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TECHNOLOGY

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February 2022 vol.35 no.7

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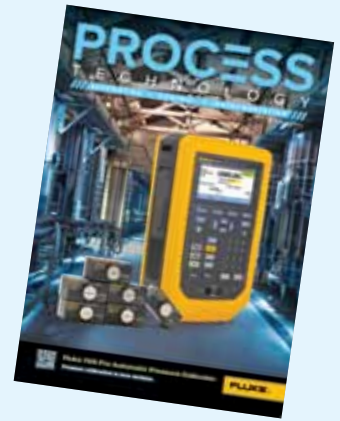
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ON THE COVER



## CONTENTS

- 4 Manufacturing operations transformation
- 19 M12 connections — the workhorse of digitalisation
- 20 Open path toxic gas detectors — key to an integrated strategy for worker safety
- 24 How vibration measurement saves manufacturers time and money
- 34 Securing cellular modems in industrial applications — best practices
- 42 Australia's goal to reach net zero can only be enabled with advanced technology



The Fluke 729 Pro Automatic Pressure Calibrator is designed specifically for process technicians to simplify the pressure calibration process and provide faster, more accurate test results. It is widely used in electric power, petroleum, chemical, pharmaceutical, metrology, metallurgy, biology, food, transportation, and automobile manufacturing industries. The Fluke 729 Pro can also automatically test multiple pressure test points and automatically document the results. Calibration is as easy as typing in the starting and ending pressure and the number of test points and tolerance level: the 729 Pro does the rest. The user can enter a pressure up to 7 MPa and the 729 Pro will automatically pump to the desired pressure.

It can also output changing pressure in step values or in a linear ramp. The user can freely switch the pressure output range to achieve the range needed for each machine without having to use a different calibrator. The 729 Pro is equipped with a lithium battery that can be charged separately or with the device, and has a capacity indicator to confirm the available power before installation. No tools are required to replace the battery.

For more information, visit [fluke.co/729pro-pt](http://fluke.co/729pro-pt).

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# MANUFACTURING OPERATIONS TRANSFORMATION

*Keith Chambers and Michael Schwarz, AVEVA\**

Achieving digital transformation includes activities that align manufacturing and IT systems to provide both operational and business improvements.

From optimising plant performance, to elevating business agility, to raising quality and compliance, there are countless reasons to pursue manufacturing operations transformation (MOT). It is the continuation of transformational activities that align manufacturing and IT systems across the business to provide both operational and business improvements.

Manufacturers are facing unprecedented challenges that have significantly impacted business results, growth and profitability. Many of these challenges have been amplified by the COVID-19 pandemic.

This article discusses the drivers of digital transformation in manufacturing, and how multi-site organisations can ensure consistent processes, reporting and KPIs that allow for a more agile and resilient supply chain and ultimately unlock the true value of their business.

### Business transformation

Back in the nineties there was an influx of ERP implementations, and companies invested in rolling out SAP or other ERP systems to digitise and standardise their business processes. Those companies are now leveraging previous technology investments to redefine how they run their businesses through global transformation initiatives. These initiatives are meant to give businesses the agility they need in their operating processes to be able to adapt to fast-changing markets and competitive forces.

Business transformation is closely connected to the digital transformation happening everywhere which is chang-

ing both B2B and B2C relationships and related expectations in user experience and services. But with all that, business transformation, like ERP implementations before, often gets stopped at the gates of the plant, which is where the businesses' primary value creation occurs.

All industrial manufacturing companies have started their transformation journey with plant and machine automation and the gains of productivity and process repeatability that brings.

### Manufacturing operations transformation (MOT)

Plant equipment automation minimises the number of manual operations and maximises the physical throughput. To further improve the utilisation of equipment, plant operations have matured into using information technologies and software applications as the basis for improvement strategies such as replacing paper-based work instructions and data collection.

#### *First-generation software and IT adoption*

The use of IT and software applications, such as manufacturing execution systems (MES), has provided more benefits than increased operational efficiency and reduction of manual processes through core application functionality. Detailed production history data and modern analytics offer additional payback opportunities by providing optimisation insights and facilitation of continuous improvement. Visibility into operations and resource status enables better decision-making and collaboration between plant and enterprise functions.

The ROI on these plant MES investments has been, and continues to be, based on improvements to operational efficiency, quality and compliance, both directly impacting bottom line results through:

- operational efficiency — increased asset performance and plant throughput, faster product changeover, increased productivity;
- increased quality and compliance — enforcement of product and process specifications, reduced waste and re-work, detailed traceability, indications and management of non-conformance, and effective recalls.

Manufacturing operations management (MOM) and supporting MES software have made great strides in bringing order, but unless they are easy to use and model the real-world dynamics of the plant, they may not be used to their fullest potential. MOT is the continuation (or beginning) of transformation activities that align these manufacturing IT systems across the business to provide both operational and business improvements.

According to the World Economic Forum, the value of digital transformations in the Fourth Industrial Revolution is estimated at \$100 trillion in the next 10 years alone, across all sectors, industries and geographies. The manufacturing sector, which has long been a driver of global prosperity and economic growth, is key to this transformation.<sup>1</sup>

### Drivers of digital transformation in manufacturing

There are three main drivers of digital transformation in manufacturing, namely:

- Technological advances in big data and predictive analytics, business process management, mobile applications and augmented reality are enabling manufacturers to empower operators and decision-makers to make sense of operational data.
- Newer platform and integration technologies like cloud, IoT, IIoT, smart and edge devices are driving down the cost of digital transformation in the manufacturing sector.
- Concepts like the digital twin and the digital transformation of work are increasingly becoming the tools to improve operational efficiency and drive the needed business outcomes at manufacturers' plants.

Manufacturing execution systems continue to play a central role in this. As machines become smarter (the 'things' in the IIoT), MES unites those machines with connected workers and other connected



**MANUFACTURING OPERATIONS MANAGEMENT (MOM) AND SUPPORTING MES SOFTWARE HAVE MADE GREAT STRIDES IN BRINGING ORDER, BUT UNLESS THEY ARE EASY TO USE AND MODEL THE REAL-WORLD DYNAMICS OF THE PLANT, THEY MAY NOT BE USED TO THEIR FULLEST POTENTIAL.**

assets — changing this collection of smart machines into a smart factory. The role of MES is evolving into a plant's digital twin, a solution that ties together all of the data from across all of the plant's assets and operations.

### Collaboration across people and systems

A key factor for future manufacturing operations improvements is the effective work process-centric collaboration of people and systems in a digital, automated and integrated fashion.

Information from IoT and cloud technologies is more easily accessible for empowering employees to work efficiently, while digital workflow and skills management systems help to guide the new generation through work tasks with instructions, forms for data collection, procedural enforcement and informational context.

The element that can bring people and process together in industrial operations is business process management (BPM) technology integrated with a manufacturing IT platform to connect workers with plant floor processes, data and systems (Figure 1).

The digital transformation of operational processes also allows businesses to capture the extensive institutional knowledge and best practices of an ageing workforce, and empowers the next-generation workforce with a digital user experience on workstations and mobile devices. It additionally establishes systematic people and system collaboration and allows the connection of workers across functional domains and functions.

### Multi-site manufacturing operations transformation

Many manufacturing businesses have grown by mergers and acquisitions, becoming large national, multinational or global organisations. These companies are now equipped with multiple production plants across regions for producing the same, or variations of similar, products. These plants often represent heterogeneous plant system landscapes and varying practices for similar operational activities and business targets.

These multi-site enterprises are changing to a broader transformative view of manufacturing to respond to the challenges of more dynamic markets and to make use of

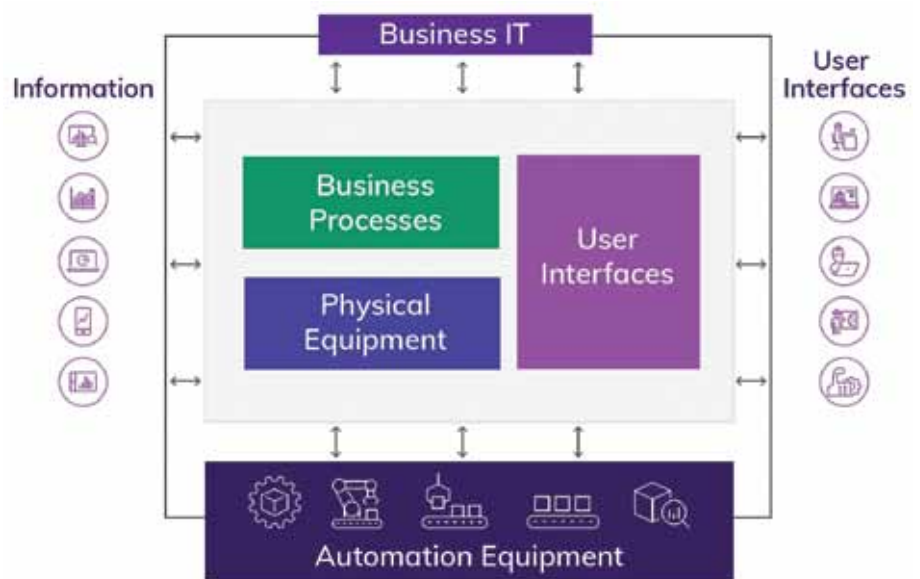


Figure 1: Integration of business and manufacturing processes.

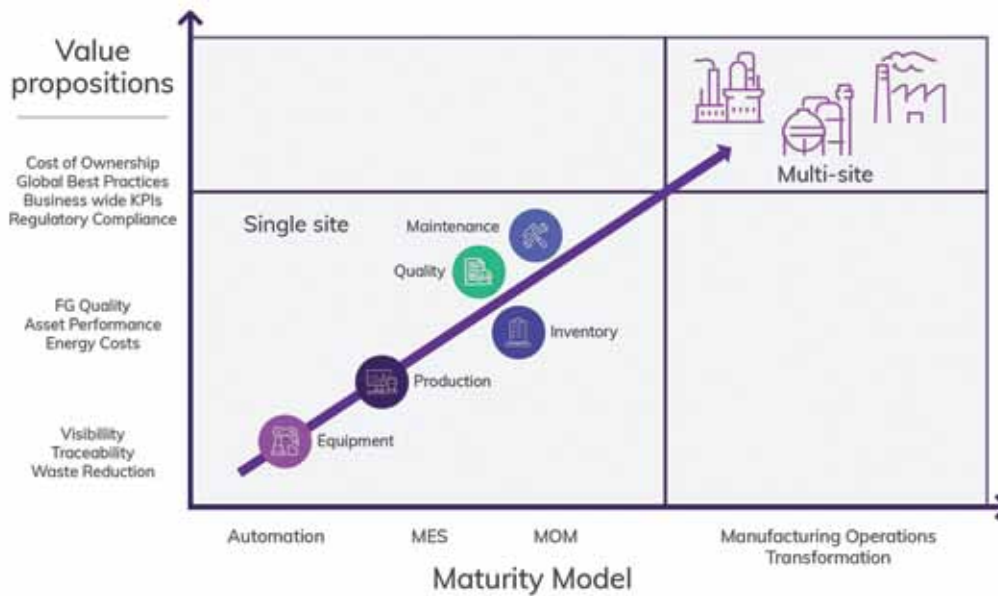


Figure 2: MOT for multi-site operations.

new significant ROI opportunities that are unique on a business-wide basis:

- Business-wide scorecards and consistent KPIs for transparency in cost, capacity and inventory for profitability and sustainability optimisation across the enterprise.
- Operational excellence, lean and continuous improvement cultures that need to collaborate and share best practices.
- A consistent, documented approach to regulatory compliance to minimise risks.
- A connected enterprise for accessibility of information anywhere and anytime, to increase business agility and the ability to innovate faster.
- Reduced cost of ownership through manufacturing technology and systems standardisation and reducing the number of applications and interfaces across the business.

**Standardisation of processes, reporting and KPIs across a multi-site business**

The primary enabler of an effective multi-site manufacturing operations transformation is the enterprise-wide standardisation of plant operations and information technologies. Such harmonisation is the foundation for integrating, executing and governing operational processes and related information flow consistently across multiple plants (Figure 2). Standardisation of operational processes is possible with the types of software components that offer:

- **a reusable operations process modelling approach**, which digitally models all operations aspects into a digital twin of the plant and simplifies deployment of standards to equipment, systems and people;

- **an open engineering and runtime platform**, leveraging industrial workflow and process management capabilities, hardened for industrial use and designed for the integration of business, manufacturing operations, smart production equipment and IoT data;
- **scalable industrial applications** from plant performance optimisation to full manufacturing operations management functionality.

**Ensuring consistency across varied plants**

The physical attributes and even the level of automation of manufacturing plants in an organisation may vary, but what standardisation strives for is common and consistent visibility into, and interaction with, all plant operations for improved business decisions and agility.

A configurable, model-driven approach to operational processes, work procedures and related user interfaces is needed to enable reusability of captured best practices and enforce operational procedures as corporate standards.

The role of a manufacturing IT platform should be to provide adaptability to local plant nuances and a plant asset model that applications can use to blend human and automated activity in the execution of standardised processes and business rules. The platform must be able to adapt to individual local physical equipment and automation, while maintaining the standard process and information models towards the enterprise.

Achieving consistency ultimately enables manufacturing industries to make operational improvements and digitally transform operations consistently across multiple sites, with

adaptability to the site-specific nuances abstracted in a digital plant information model.

**How to get started with MOT**

Multi-site digital and operational transformation harmonises entire manufacturing networks and lays the foundation to further optimise the value chain, along with solutions like predictive analytics and prescriptive planning and scheduling.

Connectivity is important. Any adopted solution should have built-in connectivity to existing plant floor systems, devices and equipment automation. It is vital to ensure an easy-to-use, accessible user interface for a work process-based approach to manufacturing operations management.

**Reference**

1. World Economic Forum 2019, *Accelerating a more sustainable industrial revolution with digital manufacturing*, <<https://www.weforum.org/agenda/2019/01/3d-printing-fourth-industrial-revolution-sustainable>>

*\*Keith Chambers, Vice President, Operations Execution Software at AVEVA is responsible for strategic direction, commercialisation and development for AVEVA's operations execution software portfolio globally. Keith has over 20 years' experience in the automation, software and MES business with a focus on manufacturing operations software in the food and beverage, CPG and life sciences industries. \*Michael Schwarz is Product Marketing Senior Manager for Operations Execution software at AVEVA.*

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## ELECTRICAL PRESSURE CALIBRATION PUMP

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Engineering the Future

## INDUCTIVE SENSORS WITH IO-LINK

Besides offering flush inductive measuring sensors with an IO-Link output, Turck is now also offering three non-flush variants. The NI4-M12, NI7-M18 and NI12-M30 models supply a signal proportional to distance over a 4, 7 or 12 mm range as an IO-Link process value (2 bytes) or as a voltage signal of 0–10 V. The measuring range can be adjusted so that the entire signal range can be used within a small measuring window.

Turck says their accuracy and long range make the sensors suitable for many applications, including the monitoring of the gap dimension on industrial rollers or detecting wear, such as for monitoring concentricity on shafts. They can also be cost-effective alternatives for rotary encoders or linear position sensors. In simple applications, they record linear and rotary movements as analog position signals using inclined planes or eccentric screws.

Additional functions can be implemented via the IO-Link interface: besides the basic process value, the sensors output the internal temperature value, the distance value to the object and other diagnostic data. Besides their actual task, they can therefore also be used for condition monitoring or predictive maintenance.

**Turck Australia Pty Ltd**  
[www.turck.com.au](http://www.turck.com.au)



## PRESSURE SENSOR MODULE

The WIKA model MTF-1 pressure sensor module is designed to be a simple and flexible option for integrating pressure measurement into a wide variety of applications.

The pressure value is digitally processed in the module and output as a standardised digital or analog signal, enabling the module to deliver data for applications with pressures of up to 1000 bar. The compact module can be easily adapted to the requirements of the respective application due to individual configuration of the process connection and electrical connection. Adjustment of the output signal is carried out by WIKA at the factory, meaning time and cost expenditure for calibration during integration is eliminated.

The pressure sensor module is designed for energy-saving operation. The digital I<sup>2</sup>C signal transmits data efficiently due to the low basic energy consumption and fast switch-on times. The energy-efficient sleep mode further reduces energy consumption. This makes the module particularly suitable for battery-operated solutions, with the long cycles between battery changes reducing maintenance costs.

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## PROCESS METER

The LC30 process meter is a reference-grade digital gauge that is optimised for fixed installation in panels and enclosures. With  $\pm 0.1\%$  full scale accuracy, intuitive controls and convenient design features for easy installation, it is suitable for both lab and OEM applications that require high precision from a panel-mounted gauge.

Users can perform live viewing of pressure or set up tests for continuous monitoring, and easily customise the gauge to the application needs using the included FieldLab calibration management software.

Designed to run on AC power, the LC30 process meter includes country adapters for Australia, New Zealand, Singapore and China, with backup battery power. It is available in 11 pressure ranges from 35 kPa to 70 MPa, a combination pressure/vacuum gauge from  $\pm 100$  kPa and a vacuum gauge measuring up to 760 mmHg.

**Ralston Instruments LLC**  
[www.ralstoninst.com](http://www.ralstoninst.com)



## HIGH STATIC DIFFERENTIAL PRESSURE TRANSMITTER

Now available in Australia, the Rosemount 3051S High Static Differential Pressure Transmitter is suitable for critical process measurements in applications requiring high static pressure capability of up to 15,000 psi (1034 bar).

In industries such as offshore and onshore oil and gas and power generation where pressures can exceed 10,000 psi, it is critical that instrumentation be robust enough to provide accurate measurements on a consistent basis. Emerson's Rosemount 3051S high-pressure transmitter technology with an all-welded, stainless steel design is engineered to withstand extremely high static pressures.

The SuperModule platform and coplanar design reduce potential leak points by 50% compared to traditional designs. The hermetically sealed SuperModule isolates the pressure sensor and electronics from harsh process and environmental conditions to optimise performance over the life of the transmitter.

Traditional instrumentation used for high pressure service is large and bulky and can double or triple the footprint and weight of a typical measurement point. The product's lightweight design and compact coplanar platform weighs 60% less than traditional transmitters, the company claims; on a typical platform using 300–500 traditional pressure transmitters, the device can help oil and gas companies reduce weight by hundreds of kilograms topside. The coplanar transmitter also integrates additional hardware such as integral manifolds into a single assembly, further reducing weight and lowering overall installation and instrumentation costs.

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## LIQUID LEVEL READER FOR GAS WELLS

QED Environmental Systems, a manufacturer of environmental measurement products, has announced the release of the Precision Level Reader (PLR), which is said to be an accurate, safe and efficient method for determining leachate or condensate levels in gas wells.

With QED's PLR device, liquid levels are detected within seconds and are recorded with a time, date and location stamp with no need to interrupt the vacuum in the well. Using a permanently installed weight and tube, the PLR engages a micro-compressor and differential sensors to determine a water level reading that is not affected by foam and will not cross-contaminate from well to well.

With no need for a water tape or well seal removal, level readings take a fraction of the time and effort, with no exposure of technicians to dangerous gases or liquids in the process. Levels are taken with the well vacuum intact, meaning no errors occur due to foam in the well or vacuum losses.

The PLR system consists of three components: the Remote Measurement System (RMS), a handheld portable PC and handset software. An IP65 ABS enclosure houses the air pump, battery, pressure sensor and interface circuits in the RMS. The associated rugged handheld unit features integrated Bluetooth, a Windows 10-based operating system, and a minimum of 64 MB RAM and 256 MB Flash memory. Finally, the customised interface application software features a user-friendly digital display with audible and visual alerts. The software offers simple data recording and storage options.

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## Ralston LC30 Digital Pressure Gauge

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## RADAR LEVEL SENSOR WITH IO-LINK

ifm efector says its LW2720 level sensor enables levels of liquid media in tanks with a height of up to 10 m to be monitored precisely and without blind areas. The non-contact radar measuring principle prevents malfunctions or failures of the sensor caused by the adhesion of viscous media or damage from agitators.

The 80 GHz frequency used provides stable measurement results even in the presence of steam or condensate in the tank. The sensor is designed for use in hygienic areas, so that even CIP and SIP processes or the use of spray balls do not impair its proper functioning.

Installation and configuration can be completed quickly due to the standard M12 cable, fast parameter setting using IO-Link and a large selection of adapters that enable customisation out of the box.

**ifm efector pty ltd**

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

**ULTRASONIC SENSORS**

In through beam mode, the Wenglor U1RT ultrasonic sensor is said to operate reliably up to 2 m, and in reflex operation up to 1.2 m. In addition to the application range at temperatures between -30 and +60°C, it is also possible to use the sensors in synchronous mode. Two independent switching outputs enable the measurement of minimum and maximum levels.

The sensors offer installation flexibility made possible by a low installation depth, and by the availability of PNP and NPN variants. An integrated IO-Link 1.1 interface with COM3 standard enables fast and secure communication with controllers. An integrated NFC interface also allows the sensors to be configured without power and wirelessly via the wenglorApp. The sensors can also be adjusted directly via the teach-in key.

In addition to compact formats such as the U1KT housing (32 × 16 × 12 mm) and the R format (56.5 × 26 × 24 mm), the ultrasonic sensors also include the metric designs in M18 and M30 format (UMD and UMF) made of stainless steel as well as the cuboidal UMS sensors (81 × 55 × 30/47 mm) for large working distances of up to 6 m and the special U1H format as a fork sensor.

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## COMPACT ELECTROMAGNETIC FLOWMETER

Krohne has introduced the AF-E 400 ultracompact electromagnetic flowmeter for utilities and industrial automation applications. It is designed to fit in applications with little installation space available, such as in cooling lines of welding equipment, bending machines and robots, or on chemical dosing skids.

The product features a stainless steel housing and is suitable for continuous use at 90°C liquid temperature, allowing for operation in demanding cooling and hot water applications. The round bore reduction of the sensor makes the flowmeter resilient in terms of increased pressure, which should enable high accuracy over a wide pressure and temperature range and a high turndown ratio without risk of cavitation. The integrated temperature measurement eliminates the need for an additional sensor.

With built-in self-diagnostics, the meter continuously monitors several critical aspects including low supply voltage, incorrect parameterisation, flow range exceedance or short circuit on any of its outputs. Warning messages according to NAMUR NE107 alert the user via the rotatable full-colour display or the communication outputs.

Due to the special design of its magnetic circuit, field strength and electronics, the unit is immune to crosstalk caused by magnetic field overlap with adjacent devices, and can be installed in series or in parallel up to a distance of 2 mm from device to device without interference.

The product supports flow rates up to 150 L/min as standard and up to 500 L/min on request. Output options include 4-20 mA, pulse, frequency, switch, IO-link or Modbus.

**KROHNE Australia Pty Ltd**

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## RADAR SAFETY SENSOR

The Pilz PSEN rd1.2 radar sensor can be used for Cat. 3/PL d and can therefore be used for robot safety applications. When used in conjunction with the PSEN rd1.x I/O PN analysing unit the company says it is easier to incorporate the safe radar system into existing applications. The safe radar system can be used anywhere that optoelectronic sensors reach their limits — particularly in rugged application conditions, such as in woodworking, mineral and steel processing and heavy industry, as well as the transport and logistics sector.

The PSEN rd1.x I/O PN analysing unit in the safe radar system now offers both an Ethernet and a Profisafe interface in addition to the existing interfaces, while the radar sensor is mounted on three axes, so that vertical ceiling installation is also possible due to the rotation around the X- and Y-axis.

It provides an operating range of 5 m as well as a narrow opening angle of 20° vertical or 20–100° horizontal, configurable in 10° increments.

The safety-related functions covered by this system solution include area monitoring, ie, the machine is brought to a safe state as soon as the danger zone is violated. There's also protection against encroachment behind the protected area. This prevents the machine from restarting automatically if there is still somebody within the danger zone.

The self-teaching background function of the safe radar system can be used to make changes within the warning or protection zones during operation.

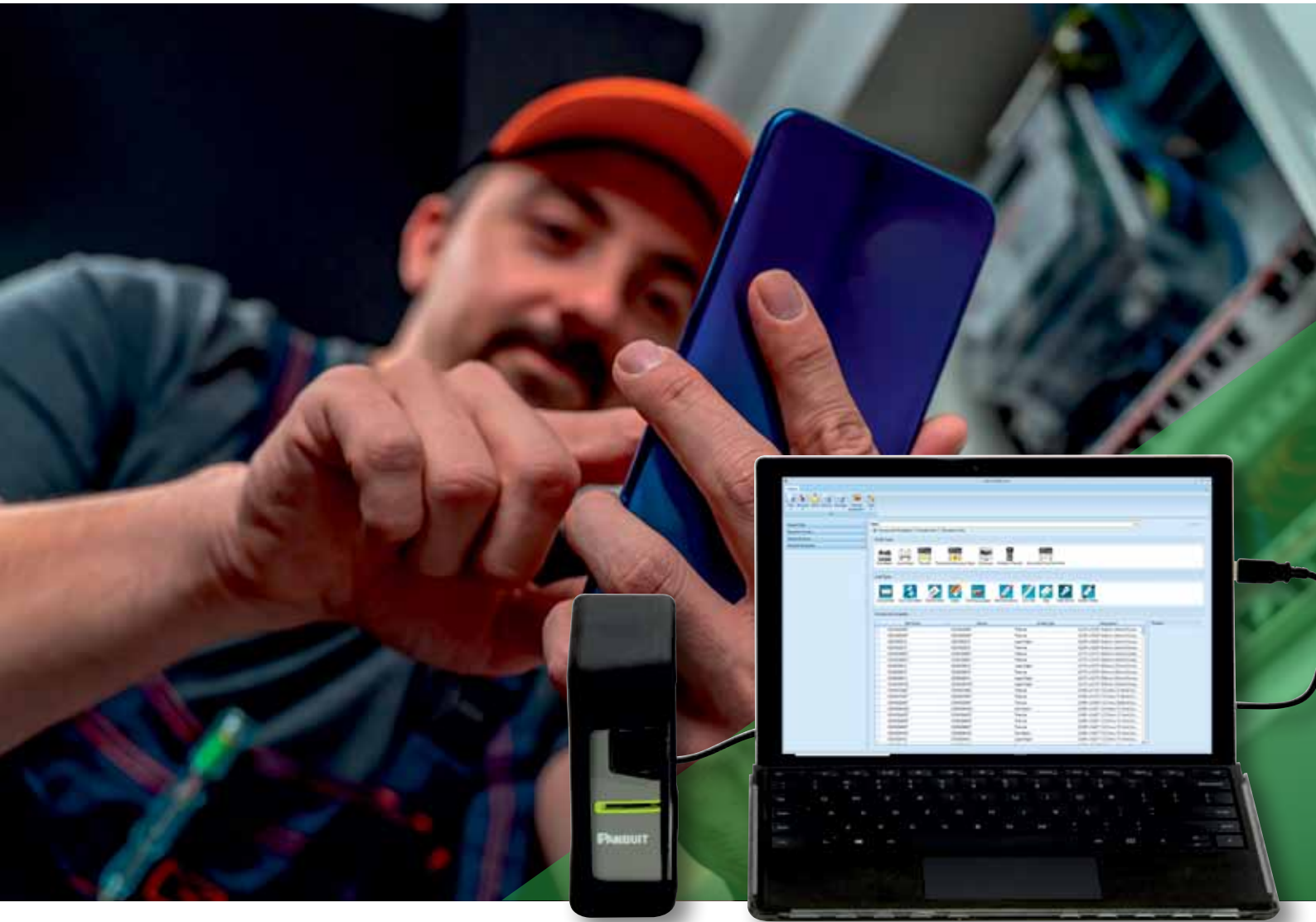
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## Rugged touchscreens enable safe refuelling on remote sites

When developing a new field controller for its fuel management system, Banlaw — a supplier for off-road liquid transfer, measurement and control solutions — wanted a user interface that could thrive in harsh industrial work environments anywhere in the world, such as remote mines and quarries. The developers also wanted a touchscreen that would work with gloved hands, provide year-round, low-maintenance operation, and be readable in both direct sunlight and the middle of the night. They chose a high-brightness industrial-grade display fitted with a rugged, custom-designed Zytronic ZyBrid touch sensor and a bespoke serial touch controller.

The Banlaw Xpress Field Controller is the central component in a complete fuel management system and is built to withstand harsh operating environments, provide ease of use, and deliver secure fuel inventory monitoring and control. The compact unit manages user and equipment identification, pump control, ball-valve control and flow metering for up to four refuelling nozzles. It also provides precise, real-time tank gauging for four fuel tanks.

Banlaw wished to collaboratively develop a fluid asset management product to satisfy customer needs.

“Component pricing and the expected longevity were important when deployed on industrial worksites,” said Sebastian Hoppe, Engineering & Development Manager, Banlaw. “However, a supplier with the subject matter expertise to help us achieve better together was more important, which is why we chose to work with JEA Technologies and Zytronic.”

Working closely with JEA, Zytronic designed a bespoke, printed glass 7” ZyBrid projected capacitive touch sensor incorporating UV and IR filters to aid system thermal management and protect the underlying display from damaging exposure to sunlight. A 6 mm-thick, thermally toughened antiglare etched glass was chosen, offering optimum impact resistance and reducing sunlight reflection in the frequently scorching weather experienced by Banlaw’s customers in Australia, Africa and the Americas

In addition to the dynamically changeable touchscreen, a fixed keypad was also required to allow frequently used information such as driver secure PIN codes, truck mileage or odometer readings to



be quickly entered into the Banlaw Xpress Controller. Consequently, working closely with JEA and Banlaw’s engineers, Zytronic designed the rugged touchscreen from a larger piece of glass and then printed the required viewable area together with ‘hard coded’ capacitive keys and an RFID reading point beneath a 10.2” touch active zone. In addition, Zytronic modified its standard ZXY100 serial controller to incorporate both dynamic touch and fixed keys managed through the same device. The overall benefit was to reduce the complexity of integrating multiple components and the size of the high brightness industrial-grade display required, and therefore overall system cost.

“This combination and integration of a projected capacitive keypad together with a touchscreen in a single user interface really helped our product development process,” Hoppe said. “Furthermore, liaising with JEA Technology and Zytronic throughout was excellent. Both organisations

added their specialist expertise, yielding fast responses and collaborative solutions for creating this new Xpress fluid asset control technology.”

Utilising Zytronic’s complete in-house ownership of touch control electronics coupled with its ability to quickly design and manufacture highly customised touchscreen designs, even in low quantities, Banlaw and its technology partners have already completed the first 20 Xpress deployments. These implementations have predominantly been for mines and quarries, and the company expects to build around 170 in the coming year. The Xpress Controller also meets the needs of many agriculture, road transport, rail, construction and liquid food production operations. The affordability of Banlaw’s Xpress solution is expected to drive uptake by these other industries that historically have struggled to invest in enterprise-class fluid asset management processes.

“I wish all my suppliers were as forthcoming and collaborative as JEA Technologies and Zytronic,” Hoppe said.

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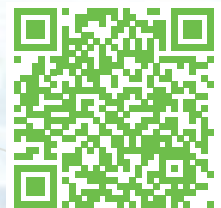
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## INDUSTRIAL VACUUM SYSTEMS

EXAIR manufactures industrial duty vacuums for chip removal, liquid transfer and cleaning. All systems use compressed air powered vacuum generators that have no moving parts, no impellers to clog and no motors to wear out, assuring maintenance-free operation. Some of the vacuum systems available in the range are shown below.

EasySwitch Wet-Dry Vac is an all-purpose vacuum with the capability of handling any job — dry or wet. Switching between vacuuming liquids or solids is as easy as removing the pleated filter when vacuuming liquids and reinstalling directly into the open filter hatch when working with dry material. It is available in 205 L capacity with either standard or HEPA filtration.

Chip Vac picks up dry or wet chips and delivers them directly to an ordinary drum. It is used to clean chips from fixtures, machines, parts and work surfaces. The lid can be moved easily from drum to drum to keep materials separate for recycling. It is available in 5 gal and 205 L capacities.

Heavy Duty Dry Vac turns an ordinary drum into a powerful, industrial duty vacuum cleaner. It vacuums more dry materials in less time than ordinary vacs. It is suitable for

vacuuming abrasives like steel shot, garnet, metal chips and sand. It is available in 205 L capacity with either standard or HEPA filtration.

Reversible Drum Vac is a two-way liquid vacuum that can fill or empty a 205 L drum in 90 s. It is suitable for spill recovery and filling or emptying coolant sumps. It is available in 5 gal and 205 L capacities. The High Lift Reversible Drum Vac provides the high lift power needed to fill or empty below grade (up to 4.6 m) coolant sumps, pits and cisterns.

All EXAIR industrial vacuum systems are CE certified and comply with OSHA's Safety Requirements for dead-end pressure and noise limitation.

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## PANEL METERS

The PM-50 panel meter from Red Lion is suitable for OEMs, machinery builders, panel builders or manufacturing companies, and is available as a 3.5" or 4.3" graphical touchscreen display in both 1/8th DIN and 1/16th DIN cut-outs for easy retrofits.

Using simple 'swipe' technology similar to smartphones, users can easily switch between relevant screens and receive operational data for monitoring equipment and production. Visual and smartphone push alerts notify the user that immediate action is necessary, either on the unit itself or via the PM-50 smartphone app.

The PM-50 offers both analog and digital signal processing with many modular I/O options, including connectivity via serial, Ethernet and Wi-Fi with Modbus for users to remotely access critical workflow and process data from the confines of the plant floor.

**Control Logic Pty Ltd**

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## POWER SUPPLIES

Industrial power supplies from the Pepperl+Fuchs PS1000 series are used in automation technology where high system availability, redundancy and economic efficiency are required. In the control cabinet and in field boxes in all industrial applications and process systems, they are designed to ensure an efficient and reliable power supply from 5 to 40 A, for 12, 24 or 48 VDC output.

The PS1000 devices have ATEX, IECEx and EAC approvals and are also certified for the North American market, allowing them to be used up to Zone 2/Div.2. The PS1000 series includes 1- and 3-phase power supplies as well as modules with built-in redundancy and redundancy modules. The PS1000 series includes 1- and 3-phase power supplies as well as modules with built-in redundancy and separate redundancy modules.

With their compact design, the modules can be mounted on DIN rails and can be used in ambient temperatures of up to +70°C. The cable length can also be compensated in the application, since the output voltage is adjustable.

**Pepperl+Fuchs (Aust) Pty Ltd**

[www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



# M12 CONNECTIONS

## THE WORKHORSE OF DIGITALISATION

It has been said that Ethernet is the backbone of digitalisation; therefore, M12 connections could be considered the workhorse of this generation.

**M**12 connections are popping up everywhere as more businesses move towards digitalisation and transformation of their processes. Their simplicity in connecting devices with network blocks in the field provides a cleaner installation and a less-wired environment.

There are a number of types of M12 technologies available, with a variety of uses and ratings to fit most, if not all purposes. But how can you ensure you're connecting them correctly to protect your device and assets?

Because of the plug-and-play analogy used with M12 connectors, installers can sometimes miss simple steps that can affect the connectivity of the M12 connector to device, and in some cases damage the connector or the block in the process.

### Different types of M12 connectors

The most common M12 connector is the A-coded. This is used for all standard I/O, both hardwired as well as IO-Link, ASI, etc. B-coded, which is defined by a purple cable, is specifically used for Profibus, while D-coded and X-coded usually have male-male connectors and are generally used for industrial Ethernet.

L-coded is a power cable that can take up to 16 A, generally used for connecting power to the blocks in the field, while S-coded is another that is a 3-pin model used for AC connections.

### Fit-for-purpose cabling

There are a number of different types of cables including right-angled and straight. Depending on your blocks and how they are all keyed will depend on the type of cable connection right for you, as well as the different types of sensors you're installing.

What is also important when choosing your M12 cable type is to ensure the cable is fit for purpose for the application. As an example, if you're using your M12 connectors for robotics you should choose a high-flex cable. More importantly, and most commonly for outdoor applications, UV stabilisation is an important consideration for cables exposed directly to weather elements. Therefore, making sure your cable always meets your site standards, including colour and durability, is extremely important for the longevity of your cabling.

### Must dos for a successful installation

Never leave cables or ports unprotected in the field during installation: dust, bugs and other debris can get lodged in the ports, affecting your

block's integrity. Try to avoid field-wireable connectors, and always install connectors with the correct force. All unused ports should be capped off after installation, and good practice is to allow a loop of excess cable available — just in case! Finish the job with labelling the cables and their respective ports if installed on a block, as some networks assign the exact port.

### Connector tightness

One of the biggest issues observed with M12 installations is the tightness of the screw clamp. There are a number of easy-to-use tools available that ensure there is no over-tightening leading to bent or compromised pins or under-tightening affecting the integrity of port connection to device.

Rule of thumb: you should be able to screw in the plug all the way by hand. You may need to wriggle it a little as you go, but never use mechanical force as this could cause a crossed thread. It is recommended to use 1.0 Nm of force for metal-metal connectors, and 0.6 Nm for metal-plastic or plastic-plastic connectors to ensure correct installation and connectivity. This is best applied with a specialised, adjustable torque driver available from a number of third-party suppliers; alternatively, a small 'key-ring' type M12 spanner can be used.

After setting the driver to the required torque, slowly turn until you hear the 'click'. There is no need to tighten any further. It will be impossible to untighten with your own hands, and this is the indication the connector is secured efficiently. If using the key-ring spanner, use a gentle force from just one finger to achieve near the correct torque.

### Final M12 connection tips

Shield blocks and connectors from mechanical stress. Ensure blocks and their connections are protected from dripping water, chemicals or cleaning fluids. Protect where possible from direct sunlight and if in a known moist environment, a little electrically insulating silicone grease will help.

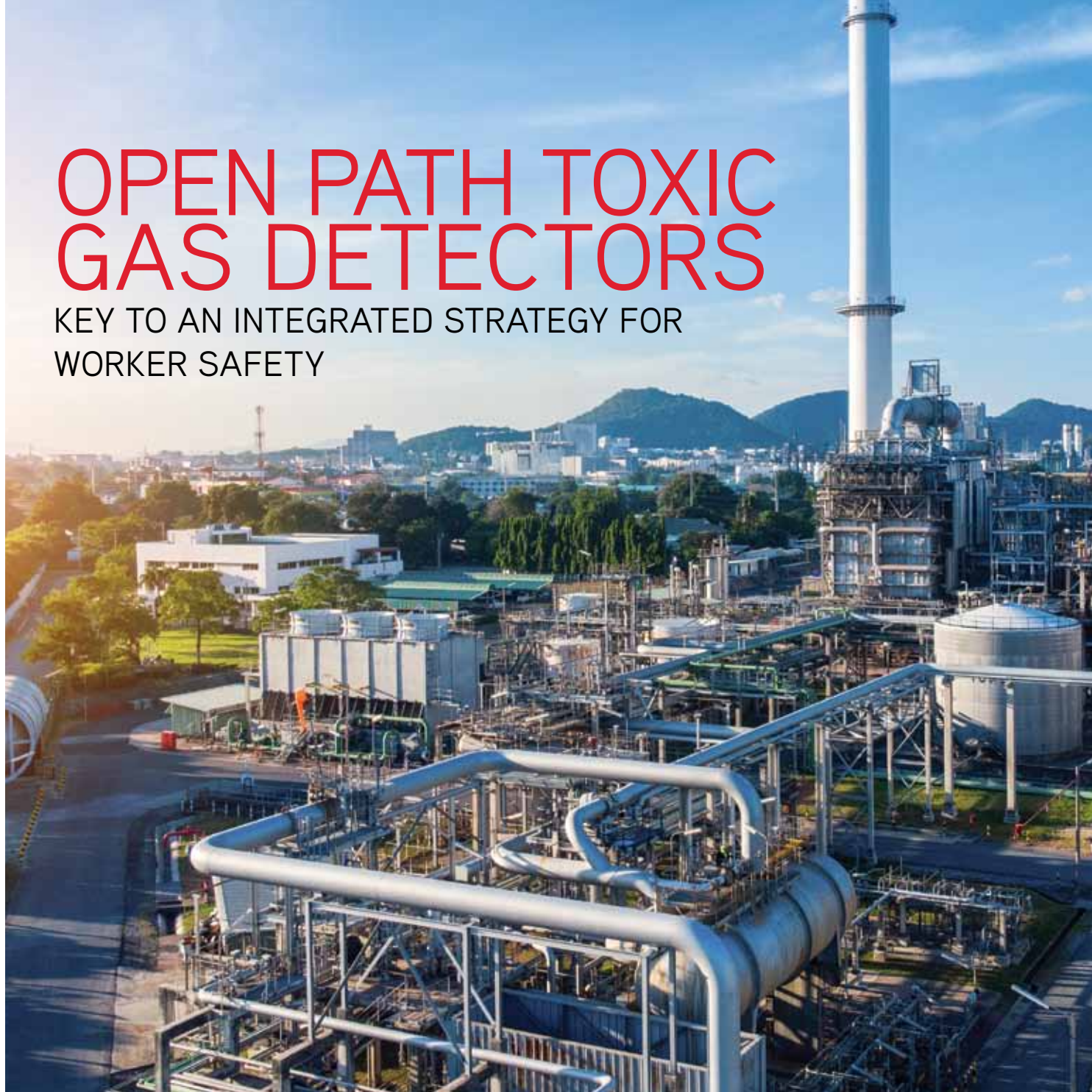
The future of connectivity is getting easier; however, we must make sure we're using the right equipment and following the right installation practices so we're protecting the investment from block to device.

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# OPEN PATH TOXIC GAS DETECTORS

KEY TO AN INTEGRATED STRATEGY FOR  
WORKER SAFETY



Hazards from toxic hydrogen sulfide lurk in every upstream oil and gas production site. Open path detectors provide critical capabilities to warn personnel of dangerous conditions.

One of the challenges related to upstream oil and gas production is hydrogen sulfide ( $H_2S$ ), which, along with the general potential for fire and explosions from hydrocarbons, represents a serious and persistent threat to workers in the industry. Producers do not create  $H_2S$ , it is simply a by-product of the same process that turned prehistoric vegetation into fossil fuels. Unfortunately, it is impossible to recover the fuels without the by-product, so producers must find ways to capture it safely. From time to time it escapes, putting workers in danger.

$H_2S$  is a highly toxic compound, normally in gaseous form, capable of incapacitating and killing workers even at low levels of exposure. It has been classified as immediately dangerous to life and health at a concentration of just 100 ppm: it is a broad-spectrum poison, with its most acute effect on nervous and respiratory systems. Heavier

than air, it tends to accumulate in low-lying areas like trenches and sumps. While  $H_2S$  has a strong odour of rotten eggs and is easy for humans to recognise, it rapidly destroys the sense of smell, sometimes causing individuals to believe it has dissipated. Low concentrations can be difficult to sense, requiring careful selection and implementation of detection equipment.

Two main detection methods hinge on monitoring an electrochemical reaction to 'smell' the gas, or by 'seeing' the gas due to the ability of  $H_2S$  to absorb specific wavelengths of light which electronic sensors can characterise. Equipment designers have applied these techniques in a variety of ways with the aim of optimising detection under specific circumstances as part of a larger safety system.

## Immediate vicinity: point detection

Point source detectors are an appropriate choice for many applications where likely toxic gas sources are understood and localised. The escaping gas must reach the sensor in sufficient concentration to cause a specific chemical reaction to take place, typically with a metal oxide on a surface or between electrodes. Point source detectors are usually placed near potential sources, with the number and



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Figure 1: An open path toxic gas detector consists of a source and detector pair that detect H<sub>2</sub>S in the path of the beam.

concentration on a near real-time basis. The concept sounds simple enough, but implementation is more complex.

Since the detector is looking for a change in the intensity of specific wavelengths, there must be a consistent light source serving as the benchmark. When implemented, this approach is configured as a two-piece unit (Figure 1) with a source and detector placed some distance apart. Ideally, the detector should be oriented to only see its corresponding light source to avoid being misled by some change in ambient conditions. With this in mind, the source and detector are deployed together, looking from one to the other across the area of coverage, effectively creating a beam of light with consistent characteristics sent from the source to the detector. Both use lenses and shading to minimise any effects from ambient light since these systems must operate equally well in full sunlight and night-time darkness. Transparent covers protecting the equipment are often heated to minimise condensation or ice formation, which can interfere with transmission.

The detector is programmed to recognise overall changes in light level along with the specific wavelengths of interest. High humidity, fog, airborne dust and the like can change the overall level, or some obstruction may block the beam entirely, but H<sub>2</sub>S should be the only gas able to create the tell-tale attenuation causing the detector to trip.

### Concentration versus distance

Point detectors depend on capturing a sufficient concentration of H<sub>2</sub>S in the immediate area in order to trip. There is no indication whether the escaping gas is a small localised cloud or an enormous release. As a practical matter, large releases will likely affect more than one detector, but the concentration at each needs to be higher than the setpoint threshold.

An open path detector set-up, on the other hand, is able to realise the cumulative effect of a cloud dispersed over a wide area, even if the concentration is low, or it can recognise a less diffused release with a high concentration. The beam attenuation across the entire distance is additive, which provides some flexibility with the nature of the cloud it is able to measure — particularly a low-concentration cloud spread over a wide area. This therefore also provides flexibility with the location of a leak, so it can cover a wide area with a large population of equipment and many potential leak sources.

### Optimising the light source

The critical wavelengths for H<sub>2</sub>S fall in the middle of the ultraviolet (UV) section of the electromagnetic spectrum, between 190 and 300 nm, so the source must be rich in that radiation.

There are two primary technologies capable of producing high-intensity UV with a form factor suitable for this type of application: tunable diode laser (TDL) and xenon strobe tubes. The former can be a continuous source, while the latter is intermittent, providing individual flashes.

location of sensors determined by the extent and geometry of an area requiring coverage and the amount of air movement. Consequently, a large outdoor area, such as an oil and gas well site, calls for a large number of detectors since there are numerous potential gas sources and extensive air movement.

This may sound at first like an impractical approach for an outdoor installation, but point source detectors can be equipped with wireless transmitters, making such a deployment far less expensive than traditional wired methods. The individual detectors are relatively inexpensive so this can be a viable approach using careful placement by experts. Wireless transmitters also allow detector repositioning if necessary, to accommodate changes in the threat profile.

### Long distance: open path detection

As mentioned, it is also possible to detect H<sub>2</sub>S due to its absorption of specific light wavelengths using differential optical absorption spectroscopy (DOAS). A DOAS detector monitors those specific wavelengths and when they decline more than the overall light level, H<sub>2</sub>S presence is the likely cause and the detector will trip. The degree of attenuation can provide an accurate quantitative value of gas

Capability requirement	TDL	Xenon strobe tubes
Measurement Resolution	Bandwidth of 2 nm increases sensitivity when in steady-state conditions but loses resolution in highly variable environments.	Wavelength bandwidth of 50-75 nm increases range with slightly less resolution.
Mixed-gas Performance	Change in the spectral fingerprint caused by mixing can result in degraded reading or missing the target gas entirely due to narrow bandwidth.	Contamination of H <sub>2</sub> S or mixing with air can change spectral fingerprint — broader bandwidth can still capture it.
Outdoor Performance	Narrower temperature range but more tolerant of rain.	Tolerant of wide temperature range but can be disrupted due to extreme rain events.
Alignment Accuracy	Exacting; must remain within $\pm 0.5$ degrees.	Can tolerate up to $\pm 1$ degree and potentially more, making it resistant to vibration-related faults.
Detection Range	Narrow bandwidth makes distances greater than 40 m difficult.	Can extend to 60 m with good conditions.
Overall Performance	Recommended for confined places, with moderate temperature changes and installation on a non-vibrating surface. Better suited for process control with predefined conditions.	Easy to install and commission. Detecting diluted gas mixtures. Less demanding precise alignment. Not impacted by temperature changes or weather conditions.

Table 1: Comparison of TDL versus xenon strobe tubes.

Each light technology has its advantages, but a Xenon strobe tube is generally easier to work with (Table 1).

## TDL technology

Using a TDL for H<sub>2</sub>S detection applications has two advantages:

1. The detector can have very high sensitivity for that wavelength, providing high detection sensitivity.
2. It is well suited for process monitoring in indoor applications with stable environmental conditions.

These benefits can also prove to be limitations in real-world installations. Consider each point:

### Point 1

The ability of a TDL to generate light within a band of about 2 nm creates high sensitivity in that specific wavelength. This results in high effectiveness for detecting H<sub>2</sub>S, provided the gas is exhibiting ideal characteristics and absorbing precisely the expected wavelength. In the real world, H<sub>2</sub>S is often mixed with various contaminants from the well or in the atmosphere, which cause the spectral fingerprint to shift. It does not take much of a shift to cause the detector to misread and possibly understate the concentration level or miss the gas mixture entirely.

### Point 2

Heat haze, or heat shimmer, is common to warm, outdoor environments particularly under full sunlight. When light passes through multiple temperature gradients, a beam can be disrupted just as we see fake water in the distance on a road. This effect jeopardises stable performance for a TDL outdoors under these conditions, hence the recommendation to concentrate use in protected areas.

If operators understand these qualifications, a TDL instrument set can provide effective service, but the alternative of a xenon strobe tube generally delivers simpler operation.

## UV xenon strobe tube technology

As mentioned, a xenon strobe tube produces a wider spectrum of light, including high levels of UV radiation, which can be maximised by selecting specific tube materials and controlling current density. When used in this application where a collimated beam is desirable, reflectors and optics can focus the output to provide maximum intensity across the full distance. The slightly thicker

beam compared with a TDL source makes alignment easier and more forgiving of shocks and vibration in operation.

The tube flashes once per second, so there is no significant measurement lag compared to a continuous source. Different models have flash tubes of varying intensity and optical systems corresponding to the maximum measurement distance. The specific light spectrum in conjunction with the flashing operation provides detector immunity to solar radiation or light from burning hydrocarbons.

The detector has a beam splitter which directs part of the incoming light to a broader band reference signal detector and the balance to the absorbed-band signal detector. The reference signal indicates the overall conditions at the site (Figure 2). If there is fog or dust, all the light reaching the detector will be attenuated, including the absorbed band. Only when the absorbed

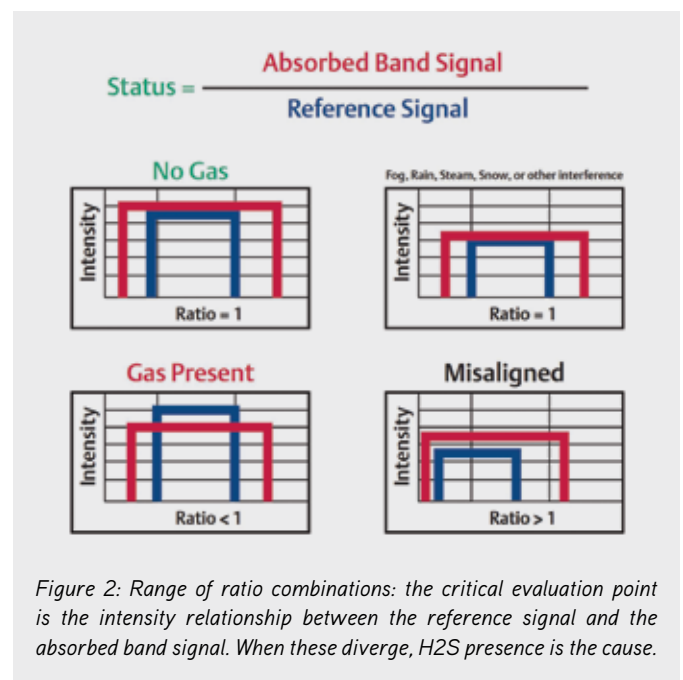


Figure 2: Range of ratio combinations: the critical evaluation point is the intensity relationship between the reference signal and the absorbed band signal. When these diverge, H<sub>2</sub>S presence is the cause.

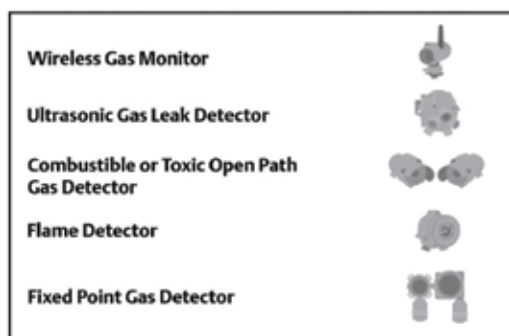
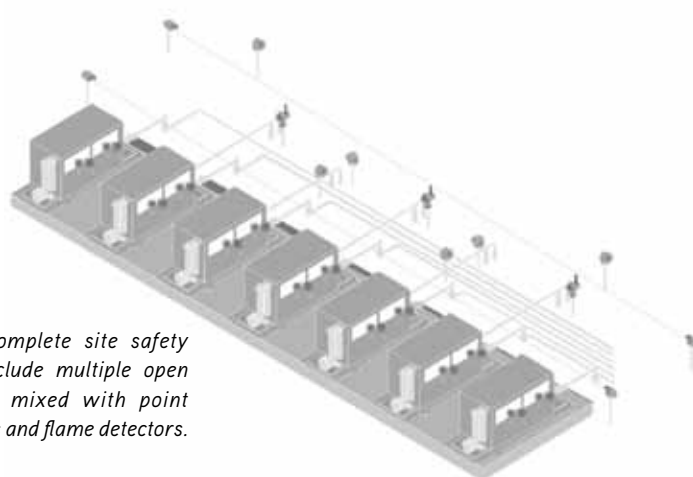


Figure 3: A complete site safety system will include multiple open path detectors mixed with point source detectors and flame detectors.



band signal decreases differently than the reference signal will the detector determine  $H_2S$  is present. The amount of difference is proportional to the gas concentration. The detector is still able to recognise the presence of  $H_2S$  even when the total light reaching the detector is obscured up to 95%.

## Applications in upstream oil and gas production

While this article concentrates on open path toxic gas detection, it is only part of a larger safety system approach for land-based and offshore production sites. These must be outfitted with a combination of toxic and flammable gas detectors, including both point and open path designs, deployed alongside flame detectors to determine if a flammable release has escalated into an actual fire.

Open path detectors, by their nature, are best at guarding clusters of equipment from around the perimeter where there is a clear line of sight. Since  $H_2S$  is heavier than air, it tends to diffuse close to the ground, so detectors should be close to ground level. For example, where there is a line of gas separators (Figure 3), the open path detector pairs should be placed as close to the equipment as practical, ideally on the side downwind based on normal weather patterns. Segmenting a large installation with multiple detector sets can result in faster reporting of a release, with a better indication of the source. Detector sets can be placed so the beams cross at right angles without concerns about interference.

Typical upstream placements include:

- Floating production, storage, and offloading (FPSO) vessels
- Offshore production platforms
- Land-based oil and gas well collection sites
- Lease tank transfer sites
- Production and storage area monitoring
- Facility perimeter (fence-line) monitoring
- Pipeline monitoring

## Installation considerations

When determining how and where open path detectors should be installed, there are a few basic points to keep in mind:

- The appropriate detector model should be selected corresponding to the open path length to be monitored, which is influenced by typical atmospheric conditions.
- The mounting point for the source and detector must be secure and stable with little or no vibration. The longer the path, the more important it is to have a solid and vibration-free mount.
- The selected location must have a direct view between the detector and the source.

- The open path should be free of potential obstructions that could block the beam, such as pedestrian traffic or a vehicle parking place.
- For  $H_2S$ , the beam should be about 60 cm above the ground. Maintain a 15–30 cm radius around the beam's line of sight to avoid reflective interference from nearby piping and supports.
- The open path must allow for free flow of air so escaping gas can move easily into the beam.

The coverage distance of each detector model is expressed as a range. Achieving the maximum range reliably depends on compatible conditions with minimal disturbances. In an area with poor weather, such as heavy fog, rain or snow, it is important to install the detector at the low end of the range and also use the highest intensity model available. If these are only intermittent problems, try to remain within 75% of the maximum. In severe weather conditions such as an offshore oil production platform, this should be reduced to 50%.

As discussed, an integrated strategy for worker safety on land or offshore must include detectors for toxic gases, including  $H_2S$ , flammable gases and flame detectors. Designing such systems to be effective and economical will usually include a mix of point and open path detectors. While it is difficult to rank these in importance, it could be argued that open path detectors carry the heaviest load of protection and therefore deserve particularly careful consideration.

This importance stems from the particular combination of open path detection capabilities already discussed:

- Long distance coverage, able to protect large groups of installed equipment outdoors.
- Fast response, typically less than 10 seconds once a cloud reaches the beam.
- High immunity to false alarms caused by sunlight, fires or other types of gases.
- Low maintenance cost with no need for consumables, long flashtube life and minimal calibration.
- Low installation costs since few units are necessary to cover large areas and installation is uncomplicated.

As a result, safety system design often begins with selection and placement of open path detectors, which are then supplemented by point source detectors for areas of specific weakness. When protecting workers from exposure to toxic  $H_2S$ , this is the best place to start.

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## HOW VIBRATION MEASUREMENT SAVES MANUFACTURERS TIME AND MONEY

Vibration is all around us. We can feel it and we can hear it. Some vibrations we find pleasant, such as music that we like to listen to, and some vibrations we find unpleasant, such as scratching fingernails across the chalkboard. Humans also can predict when something is about to fail or determine when something needs our attention based on the vibrations we can feel or hear in our surroundings. An example almost anyone can relate to is when you are driving or riding in a car and the tyres are out of balance or are damaged. In addition to the audible noise, you can feel the vibration through the steering wheel and the chassis of the car. Frequency and amplitude of the vibration typically increase as you speed up, and often amplify your worry as well. This can push you to find the cause of the vibration and fix it.

This same principle can be used in a manufacturing plant environment, which is what makes monitoring vibration so important. Without it, machines break down and stop, costing time and money. We all know that one maintenance guru who has a special gift of being able to determine what is happening with a machine based on its vibration feedback: the one who can place his hand on a machine, or hear the machine speak to him, and determine what is wrong with it.

However, using this institutional knowledge isn't foolproof and it can introduce additional variables into the mix; sometimes resulting in wasted parts, labour, unplanned machine downtime, loss of production, etc. And as tenured staff retire and are replaced with less experienced staff, it has become even more important to remove the human element from the equation and properly capture the data to determine the root cause of mechanical issues. But how? By equipping machines with a monitoring system, the machine can then continuously monitor itself. And when the variables exceed the preset acceptable thresholds, the machine can act based on predetermined actions set by the OEM manufacturer or the maintenance team.

There are many monitoring systems on the market today that vary in complexity and cost. More complex systems include sensors, cables, data acquisition cards, computers, analysis software, databases, cloud subscriptions and paid service contracts to pinpoint exact condition of the equipment or asset that is being monitored. This type of system or service is very costly, and in most cases, it is cost-prohibitive to be used on non-critical equipment or assets. However, there are lower-cost solutions that may not be able to pinpoint what has failed but can tell you when something is wrong with the machine that needs to be examined by the maintenance technician. Such devices can be easily integrated into an exist-

ing controls architecture and can provide continuous condition monitoring of the machine or asset.

The practice of continuous condition monitoring of machines can save the company valuable time and money by reducing unscheduled machine downtime, eliminating wasted parts and time for unnecessary scheduled maintenance, improving total OEE (overall equipment effectiveness) of the machine and increasing production. This all leads to increased profits.

Because there are more and more solutions available in the market today, there are a few things you need to consider when choosing the right solution for your application:

- Overall cost of implementation: what are the hardware, software and any installation costs?
- Is the solution proprietary? Hardware, software or communications?
- Is there an annual service contract or are there subscriptions?
- Does the asset require periodic or continuous monitoring?
- Quality of data: do you need to know the exact failure point or is knowing that the machine is operating outside of its specified parameters good enough?
- Can the system be easily expanded for the future state?
- Are there any additional features that can aid in analysing the condition of the machine such as pressure, temperature, humidity?

Knowing what you need and want ahead of time will help you better choose the correct solution for your application without wasting money and time on unnecessary features and functions.

*Adis Halmic graduated from Pennsylvania State University with an electrical engineering degree. With 16 years' experience in the design and programming of automated machines, including expertise in motion systems design and controls and IIoT, he has worked on a wide range of machine designs from medical, life science and semiconductors to heavy industry and automotive. He enjoys coaching and playing soccer in his free time.*





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## UHF RFID READ/WRITE HEAD

The Pepperl+Fuchs IUT-F190-B40 UHF RFID read/write head offers an integrated industrial Ethernet interface and REST API. Using these interface technologies, the IUT-F190-B40, which is designed for medium detection ranges, can be quickly and easily integrated into OT and IT systems.

Its rugged IP67 cast housing and a broad temperature range make it suitable for use even in especially challenging industrial environments. Based on UHF RFID technology, the IUT-F190-B40 achieves high ranges (up to 6 m) and detection speeds

and supports multi-tag reading. The built-in, automatically switchable antenna polarisation helps ensure reliable identification even when the tag orientation is inconsistent or unknown.

With an integrated antenna and compact housing (114 x 112 x 63 mm), the device emits 1000 mW ERP.

**Pepperl+Fuchs (Aust) Pty Ltd**

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## PNEUMATIC FLOW SWITCH

The PF3A8#H-L is the latest addition to SMC's flow switch range. Designed to cover a large flow measurement range, this modular flow sensor features a clear and easy-to-read 4-screen display.

Offering a 100:1 flow ratio, the PF3A8#H-L can detect small leaks (10 Lpm or more), monitor main line air consumption (up to 2000 Lpm) while simultaneously measuring air pressure and temperature.

The 3-colour and 2-line screen display can rotate in increments of 90° allowing operators to take notes and set the flow switch while checking the measured value. It also has IO-link compatibility, together with switchable NPN/PNP output.

Through a bore-type structure made of aluminium alloy, the PF3A8#H is said to be highly durable. The modular design also reduces the required installation space, piping and wiring work. The brackets allow the flow switch to be retrofitted on steel pipes systems and into legacy SMC air service units. All the process data (flow, pressure, temperature) as well as identification and configuration data for the PF3A8#H-L is transmitted with a single M12 standard connector.

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The Neosys SEMIL Series is said to be one of the world's first IP67-rated, waterproof and dustproof inference servers designed for demanding environments, providing a new level of robustness for rugged edge AI solutions. Coupled with Intel Xeon E or 9th/8th-Gen Core CPU, the system delivers high CPU and GPU performance for advanced edge AI applications in various environmental settings.



The series includes the SEMIL-1700, a rugged 2U half-rack computer, and the SEMIL-1700GC, a 2U computer with a pre-installed NVIDIA Tesla T4 or Quadro P2200 GPU. The SEMIL-1700GC series thermal design dissipates the heat generated by Tesla T4 or Quadro P2200 GPU to ensure maximum GPU performance in high-temperature environments (non-throttling GPU performance up to 62°C ambient).

Both the SEMIL-1700 and the SEMIL-1700GC have a corrosion-proof chassis made of stainless steel and aluminium to counteract moisture and salinity. They both also offer a variety of I/O connectivity, including 802.3at Gigabit PoE+, VGA, USB, COM ports and optional 10Gb Ethernet, all using M12 connectors for waterproof and rugged connectivity in shock and vibration conditions. They also feature M.2 for NVMe SSD, 2.5" SATA storage accommodation, 8-48 VDC wide-range power input with ignition power control and they comply with MIL-STD-810G and EN 50155 standards.

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**CAMERA AND LIGHTING COMBINATION**

Different materials and process environments put high requirements on the optical quality control of products and packaging. The SmartSpect/eLED camera and lighting combination from Laetus is said to offer intelligent high-performance image processing and ideally adjusted lighting in one compact system.

Using one single calibrated system for both lighting and image processing for inspection allows a particularly fast integration, as there is no need to configure separate hardware and software components. When used in different lines, the results can be directly compared and the parameters optimised. The camera and lighting also do not need to be synchronised again for format changes, saving time. The combined compact design also allows for space savings.

SmartSpect/eLED is designed for a wide range of applications in industries like pharmaceuticals, medical technology, cosmetics, food and FMCG. The combined camera-lighting system checks the packaging content for completeness, verifies barcodes and 2D codes, and is able to read poorly printed or deformed codes by means of text recognition. The system can also recognise labels printed with UV ink. All applications are programmed, eliminating the need for an external control device.

**Concept Automation Pty Ltd**  
[www.conceptauto.com.au](http://www.conceptauto.com.au)



**MOBILE SANITARY CONVEYOR BAG DUMP SYSTEM**

Flexicon has released a sanitary mobile tilt-down flexible screw conveyor with integral bag dump station and compactor that allows the transfer of material manually dumped from handheld bags into elevated process equipment, and the disposal of empty bags, dust-free.

Mounted on a mobile frame with locking castors and a fold-down step, the bag dump station is secured to the floor hopper with quick-release clamps, and features a gasketed bag disposal chute through the side wall of the hopper hood, allowing the operator to pass empty bags directly into the bag compactor.

Dust generated from both dumping and compaction is drawn onto the system's two cartridge filters. An automatic reverse-pulse filter cleaning system releases short blasts of compressed air inside the filters at timed intervals. This causes any dust built up on the outer surfaces to fall into the hopper, conserving useable product. Filters are readily accessed by removing the interior baffle and replaced using quick-disconnect fittings.

The compactor employs a pneumatic air cylinder to compress 50 to 80 empty bags into a removable bin lined with a plastic waste bag for dust-free tie-off and disposal. The main door, and a flapper door within the bag infeed chute, are equipped with safety interlocks that prevent operation of the compactor unless both doors are closed.

The hopper discharges into an enclosed, 4.6 m flexible screw conveyor that handles a broad range of materials, including products that pack, cake, seize, smear, fluidise or crumble, with no separation of blended products.

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**SIL 3-CERTIFIED VALVE ASSEMBLIES**

Emerson has introduced valve assemblies that meet the design process requirements of Safety Integrity Level (SIL) 3 per the IEC 61508 standard. The Fisher Digital Isolation final element solutions are designed to serve the needs of users for shutdown valves in critical safety instrumented system (SIS) applications.

For the user, engineering a safety shutdown valve is a complex task. The normal and upset process conditions must be carefully evaluated and understood when choosing valve and actuator components. In addition, the proper combination of solenoids, brackets, couplings and other critical hardware must be specified and carefully matched to the selected valve. Each of these components must function individually and in concert to operate.

The Digital Isolation assembly is designed to address these and other issues by providing an engineered Digital Isolation shutdown valve assembly, designed for each particular process. The various components are specifically selected to satisfy the application requirements. The entire assembly is sold as a fully tested and certified unit, with a single serial number and associated documentation delineating the details of every part of the assembly.

Because the assembly is built as a complete solution, it is said to have greatly improved PFD rate. In some cases, the failure rate of the assembly will be up to 50% less than the combination of the same valve components purchased individually and assembled by an end user.

This improved PFD results from the assembly being certified as a whole system by exida, to meet their rigorous Remote Actuated Valve Assembly requirements.

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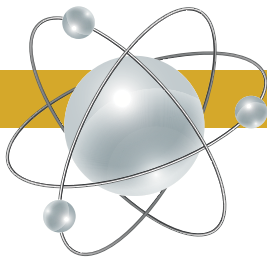
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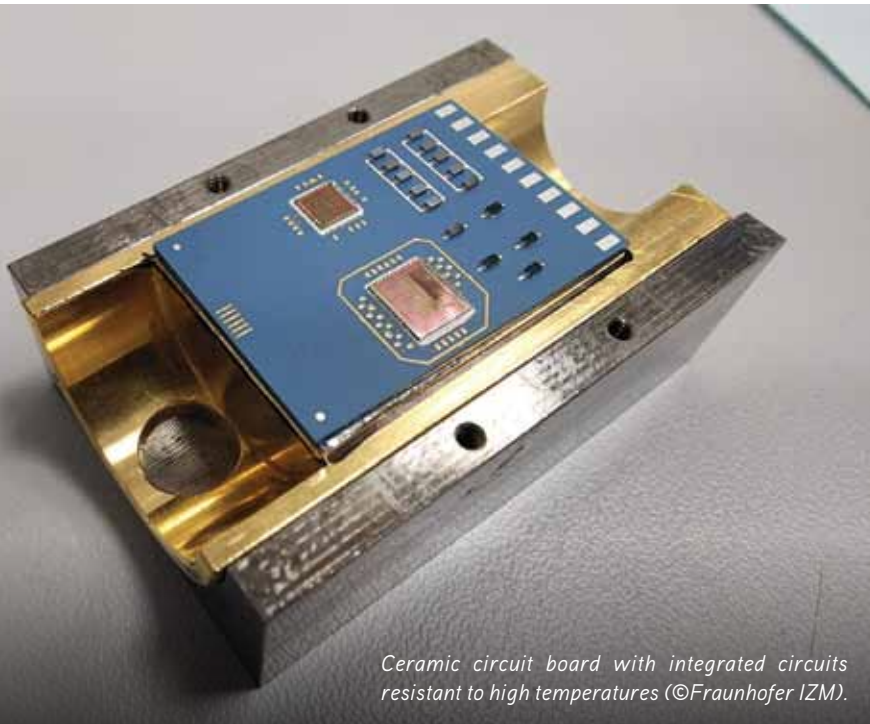
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## Performing under pressure: sensors for extremely harsh environments



*Ceramic circuit board with integrated circuits resistant to high temperatures (©Fraunhofer IZM).*

Sensors play a key role in today's production processes: they sense disruptive vibrations, issue warnings when a machine is running hot and are able to identify damaged components on a production line.

Complete production lines are managed using reliable sensing devices and artificial eyes. However, it has not yet been possible to deploy these watchful assistants in every area of industry: conventional sensors do not last long in environments that are classified as extremely harsh. These include the insides of power plants or aircraft turbines and boreholes in the ground, where temperatures and pressures are high. Sensors are also damaged by aggressive gases and liquids, or dust. To address this problem, eight Fraunhofer Institutes have joined forces in the 'eHarsh' project to develop the first highly robust sensors for extremely harsh environments.

"We have a lot of in-depth knowledge within the individual institutes," said eHarsh Coordinator Holger Kappert from the Fraunhofer Institute for Microelectronic Circuits and Systems IMS. "We know a lot about heat-resistant ceramics and we have the ability to test material properties and produce robust microelectronic circuits. On our own, though, none of us were capable of creating this type of sensor. It was only through cooperation and the combination of many individual technologies that we were able to succeed."

The team first focused on applications with high temperatures and pressures — the aforementioned turbines and boreholes. The aim was not just to incorporate robust pressure and thermal elements into

the turbines and boreholes, but also to include the electronic components to evaluate the measurements.

"The advantage of having the electronic components onsite and of having signal processing take place in the sensor itself is that it improves the quality of the sensor signals," Kappert said. "It also means we can network the sensors better in the future, saving on cabling effort."

This would be particularly useful in aircraft engines because it would reduce their weight. These engines are complex: air flows, voltages and electrical power need to be carefully controlled depending on the flight manoeuvre. Using small, robust sensors right inside the engine, the engine's status could be measured and the combustion process controlled with much greater precision in the future so that fuel can be used more efficiently, for example.

The sensor casing is made from metal and the sensor elements from ceramic that can resist temperatures of up to 500°C, while the internal electronics can withstand around 300°C. One challenge was to combine the different components so they would not come apart even when repeatedly heated and cooled, despite being made from materials that expand and contract at

different rates. Among the materials used were heat-resistant ceramic circuit boards and conductors with a tungsten admixture that is also used for the filament in light bulbs.

The sensors are not only heat resistant but can also withstand pressures of up to 200 bar — almost a hundred times the pressure in a car tyre. One possible future use for these sensors is in pumps for geothermal systems, in which buildings are heated with hot water from the earth. The pumps are situated deep down in the borehole and need to be able to withstand both the heat and the pressures at that depth. These new sensors make it possible to monitor the pumps easily and permanently.

These enhanced possibilities can also help machine manufacturers to test the service life of their sensors. These tests subject components to high pressures or temperatures so that they age more quickly, which makes it possible to determine the service life of a product within a manageable time frame. If the sensors are able to function in more extreme conditions, it will be possible to run the tests with higher load, significantly reducing testing time.

"Overall, the interdisciplinary nature of 'eHarsh' has allowed us to successfully develop a technology platform for robust sensor systems for many different uses," Kappert said.

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**LOOP-POWERED CONTROL UNIT**

The Krohne SHD 200 control unit can be used with any 4–20 mA/HART field device for monitoring of process parameters and additional control functionality in various industries.

Beyond the functionality of a pure loop-powered display, the SHD 200 offers a second current output (passive) that can be used for any HART variable provided by the field device. Thus, digital HART information can now be transmitted by an additional analog 4–20 mA signal. The second current output can also be used for LEDs for signalling of the field device status according to NAMUR NE 107 and for backlighting.

The SHD 200 also features two programmable relays for status output, system alarm or limit switch functionality. By combining the input and output options, SHD 200 can be used for basic control applications: examples are displaying static and differential pressure with limit switch valve opening function in DP flow applications, simple dosing in pH value control applications or control of heating and cooling processes using the temperature values or difference of two temperature sensors.

When used as a display, SHD 200 provides convenient displaying of 4–20 mA or HART values via user-specific measurement pages. It shows up to four different values for detailed process monitoring, including trend graph and summary page. Full access to all specific functions of the field device is possible via a HART handheld that can be connected to the SHD 200 via the internal or optional external adapter.

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**NEW  
PRODUCTS**

### WIDESCREEN HMIs

Mitsubishi Electric has launched two additional graphic operation terminals in its GOT SIMPLE Series range. The 10" and 7" widescreen models, which support virtual network computing (VNC), can be used as VNC servers enabling remote access from offices or other remote locations. This feature will help meet needs for improved work efficiencies when performing monitoring and maintenance in factories, buildings, utilities and other automation applications.

Another key feature of the latest GOT SIMPLE models is a 1.5x increase in onboard memory capacity to 15 MB, making it easier to save more screen designs. Additionally, by using an SDHC memory card, operation logs can be recorded in chronological order to achieve enhanced traceability. This can be useful for validating operations as well as troubleshooting when identifying incorrect operation or the potential root causes of problems.

The latest models in the GOT SIMPLE Series support outline fonts, offering clearer visibility of text on the screen by smoothing out edges of textual characters. This increased clarity can help prevent misreading but can also aid reading at a distance.

Since communication interfaces are another key factor for users selecting GOTs, the built-in interfaces have been enhanced. In addition to the standard GOT SIMPLE Series interfaces of Ethernet, RS-232 and RS-422, the latest units also offer RS-485 support. This facilitates the connection of a wider variety of devices, such as temperature controllers and Modbus peripherals, making it easier for users to implement connected digital manufacturing strategies in their operations.

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# SECURING CELLULAR MODEMS IN INDUSTRIAL APPLICATIONS

## BEST PRACTICES

*Mariam Coladonato, Lead Product Marketing Specialist, Networking and Security, Phoenix Contact USA*

The traditional cellular network exposes your devices directly to the public internet, and all the risks that are incurred with that access.

**M**obile communication follows the same general principle as telephones, wherein the goal is to connect two or more remote users. This is accomplished through the network equipment of a mobile network operator that is responsible for managing the service. However, unlike fixed telephones, there are no copper or optical fibre pairs in the mobile network. Radio transmissions are the final link. The user's mobile phone or modem communicates through the air with an antenna. This antenna, in turn, communicates with the operator's central office, which then routes the communication to the corresponding part of the fixed network or through other antennas.

Cellular mobile technology is a public telecommunications service. Its main objective is to facilitate communication without imposing restrictions based on geographic location and displacement. Smartphones and tablets are a prime example of common mobile usage; however, industrial cellular modems have proven to be useful and cost-effective for supervisory control and data acquisition (SCADA) applications for remotely located assets. Industrial cellular modems can facilitate remote monitoring, support and control, M2M applications, data logging and alarming.

With SCADA applications connected through modems into the public network, it is important to understand that the convenience of remote monitoring also comes with great risks. Cellular modems are a powerful tool in an Industrial Internet of Things (IIoT) environment, but there is a risk of malicious or unwanted users stealing sensitive data or, worse, sabotaging, disrupting or even halting operations.

A proper security analysis model in mobile networks is quite broad and complex to define, as the entire infrastructure is ambiguous and converges multiple technologies that can be confusing to the user. However, the following will explain some measures you can take to prevent the possible risks.

### Using private Access Point Names (APN)

An APN is the name of an access point that must be configured so that a device can connect to the internet using the networks of cellular vendors. These vendors can also provide private APN

plans — which consist of direct access to local area network (LAN) connections — allowing the user to specify a fixed number of network and security parameters. Some of these parameters may include address allocation, authentication through RADIUS servers, completely blocked internet access and more.

At this point, the industrial modem will be connected directly into a private APN network that already prevents any intrusions, such as spam or viruses. It also reduces the access of public IPs directly at the modem, as this is an open-door invitation for malicious users to attempt to log in. However, there is a downside of private APNs: every device or individual needing to connect to the private APN must also pay the private APN fee and set up secure access, such as a virtual private network (VPN), for data access.



### VPNs for remote access and monitoring

A VPN can be used when private APNs are not an option. A VPN's goal is to extend private networks across a public network such as the internet without the extra service fees that the private APN might carry. The most common VPN technology is called IP Security (IPsec); this client-server application uses a tunnel connection that carries data encryption and allows secure communications between two or more networks anywhere in the world. The three key security attributes of the tunnel are:

- the authentication of users or devices through certificates or pre-shared keys
- encryption of the data being sent through the tunnel
- the use of hashing algorithms that identify and drop manipulated or corrupted data.

Most industrial cellular modems support some type of VPN tunnel already, so it's the most feasible option for any industrial application that needs cellular connectivity. The downside is that the VPN set-up could become a technical challenge for the user, as it requires some networking and infrastructure knowledge even before setting up the devices.

### Blocking all unused ports

Blocking all additional, unused ports is a security best practice that every SCADA application owner should follow. If there are unused physical ports in the device itself, you must physically block them. This can be accomplished either by locking the control cabinet or using low-cost physical security items. Additionally, if the device itself has the functionality to disable the ports, then you can virtually

## Remote networks

disable them from the device management page. This prevents any malicious person or unwanted devices from connecting directly.

It is also important to block all unused service or application ports that could open insecure paths to your industrial equipment. Being in an industrial cellular modem, these services could be completely open to the internet. To block these ports, the user must program the security and firewall functionalities inside the specific device. Even industrial modems can support basic firewall functionality. These can be configured with traffic-filtering capabilities for incoming and outgoing data, as well as for restricting all unnecessary ports and protocols. SCADA applications normally have a small number of necessary ports that users would need to reach for day-to-day operations. If the asset owners are properly using a VPN tunnel to the industrial modem, then all applications are available through the secure VPN connection, and everything around the firewall and port forwarding functions should be blocked. For example, every industrial modem user should avoid having the following services open from the internet: FTP, SSH, Telnet, SMTP, DNS, HTTP and HTTPS. These ports are the most commonly used for malicious attacks.

### User authentication and modem management

Data encryption through the VPN and blocking all unwanted ports are great initial steps towards the overall security solution, but



**DATA ENCRYPTION THROUGH THE VPN AND BLOCKING ALL UNWANTED PORTS ARE GREAT INITIAL STEPS TOWARDS THE OVERALL SECURITY SOLUTION, BUT THEY WON'T PROTECT AGAINST EVERYTHING.**

they won't protect against everything. If the user does not change the cellular modem default admin password, then a malicious user could easily access the device itself and its 'secure' configuration. With a default password, a malicious user would have full control over the cellular modem's functionality.

Also, it is a good practice to note that a password should be personal and non-transferable, and it must be guarded properly. Standard security practices recommend using a password that combines uppercase letters, lowercase letters, numbers and special characters.

Additionally, the modem's configuration port should not be opened directly into the internet. The access to the device itself could be done through the authenticated VPN tunnel or, if supported at the device level, using two-factor authentication. The mechanics are

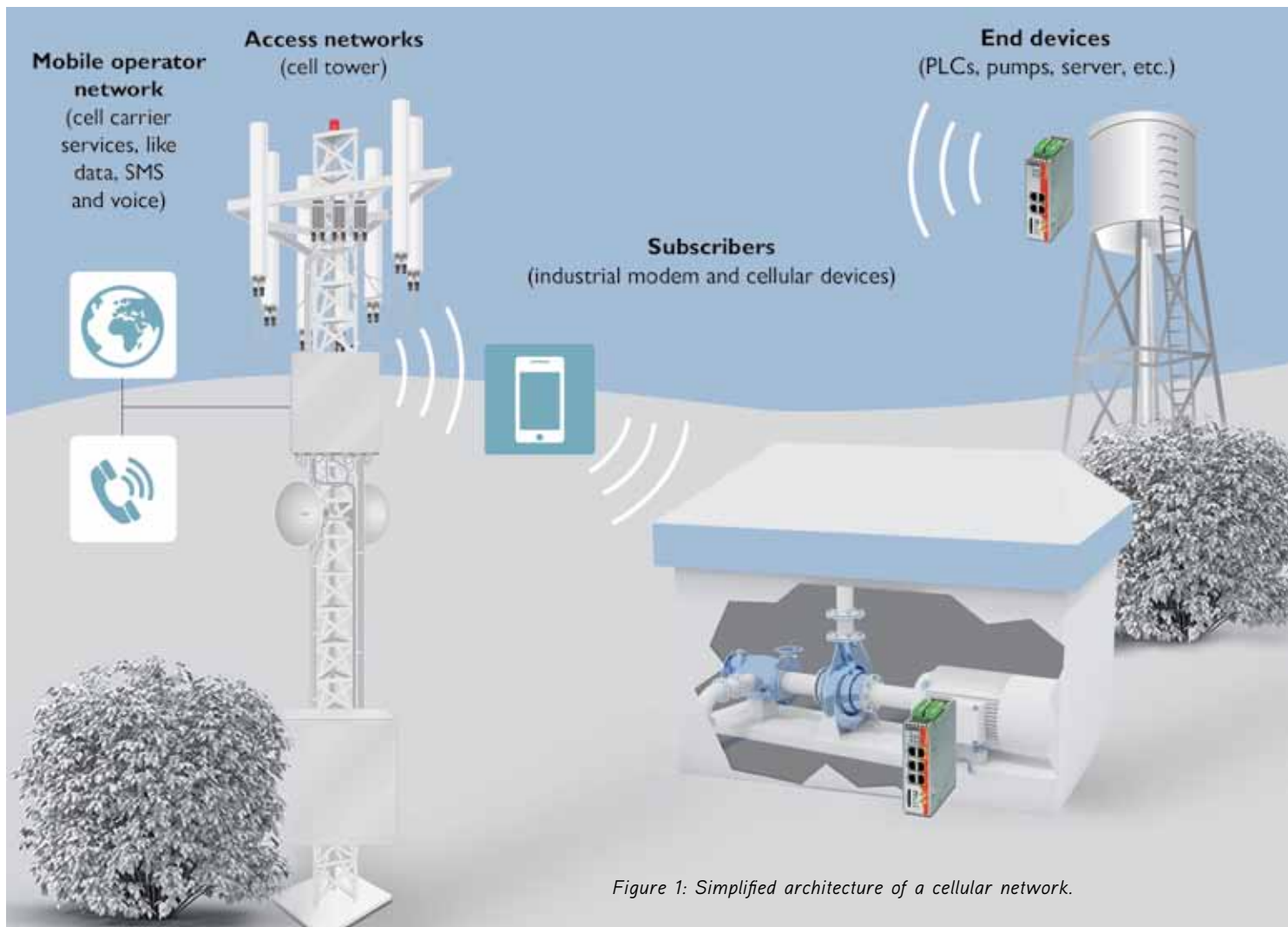


Figure 1: Simplified architecture of a cellular network.



Figure 2: Example of low-cost physical security for unmanaged switches.

simple: when the user logs into the device configuration page, this tool asks them to authenticate ownership of the account, providing two different factors. The first of these is the admin password. The second can be several things, always depending on the function supported. In the most common case, it is usually a code that is sent to a mobile phone via SMS or an email account. The fundamental essence of this tool is that if you want to log in to one of your devices, you must 'know something' and 'own something'.

### Is failover necessary?

Depending on how remote the SCADA application is and what other network infrastructure is available, you can reduce the attack surface for a denial of service (DoS) attack through failover if the cellular modem supports it.

The objective of a DoS attack is to interrupt access to services and resources for an indefinite period of time, aimed at specific networks to make them completely inaccessible to legitimate users. For example, when the industrial cellular modem is saturated by a DoS attack, a user who wants to consult the specific modem will find it unavailable. A DoS attack would overload the device until it collapses. It can also take over the whole bandwidth, preventing the device from processing real requests. To achieve this, the attacker floods the system with information that obviously exceeds the processing capacity.

Industrial cellular modems with failover capabilities won't prevent the DoS attack from happening, but if it does, the device will drop the cellular communication vector. The failover on the secondary infrastructure is then used to maintain the availability of the industrial communications.

### Monitor data usage

Proactive monitoring of device events is an often overlooked aspect of cellular modem security. Actions such as unauthorised access attempts, configuration changes, excessive port scans and more can be recorded, and the user can be alerted about the suspicious activity through email or text message. Additionally, the devices

can also forward those logs to a Syslog server or Simple Network Manager Protocol (SNMP) server, which could store and analyse security-related events.

Also, your cellular carrier could provide additional insight through your subscriber identity module (SIM) state and usages through a portal, as all SIM cards are unique.

### Enable security on end devices if available

SCADA applications also have other industrial devices such as controllers, sensors and even computers, which are vulnerable by nature. Hence a defence-in-depth strategy should be applied, default passwords should be changed before deployment and physical security such as perimeter fences or closed cabinets with tampering detection should be put in place. These measures are an added layer of security to the overall remote SCADA network.

### Conclusion

Unlike many other available network infrastructures, the traditional cellular network exposes your devices directly to the public internet, and all the risks that are incurred with that access. While this gives you efficient and high-speed access to remote sites, device-level security is not a concern for the cellular vendors. They might be protecting their network infrastructure but not considering end devices like smartphones or industrial cellular modems. If these modems are connected to critical applications such as power plants, city water pumps etc, these systems can become targets for malicious attacks through the direct and easy access of the cellular network thanks to the user's cellular provider. A layered approach is the best practice for SCADA security applications that use industrial cellular modems as means of communication. When purchasing or implementing cellular modems in your critical application, make sure your cellular modems support most of the following security mechanisms: VPNs, firewall, failover, logs and alarming.

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**SERVO MOTOR AND DRIVE SYSTEM**

Siemens is adding new servo motors to its Sinamics S210 single-cable servo drive system, thereby expanding its range of applications. Specifically, for use in the pharmaceutical and food industries, the company is also launching the Simotics S-1FS2, a motor version with a stainless steel housing, the highest degree of protection IP67/IP69 and high-resolution 22-bit absolute multturn encoders. The servo motor thus meets all hygienic conditions and can be used for mixing and stirring, air conditioning and ventilating, dosing and filling, as well as conveying, packaging and storing a wide variety of end products in the food and beverage sector and in the pharmaceutical industry.

The Simotics S-1FK2 servo planetary gearmotors complement the Sinamics S210 drive system. They are used when high cycle rates need to be achieved with a lightweight and low-inertia gear design, or when inertia matching is required to move heavy loads precisely. The motors are ready mounted and as a unit available in a wide range of gear ratios and sizes, allowing them to be optimally adapted to different applications.

The Sinamics S210 servo drive system consists of a servo converter and servo motor. All motors of the servo system are connected via a single cable that combines power wires, encoder signal and brake in one line. The range of applications includes highly dynamic servo solutions such as those found in handling systems, packaging machines and machine building applications.

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### MODULAR PNEUMATIC CONNECTORS

The ILME MIXO modular system has been expanded with metal contacts for pneumatic connections, to give better mechanical resistance and increased airflow for transmitting dry, compressed air in pneumatic systems.

The metal pneumatic contacts can now withstand a constant pressure of 10 bar. They are available in straight and angled versions for different size plastic tubing: 3, 4, 6 mm, for both inner and outer diameter (ID and OD) designation. They are also fully reusable after assembly, using a provided removal tool, and can support up to 10,000 matings with HNM enclosures and MIXO frames.

If needed, the female contact can be ordered with a retaining valve to avoid any airflow losses with the uncoupled connector.

The ILME pneumatic series can be used side to side with all the MIXO series modules and inside all the ILME enclosures.

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### 4-SLOT REDUNDANT POWER SUPPLY

The ICP DAS RPS-4M/W4 4-slot industrial redundant power supply not only adopts an N+1 parallel-connection and load-sharing technology to implement power redundancy, it also adds communication functions to enable the power supply to be monitored in real time.

The product can record the uptime of each power module, which can be used as a basis for maintenance and replacement estimation: when the power module has reached the recommended service life, the user can replace it early. The power supply has a built-in load balancing function, so there is no need to add extra load-balancing modules. With a slot-type design and a hot-swapping function, the user can replace a power module without needing to turn off the power system.

The product is designed to be used for the power supply of remote I/O equipment and control systems.

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The AdvancedLine managed switch series from Weidmüller provides a robust, secure, and cost-effective solution for industrial network management. The AdvancedLine switches can increase network availability by means of ring redundancy and security control mechanisms; and offer a range of diagnostic options for sophisticated automation networks. Integration into common fieldbus protocols such as Modbus TCP, Ethernet/IP and Profinet can be readily achieved, and they can be easily and intuitively setup via a web interface. With versions for Fast Ethernet, Gigabit and PoE as well as port sizes between 5 and 24 ports and a large variety of SFP options for fibre interfaces offers a solution fit for all requirements. Its high operating temperature range also means the switches can be used in challenging environments such as production applications or in the field.

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

## CONTROLLERS

Beckhoff's MX-System is designed to offer a flexible, space-optimised and intelligent system solution that replaces the conventional control cabinet.

The MX-System is a uniform, modular automation component that consists of a robust aluminium baseplate in protection class IP67 with integrated module slots that feature EtherCAT for communication and an integrated power supply (safe extra-low voltages as well as 400 VAC and 600 VDC). The largest expansion stage can accommodate a connected load of 400 VAC at 63 A. Corresponding modules are available for the mains connection and all other control cabinet functions.

A system combination of baseplate and modules has a protection class of IP67 and can be mounted directly on the machine. The system is designed to reduce the amount of effort involved for the manufacturer, especially during the planning and installation phases, while the integrated diagnostic functions should reduce the complexity

for the end user. This all combines to result in a modular control cabinet system with a high protection class that can be mounted on the machine without the need for additional protective housings.

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## MICROCONTROLLER STARTER KIT

Designed to be a simple alternative to relays, timers and large amounts of wiring, the LOGO! starter kits from Siemens come with everything needed to get started with basic automation applications. The Soft Comfort software included in the starter kit is easy to use with drag-and-drop programming and full explanations of the functionality. If a user can read a simple circuit diagram, they can program a LOGO!

With a LOGO! microcontroller users can perform multiple tasks in the one unit, replacing the need for multiple relays, timers and traditional wiring, saving time and space. If the user needs to perform the same task more than once, they can simply download the program to multiple controllers.

LOGO! Also comes with a built-in web interface. This allows the user to check status and control the application from anywhere.

What was previously reserved for larger controllers or PCs can now also be done by the small LOGO! Data can also be sent to or retrieved from the cloud to take over control tasks.

**APS Industrial**

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## PRESSURE HOSE CONNECTION SYSTEM

The Ralston Quick-test Connection Platform is a universal pressure hose system engineered to facilitate fast, leak-free connections for pressure testing, calibration and leak testing. The design of the hoses and adapters is said to offer secure, time-saving connections — without the need for a wrench or thread tape — for low-volume, high-pressure connections to virtually any device being tested.

Ralston Quick-test hoses have a smaller inner diameter than most hoses, which makes them suitable for transmitting high pressure without wasting large amounts of compressed gas or fluid. Being made with a polyamide-reinforced inner core, they can twist and bend without losing volume across the hose.

Ralston Quick-test Adapters allow direct connection to male or female NPT, BSPP, tube fittings, metric, AN 37° Flare and Type 50 AS 2743.2 fittings without any additional tools or thread sealant. They can also vent pressure while still connected, and because they eliminate the need for wrenching, the threads don't wear out.

**Ralston Instruments LLC**

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







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## AUSTRALIA'S GOAL TO REACH NET ZERO CAN ONLY BE ENABLED WITH ADVANCED TECHNOLOGY

We all saw how the meeting of the world's leaders last year at COP26 concluded. Combined with a turbulent global market, it has left many wondering if Australia will ever be able to reach net zero and adhere to commitments to successfully decarbonise industry and infrastructure.

As I see it, we will. We've already seen new proposals emerge with the likes of Aurizon and Rio Tinto working to design or implement battery-electric or green trains to reduce their diesel-related carbon emissions. Similarly, Fortescue Future Industries (FFI) has already invested in ammonia-fuelled locomotives and vowed to continue to invest in hydrogen and battery-powered haul trucks and rigs.

Renewable energy like solar and wind has already become a power generation priority for Australia, as we look to retire our coal- and gas-fired power plants. This is now happening at a rate that is faster than expected, and Australia's national energy grid is calculated to be coal-free by 2043. This renewable network will permit green hydrogen production locally for both local consumption and export.

As it becomes easier to implement energy-reduced operations thanks to decreasing costs and investment from the federal government, what kind of technology will be required to facilitate these initiatives?

Let's start with building and industrial sectors where 45% of the world's electricity is used to power electric motors in these applications. It's estimated that around 300 million inefficient motors are in operation today, resulting in increased carbon emissions and monumental energy losses.

If these motors were replaced by modern, high-efficiency drive systems, we could reduce global electricity consumption by up to 10%. That would account for over 40% of the greenhouse

gas emission reduction required to meet the climate goals for the Paris Agreement. Pairing a motor with a variable speed drive in a pump, fan or compressor application, for example, can typically reduce power consumption by 25%.

With the populations of cities rapidly growing, the demands of heating and cooling are growing as well. District energy is becoming key to sustainability. By allowing cities to utilise renewable energies and surplus heat, huge reductions in carbon footprint are possible. Technologies like ultra-premium IE5 synchronous reluctance motors and variable speed drives (VSDs) offer energy savings for HVAC systems at partial loads, potentially also reducing energy bills by up to 25% on average.

With the diverse challenges of climate change, water flow is also being scrutinised to ensure the efficient and reliable delivery of this precious resource. The application of IE5 motors with VSDs has already enabled reduced energy costs reductions of up to 77 tonnes of carbon emissions in water applications.

In the wake of Australia's aspirations to become a global hydrogen superpower, particularly following the new trade partnership with Japan, it begs the question: just how will Australia produce and export clean hydrogen?

One way will be with the support of clean energy technologies like liquid-cooled multi-drives and thyristor-based rectifier systems. We've already seen this technology adopted overseas by multinational hydrogen production and distribution companies and it will happen in Australia too.

Organisations and governments worldwide have made commitments to reach net zero in Scope 1 and 2 emissions. Now is the time for them to start utilising the technology already available to help them achieve this goal.



*\*Michael Briggs is the Head of Innovation and the Motion Business for ABB Australia. He collaborates cross-industry to help solve some of Australia's most complex challenges around energy efficiency, for a more sustainable future. He also oversees ABB's Motion Business, servicing organisations across mining, transport, oil and gas, food and beverage, and the commercial sectors.*

40  
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# Beamex MC6-T

## New revolutionary temperature calibrator



**AMS**

The Beamex MC6-T is an extremely versatile portable automated temperature calibration system. It combines a state-of-the-art temperature dry-block with Beamex MC6 multifunction process calibrator and communicator technology.

With the ability to generate temperature as well as measure and simulate temperature and electrical signals, it offers a really unique combination of functionality. In addition to temperature calibration abilities, the MC6-T also offers electrical and pressure calibration capability, all in one device.

It offers versatility, that no other temperature calibrator can match.

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