

Instrumentation, Process Automation, Chemical, Electrical, Analytical











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What's New in Publishing ck 2000/037639/23

Successful Measurement of Froth Interface in Flotation Vessels, Sumps and Column Flotation

Compared to other technologies, the LTM-2 has proven reliable in measuring the froth/ Slurry Interface in the mining Industry over the span of the last decade. Trusted by customers in the following flotation operations:

• Copper Flotation

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- Gold Flotation
- Molybdenum
- Platinum
- Nickel

To name but a few.

The proven reliability and accurate measurement of this interface give customers the confidence to trust the LTM-2 in these operations in providing accurate level measurement, which in turn translates to stable control of flotation circuits.

The LTM-2 gives a near instantaneous signal (100mS update time). It is not affected by density changes in the liquid, needing only a 50 μ S/cm conductivity in the liquid to be able to operate efficiently in this application. Once installed and calibrated it does not require re-calibration or maintenance, which makes this Instrument ideal for the mining and related industries.

Applications for this device are not limited to the mining industry. The LTM-2 is an excellent device for use in all level applications where high accuracy is required especially where froth/ foam is present.

Continuous Level Sensor

• Continuous level measurement in metallic vessels up to 3m in height.

- Ideal for adhesive and pasty media.
- Level measurement of foaming media.
- Minimum product conductivity 50 μ S/cm.
- Substitute for float sensors.
- Reliable interface measurement

Application Examples

- Level measurements in first running vessels of dosing plants.
- Flotation cell level measurement.
- Sump level measurement.

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Security Certified Ilot Edge **Gateway Enables Remote** Troubleshooting and Monitoring



MRON has announced the addition of the **RT1-Series** for industrial remote access into its line up of industrial automation solutions.

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The turnkey solution enables remote corrective maintenance without costly and time-consuming onsite visits.

With remote access, users can view and control interfaces, troubleshoot

equipment, and install updates without the need for traveling.

The RT1-series from OMRON, powered by Secomea, encompasses all software and hardware components needed for efficient, easy, and secure remote maintenance.

The remote access solution completes OMRON's wide offering of industrial automation solutions and drastically increases machine uptime whilst reducing the need for onsite visits.

OMRON's goal is to offer a full service for our customers for every aspect of their production architecture. The OMRON automation platform is now extended with the remote access solution, to make sure our customers can remotely respond to any issues that may arise at production sites running 24/7.

A Remote Access solution can drastically reduce the need to travel and other costs, as well as CO₂ emissions associated with machine troubleshooting and maintenance.

Main Features and Benefits of the RT1-Series:

• DIN mountable industrial gateway that can be installed in machine control panels to provide remote access for ondemand, real-time servicing of industrial equipment.

- Security certified and built-in firewall
- Troubleshooting and remote programming of a wide range of OMRON automation solutions

Service-ready device to improve responsiveness, reduce the impact of emergencies, optimize the workload of engineers and maximize machine availability and productivity

• Minimized environmental impact and increased sustainability by reducing the need for travel for machine maintenance.

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Inst **RUMENTATION AND PROCESS CONTROL**

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Pressure Probes on Water Pipelines

Reliable pressure measurements in tough environments.





Water distribution systems form the backbone of modern civilisation. Huge volumes of water have to be able to travel the long distance between their source and the end consumer efficiently and reliably. Not only can leaks in the distribution system lead to the valuable liquid being lost - it can also alter the subsoil, necessitating costly repairs. Leak-tight pipelines are a key part of a functioning supply system that delivers value for money.





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Level







Flow Rate

Consumption Monitoring



Find out more



25.3

Ultra Compact Infrared Camera for the Metal Industry



The Optris PI 1M IR camera is especially suited to measuring the temperature of metals, as these exhibit a distinctly higher emissivity at the short measurement wavelength of 1mm than at measurements in the previously conventional wavelength range of 8 -14mm.

The advantage of temperature measurements with the new infrared camera lies in the large amount of information in an IR picture/IR video and the short reaction time of 1ms for the output of temperature information of freely selectable individual pixels.

The use of these image sensors allows a large dynamic range for temperature measurement so that the previously necessary use of relatively many and narrowly defined sub-ranges is no longer required. Intelligent measuring with a pyrometer is now possible thanks to the twodimensional temperature recording of the Optris PI 1M.

With the large measurement temperature range of 450 -1800 °C, that the Optris PI 1M IR camera offers, it satisfies practically all demands in the fields of metal production and processing.

Pertinent features of the Optris PI 1M IR camera:

- Highly flexible CMOS detector with an optical resolution of up to 764 x 480 pixels
- Very large temperature measurement range (without sub-ranges) of 450 $^{\circ}\mathrm{C}$ to 1800 $^{\circ}\mathrm{C}$
- Frame rates of up to 1 kHz for fast processes
- Real-time output of middle pixel at a setup time of 1 ms
- Includes license-free analysis software and full SDK.







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3-Point Pressure Calibration in 10 Seconds!



Greg Rusznyak WIKA Instruments (Pty) Ltd. Tel. +27 11 621 0000 sales.za@wika.com www.wika.co.za The model CPC3050 high-speed pressure controller is the newest device in Mensor's lineup of precision pressure controllers and can perform end-of-line three-point verification in ten seconds.

With an innovative regulator, the CPC3050 is designed for fast pressure control in industrial environments. It can perform 25 % pressure increments in under four seconds with a 0.020 % FS accuracy.

The CPC3050 maximises throughput in industries such as oil and gas and automotive manufacturing "however, it can be used whenever speed and accuracy are needed, for example: aerospace, aviation, pharma and power generation.

It comes in high-pressure and low-pressure versions with customisable ranges, a 10:1 range limit ratio, and auto-ranging so it can fit into most factories for end-of-line testing and sensor verification.

Precision Temperature Scanner Delivers Best-in-Class Accuracy for Critical Measurements





C omtest is offering the Fluke 1586A Super-DAQ Precision Temperature Scanner.

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With up to 40 analogue input channels and scan rates as fast as 10 channels per second, the Super-DAQ is ideal for applications such as thermal mapping, process sensor calibration, quality control testing, lifecycle testing, process monitoring and environmental testing that are common in various industries including pharmaceutical, biotechnology, food processing, aerospace, and automotive.

With the flexibility of both internal and external input

modules, the 1586A is designed for use both on the factory floor where channel count as scan speeds are important, and in the calibration laboratory where accuracy and quick input connections are required.

The 1586A can measure thermocouples, platinum resistance thermometers (PRTs), thermistors, DC current, dc voltage, and resistance.

It offers best-in-class temperature measurement accuracy of plus-or-minus 0.005°C for PRTs, 0.5°C for thermocouples, and 0.002°C for thermistors.

The Super-DAQ has a colour display with channels that can chart up to four channels simultaneously. It features four modes of operation (scan, monitor, measure and digital multimeter) and alarms that indicate when a channel measurement exceeds an assigned high or low limit.

It has 20 MB of onboard memory for storing data and configuring files, a USB port to collect and store files to a USB drive and a LAN interface for easy connection to PCs and networks.

It also includes a dedicated RS-232 interface to control Fluke Calibration Drywells or temperature baths for automated tests.

Comtest

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Radar Sensor Ushers In A New Era In Level Sensing

Traditionally, the search for a suitable radar level sensor begins by asking which frequency would be best for the specific application, or by determining the properties of the medium, the temperature ranges involved and the process fittings required.

Until now, choosing an instrument was a laborious task, but VEGA is now transforming the process completely with its new VEGAPULS 6X.

"Ultimately, it's not the sensor that counts, but what the users can achieve with it in their individual processes," says Florian Burgert, who has been closely involved in product development from the very beginning.

"Knowing that they've chosen the best possible measurement solution and that they'll reach their goal faster with it makes a big difference in their everyday operations."

The success story began 30 years ago, and in the meantime, VEGA's sensors have optimized millions of industrial processes. The story includes milestones such as the world's first two-wire radar instrument and the first 80-GHz radar sensor for liquids on the market.

All-round protection

The new VEGAPULS 6X offers the best that is technically feasible today: a self-diagnosis system that immediately detects damage or interference that ensures significantly higher availability and safety, it has new radar-chip technology, with



expanded application possibilities and simpler operation.

In addition to SIL certification, the matter of cybersecurity has also been fully taken into account: Compliance with security standard IEC 62443-4-2, which specifies the strictest requirements for secure communication and access control.

The value lies in the best application

Level sensors should make it easier for users to monitor their industrial processes. The ultimate purpose of VEGAPULS 6X is: maximum simplification.

It is the one sensor that can handle any application. In the future, the customer will no longer have to

worry about the technology, frequency or instrument version. Even setup and commissioning has been reduced to a minimum, requiring now just a few clicks and basic application parameters. In many cases, all application-specific settings can be made in VEGAPULS 6X before it leaves the factory.

Mount, connect, done: It couldn't get any simpler.

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Flow Meters for Very Low Flows



nstrotech is offering Kobold model KSV flow meters and switches for very low flows with and without control valves – so even the lowest possible liquid or gas flow rates can be measured.

Specifically for liquids or air, the KSV operates on the suspended float principle.

The direction of flow is from bottom to top, and the installation position is vertical. The indication point is the upper edge of the ball.

The device has been designed as a simple, and thus economical measuring system. The optional needle valve allows economical control and the device has been designed for panel mounting.

Kobold's KSV flow meters are acid and caustic-proof, made of polycarbonate and brass or polysulfone and stainless steel materials.

They are highly suited for advanced applications in medical technology because these units are sterilizable, operating at temperatures of +120°C.

They can also be used for a wide range of applications in the analytical instrumentation field, within production and environmental monitoring, as well as in laboratory measurement and monitoring technology.

They are shock resistant, small (panel cut-out 93 + 0.5mm x 23 +0.5mm), lightweight and very simple to install.

- Available measuring ranges include:
- Water 0.25-1.5...10-80l/h
- Air 20-80 Nl/h...0.5 2-5Nm³/h
- Accuracy: <u>+</u> 6% of full scale

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A Completely New Era of Mass Flow Control



The FLEXI-FLOW is Bronkhorst's newest Mass Flow Controller series. With this revolutionary instrument, you are not only able to measure and control gas flow and measure the temperature, but also to measure and control the upstream and downstream pressures in your process with one flexible instrument. This is the future in mass flow control.

"The FLEXI-FLOW is based on a truly unique thermal mass flow measurement technique, that combines fast and stable chip sensors with reliable and accurate bypass technology." - Vincent Hengeveld, product manager FLEXI-FLOW.

Is the FLEXI-FLOW the perfect fit for you?

Can you answer 'yes' to any of the following questions: Do you...

- have limited space and need a compact flow instrument?
- use various instruments for measuring flow, temperature, and pressure?
- work with multiple gases?
- desire a swift and stable gas flow control?

• prefer an easy-to-use instrument with easy monitoring possibilities? Then the FLEXI-FLOW Compact series is your instrument of choice!

Henning Springer - Mecosa (Pty) Ltd Tel. +27 11 257-6100 measure@mecosa.co.za - www.mecosa.co.za

The Ultimate Choice for Gas Mass Flow Metering **Bronkhorst**[®] **HIGH-TECH** and Controlling WHY? Multi Range: Full scale flow rate can be re-ranged **IN-FLOW** anywhere between 40% and 150% of nominal value Multi Gas: Up to 8 different gas calibration curves can be stored in and selected from the instrument High accuracy: \pm 0,8% of reading plus \pm 0,2% of fsd FLOW Fast response time Instruments also available for ATEX CAT 3 **The New Digital In-Flow Mass** for use in Zone 2 **Flow Controller** If it is Gas it is from Bronkhorst HIGH-TECH (PTY) Exclusively available from Tel: (011) 257-6100 Fax: +27 86 531-9682 PO Box 90, Fontainebleau, 2032 E-mail: measure@mecosa.co.za Web: www.mecosa.co.za

Ultrasonic Level Sensors Accurately Measure Diesel Fuel for Rail Applications

From regional short line freight service to coast-to-coast passenger trains, the nation's railroads depend on diesel power.

With increasing investments in new technology diesel engines and repowering and replacement of existing engines, railroads are poised for achieving greater service and efficiency goals.

Diesel power is proven technology and provides efficiency,

durability reliability and now near-zero emissions, and diesel has long been the technology of choice for moving people and goods by rail.

According to the latest available data from the U.S. Bureau of Transportation Statistics (BTS), at the end of 2018 just over 26,000 freight locomotives were in operation in the U.S., and 431 passenger rail locomotives.

Except for a few passenger rail lines that are electrified, the remainder of passenger rail and all of freight rail in the U.S. is diesel-powered.

U.S. freight railroads can, on average, move one ton of freight more than 470 miles per gallon of diesel fuel, thanks to the low rolling resistance of steel wheels coupled together with the energy efficiency of the diesel locomotive.

Established in 2005, TMV Control Systems Inc. was formed from a vision to design and manufacture the next generation of locomotive control systems.

Basing the platform on 22 years of experience in designing locomotive control systems, Derick Vander Klippe's pursuit was to offer the rail industry an advanced, robust control system with long-term performance.



The result was the Traction Engine Control Unit (TECU), an intuitive system that is easy to navigate and operate to get the most out of a vehicle. Installed inside the high voltage Electrical Cabinet, the TECU I/O modules receive input from contactors, relays, Current Sensors, Fuel Level

Monitor, Pressure Sensors, Oil Sensors, and Senix ToughSonic CHEM ultrasonic level sensors.

The TECU also receives Control Stand operations such as throttle direction, notch, brake, and many other locomotive operations. This data is viewable on a display screen located nearby, so you can see exactly what your vehicle is doing, from the inside out.

TMV uses the Senix Ultrasonic CHEM 10 Level Sensor to detect fuel level in diesel-electric locomotive fuel tanks. TMV Control had the expertise to calculate fuel level based on the dimensions of the fuel tank, but needed something that could



accurate readings.

TMV Controls has selected the ToughSonic CHEM 10 due to its accuracy, ruggedness, dependability. The CHEM 10 is made of PVDV, the transducer is protected by a layer of PVDF, the PUR jacketed cable and electronics are potted and protected, and all ToughSonic sensors have an IP68 rating.

height of fuel.

alternating

accurately measure the level or

fuel level, but experienced

difficulties serious and tough

conditions of the railroad such as

trouble under movement, vibration.

temperature conditions, and

inclines. The Senix ultrasonic sensor

can endure all those and still give

weather

and

TMV Control explored options such as using flow rate to measure



Flow rates are notoriously inaccurate because fuel is pumped out of the tank, but a return line pumps some back in. The incoming and outgoing fuels tend to be at different temperatures so flow rate sensors can measure more fuel going back in the tank. Even small errors keep adding up.

Calculating the dimensions of the tank with the readings from the Senix ToughSonic CHEM 10 ultrasonic sensor is much more accurate. Senix measures, records, and displays fuel level using the Senix sensor. Senix also measure kilowatt hours. Using these two measurements, railroads can determine the efficiency of locomotives and their engines.

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smartphone

Flowmeter for Phosphate Precipitation in Wastewater Treatment Plants

K obold was tasked to provide a solution for the problem of phosphate precipitation in wastewater treatment plants.

By adding Iron (III) Chloride (FeCl3) into the aeration basin, the phosphates dissolved in excess wastewater are chemically mixed with sludge flocculants and transferred with sludge to the sludge treatment stage.

This process reduces phosphate concentration in waterways and to minimize

the potential for abnormal algae growth and the detrimental effect on the aquatic ecosystem.

Because an overdose of Iron (III) Chloride results in massively polluted water - toxic to humans as well as the environment, a completely dependable method of process monitoring was earnestly sought.

The ideal was a continuous flow measurement of the dosing chemical with a direct data connection to the process control system which would guarantee water treatment plant owners maximum safety; so that possible errors were not just discovered after the event (during sample taking) when it's too late.

The solution on offer from Kobold is the MIK magneticinductive flow meter, an optimal and economical solution for a safe dosage of Iron (III) Chloride, and specifically developed for this very application.

The unit has already proven itself very successfully in service, specifically for electric conductivity liquids, acids and caustic solutions, drinking, cooling and wastewater, groundwater, raw water, aggressive or salty solutions, but is unsuitable for oil (lacks conductivity).

The MIK is housed in Polyvinylidene Fluoride (PVDF) and the electrodes in contact with the medium are made of tantalum. Both materials have proven to be totally chemically resistant.

With the directly mounted transmitter with stainless steel housing, this device forms a very compact yet robust unit, ideal for fitting inside cramped control cabinets. It allows detection of very small dosage amounts from 10 mL/min.



The device operates according to the principle of electromagnetic measurement - Faraday's Law of magnetic induction - where a voltage is induced in a conductor moving through a magnetic field.

The electrically conductive measuring agent acts as the moved conductor. The voltage induced in the measuring agent is proportional to the flow velocity and is, therefore, a value for the volumetric flow.

The flow rate is calculated on the cross-sectional area of the pipe. The measurement is

dependent on the process liquid and its material properties such as density, viscosity and temperature.

The device may be equipped with a switch, frequency or analogue output.

With an analogue 4-20 mA signal (or optional pulse output) the MIK continuously communicates the measured values to the users' process control system, so that it allows for immediate response to the latest process conditions.

This results in increased efficiencies and cost savings in the amount of Iron Chloride required to achieve phosphate removal, as well as the vitally important environmental protection component.

Areas of application are: flow monitoring, flow measuring, dosing and counting for machine building, chemical industry, paper industry, automobile industry, cement industry and laboratories.

Finally, Kobold asserts that automation guarantees high standards of plant safety even at unmanned plants.

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UniArms



Ultrasonic Flow Meter

Available in sizes DN9.5 - DN90

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- Dosage Management
- Analog and RS485 output
- Track operation efficiency
- Used in Factories, Agricultural and Residential

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Hygienic 2-Way Bellow Control Valve for Small Flow Rates

With the Type 2380 Bürkert proves that it is possible to combine standard features with custom options in one advanced valve concept.

The compact bellow control valve with a hygienic design for neutral and aggressive media opens up possibilities for numerous applications, including innovative modular solutions.

The new 2-way bellow control valve is a pneumatically actuated process valve with a single action diaphragm actuator.

A PTFE bellow ensures the reliable separation of the media from the actuator.

The valve is constructed in full compliance with hygienic design requirements and is ideal for demanding control tasks with small flow rates, for which diaphragm valves are not suitable.

Applications include food and beverage production, pharmaceuticals and biopharmaceuticals, cosmetics and speciality chemicals.

The bellow control valve is available for different port connections from DN6 to DN20 and can be combined with seat sizes from 3 mm to 10 mm.

The space-saving drive has a low internal volume, resulting in the compact design and short response times of this valve type.

The Type 2380 valve features good control action due to the low-friction design, in addition to a linear characteristic. The correction time is generally less than one second.



Numerous combination options

The standard bellow control valve is a new addition to the unique ELEMENT system.

In combination with four different Type 869x positioner and process controllers of the ELEMENT series, as well as different connections (sleeve, clamp and welded connection) and a large choice of bodies and block solutions, it enables creation of a modular system with numerous options.

Type 2380 is designed for control functions such as the control of gases in fermentation processes and bioreactors, as well as dosing applications with small flow rates.

On the basis of this valve type the fluidics experts at Bürkert have developed an innovative solution for nitrogen

blanketing in liquid storage tanks or fermenters. The block solution consists of a pressure sensor, two bellow control valves and two ELEMENT positioners.

As opposed to the previous control concepts available on the market, this solution reliably prevents contamination, foaming and cleaning problems common in fermenters.

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Level Measurement – Now With Bluetooth®



WIKA's new model FLR-SC level transmitters with reed measuring chain are used for level measurement in liquid media. They work on the float principle with magnetic transmission.

The float's magnetic system in the guide tube actuates a resistance measuring chain that corresponds to a 3-wire potentiometer circuit.

The measurement voltage generated by this is proportional to the fill level.

The measurement voltage is very finely stepped due to the contact separation of the measuring chain and is thus virtually continuous. Depending on the requirements, several different contact separations are available.

The head-mounted transmitter in the case can be configured wirelessly via an app. The head-mounted transmitter communicates the measured values, via Bluetooth[®], to a device such as a smartphone or a tablet, which displays the level graphically.

In addition, the instrument description, the TAG number and also the 0 % and 100 % marks can be easily configured via the app.

Greg Rusznyak WIKA Instruments (Pty) Ltd Tel. +27 11 621 0000 sales.za@wika.com www.wika.co.za

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Magnetic-Inductive Flow Meter FMI

This sensor is made entirely of stainless steel. It is EHEDG-compliant with a hygienic design.

All parts in contact with the product are FDA-compliant. Conforming to 3-A Sanitary Standard, with various hygienic process connections available.

• Process connection made of stainless steel 1.4404, optionally 1.4435 with inspection certificate 3.1.

- Process connection optionally with Ra
- < 0.4mm, electropolished
- Electrodes made of stainless steel
- 1.4404 with inspection certificate 3.1.
- CIP-/SIP-cleaning up to max. 130 °C (max. 30 minutes).
- Wide selection of process adapters.
- High measurement accuracy even at low flow rates.



• Simple and user-friendly parameterization.

• Automatic empty pipe detection avoids undefined readings for empty pipes.

• PFA lining for maximum resistance to

aggressive substances such as acids and bases.

- Vacuum-tight, rigid meter tube lining, even at high temperatures.
- Swivelling housing head with illuminated graphic display.

• Operation of device via optical keys without opening the housing.

- Minimal maintenance and care requirements.
- Pharmaceutical version available with all required certificates.

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Cement Industry Solutions

n today's working environment, especially in the Cement Industry, it is essential that all economic and safety issues are addressed. By using inferior equipment, you could see an increase in breakdowns, system shutdowns, material waste and even fatalities.

Kinetrol units can be used in many processes across a Cement Plant. These include:

Pneumatic Vehicle Unloading

Rail and road vehicles can be unloaded using pneumatic conveying systems. Kinetrol can be used to control the flow of material on these systems. Flow into silos needs to be controlled to reduce abrasion and wear as well as prevent product deterioration.

Silo Discharge

Flow control gates are used for controlling, metering and shutting off the discharge of material from silos and bins. Kinetrol assemblies give accurate control of gates to give controlled feed of cement.

Air Cooler Dampers

Damper valves control the air intake into the clinker cooler. Manual handle override exists in case of power failure.



Distribution Loading

Flow control gates controlled by Kinetrol actuator and positioner assemblies feed vibratory conveyors that feed the truck loading chutes. The precision and control offered by the these assemblies means vehicles can be quickly and accurately filled. The robustness of the assemblies mean they can withstand the harsh dusty environment.

Bagging

Controlling the flow of cement to the bagging area allows for better productivity and downtime. Positioner assemblies allow for cement flow to be accurately regulated. Units are also installed on automated cement sampling units ensuring consistent quality.

Emission control

A number of companies use Kinetrol actuator packages in their environment impact solutions. These systems can be used to reduce carbon dioxide and dust levels emitted from a plant.

Cement Depots

In addition to cement plants a number of these applications, e.g. silo discharge are replicated in cement depots.

The Kinetrol Rotary Vane Actuator consists of a single moving part. It is therefore the simplest and most reliable unit for quarter turn rotary actuation. It has multiple advantages over standard Rack & Pinion actuators, cylinders and motor drives, especially in terms of durability, reliability, efficiency, accuracy and compact size.

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When Every Centimetre Counts - VEGABAR 82 As A Safety Device At A Reservoir



The Schlegeis reservoir is part of the "green battery" that provides balance and control energy and also contributes to flood protection in Zillertal. A pressure transmitter from VEGA now measures the water level exactly to the centimetre and is thus, together with a level scale, an important component of the safety system of the dam.

For many tourists, Schlegeis reservoir is an idyllic recreation area in the mountains. For Michael Sporer and his colleagues the lake is an important part of the safe, clean and affordable power supply. "Schlegeis is one of the green batteries of the Alps," explains Michael Sporer, who, together with his team, is responsible for the control technology in the Zillertal power station group of the Austrian power company VERBUND.

The high-capacity storage power station group Zillertal consists of eight power stations, seven reservoirs and numerous stream channelling systems. The Schlegeis reservoir, located at an altitude of 1782 meters, can accommodate up to 126.5 million cubic meters of water and, with its imposing 313-meter high and 725-meter long dam, is a sight to behold.

To get a better idea of the immense volume of the storage lake: The volume corresponds to a three-meter wide and onemeter deep ditch around the entire Earth at the equator. The lakes work like batteries.

"When the demand for electricity is low, the pumpedstorage power station Roßhag and Häusling pump water from the Stillupp reservoir to the higher Schlegeis and Zillergründl reservoirs. But when electricity is needed, for example at peak demand times, we can route the water from the reservoirs to the power stations within minutes via hydroelectric tunnels," continues Sporer.

VERBUND - Austria's leading power company

All the power stations belong to VERBUND, Austria's leading power company and one of the largest producers of hydropower in Europe. Every year, VERBUND generates around 30 billion kilowatt hours of electricity from renewable sources. In addition to supplying power, the reservoirs play an important role in flood protection. The large Schlegeis reservoir holds back snowmelt and storm water run-off, thus contributing to flood protection in Zillertal.

All of the facilities, whether it be power stations, reservoirs or stream channels, are interconnected via tunnels, which often run for kilometres through the mountains. The water masses are controlled by a complex interplay of turbines, pumps and valves.

All systems are automated, but also centrally monitored and operated from the central control room in Mayrhofen, where Sporer and his colleagues work.

Sporer says that he's been working together with VEGA for roughly 30 years already. Sensors for solids detection, differential pressure measurement as well as level and pressure are used at many different locations in the power station network – in the various valve chambers and stream channels, for example, but also in the Roßhag generating station with its enormous turbines.

"I estimate that over 80 measuring points are equipped with VEGA sensors. Especially in the past six to eight years we have expanded our sensor inventory enormously."

Exact level

One of the measuring points is responsible for a particularly important task. Not only for economic reasons is it crucial to know the exact level of the water in the reservoir, but also for safety reasons.

"Considering the large surface area of the lake, every centimetre of additional height translates into an enormous amount of water," explains Sporer. "Although it hasn't happened yet, a reservoir can, theoretically, overflow in severe weather conditions, such as prolonged heavy rain or thunderstorms. In order to avoid such an event, we have implemented a comprehensive package of security measures, e.g. the rerouting of streams. Exact information on the water level is thus absolutely necessary."

To ensure that the high accuracy requirements are met, level scales are prescribed by the regulatory authorities. These devices measure the level of the reservoir over the entire height, i.e. 120 meters, with centimetre precision. The authorities also require a redundant measurement.

Level scales meet the accuracy requirements but are also very cost-intensive. For that reason the power company looked for a less expensive solution. Up to that point, VERBUND had been using a pressure measuring system for the redundant measurement. It basically fulfilled the accuracy requirements, but the measured value output had a relatively high hysteresis.

Although the company had managed to live with the pressure measuring system for some time, it was decided that a better solution had to be found for the long term. "From our experience we knew that VEGABAR 82 could easily handle the task. The only problem was the measurement data output, as the analogue resolution was no better than 7 to 8 centimetres".



VEGABAR 82 takes on the task of redundant measurement, determining the water level in the reservoir with centimetre accuracy.



There are numerous sensors from VEGA not only in the dam itself, but also in the Roßhag power station. Compared to this huge shut-off valve, the two sensors are tiny.

The universally applicable pressure transmitter VEGABAR 82 has an abrasion-resistant ceramic measuring cell and is characterized by maximum operational reliability and safety. Its sensing element is the CERTEC[®] measuring cell with robust ceramic diaphragm.

The process pressure deflects the ceramic diaphragm, thus effecting a change in capacitance in the measuring cell. This is converted into an electrical signal and outputted as a measured value via the output signal.

But a resolution of 1 centimetre was required! So in order to get a resolution in the millibar range, a VEGABAR 82 of the highest accuracy class, with a measuring range of 0 to 10 bar, was chosen.

The problem of measurement data output was solved by means of a HART signal, which was forwarded through a Wago module and converted to a protocol according to IEC 60870-5-104. Now, the operators in the central control room also get the redundant water level with centimetre precision.

"It is quite impressive that a pressure transmitter can compete with a measuring system that is 10 times more expensive," says Sporer about the measurement, which has now been working flawlessly for two years.

Installation and setup were simple and straightforward. "Basically we had two measuring systems we could use to monitor the level value: the level scale and the previous redundant measurement. Since we were already familiar with VEGA sensors, installation and setup went as planned. The sensor was simply mounted on the old mounting socket," recalls Sporer.

Double and triple security

To be on the safe side, the measurements are checked again manually. There are special measuring points in the entire dam that are regularly checked during building inspections. There are also other measuring points – just in the 131-meter-high dam of the Schlegeis reservoir alone there are around 1,000 hidden measuring points, some of which transmit their measuring results electrically to the central control room in real time.

In addition, a team of qualified technicians performs regular visual inspections, does additional measurements and records and evaluates the measured values.

Outlook: At the moment, pumped-storage power stations are the only noteworthy technical method for efficient, largescale storage of electrical energy. Within minutes, water can be sent to the lower-lying power stations to cover peak power demands.

Despite decades of experience with the technology (the first pumped-storage facilities were built in the 1920s), the challenges have changed appreciably with the expanded use of renewable energy in the course of the energy revolution.

"The more alternative energy is generated, the more difficult it is to predict how much electricity is actually needed throughout the day," says Sporer. "We're accustomed to handling peak periods and working very flexibly, but predicting when and exactly how much electricity is needed has now become much more difficult." The focus is now on controlling energy flows; there's no time for non-essential maintenance work.

So for the process control team, it's all the more important that the sensors work flawlessly and deliver reliable measured values, and that repair and servicing are simple and straightforward if malfunctions do occur.

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What's New ;, PROCESSI

Automated Weld Seam Tracking - Profile Sensors



utomated weld seam in robot welding cells is a complex A task in a harsh industrial environment. The micrometeraccurate detection of the guide point with different types of joint by 2D/3D profile is one of the most effective solutions for this challenge.

In combination with Wenglor's uniVision software, the new weCat3D MLZL 2D/3D profile sensor not only combines the necessary precision and profile quality (1,280 points per profile), but also offers convenient installation, integration, robustness and is user-friendly. The working range is from 74 to 158 mm and the measuring range in X from 39 to 62 mm.

The slimline housing of the MLZL - with integrated cooling and rinsing - enable easy and space saving installation directly on the welding torch. With dimensions of only 33 x 183 x 69.8 mm, the robot can also operate in narrow corners. The sensor does not require any additional protection housing (IP67) nor does it need to be tilted for alignment. The design also offers sufficient protection against welding splatter and disturbing ambient light.

Optionally equipped with a red or blue laser, users can choose between three laser classes: 2M, 3R or 3B. The MLZL relies on the advanced laser technology of the weCat3D series

from Wenglor to deliver outstanding profile quality and optimal seam tracking.

25.3

Software uniVision 2.5.0 for Welding Applications

The configuration standard software uniVision receives a stand-alone module specifically for weld seam tracking. This means the welding applications can be set up in just a few clicks.

Due to the robust algorithms, tracking points can be reliably determined even in the event of faults in the joint course, such as with datum points. Predefined templates, where all common joint types are saved, significally reduce the configuration work. The result can be visualised on a web-based basis.

Several interfaces are available for direct integration into robot controls from Kuka, Fanuc, ABB, Kawasaki and Yasawa as well as their software.

The uniVision software is used to analyse images and height profiles in the field of industrial image processing. Two and three dimensional data from smart cameras, vision systems, smart 2D/3D profile sensors and IPCs with 2d/3D profile sensors can also be evaluated.

Up to 25 different software modules and different templates are available to users in total depending on the selected hardware. The new combination of software and hardware offers flexible solutions for every user. The most convenient and comprehensive system consists of a sensor, control unit with pre-installed uniVision software application and optional robot interface.

There are also other combinations with or without control unit and customer-specific integration software which translates to Wenglor being able to offer the right solution to suit every individual requirement.

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EtherCAT and PC-based control: New Automation Technology



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- integration of all essential machine and system functions on one control platform
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Scan to discover everything abou the Beckhoff control system

New Automation Technology **BECKHOFF**



25.3

Diaphragm Embossing Machine for Pressure Sensor Technology



The diaphragm embossing machine from Keller AG, which appears in anti-reflective red light, can be conveniently operated from all sides via the customer-specific CP3921 multi-touch Control Panel.

The Swiss company KELLER AG für Druckmesstechnik is a specialist in pressure sensor technology and offers an extremely wide range of products for a host of applications that require correspondingly complex production processes.

A diaphragm embossing machine used in prefabrication illustrates how the demanding process sequences can be automated with the aid of open control technology from Beckhoff, which is optimally scalable from a simple tabletop device to a large production plant.

Winterthur-based Keller AG für Druckmesstechnik was founded in 1974 by the inventor of the integrated silicon measuring cell, Hannes W. Keller, and proudly asserts itself as the market leader in the manufacturing of isolated pressure transducers and pressure transmitters.

The piezoresistive pressure sensors offer very high accuracy as well as pressure ranges from 5 mbar to 2,000 bar. In addition to more than 500 standard products, Keller AG also develops and produces customer-specific solutions.

In more than 35 highly specialized production islands, they manufacture large series of industrial OEM transducers, as well as special designs in very small quantities using the latest automated manufacturing processes.

Applications for the pressure transducers include monitoring groundwater levels, controlling aircraft cabin pressure, switching from natural gas to gasoline in bivalent vehicles and serving as reference sensors in laboratory technology.

Embossing the sensor diaphragm is an essential process step

Embossing the sensor diaphragm is an essential intermediate process during prefabrication, as Florian Wernli, Project Manager at Keller AG, explains: "Most of our pressure sensors feature a steel housing filled with oil. The diaphragm is crucial for transmitting the pressure of the surrounding medium to be detected via the oil to the measuring chip inside the sensor." This requires the diaphragm to have a special shape, which is achieved with a powerful automatic embossing machine.

Bruno Thalmann, Development & Production Equipment at Keller AG, adds: "After a leakage pre-test, cleaning with compressed air and a thermal equalization process, we carry out high-pressure embossing and a definitive leakage test in the same process step using a hydrogen sensor.

"This is followed by an error check based on image processing and artificial intelligence."

The central handling element within the embossing machine is a KUKA robot, which acts as a pick-and-place unit to feed the blanks into the process and separate the finished workpieces into OK and NOK parts.

Bruno Thalmann explains the advantage of this fully automatic embossing and inspection system: "Our goal was to automate a process that previously required three manual stations in production.

"In this way, we were able to increase both manufacturing quality and production quantity."

Florian Wernli confirms: "The higher productivity is due on the one hand to the fast, fully automatic process with a throughput time of only 15 s per workpiece, and on the other hand to the fact that production can continue at night despite staff working in a single shift."

Advantages of open and modular control technology

Keller AG has relied on PC-based control technology from Beckhoff since 2018. Bruno Thalmann sees advantages in the level of openness in terms of both programmability and the wide variety of supported interfaces.

The optimal scalability of PC-based control also manages

easily the system complexity or the desired degree of modularization from centralized to decentralized.

What's New in PROCESS

All in all, TwinCAT 3 benefits from a modern, objectoriented software platform that is integrated into Visual Studio^{*} and, together with TwinCAT HMI, offers powerful visualization capabilities that are consistent right through to tablet operation.

In addition to the high computing power of the C6920 control cabinet Industrial PC, further important solutions from Beckhoff include compact drive technology with One Cable Technology (OCT), the EtherCAT P and CP-Link 4 one-cable solutions, safety technology integrated into the system with TwinSAFE, and the simple integration of EtherCAT-capable third-party components such as vision systems, flow controllers, valve terminals and electric grippers.

Florian Wernli cites the simple robot integration as a particular example of the advantages of system openness: "By integrating the robot via the EL6695 EtherCAT bridge terminal and TwinCAT Robotics mxAutomation, it was possible to implement the pick-and-place functionality via simple configuration without the need for special robotics expertise.

"The fact that we have full control of the robot via PCbased control makes this the perfect solution for us."

In addition to the C6920, the hardware core of the automation solution is the CP3921 multi-touch Control Panel connected via CP-Link 4, which has a 21.5-inch display and push-button extensions.

According to Florian Wernli, this provides the machine end user with a control unit that is as convenient as it is striking: "For us, design is an extremely important factor within the overall machine concept. Added to this is the high display resolution, which is necessary for convenient access to our inspection system.

"Featuring a remote control panel mounted on a support arm, the design means that the machine, which offers 360degree accessibility, really can be operated quite flexibly from all sides."

Compact and flexible drive technology and I/O level

Since the automatic embossing machine handles only small workpieces, compact drive technology from Beckhoff is practically made for this application.

A total of 11 EL7211 and two EL7221 servomotor terminals, 11 EL9576 brake chopper terminals with ZB8110 external brake resistors, and 15 AM8100-series servomotors are used.

Complementary motion axes from the portal system are implemented via three AX5203 Servo Drives and AM803x servomotors.

According to Florian Wernli, EtherCAT also offers great advantages in terms of data communication: "We consistently rely on the EtherCAT standard because, for one, we can count on a very wide range of components from both Beckhoff and third-party suppliers.

"Another bonus is that we benefit from the extensive diagnostic functions and level of openness when integrating other bus systems, for example."



Most of the motion axes are implemented using compact drive technology from Beckhoff with EL72x1 servomotor terminals and AM81xx servomotors – shown here is the embossing core process with the pneumatic high-pressure press (left).

He sees another important aspect in the various options for reduced cabling effort: "Essentially, every cable we don't have to lay is a real bonus for us. PC-based control opens up additional optimization potential here with EtherCAT P - in addition to CP-Link 4 and OCT. In the I/ O area, we consistently rely on EtherCAT P – that is, in the case of the automatic embossing machine, on I/O Box modules from the EPP series."



With TwinSAFE terminals (top right), safety functions are also integrated directly and compactly into the I/O system.

Specifically, these are an EPP1004 4-channel digital input, five EPP1018 8-channel

digital inputs, nine EPP1809 and two EPP1816 16-channel digital inputs, as well as two EPP3184 4-channel analog inputs.

Bruno Thalmann also confirms the practical advantages: "EtherCAT P simplifies not only installation, but also maintenance. If, for example, a sensor fails, all you have to do is simply unplug the cable at the socket rather than having to pull the whole thing through all the drag chains. And, after replacing the device, you simply plug it in and the system is ready to go again."

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What is a 'Roots Blower'?

A Roots blower pump is a positive displacement Rotary Lobe pump that operates by pumping air or a gas with a pair of meshing lobes not unlike a set of stretched gears.

Air/gas is then trapped in pockets surrounding the lobes and carried from the intake side to the exhaust.

Why is the rotary lobe blower called a 'Roots Blower'?

The positive Rotary Lobe blower was designed in the 1850s by the two brothers Mr. Francis and Philander Roots.

It was later patented in 1860 by the brothers and "Roots" became the name of the design.

What is the basic principle of a 'Roots Blower'?

The Roots blower principle consists of the following: the process starts with air flowing from the inlet port into the element chamber.

The timed rotation of the rotors against the wall of the chamber creates a so-called 'air flow direction'. At this point,

there is still atmospheric pressure in these chambers.

As soon as the first lobe passes the opening to the pressure side, the system pressure is adjusted. This is called isochoric compression.

The rotors seal each other off to the inside, which prevents a change of pressure.

How does a 'Roots Blower' operate?

A Roots blower operates using the isochoric compression principle, also known as external compression. The pressure increase is achieved by intermittently transporting a gaseous medium (e.g. atmospheric air) into a system.

By forcing the medium from atmospheric conditions into a system with a given resistance (e.g. a water column, distribution network), the relevant pressure increase is achieved.

The Roots blower will operate at a controlled output level to overcome this resistance.

What is the Robuschi 'Roots Blower' series comprised of?

The Robuschi 'Roots Blower' series is known as the RBS bare shaft series, it is composed of three conjugate lobe shaped rotors (Tri-lobe) which rotate inside a pre-machined chamber.

The chamber is sealed by the rotating rotors, and the rotors are synchronised by means of a timing 1:1 gear ratio, positioned at the end of the shafts.





Bearings are positioned externally to the compression chamber with an oil lubricated system.

The drive shafts have labyrinth style oil seals, so called because of the labyrinth of grooves that the oil must pass through.

The splash lubrication system uses a fine mist of oil for lubrication.

With this design one gets oil free compressed air or vacuum.

 Rotary lobe blowers can achieve a pressure of up to 1,000 mbar (g), vacuum to 100 mbar (a) & air flow to 25,000 m³/h

• There is a very wide range of models, sizes, options, and configurations available.

• Optimal performance and maximum uptime with consistent quality and reliability in every application.

Also, the new ROBOX range of Robuschi Rotary Lobe Blowers / Vacuum exhausters has been reinvented, focusing on delivering exacting customer

requirements.

Recently launched is the new ROBOX blower unit concept, a cutting-edge solution that can accommodate rotary lobe and screw technologies to provide users with greater choice than ever before in helping meet their industrial air and gas needs.

With the new ROBOX, the difference between lobe and screw technology is reduced to just a few components.

This makes it simpler than ever to change from one technology to another and embraces the ongoing shift in mindset from capital investment to total cost of ownership.

Robuschi rotary lobe blowers are available at varying pressures above atmospheric up to 1,000 mbar (g) and for vacuum duties up to 100 mbar (a) along with maximum air flow of 25,000 m³/h.

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Goodbye to the Manometer Needle!



K eller's electronic ECO 2 manometer is an instrument that can perform all standard measuring jobs at an exceptionally low price.

Compared to its mechanical predecessors. Keller's digital technology offers high resolution, excellent repeatability at very similar prices.

The ECO 2's dual display updates twice every second, showing the measured value and the minimum or maximum value attained.

As a special feature, the ECO 2 has a Zero Tare feature, allowing the user to set the zero to any pressure, so that the manometer will then always show deviations from the Zero Tare value as the actual value.

The user-friendly two-key operating system provides access to the entire range of functions: the stored MAX/ MIN can be erased and reset to zero, or the device can be switched to continuous mode. In continuous operating mode, the battery has capacity for up to 1000 hours.

The ECO 2 electronic manometer has a standard automatic switch-off time of about 15 mins after the last key function, this extends the battery life where continuous operation is not required.

25.3

The easy-to-handle ECO 2 is available with two practice-based measuring ranges of -1...30 bar and 0...300 bar in the compensated temperature range from 0 to 50°C, the economically priced standard manometer offer typical overall accuracy of 0,5%FS (Full Scale). The standard design features IP65 protection, and the optional protective cover means that it can also be operated reliably outdoors in any weather conditions.

This instrument is also available in an Exia ATEX approved version compliant with 94/9/EC. The standard delivery includes a swivel pressure connection that optimises readout alignment during operation.

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Non-Contact Tools Increase Electrical Safety

t's the foundation of any electrical safety program: limiting the exposure of workers to the electrical hazards of shock and arc flash.

Using test leads and clamps to probe inside a live panel when troubleshooting and performing routine maintenance always exposes workers to danger.

Electrical personal protective equipment (PPE) is a last line of

defense and must never be relied upon as the primary method of protecting electricians and technicians.

Safe work practices, including the use of non-contact test tools that do not require electrical workers to place themselves in harm's way, must first be considered when it comes to electrical safety.

Fluke Connect[®], introduced in 2014, added a level of efficiency and effective collaboration for maintenance and troubleshooting, in all kinds of manufacturing, commercial, and retail facilities.

echnicians can monitor real time results from more than 20 different Fluke test tools from a smart phone (up to 10 at a time on iPhone and 6 on Android). This information can also be securely shared, in real time, with authorized team members in other locations.

In addition, test results and maintenance data can be collected through the Fluke Connect app and stored by asset in secure Fluke Cloud[™] storage.

That means that troubleshooting and maintenance staff can access that data in the field to compare new measurements to baseline measurements to more quickly identify problems.

The end result is that technicians can use Fluke Connect to quickly identify and diagnose problems while securely sharing the related data, when they want and with the specific people they have given permission to view it.

The Fluke 376 FC True RMS AC/DC Clamp Meter with iFlex and the Fluke 902 FC True-rms HVAC Clamp Meter allow the technicians to access tight places and work around large, awkward conductors and can transmit measurements to a smartphone or tablet for later, detailed analysis. Those measurements can be uploaded to the cloud. Technicians can combine measurement data from multiple Fluke Connect test tools to create and share reports from the job site via email and collaborate in real time

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with other colleagues with ShareLive[™] video calls or email, increasing productivity in the field.

The 376 and 902 clamp meters also decrease the frequency that technicians will need to wear personal protective equipment when working on high voltage/current panels.

Technicians simply turn off the panel, verify the panel is deenergized using standard safety procedures, place the clamp and sync it to a smartphone with the Fluke Connect app, close the panel, reenergize it, and take measurements from a safe distance.

The Fluke 376 FC True-rms AC/DC Clamp Meter with iFlex features:

- Integrated VFD LowPAS filter for low driver measurements
- True RMS voltage and current for non-linear signals
- Measureable to 1000Amps DC and > 25 000Amps AC
- Finds and log intermittent faults, and establishes base-line and trends
- Creates and transmits results in report-form wirelessly via Fluke Connect[®] Measurements app from site

The Fluke 902 FC True-rms HVAC Clamp Meter features:

- Dual rated CAT III, 600 /CAT IV, 300 V
- Microamps for testing pilot light sensors
- Resistance up to 60 kilohms
- AC current, AC/DC voltage
- Capacitance and contact temperature

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All-in-One Document Process Calibrator



The Fluke 750 Series Documenting Process Calibrators are specifically designed for process professionals in the gas and oil refining; chemical production; pulp and paper; food and beverage; water-wastewater industries. 23

The 750 Series combines all of the process calibration tools

into one very powerful calibrator that simply does everything. Process professionals have long trusted Fluke's Documenting Process Calibrators to increase their troubleshooting and maintenance capabilities and can be confident that this will continue with the improved model.

The 750 series is a multi-function calibrator – sourcing, simulating and measuring pressure, temperature and electrical signals.

There needs to be no downtime while operators learn a new tool – it can be picked up and used immediately (without training) thus no loss in productivity. The improved screen

makes for easier use in the field or dark environments. The improved RTD source accuracy handles even more workload.

The 754 pushes the envelope of document process calibrators by providing the ability to maintain and calibrate selected HART transmitters - a key process industry instrument.

Process plants rely on smart transmitters so they need calibrators that can communicate via industry standard digital protocols. The 754/753 combines HART communication capability in a documenting process calibrator to deliver an integrated communicating calibrator.

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Compact IR Camera for Glass Manufacturing

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G lass manufacture requires special equipment for noncontact temperature measurement due to its physical properties. In addition to the special infrared thermometers, Optris has on offer an industry-specific, thermal imaging camera Optris PI 450 G7 with 7.9mm filter.

Optris cameras are highly regarded in the industry due to their compact design and the excellent price-performance ratio, and with the new G7 model of the PI series, processes in the glass industry can now be regulated by even more highly accurate temperature measurement on glass surfaces.

Application as line scan camera for tempering processes

The Optris PI 450 G7 infrared camera can be used for various tasks in the production, refinement and processing of glass panes, glass bottles and other glass products.

The line-scan camera function which, in the tempering of toughened glass for instance, measures the temperature

distribution between the heating zone and the cooling zone, and automatically regulates heating or cooling elements where necessary.

It can also measure pane temperature during transport of glass panes on conveyor belts using the line-scan feature of the license-free Optris PI Connect software.

At an ambient temperature of up to 70°C, the infrared camera is fully operational without a cooling jacket. With a jacket size of 46x56x90 mm3 and a weight of 320 grams (including the lens), Optris PI 450 G7 is particularly suited for applications in confined spaces and for installation in industrial facilities.

Due to an imaging frequency of 80 Hz, glass products can be continuously tested, even in fast processing.

The typical parameters of Optris cameras – high measurement speed (80 Hz), high optical resolution (382 x 288 pixels) and compact design – have been kept to allow for the capturing of real-time thermal images of everything from glass beads right up to large panes.

The IR camera is used as a line-scan camera in the field of sheet glass production and offers various possibilities for documenting and controlling the process.

This compact, high-performance infra-red camera for the glass industry is available with interchangeable lenses and industrial accessories.

The camera is shipped with Optris PI Connect, an extensive thermographic analysis software package.

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Ultra-Compact Industrial PC and TwinCAT Power Robot-Based Cake Production

When thinking about robots used in Japan, many people imagine largescale robots in manufacturing plants, collaborative robots (cobots), and hospitality and care applications.

A novel solution for food manufacturing has been unveiled by Juchheim Co., Ltd., a confectionery manufacturer that has been in business for over 100 years.

The "Theo" robot bakes high-quality Baumkuchen. Theo is controlled by an ultracompact Beckhoff Industrial PC with TwinCAT software and supported by an artificial intelligence (AI) application.

The engineering firm Matsuura Denkosha Co., Ltd. provided support during the development of the control system, including the integration of a Denso Wave robot.

Founded in 1909 and operating in Japan since 1922, the Juchheim Group, with administrative headquarters in Kobe, runs more than 350 stores in the high-end Baumkuchen segment and is a supplier in Japan and Singapore. Baumkuchen is a German style of layered cake that is also popular in Japan.

Ever since the company was founded, the Juchheim confectioners have been baking the delicacy

according to the same recipe – without any food additives.

"Baking Baumkuchen requires advanced skills and experience on the part of the confectioner," emphasizes Mr. Matsumoto, Managing Director of Juchheim's central plant. However, if the oven's parameters can be captured and set remotely, and if the baking temperatures can be displayed precisely, Juchheim's pastry chefs can remotely control local machines to produce top-quality Baumkuchen.

"With Theo, Juchheim is taking one step further," said Mr. Yokoyama, a Juchheim consultant. "Through integrated AI and the expertise of master confectioners, Baumkuchen can be made anywhere in the world with the same Juchheim quality." "The idea for Theo originally came from Hideo Kawamoto, the President of Juchheim," adds Mr. Matsumoto.



The precise skimming of the dough after applying a new layer of cake also needs to be "learned" via an AI inference.



A Beckhoff IPC C6030 not only controls the conveyor systems and oven doors via TwinCAT; the trained AI model also runs on the same device under Windows.

In parallel with the development of Theo, the company planned the construction of a new building complex with the theme of food innovation – the "Baum Haus" in Sakae, Nagoya.

Part of the concept was also a transparent baking studio, which was further developed with Theo into a fully automated Baumkuchen studio.

The perfect 13 layers of dough with PC-based control

The process of making a Baumkuchen is simple in itself: a rotating core rod is repeatedly coated with raw dough and placed in the oven – until 13 layers of dough are evenly baked.

Before baking, the dough container and core rod must be transported to the oven and pushed in. This is normally done by operating personnel

but can be automated easily using a conveyor belt and robot arm.

However, the baking itself requires an expert. Theo replicates the expert's skills with the help of AI.

For this unprecedented task, Juchheim selected the engineering firm Matsuura Denkosha as its development partner. The company not only has expertise in AI, but also extensive experience in the control of articulated robots.

"The Baumkuchen plant consists of three Theos, a vertical articulated robot and a conveyor belt that transports the dough containers and rods," explains Mr. Kitano, Managing Director of Matsuura Denkosha. All components are controlled by an ultra-compact Beckhoff C6030 Industrial PC with Intel[®]-Core[™] i7 processor and networked via EtherCAT.

The high-tech bakery installed in the Baum Haus is almost completely automated.

All the operator has to do is prepare the Baumkuchen dough and the core rods, and place them on the conveyor belt, select one of the three ovens on the control panel and start the baking process.

Then the conveyor belt automatically transports the dough container and core rod to the specified position.

The robot picks up the container and rod and places them in front of the oven. Then the robot begins to coat the core rod with dough and apply the layers one by one. The AI functionality implemented in the oven monitors the process and ensures highly precise baking.

Mr. Kitano explains, "The advantage of the Beckhoff IPC and TwinCAT software is real-time process control via EtherCAT and the Windows integration."

In this system, TwinCAT 3 PLC controls the conveyor belt, the rotation of the oven, and the opening and closing of the door using EtherCAT drives and motors that are precisely synchronized with the robot's motion.

In addition, the IPC offers high scalability so that Juchheim's own Windows applications can be used as can solutions for remote system maintenance. The I/O components from Beckhoff also play an important role. After all, there are many sensors and cameras to integrate.

The compact housing and the wide range of EtherCAT I/Os enabled the system integrator to save control cabinet space and minimize engineering complexity.

AI inference and TwinCAT PLC on a single platform

The AI functionality runs as a Windows application on the same IPC as TwinCAT. "We use multimodal AI technology to monitor the quality of the Baumkuchen," Mr. Kitano points out. For this purpose, high-performance cameras are installed in front of each oven to capture images of the cake surfaces. This data is linked to other sensor data, including those from radiation pyrometers.

The AI model is based on a Convolutional Neural Network (CNN), and was previously trained in Python in a separate environment. It is implemented in the standard IPC as a Windows application.

As the number of dough layers increases, so does the diameter of the Baumkuchen. Accordingly, various parameters can vary, such as the distance from the oven wall and the baking time required to achieve a perfectly baked dough layer.

It is an extremely delicate process that requires careful monitoring of baking conditions up to removal from the oven at the optimal time, and for the application of the next layer of dough. In addition, the surface of the dough must be smoothed with a spatula to give the Baumkuchen its characteristic cylindrical shape.

Five to six batches of Baumkuchen are usually required for the system to reproduce the expert baking process of a master pâtissier. A batch requires 30 min to bake, so the total time for data collection is about 3 h. "Based on this limited amount of data, it takes about 20 hours to train the AI model, including the final tests," explains Mr. Kitano.

During operation, Theo checks the image data from the camera and the data from other sensors in real-time to determine the quality of the Baumkuchen: when a dough layer is in optimal condition, it is reported back to the control system. TwinCAT then stops the rotation of the dough tube and opens the door so the robot can remove the Baumkuchen.

The total time required from data input into the trained model, including the inference output, until feedback to the control is around 100 to 200 ms.



With PC-based control and AI support, Juchheim can offer pâtisseriequality "Baumkuchen" layered cake at all its locations.

Mr. Kitano states, "This extremely fast response time for AI applications is possible because the AI inference and PLC control are integrated in a single control platform, the Beckhoff IPC."

Another technical challenge is the constant coating of the dough rolls with identical amounts of dough. For this purpose, TwinCAT controls the optimum position and angle of the rotating rod so that the robot can apply exactly the same dough thickness for each layer. This is a huge advantage over the manual process, as material loss is minimized. "From this point of view, Theo is a better Baumkuchen baker than a master pâtissier," Mr. Yokoyama points out.

In addition to baking, the other conditions must remain stable for consistent quality, i.e. the dough should always be the same. "If the dough recipe is changed, the trained model no longer works perfectly," Mr. Yokoyama continues. Then, in collaboration with the master pâtissier, a new inference model must be created based on the modified dough.

Control flexibility supports easy optimization

The system configuration was optimized during pilot operation in the Baum Haus: The position of the safety light curtain and the layout of the conveyor belt were changed to improve the workflow for the operators. It was possible to do this easily because of the high degree of freedom with the EtherCAT network topology. System updates could also be configured in a straightforward manner, thanks to the flexible TwinCAT engineering platform.

The Baum Haus is home to the world's only automated Baumkuchen studio with Al ovens, conveyor belts and robots. Several stand-alone ovens with Al functionality and Theo, on the other hand, are in operation across Japan – even as mobile Baumkuchen studios.

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Five Challenges in Packaging and Palletizing Processes Overcome with the Help of Smart Robotics Solutions

The new product has just left the factory, in a shelfready package in the specified mixed ratio to meet customer needs. The packaging has been handled by another company: a co-packer.

Co-packing can be found in all Fast-Moving Consumer Goods (FMCG) markets, but especially in the higher-priced product segments such as personal care or confectionary, to name a few examples.



It is a fast-growing activity to satisfy the consumer demand for more variety.

If there is a lack of space, resources, or infrastructure in their own company, handling these activities yourself might simply be too expensive. Many decision-makers may decide to outsource the re-packaging of their products to special service providers.

Almost 90 % of respondents to a study published by the European Co-Packers Association (ECPA) state in this context that they would offer a complete service.

According to three-quarters of the co-packers, the requirements, particularly in terms of quality, have also recently become significantly more demanding.

What should be considered in connection with co-packing processes and the increased demand for variant-rich products in small individual quantities – High-Mix, Low-Volume (HMLV)? New strategies and technologies are needed to support packaging processes and co-packing in the HMLV environment:

Agile manufacturing in focus: Why flexibility matters now

To approach the topic, it is first worth looking at consumer behaviours, which is currently undergoing significant changes:

The trend is moving from mass consumers to consumers who make individual decisions – regardless of whether they are concerned with health, safety, freshness, or sustainability.

Added to this are changes in pack format, leading to polarization in pack size (large family and individual packs), different store displays, and advertising banners. In this context, HMLV manufacturing models are a consequence of the growing diversity of products and packaging.

A good example to illustrate such an HMLV process in the packaging environment is the repackaging of food products in multipacks –for example, different chocolate bars in a single box. Here, the focus is not only on physical packaging and repacking, but also about supply chain and logistics expertise, warehouse availability, the ability to defer packaging tasks, flexibility, and agility.

And the most important: Quality. The right amount of the right products in the right package.

Robot-assisted automation solutions offer support

Smart robot-based automation solutions can help overcome the need for manual labour that arises in HMLV production. Such solutions include robotic picking, packing, palletizing, machine tending, and optimized automated intralogistics.

Robot-based automation gives co-packing service providers or producers who

handle this activity in-house the flexibility, productivity, and reliability they need to handle ever-shorter product life cycles, changing package designs, different package sizes and product variants.

The following typical five deployment challenges and solution options show what this can look like.

Challenge 1: Mixing products in secondary packaging

Mixing different single products in a display carton presents challenges. One example of this is the integrity and correctness of such multipacks must be ensured. Manual processes might be very flexible but may affect the quality and are not ideal for repeatability. In addition, it may be hard to find and retain employees for these tasks.

Another requirement is the transport of goods and consumables. Incoming goods awaiting packaging need to be processed quickly, but the packaging material must also be readily available.

To cope with this, pick-and-place technology for secondary packaging processes is the ideal solution.

To handle and improve the flow of goods, a solution combines a complete range of different robotic automation technologies, for example, into a single, fully integrated packaging system that offers built-in algorithms that allow the different production lines to be coordinated and flow rates to be optimized.

No programming skills are required, as the graphical user interface (GUI) is easy to understand and use. With the help of a recipe manager, the line can also be configured for several products and switched between them at the touch of a button.

For users, this means greater flexibility, fewer machine idle times, a reduction in the workload for employees, and lower costs and complexity in the (re)packaging line.

Challenge 2: Material replenishment on the line

Optimal replenishment on the line is key to improving overall equipment effectiveness (OEE), avoiding waiting times at machines. But that's not all: the manual activities involved in performing these tasks are often not ergonomic and can pose safety problems.

Therefore, it makes sense to improve line-side replenishment (LSR) while avoiding the need for operators to perform these repetitive tasks. Finally, automating the supply of consumables minimizes intermediate storage of consumables and waste in the re-packing area.

Cobots, perhaps combined with mobile robots, can remedy this situation by assisting with material feeding. Such collaborative robotic solutions can improve throughput while allowing employees to focus on value-added tasks.

The cobot picks up packaging materials from one position and places them directly onto the conveyor belt or into the packaging machine. Consumables no longer need to be unloaded manually.

Examples include selective compliance assembly robot arms (SCARA) tasked with loading bottles or other containers, or highspeed parallel robot solutions used to align and position items. Such automated consumable supply reduces cost and effort but also improves production consistency and output.

Employees are freed from mindless, repetitive tasks and, in addition, packaging and product combinations can be better controlled through traceability.

Challenge 3: Intralogistics and intermediate storage

Basic processes, such as the production flow in a factory, are already highly automated. Secondary processes such as the supply of consumables or the disposal of waste, are often not yet automated.

Employees often still carry or push around the materials. A manual activity, which hinders efficiency and can lead to errors.

Aspects such as temporary storage or occupied production space involve significant, often hidden, costs for production managers. Innovative robotic solutions can help here to optimize the throughput and availability of required goods. Material transport and shipments can be handled by autonomous mobile robots.

The advantages of automated material transport are obvious: automatic replenishment ensures reduced inventories, space optimization, and just-in-time procurement. At the same time, waste can be minimized, and safety strengthened. Pallets are no longer needed along the line and waiting times are eliminated.

Added to this is the traceability and control of stock, while the movement of small-batch inventory (WIP) is automated.

OMRON robot solutions are based on traditional stationary robots, collaborative robots (cobots), autonomous mobile robots (AMR), or the MoMa (mobile manipulator).

For the AMRs OMRON Fleet Simulator additionally offers the industry's first mobile robot simulator for factory and manufacturing applications.

It plans traffic and workflows for fleets of autonomous mobile robots, allowing users to identify potential bottlenecks early and optimize workflows without having to deploy a real robot at all.

Challenge 4: Unpacking and distributing goods

Distribution centers (DC) or repacking sites must deal with other challenges, including depalletizing and unpacking cartons, transporting goods to be repacked, and also disposing of waste. In addition, there is a steady increase in SKUs and a shortage of skilled labour, which further complicates the tasks. Fully or semi-automated handling and robotic transport can save a lot of effort here.



For example, robots can be used to unload pallets.

Incoming goods are inspected. The cartons are then loaded either onto a conveyor belt or onto autonomous mobile robots (AMR), which then transport them further.

AMRs can operate as part of a fleet that drives autonomously and executes orders based on a picking system. The AMR can identify obstacles, avoid them, determine the optimal path, and adjust it if the environment changes. At the same time, cobots can also open boxes through automated cutting processes.

Here, the size of each incoming box is first determined to automatically find the programmed cutting lines. Cartons can be fed in a predetermined size sequence or mixed order. Packaging lines become more flexible and efficient by using such solutions. Traceability and safety also benefit.

Challenge 5: End-of-line palletizing

Palletizing is not a suitable task for human workers. It is repetitive, high cycle, and thus exposes workers to muscle aches and injuries. Workers can make mistakes such as mixing with wrong products or mispositions and missing boxes inside the pallet.

To address this, the market is increasingly demanding palletizing solutions that are easy and quick to install and configure, without the need for complicated robot programming.

Innovative EOL palletizing solutions provide support here. Cobots significantly simplify palletizing. Palletizing with collaborative robots helps users quickly set up their palletizing specifications.

Compared to industrial robots, such a solution requires 50% less floor space. A safety fence or cage is not required, and operators can safely work side-by-side with the robot, enabling continuous operation. Operators can easily remove an entire pallet without stopping the cobot.

Modern automation and robotics solutions help make copacking and packaging operations fit for the factory of the future by enabling a perfect balance between productivity and ease of use. Solutions are available that are scalable both upward and downward to handle swinging demands from the supply chain and reduce the total cost by reducing topics such as floor space required or intermediate stock.

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New Welding Robot for Pump Protection Valves



Everything from a single source - it's more than just a marketing promise! Over 50 drawings of various components served as the basis for the automation solution developed by EWM for pump protection valve manufacturer, Schroeder Valves GmbH in Germany.

All of the leading specialist's components did have one thing in common, they were all rotationally symmetrical. This was the starting point for welding machine manufacturer EWM in their mission to develop a custom automation solution tailored to this multifaceted challenge.

Automatic Recirculation Valves / Minimum flow valves from Schroeder Valves are used all over the world for transporting liquids using centrifugal pumps.

Their areas of application include refineries, power plants and nuclear plants, in the transport of liquefied natural gas (LNG), as well as in offshore rigs.

They are also used throughout the chemical and manufacturing industry (steelworks, pulp, sugar, distilleries) and in the utilisation of renewable energies.

Different Sizes – One Application

The aim is to weld all pump protection valve components automatically.

These valves are connected directly to the pumps and ensure continuous operation of the pumps to prevent them running dry or being damaged by cavitation during minimum flow conditions.

The pump protection valve is largely made up of the valve body and the cone, which moves inside the valve body. The sealing surfaces between the valve body and the cone must be absolutely air and watertight.

This is the only way to ensure proper functioning of the pump protection valve for decades to come.

Normally, these components are made using low-cost construction steel DIN 1.0460. The sealing surfaces are reinforced with stainless steel DIN 1.4370.

This process was previously performed manually, however, due to both the shortage of good welders and growing quality assurance requirements, automation of this step was crucial.

The inner diameter of the valve bodies and the cone diameters were between 32 mm and 400 mm. The components

being moved also differed vastly in weight, ranging from a few hundred grams to two and a half tonnes.

But all of the parts had one thing in common: they were all rotationally symmetrical, making them perfect for an automated process.

With this as a starting point, EWM was able to get the system planning ball rolling.

From Small to Big – Multiple Processing Stations

It soon became clear that only a robot system would fit the bill when it came to automating this particular process. Having to deal with so many different part sizes was a cause for concern.

Large parts require a large welding positioner. These, however, cannot provide the dynamics required for the smaller components.

This quickly gave rise to the idea of three processing stations: one large L-positioner with tilting function for the large valve bodies, one small turning/tilting positioner on a system bench for the small valve bodies, and a third station with a system bench without positioners for any other components.

The height of the building was also a particular challenge. The parts had to be able to be placed on the benches with the crane. The crane hook, however, was only approximately three metres high – extremely small for an industrial application.

To guarantee accessibility while ensuring extraction, either the extraction hood or the system benches were made to be mobile.

The robot was fitted in an extremely small booth in the centre between the three stations. This booth also includes both the power source and a Titan XQ.

These are positioned behind the L-positioner at the large processing station.

The Rob 5 drive 4X wire feeder mounted on the robot arm ensures secure wire feeding. Access to the Fanuc Arc Mate 100 iD in all three stations at all necessary positions is also ensured thanks to the extreme arm length of two metres and optimised space inside the booths.

Special Torch for Extreme Spaces

Each valve body is equipped with a cone guide which is welded from above. With an inside diameter of just 32 mm, access is extremely difficult.

For manual welding, the welder is unable to see the weld seam and instead must rely on their experience. Even for automated welding, these spaces are very unusual.

EWM was only able to accept this job because they manufacture the torches, emphasising the significance of the welding torch for this application.

The welding torch for Schroeder Valves is a special construction with a particularly small torch head and unconventionally long torch neck.

Of course, the special application had to be adapted to accommodate this unusual design: because dilution between the parent metal and the armouring needs to be as low as possible, only a little energy is used.

This ensures safe heat dissipation despite the extreme welding torch dimensions.

Secure Welding Results Through Defined Parameters

As the parts were rotationally symmetrical, it was easy to teach the components; teaching is always based on the same programs. Even new components can be welded automatically quickly.

Users simply have to set the radius, number of passes and the geometric dimensions of the surfaced parts and the robot control will take care of the rest.

The desired welding result is always guaranteed because the welding procedure is defined with all of its parameters. The quality can also be proven retrospectively as all welding parameters are continuously monitored and recorded.

Even though the system was originally designed and intended for one specific application, Schroeder is already thinking of new ideas and uses.

Schroeder would like to try out some of the various welding procedures that are included in the Titan XQ welding machine as standard. This will allow to further optimise different kinds of surfaced components. Schroeder are also looking to expand and improve the range of welding tasks.



There are hundreds of Schroeder Valves installed in plants in southern Africa protecting assets at companies like Sasol, Eskom, Mondi and Sappi to name a few. Sulzer and KSB routinely use Schroeder valves to protect their pumps.

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The Robot Revolution

Forecasts indicate that the transportation equipment, computers and electronics, electrical equipment, and machinery industries are expected to account for around 75 percent of advanced robotics installations through 2025.

According to a study conducted by The Boston Consulting Group, lower costs and increased ease of use will spur significant growth in industrial robotics over the next decade. By then, robots should be able to handle 30% to 40% of automatable tasks in these industries.

Robotics growth in these applications encompasses end of line picking and palletizing, conveyor load/unload operations and warehouse management functions. As robots are becoming more agile and intelligent, workers are safer and production lines more consistent in their quality and efficiency.

While robots are frequently added to end of line operations after the installation of core production, they are now becoming part of an integrated mechatronic offering from advanced OEMs using highly integrated electrical and mechanical systems to improve competitive performance, gain energy savings, and reduce mechanical footprints.

Robotics Across Industries

E-Commerce demands in the consumer-packaged goods industries are driving increasing complexity in packaging and logistics both in design and in production.

Manufacturers are in a constant struggle to innovate operationally to accommodate multiple sizes of packages, reduce labour costs and run efficiently for shorter production runs. Users are now finding ways to consolidate IT and operating (OT) personnel to collaborate with machine builders on smart machines capable of high-speed performance, reduced footprints, and improved information transparency.

OEMs are now incorporating enhanced automation and robotic offerings to deliver faster systems in smaller footprints capable of self-diagnostics and remote monitoring while issuing reports and alarms on demand.

The shifting demands of consumers for immediate delivery, the need for retailers to optimize shelf space and shipping options have created a need for higher responsiveness in all aspects of your machinery.

To meet these demands, robot suppliers have incorporated easier programming and teaching tools, predictive maintenance diagnostics and alarms – presented in real time to operators – and lowered costs.

Timing of all these options and technology advancements has created opportunities for OEMs to expand their capabilities while keeping machine costs and design complexity reasonable.

The Case for Integrated Robotics

The need to reduce demand fulfilment variability from labour fluctuations and improve demand response to higher variability in shipping options is prompting highly integrated information transfers as well as tightly controlled machine behaviour.

Direct communications between controllers and logistics or warehouse systems are vital to ongoing optimization efforts. Similarly, robot integration improves system speed and coordination, minimizing operator intervention and learning requirements.

Machine or robot maintenance needs are reported immediately and scheduled into appropriate downtime before any production is lost. This ensures parts and service are available at the right times and fulfilment is maintained as long as possible.

Along with robot reporting and alarming, robot behaviour logs and status during production and fulfilment are monitored and saved to the HMI, providing immediate analysis on the operator screens when necessary.

The same HMI device is used by operators to run production, and by maintenance personnel for troubleshooting or status reporting of the machine.

OEMs can design specific screens for both parties so that sensitive data can be managed at the machine or uploaded/ offloaded to a memory card.

With appropriate authorization, the robot can be reprogrammed and re-taught for specific product runs or reconfigured storage patterns on the same device.

Likewise, it is common for e-commerce installations with multiple robots and integrated machines such as AGVs or ASRS to connect fleet information to a cloud – either private or public, for larger scale behaviour monitoring and anomaly detection.

OEMs with dispersed fleets of complex machines are finding this enhances their business model by providing predictive behaviours and maintenance requirements while fulfilling demand just in time with no lost production, safer workers, and less damaged freight.

Robotic Advancements in Accuracy and Handling Become Compelling

New robot innovations have increased options for end of arm tooling providing grippers, pinchers, magnets, vacuums, and suction devices as well as integrated vision systems. The ability to tightly integrate vision systems at end of arm, along with various end of arm options; creates flexibility for package placements, lower maintenance and integration costs, and less mechanical interference and complexity.

As robotic technology improves and integrates more completely with overall control systems, both electrically and mechanically, pricing improves, and programming becomes easier - making design, operation, and maintenance more affordable.

As robots become more adaptable and are integrated into the heart of machines in the packaging, material handling, food and beverage, and other industries, users can expect improvements in labour and maintenance costs, higher speeds, improved accuracies, and tighter mechanical integration for smaller footprints.

Relationally challenged designs particularly those involving multiple robots, require cooperative control and interference avoidance through integration with the automation system.

Utilizing common programming tools and time synchronization, automation systems can now tightly integrate robot behaviours to optimize throughput.

Increasingly, robots will be collaborative, incorporating advanced sensors and safety capabilities to run intelligently near humans.

As robot technology advances, automation system integration will become more vital as entire lines and warehouses may be operating with robots and humans' side by side requiring the intelligence to slow or stop based on human behaviour as well as production requirements.

Mitsubishi Electric is leading the way in advancing these technologies to ensure optimized production, human safety,

and lowest cost of ownership for users while creating differentiated offerings for OEM premiums.

The OEM Opportunity

OEMs are now recognizing the need to integrate robotics mechanically and electrically into their machines, providing for shorter changeovers, improved sortation speed and accuracy, lower labour costs, and optimal Overall Equipment Effectiveness (OEE).



Demand management can now include robot configuration to account for variable package sizes, mixes of products and increased fill rates.

Furthermore, robots are approved for direct contact with food products providing for safer packaging and shipping options for many food producers, refrigerated warehouse operations while providing safer environments for their human co-workers.

This coincides with the need to integrate more completely with the mechatronics and electrical controls on other parts of the machine or further upstream.

Integration of robotic control with PLCs allows for more precise and accurate control of sorting, picking, and placing while running at full speed and changing product mix on the fly.

No need to separately program and operate the robotic system from separate screens, operating systems, and controls.

Operators can control the operation from a single interface, and maintenance can program any changes, troubleshoot problems, and lock out the robot from a single software toolkit.

Integrating into a common hardware platform eliminates the need for complex software handoffs and integration costs associated with tying together separate programming systems.

Timing and accuracy are improved as controller-to-robot cycle times and communication speeds decrease.

Common programming and simulation tools also lower training and development costs. And just as important, licensing costs and single point accountability lowers risk during deployment and throughout the service life of the machine while providing the features and upgrades for future business model enhancements.

OEMs with an eye to the future are adopting robotics aggressively, raising their value proposition and enhancing their revenue streams while providing accelerating performance for their customers.

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Robot-Based Welding System Increases Processing Quality and Reduces Workload

With the first robot-based welding system for elevator girders, XIZI Heavy Industry not only ensures a consistently high quality of safety-relevant welds, but welders are also relieved of strenuous and dangerous work while benefitting from significant productivity increases through PC-based control from Beckhoff.

XIZI Heavy Industry Co., Ltd. is a wholly owned subsidiary of XIZI United Holdings Co., Ltd.; one of the top 500 companies in China.

The company's product range includes complete

elevator systems, escalators, moving walkways and their accessories, including crossbeams, escalator side plates, drives and control systems, as well as elevator installation services and structural steel grids.

Higher quality, efficiency and safety

Usually, welding is done by hand, which is already arduous under normal conditions. However, to ensure consistent quality in welding seams, ventilation of the workshop is prohibited. Therefore, the welders have had to carry out demanding welding work at high temperatures and with poor ventilation – until now.

With the help of PC-based control, WTEC, a system manufacturer from Beijing that specializes in welding technology, has developed and installed a fully automated robot-based system for XIZI. According to WTEC, this is the first time fully automated, robot-assisted welding has been used in the production of elevator crossbeams.

The system not only improves the working conditions for operators; it also takes the efficiency and quality of welds

to a new level. PC-based control and EtherCAT play a major role in the 25-meter robot welding system.

A C6920 cabinet Industrial PC from Beckhoff in conjunction with TwinCAT, various EtherCAT Terminals, AX5112 Servo Drives and AM8561 servomotors – controls all welding processes:



Robot welding station for elevator structures



A C6920 control cabinet Industrial PC and various EtherCAT Terminals from Beckhoff form the core of the automation and control system.

• welding robot mounted on a gantry axis

• clamping and lifting systems

• all upstream and downstream processes

The latter includes automatic loading and welding of the typical trusses of an elevator with their upper and middle beams, the small lower beams and the fixing plates of the aprons and glass clamps.

XIZI required the solution to manufacture almost all products and their variants in a single operation.

Accordingly, the welding robot must be able to perform

a wide variety of complex tasks:

 automatic loading and welding of the small lower beams and inclined beams of the truss

 automatic loading and welding of the glass clamping parts and the apron fixing plates

• automatic loading and welding of the central beam

- vertical and horizontal welding
- vertical upward welding

• various types of welding for changing positions and workpiece sizes

TwinCAT as the universal control software

A C6920 Industrial PC with TwinCAT control software is all that is needed to implement these demanding functions: PLC, HMI, NC motion control, welding robot control, automatic generation of teaching programs – all tasks run on a single control platform.

This keeps the architecture of the control system simple and clear.

The operator console communicates with the control system via the ADS protocol in TwinCAT; the remote I/Os of

the lifting and clamping device and the robot's gantry axis via EtherCAT, and the welding robot used by WTEC via EtherNet/ IP.

Such heterogeneous network structures can be implemented easily with the open approach of PC-based

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control. If required, the standard Ethernet interface of the IPC could also be configured for other protocols.

In the production control program based on TwinCAT HMI, WTEC manages the processes of all welding types including all parameter sets for the welding robot.

After selecting a program, the welding robot receives the parameter sets for the various welding processes. After each weld is completed, the parameter sets used by the robot are reported back and archived. Documenting all welds is an important aspect in elevator construction, especially since the system produces elevator crossbeams for different manufacturers – mostly with their own specifications, material types and batch sizes.

Due to the high functionality and flexibility of TwinCAT software and PC-based control, WTEC and XIZI can cover the entire range decisively.

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3D Machine Vision Camera Gives Robots Human Eyesight



The Visionary-S CX is a rugged camera with the ability to "see" both colour and depth, as well as dimensions, even in environments with low ambient light.

This means it recognises items and objects reliably, giving it the ability to identify

and select individual products in densely packed boxes, for example. It also features a high recording speed, making it effective in high-speed applications.

It integrates easily into existing systems using system integration (SI) software, to enable prompt optimisation. The easily configurable input and output functionality of the Visionary-S CX makes it versatile and flexible.

Previously, robotic carton handling or quality control packaging systems were limited by 2D technology. A robot could be programmed to pick or select an item, that was positioned at specific position-coordinates on a pallet, a table, or conveyor belt. If the item was not in that exact location (or not positioned accurately, at the optimal height or depth) the system failed.

"The Visionary-S CX, essentially gives the robotic system human vision that identifies target items and understands where these are," explains Grant Joyce, Managing Director, SICK Automation Southern Africa.

The Visionary-S CX solution was recently applied in the Belgium-based warehouse of a pharmaceutical company, where it optimised the depalletisation and picking of cartons, enabling the system to detect cartons at a rate of 2 000 per hour and depalletise them rapidly.

As a result, the company was able to meet high demand for its products across Europe.

"Through collaboration with our SI partners, we are able to build complete application solutions such as this for customers in southern Africa," adds Joyce. Designed to deliver easy installation, programming and commissioning, the Visionary-S CX is also priced competitively for the local market.

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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.

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Electromotive Process Control Valves - Precision Control with Astounding Speed

36

The advantages of electromotive actuators are receiving more attention in process automation. As simple, smart systems they offer diverse opportunities for process optimisation.

With the Type 3360/3361 electromotive seat valves Bürkert offers a complete process control valve that sets new standards with respect to performance, reliability and cost-effectiveness.

Potential uses for the new valves include applications with stringent requirements for control accuracy and process stability, as well as applications in which operation without a compressed air system is advantageous.

The special feature of the new Bürkert product family is its performance, which is comparable to that of pneumatic actuators.

With a control speed of 6 mm/s and a closing time of less than four seconds Bürkert has improved the previous weak point of many electromotive process control valves, which have control speeds of only 0.1 ... 3 mm/s.

The Type 3360/3361 valves allow adjustment of the control speed to the requirements of the customer's specific application, in addition to definition of the stroke and closing limits and soft approach of end positions.

Another positive feature of the electromotive

valves compared to pneumatic, spring-balanced actuators is that they travel to the desired position virtually without delay and without overshooting and remain stable regardless of the media pressure.

In case of a power outage the safety position can be approached via the optional SAFEPOS energy storage pack.

In addition, the possibility of emergency manual movement also exists. In view of the trend toward "Industry 4.0" the Bürkert Type 3360/3361 valves fulfil the increasing customer requirements with respect to the diagnosis of process and valve data as well as the capability of optimal integration in a central company network.

Application focuses and customer benefits

Bürkert's development of the electromotive process control valves is intended for applications in which the use of compressed air is not desired or not possible.

Examples of such applications include large-area storage systems with long distances to the single valves, as well as systems for mobile, decentralised water treatment.

Another customer benefit is to be found in applications with stringent requirements for control accuracy and speed, together with minimal dead time, such as in engine test rigs.

The electromotive process control valves are ideal for the precise control of the media temperature by means of heat exchangers in modern food and beverage systems. In such applications, the customer benefits in particular from the



actuator surface, which is designed based on hygienic criteria in accordance with the EHEDG Guideline.

Harsh environments are no problem for the robust body with protection type IP65 / IP67, which also features an easy-to-clean and closed design.

With respect to cost-effectiveness users benefit from low energy costs and savings throughout the entire system. Lower energy costs because no expensive compressed air is needed.

With respect to the overall system, use of the new process control valves can eliminate the need for a compressed air system entirely, reduce the load on such a system or allow it to be retrograded.

IP control cabinets as well as pneumatic control lines in the field are likewise unnecessary.

Technical data and features

For the market launch the new Bürkert process control valves are available as an angle seat valve (Type 3360) and a globe valve (Type 3361) in diameters from DN15 to DN50.

They can be used with gases, liquids and steam and are designed for media temperatures from - 10 to 185 $^{\circ}$ C.

The maximum operating pressure is 16 bar. The connection options are flange, sleeve, weld-on and clamp. The Kvs values extend from 0.1 to 37 m³/h. A voltage of 24 V DC is needed for the electric power supply.

Following the market launch, continuous expansion of the new electromotive process control valves is planned. Future developments will be a process controller, membrane valves, a connecting diameter up to DN 100, a open/close solution and connection to other field bus systems in addition to Ethernet, Profinet and Modbus.

For uncompromising communication capabilities the motorised process control valves feature the Efficient Device Integration Platform (EDIP), developed by Bürkert to open the way for its products to Industry 4.0. The EDIP platform comprises numerous functions, compatible HMI devices and other services that facilitate the system integration of new devices.

Bürkert also offers a free software program, the Communicator, which features diagnostic functions for monitoring of operating data as well as alarm messages for customised parameters.

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25.3

Inclinometer for Rough and Tough Conditions

Example: Position measurement of the shovel of dredgers



The SIKO Inclinometer IK360L is capable of working under the roughest and toughest of conditions. These inclinometer sensors conform to protection classes IP68 and IP69k and is protected against access with a wire as well as being dustproof.

It is also protected against permanent immersion and infiltration by water under high-pressure and vapour steam cleaning (i.e. road vehicles).

The analogue inclinometer is housed in a PBT fibre-glass, reinforced casing and is easily installed with a 3-point mount.

The unit compensates for temperature, operating between -40° to $+85^{\circ}$. The unit can also operate within a lateral deviation of $+/-45^{\circ}$.

SIKO's Inclinometer IK360L features a compact one-axis inclinometer with integrated electronics and a system accuracy of $+/-0.5^{\circ}$ (-10...+40°C).

The measurement of inclination for one axis is $0 - 360^{\circ}$; dual-axis: +/- 80° , resolution: 0,01° and has a response time sensor of 10 ms (without filter).

The different interfaces available are RS-232+I, RS-232+U (0...10 Volt) or CANopen (bus-compatible). Programmable parameters are Resolution, Preset, Software filters.

It also features a 'Teach-In' function that measures range, zero point or measurement direction.

SIKO's Inclinometer IK360L finds application in mobile automation:

• Ensuring the horizontal position of the workman's basket or fire brigade engines

• Monitoring of the levelling of vehicles with tracks (construction) to avoid overturning

• Position measurement of the shovel of dredging vehicles.

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Fluke ii910 Precision Acoustic Imager

Key areas to scan for partial discharge

- Transformers
- High voltage power-lines or coils
- Switch gears
- Arrestors
- Busbars
- Breakers
- Capacitors



Learn More

Fats, Oils and Grease Skimmer – Innovation in Waste Water Treatment

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The Greasebuster[™] is highly effective at removing large amounts of and heavy fats present in bakeries, ready-made meal manufacturers and meat processors etc.

Effective at removing heavy materials, the Greasebuster[™] can remove heavy oils and grease from metal machining and other similar industries.

Simple effective technology

Placed directly into the tank, the simple technology allows for effective removal of fats, oils and greases from the surface of the water using hydrophobic belt materials. This belt works continuously to lift FOG from the wastewater whilst rejecting water. The FOG is then scraped from the belt and deposited into a collection vessel for recovery. In above ground tanks the Greasebuster[™] can be attached to the wall of the tank and in underground tanks the flotation variant allows the Greasebuster[™] to float in the tank and FOG is removed with an integral slurry pump to a surface collection vessel.

Features:

- Removes fats, oils and grease whilst rejecting water
- Prevents pipe and sewer blockages
- Simple installation
- 24/7 operation
- Removes up to 8m³ of FOG per day *
- Temperature range of operation up to 50°C
- Reduces wastewater bills through COD and solids reduction
- Reduces risk of environmental prosecution
- Removes microthrix, filamentous growth and floating solid waste
- Belt speed control and thermostatic temperature control

Applications

- Municipal treatment plants and sewerage networks
- Industrial effluent streams containing fats, oils and grease
- Food, mineral and surface solids removal
- Oil contaminated water cleaning
- Heavy duty oil removal
- Sludge removal





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- A single moving part.

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25.3

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Contaminated or adhesive media, such as waste oil and fat, often cause blocked control bores. Our servo-assisted valve 5282 is the exception: The 2/2-way allrounder has no pressure compensation bore in the diaphragm in which foreign objects could get stuck. What's more, no medium flows through the pilot valve in open position, which is unique among servoassisted valves with 2-way pilot control. Last but not least, additional safety is provided by the material concept: The main valve housing and return springs are made from high quality stainless steel or plastic. This way aggressive media can also be controlled safely. A neat piece of work!

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Fuel for the Future: What to Look Out for in Fuel Cell Production

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When people talk about sustainable mobility, the first thing that comes to mind is battery-powered ecars.

Fuel cells or direct hydrogen burners are complementary technologies that often fade into the background yet have a lot to offer when it comes to CO reduction and market options.

The European automotive industry takes a similar view as shown in a recent German

study: 80% of the car manufacturers surveyed stated that they consider hydrogen-powered vehicles to be more environmentally friendly and cleaner than electric cars. While 64% believe that the first hydrogen cars ready for series production will be on the market in the next two years.

What is needed is a more innovative spirit on the part of manufacturers and suppliers, support from politicians, and investments in better energy infrastructure.

Companies in the ACES environment, (ACES stands for autonomous driving, connectivity, electrification, and shared mobility) need efficient and future-proof production facilities, the *keyword being Smart Factory*.

Production lines must be automated, and digitalized, manual processes eliminated, and innovations are driven forward.

Truly sustainable hydrogen production only with renewable energy

Modern and automated battery and fuel cell production, supported by robotics, sensor technology, and AI, is at the heart of sustainable strategies.

The battery is the central element of both hydrogen drive and "classic" e-vehicles, albeit significantly smaller and differently constructed. In addition to e-drives and hydrogen, e-fuels, and synthetic fuels, should also be mentioned in the mix of sustainable drive types.

To use hydrogen in a truly sustainable way, the H fuel must be produced with electricity from renewable sources (electrolysis), which is not yet fully feasible in large quantities.

Conversion of the chemical into electrical energy

In hydrogen-powered vehicles, the process works the other way round: hydrogen (H) and oxygen (O) are converted into electricity and water (HO) in the fuel cell. The resulting energy drives the electric motor.

Fuel cell cars are therefore also electric cars, although the battery does not have to be charged before driving. Instead, the required electricity can be produced in the car by H supply.

The energy conversion from chemical to electrical energy in a polymer electrolyte membrane (PEM) fuel cell is based on the following functional principle, hydrogen is delivered to the anode and oxygen to the cathode via the flow channels of the bipolar half plates (BPHP).



Via the gas diffusion layer (GDL), the hydrogen diffuses to the anode side of the catalyst-coated membrane (CCM).

Hydrogen is catalytically oxidized, releasing electrons and forming H+ ions that pass through the wet membrane to the cathode side.

The electrons are conducted to the cathode side via an external circuit. The oxygen on the cathode side is reduced by the electrons and

reacts with the H+ ions from the membrane to form HO (water), which is rinsed off.

Some automotive companies are too cautious about hydrogen

Unlike battery cells, fuel cells are not dependent on raw materials such as lithium or cobalt. The raw material dependency means, battery manufacturers are heavily reliant on China.

In fuel cells, the central material is iron. Another advantage is that hydrogen as a molecular substance can be easily stored, transported, and made available for applications.

Hydrogen drives are already being used in more and more commercial vehicles such as city buses, which is since they offer more space for the required drive unit.

Hydrogen drives are still relatively rare in "normal" cars, which is partly due to the lack of H filling stations, but also due to the industry's hesitant implementation.

In 2020, a total of only 749 passenger cars with fuel cells (FCEVs) were newly registered in Europe. Compared to 2019, this was a minimal increase of 266 passenger cars.

Hydrogen vehicles are an important pillar of climate-friendly mobility - if their opportunities and possibilities are researched, expanded, and used on a larger scale.

European automotive players are often more innovative in this respect and acceptive to hydrogen than some large German corporations, which are primarily dedicated to e-mobility.

Increasing automation of electrolysis and fuel cell production processes

There is no way around New Energy Vehicles, so-called NEVs if we are to even come close to achieving the Paris climate targets. Hydrogen can be produced from renewable energy sources in a CO-neutral way and converted into electrical energy in fuel cells.

There are several challenges to be overcome in the production of these fuel cells to ensure efficiency and precision. This applies to both the production of the individual components and the assembly of the stacks through to the manufacture of the entire system.

The fuel cell components bipolar plate, gas diffusion layer, and catalyst-coated membrane are manufactured with different materials in different production processes.

Widespread deployment of electrolysis and fuel cell technology requires product and process innovation to reduce production costs to drive the deployment of this technology. Scaling production volumes while maintaining uniform quality requirements is needed.

Flexible and scalable production lines that can be quickly and easily adapted to individual requirements are advisable. Approaches are needed to reduce the production costs of fuel cells, as this is the only way this technology will be accepted in the longer term.

Battery expertise supports fuel cell production

Unlike battery cell production, where processes have already been automated for many years and are constantly being further developed, fuel cell production is still almost at the beginning.

This is mainly because hydrogen technologies do not yet have the application and acceptance that increased production requires. Many workflows are therefore carried out semiautomatically or even manually.

To make hydrogen applications more attractive, increased automation in manufacturing is urgently needed. Since battery and fuel cell manufacturing are similar in many respects, it is advisable to rely here on a partner who is familiar with automated battery cell manufacturing.

In addition to the technology and know-how, system integrators and machine builders are also needed to jointly drive this topic forward.

A particularly critical process in battery and fuel cell production is stacking, this is where errors, such as leaks, can occur. Finding the cause takes a lot of time. Stacking expertise is therefore also recommended. In addition, the membrane must be handled carefully so that it is not damaged.

Factory of the Future

The cornerstones of future-oriented fuel cell production to promote sustainable mobility, are the procedures and technologies of the Smart Factory.

They make it possible to comprehensively modernize production and rationalize supply chains from the ground up in parallel with the expansion and conversion to new drive technologies. Innovative industrial robotics, mobile robots, and cobots, edge computing, sensor technology, the coupling of mechatronics and IT, and augmented reality (AR) are some examples of this factory floor of the future.

The highest possible degree of digitalization is the key to success so that the manufacturing process can optimize itself independently.

Traceability is also essential, ideally to be able to trace every single layer of a fuel cell to conclude where production is not running optimally. Another pillar is artificial intelligence (AI), as it can be used to unleash new efficiency potential from highly complex production chains.

Used correctly, AI can help business leaders in the automotive sector to better understand their processes. The information collected by AI and sensor-based technologies leads to new insights to optimize processes inside and outside the company. An example is a predictive maintenance - it can be used to detect wear patterns, peculiarities, and anomalies, and thus counteract machine failures, downtimes, and errors.

Al can also help to capture market share in blue ocean segments – new innovative markets. Particular attention should also be paid to seamless and flexible intralogistics processes, the keyword being transparent supply chain.

Conclusion: Collective measures needed

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In the coming years, a mix of different drive technologies will establish itself on the market. This includes the fuel cell as an important building block.

For alternative technologies of the future to gain momentum, it is now up to politicians, manufacturers, and service providers to pull together, optimize framework and production conditions and promote digitalization and automation.

OMRON can support here, with their many years of expertise in this field, as well as having the technologies and strategies of the i-Automation! model.

In fuel cell production, the company places a special focus on high speed and precision. Newly developed edge-based algorithms (Shape Search III) are used. Fewer data are used for position adjustment to increase transparency.

At the same time, several processes work in parallel, which minimizes production time. Permanent position adjustment is dynamically corrected between NX and FH, and high-precision position adjustment is accelerated.

These are all examples of technological adjustments that can optimize fuel cell manufacturing – so that the hurdles for increased engagement in this field (hopefully) tumble.

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Easy Operation and Trustworthy Values for Lab Measurements and Random Sampling

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The new Memosens laboratory portfolio, consisting of the Liquiline CML18 and the associated CPL51E, CPL53E, CPL57E, CPL59E, CLL47 and COL37 combine simple operation with trustworthy measured values.

The portfolio supports data and quality management in verification processes of online measurements. It provides automatic and tamper-proof traceability of the calibration history and enables easy data transfer via Bluetooth.

Easy operation

No matter whether in the laboratory or for random sampling measurements directly in the field. The laboratory sensors are simply connected to the Liquiline Mobile CML18 handheld via plug-and-play and the user can start the measurement.

Switching between the various parameters such as pH, dissolved oxygen and conductivity can be performed quickly and easily directly at the measuring point.

Further calibration is not necessary thanks to pre-calibration and Memosens 2.0 technology. For advanced functions and outstanding usability, the smartphone can be connected to the handheld.

Trustable values

The sensors convince with a high accuracy and fast response time, which is indispensable especially for oxygen measurements.

Users can rely on the measured values at any time and perform simple checks of online measuring loops.

Memosens provides solid, digital signal transmission eliminating the risk of signal loss without noticing. This technology is unique in lab measurements and simplifies the daily work on all levels.

The laboratory sensors and the Liquiline Mobile support data and quality management in your verification process of online measurements.

It ensures automatic and tamper-proof traceability of the calibration history and allows easy data transmission via Bluetooth to transfer information such as time stamps. All important information can be accessed from anywhere via the free SmartBlue app

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Complete Solution with Intuitive Operation for the Process Industry

43



Within ASSTech's portfolio of top class suppliers is Germanmanufacturer Jumo, that has now expanded its extensive automation range with a complete solution for process engineering operations.

The application is designed to be particularly user-friendly and can be used in a wide spectrum of industries.

At the heart of the solution is the Jumo variTron automation system. With the aid of various Jumo smartWARE, an integrated solution can be implemented from the sensor to the cloud. The focus is on three user groups:

Manufacturers of process engineering plants can use Jumo smartWARE Setup to define individual process steps and plant types.

RICHTER FULLY LINED VALVES

Plant operators can use the smartWARE program to intuitively create and edit process engineering programs and recipes using a graphical editor. This browser-based application can be used on a PC, laptop or tablet.

End users can then visualise and control the program flow in the browser with the aid of a display, for example on a web panel or a tablet. The user interface can be freely customised, is consistent, and can be operated intuitively.

In addition, other Jumo applications such as smartWARE SCADA, Jumo Cloud or Jumo smartWARE Evaluation can be used for monitoring, batch recording and individual report generation.

The areas of application are diverse and range from the food industry to autoclaves, CIP systems and greenhouses to industrial furnace construction or environmental technology.

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