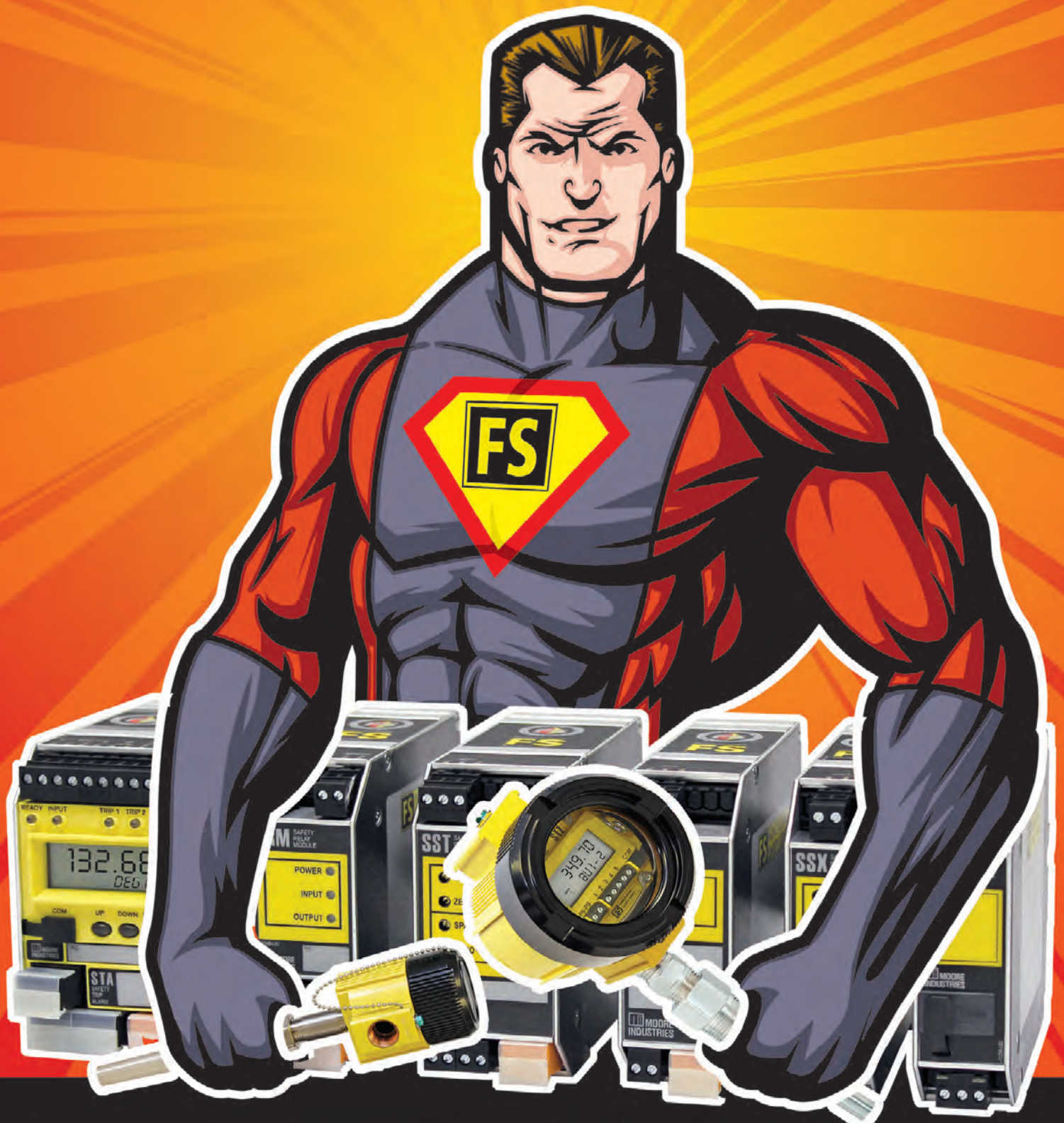


# WNIPT

September 2017 vol.31 no.4  
PP100007403

WHAT'S NEW IN  
PROCESS TECHNOLOGY

AUTOMATION + CONTROL +  
INSTRUMENTATION



 **MOORE  
INDUSTRIES**  
WORLDWIDE

**BE THE SAFETY PROCESS SUPERHERO WITH THE**  
Moore Industries FS Functional Safety Series





# Low-cost level measurement. Radar sensor for water management.

Reliable level measurement in water treatment facilities, pump stations and rain overflow basins.  
Open channel flow measurement and water level monitoring.

## **VEGAPULS WL S 61**

- Measuring range up to 8 m
- Can be used outdoors without restriction
- Flood-proof IP 68 housing
- Operation via Bluetooth with Smartphone, tablet or PC

Further information: [www.vega.com/wls61](http://www.vega.com/wls61)

Phone 1800 817 135

WHAT'S NEW IN  
PROCESS TECHNOLOGY  
SEPTEMBER 2017

ON THE COVER



Whether you are adding a single safety loop, isolating a few points, or need to augment a larger safety instrumented system, be the functional safety superhero for your plant by choosing exida-certified SIL 2 and SIL 3 capable FS Functional Safety Series instruments from Moore Industries to help detect and act on potentially dangerous process conditions.

Although the FS Series doesn't actually impart super powers, each product is designed and built in compliance with IEC 61508, the leading worldwide functional safety standard. The FS Functional Safety Series family includes the STA programmable current/voltage and RTD/thermocouple safety trip alarms, the SRM safety relay module, the SSX loop-powered HART safety isolator, the SST line-powered HART safety isolator and splitter, the STZ safety dual input smart HART temperature transmitter, and the SFY safety frequency-to-DC transmitter with display.

Our newest product in the family, the universal SLD functional safety loop display features a large integral display showing real-time process status in mA, percent, or any designated 5-character engineering units, and programs easily from any FDT-compliant host or program, such as PACTware, utilising our DTM. The new SLD is an excellent addition to any safety loop where a certified non-interference display is needed.

These cost-effective award winning solutions offer industry-leading reliability with exida certification, and FMEDA (Failure Modes Effects and Diagnostic Analysis) reports are available upon request.

**Moore Industries Pacific Inc**  
[www.miinet.com](http://www.miinet.com)

**MOORE  
INDUSTRIES**  
WORLDWIDE

# CONTENTS

- 4 An IoT primer — bridging the gap between OT and IT
- 8 Hot products online
- 12 New products
- 18 Overcoming the complexities of tank scheduling
- 24 Automation: the positive future for mining
- 26 Folded-path gas analysers — making the analyser fit the process
- 38 Functional safety in times of rising cybercriminality
- 50 Largest ever high-tech digitalisation grant



**READ ONLINE!**

*This issue is available  
to read and download at*


[www.processonline.com.au/magazine](http://www.processonline.com.au/magazine)

# AN IoT PRIMER

## BRIDGING THE GAP BETWEEN OT AND IT

You've probably heard about the Internet of Things (IoT) or the Industrial Internet of Things (IIoT), also called Industry 4.0 or the Industrial Internet. But what is it?





**T**he IoT is poised to offer society the greatest opportunity for advancement since the Industrial Revolution: a world where all kinds of things are connected, communicating and improving our standard of living. We're all going to be a part of it, and preparing for it now will let us take full advantage of its benefits.

According to Berg Insight, a dedicated machine-to-machine/IoT market research firm based in Sweden, the installed base of wireless IoT devices in industrial automation reached 10.3 million in 2014. Berg Insight predicts that the number of wireless IoT devices in automation networks will grow at a compound annual growth rate (CAGR) of 27.2% to reach 43.5 million by 2020. Industry giants like GE, Rockwell, Cisco, IBM and Microsoft are investing significant amounts of capital in IoT. If you're not already seeing elements of the IoT in your work, you soon will.

A massive change is coming in the way we conduct business, from the design and manufacturing of goods to how we service customers. The IoT intends to connect industrial and manufacturing devices and systems (things or assets) together so we can:

- share valuable data in real time
- improve processes
- tune systems autonomously
- predict system failures before they occur
- decrease downtime
- reduce costs
- increase profit.

All while improving customer experiences and providing consumers with more value.

### Components of the IoT

Just in the last few years, new technologies from low-cost sensors to advanced analysis of massive amounts of data (big data) have become more widespread and easily accessible. The costs of computing power and bandwidth continue to fall, ushering in mobility like we've never seen before, so that you now have the ability to connect almost anything to a network. You can enable low-level sensors and actuators, collect data from those devices, convert it into a routable protocol, send it across the internet and push it into a big data analytics

system — all in near real time — giving visibility into your process control systems from anywhere.

With the IoT, information flows freely from customer interaction points to business decision-makers, to resource planners, right to the manufacturing floor, and back again.

### How do we get there?

While this movement toward the IoT has already started taking place and grows at an exponential rate every year, it will not happen overnight. Even with the large investments in IoT being made by so many industry giants, there are significant hurdles that need to be overcome for the benefits of the IoT to be captured.

And we won't be able to capture those benefits without major changes in the way technologies interact in our business.

### OT/IT convergence

Within a given enterprise there are operational technology systems and information technology systems. Both technologies and each set of systems were purpose-built, and neither was designed to work with the other.

Gartner defines operational technology (OT) as "hardware and software that detects or causes a change through the direct monitoring and/or control of physical devices, processes and events in the enterprise". That's the industrial control and manufacturing automation part of the business.

Gartner defines information technology (IT) as "the entire spectrum of technologies for information processing, including software, hardware, communications technologies and related services". That's the company computer network and databases.

To make things easier, you might sum up those definitions like this:

- OT is the assets a business uses to create goods or services for sale.
- IT is the systems used to manage the production, sale and support of those goods and services.

So both OT and IT function within the enterprise to create output (goods and services). To create output most efficiently, they need to work together.

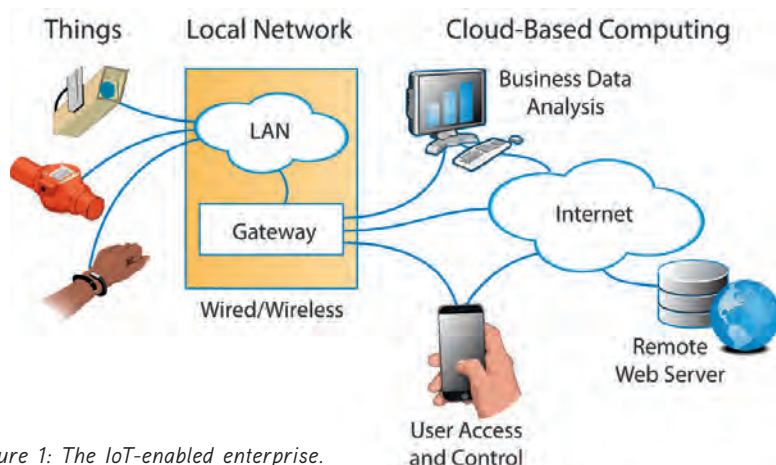


Figure 1: The IoT-enabled enterprise.

But in today's enterprise, there's a significant communication gap between OT and IT technologies. Each uses its own methods of connectivity, from the physical connectors and buses that data rides on, to the language each uses to convert bits and bytes into human-readable and actionable information. Designed years ago, OT and IT technologies remain far apart today.

## Connectivity

For decades, industrial products have been designed for long life. As a result of this long life cycle, industrial devices installed today use varied physical communication layers (fieldbuses or current loop), mostly specific to their industry.

One of the first steps in connecting legacy industrial systems to the IoT is to provide some type of conversion from these application-specific physical buses to open, ubiquitous physical interfaces such as Ethernet and wireless.

We'll also need to aggregate smaller, simpler devices like non-networkable sensors or electric circuits into a networked gateway device, in order to transmit the sensor-level signals onto standard network interfaces and then into the primary internet communications protocol: TCP/IP.

## Communications and languages

As a result of the purpose-built, application-specific nature of manufacturing and automation systems, the vast majority of devices found on the plant floor today use industrial protocols and are customised to meet application requirements.

While an industrial protocol can be useful in a single given application, eg, closed-loop process control, it creates yet another hurdle in accessing the data required to realise the benefits IoT offers.

In contrast to OT, IT enterprise networks use the same open standards and protocols found on the internet. The internet was

founded on open communication standards like TCP/IP. Application-specific protocols are layered on top: HTTP/S, SMTP, SNMP, MQTT and so on.

The internet uses programming languages like JavaScript, Java and Python, and presents information using technologies like HTML5 and CSS, all of which are open.

To realise the promise of the Internet of Things, OT and IT technologies must converge, allowing connection and communication.

Perhaps in the short run, OT and IT can converge using solutions such as protocol gateways, OPC servers and middleware. However, in the long run, OT/IT convergence will demand a flattened architecture and seamless communication between assets, using open, standards-based communication protocols and programming languages.

## IoT at the edge

The Data-Information-Knowledge-Wisdom pyramid (Figure 3) shows us the journey from raw data to wisdom. On the Internet of Things, actionable data is wisdom: what to do, when and how to do it, and how to improve business processes, reduce cost and increase profit.

The IoT is going to produce massive amounts of raw data from billions of sensors, actuators and devices. How do we sort through the data to filter out what we need and turn it into wisdom — into actionable data?

The answer is edge computing.

The majority of IoT devices will be connected at the edge of the network, the place where OT and IT physically converge. The data that OT devices generate must be mined for what is useful to the enterprise and forwarded to cloud computing systems for big data analysis, and useless data must be discarded to reduce bandwidth and noise.

Unfortunately, most of today's OT assets like individual sensors and machines don't have the computing power required to process and filter the data they generate. At best they are pass-through devices: data in and data out with no intelligence.

More intelligent OT assets like PLCs tend to focus on single-task automation functions and have not been designed to share that manufacturing data with other systems. So the current IoT requires third-party systems that act as data brokers between OT and IT assets. These third-party brokers understand both OT and IT languages and protocols, but they often require a great deal of programming and application development support.

To enable direct asset-to-asset or thing-to-thing communication and truly bridge the OT/IT gap, manufacturers will push intelligence down directly into OT assets and enable those assets with IT communication capabilities, protocols and languages.

We already see increasing capabilities as OT assets are beginning to be developed from the ground up with IoT applications in mind. Over time, we'll see not only communication technologies but also increasing intelligence, allowing assets on the edge to interpret and filter their own data into information and then expose it via standard formats documented as web APIs.

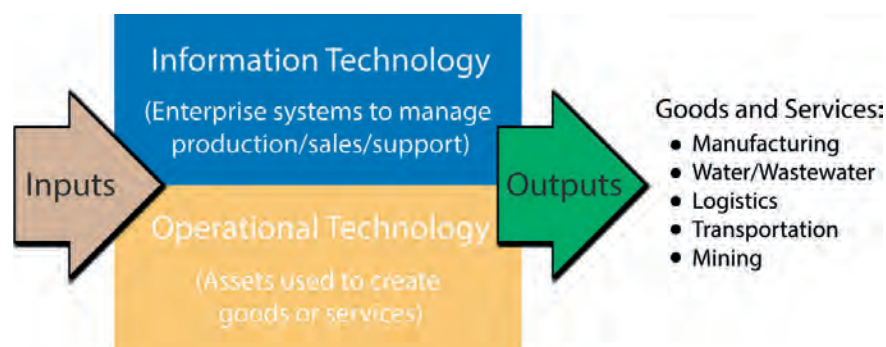


Figure 2: Both IT and OT support the production of goods and services.



IN THE LONG RUN, OT/IT CONVERGENCE WILL DEMAND A FLATTENED ARCHITECTURE AND SEAMLESS COMMUNICATION BETWEEN ASSETS, USING OPEN, STANDARDS-BASED COMMUNICATION PROTOCOLS AND PROGRAMMING LANGUAGES.

Indeed, to fully realise the benefits the IoT has to offer, OT assets will need to be designed with web technologies built directly into them, such as HTTP for interaction, SSL/TLS encryption and authentication for data security, and JSON for data format. This approach is available today and is called RESTful architecture.

### Getting started with the IoT today

If you're excited about the possibilities the IoT offers for your application — or if you just want to be prepared for the future — here are some ideas to get started now.

#### Start small

The IoT is a big concept with lots of moving parts. Developing a strategy to begin implementing IoT in your business doesn't have to be complicated. Start small and experiment.

The IoT is a concept, an idea, not a hard-and-fast set of rules. It's a method of looking at disparate systems and asking ourselves: what if those two machines could talk to each other? What could we learn if we could quickly pull any data we wanted and look for correlations between datasets? Over time, getting different devices to communicate with each other will become easier and easier.

#### Educate

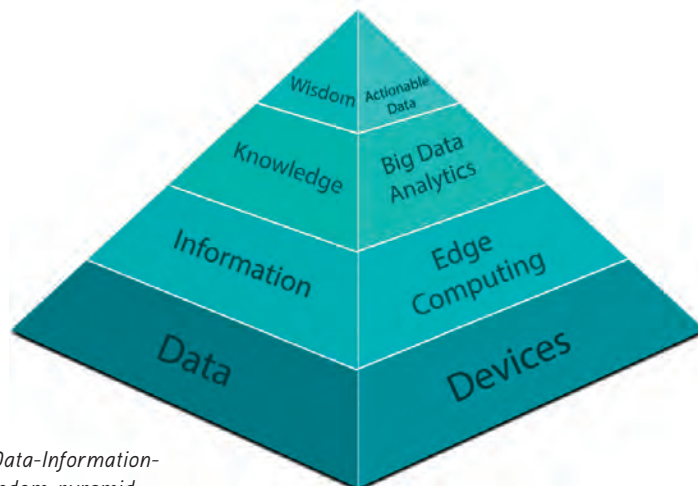
A good place to start is to learn about new technologies that are involved with the IoT. If you're coming from the process control and industrial automation side of the OT/IT convergence, it's a good idea to bone up on your basic networking skills.

- Learn how Ethernet switches and routers move data across the internet.
- Know what an IP address is and understand the potential need for IPv6.
- Get an overview of various web technologies and programming languages.

You certainly don't have to be a networking expert. But a general familiarity with these technologies will only make your life easier as the OT/IT convergence picks up momentum.

Be aware that important new skills will be required in your organisation. Network-

Figure 3: The Data-Information-Knowledge-Wisdom pyramid.



ing is one of these; other key skills are in programming languages and architectures (such as RESTful) and definitely in network security.

### Your first IoT project

#### Identifying the need

Each IoT application is different, depending on your business. And unfortunately there is no one-size-fits-all solution for developing your IoT project. However, one of the objectives of the IoT is to increase efficiencies, and that's a good place to start.

Here's a general three-step strategy you can apply for developing your first IoT project:

1. **Identify potential.** Walk around your facility, talk to your operators, and identify laborious manual processes such as pen-and-paper data collection and Excel spreadsheet data entry tasks. Also identify potentially useful data that is currently siloed and unavailable to other systems and business decision-makers.
2. **Collect data.** Look for opportunities to collect this data at an asset or 'thing' level. For example, is there a sensor you could install to more closely monitor and log your process? Instrumenting equipment is the first step to getting enhanced levels of information from the plant, remotely monitoring assets, and analysing production and reliability.
3. **Centralise and analyse.** Identify a way to aggregate the data into a central repository. This may require some type of IoT gateway or protocol converter and a database to house the information. Once you've centralised the data, you

can analyse opportunities to optimise processes. For example, develop a report to cross-analyse your newly found sensor data with production output. Do certain variables in the process relate to a higher or lower yield?

#### Justifying the investment

As the IoT becomes clearer, it's easy to be overwhelmed by the potential costs and complexity associated with IoT applications. It is important to remain focused on whether a project will benefit the enterprise by reducing cost or improving quality. You should be able to clearly demonstrate a measurable return on investment.

For example, perhaps you could connect a power monitoring device to your plant's main power feed and start monitoring power usage. Once you've started collecting power monitoring data, over time you'll be able to determine exactly what it costs in real time to turn on a motor, run a process or have the building air conditioning set to 25°C.

Or perhaps you want a daily report emailed to you showing production count, raw material inventory and average production time. All of this data can be captured through IoT technology and brought right to your mobile device.

Again, it doesn't have to be complicated. And technologies to accomplish all of these applications are available today, off the shelf.

It's like magic, but it isn't. It's the Internet of Things.

It's going to change everything, and we're all going to be a part of it.

**Systems 22 Pty Ltd**  
www.systems22.com.au

# HOT PRODUCTS

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

## PLC FOR CONTROL OUTSIDE THE CABINET

The TBEN-PLC can operate directly on-machine, enabling the implementation of machine control without the need for a control cabinet.

**Turck Australia Pty Ltd**

<http://bit.ly/2xn5JFn>



## POWER CONNECTORS FOR PROFINET APPLICATIONS

The push-pull Advance series connectors from Phoenix Contact safely transmit power up to 16 A/24 V.

**Phoenix Contact Pty Ltd**

<http://bit.ly/2x8bur2>

## LASER FORK SENSOR

With corrosion-free stainless steel, Wenglor's P1HJ00X laser fork sensor in InoxSens hygienic design provides maximised protection when detecting objects.

**Treotham Automation Pty Ltd**

<http://bit.ly/2vjWBj2>



## VIDEOSCOPE

The portable IPLEX NX videoscope is optimised for carrying out critical inspections efficiently in any environment, producing images that can be viewed in any light.

**TechRentals**

<http://bit.ly/2vTLfWJ>

# BLUETOOTH + BOUNDLESS

For your water, wastewater and utilities applications, we strive to create **boundless** opportunities to improve your processes with minimum effort. Our Micropilot FMR10 and FMR20 radar devices will save you time and money. Utilizing **Bluetooth®** wireless technology, you can quickly and easily commission, operate and maintain your instruments via our free SmartBlue app. And with our unique compact radar chip design, a first in its class of continuous radar level devices, applications with limited space are no problem!



Find out more about our complete level portfolio on  
[www.yourlevelexperts.com](http://www.yourlevelexperts.com)

Endress+Hauser   
People for Process Automation



## Line upgrade increases bottled water output by 3000 bottles/h



One of the largest producers of mineral water in France, Carola, is producing a lighter PET bottle and, in doing so, has also increased output speed by 3000 containers/h. It follows a line upgrade by Gebo Cermex, with installation and ramp-up to full-speed production achieved in less than three weeks.

Following the buy-out of the Carola by Spadel, the international group focused on the bottling and marketing of natural mineral waters and a varied range of refreshing drinks, which called for a complete overhaul of the Ribeauvillé PET line facility, in Alsace (France). The ageing line was causing problems because of its limited flexibility, restricted accumulation capacity, reduced speed due to the limitations of certain machines within the line and poor working conditions. More importantly, the performance of the line was preventing Carola from keeping pace with the fast-changing beverage market and the fluctuations in consumer demand. The company was also eager to minimise the weight of the bottles it was producing and to switch to more modern packaging formats. The new owners' investment strategy included a plan for the reduction of production costs.

Gebo Cermex was selected to undertake the modernisation work following the success of a project previously executed at Carola. Thierry Klein, director of production maintenance at Carola-Ribeauvillé, explained: "We have tested Gebo Cermex capabilities around a returnable glass line and we have been especially impressed by their expertise in line automation and project management. That positive experience convinced us to trust the company again for this upgrade, because we knew their skills would be priceless for our new PET line."

Within this type of installation, which covers everything from bottle conveyors right through to the palletiser, the connection between the line's various pieces of equipment is vitally important.

Output performance is largely determined by the efficiency with which the line handles increases in speed as well as stoppages.

The project at the Carola-Ribeauvillé factory presented the team in Gebo Cermex with several other challenges. On one hand, the company had to change everything within a complete production line without creating a supply problem for the water producer. This meant that Gebo Cermex had to replace all the equipment and get the entire line back in operation at full speed in all formats in no more than 21 days. On the other hand, the customer had to upgrade the line, taking up no more room in a facility where floor space was already at a premium.

José Lefort, industrial manager at Carola-Ribeauvillé, commented: "It's clear that this project has been a success. It's more than lived up to our expectations. The line productivity

target has been met — and speed and line regulation have been optimised for all packaging formats."

The new line has increased output rates by 3000 bottles/h for all packs' formats. This increased productivity means that Carola can now produce greater volumes to tighter deadlines, enabling the company to respond to spikes in demand while reducing the stock managed for this purpose by an external storage provider. Lefort continued: "Increasing output speeds by around 3000 bottles/h for all formats has allowed us to switch to two, eight-hour shifts — with barely any production now taking place at night."

The most crucial stage of the project, the dismantling of the existing line and the assembly of the new equipment, took place well within schedule and the restart proved successful for all formats, which now includes packs of 6, 8 and 24 bottles. Production speed was quickly ramped up and within a month the whole line was running at 75% line efficiency. All the machines and conveyors were reinstalled as close as possible to the ground so that they were directly accessible with no need to climb up on walkways — unlike the previous line. Line control is one of the major strengths of the new system, not least the advanced management of stoppages and restarts on the conveyors and the accumulation tables between the machines. Format changeovers on the new line are also much more efficient than they used to be.

Lefort concluded: "We've had no problems at all. Thanks to this project, we've been able to introduce a new and lighter bottle design. All the new bottles are perfectly stable on the conveyors. That meant that we were able to deliver our clients' orders without interruption — while offering them new packaging options."

**Gebo Cermex at Tetra Pak Marketing Pty Ltd**  
[www.gebocermex.com](http://www.gebocermex.com)



# LAPPEXPRESS

## A U S T R A L I A

Your Online Solutions Partner for Industrial Cable & Electrical Requirements

### CABLE CUT TO LENGTH DELIVERED FREIGHT FREE TO YOUR DOOR\*

Get \$25 off your next order\* Coupon Code "25OFF"



## ✓ No Cut Fee ✓ No MOQ ✓ Freight Free\*

## LAPPEXPRESS.com.au

5000+ Products / 1000+ Cables / Stocked & Available Online

\*Freight Free orders over AUD \$100. Further conditions may apply. See store for details \*Coupon Code limited to 1 use per customer.



# WEATHERCAP RELIEF VALVE PROTECTION.

- Eliminates valve malfunction by sealing out rain, sand, dust, insects and nesting birds
- Sizes to fit 1/2" to 24" Sch40 discharge piping
- Installed without tools
- Indicates valve discharge
- Reusable - Highly visible



## IDEAL FOR USE ON:

- Upstream gas skids
- Offshore platforms
- Petrochemical plants
- Refineries

1/2" TO 18" WEATHERCAPS  
IN STOCK FOR IMMEDIATE  
DELIVERY AUSTRALIA WIDE

AUSTRALIAN AGENT & STOCKIST



PRESSURE & SAFETY SYSTEMS

Tel: (03) 9699 7355

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

9303P&SS-VN1P18

**NEW  
PRODUCTS**

## SURGE PROTECTION SYSTEM

The Pepperl+Fuchs M-LB-500 surge protection system is designed to protect high-value components and plant assets from overvoltage and surge currents. For the first time the module offers a combination of diagnostics and modularity within a narrow housing design of only 6.2 mm wide, along with all of the necessary approvals and international certification. With a space-saving housing design, the M-LB-500 provides high packing density and only needs low cabinet space.



Easily installed, commissioned and maintained, the modular design of the M-LB-500 provides more than just plug-and-play installation. It also allows users to quickly exchange pluggable surge protection modules during operation without any

interruption of signal circuits. Diagnostics provide higher levels of availability and protection — the product continuously self-monitors its own health and signals when it needs to be replaced before it fails via an easy-to-understand traffic light display. With the traffic light display, the status information of the protection module is intuitively readable for everyone and the health of the surge protective device can be closely monitored at any time without any additional tools.

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

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

## PoE+ ETHERNET SWITCHES

Antaira Technologies' LNP-1604G-SFP series 16-port industrial unmanaged PoE+ Ethernet switches offer flexible connectivity and the convenience of Power over Ethernet. The series is equipped with twelve 10/100/1000BaseTx Ethernet ports that are 802.3at compliant and four SFP slots. Users can easily leverage different kinds of port combination to meet distance requirements in a variety of applications, such as process control and automation.



By supporting IEEE 802.3af/at standards, each Ethernet port can supply up to 30 W. In addition to the PoE+ feature, the units help users overcome the difficulties of cable allocation and power sourcing in harsh environments to reduce the cabling cost.

The series is manufactured to a 100% industrial-grade design. The switches feature redundant dual power inputs rated at 48–55 VDC and have a wide operating temperature range of -10 to 70°C.

**Antaira Technologies**

[www.antaira.com.tw](http://www.antaira.com.tw)



### 3D PRINTER FOR MULTILAYER PCBs

The Dragonfly 2020 3D PCB printer, from Nano Dimension, can produce professional multilayer printed circuit boards (PCBs) and 3D circuitry as a rapid prototyping tool for electronics professionals.

The Dragonfly 2020 system brings together a precise inkjet deposition printer, high-performance silver nanoparticle conductive and dielectric inks and dedicated software in order to bring the benefits of 3D printing to electronics professionals. The hardware, dedicated nano-inks and software are said to offer design flexibility to a wide range of research and development, prototyping and custom manufacturing projects. The product also offers the flexibility to print an entire board or just part of a circuit. For example, users can develop the RF and digital sections of a board in parallel, test and iterate on the fly.

The printer deposits two materials, one conductive and one dielectric, in order to build a complete multilayer PCB from the bottom up. Each pass of the printhead deposits dielectric and conductive material at the exact location specified by the design file. Starting from the underside conductive traces, the materials are built up to finish with the topside conductors. This process means that vias are built up, drop by drop, either as blind, open or complete vias. Plated and non-plated through-holes are created by repeatedly leaving a space at a particular XY coordinate, thereby building surrounding materials up around a void. The dielectric ends up as a solid piece within which the conductive traces are positioned at the precise XYZ coordinates specified.

**Emona Instruments Pty Ltd**  
[www.emona.com.au](http://www.emona.com.au)

### NVME SERVERS AND STORAGE SOLUTIONS

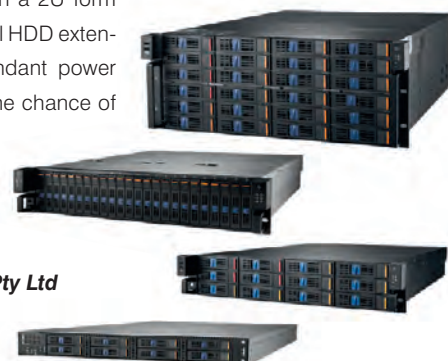
Advantech has launched a series of NVMe servers and storage solutions in 1U to 4U form-factors that fulfil today's industrial server requirements for high-performance storage applications in Industry 4.0.

The HPC-8000 series chassis feature hot-swappable NVMe SSDs, 12 Gbps SAS and SATA HDDs. NVMe technology overcomes bottlenecks in flash drives so the I/O performance can be up to 10 times greater than SATA drives. Utilising NVMe in storage servers as cache not only upgrades the performance of the drive I/O, but can also be used as the part of the memory. Using optimised storage technology in these ways can reduce TCO.

Users can configure different form-factor chassis from 2U to 4U and different types of Intel Xeon E3/E5 processors to create an optimised solution that fits space, cost and performance considerations. Storage extensions and external disk array servers in 2U and 3U form factors, or dual controller JBOD servers in a 2U form factor are also available.

The ASR-5200/ASR-5300 series external dual-controller disk array servers come in 2U and 3U form factors and offer high expansion capabilities and reliability. The SKY-4120B dual controller JBOD in a 2U form factor supports external HDD extension. They have redundant power supplies to minimise the chance of a complete computer shutdown or failure and are targeted at data centre applications.

**Advantech Australia Pty Ltd**  
[www.advantech.net.au](http://www.advantech.net.au)



# Ready for the field?

**AMS**

**AMS INSTRUMENTATION & CALIBRATION PTY LTD**

Phone: +61-3-9017 8225  
Fax: +61-3-9729 9604  
E-mail: [sales@ams-ic.com.au](mailto:sales@ams-ic.com.au)  
Internet: [www.ams-ic.com.au](http://www.ams-ic.com.au)



Being a field calibration technician is a tough job: you need to have many skills and carry multiple devices, environmental conditions can be challenging and constantly changing, documentation of data takes time and is difficult in the field and work efficiency requirements are demanding. However, having the right gear makes the work much easier and also more efficient. Learn more at [beamex.com/readyfortheField](http://beamex.com/readyfortheField)



**beamex**  
WORLD-CLASS CALIBRATION SOLUTIONS  
[www.beamex.com](http://www.beamex.com)  
[info@beamex.com](mailto:info@beamex.com)





## UNIVERSAL M12 DISTRIBUTOR BOXES

With the universal M12 distributor boxes from Phoenix Contact, actuator connectors, such as for solenoid valves, can be connected quickly and easily. Due to the full wiring of the M12 slots, both the switching wires as well as the PE connection of valve connectors are safely and easily connected to controllers and relays in the central control cabinet.

The wire cross-sections of the permanently connected master cables (1 mm<sup>2</sup> for the supply wires and 0.5 mm<sup>2</sup> for the signal wires) are sufficiently large and have low cable resistances. If larger wire cross-sections are required, these can be flexibly connected to sensor/actuator boxes with plug-in screw connection or spring-cage connections.

LED status indicators for distributor boxes and moulded valve connectors, as well as the easy-to-operate M12 Speedcon fast-locking technology — which reduce installation time by up to 90% — can also be added.

**Phoenix Contact Pty Ltd**

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

## COMPACT VARIABLE SPEED DRIVE

ABB's ACS480 compact variable speed drive has been specifically designed to optimise pump, fan and compressor operations easily as well as take advantage of energy efficiency. The series shares the same user interface, tools and options from previous ABB drives to ensure seamless scalability between them.

All essential functions have been built-in to optimise common variable-torque applications via numerous integrated and preprogrammed features such as PID (proportional integral derivative), pump and fan macros and timers. Its inbuilt EMC C2 filter ensures compliance with the latest European and international standards allowing the drive to be used in industrial and commercial (building) environments.

Bluetooth connectivity ensures easy configuration of the drive and monitoring of parameters with mobile devices. To protect both people and machinery, the drive comes with key safety functions such as TÜV-certified safe torque off (STO).

The product provides easy direct access to critical energy efficiency information due to its built-in energy optimiser. Full support for ABB's highest efficiency synchronous reluctance (SynRM) motors provides even greater efficiency and savings than traditional motors, according to the company.

The range is suitable for standard applications for energy-efficient control of light industries, including food and beverage, logistics and warehousing, and water and wastewater.

**Control Logic Pty Ltd**

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



## Continuous Emission Monitoring

- Fully Compliant
- Minimal Maintenance
- Onsite Support

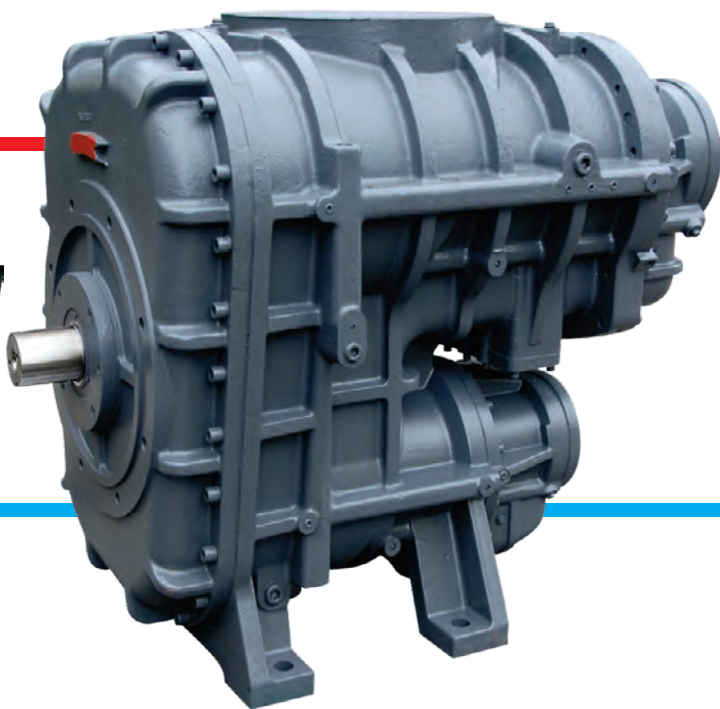


**LEADING TECHNOLOGY FOR EMISSION MONITORING AND PROCESS CONTROL**

Tel: 07 3255 5158 | Fax: 07 3255 5159 | [info@groupinstrumentation.com.au](mailto:info@groupinstrumentation.com.au) | [www.groupinstrumentation.com.au](http://www.groupinstrumentation.com.au)

# Save 15 to 20% on the cost of generating compressed air

## SOUTHERN CROSS **2 STAGE** TECHNOLOGY



- FROM 75-355 kW
- RAPID PAYBACK
- LONGER BEARING LIFE



**Talk to us about a  
cost neutral upgrade to  
new 2 Stage Technology**

If you're not up to speed with 2 Stage air compressor technology then you don't have the highest performing and most efficient compressed air system.

With around 20% less energy usage compared to conventional single stage compressors (*even greater with Variable Speed Drive*), Southern Cross 2 Stage compressors can pay for themselves in a very short time.

With kW capacities from 75 - 355 the 2 Stage range provides a huge opportunity for a wide spectrum of compressed air reliant industries.

*Ask for free assessment of your current system and we will show you how a new Southern Cross, high efficiency, 2 stage compressor can be wholly funded by the energy savings you will achieve through the upgrade.*

**SOUTHERN CROSS  
COMPRESSORS (AUSTRALIA)**



Switch on to a sustainable future

Southern Cross Compressors (Australia) Pty Ltd.  
National Sales and Service: **1300 098 901**

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





# DISPLACEMENT MEASUREMENT – ARE YOU USING THE RIGHT SENSORS?

**In a world of Industry 4.0, sensors must perform high speed measurements and provide high precision results to ensure reliable quality assurance.**

Optical measurement techniques play an essential role in the increasing automation of manufacturing and inspection processes. Non-contact sensor technology is responsible for wear-free, fast, high precision and reliable measurements of manufactured components and their measuring points. This is a decisive advantage in online measurement, particularly if the target is in a difficult-to-access area. Measurement data is generally available in real time and so can be used to automatically correct and control the production process. Process automation can improve product quality and reduce raw materials and energy usage, which minimises production costs. For these purposes, a wide range of displacement sensors are available to suit different applications based on parameters such as measuring range, frequency response and accuracy.

The manufacturing of laminated glass, solar cells, flat screens and smartphone displays are challenging as they consist of several layers and different transparent materials. When manufacturing multi-layer, laminated and curved glass for airplanes, automotive and architectural applications, precise thickness measurement of each layer is important. Due to the high cycle rates involved, the measurements must be performed quickly and precisely. Confocal sensors master these tasks. They are compact, fast, easy to integrate, and ensure the highest reliability in almost any area where high precision is expected – from machine monitoring to fully automatic quality control of the final product.

Large plants and machinery such as stone mills or telescopic installations often work with hydrostatic bearings that are continuously supplied with liquid lubricant via an external pressure supply. In this case, eddy current displacement sensors are used since they can 'see through' the lubricant and provide sub-micrometre position control.

Laser triangulation sensors with their small spot size, large stand-off, fast measuring rate and very high precision find numerous applications in industry. One example is pick-and-place machines, where laser triangulation sensors are used to monitor the position of tiny components. They ensure that the components are positioned the correct side up, at the correct location and at the

correct height. The requirements on the measurement technology are enormous; not only because the parts are extremely small, but also primarily due to the rapid change from shiny to matt surfaces. Laser sensor technology with Auto Target Compensation (ATC) provides fast control of different reflections and enables a smooth signal frequency of the distance signal, ensuring high measurement precision at all times.

Laser sensors are not only bound to one-dimensional measurements, as there is demand for multi-dimensional quality control in industrial production. Laser profile scanners are increasingly used for 2D and 3D profile and contour measurement applications. Their operating principle is based on the laser triangulation technique for two-dimensional profile detection. They detect, measure and evaluate the profiles on different object surfaces. While the laser scanners are giving 2-D information, you can get the third dimension by moving the laser scanner or the target object relative to each other. One such application that can benefit from laser scanners is the inspection of adhesive beading in smartphone housings.

With its high precision, measurement speed, compact size and fast data processing, non-contact measurement technology offers many benefits. The user can choose from different measurement systems. Each principle comes with its own advantages and limitations that all need to be carefully considered. As demanding applications require higher resolution, robustness, temperature stability, linearity or special mounting and installation conditions, Bestech Australia offers Micro-Epsilon sensors for special solutions and custom designs that are adapted to the customer's specifications. Contact type sensors such as potentiometers, LVDTs and draw wires are also available. Factory-trained application engineers with specialised product knowledge will work with you to understand your requirements and recommend the right sensors for your application.

Bestech Australia Pty Ltd  
[www.bestech.com.au](http://www.bestech.com.au)

**BESTECH**  
 Sensors & Teaching Equipment



## CALIBRATION TEST PUMP

The DCAP pneumatic hand pump from Ralston Instruments is specifically designed for use in pressure calibration and test applications in the oil and gas, petrochemical, maritime, pharmaceutical and aerospace industries.

Existing hand pumps are hard to pump at high pressure and require routine servicing. Unfortunately, parts are often inaccessible and the pumps are difficult to repair. To answer these challenges, the DCAP pump has been designed to reach 650 psi or 45 bar with less effort. The pump handles are constructed from anodised aluminium that won't stretch or corrode. Hand fatigue is also reduced by using a pumping mechanism that increases pumping force with minimal effort.

Ease of repair was solved by ensuring that the pump can be serviced using simple tools found in almost any toolbox. All of the pump parts, including the main body, are easily replaceable and a simple repair kit will take care of any seals and wear items in the pump. In addition, all wearing parts are made of stainless steel or anodised aluminium to prevent corrosion and extend life.

Another issue with existing pumps is leakage over time. In many cases, this can actually be attributed to the hoses and fittings used in conjunction with the pump. The DCAP pump connects seamlessly to Ralston's existing Quick-test hoses and adapters to reduce or eliminate leaks that are an issue in other hand pumps with standard threaded fittings. A QT hose and process fittings are included with every pump.

**Transtek Pty Ltd**

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

## Mag flows with IO-Link!



**IO-Link**

### Flow Rate, Totalising and Temperature measurement – all in one unit!

- Robust high-grade stainless steel housing for demanding applications
- High accuracy, repeatability and measurement dynamics
- Suitable for conductive media
- Also available with EPDM O-ring for drinking water applications
- Different process connections possible using adapters
- 4-digit LED display for representation of the units

### IO-Link unlocks the true potential of your sensor!

- Read multiple process values from a single sensor
- Remote parameterisation of the sensor

ifm – your IO-Link system partner.

**Contact us today! 1300 365 088**  
[sales.au@ifm.com](mailto:sales.au@ifm.com) · [www.ifm.com/au](http://www.ifm.com/au)

**ifm – close to you!**





# OVERCOMING THE COMPLEXITIES OF TANK SCHEDULING

© Stock Adobe.com/au/Den

To effectively schedule volumes, process manufacturers need systems designed for the unique needs of their industry. However, many systems are not equipped to manage the challenges of volume scheduling.

**F**or food, beverage, chemical and other process manufacturers, the use of volume-based assets such as tanks, silos, drums and vats can make the production scheduling process extremely complex.

Tanks have many characteristics that make them more complex to manage than other resources:

- Tanks store
- Tanks store only one material at a time
- Tanks buffer
- Tanks are connected by pipes
- Tanks need cleaning and other frequent maintenance
- Tanks come in different sizes
- Tanks have different characteristics
- What goes in is not always what comes out

Optimised tank scheduling is necessary to maximise utilisation and throughput in manufacturing facilities. When evaluating scheduling systems, it is essential for manufacturers to identify tools that can dynamically schedule the intricacies of tanks and simultaneously take into account the constraints and processes of their plants. Fixed defaults, workarounds and rules of thumb simply do not work. They create infeasible schedules requiring constant adjustment, effort and republishing.

## The complexities of tank scheduling

Tanks or tank equivalents — such as vessels, silos and bins — are likely an integral part of your manufacturing process. The unique and complex characteristics of tanks make it difficult to schedule them accurately, especially under capacity pressure.

Scheduling systems that cannot manage these complexities effectively generate schedules that are consistently infeasible, forcing the introduction of disruptive changes in the scheduling process. A thorough evaluation of how scheduling systems manage tank scheduling challenges is essential to maintaining quality and optimising production.

## Why is tank scheduling so difficult?

Tanks have many characteristics that make managing them more complex than the management of other resources. Following are eight such characteristics that advanced scheduling systems must be able to manage effectively.

### Tanks store

The basic fact that tanks store materials constitutes the biggest difference between tanks and other tangible resources, such as reactors, filters and packing lines. Where other types of tangible resources exhibit only flow or batch behaviour, tank behaviour includes delays caused by storing materials between inflow and

outflow. These delays are primarily determined by the availability of preceding and succeeding resources; since their occurrence and duration are dependent on the schedule, they cannot be rigidly modelled.

Scheduling systems that treat tanks like producing resources typically use a historic average or common duration to determine the effective rate or duration. However, real occurrences often differ from the historic value, resulting in an over- or underestimation of the used tank capacity and timing errors for resources that are feeding and consuming the tank. As these errors occur multiple times, they result in infeasible and unusable schedules that get worse over time as they compound.

A scheduling system must therefore be able to manage independent inflows and outflows that vary by material, resources or other constraints. It should allow for delays or standing time between inflow and outflow.

### Tanks store only one material at a time

The ability of tanks to store only one material at a time is the biggest difference between tanks and generic storage resources. Once a tank is in use by a product, no other product can be stored in it until the tank is first completely emptied (and often cleaned). Generic storage locations, such as warehouses, have no constraints on the number of different types of products they can store.

When scheduling a product, it is critical to account for storage constraints to avoid overestimating available capacity. For example, if two tanks each have a capacity of 500 units, only two products can be stored at any point in time. As soon as a single unit of product is occupying a tank, the remainder of that tank's capacity is unavailable for other different products, leaving just 500 units of capacity in the second tank. By contrast, a warehouse capable of storing 1000 units does not have similar limits on the number of different products that can be stored. If one unit of product is stored in the warehouse, 999 units of capacity remain. Just because a tank has additional capacity doesn't mean it can accommodate additional materials.

Scheduling systems need to be capable of accounting for storage constraints and handling finite-capacity scheduling to be effective at managing volume-constrained resources.

### Tanks buffer

Tanks are often used as buffers before bottlenecked resources to have product available, or following resources as soon as needed in order to remove dependency on resource availability. Tanks used in this way are what keep the throughput of your facilities as high as your bottlenecks allow. Lastly, tanks may be used as buffers where a high unpredictability exists in quality or quantity of produced product, again to keep succeeding processes moving.



TO MAXIMISE PLANT UTILISATION, DECISIONS ABOUT WHICH SIZE TANK SHOULD BE USED FOR WHICH BATCH NEED TO BE CAREFULLY CONSIDERED. FUTURE BATCH REQUIREMENTS, SUCH AS DUE DATES AND QUANTITIES, SHOULD ALSO BE PART OF THE EQUATION.

By definition, all buffers have inflow that is independent from outflow, resulting in both timing and capacity considerations. To begin buffering, inflow must start sooner than outflow; and to guarantee buffering capability, inflow and outflow rates should be different. In cases where a buffer is placed before a bottleneck, inflow capacity cannot be less than outflow capacity. When the buffer use occurs after the bottleneck, the opposite holds: higher capacity on the outflow side and multiple simultaneous consuming resources.

Buffers also have special constraints introduced by physical limitations, such as minimum fill levels before buffering can start, maximum depletion after buffering finishes, etc. These constraints, combined with the above-mentioned characteristics, form highly variable limitations on tank behaviour that cannot be managed through workarounds or rules of thumb.

Buffers are critical for achieving maximum throughput for a manufacturing facility, and scheduling systems must be able to effectively manage all of these various buffer characteristics, not just one of them. In addition, scheduling systems should include a single buffer to perform all the characteristics simultaneously. It is crucial that your system be able to handle all buffer characteristics at the same time in a single resource.

### **Tanks are connected by pipes**

Tanks and similar resources store fluid materials, such as liquids or very fine solids (eg, flour). Transportation of these materials in the plant is commonly done through pipes or blow lines that connect tanks to each other and to feeding and consuming resources. These pipes add a number of different constraints to the behaviour of tanks.

The first issue is that only a limited amount of material can pass through the pipe in any given period of time. Therefore, the tank and the pipe that connects it to another resource are in use at the same time; one is feeding while the other is consuming. None of these resources is available for anything else during this period. If a scheduling system cannot manage these constraints, manual tracking of every tank batch and related production batches is required. Otherwise, capacity will be overestimated and production mistimed, not to mention the potential serious consequences if different materials are mixed together.

Second, equivalent resources may not be able to connect to equivalent tanks, because the connections may not physically exist. Even though a product is produced using certain resources and stored in certain tanks, there may not be a pipe connecting them. In addition, routing constraints may also be product-dependent,

since some pipes may not be appropriate to use for some products. As a result, product constraints can still exist even if there is a physical connection of the resource to the tank.

Finally, pipes may converge or diverge through nodes that allow various products to flow through the same pipes either from multiple sources or to multiple destinations. However, some products cannot share the same pipes, adding more schedule-dependent constraints. In addition, when multiple tanks are feeding or draining the same resources through a shared pipe, the flow rate is different than if only one resource was using the pipe, and again, certain products absolutely can't mix with others due to regulatory compliance issues or other consequences.

Routing and product constraints are common when dealing with tank scheduling, but they can be handled efficiently when using a scheduling system that accounts for simultaneous feeding and consuming resources, connection and product-dependent constraints, and multiple flow rates.

### **Tanks need cleaning and maintenance**

Some routine cleaning and maintenance can typically be scheduled with most systems. However, to prevent contamination, most cleaning is dependent on the characteristics of the products and the order in which they pass through the tank.

For example, storing a low-quality product after a similar high-quality product may require little cleaning, but the opposite order may require extensive cleaning. This so-called variable changeover must be managed to create feasible tank schedules. However, even when a scheduling system supports variable changeovers, there are both effective and ineffective methods for handling the variable changeover situation.

A simple and commonly used ineffective method is to supply historic changeover values from product to product. Unfortunately, this approach leads to enormous changeover matrices that require a lot of maintenance. For example, 100 SKUs would require supplying and maintaining 10,000 changeover values. This is a daunting task for even a relatively small product set and will inevitably lead to deterioration in the quality of the schedule.

Scheduling systems specifically designed to handle the intricacies of tanks are able to supply changeover values for the various characteristics that actually cause the changeover, such as colour, quality, brand, lot number, etc.

### **Tanks come in different sizes**

Tanks that perform similar functions often have different capacities. When scheduling tanks, it is beneficial to match larger batches with



larger tanks; however, certain constraints influence what the best choice is at a given time. For example, differences in due dates may mean compromise. Scheduling a near-term large batch in a large tank may mean that a later large batch will need to be split across smaller tanks.

To maximise plant utilisation, decisions about which size tank should be used for which batch need to be carefully considered. Future batch requirements, such as due dates and quantities, should also be part of the equation. Using rules of thumb or having fixed default tanks for products will not consistently provide accurate results. Additionally, the product manufacturing formulas usually change based on the size of the tank. Your scheduling system has to account for formula constraints and requirements.

#### **Different tanks have different characteristics**

Different products can be stored in different but overlapping sets of tanks, due to the specifics of the tanks or the products. In the food industry, for example, some tanks may be made of metals that result in an aftertaste. Some products may require additional floating resources, such as tools, stirrers or clean-in-place equipment, that aren't available or located close to particular tanks. In some cases, history shows bad results from certain tanks, even though no definitive cause can be identified. An undesirable near-term choice for storing a product in a tank may mean that a suitable tank is not available for a later batch of a different product.

Furthermore, tanks may be part of multiple groups, and groups can contain multiple tanks. The same applies to products. Different tank groups must be available for a single storage step in the production process of a product, and each group must be capable of having different characteristics for different products. For example, if a product is stored in a group of tanks that are known to be undesirable for that product, additional standing time may need to be reserved for quality assurance.

An effective scheduling system will be able to dynamically determine what product goes in which tank, in what batch sizes, and at what time based on current conditions and constraints. An effective system will also be able to flexibly group tanks and products to support the scheduling process in a maintainable way.

#### **What goes in is not always what comes out**

In some industries, it is common for products to change while stored in tanks. This is especially true for organic products; for example, cheese matures, alcoholic beverages ferment, etc. Administrative differences are also common. The product itself may not physically change, but certain administrative processes can affect it. For example, completed quality assurance measures or incubation time cause the product to change. Sometimes a change to the product is desired behaviour and sometimes it is not.

Product changes are critical to the scheduling process, because the outcome of physical checks or quality assurance determines when outflow can begin and what the outflow product turns out to be. As the state of the product changes, the schedule needs to be adjusted to accommodate. If succeeding batches on a tank can be started sooner or need to start later, all related parts of the schedule need to be adjusted quickly and easily.

When scheduling tanks, constraints caused by changes to the product must be dynamically calculated, considering that the duration of the batch is not only schedule-dependent, but also qualification-dependent. The right scheduling system will take into account the fact that what goes into the tank is not always what comes out and will allow for easy adjustments to accommodate these changes.

**Infor Global Solutions (ANZ) Pty Ltd**  
[www.infor.com.au](http://www.infor.com.au)





**Dart Instruments**

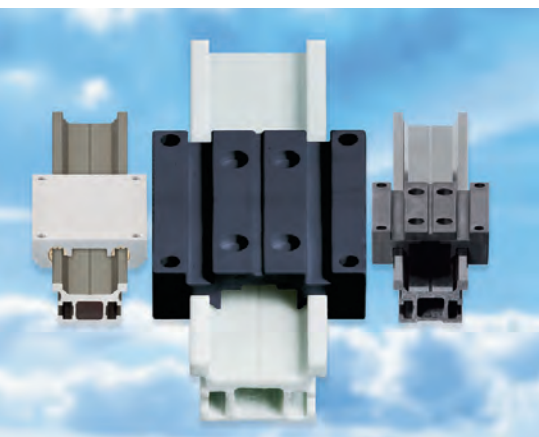
*...sense the RELIABILITY*

**Dart Instruments Pty Limited** A.C.N.109 479 763  
 Phone: 61 2 8456 7550 Fax: 61 2 8456 9988  
 Email: [sales@dartinstruments.com.au](mailto:sales@dartinstruments.com.au) [www.dartinstruments.com.au](http://www.dartinstruments.com.au)

## GRP LINEAR GUIDES

Motion plastics company igus has expanded its drylin W modular system and now also offers linear guides with rails made of glass fibre-reinforced plastic. From vehicle construction to laboratory technology, this metal-free alternative helps users save costs and weight in their overall construction.

Glass fibre-reinforced plastic (GRP) has a high media resistance and is non-magnetic. The drylin W profile made of glass fibre is 20% lighter than aluminium and 70% lighter than steel. It is also 50% cheaper than carbon, which means that this linear guide system is an alternative for use in vehicle and aircraft construction as well as for medical devices or measuring systems.



The pairing of GRP and plastic is also suitable for other industries where highly dynamic movements play a role. For example, more users are using the weight advantages of GRP components in robotics. Due to the good media resistance, the linear guide can also be used in an environment with aggressive cleaning agents.

The drylin W range manages completely without external lubrication and is insensitive to dust and dirt. For more stability, igus offers a high-profile GRP rail option. This also makes it possible to mount it by means of clamping claws. Complicated mechanical finishing is therefore unnecessary and an easy assembly is possible.

**Treotham Automation Pty Ltd**

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



## ADAPTIVE DIGITAL TEMPERATURE CONTROLLER

Omron's E5CD/E5ED digital temperature controllers are said to be the industry's first controllers that can automatically adjust temperature parameters using artificial intelligence (AI).

The temperature controllers come in two models — E5CD (48 x 48 mm) and E5ED (48 x 96 mm) — with a depth of 60 mm. Models are available with up to two auxiliary outputs and two event inputs, and various control outputs to cover a wide range of applications. Using high-speed sampling at 50 ms, adaptive control technology adjusts temperature parameters to ensure optimum values. Previously, any changes to temperature caused by variations of workpieces, environment or infrastructure affecting quality and productivity required manual adjustment by an experienced worker. With this controller series, the PID parameters are updated automatically.

Both units feature a large white display indicating information such as uptime, ambient temperature and output on/off count, similar to previous models. Using a water-cooling output adjustment function algorithm, each unit can automatically suppress temperature variations that are caused by changes in moulding machines.

For packaging machines, Omron has introduced sensors that can mount on the sealing element. When used with the automatic filter adjustment function, temperature variation readings are suppressed and output control is stabilised.

**Omron Electronics Pty Ltd**

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

## Robust MAGNETIC PROGRAMMABLE Incremental and Absolute Encoders





### Features

- Program with a mobile phone
- No software to install
- Wi-Fi connection to encoder
- Online storage of configuration
- Range of housing sizes 58 and 36mm Dia.

### Options

- Incremental Only
- Absolute single or multi turn
- Gray or Binary Code
- Dual Incremental and Absolute
- Any values 1 to 16,384

**PCA**

[www.pca-us.com.au](http://www.pca-us.com.au)

+ 61 2 9482 3733

**POSITAL  
FRABA**

Configure with your mobile phone





# Your success circulates at every degree

Configurable. Innovative. Performance.

The NEW ThermoFlex™ chillers feature quiet performance (<58 dBA) promotes a safe and reduced stress environment in your lab. These low noise models are designed to remain quiet over the entire operating range of the chiller while maintaining temperature control accuracy.



Thermo Scientific ThermoFlex  
Recirculating Chillers

Find out more at [thermofisher.com.au/recirculating-chillers](https://thermofisher.com.au/recirculating-chillers)

**ThermoFisher**  
SCIENTIFIC

## AUTOMATION: THE POSITIVE FUTURE FOR MINING

**A**utomation is the latest trend in mining with the 'cruise control' setting for many processes now increasingly becoming popular.

Many experts say automation is here to stay but as technology continues to evolve, what does this change actually mean to the future of Australian mining?

As an engineering company that's core business is around innovating new, timesaving and indeed often automated devices for the resources industry we have seen a definite increase in demand as more companies are seeing the benefits that come from automated equipment on-site. Companies are trialling driver-less trains and robotic drilling among many other automated solutions with a view to increasing safety and of course ultimately reducing costs. The use of robotic devices and remote-controlled equipment continue to provide safer and more efficient ways of operating but a less discussed and also very important advantage is that it can also often be the more environmentally friendly option.

It is reasonable that some in the industry are concerned about the impact of automation on future job prospects in what has long been considered a booming industry. However, it is possible for automation to be applied to select processes to add value to the work being achieved while still utilising skilled workers to ensure these technologies are being implemented correctly and safely. Because of this, it is no surprise that some companies are reluctant to commit large amounts of capital to still-developing technology. Instead, companies are opting for an easier entry point into automation technologies such as remote control and or even driver-assisted techniques to control mining machinery and maintain jobs. In other words, using these technologies alongside manned equipment and vehicles to enhance human work, as opposed to replacing it.

An example of mine automation is in the area of water spraying. Utilising automation technology as a part of the spray technology allows a mine to geo-fence its network of haul roads with



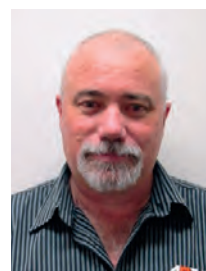
various water application rate zones. What this technology does is extend the safety of employees by removing the hazard to water truck operators introduced by incorrectly selecting water application rates. The information needed to operate the system is gathered from haul road material audits, where friction mapping is used to determine appropriate water application rates. The use of this particular automation component does currently require manpower. A person is needed to manage the haul road material audits and update the water application rate's geo-fence as the mine's network of haul roads changes.

Naturally, the growth of automation will change the mining industry's employment landscape, but this change does still require a strong human backing to be effective. It's definitely not a matter of suddenly replacing thousands of workers with robots overnight. I expect these changes will be introduced over a long period of time in quite an organic way, as opposed to seeing major job cuts. I don't believe total and complete automation is the way of the future, but as autonomous mining grows, there will be a need for people to upskill to maintain this integration.

Just as the introduction of spreadsheets didn't destroy accounting jobs, automation certainly won't destroy mining jobs, but will simply change them. Although we will see some roles being replaced with automation technologies, we will also see the expansion of new technology-related departments within the mining industry, which is exciting.

As more and more companies seek to improve the productivity and safety in their mine sites, these innovative solutions are helping Australian mining companies successfully discover, process and transport minerals, safely manage haul roads and operate in an efficient manner.

Making sure engineers are trained in automation technologies ensures that mining services companies such as ADE are consistently at the forefront of industry developments and providing solutions to challenges commonly faced by the mining and construction industries. Gradually embracing automation technologies will create a safer and more efficient mining environment to ensure mining and construction companies can operate safely and efficiently.



*Clive Gray began his career as an apprentice diesel fitter with his local shire council and 30 years later is a part owner and General Manager Director of Aus-*

*tralian Diversified Engineering, a leading manufacturing and distribution company supporting the mining and construction industries and offering engineering services specialising in the design, fabrication and assembly of custom solutions.*



Compact.  
Robust.  
Easy integration.

## The new eddy current measuring system

Fast, high precision displacement and position measurements for plant and machinery integration



- Range: 1 | 2 | 3 | 6mm
- Active temperature compensation (180°C)
- Robust and compact design to IP67
- High pressure resistance
- Max resolution: 0.5µm
- High bandwidth



Metal Processing



Food & Beverage



Oil & Gas

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

**BESTECH**  
Sensors & Teaching Equipment

Global Technology, Local Support

[enquiry@bestech.com.au](mailto:enquiry@bestech.com.au) | 03 9540 5100

# FOLDED-PATH GAS ANALYSERS

MAKING THE ANALYSER FIT THE PROCESS



In chemical plants, petrochemical plants and refineries, tunable diode lasers (TDLs) are becoming an increasingly common sight. Their high reliability and low maintenance has made them the gas analyser technology of choice for many companies. However, installation locations and conditions encountered in some processes have limited their application range.

**T**he rapid rise of tunable diode laser (TDL) analysers over recent years has led to them becoming established as a core measurement technology within the portfolio of gas analysis techniques available today.

The ability of TDLs to interface directly to the process, which eliminates the need for costly and high-maintenance sample handling systems, gives them an inherent rapid speed of response. This makes them ideal for real-time dynamic measurement of process conditions. Conversely, one aspect of TDLs has not advanced at the same pace as the measurement technology itself: the process interface available for cross-stack, in situ units.

Installing an optical, cross-stack TDL directly in a process pipe or vessel creates some installation and operational challenges and limitations which need to be considered carefully before considering their deployment. Nowadays, new innovative process adaptations have been developed that allow the operation of TDL analysers in locations and applications previously considered impractical, if not impossible.

## Installation point selection and unit size

The first consideration when planning a cross-stack/pipe TDL is the installation point. The decision has to be based on executing the measurement at the point in the process where the most pertinent analysis data can be collected. However, this can create the first challenge if there are space constraints or if the diameter of the process pipe is small.

Optical restrictions mean that an elongated housing is needed to provide the required focal length between the laser and the

receiver. These long optical housings not only create installation and measurement limitations on small pipes but, due to their large internal volumes, also exacerbate the stability of alignment, and provision and consumption of purge gas required to keep the analyser's optics clean.

## Optical alignment

Even if space limitations are not a concern, alignment of the transmitter and receiver units across the pipe is always a consideration. A cross-stack TDL requires careful alignment, which means mating flanges have to be welded onto the pipe prior to installation, adding cost and complexity to the procedure.

To aid alignment of the transmitter and receiver units, various alignment mechanisms are available, ranging from simple, large, compression O-rings to more complex, flexible, metal sealing designs. Care has to be taken to ensure that satisfactory alignment has been achieved, and that the integrity of the process line has not been compromised through introducing leak paths during the alignment process, which could allow the escape of process gases into the atmosphere.

## Physical mass

An issue that is particularly relevant when considering installing a cross-stack TDL relates to its size. Firstly, the optical alignment can degrade over time as the alignment mechanism sags due to the weight of the transmitter and receiver body together with the long optical housings (Figure 1). Additionally, if the vessel wall is thin it is essential to add braces to provide additional stability.



© Stock-Adobe.com/au/ITstudio

Even when these considerations have been thoroughly accounted for, alignment can still be compromised if the process temperature varies greatly, for example, during start-up or when using the analyser on a batch process where there is a significant temperature ramp profile. This is because the walls of the process vessel will flex as they heat up, and although this may not be visibly noticeable it can lead to the laser becoming misaligned with the receiver once the process is running, necessitating expensive and time-consuming realignment.

In an attempt to mitigate this effect, the laser beam profile can be altered to create a divergent optical spread. While this can help to ensure some signal always reaches the detector, the received signal intensity is inevitably reduced.

### Purge gas

The next major consideration is the provision of purge gas to protect the analyser's optical windows from particulates or condensation entrained in the process gas stream.

The majority of cross-stack TDLs require an optical purge, and due to the diameter of most TDL optical housings there is a large purge volume to fill and a sizable optical surface area to be kept clean. This leads to significant purge flow requirements, sometimes as much as 50 litres/min for each side. Such a high level of consumption obviously brings cost implications, and additionally introduces substantial quantities of diluent gas into the process stream, which may create process quality or other problems downstream.

### Small pipes

For many processes it would be ideal if it were possible to easily employ a TDL analyser directly across a small bore process pipe. This is a challenge for the majority of in situ TDLs due to their size, weight, sensitivity and optical design limitations. Even the best instruments available are usually limited to a minimum pipe diameter of 12" (DIN 300). This restriction often means that

a suitable expansion pipe section has to be installed, which brings its own concerns (pressure reduction and reduced velocity), or a slipstream or bypass installation must be fitted.

Although the bypass approach can enable a cross-stack TDL to be installed on a small pipe, it is not an ideal solution. Firstly, in such an arrangement the optical purge on one side is working in the direction of process flow, while the other is working against the flow. This can lead to instability of the optical path length, which in turn will result in measurement error. Secondly, the purge gas will have a pronounced dilution effect on the process gas as it passes through the bypass arm, and there are other considerations such as process flow control effects, especially as the valves can introduce undesirable pressure drops in the line.

### Beam steering

The final consideration is more subtle but nonetheless is an important phenomenon that is relevant to TDL technology. When a laser beam passes through gases at various temperatures and therefore different densities and indices of refraction, the beam will be diffracted at the interface where the density changes. When using a cross-stack TDL to analyse a hot gas stream, this is exactly what occurs, since typically there will be a non-homogeneous temperature distribution and in addition, a high flow rate of cold purge gas at each end of the optical path. This diffraction of the laser light is known as "beam steering" and contributes to signal noise. It affects the measurement stability of the analyser as well as potentially adding complications to the alignment process.

As can be seen in Figure 2, beam steering leads not only to loss of received energy at the detector, but importantly, laser energy will arrive at the receiver from various optical paths and some rays may even miss the detector entirely. The cumulative effect is random fluctuations of the laser beam at the receiver and therefore noise on the signal. In addition, the multiple signal paths further contribute to increased signal noise and measurement instability. In general, beam steering increases with temperature and pressure

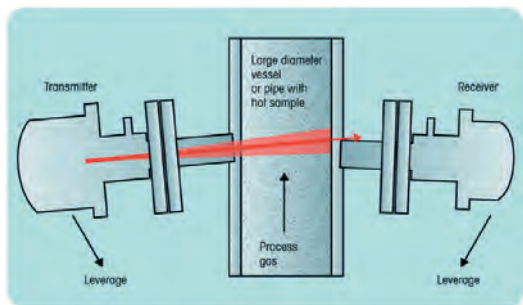


Figure 1: Difficulties of cross-stack measurement on flexible thin walls and hot processes.

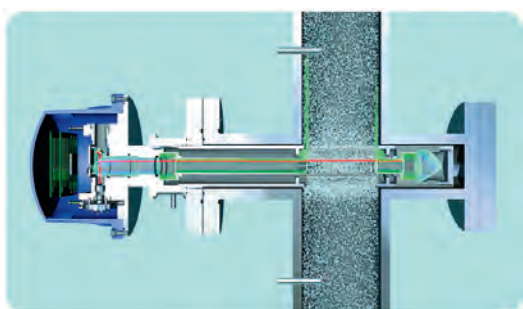


Figure 3: Example of a folded-path TDL mounted across a DIN100 pipe.

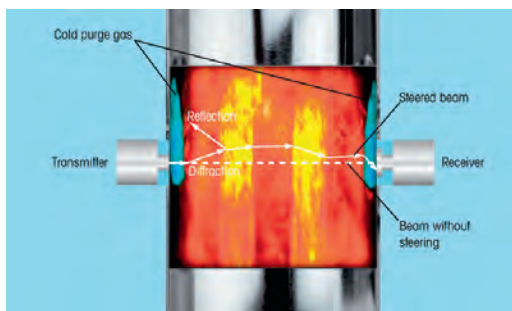


Figure 2: How beam steering affects a TDL analyzer.

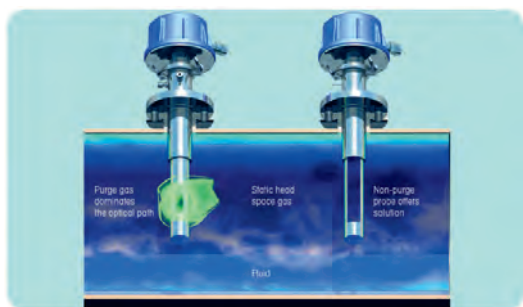


Figure 4: Purge gas dominates the optical path with a purge-type probe, but a non-purged probe offers a solution.

in the process and also with the length of the optical path through the hot gas. Even if there is no cold purge gas, beam steering can still cause a significant decrease in measurement quality.

### Make the analyser fit the process

Where can choices be made to overcome the limitations outlined above? As a general rule a reduction in the weight of the TDL can go a long way to eliminating concerns regarding alignment stability and the use of TDLs in tight spaces. Some lighter cross-stack analysers are available, but they still require alignment, which can become more difficult if the optics and beam diameter have also been reduced. There also still needs to be opposing flanges fitted across the pipe and significant volumes of purge gas.

There is an alternative to cross-stack devices. For the majority of process applications, a folded-path TDL (where the laser beam from the sensor head is reflected back to a receiver also in the sensor head) offers a host of advantages:

- Transmitter and receiver in a single unit and no need for an expensive interconnecting cable.
- Usually single flange installation.
- No tricky alignment across the pipe or vessel.
- Reduction in purge gas requirement.
- Small size, so easy to install in tight spaces.
- Greater accuracy (as the laser beam passes through the sample twice).
- Lightweight design removes stress on flanges and seals.

Folded-path TDLs (Figure 3) address many of the problems of cross-stack analysers. The advantages they offer have significantly opened up measurement opportunities in situations that have previously proved difficult or impossible to overcome. Such TDLs may still require purge gas to protect the optics, but due to the smaller diameter of the in situ probe and low internal volumes the purge requirement is significantly lower, sometimes as much as an order of magnitude lower. For gas streams containing entrained particles or where there is potential for condensation, purge will remain a necessity, at least for the foreseeable future, but not all processes fall into this category.

### Headspace monitoring using a TDL

When considering a TDL for headspace monitoring, the matter of purging is critical. This is because the purge gas will dominate the optical path of the TDL (Figure 4) as the sample is largely static and there will typically be insignificant circulation or velocity in the headspace to displace the purge gas. This would be a hazardous situation, since the analyser will always show an erroneously low target gas value. Since many headspace and inertisation applications are free of particulates, not using purge gas can be viable, but for cross-stack analysers two ports are still required. This eliminates simple attachment to the tank and means elaborate bypass or extractive systems are necessary.

A better solution is a folded-path TDL that does not require purging and that can interface through a single port into the headspace itself. The separation between the optical windows of the device fully defines the optical path, and as the laser beam passes twice through the gas, good sensitivity can be achieved with a compact probe.

### Hot and dusty applications

Another application that poses issues for deploying TDLs is hot and dusty processes. If purge gas entering the gas matrix is not a problem then it can be used to protect the optics on either a



THE MAJORITY OF CROSS-STACK TDLs REQUIRE AN OPTICAL PURGE, AND DUE TO THE DIAMETER OF MOST TDL OPTICAL HOUSINGS THERE IS A LARGE PURGE VOLUME TO FILL AND A SIZABLE OPTICAL SURFACE AREA TO BE KEPT CLEAN.

	Cross-stack	Probe-type	Non-purge probe-type	Wafer cell	Extractive cell
Alignment required	Yes	No	No	No	No
Purge gas required	Yes (large quantity)	Yes (small quantity)	No	Yes (small quantity)	No
Can be used on small pipes	Typically, no	Yes 4" (DIN 100)	Yes 4" (DIN 100)	Yes 2" (DIN 50)	N/A
Beam steering	Yes. Can be significant if path length is long	Yes. Minimal due to short path length and optical design	No	Yes. Minimal due to short path length and optical design	No

Table 1: Comparison table of cross-stack TDL versus folded-path TDL with probe and process adaptations.

cross-stack or purged folded-path TDL. But the combination of cold purge gas and hot process gas raises the problem of beam steering. The ideal solution would be to remove the purge requirement if possible (with the added benefit of simplified installation and reduced running costs). However, removing the purge means another form of protection for the optical windows is necessary. The answer here is use of a non-purged, folded-path TDL with the addition of a sintered metal filter and baffle.

### TDL on pipes down to DIN 50

In the past, a typical 'no-go' location for TDLs has been in situations where there is a need to interface directly into a small diameter process pipe. As has been discussed, cross-stack analysers require complex and expensive bypass configurations, and even folded-path analysers are typically limited to a minimum diameter line of 4" (DIN 100). An innovative inline process adaption: the wafer cell (Figure 5), provides the solution.

This adaptor allows a TDL to be installed on pipes down to 2" (DIN 50) and offers no obstruction to the process flow, which brings the additional benefits of compatibility in high velocity operation (>25 m/s) and immunity to vibration.

### Process adaption for extractive systems

There are occasions when there might be a fully serviceable sample handling system — perhaps one previously used with a paramagnetic or NDIR analyser — which a site would like to continue to use with a TDL installation.

Previously, adding a TDL analyser in these circumstances has usually meant either installing a specialised, fixed, extractive-style TDL or adding a sample cell to which the transmitter and receiver housings of a cross-stack analyser can be attached. This is a viable solution, but will often mean a large panel is required to hold the sample cell and analyser hardware and can be a significant problem if wall space is at a premium.

An elegant approach in these circumstances is an analysis device that can be easily adapted between an extractive or in situ interface, whether it is a purged or non-purged probe, or an inline wafer cell. Such an extractive process adaptor (Figure 6)



Figure 5: TDL with direct process pipe (wafer cell) adaptor.



Figure 6: Extractive process adaptor.

attaches directly to the TDL analyser to create a stable, fixed and prealigned optical cavity. The analyser can be operated continuously as an extractive analyser or modified later simply by changing the process adaptor to offer the most appropriate interface for the final in situ location.

### Conclusion

The benefits of TDL measurement are not always achieved in practice due to the limitations of the process interface of typical cross-stack, in situ TDLs. These limitations create challenges and often lead to compromises regarding measurement stability and integrity in many potential TDL applications.

By recognising these limitations and re-imagining a better solution, in the form of folded-path TDLs, it is now possible for a compact, lightweight TDL analyser to be utilised across a vast range of installation locations with confidence and without compromise.

**Mettler-Toledo Ltd**  
www.mt.com

## PROGRAMMABLE SAFETY LIGHT CURTAINS

Reer has recently released its Safegate type 4 range of safety light curtains that are suitable for the protection of a large number of high-risk industrial applications, particularly those requiring a high level of integration of the muting functions.

Safegate ensures the integration of the muting sensors that can be connected directly to the safety light curtain. It is claimed to be the most flexible muting integrated barrier on the market, offering a range covering all muting applications. The configuration can also be changed at any time.

The hardware configurable models SM and SMO allow configuration of the muting logic and functional parameters via the main connector wiring, whereas the SMPO programmable model's functional parameters are configured via the Safegate Configuration Software (SCS).

All of the light curtains feature integrated main safety functions, with the SMO and SMPO models offering an integrated status and muting lamp.

Reer also offers a wide range of accessories, including special mounting brackets and floor-mounting columns.

**Treotham Automation Pty Ltd**

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



## VORTEX FLOWMETERS



Mass Flow ONLINE has introduced updated models of its LIQUI-VIEW Base series of vortex flowmeters. The models are now equipped with a bright, wide-angle and easy-to-read display for local readout purposes. As the working principle of the instrument allows it to be mounted in any position, the structural design of the display makes it possible to rotate it through 180°. Besides a local readout, the models also offer 4–20 mA output signals.

The obstruction (bluff body) placed in the flow of the liquid sheds vortices downstream at a frequency proportional to the velocity of the liquid. A piezoelectric sensor detects the vortices and creates electrical pulses which are proportional to the liquid flow rate. The instruments can be mounted in any position and can be supplied in full-scale ranges from 10 up to 150 L/min at a maximum 12 bar pressure rating.

The instruments are suitable for monitoring the flow or consumption of cleaning or cooling water and have an IP65 protection rating.

**Anri Instruments & Controls Pty Ltd**

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

# Dwyer

## THE ACCURACY YOU NEED, THE DEPENDABILITY YOU WANT



TO LEARN MORE  
**(+61) (0) 2 4272 2055**  
[dwyer-inst.com.au](http://dwyer-inst.com.au)

**Pressure  
Transmitters**

**Flow Switches/  
Transmitters**

**Level  
Transmitters**

## SAFETY LASER SCANNER

The PSENscan safety laser scanner safely monitors up to three separate zones simultaneously, and up to four safety laser scanners can be connected in series in accordance with the master-slave principle. Due to the free configuration of warning zones and protection zones, plus the ability to adapt to existing structural conditions, PSENscan can easily be integrated into the most varied of applications.

The safety laser scanner offers two-dimensional area monitoring with a large detection angle of 275°, so applications in which several adjoining sides of a machine or AGV are to be monitored can be implemented with fewer devices. PSENscan is flexible and can be used in a variety of situations because different zone configurations can be stored.

In addition to three separate zones, up to 70 switchable configurations can be set up. With a protected field range of 3–5.5 m for the safety zone and 20 m for the warning zone, large areas can be covered with one device.

The PSENscan Configurator software tool is used for configuration via an Ethernet port. The device uses a teach-in mode to record fixed obstacles in its environment, which can then be excluded from the monitoring zones. As the complete configuration can be stored on an exchangeable memory module, there is no need to repeat the configuration if the device is replaced.

PSENscan is designed to protection level IP65. The whole structure of the device has been optimised so that errors triggered by dust particles are detected and avoided.

**Pilz Australia Industrial Automation LP**

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



**NEW**



- Unrivalled Performance
- Increased Process Insight
- Total Lifecycle Support



**YOKOGAWA** 

**Co-innovating tomorrow™**

[enquiries@au.yokogawa.com](mailto:enquiries@au.yokogawa.com) [www.yokogawa.com/au](http://www.yokogawa.com/au)

# TURCK

Your Global Automation Partner



Why change now?  
(This works great.)

It's time to connect to  
Turck's new field logic  
controller (FLC).

Our revolutionary, new ARGEE-powered FLC puts cost-effective control in your hands, on your device. Using an HTML5-based interface, you have the power and freedom to control your automated system directly at the field level.

Join the revolution. #RevolutionFLC



Call 1300 132 566 or visit [www.turck.com.au](http://www.turck.com.au)

## INSTRUMENTATION & SENSORS

### MAGNETIC CODED SAFETY SENSORS

Balluff is expanding its safety range with magnetic coded safety sensors. They are connected directly to the safe Balluff IO-Link I/O module or to any safety controller using standard M12 connectors.

Due to its non-contact operating principle, the magnetically coded safety switch is unaffected by mechanical play — for example, when doors settle or are imprecisely guided — making it simple to install. With separate processing electronics, the safety switch can be used for applications up to PLe/SIL 3.

The magnetic technology with intelligent arrangement of the reed contacts in the switch housing offers high tampering security and reduces the risk of bypassing the safety function. With the optionally available spacer, users can even install the safety switch in a ferromagnetic environment.

**Balluff Pty Ltd**  
[www.balluff.com.au](http://www.balluff.com.au)



### REAGENTLESS CHLORINE ANALYSER

The CL10 sc reagentless chlorine analyser allows for real-time control of disinfection processes by providing continuous readings that indicate when treatment conditions have changed. A measurement range from 0–20 ppm with an resolution of 0.001 ppm ensures process control in a wide range of disinfection applications.

The analyser uses Hach's Cal Watch self-diagnostics to alert users when the process has changed or the instrument needs servicing. Diagnostic features include warning of pH and chlorine calibration deviation and a non-contacting flow sensor for notification of insufficient sample flow. Free or total chlorine measurement with an amperometric analyser, such as the CL10 sc, does not require reagents, thus eliminating the need for routine reagent replacement and waste stream management.

The analyser can be used with any Hach sc digital controller without software configuration. Power supply is 12 VDC 30 mA maximum, supplied by the controller. It can be mounted on a flat, vertical surface (such as a wall, panel or stand) and requires a sample flow rate of 30–50 L/h (optimum is 40 L/h).

**Hach Pacific Pty Ltd**  
[www.au.hach.com](http://www.au.hach.com)



## 2D LASER SCANNER



In production areas and logistics centres, forklifts are always moving between different halls or parts of buildings. Since the highest point of a forklift can vary depending on the load,

it could sometime result in an overhead collision.

With a 360° measuring angle and a stable, wobble-free scanning axis, the Pepperl+Fuchs R2000 Detection 2D laser scanner is able to detect objects as small as 1 mm that move into its field of detection. The R2000 can be mounted on the side of a door, positioning the scanning axis just below the maximum clearance height to prevent collisions with vehicles that pass through them. It can recognise dangerous situations and trigger various warning signals at an early stage. The R2000 provides high precision, easy-to-see status information, 360° detection and high longevity.

**Pepperl+Fuchs (Aust) Pty Ltd**  
[www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

## PHOTOELECTRIC SENSORS

Leuze electronic has introduced the latest member of its Global Beam family with the compact sensors of the 15 series in an IP67 housing. They are suitable for the detection of objects in industrial environments, in particular in the areas of conveyor systems, material flow or secondary packaging in which large operating ranges are required.

The sensor is designed in a compact cubic housing. A bright light spot and an easily accessible potentiometer make installation quick and simple. The series is available in retroreflective, diffuse and through-beam versions and can therefore be used in all standard applications. It is also suitable for special requirements such as detecting glossy objects and reflective surfaces. The high function reserve makes detection possible even in extreme situations, therefore reducing the risk of a system standstill.

**Leuze electronic Pty Ltd**  
[www.leuze.com.au](http://www.leuze.com.au)



## Level Sensing...

**BESTA**

**Level**

**Sitron**

**KARI**

**Gems**  
Sensors & Controls

**WEKA**



## ...we've got your Control Components

FULL RANGE OF FLOW, PRESSURE  
& ENVIRONMENTAL SENSORS

WEKA MAGNETIC VISUAL LEVEL  
INDICATORS MANUFACTURED  
LOCALLY (316SS & +GF+ PLASTICS)

LOCAL SUPPORT & STOCK  
FOR QUICK DELIVERY

**CCEZY.COM.AU +61 2 9542 8977**

Distributors through Australia and New Zealand

**Control Components**



OUR  
**PROCESS  
ANALYSERS**  
ARE  
DEVELOPED  
BY  
SCIENTISTS  
WITH A  
**PASSION**  
FOR  
**UNUSUAL  
PARAMETERS**

[metrohm.com.au](http://metrohm.com.au)



Near Infrared

Colorimetry



Multichannel  
Titration

Process Ion  
Chromatography

Whatever parameters  
you need to monitor:  
**Make sure you speak to  
our specialists!**

available at  
**MEP**  
instruments  
The right chemistry.

**MEP Instruments Pty Ltd**  
Australia Tel 1300 720 485  
New Zealand Tel 09 477 0620  
[www.mep.net.au](http://www.mep.net.au)

## ELECTROMAGNETIC FLOWMETERS

The Yokogawa ADMAG Total Insight (TI) series consists of the ADMAG AXG and the ADMAG AXW electromagnetic flowmeters. The ADMAG AXG is a complete redesign of the ADMAG AXF and will accommodate bore diameters from 2.5 up to 500 mm, while the revamped ADMAG AXW will accommodate bore diameters ranging from 25 to 1800 mm.

Total Insight is a Yokogawa concept for optimising operations and reducing maintenance costs through every phase of the product life cycle.

The ADMAG AXG utilises dual frequency excitation and is intended for applications that require high accuracy and high corrosion resistance, while the ADMAG AXW is for general-purpose applications that mainly involve water and water-based fluids. Various linings are available to suit different applications.

The series includes general-purpose, sanitary (for foods and pharmaceuticals), submersible (for limited periods of time) and explosion-proof models. For each of these models, a variety of sizes, lining materials, number of signal I/Os and precision levels are available.

The flowmeters have a variety of alarm functions, with a choice of warning message or alarm (either pulse output or analog signal). A logging function provides for the simultaneous logging of four different kinds of output signals. An optional microSD Card function facilitates the retrieval of data.

A built-in verification function enables checking of magnetic, excitation and operational circuits as well as alarm logs while they are in operation, allowing for a shift to condition-based maintenance.

**Yokogawa Australia Pty Ltd**

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



## ULTRASONIC METER FOR CUSTODY TRANSFER

Honeywell Process Solutions has launched the Q.Sonic<sup>max</sup>, an ultrasonic gas flow meter for custody transfer processes. It is the flagship for Honeywell's range of Q.Sonic ultrasonic gas meters.

The eight-path ultrasonic meter combines both reflective and direct paths. This enables the product to effectively detect and correct for disturbances in the gas flow caused by short inlets, extenders, reducers, manifolds, elbows and a range of other piping elements common in natural gas plants. It also provides for extensive diagnostics to ensure correct readings.

It meets the accuracy class 0.5 requirements of the International Organization of Legal Metrology (OIML) R 137-1&2 2012 without any exclusions. The OIML, an international, intergovernmental standards-setting body, promotes global harmonisation of legal metrology. In its international recommendation the body defines three accuracy classes for gas meters.

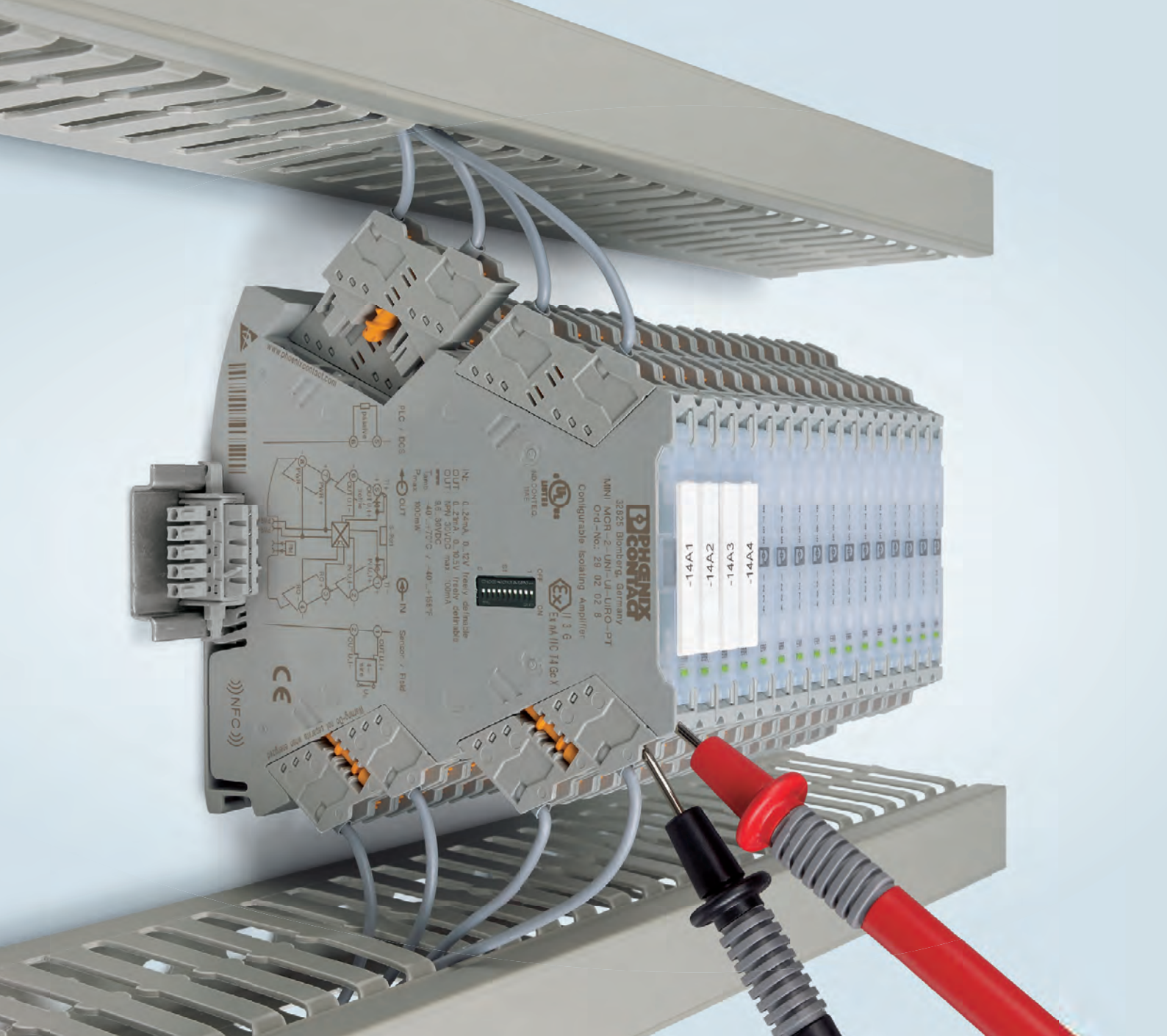
The meter is also available with SonicExplorer PC-based software. Operators, service engineers and technicians can configure, diagnose and monitor the meter locally or remotely, cutting maintenance costs by up to three quarters.

Also available is the IIoT-ready Meascon software, which provides 24/7 monitoring with real-time visibility and complete control of all gas metering stations. Users can easily and securely share real-time and historic data across the site or enterprise. With Honeywell's technical support and secure Ethernet connection, users can also choose to use Meascon to outsource the entire meter monitoring operation.

**Honeywell Process Solutions Ltd**

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





# Easier than ever but slim as before

## Highly compact signal conditioners **MINI Analog Pro**

MINI Analog Pro offers the easiest installation and startup with minimum space requirements. MINI Analog Pro is the first 6 mm signal conditioner range with plug-in connection technology. Clearly visible, easily accessible terminal points and current measurement during operation make your work easier than ever.

For additional information call **1300 786 411**  
or visit [phoenixcontact.com.au/signalcon](http://phoenixcontact.com.au/signalcon)

## MULTIPOINT THERMAL MASS FLOW METERS

The MT100 Series multipoint thermal mass flow meters from Fluid Components International are designed to assist with the optimisation of combustion or preheated air to large boilers, stack emission monitoring and reporting, and flue gas/scrubber balancing. They provide temperature-compensated direct mass flow measurement of air and gases for precise, repeatable measurement in large diameter pipes, stacks and rectangular duct installations.

The flow meters are available with 2–8 flow rate sensing points to overcome common issues such as distorted flow profiles. Multiple sensors are inserted at various depths within a pipe or duct and their outputs are multiplexed and averaged to produce the flow rate within the process line.

The series can measure flow rates over a wide range, from 0.25–1000 SFPS (0.07–305 NMPS), with 100:1 turndown and with an accuracy of  $\pm 0.75\%$  of reading,  $\pm 0.5\%$  of full scale. They can also provide temperature measurement from  $-45$  to  $454^{\circ}\text{C}$  with an accuracy of  $\pm 1.1^{\circ}\text{C}$ .

Dual, isolated, high-resolution 4–20 mA outputs compliant with Namur NE43, HART, Modbus, 0–1 kHz frequency/pulse and a USB port are included. Foundation Fieldbus and Profibus-PA are also available.

The large, colour, touch-screen LCD readout provides comprehensive process information with both analog and digital displays of flow rate, temperature and totalised flow and sensor status diagnostics. The electronics also includes a data logger feature with which flow rate, temperature and totalised flow, as well as fault codes, can be recorded on a removable 8 GB microSD card.

**AMS Instrumentation & Calibration Pty Ltd**

[www.ams-ic.com.au](http://www.ams-ic.com.au)



## Measure Liquid Flow Rates with No Pipe Disruption!

**Rent the GE Panametrics PT878T for Flow Measurements without Leaks, Contamination, or Pressure Drops**

- ✓ Thickness flow velocity range 0.03 to 12.2 m/s
- ✓ Measurement of flow rates and volume from  $-20^{\circ}\text{C}$  to  $210^{\circ}\text{C}$
- ✓ Measures through plastic, metal, or concrete-lined pipes
- ✓ Thickness gauge and 2 sets of transducers included

Visit our website for more information



**We'll beat any quote by 10%.  
That's our Rental Rate Guarantee\***  
\*Conditions Apply

TR1871

For more information, contact us today:



1800 632 652



[rent@techrentals.com.au](mailto:rent@techrentals.com.au)



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





## Process automation worth its weight in gold

Agnico Eagle was founded in 1957 and is today one of the largest gold mining companies in the world. The Kittilä mine in northern Finland is the largest primary gold producer in Europe. The mine extracts and processes about 4000 tonnes of ore per day, which results in the production of approximately 200,000 ounces (or 6000 kg) of gold per year.

The ore at the Kittilä mine goes through a treatment process of grinding, flotation, pressure oxidation and treatment in carbon-in-leach circuits. A pressure oxidation circuit (autoclave) is required because of the ore's refractory nature. Gold from the leach circuit is stripped from the carbon and recovered from the solution using electrowinning.

The primary chemical used in the separation process is cyanide, which due to its highly toxic nature places strict reliability and accuracy demands on pH measurements. An inaccurate or incorrect reading could result in a potentially hazardous situation. At the very least such an occurrence would result in difficulties, delays and higher costs.

Agnico Eagle was not fully satisfied with the functionality and reliability of its existing instruments at the time. Inaccuracies in pH measurements resulted in diminished safety and process efficiency. Also, the calibration of instruments was taking up a considerable amount of time and resources. Therefore, the company wanted to significantly boost process control with measurements and at the same time improve the maintenance of the measurement devices.

Agnico Eagle carried out an extensive year-long field trial with various manufacturers. Endress+Hauser came up on top, largely thanks to its high-performance instruments and its know-how, as well as the friendly and competent service that accompanies the products. The process in the Kittilä mine is not an easy one for measurement and analysis devices, and there are no simple solutions. Technical issues have been solved through close cooperation between the Agnico Eagle and Endress+Hauser teams.

All in all, Endress+Hauser supplied around 320 instruments, including flow meters (Coriolis, electromagnetic, thermal and ultrasonic); level transmitters (microwave and capacitance); level limit switches; pressure transmitters; temperature transmitters; and various types of analytical instruments for pH ORP and turbidity.

It was the pH measurement technology that provided the significant improvements that the mine was seeking. Endress+Hauser supplied its Memosens and Liquiline platforms to be used as a solution for the challenges of pH measurement. The Memosens sensors are able to perform reliable measurements even in extreme conditions and in demanding applications. The non-contact digital signal between the sensor and the transmitter is very reliable and is not disturbed by any external factors, such as moisture. Calibration can already be performed outside of harsh field conditions, and the devices facilitate preventive



maintenance. The effort required in calibrating the pH loops was reduced drastically.

Correct calibration is the basis for reliable measurements and analysis. With the Memosens technology, calibration no longer needed to be carried out in difficult and hazardous field conditions.

For grab sample measurements, Agnico Eagle decided to use Liquiline To Go. The handheld instrument makes it possible to use the same sensor types for grab sample measurement as those used in the process. This eliminates deviations resulting from the use of different sensor technologies.

The cleaning of devices positioned outdoors was difficult, time consuming and inconvenient, especially during the -40°C winter months. The automatic cleaning feature of the instruments provided Agnico Eagle measurable improvements in terms of both efficiency and staff satisfaction.

"In the past, pH calibration took us 2200 hours each year," said Reijo Mämmioja, senior instrumentation engineer at Agnico Eagle. "With Memosens technology we were able to decrease the time needed to 240 hours per year. This means over 2000 hours less work. With Memosens there is no need to stay in the field for the pH electrode calibration. This is a huge improvement in safety."

Using the same measuring technology for manual and inline measurements also led to complete data consistency, and thus to more confidence in the measuring results. The consumption of chemicals such as the expensive sodium metabisulfite was also reduced by up to 50% due to the more accurate pH measurements.

"Reliable pH measurement allows us more precise dosing of chemicals and therefore substantial cost savings," said Annika Niiranen, a metallurgist at Agnico Eagle.

**Endress+Hauser Australia Pty Ltd**  
[www.au.endress.com](http://www.au.endress.com)

# FUNCTIONAL SAFETY IN TIMES OF RISING CYBERCRIMINALITY

Dr Alexander Horch\*



Every production process has inherent risks, and cybercriminality is now one of these risks. To achieve the greatest possible degree of safety and security in production processes, it is important for enterprises in the process industry to implement effective separation of their process control and safety systems.

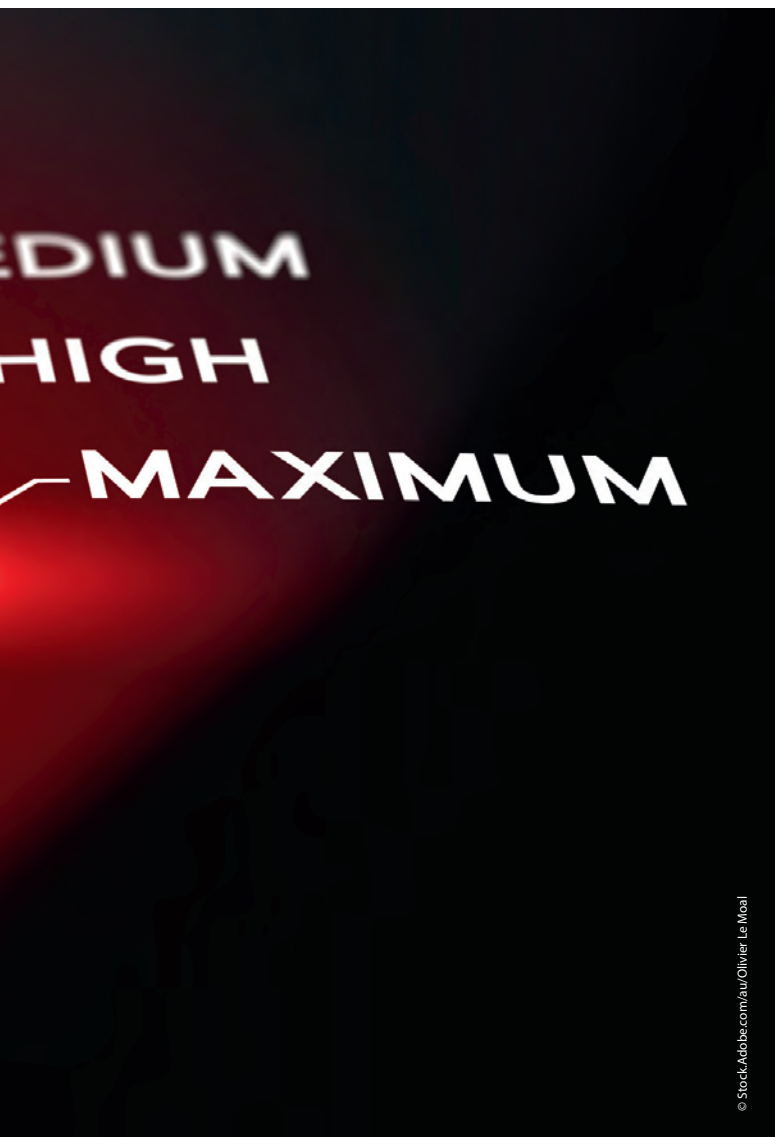
**R**ecently in Australia, some of the biggest businesses have been hit by cyber attacks from criminal elements. The Cadbury factory in Tasmania was the first Australian company to be hit, with the Petya ransomware bringing down its IT systems. The same cyber attack was also responsible for shutting down the monitoring system of Ukraine's Chernobyl nuclear power plant.

Petya is the name given to a ransomware program that holds data hostage by scrambling it until a payment is made. It not only encrypts files but also a computer's master boot record, thus ensuring that nobody can retrieve the affected information without first paying the criminals for a key.

Australia's cyber safety minister, Dan Tehan, has warned that more Australian businesses could still be impacted by cyber attack. Leading industry analysts say that Australian companies are under constant cyber attack and that unreported attacks are rife.

For the process industry, it is crucial to take precautions against cyber attacks by having a safety system independent from the process control system. This offers the highest degree of safety and security in safety-critical applications.

To better understand the interaction of safety and security, it is helpful to clarify several terms. There are numerous definitions of safety; however, a general definition is that safety is the absence of danger. This means that a condition is safe when there are no



prevailing hazards. It is frequently not possible to eliminate all possible risks, especially in complex systems, so people in the industry often say that safety means the absence of unacceptable risks.

Reducing risks to an acceptable level is the task of functional safety. This means that the safety of an application depends on the function of a corresponding technical system, such as a safety controller. If this system fulfils its protective function, the application is regarded as functionally safe. This can be clarified by the following example: if oil is flowing out of a pipeline and endangering people in the vicinity, then this is a safety issue. If a system cannot prevent icing in a pipeline, even though that is exactly its task, and a critical situation subsequently arises, that is a functional safety issue.

Functional safety systems protect people, facilities and the environment. For example, they start up or shut down systems when hazardous situations arise suddenly and people do not respond or are not able to respond, or when other safety precautions are not adequate. Functional safety systems are intended to prevent accidents and avoid costly or undesirable downtime of equipment or systems.

### Separate safety layers reduce risks

Enterprises in the process industry are becoming increasingly aware of the importance of relevant standards for the safety and profitability of their systems. The IEC 61511 standard for functional safety clearly defines the best way to reduce the risk of incidents and downtime. It prescribes separate safety layers for control, monitoring, prevention and containment, as well as emergency measures (see Figure 1). Each of these three layers provides specific functions for risk reduction, and collectively they mitigate the hazards arising from the entire production process.

IEC 61511 also prescribes independence, diversity and physical separation for each protection level. To fulfil these requirements, the functions of the different layers must be sufficiently independent of each other. It is not sufficient to use different I/O modules for the different layers because automation systems are also dependent on functions in I/O bus systems, CPUs and software. To be regarded as autonomous protection layers in accordance with IEC 61511, safety systems and process control systems must be based on different platforms, development foundations and philosophies. In concrete terms, this means that the system architecture must fundamentally be designed so that no component in the process control system level or the safety level can be used simultaneously.

### Rising risk of cyber attacks

Since the attack by the Stuxnet virus on an industrial controller in 2010, we have known that industrial systems are vulnerable and are attractive targets for cyber attacks. In the last five to 10 years, the risk of cyber attacks on industrial systems has risen significantly due to increasing digitalisation. In addition to endangering information security, these attacks increasingly pose a direct threat to system safety.

System operators must be aware of these risks and actively address them. This can be done by means of various systems and measures to increase cybersecurity. Unlike functional safety systems, which are mainly intended to protect people, these systems and measures protect technical information systems against intentional or unintentional manipulation, and from attacks intended to disrupt production processes or steal industrial secrets.

Due to the conditions mentioned above, safety and security have become closely meshed topics. Cybersecurity plays a key role, particularly for safety-oriented systems such as those in the process industry, because it forms the last line of defence against a potential catastrophe.



Figure 1: Both the safety standard and the cybersecurity standard require separate safety layers.

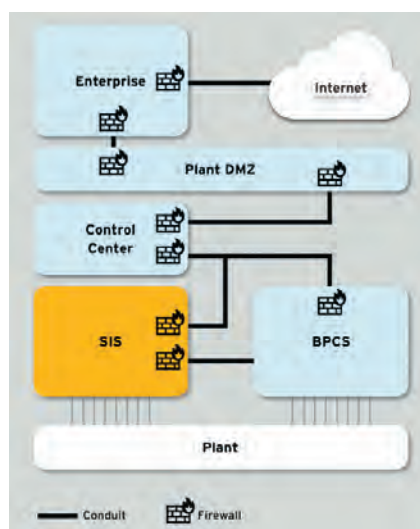


Figure 2: Along with separation of the safety logic and automation logic, the cybersecurity standard requires safety zones (DMZ) and additional firewalls at zone boundaries.

## Standards define the framework

Compliance with important international standards is necessary in the design, operation and specification of safety systems. The first of these is IEC 61508, the basic standard for safety systems, which applies to all safety-oriented systems (electrical, electronic and programmable electronic devices) in all industry sectors. The previously mentioned IEC 61511 standard, which is derived from the basic standard, is the fundamental standard for the process industry and defines the applicable criteria for the selection of safety function components.

The IEC 62443 series of standards for IT security in networks and systems, which effectively forms the standard for cybersecurity, must also be considered. Among other things, it specifies a management system for IT security, separate protection layers with mutually independent operating and protection facilities, and measures to ensure IT security over the full life cycle of a system. It also requires separate zones for the enterprise network, control room, safety instrumented system (SIS) and basic process control system (BPCS), each of which must be protected by a firewall to prevent unauthorised access (see Figure 2).

## Cybersecurity by design

Safety and security are closely related aspects of process systems, which must be considered separately and as a whole.

Standardised hardware and software in process control systems require regular updates to remedy weaknesses in the software and the operating system. However, the complexity of the software architecture makes it difficult or impossible to analytically assess the risks which could arise from a system update. For instance, updates to the process control system could affect the functions of the safety system integrated into the control system.

To avoid critical errors with unforeseeable consequences in safety-relevant processes as a result of control system updates, the process control system must be technologically separate from the safety system. This is the only way to ensure that control system updates do not impair functional safety.

For effective cybersecurity, it is not sufficient to upgrade an existing product by retrofitting additional software functionality. Every solution for functional safety must be conceived and developed with cybersecurity in mind, right from the start. This applies equally to the firmware and the application software.

## Effective protection against cyber attacks

A safety system that utilises a proprietary operating system specifically designed for safety-oriented applications and excludes all other functions is much more immune to typical attacks on IT systems. The operating systems of such controllers should be tested for resistance to cyber attacks during the development process.

Any programming and diagnostic tools that run in a Windows environment need to be able to work in a manner that is as independent as possible from Windows functions. This enables secure operation without interference from other programs or updates, and provides maximum protection against operator error when programming the safety PLCs.

## Cybersecurity is essential for functional safety

A noteworthy common feature of the process industry standard and the cybersecurity standard is that both require separation of the SIS and the BPCS. Along with being a basic prerequisite for the effective protection of process systems, this independence of safety systems is a good idea from practical and economic perspectives, for example, because the SIS and BPCS have very different life cycles and rates of change. System operators are thus free to choose 'best of breed' solutions from different manufacturers.

Integration of comprehensive operational and maintenance data is however also necessary to enable cost-effective operation of safety systems. Despite the required independence, open integration capabilities should allow integration into the process control system using high-performance, manufacturer-independent communication standards.

In summary, systems that are independent of the process technology and which also provide open integration, so that they can be easily be integrated into process control systems despite physical separation, offer the highest degree of safety and security in safety-critical applications. Practical experience shows that they are the best way to increase the operational reliability and availability of process systems and thereby to improve the profitability of production processes.

*\*Dr Alexander Horch is Head of the R&D and Product Management business area at HIMA Paul Hildebrandt GmbH.*

**HIMA Australia**  
www.hima.com.au



# KELLER OEM PRESSURE TRANSMITTERS

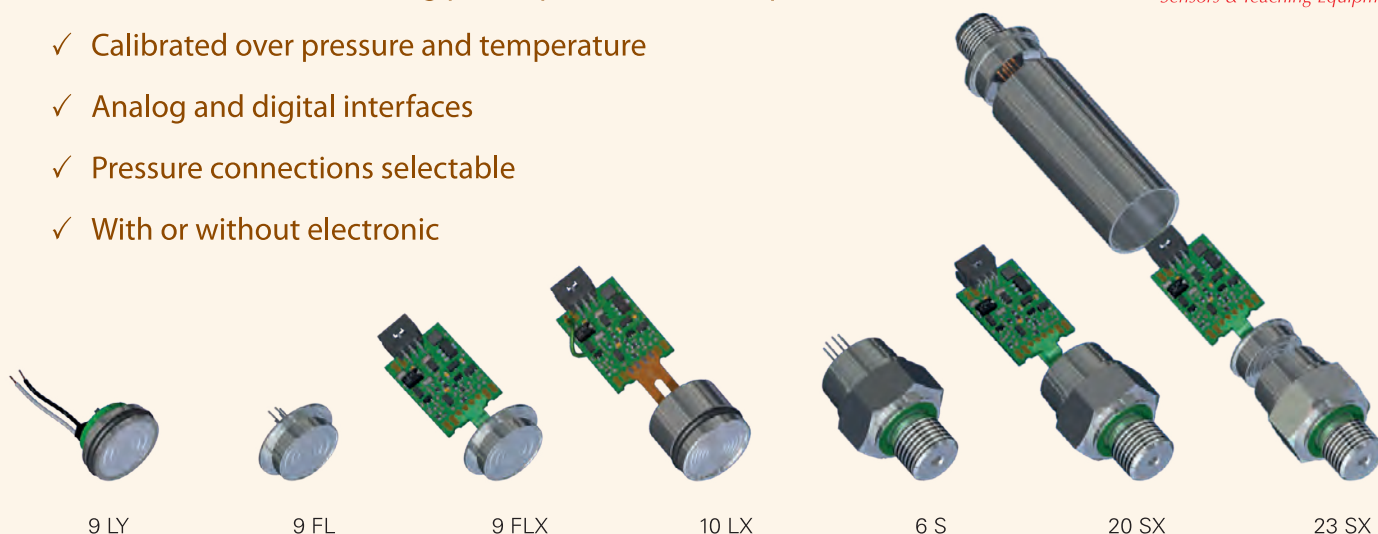
## Guaranteed to fit into your landscape

Customizable Pressure Transmitters – Possible thanks to Modular Structure

KELLER products available at

**BESTECH**  
Sensors & Teaching Equipment

- ✓ Production of the housing parts upon customer request
- ✓ Calibrated over pressure and temperature
- ✓ Analog and digital interfaces
- ✓ Pressure connections selectable
- ✓ With or without electronic



9 LY

9 FL

9 FLX

10 LX

6 S

20 SX

23 SX



## PROFIBUS FIBRE-OPTIC REPEATER

Hirschmann has released an updated version of its Profibus fibre-optic repeater. The OZD Profi 12M G22 allows Profibus networks to communicate over longer distances through fast fibre-optic signals, while also ensuring signal reliability through integrated redundancy technology.

Specific enhanced capabilities of the repeater include extended operating distances for Profibus communications due to two electrical and two optical ports, and failsafe communications with built-in ring redundancy, without any measureable interruption (within 0 ms).

High data integrity is ensured in harsh environments due to a robust metal housing with a protective coating on the internal components. High-speed data transmissions, up to 12 Mbps, are supported via single-mode, multimode and plastic fibre.

The Profibus fibre-optic repeater is suitable for real-time control networks that extend across long distances. It is useful in energy applications, such as oil and gas production or pipelines, and in the transportation industry, such as in highway traffic control systems. Other uses include water and wastewater systems and manufacturing systems that require large Profibus communication networks that are safe.

**Belden Australia Pty Ltd**

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



## HD35 SERIES WIRELESS DATA LOGGERS



- Versions for wide range of parameters Including: °C/Rh/CO/CO<sub>2</sub>/Lux/UV.
- Error free transmission with automatic channel selection and data security.
- Remote units with up to 74,000 reading Integral memory and display options.
- Base units with GSM, Ethernet, Wi-Fi and Modbus interfaces with repeater and alarm module options.
- Economically priced, fast delivery & 2 year warranty and this is just the beginning...



**W&B Instruments Pty Ltd**



A.C.N. 005 982 856  
Factory 4, Enterprise Way, (PO Box 208)  
Bayswater VIC 3153  
Tel: (03) 9729 2112 Fax: (03) 9720 0617  
Website: [www.wandbinstruments.com.au](http://www.wandbinstruments.com.au)  
Email: [wandbinstruments@bigpond.com.au](mailto:wandbinstruments@bigpond.com.au)



## IIoT PLANT OPTIMISATION

Schneider Electric has added enterprise-wide IIoT plant performance and control optimisation software to its PES and Foxboro Evo process automation systems and Foxboro I/A Series distributed control system. Leveraging Expertune PlantTriage technology, EcoStruxure Control Advisor provides plant personnel with actionable real-time operating data and predictive analytics capabilities so they can monitor and adjust every control loop across multiple plants and global sites 24/7. The software is designed to empower them to optimise the real-time efficiency of the process throughout the plant life cycle and to contribute directly to improved business performance.

Because it is more tightly integrated with the company's PES, Foxboro Evo and I/A Series process automation and control systems, Control Advisor is said to give users better opportunities to improve business performance. An easy-to-use tool that works natively across a broad spectrum of industrial applications without substantial capital investments, it extracts more value from existing investments by bringing plant operations closer to set point, minimising out-of-spec production and identifying predictive maintenance indicators. Improving the performance of each control loop not only restores stability to the operation, it can drive up to a 2% increase in energy savings and up to a 10% increase in production capacity. In addition to its ability to drive energy savings and production efficiencies, it is said to enhance safety, optimise maintenance, lower operating costs, increase product quality and reduce emissions, among many other things.

**Schneider Electric**

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

## MODULAR MANAGED SWITCH

The ORing IGS-9122GPM is a modular managed Industrial Ethernet networking switch. The base unit supports 12 10/100/1000Base-T(X) ports and two 100/1000Base-X SFP ports. The SFP ports can meet demand for long-distance data transmission with a selection of SFP modules.

The switch comes with three additional modular slots to provide Ethernet port expansion. Each of these modules supports hot-swap installation, avoiding the need to power off the switch if module replacement is required. The switch supports a variety of redundancy technologies to enable fast fault recovery including MSTP, STP and RSTP, and ORing's proprietary O-Ring self-healing technology.

With a wide operating temperature range of -40 to 75°C, the device can be managed centrally via ORing's Open-Vision platform as well as via a web-based interface. The range has been designed for a wide range of applications.

**Control Logic Pty Ltd**  
[www.control-logic.com.au](http://www.control-logic.com.au)



## LIMIT ALARMS AND TRANSMITTERS

Acromag has recently added limit alarm and transmitter solutions to its line of microBlox signal conditioners. The microBlox signal conditioning modules, available for a wide range of sensor inputs, plug into the uBTA Transmitter Alarm Carriers to provide threshold value switch and process signal output capabilities.

Single- and dual-channel models support a wide variety of input, output, alarm and relay types. Models with mechanical relays feature two SPDT switches rated for 5 A at 250 VAC, 30 VDC. Solid-state relay models have two SPST switches rated for 1 A at 200 Vpk (AC or DC).

Acromag's Agility app simplifies setting custom I/O ranges and alarm set-points using a smartphone or tablet. Bluetooth wireless technology provides a fast and easy connection to Android or iOS mobile devices.

The microBlox system's modular approach, combining an assortment of plug-in input modules with output carriers, offers flexibility to meet a broad range of alarm and signal interfacing applications. uBTA Carriers are offered in a thin 12.5 mm housing or as a panel. Both formats mount on DIN rails.

Suitable for use in harsh industrial environments, microBlox alarms have high immunity to the unwanted effects of noise, surges, shock and vibration. They also offer dependable operation in extreme temperatures from -40 to +75°C, with low drift and high stability.

**Metromatics Pty Ltd**  
[www.metromatics.com.au](http://www.metromatics.com.au)



Our passion is enclosures.

## WE CREATE SOLUTIONS

With the worldwide greatest standard collection of modern industrial enclosures - for IoT, Industry 4.0 and also for all other electronic components.



ROLEC OKW  
Australia New Zealand Pty Ltd  
Unit 6/29 Coombes Drive  
Penrith NSW 2750  
Phone: +61 2 4722 3388  
E-Mail: [sales@rolec-okw.com.au](mailto:sales@rolec-okw.com.au)  
[www.rolec-enclosures.com.au](http://www.rolec-enclosures.com.au)

## OPC UA SERVER SOFTWARE

The PC Worx UA server from Phoenix Contact enables users to access all variables of PC Worx programmable controllers via the OPC UA communication protocol. With the release of server version 1.10, redundancy controllers (RFC 460R) are now also supported. In the event of a redundancy switchover, the server automatically accesses the new controller handling the process without variables being lost.

The server is designed for high volumes: it can forward data from up to 200 controllers to a visualisation or production control system. Variables are mapped via the PLCopen profile. The OPC UA server uses the binary protocol for communication, resulting in high data transmission speeds. A security concept based on certificates protects against unauthorised access, tampering and operating errors. The server also offers the option of encrypted communications.

Using the supplied configurator, users can easily configure the security settings and diagnose the current communication connections to the clients and controllers, both locally and remotely.

**Phoenix Contact Pty Ltd**

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



## COMPUTERS, THIN CLIENTS AND MONITORS

Allen-Bradley VersaView 5000 industrial computers, thin clients and monitors are designed to help manufacturers modernise their standalone or distributed HMI applications to support smart manufacturing. Offering an open architecture design, the range gives manufacturers greater freedom to install the software that fits their needs.

The range includes five products: VersaView 5400 display and non-display computers; VersaView 5200 display and non-display thin clients; and VersaView 5100 monitors. The display options include an edge-to-edge glass display, a 22" wide-screen option, full HD; and 10-point multitouch capabilities to help improve operator productivity. The use of a supercapacitor mitigates the need to replace batteries and simplifies air shipment logistics.

When combined with FactoryTalk View Site Edition software, the VersaView 5400 industrial computers can provide compliance with 21 CFR Part 11. The software stores, processes and transmits electronic records and signatures to show which employees have made changes. This is critical for highly regulated industries like life sciences.

The VersaView 5200 thin clients are designed to be the preferred thin client hardware for use with the company's ThinManager software, which centrally manages content and visualisation. Device configuration is not needed, resulting in faster device replacement. Because information is stored on a server instead of locally, sensitive information is less likely to be lost if a device goes missing. The ThinManager software also provides multifactor user authentication, including biometric authentication using fingerprint scanning.

In addition to the 22" screen size, the VersaView 5000 portfolio includes 12", 15" and 19" wide-screen options.

**Rockwell Automation Australia**

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



**Ralston Instruments**

**The new DCAP pump**  
makes calibrating pressure transmitters and pressure gauges much easier



- Easily pump up to 650 psi / 45 bar / 4.5 MPa
- Anodized aluminum handles are more durable than competitors
- Stainless steel fittings and hose ends make this exceptionally durable
- Soft seat vent valve makes venting pressure very precise
- Unique fine adjust is precise and easy to operate, even at high pressure
- Includes Ralston Quick-test™ hose, process connection and two outlet ports so the user does not need a tee
- Kits available with digital gauge or FieldLab provide everything the user needs to calibrate pressure devices

ISO 9001:2008 Certified



Made in the U.S.A.



TRANSTEK  
CALIBRATED EQUIPMENT • CERTIFIED SAFETY

For sales & service:  
**(08) 9331 7500**  
[sales@transtek.com.au](mailto:sales@transtek.com.au)  
[www.transtek.com.au](http://www.transtek.com.au)

## MQTT-ENABLED I/O DEVICES

Suitable for constrained environments with low network bandwidth or high latency, and for remote devices with limited memory and processing capabilities, the MQTT protocol's light payloads reduce bandwidth needs for high-volume data collection from mechanical and enclosed equipment and facilitate remote execution of real-time status monitoring and event handling.

Advantech is now offering a complete range of MQTT-capable products, such as its WebAccess software platform, WISE-4000 wireless sensor nodes and ADAM-3600 RTU and ADAM-6000 Ethernet I/O modules, ECU-1152 protocol gateways and SmartSwarm 300 cellular IIoT gateway. Advantech's IoT devices, specifically the WISE-4000 series and ADAM-6000 series, can be directly connected to the cloud or ERP/MES systems and communicate using the MQTT protocol without needing a gateway or converter. Such device-to-cloud architectures not only reduce equipment costs and facilitate device authentication, access control and network intelligence, they also offer nearly instant communication between enterprise applications and the cloud network.

Integrated with Advantech's WebAccess/SCADA software, Advantech devices with MQTT capabilities support plug-and-play installation on cloud platforms. This eliminates the time-consuming configuration of individual sensor nodes and reduces installation costs and turnaround time for large data acquisition systems.

Advantages of using the MQTT protocol with WebAccess/SCADA include the ability to resume operations from any breakpoint without data losses. Moreover, during network interruptions, data can be buffered in the WISE-4000 module until network communication is resumed and a client device reads the data. This not only prevents data loss, it also allows users to manage the information flow to network nodes.

**Advantech Australia Pty Ltd**

[www.advantech.net.au](http://www.advantech.net.au)



## Enhance your manufacturing operations by switching to wireless

When it comes to the food and beverage industry, NHP understands the many challenges faced in order to achieve optimum site efficiency, and ultimately project success.

NHP offers an extensive range of wireless switches and sensors including pushbuttons, footswitches, limit switches, miniature remotes and inductive sensors. Our high quality products are supported by local service expertly delivered through qualified technicians backed by the knowledge base of world class global partners.

With a comprehensive range of wireless devices, rely on NHP to provide you with a tailored solution to improve your food and beverage application performance.

NHP ELECTRICAL ENGINEERING PRODUCTS

1300 NHP NHP | [nhp.com.au](http://nhp.com.au) | [f](#) [in](#) [t](#) [v](#)



## MULTIPROTOCOL DIGITAL I/O

Lumberg Automation is extending its LioN-Power distributed field I/O range with the addition of EtherCAT protocol support. This version of Lumberg's multiprotocol digital I/O platform (DI, DO, DI DO, DIO) will support all three networks (EtherNet/IP, Profinet and EtherCAT).

Lumberg has integrated, scalable, digital input/output (DIO) universal module options into the range. Users can easily adapt the modules to any I/O configuration needed, such as 12 inputs and four outputs or 11 inputs and five outputs.

Fieldbus-independent LioN-Power multiprotocol I/O modules are designed to be helpful for applications where machines or systems are built in an identical way, but with different PLCs. One single LioN-Power I/O device can be used across all three different control systems (protocols) and therefore helps design standardised machines with identical field-level components.

The modules also have the latest M12 power technology, as well as standard 7/8" power technology. This means users don't have to change machine designs in order to upgrade to later technologies.

The module's M12 power technology offers a high current rating (unscaled 2 x 16 A), so users can connect at least 50% more field devices in a daisy chain when compared to standard 7/8" power connections.

I/O options include 16 digital outputs, 16 digital inputs, eight digital inputs plus eight digital outputs, and 16 universal digital inputs/outputs.

**Belden Australia Pty Ltd**

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



## DUAL MODBUS TEMPERATURE TRANSMITTER

Moore Industries' TMZ Dual (2TPRG) PC-programmable Modbus temperature transmitter allows users to increase density with dual RTD, thermocouple, mV, resistance or potentiometer inputs by doubling temperature monitoring capability in a single unit. The product's two independent sensor inputs are easy to configure using the company's Intelligent PC Configuration software. The data from both sensors is available on the Modbus output, allowing the host to use the data for averaging, differential or sensor backup.

Up to 32 (without repeaters) TMZs or TMZ Duals can be multidropped onto a single communication link (such as a twisted wire pair), eliminating the need to run a dedicated wire for each signal. The TMZ Dual provides increased sensor density, delivering savings on installation, cable, conduit, connection and wire tray costs.

Both the TMZ and TMZ Dual feature long-term stability (five years), 20-bit input resolution, isolation and RFI/EMI protection. Since the measurement is delivered to the control system as a digital signal, the output error produced by a traditional analog transmitter is eliminated.

**Moore Industries Pacific Inc**

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

# MOBILITY ENABLING EFFICIENCY

[www.ecom-ex.com](http://www.ecom-ex.com)

For sales & service:

**(08) 9331 7500**

[sales@transtek.com.au](mailto:sales@transtek.com.au)

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



## WINDOWS PAC PC

The ICP DAS WP-5231PM-3GWA-CE7 is a compact PAC PC running Windows Embedded Compact 7.0. It combines computing, I/O and operator interface in a single unit, providing a solution for integrating HMI, data acquisition and control in a single PAC.

The product is equipped with a Cortex-A8 1 GHz CPU and Gigabit Ethernet, USB port, RS-232 and RS-485 interface. An I/O expansion slot is available to add optional I/O modules. The built-in Windows CE 7.0 OS offers hardware real-time capabilities, small size core, fast boot, deep interrupt handling and stable control. It also supports PC-compatible development software such as Visual Basic .NET, Visual C# and Visual C++.

The device is designed to operate over a wide -25 to +75°C ambient temperature range and has a fanless design. It is equipped with an I/O expansion bus to support one optional expansion board, called XV-board. It can be used to implement various I/O functions such as DI, DO, A/D, D/A and timer/counter.

**ICP Electronics Australia Pty Ltd**

[www.icp-australia.com.au](http://www.icp-australia.com.au)

## ELECTRO-HYDROSTATIC PUMP UNIT

Moog has launched an electro-hydrostatic pump unit (EPU) designed to help machine builders and end users derive the combined benefits of both hydraulic and electric actuation.

The EPU helps enable the deployment of a decentralised drive system. This eliminates the need for a hydraulic power unit (HPU) and complex piping, thereby reducing the overall machine footprint. The compact product design features an interface that enables direct mounting onto a cylinder, thereby minimising the requirement of additional space on each axis.

The EPU has been developed to meet the needs of original equipment manufacturers (OEMs), system integrators and end users, who increasingly seek cleaner and more energy-efficient products without compromising on the requirement for high forces. The EPU is designed for easy installation and commissioning and reduces the number of components required.

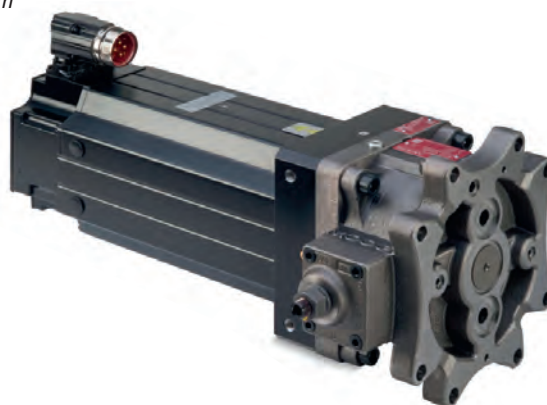
The self-contained units have reduced chances of leakage and breakdown and help lower ongoing maintenance costs and the total cost of ownership (TCO).

The electro-hydrostatic pump unit can be used for a wide range of applications, such as metal forming, heavy industry, injection moulding and die-casting, gas and steam turbines, and wind turbine pitch control.

The pump unit is available either as a standalone unit or as an entire system, called the Electro-hydrostatic Actuation System (EAS). The EAS combines the electro-hydrostatic pump unit and any optional parts a user might need, such as drives, controllers, manifolds or cylinders.

**Moog Australia Pty Ltd**

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



**New Anybus Gateways connect industrial equipment with Building Management Systems (BMS).**

**Connects Modbus-based equipment to BACnet.**



Anybus Modbus  
to BACnet Gateway



Supports  
BACnet MS/TP  
& BACnet IP!

**GLOBAL**  
M2M

Ph: +61 3 9338 5659  
[www.globalM2M.com.au](http://www.globalM2M.com.au)  
[www.globalM2M.co.nz](http://www.globalM2M.co.nz)

**FREE EXPO  
ENTRY**

**21-23 November 2017**

Melbourne Convention and Exhibition Centre

**MELBOURNE**



# COMMS 2017 CONNECT

*Events for critical communications users and industry*

**1500+ users and industry experts | 100+ exhibitors | 75+ speakers**  
**8 training workshops | 3 conference streams**

Platinum Sponsor



Gold Sponsors



Digital  
Partner



Lanyard Sponsor



Networking Drinks Sponsor



Wireless Innovation

Media Partner



Association Partner



## CONFERENCE HIGHLIGHTS:

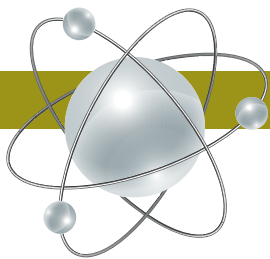
*International speakers*

- ◆ **Michael Doucet** — Executive Director, Security Intelligence Review Committee (**Canada**)
- ◆ **Tony Gray** — Board Member & Director, TCCA (**UK**)
- ◆ **TJ Kennedy** — President, First Responder Network Authority (**UK**)
- ◆ **Duncan Swan** — Director, Mason Advisory, (**UK**)
- ◆ **Dr David Lund** — Coordinator of BroadMap/Board Member – Public Safety Communications (**Europe**)
- ◆ **Jinhong Sim** — Chief Manager of Safe-Net Project Division, Ministry of the Interior and Safety (**South Korea**)
- ◆ **Peter Clemons** — Founder, Quixoticity (**UK**)

In conjunction with the  
**ARCIA Industry Gala Dinner**  
**22 November –**  
**MCEC, Melbourne**

**EARLY BIRD  
CLOSES  
13 OCT**

**[www.melbourne.comms-connect.com.au](http://www.melbourne.comms-connect.com.au)**



## Helping the process industries find a way to Industry 4.0

As far as the process industries are concerned, the road to Industry 4.0 is still long. Fraunhofer researchers and engineers are working on interconnecting process systems so that they can be serviced and maintained predictively, by combining operating data with employees' knowledge.

A lot of time is lost compiling relevant information and documents, or gathering experienced employees' knowledge, during the troubleshooting of process systems. Important know-how from maintenance and manufacturing staff is also tremendously insecure because it is unavailable whenever employees are ill, or is lost to a company entirely when employees depart. It would therefore be desirable to have it constantly available for automated system control. This is where Industry 4.0 solutions can help.

Industry 4.0 is still in its infancy in the process industries, though. There are only sporadic research projects. This is why many companies in the chemical, pharmaceutical, steel and cement industries, as well as their suppliers, fear falling somewhat behind in technological development. Researchers and engineers are developing a new digital monitoring system in a project at the Fraunhofer Institute for Factory Operation and Automation IFF, which will enable the process industry to use Industry 4.0 technologies. It is intended to simplify process system maintenance and servicing significantly in the future. The researchers and engineers are doing this by digitising system monitoring and interconnecting every relevant level of a process operation in several ways.

The researchers and engineers are using a fluidised bed granulation plant as their technology demonstrator. Such plants produce products such as granular pesticide. "The envisioned interconnectivity of systems is based on their digital twin," explained Dr Nico Zobel, a research manager at the Fraunhofer IFF.

The process being developed by researchers will interconnect plants in three dimensions for maintenance. The first dimension spans the lifecycle. The experts use plant engineering documents (eg, the three-dimensional CAD model created as the plant was engineered) for equipment operation. Workers needing information on a particular component, such as a pump, can scan the pump's QR code using a tablet computer on which every available planning document on the component is displayed. Workers can additionally view the pump's stored operating data, such as temperature and pressure curves. The digital twin also helps with troubleshooting: an interactive recommended action can be issued for every problem the control system reports. This will guide employees as they localise problems, and digital instructions will tell them how to eliminate problems step by step.

The second level of interconnectivity the researchers and engineers intend to implement is vertical interconnectivity. "The sensors installed in a plant send the data they collect to the cloud. Any data can already be incorporated in the planning of maintenance actions at this early stage," explained Dr Zobel. This makes it possible to implement predictive maintenance in such process plants. Injectors such as those found in granulation plants are an example: injectors clog from time to time, thus increasing the likelihood of bringing a plant to a standstill. The more sensors that send their data to the cloud, the more precise the base of data is, which the system then uses to ascertain the next scheduled injector servicing.



*Digital plant monitoring for predictive maintenance based on digital twins.*

The researchers and engineers not only take operating data as the basis for the second level of interconnectivity, they also combine it with employee know-how. The researchers and engineers ask the employees specific questions in order to collect their know-how. They use the responses to their surveys to develop a mathematical model of probabilities of wear or failure. They additionally link this model with artificial neural networks, which are used to develop correlations between sensor data and a component's wear allowance based on the system's historical data. This provides a basis for delivering good forecasts of the future performance of individual plant components.

The third level of interconnectivity is intended to link current production with the supply chain. If, for instance, a seal in equipment has to be replaced, employees are instantly notified if it is in stock. If it is not, the purchasing process is started automatically.

**Fraunhofer IFF**  
[www.iff.fraunhofer.de/en.html](http://www.iff.fraunhofer.de/en.html)



## LARGEST EVER HIGH-TECH DIGITALISATION GRANT

Siemens has announced the largest ever software grant in Australia to support Swinburne University of Technology establish what is believed to be Australia's first Industry 4.0 Factory of the Future facility in Hawthorn, Victoria. The \$135 million industrial digitalisation software grant will be used to fully digitalise the Swinburne University of Technology Factory of the Future.

The software will help develop the workforce of the future across the entire work lifecycle from apprenticeships to PhDs.

At the announcement, Jeff Connolly, the chairman and CEO of Siemens Australia, said this grant will support Victoria and Australia by preparing students so they can participate in the many opportunities that digitalisation provides within the new innovation economy that is globally interconnected.

"This is about jobs of the future today," he said. "I'm proud to be standing here today side by side with Swinburne University of Technology announcing the largest ever industrial software grant in Australia. Our country's future relies on companies working with key educational and research institutions to get our workforce ready for the Fourth Industrial Revolution.

"The world is changing rapidly through technology and Australia needs to equip our future generations and our existing workforce with the necessary capabilities and tools to make things faster, cheaper and better — ultimately, this is about jobs and competition."

The announcement coincides with the 145th anniversary of the Siemens-commissioned Darwin to Adelaide telegraph — another technology breakthrough that transformed the fabric of Australia.

"For Siemens to be here at least another 145 years, we need a viable and successful base of industry, manufacturing and infrastructure along with a highly skilled workforce driven by forward-thinking educators," said Connolly. "So it's vitally important that our future generations are equipped with the



globally competitive technology and skills to take us on that journey."

Siemens provides a suite of advanced PLM (product lifecycle management) software and new-generation, cloud-based, Internet of Things (IoT) platform Mindsphere, which will allow students and researchers to have access to the same apparatus being used by leading industries on the most advanced projects, according to Connolly, who is also chair of the Prime Minister's Industry 4.0 Taskforce.

"These are the same tools used to create digital shipyards for the US Navy. The same software used to design, build and operate everything from the latest oil and gas platforms to high-tech production lines such as the Maserati Ghibli. We provide the innovation tools so that Australia can provide the ingenuity," Connolly said.

"Imagine creating a digital twin, not only of the product but of the entire manufacturing process, so you don't need to have costly and time-consuming physical prototypes. Everything from the assembly line to tooling, ergonomics and resources can be fully simulated digitally. This is exactly what our software grant will help students achieve in Swinburne's Factory of the Future."

The grant also includes a co-contribution by Swinburne for initialisation and ongoing interaction with and global support by Siemens expert software engineers.

According to Professor Aleksandar Subic, Deputy Vice-Chancellor (Research and Development) and chair of Industry 4.0 Testlabs on the Prime Minister's Industry 4.0 Taskforce, digitalisation of manufacturing is critical to help Australian industry transition to the future.

"We're immersed in the Fourth Industrial Revolution and we want to make sure that students and researchers are equipped with the required advanced capabilities and technologies to help Australia access global value chains. The international competition will be fierce in the manufacturing domain, which is why this development is so timely and critical," said Subic.

**Westwick-Farrow Media**  
A.B.N. 22 152 305 336

**www.wfmedia.com.au**

Head Office

Cnr. Fox Valley Road & Kiole Street,  
(Locked Bag 1289)

Wahroonga NSW 2076  
AUSTRALIA

ph: +61 2 9487 2700 fx: +61 2 9489 1265

Editor

Glenn Johnson

wnipt@wfmedia.com.au

Publishing Director/MD

Geoff Hird

Art Director/Production Manager

Julie Wright

Art/Production

Linda Klobusiak, Wendy Blume

Circulation

Dianna Alberry, Sue Lavery

circulation@wfmedia.com.au

Copy Control

Mitchie Mullins

copy@wfmedia.com.au

Advertising Sales

Industrial Group Sales Manager

Nicola Fender-Fox – 0414 703 780

nfender-fox@wfmedia.com.au

Sandra Romanin – 0414 558 464

sromanin@wfmedia.com.au

Tim Thompson – 0421 623 958

tthompson@wfmedia.com.au

Subscriptions

For unregistered readers price on application.

If you have any queries regarding our privacy  
policy please email

privacy@wfmedia.com.au

**AMMA**  
Audited Media  
Association of Australia



September 2016 total CAB audited circulation (Aust + NZ)  
5,598 readers (73% personally requested)



Contact the editor

Printed and bound by SOS Print+Media Group  
Print Post Approved PP100007403  
ISSN No. 0819-5447

All material published in this magazine is published in good faith and every care is taken to accurately relay information provided to us. Readers are advised by the publishers to ensure that all necessary safety devices and precautions are installed and safe working procedures adopted before the use of any equipment found or purchased through the information we provide. Further, all performance criteria was provided by the representative company concerned and any dispute should be referred to them.

Information indicating that products are made in Australia or New Zealand is supplied by the source company. Westwick Farrow P/L does not quantify the amount of local content or the accuracy of the statement made by the source.

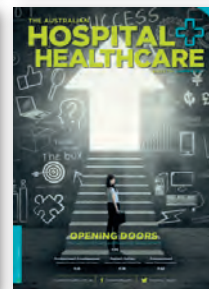
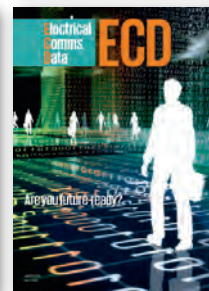
# FREE

to industry and business professionals



The magazine you are reading is just one of **thirteen** published by Westwick-Farrow Media.

To receive your **free subscription** (magazine and eNewsletter), visit the link below.



[www.WFMedia.com.au/subscribe](http://www.WFMedia.com.au/subscribe)

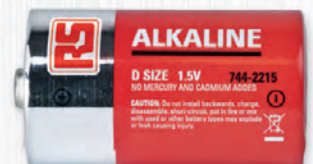


**FROM IDEA TO  
IMPLEMENTATION,  
EVERY PART MATTERS.**

**Choose quality, performance  
and value without compromise.**

Decisions have consequences. Making the right choices can improve the efficiency and productivity of your entire organisation.

Because every decision matters, every part matters. That's why RS Pro gives you everything that matters – quality, performance, choice and exceptional value for money.



**Find out more**  
[au.rs-online.com/RSPRO](http://au.rs-online.com/RSPRO)

