

**What's New in**

# PROCESSING

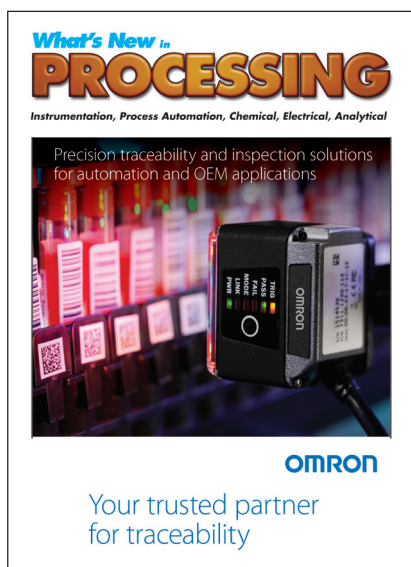
*Instrumentation, Process Automation, Chemical, Electrical, Analytical*

Precision traceability and inspection solutions  
for automation and OEM applications



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**What's New in Publishing**  
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*On the cover ...*

## ***Precision Traceability and Inspection Solutions for Automation and OEM Applications***

Omron has coined the term “Traceability 4.0” to encapsulate the ever-evolving concept of traceability in the manufacturing and supply chain realm.

Unlike its predecessors, this latest phase integrates seamlessly with the 4 Ms of lean manufacturing, offering a comprehensive understanding of every aspect of a product or part across the entire enterprise.

With roots tracing back over 40 years to the advent of automatic data capture equipment, such as barcode readers, traceability applications have matured in tandem with industrial development.

Traceability 4.0 represents a paradigm shift, enabling manufacturers to delve into the complete genealogy of a product.

This depth of insight significantly enhances root cause analysis, addressing questions like production timing, and machine operators, and identifying production bottlenecks.

The benefits of Traceability 4.0 are far-reaching. Manufacturers gain the ability to pinpoint specific product failures with detailed operating parameters, expediting precise root cause analysis.

The system empowers decision-making by revealing the intricacies of a part's journey through production, optimizing assembly verification, quality assurance, and bill of material control.

Omron stands out in this arena, offering a global portfolio of traceability products and solutions that are integrated, intelligent, and interactive.

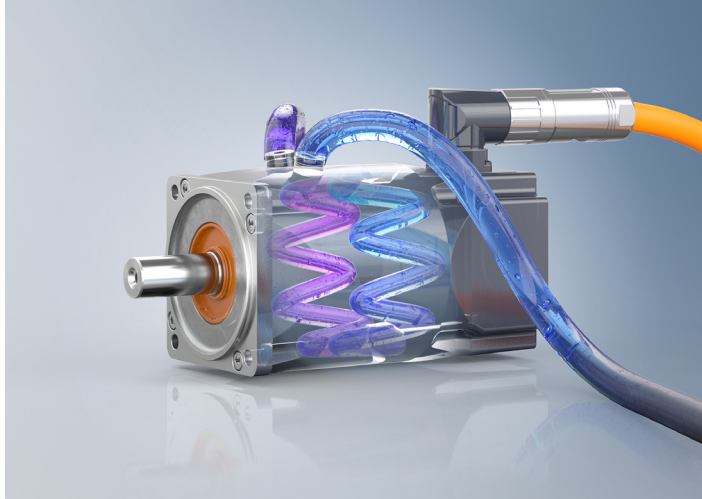
Their “MVRC” core offerings, comprising barcode readers, ISO-compliant barcode verifiers, laser markers, and RFID, form a comprehensive automation platform.

This platform encompasses programmable logic controllers, motion controllers, machine vision systems, safety technology, and robotics—providing a holistic traceability solution for data management, inspection, and material handling.

In essence, Traceability 4.0 not only marks a technological advancement but also a strategic shift, allowing manufacturers to navigate the intricate landscape of modern industrial processes with unprecedented clarity and efficiency.

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## Servo Technology for Extreme Performance and Dynamic Requirements



The AM8300 servomotors expand the Beckhoff portfolio to include a modular motor series with integrated water cooling. Due to the efficient cooling, an extremely high power density is achieved, so that a rated power of up to 40 kW can be delivered in the smallest installation space, depending on the size.

Compared to similar conventional convection-cooled motors, the standstill torque is three times higher.

In terms of technology, the AM8300 series is based on the tried-and-tested AM8000 series and its advantageous modular system with its wide range of options and consistent availability. The servomotors offer maximum dynamics, as the torque increases with water cooling, but the rotor moment of inertia remains constant.

These are particularly suitable for applications with higher speed and torque requirements. Five flange codes, each with three lengths – with standstill torques from 5.1 to 274 Nm – cover an extremely wide range of applications. The AM8300 motors can optionally be equipped with a backlash-free permanent magnet holding brake, shaft seal and keyway.

Depending on the size, they are available with various feedback systems such as resolvers or batteryless single and multiturn encoders with One Cable Technology (OCT) or Hiperface.

With its water cooling system and high IP65 protection rating, the AM8300 is also suitable for demanding environmental conditions – particularly those with high ambient temperatures. Depending on the size, the AM8300 is equipped with a 1/8" or 1/4" thread for connecting the cooling circuit.

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- Complete pressure, temperature, and mA loop calibrator
- Troubleshoot and calibrate HART smart digital transmitters
- Create calibration procedures and automatically document results



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## Why it is Essential to Choose the Correct Valve Size for your Application

The sizing of a valve is absolutely crucial. It not only affects how much flow can pass through the valve, but it also dictates the flow coefficient and the overall performance.

Here are four key reasons why it's so important to have a correctly sized valve...

- Quieter operation
- More accurate flow control
- Lasts longer
- Won't leak

Ensuring that the correct valve size is specified for an application, is essential.

### What happens with an undersized valve?

If a valve is too small for a given application, there won't be enough flow through the valve.

The system has to overcompensate by raising the head pressure of the pump. This in turn gives a higher differential pressure across your valve.

Upon leaving the valve there will be a sudden drop in pressure and this will cause it to flash and bubble (otherwise called cavitation).

This will significantly reduce the life of the valve as the flashing of liquid creates vibration and turbulence which erodes the seats and seals.

What's more, cavitation weakens the joints causing the piping to leak and the vibration sound can be carried throughout the whole system.

### What's wrong with an oversized valve?

Whereas with an undersized valve many damages can arise to the system, this isn't quite to the same effect for an oversized valve.

However, it too is just as damaging in terms of controllability. This becomes a massive issue, especially if you're using a modulating control valve. To achieve the required flow change, it may need more compelling position changes.

Likewise, the valve and actuator can wear out prematurely as a result of the valve hunting and overshooting continually.



**But don't forget about the CV calculation...**

And last but not least, it's extremely important that the CV calculation is done accurately as if this is wrong, it will affect all of the above.

Visit the Burkert website to do your own valve sizing calculation, thereby ensuring that you have the correct valve to install.

### Benefits of using the Burkert sizing programme:

- Easy access - no installation or registration necessary
- Calculation of flow coefficient Kv or Cv, flow or pressure drop for media from a large media database
- Easy sizing for steam with

stored steam tables

- Transparency also for different measurement units through integrated conversion
- Fast and direct request for quotations
- For control valves
- Calculation of the characteristic curves with up to 3 operating points
- Reliability assessment of valves for operating conditions
- Warning for critical operating conditions such as cavitation, choking and flashing
- Includes noise prediction

Based on the flow coefficient Kv/Cv a suitable valve can be selected easily for the operation conditions of your application.

For control valves it is additionally possible to evaluate whether critical conditions restrict the reliability of valves.

Within the process valve selection and sizing tool, an info tour with help texts guides you through the procedure.

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## Fully Autonomous Mobile Robots (AMRs)

Our mobile robots increase throughput, eliminate errors, improve material traceability, and allow employees to focus on tasks that require complex human skills. Unlike traditional AGVs, our mobile robots navigate by the natural features of the facility and require no expensive facility modification.

[industrial.omron.co.za](http://industrial.omron.co.za)



## Tough Recycled Polymer Bearing

**M**otion plastics specialist igus has introduced a new plain bearing made from recycled plastic. The bearing, iglide ECO P210, is a chemical-resistant variant that has been added to the company's iglide ECO series.

The iglide ECO series is manufactured using regranulate made from the sprue and defective injection-moulded parts produced by igus.

This allows the company to recycle plastic waste and reduce the amount of virgin plastic used in production.

The new iglide ECO P210 plain bearing has been designed for use in machines that regularly come into contact with chemicals. Potential applications include agitators, laboratory mills, filtration devices, and car washes.

The bearing has a maximum recommended surface pressure of 50MPa at room temperature and can operate between -40°C and 100°C. Like all igus plain bearing materials, it does not require external lubrication with oil or grease.

South Africa's product manager responsible for bearings, Juan-Eric Davidtz adds, "Our in-house laboratory tests show that plain bearings made of regranulate provide almost the same performance as the conventional iglidur P210 series.



"They are similarly resistant to edge pressure, shocks and impacts with only slight concessions."

The ECO P210 is the fifth product in the iglide ECO family. Other materials available include ECO H, ECO P, ECO G, and ECO A180.

According to igus, all ECO materials consist of at least 97 percent recycled plastic.

The ECO series development is part of the igus sustainability strategy. Among other things, igus

shows the CO footprint of best-selling iglide materials. This enables customers to compare and select the bearing with the lowest CO footprint.

igus is striving to transform the classic linear plastics economy into a sustainable circular economy.

To this end, it not only recycles but also invests in innovative technologies, such as those from Mura Technology, a British company developing a process to turn plastic back into crude oil using only water, high temperatures, and pressure.

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## Robust Miniature Pressure Controllers



**B**ronkhorst's IQ+FLOW series of miniature mass flow and pressure meters and controllers is widely used by equipment manufacturers in the analytical, biotechnology and life science market.

Due to the application of chip sensors and mini-valves the footprint of single channel instruments is only 20 x 40mm.

This is a great advantage for manufacturers of desktop equipment, who are always looking for optimal space efficiency.

The IQ+FLOW product line has now been extended with pressure instruments with media-isolated pressure sensors.

The sensor chip is protected by a stainless-steel diaphragm and oil-filled compartment.

With this new option, the instruments can handle a much wider variety of media than before, including thin gases such as hydrogen and helium.

According to the requirements of the aforementioned markets, the instruments have low-outgassing and clean wetted parts.

IQ+FLOW series are available in three configurations: single channel versions for either inline or topmount integration and multi-channel versions.

Compact 2- or 3-channel instruments can be configured on customer specification to measure or control the mass flow and/or the upstream or downstream pressure in a system.

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## Adroit Technologies Partners with Energy Capital to Drive Energy Efficiency in the Retail Sector

Energy Capital approached Adroit Technologies with the task of conceptualising, engineering, and delivering an innovative solution aimed at firstly understanding and then reducing both assets and energy consumption for a customer in the retail sector.

This initiative stemmed from the realisation that many retail owners lack expertise in energy management, despite its substantial impact on business overheads.

To address this challenge, the partnership focuses on empowering retail proprietors to gain comprehensive insights into energy mix, distribution, and consumption.

By offering a groundbreaking solution, the collaboration strives to continuously diminish energy costs while enhancing the overall operational efficiency of these businesses.

### The Challenge: Bridging the gap between energy understanding and management

Energy is not the expert domain of the retail sector. To quote a food retail manager, "We know how to sell baked beans!". Retailers often lack the expertise required to effectively manage energy consumption, yet it is a significant overhead to their business.

The challenge was multifaceted: In food retail most of the assets are used to either cool or heat products, both large energy consumers.

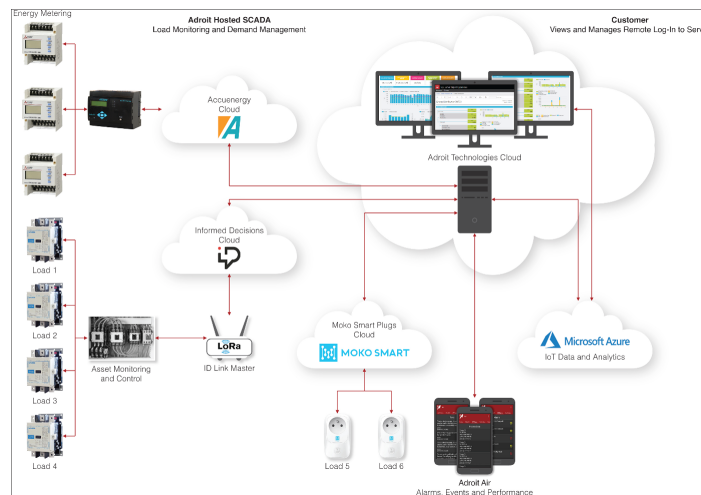
The solution aimed to cover Asset and Energy monitoring devices and the end goal was to understand how asset performance, largely heating and cooling equipment, related to energy costs in time and performance.

Municipal energy billing is time-of-use and maximum demand based and the focus of the solution was to create visibility of asset energy against the backdrop and cost to the business over time, allowing the managers to effect control by shifting energy usage and automatically doing load control to ensure the maximum demand charges are kept low.

### The Innovation:

Integrating various cloud-based solutions for Real-Time Control Adroit Technologies spearheaded the integration of various cloud-based hardware vendors into an Adroit SCADA (Supervisory Control and Data Acquisition) system based in the cloud.

This innovative approach allowed for real-time monitoring and control of assets, providing retail management with actionable insights to make informed decisions.



The solution incorporated the following components:

**Energy Monitoring:** Leveraging Accuenergy's energy measurement products, the system monitored energy consumption in real-time, enabling precise analysis of usage patterns across different sections of the store.

**Asset Monitoring and Management Hardware:** Partnering with Informed Decisions, Adroit Technologies utilised custom-

designed nodes to monitor and control assets, ensuring reliability even during power fluctuations. These include temperature, humidity, equipment status.

**Single Phase Plug-Socket Control:** Stand-alone fridges were managed efficiently using Moko Smart plugs, which communicated with a cloud-based solution via Wi-Fi, allowing for remote control and energy usage tracking.

**Software Packages and Platforms:** Adroit Technologies employed their latest SCADA technology, ensuring secure access to real-time data via the Adroit Secure Mobile Gateway. Data transmission to IoT endpoints in the cloud was facilitated through the Adroit EDGE Gateway technology, integrated with Microsoft Azure. Microsoft Power BI provided reports and analytics.

### Innovation Methodology: Collaboration, Testing and Iteration

Recognising the complexity of the solution, Adroit Technologies prioritised reliability and security throughout the development process. The team collaborated closely with Informed Decisions, conducting rigorous tests to ensure the system's stability.

Extensive iterative testing was performed on the Informed Decisions' hardware nodes in order to attain confident acceptable control levels. Continuous feedback sessions enabled the creation of a User Interface that held meaningful value for the managers.

Adroit Technologies' innovative approach has not only revolutionised energy management for retail outlets but has set a new standard for real-time control and efficiency in the retail sector.

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## Hollow Cone Liquid Nozzle for Cooling and Washing

The new 1/8 NPT HollowStream™ liquid atomizing spray nozzle is the latest addition EXAIR's line of Liquid Atomizing Nozzles.

Providing a hollow cone spray pattern, the HollowStream features a tangential flow design is vaneless, with wide open internal features to resist clogging while producing a uniform distribution in a ring pattern with medium to large droplets to solve cooling, cleaning, foam breaking, rinsing and dust suppression applications for industry.

With HollowStream nozzles, the liquid is supplied into the body of the nozzle creating a swirling action within a vortex chamber.

This vortex produces the spray pattern when the machined nozzle breaks the liquid surface tension as it exits the orifice and into a controlled spray angle.

The open, right-angle design is compact and serves well in applications involving liquids that are thicker or containing



particulate up to 250 PSI.

Stainless steel construction of liquid atomizing nozzles adds to their durability and corrosion resistance.

HollowStream nozzles are CE compliant and available in a variety of flow rates.

They complement EXAIR's large line of 1/8, 1/4 and 1/2 NPT Air Atomizing and No Drip Air Atomizing Spray nozzles. Models come with their five year Built to Last Warranty.

**Terri Carlson**

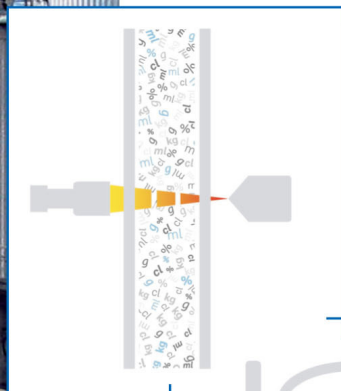
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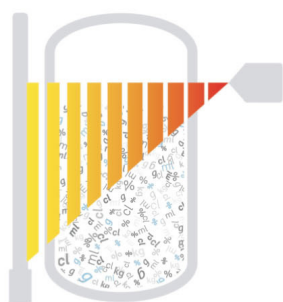
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**BERTHOLD**

## Successful Testing of Industry-First Automated Robot Charger for Increased Safety in Underground Mines

**A**BB has successfully completed testing of the industry-first automated robot charging technology for underground mines in partnership with mine operators Boliden and LKAB.

The goal is to make mines safer by automating one of few manual processes left in mining: charging the blasting holes with explosives.

Blasting schedules in underground mines can vary, but the process takes place up to 15 times per day in larger mines as miners expand the chambers to extract mineral and metal ores.

ABB Robot Charger automatically detects boreholes and fills them with charges without the presence of humans, removing the need for people to be near the unsupported rock face during blasting sequences.

The completed testing phase confirms the effectiveness of integrating the robot charger with a carrier vehicle, communication with bulk emulsion and vision systems and incorporation of a second robot arm to assemble prime and detonator.

It ensures full reach to all borehole levels and areas of the rock face and remote control for operators.

The program has been undertaken at Boliden Garpenberg, which is the world's most productive underground zinc mine and is located 180 kilometres northwest of Stockholm.

ABB is now embarking on the final stage of development that aims to execute the full blasting sequence in the



underground mine with full control of the robot handed over to the customer.

ABB is also starting discussions with other mine operators to eventually join the co-development project, so that the technology can be tested in different mine environments and in regions beyond Northern Europe with varying climate and rock composition.

"This is a significant technology development for ABB and the wider industry where safety is part of overall

ESG commitments," said Vedrana Spudic, Head of Technology, Business Line Mining, ABB.

"The robot locates the drilled holes on the rock face using a vision system, and these recent tests show all can be reached and charged with the cycle fully automated. This removes the need for human operators in a small, unsupported area right at the face."

ABB developed the robot charger technology with vision systems and automation solutions to communicate with the truck, crane and ABB industrial robotic arm. The solution can be retrofitted to any truck.

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## Severe Duty Ball Valves

**K**inetrol's PDK range of special engineered ball valves feature UHMWPE (ultra-high molecular weight polyethylene) seats and have been specially designed for high cycle reliability for abrasive process media, such as slurry. Currently, they are available as 1" Class 900, 2" Class 900, 3 piece ball valves with a process temperature of -40°C to +80°C.

### Specification

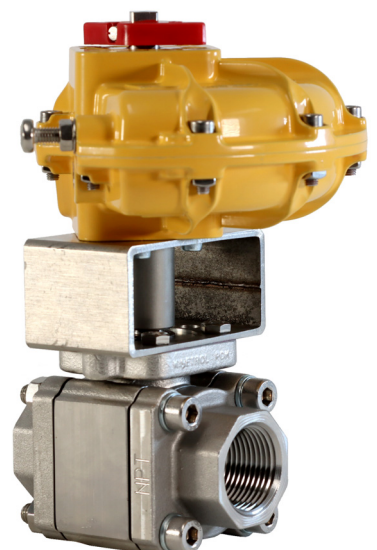
- Class 900 (104.4 Bar Max)
- O-ring loaded UHMWPE Seats
- ISO5211 Mounting Pad
- PED Category I Module A
- Designed to EN12516-1
- Floating Ball - Reduced Bore
- Tested at 100bar – 1M cycles
- Operating Limits -40°C to 80°C (-40°F to 176°F)
- Group 2 : Liquids & Gases
- Tested to EN1226-1

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## IZMSA Magnetic-Inductive Flow Meter

FOOD, BEVERAGE AND DAIRY

- Optional certifiable version with certificate TC7520 for installation in official measuring systems according to 2014/32/EU
- For liquids, mash and pastes with solids content < 5%
- Very high accuracy  $\pm 0,5\%$   $\pm 2$  mm/s and reproducibility also with low flow rate, ideal for dosing and filling applications
- Large selection of process adapters (optional without adapter)
- Option: Quantity Preselection with throttling stage
- Option: Temperature detection including time and date recording
- Auto-supervision with automatic error diagnostic
- Self-learning overrun control
- Vacuum proof PFA coating for pig cleaning and maximum resistance to aggressive media



*Certifiable magnetic-inductive flow and volume measurement of media with a minimum conductivity >5  $\mu$ S/cm*

*IZMSA: Precision with self-learning effect , also Certifiable Flow measurement with many options*



## Infrared Camera for Condition Monitoring and Early Fire Detection

The thermal imager Optris PI 640i is the smallest measuring VGA infrared camera, with a body-sized 45x56x90 mm and weighing only 269 - 340 g (depending on the lens), the Optris PI 640i counts among the most compact thermal imaging cameras on the world market.

Optris PI 640i is a specifically designed product package for outdoor condition monitoring and fire detection.

The unit's environmental rating of IP66 and an integrated air purge ensure reliable 24/7 operation under harsh conditions.

The built-in heater/fan has an extra wide operating temperature range of - 40 °C, up to 50 °C.

This IR camera has a spec of 640 x 480 pixels and delivers pin-sharp radiometric pictures and real-time HD videos with a spec of 1280 x 720 pixels.

The USB Server (PoE) ensures easy integration of both camera streams (IR + VIS) in the video management systems.

### Areas of application for the thermal imager Optris PI 640i

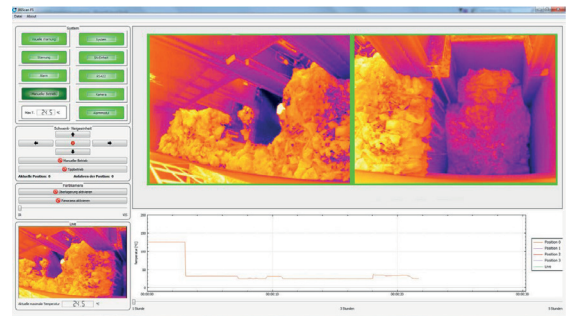
The high-resolution infrared camera PI 640i finds use in all industrial applications, where pin-sharp infrared pictures and videos are essential for process monitoring, condition monitoring, early fire detection and optimisation.

The real-time thermographic images also prove especially valuable for surveillance and quality assurance in the automotive sector, in the plastics branch, and in the semiconductor as well as photovoltaic industries.

The unit can be delivered with industrial thermal imager equipment and comes with an extensive license-free thermography software package.



*Optris PI 640i fitted with outdoor protective housing, air purge collar, USB Server and wall mount*



*Screen grab of the actual visual image on camera alongside IR reading of the same area*

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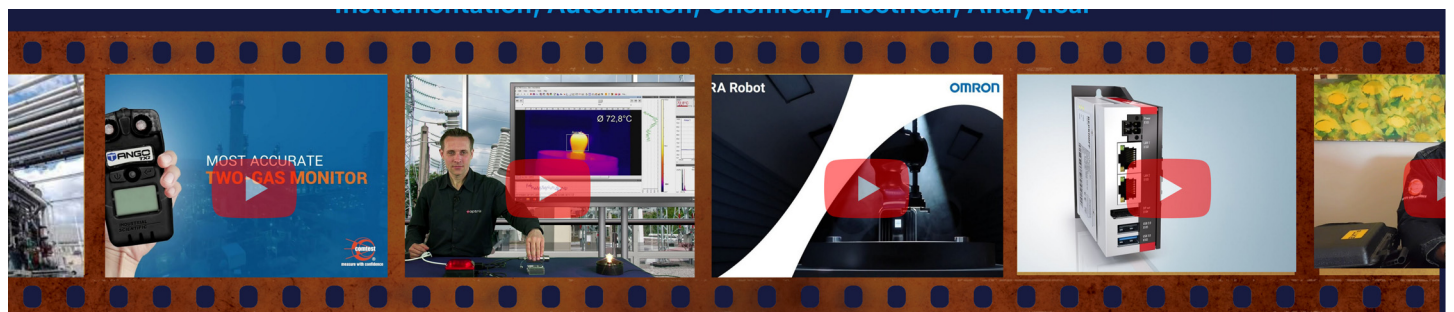
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## Solenoid Valves with Energy-Saving Kick and Drop Double Coil Technology

Media such as fluids or gases must be shut off, released, dosed, distributed or mixed. These tasks are among the tasks undertaken by solenoid valves.

This means that they are subject to countless requirements in a wide range of different application environments.

The challenge for the future lies in a sustainable and energy-saving solenoid valve solution.

Valves with electromagnetic coil systems are widespread in order to automatically control gaseous and liquid media.

The current demands are therefore to save as much energy as possible across industries, and to use more sustainable, low-maintenance solutions. Switching pressures and requirements for low noise emissions also come into play.

Bürkert is supplying the future-proof answer to these questions with solenoid valves based on the Kick and Drop coil technology.

The solenoid valves with the new Kick and Drop technology are 35% smaller than conventional valves, but just as efficient.

Moreover, Kick and Drop prevents environmental impact from occurring, as they work silently and do not cause any unpleasant mains humming or whistling.

Kick and Drop coils are ideal when long duty cycles and high pressures are required, such as for gas or tap water protection valves.

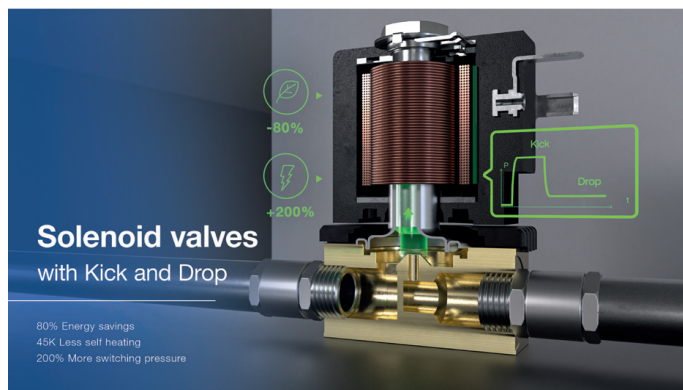
They also ensure safe operation in electromagnetically sensitive environments – and anywhere where water containing lime poses a problem.

The Kick and Drop coils enable impressive energy savings, compared to typical coils: it reduces energy consumption by up to 80%. At the same time, solenoid valves with this technology enable up to three times the switching pressure of conventional valves.

The portfolio includes three coil variants with different power ranges to suit your application.

Coils with Kick and Drop technology consist of inrush winding and holding winding.

Bürkert have completely rethought the tried-and-tested technology with their solenoid valves: rectifier and switching electronics are directly located in the coil.



Proprietary control units can be consigned to the cable plugs of the past. This saves time during start-up and ensures longer maintenance intervals for the valve.

A short current pulse generates the required starting power to open the valve. About half a second later, the holding winding is changed to inrush winding in series.

This then reduces the required power and ensures that holding operation will save an enormous amount of energy.

### Bürkert's Kick and Drop coil technology:

- saves 80% electrical energy.
- reduces 100% valve calcification.
- for building and industrial applications.

### Every added value has a benefit for you:

- The printed circuit board integrated into the coil enables the cable plug to be freely selected, saves tedious adjustments and ensures easy start-up.
- The Kick and Drop coils ensure a quick power reduction. This comes with a reduced surface temperature, from 92° C to only 52 °C. There is no risk of burns.
- Thanks to the innovative technology, the self-heating of the coil is reduced by 45 K, which also reduces calcification, and the solenoid valve has an extended service life.
- You will save up to 35% space due to the compact design and the smaller coil.
- Thanks to the electronic control in the coil, no disturbing noises occur, such as humming or whistling. This makes application pleasant for humans and animals.
- The power supply for the dual coil is universal and frequency independent. This means that it can be used worldwide, be it with AC, DC, 50 Hz or 60 Hz.

**Andre Nel**

**Bürkert South Africa (Pty) Ltd**

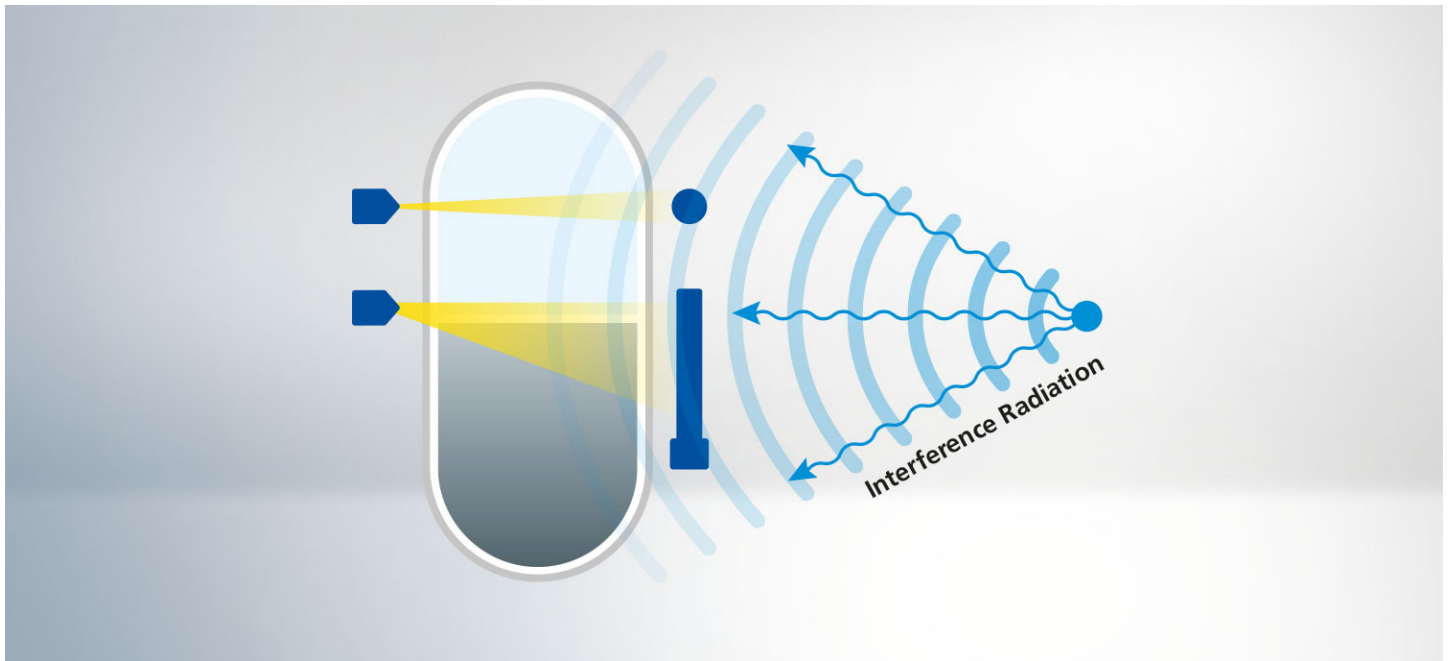
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## ***Safeguarding Precision in Industrial Radiometric Measurements with X-Ray Interference Protection***



In the complex landscape of industrial plant operations, precision is paramount, especially when it comes to weld inspections to test for structural integrity of pipes.

This test is also known as NDT (nondestructive testing). The use of high activity gamma sources for these inspections is a common practice.

However, this poses a major challenge for radiometric level and density measurements as they are highly susceptible to strong interference radiation, leading to potential inaccuracies and safety deficiencies.

Berthold has the ideal answer to this challenge – X-Ray Interference Protection (XIP).

In a market where maximum precision is required, this technology clearly stands out as it guarantees the reliability of measurements despite external interference radiation.

Berthold is the only supplier of radiometric measurement technology providing an integrated protection against interference radiation due to nondestructive weld inspections.

The principle behind XIP is simple but effective. When external interference radiation is detected, the process value is immediately frozen until the interference subsides.

During this frozen state, a binary signal is emitted to alert the control room to the presence of interference radiation.

This not only ensures the accuracy of measurements, but also provides real-time information to the operating personnel, enabling swift response and intervention.

As soon as the NDT interference radiation has disappeared the Berthold system automatically returns from frozen state into normal operation and reliably provides the current process value to the DCS.

The integrated XIP technology clearly distinguishes Berthold in this area.

None of the competition currently offers an integrated protection against interference radiation, which is no trivial matter for industrial plants employing radiometric measurements.

Strong interference radiation poses a serious threat to the detector electronics and can lead to irreparable damage of the instruments if no protection is provided.

Separate X-ray detector or mechanical devices mitigate this risk, adding complexity and potential points of failure to the system especially for long measuring ranges or when high count rates are present.

It is worth highlighting that Berthold's commitment to precision and safety extends across the company's entire range of density, level switch and level measurement products; all are equipped with XIP as a standard feature.

This proactive approach not only sets a new standard in the industry, but also underlines Berthold's commitment to deliver reliable and accurate solutions to their customers.

In conclusion, Berthold's X-Ray Interference Protection XIP not only addresses a critical need in the industry but elevates the standards for precision and safety in industrial processes.

Berthold emerges as a trusted partner, ensuring that measurements remain accurate, reliable, and without failure in case of external interference radiation.

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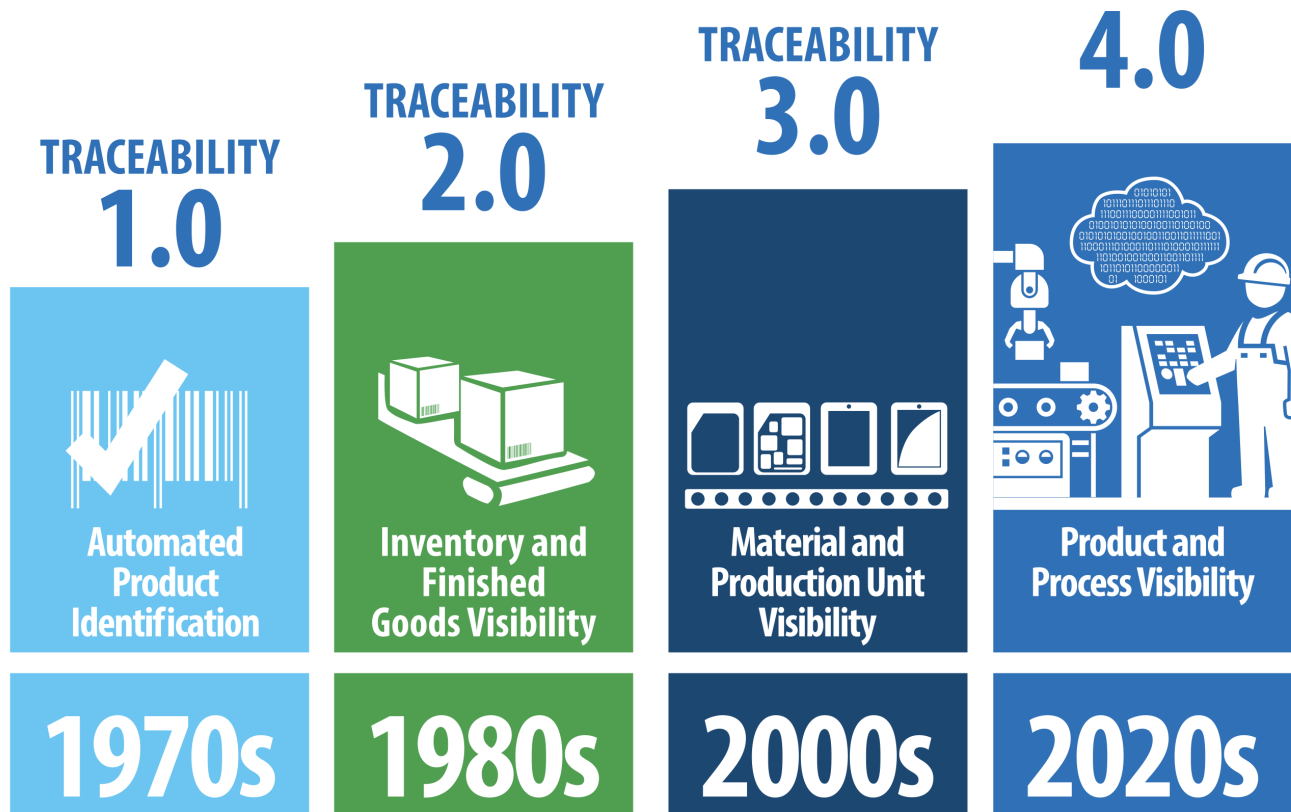
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## Traceability 4.0: The Fundamental Element of Global Manufacturing

*The breadth and scope of traceability have expanded significantly over the years along with advances in technology, making it a ubiquitous and critical application for today's world-class manufacturers.*

*We'll explore the evolution of traceability and its nuances in this article and explain why the latest phase, Traceability 4.0, is not just about tracking products and components throughout the supply chain but also optimizing productivity, quality, and brand reputation within the manufacturing operation by tying product to process parameters.*



**T**raceability is a much-used term these days in manufacturing and supply chain management. Like many industry phrases (Internet of Things, for example), traceability can mean different things to different people or organizations.

For that reason, “Traceability 4.0” is the term that Omron has coined to describe the current and future phases of traceability in a global context.

Traceability definitions have been evolving since the invention of automatic data capture equipment – primarily barcode readers – over 40 years ago.

Since then, traceability applications have evolved to support industrial development from both a product technology and business process perspective.

### Traceability 1.0

Traceability 1.0 is about automatically identifying products to drive accuracy and efficiency. Barcode readers were initially used in simple manufacturing processes, yet grew rapidly in adoption. The ability to mark a part and then track it was ground-breaking.

Barcodes became, and still are, a necessary core in manufacturing and industry to improve operator efficiency and productivity. In manufacturing, this is quite often the “first step” in implementing traceability solutions.

The barcode’s first grand-scale commercial use was in retail operations.

Before the advent of barcodes, cashiers had to key the product and price into a cash register.

The automatic data capture enabled by barcodes saved a significant amount of time, improved accuracy, and increased throughput.

Developed for retail, the first Universal Product Code (UPC) debuted in 1974 and they are still in use today.

Another adaptation of bar code use, still prominent today, is the use of 1D barcodes on test tubes containing animal or human specimens.

Tubes of blood or other biological material are sent to labs where they are placed in clinical diagnostic instruments. Those instruments then run various tests on samples, such as lipid panels and other medical tests.

Barcodes are used to track individual specimens and to ensure that test results are associated with the appropriate specimen and patient.

Today, there are many more widespread applications in use. Traceability 1.0 is transformational in manufacturing and industry for efficiency and accuracy when processing a large number of discrete items or transactions.

### Traceability 2.0

Traceability 2.0 is about managing inventory and meeting the needs of society. Now that barcodes were being applied to manufactured items, manufacturers recognized additional uses for them. They could track materials within the manufacturing facility and throughout the supply chain.

Comprehensive tracking, from original raw materials to finished products to optimize inventory management and reduce cost, became possible. At the same time, consumers became more quality- and health-conscious, and the media became more aggressive in responding to product quality issues.

Whether a supplier, manufacturer or consumer, no one wants to be involved in a product recall. Product defects and recalls can happen in any industry.

An example would be the Tylenol recall in 1982. This incident prompted a reform for the packaging of over-the-counter drug products. The recall cost in 1982 was \$100M. In 2000, Bridgestone and Ford lost massive brand appeal and spent \$5.6B on allegedly defective tires, recalling almost 20 million tires. The 2016 Samsung Note 7 recall due to fire and burn hazards remains infamous.

Today, across industries and throughout supply chains, recalls can cause serious issues. The demand for Traceability 2.0 has skyrocketed, largely to address these issues and broader social needs and awareness.

Traceability 2.0 enables targeted product recalls according to date and lot codes. This reduces the cost of quality improvement and also increases consumer confidence, as manufacturers can now pinpoint the source of the problem within their processes.

Much has been reported about defective products in many industries, from tainted food to defective automotive parts.

Retailers push traceability requirements onto manufacturers and require that barcodes themselves have high standards of quality.

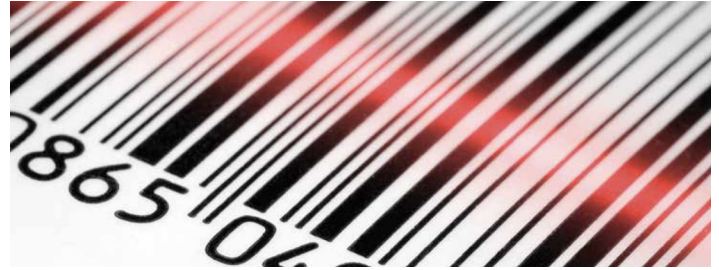
The retail industry as well as the United States Food and Drug Administration (FDA) for the manufacturing of medical devices (Unique Device Identifiers or UDI), has adopted the International Organization for Standardization (ISO) barcode quality specifications, which impacts multiple levels within the respective supply chains.

### Traceability 3.0

Traceability 3.0 is about the optimization of manufacturing and supply chain security by focusing on material, the second of "the 4Ms of lean manufacturing": Man (People), Material, Machine and Method.

Manufacturers began to extend traceability to their suppliers by requiring barcodes and other identifying information to be placed on components and packaging. Some refer to this as component, subcomponent or line item traceability.

As more suppliers began adding information, manufacturers were able to optimize manufacturing processes and product



quality even further by employing traceability within the manufacturing facility.

Traceability 3.0 is also about the ability to perform preventative control before an emergency or a quality issue occurs. Subcomponents can now each be identified, tracked and inspected for quality before final assembly. When a manufacturer can go back to the last acceptable checkpoint, adjustments can be made in final production to ensure quality products are released for shipping.

The introduction of Data Matrix (developed by a company in Omron's acquisition genealogy) and other 2D symbologies greatly facilitated Traceability 3.0, as symbols could be substantially smaller than their 1D counterparts while containing more data. This is especially important in the electronics industry, where device components continue to decrease in size.

The development of the Direct Part Mark (DPM) occurred during this phase of the traceability evolution because of the need for robust identifiers to withstand harsh manufacturing or environments. Manufacturers etch DPM symbols directly onto materials such as metal or plastic, eliminating the need for easily damaged barcode labels.

Traceability 3.0 provides manufacturers with a greater ability to ensure the authenticity of their products and a better foundation for anti-counterfeiting programs. Counterfeit automotive parts are estimated to cost the automotive industry between \$10 billion and \$30 billion per year.

By identifying all of the components in an assembly or product and improving the resilience of 1D barcodes and 2D symbols, manufacturers can implement anti-counterfeiting programs that successfully reduce counterfeit products from entering the supply chain.

### Traceability 4.0

In this article, we have discussed product, component and supply chain tracking as key traceability goals. Traceability 4.0 is the union of all these, along with machine and process parameters to achieve the highest level of manufacturing.

This includes Overall Equipment Effectiveness (OEE) as well as production and quality data to improve overall manufacturing effectiveness.

Although some manufacturers are already employing Traceability 4.0, it represents the future for the majority of manufacturers.

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A similar way of describing Traceability 4.0 is the complete implementation of traceability in the context of the 4 Ms of lean manufacturing. Manufacturers can now know everything there is to know across their enterprise about a part or product, including its complete genealogy.

Traceability 4.0 greatly enhances root cause analysis. On which machine was this product produced and at what time? Who was operating the machine? Where is the production bottleneck located? The potential diagnostic scenarios are virtually limitless.

Substantial improvements come to light in many areas with Traceability 4.0. The ability to identify specific product failures with detailed operating parameters and conditions enables faster and more precise root cause analysis.

Manufacturers can also drive manufacturing decisions and processes with Traceability 4.0. Through what process does a particular part move during production? What route does a part take throughout the manufacturing process? Which components are used on a specific subassembly?

Assembly verification, quality assurance, and bill of material control are all optimized with Traceability 4.0.

In the automotive industry, Traceability 4.0 can go beyond geometric dimensioning and tolerancing (GD&T). Components that must fit together precisely, such as pistons and engine blocks, are categorized and identified based on their exact GD&T measurements and then automatically matched based on their corresponding IDs to achieve extremely high precision and performance.

One electronics manufacturer has developed a Traceability 4.0 solution using Omron technology to track a product through all processing steps. Each processing machine writes a proprietary DPM on each product to create a real-time manufacturing genealogy in addition to the machining of the product.

Finally, in an advanced state, Traceability 4.0 systems can make automatic decisions that optimize equipment and processes based on acquired data, including automatic predictive maintenance.

This is facilitated by smart sensors, AI controllers, RFID and advanced data management software. This process knowledge can then lead to improvements in other facilities across the enterprise and around the world.

All levels of traceability are critical to the success of manufacturing. Most industries will see and use all levels in their plants or facilities. One phase is not “better” than the other; the full complement is their strength.

The evolution of traceability is the direct result of business needs and is crucial in the hyper-competitive world of global manufacturing.

While similar in many ways to Industry 4.0, Traceability 4.0, and all its phases, is different in several ways. Timing and availability are one key difference.

When speaking of Industry 4.0, in some cases there are decades between advancements, and generally, they are not being developed, or used, at the same time. Many steps of this progression were sequential.

The concepts and technologies of traceability began just 40 years ago, and are actively building upon each other and are being used concurrently, for both bettering production and sparking new technology developments.

The other large difference we see is the focus of Industry 4.0 compared to that of Traceability 4.0. They both focus on improving and connecting digital and physical technologies to optimize manufacturing and improve yield.

Traceability, however, brings an additive dimension – ensuring quality components and end products. It is this laser-sharp focus on credibility and brand protection that true traceability can deliver.

Omron’s vision has always included the working relationship between people and robots. We call this Highly Diverse Traceability: tracing the fusion line of people, robots, machines and devices without interruption.

### Summary

Traceability 1.0 generates enhanced efficiency and productivity. Traceability 2.0 helps to optimize inventory management, product quality, safety, and regulatory compliance. Traceability 3.0 is essential to anti-counterfeiting programs and product and component compatibility optimization.

Traceability 4.0 achieves the 4 Ms, optimizing overall manufacturing effectiveness and brand protection, and also introduces AI into certain elements of process control. Crucially, the four phases of traceability have not cannibalized one another. They have been accretive and will continue to build upon each other.

Transactional efficiency, social needs, supply chain management, and manufacturing optimization will only become more important in the coming decades.

Omron’s global portfolio of traceability products and solutions is integrated, intelligent, and interactive.

Our core “MVRC” offerings (mark- verify-read-communicate) include barcode readers, ISO-compliant barcode verifiers, laser markers, and RFID. Omron has a complete automation platform featuring programmable logic controllers, motion controllers, machine vision systems, safety technology, and robotics to facilitate a complete traceability solution for data management, inspection, and material handling.

Omron’s IoT-enabled devices communicate data seamlessly with each other and across multiple data layers within an organization (MES or ERP). This data connectivity enables analysis for continual improvements to be realized.

We were present at the beginning of traceability’s evolution and will continue to drive that evolution forward. Omron has facilitated many Traceability 4.0 applications in the digital, automotive, and food and commodities industries with exceptionally positive results.

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## Copper is the New Gold - Sensors Ensure Reliable Supply

*The processing of copper scrap involves many precisely coordinated processes. This is the only way to ensure that the recycled copper can be used effectively later on.*

*When it comes to level instrumentation, Montanwerke Brixlegg relies on radar technology from VEGA.*

*The conditions around the shaft furnace are harsh. However, the radar sensors are not impressed by dust or the high temperatures.*



*A radar sensor monitors the uniform feed of the scrap packages in the combustion chamber.*



Very few companies can look back on over 550 years of company history. The Brixlegg copper-silver smelter appeared in documents for the first time in 1463. Copper and silver ores were mined there and refined into pure metals up until the 20th century.

Since 1890, secondary materials containing copper have been increasingly used as raw materials instead of ores.

“While the challenges back then were for the most part exclusively mining problems, today they are much broader. We are now responsible for maintaining a positive interplay between people, the environment and the economy,” explains Patrick Oberladstätter, Head of Electrical Engineering at Montanwerke Brixlegg in Tyrol.

Today, Montanwerke Brixlegg AG is a 100 % upcycling company with more than 350 employees and one of the most important industrial operations in western Austria.

The plant in Brixlegg is considered a specialist in copper recycling and the associated copper refining.

But there is more to it: The Tyrolean company is also rushing ahead in the area of climate protection – the world’s most climate-friendly copper is produced here.

The plant generates the lowest CO<sub>2</sub> emissions of any comparable industry, and uses 100 % recycled raw materials as well as 100% renewable energy for electricity requirements.

“In this way, we are not only doing pioneering work for today’s needs, but as the first in the value chain, we are laying the groundwork for absolutely climate-neutral manufacturing in the future,” says Oberladstätter.

### Scrap turns into valuable raw materials

The raw materials used are copper-bearing dust, ash,

shredded materials, sludge and return slag with a copper content of between 15 and 60 %, as well as alloy scrap such as brass, bronze and gunmetal with a copper content of between 60 and 80 %.

Refined materials and chopped and sorted electrical cables have a copper content of around 80 - 99 %. High-purity scrap retrieved from semi-finished product manufacturing, on the other hand, is used directly in the foundry without refining.

Beside these solid raw materials, copper chloride solutions from the electronics industry are also processed.

In addition to copper, numerous other metals such as nickel, zinc, tin and precious metals are extracted from the raw materials.

The copper cathodes, round billets, rolled plates and precious metals produced in this way become valuable raw materials for various applications in the electrical and construction industries, in mechanical and plant engineering, in the high-tech sector as well as in electroplating and agriculture.

### The sensor withstands harsh ambient conditions

Without reliable and robust measurement technology, the finely tuned production processes would not be possible.

VEGA instruments have been in use here for a long time already; however, collaboration between the two companies has intensified greatly since 2016.

“In my opinion, VEGA’s specialisation in pressure and level measurement has brought huge benefits. We’re absolutely thrilled with the quality and handling of the sensors, which is why we rely on VEGAPULS for continuous level measurement,” says Oberladstätter.

“Since the market launch of the VEGAPULS 21 compact sensor series in 2020, we’ve installed almost 50 of the units.”

These are used in various sensitive chemical applications, like the measurement of acids, alkalis, milk of lime, etc. One example is the continuous measurement of acidic liquids in the electrolysis sector, which is of utmost importance for optimal use and control of the pumps.

Numerous VEGASWING 61 and 63 level switches have also been installed as overfill protection. Recently, more NAMUR versions have been installed, as the periodic function test using the test key on VEGATOR makes things significantly easier.

With NAMUR electronics, not only is very simple wiring possible, but also the test of the sensor via the test key on VEGATOR in the control cabinet.

It is therefore no longer necessary to climb up to the top of the vessel; dismantling the instruments for testing is also a thing of the past. This in turn saves a lot of time and increases the safety of personnel.

VEGASWING detects limit levels in the vessel and forwards them to the VEGATOR controller.

The measured value is adapted to the specific conditions of the measuring point through an adjustment in the controller. Readings are shown on the display and outputted via the integrated current outputs.

This means that the point level signals can also be used for simple control tasks. What is more, the signal circuit is monitored for line interruption and short-circuit.

### Monitoring the level in the shaft furnace

A very special place of application for continuous level measurement is the shaft furnace. Packages of scrap are fed into this furnace via a conveyor.

Beside the high ambient temperatures, the process heat itself as well as dust and vibration constantly create new challenges for the deployed measurement technology.

Until December 2021, a radiometric measuring system for min/max monitoring was used at this site, but it did not deliver reliable readings. And this method was very limited in scope – it only allowed point level detection.

For this reason, and because of the ever-present danger of the radiation source, the company wanted to replace it with something better.

“We have to monitor the level precisely in order to maintain the optimal filling volume,” explains Oberladstätter further. A steady inflow of product mix is extremely important for the entire process.

The special situation: There must always be product in the combustion chamber, otherwise the fire could flash back and cause great damage. Here, continuous measurement with VEGA sensors makes it possible to feed in the scrap packages evenly.

He goes on to emphasize this point: “Before this measuring system was installed, the shaft furnace was repeatedly emptied too much and it was damaged as a result of the excessive temperatures.”

Now, the VEGAPULS radar sensor keeps the level in the shaft furnace exactly at the optimal point. With the help of a 45°



*In addition to copper, numerous other metals such as nickel, zinc, tin and precious metals are extracted from the raw materials.*



*With the aid of a 45 degree mirror the filling level in the shaft furnace is measured.*

mirror, the level inside the shaft furnace is measured by the externally mounted, and thus well protected, VEGAPULS.

The sensor was installed and commissioned by Oberladstätter and his team at the end of December 2021. Fine adjustment was carried out by a VEGA engineer.

VEGAPULS is hardly affected by the harsh conditions, even the deposits on the shaft walls do not interfere with the measurement. This is due to the sensor’s very small beam angle of 4°.

As a result, the sensor can be used reliably even in narrow shafts with internal installations or buildup on the walls, because the measuring beam simply travels right past such obstacles.

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*Continues ...*

### Eliminating false signals

Two aspects played a role in selecting the sensor. The first: VEGAPULS can cope with extremely high temperatures.

The process temperature inside the furnace is approx. 200 °C and the ambient temperature outside the furnace, approx. 50 °C, is still quite hot.

And the second: VEGAPULS is optimised for measurement at close range.

Special processing of the reflections in the close range makes it possible to reduce the influence of interference signals directly in front of the antenna system. The tight focusing of the transmitted signal offers further advantages.

The most important is that the actual measurement signal can be separated quite well from interference signals, allowing even the smallest reflected signals to be picked up.

And last but not least, the sensor is non-sensitive to buildup on its own surfaces – extremely important in the harsh environment of the furnace.

Beside the advantages in the process and the high measurement accuracy, there were also very practical considerations that convinced Oberladstätter and his engineering team that VEGA technology was the right choice.

These included the simple installation and maintenance, the price and the customer service.

VEGA sensors can also be conveniently adjusted via a smartphone with Bluetooth, which makes them ideal for harsh environments, Ex areas or measuring points that are difficult to access.

Thanks to Bluetooth and the intuitive adjustment structure, Oberladstätter's team was able to install VEGAPULS in the shaft furnace and get it up and running in no time.

What is more, they can now instantly retrieve all relevant information about the VEGA instrument just by entering its serial number. This greatly facilitates maintenance work carried out later.

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## New Optoelectronic Level Switch and Switching Amplifier for the Process Industry

The WIKA model OLS-2 optoelectronic level switch is used for the detection of limit levels in liquids. The OLS-2 operates widely independent of physical characteristics such as refractive index, colour, density, dielectric constant and conductivity.

Measurement of level change is also done in small volumes. Signal processing is made using a separate switching amplifier, model OSA-SC.

The model OLS-2 limit level switch consists of an infrared LED and a phototransistor. The light of the LED is directed into a prism.

So long as the sensor tip of the prism is in the gaseous phase, the light is reflected within the prism to the receiver.

When the liquid in the vessel rises and wets approximately 2/3 of the glass tip, the infrared light beam into the liquid is



interrupted and only a small portion reaches the receptor.

This difference is evaluated by the electronics and triggers a switching operation.

The instruments are very robust and designed for rough operating conditions. The installation position can be as required.

Thus, the OLS-2 can be installed from above, from below, vertically, horizontally or at an angle.

The cable to the model OSA-SC switching amplifier does not need any shield, enabling easy and economic cabling.

The change in the alarm direction, the sensitivity of the switching threshold, as well as a time delay of up to 8 seconds can be easily

transferred to the OSA-SC via Bluetooth® app and changed individually.

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## *TwinCAT as the Basis for State-Of-The-Art Software Engineering in A*



Software company Zeugwerk GmbH, headquartered in the Austrian town of Wattens, is convinced that state-of-the-art software engineering is becoming an increasingly important factor in automation.

They believe this is the only way for machine builders to cope with the increasing demands on automation software despite the looming shortage of skilled workers, while at the same time increasing the speed and quality of project implementation.

This mindset is what prompted Zeugwerk to launch its Framework and Creator products, which are based on TwinCAT from Beckhoff and used by machine builder Nordfels GmbH in Bad Leonfelden, Austria, among others.

“With Zeugwerk Framework and Zeugwerk Creator, we are bringing many elements of state-of-the-art software development into the world of control software to facilitate a standardized, holistic, and sustainable development approach,” explains CEO Matthias Pfurtscheller.

A broad spectrum of Zeugwerk customers are set to benefit from this approach, ranging from custom and series machine builders to automation specialists and machine operators.

Furthermore, the Services division provides customers with access to expertise in implementing specific solutions and using modern software paradigms such as CI/CD tools and unit testing.

According to Pfurtscheller, the extent to which users can benefit from state-of-the-art software engineering can be illustrated by the following prime example:

“The mechanical engineering company Nordfels recognized several years ago that standardization in the development process provides a clear advantage in terms of speed and quality when implementing machine projects.

“This makes it an ideal customer for Zeugwerk, on the one hand because Nordfels is already familiar with the potential benefits of a standardized development process, and on the other hand because we can provide immediate assistance in implementing new possibilities offered by TwinCAT and state-of-the-art software development.”

This project was backed by the comprehensive support of the Austrian Beckhoff sales offices in Hagenberg and Innsbruck, with the experienced experts Klaus Wurm and George Hampel, along with the associated Beckhoff support specialists.

### **TwinCAT as an open and state-of-the-art software platform**

Zeugwerk can already draw on 20 years of TwinCAT experience and has been an active Beckhoff Solution Provider since 2022.

According to Pfurtscheller, the open Beckhoff control platform makes it possible to efficiently implement modern software paradigms such as object-oriented programming, code generation, and test automation.

By offering all the necessary interfaces and including an API with its products, Beckhoff opens the door to contemporary methods in the development of control software.

He continues, “TwinCAT provides the foundation for implementing state-of-the-art development approaches with the possibility to address both engineering and runtime automatically via corresponding interfaces.

“The TwinCAT Automation Interface and the PC-based control platform represent important components in this regard.”

Zeugwerk defines software engineering as a holistic and sustainable approach to the entire life cycle of a software product.

## Automation

The aim is to achieve a comprehensive level of standardization, from the requirements analysis and project planning through to the implementation, commissioning, and use of the software along with the accompanying support.

The company believes this is the only way to maintain – or even increase – the quality and speed of development in spite of increasing requirements and a shortage of skilled workers.

Pfurtscheller explains, “We operate on the principle of ‘Do what works to develop better software faster.’ Rather than trying to reinvent the wheel, we incorporate elements from IT into the world of automation technology.”

It is also very important for the software developers to see an immediate benefit in their own daily work and not feel overwhelmed by new or changed ways of working.

### Simplifying software development processes

In the world of software development, the use of frameworks has proven to be key to simple and efficient workflows. Frameworks define large parts of the structure and architecture of a software product with templates, libraries, and standard modules.

This allows software developers to concentrate on the functional and project-specific requirements in programming while working with a standardized software architecture.

Framework-based development is already standard in the IT world; however, Zeugwerk’s experience shows that this approach to control development is still relatively new.

Nevertheless, the advantages are clear, since the predefined, often modular structure provides additional support for standardized practices in project planning and commissioning.

Furthermore, standardization through framework-based software development offers significant potential and numerous opportunities to automate various steps in the development process, including documentation, testing, delivery, and code generation.

Zeugwerk Framework is a standardized application template along with various libraries that offer extensive functions for application development. It covers standardized aspects such as communication, data, functional units, and various modules for implementing machine processes.

Zeugwerk Creator is an extension of the TwinCAT development environment TcXaeShell, which significantly simplifies and accelerates application development through context-specific menus, dialogs, and functions, as well as through standardization with Zeugwerk Framework.

Regarding the integration as a plug-in, Pfurtscheller adds, “Expanding TcXaeShell with Creator allows for seamless integration with Zeugwerk Framework to establish consistent, fast, and error-free workflows.

“The primary advantage here is that the existing, familiar development environment is enhanced with new features for standardized application development, thereby minimizing the familiarization time.

As a result, application engineers never have to leave the TwinCAT environment.” The TwinCAT Automation Interface has simplified the integration process, serving as the necessary

interface to the Visual Studio or TcXaeShell engineering environment and enabling programmatic access to a TwinCAT project.

In conclusion, integration would never have been possible without the TwinCAT Automation Interface.

### Clear advantages for machine building

Another advantage of the TwinCAT Automation Interface, as highlighted by Pfurtscheller, is the automatic code generation, which speeds up development significantly.

Configuring plant software with the corresponding modules and typically very similar structure can be achieved much faster in this way.

Users can then continue programming and refining in the familiar TwinCAT environment. Matthias Pfurtscheller goes on to explain that, “Users can configure their applications using the Zeugwerk Creator functions without having to write a single line of code. The structure of the application is always the same and can be created on a project-specific basis in no time.

“Automatically generated test environments for commissioning and backup/restore options for data are further advantages afforded by the integration and use of Creator.

“Nordfels was able to cut the time needed to create a major machine project from several days to just a few hours, for example.”

Tasked with tackling this project for machine builder Nordfels, Zeugwerk developed a custom extension for TcXaeShell that enables the automatic, menu-driven generation of the PLC for a machine project.

This offers dialogs for creating stations and substations, which subsequently perform the generation of all necessary code segments.

This additional functionality can be used in the TcXaeShell development environment as if it were part of TwinCAT.

Further functions, such as the creation of a new station, are offered as menu items in the TcXaeShell in the appropriate places to naturally add application parts to a Nordfels PLC.

According to Matthias Pfurtscheller, this approach ensures that the additional functionality is actually used, as the benefits are significant and the barrier to entry is minimal.

Edmund Jenner, CEO of Nordfels, confirms the benefits as follows, “The introduction of modern software paradigms has made cross-team and cross-project software creation possible in a meaningful way, which opens up completely new perspectives for us in terms of further development and reuse of each individual software project.”

Nordfels has gained a quality, speed, and reusability advantage for every future automation project thanks to this unique development, while also consolidating consistent, standardized workflows across the entire team.

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## Easy-To-Use Maintenance Tool Offers Generous Energy Savings for Plants and Helps Reduce Carbon Footprint



**B**usinesses worldwide face the dual challenge of rising fuel costs and environmental energy taxes; there has never been a more critical time to focus time and effort on reducing utility costs.

Sanid Usanovic reviews how a German food and beverage plant makes Fluke ii900 Industrial Acoustic Imager standard maintenance to save energy significantly.

For the efficient management of plant operations, the critical considerations for the energy manager include product quality, safety, downtime, and, of course, energy use.

A production plant in Germany has set a greenhouse gas emissions reduction goal of 25% by 2030 (using 2015 as a baseline) and turned to the Plant Energy manager to help deliver that target.

One way of achieving that goal is to reduce energy use. How can the plant energy manager accomplish this without impacting product quality, safety or downtime?

### Reducing environmental impact

Manufacturing firms worldwide are reviewing the efficiency of operations to reduce costs and drive down their environmental impact. Led by sustainability officers' with the support of energy managers, efforts to lower energy usage are helping to decrease the environmental impact of production and contribute to global and local efforts to reduce climate change.

In 2011, the International Organisation for Standardisation (ISO) introduced a new voluntary standard for designing, implementing and maintaining an energy management system. A technical committee undertook the development of ISO50001.

Like other ISO standards, it is intended to be realised across various industries and encourages adopters to implement a Plan, Do, Check, Act framework for energy management.

Since the Paris Agreement of 2015, the drive for ever more sustainable operations and to reduce the effect of climate change has accelerated.

This company is taking a stand against climate change and has committed to reducing greenhouse gas emissions.

One crucial program element focuses on reducing the plant's indirect emissions from energy use. Specifically, this considers the emissions resulting from the generation of the electricity purchased by the company from the utility provider.

For the bottling plant in Germany, one area under review was how to tackle the energy wasted through leaks in compressed air systems.

The Carbon Trust estimates that the UK industry uses over 10TWh of electricity to produce compressed air, making it the direct root cause of over five million tonnes of CO<sub>2</sub> emissions a year (source: The Carbon Trust, 'Compressed air – business opportunities').

### Compressed air resource

Approximately 90% of all companies use compressed air in some aspect of their operation, such that it is sometimes referred to as the fourth utility. However, compressed air is often generated on-site, unlike other utilities such as gas, electricity or water supplied to the site by an external utility's provider.

Therefore, the manufacturing companies are responsible for ensuring its efficient production and distribution.

While many people may view compressed air as being as free as the air around them, due to the nature of the process, a significant proportion of the energy a compressor uses to compress the gas is lost as heat.

It is an energy-intensive process, and the environmental impact that electricity production can have makes it anything but.

Once produced, it is used to automate processes, package products, provide motive power, or generate other gases on-site.

Clearly, the waste of this expensive resource needs to be minimised. The priority is to set up a leak reporting and repair programme. This will give you an idea of where the troublesome connectors and lines are sited and allow you to formulate a repair strategy to ensure they are kept fully working.

#### **The cost of compressed air leaks**

The energy consumption at the food and beverage processing plant compressed air systems was at R6M. It is estimated that if there were no maintenance system in place, the losses due to leaks in the network would be between 25-30%.

Implementing a maintenance regime from this starting point would represent a potential energy cost saving of R2,4M- R3M per year for the plant in question.

Whilst desirable, it is doubtful that any plant will achieve a 100% leak-free compressed air system. The target for good practice is between 8%-15%, and for best practice is 6-8% energy losses due to leaks.

#### **Maintenance Methods**

When looking for leaks, it is essential to remember that some components of a compressed air system are especially vulnerable, such as pneumatic cylinders, flanges, filters, tools, presses and drop hammers, which should be checked first.

Some traditional ways of detecting leaks include listening for hissing sounds or coating joints with soap and checking for bubbles. The soapy water method is inefficient and inadequate for a manufacturing facility's size and scope of compressed air lines.

Many cannot hear the hissing of air leaks in a quiet environment, let alone a functioning bottling plant. An improvement on the soap and water method was ultrasonic leak inspection.

Ultrasonic tools use microphones to identify the sounds associated with escaping air/gas. In a range of about 38 to 42 kHz. They convert sound captured in this range into audible sound and rely on human hearing to identify whether a noise is a leak.

That makes the detection subjective and reliant on enhanced skills and training.

Large manufacturing companies like this one may outsource checks and inspections for leaks in compressed air networks. Specialist companies will carry out annual checks that could deliver what would be considered good practice levels of leakage, between 8-15%.

However, a new testing regime less reliant on annual checks through a third-party vendor was sought to decrease the energy losses further by reducing leaks in the network.

The food and beverage production plant agreed to test the use of industrial acoustic imagers at the plant to check for leaks in compressed air systems.

Recent developments in industrial acoustic imagers, such as the Fluke ii900, mean they are equipped with an array of microphones, providing visualisation of sound field within an expanded field-of-view, that enables maintenance teams to

visually locate air, gas, or vacuum leaks very quickly and accurately in compressed air systems.

This means it is possible to detect leaks even in noisy environments and from a distance, and as such, maintenance programs can be adopted whilst the plant is operational.

The detected leaks are then displayed on an LCD display, making it possible for a user with little-to-no experience to detect leaks immediately. The acoustic imagers can evaluate the distance to the target and estimate size of the leak, making it easier to prioritise a repair schedule.

Solar loading and wind are environmental factors that must be considered. Solar loading occurs when one or more sides of a structure are uniformly heated by the sun, causing temperature differences to be masked over.

Similarly, wind moving over a structure can wash away thermal signatures or create unexpected pressure differences, leaving some problems undetected.

The food and beverage production plant has started using the Fluke ii900 to locate compressed air leaks in:

- Conveyor systems
- Tubing, piping, flanges and valves in the Clean-in-Place system, the syrup maker, and the CO2 blender
- Hard-to-reach gated areas

The equipment is capable of reporting an estimation of the size of the leak. From that data, it is possible to estimate the company's energy cost and evaluate the return on investment.

Crucially for delivering a targeted reduction in carbon emissions, quantifying the energy lost is an essential feature so that the reduction in greenhouse gases can be calculated.

"This innovative technology has excited me from the moment I first heard about it! The imager was primarily purchased for localising leaks in our compressed air systems throughout the plant. We have already seen enormous energy savings." ... Plant energy manager

#### **The Future**

As energy prices continue to increase, the need to reduce energy costs and deliver on shared sustainability goals intensifies. Many more consumer goods manufacturing companies are taking on sustainability and energy managers to reduce waste and spotlight opportunities to run the plant more efficiently.

The maintenance teams at the plant are vital to the delivery of efficient operations. Using tools such as acoustic imagers that can bring enhanced savings to maintenance routines and reduce energy costs is a quick win for all manufacturing plants with significant compressed air demands.

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**Product: [www.bit.ly/3Mt1eBO](http://www.bit.ly/3Mt1eBO)**

## Ultracompact Coriolis Mass Flow Meters with Advanced Transmitters

Emerson has introduced the Micro Motion™ G-Series line of Coriolis mass flow and density meters, the most compact dual-tube Coriolis mass flow meters on the market.

The Micro Motion G-Series Coriolis Flow and Density Meter offers the same level of quality and reliability as standard designs, but in a much smaller and lighter form factor.

Compared to traditional volumetric flow meters, it provides direct mass flow measurement, immunity of process temperature/pressure changes and advanced process and health diagnostics.

Emerson also introduced the Micro Motion 4700 Coriolis Transmitter, adding new capabilities for use with its Micro Motion family of Coriolis flow meters.

The transmitter can be retrofitted to most existing Micro Motion sensors, and ordered with all new meters, including the new Micro Motion G-Series.

The combination of these two new products provides an ideal solution for chemical and other industrial applications.

### Micro Motion G-Series Flow and Density Meter

Micro Motion G-Series Flow Meters are ideal for chemical plants that need to improve safety, reduce energy use, and minimise emissions.



They are available with Pressure Equipment Directive (PED), Safety Integrity Level SIL 2 and SIL3 certification, and are designed to meet NAMUR NE 132 guidelines.

Hygienic models will also be available in the first half of 2024 for food and beverage, life sciences, and other applications where 3-A or European Hygienic Engineering & Design Group (EHEDG) certification is required.

Although Coriolis meters do not require upstream or downstream straight pipe runs like many other flow measurement technologies,

some models have a larger footprint, limiting their use in confined spaces.

Emerson's new meters address this issue with a face-to-face dimension of less than 12 inches for the 1-inch line size model.

The compact form factor is complemented by a significant reduction in weight, providing benefits for transportation, installation, and safety.

The flexibility in communication and power options reduces installation cost and complexity. Connection to host systems is available via a combination of discrete and 4-20mA HART® signals, or via digital connections, including Wi-Fi, Bluetooth® technology, and power over Ethernet (PoE) solutions, including Ethernet/IP, Modbus TCP, or PROFINET.

## Sweep Frequency Response Analyser



The SFRA45 Sweep Frequency Response Analyser has a bandwidth of 5Hz to 45MHz and offers a fully portable solution.

It fully complies with IEC60076-18 – Power Transformers Part 18 – Measurement of frequency

response requirements.

It features a built-in colour LCD screen and is battery powered. The tablet style instrument can be used with or without PC Software.

The dedicated software available (SFRAComm) enables the user to create databases from which historical transformer sweeps can be recalled and compared to current sweeps for analysis.

This offers the ability to perform the most common sweep frequency response analysis "Fingerprint Comparison" as well

as all other comparison techniques.

### Features:

- 0.02dB Basic accuracy • Frequency range 5Hz to 45MHz
- Full Colour VGA Display • RS232, LAN and USB
- PC Software package included • 2Hr Battery Life
- Leading Phase Accuracy • Truly Portable Measurements
- LCR Mode • Save Data to external USB
- 50Ohm or High Impedance Input • Scope Function
- Save Data to Database for comparison
- Import Formats:- .txt, .csv, .xml, .sfra, .pax
- Export Formats:- .csv, .xml, .xmlx
- Supplied with all accessories and carry case

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## Improve Installation Flexibility and Connectivity

Each of these digital connections enables two-way communication of a variety of data, including process variables, diagnostics, status, configuration, and calibration.

This data can be used to implement proactive maintenance practices and digital transformation initiatives.

Six line sizes are available from ¼-inch to 3-inch, and product selection is provided via simplified and streamlined configuration.

Direct laser-etch tagging provides durability in even the harshest conditions, and it eliminates the need for adhesive labels and spot-welded tags.

MyEmerson digital specification tools are easily accessible through a QR code, providing a quick and easy solution for storing and accessing information related to each flow meter.

### Micro Motion 4700 Config I/O Coriolis Transmitter

End users have deployed Micro Motion Coriolis flow meters extensively in a variety of industries, including chemical, food and beverage, life sciences, oil and gas, petrochemical, and others.

Many of these end users are interested in switching to an upgraded transmitter with additional features and benefits, while avoiding the expense of changing existing flow meter installations, which typically have provided decades of trouble-free service.

The Micro Motion 4700 Coriolis Transmitter addresses this issue by providing a retrofit adapter solution to replace the legacy transmitter in existing installations.

Once installed, the transmitter will automatically interface with the existing flow meter, adding capabilities just as if it were a new application.

The transmitter is compatible with all Micro Motion ELITE® (CMF and CMFS), F-Series, H-Series, R-Series, T-Series, HPC-Series, and the new G-Series Coriolis flow meters.

The transmitter adds many new capabilities, including a Bluetooth connectivity option, which provides wireless communications at distances up to 50 feet (15 meters) between the transmitter and Emerson's AMS Device Configurator.

Wireless access via Bluetooth technology allows users to configure the meter, access Smart Meter Verification diagnostics, and access process information.

Using the AMS Device Configurator application, users can quickly locate and identify transmitters, and then perform tasks related to configuration, device status, and diagnostics.

Reliability is improved because transmitters no longer need to be opened for access, protecting them from exposure to the environment.

The transmitter has three configurable wired I/O channels to provide connectivity options, including 4-20mA HART, frequency output, discrete output and input, and Modbus RS-485.

The Micro Motion 4700 provides an ideal solution for upgrades to existing Micro Motion Coriolis installations, and it is available as an option to provide advanced capabilities for new installations.

The process industry can rely on Emerson's robust equipment and expertise, leveraging these two products individually or together to enhance both operational efficiency and equipment maintenance programs.

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## Next Level of Valve Stability, Accuracy and Speed Control



When there is the need to reduce or eliminate harmful shock or excessive motion, or when a valve application requires accurate and repeatable closing or opening times, Kinetrol Steadyline provides the next level of valve stability, accuracy, and speed control.

The Kinetrol Steadyline series are precision valve actuators with built-in damping devices providing smooth resistance to actuator/valve shaft rotation (the resistance increases with angular velocity).

The Kinetrol Steadyline product smooths out the actuator's standard travel, dampens any pipeline flow-induced valve disc oscillations, and allows the user to specify a minimum amount of travel time upon power failure.

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## Software Optimizes Maintenance Based on Valve Condition Data, Saving Manhours and Downtime

The New Valve Health app uses custom data analytics to provide timely plantwide health indicators for improved safety, maintenance, and performance.

The Plantweb Insight™ Valve Health Application, a powerful software tool that combines Fisher control valve expertise with advanced analytic algorithms.

The new app makes it possible for users to visualise an entire connected fleet of valves, while prioritizing actions based on the health index of each valve.

This helps plant personnel optimize valve repair activities, resulting in faster and better maintenance decisions, leading to reduced downtime.

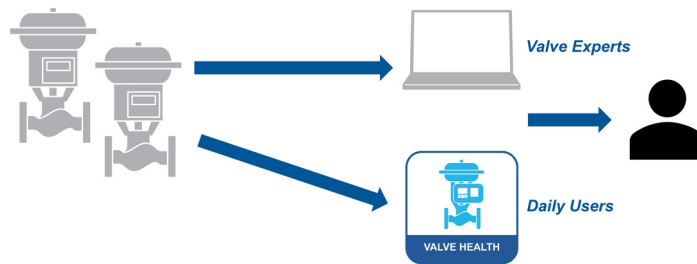
Most process plants and facilities have hundreds of control valves installed and operating in various applications.

These valves have multiple parts that must frequently move in concert to regulate flows of process media, with some of these parts coming into constant, direct contact with the media.

These operating conditions create wear and tear, requiring maintenance personnel to track the condition of each valve.

This is typically done by examining each valve individually, either locally or remotely, a time-consuming endeavour that requires a high level of expertise to ascertain valve health and follow-up action.

The Plantweb Insight Valve Health Application speeds and simplifies this control valve monitoring task by providing a user-friendly interface, with easy-to-understand and intuitive graphics.



The app includes Emerson's Valve Health Index, produced by a proprietary algorithm, which shows plant personnel the level of health for each valve.

The Valve Health Index allows users to enter information regarding their plant's processes, including

criticality of the valve and financial impact if the valve were to fail, making the index more informative.

The app allows users to prioritize repair and maintenance activities with five different indicators—Repair Urgency Status, Valve Health Index, Financial Impact, Criticality, and NE107 Alert Status—to meet specific needs.

The app includes explanations, recommendations, and suggested time to take action. This last indicator is totally new to the market and is one of the app's exclusive features.

"Plants and facilities harnessing all the functionalities of the Plantweb Insight Valve Health Application will experience reduced analysis time, faster troubleshooting, and improved prioritization of maintenance actions," said Jaime Alvarado Millan, software product manager for flow controls with Emerson's final control business.

"The result will be fewer man-hours required for repairs and maintenance, increased uptime, and fewer unplanned shutdowns.

"These and other benefits will increase productivity, lower costs, and improve profitability."

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## Enhancing Safety in Winder Operations



Within mining operations, winders are instrumental in vertical transportation, ensuring safe and efficient transport of people and tools in the mine shafts.

Maintaining the hydraulic oil that regulates the winder brakes can pose a challenge. Leaks can lead to a significant loss of oil and jeopardise operations.

Wika provides innovative solutions to such challenges, like their Float Level Switch, which effectively detects oil loss and automatically triggers the shutdown of pumps once a certain threshold is reached.

This technology minimises the risk of losing substantial amounts of hydraulic oil, promoting operational continuity and safety.

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## Stronger Than Steel Polymer Materials

German polymer manufacturer, igus, is slowly changing the way we do things by replacing metals and other everyday materials with stronger, longer lasting polymers that can stand up to almost any challenge.

In South Africa igus is gaining a reputation for its innovative plastics that can outlast even the strongest traditional materials hundreds of times over and are best known for their exceptional performance, durability and low friction properties.

Among these materials, iglidur stands out as a versatile choice for various applications across industries. Here is a showcase of its most successful uses in a variety of technical and industrial contexts.

### Bearing Applications

igidur materials are extensively used in bearing applications. These self-lubricating materials offer low friction, long service life and resistance to wear and tear, making them ideal for applications in automotive, aerospace, and industrial machinery.

### Food Processing

In the food and beverage industry, iglidur materials are a preferred choice due to their FDA compliance, low moisture absorption and corrosion resistance.

No lubricants are required for these materials used for various applications, including conveyor systems, bottling equipment and packaging machinery.

### Medical Equipment

The medical sector benefits from iglidur materials in equipment such as patient beds, medical robots and diagnostic devices. iglidur's biocompatibility, chemical resistance and low particle emission characteristics make them suitable for this critical industry.

### Automotive Seating

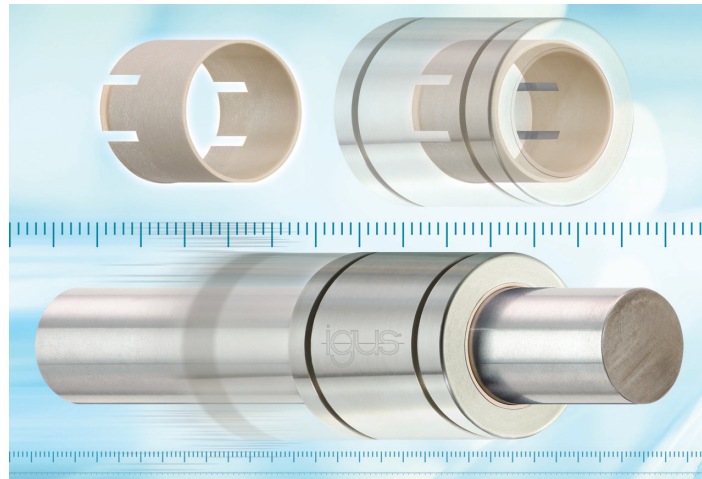
Automotive manufacturers use iglidur materials in seat height adjustment systems. These materials provide silent, low-friction operation and reduce maintenance requirements, contributing to a comfortable and reliable driving experience.

### Material Handling

Conveyor systems, sorting machines and automated warehouses depend on iglidur materials for their low wear and quiet operation. These materials enhance the performance and longevity of the equipment in material handling applications.

### Packaging Machinery

The packaging industry relies on iglidur materials for various applications, including pick-and-place systems, labelling



machines and filling equipment.

The self-lubricating properties of iglidur materials reduce downtime and maintenance.

### Agriculture

In agriculture, iglidur materials are used in applications such as crop protection equipment, harvesting machinery and irrigation systems.

The materials' resistance to dirt and dust, combined with their durability, ensures reliable performance in harsh outdoor conditions.

### 3D Printing

Iglidur materials are employed as 3D printer bushings, providing smooth and precise motion.

Their self-lubricating properties eliminate the need for additional lubrication, simplifying the printing process.

### Furniture

igidur materials find applications in furniture design, particularly in drawer slides and pivot joints.

Their silent operation, resistance to humidity and longevity enhance the quality and functionality of modern furniture.

### Offshore and Marine

For the offshore and marine industries, iglidur materials are employed in winches, cranes, and other machinery used in harsh saltwater environments.

Their resistance to corrosion and long service life makes them a reliable choice for these demanding applications.

igus product specialist, Juan-Eric Davidtz says engineers from a wide range of industries regularly enquire about igus polymers to improve processes and enhance the durability of products that they manufacture.

"In most instances they choose iglidur which offers remarkable versatility in applications across various industries. From the automotive sector to medical equipment, packaging machinery to agriculture, these materials have proven their worth in diverse applications.

"As industries continue to evolve and demand more from their equipment, igus iglidur materials remain a trusted choice for improving performance and reliability."

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## Enabling Engineers to Prioritise Arc Flash Safety with a Range of Thermal Imaging and Wireless Testing Tools



Introducing a range of thermal imaging and wireless testing tools designed to ensure safety is the top priority for engineers working in potentially dangerous arc flash zones.

Every company's electrical safety strategy should be based on limiting workers' exposure to such electrical hazards as arc flash and electrocution.

Fluke says the best way to keep operators out of harm's way is to give them access to the right non-contact tools that not only protect them but also reduce dramatically (by up to half) the amount of time they are required to work on live circuits in arc flash zones.

Arc flash is the light and heat created from an arc fault explosion; temperatures can reach up to 19,000°C (35,000°F), capable of igniting an operator's clothing and burning the skin of anyone within a few feet.

Arc flash can also melt metal, cause lung and eyesight damage and lead to hospitalisation, even death.

Engineers and health & safety teams will be familiar with establishing arc flash boundaries and wearing arc-rated clothing and rubber-insulating gloves.

However, using non-contact tests and measurement tools means operators can minimise the level of personal protective equipment (PPE) required and the amount of time they need to spend inside the boundary.

One such product is Fluke's PQ400 electrical measurement

window (EMW), permanently installed into cabinets with voltage and current connections inside the panel.

The PQ400 gives workers access to critical power quality and energy data while decreasing testing time and maintaining a high level of safety.

Users can plug their power quality tools directly into the EMW to collect all the needed data.

As well as the safety aspects, advantages of using the PQ400 include lower maintenance costs and reduced downtime by making critical power quality and energy measurements without opening the panel door.

The EMW also enables logging and monitoring to be done at any time without disrupting operations while increasing measurement efficiency.

A second product – Fluke's CV400 ClirVu 4in window – is a permanent infra-red window that provides a view of what's on the other side of a panel without workers being exposed to live voltage or needing full PPE.

Offering the most visibility into a panel for a thermal camera (simplifying the inspection process by allowing measurements to be taken without having to open a cabinet), the widest Fluke window option available also helps to reduce the time and costs involved in preventive maintenance.

Likewise, Fluke's TiS75+ thermal camera enables operators to capture and measure heat energy emanating from a source

## Thermal Imaging and Wireless

without having to make physical contact, meaning they can see instantly what's running too hot or too cold before anything breaks down.

Offering one-handed image capture, review and save facilities. The camera helps operators keep a safe distance from an arc flash boundary.

Using the Fluke Connect app allows them to compare thermal scans over time.

A fourth product – the Fluke 376 FC clamp meter – makes it possible to set up measurements and transmit the data from inside the arc flash boundary, meaning someone within 20m of the equipment can open the Fluke Connect app and read the figures from outside the boundary.

As well as reducing the time technicians spend in the arc flash boundary, the clamp meter helps them log, trend, and monitor measurements remotely so they can pinpoint intermittent faults.

Finally, the Fluke 3000FC digital multimeter is a flexible DMM allowing users to read results through the Fluke Connect app outside the arc flash boundary.

Using this equipment cuts technicians' time inside the boundary and offers them an easy-to-read display with large digits and a bright backlight.

Says Eric van Riet: "There's no need for engineers to put themselves in an arc blast zone if they can avoid being there. Products such as wireless and non-contact tools and remote displays can help place them as far away as possible from risk and danger while allowing them to take accurate, instant readings that can be analysed remotely.

"Arc flash safety is essential, and the latest thermal imaging and wireless testing tools are the best way to offer operators maximum protection."

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Product: [www.bit.ly/3N8IHMI](https://www.bit.ly/3N8IHMI)

## Compact and Integrated EtherCAT Stepper Motor Drives



The integrated ASI8100 stepper motor drive from Beckhoff's range of compact drive technology products (up to 48 V DC) combines a stepper motor, stepper motor output stage, and fieldbus connection in a space-saving design.

As an EtherCAT slave, it can be placed directly on the machine without a control cabinet or upstream I/O level, allowing for highly compact, control cabinet-free machines.

The series covers all motion requirements for stepper motors in the power range up to 250 W. Drive monitoring is indicated by integrated status LEDs in this case.

With the integrated travel path control, simple function blocks for motion applications are already pre-integrated. The standardized M8 (for EtherCAT) and M12 (L-coded, for power) connectors also provide cost-effective, industrially compatible connection technology.

The two additional I/Os allow drive-related functions, such as the detection of end positions or the latching of positions, to be executed efficiently.

The series starts with NEMA 17 drives (42 mm), available in two stack lengths with a 0.29 Nm or 0.8 Nm holding torque. This is followed by four NEMA 23 devices (56 mm) with holding torques of 0.75 Nm, 1.4 Nm, 2.35 Nm, and 2.5 Nm.

Pre-assembled cables and infrastructure components, such as IP67 distribution box modules, are available as accessories.

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## Revolutionizing Agriculture with Automation

In the heart of modern agriculture, where precision and efficiency are paramount, Aspera Systems is paving the way for a new era of farming with its cutting-edge automation solutions.

As the world grapples with increasing demands for food production and sustainability, the role of technology in agriculture becomes more crucial than ever.

This article sheds light on automation solutions for animal feed processing plants, grain storage facilities, and the implementation of Industry 4.0 in agriculture, along with the incorporation of remote weather stations, AGVs (Automated Guided Vehicles), drones, and an exciting development: a fully South African AGV for Soil Analysis.

### Animal Feed Processing Plants

In the livestock industry, efficient and high-quality feed production is essential for maintaining the health and productivity of animals.

Aspera Systems has revolutionized animal feed processing plants by introducing state-of-the-art automation technology.

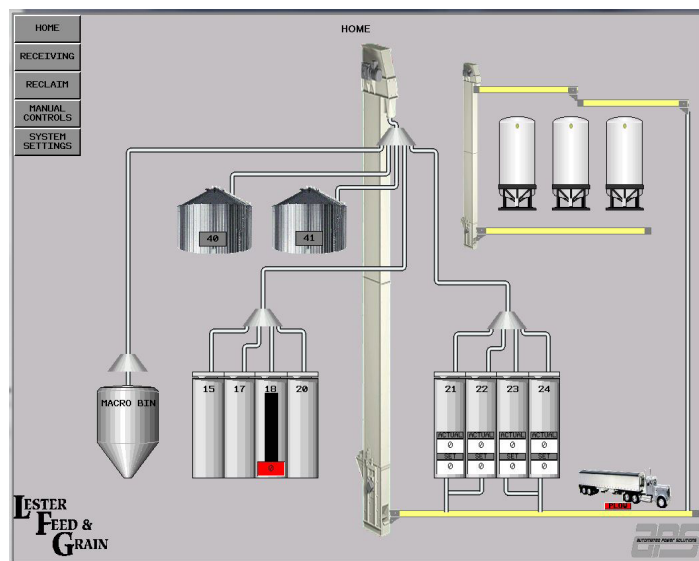
Through advanced machinery, IoT sensors, and data analytics, they have made it possible for farmers to achieve unparalleled precision and consistency in feed production.

With Aspera's automation solutions, farmers can control every aspect of the feed production process. The integration of Industry 4.0 technologies allows for real-time monitoring and adjustment of ingredient proportions, quality checks, and even predictive maintenance.

This not only reduces operational costs but also ensures that animals receive the highest quality feed, leading to healthier livestock and increased yields.

### Grain Storage Facilities

For grain storage facilities, Aspera Systems' automation technology- Using cutting edge PLC's, SCADA, Remote



Connectivity and Cloud based control as well as Data Acquisition has streamlined the storage and distribution processes, reducing losses due to spoilage, pests, and inefficiencies.

By implementing smart grain silos and storage solutions, Aspera enables real-time monitoring of temperature, humidity, and grain conditions through remote weather stations. This data allows for precise management of grain storage, minimizing waste and maximizing the value of stored crops.

In addition, Aspera's automation systems optimize the loading and unloading of grain, making the process more efficient and cost-effective through the use of AGVs. The integration of robotic systems and autonomous vehicles ensures that grain is handled with the utmost care and speed.

This not only reduces labor costs but also minimizes damage to grains during transportation.

### Industry 4.0 Integration

The fourth industrial revolution, often referred to as Industry 4.0, has transformed the way businesses operate, and Aspera Systems is at the forefront of incorporating this revolution into agriculture.

The fusion of automation, data analytics, and the Internet of Things (IoT) has enabled farmers and facility managers to make data-driven decisions that significantly improve operations.

Through Industry 4.0, Aspera Systems provides real-time data analytics and remote monitoring capabilities. Farmers can access critical information on their operations from anywhere, allowing for proactive decision-making.

The ability to predict equipment maintenance needs, optimize resource usage, and monitor inventory levels ensures maximum efficiency and sustainability.



# Kick and Drop

ENERGY-SAVING  
SOLENOID VALVES  
WITH KICK AND DROP  
DOUBLE COIL  
TECHNOLOGY

Power-saving,  
durable and space-saving

bürkert  
FLUID CONTROL SYSTEMS

### Incorporating Weather Stations, AGVs, and Drones

Aspera Systems doesn't stop at automation within the facilities; they extend their innovations to the field. By incorporating remote weather stations, farmers have access to real-time weather data, allowing them to make informed decisions about planting, irrigation, and harvesting, ultimately improving crop yields and resource efficiency.

AGVs, or Automated Guided Vehicles, play a vital role in modern agriculture. These autonomous vehicles are used for tasks such as crop harvesting, transportation, and field maintenance.

The integration of AGVs streamlines these processes, reducing labour costs and minimizing the risk of human error. Notably, Aspera Systems is currently developing a fully South African AGV for Soil Analysis, further enhancing their commitment to local innovation.

Drones have become a game-changer in agriculture, providing a bird's-eye view of fields and helping farmers monitor crop health, detect pests, and assess irrigation needs. This technology gives farmers an edge in precision farming.

### Sustainability and Environmental Impact

Aspera Systems takes sustainability seriously, and their automation solutions, coupled with the use of weather stations, AGVs, drones, and the upcoming South African AGV for Soil Analysis, are designed to reduce environmental impacts.

By optimizing processes and resource usage, they help minimize waste, energy consumption, and greenhouse gas emissions. Precision agriculture, made possible by Aspera's automation, conserves resources and reduces the environmental footprint of farming operations.

For grain storage facilities, Aspera's solutions help to minimize crop spoilage, which has a significant environmental and economic impact. By reducing the need for chemical treatments and the disposal of spoiled grains, they contribute to a more sustainable agricultural industry.

### Customer Success Stories

Aspera Systems' success is not just in providing cutting-edge technology; it's also in the success stories of the farmers and agribusinesses they support.

Many customers have experienced increased yields, improved product quality, and cost savings through the adoption of Aspera's automation solutions, including the use of remote weather stations, AGVs, drones, and the upcoming, in the process of development of a South African Home Grown AGV for Soil Analysis.

These success stories serve as a testament to the real-world benefits of automation in agriculture.

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## Highly Sensitive Detectors for Accurate and Reliable Measurement



**B**erthold are experts in radiometric measurements, specializing in solutions for density, point level, continuous level, and multiphase/density profile.

Where other technologies must be constantly recalibrated or replaced due to corrosion or process build up, Berthold's products provide a more accurate and reliable measurement without intrusion into the process and are not affected by volatile or caustic processes.

### Highly sensitive detectors

When compared to our competitors, our detectors with industry leading sensitivity achieve better accuracy with the same source or can even extend the useful life of aged and low activity sources.

Depending on the application, the source activity can be reduced by up to 80%. The detector's sensitivity describes how efficiently radiation is converted into a useable signal (i.e. "counts").

Especially in low radiation conditions, the highly sensitive detectors improve the signal to noise ratio, resulting in superior measurement performance compared to competing systems.

### Detector stability

In addition to increased sensitivity, our detectors also feature patented technology that distinguishes them from all competitors.

All the detectors feature cosmic ray technology which curbs temperature drift to  $\pm 0.002\%/^{\circ}\text{C}$ , and XIP (X-Ray Interference Protection), which automatically detects interference and protects your control system from false level fluctuations.

### Functional safety

The high reliability of the measurement is supported by important diagnostic functions, e.g. permanent monitoring of the detector function by comparison with cosmic background radiation and much more. This guarantees outstanding operational safety.

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# What Type of pH Calibration Solution Should You Use?



pH calibration solutions, also called pH buffers, are an essential tool when measuring pH. While some users will try to make their own solutions to save money, these homemade buffers are not accurate nor stable, and in the end will interfere with the accuracy of your results.

A professionally made pH buffer is more stable and is resistant to change.

Using a high-grade buffer to calibrate your meter before each use is the only tried-and-true way to get the most accurate results every time.

## Why do you need to calibrate a pH meter?

Frequent calibration is important in pH measurement because calibration keeps your readings accurate and reliable. All electrodes are based off of slope and offset (the Nernst equation).

However, the electrode won't behave exactly based on the Nernst equation every time; that's where calibration comes in.

Proper calibration will make up for an aging electrode by determining its actual slope and offset when using known buffers and will then update the algorithm in your meter to match.

Using pH calibration solutions can also alert you of any damages in the electrode through the slope and offset. If these numbers are off during calibration, that's a strong indication that the probe is damaged, dirty, or too old and needs to be replaced.

Hanna makes three different types of pH calibration solutions: standard, technical, and millesimal.

With so many options available it can get confusing and overwhelming, but we broke it down and made it easy to choose which one is right for you.

## 1. Standard pH calibration solutions

Standard pH calibration solutions have an accuracy of  $\pm 0.01$  pH at 25°C (77°F) and come in seven different pH values from 1.68 to 10.01.

Our most popular and commonly used buffers (4.01, 7.01, and 10.01) are dyed different colors so they can be easily identified when you are busy working.

Like all of our calibration buffers, the standard solutions are made in accordance with ISO standards, are NIST traceable, and come in a variety of sizes from single-use sachets to one-gallon jugs.

(Note that while all standard solutions are certified, not all of them come with a certificate. Some certificates may be available upon request.)

Standard pH calibration solutions are great for use in virtually any application and with most meters. Whether you are measuring the pH of cheese with the HALO wireless pH meter or using a benchtop meter in a laboratory setting, standard pH buffers will work for you.

**Hanna Tip:** If you are measuring pH in a sample that is out of the 25°C (77°F) accuracy range, refer to the chart on the side of the packaging for the actual pH range for that temperature.

## 2. Technical pH calibration solutions

Technical solutions have the same accuracy, follow the same specifications as standard solutions, and come with certificates.

Technical solutions come in a wider range than basic solutions, which hit nearly every point on the pH scale so that you can bracket your calibrations around any desired measurement.

What is bracketing? Also known as a two-point or multi-point calibration, bracketing consists of calibrating to two pH

points – one above and one below your desired pH range.

For example, if you want to measure the pH of lemon juice, which has a pH around 2, you could use technical buffers 1.00 and 4.01 for a two-point calibration.

**Hanna Tip:** For even better accuracy, we recommend performing a third calibration at pH **7.01**, since this is how the offset is determined. Calibrating at pH 7.01 helps you determine problems, such as a contaminated or broken probe, and helps avoid any errors in measurement.

### 3. Millesimal pH calibration solutions

Millesimal buffers come in a wide variety of pH ranges (more than the standard buffers, but less than technical ones), and they all come with certificates.

The thing that makes millesimal solutions unique is their greater accuracy.

Unlike standard and technical solutions, which have an accuracy of  $\pm 0.01$ , the millesimal solutions are accurate to  $\pm 0.002$ .

Millesimal calibration solutions are used in places where an accuracy down to three decimal places is crucial, like in science labs, municipal drinking water plants, and medical research facilities.

### Maintaining your pH calibration solutions

Many of the standard pH buffers come in FDA approved light block bottles to help maintain their pH values. The millesimal solutions also come in blue, opaque bottles which keep out light.

Even if you are using a solution with a light blocking bottle, however, there are precautions that everyone should take with their solutions to maintain their integrity and ensure accuracy.

To keep from contaminating your buffer, never submerge your electrode right into the bottle.

Pour out just what is needed into a container rinsed with deionized (DI) water and use that for your calibration. Never pour used buffer back into the bottle.

Although we recommend calibrating every day, we understand that it is a time-consuming task, and many people are busy. If high accuracy is not important in your measurements, it's okay to calibrate once or twice a week.

Since the shelf life of a solution is cut short after the bottle is opened, if you are only calibrating once a week a good option for you might be the single-use packets, which ensures you are using a fresh buffer every time.

**Hanna Tip:** Our calibration solutions are designed to have a long shelf life when left unopened. Once opened, a buffer with a pH lower than 7 will last around 3-6 months, while a buffer with a pH over 7 will be good for about 1-3 months.

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SCAN ME

## Delivering The Best in Crane Lifecycle Care



Investing in cranes and associated lifting equipment is probably one of the most important CAPEX expenditures that a company can budget for. It makes sense then to ensure that the maintenance programming reduces downtime, is solution and predictive driven and cost efficient.

Konecranes and Demag, one of the world's leading lifting equipment specialists, offer the latest in live online data driven strategies for maintenance inspection, repair and monitoring through their Lifecycle Care Services.

Lifecycle Care is a real-time comprehensive and systematic approach to managing customer assets that connects data, machines and people to deliver a digitally-enabled customer experience.

Crane experts apply a systematic Risk and Recommendation Method and a consultative, planning and review process to drive continuous improvement in safety and productivity.

"We are very aware of the impact maintenance and breakdowns can have on production levels in industries where downtime needs to be kept to a minimum" commented Ian Grobler, Sales Manager for Konecranes and Demag South Africa.

"This is why we have introduced our Lifecycle Care in Real Time initiative which is specifically designed to maximise the productivity of uptime and minimise the costs of downtime. This strategic approach enables us to achieve the highest lifecycle value for our customers" he said.

"Our customer engagement philosophy is to 'Partner Up', meaning that we walk the lifespan of their lifting equipment with them.

"We take cognisance of our customers' requirements and challenges in a way that gives them the best possible solution for the most productive output at the most efficient levels.

"Our Lifecycle Care approach does just that. It delivers benefits that include better data maintenance management;

assistance with statutory safety compliances and the establishment of 360-degree maintenance plans based on the latest data analysis tools to highlight but a few.

"We use this data along with our knowledge and experience to provide insights that allow our customers to optimise their maintenance operations and activities." said Grobler.

### What is the Lifecycle Care Process?

The Lifecycle Care process comprises:

- Inspection and Preventative Maintenance - regular inspections and preventive maintenance activities help identify risks and opportunities for improvement while supporting compliance.
- Predictive Maintenance and Remote Monitoring - Predictive Maintenance utilises condition monitoring, advanced inspections, and data analytics to predict component or equipment failure. Our TRUCONNECT Remote Monitoring is a key element of this element.
- Corrective Maintenance and Retrofits - addresses safety and productivity issues and capitalises on improvement opportunities through timely repairs, replacing components and/or adding new technology to your crane.
- Consultation Services - these services take a deeper look at a company's crane equipment. These services use advanced technology and trained specialists to uncover critical issues and help to guide decision making.
- Modernisation Services - Modernisations are tailored upgrades or modifications designed to extend the service life of your overhead crane and meet current regulatory, maintenance and production requirements.
- New Equipment and Spares – In terms of spare parts and service, it doesn't matter who made your crane. Genuine Konecranes spare parts as well as replacement parts for all other makes and models are on offer.

"The Lifecycle Care programme has been developed to ensure that cranes and associated lifting equipment is optimally maintained throughout its lifespan via the utilisation of our online remote technical and customer portals.

"It has been developed to ensure that our customers have exposure to the latest in technology supported by superior data analytics and that the most cost-efficient solution is found for greater equipment performance, a higher productivity cycle and with significantly less downtime" concluded Grobler.

**Ian Grobler**

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## Permanently Precise Flow Measurement

The compact & cost-effective all-rounder with IO-Link FMQ: It has everything you really need.

The FMQ electromagnetic flow meter is a tried- and tested, extremely versatile, robust, and reliable device for all conductive media.

The performance spectrum is tailored to almost all applications, including dosing and filling applications.

IO-Link in Flex-Hybrid technology: digital or analog communication or both.

- **Extremely compact:** Minimal size of measuring body and electronics allow easy, vibration-insensitive integration into almost all applications

- **Extremely robust:** All components are completely made of stainless steel.

The magnetic field coils of the measuring system are consistently encapsulated, which guarantees permanently reliable, precise measuring results even in very harsh environments with strong vibrations or pressure surges

- **Extremely reliable:** Completely protected against moisture, corrosion, and vibrations; vacuum-proof tube lining made of high-quality PFA; process temperature up to 100°C (212 °F), CIP & pigging possible.

- **Always accurate:** Automatic signal processing ensures correct measured values even when changing media (e.g. milk/ CIP cleaner)



- **Easy commissioning and operation:** User-friendly, rotatable display with optical buttons, no opening of the housing, no mechanical buttons, for quick and easy programming

- **Manufacturer-independent process connection:** Standard aseptic flange according to DIN 11864, with O-ring (no sanitary-sensitive surface seal), pipe standard DN10 ...DN100 (1/2"..."4")

- **Remote version** (separate electronics) available, cable length from 1 to 10 m

### Technical specifications at a glance

- Flex-Hybrid Technology with digital + analog interface (IO-Link + 4...20 mA)
- Measuring range from 30 l/h to 640 000 l/h
- Measuring accuracy:  $\pm 0,5\%$   $\pm 2\text{mm/s}$
- For liquids, mashes and pastes with a conductivity of  $> 5 \text{ } \mu\text{S/cm}$

- Process temperature up to 100 °C (212 °F) permanently
- CIP-/ SIP-cleaning up to 130 °C (266 °F) / max. 30 minutes

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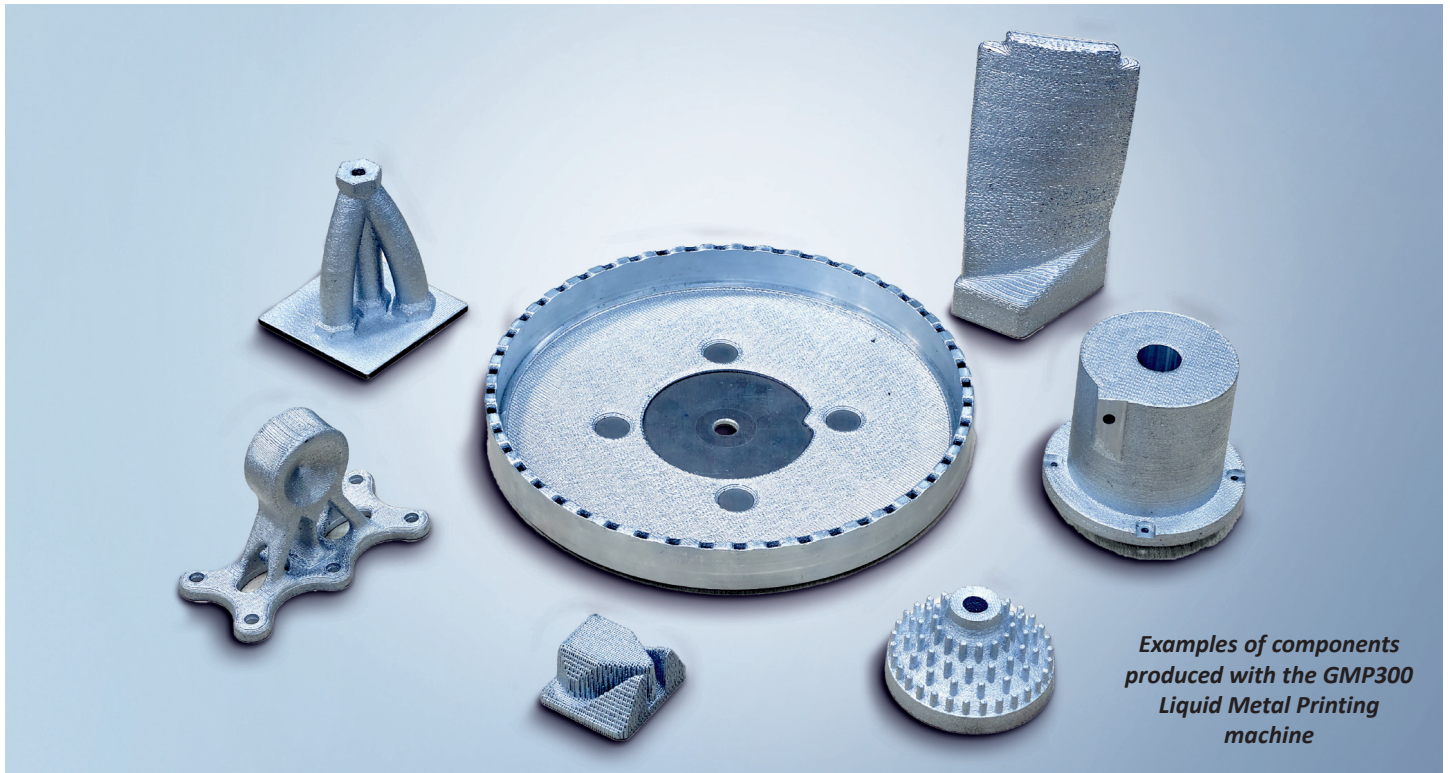
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- Easy integration



## Open PC-Based Control and Drive Technology in the Field of Additive Manufacturing



As a globally operating family business, GROB-Werke has been developing systems and machine tools for the most renowned automotive manufacturers, among others, for over 95 years.

This period has been characterized not only by technical innovations, but also by the opening up of new markets. A prime example is the field of additive manufacturing, for which the first prototype machines were developed in 2019.

With the new GMP300 Liquid Metal Printing machine, which is automated with PC-based control, wires made of aluminum alloys can now be used cost-effectively and efficiently in the printing process to achieve precise and fast 3D printing.

The portfolio of GROB-Werke GmbH & Co. KG, based in the German town of Mindelheim, ranges from universal machining centers to highly complex production systems and manual assembly stations to fully automated assembly lines mainly for the automotive sector.

The focus on additive manufacturing equipment first came to the fore in 2018 as part of an innovation management process to assess future technology and which also included electromobility and fuel cell technology.

### Economical and flexible additive manufacturing

The GMP300 Liquid Metal Printing machine uses a powder-free manufacturing process to produce near-net-shape components safely and quickly.

This provides customers with a reliable, efficient, and cost-effective system technology – with 3-axis kinematics and a max. axis speed of 30 m/min – while also offering maximum production flexibility.

Further advantages are provided by an assembly space with an oxygen-reduced atmosphere, numerous sensors for droplet,

nozzle, and component height monitoring, among others, as well as the processing of aluminum alloys supplied in wire form, and reduced hazard potential as no powder has to be handled.

Dr. Johannes Glasschröder, team leader for Additive Manufacturing at GROB, explains: “We have developed a completely new technology for this which makes additive manufacturing a much more interesting prospect compared to traditional processes.

“For instance, the raw material in wire form is far less expensive than the usual powder material. This provides the optimum conditions for producing required components from aluminum quickly and economically in small batches.”

Commenting on the technical challenges accomplished, Emanuel Engelsberger from GROB’s Additive Manufacturing team adds: “The precise synchronization of the CNC with the individual aluminum droplets is crucial.

“For their highly accurate positioning, for example, the drop time from the print head to the component must be precisely compensated. A lot of time and expertise has gone into this development in particular to enable corners and sharp edges to be produced precisely and at maximum speed, for example.

“The coupling of droplet frequency and axis speed also plays an extremely important role. The same applies to the large amount of sensor data, which, as well as being recorded for analyses, also forms the basis for active parameter adjustment and process control.

“This is the only way to compensate for any minimal errors directly during component production.”

While the conceivable range of applications is exceptionally broad – Dr. Glasschröder sees almost no limitations here – the requirements with regard to printing speed are just as varied

## Additive Manufacturing

He explains that the print speed is usually 250 aluminum droplets per second, but that printing at up to 1,000 droplets per second has already been achieved.

With the slower first value, however, the results are usually more precise and can also be achieved quickly using a larger droplet volume.

### PC-based control for speed and precision

Following GROB's previous success with PC-based control from Beckhoff in the area of electromobility, the additive manufacturing team also decided to put its trust in this technology. Engelsberger explains:

"Firstly, we benefited from existing experience and internal standards. And, secondly, the PC-based control technology was able to meet our requirements in terms of speed and precision perfectly."

This is also confirmed by Dr. Glasschröder: "On top of this, the control platform from Beckhoff is easy to use and open to the integration of our own expansions, meaning that it is also future-proof."

The hardware core of the control solution is formed by a C6030 ultra-compact Industrial PC, which is ideally suited to this application on account of its exceptionally high single-core computing power.

Dr. Glasschröder also thinks it crucial that the broad and regularly updated range of processors for Beckhoff Industrial PCs covers both future requirements and sustainability aspects.

Convenient machine operation is ensured by a CP3918 multi-touch Control Panel with 18.5-inch display and customer-specific push button extension.

The required precise and dynamic movements of the total of seven servo axes are implemented via three 1-channel and two 2-channel AX5000 Servo Drives as well as AM8000 servomotors.

The system-integrated safety technology of PC-based control is also used here: in the servo drives via the AX5805 TwinSAFE drive option cards and in the I/O area with the EL6910 TwinSAFE Logic and several TwinSAFE Terminals.

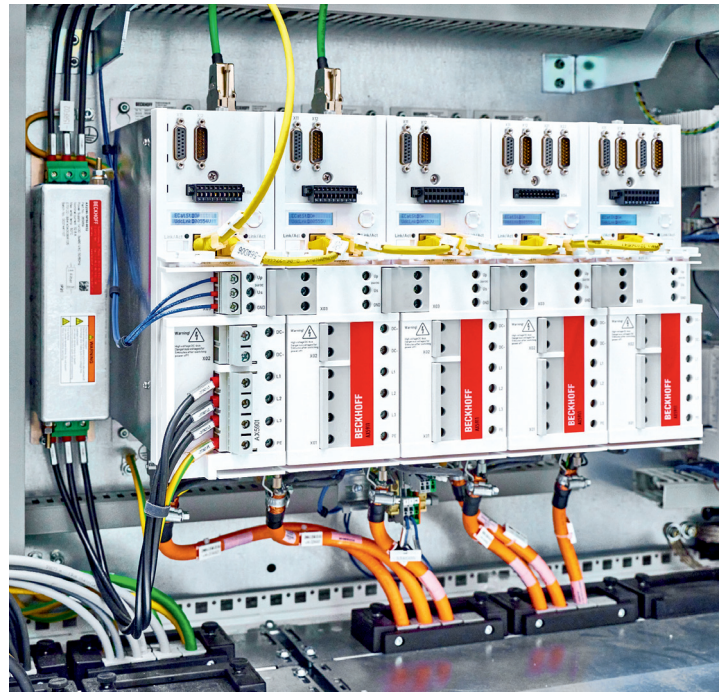
Overall, the I/O level is composed of numerous digital and analog EtherCAT Terminals and EtherCAT Box modules.

Engelsberger describes their key advantages as follows: "The decisive factors for us are speed and precision in data acquisition and processing. eXtreme Fast Control Technology (XFC) from Beckhoff, i.e., with the EL2262 oversampling terminal, is the only way we can set the corresponding trigger signal exactly according to our path planning and achieve the required synchronization with the vision system, for example. And that is precisely the core application of the GMP300."

In addition, there is the advantage of the wide range of interfaces that are available in the Beckhoff I/O portfolio, which make it very easy to integrate features such as IO-Link sensor technology (via EL6224).

### Convenient and powerful software suite

According to Engelsberger, Beckhoff TwinCAT automation



*The AX5000 Servo Drives, in conjunction with servomotors from the AM8000 series, ensure dynamic and precise movements.*

software has proven its worth not least in conjunction with the numerous EtherCAT analog terminals, due in part to the wide range of control algorithms offered by the TwinCAT 3 Controller Toolbox (TF4100).

For example, he says that correct temperature control is crucial when producing a homogeneous aluminum melt from the wire-shaped raw material supplied in the print head.

In the engineering environment, advantages arise from the pre-simulation of machine sequences without having to spend time on changing the development environment, as well as from the extensive virtualization options.

For the application core – the path calculation – TwinCAT 3 CNC (TF5200) forms the basis, as Engelsberger explains: "The engineering interface, software architecture, and usability of TwinCAT have already supported me during the familiarization period."

"Working in TcXaeShell is very straightforward and does not require a lot of effort, which ultimately makes it easier for us to implement our core expertise. So, as mentioned, in order to position the aluminum droplet in the CNC exactly, something akin to a precalculation has to take place in order to take the droplet fall time correctly into account."

"Therefore, we have to know exactly where the next droplet is going to be during the trajectory curve and then set the trigger accordingly."

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## INNOVATIVE SENSOR TECHNOLOGY

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