JUMO

SENSORS + AUTOMATION

Issue 2/2020

Up to the cloud?

JUMO makes it possible

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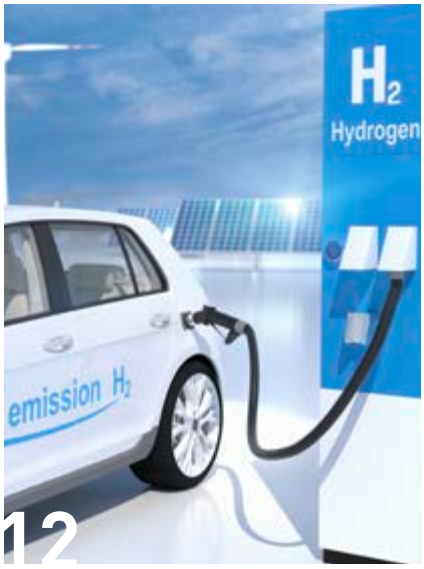

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Dear Reader,

"Hoping for the best, prepared for the worst, and unsurprised by anything in between."

... this sentence, which is from an American poem, could very well be a suitable motto for 2020. Just like all other businesses around the world, over the past few months, JUMO has had to learn not to be surprised by anything. Yet at the same time, despite all due caution, we could not lose confidence.

Thanks to the JUMO crisis management team, which started putting measures in place at the beginning of February, it was possible to guarantee optimum protection for our employees at all times while simultaneously maintaining production worldwide.

Of course, we also have to bear a considerable decline in turnover. But in this situation it is more important than ever to keep our sights set on the future. In fact, key trends like digitization are likely to be accelerated by the coronavirus pandemic rather than slowed down.

This is why, despite the tense situation, we have brought the development of the JUMO Cloud to a successful finish. As it will be a core strategic component for the future of our business, we are presenting it as the cover story in this issue of our customer magazine. In combination with tried-and-tested JUMO measuring and automation technology and innovative engineering services, the JUMO Cloud opens the door to modern IoT and big data solutions. We are thrilled to have the opportunity to walk the path to the "Smart Factory" together with our customers.

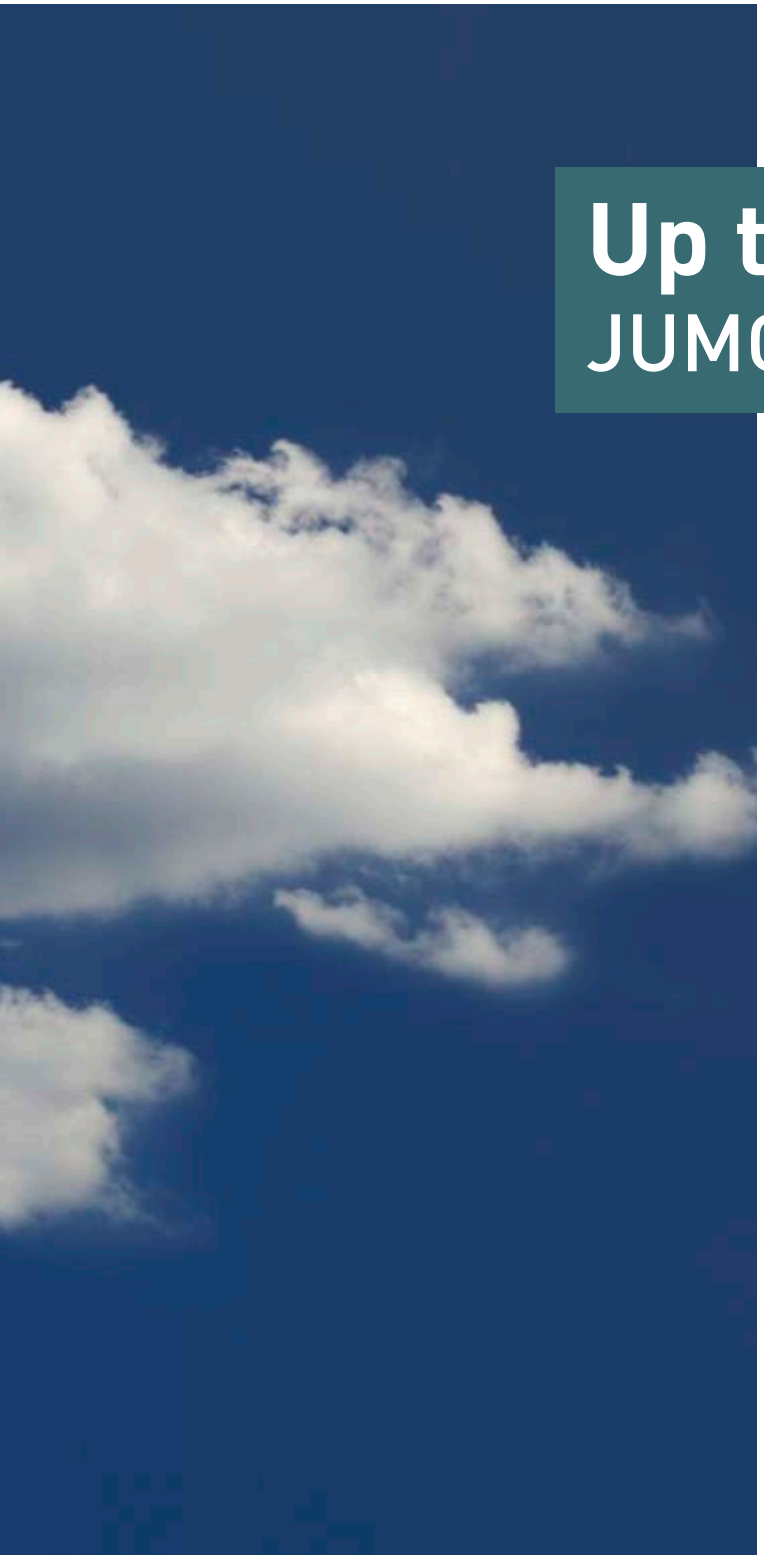
On that note: keep healthy, stay optimistic, and don't let anything surprise you!

Bernhard Juchheim *Michael Juchheim*
Chief Executive Officers and General Partners

Dimitrios Charisiadis
Chief Executive Officer

The JUMO Cloud and JUMO smartWARE SCADA open up completely new automation possibilities

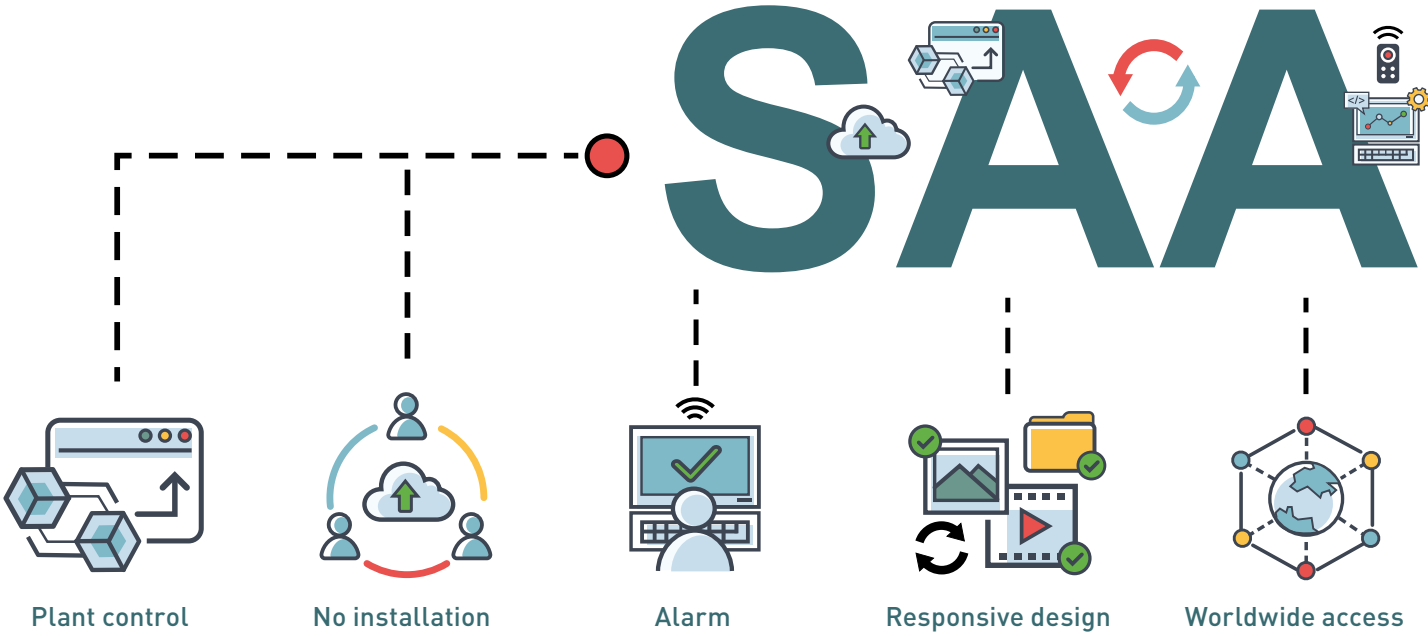
IN THE SPOTLIGHT



Up to the cloud?
JUMO makes it possible

Global data volumes are exploding, pushing traditional storage media to the limits of their capacity. The solution is the cloud. For the first time worldwide, more data is expected to be stored in clouds than locally. That is why global turnover from cloud computing has increased more than fivefold over the last 10 years and is currently estimated at over 200 billion euro. According to the study "Cloud Monitor 2020" conducted by the association "Bitkom", three quarters of companies in Germany with 20+ employees are already using cloud-based solutions.

But what is driving this huge growth in data? One of the main factors is digitization. A self-driving car, for example, produces around 3 terabytes of data per hour. So it is no wonder that experts estimate that the volume of data generated globally will more than triple in the next 5 years alone – to 175 zettabytes (that is 175 with 21 zeros). If this quantity of data were saved on DVDs, the resulting pile would reach from the Earth all the way to the Moon. ➜



JUMO · CLOUD

Another factor driving the cloud development is the digitization of industry. More and more processes are being monitored and controlled through automatic means. Measurement data is collected and analyzed. This is where JUMO comes into play. For a number of years, JUMO has been evolving as a supplier of industry-specific end-to-end solutions, for which JUMO also produces the necessary hardware. The JUMO portfolio stretches from sensors for various physical measurands to controllers, paperless recorders, and powerful automation systems.

JUMO is driving digitization forwards

The cloud is the next logical step in this development. Although JUMO is not one of the pioneers of this technology, it has consciously taken the necessary time to develop a sophisticated, customer-friendly product.

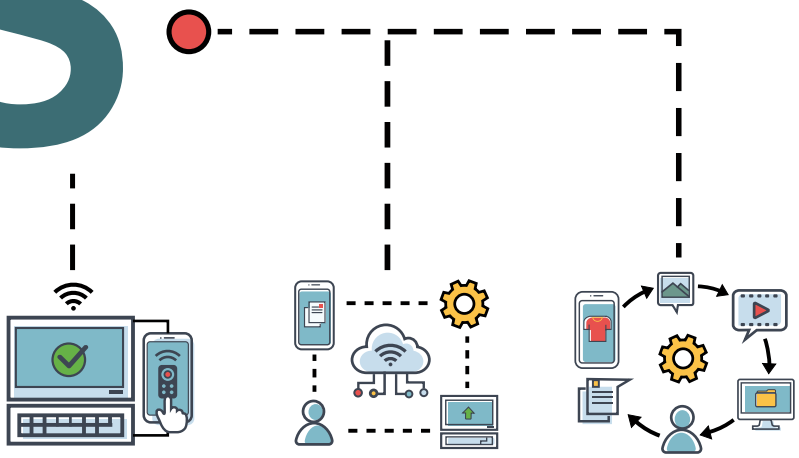
There are 3 fundamental types of cloud-based solutions. Firstly, providers of "Infrastructure as a Service" (IaaS) make data storage and processing power available on their own servers. Secondly, with "Platform as a Service" (PaaS), companies can rent predefined platforms for software development. The JUMO Cloud belongs to the third category and offers "Software as a Service" (SaaS). SaaS is a cloud-based application software with a predefined user interface.

The JUMO Cloud is an IoT platform for process visualization as well as data acquisition, evaluation, and archiving. Additionally, it enables worldwide access to measurement data. It supports all common browsers and is characterized by a level of high security as well as highly useful visualization and alarm functions (e.g. via text message, email, or voice call). Customers can use the JUMO Cloud to monitor several distributed plants, processes, or sites in one dashboard, which, in turn, increases process reliability. JUMO uses a redundant infrastructure for data storage, as a result of which users save a significant amount of time. The computer center where the data is stored is certified according to current security standards (ISO/IEC 27001), is compliant with the General Data Protection Regulation, and is located in Germany. Professional reporting and export functions considerably reduce the effort required for data acquisition requiring proof.

JUMO is even going one step further by simultaneously presenting the new JUMO smartWARE SCADA. This software solution is located in the automation pyramid at the control level. Although a SCADA solution has been part of the JUMO portfolio for several years, the development of the cloud has seen it be replaced with a brand new state-of-the art system that is based on the technology of the JUMO Cloud.

The new SCADA software provides easy access to measurement data using conventional web browsers. It offers functions for process visualization as well as for evaluation and archiving the acquired data. Visualization occurs through an editor that has an integrated animation and test tool as well as vector-based, self-scaling process screens.

Consequently, JUMO smartWARE SCADA is a highly scalable and powerful digitization platform that supports



JUMO smartWARE·SCADA

manufacturing as well as work processes with efficient visualization, alarm, and planning functions. Thanks to its modern web-based interface, customers can access it without having to install any software. As a system that supports multiple clients, the software also has user rights that can be configured on an individual basis. Security is guaranteed by end-to-end encryption with possible two-factor authentication.

Flexible pricing

When paying for a JUMO Cloud the customer can choose between a flat rate and a pay-per-use model. The cloud memory can be flexibly expanded and adapted to the respective customer requirements. A key factor is that raw data is stored in an extremely compact manner. JUMO smartWARE SCADA allows variable and customer-specific pricing.

"The combination of high-quality JUMO hardware, a modern cloud environment, and innovative engineering services results in a 'comprehensive carefree package'."

Nico Müller
Product Manager Software

http://engineering.jumo-en.info

What functional range does the JUMO Cloud have to offer? The possibilities are just as diverse as the JUMO portfolio itself. They span from simple alarm messages through to condition monitoring and complete plant control. The Cloud has been configured to integrate seamlessly with the new hardware and software platform JUMO JUPITER, which is also the key component in the automation system JUMO variTRON. The JUMO Engineering team with its many years of expertise is available to assist in the implementation of industry and project-specific cloud and SCADA applications. The team's extensive capabilities range from running basic feasibility studies and workshops to drawing up product requirements specifications and specification sheets as well as the configuration, programming, and validation of automation solutions. In addition to startup and project documentation, individual training courses are also offered.

Currently, first projects for customers in the power plant sector or thermal process technology are being examined. Manufacturers of aquaculture facilities and cooling technology have also been signaling an interest. ■

Good to know:

+ Cloud computing is an "invention" of the Internet giant Amazon. Over the Christmas period, the company requires a vast quantity of server capacity, which is idle for the rest of the year so that it can be rented out.
+ Small and medium businesses can save up to 40 percent of their IT costs by using cloud-based services.
+ Professionally an employee on average uses 36 different cloud services. Most of these are collaboration services (9), followed by file sharing (6), and content sharing services (5).

JUMO innovations

4 products that make life easier for technicians

1 Precision pressure transmitter

JUMO TAROS S47 P

The JUMO TAROS S47 P pressure transmitter comes with outstanding active temperature compensation. As a result, it can ensure accurate pressure measurements and thereby improve process reliability. The robust construction enables protection types up to IP69 and therefore use in all areas, regardless of the environmental influences. Default measuring ranges for the JUMO TAROS S47 P lie between 0.1 to 100 bar relative pressure and 0.6 to 40 bar absolute pressure. The medium temperature can be between -40 and +125 °C. Linearity and long-term stability are both very low at 0.1 percent. The overall accuracy at 20 °C is at the most 0.25 percent of the measuring span. The zero point correction can easily be carried out with a magnet. This way, the pressure transmitter delivers reliable measured values over a long time. A wide range of process connections and electrical connections are available for the compact design of the JUMO TAROS S47 P.

2 Float switches in horizontal design

JUMO NESOS R40 LSH

Due to the horizontal design, the JUMO NESOS R40 LSH float switch can be easily mounted on the side walls of tanks and containers, from where it can then reliably measure the respective point level (MIN/MAX-level). The measurement is independent of many media properties, pressure conditions, and container geometries. It provides up to 2 switching contacts – which do not require auxiliary power (voltage supply) – for redundant level measurement. JUMO NESOS R40 LSH is available with a guide tube length of up to 1 m. The device can be operated at temperatures from -52 to +240 °C and process pressures of up to 88 bar. It is available in protection types IP65 to IP68 and optionally with ATEX as well as IECEx approval ([Ex i] and [Ex d]) for use in zone 0. Consequently, it guarantees a particularly high level of process reliability.

3 Wide range of applications and 2 channels

JUMO Ex-i isolating switch amplifier

The two-channel, intrinsically safe JUMO Ex-i isolating amplifier was developed especially for the float switches of the JUMO NESOS series, but also supports all proximity sensors in accordance with the NAMUR standard. The JUMO Ex-i isolating switch amplifier is a new addition to the JUMO Safety Performance (JSP) portfolio that enables reliable, galvanic three-way isolation, as well as the safe transfer of switching signals – for both non-Ex and Ex applications. It can be used in an extended ambient temperature range of -40 to +60 °C, has ATEX and IECEx approval, and can also be mounted in Ex zone 2. The connected float switch contact or proximity sensor can be operated up to zone 0. In addition, the JUMO Ex-i isolating switch amplifier has UL as well as DNV GL approval and meets SIL 2 in safety-related applications. A changeover relay with a phase reversal option per channel is available as a switching output.

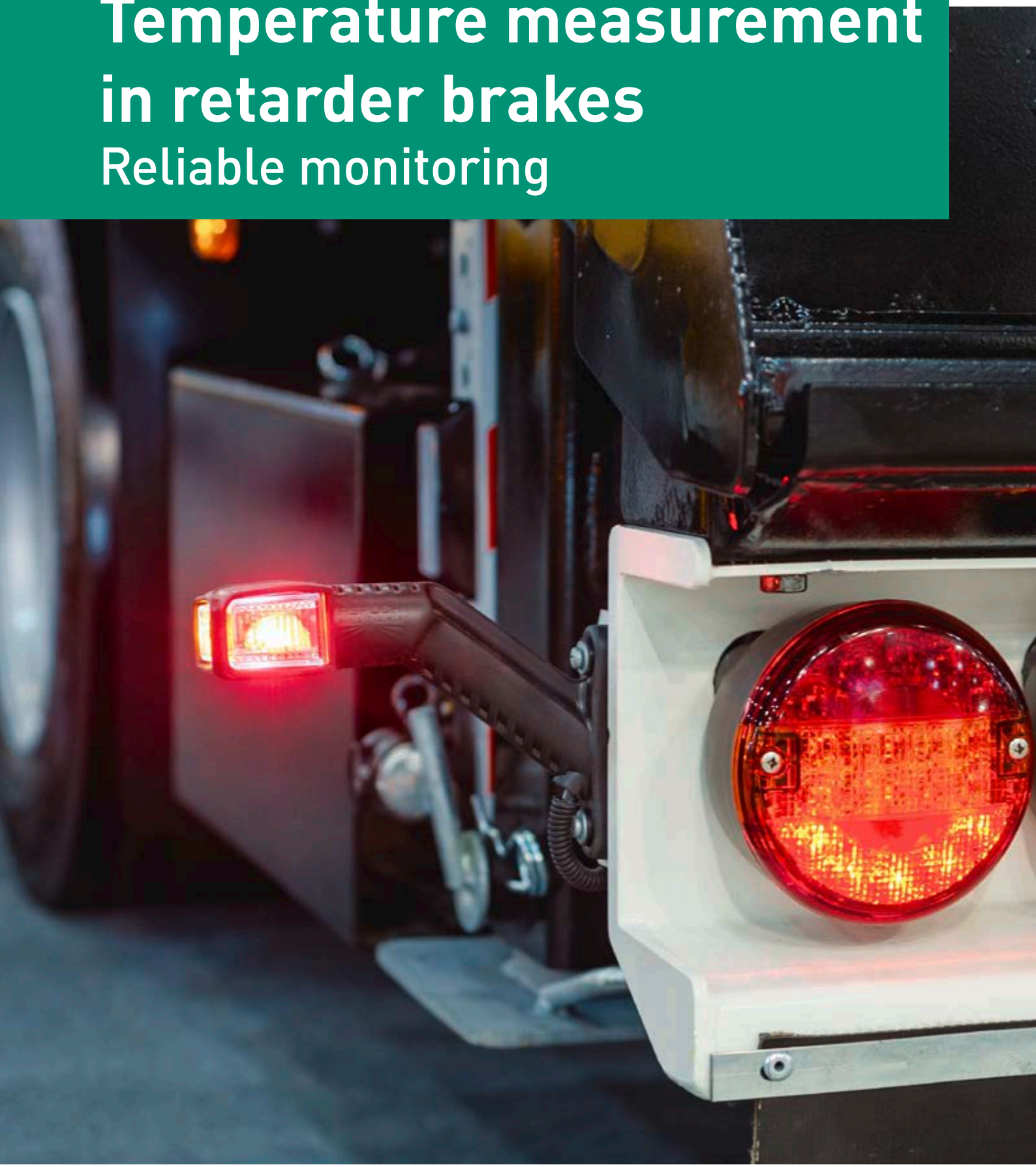
4 New modules for the automation system

JUMO variTRON 500

The JUMO variTRON automation system impresses with its high speed performance and modular operating philosophy. 3 new modules have now been added to the application areas. At the 32-channel **digital input and output module**, 17 channels are configured as digital outputs by default. Up to 3 option plug-in boards can be used to add 5 digital inputs or outputs each. The switching statuses are visualized by LED displays. The new **2-port router module** extends the central processing unit of JUMO variTRON by 2 system bus outputs. As a result, the system bus can be transferred to the **3-port router module** – which is also new – on other DIN rails in the same or in other control cabinets up to 100 m away. This way, input and output modules can be distributed and the automation system can be arranged in a decentralized manner. ■

Temperature measurement in retarder brakes

Reliable monitoring



Retarders ensure wear-free braking

Retarder brakes are wear-free brakes and a core safety element in every truck. For more than 10 years, JUMO has been manufacturing special sensors that reliably monitor the temperature in retarder brakes.

Slowing down an extremely heavy truck requires a huge amount of braking power. In challenging situations, such as performing braking maneuvers on the freeway or long down-hill stretches, conventional friction brakes can reach temperatures of up to 1 000 °C. This causes a rapid decline in the efficiency of the brakes.

That is why trucks usually have 4 braking systems: a parking brake, a service brake, an emergency brake, and an endurance braking system. The latter is a type of wear-free brake. They can typically come in the form of exhaust brakes or retarders.

When using retarders, up to 90 percent of all braking procedures can be conducted wear-free. That is a clear advantage in terms of safety. Retarders thereby protect the service brake, which is fully operational in an emergency. They also reduce the cost of spare parts and maintenance. Additionally, transportation performance is improved, as average speeds end up being higher.

Essential temperature measurement

Retarders work based on either hydrodynamics or electrodynamics. Especially in the field of hydrodynamic endurance brakes, temperature measurement is essential for optimum operation. In simple terms, a hydrodynamic retarder is a sort of pump that pumps the liquid in a cycle. The braking effect is achieved through the pump load resistance – which is variable. This process requires both a highly accurate and fast measurement of the temperature. If the temperature of the oil or water in the retarder is not measured correctly, the worst result would be increased wear of the entire brake system.

JUMO VIBROtemp temperature probes are designed to monitor the temperature of the medium in retarders. Thereby, they indirectly ensure that both the operating temperature of the medium and the braking power are optimal. Even when under pressure, the screw-in RTD temperature probes from the JUMO VIBROtemp series ensure reliable temperature measurements in commercial vehicles, construction machinery, agricultural machinery, motors, compressors, and in railway technology.

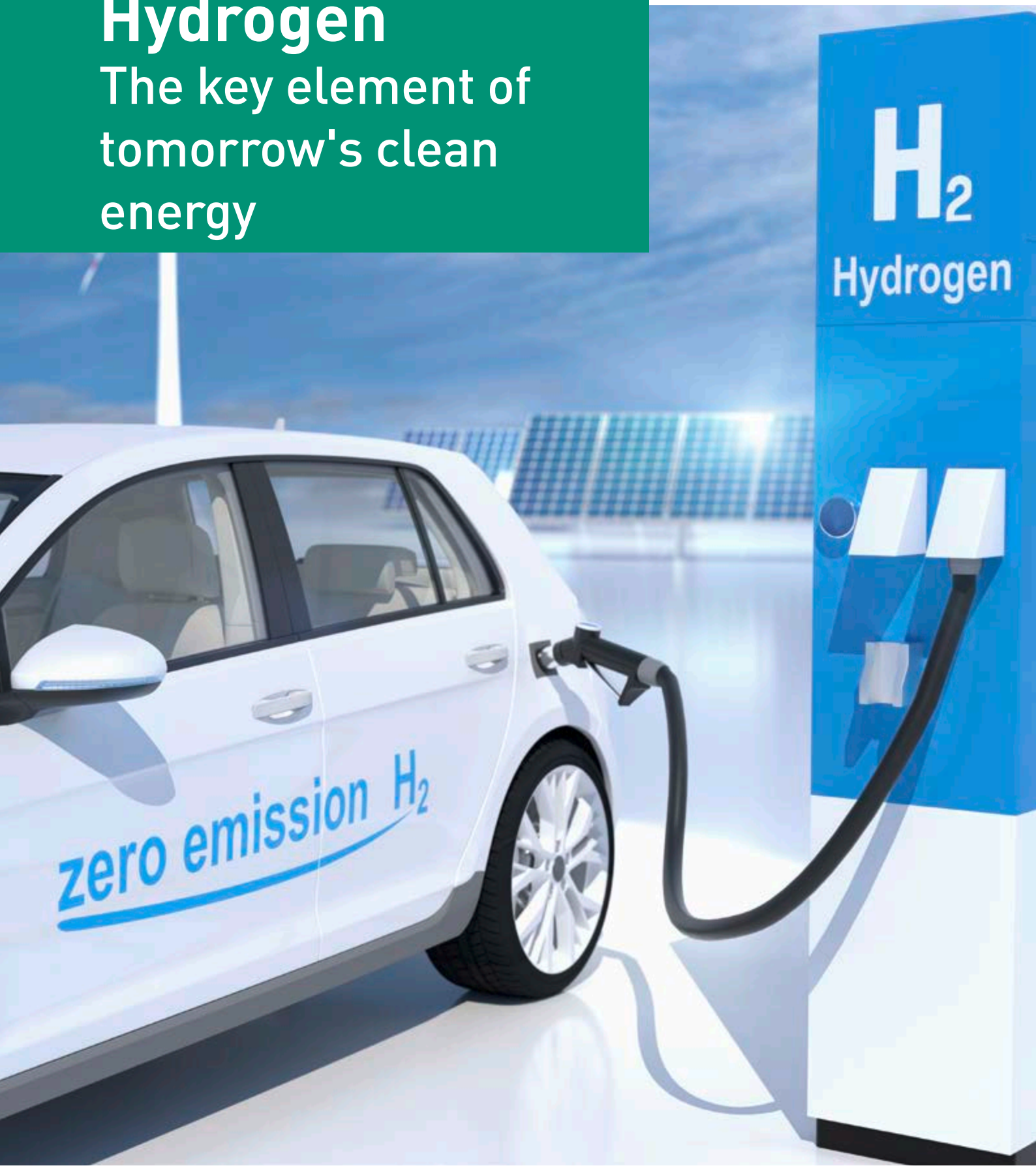
Especially quick response time

Different plug connectors and protection fitting materials are available to suit the specific application area. The special geometry of the protection fitting makes a particularly fast response time possible. Per default, the measuring insert is a Pt100 temperature sensor according to DIN EN 60751, class B in a two-wire circuit. Versions with Pt500, Pt1000, and PTC or NTC temperature sensors are also possible.

Depending on the version, the VIBROtemp product range can cover measuring ranges from -50 to +270 °C, and for a short time even up to 300 °C. Frequencies from 10 to 3 000 Hz, acceleration up to 30 *g*, or shocks up to 100 *g* per 5 milliseconds are easy for this compact temperature sensor to handle. In the application example described, JUMO VIBROtemp probes can provide reliable measurements of the oil temperature up to 180 °C and of the coolant temperature up to 150 °C. ■

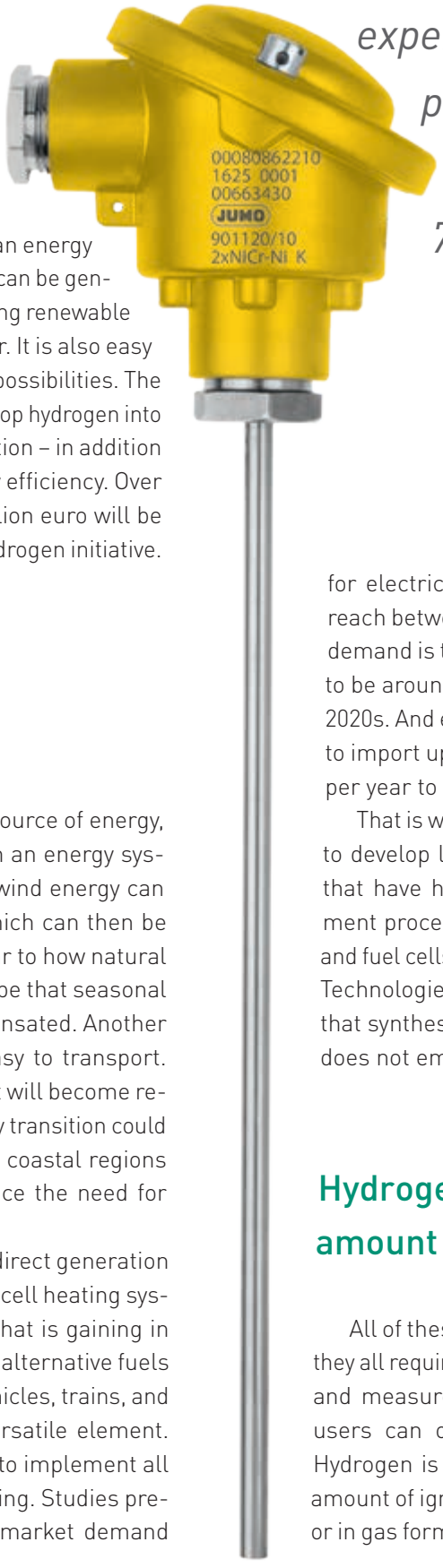
Hydrogen

The key element of tomorrow's clean energy



JUMO has been considered an expert in temperature and pressure measurement technology for over 70 years

In the course of the energy transition, hydrogen is set to play an increasingly important role throughout the world. JUMO offers the right sensor technology for monitoring pressure and temperature in climate-friendly energy systems.



Hydrogen has been considered an energy source of the future for decades. It can be generated with zero CO_2 emissions using renewable energies like wind and solar power. It is also easy to store and has many application possibilities. The German government wants to develop hydrogen into another pillar of the energy transition – in addition to renewable energies and energy efficiency. Over the next few years, a total of 9 billion euro will be invested as part of this national hydrogen initiative.

Hydrogen is a truly versatile element

"Green" hydrogen is an ideal source of energy, as it can perform various tasks in an energy system. Previously unused solar or wind energy can be used to produce hydrogen, which can then be stored almost indefinitely – similar to how natural gas works now. One result would be that seasonal energy fluctuations can be compensated. Another advantage is that hydrogen is easy to transport. Existing natural gas pipelines that will become redundant in the course of the energy transition could be used to convey hydrogen from coastal regions to inland areas. This would reduce the need for new energy lines.

Hydrogen is also ideal for the direct generation of heat (e.g. in gas heaters or fuel cell heating systems). Another application area that is gaining in importance is the manufacture of alternative fuels (e-fuels) for ships, commercial vehicles, trains, and airplanes. Hydrogen truly is a versatile element. But the necessary infrastructure to implement all these ambitious goals is still lacking. Studies predict that in Germany alone, the market demand for electrical power generated by hydrogen will reach between 50 and 80 gigawatts by 2050. If this demand is to be fulfilled, the rate of growth needs to be around 1 gigawatt per year by the end of the 2020s. And even then it will be necessary as of 2050 to import up to 25 million metric tons of hydrogen per year to Germany.

That is why now, and in the future, it is important to develop lots of new technologies and systems that have hydrogen at the heart of the development process. This includes electrolysis systems and fuel cells, but extends far beyond these 2 things. Technologies that replace natural gas systems or that synthesize methane and e-fuels in a way that does not emit CO_2 are also required.

Hydrogen requires just a small amount of ignition power

All of these systems have one thing in common: they all require the use of modern sensors to monitor and measure pressure and temperature, so that users can operate them reliably and smoothly. Hydrogen is flammable and requires just a small amount of ignition power. It can be stored as a liquid or in gas form at 200 to 700 bar in pressure tanks. ➜

JUMO also offers a broad product portfolio for temperature measurement. These include up to 40 different types of sensors in RTD temperature probes and thermocouples that enable measuring chains certified up to SIL 3. The RTD temperature probes are available for temperatures of up to 700 °C and the thermocouples for temperatures up to 1 500 °C.

JUMO offers more than 40 different sensor types

JUMO has more than 70 years of significant experience in temperature and pressure measurement technology and can therefore offer just the right measurement technology for any situation. For pressure measurement, this would be the JUMO MIDAS S05. This pressure transmitter is available for both relative and absolute pressure measurement ranges. The fully welded and therefore seal-free measuring system made of high-grade 316L stainless steel can be used in almost all media, even when the conditions are rough. Its piezoresistive sensor system has an overload capacity for any measuring range.

When it comes to sophisticated SIL or Ex applications, the JUMO dTRANS p20 is an ideal choice. The version with explosion protection [Ex ia] (intrinsically safe) allows the pressure transmitter to be installed even in zone 0. The housing and sensors are manufactured from high-grade stainless steel. A special high-temperature version which can withstand temperatures of up to 200 °C is available for measurement tasks involving hot media and lines. The pressure transmitter is adjustable and can therefore be flexibly adapted to various measuring tasks. An easy-to-use setup program is available as an accessory to enable operation via the HART interface.

Brief explanation:

Hydrogen is one of the basic elements of all life on our planet. It was discovered in 1766 by the chemist and physicist Henry Cavendish. It is the most widespread element in the universe. On Earth it most commonly occurs in water, but is also found in natural gas and many other compounds.

News from the calibration laboratory

Service for humidity and pressure

Stefan Krummeck
JUMO Calibration Expert
stefan.krummeck@jumo.net

The accredited calibration laboratory for the measurand temperature has been operating in Fulda since 1992. But now, JUMO has been accredited by the German National Accreditation Body (DAkkS) as a service provider of humidity and pressure calibration as well. As a result, JUMO can support customers across the entire product cycle.

Humidity

A new feature includes the calibration of sensors for measuring humidity.

Humidity affects many properties of the air and the materials that are exposed to it. Monitoring and measuring humidity levels is important if effects such as condensation, corrosion, mold growth, warping, and pollutants are to be prevented for products.

Humidity has to be measured in industries that produce and sell food, pharmaceutical products, chemicals, fuels, wood, textiles, and paper. Museums, art galleries, data centers, hospitals, research labs, and semiconductor manufacturers are other institutions/companies for which measuring humidity is of vital importance.

The in-house laboratory in Fulda is where JUMO calibrates hygrometers used for the direct acquisition of relative humidity (including the use of transmitters and data loggers). These calibrations are always accredited.

Pressure

It is advisable to calibrate electric and mechanical pressure measuring devices once a year to ensure that they operate at optimum performance.

The necessary adjustments, maintenance, or cleaning are part of JUMO's services. A new addition to our service portfolio is providing accredited calibrations of the mechanical measurand pressure directly at the customer's premises. It can be carried out regardless of manufacturer. JUMO can calibrate absolute pressure and relative pressure within a measuring range from -1 to +600 bar.

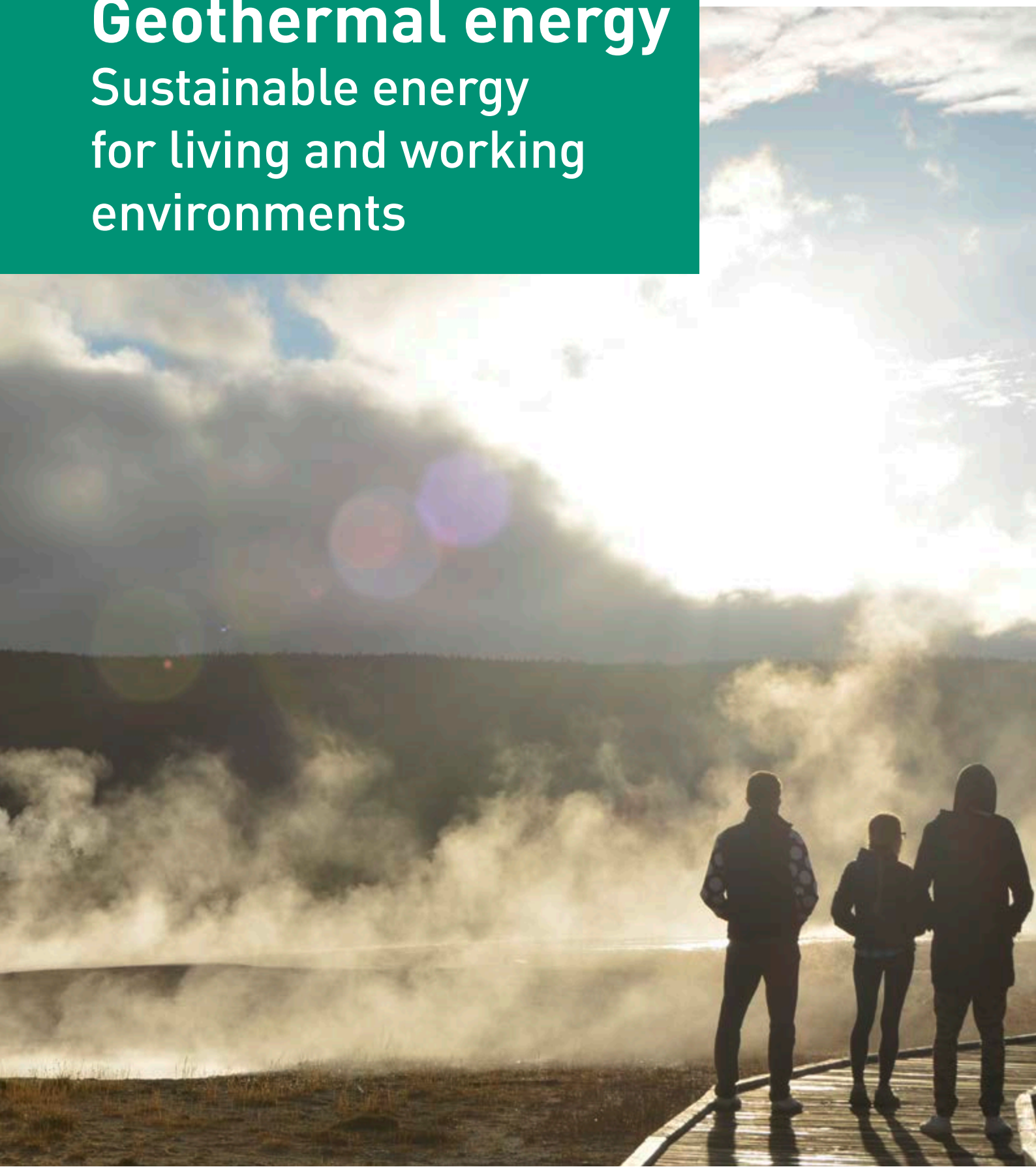
The calibration process adheres to DKD-R 6-1:2014 or DIN EN 837:1997. Other services include issuing a calibration certificate, applying a calibration mark on the calibration object, and disclosure of the measured values before making adjustments. ■

JUMO news:

In addition to an extensive product portfolio, JUMO also offers services such as the installation, calibration, and maintenance of complete measuring chains: **service@jumo.net**

Geothermal energy

Sustainable energy for living and working environments



JUMO webinar
Using the conductive, four-pole conductivity sensor JUMO BlackLine CR 4P
January 19, 2021

Conductivity sensors are particularly suited for measuring the salt content of process water

In almost two thirds of all German households, heating and hot water is supplied by a grid-bound source of energy – so natural gas, district heating, or electricity. At 48.2 percent, natural gas makes up the greatest share of the market. As sustainability is playing an increasingly important role in the energy transition when it comes to the consumption of raw materials, interest is growing in alternatives such as geothermal energy (i.e. thermal energy), which comes out of the ground. The fact that this resource will never run out is just one of the many advantages for energy production.

How exactly does geothermal energy work?

Geothermal energy is usually generated by heating up salty water in a deep layer of soil from where it is then pumped up to the surface. A pipe and pump system conveys this water to a heat exchanger, in which the heat from the salt water is transferred to a fresh water pipe. This pipe is routed to developed areas to heat houses, greenhouses, or other buildings. After use, the water is pumped back into the ground, where it heats up again naturally. In other words, it is a renewable energy cycle.

Dutch greenhouse horticulture

One of the sectors in the Netherlands searching for a sustainable alternative for fossil fuels is the horticulture sector. Many greenhouse horticulture businesses use cogeneration plants, which turn natural gas into heat, CO_2 and electricity. The fixed costs of these cogeneration plants, however, are high, and the variable returns from feeding the electricity back into the grid have been disappointing in the last few years. That is why 90 percent of geothermal projects in the Netherlands are within the greenhouse horticulture sector. Continual availability, sustainability, and the reduction of CO_2 emissions are important prerequisites for the successful implementation in this industry.

Technical challenge

Salt can have a heavily corrosive effect. When applied at concentration levels that are too high, it can also damage plants. That is why the strict separation between pumped salt water from the fresh water side is important. In a greenhouse horticulture context, the fresh water side of the heat exchanger is monitored very closely. Checking the fresh water side of the heat exchanger for leaks is particularly important.

Corrosion can damage the pipe system, which – at worst – can cause the entire system to fail. Conductivity sensors are particularly suited for detecting the salt content of process water. Another hazard source of geothermal plants is that salt water could leak into surface water and groundwater. As this technology involves drilling down to great depths and the pipes are subjected to high loads, it is vital that the pressure in the lines is monitored on a permanent basis. This helps to safeguard the quality of the groundwater.

JUMO offers the ideal sensors, controllers, and paperless recorders for measuring both conductivity and pressure. ■

Brief explanation:

Geothermal energy is a source of hope for the energy generation of the future. According to a projection from the Leibnitz Institute in Hanover, around 60 percent of all of the heat energy required in Germany could stem from underground drilling by 2050.

"Industry 4.0" worldwide

Automated rotation speed control for hammer mills with remote maintenance

Marco Lange (JUMO, left) and Marco Schätzel (Tietjen, right) organized the project

Tietjen Verfahrenstechnik GmbH has been building hammer mills for a wide variety of applications since 1959. Recently, the company has started using JUMO technology to control their dosing systems. In collaboration with the JUMO Engineering team, the company has also developed a modern web application to drive forward the innovative Tietjen remote maintenance concept for hammer mills. The result of this fruitful cooperation is a JUMO controller in Tietjen design that is optimally tailored to the application and that uses customer-specific software.

The company's mill systems are constructed individually, but they are predominantly used in feed and food production. They are also used for shredding wood and fibers as well as for biowaste or biomass.

An important element for the efficiency of any mill is the upstream dosing device. Plants that process biomass in particular usually require the ingoing material to be dosed. For dry material, many systems require an aspiration – an air stream that feeds generated dust to a separation unit. Furthermore, no impurities such as metals, stones, or plastics should enter the process. ➜

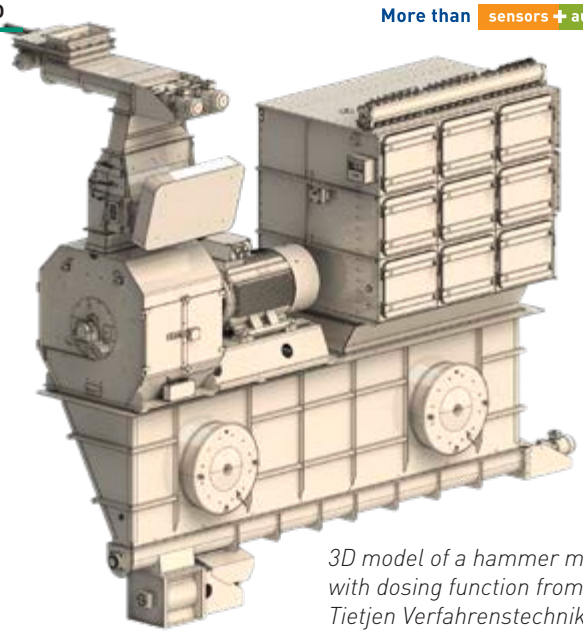
High-precision control required

Depending on the application, either screw feeders, vibration feeders, or drum feeders are used. Their speed has to be monitored with the utmost precision so that only the defined quantity of ground material is supplied. To complicate matters, the plant reacts differently depending on the ground material, which means the control parameters have to be adjusted with precision. Even the startup of this kind of plant is difficult because, depending on the feed method and design, some time may be required for the ground material to begin dosing continuously. During this time, the controller must not become unstable, as overdosing could bring the plant to a standstill.

Last year, Tietjen Verfahrenstechnik GmbH set out in search of a new and modern controller component for this task. Specifically, the company wanted a controller component with functions that fell under the umbrella term "Industry 4.0", which included a remote maintenance option. The controller's main task would be to control the speed of the electric drive of the dosing process, based on the load from the ground material. Further requirements here were a continuous PD controller that was as accurate as possible and a 24 volts voltage supply. The controller had to have UL approval for exporting and it had to be installed in a control cabinet.

Furthermore, a higher-level control needed to continue implementing external controller release as well as the setting for an external setpoint value. Finally, the connection of further temperature signals for plant monitoring had to be available as an option.

JUMO had just the right product in its portfolio for all of these requirements. The JUMO DICON touch is a multichannel process and program controller with a modular hardware concept so that it can be used in a wide range of applications.



3D model of a hammer mill with dosing function from Tietjen Verfahrenstechnik GmbH

JUMO DICON touch also offers useful functions for this application situation such as time-dependent parameter block switchover and, alternatively, a startup ramp. Furthermore, limit values can be defined which cause the controller to switch off, and consequently, to halt the dosing process in the event of grinder overload.

Modern remote maintenance concept

All JUMO DICON touch / TCU 96 (customer's description) devices are delivered with an especially developed web application. It prepares the hammer mills for remote maintenance. Also, it enables operation and startup that is as simple as possible for on-site service staff or staff from the Tietjen Verfahrenstechnik GmbH service department.

In this case, Tietjen Verfahrenstechnik GmbH and JUMO Engineering applied the extensive requirements that an "Industry 4.0" capable plant has to meet. The result was implemented as the standard on the device web server. It can be accessed in several ways: via a local Wi-Fi connection using a laptop, tablet, or smartphone, via a VPN gateway, or through a customer's network structure at the end customer's premises via DSL.

The application is designed for operating the plant as well as for starting it up and optimizing it remotely. That is why applicable configuration parameters can only be accessed using a password in a separate configuration environment. Operating the controller when it is running does not require a password. This web application enables Tietjen Verfahrenstechnik GmbH to seamlessly map out its sophisticated remote maintenance concept. ■

Basic principles for the measuremen

Use of the optical measuring method

Oxygen concentration levels are measured in wide variety of applications ranging from fish farms through to sewage treatment plants. Both of these example applications require a minimum oxygen concentration level. The concentration level can be increased by suppling additional oxygen directly or through ventilation. Many applications do not require a highly accurate measurement. But a measurement must still be made, as otherwise the concentration level could be increased unnecessarily, which in turn would increase operating costs. Depending on the size of the plant, the cost of the measurement technology pays off in a relatively short time.

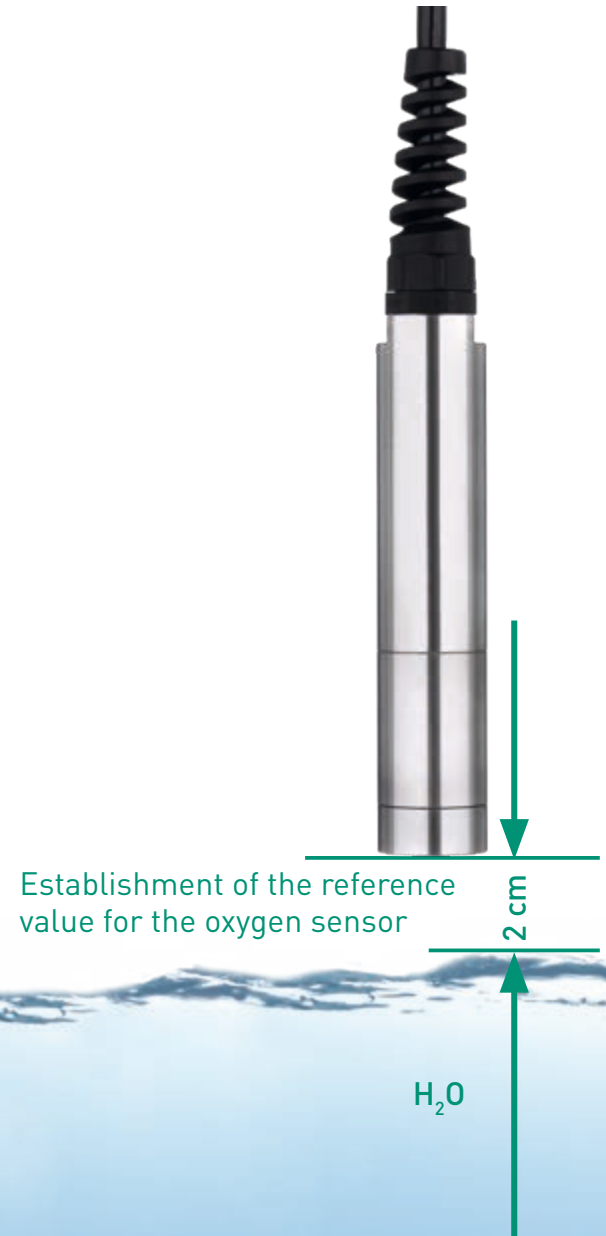
Units and dependencies

Oxygen concentration levels can be expressed as mg/l or ppm (parts per million) – which mean the same thing.

Water can only absorb a certain amount of oxygen. If the maximum possible level of oxygen has been dissolved in the water, the so-called oxygen saturation level is 100 percent. The maximum possible level of oxygen depends on the temperature. At lower temperatures, greater levels of oxygen can be dissolved. For example, fresh water with a temperature of 20 °C at an atmospheric pressure of 1 013 hPa can reach an oxygen concentration level of 8.84 mg/l. But at 10 °C, the maximum goes up to 10.92 mg/l, and at 0 °C, 14.6 mg/l of oxygen per liter of water can be absorbed. If oxygen-saturated water at a temperature of 20 °C (8.84 mg/l) were to cool down to 0 °C, the saturation level at 8.84 mg/l (or 14.6 mg/l) would be ≈ 61 percent. It is assumed that during the cooling process, no oxygen is absorbed from the atmosphere.

The maximum amount that can be absorbed also depends on the actual air pressure and on the salt content (salinity). The absorption capacity will drop if the air pressure is decreased and the salt content is increased.

In many applications the oxygen saturation level in the aqueous liquid must be determined. A sensor is used to measure the oxygen content (e.g. in mg/l) and the temperature. The actual air pressure and salinity are entered as fixed values in the transmitter. These 4 measurands are used to determine the oxygen saturation level.



JUMO webinar
Application of JUMO digiLine series O-DO oxygen sensors
January 20, 2021

t of dissolved oxygen

Manfred Schleicher
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The optical measuring principle

In addition to electrolyte-filled systems, optical sensors are suitable for measuring dissolved oxygen.

The sensors have a membrane that consists of a carrier material and a luminophore. A beam of light is shone at the membrane at regular intervals. As a result of the radiation the luminophore changes to an energetically higher state and returns to its basic state when luminescence radiation is released. The emitted radiation is also measured in the sensor. When oxygen is present, part of the stimulated luminophore collides with it and instead of luminescence radiation, energy is transferred to the oxygen atoms. The higher the oxygen concentration level in the membrane, the less radiation is emitted.

Checking the system and calibration

The sensors are already calibrated upon delivery so that they can be used immediately.

Using a reference value (oxygen saturation level 100 percent), the system can be checked and calibrated after an appropriately long period of use. The sensor is used in water, but an oxygen saturation level of 100 percent is reached in vapor-saturated air. Here, the surface of the membrane is dried with a cloth and the sensor is placed approximately 2 cm above a water surface. After a certain waiting period the reference value will set in. ■

❶ Sensor with membrane cap removed
❷ Light source
❸ Membrane cap with luminophore
❹ Closed optical oxygen sensor

JUMO news:

Further information on the topic can be found in our webinar recording on oxygen measurement. You can find the webinar at: **http://elearning.jumo-en.info**

JUMO and the coronavirus pandemic

When the state of emergency becomes the norm

Almost without warning, everything came to a grinding halt: as of March 23, 2020 at the latest (the day Germany went into lockdown) the world in which we live has become a completely different place. But even in the weeks before, it became apparent that SARS-CoV-2 is anything but a harmless flu virus – though this is what some sceptics are still claiming.

Early response

By January 2020, JUMO had already received alarming news from its Chinese subsidiary in Dalian. In response, a cross-departmental crisis management team was rapidly put into place in February, which in the beginning set about developing and successfully implementing a hygiene action plan for JUMO employees in China. Subsequently, it was possible to use this experience when the situation became more critical in Germany and in the other countries.

A major internal event planned for early March with colleagues from all 25 subsidiaries was restructured to an online format. Once the lockdown began, it only took one working week to provide remote-working access for several hundred employees at the company headquarters in Fulda as well as for the employees in the subsidiaries.

During the same period, the shift-work and break schedules at the production sites were adjusted to ensure compliance with the required hygiene and distance rules. Protecting employees took first priority in all considerations.

Delivery capability guaranteed

A temporary closure of the sites was never up for discussion. The reason is that JUMO supplies measurement and control technology for numerous "critical infrastructures". According to the German Federal Office of Civil Protection and Disaster Assistance (BBK), this refers to organizations or institutions that are essential to core public infrastructure. If these were to fail or become hindered, the result would be supply shortages with long-term effects, considerable disruption to public safety, and other dramatic consequences.

In Germany these kinds of organizations and institutions include energy suppliers, medical laboratories and medicine manufacturers, the food industry, public water supply, and wastewater disposal. By keeping production running without interruption, JUMO helped with maintaining the infrastructure during this critical period. Even the international delivery capability was not affected at any time.

JUMO news:

The coronavirus will keep the world in suspense at least until a working vaccine is found. However, JUMO is well prepared for the time ahead so that it remains a reliable partner for customers around the globe.

Optimistic into the future

In the current situation, JUMO benefits not only from efficient crisis management, but also from its broad product and industry portfolio. Nevertheless, even JUMO had to implement reduced working hours to cushion the effect from the slump in turnover since April. However, by taking a prioritization approach to the numerous development projects, JUMO was able to ensure that work on core future projects could continue. ■

Events in times of the coronavirus

Seizing opportunities in the crisis

Over the course of 2020, the coronavirus pandemic has turned the trade fair and events sector on its head throughout the world. Almost all events had to be canceled, and instead, new creative event formats have been developed. JUMO clearly focuses on the greatest possible safety for customers and employees – and therefore proactively promotes virtual events.

Well prepared for digitization

In terms of events, JUMO has spent the last few years putting measures into place to ensure optimal preparation for digitization: live webinars, online exclusive training courses, and over 200 e-learning courses have been core components of our training program for many years.

Conferences are becoming virtual

When the coronavirus pandemic began to spread at the beginning of 2020, JUMO had to react fast: within just 2 weeks, the International Sales Meeting with its 400 international attendees was reorganized as a hybrid format. That meant some attendees went to the event on-site and the rest took part via webinar. This successful start was followed by other virtual and hybrid internal conferences where expertise was developed further. JUMO has used the time to position itself even better for the virtual future in the event sector. That meant the use of virtual whiteboards, the introduction of modern e-learning formats, and tests of virtual networking rooms.

The first virtual JUMO trade fair

All these experiences will now be incorporated into our upcoming premiere: the first virtual JUMO trade fair will go online on **January 27 and 28, 2021**!

The innovative virtual platform will not only give customers and visitors the chance to experience the latest new products and industry-specific solutions at various virtual booths, but also enable them to talk directly with JUMO consultants via chat or video at the booth.

Livestream and networking

As the centerpiece of the virtual trade fair, visitors can expect an exciting livestream with high-quality presentations on JUMO highlights and current topics. Here, too, visitors will have the opportunity to chat live with the JUMO experts and ask questions.

A central factor for success in every trade fair is one thing above all: contact and communication with other people. And it is this very thing that many have been missing over these past few months. For this reason, JUMO has made the subject of networking another focal point for the virtual trade fair. Visitors will be able to see at all times how many other people are currently attending the trade fair. Just like at a real booth, they will have the opportunity to strike up a conversation at any time.

Welcome to the "Wonder Bar"

To help facilitate networking even more, JUMO has planned to have a "Networking Bar" at the trade fair. It is a collaboration project between JUMO and a startup company based in Berlin. Using an innovative tool named "Wonder", visitors can enter a virtual room straight through their browser and move around in it freely. As soon as a visitor approaches another attendee, a video chat starts up. Other participants can join this group. Anyone can move on at any time to join the next group or start up a new group. Finally, visitors will have the chance to prearrange individual meetings with JUMO customer advisers to conduct a consultation in one of the virtual meeting rooms. ■

JUMO news:

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