01 / 2014

sensors + automation

The customer magazine from JUMO

JUMO

Water – liquid gold

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JUMO

Versatile adjustment.

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Particularly flexible:

The JUMO AQUIS touch devices for liquid analysis

Thanks to the modular device concept, the multi-parameter measuring devices can be flexibly adjusted to the different processing requirements for drinking water, bathing water, process water, and wastewater.

Whether dealing with control technology tasks or official recording obligations, you can combine measurement, display, control, and recording with a clear and user-friendly touchscreen.

Welcome to JUMO.

Scan the QR code to find out more about our products

www.aquis-touch.net

Dear Reader,

Water is now already one of the most important resources around the world. A healthy person only needs approximately 2.5 liters per day to survive, but the per capita consumption in Germany alone currently lies at 130 liters per day. Above all, in emerging industrial nations, such as India or China, the supply of clean drinking water and the reliable disposal of wastewater play an extremely important role.

We have dedicated this customer magazine to the subject of "water" and what the JUMO business group can contribute to this topic. After all, we have already been devoting ourselves to water and wastewater management with our analytical measurement area for decades. Our continuous growth and success in the industry have provided us with further momentum to continuously expand our product range in this field.
You will find two practical reports on pages 8 to 11 about water in its solid and liquid form. Our devices play a vital role in both applications. In the first case, we ensure the enjoyment of a number of winter sports athletes and in the second case, JUMO products help convert seawater into drinking water.

We hope you enjoying reading these contributions and the other articles in our customer magazine.

JUMO. More than sensors + automation.

Your
Managing Partners,

Bernhard Juchheim *Michael Juchheim*

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Published by	JUMO GmbH & Co. KG
Project manager	Michael Brosig
Design	Manfred Seibert
Printing	Hoehl-Druck Medien + Service GmbH, Bad Hersfeld

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JUMO MIDAS C18 SW
OEM seawater pressure transmitter
Type 401012

JUMO LOGOSCREEN nt
Paperless recorder with TFT display,
CF card, and USB interfaces
Type 706581

Water – liquid gold

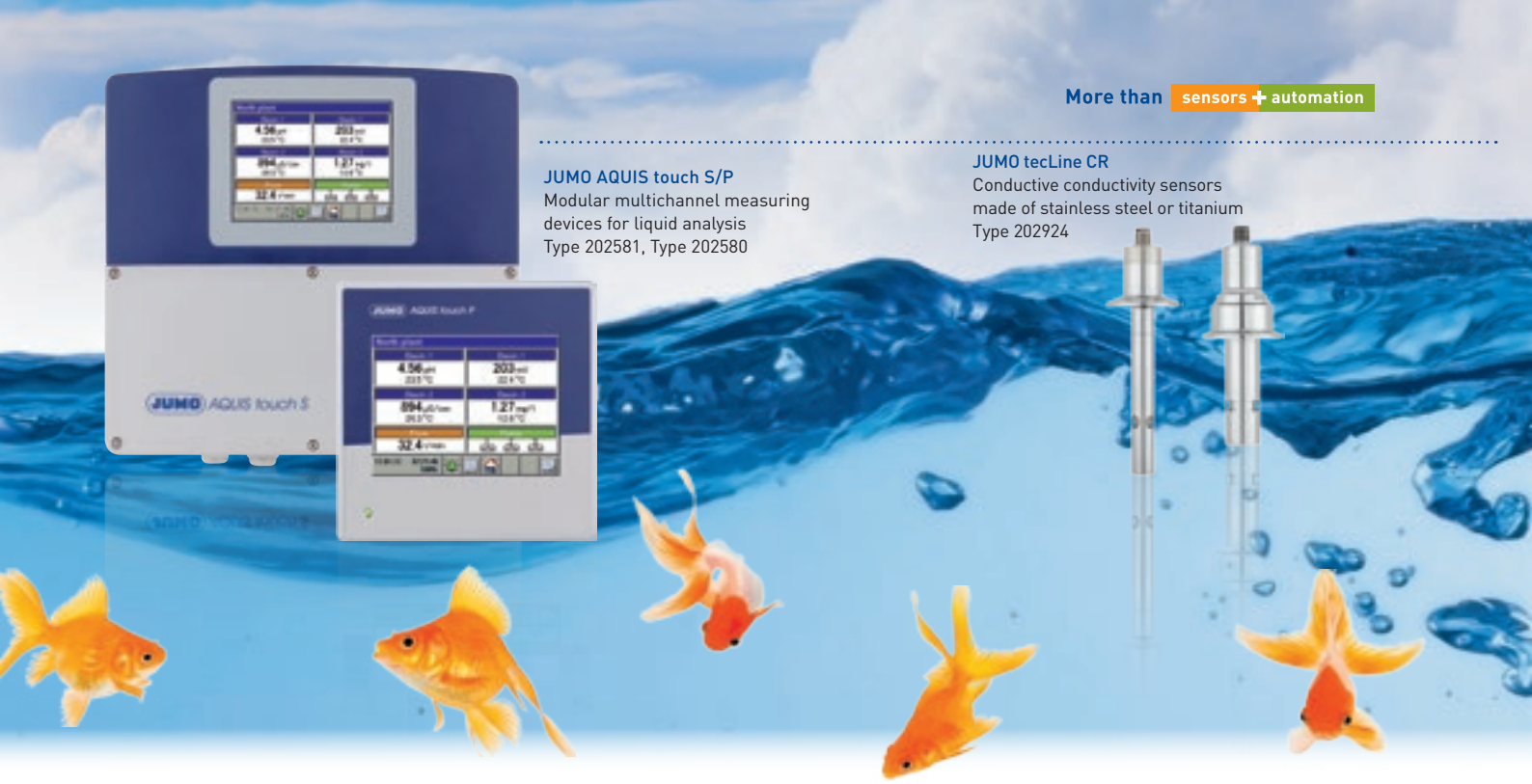
JUMO has dedicated itself, with great success, to analytical measurement for decades

More than 2000 years ago, the Greek philosopher Thales of Miletus already knew that "the principle of all things is water". Today, this saying seems more relevant than ever. Some experts today refer to the resource as gold of the 21st century. What's the reason for this? Since 1950, the per capita consumption in Germany alone has increased by almost 50 percent. Nowadays, each resident of Germany consumes approximately 8,500 bathtubs full of water per year. Although this development has slightly decreased, we cannot hide the fact that the true challenges in water supply and disposal in the next few years lie in the emerging industrial nations around the globe.

"In many cases, the availability of clean drinking water decides between life and death and the availability of economically viable service water determines prosperity or poverty. This is why water can result in social and armed conflicts." That is what the "Berlin Institute for Population and Development" determined, and rightly so. Around 1.1 billion people do not have access to clean water. 2.6 billion people must make do without adequate sanitary facilities and 1.8 million people die each year due to water-born diseases. In India, for example, only 37 percent of households are connected to a distribution network. Approximately the same number draws their drinking water from manual pumps and 18 percent through well systems. The 1,000 cities with more than 500,000 residents produce 26 million m³ of wastewater each day, with a maximum daily treatment capacity of 7 million m³. As a result, 19 million m³ of wastewater are not cleaned. That is 73 percent of the total wastewater quantity that can end up untreated in the water circulation system. To achieve the millennium development goals set by the United Nations, 116 million toilets must be installed in Indian cities and up to 290 million in the countryside in the next three years.

Solutions for a wide variety of tasks

Reliable and precision measurements are an absolute must for reaching the goal of securing a constant high water and wastewater quality. JUMO therefore offers a number of solutions for a wide range of applications for water and wastewater engineering. For example, the measurands pH-value, filling level, flow, conductivity, pressure, and chlorine play a role in the process of treating groundwater. This starts with sensors for the conductive or inductive conductivity measurement and ranges up to modular multichannel measuring and control devices of the



JUMO AQUIS touch S/P
Modular multichannel measuring devices for liquid analysis
Type 202581, Type 202580

JUMO tecLine CR
Conductive conductivity sensors made of stainless steel or titanium
Type 202924

AQUIS touch series for liquid analysis. In emerging and developing countries, the treatment of brackish water and seawater plays a very important role. Around 97.5 percent of the water in the world contains salt. Due to the limited availability of drinking water, seawater represents a significant source of drinking water.

JUMO products are used in seawater desalination plants around the world. The reverse osmosis unit is the heart of the seawater desalination plants. During reverse osmosis, the seawater is pressed under high pressure through a fine porous membrane. This membrane functions like a filter and only allows specific ions and molecules to pass through. Due to the high salt content of seawater, a pressure between 60 and 80 bar is necessary. To ensure that the plant operates safely, the pressure upstream of the reverse osmosis unit must be monitored. We recommend pressure transmitters from JUMO for this task.

JUMO products are used around the globe

Product range with all the important approvals

Mechanical, biological, and chemical procedures are applied in the treatment of wastewater. The requirements for measuring accuracy in this area are particularly high. With all process steps – from the computer system, sand filter, and the various treatment tanks to the digestion tower – sensors, display devices, and controllers from JUMO can be used.

To best meet the strict hygienic requirements in water and wastewater engineering, a number of JUMO products have approvals from the FDA (Food and Drug Administration) or the EHEDG (European Hygienic Engineering & Design Group). A special range of products with ATEX approvals is available for use in digestion towers. The comprehensive range of JUMO products thereby makes an important contribution for ensuring clean drinking water and treated wastewater.

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"The supply of clean drinking water and the environmentally-friendly disposal of wastewater are among the biggest challenges of the 21st century."

Dipl.-Ing. Matthias Kremer

Head of Business Unit Analytical Measurement

JUMO AQUIS touch S
Modular multichannel measuring device for liquid analysis with integrated controller and paperless recorder
Type 202581

JUMO AQUIS touch S

The all-rounder in use ...

When producing a project design or revising an existing plant, various measurands must frequently be determined, displayed, controlled, and sometimes also recorded. To solve these tasks, you can combine different products or you can look for one device that meets all these requirements. For applications that require different measurands of analytical measurement, JUMO offers the AQUIS touch S as a comprehensive solution.

Sensors can be directly connected to the device for liquid analysis, such as pH-value, conductivity, turbidity, oxygen, chlorine, and others. Other measurands, such as flow, pressure, level, and temperature can also be integrated through the additional existing inputs. A practical example is provided below:

The left container here is the upstream storage container in which wastewater is collected or stored for treatment. This is then transferred into the right container that represents the treatment tank. There, the wastewater is neutralized by adding chemicals, for example.

The level sensors or the depth gauge provide the measured values of the filling levels in the containers. On this basis the pumps that are responsible for transporting the water from one container to the other are activated by internal relay contacts.

The electrolytic conductivity is also determined with an inductive sensor in the storage container (left). It is connected directly to the JUMO AQUIS touch S. Based on the measured values, various actions can be performed – examples include triggering an alarm, pretreatments, or similar operations. The device can, for example, also calculate the concentration values of a specific substance based on the electrolytic conductivity measured values.

The measurands dissolved oxygen and turbidity are determined in the treatment tank (right) before the contents of the container can be released for the next treatment step or into the sewer. The pH-value could also be controlled here.

All relevant data is recorded using the integrated paperless recorder and can be processed further by the JUMO PC evaluation software (e.g. printed or archived).

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NEW PRODUCT

JUMO Wtrans E01

Universal wireless measuring probe to measure humidity, temperature, and CO_2

The digital JUMO Wtrans E01 measures humidity, temperature, and CO_2 content. The device is designed for even the most demanding applications in heating and air-conditioning technology, agriculture, or industry. The multipoint CO_2 and temperature adjustment creates outstanding CO_2 measuring accuracy across the whole temperature range. Digital probes for CO_2, humidity, and temperature, along with an RTD temperature probe with Pt1000 temperature sensor can be connected to the device.

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NEW PRODUCT

JUMO PINOS L01

Fast, cost-effective, user-friendly

Flow sensors are required in a range of industries and applications. With the PINOS L01, JUMO presents a device that is characterized by its extremely short reaction time, simple as well as multi-directional mounting (360°), and con-venient operation. The JUMO PINOS L01 can, for example, be used to monitor cooling circuits, compressors, pumps, and heat exchangers.

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NEW PRODUCT

JUMO frostTHERM-ATE

Stay cool with confidence

Frost protection thermostats are used on the air-side of air-conditioning systems, heat exchangers, heating registers, and similar units to protect them against frost damage and freezing. With the frostTHERM-ATE, JUMO is expanding its electromechanical range to include an electronic solution. A special start-up function and the particularly simple operation set this new product apart from the rest. Integrated membrane heating allows it to be used up to –15 °C.

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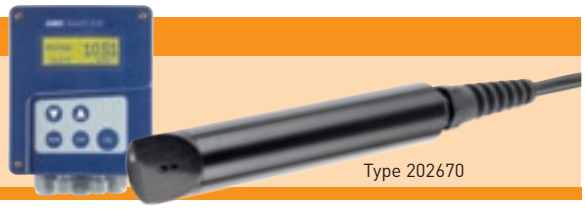
NEW PRODUCT



JUMO ecoLine NTU – optical sensor for turbidity measurement

The turbidity measurement according to DIN EN ISO 7027 is an efficient and widespread measurement method for controlling and determining quality, particularly of water with low to medium turbidity. Thanks to the optical turbidity sensor ecoLine NTU, JUMO can now offer such a method.

The measuring principle of the JUMO ecoLine NTU is based on an infrared light measurement according to the 90° scattered light principle. Thanks to turbidity measurement at a wavelength of 880 nm and a measuring range of 0-4000 NTU at operating temperatures from 0 to +50 °C, the sensor is suitable for application in numerous fields. Drinking water monitoring, municipal and industrial wastewater treatment, final wastewater inspection, monitoring bodies of water, or application in fish farming operations are just some examples. The data is evaluated using the JUMO AQUIS 500 RS. The sensor housing is characterized by a lean and durable design. The calibration data and the calibration history are stored in the implemented electronics. Both immersion and flow fittings are available as accessories.

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"JUMO sets sail"

In the future, the JUMO industry portal will also include the shipbuilding industry. This industry places a wide range of particularly high demands on measurement technology. The used devices must offer process reliability and long-term stability and be resistant to salty, humid sea air. Here, JUMO offers a high-quality selection of sensors and automated solutions. In addition to innovative touch devices, the selection also includes numerous products that have been used successfully in the field for many years.

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Measurement and control technology for seawater desalination

Converting seawater into drinking water

Over 70 percent of the Earth's surface is covered by water, but only 2.5 percent of this is fresh water. Two-thirds of the fresh water is frozen at the poles and is therefore inaccessible to us as drinking water. In light of the limited natural availability of drinking water, developing seawater into a significant source of drinking water is essential.

Drinking water or process water can be obtained from seawater by reducing its salt content which is also referred to as seawater desalination.
Various thermal or membrane processes are used for this purpose: membrane distillation, reverse osmosis, evaporation, or electrodialysis. The most widely-used method today is reverse osmosis.

Reverse osmosis

The filtration process during reverse osmosis is essentially based on the diffusion effect. Desalination is achieved using a special form of membrane filtration. Seawater is forced under high pressure through a semipermeable membrane (permeable in one direction). It has such fine pores that it only allows the water molecules to pass through and retains the salt. The result of this process is fresh water. To ensure that the sensitive membrane is not clogged up or destroyed by particles and layers of algae or bacteria, the seawater must be pretreated before reverse osmosis.
Ensuring quality in reverse osmosis plants requires a number of measures including continuous monitoring of the measurands pressure and conductivity, etc.

Osmotic pressure

In the reverse osmosis process the seawater being treated is forced through a synthetic membrane at more than twice the osmotic pressure (at 60 to 80 bar) using a high-pressure pump. With minor exceptions only water molecules are small enough to pass through the fine pores while particles, microorganisms, and various other contaminants are removed with a partial flow.
The seawater used for reverse osmosis contains a salt concentration of up to 35 g/l. When using conventional pressure transmitters, measuring errors or sensor failures can result at such a high salt content due to deposits and corrosion. With its case and pressure connection made of corrosion-resistant, durable titanium and the chemical-resistant, oil-free

measuring cell, the JUMO MIDAS C18 SW pressure transmitter specifically aims to meet these challenging demands.

The central part here is a hysteresis-free, piezoresistive, ceramic-based pressure sensor that employs thick-film technology. In addition to excellent long-term stability, it features overload resistance three times the final measuring value. The JUMO MIDAS C18 SW can record relative pressures in ranges from 1.6 to 100 bar and can output them as standard signals.

Inductive conductivity measurement

The JUMO ecoLine Ci inductive conductivity sensor is ideal for conductivity measurements of seawater. Compared to the conductive two-pole or four-pole measuring method, the inductive process is virtually maintenance-free. The measuring accuracy is practically unaffected by deposits, grease, or oil films on the surface of the sensor. The installed Pt1000 temperature probe records the process temperature while simultaneously allowing for fast, accurate temperature compensation – this is especially important for measuring conductivity.

As standard procedure, the standard sensor body material is made out of polypropylene (PP) and is therefore particularly suitable for use in seawater. Materials that come into contact with the measurement medium are approved for food use (drinking water), physiologically safe, and listed by the FDA.

The modular multichannel measuring devices of the JUMO AQUIS touch series are designed for liquid analysis. They can feature any combination of up to four analysis inputs for directly connecting sensors. In addition, up to five additional measuring signals – for example, pressure – can be connected.

A 3.5 inch color monitor with touchscreen displays all the parameters as well as the device operation and settings. The user can select the operating language. The measured values can also be converted into standard signals or exported via digital interfaces for further processing in a controller, such as a PLC. Integrated logic and math modules allow for extensive calculations that incorporate an array of measurement parameters.

With the paperless recorder, up to eight analog and six binary signals can be recorded simultaneously and then displayed on the screen in their temporal sequence, as with a paper recorder. Data storage is tamper-proof and enables official record-keeping requirements to be met without additional devices. A web server function enables remote diagnostics.

Thanks to the devices' flexibility, they cover a large number of applications. These include drinking and bathing water monitoring, municipal and industrial wastewater treatment plants, process systems, cooling tower controls, ion exchangers, or even for the desalination of seawater.

Summary

The desalination of seawater plays an important role in areas with little or contaminated ground and surface water. To ensure quality and process reliability, important parameters such as pressure and conductivity must be continuously recorded, monitored, and controlled. JUMO offers a wide assortment of suitable process sensors as well as the matching transmitters and controllers for this area of analysis and pressure measuring technology.

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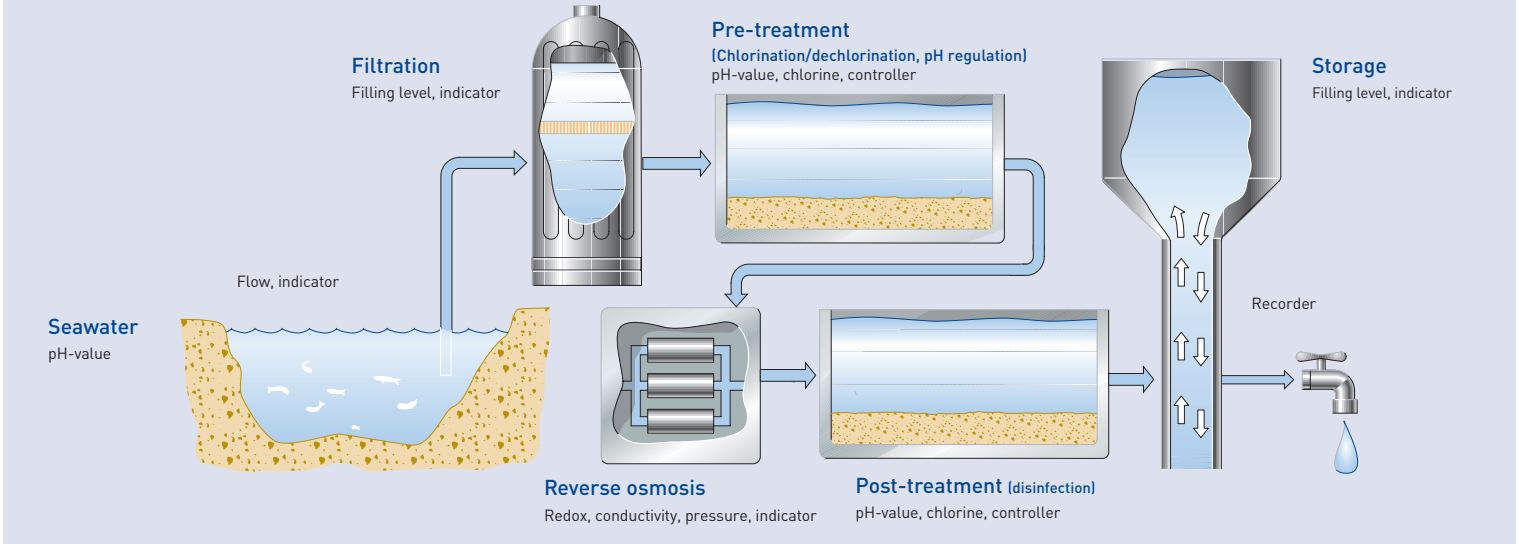
Desalination of brackish water and seawater: diagram of a reverse osmosis plant



Leak monitoring in cooling systems

JUMO products in use at an ice rink in Wengen, Switzerland

Monitoring of leaks in cooling systems using pH measurement is an alternative to previously utilized methods. Cooling systems are used in many sectors. Reaching the required cooling capacity is only one of the objectives involved here. They should also be safe, environmentally friendly, cost-effective, and energy-efficient. Ammonia (NH_3) is a cooling agent which has regained importance in new cooling systems since the prohibition of chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs).

Ammonia

Ammonia is present in cooling circuits in part as a liquid and in part as a gas. Under normal conditions (0 °C and 1013 mbar), ammonia is a colorless, poisonous, and corrosive gas. As a liquid, it is either compressed or cryogenic (boiling point of -33.4 °C, 1013 mbar).

Ammonia is readily soluble in water and the resulting solution is referred to as ammonium hydroxide. The temperature and the molar concentration of the ammonia in water can be used to calculate the pH-value *(Figure 1)*.

Cooling

To achieve the required cooling, compression cooling machines are used in most plants. Here, the gaseous ammonia is drawn in by the compressor and compressed. The temperature of the ammonia rises as a result. At the downstream condenser this heat is removed from the ammonia (e.g. with water cooling) which causes it to become a liquid. The ammonia is then decompressed at the flow regulator and cools down. The resulting thermal energy is now reduced compared to before compression and heat can therefore be withdrawn from the environment at the evaporator, producing a cooling effect. The ammonia changes its physical condition at this stage and becomes gaseous again. It is then drawn in again by the compressor and the cycle is complete *(Figure 2)*.

Weak point: condenser

The condenser can be a weak point, as the ammonia is under high pressure. Even if only very small quantities of ammonia leak out at this point, it can have disastrous effects on humans and the en-

vironment. As previously mentioned, the ammonia concentration influences the pH-value of a liquid. Ammonia entering the cooling water circuit at a particular point can be determined by measuring the pH-value upstream and downstream of the condenser (applies to cooling circuits with water; with ethylene glycol additives the impact on the pH-value is too little). If large quantities of ammonia leak, a difference between the measurements is evident immediately. In the case of smaller quantities, no substantial difference will result but the absolute pH-value will gradually increase. Monitoring the difference and absolute value is therefore essential *(Figure 3)*.

Application example on an ice rink

The difference monitoring also triggers in the event of a possible drifting (aging) of the pH probes, providing the system with a certain degree of safety. This monitoring principle has been used with great success for some years now at the ice rink in Wengen, Switzerland. The process involves using glacial water to cool the condenser. The heated water is used to heat the water for an open-air swimming pool. To measure the pH-value, two JUMO pH combination electrodes with subsequent JUMO dTRANS pH02 transmitters are used for each circuit (condenser and evaporator). The measured values are compared with one another using a JUMO di308 display unit and checked for their absolute value. If the predetermined limit values are exceeded, an alarm is activated immediately.

In plants where air is used to cool the condenser, only the evaporator circuit is monitored. This is how JUMO products provide safe winter enjoyment.

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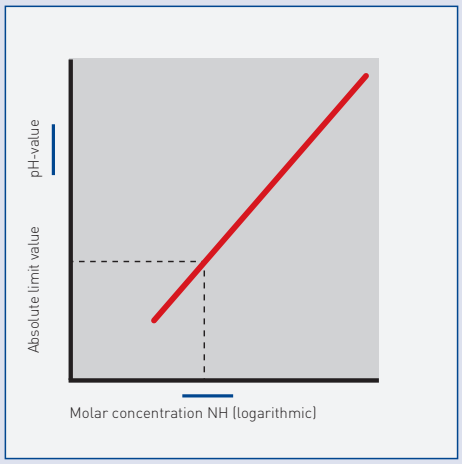

Fig. 1: Determining the pH-value based on the temperature and the molar concentration in water

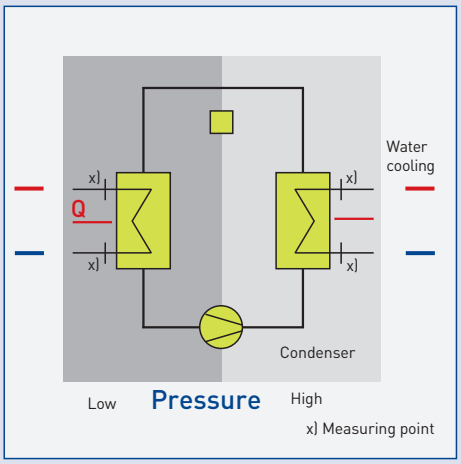

Fig. 2: Cooling circuit diagram

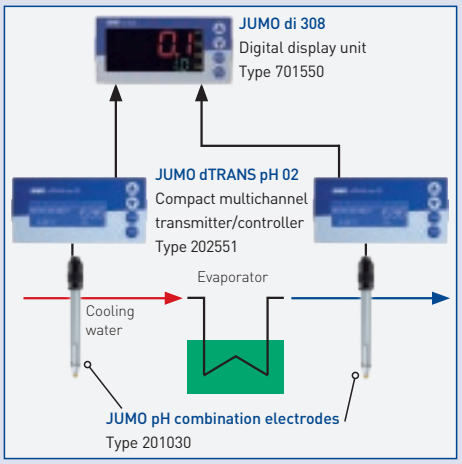

Fig. 3: Monitoring the difference- and absolute value

JUMO wheelset temperature probe
Push-In RTD temperature probe
with connecting cable
Type 902150

JUMO surface-mounted thermostat
AMTHF series
Type 603051

From product to solution provider

Expanding the JUMO market segment management

JUMO has been ratcheting up its efforts in pursuing an industry strategy for several years. As a result, the company has been continuously developing itself from a component supplier to a system provider. As a "hybrid company", its objective is to offer the customer the entire value-added chain from development to production through to professional services from a single source.

An industry manager is already successfully servicing the pharma & food sector. The solutions that have been developed for dairies, breweries, or meat-processing companies are exemplary. Walter Wuest has been supporting the business group as an "industry manager for railway technology" since the beginning of the year. He significantly developed the entire railway sector for JUMO as the managing director of the Swiss subsidiary and has acquired a vast wealth of industry knowledge.

The growth figures in the railway sector are impressive. For example, the railway industry in Germany posted new orders totaling 8.7 billion euro in the first half of 2013. That is almost 50 percent more than in the same period of the previous year. The German industry generated over 10 billion euro last year, with this figure set to increase in the future. If you consider the enormous investment backlog in the infrastructure sector you can expect substantial growth in the next few years. The railway industry in emerging countries in particular, however, is a market of the future with breathtaking outlooks. For example, the annual railway traffic capacity in China in both cargo and passenger transport has for some years been showing constant growth rates hovering around six percent. With the new market sector management, JUMO is now in a much stronger position to be able to tap into the vast potential of this development.

JUMO has taken a great step forward in expanding its market segment management to provide better customer service. This strategy, which has already enjoyed vast success, will also be continuously pursued in the future.

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New management for JUMO in Romania

Raul Guenther Adochiei Hanganu (56) has been the new managing director of the JUMO Romanian subsidiary in Arad since October 1, 2013.

Hanganu studied electrical engineering and has been a sales engineer, sales manager, and managing director in various companies in Germany, Belgium, and Romania for over 20 years. In addition to customer service and acquisition his tasks in Romania include strengthening the integration of the Romanian location in the global JUMO production network.

New JUMO temperature sensor makes soldering safe

Improved usability through pre-tinning

Platinum temperature sensors are robust, durable, and reliable. They are characterized by good vibration resistance and a fast response behavior and can record temperatures in a range of several hundred degrees. In some cases, however, soldering the nickel connection wires of the sensors has proven difficult. This is why JUMO is now offering a platinum temperature sensor with additional pre-tinning.

With the PCA ET (economic tinned), JUMO is entering new territory in the field of sensor manufacturing. Here, the company benefits from its longstanding experience in sensor production. In the last ten years alone the factory has produced more than 40 million temperature sensors.

The connection wires of the sensors generally consist of nickel. Usually this wire material can be easily soldered. However, the surface must be absolutely free of oxides. Even a few atomic layers of oxide that are invisible to the naked eye hinder the wetting process with tin and lead to unsatisfactory soldering results. To protect the tin against oxidation during the soldering process, flux materials with different degrees of activation are used. These remove the oxides lying on the surfaces to be connected by means of chemical reactions. In addition, flux materials reduce the interfacial surface tensions and allow for improved wetting.

Using these flux materials frequently presents a balancing act. Flux materials with good activating properties can leave salts behind as residue after soldering. Over time, this can lead to corrosion, shunts, or thermoelectric voltages. It is therefore imperative that these salts are removed in an additional step. "No clean" flux that is considered to have no residue is to be used to rectify the problem. This flux material, however, generally only achieves insufficient soldering results with nickel.

JUMO hygrothermal transducer for climate monitoring
Type 907021

JUMO PCA ET temperature sensor
Type 906121

Up until now, the JUMO temperature sensors have only been offered without tin, since a soldering process is normally qualified by the end customer in which, among other things, the flux material to be used is precisely specified. The ET temperature sensor that has now been launched on the market already features pretinning. As a result, each soldering process – irrespective of the flux material used – can be used. Customers can easily use the specific, qualified soldering processes on the new JUMO sensor. The PCA ET platinum temperature sensor is available in sizes of 1.5 × 5 × 1 mm and 2 × 1.3 mm. It is also available with the nominal values Pt100, Pt500, and Pt1000 and with tolerances of F0.1, F0.15, and F0.3.

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Improved process reliability and optimum plant availability

Customers regularly use calibration and maintenance services

In addition to the products, customers from various industries also take advantage of the on-site services from JUMO for monitoring their processes. The key decision-making factors here include economics, safety, and sustainability. First-class technical equipment is essential for these JUMO services. After all, only the interplay of ideally trained service employees and high-precision devices ensures the best user benefits.

Why is regular calibration essential? Each measuring instrument works with a defined tolerance that is guaranteed by the manufacturer at the time of the purchase. You cannot assume that the measuring instrument maintains this required measuring accuracy during its entire service life. External influences, the operating conditions themselves, or improper use can result in systematic changes in the measured values and thereby the tolerance. This is why a calibration at defined intervals is part of the basic requirement for ensuring the defined tolerances during the operational phase and for recognizing faults early on.

Since the demand for monitoring and adjustment measures with the corresponding documentation in the form of calibration certificates continues to grow, JUMO decided to add another device from a renowned supplier to its existing array of measuring equipment.

This product replaces a number of individual devices such as a pressure calibrator, current loop calibrator, temperature calibrator, a resistance decade, or a frequency generator.

Just reducing the amount of equipment needed to one multifunctional process calibrator that can display and archive a wide range of measured values in a standard calibration certificate saves setup and subsequent costs.

Our range of services

JUMO calibrates and qualifies sensors for temperature, pressure, and liquid analysis as well as the entire measuring chain from the sensor to the automated solution.

On-site calibration makes the detection and evaluation of influencing factors and their inclusion in the measurement result possible.

Advantages for the user:

- Monitoring of the specified regular calibration and maintenance dates by JUMO
- Optimum plant availability
- Improved process reliability
- Reducing the load of internal service personnel
- No costs incurred for qualified testing devices and accessories
- Assessment of faulty devices, including repair or replacement so that the plant is immediately available again

The new calibration device saves setup and subsequent costs for customers.

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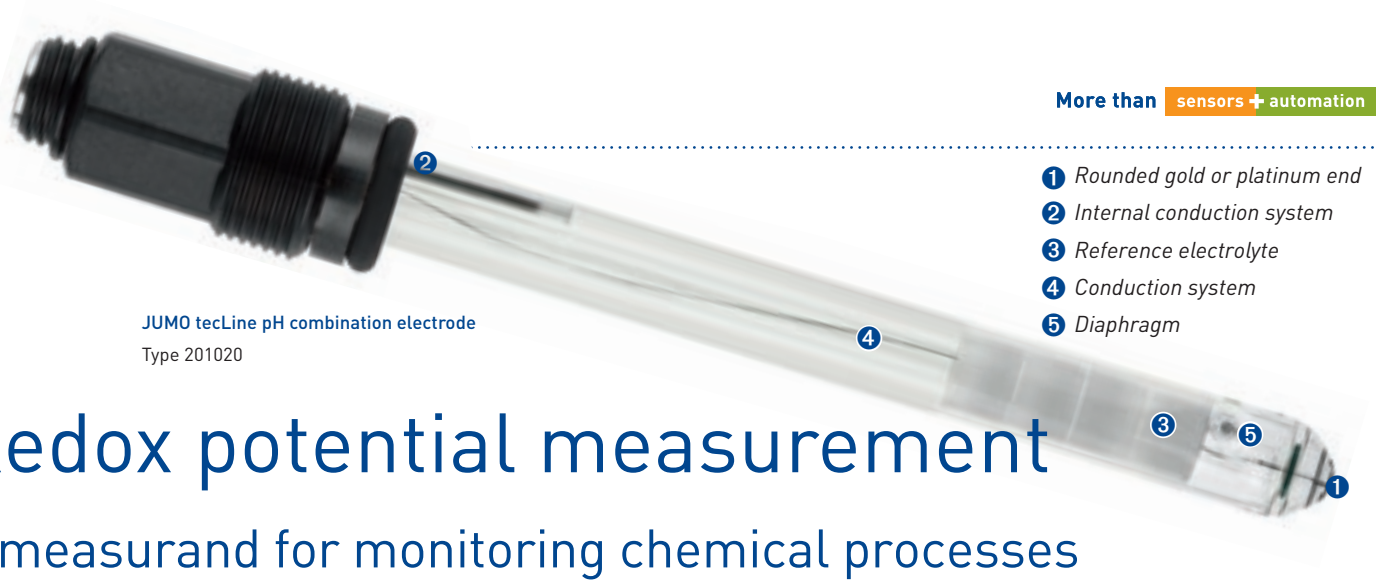

JUMO tecLine pH combination electrode
Type 201020

Redox potential measurement

A measurand for monitoring chemical processes

Redox potential is a commonly occurring measurand for monitoring chemical processes in industrial and municipal wastewater plants as well as in bathing water monitoring facilities.

Redox potential – reduction and oxidation

The redox potential is a measure for the reduction or oxidation potential of chemical reactants such as in liquid media. It describes the degree to which substances are able to absorb or release electrons. The redox potential is measured in mV or V.

A substance that releases electrons is oxidized and the electron-absorbing substance is reduced.

The substance that oxidizes the other substance is referred to as an oxidant. It has the higher redox potential. At the same time, it absorbs electrons and is reduced. Examples for oxidants include oxygen, disinfectants such as chlorine or ozone, peroxide, sulfur, or bleach.

Reducing agents refer to a substance that reduces the other substance. It simultaneously releases electron itself and is oxidized. Its redox potential is lower. Examples for reducing agents include organic substances – such as sugars, fats, and proteins as well as sulfides, nitrogen oxides, and metals – such as zinc and sodium. The redox potential is determined by referencing the redox potential of a substance compared with the redox potential of hydrogen.

Application example – water treatment in a swimming pool

Swimming pool water is chlorinated for disinfection purposes. The concentration of free chlorine allowed according to the requirements for swimming pool and bathing water (DIN 9643) is 0.3 to 0.6 mg/l. In this application, chlorine acts as an oxidant. (Clean water with the specified chlorine concentration has a redox potential of approx. 750 mV). To achieve a sufficient disinfecting effect the redox potential must be 750 mV and higher depending on the pH-value. In this application, organic contamination (dandruff, etc.) acts as a reducing agent and reduces the redox potential of the bathing water. The redox potential is thereby an indicator for the cleanliness and sanitation level of the water. If the redox potential of the water continues to drop despite the filtration and set chlorine concentration then the treatment plant or measuring device must be tested.

Structure of redox combination electrodes

A redox combination electrode includes a measuring and reference system. The measuring system (MS) consists of a rounded gold or platinum end depending on the application. The measuring solution's redox potential occurring at the rounded end is relayed into the internal conduction system. The reference system (BS) consists of a diaphragm, reference electrolyte, and conduction system. The diaphragm establishes the conductive connection between the measuring solution and the reference electrolyte (KCl solution). The reference electrolyte and conduction system create a constant reference potential compared to the metal electrode potential.

Transmitters and controllers

A transmitter is generally required for measuring the redox potential. A redox combination electrode and transmitter are interconnected via a coaxial cable. In addition to signal processing, the transmitters also offer a calibration option.

A number of liquid analysis applications require the measurement of several parameters. The redox potential, chlorine concentration, and pH-value are determined in the described water treatment process. The pH-value must be measured, since, for example, the risk of corrosion increases with insufficient values and the chlorine's disinfection effect drops with excessive pH-values. The JUMO AQUIS touch device series, which also controls the chlorine concentration and the pH-value, is ideal for this application.

Additional information
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