico
13.10. – 15.10.2015	Elo Sys	Trenčín, Slovakia
20.10. – 22.10.2015	Distributed Control System	Miskolc-Lillafüred, Hungary
27.10. – 29.10.2015	Automation	Saint Petersburg, Russia
27.10. – 30.10.2015	Gastech	Singapore, Singapore
03.11. – 07.11.2015	China International Industry Fair	Shanghai, China
09.11. – 12.11.2015	Fabtech	Chicago, USA
11.11. – 14.11.2015	Adipec	Abu Dhabi, United Arab Emirates
24.11. – 26.11.2015	SPS IPC Drives	Nuremberg, Germany

The Net

On the Turck website and product database you will find all the relevant information about Turck's products and technologies, systems and industry solutions – from success stories to data sheets right through to the download of CAD data.

www.turck.com



Sites

With 28 subsidiaries and more than 60 branch offices, Turck is always nearby, anywhere in the world. This guarantees fast contact to your Turck partners and direct support on site.

GERMANY

Headquarters HANS TURCK GmbH & Co. KG

Witzlebenstraße 7 | Mülheim an der Ruhr | +49 208 4952-0 | more@turck.com

- **ARGENTINA** | Aumecon S.A.
(+54) (11) 47561251 | aumecon@aumecon.com.ar
- **AUSTRALIA** | TURCK Australia Pty. Ltd.
(+61) 3 95609066 | australia@turck.com
- **AUSTRIA** | TURCK GmbH
(+43) (1) 4861587 | austria@turck.com
- **BAHRAIN** | TURCK Middle East S.P.C.
(+973) 16030646 | bahrain@turck.com
- **BELARUS** | FEK Company
(+375) (17) 2102189 | turck@fek.by
- **BELGIUM** | Multiprox N. V. (TURCK)
(+32) (53) 766566 | mail@multiprox.be
- **BOLIVIA** | Control Experto
(+591) 4 4315262 | conexturck@controlexperto.com
- **BRAZIL** | TURCK do Brasil Ltda.
(+55) (11) 26769600 | brazil@turck.com
- **BRUNEI** | TURCK Singapore
(+65) 65628716 | singapore@turck.com
- **BULGARIA** | Sensomat Ltd.
(+359) (58) 603023 | info@sensomat.info
- **CANADA** | TURCK Chartwell Canada Inc.
(+1) (905) 5137100 | sales@chartwell.ca
- **CHILE** | Seiman S.A.
(+56) (32) 2699310 | ventas@seiman.cl
- **CHILE** | Egaflow S.P.A.
(+56) (9) 866 19642 | info@egaflow.cl
- **CHINA** | TURCK (Tianjin) Sensor Co. Ltd.
(+86) (22) 83988188 | china@turck.com
- **COLOMBIA** | Dakora S.A.S.
(+57) 8630669 | ventas@dakora.com.co
- **COSTA RICA** | TURCK USA
(+1) (763) 5539224 | usa@turck.com
- **CROATIA** | Tipteh Zagreb d.o.o.
(+385) (1) 3816574 | tipteh@tipteh.hr
- **CYPRUS** | AGF Trading & Engineering Ltd.
(+357) (22) 313900 | agf@agfelect.com
- **CZECH REPUBLIC** | TURCK s.r.o.
(+420) 495 518 766 | czech@turck.com
- **DENMARK** | Hans Folsgaard A/S
(+45) (43) 208600 | hf@hf.dk
- **Dominican Republic** | TURCK USA
(+1) (763) 553-7300 | usa@turck.com
- **ECUADOR** | Bracero & Bracero Ingenieros
(+593) (9) 7707610 | bracero@bracero-ingenieros.com
- **EGYPT** | Electric Technology
(+20) 3 4248224 | electech@electech.com.eg
- **EL SALVADOR** | Elektro S.A. de C.V.
(+502) 7952-5640 | info@elektroelsalvador.com
- **ESTONIA** | Osauhing "System Test"
(+37) (2) 6405423 | systemtest@systemtest.eem
- **FINLAND** | Sarlin Oy Ab
(+358) (10) 5504000 | info@sarlin.com
- **FRANCE** | TURCK BANNER S.A.S.
(+33) (0) 160436088 | info@turckbanner.fr
- **GREAT BRITAIN** | TURCK BANNER LIMITED
(+44) (1268) 578888 | enquiries@turckbanner.com
- **GREECE** | Athanassios Greg. Manias
(+30) (210) 9349903 | info@manias.gr
- **GUATEMALA** | Prysa
(+502) 2268-2800 | info@prysaguatemala.com
- **HONDURAS** | TURCK USA
(+1) (763) 5539224 | usa@turck.com
- **HONG KONG** | Hilford Trading Ltd.
(+852) 26245956 | hilford@netnavigator.com
- **HUNGARY** | TURCK Hungary Kft.
(+36) (1) 4770740 | hungary@turck.com
- **ICELAND** | Km Stal HF
(+352) 5678939 | kall@kmstal.is
- **INDIA** | TURCK India Automation Pvt. Ltd.
(+91) 7768933005 | india@turck.com
- **INDONESIA** | TURCK Singapore Pte. Ltd.
(+65) 65628716 | singapore@turck.com
- **IRELAND** | Tektron Electrical
(+353) (21) 4313331 | webenquiry@tektron.ie
- **ISRAEL** | Robkon Industrial Control & Automation Ltd.
(+972) (3) 6732821 | robkonfr@inter.net.il
- **ISRAEL** | Nisko Electrical Engineering & System Ltd.
(+972) (8) 9257355 | joseph.shapira@niskoeng.com
- **ITALY** | TURCK BANNER S.R.L.
(+39) 2 90364291 | info@turckbanner.it
- **JAPAN** | TURCK Japan Office
(+81) (3) 52982128 | japan@turck.com
- **JORDAN** | Technology Integration
(+962) 6 464 4571 | info@ti.jo
- **KENYA** | Westlink Limited
(+254) (53) 2062372 | sales@westlinktd.co.ke
- **KOREA** | TURCK Korea Co. Ltd.
(+82) (2) 20831630 | korea@turck.com
- **KUWAIT** | Warba National Contracting
(+965) 24763981 | sales.wncc@warbagroup.com
- **LATVIA** | Will Sensors
(+37) (1) 67718678 | info@willsensors.lv
- **LEBANON** | Industrial Technologies (ITEC)
(+961) 1 491161 | support@itec.liv
- **LITHUANIA** | Hidroteka
(+370) (37) 352195 | hidroteka@hidroteka.lt
- **LUXEMBOURG** | Multiprox N. V. (TURCK)
(+32) (53) 766566 | mail@multiprox.be
- **MACEDONIA** | Tipteh d.o.o. Skopje
(+389) 70399474 | tipteh@on.net.mk
- **MALAYSIA** | TURCK Singapore Pte. Ltd.
(+65) 65628716 | singapore@turck.com
- **MEXICO** | TURCK Comercial, S. de RL de CV
(+52) 844 4116650 | mexico@turck.com
- **NEW ZEALAND** | CSE-W Arthur Fisher Ltd.
(+64) (9) 2713810 | sales@cse-waf.co.nz
- **NETHERLANDS** | TURCK B. V.
(+31) (38) 4227750 | netherlands@turck.com
- **NICARAGUA** | Iprocen S.A.
(+505) 22442214 | ingenieria@iprocen.com
- **NIGERIA** | Milat Nigeria Ltd.
(+234) (80) 37236262 | commercial@milat.net
- **NORWAY** | HF Danyko A/S
(+47) 37090940 | danyko@hf.net
- **OMAN** | International Business Development LLC
(+968) 24487147 | ibd@ibdoman.com
- **PAKISTAN** | Speedy Automation
(+92) 51 4861901 | speedy@speedy.com.pk
- **PANAMA** | TURCK USA
(+1) (763) 5539224 | usa@turck.com
- **PERU** | NPI Peru S.A.C.
(+51) (1) 2731166 | npiperu@npiperu.com
- **PHILIPPINES** | TURCK Singapore Pte. Ltd.
(+65) 65628716 | singapore@turck.com
- **POLAND** | TURCK sp.z o.o.
(+48) (77) 4434800 | poland@turck.com
- **PORTUGAL** | Bresimar Automação S.A.
(+351) 234303320 | bresimar@bresimar.pt
- **PUERTO RICO** | TURCK USA
(+1) (763) 5539224 | usa@turck.com
- **QATAR** | Doha Motors & Trading Company WLL
(+974) 4651441 | dohmotor@qatar.net.qa
- **ROMANIA** | TURCK Automation Romania SRL
(+40) (21) 2300279 | romania@turck.com
- **RUSSIA** | O.O.O. TURCK Rus
(+7) (495) 2342661 | russia@turck.com
- **SAUDI-ARABIA** | Binzagr Factory
(+966) 3 8640980 | avig@bfim.com.sa
- **SERBIA** | Tipteh d.o.o. Beograd
(+381) (11) 3131057 | damir.veverka@tipteh.rs
- **SINGAPORE** | TURCK Singapore Pte. Ltd.
(+65) 65628716 | singapore@turck.com
- **SLOVAKIA** | Marpex s.r.o.
(+421) (42) 4440010 | marpex@marpex.sk
- **SLOWENIA** | Tipteh d.o.o.
(+386) (1) 2005150 | info@tipteh.si
- **SPAIN** | Elion S.A.
(+34) 932982000 | elion@elion.es
- **SOUTH AFRICA** | R.E.T. Automation Controls (Pty.) Ltd.
(+27) (11) 4532468 | sales@retautomation.com
- **SWEDEN** | TURCK Office Sweden
(+46) 10 4471600 | sweden@turck.com
- **SWITZERLAND** | Bachofen AG
(+41) (44) 9441111 | info@bachofen.ch
- **TAIWAN** | Taiwan R.O.C. E-Sensors & Automation Int'l Corp.
(+886) 7 7323606 | ez-corp@umail.hinet.net
- **TAIWAN** | Jach Yi International Co. Ltd.
(+886) 2 27312820 | james.yuan@jachyi.com
- **THAILAND** | TURCK Singapore Pte. Ltd.
(+65) 65628716 | singapore@turck.com
- **TRINIDAD AND TOBAGO** | TURCK USA
(+1) (763) 5539224 | usa@turck.com
- **TURKEY** | TURCK Otomasyon Tic. Ltd. Şti.
(+90) (216) 5722177 | turkey@turck.com
- **Ukraine** | SKIF Control Ltd.
(+380) (44) 5685237 | d.startsev@skifcontrol.com.ua
- **UNITED ARAB EMIRATES** | TURCK Middle East S.P.C.
(+973) 77 082882 | bahrain@turck.com
- **URUGUAY** | Fidemar S.A.
(+598) 2 402 1717 | info@fidemar.com.uy
- **USA** | TURCK Inc.
(+1) (763) 553-7300 | usa@turck.com
- **VENEZUELA** | CADECI C.A.
(+58) (241) 8345667 | cadeci@cantv.net
- **VIETNAM** | TURCK Singapore Pte. Ltd.
(+65) 65628716 | singapore@turck.com

IMPRINT

Publisher

Hans Turck GmbH & Co. KG
Witzlebenstraße 7
45472 Mülheim an der Ruhr, Germany
Tel. +49 208 4952-0
more@turck.com

Editorial Staff

Klaus Albers (responsible),
klaus.albers@turck.com
Simon Dames,
simon.dames@turck.com
Paul Gilbertson,
paul.gilbertson@turck.com

Contributors to this Issue

Klaus Ebinger, Sander Makkinga,
Thomas Pettersson, Peter Praske,
Dr. Ulla Reutner, Baolai Tian

Art Direction / Graphic Design

Arno Krämer, Britta Fehr

All rights reserved. We reserve the right to make technical changes or correct errors. Reprint and electronic processing permitted with written approval from the publisher.

Your Global Automation Partner

TURCK



D900921 1506



www.turck.com