

# WNIPT

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WHAT'S NEW IN  
PROCESS TECHNOLOGY

AUTOMATION + CONTROL +  
INSTRUMENTATION



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### Conference Highlights



**ROD GILMOUR**

Chairman, NSW Telco Authority  
*Strategic developments in  
operational communications*



**DALE MCFEE**

Deputy Minister of Corrections  
and Policing, Ministry of Justice,  
Government of Saskatchewan  
*The importance of information  
management in building a national  
community safety model*



**DECLAN GANLEY**

CEO, Rivada Networks  
*Dynamic spectrum arbitrage: a  
new model for building, sharing  
and paying for public safety  
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- Public safety mobile broadband: governance, operating models and funding
- Advanced radio over IP
- Today's communication market is all about usability, increased productivity and apps. How does DMR fit in this market?
- Dispelling the myths of microwave radio
- Evolutionary paths from 2G PMR to critical LTE

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WHAT'S NEW IN  
PROCESS TECHNOLOGY  
NOVEMBER 2015

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### NOW in DIGITAL!

Your copy of *What's New in Process Technology* is now available as an online eMag.  
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Since 1885, Mankenberg's German team of engineers have designed custom-engineered special valves for a wide range of industrial process applications.

From applications within industrial power plants, to the facilities of NASA, major oil and gas producers and the pharmaceutical industry, Mankenberg's designs and methods of construction bear no equal. In pharmaceutical plants, the pure steam generator is among one of the most important devices, because it serves to produce ultra-pure, sterile and pyrogen-free steam from fully demineralised water. The main component of the pure steam generator is a tube bundle heat exchanger connected to an evaporator with a high-volume water feed. Evaporation is done in the natural circulation mode. The device is heated with saturated steam which is not yet sterile, through the heat exchanger jacket. Pressure reducing valves reliably reduce the pressure of the steam which is conducted into the heating jacket as well as downstream towards the plant components.

To control this service, various sizes of Mankenberg DM 462 valves are used, with tempered electro-polished surfaces (up to  $Ra < 0.25 \mu m$ ) and all types of aseptic flanges, tri-clamps, or similar. Only pharmaceutical-compatible materials are used, with low delta-ferrite body and trim materials and FDA and USP-VI elastomers. They are designed also for use in specialty gases (Ar, CO<sub>2</sub>, N<sub>2</sub>, H<sub>2</sub> etc) and for ultra-pure water, injection water and chemical processes.

Such valves and other Mankenberg products have been designed also for sanitary CIP applications within the dairy, beverage and other food manufacturing industries, as well as animal food processing plants (TSE-free).

Powerflo Solutions Pty Ltd  
[www.powerflo.com.au](http://www.powerflo.com.au)



# INDUSTRIAL COMPUTERS AND THE IIoT

*John Wilhite, Jr, PC-based Automation Product Manager, Siemens Digital Factory*

The next level of industrial evolution is already here. How will you put all the new capabilities to work?





Industry 4.0, the next industrial revolution, is already underway. It is driven by the need for more efficient and cost-effective manufacturing. It will be supported by advances in automation as exemplified by the Industrial IoT and a shift to PC-based controllers.

Major advances in manufacturing are getting faster: if the first industrial revolution happened around 1760 with the advent of steam and hydropower, the second took more than 100 years to emerge with the development of mass production beginning around 1870. That lasted another 100 years until the third industrial revolution in 1970 as computers began to replace mechanical systems. Now, the fourth revolution is already here, and it's been less than 50 years. We're talking about Industry 4.0 and the Industrial Internet of Things (IIoT). Their effects will be bigger than the first coming of the computer to the shop floor and it will happen much faster.

Just as electronic sensors replaced pneumatics and CNC replaced cam-driven tools, smart devices using IP communication are already on their way to domination of the industrial landscape. Unlike earlier generations, people working today but nearing retirement have seen one revolution and will see this new one in their lifetime.

One of the main conceptual elements of the IIoT is the ability to have devices talking to devices, machine to machine (M2M). For many industrial users, this might not seem all that new or innovative at first blush. An oil refinery can have tens of thousands of devices communicating with control systems, and that sort of thing has been going on for decades. The difference now is that devices are becoming smarter with more information to exchange, and they will do it using IP communication. Every device will have its own IP address so it can be reached from anywhere via the internet. Users are only beginning to comprehend the full impact of this capability.

### Why digital matters

Devices used in manufacturing, whether process or factory automation, are getting smarter in the nature of what they can measure, how they monitor their own condition and how they communicate. A conventional dumb pressure sensor or proximity sensor converts a pressure or distance reading into an analog signal, but that's all. That may represent M2M communication, but only in

its crudest form. Analog communication, with all its limitations, is rapidly giving way to digital, and the effect is like trading two cans and a string for a smartphone.

Sophisticated devices need sophisticated controllers to get the most out of their capabilities. A PLC from 10 or 20 years ago is certainly capable of reading I/O and following program steps. However, manufacturing today goes beyond those simple requirements. A controller today must be able to handle the range of control functions needed now to execute the complex strategies needed to run digital factories. A new generation of controllers has emerged that combines the capabilities of the world's best PLCs with the versatility of a PC.

### Powerful device and controller combinations

The combination of the new generation of devices and controllers helps us create digital factories based on cyber-physical systems. While it's true that computers have been moving more to the shop floor since 1970, the nature of what they're doing is evolving very rapidly. Early PLCs weren't much better than the relays they replaced, but the things they could control changed and grew with technical developments and the ability for users to imagine how they could be put to work. The limits of human creativity had to be overcome before greater things could be realised, and we're still overcoming that today.

Think about a basic robotic operation. Traditionally, manufacturing robots are programmed to do the same operation again and again, day after day. But with new cyber-physical concepts, the robot and its controller can be programmed to look at its situation and decide what operation needs to be performed. As a simple example, let's say a conveyor can move a variety of bottles into a capper. They are the same basic shape but can be any one of five different colours. Each colour of bottle needs a matching colour cap. The cyber-physical system can look at each bottle and tell the robot to grab and screw on the appropriate colour cap. But that might not be enough.

The system can also look to make sure the bottle is not deformed, unlabelled or not filled to the correct level. Using information from a group of smart sensors, the same robot can grab bad bottles and pull them off the line. The system can be programmed to consider a whole range of possible situations and respond appropriately for each.





ONE OF THE MOST INTERESTING RECENT DEVELOPMENTS IS THE CONCEPT OF THE OPEN CONTROLLER. IT FEATURES THE SAME FUNCTIONALITIES AND FORM FACTOR AS A TRADITIONAL PLC, BUT AT THE SAME TIME IT IS A TRUE INDUSTRIAL PC.

### Smart controllers for smart applications

Creative users are finding new approaches to help manufacturing systems do more sophisticated functions in complex applications. New PC-based controllers are at the heart of these cyber-physical systems because of the variety of operations, field devices and communication protocols that may be necessary to make a complex operation possible. One controller may have to work with pressure and flow sensors, machine vision cameras, barcode readers, motor drives, valve actuators, robots and any number of other types of devices, simultaneously.

That variety of devices may depend on a variety of communication protocols from an analog current loop to multiple flavours of Industrial Ethernet. The speed of such systems depends on even faster protocol conversion so everything can work together and support the kind of production a manufacturer expects. Moreover, all those devices can send diagnostic information to a central location where it can be evaluated. It can send a message to its human operator or the maintenance department to say that an LED on the machine vision camera is about to burn out, or the cooling fan on the equipment cabinet is being clogged with dust. These preventive maintenance capabilities avoid failures and shutdowns during production times.

### Is it a PLC or a PC? Yes!

One of the most interesting recent developments is the concept of the open controller. It features the same functionalities and form factor as a traditional PLC, but at the same time it is a true industrial PC. On one end it has all the connectivity of a current model PC while on the other it has I/O card slots as expected on a PLC. That gives it the ability to work seamlessly with common industrial field devices or commercial peripherals, regardless of the communication protocols they use.

It can also function as a PLC and a PC at the same time. While it's running a machine as a controller, the hypervisor isolates the Windows system from the controller functionality, allowing the operator to perform completely different tasks simultaneously in Windows. The real-time operating system

working with a dual-core processor makes the separation between the PLC and Windows sides so complete that an operator can put Windows through a cold restart without affecting the machine control functions. Both sides of the controller can be integrated with enterprise-level systems as necessary.

From a functionality standpoint, modern industrial PCs can do anything a PLC can — with all the same capabilities and diagnostics. The lines between various types of controller families are quickly blurring as more units develop more capabilities.

Industrial users expect equipment to operate over the long haul, and there is a natural reluctance to embrace something that evolves as quickly as PC technology. In the world of IT, something that's been running for two years is considered old and after four years it might be obsolete. Siemens, for example, has agreements with Intel that will allow it to maintain availability of any industrial PC platform for at least 10 years. For most industrial PCs, that means an active selling period of five years, followed by full support for another five years.

### Looking ahead

All these elements — smart devices, PC-based controllers, cyber-physical systems and internet communications — are coming together to support Industry 4.0 and the current digital manufacturing revolution. Consider the following description of how a new product can be designed and produced.

Product designers will create the item on a computer, including all its component parts. The design platform will understand the characteristics of the individual parts, their materials of construction and the manufacturing processes necessary to produce them.

A product may involve components that are injection-moulded plastic, machined metal parts and others made from powdered metal or additive processes. The system will consider how all the elements relate and ensure each is structurally sound and capable of being built and assembled efficiently using the anticipated processes.

The design platform will take the next step and determine what is necessary to produce the components and final assembly.

It will determine if existing production facilities are up to the task, if specific elements need to be modified to make it more suitable or if it needs to create a completely new manufacturing line. The result will be a very clear and detailed picture of how the product can be made, including cost estimations and production rates.

Once production begins, all the information necessary to develop a service program will be available to support a product over its life cycle. All this can happen without the necessity of creating a single prototype. The product and its manufacturing processes are designed virtually using compatible software, and the manufacturing facility can be built also using compatible production equipment, controllers and software.

### On the manufacturing floor

Manufacturing facilities designed this way will be integrated like nothing before. Every device, down to individual sensors and actuators, will use IP communication and each will have its own IP address. Any individual with appropriate authorisation can access any device from any location using the internet, providing diagnostic and production-related information.

Production will be highly reliable thanks to diagnostic information feeding condition-based maintenance programs. Unplanned outages will be a thing of the past. Manufacturing systems will be seamlessly integrated with all other levels up to the enterprise and protected by sophisticated cybersecurity strategies. Companies with multiple locations can share information easily anywhere in the world.

Many of the technologies necessary to make this a reality are already available. Product design software running on industrial computers does the creating, and those same platforms can power and control manufacturing facilities. The last elements still to be realised are industrial sensors and actuators that communicate through the IIoT. The first waves are being designed and more will be on the way soon. The technical elements to make Industry 4.0 a reality already exist. Now all we need are manufacturers with the vision and creativity to put it to work.

**Siemens Ltd**  
[www.siemens.com.au](http://www.siemens.com.au)

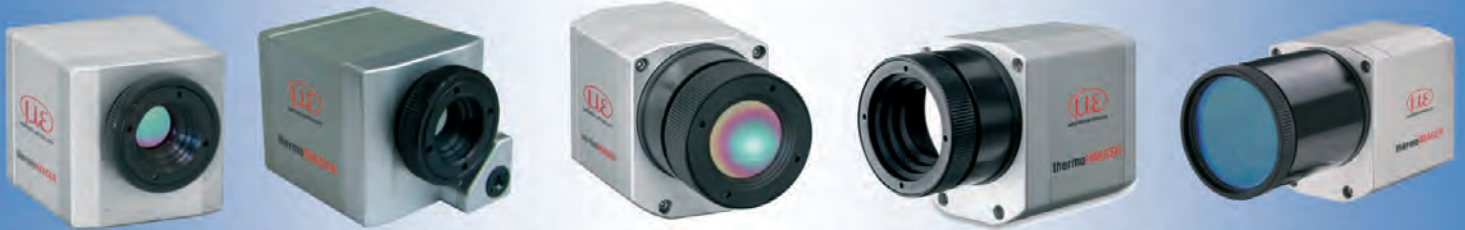


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### ULTRASMALL RFID READ/WRITE HEAD

Turck is now offering users the ultrasmall TB-Q08 ISO15693-compliant RFID read/write head with protection to IP67. In spite of its compact dimensions of 32 x 20 x 8 mm, the housing manages to integrate the antenna, electronics and two LEDs visible from all directions. The LEDs indicate a functioning power supply as well as active read/write operations to the user.

Due to its compact rectangular design and the 15 cm-long connection cable with an M12 connector, the TB-Q08 is particularly suitable for use in restricted mounting conditions, such as in small assembly and transport lines. The rugged and compact design also makes it suitable for tool or mould identification, such as in injection moulding or die stamping.

When combined with Turck's R10 and R12 tags, the TB-Q08 can be used in the identification of metal objects. The 10 and 12 mm diameter tags can be mounted directly in metal and are equipped with a chip that supports password functions. In conjunction with Turck's BL ident RFID system, the user can implement simple brand protection, access protection and access rights management.

**Turck Australia Pty Ltd**

[www.turck.com.au](http://www.turck.com.au)

### HAZARDOUS AREA ROUTING SWITCHES

The Westermo RedFox industrial ethernet switch range is now fully certified for use in hazardous areas. ATEX/IECEx certification by BASEEFA enables the Layer 3 switches to be installed in potentially explosive atmospheres typically found in oil and chemical processing plants, sewage treatment and gas distribution centres, sugar refineries and grain handling locations.

RedFox is powered by Westermo's WeOS network operating software, which is now available for 70 different products within the Westermo range. WeOS has been developed to allow cross-platform and futureproof solutions. WeOS is claimed to deliver unique IP security functionality for this class of product, while secure remote access to a network can be provided using encrypted VPNs.

As a Layer 3 routing switch, RedFox delivers enterprise-type routing functionality, utilising industry-standard protocols such as OSPF, RIP and VRRP should a failure occur within a ring network.

Westermo's FRNT protocol rapidly reconfigures (around 20 ms) the network to ensure the process can continue. This helps to minimise any disruption to operations and ensure resilient networks can be constructed.



RedFox has a wide power range of 19–60 VDC on dual power inputs for resilience, and requires 30% less power than the previous generation of products. It also has a wide operating temperature range of -40°C to +70°C, making it suitable for extreme environmental conditions. Because it has no moving parts or cooling holes in the aluminium enclosure, the reliability of the switch is maximised, providing an MTBF of up to 388,000 h for ATEX/IECEx approved models.

**Madison Technologies**

[www.madisontech.com](http://www.madisontech.com)

### HMI RANGE

Monitouch has introduced the V9 series of HMI screens. To cover a broad range of industry applications, Monitouch has introduced the V9 Lite, V9 Standard and the V9 Advanced models. The V9 series ranges in size from 5.7" to 15". All models in the V9 Series are UL certified and come standard with onboard Ethernet ports and SD card slots. These features allow for better connectivity to peripheral devices and provide flexible system configuration that allows users to meet diversified project requirements.

The V9 Series has been designed with an internal VPN router that enables communication to any device that is connected via Ethernet to a V9 HMI. One-click access to this VPN enables secure, remote monitoring and enables the V9 series to be used for both WMI (web machine interface) or HMI applications.

They offer touchscreen control, 16.7 million colours, a VNC server function and a wireless LAN function for data transfer.

**Automated Control Pty Ltd**

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## Safe Automation

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# HOT PRODUCTS

ON [WWW.PROCESSONLINE.COM.AU](http://WWW.PROCESSONLINE.COM.AU) THIS MONTH

## DEVICE CIRCUIT BREAKERS

The four- and eight-channel devices can be installed quickly and tool-free, and can be easily set, with easy-to-maintain restart options.

**Phoenix Contact Pty Ltd**

<http://bit.ly/1PB1fQx>



## MACHINERY PROTECTION SOLUTION

The CSI 6500 ATG is a standalone machinery protection solution that allows users to cost-effectively introduce predictive monitoring of critical assets.

**Emerson Process Management**

<http://bit.ly/1W1T8ML>



## RFID PRESSURE TESTING

The Stauff PT-RF series of pressure transmitters is an alternative solution for universal pressure measurements in fluid technology application.

**STAUFF Corporation Pty Ltd**

<http://bit.ly/1hOYu09>



## PROCESS MOISTURE ANALYSER

The QMA601 is installed as a self-contained analyser or sampling system package within hazardous areas and is easy to retrofit to an existing site.

**AMS Instrumentation & Calibration Pty Ltd**

<http://bit.ly/1ZYSkNp>



## PROFIBUS/PROFINET GATEWAYS

With its recently upgraded Anybus X-gateways, HMS Industrial Networks can offer ways to get heterogeneous PROFI-equipment connected, enabling communication between different physical formats or to couple/decouple I/O data between two controlling networks.

The Anybus X-gateway can act as a Profinet/Profinet coupler enabling fast transfer of I/O data. The Profinet interface works as an I/O-Device on the Profinet I/O or IRT network. In a similar way, coupling or decoupling of I/O data between two controlling Profibus networks (DP/DP coupling) can be achieved, and the two Profibus networks become galvanically and logically isolated from each other.

It is also possible to couple or decouple I/O data between two controlling Profinet I/O networks. A well-known name for this functionality is PN/PN coupling.

Profinet FO is especially popular in the German automotive industry. However, many machines and systems do not come with fibre-optic connectivity. Anybus X-gateway can act as a coupler between the two network versions, enabling them to communicate.

Many factories have well-functioning Profibus networks; however, there is often a need to install devices or systems which run Profinet. With an Anybus X-gateway, this switch is easily done. The X-gateway acts as translator between the two networks and can be installed within minutes — a very fast way to migrate from fieldbus to Industrial Ethernet. End users will be able to re-use and connect well-working existing equipment to new high-performing automation systems.

**Global Automation Asia-Pacific**

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## CORIOLIS FLOWMETERS WITH EGM

The OPTIMASS 1400 and OPTIMASS 2400 Coriolis flowmeters include an MFC 400 signal converter, allowing the meters to offer entrained gas management (EGM).

In the past, gas entrainments in liquid media presented a challenge for mass flowmeters because the relative movement between gas and fluid dampens the amplitude of the measuring tube. OPTIMASS flowmeters with EGM are able to follow and correct for the varying amplitudes. This is achieved for entrained gas up to 100% of volume and continues to present an actual measured reading, together with an indication or configurable alarm for the user.

OPTIMASS 1400 is a universal mass flowmeter for standard applications with liquids and gases. With its stainless steel twin straight tube design, it can be drained and cleaned easily, and gives accurate measurement of mass or volume flow, density and temperature in a variety of applications up to 130°C. In addition to standard flange process connections DN15-80, it supports a wide range of industry-standard hygienic connections.



OPTIMASS 2400 is a mass flowmeter for bulk mass and volume flow of liquids and gases. Originally developed to meet custody transfer applications in the oil and gas industry, it suits bulk, storage/loading/unloading and high-volume measurement of products like syrup, molasses and raw chemicals. For flow rates up to 2,300,000 kg/h, OPTIMASS 2400 is available in sizes DN100-300 with NACE compliant stainless steel measuring tubes. The Super Duplex option offers a maximum operating pressure of 180 barg (2600 psi).

**KROHNE Australia Pty Ltd**  
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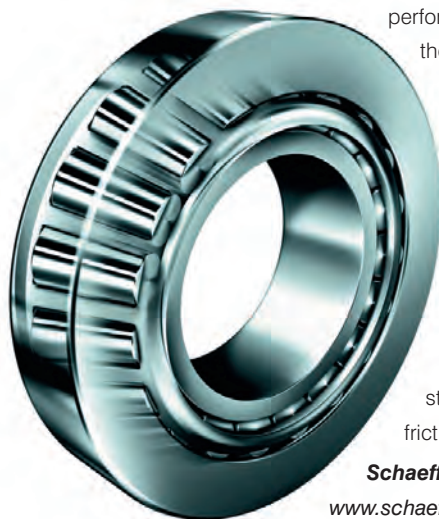
## SPHERICAL ROLLER BEARINGS FOR HEAVY LOADS

Schaeffler's FAG X-life Spherical Roller Bearings offer enhanced load capacity and service life optimisation for major industrial machinery. The high-performance bearings offer up to 70% longer service life with the same loads, delivering benefits of greater efficiency and operational reliability.

The spherical roller bearings are used in applications where heavy loads have to be accommodated or where shaft deflections or misalignments of bearing seats must be compensated for.

They are suitable for harsh environmental conditions, such as gearboxes, paper machines, construction machinery and vibrating machinery.

Other features of the roller bearings include high static safety and less strain on lubricant due to less friction and lower bearing temperatures.



**Schaeffler Australia Pty Ltd**  
[www.schaeffler.com.au](http://www.schaeffler.com.au)



## RUGGEDISED CONNECTIVITY

Siemon has announced the expansion of its ruggedised connectivity for harsh environments, including ruggedised G2 LC fibre adapters and Category 6 UTP patch cords.

The Gen2 (G2) ruggedised LC adapters combine Siemon's LC fibre connectivity with durable IP66/IP67 ruggedised shells to provide a fibre connectivity solution for harsh environments. Like the current G2 ruggedised Z-MAX copper outlets, the G2 ruggedised LC adapters are inserted from the front with the locking nut positioned behind the faceplate. This allows the use of an aggressive locking nut that is easier to fully tighten without the use of tools. Compatible with all Siemon ruggedised surface mount boxes and ruggedised stainless steel faceplates, the G2 ruggedised LC adapters are available in both bulkhead and inline (coupler) options to support installation in a wide range of environments. A G2 ruggedised outlet dust cap is also available for protecting unused outlets following installation.

All ruggedised LC adapters now feature ceramic alignment sleeves that provide a tighter tolerance for optimum core-to-core alignment when mating.

Siemon's ruggedised Category 6 UTP patch cords are constructed using a flame-retardant thermoplastic elastomer (TPE) outer jacket over a polyvinyl chloride (PVC) inner jacket that allows for a 60% greater temperature range than standard commercial-grade cords. They are available with a ruggedised IP66/IP67 plug on one end and either a ruggedised IP66/IP67 or standard modular RJ45 plug on the other end. They combine a -40 to 75°C temperature range, high flex construction, oil-resistant jacket and an indoor/outdoor rating.

**Siemon Australia**  
[www.siemon.com.au](http://www.siemon.com.au)



### 3D CONTENT VERIFICATION FOR PACKAGING

Errors and mistakes are an inevitable part of manual packing processes, which is why downstream completeness checks are essential to ensure product quality and customer satisfaction.

To have these quality control processes carried out by staff is expensive, time-consuming and often inconsistent. The ConVer quality control system from Sick checks whether boxes or containers have been filled correctly and include all the required contents.

The ConVer system comprises a scalable number of inspection stations that can be positioned along a belt wherever they are required. Each station is fitted with a Ranger E 3D vision sensor and a laser platform with six 2M lasers. The lasers generate a 1 m wide laser line that is powerful yet still safe for the eyes.

The Ranger E uses this laser to collect 3D information about the objects passing the sensor. This information is then compared in real time with reference images that have been taught-in previously. If any variance is detected, the system stops the belt straight away. Signal lamps and the monitor display guide the operator to quickly correct the packaging error.

ConVer is suitable for companies that offer a wide range of different products in either large or small batches as the product can be changed in seconds.

To teach-in reference images for the checking process, the packaged object is transported once through all stations of the packaging process and the operator sets parameters, such as characteristic features. The measurement data and

images recorded by the system can also be used in subsequent systematic evaluations to identify any errors in the upstream production process that would otherwise remain undetected.

**SICK Pty Ltd**  
[www.sick.com.au](http://www.sick.com.au)

### HEAVY-DUTY COLLABORATIVE ROBOT

The FANUC CR-35iA heavy-duty collaborative robot uses a form of integrated vision technology called iRVision to automatically stop itself from functioning as soon as it touches the human working alongside it. This means that the robot will not require safety fences.

The robot is able to lift payloads of up to 35 kg, making it suitable for a variety of manufacturing environments. A soft covering material reduces the force of any impacts and prevents human operators from being pinched by the mechanism. If the robot comes too close to an operator, they can simply push it away.

The 990 kg, 6-axis robot is suitable for duties such as transferring heavy workpieces or assembling parts. The robot complies with ISO 10218-1:2011, Cat 3, PL d. It has a reach of 1.8 m and can move at speeds of up to 250 mm/s — or 750 mm/s if the area is monitored by a separate safety sensor. The servo-driven machine has a repeatability of  $\pm 0.08$  mm.

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## SAFETY LIGHT CURTAINS

The Safetinx YBB series of Type 2 light curtain offers hand protection with a resolution of 30 mm and protective heights from 150 mm up to 1827 mm. The operating range is 12 m. Its rugged housing and screen ensure high resistance to shock and vibration. Moreover, this active optoelectronic protective device (AOPD) also includes high performance features, such as optical synchronisation and permanent autocontrol of the output.

Safetinx YBB series Type 2 light curtains have a protection rating of IP65 and IP67. This makes them also suitable for applications where fluids are used. Quick and simple installation is achieved by a 5-pin M12 connector, alignment LED and the mounting brackets included.

Typical applications for Type 2 (Cat. 2, c PL, SIL 1) include metal forming, pick-and-place equipment, welding machines and industrial lift systems.

**Micromax Specialists in Automation Pty Ltd**

[www.micromaxsa.com.au](http://www.micromaxsa.com.au)



## ARC FLASH SOLUTION

The Fluke PRV240 proving unit is designed to reduce the risk of shock and arc flash by providing a known voltage in a controlled, low-current state in accordance with safe work practices. The unit provides a safe method for Test Before Touch (TBT) verification of electrical test tools without placing the technician in potentially hazardous electrical environments, which would generally involve using known live voltage sources.

The pocket-sized device sources 240 V of both AC and DC steady-state voltage for testing of both high- and low-impedance multimeters, clamp meters and two-pole testers, eliminating both the need for multiple verification tools and the use of a known high-energy voltage source for test instrument verification.

To avoid accidental contact, the voltage is supplied through recessed contacts that are activated only when test probes are inserted into the module's insulated access points. A single LED indicates the sourcing of the voltage to verify the test tool, simplifying test tool verification without the need for personal protective equipment.

The proving unit can perform up to 5000 tests per set of four AA batteries and comes with a TPAK magnetic hanging strap for easy accessibility.

**Fluke Australia Pty Ltd**

[www.fluke.com.au](http://www.fluke.com.au)



## ETHERNET CABLES FOR MOVING APPLICATIONS

Ethernet cables are increasingly being used in factories to ensure all stations can exchange data with each other. This doesn't just apply to stationary applications, but also to moving ones. igus has designed 23 different copper-based Ethernet cables for industrial and continuously moving applications with various mechanical requirements.

The Cat 7 Ethernet cable CFBUS.052 is for continuously moving applications. It has braided shields, pair shields and an overall braided shield with 90% optical cover, to ensure data safety and functionality even after millions of bending cycles in energy chains. The braided structure offers long-lasting strength and protects the overall shield against mechanical fractures as well as the electromagnetic compatibility of the cable. It meets high mechanical and electrical requirements in terms of data transmission. The cable is flame retardant, has a high abrasion resistance and is suitable for cleanroom environments.

The range of fibre-optic cables also covers all mechanical requirements for continuous movement, from indoor use, to woodworking machines, to offshore and marine applications. The fibres are stranded together and are highly bend resistant with a high-strength braid, so even high tensile forces in hanging applications do not damage the cable. They are flame resistant with a pressure-extruded PUR outer jacket to provide additional protection against external mechanical damage. They can be easily and economically fitted with connectors.

**Treotham Automation Pty Ltd**

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# Lifting failing coal and ore chute systems out of the past

A new generation of coal and ore materials handling technology is being introduced to Australasian and international markets by a group that engineers chutes and complementary systems to permit faster conveyor belt speeds, greater throughput, fewer breakdowns and enhanced safety.

The Chute Technology engineering group targets problems common to many coal and ore plants and loading systems by addressing them with a combination of three skill sets: advanced engineering analysis of flow; 3D Discrete Element Method (DEM) design processes; and custom manufacturing to individual plant needs.

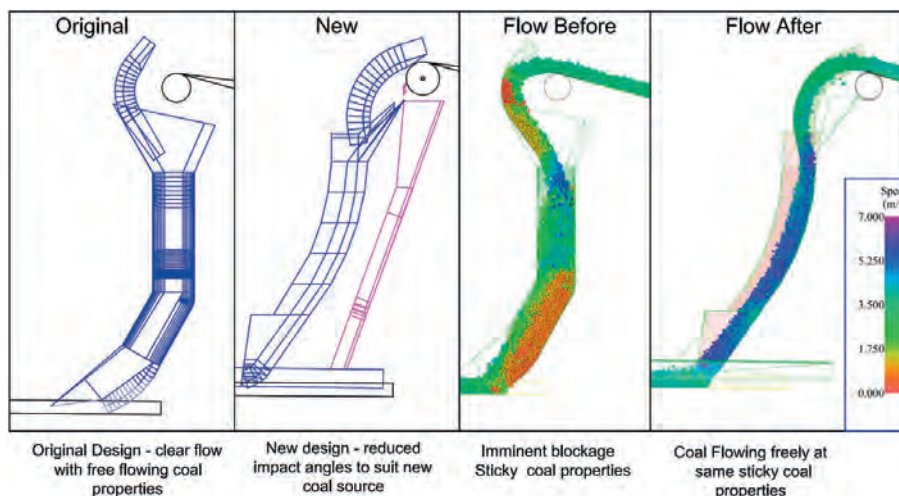
The combined technologies — which are applicable to existing as well as new projects — are complemented by the practical experience of each of the three principal partners in Chute Technology, who have combined experience of more than 80 years in a wide variety of resource industries including coal, iron ore, alumina and limestone across Australia, the USA, South America and South Africa. The technologies are also applicable to gold, nickel and other bulk minerals and ores.

Major benefits of the chute design technologies have already been demonstrated in service with a Western Australian iron ore producer, which increased production by 50%. Several Hunter Valley coal mines, meanwhile, are also benefiting from less wear and fewer breakdowns because of practical individualised designs produced by one of the partners in Chute Technology — long-established Hunter Valley mining industry supplier TW Woods.

Chute Technology combines the local and international manufacturing experience of TW Woods, represented by director Tom Woods, with the similarly broad engineering and technology experience of engineering consultant Dennis Pomfret of Dennis Pomfret Engineering, as well as the project management, engineering and drafting experience of design engineer Gary Telford of McKajj Services.

"We believe Chute Technology brings together a combination of skills that is unique in the marketplace, in that it brings three proven skill sets that are vital to solving typical mineral processing issues," says Woods. These issues include reducing wear, removing bottlenecks caused by clogging, minimising damaging impacts on belts and optimising operational safety and efficiency by curbing breakdowns and clean-ups.

"Existing chute designs have fundamentally been stuck in the past, because few companies have seen the need to take advantage of



innovations now available with advancing technology and knowledge. But under the impact of steeply rising 21st century volumes, existing designs are breaking down incessantly — sometimes wearing out in weeks — and always slowing up production with downtime and repairs," says Woods. "As Australian and international producers set out to double and treble outputs, the underlying problems are becoming starkly apparent through breakdowns, downtime, problems with sticky material throughput, and spillage that creates clean-up and safety issues.

"Supervisors on sites or on loading facilities are often painfully aware that they have got the problem, but these issues have become so prevalent that they sometimes think of it as inevitable. It's not inevitable, just inefficient — and a matter of rectifying the problem with focused design and smarter manufacturing."

Through their specialist company focused on the design, manufacture and optimisation of materials handling systems, Chute Technology's partners aim to deliver benefits by applying rigorous design skills and practical know-how gained by experience in mines, ports and industrial plants.

"In addition to a proven capability to design new chutes, the new Chute Technology organisation will specialise also in the retrofit of existing plants," says Pomfret, who holds patents on proven materials handling technologies.

"A principal aim will be to eliminate reliability problems and production obstacles so as to bring handling systems up to their full potential."

*A slightly longer and more detailed version of this article can be read online at <http://bit.ly/1GukzNK>*

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## STAINLESS STEEL RFID TAGS

Low-frequency, all-metal transponders from Contrinex are resistant to metal chips, dirt, alkaline cleaning agents and hot water. They withstand wash down processes undamaged and are recommended for use in construction machines, cement works, the food industry and aluminium processing.

The read/write modules and tags (125 kHz, operating frequency: 31.25 kHz) have an IP68 protection rating and can therefore be used even underwater. Models additionally rated to IP69K, a normal protection type for food industry use, will withstand high-pressure cleaning with hot water and highly chemically active detergents or disinfectants, such as hydrogen peroxide and products with alkaline or chlorine content. For these requirements, transponders are hermetically sealed in a one-piece stainless steel housing with a laser-welded backplate.

They also work faultlessly in stainless steel environments — even when embedded with only the transponder face visible. Mechanical wear, for example from aluminium chips or dirt particles, is practically non-existent.

The transponders are suitable for an operating temperature range of -40°C to 180°C.

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## DISCONNECT SPLITTERS

Turck has announced an expansion to the YB2 line of compact disconnect splitters with LEDs. The addition to the YB2 line features a translucent black overmoulded design that encapsulates the LEDs and protects them from physical damage while also complementing visibility. The LEDs are visible from both sides of the splitter, which allows for more flexible mounting options. The YB2 is available with an M12 eurofast trunk connector and either M12 eurofast or M8 picofast branch connectors.

This YB2 splitter is used to consolidate two separate discrete PNP device signals into a single cable or into a multiport junction box. It is a suitable solution for applications in the material handling, food and beverage, and automotive industries. Additionally, The YB2 is the recommended consolidation splitter for users of Turck's Z-style junction boxes.

The LEDs provide a visual indication of when power is applied and when one or both discrete signals are present. Additionally, the YB2 has a rating of 10–30 VDC at up to 4 A and has an ingress protection rating of IP67.

**Turck Australia Pty Ltd**

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## CONVEYORS FOR CYLINDRICAL PRODUCTS

Cylindrical products are often difficult to transport or accumulate and store on conveyor systems due to the shape of the product. Sensitive cylindrical products can also be damaged or caught up on the conveyor.

Adept Conveyor Technologies has developed a means to convey such product using two smaller conveyors set in a V configuration.

The solution is adaptable to a wide range of product diameters, lengths and weights, and can minimise surface damage due to transport and storage. This system is also cost effective compared to other complex solutions. V conveyors can be powered or non-powered and are available as either roller or belt conveyors, and in a variety of materials and surface finishes. Lifting devices for loading, unloading and rotating products, along with storage skids and trolleys, are also available.

Powered V conveyors can be configured as simple transport conveyor modules or as accumulation and storage conveyor modules with minimal change required.

The features of the powered conveyor modules are: 24 VDC power; robust gearbox design to operate with high efficiency; a wide range of speed and power using low energy; IP54 rating.

**Adept Conveyor Technologies**

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## FLOW COMPUTER

Process Control's UNIFLOW-200 flow computer can measure eight fluid streams simultaneously so that it replaces eight single-stream flow computers in one case. Any change in the existing metering applications or any new application can be implemented easily, quickly and cost effectively. Versatile communication protocols ensure easy integration with SCADA/HMI systems.

The UNIFLOW-200 MFC was specifically designed for hydrocarbon gas and liquid flow measurement. The standard features of the instrument make it suitable for fiscal measurement and custody transfer. However, it is cost-effectively applicable for process applications as well.

The UNIFLOW-200 can be used for single- or multi-run applications for up to eight meter runs. In a multi-run system different types of fluids can be assigned to different meter runs. For example, the operator can configure two runs for gas and three runs for liquid process media. In addition, four virtual meter runs can be configured as station totalisators. They can, for example, summarise flows in parallel meter runs or can subtract one meter run flow from the other. Based on the input and output flows, calculation of efficiency for a given part of the technology can be implemented. Every meter run can be configured with different types of flow meters.

The entire configuration can be done using the instrument display and keypad, or by means of a PC-based parameter configuration software (U200ToolBox). Supported flow meters include orifice, Venturi tube, nozzle, V-Cone, averaging pitot tubes, vortex, turbine, positive displacement, ultrasonic, electromagnetic and Coriolis.

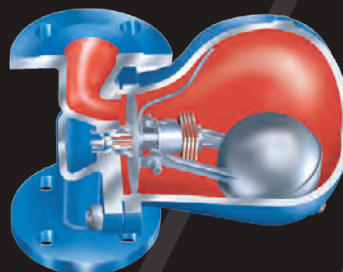
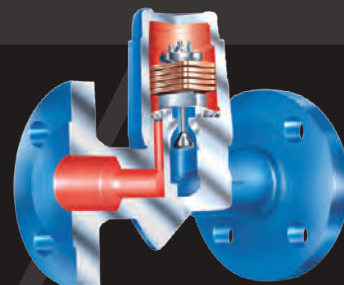
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# HIGH PERFORMANCE STEAM TRAPS



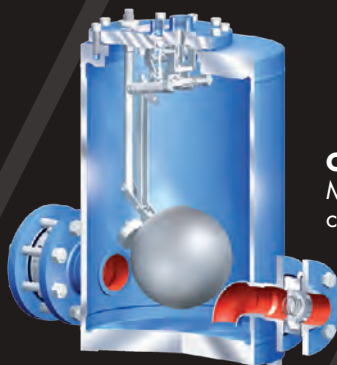
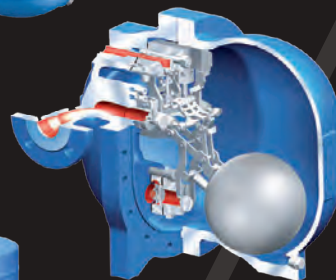
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# DETECTING HYDROGEN SULPHIDE GAS

Many oil fields, especially mature ones, can produce high levels of hydrogen sulphide, which is deadly at even low concentrations. As drilling and completions are often in remote locations, getting to the nearest hospital in time to respond to an exposure event could be impossible. It is always crucial to be able to detect the gas as soon as possible when a leak occurs, in even the most challenging conditions.

It is important to remember that detection coverage for hydrogen sulphide ( $H_2S$ ) in facilities where it is known to be present is an ongoing program that needs to be constantly evaluated and updated. Many facilities have constantly changing conditions with connections that are affected by the highly corrosive properties of  $H_2S$ . Some facilities simply do not have adequate coverage or don't completely understand the options available to protect their plant and the people who work there. This article will explore the various technologies available and their application in order to maximise coverage of this serious threat.

The health and safety standards in many countries have been slowly decreasing the acceptable exposure levels as sensor response times and overall stability of sensing elements have improved. The US Occupational Safety and Health Administration (US Department of Labor) lists the acceptable concentration limit for exposure to  $H_2S$  at 20 ppm for an eight-hour period, with the maximum peak exposure at 50 ppm for 10 minutes<sup>1</sup>. In contrast, the UK Health and Safety Executive states that the maximum peak exposure is 15 minutes at a 10 ppm concentration. Their acceptable concentration limit for  $H_2S$  is 5 ppm for an eight-hour period. These standards do not change the fact that exposure to  $H_2S$  in high concentrations can cause instant death. A short-term exposure to even 500–1000 ppm of  $H_2S$  gas can be life threatening and can cause

serious harm. Repeated exposure to  $H_2S$  in low concentrations can cause photophobia, conjunctivitis, corneal bullae, extreme pain and temporary loss of vision.

The toxicity of  $H_2S$  gas is extremely high. Its flammable level is actually much lower than its toxic level for humans. Fortunately, having the distinct odour of rotten eggs allows plant workers to detect  $H_2S$  gas in the relatively safe range of parts per billion. This is well below the danger level; however, exposure to very low concentrations (30 parts per million or greater) can actually paralyse a worker's ability to smell  $H_2S$ . Training for rig and plant personnel includes extensive coverage of  $H_2S$  gas dangers and what to do if detected, but in some cases all the training in the world cannot help with a sudden high level exposure.

Consider the following common scenario: A technician in an oil and gas facility is rushing to complete some routine maintenance towards the end of the day. Suddenly he feels a slight irritation in his eyes and then smells rotten eggs. The worker stops and cautiously investigates the area. In that moment a slight change in airflow moves the released gas just slightly out of his range. The odour quickly fades away, so he believes that only low levels of the gas were present and carries on with his work. A large number of workers would do just the same, dangerously assuming that there is no issue continuing to work in the area since no



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alarm had been triggered, sacrificing precious seconds required to react and reach a safe area should even a small amount of highly toxic  $H_2S$  be present.

### Considerations for $H_2S$ exposure

The primary goal of any fixed point  $H_2S$  detection system is to safeguard workers by warning them of the presence of hazardous toxic levels of  $H_2S$  in their workplace. The explosive levels of  $H_2S$  are not generally considered in safety applications. Exposure to levels of  $H_2S$  at 1000 ppm, which is several magnitudes lower than the lowest explosive level of the gas, can cause death. The use of personal gas detectors, or handheld portable gas detectors, in combination with a comprehensive fixed gas detection system is excellent practice for complete site safety. In many countries, standards exist that require every worker in a potentially hazardous area to be equipped with a personal gas detector. As manufacturers continue to improve toxic gas detection technology, it is important to understand how these may be applicable in your oil and gas installation. Electrochemical and metal oxide semiconductor (MOS) cells have, for many years, been the only field-proven toxic sensing technologies, but more advanced optical sensing technologies are now emerging and have widened the scope.

Risk areas are present in numerous applications within the oil and gas industry as well as other industries such as mining, life sciences, wastewater and power generation. When an  $H_2S$  gas release occurs due to a loss-of-integrity event, a complete hazardous risk analysis of the facility should be performed to identify the existing and other potential sources of leaks. It is also important to note that  $H_2S$ , being heavier than air, sinks to the lowest lying area. Sensing elements must be positioned accordingly to optimise performance. Factors such as wind speed, direction as well as changing humidity and temperature can also affect the detector's performance.  $H_2S$  detectors process both the specific and changing factors of the environment as well so it is crucial for these to be considered with the detector placement in order to ensure peak performance in case of an  $H_2S$  leak. Many oil and gas companies are beginning to focus operations in areas with extreme hot or cold climates. It is a real challenge to operate safely and efficiently in these conditions and it's imperative operators select the correct type of  $H_2S$  detection technology for dealing with extreme environmental conditions.

### MOS sensors

For the purposes of this article, we will refer to two types of metal oxide semiconductor (MOS) sensors: 'traditional' sensor materials using somewhat dated technology and the latest 'nano-enhanced' MOS sensor materials which have dramatically improved the overall performance of this sensor type.

The typical construction of an MOS sensing element includes a platinum heater element, an insulation medium and the sensing element itself, which is a gas-sensitive resistive film. This film will employ traditional materials or materials that are enhanced at the nano-level to improve performance. When  $H_2S$  comes into contact with this film, there are measurable changes in the electrical conductivity. These changes are typically amplified in a transmitter device. MOS detectors have a long life compared to electrochemical sensors and continue to operate in wide-ranging temperatures, particularly high temperatures, as well as in extremely dry conditions. Similar to electrochemical detectors, MOS detectors are not failsafe and a change in oxygen levels may affect their output.

The following are the primary challenges that traditional MOS sensors experience:

- Slow  $H_2S$  response time (up to 120 seconds at T90 for some manufacturers).
- Sensors 'fall asleep' and completely stop functioning until bump tested, with no failure alert.

Recently, advances in nano-enhanced material construction have been able to effectively deal with the above challenges. While the appearance and operating principle of an NE-MOS sensor is identical to that of a traditional MOS sensor, NE-MOS benefits from a mechanically conformed array of sensing components known as 'nanotubes' being applied to the resistive film in a manner in which they are perfectly aligned, symmetric and extremely concentrated during the manufacturing process. Traditional materials are produced





**OPERATORS NEED TO CONSIDER SPECIFIC APPLICATION AND ENVIRONMENTAL CONDITIONS TO BE ABLE TO SELECT THE BEST AVAILABLE TECHNOLOGY THAT WILL PROVIDE THE HIGHEST DEGREE OF SAFETY AND PERFORMANCE.**

using a process that leaves gaps and creates irregularities, resulting in the performance challenges outlined above. Nano-enhanced materials equate to increased overall sensing capability, faster response and much higher stability.

With their advanced design, NE-MOS sensors can, in some applications, respond faster than both the electrochemical and traditional MOS sensors. NE-MOS response to T50 (the time it takes for the detector to reach 50% of full-scale concentrations) can be as quick as 10 seconds. It responds to T90 in approximately 15 seconds. The latest design has also been able to include electronic temperature and humidity compensation, enabling NE-MOS detectors to function efficiently in even the most extreme climate conditions.

### Electrochemical detectors

In an electrochemical sensor, the cells combine enclosed electrodes and electrolyte. H<sub>2</sub>S diffuses through a permeable membrane, the volume of H<sub>2</sub>S increases in the air, an oxidation or reduction reaction occurs at one of the electrodes and, as a result, a linear current change occurs. This enables a display or an amplifier device to generate an indication of the H<sub>2</sub>S level. These detectors also have high sensitivity and repeatability, which has established this as the toxic detection technology of choice in a wide variety of applications.

The use of electrochemical sensors in desert and arctic regions is not the ideal solution though. The detector's lack of resilience in high and low temperatures and the effect of humidity on the detector's performance are serious considerations. The capability of the sensor and its performance life will likely be affected due to evaporation of electrolytes in dry, hot conditions. Extreme cold conditions may also reduce the detector's speed of response. Normally, one can expect a T90 response in around about 30 seconds in temperate conditions. When you start to approach -20°C, the detector's speed of response reduces significantly; as temperatures continue to lower, the output will decrease even further.

Other considerations with electrochemical sensors are that they do require routine calibration, every six months is typically recommended. It may be required more frequently depending on the site conditions. The sensors are not inherently failsafe but some manufacturers have employed electronic sensor health monitoring which will generate a fault output. And electrochemical detectors are all cross-sensitive to other specific types of gases, which need to be considered during installation to avoid exposure to these contaminants.

### Optical sensing technology

Optical hydrocarbon detectors are a field-proven detection solution in many industrial applications and optical H<sub>2</sub>S detectors use the same basic operating principle. In an optical H<sub>2</sub>S sensor, the signal is absorbed by the H<sub>2</sub>S gas as it passes through the detector's optical path. The sensor will record the signal reduction and a microprocessor will calculate a corresponding gas value.

Because the sensor uses positive feedback at its zero gas level, this technology is inherently failsafe. Any internal damage to the detector results in an impact on processing so they must continuously perform valuable fault diagnostics to ensure optimum performance, which also compensates effectively for temperature and humidity.

Optical sensors are deployed as either a fixed point-type detector or an open path installation. Fixed point-type gas detectors must be strategically located to effectively provide coverage for a targeted area. Regular routine inspections are good practice but full calibrations are typically only required every 12 months.

Open path or line-of-sight detectors employ an optical transmitter and a paired receiver located at a maximum specified distance apart, monitoring the space between them. Any volume of the H<sub>2</sub>S gas passing through the beam of light will provide a reading. But it is not currently possible to accurately determine the ppm level with this technology. They also cannot have any obstructions to their path, which makes their effective application somewhat limited in areas where workers are constantly present. They are well suited to monitoring gas migration into perimeter areas of an installation.

### Final thoughts on H<sub>2</sub>S monitoring

Manufacturers of H<sub>2</sub>S sensing solutions face several unique challenges in a wide variety of applications. As the current oil and gas fields located in hospitable regions are completing their life cycle, there is going to be a fundamental shift to the more extreme operating locations of the world. In this context, it is critical that the safety devices perform at a high level in these conditions in order to protect plant and personnel as well as maximise uptime in these locations that require more capital to operate.

Operators need to consider specific application and environmental conditions to be able to select the best available technology that will provide the highest degree of safety and performance. As new technologies emerge it may become possible to combine the point-type devices, open-path optical detectors, with new and emerging technologies like ultrasonic gas leak detection and laser-based sensing for providing enhanced safety to support even higher standards. The ISA performance standard (ISA 92.0.01, Part I) for H<sub>2</sub>S detectors is an excellent minimum requirement policy to adopt for plant safety. Third-party testing and approvals will also provide operators with performance qualifications on the multitude of options available in the marketplace. All these resources are helping to improve the workplace's safety standards, ensure that you make an informed decision when you select your H<sub>2</sub>S detector and be confident in its performance and capability, as well as the ability of the entire detection platform to improve your overall processes.

#### References:

1. U.S. Department of Labor, Occupational Safety & Health Administration, [http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=STANDARDS&p\\_id=9993](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9993)

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## CONTRAST SENSOR

The KT#-4155-407 sensor is suitable for all industrial applications where accurate detection of markings is required. This applies in particular to the packaging and printing industries. The sensor has a teach-in function and five switching tolerance levels. During the teach-in process, intensity levels of background and marking are captured and a detection threshold is set between them. Five tolerance levels allow the user to set a detection threshold either close or very close to the intensity of the marking, or in the middle, or close or very close to the background intensity. Simple teaching takes place either directly on the sensor, or via IO-Link, or via external teach-in. LED indicators facilitate the teach-in process.

Three LEDs automatically emit red, green or blue light, reliably ensuring differentiation even between close levels of contrast. The light spot is very small, measuring just 1.5 x 3.5 mm, allowing even the smallest markings to be detected.

The sensing range is 12 mm, with a response time of 50  $\mu$ s, and a frequency of up to 10 kHz.

The sensor is available either with a connector (KTS-4155-407) or cable (KTK-4155-407) and operates simultaneously as a PNP or NPN sensor. The connector is adjustable through 0°, 45° and 90°. The space-saving dimensions (40 x 50 x 15 mm) and rugged cubic housing of this small sensor make it suitable for integration anywhere.

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## Bredel pumps save water, chemical and maintenance costs

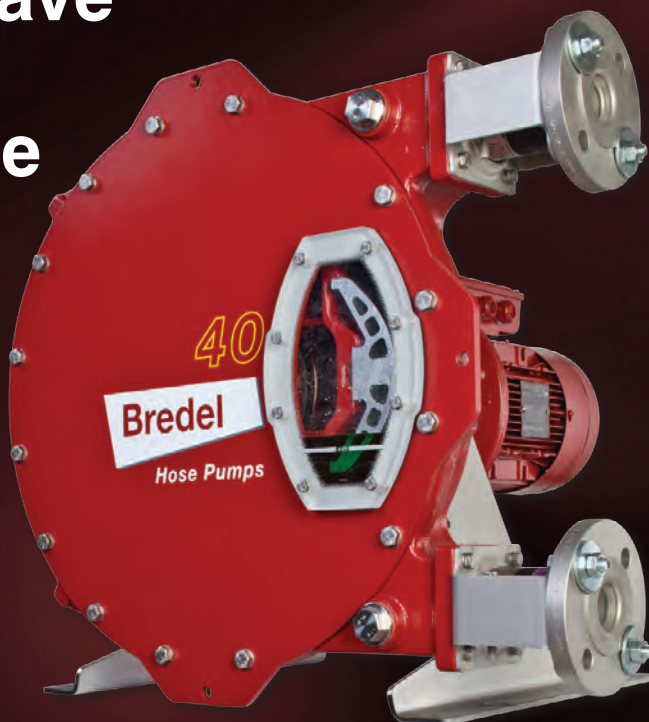
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## RIGHT-ANGLE GEARHEADS

Motion Technologies has introduced Cone Drive's range of IP69K rated right-angle gearheads. The gearboxes have gone through rigorous testing and certification in the US and are designed to survive caustic wash-down environments.

The gearheads are available in various sizes with standard NEMA flange options, as well as solid or

hollow shaft options. Cone Drive has incorporated a double bearing system on the input shaft to eliminate leaks and ensure good motor alignment for longer life. The smooth, stainless steel design ensures easy cleaning and bacteria-free surfaces.

**Motion Technologies Pty Ltd**

[www.motiontech.com.au](http://www.motiontech.com.au)



## MOTOR VALVES

Recently released compact motor valves from Bürkert use two different drive and valve concepts, depending on the orifice size. The first is based on linear drive seat valves for orifices DN2 to DN6 (Type 3270: shut-off valve; Type 3280: proportional valve). For the larger orifices DN8 to DN25, rotary drive disc valves are used. They are likewise available as shut-off valves (Type 3275) and as proportional valves (Type 3285).

Types 3270 and 3280 are housed in a standard body with dimensions of 137 x 55 x 64 mm. For Types 3275 and 3285, there are three compact sizes due to the larger spectrum of orifices. The valve bodies are available in brass or stainless steel.

Motor valves offer an alternative to solenoid valves in less dynamic applications which do not require response times in the millisecond range. They also feature low energy consumption due to negligible holding power for a defined valve opening position and precise positioning due to high-quality electric stepper motors.

The compact valves can be used with combustible gases at pressures from 0 to 3 bar and with neutral gases and liquids up to 6 bar. Seals of FKM or NBR and a body of polyphenylene sulfide and polycarbonate make them very robust. The compact valves are designed for an ambient temperature from -10°C to 60°C and fluid temperatures from 0°C to 70°C.

**Bürkert Fluid Control Systems**

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## DUAL-INPUT TEMPERATURE TRANSMITTER

Moore Industries has released the SIL 3-capable STZ functional safety smart HART temperature transmitter family. The STZ is said to be a dependable and accurate temperature transmitter for use in safety instrumented systems where dangerous processes occur. The STZ has been certified by exida after rigorous evaluation to ensure conformance with strict IEC 61508:2010 standards for safety-related applications.

The STZ offers a dual sensor input that reduces process interruptions. Backup and fail-over protection allows either of the sensors or inputs to be designated as the primary measurement, with the secondary input acting as the backup sensor in case of primary sensor failure. The dual sensor input also allows for average and differential measurements along with high-select and low-select options.

The STZ is HART 7 compliant with exception-based reporting and dynamic variable mapping. It is HART and DTM programmable with user-oriented basic configuration for fast and accurate set-up. Utilising the HART DD, it can be configured and interrogated on the 4-20 mA loop via any HART handheld communicator or HART compatible host. To prevent unauthorised or accidental reconfiguration of the STZ while it's performing its safety function, it has an added security feature to allow users to set HART communication into a read-only or off mode. Users can also program or monitor the transmitter with any FDT-compliant host or program such as PACTware using the STZ DTM.

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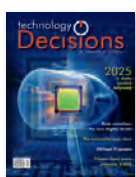


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## GSM ROUTER AND MODEM

Providing features specifically for industrial protocols, the Red Lion SN/RAM range of 3G/4G modems are built tough to withstand any industrial environment.

Web accessibility demands the highest security level, and is typically managed through third parties via VPN connections as a monthly fee. By offering self managed VPN capabilities, Red Lion removes any need for third parties. Data encryption, stateful firewall configuration and other comprehensive router features are easily accessed and included.

With a robust DIN mount metal enclosure and the option of POE power if required, the series can operate in extreme temperatures of -30°C to +75°C. The series has the option of one or five Ethernet ports including 3G/4G connectivity, and accommodates industrial protocols such as Modbus/DNP3 passthrough.

In the event of the 3G/4G network failing, the RAM series will store critical site data via DNP3 registers until the cellular network is restored, repopulating the missing data back into SCADA thereby ensuring your data's integrity is at the highest level.

Red Lion modems are suitable for deployment in industrial M2M networks such as water and wastewater, transportation, energy utilities, logistics, manufacturing, mining and energy management. With consistent reliable network extensions to remote locations, users can save wiring time, space and cost by combining separate functions into one cellular device.

**Control Logic Pty Ltd**

[www.control-logic.com.au](http://www.control-logic.com.au)



## STAINLESS STEEL PUMP

An Aussie 'Smart Pump' has been released featuring 316 stainless steel casing. The I Series pump is an extension of Australian Pump Industries' range of pumps designed for a wide range of potentially corrosive or difficult-to-handle liquids.

The pump's internals are available in fibreglass reinforced polyester, polypropylene or Ryton. Elastomer options, including O-rings on the mechanical seal, mean these pumps can be configured to suit a wide range of difficult liquids. For example, for sea water or brine Buna N seals are combined with polypropylene internal components (impeller and volute). For concentrated nitric acid, pump internals in either Ryton or polypropylene fitted with Viton seals make a suitable combination.

The pumps will handle a wide range of sodium-based chemicals as well as urea, vinegar and even solutions of zinc sulfate.

The pump offers a maximum flow of 660 L/min combined with a maximum head of around 32 m. It's highly efficient self-priming centrifugal design provides it with a vertical suction lift of 6 m. The double flush volute provides efficient operation and, combined with the integrated check valve, fast priming.

The two stainless steel body halves are held together with a 'V' band clamp, which has a plastic toggle nob that facilitates easy disassembly for cleanout or service.

The porting on the pump is compatible with both 1½" and 2" pipework. It achieves this with a smart port design that doubles as a 1½" female BSP or 2" male BSP connection.

**Australian Pump Industries Pty Ltd**

[www.aussiepumps.com.au](http://www.aussiepumps.com.au)

## RUPTURE DISC FOR HYGIENIC APPLICATIONS

Rupture disc manufacturer Elfab has launched the Ferrule Opti-Gard SoLo, a reverse-acting disc designed for use in ultralow-pressure hygienic and aseptic applications. The product features a 95% operating ratio and 3% tolerance.

Available in a variety of sizes, the design is non-fragmenting and capable of supporting vacuum and back pressures. Designed for installation between tri-clamps and ferrules, the disc benefits from an uninterrupted surface finish to meet FDA approvals, making it suitable for use in CIP and SIP applications.

The design also includes an integral Flo-Tel+ actuator, offering the added benefit of non-invasive, ATEX approved rupture detection through the Flo-Tel+ system.

**Elfab Limited**

[www.elfab.com](http://www.elfab.com)



### 3D SENSORS FOR MOBILE MACHINES

Driver assistance and automated working processes increase both machine efficiency and safety when operating mobile machines. The O3M151 sensor from ifm efector features three-dimensional detection of the machine environment and automated evaluation of scenes and objects to enhance safety.

Similar to the comfort and safety functions in modern motor vehicles, such as distance sensors, rear-view cameras and emergency brake assist, the sensor offers automatic object recognition. This makes it possible to record more than 1000 distance values synchronously and to detect and follow up to 20 objects. This function can, for example, be used as a collision warning. Functions such as minimum, maximum and average distance, with free segmentation of the field of view in three dimensions, offer many degrees of freedom in the application. A typical range of up to 35 m is ensured.

The heart of the unit is the PMD 3D sensor. Interference caused by changing environmental conditions, such as sunlight, rain or materials with different reflective characteristics, does not influence the repeatability of the measured data. The unit also offers high vibration and shock resistance and protection ratings of IP67 and IP69K.

**ifm efector Pty Ltd**

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### Out of this world versatility.

OK, so it still can't fly to the moon. But for anything that needs measuring, controlling and metering, the Burkert multiCELL multi-channel transmitter/controller Type 8619 is the ideal choice. Up to 6 modular signal inputs and outputs as well as options for mathematical functions or data logging adapt this universal genius individually to every application. This gives you more flexibility, expands the range of possible applications – including those that you might not even have thought of yet – and gives you precisely the support you need. Now also available for measuring chlorine and wall or pipe mounting with an operating voltage of 12..36 VDC and 110/230 VAC. The sky really is the limit!

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## UNIVERSAL PROCESS TRANSMITTER

The UPT-2x process transmitter from WIKA has achieved approval for use in hazardous areas in accordance with IECEx, ATEX and now also EAC.

The multifunction device is suitable for tasks in pressure, level and volume measurement. Its sensor, with a measuring range from 0–400 mbar and 0–1000 bar, operates with an accuracy of up to 0.1% of the measuring span. For applications in the pharmaceutical and food industries, flush-mounting versions are available. The electronics are protected by a conductive plastic case, or optionally by a stainless steel case in hygienic design.

The measuring ranges of the product are freely scalable and can therefore be adjusted to individual measurement tasks. An intuitive-to-use menu in accordance with the HART v7 standard, in addition to the integrated display, makes programming easier. The unit can be handled without the need for tools, offers long-term stability and has universal application possibilities.

**WIKA Australia**  
[www.wika.com.au](http://www.wika.com.au)



## DISTRIBUTION SWITCH

Rockwell Automation has expanded its portfolio of industrial Ethernet switches with the Allen-Bradley Stratix 5410 industrial distribution switch. With four 10 Gb Ethernet ports, the Stratix 5410 switch provides a high-performance connection to the rest of a facility's network architecture. The switch can be used as a Layer 2 switch or a Layer 3 routing switch, which allows engineers to use it in various applications.

With a 19" rackmount design, the Stratix 5410 switch gives end users a centralised point of network distribution and increased port density. It is suitable for heavy industry applications where resiliency is often required and has a rugged exterior to help withstand harsh environmental conditions.

With embedded Cisco technology and Premier Integration into the Rockwell Automation Integrated Architecture system, the Stratix 5410 switch provides familiar solutions for information technology (IT) and operations technology (OT) professionals. This helps ease network configuration, management and support. Using the Rockwell Software Studio 5000 design environment, engineers can leverage FactoryTalk View faceplates from Rockwell Automation and add-on profiles to simplify switch configuration and monitoring. In addition, the embedded Cisco technology helps optimise integration with the enterprise network.

Enhanced security features include programmable port access, as well as configurable port security. Capabilities such as encrypted administrative traffic, 802.1x authentication, access control lists (ACL), and TACACS+ and RADIUS support plantwide security as part of a defence-in-depth security approach.

**Rockwell Automation Australia**  
[www.rockwellautomation.com.au](http://www.rockwellautomation.com.au)

## FREE CHLORINE ANALYSER

The ECD FC80 free chlorine analyser is a panel-mounted, ready-to-use analyser that requires no reagent. It is designed to monitor free chlorine (residual chlorine) in drinking water, industrial cooling and rinse water, wastewater or other fresh water samples containing chlorine in the range of 0.05 to 20 ppm  $\text{Cl}_2$  (high range) or 0.01 to 5.00 ppm  $\text{Cl}_2$  (low range).

It features a plug-and-play design that incorporates a flow control device, a pH sensor, a chlorine sensor and the T80 transmitter conveniently mounted on a PVC panel. Users connect the sample and drain lines, connect the power and outputs, and it is ready to use.

The T80 analyser offers dual measurement outputs with a choice of 4–20 mA, Modbus or HART communication, three alarm relay outputs, and 24 VDC or 110/220 VAC power.

The use of automatic flow control and large flow tubes and cells reduces clogging and blockage of the analyser and allows for easy cleaning. It can also be ordered with an auto-cleaning option to keep the chlorine clean from contaminants for an extended period of time.

The FC80 is calibrated at the factory before shipment — additional calibrations are accomplished by DPD comparison.

**AMS Instrumentation & Calibration Pty Ltd**  
[www.ams-ic.com.au](http://www.ams-ic.com.au)



# ABB delivers microgrid power for remote WA towns

Remote locations such as Marble Bar and Nullagine in Western Australia — towns which are not connected to the grid — would typically rely solely on diesel fuel for their power. Instead, a microgrid solution from ABB is enabling multiple energy sources, maximising the intake of solar power generation and minimising diesel fuel generation.

Marble Bar is a town and rock formation in the Pilbara region of north-western Australia. It was named after a local deposit of mineral first thought to be marble but which later proved to be jasper. Officially gazetted in 1893 following the discovery of gold in the area, the town once boasted a population of 5000 people when the prospectors came in their droves. The gold rush in the Pilbara was short-lived, however, with the huge discoveries on the Eastern Goldfields and in The Murchison at places like Coolgardie and Kalgoorlie. In 2006, the population was less than 200.

On the way to Marble Bar, a road sign offers visitors the 'warmest welcome from Australia's hottest town'. The arid climate and blistering summers helped this small mining centre in remote Western Australia set a world record for heat — 160 consecutive days at 37.8°C or above, ending on 20 April 1924 — which still stands after 90 years! During December and January, temperatures in excess of 45°C are common, and the average maximum temperature exceeds normal human body temperature for six months each year. Rainfall mostly occurs in the summer months, and Marble Bar receives 159.6 clear days annually.

The burning sun has also made Marble Bar unique as the site of one of the world's first utility-scale, high-penetration solar photovoltaic diesel power stations. The other station is located in the adjoining gold-rush town of Nullagine, with a similar history and now home to 200 people.

ABB, through its Darwin-based team, worked closely with Horizon Power and SunPower Australia to install these new power stations, which are setting benchmarks — at an 85% peak — for isolated hybrid diesel power systems with extremely high renewable energy generation and conversion.

The Marble Bar and Nullagine power stations each consist of four 320 kW diesel generators and a 300 kW solar array. They



utilise some 2000 solar modules and a single-axis solar tracking system, which follows the path of the sun throughout the day. The ground-mounted systems were the largest solar tracking systems commissioned in Australia at the time.

The hybrid solution includes a photovoltaic and a diesel generation plant as well as integration and control solutions. The microgrid is equipped with ABB's PowerStore kinetic flywheel grid stabilising technology, which enables high solar energy penetration by injecting or absorbing power extremely fast in order to stabilise fluctuating power output from the solar power plant. ABB's Microgrid Plus technology will help control the network.

The hybrid microgrid power solution is now supplying both towns with close to 60% of their power through solar generation, saving approximately 400,000 L of diesel fuel and 1100 tonnes of greenhouse gas emissions each year.

The ability to resolve intermittency issues caused by solar and wind generation in weak power systems enables renewable generation to be increasingly used as a primary power source in many remote communities with zero or limited access to diesel or other types of fossil fuels. About 80 similar ABB installations in a wide variety of applications around the world utilise this powerful green technology, showing that freedom from fossil fuels is a real option now and in the future.

**ABB Australia Pty Ltd**

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## HOW 3D PRINTING COULD MAKE USE-BY DATES OBSOLETE

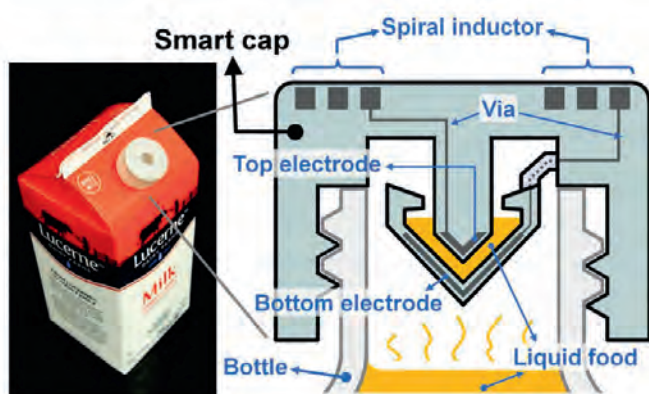
With engineers succeeding in 3D-printing electrical components — such as resistors, inductors and capacitors — they put the new technology to the test by printing a wireless ‘smart cap’ for a milk carton that detected signs of spoilage using embedded sensors.

The past decade has seen rapid advances in additive manufacturing technology, resulting in 3D-printed prosthetics, medical implants, toys, vehicle parts, building materials and even food. What had been missing was the ability to produce sensitive electronic components via 3D printing.

But that milestone too has now been passed, with engineers succeeding in 3D-printing electrical components, such as resistors, inductors, capacitors and integrated wireless electrical sensing systems.

And they’ve put the new technology to the test by printing a wireless ‘smart cap’ for a milk carton that detected signs of spoilage using embedded sensors.

The findings, published in the open-access journal *Microsystems & Nanoengineering*, are the first demonstration of 3D printing for working basic electrical components, as well as a working wireless sensor.



UC Berkeley engineers created a ‘smart cap’ using 3D-printed plastic with embedded electronics to wirelessly monitor the freshness of milk. Photo by Sung-Yueh Wu.

“One day, people may simply download 3D-printing files from the internet with customised shapes and colours and print out useful devices at home,” said senior author Liwei Lin, a professor of mechanical engineering and co-director of the Berkeley Sensor and Actuator Center at the University of California, Berkeley.

The flexibility of polymers has made them popular materials in the world of 3D printing; however, such materials are poor conductors of electricity. To get around this, the researchers built a system using polymers and wax. They then removed the wax, leaving hollow tubes into which liquid metal was injected and then cured.

The shape and design of the metal determined the function of different electrical components. For instance, thin wires acted as resistors, and flat plates were made into capacitors.

To test the electronic components, the researchers integrated them into a plastic milk carton cap to monitor signs of spoilage. The smart cap was fitted with a capacitor and an inductor to form a resonant circuit. A quick flip of the carton allowed a bit of milk to get trapped in the cap’s capacitor gap, and the entire carton was then left unopened at room temperature (about 22°C) for 36 hours.

The circuit could detect the changes in electrical signals that accompany increased levels of bacteria. The researchers periodically monitored the changes with a wireless radiofrequency probe at the start of the experiment and every 12 hours thereafter, up to 36 hours. The property of milk changes gradually as it degrades, leading to variations in its electrical characteristics. Those changes were detected wirelessly using the smart cap, which found that the peak vibration frequency of the room-temperature milk dropped by 4.3% after 36 hours. In comparison, a carton of milk kept in refrigeration at 4°C saw a relatively minor 0.12% shift in frequency over the same time period.

“This 3D-printing technology could eventually make electronic circuits cheap enough to be added to packaging to provide food safety alerts for consumers,” said Lin. “You could imagine a scenario where you can use your cell phone to check the freshness of food while it’s still on the store shelves.”

## RUGGED SERVERS

The RS549 and RS5718L24 rugged 5U servers from Crystal Group are specifically developed for applications in industries such as oil and gas, public transportation, utilities, mining, military and security.

These servers provide high compute performance in tough environmental conditions and are designed to collect, store and process more data while providing the space necessary to customise platforms for unique purposes.

The dimensions of the RS549 are 44.45 x 22.15 x 50.8 cm. The CPU is an Intel Quad E5-4600 Class processor. It has multiple expansion slots: four PCIe X16 (double-width) slots and 32-1024 GB registered DDR3 with ECC memory. The unit has four options on external bays configurations: nine removable SATA or SAS 2.5" or 3.5" HDDs; 18 2.5" SATA or SAS HDDs; three drive packs and eight removable SATA or SAS 2.5" HDDs; or one CD/DVD/BD (R/W).

The RS5718L24 dimensions are 44.45 x 22.22 x 60.32 cm. The unit has three CPU options: Sandy Bridge or Ivy Bridge LGA2011, X9DRL-IF; Sandy Bridge or Ivy Bridge LGA1155, X9SAE-V; or Haswell LGA2011, X10SRL-F or X10DRL-I. The unit has seven full height slots, with combinations being configuration dependent. There are two options for external bays: up to 18 removable SATA or SAS 3.5" HDDs; or a rugged drive pack (RDp) offers up to 30 hot-swappable 2.5" HDDs, or eight 4-drive packs.

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Electronic device circuit breakers are ideal for protecting relays, programmable controllers, motors, sensors, actuators, and valves, as examples.







## RFID PRESSURE SENSORS

The Keller 21D/DC RFID series combine industrial pressure sensing with RFID wireless communication and data logging.

The D-line piezoresistive transmitters used to measure pressure are based on Keller's chip-in-oil technology. The laser-welded, hermetically sealed stainless steel housing, which is filled with oil for pressure transmission, contains the pressure transducer and energy-efficient compensation electronics with an I<sup>2</sup>C interface.

The Series 21D RFID passive RFID pressure transmitter has a plastic cap

that houses the interface to the pressure transmitter and all RFID components, including the antenna. The scanner provides the power required to log instantaneous values.

The Series 21DC RFID data loggers are pressure transmitters that come with an extra data recording functionality. The integrated battery allows data to be measured and stored. Stored measurements are transmitted wirelessly and exclusively via the RFID interface.

Resistant to environmental impact, both models are housed in an ultracompact stainless steel housing and also available in Hastelloy C-276. They offer high accuracy and long-term stability and are hysteresis-free. They also provide a temperature reading as well as pressure in the range from 3 to 1000 bar.

The series are suitable for mining applications where the trucks run 24/7 and require preventive maintenance on the 400 bar hydraulic system every 20 days.

**Bestech Australia Pty Ltd**

[www.bestech.com.au](http://www.bestech.com.au)

## ENTRY-LEVEL VIDEOSCOPE

The Series C entry-level videoscope is designed to provide quick and easy inspections in difficult-to-reach areas.

The product has advanced image processors that can operate in low light levels and resolve fine details such as corrosion, burrs and small defects or cracks. The videoscope combines Olympus optical and precision device expertise to allow an operator to inspect areas that have access ports down to 6.2 mm and captures a clear image by combining eight brightness settings, glare reduction, high-intensity LED and light-sensitive CCD camera chip technologies. The carrying case holds everything needed for the majority of inspection projects.

Ergonomically designed to fit in the palm of either the right or left hand and weighing less than a kilogram, the portability, durable construction and ease of use mean the product can be used for remote inspections for the full 120 min battery life, and even longer when connected to mains power.

Designed for long product life, a unit features an abrasion-resistant insertion tube with a tungsten outer braid. The spring neck design of the distal end reduces stress when navigating through tight bends. The protective cap on the distal end can easily be replaced, resulting in more inspections being done with minimum downtime.



**Olympus Australia Pty Ltd**

[www.olympusaustralia.com.au](http://www.olympusaustralia.com.au)

## COIL CLAMP METERS

The FLIR Systems range of CM55/57 flexible clamp meters is designed for electrical inspections, making it easier to take measurements around multiple conductors, crowded panels, tight switch gears, large bus bars and wire bundles. Available in 10 or 18" coil lengths and made with narrow, flexible coil clamps, these tools allow electricians to take accurate measurements in tight spots that are difficult to access with a traditional hard-jaw clamp meter.

The flexibility of the meters enables up to 3000 A AC current for multiple conductor measurements. They are portable, lightweight and ruggedly built to withstand a 3 m drop. They also provide dual LED work lights for illumination when taking readings in poorly lit locations.

The devices feature Bluetooth communication for remote viewing and data transfer to iOS and Android devices via the FLIR Tools mobile app, enabling data to be shared and analysed directly from a job site. Users can also connect multiple units wirelessly for remote viewing of multiphase systems.

**FLIR Systems Australia Pty Ltd**

[www.flir.com.au](http://www.flir.com.au)



## LTE-ENABLED INDUSTRIAL COMPUTER

Devices located at the edge of industrial IoT networks have already started using compact, wireless-enabled industrial computing platforms to send preprocessed data to a control centre through LTE, Wi-Fi or other wireless protocols. These devices, including sensors, gateways and computing platforms, are often installed in space-constricted areas subject to harsh environmental conditions, which could include extreme temperatures, floating dust and strict power limitations. LTE also generates more heat than other wireless options and requires computer designers to use a housing with thermal properties that allow it to radiate away much of that heat.

The thermal design of Moxa's LTE-enabled V2201 wireless computers ensures reliable system operation in temperatures ranging from -40°C to 70°C. Designed to fit in the palm of the hand, the computers are fanless, feature low power consumption (18 W) and support both DIN-rail and wall-mounting capability.

The industrial wireless computers use the Intel Atom E3800 series processor to provide high computing performance for local data analysis and processes. With an SD socket and mSATA connector, users don't need to worry about storage limitations.

To ensure that the product is suitable for a wide range of data communication infrastructures, the computer has two built-in serial ports, two ethernet ports and a set of DI/DO ports. It also supports a full range of wireless connectivity protocols, including Bluetooth, Wi-Fi, 3G and LTE modules that fit into the computer's two mini PCIe sockets.

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# MONITORING BIOMASS COMBUSTION

*Glenn Johnson*



The world's most common form of renewable energy production is not solar energy or wind power, but energy generated by burning biomass or biogas. Like coal-fired power generation, the efficiency of the process needs to be monitored, as well as the range of toxic materials that can be released when burning organic materials and other waste.

In a general sense, bioenergy is a form of renewable energy derived from biomass, which is used to generate electricity and heat or to produce liquid fuels. Biomass is any organic matter of recently living plant or animal origin, and is available in many forms such as agricultural products, forestry products, and municipal and other waste.

Bioenergy technologies make up a significant proportion of renewable energy production around the world. For example, the US Institute for Energy Research<sup>1</sup> reports that approximately 5.2% of energy is generated from biomass, accounting for 55% of renewable sources. In Australia this is considerably less, with the Australian Renewable Energy Agency (ARENA)<sup>2</sup> reporting that bioenergy sources account for approximately 1% of electricity generation and about 7% of renewable sources. According to ARENA:

"Australia's bioenergy industry currently uses a range of biomass resources including:

- bagasse, which remains after sugar has been extracted from sugarcane
- landfill gas
- wood waste and black liquor
- energy crops
- agricultural products
- municipal solid waste.

The majority of Australia's installed bioenergy capacity is derived from bagasse cogeneration."

Although the burning of biomass releases carbon into the atmosphere in the same way that coal-fired power generation does, the difference is that the fuel is captured from the Earth's biosphere. That is, the material being burned releases carbon that was only recently captured from the atmosphere, and so is a carbon-neutral cycle – in contrast with coal and natural gas, in which the carbon being released was trapped underground for many millions of years and is no longer a natural part of the Earth's biosphere.

As carbon-neutral as biomass generation may be, however, there are still challenges associated with other toxic compounds that are released during the burning of the fuel, requiring the same type of careful measurement and monitoring as other processes.

## Challenges

There are number of challenges associated with the transformation of biomass into electricity. Firstly, the efficient use of fuel and the protection of assets are of utmost importance to ensure optimum profitability; secondly, emission monitoring and pollution control is a requirement in nearly every country. It is imperative for every industrial plant to monitor the production process from material flow to pollution control and to maximise energy efficiency – but with minimal danger to the plant staff or damage to the environment. To achieve these goals, there are important monitoring requirements for:

- fuel flow to the burner for custody transfer and boiler efficiency monitoring
- the efficiency of the pollution removal system – for pollutants such as dust or gas ( $\text{SO}_2$ ,  $\text{NO}_x$ , etc)

- bulk material transport and storage monitoring – measuring the level and volume flow of the fuel.

## Biogas

Biogas typically refers to a mixture of gases resulting from the breakdown of organic matter in the absence of oxygen, and can be produced from raw biomass materials such as agricultural waste, manure, municipal waste, plant material, sewage, green waste or food waste.

Biogas can be produced as landfill gas, by anaerobic digestion (in which anaerobic bacteria are used to digest material inside a closed system) or by fermentation of biodegradable materials. Biogas is primarily methane ( $\text{CH}_4$ ) and carbon dioxide ( $\text{CO}_2$ ) and may have small amounts of hydrogen sulfide ( $\text{H}_2\text{S}$ ), moisture and siloxanes. The gases methane, hydrogen and carbon monoxide ( $\text{CO}$ ) can be combusted or oxidised with oxygen, allowing biogas to be used as a fuel.

## Process monitoring

### Fuel storage and delivery

Solid biomass is generally stored in silos until it is ready to be used as fuel. Such silos require some form of level monitoring for quantifying the fuel supply and for overfill prevention.

Conveyors are used to transfer solid biomass to shredders, and from the shredders to the incinerators. In order to monitor fuel use, and to measure the efficiency of the plant, the volume of material being moved needs to be measured. Conveyor mass flow is often measured by continuous weighing, but this can result in significant inaccuracies in this application as on rainy days, the biomass absorbs a significant amount of water and becomes heavier. A better method is to use a laser scanner to measure the material volume.

In the case of biogas, an ultrasonic flow meter can be used to measure the volumetric flow rate.

The raw fuel storage also needs protection from combustion in the silos and shredders. For this purpose, a gas analyser that simultaneously measures  $\text{O}_2$  and  $\text{CO}$  can be used to detect smouldering fires in the material.

### Incinerator optimisation

Incineration requires  $\text{O}_2$ , and measurement of the  $\text{O}_2$  concentration at the outlet of the combustion chamber allows the oxygen concentration to be optimised to maximise the burner's efficiency.

### Denitrification systems

The reduction of  $\text{NO}_x$  emissions is performed by two methods: non-catalytic and catalytic reduction.

In non-catalytic reduction, an ammonia ( $\text{NH}_3$ ) or urea solution is injected into the combustion process at 900-1100°C. The compound reacts with the nitrogen oxides to produce nitrogen and water. It is therefore necessary to measure the  $\text{NO}$  concentration at the combustion chamber outlet, as well as unreacted  $\text{NH}_3$ .

Catalytic reduction involves the removal of nitrogen oxides from flue gases with the injection of ammonia along with a catalyst at 200-400°C. As for non-catalytic reduction, the  $\text{NO}$





concentration after reduction, as well as unreacted  $\text{NH}_3$ , need to be measured.

Measurement of  $\text{NO}$  and  $\text{NH}_3$  are performed with a gas analyser suitable for measurement of nitrogen compounds. For compliance with emission regulations, these compounds also need to be detected and measured in the final flue gas output.

### **Flue gas scrubbers**

Flue gas scrubbers are used to remove further toxic compounds: hydrochloric acid ( $\text{HCl}$ ), sulfur dioxide ( $\text{SO}_2$ ) and mercury ( $\text{Hg}$  and  $\text{HgCl}_2$ ).

Wet scrubbers spray a cleaning solution into the output gas, while dry scrubbers use lime powder or milk of lime. To remove heavy metals and organic pollutants, activated carbon is also added. To optimise the consumption of the reagents and to monitor the scrubbing effectiveness, a gas analyser is needed that can simultaneously measure  $\text{SO}_2$ ,  $\text{HCl}$ , water and, optionally,  $\text{O}_2$ .

Mercury can be released when incinerating waste. If the  $\text{Hg}$  concentration is very high (greater than  $3000 \mu\text{g}/\text{m}^3$ ), action needs to be taken to ensure that the emission thresholds are respected.

### **Dedusting**

The flue gas is dedusted to remove particulates using electrostatic precipitators and fabric filters. The filters also separate bicarbonate and activated carbon left over from the scrubbing process.

Dust concentration is most effectively monitored using a laser scattering instrument. The particulates also need to be measured in this way in the final exhaust stack for compliance purposes.

The dust particles that are filtered out are collected in an ash hopper. To determine when the hopper is full, a vibrating fork level switch can be the most effective method for detecting when the hopper is full.

### **Emission measurement**

For environmental compliance, the final output from the stack needs to be monitored. Depending on the type of fuel, the following pollutants will need to be detected:

- $\text{HCl}$ ,  $\text{HF}$ ,  $\text{CO}$ ,  $\text{NO}_x$ ,  $\text{SO}_2$  and  $\text{NH}_3$
- Total organic carbon



ALTHOUGH THE BURNING OF BIOMASS RELEASES CARBON INTO THE ATMOSPHERE IN THE SAME WAY THAT COAL-FIRED POWER GENERATION DOES, THE DIFFERENCE IS THAT THE FUEL IS CAPTURED FROM THE EARTH'S BIOSPHERE.

- Dust
- Gas velocity, pressure, temperature,  $\text{O}_2$  and  $\text{H}_2\text{O}$

In some countries, continuous measurement of mercury content is also required.

The gaseous components can be measured using direct in-situ or sample extraction methods. The pressure and temperature parameters are measured for normalising the gas sample measurements.

The dust component can be measured using an instrument that uses a laser light scattering method.

If  $\text{HF}$  or  $\text{Hg}$  detection is required, instruments specially designed for the purpose are readily available.

### **Other measurements**

As consumables, the supply of reagents and activated carbon also need to be monitored. For these purposes, overfill protection can be afforded using a vibrating fork level switch, both for solid and liquid reagents.

As for solid fuel silos, activated carbon filter beds need to be monitored to be sure that fires do not occur - usually with a twin-component multigas analyser that can measure changes in  $\text{CO}$  concentration.

### **Conclusion**

Similar to coal-fired power generation, biomass and biogas power generation requires significant monitoring and offers a good example of what can be measured and what benefits can be derived through investment in the right probes and sensors. Through direct real-time measurement, renewable power generation plants can be accurately monitored for plant efficiency, fuel and reagent consumption and emission monitoring.

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## VIDEOSCOPE

The Olympus IPLEX RT is designed for the visual inspection of heat exchangers, turbines, gearboxes, automotive parts, aircraft and other industrial machinery. It is available to rent from TechRentals.

The lightweight videoscope weighs only 2.9 kg, has a 6.5" LCD screen and comes with a 7.5 m-long, 6 mm-diameter tungsten braided insertion tube. The insertion tube will withstand high temperatures, with 100° articulation and a 120° field of view.



The product handles bright and sharp still images as well as high-quality movies, all of which can be downloaded via the USB port. Navigating through the unit's functions is simple with the InHelp Inspection Assist Software and onboard instruction manuals.

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## INDUSTRIAL APPLIANCE

Developed by Opto 22, groov is a web-based way to build and view operator interfaces to monitor and control automation systems and equipment, and requires zero programming or coding. It allows access to system data from anywhere a network is available and also allows users to receive real-time notifications based on configurable events. The groov system is also secure, as all communications are encrypted over HTTPS and all connections need to be authenticated with username and password.

Developed as an IoT tool for the Industry 4.0 paradigm for smart factories, the groov Box is a hardware and software solution that means that a PC is not required on-site. It is therefore suitable for deployment in manufacturing and automation facilities or remote sites where there are very low levels of IT equipment or infrastructure in place. The appliance has a rugged and solid-state fanless design, operating across a 0 to 70°C temperature range. Offering a compact footprint with dimensions of 106 x 171 x 33 mm, the groov Box also features gigabit Ethernet interfaces and USB expansion for wireless LAN interfaces.

In addition to the groov Box appliance, groov is also available via software download: groov Server for Windows has a small software footprint for use on Windows-based PCs and is suitable for facilities with PCs or an IT infrastructure. The groov system can be connected to Modbus/TCP devices and Opto 22 SNAP PAC controllers directly, or to devices from other manufacturers through an OPC-UA server.

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## SUSPENDED SOLIDS MEASUREMENT

The Triton TR86 sensor by Electro-Chemical Devices is designed for the continuous measurement of suspended solids in various ranges from 0-1000 to 0-5000 mg/L. The sensor emits a beam of 850 nm near-infrared light into the sample where it is scattered by particles suspended in the water. The amount of back-scattered light returning to the sensor is measured and correlated to the amount of suspended solids in the sample. The TR86 response depends on the size, shape and composition of the suspended particles. For this reason, mg/L, ppm and % solids measurements must be calibrated with suspended solids from the waters to be monitored.

Turbidity measurements (NTU, FNU) can be calibrated with calibration standards such as formazin, StablCal or SDVB beads.

The Triton TR86 sensors are designed to work with the T80 transmitter. The T80 is a single- or dual-channel transmitter with one or two 4-20 mA outputs with Modbus RTU and optional alarm relay outputs or HART 7 communication. The T80 transmitter allows the suspended solids measurement to be combined with any of its other standard measurements using the S80 pH, S80 ORP, S80 plon, S80 conductivity or S80 dissolved oxygen sensors.



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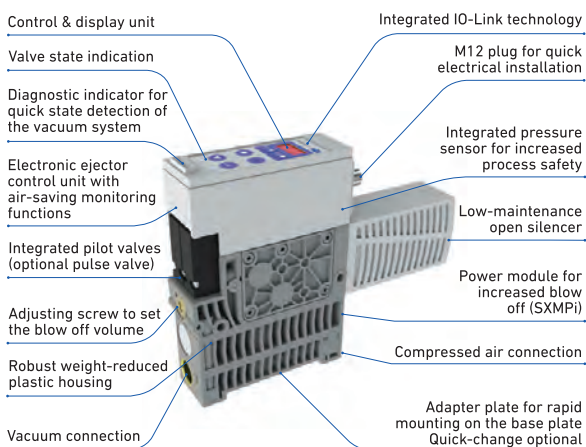
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## EFFICIENT FILTER FANS

Pfannenbergs Filterfan has flow optimised fins and rotor blades, giving it a high airflow and, at the same time, IP55 environmental protection.

The four-corner fastening system enables quick and simple installation. The filter medium can be replaced in seconds, without the need to enter the electrical cabinet, due to a tool-less click mechanism. The fluted filter used in IP55 models not only ensures a IP protection but also extends the life of the filter by up to 300% longer than conventional filter media.

Even at IP55, the airflow provided by the Filterfan is increased due to the filter's folded structure. A further increase in efficiency is also possible when coupling the Filterfan with a Pfannenbergs thermostat, ensuring the fan is only running when cooling is actually necessary.

Pfannenbergs also supplies a sizing software package designed to assist with selecting the optimal airflow capacity to suit the application. This process can avoid both oversizing and undersizing of cooling requirements.

**Control Logic Pty Ltd**

[www.control-logic.com.au](http://www.control-logic.com.au)



# Positioning systems improve airport logistics

An airport apron bustles with traffic — the tow tractors, tankers and buses moving busily around a jet run the risk of colliding. An enhanced positioning system will increase safety and the efficiency of logistical operations in the future — and available airport capacity will be utilised better.

Dense fog is hanging over an airport apron. Even when tow tractors, pushback tractors and tankers are moving at merely a snail's pace, collisions can always occur, be they with other vehicles or with aircraft. Tanking and loading of luggage, air cargo and catering takes significantly

longer in fog or rain than when visibility is clear. Passengers end up sitting at departure gates longer than planned, and the schedule for cargo containers is jeopardised too.

Poor weather conditions will impede work on the apron far less in the future. Researchers at the Fraunhofer Institute for Factory Operation and Automation IFF in Magdeburg are establishing the basis for this in the EU project 'e-Airport', together with various European partners.

"We are developing a positioning system that will increase safety on the apron," explains Olaf Poenicke, research manager at the Fraunhofer IFF. "It will additionally make it possible to utilise airport capacities more efficiently, because the system allows logistical operations to run in a significantly more structured way than before."

One important aspect: the steady increase of air traffic is compelling airports either to build new runways and terminals or to utilise the existing infrastructure's capacities more efficiently.

The European Galileo satellite system is the basis of the novel positioning system in the e-Airport project. The principle is similar to that of an automotive navigation system: tow tractors, pushback tractors and other vehicles have onboard receivers for global navigation satellite systems (GNSS). They receive signals from the Galileo satellites and other systems such as GPS and use them to establish their exact location. Positioning data are sent by WLAN or cellular radio, for instance, to the control centre. The control system, in turn, sends messages back to the drivers: a display warns when a vehicle is getting too close to another, driving too close to restricted areas or leaving a specified route.

"We at the Fraunhofer IFF are contributing our expertise in air cargo to this control centre, modelling the processes and specifying the job orders received by a tow tractor driver," explains Poenicke.



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The process models help define ideal target processes. They are compared in the control centre with actual data sent from the apron by sensors. Discrepancies can thus be identified, and instructions derived from them can be sent to tow tractor drivers.

Although positioning systems that determine vehicle locations exist, they are based on GPS. This entails problems, especially in the vicinity of buildings. Shadowing occurs; positioning data are imprecise or break off completely. This doesn't happen in e-Airport: additional signals from the Galileo satellites and other correction signals from the European EGNOS D-GPS system increase accuracy and reliability substantially.

Up to now, tow tractor drivers have usually received printed work assignments. Where do they have to hitch which dollies (trailers loaded with air cargo pallets or containers)? Where should they deliver them? Errors occur time and again. Dollies are parked on the airport premises and forgotten, for instance, and have to be hunted laboriously later. "Our system eliminates such errors. It knows both the desired and actual status and gives the driver pertinent work instructions," says Poenicke.

The researchers are additionally developing special wireless sensors which are attached to dollies. They use an energy-saving wireless protocol to send their data (a trailer's identification number and load) to a receiver unit in the tow tractor. The unit automatically analyses which dollies are hitched and relays the dolly data, together with the tow tractor's positioning data, to the control centre. The latest status data keeps the e-Airport system always in the know, even about the location of a dolly parked on the apron. In short, the control centre has aggregated data not only on vehicles, but also on their dollies and the cargo loaded on them.

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## VORTEX FLOWMETERS

Behind a bluff body integrated in the measuring pipe, the flowing medium generates swirling vortices depending on its velocity. These vortices are detected by a piezoceramic sensor. If the cross-section is known, the number of the vortices allows determination of the flow rate. This flow rate measurement principle, known as vortex principle, is virtually independent of pressure and temperature fluctuations of the medium.

The SV type vortex flowmeters are suitable for use in cooling water circuits. They can be used for water with and without conductivity. The current flow and temperature are output as standardised current signal (4–20 mA), as a frequency signal, a switching output or via IO-Link as an option.

These space-saving devices from ifm efector inform the user quickly and clearly about the current volumetric flow. The multicolour display can be rotated electronically and the red/green colour selection for process values can be set. Installation can be independent of orientation due to the rotatable G and R process connections, which are optionally available. In addition, the SV flowmeters come with an integrated temperature measurement.

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## STAINLESS STEEL ENCODER

Turck has expanded its QR24 line of contactless rotary position sensors to include a version with stainless steel housing. Available in SSI or with incremental outputs and equipped with 316 stainless steel housing, the variant is built to withstand harsh environments such as those involving chemicals or high-pressure water sprays.

The stainless steel QR24 sensor features a fully potted and sealed IP69K/IP68-rated housing to protect against moisture and dust. It also offers flexible parameterisation via IO-Link or easyteach, allowing the sensor to easily adapt to specific application requirements.

While rotary feedback is crucial in many installations, many rely on their mechanical bearings to provide proper tolerance and position of the internal system. After time, mechanical wear, vibration, potential leaks in bearing seals, etc, can contribute to premature failure. The product provides users with contactless position detection, executing the same functions but without the need for contact or bearings, allowing for a more reliable solution that saves installation time and costs.

The series is part of the company's Q-track family of sensors, which utilise resistance inductance capacitance (RLC) measuring technology. The sensors incorporate precisely manufactured printed-emitter and receiver-coil systems. The emitter coils are activated with a high-frequency AC field and produce an inductive RLC circuit with the positioning element. The element is inductively coupled with the receiver coils, which are arranged so different voltages are induced in the coils depending on the position of the actuator.

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## INDUSTRIAL HMI

The Beijer iX-T10F-2 is an industrial HMI with a high-resolution touch screen and modern design in an IP65 plastic housing.

The product has a high-resolution, 10" wide (800 x 480 pixels) screen design and features ethernet, serial and USB ports. The operator panel is programmed with the free iX HMI software, which provides smart tools to communicate efficiently on all hardware.

The iX-T10F-2 combines vector graphics and easy-to-use functions that provide intuitive operation. Almost limitless connectivity is possible through an extensive range of available drivers, including EtherNet/IP for Allen Bradley's range of programmable controllers.

**Global Automation Asia-Pacific**  
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## HART-IP CONNECTOR

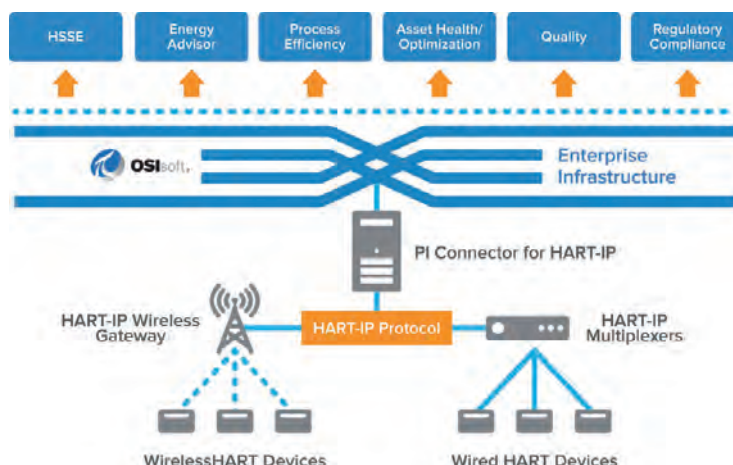
Emerson Process Management and OSIsoft have introduced the OSIsoft PI Connector for HART-IP, a link between HART field devices and OSIsoft's PI System enterprise software infrastructure for managing streaming sensor data in real time. The PI Connector for HART-IP automatically and seamlessly maps wired and WirelessHART devices to the asset structure in the PI Server, eliminating effort and chances for error. It enables end users to gain benefits from their intelligent field networks faster and more easily.

Emerson is developing and deploying numerous diagnostic and optimisation packages that analyse field device information to help improve process management, energy consumption and plant safety and reliability. The PI Connector for HART-IP leverages the widely used PI System to serve up information to these application suites.

The connector was jointly developed as an integral extension of OSIsoft's capability. It is said to reduce the cost and effort needed to access and use information from Emerson's Smart Wireless Gateways and HART multiplexers. Prior to this release, some information from HART devices was only available through OPC connections that had to be made on a time-consuming point-by-point basis. With the PI Connector for HART-IP, all of the necessary linkages populate to their respective applications automatically, giving the user instant access to valuable process and diagnostic information.

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TR1461



# IMPROVING TEMPERATURE MEASUREMENT ACCURACY

Gary Prentice\*



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Some processes do not require temperature measurement accuracy, and others do. However, you may be unsure whether accuracy is important for your particular application, or whether improving accuracy will make enough of a difference in your process results to justify the cost and effort.



Not all processes require highly accurate temperature measurement, and the cost of making them more accurate may be high due to the various factors that impact the reliability of the measurement. Temperature measurements can be categorised into three groups:

1. Those which do not require accuracy — you simply need to know if the temperature is stable or else going up or down.
2. Those which do require accuracy.
3. Those where there is uncertainty about the accuracy requirement — if the measurements in this category are on a preventive maintenance schedule for calibration or verification you may want to take steps to improve accuracy.

The same steps we take to achieve higher accuracy also result in reduced drift and that would have a positive impact on maintenance frequency. Improving accuracy and reducing measurement drift are often related and can have measurable results.

### Sensors and accuracy

There are times when the temperature sensor is selected based on convenience, what is on the shelf or the 'plant standard'. It is not uncommon to see a Type J or K thermocouple measuring a temperature that should be measured with a platinum RTD. ASTM and IEC temperature standards provide us with sensor measurement uncertainty, so if we pick a sample temperature of 260°C, the uncertainty of a standard grade J or K thermocouple is  $\pm 2.2^{\circ}\text{C}$ , while a Class A 100  $\Omega$  Pt RTD has an uncertainty of  $\pm 0.67^{\circ}\text{C}$ .

Many process engineers and technicians prefer RTDs. Selecting the best sensor for the application greatly affects the accuracy of the measurement and an RTD is the most accurate sensor to use when the process temperature is within its measuring range. But you will need to use less accurate thermocouples when you need to measure temperatures that are hotter than the RTD's upper measuring limits. In these instances you will want to take specific steps with thermocouples to improve the accuracy of the measurement results.

You can improve sensor accuracy by using thermocouples constructed with 'special tolerance' (also called 'premium grade') wire. The reduced error is achieved by using wire with higher purity alloys. At 260°C, the uncertainty of a special tolerance thermocouple is about  $\pm 1.1^{\circ}\text{C}$ .

Sensor selection is very important to measurement accuracy. As stated above, a Class A Pt RTD uncertainty is about  $\pm 0.67^{\circ}\text{C}$  at the same operating temperature. To simplify the process of choosing a sensor, you can operate from the assumption that changing from a standard-grade thermocouple to a premium-grade thermocouple cuts the error rate in half; changing from a premium-grade thermocouple to a Class A RTD cuts the error in half again.



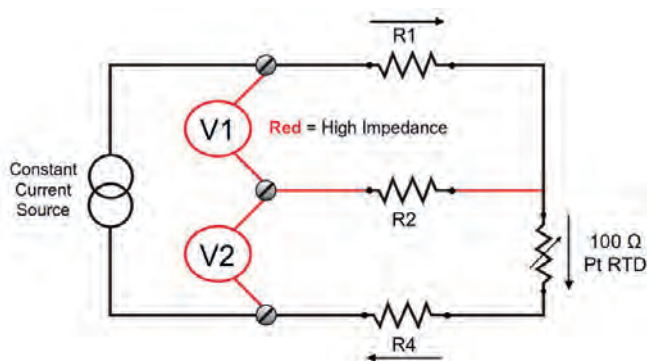


Figure 1: 3-wire RTD circuit.

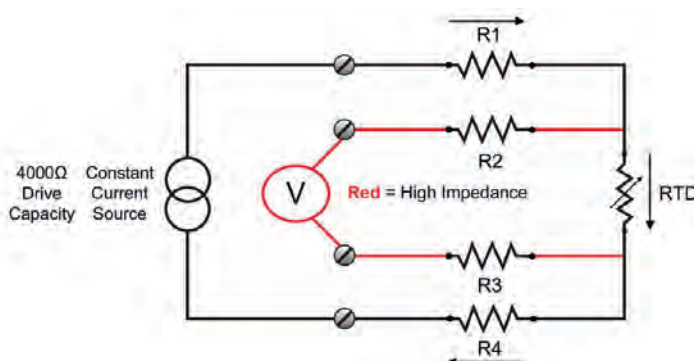


Figure 2: 4-wire RTD circuit.

### How thermocouple extension wire affects accuracy

Thermocouples wired back to a PLC or DCS must use thermocouple extension wire. Unfortunately, the extension wire is yet another source of measurement error. Using standard-grade J or K extension wire also adds another  $\pm 2.2^\circ\text{C}$  error. You can cut the error rate by using premium-grade extension wire, which has half the error rate of standard extension wire, just as with premium thermocouples. However, these error figures are only true when the wire is new and 'pure' — over time the error gets worse as the wire gets contaminated from the atmosphere in your plant and the wire is exposed to temperatures greater than or lower than the wire tolerances. There are many instances where contamination causes even more drift than the original uncertainty of new thermocouple wire.

If the uncertainty caused by thermocouples was a fixed offset, we could simply calibrate it out and be done with it. But when the error is in the form of drift that changes over time, calibration becomes a preventive maintenance task that few want to take on. Most plants prefer to avoid that extra labour whenever possible.

How do you solve these problems? Start by determining how much error is caused by the thermocouple extension wire. Most people overlook this option until Plant Operations declares there is a problem or a catastrophic measurement failure occurs. We all know thermocouples fail, but it is easy to forget that thermocouple extension wire also fails. When it does, it has to be replaced. If you replace the extension wire with a new one, you perpetuate the same problems by reintroducing the error and drift it causes. You may have to live with thermocouples, but you don't have to live with thermocouple extension wire — you can replace it with other solutions.

Two options for replacing thermocouple extension wire are temperature transmitters and remote I/O hardware. Both use copper wire to transport their signals back to the control system, but unlike thermocouple extension wire, you can expect the copper to last the life of the plant. Modern I/O products have performance characteristics similar to transmitters and can save a lot of money. You still need short sections of extension wire when you use these transmitters or I/O products, so use special-grade thermocouple wire instead of standard extension wire in these cases to further minimise the error.

### Compensating for RTD lead wires

Copper wire is used for RTD lead wires. If you are familiar with 3-wire RTDs you know one lead is called the compensating lead. Between the copper and a compensating lead you might believe that RTD lead wire does not contribute to the measurement error.

Unfortunately, this is not true. Copper wire can cause significant error in an RTD measurement because RTDs are resistors and copper wire is resistance. There are many contaminants in a typical process plant that cause corrosion and this corrosion changes the resistance of the copper lead wires, which can then cause further error. To eliminate lead wire error the solution is to use 4-wire RTDs.

Here is why: When a third lead wire is added to the RTD, the measurement is made with today's electronics by taking two voltage measurements (as shown in Figure 1, V1 and V2). The important thing to remember is that these are high impedance voltage measurements. For all practical purposes, there is no current flow through that third lead; thus R2 never enters into the equation.

V1 gives the value of the lead wire resistance R1. V2 gives the value of the RTD plus the R4 lead resistance. Subtract V1 from V2 and as long as the lead resistances R1 and R4 are equal, only the value of the RTD remains. This is an accurate measurement.

Realise, too, that many things work against making R1 and R4 identical when accuracy is your primary concern. Wire gauge intolerance and work hardening varies the resistance. Even if no human error takes place during installation, corrosion constantly works against the measurement and is the main reason R1 never equals R4. So what happens if the lead's resistances are not equal?

If the resistance imbalance is as little as  $1\ \Omega$ , a  $100\ \Omega$  Pt RTD has an error of about  $\pm 2.6^\circ\text{C}$ . If you are trying to achieve a  $\pm 0.55^\circ\text{C}$  measurement accuracy, this corrosion is standing between you and success. You can spend your life calibrating this error out or eliminate the error totally with a 4-wire RTD. Remember the voltage measurement is high impedance so, for all practical purposes, there is no current flow through R2 and R3 and no voltage drop (Figure 2) — the voltage is only measured across the RTD. R1 and R4 are never measured, thus they cannot create a differential resistance and an error. When using 4-wire RTDs, for all practical purposes, there is no error caused by the lead wire.

4-wire RTDs can have a lead wire of any length and the leads can undergo constant resistance change and still cause no meas-



**COPPER WIRE CAN CAUSE SIGNIFICANT ERROR IN AN RTD MEASUREMENT BECAUSE RTDs ARE RESISTORS AND COPPER WIRE IS RESISTANCE.**

urement error. However, it is still important to ensure your total resistance does not exceed the drive capacity of your constant current source. Typical modern-day temperature transmitters offer enough current drive to support RTD circuits that have up to 3–4 k $\Omega$  of total resistance. With lead wire error eliminated you are able to focus on the sensor and measuring device to further reduce error. The only reasonable objection to using the 4-wire RTD is that the existing legacy input card only accepts 3-wire RTDs. This is old technology and should be considered for replacement.

There is another option to consider if you are not able to use 4-wire RTDs: switch from 100  $\Omega$  Pt RTDs to 1000  $\Omega$  Pt RTDs. As stated earlier in this paper, 1  $\Omega$  of resistance imbalance in the current carrying legs of a 100  $\Omega$  Pt element produces about  $\pm 2.6^\circ\text{C}$  error. If you change to a 1000  $\Omega$  sensor, that same 1  $\Omega$  of imbalance will have one-tenth of the effect — the 1  $\Omega$  of imbalance error drops to about  $\pm 0.26^\circ\text{C}$ .

While the use of the 1000  $\Omega$  3-wire RTD is a big improvement over the use of a 100  $\Omega$  3-wire RTD, it is not a panacea. When the lead wire resistance imbalance changes, it causes the measurement accuracy to change. This means you still need a calibration program to temporarily eliminate the error. The 4-wire RTD is still the single best solution because it removes all lead wire error and eliminates the need to calibrate due to the inevitable corrosion.

### Plant noise

VFDs, motors and radios create levels of EMI and RFI sufficient to cause errors on temperature measurements. Thermocouple and RTD signals are very low-level mV signals, so it does not take much noise to cause significant distortion of the measurements. If you are wiring these low-level signals back to the control system, please use best practices to keep noise off these signal wires by using drain wires, proper grounding and physical separation.

A better solution is to convert the low-level signals to high-level signals as close to the temperature sensor as possible. The same amount of noise will affect high-level signals less than low-level signals. Signals like 4–20 mA, HART or RS485 survive most typical levels of noise.

### The temperature measurement device and remote I/O

When you finally get to the actual temperature measurement device, your ability to make significant improvements to accuracy has passed. Modern temperature transmitters and temperature I/O systems from major instrument companies have similar performance specifications. If you are trying to differentiate the finer points, you might compare these specifications:

- The greater the input resolution the measuring circuit can detect, the smaller the changes in the sensor's temperature that can be detected.
- The long-term drift specification is a measure of the transmitter's stability.

- RTD excitation current should be low to minimise self-heating error.
- Seek the highest input impedance possible so that the measuring device does not draw current.
- Advanced diagnostics help to predict failures.

If you are pursuing the very highest accuracy, you have to deal with the final 'as built' error in the RTD. The transmitter can be used to calibrate out that final offset error and match you to the ideal curve. Such a process delivers a typical transmitter and sensor combined accuracy of better than 0.05% of span.

Putting a temperature transmitter or remote I/O near your sensor digitises your temperature measurement, so from that point on the measurement retains its accuracy.

If you are direct wiring temperature sensors back to the DCS or PLC, it likely means that you did not want to pay for temperature transmitters for each of those data acquisition points. But consider this: If you use modern remote I/O technology instead, you will actually save money on instrumentation and wiring. It has the same accuracy, ambient temperature specifications and sometimes similar hazardous area certifications as you would find on temperature transmitters at a fraction of the cost. The remote I/O digitises all the temperatures and can deliver them as 32-bit floating point numbers to the DCS or PLC Modbus port using your choice of physical layers. Remote I/O also eliminates thermocouple extension wire and all the associated drift, errors and replacement costs in the same way a transmitter does.

### Summary

In conclusion, here are a few practical steps you can take to improve your temperature measurement accuracy. Remember that these steps also improve the stability of your measurement, which minimises your calibration expenses.

- 4-wire RTDs eliminate the errors caused by the copper lead wire.
- Use premium-grade thermocouples and premium-grade extension wire if the temperature to be measured requires the use of thermocouples.
- Be sure to use noise protection installation techniques whenever you have long extension wire runs.
- Mount transmitters or remote I/O as close to the sensors as possible in order to get rid of long thermocouple extension wire runs, which are an error source, have a finite life and are expensive to replace.
- Get rid of the final RTD offset error by bath calibrating.
- Buy the highest accuracy and highest stability transmitter or I/O you can afford.

*\*Gary Prentice is the National Sales Manager at Moore Industries. He has a BSEE from Lafayette College in Pennsylvania and more than 36 years' experience in the process control industry.*

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## SAFETY FUSES FOR PNEUMATIC SYSTEMS

Protect-Air HoseGuard safety fuses offer protection to pneumatic systems in the event of a broken compressed air hose or pipe.

If the volume of air exceeds a set value (which is factory set to allow normal air consumption when using air tools), an internal piston instantly shuts off the main flow, while an integral bleed hole allows some air to flow through. This enables the line pressure to automatically reset the safety fuse once the main break is repaired.

The safety fuses are manufactured in aluminium and can be ordered in 316L stainless steel. They are suitable for all applications where compressed air is used, including manufacturing facilities, the chemical and pharmaceutical industries and clean rooms.

The system meets OSHA and MSHA requirements, is CE compliant and complies with EN ISO 4414-11.2010-§5.4.5.11.1: Failure of hose assemblies and plastic piping.

**Compressed Air Australia Pty Ltd**

[www.caasafety.com.au](http://www.caasafety.com.au)



## MODULAR HMI

Schneider Electric has introduced the Magelis GTU HMI with smartphone-like navigation. It allows users to create an HMI for their application by snapping together the panel box and display of their choice. Optimised for the latest HMI configuration software from Schneider Electric, Vijeo XD, the Magelis GTU is as easy and comfortable to use as a smartphone or tablet, with intuitive navigation and many connectivity options, including remote access.

The Magelis GTU is easy to integrate with any system architecture due to a high variety of embedded interfaces: a dual Gigabit Ethernet port for network connectivity, dual serial and one optional fieldbus interface for easy communication with industrial devices, and up to four USB ports for connecting peripherals while minimising wiring.

Due to industrial multitouch, users can zoom in and out, swipe and scroll through intuitive menus while wearing protective gloves or through a protective screen cover. A high-resolution, 16 million colour screen delivers a clear view of the same key functions and tools as a PC, including Office viewer, Adobe viewer, Internet Explorer, multimedia player, etc. Magelis GTU applications can also be accessed through a second display via the DVI interface and managed remotely through the Vijeo Design'Air app for mobile devices.

**Schneider Electric Industry Business**

[www.schneider-electric.com](http://www.schneider-electric.com)

## DRY BLOCK CALIBRATOR

The Fluke 9144 dry block calibrator is suitable for comparison calibrations, transmitter loop calibrations and simple checks of thermocouple sensors. This industrial temperature loop calibrator provides fast, uniform and stable results for measurements in the field. It is available to rent from TechRentals.

This 9144 Metrology Well has a well depth of 150 mm and insert hole sizes of 9.52 mm, two 6.4 mm, 4.75 mm, and 3.17mm. Heating time for the 9144 is 15 min up to 660°C, and the cooling time is 35 min from 660 to 50°C. The unit comes with a NATA-certified calibration and includes PC software and interface cable.

The Fluke 9144 features a temperature range of 50-660°C, with a stability of  $\pm 0.03^\circ\text{C}$  and a display accuracy from  $\pm 0.35^\circ\text{C}$ .

**TechRentals**

[www.techrentals.com.au](http://www.techrentals.com.au)





## LINEAR POSITION SENSORS

Linear variable inductive transducer technology (LVIT) merges the benefits of contactless inductive sensing and low cost of contact-based technologies. LVITs are linear position sensing devices designed for factory automation and a variety of heavy-duty industrial or commercial applications such as solar cell positioners, wind turbine prop pitch and brakes, chute or gate positioners, and robotic arm position feedback.

These LVIT position sensors have sensing ranges from 12.5 to 450 mm and four analog outputs, and axial termination versions come with either an M12 connector or 1 m cable.

The LRS-18 model is spring loaded, has a 3/4" OD aluminium body and is offered in ranges 12.5 to 100 mm. The LRS-18 is suitable for OEM and factory automation applications where small size and low cost are important. Like the LRS-18, the LR-19 model has a 3/4" OD aluminium body and is offered in ranges up to 200 mm.

The LR-27 series industrial-duty LVIT position sensor is more robust than the LR-19 and is offered in both a 1" OD aluminium or stainless steel housing. It is also suitable for industrial OEM and factory automation applications where the application or environment is too extreme for the LR-19.

The LV-45 extreme-duty series units are also available, and are designed to survive the most extreme environments being installed on bridges, train tracks and off-road vehicles for construction and agriculture.

**Bestech Australia Pty Ltd**

[www.bestech.com.au](http://www.bestech.com.au)



### Precise measured values

The real effective value measurement (True RMS) identifies the real load power consumption level exceeding or falling below the nominal current.

### Transparency via communication

Up to 16 modules connected via gateway on Ethernet communications for monitoring & recording of diagnostic data.

### Easy to install

Built-in feed-through hole 0-10A/0-60A provide the load-current carrying cable to be directly monitored.



**Weidmüller**

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[www.weidmuller.com.au](http://www.weidmuller.com.au)





### SAFETY PULL WIRE SWITCHES

The ZQ900 series rugged safety pull wire switches offer reliable and robust emergency stop solutions for use along the length of conveyors or similar types of installations.

The die-cast body of the switch provides protection from harsh environmental conditions and an external watertight collar provides IP65 ingress protection making it suitable for use in any application from mining conveyors to packaging systems.

Up to 75 m can be covered by a single switch when using a tensioning spring, and LED indication is optional for status indication for installations of more than one device. Integrated safety features include an emergency stop button on the front housing of the switch offering full emergency stop functionality across the entire protected area. Wire pull and breakage detection ensures the system remains operational at all times.

Installation is made easier by the addition of three M20 cable entries on both sides and at the back of the switch body. Setting the tension is aided by a transparent indication window on the front of the housing.

**Control Logic Pty Ltd**

[www.control-logic.com.au](http://www.control-logic.com.au)

### ANDROID SMARTPHONE FOR HAZARDOUS AREAS

German company Bartec has created a device that is claimed to bridge the gap between consumer and industrial mobile devices. The Impact X is an intrinsically safe smartphone with the same usability, performance and functionality as high-end consumer devices. It is ready to use right out of the box, just like a regular smartphone.

In addition to being Zone 1 and 2 ATEX and IECEx certified, the device is waterproof and rugged. It has a sunlight-readable display with a touch sensor designed for heavy rain and for operation with gloves. The device has three cameras, a fast processor and double the battery capacity of a typical consumer smartphone.

Users of the device have access to a range of apps and services, such as office mobility apps, inspection and maintenance apps, ERP solutions, safety systems and communication tools. Bartec PIXAVI is also launching a range of video collaboration apps and device management software solutions. One application is called SIPIDO, which allows the user to conduct live videoconferencing sessions and stream video from the field. It is designed help users solve problems remotely, without having to send experts and technicians to the site.

**BARTEC Australia Pty Ltd**

[www.bartec.de/au](http://www.bartec.de/au)



### INTEGRATED SCREW/SLIDE SYSTEM

Haydon Kerk Motion Solutions has added the WGS wide guide screw to its linear slide product line. The WGS linear slide utilises a screw-driven carriage that claims to offer reliable, continuous linear speed, while maintaining accurate positioning. Length and speed of the WGS are not limited by critical screw speed, allowing high rpm, linear speed and long stroke lengths.

The WGS slide has a compact profile that provides improved torsional stiffness and stability. An integral mounting base can provide support over the entire length, which can extend up to 2.4 m. Longer lengths are available on a special order basis.

Standard leads include: 2.54, 5.08, 12.7 and 25.4 mm travel per revolution. Other imperial and metric leads are available. There are short leads for non-back driving vertical applications, eliminating the need for brakes, as well as longer leads capable of speeds of more than 1.5 m/s, which rival belts and cables while offering positioning accuracy, repeatability, axial stiffness and lower maintenance costs.

The WGS utilises sliding plane bearings on a low-profile aluminium guide rail that keeps the motion smooth throughout the travel distance. The lead-screw is precision made of high-quality stainless steel rolled on-site at a Haydon Kerk manufacturing facility.

All moving surfaces include Kerkite high-performance polymers running on a Kerkote TFE coating. The slides come with wear-compensating, anti-backlash driven carriages. Additional driven or passive carriages can be added, along with application-specific customisation. Linear guides without the drive screw also are available.

**Motion Technologies Pty Ltd**

[www.motiontech.com.au](http://www.motiontech.com.au)

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\* Feb 2015 research by Markets and Markets



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## DUAL-ARM COLLABORATIVE ROBOT

ABB has announced that its YuMi collaborative robot is now available in Australia. The robot has the ability to work side by side on the same tasks as humans while still ensuring the safety of those around it — thereby eliminating the need for protective barriers or safety zones. Its lightweight yet rigid magnesium skeleton features a floating plastic casing wrapped in soft padding in order to absorb impacts.

While YuMi was specifically designed to meet the flexible and agile production needs of the consumer electronics industry, it has equal application in any small parts assembly environment due to its dual arms, flexible hands, universal parts feeding system, camera-based part location, lead-through programming and state-of-the-art precise motion control.

YuMi can operate in very close collaboration with humans thanks to its inherently safe design. It is also compact, with human dimensions and human movements, which makes humans co-workers feel safe and comfortable.

If YuMi senses an unexpected impact, such as a collision with a co-worker, it can pause its motion within milliseconds, and the motion can be restarted again as easily as pressing play on a remote control. YuMi also has no pinch points so that nothing sensitive can be harmed as the axes open and close.



**ABB Australia Pty Ltd**

[www.abbaustralia.com.au](http://www.abbaustralia.com.au)

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## STAINLESS STEEL SENSOR

Turck has announced the addition of a compact stainless steel housed sensor to its line of Q08 sensors. The stainless steel Q08F provides users with a robust sensor alternative where standard Q08 sensors would not be suitable, or where a more durable sensor could minimise downtime and alleviate trouble areas.

The rectangular sensor offers a compact housing (32 x 28 x 8 mm), is made from 316 stainless steel and has an IP68/69K rating. Additionally, the sensor provides a 7 mm sensing range and can be flush mounted to offer a wide range of mounting and application possibilities. With these features, the stainless steel Q08F is a suitable solution for customers in the stamp and die, metal forming, welding and automotive industries where durability and reliability are a must.

The stainless steel Q08F comes equipped with an integrated LED to provide users with a visual indication of the sensor's status. The sensors also come outfitted with a PUR cable, the choice of a PNP or NPN output, and an operating range of -25 to 70°C.

**Turck Australia Pty Ltd**

[www.turck.com.au](http://www.turck.com.au)



## PROCESS CONTROL AND AUTOMATION TECHNOLOGY TO FEATURE AT AOG 2016

The world's leading oil and gas industry process control specialists are coming together in Perth next year for the annual Australasian Oil & Gas Exhibition and Conference (AOG).

With a string of world-class Australian LNG projects making the transition from the construction to operational phase, it is timely that process control and automation technology will again feature highly when the annual Australasian Oil & Gas Exhibition and Conference (AOG) is staged in Perth from 24–26 February 2016.

Celebrating its 35th year, AOG 2016 will bring together specialist companies from around the globe to exhibit their products. The AOG 2016 conference will meanwhile feature a theme of 'collaboration', with over 100 experts from leading companies providing input on how industry, government and other key stakeholders should continue to work closely together to reduce costs and improve productivity at a time of global crude oil price uncertainty.

Instrumentation, control and automation, non-destructive testing (NDT), condition monitoring (CM) and asset integrity will feature in separate specialist zones at AOG 2016, with strong content support being provided by the Institute of Instrumentation Control and Automation (IICA) and the Australian Institute for Non-Destructive Testing (AINDT).

These zones will include exhibits from the leading global names in process control and automation, NDT and CM asset integrity.

"We are really pleased to be continuing our strong focus on these key areas at AOG 2016," said Bill Hare, AOG event director at Diversified Communications.

"The Instrumentation Control and Automation Zone and NDT & CM Asset Integrity Zone are always very popular areas within the exhibition hall and we expect that this may be even more so next year, with LNG projects on both the east and west coasts of Australia rapidly transitioning to an operational phase.

"We are very grateful for our close working partnership with both IICA and AINDT, and their assistance in ensuring that the content for the Instrumentation Control and Automation Zone and NDT & CM Asset Integrity Zone at AOG 2016 will be timely and valuable."

Hare highlighted the importance of events such as AOG during times of change for the industry.

"AOG has been around for a very long time, and one thing we have noted during that period is that at junctures like this, when the oil and gas industry has been affected by low commodity prices, major global gatherings like AOG remain must-attend events.

"In a downturn, there is nothing more critical than ensuring your name is out there and that you are being seen to be proactive by your clients and your peers. That doesn't just mean marketing of goods and services, with personal networking just as important — and our large suite of networking events are sure to be popular.

"AOG's record and reputation for being the best attended oil and gas exhibition and conference in Australia will ensure that the event will again attract strong support, both locally and internationally."

Registrations are now open for AOG 2016, which will once again be one of the key global oil and gas industry gatherings. Significant international participation — including exhibitors from over 25 countries — has already been confirmed, with the 2016 event featuring a range of major international pavilions. AOG is once again playing a critical role in the transfer of knowledge between the northern and southern hemispheres.

For more information on AOG 2016, or to register now, please go to [www.aogexpo.com.au](http://www.aogexpo.com.au).







## DISRUPTIVE TECHNOLOGY IS COMING TO THE PROCESS CONTROL INDUSTRY

In the past we have seen a variety of innovations that have become disruptive technologies. What's changed is that we have a new name for it, and it occurs at a much faster pace today.

I remember the early days of my career, when a step controller came onto the market to replace relay control systems. The step controller was then replaced by the programmable controller, and then by the programmable logic controller — the PLC. The DCS systems also went through a similar evolution. Later came the personal computer, which then was advanced with the Windows operating system, followed by laptop computers — and today we have smartphones with more power than the original PCs.

There was a time when safety was achieved through hardwired systems and today even they utilise wireless technology. These are all examples of disruptive technologies.

Disruptive innovation is affecting our lives today — for example, Uber taking on the taxi market and Airbnb taking on the hotel market. It's about innovation disrupting or replacing past technology. You can now purchase LED lighting systems that are controlled and powered via a communications cable.

Industry and business is changing rapidly and the digital economy is playing a key role, which is opening up some new opportunities for our industry. While Australia can't compete in large-scale production, we have a great opportunity to use our unique creativity to be a leading player in this new market.

Australia has a very innovative past and great experience in creating flexible manufacturing plants, for low-volume production and for process control systems that lead the world. There is some fantastic and exciting new research being undertaken in Australia by industry and our universities into areas like nanotechnology, digital printing, solar energy being used to create hydrogen fuel

cells and the new generation robots, such as Baxter.

These innovations are assisting Australian companies to diversify and are also creating some exciting new companies. The government is also actively supporting this with a variety of programs to assist manufacturing companies. So now is the time to make sure you are not left behind.

We know that in today's world, the jobs university students are taking up at the end of their study were not around when they started their courses.

For many years our industry has seen a slow decline in exhibitions, conferences and seminars, but we are now seeing a renewed interest with record attendances at the IICA events around Australia in 2015. Where else will you be able to enhance your professional career, with so many presentations and an expo to see the latest technology available and enhance the profile of the instrumentation, control and automation industry and keep up to date with the latest technology?

As for tomorrow, we Australians have a blank sheet of paper, and it's up to our industry to step up and take a lead role in creating the next disruptive technology.



*CEO of the Institute of Instrumentation, Control & Automation (IICA). He has a solid business and industry background, with his most recent role being a partner at nem Australasia, assisting business leaders achieve their potential by enhancing their performance, vision and aspirations. Greg has been involved in the automation and process control industry since 1997 and has held key roles in several market-leading automation and instrumentation companies.*



A.B.N. 22 152 305 336

### Head Office

Cnr. Fox Valley Road & Kiogle Street,  
(Locked Bag 1289)  
Wahroonga NSW 2076  
AUSTRALIA

ph: +61 2 9487 2700 fx: +61 2 9489 1265  
[www.westwick-farrow.com.au](http://www.westwick-farrow.com.au)

### Editor

Glenn Johnson  
[wnipt@westwick-farrow.com.au](mailto:wnipt@westwick-farrow.com.au)

### Chief Editor

Janette Woodhouse

### Publisher

Geoff Hird

### Art Director/Production Manager

Julie Wright

### Art/Production

Tanya Barac, Colleen Sam

### Circulation Manager

Lora Tomova  
[circulation@westwick-farrow.com.au](mailto:circulation@westwick-farrow.com.au)

### Copy Control

Mitchie Mullins  
[copy@westwick-farrow.com.au](mailto:copy@westwick-farrow.com.au)

### Brand Manager Industrial

Nicola Fender-Fox

### Advertising Sales

#### VIC

Sandra Romanin - 0414 558 464  
[sromanin@westwick-farrow.com.au](mailto:sromanin@westwick-farrow.com.au)

#### SA/WA/Asia

Lachlan Rainey - 0402 157 167  
[lrainey@westwick-farrow.com.au](mailto:lrainey@westwick-farrow.com.au)

#### QLD/NSW

Nicola Fender-Fox - 0414 703 780  
[Nfender-fox@westwick-farrow.com.au](mailto:Nfender-fox@westwick-farrow.com.au)

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